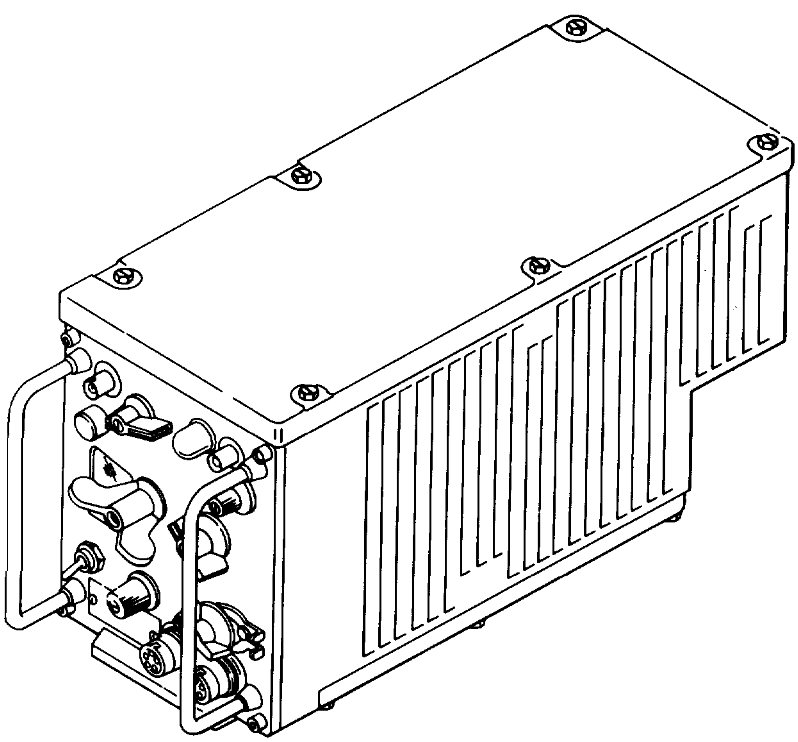
ARMY TM 11-5820-401-34-3
NAVY NAVELEX 0967-LP-432-3060

TECHNICAL MANUAL

DIRECT SUPPORT
AND
GENERAL SUPPORT
MAINTENANCE MANUAL



RADIO SETS
AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-44 (NSN 5820-00-223-7417), AN/VRC-47 (NSN 5820-00-223-7434), AND AN/VRC-48 (NSN 5820-00-223-7435)

RECEIVERS
RADIO R-442/VRC AND R-442A/VRC (NSN 5820-00-892-0624)

DEPARTMENTS OF THE ARMY AND NAVY

16 APRIL 1984

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

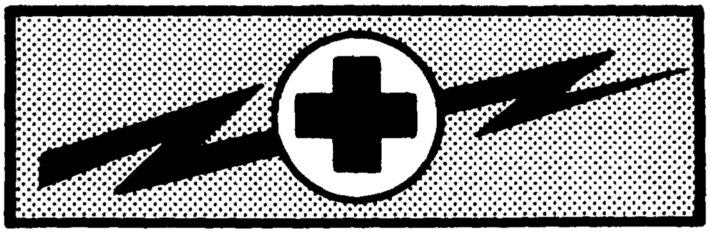
2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING



WARNING

HIGH VOLTAGE

IS USED IN THE OPERATION OF THIS EQUIPMENT

DEATH ON CONTACT

MAY RESULT IF PERSONNEL FAIL TO OBSERVE SAFETY PRECAUTIONS

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNiNG Do not be misled by the term “low voltage”. Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

WARNING

HIGH VOLTAGE

is used in this equipment.

DEATH ON CONTACT

MAY RESULT IF SAFETY PRECAUTIONS

ARE NOT OBSERVED.

Remove all rings, watches and jewelry before turning power on.

Make certain you are not grounded when working inside the equipment with power turned on. Do not attempt internal service or adjustment unless another person is present who is capable of rendering first aid and resuscitation. A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended.

WARNING

TRICHLOROTRIFLUOROETHANE

Fumes of TRICHLOROTRIFLUOROETHANE are poisonous. Provide adequate ventilation whenever you use TRICHLOROTRIFLUOROETHANE. Do not use solvent near heat or open flame. TRICHLOROTRIFLUOROETHANE will not burn, but heat changes the gas into poisonous, irritating fumes. DO NOT breathe the fumes or vapors. TRICHLOROTRIFLUOROETHANE dissolves natural skin oils. DO NOT get the solvent on your skin. Use gloves, sleeves, and an apron which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

TECHNICAL MANUAL
NO. 11-5820 -401-34-3
NAVELEX 0967-LP-432-3060

DEPARTMENTS OF THE ARMY AND NAVY
Washington, DC, 16 April 1984

Direct Support and General Support Maintenance Manual

RADIO SETS: AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-44 (NSN 5820-00-223-7417), AN/VRC-47 (NSN 5820-00-223-7434), AND AN/VRC-48 (NSN 5820-00-223-7435)

RECEIVERS, RADIO R-442/VRC AND R-442A/VRC (NSN 5820-00-892-0624)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. For Navy, mail comments to the Commander, Naval Electronics Systems Command, ATTN: ELEX 8122, Washington, DC 20360. In either case, a reply will be furnished direct to you.

Page

*This manual, together with, TM 11-5820-401-34-2-1/NAVELEX 0967-LP-432-3030, 16 April 1984 and TM 11-5820-401-34-2-2/NAvELEX 0967-LP-432-3060, 16 April 1984 supersedes TB 11-5820-401-34-1/ EE150-JA-MMl-DID/E154RT246, 23 February 1984 and TM 11-5820-401-34-3/NAVELEX 0967-LP-432-3030, 10 May 1976, This manual also supersedes TM 11-5820-401-10 LD-5, LD-6, LD-7, and LD-8, 1 June 1978, and TM 11-5820-401-34 LD-2, September 1976.

HOW TO USE THIS MANUAL

This manual is designed to help you maintain the Receiver, Radio R-442(*)/VRC used in the AN/VRC-12 series radio sets.

The table of contents on the front cover is provided for quick reference to important information. There is also an alphabetical index in the back of the book to help locate specific information.

Measurements in this manual are given in both US standard and metric units.

Read all preliminary information found at the beginning of each procedure. It contains important directions which must be followed to perform the task correctly.

Warning pages are located in the front of this manual. You should learn the warnings before doing maintenance on the equipment.

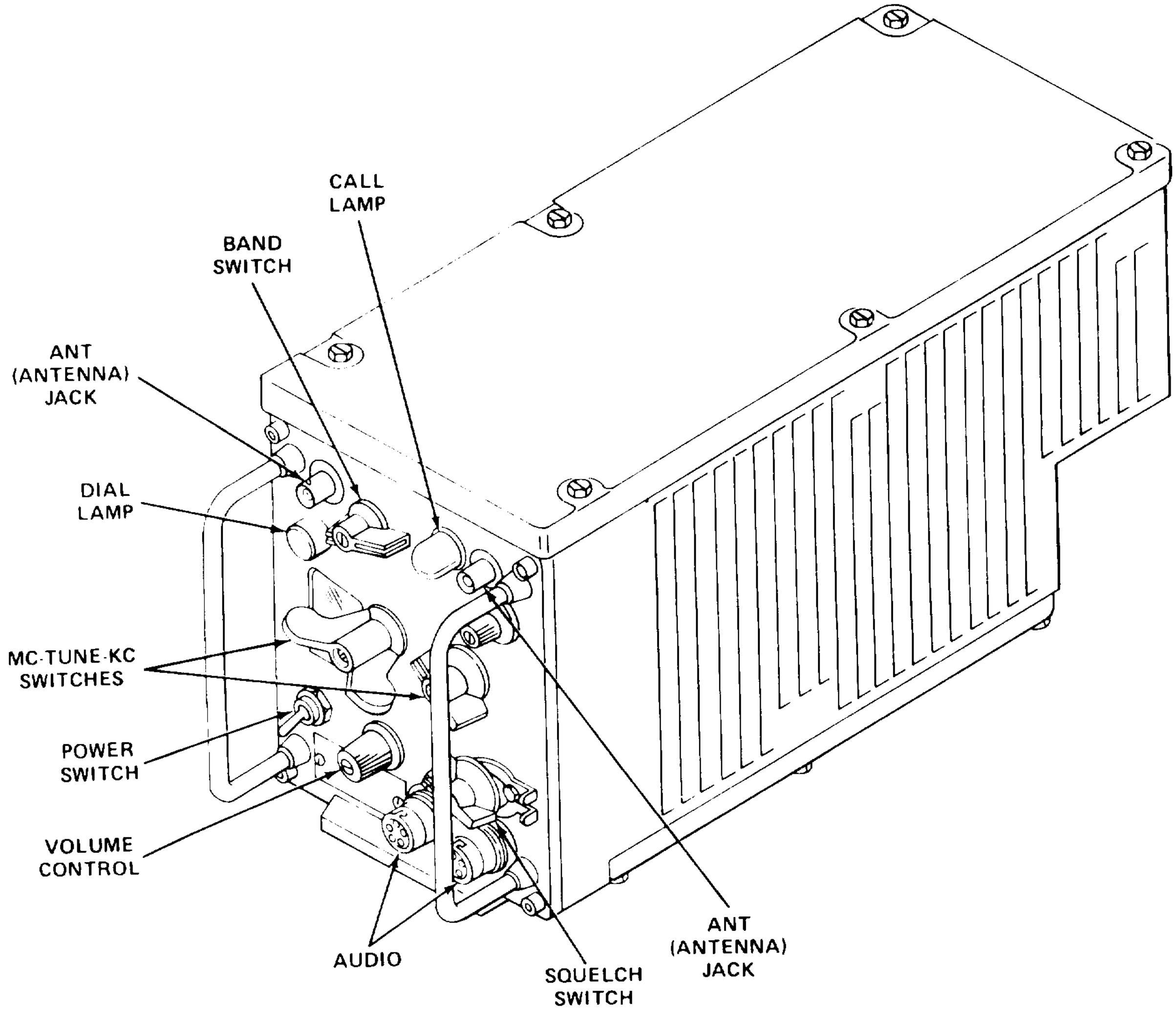
Paragraphs in this manual are numbered by chapter and order of appearance within a chapter. A subject index appears at the beginning of each chapter, breaking the chapter into sections. A more specific subject index is located at the beginning of each section to help you find the exact paragraph you are looking for.

There are three chapters covering direct support performance tests, troubleshooting, and alinement procedures. Each chapter shows how to perform these tasks using a different set of test equipment; that is:

1. Chapter 3 contains performance and troubleshooting procedures, using Maintenance Kit MK-1978/VRC and discrete test equipment (TMDE).
2. Chapter 4 contains performance and troubleshooting procedures, using Test Set AN/GRM-114A.
3. Chapter 5 contains performance and troubleshooting procedures, using Test Cable No. 1 and discrete test equipment (TMDE).

The procedures you follow will depend upon the test equipment at your disposal.

For repair parts and tools required to support direct support and general support maintenance, refer to TM 11-5820-401-34P-3.



RECEIVER R-442(*)/VRC

EL4GQ237

CHAPTER 1

INTRODUCTION

OVERVIEW

This chapter will familiarize you with Receivers, Radio R-442/VRC and R-442A/VRC. It contains general information about the equipment, references to pertinent forms and publications, equipment specifications, and principles of operation.

Section I GENERAL INFORMATION

1-1. SCOPE.

Type of Manual: Direct support and general support maintenance manual,

Equipment Names and Model Numbers: Receivers, Radio R-442/VRC and R-442A/VRC, part of Radio Sets AN/VRC-12, AN/VRC-44, AN/VRC-47, and AN/VRC-48.

Purpose of Equipment: To provide short-range, frequency-modulated (fm) reception on the 30.00- to 75.95-MHZ frequency range.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT

Department of the Army forms and procedures used for equipment maintenance and status will be those prescribed in DA PAM 738-750, the Army Maintenance Management Update.

Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.2, Vol 3 and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790.2, Vol 2, chapter 17.

REPORT OF PACKAGING AND HANDLING DEFICIENCIES

Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed by AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF 361)

Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR-75-18/MCO P4610.19D/DLAR 4500.15.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your AN/VRC-12 series of radio sets needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on SF 368 (Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey, 07703. We'll send you a reply.

Navy personnel are encouraged to submit EIR through their local Beneficial Suggestion Program.

1-5. DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-6. ADMINISTRATIVE STORAGE.

Preventive maintenance, in accordance with PMCS charts, will be performed prior to administrative storage of equipment issued to and used by Army activities. When removing the equipment from administrative storage, the PMCS shall be performed to insure operational readiness. Refer to TM 11-5820-401 -20-1 and TM 11-5820 -401-20-2 for PMCS.

Administrative storage of equipment shall be done in accordance with TM 740-90-1.

Repacking of equipment for storage on shipment is covered in TM 11-5820-401-20-1 and TM 11-5820-401-20-2.

1-7. NOMENCLATURE CROSS-REFERENCE LIST.

NOTE

When (*) follows equipment nomenclature, all models are represented. R-442(*)/VRC, for example, covers both Receivers, Radio R-442/VRC and R-442A/VRC.

This list contains common names used throughout this manual in place of official nomenclature.

Common Name	Official Nomenclature
AN/VRC-12 series radio sets	AN/VRC-12, AN/VRC-43, AN/VRC-44, AN/VRC-45, AN/VRC-46, AN/VRC-47, AN/VRC-48, and AN/VRC-49
frequency counter	Frequency Counter AN/USM-207
handset	Handset H-250/U
loudspeaker or speaker	Loudspeaker LS-454/U
microphone	Microphone Dynamic M-80/U
port	jack or connector
receiver	Receiver, Radio R.442(*)/VRC
T-connector	Adapter UG-274/U
wattmeter	Wattmeter AN/URM-120

Section II EQUIPMENT DESCRIPTION AND DATA

1-8. GENERAL.

This section contains overall information about the R-442(*)/VRC. It includes references to publications that provide detailed equipment description and data, coverage of major differences between models, and a summary of warnings, cautions, and general handling procedures.

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

Equipment characteristics, capabilities, and features of the R-442(*)/VRC are found in TM 11-5820-401-20-1 and TM 11-5820-401-20-2.

1-10. EQUIPMENT DATA.

The following publications cover R-442(*)/VRC equipment data:

1. TM 11-5820 -401-10-1
2. TM 11-5820-401 -10-2
3. TM 11-5820-401 -20-1
4. TM 11-5820-401 -20-2

1-11. DIFFERENCES BETWEEN MODELS/SILICON VERSIONS.

This paragraph contains information covering redesigned R-442(*)/VRC modules using silicon semiconductors in lieu of germanium devices. For details of model differences affecting operation (controls, pushbutton tuning, etc) refer to TM 11-5820-401-10-1.

Silicon modules are considered to be throw away items, however all silicon modules replaced shall be returned to depot for final disposition.

MODULES CONTAINING SILICON SEMICONDUCTORS

Modules equipped with silicon semiconductors are identified by the suffix letter A. For example, A5200A denotes a silicon version squelch amplifier. The A5200 is the germanium version of the same module.

It is possible that radios in field use might be equipped with a combination of germanium and silicon modules.

Receiver Silicon Modules

A1400A mixer assembly
A1500A local oscillator
A1600A tuner power supply
A2000A CRS oscillators
A2100A voltage regulator
A3100A CRS harmonic generator
A3200A CRS balanced mixer
A3300A CRS second mixer
A3400A CRS first and second IF amps
A3500A CRS limiter
A3600A CRS hunt discriminator
A3700A CRS phase discriminator
A4100A first and second IF amps
A4200A IF amps and limiter
A4300A audio and squelch preamp
A5100A audio amplifier
A5200A squelch amplifier
A5300A squelch filter

INTERCHANGEABILITY OF MODULES

Germanium and silicon modules may be used together in the same radio with the following exceptions.

Squelch Amplifier A5200(*) and Squelch Filter A5300(*)

The germanium version of the squelch amplifier must not be used with the silicon version of the squelch filter, nor can the silicon squelch amplifier be used with the germanium squelch filter.

Any individual radio must be equipped with either an A5200 and A5300 or an A5200A and A5300A in matched pairs.

ALINEMENT DIFFERENCES

With the following exceptions, there is no difference in germanium and silicon version alinement procedures.

1-11. **DIFFERENCES BETWEEN MODELS/SILICON VERSIONS.** (CONT)

IF Amplifiers A4200(*) and Audio/Squelch Preamp A4300(*)

The A4200A uses an integrated circuit quadrature-type fm demodulator in place of the Travis-type discriminator used in the A4200. Therefore, only one coil (L4202) requires peaking, and no dc offset voltage is present at TP4003. Since the A4200A demodulator's output is only 53 millivolts minimum compared to 100 millivolts minimum for the germanium version, readjustment of the Squelch Preamplifier A4300(*) is necessary when an A4200A is used to replace an A4200.

Squelch Amplifier A5200(*) and Squelch Filter A5300(*)

The silicon versions of these two modules differ from the germanium versions in operating levels and ac feedback. An integrated circuit dual differential amplifier is used as a squelch amplifier, tone detector, and voltage comparator.

A separate relay driver circuit is provided to operate K5002, eliminating this relay's effect on squelch adjustment with temperature changes and age.

The amplifier gain between TP5012 and TP5008 is minimal, but independent of the frequency setting of A5300A. Therefore, offsetting the squelch filter to achieve the required gain is not required.

1-12. SAFETY, CARE, AND HANDLING.

WARNING

High voltage is used in this equipment. Death on contact may result if safety precautions are not observed.

Remove all rings, watches and jewelry before turning power on.

Make certain you are not grounded when working inside the equipment with power turned on. Do not attempt internal service or adjustment unless another person is present who is capable of rendering first aid and resuscitation. A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended.

Fumes of TRICHLOROTRIFLUOROETHAN E are poisonous. Provide adequate ventilation whenever you use TRICHLOROTRIFLUOROETHAN E. Do not use solvent near heat or open flame. TRICHLOROTRIFLUOROETHAN E will not burn, but heat changes the gas into poisonous, irritating fumes. DO NOT breathe the fumes or vapors. TRICHLOROTRIFLUOROETHANE dissolves natural skin oils. DO NOT get the solvent on your skin. Use gloves, sleeves, and an apron which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Section III PRINCIPLES OF OPERATION

1-13. GENERAL.

This section contains information covering principles of operation of the major electronic assembles of R-442/VRC. The material is presented in functional block diagram format, with supporting text which explains the operation of each electronic module in the radio.

Details pertaining to the operation of most individual components in each module are not discussed in this section. Instead, the text is intended to explain the overall effect each module has on an incoming signal, and how the module contributes to the operation of the radio. individual circuit details can be found in the foldouts in the back of this manual.

At the DS/GS level of maintenance, electronic components within radio modules are not replaced. Because of this maintenance approach, this section generally does not discuss the performance of specific circuits and components such as diodes, transistors, etc. In fact, it is not necessary to understand how the circuits in a module operate to effectively troubleshoot or aline it. However, it is very important to know what a module actually does in order to perform signal checks attest points for the purpose obtesting, troubleshooting, or alining the module.

1-14. RECEIVER SIGNAL PATH.

A system block diagram showing receiver signal flow can be found in FO-10 in the back of this manual. Refer to the foldout while reading the text in this paragraph.

Frequency-modulated rf signals are applied to the antenna tuning and protection circuits in the A1100 module (1) of the receiver's vhf section. The A1100 module passes signals of the frequency to which the receiver is tuned, and rejects another frequencies.

1-14. RECEIVER SIGNAL PATH. (CONT)

Very low amplitude rf is applied to the first rf Amplifier A1200 module (2) which provides the first stage of amplification. A second stage of amplification is provided by the second rf Amplifier A1300 module (3).

Amplified rf is then applied to the Mixer A1400 module (4), where the signals are heterodyned (mixed) with the output of the local oscillator (5) in the A1500 module. For all MC-TUNE-KC settings in the (A) band range, the local oscillator runs exactly 11.5 MHz above the frequency to which the receiver A1100 module (1) is tuned. For all MC-TUNE-KC settings in the (B) band range, the local oscillator runs exactly 11.5 MHz below the receiver's tuned frequency.

The A1400 module (4) produces sum and difference frequencies as a result of the mixing process. All frequencies, except the 11.5-MHz intermediate frequency, are rejected by the 11.5-MHz Crystal Filter FL4001 (6).

The intermediate frequency (if) is amplified by the first and second IF Amplifier A4100 module (7), filtered by FL4002 (8) to eliminate any unwanted frequencies, and further amplified by the third and fourth IF amplifiers in the A4200 module (9).

In the fifth IF Amplifier and Limiter A4200 (10), the 11.5-MHz rf is again amplified and if noise spikes are clipped. The limiter clips noise, that is, excessive amplitude, from the if to prevent distortion in the demodulated audio output of the Travis-type discriminator. Both positive and negative spikes are clipped, keeping the if amplitude constant. Several if amplification stages are used to insure that the signals applied to the limiter are strong enough to reach the limiter's minimum clipping amplitude. If the signals applied to the limiter are too low in amplitude, the limiter cannot clip the upper and lower wave peaks; therefore, the if applied to the discriminator can vary in amplitude, resulting in distorted audio.

SILICON VERSION THIRD IF AMPLIFIER/LIMITER/DISCRIMINATOR A4200A

The silicon version of the A4200 module contains silicon, instead of germanium transistors. Discrete fourth and fifth if amplifier stages are not required because an integrated circuit quadrature detector is used which incorporates amplification, limiting, and discriminating stages. The quadrature detector also simplifies alinement.

Demodulated audio output from the discriminator is applied to Audio and Squelch Preamplifier A4300 (12) for initial amplification. The A4300's output is fed to Audio Filter FL5001 (13), and by a parallel circuit to Squelch Amplifier A5200 (14). However, in the OFF positions of the front panel SQUELCH switch, the squelch amplifiers and related circuits are essentially inoperative. The reason for this is as follows:

Audio signals are amplified by the Monitor Amplifier A5100 (15), whose output is not volume controlled, and by Audio Amplifier A5100 (16), the output of which is determined by the position of the VOLUME control. Both amplifiers require 16 vdc to operate. In the OFF position of the SQUELCH switch, the amplifiers get their 16-vdc power directly from the SQUELCH switch (17); therefore, the amplifiers operate independent of the squelch circuits. The squelch function is covered in greater detail in paragraph 1-30.

Output from the audio amplifier (16) is applied to Audio Transformer T5100 (18) which provides unmuted audio, and muted audio through Muting Circuit R5117 (19).

1-15. LOCAL OSCILLATOR AFC/CRYSTAL REFERENCE SYSTEM.

Correct operation of the receiver depends on a very precisely controlled local oscillator whose frequency is maintained with minimal variation. At any frequency selected by the MC-TUNE-KC control, the local oscillator is held to a tolerance of ± 3.5 kHz by the action of the crystal reference system. Therefore, the crystal reference system (CRS) functions as an automatic frequency control (AFC) loop.

A system block diagram showing CRS signal flow can be found on F0-11 in the back of this manual. Refer to the foldout while reading the text in this paragraph.

The local oscillator's (1) output is applied to a high-pass Filter FL3002 (2) and then to Balanced Mixer A3200 (3). At the same time, 12 frequencies (ie, 1 to 12 MHz), are applied to the balanced mixer from the crystal-controlled Harmonic Generator A3100 (4).

The inputs to the balanced mixer are heterodyned, thereby producing 12 sum and difference frequencies. Two frequencies closest to 53 MHz are passed by band-pass Filter FL3003 (5), while other signals are attenuated. The two accepted frequencies are then applied to the CRS Second Mixer A3300 (6), and heterodyned with the output of the interpolation oscillator (7).

Within the interpolation oscillator (Crystal Switch A2000) are ten crystals. Each crystal corresponds to a group of frequencies tunable by the MC-TUNE-KC control. When a frequency is selected, the radio's gear train also selects one of ten crystals, which precisely controls the frequency of the interpolation oscillator.

The heterodyning process in the CRS Second Mixer A3300 (6) produces sum and difference frequencies. Two of the difference frequencies are very close to 5.625 MHz. The frequency closest to 5.625 MHz is coupled across a 5.625-MHz tuned tank contained within the second mixer, to the first and second IF Amplifiers A3400 (7). Other frequencies are greatly attenuated by the resonant tank circuit.

After amplification, the IF signals are filtered by FL3004 (9), which is sufficiently selective to attenuate any unwanted frequencies. The third IF Amplifier and Limiter A3500 (10) functions in a manner similar to that described in paragraph 1-26, covering the Amplifier and Limiter A4200 stages.

Output from the A3500 (10) is applied to the phase discriminator and hunt generator at the same time to coarse tune, and then fine tune the local oscillator.

COARSE TUNING THE LOCAL OSCILLATOR

The A3500's output is applied to band-pass Filter FL3005 (11) to attenuate any unwanted frequencies which may have passed through the limiter. From the filter, the signals are applied to the Hunt Discriminator A3600 (12).

The hunt discriminator contains a triple-tuned Travis-type discriminator similar to the one used in the A4200 module described in paragraph 1-26. Large deviations away from the discriminator's 5.625-MHz center frequency cause the discriminator to output a plus or minus dc signal with an ac component riding on it.

Both the dc and ac outputs are applied to the damping network (13), wherein the ac component is damped or attenuated. From the damping network, a positive or negative dc error signal is applied to the local oscillator (1). The error signal biases the local oscillator close to correct frequency by a hunting action, that is, an initial large dc error signal followed by smaller error signal voltages until the oscillator is close enough to its correct frequency for the phase discriminator to begin fine tuning.

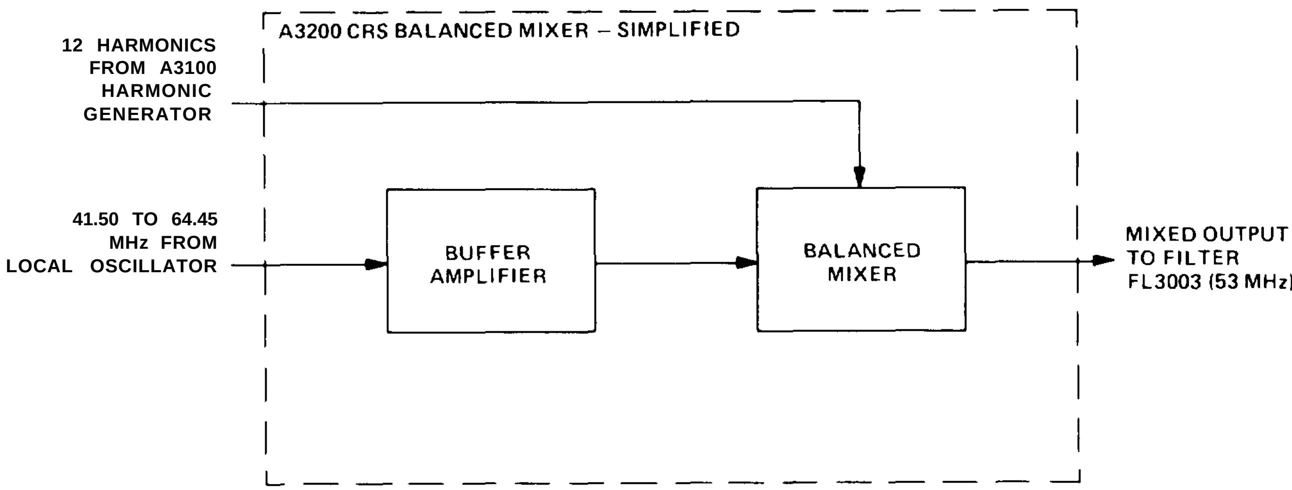
1-15. LOCAL OSCILLATOR AFC/CRYSTAL REFERENCE SYSTEM. (CONT)

The hunt discriminator can coarse tune the local oscillator when its frequency error is within ± 400 kHz.

FINE TUNING THE LOCAL OSCILLATOR

The hunt discriminator is sensitive to large errors in local oscillator frequency, while the phase discriminator (14) responds to small errors. The phase discriminator compares the fixed output of the reference oscillator (15) with the variable output of the limiter (10). When the two input signals are of unequal frequency (due to incorrect local oscillator frequency), the phase difference causes the phase discriminator to output a dc error voltage which is applied to the local oscillator to bias it into correct frequency operation.

1-16. CRS BALANCED MIXER A3200.



EL4GQ191

The balanced mixer accepts inputs from the following two sources:

1. The local oscillator through the high-pass Filter FL3002.
2. The harmonic generator.

Local oscillator signals are applied to the mixer through a buffer amplifier to prevent loading down the local oscillator. Twelve frequencies, 1 to 12 MHz, are applied to the mixer along with the local oscillator's output. The signals are heterodyned to produce four strong mixed output frequencies.

BALANCED MIXER OPERATING EXAMPLE

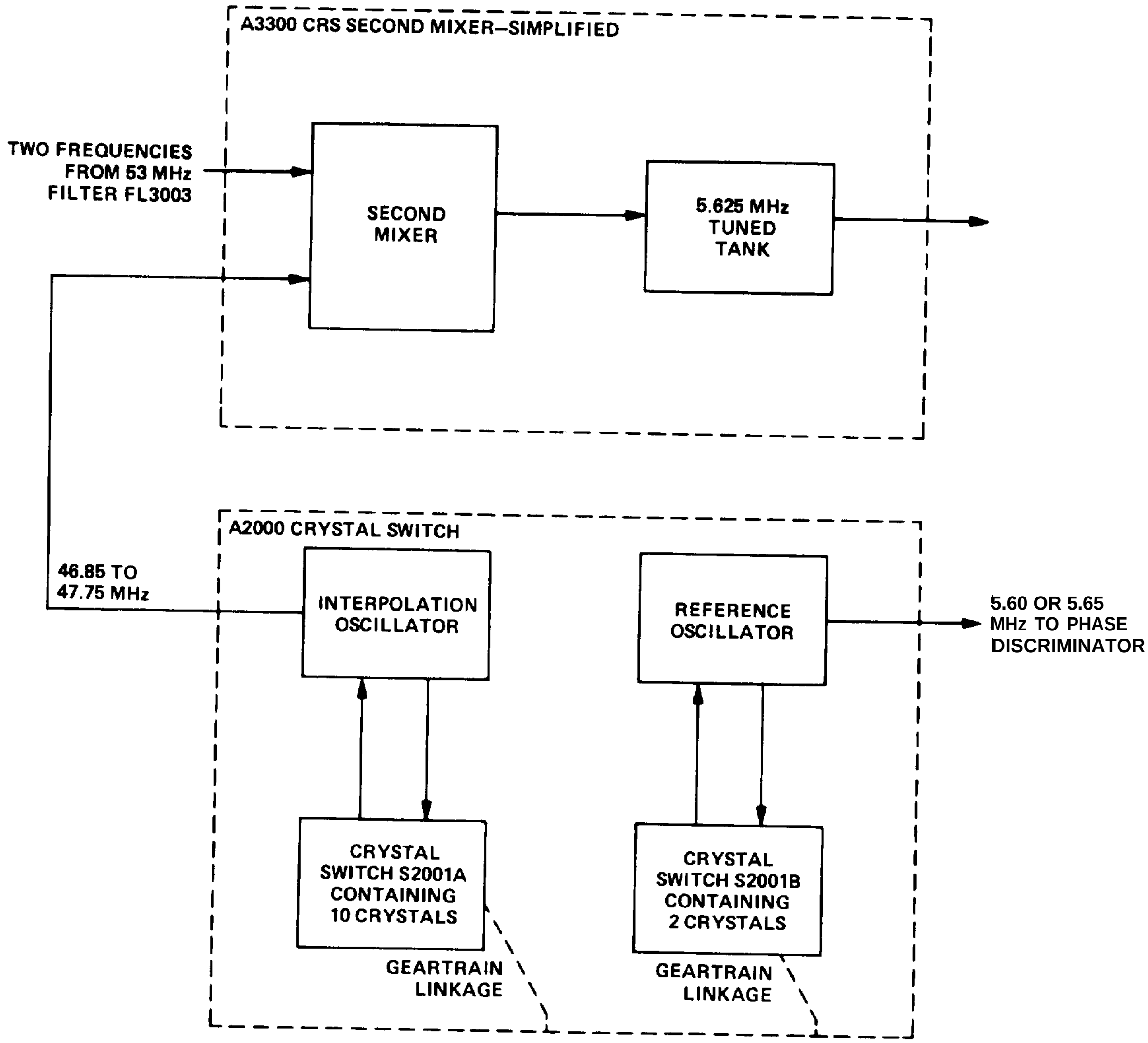
Assume that the radio is tuned to 30 MHz, in which case the local oscillator runs at 41.50 MHz. The 41.50-MHz frequency is mixed with 12 signals generated by the harmonic generator, producing mixed output containing each of the 12 harmonics, the local oscillator frequency, and sum and difference frequencies listed below.

1-16. CRS BALANCED MIXER A3200. (CONT)

LOCAL OSCILLATOR FREQUENCY	HARMONIC GENERATOR FREQUENCY	SUM	DIFFERENCE
41.50	1 MHz	42.50 MHz	40.50 MHz
41.50	2 MHZ	43.50 MHZ	39.50 MHz
41.50	3 MHZ	44.50 MHZ	38.50 MHz
41.50	4 MHZ	45.50 MHZ	37.50 MHz
41.50	5 MHZ	46.50 MHz	36.50 MHz
41.50	6 MHZ	47.50 MHz	35.50 MHz
41.50	7 MHZ	48.50 MHz	34.50 MHz
41.50	8 MHZ	49.50 MHz	33.50 MHz
41.50	9 MHZ	50.50 MHz	32,50 MHz
41.50	10 MHz	51.50 MHz	31.50 MHz
41.50	11 MHz	52.50 MHz	30.50 MHz
41.50	12 MHZ	53.50 MHz	29.50 MHz

Since the output of the balanced mixer is applied to a 53-MHz filter (FL3003), only two of the frequencies listed are close enough to the filter's band pass to reach the next CRS module without substantial attenuation. These two frequencies are 52.50 and 53.50 MHz, which are applied to the second mixer.

1-17. CRS SECOND MIXER A3300 AND CRYSTAL SWITCH A2000.



EL4GQ192

SECOND MIXER

The second mixer performs a signal heterodyning function, mixing the output of the 53-MHz filter with a frequency from the interpolation oscillator.

Within the mixer module is a tuned tank circuit which couples the mixer's output to the first and second IF Amplifiers A3400. The tank circuit is tuned to resonate at 5.625 MHz, so that frequencies near 5.625 MHz are coupled while frequencies below and above the tank's half-power points are severely attenuated.

1-17. CRS SECOND MIXER A3300 AND CRYSTAL SWITCH A2000. (CONT)

CRYSTAL SWITCH A2000

The A2000 assembly contains two crystal controlled oscillators: the interpolation oscillator and the reference oscillator. The reference oscillator is discussed in paragraph 1-15.

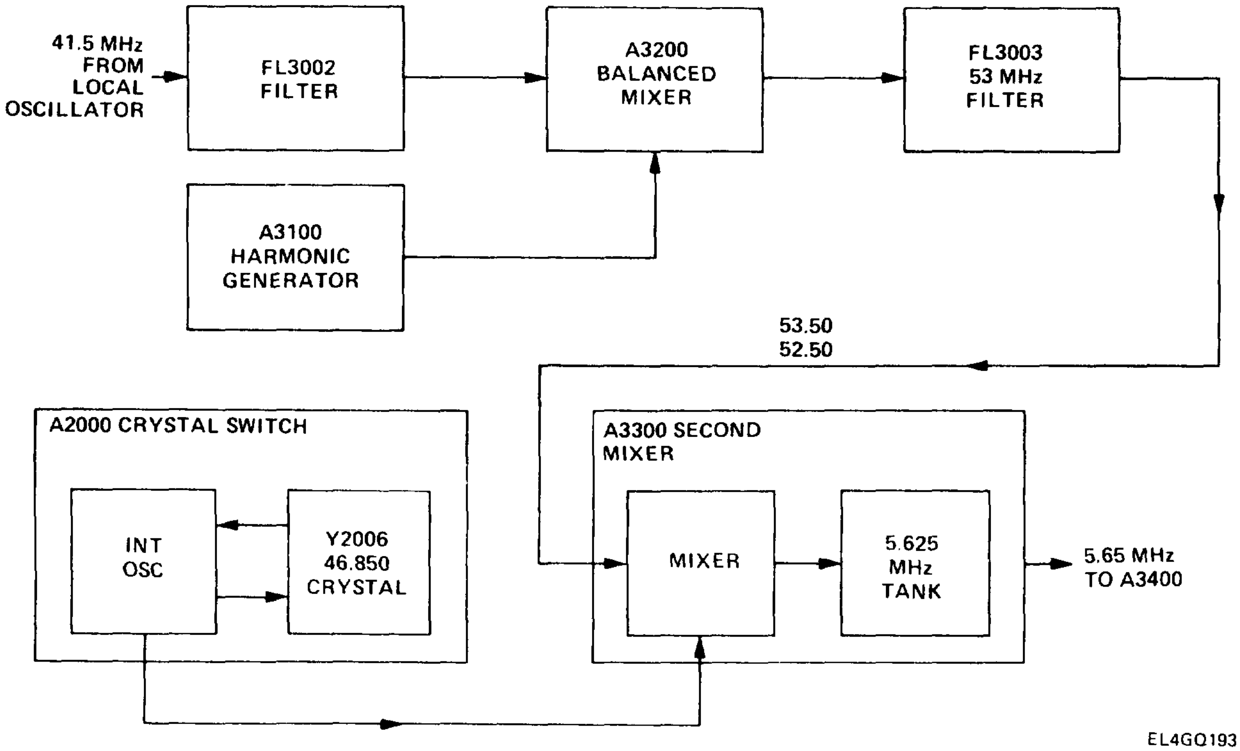
The interpolation oscillator's output frequency is controlled by one of ten possible crystals which are selected by a switch through the action of the radio's gear train. Each crystal corresponds to two positions of the radio's KC control, out of the 20 possible 50-kHz increments that can be selected between whole-numbered frequencies. For example, in tuning from 30 to 31 MHz, the KC control selects frequencies of 30.05, 30.10, 30.15, 30.20, 30.25, etc. The first two steps (ie, 30.05 and 30. 10) correspond to a particular crystal in the crystal switch. The next two steps (ie, 30.15 and 30.20) have a different corresponding crystal. This pattern repeats itself until all ten crystals have been individually selected. When the MC-TUNE-KC control reaches 31.00 MHz, the same crystal is selected as was used for 30.00 MHz.

The following table lists the ten pairs of radio dial frequencies between each whole-number setting, the number of the corresponding crystal, and the interpolation oscillator's frequency when that particular crystal is selected.

RADIO DIAL KC FREQUENCY	CRYSTAL NUMBER	OSCILLATOR FREQUENCY
.05 or .10	Y2007	46.950 MHz
.15 or .20	Y2008	47.050 MHz
.25 or .30	Y2009	47.150 MHz
.35 or .40	Y2010	47.250 MHz
.45 or .50	Y2005	47.350 MHz
55 or .60	Y2004	47.450 MHz
,55 or .70	Y2003	47.550 MHz
.75 or .80	Y2002	47.650 MHz
.85 or .90	Y2001	47.750 MHz
.95 or .00	Y2006	46.850 MHz

1-17. CRS SECOND MIXER A3300 AND CRYSTAL SWITCH A2000. (CONT)

SECOND MIXER AND CRYSTAL SWITCH OPERATING EXAMPLE



Radio MC-TUNE-KC Control Set to 30.00 MHz

Two strong frequencies enter the second mixer from the 53-MHz filter: 53.50 and 52.50 MHz. These signals are heterodyned with the output from the interpolation oscillator.

With the radio tuned to 30.00 MHz, the Y2006 crystal is selected. This crystal sets the interpolation oscillator's output at 46.850 MHz. When 46.850 MHz is mixed with 53.50 and 52,50 MHz, several strong frequencies are produced. However, the difference frequencies are closest to the 5.625-MHz resonant frequency of the A3300 tank circuit.

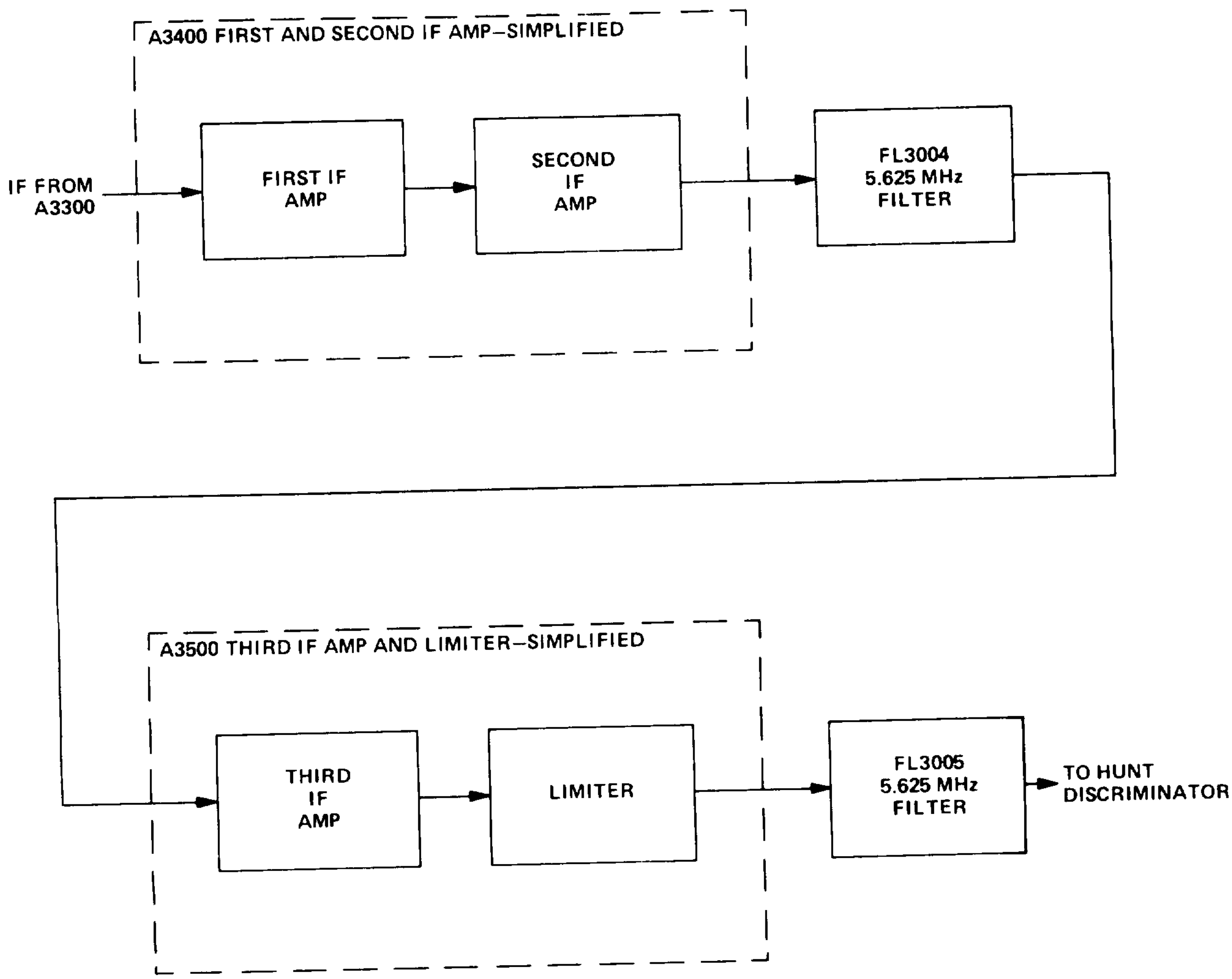
The two difference frequencies are produced as follows:

$$\begin{array}{r} 53.500 \\ -\ \underline{46.850} \\ 6.650 \end{array} \qquad\qquad \begin{array}{r} 52.500 \\ -\ \underline{46.850} \\ 5.650 \end{array}$$

Of the two difference frequencies, 5.650 MHz is coupled across the tank to the next module. The other frequency, 6.650, is beyond the tank's bandwidth and, therefore, is attenuated.

The example presented assumes that the local oscillator is running exactly at its correct frequency. In this case, exactly 5.65 MHz is passed by the second mixer's tank circuit. However, if the local oscillator is running above or below 41.5 MHz when the radio is tuned to 30.00 MHz, the heterodyning occuring in the A3200 mixer and in the A3300 second mixer causes the second mixer to output a signal that differs from 5.65 MHz by the amount the local oscillator differs from 41.5 MHz. When the second mixer's output is not exactly 5.65 MHz, an error signal is generated to correct the local oscillator.

1-18. CRS FIRST AND SECOND IF AMP A3400/CRS THIRD IF AMP AND LIMITER A3500.



EL4G0194

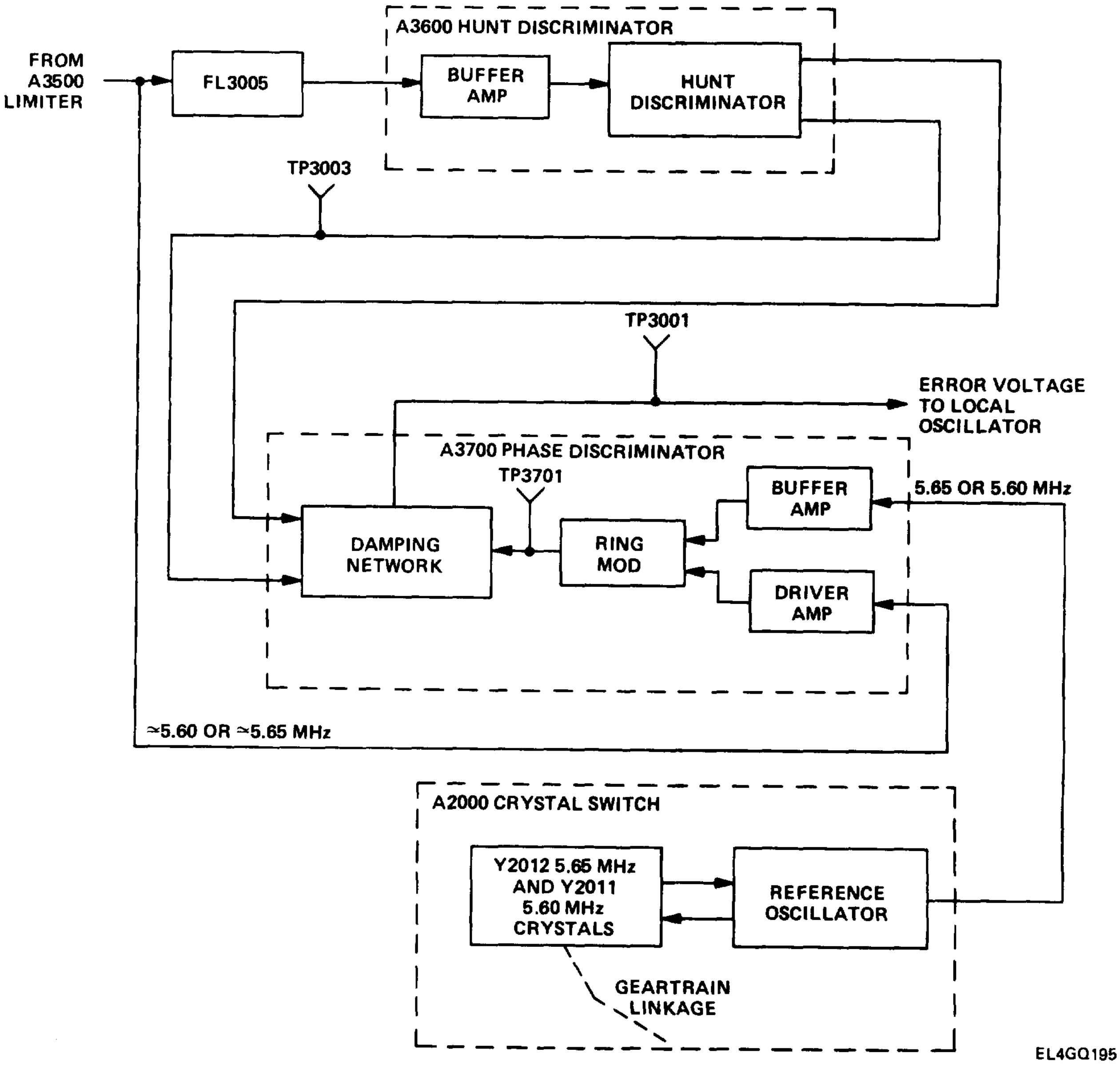
An intermediate frequency from the second mixer is applied to the first if amplifier. The intermediate frequency is approximately 5.65 MHz for all front panel KC control settings which are even, such as 30.00, 30.10, 30.20, etc. An if of approximately 5.60 MHz is applied to the first if amplifier for all odd KC control settings, such as 30.05, 30.15, 30.25, etc. The if inputs are given as approximations because they vary in response to the local oscillator's frequency error.

Further amplification is provided by the second if amplifier, after which the signal is passed through Filter FL3004. The filter's band pass is narrow, and, therefore, causes attenuation of any frequencies other than the if which might pass through the A3400.

1-18. CRS FIRST AND SECOND IF AMP A3400/CRS THIRD IF AMP AND LIMITER A3500. (CONT)

The third IF amplifier increases signal strength sufficiently to drive the limiter. The limiter clips the upper and lower peaks of the if to maintain the constant amplitude required by the Travis-type discriminator in the Hunt Discriminator A3600. Filter FL3005 provides additional attenuation of all signals other than the if input.

1-19. CRS HUNT DISCRIMINATOR A3600, CRS PHASE DISCRIMINATOR A3700, AND REFERENCE OSCILLATOR A2000.



HUNT DISCRIMINATOR A3600

If signals with a frequency of approximately 5.60 or 5.65 MHz are applied to the Buffer Amplifier A3600, which prevents loading down the limiter. The buffer amplifier's output is then fed to the Travis-type hunt discriminator.

1-19. CRS HUNT DISCRIMINATOR A3600, CRS PHASE DISCRIMINATOR A3700, AND REFERENCE OSCILLATOR A2000. (CONT)

The hunt discriminator is tuned to a 5.625-MHz center frequency. Therefore, it will generate output signals when its if input is substantially under or over 5.625 MHz, which condition corresponds to a large local oscillator error.

The hunt discriminator generates two kinds of signals, one of which is applied to the local oscillator through the damping network to coarse tune the oscillator. When the local oscillator is far off frequency (eg, - 250 kHz), as it could be when changing channels, the hunt discriminator outputs a negative dc voltage. This voltage can be measured at TP3003 with a dc voltmeter. When changing channels, the local oscillator could be off frequency by some positive number of cycles, in which case a positive voltage could be measured at TP3003. The plus or minus dc signal is applied to the local oscillator as an error voltage, which corrects the local oscillator's frequency. Therefore, the dc voltage at TP3003 is only momentary (ie, it disappears when the local oscillator approaches the correct frequency).

Besides the dc error voltage, the hunt discriminator outputs an ac signal riding on the dc level. This occurs because the local oscillator can drift around its steady state tuned frequency. The rate of drift produces an ac from the hunt discriminator at the oscillator's drift rate. However, this ac component is almost completely attenuated in the phase discriminator's damping network, and therefore has no effect on the local oscillator.

The hunt discriminator is capable of outputting an error signal as great as ± 2.6 vdc measured at TP3001 when a ground is applied to TP3701 (shorting the phase discriminator's output), and the local oscillator is running ± 350 kHz off frequency. The strong dc output from the hunt discriminator rapidly biases the local oscillator to within approximately 100 kHz of its correct frequency. Once the local oscillator is running ± 100 kHz from center frequency, the hunt discriminator is not sensitive enough to fine tune the oscillator further. At this point, the phase discriminator begins to take control.

PHASE DISCRIMINATOR

The Phase Discriminator A3700 contains a ring modulator. It compares the phase of the signals from the Buffer and Driver Amplifiers A3700, and outputs a dc error voltage when a phase difference exists. An ac component will ride the dc level due to oscillator drift, but the ac is attenuated in the damping network and, therefore, is not measurable at TP3001.

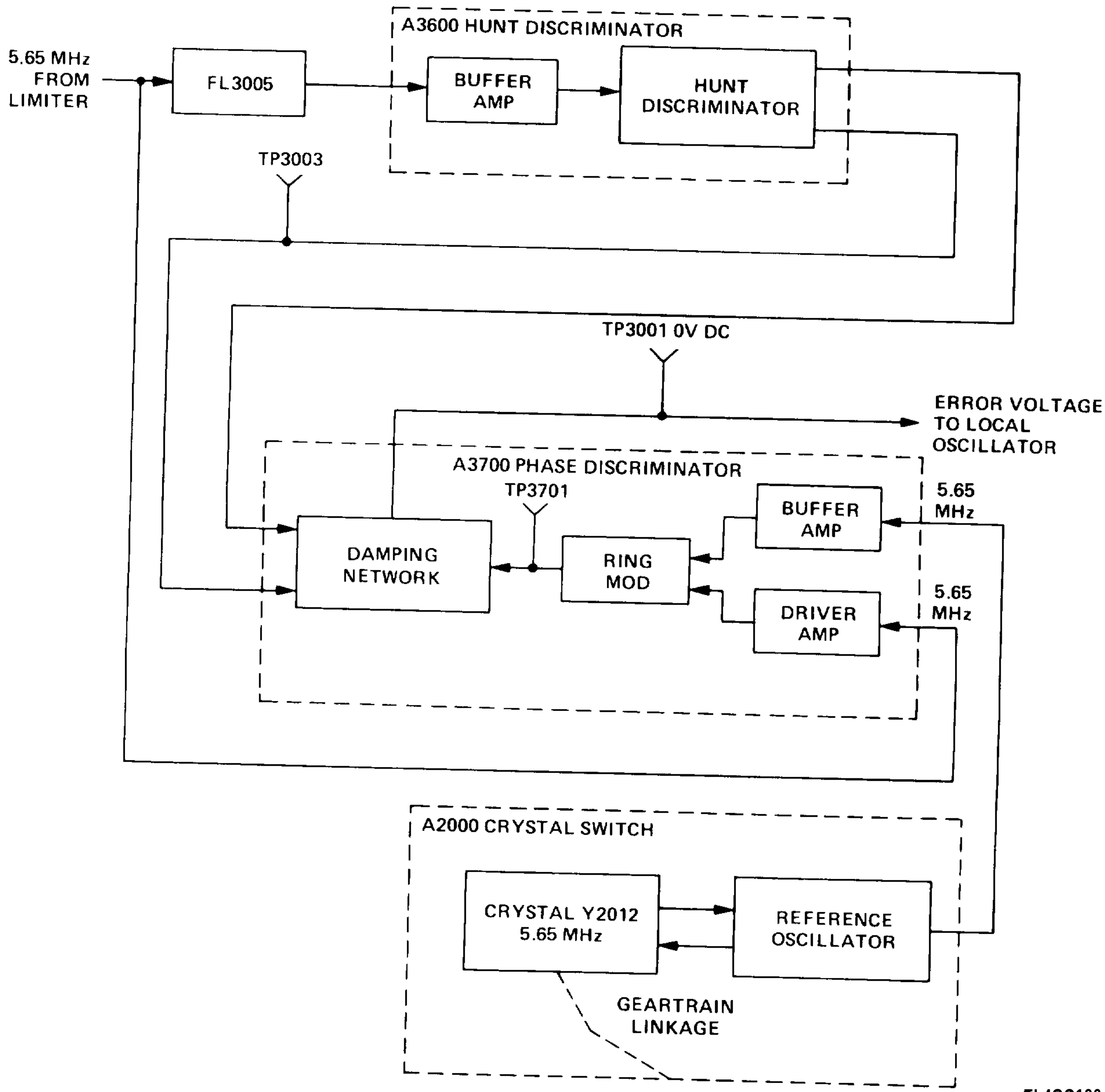
Once the hunt discriminator forces the local oscillator close to its correct frequency, the phase discriminator maintains a ± 3.5 kHz oscillator tolerance. Because of its sensitivity to small errors in oscillator frequency, the phase discriminator performs a fine tuning function.

REFERENCE OSCILLATOR

Output of the reference oscillator is controlled by one of two crystals: a 5.60-MHz crystal and another at 5.65 MHz. The crystals are selected by a switch through the action of the radio's gear train. The switch contains contacts that correspond to the 20 possible 50-kHz increments that can be selected between whole-numbered frequencies. All frequencies whose KC digits end in zero utilize the 5.65-MHz crystal. For example, the rotary switch selects the 5.65 crystal for 30.00,30.10,30.20,30.30 MHz, etc. KC frequencies ending in five use the 5.60 crystal (eg, 30.05,30.15,30.25 MHz, etc).

1-19. CRS HUNT DISCRIMINATOR A3600, CRS PHASE DISCRIMINATOR A3700, AND REFERENCE OSCILLATOR A2000. (CONT)

HUNT DISCRIMINATOR, PHASE DISCRIMINATOR; REFERENCE OSCILLATOR - WORKING EXAMPLE - LOCAL OSCILLATOR AT CORRECT FREQUENCY



If the radio is set to 30.00 MHz, the local oscillator runs at 41.50 MHz, assuming that it is properly alined. In this case, the output of the limiter is 5.65 MHz.

When 5.65 MHz is applied to the hunt discriminator through the buffer amplifier, no dc signal is fed from the hunt discriminator to the damping network. Therefore, no dc voltage will be present at TP3001 due to hunt discriminator action.

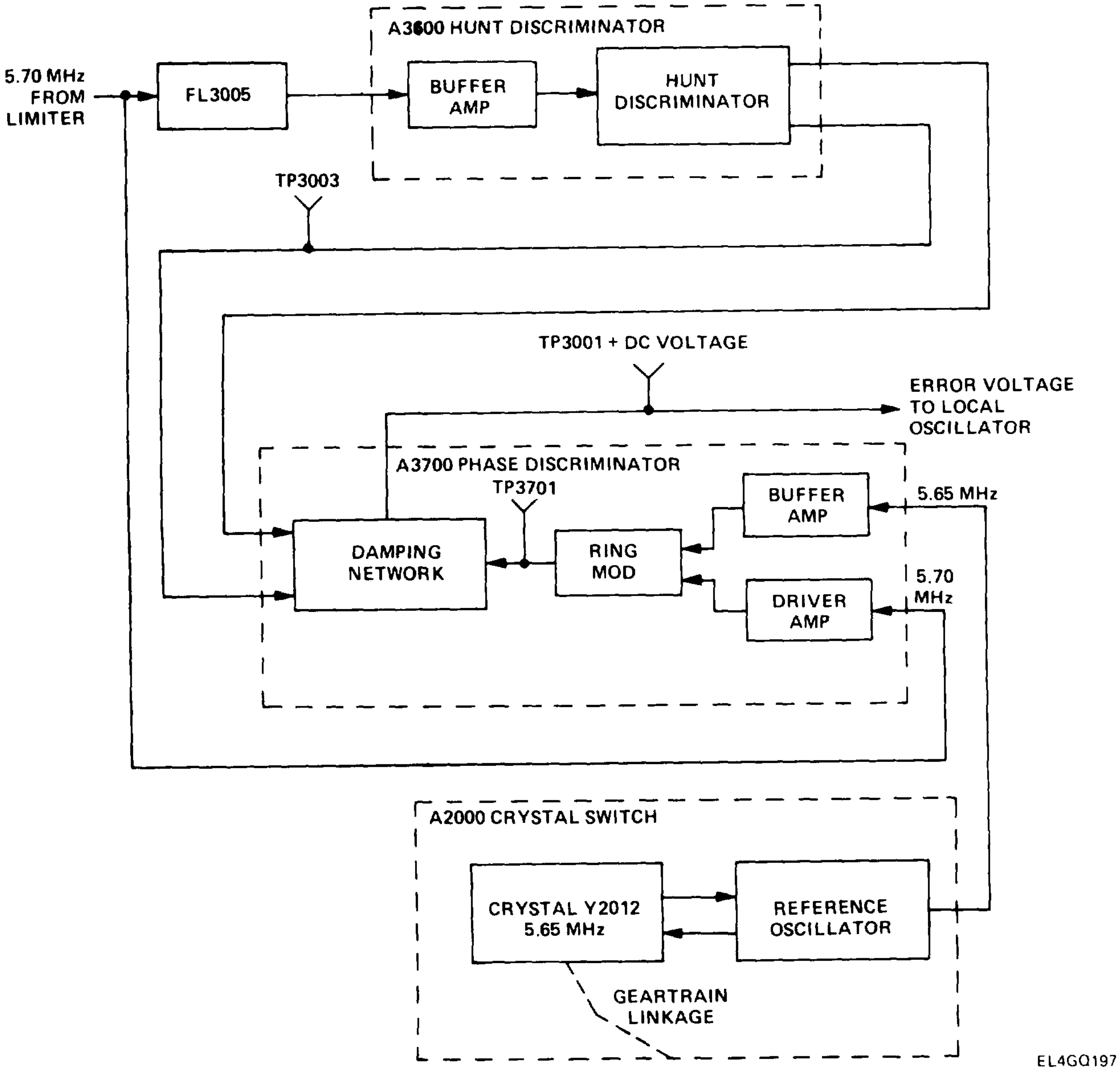
The same 5.65-MHz signal applied to the hunt discriminator is fed to the driver amplifier in the phase discriminator module, This frequency is compared with the output of the reference oscillator which is applied to the Buffer Amplifier A3700.

1-19. CRS HUNT DISCRIMINATOR A3600, CRS PHASE DISCRIMINATOR A3700, AND REFERENCE OSCILLATOR A2000. (CONT)

With the radio set to 30.00 MHz, the 5.65-MHz crystal is selected, causing the reference oscillator to output a 5.65-MHz fixed frequency. Since the reference oscillator and limiter output frequencies are the same, the phase discriminator does not output a dc voltage to the damping network. Therefore, no dc voltage will be present at TP3001 due to phase discriminator action.

In actual operation, even with the local oscillator almost perfectly alined, a slight plus or minus dc voltage is present at TP3001. Its presence is due to normal imbalances in the hunt discriminator and phase discriminator circuits.

HUNT DISCRIMINATOR, PHASE DISCRIMINATOR; REFERENCE OSCILLATOR - WORKING EXAMPLE - LOCAL OSCILLATOR RUNNING TOO HIGH

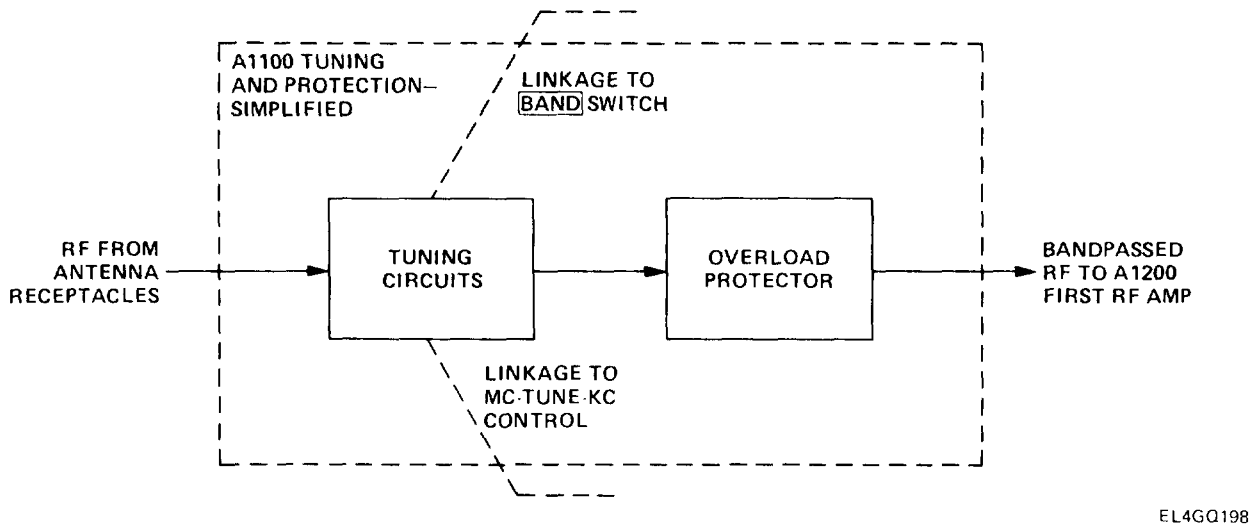


1-19. CRS HUNT DISCRIMINATOR A3600, CRS PHASE DISCRIMINATOR A3700, AND REFERENCE OSCILLATOR A2000. (CONT)

Assume that the radio is set to 30.00 MHz and the local oscillator is misalined, thereby causing it to operate at 41.550 MHz. The output of the limiter 5.70 MHz, is 50 kHz higher than it would be if the oscillator were exactly on frequency.

The two signals entering the phase discriminator are 5.65 MHz from the reference oscillator, and 5.70 MHz from the Limiter A3500. Because of the difference in frequencies, the phase discriminator outputs a dc voltage. This positive dc voltage is measurable at TP3001.

1-20. ANTENNA TUNING AND PROTECTION MODULE A1100.

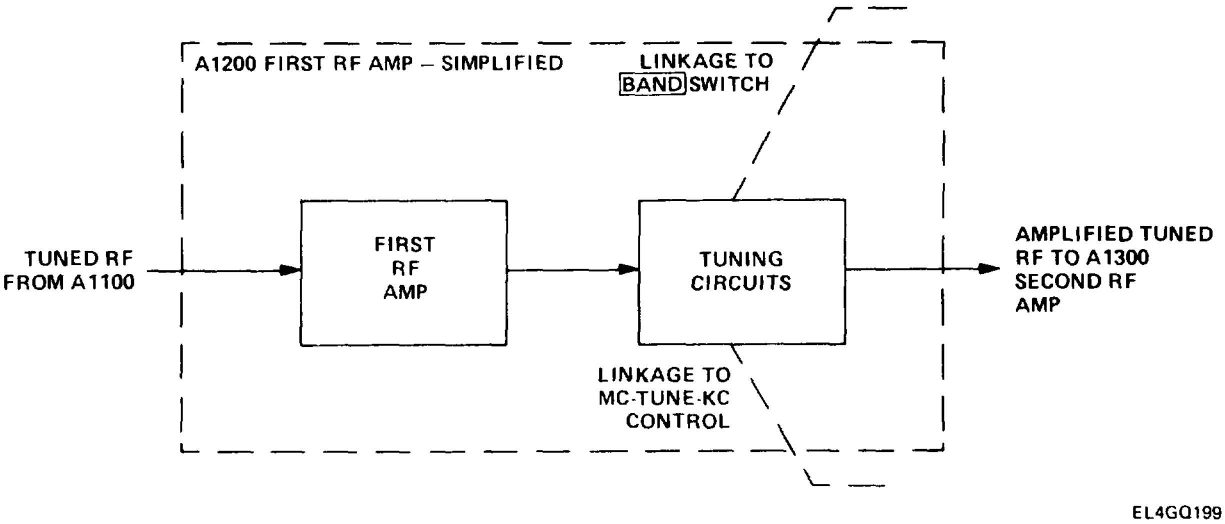


Frequency-modulated rf signals from the antenna are fed to the Al 100 tuning circuits which consist of tuned tank circuits. The resonant frequencies of the tank circuits are varied by altering the inductance when the MC-TUNE-KC control is rotated, and by changing their overall LC ratio when the band is changed from (A) to (B) .

The bandwidths of the resonant tank circuits allow passage of signals of the selected frequency while unwanted frequencies are rejected.

The overload protector consists of a neon lamp which fires, shunting excess rf signal strength to ground. From the overload protector, the rf signals are applied to the tuning circuits in the first rf amplifier.

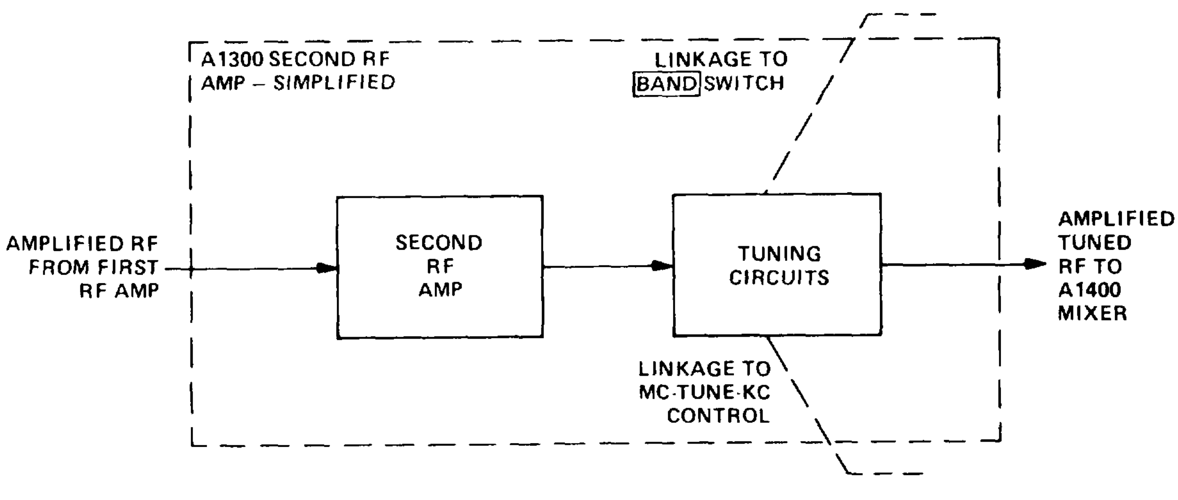
1-21. FIRST RF AMPLIFIER MODULE A1200.



Rf signals are voltage amplified by the first rf amplifier, which consists of Vacuum Tube V1201. Amplified signals are then fed to the tuning circuits which function similarly to those described in the previous paragraph.

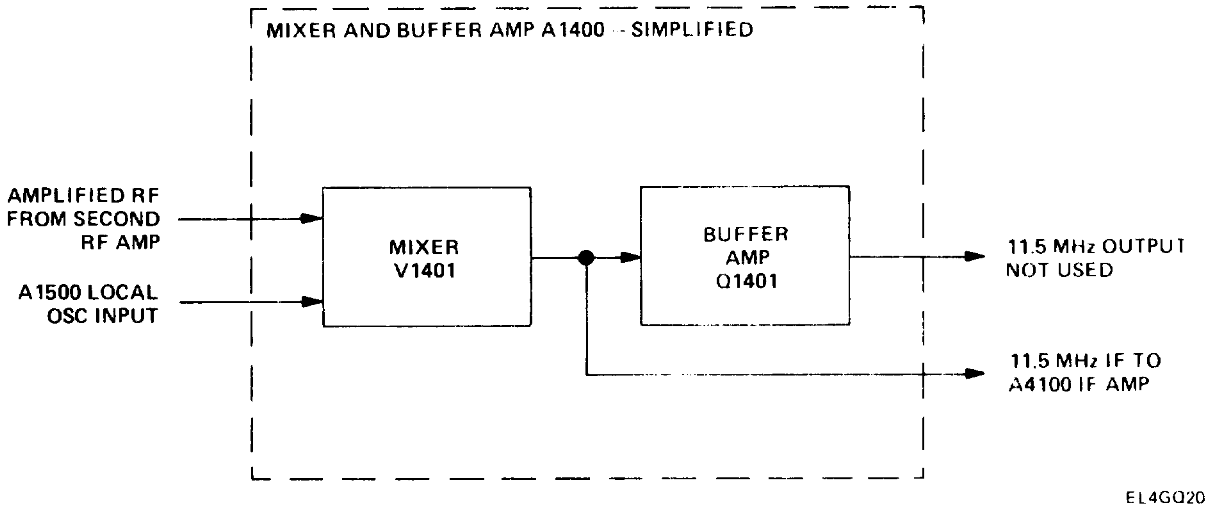
The A1200 tuning circuits provide additional attenuation of unwanted frequencies by the action of their narrow band pass resonant tanks.

1-22. SECOND RF AMPLIFIER MODULE A1300.



The signals from the first rf amplifier are further voltage amplified by the second rf amplifier. The tuning circuits function similarly to those in the A1200 module.

1-23. MIXER AND BUFFER AMPLIFIER A1400.



MIXER V1401

Mixer V1401 is the last of three vacuum tubes in the receiver. During reception it accepts the following inputs:

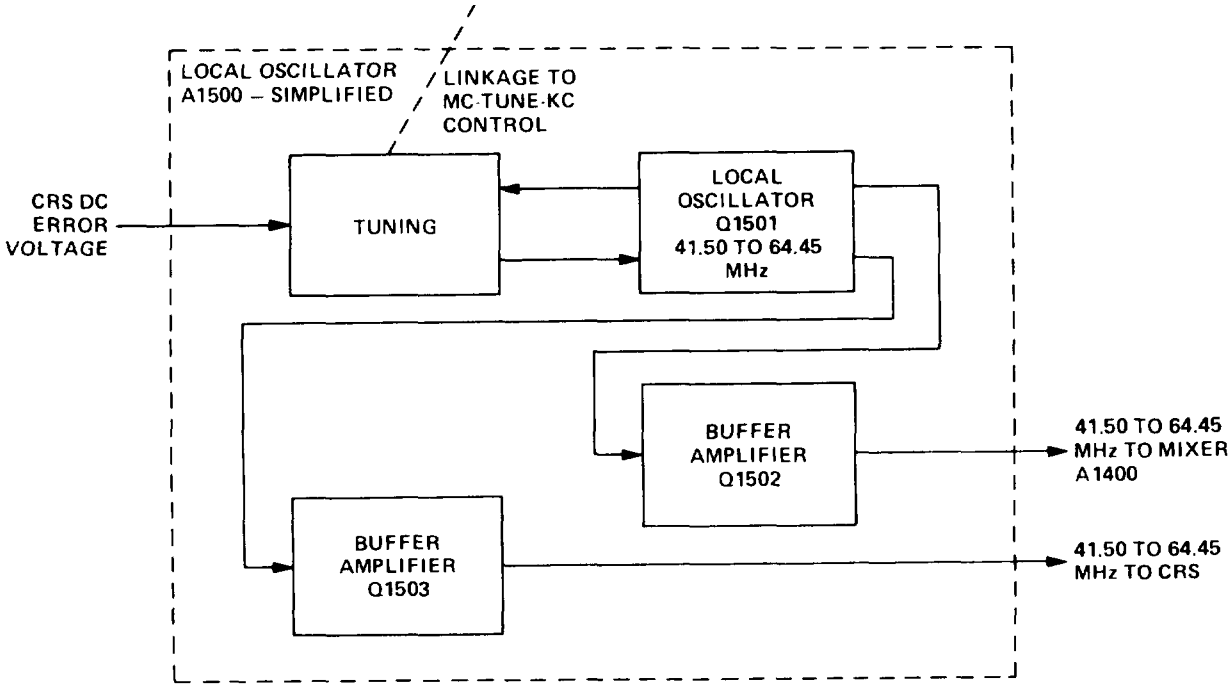
1. Amplified fm rf from the A1300 module.
2. Rf from the local oscillator 11.5 MHz above or 11.5 MHz below frequency of A1300 input.

The signals applied to the mixer are heterodyned to produce four strong frequencies. One of these, the 11.5-MHz difference frequency, is applied to the receiver if amplifiers. The 11.5-MHz difference frequency carries the audio intelligence, and is referred to as the if (intermediate frequency).

BUFFER AMPLIFIER Q1401

The buffer amplifier in the A1400 assembly is not used in the R-442/VRC.

1-24. LOCAL OSCILLATORA 1500.



EL4G0202

The Local Oscillator A1500 assembly contains the following items:

1. Tuning circuits
2. Local oscillator
3. Buffer Amplifier Q1502
4. Buffer Amplifier Q1503.

TUNING CIRCUITS

The tuning circuits control the frequency of the oscillator. They contain resonant tanks with a mechanical linkage from a variable inductor slug to the gear train linkage.

A feedback dc signal from the crystal reference system is applied to a varactor (variable capacitance diode) in the tuning circuits to alter the tank capacitance, thereby changing the resonant frequency and the operating frequency of the oscillator. The dc voltage from the CRS keeps the oscillator running to within ± 3.5 kHz of the frequency selected by the MC-TUNE-KC control.

1-24. LOCAL OSCILLATOR A1500. (CONT)

LOCAL OSCILLATOR Q1501

Q1501 is a pnp transistor. The overall oscillator design is a modified colpitts configuration. Frequency tuning by the tuning circuits enables the oscillator to operate within a range of 41.50 to 64,45 MHz,

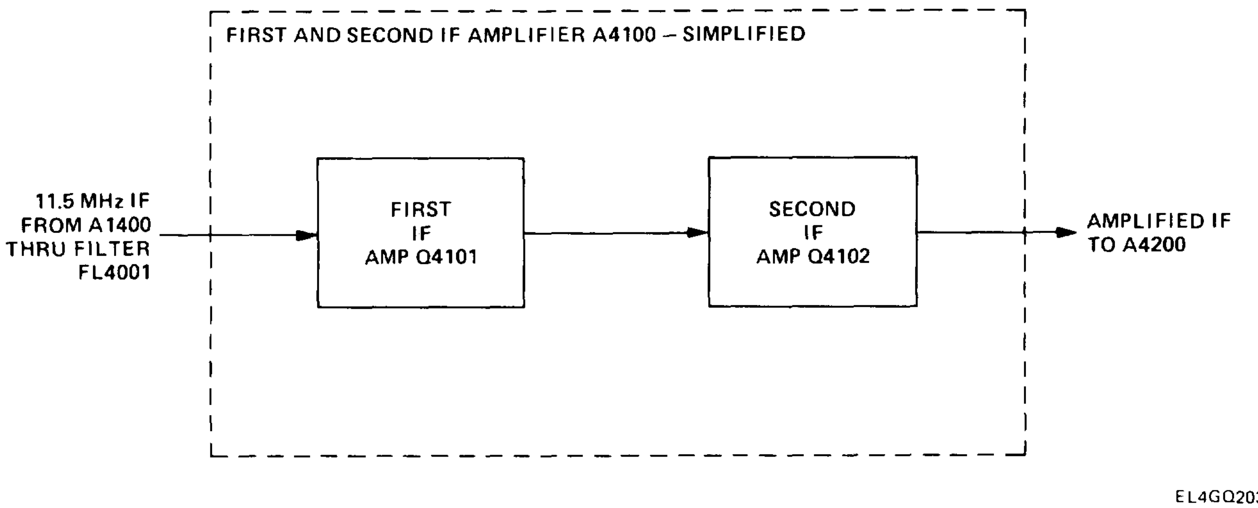
BUFFER AMPLIFIER Q1502

Q1502 impedance matches the oscillator's output to the input impedance of the Mixer A1400.

BUFFER AMPLIFIER Q1503

Q1503 impedance matches the oscillator's output to the input impedance of the crystal reference system.

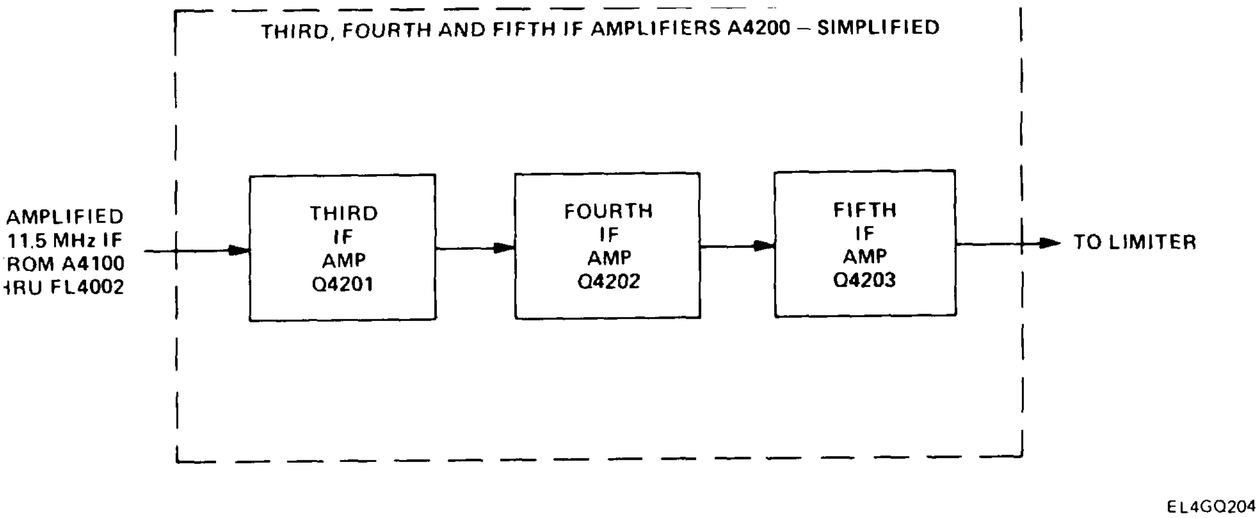
1-25. FIRST AND SECOND IF AMPLIFIER A4100.



The intermediate 11.5-MHz frequency carrying audio intelligence is applied to Amplifier Q4101 which performs the first stage of amplification. Second IF Amplifier Q4102 provides a second stage of amplification. Overall, the first and second if amplifiers provide a gain of X100,

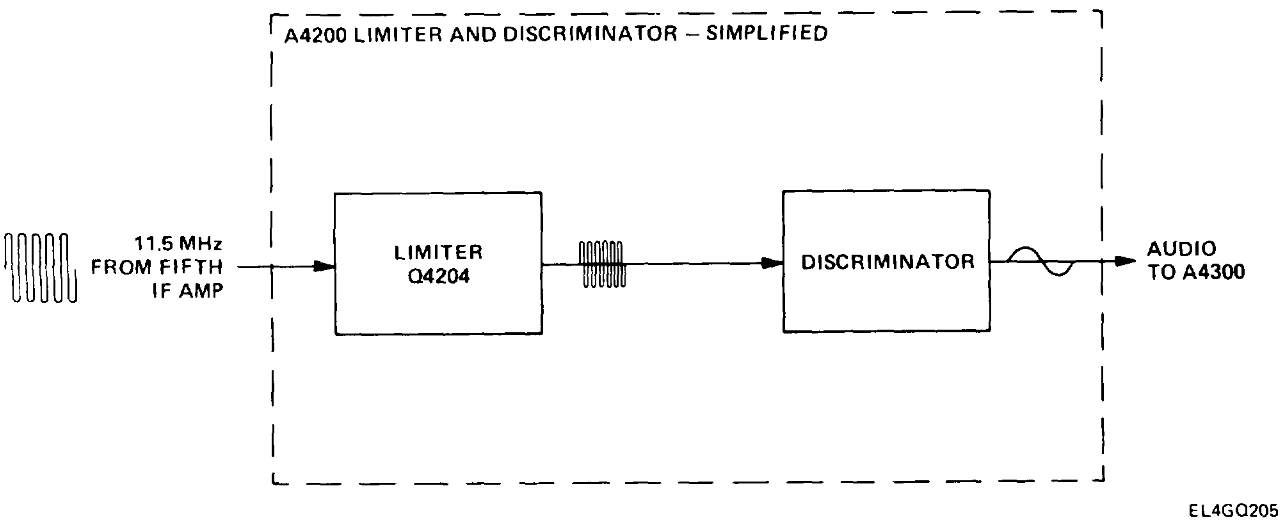
1-26. THIRD, FOURTH, AND FIFTH IF AMPLIFIER, LIMITER, AND DISCRIMINATOR A4200 - GERMANIUM TRANSISTOR VERSION.

THIRD, FOURTH, AND FIFTH IF AMPLIFIERS



The third, fourth, and fifth IF amplifiers provide the additional gain necessary to drive the limiter.

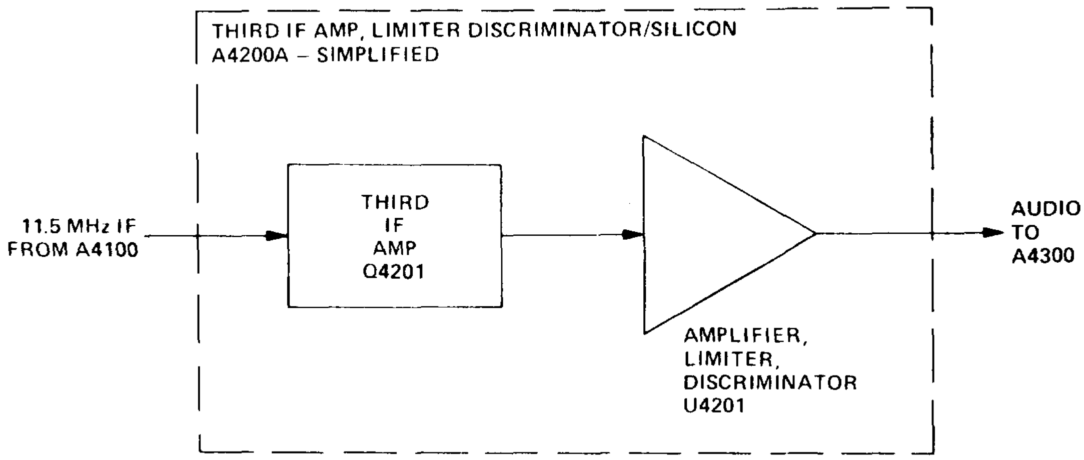
LIMITER AND DISCRIMINATOR



The limiter receives if input from the fifth if amplifier. The upper and lower peaks of the if waveform are clipped by the limiter to provide a constant amplitude signal to the discriminator.

The discriminator is a Travis-type containing upper and lower tuned resonant tanks. When properly alined, the output is the modulating intelligence with no dc offset. Any residual if is shunted to ground by an rf trap.

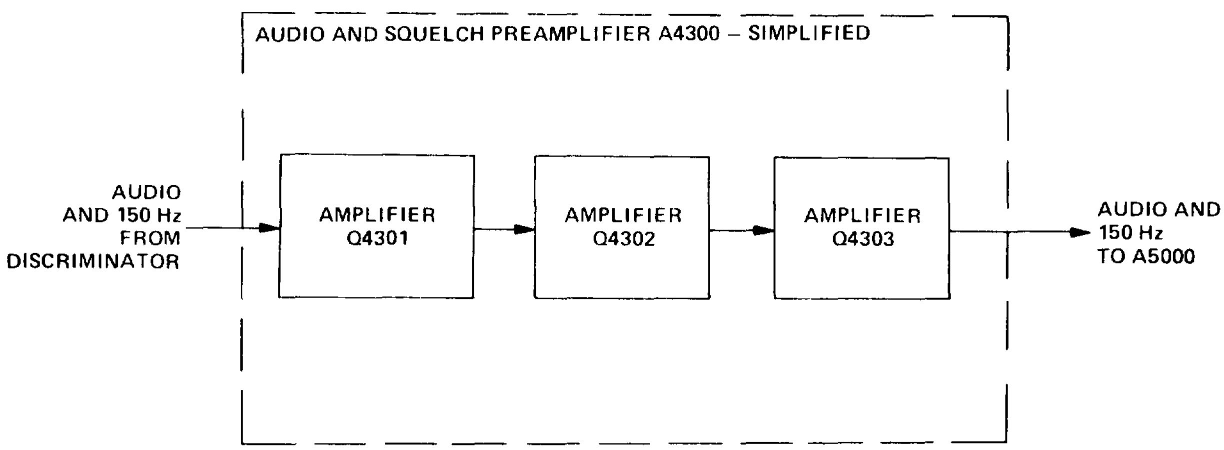
1-27. THIRD IF AMPLIFIER, LIMITER AND DISCRIMINATOR A4200A - SILICON TRANSISTOR VERSION.



Silicon Transistor Q4201 provides the third stage of amplification in the A4200A module. However, discrete fourth and fifth stages are not used as in the germanium A4200 version.

Integrated Circuit U4201 provides additional amplification, limiting, and then detection of the audio intelligence. The discriminator consists of a quadrature coil detector which makes alinement easier than it is when a Travis-type discriminator is used.

1-28. AUDIO AND SQUELCH PREAMPLIFIER A4300.



EL4GQ207

The discriminator in the A4200 demodulates both audio intelligence and the transmitted 150-Hz new squelch signals. The Audio and Squelch Preamplifier A4300 subjects both these frequencies to preliminary stages of amplification.

1-29. AUDIO AMPLIFICATION/A5000.

A block diagram showing a simplified layout of the A5000 tray is contained in F0-12. Refer to the foldout while reading the information in this paragraph.

FILTER FL5001

Audio signals from the preamplifier are applied to low-pass Filter FL5001, which filters noise components above 3000 Hz.

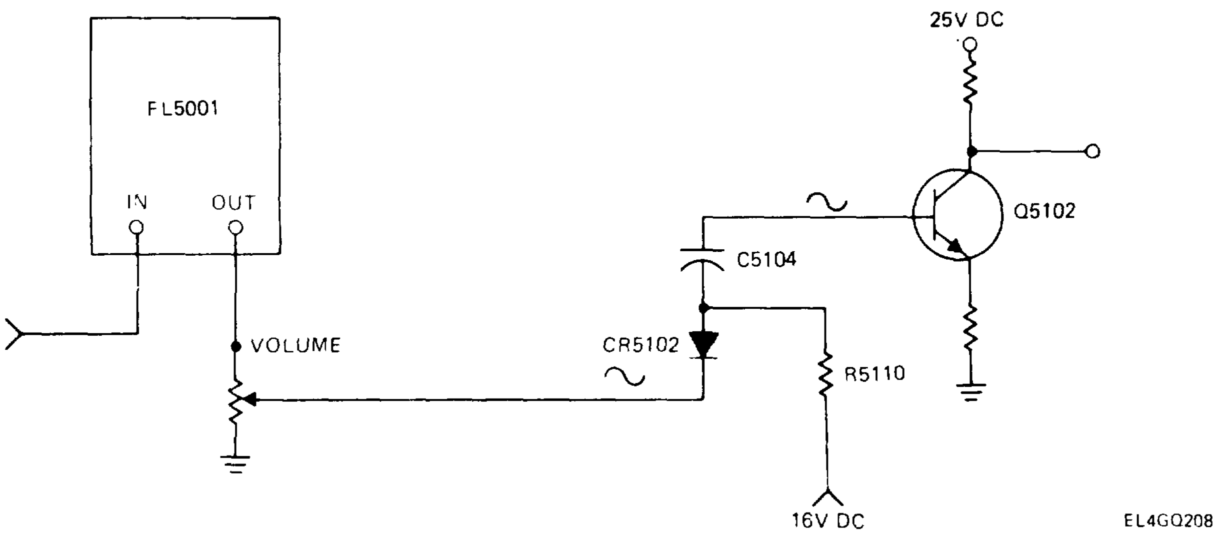
MONITOR AMPLIFIER A5100

Output from the FL5001 filter is applied directly to the monitor amplifier. The monitor amplifier's output is a low-level audio signal of constant amplitude (under 1 vac), due to the absence of any volume control on its input.

AUDIO AMPLIFIER A5100

The audio amplifier receives its input through the VOLUME control which attenuates signal amplitude to control the amplifier's gain. Amplified audio from the A5100 is then applied to the power amplifier.

A biasing voltage of 16 vdc must be applied to the audio amplifier for it to function. This can be seen in the following illustration, which shows a simplified version of the biasing circuit.



With no audio signals from Filter FL5001, 16 vdc flows through R5110, charges C5104, flows through CR5102, and through the volume control resistor to ground.

1-29. AUDIO AMPLIFICATION/A5000. (CONT)

When a positive going audio signal is applied to the cathode of CR5102, the reverse biasing causes the voltage at point A to increase due to reduced current flow through R5110 and CR5102. The voltage increase is coupled across C5104 and applied to the base of Q5102 for amplification.

When the audio signal swings negative, the voltage at point A drops due to the change in biasing at the CR5102 cathode and increased current flow through R5110 and CR5102. The voltage drop at point A is coupled across C5104 and applied to the base of Q5102 for amplification.

Transistor Q5102 receives 25 vdc as operating voltage; however, this is not the voltage which is switched by the squelch relay to turn the amplifier on and off. As shown in F0-12, 16 vdc is switched by the squelch relay. However, it is applied constantly when the SQUELCH switch is in either of the two OFF positions.

Referring back to the simplified version of the biasing circuit, it can be seen that the absence of 16 vdc removes the bias at point A and the anode of CR5102. Without the bias, positive going audio signals are clipped by the diode, and no signal is coupled across Capacitor C5104. Therefore, the amplifier cannot work.

POWER AMPLIFIER Q401

Q401 is a power transistor which is not mounted in the A5000 tray. A5100 amplified output is applied to the power amplifier prior to application of the signal to Transformer T5001.

TRANSFORMER T5001

The transformer performs an impedance matching function between the power amplifier and external audio accessories. One of its outputs, unmuted audio, is a volume-controlled signal to a set of external earphones.

MUTING RELAY K5001 AND MUTING RESISTOR R5117

The muting relay is an electromechanical switch which applies one of the transformer's audio outputs to the muting resistor or otherwise bypasses the resistor.

When the relay is not energized, audio signals bypass the resistor, resulting in full-amplitude loud-speaker audio output. If the relay is energized by an external ground source, the audio signals are applied to the resistor, which provides attenuation and resultant speaker quieting.

Speaker quieting prevents acoustic feedback from the speaker into the microphone of a transmitter located near the R-442. The muting relay ground is provided by the transmitter when it is keyed.

1-30. RECEIVER SQUELCH FUNCTION.

A block diagram showing a simplified layout of the A5000 tray along with related squelch components is contained in F0-12. Refer to the foldout while reading the information in this paragraph.

OLD SQUELCH

The receiver is squelched when 16-vdc power to the audio amplifier is turned off. In the OLD SQUELCH position of the SQUELCH switch, 16-vdc power is available through the squelch relay only when rf signals of at least 0.5 microvolt are received.

1-30. RECEIVER SQUELCH FUNCTION (CONT)

When no rf signals are received, the radio's components generate internal noise frequencies. The noise is quieted by rf reception. One of the most pronounced frequencies, 7.3 kHz, is used to switch the squelch relay through a series of actions involving the following components.

SQUELCH Switch

In the OLD ON position, the SQUELCH switch selects a special set of circuits that respond particularly to 7.3 kHz. The circuits are located in the Squelch Filter A5300.

Squelch Filter

The squelch filter contains circuitry to filter out 7.3-kHz signals. The 7.3-kHz noise is applied to the Squelch Amplifier A5200. A feedback loop applies the noise (many frequencies including 7.3 kHz) to the squelch filter. The squelch filter attenuates 7.3 kHz, and feeds back all other frequencies degeneratively to the ac amplifier, Therefore, the ac amplifier responds well to 7.3 kHz, but degenerates sharply for any other frequencies.

The degenerative feedback is important to insure that the receiver remains squelched in response to the presence of 7.3-kHz internal noise, which is the best possible frequency of internal noise to indicate the absence of a valid rf input. Other noise frequencies can be present even when rf is received, in which case the radio would remain squelched if it were not for the selectivity of the squelch filter.

Squelch Amplifiers

The ac amplifier increases the signal amplitude of the 7.3-kHz sine wave. The sine wave is then rectified and applied to the OLD ON DC amp. Application of the rectified signal to the dc amplifier results in a ground path being opened at one of the amplifier's transistors. The ground path is the enable circuit for the squelch relay. With no ground path, the relay cannot energize.

Squelch Relay

When the relay's enable circuit is ungrounded at the OLD ON DC amp the relay deenergizes, switching 16 vdc off. With no 16-vdc power available, no audio can be coupled to the amplifier; therefore, the radio is silent.

As soon as rf at 0.5-microvolt level or above is received, the 7.3-kHz noise disappears, a ground is created by the dc amplifier in the A5200, and the squelch relay energizes, applying 16 vdc to the audio amplifier.

NEW SQUELCH

In the NEW SQUELCH position of the SQUELCH switch, 16-vdc power to the audio amplifier is available through the squelch relay only when a 150-Hz new squelch tone is received along with the rf carrier. The 150-Hz tone is used to switch the squelch relay through a series of actions involving the following components.

SQUELCH Switch

In the NEW ON position, the SQUELCH switch selects a special set of circuits that respond particularly to 150 Hz, The circuits are located in the Squelch Filter A5300.

1-30. RECEIVER SQUELCH FUNCTION. (CONT)

Squelch Filter

The squelch filter contains circuitry to filter out 150-Hz signals. These signals are applied to the Squelch Amplifier A5200. A feedback loop applies the 150-Hz signals to the squelch filter. Since the 150-Hz signals come from the Audio and Squelch Preamplifier A4300, audio frequencies and some noise are also applied to the squelch filter along with the 150-Hz tone.

However, the squelch filter attenuates 150-Hz signals and feeds back all other frequencies degeneratively to the ac amplifier. Therefore, the ac amplifier responds well to 150 Hz, but degenerates sharply for any other frequencies.

The degenerative feedback is important to insure that the receiver remains squelched until 150 Hz is received with the rf carrier. Without degenerative feedback, frequencies other than 150 Hz could unsquelch the radio.

Squelch Amplifiers

The ac amplifier increases the signal amplitude of the 150-Hz sine wave. The sine wave is then rectified and applied to the NEW ON DC amp. Application of the rectified signal to the dc amplifier results in a ground path being made available at one of the amplifier’s transistors.

The ground path is the enable circuit for the squelch relay. When grounded, the relay energizes, providing 16-vdc power to the audio amplifier. Therefore, when a 150-Hz tone is received, the audio amplifier turns on, thus unsquelching the radio.

CHAPTER 2

DIRECT SUPPORT REPAIR PROCEDURES

OVERVIEW

This chapter contains direct support repair procedures for the R-442(*)/VRC. References are made to those publications listing repair parts, tools, and TM DE. The description of this manual's approach to troubleshooting includes an explanation of how to use the troubleshooting charts in chapters 3,4, and 5. The maintenance section covers assembly, disassembly, and replacement procedures.

There are three other direct support chapters in this manual. Each chapter covers direct support performance tests, troubleshooting, and alinement procedures performed with a different set of test equipment; that is:

1. Chapter 3 contains procedures using Maintenance Kit MK-1978/VRC and discrete test equipment (TMDE).
2. Chapter 4 contains procedures using Test Set AN/GRM-114A.
3. Chapter 5 contains procedures using Test Cable No. 1 and discrete test equipment (TMDE).

The procedure you follow will depend upon the equipment at your disposal.

Section I DIRECT SUPPORT REPAIR PARTS, TOOLS, AND TMDE

2-1. DIRECT SUPPORT REPAIR PARTS AND TOOLS.

For repair parts and tools required for direct support maintenance, refer to TM 11-5820-401-34P-2-2.

2-2. SPECIAL TOOLS AND TMDE.

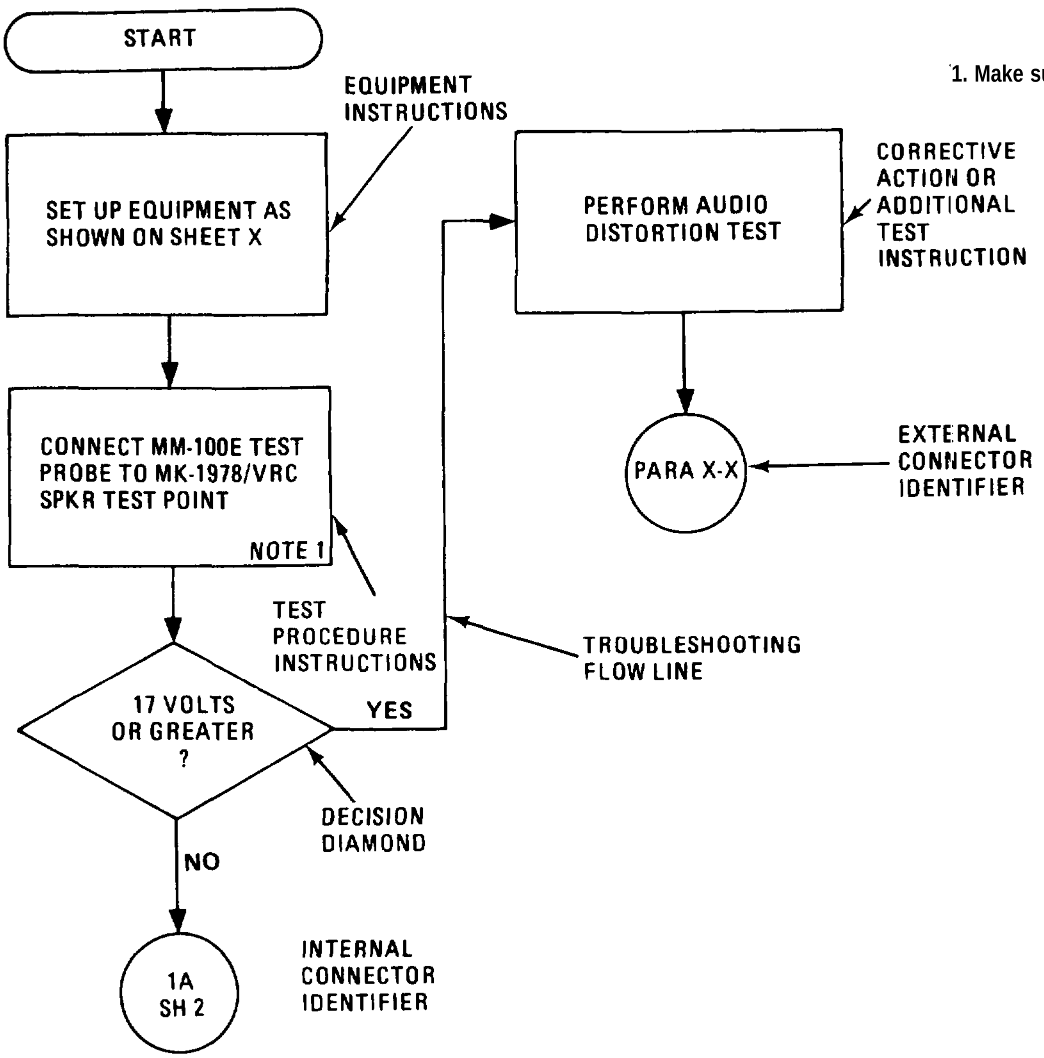
For special tools and TM DE, refer to the Maintenance Allocation Chart (MAC) in TM 11-5820-401-20-1 or TM 11-5820-401-20-2.

Section II DIRECT SUPPORT TROUBLESHOOTING

2-3. GENERAL.

This manual contains procedures that will assist the technician in troubleshooting failures in the R-442(*)/VRC receiver. The procedures are written as troubleshooting logic flowcharts.information covering the use of these charts is contained in the following paragraph.

2-4. HOW TO USE TROUBLESHOOTING CHARTS.



NOTES

1. Make sure MM-1OOE is set to AC HI Z.

2-4. HOW TO USE TROUBLESHOOTING CHARTS. (CONT)

The preceding illustration is a sample portion of a troubleshooting logic flow chart. Refer to the illustration while reading the following information.

START

Each individual chart contains a start segment indicating the start of the troubleshooting procedure.

EQUIPMENT INSTRUCTIONS

Equipment instructions are contained in a rectangular box. They provide details concerning proper hookup of test equipment and correct control settings necessary to perform the troubleshooting procedure.

The initial equipment instructions found at the beginning of each troubleshooting chart reference a sheet number where an equipment test setup diagram can be found. The sheet number is located at the top of each page of the troubleshooting chart, next to the title.

Within a troubleshooting procedure, many changes of equipment control settings, and even hookups, are often required. These changes are detailed in the equipment instruction boxes. At any step in the troubleshooting chart, the equipment status is always that defined by the nearest equipment instruction box in the troubleshooting chain.

TEST PROCEDURE INSTRUCTIONS

These instructions usually contain details covering specific receiver test points to be probed.

DECISION DIAMOND

As a result of a particular test point probe, some electrical value should be observed, such as a voltage indication on a piece of test equipment. The decision diamond defines what value **should** be observed, and permits a yes or no decision in response to what **is** observed.

TROUBLESHOOTING FLOW LINE

Troubleshooting flow lines provide direction to successive steps in the logic chart. An arrow at the end of each flow line indicates the next step in the troubleshooting chain.

INTERNAL CONNECTOR IDENTIFIER

There are two sizes of circular identifiers used in the troubleshooting charts. The smaller of the two is the internal connector identifier.

The internal connector identifier indicates a continuation of the procedure to another sheet in the troubleshooting flow chart. The sheet on which the procedure is continued contains a corresponding identifier, that is, a small circle in which the same number and letter are printed.

For example in the sample illustration, the “NO” branch of the decision diamond flows to the identifier containing 1A SH 2. This means that the procedure is continued on sheet 2, at the small circle containing 1A.

2-4. HOW TO USE TROUBLESHOOTING CHARTS. (CONT)

EXTERNAL CONNECTOR IDENTIFIER

The external connector identifier is a large circle which references a paragraph or another troubleshooting chart. In the sample illustration, the large circle contains the information "Para x-x. " This paragraph reference identifies the location of the audio distortion test, which is not found anywhere in that flow chart. In fact, a large circle always references some information external to the flow chart containing the circle.

CORRECTIVE ACTION OR ADDITIONAL TEST INSTRUCTION

A corrective action box can contain the following information when a problem is defined by a decision diamond:

1. Instructions to aline an electronic module.
2. Instructions to replace a module or other radio component.
3. Instructions to repeat a performance test sequence or do a particular performance test found elsewhere in the manual.

NOTES

The third column on each troubleshooting sheet may contain written notes and/or illustrations used to clarify information contained in the troubleshooting chart.

2-5. ORGANIZATION OF TROUBLESHOOTING CHARTS.

LOCATION IN MANUAL

Troubleshooting charts are contained in chapters 3, 4, and 5. The charts in each chapter are tailored to the use of specific test equipment.

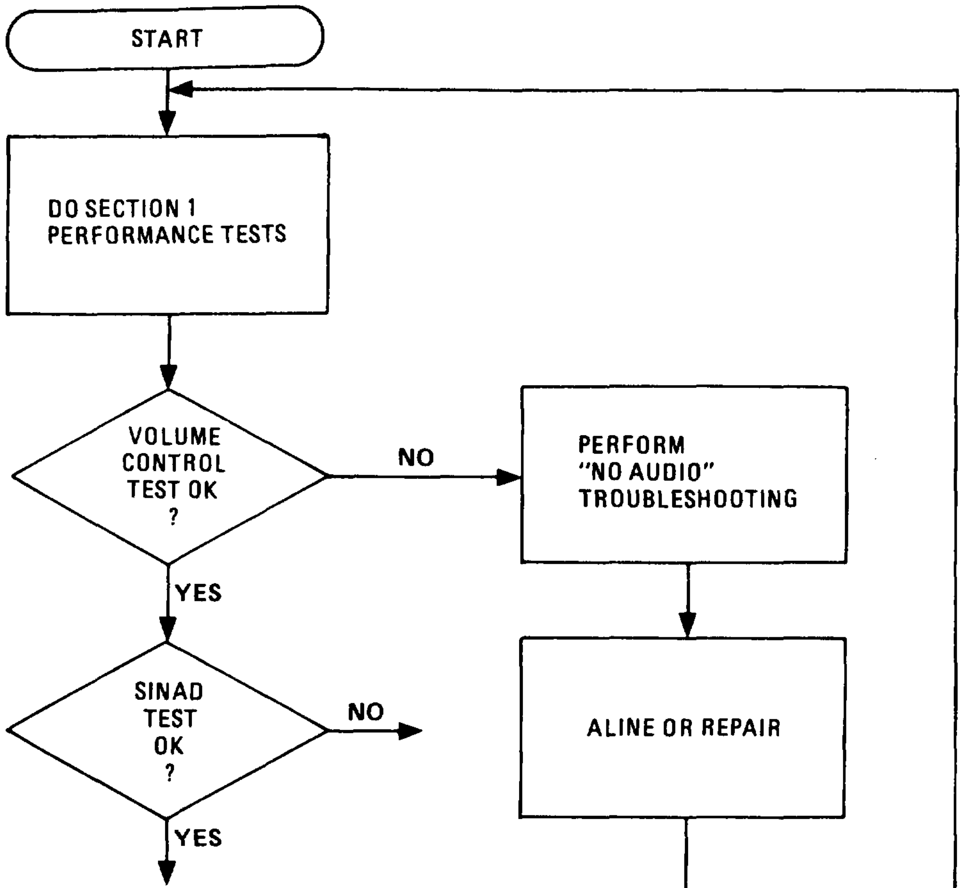
Chapter 3 contains charts which are intended for use if the equipment available includes Maintenance Kit MK-1978/VRC and TMDE (discrete test equipment, eg, signal generators, voltmeters, etc).

Chapter 4 contains charts intended for use if the equipment available includes Test Set AN/GRM-114A and Maintenance Kit M K-1978/VRC.

The troubleshooting charts in chapter 5 are used if the equipment available includes TMDE and Test Cable No. 1.

2-5. ORGANIZATION OF TROUBLESHOOTING CHARTS. (CONT)

GENERATION OF TROUBLESHOOTING CHARTS



Each troubleshooting logic flow chart is generated by the failure of one of several performance tests, all of which are located in section 1 of chapters 3, 4, and 5. The preceding illustration shows the logic flow involved in generating a troubleshooting procedure.

Referring to the preceding illustration, it can be noted that the performance tests in section 1 are done prior to troubleshooting. The first performance test is the VOLUME control test. If the radio fails the VOLUME control test, troubleshooting must be done to determine the cause of failure. In this example, the "NO" flow line leads to the box containing the instruction "perform 'no audio' troubleshooting. "

Performance of the troubleshooting procedure results in the determination of the need for alinement or repair. When these tasks are accomplished, the performance test must be repeated to insure that the corrective action was sufficient to enable the radio to pass the VOLUME control test. Therefore, a flow line from the corrective action box leads back to the start of the performance tests.

If the radio passes the VOLUME control test, the SINAD test is next in order. The decision diamond containing the SINAD test has "YES" and "NO" flow lines as does the previous diamond. The "YES' flow line leads to an additional performance test, while the "NO" flow line leads to a second troubleshooting flow chart. This pattern is repetitive down to the last performance test. If the radio passes all performance tests, no troubleshooting is done, and it is returned to service.

Section III DIRECT SUPPORT MAINTENANCE PROCEDURES

2-6. GENERAL.

This section contains instructions for direct support maintenance of the R-442(*)VRC receiver. The following setup information applies to all procedures.

Resources required are not listed unless they apply to the procedure.

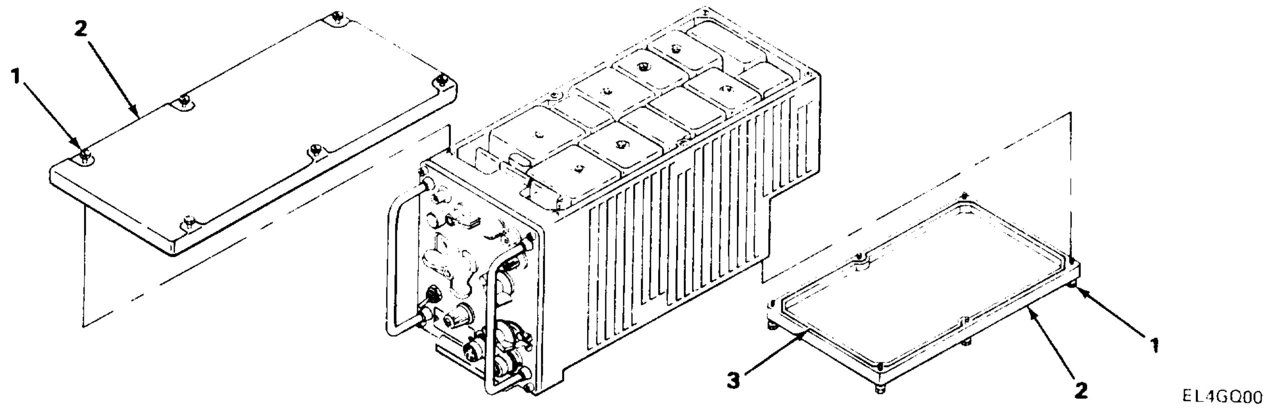
Personnel are listed only if the task requires more than one technician. If personnel required is not listed, one technician can do the job.

These procedures can be performed using Tool Kit, Electronic Equipment TK-105/G. Tools will not be listed unless special tools are required.

The normal equipment condition to start a maintenancetask is power off. Equipment condition is not listed unless some other condition is required.

2-7. TOP AND BOTTOM COVER REPLACEMENT.

MATERIALS/PARTS: Top Cover, P/N SMD 414959
Bottom Cover, P/N SMD 414960



REMOVAL

NOTE

Steps given are typical for top and bottom covers.

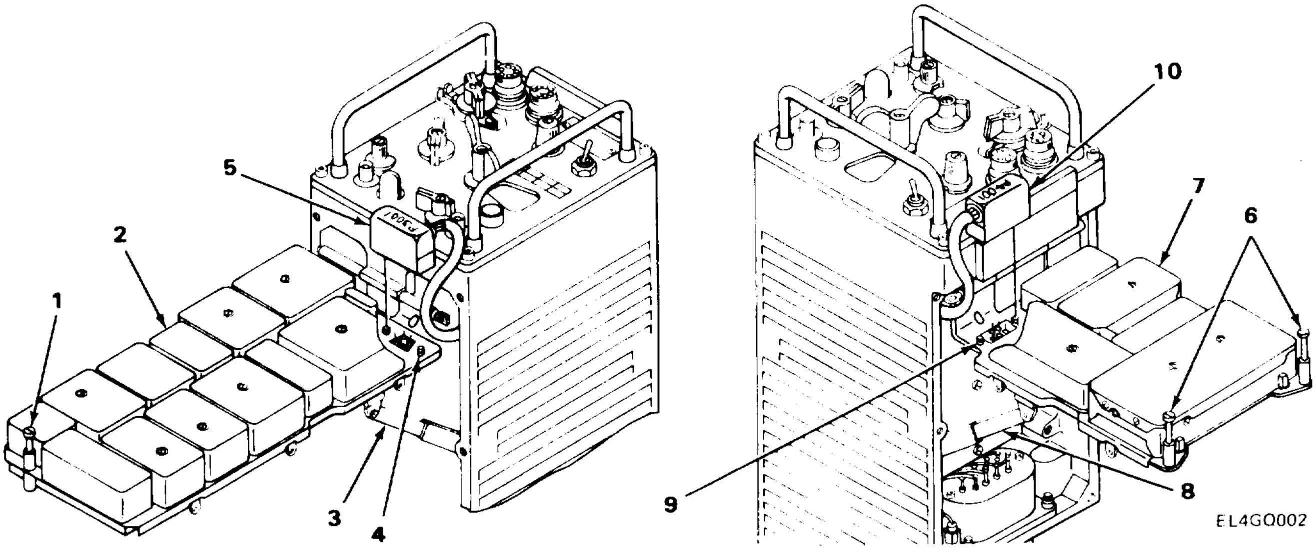
1. Using screwdriver, loosen six captive screws (1).
2. Remove cover (2).

INSTALLATION

1. Apply a light coat of silicon compound to cover seals (3).
2. Install cover (2).
3. Using screwdriver, tighten six captive screws (1).

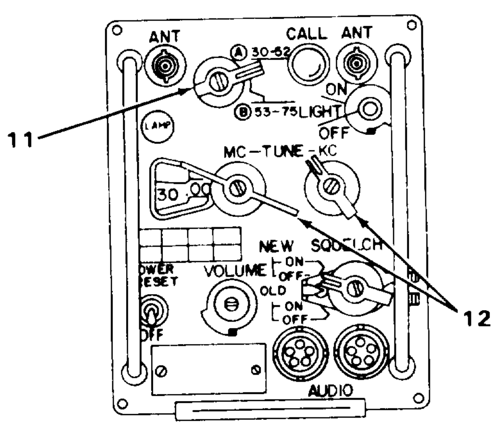
2-8. FRONT PANEL REPLACEMENT.

MATERIALS/PARTS: Front Panel, P/N SMD 414932
PRELIMINARY PROCEDURE: Remove top and bottom covers. (See paragraph 2-7.)



REMOVAL

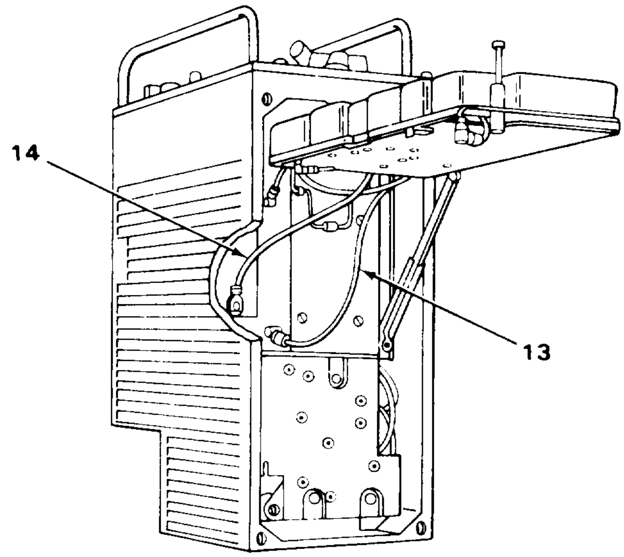
1. Using screwdriver, loosen one captive screw (1).
2. Raise A3000 assembly (2) and secure brace (3).
3. Using screwdriver, loosen two captive screws (4) and carefully lift Connector P3001 (5) from pins.
4. Using screwdriver, loosen two captive screws (6).
5. Raise A4000 assembly (7) and secure brace (8).
6. Using screwdriver, loosen two captive screws (9) and carefully lift Connector P4001 (10) from pins.



EL4GQO03

7. Rotate BAND switch (11) to BAND A.
8. Rotate MC-TUNE-KC controls (12) to 30.00-MHz channel.

2-8. FRONT PANEL REPLACEMENT. (CONT)



EL4GQ004

NOTE

The instructions given below are performed on top of the receiver.

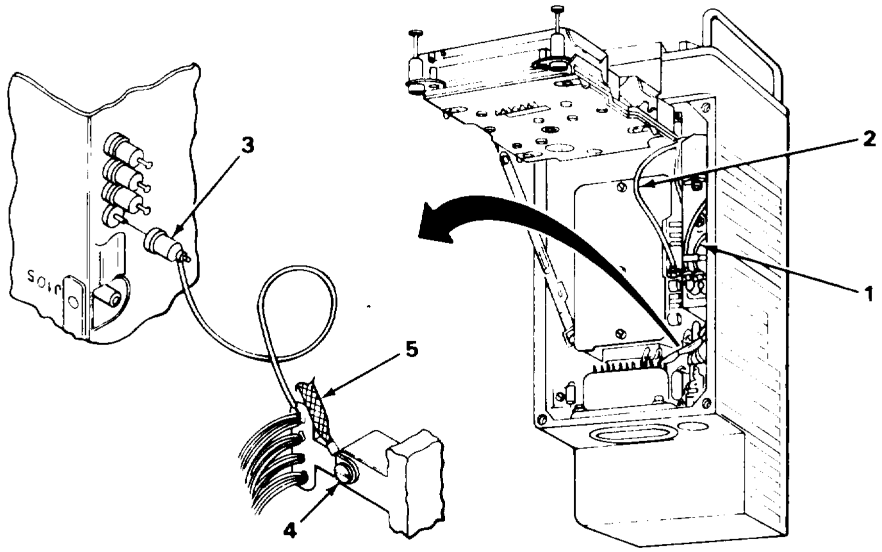
If color coding on unit varies from one shown, note corrected color coding before disassembly.

9. Disconnect wires listed in table below.

WIRE NO.	COLOR	FROM	TO	INDEX NO.
W202/W402	Grn	A3000 Assy	J1004	13
W204	Red	A3000 Assy	J2003	14

2-8. FRONT PANEL REPLACEMENT. (CONT)

REMOVAL(CONT)



EL4GOO05

NOTE

The instructions given below are performed on bottom of receiver.

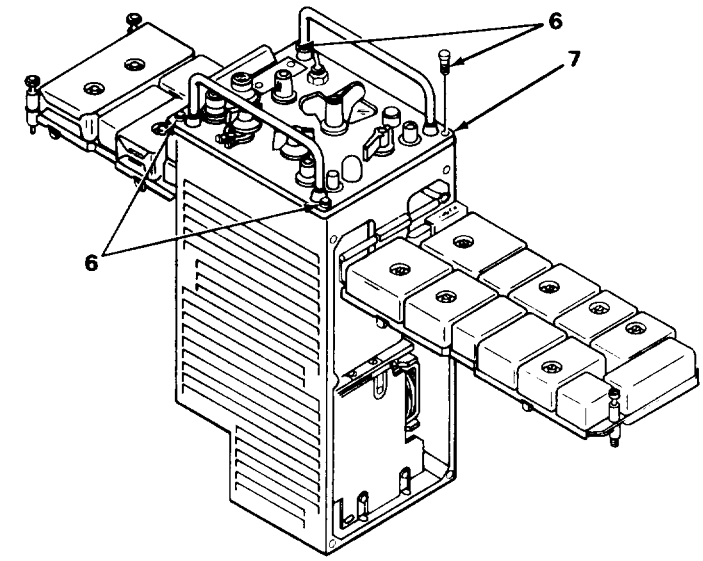
If color coding on unit varies from one shown, note corrected color coding before disassembly.

10. Disconnect wires listed in table below.

WIRE NO.	COLOR	FROM	TO	INDEX NO.
W203	Blk	A3000 Assy	J2002	1
W201/W401	Blu	A4000 Assy	J1005	2

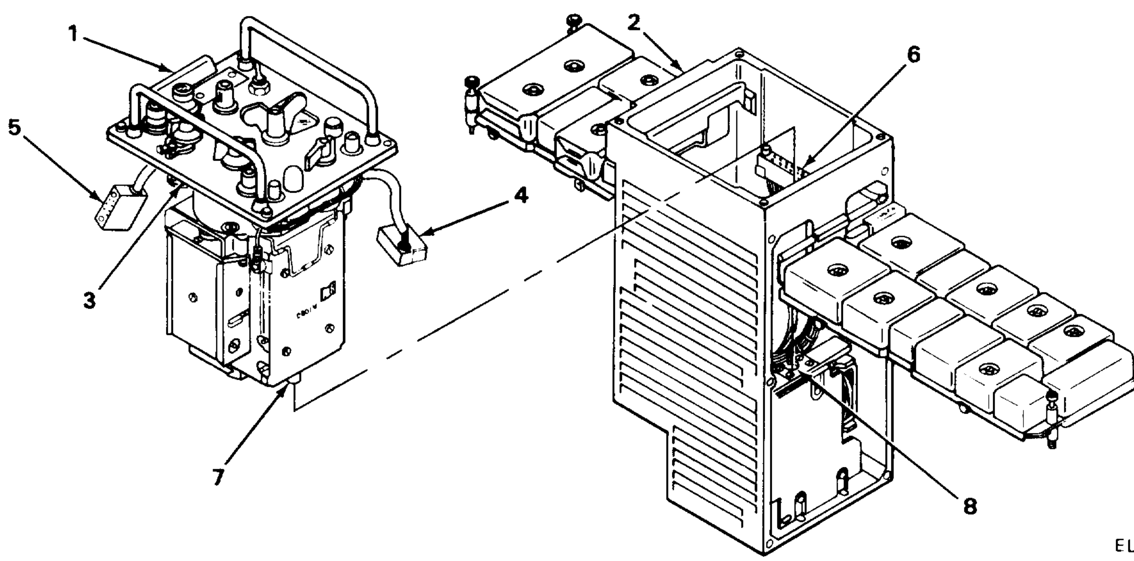
11. Disconnect yellow color-coded wire plug (3) from A1000 assembly.
12. Using screwdriver, loosen screw (4) and remove ground strap (5). Do not remove screw (4).

2-8. FRONT PANEL REPLACEMENT. (CONT)



13. Using hex wrench, remove four screws (6).
14. Carefully remove front panel (7) from case.

INSTALLATION



1. Line up clamp bosses (1) and (2), and lower front panel (3) into case, part way.

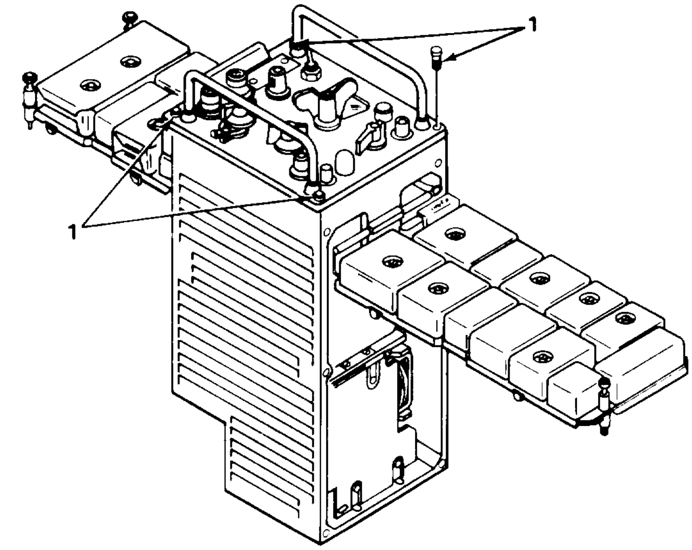
CAUTION

When performing next step, make sure connectors (4) and (5) are put into case first, connector (6) mates with companion connector, and locator stud (7) is in hole (8) of A 1000 assembly.

2. Carefully lower front panel (3) into case. Do not pinch any wires.

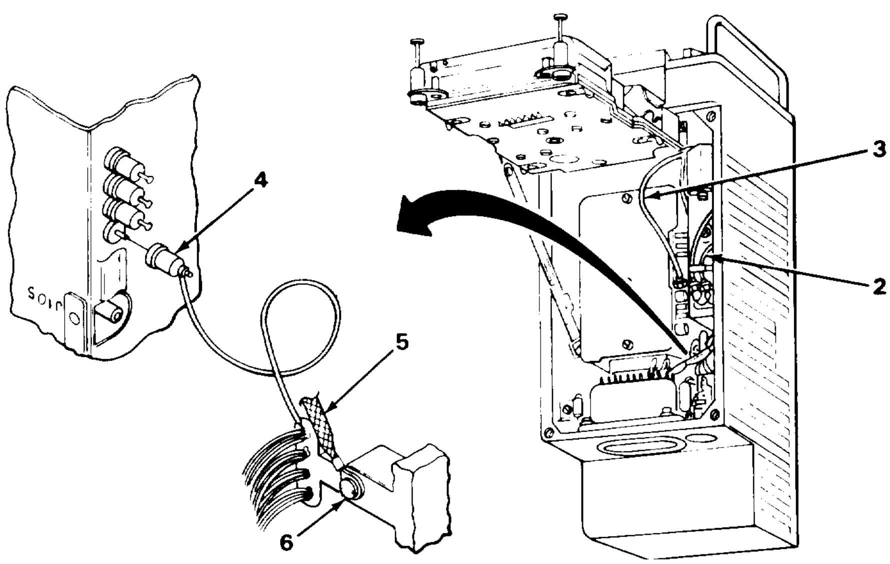
2-8. FRONT PANEL REPLACEMENT. (CONT)

INSTALLATION (CONT)



EL4GQ008

3. Install four screws(1).
4. Using hex wrench, tighten four screws (1).



EL4GQ009

NOTE

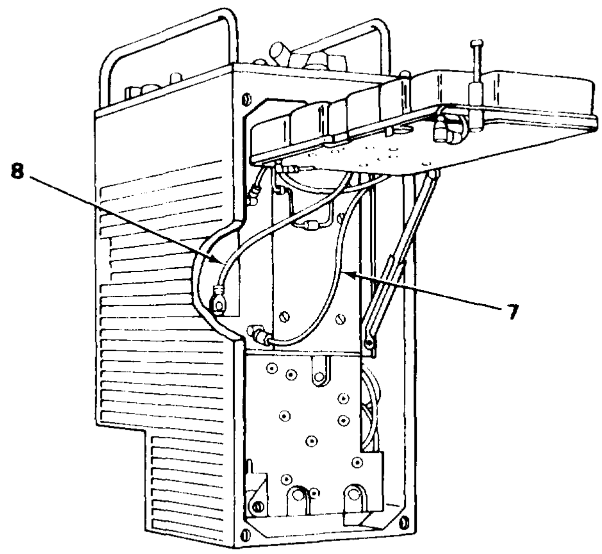
If color coding on unit varies from one shown, note corrected color coding during disassembly.

2-8. FRONT PANEL REPLACEMENT. (CONT)

5. Connect wires listed in table below.

WIRE NO.	COLOR	FROM	TO	INDEX NO.
W203	Blk	A3000 Assy	J2002	2
W201/W401	Blu	A4000 ASSY	J1005	3

6. Connect yellow color-coded wire plug (4) to A1000 assembly.
7. Position ground strap (5) under screw (6).
8. Using screwdriver, tighten screw (6).



NOTE

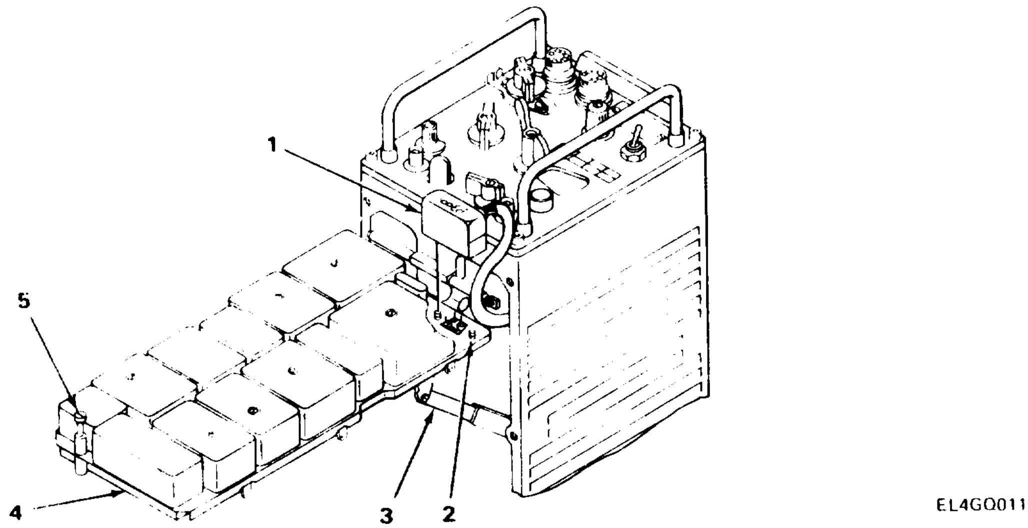
If color coding on unit varies from one shown, note corrected color coding during disassembly.

9. Connect wires listed in table below.

WIRE NO.	COLOR	FROM	TO	INDEX NO.
W202/W402	Grn	A3000 Assy	J1004	7
W204	Red	A3000 Assy	J2003	8

2-8. FRONT PANEL REPLACEMENT. (CONT)

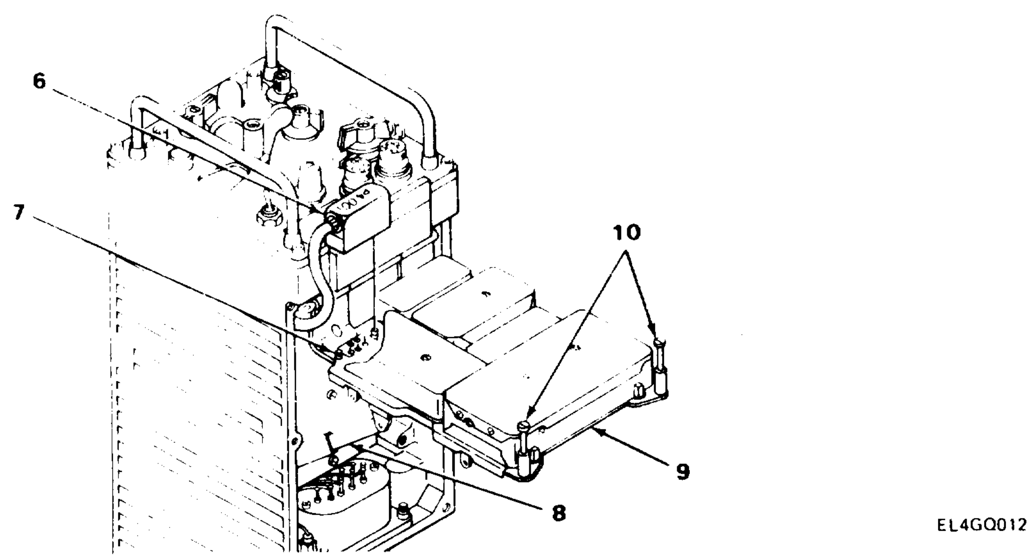
INSTALLATION (CONT)



CAUTION

Make sure pins on A3000 assembly are not bent. Straighten any bent pins.

10. Position P3001 (1) on pins and push Into place.
11. Using screwdriver, tighten two captive screws (2).
12. Release brace (3) and lower A3000 assembly (4) into position.
13. Using screwdriver. tighten one captive screw (5).



CAUTION

Make sure pins on A4000 assembly are not bent. Straighten any bent pins.

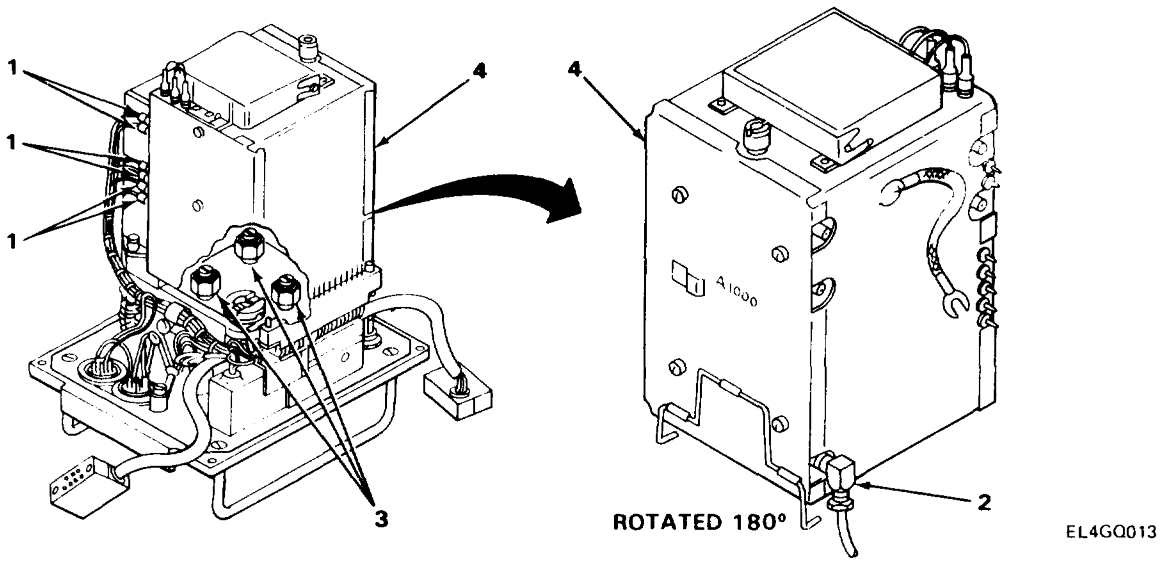
2-8. FRONT PANEL REPLACEMENT. (CONT)

14. Position P4001 (6) on pins and push into place.
15. Using screwdriver, tighten two captive screws (7).
16. Release brace (8) and lower A4000 assembly (9) into position.
17. Using screwdriver, tighten two captive screws (10).

FOLLOW-ON MAINTENANCE: install top and bottom covers. (See paragraph 2-7.)

2-9. A1000 ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: Radio Frequency Tuning Unit, A1OOO
PRELIMINARY PROCEDURE: Remove front panel. (See paragraph 2-8.)



REMOVAL

1. Disconnect six color-coded wire plugs (1).
2. Disconnect brown wire (W102) (2) from J1001.

CAUTION

Care must be taken when performing next step to prevent damage to vhf tuner linkage arm.

3. Using wrench, loosen three captive nuts (3).
4. Remove A1000 assembly (4).

CAUTION

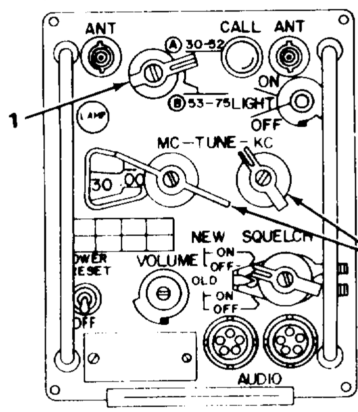
Note relative positions of gear train couplers on A1000 assembly and rent panel. Do not turn any of them.

2-9. A1000 ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION

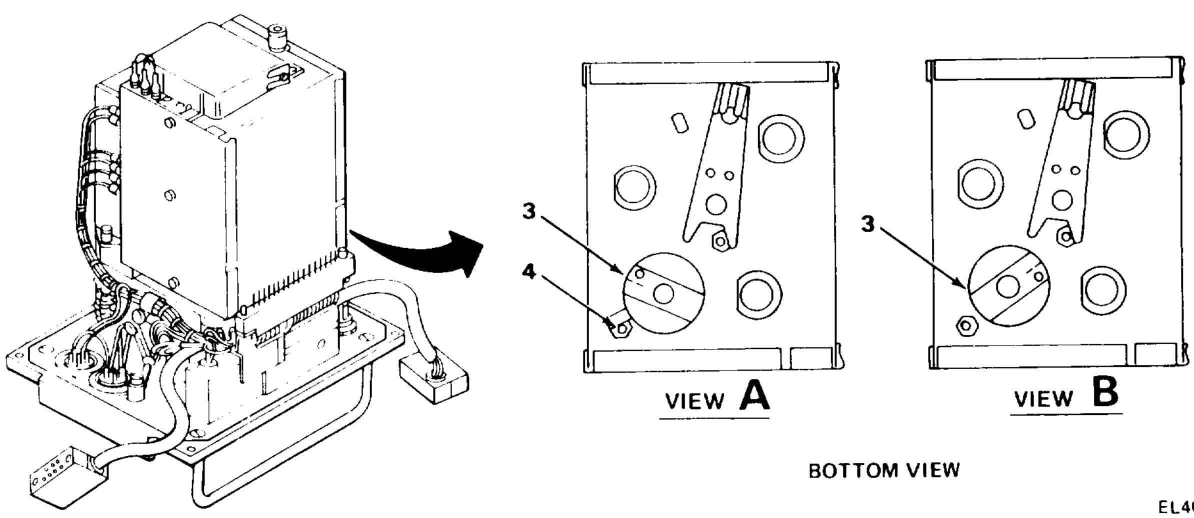
NOTE

The step below are used only if any front panal controls or the unit coupler have been turned during repair. if not, proceed to step 5.



EL4GQ014

1. Rotate BAND switch (1) to BAND (A).
2. Rotate MC-TUNE-KC controls (2) to 30.00-MHZ channel.



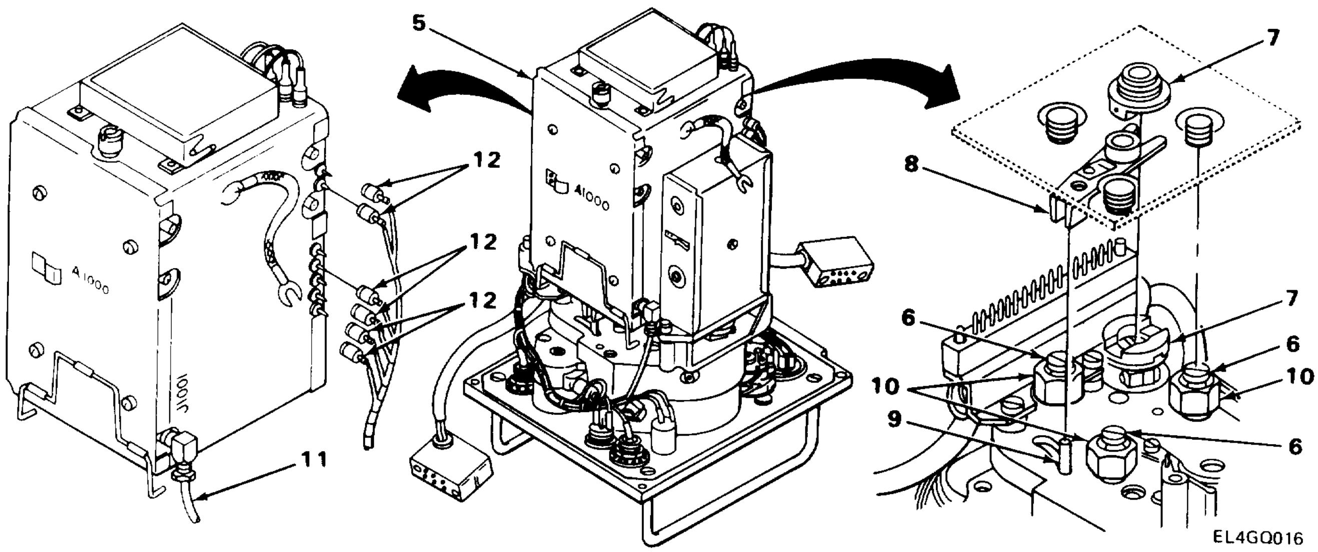
EL4GQ015

3. Turn coupler (3) (view A) counterclockwise to stop (4).
4. Turn coupler (3) (view B) clockwise one-quarter turn.

NOTE

Coupler (3) may have to be turned slightly to engage with mating part.

2-9. A1000 ASSEMBLY REPLACEMENT. (CONT)



5. Carefully place A1000 assembly (5) on captive nut towers (6) and aline gear train couplers (7), linkage arm (8), and BAND switch cam (9).
6. Handtighten three captive nuts (10).

CAUTION

Care must be taken when performing next step to prevent damage to vhf tuner linkage arm (8).

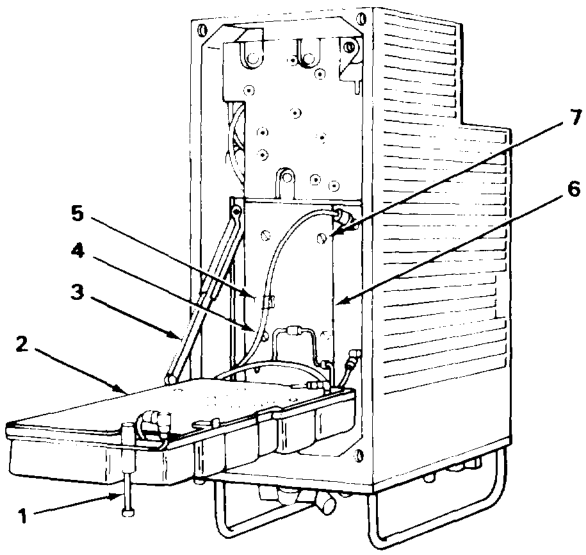
7. Using wrench, carefully tighten three captive nuts (10).
8. Connect brown wire (W102) (11) to J1001.
9. Connect six color-coded wire plugs (12).

FOLLOW-ON MAINTENANCE: Install front panel. (See paragraph 2-8.)

2-10. MODULES A1100 THROUGH A1500 REPLACEMENT.

MATERIALS/PARTS: Circuit Card Assembly A1100
Circuit Card Assembly A1200
Circuit Card Assembly A1300
Circuit Card Assembly A1400
Circuit Card Assembly A1500

PRELIMINARY PROCEDURE: Remove top cover. (See paragraph 2-7.)



FL4GO049

REMOVAL

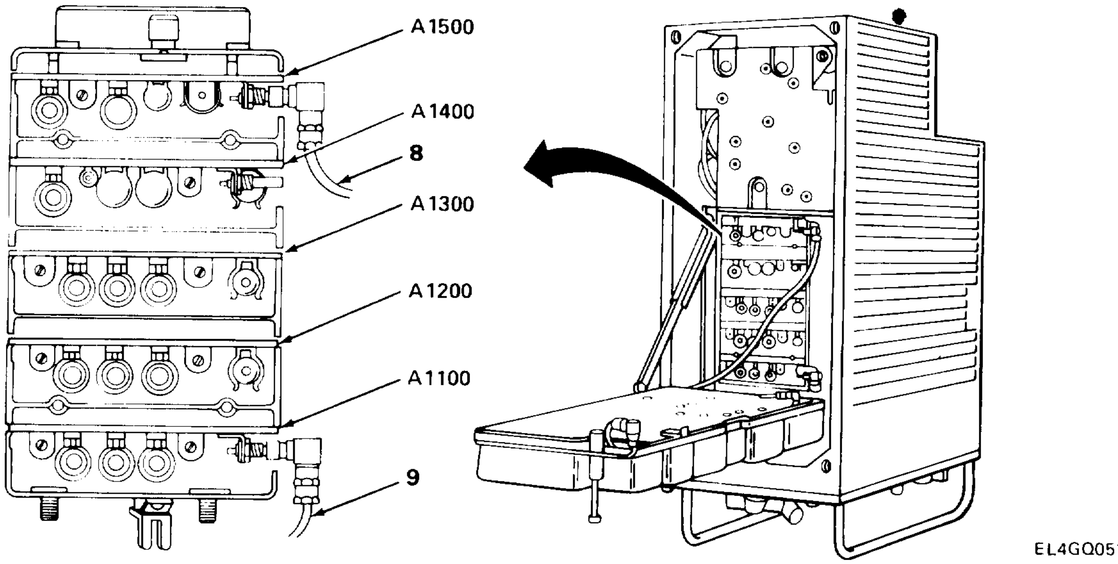
NOTE

Modules Al 100 through A1500 are housed within the A1000 assembly. To get to the A1000 assembly, A3000 assembly must first be moved out of the way.

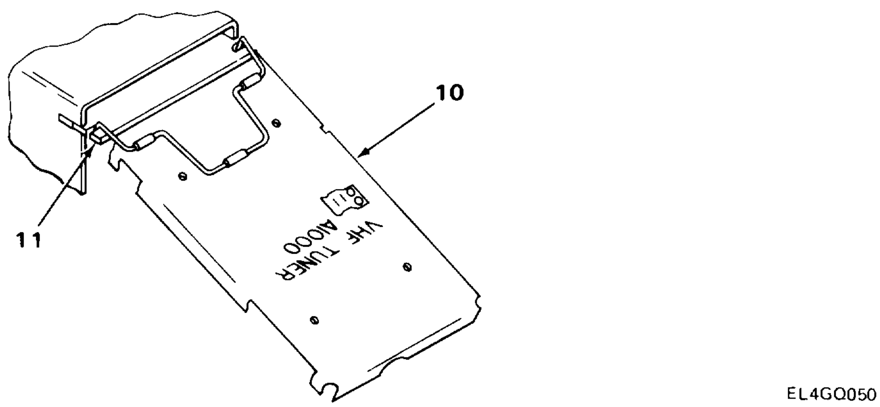
The steps given are typical for removal of all modules.

1. Place BAND switch control on front panel to BAND A .
2. Using screwdriver, loosen one captive screw (1) on A3000 assembly (2).
3. Lower A3000 assembly (2) and secure brace (3).
4. Disconnect green wire (W202/W402) (4) from clip (5) on A1000 assembly cover (6).
5. Using screwdriver, loosen four captive screws (7) and remove A1000 assembly cover (6).

2-10. MODULES A1100 THROUGH A1500 REPLACEMENT. (CONT)



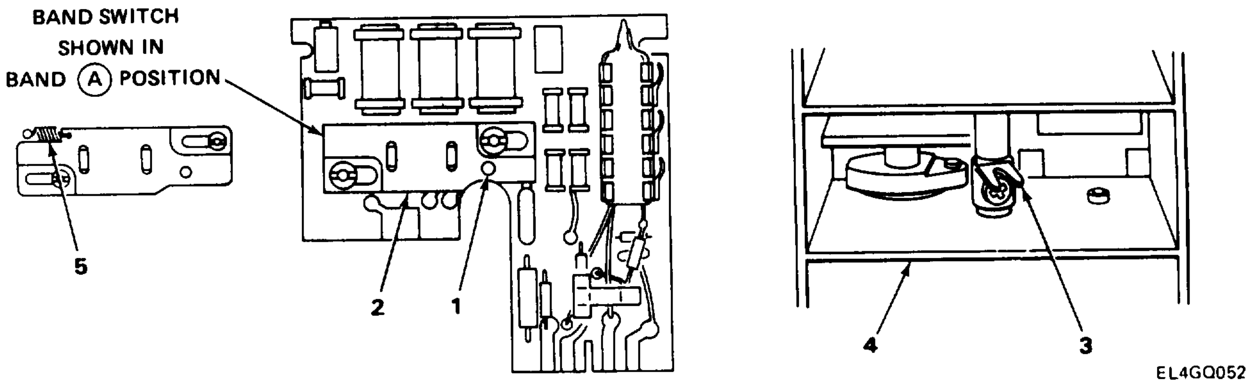
6. Before removing module A1500, disconnect green wire (W202/W402) (8) from J1004. Before removing module Al 100, disconnect brown wire (W102) (9) from J1001.



7. Using module puller (10), carefully remove modules (11).

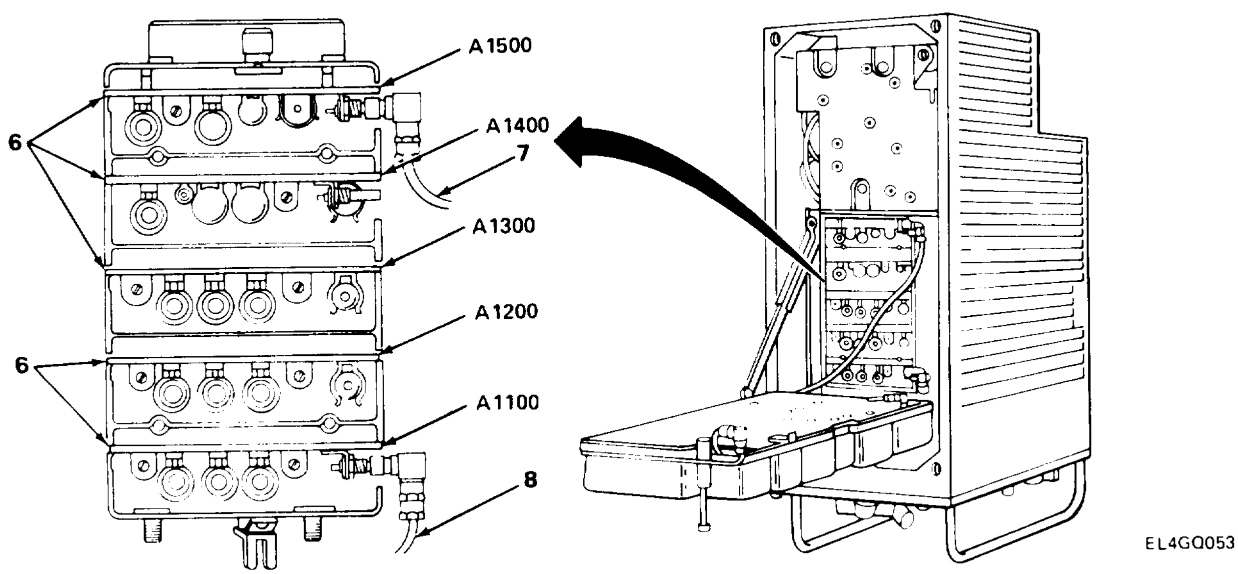
2-10. MODULES A1100 THROUGH A1500 REPLACEMENT. (CONT)

INSTALLATION



CAUTION

Before installing modules A1100 through A1300, make sure BAND switch pin (1) on module (2) is positioned to mate with BAND switch actuating pawl (3) on A1000 assembly (4) . On some A1100 through A1300 modules, spring (5) returns BAND switch to BAND (B) position. On these modules, turn BAND switch control to BAND (B) for installation then return to BAND (A) position.



1. Carefully push modules (6) into place.

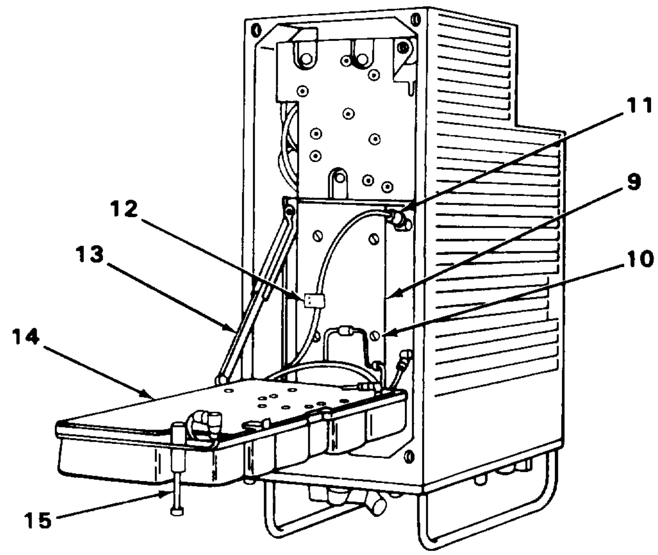
NOTE

Note locations of different numbered modules.

Make sure spring contacts on modules make contact with partitions between modules.

2. If modules A1100 or A1500 were removed, reconnect green wire (W202/W402) (7) to J1004 and brown wire (W102) (8) to J1001.

2-10. MODULES A1100 THROUGH A1500 REPLACEMENT. (CONT)



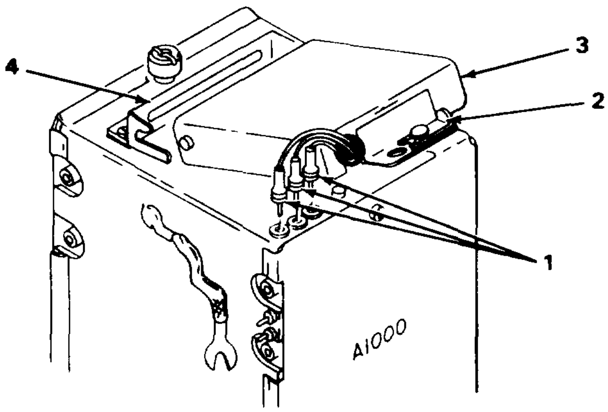
EL4GQ054

3. Install A1000 assembly cover (9) on A1000 assembly.
4. Using screwdriver, tighten four captive screws (10).
5. Connect green wire (W202/W402) (11) to clip (12).
6. Release brace (13) and raise A3000 assembly (14) into position.
7. Using screwdriver, tighten one captive screw (15).

FOLLOW-ON MAINTENANCE: Install top cover. (See paragraph 2-7.)

2-11. A1600 ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: Power Supply Assembly A1600
PRELIMINARY PROCEDURE: Remove bottom cover. (See paragraph 2-7.)



EL4GQ017

REMOVAL

NOTE

The A1600 assembly is located on top of the A1000 assembly.

1. Disconnect three color-coded wire plugs (1).
2. Unfasten retaining clip (2) by moving clip to right.
3. Lift front of assembly (3) and pull forward to remove from bracket (4).

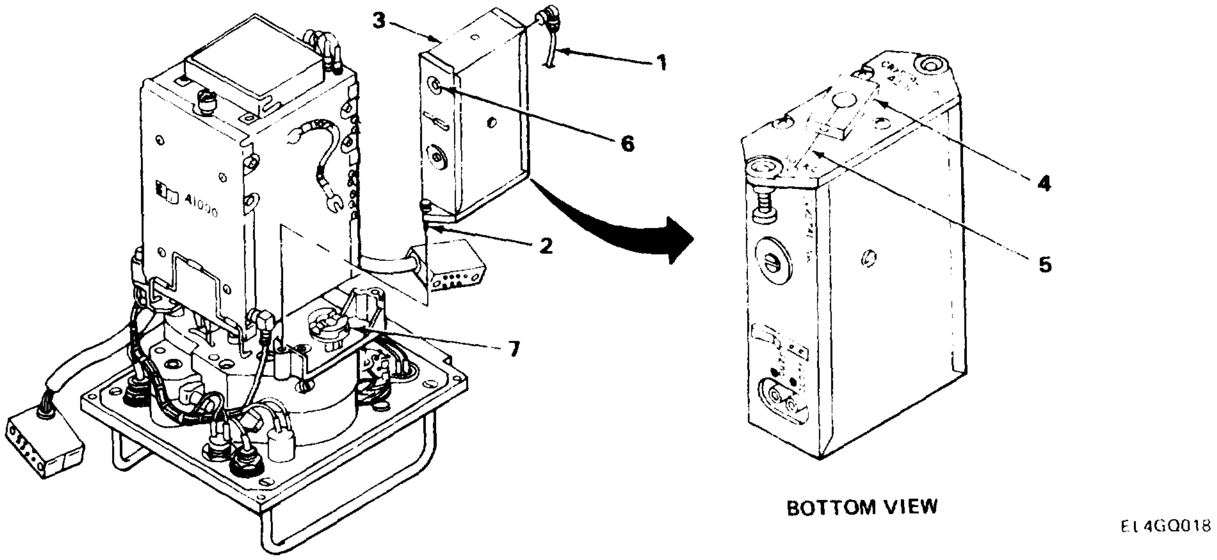
INSTALLATION

1. Place assembly (3) in bracket (4) and push into place.
2. Push front of assembly (3) down and secure by moving retaining clip (2) to left.
3. Connect three color-coded wire plugs (1).

FOLLOW-ON MAINTENANCE: Replace bottom cover. (See paragraph 2-7.)

2-12. A2000 ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: Radio Frequency A2000 Oscillator Assembly
PRELIMINARY PROCEDURE: Remove top and bottom covers. (See paragraph 2-7.)



NOTE

Front panel is removed to eliminate possibility of damaging color-coded pins on A1000 assembly.

REMOVAL

1. Disconnect orange wire (W103) (1) from J2001.
2. Using screwdriver, loosen two captive screws (2).
3. Remove A2000 assembly (3).

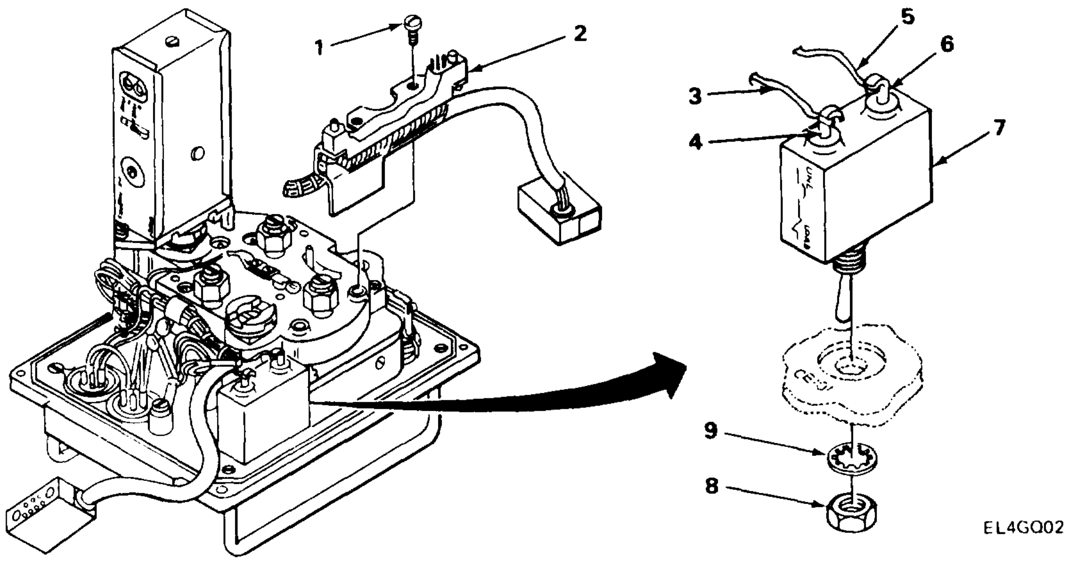
INSTALLATION

1. Aline coupler (4) with scribe mark (5).
2. Install A2000 assembly (3) so that J2003 terminal (6) faces top of radio.
3. Aline coupler (4) with mating coupler (7). Coupler (4) may have to be turned slightly to mate with coupler (7).
4. Using screwdriver, tighten two captive screws (2).
5. Connect orange wire (W103) (1) to J2001.

FOLLOW-ON MAINTENANCE: Replace top and bottom covers. (See paragraph 2-7.)

2-13. POWER SWITCH/CIRCUIT BREAKER CB101 REPLACEMENT.

MATERIALS/PARTS: Circuit Breaker
PRELIMINARY PROCEDURE: Remove A1000 assembly. (See paragraph 2-9.)



NOTE

At this time S103, J101, J102, PS101, CR101, and CR102 may also be removed. Removal and installation procedures are obvious.

REMOVAL

1. Using screwdriver, remove two screws (1).
2. Carefully move Connector P101 (2) out of way.
3. Using soldering iron, carefully unsolder red wire (3) from LINE side (4) and white/red wire (5) from LOAD side (6) of switch (7).
4. Using wrench, remove nut (8) and IT lockwasher (9).
5. Carefully push switch (7) out of panel.

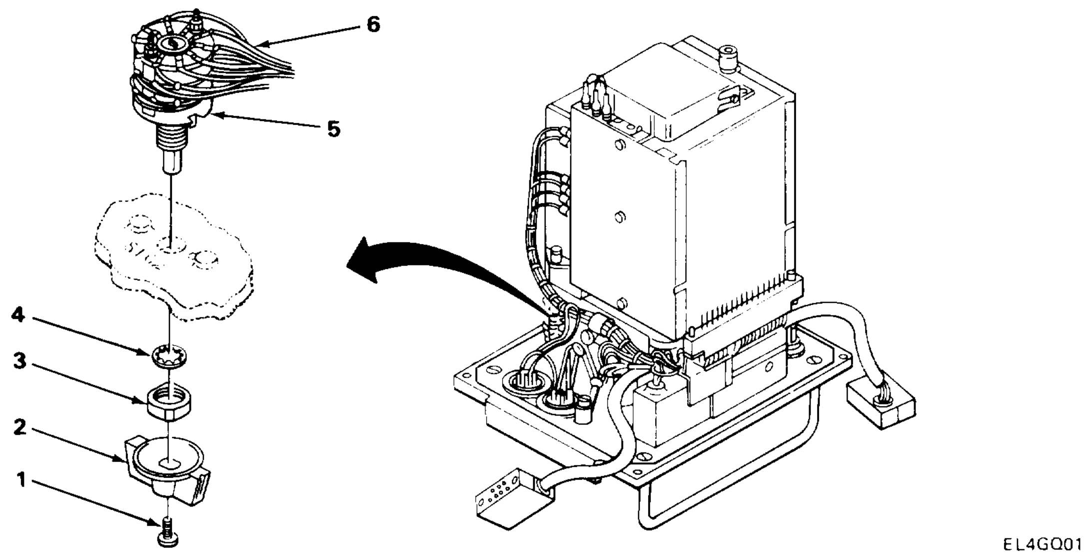
INSTALLATION

1. Position switch (7) in panel and install IT lockwasher(9) and nut (8).
2. Using wrench, tighten nut (8).
3. Using soldering iron, carefully solder red wire (3) to LINE side (4) and white/red wire (5) to LOAD side (6) of switch (7).
4. Position Connector P101 (2) over holes and install two screws (l).
5. Using screwdriver, tighten two screws (1).

FOLLOW-ON MAINTENANCE: Install A1000 assembly. (See paragraph 2-9.)

2-14. SQUELCH SWITCH S102 REPLACEMENT.

MATERIALS/PARTS: Rotary Switch
PRELIMINARY PROCEDURE: Remove front panel. (See paragraph 2-8.)



REMOVAL

1. Using screwdriver, remove screw (1) and knob (2).
2. Using wrench, remove nut (3).
3. Remove IT Iockwasher (4) and push switch (5) out of front panel.
4. Using soldering iron, carefully remove and resolder 13 wires (6) one at a time from defective switch to replacement switch.

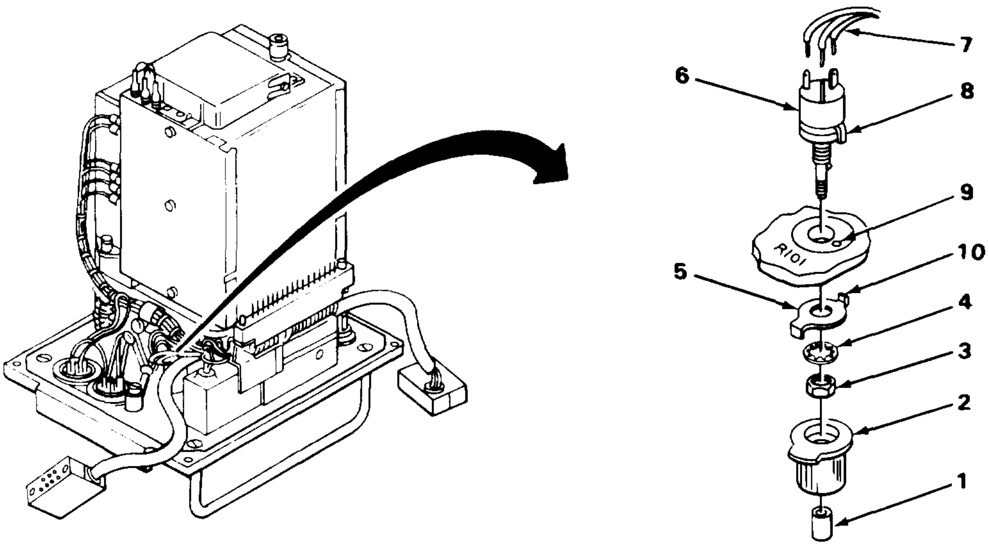
INSTALLATION

1. Carefully push switch (5) back into front panel.
2. Install IT Iockwasher (4) and nut (3).
3. Using wrench, tighten nut (3).
4. Install knob (2) and screw (1),
5. Using screwdriver, tighten screw (1).

FOLLOW-ON MAINTENANCE: Install front panel. (See paragraph 2-8.)

2-15. VOLUME CONTROL R101 REPLACEMENT.

MATERIALS/PARTS: Variable Composition Resistor
PRELIMINARY PROCEDURE: Remove front panel. (See paragraph 2-8.)



REMOVAL

1. Using screwdriver, remove screw (1) and knob (2).
2. Using wrench, remove nut (3), ET lockwasher (4), and stop clip (5).
3. Push potentiometer (6) out of front panel.
4. Using soldering iron, carefully unsolder three wires (7) one at o time and resolder on replacement potentiometer.

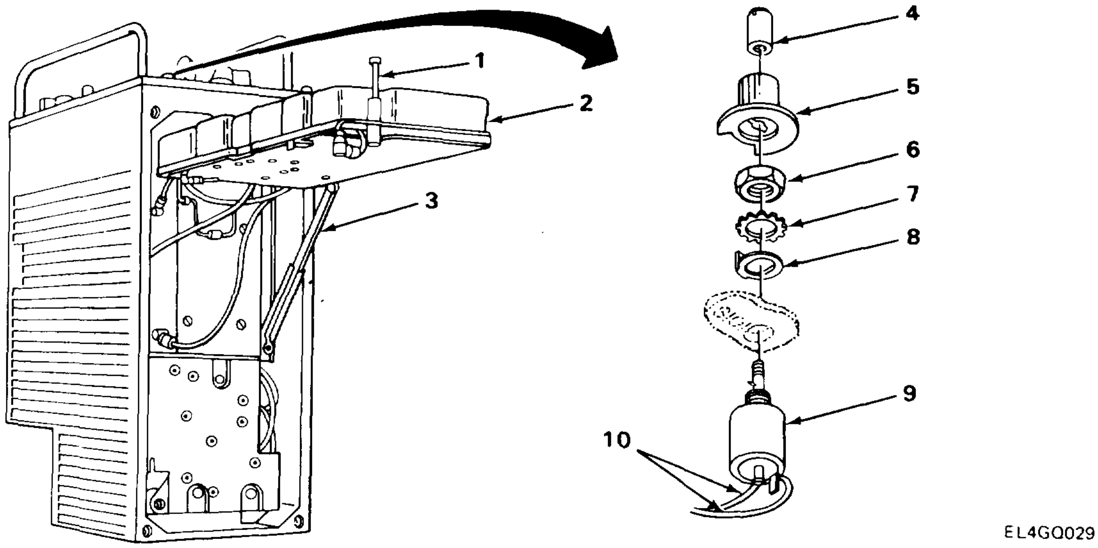
INSTALLATION

1. Push potentiometer (6) into front panel and position stop pin (8) in hold (9).
2. Install stop clip (5) with short end (10) in hole (9).
3. Install ET lockwasher (4) and nut (3).
4. Using wrench, tighten nut (3).
5. Install knob (2) and screw (1).
6. Using screwdriver, tighten screw (1).

FOLLOW-ON MAINTENANCE: Install front panel. (See paragraph 2-8.)

2-16. LIGHT SWITCH S101 REPLACEMENT.

MATERIALS/PARTS: Rotary Switch
PRELIMINARY PROCEDURE: Remove top cover. (See paragraph 2-7.)



REMOVAL

1. Using screwdriver, loosen one captive screw (1), raise A3000 assembly (2), and secure brace (3).
2. Using screwdriver, remove screw (4) and knob (5).
3. Using wrench, remove nut (6), IT lockwasher (7), and stop clip (8).
4. Push switch (9) out of front panel.
5. Using soldering iron, carefully unsolder two wires (10) one at a time and resolder on replacement switch.

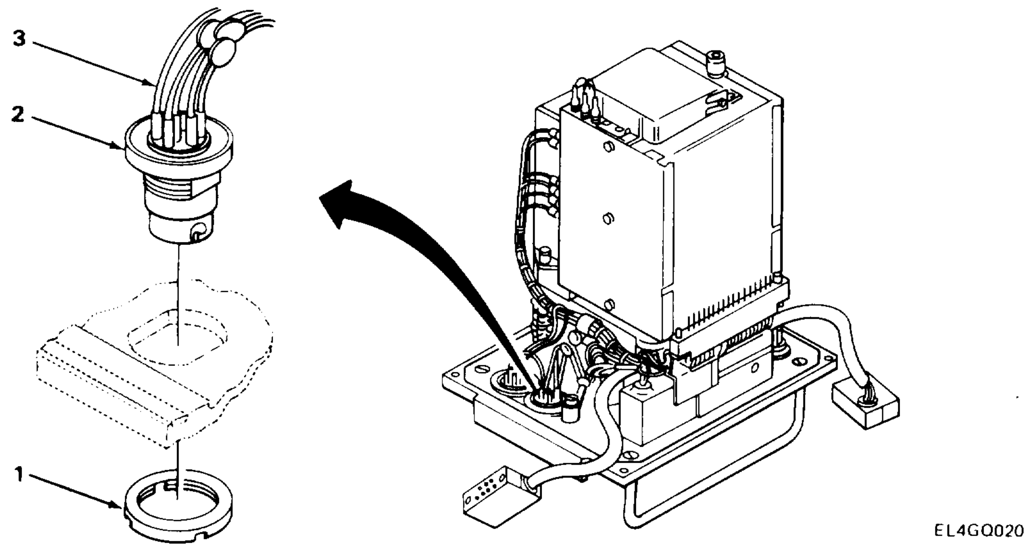
INSTALLATION

1. Push switch (9) into front panel and install stop clip (8), IT lockwasher (7), and nut (6).
2. Using wrench, tighten nut (6).
3. Install knob (5) and screw (4).
4. Release brace (3) and lower A3000 assembly (2) into case.
5. Using screwdriver, tighten one captive screw (1).

FOLLOW-ON MAINTENANCE: Install top cover. (See paragraph 2-7.)

2-17. AUDIO CONNECTOR J103 AND J104 REPLACEMENT

MATERIALS/PARTS: Electrical Connector Assembly, P/N SMC415681
PRELIMINARY PROCEDURE: Remove front panel (See paragraph 2-8.)



REMOVAL

NOTE

The steps given are typical of both connectors. The only difference is that Connector J103 has six wires and Connector J104 has five wires.

1. Using spanner wrench, remove locknut (1).
2. Carefully push connector (2) out of panel.
3. Using soldering iron, carefully remove and resolder wires (3) from defective connector to replacement connector one at a time. (See note for number of wires on each connector.)

INSTALLATION

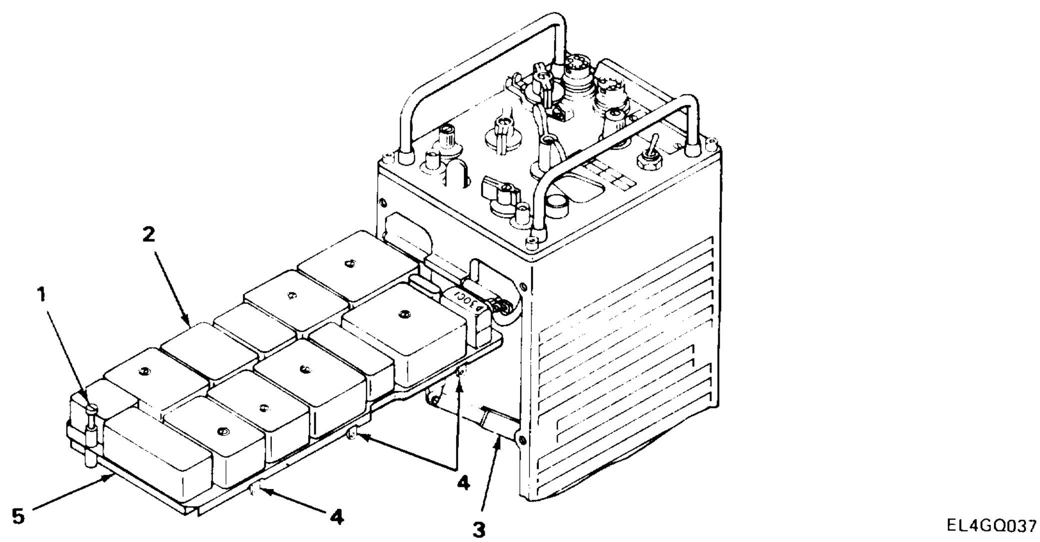
1. Carefully push connector (2) back into panel.
2. Install locknut (1) on connector (2).
3. Using spanner wrench, tighten locknut (1).

FOLLOW-ON MAINTENANCE: Install front panel. (See paragraph 2-8.)

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: Crystal REF System Assembly A3000, P/N SMD413519
Harmonic Generator Assembly A3100
Amplifier Mixer Assembly A3200
Second Mixer Assembly A3300
Intermediate Frequency Amplifier A3400
Limiter Amplifier A3500
Electrical Frequency Discriminator A3600
Assembly Phase Discriminator A3700
Low-Pass Filter FL3001
High-Pass Filter FL3002
Band-Pass Filter FL3003
Band-Pass Filter FL3004 and FL3005

PRELIMINARY PROCEDURE: Remove top cover, (See paragraph 2-7.)



REMOVAL

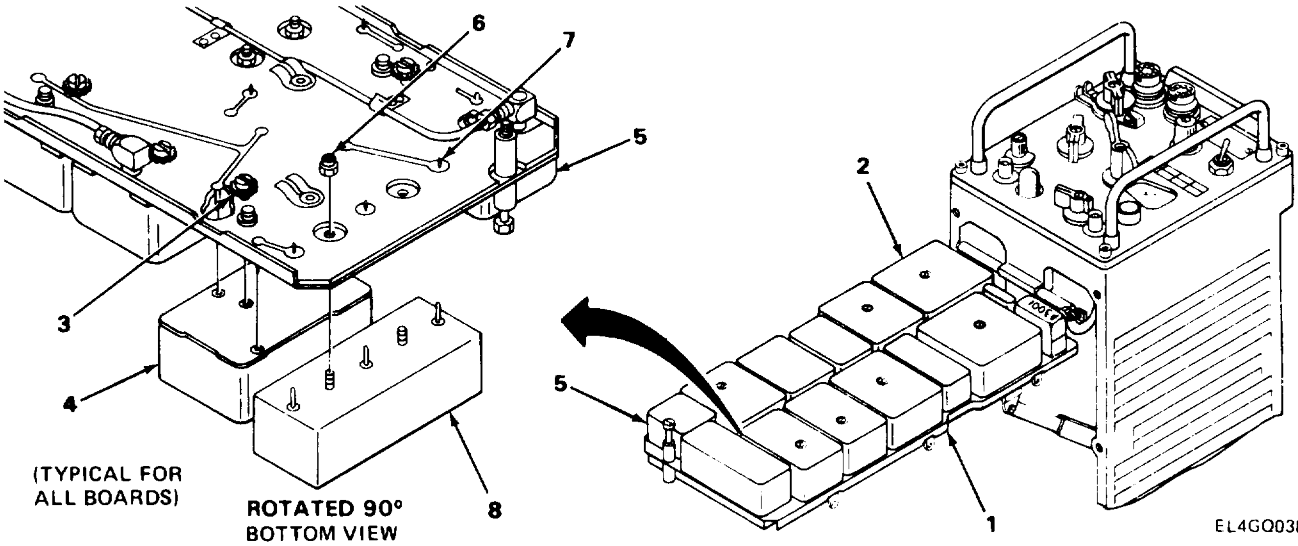
1. Using screwdriver, loosen one captive screw (1).
2. Swing assembly (2) out and secure brace (3).
3. Pull out five slide clips (4) and remove shield (5).

NOTE

Assembly can be removed with or without first removing modules. If assembly is to be removed without removing modules, proceed to step 11.

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

REMOVAL (CONT)



NOTE

Modules A3100 through A3700 are secured with captive screws. Steps 4, 5 and 6 are typical for all modules.

4. Disconnect black wire (W203) from A3300 (1) and red wire (W204) from A3700 (2).
5. Using screwdriver, loosen captive screws (3).
6. Carefully pull module (4) off board to release from pins. Do not twist from side to side.

NOTE

Modules FL3001 through FL3005 are secured with locknuts and are soldered to printed circuit board. Steps 7 through 10 are typical for all modules.

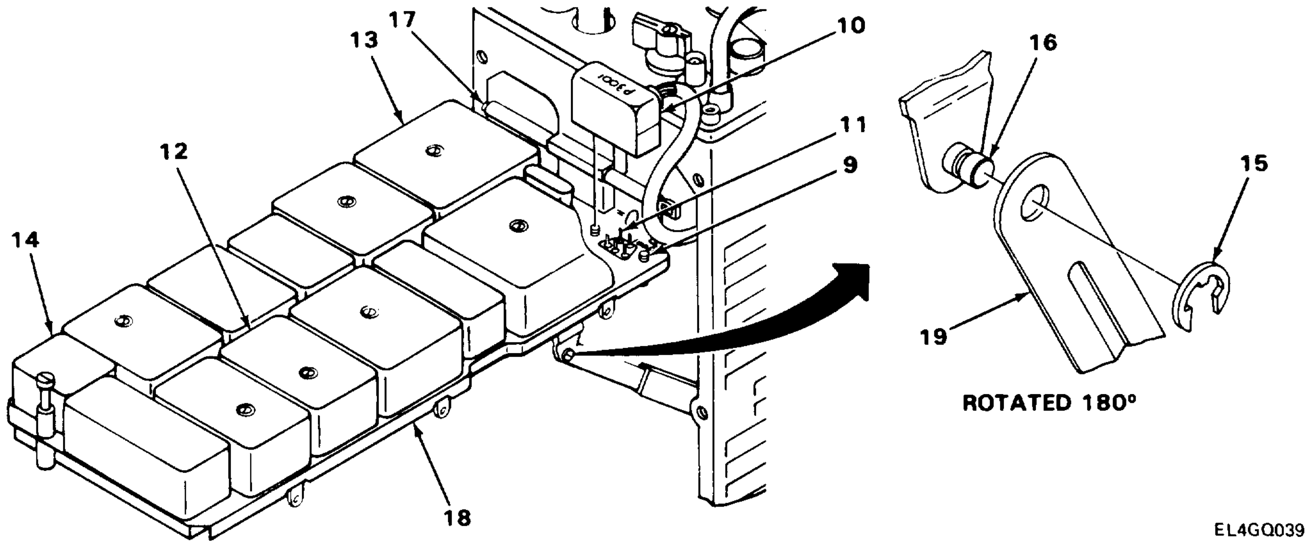
7. Disconnect green wire (W202/W402) from FL3002 (5).
8. Using wrench, remove locknuts (6).

CAUTION

Care must be taken when performing next step to prevent damage to printed circuit board.

9. Using soldering iron, carefully unsolder module wires (7) from printed circuit board.
10. Carefully pull module (8) off board.

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



11. Using screwdriver, loosen two captive screws (9).

CAUTION

Care must be taken when performing next step to prevent damage to pins on assembly.

12. Carefully pull P3001 (10) off pins (11).
13. Disconnect black wire (W203) from A3300 (12), red wire (W204) from A3700 (13), green wire (W202/W402) from FL3002 (14), and all wires from wire clips.
14. Using jeweler's screwdriver, remove C-clip (15) from pin (16) and remove brace.
15. Using pliers, pull hinge pin (17) out of hinge.
16. Remove assembly (18).

INSTALLATION

CAUTION

Before installing assembly, make sure pins (11) are not bent. Straighten any bent pins.

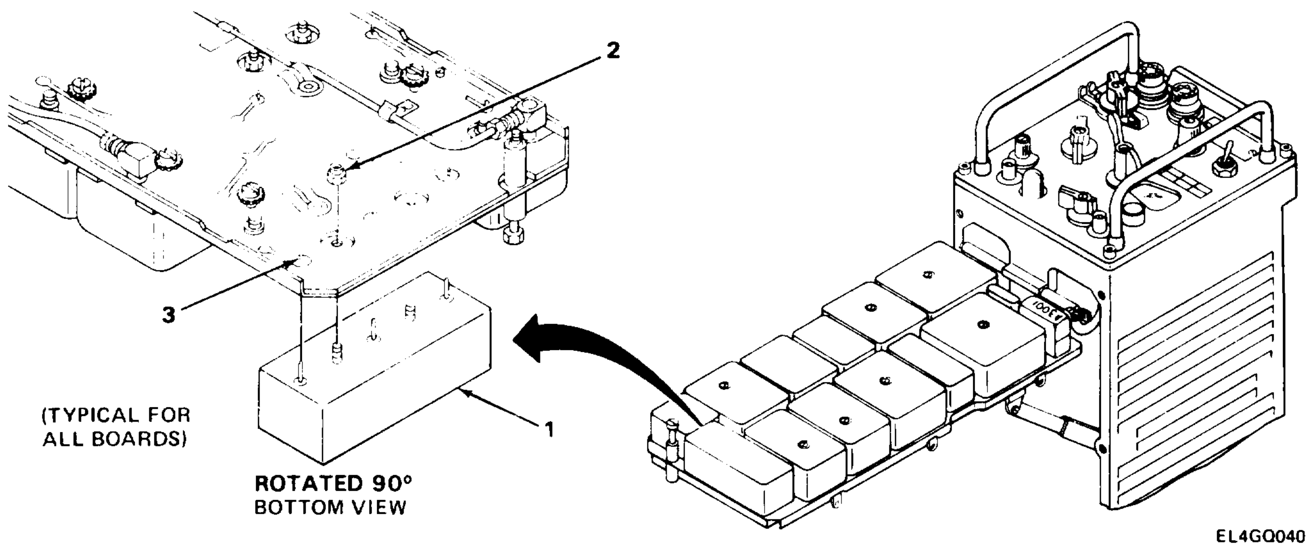
1. Position assembly (18) in hinge and insert hinge pin (17).
2. Position brace (19) on pin (16) and install C-clip (15).

NOTE

If modules were not removed from assembly, proceed to step 8 for installation of assembly.

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION (CONT)



NOTE

Modules FL3001 through FL3005 are secured with locknuts and are soldered to printed circuit board. Steps 3, 4, and 5 are typical of all modules.

Module number locations are stamped on board.

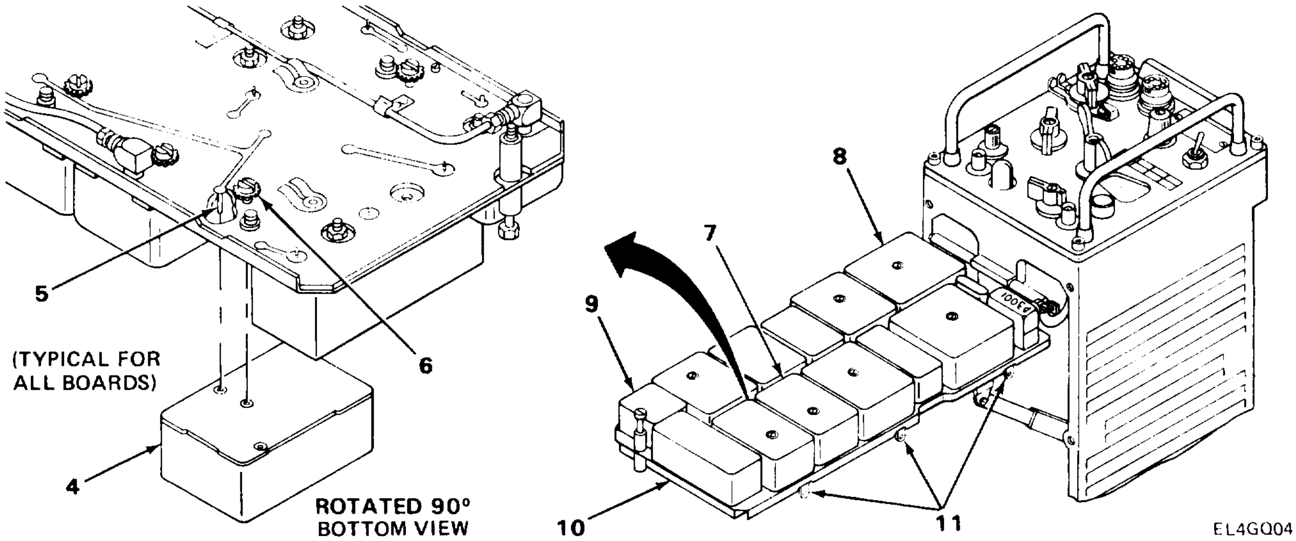
3. Position module (1) on board and install locknuts (2).
4. Using wrench, tighten locknuts (2).

CAUTION

Care must be taken when performing next step to prevent damage to printed circuit board.

5. Using soldering iron, carefully solder pins (3) of module to printed circuit board.

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



CAUTION

Before installing modules, make sure pins on assembly are not bent. Straighten any bent pins.

Care must be taken when performing next step to prevent damage to pins on assembly.

NOTE

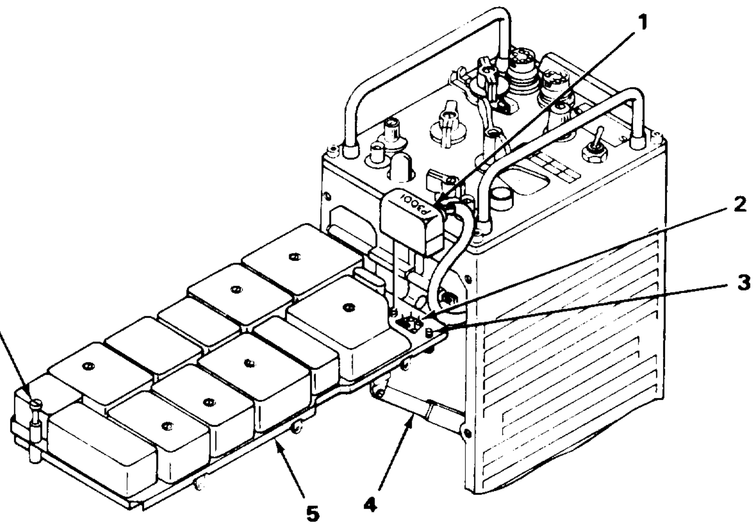
Modules A3100 through A3700 are secured with captive screws. Steps 6 and 7 are typical for all modules.

Module number location is stamped on board.

6. Carefully position module (4) on pins (5) and push into place.
7. Using screwdriver, tighten captive screws (6).
8. Connect black wire (W203) to A3300 (7), red wire (W204) to A3700 (8), green wire (W202/W402) to FL3002 (9), and all wires to wire clips.
9. Position shield (10) under board and aline with pins.
10. Secure shield (10) by pushing in five slide clips (11).

2-18. A3000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION (CONT)



EL4GQ042

CAUTION

Before installing P3001, make sure pins on assembly are not bent. Straighten any bent pins.

Care must be taken when performing next step to prevent damage to pins on assembly.

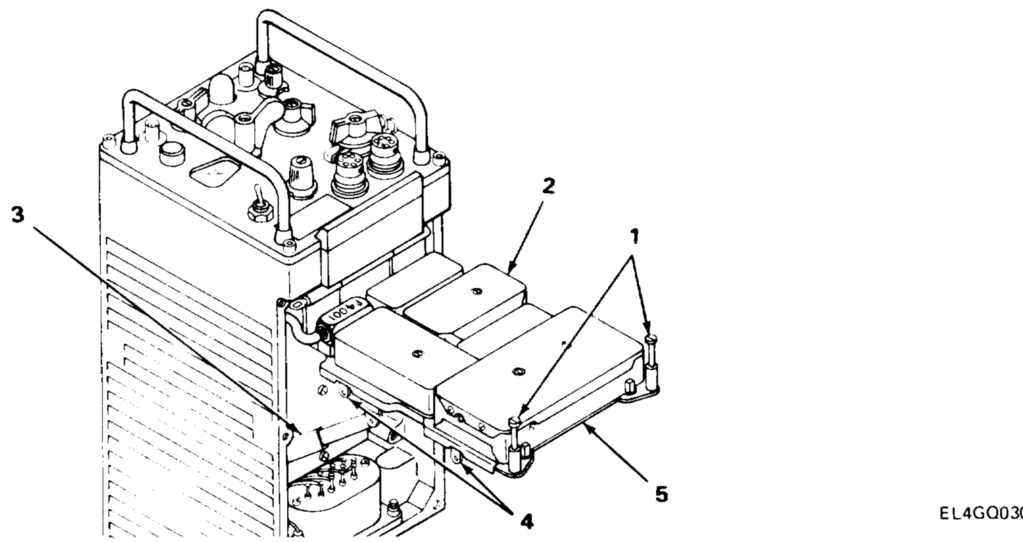
11. Carefully position P3001 (1) on pins (2) and push into place.
12. Using screwdriver, tighten two captive screws (3).
13. Release brace (4) and lower assembly (5) into position.
14. Using screwdriver, tighten one captive screw (6).

FOLLOW-ON MAINTENANCE: Install top cover. (See paragraph 2-7.)

2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT

MATERIALS/PARTS: IF Amplifier Assembly A4000
Electrical Frequency Discriminator A4200
Band-Pass Filters FL4001 and FL4002
IF Amplifier Assembly A4100
Audio Frequency Amplifier A4300

PRELIMINARY PROCEDURE: Remove bottom cover. (See paragraph 2-7.)



REMOVAL

1. Using screwdriver, loosen two captive screws (1).
2. Swing assembly (2) out and secure brace (3).

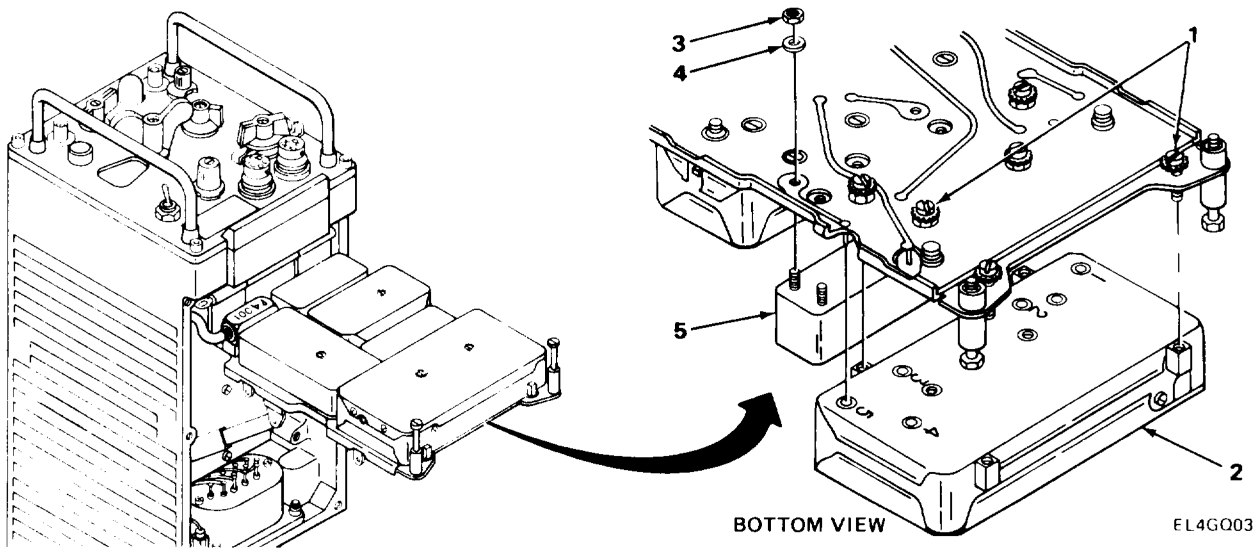
NOTE

Assembly can be removed with or without first removing modules. If assembly is to be removed without removing modules, proceed to step 8.

3. Pull out four slide clips (4) and remove shield (5).

2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

REMOVAL (CONT)



NOTE

Modules A4100 through A4300 are secured with captive screws. Steps 4 and 5 are typical for all modules.

4. Using screwdriver, loosen captive screws (1).
5. Carefully pull module (2) off board to release from pins. Do not twist from side to side.

CAUTION

Extreme care must be taken when performing next step to prevent damaging test points on printed circuit board.

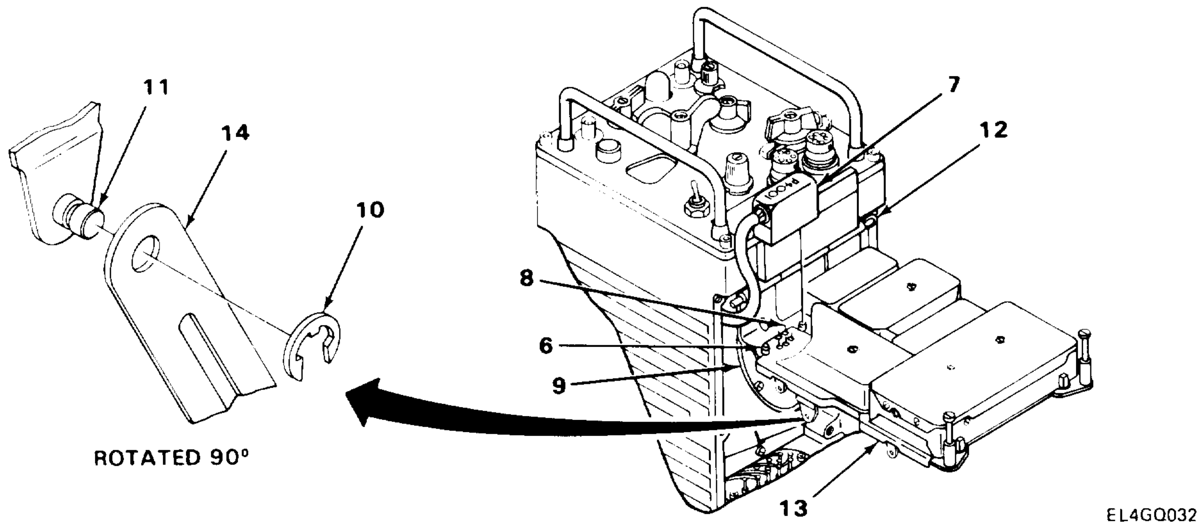
NOTE

Modules FL4001 and FL4002 are secured with locknuts. Steps 6 and 7 are typical for both modules.

Note position of FL4002 module for 50KC or WIDE BAND operation mode.

6. Using wrench, remove locknuts (3) and IT Iockwashers (4).
7. Carefully pull module (5) off board.

2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



8. Using screwdriver, loosen two captive screws (6).

CAUTION

Care must be taken when performing next step to prevent damage to pins on assembly.

9. Carefully lift P4001 (7) off pins (8).
10. Remove blue wire (W201/W401) (9) from J1005.
11. Using jeweler's screwdriver, remove C-clip (10) from pin (11).
12. Using pliers, pull hinge pin (12) out of hinge.
13. Remove assembly (13).

INSTALLATION

CAUTION

Before installing assembly, make sure pins (8) are not bent. Straighten any bent pins.

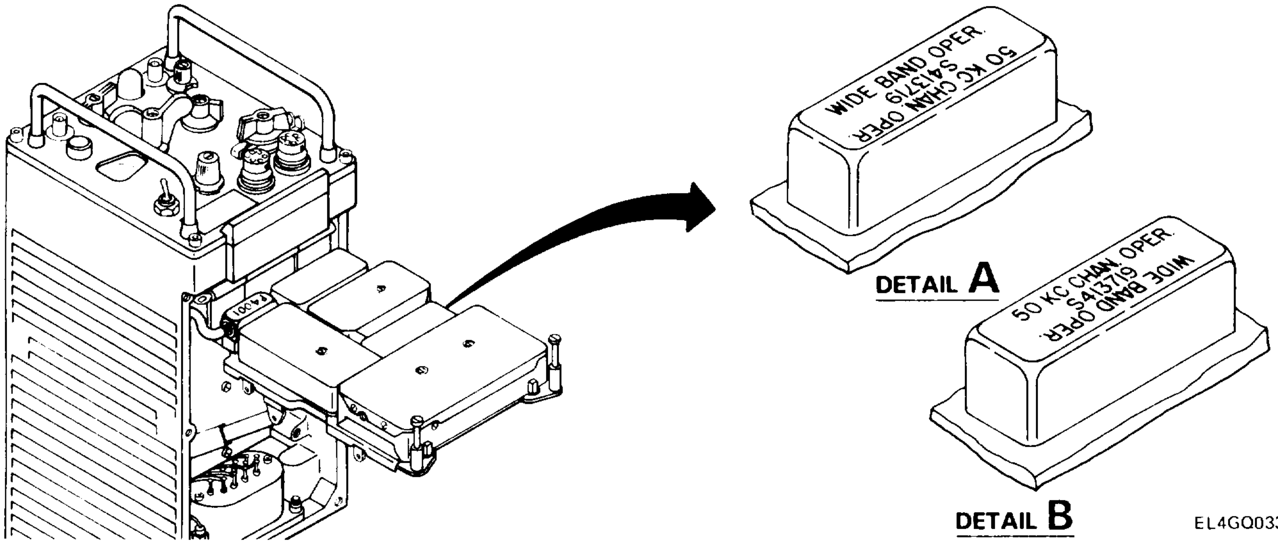
1. Position assembly (13) in hinge and insert hinge pin (12).
2. Position brace (14) on pin (11) and install C-clip (10).

NOTE

If modules were not removed from assembly, proceed to step 9 for installation of assembly.

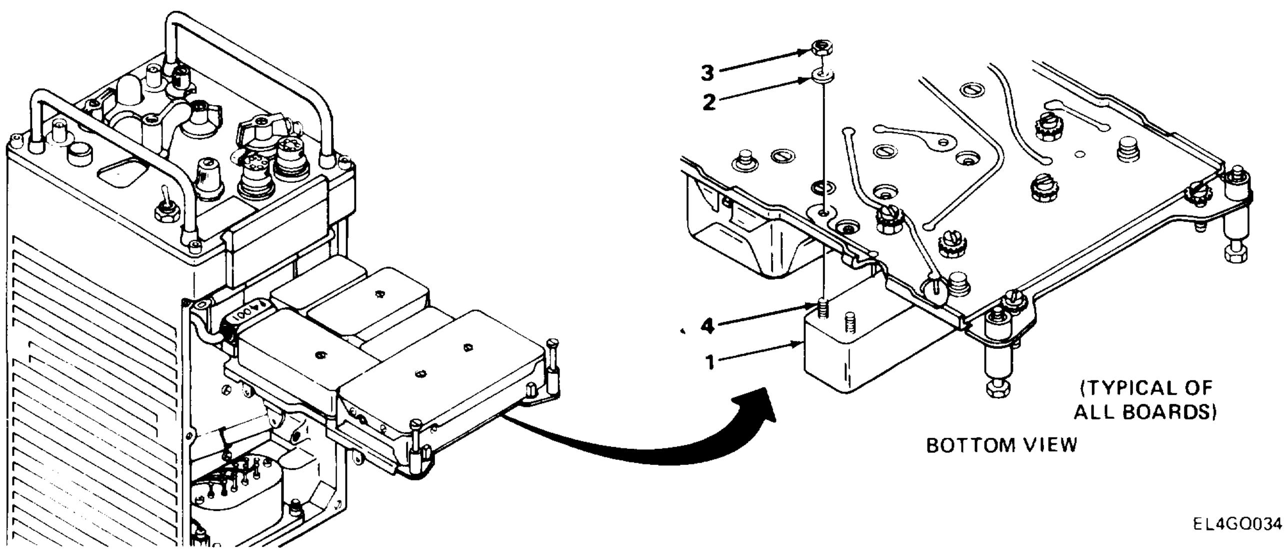
2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION (CONT)



NOTE

Before installing Filter FL4002, establish whether a 50KC or WIDE BAND operation mode will be used. The position of the Filter FL4002 will depend on operation mode selected. See detail A for 50KC operation mode and detail B for WIDE BAND operation mode.



NOTE

Modules FL4001 and FL4002 are secured with locknuts. Steps 3 and 4 are typical for both modules.

Module number location is stamped on board.

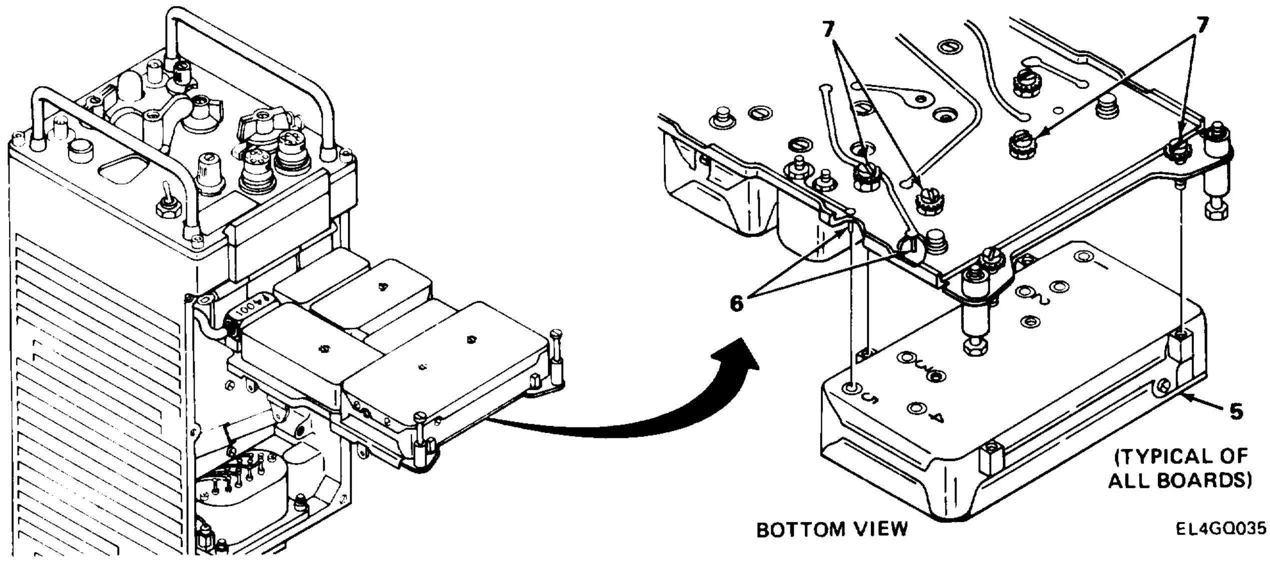
3. Position module (1) on board and install IT lockwashers (2) and locknuts (3) on studs (4).

2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

CAUTION

Extreme care must be taken when performing next step to prevent damaging test points on printed circuit board. Do not overtighten.

4. Using wrench, carefully tighten locknuts (3).



CAUTION

Before installing modules, make sure pins on assembly are not bent. Straighten any bent pins.

Extreme care must be taken when performing next step to prevent damage to pins on assembly.

NOTE

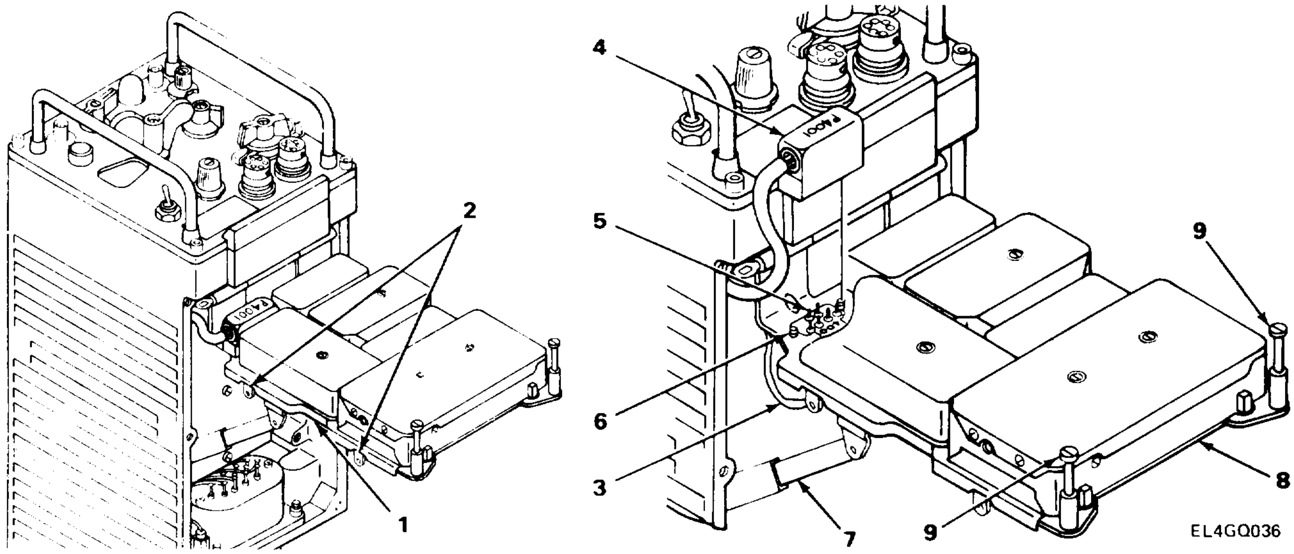
Modules A4100 through A4300 are secured with captive screws. Steps 5 and 6 are typical for all modules.

Module number location is stamped on board.

5. Carefully position module (5) on pins (6) and push into place.
6. Using screwdriver, tighten captive screws (7).

2-19. A4000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION (CONT)



7. Position shield (1) under board and aline with pins,
8. Secure shield (1) by pushing in four slide clips (2).

CAUTION

Check screws on top of modules for tightness. If loose, tighten.

9. Install blue wire (W201/W401) (3) to J1005.

CAUTION

Care must be taken when performing next step to prevent damage to pins on assembly.

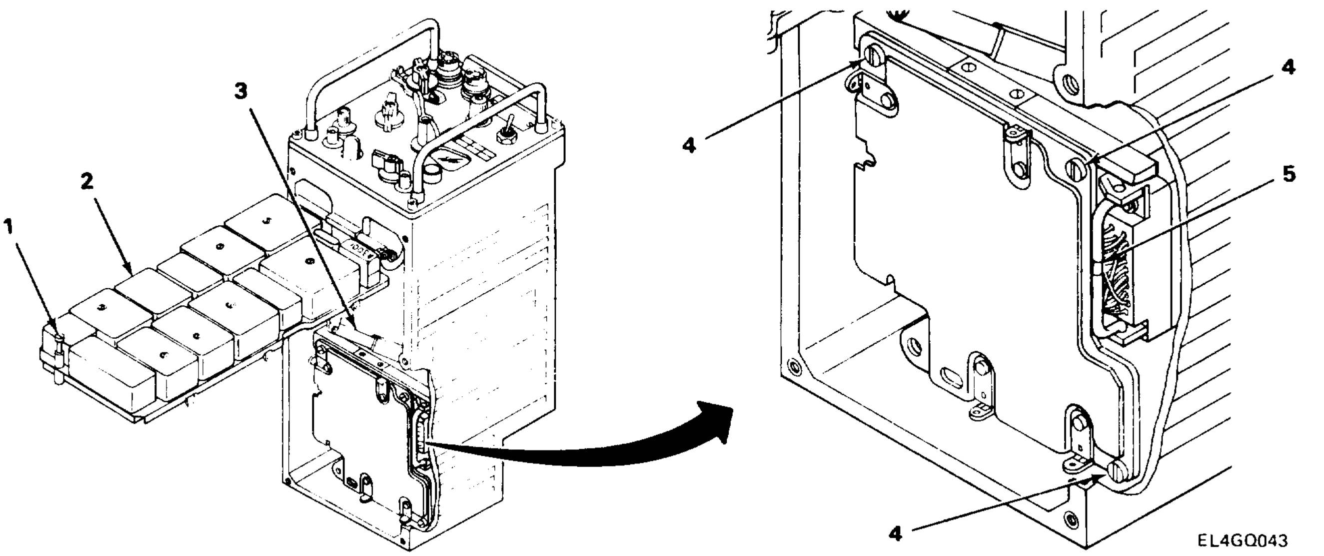
10. Carefully position P4001 (4) on pins (5) and push into place.
11. Using screwdriver, tighten two captive screws (6).
12. Release brace (7) and lower assembly (8) into position.
13. Using screwdriver, tighten two captive screws (9).

FOLLOW-ON MAINTENANCE: Install bottom cover. (See paragraph 2-7.)

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: IF Amplifier Assembly A5000
Audio Frequency Assembly Amplifier A5100
Amplifier Limiter A5200
Squelch Assembly A5300
Audio Frequency Transformer T5001
Band-Pass Filter FL5001
Armature Relay K5001
Armature Relay K5002

PRELIMINARY PROCEDURE: Remove top cover. (See paragraph 2-7.)



REMOVAL

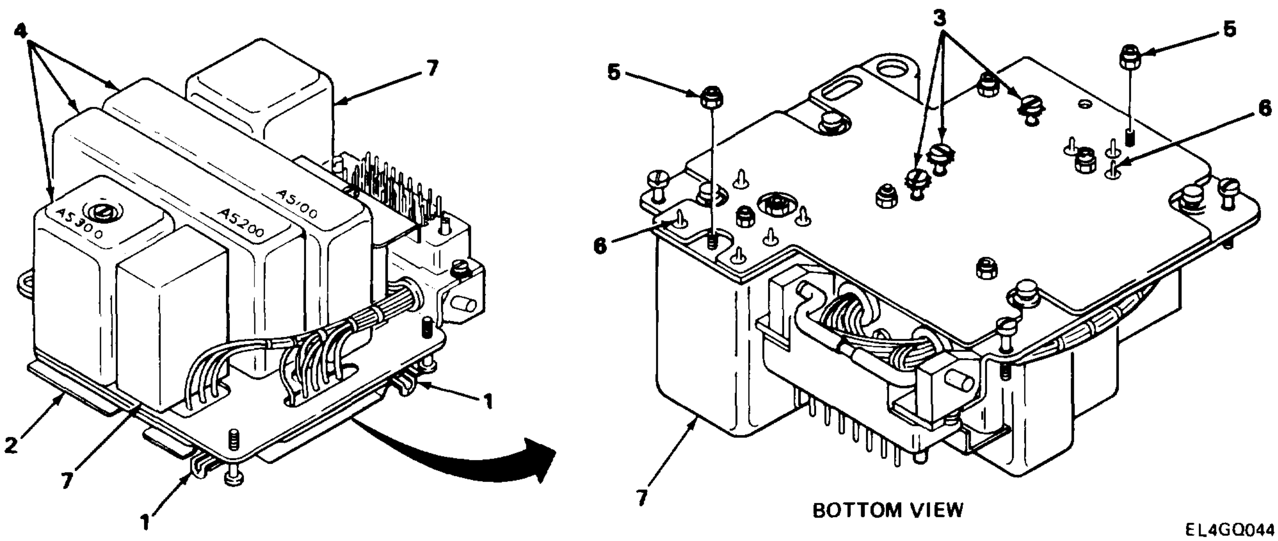
NOTE

To get to A5000 assembly, A3000 assembly must first be moved out of the way.

1. Using screwdriver, loosen one captive screw (1).
2. Swing A3000 assembly (2) out and secure brace (3).
3. Using screwdriver, loosen three captive screws (4).
4. Pry up pull ring (5) and carefully pull assembly out of case.

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

REMOVAL (CONT)



5. Pull out four slide clips (1) and remove shield (2).

NOTE

Modules A5100 through A5300 are secured with captive screws. Steps 6 and 7 are typical for all modules.

6. Using screwdriver, loosen captive screws (3).
7. Carefully pull module (4) off board to release from pins. Do not twist from side to side.

NOTE

Modules FL5001 and T5001 are secured with locknuts and are soldered to printed circuit board. Steps 8, 9, and 10 are typical for both modules.

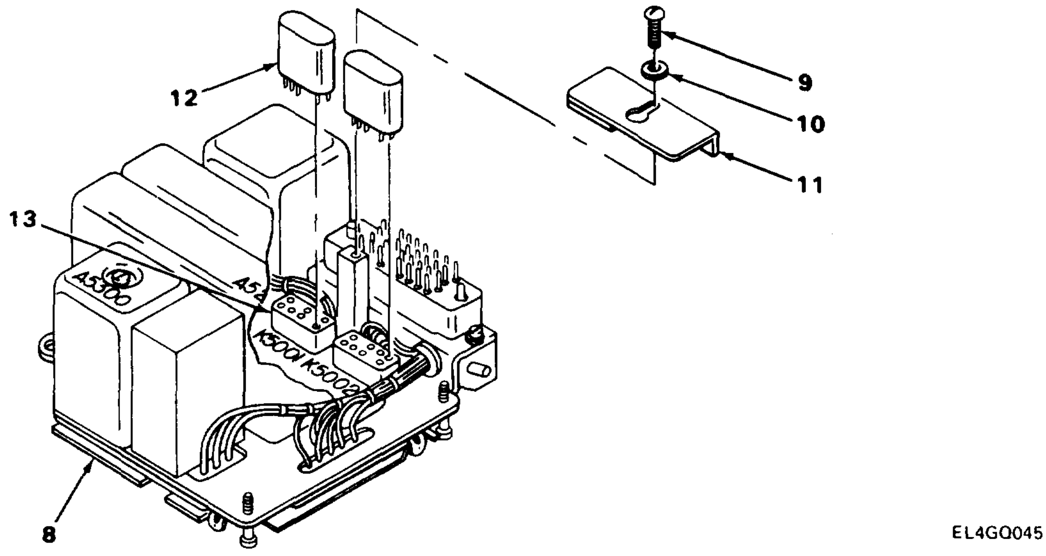
8. Using wrench, remove locknuts (5).

CAUTION

Care must be taken when performing next step to prevent damage to printed circuit board.

9. Using soldering iron, carefully unsolder module pins (6) from printed circuit board.
10. Carefully pull modules (7) off board.

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



NOTE

Shield (8) does not have to be removed in order to replace K5001 and K5002 modules.

Steps for removing K5001 and K5002 modules are the same.

11. Using screwdriver, remove screw (9), flat washer (10), and holddown (11).
12. Carefully pull module (12) from receptacle (13).

INSTALLATION

NOTE

If modules were not removed from assembly, proceed to step 11.

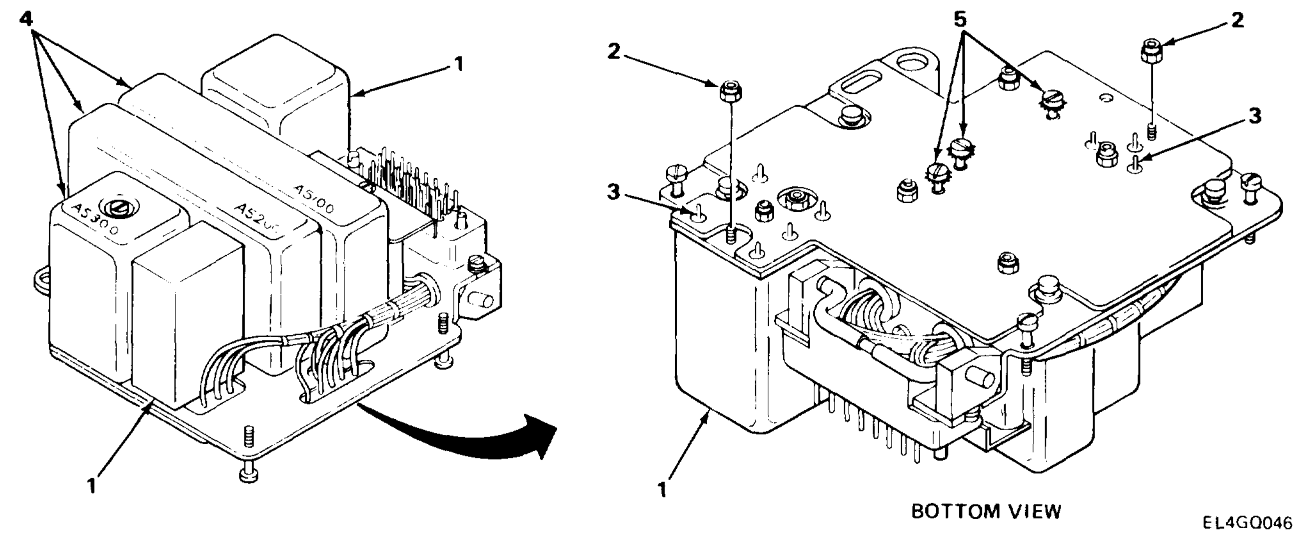
Steps for installing K5001 and K5002 modules are the same.

Module number location is stamped on board.

1. Carefully position module (12) in receptacle (13) and push into place.
2. Install holddown (11), flat washer (10), and screw (9).
3. Using screwdriver, tighten screw (9).

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)

INSTALLATION (CONT)



NOTE

Modules FL5001 and T5001 are secured with locknuts and are soldered to printed circuit board. Steps 4, 5, and 6 are typical for both modules.

Module number location is stamped on board.

4. Position module (1) on board and install locknuts (2).
5. Using wrench, tighten locknuts (2).

CAUTION

Care must be taken when performing next step to prevent damage to printed circuit board.

6. Using soldering iron, carefully solder pins (3) of module to printed circuit board.

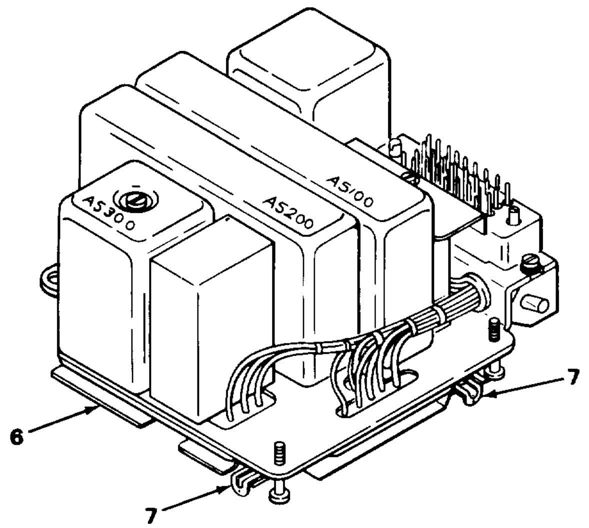
NOTE

Modules A5100 through A5300 are secured with captive screws. Steps 7 and 8 are typical for all modules.

Module number is stamped on board.

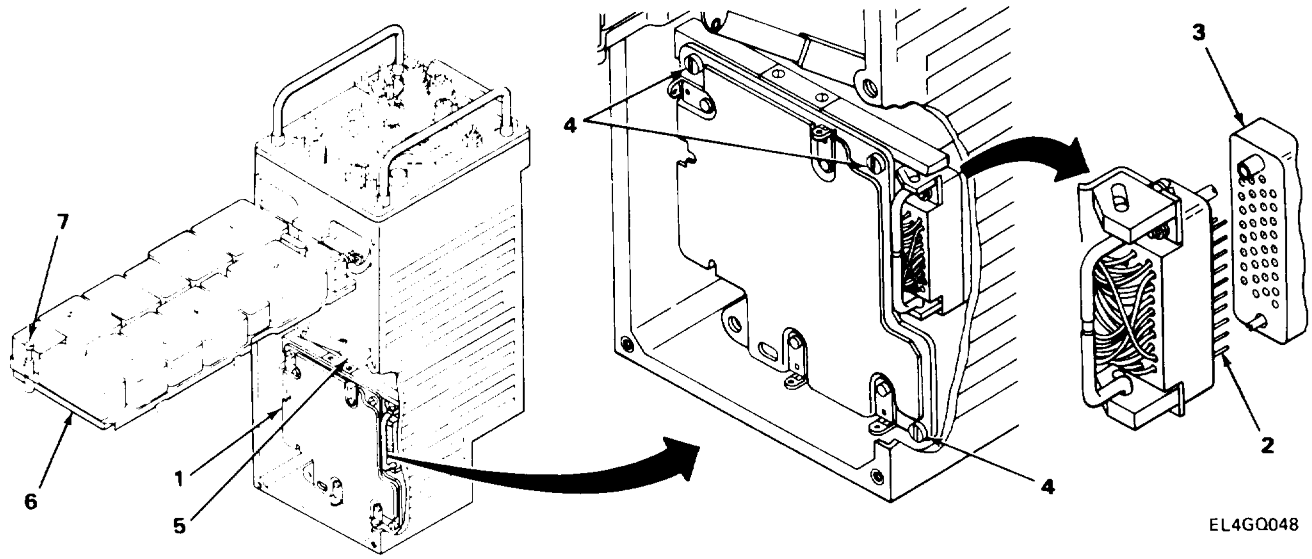
7. Carefully position module (4) on pins and push into place.
8. Using screwdriver, tighten captive screws (5).

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



9. Position shield (6) under board and a line with pins.
10. Secure shield (6) by pushing in four slide clips (7).

2-20. A5000 MODULE AND ASSEMBLY REPLACEMENT. (CONT)



CAUTION

Care must be taken when performing next step to prevent damage to pins on assembly connector.

11. Carefully position assembly (1) in case and push into place, engaging assembly connector pins (2) and case connector (3).
12. Using screwdriver, tighten three captive screws (4).
13. Release brace (5) on A3000 assembly (6) and lower into place.
14. Using screwdriver, tighten one captive screw (7).

FOLLOW-ON MAINTENANCE: Install top cover. (See paragraph 2-7.)

CHAPTER 3

DIRECT SUPPORT PERFORMANCE AND TROUBLESHOOTING PROCEDURES USING MAINTENANCE KIT MK.1978/VRC AND DISCRETE TEST EQUIPMENT (TMDE)

OVERVIEW

This chapter contains performance tests, troubleshooting, and alinement procedures at the direct support level, using Maintenance Kit MK-1978/VRC and discrete test equipment (TMDE).

The performance tests are diagnostic in purpose. They should be used to verify that an R-442/VRC is operating properly or to point out the existence of faults.

If failure to meet a performance test standard confirms that a fault is present in the unit under test, the test procedure will refer you to a specific chart in the troubleshooting section. The troubleshooting charts are designed to isolate the faults noted in the performance tests. They will guide you to the source of defects and/or misalinements.

Once it has identified the source of a fault, a troubleshooting chart will refer you to the appropriate repair/replacement instructions or alinement procedure. Because each stage of the receiver depends upon its other stages for overall operating efficiency, the replacement, repair, or realinement of even one component could alter the signals enough to create the need for other realinements. Therefore, after making any alterations in the R-442/VRC, do all the performance tests, even those you have done already.

Section I PERFORMANCE TESTS

3-1. GENERAL.

This section contains performance test procedures for use with Maintenance Kit MK-1978/VRC and discrete test equipment (TMDE). They will enable you to determine whether or not an R-442/VRC is operating acceptably. Each test procedure checks specific functions of the receiver to help you find and isolate faults.

3-1. GENERAL. (CONT)

Each test is complete and may be performed individually. Therefore, you may choose the appropriate test to verify gross equipment failure or performance degradation of specific stages. However, this maintenance approach is not recommended. It is best to perform all the tests in sequence. This systematic maintenance approach will ensure that all faults are found and corrected.

Faults in the R-442/VRC are evidenced by failure of the radio to meet the performance standards found within the test procedures in **bold type.** When an R-442/VRC fails to meet a performance standard, discontinue the test and turn to the troubleshooting chart referred to in the procedure.

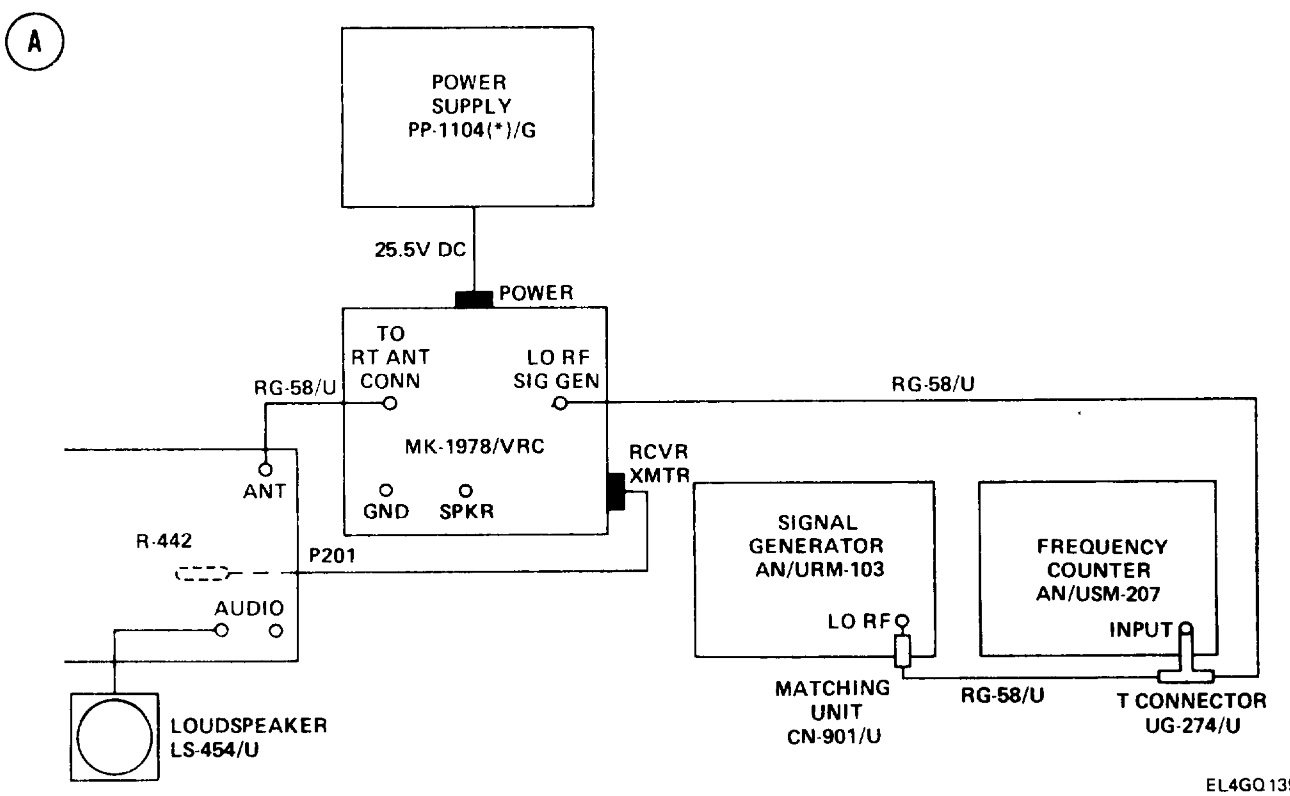
3-2. VOLUME CONTROL TEST.

PURPOSE. This test checks the VOLUME control of the R-442/VRC for proper operation. When a 1-kHz tone is injected into the receiver ANTENNA port, the speaker should output a clear tone with no scratchy sound or sudden drop in volume. The absence of a tone means that the signal is not passing completely through the R-442/VRC circuitry and could even indicate total equipment failure; therefore, perform this test before the others in this section.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Loudspeaker LS-454/U
Maintenance Kit MK-1978/VRC
Rf Cables (two) RG-58/U

TEST SETUP. Connect equipment as shown in test setup diagram A



3-2.. VOLUME CONTROL TEST. (CONT)

Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, 20-µ rf input level, 1-kHz modulation and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-l03	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µ
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	AUX RCVR	NORMAL
	X-MODE (RT)	NORMAL
	SQUELCH	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

3-2. VOLUME CONTROL TEST. (CONT)

NOTE

To produce a display on the AN/USM-207, the AN/U RM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to 20 µ.

2. Disconnect T-connector from AN/USM-207.
3. Turn R-442/VRC VOLUME control fully clockwise, then fully counterclockwise.

STANDARD. Tone from speaker should be clear, with no scratchiness or sudden changes in volume at any point in the rotation of the VOLUME control.

4. If volume changes suddenly, if tone is scratchy, or if no tone at all is heard, see troubleshooting chart 3-1.

3-3. RECEIVER SENSITIVITY TEST.

PURPOSE. This test checks the ability of the R-442/VRC to detect low-level rf signals by measuring its SIN AD at several frequencies. SIN AD gives receiver sensitivity in terms of the following ratio:

Signal + noise + distortion/noise + distortion.

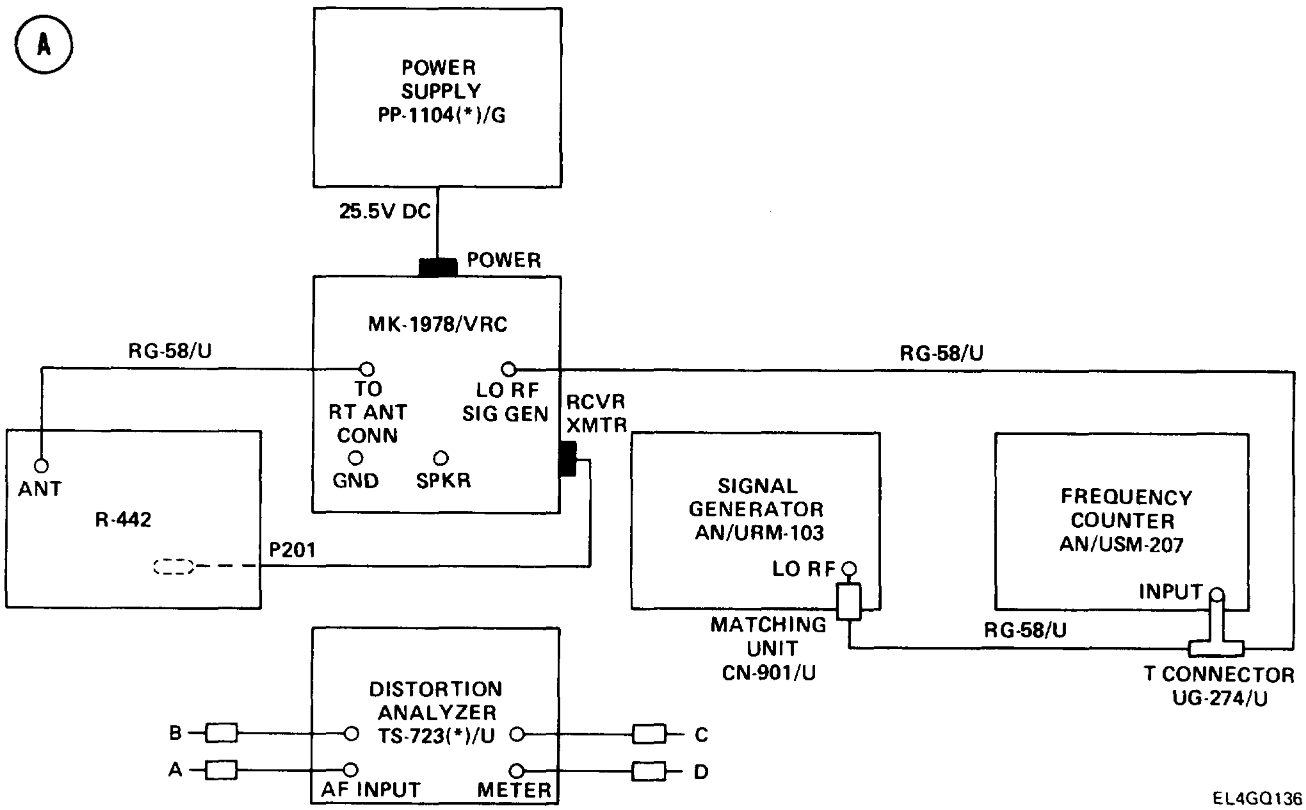
SINAD is expressed in decibels. The better a receiver's SINAD, the better signals, even weak ones, can be heard over unwanted internal noise. The SINAD for the R-442/VRC should be at least -10 db (from a zero-db reference) when the rf level is 0.5 µ.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Distortion Analyzer TS-723(*)/U
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274B/U
Matching Unit CN-901/U
Maintenance Kit MK-1978/VRC
Rf Cables (two) RG-58/U

3-3. RECEIVER SENSITIVITY TEST. (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram A .



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. if using alternate test equipment, adjust for 30.00 MHz, 0.5-µ rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

3-3. RECEIVER SENSITIVITY TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-I03	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	0.5/µ
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	X-MODE (RT)	RCVE
	RT	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON
TS-723(*)U	RANGE	X10
	AF INPUT	MIN
	AF-RF	AF
	FREQUENCY	100
	FUNCTION	METER
	R.M.S. VOLTS/DB	30 v

TEST PROCEDURE

Sensitivity Test at 30.00 MHz

1. Connect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; connect lead D to GND jack. (See test setup diagram A , page 3-5.)
2. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to 0.5 µ.

3-3. RECEIVER SENSITIVITY TEST. (CONT)

3. Disconnect T-connector from AN/USM-207.
4. Adjust R-442/VRC VOLUME control for 17-volt indication on TS-723(*)/U meter.
5. If 17-volt indication cannot be obtained, see troubleshooting chart 3-10.
6. Disconnect TS-723(*)/U METER leads from MK-1978/VRC jacks.
7. Connect TS-723(*)/U AF INPUT lead B to MK-1978/VRC SPKR jack; connect lead A to GND jack. (See test setup diagram A)
8. Turn TS-723(*)/U FUNCTION switch to SET LEVEL.
9. Adjust TS-723(*)/U AF INPUT control for zero-db indication on meter.
10. Change TS-723(*)/U FUNCTION switch to DISTORTION.
11. Adjust TS-723(*)/U FREQUENCY and BALANCE controls for minimum meter indication.

STANDARD. The new TS-723(')/U meter indication (step 11) should be at least -10 db from the previous zero-db indication (step 8).

12. If TS-723(*)/U meter indication is not at least -10 db from previous indication, see trouble-shooting chart 3-2.

Sensitivity Test at 53.00 MHz

13. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B .
14. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 53.00-MHz meter indication.
15. Reconnect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; reconnect lead D to GND jack.
16. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz,
17. Repeat steps 3 through 12.

Sensitivity Test at 41.00 MHz

18. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A .
19. Turn AN /URM-103 BRAND SWITCH to C and RF TUNING control for 53.00 MHZ meter indication.
20. Reconnect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; reconnect lead D to GND jack.
21. Adjust AN/URM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
22. Repeat steps 3 through 12.

Sensitivity Test at 64.00 MHz

23. Change R-442/VRC MC-TUNE-KC switch to 64.00 MHz and BAND to B .
24. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 64.00-MHz meter indication.
25. Reconnect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; reconnect lead D to GND jack.
26. Adjust ANLJRM-103 RF TUNING control for 64.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 64.00 MHz.
27. Repeat steps 3 through 12.

3-3. RECEIVER SENSITIVITY TEST. (CONT)

Sensitivity Test at 52.00 MHz

28. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz and BAND to (A).
29. Turn AN/URM-103 BAND SWITCH to (C) and RF TUNING control for 52.00-MHz meter indication.
30. Reconnect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; reconnect lead D to GND jack.
31. Adjust AN/URM-103 RF TUNING control for 52.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 52.00 MHz.
32. Repeat steps 3 through 12,

Sensitivity Test at 75.00 MHz

33. Change R-442/VRC MC-TUNE-KC switch to 75.00 MHz and BAND to (B).
34. Turn AN/URM-103 BAND SWITCH to (D) and RF TUNING control for 75.00-MHz meter indication.
35. Reconnect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; reconnect lead D to GND jack.
36. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz.
37. Repeat steps 3 through 12.

3-4. NEW SQUELCH TEST.

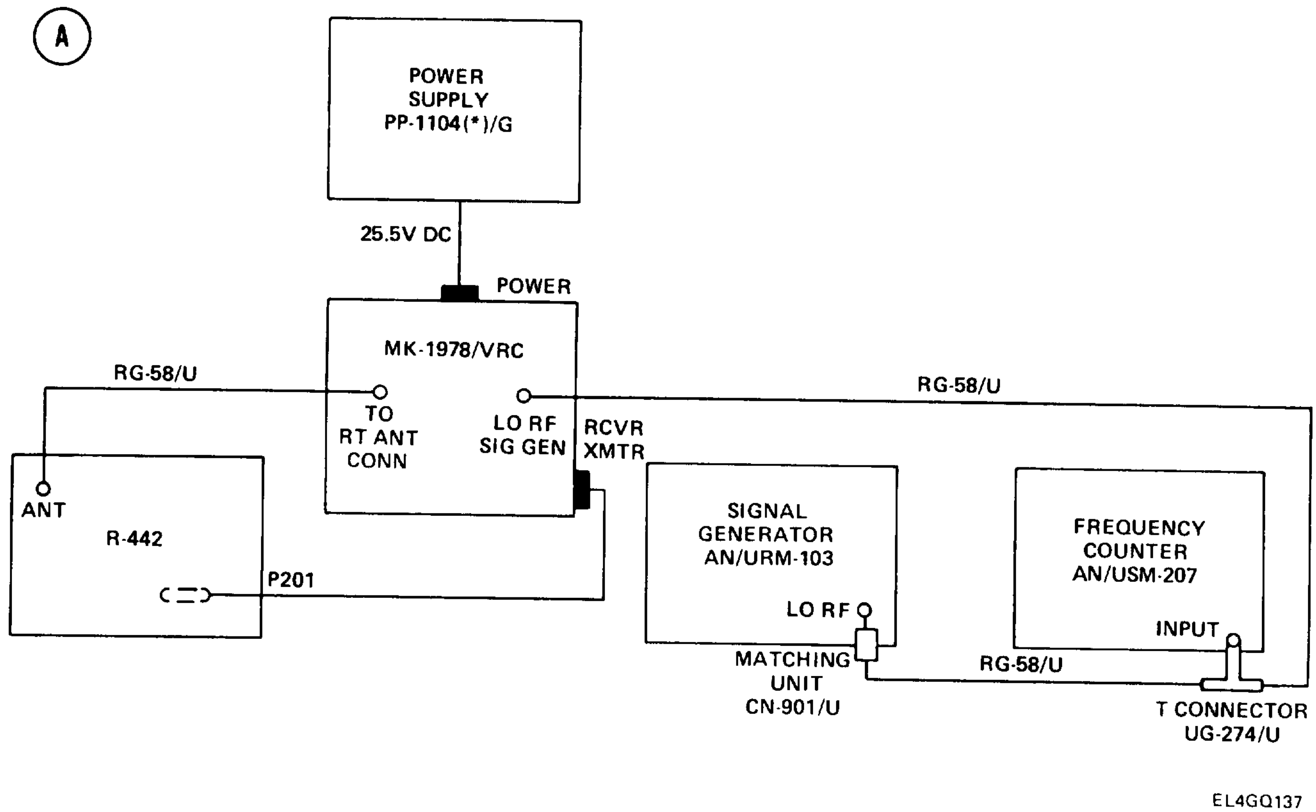
PURPOSE. This test checks the sensitivity of R-442/VRC squelch modules (A5200, A5300) to the NEW SQUELCH signal (150 Hz) at several carrier frequencies. The 150-Hz signal is injected into the R-442/VRC ANTENNA port, energizing Squelch Module Relay K5002, which unsquelches the receiver. Proper operation of the squelch modules is verified by CALL lamp response to carrier signal strength at or below a 0.5-µ rf level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Maintenance Kit MK-1978/VRC

3-4. NEW SQUELCH TEST. (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



Turn on test equipment, Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, minimum rf input level, 150-Hz modulation, and 3-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

3-4. NEW SQUELCH TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	NEW ON
	VOLUME	Fully counterclockwise
	POWER	ON
	LIGHT	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	150 Hz
	DEVIATION	Adjust for 3-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Minimum setting

TEST PROCEDURE

NEW SQUELCH Test at 30.00 MHz

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the ANLJRM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. If necessary, readjust AN/URM-103 DEVIATION control for 3-kHz meter indication.
4. Turn AN/URM-103 LO RF UV control slowly clockwise until R-442/VRC CALL lamp lights.

STANDARD. R-442/VRC CALL lamp should light while the AN/U RM-103 LO RF UV control setting is at or below 0.5 µv.

3-4. NEW SQUELCH TEST. (CONT)

5. If LO RF UV control setting is more than 0.5 µ when CALL lamp lights, or if CALL lamp does not light, see troubleshooting chart 3-3.
6. Remove cable from R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should go out. Remember that without the 150-Hz tone, Relay K5002 will not be energized to supply the 16 volts necessary to turn on the audio amplifiers; therefore, the receiver is squelched.

7. If CALL lamp does not go out, see troubleshooting chart 3-3.
8. Reconnect cable to R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should light.

9. If CALL lamp does not light, see troubleshooting chart 3-3.

NEW SQUELCH Test at 41.00 MHz

10. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A .
11. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 41.00-MHz meter indication.
12. Adjust AN/U RM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
13. Repeat steps 2 through 9.

NEW SQUELCH Test at 52.00 MHz

14. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz.
15. Turn AN/URM-103 RF TUNING control for 52.00-MHz meter indication.
16. Adjust AN/URM-103 RF TUNING control for 52.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 52.00 MHz.
17. Repeat steps 2 through 9.

NEW SQUELCH Test at 53.00 MHz

18. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B .
19. Turn AN/URM-103 RF TUNING control for 53.00-MHz meter indication.
20. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz.
21. Repeat steps 2 through 9.

NEW SQUELCH Test at 65.00 MHz

22. Change R-442/VRC MC-TUNE-KC switch to 65.00 MHz,
23. Turn AN/URM-103 BAND SWITCH to D) and RF TUNING control for 65.00-MHz meter indication.

3-4. NEW SQUELCH TEST. (CONT)

24. Adjust AN/URM-103 RF TUNING control for 65.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 65.00 MHz.
25. Repeat steps 2 through 9.

NEW SQUELCH Test at 75.00 MHz

26. Change R-442/VRC MC-TUNE-KC switch to 75.00 MHz.
27. Turn AN/URM-103 RF TUNING control for 75.00-MHz meter indication.
28. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz.
29. Repeat steps 2 through 9.

3-5. OLD SQUELCH TEST.

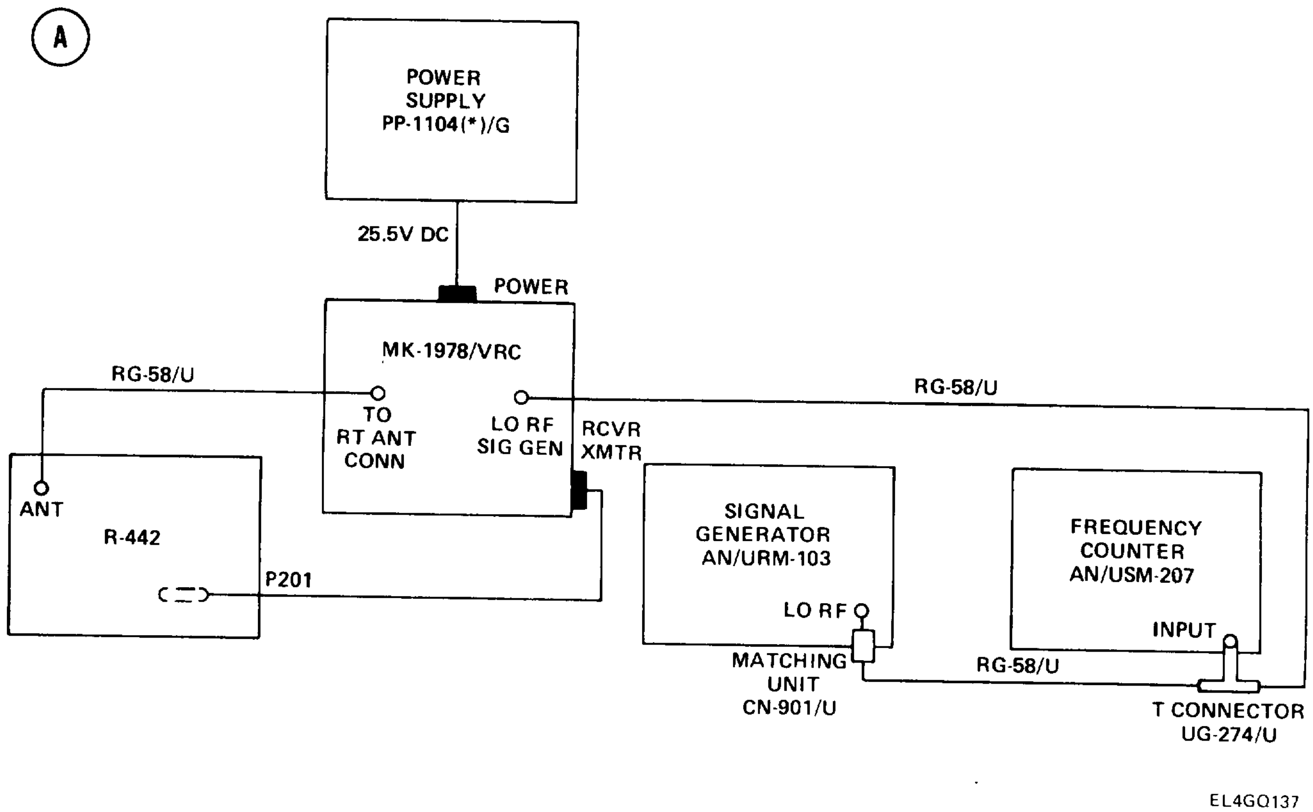
PURPOSE. This test checks the sensitivity of the R-442/VRC squelch modules (A5200, A5300) to OLD SQUELCH noise components (7300 Hz) at several carrier frequencies. Proper operation of the squelch modules is verified by CALL lamp response to signal strength at or below a 0.7-µ rf carrier level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/US M-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Maintenance Kit MK-1978/VRC

3-5. OLD SQUELCH TEST. (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram (A).



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, minimum rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

3-5. OLD SQUELCH TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STANDBY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TOLINE	To red line
	RF OUT PUT	LO, 0-10 KUV
	LO RF UV	Minimum setting
R-442/VRC	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	OLD ON
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON

TEST PROCEDURE

OLD SQUELCH Test at 30.00 MHz

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. Turn AN/URM-103 LO RF UV control clockwise until R-442/VRC CALL lamp lights.

STANDARD. R-442/VRC CALL lamp should light while LO RF UV control setting is at or below 0.7µ.

4. if LO RF UV control setting is more than 0.7 µ, see troubleshooting chart 3-3.
5. Remove cable from R-442/VRC ANTENNA port.

3-5. OLD SQUELCH TEST. (CONT)

STANDARD. R-442/VRC CALL lamp should go out.

6. If CALL lamp stays lit, see troubleshooting chart 3-3.
7. Reconnect cable to R-442/VRC ANTENNA port.

STANDARD R-442/VRC CALL lamp should light.

8. If CALL lamp does not light, see troubleshooting chart 3-3.

OLD SQUELCH Test at 41.00 MHz

9. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A .
10. Turn AN/URM-103 BAND SWITCH to © and RF TUNING control for 41.00-MHz meter indication.
11. Adjust AN/URM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
12. Repeat steps 2 through 8.

OLD SQUELCH Test at 52.00 MHz

13. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz.
14. Turn AN/URM-103 RF TUNING control for 52.00-MHz meter indication.
15. Adjust AN/URM-103 RF TUNING control for 52.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 52.00 MHz.
16. Repeat steps 2 through 8.

OLD SQUELCH Test at 53.00 MHz

17. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B .
18. Turn AN/URM-103 RF TUNING control for 53.00-MHz meter indication.
19. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz.
20. Repeat steps 2 through 8.

OLD SQUELCH Test at 65.00 MHz

21. Change R-442/VRC MC-TUNE-KC switch to 65.00 MHz.
22. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 65.00-MHz meter indication.
23. Adjust AN/URM-103 RF TUNING control for 65.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 65.00 MHz.
24. Repeat steps 2 through 8.

OLD SQUELCH Test at 75.00 MHz

25. Change R-4421VRC MC-TUNE-KC switch to 75.00 MHz.
26. Turn AN/URM-103 RF TUNING control for 75.00-MHz meter indication.

3-5. OLD SQUELCH TEST. (CONT)

27. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz.
28. Repeat steps 2 through 8.

3-6. RECEIVER AUDIO POWER TEST.

PURPOSE. This test checks the ability of the R-442/VRC to drive its three audio outputs, namely:

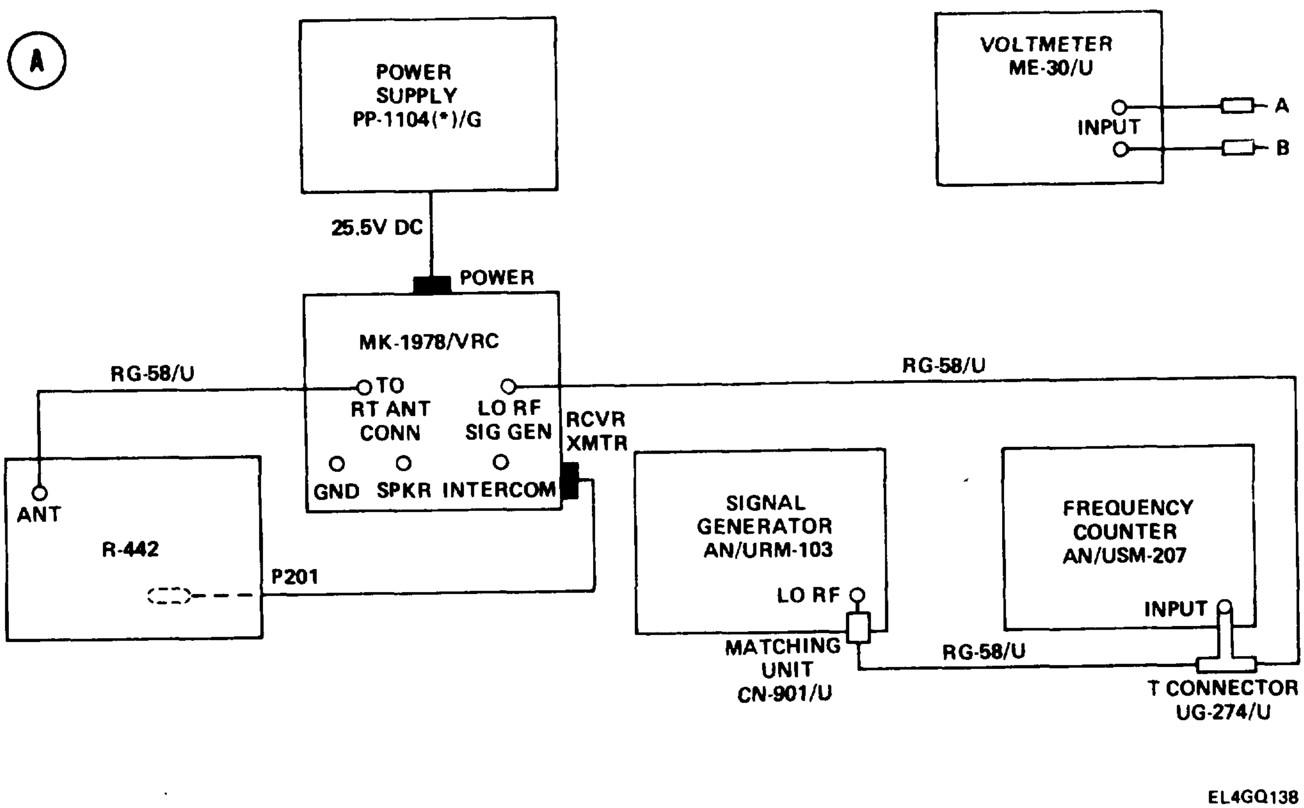
1. The MUTED audio output, which supplies power to the speaker.
2. The UNMUTED audio output, which supplies power to the headphones.
3. The FIXED LEVEL audio output, which supplies power to the interphone system.

An rf level strong enough to drive the A4200 module into limiting (20µv) is injected into the R-442/VRC ANTENNA port. The audio output voltages are then measured at the SPKR and INTERCOM jacks of the MK-1978/VRC.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Ac Voltmeter ME-30(*)/U
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Maintenance Kit MK-1978/VRC
Rf Cable RG-58/AJ

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



3-6. RECEIVER AUDIO POWER TEST. (CONT)

Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 60.00 MHz, 20µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	60.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
ME-30(*)/U	RANGE selector switch	30 v
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	AUX RCVR	NORMAL
	X-MODE (RT)	NORMAL
	SQUELCH	ON
R-442/VRC	BAND	B
	MC-TUNE-KC	60.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

3-6. RECEIVER AUDIO POWER TEST. (CONT)

TEST PROCEDURE

Muted Audio Power Test

1. Connect ME-30(*)/U INPUT lead A to MK-1978/VRC SPKR jack; connect lead B to GND jack. (See test setup diagram A page 3-16.)
2. Adjust AN/URM-103 RF TUNING control for 60.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 60.00 MHz, and reset the LO RF UV control to 20 µv.

3. Disconnect T-connector from AN/USM-207.
4. Turn R-442/VRC VOLUME control fully clockwise.

STANDARD. ME-30(*)/U meter should indicate at least 17 volts.

5. If ME-30(*)/U meter indication is less than 17 volts, see troubleshooting chart 3-10.

Unmuted Audio Power Test

6. Change MK-1978/VRC AUDIO switch to UNMUTED setting.
7. Step ME-30(*)/U RANGE selector switch to lower settings until reaching most exact on-scale reading.

STANDARD. ME-30(*)/U meter should indicate at least 7.75 volts.

8. If ME-30(*)/U meter reading is less than 7.75 volts, see troubleshooting chart 3-10.

Fixed Audio Power Test

9. Connect ME-30(*)/U INPUT lead A to MK-1978/VRC INTERCOM jack.
10. Set ME-30(*)/U RANGE selector switch to lower settings until reaching most exact on-scale reading.

STANDARD. ME-30(*)/U meter should indicate at least 0.16 volts.

11. If ME-30(*)/U meter indicates less than 0.16 volts, see troubleshooting chart 3-10.

3-7. RECEIVER AUDIO DISTORTION TEST.

PURPOSE. This test checks the ability of the R-442/VRC to minimize distortion. It is similar to the Receiver Sensitivity Test (paragraph 3-3), except that now a strong (20-µv) rf level is used instead of a weak (0.5-µv) one. The 20-µv rf level is injected into the R-442/VRC ANTENNA port. The audio distortion, measured at the MUTED AUDIO output jack of the MK-1978/VRC, should be less than 8 percent.

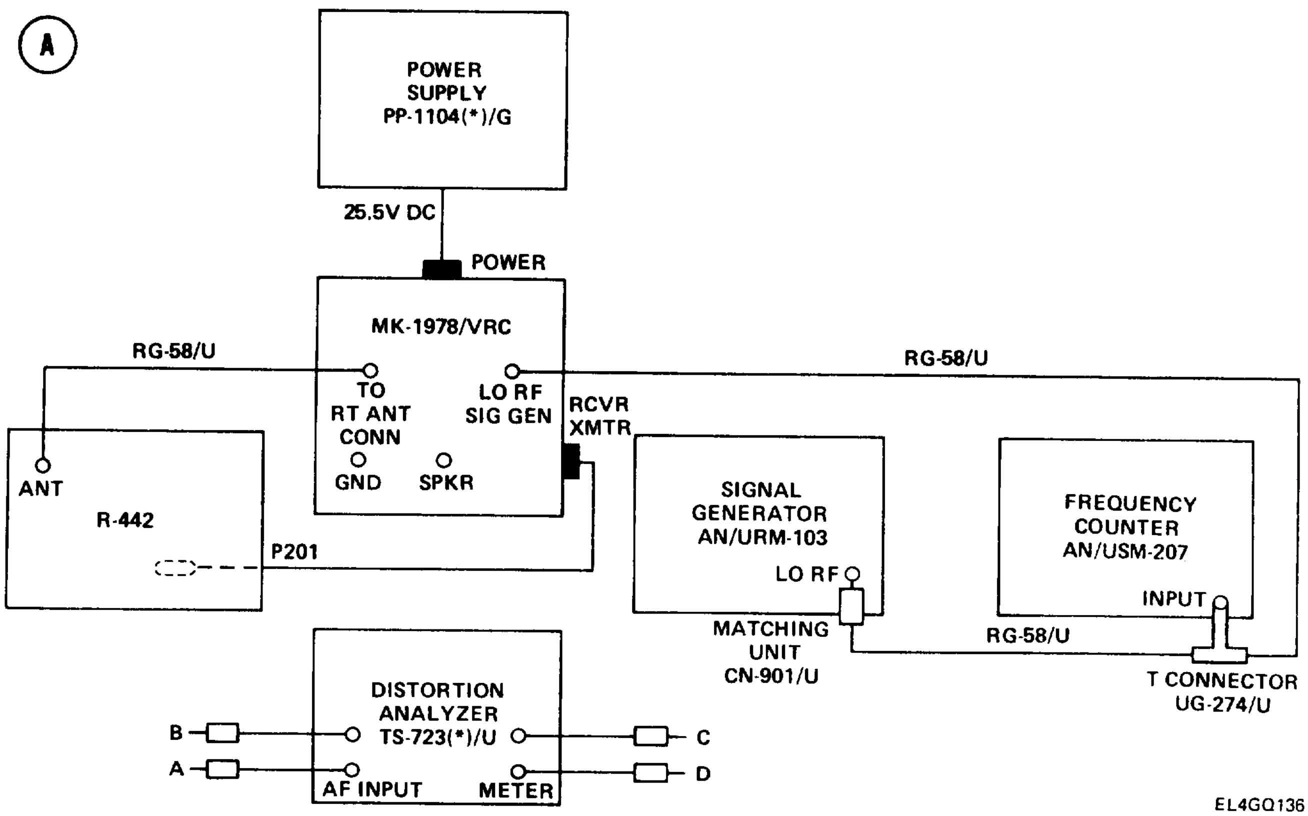
3-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Distortion Analyzer TS-723(*)/U
Frequency Counter AN/USM-207
Signal Generator AN/U RM-103

Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Maintenance Kit MK-1978/VRC

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

3-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
TS-723(*)/U	RANGE	x10
	INPUT	MIN
	AF-RF	AF
	FREQUENCY	100
	FUNCTION	METER
	R.M.S. VOLTS/DB	30 v
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON

TEST PROCEDURE

1. Connect TS-723(*)/U METER lead C to MK-1978/VRC SPKR jack; connect lead D to GND jack, (See test setup diagram A, page 3-19.)
2. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

3-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20 µv.

3. Disconnect T-connector from AN/USM-207.
4. Adjust R-442/VRC VOLUME control for 17-volt indication on TS-723(*)/U meter.
5. Disconnect TS-723(*)/U METER leads from MK-1978/VRC jacks.
6. Connect TS-723(*)/UAF INPUT lead B to MK-1978/VRC SPKR jack; connect lead A to GND jack. (See test setup diagram A)
7. Turn TS-723(*)/U FUNCTION switch to SET LEVEL.
8. Set TS-723(*)/U METER RANGE switch to 100 percent.
9. Adjust TS-723(*)/U signal INPUT control for full scale meter deflection.
10. Turn TS-723(*)/U FUNCTION switch to DISTORTION.
11. Adjust TS-723(*)/U FREQUENCY and BALANCE controls for minimum meter indication.

STANDARD. TS-723(*)/U meter should indicate less than 8 percent (distortion),

12. If TS-723(*)/U meter indicates 8 percent or above, see troubleshooting chart 3-4.

3-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE).

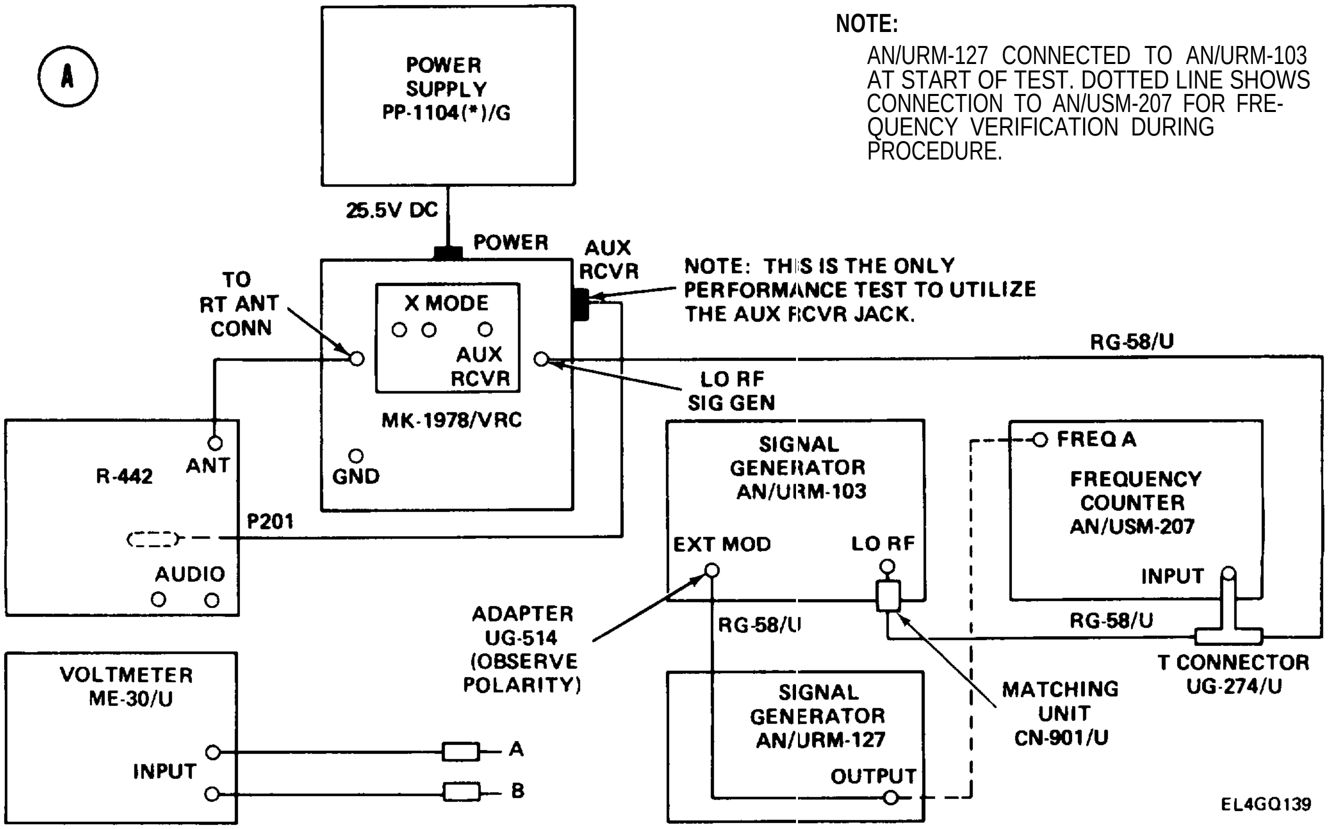
PURPOSE. This test checks the R-442/VRC A5000 tray circuits for a flat response to modulating frequencies at and below 3 kHz. Receiver circuits are said to have a flat response if their gain remains nearly constant over a specified bandwidth. Frequencies not falling within this limited range receive little or no gain. The ability of the R-442/VRC to detect and respond flatly to the desired voice frequencies is verified by injecting 1 kHz, 500 Hz, and 3 kHz into its ANTENNA port and insuring that the power measured at the SPKR jack of the MK-1978/VRC falls within the required range.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-127
Signal Generator AN/URM-103
Ac Voltmeter ME-30(*)/U
Adapters (two) UG-274 B/U (l-Connector) and UG-514
Matching Unit CN-901/U
Rf Cables (three) RG-58/U
Maintenance Kit MK-1978/VRC

3-8. RECEIVER AUDIO RESPONSE TEST(NORMAL MODE). (CONT)

TEST EQUIPMENT SETUP. Connect test equipment as shown in test setup diagram (A)



NOTE:
AN/URM-127 CONNECTED TO AN/URM-103 AT START OF TEST. DOTTED LINE SHOWS CONNECTION TO AN/USM-207 FOR FREQUENCY VERIFICATION DURING PROCEDURE.

Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

3-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	EXT MOD
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 /µv
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/URM-127	FREQ RANGE MULTIPLIER	x10
	FREQ RANGE DIAL	100
	Attenuator	x1
	OUTPUT CONTROL	Fully clockwise (maximum)
ME-30(*)/U	RANGE selector switch	30 v
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20 µv.

2. Disconnect T-connector from AN/USM-207.

3-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

Audio Response Test (Normal Mode) at 1 kHz

3. Set AN/USM-207 controls to following positions:

CONTROL/SWITCH	POSITION/SETTING
POWER	TRACK
DISPLAY	MIN (fully counterclockwise)
SENSITIVITY	0.1 v
GATE TIME	1 (black knob)
FUNCTION	FREQ

4. Disconnect rf cable from Adapter UG-514. (See test setup diagram A Page 3-22.)
5. Connect rf cable to AN/USM-207 FREQ A connector.
6. Adjust AN/URM-127 FREQ RANGE DIAL for 1-kHz display on AN/USM-207.
7. Disconnect rf cable from AN/USM-207 FREQ A connector.
8. Reconnect rf cable to Adapter UG-514.
9. Connect ME-30(*)/U INPUT lead A to MK-1978/VRC SPKR jack; connect lead B to GND jack.
10. Adjust R-442/VRC VOLUME control for 17-volt indication on ME-30(*)/U. Do not change VOLUME control position during rest of test.

STANDARD. A 1-kHz modulating tone injected into the R-442/VRC should produce 17 volts at the output.

11. If R-442/VRC VOLUME control adjustment cannot produce 17-volt indication on ME-30(*)/U, see troubleshooting chart 3-10.

Audio Response Test (Normal Mode) at 500 Hz

12. Turn AN/URM-127 FREQ RANGE DIAL to 50.
13. Disconnect rf cable from Adapter UG-514. (See test setup diagram A .)
14. Connect rf cable to AN/USM-207 FREQ A connector.
15. Adjust AN/URM-127 FREQ RANGE DIAL for 500-Hz display on AN/USM-207.
16. Disconnect rf cable from AN/USM-207 FREQ A connector.
17. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U should indicate between 14 and 22 volts.

18. If ME-30(*)/U indicates below 14 volts or above 22 volts, see troubleshooting chart 3-5.

Audio Response Test (Normal Mode) at 3 kHz

19. Switch AN/URM-127 FREQ RANGE MULTIPLIER to x100.
20. Turn FREQ RANGE DIAL to 30.
21. Disconnect rf cable from Adapter UG-514. (See test setup diagram A .)
22. Connect rf cable to AN/USM-207 FREQ A connector.
23. Adjust AN/URM-127 FREQ RANGE DIAL for 3-kHz display on AN/USM-207.
24. Disconnect rf cable from FREQ A connector.
25. Reconnect rf cable to Adapter UG-514.

3-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

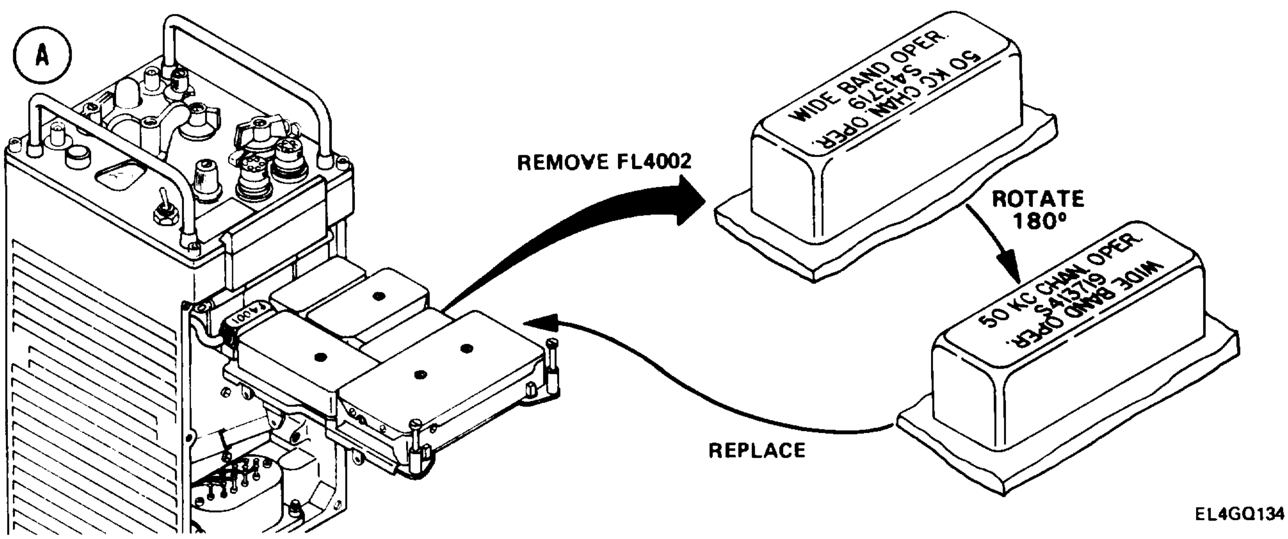
STANDARD. ME-30(*)/U should indicate between 14 and 22 volts.

26. If ME-30(*)/U indicates below 14 volts or above 22 volts, see troubleshooting chart 3-5.

3-9. RECEIVER AUDIO RESPONSE TEST (X-MODE).

PURPOSE. This test is similar to the Audio Response Test (Normal Mode). When set up for X-mode, however, the R-442/VRC responds to a wider band of frequencies because the A5000 tray is not used. The ability of the receiver to detect and respond flatly to the desired intelligence is verified by comparing db readings taken at the MK-1978/VRC, X-MODE AUX RCVR jack while injecting several modulating frequencies to a reference voltage measurement taken at 1-kHz modulation.

R-442/VRC X-MODE SETUP PROCEDURE



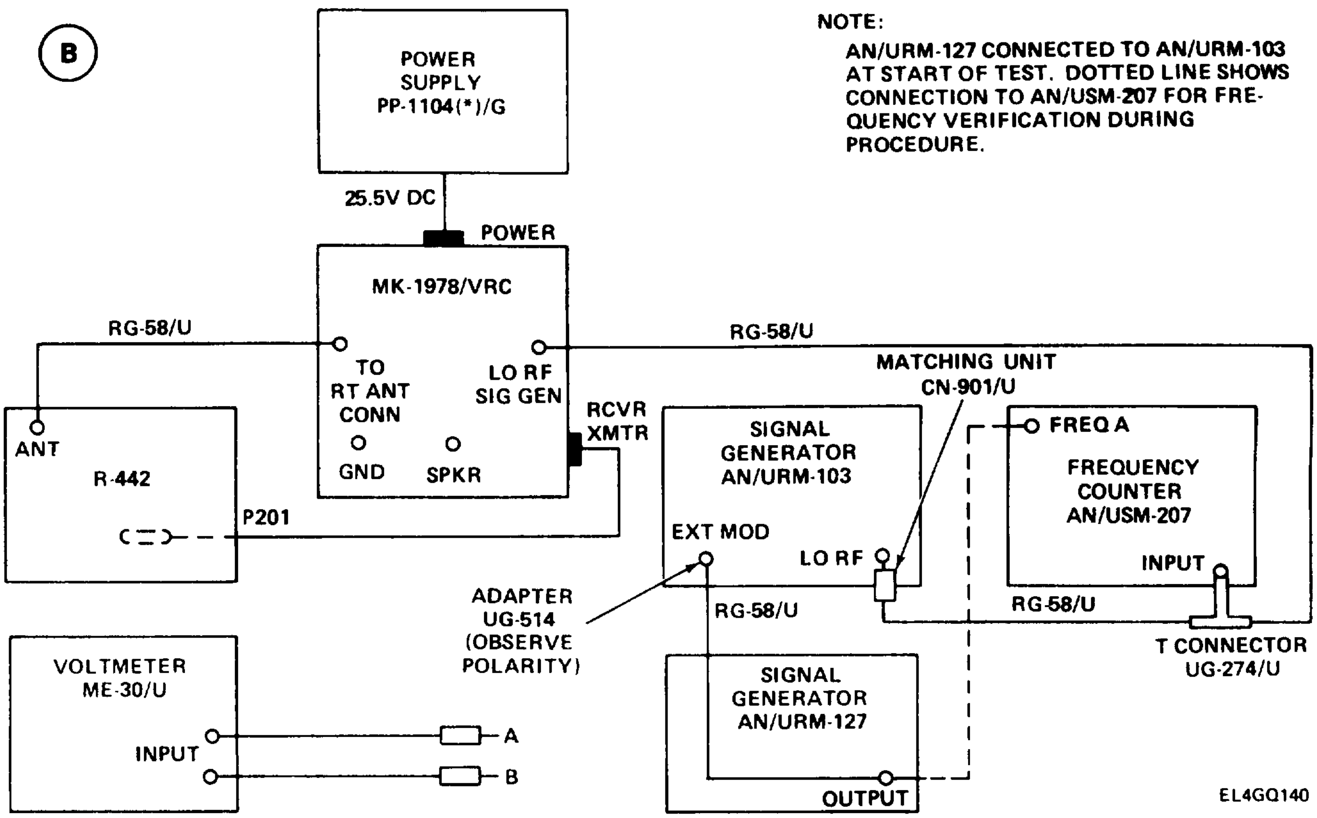
1. Remove bottom cover from R-442/VRC. (See paragraph 2-7).
2. Raise A4000 tray and secure brace.
3. Remove Filter FL4002.
4. Rotate Filter FL4002 180 degrees.
5. Put Filter FL4002 back into tray.
6. Set X-MODE-NORMAL Switch S4001, located underneath tray, to X-MODE position.
7. Release brace and lower A4000 tray.
8. Replace R-442/VRC bottom cover.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G	Adapters (two) UG-274 B/U (T-Connector) and UG-514
Frequency Counter AN/USM-207	Matching Unit CN-901/U
Signal Generator AN/URM-103	Rf Cables (three) RG-58/U
Signal Generator AN/URM-127	Maintenance Kit MK-1978/VRC
Ac Voltmeter ME-30(*)/U	

TEST SETUP. Connect test equipment as shown in test setup diagram B, page 3-26.

3-9. RECEIVER AUDIO RESPONSE TEST (X.MODE). (CONT)



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-127	FREQ RANGE MULTIPLIER	x10
	FREQ RANGE DIAL	100
	Attenuator	x1
	OUTPUT CONTROL	Fully clockwise (maximum)
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

3-9. RECEIVER AUDIO RESPONSE TEST (X=MODE). (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	EXT MOD
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
R-442/VRC	BAND	B
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
ME-30(*)/U	RANGE selector switch	3V
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	AUX RCVR	CIPHER
	SQUELCH	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20 µv.

2. Disconnect T-connector from AN/USM-207.

Audio Response Test (X-Mode) at 1 kHz

3. Set AN/USM-207 controls to the following positions.

3-9. RECEIVER AUDIO RESPONSE TEST (XMODE).(CONT)

CONTROL/JSWITCH	POSITION/SETTING
POWER	TRACK
DISPLAY	MIN (fully counterclockwise)
SENSITIVITY	0.1
GATE TIME	1 (black knob)
FUNCTION	FREQ

4. Disconnect rf cable from Adapter UG-514. (See test setup diagram B page 3-26.)
5. Connect rf cable to AN/USM-207 FREQ A connector.
6. Adjust AN/URM-127 FREQ RANGE DIAL for 1-kHz display on AN/USM-207.
7. Disconnect rf cable from AN/USM-207 FREQ A connector.
8. Reconnect rf cable to Adapter UG-514.
9. Connect ME-30(*)/U INPUT lead A to MK-1978/VRC AUX RCVR jack (inside X-MODE square). Connect lead Bto GND jack. Note meter indication.

STANDARD. ME-30(*)U meter should indicate at least 0.78 volt.

10. If ME-30(*)/U meter does not indicate at least 0.78 volt, see troubleshooting chart 3-9.

Audio Response Test (X-Mode) at 500 Hz

11. Turn AN/URM-127 FREQ RANGE DIAL to 50.
12. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
13. Connect rf cable to AN/USM-207 FREQ A connector.
14. Adjust AN/URM-127 FREQ RANGE DIAL for 500-Hz display on AN/USM-207.
15. Disconnect rf cable from AN/USM-207 FREQ A connector.
16. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

17. If ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading taken in step 9, see troubleshooting chart 3-9.

Audio Response Test (X-Mode) at 3 kHz

18. Turn AN/URM-127 FREQ RANGE MULTIPLIER to x100.
19. Turn FREQ RANGE DIAL to 30.
20. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
21. Connect rf cable to AN/USM-207 FREQ A connector.
22. Adjust AN/URM-127 FREQ RANGE DIAL for 3-kHz display on AN/USM-207.
23. Disconnect rf cable from AN/USM-207 FREQ A connector.
24. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

25. If ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading noted in step 9, see troubleshooting chart 3-9.

3-9. RECEIVER AUDIO RESPONSE TEST (X-MODE). (CONT)

Audio Response Test (X-Mode) at 5 kHz

26. Turn AN/URM-127 FREQ RANGE DIAL to 50.
27. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
28. Connect rf cable to AN/USM-207 FREQ A connector.
29. Adjust AN/URM-127 FREQ RANGE DIAL for 5-kHz display on AN/USM-207.
30. Disconnect rf cable from ANUSM-207 FREQ A connector.
31. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

32. if ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading taken in step 9, see troubleshooting chart 3-9.

Audio Response Test (X-Mode) at 10 kHz

33. Turn FREQ RANGE DIAL to 100.
34. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
35. Connect rf cable to AN/USM-207 FREQ A connector.
36. Adjust AN/URM-127 FREQ RANGE DIAL for 10-kHz display on AN/USM-207.
37. Disconnect rf cable from AN/USM-207 FREQ A connector.
38. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

39. If ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading noted in step 9, see troubleshooting chart 3-9.

NOTE

Before performing any other test in this section, see R-442/VRC X-MODE Setup Procedure and do the following:

Set X-MODE-NORMAL switch S4001 to NORMAL.
Return Filter FL4002 to its original position.

3-10. RECEIVER SELECTIVITY TEST.

PURPOSE. This test checks the ability of the R-442/VRC A4000 tray IF Filters FL4001 and FL4002 to reject unwanted signals and, thus, determine bandwidth. The R-442/VRC should have a minimum bandwidth of 32 kHz at the filters' 6-db attenuation point and a maximum bandwidth of 80 kHz at their 60-db attenuation point. This is verified by:

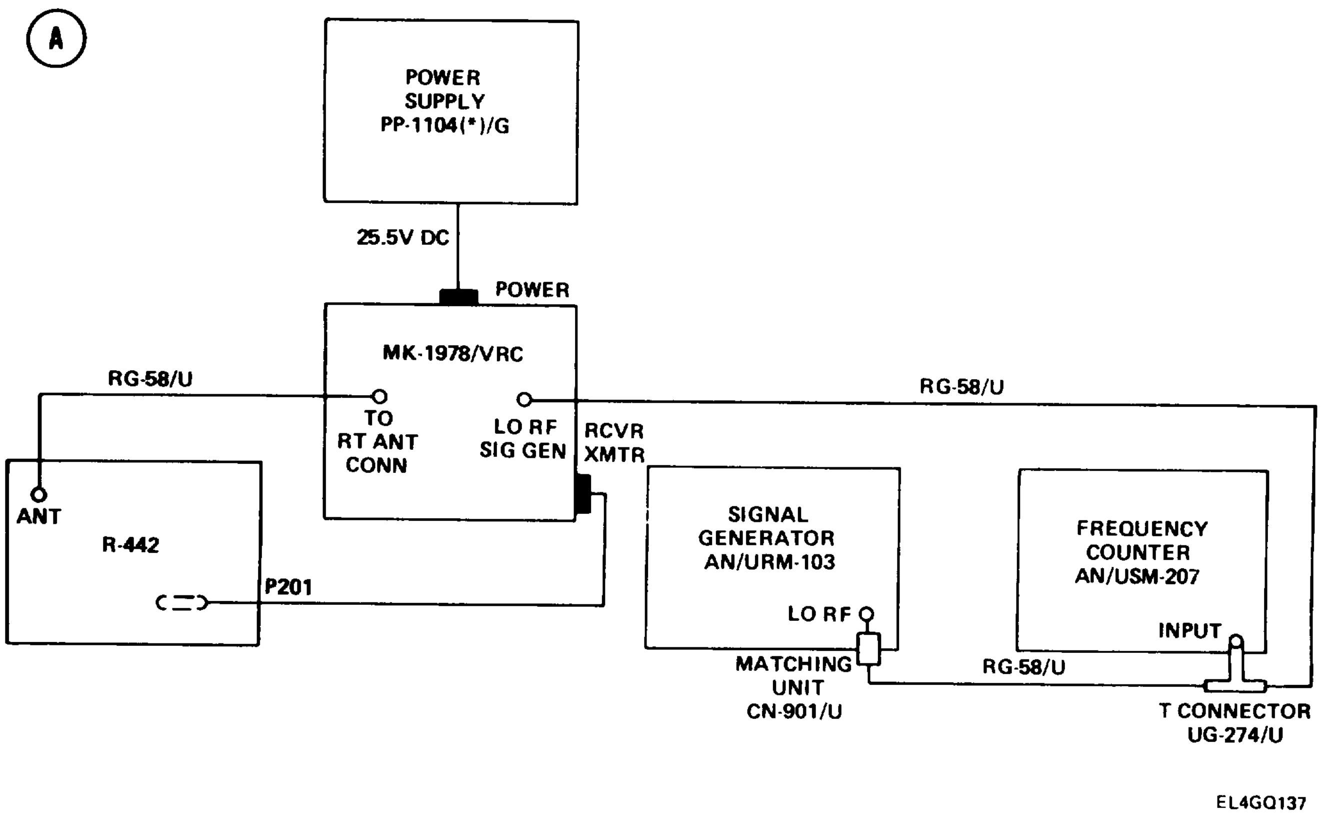
1. Finding the minimum rf level which must be injected into the R-442/VRC ANTENNA port to cause the CALL lamp to light.
2. Injecting twice the rf level found in step 1, while observing that the R-442/VRC CALL lamp is lit when the frequency is offset ±16 kHz from the carrier.
3. Injecting 1000 times the rf level found in step 1, while observing that the R-442/VRC CALL lamp is off when the frequency is offset more than ±40 kHz from the carrier.

3-10. RECEIVER SELECTIVITY TEST. (CONT)

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Maintenance Kit MK-1978/VRC

TEST SETUP. Connect equipment as shown in test setup diagram (A)



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, minimum rf input level, and no modulation.

3-10. RECEIVER SELECTIVITY TEST. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	103 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYN E	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	MOD OFF
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Minimum setting
R-442/VRC	BAND	A
	MC-TUNE-KC	3 0 . 0 0
	SQUELCH	OLD ON
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. Turn AN/URM-103 LO RF UV control slowly clockwise until R-442VRC CALL lamp lights. Note control setting.

3-10. RECEIVER SELECTIVITY TEST. (CONT)

4. Increase AN/URM-103 LO RF UV level to twice the reading noted in step 3.

STANDARD. R-442/VRC CALL lamp should remain lit.

5. If R-442/VRC CALL lamp goes off, see troubleshooting chart 3-6.
6. Change AN/USM-207 GATE TIME to 10^2.
7. Reattach T-connector to AN/USM-207.
8. Adjust AN/URM-103 RF TUNING control for 30.019-MHz (30019.0-kHz) display on AN/USM-207. To produce display, follow instructions in note under step 1, but reset AN/URM-103 LO RF UV control to level arrived at in step 4.
9. Disconnect T-connector from AN/USM-207.

STANDARD. R-442/VRC CALL lamp should be off.

10. If R-442/VRC CALL lamp is lit, see troubleshooting chart 3-6.
11. Turn AN/URM-103 RF TUNING control slowly counterclockwise until R-442/VRC CALL lamp lights.
12. Reattach T-connector to AN/USM-207.
13. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
14. Adjust AN/URM-103 RF TUNING control for 29.981-MHz (29981.0-kHz) display on AN/USM-207.
15. Disconnect T-connector from AN/USM-207.
16. Reset AN/URM-103 LO RF UV control to level arrived at in step 4.

STANDARD. R-442/VRC CALL lamp should be off.

17. If R-442/VRC CALL lamp is lit, see troubleshooting chart 3-6.
18. Turn AN/URM-103 RF TUNING control slowly clockwise until R-442/VRC CALL lamp lights.
19. Reattach T-connector to AN/USM-207.
20. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
21. Subtract frequency noted in step 20 from frequency noted in step 13.

STANDARD. The difference between the two frequencies should beat least 32 kHz.

22. If difference between frequencies noted in steps 13 and 20 is less than 32 kHz, see troubleshooting chart 3-6.
23. Increase LO RF UV level to 1000 times reading noted in step 3.
24. Change AN/USM-207 GATE TIME to 10^4.
25. Reattach T-connector to AN/USM-207.
26. Adjust AN/URM-103 RF TUNING control for 30.41-MHz display on AN/USM-207. To produce display, follow instructions in note under step 1, but reset AN/URM-103 LO RF UV control to level arrived at in step 23.
27. Disconnect T-connector from AN/USM-207.

STANDARD. R-442/VRC CALL lamp should be off.

28. If R-442/VRC CALL lamp is lit, see troubleshooting chart 3-6.
29, Turn AN/URM-103 RF TUNING control slowly counterclockwise until R-442/VRC CALL lamp lights.
30. Reattach T-connector to AN/USM-207.

3-10. RECEIVER SELECTIVITY TEST. (CONT)

31. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
32. Adjust AN/URM-103 RF TUNING control for 29.59-MHz display on AN/USM-207.
33. Disconnect T-connector from AN/USM-207.
34. Reset AN/URM-103 LO RF UV control to level arrived at in step 23.

STANDARD. R-442/VRC CALL lamp should be off.

35. If R-442/VRC CALL lamp is lit, see troubleshooting chart 3-6.
36. Turn AN/URM-103 RF TUNING control slowly clockwise until R-442/VRC CALL lamp lights.
37. Reattach T-connector to AN/USM-207.
38. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
39. Subtract frequency noted in step 38 from frequency noted in step 31.

STANDARD. The difference between the two frequencies should be 80 kHz or less.

40. If difference between frequencies noted in steps 31 and 38 is more than 80 kHz, see troubleshooting chart 3-6.

Section II TROUBLESHOOTING

3-11. GENERAL.

This section contains troubleshooting charts which will help you diagnose failures in the R-442/VRC receiver. The troubleshooting charts are designed to isolate faults in response to specific performance problems noted during performance testing in section I of this chapter.

There are two basic kinds of troubleshooting charts provided: gross failure troubleshooting and performance degradation troubleshooting. Both kinds of troubleshooting are based on the use of TMDE and Maintenance Kit MK-1978/VRC.

3-11. GENERAL. (CONT)

GROSS FAILURE TROUBLESHOOTING

Gross failure troubleshooting is generated by failure of the VOLUME control test, the first of the performance tests in section I of this chapter. Failure of the VOLUME control test indicates that no audio at all is available at the receiver's loudspeaker jack. This implies a total failure of some module or component resulting in complete loss of signal. Therefore, the gross troubleshooting charts are designed to help you locate the failed module or component, with the assumption that the failed part does not operate at all.

This assumption differs from the approach taken in performance degradation troubleshooting, which assumes that a module or component may be responsible for slight defect symptoms because the part may be only partially operational.

PERFORMANCE DEGRADATION TROUBLESHOOTING

When the receiver produces audio output, but the signal fails to meet certain standards, the receiver's performance is considered degraded. Degraded performance can result in weak audio, limited reception range, distortion, and many other problems.

The troubleshooting charts are designed to locate the cause of the performance degradation by using procedures more complex than those utilized for gross troubleshooting. Added complexity is due to the fact that the troubleshooting tests must evaluate the quality of the signals at various test points, instead of merely confirming the presence of signals as is usually the case in gross troubleshooting.

OVERALL TROUBLESHOOTING APPROACH

Both kinds of troubleshooting charts contained in this section are intended for use based on the following assumptions in connection with the R-442/VRC.

1, Only one malfunction exists which is causing the defect symptom.
2. The troubleshooting charts do not isolate every possible defect.
3. Failure to locate a defect using the charts suggests a wiring-related problem which can be isolated using the schematics located in the back of this manual.
4. Troubleshooting procedures for germanium and silicon versions of the R-442/VRC are the same.

3-12. GROSS TROUBLESHOOTING PRELIMINARY INSTRUCTIONS.

The gross troubleshooting charts in this section are based on the assumption that the receiver fails the VOLUME control test at any frequency setting of the MC-TUNE-KC control. However, certain defects in the crystal reference system can result in loss of audio at some frequencies while the receiver can function normally at other frequency settings.

3-12. GROSS TROUBLESHOOTING PRELIMINARY INSTRUCTIONS. (CONT)

Before proceeding with the steps given in the gross troubleshooting chats, determine whether or not the failure to the volume control test conforms to any of the following failure modes:

FAILURE MODE	CAUSE	CORRECTION
No audio on all channels ending in "O", (eg, 30.00,30.10,30.20, etc)	Crystal Y2012 (5.65 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on all channels ending in "5", (eg, 30.05,30.15,30.25, etc)	Crystal Y2011 (5.60 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on the same 100-kHz segment for each MHz of tuning	Defective interpolation oscillator crystal	Replace A2000 assembly. See interpolation oscillator crystal chart.

INTERPOLATION OSCILLATOR CRYSTAL CHART

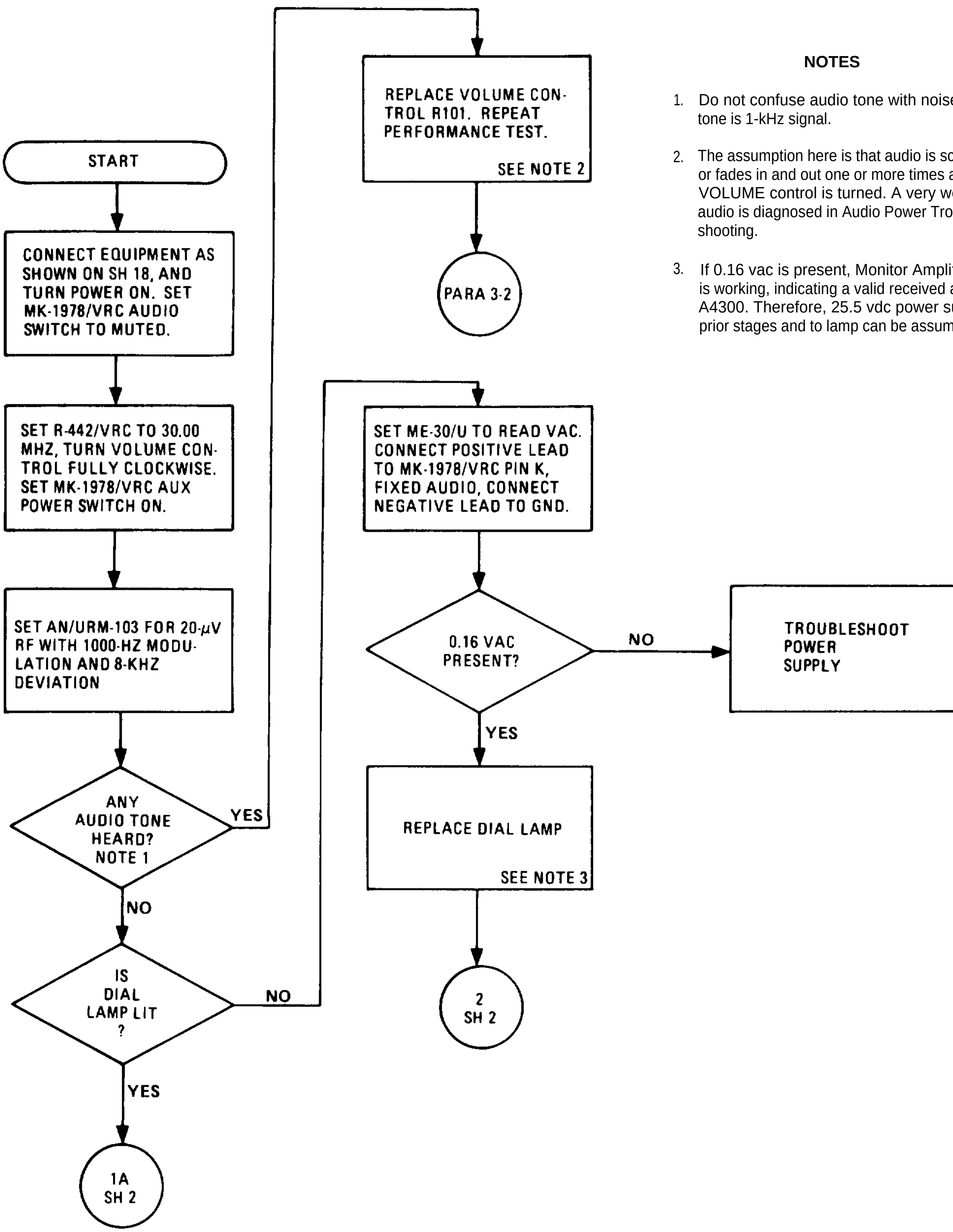
The following chart is used to isolate the particular crystal responsible for audio failure in the same 100-kHz segment for each MHz of tuning. In this failure mode, if audio is absent at 30.05 and 30.10, it will be absent at 40.05 and 40.10; 50.05 and 50.10, etc.

INTERPOLATION OSCILLATOR CRYSTAL CHART

SEGMENT OF KC CONTROL WHERE AUDIO IS ABSENT	CAUSE	CORRECTION
05 and 10	Crystal Y2007	Replace A2000 assembly.
15 and 20	Crystal Y2008	Replace A2000 assembly.
25 and 30	Crystal Y2009	Replace A2000 assembly.
35 and 40	Crystal Y2010	Replace A2000 assembly.
45 and 50	Crystal Y2005	Replace A2000 assembly.
55 and 60	Crystal Y2004	Replace A2000 assembly.
65 and 70	Crystal Y2003	Replace A2000 assembly.
75 and 80	Crystal Y2002	Replace A2000 assembly.
85 and 90	Crystal Y2001	Replace A2000 assembly.
95 and 100	Crystal Y2006	Replace A2000 assembly.

3-13. TROUBLESHOOTING FLOW CHARTS.

CHART 3-1
No Audio Troubleshooting
(Sheet 1 of 18)

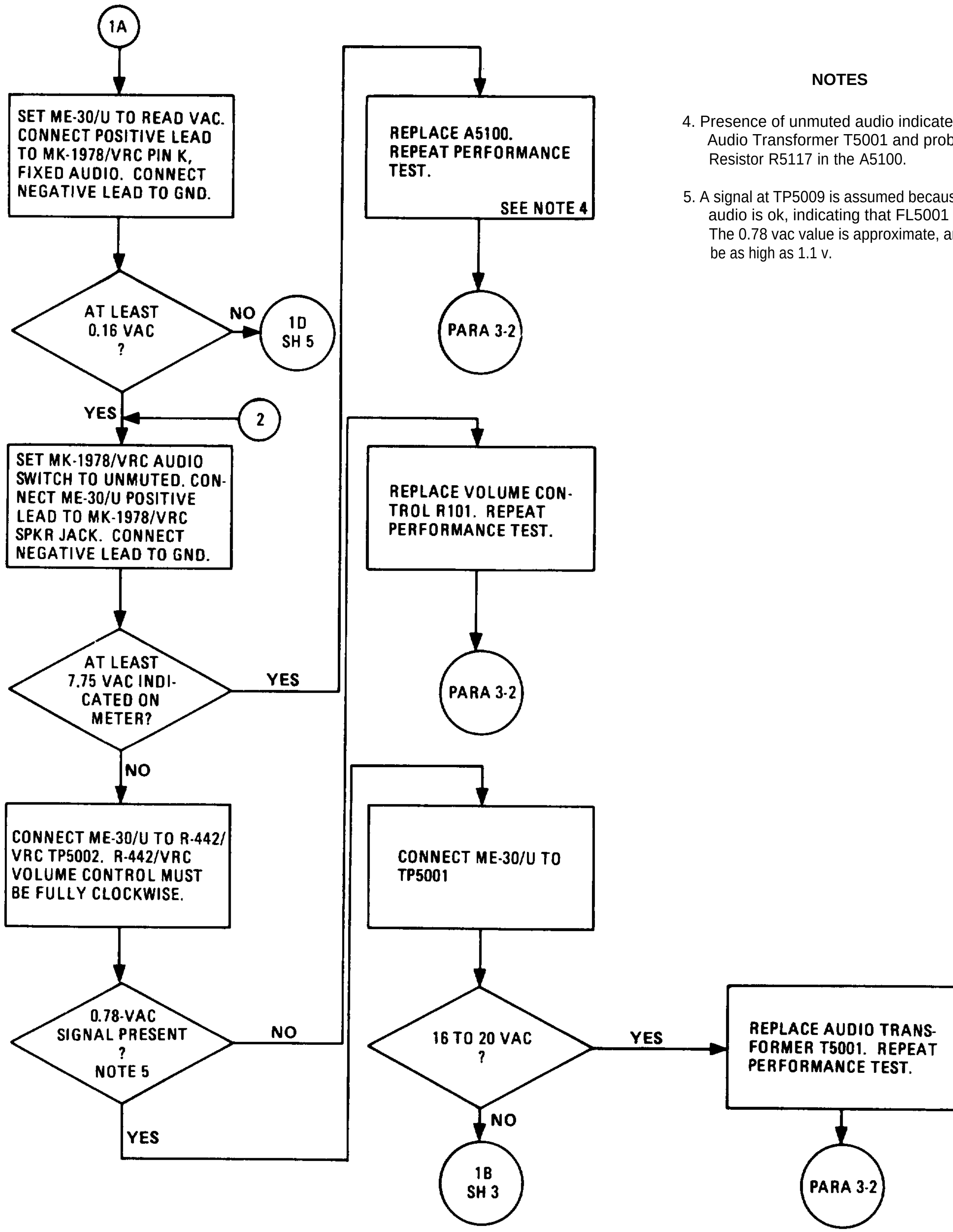


NOTES

1. Do not confuse audio tone with noise. Audio tone is 1-kHz signal.
2. The assumption here is that audio is scratchy or fades in and out one or more times as VOLUME control is turned. A very weak audio is diagnosed in Audio Power Troubleshooting.
3. If 0.16 vac is present, Monitor Amplifier A5100 is working, indicating a valid received audio from A4300. Therefore, 25.5 vdc power supply to prior stages and to lamp can be assumed ok.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 2 of 18)



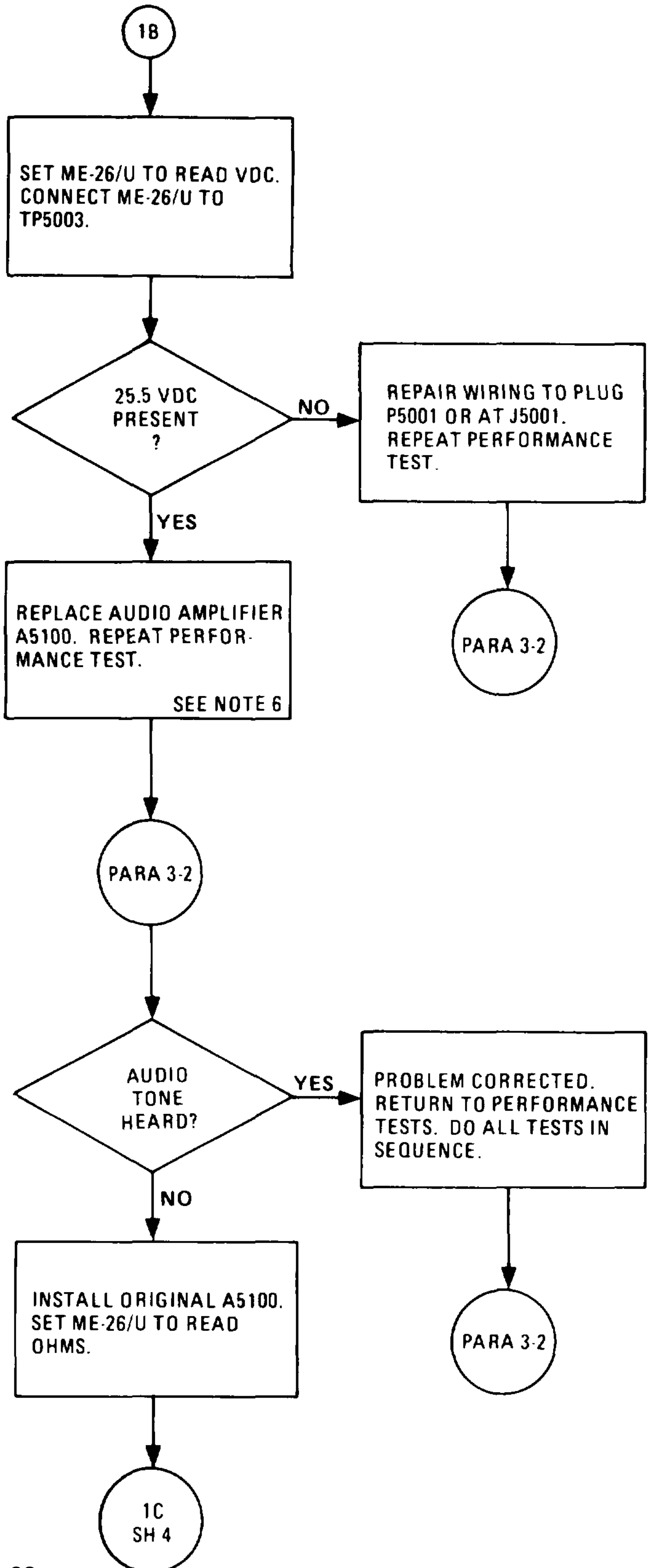
NOTES

4. Presence of unmuted audio indicates good Audio Transformer T5001 and probable bad Resistor R5117 in the A5100.

5. A signal at TP5009 is assumed because fixed audio is ok, indicating that FL5001 is good. The 0.78 vac value is approximate, and can be as high as 1.1 v.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 3 of 18)

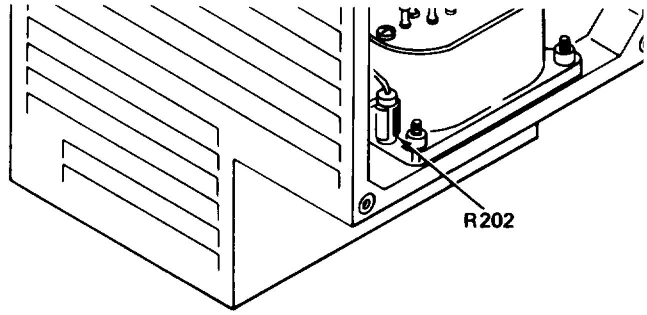


NOTE

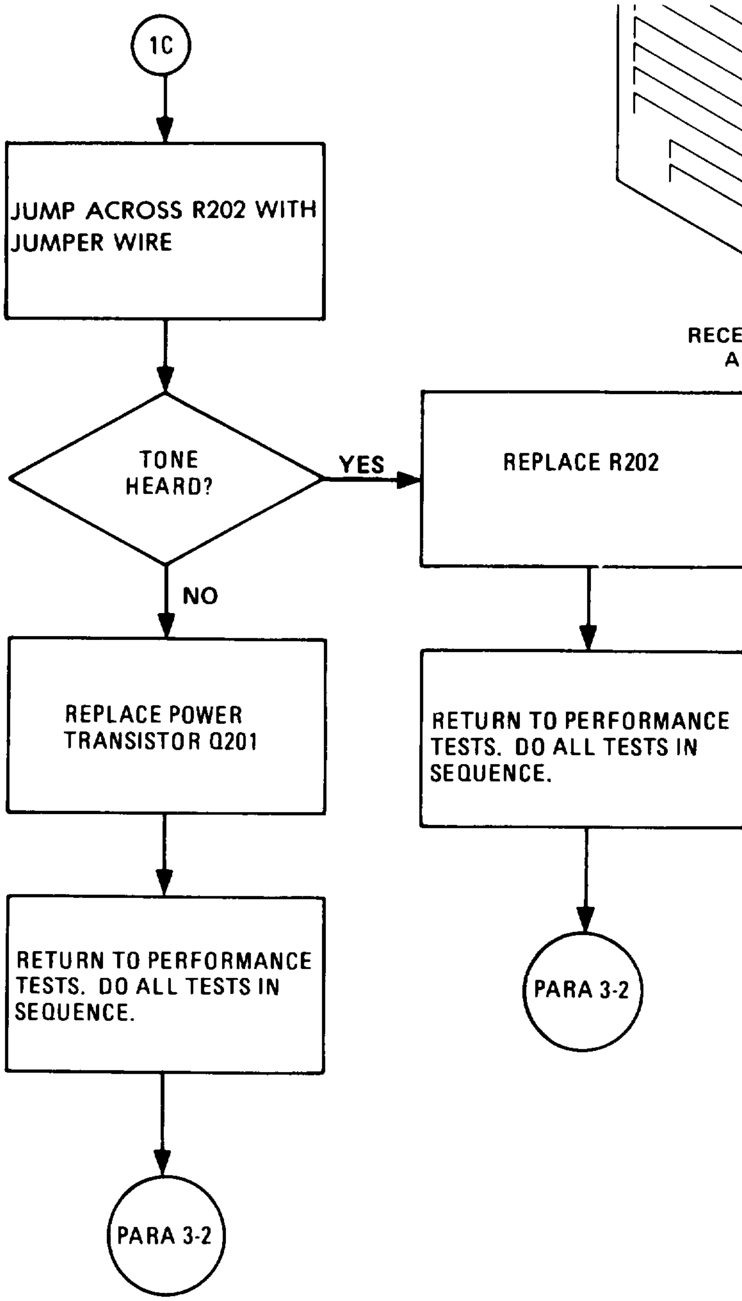
6. Due to limited number of test points, component substitution is sometimes necessary. Absence of signal at TP5001 could be due to failed Power Transistor Q201 or Resistor R202. These components are difficult to test directly, and much more difficult to substitute than the A5100 assembly.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 4 of 18)

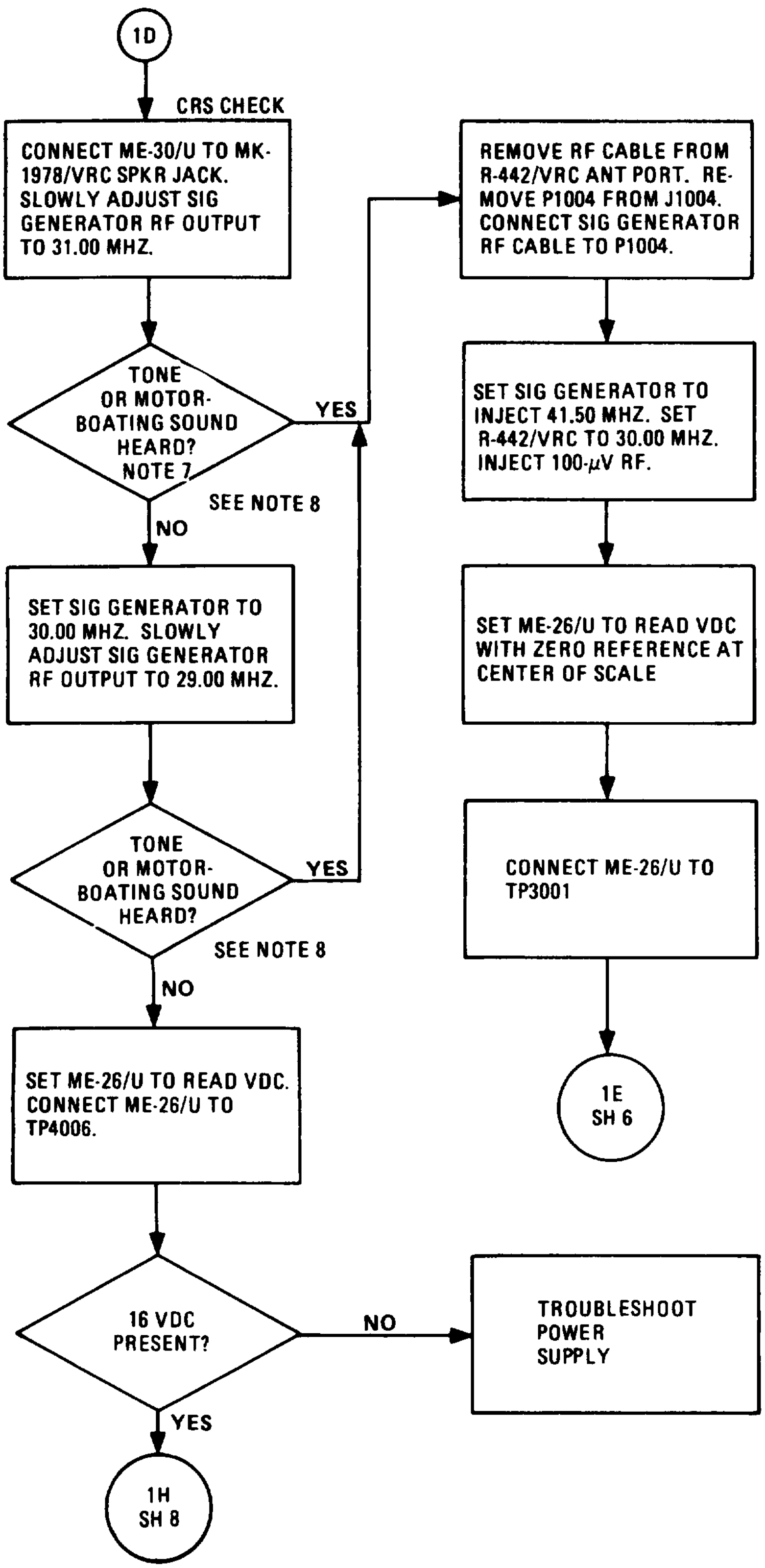


RECEIVER, BOTTOM VIEW OF CONNECTOR P201
AREA WITH ASSEMBLY A1000 REMOVED



3-13. TROUBLESHOOTING FLOWCHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 5 of 18)

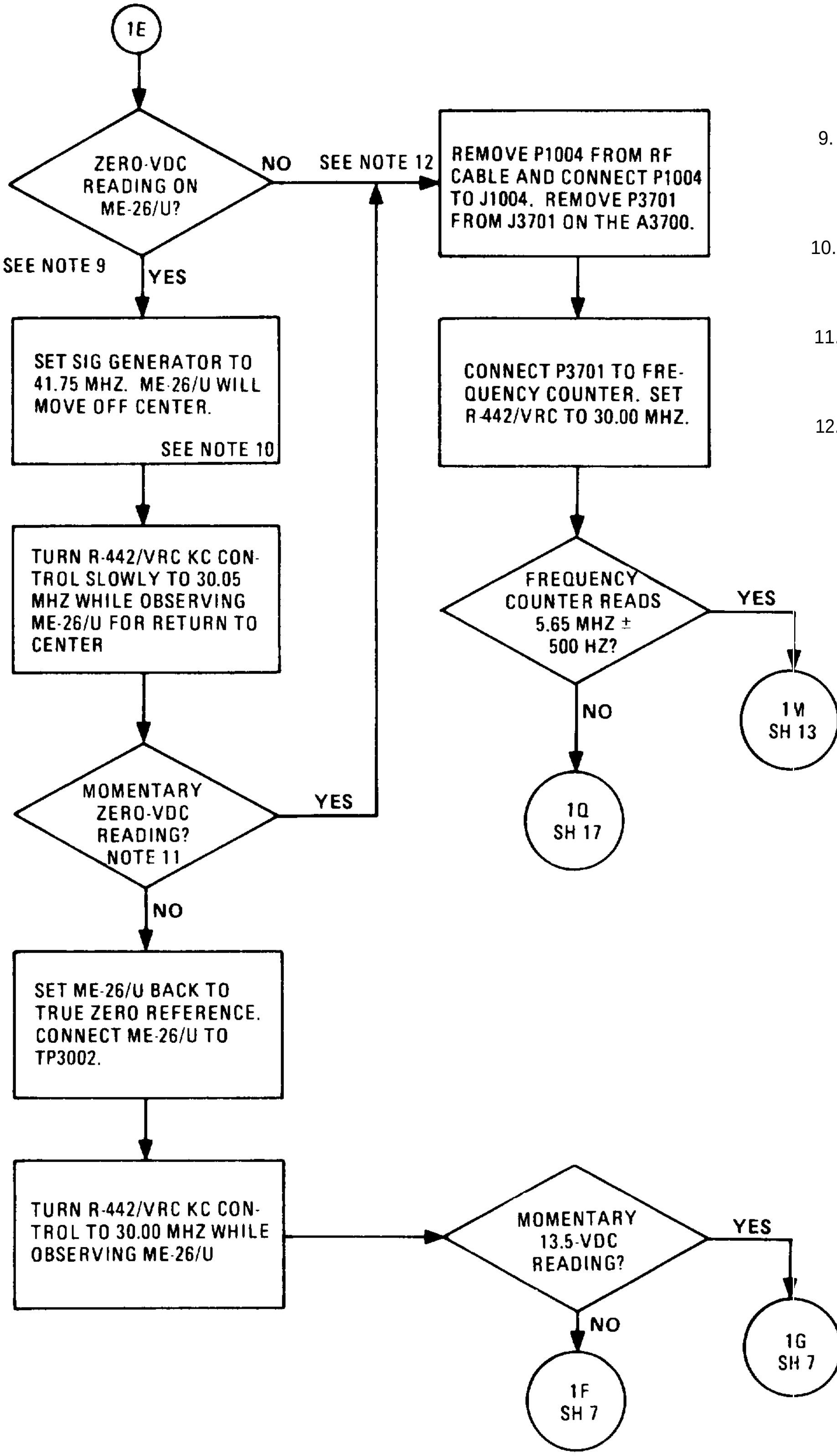


NOTES

7. An alternate method of checking for a bad CRS is to ground TP3001 in the A3000 assembly while the sig generator is varied ± 1 MHz. If the audio tone is heard when TP3001 is grounded, it means that the CRS is bad.
8. Keep in mind that this entire troubleshooting procedure assumes one total component failure causing absence of an audio signal. This simple check can quickly isolate a bad CRS.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 6 of 18)



NOTES

9. With R-442/VRC set at 30 MHz and 41.5 MHz injected into FL3002, there should be no error signal from the CRS. The meter will remain centered.

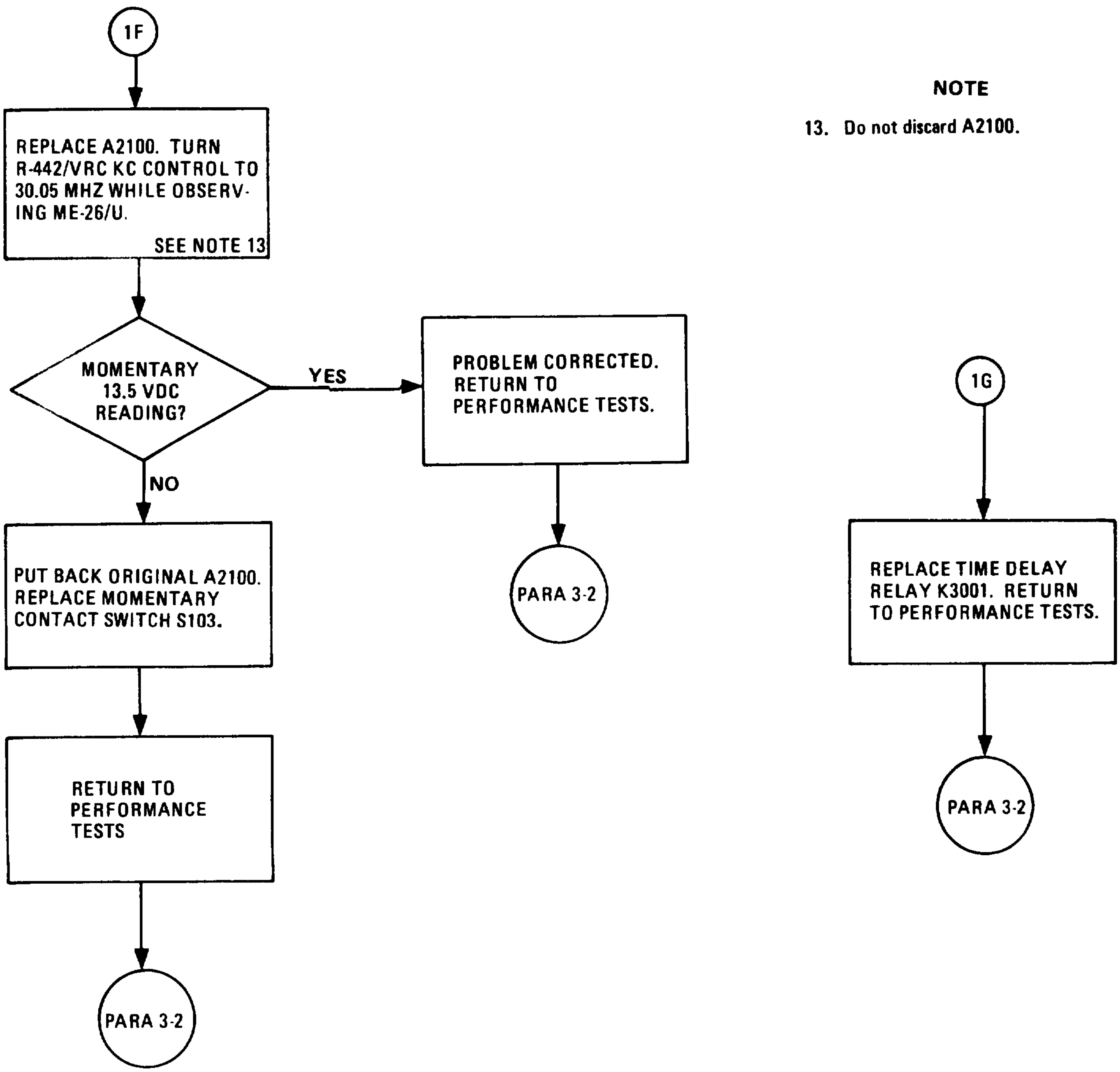
10. This setting should force the CRS to output a dc error voltage. The voltmeter will indicate this voltage.

11. If the Time Delay Relay K3001 fails to momentarily short the dc error signal, the CRS can shift the local oscillator 1 MHz.

12. Since previous steps confirmed presence of audio tone when CRS was isolated from other stages, the local oscillator can be considered alined. Therefore, CRS must be generating incorrect error signal, driving local oscillator off frequency.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 7 of 18)



NOTE

13. Do not discard A2100.

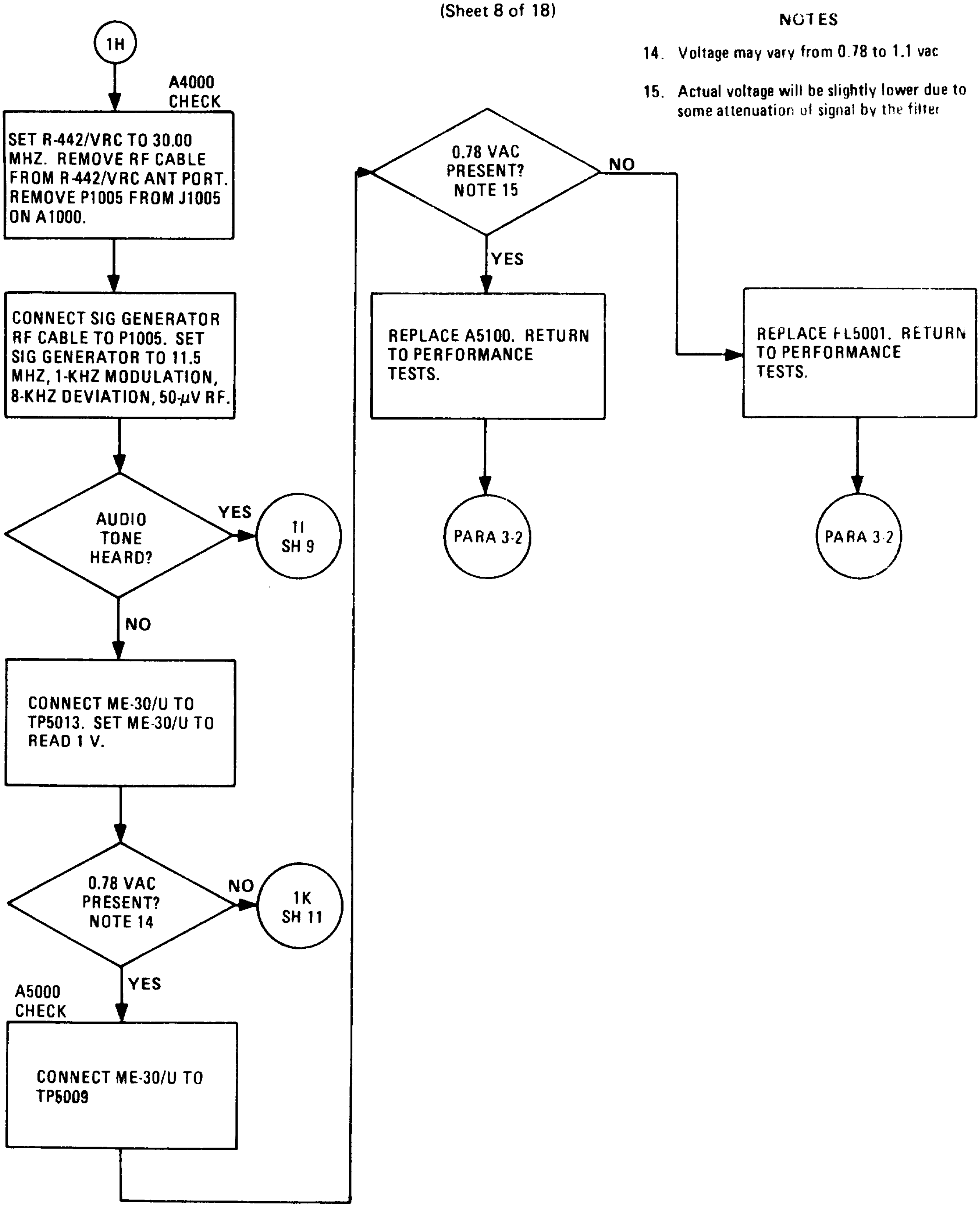
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 8 of 18)

NOTES

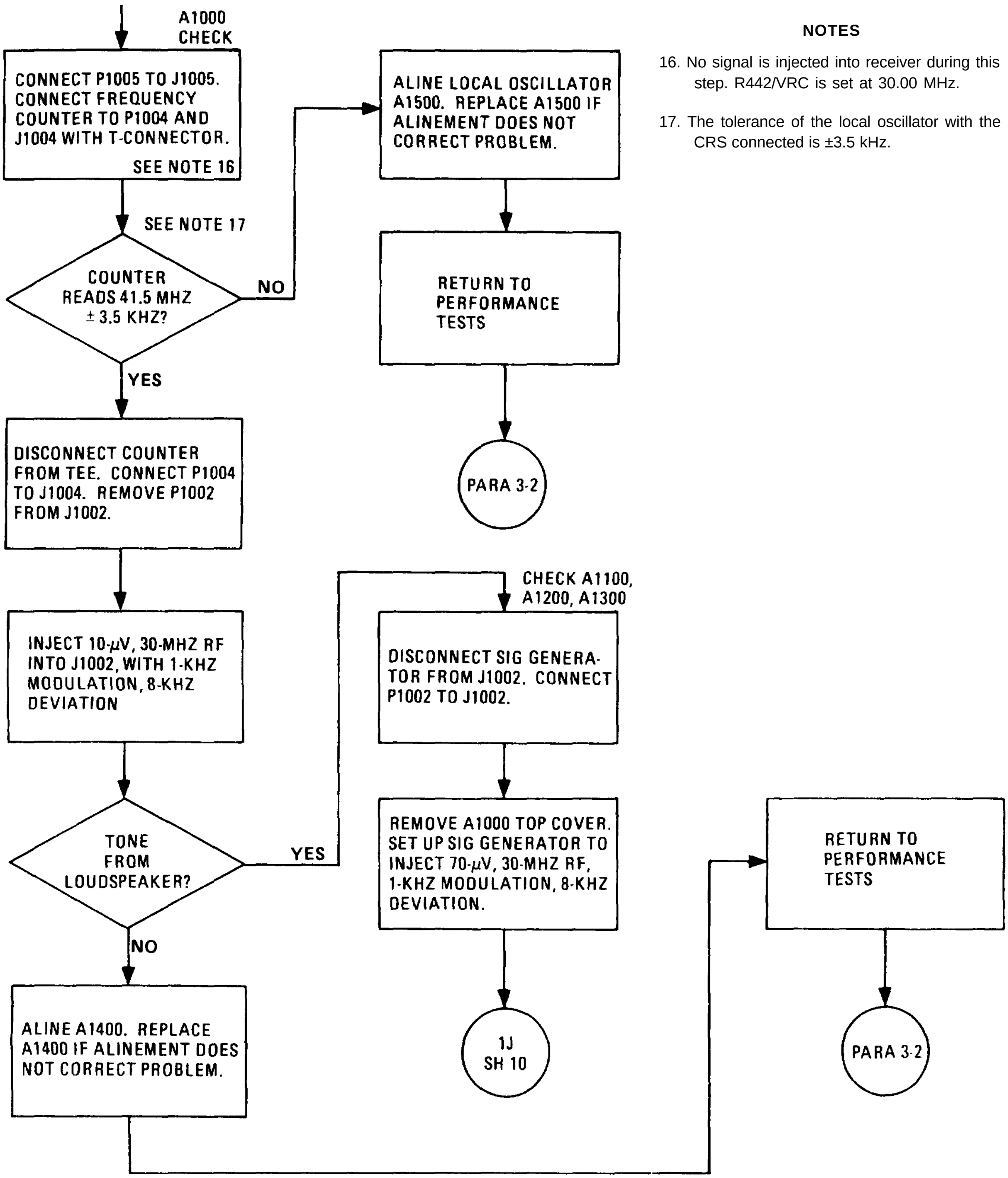
14. Voltage may vary from 0.78 to 1.1 vac

15. Actual voltage will be slightly lower due to some attenuation of signal by the filter



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 9 of 18)



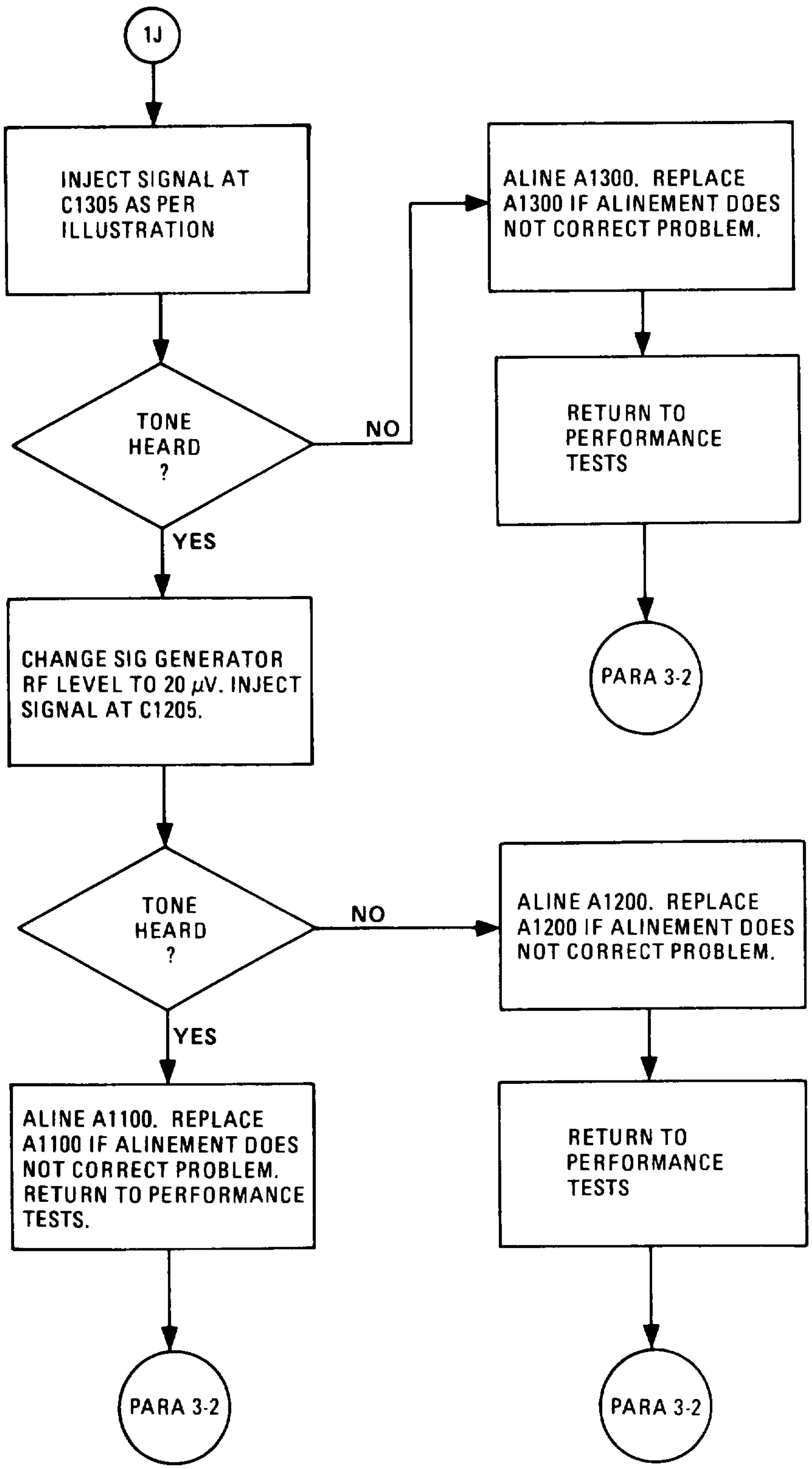
NOTES

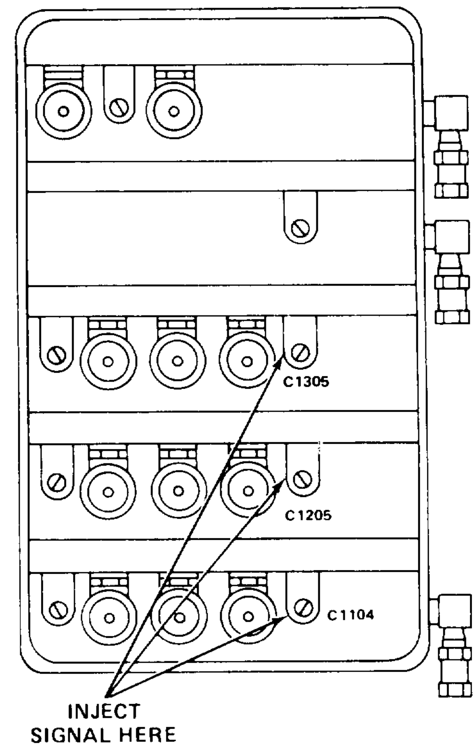
16. No signal is injected into receiver during this step. R442/VRC is set at 30.00 MHz.

17. The tolerance of the local oscillator with the CRS connected is ±3.5 kHz.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 10 of 18)



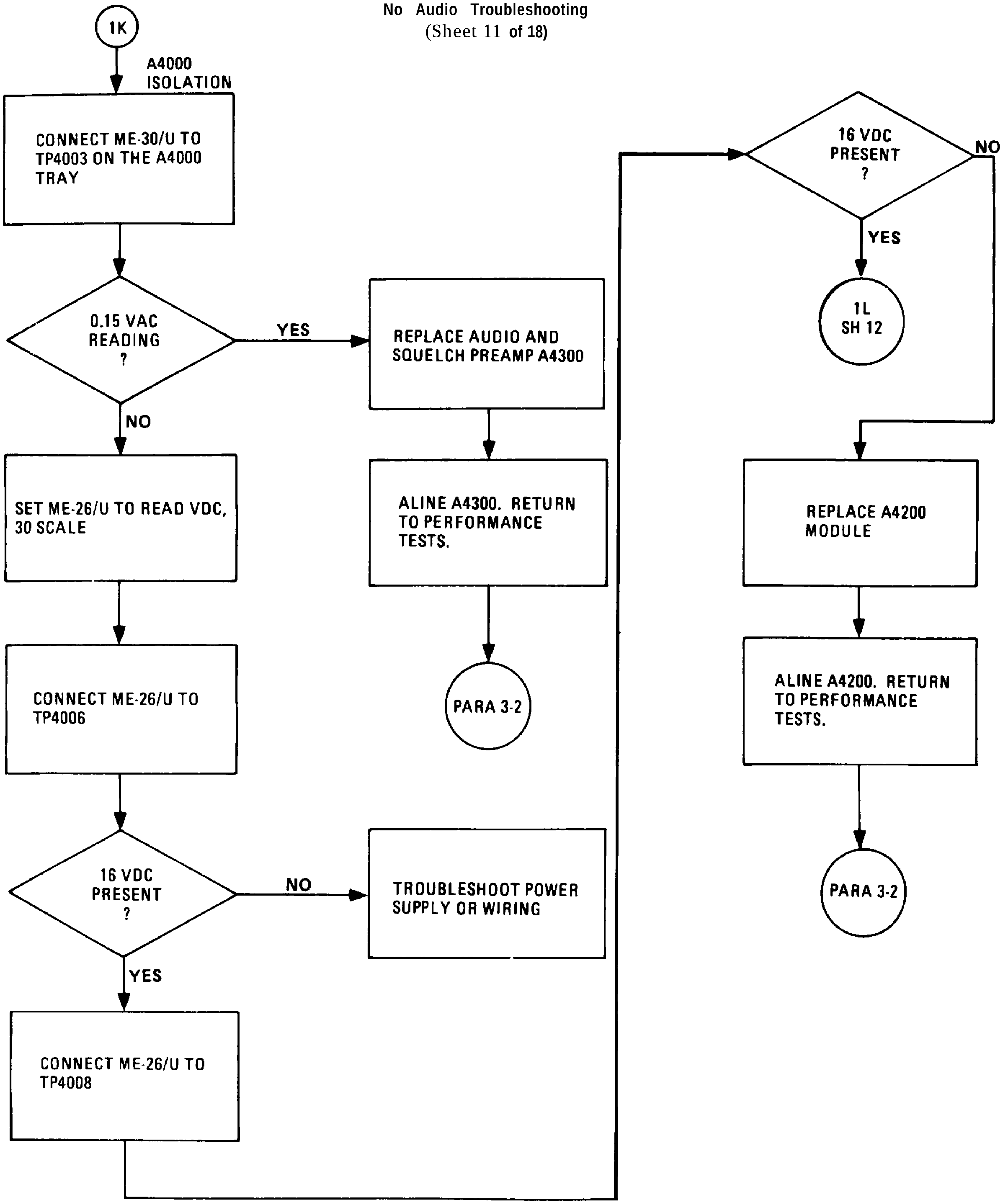


A1000 ASSEMBLY

EL4GQ212

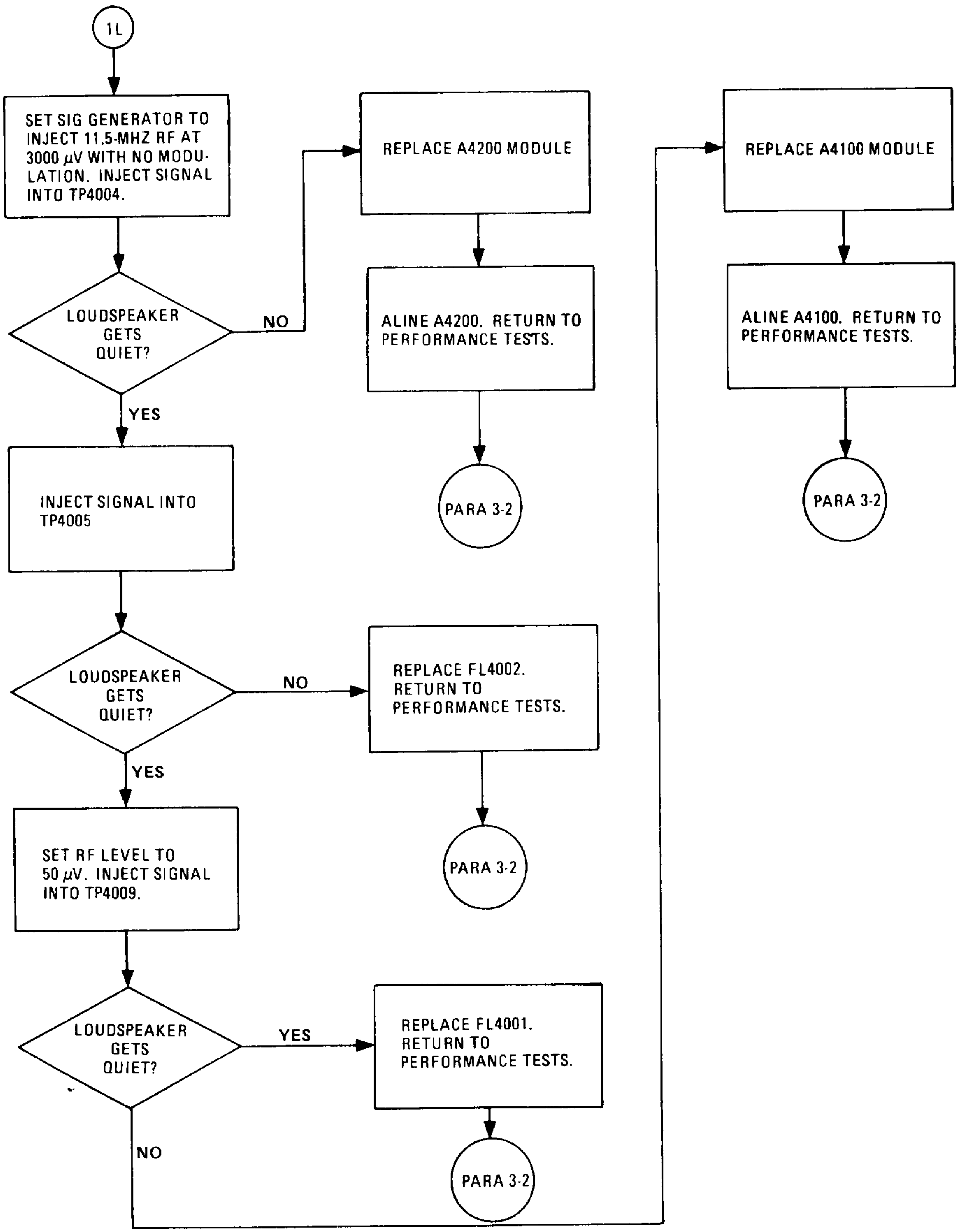
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 11 of 18)



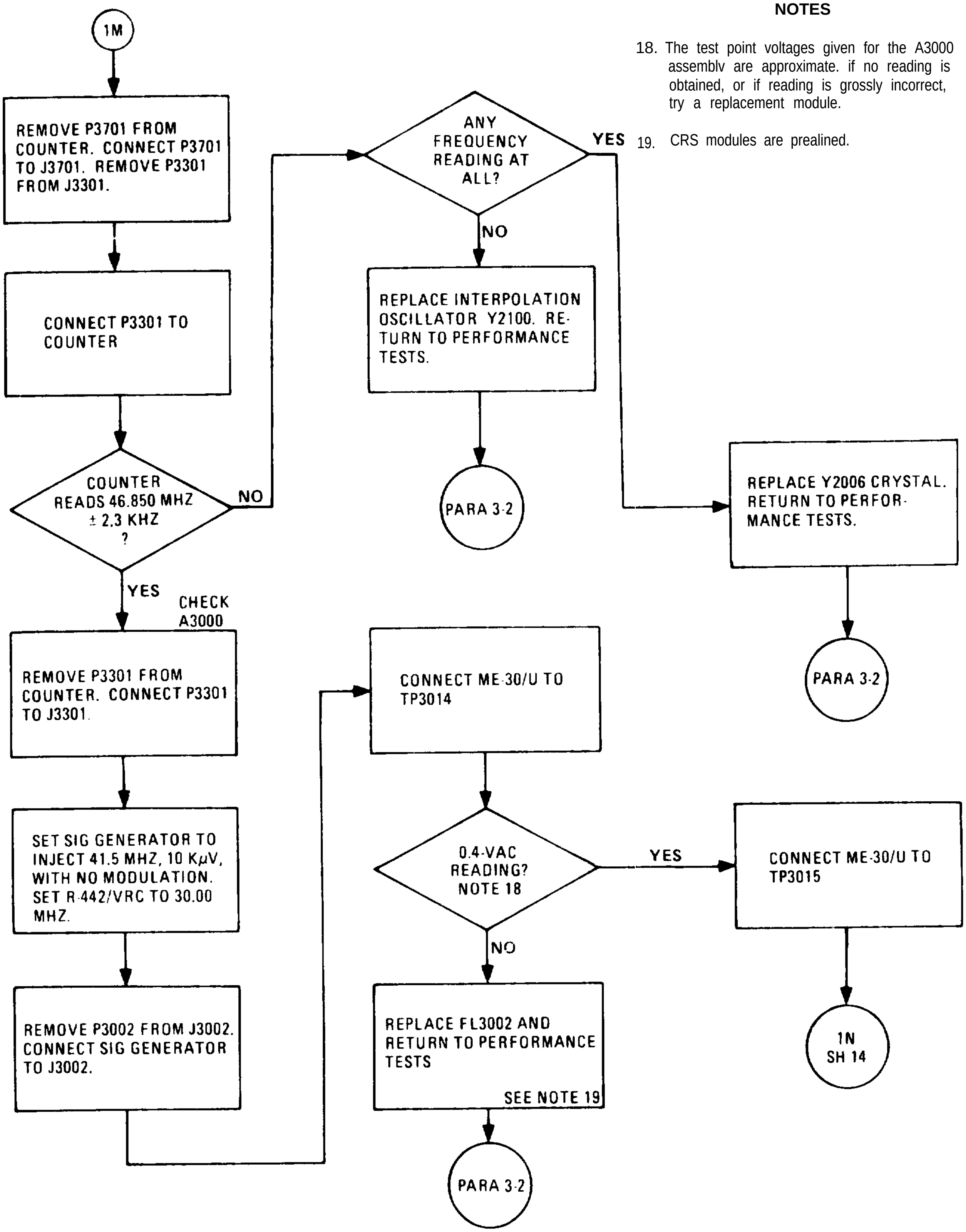
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 12 of 18)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 13 of 18)



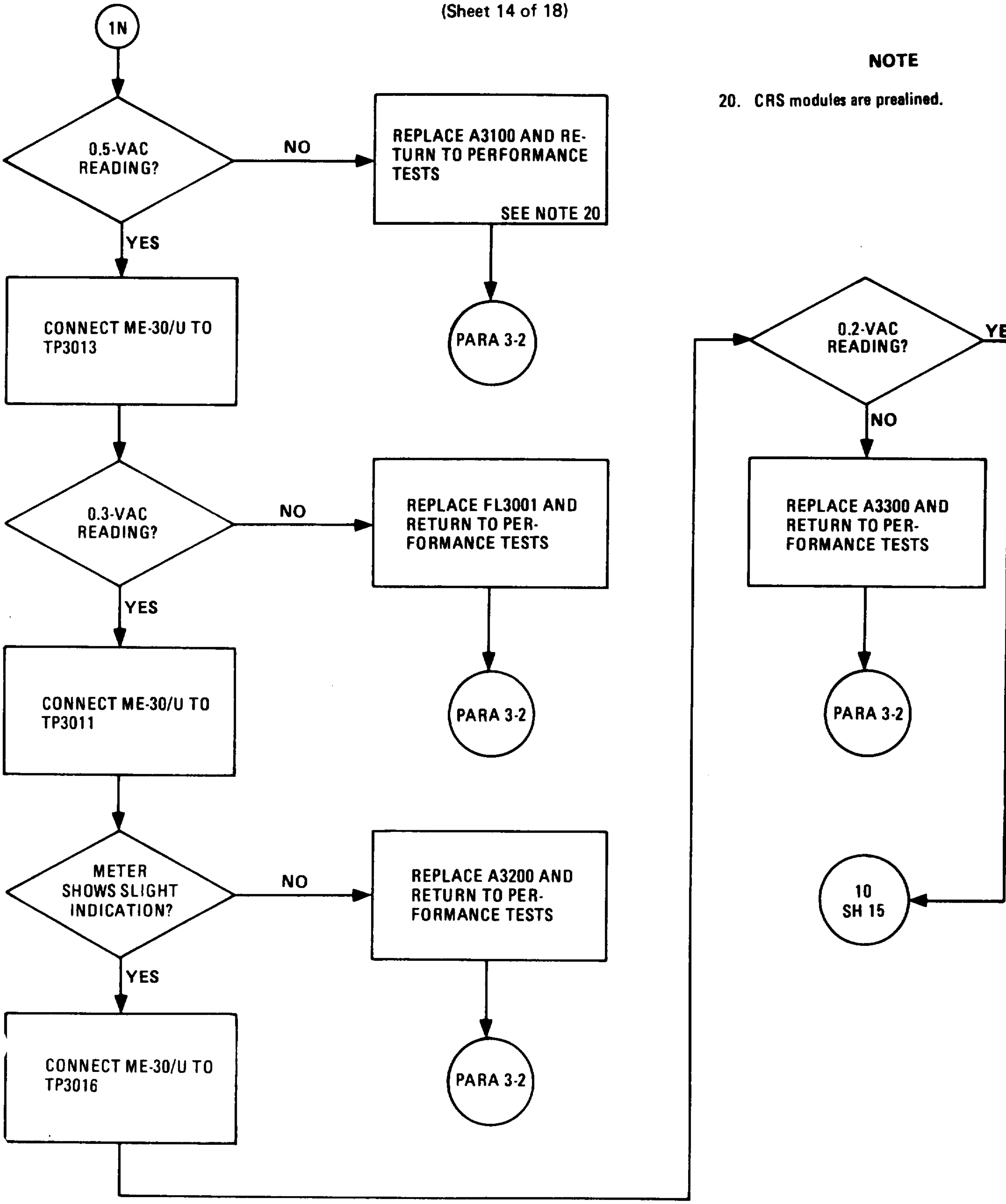
NOTES

18. The test point voltages given for the A3000 assemblv are approximate. if no reading is obtained, or if reading is grossly incorrect, try a replacement module.

19. CRS modules are prealined.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 14 of 18)

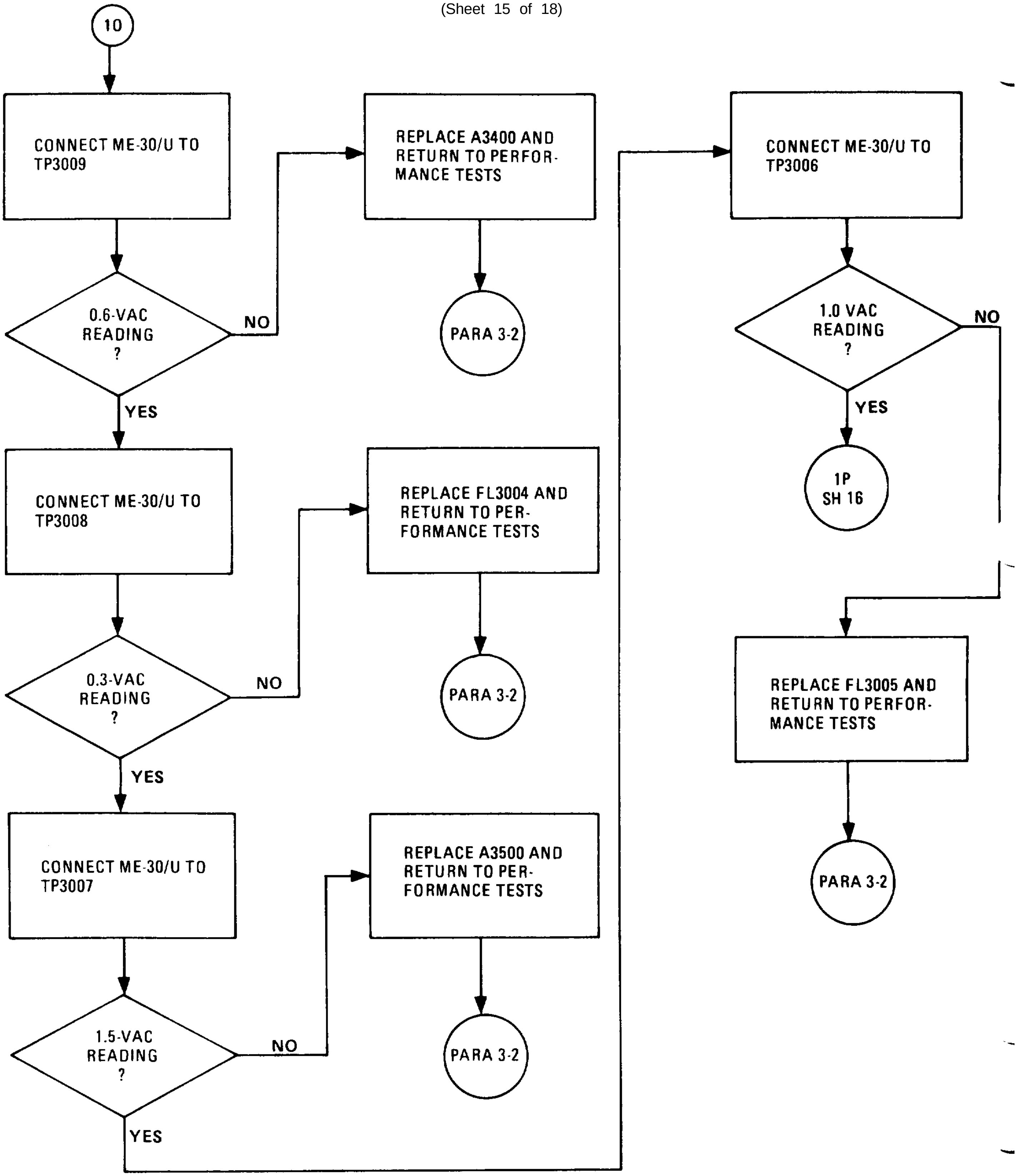


NOTE

20. CRS modules are prealined.

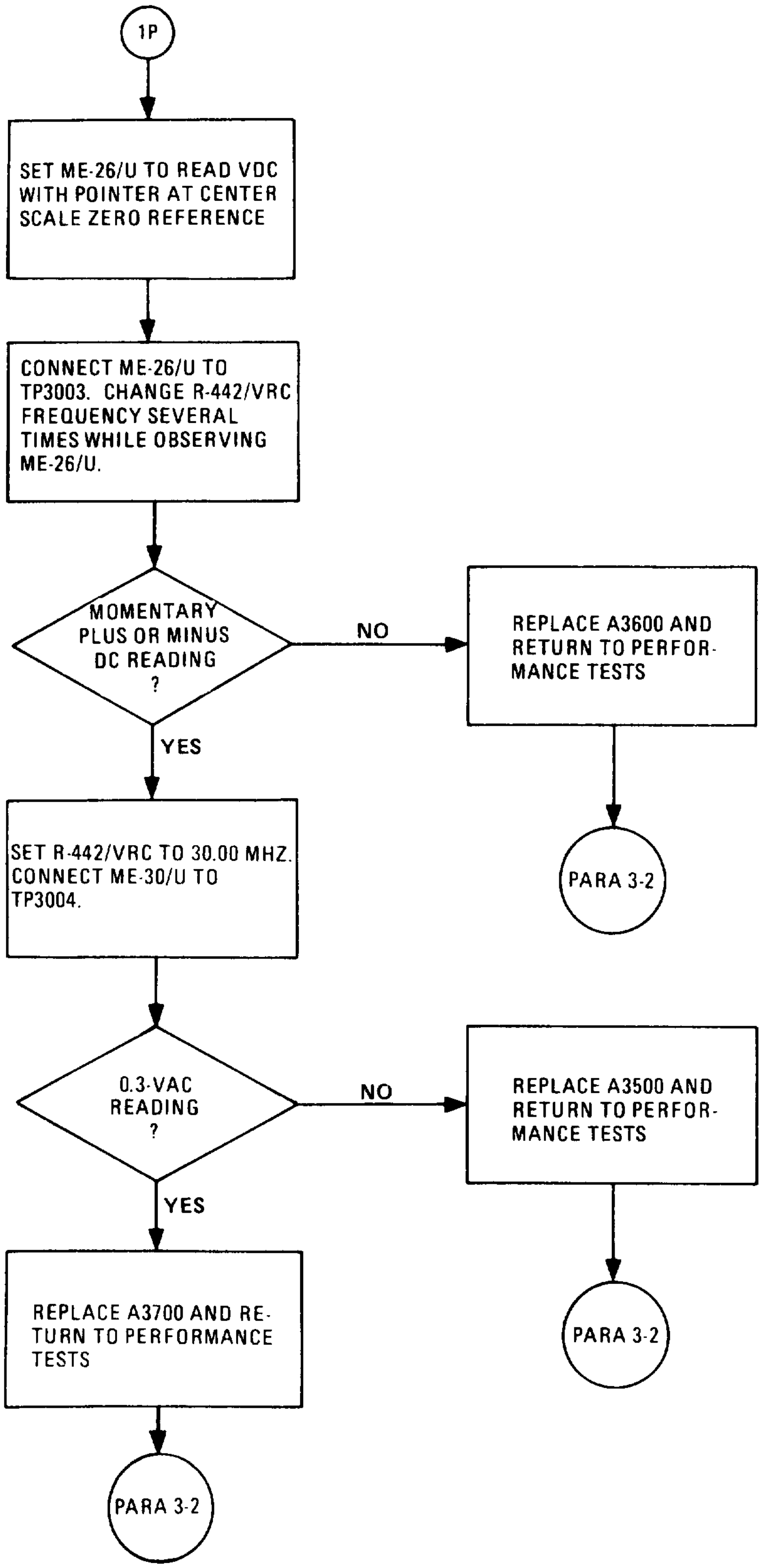
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 15 of 18)



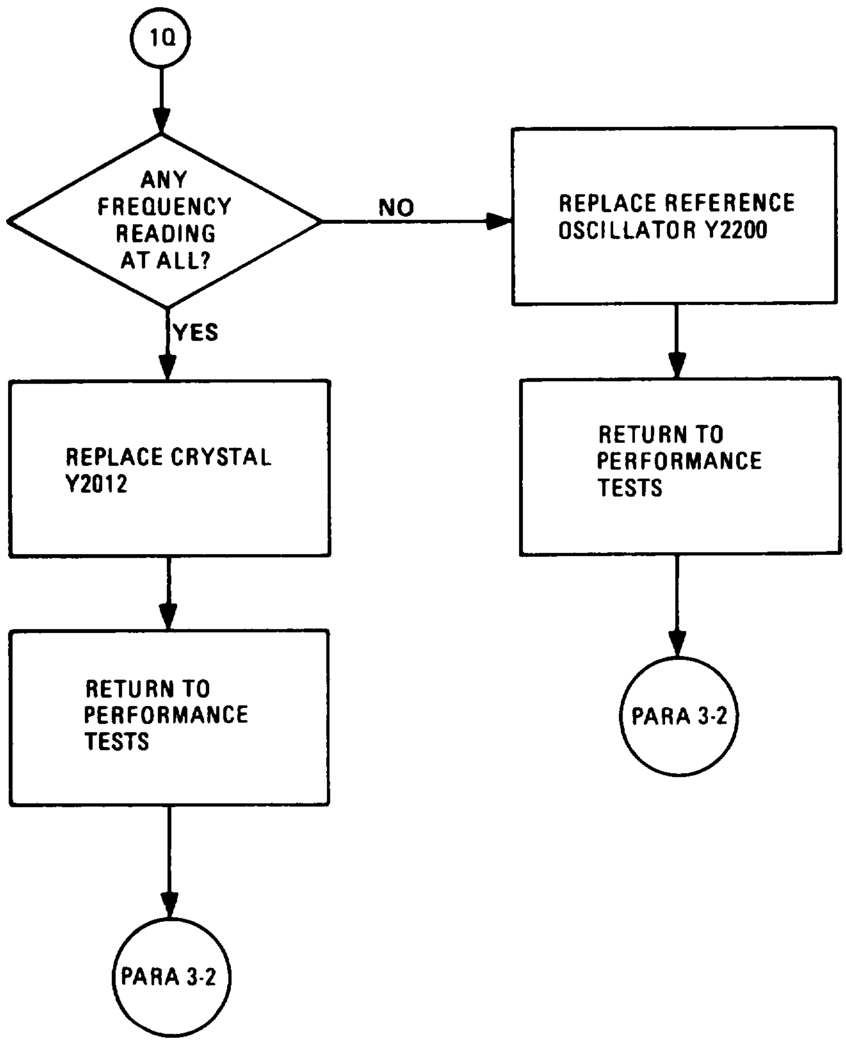
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 16 of 18)



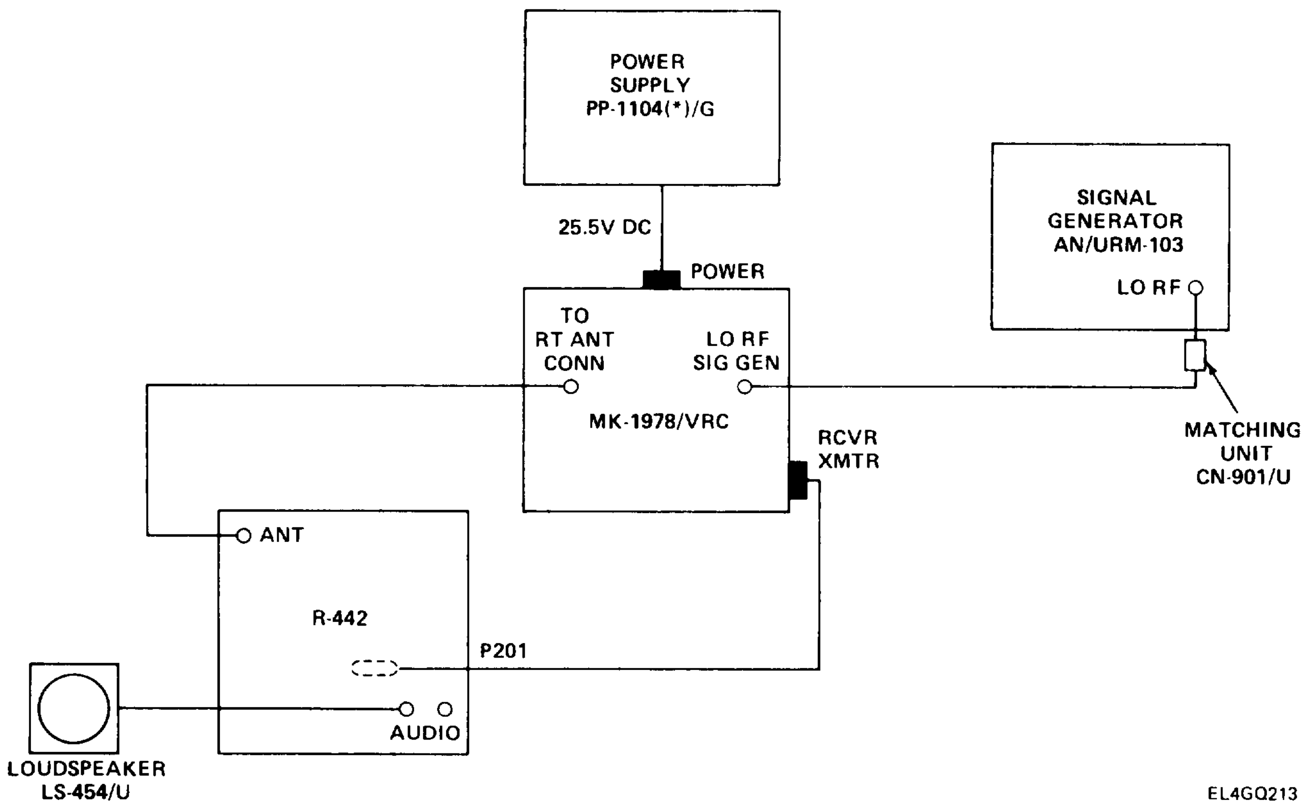
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 17 of 18)



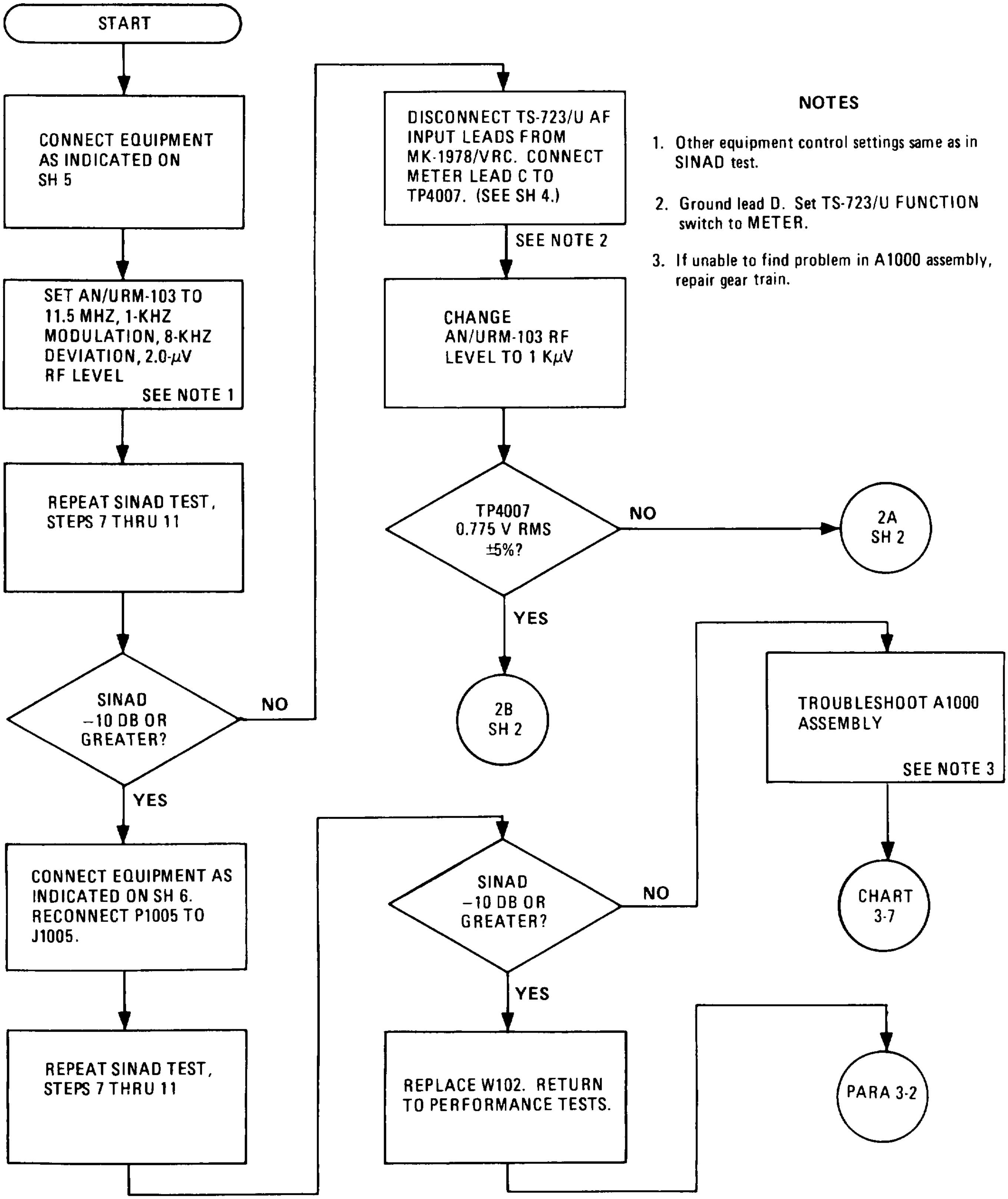
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-1
No Audio Troubleshooting
(Sheet 18 of 18)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 1 of 7)

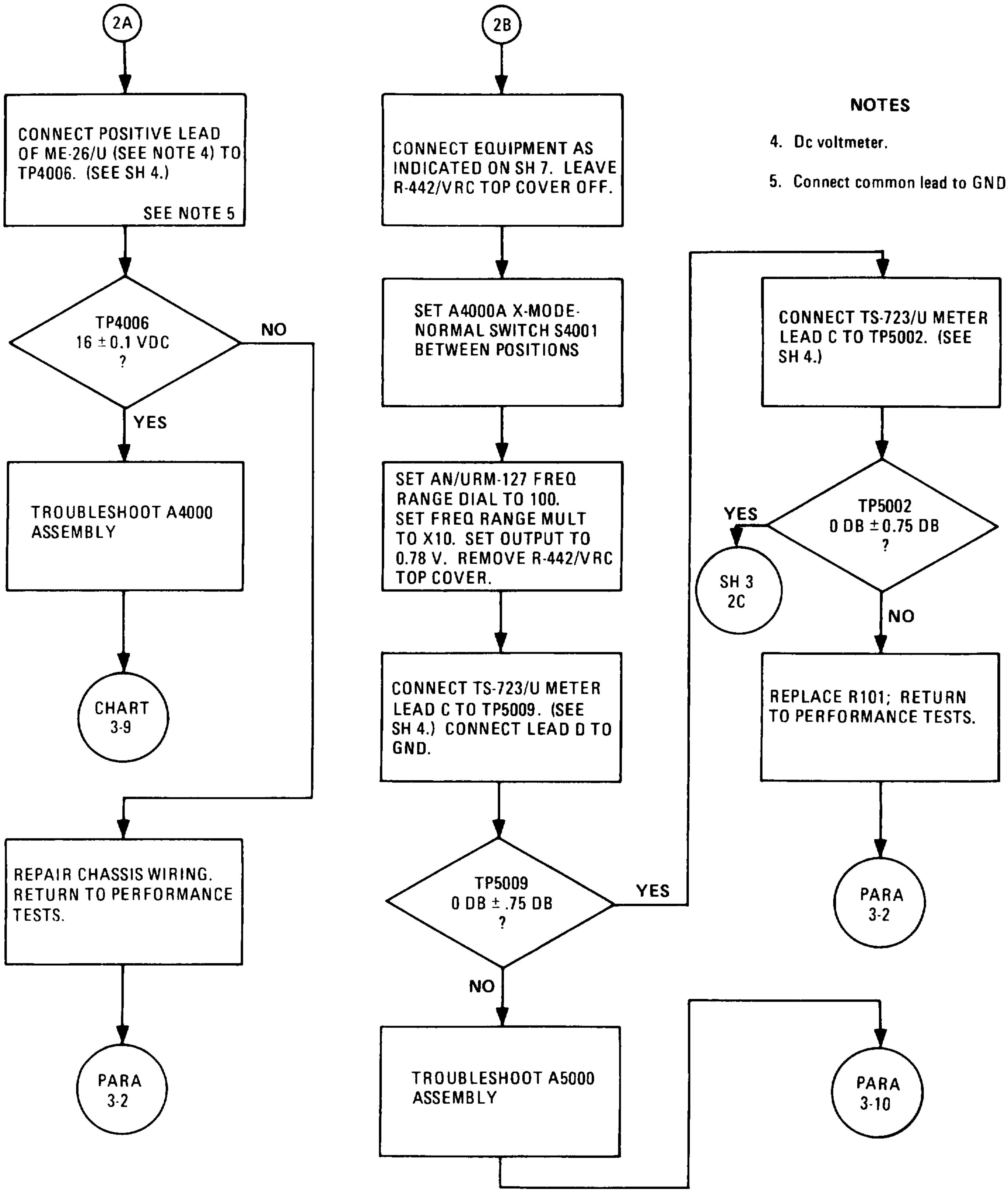


NOTES

1. Other equipment control settings same as in SINAD test.
2. Ground lead D. Set TS-723/U FUNCTION switch to METER.
3. If unable to find problem in A1000 assembly, repair gear train.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 2 of 7)

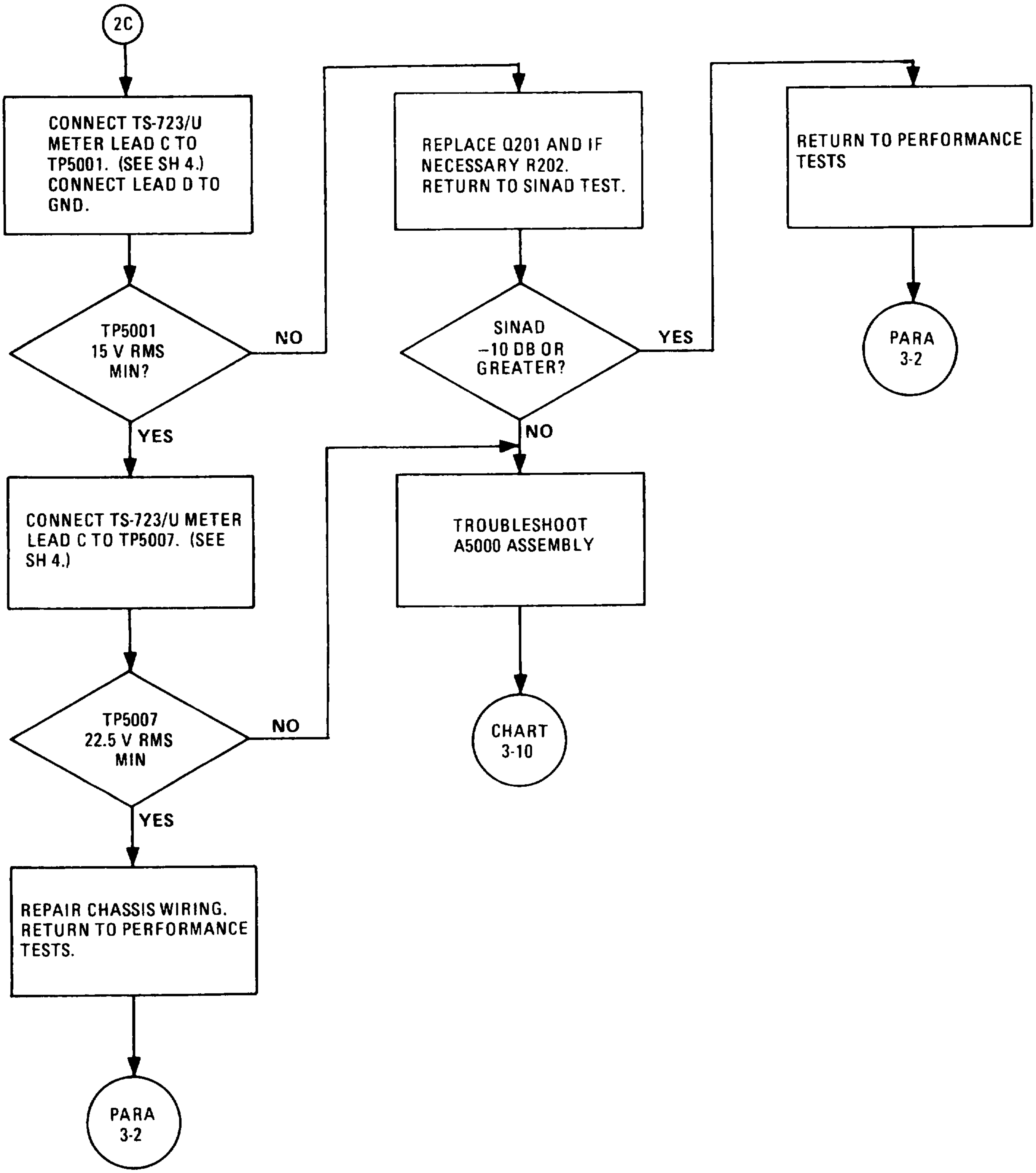


NOTES

4. Dc voltmeter.
5. Connect common lead to GND.

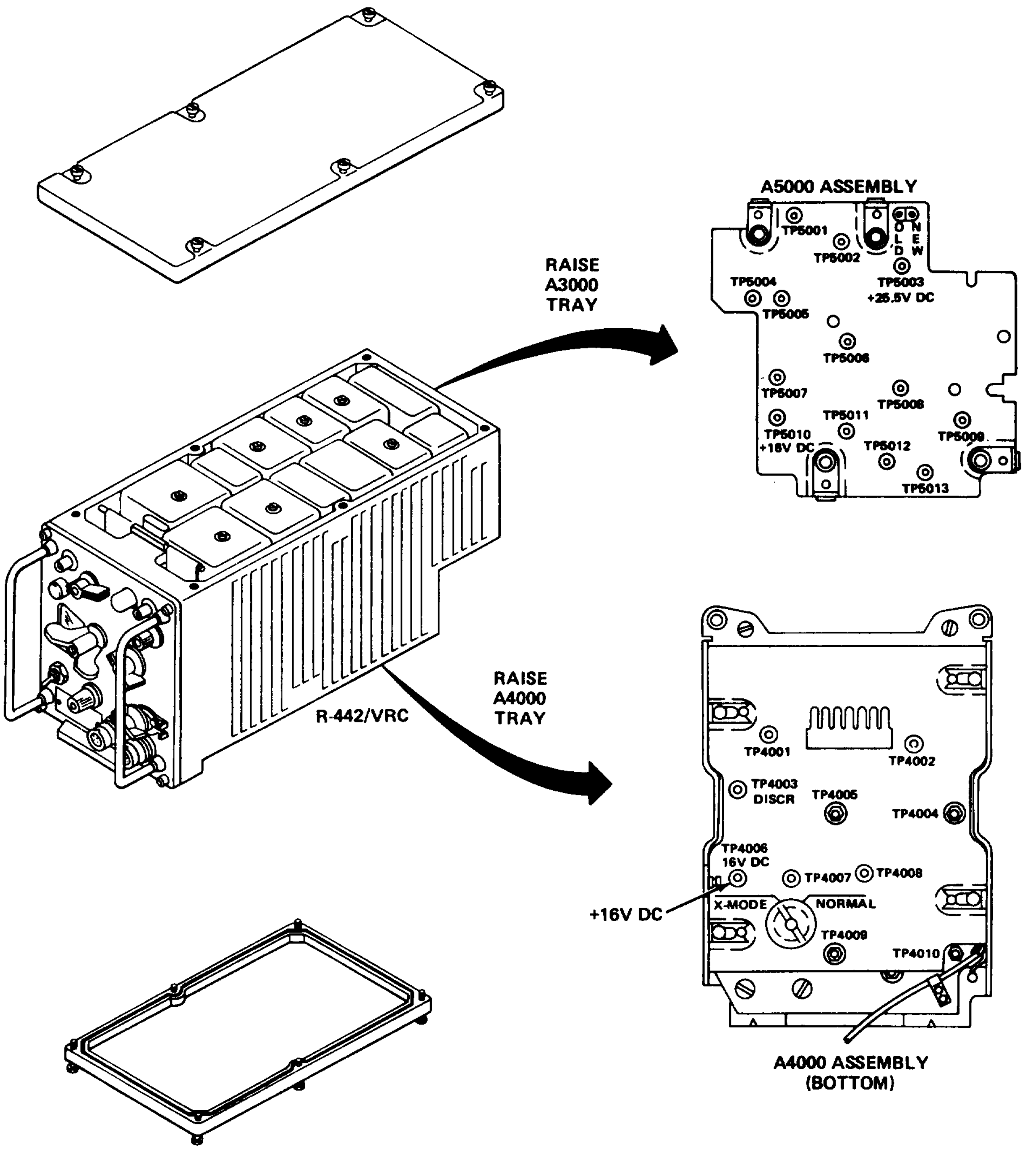
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 3 of 7)



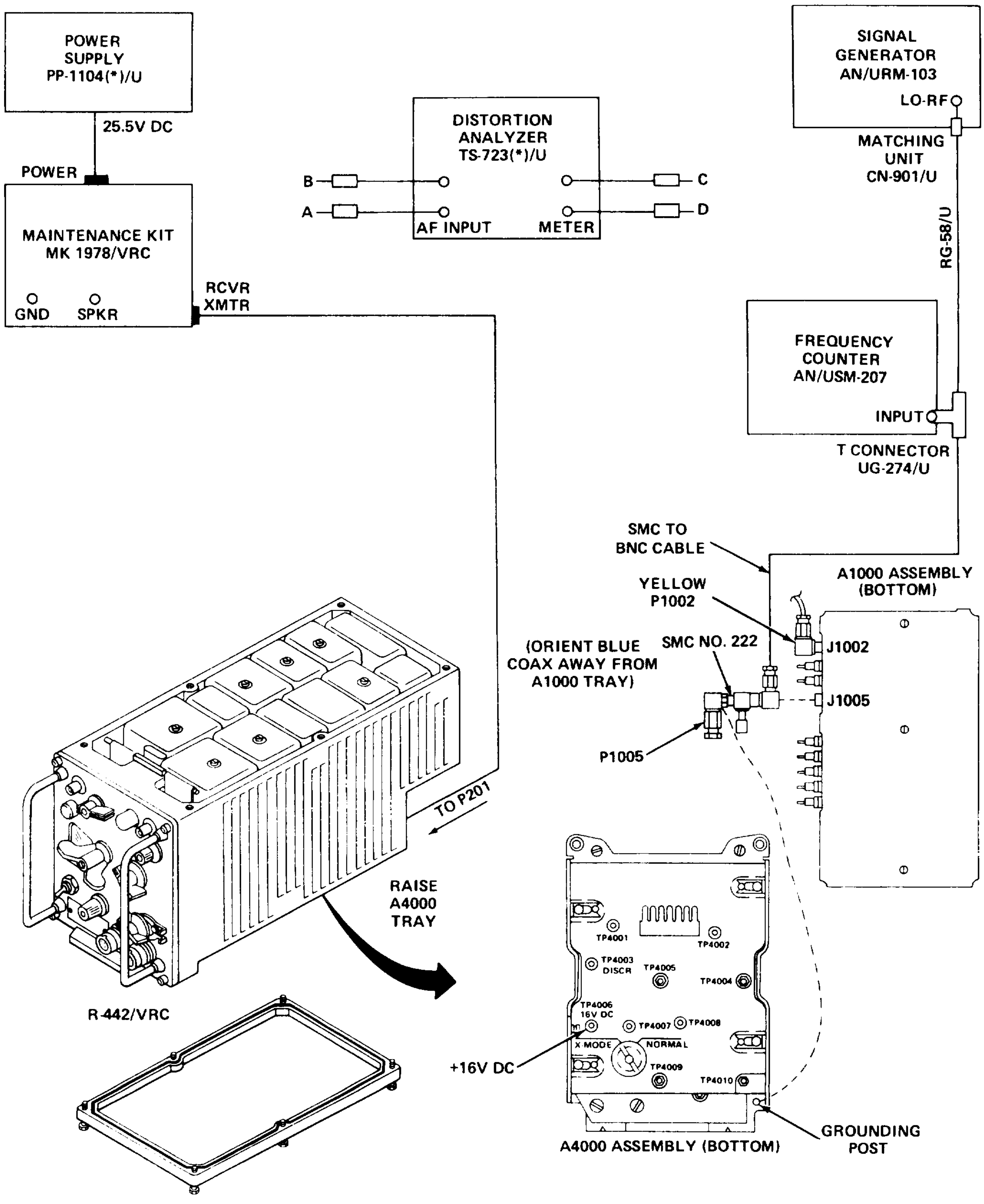
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 4 of 7)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 5 of 7)

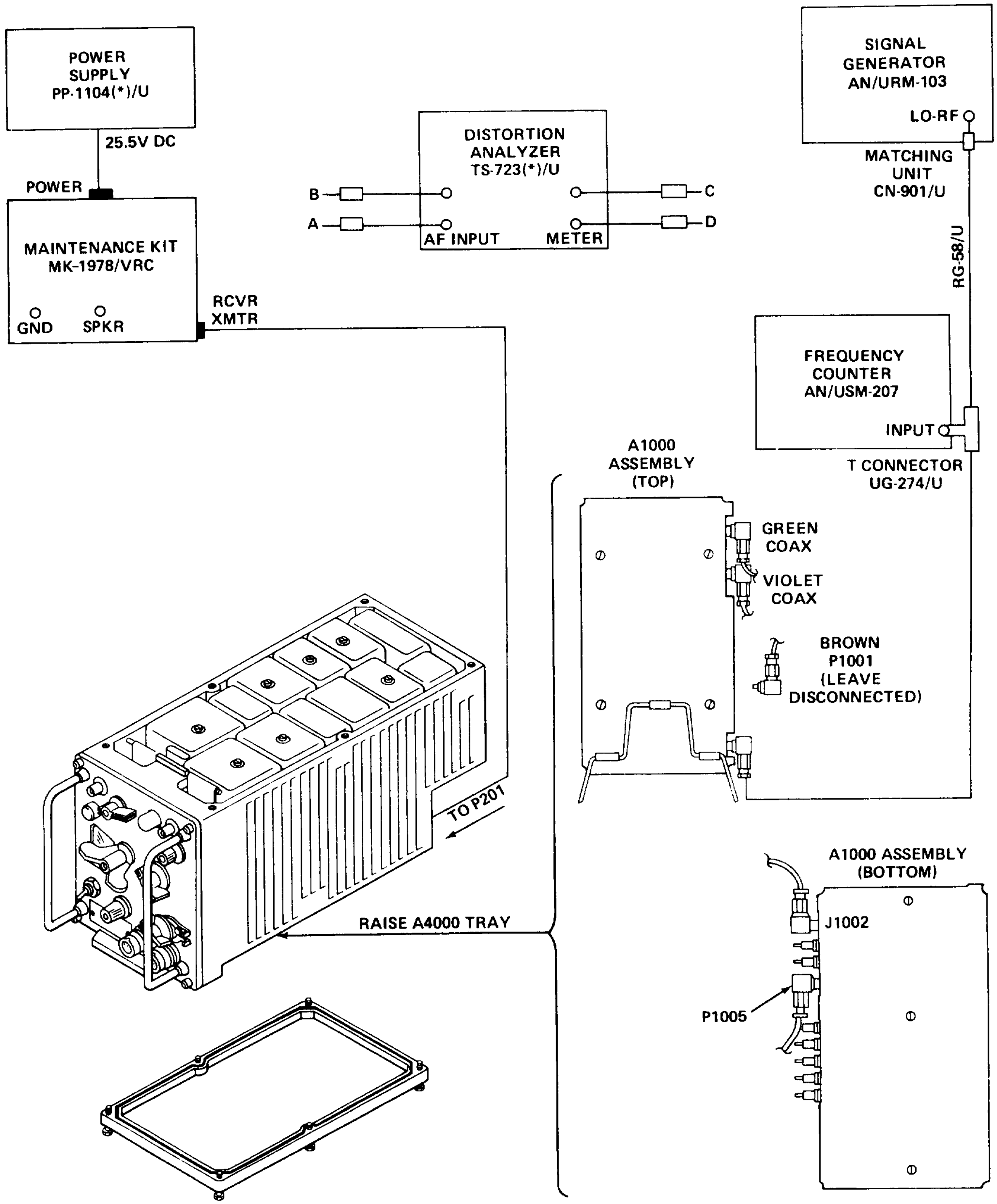


3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2

SINAD Test Failure Troubleshooting

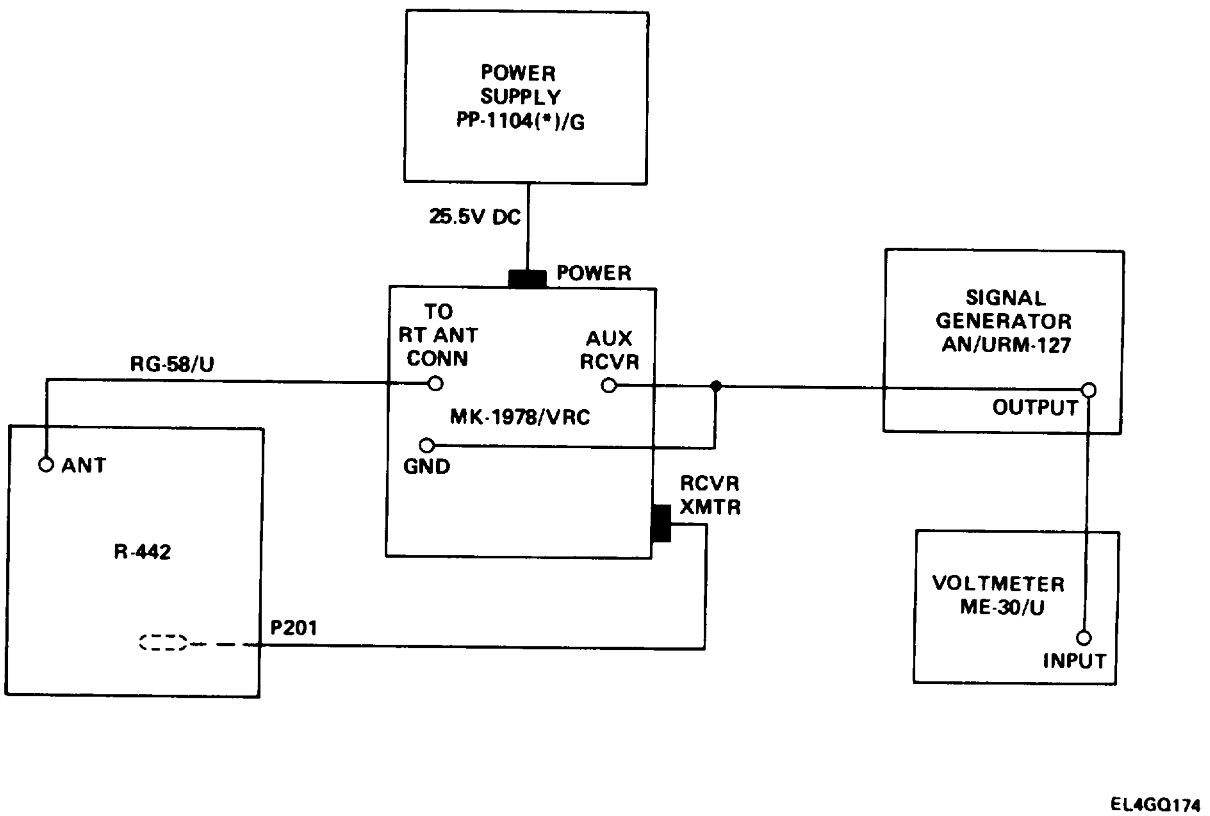
(Sheet 6 of 7)



EL4GQ173

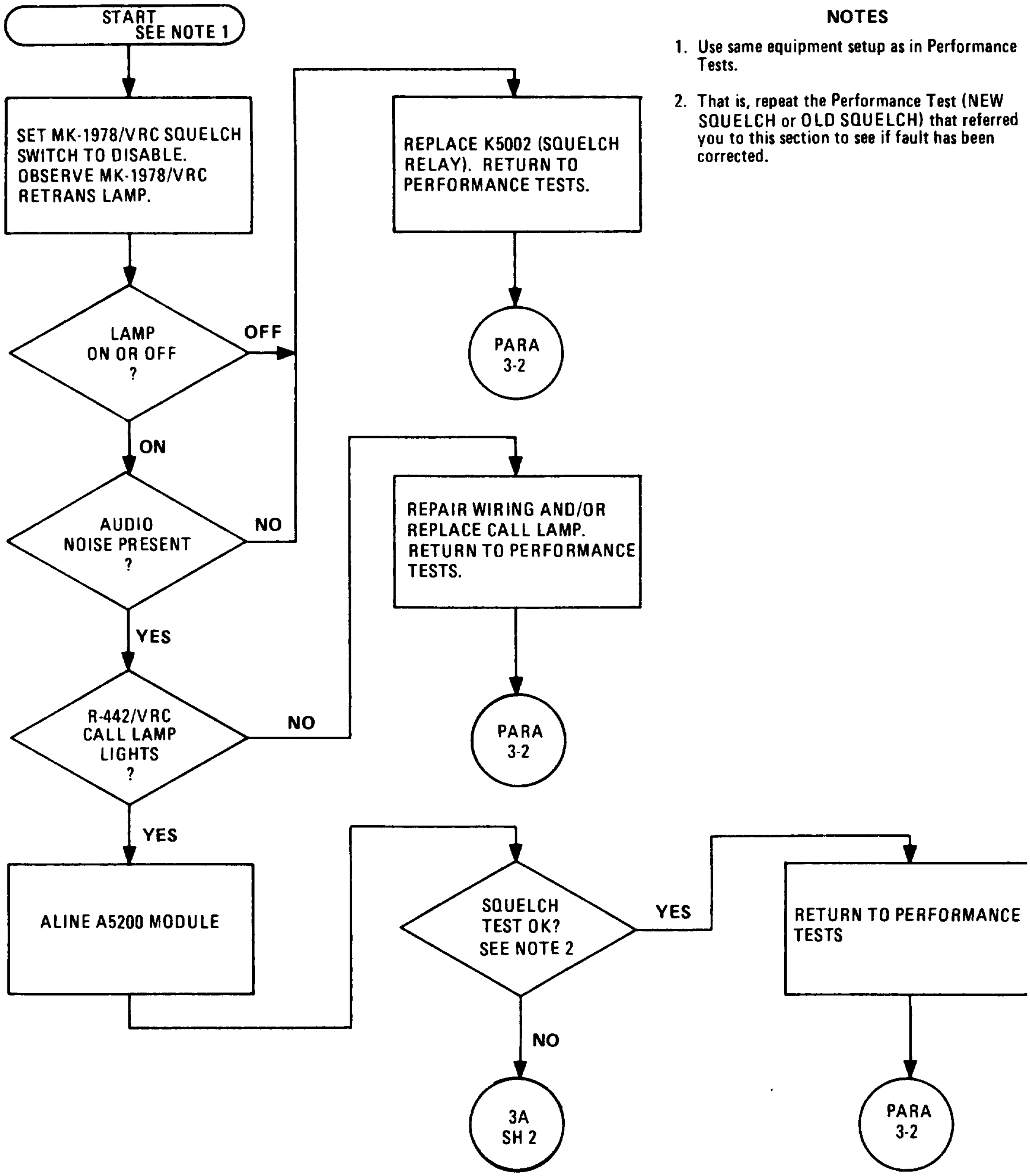
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-2
SINAD Test Failure Troubleshooting
(Sheet 7 of 7)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-3
Squelch Test Failure Troubleshooting
(Sheet 1 of 2)

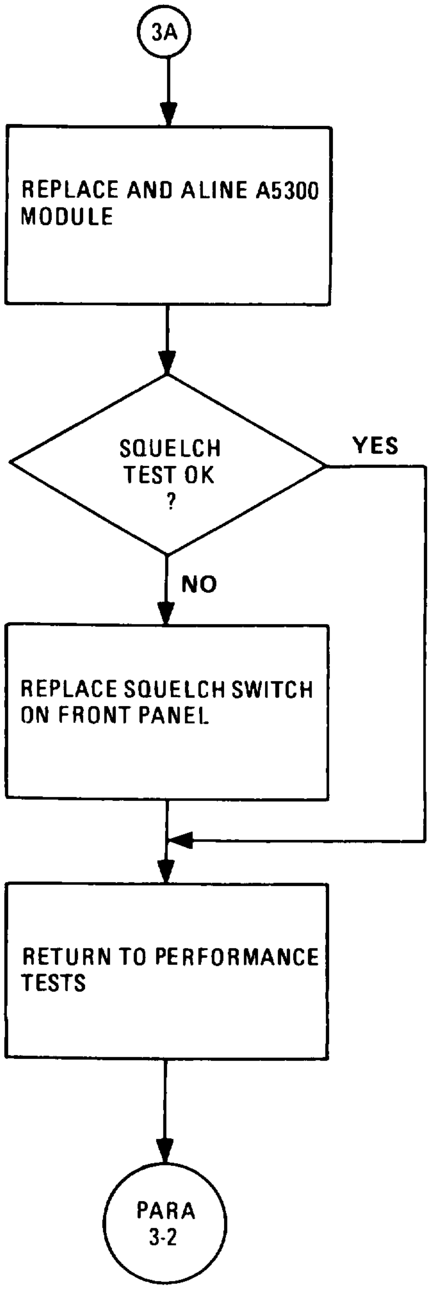


NOTES

1. Use same equipment setup as in Performance Tests.
2. That is, repeat the Performance Test (NEW SQUELCH or OLD SQUELCH) that referred you to this section to see if fault has been corrected.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-3
Squelch Test Failure Troubleshooting
(Sheet 2 of 2)

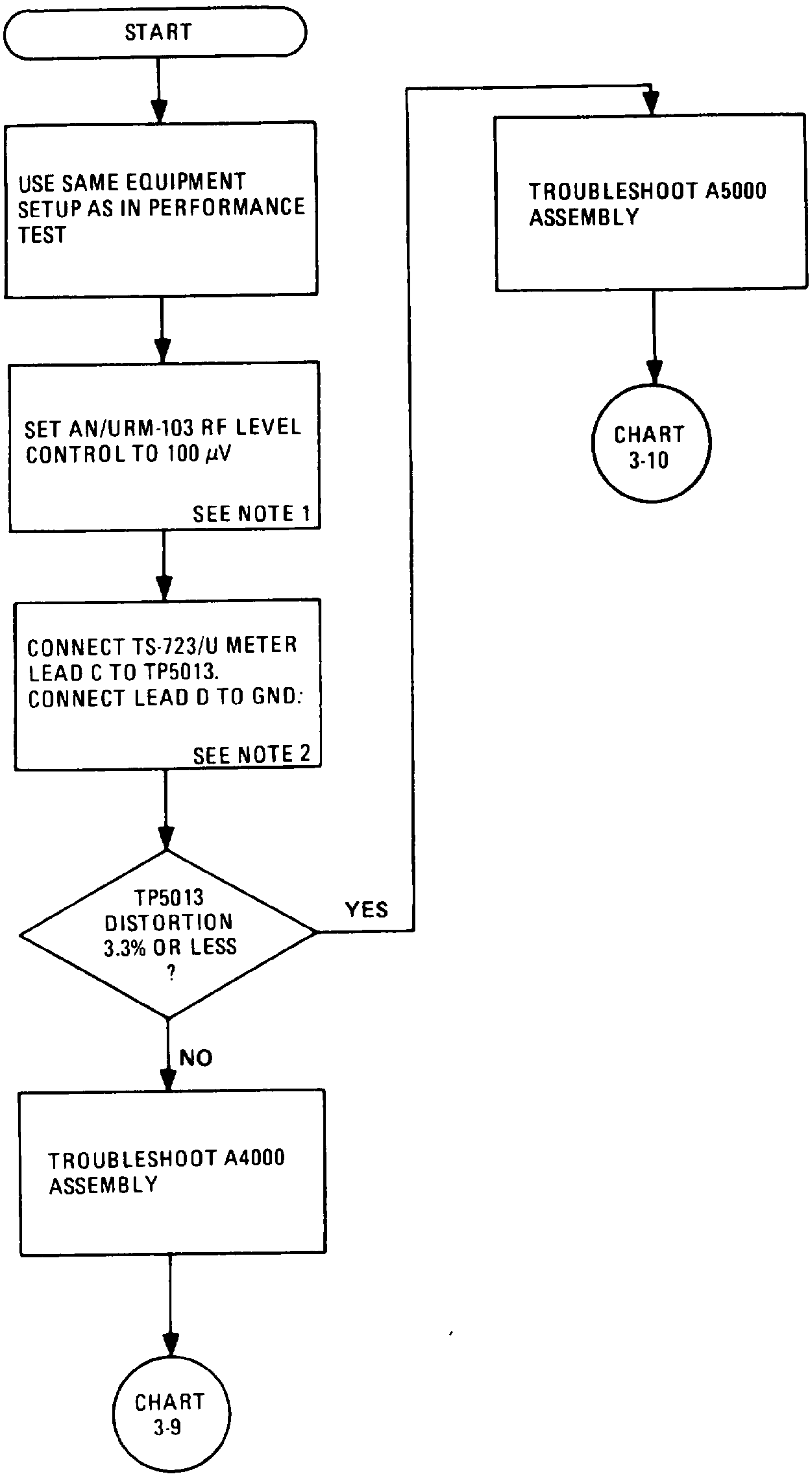


3-13. TROUBLESHOOTING FLOWCHARTS.

CHART3-4

Audio Distortion Test Failure Troubleshooting

(Sheet 1 of 1)

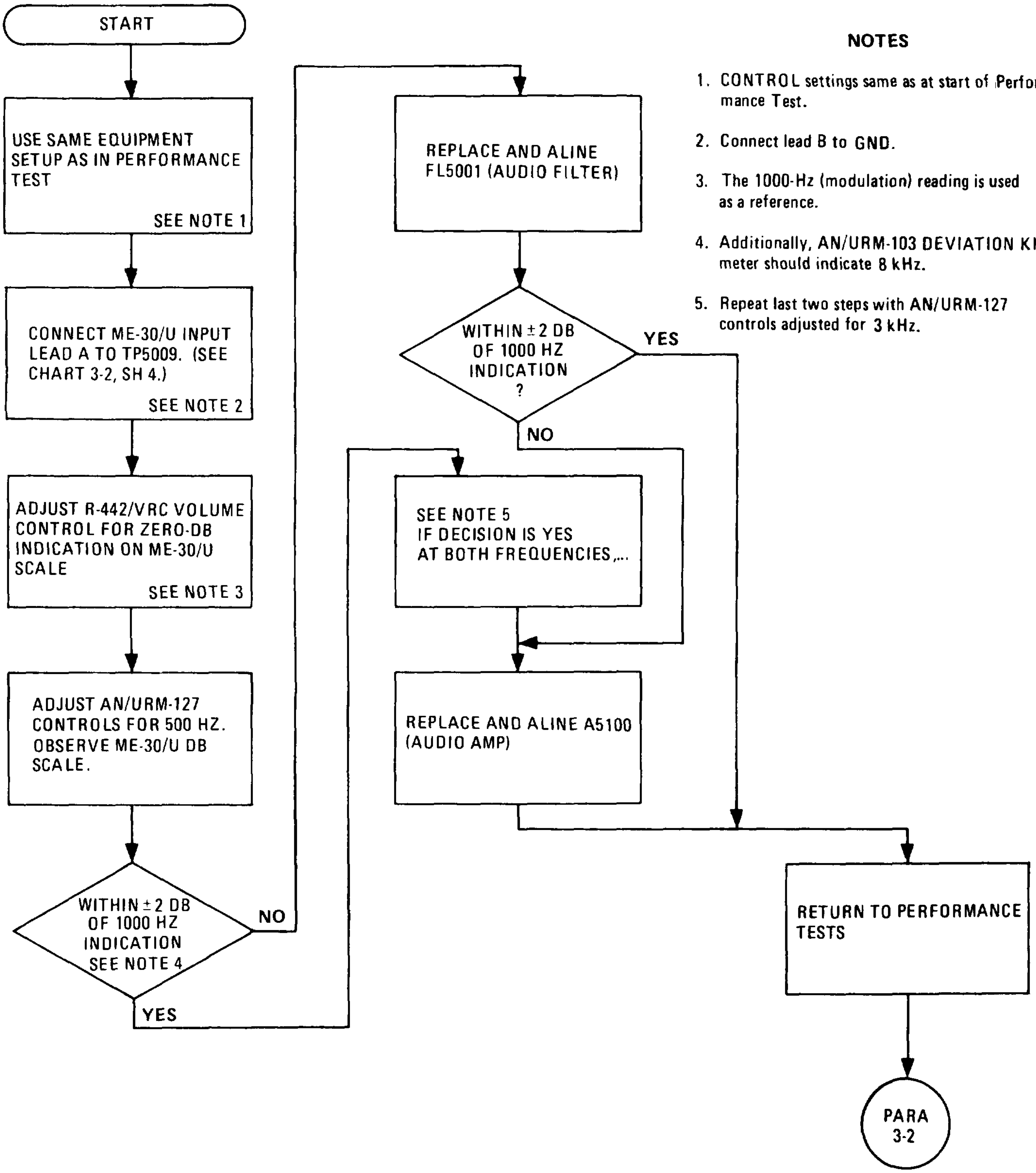


NOTES

1. Other equipment control settings same as in Distortion Test.
2. Set TS-723/U FUNCTION switch to DISTORTION.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-5
Audio Response Test Failure (Normal Mode) Troubleshooting
(Sheet 1 of 1)

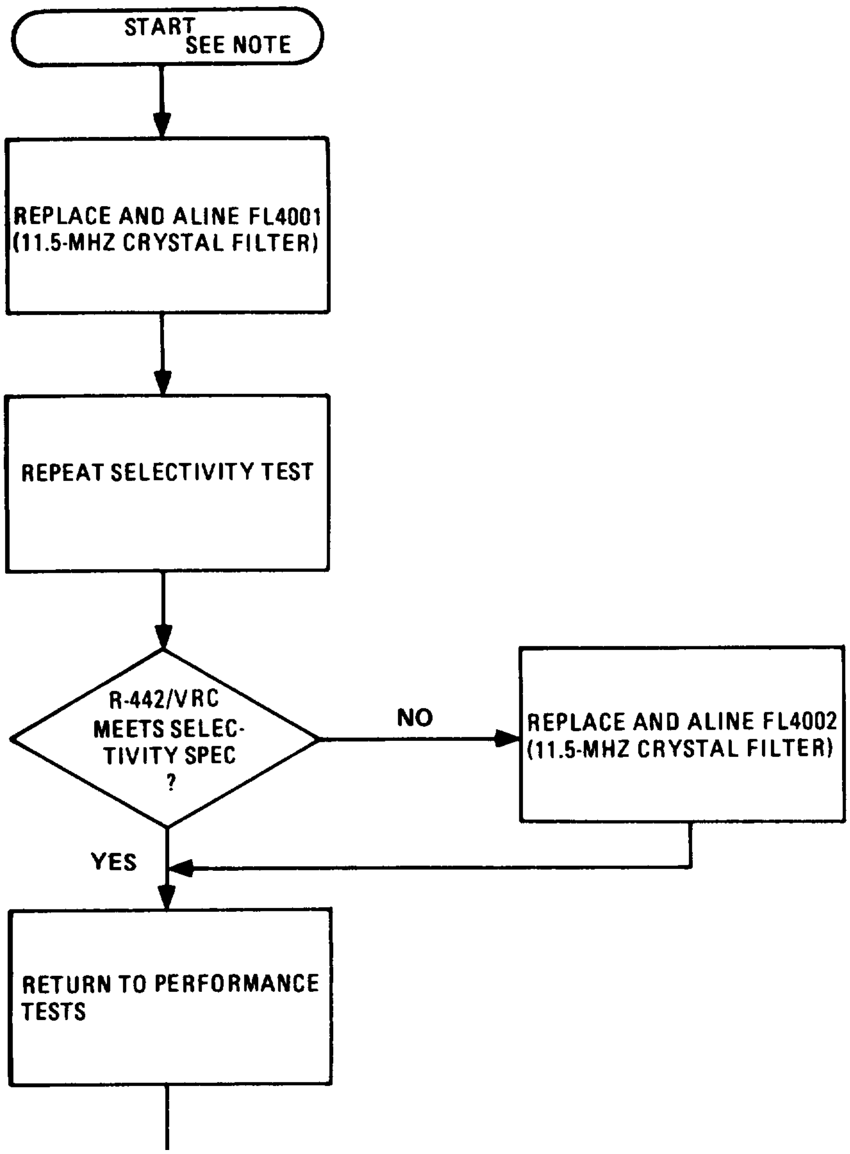


NOTES

1. CONTROL settings same as at start of Performance Test.
2. Connect lead B to GND.
3. The 1000-Hz (modulation) reading is used as a reference.
4. Additionally, AN/URM-103 DEVIATION KHZ meter should indicate 8 kHz.
5. Repeat last two steps with AN/URM-127 controls adjusted for 3 kHz.

3-19. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-6
Selectivity Test Failure Troubleshooting
(Sheet 1 of 1)

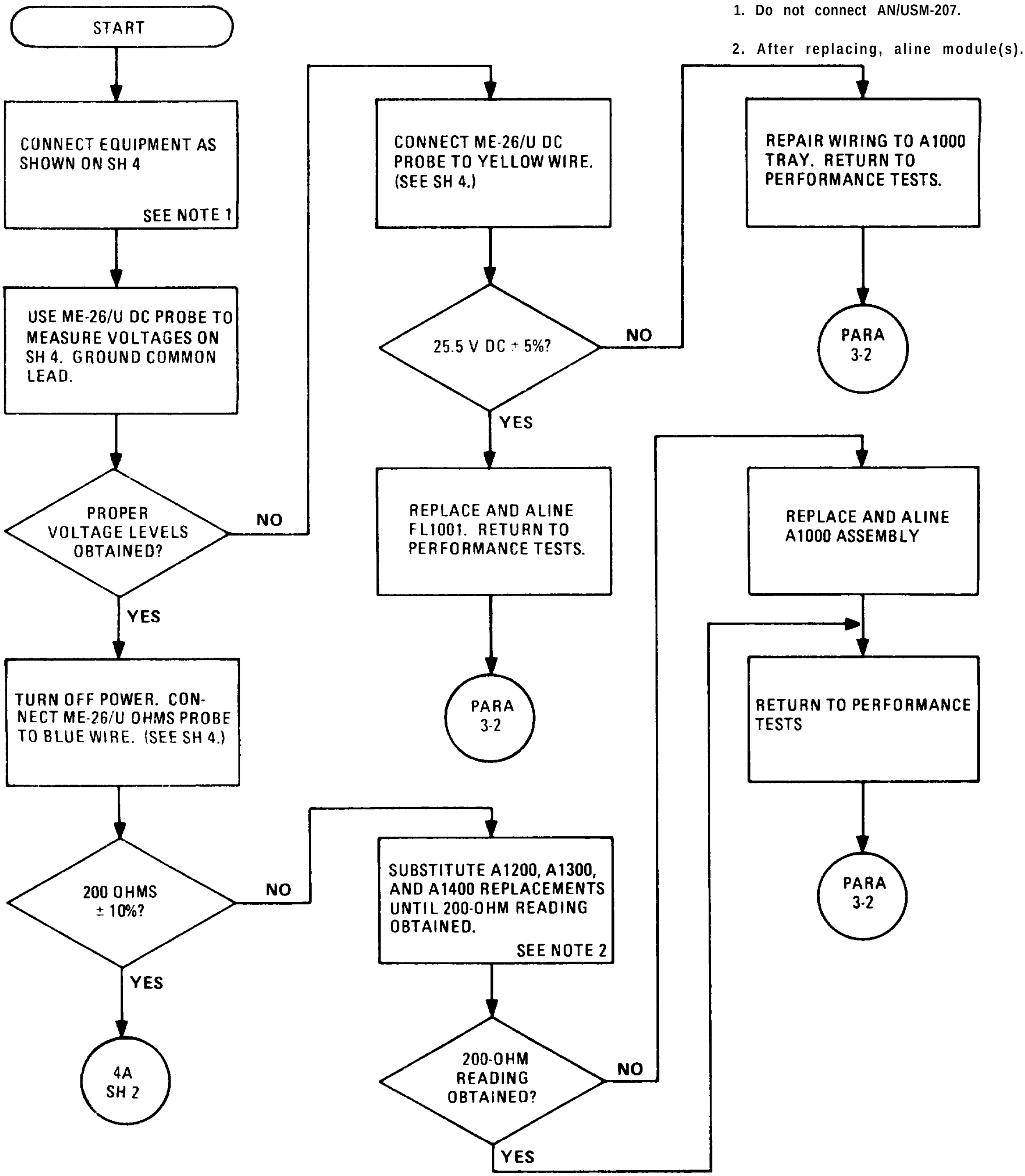


NOTE

Use same equipment setup as in Performance Test.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-7
A1000 Assembly Troubleshooting
(Sheet 1 of 5)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

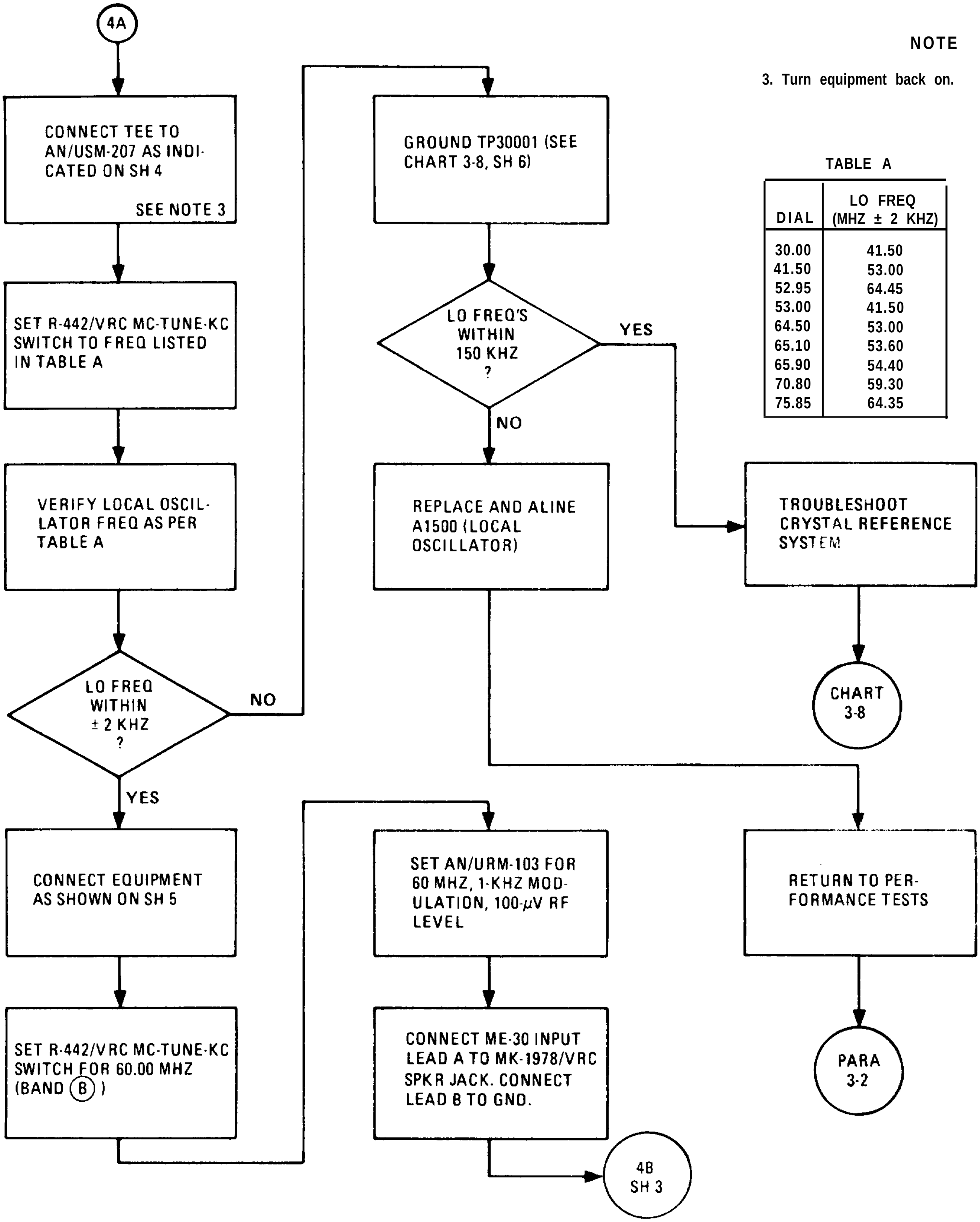
CHART 37
A1000 Assembly Troubleshooting
(Sheet 2 of 5)

NOTE

3. Turn equipment back on.

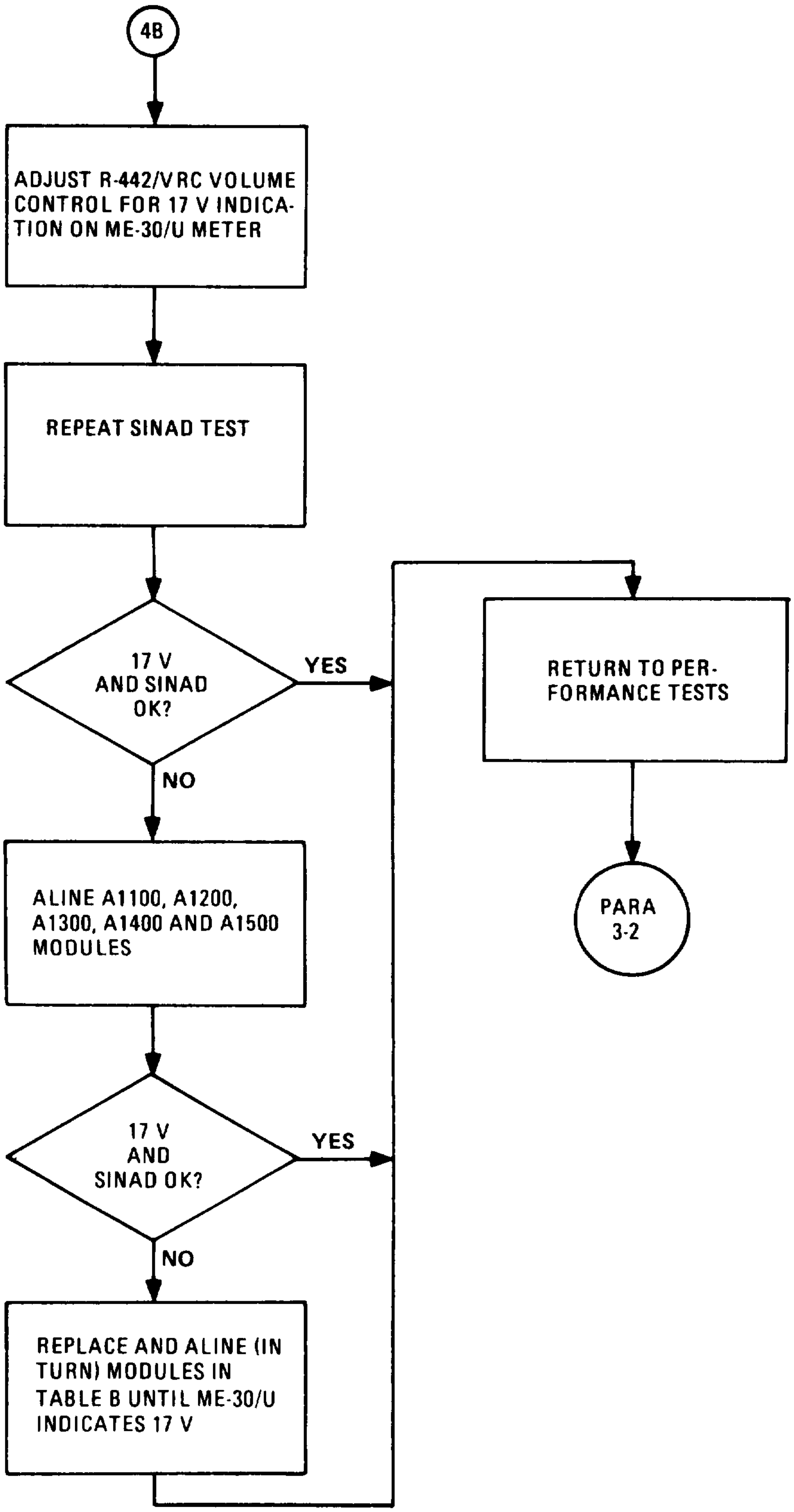
TABLE A

DIAL	LO FREQ (MHZ ± 2 KHZ)
30.00	41.50
41.50	53.00
52.95	64.45
53.00	41.50
64.50	53.00
65.10	53.60
65.90	54.40
70.80	59.30
75.85	64.35



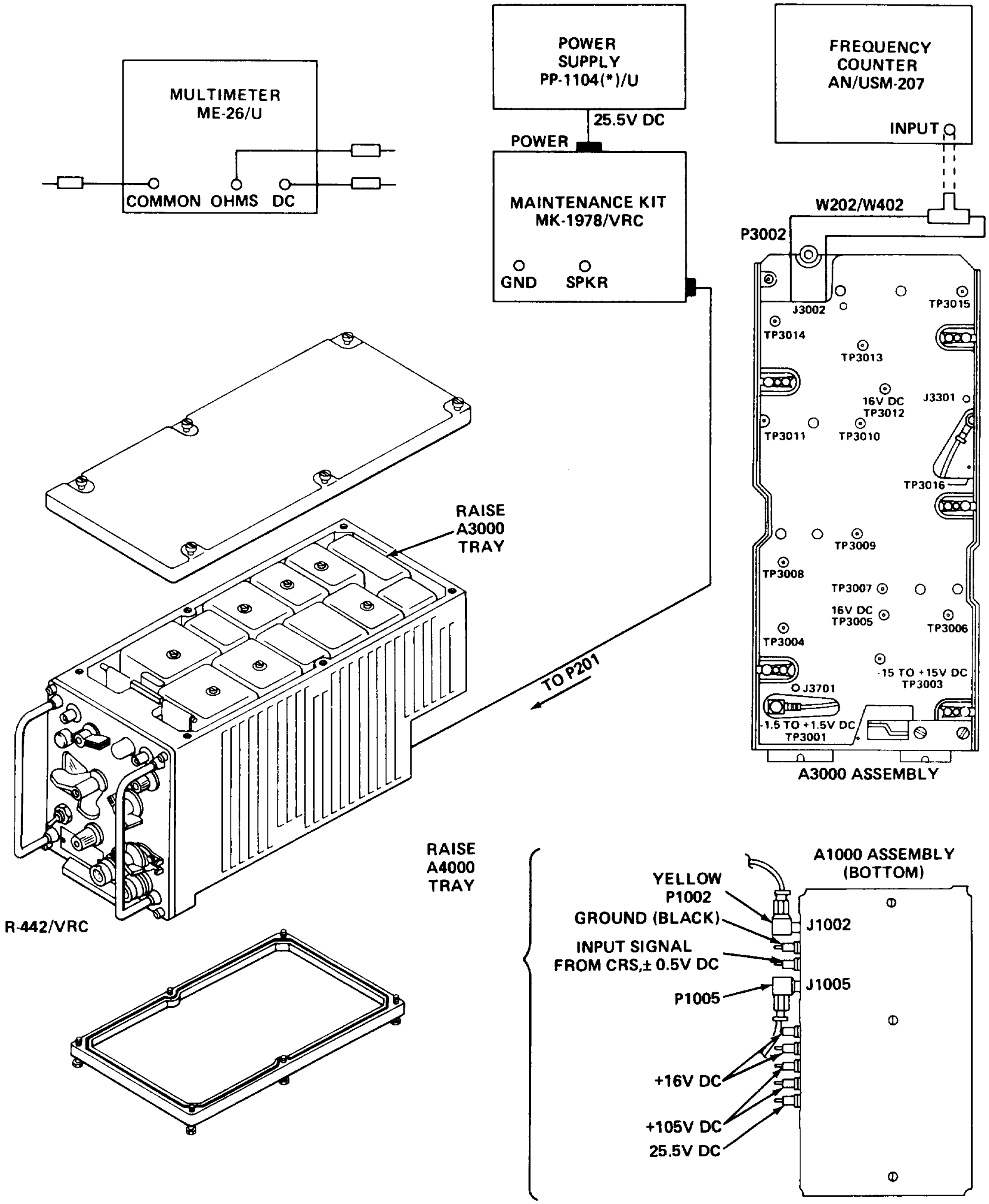
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-7
A1000 Assembly Troubleshooting
(Sheet 3 of 5)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

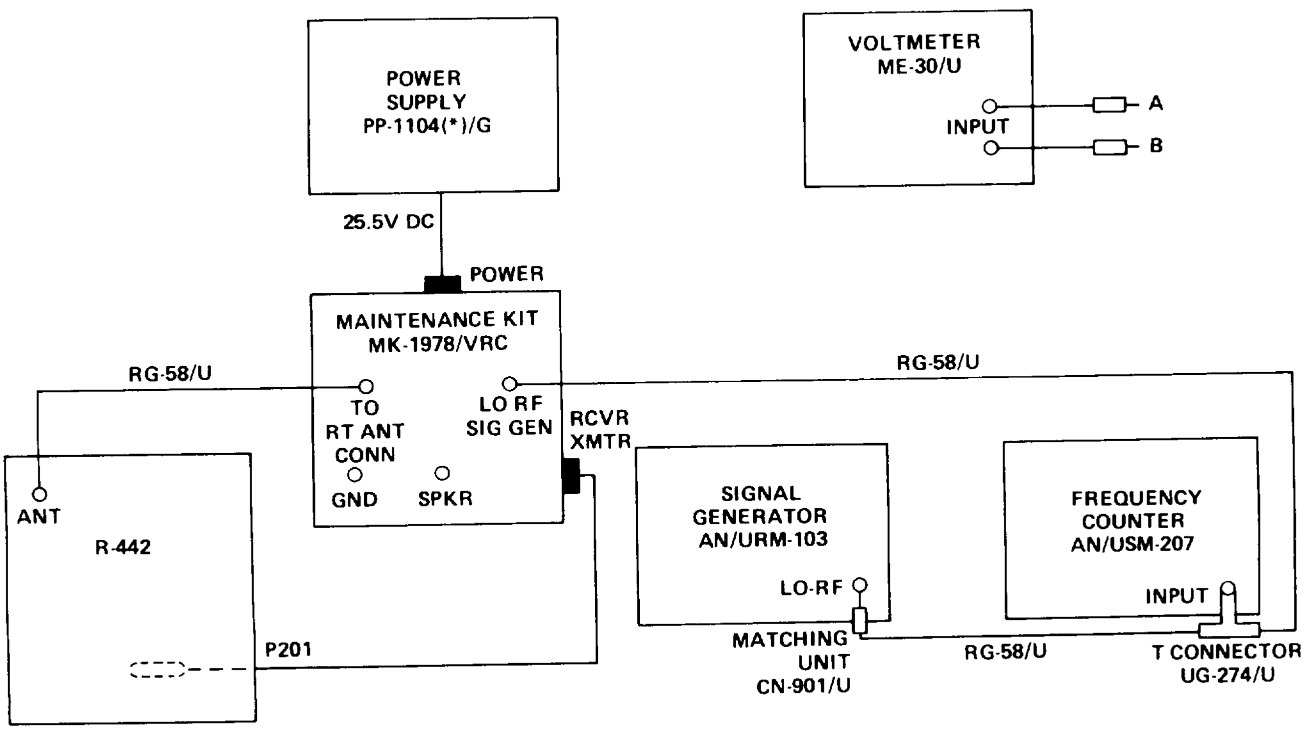
CHART 3-7
A1000 Assembly Troubleshooting
(Sheet 4 of 5)



EL4GQ175

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

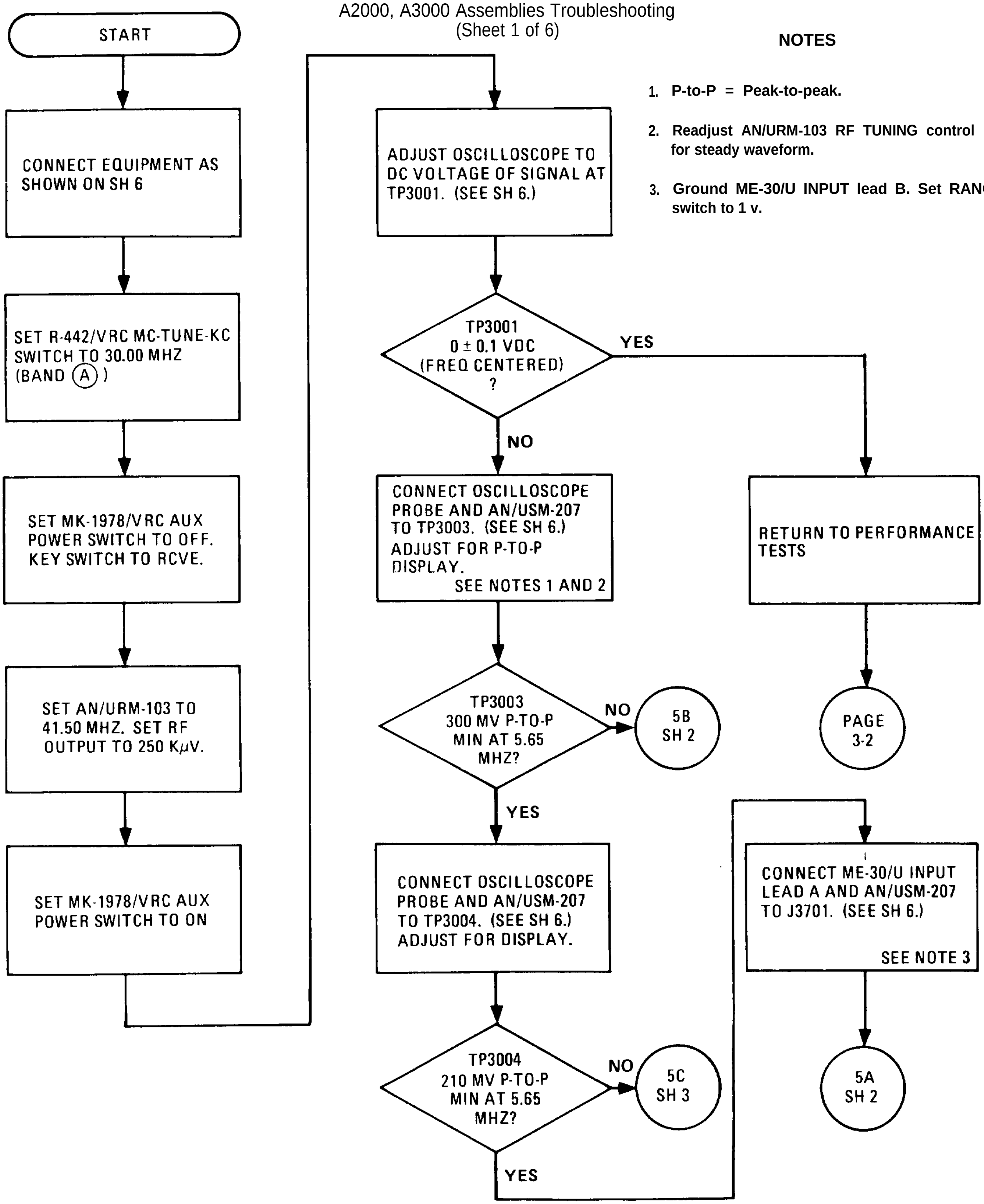
CHART 3-7
A1000 Assembly Troubleshooting
(Sheet 5 of 5)



EL4G0176

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 1 of 6)

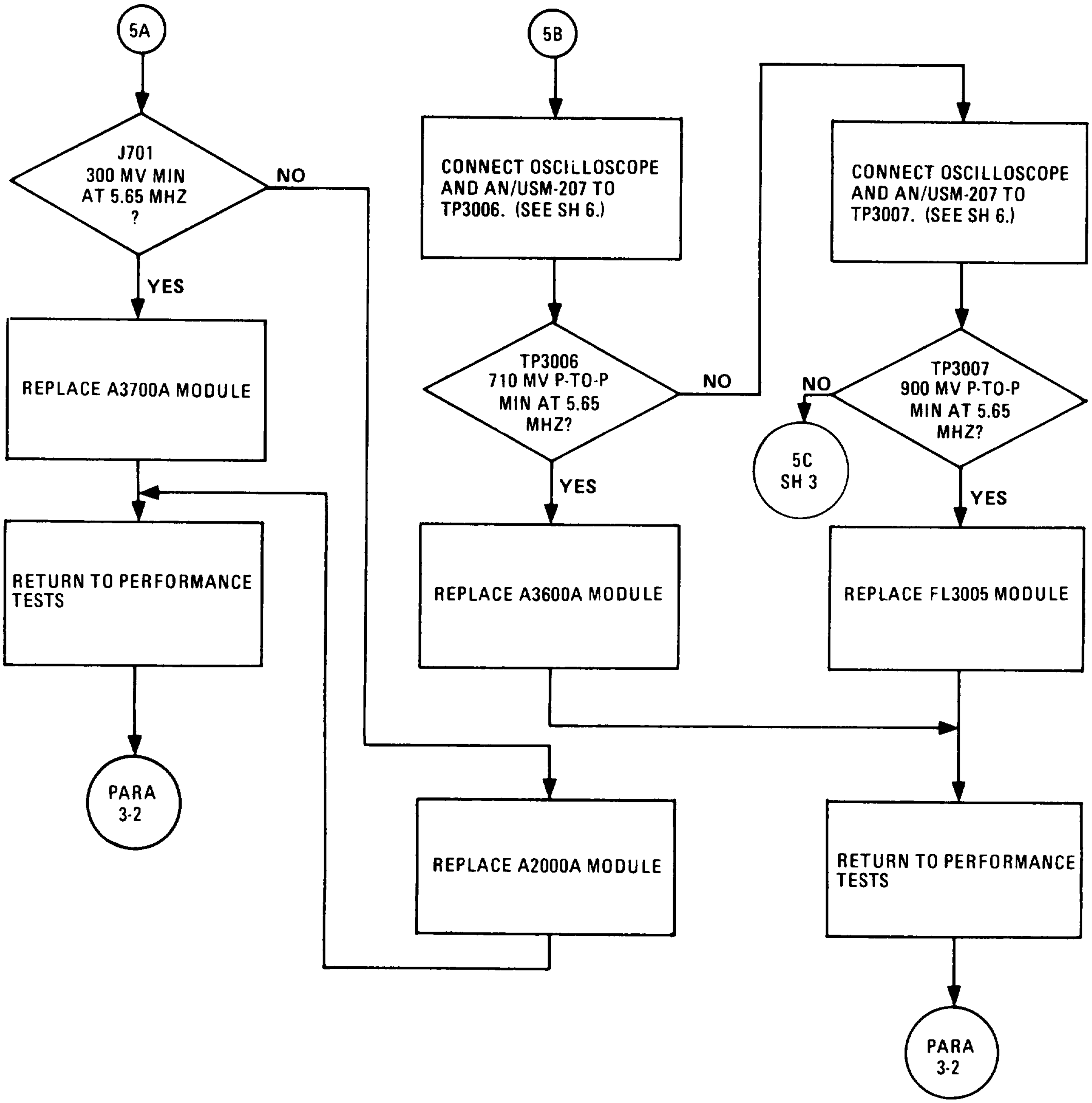


NOTES

1. **P-to-P = Peak-to-peak.**
2. **Readjust AN/URM-103 RF TUNING control for steady waveform.**
3. **Ground ME-30/U INPUT lead B. Set RANGE switch to 1 v.**

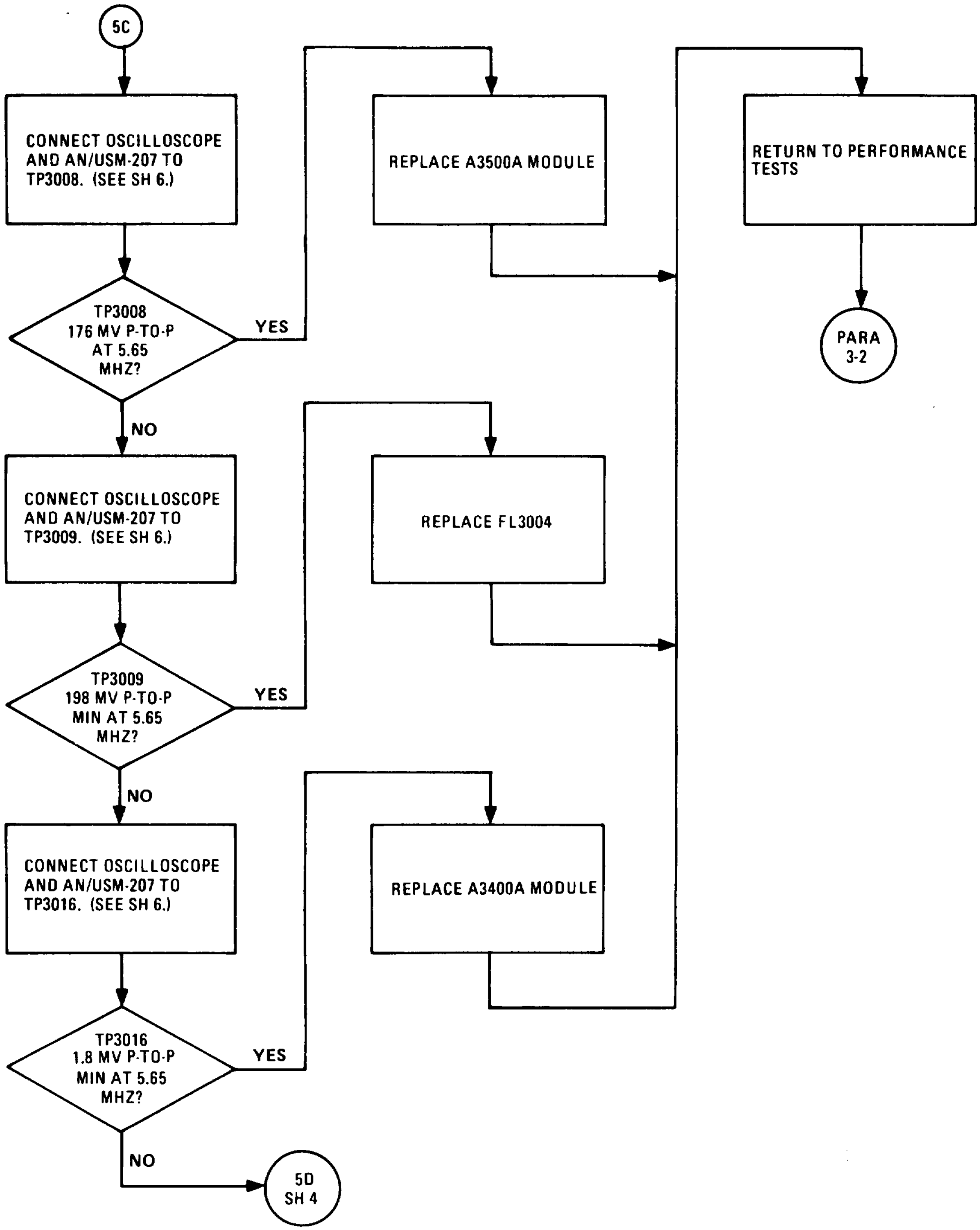
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 2 of 6)



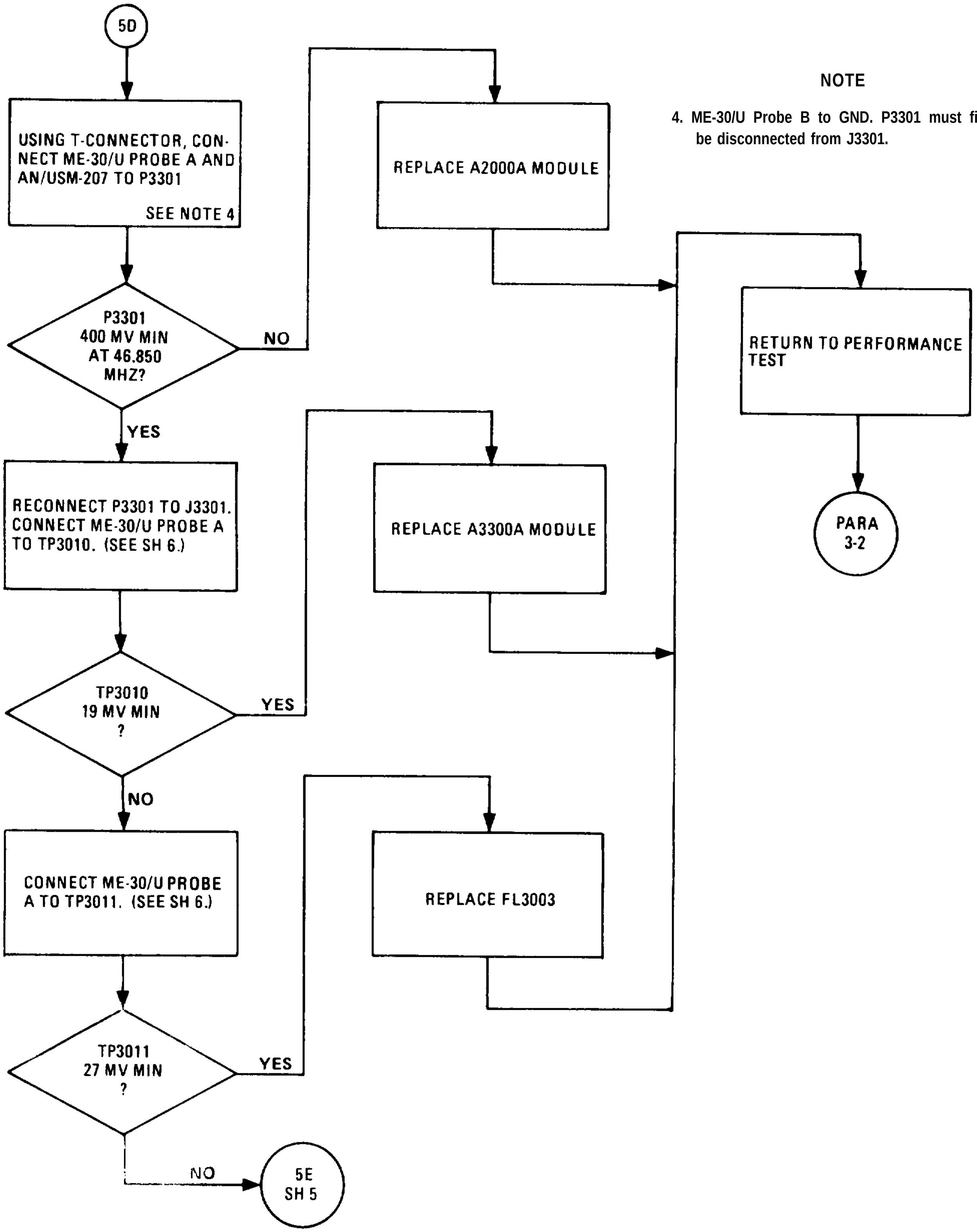
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 3 of 6)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 4 of 6)



NOTE

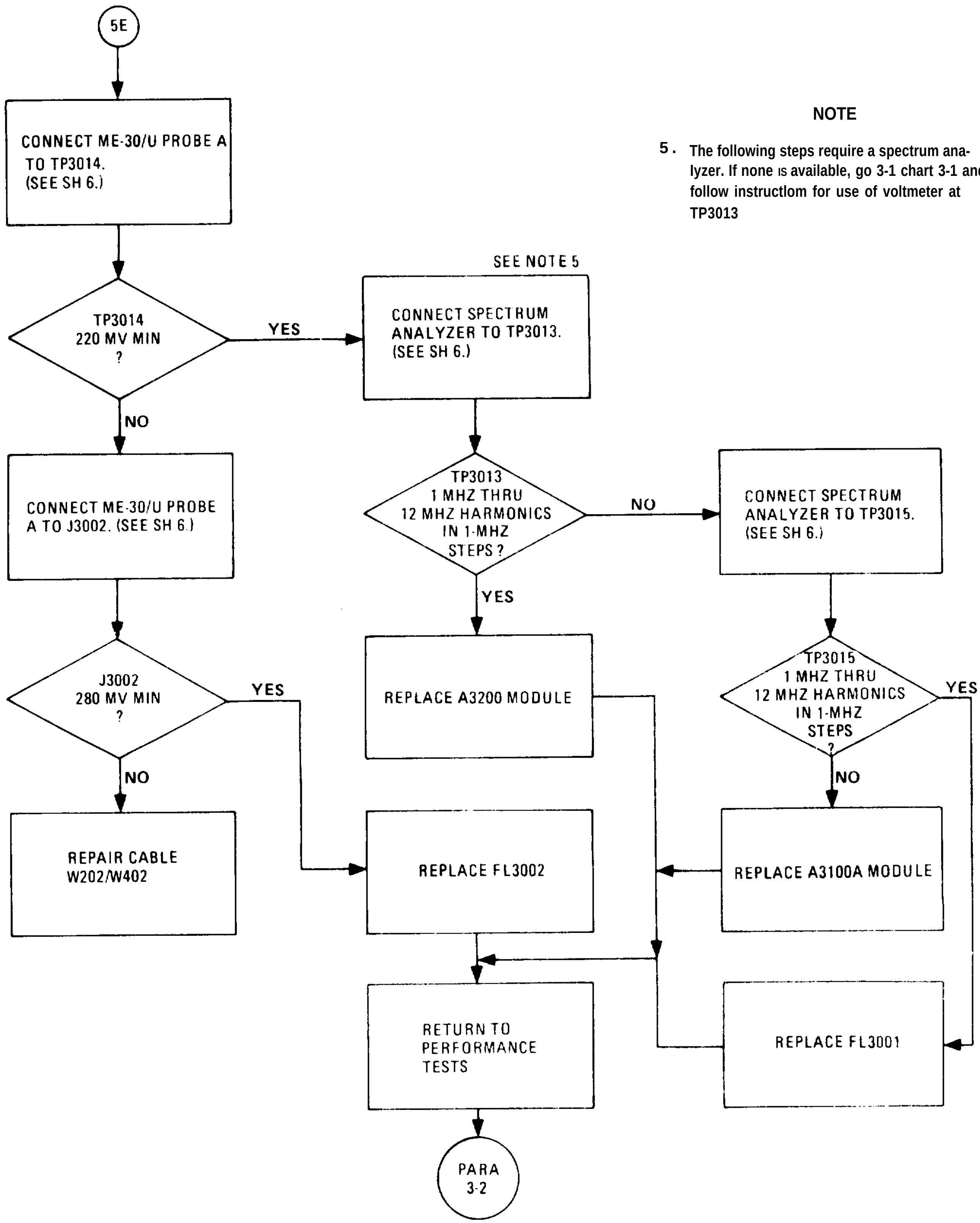
4. ME-30/U Probe B to GND. P3301 must first be disconnected from J3301.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 5 of 6)

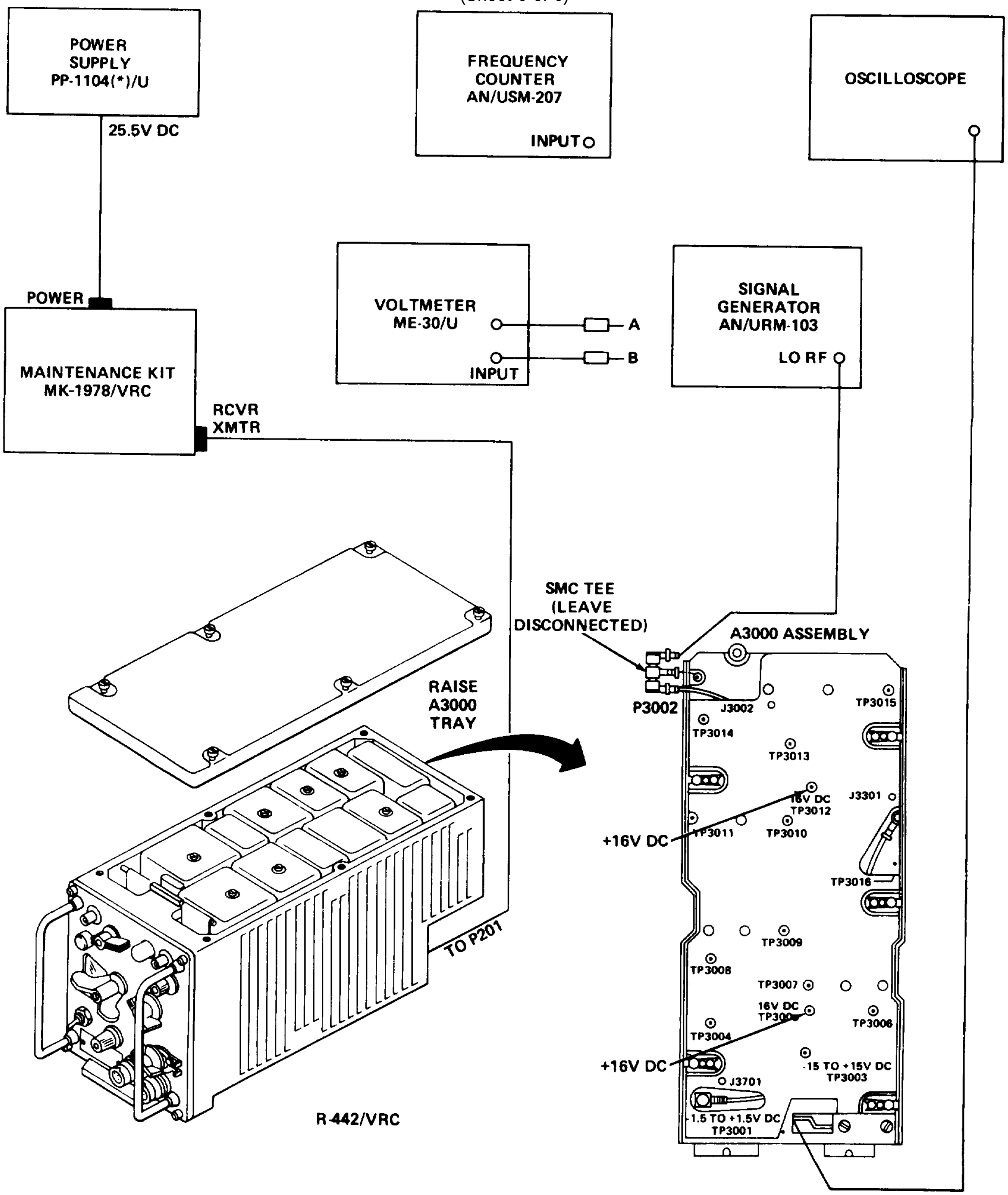
NOTE

5. The following steps require a spectrum analyzer. If none is available, go 3-1 chart 3-1 and follow instructlom for use of voltmeter at TP3013



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

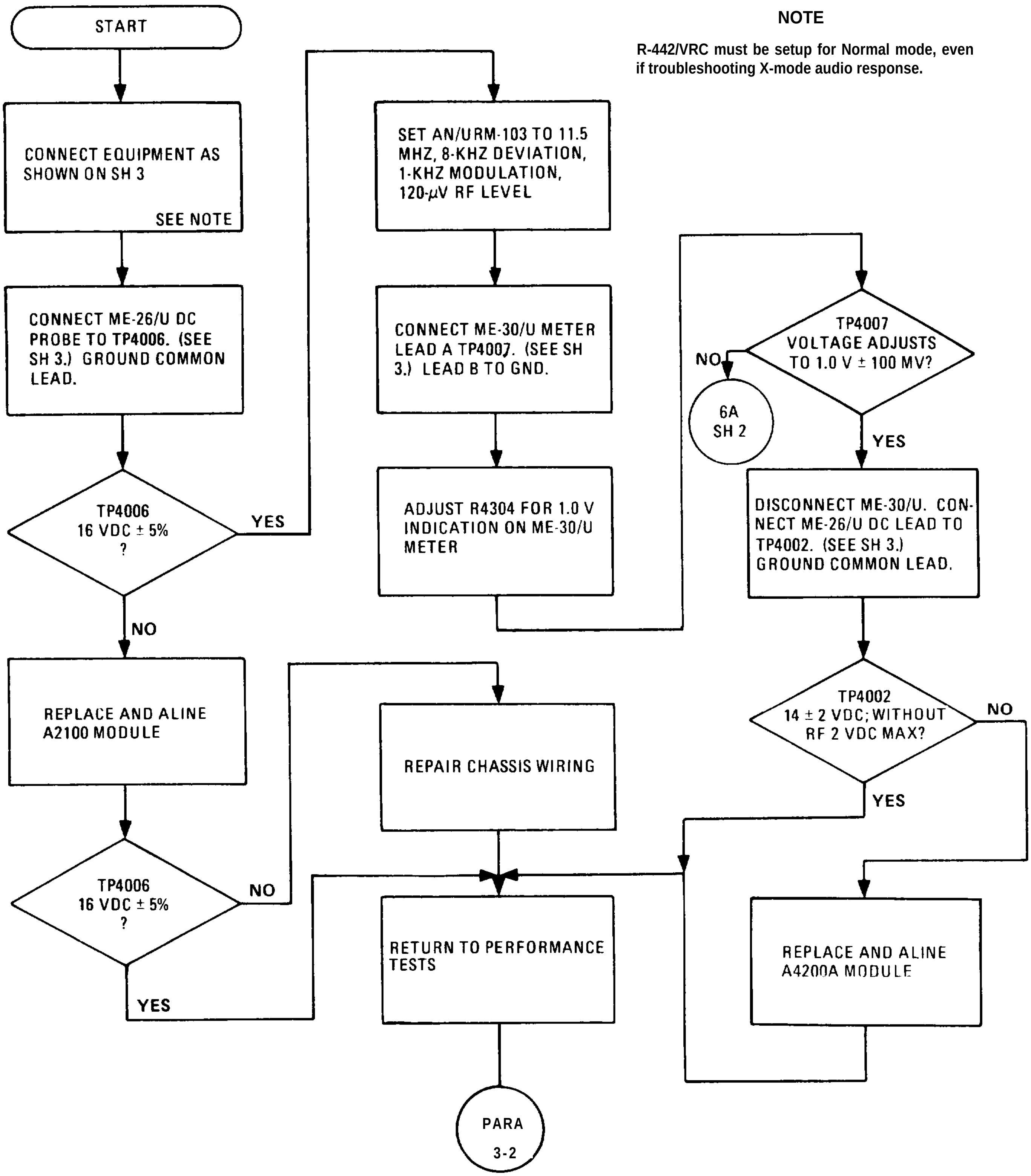
CHART 3-6
A2000, A3000 Assemblies Troubleshooting
(Sheet 6 of 6)



EL4GQ177

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-9
A4000 Assembly Troubleshooting
(Sheet 1 of 3)

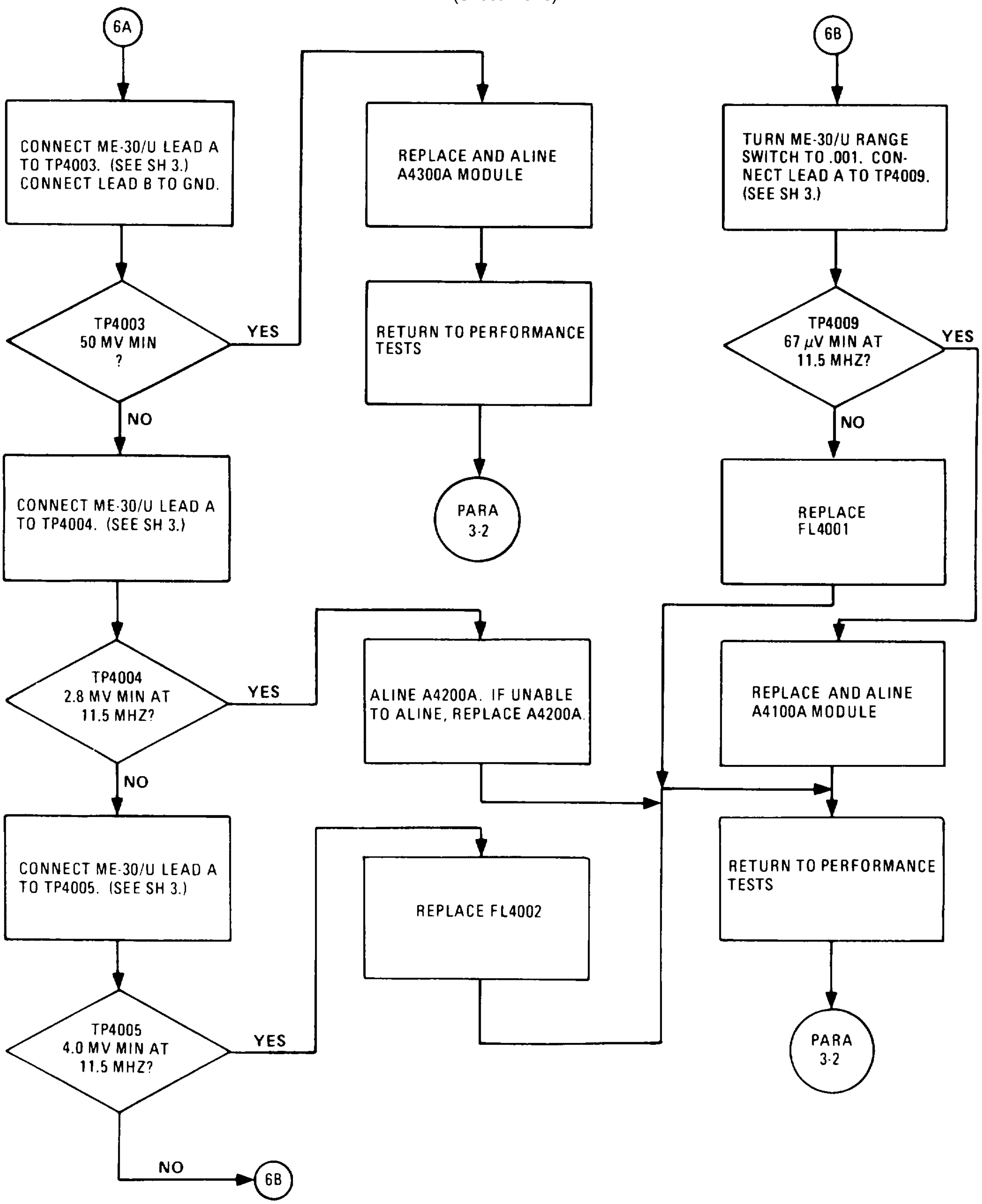


NOTE

R-442/VRC must be setup for Normal mode, even if troubleshooting X-mode audio response.

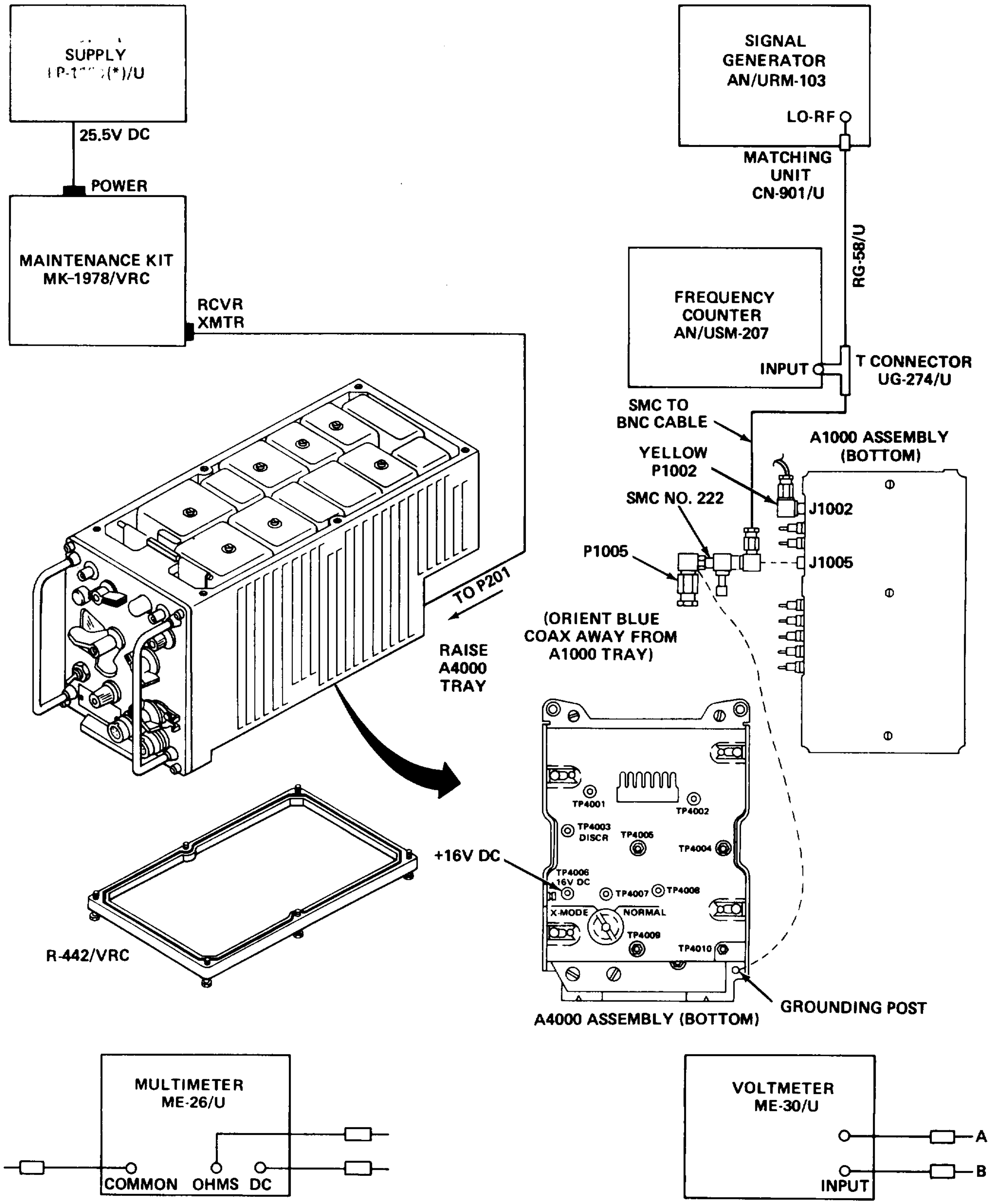
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-9
A4000 Assembly Troubleshooting
(Sheet 2 of 3)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

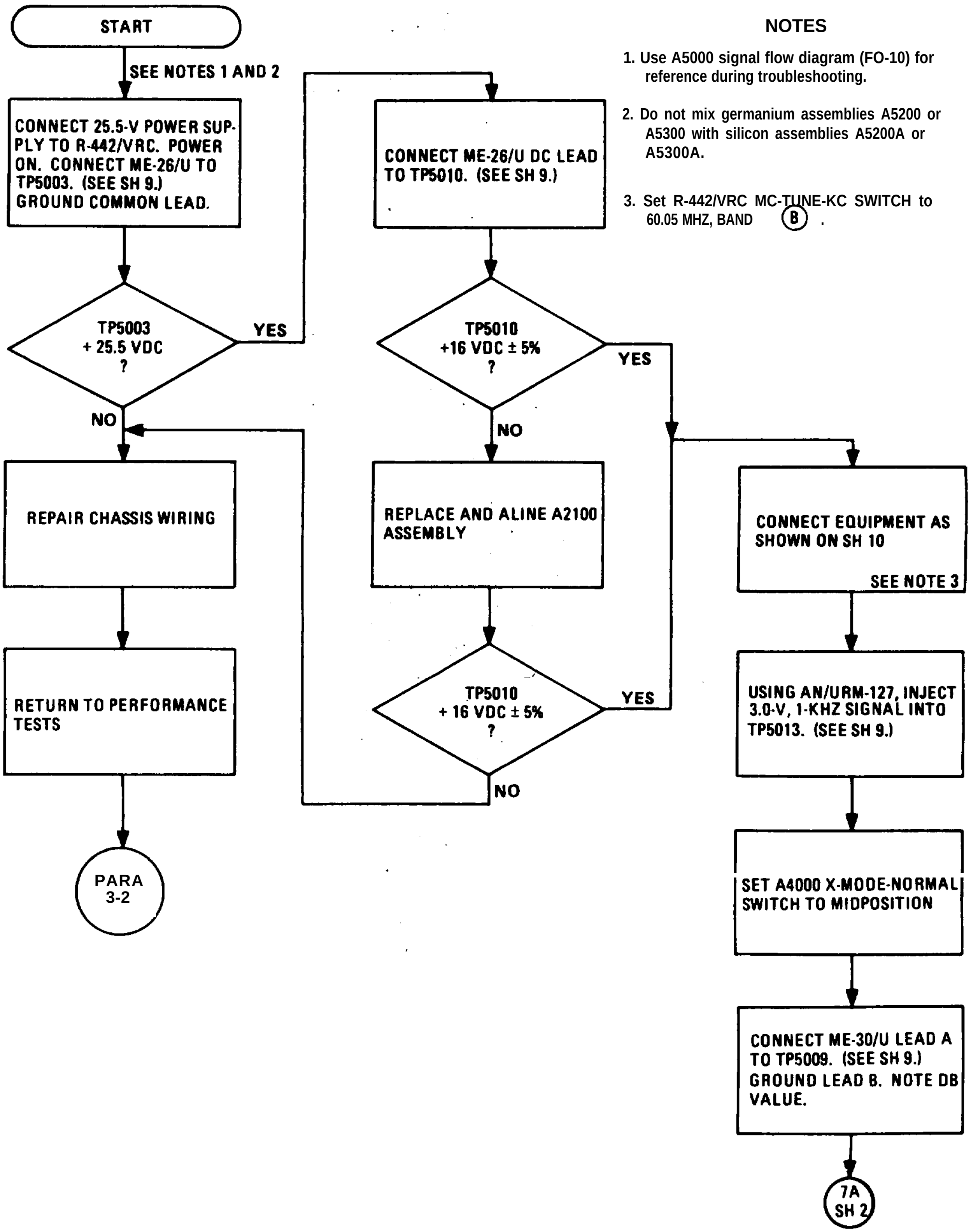
CHART 3-9
A4000 Assembly Troubleshooting
(Sheet 3 of 3)



EL4GQ178

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 1 of 10)



NOTES

1. Use A5000 signal flow diagram (FO-10) for reference during troubleshooting.
2. Do not mix germanium assemblies A5200 or A5300 with silicon assemblies A5200A or A5300A.
3. Set R-442/VRC MC-TUNE-KC SWITCH to 60.05 MHZ, BAND B .

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 2 of 10)

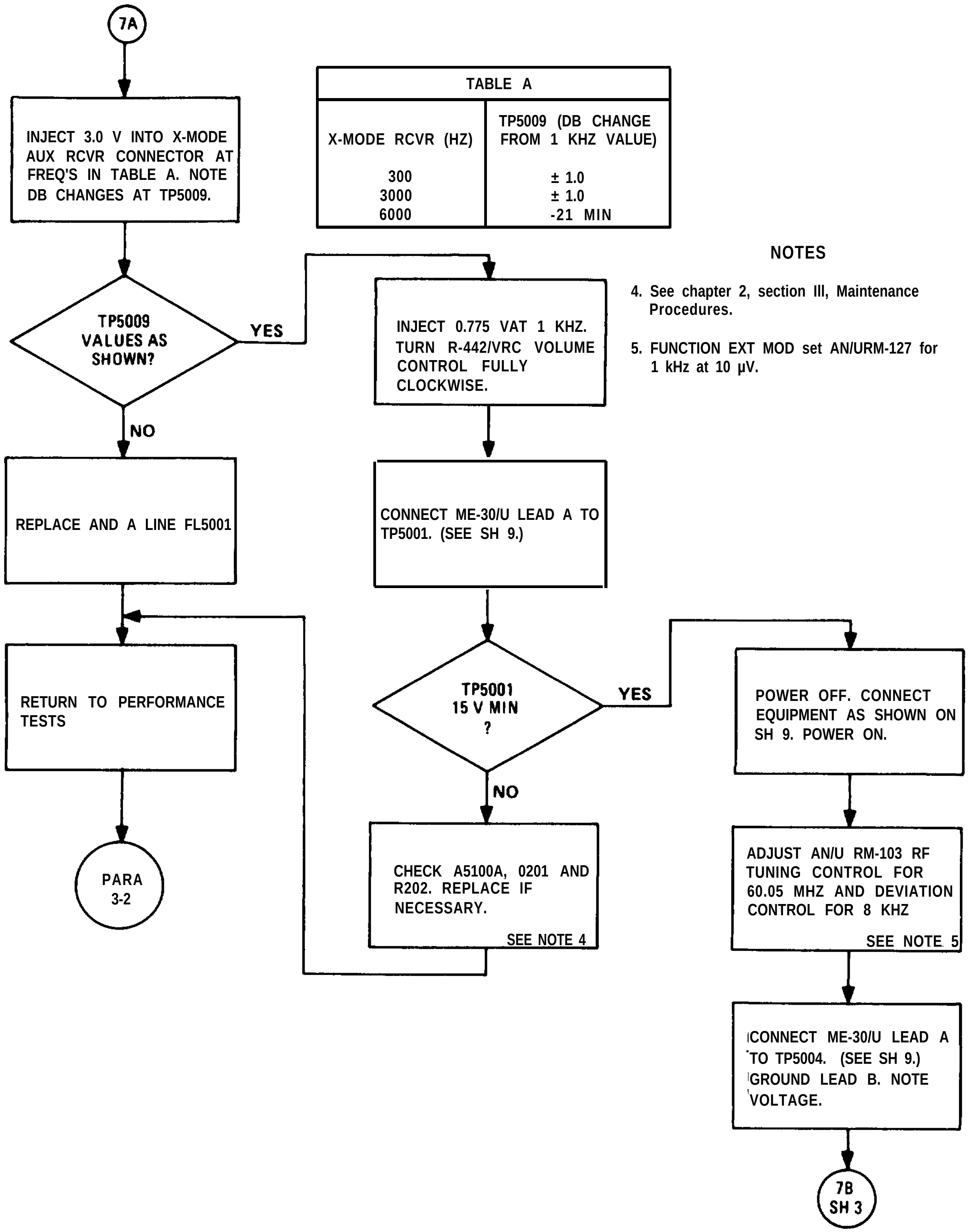


TABLE A

X-MODE RCVR (HZ)	TP5009 (DB CHANGE FROM 1 KHZ VALUE)
300	± 1.0
3000	± 1.0
6000	-21 MIN

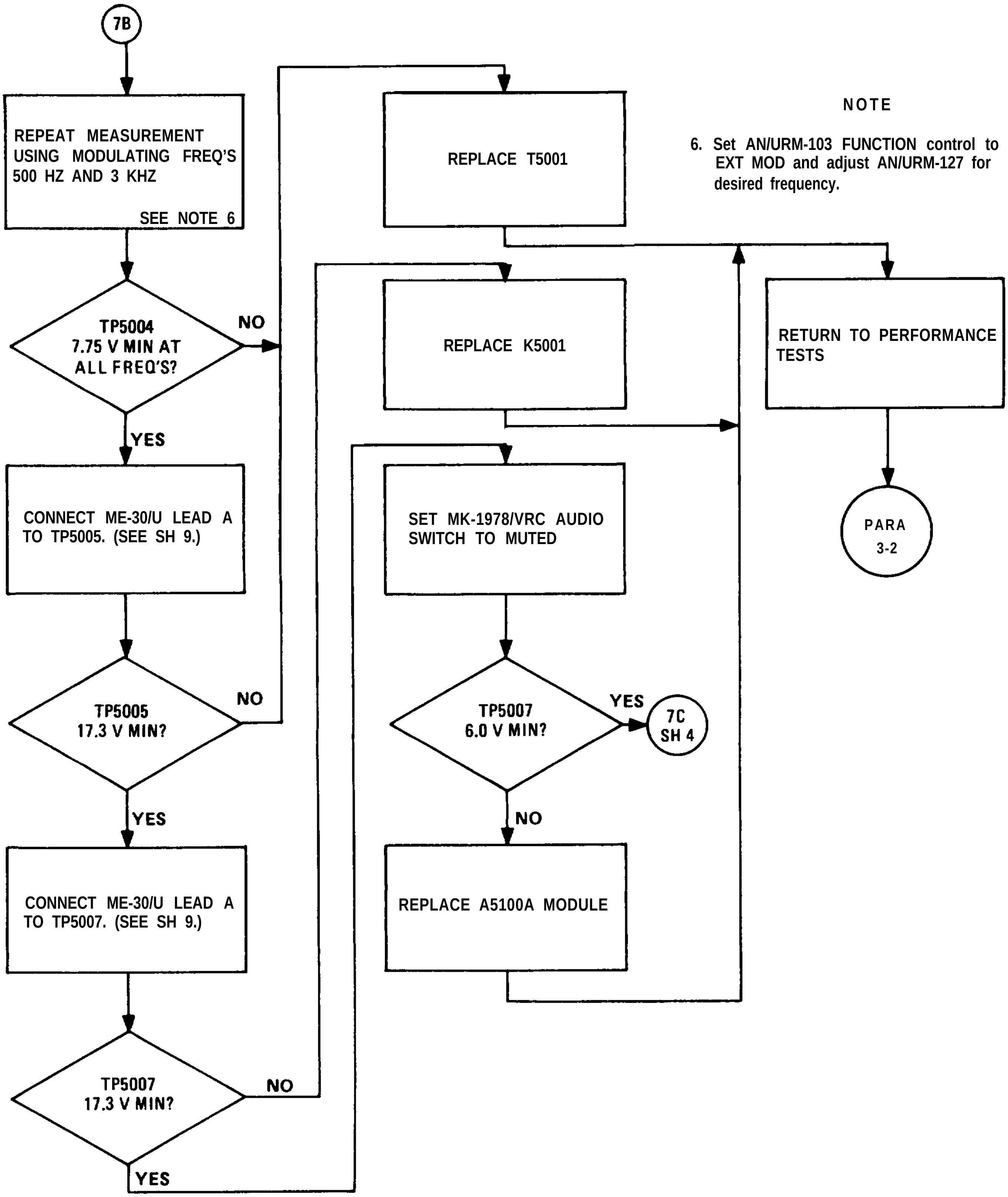
NOTES

4. See chapter 2, section III, Maintenance Procedures.

5. FUNCTION EXT MOD set AN/URM-127 for 1 kHz at 10 μV.

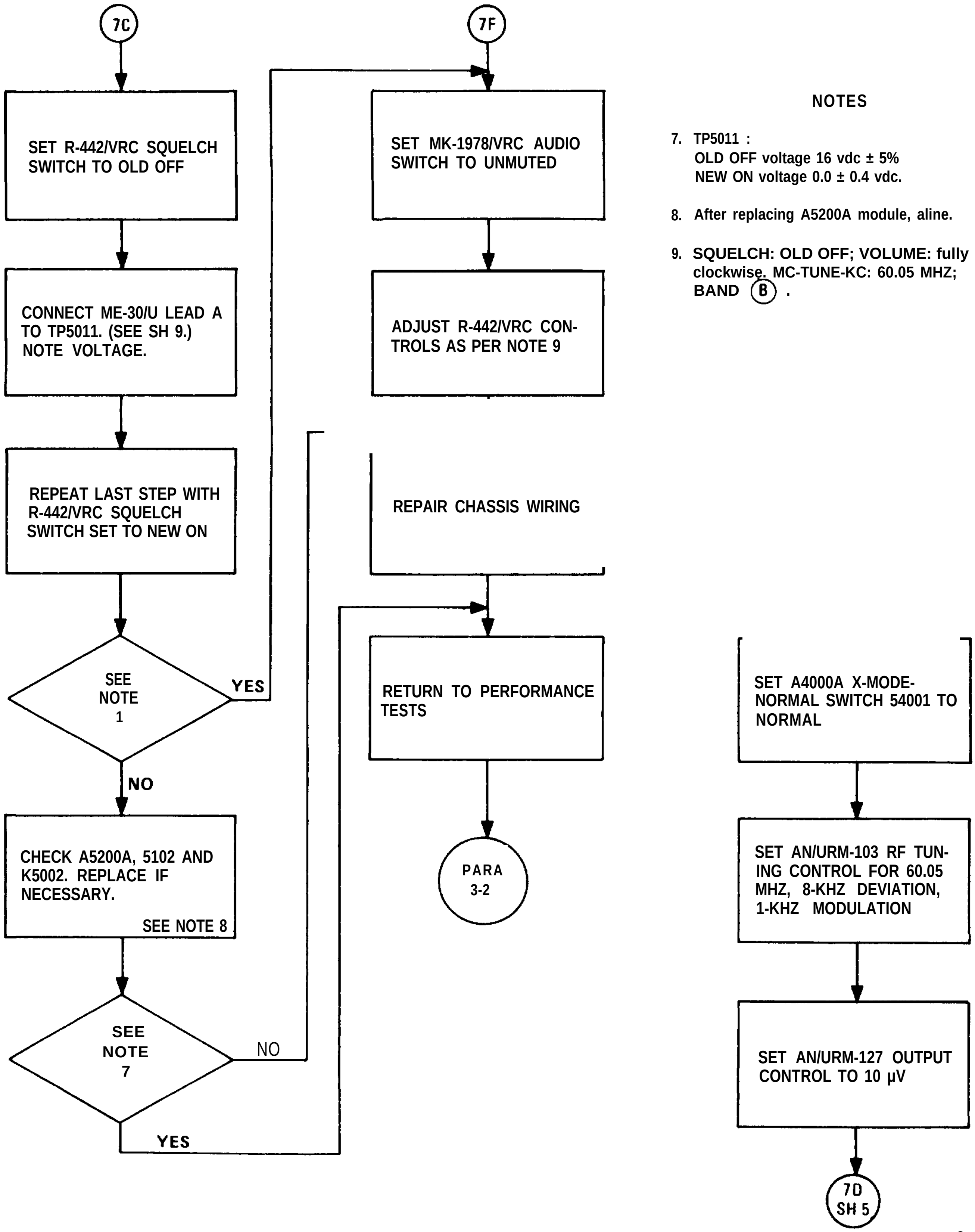
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 3 of 10)



3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 4 of 10)



NOTES

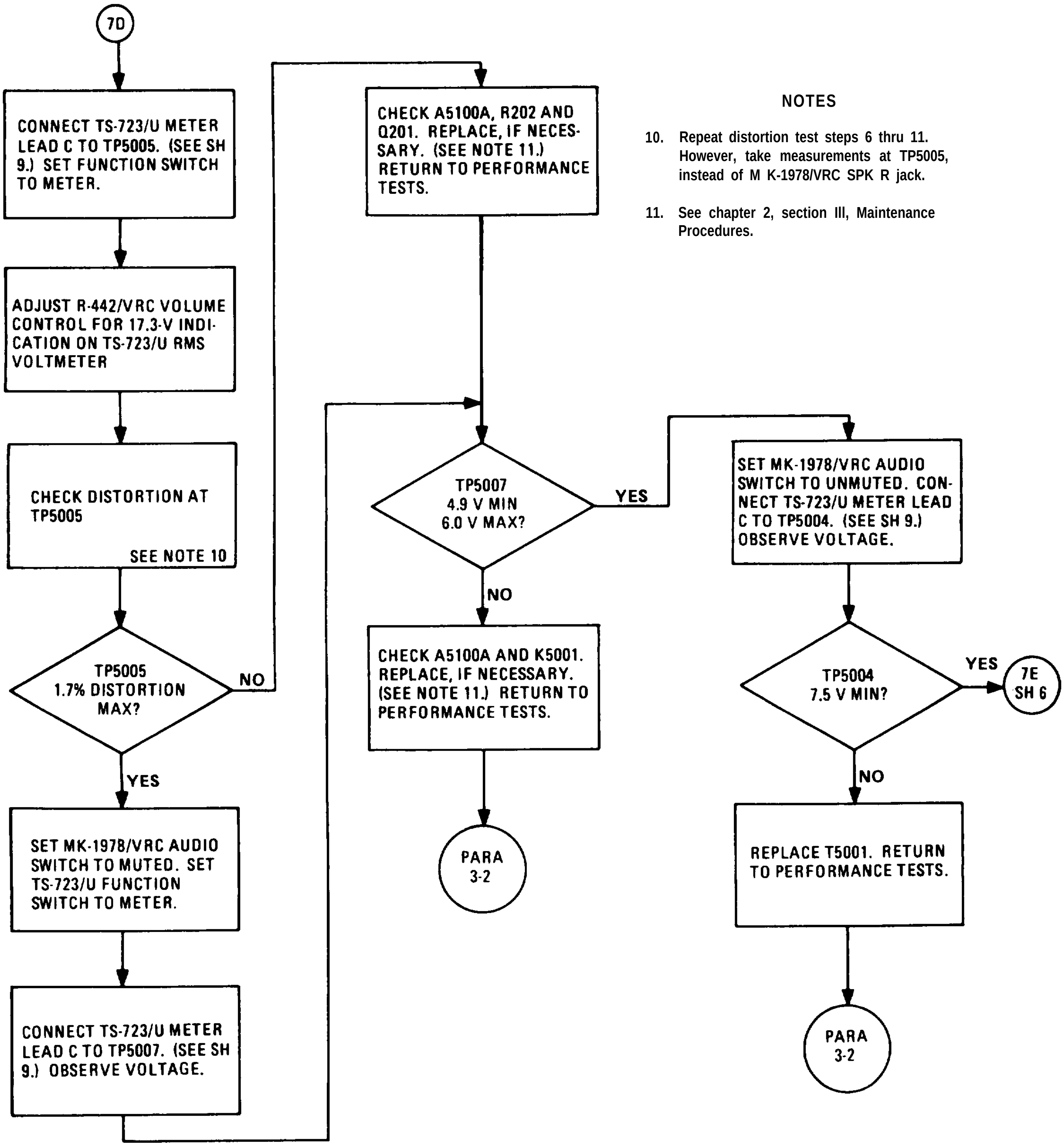
7. TP5011 :
   OLD OFF voltage 16 vdc ± 5%
   NEW ON voltage 0.0 ± 0.4 vdc.

8. After replacing A5200A module, aline.

9. SQUELCH: OLD OFF; VOLUME: fully clockwise. MC-TUNE-KC: 60.05 MHZ; BAND B .

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 5 of 10)



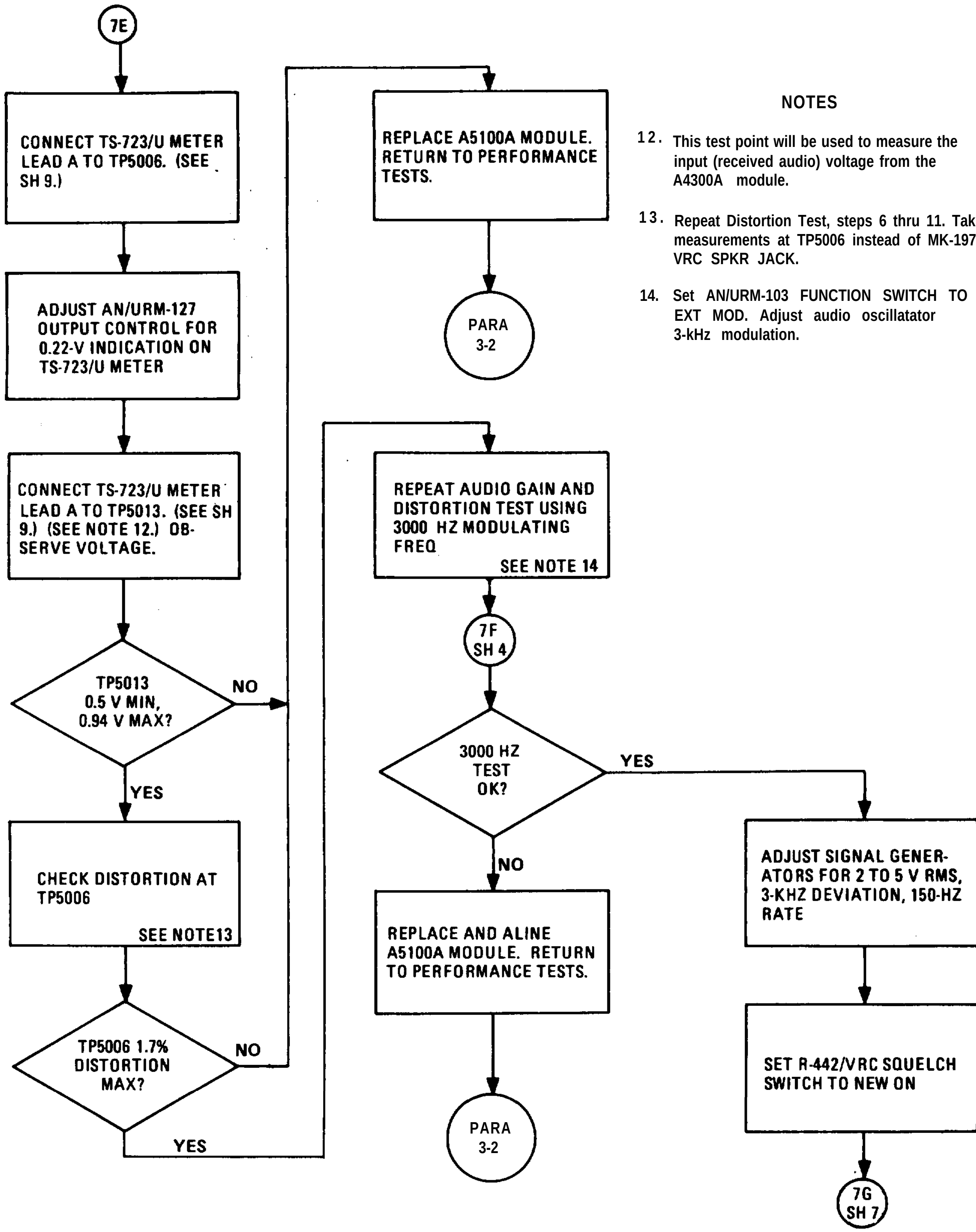
NOTES

10. Repeat distortion test steps 6 thru 11. However, take measurements at TP5005, instead of M K-1978/VRC SPK R jack.

11. See chapter 2, section III, Maintenance Procedures.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 6 of 10)



NOTES

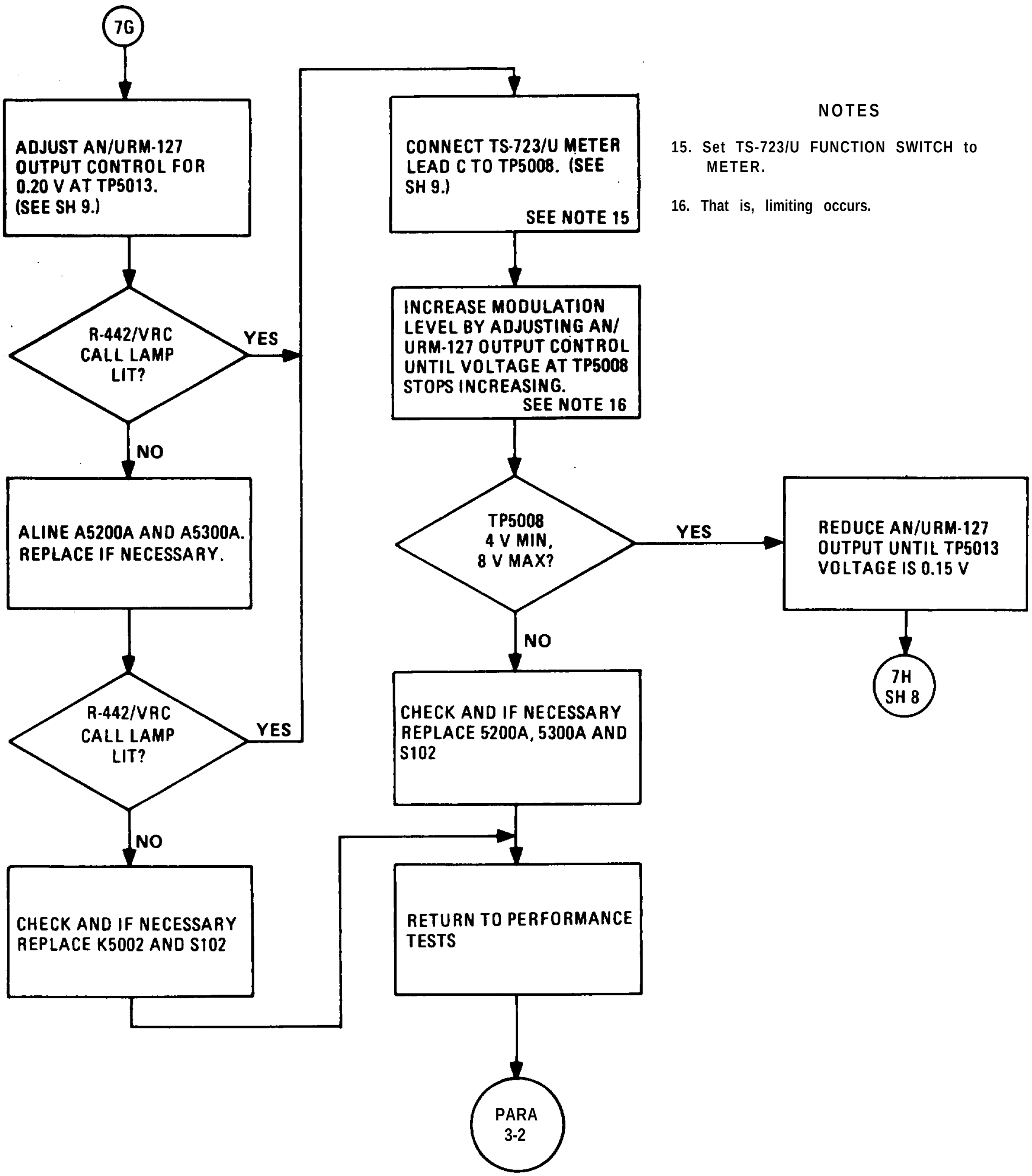
12. This test point will be used to measure the input (received audio) voltage from the A4300A module.

13. Repeat Distortion Test, steps 6 thru 11. Take measurements at TP5006 instead of MK-1978/VRC SPKR JACK.

14. Set AN/URM-103 FUNCTION SWITCH TO EXT MOD. Adjust audio oscillatator 3-kHz modulation.

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 7 of 10)



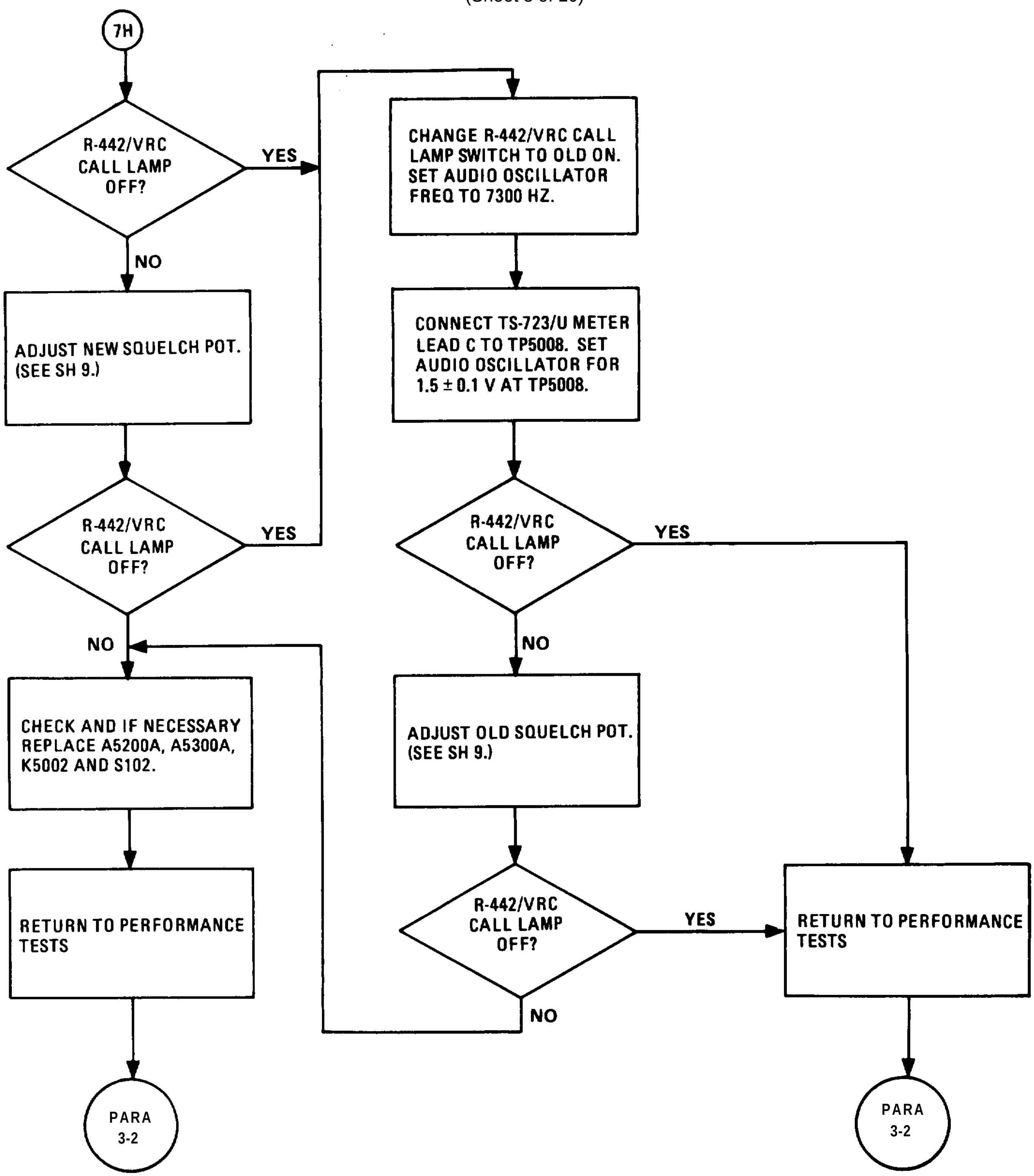
NOTES

15. Set TS-723/U FUNCTION SWITCH to METER.

16. That is, limiting occurs.

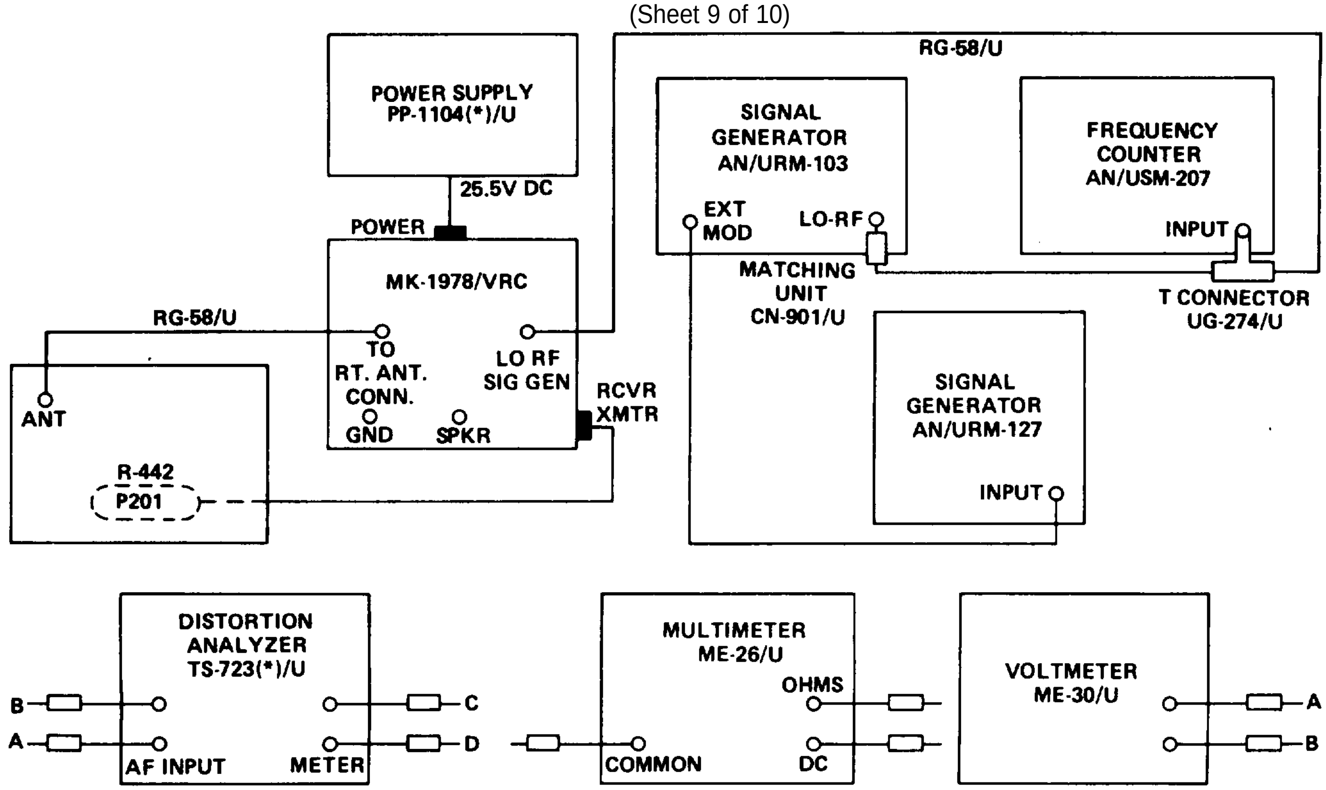
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

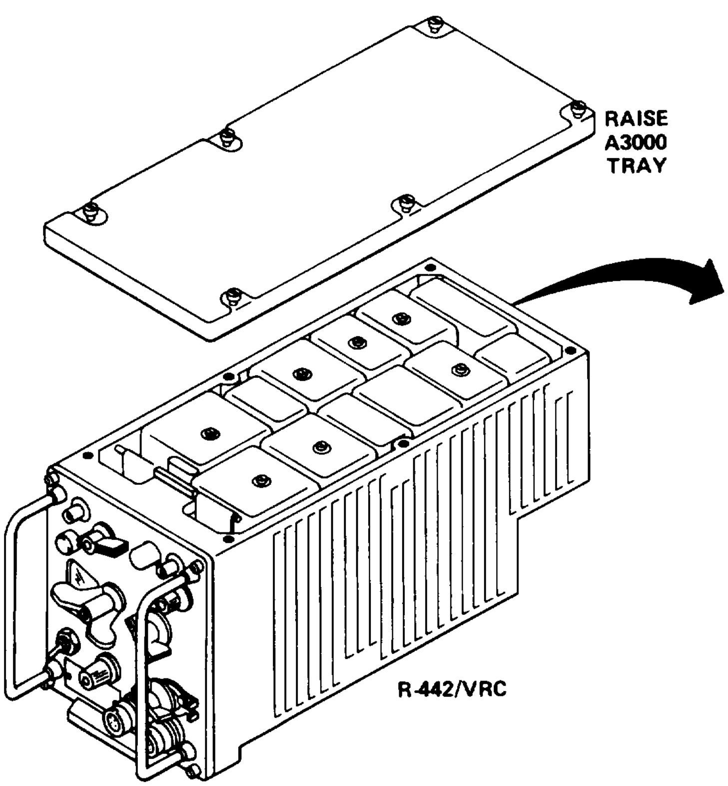
CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 8 of 10)



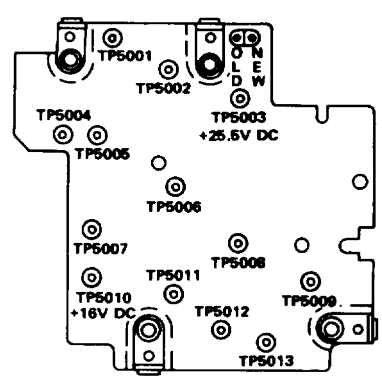
3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 9 of 10)





R-442/VRC

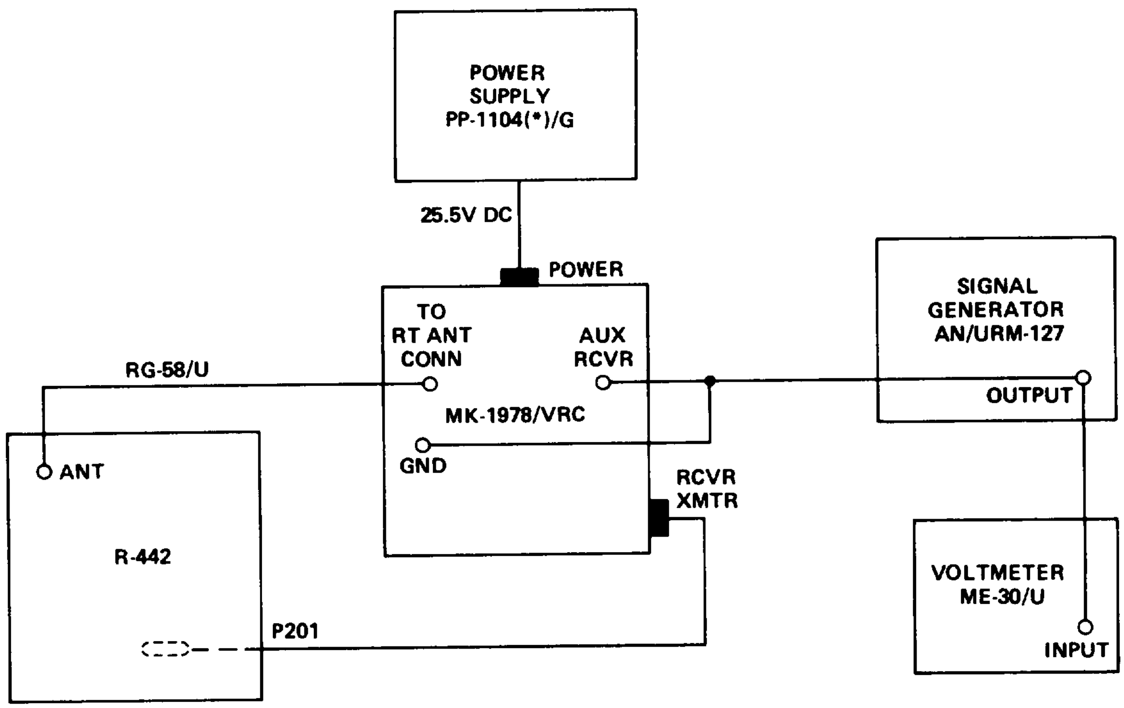


A5000 ASSEMBLY

EL4GQ179

3-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 3-10
A5000 Assembly Troubleshooting
(Sheet 10 of 10)



EL4G0174

Section III ALINEMENT AND ADJUSTMENT PROCEDURES

3-14. GENERAL.

This section contains alinement instructions for use with Maintenance Kit MK-1976/VRC and TMDE (discrete test equipment).The instructions are presented in individual procedures which apply to a specific stage of the receiver.

Except for the local oscillator alinements, each procedure is self-contained; that is, all necessary instructions are provided without reference to any previously performed alinement. Therefore, it is possible to use the procedures in this section to aline an individual module without doing any work on other stages in the radio.

Howeve, this maintenance approach is not recommended. It is best to perform a complete realinement of all modules after replacing an individual module. This should be done even if the radio has undergone its annual realinement less than one year prior to the repair.

Careful performance of all the instructions contained in the alinement procedures ensures that the radio will meet all performance standards outlined infection I of this chapter. Although the radio may seem to work satisfactorily if other quick-fix methods are used, there is no guarantee that such methods will result in proper performance when the radio is used along with secure equipment, or for other than voice communication.

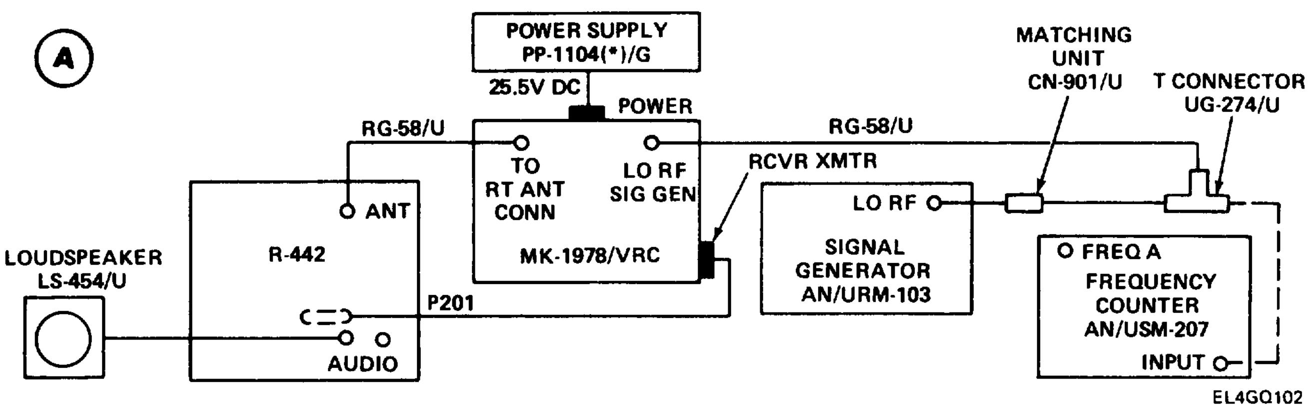
3-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST.

PURPOSE. This test is performed to make sure that the local oscillator will not be pulled off frequency by a malfunctioning CRS. Steps 1 through 8 involve a quick check to determine whether the CRS is putting out an incorrect error signal causing improper local oscillator frequency and loss of audio tone. The remaining steps are done with the local oscillator disconnected from the CRS in order to check CRS performance in response to a nonfluctuating 42.00-MHz signal generator output. If the CRS passes the second part of the test, it will be able to correct normal fluctuation in local oscillator frequency.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1 104 (*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Multimeter ME-26(*)/U
Amphenol Adapter M-39012/16

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/ VRC top and bottom covers. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 100-µv rf at 30 MHz, 1-kHz modulation, and 8-kHz deviation.

3-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

CONTROL AND SWITCH SETTINGS

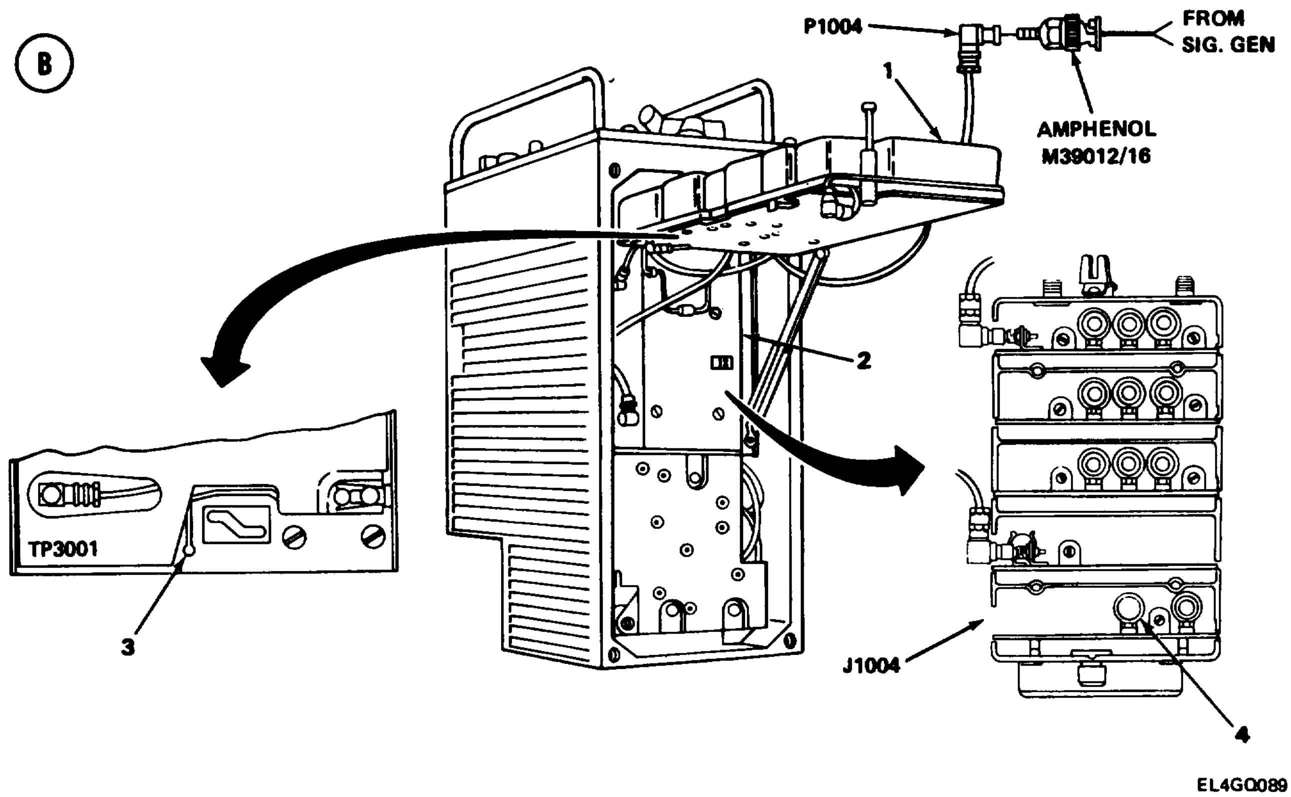
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAN D BY	OPERATE (allow 15-minute warmup)
	FUNCTION	1000 Hz
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	100 µv
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYN E	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

TEST PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µv rf level; then disconnect the T-connector from the counter.

3-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)



1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz. The 1000-Hz tone will be heard on speaker. If no tone is heard, CRS may be defective. Proceed to step 2.
2. Adjust R-442/VRC VOLUME control for comfortable level.
3. Raise A3000 tray (1).
4. Remove A1000 cover (2) and install alinement cover with at least one screw to ensure good ground.
5. Ground TP3001 (3) with screwdriver.
6. Adjust L1502 (4) to get clearest possible 1000-HZ tone from speaker.
7. Remove ground from TP3001. Tone must not change.

NOTE

If the tone heard changes to a rushing noise when step 7 is completed, the CRS is defective. See the troubleshooting section.

8. Set R-442/VRC MC-TUNE-KC control to 40.00 MHz; then back to 30.00 MHz. Tone must not change.

NOTE

If the tone changes after step 8 is completed, the CRS may be defective. See the troubleshooting section.

3-15. **CRYSTAL REFERENCE SYSTEM (CRS) TEST.** (CONT)

9. Set R-442/VRC MC-TUNE-KC control to 30.50 MHz.
10. Remove rf cable and matching unit from AN/URM-103 LO-RF jack an insert in HI-RF jack.
11. Remove P1004 from J1004 on A1000 tray. (See test setup diagram B, page 3-93.)
12. Remove rf cable from ANT jack on the R-442/VRC.
13. Using Amphenol Adapter M-39012/16, connect rf cable to P1004.
14. Connect AN/USM-207 frequency counter to T-connector.
15. Set AN/URM-103 signal generator RF OUTPUT control to 125 KUV.
16. Adjust AN/URM-103 RF TUNING control for 42.00-MHz output. Verify frequency on frequency counter.
17. Set Multimeter ME-26(*)/U to 3-vdc scale and turn ZERO ADJ for midscale reading.
18. Connect ME-26(*)/U positive lead to TP3001 (3) and negative lead to ground.
19. Check reading on ME-26 (*)/U. Meter should read zero vdc (midscale), with slight fluctuation.

NOTE

If ME-26(*)/U reads greater than +0.32 vdc or less than -0.32 vdc, the CRS is defective. See the troubleshooting section.

In steps 20 and 21, ME-26(*)/U should vary smoothly at least +0.5 vdc and then at least -0.5 vdc. If not, the CRS is defective. See the troubleshooting section.

20. Slowly turn AN/URM-103 RF TUNING control to increase output frequency to 42.25 MHz. Note change in reading on ME-26(*)/U.
21. Slowly turn AN/URM-103 RF TUNING control to decrease output frequency to 41.75 MHz. Note change in reading on ME-26 (*)/U.
22. Proceed to paragraph 3-16, Local Oscillator A1500 Alinement.

3-16. LOCAL OSCILLATOR A1500 ALINEMENT.

PURPOSE. If the local oscillator is operating at the correct frequency, the CRS will not output a dc error signal. This procedure alines the oscillator by tuning its circuits to bring the CRS error signal as close to zero as possible. The Crystal Reference System Test (paragraph 3-15) must be done prior to performing this alinement.

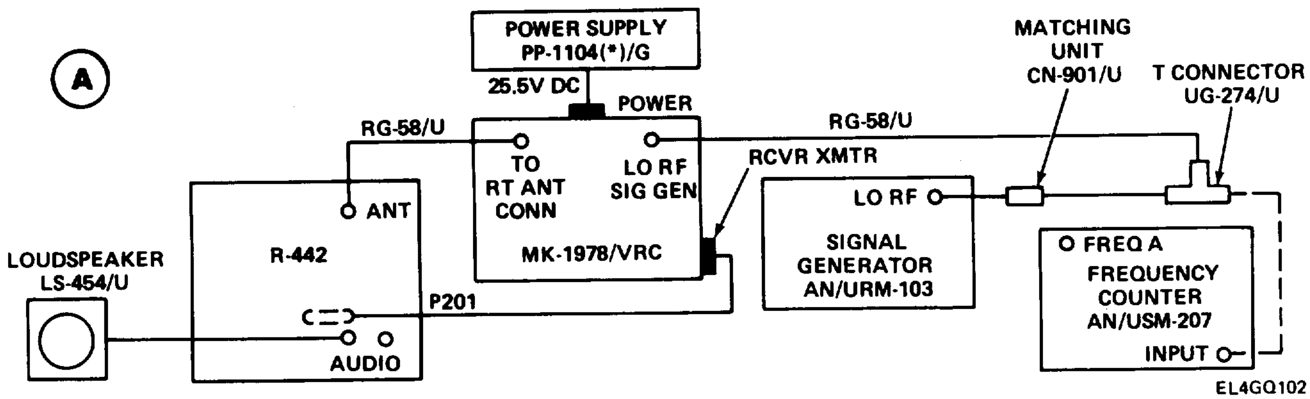
3-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC

Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Multimeter ME-26(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/ VRC top cover. (See paragraph 3-7.) Connect P1004 to J1004 on the A1000 tray.



INITIAL EQUIPMENT CONTROL SETTINGS. Change the final settings used in the CRS Test as follows:

1. Set AN/URM-103 RF OUTPUT switch to 0-10 KUV.
2. Adjust AN/URM-103 RF TUNING control for 42.00-MHz output.

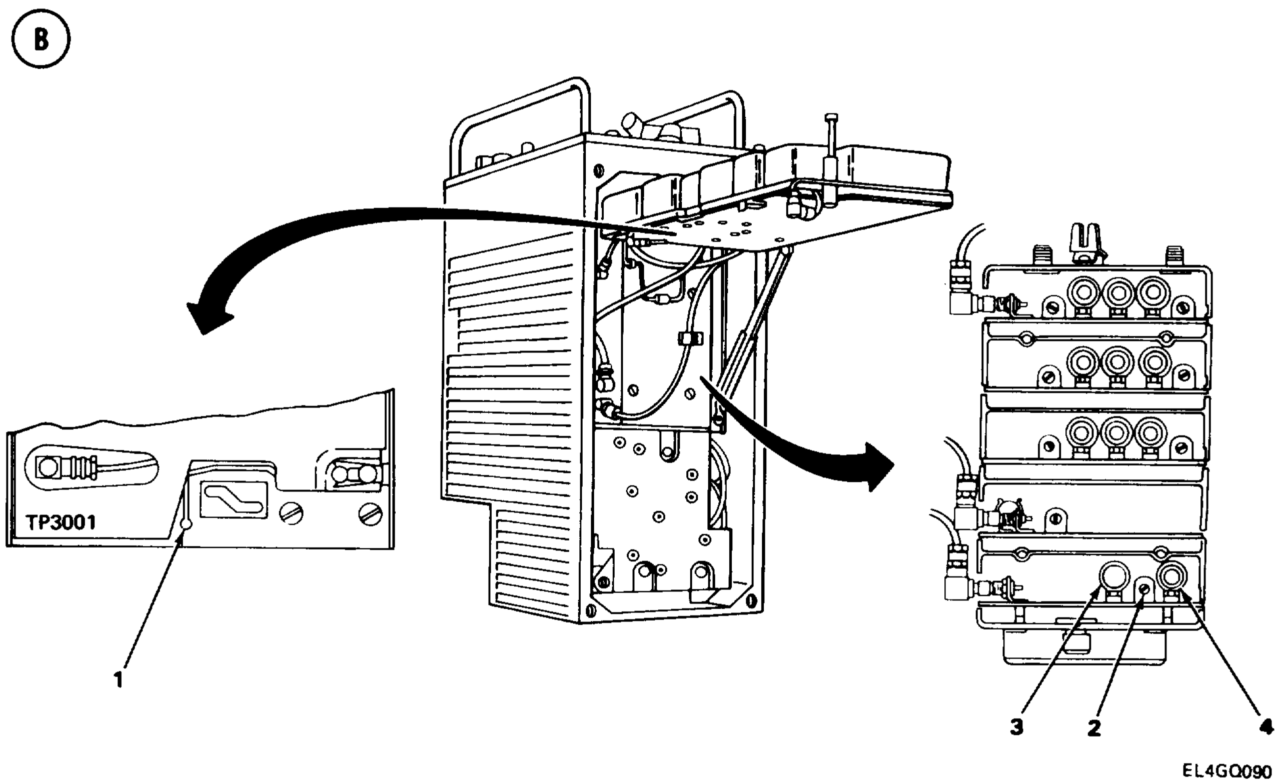
NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 42.00 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µv rf level; then disconnect the T-connector from the counter.

3. Set R-442/VRC MC-TUNE-KC control to 42.00 MHz.
4. Adjust AN/URM-103 DEVIATION control for 8-kHz reading on DEVIATION KHZ meter.

3-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

ALINEMENT PROCEDURE



1. Connect ME-26(*)/U positive lead to TP3001 (1) and negative lead to ground.
2. Adjust C1501 (2) for clear audio tone and zero-volt reading on ME-26(*)/U.
3. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
4. Connect AN/USM-207 frequency counter to T-connector.
5. Adjust AN/URM-103 RF TUNING control for 30.00-MHz output. Check frequency on counter.
6. Adjust L1502 (3) for clear audio tone and zero-volt reading on ME-26(*)/U.
7. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
8. Connect frequency counter to T-connector.
9. Adjust AN/URM-103 RF TUNING control for 52.00-MHz output.
10. Adjust L1501 (4) for clear audio tone and zero-volt reading on ME-26(*)/U.
11. Repeat steps 2 through 10 to make sure that local oscillator tracks with no more than 0.5-vdc error signal required in any of the three test frequencies.

NOTE

If the ME-26(*)/U indicates more than + 0.5 vdc or less than -0.5 vdc in any frequency, and repetition of steps 2 through 10 does not correct the problem, replace the A1500 assembly.

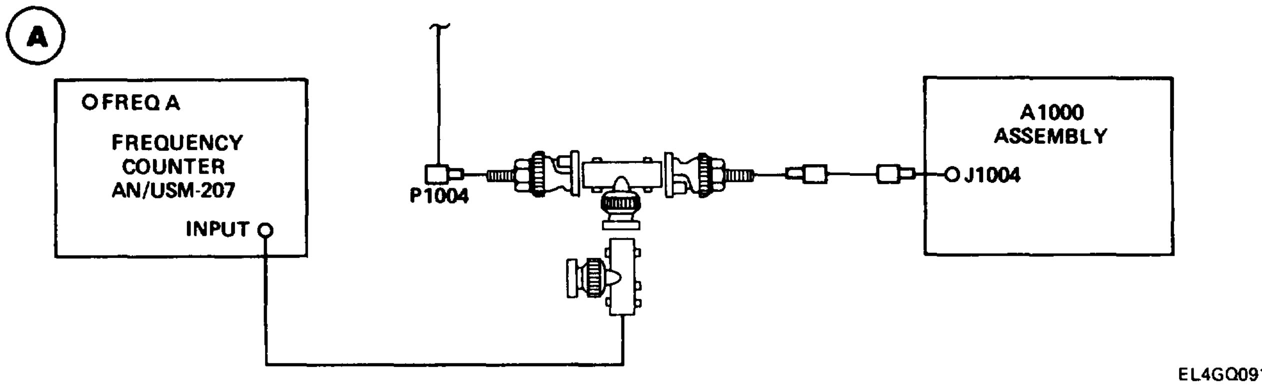
3-17. LOCAL OSCILLATOR A1500 ALTERNATE ALINEMENT PROCEDURE.

PURPOSE. This procedure permits alinement of the local oscillator without the use of a signal generator. The frequency of the local oscillator is checked directly with a counter; therefore, the presence of an audible audio tone is not important. Thus, alinement does not depend on the performance of the A4000 or A5000 sections of the receiver. The CRS Test must be done prior to performing this alinement.

TEST EQUIPMENT AND MATERIALS

Frequency Counter AN/USM-207
Amphenol Adapters (two) M-39012/16
Multimeter ME-26(*)/U
One extra SMC rf cable
T-Connectors (two) UG-274/U

TEST SETUP. Connect the equipment as shown in test setup diagram A .



INITIAL EQUIPMENT CONTROL SETTINGS. Change the final settings used in the CRS Test as follows:

1. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
2. Set AN/USM-207 SENSITIVITY switch as necessary to trigger frequency counter.

ALINEMENT PROCEDURE

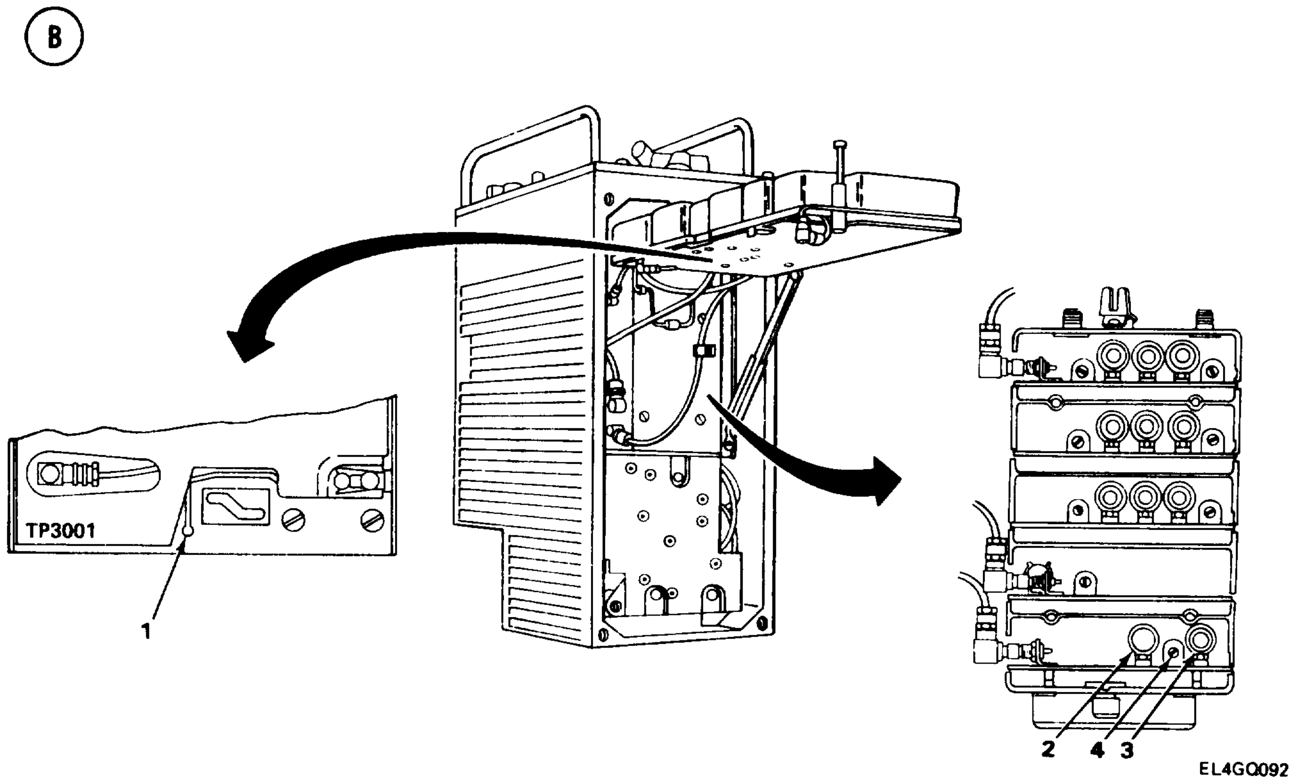
1. Connect ME-26(*)/U positive lead to TP3001 (1) and negative lead to ground. (See test setup diagram B , page 3-98.)

NOTE

In the following adjustments, it may not be possible to achieve zero-frequency error and zero-vdc indication on the ME-26(*)/U. Local oscillator tolerance with the CRS connected is ± 3.5 kHz. The ME-26(*)/U should not exceed ± 0.5 vdc.

2. Adjust L1502(2) for 41.5-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
3. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.

3-17. LOCAL OSCILLATOR A1500 ALTERNATE ALINEMENT PROCEDURE. (CONT)



4. Adjust L1501 (3) for 63.50-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
5. Set R-442/VRC MC-TUNE-KC control to 42.00 MHz.
6. Adjust C1501 (4) for 53.50-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
7. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
8. Repeat steps 2 through 6 until ME-26(*)/U reads zero vdc for all three frequencies.
9. Reconnect P1004 to J1004.

3-18. TUNER A1000 ALINEMENT.

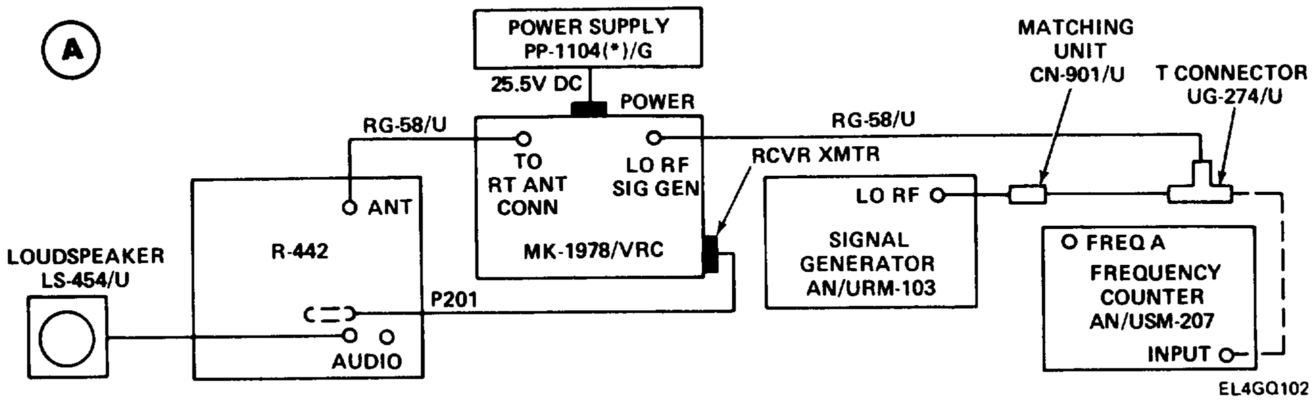
PURPOSE. This procedure tunes the A1000 assembly to produce maximum amplification of low-level signals and maximum attenuation of noise.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

3-18. TUNER A1000 ALINEMENT.

TEST SETUP. Connect equipment as shown in test setup diagram A .



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject unmodulated rf carrier at 30,52,53,75,65, and 52 MHz, in that order. Rf output level will vary according to alinement requirements.

CONTROL AND SWITCH SETTINGS

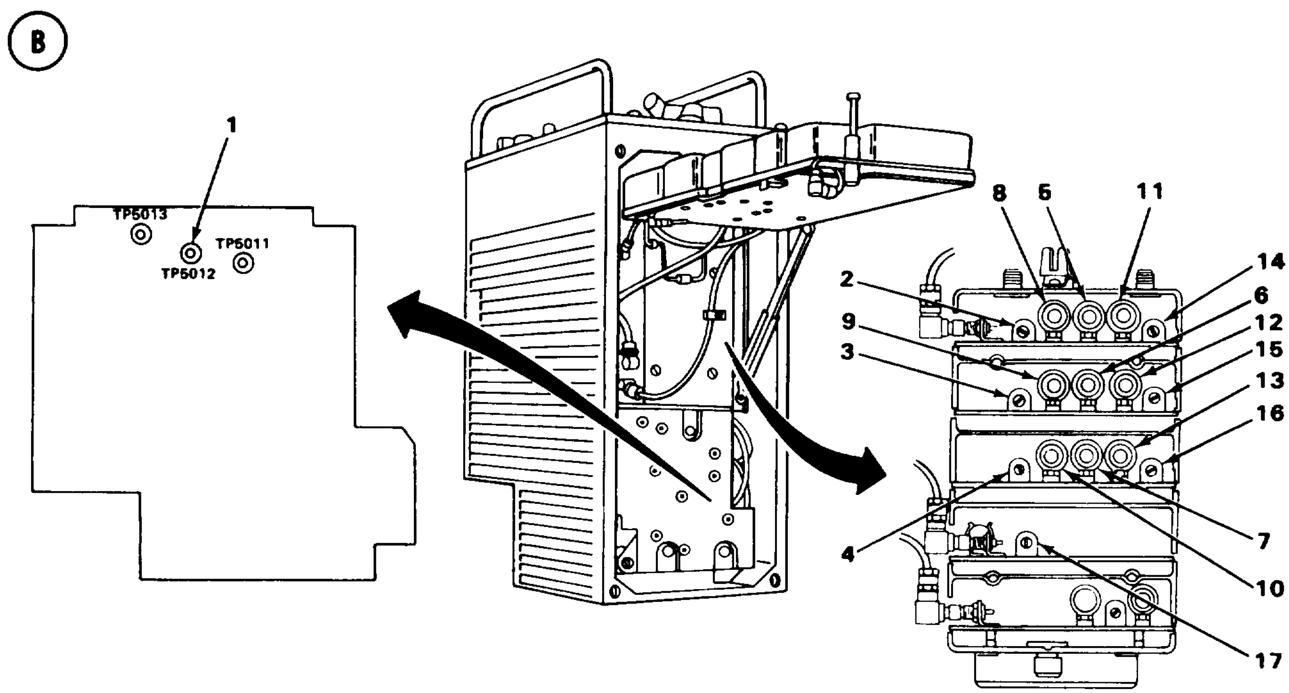
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	NEW OFF
	VOLUME	Fully clockwise
AN/URM-103	FUNCTION	MOD OFF
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Set to zero output
	BAND SWITCH	B
	RF TUNING	30.00
	OPERATE/OFF/STAND BY	OPERATE
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	Sensitivity	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	IN PUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

3-18. TUNER A1000 ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE

ALINEMENT PROCEDURE



30-MHz Test

1. Check AN/URM-103 frequency output on frequency counter.
2. Set ME-30(*)/U to 3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5012 (1), and negative lead to ground.
4. Note reading on ME-30(*)/U.
5. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 4 reading.
6. Adjust C1104 (2), C1205 (3), and C1305 (4) for lowest possible ME-30(*)/U reading and minimum noise from speaker.

3-18. TUNER A1000 ALINEMENT. (CONT)

52-MHz Test

7. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
8. Adjust AN/URM-103 RF TUNING control to 52.00 MHz. Check on frequency counter.
9. Set AN/URM-103 LO RF UV control for zero-rf output.
10. Note reading on ME-30(*)/U.
11. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF Uv control until ME-30(*)/U drops to one-half of step 10 reading.
12. Adjust L1102 (5), L1202 (6), and L1302 (7) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B, page 3-100.)

53-MHz Test

13. Set R-442/VRC MC-TUNE-KC control to 53.00 MHz.
14. Adjust AN/URM-103 RF TUNING control to 53.00 MHz. Check on frequency counter.
15. Set AN/URM-103 LO RF UV control for zero-rf output.
16. Note reading on ME-30(*)/U.
17. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 16 reading.
18. Adjust L1103 (8), L1203 (9), and L1303 (10) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B.)

75-MHz Test

19. Set R-442/VRC MC-TUNE-KC control to 75.00 MHz.
20. Adjust AN/URM-103 RF TUNING control to 75.00 MHz. Check on frequency counter.
21. Set AN/URM-103 LO RF UV control for zero-rf output.
22. Note reading on ME-30(*)/U.
23. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 22 reading.
24. Adjust L1101 (10), L1201 (11), and L1301 (12) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B.)

65-MHz Test

25. Set R-442/VRC MC-TUNE-KC control to 65.00 MHz.
26. Adjust AN/URM-103 RF TUNING control to 65.00 MHz. Check on frequency counter.
27. Set AN/URM-103 LO RF UV control for zero-rf output.
28. Note reading on ME-30(*)/U.
29. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 28 reading.
30. Adjust C1101 (13), C1201 (14), and C1301 (15), for lowest possible ME-30(*)/U reading, and minimum noise from speaker. (See test setup diagram B.)

3-18. TUNER A1000 ALINEMENT. (CONT)

Mixer Adjustment

31. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
32. Adjust AN/URM-103 RF TUNING control to 52.00 MHz. Check on frequency counter.
33. Set AN/URM-103 LO RF UV control for zero-rf output.
34. Note reading on ME-30(*)/U.
35. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 34 reading.
36. Set ME-30(*)/U to l-volt scale.
37. Adjust C1404 (16) for lowest possible ME-30(*)/U reading.

NOTE

The ME-30(*)/U reading can also decrease if C1404 is turned in or out too far. The first sharp decrease in the ME-30(*)/U reading will indicate the correct C1404 adjustment.

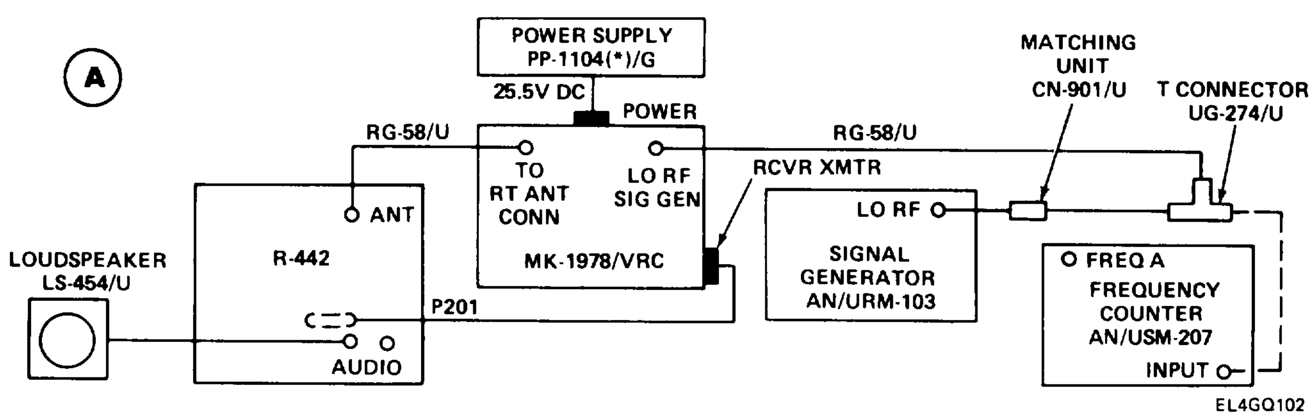
3-19. IF DISCRIMINATOR A4200 ALINEMENT.

PURPOSE. This procedure enables the discriminator to provide maximum separation of the audio signal from the rf carrier. Adjusting for zero vdc at TP4003 ensures that T4206 and T4207 are conducting equally around the carrier frequency. Adjusting for maximum ac at TP4007 ensures that the discriminator is tuned exactly to the 11.5-MHz center frequency.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Multimeter ME-26(*)/U
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC bottom cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 20-µv rf at 30 MHz, 1-kHz modulation, and 8-kHz deviation.

3-19. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS

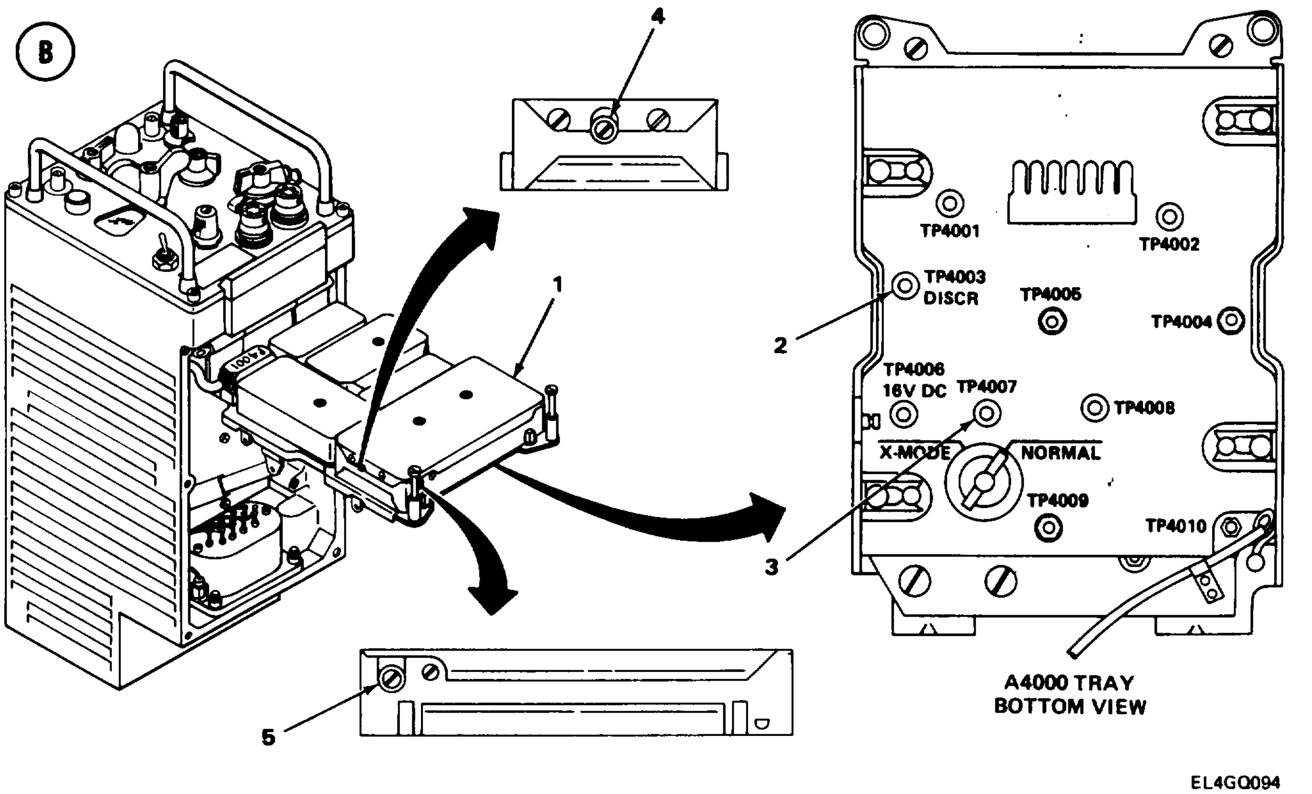
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	1000 Hz
	BAND SWITCH	B
	RF TUNING	30.06
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.

3-19. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)



1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-26(*)/U to 1-vdc scale and turn ZERO ADJ for midscale reading.
3. Set ME-30(*)/U to 3-volt scale.
4. Lift A4000 tray (1). (See test setup diagram B.)
5. Connect ME-26(*)/U positive lead to TP4003 (2), and negative lead to ground.
6. Connect ME-30(*)/U positive lead to TP4007 (3), and negative lead to ground.
7. Adjust T4206 (4) for zero-vdc reading on ME-26(*)/U.
8. Adjust T4207 (5) for peak reading ME-30(*)/U.
9. Repeat steps 7 and 8 until maximum ME-30(*)/U reading and zero-vdc ME-26(*)/U reading occur at the same time.

3-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT.

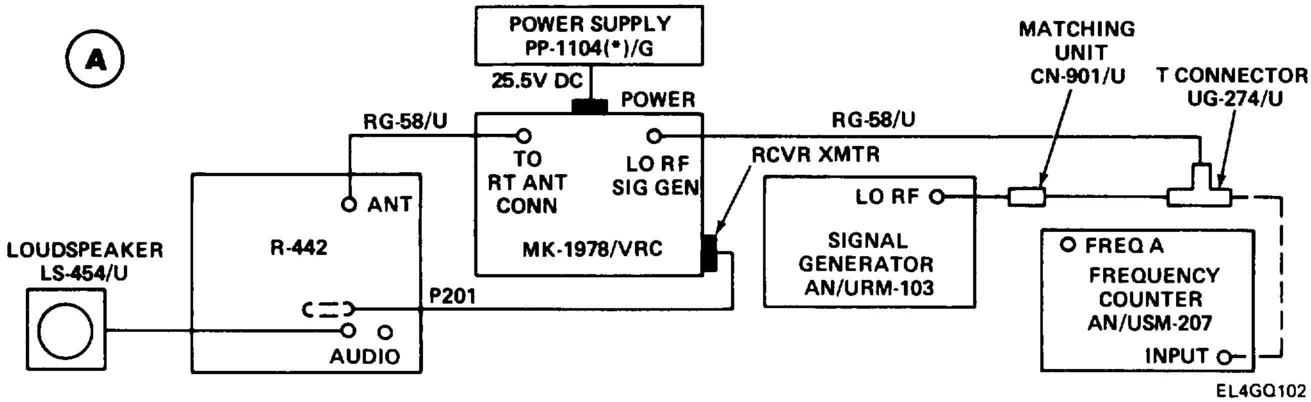
PURPOSE. This procedure enables the integrated circuit discriminator to provide maximum separation of the audio signal from the rf carrier. Coil L4202 is adjusted to tune the fm detector portion of the integrated circuit exactly to the 11.5-MHz center frequency.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

3-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC bottom cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 20-µv rf at 30 MHz, 1-kHz modulation, and 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	(A)
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	1000 Hz
	BAND SWITCH	(A)
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv

3-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

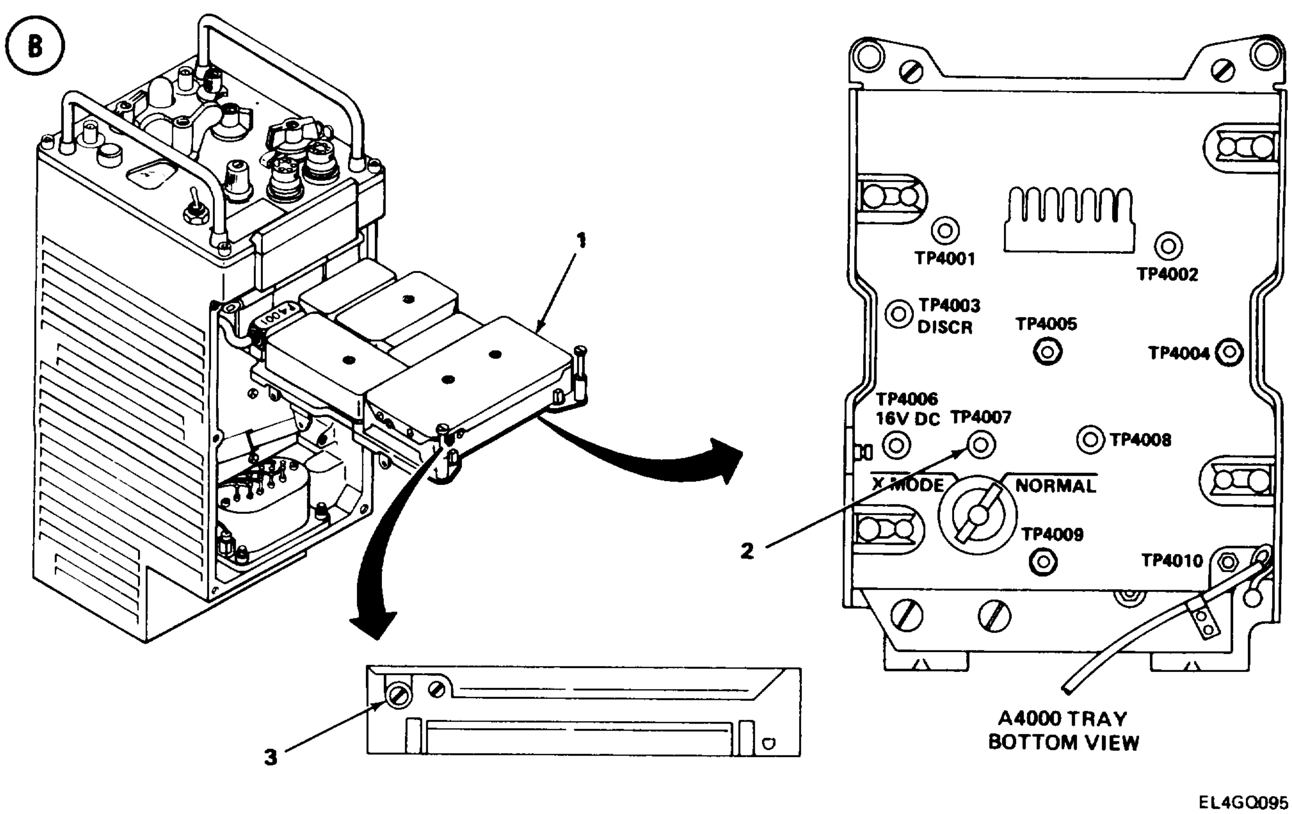
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.



3-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to l-volt scale.
3. Lift A4000 tray (1). (See test setup diagram B, page 3-106.)
4. Connect ME-30(*)/U positive lead to TP4007 (2), and negative lead to ground.
5. Adjust L4202 (3) for maximum indication on ME-30(*)/U.

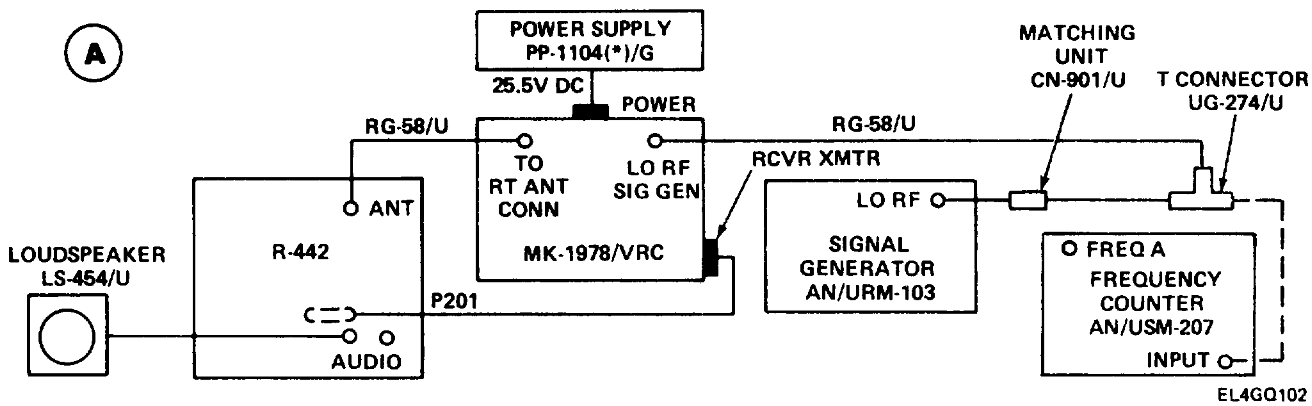
3-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT.

PURPOSE. This procedure adjusts the gain of the A4300 assembly.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/ VRC bottom cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 20-μv rf at 30 MHz, 1-kHz modulation, and 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF

3-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

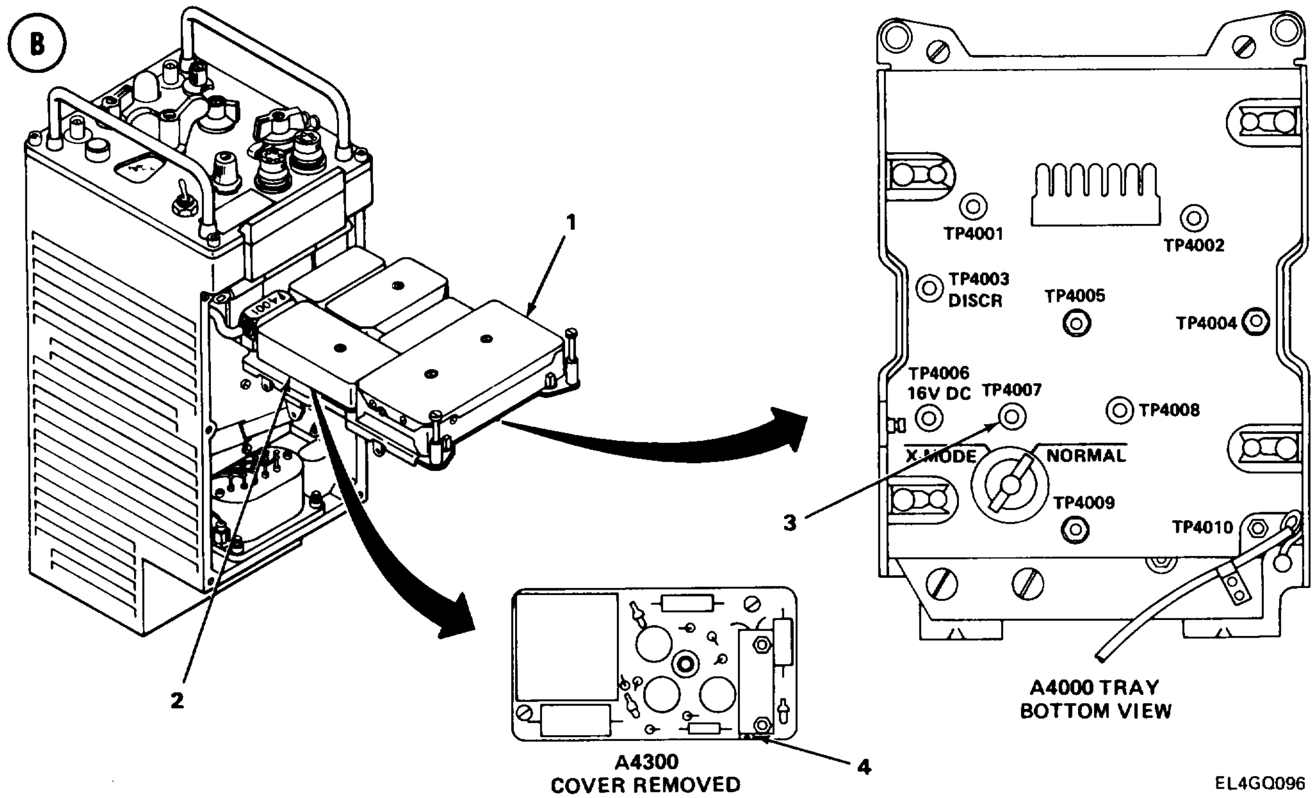
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE (allow 15-minute warmup)
	FUNCTION	1000 Hz
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.

3-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)



1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to 1-volt scale.
3. Lift A4000 tray (1). (See test setup diagram B .)
4. Remove A4300 cover (2).
5. Connect ME-30(*)/U positive lead to TP4007 (3) and negative lead to ground.
6. Adjust R4304(4) for 0.8-vac reading on ME-30(*)/U.

3-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT.

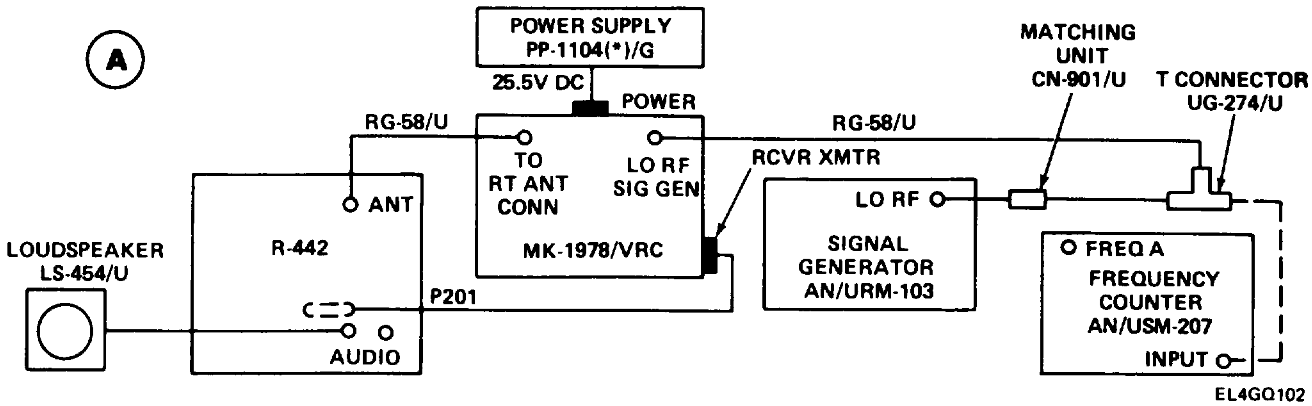
PURPOSE. This procedure adjusts the gain of the A4300A assembly.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104 (*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A , page 3-110. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

3-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 10-µv rf at 64 MHz, 1-kHz modulation, and 6-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE (allow 15-minute warmup)
	FUNCTION	100 Hz
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	10 µv

3-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)

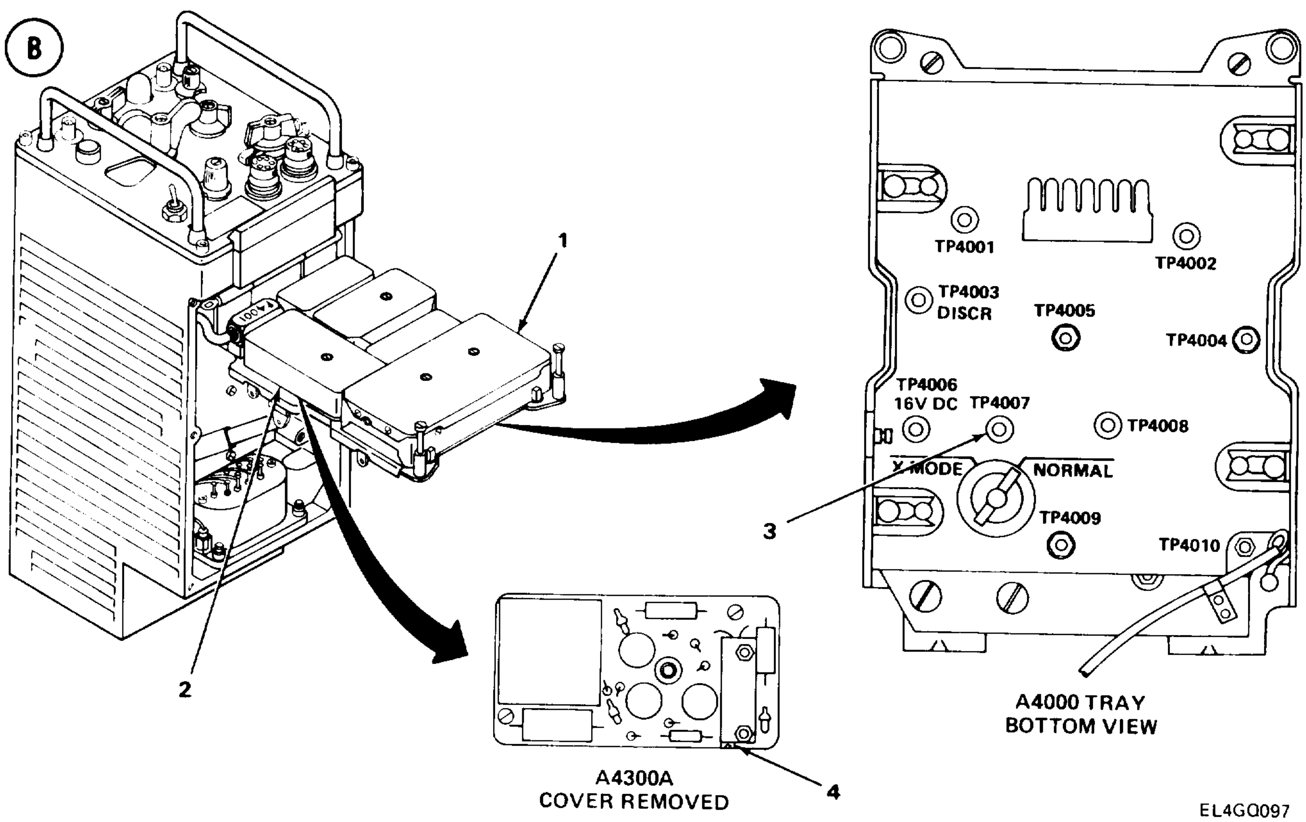
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 64 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 10-µv rf level; then disconnect the T-connector from the counter.



1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to 1-volt scale.
3. Lift A4000 tray (1). (See test setup diagram (B) .)
4. Remove A4300A cover (2).
5. Connect ME-30(*)/U positive lead to TP4007 (3) and negative lead to ground.
6. Adjust R4304(4) for 0.8-vac reading on ME-30(*)/U.

3-23. A5300 SQUELCH FILTER ALINEMENT.

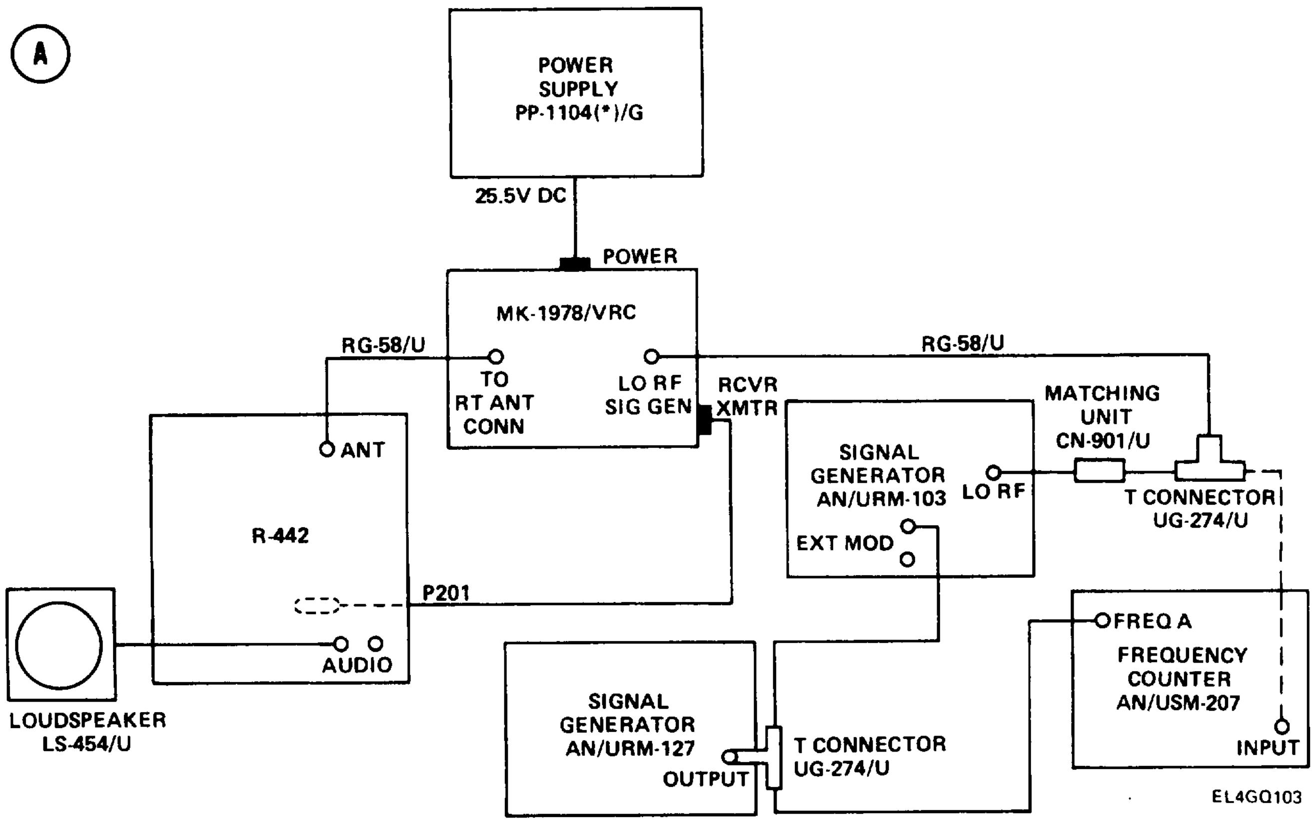
PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200 in the NEW SQUELCH mode of operation. By adjusting Resistor R5301 in the squelch filter, the filter is properly tuned to attenuate the 150-Hz squelch tone, thus providing maximum degenerative feedback to Squelch Amplifier A5200 for all frequencies other than 150 Hz. This permits the squelch amplifier to provide maximum gain for 150-Hz signals. Alinement of the A5300 squelch filter must be done before the Squelch Amplifier A5200 Alinement, NEW SQUELCH Level, paragraph 3-25.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Signal Generator AN/URM-127
Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/ VRC top cover. (See paragraph 2-7.)

A



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 1000-µv rf at a frequency which gives maximum TP5008 voltage.
Use variable external modulation around 150-Hz reference. Deviation will vary according to alinement requirements.

3-23. A5300 SQUELCH FILTER ALINEMENT. (CONT)

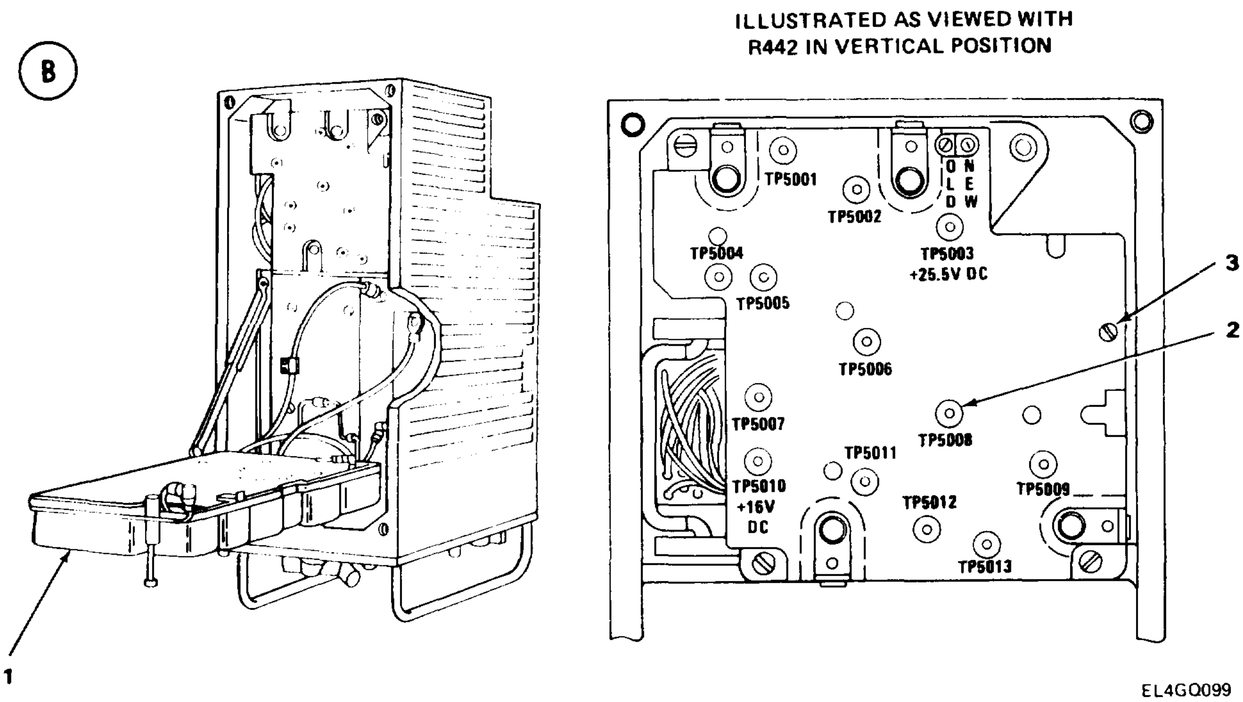
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	Follow instructions in alinement procedure
	RF TUNING	Follow instructions in alinement procedure
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	Set to 1 K (1000 µv)
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x1
	FREQ RANGE DIAL	150
	ATTENUATOR	x10
	OUTPUT CONTROL	Fully clockwise
AN/USM-207 (to verify AN/URM-127 low-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1
	GATE TIME	1 (black knob)
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	103 (black knob)
	DIRECT/H ETERODYN E	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING – MC	100

ALINEMENT PROCEDURE

1. Disconnect rf cable from R-442/VRC ANTENNA port.
2. Lift R-442/VRC A3000 tray (1). (See test setup diagram B, page 3-114.)
3. Set ME-30(*)/U to 10-volt scale.
4. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
5. Set R-442/VRC MC-TUNE-KC control to any frequency that results in at least a 4-vac reading on the ME-30(*)/U.

3-23. A5300 SQUELCH FILTER ALINEMENT. (CONT)



6. Set R-442/VRC SQUELCH switch to NEW ON.
7. Adjust R5301 (3) for approximately 1-vac reading on ME-30(*)/U.
8. Reconnect rf cable to R-442/VRC ANTENNA port.
9. Set AN/URM-103 BAND SWITCH to range that includes R-442/VRC frequency setting.
10. Adjust AN/URM-103 RF TUNING control to same frequency selected in step 5.
11. Adjust AN/URM-103 DEVIATION control for 3.5-kHz reading on DEVIATION KHZ meter.
12. Adjust AN/U RM-127 FREQ RANGE DIAL to vary frequency above and below 150 Hz while observing ME-30(*)/U. Stop at frequency that gives highest possible ME-30(*)/U reading. At same time, adjust AN/URM-103 DEVIATION control to keep ME-30(*)/U reading between 2 and 4 vac. If adjustment of DEVIATION control is required, readjust AN/URM-127 frequency for peak ME-30(*)/U reading.
13. Check and record AN/URM-127 modulating frequency as indicated by AN/USM-207 frequency counter. If frequency is 150 ± 1 Hz, no alinement is necessary. If frequency is above 151 Hz, go to step 14; if below 149 Hz, go to step 17.

NOTE

In steps 14 and 17, maintain a voltage reading of 2 to 4 vac at TP5008 by adjusting the AN/URM-103 DEVIATION control.

14. FREQUENCY ABOVE 151 HZ. Turn R5301 (3) counterclockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
15. Check frequency on AN/USM-207.
16. Repeat steps 14 and 15 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.

3-23. A500 SQUELCH FILTER ALINEMENT. (CONT).

17. FREQUENCY BELOW 149 HZ. Turn R5301 (3) clockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
18. Check frequency on AN/USM-207.

Repeat steps 17 and 18 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.

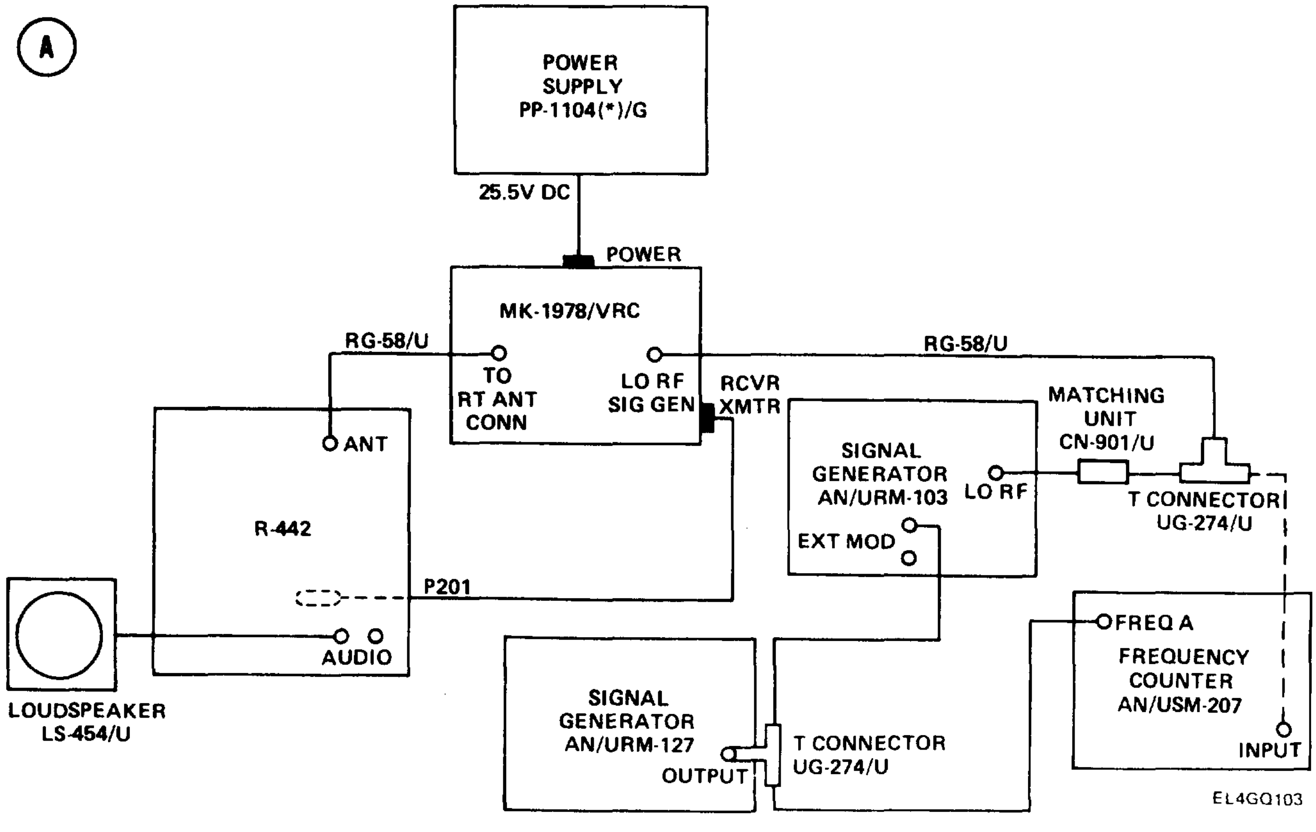
3-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT.

PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200A in the NEW SQUELCH mode of operation. Alinement of the A5300A squelch filter must be done before the Silicon Version Squelch Amplifier A5200A Alinement, NEW SQUELCH Level, paragraph 3-26.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Signal Generator AN/URM-127
Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A . Remove R-442/VRC top cover. (See paragraph 2-7.)



3-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 1000-µ rf at a frequency that gives maximum TP5008 voltage. Use variable external modulation around 150-Hz reference. Deviation will vary according to alinement requirements.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x 1
	FREQ RANGE DIAL	150
	ATTENUATOR	X10
	OUTPUT CONTROL	Fully clockwise
AN/USM-207 (to verify AN/URM-127 low frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1 (black knob)
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	Set to 1 K (1000µ v)

3-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

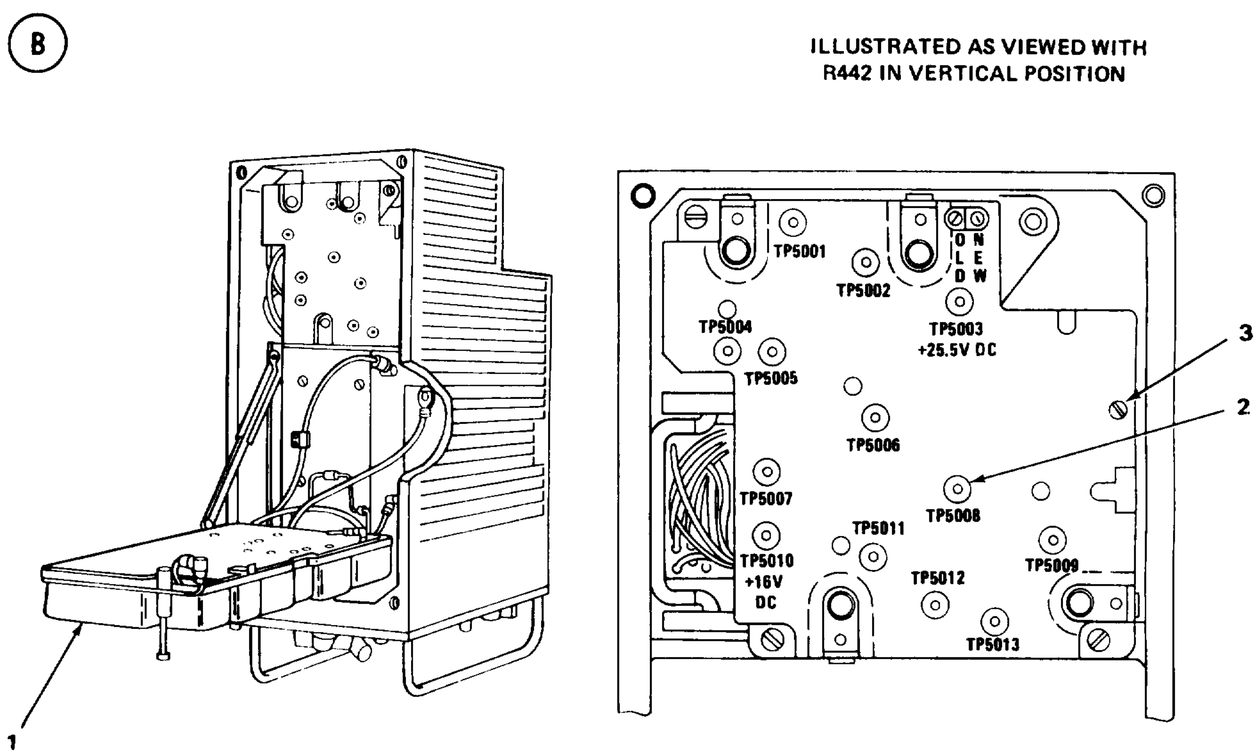
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

ALINEMENT PROCEDURE

NOTE

Before performing A5300A alinement, make sure that the squelch amplifier is the silicon version A5200A.

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 1000-PV rf level; then disconnect the T-connector from the counter.



EL4GQ099

3-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)

1. Lift R-442/VRC A3000 tray (1). (See test setup diagram (B), page 3-117.)
2. Set ME-30(*)/U to 10-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter indicates 8 kHz.
5. Adjust AN/URM-127 FREQ RANGE DIAL to vary frequency above and below 150 Hz while observing ME-30(*)/U. Stop at frequency that gives highest possible ME-30(*)/U reading.
6. Check and record the AN/URM-127 modulating frequency as indicated by AN/USM-207 frequency counter. If frequency is 150 ± 1 Hz, A5300A alinement is satisfactory. If frequency is above 151 Hz, go to step 7; if under 149 Hz, go to step 10.
7. FREQUENCY ABOVE 151 HZ. Turn R5303 (3) counterclockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
8. Check frequency on AN/USM-207.
9. Repeat steps 7 and 8 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.
10. FREQUENCY BELOW 149 HZ. Turn R5303 (3) clockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
11. Check frequency on AN/USM-207.
12. Repeat steps 10 and 11 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.

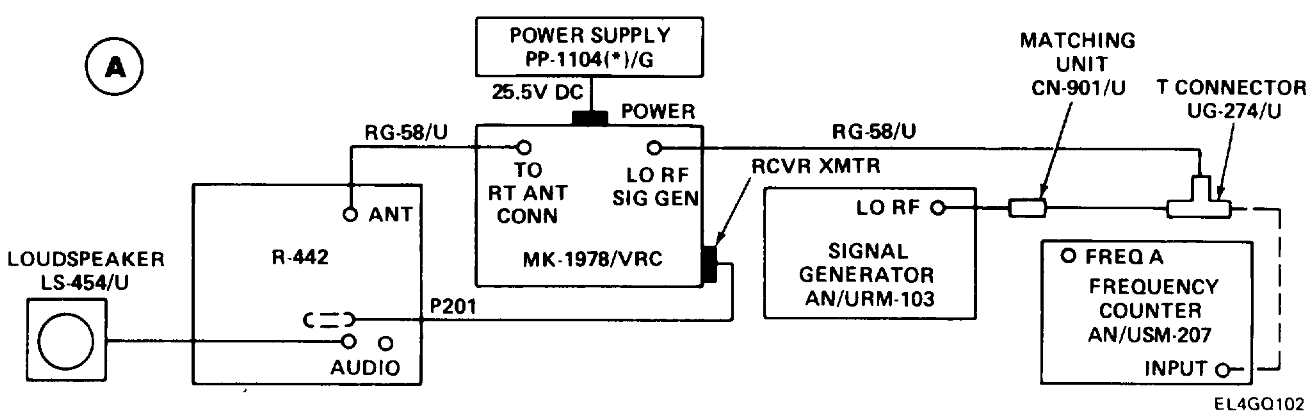
3-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the eqipment as shown in test setup diagram (A). Remove R-442/VRC top cover. (See paragraph 2-7)



3-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 20-µ rf at 30 MHz, with 150-Hz modulation, and deviation as per alinement requirements.

CONTROL AND SWITCH SETTINGS

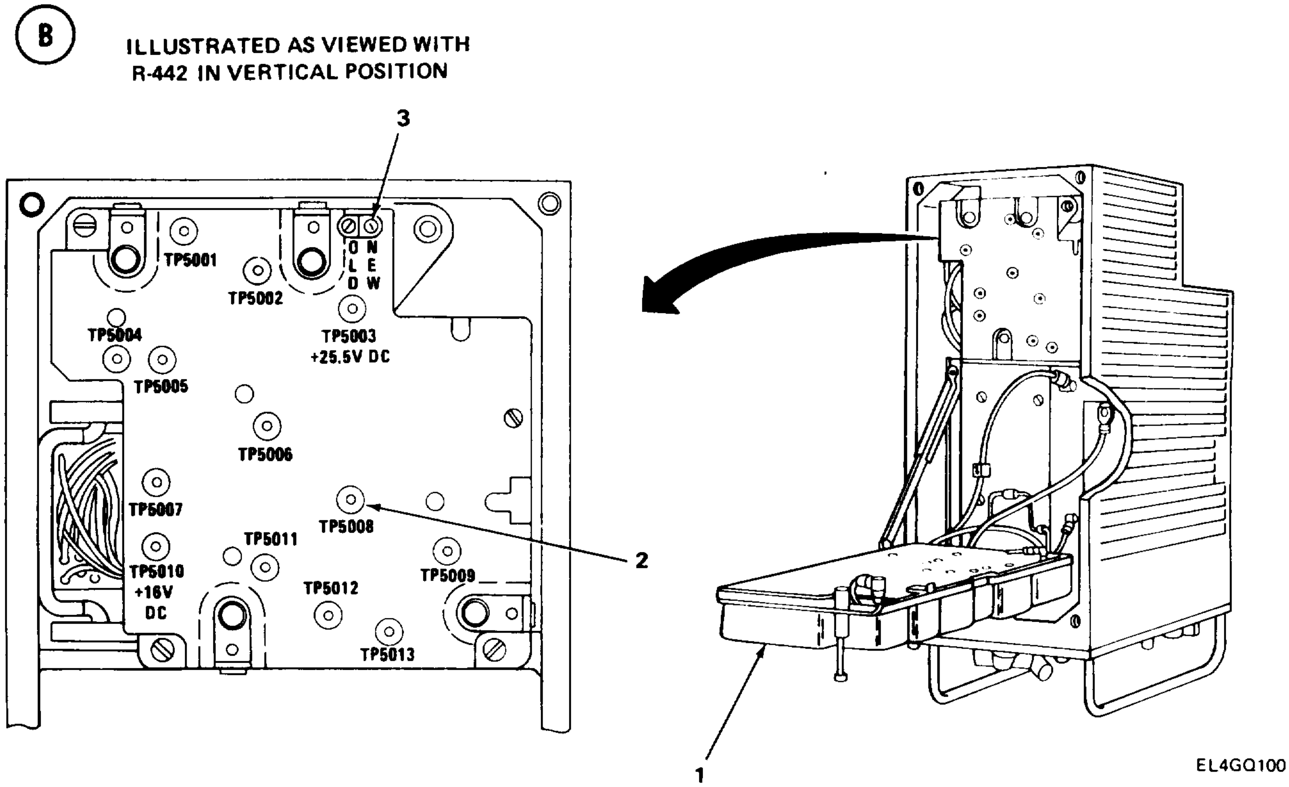
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	150 Hz
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µ rf level; then disconnect the T-connector from the counter.

3-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)



1. Lift R-442/VRC A3000 tray (1).
2. Set ME-30(*)/U to 10-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2) and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 4 vac.
5. Remove ME-30(*)/U positive lead.
6. Adjust NEW Squelch Resistor R5217 (3) until R-442/VRC CALL light just comes on.

3-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

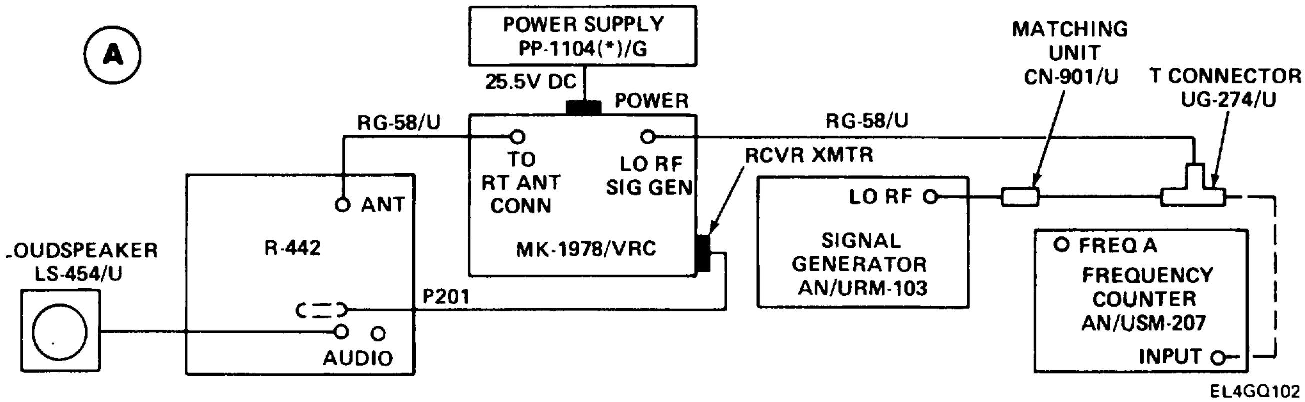
PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A, page 3-121. Remove R-442/VRC top cover. (See paragraph 2-7.)

3-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 2000-µv rf at 64 MHz, 150-Hz modulation, and deviation as per alinement requirements.

CONTROL AND SWITCH SETTINGS

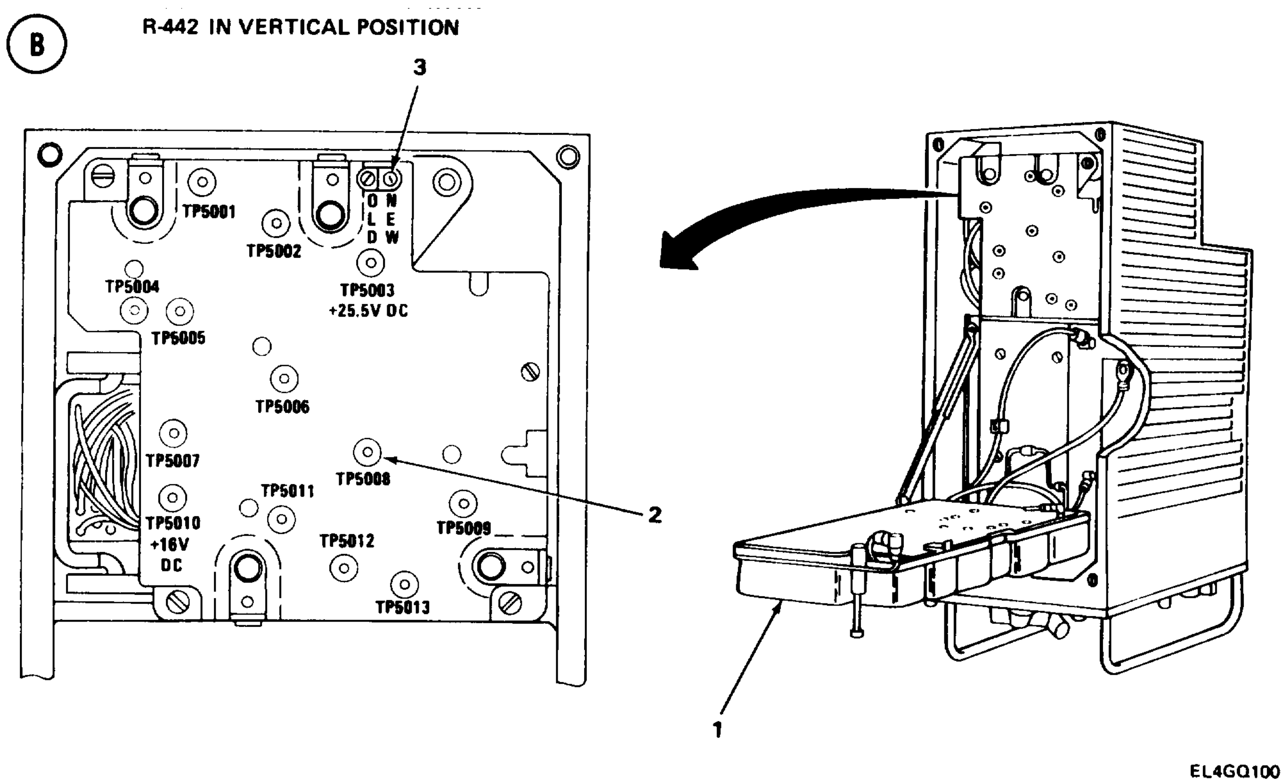
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	150 Hz
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	2000 µv
AN/USM-207	Same as A5200 Squelch Amplifier Alinement, paragraph 3-25	

3-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 64 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 2000-μv rf level; then disconnect the T-connector from the counter.



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram B)
2. Set ME-30(*)/U to 0.3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 0.20 ± 0.01 vac.
5. Adjust NEW Squelch Resistor 5207(3) until R-442/VRC CALL light just comes on.
6. Turn AN/URM-103 DEVIATION control counterclockwise until ME-30(*)/U reads 0.15 ± 0.01 vac. R-442/VRC CALL light should be off.

NOTE

If CALL light does not go off in step 6, repeat steps 4 and 5.

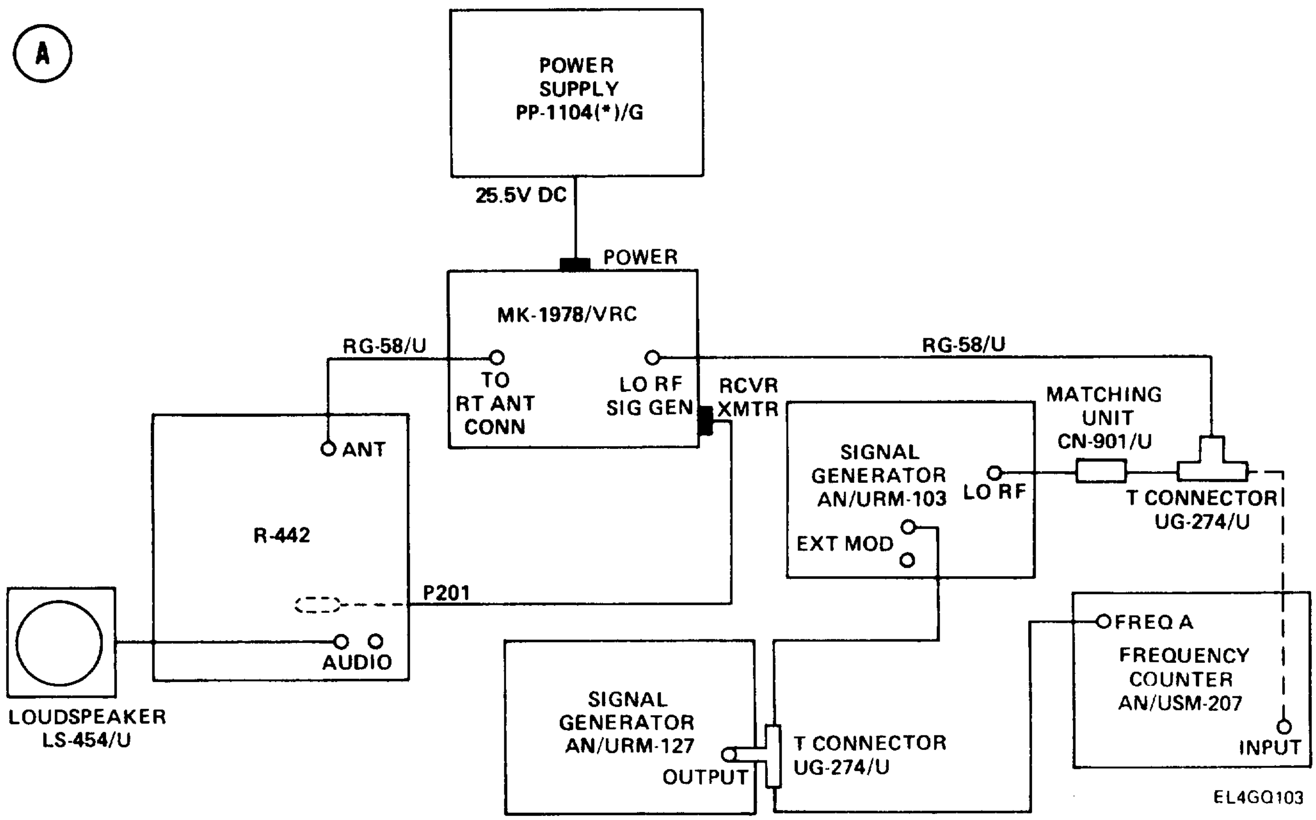
3-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which include internal noise and the received carrier.

TEST EQUIPMENT AND MATERIALS

- Signal Generator AN/URM-103
- Frequency Counter AN/USM-207
- Power Supply PP-1104(*)/G
- Signal Generator AN/URM-127
- Maintenance Kit MK-1978P/VRC
- Matching Unit CN-901/U
- T-Connector UG-274/U
- Loudspeaker LS-454/U
- Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 20-µv rf at 42 MHz, 7.3-kHz modulation, and deviation as per alinement requirements.

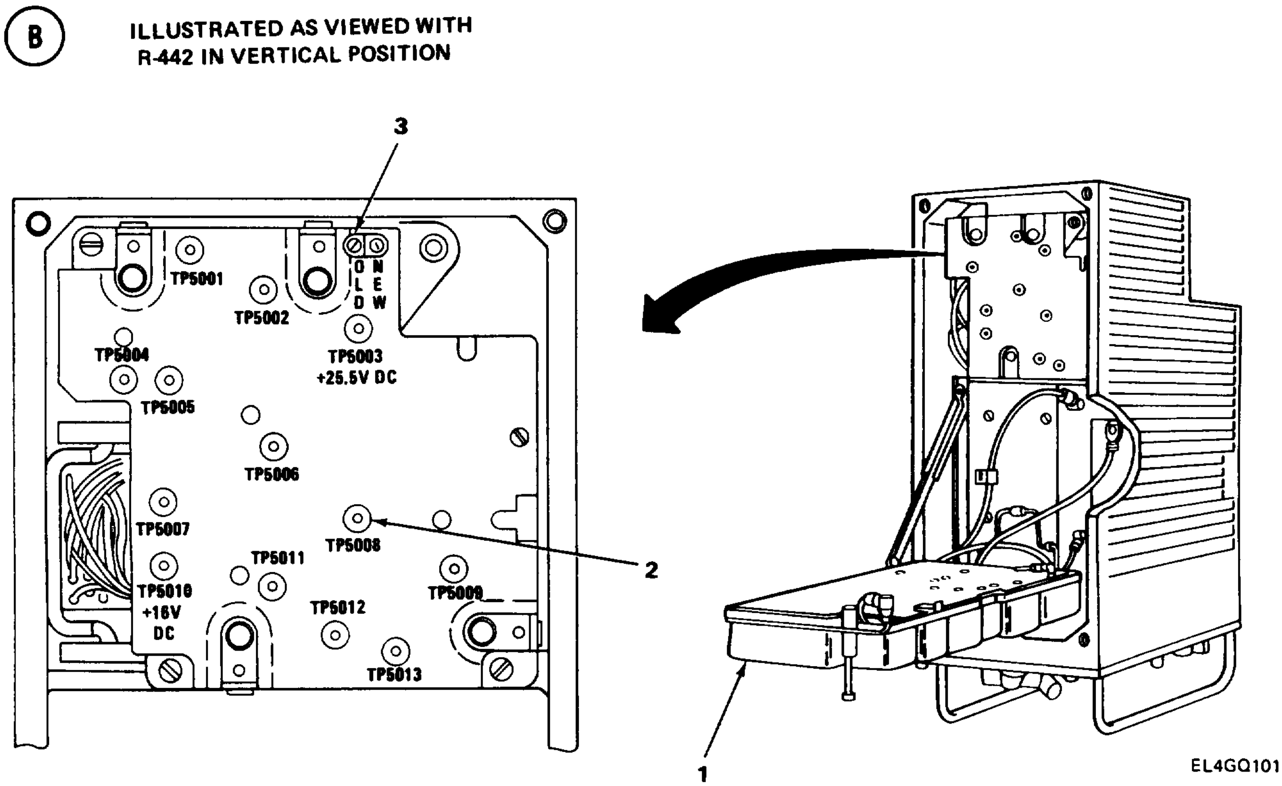
3-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	Follow instructions in alinement procedure
	RF TUNING	Follow instructions in alinement procedure
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/USM-207 (To verify AN/URM-127 IOW-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1 (black knob)
	FUNCTION	FREQ
AN/USM-207 (10 verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	X100
	FREQ RANGE DIAL	73
	ATTENUATOR	X10
	OUTPUT CONTROL	Turn clockwise for 2.2-volt reading on panel voltmeter
	FREQ METER	ON

3-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Disconnect rf cable from R-442/VRC ANTENNA port.
2. Lift R-442/VRC A3000 tray (1). (See test setup diagram B .)
3. Set ME-30(*)/U to 10-volt scale.
4. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
5. Set R-442/VRC MC-TUNE-KC control to any frequency which results in at least a 4-vac reading on ME-30(*)/U. Record ME-30(*)/U reading.
6. Reconnect rf cable to R-442/VRC ANTENNA port.
7. Set AN/URM-103 BAND switch to range that includes R-442/VRC frequency setting.
8. Set AN/URM-103 RF TUNING control to same frequency selected in step 5.

NOTE

Check the frequency counter to make sure that the signal generator is outputting the correct frequency. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.

9. Adjust AN/URM-103 DEVIATION control for 3-kHz reading on DEVIATION KHZ meter.
10. Adjust AN/URM-127 FREQ RANGE DIAL to vary frequency above and below 7.3 kHz while observing ME-30(*)/U. Stop at frequency that gives highest possible ME-30(*)/U reading. At same time, adjust AN/URM-103 DEVIATION control to keep ME-30(*)/U reading between 2 and 4 vac. If adjustment of DEVIATION control is required, readjust AN/URM-127 frequency for peak ME-30(*)/U reading.

3-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

11. Adjust AN/URM-103 DEVIATION control for ME-30(*)/U reading 4 db less than reading recorded in step 5.
12. Check R-442/VRC CALL light. If light is out, go to step 13. If light is on, go to step 14.
13. CALL LIGHT OUT. Turn R5216 (3) counterclockwise slowly and stop at point where light just comes on. (See test setup diagram B, page 3-125.)
14. CALL LIGHT ON. Turn R5216 (3) clockwise until light goes out, then repeat step 13.

OLD SQUELCH Final Test

15. Adjust ANLJRM-103 DEVIATION control for 8-kHz reading on DEVIATION KHZ meter.
16. Set AN/USM-127 FREQ RANGE MULTIPLIER to x10.
17. Set AN/USM-127 FREQ RANGE DIAL to 35 (350 Hz). R-442/VRC CALL light should be on.

NOTE

CALL light must stay on through range of 350 to 3500 Hz.

18. Rotate FREQ RANGE DIAL fully clockwise to 2000 Hz. CALL light should stay on.
19. Rotate FREQ RANGE DIAL fully counterclockwise.
20. Set FREQ RANGE MULTIPLIER to x100,
21. Rotate FREQ RANGE DIAL to 35 (3500 Hz). CALL light should stay on.

NOTE

If R-442/VRC fails the OLD SQUELCH Final Test, replace the A5300 module and repeat the entire alinement procedure.

3-28. **SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.**

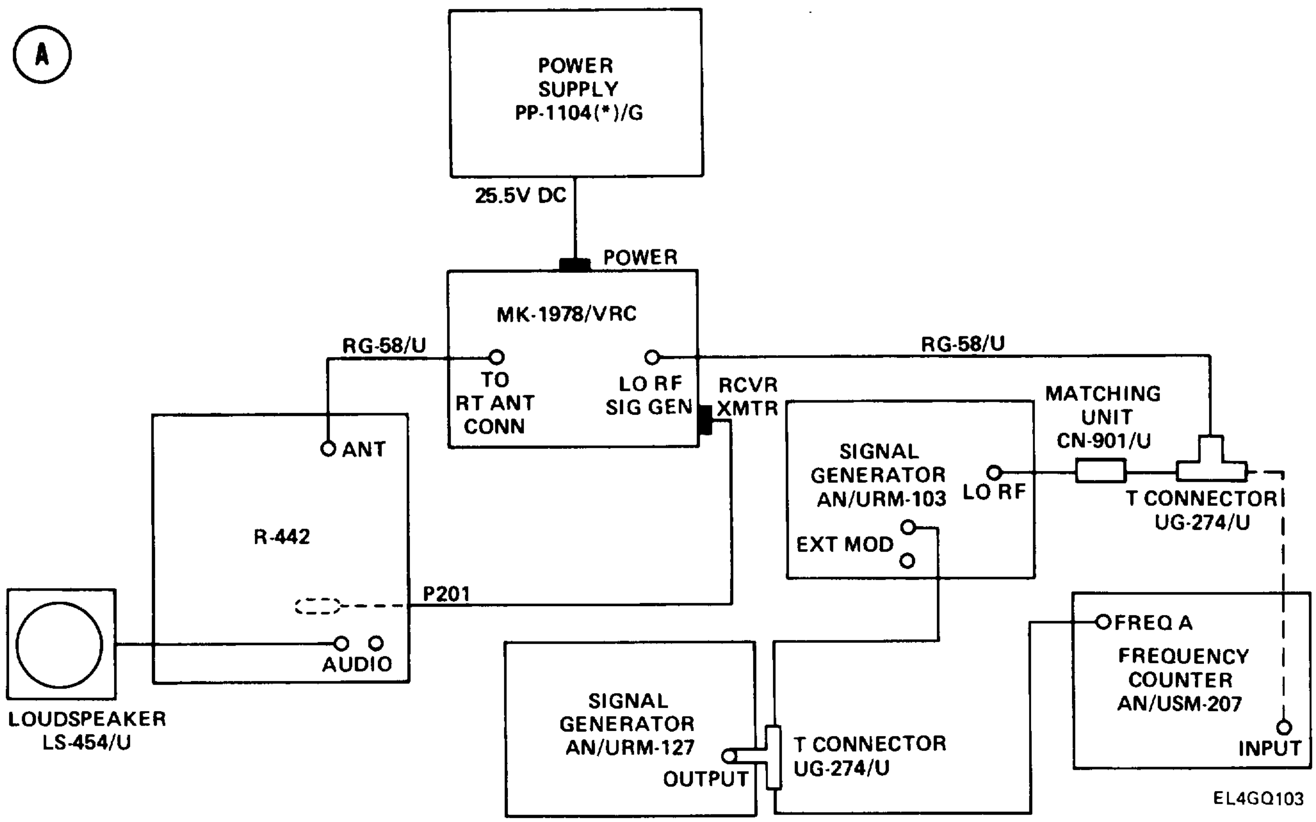
PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which include internal noise and the received carrier.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103	Matching Unit CN-901/U
Frequency Counter AN/USM-207	T-Connector UG-274/U
Power Supply PP-1104(*)/G	Loudspeaker LS-454/U
Signal Generator AN/URM-127	Voltmeter ME-30(*)/U
Maintenance Kit MK-1978/VRC	

3-28 SILICON A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

TEST SETUP. Connect the equipment as shown in illustration A .Remove R-442/VRC top cover. See paragraph 2-7



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table. When using alternate equipment, inject 20-µ rf at 64 MHz, 7.3-KHz modulation, and deviation as per alinement requirements.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
MK-1978/VRC	POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

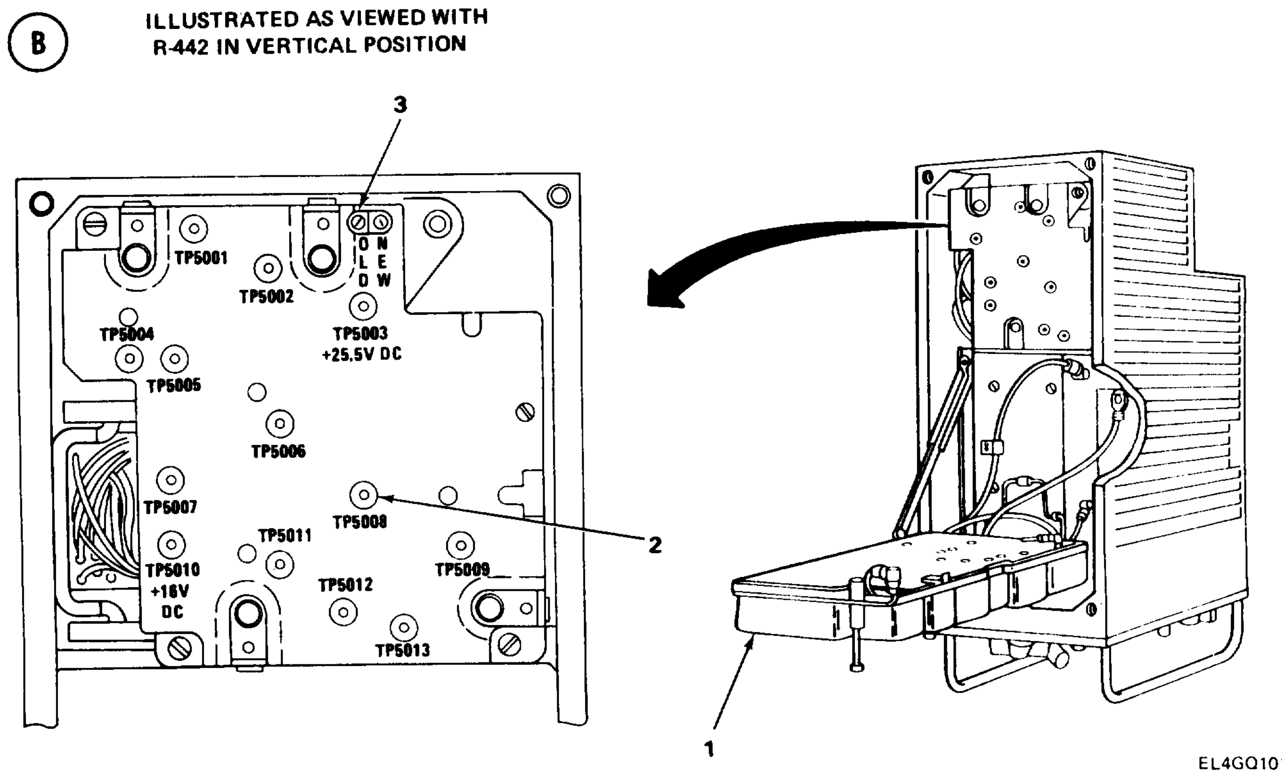
3-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0- 10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20µv
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x100
	FREQ RANGE DIAL	73
	ATTENUATOR	x10
	OUTPUT CONTROL	Turn clockwise for 2.2-volt reading on panel voltmeter
	FREQ METER	ON
AN/USM-207 (to verify AN/ URM-127 IOW-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1 (black knob)
	FUNCTION	FREQ
AN/USM-207 (to verify AN/ URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYN E	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

3-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram (B) .)
2. Set ME-30(*)/U to 3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground. (See test setup diagram (B) .)
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 1.5 vac. R-442/VRC CALL light should be off. If necessary, adjust R5208 (3) until CALL light goes off.
5. Turn DEVIATION control counterclockwise until ME-30(*)/U reads 1.0 vac. Adjust R5208 (3) and stop at point where CALL light just comes on.

CHAPTER 4

DIRECT SUPPORT PERFORMANCE AND TROUBLESHOOTING PROCEDURES USING TEST SET AN/GRM-114A

OVERVIEW

This chapter contains performance tests, troubleshooting, and alinement procedures at the direct support level usingTestSet AN/GRM-114A.

The performance tests are diagnostic in purpose. They should be used to verify that an R-442/VRCis operating properly or to point out the existence of faults.

If failure to meet a performance test standard confirms that a fault is present in the unit under test, the test procedure will refer you to a specific chart in the troubleshooting section. The troubleshooting charts are designed to isolate the faults noted in the performance tests. They will guide you to the source of defects and/or misalinements.

Once it has identified the source of a fault, a troubleshooting chart will refer you to the appropriate repair/replacement instructions or alinement procedure. Because each stage of the receiver depends upon its other stages for overall operating efficiency, the replacement, repair, or realinement of even one component could alter the signals enough to create the need for other real inements. Therefore, after making any alterations in the R-442/VRC, do all the performance tests, even those you have done already.

Section I PERFORMANCE TESTS

4-1. GENERAL.

This section contains performance test procedures for use with Test Set AN/GRM-114A. They will enable you to determine whether or not an R-442/VRC is operating acceptably. Each test procedure checks specific functions of the receiver to help you find and isolate faults.

Each test is complete and may be performed individually. Therefore, you may choose the appropriate test to verify gross equipment failure or performance degradation of specific stages. However, this maintenance approach is not recommended. It is best to perform all the tests in sequence. This systematic maintenance approach will ensure that all faults are found and corrected.

Faults in the R-442/VRC are evidenced by failure of the radio to meet the performance **standards** found within the test procedures in **bold type.** When an R-442/VRC fails to meet a performance standard, discontinue the test and turn to the troubleshooting chart referred to in the procedure.

4-2. VOLUME CONTROL TEST.

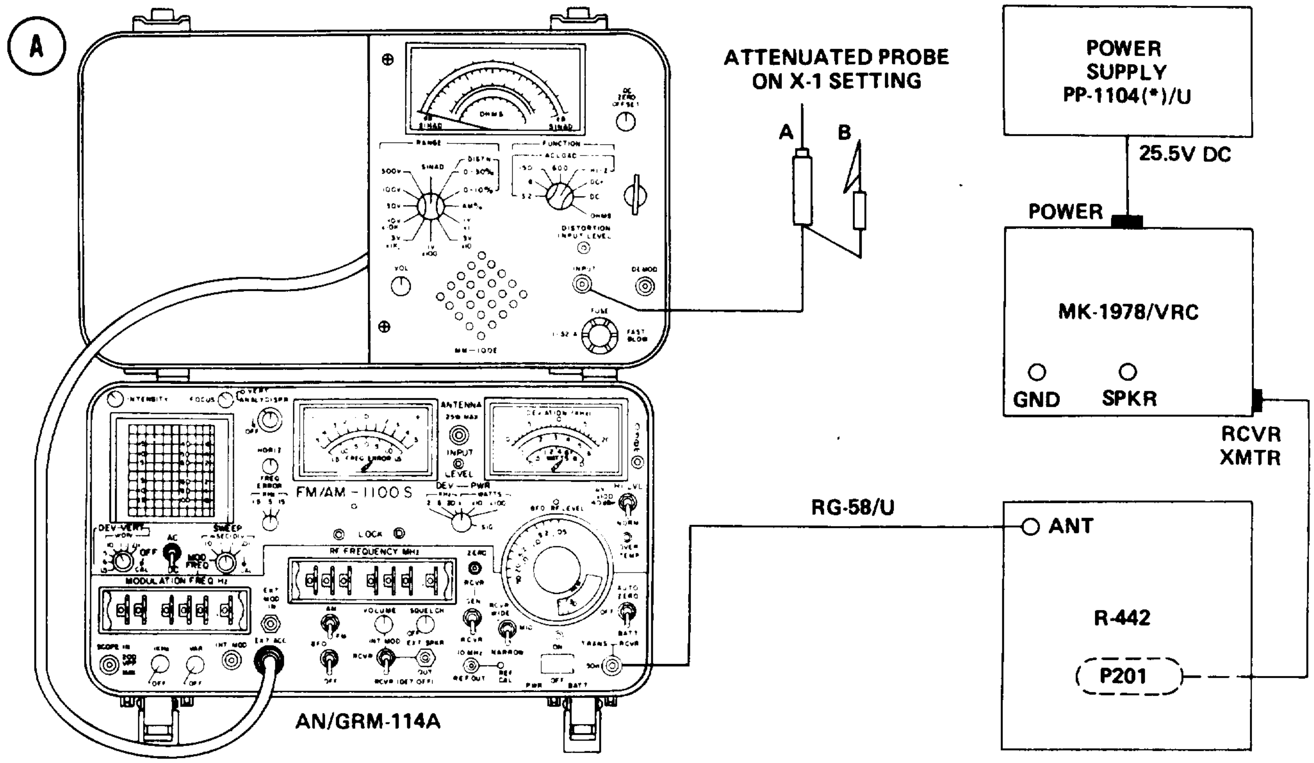
PURPOSE. This test checks the VOLUME control of the R-442/VRC for proper operation. When a 1-kHz tone is injected into the R-442/VRC ANTENNA port, the speaker should output a clear tone with no scratchy sound or sudden drop in volume. The absence of a tone means that the signal is not passing completely through the R-442/VRC circuitry and could even indicate total equipment failure; therefore, perform this test before the others in this section.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G	Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC	Rf Cable RG-58/U

4-2. VOLUME CONTROL TEST. (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



EL4GQ141

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

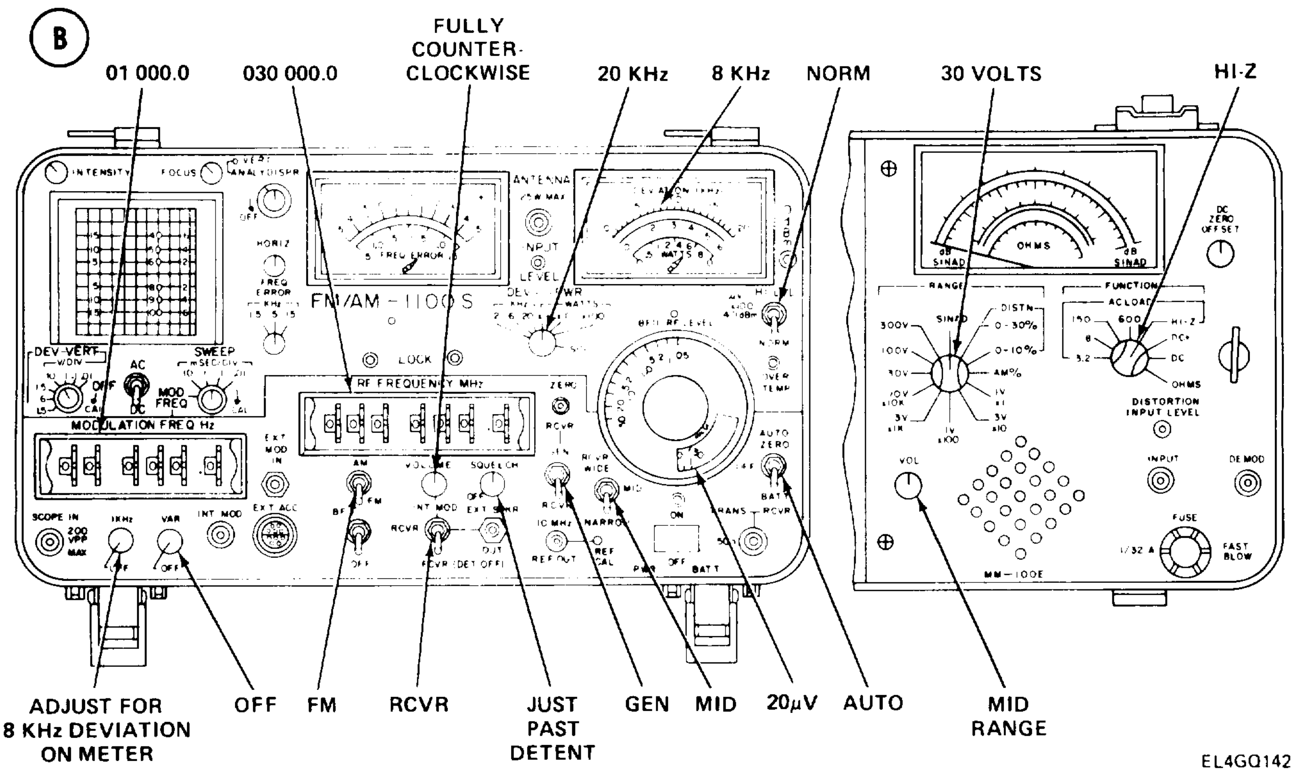
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON
R-442/VRC	BAND	(A)
	MC-TUNE-KC	30. 00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

4-2. VOLUME CONTROL TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM-114A; MM-100E	See test setup diagram (B)	



TEST PROCEDURE

1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack; connect probe B to GND jack.(See test setup diagram (A), page 4-3.)
2. Turn R-442/VRC VOLUME control fully clockwise, then fully counterclockwise.

STANDARD. Tone from MM-100E speaker should be clear with no scratchiness or sudden changes in volume at any point in the rotation of the VOLUME control.

3. If volume changes suddenly, if tone is scratchy, or if no tone at all is heard, see trouble-shooting chart 4-1.

4-3. RECEIVER SENSITIVITY TEST.

PURPOSE. This test checks the ability of the R-442/VRC to detect low-level rf signals by measuring its SINAD at several frequencies. SINAD gives receiver sensitivity in terms of the following ratio:

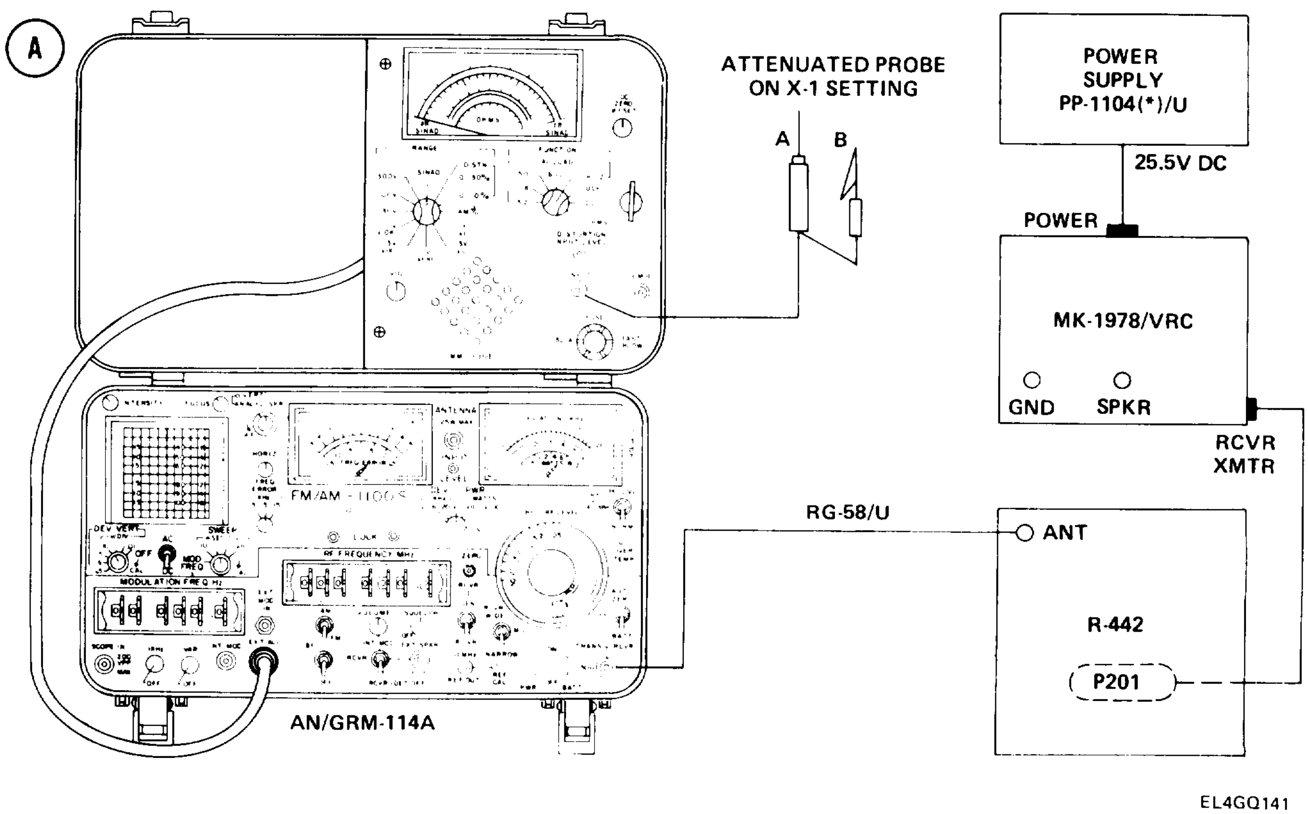
signal + noise + distortion/noise + distortion.

SINAD is expressed in decibels. The better a receiver's SINAD, the better signals, even weak ones, can be heard over unwanted internal noise. The SINAD for the R-442/VRC should be at least -10 db (from a zero-db reference) when the rf level is 0.5 µv

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

TEST SETUP. Connect equipment as shown in test setup diagram .

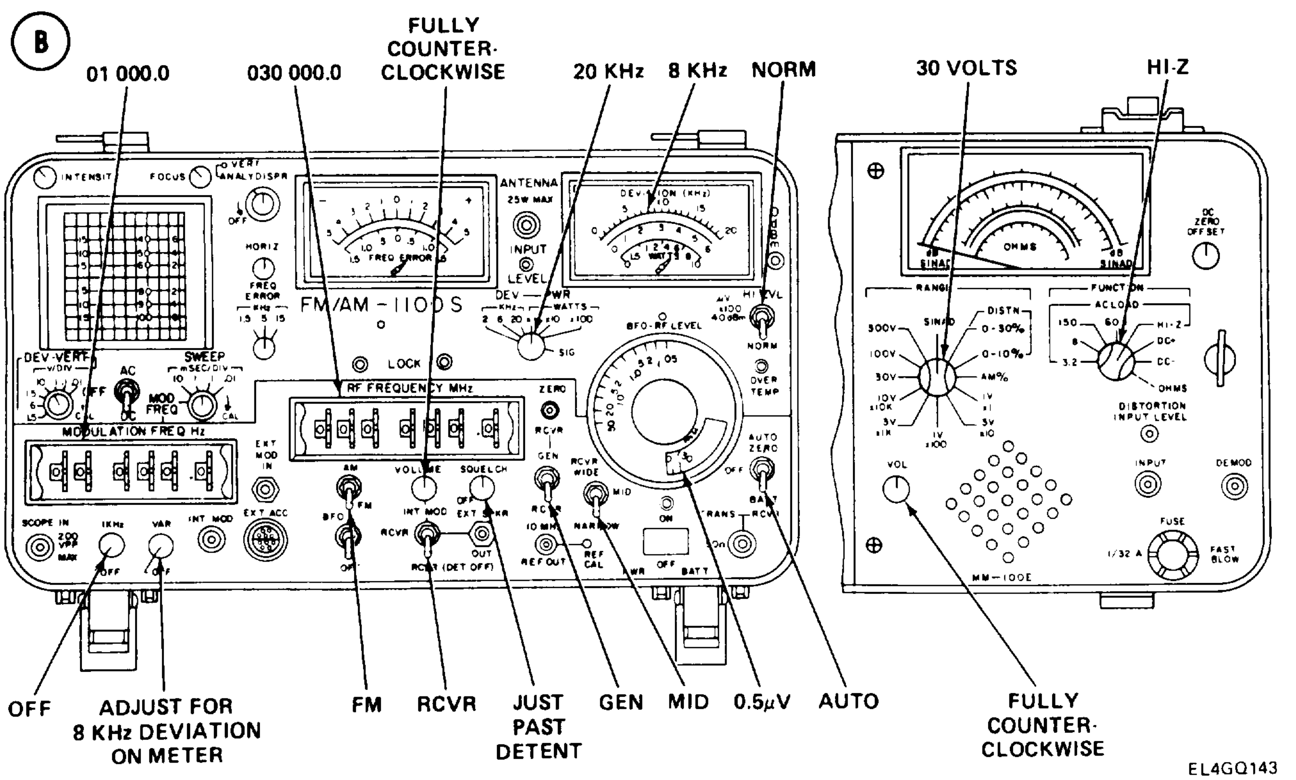


4-3. RECEIVER SENSITIVITY TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	SQUELCH	ON
R-442/VRC	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/GRM-114A; MM-100E	See test setup diagram B	



4-3. RECEIVER SENSITIVITY TEST. (CONT)

Sensitivity Test at 30.00 MHz

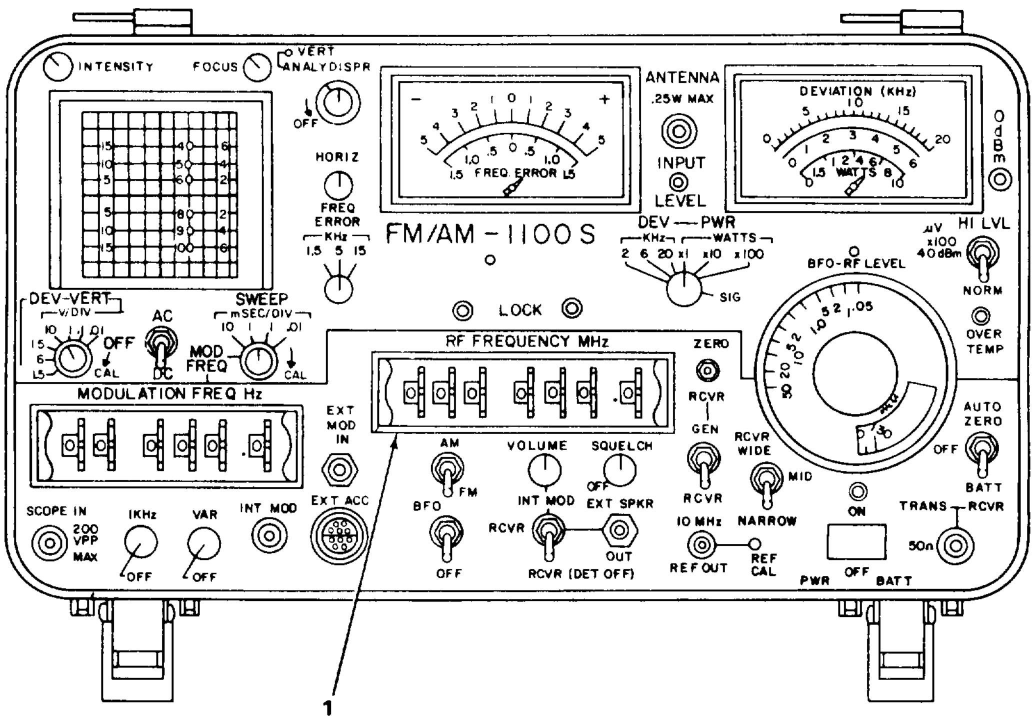
1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack; connect probe B to GND. (See test setup diagram A, page 4-5.)
2. Adjust R-442/VRC VOLUME control for 17-volt indication on MM-100E meter.
3. If 17-volt indication cannot be obtained on MM-100E, see troubleshooting chart 4-6.
4. Change MM-100E RANGE switch to SINAD.

STANDARD. MM-100E blue SINAD scale should indicate 10 or greater.

5. If MM-100E scale indicates less than 10, see troubleshooting chart 4-2.

Sensitivity Test at Other Frequencies

C



EL4GQ159

6. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (1) and R-442/VRC MC-TUNE-KC switch to frequency control settings listed below. After each frequency change, note MM-100E blue SINAD scale indication.

R-442/VRC SWITCH SETTINGS	EQUIVALENT AN/GRM-114A THUMBWHEEL SETTINGS
41.00 MHz (BAND A)	041000.0 Hz
52.00 MHz(BAND A)	052000.0 Hz
53.00 MHz (BANd B)	053000.0 Hz
64.00 MHz (BAND B)	064000.0 Hz
75.00 MHz (BAND B)	075000.0 Hz

4-3. RECEIVER SENSITIVITY TEST. (CONT)

STANDARD. MM-100E blue SINAD scale should indicate 10 or greater at each frequency.

7. If MM-100E indication falls below 10 at any frequency, see troubleshooting chart 4-2.

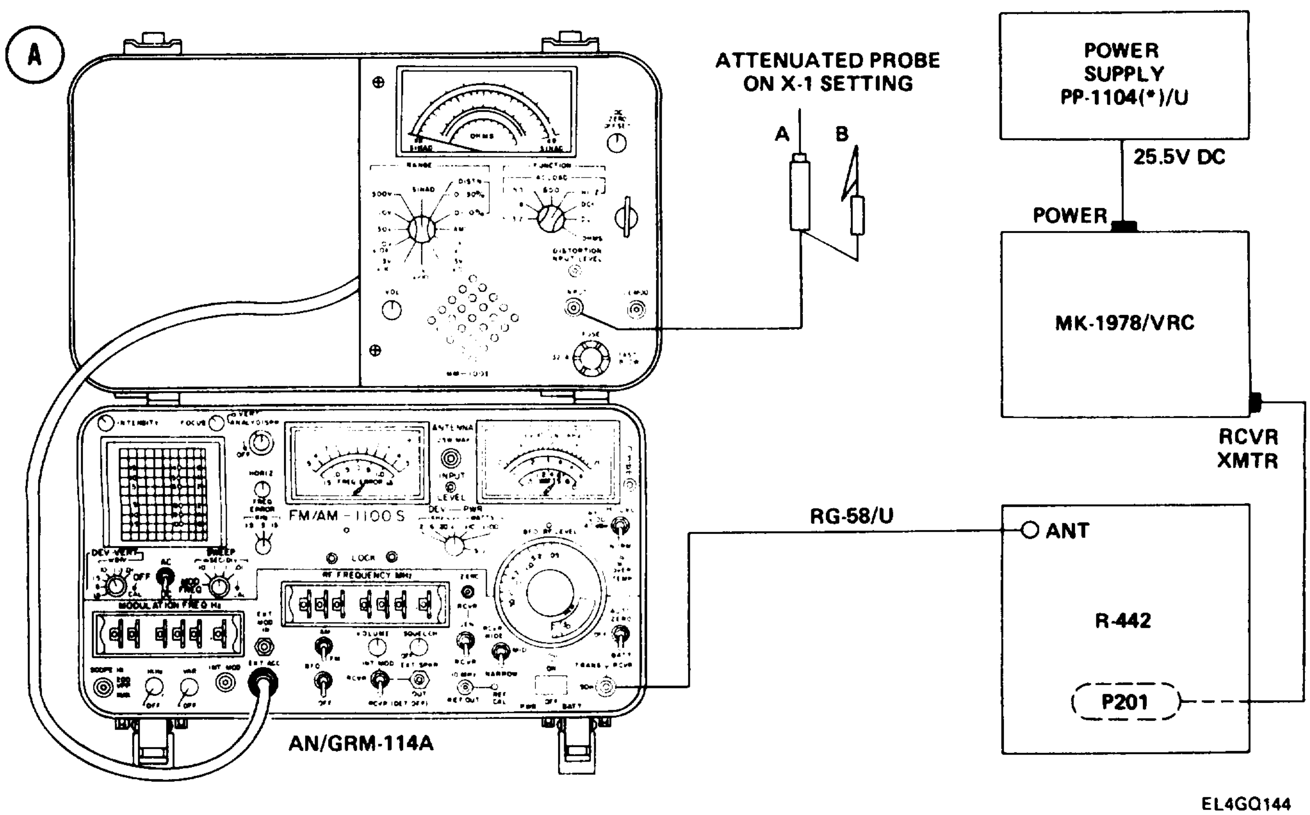
4-4. NEW SQUELCH TEST.

PURPOSE. This test checks the sensitivity of the R-442/VRC squelch modules (A5200, A5300) to the NEW SQUELCH signal (150Hz) at several carrier frequencies. The 150-Hz signal is injected into the R-442/VRC ANTENNA port, energizing Squelch Module Relay K5002, which unsquelches the receiver. Proper operation of the squelch modules is verified by CALL lamp response to carrier signal strength at or below a 0.5-µv rf level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

TEST SETUP. Connect equipment as shown in test setup diagram (A) .

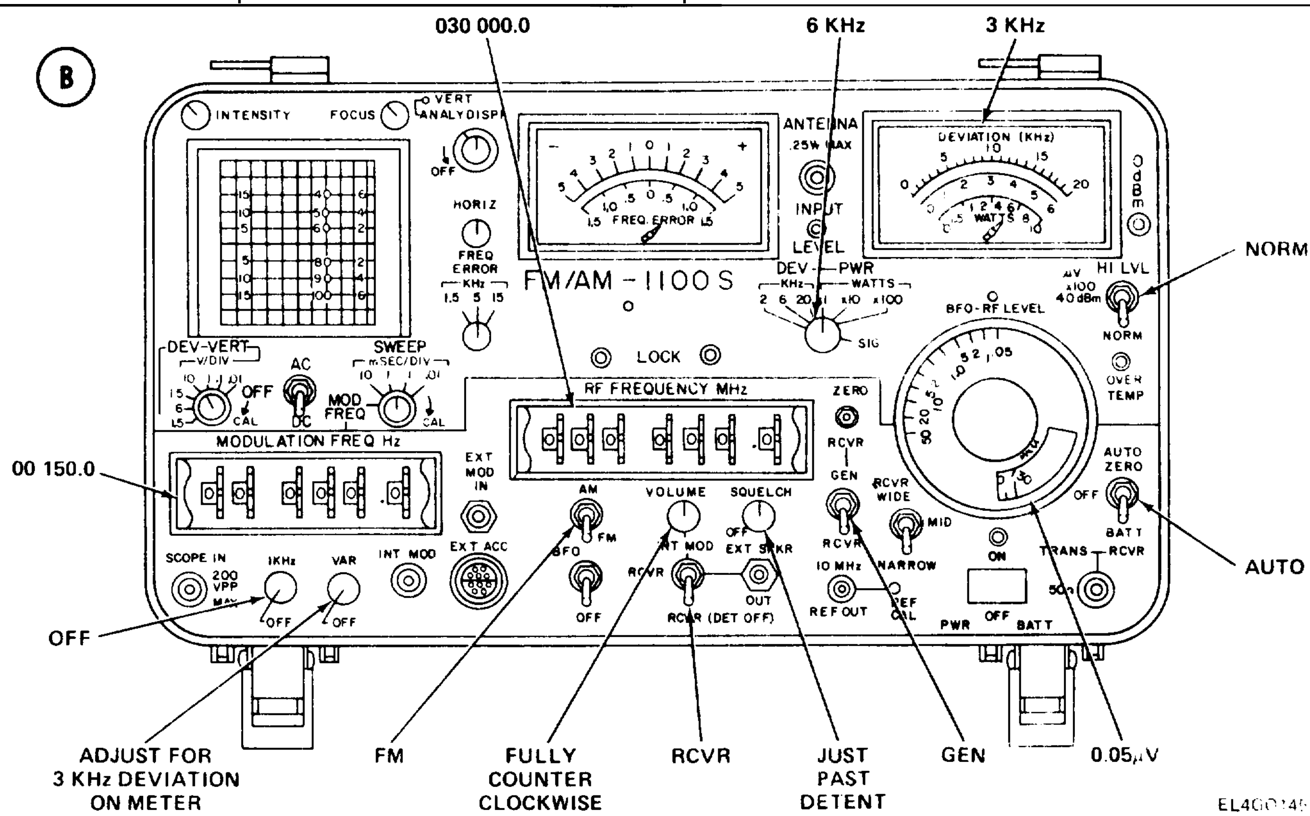


INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

4-4. NEW SQUELCH TEST. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	SQUELCH	OFF
R-442/VRC	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	NEW ON
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/GRM-114A	See test setup diagram B	

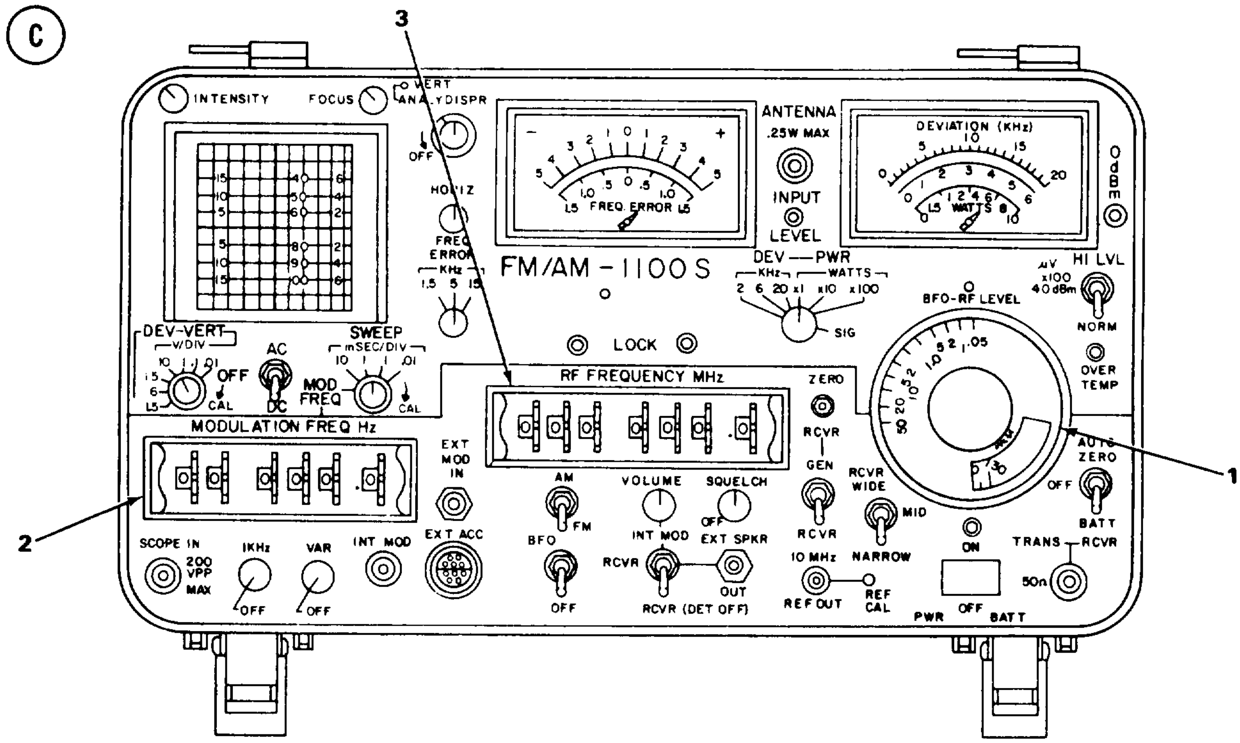


TEST PROCEDURE

NEW SQUELCH Test at 30.00 MHz

1. Turn AN/GRM-114A RF LEVEL control (1) slowly clockwise until R-442/VRC lamp lights. (See test setup diagram C, page 4-10.)

4-4. NEW SQUELCH TEST. (CONT)



EL4GQ146

2. If CALL lamp does not light, set AN/GRM-114A MODULATION FREQ Hz thumbwheels (2) to 00151.0 Hz, return RF LEVEL control (1) to minimum setting, and repeat step 1. If CALL lamp still does not light, set MODULATION FREQ Hz thumbwheels (2) to 00149.0, return RF LEVEL control (1) to minimum setting, and repeat step 1.

STANDARD. R-442/VRC CALL lamp should light while AN/GRM-114A RF LEVEL is at or below 0.5 µv.

3. If RF LEVEL (1) is more than 0.5 µv when R-442/VRC CALL lamp lights or if CALL lamp will not light, see troubleshooting chart 4-5.
4. Remove cable from R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should go out. Remember, without the 150-Hz tone, Relay K5002 will not be energized to supply the 16 volts necessary to turn on the audio amplifiers; therefore, the receiver is squelched.

5. If CALL lamp does not go out, see troubleshooting chart 4-5.
6. Reconnect cable to R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should light,

7. If CALL lamp does not light, see troubleshooting chart 4-5.

NEW SQUELCH Test at Other Frequencies

8. Return AN/GRM-114A RF LEVEL control (1) to minimum setting.
9. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (3) and R-442/VRC MC-TUNE-KC switch to frequency control settings listed below. Repeat steps 1 through 7 at each frequency.

4-4. NEW SQUELCH TEST. (CONT)

NOTE

Change R-442/VRC to BAND (B) at 53, 65, and 75 MHz.

R-442/VRC SWITCH SETTING	EQUIVALENT AN/GRM-114A THUMBWHEEL SETTING
41.00 MHz	041000.0 Hz
52.00 MHz	052000.0 Hz
53.00 MHz	053000.0 Hz
65.00 MHz	065000.0 Hz
75.00 MHz	075000.0 Hz

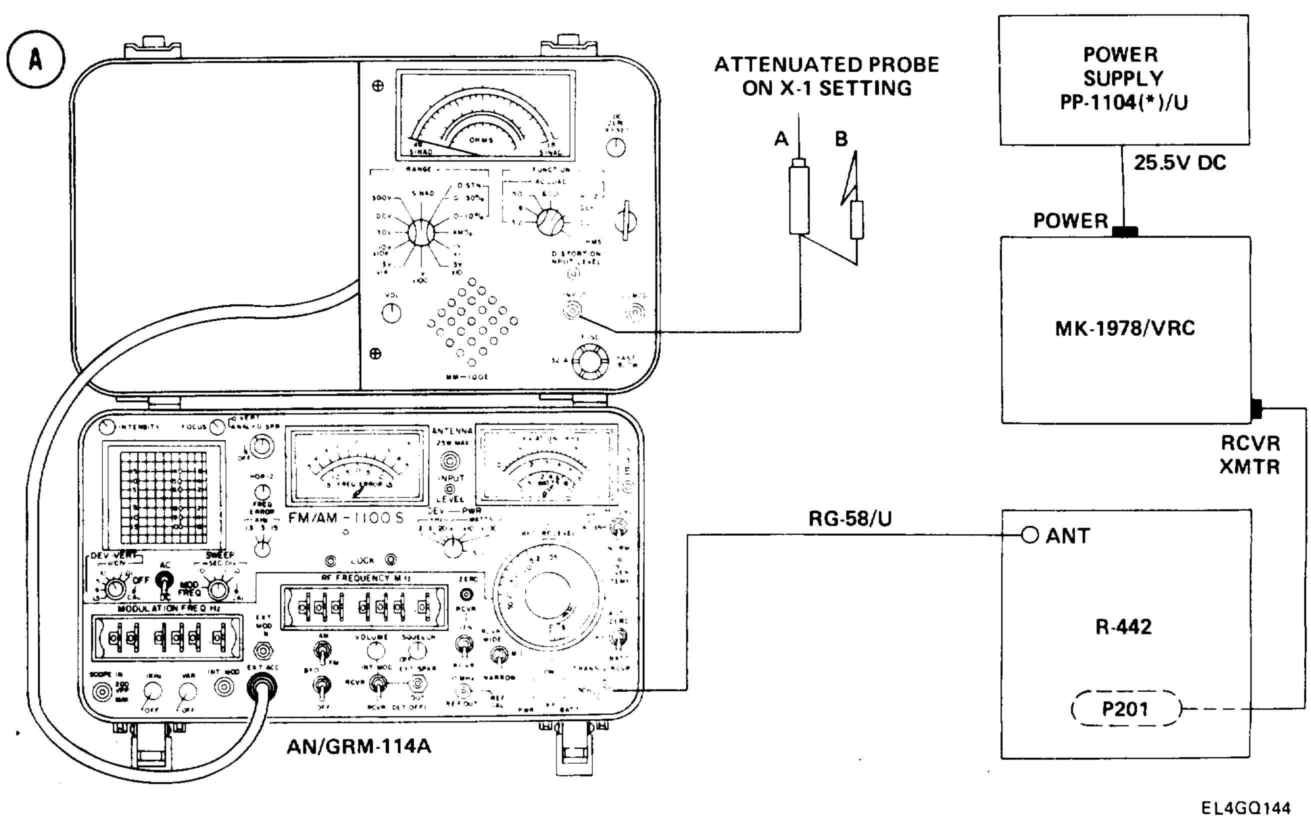
4-5. OLD SQUELCH TEST.

PURPOSE. This test checks the sensitivity of the R-442/VRC squelch modules (A5200, A5300) to OLD SQUELCH noise components (7300 Hz) at several carrier frequencies. Proper operation of the squelch modules is verified by the CALL lamp response to signal strength at or below a 0.7-µv rf carrier level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

TEST SETUP. Connect equipment as shown in test setup diagram (A).

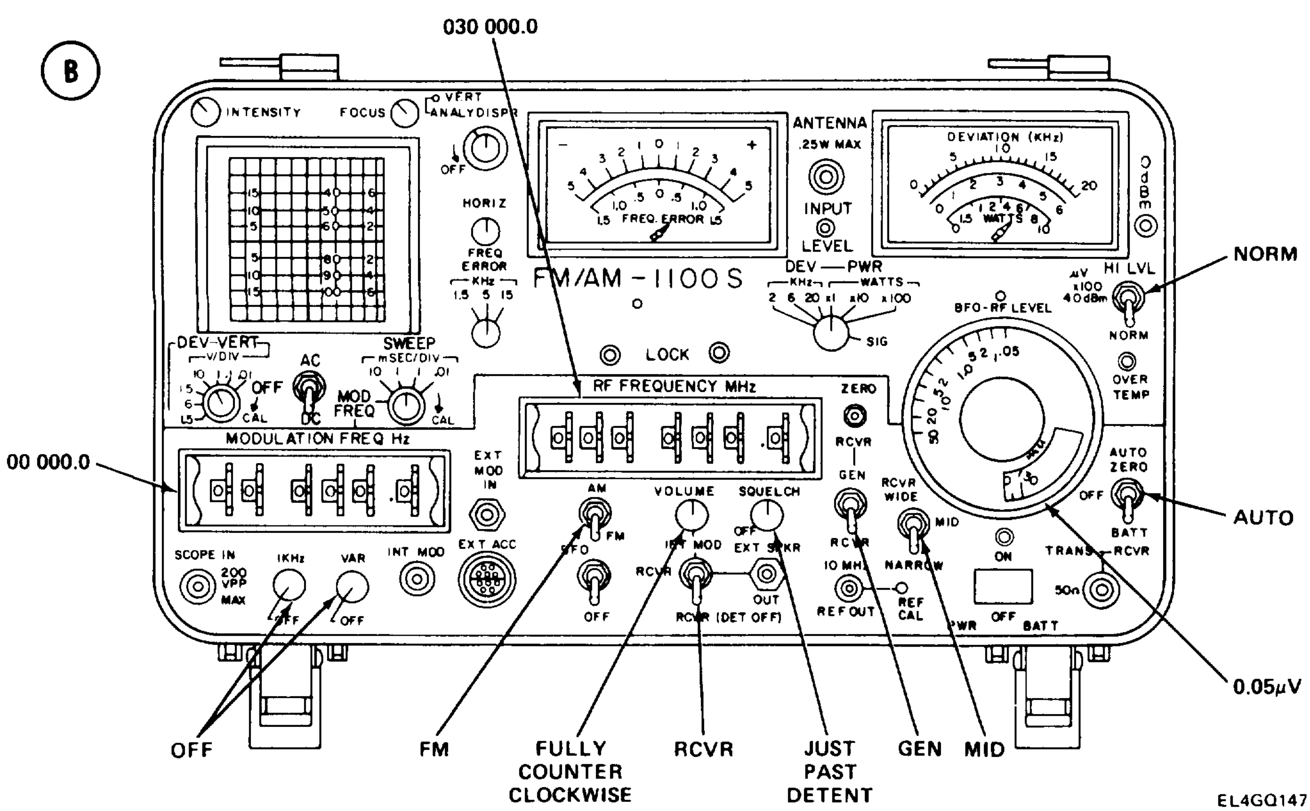


4-5. OLD SQUELCH TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

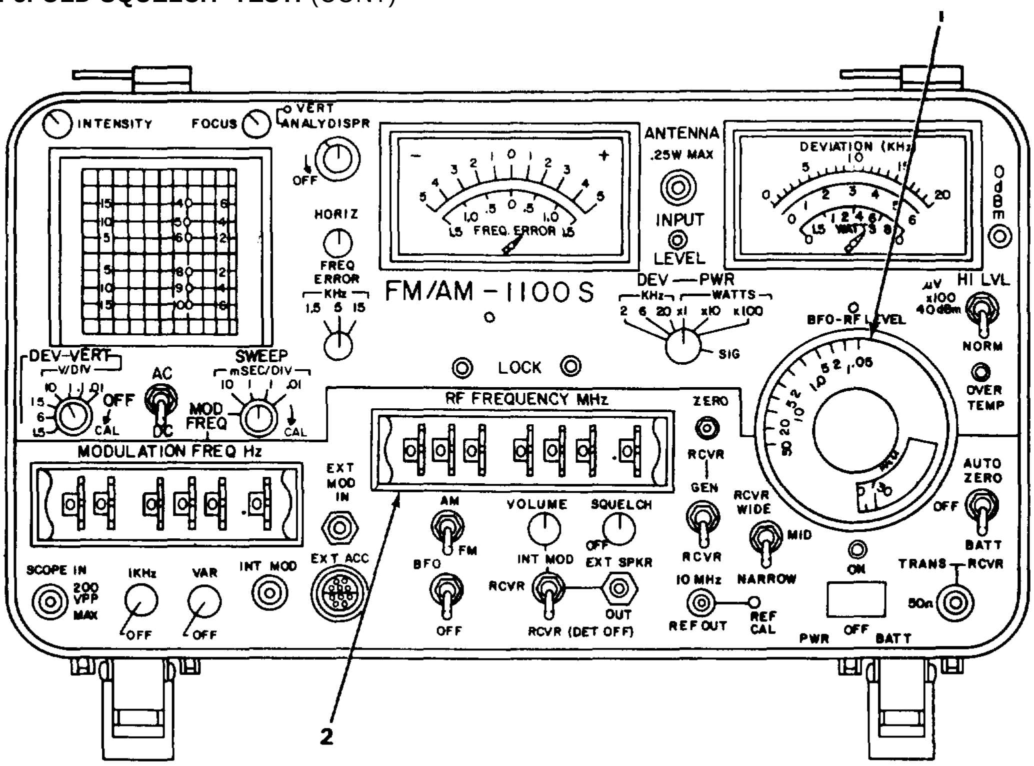
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	SQUELCH	OFF
	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
R-442/VRC	POWER	ON
	VOLUME	Fully counterclockwise
	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	OLD ON
	LIGHT	ON
AN/GRM-114A; MM-100E	See test setup diagram B	



4-5. OLD SQUELCH TEST. (CONT)

(C)



EL4GQ148

OLD SQUELCH Test at 30.00 MHz

1. Turn AN/GRM-114A RF LEVEL control (1) slowly clockwise until CALL lamp lights.

STANDARD. R-442/VRC CALL lamp should light while AN/GRM-114A RF LEVEL is at or below 0.7 Uv.

2. If RF LEVEL control (1) is more than 0.7µv, see troubleshooting chart 4-5.
3. Remove cable from R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should go out.

4. If R-442/VRC CALL lamp does not go out, see troubleshooting chart 4-5.
5. Reconnect cable to R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should light.

6. If CALL lamp does not light, see troubleshooting chart 4-5.

OLD SQUELCH Test at Other Frequencies

7. Return AN/GRM-114A RF LEVEL control (1) to minimum setting.
8. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (3) and R-442/VRC MC-TUNE-KC switch to frequency control settings listed below. Repeat steps 1 through 7 at each frequency.

NOTE

Change R-442/VRC to BAND (B) at 53, 65, and 75 MHz.

4-5. OLD SQUELCH TEST. (CONT)

R-442/VRC SWITCH SETTING	EQUIVALENT AN/GRM-114A THUMBWHEEL SETTING
41.00 MHz	041000.0 Hz
52.00 MHz	052000.0 tiz
53.00 MHz	053000.0 Hz
65.00 MHz	065000.0 Hz
75.00 MHz	075000.0 Hz

4-6. RECEIVER AUDIO POWER TEST.

PURPOSE. This test checks the ability of the R-442/VRC to drive its three audio outputs, namely:

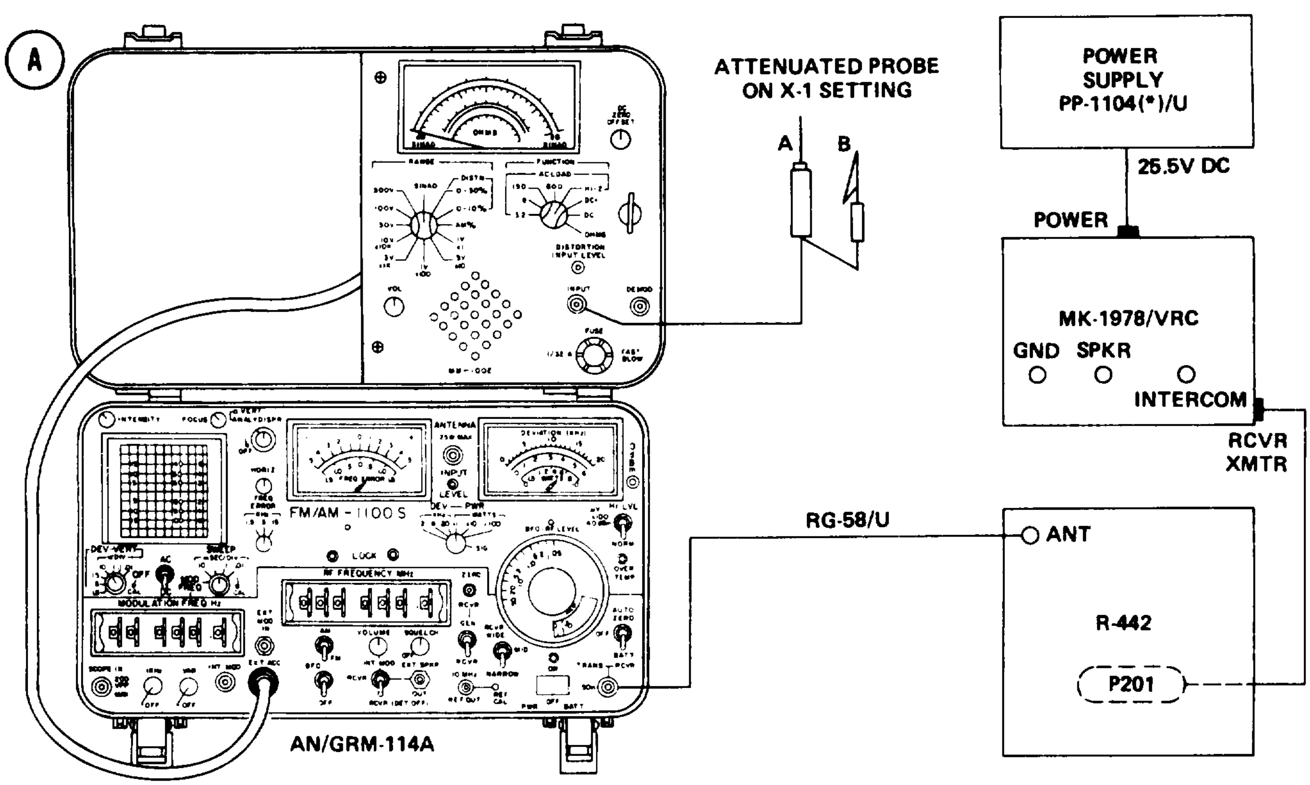
1. The MUTED audio output, which supplies power to the speaker.
2. The UNMUTED audio output, which supplies power to the headphones.
3. The FIXED LEVEL audio output, which supplies power to the interphone system.

An rf level strong enough to drive the A4200 module into limiting (20 µv) is Injected into the R-442/VRC ANTENNA port. The audio output voltages are then measured at the SPKR and INTERCOM jacks of the MK-1978/VRC.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

TEST EQUIPMENT SETUP. Connect equipment as shown in test setup diagram (A)



EL4GQ149

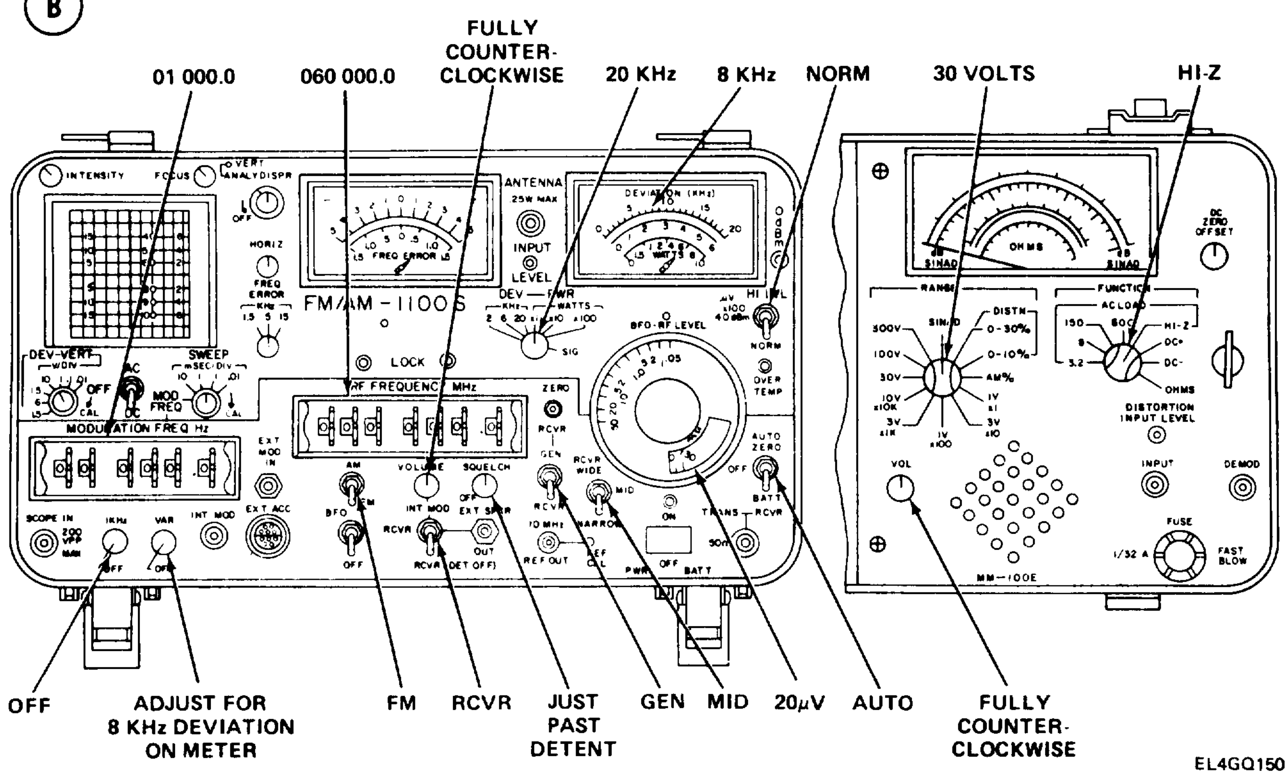
4-6. RECEIVER AUDIO POWER TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER AUDIO KEY X-MODE (RT) SQUELCH	ON MUTED RCVE NORMAL ON
R-442/VRC	BAND MC-TUNE-KC SQUELCH LIGHT VOLUME POWER	B 60.00 OLD OFF ON Fully counterclockwise ON
AN/GRM-114A; MM-100E	See test setup diagram B	

B



4-6. RECEIVER AUDIO POWER TEST. (CONT)

TEST PROCEDURE

Muted Audio Power Test

1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack; connect probe B to GND jack. (See test setup diagram (A), page 4-14.)
2. Turn R-442/VRC VOLUME control fully clockwise.

STANDARD. MM-100E meter should indicate at least 17 volts,

3. If MM-100E meter indicates less than 17 volts, see troubleshooting chart 4-6.

Unmuted Audio Power Test

4. Change MK-1978/VRC AUDIO switch to UNMUTED setting,
5. Change MM-100E RANGE switch 10 volts.

STANDARD. MM-100E should indicate at least 7.75 volts.

6. If MM-100E meter indicates less than 7.75 volts, see troubleshooting chart 4-6.

Fixed Audio Power Test

7. Connect MM-100E attenuated probe A to MK-1978/VRC INTERCOM jack. (See test setup diagram (A).)
8. Change MM-100 RANGE switch to 0.3 volts.

STANDARD. MM-100E should indicate at least 0.16 volts.

9. If MM-100E meter indicates less than 0.16 volts, see troubleshooting chart 4-6.

4-7. RECEIVER AUDIO DISTORTION TEST.

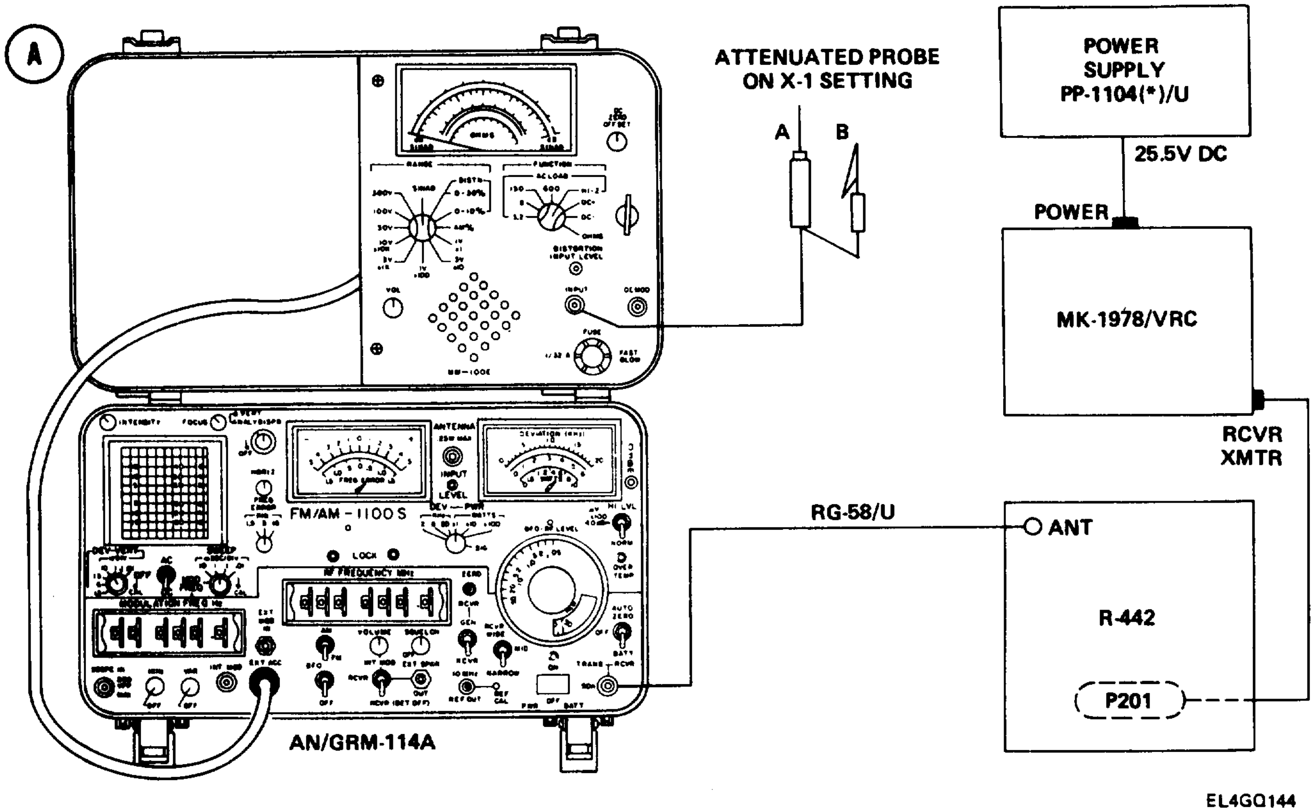
PURPOSE. This test checks the ability of the R-442/VRC to minimize distortion. It is similar to the Receiver Sensitivity Test (paragraph 4-3), except that now a strong (20-µv) rf level is used instead of a weak (0.5-pv) one. The 20-µv rf level is injected into the R.442/VRC ANTENNA port. The audio distortion, measured at the MUTED AUDIO output jack of the MK-1978/VRC, should be less than 8 percent.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G	Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC	Rf Cable RG-58/U

4-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

TEST EQUIPMENT SETUP. Connect test equipment as shown in test setup diagram Ⓐ.



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

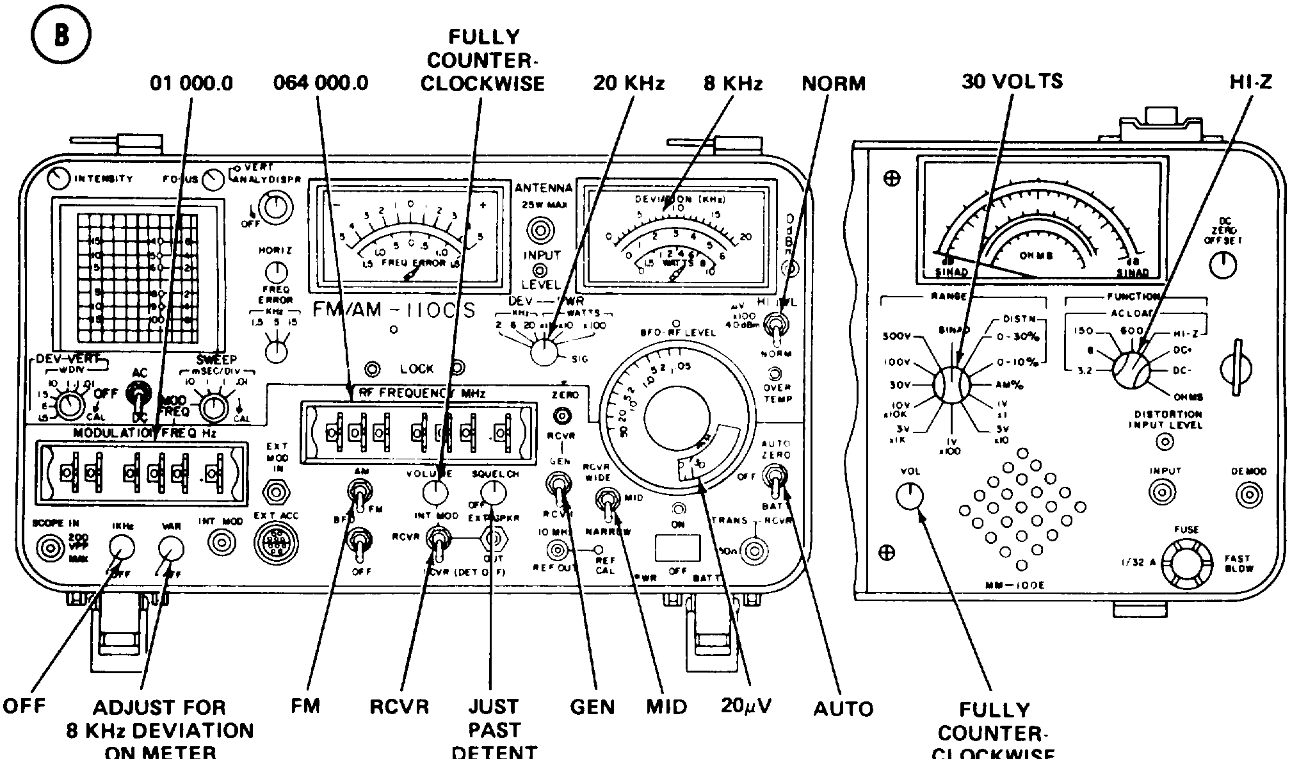
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	AUX RCVR	NORMAL
	X-MODE (RT)	NORMAL
	SQUELCH	ON

4-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/GRM-114A; MM-100E	See test setup diagram B	

B



EL4GQ151

TEST PROCEDURE

1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack; connect probe B to GND jack. (See test setup diagram A, page 4-17.)
2. Adjust R-442/VRC VOLUME control for 17-volt indication on MM-100E meter.
3. Change MM-100E RANGE switch to DIST 0-30%. If meter indicates less than 10 percent, set RANGE switch to 0-10%.

4-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

STANDARD. MM-100E (distortion) meter should indicate less than 8 percent.

4. If MM-100E meter indicates 8 percent or above, see troubleshooting chart 4-7.

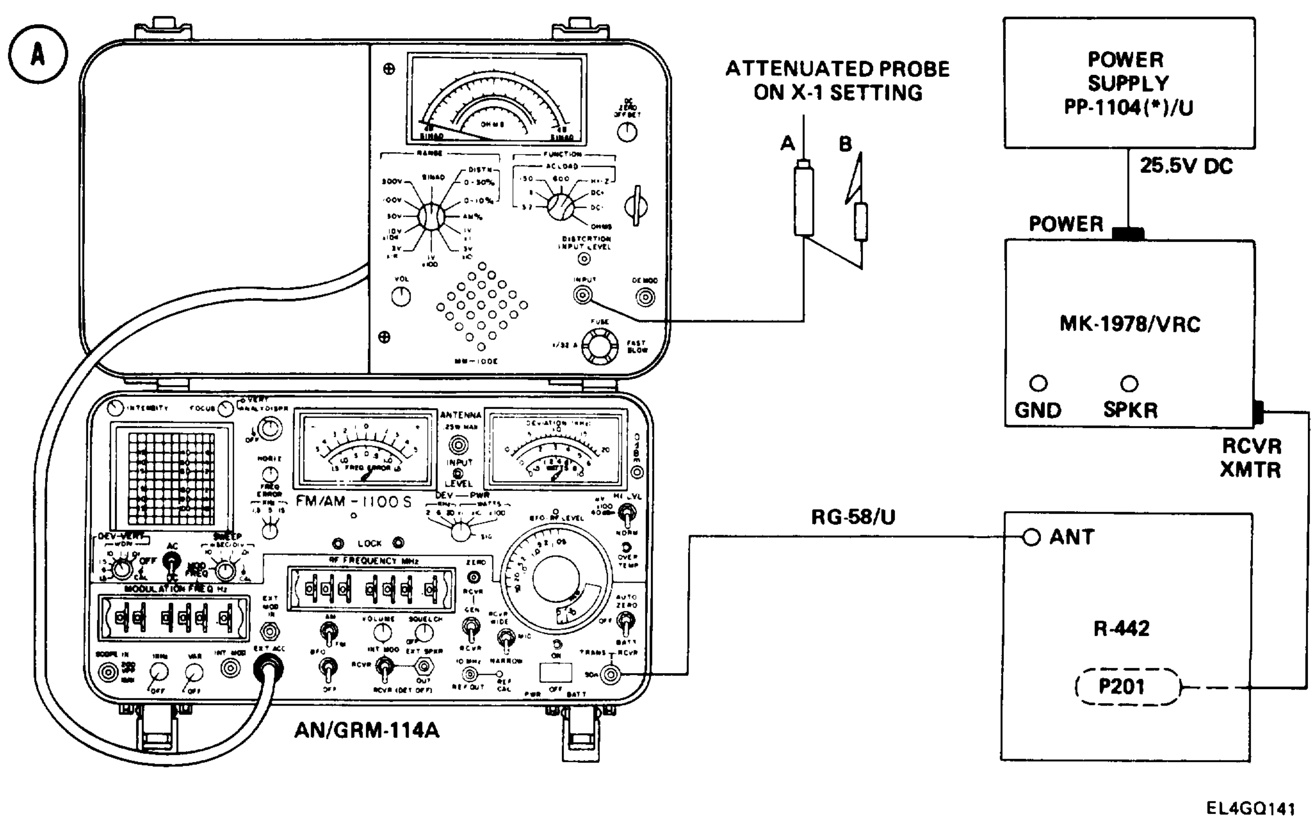
4-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE).

PURPOSE. This test checks the R-442/VRC A5000 tray for a flat response to modulating frequencies at and below 3 kHz. Receiver circuits are said to have a flat response if their gain remains nearly constant over a specified bandwidth. Frequencies not falling within this limited range receive little or no gain. The ability of the R-442/VRC to detect and respond flatly to the desired voice frequencies Is verified by injecting 1 kHz, 500 Hz, and 3 kHz into its ANTENNA port and insuring that the power measured at the SPKR jack of the MK-1978/VRC falls within the required db range.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G	Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC	Rf Cable RG-58/U

TEST EQUIPMENT SETUP. Connect equipment as shown in test setup diagram (A) .

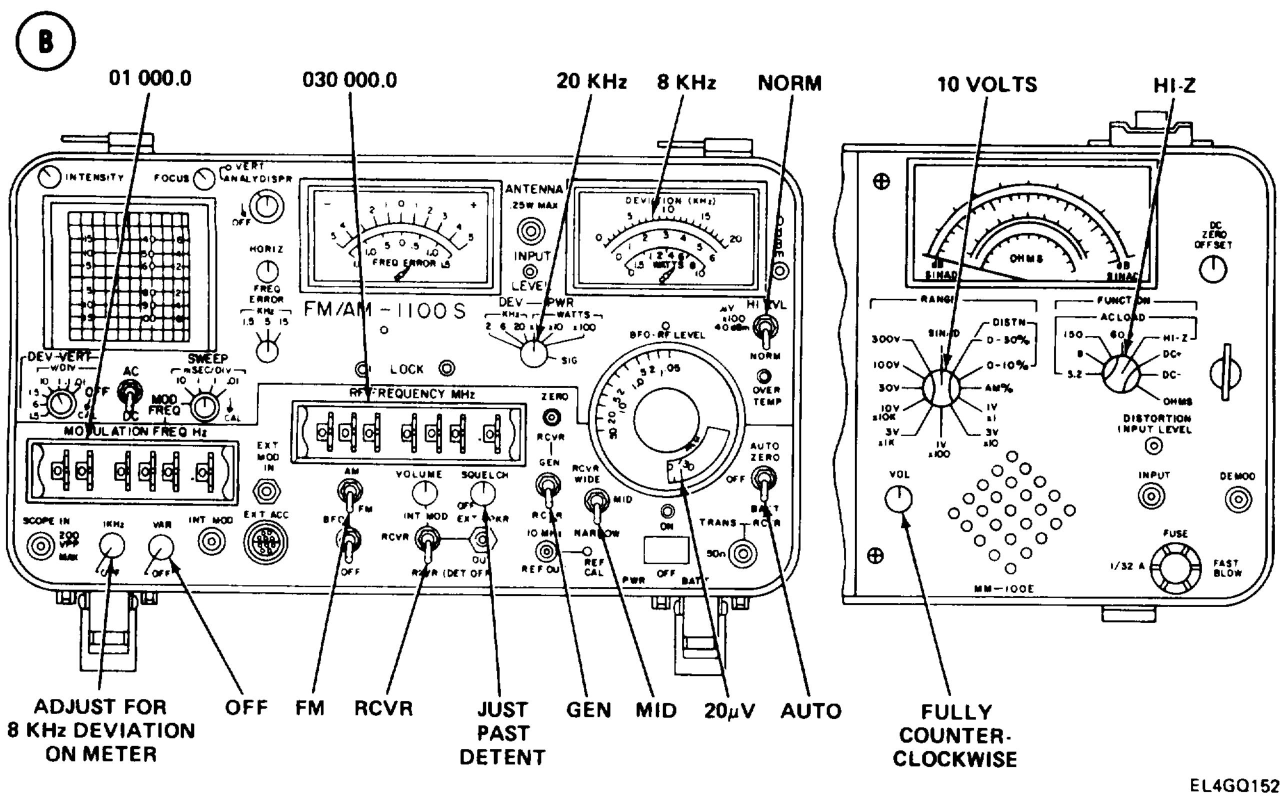


4-8. RECEIVER AUDIO RESPONSE TEST(NORMAL MODE). (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

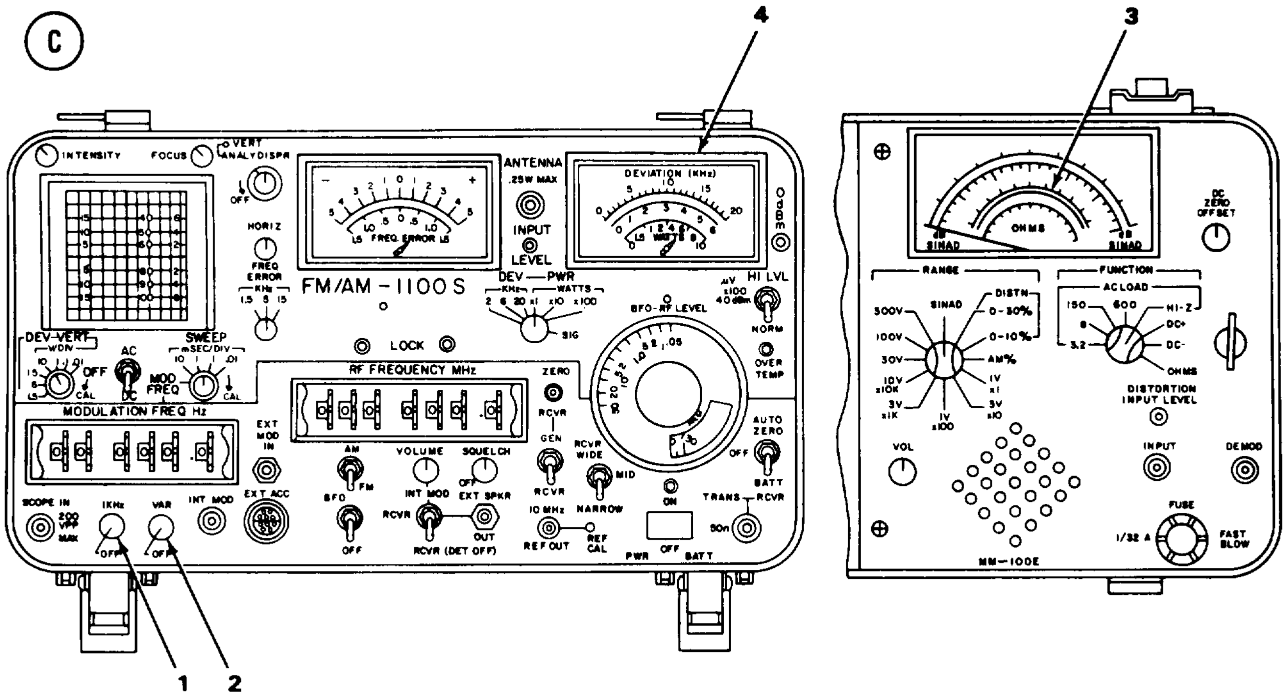
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
	AUX RCVR	NORMAL
	SQUELCH	ON
R-442/VRC	BAND	(A)
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/GRM-114A; MM-100E	See test setup diagram (B))	



4-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

TEST PROCEDURE



EL4GQ153

1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack; connect probe B to GND. (See test setup diagram A, page 4-19.)
2. Adjust R-442/VRC VOLUME control until MM-100E red db scale indicates zero db.
3. Turn AN/GRM-114A 1 kHz/OFF control (1) to OFF.
4. Adjust AN/GRM-114A VAR/OFF control (2) for zero-db indication on red db scale of MM-100E (3).

STANDARD. The AN/GRM-114A DEVIATION meter (4) should indicate 8 kHz.

5. If DEVIATION meter does not indicate 8 kHz, see troubleshooting chart 4-9.

Audio Response Test (Normal Mode) Modulating Frequencies

6. Set AN/GRM-114A MODULATION FREQ Hz thumbwheels to modulating frequencies listed below. Note MM-100E and AN/GRM-114A DEVIATION meter indications.

   a. 2000 Hz
   b. 3000 Hz
   c. 500 Hz
   d. 1000 Hz

STANDARD. MM-100E should indicate 0 ± 2 db and NWGRM-114A DEVIATION meter should indicate 8 kHz at each frequency.

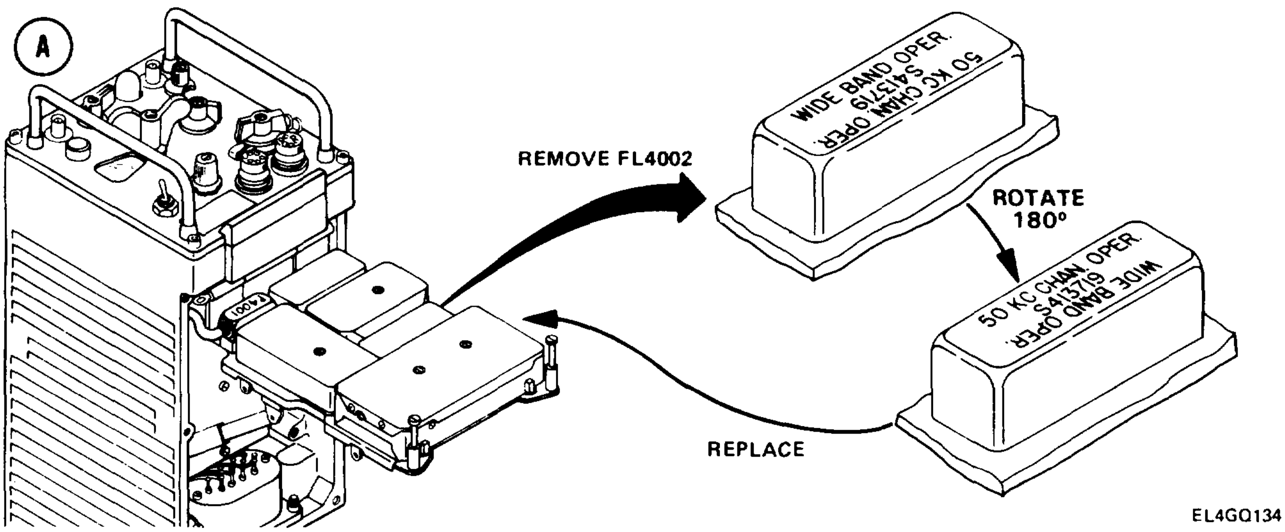
7. If, at any frequency, MM-100E indicates more than 2 db above or below 0 db, or if AN/GRM-114A DEVIATION meter does not indicate 8 kHz, see troubleshooting chart 4-9.

4-9. RECEIVER AUDIO RESPONSE TEST(X-MODE).

PURPOSE. This test is similar to the R-442/VRC Receiver Audio Response Test (Normal Mode). When setup for X-mode, however, the R-442/VRC responds to a wider band of frequencies because the A5000 tray is not used. The ability of the R-442/VRC to detect and respond flatly to the desired intelligence is verified by:

1. Injecting 1-kHz modulation into the R-442/VRC ANTENNA port while measuring the voltage at the MK-1978/VRC X-MODE AUX RCVR jack.
2. Changing the modulation rate to 500 Hz, 3 kHz, 5 kHz, and 10 kHz, while taking db readings at the MK-1978/VRC X-MODE AUX RCVR jack.
3. Comparing the db readings taken in step 2 to the reference voltage taken in step 1 to see if the standard is met.

R-442/VRC X-MODE SETUP PROCEDURE



1. Remove bottom cover from R-442/VRC. (See paragraph 2-7.)
2. Raise A4000 tray and secure brace.
3. Remove Filter FL4002.
4. Rotate Filter FL4002 180 degrees.
5. Put Filter FL4002 back into tray.
6. Set X-MODE-NORMAL Switch S4001, located underneath A4000 tray, to X-MODE position.
7. Release brace and lower A4000 tray.
8. Replace R-442/VRC bottom cover.

TEST EQUIPMENT AND MATERIALS

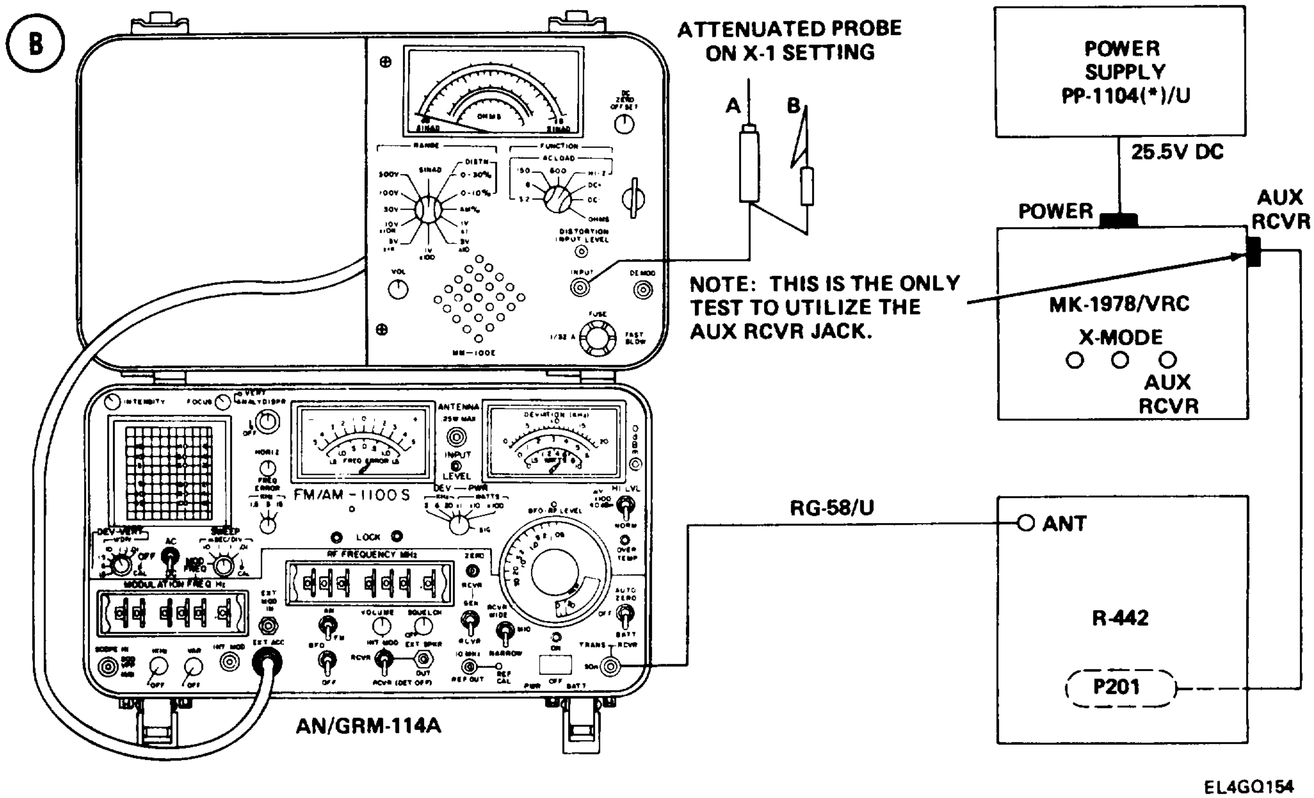
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

4-9. RECEIVER AUDIO RESPONSE TEST(XMODE). (CONT)

TEST SETUP. Connect test equipment as shown in test setup diagram (B)

NOTE

This is the only test to utilize the MK-1978/VRC AUX RCVR jack.



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

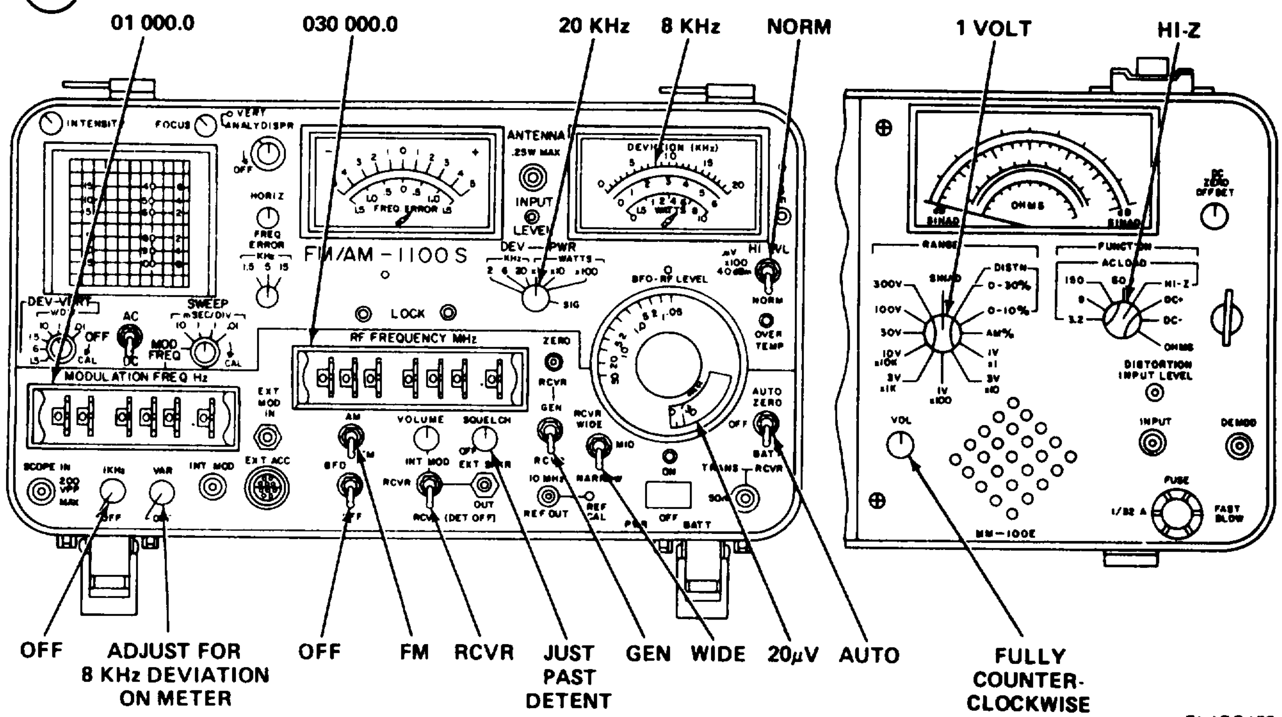
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	AUX RCVR	CIPHER
	SQUELCH	ON
R-442/VRC	BAND	(A)
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

4-9. RECEIVER AUDIO RESPONSE TEST (X-MODE). (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM-114A; MM-100E	See test setup diagram C	

C



EL4GQ156

TEST PROCEDURE

Audio Response Test (X-Mode) at 1000 Hz

1. Connect MM-100E probe A to MK-1978/VRC AUX RCVR jack (inside X-MODE square); connect probe B to GND jack. (See test setup diagram B , page 4-23.) Note meter indication.

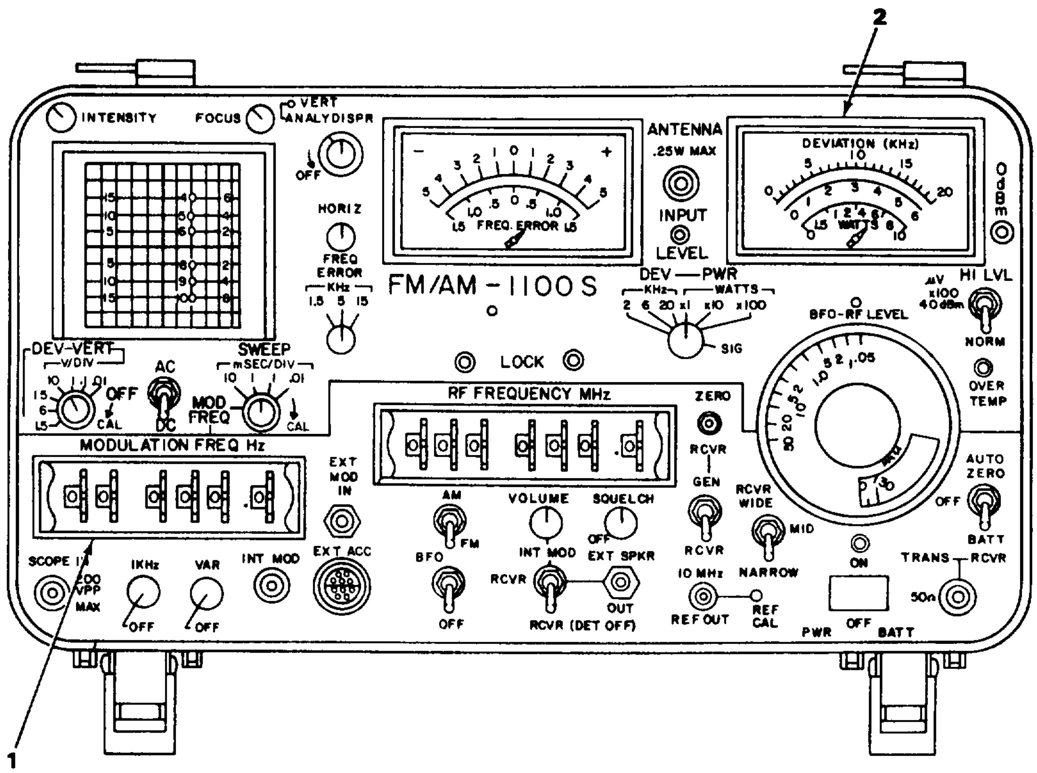
STANDARD. MM-100E meter should indicate at least 0.78 volts.

2. If ME-30(*)/U does not indicate at least 0.78 volts, see troubleshooting chart 4-8.

4-9. RECEIVER AUDIO RESPONSE TEST (X- MODE). (CONT)

Audio Response Test (X-Mode) at Other Modulating Frequencies

D



EL4GQ156

3. Set AN/GRM-114A MODULATION FREQ Hz thumbwheels (1) to modulating frequencies listed below. Note MM-100E meter and AN/GRM-114A DEVIATION meter(2) indications.

   a. 03000.0 Hz
   b. 05000.0 Hz
   c. 10000.0 Hz
   d. 00500.0 Hz

STANDARD. MM-100E meter should indicate between + 2 db and -3 db of reading noted in step 1, and AN/GRM-114A DEVIATION meter should indicate 8 kHz at each frequency.

4. If MM-100E meter does not indicate between + 2 db and -3 db of reading noted in step 1, or if AN/GRM-114A DEVIATION meter does not indicate 8 kHz at each frequency, see troubleshooting chart 4-8.

NOTE

Before performing any other test in this section, see R-442 X-MODE Setup Procedure (page 4-22) and do the following:

Set X-Mode-Normal Switch S4001 to NORMAL.
Return filter FL4002 to its original position.

4-10. RECEIVER SELECTIVITY TEST.

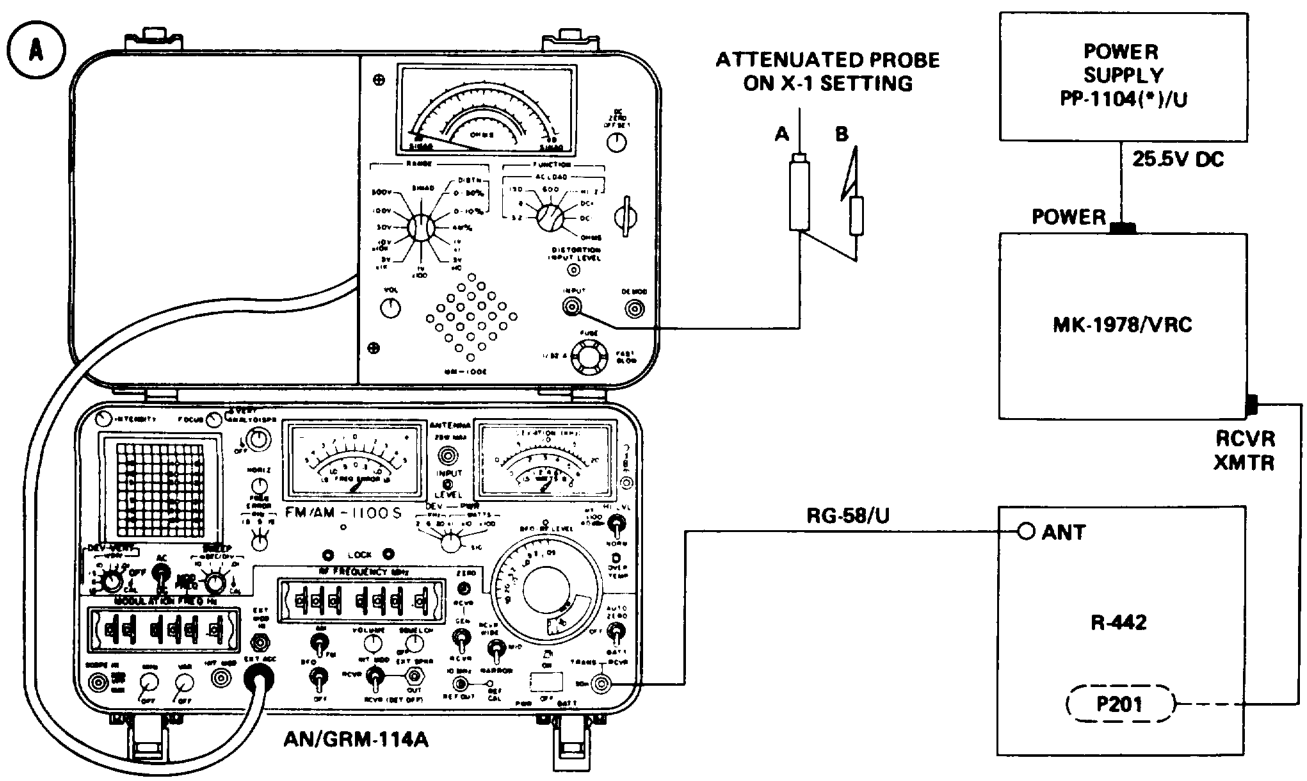
PURPOSE. This test checks the ability of the R-442/VRC A4000 tray IF Filters FL4001 and FL4002 to reject unwanted signals and, thus, determine bandwidth. The R-442/VRC should have a minimum bandwidth of 32 kHz at the filters' 6-db attenuation point and a maximum bandwidth of 80 kHz at their 60db attenuation point. This is verified by:

1. Finding the minimum rf level which must be injected into the R-442/VRC ANTENNA port to cause the CALL lamp to light.
2. Injecting twice the rf level found in step 1, while observing that the R-442/VRC CALL lamp Is lit when the frequency is offset k± 16 kHz from the carrier.
3. Injecting 1000 times the rf level found in step 1, while observing that the R-442/VRC CALL lamp Is off when the frequency is offset more than ± 40 kHz from the carrier.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Maintenance Klt MK-1978/VRC
Test Set AN/GRM-114A
Rf Cable RG-58/U

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



EL4GQ144

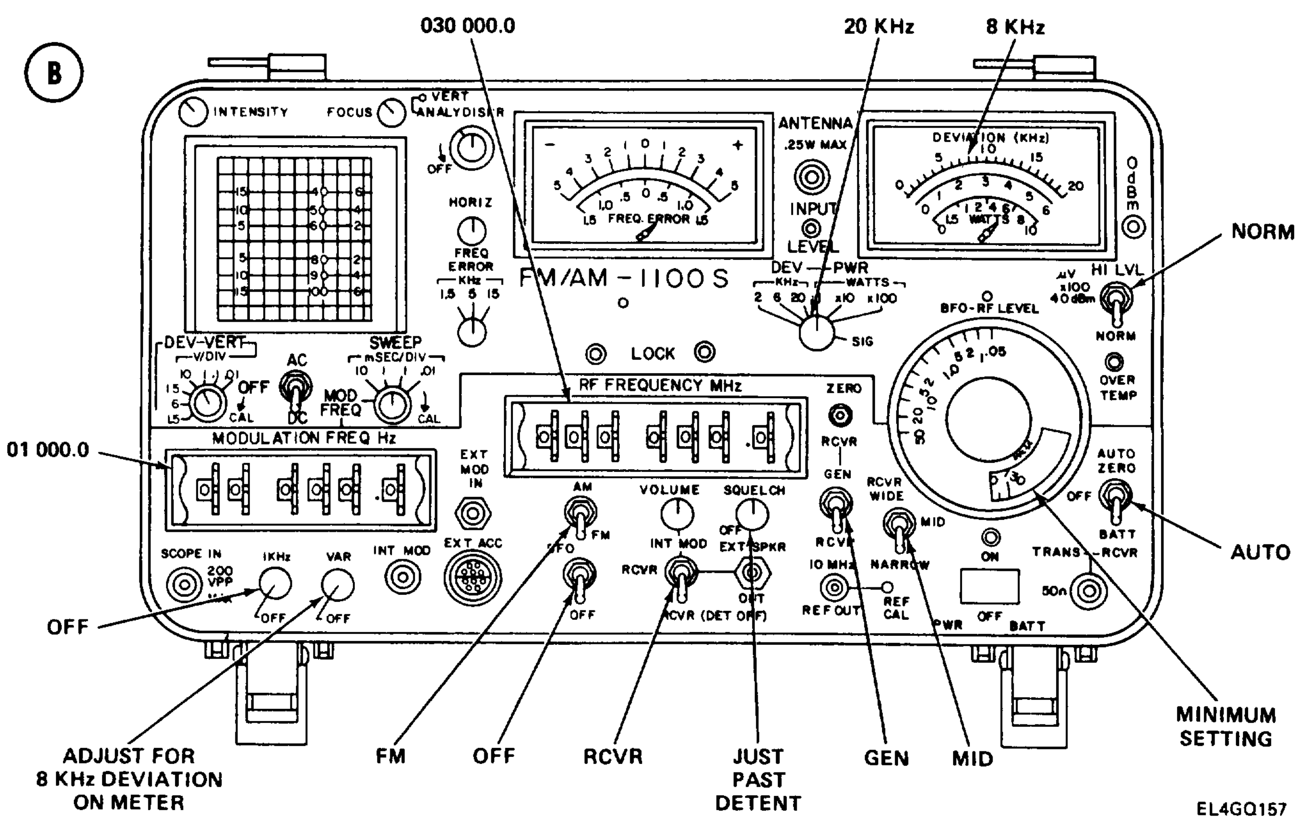
4-10. RECEIVER SELECTIVITY TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

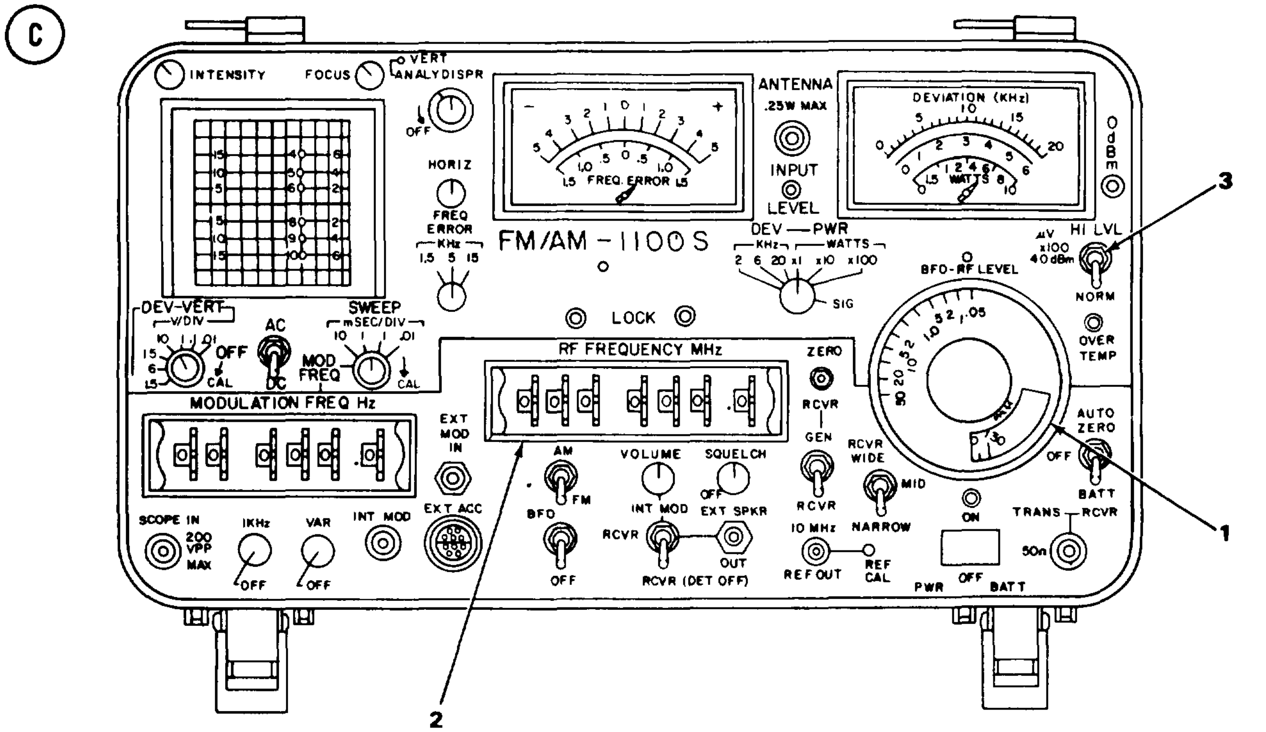
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	SQUELCH	ON
	AUX POWER	ON
	AUDIO	MUTED
	KEY	RCVE
	X-MODE (RT)	NORMAL
R-442/VRC	POWER	ON
	VOLUME	Fully counterclockwise
	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	OLD ON
	LIGHT	ON
AN/GRM-114A; MM-100E	See test setup diagram B	

B



4-10. RECEIVER SELECTIVITY TEST. (CONT)

TEST PROCEDURE



EL4GQ158

1. Turn AN/GRM-114A RF LEVEL control (1) slowly clockwise until R-442/VRC CALL lamp lights. Note RF LEVEL setting.
2. Increase RF LEVEL to twice indication noted in step 1.

STANDARD. R-442/VRC CALL lamp should stay lit.

3. If R-442/VRC CALL lamp goes off, see troubleshooting chart 4-10.
4. Set AN/GRM-114A RF FREQUENCY M1-fz thumbwheels (2) to 030019.0 (30.019 MHz).

STANDARD. R-442/VRC CALL lamp should go off.

5. If R-442/VRC CALL lamp stays lit, see troubleshooting chart 4-10.
6. Decrease AN/GRM-114A RF FREQUENCY MHz thumbwheel setting (2) in 1-kHz steps until R-442/VRC CALL lamp lights. Note FREQUENCY MHz setting (2).
7. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (2) to 029981.0 (29.981 MHz).

STANDARD. R-442/VRC CALL lamp should go off.

8. If R-442/VRC CALL lamp stays lit, see troubleshooting chart 4-10.
9. Increase AN/GRM-114A RF FREQUENCY MHz thumbwheel setting (2) in 1-kHz steps until R-442/VRC CALL lamp lights. Note RF FREQUENCY MHz setting (2).
10. Subtract frequency noted in step 9 from frequency noted in step 6.

4-10. RECEIVER SELECTIVITY TEST. (CONT)

STANDARD. The difference between the two frequencies should beat least 32 kHz.

11. If difference between frequencies noted in step 9 and step 6 is less than 32 kHz, see troubleshooting chart 4-10.
12. Set AN/GRM-114A HI LVL/µV x 100/NORM switch (3) to µV x 100.
13. increase AN/GRM-114A RF LEVEL control (1) to ten times indication noted in step 1.
14. Set AN/GRM-114A RF FREQUENCY MHz thumbwheeis (2) to 030 041.0 (30.014 MHz).

STANDARD. R-442/VRC CALL lamp should go off.

15. If R-442/VRC CALL lamp stays iit, see troubleshooting chart 4-10.
16. Decrease AN/GRM-114A RF FREQUENCY MHz thumbwheel setting (2) in 1-kHz steps until R-442/VRC CALL lamp lights. Note RF FREQUENCY MHz setting (2).
17. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (2) to 029 959.0 (29.959 MHz).

STANDARD. R-442/VRC CALL lamp should go off.

18. If R-442/VRC CALL lamp stays lit, see troubleshooting chart 4-10.
19. increase AN/GRM-114A RF FREQUENCY MHz thumbwheel settings (2) in 1-kHz steps until R-442/VRC CALL lamp iights. Note RF FREQUENCY MHz setting (2).
20. Subtract frequency noted in step 19 from frequency noted in step 16.

STANDARD. The difference between the two frequencies should be 80 kHz or less.

21. If difference between frequencies noted in step 19 and step 16 is more than 80 kHz, see troubleshooting chart 4-10.

Section II TROUBLESHOOTING

4-11. GENERAL.

This section contains troubleshooting charts which will help you diagnose failures in the R-442/VRC receiver. The troubleshooting charts are designed to isolate faults in responseto specific performance problems noted during performance testing in section I of this chapter.

There are two basic kinds of troubleshooting charts provided: gross faiiure troubleshooting and performance degradation troubleshooting. Both kinds of troubleshooting in this section are basedon the use of Test Set AN/GRM-114A and Maintenance Kit MK-1978/VRC.

GROSS FAILURE TROUBLESHOOTING

Gross failure troubleshooting is generated by failureof the VOLUME control test, the first of the performance tests in section I of this chapter. Failure of the VOLUME control test indicates that no audio at all is available at the receiver's loudspeaker jack. This implies a total failure of some module or component resulting in complete loss of signal.Therefore, the gross troubleshooting charts are designed to help you locate the failed module or component, with the assumption that the failed part does not operate at all.

This assumption differs from the approach taken in performance degradation troubleshooting, which assumes that a module or component may be responsible for slight defect symptoms because the part may be only partially operational.

PERFORMANCE DEGRADATION TROUBLESHOOTING

When the receiver produces audio output, but the signal fails to meet certain standards, the receiver's performance is considered degraded. Degraded performance can result in weak audio, limited reception range, distortion, and many other problems.

4-11. GENERAL. (CONT)

The troubleshooting charts are designed to locate the cause of the performance degradation by using procedures more complex than those utilized for gross troubleshooting. Added complexity is due to the fact that the troubleshooting tests must evaluate the quality of the signals at various test points, instead of merely confirming the presence of signals as is usually the case in gross troubleshooting.

OVERALL TROUBLESHOOTING APPROACH

Both kinds of troubleshooting charts contained in this section are intended for use based on the following assumptions in connection with the R-442/VRC:

1. Only one malfunction exists which is causing the defect symptom.
2. The troubleshooting charts do not isolate every possible defect.
3. Failure to locate a defect using the charts suggests a wiring-related problem which can be isolated using the schematics located in the back of this manual.
4. Troubleshooting procedures for germanium and silicon versions of the R-442/VRC are the same.

4-12. GROSS TROUBLESHOOTING PRELIMINARY INSTRUCTIONS.

The gross troubleshooting charts in this section are based on the assumption that the receiver fails the VOLUME control test at any frequency setting of the MC-TUNE-KC control. However, certain defects in the crystal reference system can result in loss of audio at some frequencies while the receiver can function normally at other frequency settings.

Before proceeding with the steps given in the gross troubleshooting charts, determine whether or not the failure of the volume control test conforms to any of the following failure modes.

FAILURE MODE	CAUSE	CORRECTION
No audio on all channels ending in "0", (eg, 30.00, 30.10,30.20,etc)	Crystal Y2012 (5.65 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on all channels ending in "5", (eg, 30.05, 30.15,30.25,etc)	Crystal Y2011 (5.60 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on the same 100-kHz segment for each MHz of tuning	Defective interpolation oscillator crystal	Replace A2000 assembly. See interpolation oscillator crystal chart.

4-12. GROSS TROUBLESHOOTING PRELIMINARY INSTRUCTIONS. (CONT)

INTERPOLATION OSCILLATOR CRYSTAL CHART

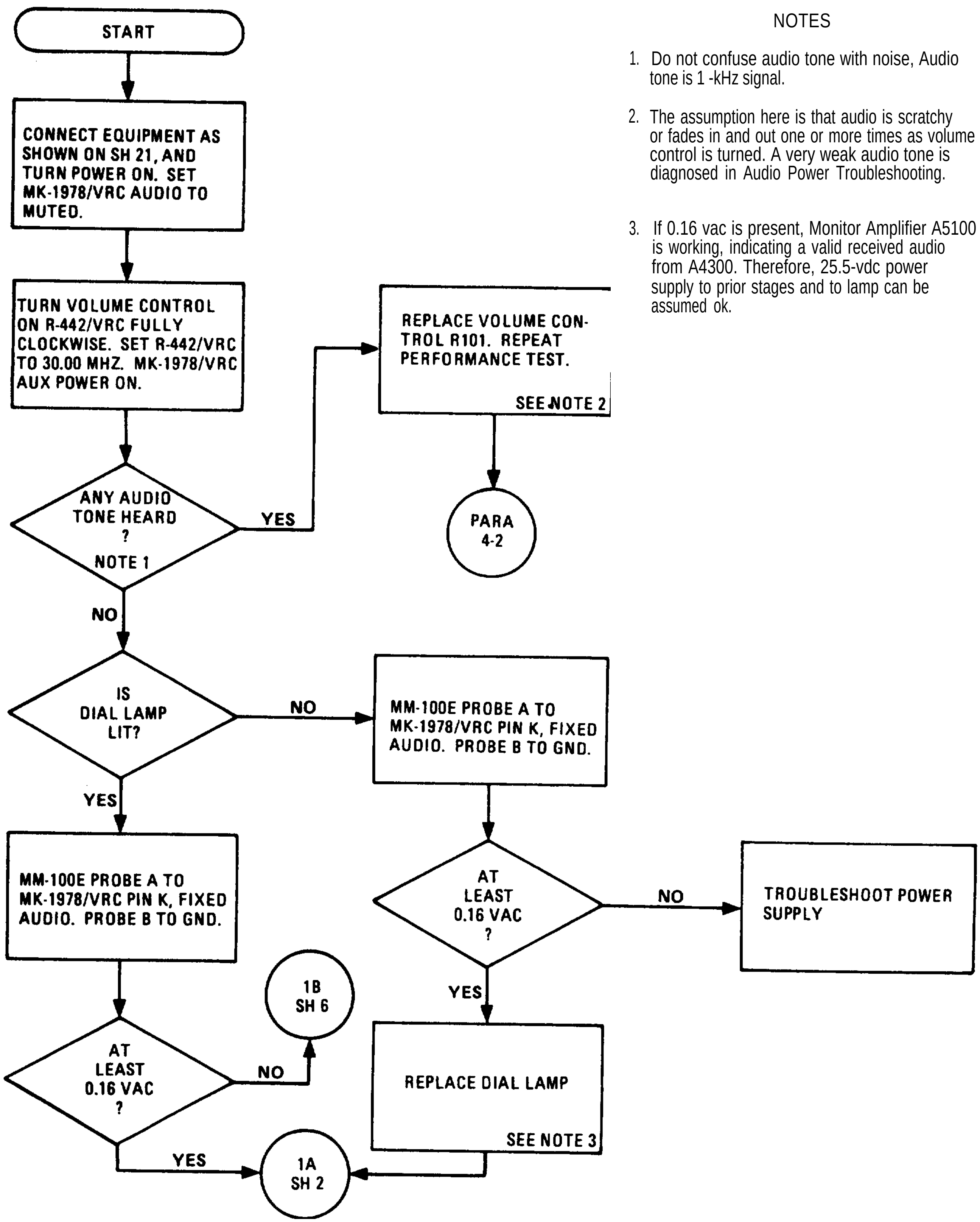
The following chart is used to isolate the particular crystal responsible for audio failure in the same 100-kHz segment for each MHz of tuning. In this failure mode, if audio is absent at 30.05 and 30.10, it will be absent at 40.05 and 40.10; 50.05 and 50.10; etc.

INTERPOLATION OSCILLATOR CRYSTAL CHART

SEGMENT OF KC CONTROL WHERE AUDIO IS ABSENT	CAUSE	CORRECTION
05 and 10	Crystal Y2007	Replace A2000 assembly.
15 and 20	Crystal Y2008	Replace A2000 assembly.
25 and 30	Crystal Y2009	Replace A2000 assembly.
35 and 40	Crystal Y2010	Replace A2000 assembly.
45 and 50	Crystal Y2005	Replace A2000 assembly.
55 and 60	Crystal Y2004	Replace A2000 assembly.
65 and 70	Crystal Y2003	Replace A2000 assembly.
75 and 80	Crystal Y2002	Replace A2000 assembly.
85 and 90	Crystal Y2001	Replace A2000 assembly.
95 and 100	Crystal Y2006	Replace A2000 assembly.

4-13. TROUBLESHOOTING FLOW CHARTS.

CHART 4-1
No Audio Troubleshooting
(Sheet 1 of 25)

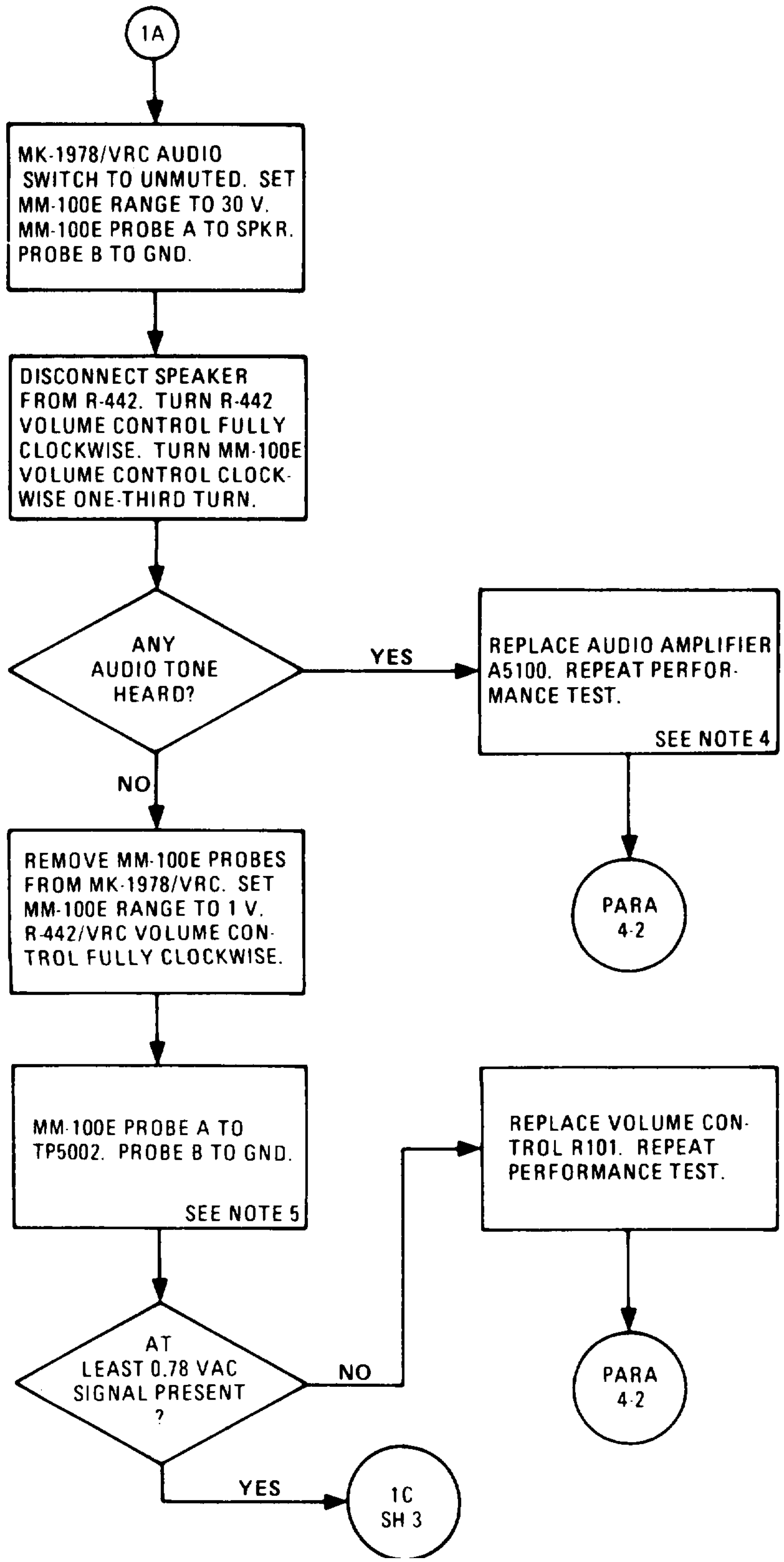


NOTES

1. Do not confuse audio tone with noise, Audio tone is 1 -kHz signal.
2. The assumption here is that audio is scratchy or fades in and out one or more times as volume control is turned. A very weak audio tone is diagnosed in Audio Power Troubleshooting.
3. If 0.16 vac is present, Monitor Amplifier A5100 is working, indicating a valid received audio from A4300. Therefore, 25.5-vdc power supply to prior stages and to lamp can be assumed ok.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 2 of 25)



NOTES

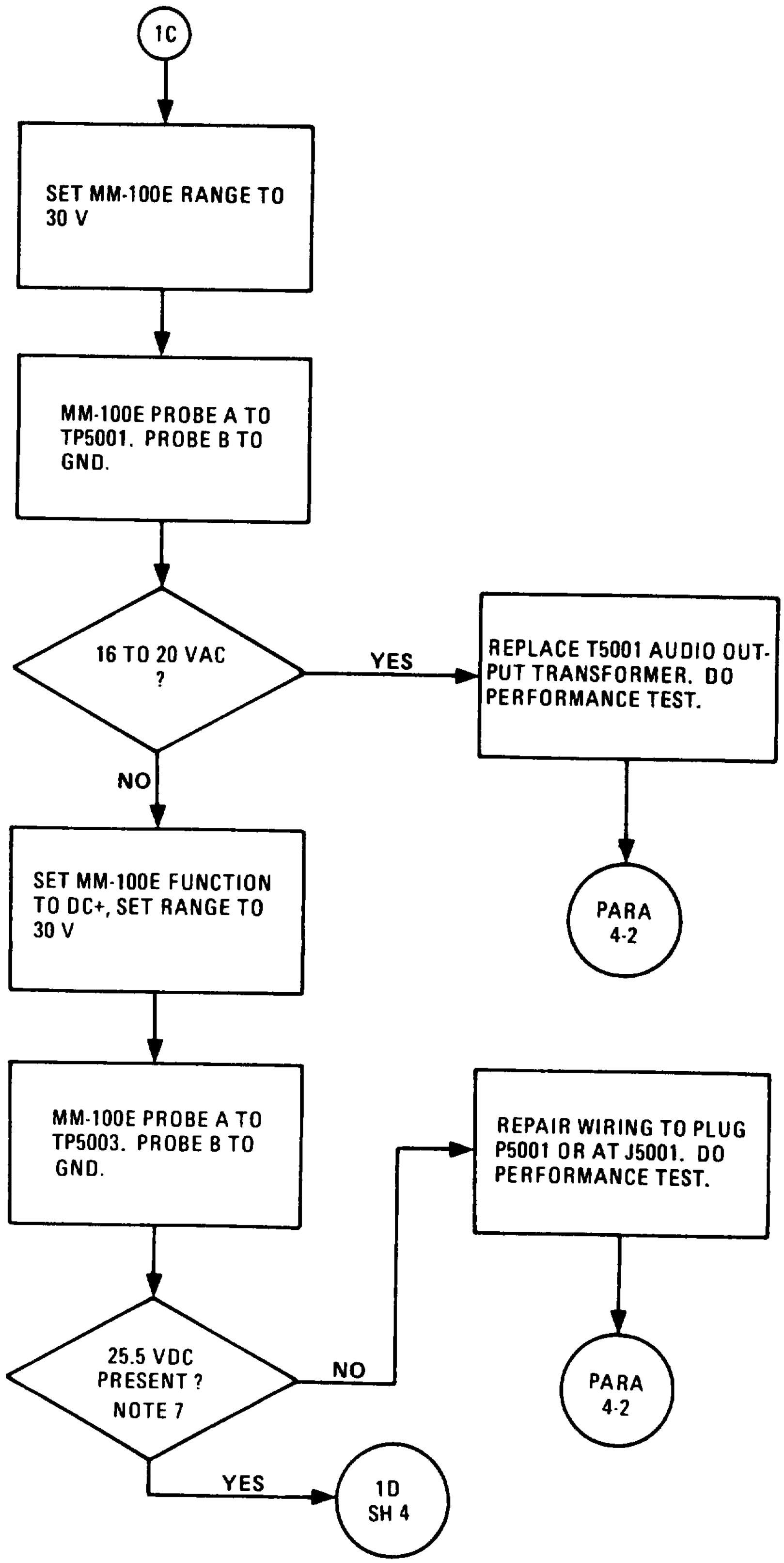
4. Presence of unmuted audio indicates good Audio Transformer T5001 and probable bad Resistor R5117 in A5100.

5. Be sure that R-442/VRC VOLUME control is fully clockwise.

6. Signal at TP5009 is assumedbecause fixed audio is ok, indicating that FL5001 is good. The 0.78wac value is approximate and can be as high as 1.1 v.

4-13. TROUBLESHOOTING FLOW CHART (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 3 of 25)

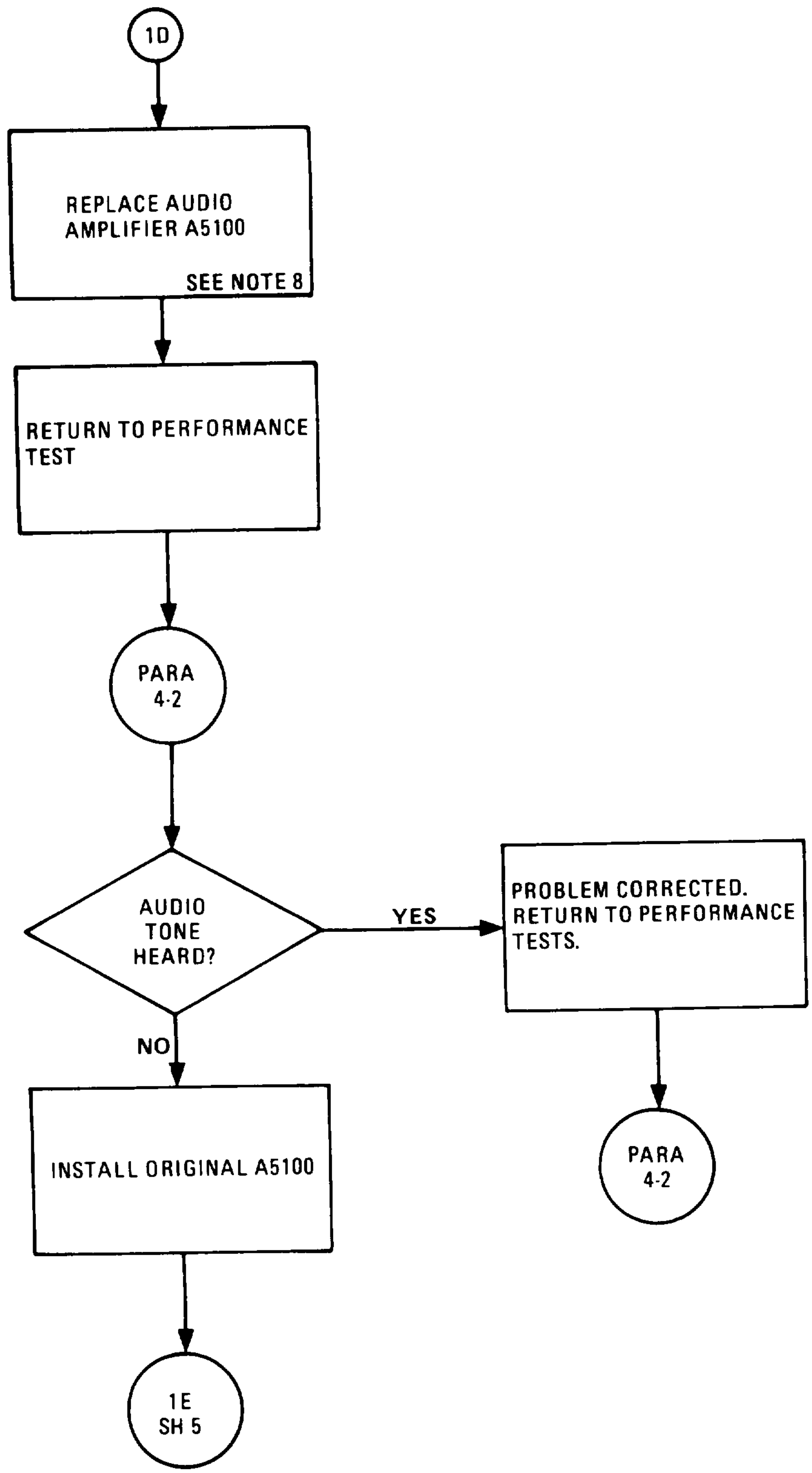


NOTE

7, See Note 3, Sh 1. Possibility of failure of 25.5-vdc supply localized to A5000 stages is small. However, check is aasy to do; therefore it is covered in this procedure.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 4 of 25)

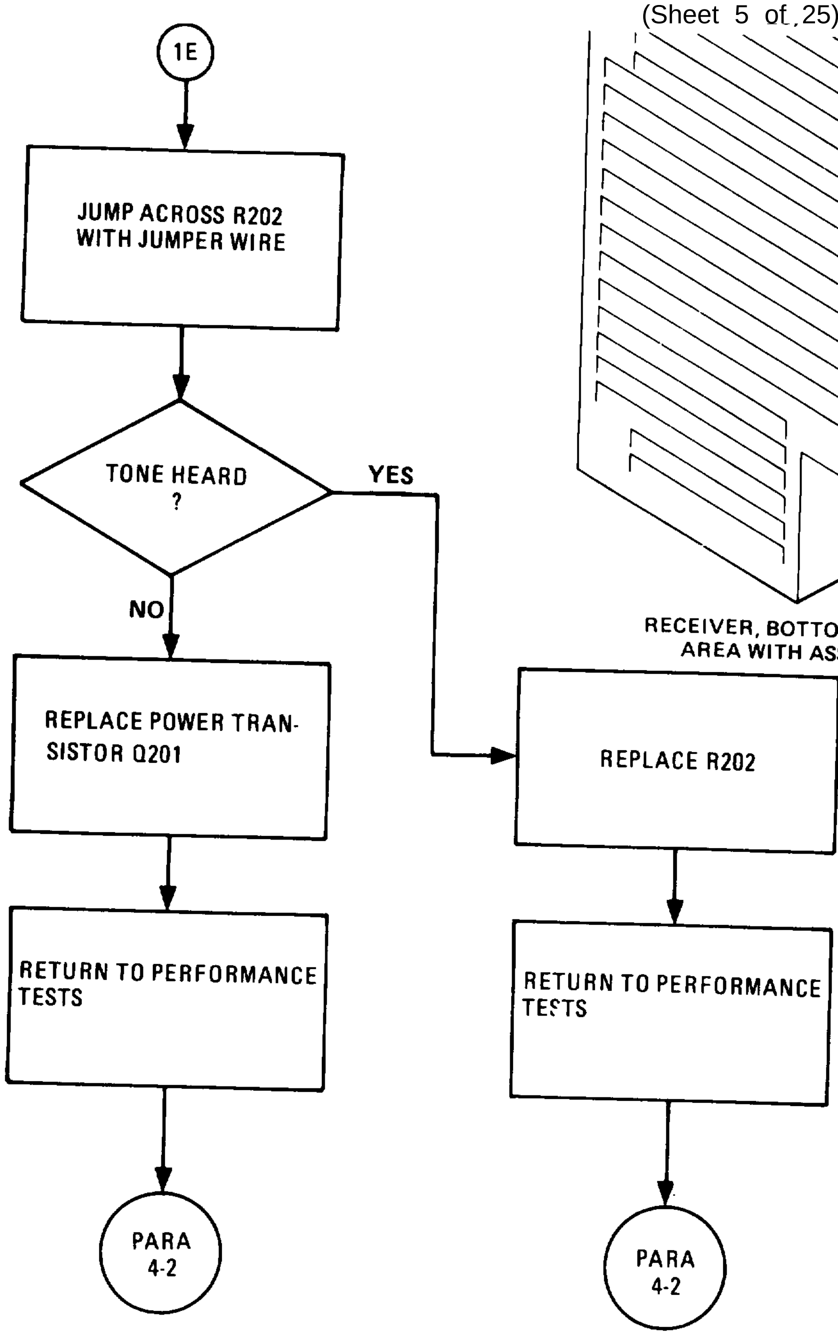


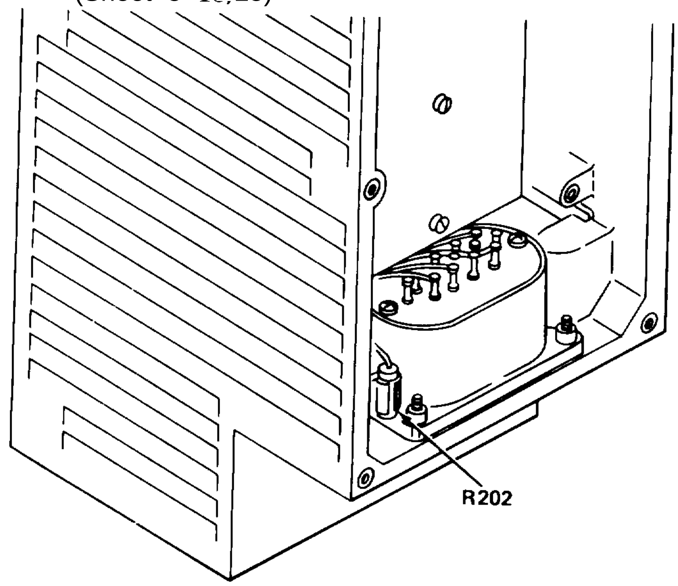
NOTES

8. Due to limited number of test points, component substitution is sometimes necessary. Absence of signal at TP5001 could be due to failed Power Transistor 0201 or Resistor R202. These components are difficult to test directly and much more difficult to substitute than the A5100 assembly.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 5 of 25)



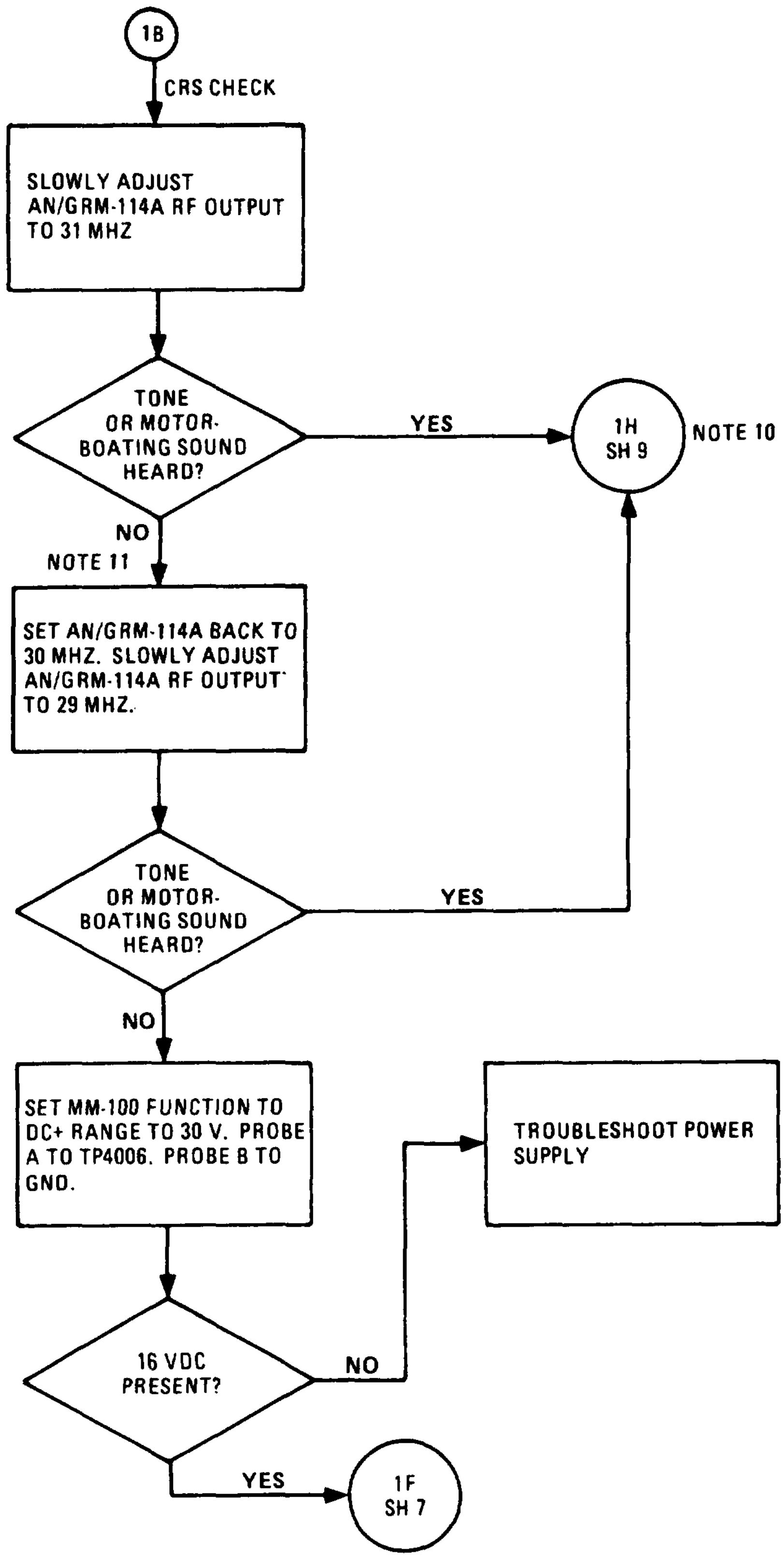


RECEIVER, BOTTOM VIEW OF CONNECTOR P201 AREA WITH ASSEMBLY A1000 REMOVED

EL4GQ210

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 6 of 25)



NOTES

9. MM-100 FUNCTION to HI-Z. RANGE to 30 V. Probe A to MK-1978:VRC SPKR, Probe B tO GND.

10. Keep in mind that this entire troubleshooting procedure assumes one total component failure, causing absence of an audio signal. This simple check can quickly isolate a bad CRS.

11. An alternate mathod of checking for a bad CRS is to ground TP3001 in the A3000 assembly while the AN/GRM. 114A rf output is variad ±1 MHz. If the audio tone is heard when TP3001 is grounded, it means that the CRS is bad. If so, go to 1H, Sh 9.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 7 of 25)

IF — A4000 CHECK

TURN OFF POWER TO AN/GRM-114A

REMOVE AN/GRM-114A RF CABLE FROM R-442/VRC ANTENNA PORT

FREE END TO SMC #222. REMOVE P1005 FROM A1000 TRAY. P1005 TO SMC #222.

SET AN/GRM-114 FREQUENCY MHZ THUMBWHEELS TO 011 500.0 (11.5 MHZ)
SEE NOTE 12

TURN ON POWER TO AN/GRM-114A

SET AN/GRM-114A RF OUTPUT TO 50 μV. SET MM-100E AS PER NOTE 13.

AUDIO TONE HEARD?
YES — 1N SH 15
NO

MM-100 FUNCTION TO HI-Z. RANGE TO 1 V. PROBE A TO TP5013. PROBE B TO GND.

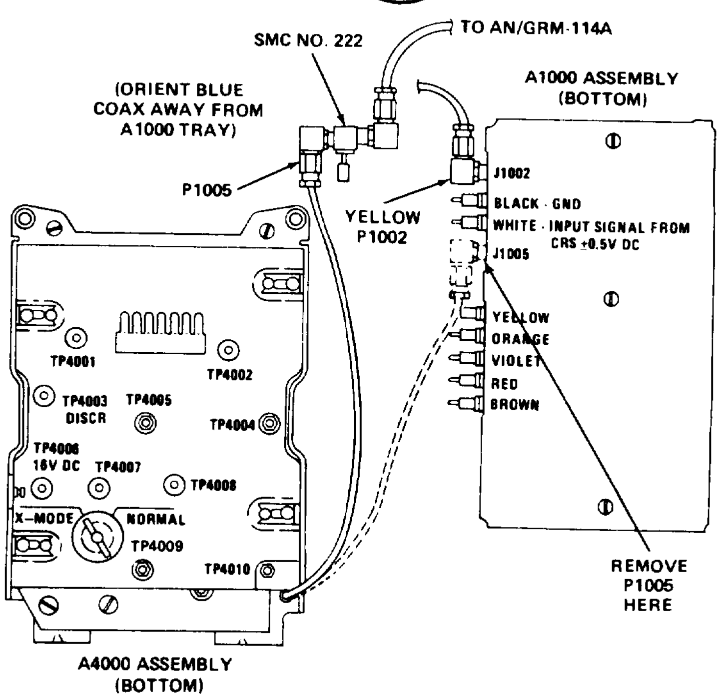
0.78 VAC PRESENT? NOTE 14
NO — 1Q SH 18
YES — 1G SH 8

NOTES

12. MODULATION FREQI Hz remains at 1000.0. Keep deviation at 8 kHz.

13. MM-100E RANGE to 30 V. FUNCTION to HI-Z. Probe A to MK-1978/VRC SPKR. Probe B to GND.

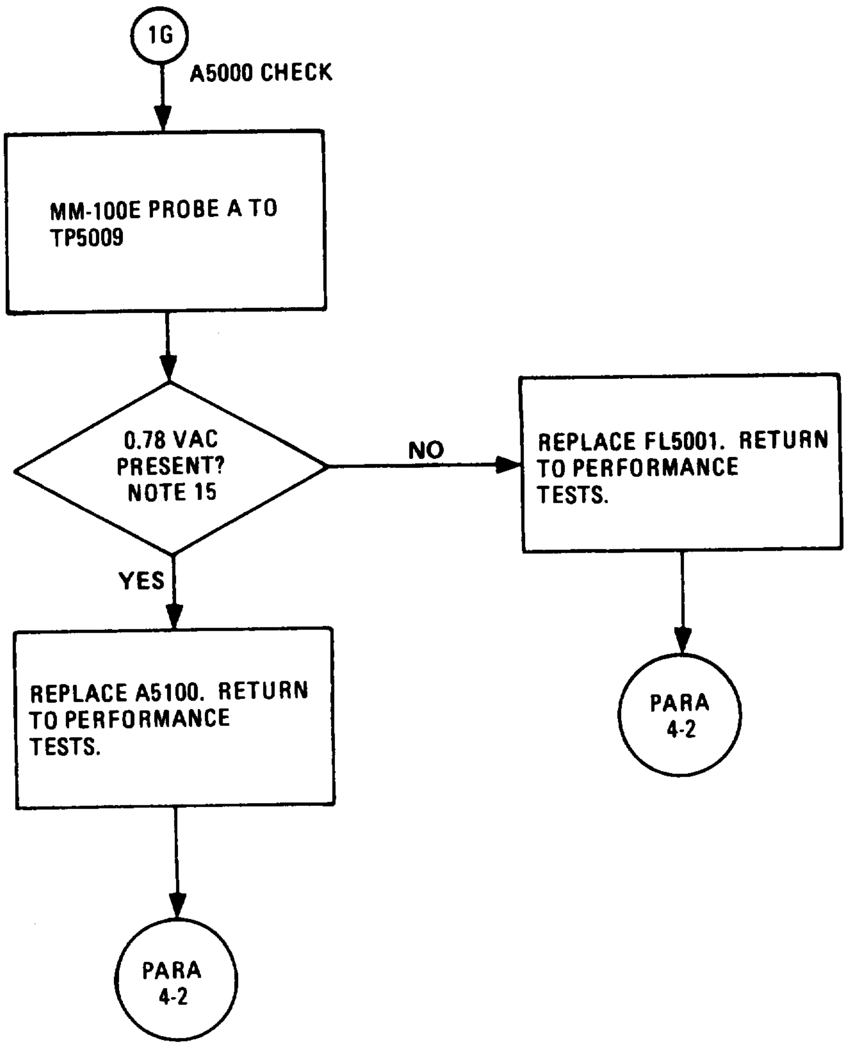
14. Voltage can vary from 0.78 to 1.1 vac.



EL4GQ214

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 8 of 25)

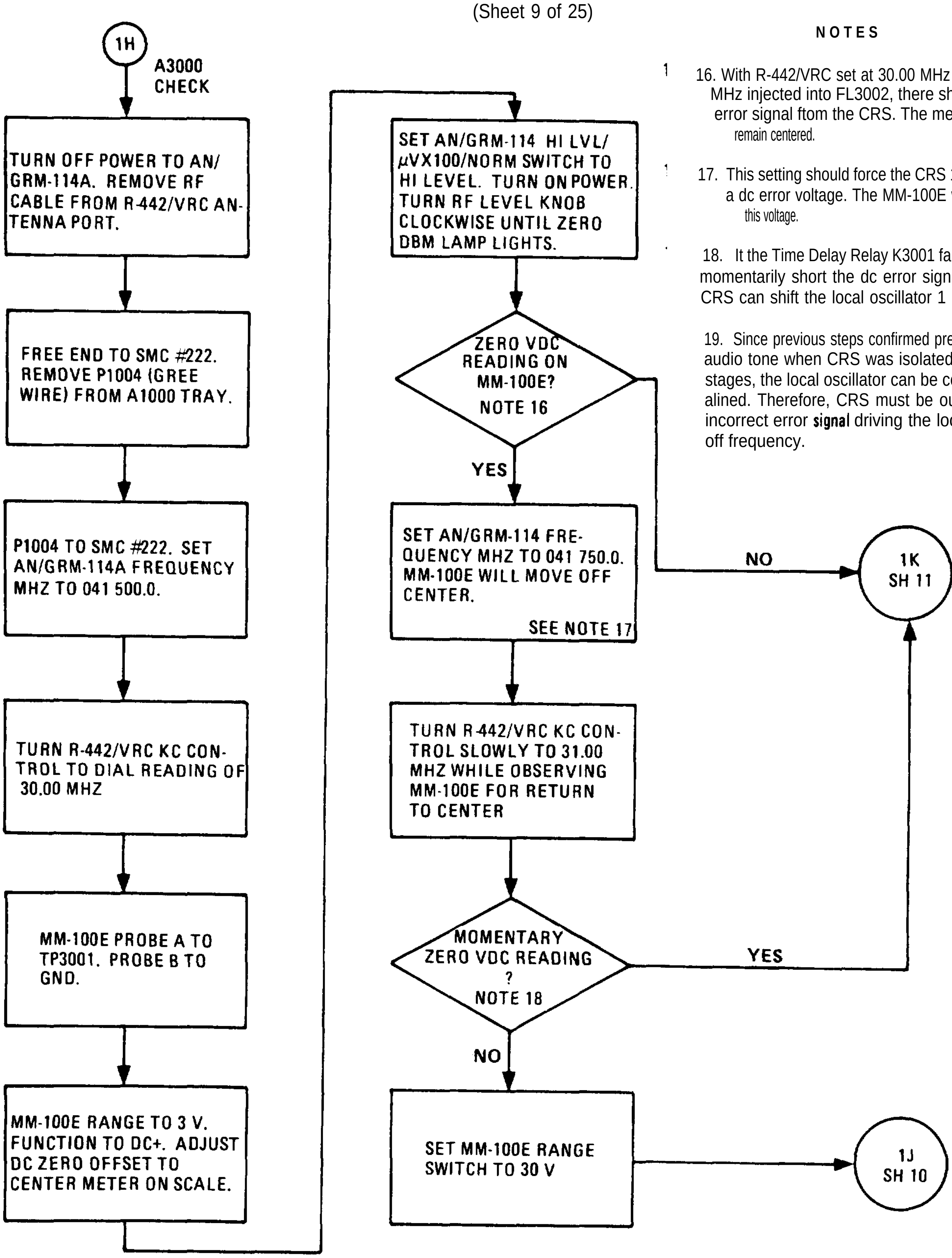


NOTE

15. Actual voltage will be slightly lower due to some attenuation of signal by the filter.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 9 of 25)



NOTES

16. With R-442/VRC set at 30.00 MHz and 41.5 MHz injected into FL3002, there should be no error signal ftom the CRS. The meter will remain centered.

17. This setting should force the CRS 10 output a dc error voltage. The MM-100E will indicate this voltage.

18. It the Time Delay Relay K3001 fails to momentarily short the dc error signal, the CRS can shift the local oscillator 1 MHz.

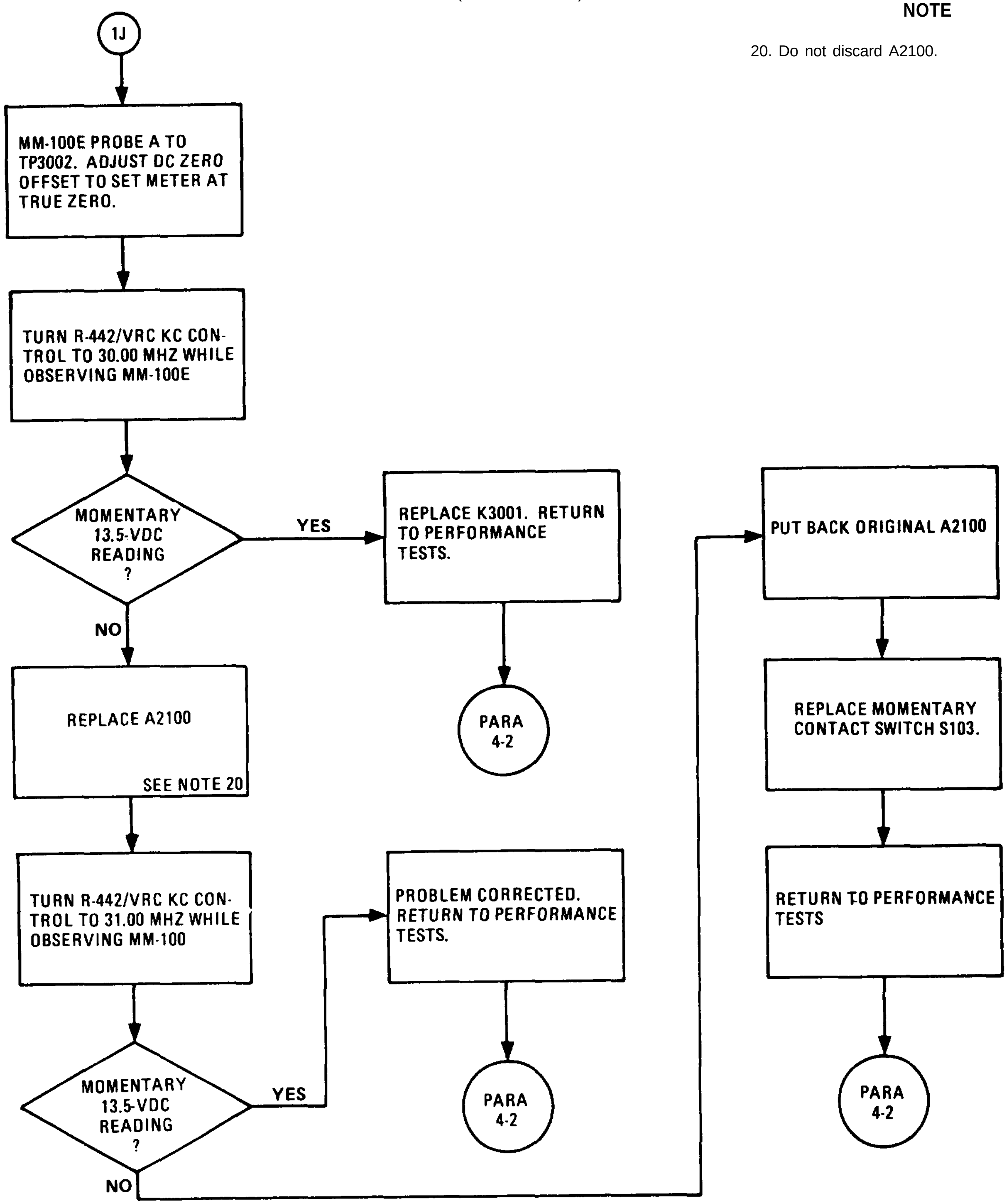
19. Since previous steps confirmed presance of audio tone when CRS was isolated from other stages, the local oscillator can be considered alined. Therefore, CRS must be outputting incorrect error signal driving the local oscillator off frequency.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 10 of 25)

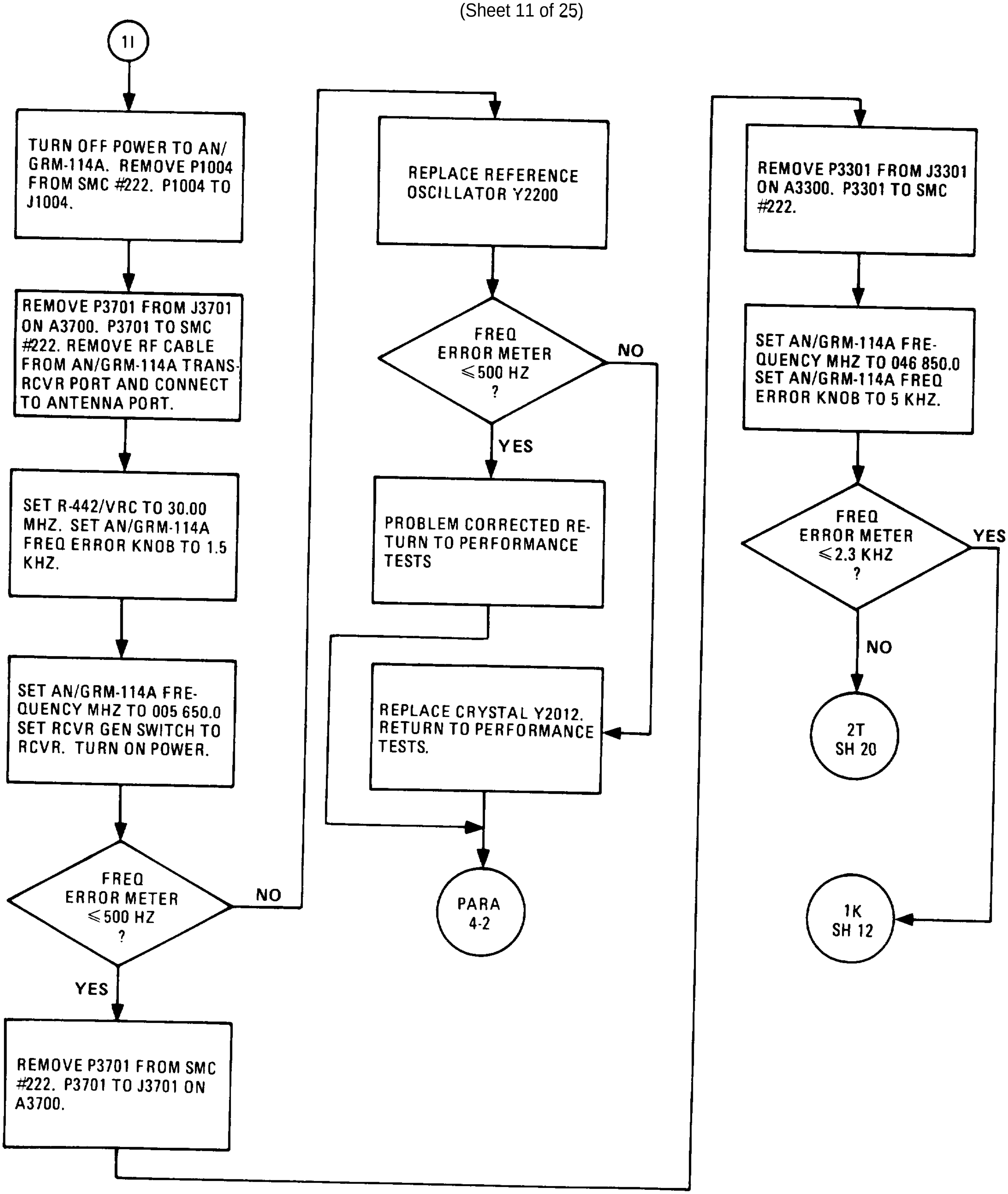
NOTE

20. Do not discard A2100.



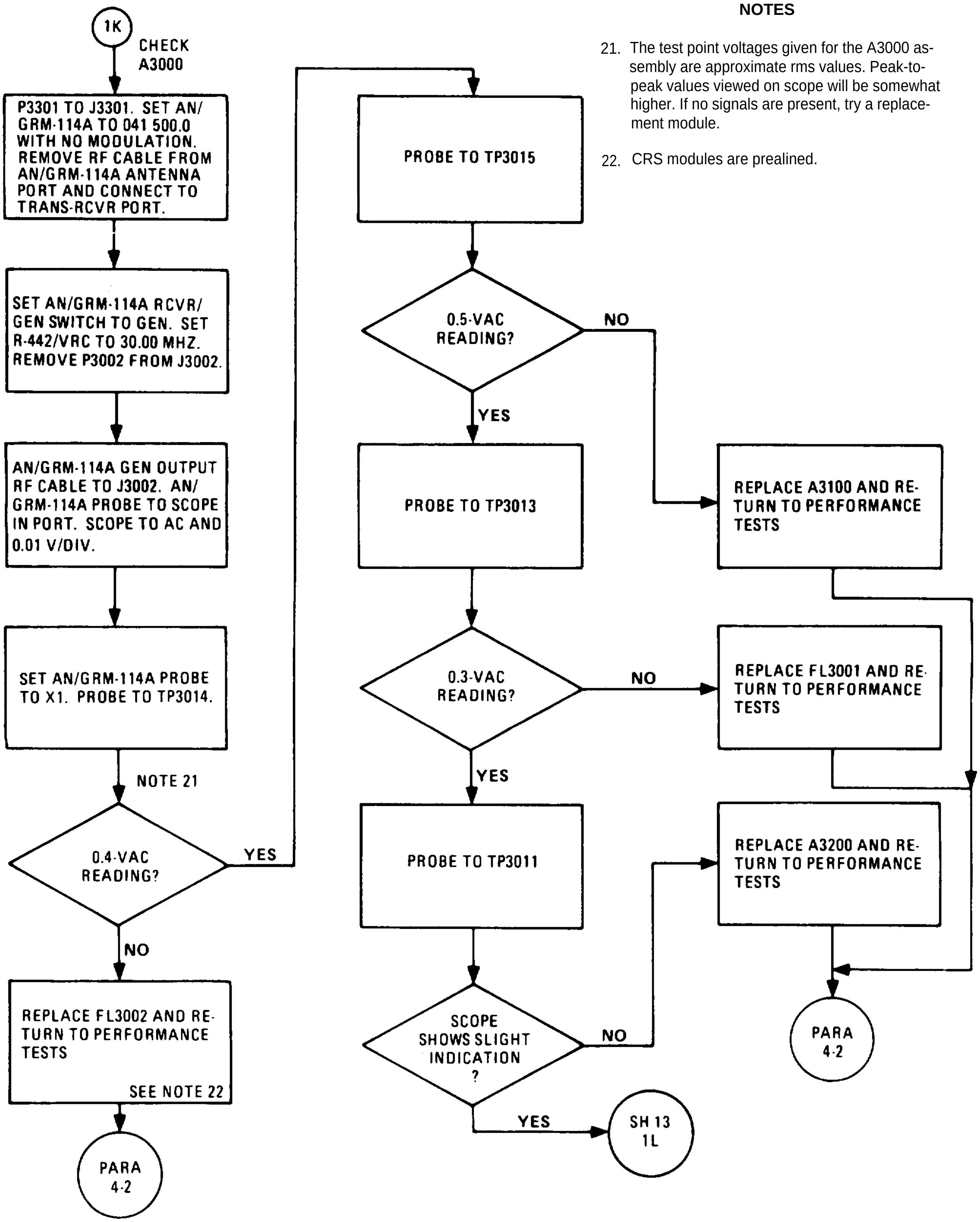
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 11 of 25)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 12 of 25)



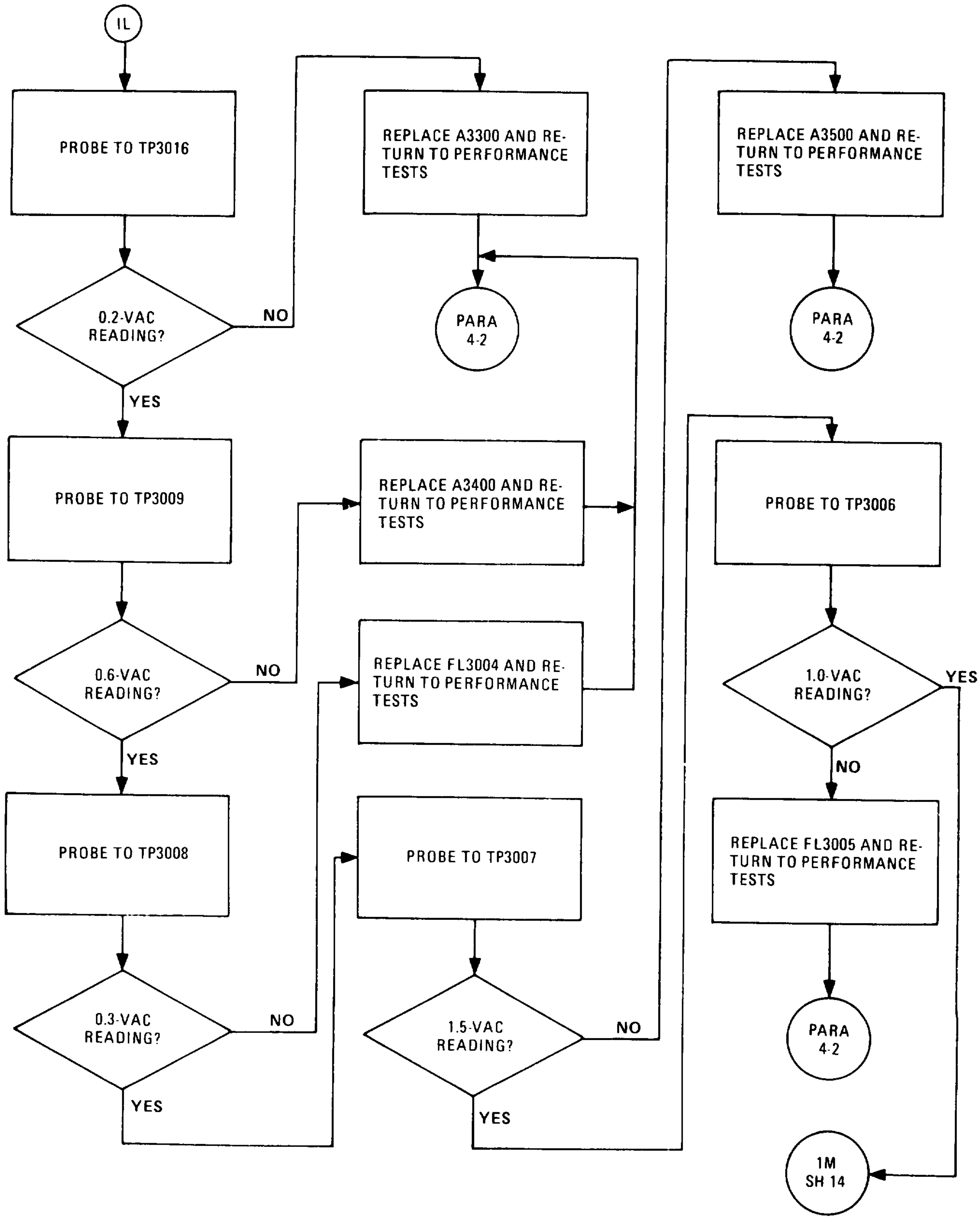
NOTES

21. The test point voltages given for the A3000 assembly are approximate rms values. Peak-to-peak values viewed on scope will be somewhat higher. If no signals are present, try a replacement module.

22. CRS modules are prealined.

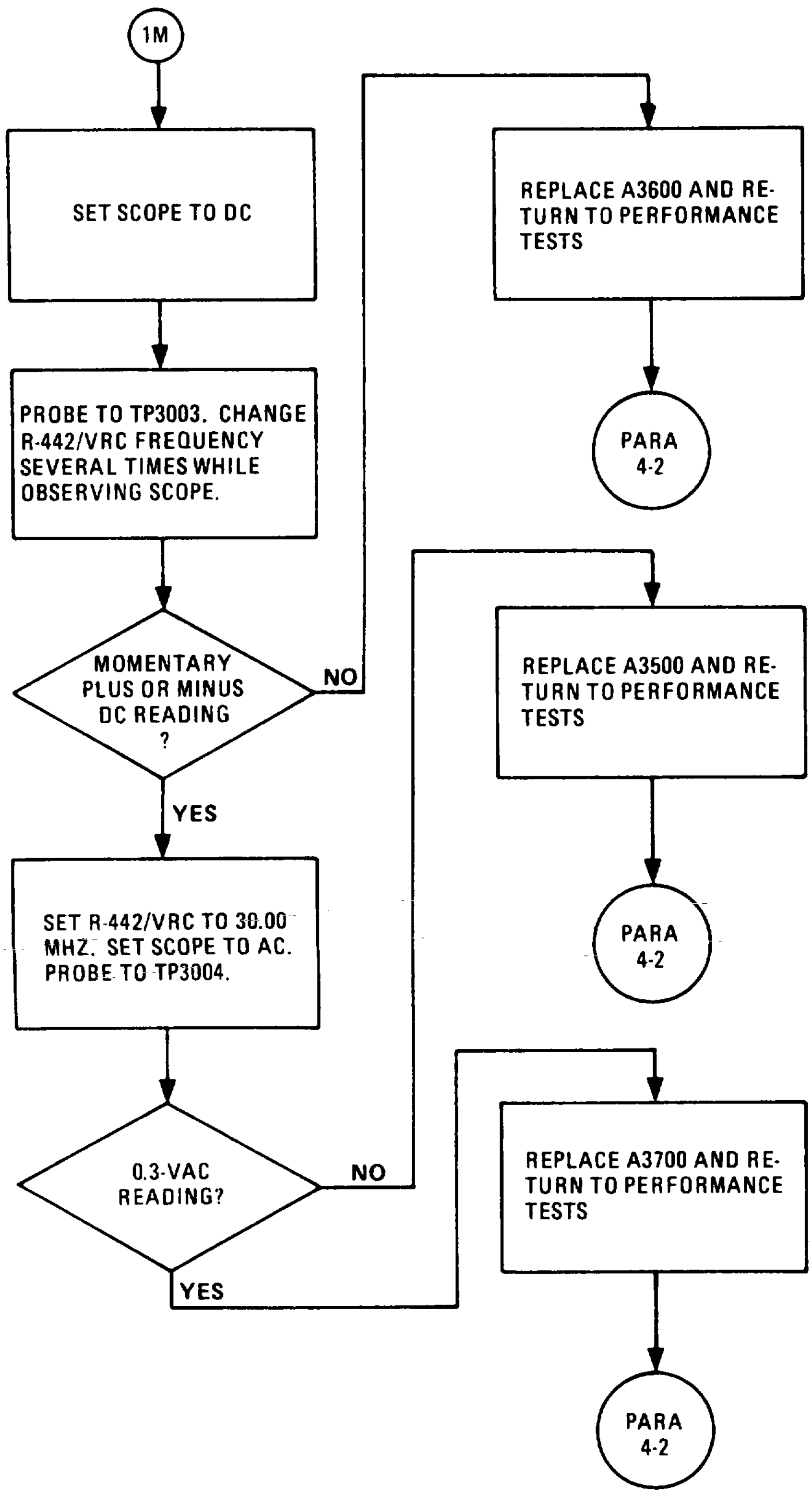
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 13 Of 25)



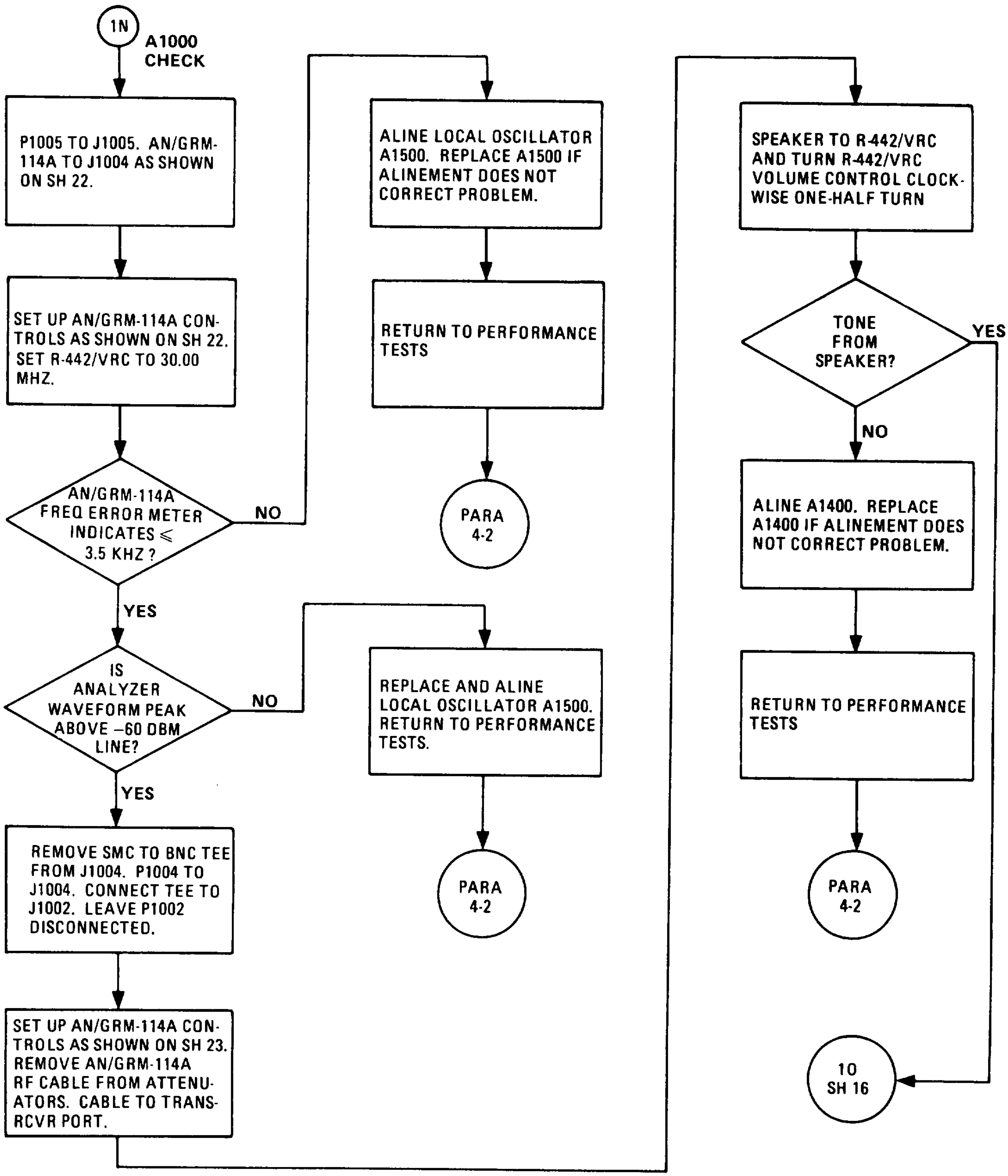
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 14 of 25)



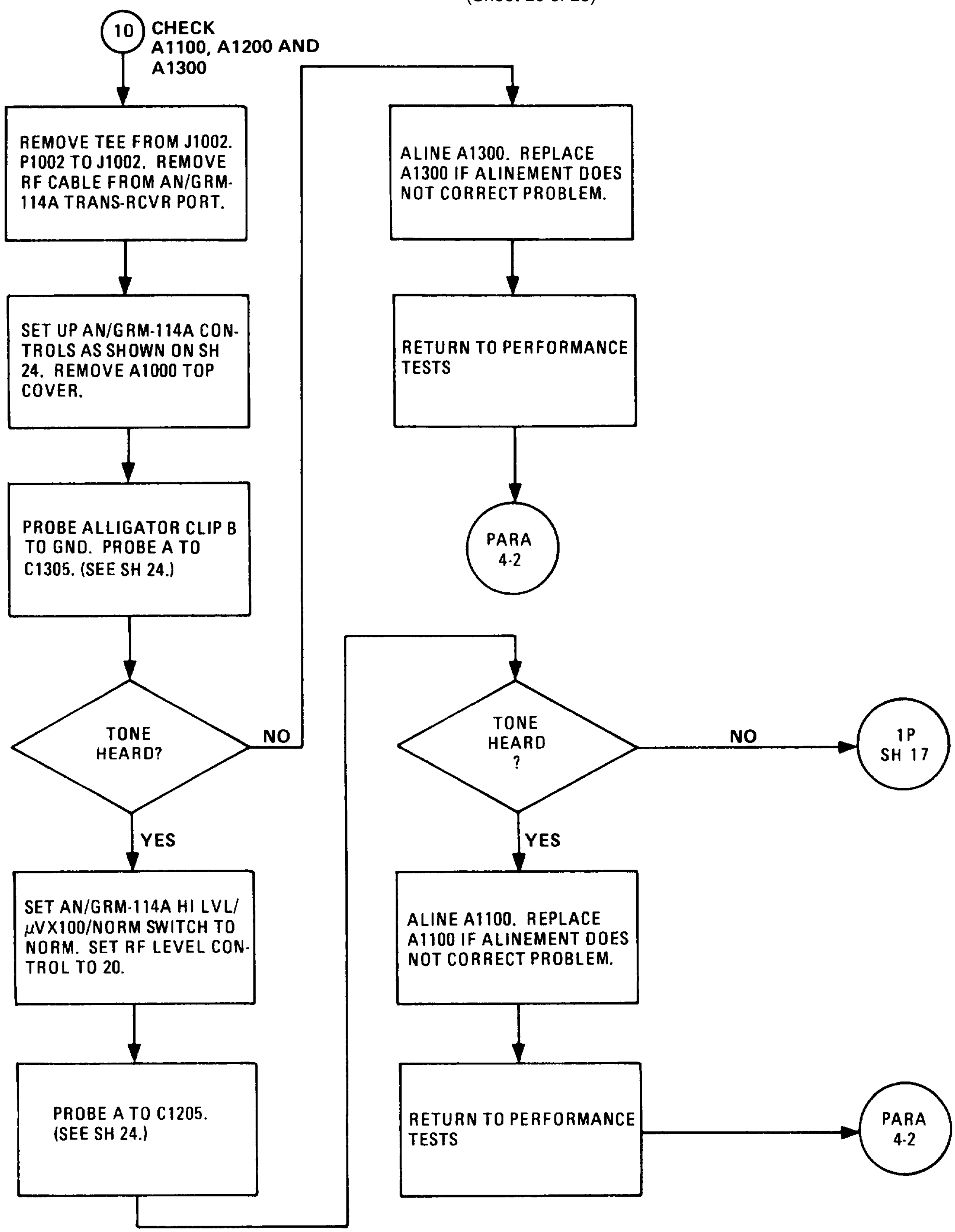
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 15 of 25)



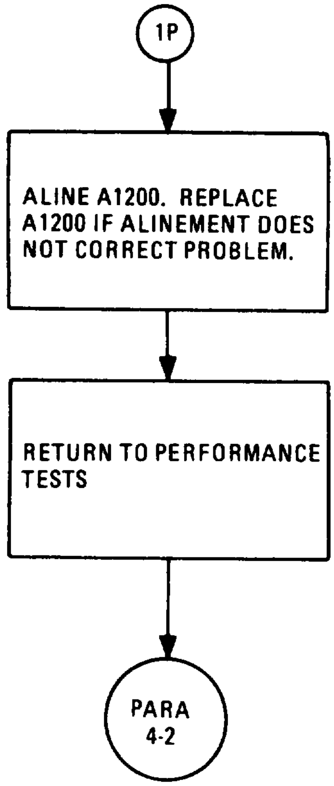
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 16 of 25)



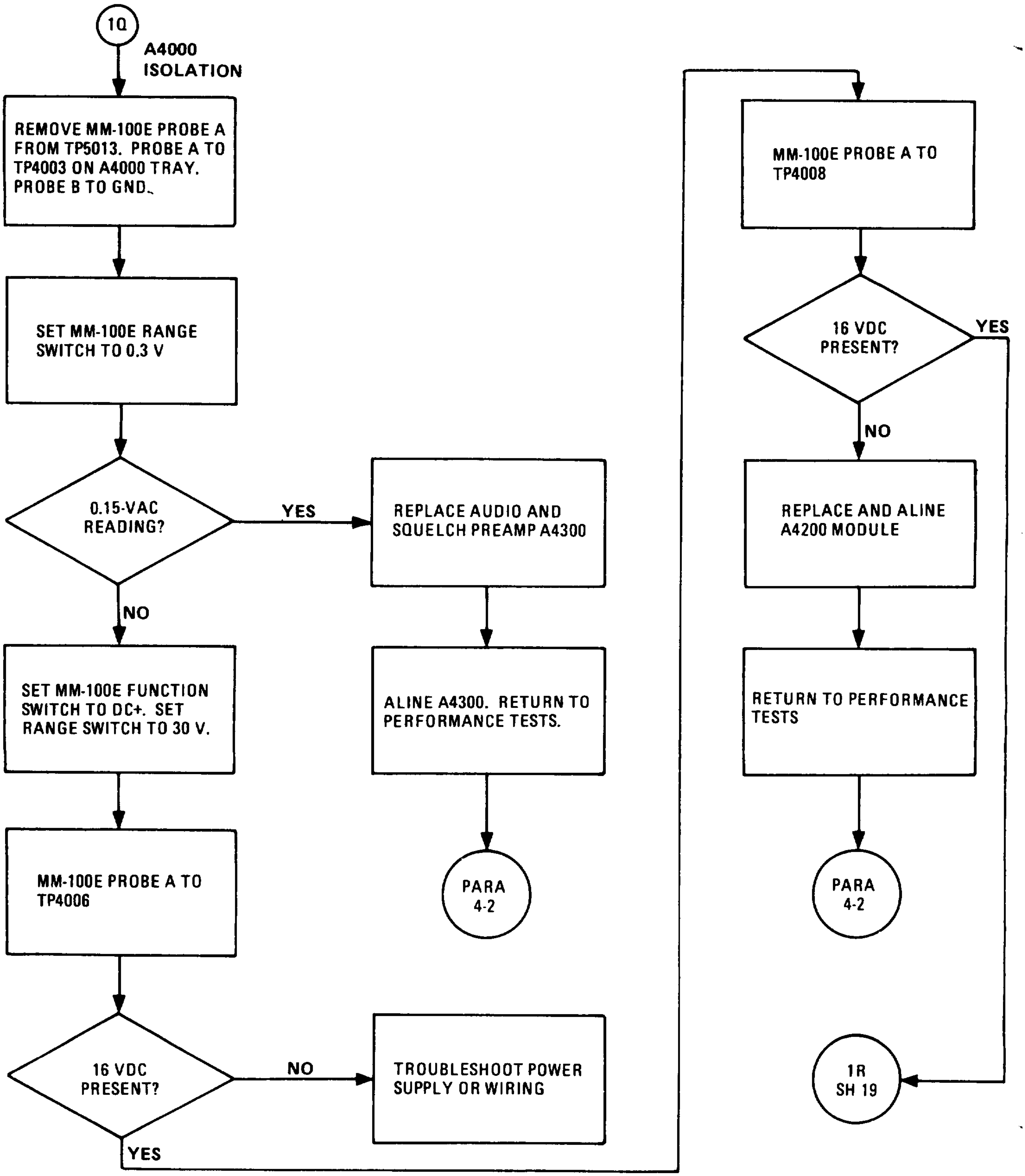
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 17 of 25)



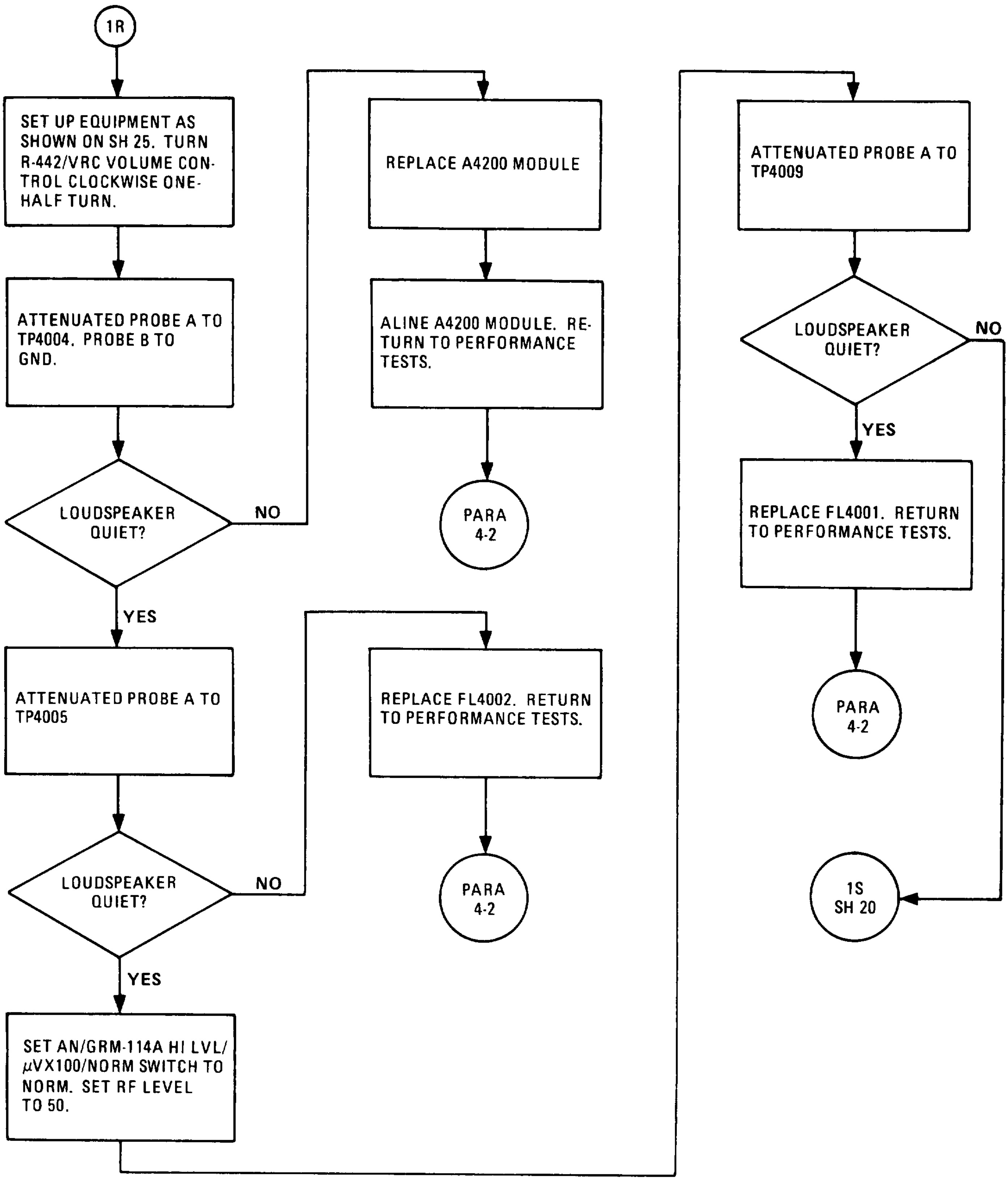
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 18 of 25)



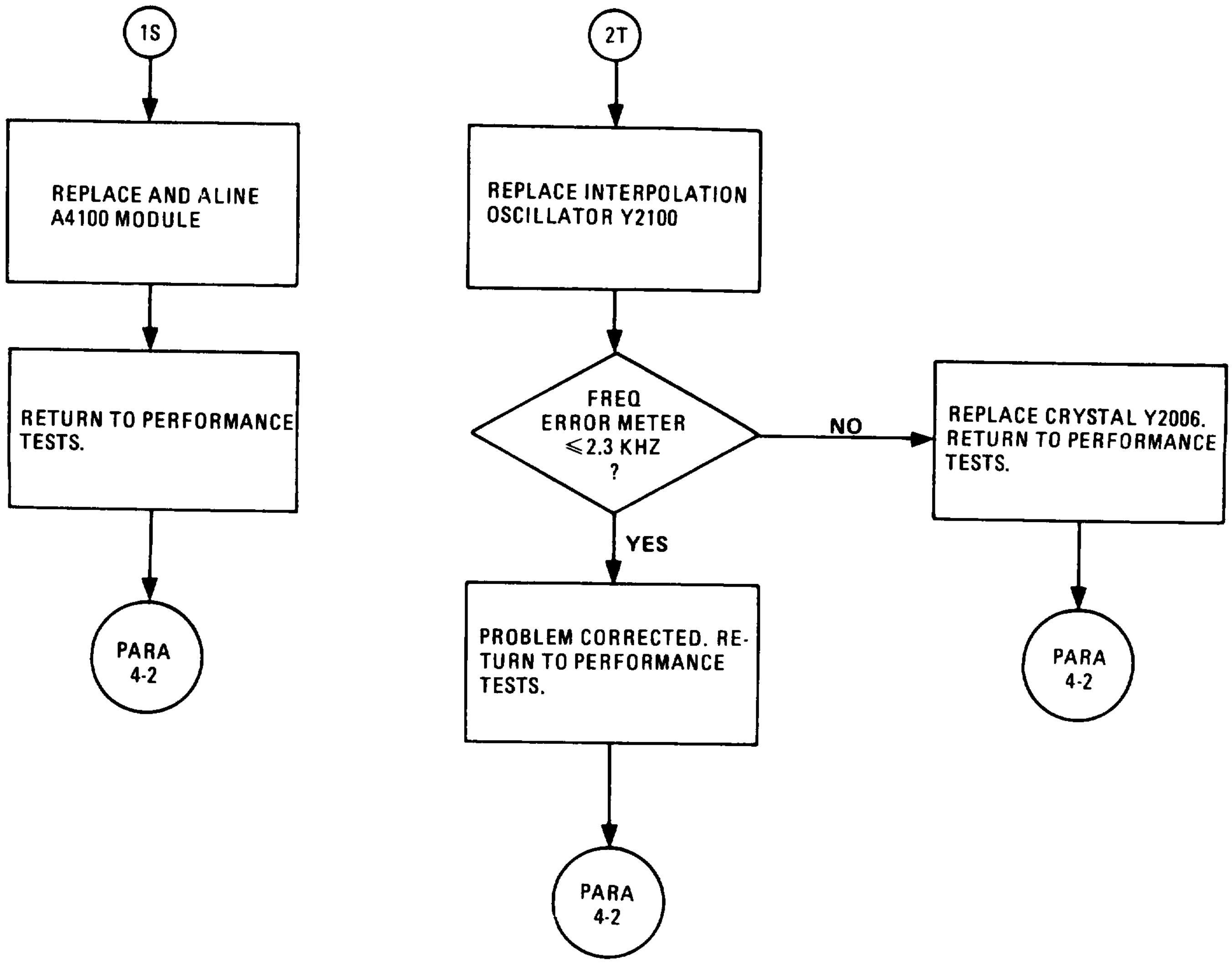
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 19 of 25)



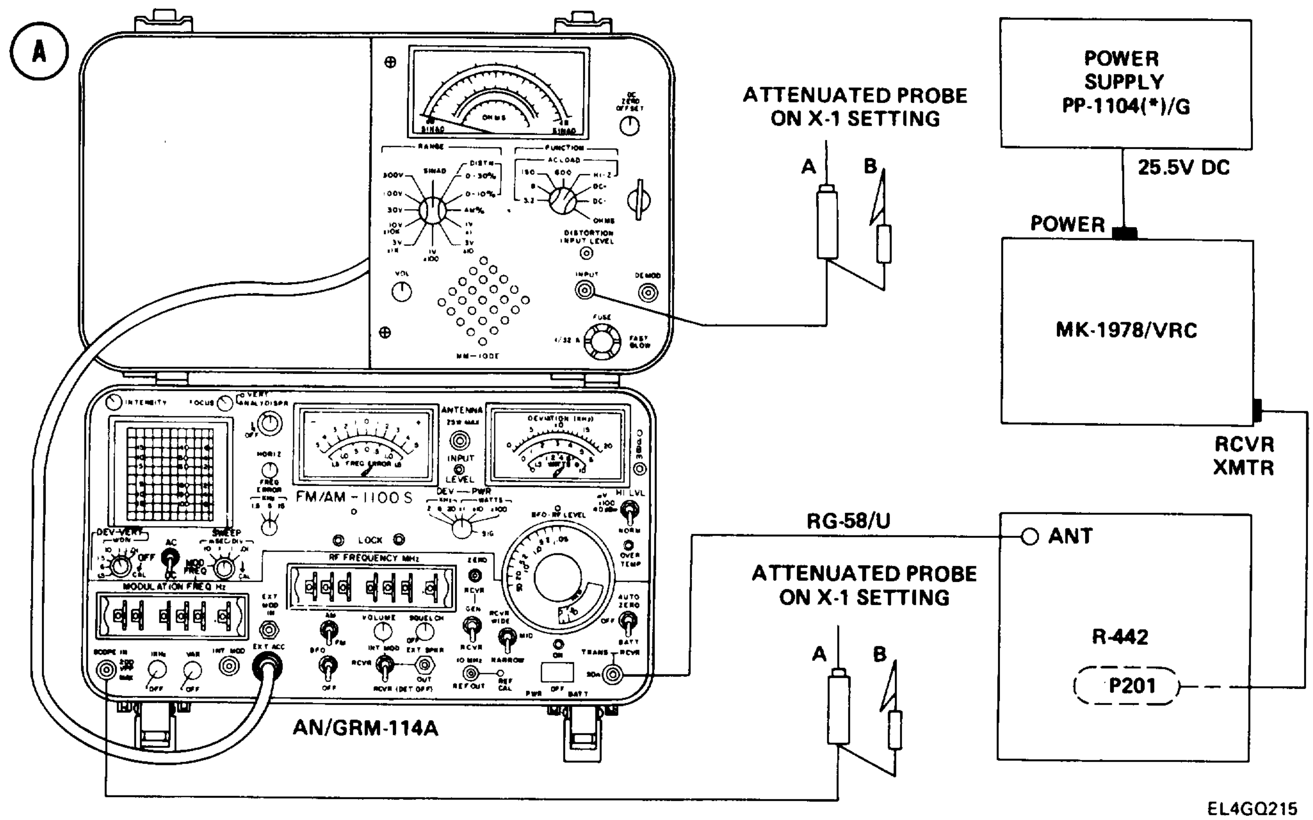
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

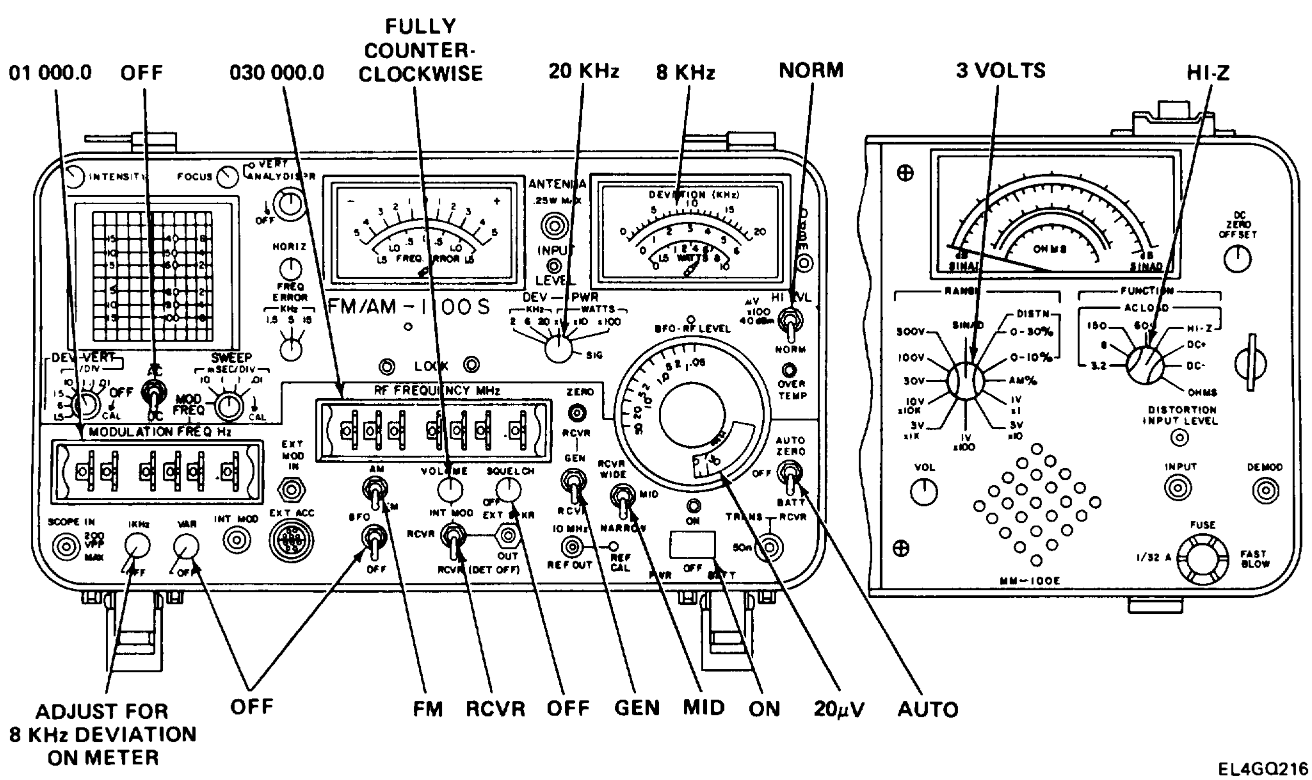
CHART 4-1
No Audio Troubleshooting
(Sheet 20 of 25)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

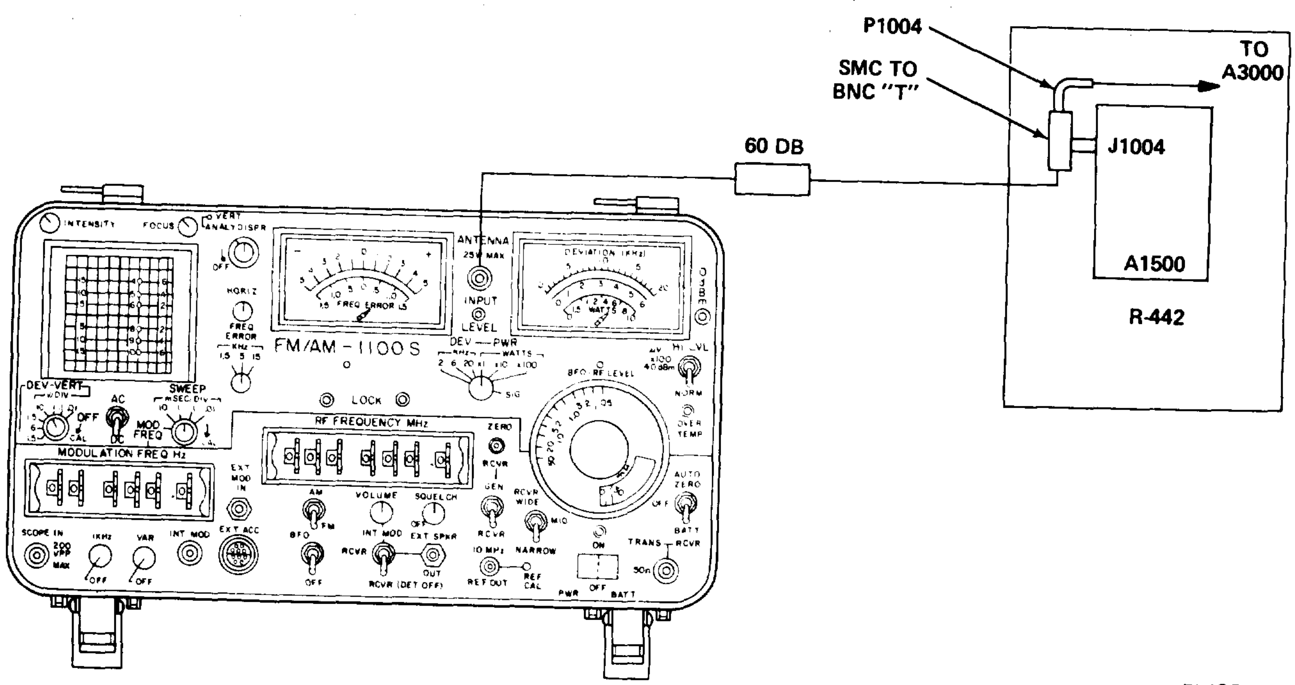
CHART 4-1
No Audio Troubleshooting
(Sheet 21 of 25)



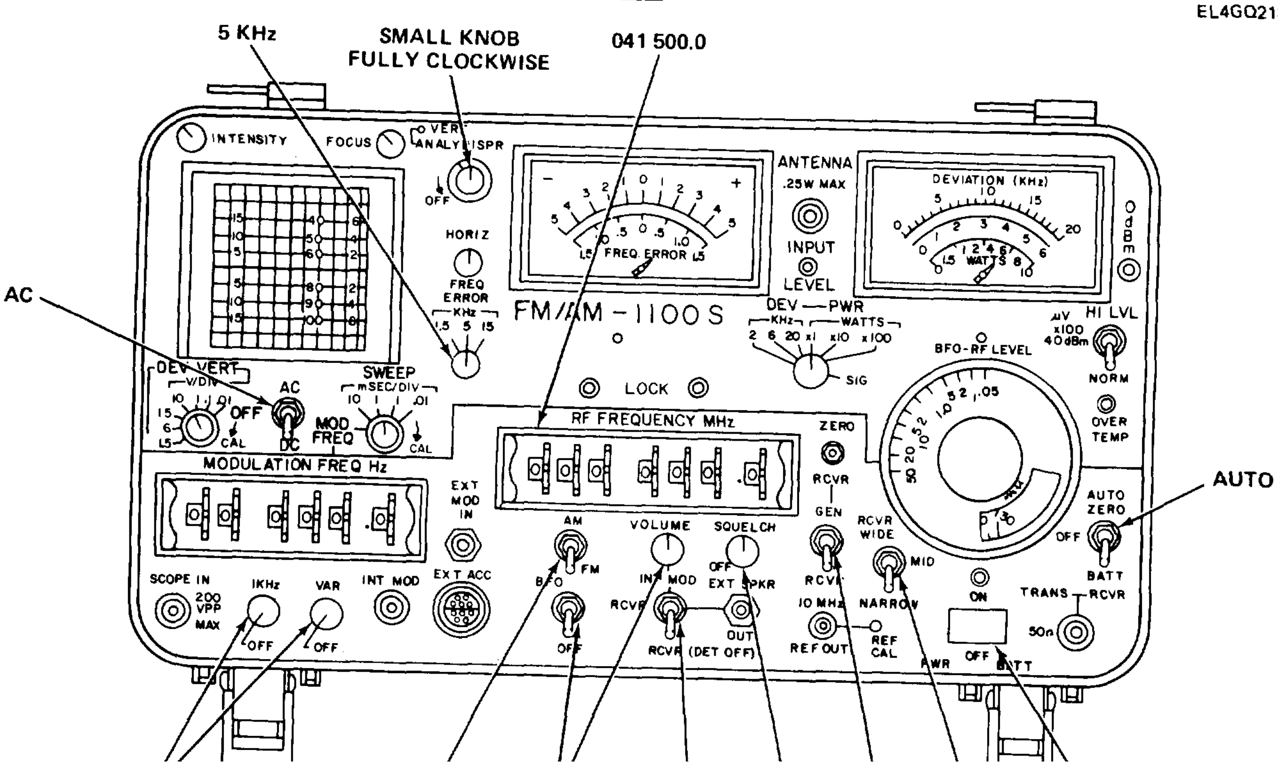


4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 22 of 25)

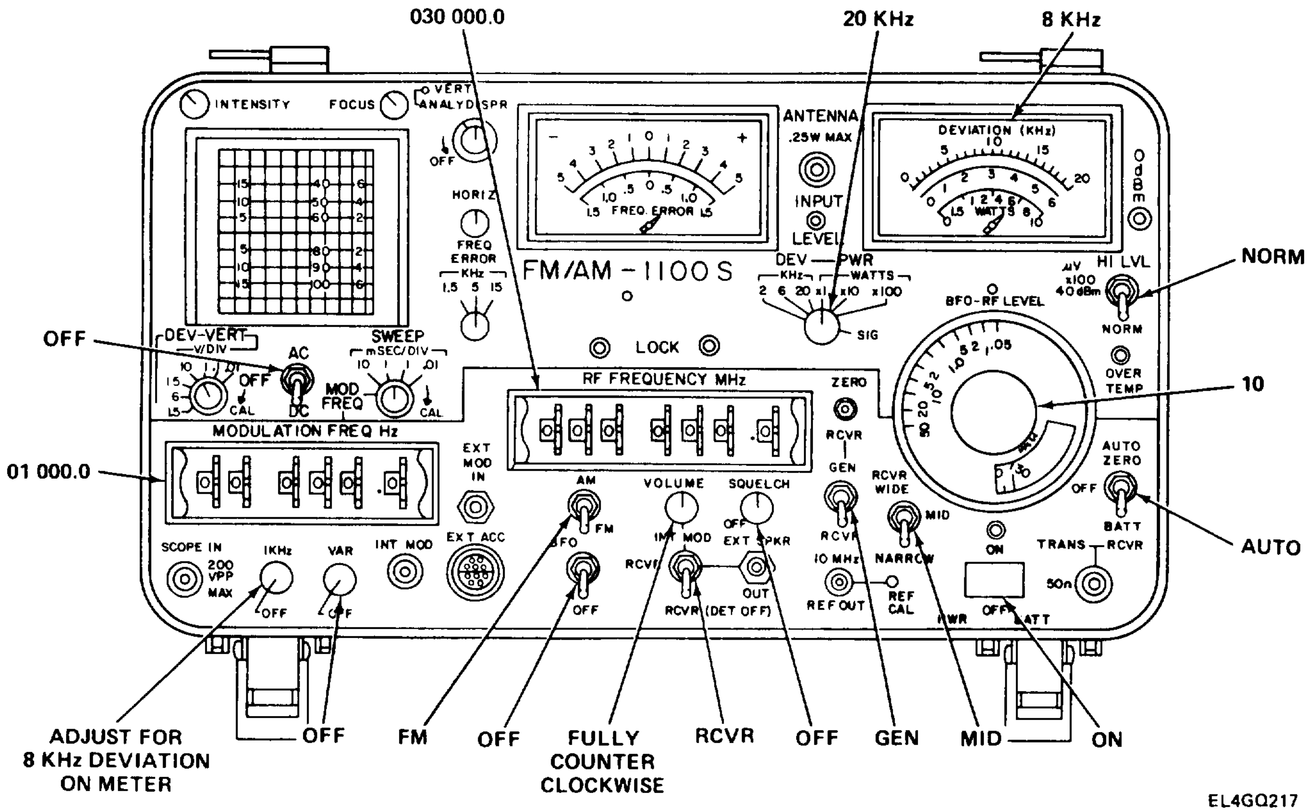


EL4GQ218



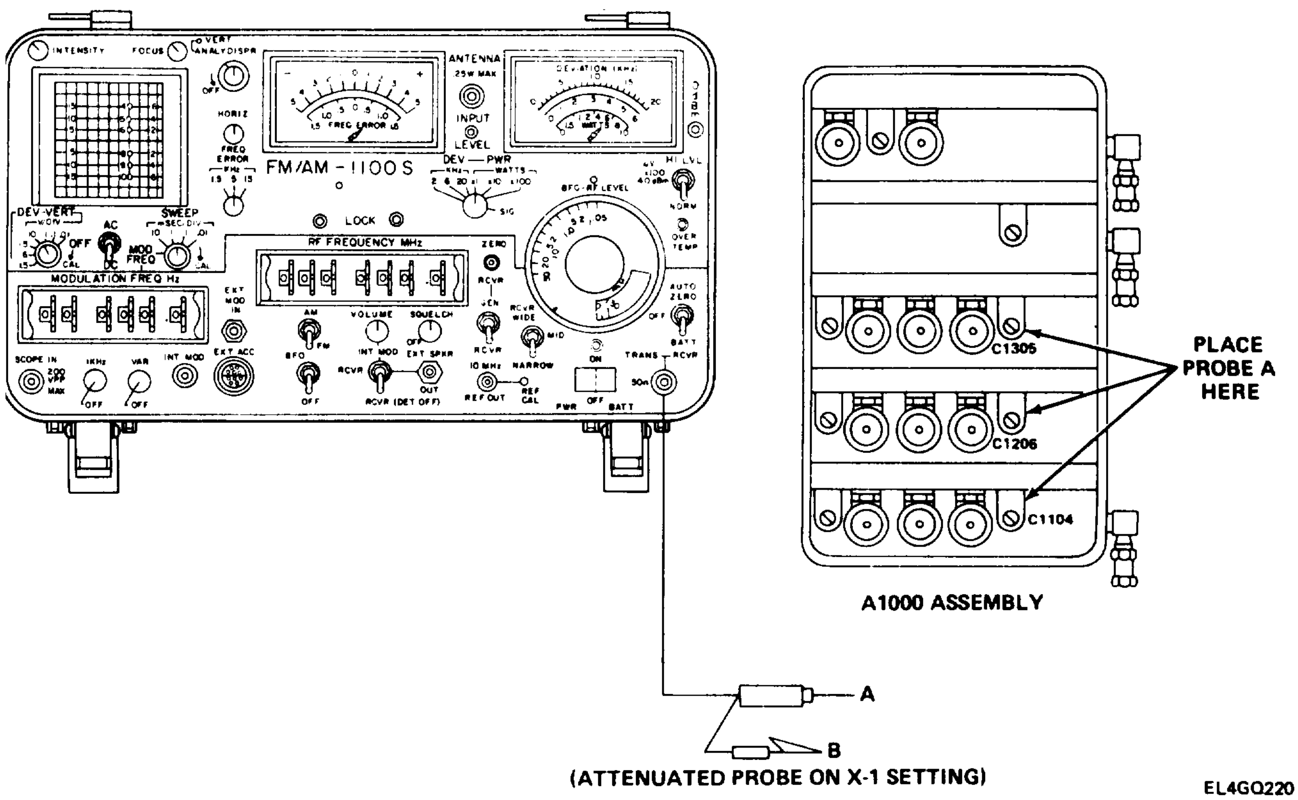
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 23 of 25)

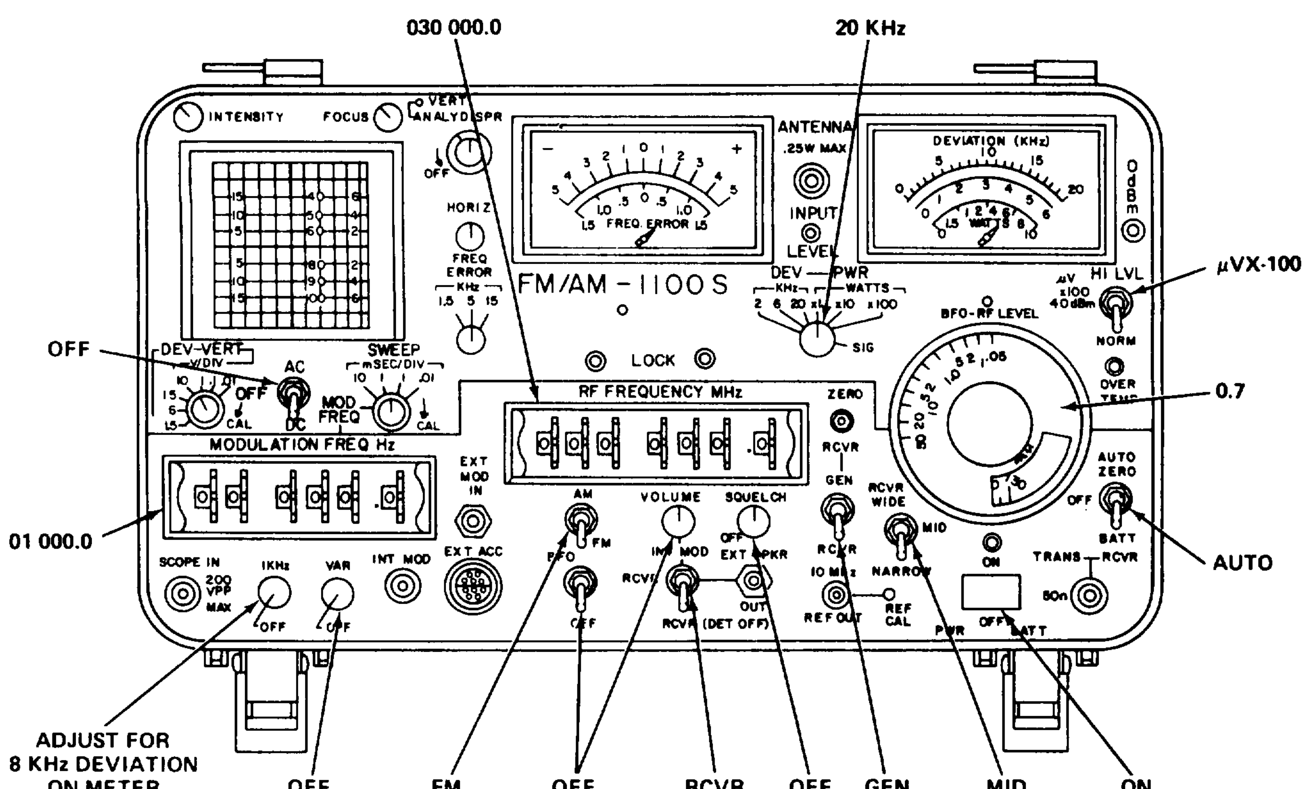


4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 24 of 25)



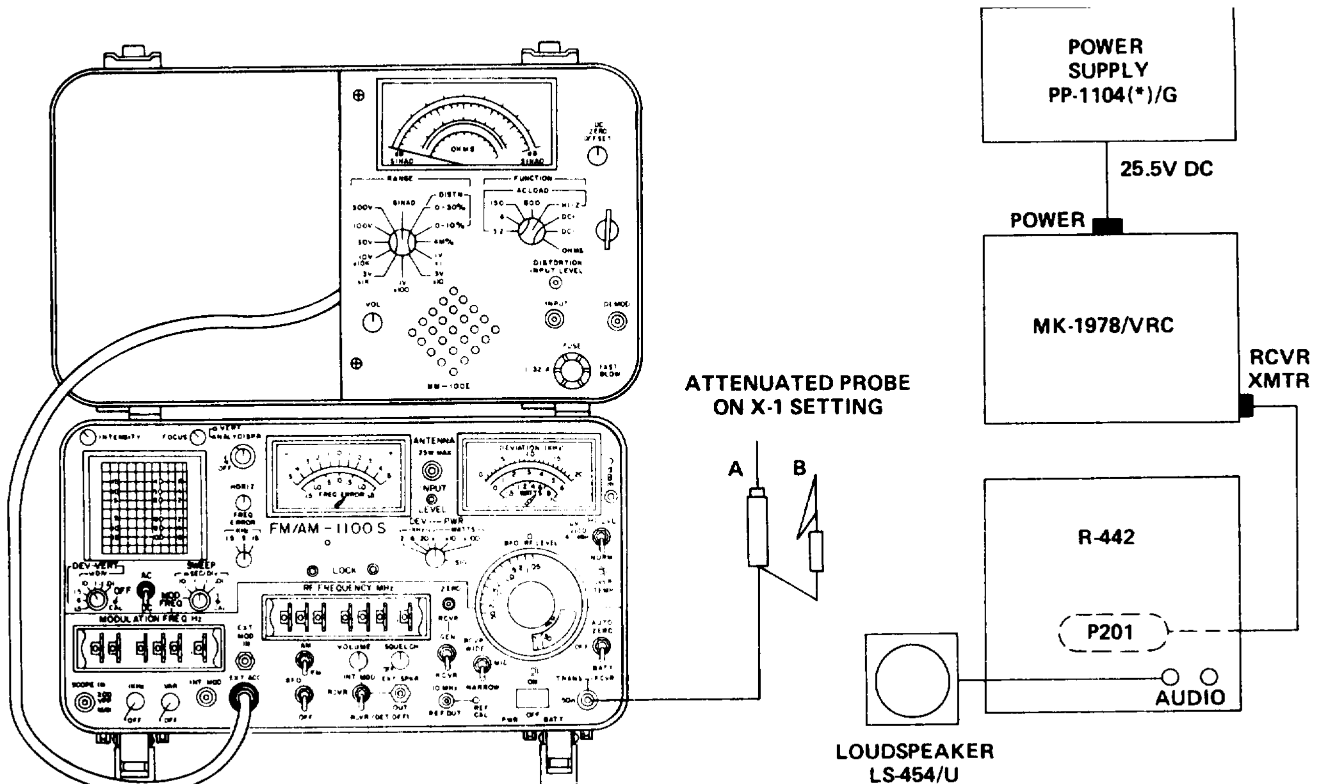
EL4GQ220



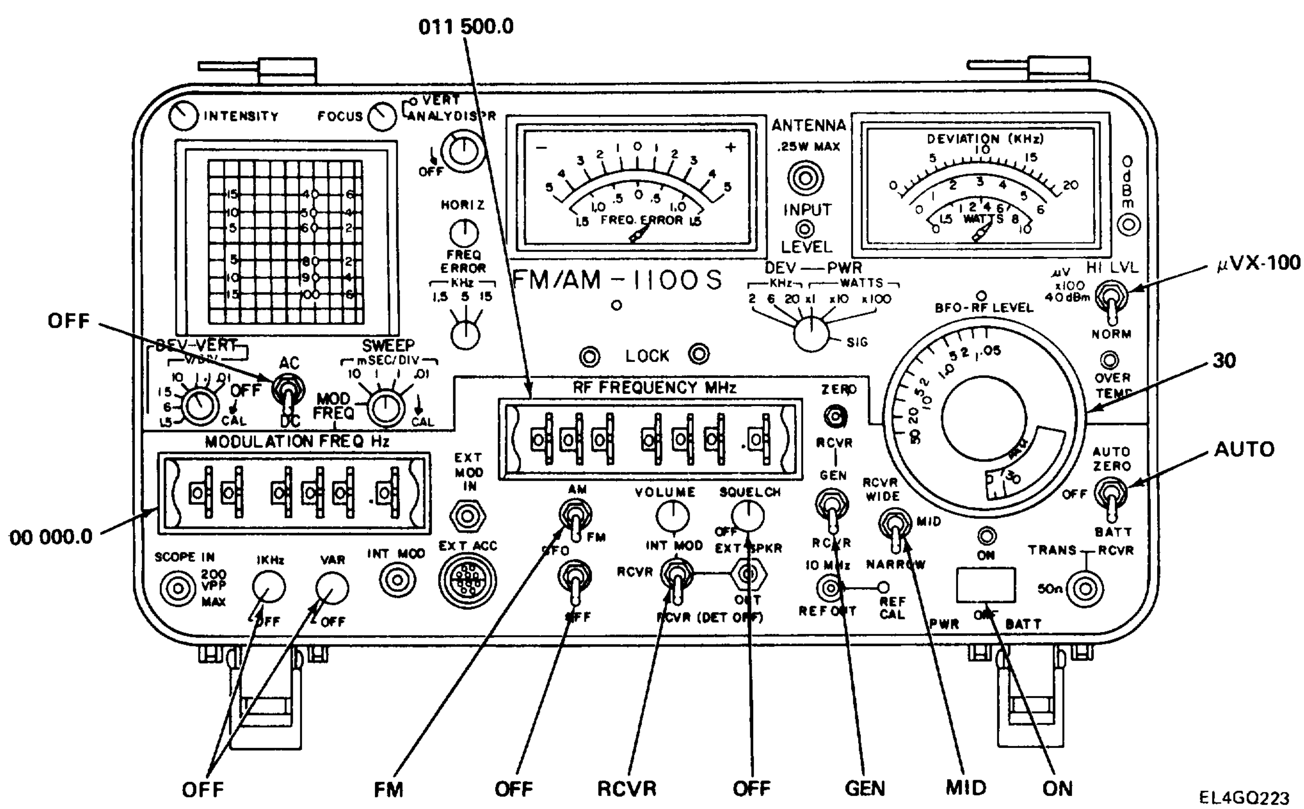
EL4GQ221

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-1
No Audio Troubleshooting
(Sheet 25 of 25)



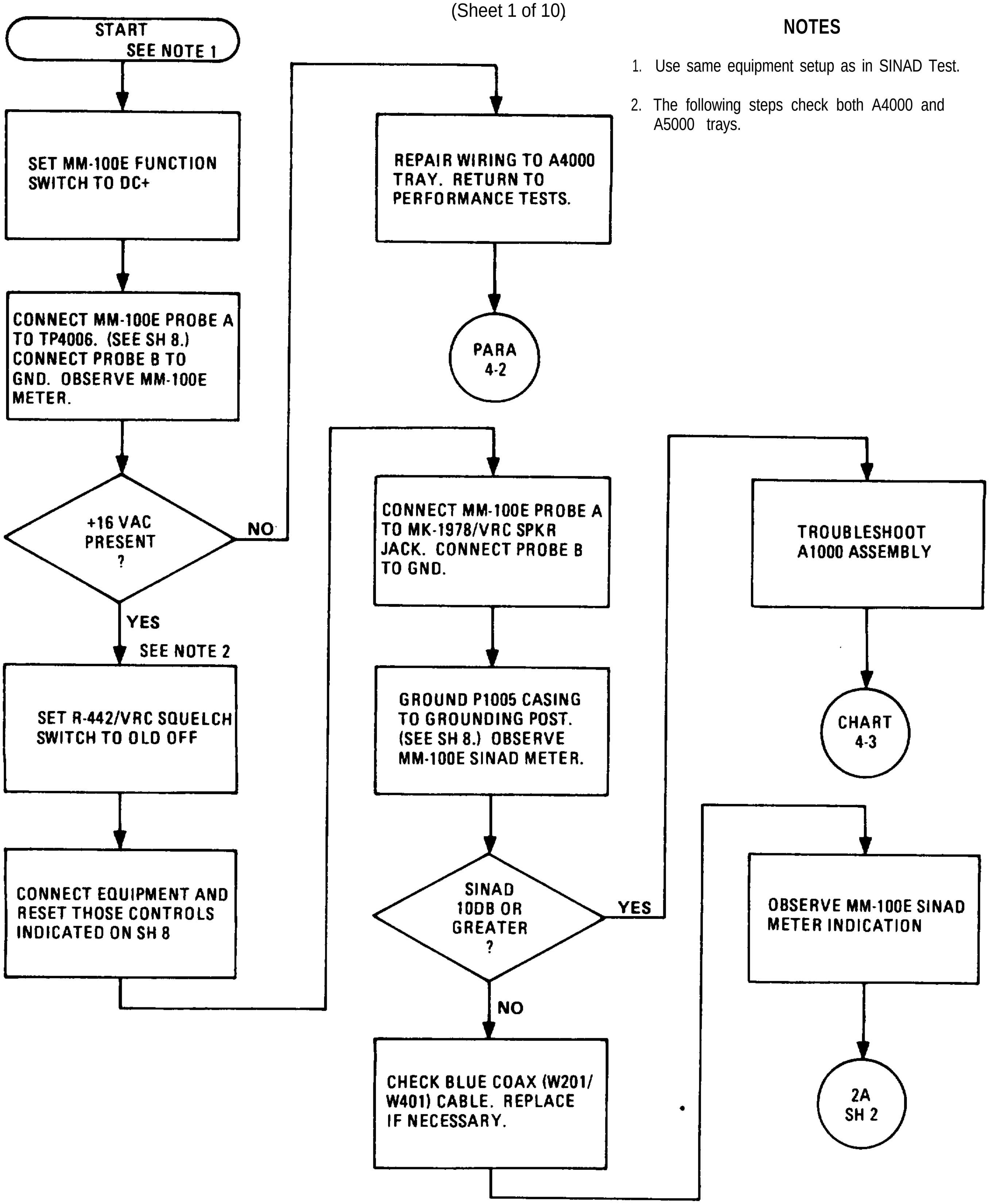
EL4GQ222



EL4GQ223

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 1 of 10)



NOTES

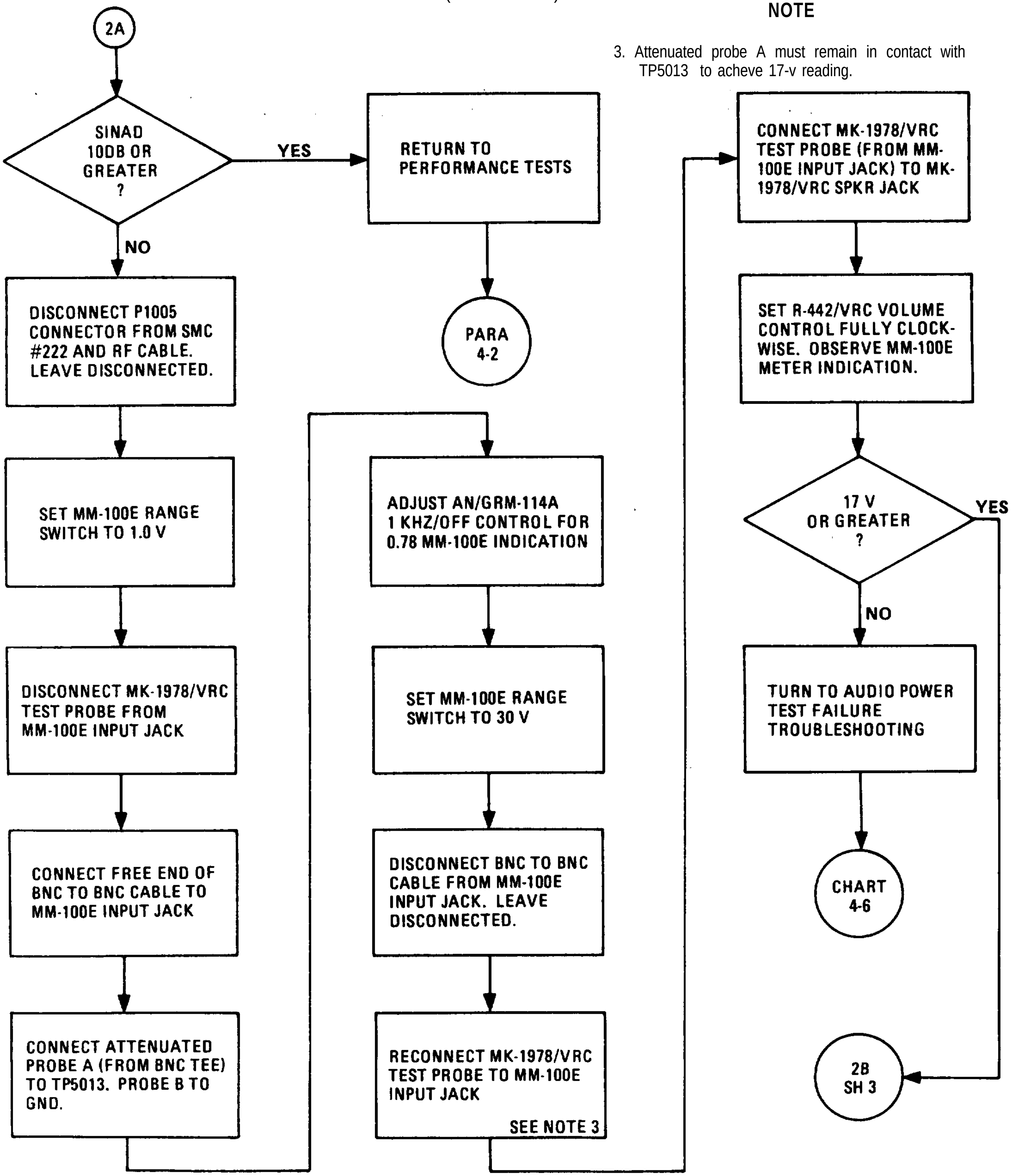
1. Use same equipment setup as in SINAD Test.
2. The following steps check both A4000 and A5000 trays.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 2 of 10)

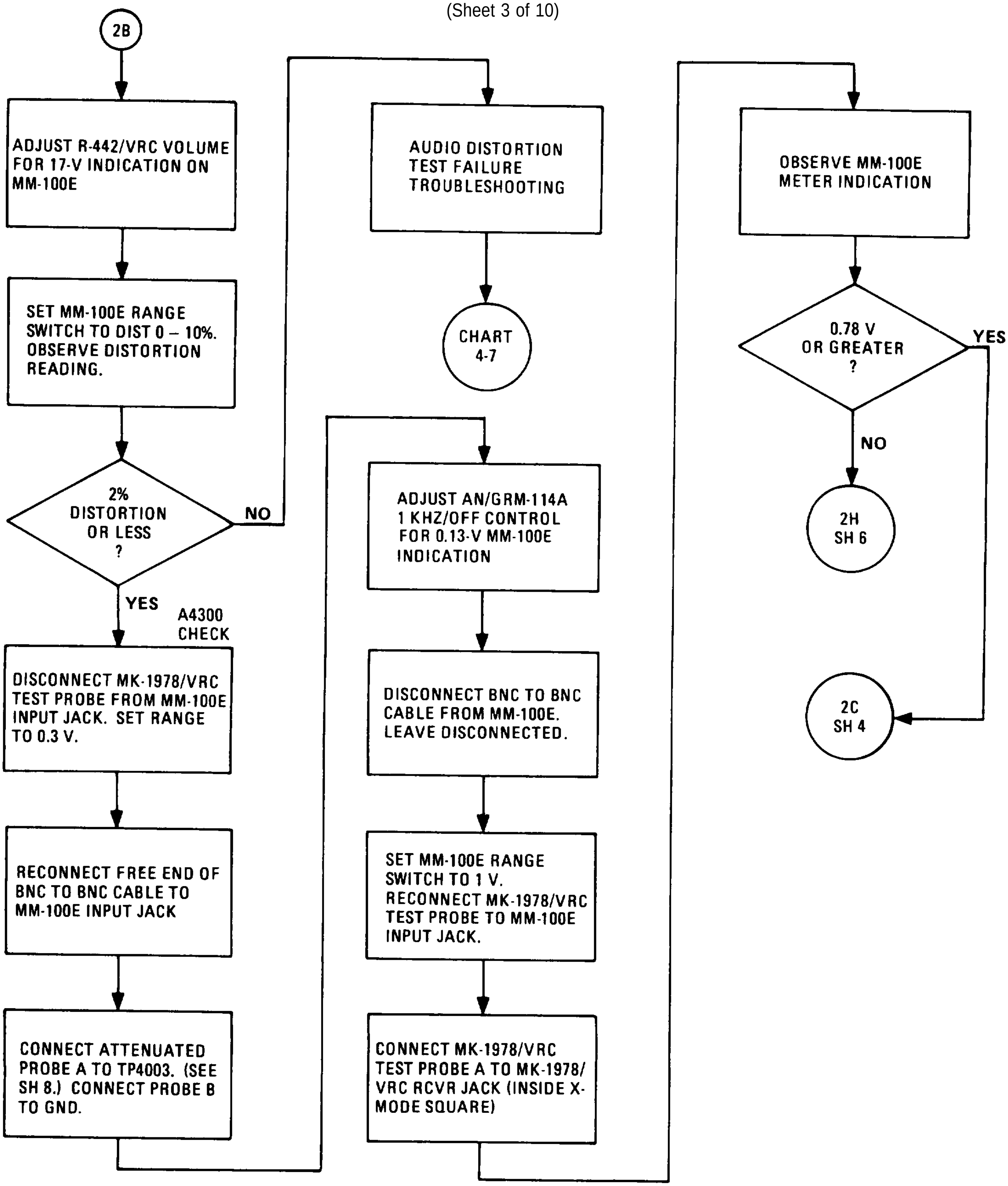
NOTE

3. Attenuated probe A must remain in contact with TP5013 to acheve 17-v reading.



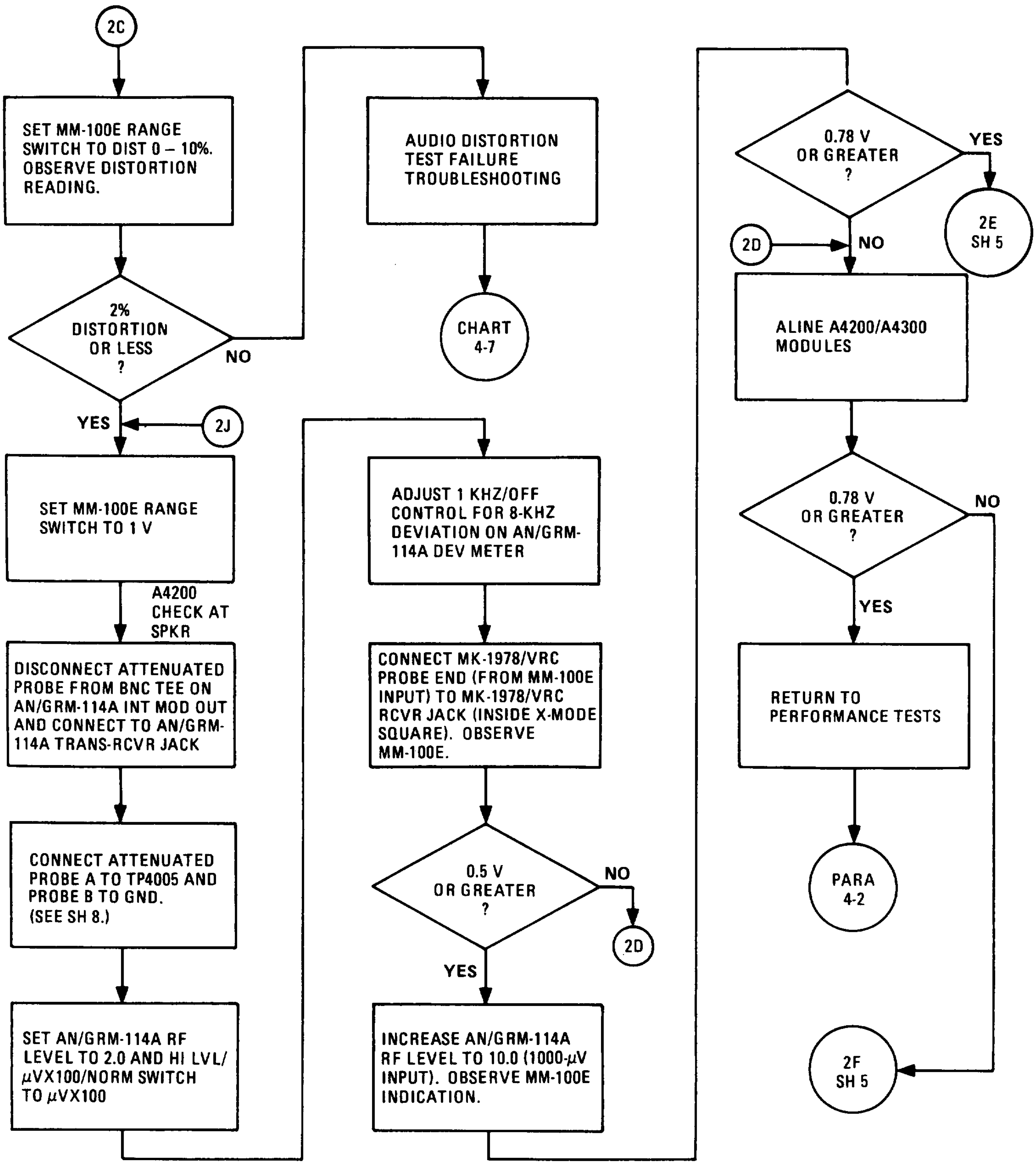
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 3 of 10)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 4 of 10)

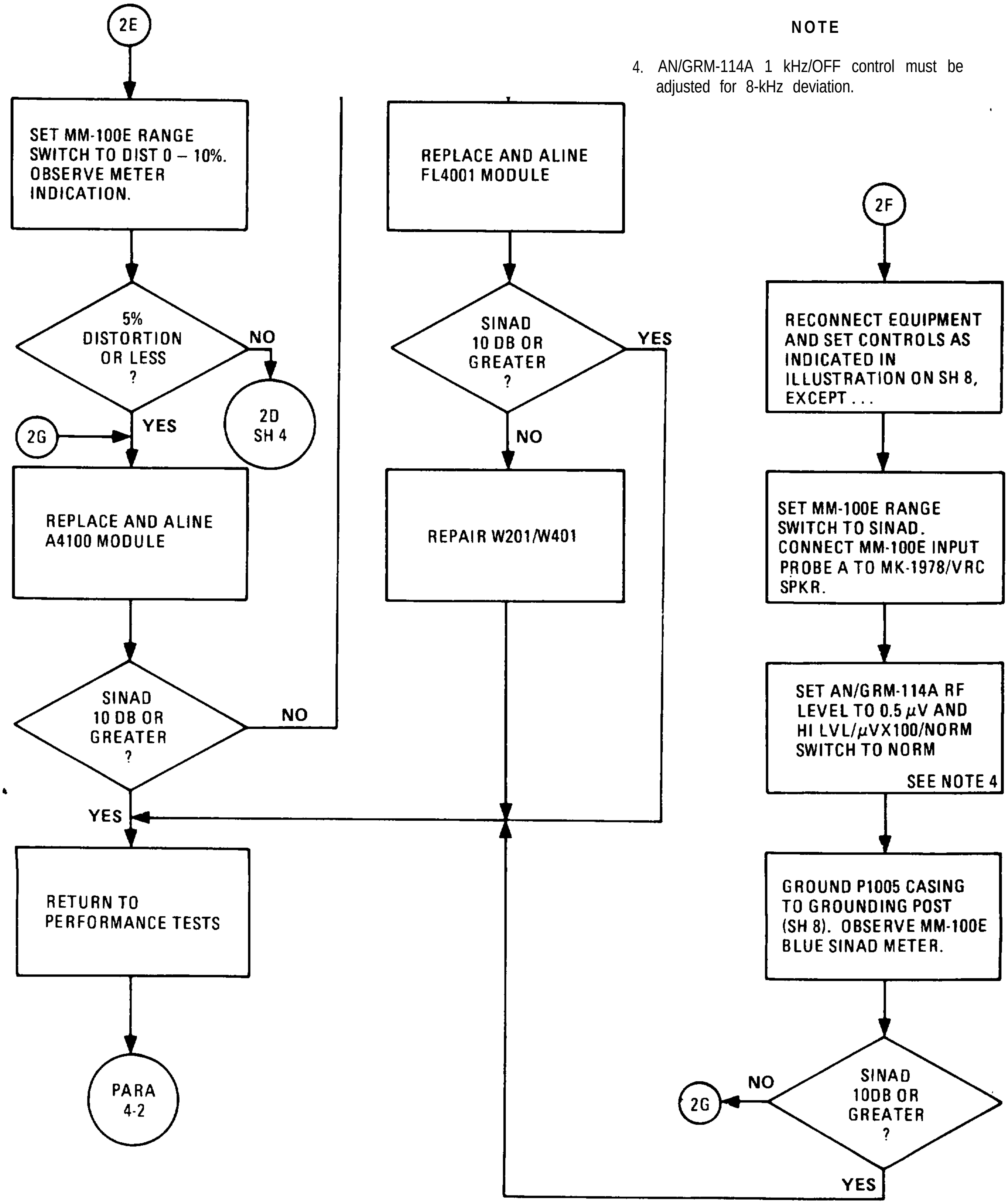


4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 5 of 10)

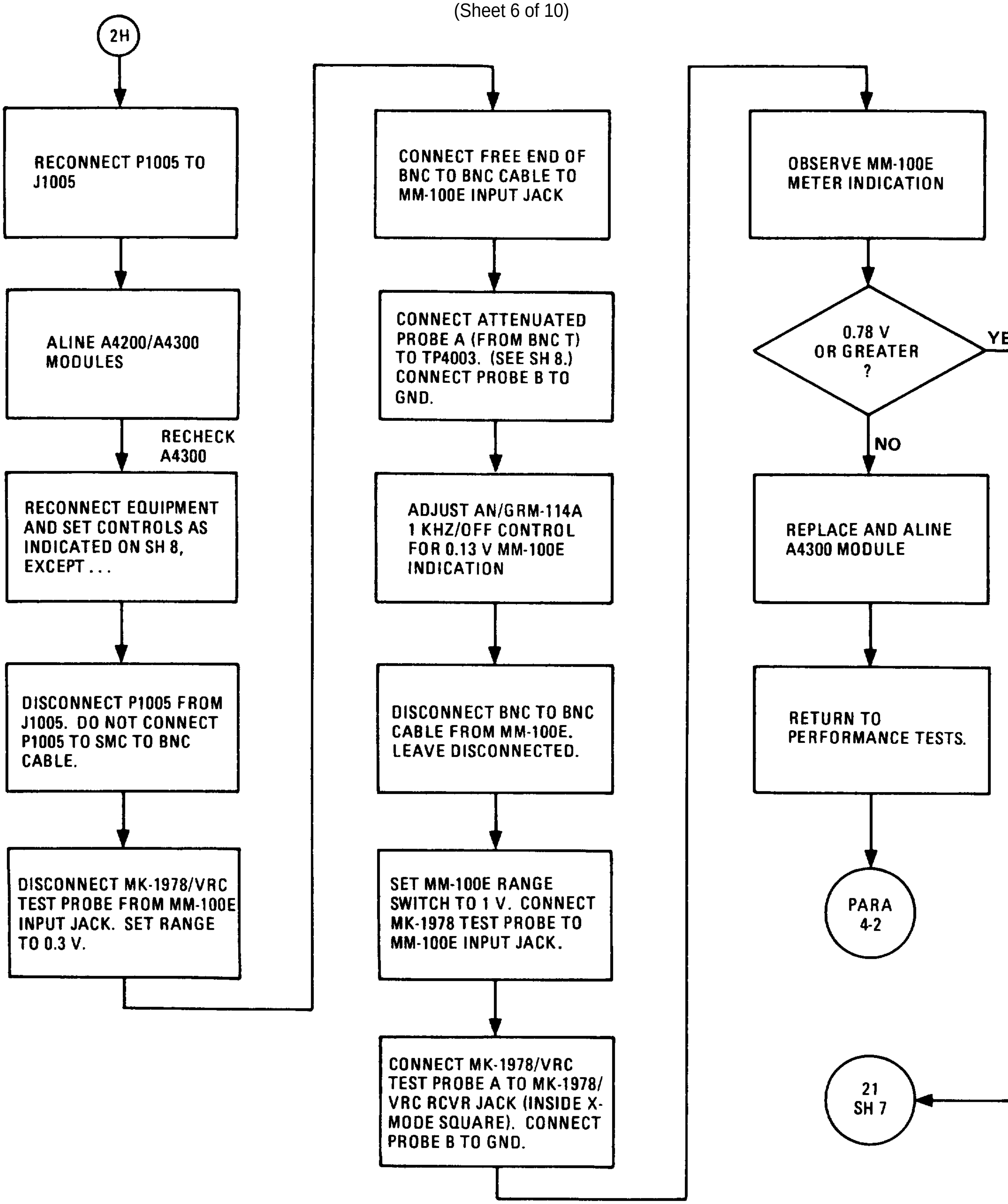
NOTE

4. AN/GRM-114A 1 kHz/OFF control must be adjusted for 8-kHz deviation.



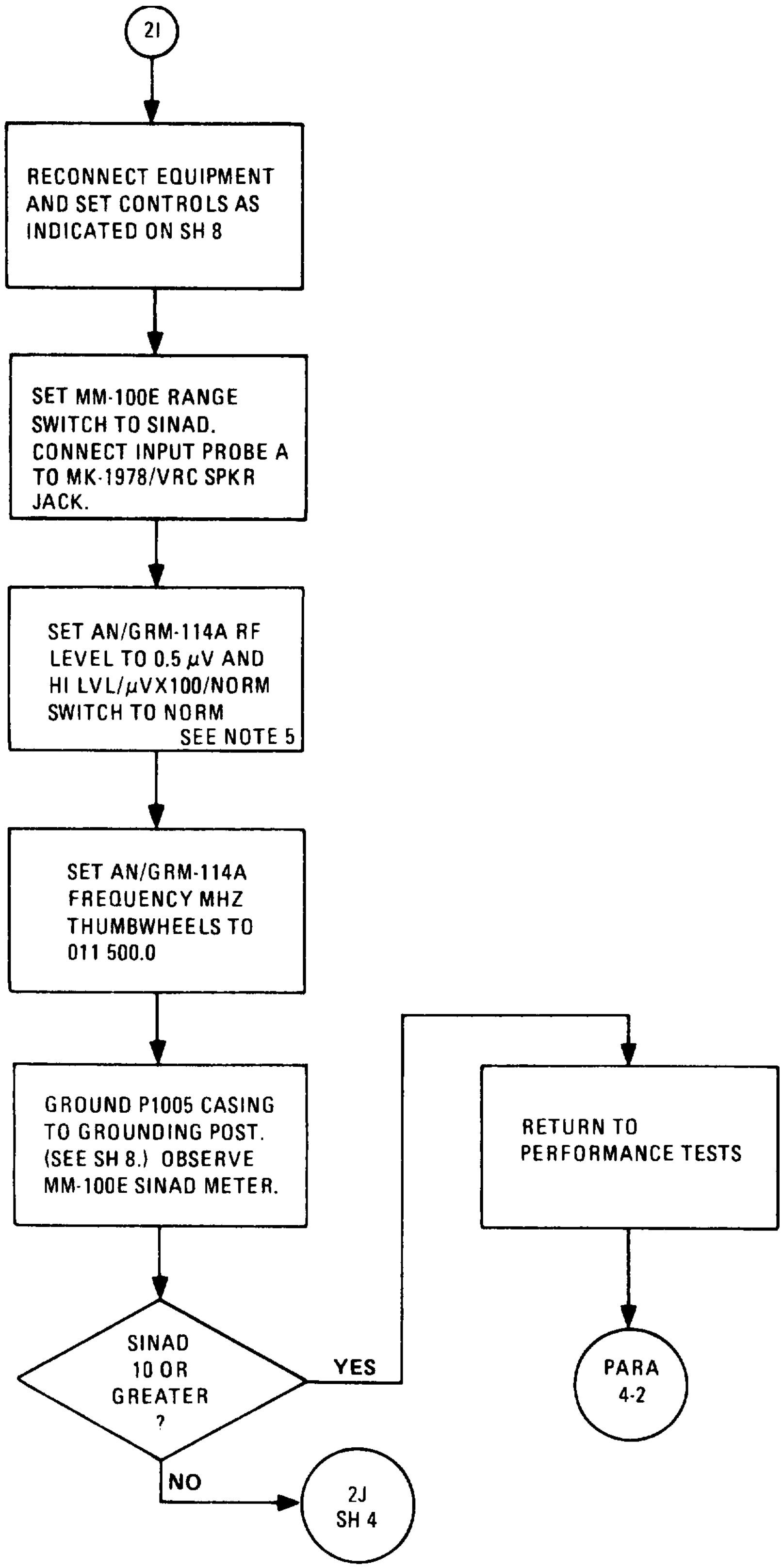
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 6 of 10)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 7 of 10)

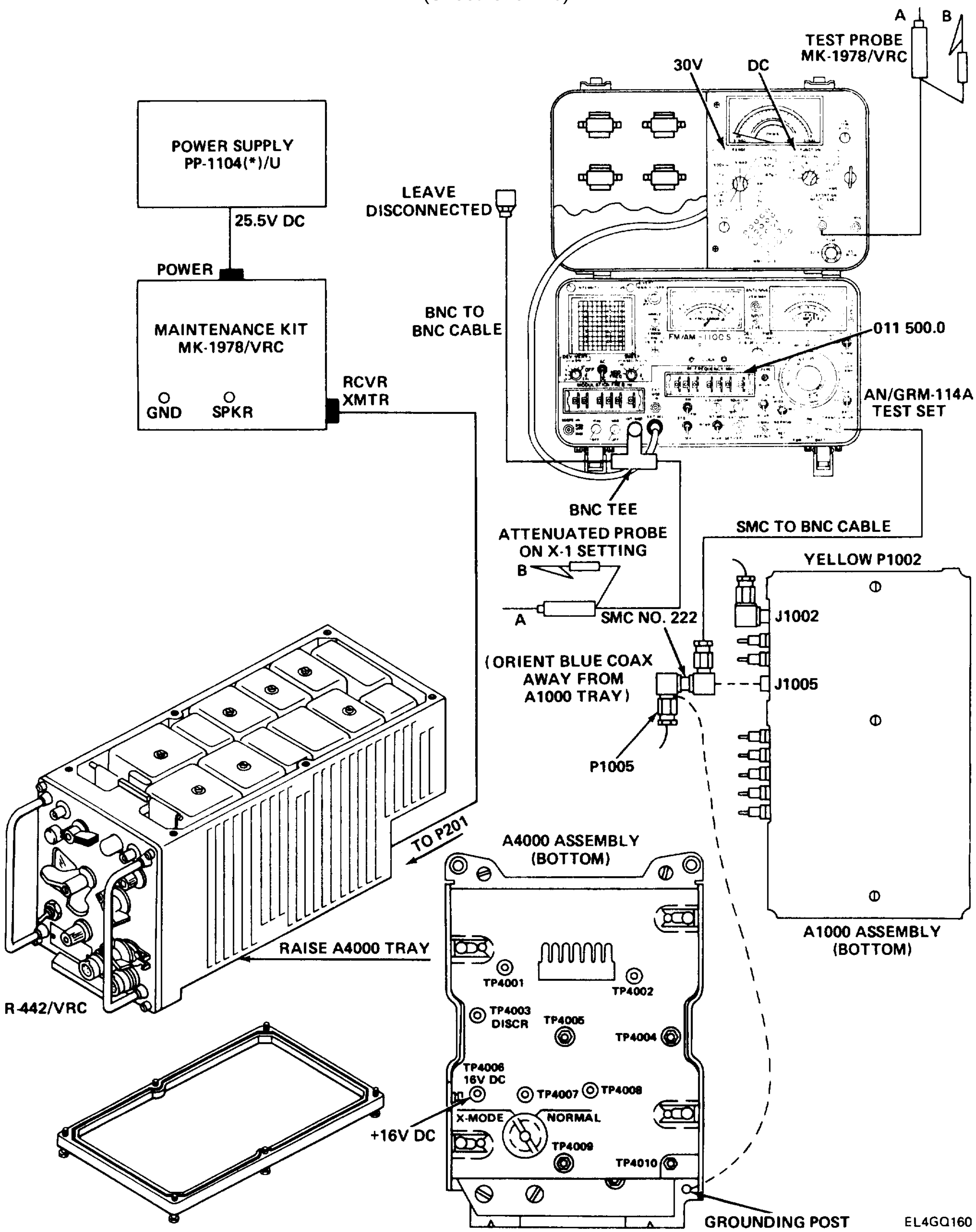


NOTE

5. AN/GRM-114A 1 kHz/OFF control must be adjusted for 8-kHz deviation.

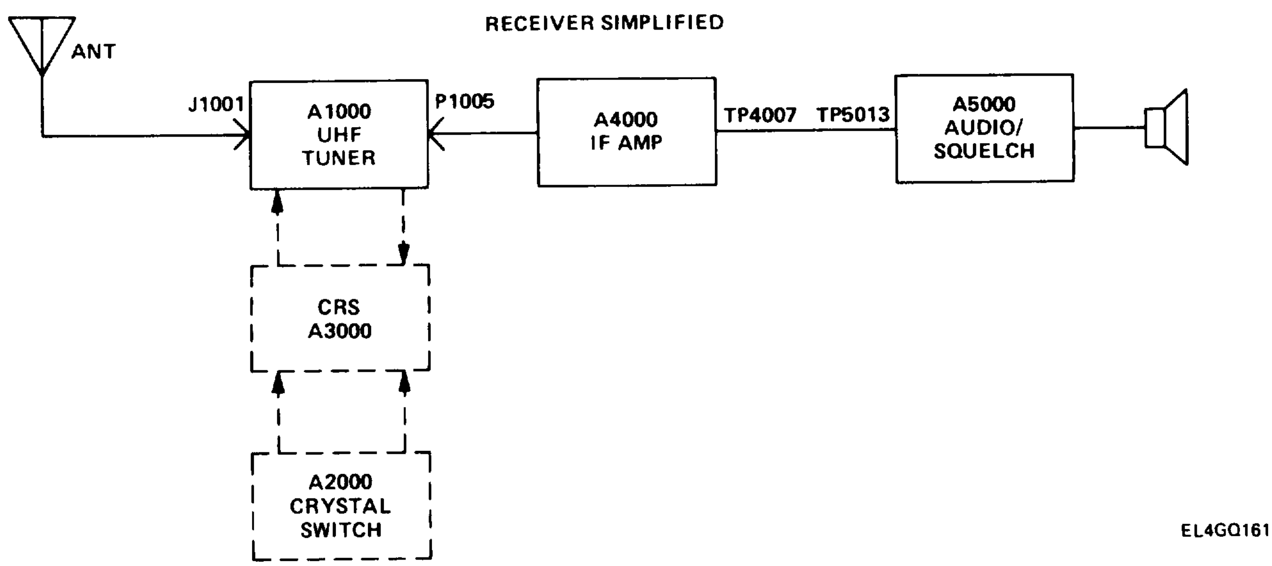
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 8 of 10)



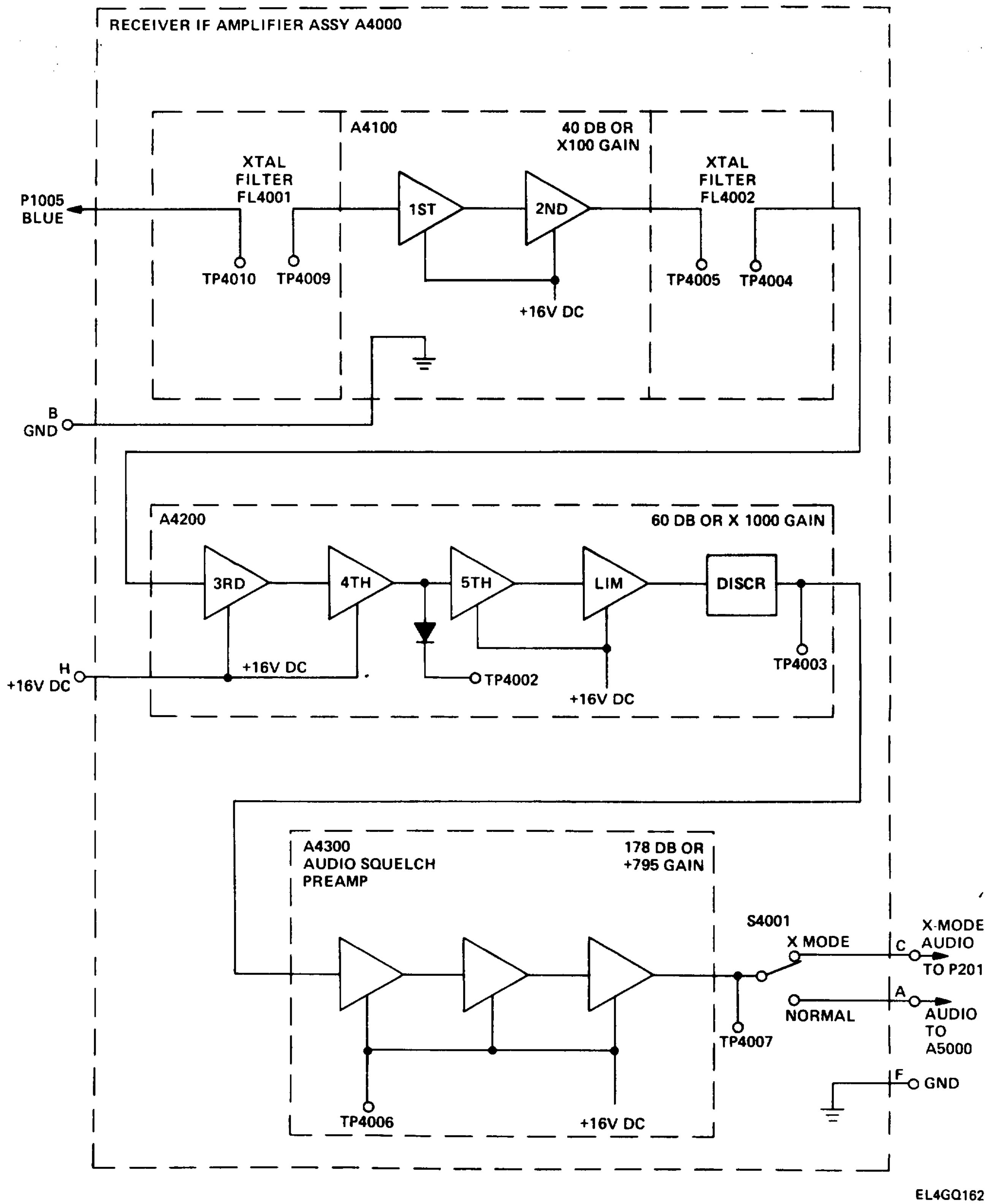
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 9 of 10)



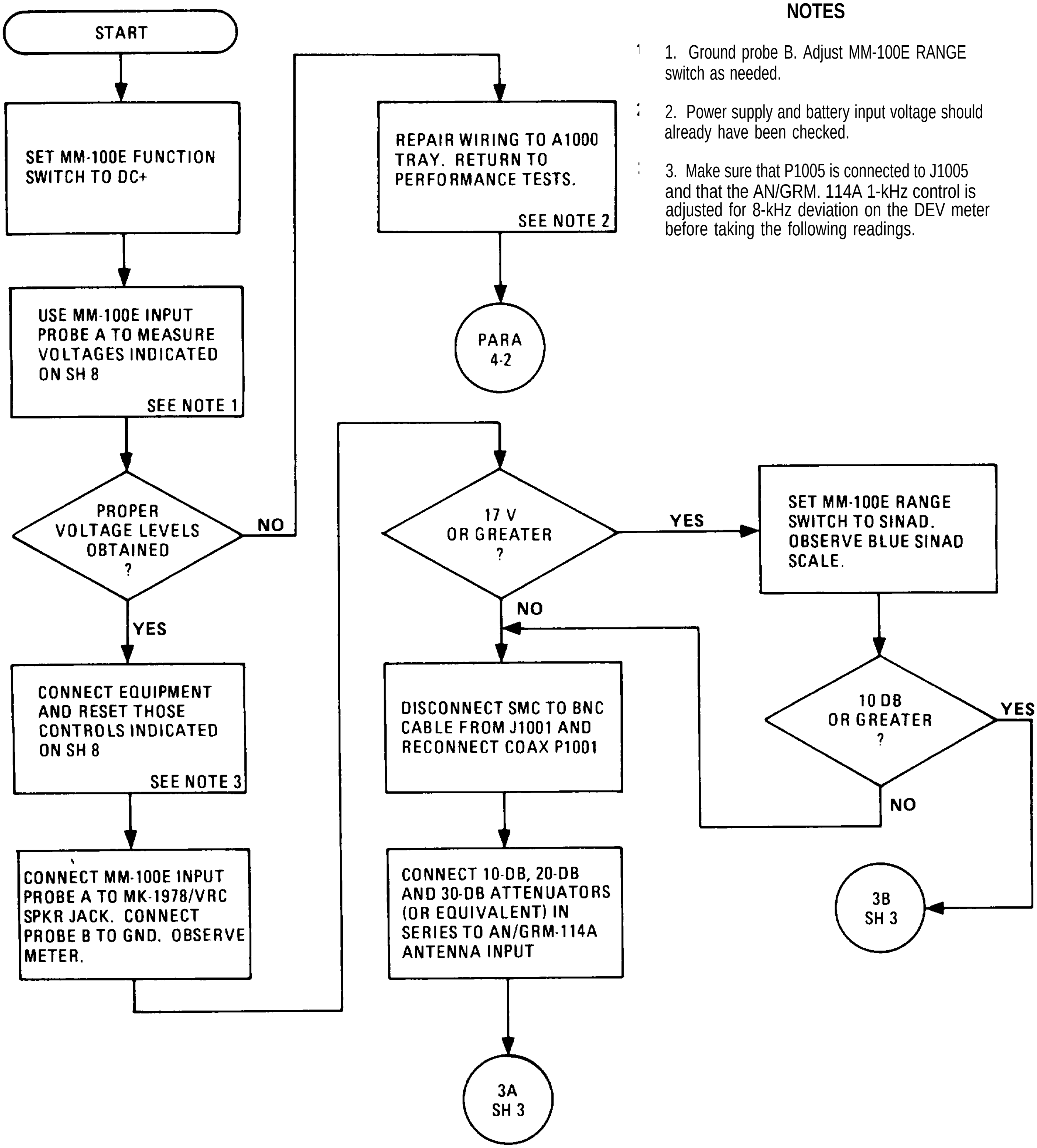
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-2
A4000 Assembly Troubleshooting
(Sheet 10 of 10)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 1 of 8)

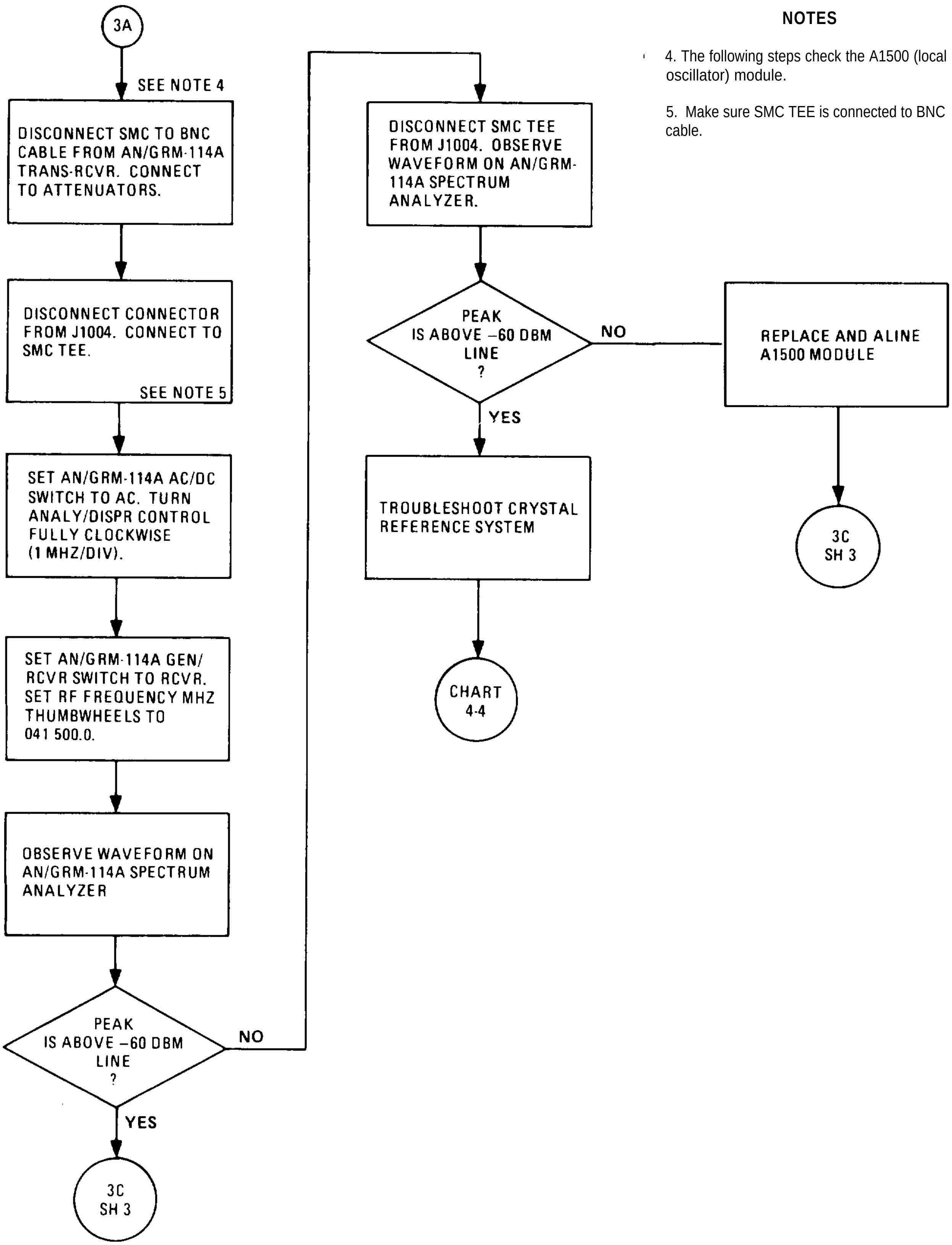


NOTES

1. Ground probe B. Adjust MM-100E RANGE switch as needed.
2. Power supply and battery input voltage should already have been checked.
3. Make sure that P1005 is connected to J1005 and that the AN/GRM. 114A 1-kHz control is adjusted for 8-kHz deviation on the DEV meter before taking the following readings.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 2 of 8)



NOTES

4. The following steps check the A1500 (local oscillator) module.

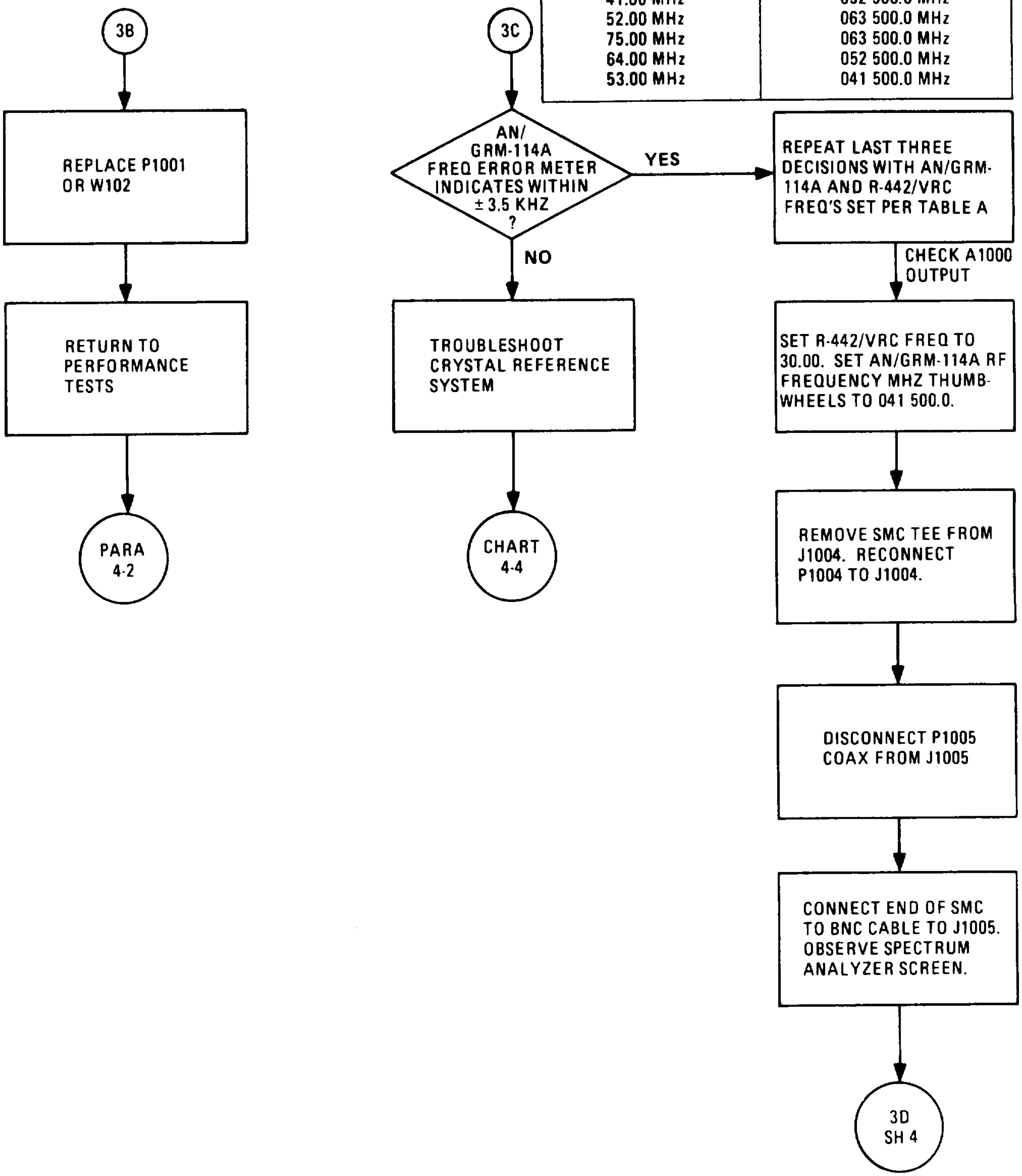
5. Make sure SMC TEE is connected to BNC cable.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 3 of 8)

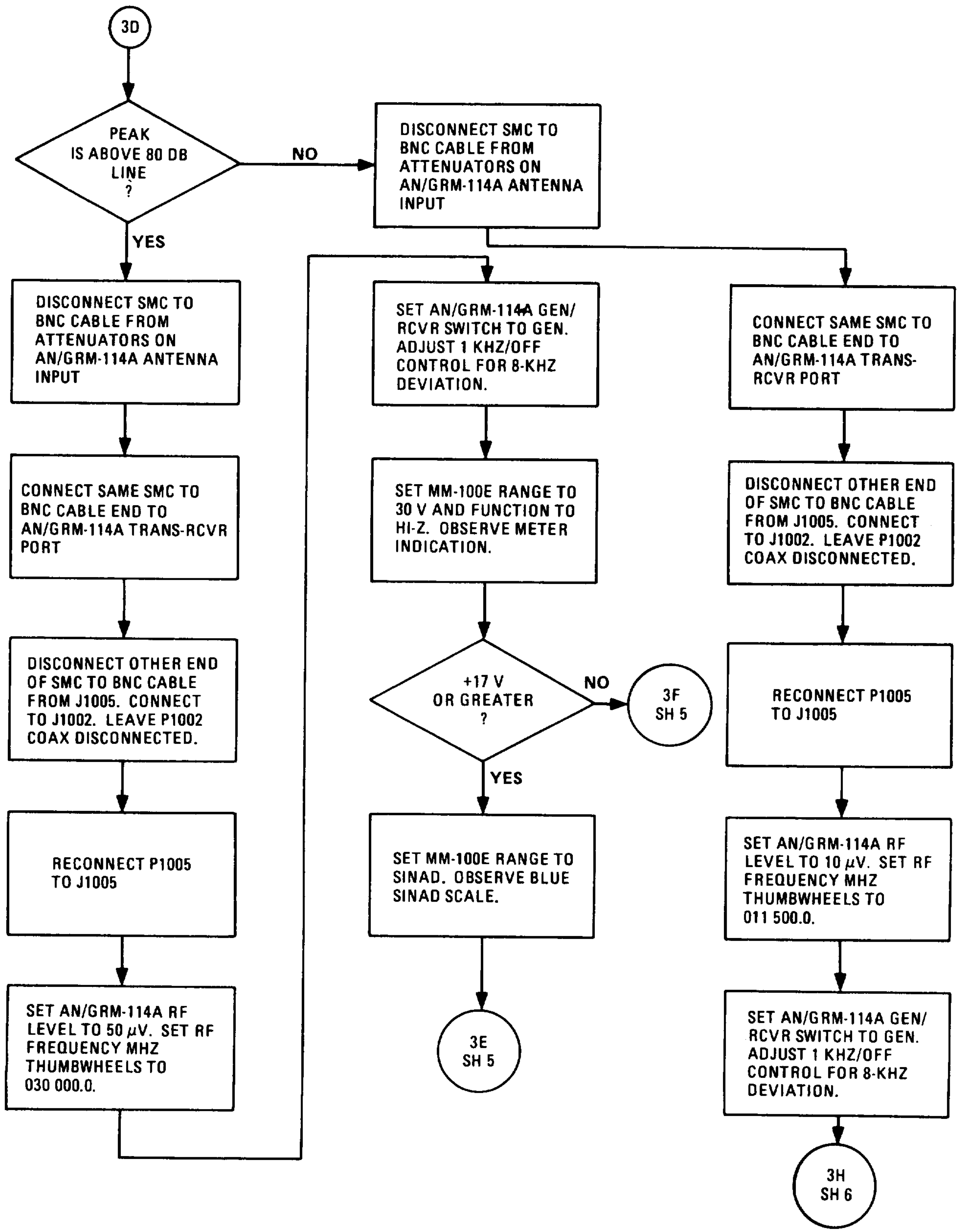
TABLE A

R-442/VRC FREQUENCY	AN/GRM-114A FREQUENCY
30.00 MHz	041 500.0 MHz
41.00 MHz	052 500.0 MHz
52.00 MHz	063 500.0 MHz
75.00 MHz	063 500.0 MHz
64.00 MHz	052 500.0 MHz
53.00 MHz	041 500.0 MHz



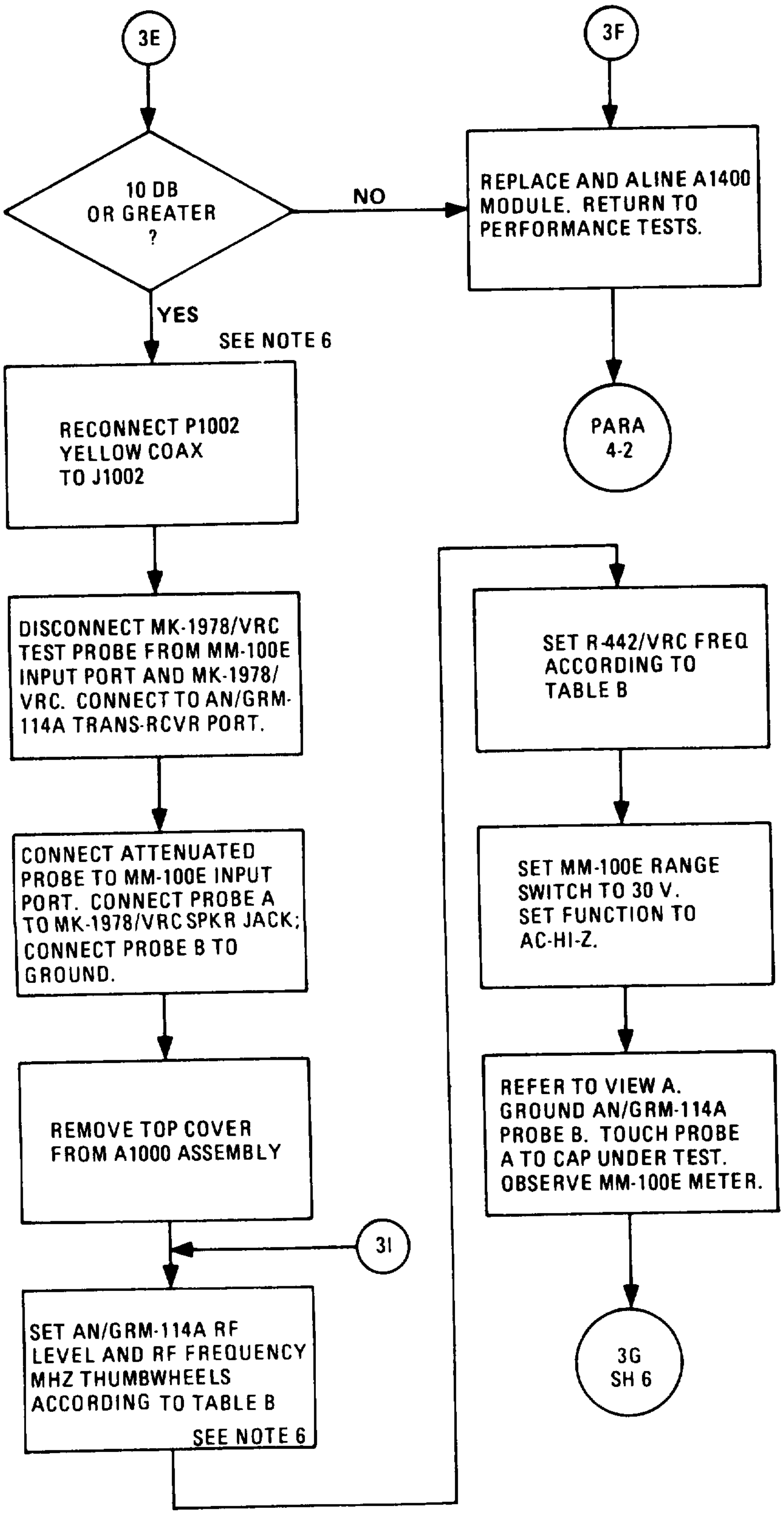
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 4 of 8)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 5 of 8)



NOTE

6. Adjust 1 KHz/OFF control for 8-kHz deviation

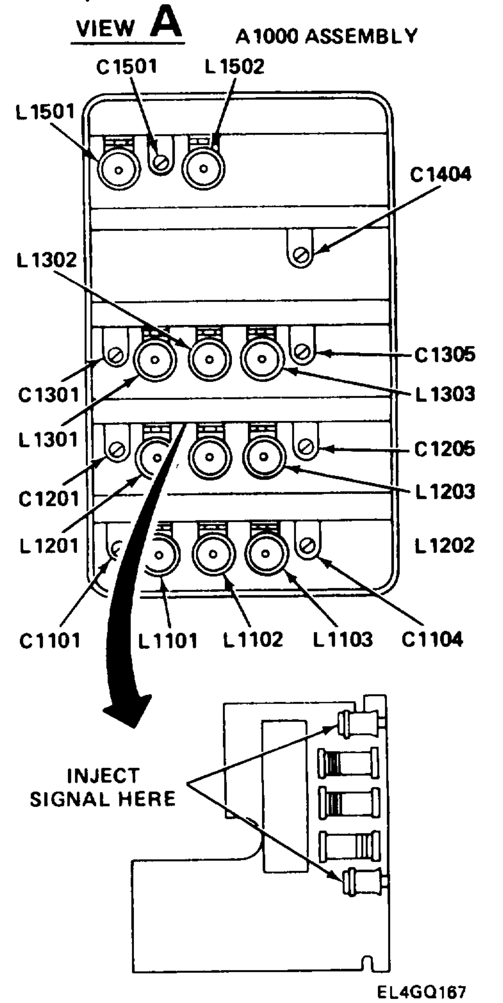


TABLE B

AN/GRM-114A AND R-442/VRC FREQUENCY SETTING	AN/GRM-114A RF LEVEL		
	70 µV*	20 µV*	3 µV*
30.00 MHz (BAND Ⓐ)	C1305	C1205	C1104
64.90 MHz (BAND Ⓑ)	C1301	C1201	C1101

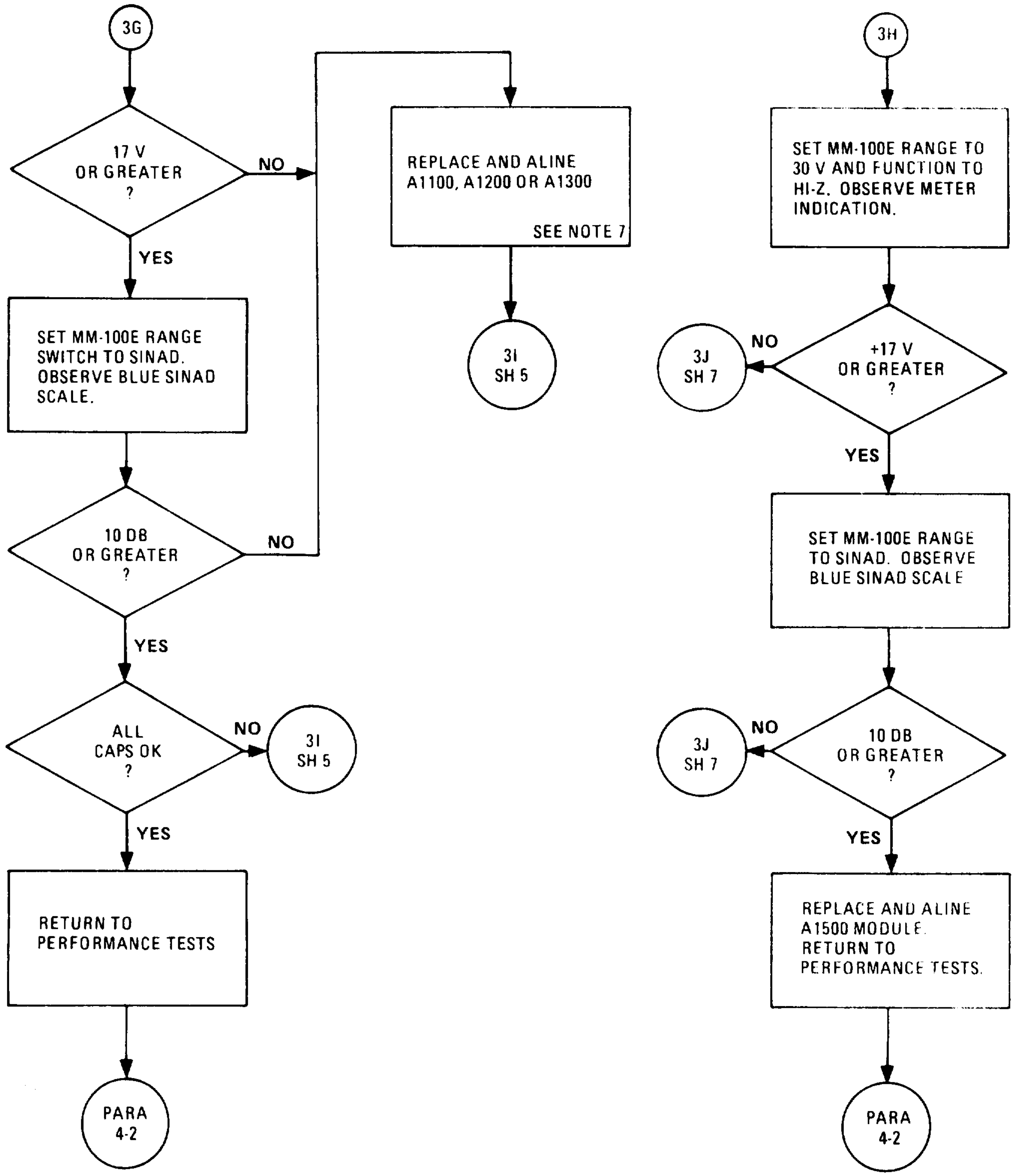
*THESE INPUT LEVELS LISTED COMPENSATE FOR A 6 dB LOSS DUE TO MK-1978/VRC TEST PROBE. USE ONLY THE MK-1978/VRC TEST PROBE.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 6 of 8)

NOTE

7. Depending upon which caps fail to meet requirements.

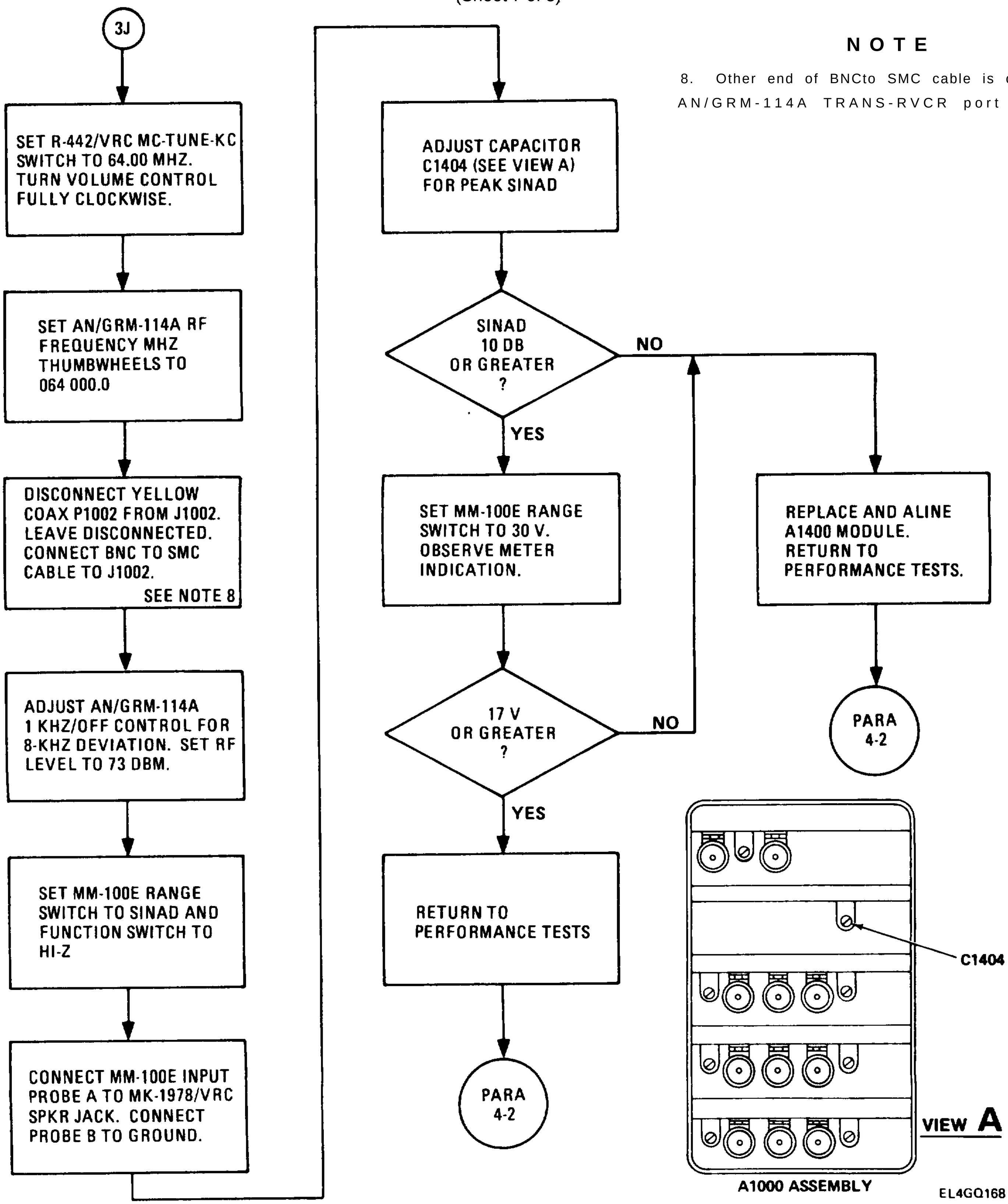


4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 7 of 8)

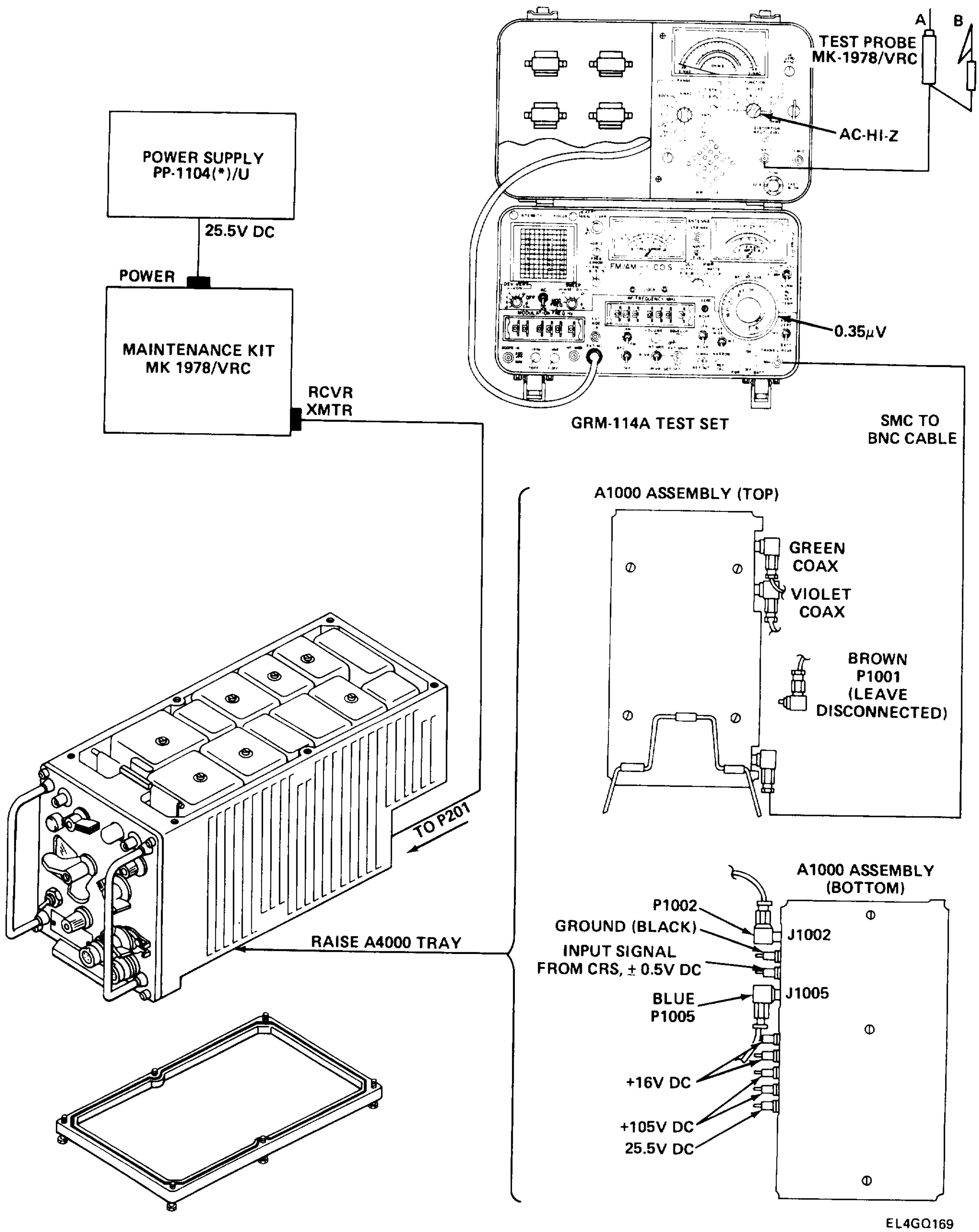
NOTE

8. Other end of BNCto SMC cable is connected to AN/GRM-114A TRANS-RVCR port



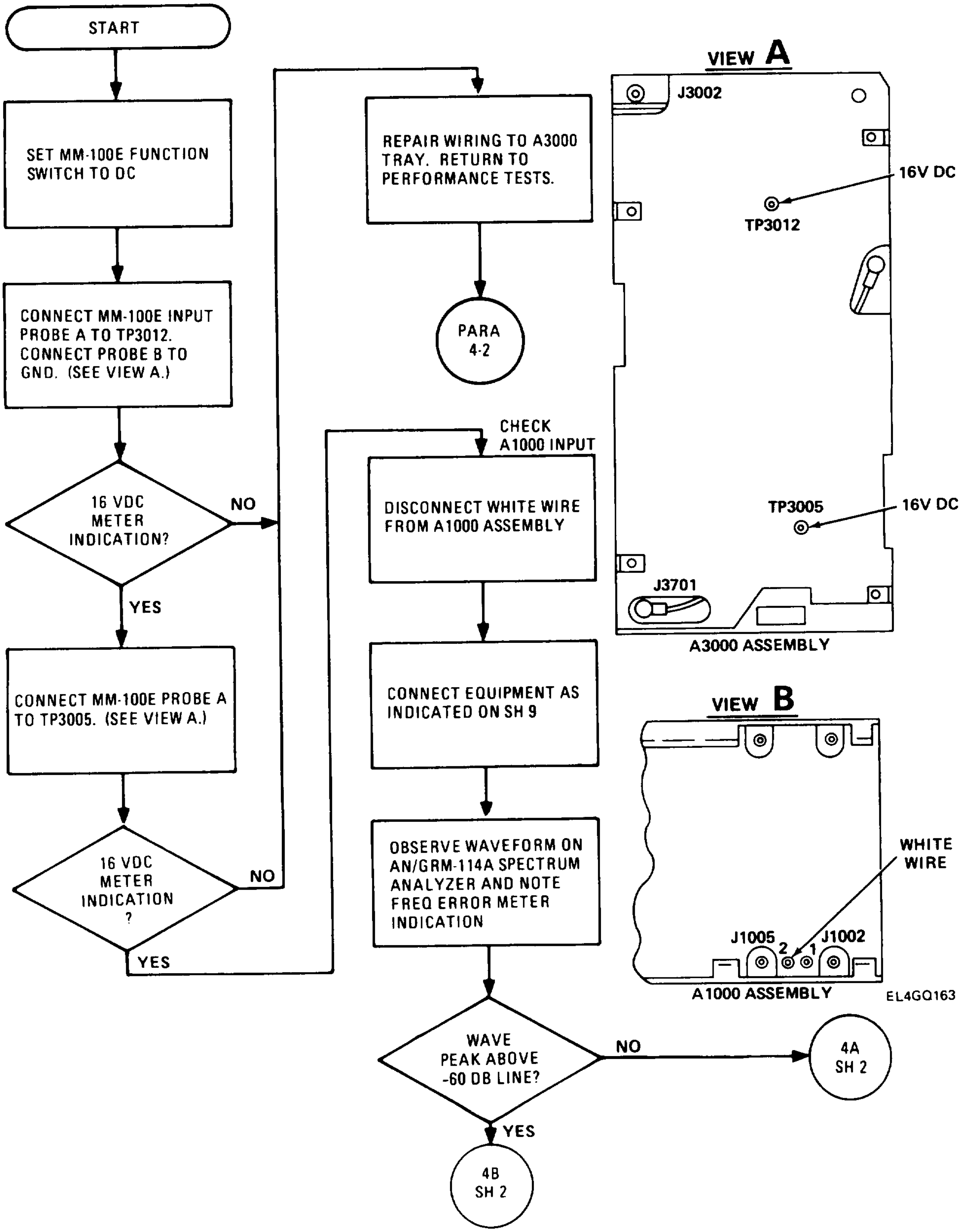
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-3
SINAD Test Failure Troubleshooting – A1000 Assembly
(Sheet 8 of 8)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 1 of 9)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 2 of 9)

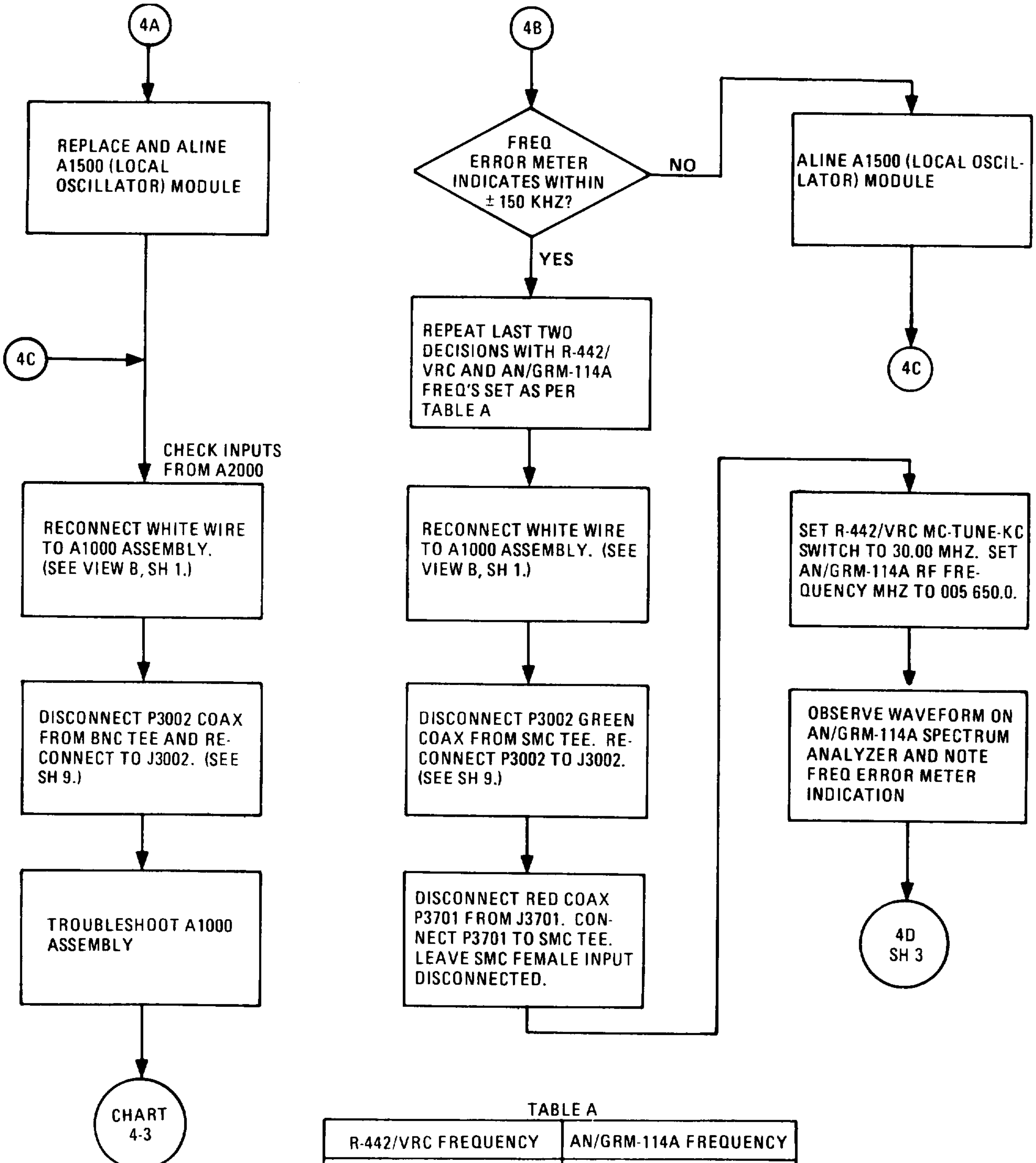
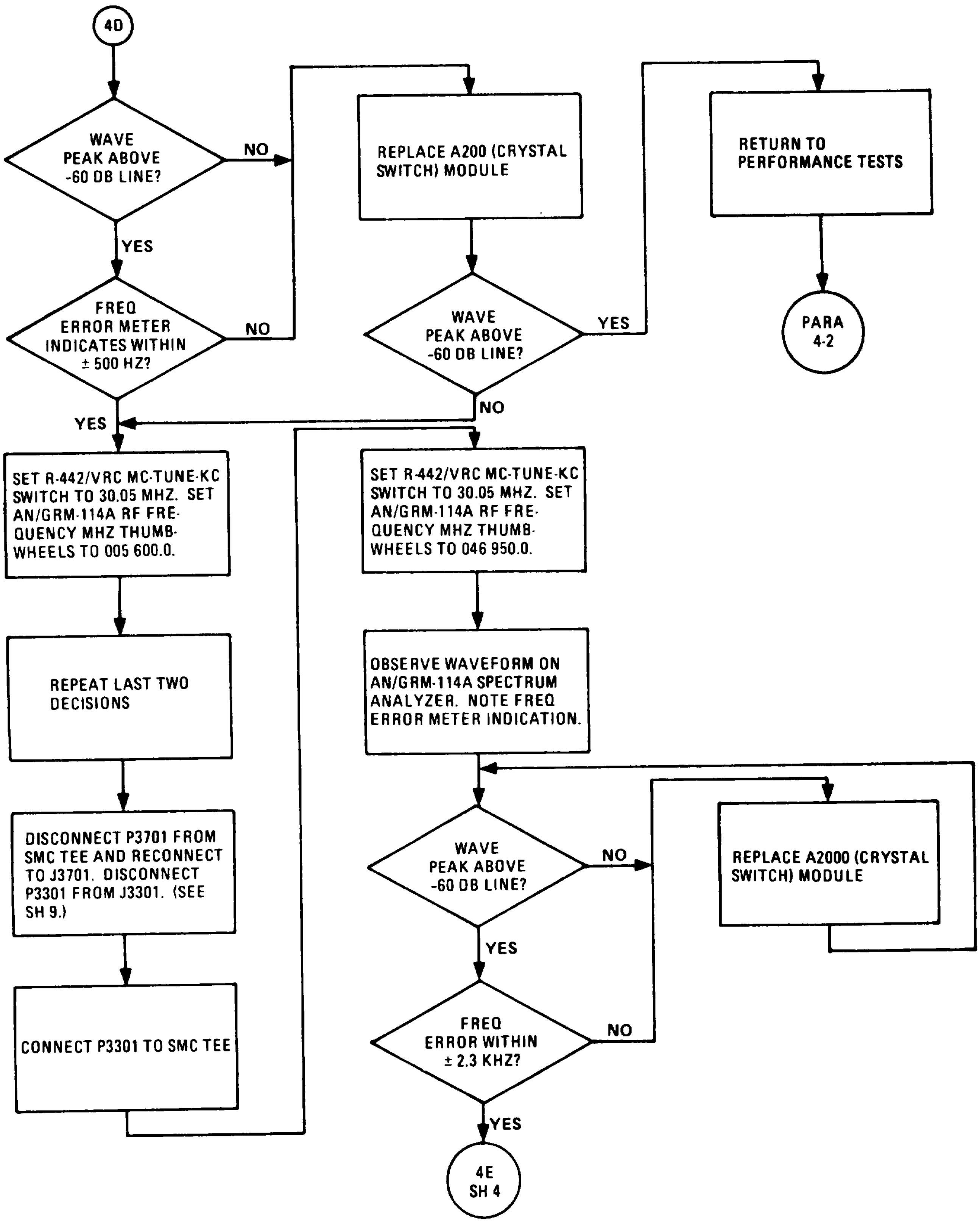


TABLE A

R-442/VRC FREQUENCY	AN/GRM-114A FREQUENCY
30.00 MHz	041 500.0 MHz
41.00 MHz	052 500.0 MHz
52.00 MHz	063 500.0 MHz
75.00 MHz	063 500.0 MHz
64.00 MHz	052 500.0 MHz
53.00 MHz	041 500.0 MHz

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting- A2000, A3000 Assemblies
(Sheet 3 of 9)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 4 of 9)

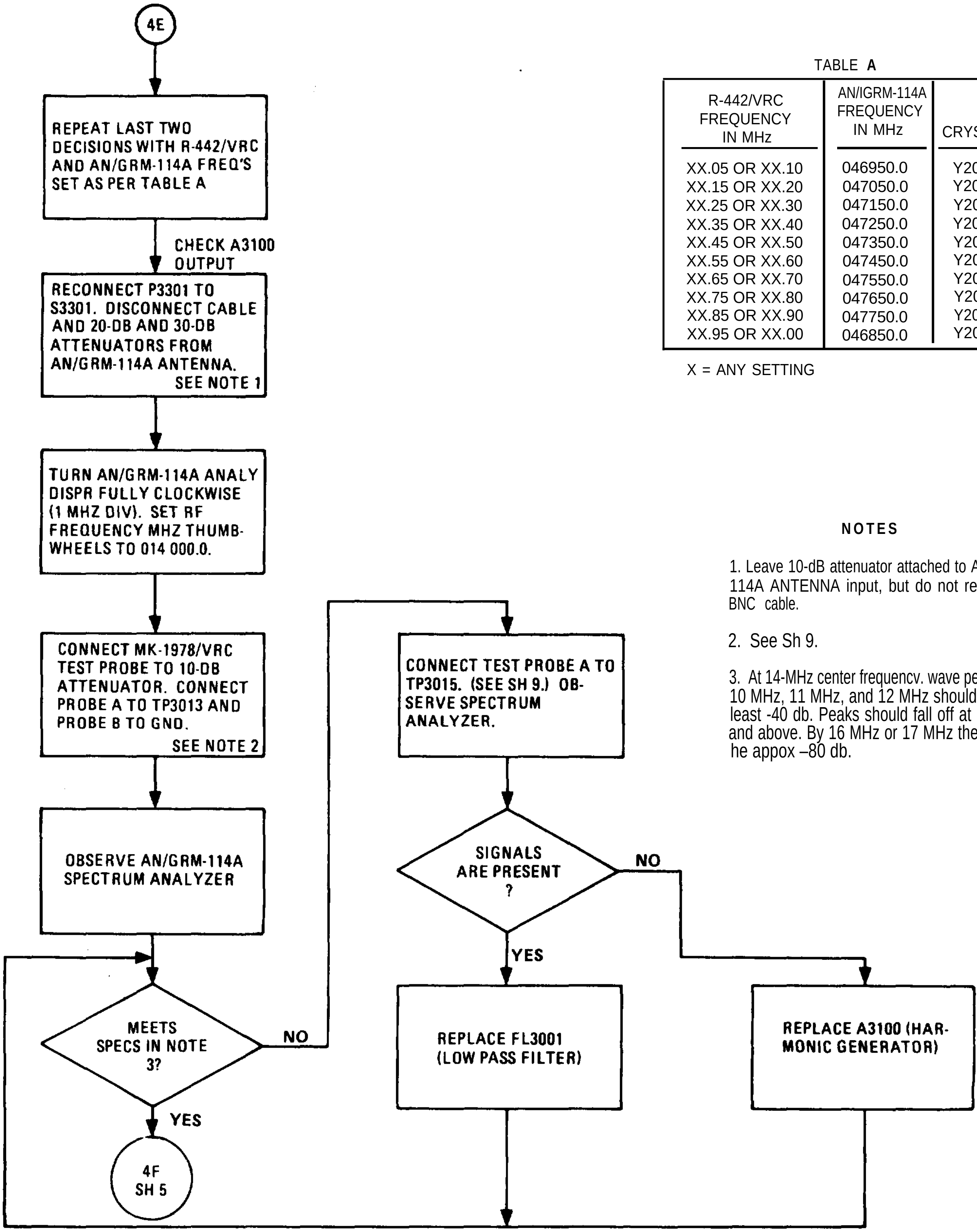


TABLE A

R-442/VRC FREQUENCY IN MHz	AN/IGRM-114A FREQUENCY IN MHz	CRYSTAL
XX.05 OR XX.10	046950.0	Y2007
XX.15 OR XX.20	047050.0	Y2008
XX.25 OR XX.30	047150.0	Y2009
XX.35 OR XX.40	047250.0	Y2010
XX.45 OR XX.50	047350.0	Y2005
XX.55 OR XX.60	047450.0	Y2004
XX.65 OR XX.70	047550.0	Y2003
XX.75 OR XX.80	047650.0	Y2002
XX.85 OR XX.90	047750.0	Y2001
XX.95 OR XX.00	046850.0	Y2006

X = ANY SETTING

NOTES

1. Leave 10-dB attenuator attached to AN/GRM-114A ANTENNA input, but do not reconnect BNC cable.

2. See Sh 9.

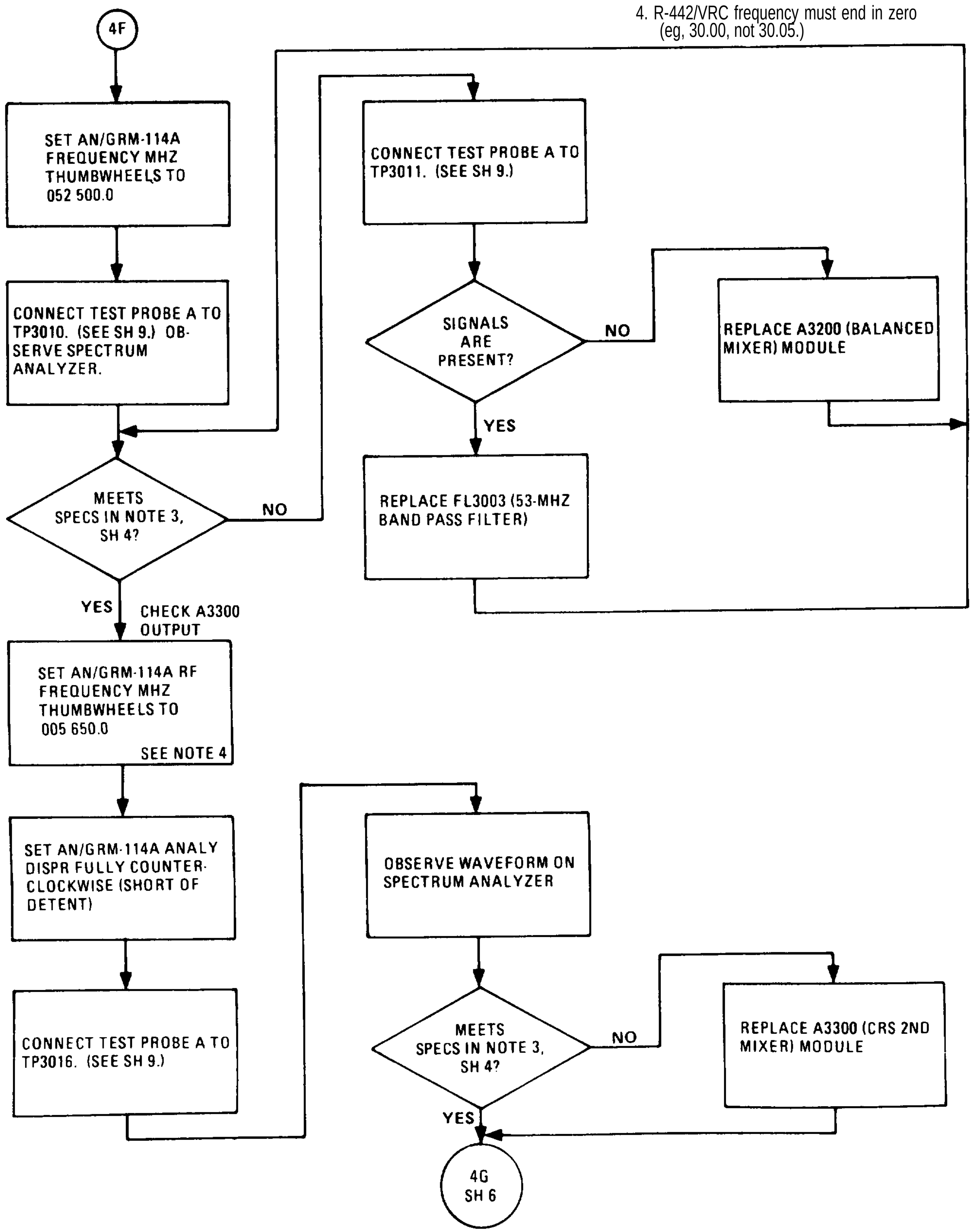
3. At 14-MHz center frequencv. wave peaks at 10 MHz, 11 MHz, and 12 MHz should beat least -40 db. Peaks should fall off at 13 MHz and above. By 16 MHz or 17 MHz they should he appox –80 db.

4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 5 of 9)

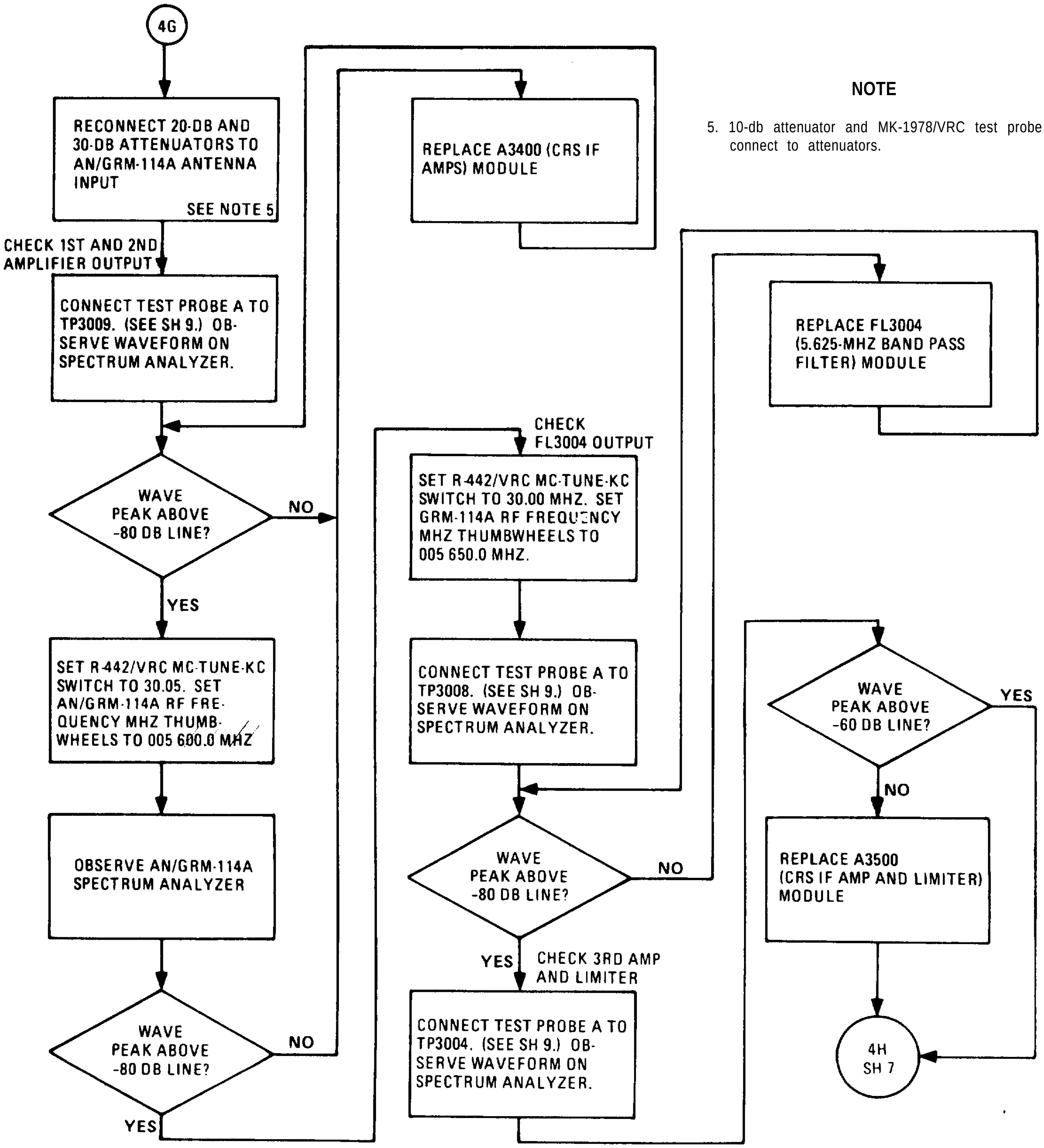
NOTE

4. R-442/VRC frequency must end in zero (eg, 30.00, not 30.05.)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 6 of 9)

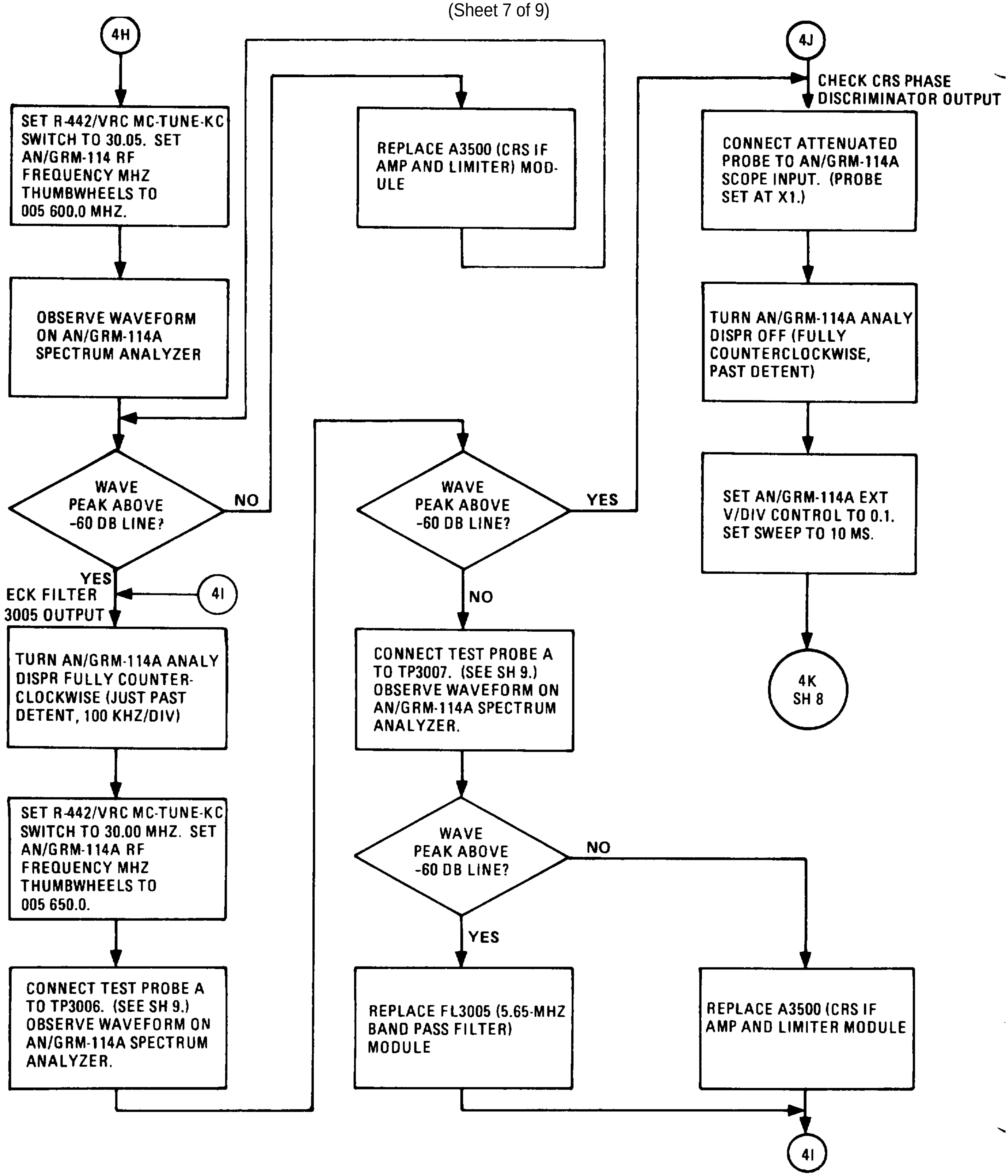


NOTE

5. 10-db attenuator and MK-1978/VRC test probe connect to attenuators.

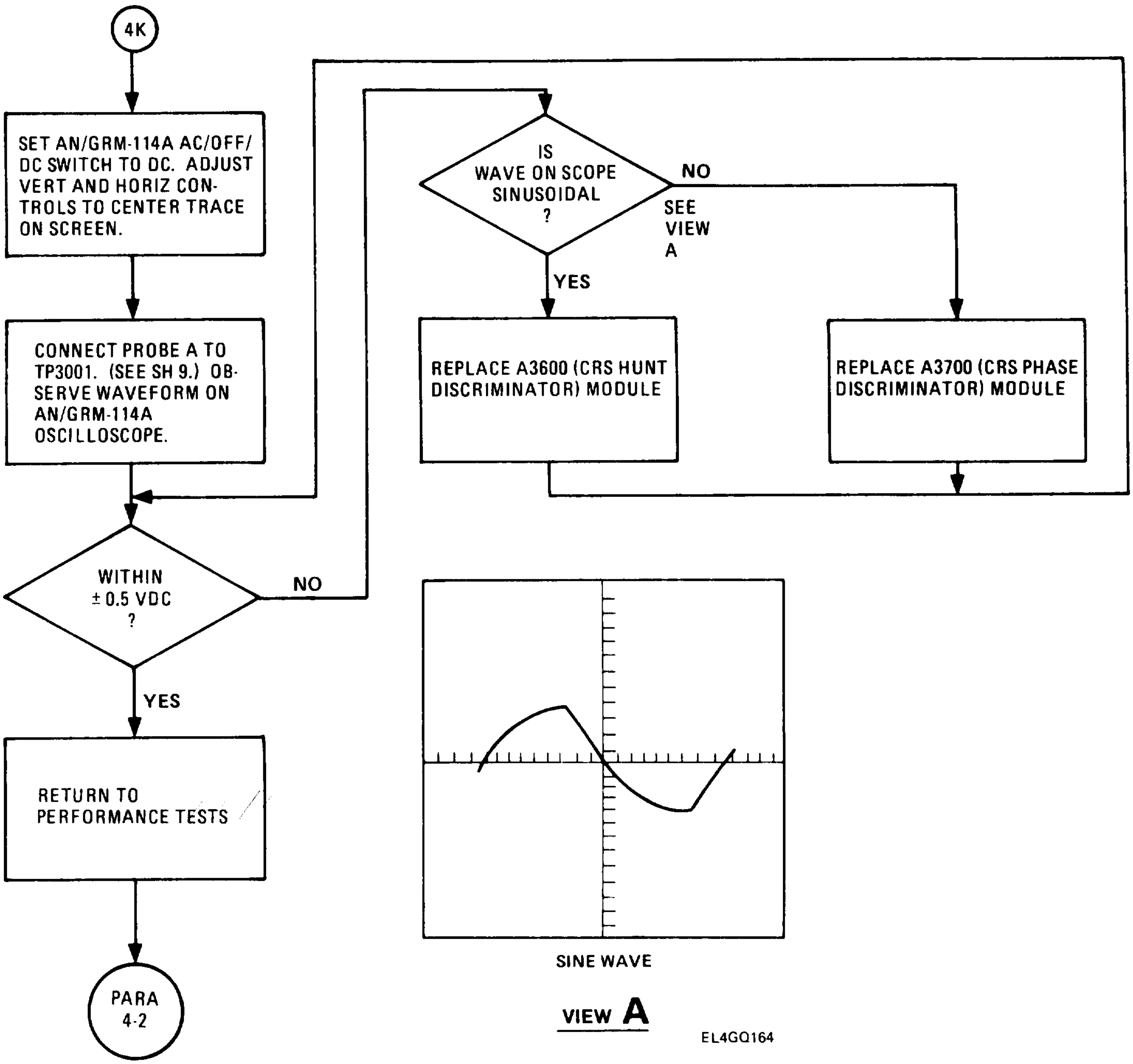
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 7 of 9)



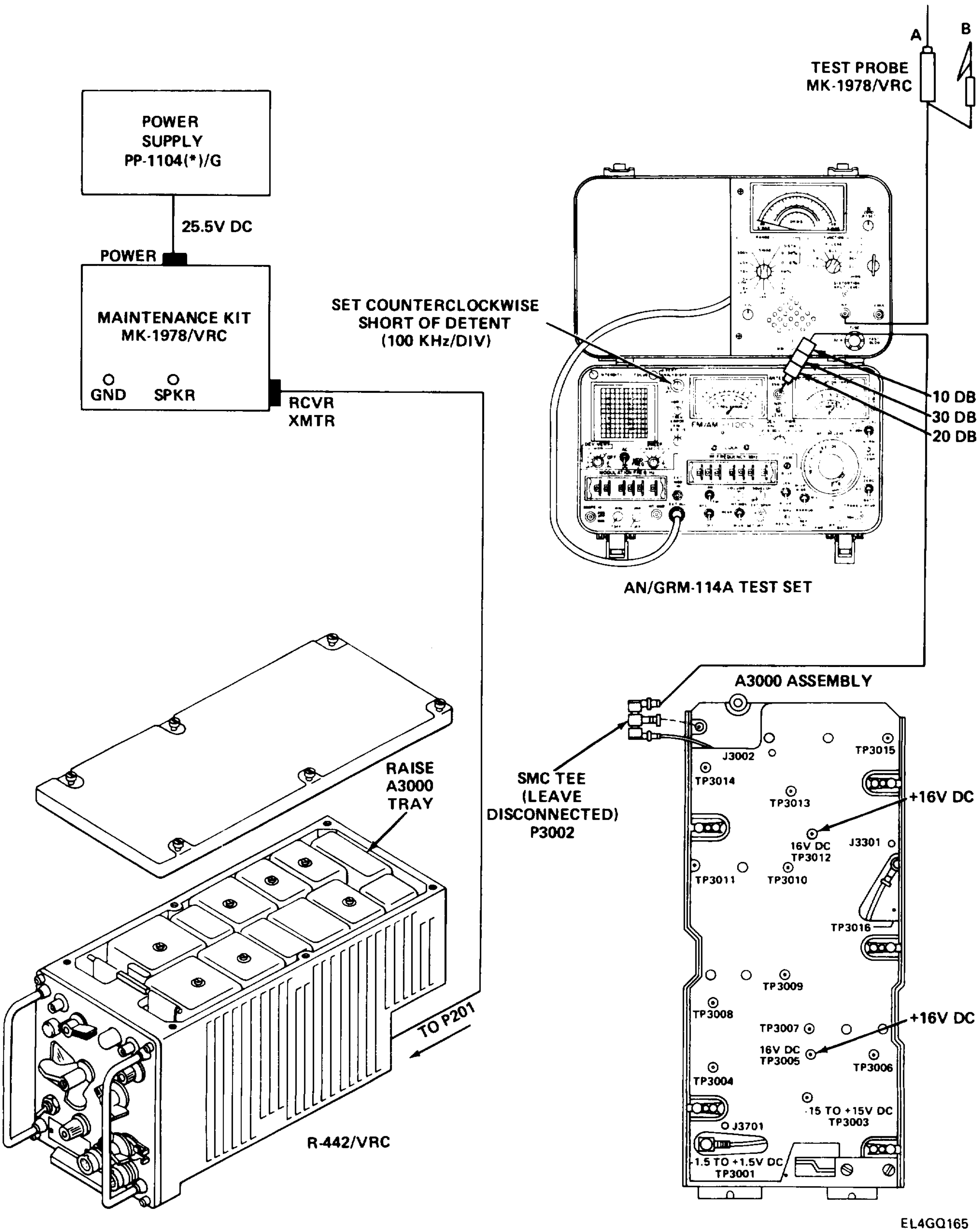
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 8 of 9)



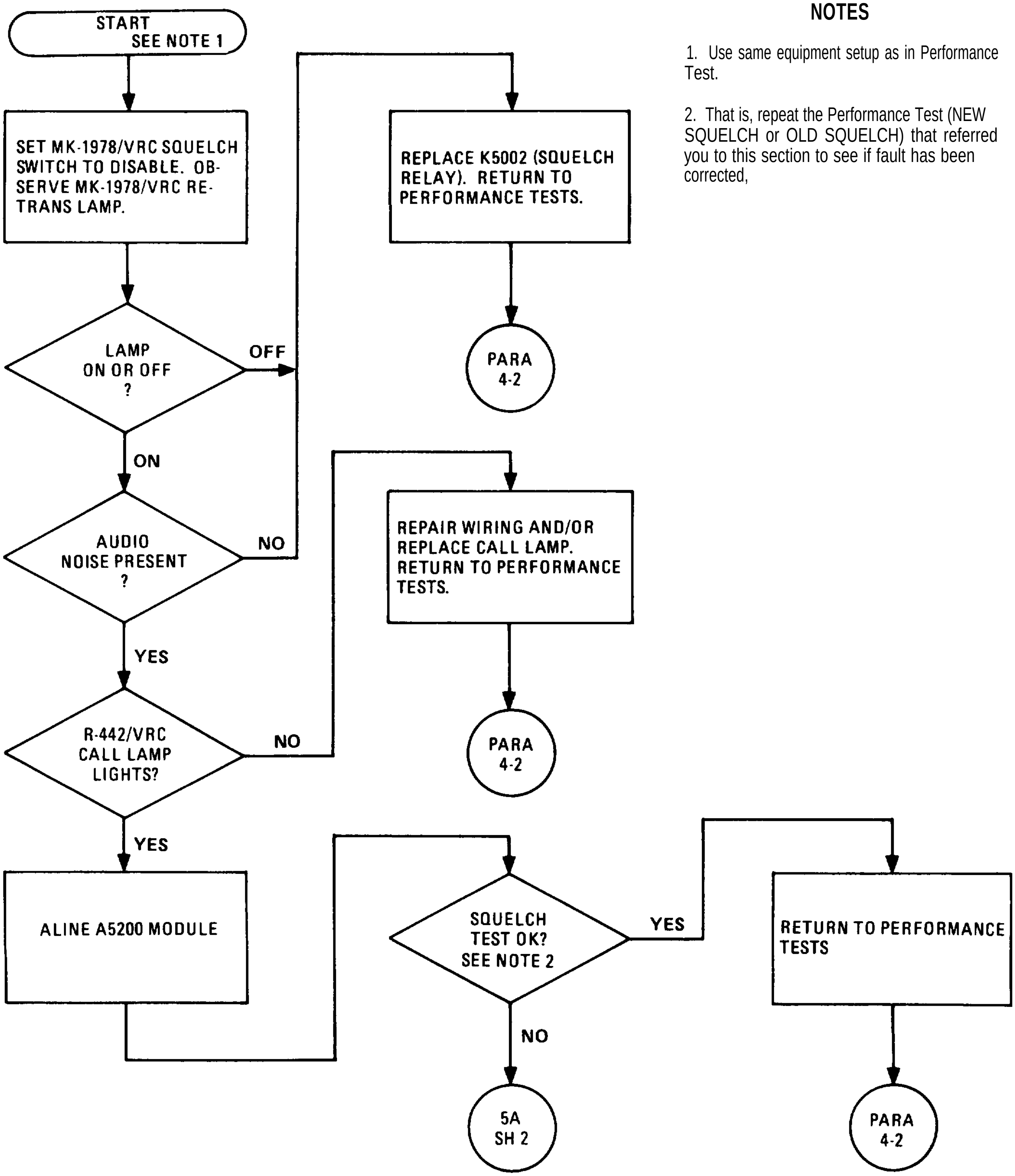
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-4
SINAD Test Failure Troubleshooting – A2000, A3000 Assemblies
(Sheet 9 of 9)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-5
Squelch Test Failure Troubleshooting
(Sheet 1 of 2)



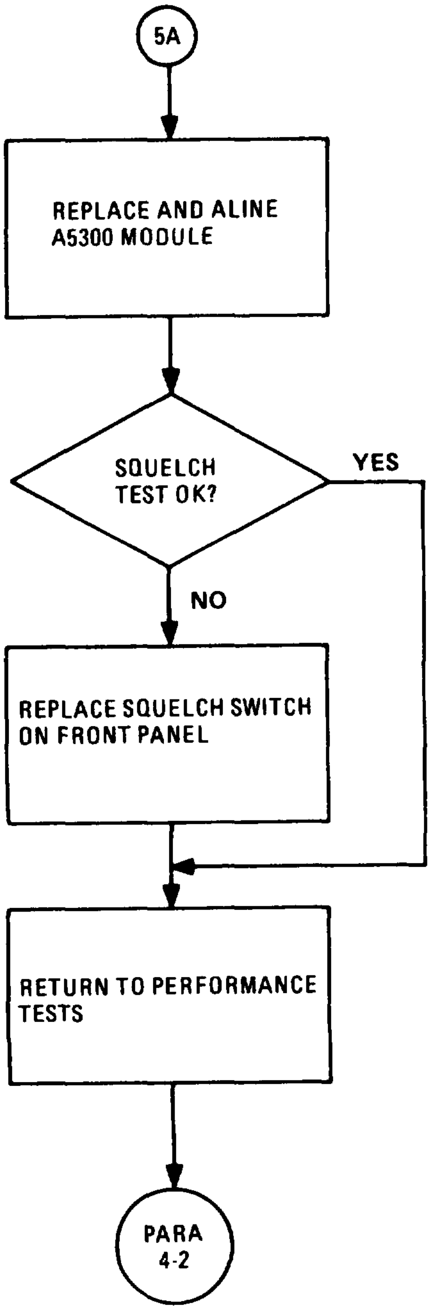
NOTES

1. Use same equipment setup as in Performance Test.

2. That is, repeat the Performance Test (NEW SQUELCH or OLD SQUELCH) that referred you to this section to see if fault has been corrected,

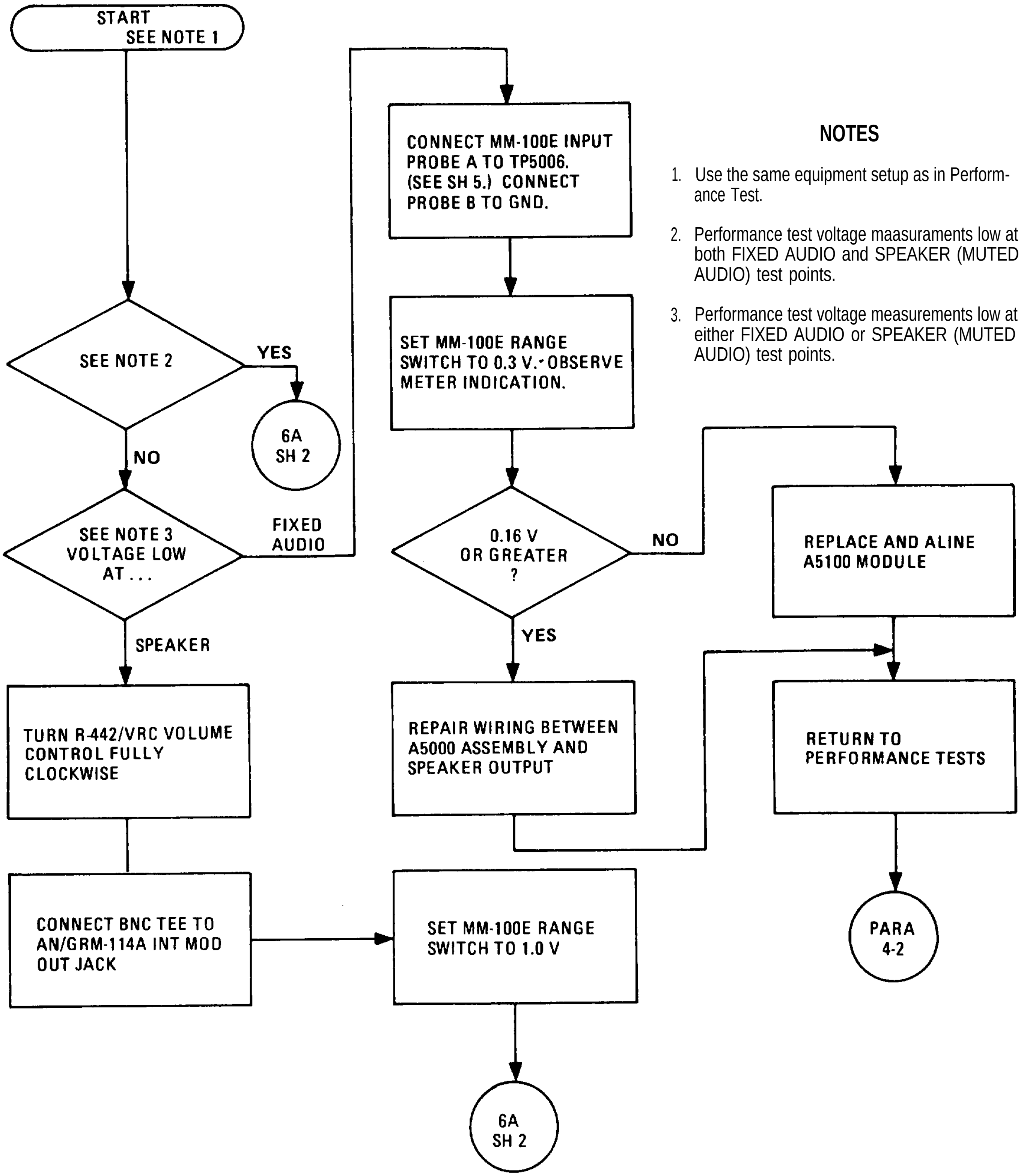
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-5
Squelch Test Failure Troubleshooting
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 1 of 7)

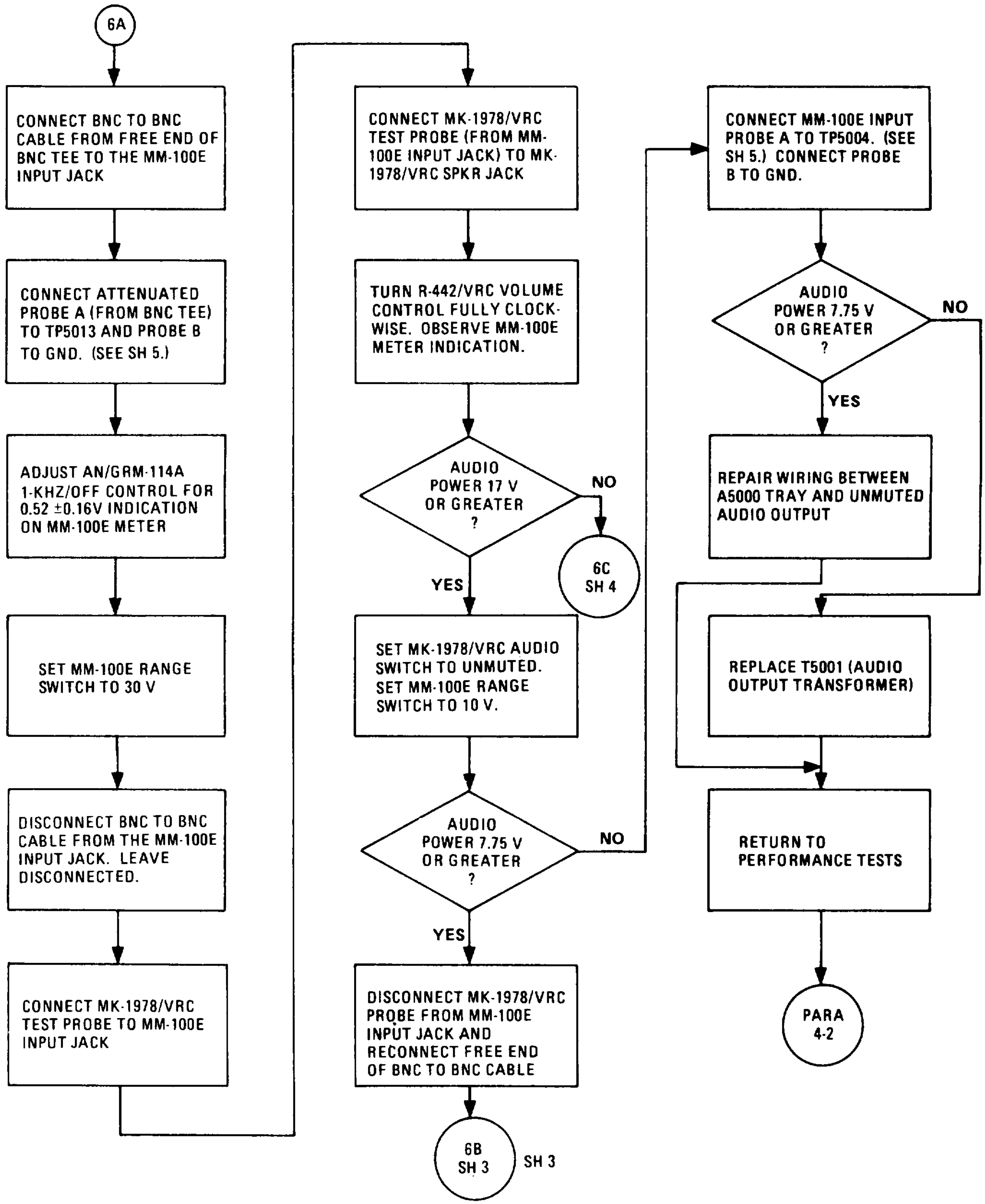


NOTES

1. Use the same equipment setup as in Performance Test.
2. Performance test voltage maasuraments low at both FIXED AUDIO and SPEAKER (MUTED AUDIO) test points.
3. Performance test voltage measurements low at either FIXED AUDIO or SPEAKER (MUTED AUDIO) test points.

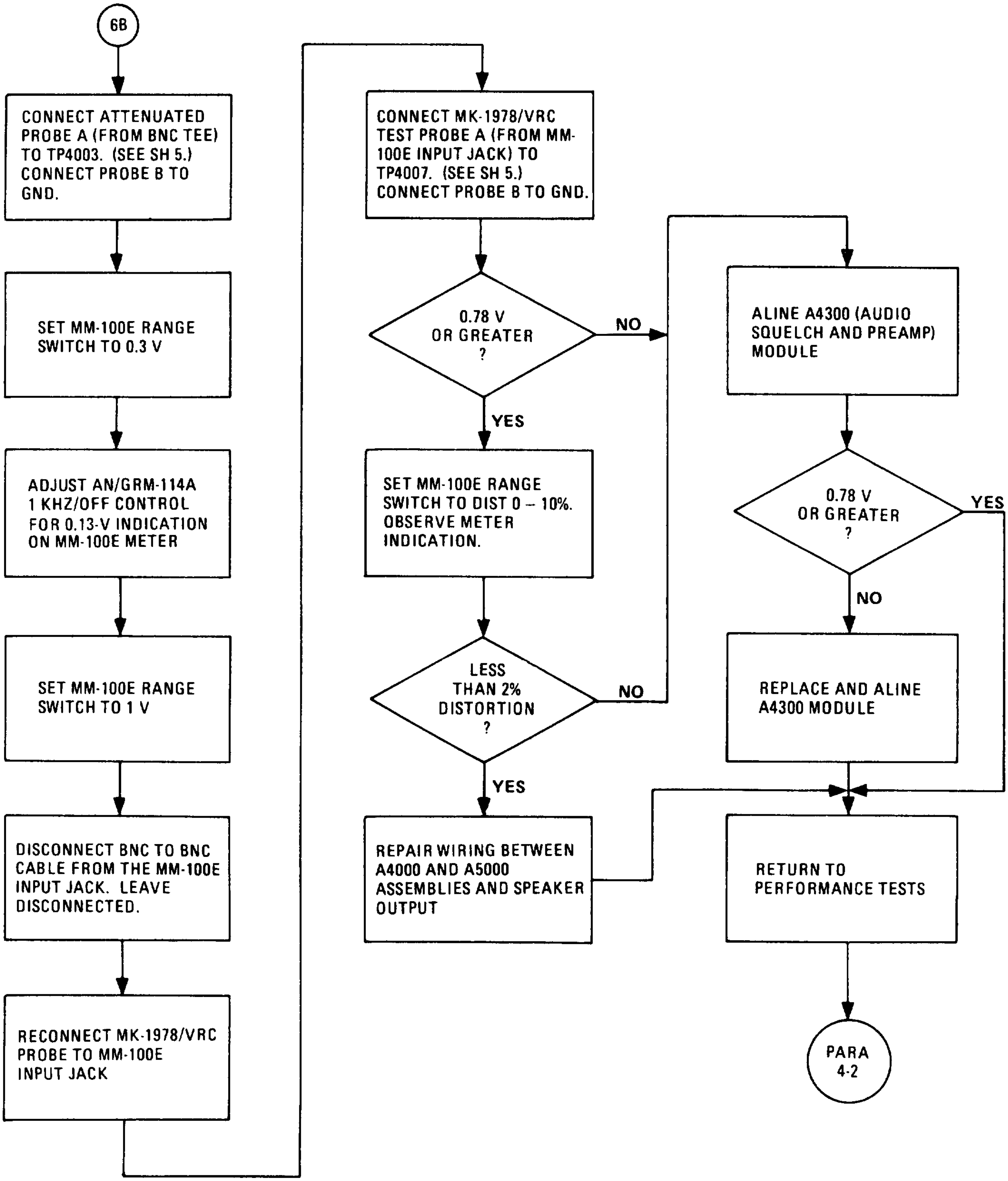
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio power Test Failure Troubleshooting
(Sheet 2 of 7)



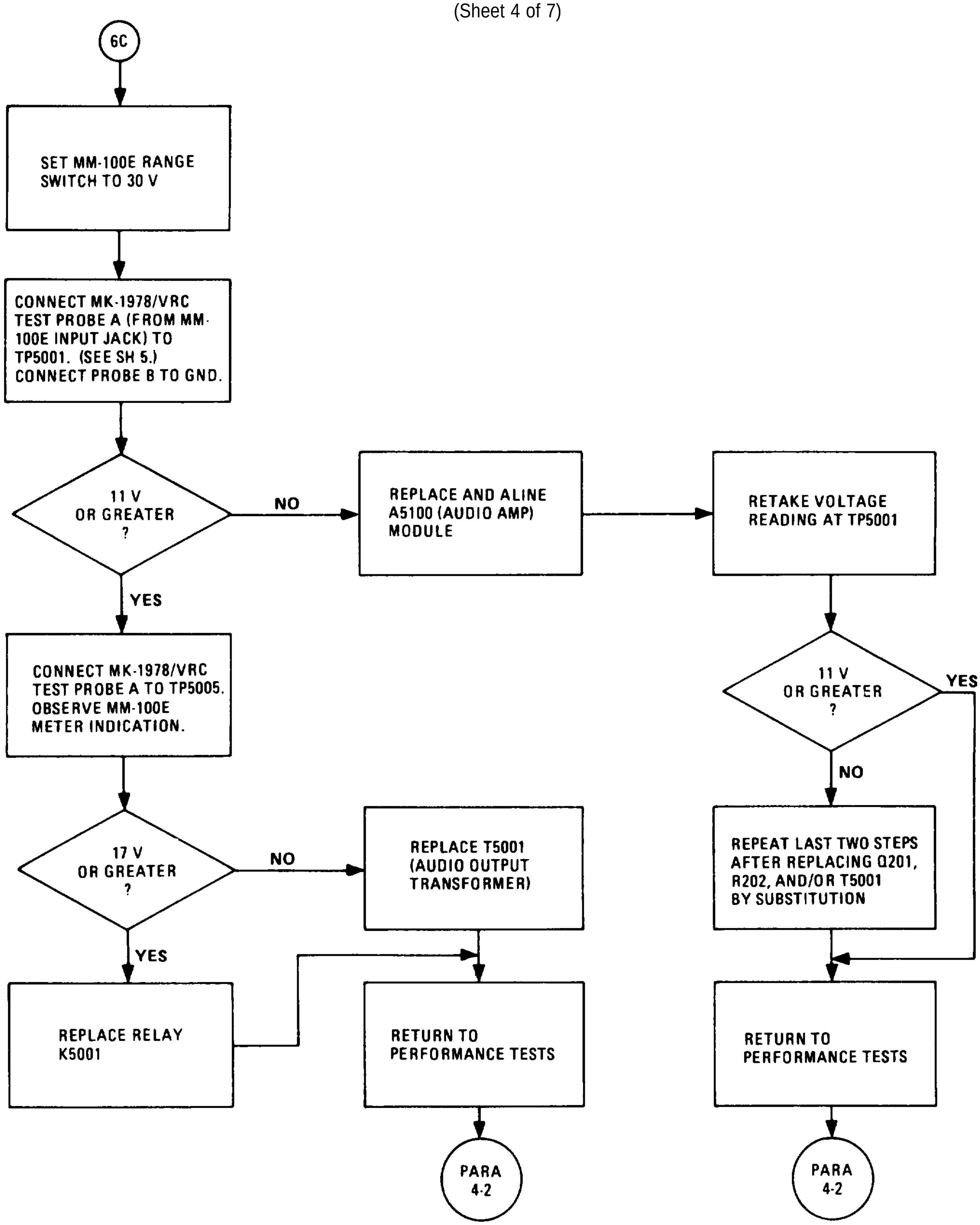
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 3 of 7)



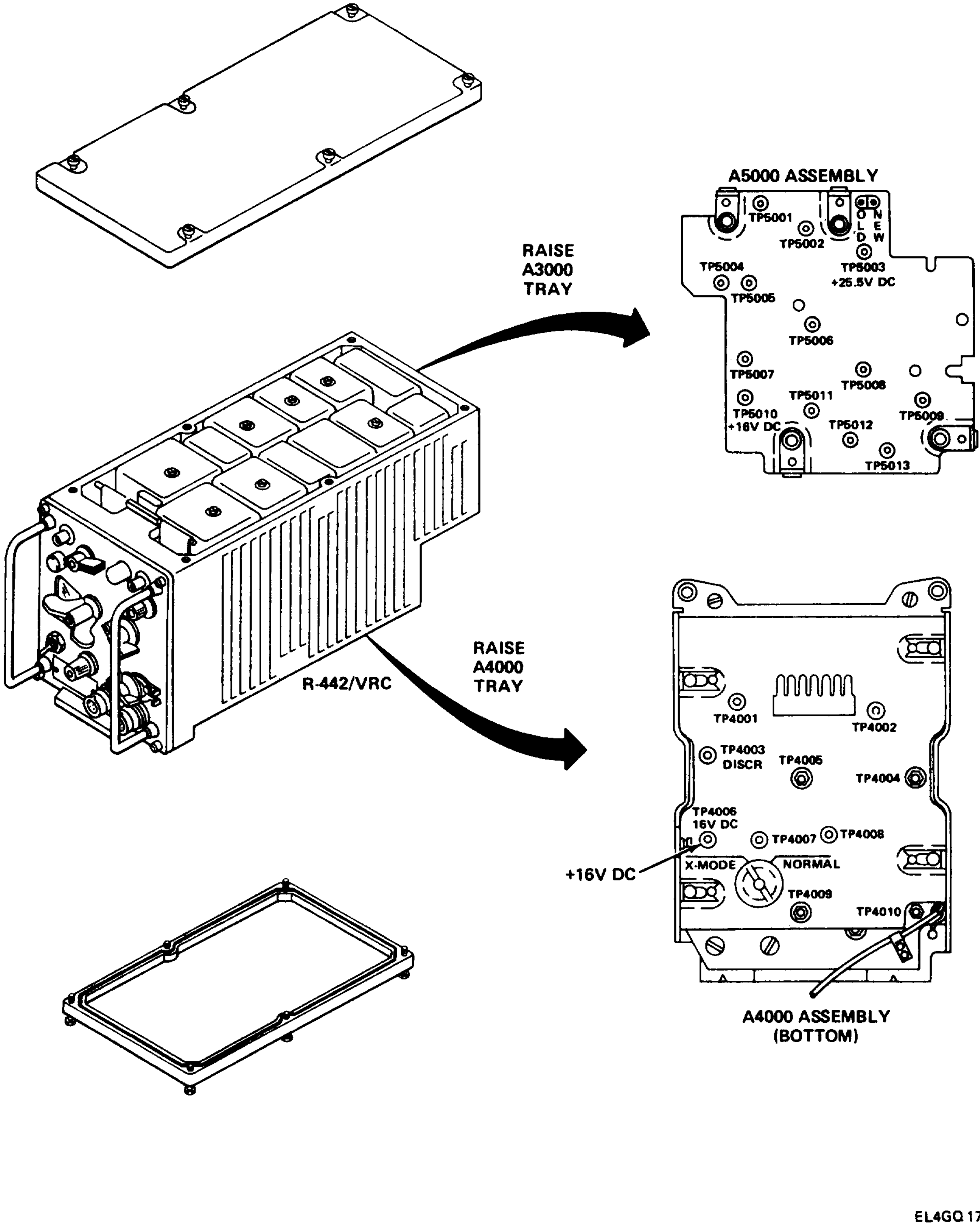
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 4 of 7)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

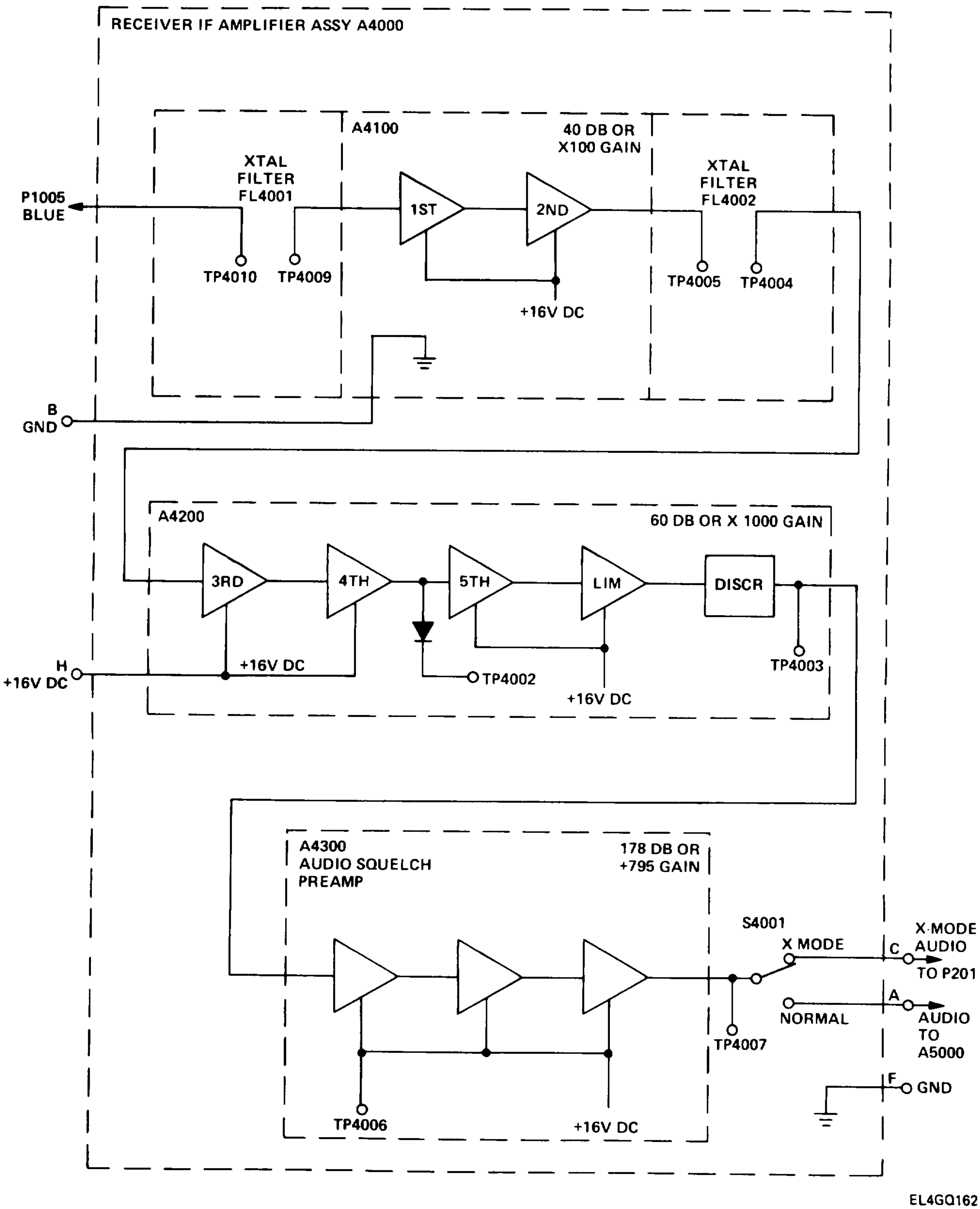
CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 5 of 7)



EL4GQ 170

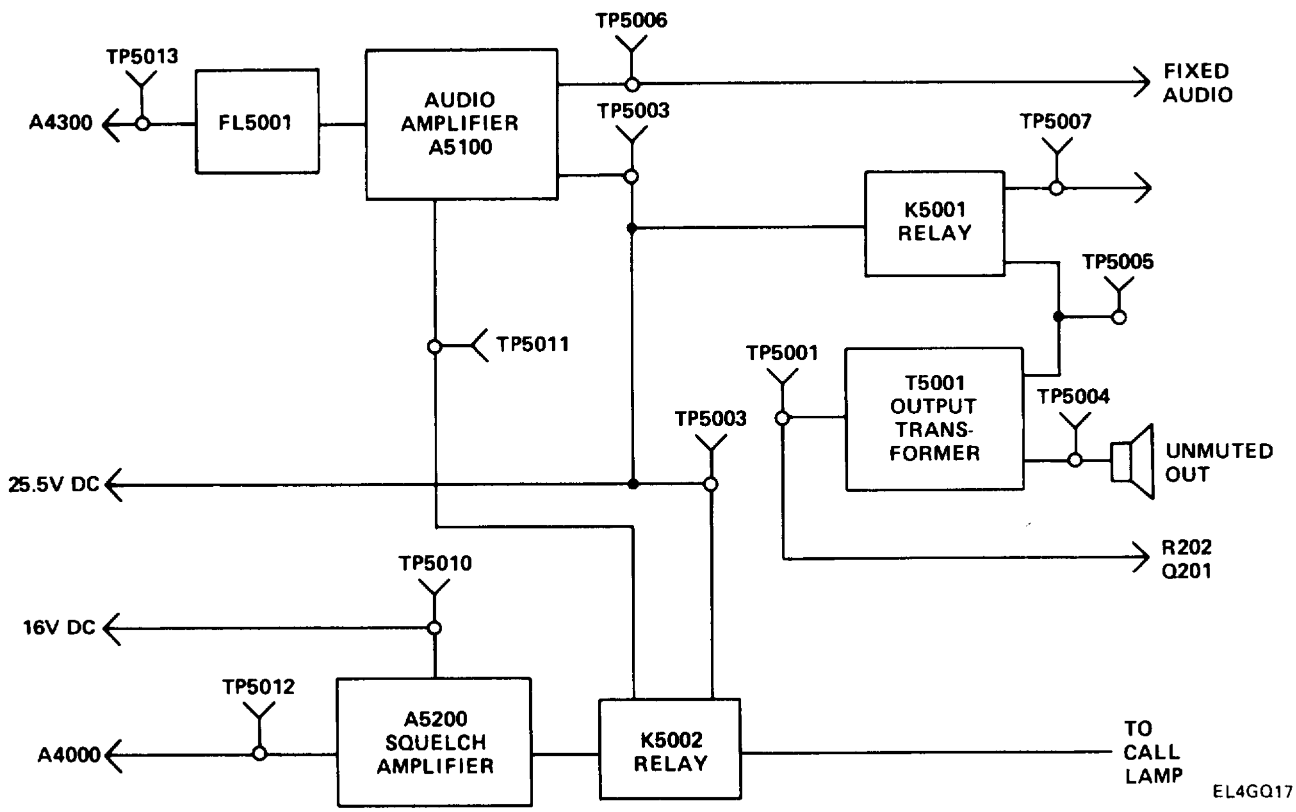
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 6 of 7)



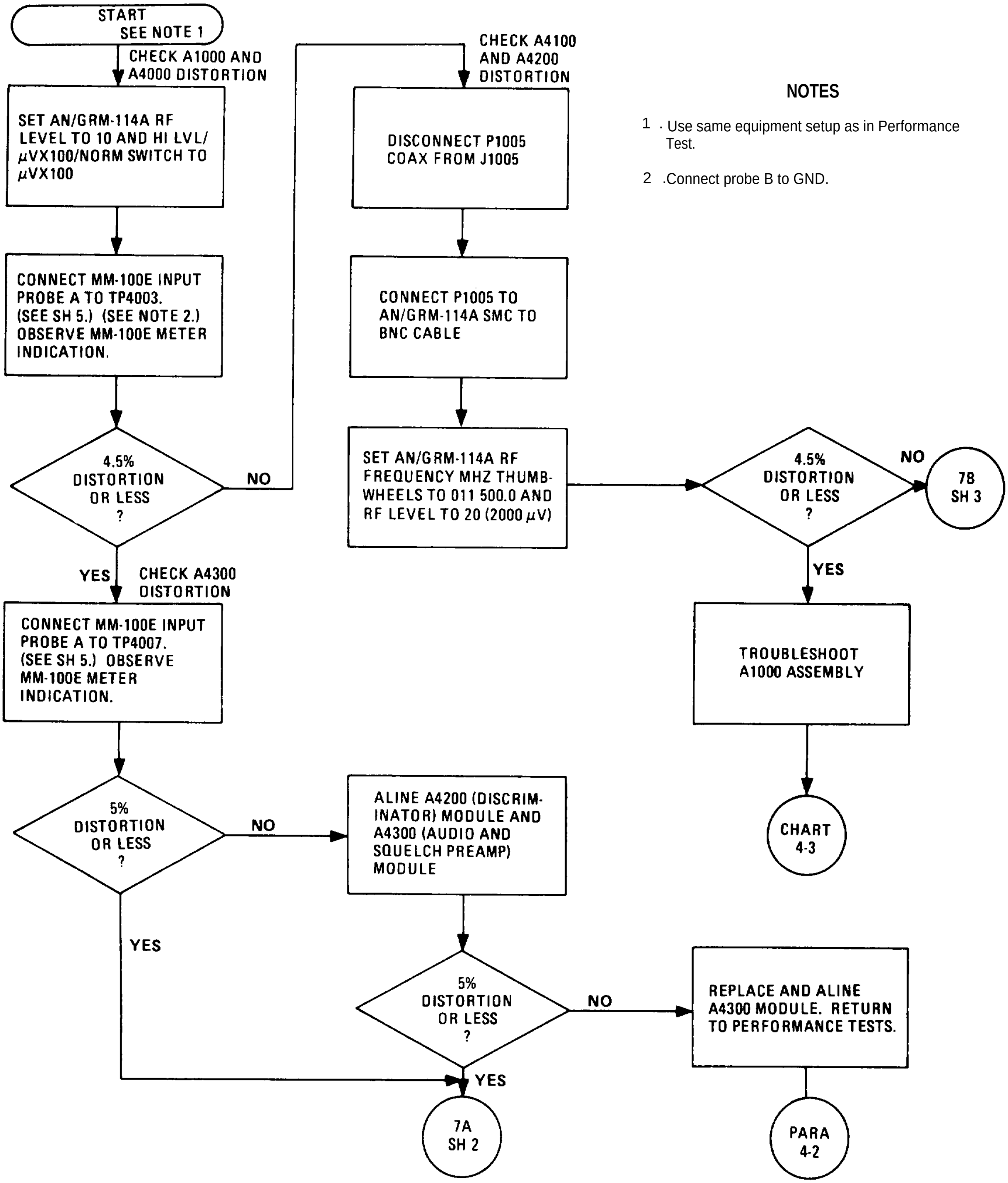
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-6
Audio Power Test Failure Troubleshooting
(Sheet 7 of 7)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 1 of 7)



NOTES

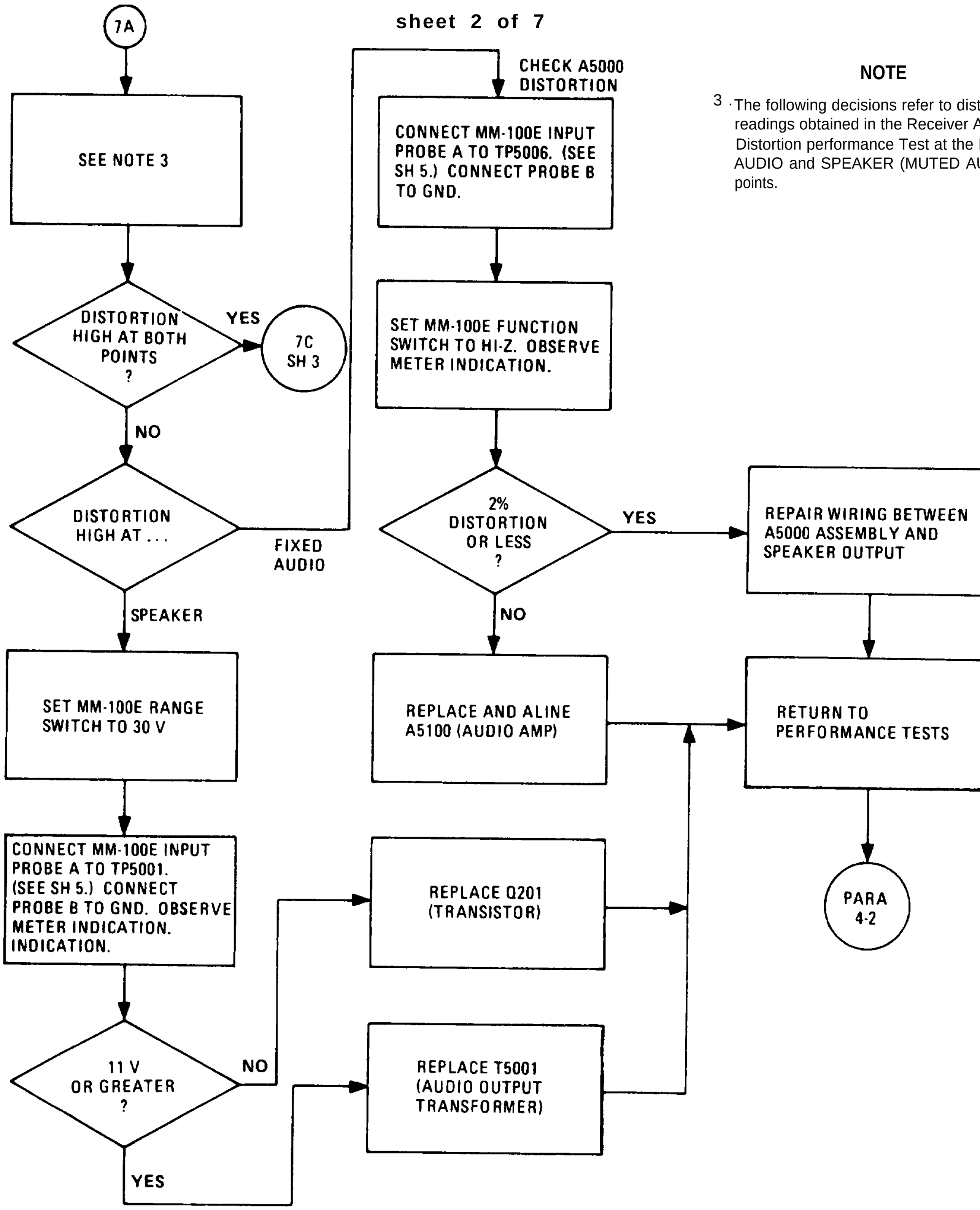
1. Use same equipment setup as in Performance Test.
2. Connect probe B to GND.

4-13. TROUBLESHOOTING FLOW CHARTS (CONT)

CART 4-7

Audio Distortion Test Failure Troubleshooting

sheet 2 of 7

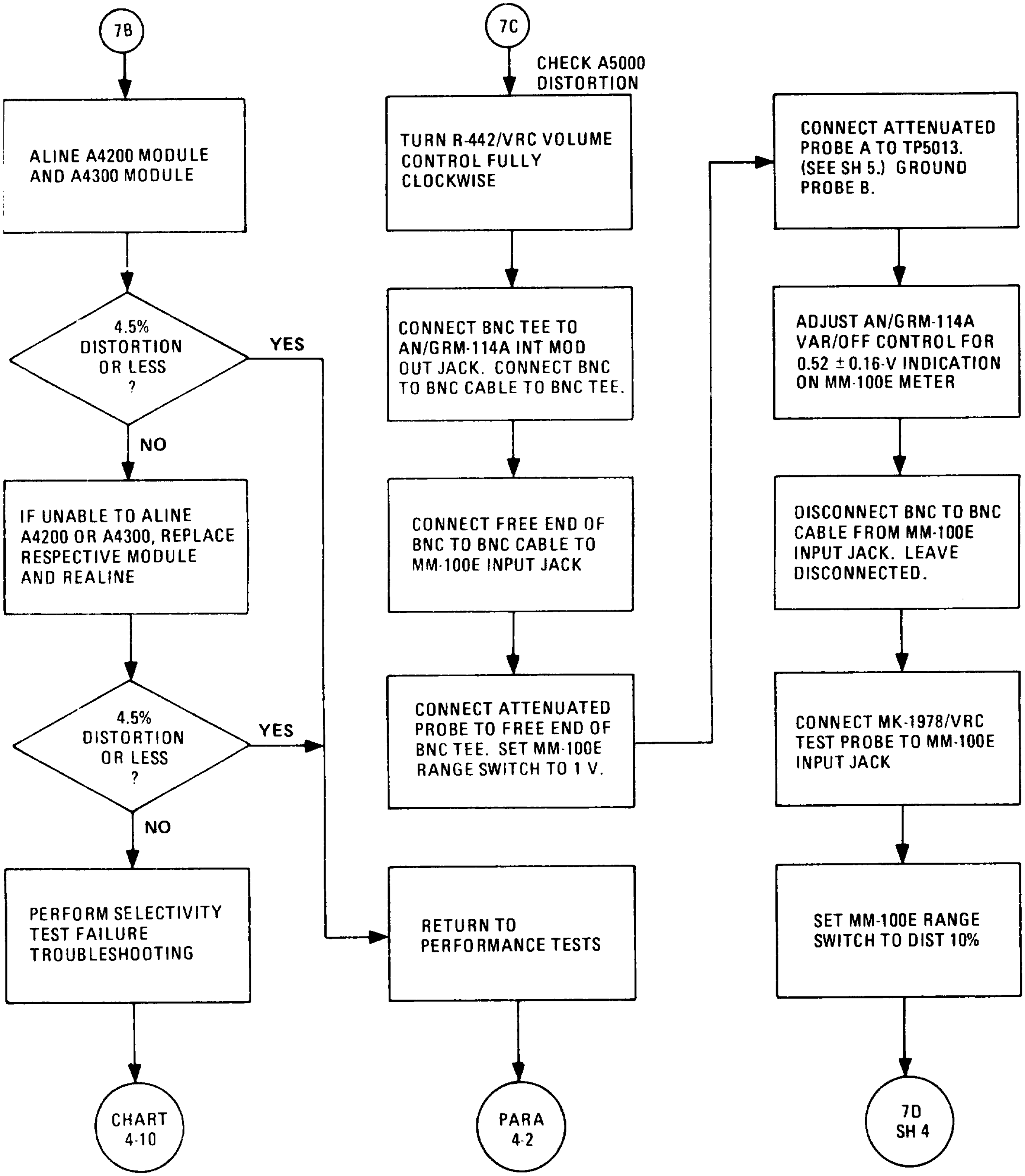


NOTE

3. The following decisions refer to distortion readings obtained in the Receiver Audio Distortion performance Test at the FIXED AUDIO and SPEAKER (MUTED AUDIO) test points.

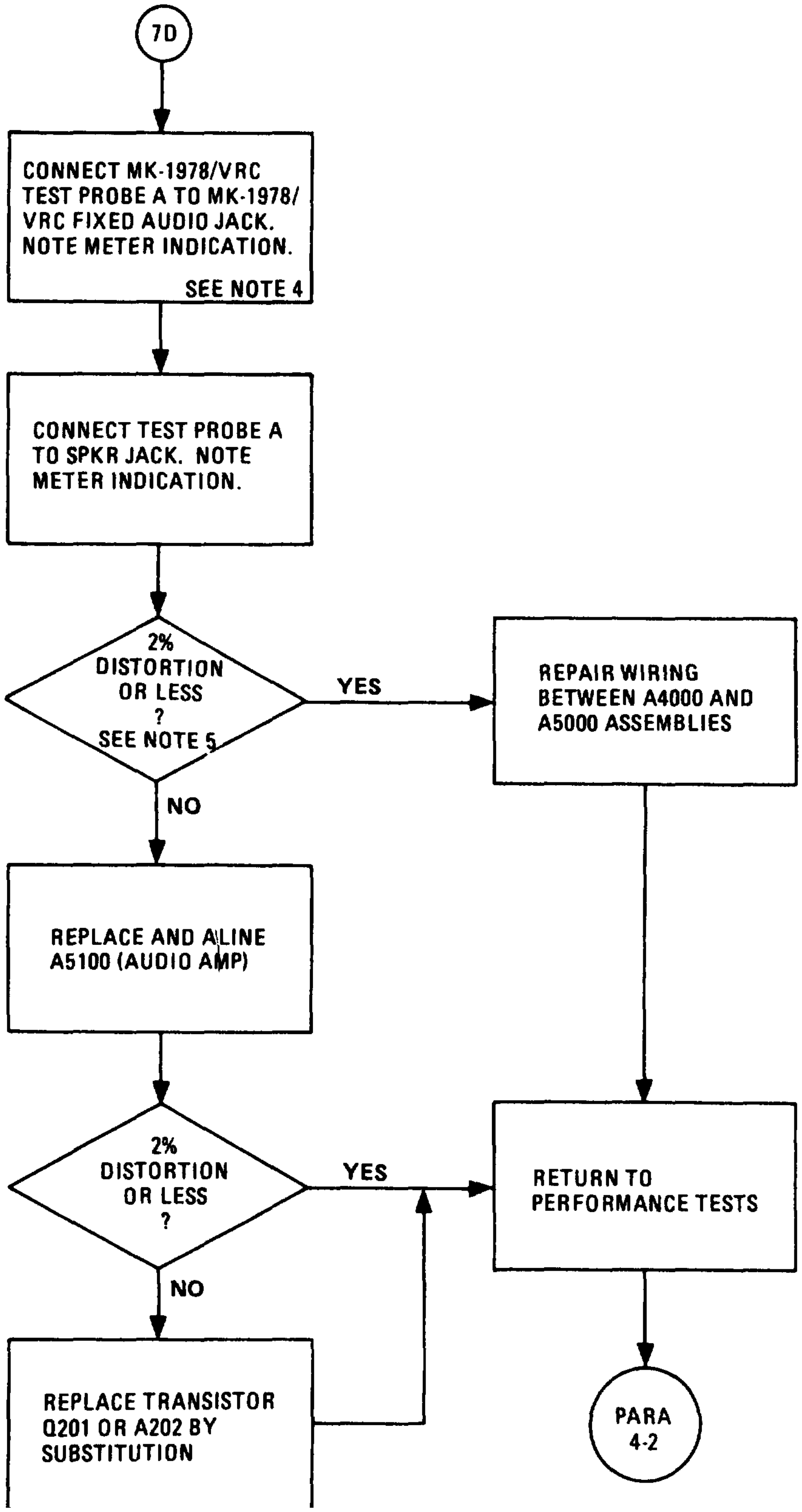
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 3 of 7)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 4 of 7)



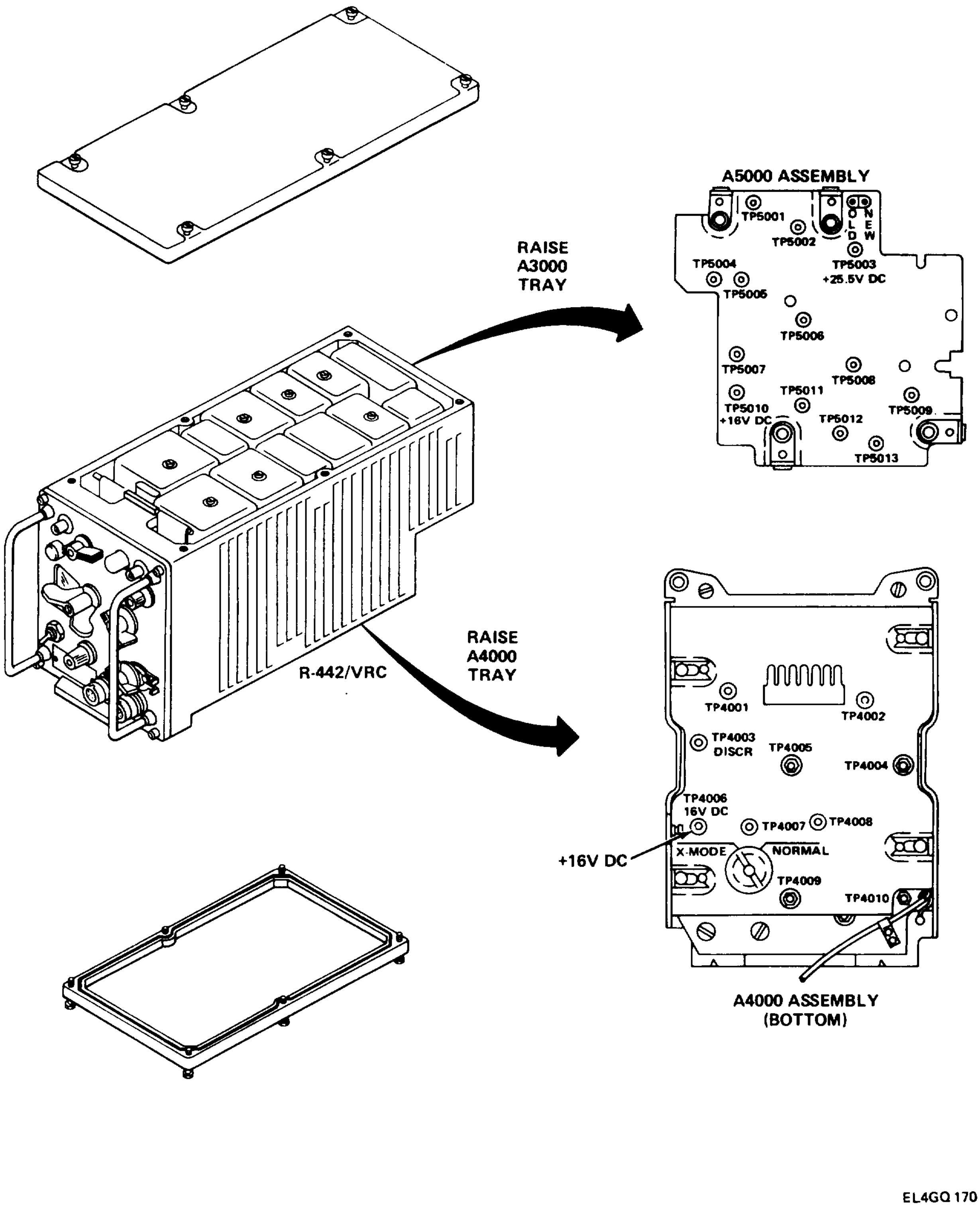
NOTES

4. Connect probe B to GND jack.

5. That is, 2% distortion or less at both FIXED AUDIO and SPKR jacks.

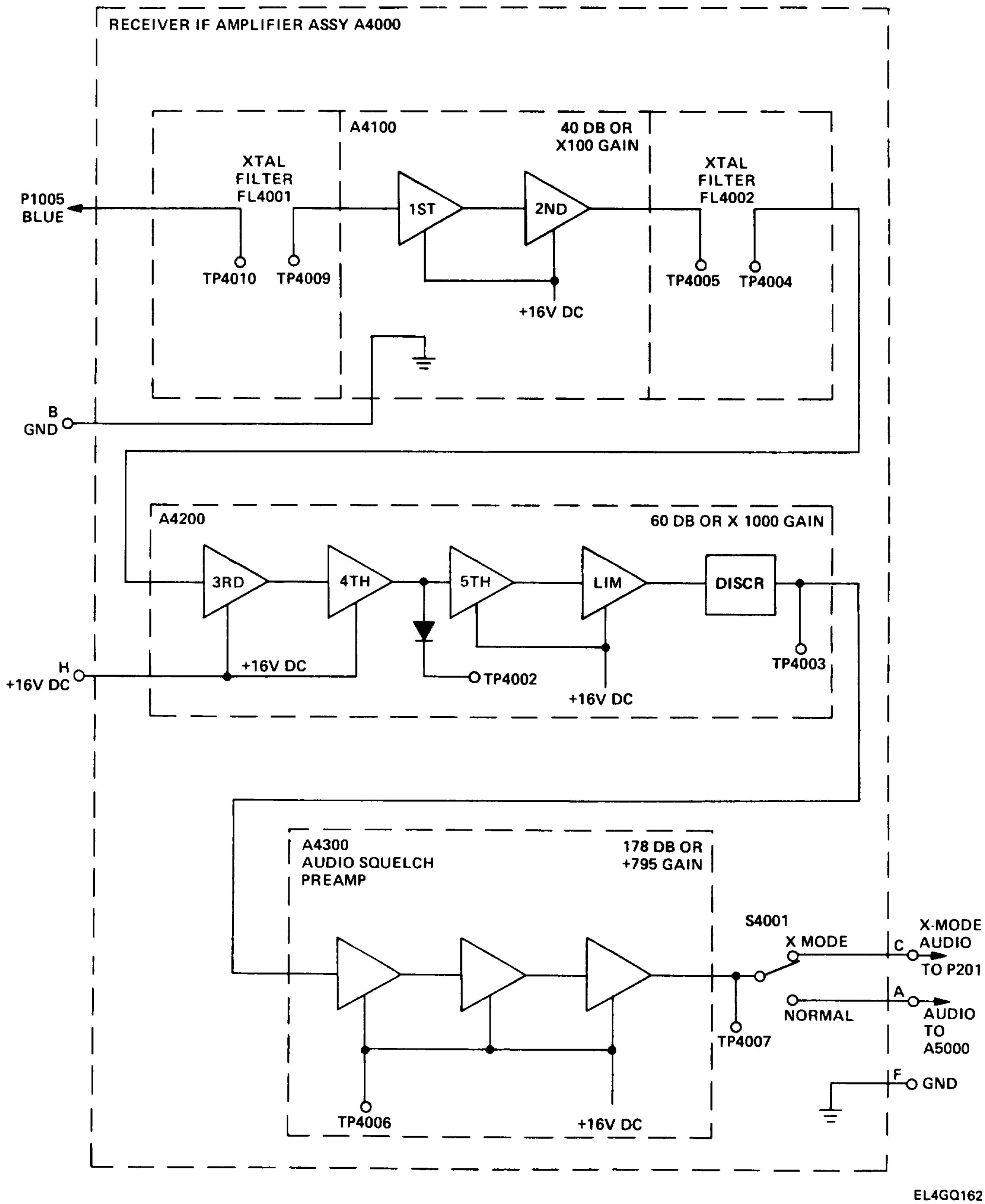
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 5 of 7)



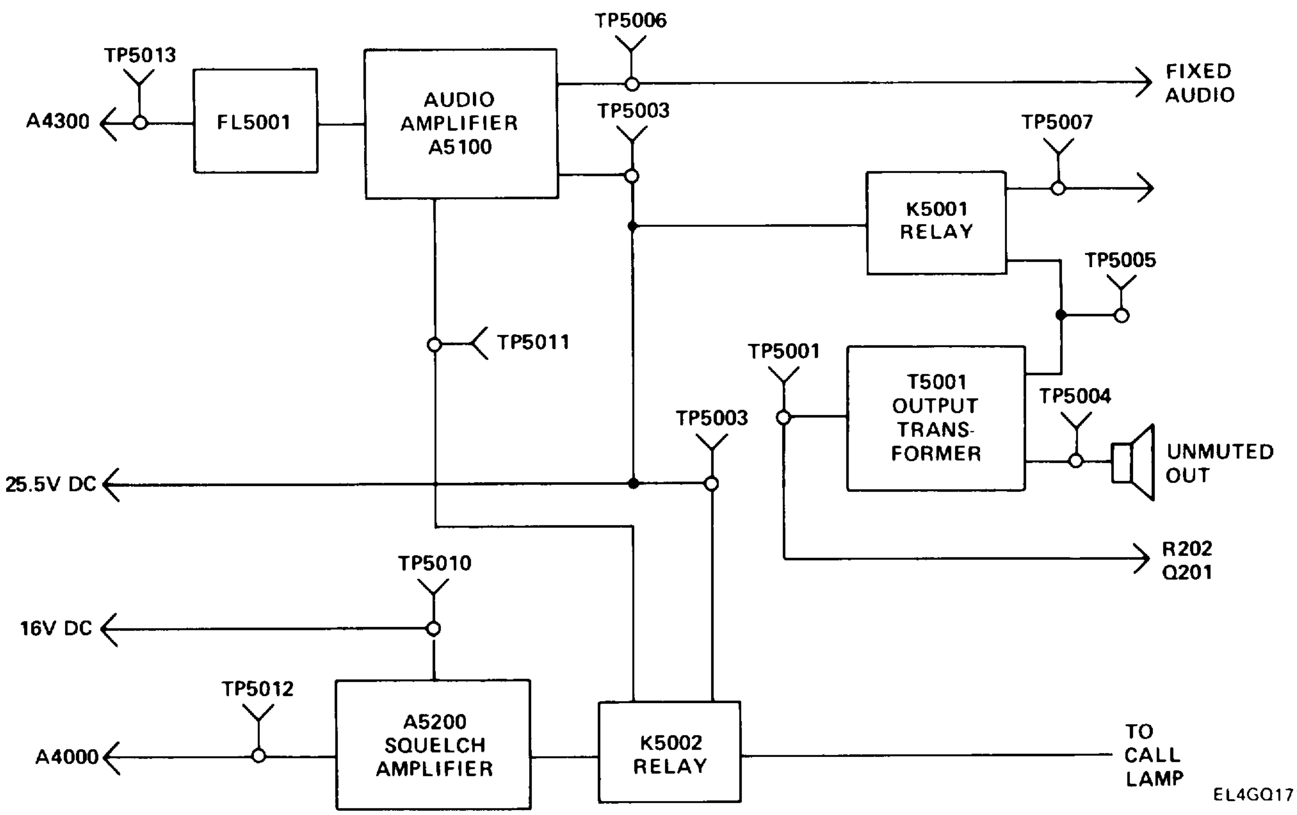
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 6 of 7)



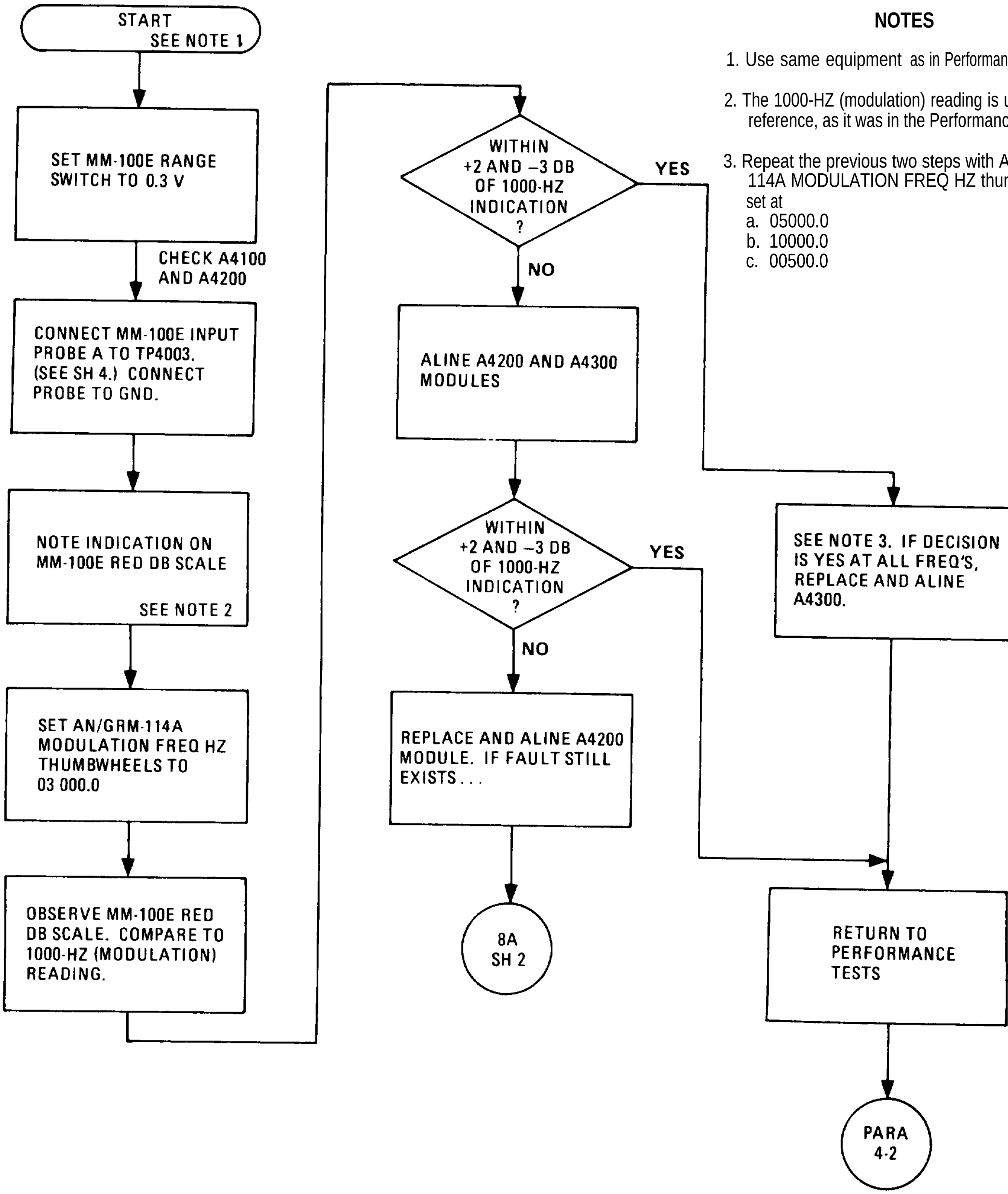
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART4-7
Audio Distortion Test Failure Troubleshooting
(Sheet 7 0f 7)



4-13. TROUBLESHOOTING Flow charts. (CONT)

CHART 4-8
Audio Response Test Failure (X-Mode) Troubleshooting
(Sheet 1 of 4)

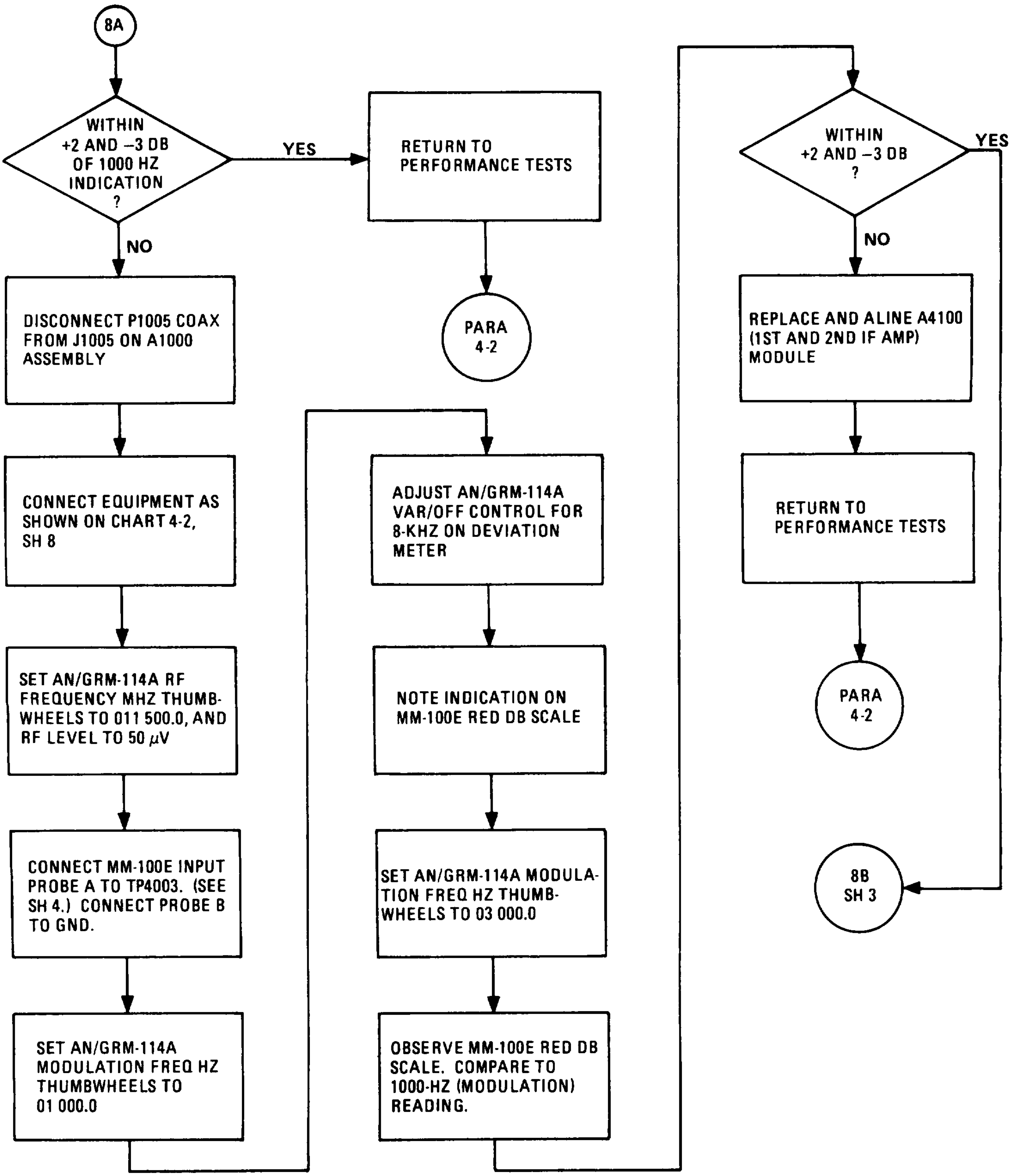


NOTES

1. Use same equipment as in Performance Test.
2. The 1000-HZ (modulation) reading is used as a reference, as it was in the Performance Test.
3. Repeat the previous two steps with AN/GRM-114A MODULATION FREQ HZ thumbwheels set at
   a. 05000.0
   b. 10000.0
   c. 00500.0

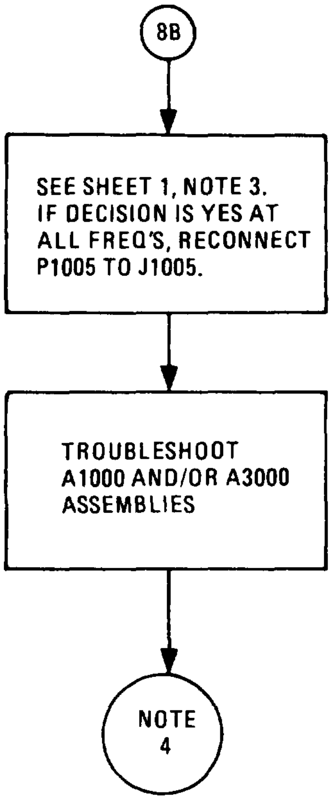
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-8
Audio Response Test Failure (X-Mode) Troubleshooting
(Sheet 2 of 4)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART4-8
Audio Response Test Failure (X-Mode) Troubleshooting
(Sheet 3 of 4)

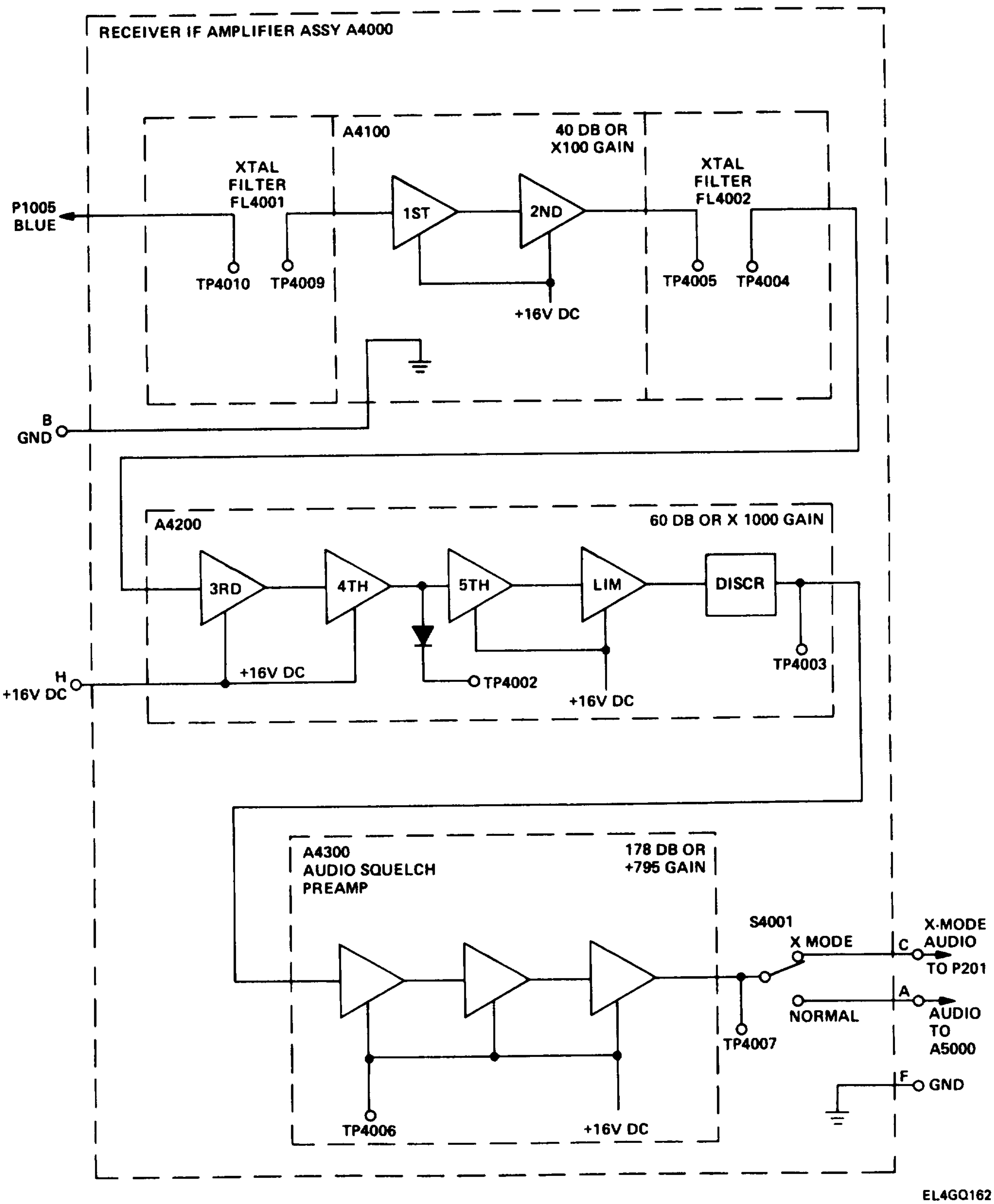


NOTE

4. A1000 assembly troubleshooting, chart 4-3
A3000 troubleshooting, chart 4-4

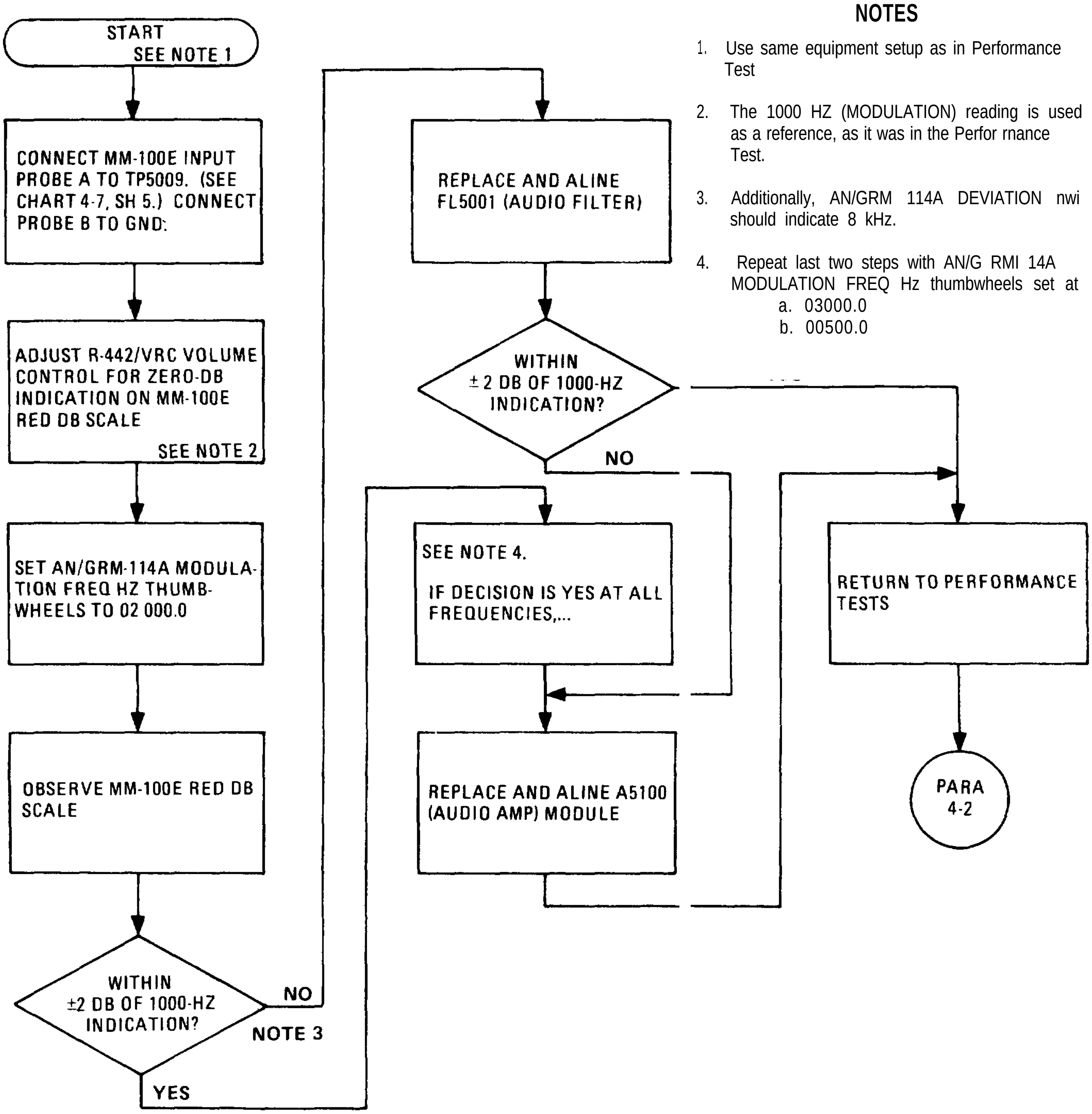
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-8
Audio Response Test Failure (X-Mode) Troubleshooting
(Sheet 4 of 4)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-9
Audio Response Test Failure (Normal Mode) Troubleshooting
(Sheet 1 of 2)

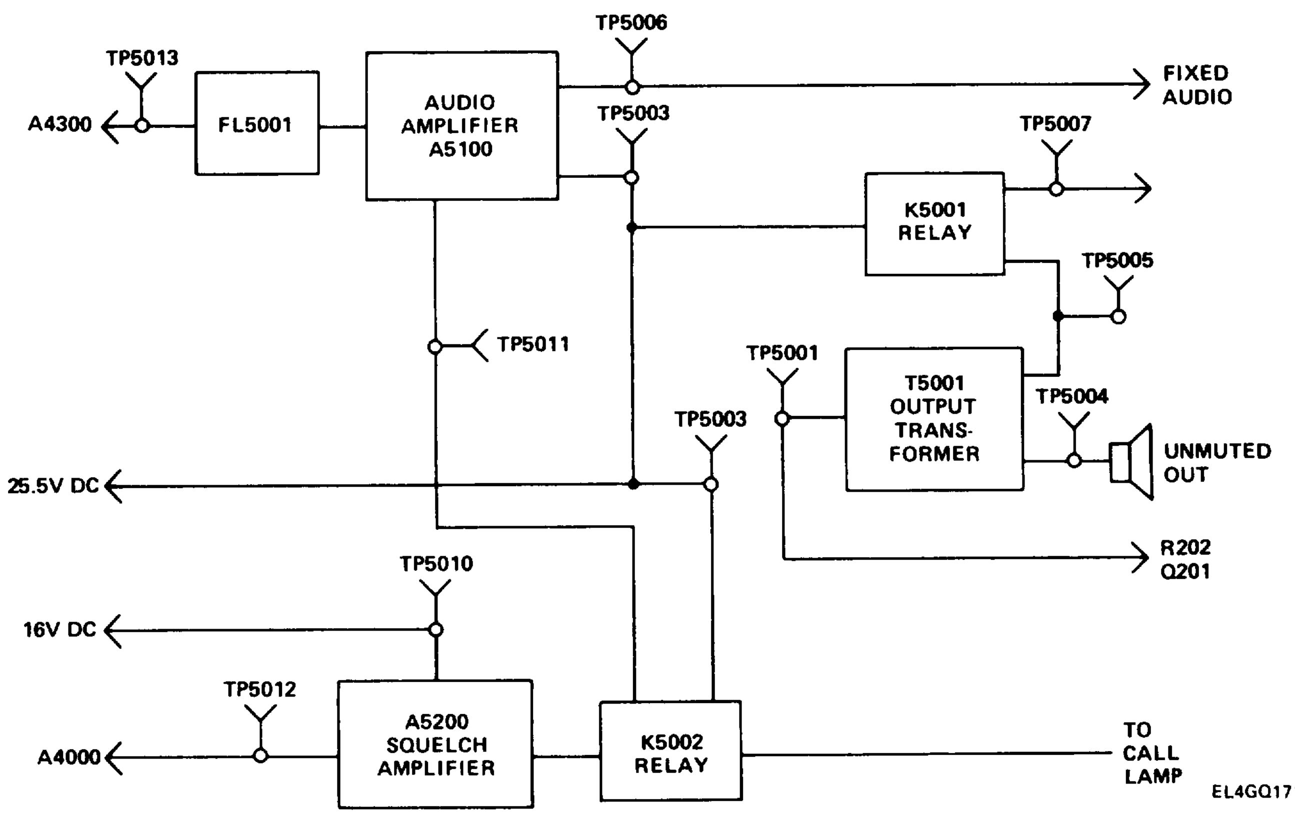


NOTES

1. Use same equipment setup as in Performance Test
2. The 1000 HZ (MODULATION) reading is used as a reference, as it was in the Perfor rnance Test.
3. Additionally, AN/GRM 114A DEVIATION nwi i! should indicate 8 kHz.
4. Repeat last two steps with AN/G RMI 14A MODULATION FREQ Hz thumbwheels set at
   a. 03000.0
   b. 00500.0

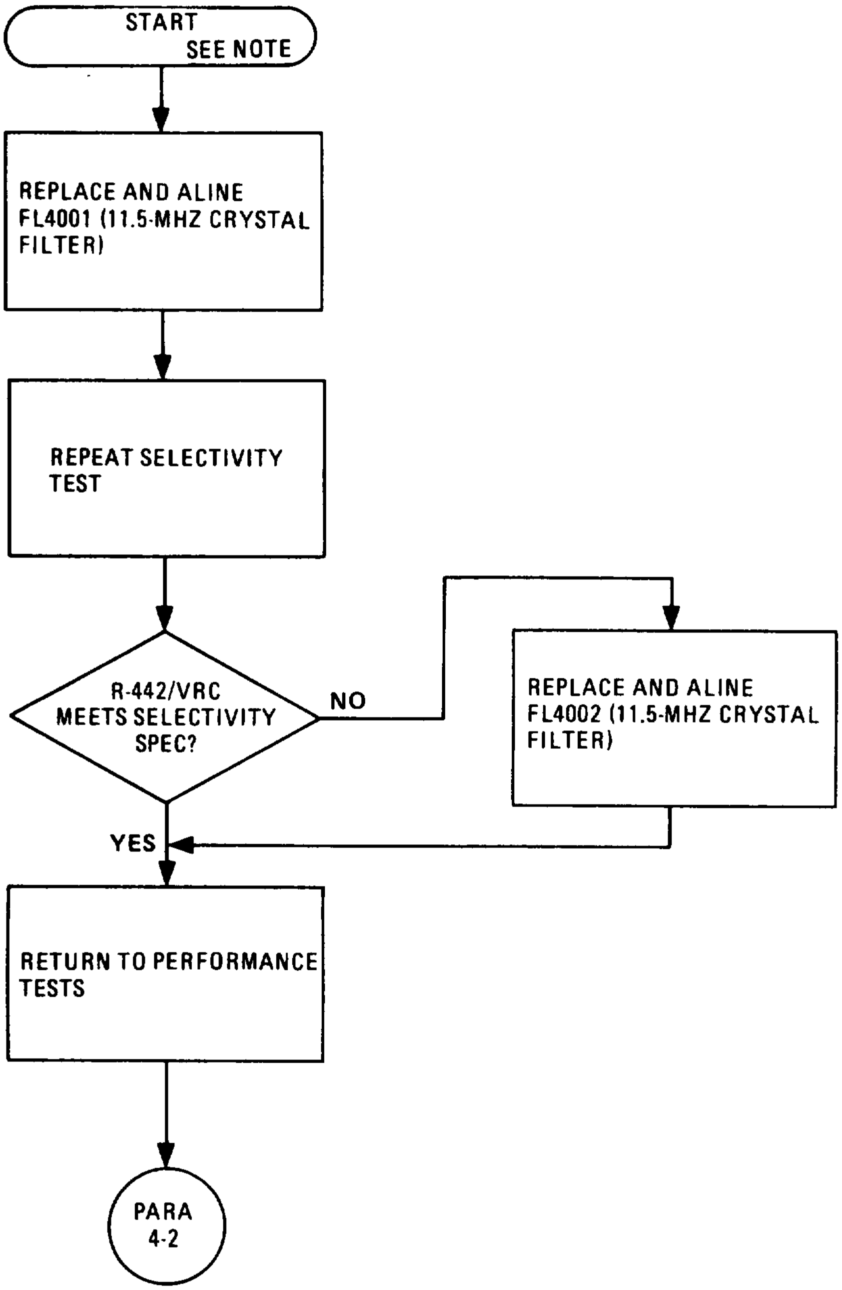
4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-9
Audio Response Test Failure (Normal Mode) Troubleshooting
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 4-10
Selectivity Test Failure Troubleshooting
(Sheet 1of1)



NOTE

Use same equipment setup as in Performance Test.

Section III ALINEMENT AND ADJUSTMENT PROCEDURES

4-14.GENERAL.

This section contains alinement instructions for use with Maintenance Kit MK-1978/VRC and Test Set AN/GRM-114A.The instructions are presented in individual procedures which apply to a specific stage of the receiver.

Except for the local oscillator alinements, each procedure is self-contained; that is, all necessary instructions are provided without reference to any previously performed alinement. Therefore, itis possible to use the procedures in this section to aline an individual module without doing anyworkon other stages in the radio.

However, this maintenance approach is not recommended. It is best to perform a complete realinement of all modules after replacing an individual module. This should be done even if the radio has undergone its annual realinement less than one year prior to the repair.

Careful performance of all the instructions contained in the alinement procedures ensures that the radio will meet all performance standards outlined in section I of this chapter. Although the radio may seem to work satisfactorily if other quick-fix methods are used, there is no guarantee that such methods will result in proper performance when the radio is used along with secure equipment, or for other than voice communication.

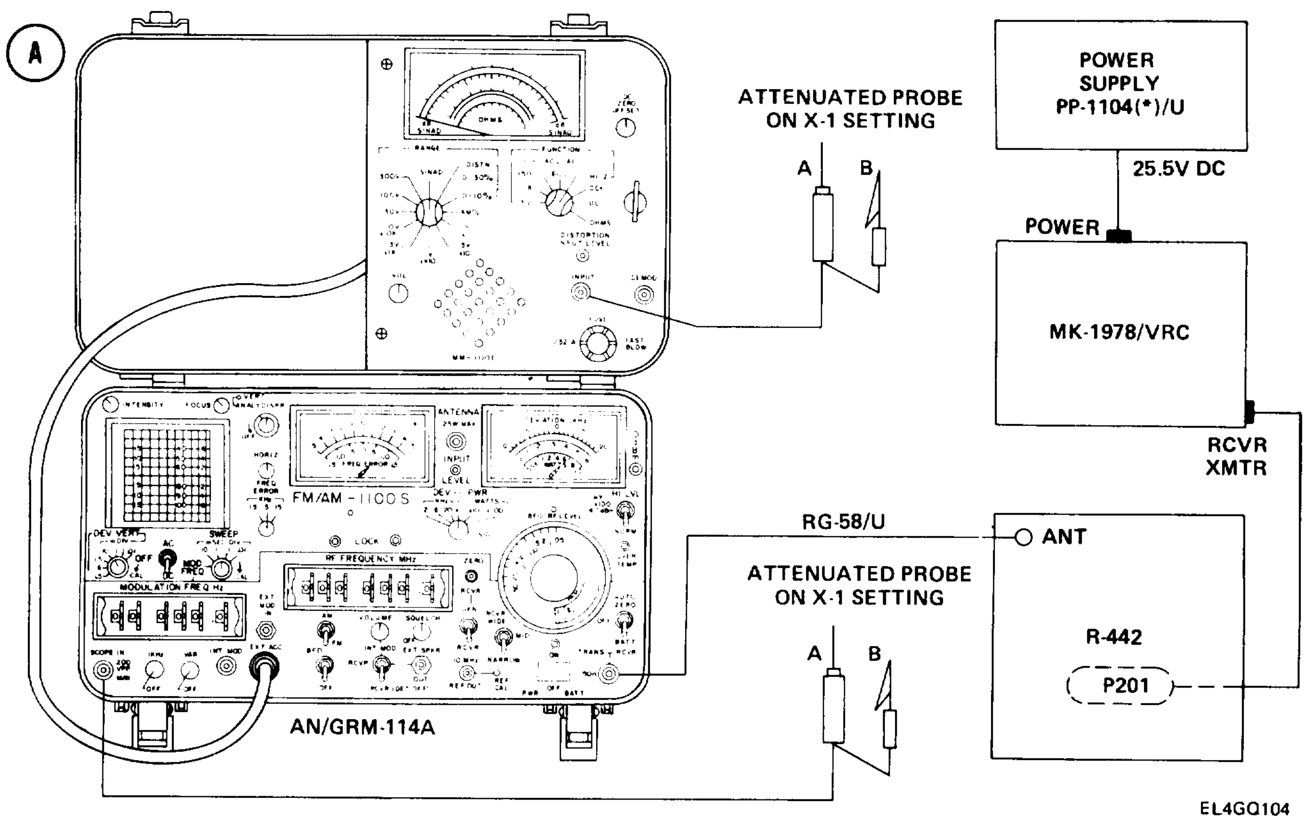
4-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST.

PURPOSE. This test is performed to make sure that the local oscillator will not be pulled off frequency by a malfunctioning CRS. Steps 1 through 8 involve a quick check to determine whether the CRS is putting out an incorrect error signal causing improper local oscillator frequency and loss of audio tone The remaining steps are done with the local oscillator disconnected from the CRS in order to check CRS performance in response to a nonfluctuating 42.00-MHz signal generator output. If the CRS passes the second part of the test, it will be able to correct normal fluctuation in local oscillator frequency.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC
T-Connector UG-274/U
Amphenol Adapter M-39012/16

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC top and bottom covers. (See paragraph 2-7.)

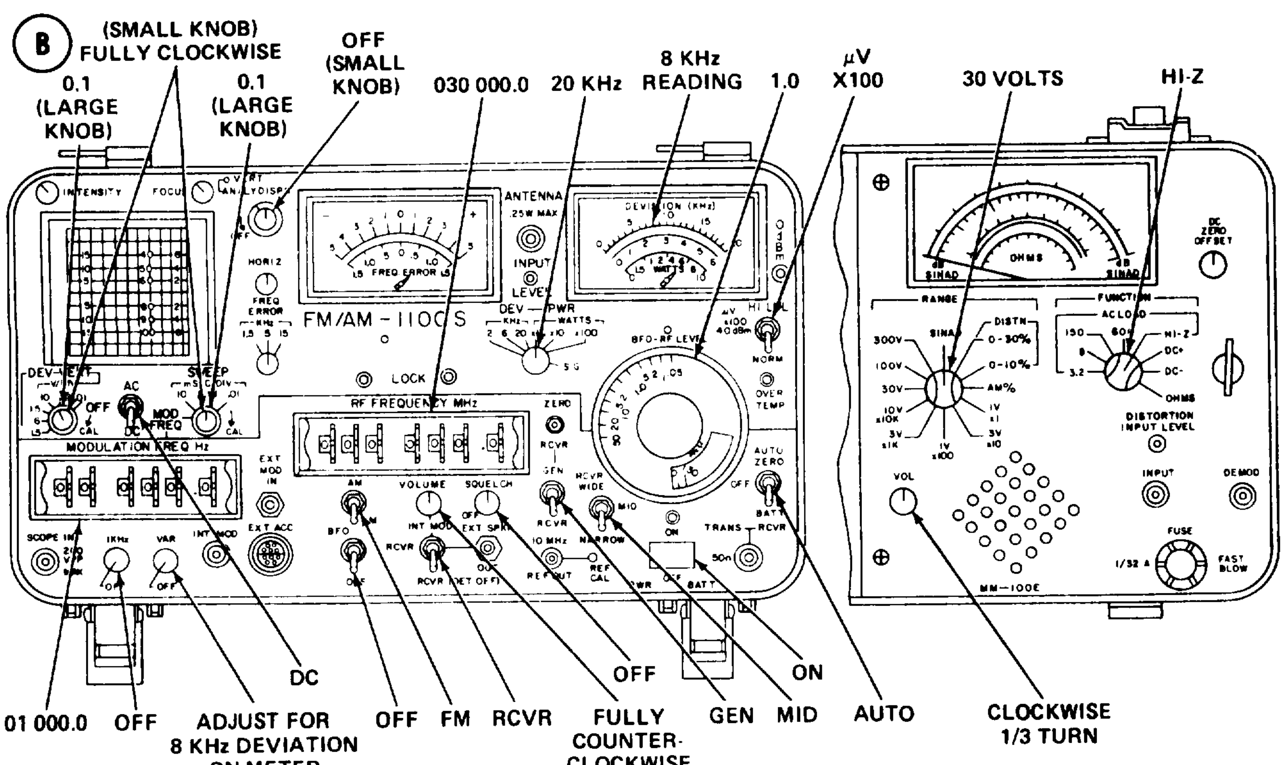


4-15. CRYSTAL REFERENCE SYSTEM (CRS)TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 100μv rf at 30 MHz, 1-kHz modulation: 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

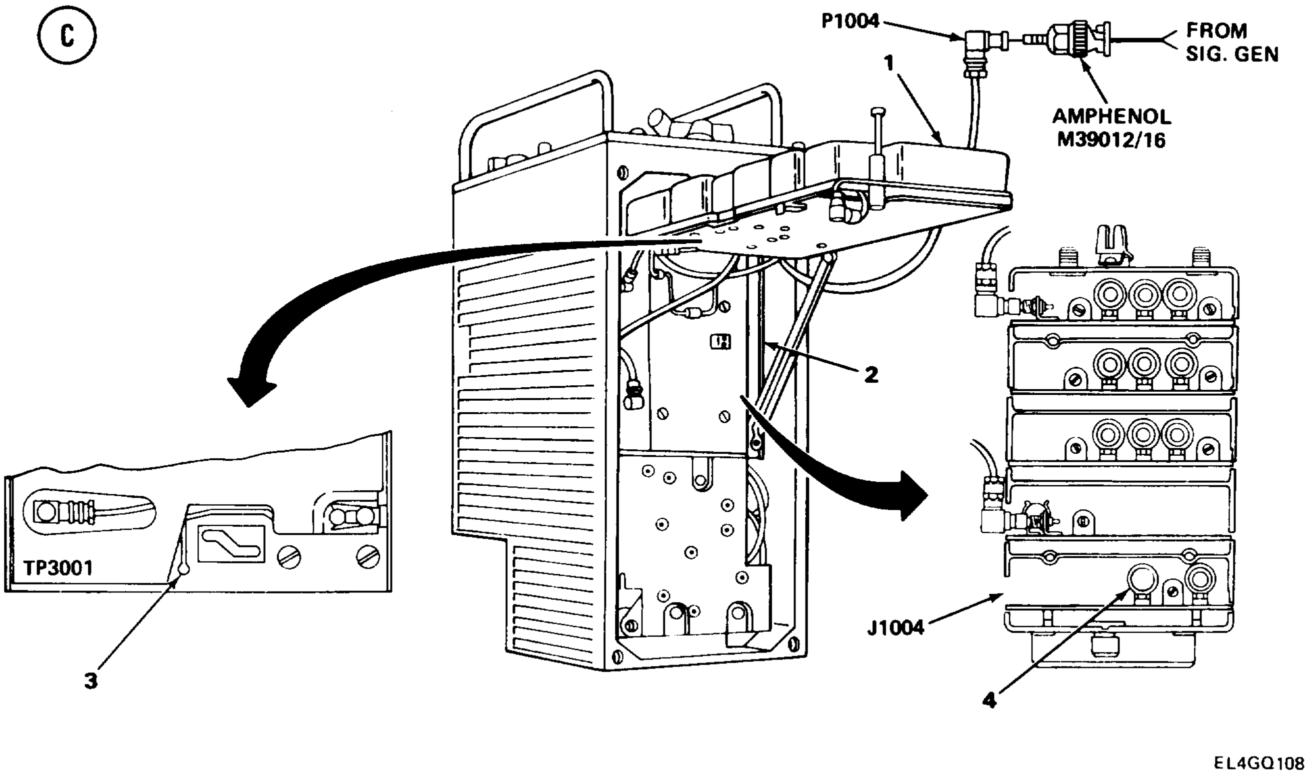
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET A 30.00 Fully clockwise NEW OFF
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE
AN/GRM-114A; MM-100E	See test setup diagram B	



EL4GQ105

4-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

TEST PROCEDURE



1. Connect MM-100E attenuated probe A to MK-1978/VRC SPKR jack in MK-1978/VRC AUDIO square. Connect probe B to MK-1978/VRC GND jack. A 1000-HZ tone will be heard on MM-100E speaker.
2. Adjust R-442/VRC VOLUME control for comfortable level.
3. Raise A3000 tray (1).
4. Remove A1000 cover(2) and install alinement cover with at least one screw to ensure good ground.
5. Ground TP3001 (3) with screwdriver.
6. Adjust L1502 (4) to get clearest possible 1000-HZ tone from speaker.
7. Remove ground from TP3001. Tone must not change.

NOTE

If the tone changes to a rushing noise when step 7 is completed, the CRS is defective. See the troubleshooting section.

8. Set R-442/VRC MC-TUNE-KC control to 40.00 MHz; then back to 30.00 MHz. Tone must not change.

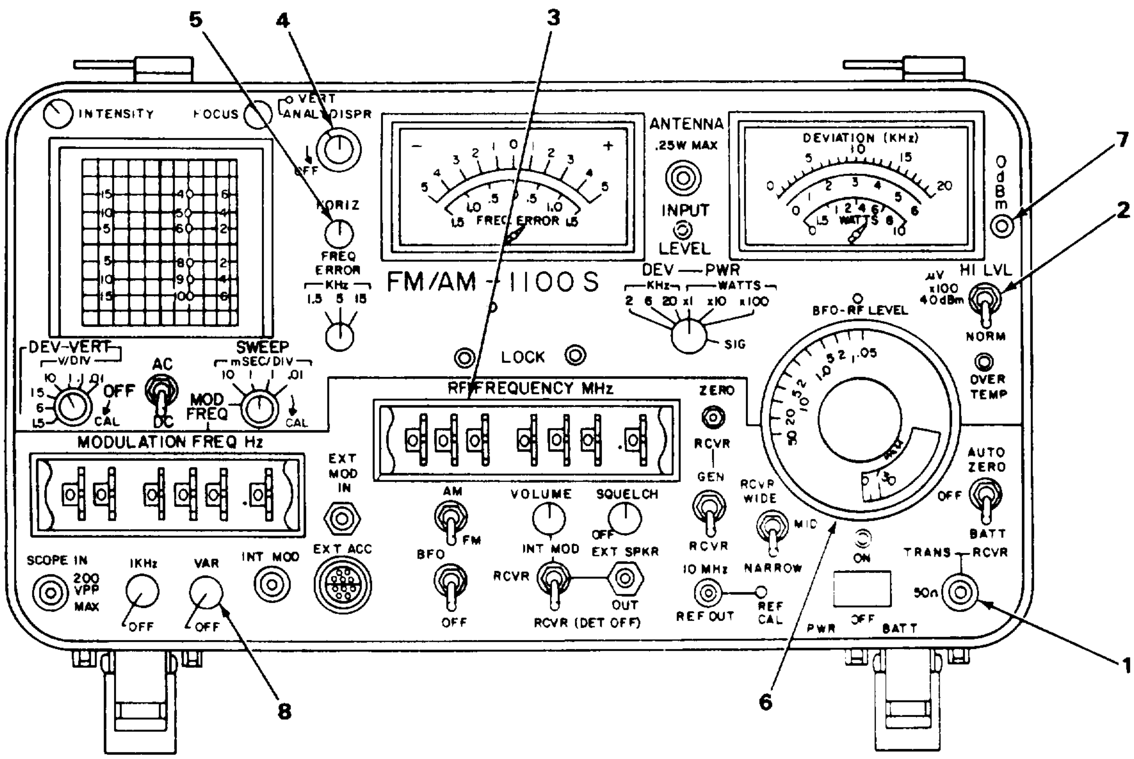
4-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

NOTE

If the tone changes after step 8 is completed, the CRS may be defective. See the troubleshooting section.

9. Set R-442/VRC MC-TUNE-KC control to 30.50 MHz.

D



EL4GQ106

10. Disconnect rf cable from AN/GRM-114A TRANS-RCVR jack (1). (See test setup diagram D .)
11. Connect amphenol adapter to TRANS-RCVR jack.
12. Disconnect P1004 from J1004 on A1000 tray. (See test setup diagram C , page 4-111.)
13. Connect P10004 to amphenol adapter at AN/GRM-114A TRANS-RCVR jack .
14. Set AN/GRM-114 HI LVL/ v x 100/NORM switch (2) to HI LVL. (See test setup diagram D .)
15. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels (3) to 0420000. (See test setup diagram D .)
16. Adjust AN/GRM-114A VERT control (4) and HORIZ control (5) to center scope trace on screen. (See test setup diagram D .)
17. Turn AN/GRM-114A RF LEVEL control (6) fully counterclockwise; then slowly clockwise and stop when 0 dbM lamp (7) comes on. (See test setup diagram D .)

4-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

18. Set AN/GRM-114A VAR control (8) to OFF. (See test setup diagram D.)
19. Connect AN/GRM-114A SCOPE probe A (see test setup diagram A, page 4-109) to TP3001 (3) (see test setup diagram C, page 4-111), and probe B to ground. Set attenuated probe to X10.

NOTE

Scope trace should be centered on screen. A slight ac component superimposed on the horizontal trace is normal. If dc level varies higher than + 0.32 vdc or lower than -0.32 vdc, the CRS is defective. See the troubleshooting section.

In steps 20 and 21, scope trace should vary up to at least + 0.5 vdc and then down to at least -0.5 vdc. If this does not happen, the CRS is defective. See the troubleshooting section.

20. Slowly adjust AN/GRM-114A RF FREQUENCY MHz thumbwheels to 042250 0. Note scope trace.
21. Slowly adjust AN/GRM-114A RF FREQUENCY MHz thumbwheels to 0417500. Note scope trace.

4-16. LOCAL OSCILLATOR A1500 ALINEMENT.

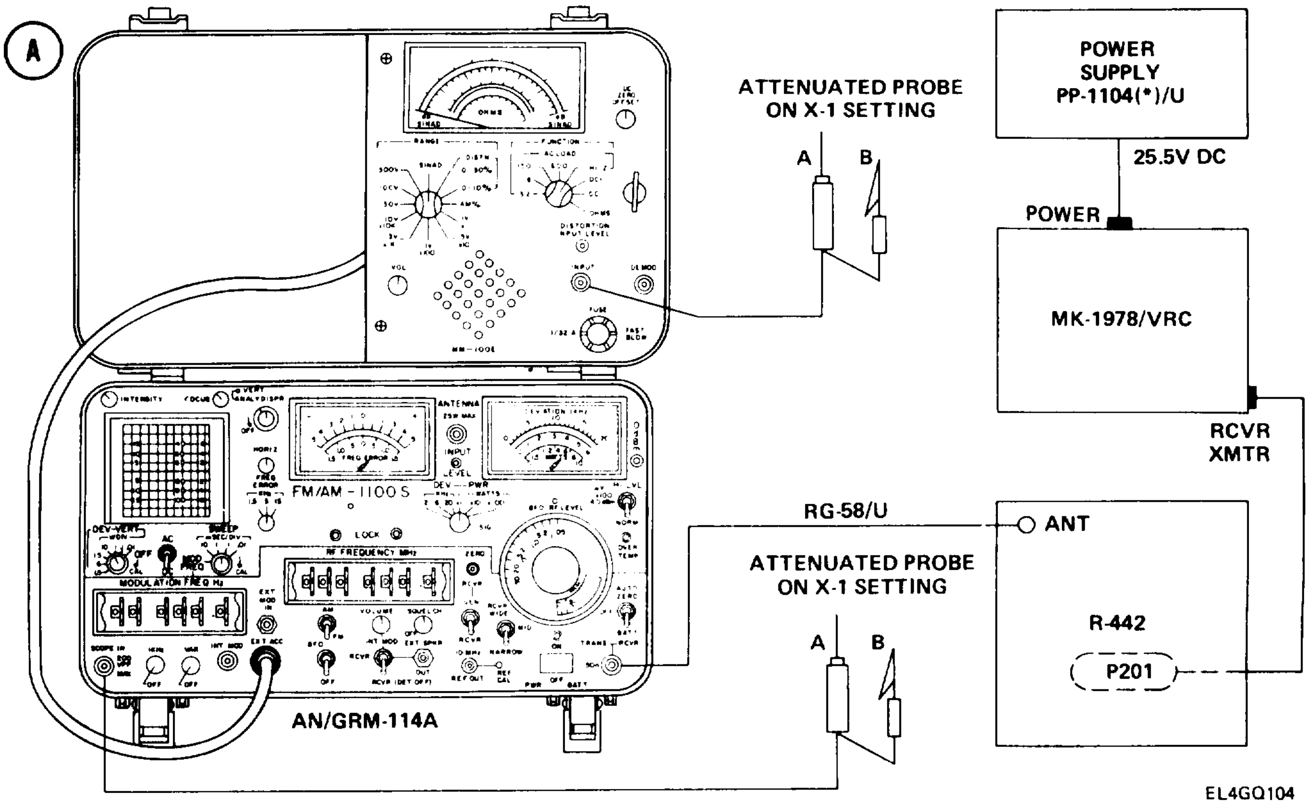
PURPOSE. If the local oscillator is operating at the correct frequency, the CRS will not ouput a dc error signal. This procedure alines the oscillator by tuning its circuits to bring the CRS error signal as close to zero as possible. The Crystal Reference System Test (paragraph 4-15) must be done prior to performing this alinement.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram A, page 4-114. Remove R-442/VRC top cover. (See paragraph 2-7.) Connect P1004 to J1004 on the A1000 tray.

4-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

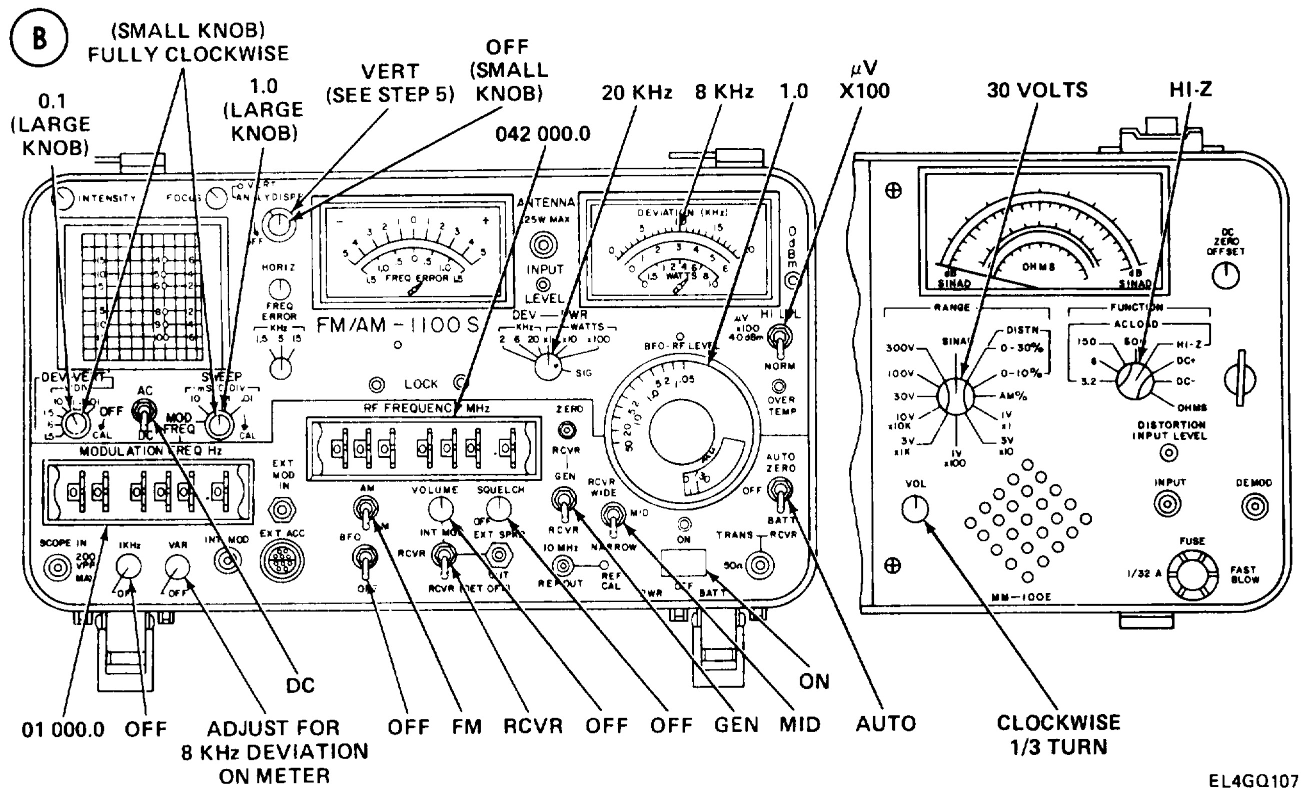


INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 100-µV rf at 30, 52, and 42 MHz, with 1000-HZ modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	42.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE
AN/GRM-114A; MM-100E	See test setup diagram B), page 4-115	

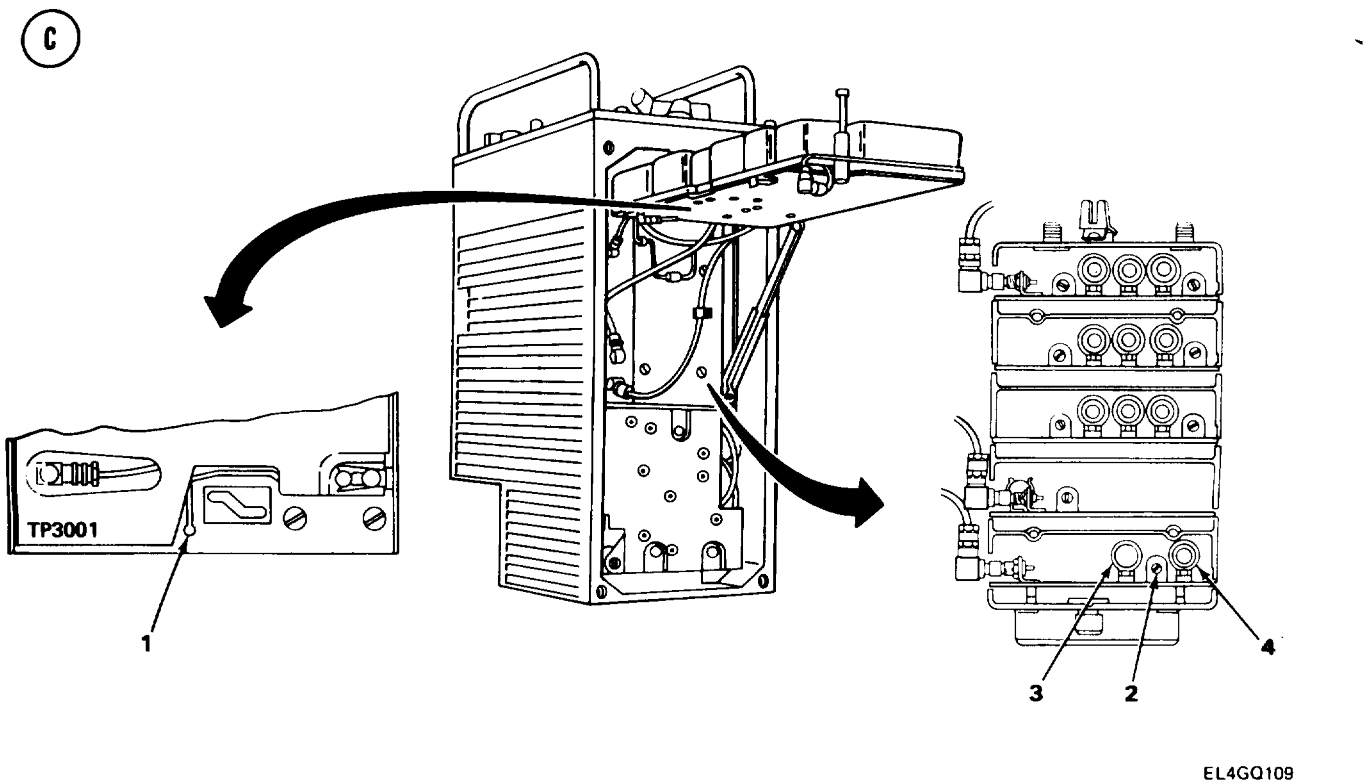
4-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)



EL4GQ107

4-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

ALINEMENT PROCEDURE



1. Adjust AN/GRM-114A VERT control to zero scope trace.
2. Connect MK-1978/VRC test probe (test setup diagram (A), page 4-114) to TP3001 ((1)test setup diagram (C)), and alligator clip to ground.

NOTE

Probe must be on x10 setting for correct scope reading.

Due to a 3.5-kHz local oscillator tolerance with the CRS operating, it may not be possible to achieve a zero-vdc scope trace in the following steps. The dc voltage should not exceed & 0.5 volts.

3. Adjust C1501 (2) for zero-vdc scope reading.
4. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
5. Set AN/GRM-l14A RF FREQUENCY MHz thumbwheels to 030000 0.
6. Adjust L1502 (3) for zero-vdc scope reading.
7. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
8. Set AN/GRM-l 14A RF FREQUENCY MHz thumbwheels to 052000 0.
9. Adjust L1501 (4) for zero-vdc scope reading.
10. Repeat steps 3 through 9 until scope reads as close to zero vdc as possible for all three frequencies, with clear audio.

4-17. TUNER A1000 ALINEMENT.

PURPOSE. This procedure tunes the A1000 assembly to produce maximum amplification of low-level signals and maximum attenuation of noise.

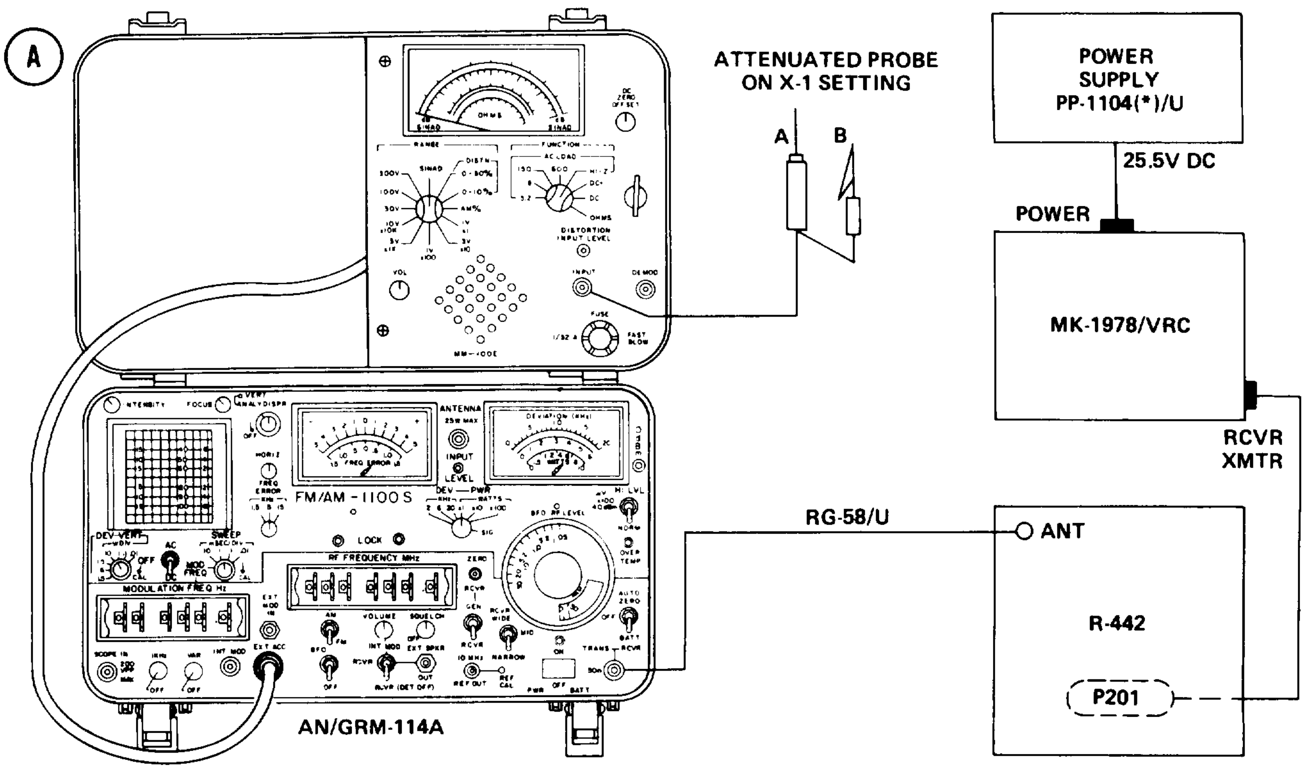
TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114
Power Supply PP-1104(*)/G

Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top and bottom covers. (See paragraph 2-7.)

A



EL4GQ115

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

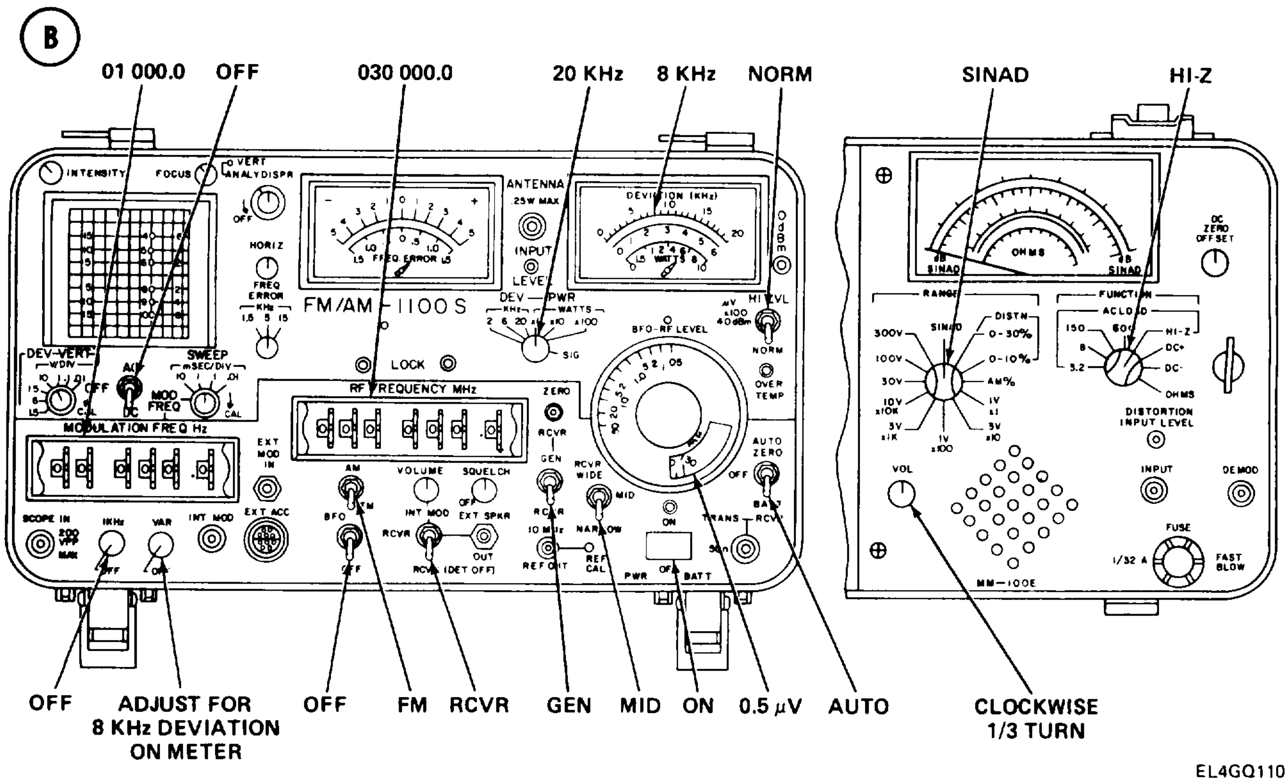
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET A 30. 00 Fully clockwise NEW OFF

4-47. TUNER AI000 ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM-114A; MM-100E	See test setup diagram B	
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE



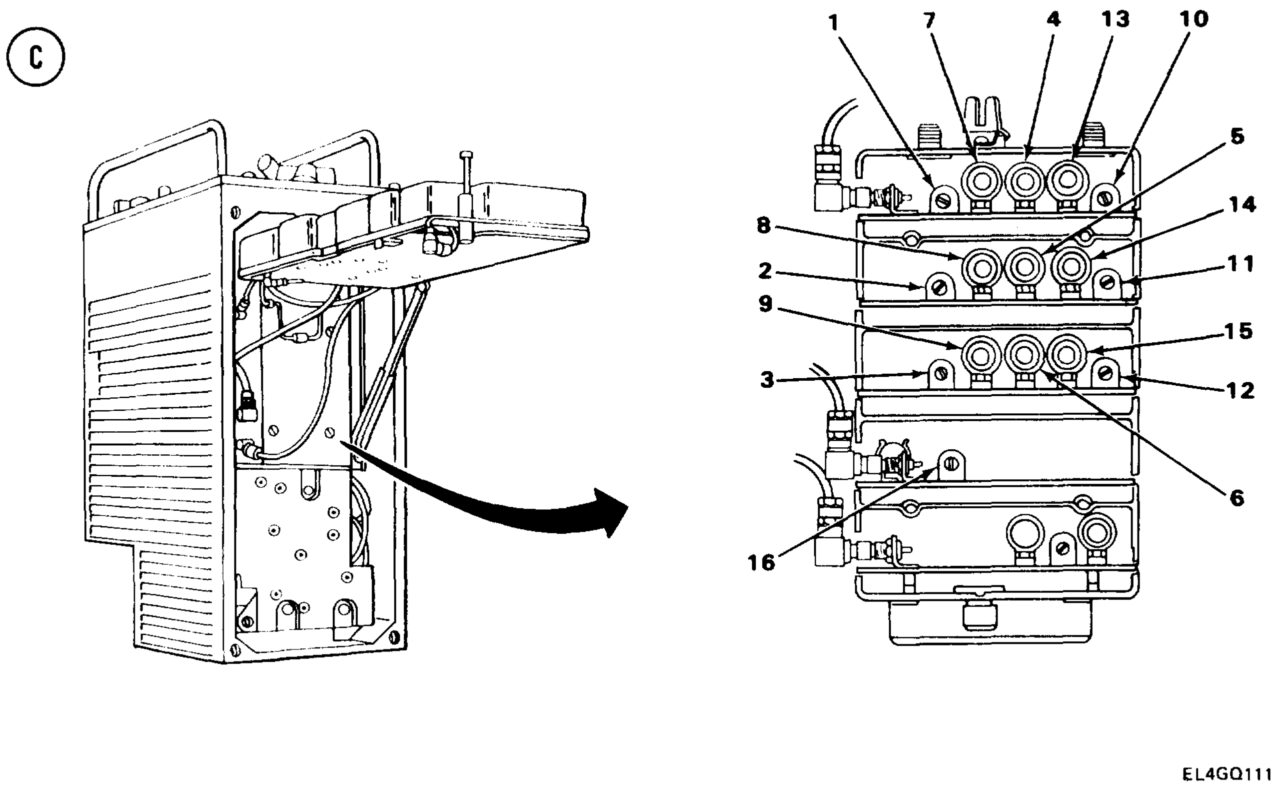
ALINEMENT PROCEDURE

1. Connect MM-100E attenuated probe A (see test setup diagram A page 4-117) to SPKR jack in MK-1978/VRC AUDIO square, Connect alligator clip to GND.
2. Install A1000 alinement cover, securing it with one screw.

NOTE

In the following steps, a 1000-HZ audio tone will be heard on the loudspeaker.

4-17. TUNER A1000 ALINEMENT. (CONT)



NOTE

During alinement of A1000 circuits, a reading of at least 10 db SINAD on the MM-100E blue scale at 0.5-I.w rf indicates correct receiver sensitivity. However, problems in the A4000 or A5000 can result in a lower SINAD even though the 1000 is properly alined. Therefore, adjust all A1000 inductors and capacitors for best possible SINAD reading.

3. Adjust C1104 (1),,C1205 (2), and C1305 (3) for highest SINAD reading. (See test setup diagram) C
4. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels to 052 000 0.
5. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
6. Adjust L1102 (4), L1202 (5), and L1302 (6), for highest SINAD reading.
7. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels to 053 000 0.
8. Set R-442/VRC BAND switch to B .
9. Set R-442/VRC MC-TUNE-KC control to 53.00 MHz.
10. Adjust L1 103 (7), L1203 (8), and L1303 (9) for highest SINAD reading.
11. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels to 065 000 0.
12. Set R-442/VRC MC-TUNE-KC control to 65.00 MHz.
13. Adjust C1 101 (10), C1201 (11), and C1301 (12) for highest SINAD reading.
14. Set AN/GRM-114A RF FREQUENCY MHz thumbwheels to 075 000 0.
15. Set R-442/VRC MC-TUNE-KC control to 75.00 MHz.
16. Adjust L1101 (13), L1201 (14), and L1301 (15) for highest SINAD reading.

4-17. TUNER A1000 ALINEMENT. (CONT)

Mixer Adjustment

17. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
18. Set AN/GRM-114A FREQUENCY MHz thumbwheels to 052 000 0.
19. Adjust C1404 (16) for highest SINAD reading.

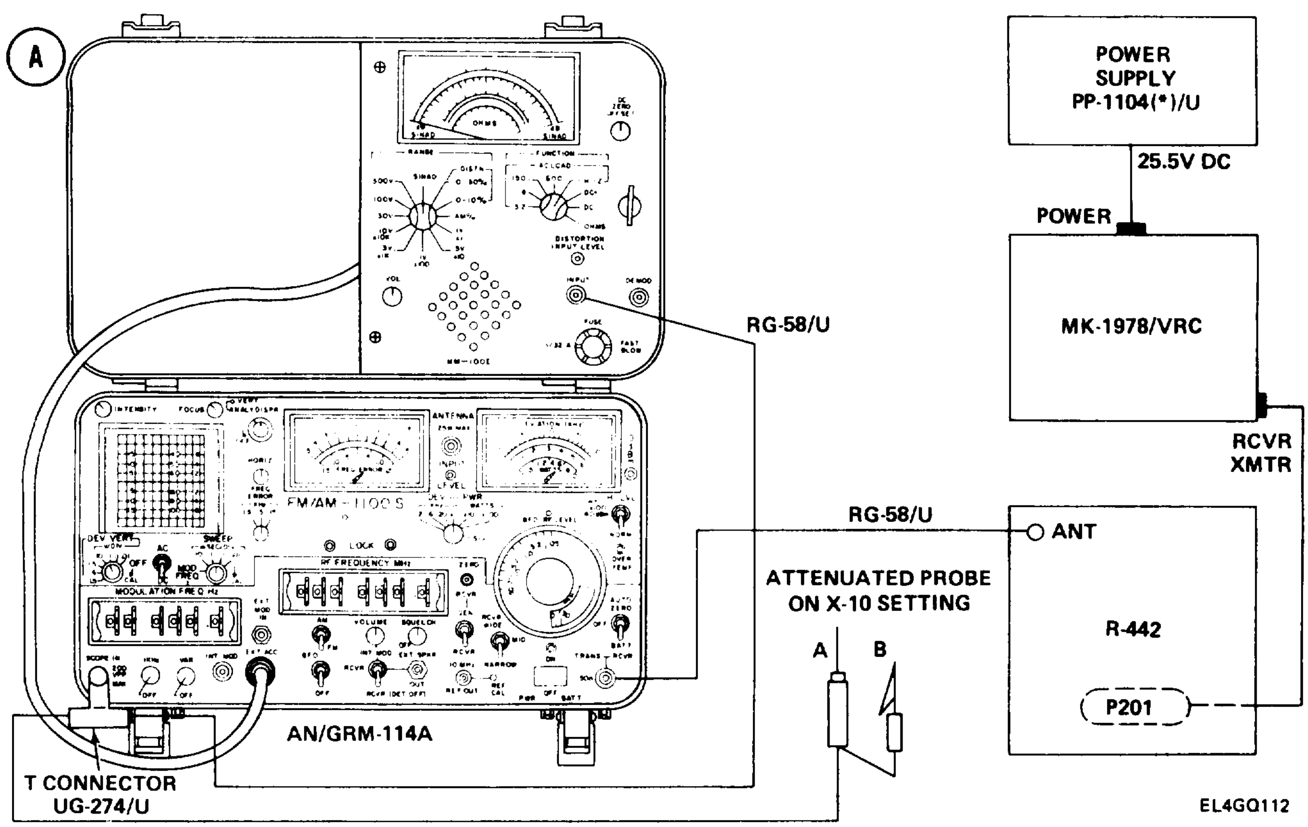
4-18. IF DISCRIMINATOR A4200 ALINEMENT.

PURPOSE. This procedure enables the discriminator to provide maximum separation of the audio signal from the rf carrier. Adjusting for zero vdc at TP4003 ensures that T4208 and T4207 are conducting equally around the carrier frequency. Adjusting for maximum ac at TP4007 ensures that the discriminator is tuned exactly to the 11.5-MHz center frequency.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A	Maintenance Kit MK-1978/VRC
Power Supply PP-1104(*)/G	T-Connector UG-274/U

TEST SETUP. Connect the equipment as shown in test setup diagram . Remove R-442/VRC bottom cover. (See paragraph 2-7.)

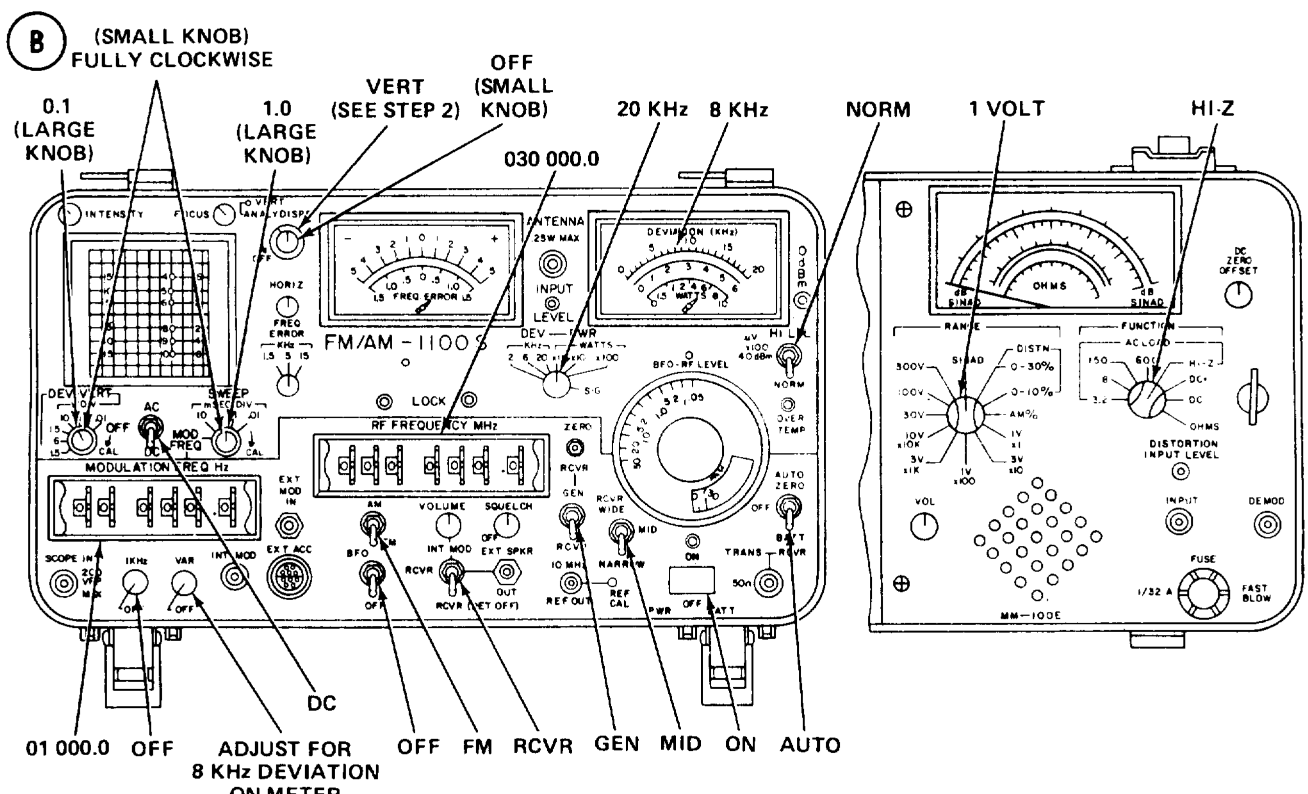


4-18. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 20-µv rf at 30 MHz, 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

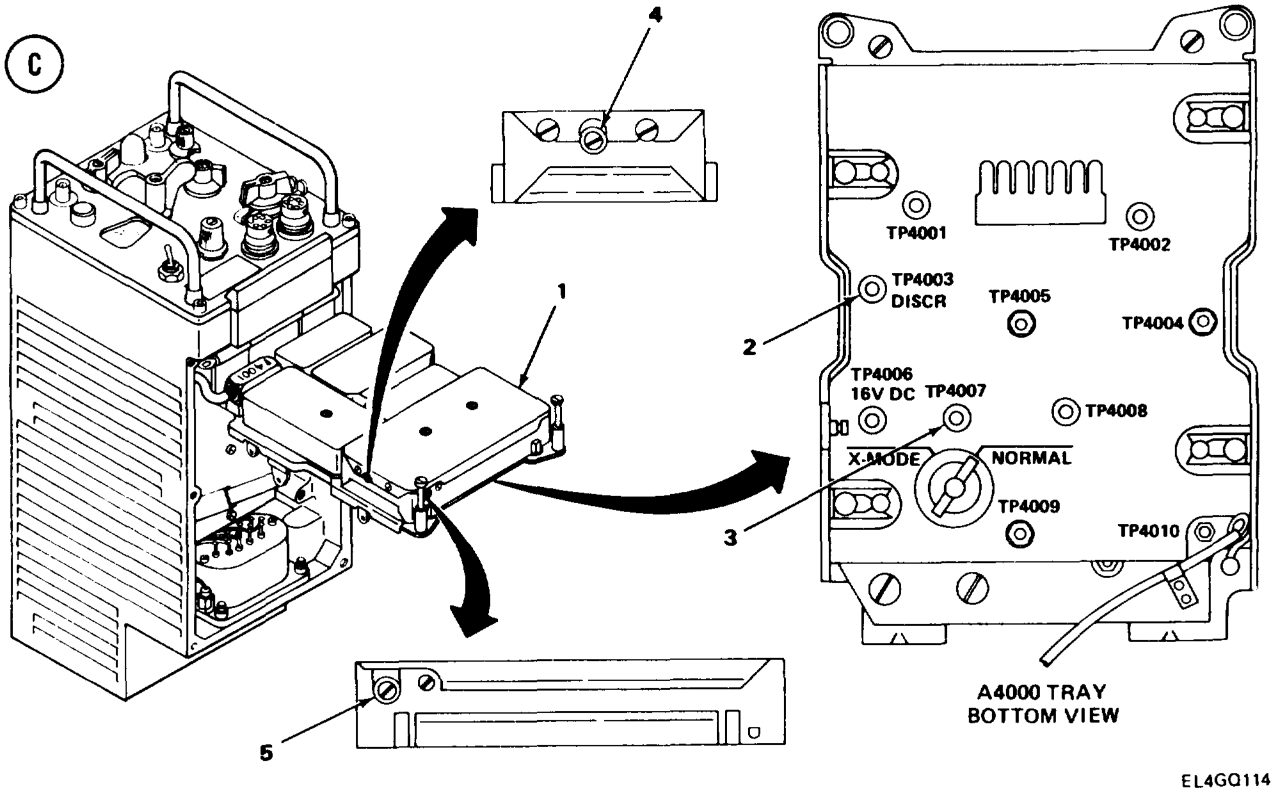
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET A 30.00 Fully clockwise NEW OFF
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE
AN/GRM-114A; MM-100E	See test setup diagram (B)	



EL4GQ113

4-18. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

ALINEMENT PROCEDURE



1. Lift A4000 tray (1).
2. Adjust AN/GRM-114A VERT and HORIZ controls to center scope trace at zero line.
3. Connect AN/GRM-114A test probe A to TP4003 (2). Connect lead B to ground.
4. Adjust T4206 (4) to center scope trace on zero line.
5. Set attenuated probe to x1.
6. Connect probe A to TP4007 (3).
7. Adjust T4207 (5) for maximum voltage reading on MM-100E.
8. Repeat steps 3 through 7 until maximum MM-100E reading and zero-vdc scope trace are present at same time.
9. Connect probe A to TP4003 (2). Probe must remain on xl setting.
10. Set MM-100E to 01- 10% DIST.
11. Set AN/GRM-114A HI LVL/µv x 100/NORM switch to µv x 100.
12. Set AN/GRM-114A RF LEVEL control to 2.
13. Adjust T4207 (5) for distortion reading on MM-100E slightly less than 5 percent.
14. If adjustment of T4207 is required in step 13, repeat steps 2 through 7 after first restoring MM-100E and AN/GRM-114A controls to initial settings given in test setup diagram B , page 4-121.

4-19. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT.

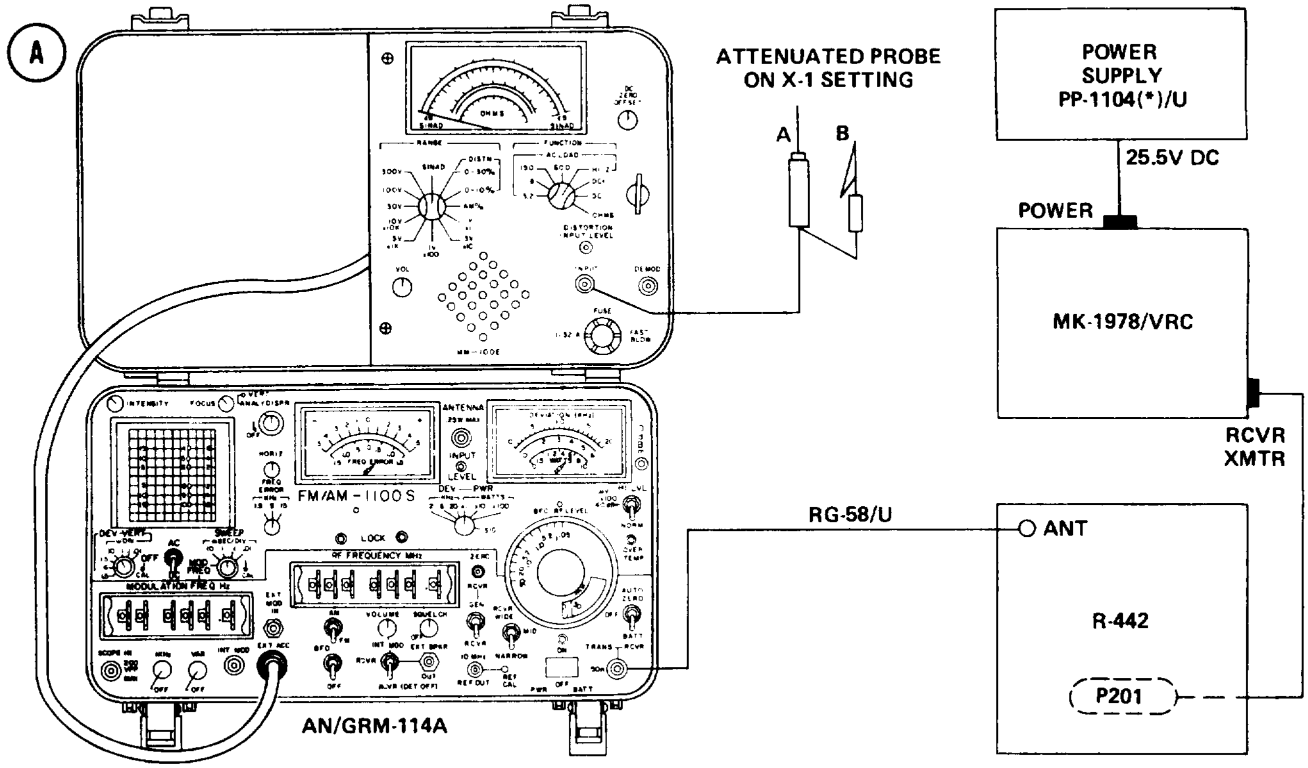
PURPOSE. This procedure enables the integrated circuit discriminator to provide maximum separation of the audio signal from the rf carrier. Coil L4202 is adjusted to tune the fm detector portion of the integrated circuit exactly to the 11.5-MHz center frequency.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G

Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC bottom cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 20-µv rf at 30 MHz, 1-kHz modulation: 8-kHz deviation.

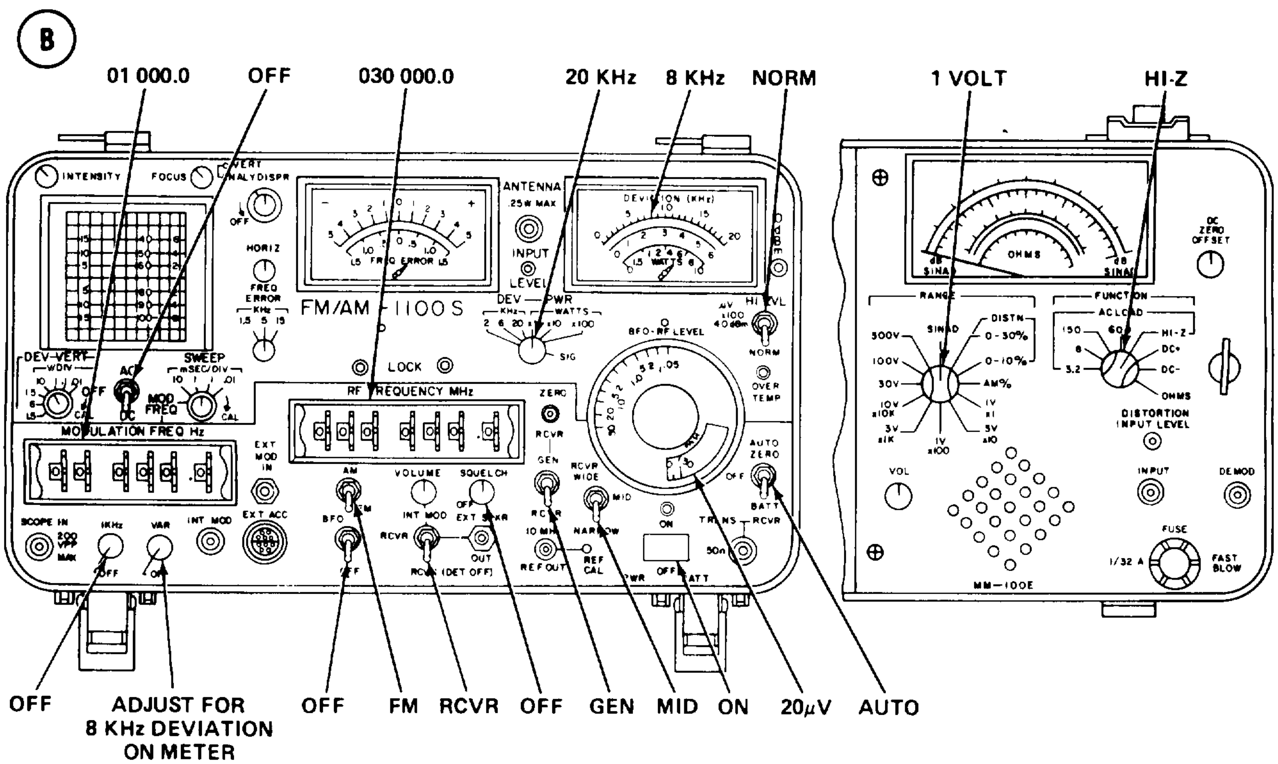
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM114A; MM-100E	See test setup diagram (B), page 4-124	

4-19. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

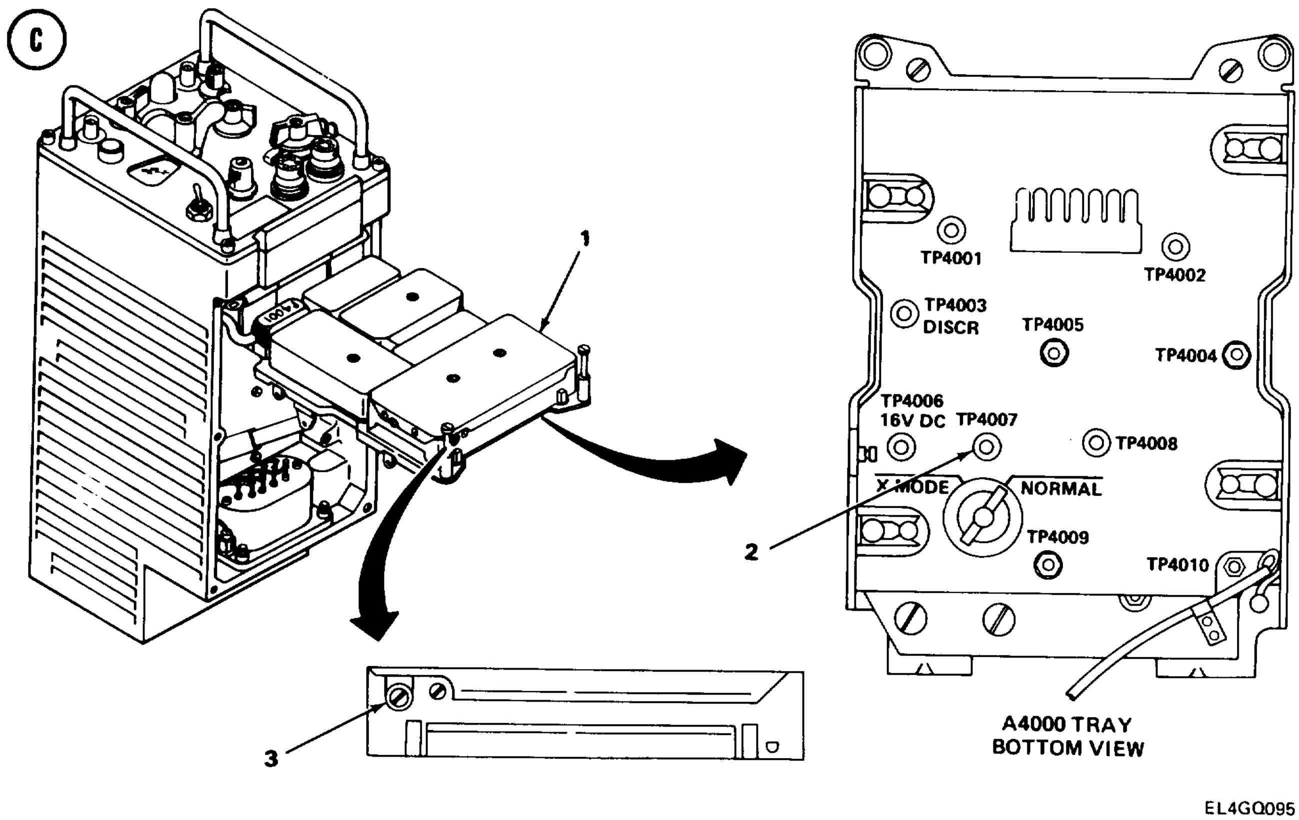
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE



EL4GQ116

4-19. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)



1. Lift A4000 tray(1). (See test setup diagram (C).)
2. Connect MM-100E attenuated probe A (test setup diagram (A), page 4-123) to TP4007 (2); connect alligator clip to ground.
3. Adjust L4202 (3) for maximum indication on MM-100E.

4.20. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT.

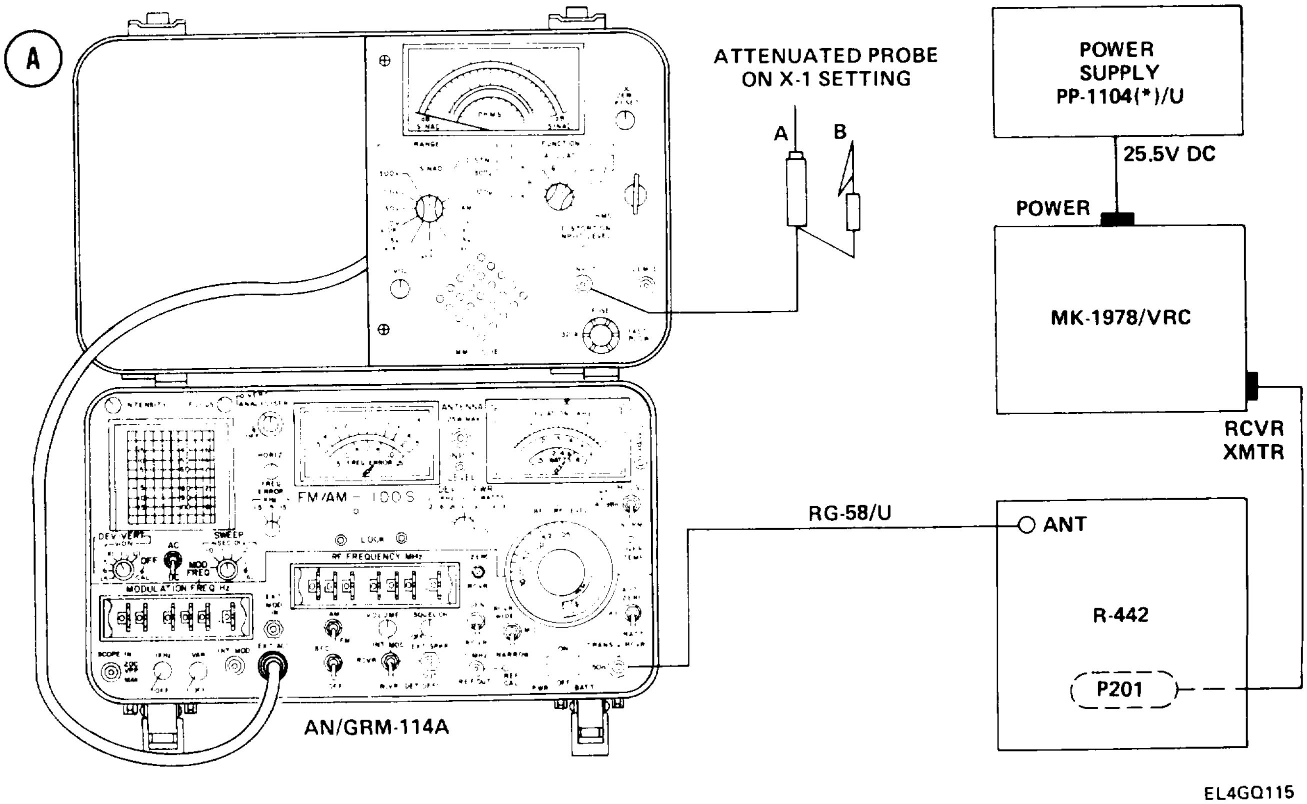
PURPOSE. This procedure adjusts the gain of the A4300 assembly.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC
Power Supply PP-1104(*)/G
Attenuated Probe

TEST SETUP. Connect the equipment as shown in test setup diagram (A), page 4-126. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

4-20. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)

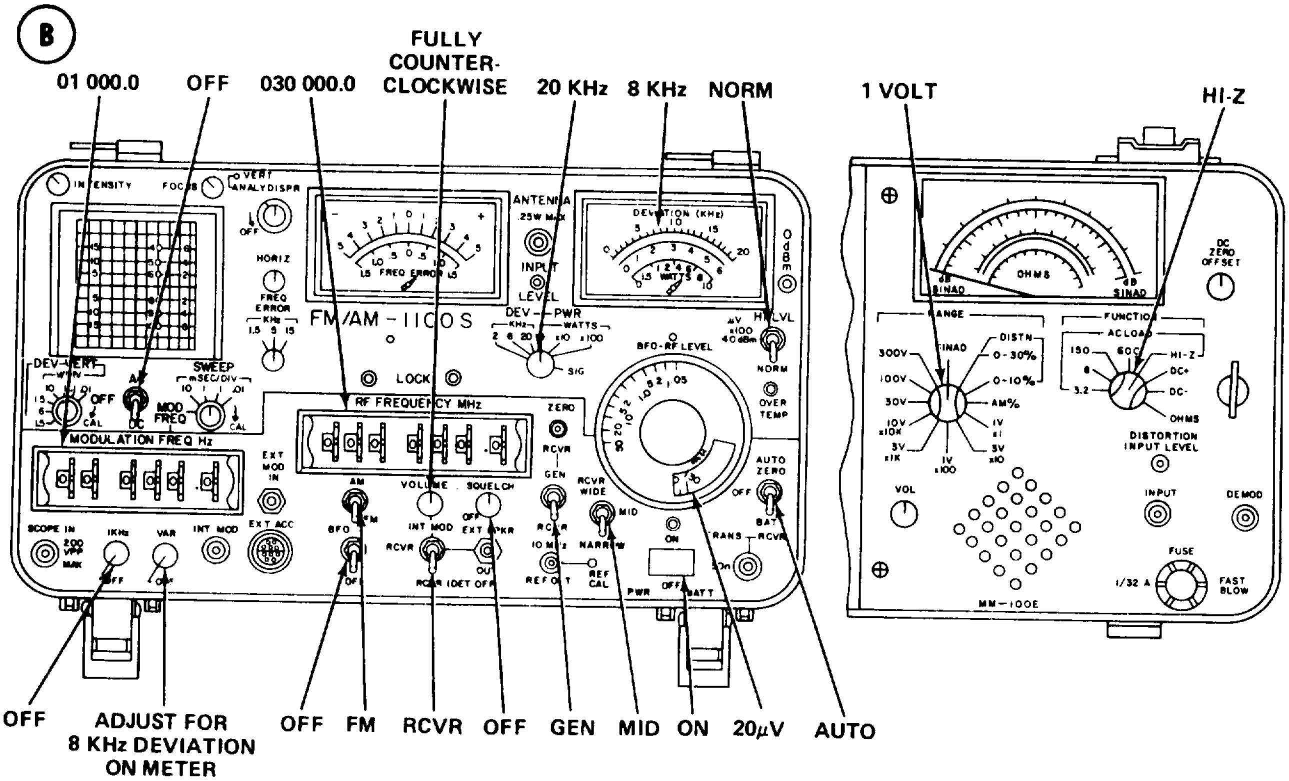


INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

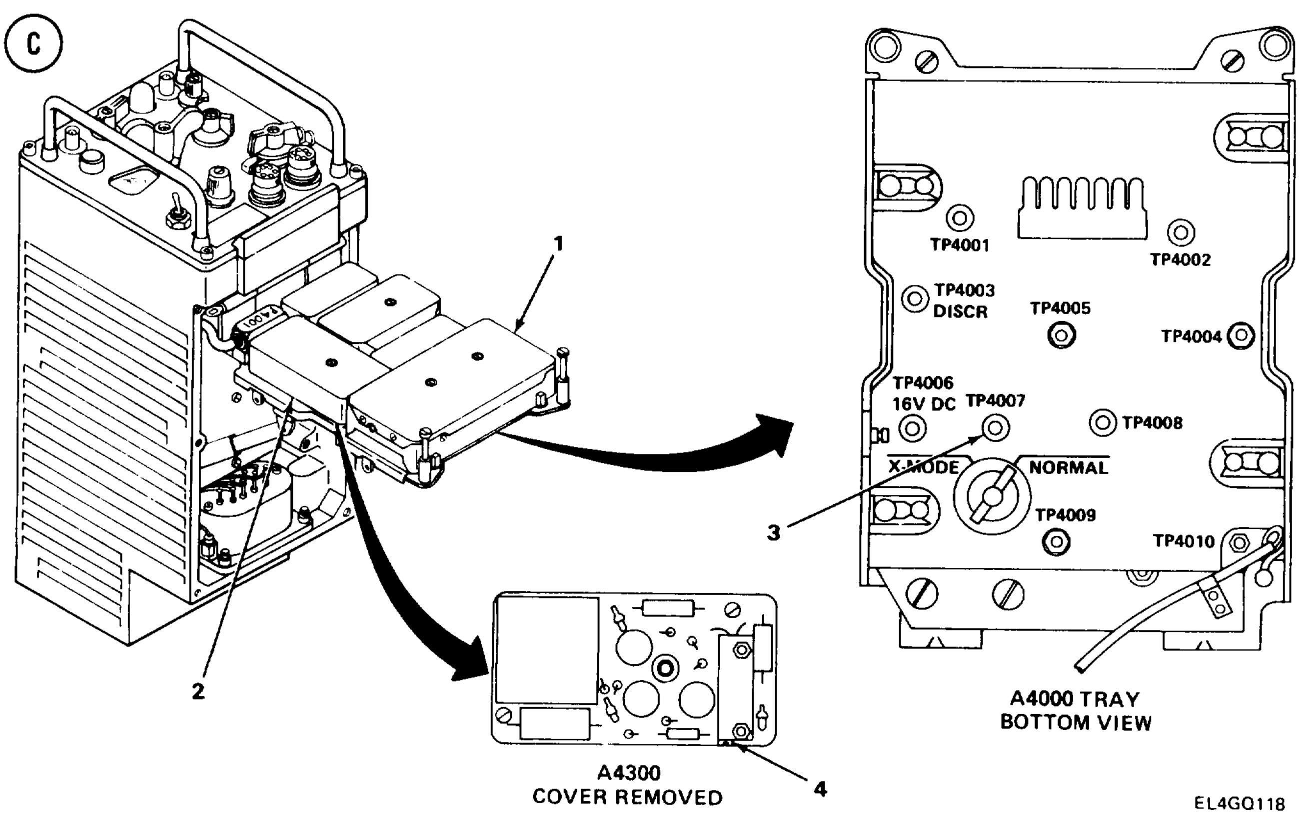
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET A 30.00 Fully clockwise NEW OFF
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE
AN/GRM-114A; MM.100E	See test setup diagram B, page 4-127	

4-20. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)



EL4GQ117

ALINEMENT PROCEDURE



EL4GQ118

4-20. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)

1. Lift R-442 A4000 tray (1). (See test setup diagram C, page 4-127.)
2. Remove A4300 cover (2).
3. Connect alternated probe A to TP4007 (3). Connect alligator clip B to ground.
4. Adjust R4304 (4) for 0.8-volt reading on MM-100E.

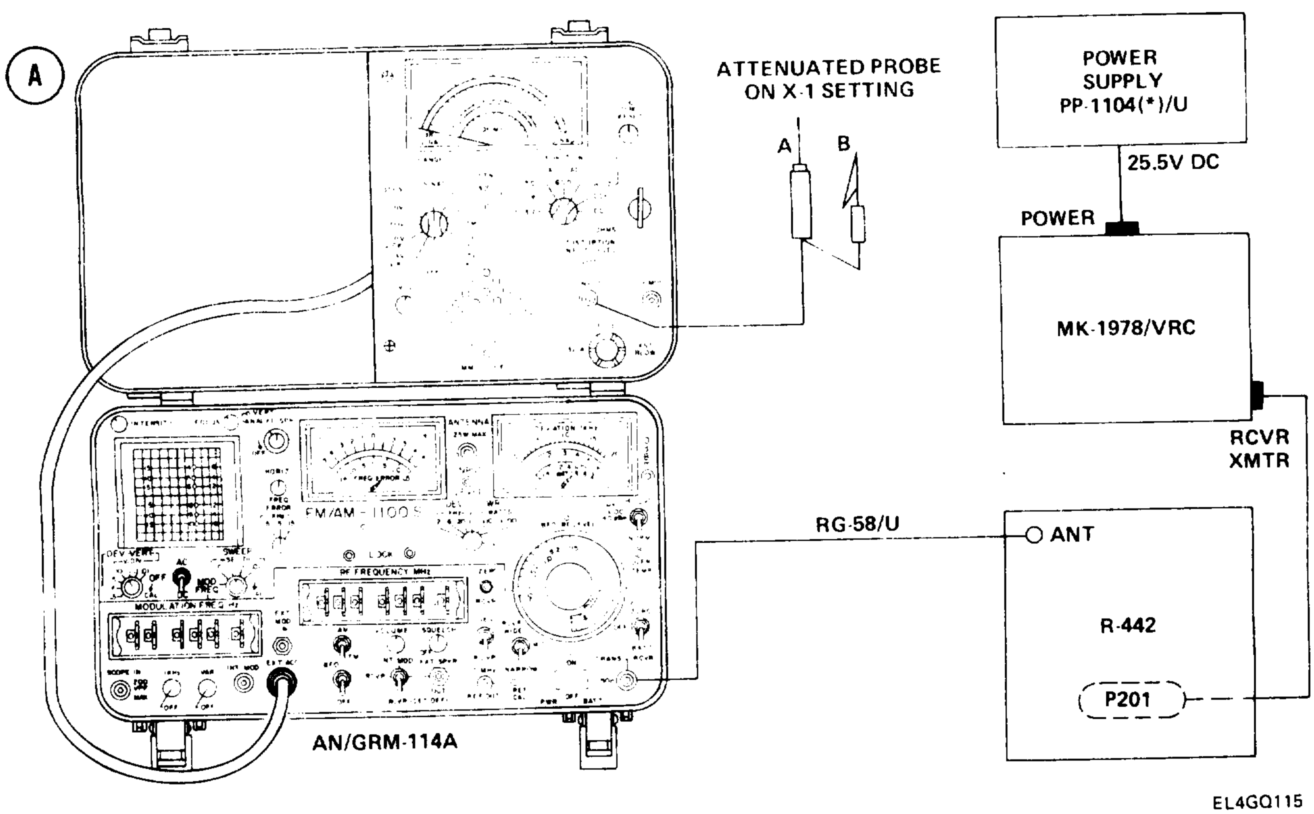
4-21. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT.

PURPOSE. This procedure adjusts the gain of the A4300A assembly.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC
Power Supply PP-1104(')IG
Attenuated Probe

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

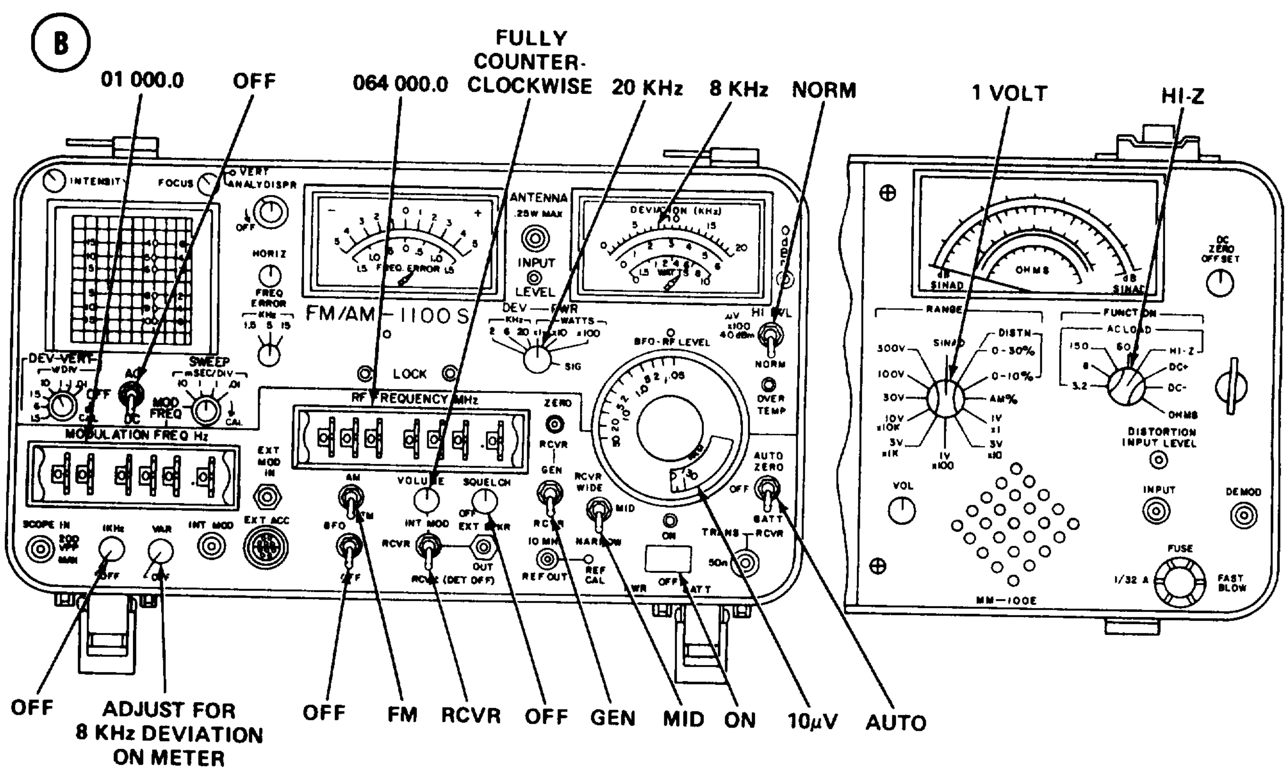


4-21. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table.

CONTROL AND SWITCH SETTINGS

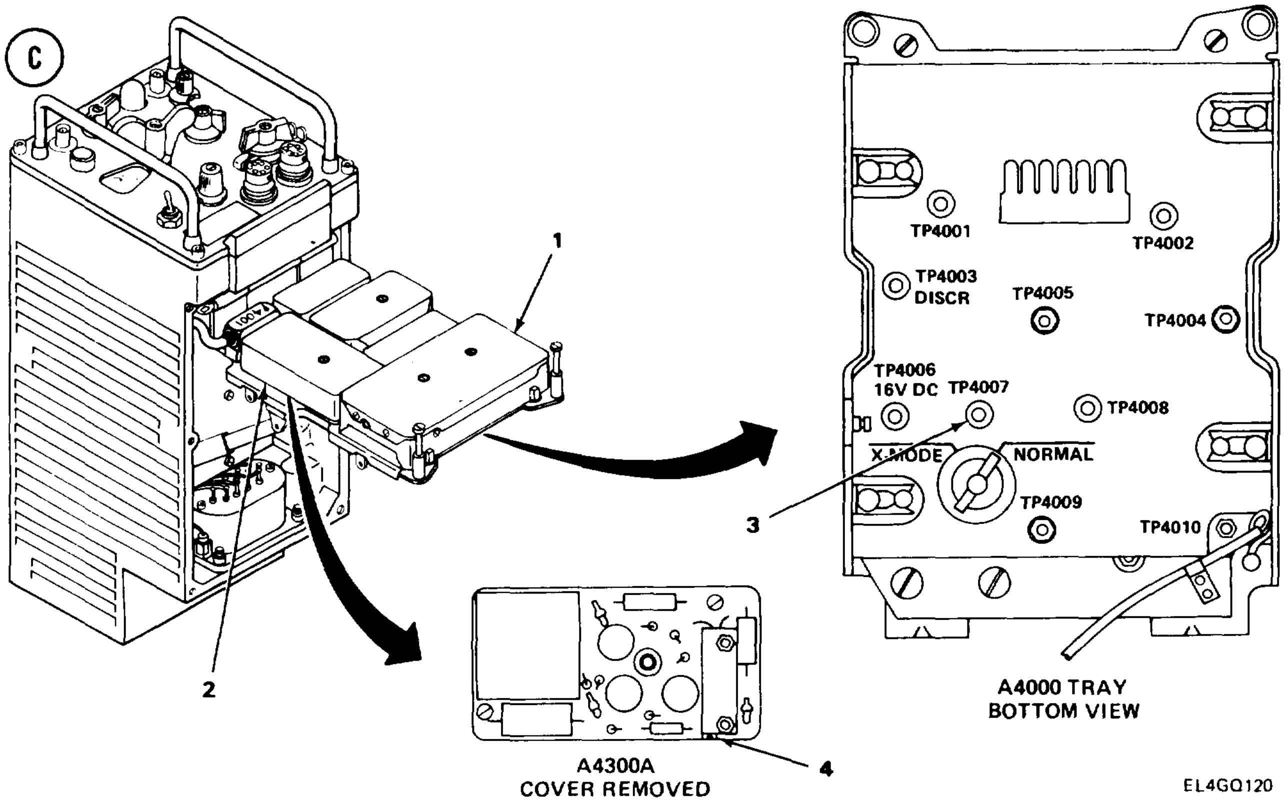
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	64.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE
AN/GRM-114A; MM-100E	See test setup diagram (B)	



EL4GQ119

4-21. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)

ALINEMENT PROCEDURE



1. Lift R-442 A4000 tray (1).
2. Remove A4300A cover(2).
3. Connect attenuated probe A to TP4007 (3). Connect alligator clip B to ground.
4. Adjust R4304 (4) for 0.8-volt reading on MM-100E.

4-22. A5300 SQUELCH FILTER ALINEMENT.

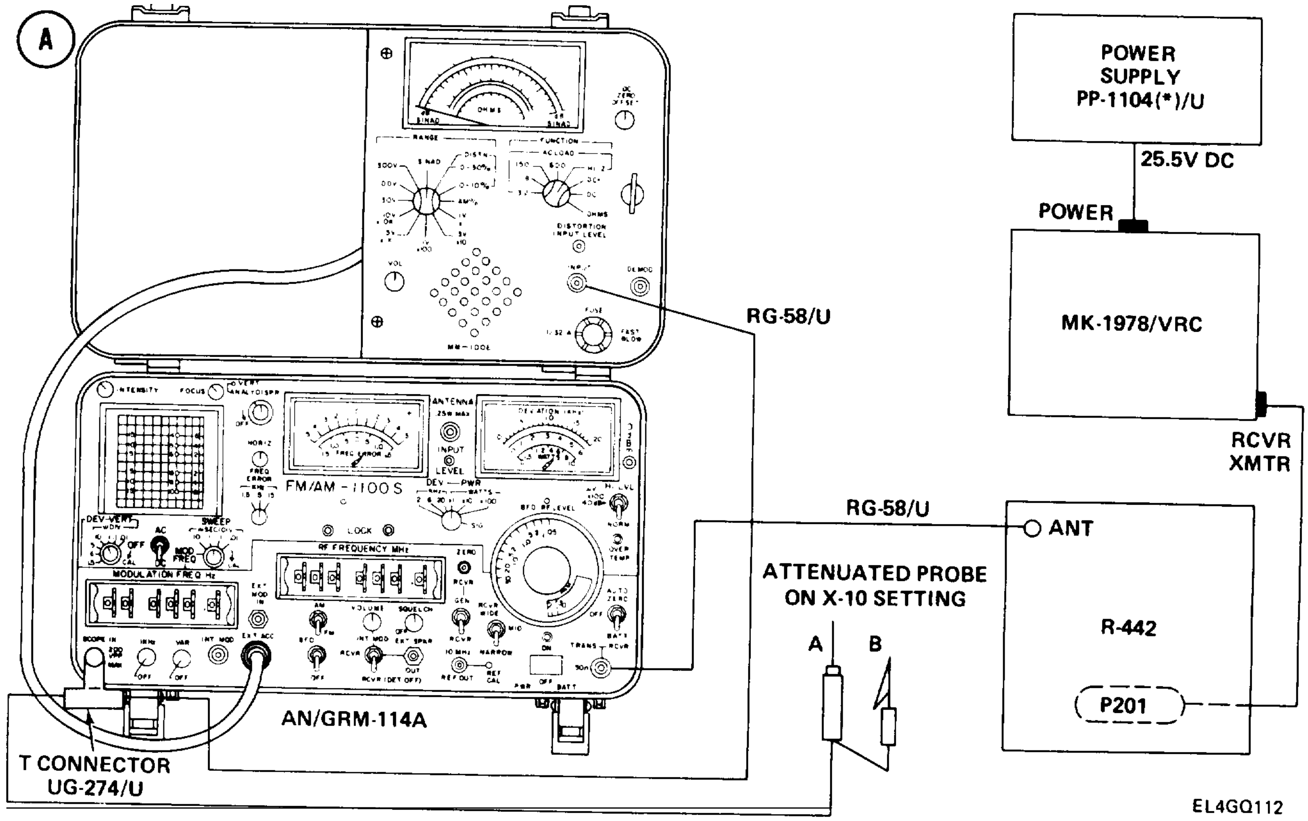
PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200 in the NEW SQUELCH mode of operation. By adjusting Resistor R5301 in the squelch filter, the filter is properly tuned to attenuate the 150-Hz squelch tone, thus providing maximum degenerative feedback to the squelch amplifier for all frequencies other than 150 Hz. This permits the squelch amplifier to provide maximum gain for 150-Hz signals. Alinement of Squelch Filter A5300 must be done before Squelch Amplifier A5200 Alinement, NEW SQUELCH LEVEL, covered in paragraph 4-24.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Maintenance Kit MK-1978/VRC
Rf Cable RG-58/U
T-Connector UG-274/U
Attenuated Probe
Power Supply PP-1104(*)/G

4-22. A5300 SQUELCH FILTER ALINEMENT. (CONT)

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R.442/VRC top cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 1000µV rf at 30 MHz, 150-Hz modulation; 2-kHz deviation

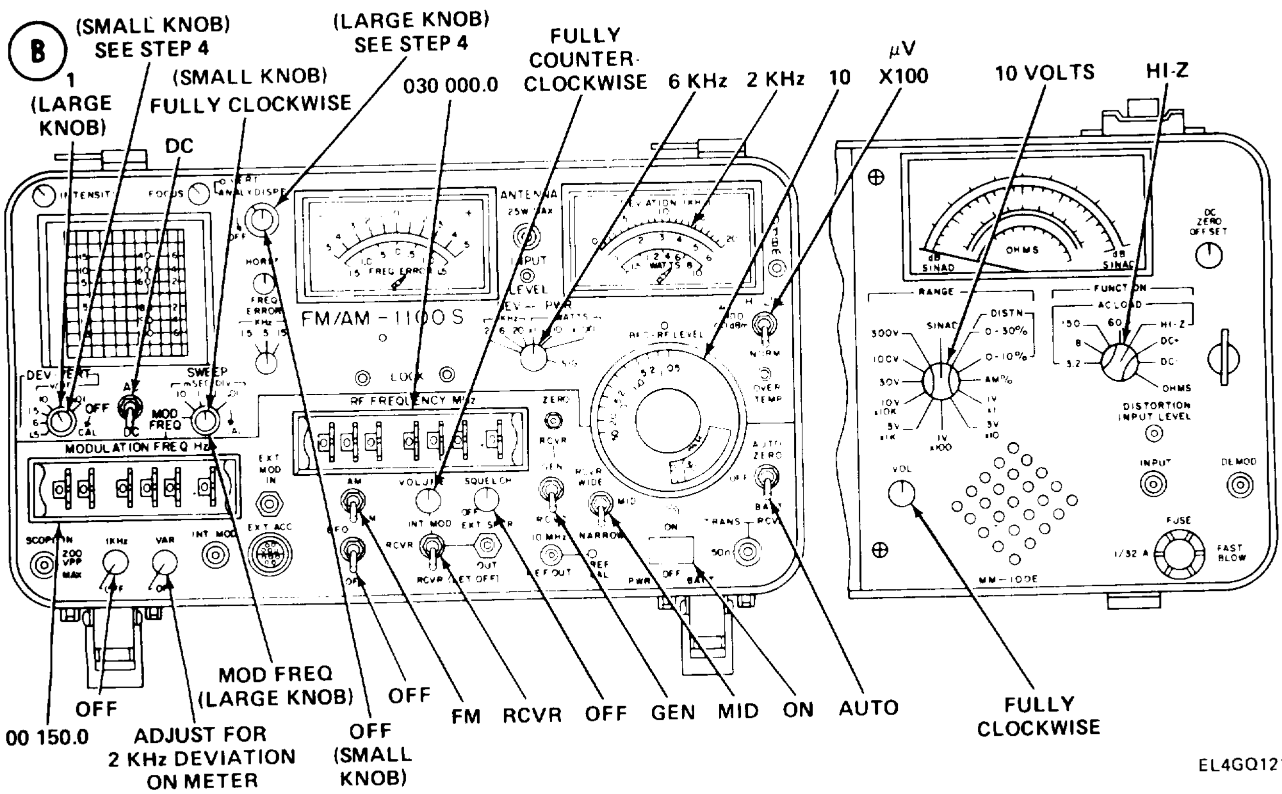
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON -RESET
	BAND	(A)
	MC-TUNE-KC	30.00
	VOLUME	Fully counterclockwise
	SQUELCH	NEW ON
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE

4-22. A5300 SQUELCH FILTER ALINEMENT. (CONT)

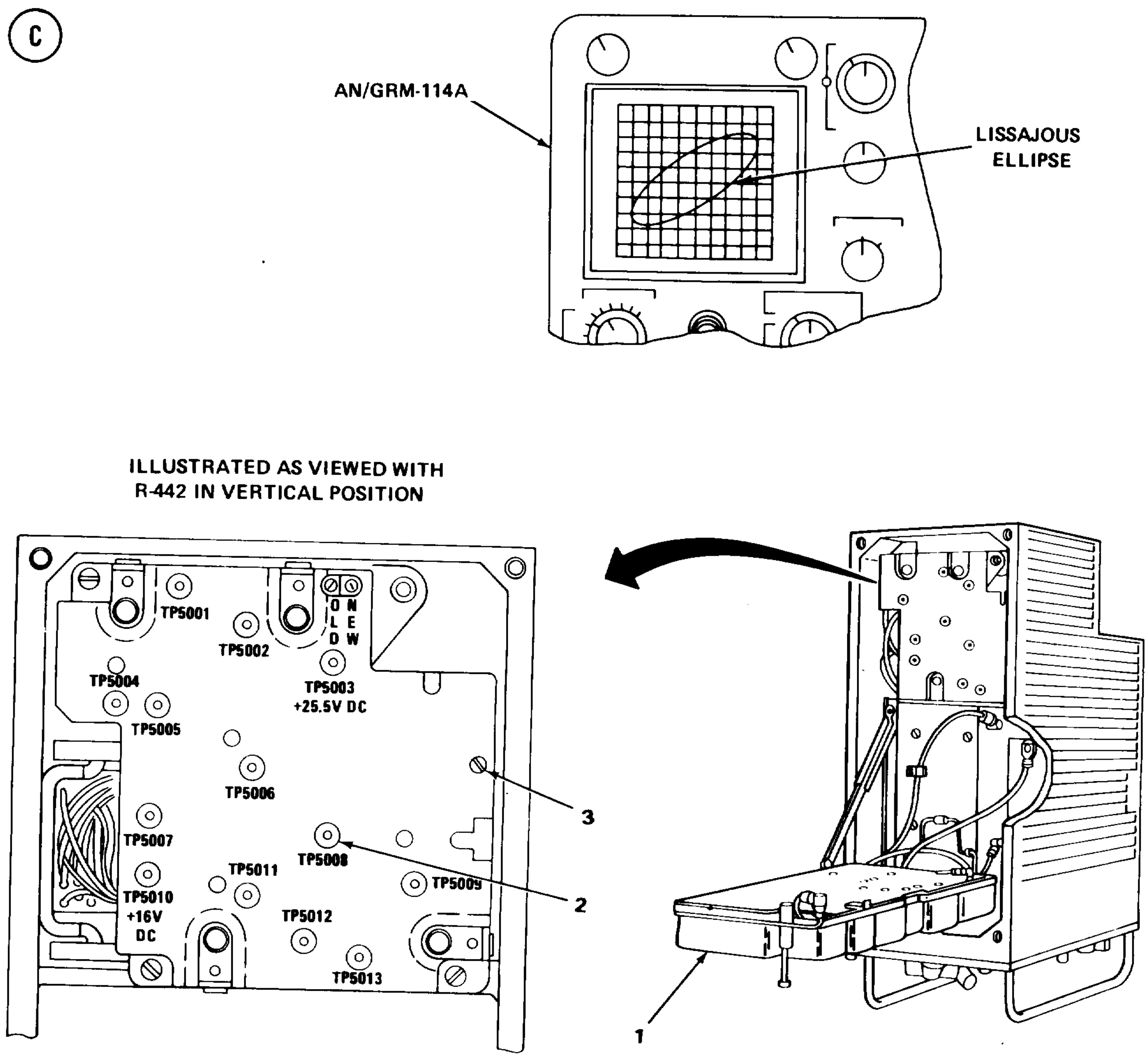
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM-114A; MM-100E	See test setup diagram (B)	



4-22. A5300 SQUELCH FILTER ALINEMENT. (CONT)

ALINEMENT PROCEDURE



EL4GQ122

1. Lift R-442/VRC A3000 tray (1). (See test setup diagram C .)
2. Connect MM-100E attenuated probe A (x1 setting) to TP5008 (2), and probe B to ground.
3. Adjust R5301 (3) until 150-Hz tone is heard on MM-100E speaker.
4. Adjust AN/GRM-114 A scope VERT control (large knob) and DEV-VERT CAL control (small knob) to bring trace on center of screen and to obtain Iissajous ellipse. (See test setup diagram C .)
5. Continue ajusting R5301 until all three of the following conditions are met:
   a. 150-Hz tone on speaker is clear and steady, with no tone oscillation.
   b. MM-100E voltage is at peak ac value (about 2.5 to 6.0 volts).
   c. Lissajous ellipse is steady, with no rotation.

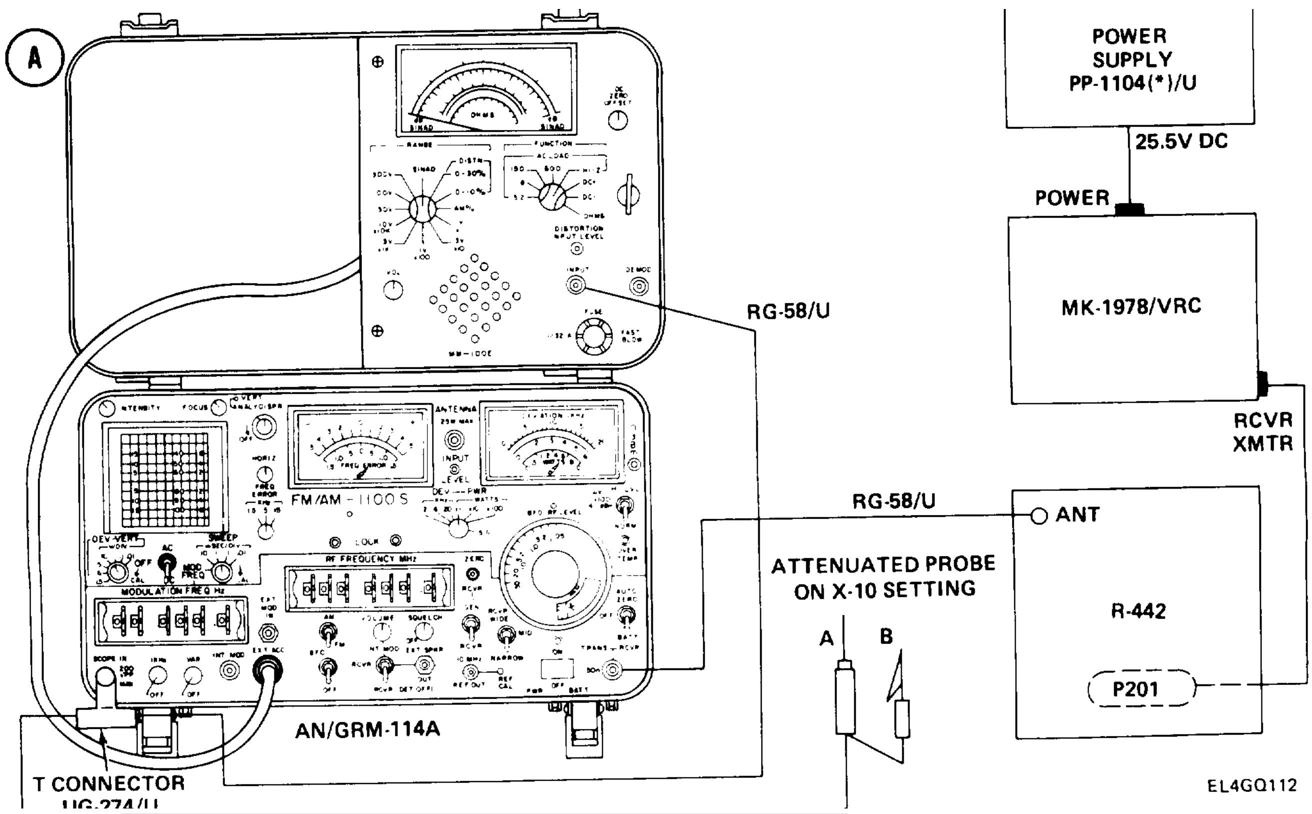
4-23. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT.

PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200 in the NEW SQUELCH mode of operation. By adjusting Resistor R5301 in the squelch filter, the filter is properly tuned to attenuate the 150-Hz squelch tone, thus providing maximum degenerative feedback to the squelch amplifier for all frequencies other than 150 Hz. This permits the squelch amplifier to provide maximum gain for 150-Hz signals. Alinement of Squelch Filter A5300 (paragraph 4-22) must be done before Squelch Amplifier A5200 Alinement, NEW SQUELCH level, covered in paragraph 4-24.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114 A
Maintenance Kit MK-1978/VRC
Rf Cable RG-58AJ
T-Connector UG-274/U
Attenuated Probe
Power Supply PP-1104(*)/G

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC top cover. (See paragraph 2-7.)

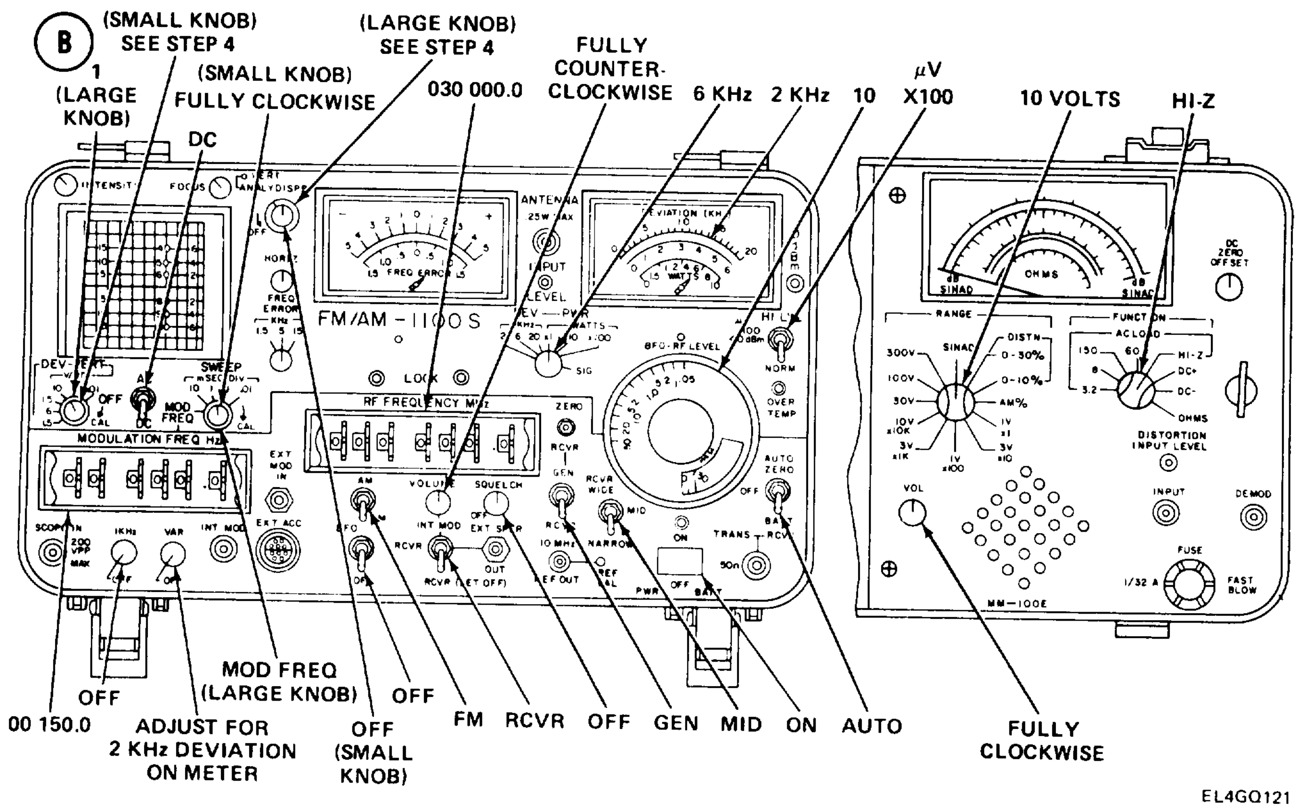


INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. Inject 1000-µv rf at 30 MHz, 150-Hz modulation; 2-kHz deviation.

4-23. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS

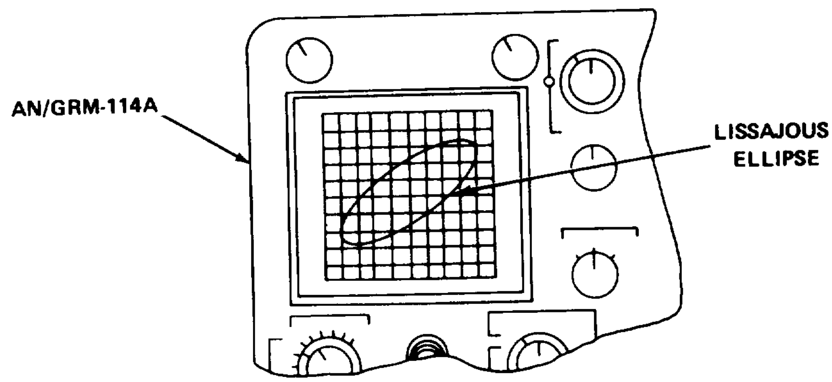
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/GRM-114A; MM-100E	See test setup diagram B	
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64.00
	VOLUME	Fully counterclockwise
	SQUELCH	NEW ON
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE



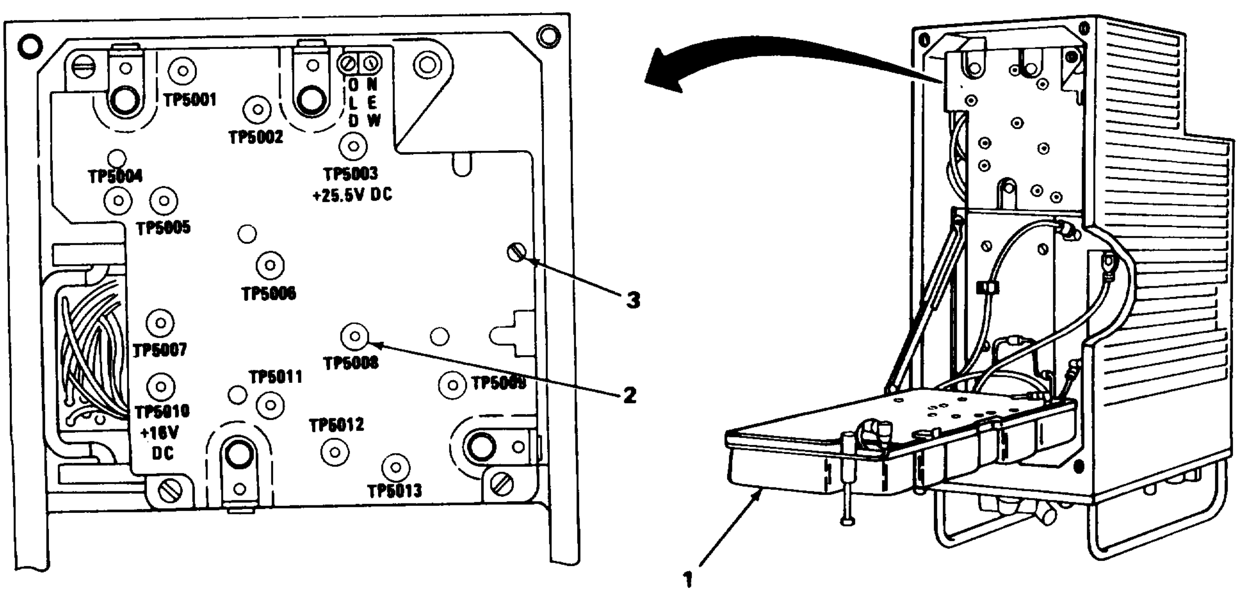
4-23. SILICON VERSION A5300A SQLJELCH FILTER ALINEMENT. (CONT)

ALINEMENT PROCEDURE

C



ILLUSTRATED AS VIEWED WITH R-442 IN VERTICAL POSITION



EL4GQ122

1. Lift R-442/VRC A3000 tray (1). (See test setup diagram C).
2. Connect MM-100E attenuated probe A (x1 setting) to TP5008 (2), and probe B to ground.
3. Adjust R5301 (3) until 150-Hz tone is heard on MM-100E speaker.
4. Adjust AN/GRM-114A scope VERT control (large knob) and DEV-VERT CAL control (small knob) to bring trace on center of screen to obtain lissajous ellipse.
5. Continue adjusting R5301 until all three of the following conditions are met:
   a. 150-Hz tone on speaker is clear and steady, with no tone oscillation.
   b. MM-100E voltage is at peak ac value (about 2.5 to 6.0 volts).
   c. Lissajous ellipse is steady, with no rotation.

4-24. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

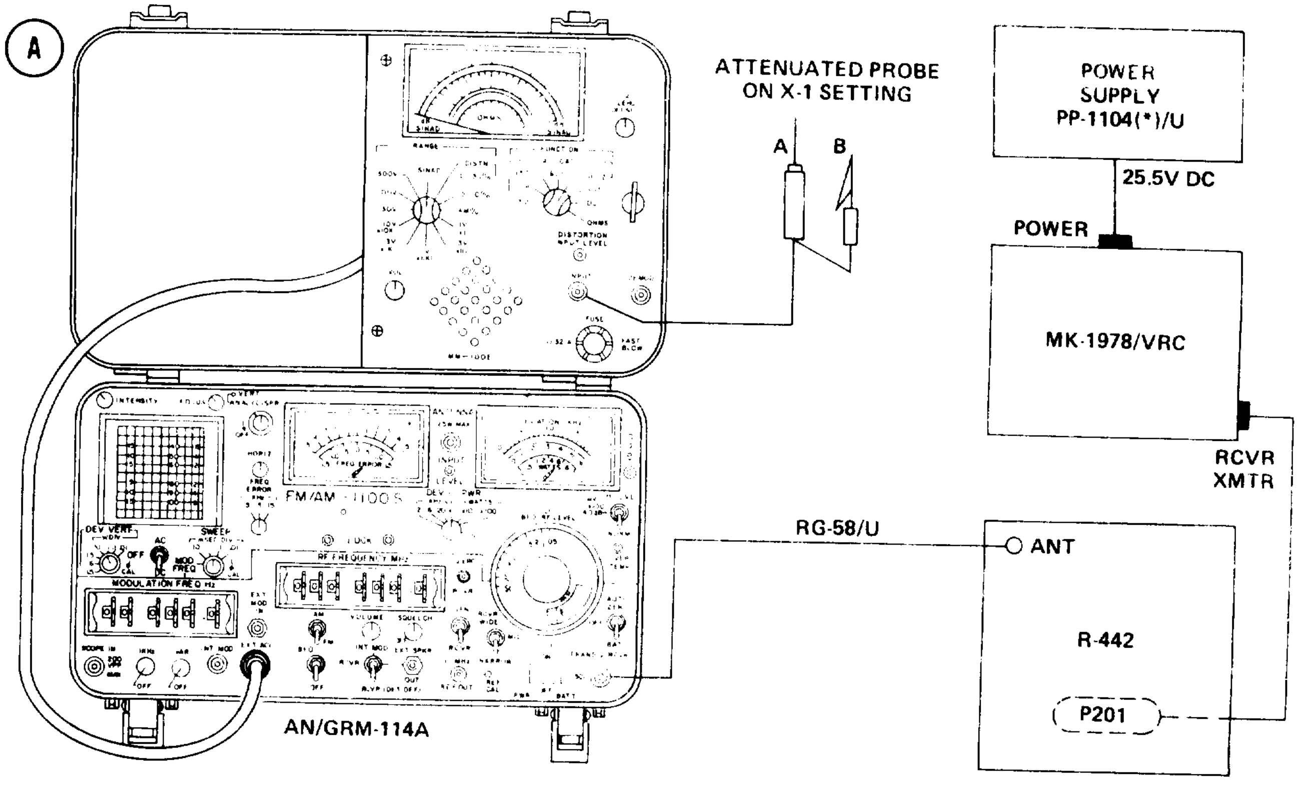
PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

TEST EQUIPMENT AND MATERIALs

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G

Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram (A) Remove R-442/VRC top cover. (See paragraph 2-7.)



EL4GQ115

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table.

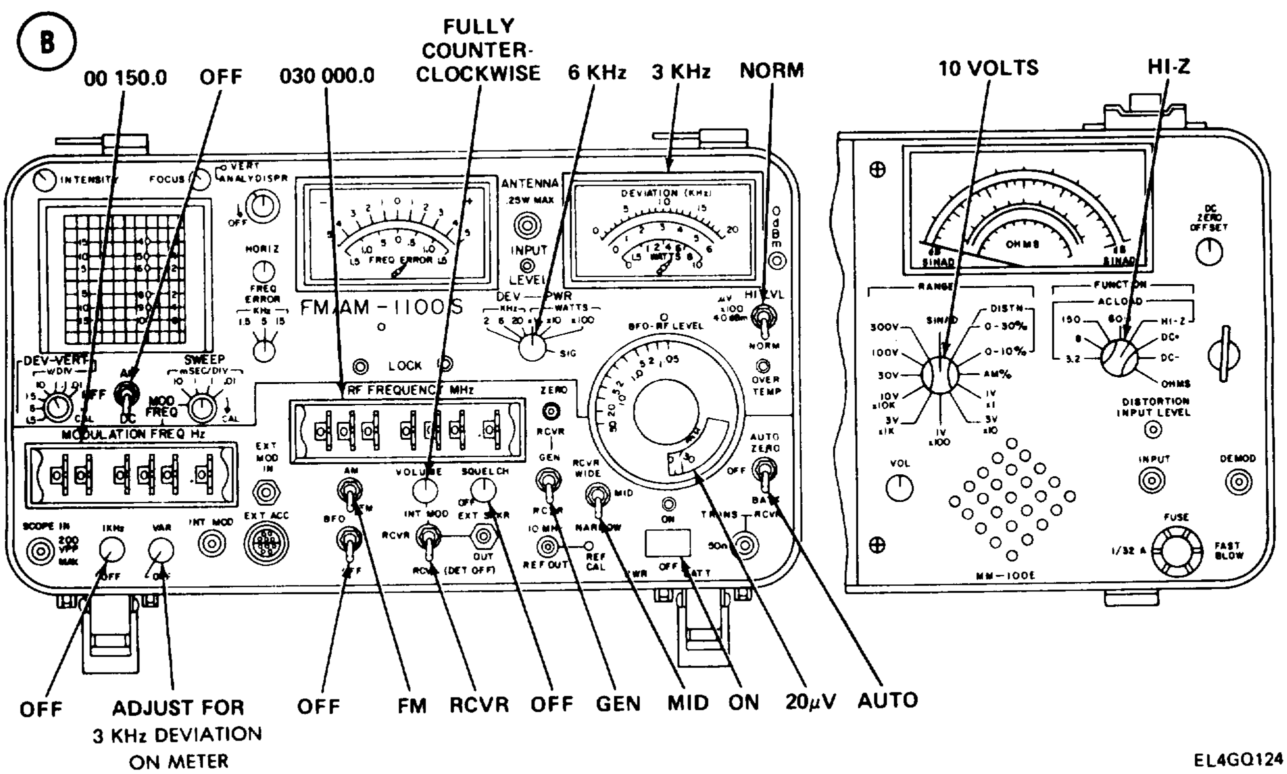
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET (A) 30.00 FulIY clockwise NEW ON
AN/GRM-114A; MM-100E	See test setup diagram (B) , page 4-138	

4-24. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

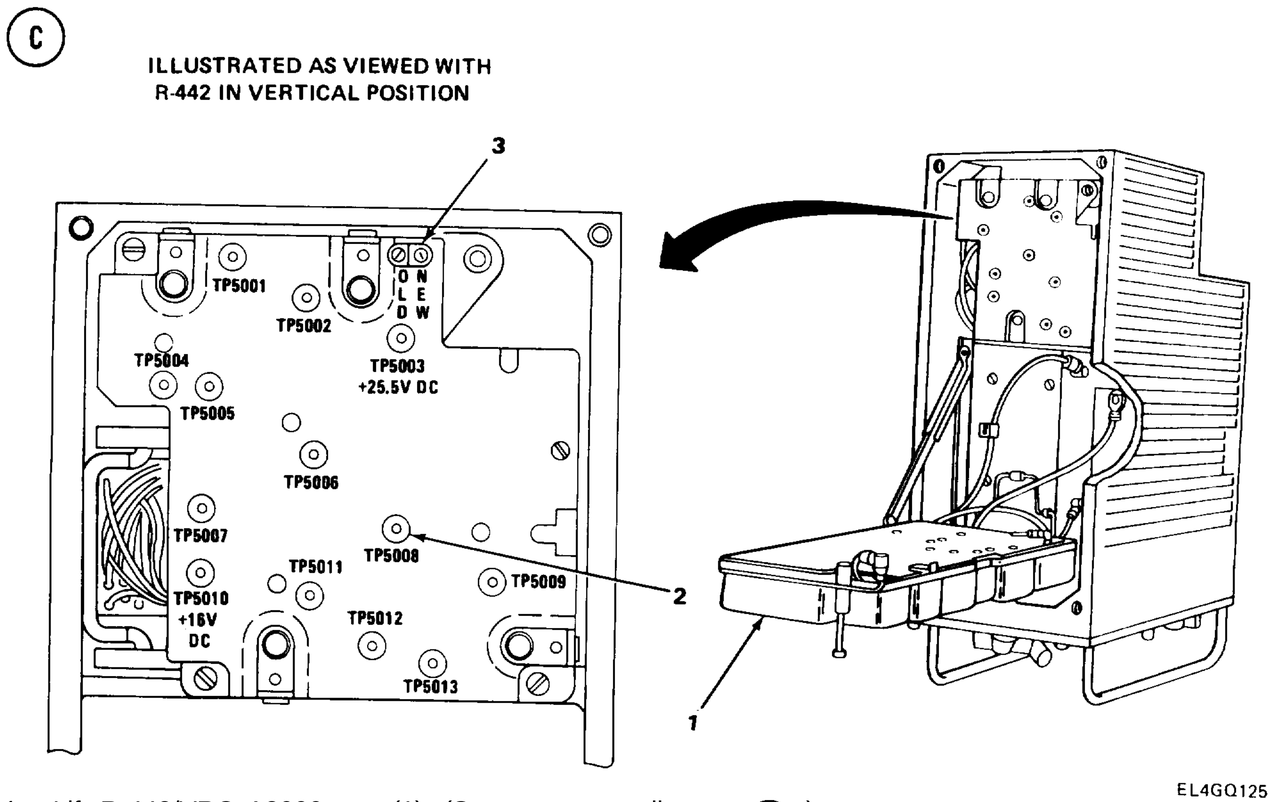
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE



EL4GQ124

4-24. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram C .)
2. Connect MM-100E attenuated probe A to TP5008 (2). Connect alligator clip B to ground.
3. Adjust AN/GRM-114A VAR control (deviation control) for 4-vac reading on MM-100E.
4. Adjust NEW Squelch Resistor R5217 (3) until R-442/VRC CALL light just comes on.

4-25. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

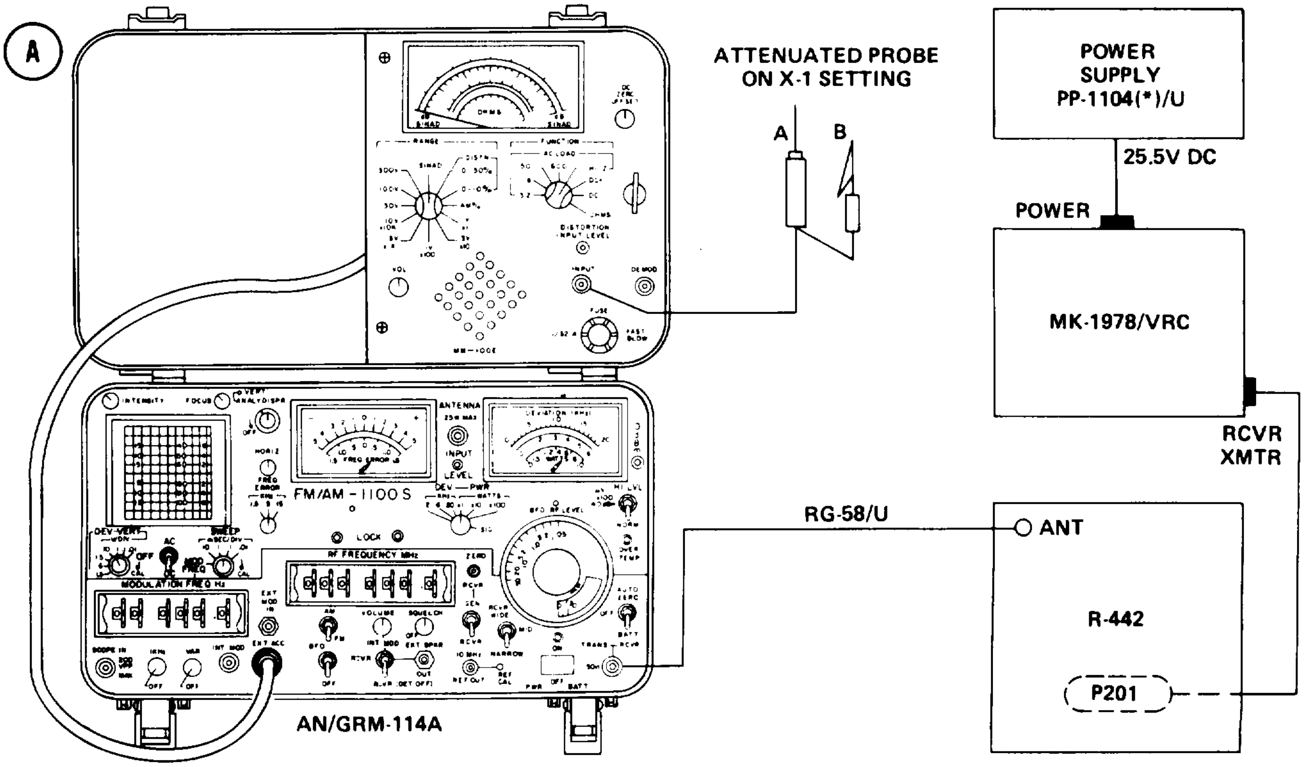
TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G

Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the eqipment as shown in setup diagram A. Remove R442/VRC top cover. (See paragraph 2-7.)

4-25. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)



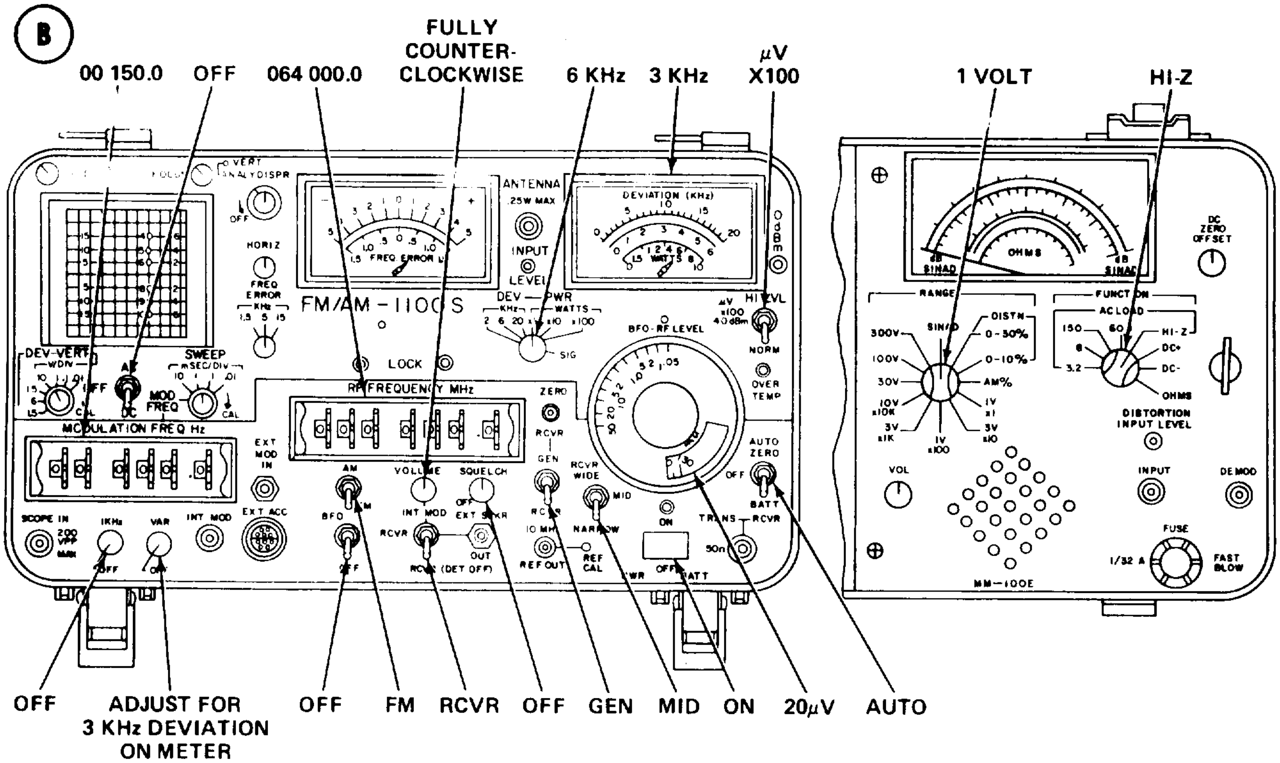
EL4GQ115

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table.

CONTROL AND SWITCH SETTINGS

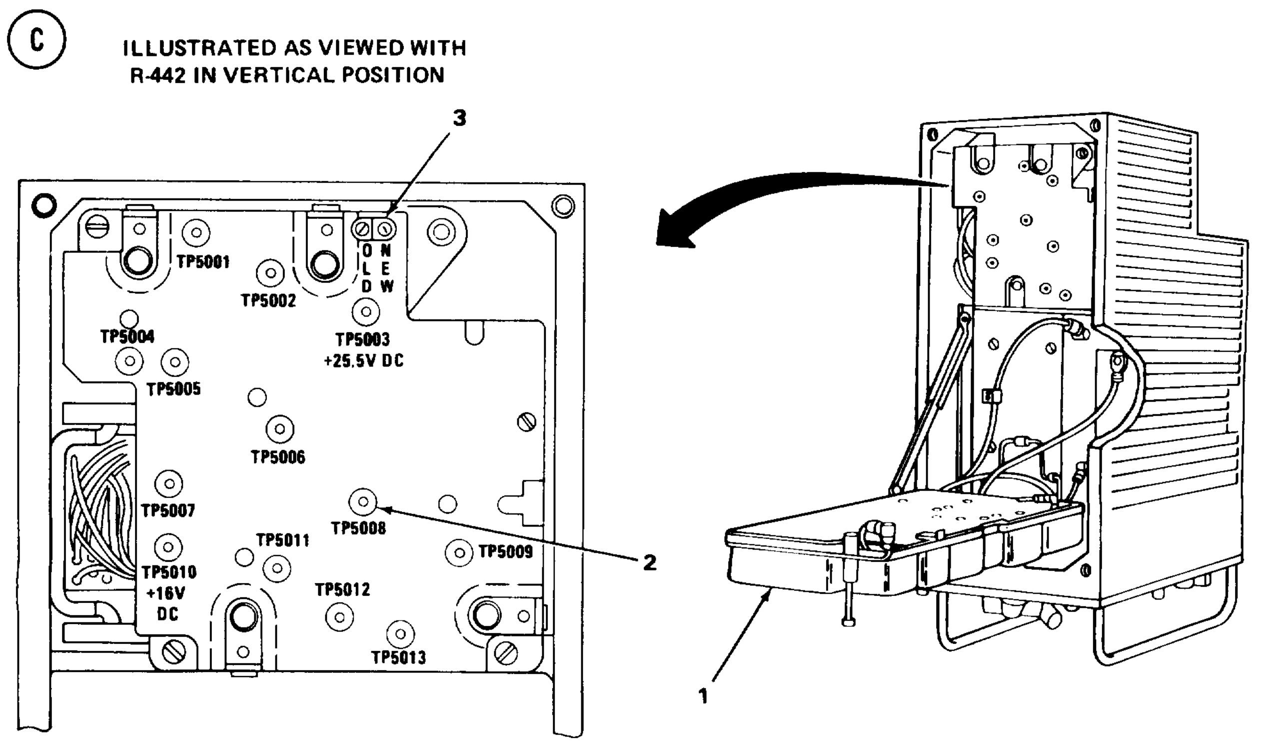
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON-RESET B 64.00 Fully clockwise NEW ON
AN/GRM-114A; MM-100E	See test setup diagram B, page 4-141	
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE

4-25. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)



EL4GQ126

ALINEMENT PROCEDURE



EL4GQ125

4-25. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

1. Lift R-442/VRC A3000 tray (1). (See test setup diagram C, page 4-141.)
2. Connect MM-100E attenuated probe A to TP5008 (2). Connect alligator clip B to ground.
3. Adjust AN/GRM-114A VAR control (deviation control) for 0.20 ± 0.01 vac reading on MM-100E.
4. Adjust NEW Squelch Resistor R5217 (3) until R-442/VRC CALL light just comes on.

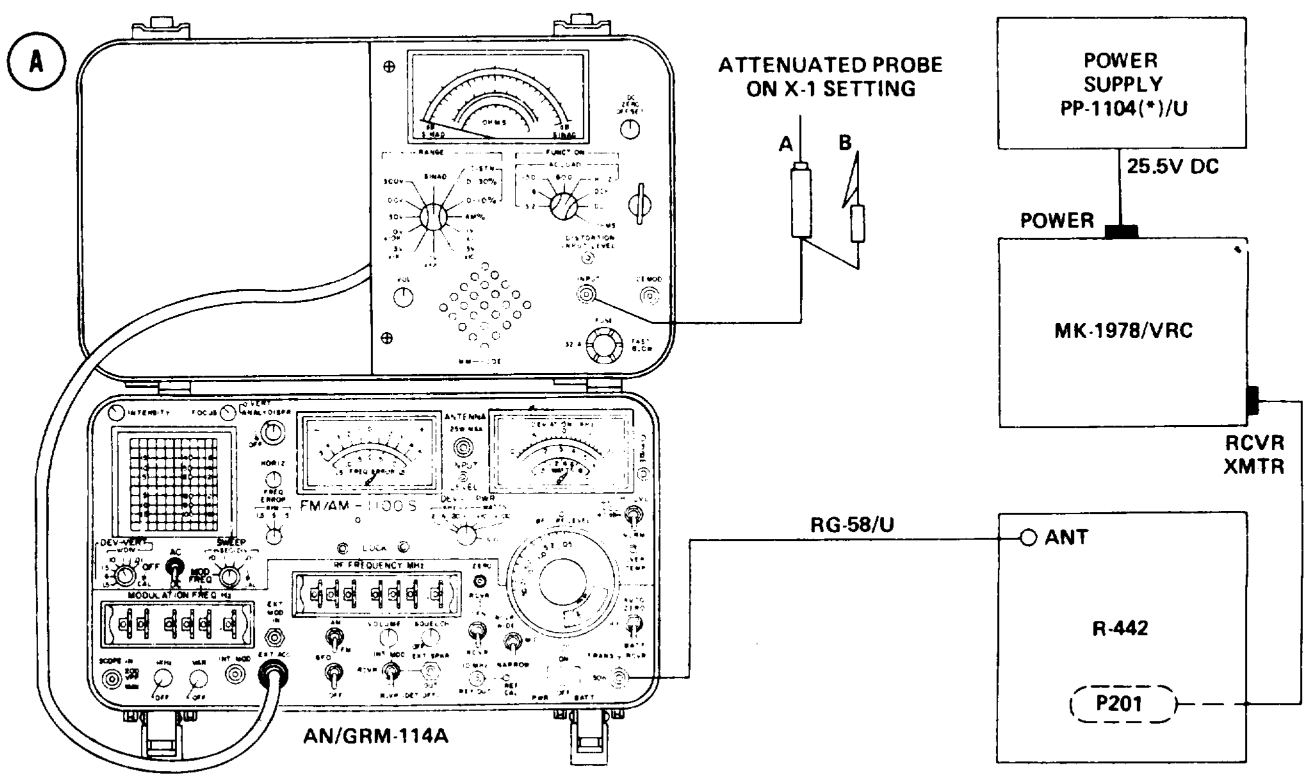
4-26. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which include internal noise and the received carrier.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)



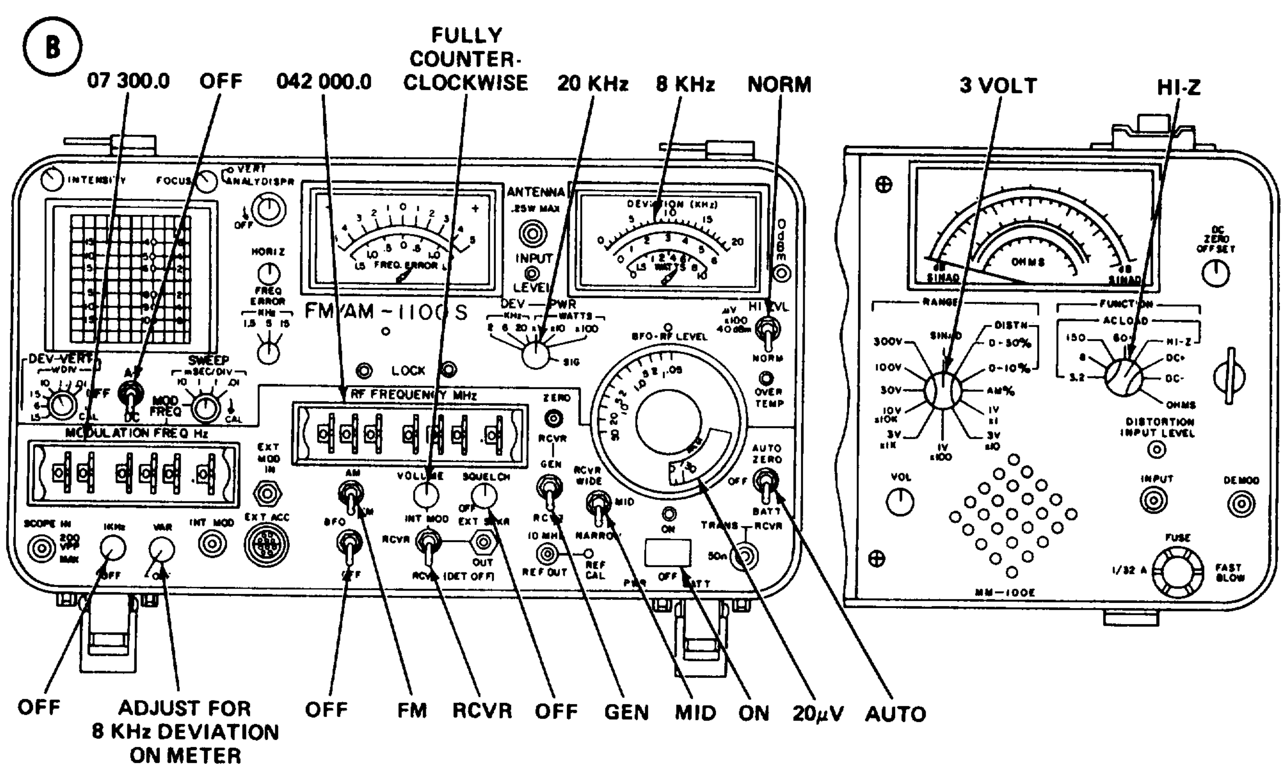
EL4GQ115

4-26. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table.

CONTROL AND SWITCH SETTINGS

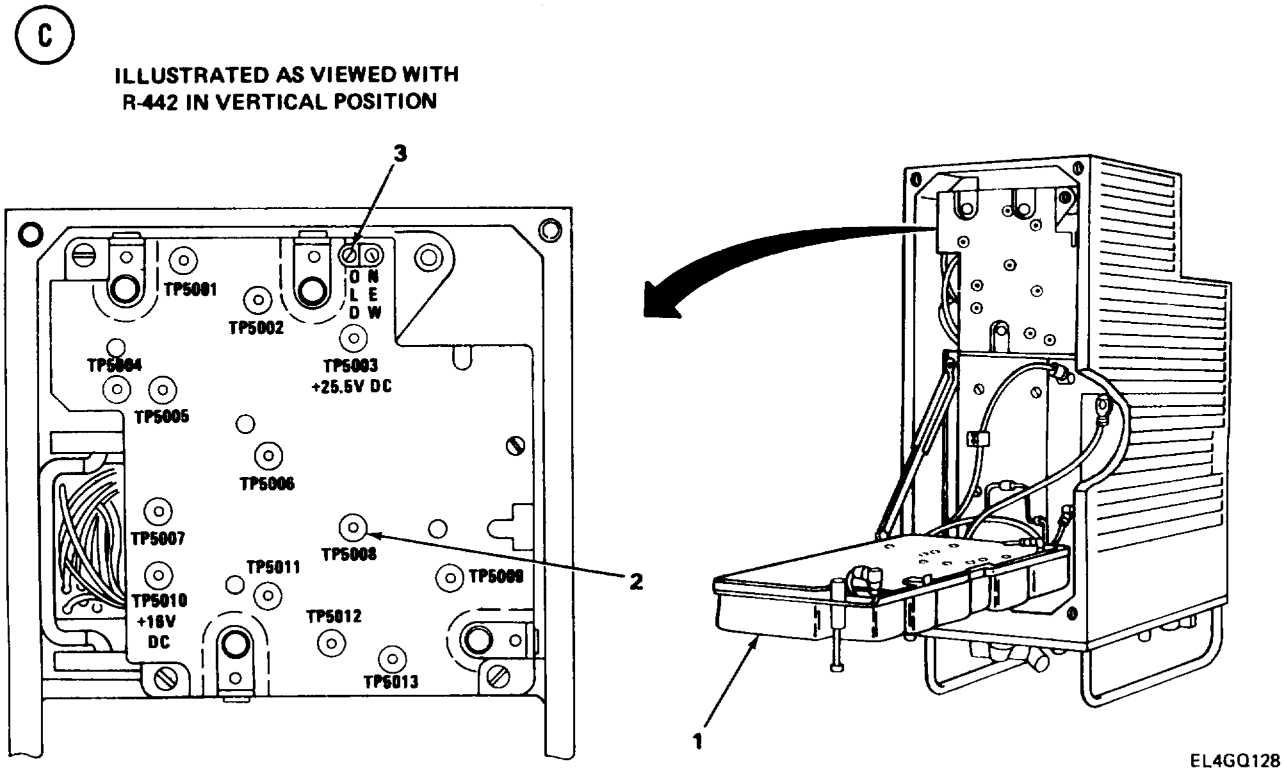
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER BAND MC-TUNE-KC VOLUME SQUELCH	ON -RESET (A) 42. 00 Fully clockwise OLD ON
AN/GRM-114A; MM-100E	See test setup diagram (B)	
MK-1978/VRC	AUX POWER AUX RCVR AUDIO SQUELCH KEY	ON NORMAL MUTED ON RCVE



EL4GQ127

4-26. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Disconnect rf cable from R-442/VRC ANTENNA port.
2. Lift R-442/VRC A3000 tray (1). (See test setup diagram (C) .)
3. Connect attenuated probe A to TP5008 (2). Connect alligator clip B to ground.
4. Note db reading on MM-100E red db scale.
5. Reconnect rf cable to R-442/VRC ANTENNA port.
6. Reset AN/GRM-114A MODULATION FREQ Hz thumbwheels to vary modulation frequency ± 100 Hz while observing MM-100E for voltage peak. Stop at frequency that produces peak voltage within the ± 100-HZ limits.

NOTE

If a voltage peak is not seen, it is possible that the modulating signal strength is too high. Try reducing the deviation by adjusting the VAR control, then repeat step 6. If a peak is still not clearly observed, leave the MODULATION FREQ Hz set at 07300.0, and go to step 7.

7. Adjust VAR (deviation) control for an MM-100E reading 4 db less than that noted in step 4.
8. Check R-442NRC CALL light. If light is out, go to step 9. If light is on, go to step 10.
9. CALL LIGHT OUT. Turn R5216 (3) counterclockwise slowly and stop at point where light just comes on.
10. CALL LIGHT ON. Turn R5216 (3) clockwise until light goes out, then perform step 9.

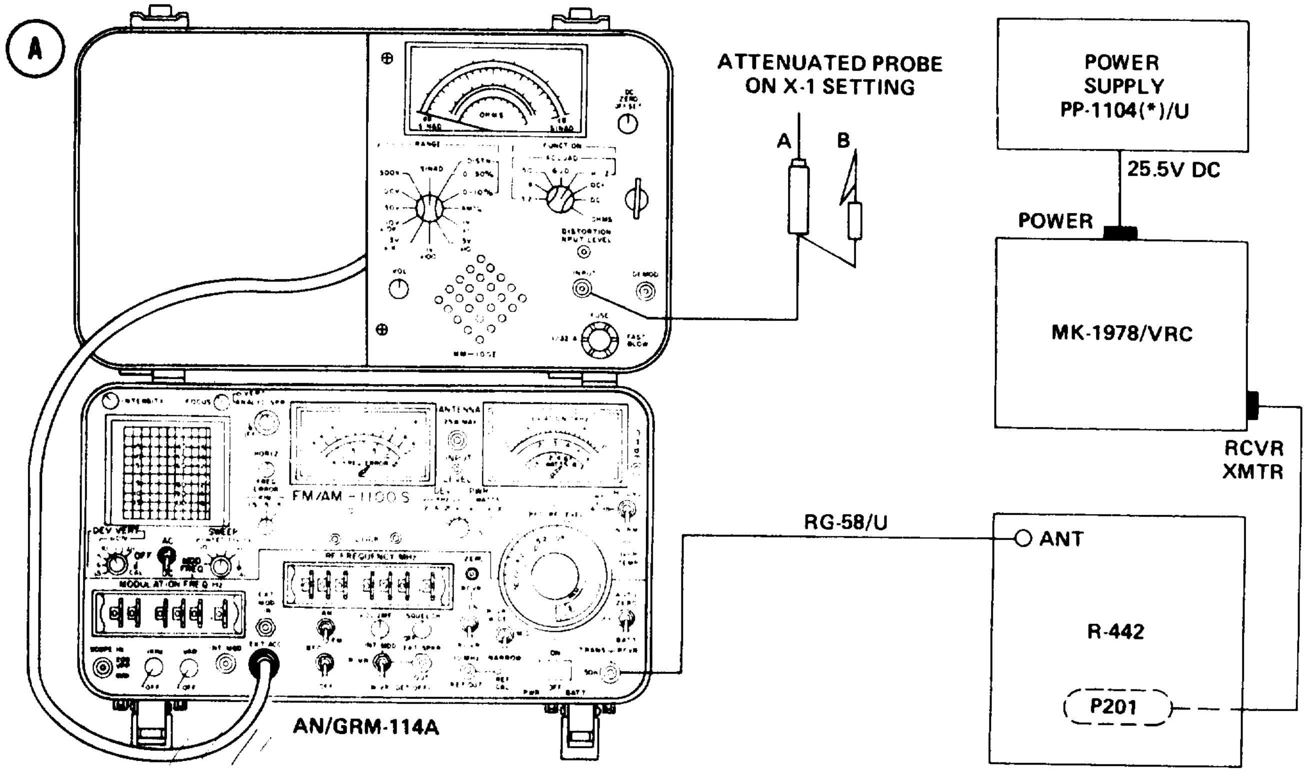
4-27. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which inciude internal noise and the received carrier.

TEST EQUIPMENT AND MATERIALS

Test Set AN/GRM-114A
Power Supply PP-1104(*)/G
Maintenance Kit MK-1978/VRC

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC top cover. (See paragraph 2-7.)



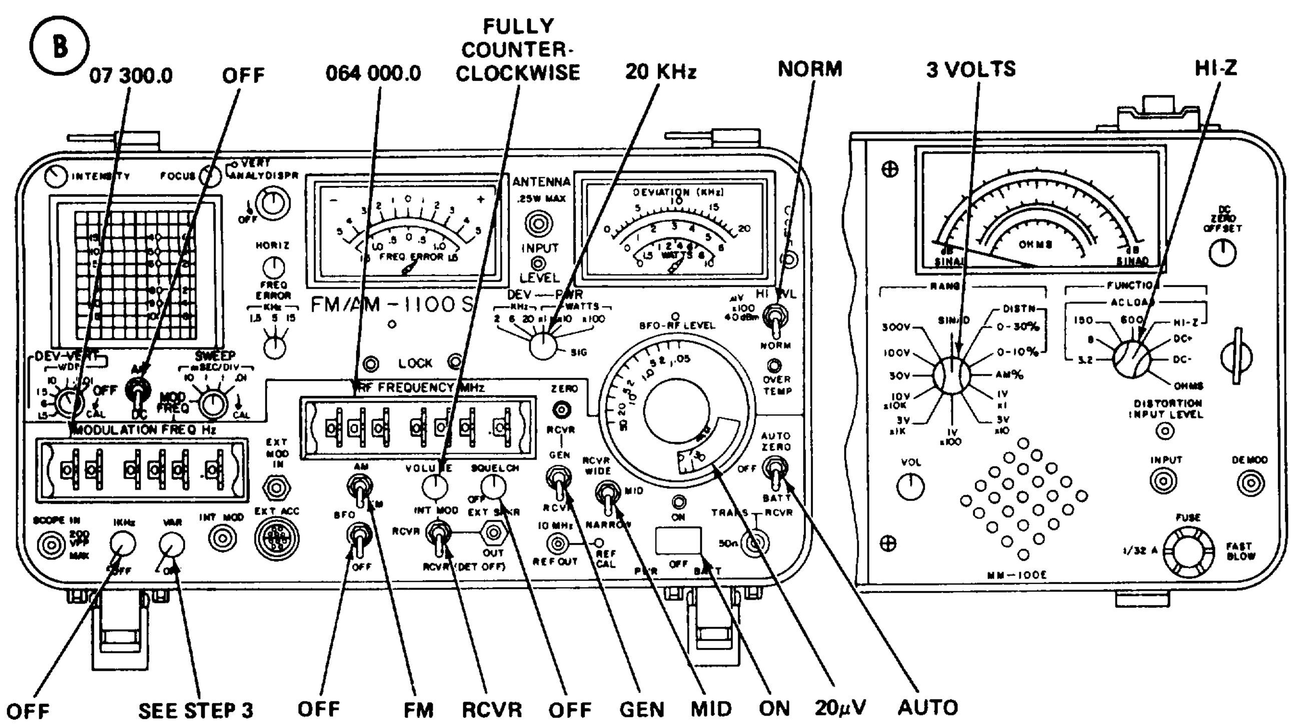
EL4GQ115

4-27. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment as indicated in the following table.

CONTROL AND SWITCH SETTINGS

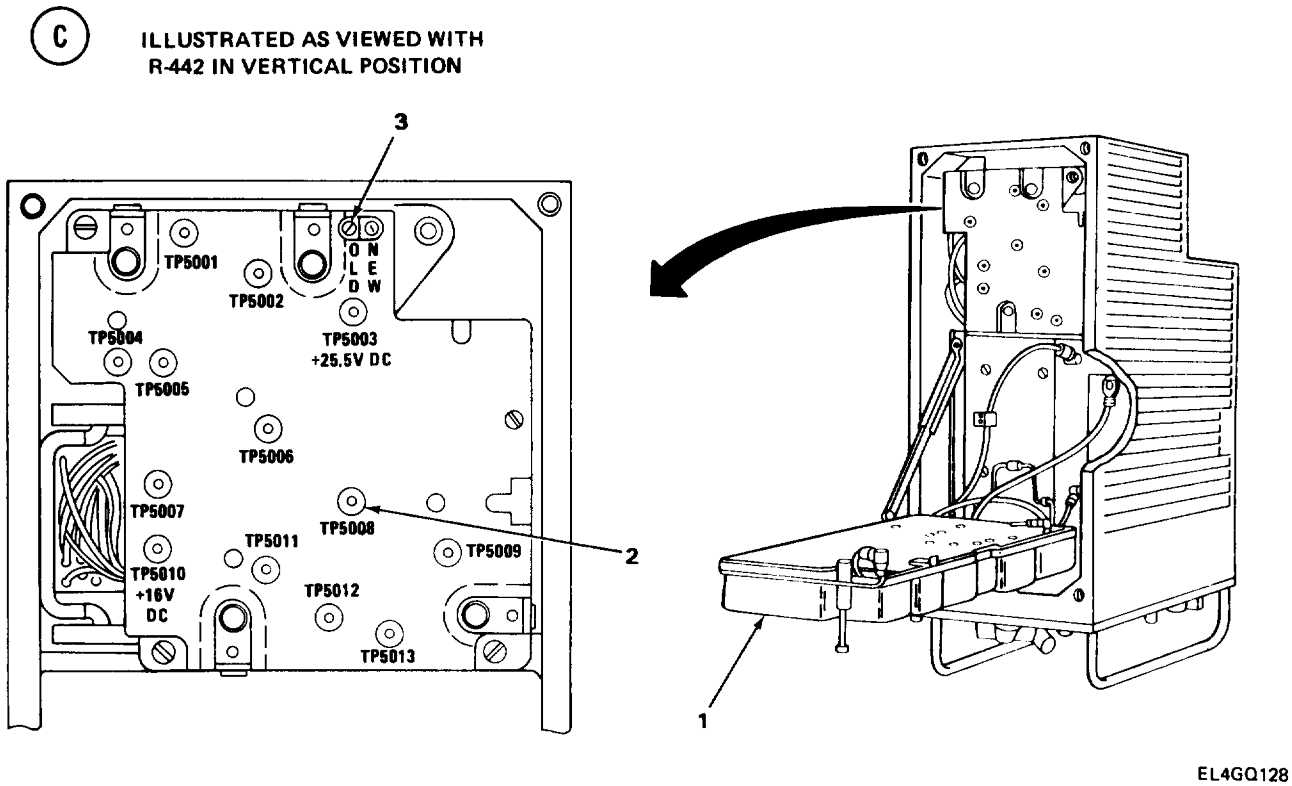
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64. 00
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
AN/GRM-114A; MM-100E	See test setup diagram B	
MK-1978/VRC	AUX POWER	ON
	AUX RCVR	NORMAL
	AUDIO	MUTED
	SQUELCH	ON
	KEY	RCVE



EL4GQ129

4-.27. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram C .)
2. Connect attenuated probe A to TP5008 (2). Connect alligator clip B to ground.
3. Adjust AN/GRM-114A VAR (deviation) control to obtain 1.5-vac reading on MM-100E.
4. Check R-442 VRC/CALL light, If light is out, go to step 5. If light is on, go to step 6.
5. CALL LIGHT OUT. Turn R5216 (3) counterclockwise slowly and stop at point where light just comes on.
6. CALL LIGHT ON. Turn R5216 (3) clockwise until light goes out, then perform step 5.

CHAPTER 5

DIRECT SUPPORT PERFORMANCE AND TROUBLESHOOTING PROCEDURES USING TEST CABLE NO. 1 AND DISCRETE TEST EQUIPMENT (TMDE)

OVERVIEW

This chapter contains performance tests, troubleshooting, and alinement procedures at thedirect support level using Test Cable No. land discrete test equipment (TMDE).

The performance tests are diagnostic inpurpose. They should be used toverifythat an R-442/VRCis operating properlyorto point out the existence of faults.

If failure to meet a performance test standard confirms that afaultis present inthe unit undervest, the test procedure will refer you to a specific chart in the troubleshooting section. The troubleshooting charts are designed to isolate the faults noted in the performance tests. They will guide you to the source of defects and/or misalinements.

Once it has identified the source of a fault, a troubleshooting chart will refer you to the appropriate repaidreplacement instructions or alinement procedure. Because each stage of the receiver depends upon its other stages for overall operating efficiency, the replacement, repair, or real inement of even one component could alter the signals enough to create the need for other real inements. Therefore, after making any alterations in the R-442PJRC, do all the performance tests, even those you have done already.

Section I PERFORMANCE TESTS

5-1. GENERAL.

This section contains performance test procedures for use with Test Cable No. 1 and discrete test equipment (TMDE). They will enable you to determine whether or not an R-442/VRC is operating acceptably. Each test procedure checks specific functions of the receiver to help you find and isolate faults.

5-1. GENERAL. (CONT)

Each test is complete and maybe performed individually. Therefore, you may choose the appropriate test to verify gross equipment failure or performance degradation of specific stages. However, this maintenance approach is not recommended. It is best to perform all the tests in sequence. This systematic maintenance approach willl ensure that all faults are found and corrected.

Faults in the R-442/VRC are evidenced by failure of the radio to meet the performance standards found within the test procedures in bold type. When an R-442/VRC fails to meet a performance standard, discontinue the test and turn to the troubleshooting chart referred to in the procedure.

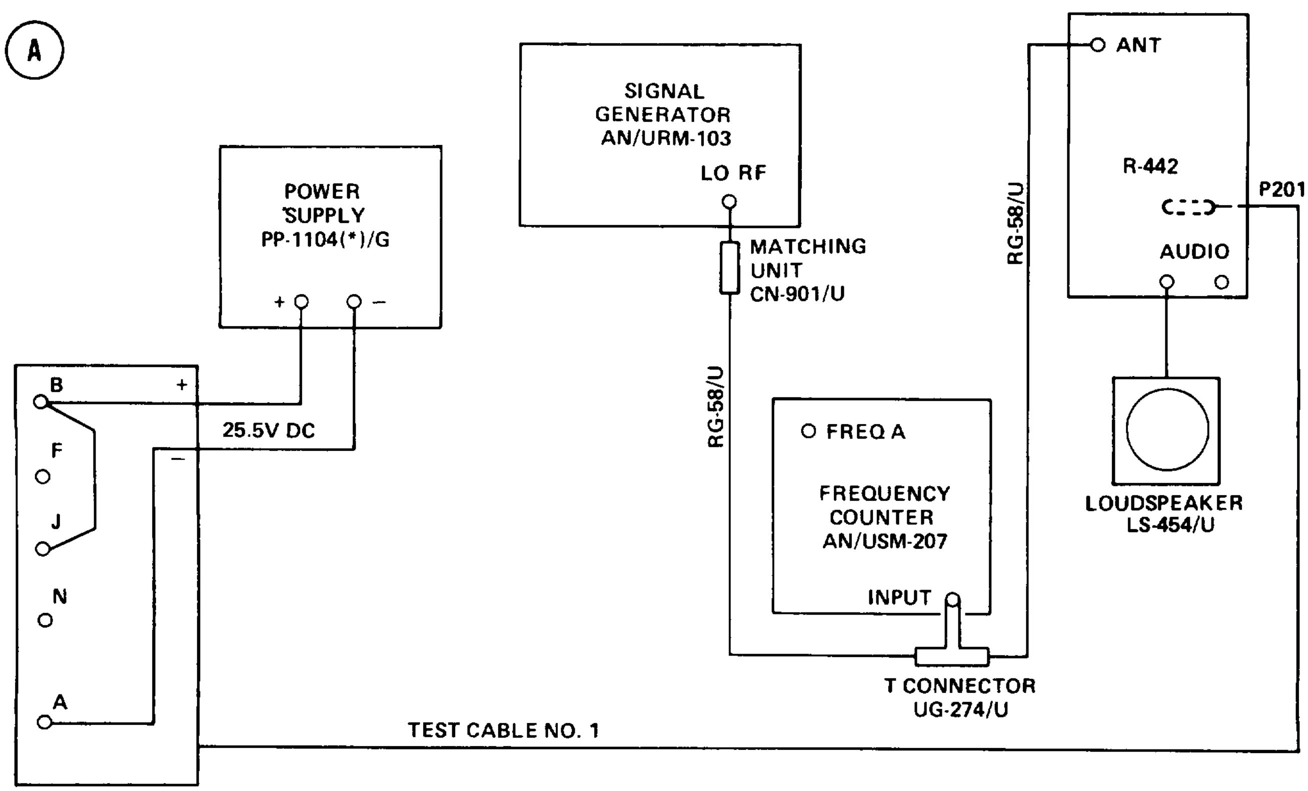
5-2. VOLUME CONTROL TEST.

PURPOSE. This test checks the VOLUME control of the R-442/VRC for proper operation. When a 1-kHz tone is injected into the R-442/VRC ANTENNA port, the speaker should output a clear tone with no scratchy sound or sudden drop in volume. The absence of a tone means that the signal is not passing completely through the R-442/VRC circuitry and could even indicate total equipment failure; therefore, perform this test before the others in this section.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter ANWSM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Loudspeaker LS-454/U
Rf Cables (two) RG-58/U
Test Cable No. 1

TEST SETUP. Connect equipment as shown in test setup diagram A



EL4GQ088

5-2. VOLUME CONTROL TEST. (CONT)

Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
R-442/VRC	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207,

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the dispiay appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to 20 µv.

2. Disconnect T-connector from AN/USM-207.
3. Turn R-442/VRC VOLUME control fully clockwise, then fully counterclockwise.

5-2. VOLUME CONTROL TEST. (CONT)

STANDARD. Tone from speaker should be clear with no scratchiness or sudden changes in volume at any point in the rotation of the VOLUME control.

4. If volume changes suddenly, if tone is scratchy, or if no tone at all is heard, see troubleshooting chart 5-1.

5-3. RECEIVER SENSITIVITY TEST.

PURPOSE. This test checks the ability of the R-442/VRC to detect low-level rf signals by measuring its SIN AD at several frequencies. SINAD gives receiver sensitivity in terms of the following ratio:

Signal + noise + distortion/noise + distortion.

SIN AD is expressed in decibels. The better a receiver's SINAD, the better signals, even weak ones, can be heard over unwanted internal noise. The SINAD for the R-442/VRC should be at least -10 db (from a zero-db reference) when the rf level is 0.5 µv.

TEST EQUIPMENT AND MATERIALS

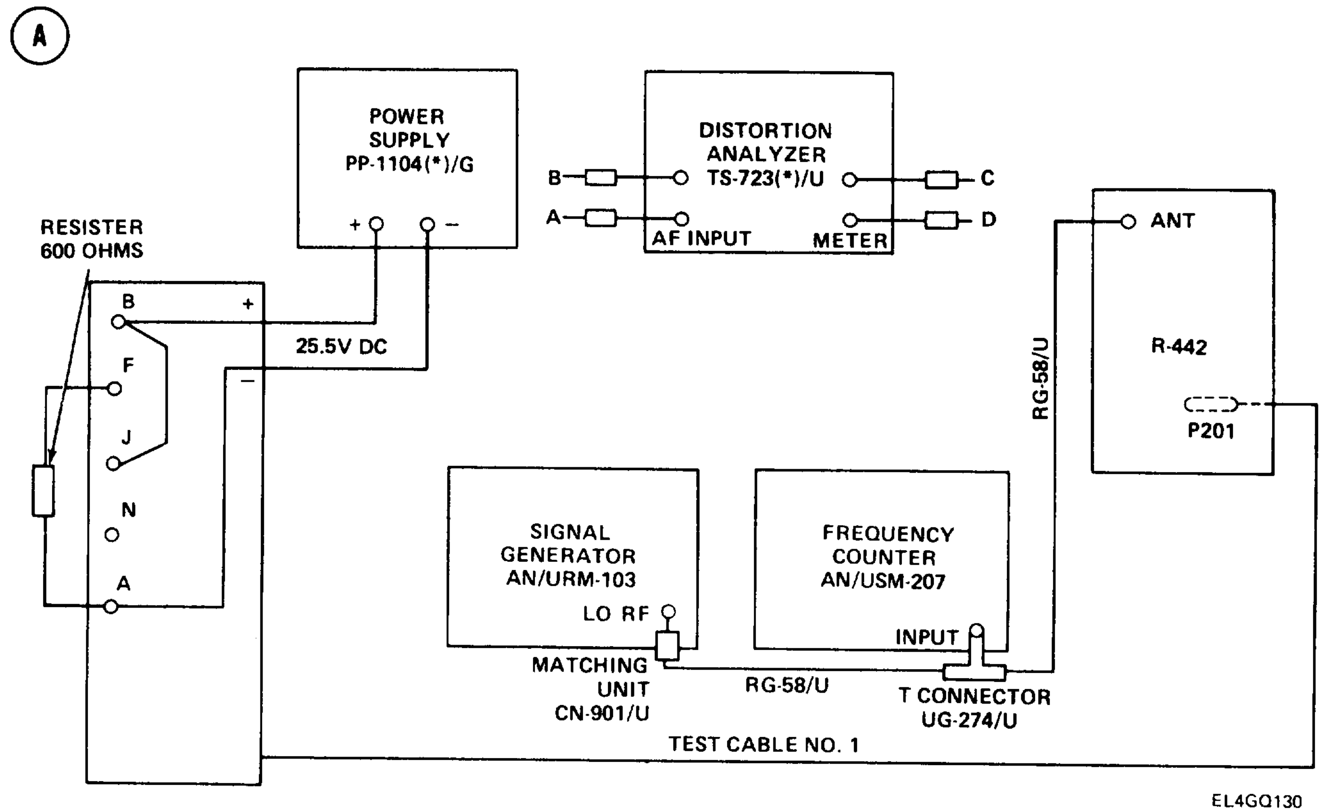
Power Supply PP-1104(*)/G
Distortion Analyzer TS-723(*)/U
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN.901/U
Resistor, 600.ohm ± 5%, 2-watt
Rf Cables (two) RG-58/U
Test Cable No. 1

NOTE

The 600-ohm resistor provides an impedance matching load for the audio transformer. The resistor is used in place of Loudspeaker LS-454/J, which would issue a loud, distracting tone when the R-442/VRC VOLUME control is adjusted during the test. If no 600-ohm resistor is available, however, the loudspeaker must be connected.

5-3. RECEIVER SENSITIVITY TEST. (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30 MHz, 0.5-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

5-3. RECEIVER SENSITIVITY TEST. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPRATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	0.5 µv
TS-723(*)/U	RANGE	x10
	AF INPUT	MIN
	AF-RF	AF
	FREQUENCY	100
	FUNCTION	METER
	R.M.S. VOLTS/DB	30 v
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

TEST PROCEDURE

Sensitivity Test at 30.00 MHz

1. Connect TS-723(*)AJ METER lead C to Test Cable No. 1 terminal F; connect lead D to terminal A. (See test setup diagram A, page 5-5.)
2. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM.207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 Indicates 30.00 MHz, and reset the LO RF UV control to 0.5 µv.

3. Disconnect T-connector from AN/USM-207.
4. Adjust R-442/VRC VOLUME control for 17-volt indication on TS-723(*)/U meter.
5. If 17-volt indication cannot be obtained on TS-723(*)/U meter, see troubleshooting chart 5-10.
6. Disconnect TS-723(*)/U METER leads from Test Cable No. 1 terminals.

5-3. RECEIVER SENSITIVITY TEST. (CONT)

7. Connect TS-723(*)/U AF INPUT lead B to Test Cable No. 1 terminal F; connect lead A to terminal A. (See test setup diagram A.)
8. Turn TS-723(*)/U FUNCTION switch to SET LEVEL.
9. Adjust TS-723(*)/U AF INPUT control for zero-db indication on meter.
10. Change TS-723(*)/U FUNCTION switch to DISTORTION.
11. Adjust TS-723(*)/U FREQUENCY and BALANCE controls for minimum meter indication.

STANDARD. The new TS-723(*)/U meter indication (step 11) should be at least -10 db from the previous indication (zero db) (step 8).

12. If TS-723(*)/U meter indication is not at least -10 db from previous indication, see troubleshooting chart 5-2.

Sensitivity Test at 53.00 MHz

13. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B.
14. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 53.00-MHz meter indication.
15. Reconnect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; reconnect lead D to terminal A.
16. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz.
17. Repeat steps 3 through 12.

Sensitivity Test at 41.00 MHz

18. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A.
19. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 41.00-MHz meter indication.
20. Reconnect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; reconnect lead D to terminal A.
21. Adjust AN/URM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
22. Repeat steps 3 through 12,

Sensitivity Test at 64.00 MHz

23. Change R-442/VRC MC-TUNE-KC switch to 64.00 MHz and BAND to B.
24. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 64.00-MHz meter indication.
25. Reconnect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; reconnect lead D to terminal A.
26. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207. To produce display, see note under step 2 and readjust RF TUNING control until AN/USM-207 indicates 64.00 MHz.
27. Repeat steps 3 through 12.

5-3. RECEIVER SENSITIVITY TEST. (CONT)

Sensitivity Test at 52.00 MHz

28. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz and BAND to A.
29. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 52,00-MHz meter indication.
30. Reconnect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; reconnect lead D to terminal A.
31. Adjust AN/URM-103 RF TUNING control for 52.00-MHz display on AN/USM-207. To produce display, see note under step 2, and readjust RF TUNING control until AN/USM-207 indicates 52.00 MHz.
32. Repeat steps 3 through 12.

Sensitivity Test at 75.00 MHz

33. Change R-442/VRC MC-TUNE-KC switch to 75.00 MHz and BAND to B.
34. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 75.00-MHz meter indication.
35. Reconnect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; reconnect lead D to terminal A.
36. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 2, and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz,
37. Repeat steps 3 through 12.

5-4. NEW SQUELCH TEST.

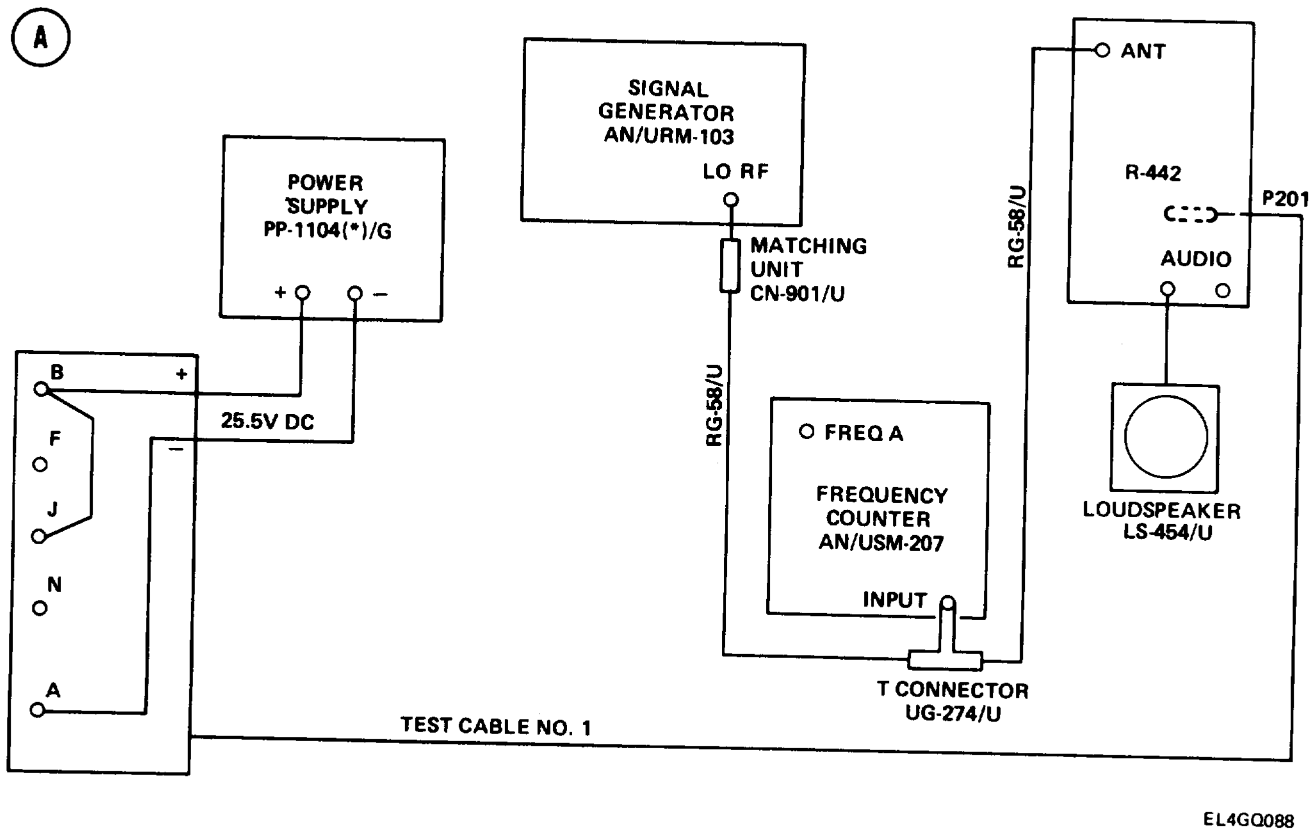
PURPOSE. This test checks the sensitivity of R-442/VRC squelch modules (A5200, A5300) to the NEW SQUELCH signal (150 Hz) at several carrier frequencies. The 150-Hz signal is injected into the R-442/VRC ANTENNA port, energizing Squelch Module Relay K5002, which unsquelches the receiver. Proper operation of the squelch modules is verified by CALL lamp response to carrier signal strength at or below a 0.5-µv rf level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Loudspeaker LS-454/U
Rf Cables (two) RG-58/U
Test Cable No. 1

5-4. NEW SQUELCH TEST (CONT)

TEST SETUP. Connect equipment as shown in test setup diagram (A) :



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, minimum rf input level, 150-Hz tone rate, and 3-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

5-4. NEW SQUELCH TEST. (CONT)

CONTROL, AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROLORSWITCH	POSITION/SETTING
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	NEW ON
	VOLUME	Fully counterclockwise
	POWER	ON
	LIGHT	ON
AN/URM-103	OPERATE/OFF/STANDBY	OPRATE
	BAND SWITCH	B
	RFTUNING	30.00
	OEVIATIONRANGEKHZ	10
	FUNCTION	150 Hz
	DEVIATION	Adjust for 3-kHz meter reading
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Minimum setting

TEST PROCEDURE

NEW SQUELCH Test at 30.00 MHz

1. Adjust ANWRM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the ANAIRM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. If necessary, readjust AN/URM-103 DEVIATION control for 3-kHz meter indication.
4. Turn AN/URM-103 LO RF UV control slowly clockwise until R-442/VRC CALL lamp lights.

STANDARD. R-442/VRC CALL lamp should light while LO RF UV control setting is at or below 0.5 µv.

5. If LO RF UV control setting is more than 0.5 µv, when R-442/VRC CALL lamp lights or if CALL lamp will not light, see troubleshooting chart 5-3.
6. Remove cable from R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should go out. Remember, without the 150-Hz tone, Relay K5002 will not be energized to supply the 16 volts necessary to turn on the audio amplifiers; tnerefore, the receiver is squelched.

7. If CALL lamp does not go out, see troubleshooting chart 5-3.
8. Reconnect cable to R-442/VRC ANTENNA port.

5-4. NEW SQUELCH TEST .(CONT)

STANDARD. R-442/VRC CALL lamp should light.

9. If CALL lamp does not light, see troubleshooting chart 5-3.

NEW SQUELCH Test at 41.00 MHz

10. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A .
11. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 41.00-MHz meter indication.
12. Adjust AN/URM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
13. Repeat steps 2 through 9.

NEW SQUELCH Test at 52.00 MHz

14. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz.
15. Turn AN/URM-103 RF TUNING control for 52.00-MHz meter indication.
16. Adjust AN/URM-103 RF TUNING control for 52.00. MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 52.00 MHz.
17. Repeat steps 2 through 9.

NEW SQUELCH Test at 53.00 MHz

18. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B .
19. Turn AN/URM-103 RF TUNING control for 53.00-MHz meter indication.
20. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz.
21. Repeat steps 2 through 9.

NEW SQUELCH Test at 65.00 MHz

22. Change R-442/VRC MC-TUNE-KC switch to 65,00 MHz.
23. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 65.00-MHz meter indication.
24. Adjust AN/URM-103 RF TUNING control for 65.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 65.00 MHz.
25. Repeat steps 2 through 9.

NEW SQUELCH Test at 75.00 MHz

26. Change R-442NRC MC-TUNE-KC switch to 75.00 MHz.
27. Turn AN/URM-103 RF TUNING control for 75.00-MHz meter indication.
28. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz.
29. Repeat steps 2 through 9.

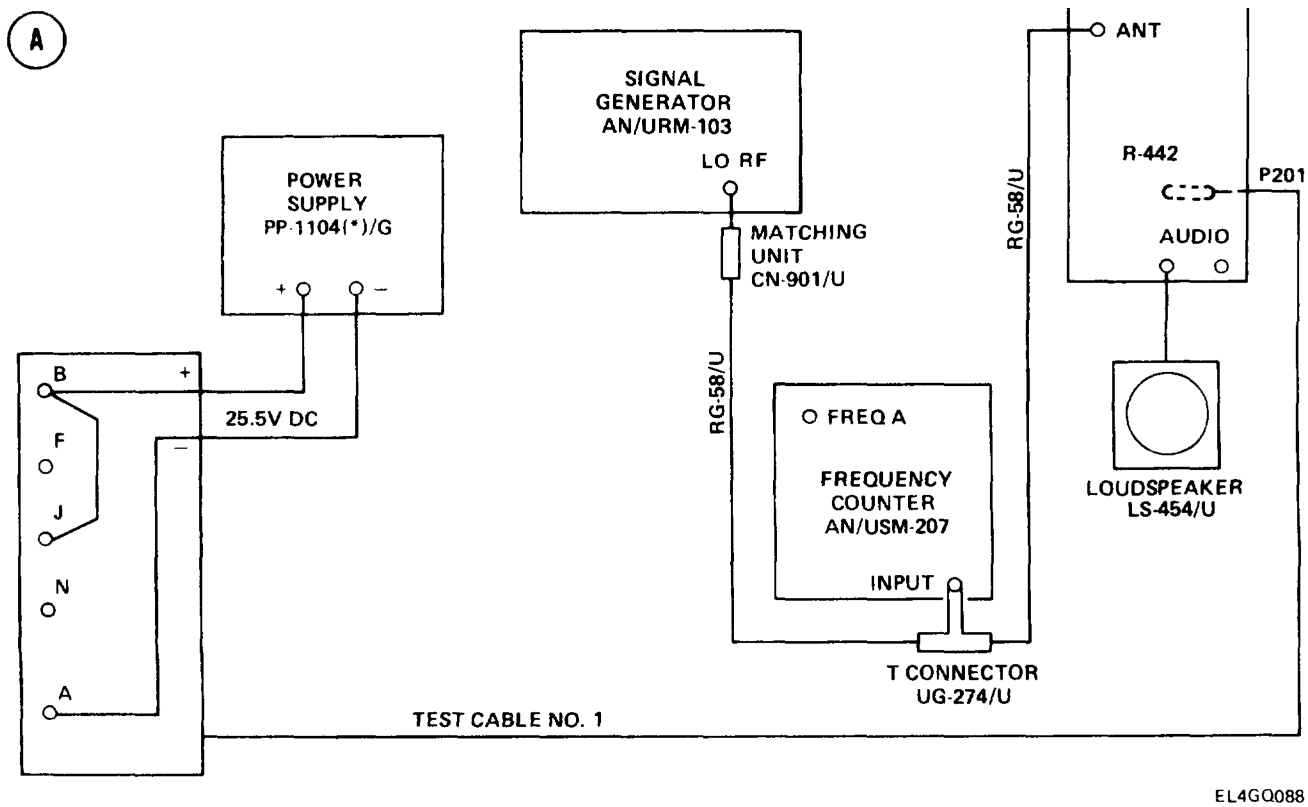
5-5. OLD SQUELCH TEST.

PURPOSE. This test checks the sensitivity of the R-442/VRC squelch modules (A5200, A5300) to OLD SQUELCH noise components (7300 Hz) at several carrier frequencies. Proper operation of the squelch modules is verified by CALL lamp response to signal strength at or below a 0.7-µv rf carrier level.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G	Matching Unit CN-901/U
Frequency Counter AN/USM-207	Loudspeaker LS-454/U
Signal Generator AN/URM-103	Rf Cables (two) RG-58/U
Adapter (T-Connector) UG-274 B/U	Test Cable No. 1

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

5-5. OLD SQUELCH TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 30.00 MHz, minimum rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Minimum setting
R-442/VRC	BAND	A
	MC-TUNE-KC	30. 00
	SQUELCH	OLD ON
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

TEST PROCEDURE

OLD SQUELCH Test at 30.00 MHz

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the ANWSM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. Turn AN/URM-103 LO RF UV control clockwise until R-442/VRC CALL lamp lights.

5-5. OLD SQUELCH TEST. (CONT)

STANDARD. R-442/VRC CALL lamp should light while LO RF UV control setting is at or below 0.7µv.

4. If LO RF UV control setting is more than 0.7 µv, see troubleshooting chart 5-3.
5. Remove cable from R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should go out.

6. If CALL lamp stays lit, see troubleshooting chart 5-3.
7. Reconnect cable to R-442/VRC ANTENNA port.

STANDARD. R-442/VRC CALL lamp should light.

8. If CALL lamp does not light, see troubleshooting chart 5-3.

OLD SQUELCH Test at 41.00 MHz

9. Change R-442/VRC MC-TUNE-KC switch to 41.00 MHz and BAND to A .
10. Turn AN/URM-103 BAND SWITCH to C and RF TUNING control for 41.00-MHz meter indication.
11. Adjust AN/URM-103 RF TUNING control for 41.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 41.00 MHz.
12. Repeat steps 2 through 8.

OLD SQUELCH Test at 52.00 MHz

13. Change R-442/VRC MC-TUNE-KC switch to 52.00 MHz.
14. Turn AN/URM-103 RF TUNING control for 52.00-MHz meter indication.
15. Adjust AN/URM-103 RF TUNING control for 52.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until ANLJSM-207 indicates 52.00 MHz.
16. Repeat steps 2 through 8.

OLD SQUELCH Test at 53.00 MHz

17. Change R-442/VRC MC-TUNE-KC switch to 53.00 MHz and BAND to B .
18. Turn AN/URM-103 RF TUNING control for 53.00-MHz meter indication.
19. Adjust AN/URM-103 RF TUNING control for 53.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 53.00 MHz.
20. Repeat steps 2 through 8.

OLD SQUELCH Test at 65.00 MHz

21. Change R-442/VRC MC-TUNE-KC switch to 65.00 MHz.
22. Turn AN/URM-103 BAND SWITCH to D and RF TUNING control for 65.00-MHz meter indication.
23. Adjust AN/URM-103 RF TUNING control for 65.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 65.00 MHz.
24. Repeat steps 2 through 8.

5-5. OLD SQUELCH TEST .(CONT)

OLD SQUELCH Test at 75.00 MHz

25. Change R-442/VRC MC-TUNE-KC switch to 75.00 MHz.
26. Turn AN/URM-103 RF TUNING control for 75.00-MHz meter indication.
27. Adjust AN/URM-103 RF TUNING control for 75.00-MHz display on AN/USM-207. To produce display, see note under step 1 and readjust RF TUNING control until AN/USM-207 indicates 75.00 MHz.
28. Repeat steps 2 through 8.

5-6. RECEIVER AUDIO POWER TEST.

PURPOSE. This test checks the ability of the R.442/VRC to drive its three audio outputs, namely:

1. The MUTED audio output, which supplies power to the speaker.
2. The UNMUTED audio output, which supplies power to the headphones.
3. The FIXED LEVEL audio output, which supplies power to the interphone system.

An rf level strong enough to drive the A4200 module into limiting (20 µv) is injected into the R-442/VRC ANTENNA port. Audio output voltages are then measured at Test Cable No. 1 terminals F, S, and K to make sure minimum standards are met.

TEST EQUIPMENT AND MATERIALS

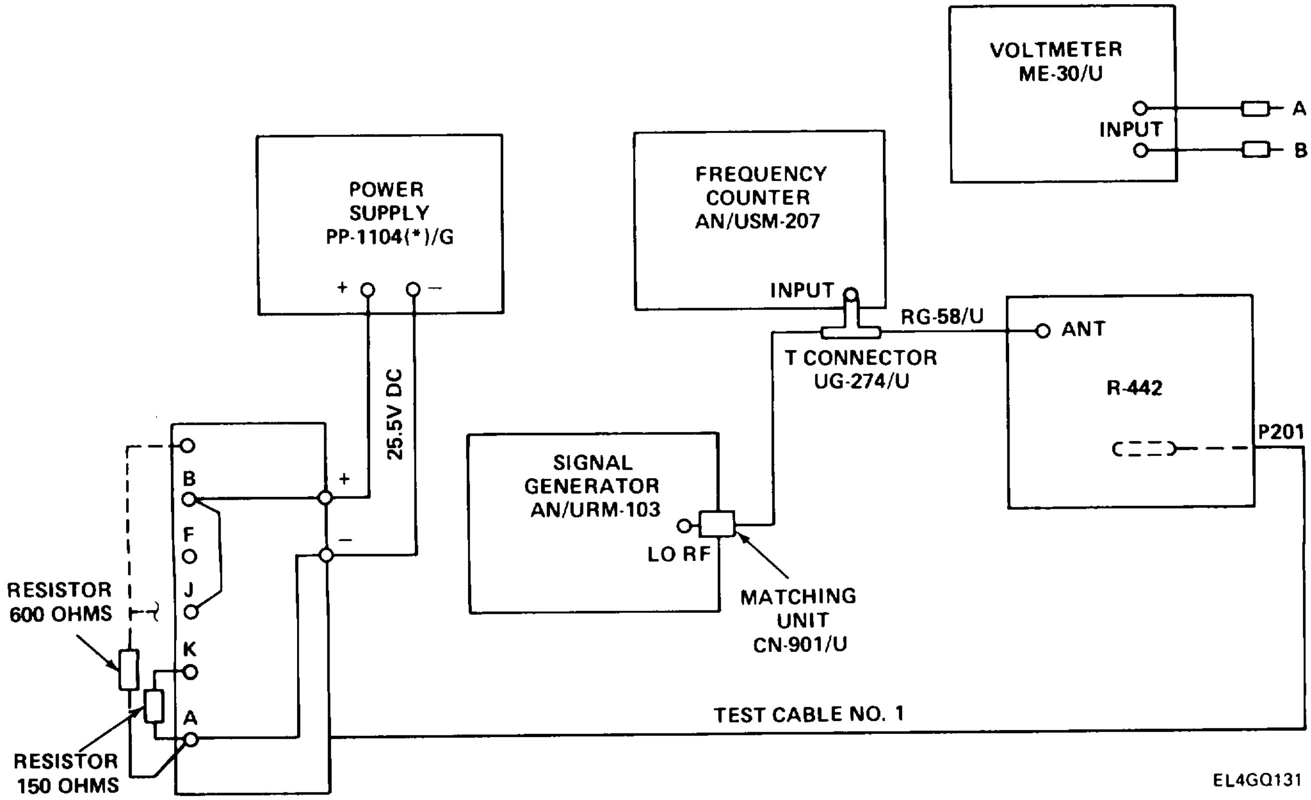
Power Supply PP-1104(*)/G	Matching Unit CN-901/U
Ac Voltmeter ME-30(*)/U	Resistor, 600-ohm ± 5%, 2-watt
Frequency Counter AN/USM-207	Resistor, 150-ohm ± 5%, 2-watt
Signal Generator AN/URM-103	Rf Cables (two) RG-58/U
Adapter (T-Connector) UG-274 B/U	Test Cable No, 1

NOTE

The 600- and 150-ohm resistors provide impedance matching loads for the audio transformer. The 600-ohm resistor is used in place of Loudspeaker LS-454/U, which would issue a loud, distracting tone when the R-442/VRC VOLUME control is adjusted during the test. If no 600-ohm resistor is available, however, the loudspeaker must be connected.

5-6. RECEIVER AUDIO POWER TEST. (CONT)

TEST SETUP. Connect test equipment as shown intest setup diagram (A)



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

5-6. RECEIVER AUDIO POWER TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 60.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPRATE
	BAND SWITCH	D
	RF TUNING	60.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
R-442/VRC	BAND	B
	MC-TUNE-KC	60.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
ME-30(*)/u	RANGE selector switch	30 v

TEST PROCEDURE

Muted Audio Power Test

1. Connect free lead of 600-ohm resistor to Test Cable No. 1 terminal F. (See test setup diagram A, page 5-16).
2. Connect ME-30(*)/u INPUT lead A to Test Cable No. 1 terminal F; connect lead B to terminal A.
3. Adjust AN/URM-103 RF TUNING control for 60.00-MHZ display on AN/USM.207

5-6. RECEIVER AUDIO POWER TEST. (CONT)

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 60.00 MHz, and reset the LO RF UV control to 20 µv.

4, Disconnect T-connector from AN/USM-207.
5. Turn R-442/VRC VOLUME control fully clockwise.

STANDARD. ME-30(*)U meter should indicate at least 17 volts.

6. If ME-30(*)/U meter indicates less than 17volts, see troubleshooting chart 5-10.

Unmuted Audio Power Test

7. Disconnect 600-ohm resistor lead from Test Cable No. 1 terminal F and connect it to terminal 5. (See test setup diagram A .)
8. Connect ME-30(*)/U INPUT lead A to Test Cable No. 1 terminal 5; connect lead B to terminal A. (See test setup diagram A .)
9, Set ME-30(*)/U RANGE selector switch to lower settings until reaching most exact on-scale reading.

STANDARD. ME-30(*)/U meter should indicate at least 7.75 volts.

10. If ME-30(*)LJ meter indicates less than 7.75 volts, see troubleshooting chart 5-10.

Fixed Audio Power Test

11. Connect ME-30(*)W INPUT lead A to Test Cable No. 1 terminal K; connect lead B to terminal A. (See test setup diagram A .)
12. Set ME-30(*)/U RANGE selector switch to lower settings until reaching most exact on-scale reading.

STANDARD. ME-30(*)/U meter should indicate at least 0.16 volt.

13. If ME-30(*)/U meter indicates less than 0.16 volt, see troubleshooting chart 5-10.

5.7. RECEIVER AUDIO DISTORTION TEST.

PURPOSE. This test checks the ability of the R-442/VRC to minimize distortion. It is similar to the Receiver Sensitivity Test (paragraph 5-3), except that now a strong (20-µv) rf level is used instead of a weak (0.5-µv) one. The 20-µv level is injected into the R-442/VRC ANTENNA port. The audio distortion, measured at the MUTED AUDIO output terminal (pin F) of Test Cable No. 1, should be less than 8 percent.

5-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

TEST EQUIPMENT AND MATERIALS

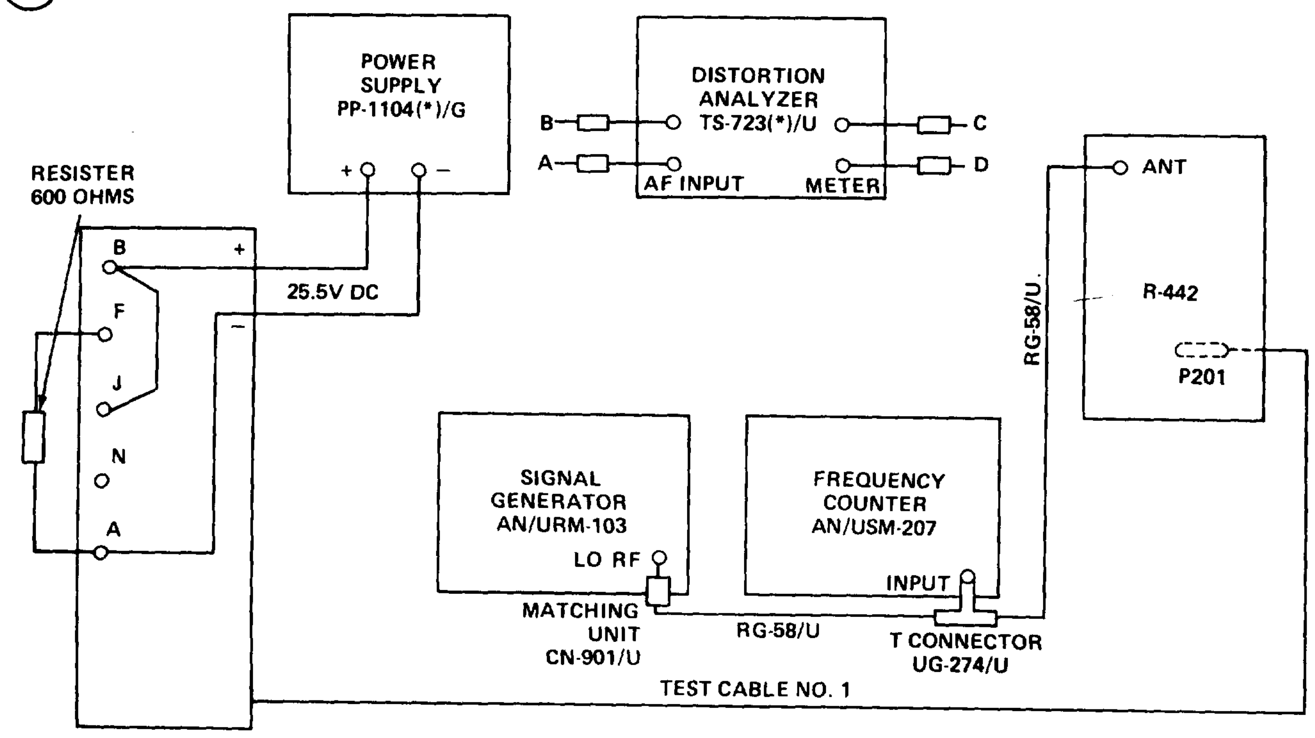
Power Supply PP-1104(*)/G
Distortion Analyzer TS"723(*)/U
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Resistor, 600-ohm ± 5%, 2-watt
Rf Cables (two) RG.58/U
Test Cable No. 1

NOTE

The 600-ohm resistor provides an impedance matching load for the audio transformer. The resistor is used in place of Loudspeaker LS-454/U, which would issue a loud, distracting tone when the R-442/VRC VOLUME control is adjusted during the test. If no 600-ohm resistor is available, however, the loudspeaker must be connected.

TEST SETUP. Connect test equipment as shown in test setup diagram (A) .

(A)



EL4GQ130

Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

5-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPRATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	1000 Hz
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
TS-723(*)/U	RANGE	x10
	AF INPUT	MIN
	AF-HF	AF
	FREQUENCY	100
	FUNCTION	METER
	R.M.S. VOLTS/DB	30 v

TEST PROCEDURE

1. Connect TS-723(*)/U METER lead C to Test Cable No. 1 terminal F; connect lead D to terminal A. (See test setup diagram A, page 5-19.)
2. Adjust ANLIRM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

5-7. RECEIVER AUDIO DISTORTION TEST. (CONT)

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20µv.

3. Disconnect T-connector from AN/USM-207.
4. Adjust R-442/VRC VOLUME control for 17-volt indication on TS-723(*)/U meter.
5. Disconnect TS-723(*)/U METER leads from Test Cable No. 1 terminals.
6. Connect TS-723(*)/U AF INPUT lead B to Test Cable No. 1 terminal F; connect lead A to terminal A. (See test setup diagram A .)
7. Turn TS-723(')KI FUNCTION switch to SET LEVEL.
8. Set TS-723(*)/U METER RANGE to 100 percent.
9. Adjust TS-723(*)/U signal INPUT control for full scale meter deflection.
10. Turn TS-723(*)/U FUNCTION switch to DISTORTION.
11. Adjust TS-723(*)/U FREQUENCY and BALANCE controls for minimum meter indication,

STANDARD. TS-723(*)/U meter should indicate less than 8 percent.

12. If TS-723(*)/U meter indicates 8 percent or greater, see troubleshooting chart 5-4.

5-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE)

PURPOSE. This test checks the R-442/VRC A5000 tray circuits for a flat response to modulating frequencies at and below 3 kHz. Receiver circuits are said to have a flat response if their gain remains nearly constant over a specified bandwidth. Frequencies not falling within this limited range receive little or no gain. The ability of the R-442/VRC to detect and respond flatly to the desired voice frequencies is verified by injecting 1 kHz, 500 Hz, and 3 kHz into its ANTENNA port and ensuring that the power measured at the MUTED audio output (pin F) of Test Cable No. 1 falls within the required range.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-127
Signal Generator AN/URM-103
Ac Voltmeter ME-30(*)/U

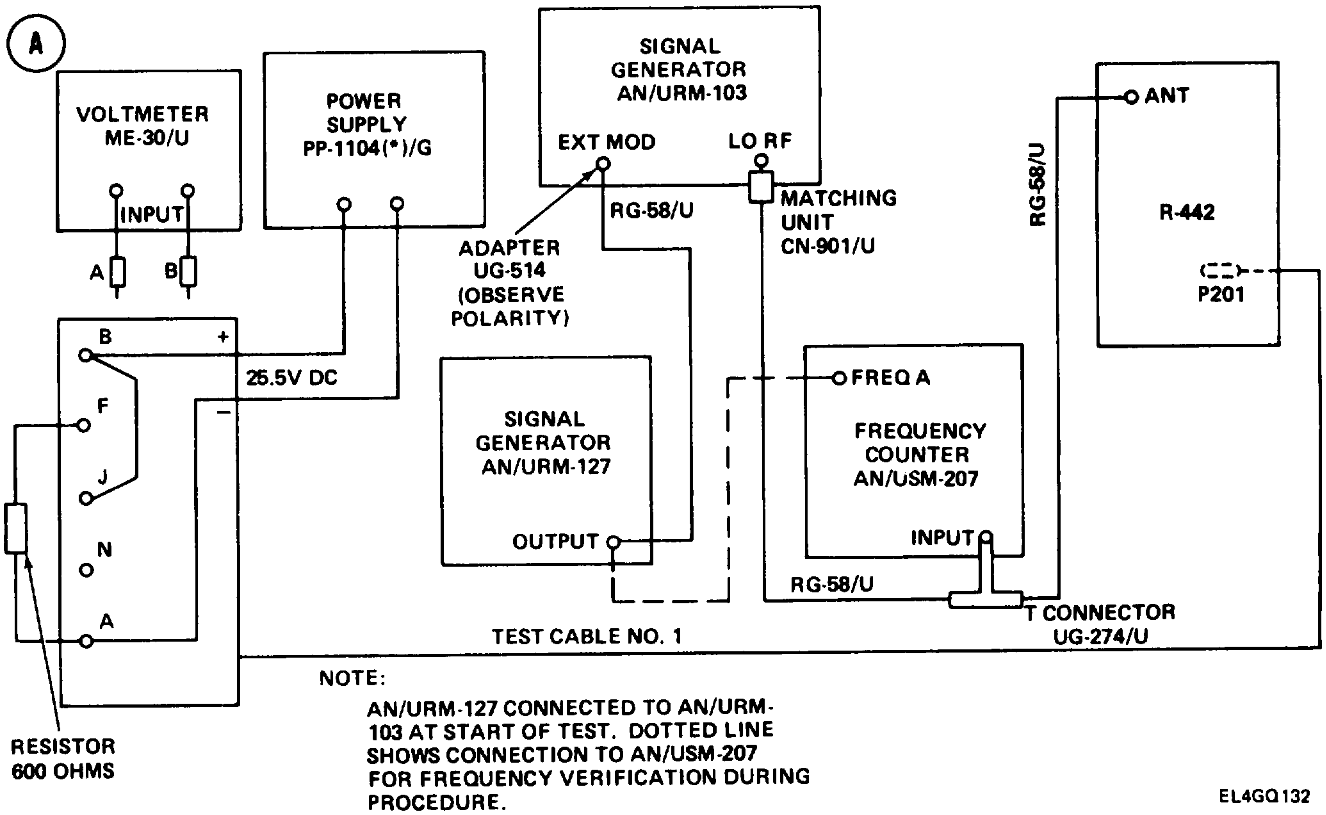
Adapters (two) UG-274 B/U (T-Connector) and UG-514
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Resistor, 600-ohm ± 5%, 2-watt
Test Cable No. 1

NOTE

The 600-ohm resistor provides an impedance matching load for the audio transformer. The resistor is used in place of Loudspeaker LS-454/U, which would issue a loud, distracting tone when the R-442/VRC VOLUME control is adjusted during the test. If no 600-ohm resistor is available, however, the loudspeaker must be connected. (See test setup diagram A, page 5-22.)

5-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

TEST SETUP. Connect test equipment as shown in test setup diagram A :



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following tabie. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DiSPLAY	MIN (fuliy counterclockwise)
	INPUT	0.3 V MAX (both switches to ieft)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT

5-8. RECEIVER AUDIO RESPONSE TEST(NORMAL MODE). (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
ME-30(*)/U	RANGE selector switch	30 v
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	EXT MOD
	DEVIATION	Adjust for 8-kHz meter indication
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON
AN/URM-127	FREQ RANGE MULTIPLIER	x10
	FREQ RANGE DIAL	100
	ATTENUATOR	x1
	OUTPUT CONTROL	Fully clockwise (maximum)

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20 µv.

2. Disconnect T-connectors from AN/USM-207,

5-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE). (CONT)

Audio Response Test (Normal Mode) at 1 kHz

3. Set AN/USM-207 controls to the following positions:

CONTROL/SWITCH	POSITION/SETTING
POWER	TRACK
DISPLAY	MIN (fully counterclockwise)
SENSITIVITY	0.1 v
GATE TIME	1 (black knob)
FUNCTION	FREQ

4. Disconnect rf cable from Adapter UG-514. (See test setup diagram A, page 5-22.)
5. Connect rf cable to AN/USM-207 FREQ A connector (3).
6. Adjust AN/URM-127 FREQ RANGE DIAL for 1-kHz display on AN/USM-207.
7. Disconnect rf cable from AN/USM-207 FREQ A connector.
8. Reconnect rf cable to Adapter UG-514.
9. Connect ME-30(")/U INPUT lead A to Test Cable No. 1 terminal F; connect lead B to terminal A.
10. Adjust R-442/VRC VOLUME control for 17-volt indication on ME-30(*)/U. Do not change VOLUME control position during rest of test.

STANDARD. A 1-kHz modulating tone injected into the R-442/VRC should produce 17 volts at the output.

11. If R-442/VRC VOLUME control adjustment cannot produce 17-volt indication on ME-30(*)/U, see troubleshooting chart 5-10.

Audio Response Test (Normal Mode) at 500 Hz

12. Turn AN/URM-127 FREQ RANGE DIAL to 50.
13. Disconnect rf cable from Adapter UG-514. (See test setup diagram A .)
14. Connect rf cable to AN/USM-207 FREQ A connector.
15. Adjust AN/URM-127 FREQ RANGE DIAL for 500-Hz display on AN/USM-207.
16. Disconnect rf cable from AN/USM-207 from FREQ A connector.
17. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U should Indicate between 14 and 22 volts,

18. If ME-30(*)/U indicates below 14 volts or above 22 volts, see troubleshooting chart 5-5.

Audio Response Test (Normal Mode) at 3kHz

19. Turn AN/URM-127 FREQ RANGE MULTIPLIER to x100.
20. Turn FREQ RANGE DIAL to 30.
21. Disconnect rf cable from Adapter UG-514. (See test setup diagram A .)
22. Connect rf cable to AN/USM-207 FREQ A connector.
23. Adjust AN/URM-127 FREQ RANGE DIAL for 3-kHz display on AN/USM-207.
24. Disconnect rf cable from AN/USM-207 FREQ A connector.
25. Reconnect rf cable to Adapter UG-514.

5-8. RECEIVER AUDIO RESPONSE TEST (NORMAL MODE. (CONT)

STANDARD. ME-30(*)/U should indicate between 14 and 22 volts.

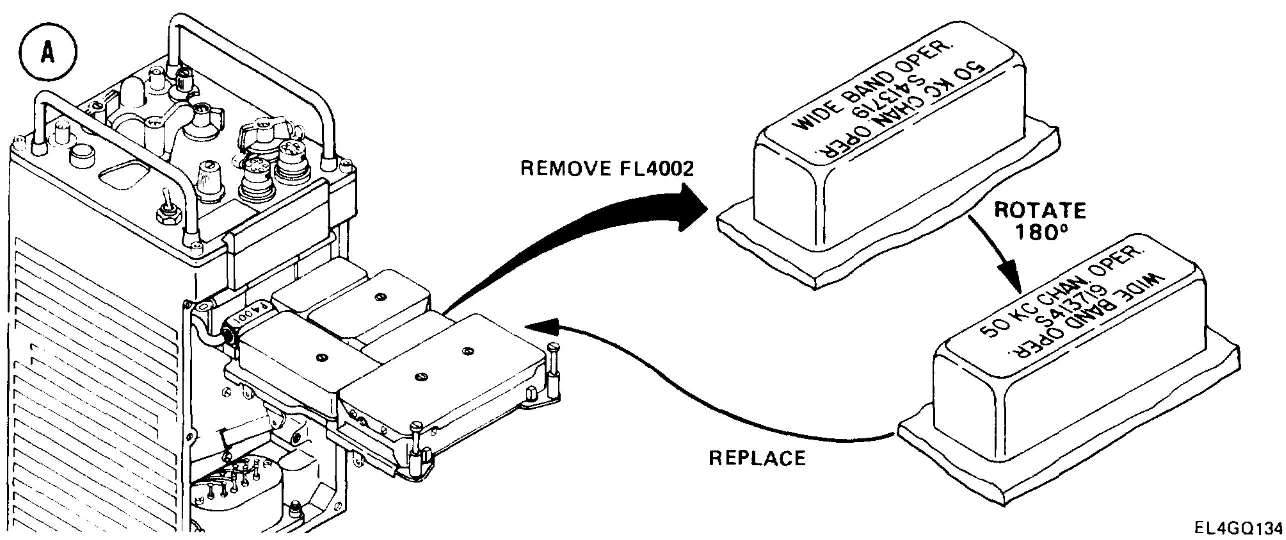
26. If ME-30(*)/U indicates below 14 volts or above 22 volts, see troubleshooting chart 5-5.

5-9. RECEIVER AUDIO RESPONSE TEST (X.-MODE).

PURPOSE. This test is similar to the R-442/VRC Receiver Audio Response Test (Normal Mode). When set up for X-mode, however, the receiver responds to a wider band of frequencies because the A5000 tray is not used. The ability of the R-442/VRC to detect and respond flatly to the desired intelligence is verified by:

1. Injecting 1-kHz modulation into the R-442/VRC ANTENNA port, while measuring the voltage at pin L (X-MODE IN) of Test Cable No. 1.
2. Changing the modulation rate to 500 Hz, 3 kHz, 5 kHz, and 10 kHz, while taking db readings at pin L (X-MODE IN) of Test Cable No. 1.
3. Comparing the db readings taken in step 2 to the reference voltage taken in step 1 to see if the standard is met.

R-442/VRC X-MODE SETUP PROCEDURE



1. Remove bottom cover from R-442/VRC. (See paragraph 2-7.)
2. Raise A4000 tray and secure brace.
3. Remove Filter FL4002. (See X-MODE setup diagram A .)
4. Rotate Filter FL4002 180 degrees.
5. Put Filter FL4002 back into tray.
6. Set X-MODE – NORMAL Switch S4001, located underneath A4000 tray, to X-MODE position
7. Release brace and lower tray.
8. Replace R-442/VRC bottom cover.

5-9. RECEIVER AUDIO RESPONSE TEST (X- MODE). (CONT)

TEST EQUIPMENT AND MATERIALS

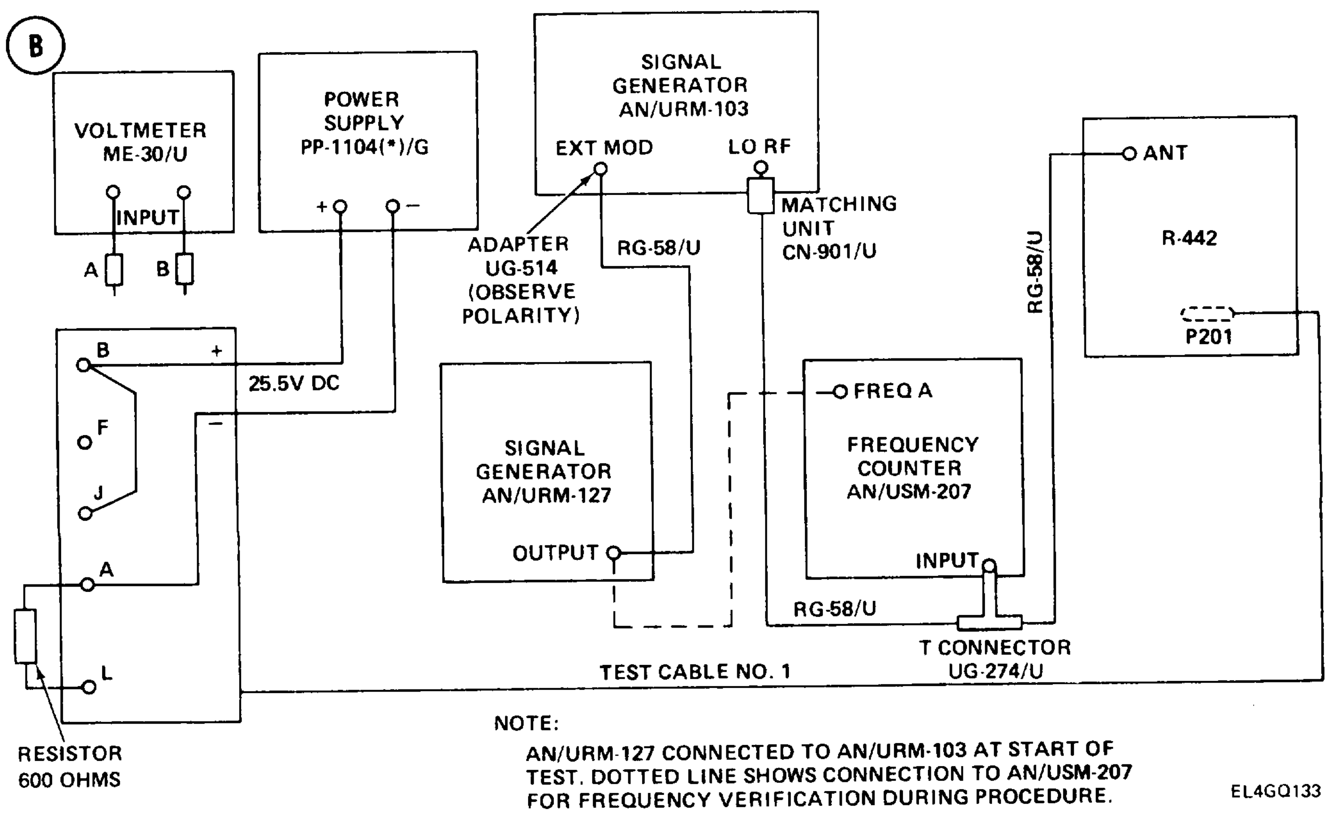
Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator AN/URM-103
Signal Generator AN/URM-127
Ac Voltmeter ME-30(*)/U
Resistor, 600-ohm ± 5%, 2-watt

Adapters (two) UG-274B/U (T-Connector) and UG-514
Matching Unit CN-901/U
Rf Cables (three) RG-58/U
Test Cable No. 1

NOTE

The 600-ohm resistor provides an impedance matching load for the audio transformer. The resistor is used in place of Loudspeaker LS-454/U, which would issue a loud, distracting tone when the R-442/VRC VOLUME control is adjusted during the test. If no 600-ohm resistor is available, however, the loudspeaker must be connected.

TEST SETUP. Connect test equipment as shown in test setup diagram (B)



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as ;ndicated in the following table. If using alternate test equipment, adjust for 64.00 MHz, 20-µv rf input level, 1-kHz modulation, and 8-kHz frequency deviation.

5-9. RECEIVER AUDIO RESPONSE TEST (X- MODE). (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	FUNCTION	EXT MOD
	DEVIATION	Adjust for 8-kHz meter reading
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	20 µv
AN/URM-127	FREQ RANGE MULTIPLIER	x10
	FREQ RANGE DIAL	100
	ATTENUATOR	x1
	OUTPUT CONTROL	Fully clockwise (maximum)
ME-30(*)/u	RANGE selector switch	3V
R-442/VRC	BAND	B
	MC-TUNE-KC	64.00
	SQUELCH	OLD OFF
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 64.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 64.00 MHz, and reset the LO RF UV control to 20 µv.

5-9. RECEIVER AUDIO RESPONSE TEST (X-MODE). (CONT)

2. Disconnect T-connector from AN/USM-207.

Audio Response Test (X-Mode) at 1 kHz

3. Set AN/USM-207 controls to the following positions:

CONTROL/SWITCH	POSITION/SETTING
POWER	TRACK
DISPLAY	MIN (fully counterclockwise)
SENSITIVITY	0.1 v
GATE TIME	1 (black knob)
FUNCTION	FREQ

4. Disconnect rf cable from Adapter UG-514. (See test setup diagram B, page 5-26.)
5. Connect rf cable to AN/USM-207 FREQ A connector.
6. Adjust AN/URM-127 FREQ RANGE DIAL for 1-kHz display on AN/USM-207.
7. Disconnect rf cable from AN/USM-207 FREQ A connector.
8. Reconnect rf cable to Adapter UG-514.
9. Connect ME-30(*)/U INPUT lead A to Test Cable No. 1 terminal 2; connect lead B to terminal A. Note meter indication.

STANDARD. ME-30(*)/U meter should indicate at least 0.78 volt.

10. If ME-30(*)/U meter does not indicate at least 0.78 volt, see troubleshooting chart 5-9.

Audio Response Test (X-Mode) at 500 Hz

11. Turn AN/URM-127 FREQ RANGE DIAL to 50.
12. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
13. Connect rf cable to AN/USM-207 FREQ A connector.
14. Adjust AN/URM-127 FREQ RANGE DIAL for 500-Hz display on ANWSM-207.
15. Disconnect rf cable from AN/USM-207 FREQ A connector.
16. Reconnect rf cable to Adapter UG-514. Note ME-30(*)/U meter indication.

STANDARD. ME-30(*)/U meter should indicate between + 2db and -3 db of reading noted in step 9.

17. If ME-30(*)/U meter does not indicate between + 2db and -3 db of reading taken in step 9, see troubleshooting chart 5-9.

Audio Response Test (X-Mode) at 3 kHz

18. Turn AN/URM-127 FREQ RANGE MULTIPLIER to x100.
19. Turn FREQ RANGE DIAL to 30.
20. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
21. Connect rf cable to AN/USM-207 FREQ A connector.
22. Adjust AN/URM-127 FREQ RANGE DIAL for 3-kHz display on AN/USM-207.
23. Disconnect rf cable from AN/USM-207 FREQ A connector.
24. Reconnect rf cable to Adapter UG-514.

5-9. RECEIVER AUDIO RESPONSE TEST (X-MODE). (CONT)

STANDARD. ME-30('WJ meter should indicate between + 2 db and -3 db of reading noted in step 9.

25. If ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading noted in step 9, see troubleshooting chart 5-9.

Audio Response Test (X-Mode) at 5 kHz

26. Turn AN/URM-127 FREQ RANGE DIAL to 50.
27. Disconnect rf cable from Adapter UG-514. (See test setup diagram B .)
28. Connect rf cable to AN/USM-207 FREQ A connector.
29. Adjust AN/URM-127 FREQ RANGE DIAL for 5-kHz display on AN/USM-207.
30. Disconnect rf cable from AN/USM-207 FREQ A connector.
31. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

32. If ME-30(*)/U meter does not indicate between + 2 db and -3 db of reading noted in step 9, see troubleshooting chart 5-9.

Audio Response Test (X-Mode) at 10 kHz

33. Turn FREQ RANGE DIAL to 100.
34. Disconnect rf cable from Adapter UG-514. (See test setup diagram B ..)
35. Connect rf cable to AN/USM-207 FREQ A connector.
36. Adjust AN/URM-127 FREQ RANGE DIAL for 10-kHz display on AN/USM-207.
37. Disconnect rf cable from AN/USM-207 FREQ A connector.
38. Reconnect rf cable to Adapter UG-514.

STANDARD. ME-30(*)/U meter should indicate between + 2 db and -3 db of reading noted in step 9.

39. If ME-30(*)/U r@er does not indicate between + 2 db and -3 db of reading taken in step 9, see troubleshooting chart 5-9.

NOTE

Before performing any other test in this section, see R-442/VRC X-MODE SETUP PROCEDURE (page 5-25) and do the following:

Set X-MODE-NORMAL Switch S4001 to NORMAL.
Return Filter FL4002 to its original position.

5-10. RECEIVER SELECTIVITY TEST.

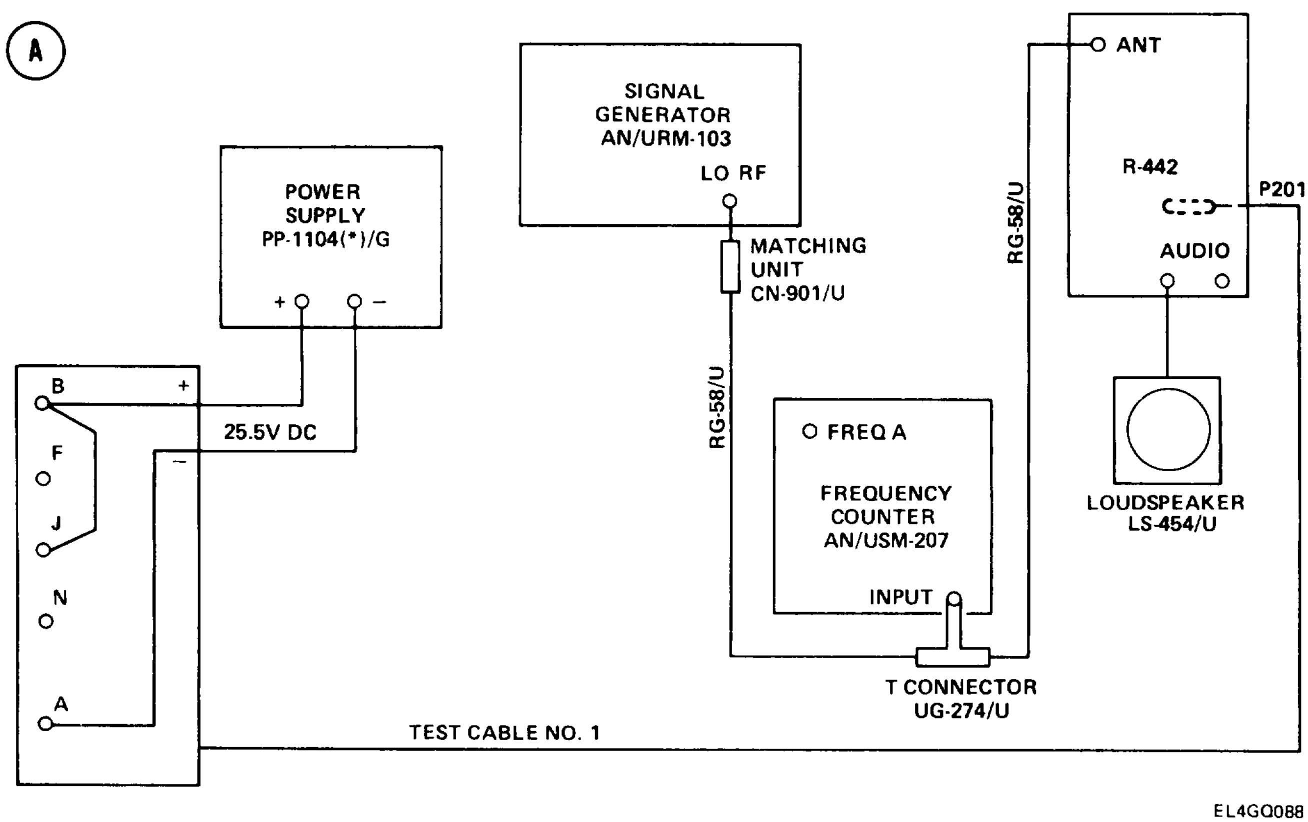
PURPOSE. This test checks the ability of the R-442/VRC A4000 tray IF Filters FL4001 and FL4002, to reject unwanted signals and, thus, determine bandwidth. The R-442/VRC should have a minimum bandwidth of 32 kHz at the filters' 6-db attenuation point and a maximum bandwidth of 80 kHz at their 60-db attenuation point. This is verified by:

1. Finding the minimum rf level which must be Injected Into the R-442/VRC ANTENNA port to cause the CALL lamp to light.
2. Injecting twice the rf level found in step 1, while observing that the R-442/VRC CALL lamp Is llt when the frequency Is offset ± 16 kHz from the carrier.
3. Injecting 1000 times the rf level found in step 1, while observing that the R-442/VRC CALL lamp is off when the frequency Is offset more than t 40 kHz from the carrier.

TEST EQUIPMENT AND MATERIALS

Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Signal Generator ANWRM-103
Loudspeaker LS-454/U
Adapter (T-Connector) UG-274 B/U
Matching Unit CN-901/U
Rf Cables (two) RG-58/U
Test Cable No. 1

TEST SETUP. Connect equipment as shown in test setup diagram (A) .



Turn on test equipment. Allow at least 15 to 30 minutes for warmup.

5-10. RECEIVER SELECTIVITY TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If alternate test equipment is used, adjust for 30 MHz, minimum rf input level, no modulation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	FREQUENCY TUNING-MC	100
	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	INPUT	0.3 V MAX (both switches to left)
	GATE TIME	10^3 (black knob)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	DIRECT/HETERODYNE	DIRECT
AN/URM-103	OPERATE/OFF/STAN D BY	OPRATE
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	FUNCTION	MOD OFF
	RF SET TO LINE	To red line
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Minimum setting
R-442/VRC	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	OLD ON
	LIGHT	ON
	VOLUME	Fully counterclockwise
	POWER	ON

TEST PROCEDURE

1. Adjust AN/URM-103 RF TUNING control for 30.00-MHz display on AN/USM-207.

NOTE

To produce a display on the AN/USM-207, the AN/URM-103 rf level must be increased by turning the LO RF UV control clockwise. When the display appears, readjust the AN/URM-103 RF TUNING control until the AN/USM-207 indicates 30.00 MHz, and reset the LO RF UV control to minimum setting.

2. Disconnect T-connector from AN/USM-207.
3. Turn AN/URM-103 LO RF UV control slowly clockwise until R-442/VRC CALL lamp lights. Note control setting,
4. Increase AN/URM-103 LO RF UV level to twice the reading noted in step 3.

5-10. RECEIVER SELECTIVITY TEST. (CONT)

STANDARD. R-442/VRC CALL lamp should remain lit.

5. If R-442/VRC CALL lamp goes off, see troubleshooting chart 5-6.
6. Change AN/USM-207 GATE TIME to 10^2.
7. Reattach T-connector to AN/USM-207.
8. Adjust AN/URM-103 RF TUNING control for 30.019-MHz (30019.0-kHz) display on ANAJSM-207. To produce display, follow instructions in note under step 1, but reset AN/URM-103 LO RF UV control to level arrived at in step 4.
9. Disconnect T-connector from AN/USM-207.

STANDARD. R-442/VRC CALL lamp should be off.

10. If R-442/VRC CALL lamp is lit, see troubleshooting chart 5-6.
11. Turn ANWRM-103 RF TUNING control slowly counterclockwise until R-442/VRC CALL lamp lights.
12. Reattach T-connector to AN/USM-207.
13. Turn ANAJRM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
14. Adjust ANAIRM-103 RF TUNING control for 29.981-MHz (29981.0-kHz) display on AN/USM-207.
15. Disconnect T-connector from AN/USM-207.
16. Reset AN/URM-103 LO RF UV control to level arrived at in step 4.

STANDARD. R-442/VRC CALL lamp should be off.

17. If R-442/VRC CALL lamp is lit, see troubleshooting chart 5-6.
18. Turn AN/URM-103 RF TUNING control slowly clockwise until R-442/VRC CALL lamp lights.
19. Reattach T-connector to AN/USM-207.
20. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
21. Subtract frequency noted in step 20 from frequency noted in step 13.

STANDARD. The difference between the two frequencies should beat least 32 kHz.

22. If difference between frequencies noted in steps 13 and 20 is less than 32 kHz, see troubleshooting chart 5-6.
23. Increase LO RF UV level to 1000 times reading noted in step 3.
24. Change AN/USM-207 GATE TIME to 10^4.
25. Reattach T-connector to AN/USM-207.
26. Adjust AN/URM-103 RF TUNING control for 30.41-MHz display on AN/USM-207. To produce display, follow instructions in note under step 1, but reset AN/URM-103 LO RF UV control to level arrived at in step 23.
27. Disconnect T-connector from AN/USM-207.

STANDARD. R-442/VRC CALL lamp should be off.

28. If R-442/VRC CALL lamp is lit, see troubleshooting chart 5-6.
29. Turn AN/URM-103 RF TUNING control slowly counterclockwise until R-442/VRC CALL lamp lights.
30. Reattach T-connector to AN/USM-207.

5-10. RECEIVER SELECTIVITY TEST. (CONT)

31. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
32. Adjust AN/URM-103 RF TUNING control for 29.59-MHz display on AN/USM-207.
33. Disconnect T-connector from AN/USM-207.
34. Reset AN/URM-103 LO RF UV control to level arrived at in step 23.

STANDARD. R-442/VRC CALL lamp should be off.

35. If R-442/VRC CALL lamp is lit, see troubleshooting chart 5-6.
36. Turn AN/URM-103 RF TUNING control slowly clockwise until R-442/VRC CALL lamp lights.
37. Reattach T-connector to AN/USM-207.
38. Turn AN/URM-103 LO RF UV control clockwise until display appears on AN/USM-207. Note frequency displayed.
39. Subtract frequency noted in step 38 from frequency noted in step 31.

STANDARD. The difference between the two frequencies should be 80 kHz or less.

40. If difference between frequencies noted in steps 31 and 38 is more than 80 kHz, see troubleshooting chart 5-6.

Section II TROUBLESHOOTING

5-11. GENERAL.

This section contains troubleshooting charts which will help you diagnose failures in the receiver R-442/VRC. The troubleshooting charts are designed to isolate faults in response to specific performance problems noted during performance testing in section I of this chapter.

There are two basic kinds of troubleshooting charts provided: gross failure troubleshooting and performance degradation troubleshooting. Both kinds of troubleshooting in this section are based on the use of Tes tCable No. 1 and TMDE.

GROSS FAILURE TROUBLESHOOTING

Gross failure troubleshooting is generated by failure of the VOLUME control test, the first of the performance tests in section I. Failure of the VOLUME control test indicates that no audio at all is available at the receiver's Ioudspeaker jack. This implies a total failure of some module or component resulting in complete loss of signal, Therefore, the gross troubleshooting charts are designed to help you locate the failed module or componen~ with the assumption that the failed part does not operate at all.

This assumption differs from the approach taken in performance degradation troubleshooting, which assumes that a module or component may be responsible for slight defect symptoms because the part may be only partially operational.

PERFORMANCE DEGRADATION TROUBLESHOOTING

When the receiver produces audio output, but the signal fails to meet certain standards, the receiver's performance is considered degraded. Degraded performance can result in weak audio, limited reception range, distortion, and many other problems.

5-11. GENERAL. (CONT)

The troubleshooting charts are designed to locate the cause of the performance degradation by using procedures more complex than those utilized for gross troubleshooting. Added complexity is due to the fact that the troubleshooting tests must evaluate the quality of the signals at various test points, instead of merely confirming the presence of signals as is usually the case in gross troubleshooting.

OVERALL TROUBLESHOOTING APPROACH

Both kinds of troubleshooting charts contained in this section are intended for use based on the following assumptions in connection with the R-442/VRC.

1. Only one malfunction exists which is causing the defect symptom.
2. The troubleshooting charts do not isolate every possible defect.
3. Failure to locate a defect using the charts suggests a wiring-related problem which can be isolated using the schematics located in the back of this manual.
4. Troubleshooting procedures for germanium and silicon versions of the R-442/VRC are the same.

5-12. GROSS TROUBLESHOOTING PRELIMINARY INSTRUCTIONS.

The gross troubleshooting charts in this section are based on the assumption that the receiver fails the VOLUME control test at any frequency setting of the MC-TUNE-KC control. However, certain defects in the crystal reference system can result in loss of audio at some frequencies while the receiver can function normally at other frequency settings,

Before proceeding with the steps given in the gross troubleshooting charts, determine whether or not the failure of the VOLUME control test conforms to any of the following failure modes.

FAILURE MODE	CAUSE	CORRECTION
No audio on all channels ending in 0, eg, 30.0030.10, 30.20, etc	Crystal Y2012 (5,65 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on all channels ending in 5, eg, 30.05, 30.15,30.25, etc	Crystal Y2011 (5.60 MHz) in A2000 assembly	Replace A2000 assembly.
No audio on the same IOO-kHz segment for each MHz of tuning	Defective interpolation oscillator crystal	Replace A2000 assembly. See interpolation oscillator crystal chart.

5-12. GROSS TROUBLESHOOTING PERLIMINARY INSTRUCTIONS. (CONT)

INTERPOLATION OSCILLATOR CRYSTAL CHART

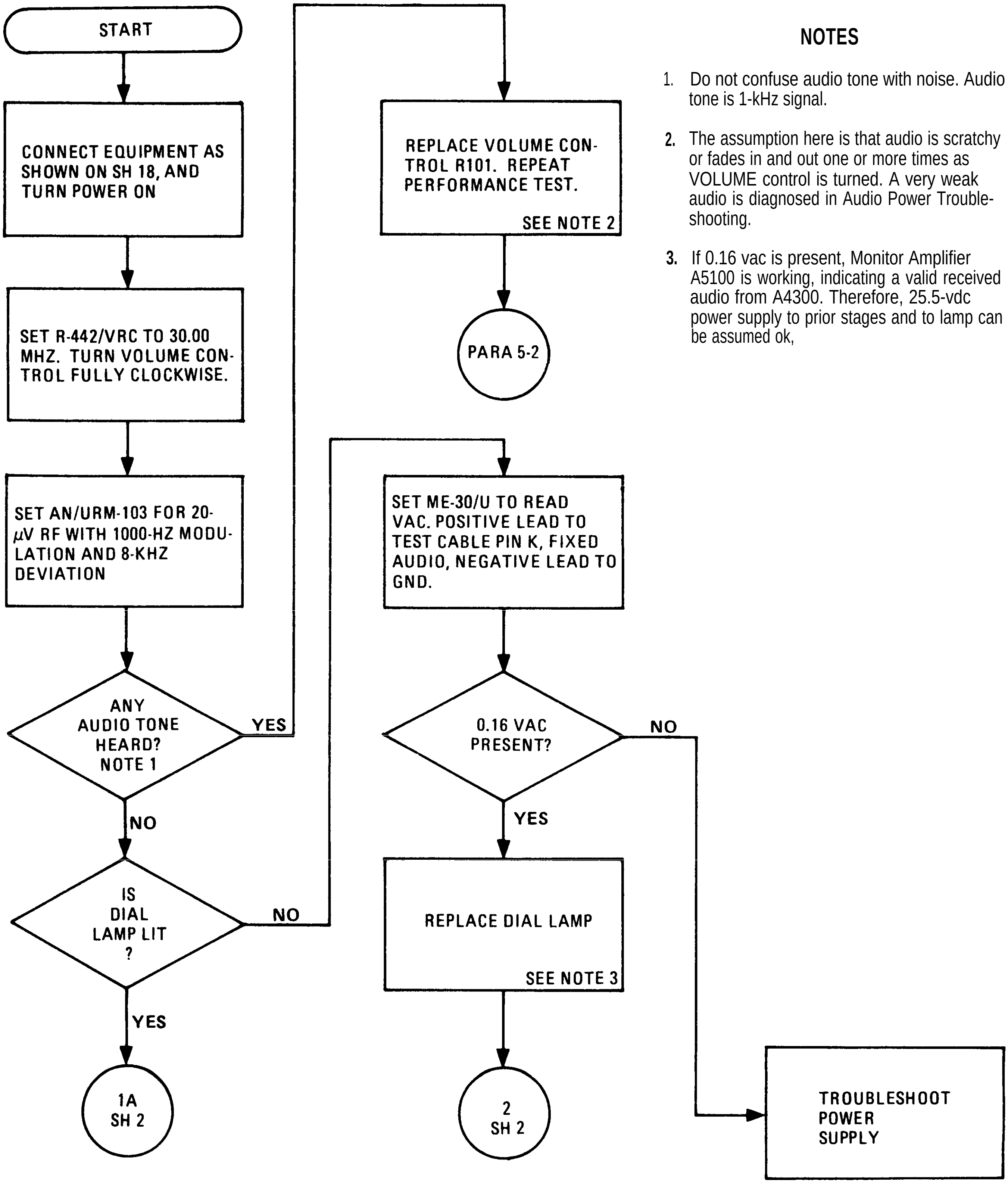
The following chart is used to isolate the particular crystal responsible for audio failure in the same 100-kHz segment for each MHz of tuning. In this failure mode, if audio is absent at 30.05 and 30.10, it will be absent at 40.05 and 40.10; 50.05 and 50.10, etc.

INTERPOLATION OSCILLATOR CRYSTAL CHART

SEGMENT OF KC CONTROL WHERE AUDIO IS ABSENT	CAUSE	CORRECTION
05 and 10	Crystal Y2007	Replace A2000 assembly.
15 and 20	Crystal Y2008	Replace A20.00 assembly.
25 and 30	Crystal Y2009	Replace A2000 assembly.
35 and 40	Crystal Y2010	Replace A2000 assembly.
45 and 50	Crystal Y2005	Replace A2000 assembly.
55 and 60	Crystal Y2004	Replace A2000 assembly.
65 and 70	Crystal Y2003	Replace A2000 assembly.
75 and 80	Crystal Y2002	Replace A2000 assembly.
85 and 90	Crystal Y2001	Replace A2000 assembly.
95 and 100	Crystal Y2006	Replace A2000 assembly.

5-13. TROUBLESHOOTING FLOW CHARTS.

CHART 5-1.
No Audio Troubleshooting
(Sheet 1 of 18)

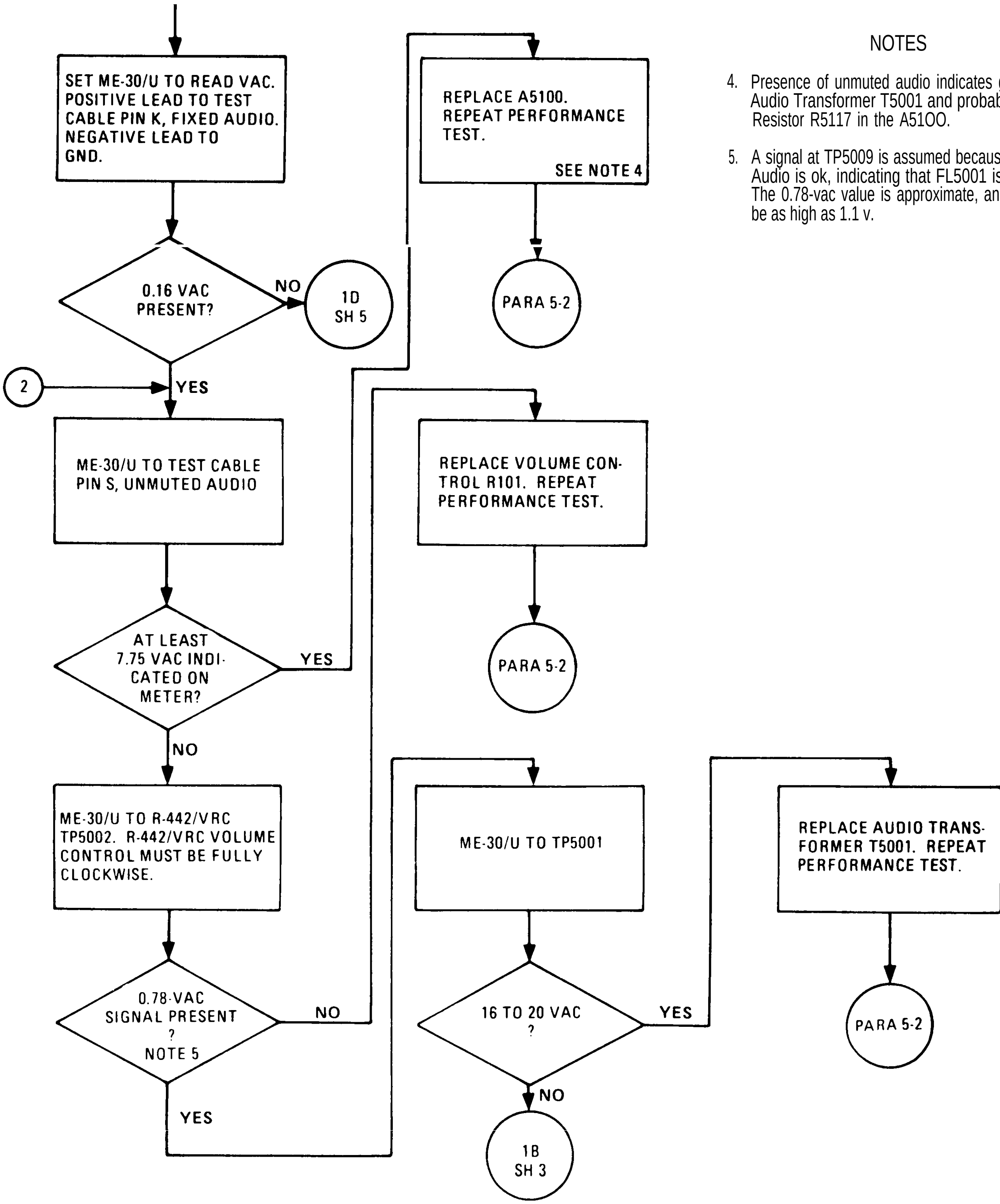


NOTES

1. Do not confuse audio tone with noise. Audio tone is 1-kHz signal.
2. The assumption here is that audio is scratchy or fades in and out one or more times as VOLUME control is turned. A very weak audio is diagnosed in Audio Power Troubleshooting.
3. If 0.16 vac is present, Monitor Amplifier A5100 is working, indicating a valid received audio from A4300. Therefore, 25.5-vdc power supply to prior stages and to lamp can be assumed ok,

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 2 of 18)



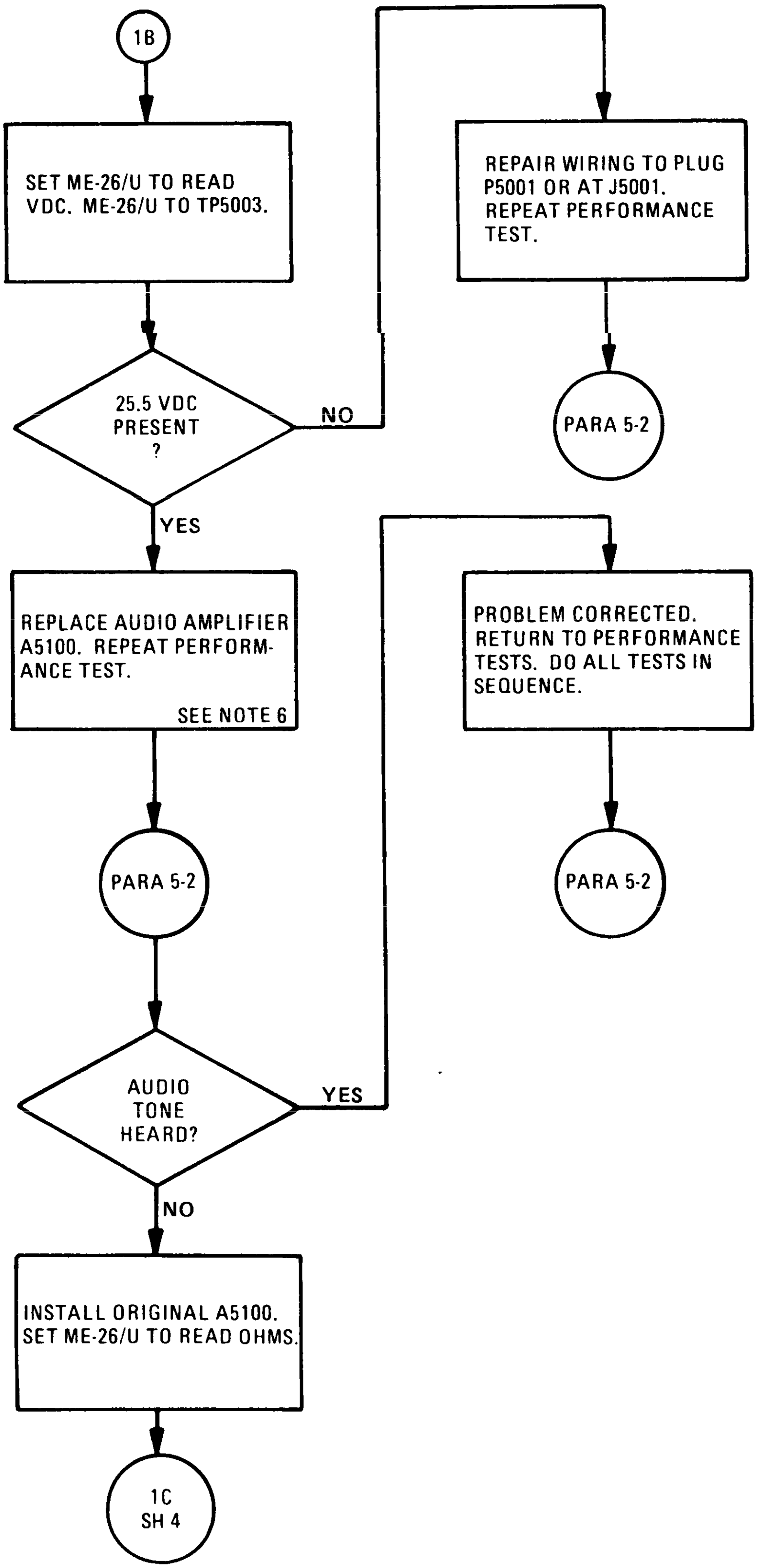
NOTES

4. Presence of unmuted audio indicates good Audio Transformer T5001 and probable bad Resistor R5117 in the A51OO.

5. A signal at TP5009 is assumed because Fixed Audio is ok, indicating that FL5001 is good. The 0.78-vac value is approximate, and can be as high as 1.1 v.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 3 of 18)



NOTES

6. Due to limited number of test points, component substitution is sometimes necessary. Absence of signal at TP5001 could be due to failed Power Transistor Q201 or Resistor R202. These components are difficult to test directly, and much more difficult to substitute than the A5100 assembly.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 4 of 18)

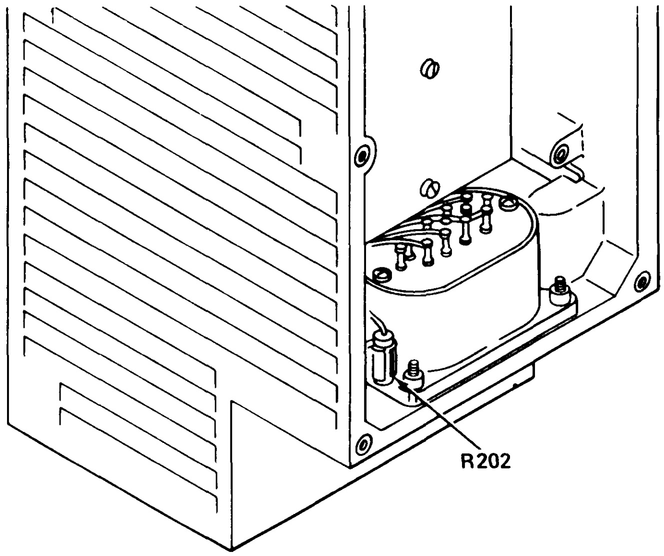
1C

JUMP ACROSS R202 WITH JUMPER WIRE

TONE HEARD ?

YES → REPLACE R202 → RETURN TO PERFORMANCE TESTS. DO ALL TESTS IN SEQUENCE. → PARA 5-2

NO → REPLACE POWER TRANSISTOR Q201 → RETURN TO PERFORMANCE TESTS. DO ALL TESTS IN SEQUENCE. → PARA 5-2

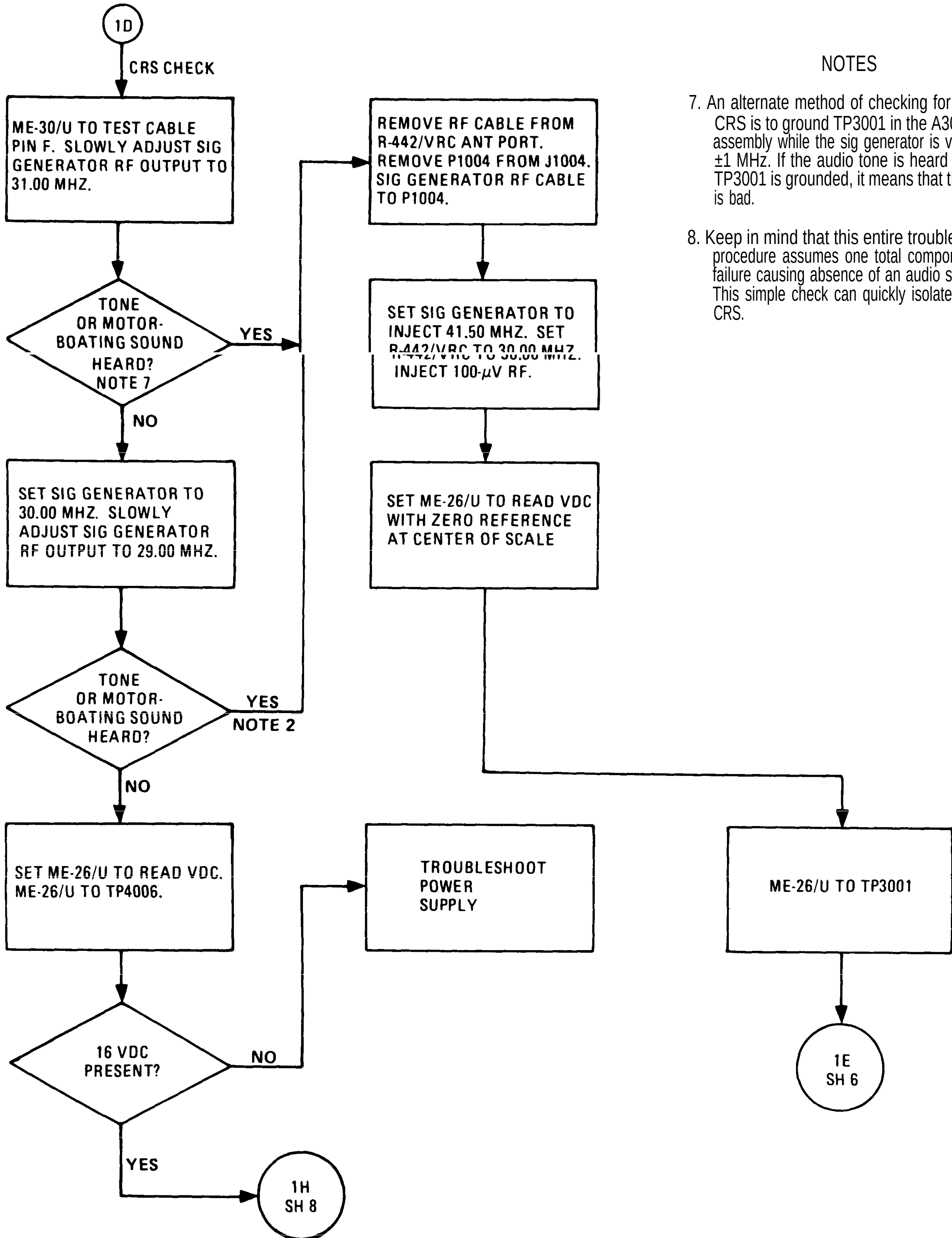


RECEIVER, BOTTOM VIEW OF CONNECTOR P201 AREA WITH ASSEMBLY A1000 REMOVED

EL4GQ210

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 5 of 18)



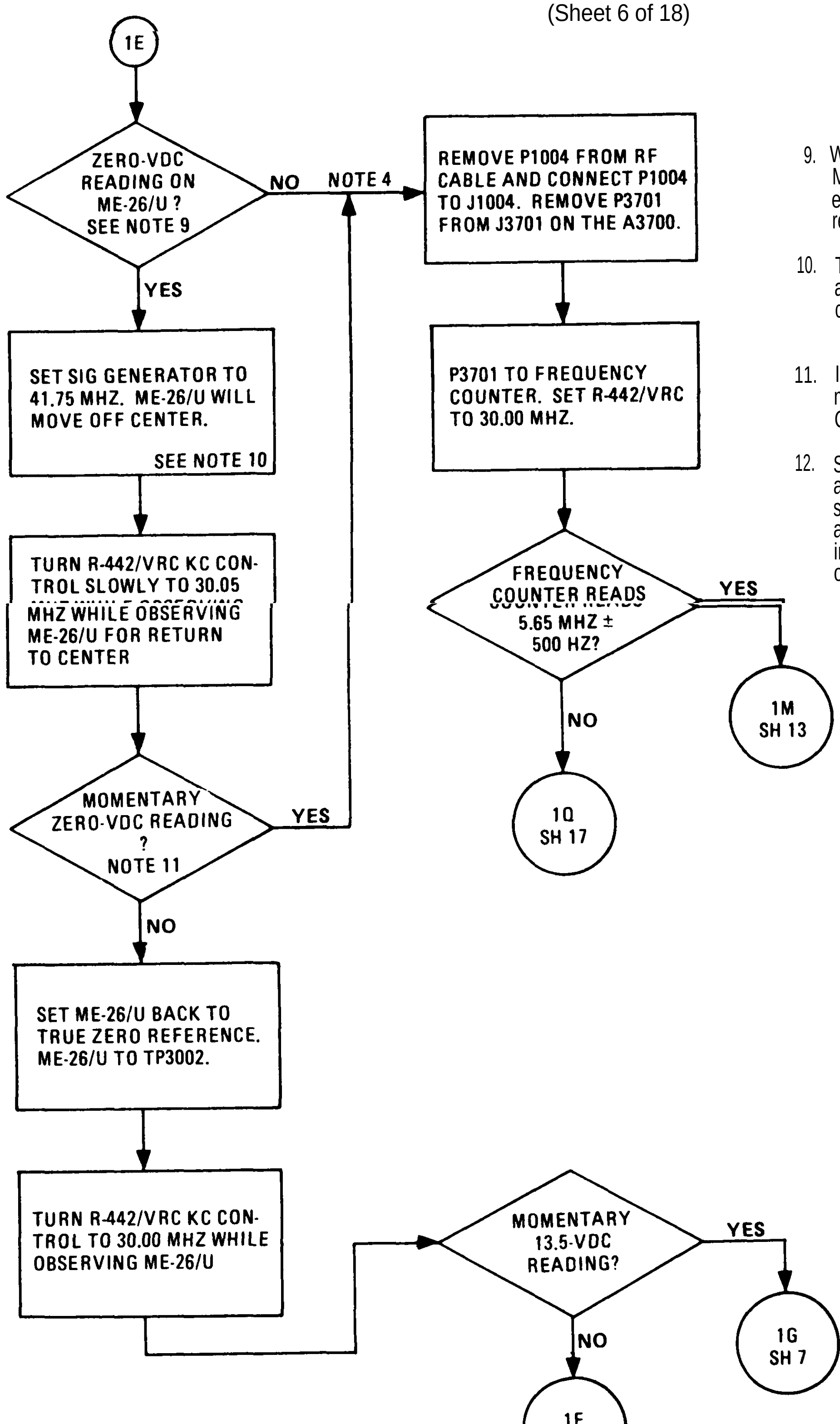
NOTES

7. An alternate method of checking for a bad CRS is to ground TP3001 in the A3000 assembly while the sig generator is varied ±1 MHz. If the audio tone is heard when TP3001 is grounded, it means that the CRS is bad.

8. Keep in mind that this entire troubleshooting procedure assumes one total component failure causing absence of an audio signal. This simple check can quickly isolate a bad CRS.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 6 of 18)



NOTES

9. With R442/VRC set at 30.00 MHz and 41.5 MHz injected into F L3002, there should be no error signal from the CRS. The meter will remain centered.

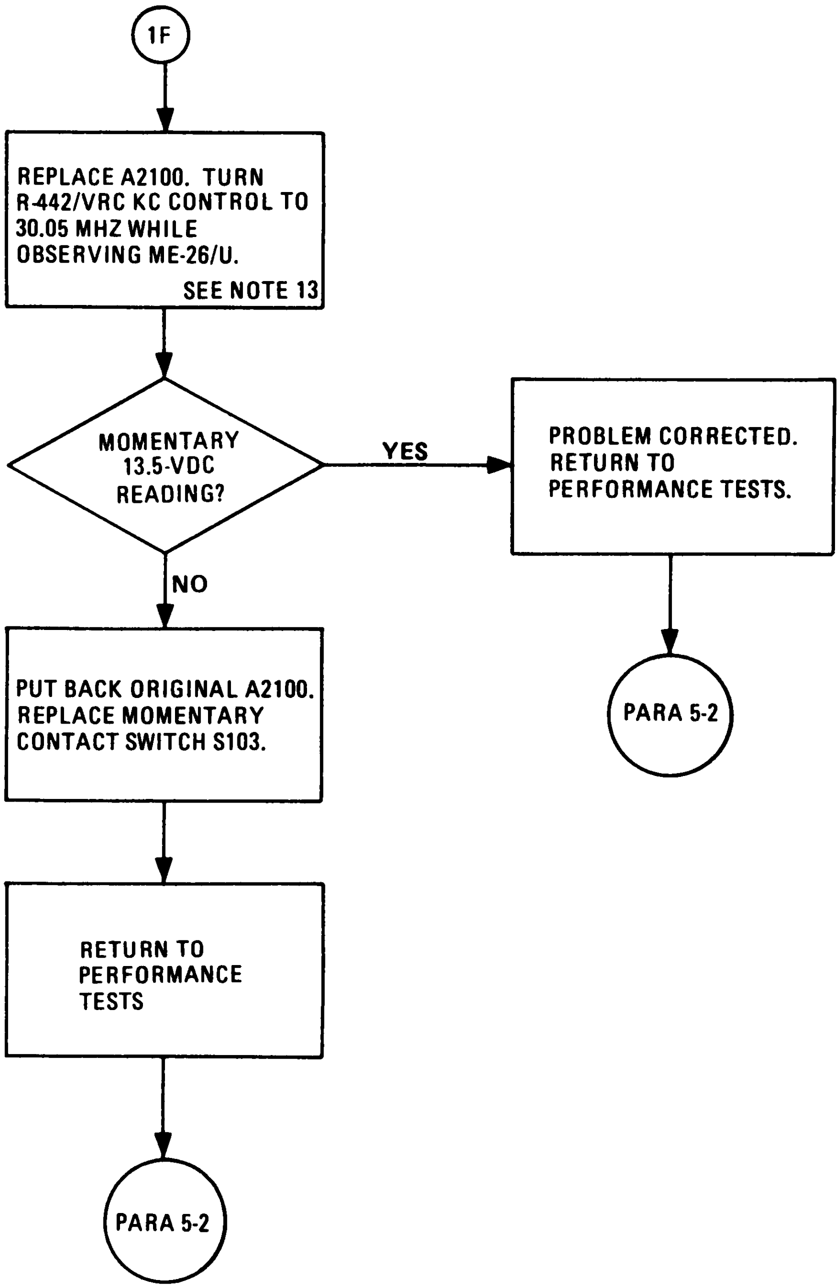
10. This setting should force the CRS to output a dc error voltage. The voltmeter will indicate this voltage.

11. If the Time Delay Relay K3001 fails to momentarily short the dc error signal, the CRS can shift the local oscillator 1 MHz.

12. Since previous steps confirmed presence of audio tone when CRS was isolated from other stages, the local oscillator can be considered alined. Therefore, CRS must be generating incorrect error signal, driving local oscillator off frequency.

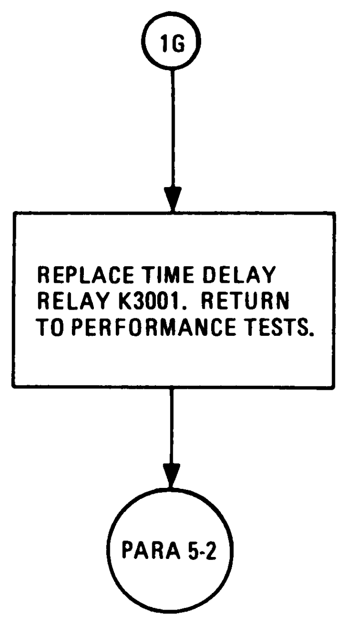
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 7 of 18)



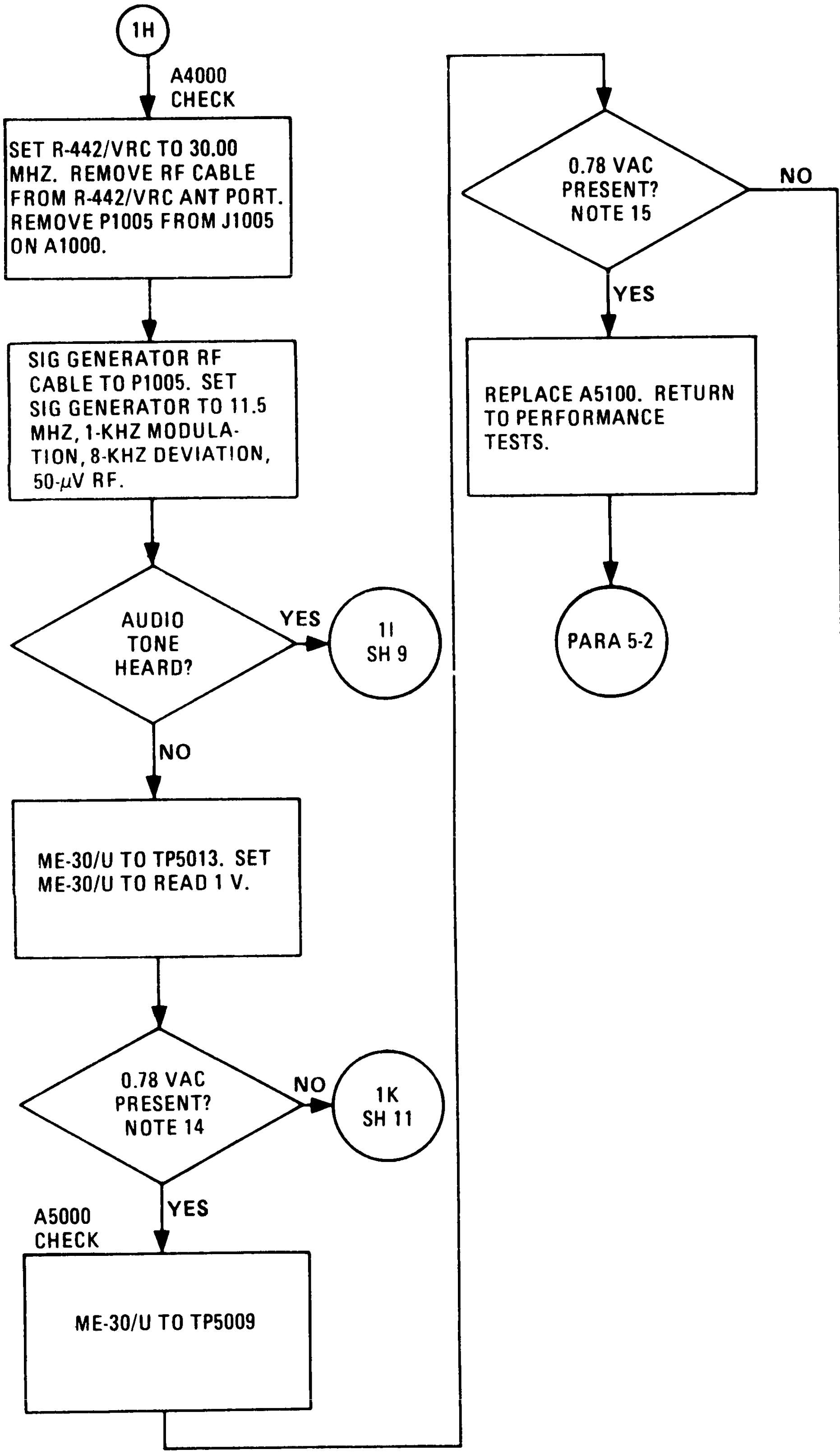
NOTES

13. Do not discard A21OO.



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 8 of 18)



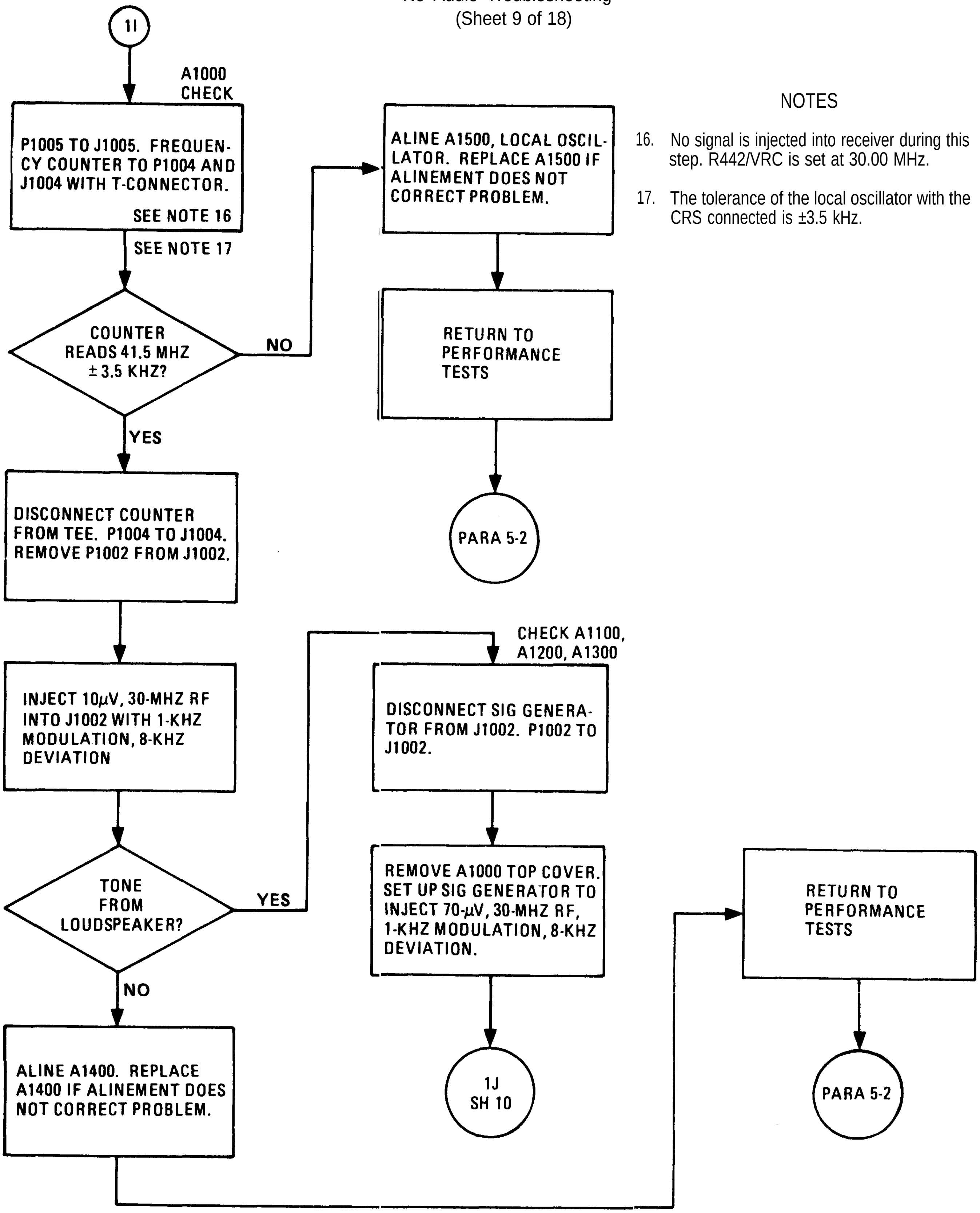
NOTES

14. Voltage may vary from 0.78 to 1.1 vac.

15. Actual voltage will be slightly lower due to some attenuation of signal by the filter.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 9 of 18)



NOTES

16. No signal is injected into receiver during this step. R442/VRC is set at 30.00 MHz.

17. The tolerance of the local oscillator with the CRS connected is ±3.5 kHz.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 10 of 18)

1J

INJECT SIGNAL AT C1305 AS PER ILLUSTRATION

TONE HEARD ?

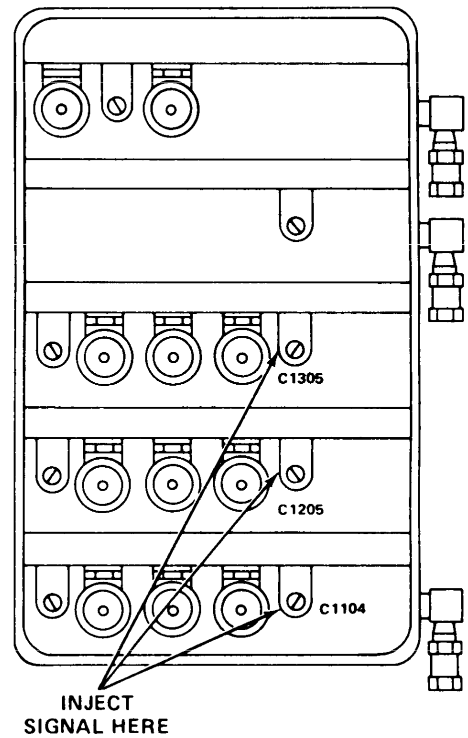
NO → ALINE A1300. REPLACE A1300 IF ALINEMENT DOES NOT CORRECT PROBLEM. → RETURN TO PERFORMANCE TESTS → PARA 5-2

YES → CHANGE SIG GENERATOR RF LEVEL TO 20 μV. INJECT SIGNAL AT C1205.

TONE HEARD ?

NO → ALINE A1200. REPLACE A1200 IF ALINEMENT DOES NOT CORRECT PROBLEM. → RETURN TO PERFORMANCE TESTS → PARA 5-2

YES → ALINE A1100. REPLACE A1100 IF ALINEMENT DOES NOT CORRECT PROBLEM. RETURN TO PERFORMANCE TESTS. → PARA 5-2

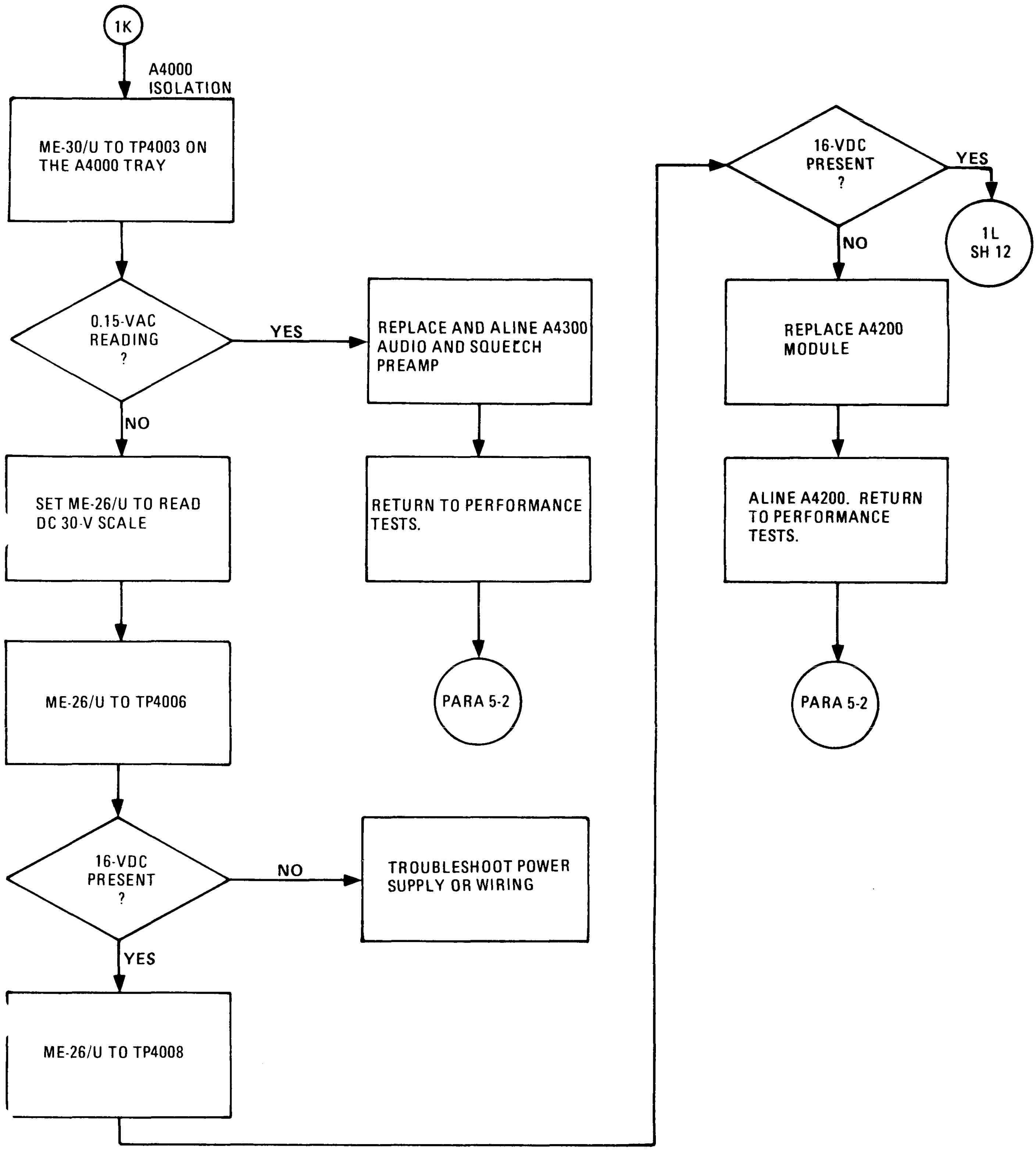


A1000 ASSEMBLY

EL4GQ212

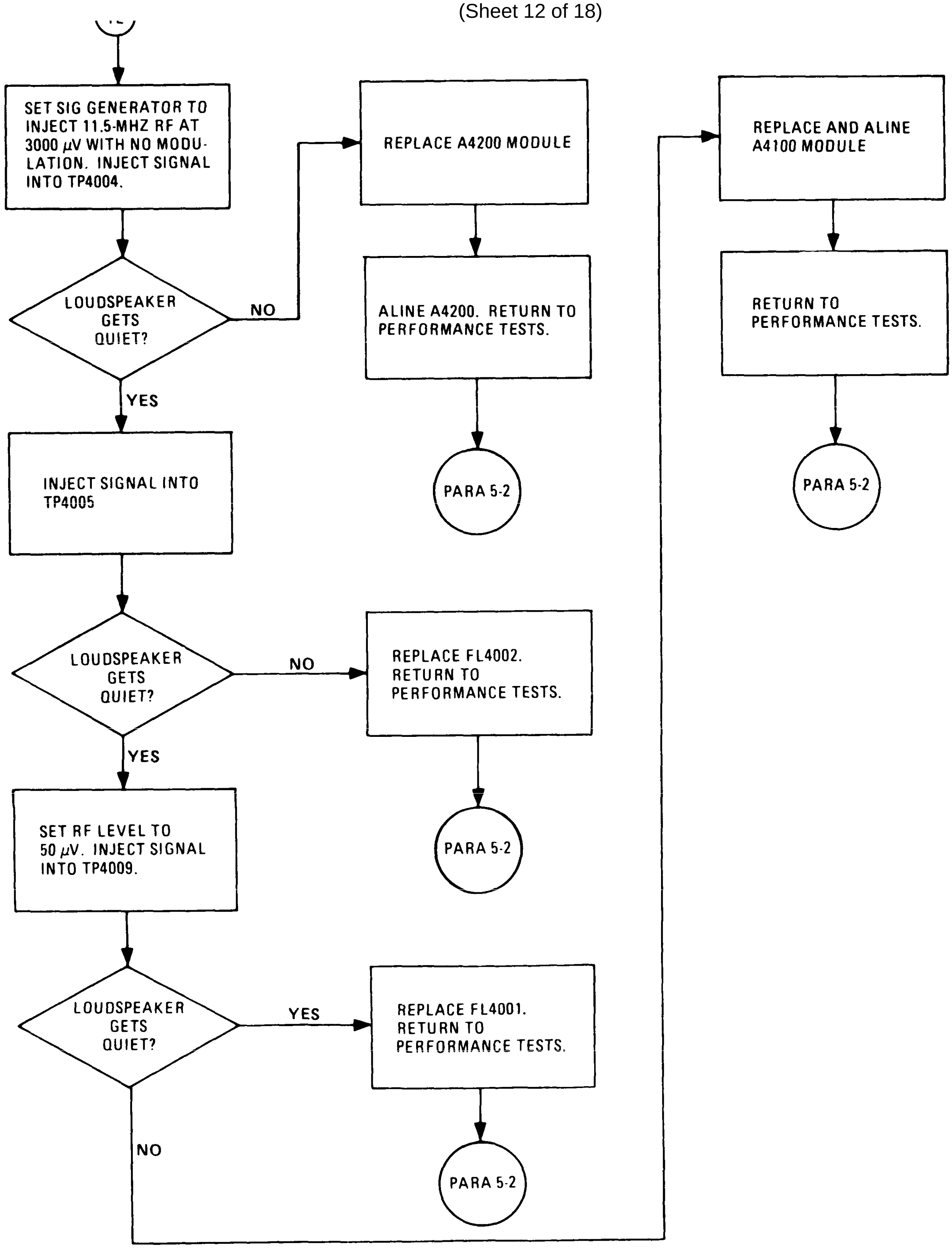
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 11 of 18)



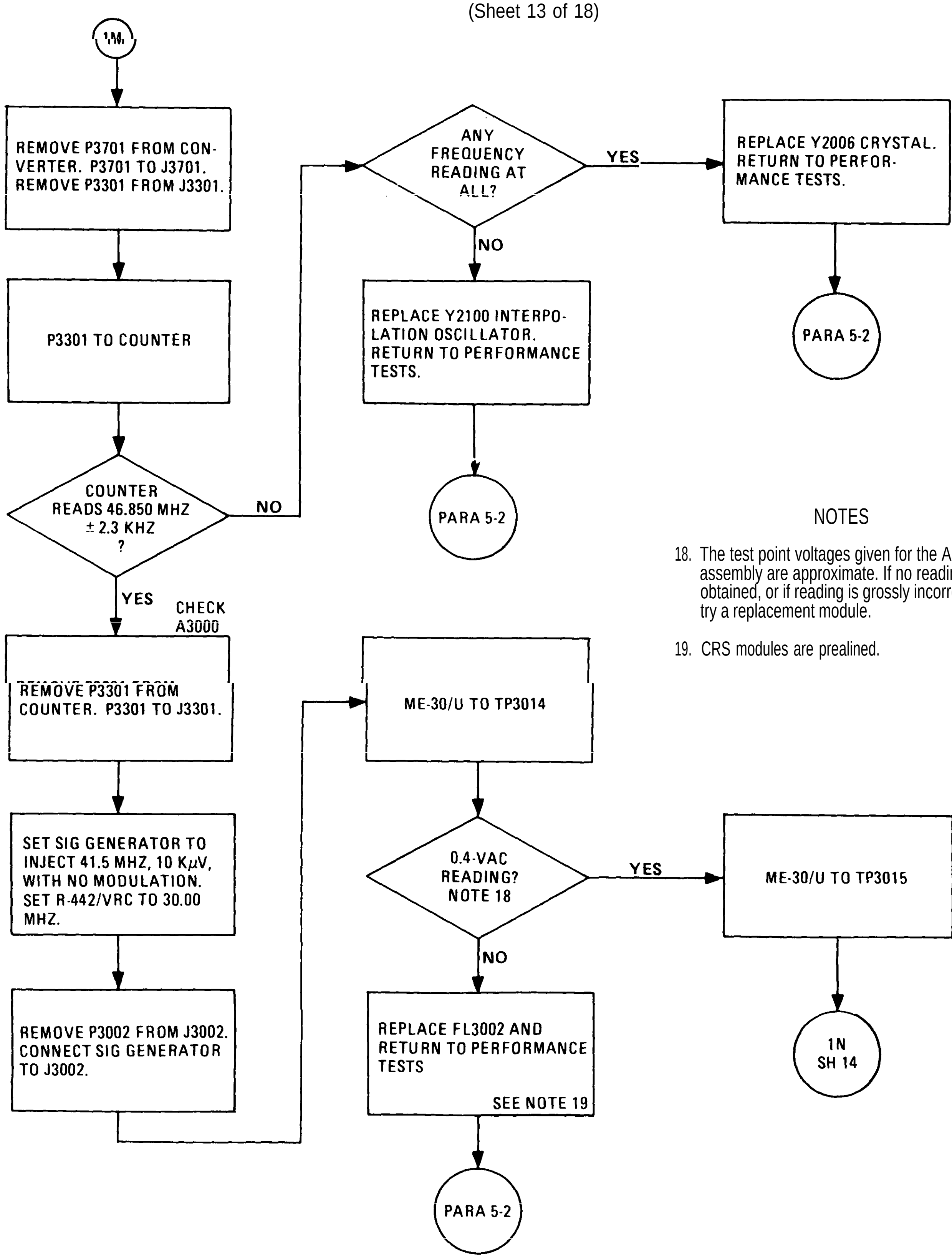
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 12 of 18)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 13 of 18)



NOTES

18. The test point voltages given for the A3000 assembly are approximate. If no reading is obtained, or if reading is grossly incorrect, try a replacement module.

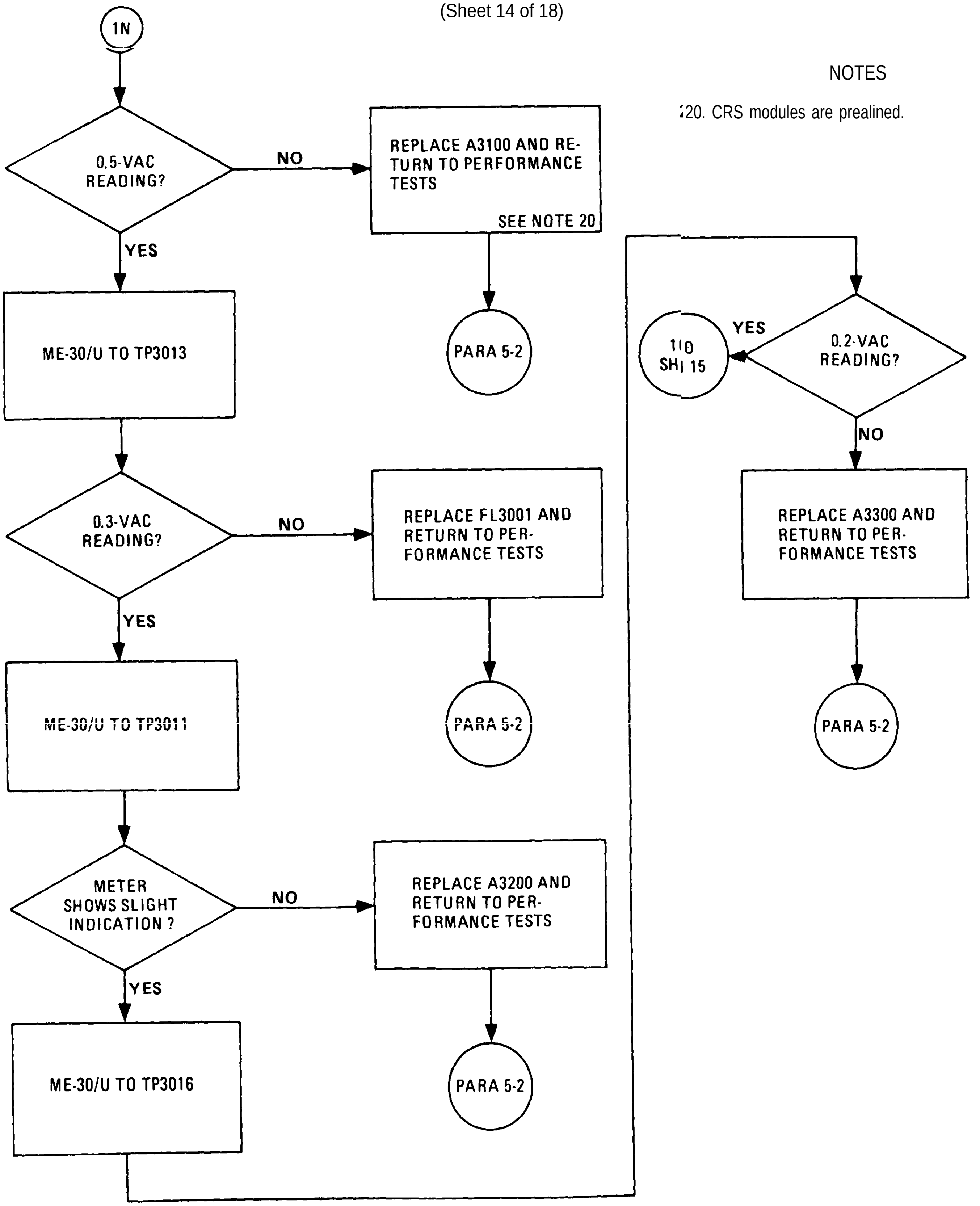
19. CRS modules are prealined.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 14 of 18)

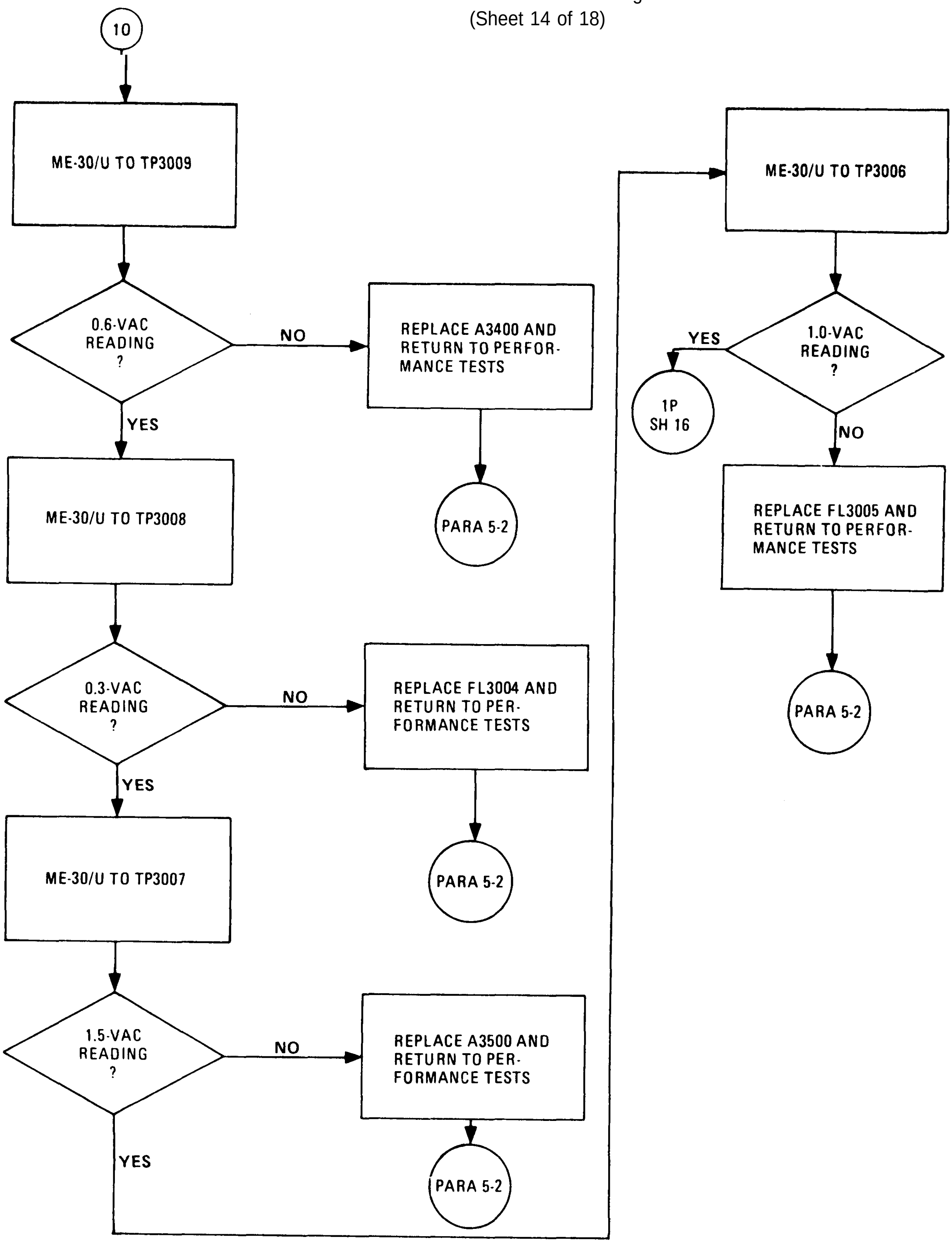
NOTES

20. CRS modules are prealined.



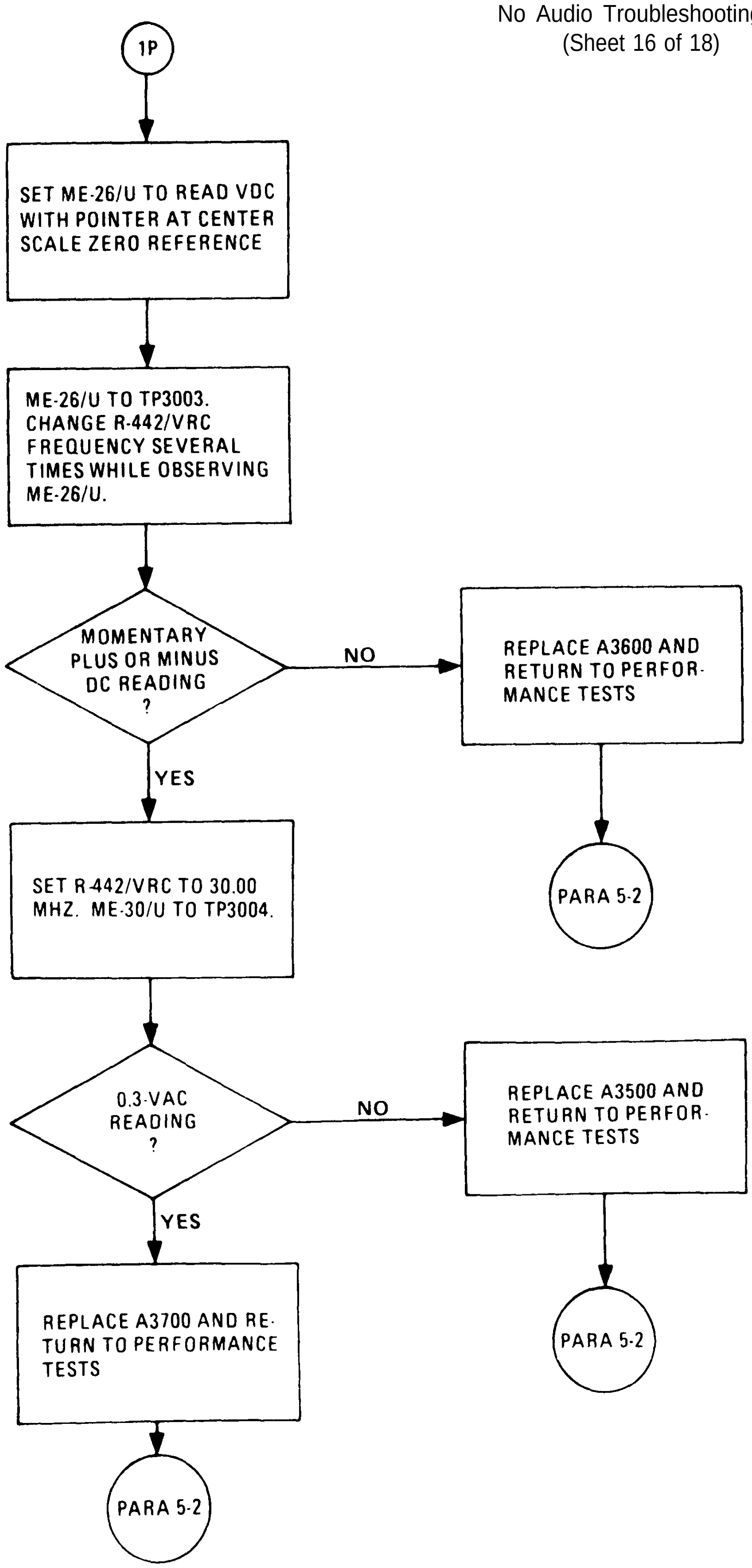
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 14 of 18)



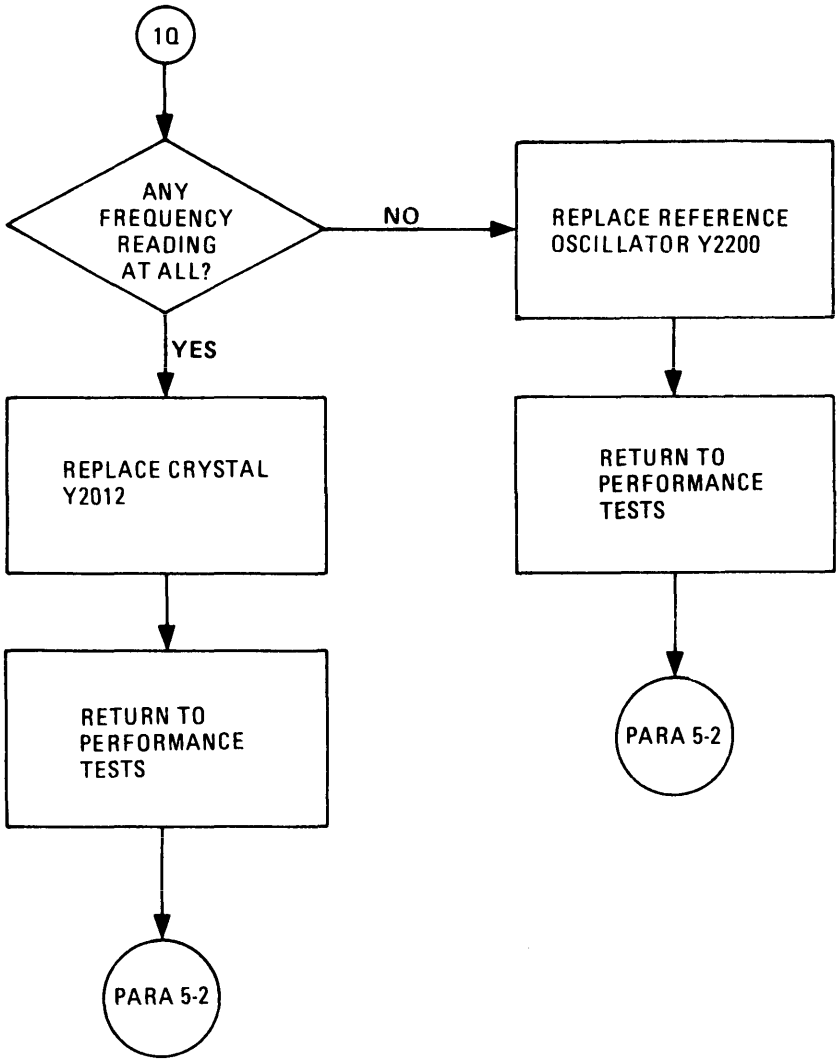
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 16 of 18)



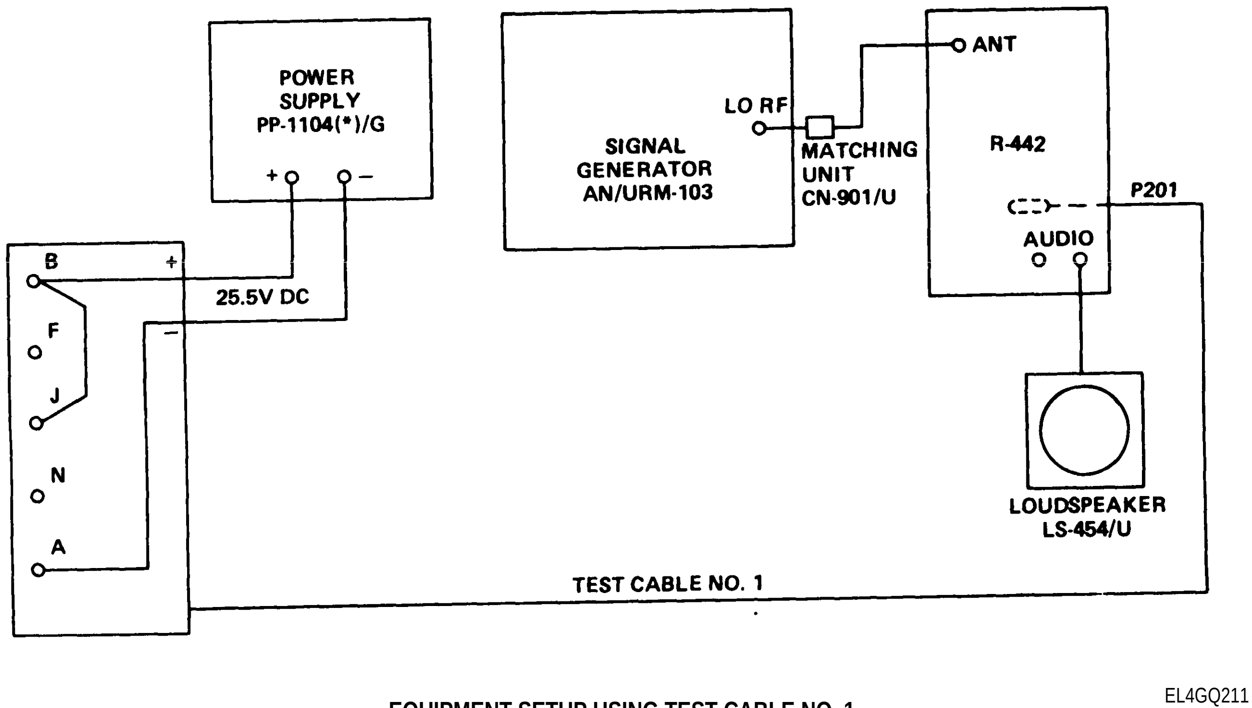
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-1
No Audio Troubleshooting
(Sheet 17 0f 18)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

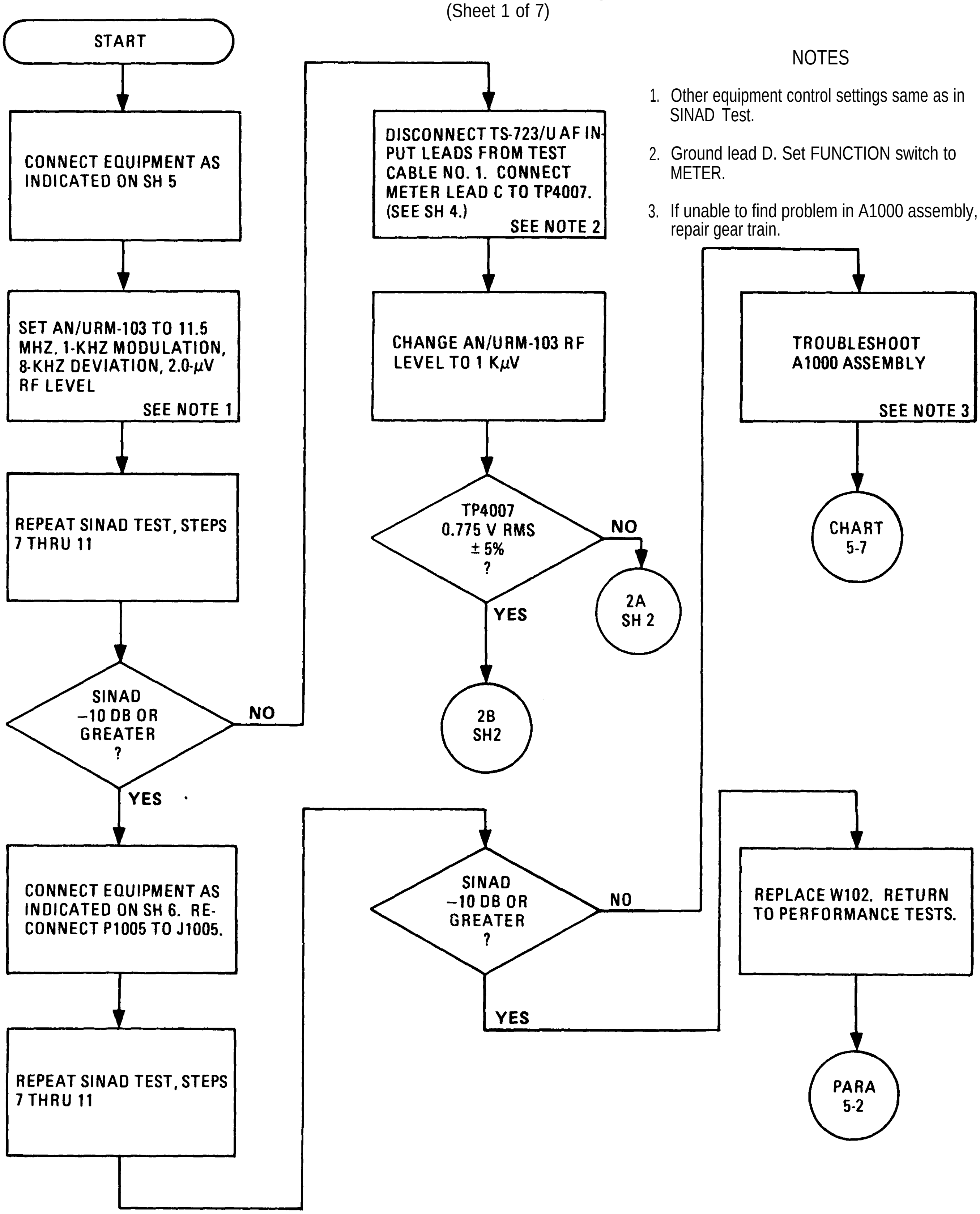
CHART 5-1
No Audio Troubleshooting
(Sheet 18 of 18)



EQUIPMENT SETUP USING TEST CABLE NO. 1

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 1 of 7)

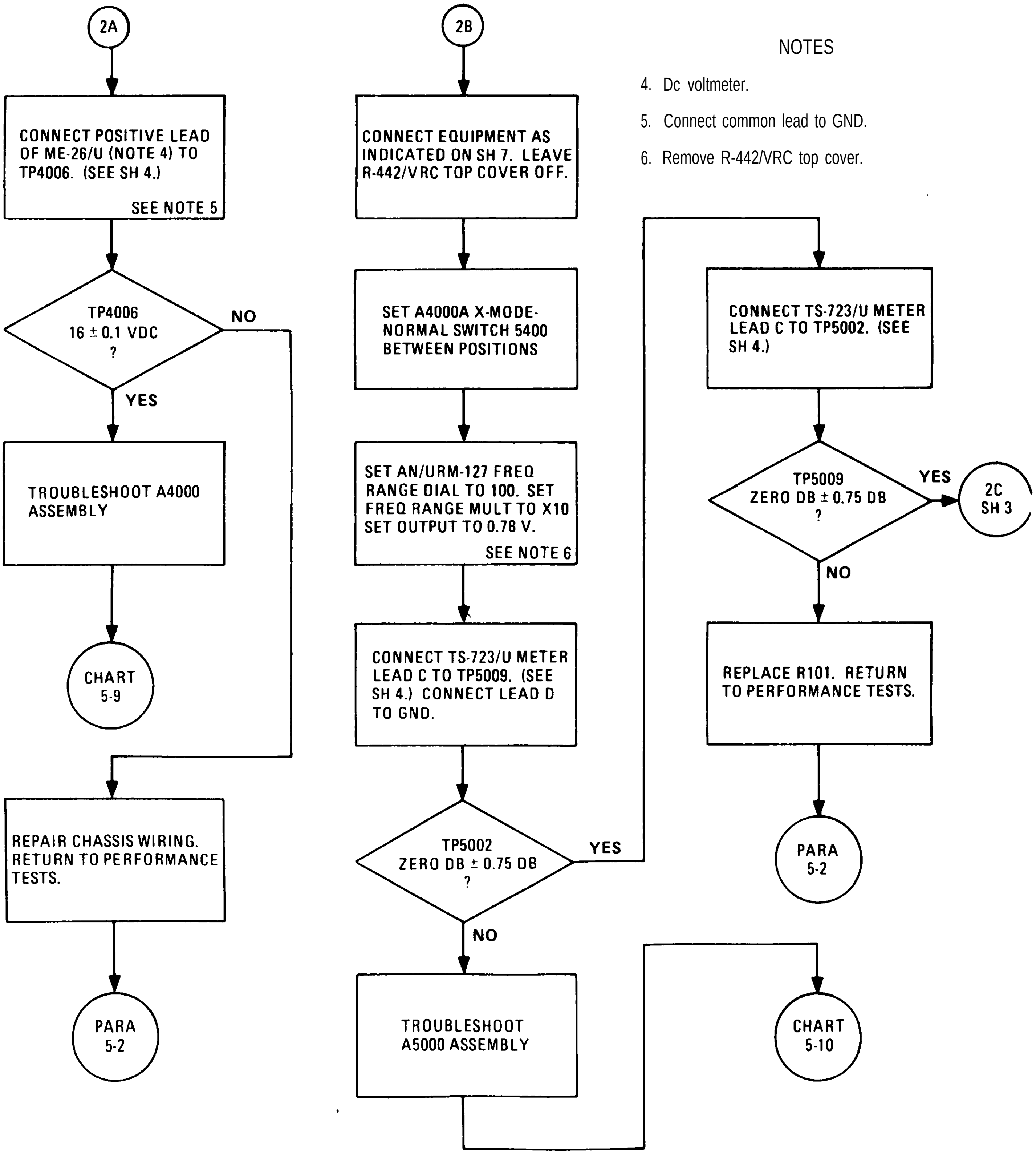


NOTES

1. Other equipment control settings same as in SINAD Test.
2. Ground lead D. Set FUNCTION switch to METER.
3. If unable to find problem in A1000 assembly, repair gear train.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 2 of 7)

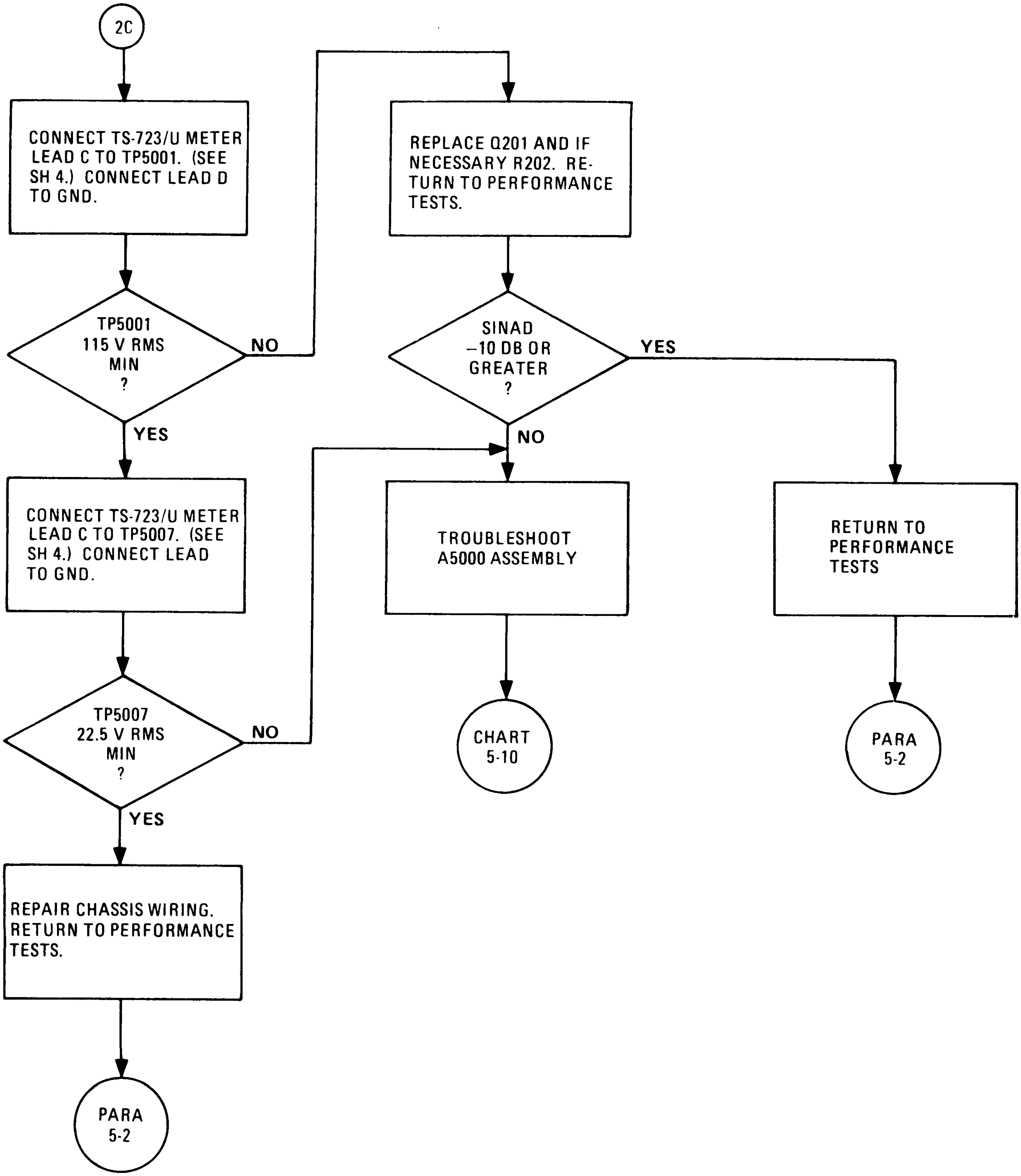


NOTES

4. Dc voltmeter.
5. Connect common lead to GND.
6. Remove R-442/VRC top cover.

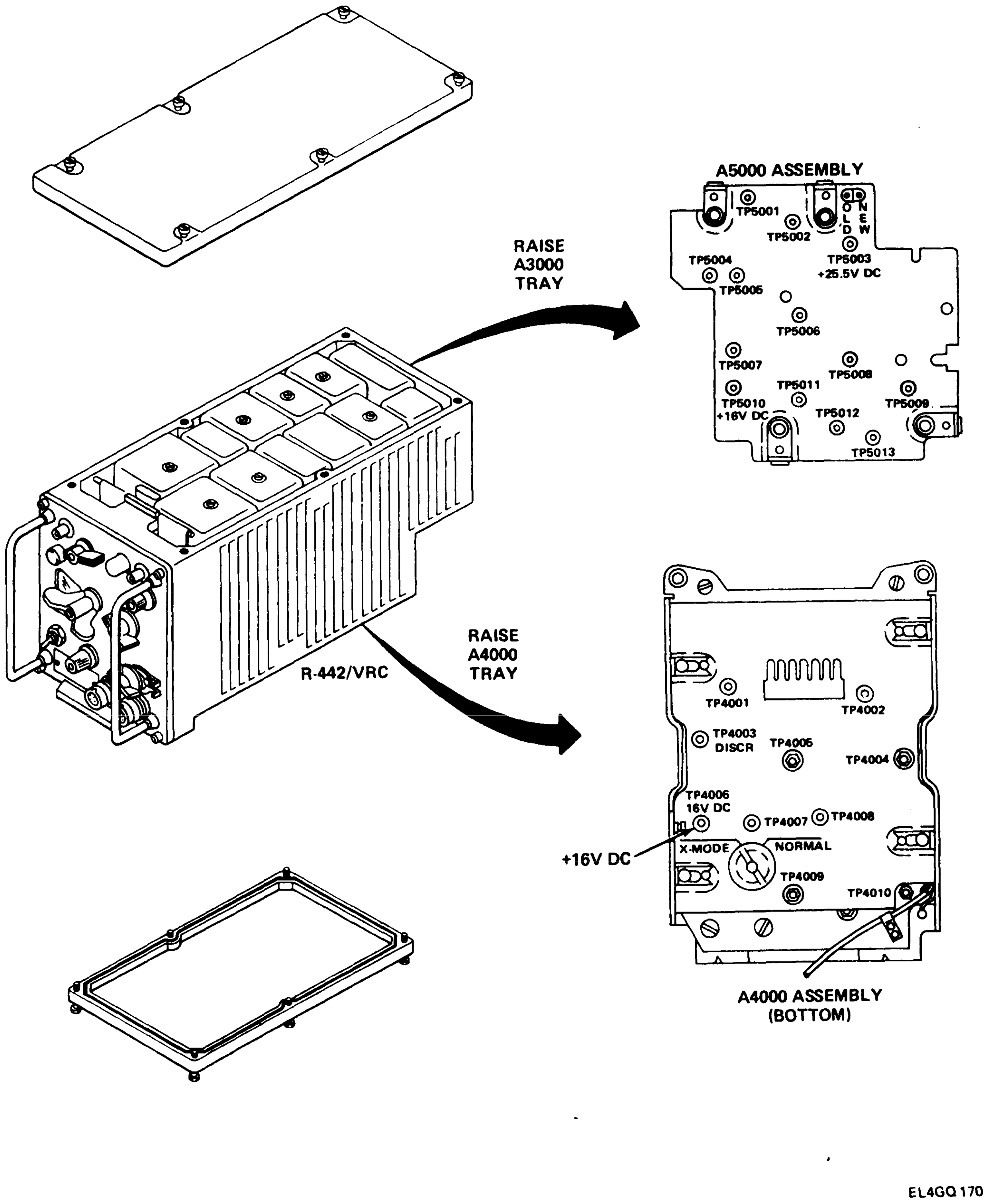
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 3 of 7)



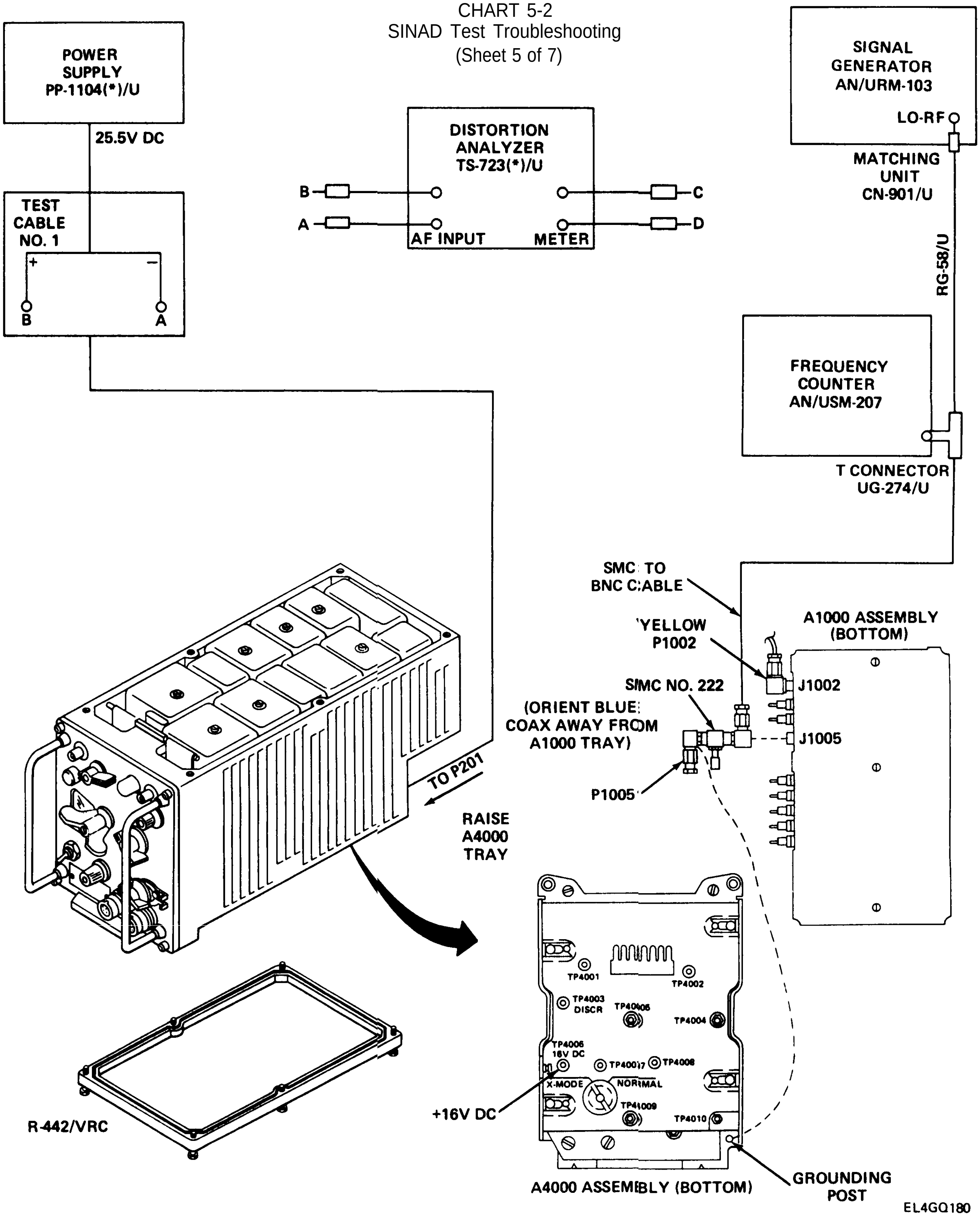
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 4 of 7



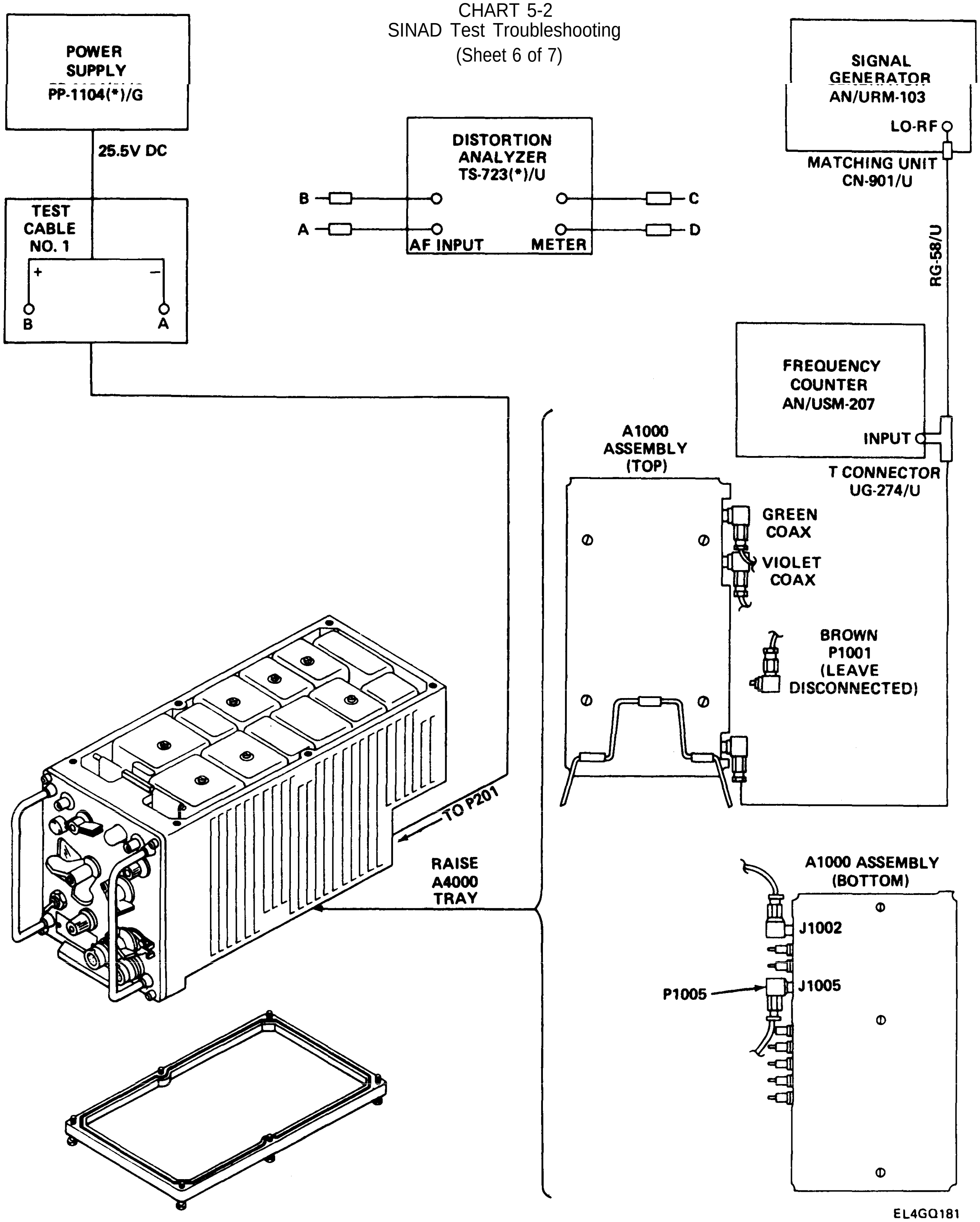
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 5 of 7)



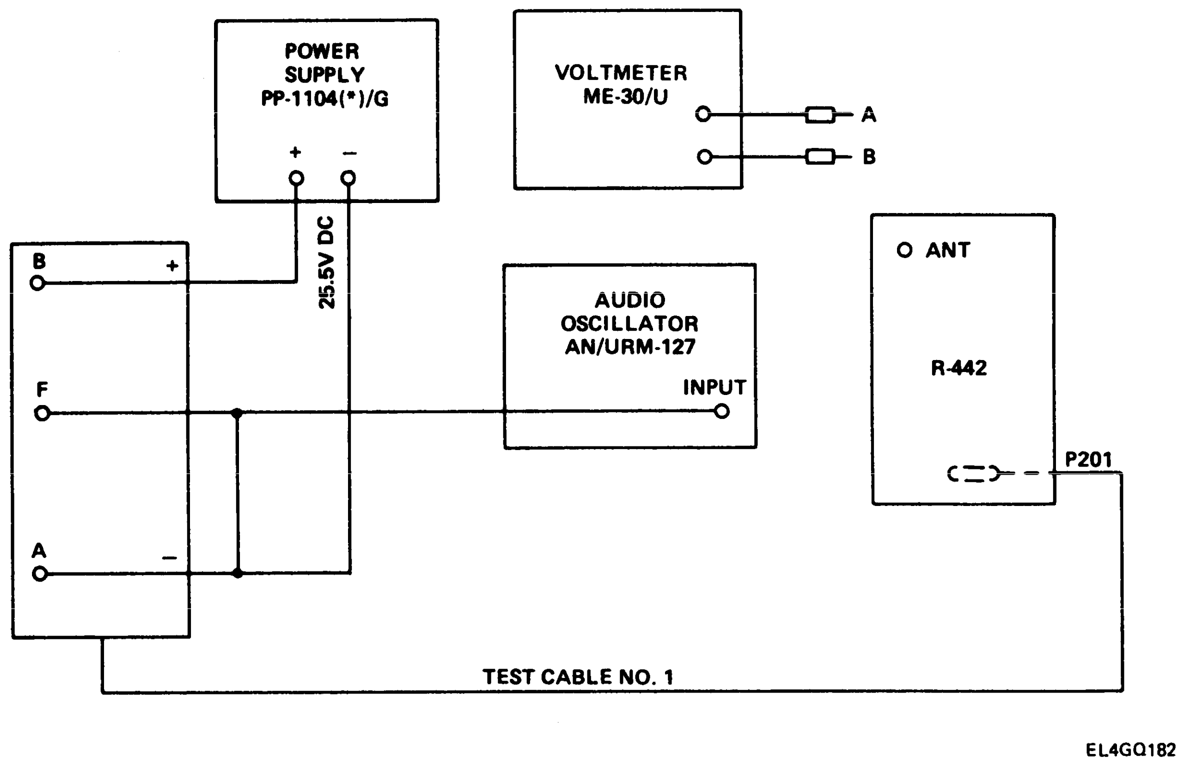
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 6 of 7)



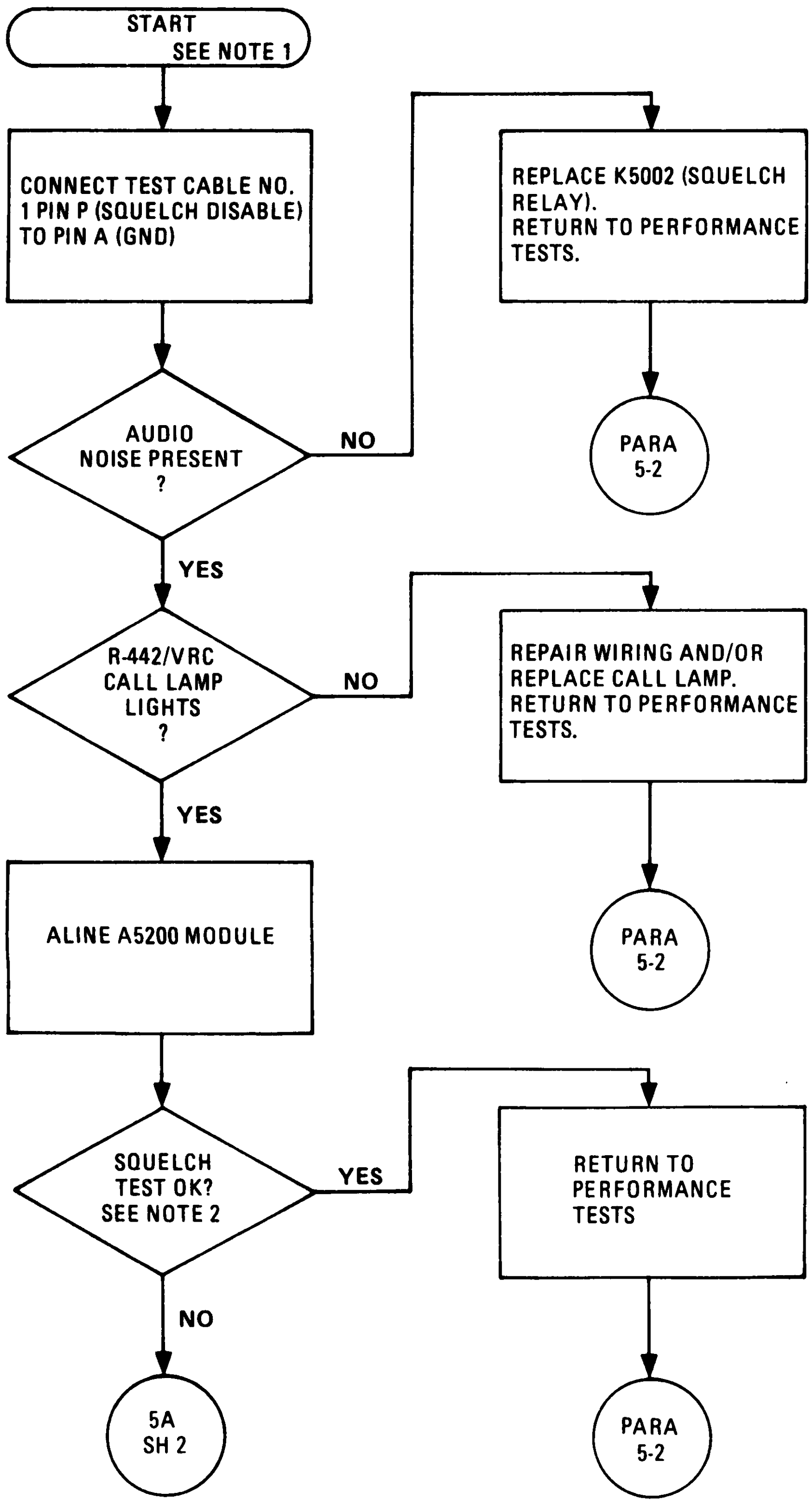
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-2
SINAD Test Troubleshooting
(Sheet 7 of 7)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-3
Squelch Test Failure Troubleshooting
(Sheet 1 of 2)

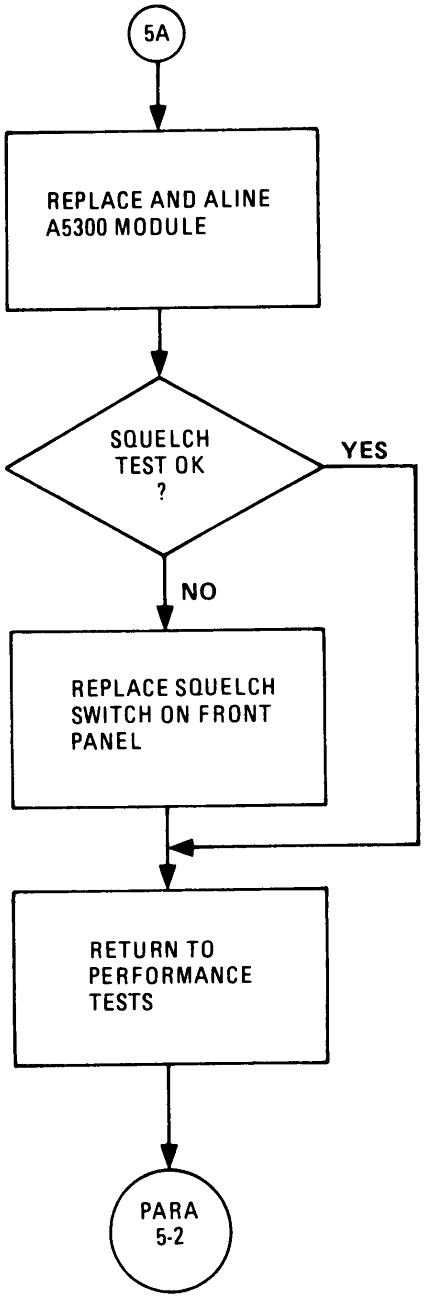


NOTES

1. Use same equipment setup as in Performance Test.
2. That is, repeat Performance Test (NEW SQUELCH or OLD SQUELCH) that referred you to this section to see if fault has been corrected.

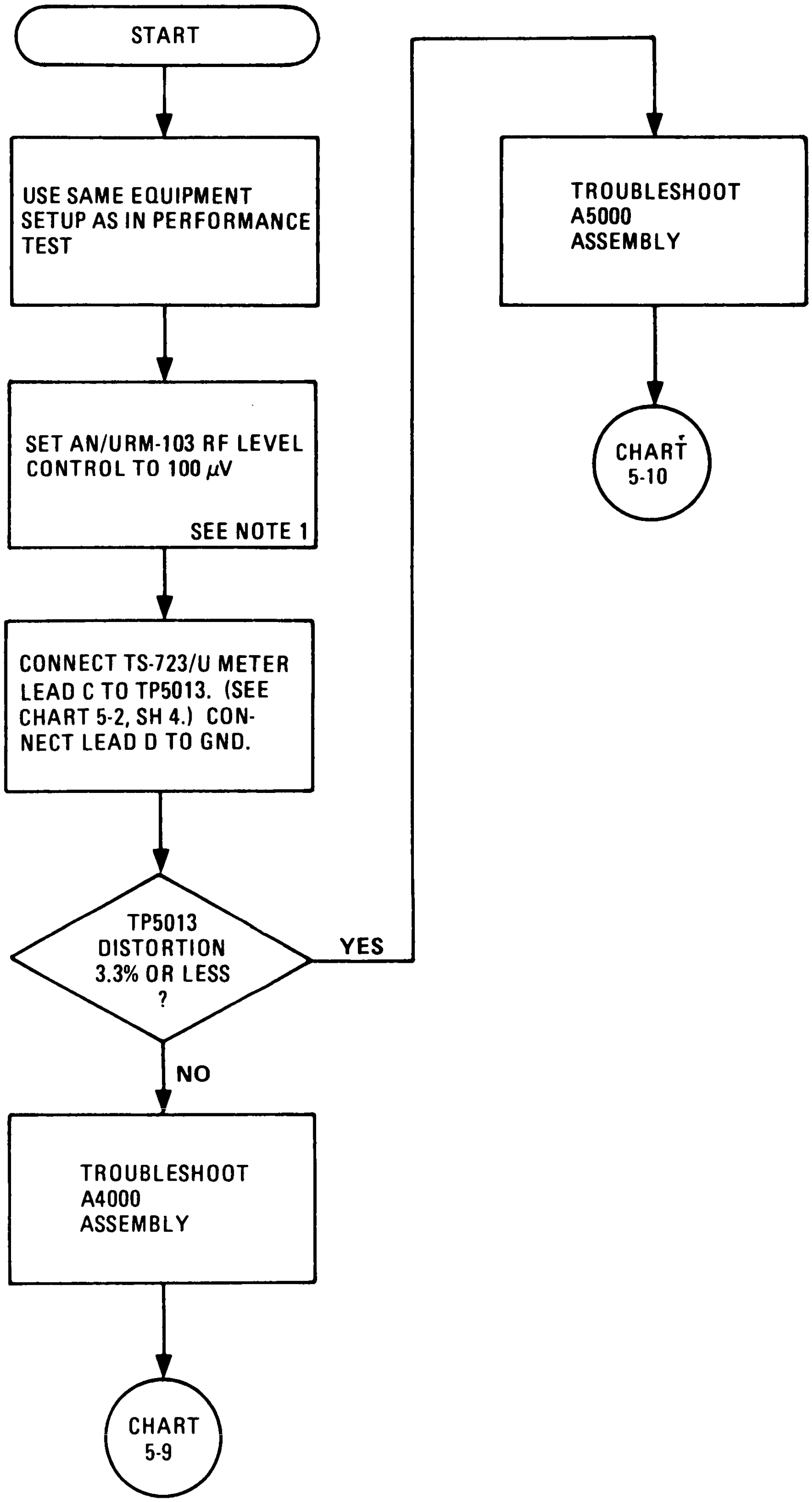
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-3
Squelch Test Failure Troubleshooting
(Sheet 2 of 2)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-4
Audio Distortion Test Failure Troubleshooting
(Sheet 1 of 1)



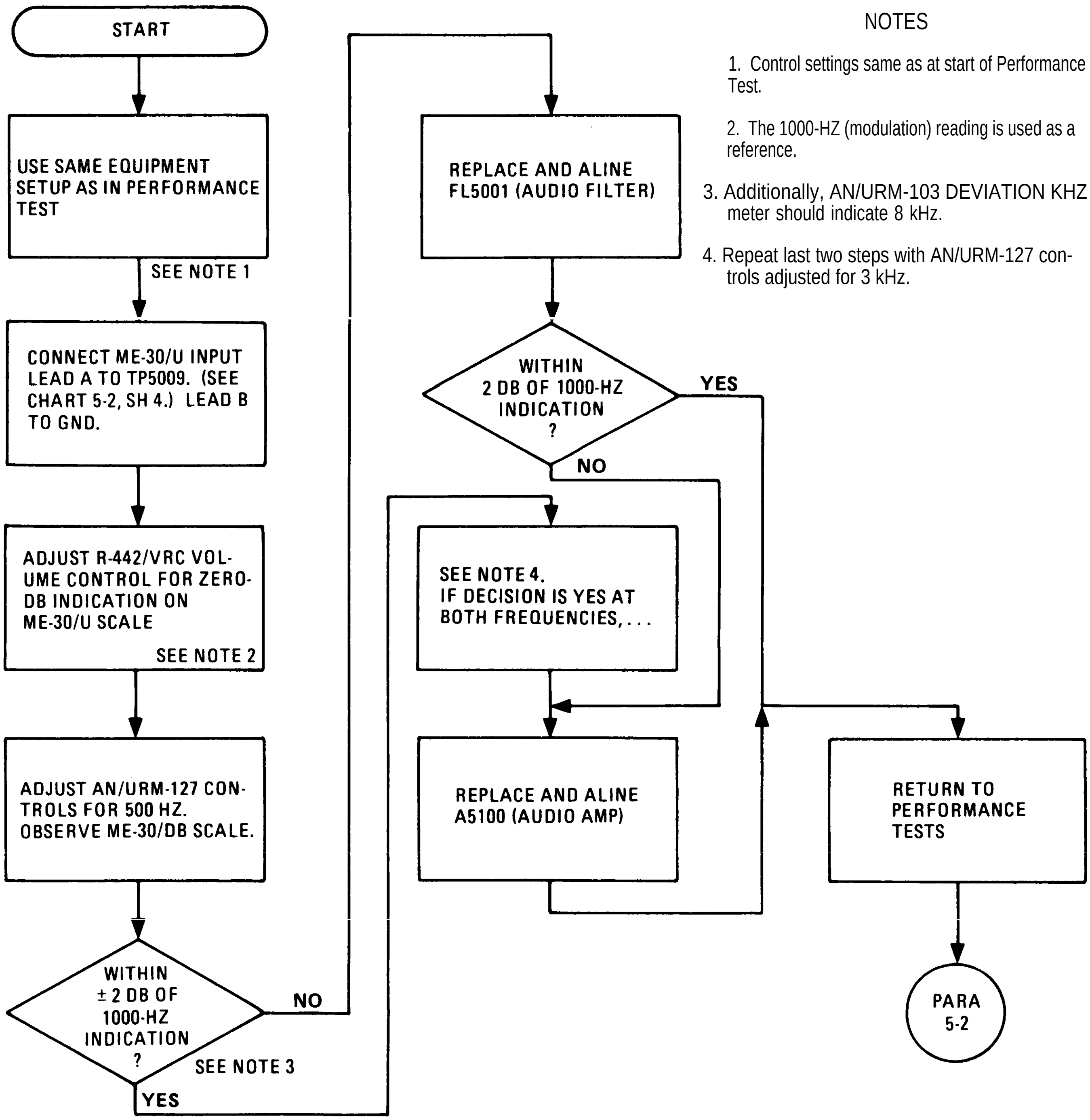
NOTES

1. Other equipment control settings same as in Distortion test.

2. Set TS-723/U FUNCTION switch to DISTORTION.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-5
Audio Response Test Failure (Normal Mode) Troubleshooting
(Sheet 1 of 1)

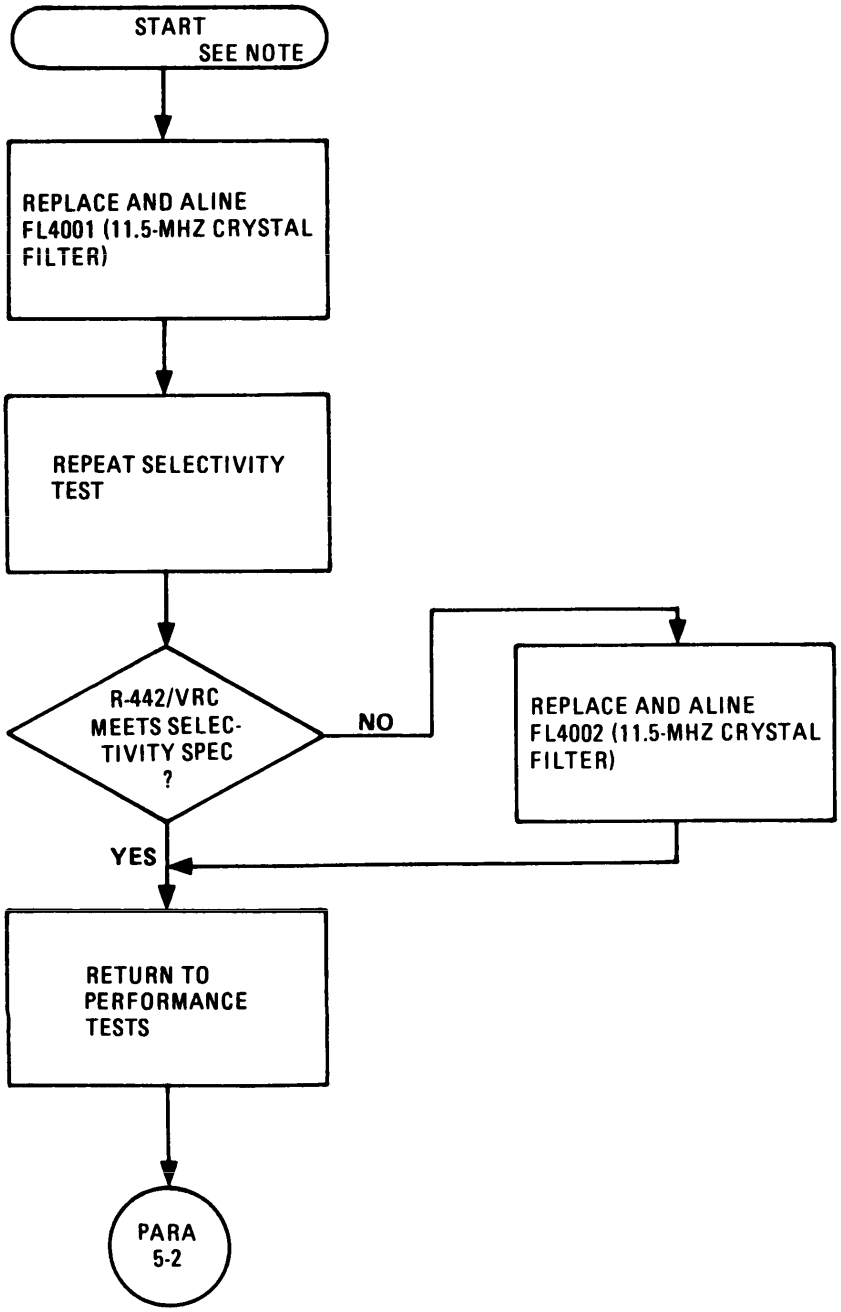


NOTES

1. Control settings same as at start of Performance Test.
2. The 1000-HZ (modulation) reading is used as a reference.
3. Additionally, AN/URM-103 DEVIATION KHZ meter should indicate 8 kHz.
4. Repeat last two steps with AN/URM-127 controls adjusted for 3 kHz.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-6
Selectivity Test Failure Troubleshooting
(Sheet 1 of 1)



NOTE

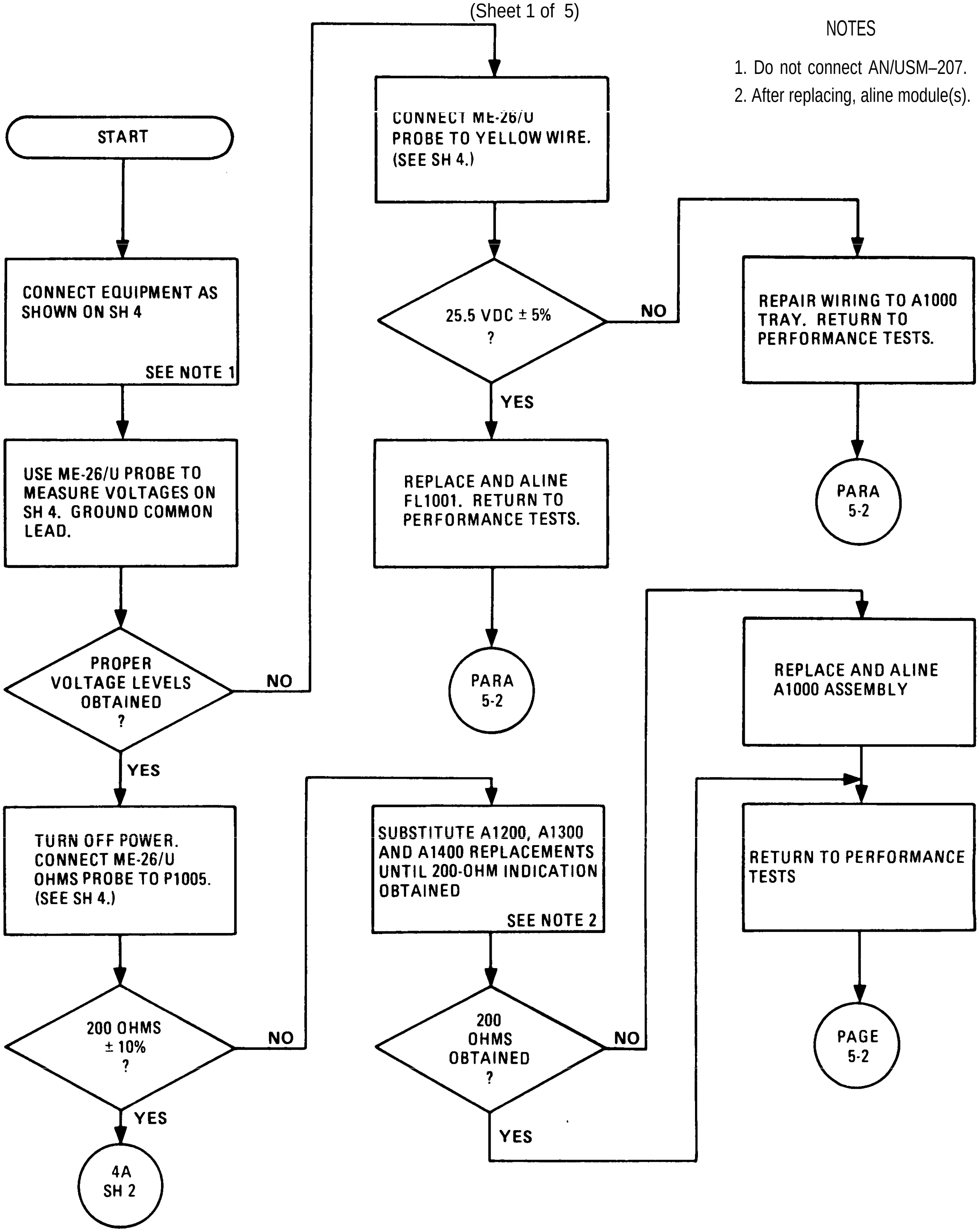
Use same equipment setup as in Performance Test.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-7
A1000 Assembly Troubleshooting
(Sheet 1 of 5)

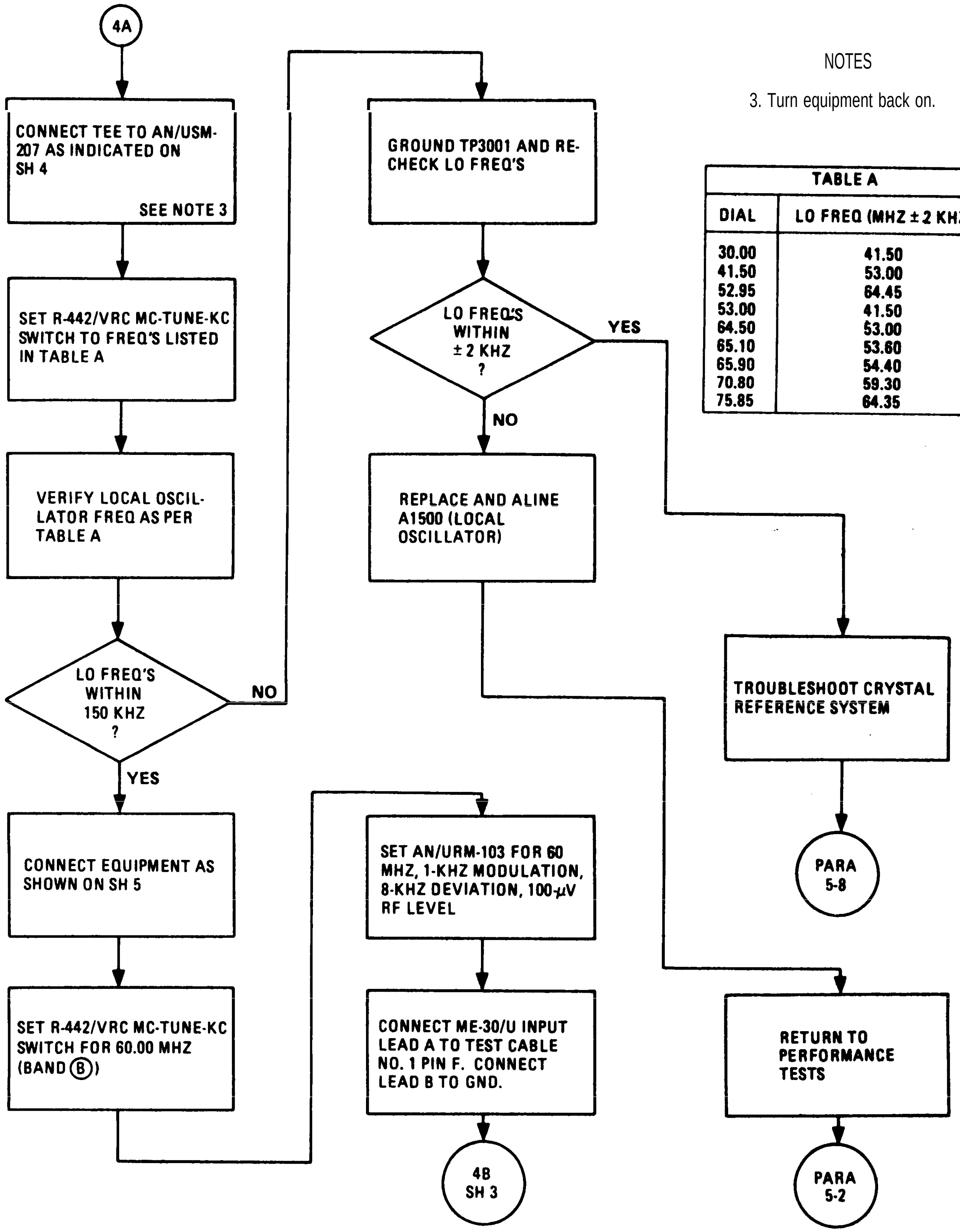
NOTES

1. Do not connect AN/USM–207.
2. After replacing, aline module(s).



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-7
A1000 Assembly Troubleshooting
(Sheet 2 of 5)



NOTES

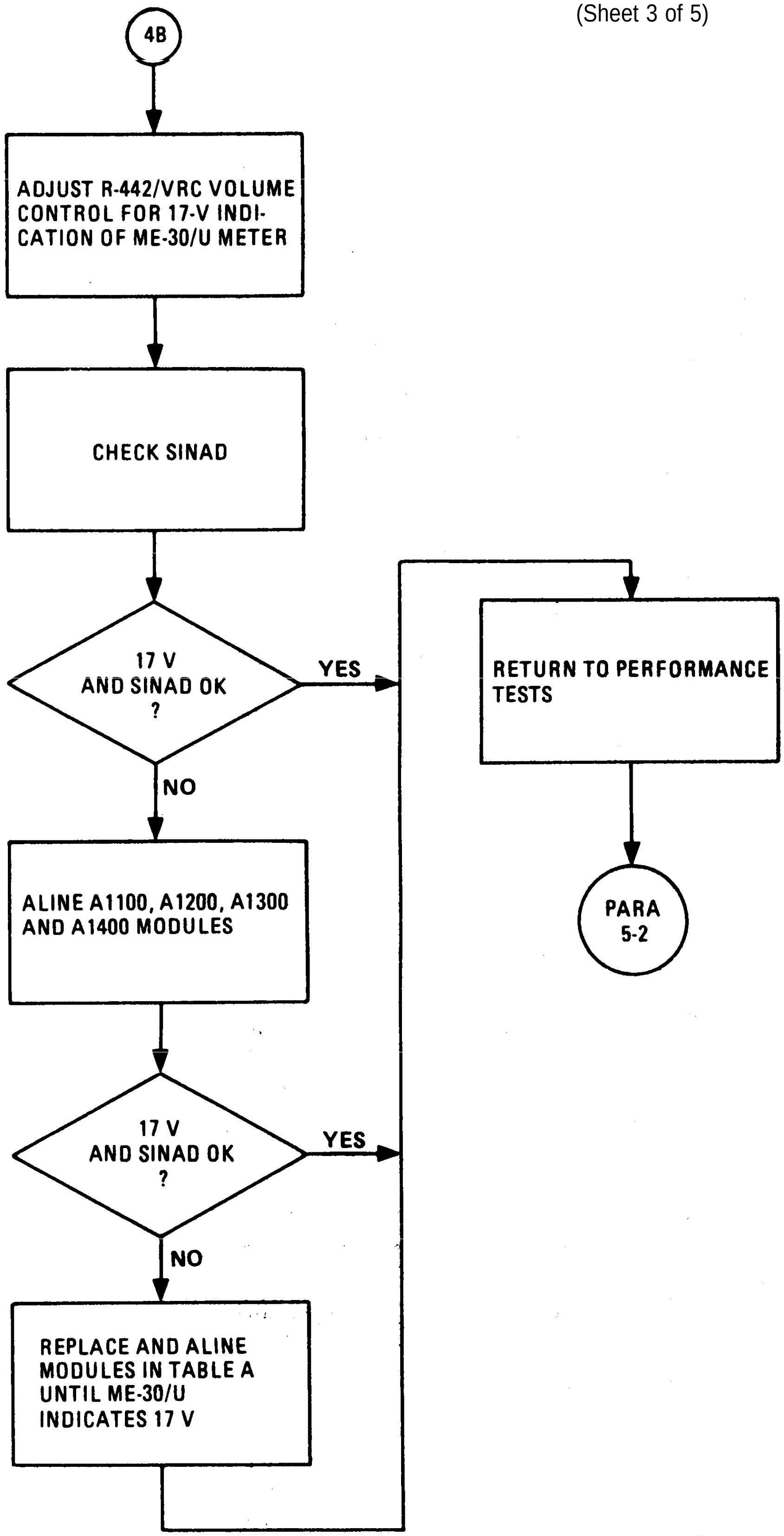
3. Turn equipment back on.

TABLE A

DIAL	LO FREQ (MHZ ± 2 KHZ)
30.00	41.50
41.50	53.00
52.95	64.45
53.00	41.50
64.50	53.00
65.10	53.60
65.90	54.40
70.80	59.30
75.85	64.35

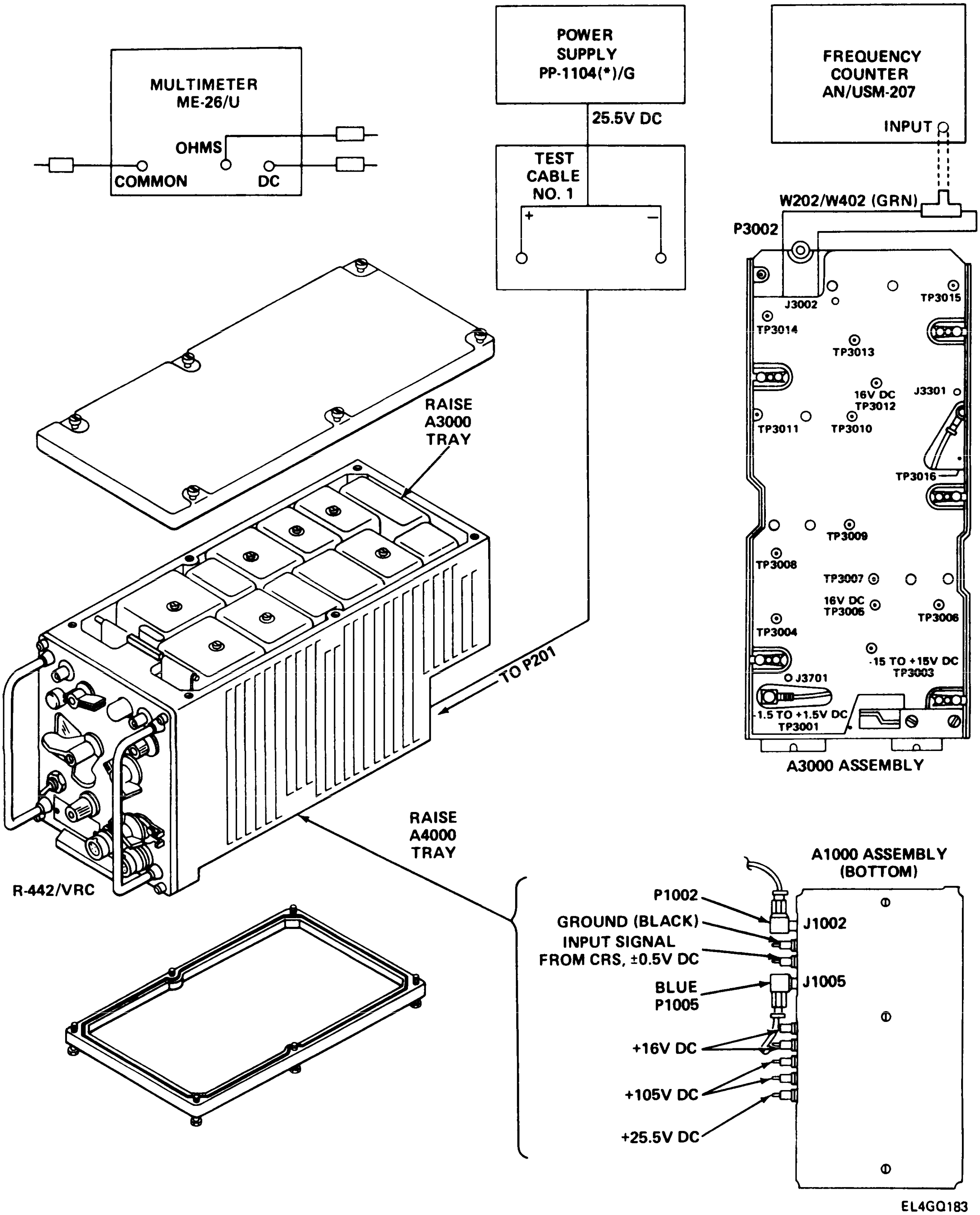
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-7
A 1000 Assembly Troubleshooting
(Sheet 3 of 5)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-7
A1000 Assembly Troubleshooting
(Sheet 4 of 5)

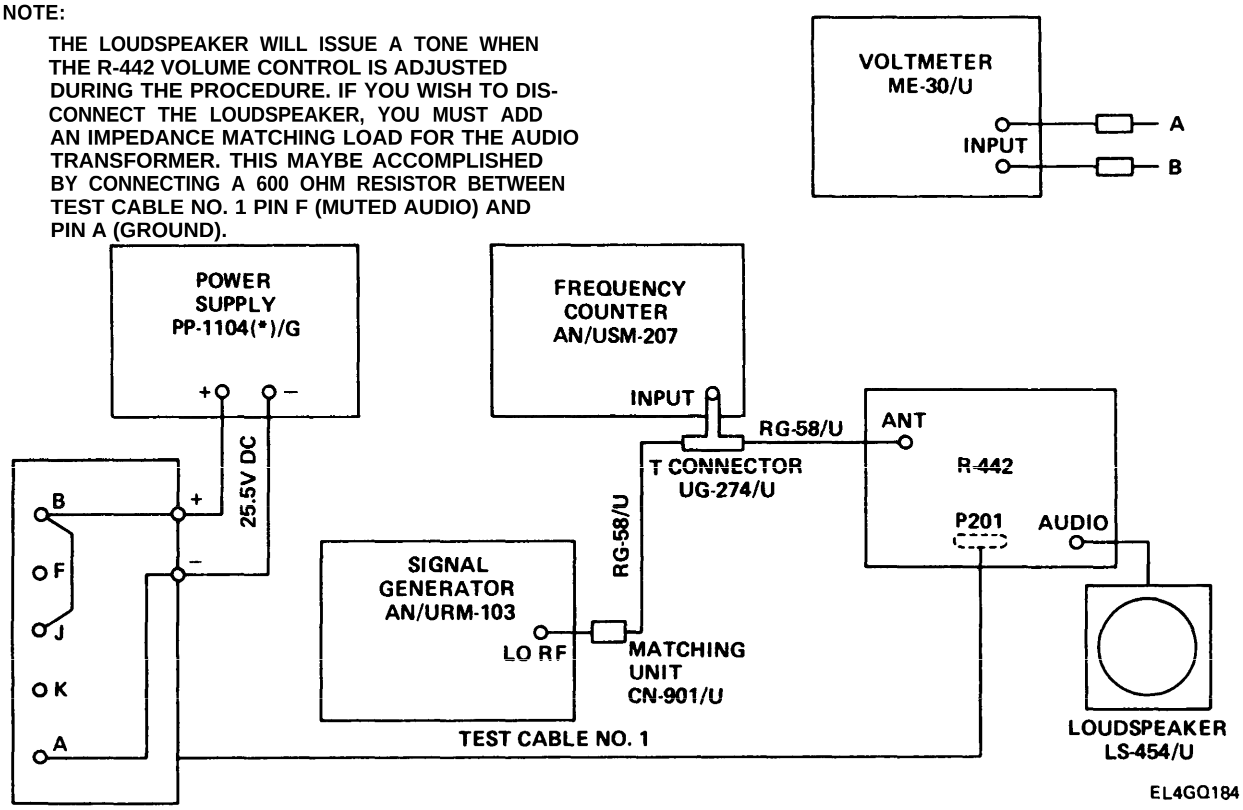


5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-7
A1000 Assembly Troubleshooting
(Sheet 5 of 5)

NOTE:

THE LOUDSPEAKER WILL ISSUE A TONE WHEN THE R-442 VOLUME CONTROL IS ADJUSTED DURING THE PROCEDURE. IF YOU WISH TO DISCONNECT THE LOUDSPEAKER, YOU MUST ADD AN IMPEDANCE MATCHING LOAD FOR THE AUDIO TRANSFORMER. THIS MAYBE ACCOMPLISHED BY CONNECTING A 600 OHM RESISTOR BETWEEN TEST CABLE NO. 1 PIN F (MUTED AUDIO) AND PIN A (GROUND).

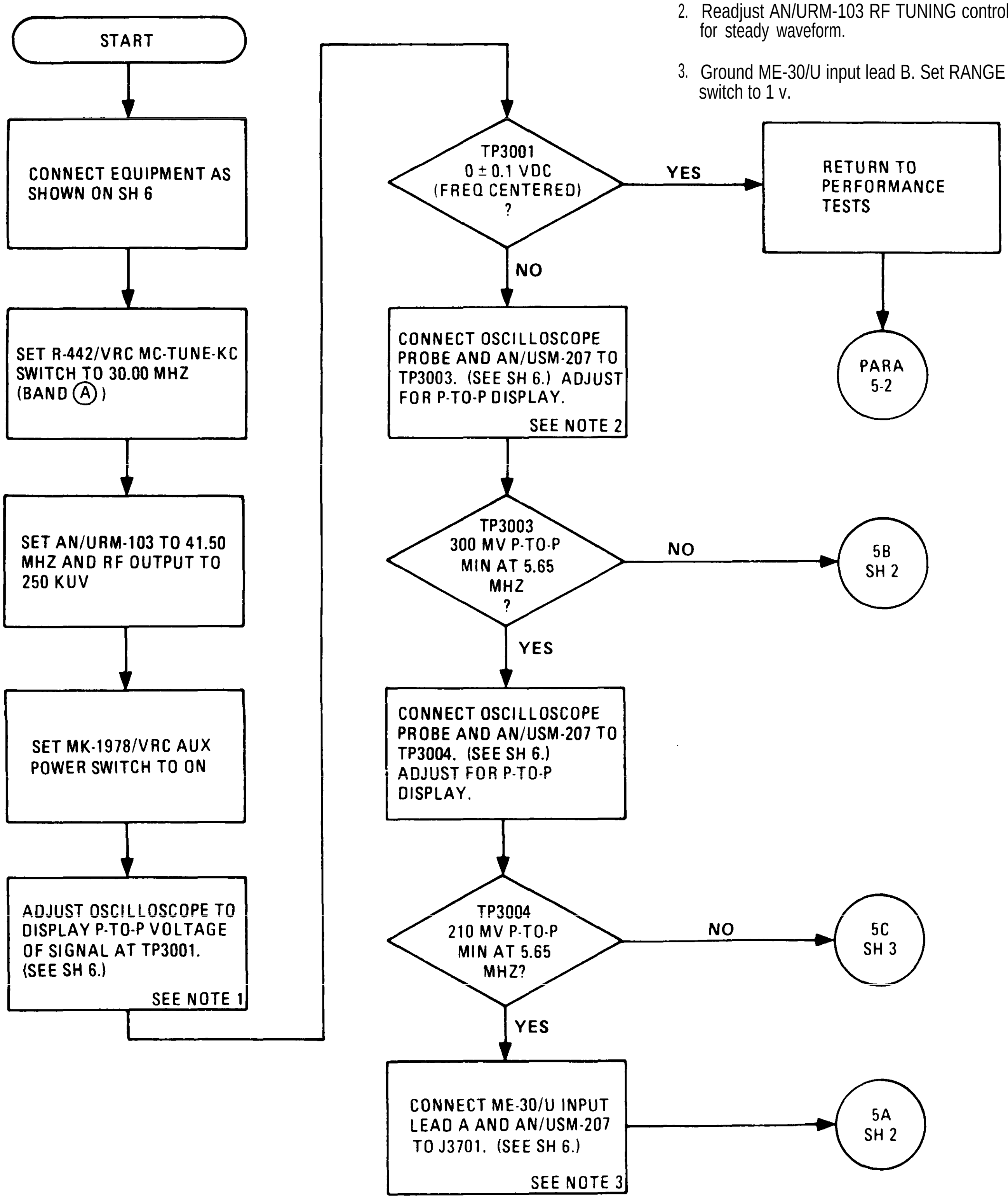


5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 1 of 6)

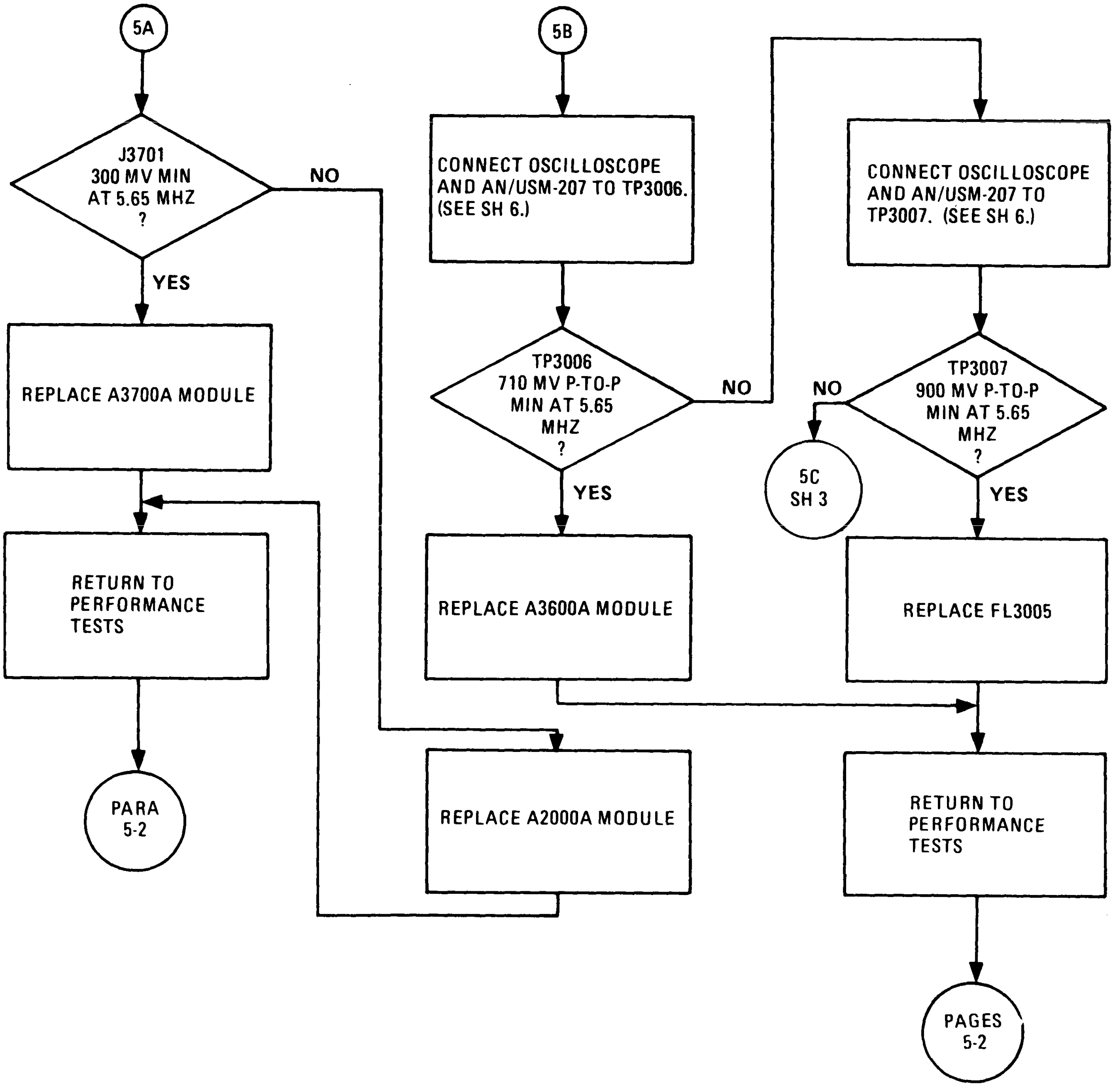
NOTES

1. P-to-P = Peak-to-Peak
2. Readjust AN/URM-103 RF TUNING control for steady waveform.
3. Ground ME-30/U input lead B. Set RANGE switch to 1 v.



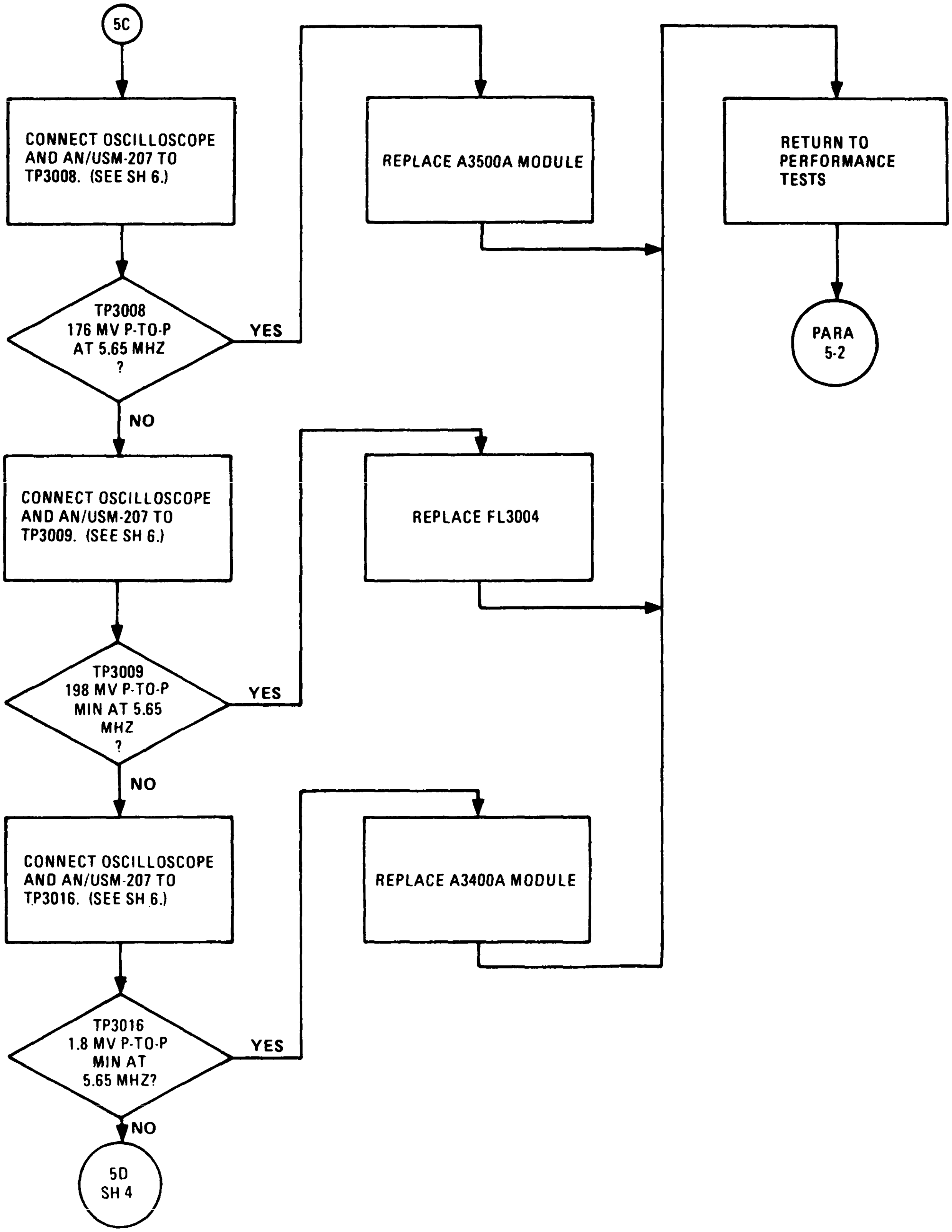
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 2 of 6)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 3 of 6)

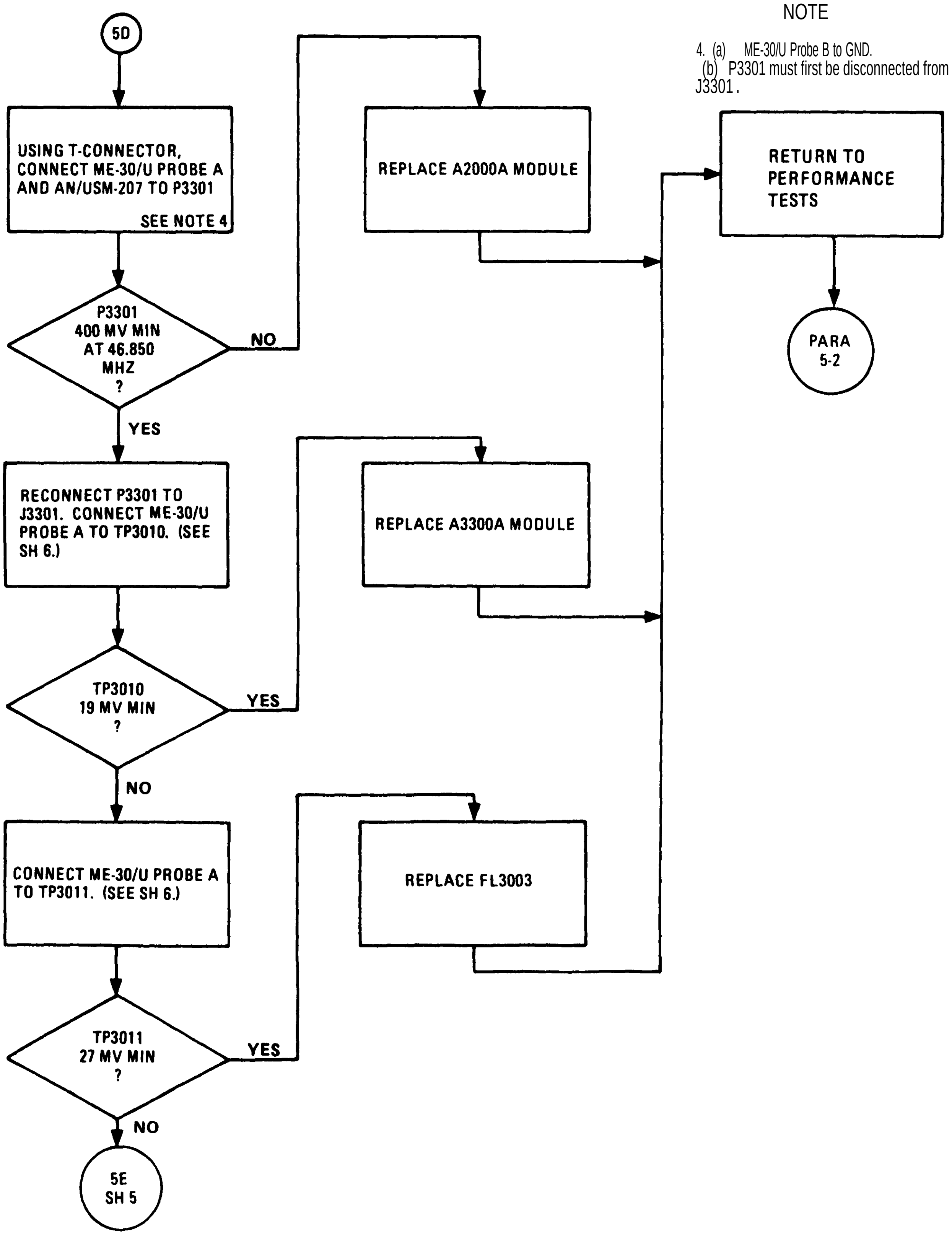


5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 4 of 6)

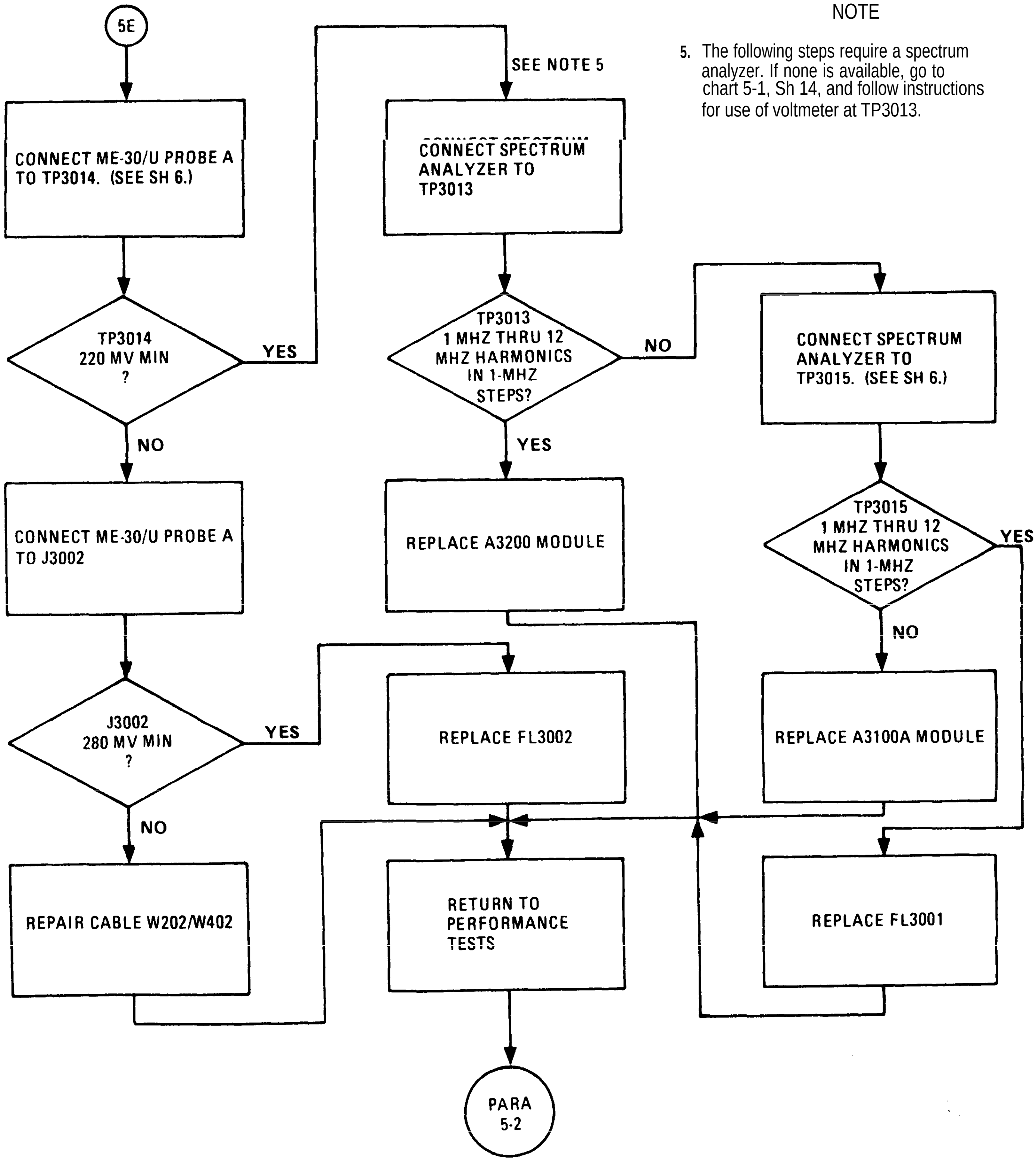
NOTE

4. (a) ME-30/U Probe B to GND.
(b) P3301 must first be disconnected from J3301.



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 5 of 6)

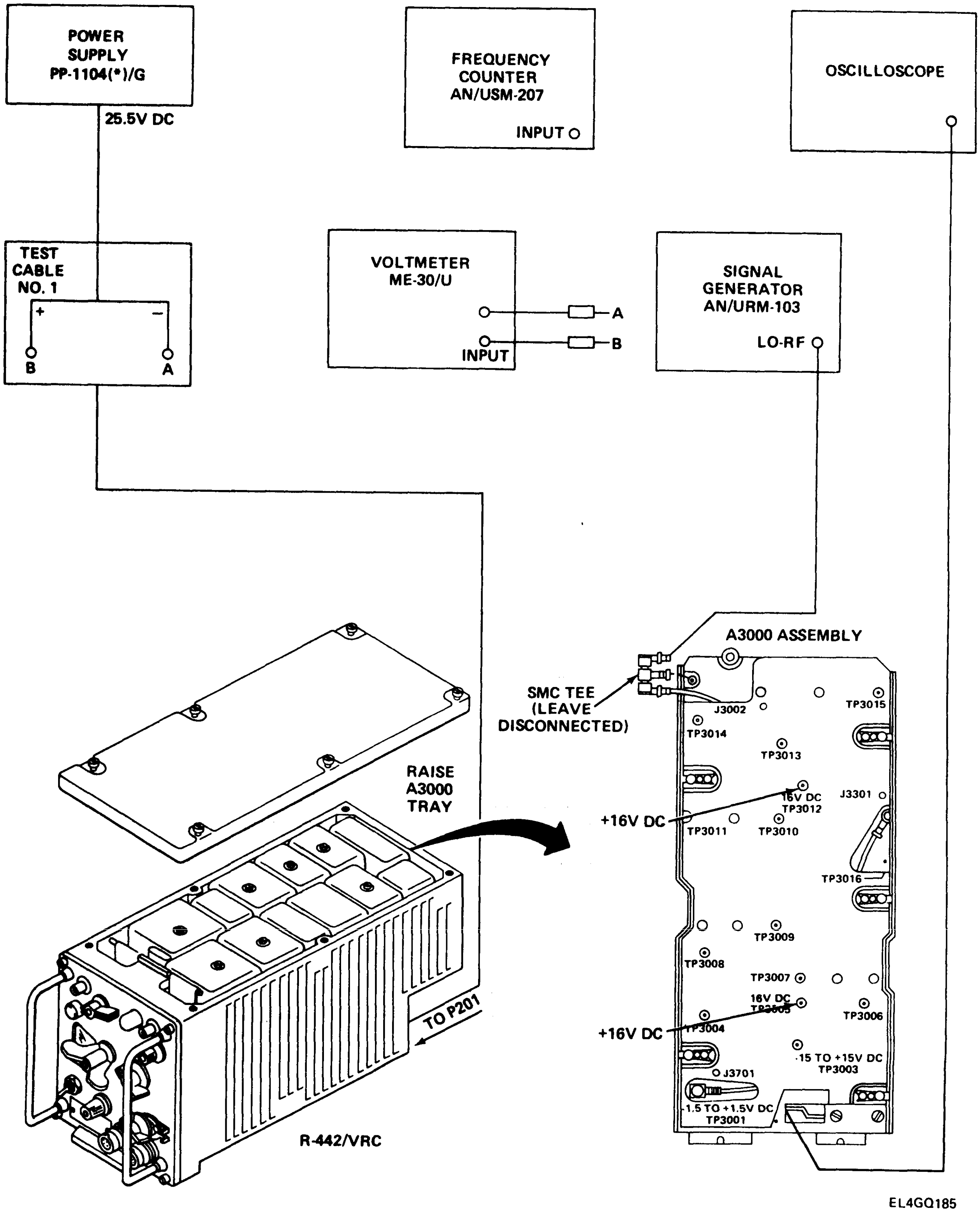


NOTE

5. The following steps require a spectrum analyzer. If none is available, go to chart 5-1, Sh 14, and follow instructions for use of voltmeter at TP3013.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-8
A2000, A3000 Assemblies Troubleshooting
(Sheet 6 of 6)

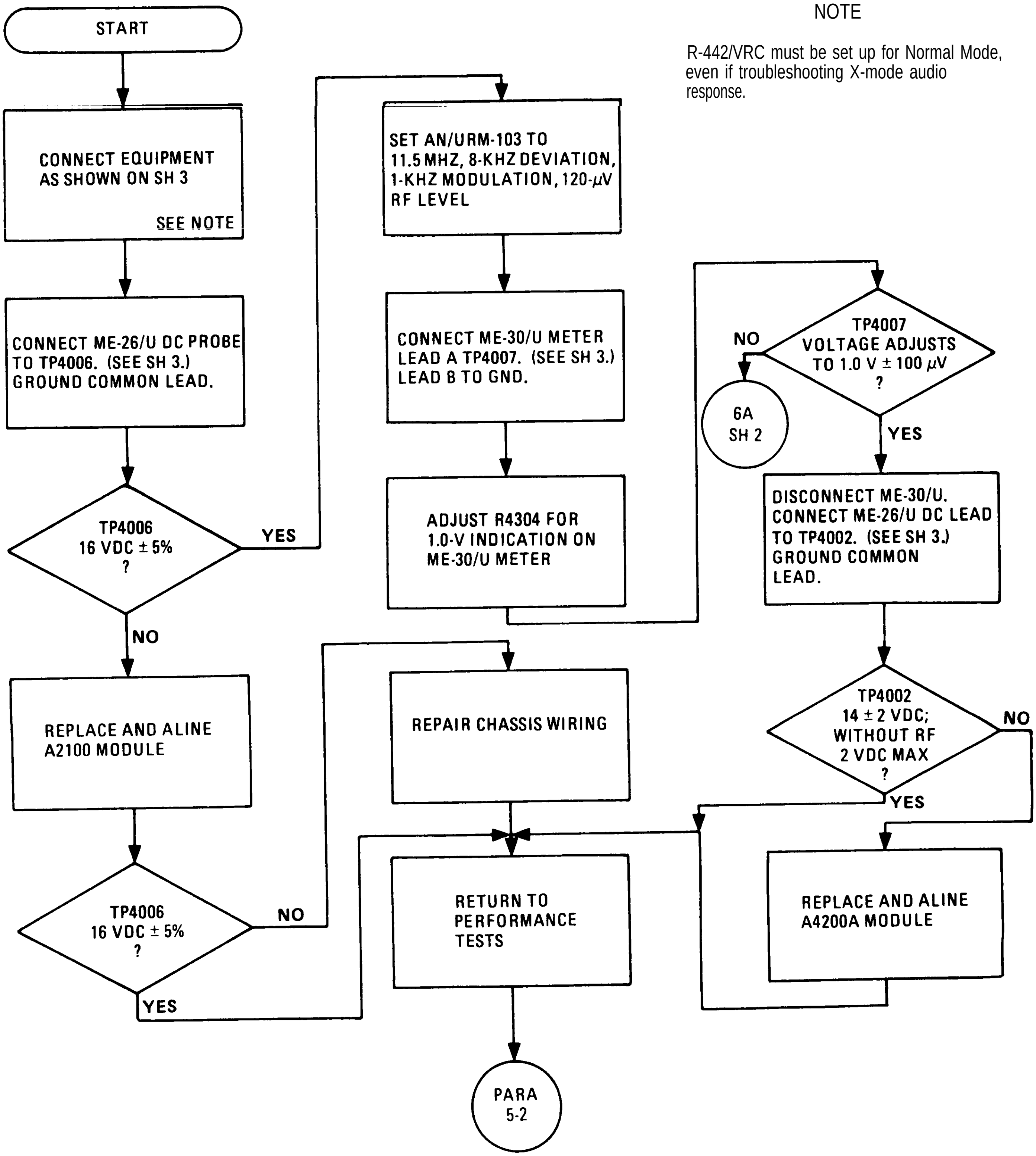


5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-9
A4000 Assembly Troubleshooting
(Sheet 1 of 3)

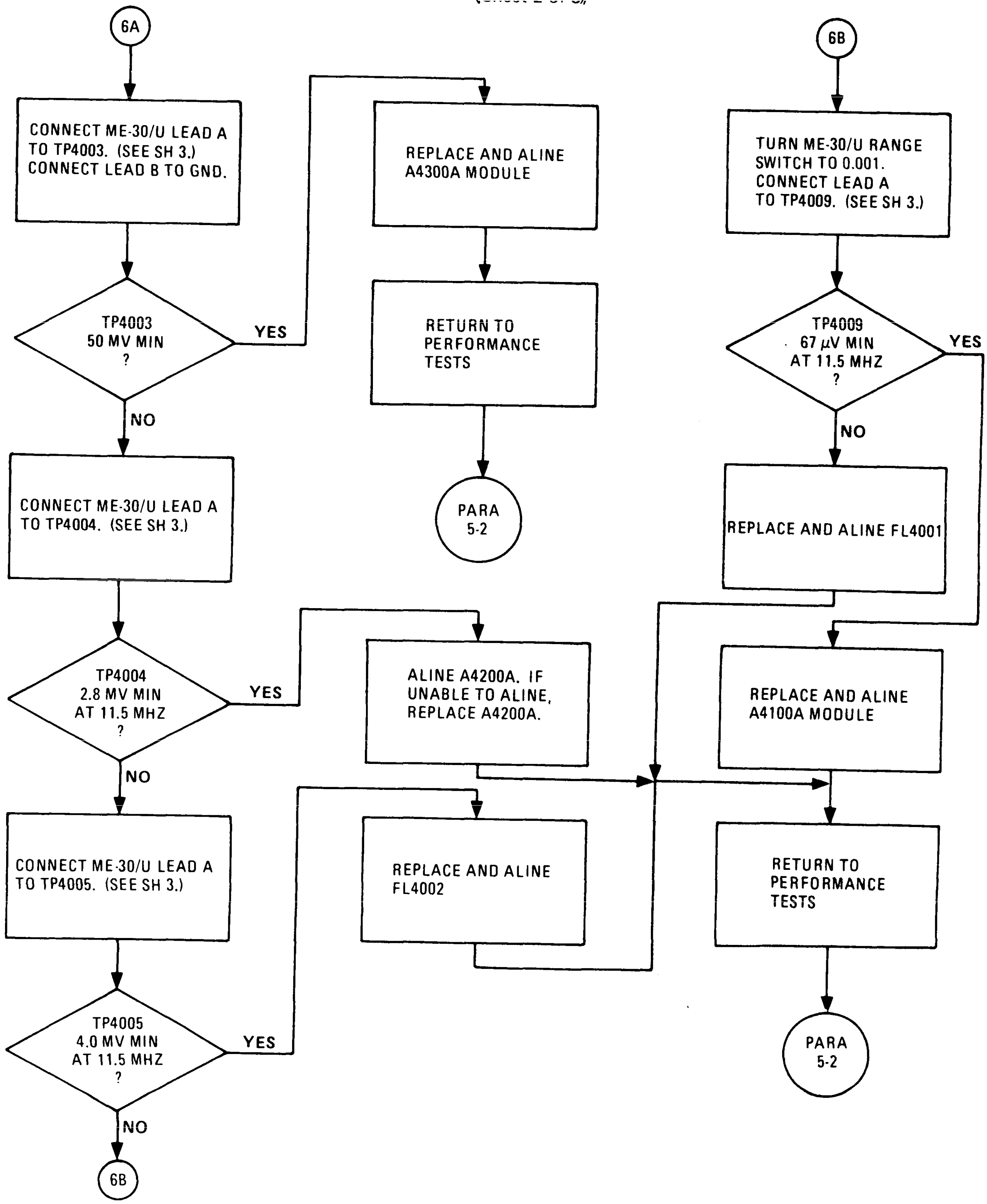
NOTE

R-442/VRC must be set up for Normal Mode, even if troubleshooting X-mode audio response.



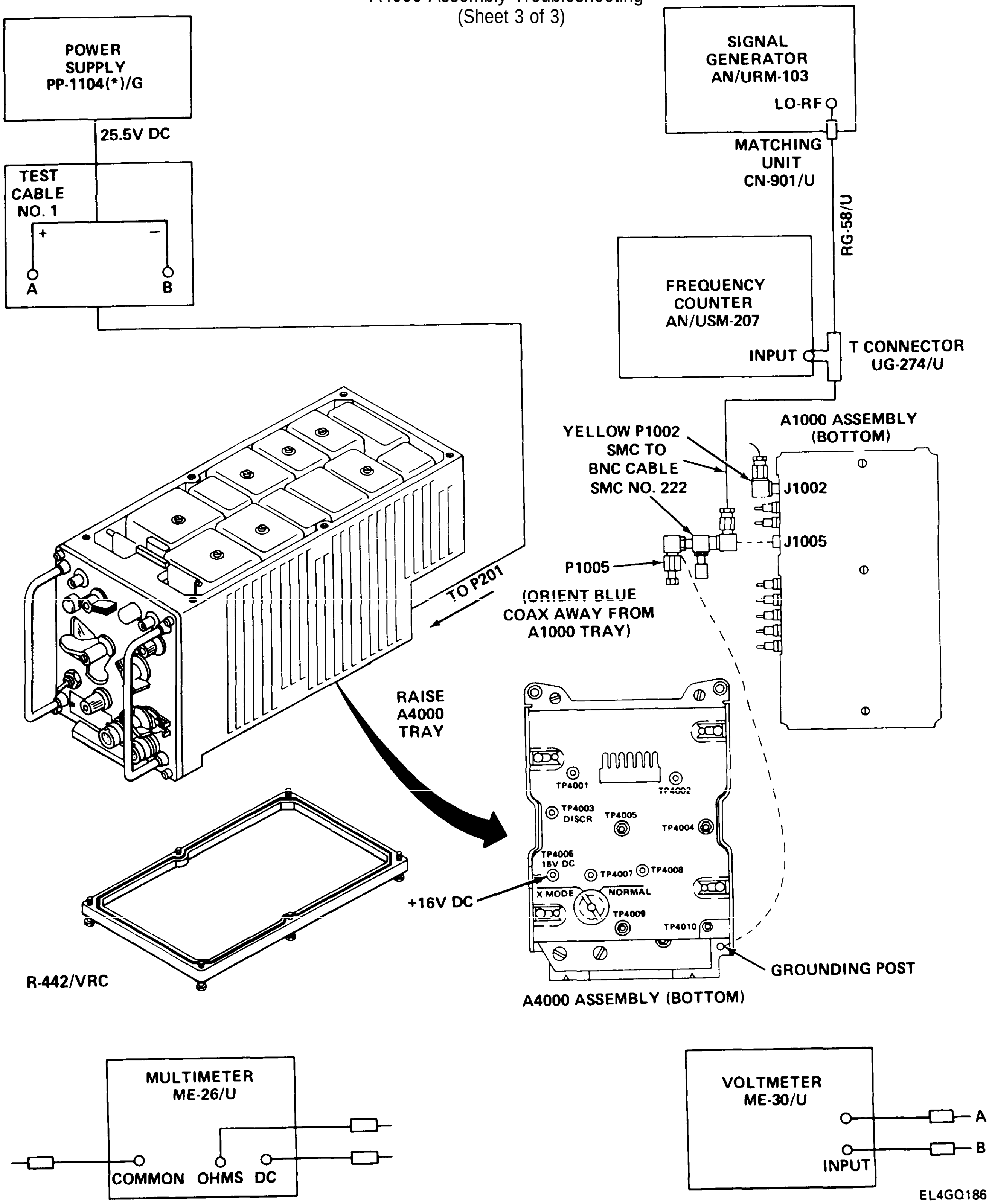
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-9
A4000 Assembly Troubleshooting
(Sheet 2 of 3)



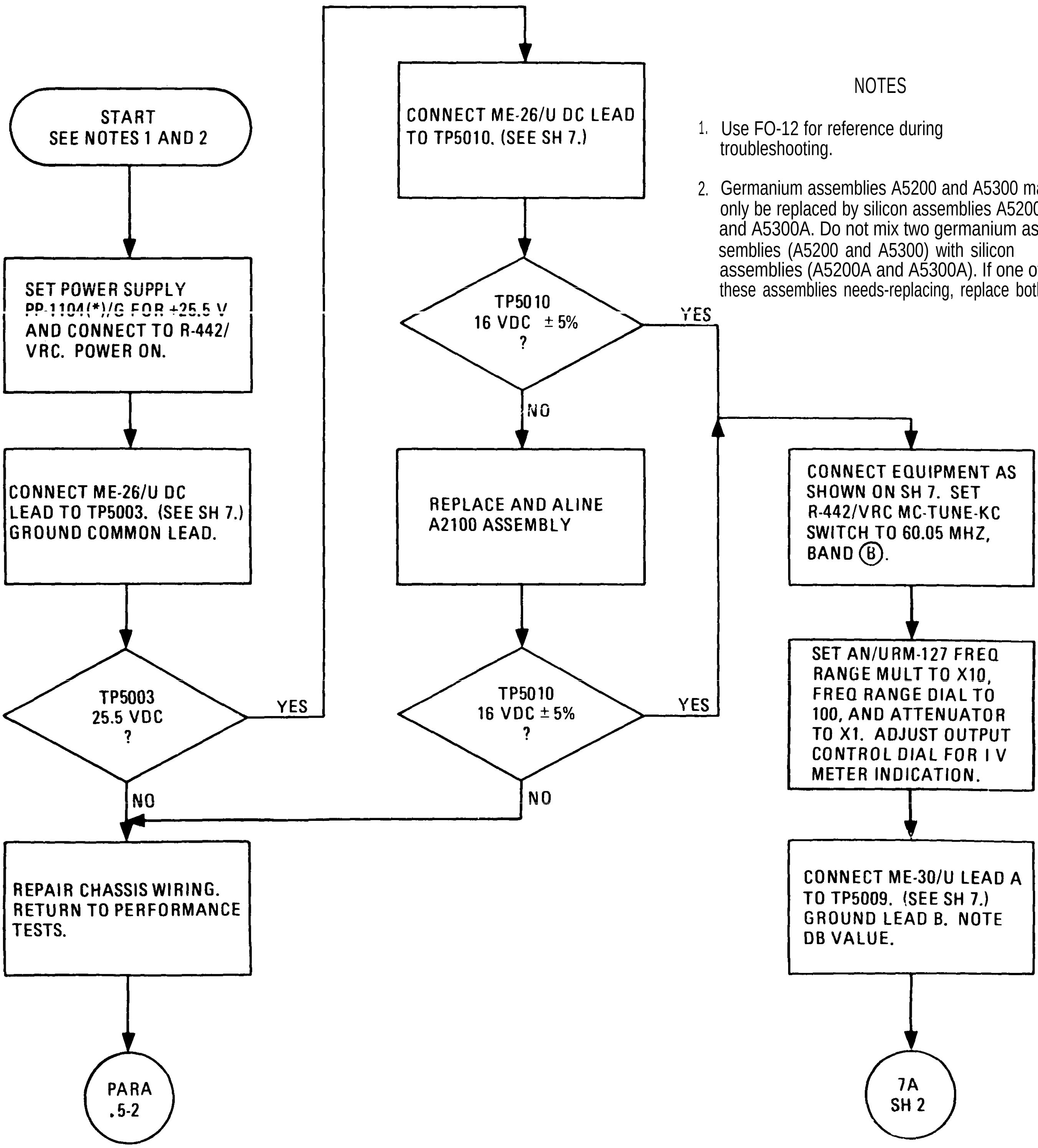
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-9
A4000 Assembly Troubleshooting
(Sheet 3 of 3)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 1 of 8)



NOTES

1. Use FO-12 for reference during troubleshooting.
2. Germanium assemblies A5200 and A5300 mav only be replaced by silicon assemblies A5200A and A5300A. Do not mix two germanium assemblies (A5200 and A5300) with silicon assemblies (A5200A and A5300A). If one of these assemblies needs-replacing, replace both.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

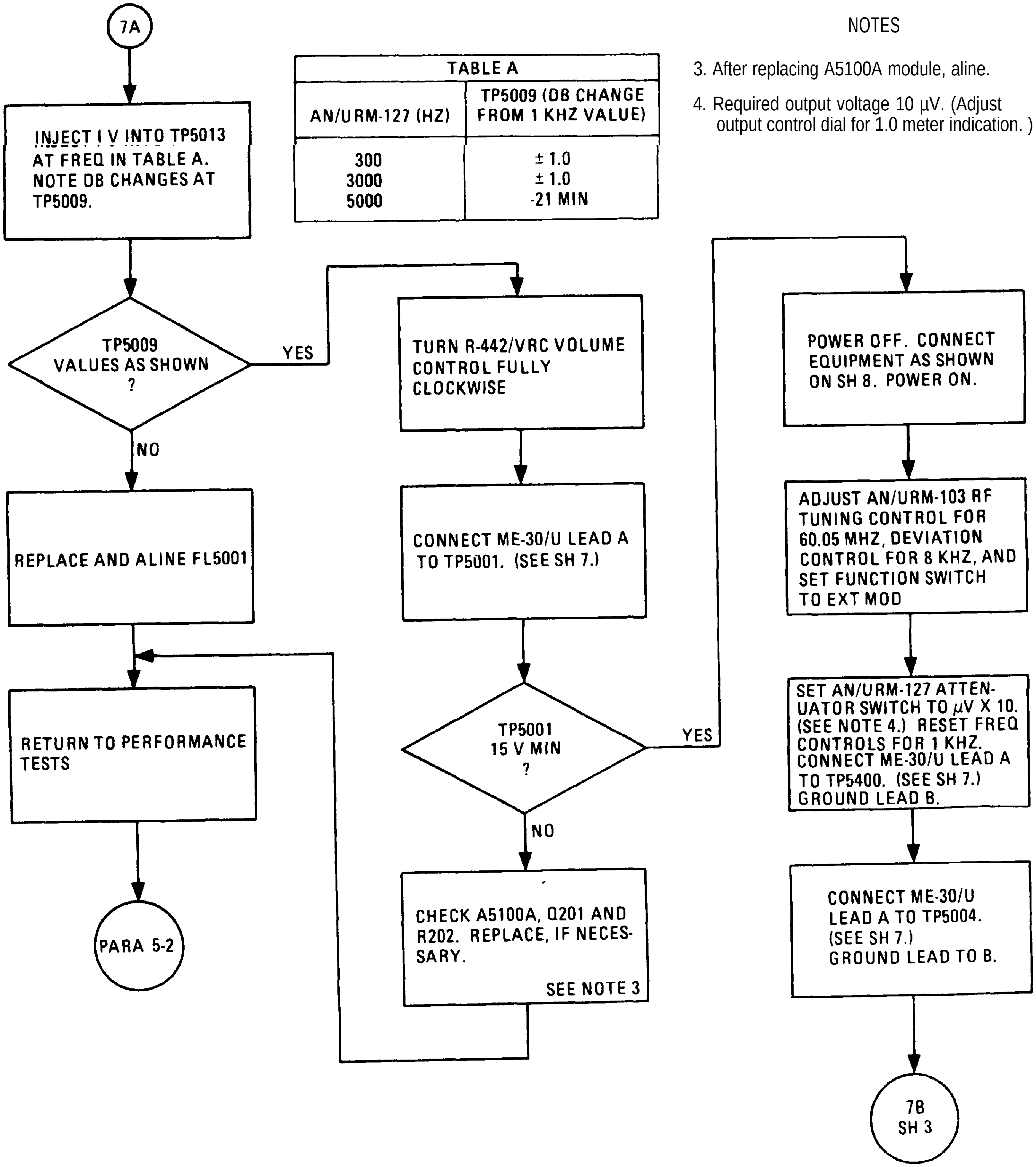
CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 2 of 8)

NOTES

3. After replacing A5100A module, aline.
4. Required output voltage 10 µV. (Adjust output control dial for 1.0 meter indication.)

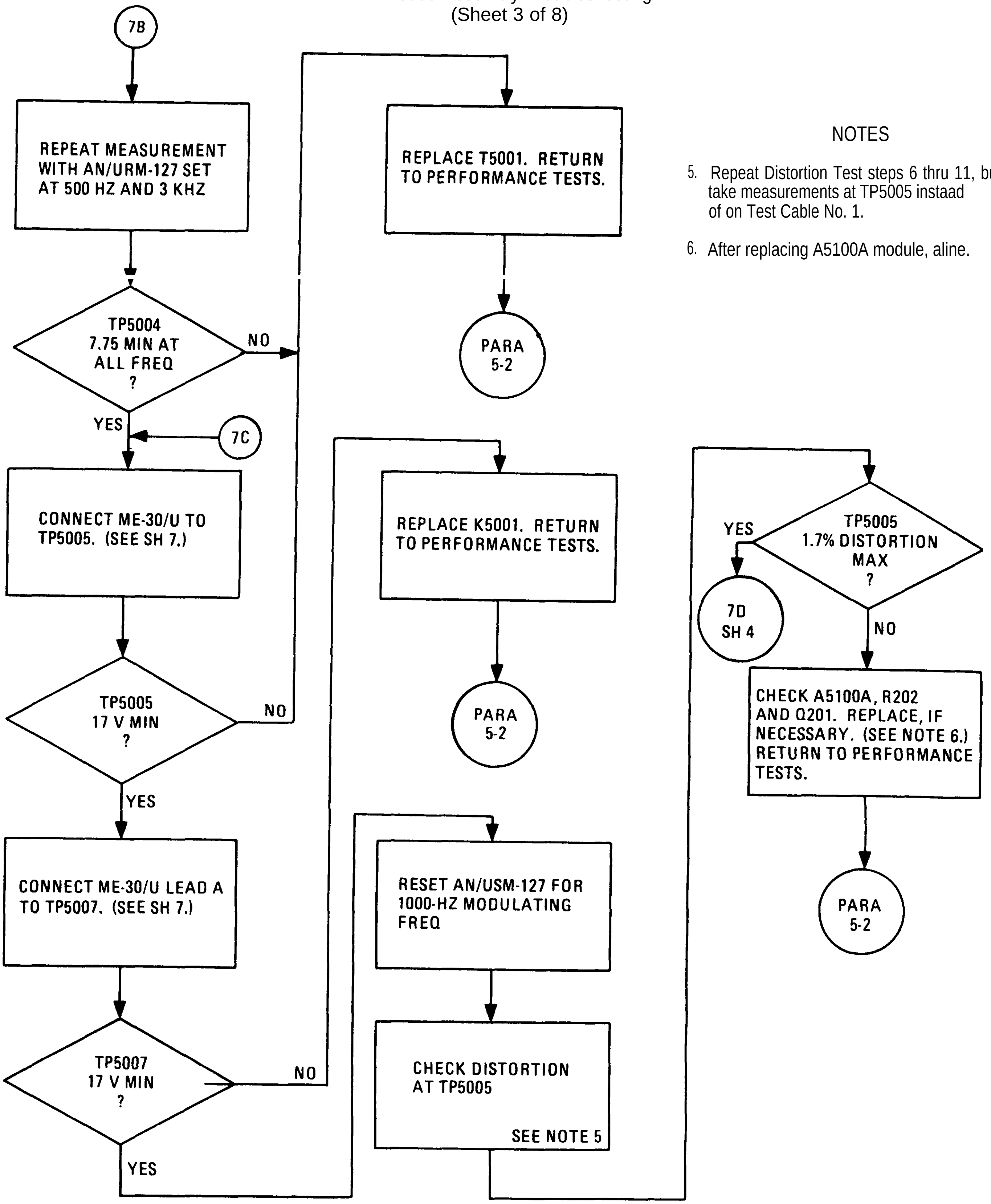
TABLE A

AN/URM-127 (HZ)	TP5009 (DB CHANGE FROM 1 KHZ VALUE)
300	± 1.0
3000	± 1.0
5000	-21 MIN



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 3 of 8)



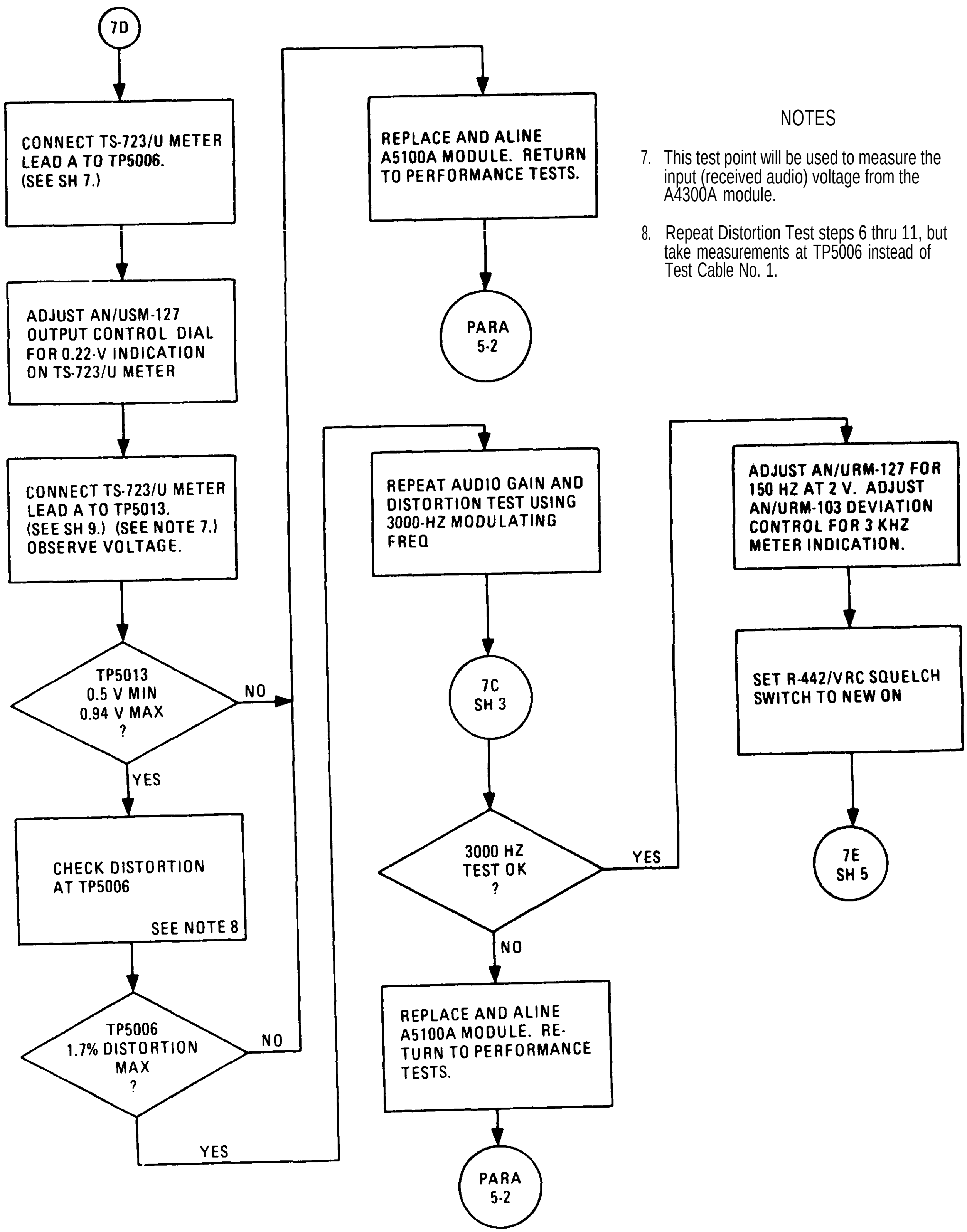
NOTES

5. Repeat Distortion Test steps 6 thru 11, but take measurements at TP5005 instaad of on Test Cable No. 1.

6. After replacing A5100A module, aline.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 4 of 8)



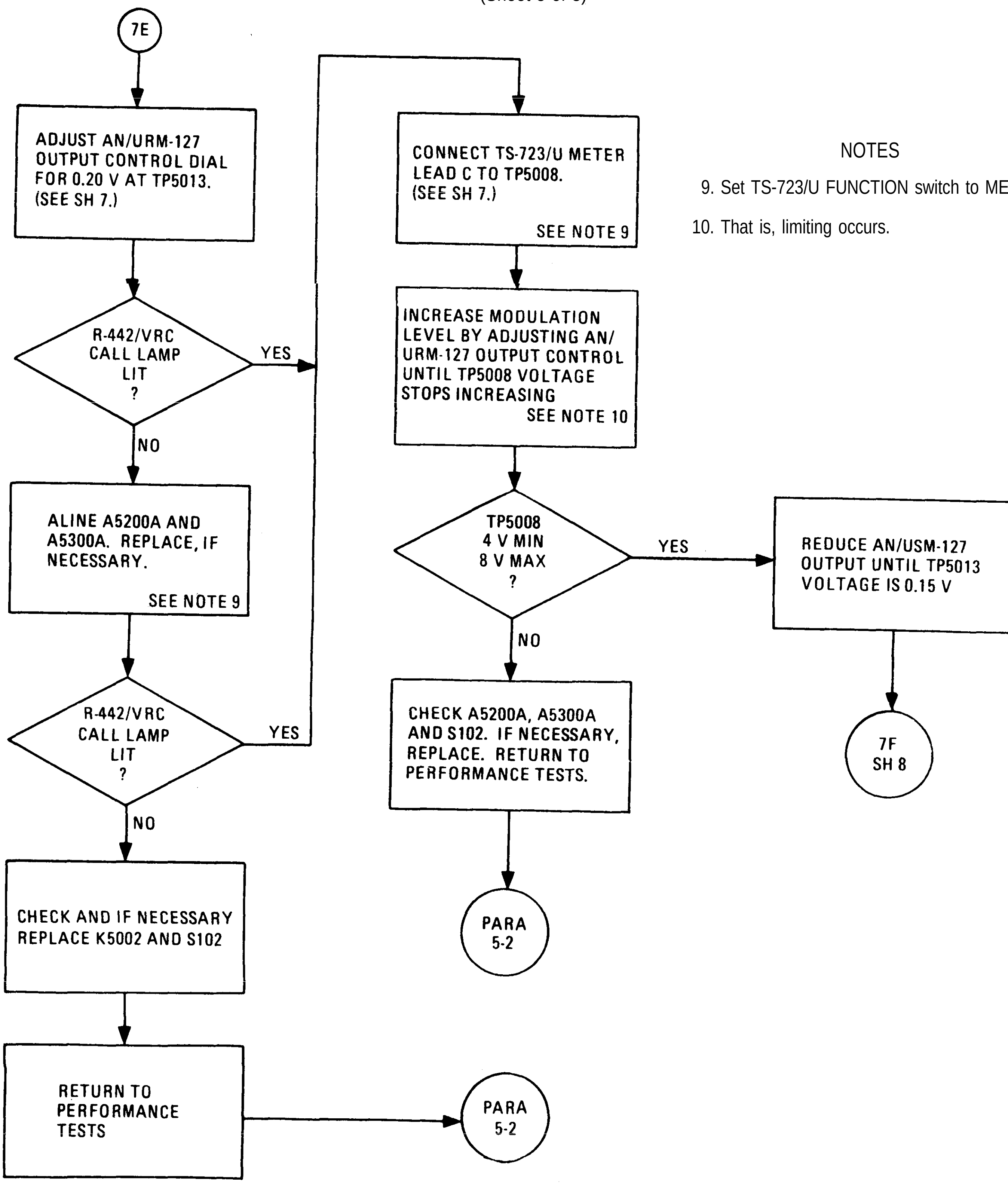
NOTES

7. This test point will be used to measure the input (received audio) voltage from the A4300A module.

8. Repeat Distortion Test steps 6 thru 11, but take measurements at TP5006 instead of Test Cable No. 1.

5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 5 of 8)



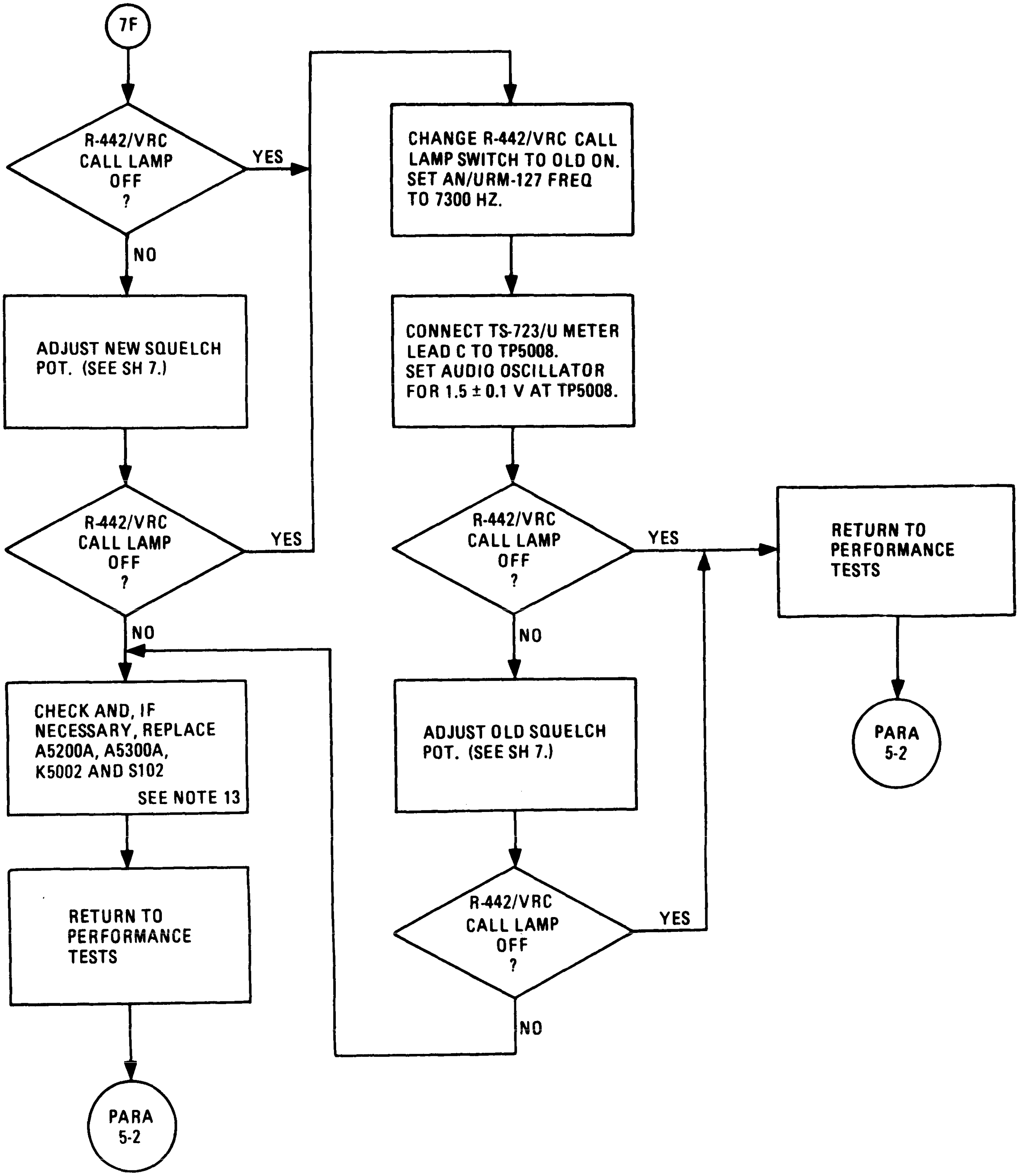
NOTES

9. Set TS-723/U FUNCTION switch to METER.

10. That is, limiting occurs.

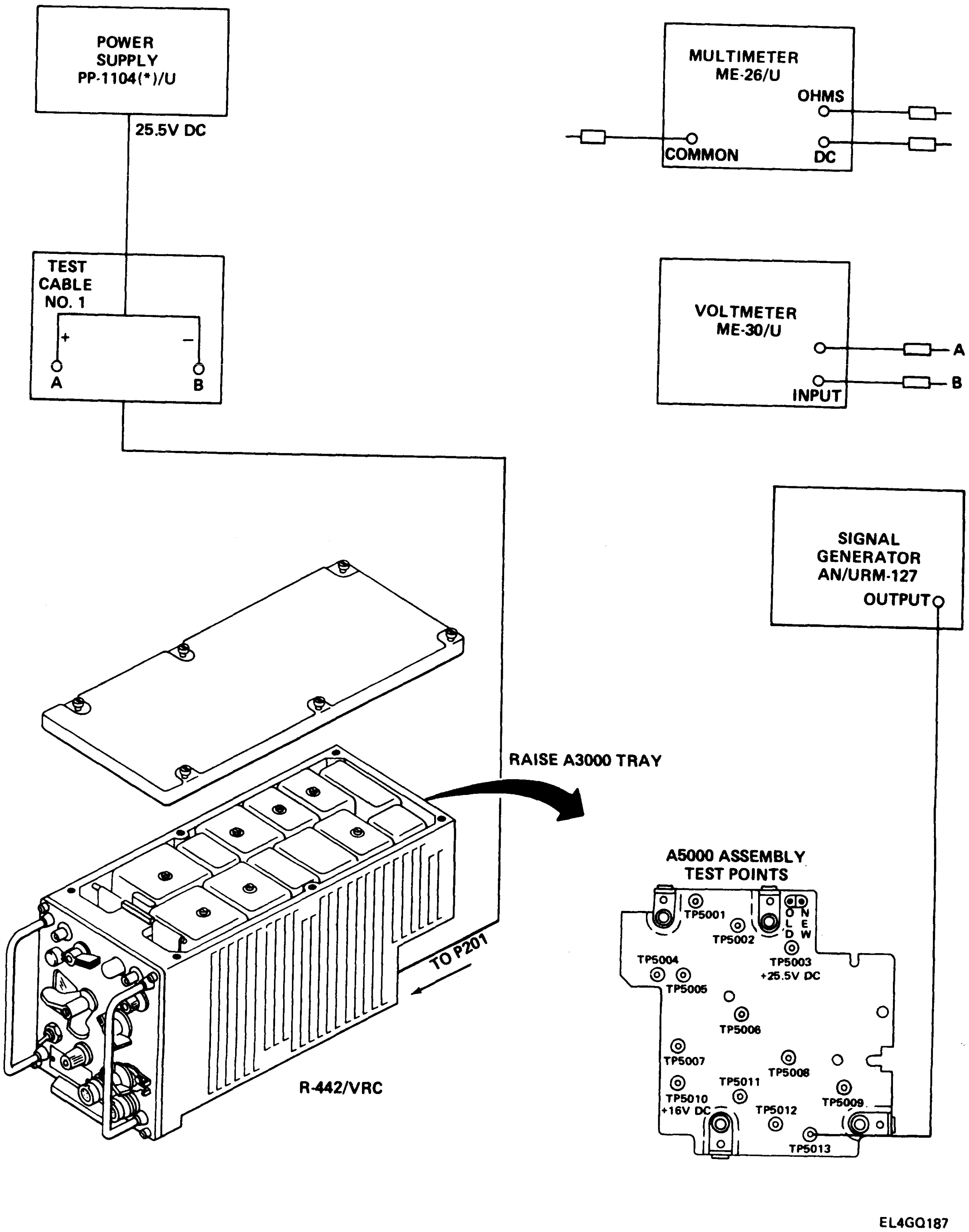
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 6 of 8)



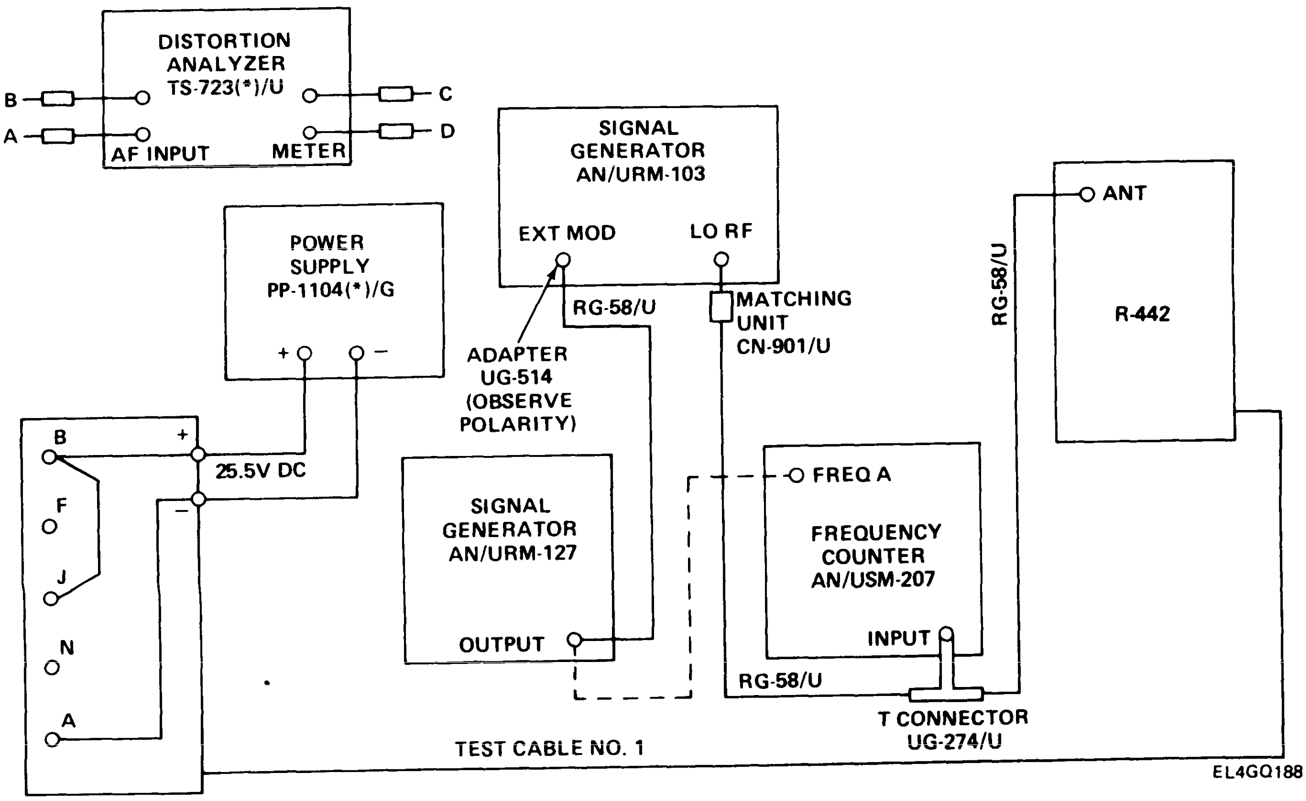
5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 7 of 8)



5-13. TROUBLESHOOTING FLOW CHARTS. (CONT)

CHART 5-10
A5000 Assembly Troubleshooting
(Sheet 8 of 8)



Section III ALINEMENT AND ADJUSTMENT PROCEDURES

5-14. GENERAL.

This section contains alinement instructions for use with Test Cable No. 1 and TMDE (discrete test equipment). The instructions are presented in individual procedures which apply to a specific stage of the receiver.

Except for the local oscillator alinements, each procedure is self-contained; that is, all necessary instructions are provided without reference to any previously performed alinement. Therefore, it is possible to use the procedures in this section to aline an individual module without doing any work on other stages in the radio.

However, this maintenance approach is not recommended. It is best to perform a complete realinement of all modules after replacing an individual module. This should be done even if the radio has undergone its annual realinement less than one year prior to the repair.

Careful performance of all the instructions contained in the alinement procedures ensures that the radio will meet all performance standards outlined in section I of this chapter. Although the radio may seem to work satisfactorily if other quick-fix methods are used, there is no guarantee that such methods will result in proper performance when the radio is used along with secure equipment, or for other than voice communication.

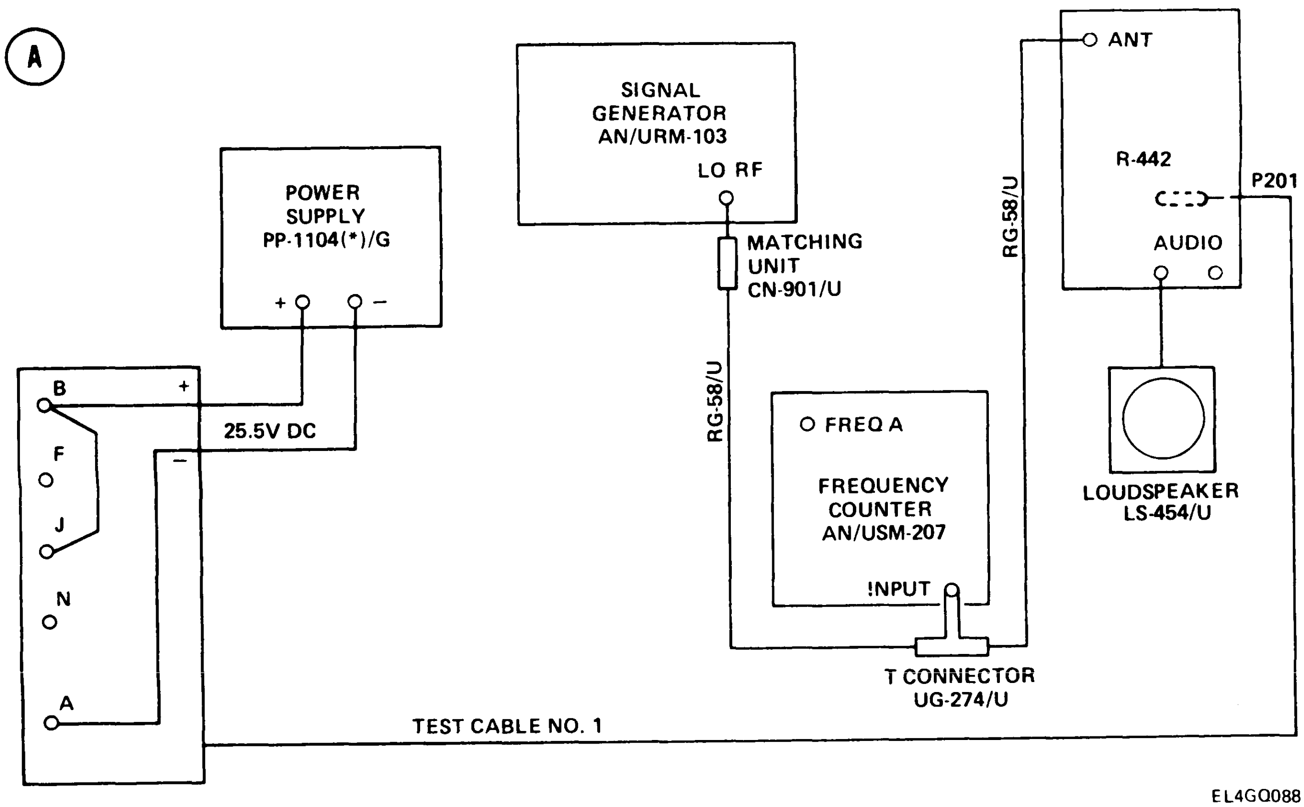
5-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST.

PURPOSE. This test is performed to make sure that the local oscillator will not be pulled off frequency by a malfunctioning CRS. Steps 1 through 8 involve a quick check to determine whether the CRS is putting out an incorrect error signal causing improper local oscillator frequency and loss of audio tone. The remaining steps are done with the local oscillator disconnected from the CRS in order to check CRS performance in response to a nonfluctuating 42.00-MHz signal generator output. If the CRS passes the second part of the test, it will be able to correct normal fluctuation in local oscillator frequency.

TEST EQUIPMENT AND MATERIALS

- Signal Generator AN/URM-103
- Frequency Counter AN/USM-207
- Power Supply PP-1104(*)/G
- Test Cable No. 1
- Rf Cable RG-58/U
- Matching Unit CN-901/U
- T-Connector UG-274/U
- Loudspeaker LS-454/U
- Multimeter ME-26(*)/U
- Amphenol Adapter M-39012/16

TEST SETUP. Connect the equipment as shown in test setup diagram (A). Remove R-442/VRC top and bottom covers. (See paragraph 2-7.)



5-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 100-µv rf at 30 MHz; 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30. 0
	VOLUME	Clockwise one-third turn
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE (allow 15-minute warmup)
	FUNCTION	1000 Hz
	BAND SWITCH	B
	RF TUNING	30.00 (check on counter)
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	100µv
AN/USM-207	POWER	TRACK (allow 5-minute warmup)
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

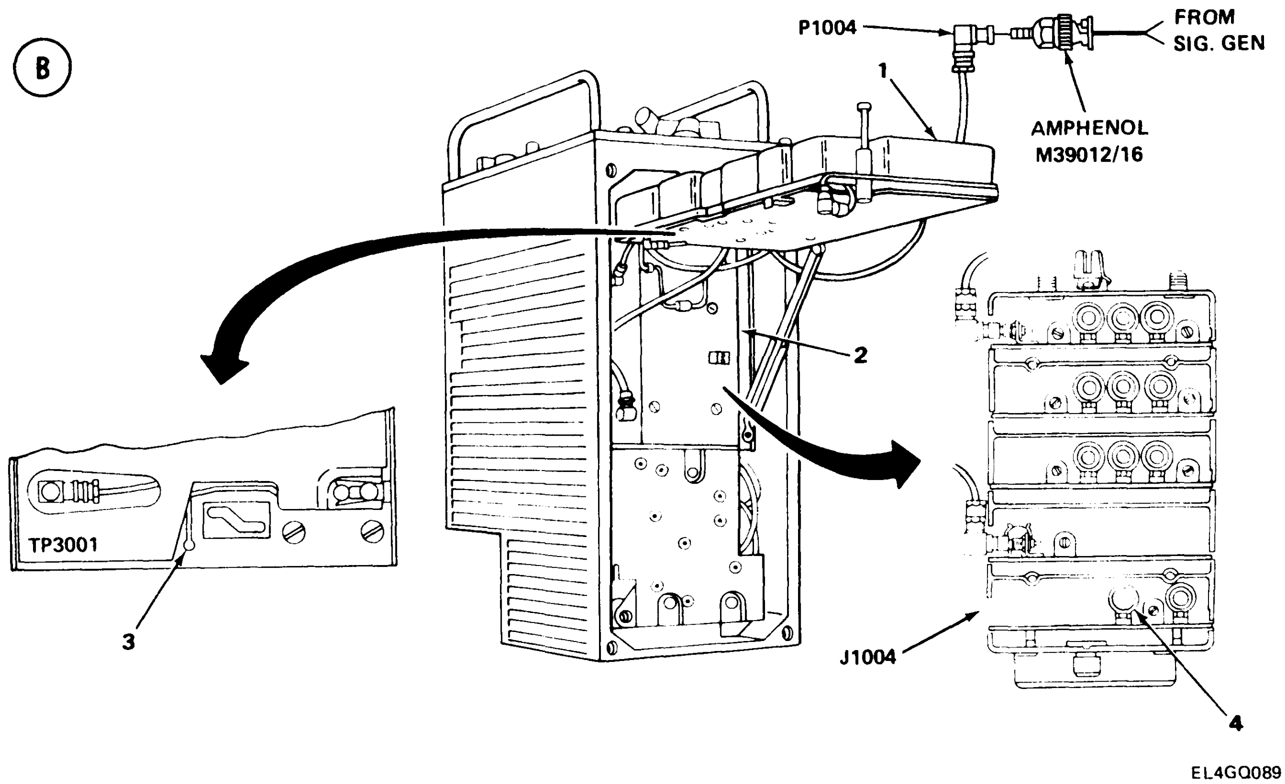
TEST PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µv rf level; then disconnect the T-connector from the counter.

1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz. 1000-Hz tone will be heard on speaker. If no tone is heard, CRS may be defective. Make sure T-connector is disconnected from counter.
2. Adjust R-442/VRC VOLUME control for comfortable level.

5-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)



3. Raise A3000 tray (1). (See test setup diagram B .)
4. Remove A1000 cover (2) and install alinement cover with at least one screw to ensure good ground.
5. Ground TP3001 (3) with screwdriver.
6. Adjust L1502 (4) to get clearest possible 1000-HZ tone from speaker.
7. Remove ground from TP3001. Tone must not change.

NOTE

If the tone heard changes to a rushing noise when step 7 is completed, the CRS is defective. See the troubleshooting section.

8. Set R-442/VRC MC-TUNE-KC control to 40.00 MHz, then back to 30.00 MHz. Tone must not change.

NOTE

If the tone changes after step 8 is completed, the CRS may be defective. See the troubleshooting section.

9. Set R-442/VRC MC-TUNE-KC control to 30.50 MHz.
10. Remove rf cable and matching unit from AN/URM-103 LO-RF jack and insert in HI-RF jack.
11. Remove P1004 from J1004 on A1000 tray.
12. Remove rf cable from ANT jack on R-442/VRC.
13. Connect rf cable to P1004 using Amphenol Adapter M-39012/16.

5-15. CRYSTAL REFERENCE SYSTEM (CRS) TEST. (CONT)

14. Connect T-connector to frequency counter.
15. Set AN/URM-103 RF OUTPUT control to 125 KUV.
16. Adjust AN/URM-103 RF TUNING control for 42.00-MHz output. Verify frequency on frequency counter.
17. Set ME-26(*)/U to 3-vdc scale and turn ZERO ADJ for midscaie reading.
18. Connect ME-26(*)/U positive lead to TP3001 (3) and negative lead to ground.
19. Check reading on ME-26(*)/U. Meter should read zero vdc (midscale), with Slight fluctuation.

NOTE

If ME-26(*)/U reads greater than + 0.32 vdc or less than -0.32 vdc, the CRS is defective. See the troubleshooting section.

20. Slowly turn AN/URM-103 RF TUNING control to increase output frequency to 42.25 MHz. Note change in reading on ME-26(*)/U.
21. Slowly turn AN/URM-103 RF TUNING control to decrease output frequency to 41.75 MHz. Note change in reading on ME-26(*)/U.

NOTE

In steps 20 and 21, ME-26(*)/U should vary smoothly at least + 0.5 vdc and then at least -0.5 vdc. If not, the CRS is defective. See the troubleshooting section.

22. Proceed to paragraph 5-16, Local Oscillator A1500 Alinement.

5-16. LOCAL OSCILLATOR A1500 ALINEMENT.

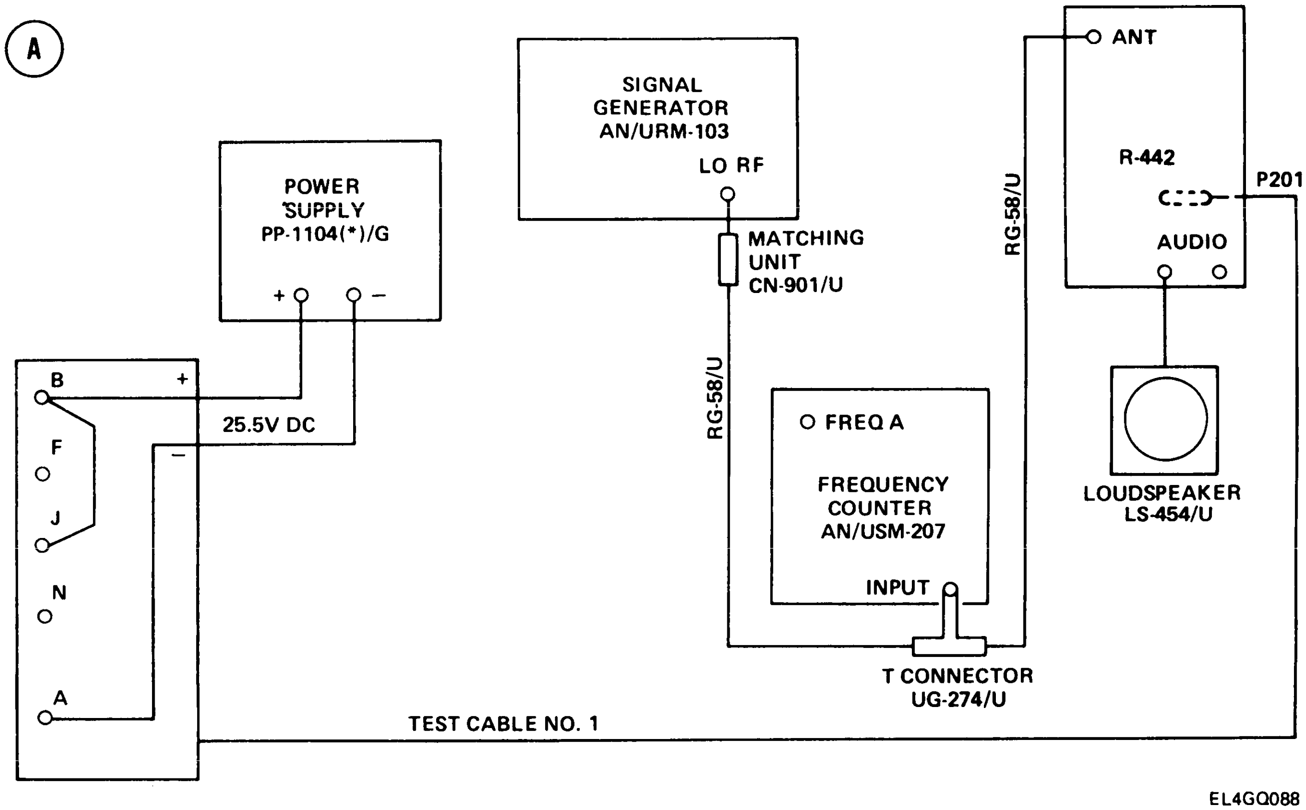
PURPOSE. If the local oscillator is operating at the correct frequency, the CRS will not ouput a dc error signal. This procedure alines the oscillator by tuning its circuits to bring the CRS error signal as close to zero as possible. The Crystal Reference System Test (paragraph 5-15) must be done prior to performing this alinement.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Multimeter ME-26(*)/U

5-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

TEST SETUP. Connect the equipment as shown in test setup diagram (A) . Remove R-442/VRC top cover. (See paragraph 2-7.) Connect P1004 to J1004 on the A3000 tray.



INITIAL EQUIPMENT CONTROL SETTINGS. Change the final settings used in the CRS Test as follows:

1. Set AN/URM-103 RF OUTPUT switch to 0-10 KUV.
2. Adjust AN/URM-103 RF TUNING control for 42.00-MHz output.

NOTE

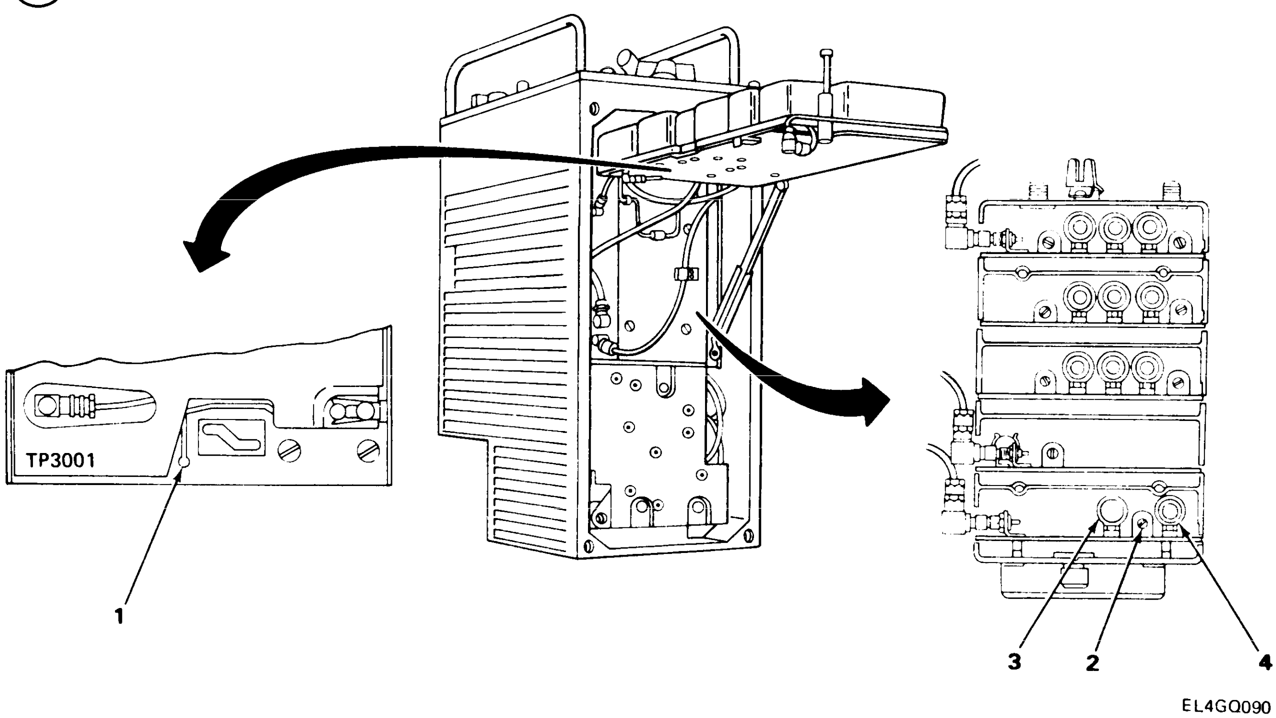
Check the frequency counter to make sure that the signal generator is outputting exactly 42 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µV rf level; then disconnect the T-connector from the counter.

3. Set R-442/VRC MC-TUNE-KC control to 42.00 MHz.
4. Adjust AN/URM-103 DEVIATION control for 8-kHz reading on DEVIATION KHZ meter.

5-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

ALINEMENT PROCEDURE

B



1. Connect ME-26(*)/U positive lead to TP3001 (1) and negative lead to ground. (See test setup diagram B .)
2. Adjust C1501 (2) for clear audio tone and zero-volt reading on ME-26(*)/U. Zero-volt reading means zero deflection from 1.5 v center of scale.
3. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
4. Connect AN/USM-207 to T-connector.
5. Adjust AN/URM-103 RF TUNING control for 30.00-MHz output.

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µv rf level; then disconnect the T-connector from the counter.

6. Adjust L1502 (3) for clear audio tone and zero-volt reading on ME-26(*)/U.
7. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
8. Connect AN/USM-207 to T-connector.
9. Adjust AN/URM-103 RF TUNING control for 52.00-MHz output.

5-16. LOCAL OSCILLATOR A1500 ALINEMENT. (CONT)

10. Adjust L1501 (4) for clear audio tone and zero-volt reading on ME-26(*)/U. (See test setup diagram B, page 5-95.)
11. Set R-442/VRC to 42.00 MHz and AN/URM-103 to 42 MHz.
12. Repeat steps 2 through 10 to make sure that local oscillator tracks with no more than 0.5-vdc error signal required in any of the three test frequencies.

NOTE

If the ME-26(*)/U indicates more than + 0.5 vdc or less than -0.5 vdc in any frequency, and repetition of steps 2 through 10 does not correct the problem, replace the A1500 assembly.

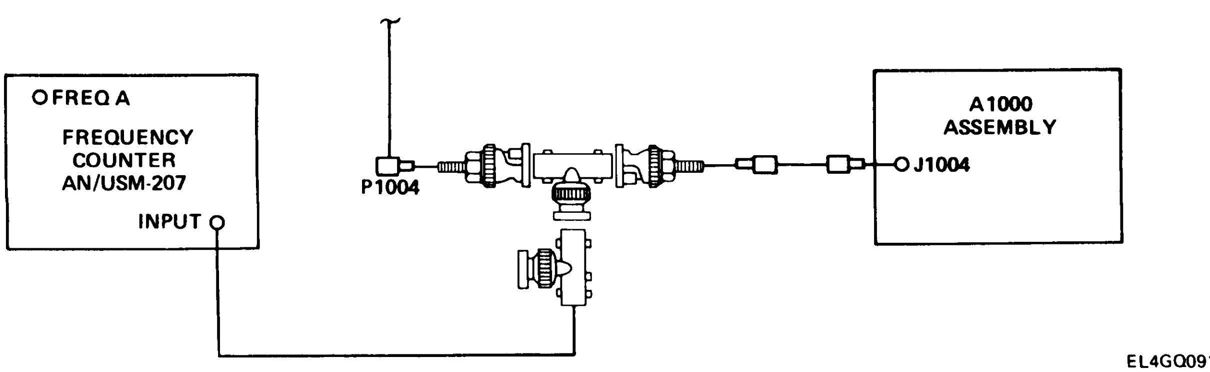
5-17. LOCAL OSCILLATOR A1500 ALTERNATE ALINEMENT PROCEDURE.

PURPOSE. This procedure permits alinement of the local oscillator without the use of a signal generator. The frequency of the local oscillator is checked directly with a counter; therefore, the presence of an audible audio tone is not important. Thus, alinement does not depend on the performance of the A4000 or A5000 sections of the receiver. The CRS Test (paragraph 5-15) must be done prior to performing this alinement.

TEST EQUIPMENT AND MATERIALS

Frequency Counter AN/USM-207
Amphenol Adapters (two) M-39012/16
T-Connectors (two) UG-274/U
Multimeter ME-26(*)/U
One extra SMC rf cable

TEST SETUP. Connect equipment as shown in test setup diagram A .

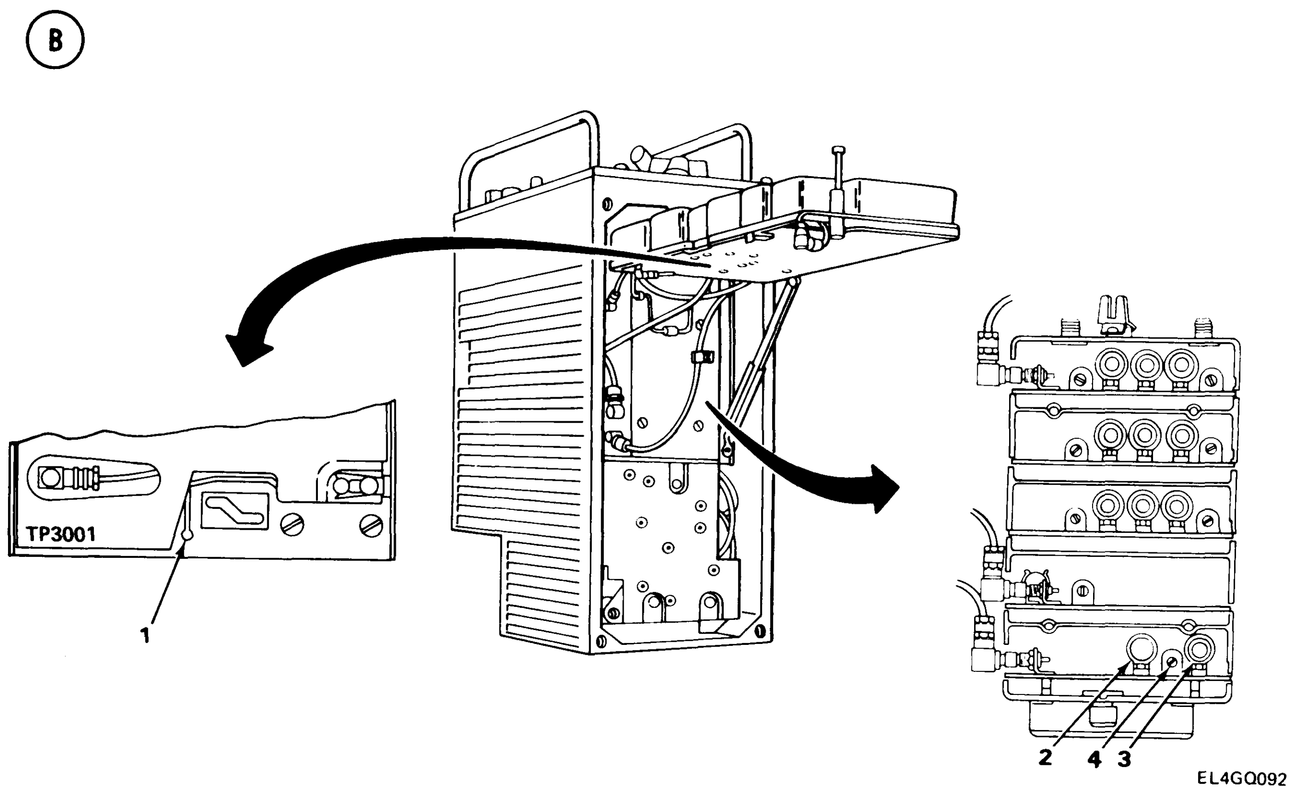


5-17. LOCAL OSCILLATOR A1500 ALTERNATE ALINEMENT PROCEDURE. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Change the final settings used in the CRS test as follows:

1. Set R-442/VRC MC-TUNE-KC control to 30.00 MHz.
2. Set AN/USM-207 SENSITIVITY switch as necessary to trigger frequency counter.

ALINEMENT PROCEDURE



1. Connect M&26(*)/U positive lead to TP3001 (1) and negative lead to ground. (See test setu~ diagram (B) .)

NOTE

In the following adjustments, it may not be possible to achieve zero-frequency error and zero-vdc indication on the ME-26(*)/U. Local oscillator tolerance with the CRS connected is ± 3.5 kHz. The ME-26(*)/U should not exceed ± 0.5 vdc.

2. Adjust L1502 (2) for 41.5-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
3. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
4. Adjust L1501 (3) for 63.5-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
5 Set R-442/VRC to 42.00 MHz.
6. Adjust C1501 (4) for 53.5-MHz reading on counter and zero vdc (midscale) on ME-26(*)/U.
7. Set R-442/VRC to 30.00 MHz.
8. Repeat steps 2 through 6 until ME-26(*)/U reads zero vdc for all three frequencies.
9. Reconnect P1004 to J1004.

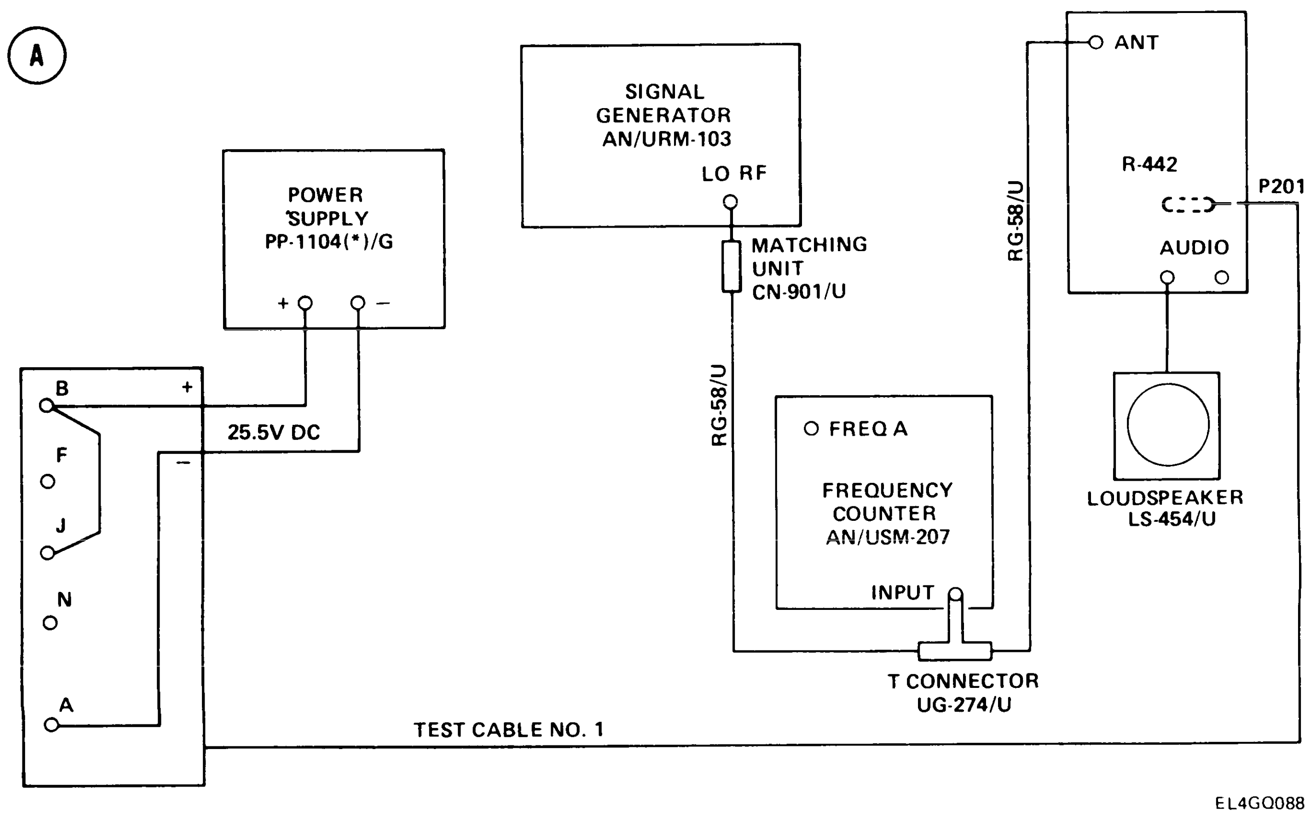
5-18. TUNER A1000 ALINEMENT.

PURPOSE. This procedure tunes the A1000 assembly to produce maximum amplification of low-level signals and maximum attenuation of noise.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frquency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect equipment as shown in test setup diagram (A).



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject unmodulated rf carrier at 30, 52, 53, 75, 65, and 52 MHz, in that order. Rf output level will vary according to alinement requirements.

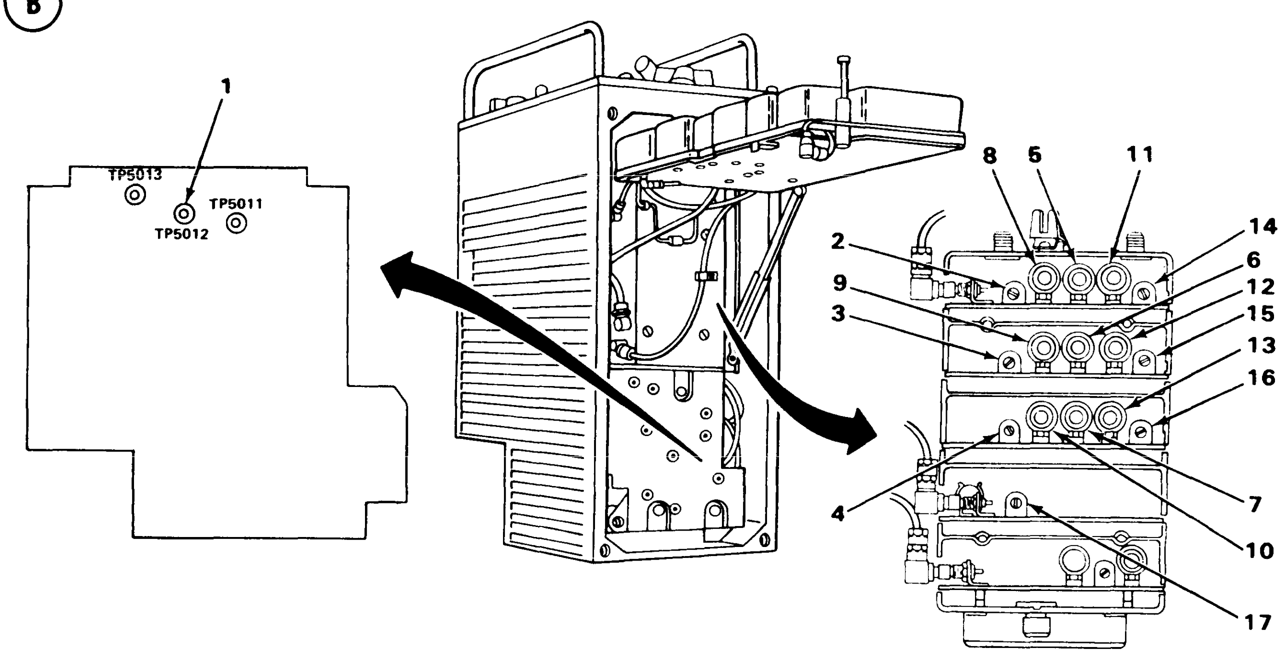
5-18. TUNER A1000 ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	SQUELCH	NEW OFF
	VOLUME	Fully clockwise
AN/URM-103	FUNCTION	MOD OFF
	RF OUTPUT	LO, 0-10 KUV
	LO RF UV	Set to zero output
	BAND SWITCH	B
	RF TUNING	30.00
	OPERATE/OFF/STAND BY	OPERATE
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

ALINEMENT PROCEDURE

B



EL4GQ093

5-18. TUNER A1000 ALINEMENT. (CONT)

30-M Hz Test

1. Check AN/URM-103 frequency output on frequency counter, then disconnect from counter.
2. Set ME-30(*)/U to 3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5012 (1), and negative lead to ground. (See test setup diagram B, page 5-99.)
4. Note reading on ME-30(*)/U.
5. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 3 reading.
6. Adjust C1104 (2), C1205 (3), and C1305 (4) for lowest possible ME-30(*)/U reading and minimum noise from speaker.

52-MHz Test

7. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
8. Adjust AN/URM-103 RF TUNING control to 52.00 MHz. Check on frequency counter.
9. Set AN/URM-103 LO RF UV control for zero-rf output.
10. Note reading on ME-30(*)/U.
11. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 10 reading.
12. Adjust L1102 (5), L1202 (6), and L1302 (7) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B .)

53-MHz Test

13. Set R-442/VRC MC-TUN E-KC control to 53.00 MHz.
14. Adjust AN/URM-103 RF TUNING control to 53.00 MHz. Check on frequency counter.
15. Set AN/URM-103 LO RF UV control for zero-rf output.
16. Note reading on ME-30(*)/U.
17. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 16 reading.
18. Adjust L1103 (8), L1203 (9), and L1303 (10) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B .)

75-MHz Test

19. Set R-442/VRC MC-TUNE-KC control to 75.00 MHz.
20. Adjust AN/URM-103 RF TUNING control to 75.00 MHz. Check on frequency counter.
21. Set AN/URM-103 LO RF UV control for zero-rf output.
22. Note reading on ME-30(*)/U.
23. While observing ME-30(*)W, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 22 reading.
24. Adjust L1101 (11), L1201 (12), and L1301 (13) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B .)

5-18. TUNER A1000 ALINEMENT. (CONT)

65-MHz Test

25. Set R-442/VRC MC-TUNE-KC control to 65.00 MHz.
26. Adjust AN/URM-103 RF TUNING control to 65.00 MHz. Check on frequency counter.
27. Set AN/URM-103 LO RF UV control for zero-rf output.
28. Note reading on ME-30(*)/U.
29. While observing ME-30(*)W, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 28 reading.
30. Adjust C1101 (14), C1201 (15), and C1301 (16) for lowest possible ME-30(*)/U reading and minimum noise from speaker. (See test setup diagram B .)

Mixer Adjustment

31. Set R-442/VRC MC-TUNE-KC control to 52.00 MHz.
32. Adjust AN/URM-103 RF TUNING control to 52.00 MHz. Check on frequency counter.
33. Set AN/URM-103 LO RF UV control for zero-rf output.
34. Note reading on ME-30(*)/U.
35. While observing ME-30(*)/U, increase rf output level of AN/URM-103 by turning LO RF UV control until ME-30(*)/U drops to one-half of step 34 reading.
36. Set ME-30(*)/U to 1-volt scale.
37. Adjust C1404 (17) for lowest possible ME-30(*)/U reading. (See test setup diagram B .)

NOTE

The ME-30(*)/U reading can also decrease if C1404 is turned in or out too far. The first sharp decrease in the ME-30(*)/U reading will indicate the correct C1404 adjustment.

5-19. IF DISCRIMINATOR A4200 ALINEMENT.

PURPOSE. This procedure enables the discriminator to provide maximum separation of the audio signal from the rf carrier. Adjusting for zero vdc at TP4003 ensures that T4206 and T4207 are conducting equally around the carrier frequency. Adjusting for maximum ac at TP4007 ensures that the discriminator is tuned exactly to the 11.5-MHz center frequency.

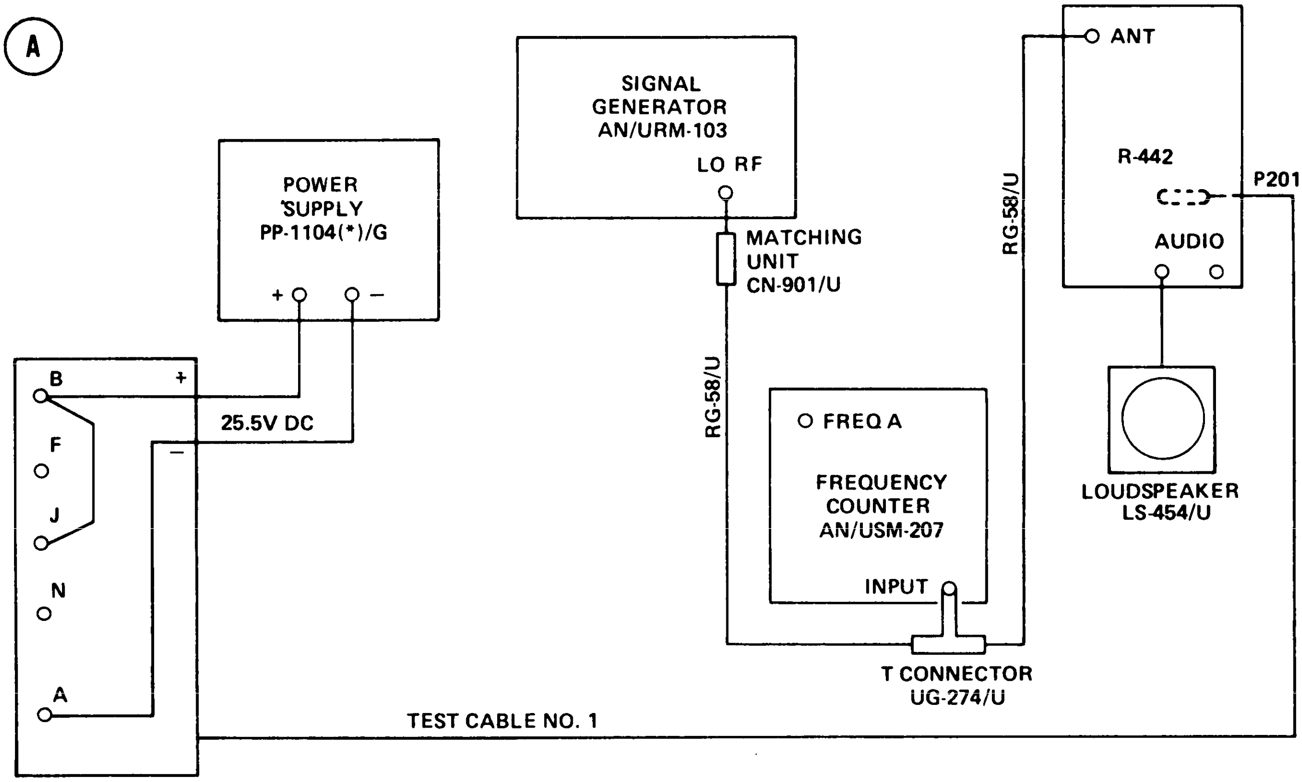
TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103	Matching Unit CN-901/U
Frequency Counter AN/USM-207	T-Connector UG-274/U
Power Supply PP-1104(*)/G	Loudspeaker LS-454/U
Test Cable No. 1	Voltmeter ME-30(*)/U
Multimeter ME-26(*)/U	

TEST SETUP. Connect the equipment as shown in test setup diagram A , page 5-102. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

5-19. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

A



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 20-µv rf at 30 MHz, 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAN D BY	OPERATE
	FUNCTION	1000 Hz
	BAND SWITCH	R
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv

5-19. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

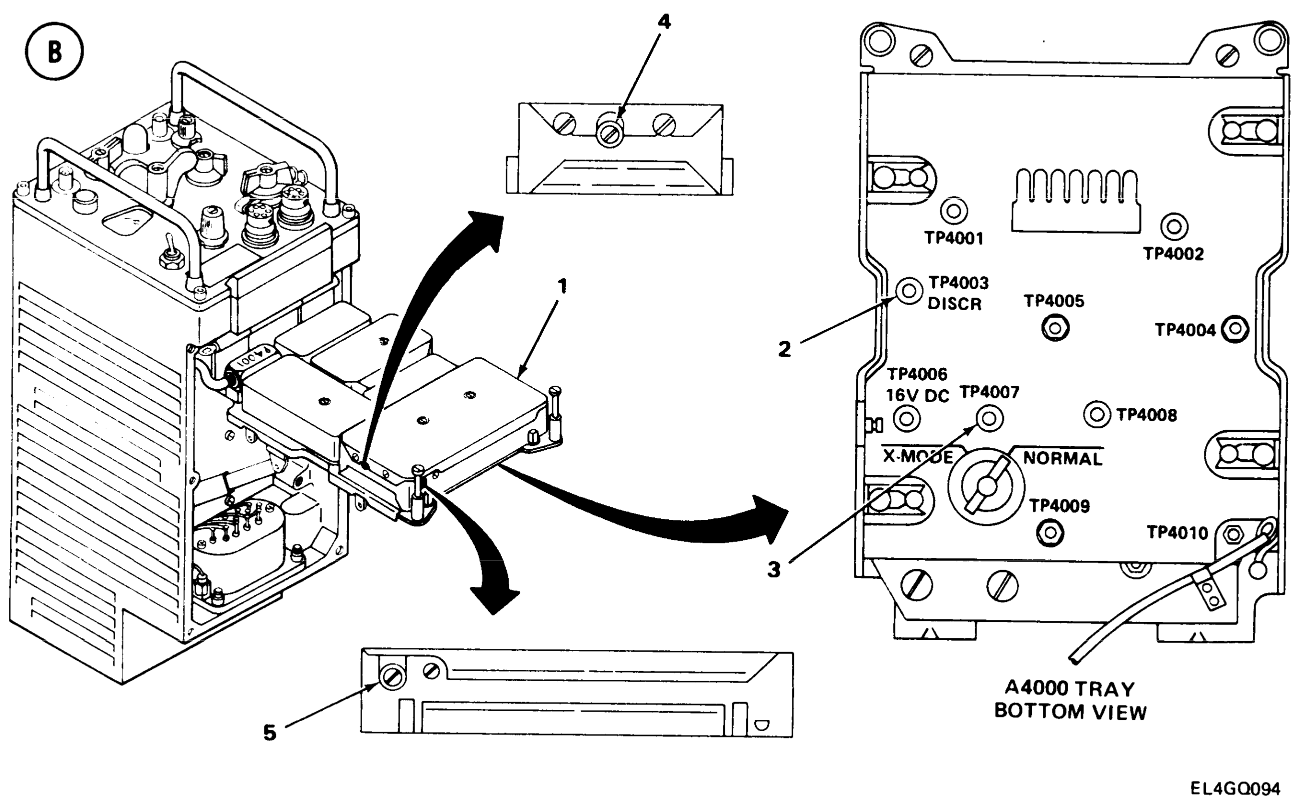
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.



5-19. IF DISCRIMINATOR A4200 ALINEMENT. (CONT)

1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-26(*)/U to 1-vdc scale and turn ZERO ADJ for midscale reading.
3. Set ME-30(*)/U to 3-volt scale.
4. Lift A4000 tray (1). (See test set up diagram B, page 5-103.)
5. Connect ME-26(*)/U positive lead to TP4003 (2), and negative lead to ground.
6. Connect ME-30(*)/U positive lead to TP4007 (3), and negative lead to ground.
7. Adjust T4206 (4) for zero-vdc reading (center of scale; no deflection) on ME-26(*)/U.
8. Adjust T4207 (5) for peak reading ME-30(*)/U.
9. Repeat steps 7 and 8 until maximum ME-30(*)/U reading and zero-vdc ME-26(*)/U reading occur at the same time.

5-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT.

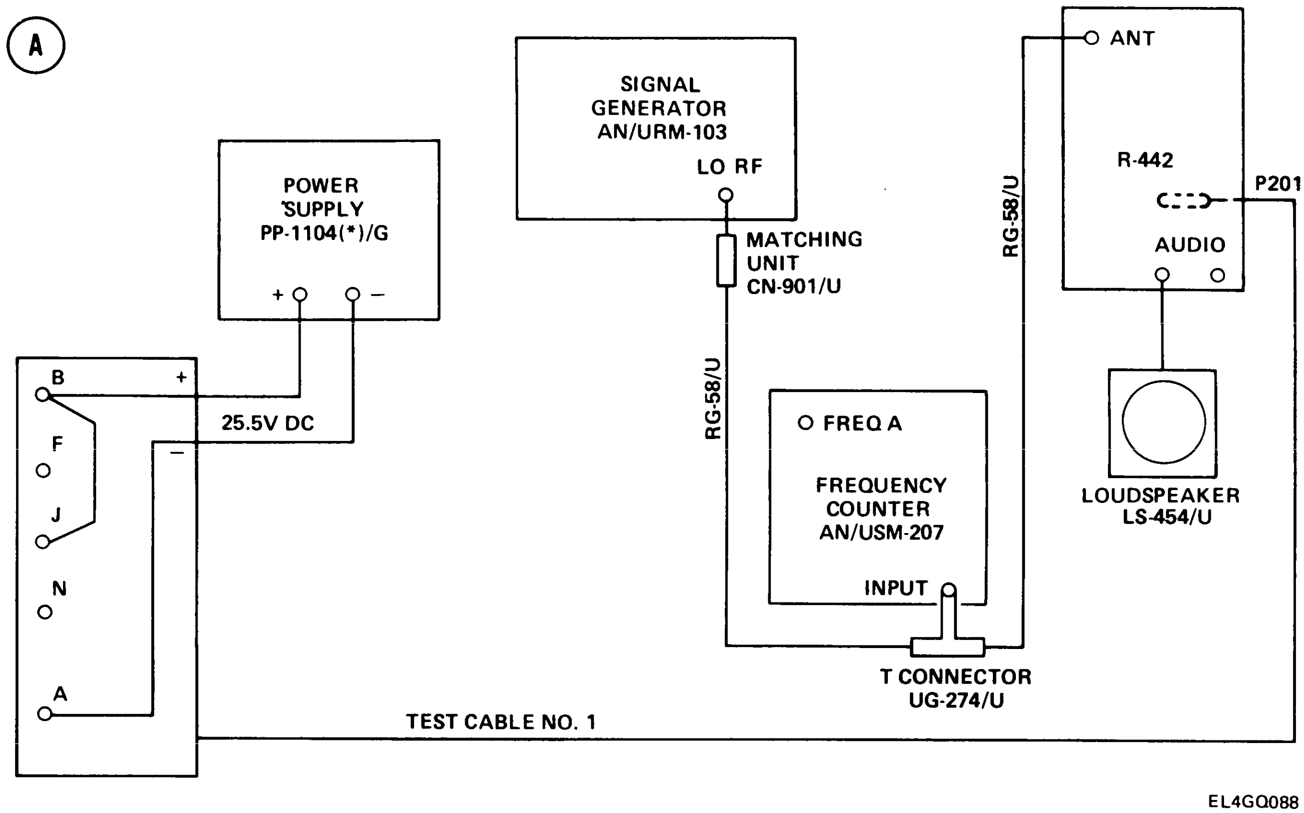
PURPOSE. This procedure enables the integrated circuit discriminator to provide maximum separation of the audio signal from the rf carrier. Coil L4202 is adjusted to tune the fm detector portion of the integrated circuit exactly to the 11.5-MHz center frequency.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103	Matching Unit CN-901/U
Frequency Counter AN/USM-207	T-Connector UG-274/U
Power Supply PP-1104(*)/G	Loudspeaker LS-454/U
Test Cable No. 1	Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A pages 5-105. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

5-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. If using alternate equipment, inject 20-µv rf at 30 MHz, 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	1000 Hz
	BAND SWITCH	A
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully clockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv

5-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

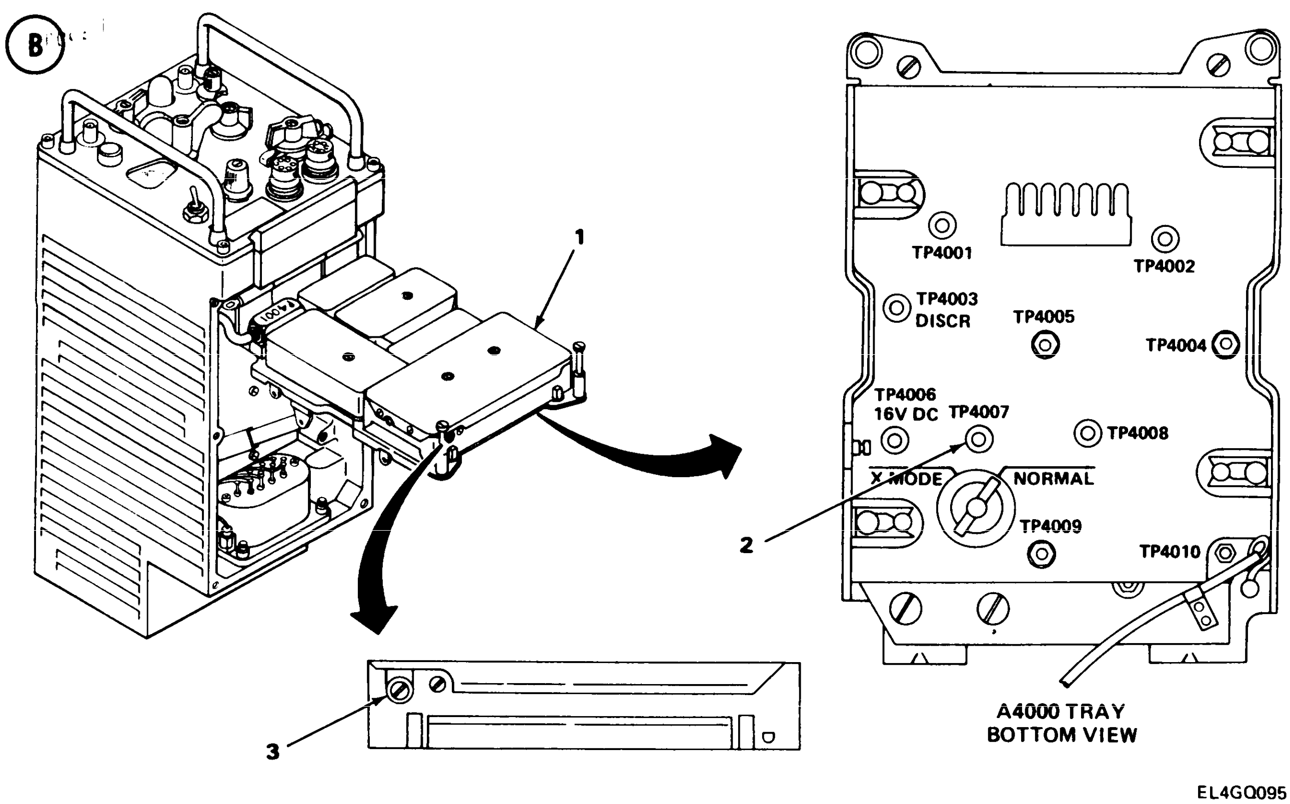
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.



5-20. SILICON VERSION IF DISCRIMINATOR A4200A ALINEMENT. (CONT)

1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to 1-volt scale.
3. Lift A4000 tray (1). (See test setup diagram B , page 5-106.)
4. Connect ME-30(*)/U positive lead to TP4007 (2), and negative lead to ground.
5. Adjust L4202 (3) for maximum indication on ME-30(*)/U.

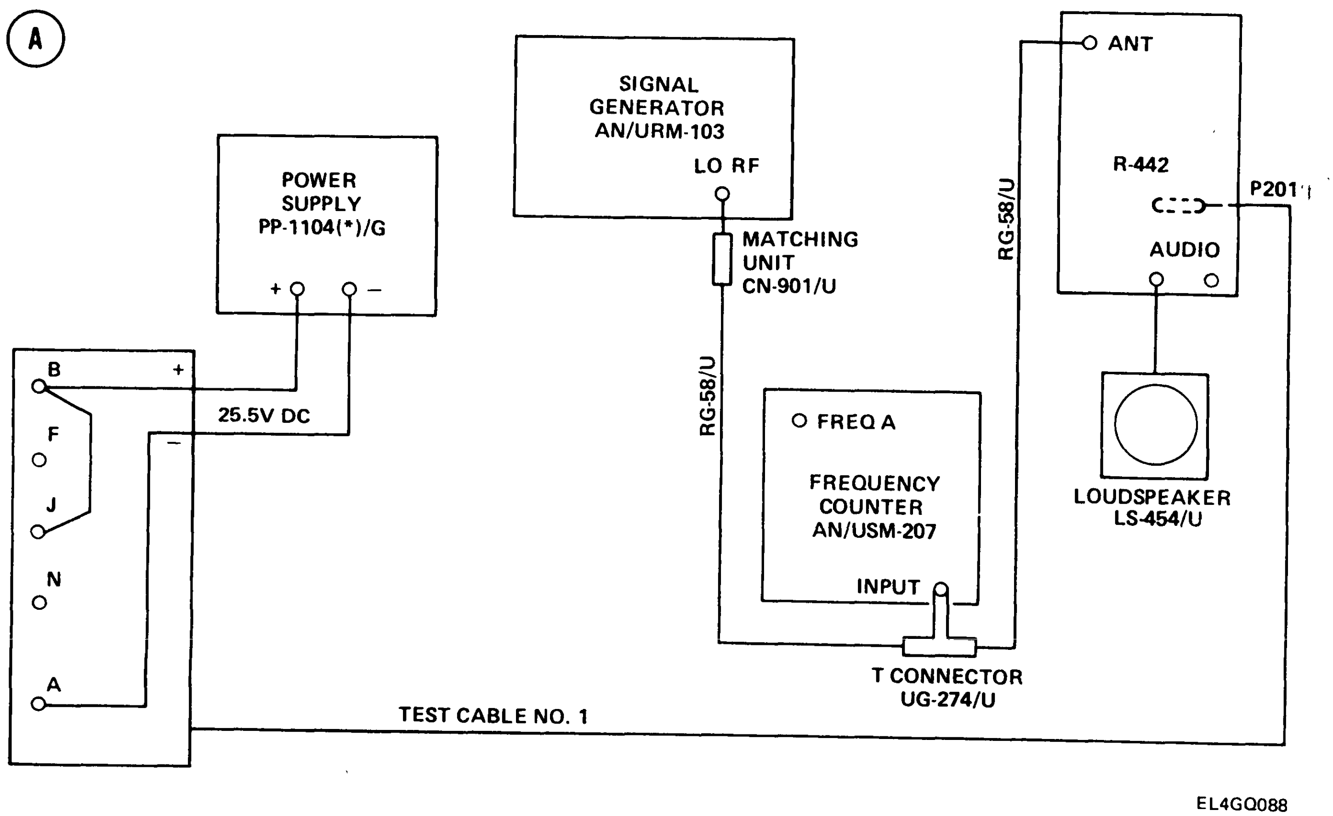
5-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT.

PURPOSE. This procedure adjusts the gain of the A4300 assembly.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A . Remove R-442/VRC bottom cover. (See paragraph 2-7.)



5-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 20-µv rf at 30 MHz, 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

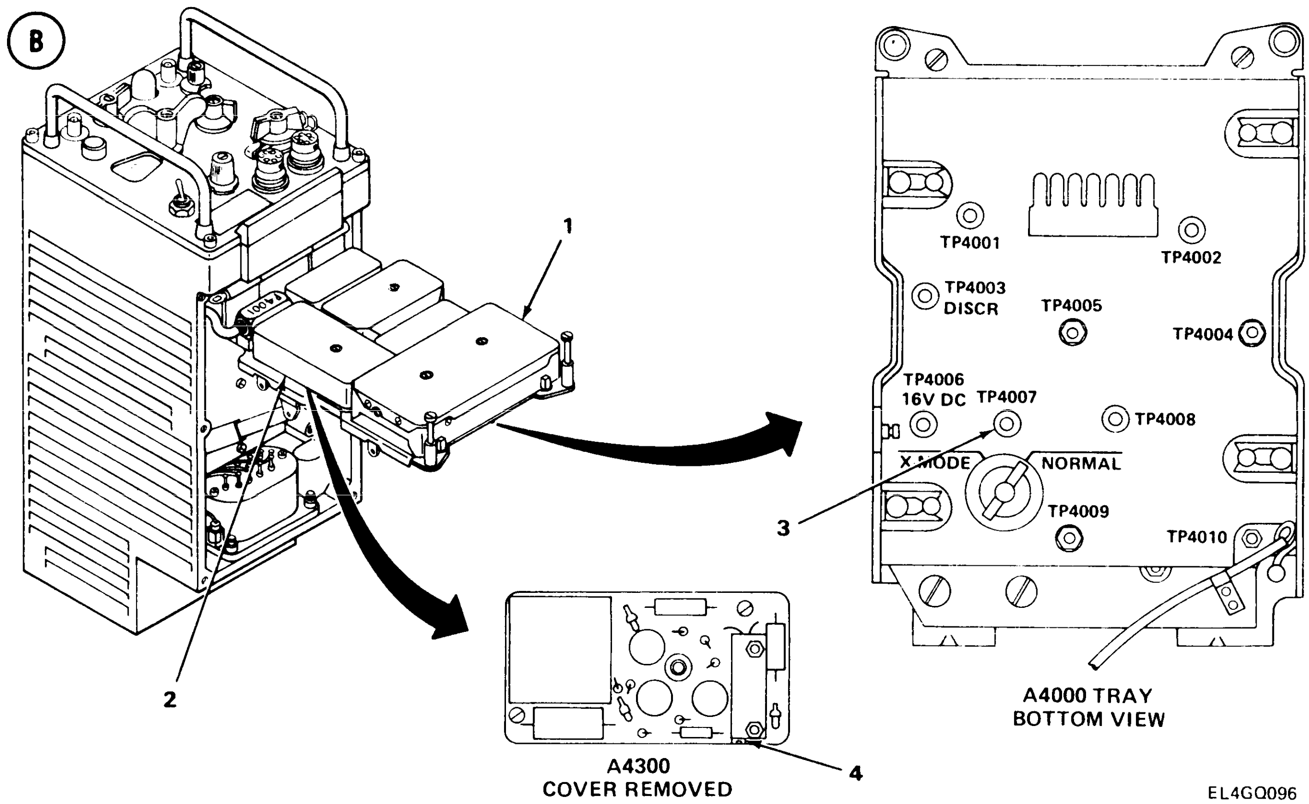
EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE (allow 15-minute warmup)
	FUNCTION	1000 Hz
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 100-µv rf level; then disconnect the T-connector from the counter.

5-21. AUDIO AND SQUELCH PREAMPLIFIER A4300 ALINEMENT. (CONT)



1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to 1-volt scale.
3. Lift A4000 tray (1). (See test setup diagram B .)
4. Remove A4300 cover (2).
5. Connect ME-30(*)/U positive lead to TP4007 (3), and negative lead to ground.
6. Adjust R4304(4) for 0.8-vac reading on ME-30(*)/U.

5-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT.

PURPOSE. This procedure adjusts the gain of the A4300A assembly.

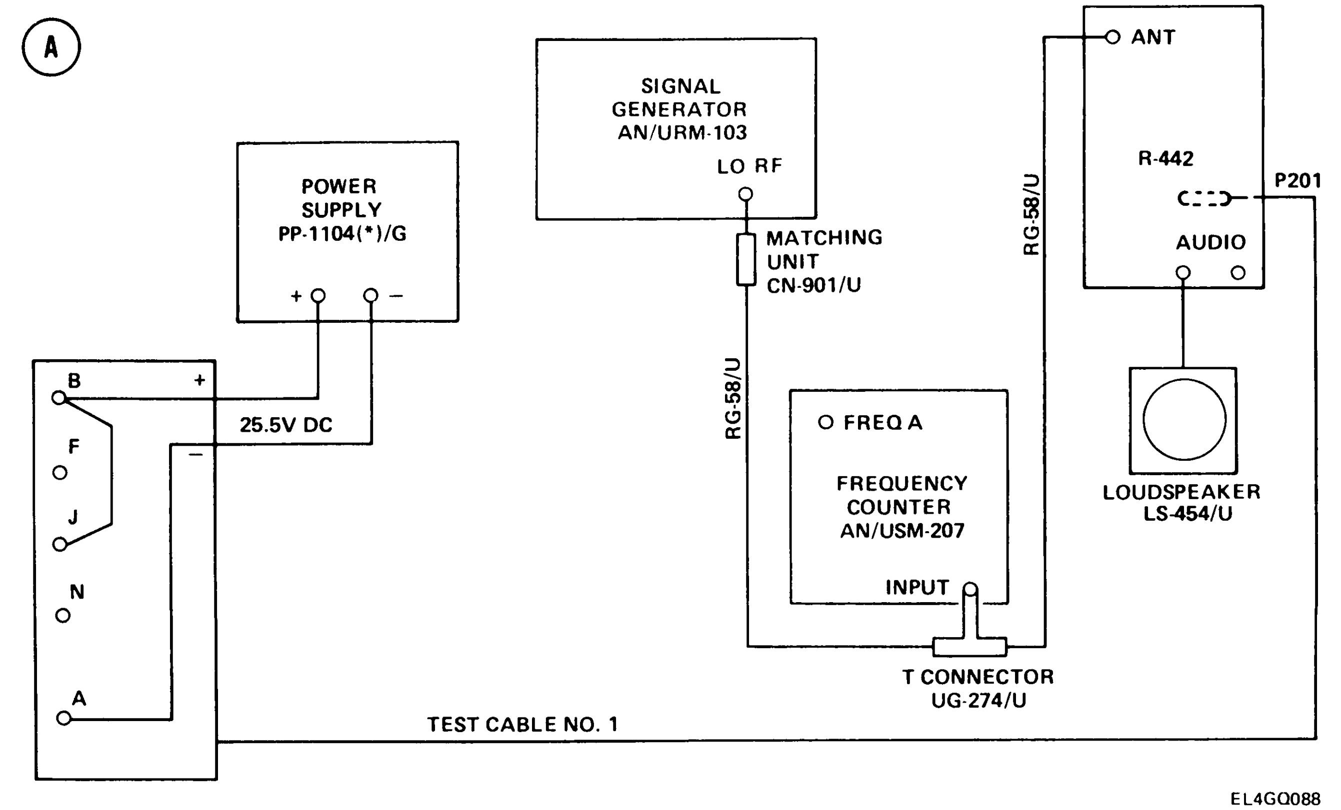
TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1

Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A, page 5-110. Remove R-442/VRC bottom cover. (See paragraph 2-7.)

5-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 10-µv rf at 64 MHz, 1-kHz modulation; 8-kHz deviation.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64.00
	VOLUME	Fully clockwise
	SQUELCH	NEW OFF
AN/USM-207	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

5-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)

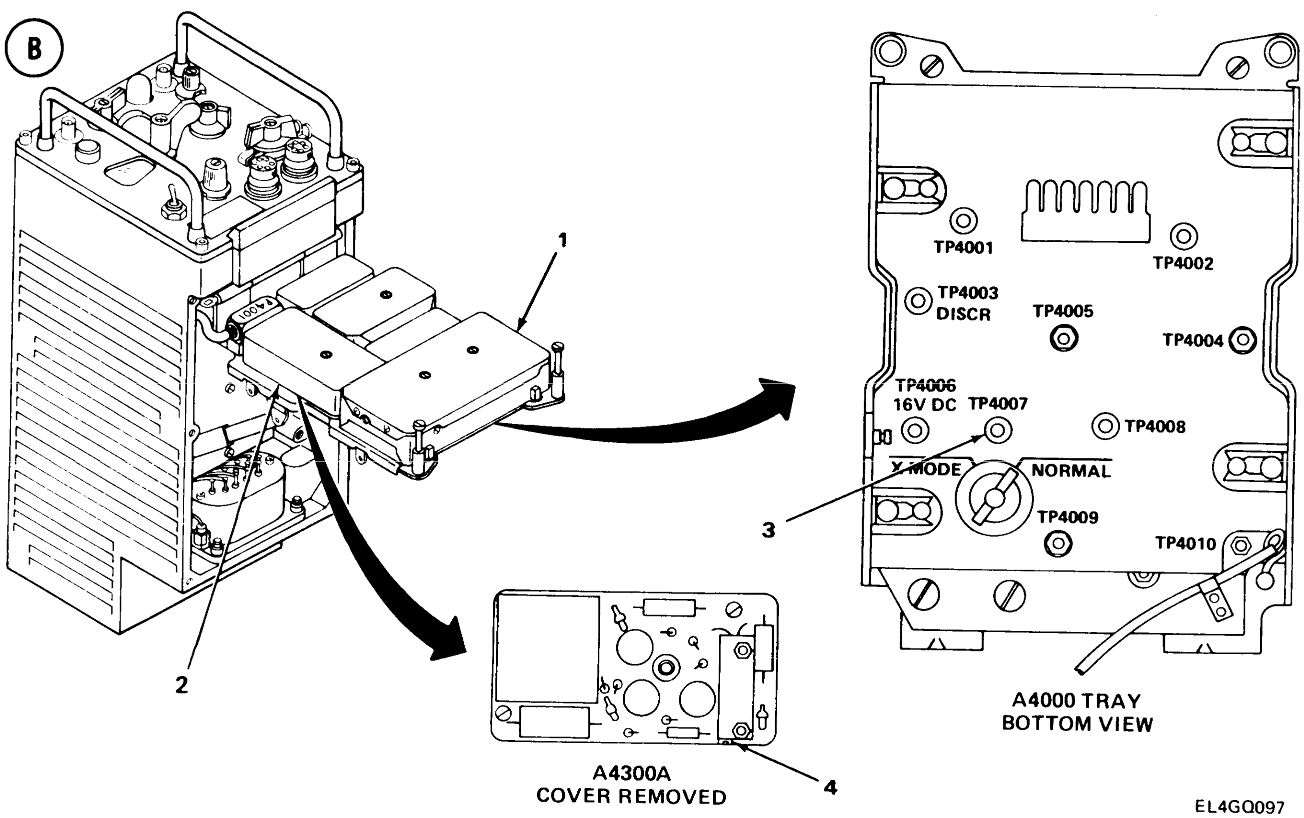
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY FUNCTION BAND SWITCH RF TUNING DEVIATION RANGE KHZ RF OUTPUT DEVIATION RF SET TO LINE LO RF UV	OPERATE (allow 15-minute warmup) 1000 Hz D 64.00 10 LO, 0-10 KUV Fully counterclockwise Adjust until needle on IF UV RF SET TO LINE meter is over red line 10µv

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 64 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 10µv rf level; then disconnect the T-connector from the counter.



5-22. SILICON VERSION AUDIO AND SQUELCH PREAMPLIFIER A4300A ALINEMENT. (CONT)

1. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter reads 8 kHz.
2. Set ME-30(*)/U to 1-volt scale.
3. Lift A4000 tray (1). (See test setup diagram B, page 5-111.)
4. Remove A4300A cover (2).
5. Connect ME-30(*)/U positive lead to TP4007 (3) and negative lead to ground.
6. Adjust R4304 (4) for 0.8-vac reading on ME-30(*)/U.

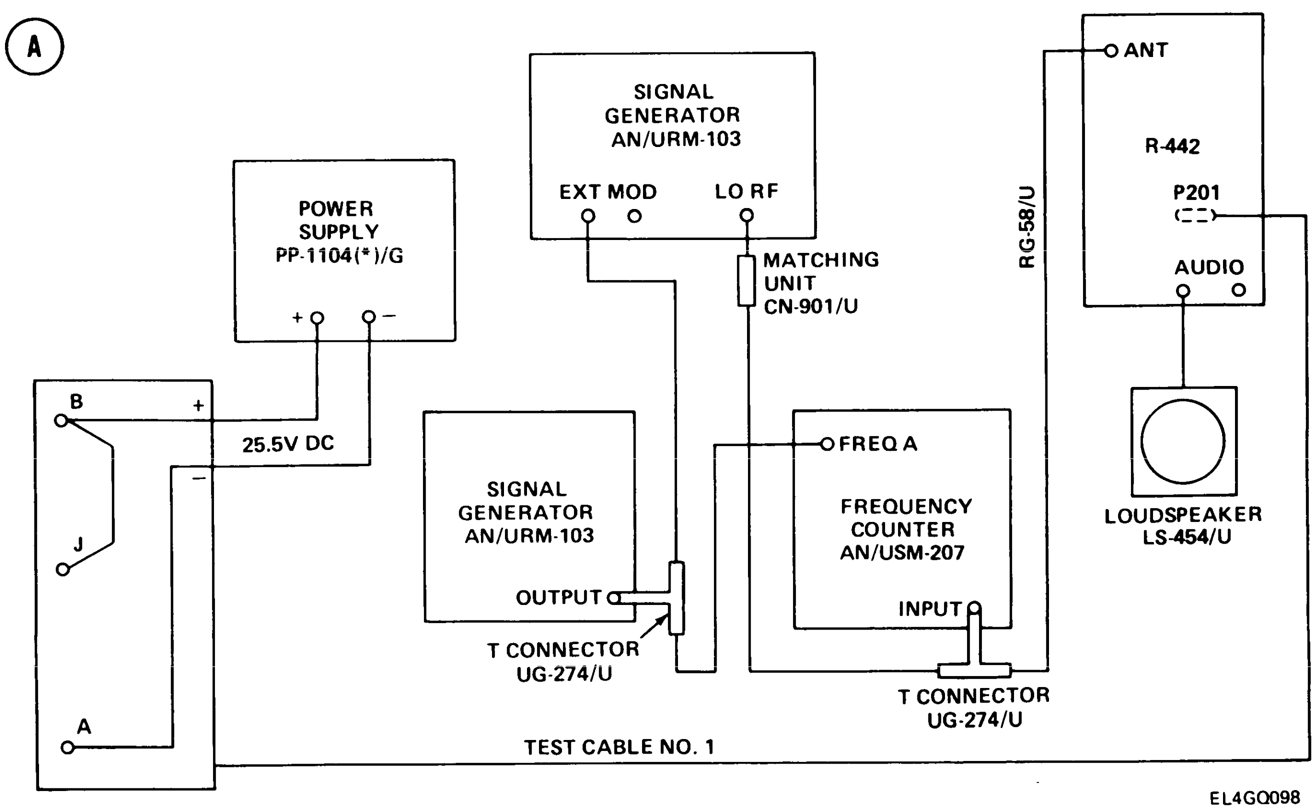
5-23. A5300 SQUELCH FILTER ALINEMENT.

PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200 in the NEW SQUELCH mode of operation. By adjusting Resistor R5301 in the squelch filter, the filter is properly tuned to attenuate the 150-Hz squelch tone, thus providing maximum degenerative feedback to the squelch amplifier for all frequencies other than 150 Hz. This permits the squelch amplifier to provide maximum gain for 150-Hz signals. Alinement of the A5300 squelch filter must be done before the A5200 Squelch Amplifier Alinement, NEW SQUELCH Level, paragraph 5-25.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Signal Generator AN/URM-127
Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)



5-23. A5300 SQUELCH FILTER ALINEMENT. (CONT)

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 1000-µv rf at a frequency that gives maximum TP5008 voltage. Use variable external modulation around 150-Hz reference. Deviation will vary according to alinement requirements.

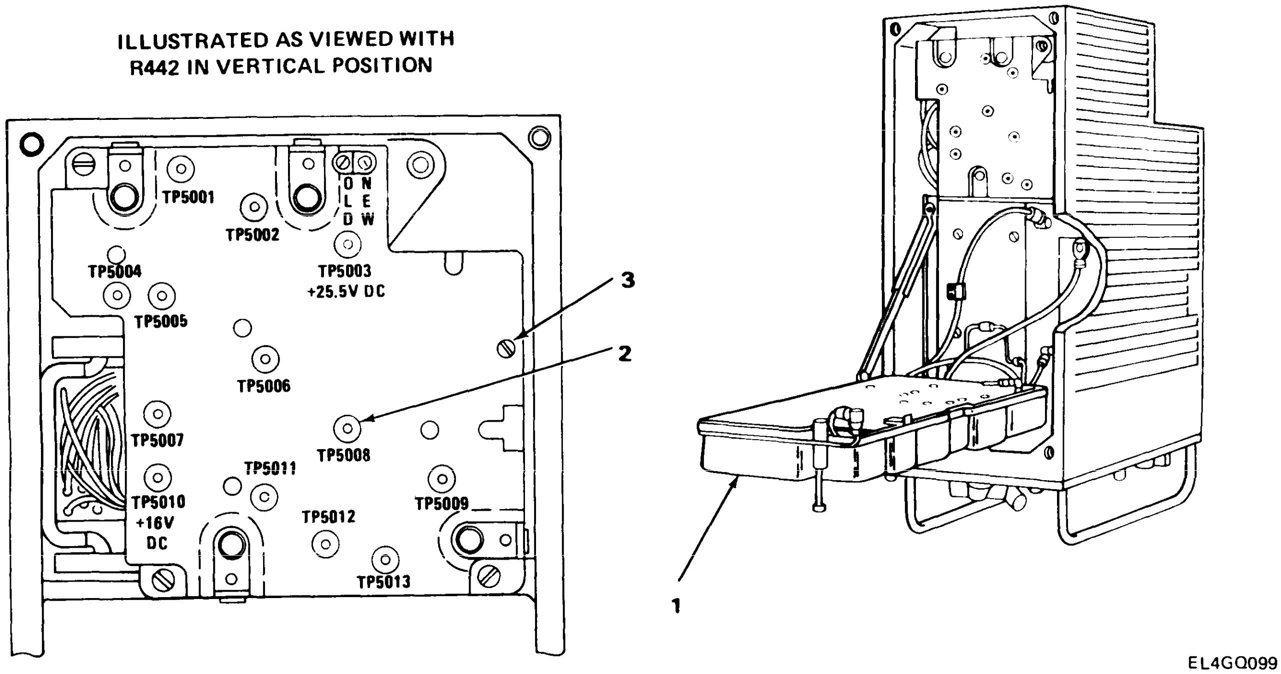
CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	Follow instructions in alinement procedure
	RF TUNING	Follow instructions in alinement procedure
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	Set to 1 K (1000µv)
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x1
	FREQ RANGE DIAL	150
	ATTENUATOR	x10
	OUTPUT CONTROL	Fully clockwise (maximum)
AN/USM-207 (to verify AN/URM-127 low-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

5-23. A5300 SQUELCH FILTER ALINEMENT. (CONT)

ALINEMENT PROCEDURE

B



1. Disconnect rf cable from R-442/VRC ANTENNA port.
2. Lift R-442/VRC A3000 tray (1). (See test setup diagram B .)
3. Set ME-30(*)/U to 10-volt scale.
4. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
5. Set R-442/VRC MC-TUNE-KC control to any frequency that results in at least a 4-vac reading on the ME-30(*)/U.
6. Set R-442/VRC SQUELCH switch to NEW ON.
7. Adjust R5301(3) for approximately l-vat reading on ME-30(*)/U.

NOTE

The voltage in step 7 will fluctuate. This is normal.

8. Reconnect rf cable to R-442/VRC ANTENNA port.
9. Set AN/URM-103 BAND SWITCH to range that includes R-442/VRC frequency setting.
10. Adjust AN/URM-103 RF TUNING control to same frequency selected in step 5.

NOTE

Check the frequency counter to make sure that the AN/URM-103 is outputting the correct frequency. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 1000-µv rf level; then disconnect the T-connector from the counter.

5-23. A5300 SQUELCH FILTER ALINEMENT. (CONT)

11. Adjust AN/URM-103 DEVIATION control for 3.5-kHz reading on DEVIATION KHZ meter.
12. Adjust AN/URM-127 FREQ RANGE DIAL to vary frequency above and below 150 Hz while observing ME-30(*)/U at TP5008. Stop at frequency that gives highest possible ME-30(*)/U reading. At same time, adjust AN/URM-103 DEVIATION control to keep ME-30(*)/U reading between 2 and 4 vac. If adjustment of DEVIATION control is required, readjust AN/URM-127 frequency for peak ME-30(*)/U reading.
13. Check and record AN/URM-127 modulating frequency as indicated by AN/USM-207 frequency counter. If frequency is 150 ± 1 Hz, squelch filter alinement is satisfactory. If above 151 Hz, go to step 14; if below 149 Hz, go to step 17.

NOTE

In steps 14 and 17, maintain a voltage reading of 2 to 4 vac at TP5008 by adjusting the AN/URM-103 DEVIATION control.

14. FREQUENCY ABOVE 151 HZ. Turn R5301 (3) counterclockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
15. Check frequency on AN/USM-207.
16. Repeat steps 14 and 15 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.
17. FREQUENCY BELOW 149 HZ. Turn R5301 (3) clockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
18. Check frequency on AN/USM-207.
19. Repeat steps 17 and 18 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.

5-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT.

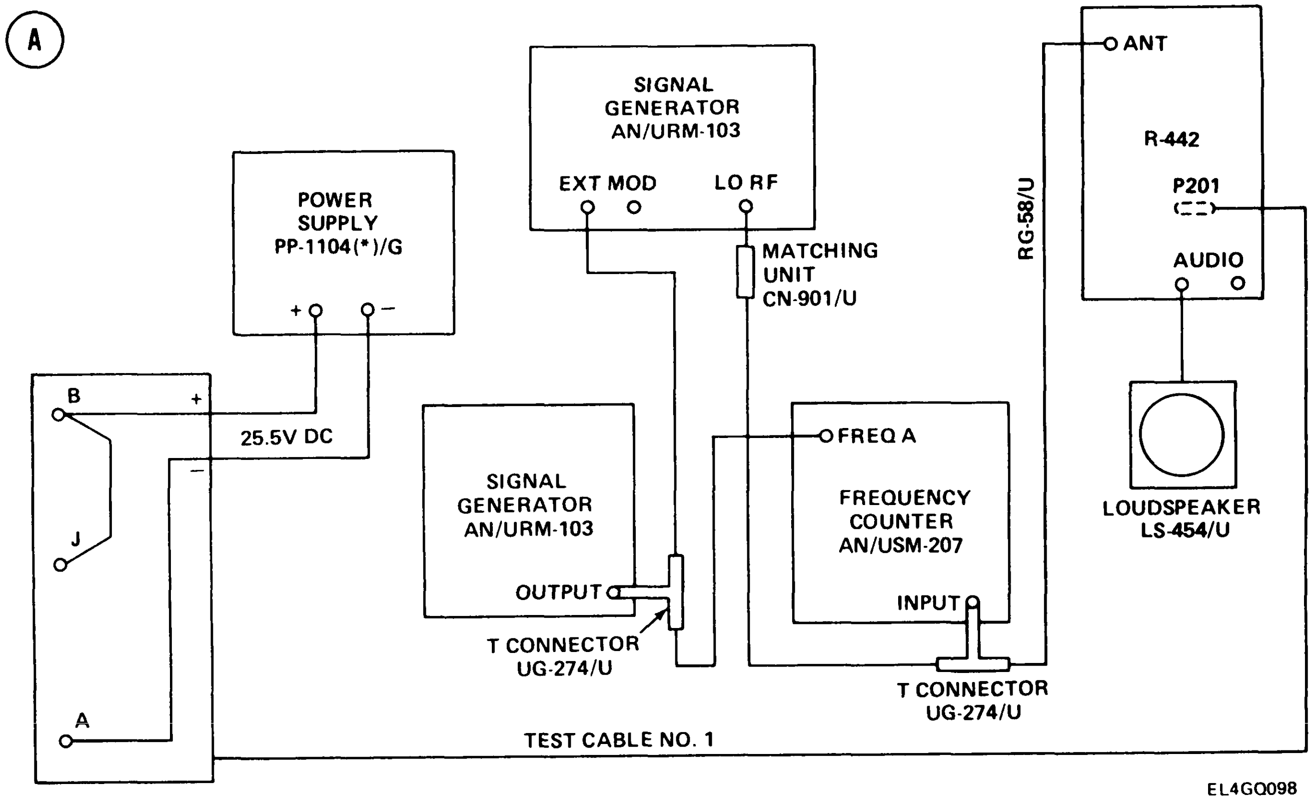
PURPOSE. This procedure adjusts the gain of Squelch Amplifier A5200A in the NEW SQUELCH mode of operation. Alinement of the A5300A squelch filter must be done before the Silicon Version A5200A Squelch Amplifier Alinement, NEW SQUELCH Level, paragraph 5-25.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Signal Generator AN/URM-127
Power Supply PP-1104(*)/G
Frequency Counter AN/USM-207
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A, page 5-116. Remove R-442/VRC top cover. (See paragraph 2-7.)

5-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 1,000-µv rf at a frequency that gives maximum TP5008 voltage. Use variable external modulation around 150-Hz reference. Deviation will vary according to alinement requirements.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/USM-207 (to verify AN/URM-127 low-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1 (black knob)
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^3 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

5-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON
AN/URM-103	OPERATE/OFF/STAN D BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	Set to 1 K (1000 µv)
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x1
	FREQ RANGE DIAL	150
	ATTENUATOR	x10
	OUTPUT CONTROL	Fully clockwise

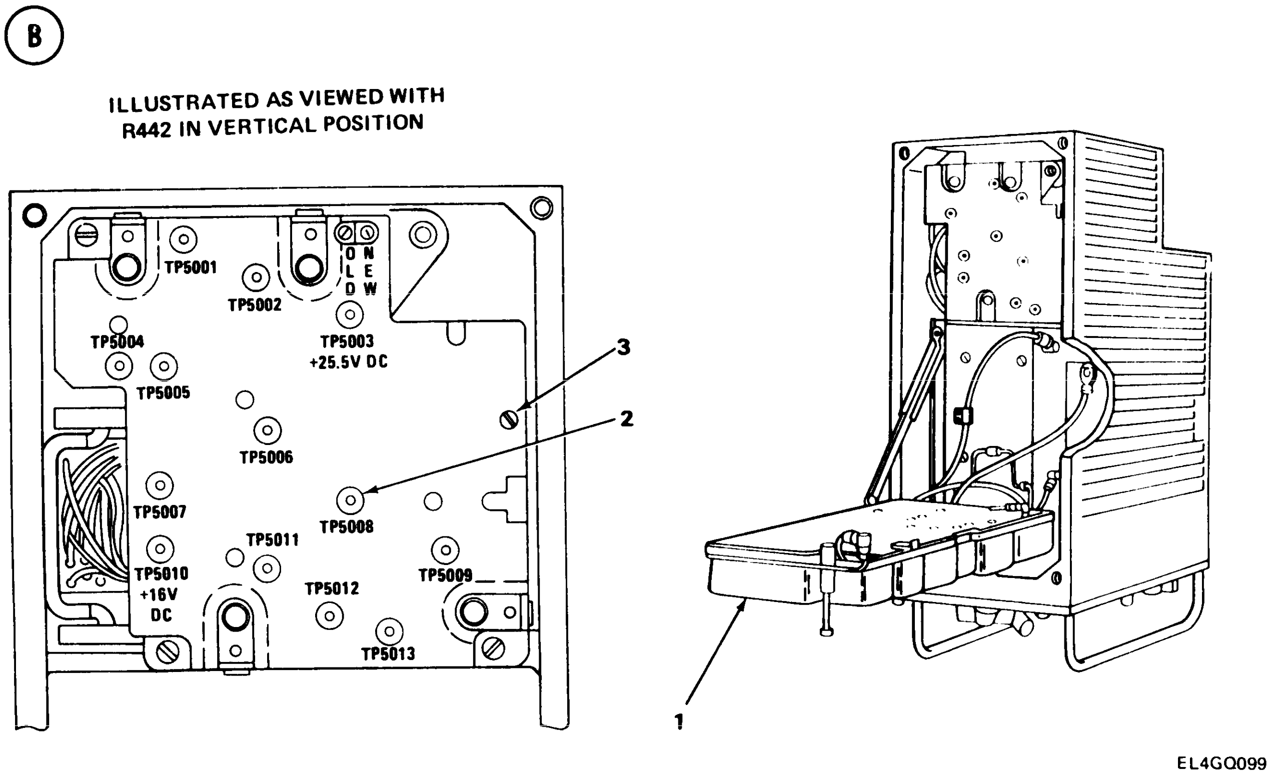
ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 1000-µv rf level; then disconnect the T-connector from the counter.

Before performing A5300A alinement, make sure that the squelch amplifier is the silicon version A5200A.

5-24. SILICON VERSION A5300A SQUELCH FILTER ALINEMENT. (CONT)



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram (B).)
2. Set ME-30(*)/U to 10-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until DEVIATION KHZ meter indicates 8 kHz.
5. Adjust AN/URM-127 FREQ RANGE DIAL to vary frequency above and below 150 Hz while observing ME-30(*)/U. Stop at frequency that gives highest possible ME-30(*)/U reading.
6. Check and record AN/URM-127 modulating frequency as indicated by AN/USM-207 frequency counter. if frequency is 150 ±1Hz, A5300A alinement is satisfactory. If frequency is above 151 Hz, go to step 7; if under 149 Hz, go to step 10.
7. FREQUENCY ABOVE 151 HZ. Turn R5303 (3) counterclockwise slightiy. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
8. Check frequency on AN/USM-207.
9. Repeat steps 7 and 8 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.
10. FREQUENCY BELOW 149 HZ. Turn R5303 (3) clockwise slightly. Reset AN/URM-127 FREQ RANGE DIAL to obtain a peak reading on ME-30(*)/U.
11. Check frequency on AN/USM-207.
12. Repeat steps 10 and 11 until peak ME-30(*)/U reading is obtained at a frequency between 149 and 151 Hz.

5-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

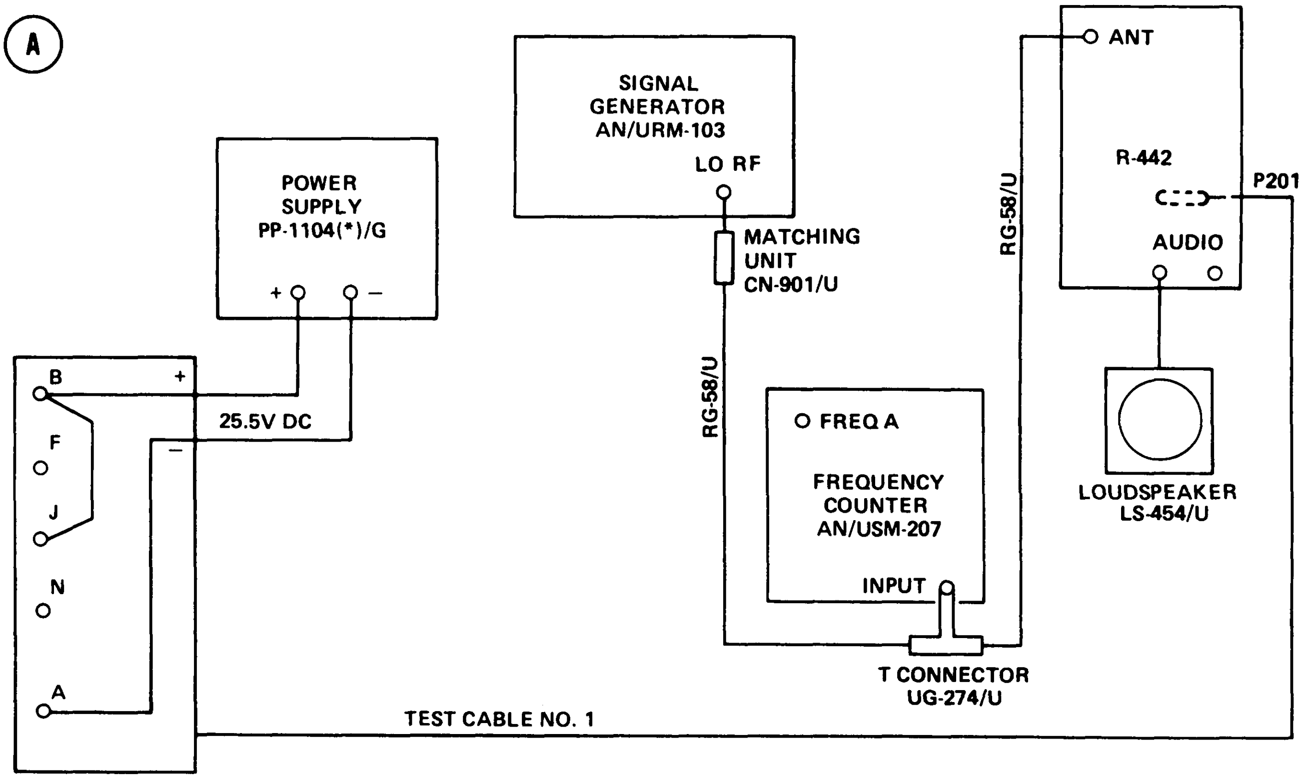
PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1
Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)

A



EL4GQ088

INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 20-µv rf at 30 MHz, 150-Hz modulation; deviation as per alinement requirements.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	A
	MC-TUNE-KC	30.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON

5-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

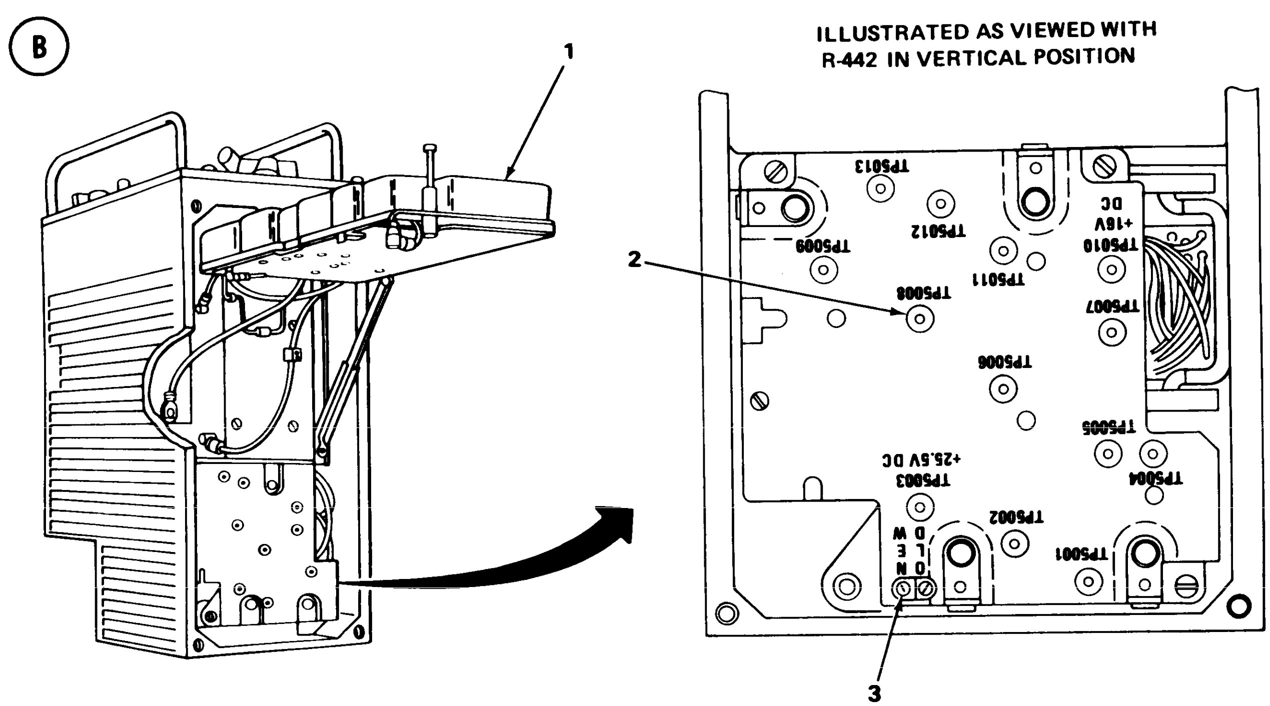
CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	15 Hz
	BAND SWITCH	B
	RF TUNING	30.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv

ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 30 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.



EL4GQ100

5-25. A5200 SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

1. Lift R-442/VRC A3000 tray (1). (See test setup diagram B, page 5-120.)
2. Set ME-30(*)/U to 10-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 4 vat.
5. Remove ME-30(*)/U positive lead.
6. Adjust NEW Squelch Resistor R5217 (3) until R-442/VRC CALL light just comes on.

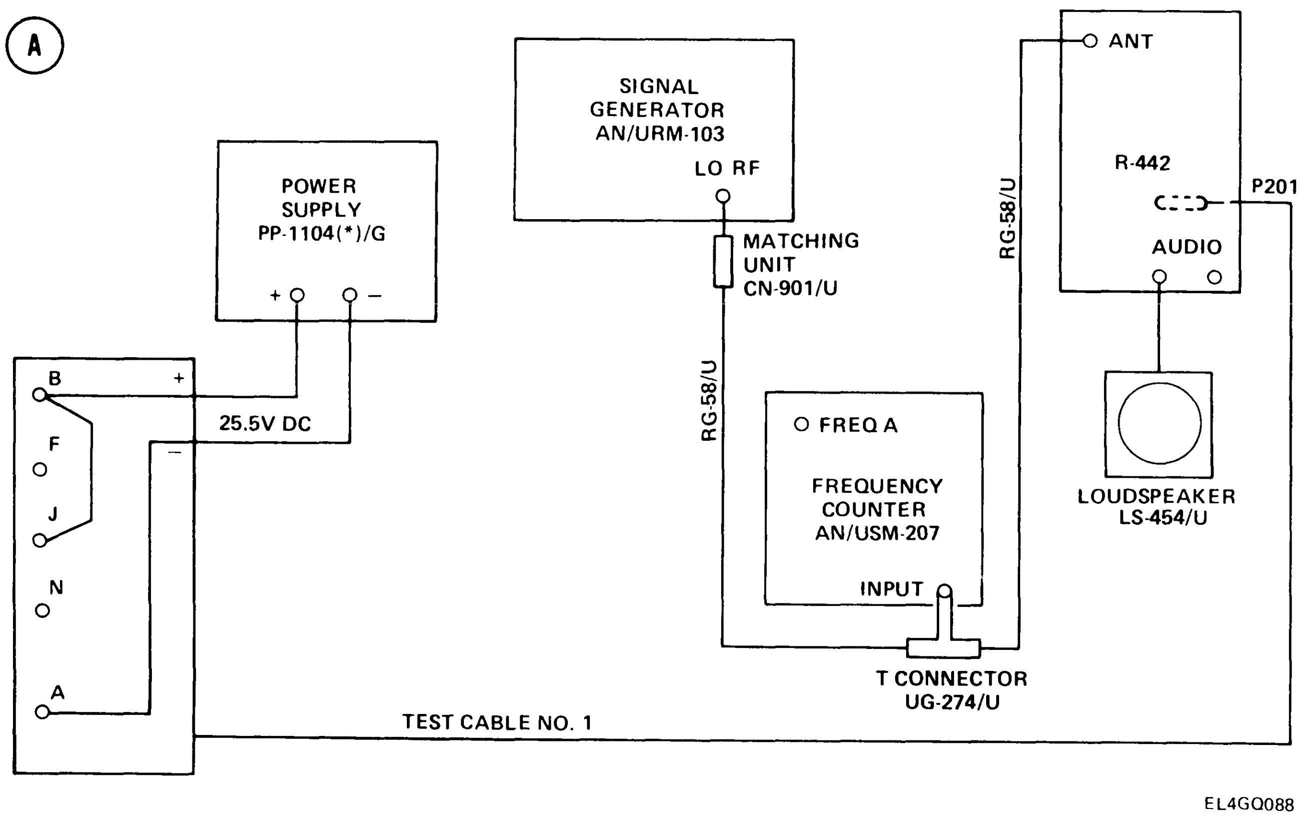
5-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the 150-Hz NEW SQUELCH tone.

TEST EQUIPMENT AND MATERIALS

Signal Generator AN/URM-103	Matching Unit CN-901/U
Frequency Counter AN/USM-207	T-Connector UG-274/U
Power Supply PP-1104(*)/G	Loudspeaker LS-454/U
Test Cable No. 1	Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 2000-µv rf at 64 MHz, 150-Hz modulation; deviation as per alinement requirements.

5-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	B
	MC-TUNE-KC	64.00
	VOLUME	Fully clockwise
	SQUELCH	NEW ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	15 Hz
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	2000 µv

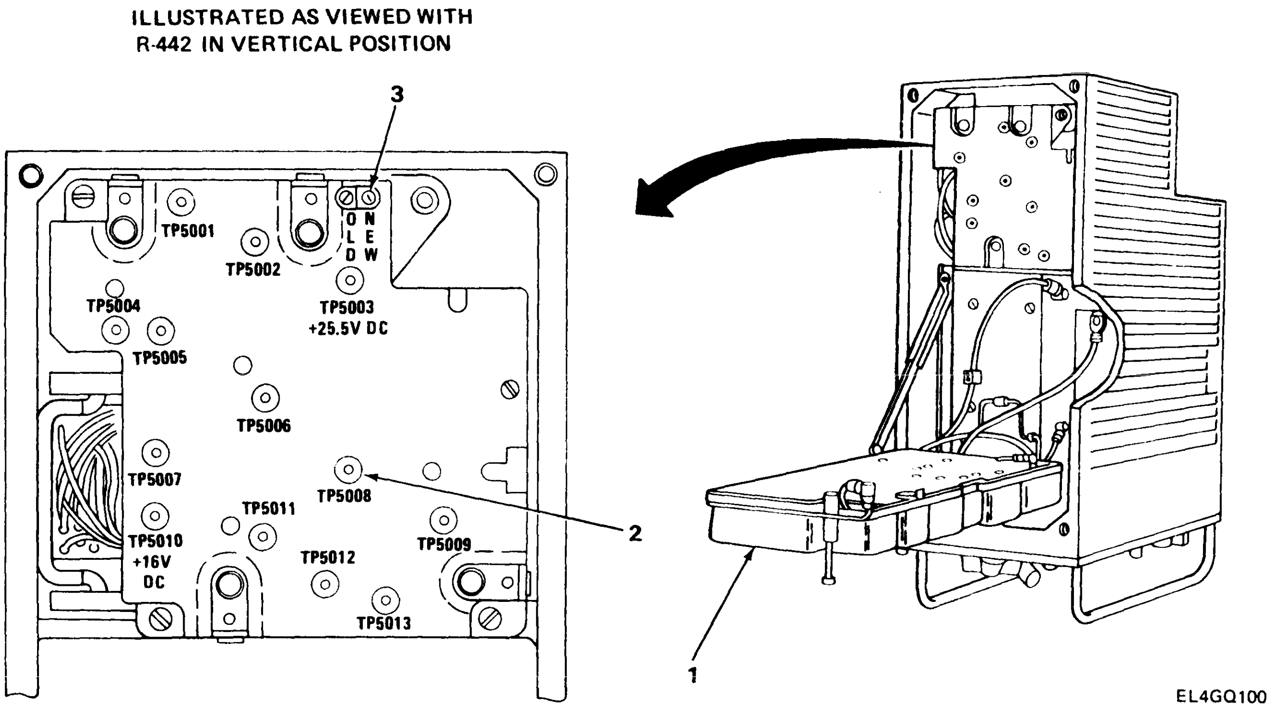
ALINEMENT PROCEDURE

NOTE

Check the frequency counter to make sure that the signal generator is outputting exactly 64 MHz. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 2000-µv rf level; then disconnect the T-connector from the counter.

5-26. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, NEW SQUELCH LEVEL. (CONT)

B



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram B .)
2. Set ME-30(*)/U to 0.3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 0.20 ± 0.01 vac.
5. Adjust NEW Squelch Resistor R5207(3) until R-442/VRC CALL light just comes on.
6. Turn AN/URM-103 DEVIATION control counterclockwise until ME-30(*)/U reads 0.15 ± 0.01 vac. R-442/VRC CALL light should be off.

NOTE

If CALL light does not go off in step 6, repeat steps 4 and 5.

5-27 A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.

PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which include internal noise and the received carrier.

TEST EQUIPMENT AND MATERIALS

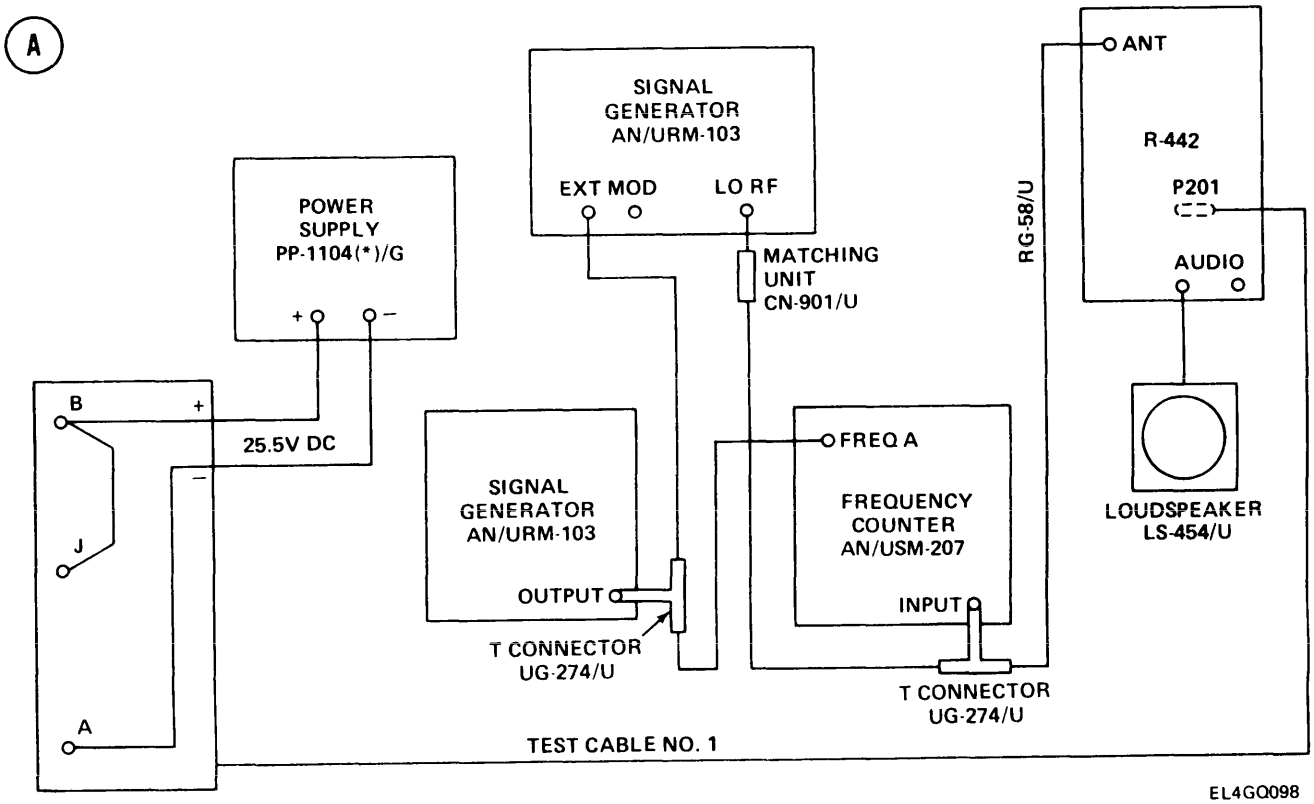
Signal Generator AN/URM-103
Frequency Counter AN/USM-207
Power Supply PP-1104(*)/G
Test Cable No. 1
Signal Generator AN/URM-127

Matching Unit CN-901/U
T-Connector UG-274/U
Loudspeaker LS-454/U
Voltmeter ME-30(*)/U

5-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)

A



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 20-µv rf with 7.3-kHz modulation; deviation as per alinement requirements, carrier frequency determined by test requirements.

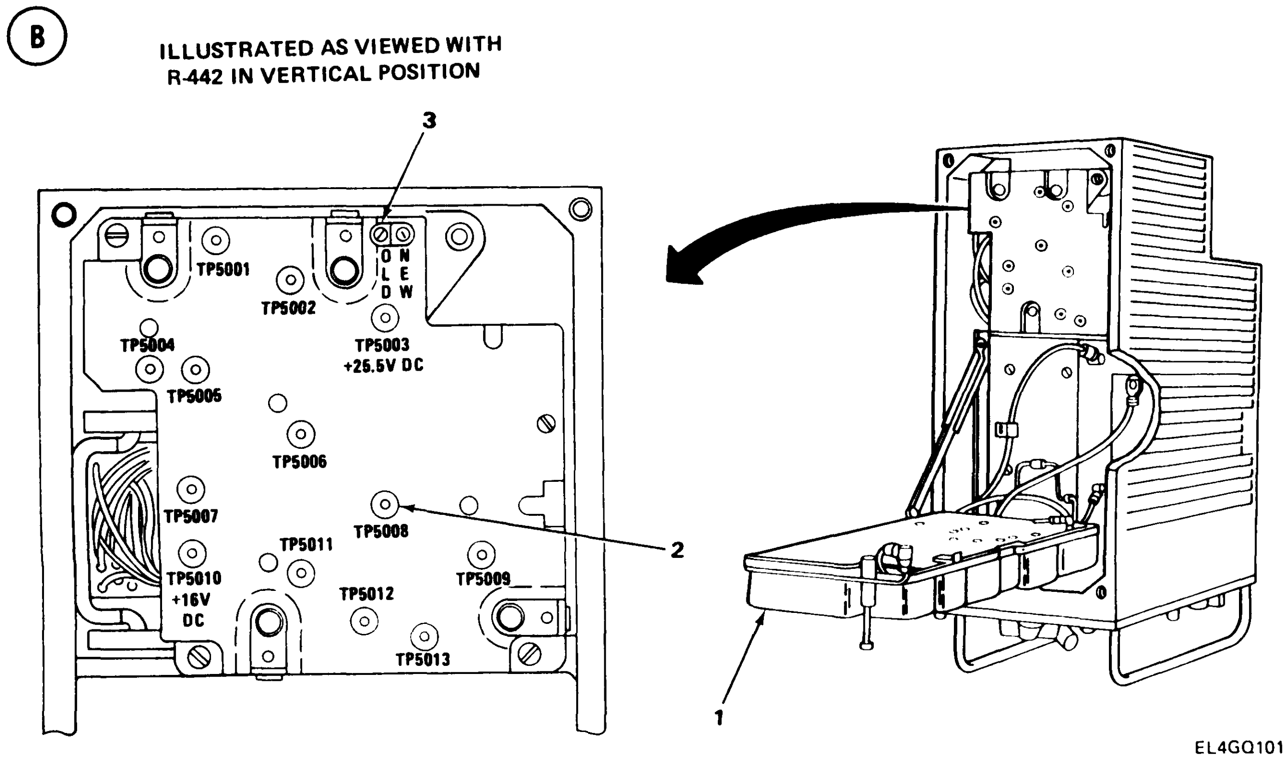
5-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	Follow instructions in alinement procedure
	RF TUNING	Follow instructions in alinement procedure
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x100
	FREQ RANGE DIAL	73
	ATTENUATOR	x10
	OUTPUT CONTROL	Turn clockwise for 1.2-volt reading on panel voltmeter
AN/USM-207 (to verify AN/URM-127 low-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

5-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Disconnect rf cable from R-442/VRC ANTENNA port.
2. Lift R-442/VRC A3000 tray (1). (See test setup diagram B.)
3. Set ME-30(*)/U to 10-volt scale.
4. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground.
5. Set R-442/VRC MC-TUNE-KC control to any frequency that results in at least a 4-vac reading on ME-30(*)/U. Record ME-30(*)/U reading.
6. Reconnect rf cable to R-442/VRC ANTENNA port.
7. Set AN/URM-103 BAND switch to range that includes R-442/VRC frequency setting.
8. Set AN/URM-103 RF TUNING control to same frequency selected in step 5.

NOTE

Check the frequency counter to make sure that the signal generator is outputting the correct frequency. The rf level must be increased temporarily to enable the frequency counter to display. Adjust the AN/URM-103 RF TUNING control as necessary, reset to 20-µv rf level; then disconnect the T-connector from the counter.

5-27. A5200 SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

9. Adjust AN/URM-103 DEVIATION control for 3-kHz reading on DEVIATION KHZ meter.
10. Adjust AN/URM-127 FREQ RANGE DIAL to vary frequency above and below 7.3 kHz while observing ME-30(*)/U. Stop at frequency that gives highest possible ME-30(*)/U reading. At same time, adjust AN/URM-103 DEVIATION control to keep ME-30(*)/U reading between 2 and 4 vac. If adjustment of DEVIATION control is required, readjust AN/URM-127 frequency for peak ME-30(*)/U reading.
11. Adjust AN/URM-103 DEVIATION control for ME-30(*)/U reading 4 db less than reading recorded in step 5.
12. Check R-442/VRC CALL light. If light is out, go to step 13. If light is on, go to step 14.
13. CALL LIGHT OUT. Turn R5216 (3) counterclockwise slowly and stop at point where light just comes on.
14. CALL LIGHT ON. Turn R5216 (3) clockwise until light goes out, then perform step 13.

OLD SQUELCH Final Test

15. Adjust AN/URM-103 DEVIATION control for 8 kHz reading on DEVIATION KHZ meter.
16. Set AN/USM-127 FREQ RANGE MULTIPLIER to x10.
17. Set AN/USM-127 FREQ RANGE DIAL to 35 (350 Hz). R-442/VRC CALL light should be on.

NOTE

CALL light must stay on through range of 350 to 3500 Hz.

18. Rotate FREQ RANGE DIAL fully clockwise to 2000 Hz. CALL light should stay on.
19. Rotate FREQ RANGE DIAL fully counterclockwise.
20. Set FREQ RANGE MULTIPLIER to x100.
21. Rotate FREQ RANGE DIAL to 35 (3500 Hz). CALL light should stay on,

NOTE

If R-442/VRC fails the OLD SQUELCH Final Test, replace the A5300 module and repeat the entire alinement procedure.

5-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL.

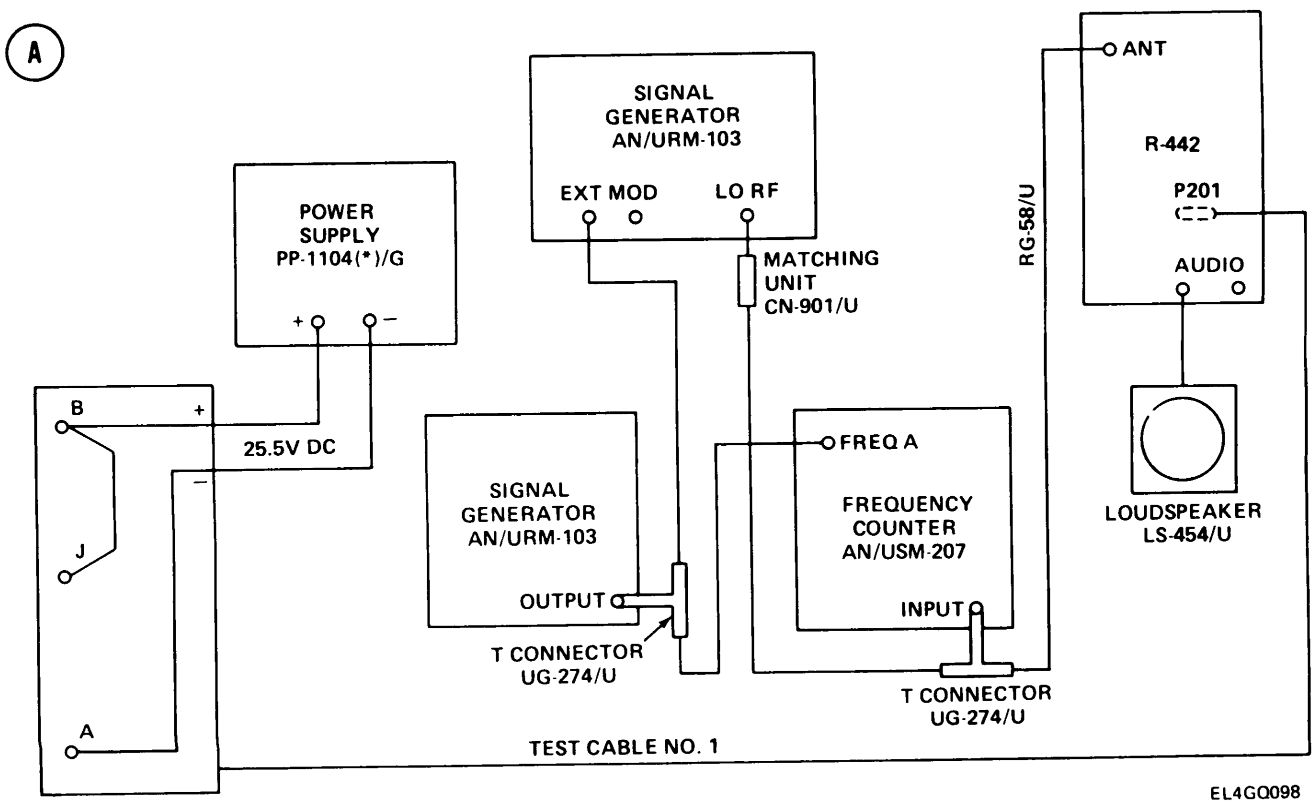
PURPOSE. This procedure adjusts the receiver sensitivity to the OLD SQUELCH signals which include internal noise and the received carrier.

5-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

TEST EQUIPMENT AND MATERIALS

- Signal Generator AN/URM-103
- Frequency Counter AN/USM-207
- Power Supply PP-1104(*)/G
- Test Cable No. 1
- Signal Generator AN/URM-127
- Matching Unit CN-901/U
- T-Connector UG-274/U
- Loudspeaker LS-454/U
- Voltmeter ME-30(*)/U

TEST SETUP. Connect the equipment as shown in test setup diagram A. Remove R-442/VRC top cover. (See paragraph 2-7.)



INITIAL EQUIPMENT CONTROL SETTINGS. Set equipment controls as indicated in the following table. When using alternate equipment, inject 20-µv rf at 64 MHz, 7.3-kHz modulation; deviation as per alinement requirements.

CONTROL AND SWITCH SETTINGS

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
R-442/VRC	POWER	ON-RESET
	BAND	Follow instructions in alinement procedure
	MC-TUNE-KC	Follow instructions in alinement procedure
	VOLUME	Fully clockwise
	SQUELCH	OLD ON

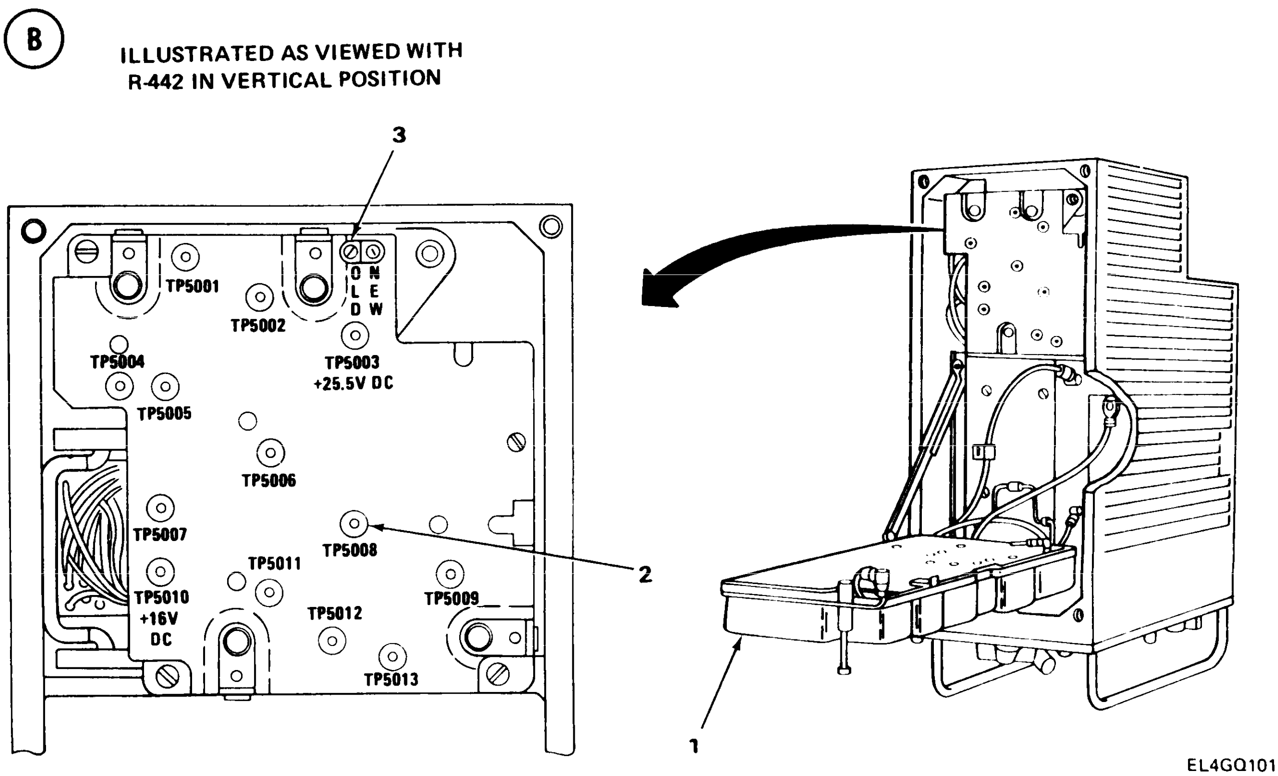
5-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

CONTROL AND SWITCH SETTINGS (CONT)

EQUIPMENT	CONTROL OR SWITCH	POSITION/SETTING
AN/URM-103	OPERATE/OFF/STAND BY	OPERATE
	FUNCTION	EXT MOD
	BAND SWITCH	D
	RF TUNING	64.00
	DEVIATION RANGE KHZ	10
	RF OUTPUT	LO, 0-10 KUV
	DEVIATION	Fully counterclockwise
	RF SET TO LINE	Adjust until needle on IF UV RF SET TO LINE meter is over red line
	LO RF UV	20 µv
AN/URM-127	POWER	ON
	FREQ RANGE MULTIPLIER	x100
	FREQ RANGE DIAL	73
	ATTENUATOR	x10
	OUTPUT CONTROL	Turn clockwise for 2.2-volt reading on panel voltmeter
	FREQ METER	ON
AN/USM-207 (to verify AN/URM-127 low-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	0.1 v
	GATE TIME	1
	FUNCTION	FREQ
AN/USM-207 (to verify AN/URM-103 high-frequency output)	POWER	TRACK
	DISPLAY	MIN (fully counterclockwise)
	SENSITIVITY	PLUG IN
	FUNCTION	FREQ
	GATE TIME	10^4 (black knob)
	DIRECT/HETERODYNE	DIRECT
	INPUT	0.3 V MAX (both switches to left)
	FREQUENCY TUNING-MC	100

5-28. SILICON VERSION A5200A SQUELCH AMPLIFIER ALINEMENT, OLD SQUELCH LEVEL. (CONT)

ALINEMENT PROCEDURE



1. Lift R-442/VRC A3000 tray (1). (See test setup diagram B .)
2. Set ME-30(*)/U to 3-volt scale.
3. Connect ME-30(*)/U positive lead to TP5008 (2), and negative lead to ground. (See test setup diagram B .)
4. Turn AN/URM-103 DEVIATION control clockwise until ME-30(*)/U reads 1.5 vac. R-442/VRC CALL light should be off. If necessary, adjust R5208 (3) until CALL light goes off.
5. Turn DEVIATION control counterclockwise until ME-30(*)/U reads 1.0 vac. Adjust R5208 (3) and stop at point where CALL light just comes on.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE

OVERVIEW

This chapter contains general support maintenance procedures for the R-442(*)/VRC receiver. References are made to those publications listing repair parts, tools, and TMDE that support this level of maintenance.

There are no general support troubleshooting procedures required to maintain the R-442(*)/VRC receiver. The maintenance procedures contained in section II of this chapter are supported by troubleshooting performed at the direct support (DS) level.

Chapters 3,4, and 5 contain troubleshooting charts appropriate for fault isolation of those assemblies/parts included in this chapter's maintenance procedures. See chapter 2, section II, for the explanation of how to use these charts. Since the need to replace an assembly or part can be established by visual evidence of defects or damage, a corresponding troubleshooting procedure may not exist.

Section I GENERAL SUPPORT REPAIR PARTS, TOOLS, AND TMDE

6-1. GENERAL SUPPORT REPAIR PARTS AND TOOLS.

For repair parts and tools required to support general support maintenance, refer to TM 11-5820-401-34P-3.

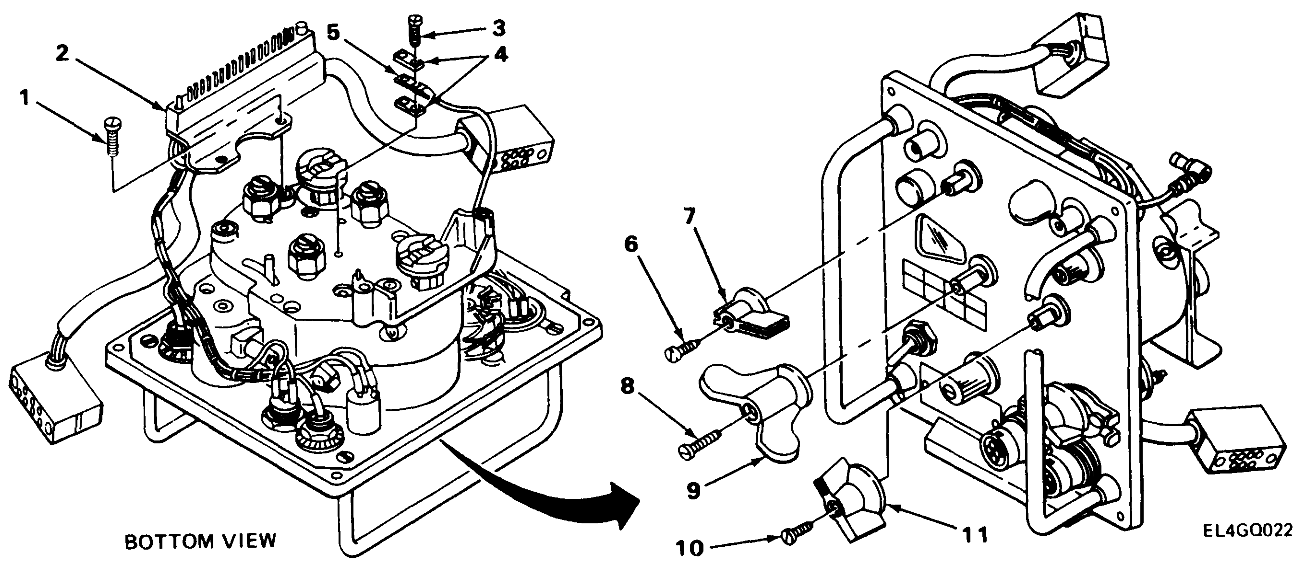
6-2. SPECIAL TOOLS AND TMDE.

For special tools and TMDE, refer to the Maintenance Allocation Chart (MAC) in TM 11-5820-401-20-1 or TM 11-5820-401-20-2.

Section II GENERAL SUPPORT MAINTENANCE PROCEDURES

6-3. FRONT PANEL GEAR TRAIN ASSEMBLY MP101 REPLACEMENT.

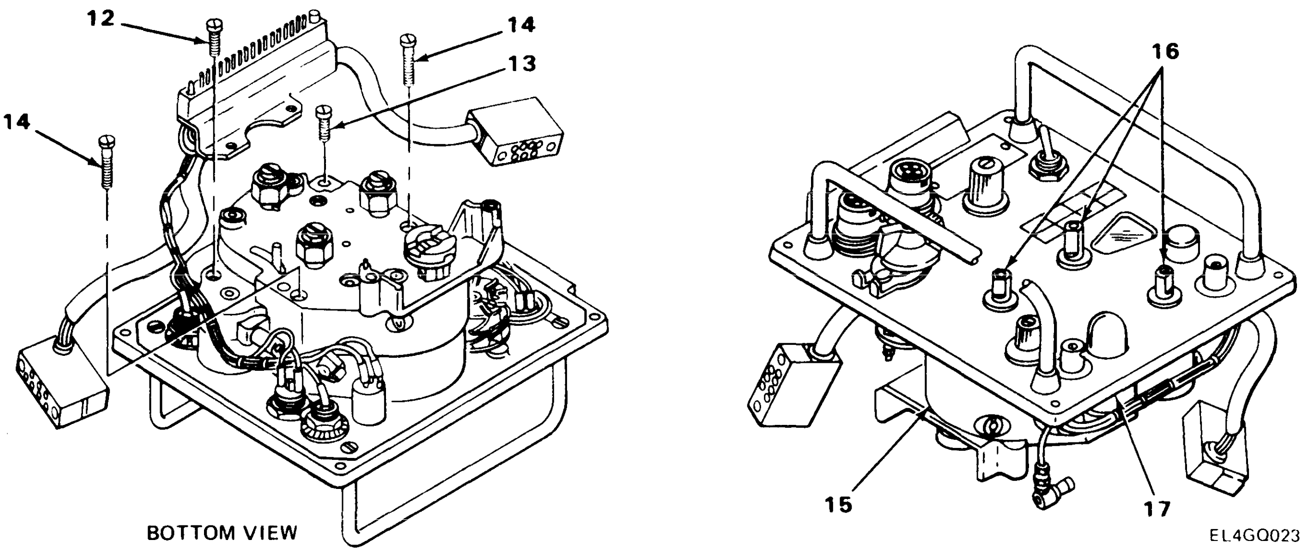
MATERIALS/PARTS: Helical Matched Front Panel Gear Train
PRELIMINARY PROCEDURE:, Remove A1000 Assembly. (See paragraph 2-9.)
Remove A2000 Assembly. (See paragraph 2-12.)



REMOVAL

1. Using screwdriver, remove two screws (1) and move Connector P101 (2) out of way.
2. Using small screwdriver, remove two screws (3) and spacers (4), and move wire (5) out of way.
3. Using screwdriver, remove screw (6) and BAND switch knob (7).
4. Using screwdriver, remove screw (8) and MC knob (9).
5. Using screwdriver, remove screw (10) and KC knob (11).

6-3. FRONT PANEL GEAR TRAIN ASSEMBLY MP101 REPLACEMENT. (CONT)



CAUTION

Note locations of three different length screws used to secure gear train assembly.

6. Using screwdriver, remove one 1/2-inch-Iong screw (12), one 3/8-inch-long screw (13), and two 15/16-inch-long screws (14).

CAUTION

Position front panel face up to prevent parts within gear train assembly from falling out when removed from front panel.

7. While holding gear train assembly (15) from bottom, push down on three knob stems (16) while removing from front panel (17).

CAUTION

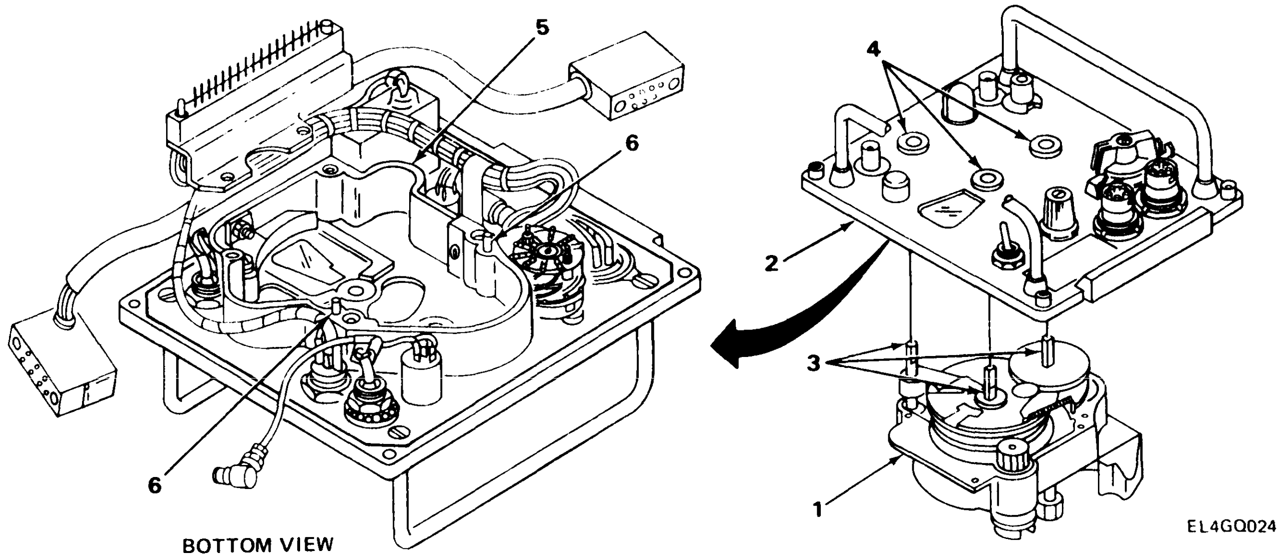
Do not turn gear train assembly upside down when removed to prevent parts from falling out.

Note number of shims, if any, used on knob stems.

Do not turn any gear train couplers or dials.

6-3. FRONT PANEL GEAR TRAIN ASSEMBLY MP101 REPLACEMENT. (CONT)

INSTALLATION



NOTE

If knob stem shims are used, make sure they are in place.

1. Position gear train assembly (1) under front panel (2) and aline knob stems (3) with knob stem holes (4).

NOTE

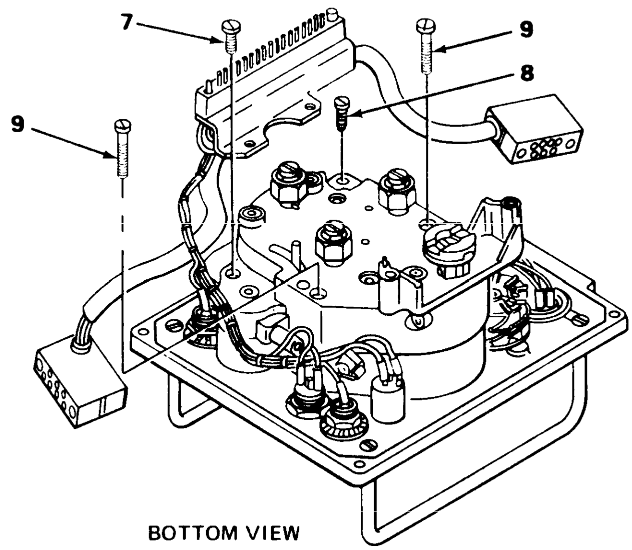
Make sure gear train assembly (1) fits flush against seat (5) and no wires are pinched.

2. Carefully push gear train assembly (1) into place making sure it engages with alinement pins (6) on front panel.

NOTE

Place front panel face down on workbench.

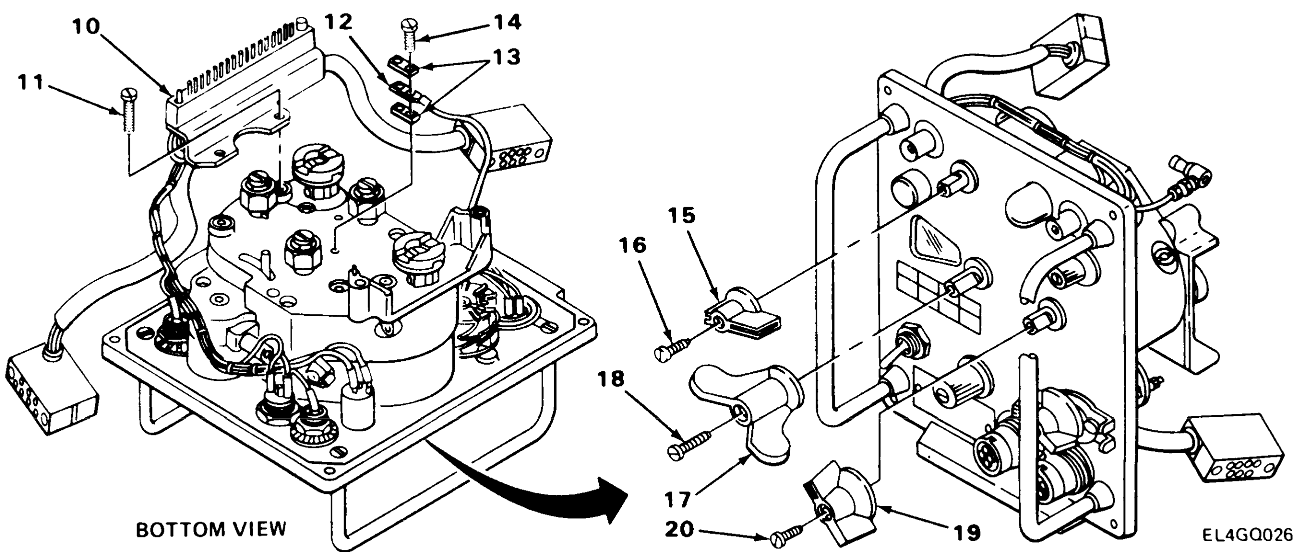
6-3. FRONT PANEL GEAR TRAIN ASSEMBLY MP1O1 REPLACEMENT. (CONT)



CAUTION

Note locations of three different length screws used to secure gear train assembly.

3. Install one 1/2-inch-long screw (7), one 3/8-inch-long screw (8), and two 15/16-inch-long screws (9).
4. Using screwdriver, tighten four screws (7), (8), and (9).



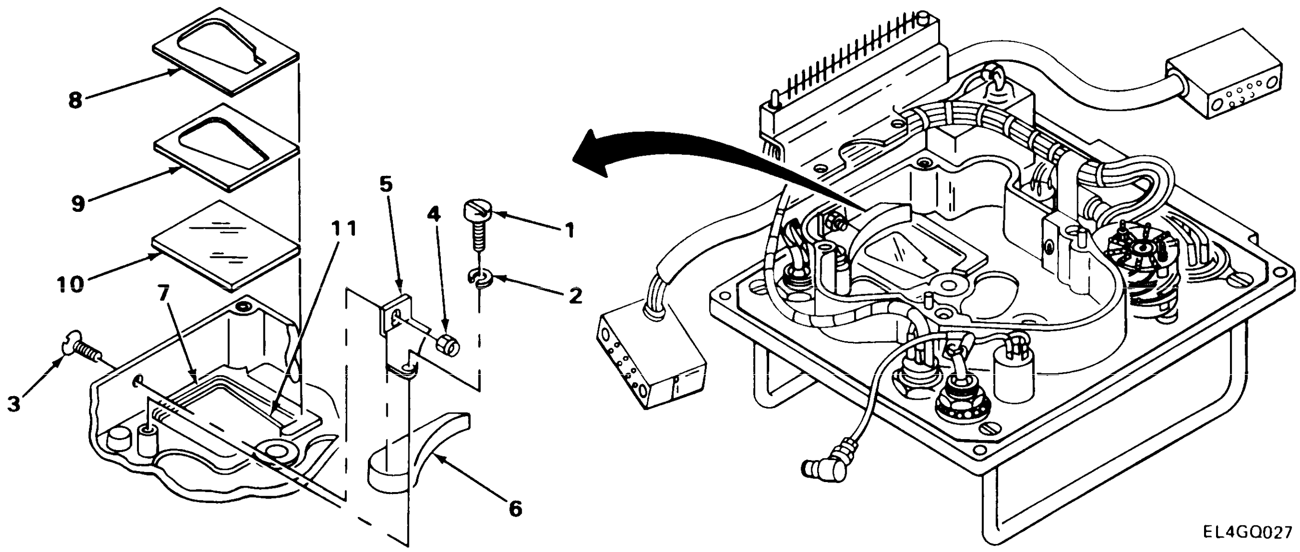
5. Position Connector P101 (10) over holes and install two screws (11).
6. Using screwdriver, tighten two screws (11).
7. Position wire (12) and two spacers (13), and install two screws (14).
8. Using small screwdriver, tighten two screws (14).
9. Install BAND switch knob (15) and screw (16), MC knob (17) and screw (18), and KC knob (19) and screw (20).

FOLLOW-ON MAINTENANCE: Install A2000 assembly. (See paragraph 2-12.)
Install A1000 assembly. (See paragraph 2-9.)

6-4. DIAL GLASS AND GASKET REPLACEMENT.

MATERIALS/PARTS: Dial Glass
Gasket
Sealer, EC-800 or equivalent

PRELIMINARY PROCEDURE: Remove Front Panel Gear Train Assembly MP101. (See paragraph 6-3.)



REMOVAL

1. Using screwdriver, remove screw (1) and lockwasher (2).
2. Using screwdriver and adjustable wrench, remove screw (3) and nut (4).
3. Remove bracket (5) and reflector (6).
4. Using scraper, carefully remove cement from around mask mating surface (7).
5. Remove mask (8), gasket (9), and dial glass (10).

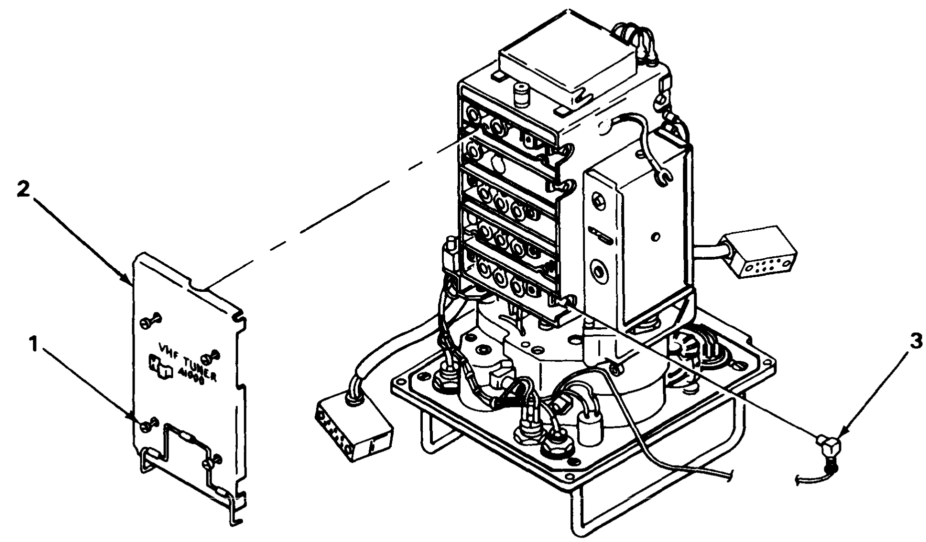
INSTALLATION

1. Using scraper, remove cement from dial glass mating surface (11).
2. Apply sealer EC-800 or equivalent to dial glass mating surface (11).
3. Install dial glass (10), gasket (9), and mask (8).
4. Stake mask (8) to front panel.
5. Apply small bead of cement around mask mating surface (7).
6. Install reflector (6), bracket (5), nut (4), screw (3), lockwasher (2), and screw (1).
7. Using screwdriver and adjustable wrench, tighten screw (3) and nut (4).
8. Using screwdriver, tighten screw (1).

FOLLOW-ON MAINTENANCE: Install Front Panel Gear Train Assembly MP101. (See paragraph 6-3.)

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT.

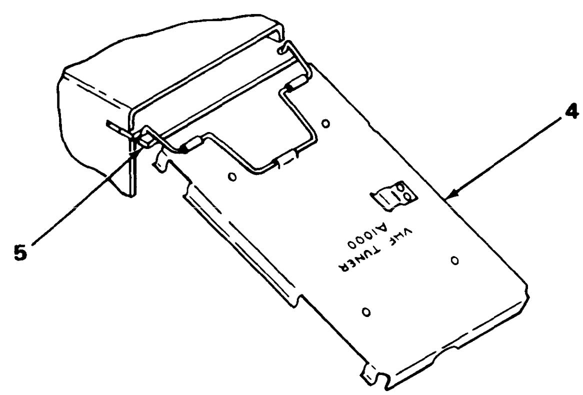
MATERIALS/PARTS: Regulator Assembly VR1001
PRELIMINARY PROCEDURE: Remove front panel. (See paragraph 2-8.)



EL4GQ055

REMOVAL

1. Using screwdriver, loosen four captive screws (1) and remove A1000 top cover (2).
2. Disconnect brown wire (W201) (3) from J1001.



EL4GQ056

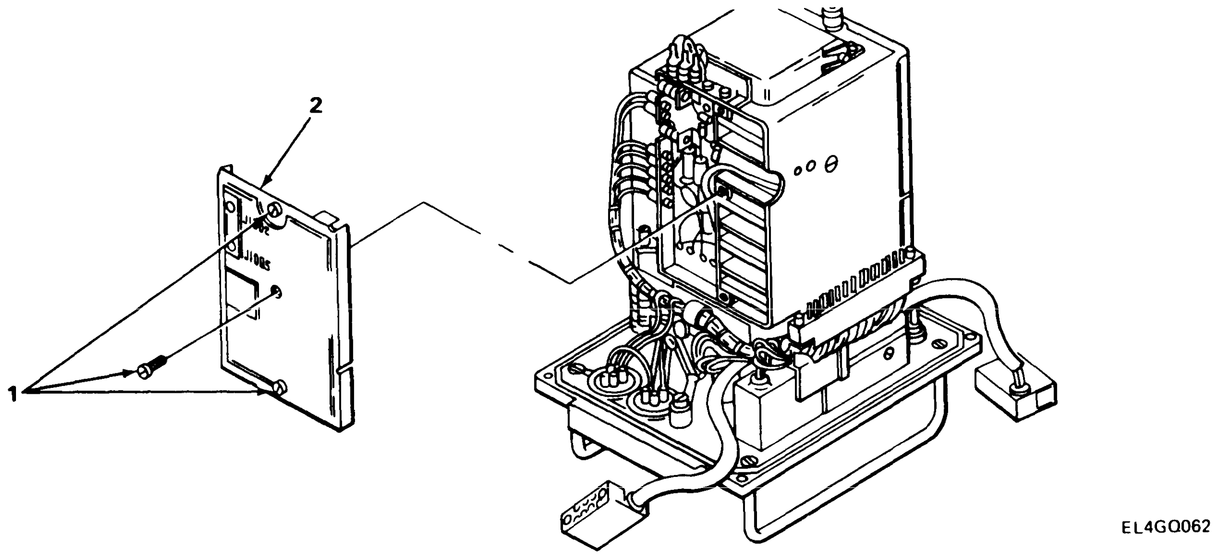
CAUTION

To prevent damaging any modules, all modules should be removed from A1000 assembly.

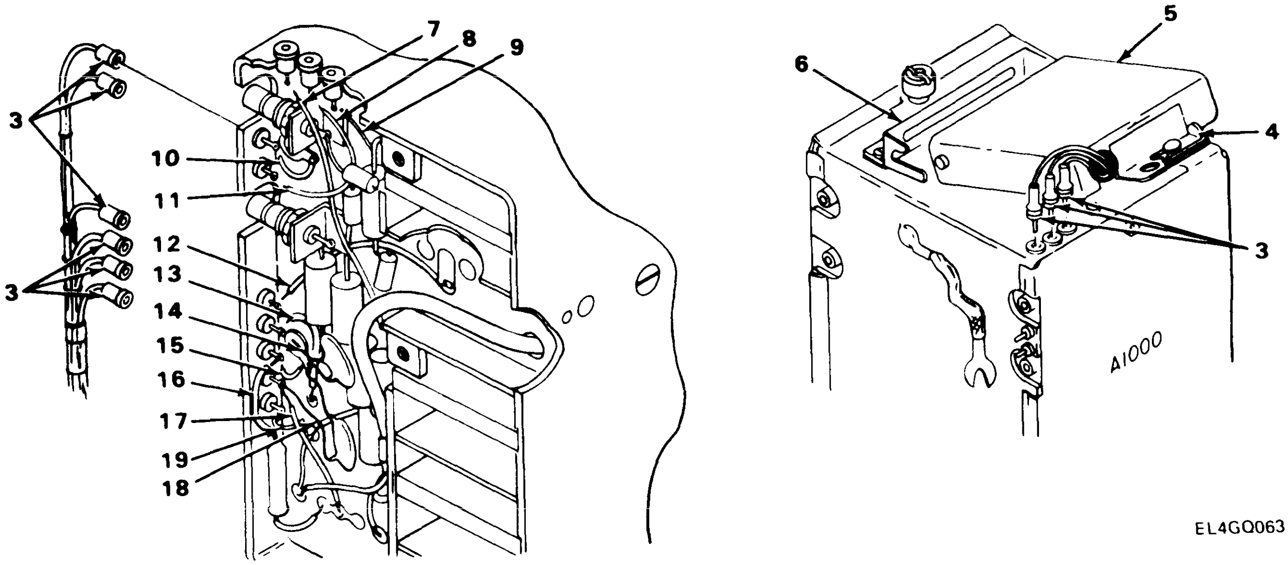
3. Using module puller (4), carefully remove all five modules (5).

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

REMOVAL (CONT)



4. Using screwdriver, remove three screws (1) and A1000 bottom cover (2).



6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

5. Unplug nine color-coded wire plugs (3).
6. Unfasten retaining clip (4) by moving retaining clip to right.
7. Lift front of A1600 assembly (5) up and pull forward to remove from bracket (6).

CAUTION

Extreme care must be taken when performing next step to prevent damage to Circuit Board VR1001 and color-coded wire plugs.

NOTE

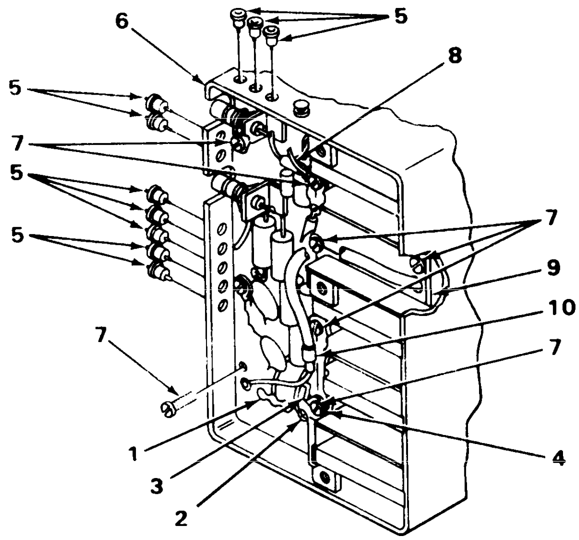
If color coding on unit varies from one shown, note corrected color coding before disassembly.

8. Using soldering iron, carefully unsolder wires from color-coded wire plugs. See table below.

TOP OF A1000 ASSEMBLY			SIDE OF A1000 ASSEMBLY		
PLUG COLOR	WIRE COLOR	INDEX NO.	PLUG COLOR	WIRE COLOR	INDEX NO.
Brown	Brown	7	Black	Black	10
Purple	Purple	8	White	White	11
Black	Black	9	Yellow	Yellow/White	12
			Orange	Orange	13/14
			Violet	Violet/White	15/16
			Red	Violet	17/18
			Brown	Red/White	19

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

REMOVAL (CONT)



EL4GQ064

CAUTION

Extreme care must be taken when performing next step to prevent damage to Circuit Board VR1001.

NOTE

Step 9 is for Circuit Board VR1001 with Voltage Regulator FL1001 which is used on A-models only. For plain models, proceed to step 10.

9. Using soldering iron, carefully unsolder yellow wire (1) and blue wire (2) from Circuit Board VR1001 and ground wire (3) from ground lug (4).
10. Carefully push ten color-coded wire plugs (5) out of case (6).
11. Using small flat-tip screwdriver, remove eight screws (7) and ground lug (4).

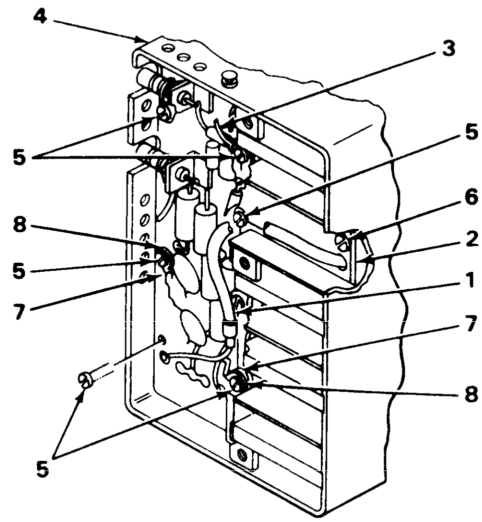
NOTE

Move ground wire (8) out of way before removing Circuit Board VR1001.

12. Carefully remove Circuit Board VR1001 (9). On A-models only, push Voltage Regulator FL1001 wiring harness (10) through hole in Circuit Board VR1001.

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

INSTALLATION



EL4GQ065

NOTE

Step 1 is for A-model only. If plain model, proceed to step 2.

1. Put end of Voltage Regulator wiring harness (1) through hole in Circuit Board VR1001 (2).

CAUTION

To prevent breaking ground wire (3), move out of way before installing Circuit Board VR1001 (2).

2. Position Circuit Board VR1001 (2) in case (4) and install five small screws (5) and one large screw (6).
3. Install ground lugs (7) and two small screws (8).

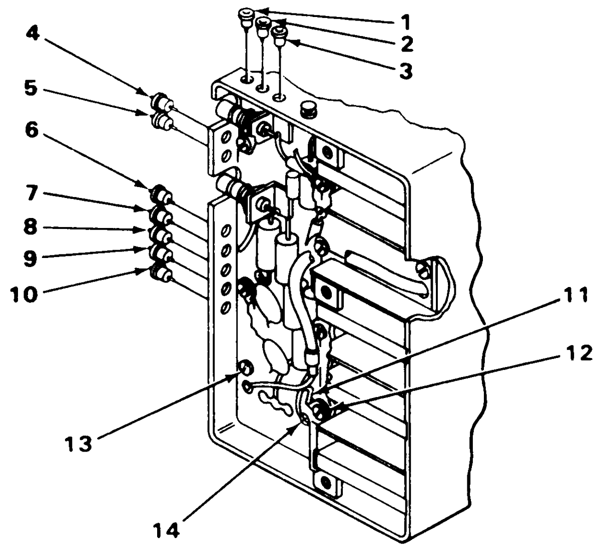
NOTE

Note positioning of ground lugs (7).

4. Using small screwdriver, carefully tighten eight screws (5), (6), and (8).

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

INSTALLATION (CONT)



NOTE

If color coding on unit varies from one shown, note corrected color coding before disassembly.

5. Install color-coded wire plugs where indicated. See table below.

PLUG TYPE: MALE/FEMALE		PLUG TYPE: MALE/MALE	
PLUG COLOR	INDEX NO.	PLUG COLOR	INDEX NO.
Brown	1	Black	4
Purple	2	White	5
Black	3	Yellow	6
		Orange	7
		Purple	8
		Red	9
		Brown	10

CAUTION

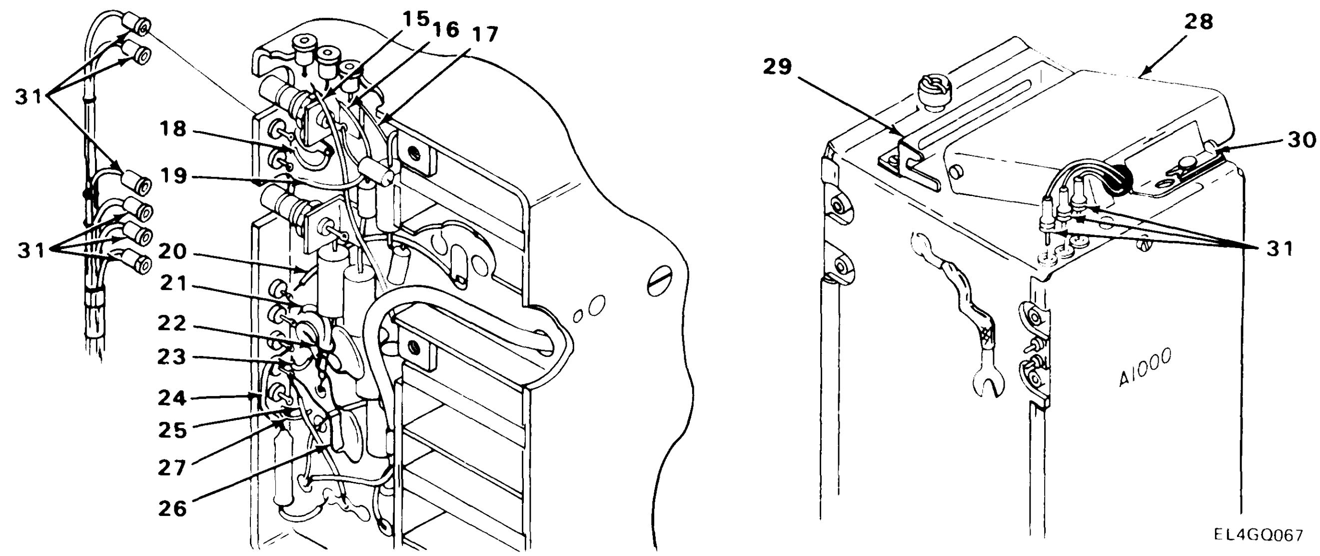
Extreme care must be taken when performing next step to prevent damage to Circuit Board VR1001.

NOTE

Step 6 is for Circuit Board VR1001 with Voltage Regulator FL1001 which is used on A- . models only. For plain models, proceed to step 7.

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

6. Using soldering iron, carefully solder ground wire (11) to ground lug (12), and yellow wire (13) and blue wire (14) to Circuit Board VR1001.



CAUTION

Extreme care must be taken when performing next step to prevent damage to Circuit Board VR1001 and color-coded wire plugs.

NOTE

If color coding on unit varies from one shown, note corrected color coding before disassembly.

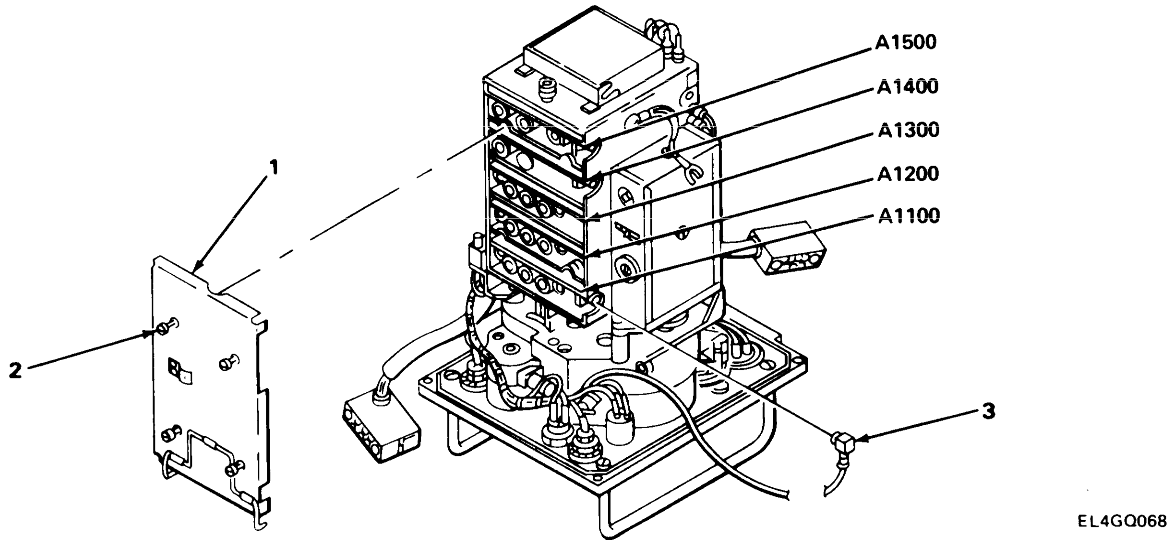
7. Using soldering iron, carefully solder wires to color-coded wire plugs. See table below.

TOP OF A1000 ASSEMBLY			SEDE OF A1000 ASSEMBLY		
PLUG COLOR	WIRE COLOR	INDEX NO.	PLUG COLOR	WIRE COLOR	INDEX NO.
Brown	Brown	15	Black	Black	18
Purple	Purple	16	White	White	19
Black	Black	17	Yellow	Yellow/White	20
			Orange	Orange	21/22
			Violet	Violet/White	23/24
			Red	Violet	25/26
			Brown	Red/White	27

8. Position A1600 assembly (28) in bracket (29) and push into place.
9. Fasten retaining clip (30) by moving retaining clip to left.
10. Connect nine color-coded wire plugs (31).

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)

INSTALLATION (CONT)



CAUTION

Care must be taken when performing next step to prevent damage to modules.

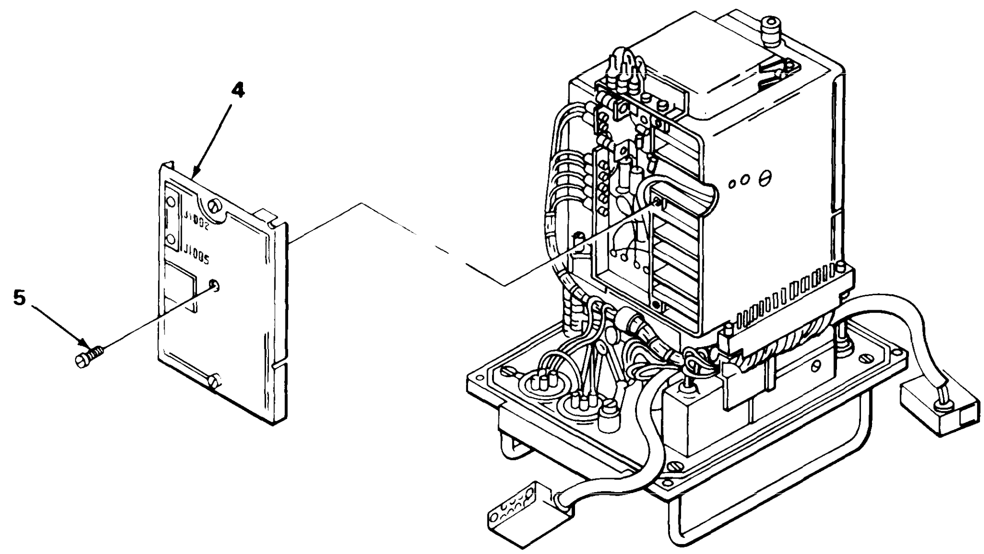
Ground tabs on modules must make contact with partitions in assembly.

NOTE

Module number is stamped on module. Note locations of different numbered modules

11. Carefully install all five modules in A1000 assembly.
12. Install A1000 top cover (1).
13. Using screwdriver, tighten four captive screws (2).
14. Connect brown wire (W102) (3) to J1001.

6-5. A1000 ASSEMBLY MAIN CIRCUIT BOARD VR1001 REPLACEMENT. (CONT)



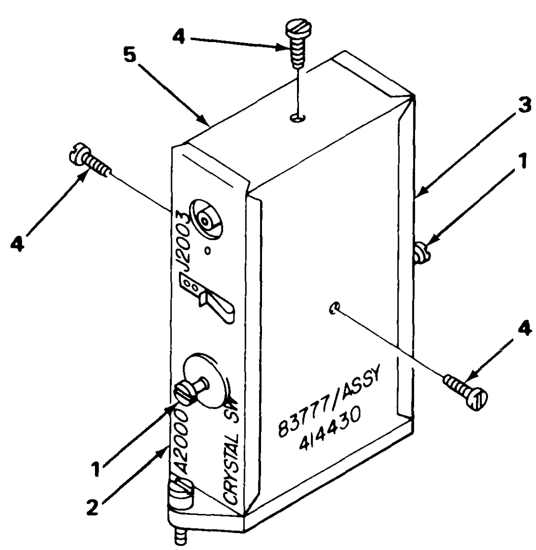
EL4GQ069

15. Install A1000 bottom cover (4) and three screws (5).
16. Using screwdriver, tighten three screws (5).

FOLLOW-ON MAINTENANCE: Install front panel. (See paragraph 2-8.)

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT.

MATERIALS/PARTS: Oscillator Y2200
Oscillator Y2100
PRELIMINARY PROCEDURE: Remove A2000 assembly. (See paragraph 2-12.)



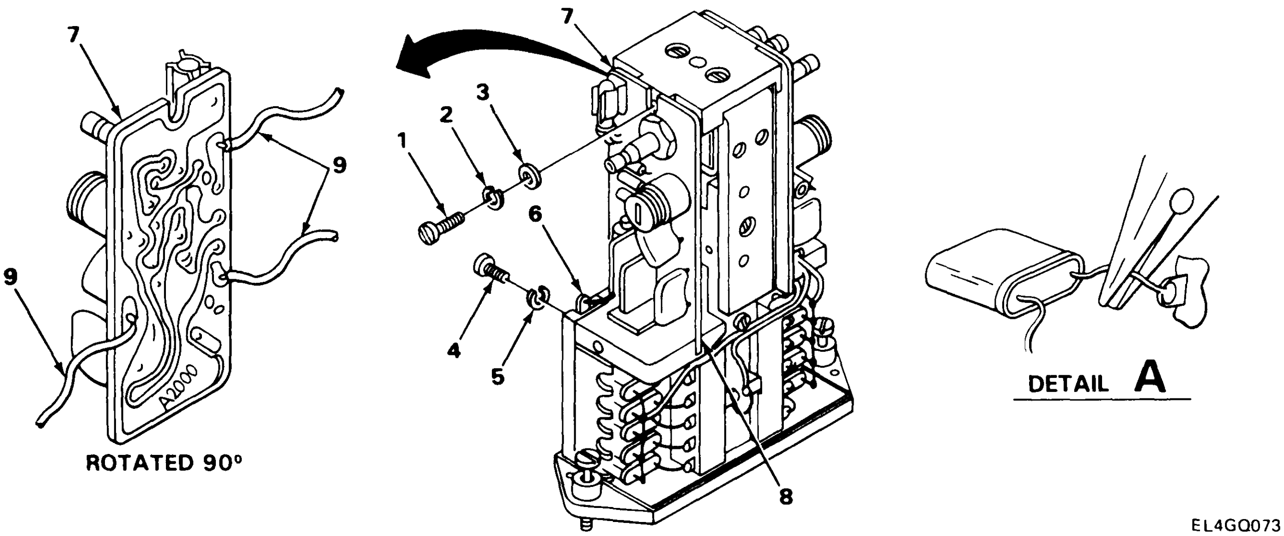
EL4GQ070

REMOVAL

1. Using screwdriver, loosen two captive screws (1), and remove top cover (2) and bottom cover (3).
2. Using screwdriver, remove three screws (4) and U-shaped cover (5).

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT. (CONT)

REMOVAL (CONT)



NOTE

Steps 3 through 6 are for the removal of Circuit Board Y2200.

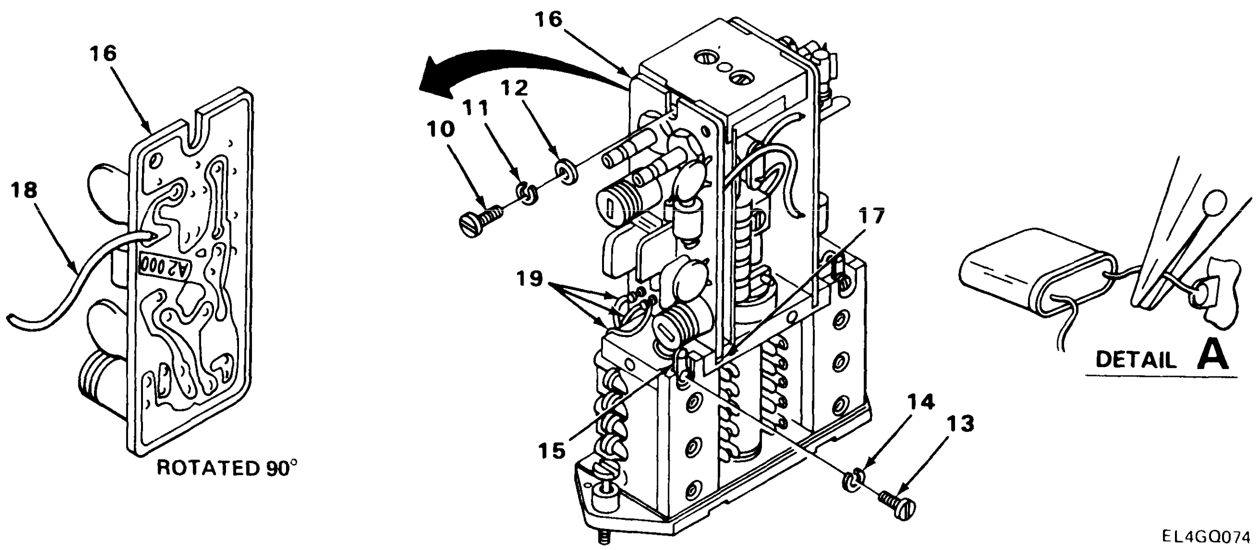
3. Using screwdriver, remove screw (1), lockwasher (2), and flat washer (3).
4. Using small screwdriver, remove screw (4) and lockwasher (5) from ground lug (6).
5. Lift circuit board (7) out of groove (8) and turn to gain access to rear of circuit board.

CAUTION

When unsoldering a circuit board wire that leads to a crystal, clamp crystal terminal connection with heat sink pliers (see detail A) to prevent heat transfer during unsoldering operation.

6. Using soldering iron, carefully unsolder three wires (9) from circuit board (7) and remove circuit board.

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT. (CONT)



NOTE

Steps 7 through 10 are for the removal of Circuit Board Y2100.

7. Using screwdriver, remove screw (10), Iockwasher (11) and flat washer (12).
8. Using small screwdriver, remove screw (13) and Iockwasher (14) from ground lug (15).
9. Lift circuit board (16) out of groove (17) and turn to gain access to rear of circuit board.

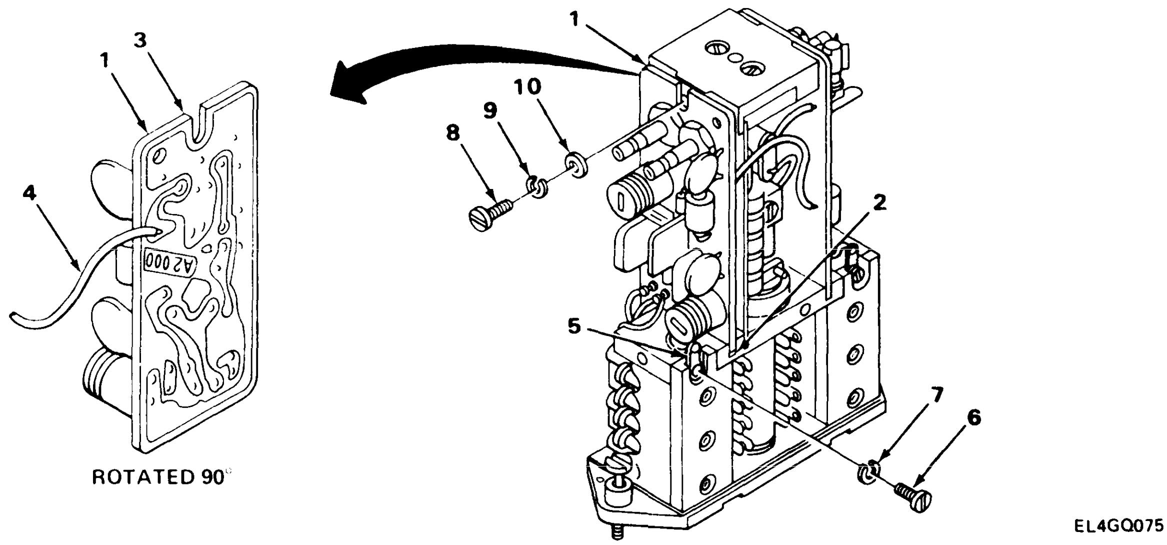
CAUTION

When soldering a circuit board wire that leads to a crystal, clamp crystal terminal connection with heat sink pliers (see detail A) to prevent heat transfer during unsoldering operation.

10. Using soldering iron, carefully unsolder one wire (18) from rear of circuit board, and three wires (19) from front of circuit board.

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT. (CONT)

INSTALLATION



NOTE

Steps 1 through 7 are for the installation of Circuit Board Y2100.

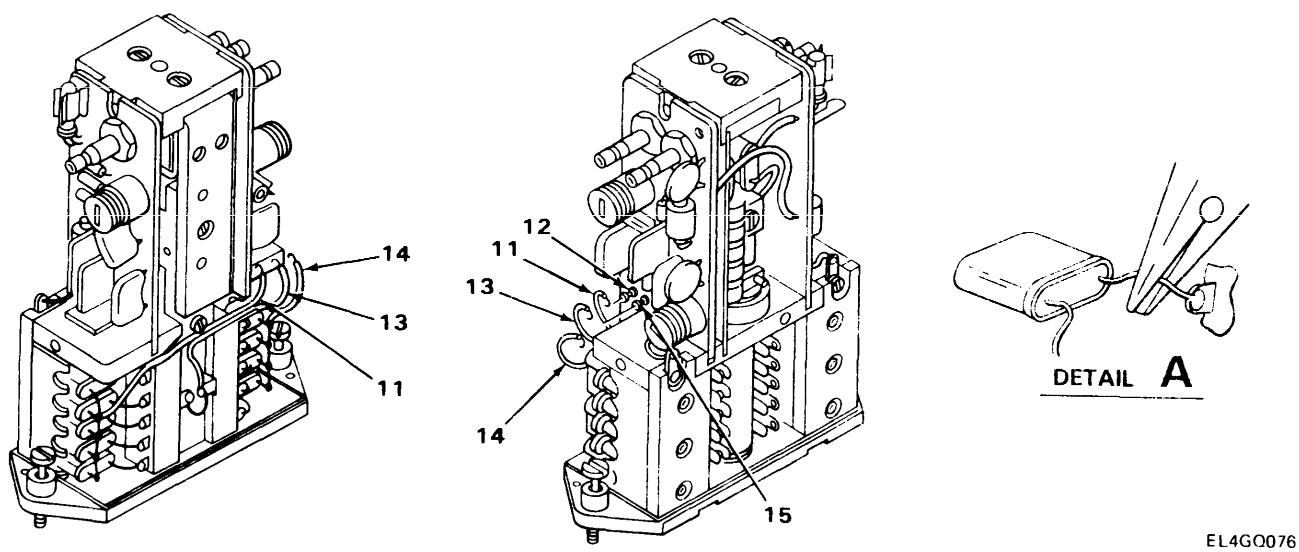
1. Position circuit board (1) in groove (2) with notch (3) facing top.

CAUTION

Care must be taken when performing next step to prevent damage to circuit board.

2. Using soldering iron, carefully solder circuit board jumper wire (4) to circuit board (1).
3. Position ground lug (5) in recess and install screw (6) and lockwasher (7).
4. Using screwdriver, tighten screw (6).
5. Install screw (8), lockwasher (9), and flat washer (10) through circuit board (1).
6. Using screwdriver, tighten screw (8).

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT. (CONT)



EL4GQ076

CAUTION

Care must be taken when performing next two steps to prevent damage to circuit board.

When soldering a circuit board wire that leads to a crystal, clamp crystal terminal connection with heat sink pliers (see detail A) to prevent heat transfer during soldering operation.

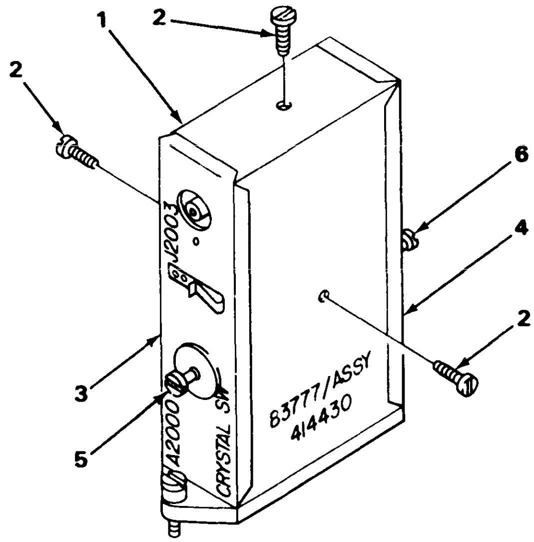
7. Using soldering iron, carefully solder green wire (11) to pin (12), and green wire (13) and clear wire (14) to pin (15).

CAUTION

Make sure all wires are routed as shown in illustration to prevent pinching when covers are installed.

6-6. A2000 ASSEMBLY CIRCUIT BOARD Y2200 AND Y2100 REPLACEMENT. (CONT)

INSTALLATION (CONT)



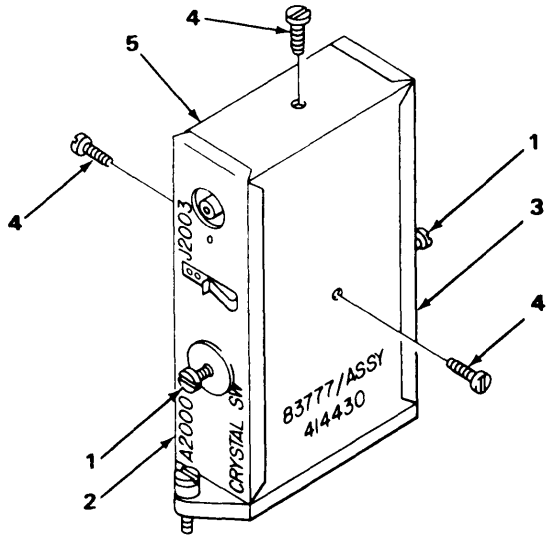
EL4GQ077

8. Position U-shaped cover (1) over assembly and install three screws (2).
9. Position top cover (3) and bottom cover (4) on assembly.
10. Using screwdriver, tighten three screws (2) and two captive screws (5) and (6).

FOLLOW-ON MAINTENANCE: Install A2000 assembly. (See paragraph 2-12.)

6-7. A2000 CRS ASSEMBLY MECHANICAL ADJUSTMENT.

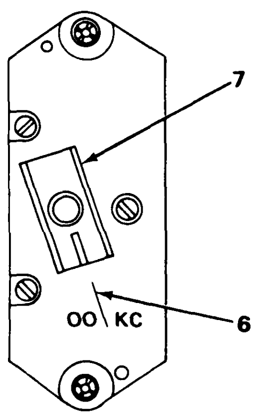
PRELIMINARY PROCEDURE: Remove A2000 assembly, (See paragraph 2-12.)

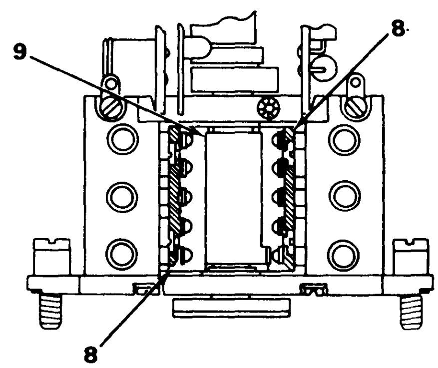


EL4GQ082

DISASSEMBLY

1. Using screwdriver, loosen two captive screws (1) and remove top cover (2) and bottom cover (3).
2. Using screwdriver, remove three screws (4) and U-shaped cover (5).





EL4GQ078

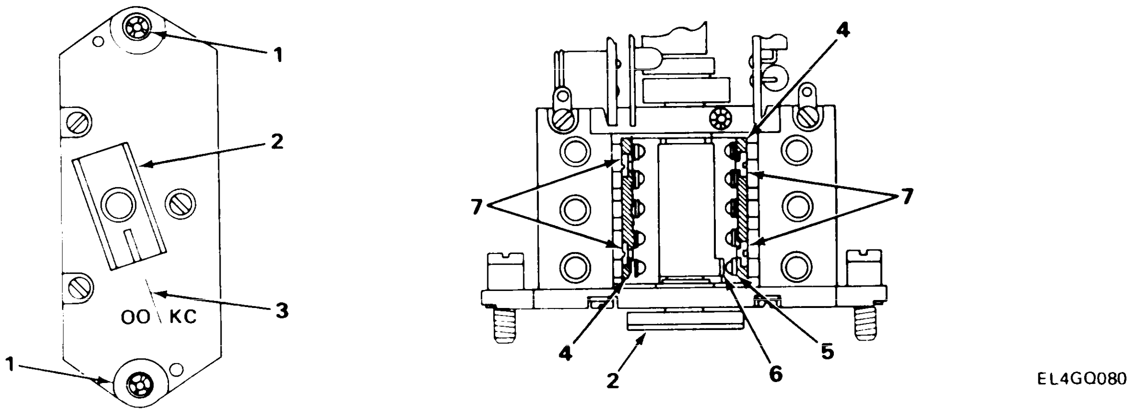
ADJUSTMENT

NOTE

The OO/KC scribe mark (6) on assembly chassis is alined with scribe mark on the A2000 coupler (7) to provide a starting point or reference during adjustment of point overlap. This represents the angular rotation of the A2000 coupler (7) in relation to contacts on Switch S2001 (8) that are closed by the S2001 cam (9).

6-7. A2000 CRS ASSEMBLY MECHANICAL ADJUSTMENT. (CONT)

ADJUSTMENT (CONT)



CAUTION

When bending fixed contacts, the effect may be reflected in the tuning of adjacent contacts.

NOTE

For a properly adjusted Switch S2001, there should be an overlap of 2 degrees minimum between any two successive switch closures.

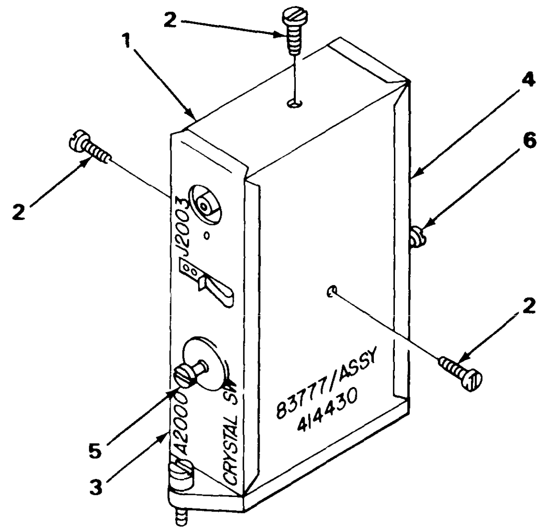
3. Position template with two screws (1) through holes in template. (See FO-13.)
4. Aline scribe mark on A2000 coupler (2) and OO/KC mark (3) on template.
5. Rotate the A2000 coupler (2) and note all switch closures on Switch S2001 (4).
6. If overlap is insufficient, carefully bend fixed contact (5) toward movable contact (6).
7. If overlap is excessive, carefully bend fixed contact (5) away from movable contact (6).
8. If switch closures do not agree with template, loosen adjustment screws (7) of effect switch section, and move Switch S2001 (4) up or down until proper overlap is reached. Tighten adjustment screws (7).

NOTE

Care must be taken when tightening adjustment screws (7) not to disturb adjustment. Switch closures must be tested clockwise and counterclockwise for proper function.

6-7. A2000 CRS ASSEMBLY MECHANICAL ADJUSTMENT. (CONT)

ASSEMBLY



EL4G0081

1. Position U-shaped cover (1) over assembly and install three screws (2).
2. Position top cover (3) and bottom cover (4) on assembly.
3. Using screwdriver, tighten three screws (2) and two captive screws (5) and (6).

FOLLOW-ON MAINTENANCE: Install A2000 assembly. (See paragraph 2-12.)

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all pamphlets, forms, service catalogues, service bulletins, technical bulletins, and technical manuals referenced in this manual. It also lists those technical manuals covering the operation of the test equipment needed to perform the test, troubleshooting, and alinement procedures in chapters 3, 4, and 5.

A-2. PAMPHLETS.

Consolidated Index of Army Publications and Blank Forms	DA PAM 310-1

A-3. FORMS.

Recommended Changes to Publications and Blank Forms	DA FORM 2028
Recommended Changes to Equipment Technical Manuals	DA FORM 2028-2
Equipment Inspection and Maintenance Worksheet	DA FORM 2404
Discrepancy in Shipment Report (DISREP)	SF-361
Report of Discrepancy (ROD)	SF-364
Quality Deficiency Report	SF-368

A-4. SERVICE CATALOGUES.

Tool Kit, Electronic Equipment TK-105/G (NSN 5180-00-610-8177)	SC 5180-91-CL-07
Tool Kit, Electronic Equipment TK-101/G (NSN 5180-00-064-5178)	SC 5180-91-CL-R13
Tool Kit, Electronic Equipment TK-100/G (NSN 5180-00-605-0079)	SC 5180-91-CL-S21

A-5. SERVICE BULLETINS.

Vehicular Radio Sets and Authorized Installations	SB11-131
Painting and Preservation Supplies Available for Field Use for Electronic Equipment	SB11-573

A-6. TECHNICAL BULLETIN.

Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters	TB 43-0118

A-7. TECHNICAL MANUALS.

Power Supplies PP-1104(A)/G and PP-1104(B)/G (NSN 6130-00-542-6385)	TM 11-5126
Operator's, organizational, Direct Support, and General Support Maintenance Manual for Installation Kits, Electronic Equipment TSEC/KY-38 and HYL3/TSEC	TM 11-5810-290-14&P

A-7. TECHNICAL MANUALS. (CONT)

Operator's Manual: Radio Sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437) (Used without an intercom system)	TM 11-5820-401-10-1
Hand Receipt Technical Manual Covering End Item/Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for Radio Sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437) (Used without intercom systems)	TM 11-5820-401-10-1-HR
Operator's Manual: Radio Sets AN/VRC-12 (NSN 5820-00-223-741 2), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437) (Used with Intercom System)	TM 11-5820-401-10-2
Hand Receipt Technical Manual Covering End Item/Components of End Item (COEI), Basic Issue Items (BII) and Additional Authorization List (AAL) for Radio Sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437) (Used with Intercom System)	TM 11-5820-401-10-2-HR
Organizational Maintenance Manual: Radio Sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437)	TM 11-5820-401-20-1
Organizational Maintenance Manual: Radio Sets AN/VRC-12 (NSN 5820-00-223-741 2), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437) (Used with Intercom Set AN/VIC-1(V))	TM 11-5820-401-20-2
Direct Support and General Support Maintenance Manual: Radio Sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437), Receiver-Transmitters Radio RT-246/VRC and RT-246A/VRC (NSN 5820-00-892-0823) and RT-524/VRC and RT-524A/VRC (NSN 5820-401-34-2)	TM 11-5820-401-34-2

A-7. TECHNICAL MANUALS. (CONT)

Direct Support and General Support Maintenance Repair Parts and Special Tools for Receivers, Radio R-442/VRC and R-442A/VRC (NSN 5820-00-892-0624)	TM 11-5820-401-34P-3
Operator, Organizational, Field and Depot Maintenance Repair Parts and Special Tool Lists: Loudspeaker, Permanent Magnet LS-454/U	TM 11-5965-255-15P
Operator, Organizational, Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts and Special Tools List): Handset H-189/GR (NSN 5965-00-069-8886)	TM 11-5965-280-15
Operator, Organizational, Direct Support, General Support, and Depot Maintenance Multimeter, ME-26(*)/U	TM 11-6625-200-15
Operator's, Organizational, Direct Support, and General Support Maintenance Manual Spectrum Analyzer TS-723 A/U (NSN 6625-00-833-2602), TS-723 B/U (NSN 6625-00-668-9418), and TS-723 C/U and TS-723 D/U (NSN 6625-00-668-9418)	TM 11-6625-255-14
Operator and Organizational Maintenance Manual Generator, Signal AN/URM-103	TM 11-6625-586-12
Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual Signal Generator AN/URM-127 (NSN 6625-00-783-5965)	TM 11-6625-683-15
Operator's Manual: Digital Readout, Electronic Counter AN/USM-207 (NSN 6625-00-911-6368)	TM 11-6625-700-10
Operator, Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools, Digital Readout Electronic Counter AN/USM-207A	TM 11-6625-700-14-1
Organizational, Direct Support, General Support, and Depot Maintenance Manual Digital Readout Electronic Counter, AN/USM-207 (NSN 6625-00-911-6368)	TM 11-6625-700-25
Operator, Organizational, Direct Support, and General Support Maintenance Manual Voltmeter Electronic, ME-30F/U (NSN 6625-00-420-9354)	TM 11-6625-2745-14
Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Maintenance Kits, Electronic Equipment, MK-1978/VRC and MK-1978A/VRC (NSN 6625-01-078-5893)	TM 11-6625-2971-14*P
Operator's Manual, Radio Test Set AN/GRM-114A (NSN 6625-01-071-2817)	TM 11-6625-3016-10-1
Maintenance Management Update	DA Pam 738-750
Administrative Storage of Equipment	TM 740-90-1
Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)	TM 750-244-2

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

B-1. SCOPE.

This appendix lists expendable supplies and materials you will need to maintain the R-442(*)/VRC. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

B-2. EXPLANATION OF COLUMNS.

a. Column (1), Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (for example, “Use cleaning compound, item 6, appendix B“).

b. Column (2), Level. This column identifies the lowest level of maintenance that requires the listed item.

F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3), National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4), Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5), Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (eg, ea. in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F	9105-00-293-4208	Silicone Insulating Compound (MIL-S-86660) (DC-4 or equal)	tube (8 oz)
2	F	5905-00-293-4208	Wire, Nonelectrical (Safety Wire)	lb
3	F	5970-00-816-6056	Insulation Tape, Electrical, Plastic	ft
4	F	7510-00-290-8036	Pressure Sensitive Tape, Filament Reinforced	yd (60)
5	F	6850-00-105-3084	Cleaning Compound, Freon TF (Trichlorotrifluoroethane)	oz (16)
6	F	6850-00-984-5853	Cleaning Compound, Freon PCA (Trichlorotrifluoroethane)	gal. (5)
7	H	8040-00-843-0802	Adhesive/Sealer Silicon	tube (3 oz)

APPENDIX C

MANUFACTURED/FABRICATED ITEMS

C-1. INTRODUCTION.

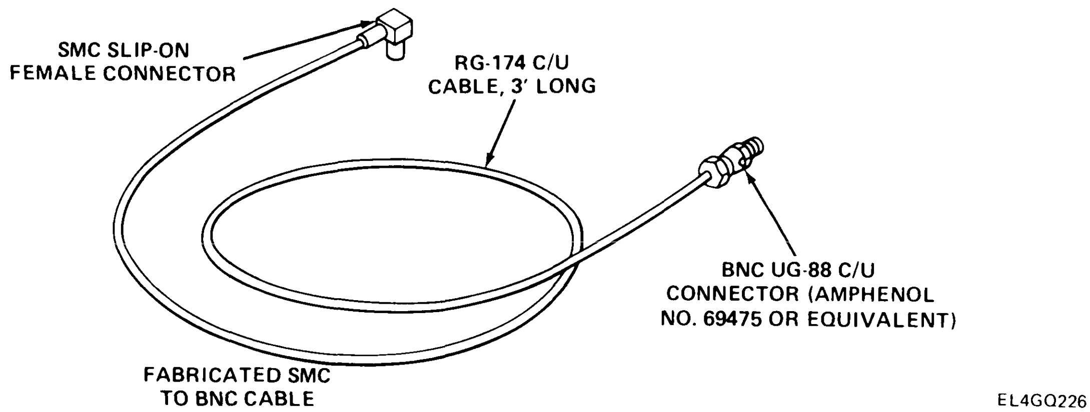
This appendix includes instructions for making items authorized to be manufactured or fabricated at the direct support level.

C-2. FABRICATED SMC TO BNC CABLE.

A fabricated SMC connector to BNC male connector is required to perform the troubleshooting in chapter 4, section II, charts 4-x and 4-x. It is used to connect the AN/GRM-114A to various SMC jacks on the R-442(*)/VRC.

Parts needed:

BNC Connector UG-88 C/U
Cable RG174 C/U
SMC Connector, Female, Slip-On



Connect parts as shown in the following diagram.

APPENDIX D

MAINTENANCE INFORMATION INDEX

References are indexed by paragraph number unless otherwise indicated.

ASSEMBLY/ MODULE COMPONENT/ PART	ILLUSTRATION OR SCHEMATIC	TEST	TROUBLESHOOT (BY CHART NUMBER	ALINE	REPAiR/ REPLACE
A100 (Front Panel Assy)	FO-2				2-8
CB101	2-13				2-13
Dial Glass and Gasket	6-4				6-4
J103, J104	2-17				2-17
MP101 (Gear Train)	6-3				6-3
R101	2-15				2-15
S101	2-16				2-16
S102	2-14				2-14
A1000 (Vhf Tuner Assy)	FO-4	3-2, 4-2, 5-2	3-7, 4-3, 5-7	3-18, 4-17, 5-18	2-9
A1100 thru A1500	2-10				2-10
A1600	2-11				2-11
VR1001	6-5				6-5
A2000 (Crystal Switch Assy)	2-12	3-15, 4-15, 5-15	3-8, 4-4, 5-8	1-15, 4-15, 5-15	2-12
Y2100	6-6				6-6
Y2200	6-6				6-6
A3000 (CRS Assembly)	FO-5, 2-18	3-15, 4-15, 5-15	3-8, 4-4, 5-8	1-15, 4-15, 5-15	2-18
A4000 (If Amplifier Assy)	FO-6, 2-19	3-10, 4-10, 5-10	3-6, 3-9, 4-2, 4-10, 5-6, 5-9		2-19
A4100 thru A4300				3-19, 3-21, 4-18, 4-20, 5-19 ,5-21	

MAINTENANCE INFORMATION INDEX (CONT)

ASSEMBLY/ MODULE COMPONENT/ PART	ILLUSTRATION OR SCHEMATIC	TEST	TROUBLESHOOT (BY CHART NUMBER)	ALINE	REPAIR/ REPLACE
A5000 (Audio and Squelch Assy)	FO-8, 2-20	3-4, 3-5, 3-6, 3-8, 4-4, 4-5, 4-6, 4-8, 5-4, 5-5, 5-6, 5-8	3-3 3-5, 3-10, 4-5, 4-6, 4-9, 5-3, 5-5, 5-10		2-20
A5100 thru A5300				3-23, 3-25, 3-27, 4-22, 4-24, 4-26, 5-23, 5-25, 5-27	
Cover, Bottom	2-7				2-7
Cover, Top	2-7				2-7
CRS Mechanical Adjustment	6-7				6-7

GLOSSARY

Section I ABBREVIATIONS

afc	automatic frequency control
CRS	Crystal Reference System
ant cent	antenna control
demod	demodulation
kHz (kc)	kilohertz (kilocycles)
MHz (mc)	megahertz (megacycles)
OSC	oscillator
pot	potentiometer

Section II DEFINITION OF UNUSUAL TERMS

Attenuate. To reduce signal strength.

Automatic frequency control (aft). A system that produces an error voltage which is proportional to the amount of oscillator drift. The error voltage corrects this drift.

Limiting. Clipping those portions of a wave that exceed a specific amplitude.

Muting. Reducing speaker output to prevent acoustical feedback.

Sniffer. A small antenna used as a probe to detect radiated signals.

Squelch. To quiet a receiver by cutting off its output when no signal is being received.

INDEX

INDEX (CONT)

INDEX (CONT)

Subject Page

D (CONT)

E

F

G

H

INDEX (CONT)

Subject | Page

INDEX (CONT)

INDEX (CONT)

Subject | Page

S (CONT)

T

V

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

TM 11-5820-401-34-3/0967-LP-432-3060

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}. REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
SSG I. M. DeSpiritof

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

____

____

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Communications-Electronics
Command and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, N.J. 07703

SAMPLE

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5820-401-34-3/0967-LP-432-3060	16 Apr 84	Radio Sets, AN/VRC-12 Series; Receivers, Radio R-442/VRC and R-442A/VRC

BE EXACT . . . PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

____

____

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Communications-Electronics
Command and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, N.J. 07703

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5820-401-34-3/0967-LP-432-3060	16 Apr 84	Radio Sets, AN/VRC-12 Series; Receivers, Radio R-442/VRC and R-442A/VRC

BE EXACT . . . PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 **2028-2**

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

REVERSE OF DA FORM 2028-2

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Communications-Electronics
Command and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, N.J. 07703

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5820-401-34-3/0967-LP-432-3060	16 Apr 84	Radio Sets, AN/VRC-12 Series; Receivers, Radio R-442/VRC and R-442A/VRC

BE EXACT . . . PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

REVERSE OF DA FORM 2028-2

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Communications-Electronics
Command and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, N.J. 07703

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter=10 Millimeters =0.01 Meters=0.3937 Inches
1 Meter= 100 Centimeters =1000 Millimeters=39.37 Inches
1 Kilomter=1000 Meters=0.621 Miles

HEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
1 Kilogram=1000 Grams=2.2 Lb
1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
1 Liter=1000 Milliliters=33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
1 Sq Meter=l0,000 Sq Centimters=10.76 Sq Feet
1 Sq Kilometer=1,000,000 Sq Meters=0.0386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

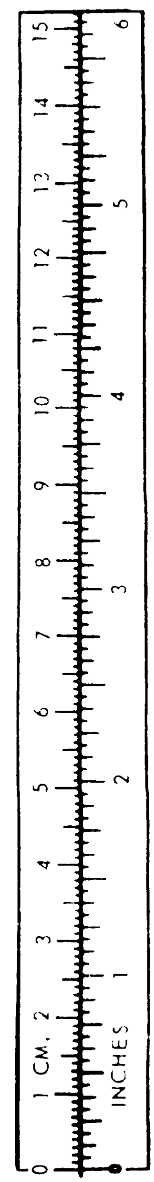
TEMPERATURE

5'9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9'5 C° +32=F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles Per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



(FOR REFERENCE ONLY)

TA089991

By Order of the Secretaries of the Army and the Navy:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

Official:

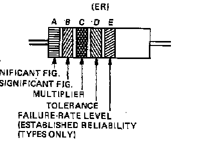
ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

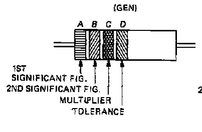
G. B. SCHICK, JR.
Rear Admiral, United States Navy
Commander, Naval Electronic
Systems Command

DISTRIBUTION:

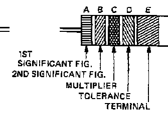
To be distributed in accordance with DA Form 12-51 requirements for AN/VRC-12 and RT-442/VRC.

* U.S. GOVERNMENT PRINTING OFFICE: 1984-720-030/10038 (2-11)





COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.



COLOR-CODE MARKING FOR FILM-TYPE RESISTORS

TABLE 1

COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM.
BLACK	0	BLACK	0	BLACK	1			BROWN	M = 1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P = 0.1	
RED	2	RED	2	RED	100			ORANGE	R = 0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S = 0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP. TYPE ONLY*)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY).			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A – THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH).

BAND B – THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C – THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL VALUE.)

BAND D – THE RESISTANCE TOLERANCE.

BAND E – WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1½ TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

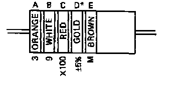
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHANUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

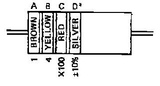
2R7 = 2.7 OHMS   10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED, IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING

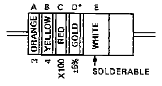


NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M



NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

COMPOSITION-TYPE RESISTORS



NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLERABLE

FILM-TYPE RESISTORS

*IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD.

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.

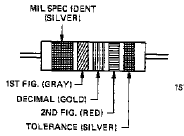
TABLE 2

COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

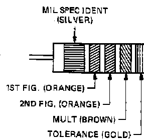
COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

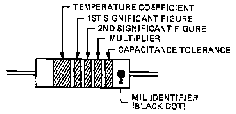


(A) 8.2UH ±10%

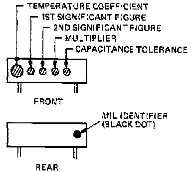


(B) 220 UH ±5%

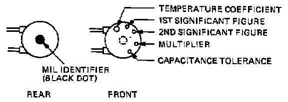
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED.



AXIAL LEAD

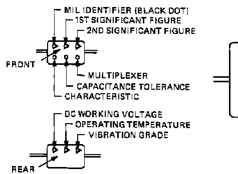


RADIAL LEAD

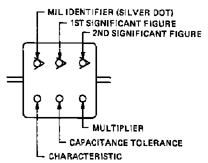


DISK-TYPE

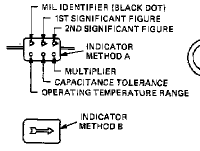
CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB.



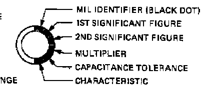
MICA - DIELECTRIC



PAPER-DIELECTRIC



GLASS-DIELECTRIC, GLASS CASE



MIC, BUTTON TYPE

TABLE 3 – FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2ND SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY CB	0	0	1			±20%	±20%		A			−55° TO +70°C	10 – 55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				−55° TO +85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				−55° TO +125°C	10 – 2,000 Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										−55° TO +150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

TABLE 4 – TEMPERATURE COMPENSATING, STYLE CC.

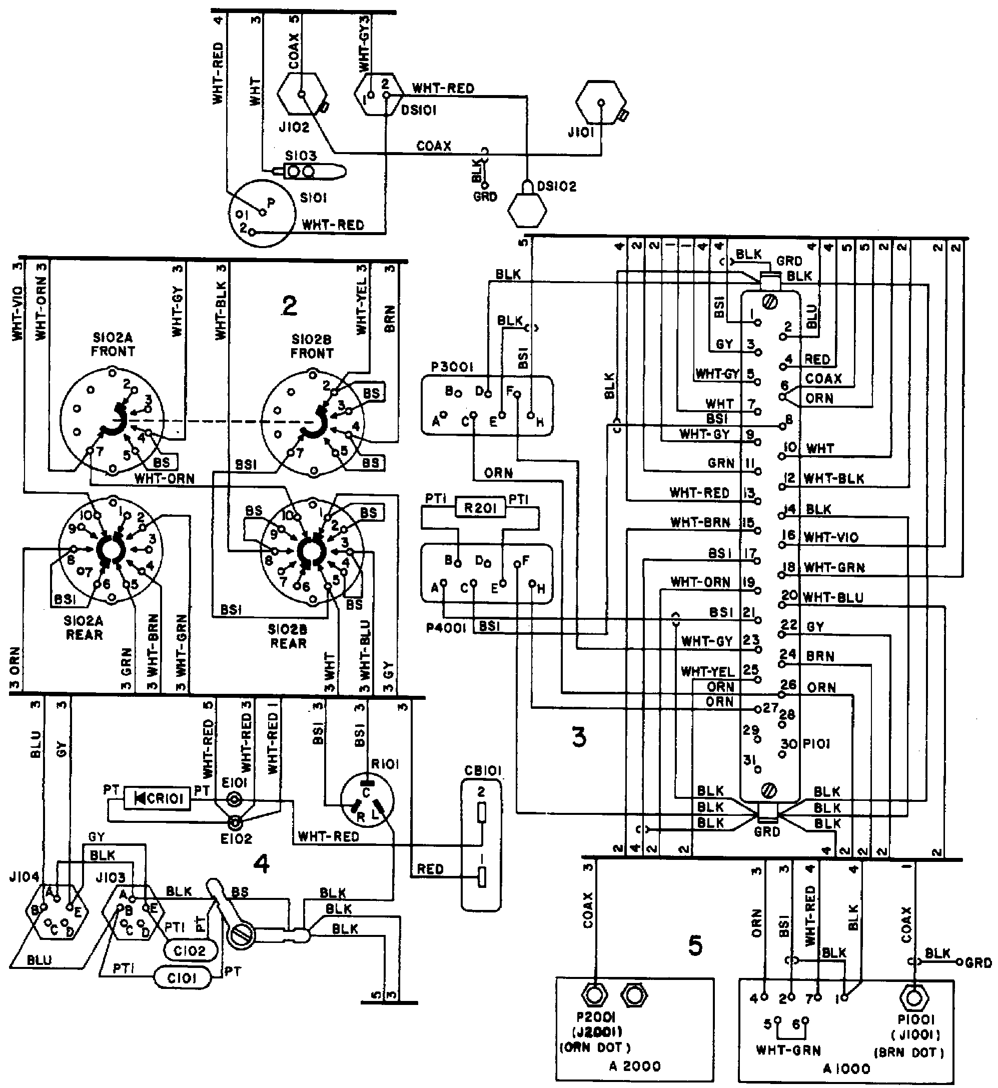
COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2ND SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	−30	1	1	10	±1%		
RED	−80	2	2	100	±2%	±0.25 UUF	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		±5%	±0.5 UUF	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS: MIL–C–5, MIL–C–25D, MIL–C–11272B, AND MIL–C–10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL–C–11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

EL4GO227

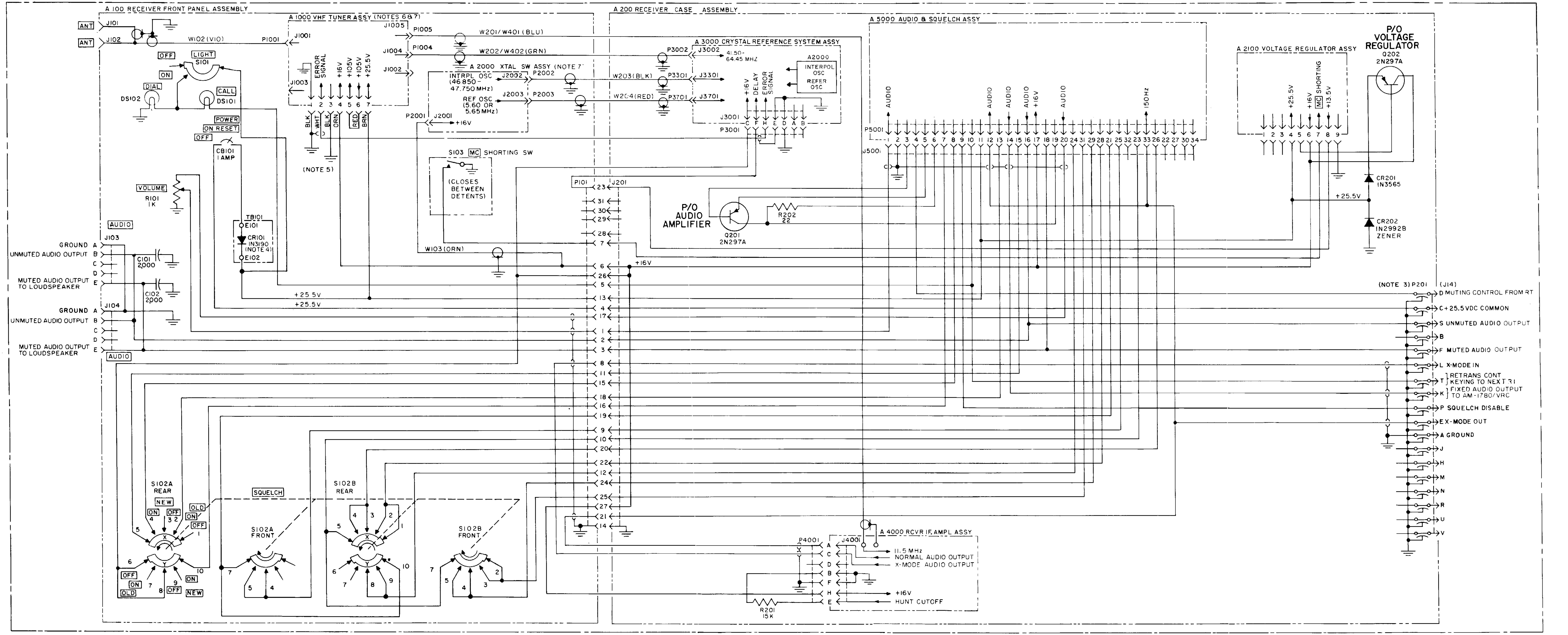
FO-1. Resistor, capacitor, and inductor color codes.



NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. B S DENOTES TINNED, ANNEALED COPPER WIRING.
3. B S I DENOTES TINNED, ANNEALED COPPER WIRING INSULATED WITH SLEEVING.
4. P T DENOTES PIGTAIL LEAD.
5. P T I DENOTES PIGTAIL LEAD INSULATED WITH SLEEVING.
6. ⊂⊃— DENOTES SHIELDED CONNECTION.

FO-2. R-442(*)/VRC front panel assembly A100 wiring diagram.



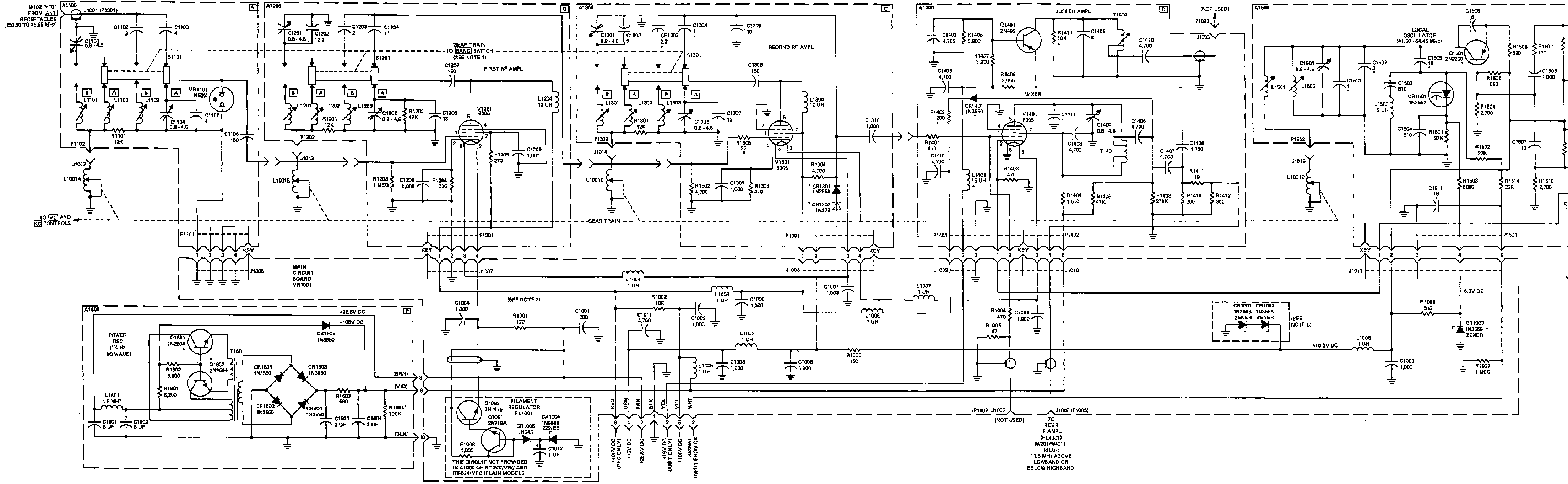
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. ▭ INDICATES EQUIPMENT MARKING.
3. FEEDTHROUGH CAPACITORS ARE BUILT INTO CONNECTOR P201. THE VALUE OF EACH CAPACITOR IS 2,000 UUF.
4. DIODE TYPE IN1415 MAY BE PROVIDED IN EARLY PRODUCTION UNITS.
5. IN R-442A/VRC, PIN 3 OF A1000 IS GROUNDED TO PREVENT OSCILLATIONS BY BUFFER IN A1400.
6. BAND SWITCH IS GEAR TRAIN CONNECTED TO A1100, A1200, AND A1300 IN A1000.
7. MC AND KC CONTROLS ARE GEAR TRAIN CONNECTED TO A1100, A1200, A1300, AND A1500 IN A1000 AND TO A2000 (REFERENCE OSCILLATOR AND INTERPOLATION OSCILLATOR).
8. THIS SCHEMATIC DIAGRAM IS OF THE LATEST CONFIGURATION OF THE EQUIPMENT. REFER TO THE EQUIPMENT DIFFERENCES PARAGRAPH FOR INFORMATION ON COMPONENTS THAT HAVE CHANGED DURING THE EVOLUTION OF THE EQUIPMENT.
9. SWITCHES ARE AS SHOWN:

SWITCH		POSITION
S101	LIGHT	OFF
S102	SQUELCH	OLD OFF
S103		OPEN

EL4GQ229

FO-3. R44-2(*)/VRC front panel and case assemblies, schematic diagram.

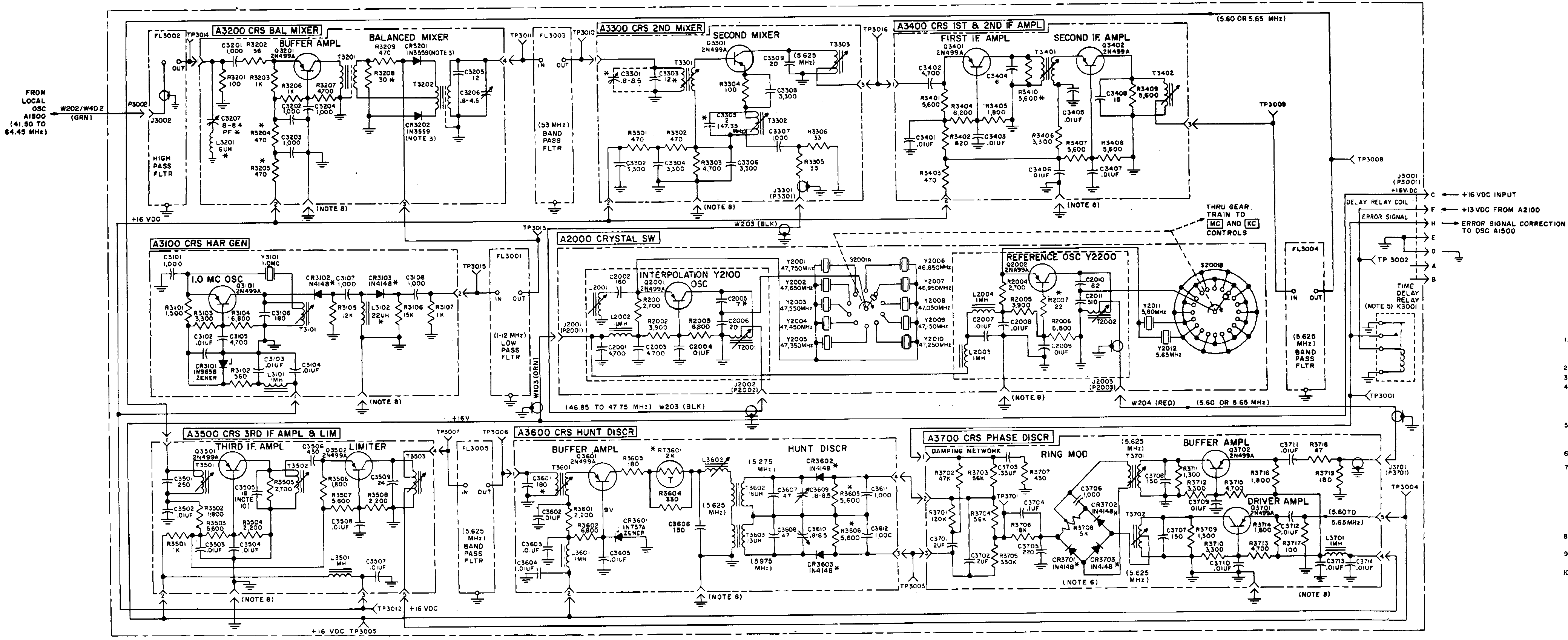


NOTES:

1. UNLESS OTHERWISE INDICATED RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN PF.
2. $\boxed{}$ INDICATES EQUIPMENT MARKING.
3. KEY DENOTES NOTCHES IN THE CONNECTORS.
4. $\boxed{\text{BAND}}$ SWITCHES S1101, S1201, S1301 SHOWN IN $\boxed{\text{A}}$.
5. TERMINAL DESIGNATION NUMBERS FOR CONNECTORS ARE ARBITRARY AND DO NOT APPEAR ON EQUIPMENT FOR JACKS J1006 THROUGH J1011.
6. CR1001 AND CR1002 ARE MATCHED PAIR OF IN751'S IN SOME SETS.
7. R1001 IS 40 OHMS WHEN FILAMENT REGULATOR IS NOT PROVIDED.
8. THIS SCHEMATIC DIAGRAM IS THE LATEST CONFIGURATION OF THE EQUIPMENT. REFER TO THE EQUIPMENT DIFFERENCES PARAGRAPH FOR INFORMATION ON THOSE COMPONENTS MARKED WITH (*) WHICH ARE USED IN PREVIOUS PRODUCTIONS OF THE ASSEMBLY.
9. GROUND PROVIDED IN R-442A/VRC MODEL (TO PREVENT Q1401 FROM OSCILLATING).

EL4GO230

FO-4. VHF tuner assembly A1000, schematic diagram.

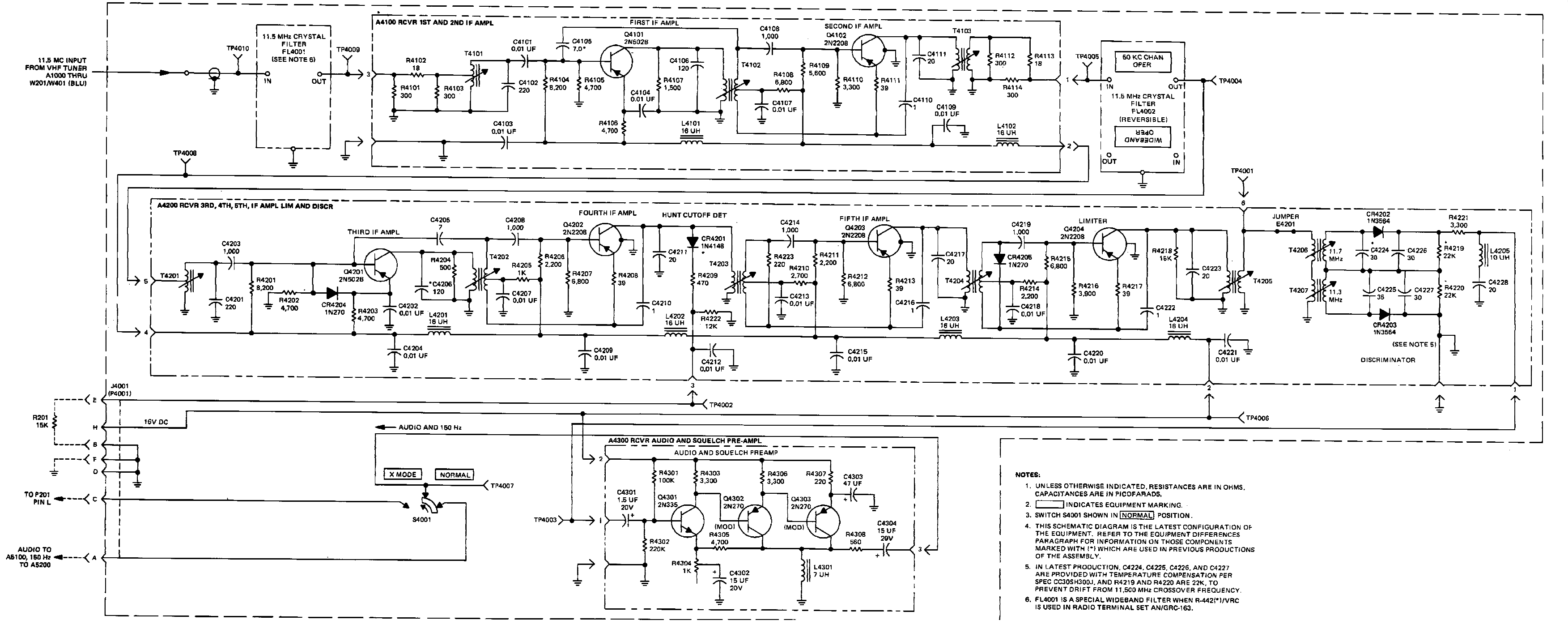


NOTES

1. UNLESS OTHERWISE INDICATED ALL RESISTANCES ARE IN OHMS, ALL CAPACITANCES IN PF.
2. $\boxed{}$ INDICATES EQUIPMENT MARKING.
3. DIODE IN3559 IS A MATCHED PAIR.
4. SWITCH S2001 SHOWN IN POSITION FOR USING 46.950-MHz INTERPOLATION OSCILLATOR FREQUENCY AND A 5.60-MHz REFERENCE OSCILLATOR FREQUENCY.
5. RELAY K3001 SHOWN DE-ENERGIZED OPERATES (FOR 1/4-SECOND) ONLY WHEN POWER IS TURNED ON OR $\boxed{\text{MC}}$ CONTROL IS CHANGED.
6. DIODES ARE MATCHED
7. THIS SCHEMATIC DIAGRAM IS THE LATEST CONFIGURATION OF THE EQUIPMENT. REFER TO THE EQUIPMENT DIFFERENCES PARAGRAPH FOR INFORMATION ON THOSE COMPONENTS MARKED WITH (*) WHICH ARE USED IN PREVIOUS PRODUCTIONS OF THE ASSEMBLY.
8. GROUND CONNECTION IS MADE THROUGH MODULE MOUNTING SCREW RECEPTACLE.
9. TRANSISTOR TYPE 2N499A (GERMANIUM) HAS BEEN REPLACED BY TYPE 2N2907A (SILICON).
10. C3505 IS 8PF WHEN Q3501 IS TYPE 2N2907A.

EL4GQ231

FO-5. Crystal reference system A3000, schematic diagram.

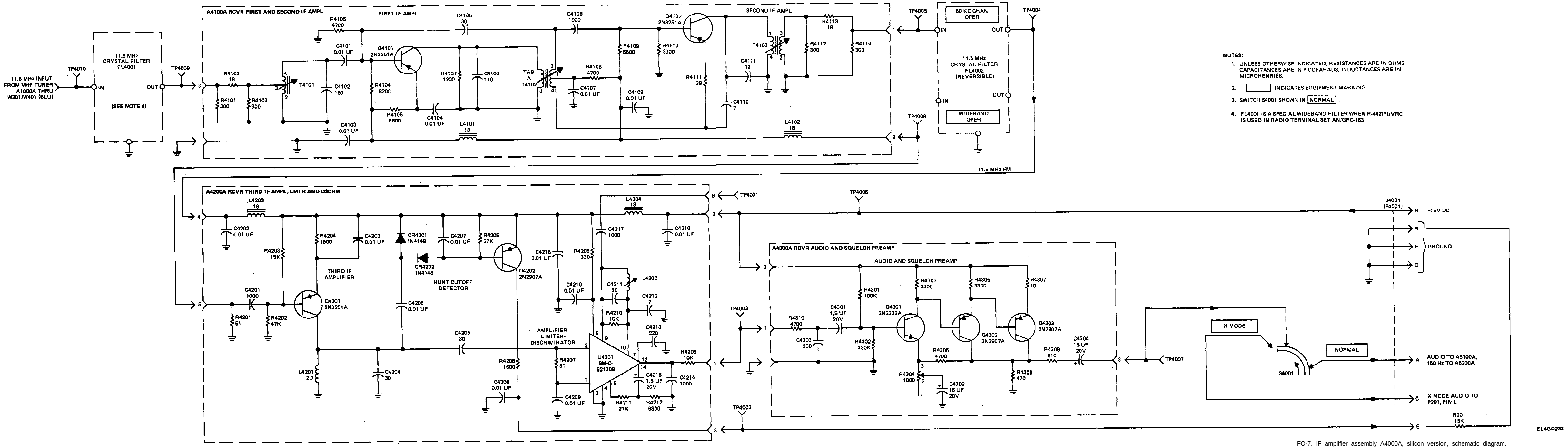


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN PICOFARADS.
2. [ ] INDICATES EQUIPMENT MARKING.
3. SWITCH S4001 SHOWN IN NORMAL POSITION.
4. THIS SCHEMATIC DIAGRAM IS THE LATEST CONFIGURATION OF THE EQUIPMENT. REFER TO THE EQUIPMENT DIFFERENCES PARAGRAPH FOR INFORMATION ON THOSE COMPONENTS MARKED WITH (*) WHICH ARE USED IN PREVIOUS PRODUCTIONS OF THE ASSEMBLY.
5. IN LATEST PRODUCTION, C4224, C4225, C4226, AND C4227 ARE PROVIDED WITH TEMPERATURE COMPENSATION PER SPEC CC30SH300J, AND R4219 AND R4220 ARE 22K, TO PREVENT DRIFT FROM 11,500 MHz CROSSOVER FREQUENCY.
6. FL4001 IS A SPECIAL WIDEBAND FILTER WHEN R-442(*)/VRC IS USED IN RADIO TERMINAL SET AN/GRC-163.

EL4GQ232

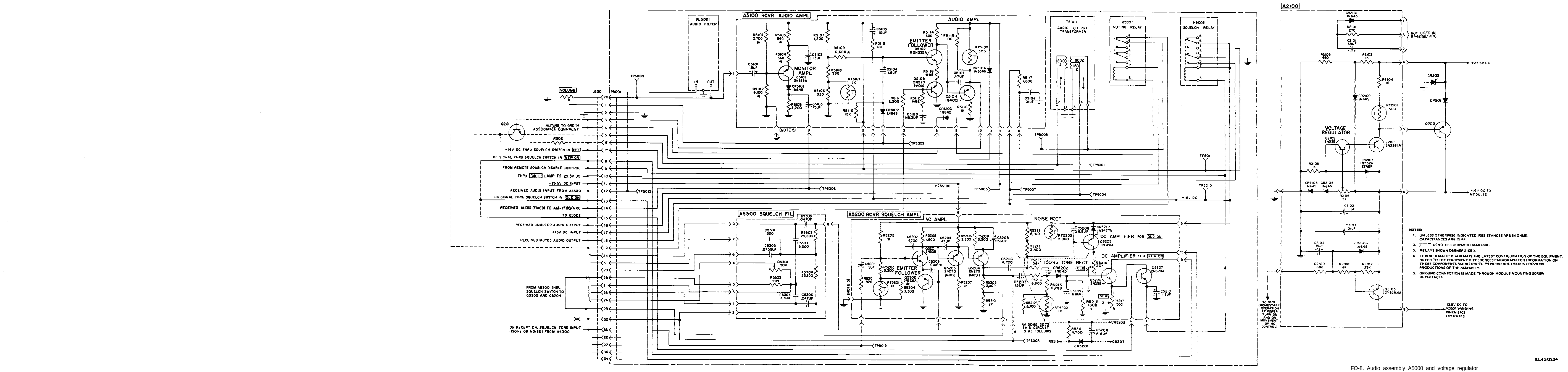
FO-6. IF amplifier assembly A4000, schematic diagram.



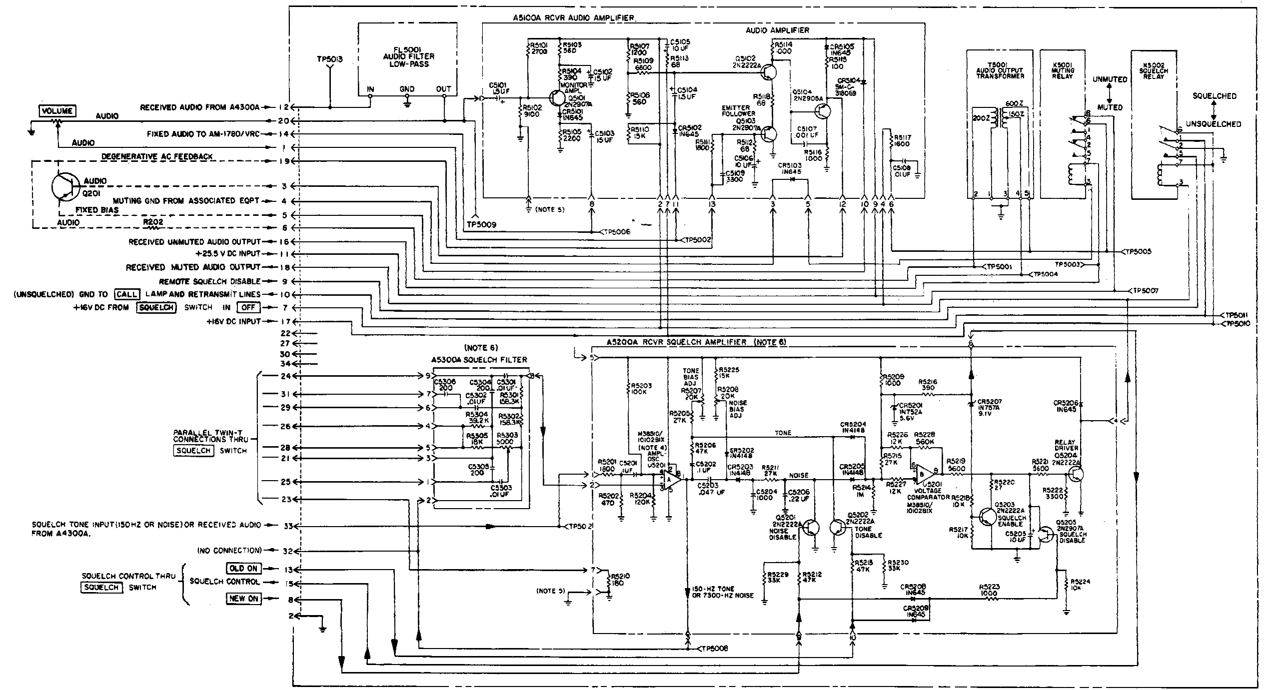
NOTES:

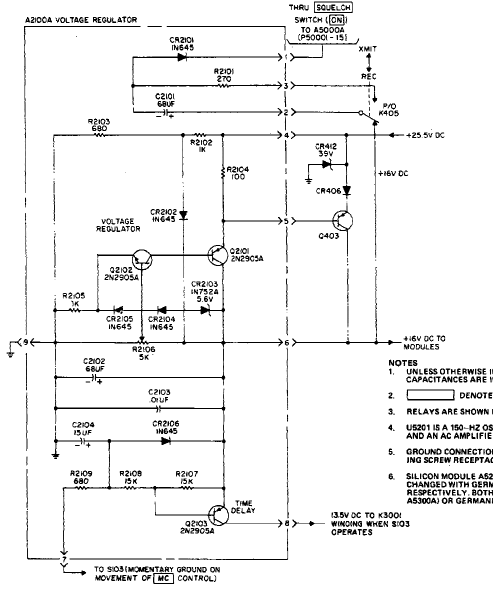
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN PICOFARADS, INDUCTANCES ARE IN MICROHENRIES.
2. [ ] INDICATES EQUIPMENT MARKING.
3. SWITCH S4001 SHOWN IN $\boxed{\text{NORMAL}}$.
4. FL4001 IS A SPECIAL WIDEBAND FILTER WHEN R-442(*)/VRC IS USED IN RADIO TERMINAL SET AN/GRC-163

FO-7. IF amplifier assembly A4000A, silicon version, schematic diagram.



FO-8. Audio assembly A5000 and voltage regulator assembly A2100, silicon version, schematic diagram.

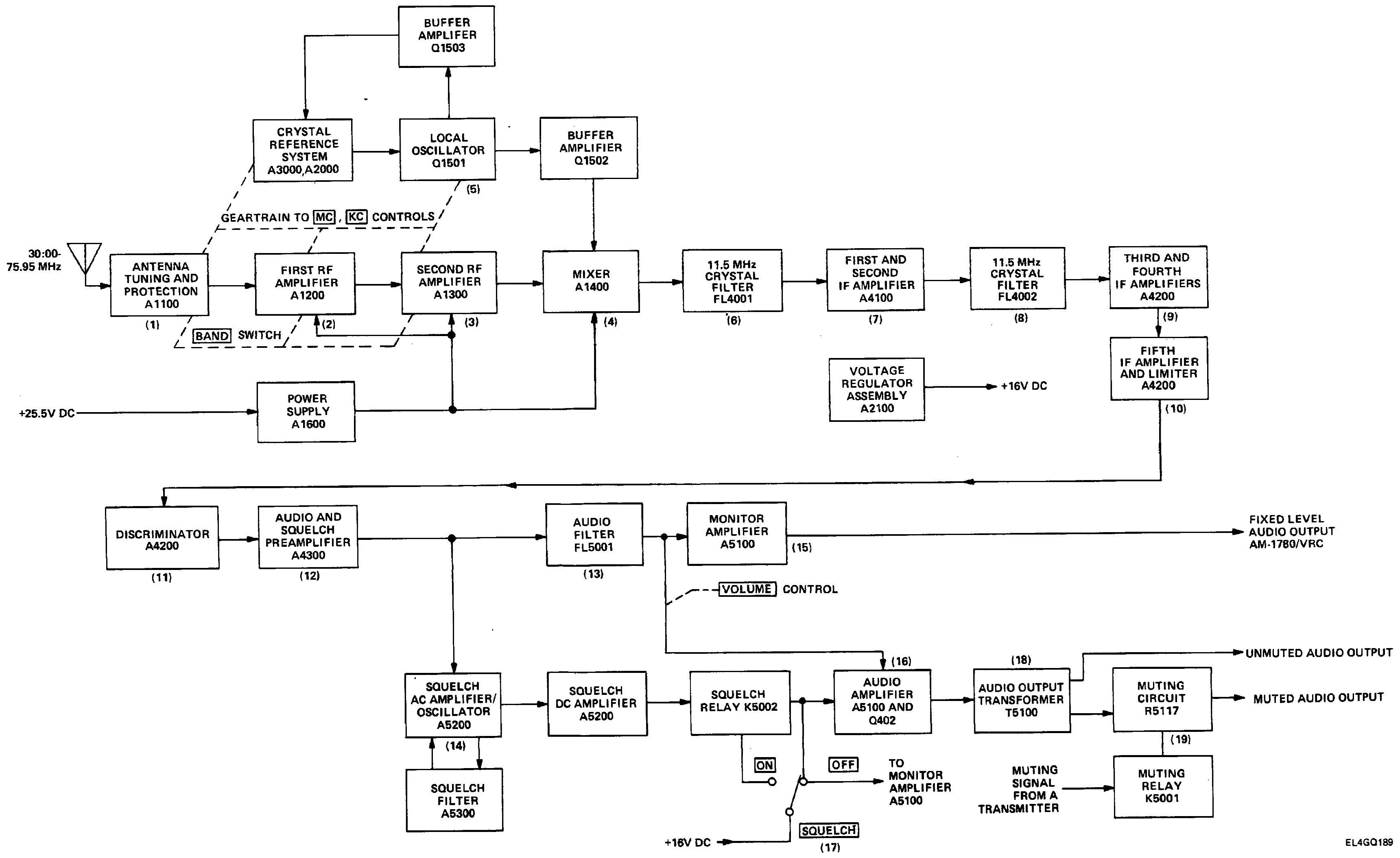




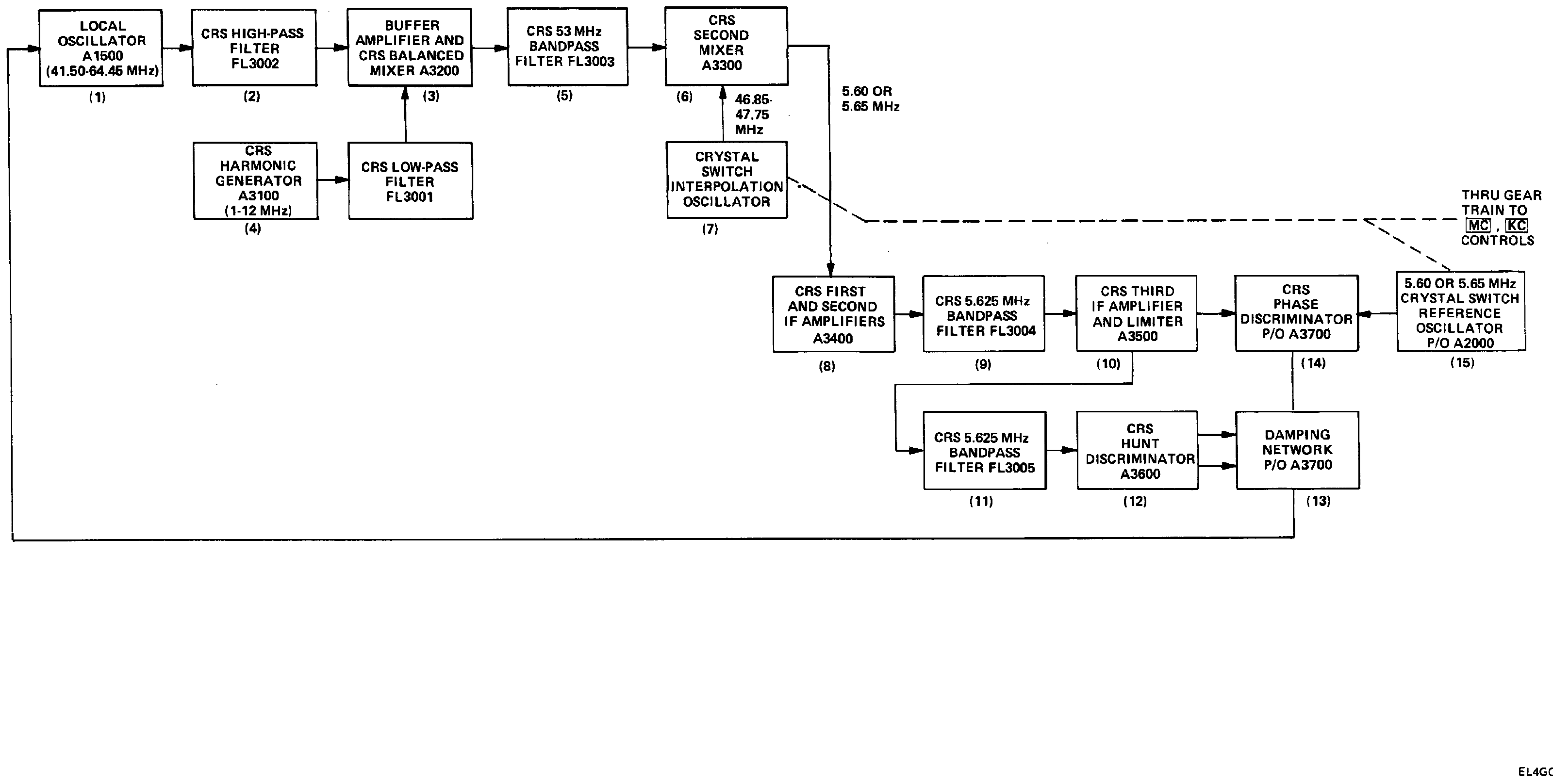
NOTES
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN PICOFARADS.
2. ▭ DENOTES EQUIPMENT MARKING.
3. RELAYS ARE SHOWN DEENERGIZED.
4. U5201 IS A 150-HZ OSCILLATOR DURING TRANSMISSION AND AN AC AMPLIFIER DURING RECEPTION.
5. GROUND CONNECTION IS MADE THROUGH MODULE MOUNTING SCREW RECEPTACLE.
6. SILICON MODULE A5200A OR A5300A CANNOT BE INTERCHANGED WITH GERMANIUM MODULE A5200 OR A5300, RESPECTIVELY. BOTH MUST BE SILICON (A5200A WITH A5300A) OR GERMANIUM (A5200 WITH A5300).

EL4GQ235

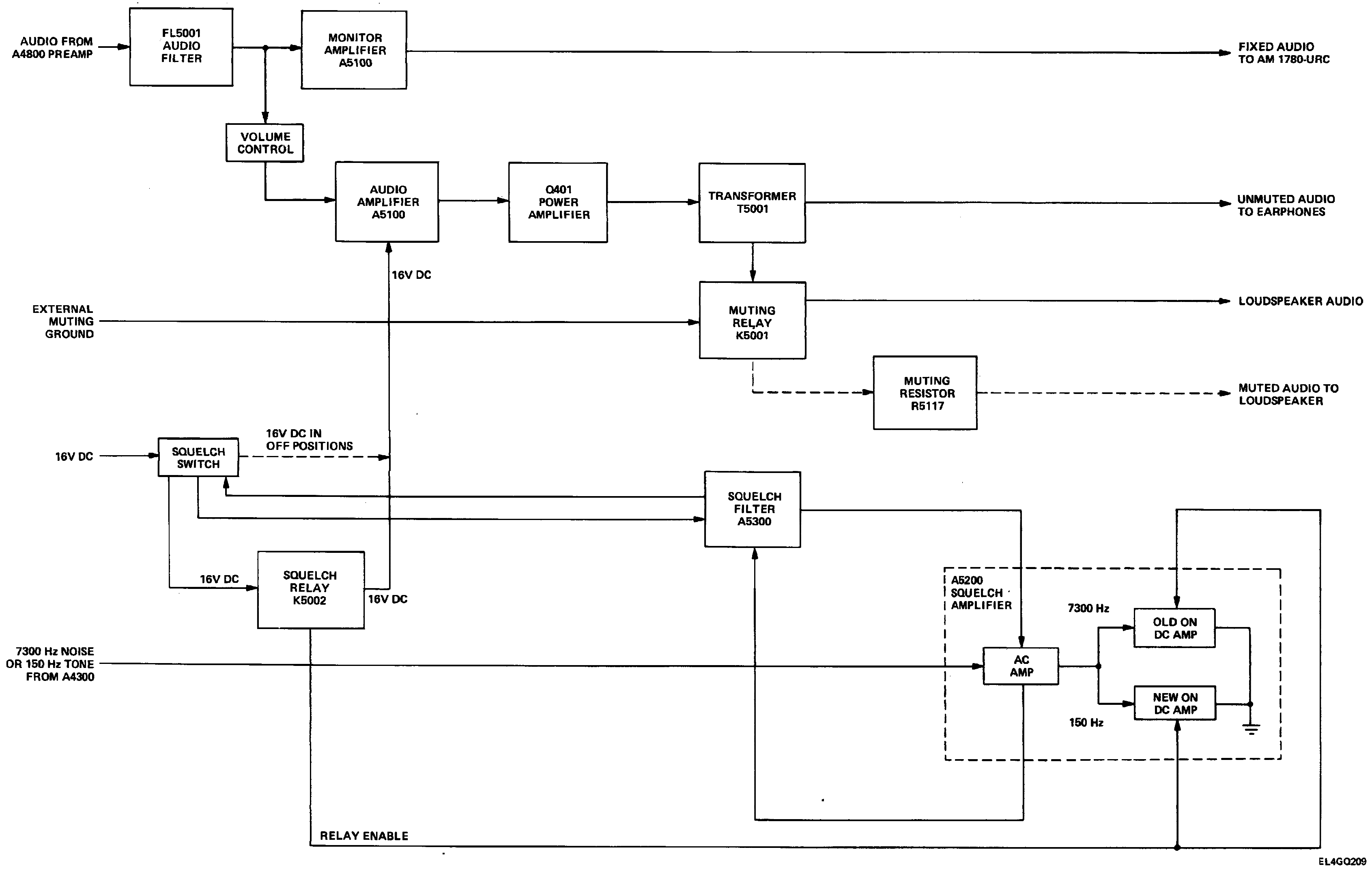
FO-9. Audio assembly A5000A, silicon version, and voltage regulator assembly A21OOA, silicon version, schematic diagram.



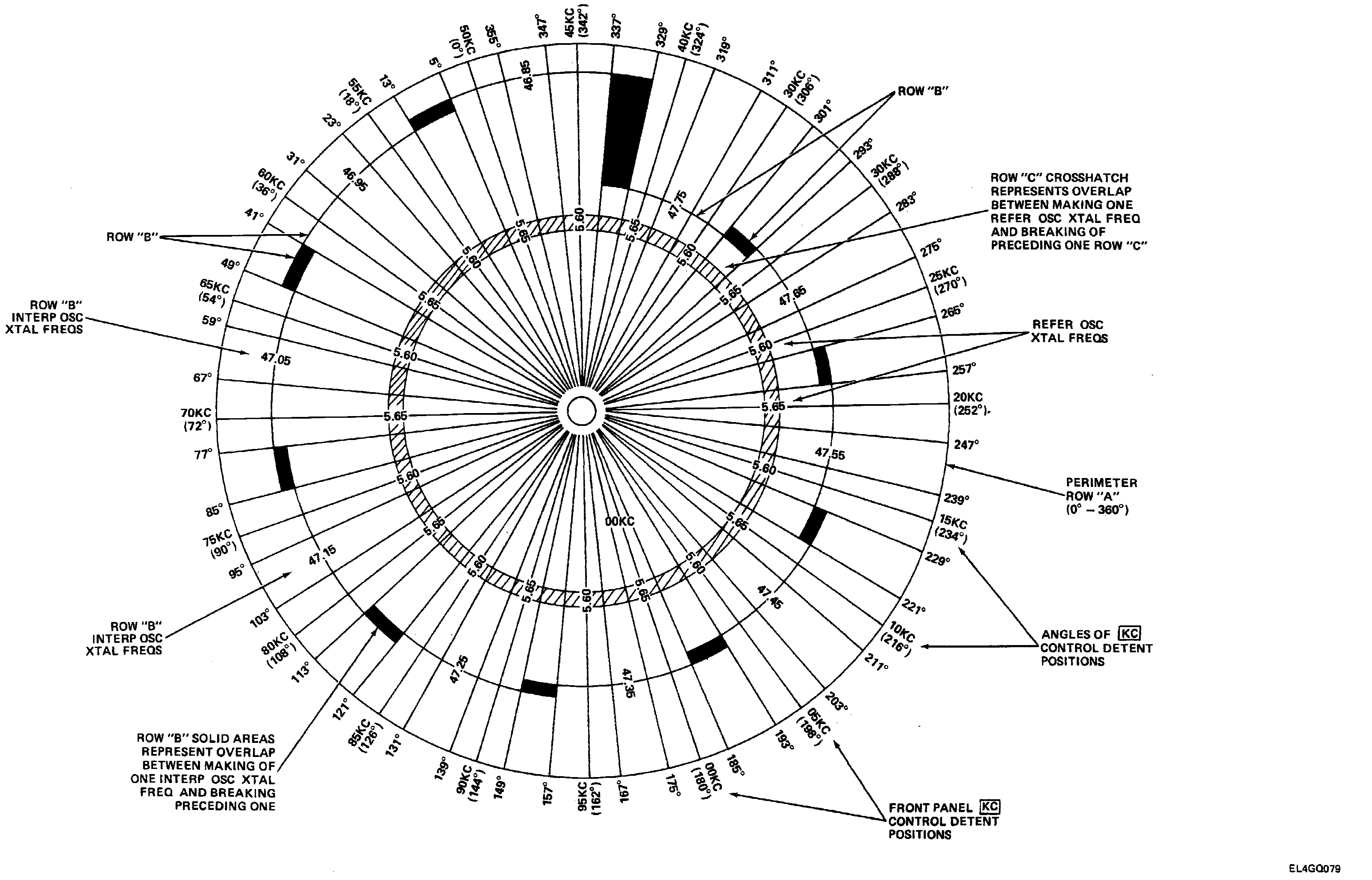
FO-10. Received signal path, simplified.



FO-11. Crystal reference system, simplified.



FO-12. A5000 audio and squelch assembly, simplified.



FO-13. Degree wheel for crystal reference system (CRS) adjustment.

PIN: 031267-000