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SUPPORT MANUAL for the Apollo Block II Special Test Equipment PM RECEIVER

MOTOROLA Military Electronics Division

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SUPPORT MANUAL for the Apollo Block II Special Test Equipment PM RECEIVER



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SECTION I. DESCRIPTION

1-1. INTRODUCTION

1-2. The PM Receiver, Motorola Part No. 01-22981G01, is manufactured for Collins Radio Company under Contract No. NASA 9-150, by Motorola Inc., Military Electronics Division, Scottsdale, Arizona. This assembly, shown in figures 1-1 and 1-2, is supplied as a part of the Special Test Equipment (STE) used in testing the Apollo Block II Unified S-Band Equipment (USBE).

1-3. This manual contains information that will enable an experienced technician to operate, test, calibrate, and repair the PM Receiver.

1-4. PURPOSE OF EQUIPMENT

1-5. The PM Receiver converts an S-band input signal of 2287.5 mc from the USBE to a 10-mc intermediate frequency for use in ranging test equipment, and provides four information outputs for monitoring and testing the Unified S-Band Equipment. A simplified block diagram showing the relationship of the PM Receiver to the USBE, and to other STE is shown in figure 1-3.

1-6. EQUIPMENT CHARACTERISTICS

1-7. PHYSICAL CHARACTERISTICS

1-8. The PM Receiver is completely self contained in a standard 19-inch wide electronic equipment drawer. The drawer is provided with slides for mounting in a standard commercial electronic equipment cabinet with an Electronic Industries Association (EIA) mounting pattern. Overall dimensions of the drawer are 21 x $16-1/2 \ge 8$ inches. The front panel is 19 $\ge 8-3/4$ inches.

1-9. The PM Receiver requires no special cooling, and may be bench operated in addition to its normal equipment cabinet operation. No special mounts are required for bench operation.







Figure 1-2. PM Receiver, Rear View



Figure 1-3. PM Receiver/STE/USBE System Relationship

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1-4

1-10. All frequently-used controls, displays, and electrical connections are located on the drawer front panel. The primary power input jack, fuse holder, and ranging output jacks are located on the drawer rear panel and need not be disturbed during normal operation.

1-11. The PM Receiver contains 13 subassemblies, as listed in Table 1-1. All subassembly replacements can be accomplished with the drawer mounted in the cabinet. Checkout, troubleshooting, and calibration can be performed on most subassemblies without removing the subassemblies from the drawer. Barrier strips are conveniently located for testing and removal of subassembly interconnect wiring. Adjustments and test points are listed in the checkout and calibration procedures in section V.

1-12. Access may be gained to most subassemblies and their components by raising the subassemblies to an extended position and sliding the subassembly cover open. Figures 1-4 and 1-5 illustrate typical subassembly position for checkout, trouble-shooting, or calibration operations.

1-13. Table 1-1 lists the subassembly reference designators used throughout this manual. Subassembly input jacks, test points, and output jacks are prefixed with the subassembly reference designator. For example, jack J2 of subassembly A5 is referred to as A5J2. Assembly input jacks, test points, and output jacks are not prefixed with reference designators.

Ref Desig.	Name	Motorola Part No.
1A2	PM Receiver	01-22981G01
Al	23 Mc VCO and X96 Multiplier	01-22791G01
A2	S-Band Mixer and 50 Mc Pre-Amplifier	01-29938B25
A3	50 Mc Mixer and 10 Mc AGC Amplifier	01-22801G01

TABLE 1-1. PM RECEIVER SUBASSEMBLIES

1



Figure 1-4. Subassembly Extended and Raised



Contraction of the second s		
Ref. Desig.	Name	Motorola Part No.
A4	10 Mc Distribution Amplifier	01-22806G01
A 5	10 Mc IF Amplifier	01-22811G01
A6	Loop Phase Detector/Loop Filter	01-22816G01
Α7	20 Mc Oscillator and X3 Multiplier	01-22821G01
A8	X 1/2 Multiplier and 10 Mc Reference Distribution Amplifier	01-22826G01
A9	Coherent Amplitude Detector, AGC Amplifier, and Relay Driver	01-22831G01
A10	10 Mc Wideband Phase Detector and 10 Mc Narrow-Band Discriminator	01-22836G01
A11	Video Amplifier	01-22841G01
PS2	-12 VDC Power Supply	01-29938B22
PS1	±15 VDC Power Supply	01-28091G01

TABLE 1-1. (cont)

1-14. ELECTRICAL CHARACTERISTICS

1-15. The PM Receiver is a phase lock loop, double conversion superheterodyne employing solid-state circuitry. The electrical characteristics of the PM Receiver are listed in Table 1-2.

INPUTS	
Frequency	2287.5 mc ±100 kc
Signal Level	0 to -50 dbm
VSWR	1.3:1 maximum with respect to 50 ohms at ± 20 mc of f ₀ .
Noise Figure	14 db maximum with attenuator set at minimum.
Attenuation Range	30 db
First IF Frequency	50 mc

TABLE 1-2. PM RECEIVER ELECTRICAL CHARACTERISTICS

TABLE 1-	-2. (cont)
INPUTS (cont)	
Second IF Frequency	10 mc
Tracking Bandwidth	21.2 cps = β_{L}
	$400 \text{ cps} = \beta_{\text{L}}$
Phase Stability	3.0° maximum in 21.2 cps bandwidth
Transfer Function	H (S) $\frac{1 + T_2 S}{1 + T_2 S + \frac{T_1}{G} S^2}$ for $\frac{1}{G} < T_2$
AGC Loop	
Bandwidth	0 db open loop at 5 cps maximum
Gain	40 db (minimum)
Range (AGC/MGC)	20 db
Transfer Function	H (S) $\frac{1}{1 + \frac{T_S}{G}}$ for G < 1
Oscillator Stability	
23 mc VCO	$1 \times 10^{-6}/3$ hour long term
20 mc reference	$2.5 \times 10^{-6}/3$ hour long term
Manual Acquisition Range at S-Band	±100 kc in 400 cps Bandwidth ±40 kc in 21.2 cps Bandwidth
Time Delay Variation	$1 \text{ nanosecond } (10^{-9}) \text{ maximum}$
OUTPUTS	
Information Outputs	
Emergency Voice (J5) (Discriminator Output)	.1 v/kc Sensitivity BW (3 db) = 300 cps to 2 kc
10 kc Subcarrier (J4)	$\begin{array}{l} 0 dbm \pm 1 db/50 \\ BW (3 db) = f_{0} \pm 1 kc nominal \end{array}$

1-9

TABLE 1-2	. (cont)
OUTPUTS (cont)	
100 kc Subcarrier (J4)	0 dbm \pm 1 db/50 Ω BW (3 db) = f ₀ \pm 5 kc nominal
500 kc Subcarrier (J4)	0 dbm \pm 1 db/50 Ω BW (3 db) = f \pm 12.5 kc nominal
1.024 mc Subcarrier (J4)	0 dbm ± 1 db/50 BW (3 db) = f ± 10 kc 10%
1.25 mc Subcarrier (J4)	0 dbm ± 1 db/50 Ω BW (3 db) = f ₀ ± 10 kc 10%
Ranging Outputs	이 집 것 같아.
10 mc Predetection (J9)	-10 dbm \pm 1 db/50 Ω with carrier only (i.e., no modulation)
10 mc Reference (J10)	+10 dbm ± 2 db/50 Ω
Monitor Outputs	e and a second
AGC Voltmeter	0 - 10 vdc
Dynamic Phase Error	Front Panel BNC
Static Phase Error	Meter
23 mc VCO Test	Front Panel BNC O dbm \pm 1 db/50 Ω
50 mc Spectrum	Front Panel BNC -22 dbm \pm 1 db/50 Ω
POWER SOURCE REQUIRED	115 vac ± 10%, 60 cps, single phase, 100 watt maximum power consumption

1-16. CONTROLS, DISPLAYS, AND ELECTRICAL CONNECTIONS

1-17. The PM Receiver controls are all located on the drawer front panel, and are illustrated in figure 1-6. The description and function of each control is listed in Table 1-3.

TABLE 1-3. PM RECEIVER CONTROLS

Control	Description	Function
ATTENUATOR	Input Variable Attenuator Dial, 0 - 30 db	Attenuates Large Input Signals
VCO MANUAL CONTROL	10 Turn Potentiometer with Counting Dial	Manual Acquisition
MGC/AGC GAIN CONTROL	Illuminated Rectangular Pushbutton Switch	Selects AGC or MGC
MGC	Two Watt Potentiometer	Varies MGC Level
400 CPS/21 CPS LOOP CONTROL	Illuminated Rectangular Pushbutton Switch	Selects 400 cps or 21.2 cps Bandwidth
OPEN/CLOSED LOOP CONTROL	Illuminated Rectangular Pushbutton Switch	Selects Open Loop or Closed Loop Position
POWER	Illuminated Rectangular Pushbutton Switch	Turns Prime Power ON or OFF
VIDEO OUTPUT	Six Position Rotary Selector Switch	Selects Video Outputs of 10 kc, 100 kc, 500 kc, 1.024 mc, 1.25 mc, or Wideband Video at J4.

1-18. The PM Receiver displays are all located on the front panel, with the exception of the fuse indicator, which is located on the rear panel. The descriptions and functions of the displays are listed in Table 1-4.

1-19. Electrical connections of the PM Receiver are illustrated in figures 1-6 and 1-7. The descriptions and functions of the electrical connections are contained in Table 1-5.

1-20. TEST EQUIPMENT

1-21. The following test equipment shall be calibrated using standards traceable to the National Bureau of Standards, Boulder, Colorado.



Figure 1-6. PM Receiver Front Panel





1-13

Display	Description	Function
FM TUNING	-50 to 0 to 50 vdc Null Meter, calibrated in KC	Aids in tuning VCO Manual Control for Acquisition
LOOP STATUS IN LOCK/OUT OF LOCK	Indicator Light	Indicates Status of Loop
SIGNAL STRENGTH	0 to -10 vdc Voltmeter	Indicates Input Signal Level
STATIC ϕ ERROR	-0.5 to 0 to 0.5 vdc Null Voltmeter	Indicates Phase Error
Fuse*	Three Amp Fuse Contained in Indicating Fuse Holder	Protects PM Receiver against Overload and Lights when Fuse is Blown

TABLE 1-4. PM RECEIVER DISPLAYS

*Located on rear of drawer.

TABLE	1-5.	\mathtt{PM}	RECEIVER	ELECTRICAL	CONNECTIONS	
	and the second		The second secon			_

Electrical Connection	Description	Function
AC Power*, J1 Hubell male receptacle	115 vac, 60 cps, Single Phase	Prime Power Input
Ground*	Chassis Ground	Chassis Ground
DYNAMIC ϕ ERROR, J3	BNC	Phase Error Output
50 MC SPECTRUM, J6	BNC	lst IF Spectrum Test Output
10 mc Predetection Output*, J9	BNC	Information Out- put to Ranging Receiver
10 mc Reference Output*, J10	BNC	Reference Output to Ranging Receiver Drawer, 4A3J3

Electrical Connection	Description	Function
20 MC OSC TEST, J7	BNC	Test 20 mc Oscillator Frequency
23 MC VCO TEST, J8	BNC	Test 23 mc VCO Frequency
VIDEO, J4	BNC	Information Output for USBE Test
VOICE, J5	BNC	Information Output for USBE Test
RF INPUT, J2	BNC	PM Receiver RF Input

TABLE 1-5. PM RECEIVER ELECTRICAL CONNECTIONS (cont)

*Located on rear of drawer.

1-22. COMMERCIAL EQUIPMENT REQUIRED.

1-23. The commercial equipment, or its equivalent, required for electrical checkout of the PM Receiver, is listed alphabetically in Table 1-6. Where two or more pieces of identical equipment are used in the same test, the number required is listed in parentheses.

NOTE

Refer to individual equipment manuals for correct operating procedures, warmup times, and calibration intervals.

TABLE 1-6. COMMERCIAL TEST EQUIPMENT

Equipment Name	Manufacturer	Туре
Attenuator, 6 db	Microlab	AB06N
Attenuator, 10 db	Microlab	AB10N
DC Power Supply (3)	Power Designs	5015A

TABLE 1-6. COMMERCIAL TEST EQUIPMENT (cont)

Equipment Name	Manufacturer	Туре
DC Null Voltmeter	Hewlett Packard	413A
DC Voltmeter (Electronic)	Hewlett Packard	410C
DC Voltmeter-Ohmmeter- Ammeter	Hewlett Packard	412A
Differential DC-AC Voltmeter	John Fluke	803B
Digital Recorder	Hewlett Packard	561B
Digital Voltmeter	Cimeron	7200A
Directional Coupler	Narda	3003-10, -20 (one each)
Frequency Counter	Hewlett Packard	5245L
Frequency Converter Unit	Hewlett Packard	5251A
Frequency Converter Unit	Hewlett Packard	5254A
Frequency Meter	Hewlett Packard	536A
Isolator	E and M	S22N
Low Frequency Function Generator	Hewlett Packard	202A
Noise Figure Meter	Hewlett Packard	340B
Oscilloscope	Tektronix	543
Wide-Band Calibrated Preamp	Tektronix	В
PM Transmitter	Motorola	2A1
Power Meter	Hewlett Packard	431B
Thermistor Mount	Hewlett Packard	478A
Recorder	Sanborn	7714A
RF Sweep Generator	Jerrold	602
RF Voltmeter	Boonton Electronics Corp.	91-CA
Adapter, 50 Ohm	Boonton Electronics Corp.	91-8B
Adapter, Unterminated	Boonton Electronics Corp.	91-6B

TABLE 1-6. COMMERCIAL TEST EQUIPMENT (cont)

Equipment Name	Manufacturer	Туре
RMS Voltmeter	Hewlett Packard	400D
RMS Voltmeter	Hewlett Packard	3400A
Signal Generator, FM-AM	Boonton Radio Co.	202H
Signal Generator	Hewlett Packard	8614A
Signal Generator, HF	Hewlett Packard	606A
Sampling Oscilloscope	Hewlett Packard	185B
Dual-Trace Amplifier	Hewlett Packard	187C
Selektives Mikro- Voltmeter	Rohde and Schwarz	USVH
Slotted Line	Hewlett Packard	805C
Spectrum Analyzer		
RF Section	Hewlett Packard	8551A
Display Section	Hewlett Packard	851A
SWR Meter	Hewlett Packard	415D
Termination, 50 Ohm (4)	Microlab	TA 5MN
Test Translator	Motorola	2A2
UHF Noise Source	Hewlett Packard	349
VHF Attenuator (step) (one each)	Hewlett Packard	355 C and D
Volt-Ohm-Milliammeter	Triplet	630A
Wide-Range Oscillator	Hewlett Packard	200CD

1-24. SPECIAL TEST FIXTURES

1-25. The special test fixtures, not supplied with the PM Receiver, are necessary to check out and calibrate PM Receiver subassemblies Al, A9, and AlO. The following circuit descriptions, schematic diagrams, and parts lists will enable an experienced technician to construct and operate these test fixtures.

1-26. BIAS BOX TEST FIXTURE. The Bias Box Test Fixture provides a high resolution variable voltage from -7.5 to +7.5 vdc, used to

adjust the sensitivity and linearity of the 23 mc VCO in subassembly Al. The fixture circuitry consists of two 7-1/2 volt dry cell batteries connected in series with a 10-turn 10 K-ohm potentiometer. The wiper of the potentiometer is connected to an output voltage BNC.

1-27. A schematic diagram of the test fixture is shown in figure1-8. Required parts are listed in Table 1-7.

Part	Mil Part No. or Mfg. Part No.	Manufacturer	No. Required		
Connector, BNC	UG 1094/U	Schweber Elect	1		
Banana, Jack, Nylon	1508	H. H. Smith	2		
Switch, Toggle DPDT	MS35059-23	Microswitch	1		
Battery, 6-7 1/2 V	773	Eveready	2		
Potentiom- eter, WW, 10-turn, 10 K Ohm	3500 S-2- 103	Bourns	1		
Chassis, wire, and misc mtg Hardware					

TABLE 1-7. 23 MC VCO BIAS BOX TEST FIXTURE PARTS LIST

1-28. AGC AMPLIFIER TEST FIXTURE. The AGC Amplifier Test Fixture aids in setting the input level to the AGC Amplifier and Relay Driver portion of subassembly A9, and in checkout of the d-c gain, module time constant, and relay switching functions.

1-29. The fixture circuitry consists of a resistive network (25 K-ohm, 1 K-ohm, 10 ohms, and 39 K-ohm) for setting the dc input level, and a switch, S1, for changing the input level; a resistive network (2700 ohm, 5 K-ohm, and 560 ohm), and a switch,



Figure 1-8. Bias Box Test Fixture

S3, for adjusting the MGC level; and associated test points (TP1, 2, 4, 7, and 8) for monitoring the dc output and relay output.
1-30. A schematic diagram of the fixture is shown in figure 1-9.
Required parts are listed in Table 1-8.

1-31. <u>50 MC/60 MC, 10 MC MIXER TEST FIXTURE</u>. The 50 Mc/60 Mc, 10 Mc Test Fixture is necessary as no commercial 10-Mc fm signal generator is available. A 60-Mc fm signal is mixed with a 50-Mc cw signal in the test fixture, and the 10 mc fm output is used in testing the 10-Mc Narrow-Band Discriminator and 10 Mc Wideband Phase Detector (subassembly A10).

1-32. The 50 Mc/60 Mc, 10 Mc Mixer Test Fixture circuitry consists of a balanced set of diodes in a quadrature bridge

TABLE 1-8. AGC AMPLIFIER TEST FIXTURE PARTS LIST

TABLE 1-	S. AGC AMPLIFIER IE	SI FIAIURE PARIS LI	.51		
Part	Mil Part No. or Mfg Part No.	Manufacturer	No. Required		
Connector, 15 Pin	DAM-15S-C33	Cinch	1		
Connector, BNC	UG 1094/U	Schweber Elect	3		
Jack, Tip, Nylon (Test Points)	MS16108	Raytheon	5		
Jack, Banana, Nylon	1508-102	H. H. Smith	4 (one with grd) strap)		
Switch Toggle, SPDT	MS35058-23	Microswitch	2		
Potentiometer, 5 Kilohm, <u>1</u> watt, 1 turn	RF6LAYSA 502A	CTS	1		
Potentiometer, 25 Kilohm, ½ watt, 1 turn	RV6LAYSA253A	CTS	1		
Resistor, Fxd, Comp., $\frac{1}{4}$ W, 560 Ohm, ±5%	RC07GF561J	Allen-Bradley	1		
Resistor, Fxd, Comp., $\frac{1}{4}$ W, 270 Ohm $\pm 5\%$	RC07GH271J	Allen-Bradley	1		
Resistor, Fxd, Comp., $\frac{1}{4}$ W, 10 Ohm $\pm 5\%$	RC07GF100J	Allen-Bradley	1		
Resistor, Fxd, Comp., ¼ W, 39 Kilohm ±5%	RC07GF393J	Allen-Bradley	1		
Resistor, Fxd, Comp., $\frac{1}{4}$ W, 1 Kilohm ±5%	RC07GF102J	Allen-Bradley	1		
Resistor, Fxd, Comp., 1 W, 150 Ohm ±5%	RC42GF151J	Allen-Bradley	1		
Chassis, wire, and m	Chassis, wire, and misc mtg hardware.				



Figure 1-9. AGC Amplifier Test Fixture

arrangement, two transformers for the LO and r-f input signals, and a transformer and filter for the i-f output signal.

1-33. A schematic diagram of the fixture is shown in figure 1-10. Required parts are listed in Table 1-9.



Figure 1-10. 50 Mc/60 Mc, 10 Mc Mixer Test Fixture.

TABLE 1-9. 50 MC/60 MC, 10 MC MIXER TEST FIXTURE PARTS LIST

Part	Mil Part No. or Mfg Part No.	Manufacturer	No. Required		
Capacitor, Fxd, Mica, 120 pf, ±5%	DM10-121J	El Menco	4		
Choke, 6.8 uH	1537-32	Delevan	2		
Connector, BNC	UG 1094/U	Schweber Elect	3		
Diode Bridge	FA 4000	Fairchild	1		
Resistor, Fxd, Comp, ¼ W, ±5%	RC07GF560J	Allen-Bradley	1		
Transformer (T1 & T2) 8: 12/12 Ratio Transformer Core 30 AWG Magnet Wire	CF 101-Q1	Indiana General	2		
Transformer (T3) 20: 9 Ratio Transformer Core 30 AWG Magnet Wire	Т 25-2	Micro Metals	1		
Chassis, wire, and misc mtg hardware.					

SECTION II. INSTALLATION AND OPERATION

2-1. INTRODUCTION

2-2. This section contains instructions for unpacking, inspection, packing, installation, and operation of the PM Receiver.

2-3. UNPACKING, INSPECTION, AND PACKING

2-4. UNPACKING

2-5. The PM Receiver is packaged for shipment in a molded polyethylene foam container, a fiberboard carton, and a plywood box, as illustrated in figure 2-1. Unpacking is performed by removing the packing materials and equipment as follows:

- a. Remove the 12 Klimp fasteners securing the cover of the plywood box and remove the cover.
- b. Remove the latex hair mats from the top and sides of the fiberboard carton.
- c. Remove and open the fiberboard carton.
- d. Remove the barrier bag enclosed polyethylene container from the fiberboard carton.
- e. Remove the barrier bag and banding from the polyethylene container.
- f. Remove the top of the polyethylene container.
- g. Remove the polyethylene inserts and the desiccant from around the PM Receiver.
- h. Remove the PM Receiver from the bottom half of the polyethylene container.

2-6. INSPECTION

2-7. After the equipment has been unpacked, check the package contents against the packing list to ensure that the shipment is complete. Visually inspect the equipment for damage incurred during shipment.

- BOX TOP 1.
- HANDBOOKS 2.
- 3.
- WATERPROOF ENVELOPE, SIZE 13 x 11 BANDING, AVISTRAP, AMERICAN VISCOSE 4 CO. OR EQUIVALENT
- PLASTIC WRAP, 4 MIL 5.
- 6, END ITEM
- HUMIDITY INDICATOR 7.
- KLIMP FASTENERS, SIZE #3, 12 EACH FOR 8. TOP OF BOX
- 9. "DELICATE INSTRUMENT" LABEL
- "FRAGILE" LABEL PACKING LIST 10.
- 11.
- "UP" LABEL 12.
- 13.
- PLYWOOD BOX, HAIR, LATEX, FIRM, 4 INCHES THICK 14 LOADED ON EDGE (2) SIDES, (2) END, TOP AND BOTTOM
- 15. FIBERBOARD CARTON,
- 16. BARRIER BAG, MIL SPEC MIL-B-131 CLASS 1, SIZE 52 x 42
- POLYETHYLENE CONTAINER, (*) SEE NOTE 1 17.
- DESSICANT, 48 UNITS 18.
- POLYETHYLENE CONTAINER INSERTS, (*) SEE 19. NOTE 2
- POLYETHYLENE CONTAINER TOP, (*) SEE 20. NOTE 1

NOTES

- 1. MOLDED POLYETHYLENE FOAM CONTAINER MODEL NUMBER RM-52417. SUPPLIER, W. D. ADAMS CO., COSTA MESA, CALIF.
- 2. MOLDED POLYETHYLENE EXPAN-SERTS MODEL NUMBER R1-175-24





2-8. PACKING

2-9. Packaging the PM Receiver for shipment or storage, when required, is performed in the reverse order of unpacking described in paragraph 2-4. The original packaging materials, if available and undamaged, should be used. If the original packaging materials are not available, packaging should conform to Specification MIL-P-116D, Method IIb. All containers should be marked in accordance with Specification MIL-STD-129C.

2-10. EQUIPMENT INSTALLATION

2-11. EQUIPMENT CABINET INSTALLATION.

2-12. Installation of the PM Receiver drawer in an electronic equipment cabinet is accomplished as follows:

- a. Extend both cabinet equipment rack slides until they lock in their fully extended positions.
- b. Lift the drawer and start the drawer rollers into the rack slides.
- c. Push the drawer into the equipment cabinet until the drawer locking detents contact the rack slides.
- d. Push the drawer locking detents in and push the drawer into the cabinet until the drawer locking detents lock into position in the rack slide. This is the fully extended position for the drawer when it is cabinet mounted.
- e. Unlock the rack slide locking detents on the inside of the equipment cabinet.
- f. Push in the drawer locking detents and push the drawer to its fully closed position in the cabinet.
- g. Secure the drawer to the cabinet with the four screws on the drawer front panel.
- h. Connect the PM Receiver as shown in figure 2-2.

2-13. EQUIPMENT BENCH SETUP

2-14. If the PM Receiver drawer is not to be mounted in an equipment cabinet, place the drawer on a stable base, and connect the PM Receiver as shown in figure 2-2.

2-15. OPERATION

NOTE

Before using the PM Receiver for any measurements of the Unified S-Band Equipment (USBE), perform the Drawer Checkout procedures given in paragraph 5-7.

2-16. NORMAL OPERATION

- 2-17. Procedures for operating the PM Receiver are as follows:
 - a. Connect the PM Receiver as shown in figure 2-3.
 - b. Push the POWER switch to the ON position.



Figure 2-2. PM Receiver Installation, Block Diagram



Figure 2-3. PM Receiver Operational Setup, Block Diagram

NOTE

Allow two hours warmup before using the PM Receiver for any measurements of the USBE.

c. Push the LOOP CONTROL switches to the 400 CPS and OPEN positions.

NOTE

If the 21.2 CPS bandwidth is to be used, lock the PM Receiver to the input signal in the 400 CPS mode, and switch to the 21.2 CPS mode after lock-up.

- d. Push the GAIN CONTROL switch to the AGC position.
- e. Set the input variable ATTENUATOR dial to zero.
- f. Set the VCO MANUAL CONTROL potentiometer dial to 5 (midrange). The LOOP STATUS indicator should indicate OUT OF LOCK.
- g. Observe the FM TUNING meter and vary the VCO MANUAL CONTROL potentiometer dial from 5 to 10 or from 5 to 0 until the FM TUNING meter nulls.
- h. Observe the oscilloscope at J3; a low frequency beat note will appear. Adjust the VCO MANUAL CONTROL until the beat note on the oscilloscope decreases to a dc level.
- i. Push the LOOP CONTROL switch to the CLOSED position. PM Receiver lock-up with the input signal will be indicated on the oscilloscope by a sweeping trace.
- j. Adjust the input variable ATTENUATOR dial until the SIGNAL STRENGTH meter reads in the green area (-5 1/2 to -6 1/2 vdc). The LOOP STATUS indicator should indicate IN LOCK.

2-18. After lock-up of the PM Receiver to the USBE, ranging information is provided to the Ranging Receiver, 4A3. Other USBE test information is available at PM Receiver front panel outputs J3, J4, J5, and J6.

2-19. MGC OPERATION

2-20. Procedures for operating the PM Receiver when the AGC mode is disabled, are as follows:

- a. Repeat steps (a) through (c) of paragraph 2-17.
- b. Push the GAIN CONTROL switch to the MGC position.
- c. Repeat steps (e) through (j) of paragraph 2-17.

NOTE

The IN LOCK/OUT OF LOCK indicator will light in the MGC mode, but it is not calibrated for an MGC threshold, making its indications erroneous.

- d. Subtract the known input signal level at J2 from -30 dbm.
 Set the input variable ATTENUATOR dial to the difference in db. For example, if the input signal is -10 dbm, then
 - -30 dbm

-10 dbm

20 db, and -20 db is the ATTENUATOR dial setting.

e. Set the MGC control potentiometer such that the SIGNAL STRENGTH meter reads in the green area (-5 1/2 to -6 1/2 vdc).
SECTION III. THEORY OF OPERATION

3-1. INTRODUCTION

3-2. This section presents the theory of operation of the PM Receiver at the functional block level. Each subassembly is discussed separately. Where two or more functions are performed by a single subassembly, each function is presented individually. Where two or more subassemblies are required to perform a single function, the subassemblies are discussed in relation to that particular function.

3-3. Throughout this section, all references to subassembly input and output connections are preceded by the subassembly reference designator. For example, input jack J2 of subassembly A4 is referred to as A4J2. Assembly input and output connections are not preceded by a reference designator. A list of the 13 PM Receiver subassemblies and their reference designators is contained in Table 1-1. Figures 6-1, PM Receiver Block Diagram, and 6-2, PM Receiver Interconnection Diagram, are to be used in conjunction with the text of this section.

3-4. RF FRONT END (Figure 6-4)

3-5. The rf front end consists of an input variable attenuator, a coaxial isolator, and the S-Band Mixer and 50 Mc Preamplifier A2.

3-6. INPUT VARIABLE ATTENUATOR AND COAXIAL ISOLATOR

3-7. The PM Receiver is provided with an rf input signal of 2287.5 mc ± 100 kc, at a level of 0 dbm to -50 dbm. The signal is applied through front panel jack J2, RF INPUT, to an S-band variable attenuator calibrated at 2287.5 mc. The attenuator has an attenuation range of 30 db, and a calibration accuracy of 0.1 db. The attenuator is adjusted manually for a -30 dbm output (an indication of 5.5 to 6.5 volts on the SIGNAL STRENGTH meter) into the coaxial isolator. The isolator has a nominal insertion loss of

0.6 db, a vswr of l.1:1, and reverse isolation of 30 db to isolate the local oscillator signal from the RF INPUT jack. The rf input signal is applied through the isolator to the S-Band Mixer and 50 Mc Preamplifier, subassembly A2.

3-8. S-BAND MIXER AND 50 MC PREAMPLIFIER, 1A2A2

3-9. At subassembly A2 the 2287.5 mc, -30 dbm signal input (through A2J2) is mixed with a 2237.5 mc, 0 dbm local oscillator signal (input A2J3), from subassembly A1 (23 Mc VCO and X96 Multiplier). The 50 mc difference frequency from the balanced mixer is amplified in a wideband amplifier consisting of three stages with a 12 mc bandwidth and a nominal conversion gain of 10 db producing a 50 mc, -20 dbm input to the 50 Mc Mixer and 10 Mc AGC Amplifier, subassembly A3.

3-10. 50 MC MIXER AND 10 MC AGC AMPLIFIER, 1A2A3 (Figure 6-5)

3-11. 50 MC Amplifier

3-12. The 50 mc, -20 dbm, input signal is inserted through A3J2 where it is isolated by an emitter follower circuit and applied to front panel jack J6, 50 MC SPECTRUM, through output A3J3. The signal is also fed into a 50 mc wideband amplifier with a gain of approximately 6 db.

3-13. 50 MC MIXER

3-14. The amplifier output is then mixed with a 60 mc, +10 dbm signal from subassembly A7 (20 Mc Reference Oscillator and X3 Multiplier) entering through A3J4. The 10 mc difference signal is then filtered to eliminate 50 and 60 mc components, and unwanted harmonics, and is fed into the 10 mc agc amplifier.

3-15. 10 MC AGC AMPLIFIER

3-16. The agc amplifier has a 4 mc bandwidth and an agc range of 20 db to hold the -40 to -20 dbm input to a constant -20 dbm output. The agc control voltage from subassembly A9 is injected through A3J6 into the amplifier. The agc voltage range is -1 to -8v, with

-lv representing maximum gain, and -8v representing minimum gain. The output signal is then fed to the 10 Mc Distribution Amplifier, subassembly A4.

3-17. 10 MC DISTRIBUTION AMPLIFIER, 1A2A4 (Figure 6-6)

3-18. Subassembly A4 receives the 10 mc, -20 dbm signal from subassembly A3 and provides amplification, proper impedance matching, and distribution of four 10 mc signal outputs. The input at A4J2 is amplified by a wideband amplifier with a bandwidth of 10mc ± 2 mc, flat within 0.05 db, and applied to an emitter follower. The output of the emitter follower is used to drive four circuits that provide the outputs at A4J3, A4J4, A4J5, and A4J6. The first circuit consists of an emitter follower, a wideband amplifier, and an output emitter follower stage that provides a 10 mc, -10 dbm signal through A4J3 to the 10 Mc Predetection Output jack, J9, on the drawer rear panel. The second circuit consists of a wideband amplifier and an emitter follower output stage that provides a 10 mc, -10 dbm signal through A4J4 to 10 Mc Narrow-band Discriminator, Alo. The third circuit is an emitter follower output stage that provides a 10 mc, -20 dbm signal through A4J5 to the 10 Mc Wideband Phase Detector, subassembly AlO. The fourth circuit is an emitter follower output stage that provides a 10 mc, -20 dbm signal through A4J6 to the 10 Mc IF. Amplifier, subassembly A5.

3-19. 10 MC IF AMPLIFIER, 1A2A5 (figure 6-7)

3-20. The 10 mc, -20 dbm input signal from subassembly A4 is amplified and distributed to two functions. One function, the 10 mc, -16 dbm linear output, is amplified by a second stage and is fed to the coherent amplitude detector (subassembly A9), by A5J3, to develop loop agc voltage. The other function of the signal is fed to a limiter such that a 10 db signal change on the input will cause an output change of less than 1 db. The limited signal is then amplified by two stages and its 10 mc, +6 dbm output at A5J4 is fed to the loop phase detector (subassembly A6). This is for the phase lock loop portion of the receiver. 3-21. LOOP PHASE DETECTOR AND LOOP FILTER, 1A2A6 (Figure 6-8)

3-22. Subassembly A6 is divided into two functional portions. The first portion, the Loop Phase Detector, receives two input signals. The input through A6J2 is from subassembly A8, the X 1/2and 10 Mc Reference Distribution Amplifier, at a level of +10 dbm at 10 mc. This input is crystal controlled from subassembly A7, and is the reference input. The input signal through A6J3 is from subassembly A5, the 10 Mc IF. Amplifier, at a level of +6 dbm at 10 These two signals are detected in a balanced bridge type mc. phase detector. If the input signals are out of phase, a dc error voltage is generated. This error voltage is fed to the second portion of the subassembly, the loop filter. The filter translates the input error signal into a dc correction voltage, which is inserted through A6J6 to subassembly A1, and establishes the tracking bandwidths of the phase lock loop. The filter has two bandwidths, a 400 cps loop bandwidth, β_{T} , and a 40 radian loop bandwidth, β_{I} , equivalent to 21.2 cps. The 400 cps bandwidth is used for all tests, except phase noise for which the 21,2 cps mode is used. Selection of the different bandwidths is accomplished by relay selection of RC combinations which make up a passive loop filter. Output A6J4 is routed to the receiver front panel J3, DYNAMIC ϕ ERROR. Output A6J5 is routed to the STATIC ϕ ERROR meter on the receiver front panel.

3-23. 23 MC VCO AND X96 MULTIPLIER, 1A2A1, AND COAXIAL ISOLATOR (Figures 6-1, 6-2, and 6-3)

3-24. The 23 Mc VCO and X96 Multiplier consists of four subassemblies: the 23 mc vco and two buffer amplifiers, X2 and X3 multipliers with three stages of power amplification, a X16 cavity multiplier, and a coaxial isolator.

3-25. 23 MC VCO

3-26. The 23 mc vco is crystal controlled with two back-biased capacitive diodes (Varicaps), in a series resonant loop. The Loop Phase Detector error voltage (input AlJ2), or front panel adjust

VCO MANUAL CONTROL voltage, (input A1J3), is injected into the loop, changes the bias on the diodes, causing diode capacities to change, thus shifting the crystal frequency 600 cps per volt of bias (four volt range). The vco output signal is isolated by two buffer-amplifier stages and the 23 MC VCO TEST output is applied through AlJ4 to J8 on the drawer front panel. The vco output then enters the X3, X2, and power amplifiers.

3-27. X6 MULTIPLIER AND AMPLIFIER

3-28. In this subassembly the 23 mc signal is multiplied to 140 mc by the X3 and X2 multipliers, and amplified to approximately +20 dbm by three stages of power amplification.

3-29. X16 CAVITY MULTIPLIER

3-30. The filtered 140 mc signal is fed into a X16 cavity which uses a step recovery diode for harmonic generation. The multiplied signal is inserted into a three-pole filter, (tuned to 2237.5 mc) which attenuates the 15th and 17th harmonics 50 to 55 db down from the output.

3-31. COAXIAL ISOLATOR

3-32. The 2237.5 mc output signal (at AlJ7) is then sent to a coaxial isolator which holds the loading effect of the three-pole filter constant. The isolator has 30 db of reverse isolation, a forward insertion loss of 0.6 db, and a vswr of 1.1:1. The 2237.5 mc, 0 dbm, output signal is mixed with the 2287.5 mc rf input in the Mixer Preamplifier, which completes the phase lock loop portion of the receiver.

3-33. 20 MC REFERENCE OSCILLATOR AND X3 MULTIPLIER, 1A2A7 (Figure 6-9)

3-34. Subassembly A7 generates the reference frequency for the phase lock loop, and provides a monitor output to the drawer front panel. The signal is also multiplied and sent to the 50 mc mixer portion of subassembly A3, where it is used as the second local oscillator signal.

3-35. The 20 mc oscillator is a crystal controlled circuit with a crystal frequency of 20.000000 ± 5 percent. The oscillator output is amplified and performs several functions. The output is multiplied by a X3 multiplier, amplified, and a 60 mc +10 dbm output signal is sent to the 50 mc mixer (subassembly A3) through output A7J2. The 20 mc amplified oscillator output is also amplified to +10 dbm and sent to subassembly A8 through output A7J3, where it becomes the loop reference frequency. This signal is also divided by a 10 db voltage divider to 0 dbm and sent through output A7J4 to drawer front panel jack J7, 20 MC OSC TEST.

3-36. X1/2 MULTIPLIER AND 10 MC REFERENCE DISTRIBUTION AMPLIFIER, 1A2A8 (Figure 6-10)

3-37. Subassembly A8 receives the 20 mc reference frequency from subassembly A7, divides it by two, isolates, and distributes four 10 mc reference signals, two of which are phase shifted.

3-38. X1/2 MULTIPLIER

3-39. The X1/2 multiplier is a parametric divider which uses two capacitive diodes (Varicaps). The multiplier output is isolated by a buffer amplifier and distributed to four amplifiers.

3-40. 10 MC REFERENCE DISTRIBUTION AMPLIFIER

3-41. The 10 mc reference signal is applied to two separate single stage isolation amplifiers. After leaving the isolation amplifiers, both signals are 10 mc, +10 dbm. Output A8J3 is fed directly into subassembly A6 and is the basic reference frequency for the phase lock loop. Output A8J4 is fed to J10 on the rear drawer panel, and is the 10 mc Reference Output to Ranging Receiver drawer 4A3 (input J3).

3-42. PHASE SHIFTER

3-43. The other two 10 mc signals are sent to single stage isolation amplifiers identical to those used for the reference outputs. From here each signal goes to a variable RL and C network phase shifter, capable of shifting the signal phase 0 to 180 degrees. One signal is shifted 90 degrees from the phase lock loop signal, and sent to subassembly A9 through output A8J5, where the coherent amplitude detector (subassembly A9) operates in phase quadrature with the loop phase detector (subassembly A6). The second signal is phase shifted to compensate for cable lengths which introduce phase shifts, and to place the signal in phase with the loop phase detector, so that VIDEO information outputs will not be distorted. After being phase shifted, this 10 mc, +10 dbm, output (A8J6) is sent to the 10 mc wideband phase detector (subassembly A10).

3-44. COHERENT AMPLITUDE DETECTOR, AGC AMPLIFIER, AND RELAY DRIVER, 1A2A9. (Figure 6-11)

3-45. Subassembly A9 circuitry may be divided into four parts: the coherent amplitude detector, the agc amplifier, the relay driver, and MGC/AGC switching.

3-46. COHERENT AMPLITUDE DETECTOR

3-47. The coherent amplitude detector is a balanced bridge type detector, similar to the loop phase detector in subassembly A6. Two inputs are inserted in the detector. The reference input at A9J2 is a 10 mc, +10 dbm output from subassembly A8. The signal input at A9J3 is a 10 mc, -16 dbm output from subassembly A5. The signal input is compared with the reference input in the detector, and a dc error voltage proportional to the amplitude of the signal input is generated. The error voltage is then sent to the AGC amplifier.

3-48. AGC AMPLIFIER

3-49. The AGC amplifier is a dc amplifier which amplifies the error signal for use in the 10 mc AGC amplifier, subassembly A3, as the loop AGC voltage (output A9J5). At the same time the error voltage is sent to the SIGNAL STRENGTH meter through output A9J4.

3-50. RELAY DRIVER

3-51. The relay driver is a logic switching circuit which triggers relay K2. When the AGC voltage, as read on the SIGNAL STRENGTH meter, falls below -0.7 volt, the relay driver triggers the IN LOCK/ OUT OF LOCK indicator relay, causing the OUT OF LOCK indicator to light. When the OUT OF LOCK indicator is lit and the AGC voltage rises above -0.7 volt, the relay driver triggers the indicator relay, and the IN LOCK indicator lights.

3-52. MGC/AGC SWITCHING

3-53. MGC/AGC switching is accomplished on the drawer front panel by the GAIN CONTROL switch. Actuation of the switch triggers relay Kl, switching out the AGC circuitry at the AGC Amplifier output. The MGC voltage, controlled by the MGC potentiometer (R2) on the drawer front panel, is fed through outputs A9J4 and A9J5 as in the AGC mode. MGC voltage is then read on the SIGNAL STRENGTH meter. The IN LOCK/OUT OF LOCK indicator will light in the MGC mode, but is not calibrated for an MGC threshold, making its indications erroneous.

3-54. 10 MC NARROW-BAND DISCRIMINATOR, 1A2A10 (Figure 6-12)

3-55. The 10 Mc Narrow-Band Discriminator is a separate functional unit which shares Subassembly AlO with the 10 Mc Wideband Phase Detector.

3-56. The input signal at A10J2 is 10 mc, -10 dbm, from subassembly A4. The signal is amplified in a two stage 10 mc limiting amplifier to prevent amplitude modulation from reaching the discriminator. The discriminator is a double-tuned type having nominal linearities of ± 0.5 percent for a ± 20 kc range. Deviation output of the sub-assembly is 0.1 volt/1000 cps, nominal. One output of the discriminator is sent to the FM TUNING meter, on the drawer front panel, through A10J4. Another output of the discriminator is fed into an audio amplifier that has a 3 db response from 300 cps to 2 kc. The audio output is then sent through A10J3 to drawer front panel output J5, VOICE.

3-57. 10 MC WIDEBAND PHASE DETECTOR, 1A2A10, AND VIDEO DISTRIBUTION AMPLIFIER, 1A2A11 (Figures 6-12 and 6-13)

3-58. The 10 Mc Wideband Phase Detector and the Video Distribution Amplifier operate together as a functional unit. However, the 10 Mc Wideband Phase Detector physically shares subassembly A10 with the 10 Mc Narrow-Band Discriminator. The Video Distribution Amplifier is packaged separately in Subassembly A11.

3-59. 10 MC WIDEBAND PHASE DETECTOR

3-60. The phase detector receives two 10 mc inputs: a signal input and a reference input. The -20 dbm signal input from subassembly A4 is fed through A10J5 into a single stage amplifier and two emitter followers, which provide reverse isolation to prevent feedback of the 10 mc reference signal into subassembly A4, a condition which would cause the PM Receiver to acquire its own reference signal (false lock). The 10 mc, +10 dbm reference input is a phase shifted output of subassembly A8. The reference input is fed directly through A10J6 to the phase detector. The input phases are compared in a balanced quadrature ring type configuration consisting of four diodes. The output of the phase detector, when the reference input is properly phased, consists of 300 cps to 1.5 mc of modulated information which was imposed on the S-band carrier. The subcarriers are amplified to 0 dbm by a four stage amplifier whose bandwidth is flat within 0.05 db from 300 cps to 1.5 mc, and sent to subassembly All through Al0J7.

3-61. VIDEO DISTRIBUTION AMPLIFIER

3-62. The input signals are received at subassembly All through AllJ2. One signal goes directly through this subassembly via AllJ3 to the VIDEO OUTPUT selector switch on the drawer front panel. This is the WB VIDEO output and consists of frequencies from 300 cps to 1.25 mc. The subcarrier frequencies of 10 kc, 100 kc, 500 kc, 1.024 mc, and 1.25 mc are individually amplified, filtered, amplified again, and sent to the VIDEO OUTPUT selector switch through outputs J6, J5, J4, J8, and J7, respectively. The VIDEO OUTPUT selector switch selects one of the five subcarrier outputs or the wideband video output, which is then sent to VIDEO output J4, located on the drawer front panel.

SECTION IV. PROGRAMMING DATA

NOT APPLICABLE

SECTION V. MAINTENANCE

5-1. INTRODUCTION.

5-2. This maintenance section consists of drawer operational checkout, drawer performance checkout, and calibration and adjustment procedures. The checkout procedures will assist the experienced technician in localizing troubles to the subassembly level.

5-3. The drawer operational checkout is primarily confined to using a series of simple tests to determine the location of the catastrophic type of failure. The drawer performance checkout tests are more sophisticated and reveal the circuit design performance.

5-4. When it has been determined that a particular subassembly is contributing to failure in design performance, the calibration and/or adjustment procedure for that subassembly should be performed. If calibration does not restore performance, the defective subassembly must be returned to the factory for repair or troubleshooting carried out using the schematic diagram.

5-5. DRAWER OPERATIONAL CHECKOUT.

5-6. During these tests, terminate all drawer connectors, other than those being used for the particular test, in 50 ohms. Connect the 115 VAC INPUT connector J1 of the PM Receiver drawer to a 115 VAC 60-cycle single-phase power source capable of delivering 10 amperes. Perform the procedure of Table 5-1, in order, by item number.

Action	Normal Indication
Turn on PM Receiver by pressing POWER switch Sl.	A-c power applied when -12 vdc output of power supply lights lamps DS1 and DS2 behind switch button.
Check d-c output of -12 vdc and plus and minus 15 vdc supplies. -12 vdc supply (TB5-1 to TB5-4)	-12 vdc ± volts at TB5-1.
+15 vdc supply (TB2-6 to TB1-7) -15 vdc supply (TB4-5 to TB1-4)	+15 vdc ± volts at TB2-6. -15 vdc ± volts at TB4-5.
Position switches as follows: LOOP CONTROL S2 at 400 CPS LOOP CONTROL S3 at OPEN GAIN CONTROL S4 at MGC	
Adjust MGC knob	6 vdc as observed on SIGNAL STRENGTH meter.
Measure 23 Mc VCO subassembly Al frequency and power at the 23 MC VCO TEST jack J8 using a frequency counter and power meter.	23.307292 mc ± 1050 cycles 0 dbm ± 2 dbm
Disconnect the isolator AT3 from the LO input A2J3 of the mixer-preamplifier A2. Termi- nate the output side of AT3 in 50 ohms and measure fre- quency and power. Use HP 536A frequency meter and HP 431B power meter. Reconnect AT3 to A2J3.	2237.5 mc ± 2 mc 0 dbm ± 1 dbm
	Action Turn on PM Receiver by pressing POWER switch S1. Check d-c output of -12 vdc and plus and minus 15 vdc supplies. -12 vdc supply (TB5-1 to TB5-4) +15 vdc supply (TB2-6 to TB1-7) -15 vdc supply (TB4-5 to TB1-4) Position switches as follows: LOOP CONTROL S2 at 400 CPS LOOP CONTROL S3 at OPEN GAIN CONTROL S4 at MGC Adjust MGC knob Measure 23 Mc VCO subassembly Al frequency and power at the 23 MC VCO TEST jack J8 using a frequency counter and power meter. Disconnect the isolator AT3 from the LO input A2J3 of the mixer-preamplifier A2. Termi- nate the output side of AT3 in 50 ohms and measure fre- quency and power. Use HP 536A frequency meter and HP 431B power meter. Reconnect AT3 to A2J3.

TABLE 5-1. DRAWER OPERATIONAL CHECKOUT

Apply a 2287.5 mc input signal at -30 dbm to RF INPUT jack J2. Set the ATTENUATOR AT1 to 0 db and measure frequency and power at J6.	50 mc -22 dbm nominal
Vary the ATTENUATOR AT1 in 5 db steps over the dial. Leave ATTENUATOR dial at 0 db and signal input as in step (7) until directed otherwise.	Output power at J6 must change 5 db ± 1 db for each step.
Terminate the 20 MC OSC TEST jack J7 in 50 ohms. Measure the 20 mc ref oscillator A7 output frequency and power.	20.000000 mc ± 200 cps 0 dbm ± 0.2 dbm
Terminate the cable tied into subassembly jack A3J4 in 50 ohms and measure the frequency and power of the X3 output of the 20 Mc Reference Oscillator and X3 subassembly A7. Restore circuit connections.	60.000000 mc +10 dbm nominal
Terminate output connector A3J5 of the 50 Mc Mixer and 10 MC AGC Amplifier A3 in 50 ohms. Check the output frequency and power at A3J5. Restore circuit connections.	10.000000 mc -20 dbm nominal
	Apply a 2287.5 mc input signal at -30 dbm to RF INPUT jack J2. Set the ATTENUATOR AT1 to 0 db and measure frequency and power at J6. Vary the ATTENUATOR AT1 in 5 db steps over the dial. Leave ATTENUATOR dial at 0 db and signal input as in step (7) until directed otherwise. Terminate the 20 MC OSC TEST jack J7 in 50 ohms. Measure the 20 mc ref oscillator A7 output frequency and power. Terminate the cable tied into subassembly jack A3J4 in 50 ohms and measure the frequency and power of the X3 output of the 20 Mc Reference Oscillator and X3 subassembly A7. Restore circuit connections. Terminate output connector A3J5 of the 50 Mc Mixer and 10 MC AGC Amplifier A3 in 50 ohms. Check the output frequency and power at A3J5. Restore circuit connections.

TABLE 5-1. (cont)

TABLE 5-1. (cont)

Item	Action	Normal Indication
12	Terminate the output connector A4J6 of the 10 Mc Distribution Amplifier A4 in 50 ohms. Meas- ure the frequency and output power at A4J6. Restore circuit connections.	10.000000 mc -20 dbm nominal
13	Terminate the output connector J9 at the rear of the drawer in 50 ohms. (10 mc turn around code.) Measure the frequency and output power at J9.	10.000000 mc -10 dbm ±1 db
14	Disconnect the output cable from the 10 Mc IF. Amplifier at jack A9J3 of subassembly A9. Terminate the cable in 50 ohms. Check the output fre- quency and power at the termin- nated cable end. Restore circuit connections.	10.000000 mc -16 dbm nominal
15	Check the frequency and power output of the 10 mc ref dis- tribution amplifier (p/o sub- assembly A8) at the 10 mc ref connector J10 at the rear of the drawer.	10.000000 mc +10 dbm nominal
16	Check the 10 mc ref distri- bution amplifier output at A8J3 in the following manner:	

TABLE 5-1. (cont)

Item	Action	Normal Indication
16	a. Remove the cable from	
cont	connector J2 of sub-	an garan ing di baak
n I mili	assembly A6.	
	b. Terminate the open end of	10.000000 mc
	the cable in 50 ohms.	
	Measure frequency.	그는 이번 소방을 받는 것을 것
	c. Remove the termination	+10 dbm nominal
	and measure power with	. 그는 가지에 그 옷을 다양했다.
	the MV-28B (has 50-ohm	~ ~ 이
	probe).	그는 것은 것이 같은 것이 같을 것이 같을 것이다.
17	Check the 10 mc limited ampli-	
	fier output at A5J4 (p/o sub-	이 지도 아파는 그 집안에서 안 같아.
	assembly A5) in the following	
n de la companya de la constituir la de la constituir de la la constituir de la constitu	manner:	
	a. Disconnect the cable tied	10 mc
	to A6J3. Terminate the	
	open end of the cable in	
X	50 ohms. Measure fre-	
	quency at the terminated	이 사람님께 깨끗한 문다.
	end.	
50	b. Remove the termination	+6 dbm nominal
	and measure power at the	
	open cable end with an	
	MV-28B power meter.	
	c. Reconnect cable to A6J3.	
18	Check the A5J4 and A5J5 outputs	
	from the 10 Mc Distribution	
	Amplifier A4 as follows:	이 가장님께서 한 경험에서 지지 않는 것이다.
		그는 그는 것은 감독 모습이었다.
		그는 이 것 같은 것 것 않는 것 같아요.

TABLE 5-1. (cont)

Item	Action	Normal Indication
18	a. Disconnect cable tied to	10 mc
cont	connector Al0J2. Termi-	
	nate the cable in 50 ohms.	
	Measure frequency at	service period
	terminated end.	: : : : : : : : : : :
	b. Remove termination and	-10 dbm nominal
	measure power at the open	에 가지 않는 것이 있는 것이 있는 것이 있다. 같은 것이 같은 것이 있는 것이 있는 것이 있는 것이 있는 것이 같은 것이 있는 것이 같은 것이 같은 것이 같은 것이 같은 것이 없다. 것이 있는 것이 같은 것이 없는 것이 없는 것이 없는 것이 있는
	cable end with an $MV-28B$	
71.1	power meter. Reconnect	
	cable.	
	c. Perform operation of (a)	10 mc
	and (b) above at connec-	-20 dbm nominal
	tor Al0J5.	

5-7. DRAWER PERFORMANCE CHECKOUT

5-8. This test procedure contains information required to check out the PM Receiver. The procedures should be performed in the sequence presented.

5-9. Test equipment required for these procedures is listed in Table 1-6. Test equipment required for the specific setups is given in text or in the test setup diagram.

5-10. INPUT VSWR

- a. Connect the PM Receiver as shown in figure 5-1.
- b. Set the UHF signal generator to 2287.5 mc at 0 dbm.
 Verify the frequency with the frequency meter and power meter.

- . c. Modulate the signal generator with 1000 cps by means of its internal square wave. Do not use the signal generator automatic level control during this test.
 - d. Tune the slotted line and measure the input vswr. The input vswr should be 1.3:1, or less, with respect to 50 ohms at ± 20 mc of f.

NOTE

If the input vswr is not within limits, check all input cables and their connectors for tightness and continuity. If all input cables are satisfactory, the input attenuator may be defective.

5-11. INPUT VARIABLE ATTENUATOR LINEARITY

- a. Connect the equipment as shown in figure 5-2.
- b. Set the ATTENUATOR dial to zero.
- c. Set the LOOP CONTROL switch to OPEN.
- d. Adjust the VCO MANUAL CONTROL for a 50 mc output at J6.
- e. Measure the power output level at J6 with the RF voltmeter. This is the reference level.
- f. Vary the ATTENUATOR dial in 5 db steps over the dial. The output level for each succeeding setting must be 5 db ±1 db from the previous setting.

NOTE

If the linearity of the input variable attenuator is not within limits, the input attenuator is defective and must be replaced.







Figure 5-2. Input Variable Attenuator Linearity/50 Mc IF Bandwidth/10 Mc IF Bandwidth, Test Setup

5-12. 23 MC VCO AND X96 MULTIPLIER 1A2A1 OUTPUT

- a. Disconnect the LO isolator from the Mixer Preamplifer, A2J3, and connect it to the Spectrum Analyzer (H-P 8551A/ 851A). The level of all spurious signals from 2000 to 2400 mc should be at least 50 db down from the reference level of 0 dbm at 2237.5 mc.
- b. Reconnect the LO isolator to A2J3.

NOTE

If the power, frequency, or spurious outputs at the LO isolator are not within limits, subassembly Al must be checked out.

- 5-13. 50 MC IF. BANDWIDTH
 - a. Connect the equipment as shown in figure 5-2.
 - b. Set the LOOP CONTROL switch to the OPEN position.
 - c. Adjust the VCO MANUAL CONTROL for a 50 mc output at J6.
 - d. Vary the frequency on the signal generator plus and minus 2 mc from 2287.5 mc. Ensure that the input power level remains constant over the frequency range. The output power level at J6 should be within ±0.05 db of the reference power output at 2287.5 mc.

NOTE

If the power output levels at J6 are not within limits, subassembly A2 must be checked out.

5-14. 10 MC IF. BANDWIDTH

 a. Connect the equipment as shown in figure 5-2 and connect the rf voltmeter and spectrum analyzer to A4J6 (10 mc Distribution Amplifier).

- b. Set the LOOP CONTROL switch to the OPEN position and the GAIN CONTROL switch to the MGC position. Select an easily-read MGC voltage for reference.
- c. Adjust the VCO MANUAL CONTROL for a 10 mc signal output at A4J5.
- d. Vary the input frequency plus and minus 2 mc from 2287.5 mc. The power output deviation at A4J5 should be within ± 0.05 db of the reference power output at 2287.5 mc.

NOTE

If the power output levels at the J6 are not within limits, subassembly A3, and, or, subassembly A4 must be checked out.

5-15. MGC RANGE

- a. Connect the equipment as shown in figure 5-3.
- b. Set the ATTENUATOR dial to zero.
- c. Set the LOOP CONTROL switch to the OPEN position. Adjust the MGC control and the VCO MANUAL CONTROL for a 10 mc, -20 dbm output at A4J5 with the ATTENUATOR dial set to zero.
- d. Vary the ATTENUATOR dial in 5-db steps from 0 to 20 db and readjust the MGC control for -20 dbm output at A4J5. The MGC voltage range should be sufficient to compensate for an input signal change of 20 db.

NOTE

If the MGC range is not sufficient to compensate for a 20-db input signal change, subassembly A3 must be checked out.

5-16. AGC RANGE

- a. Connect the equipment as shown in figure 5-3.
- b. Set the LOOP CONTROL switches to the 400 CPS and CLOSED positions. Set the ATTENUATOR DIAL to zero.
- c. Monitor the 10 mc output at A4J5.



Figure 5-3. MGC Range/AGC Range, Test Setup

d. Vary the ATTENUATOR dial in 5 db steps from 0 to 20 db. The agc voltage range should be sufficient to compensate for an input signal change of 20 db, while maintaining a constant output of -20 dbm ± 0.1 db at A4J5.

NOTE

If the agc range is not sufficient to compensate for a 20-db input signal change, subassembly A3 must be checked out.

5-17. LOOP GAIN

- a. Connect the equipment as shown in figure 5-4.
- b. Set the LOOP CONTROL switches to the 400 CPS and CLOSED positions.
- c. Adjust the VCO MANUAL CONTROL potentiometer for 0 volt error voltage on the dc null voltmeter. Note the frequency of the 23 mc vco (nominal frequency: 23.307292 mc).



Figure 5-4. Loop Gain Test Setup

d. Vary the PM Transmitter FREQ SET control for +1 volt error on the dc null voltmeter and note the frequency of the 23 mc vco. It should vary 600 cps $\pm 10\%$ from the reference noted in step c.

NOTE

If the 23 mc vco frequency deviation at +1 v error is not within limits, subassembly A1 must be checked out.

 Repeat step (d) for -1 volt error. Note the 23 mc vco frequency. It should vary 600 cps ±10% from the reference noted in step (c).

NOTE

If the 23 mc vco frequency deviation at -1 v error is not within limits, subassembly Al must be checked out.

f. Determine the loop gain from the following formula:

 $G = \left(\text{Kd } \frac{\text{volts}}{\text{degree}} \right) \left(\text{Kvco } \frac{\text{cps}}{\text{volt}} \right) \left(\text{A } \frac{\text{volts}}{\text{volts}} \right) \left(\text{M } \frac{\text{cps}}{\text{cps}} \right) \left(\alpha \frac{\text{volt}}{\text{volt}} \right)$ $G = \left(.360/\text{degree} \right) \left(\Delta f \frac{\text{cps}}{\text{volt}} \right) : 553 \times 96 \times 1$ For an error voltage of 1.0 volt, $G = 360 \times 96 \times .360 \times f \times .553,$ where $\Delta f = \text{vco frequency change.}$ Limit: 4.125 x 10⁶ ±10 percent

NOTE

If the loop gain is not within limits, subassemblies Al, and, or A6 must be checked out.

5-18. LOOP BANDWIDTH

- a. Connect the equipment as shown in figure 5-5.
- b. Set the LOOP CONTROL switches to the 400 CPS and CLOSED positions. Lock the PM Receiver to the PM Transmitter.
- c. Apply 1 kc of modulation from the signal generator to the PM Transmitter. Adjust the signal generator input level until a convenient reference output level is read on the oscilloscope.
- d. Vary the frequency of the signal generator from 1 kc to 10 cps, keeping its level constant, and plot several points on a graph showing relative response versus modulation frequency. The response curve should be within ±10% of figure 5-6.



Figure 5-5. Loop Bandwidth Test Setup.

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Figure 5-6. 400 CPS Loop Bandwidth Response Curve.

5-15

If the loop bandwidth response curve is not within ±10 percent of figure 5-6, the Loop Filter A3 must be checked out.

e. Set the LOOP CONTROL switch to the 21 CPS position and repeat steps (c) and (d), except vary the frequency of the signal generator from 100 to 1 cps. The response curve should be within $\pm 10\%$ of figure 5-7.

NOTE

If the loop bandwidth response curve is not within ± 10 percent of figure 5-7, the Loop Filter A3 must be checked out.

5-19. AGC BANDWIDTH

- a. Connect the equipment as shown in figure 5-8.
- b. Set the LOOP CONTROL switches to CLOSED and 400 CPS, lock the loop, and set the GAIN CONTROL to AGC.
- c. Set the function generator for a 40 cps sine wave signal.
- d. Set the power supply (2005) to -2.4 volts.
- e. Adjust the output level at the function generator until the 40 cps envelope or the oscilloscope is 20 mv peak-topeak.
- f. Decrease the frequency of the function generator, maintaining the output level constant, until the presentation on the oscilloscope has fallen 3 db (0.707) of the original level. The frequency shall be 5 cps maximum.

NOTE

If the agc bandwidth is not within limits, subassembly A9 must be checked out.



Figure 5-7. 21.2 CPS Loop Bandwidth Response Curve.

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Figure 5-8. AGC Bandwidth Test Setup

5-20. PHASE NOISE

- a. Connect the equipment as shown in figure 5-9.
- b. Place the LOOP CONTROL switches to CLOSED and 21 CPS positions and lock the loop.
- c. Set the Function switch on the integrating voltmeter to Auto Range.
- d. Set the Sample Period selector on the integrating voltmeter to 10 seconds.
- e. The reading on the integrating voltmeter is percent of full scale of the rms voltmeter. Note the reading of the integrating voltmeter times full scale of the rms voltmeter.
- f. Convert the voltage reading to rms degrees by using the relationship below. Maximum phase noise should be 2.5° .

rms phase noise (volts)
 K(volt/degrees) = rms phase noise (degrees)

where $K = \frac{\text{peak value of open loop beat note (volts/radian)}}{57.3 (degrees/radian)}$

NOTE

If the rms phase noise is not within limits, subassembly Al should be checked out.

5-21. 23 MC VCO AND 20 MC OSCILLATOR STABILITY

NOTE

Allow the PM Receiver two hours warm-up before performing this checkout procedure.

- a. Connect the equipment as shown in figure 5-10.
- b. Set the LOOP CONTROL switch to the OPEN position.
- c. Adjust the VCO MANUAL CONTROL to midrange.
- d. Measure and note the frequencies at the 20 MC OSC TEST jack and the 23 MC VCO TEST jack at the start and end of a three hour period.



Figure 5-9. Phase Noise Test Setup



Figure 5-10. Oscillator Stability and Manual Frequency Range Test Setup e. Calculate the difference between the start and stop readings obtained at the 23 MC VCO TEST jack. Total drift for any three hour period should be 23 cps maximum.

NOTE

If the 23 mc vco stability is not within limits, subassembly Al must be checked out.

f. Calculate the difference between the start and stop readings obtained at the 20 MC OSC TEST jack. Total drift for any three hour period should be 50 cps maximum.

NOTE

If the 20 mc crystal oscillator is not within limits, subassembly A7 must be checked out.

5-22. MANUAL FREQUENCY RANGE

- a. Connect the equipment as shown in figure 5-10, with the frequency counter connected to the 23 MC VCO TEST jack, and the 20 MC OSC TEST jack terminated in 50 ohms.
- b. Set the LOOP CONTROL switch to the OPEN position.
- c. Set the VCO MANUAL CONTROL fully clockwise and note the frequency.
- d. Set the VCO MANUAL CONTROL fully counter-clockwise and note the frequency.
- e. Calculate the frequency range. The limits for frequency range are ± 1050 cps minimum from 23.307292 mc.

NOTE

If the manual frequency range is not within limits, subassembly Al must be checked out.

5-23. ACQUISITION RANGE

- a. Connect the equipment as shown in figure 5-11.
- b. Set the PM Transmitter to 2287.4 mc.
- c. Set the LOOP CONTROL switches to the 400 CPS and CLOSED positions. Vary the VCO MANUAL CONTROL potentiometer until lockup with the PM Transmitter is accomplished.
- d. Set the PM Transmitter to 2287.6 mc and repeat step (c).
- e. Set the PM Transmitter to 2287.46 mc.
- f. Set the LOOP CONTROL switch to the 21 CPS position. Vary the VCO MANUAL CONTROL potentiometer until lockup with the PM Transmitter is accomplished.
- g. Set the PM Transmitter to 2287.54 mc and repeat step (f).

NOTE

If the acquisition range of the VCO MANUAL CONTROL is not adequate to accomplish lockup with the PM Transmitter at the frequencies in steps b, d, e, and g, subassemblies Al and/or A6 must be checked out.



Figure 5-11. Acquisition Range Test Setup

- 5-24. 10 MC PREDETECTION OUTPUT AND 10 MC REFERENCE OUTPUT
 - a. Connect the equipment as shown in figure 5-12.
 - b. Measure the frequency and output levels at J9. The frequency at J9 should be 10 mc nominal. The output level should be -10 dbm ± 1 db.

NOTE

If the frequency and power output levels at J9 are not within limits, subassembly A4 must be checked out.

c. Connect the rf voltmeter, spectrum analyzer, and frequency counter to J10.



Figure 5-12. 10 MC Predetection Output and 10 MC Reference Output, Test Setup

d. Measure the frequency and power output levels at J10. The frequency at J10 should be 10 mc \pm 100 cps. The power output level should be \pm 10 dbm \pm 2 db.

NOTE

If the frequency and power output levels at J10 are not within limits, subassembly A8 must be checked out.

5-25. PM DEMODULATION

- a. Connect the equipment as shown in figure 5-13.
- b. Set the LOOP CONTROL switches to the 400 CPS and CLOSED positions. Set the VIDEO OUTPUT selector switch in the 10 KC position. Lock the PM Receiver to the PM Transmitter.
- c. Modulate the PM Transmitter carrier with 10 kc at 1.0 radian from the signal generator.
- d. Measure the output level at J4. Limit: 0 dbm ±1 db.

NOTE

If the power output level at J4 is not within limits, subassemblies AlO, and/ or All must be checked out.

e. Modulate the PM Transmitter carrier successively with 100 kc, 500 kc, 1.024 mc, and 1.25 mc at 1.0 radian. Measure the output levels at each modulation frequency with the VIDEO OUTPUT selector switch set to the corresponding frequency. The output level for each modulation frequency, measured at J4, should be 0 dbm ±1 db.

NOTE

If the power output levels at J4 are not within limits, subassemblies AlO, and/or All must be checked out.

f. Set the VIDEO OUTPUT selector switch to WB VIDEO.



Figure 5-13. PM Demodulation Test Setup

g. Modulate the PM Transmitter successively with 300 cps, 1 kc, 10 kc, 100 kc, 1 mc, and 1.5 mc at 1.0 radian. The power output level for each modulation frequency at J4 should be 0 dbm ±1 db.

NOTE

If the output power levels at J4 are not within limits, subassembly Al0 must be checked out.

5-26. FM DEMODULATION

- a. Connect the equipment as shown in figure 5-14.
- b. Place the GAIN CONTROL switch in the MGC position. Place the LOOP CONTROL switch in the OPEN position. Null the FM TUNING meter using the VCO MANUAL CONTROL potentiometer.


Figure 5-14. FM Demodulation Test Setup

- c. Modulate the PM Transmitter carrier with 1 kc at a modulation index of 1.0 radian.
- d. Measure the power output level at J5 with the rf voltmeter. Limit: 100 mv nominal.
- e. Repeat step (c) with deviations of 0.5, 1.5, and 2.0 radians.
- f. Measure the power output levels at J5 with the rf voltmeter. Limits: ±5 percent per radian.

NOTE

If the power output levels at J5 are not within limits, the Narrow-Band Discriminator Al0 must be checked out.

5-27. CALIBRATION OF SUBASSEMBLIES

5-28. 23 MC VCO AND X96 MULTIPLIER 1A2A1.

5-29. Calibration of subassembly Al is performed on the bench, due to limited access of electrical connections and components when in the drawer. Refer to paragraph 5-57 for module removal instructions.

5-30. Make the test connections shown in figure 5-15. Set the bias at J2 to 0 vdc, and the acquisition voltage at J3 to +9 vdc by means of the 10 k ohm potentiometer.

- a. Connect the frequency counter to the 23 mc test connector J4.
- b. Adjust L5 for an output of 23.307292 mc ±100 cps at J4.
- c. Disconnect the frequency counter and connect the r-f voltmeter (Boonton 91CA) to J4.
- d. Adjust C8, C16, and L8 for 0 dbm ±2 db output at J4.
- e. Repeat steps (a) through (d) as required.
- f. Disconnect cable W1 connecting J5 and J6. Connect the r-f voltmeter (91CA) to J5.
- g. Adjust L10, L12, L14, L15, L18, L21, and L22 for maximum 140 ms output at J5.
- h. Remove the r-f voltmeter and connect the spectrum analyzer to J5. Check that the 2nd harmonic is down 30 db and any other spurious down at least 40 db.
- i. Connect the r-f voltmeter at J4.
- j. Vary the bias input to J2 from -2 vdc to +2 vdc and adjust L4 for a VCO sensitivity of 600 cps per volt $\pm 5\%$ at J4.
- k. Disconnect thr r-f voltmeter and spectrum analyzer and reconnect J5 to J6 with cable W1. Connect the test equipment, shown within the dotted enclosure of figure 5-15 to J7.



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- 1. Adjust the three tuned cavities and C56 of Al for maximum power output at 2237.5 mc at J7.
- m. Repeat step (1) until the power output is greater than 0 dbm and all spurs are down at least 50 db.
- n. Disconnect all test equipment and install subassembly Al in the PM Receiver.

5-31. S-BAND MIXER AND 50 MC PREAMPLIFIER 1A2A2

5-32. Calibration of subassembly 1A2A2 can be performed only at the factory. The following calibration checks, however, should be performed at any time the subassembly is suspected of not meeting performance specifications.

- a. Connect the equipment as shown in figure 5-16.
- b. Set the LOOP CONTROL switch to the OPEN position.
- c. Apply a 2287.5 mc input signal at -30 dbm to RF INPUT jack J2.
- d. Set the ATTENUATOR AT1 dial to 0 db.
- e. Measure the frequency at 50 MC SPECTRUM jack J6 and adjust the VCO MANUAL CONTROL for 50 mc output.
- f. Measure the power output at J6. It should be -22 dbm nominal.
- g. Vary the RF INPUT signal plus and minus 2 mc around 2287.5
 mc. The power output should remain flat within 0.05 db.

5-33. 50 MC MIXER AND 10 MC AGC AMPLIFIER 1A2A3

5-34. The subassembly 1A2A3 may be calibrated in the drawer assembly. Raise the subassembly to gain access to the connectors and adjustments. Refer to figure 5-17, and remove drawer connections to 1A2A3 at J1, J2, J3, J4, J5, and J6. Connect test equipment to the subassembly as shown in figure 5-17.

- a. Set the agc voltage to J6 at -1 vdc.
- Adjust the signal generator for a 60 mc input at +10 dbm to J4.



Figure 5-16. Test Setup for Calibration Check of S-Band Mixer and 50 Mc Preamplifier 1A2A2

- c. Adjust the signal generator for a 50 mc input at -40 dbm to J2.
- d. Adjust R51 for -20 dbm as measured at J5 with the r-f voltmeter.
- e. Vary the signal generator input to J2 over the range of 48 to 52 mc, and adjust C6 for a frequency response of ±0.5 db. Use the spectrum analyzer and/or microvoltmeter as required. Check that all spurs are at least 40 db down from the 10 mc output signal at J5.



Figure 5-17. Test Setup for Calibration of 50 Mc Mixer and 10 Mc AGC Amplifier 1A2A3

5-35. 10 MC DISTRIBUTION AMPLIFIER 1A2A4

5-36. There are no adjustments on subassembly 1A2A4. In event of repair and replacement of parts, the subassembly should be checked out according to the following procedure. Failure to meet output level requirements may necessitate selection of new values for R4, R22, or R41 (see notes on schematic diagram fig.). Raise the subassembly to gain access to the connectors.

- a. Disconnect cable W4 from connector J2 of subassembly 1A2A4.
- b. Connect a signal generator (H-P 606A) to J2 and adjust the generator output for 10 mc at -20 dbm.
- c. Remove the cable connection at J3 and terminate J3 in 50 ohms.
- d. Use an r-f voltmeter (Boonton 91CA/91-8B) and check the power level at J3.
- e. Repeat steps (c) and (d) at connectors J4, J5, and J6.
- f. If the power levels are not as listed in the following, refer to step (g).

J3	-10	dbm
J4	-10	dbm
J5	-20	dbm
J6	-20	dbm

g. If all outputs are off, select a different value for R4. If the J3 output is off, select a new value for R22. If the J4 output is off, select a new value for R41.

5-37. 10 MC IF. AMPLIFIER 1A2A5

5-38. Calibration of subassembly 1A2A5 can be performed in the drawer. Refer to the test setup of figure 5-18, and make the connections shown.

a. Set the variable attenuator (H-P 355C & D) for zero attenuation and adjust the signal generator for 10 mc at -20 dbm at J2.



Figure 5-18. Test Setup for Calibration of 10 Mc I.F. Amplifier 1A2A5.

- b. Adjust C5 and C12 for maximum output (-16 dbm) at J3.
- c. Observe the power level at J4 and insert attenuation at J2 until the power level at J4 changes (limiting ceases).
- d. Adjust C16, C24, and C31 for maximum output at J4.
- e. Decrease the attenuation until the input to J2 is -20 dbm. The power output at J4 should be +6 dbm ± 2 db.
- f. Reduce the input signal at J2 by 5 db. The J4 output should decrease no more than 1 db. If it exceeds this level, select a higher value for R16 and a lower value for R18.
- g. If R17 and R18 are changed, repeat steps (c) through (f).

5-39. LOOP PHASE DETECTOR AND LOOP FILTER 1A2A6

5-40. Calibration of subassembly 1A2A6 may be performed in the equipment drawer. Make the test connections shown in figure 5-19.

- a. Connect the d-c null voltmeter to A6E1. Disconnect R21 from R16, and connect a 1 k ohm resistor from R16 to ground.
- b. Set the reference input signal generator at J2 to 10 mc and -80 dbm. Set the signal input signal generator at J3 to 10 mc and +6 dbm.
- c. Adjust C21 and C29 for maximum d-c voltage at test point E1 (approximately 15 vdc).
- d. Set the reference input signal generator at J2 to 10 mc and +10 dbm. Set the signal input signal generator at J3 to 10 mc and -80 dbm.
- e. Adjust Cll and Cl5 for maximum d-c voltage at test point El (approximately 20 vdc).
- f. Move the d-c null voltmeter to test point E2.
- g. Adjust C18 for 0 ±5 mvdc at E2.
- h. Set the reference input signal generator at J2 to 10 mc and -80 dbm. Set the signal input signal generator at J3 to 10 mc and +6 dbm.

5 - 34



Figure 5-19. Test Setup for Calibration of Loop Phase Detector and Loop Filter 1A2A6.

- i. Adjust C23 for 0 ± 5 mvdc at test point E2.
- j. Repeat steps (a) through (i) until proper balance is achieved.
- k. Set the reference input signal generator at J2 to 10 mc and +10 dbm. Set the signal input signal generator at J3 to 10 mc and -80 dbm.
- 1. Adjust C18 and/or C23 for best balance.
- m. Set the signal input signal generator at J3 to +6 dbm.
- n. Adjust C18 and/or C23 for 0 ±100 mvdc.
- o. Repeat steps m and n, above until the balance is within ± 100 mvdc for both conditions.
- p. Ground the free end of R21 and adjust R25 for 0 vdc ±10 mvdc at J4. Use the d-c null voltmeter at J4.
- q. Free R21 from ground and, using the audio signal generator, apply a +1 volt peak of 1 kc to the free end of R21.
- r. Increase the input to +20 volts peak. The voltage at J4 should be 15 volts peak $\pm 20\%$.
- s. Remove the 1 k ohm resistor (step 2) and reconnect R16 to R21.

5-41. 20 MC REFERENCE OSCILLATOR AND X3 MULTIPLIER 1A2A7

5-42. The calibration of subassembly 1A2A7 may be performed in the drawer. Make the test connections as directed in the procedure following.

- Adjust C6, C13, and L10, as required, for 10 dbm ±2 db output at J3, as measured with an r-f voltmeter (Boonton 91CA/91-8B).
- b. Adjust C21 and C28 for 10 dbm ± 2 db at J2, as measured with the r-f voltmeter.

NOTE

Do not adjust C27 at this time.

- c. Connect a frequency counter (H-P 5245L) to J3 and adjust L3 for 20 mc ± 200 cps.
- d. Repeat steps (a), (b) and (c) as required.
- e. Connect a spectrum analyzer (H-P 8551A/851A) to J2.
- f. Adjust C27 so that all spurs are at least 40 db down from the 60 mc output at J2.

5-43. X $\frac{1}{2}$ MULTIPLIER AND 10 MC REF DISTRIBUTION AMPLIFIER 1A2A8 5-44. The subassembly 1A2A8 may be calibrated in the equipment drawer. Make the test connections as directed in the procedure following.

- a. Connect a signal generator (H-P 606A) to J2. Adjust the generator for a 20 mc +10 dbm output.
- b. Connect a d-c voltmeter (H-P 412A) to test point El. Adjust C5 for 0.32 vdc as measured at El.
- c. Measure the power levels at J3, J4, J5, and J6. Use an r-f voltmeter (Boonton 91CA/91-8B). If the outputs are not as listed below, select a different value of resistance, approximately that listed on the schematic diagram, to adjust the power level.

Connector	Power Level	Change Value of
13	10 dbm ± 2 db	R33
J4	10 dbm ± 2 db	R30
J5	10 dbm ± 2 db	R38
J6	$10 \text{ dbm } \pm 2 \text{ db}$	R41

5-45. COHERENT AMPLITUDE DET, AGC AMPL AND RELAY DRIVER 1A2A9 5-46. Calibration of subassembly 1A2A9 can be performed in the equipment drawer. 5-47. DETECTOR BALANCE. Adjust the detector balance as directed, with subassembly 1A2A9 in the drawer.

- a. Disconnect R16 from the input 1 of the operational amplifier
 AR1. Ground R16 through a 1 k ohm resistor. Adjust C11,
 C15, C21, and C29 for mid-range.
- b. Connect a signal generator (H-P 606A) to the ref input J2 of subassembly 1A2A8. Adjust its output for 10 mc at -80 dbm.
- c. Connect a signal generator (H-P 606A) to the signal input J3 of subassembly 1A2A8. Adjust its output for 10 mc at ±10 dbm.
- d. Connect a d-c null voltmeter (H-P 413A) to test point El. Adjust C21 and C29 for maximum voltage (approx 15 vdc) as measured at El.
- e. Set the input at J2 to +10 dbm and the input at J3 to -80 dbm.
- f. Adjust Cll and Cl5 for maximum voltage (approx 20 vdc) as measured at El.
- g. Connect the d-c null voltmeter to test point E2. Adjust C18 for 0 ± 5 mv as measured at E2.
- h. Set the input at J2 to -80 dbm and the input at J3 to +10 dbm. Adjust C23 for 0 ± 5 mv as measured at test point E2.
- i. Repeat steps (d) through (h) until the proper balance is achieved.
- j. Set the input at J2 to +10 dbm and the input at J3 to -80 dbm. Adjust C18 and/or C23 for best balance as measured at test point E2.
- k. Increase the input at J3 to 0 dbm and adjust C18 or C23 for best balance.
- 1. Alternately repeat steps (j) and (k) until balance is within $0 \pm 100 \text{ mvdc}$ for both steps (j) and (k).
- m. If the repairs called only for recalibration of the balance circuits, remove the 1 k ohm resistor (step a) and reconnect R16 to terminal 1 of AR1.

5-48. AGC AMPLIFIER. Before making the test connections to subassembly 1A2A9, disconnect pin 1 of the operational amplifier A9AR1 from A9R16 and A9C32. Disconnect one end of capacitor A9C36.

- a. Make the test connections shown in figure 5-20 and connect pin 1 of A9AR1 to J1 on the test fixture.
- b. Connect the d-c null voltmeter (H-P 413A) to TP1 on the test fixture.
- c. Set S1 of the test fixture to position 2 and adjust R1 (test fixture) for $3v \pm 20$ mvdc as measured on the d-c null voltmeter.
- d. Set S3 (test fixture) to AGC and connect the d-c null voltmeter to TP2 on the test fixture.
- e. Adjust A9R25 for -1 vdc as measured on the d-c null voltmeter.
- f. Remove test equipment and restore connections within subassembly 1A2A9. Reconnect pin 1 of A9AR1 to A9R16 and A9C32. Reconnect A9C36.

5-49. 10 MC NB DISCRIMINATOR AND 10 MC WB PHASE DET 1A2A10

5-50. Calibration of the subassembly 1A2A10 can be performed in the equipment drawer.

- a. Connect a signal generator (H-P 606A) to J2. Set the generator for 10.410 mc at -10 dbm.
- b. Connect an r-f voltmeter (Boonton 91CA W/50-ohm probe) to the high side of R71.
- c. Adjust C8 for peak response as indicated on the r-f voltmeter.
- d. Set the signal generator output to 9.590 mc at -10 dbm.
- e. Connect the r-f voltmeter to the high side of R72.
- f. Adjust Cll for peak response as indicated on the r-f voltmeter.
- g. Set the signal generator output at 10.000 mc at -10 dbm.



Figure 5-20. AGC Amplifier (part of 1A2A9), Test Setup.

5-40

- h. Connect a d-c microvoltmeter (Rohde & Schwarz USVH) to the detector output junction of R11 and R60 (J4).
- i. Adjust Cll for a null on the microvoltmeter.
- j. Vary the 10.000 mc input ±10 kc and observe the d-c output voltage variation on the microvoltmeter. The variation should be 20 mv either side of zero (null) for a 2 mv/kc sensitivity.
- k. Refer to the schematic for subassembly 1A2A10 and select a value of R7 as required to give proper sensitivity.

5-51. VIDEO DISTRIBUTION AMPLIFIER 1A2A11

5-52. Calibration of the subassembly 1A2A11 may be performed in the equipment drawer. When checking one of the outputs J4 through J8, lift the connecting cable and terminate the subassembly output connector in 50 ohms.

- a. Adjust the J7 output as follows:
 - (1) Connect a signal generator (H-P 606A) to J2 and set its output to 1.25 mc at 0 dbm.
 - (2) Adjust L5 and L6 for maximum power and a 3-db bandwidth of ±10 kc at J7. Use an rms voltmeter (H-P 400D) and oscilloscope (TEK 543/B), as required at J7.
 - (3) The power output at J7 should be 0 dbm ±1 db. If it is not, refer to the schematic diagram and select a value of R23 that will satisfy this requirement.
- b. Adjust J8 output as follows:
 - (1) Change the generator input at J2 to 1.024 mc at 0 dbm.
 - (2) Adjust L7 and L8 for maximum power and a 3-db bandwidth of ± 10 kc $\pm 10\%$ at J8. Use the H-P 400D and the TEK 543/B, as required, at J8.
 - (3) The power output at J8 should be 0 dbm ±1 db. If it is not, refer to the schematic diagram and select a value of R33 that will satisfy this requirement.

- c. Adjust the J4 output as follows:
 - (1) Change the generator input at J2 to 500 kc at 0 dbm.
 - (2) Adjust Ll and L2 for maximum power and a 3-db bandwidth of ± 12.5 kc $\pm 10\%$ at J4. Use the H-P 400D and TEK 543/B, as required at J4.
 - (3) The power output at J4 should be 0 dbm ±1 db. If it is not, refer to the schematic diagram and select a value of R3 that will satisfy this requirement.
- d. Adjust the output at J5 as follows:
 - (1) Change the generator input at J2 to 100 kc at 0 dbm.
 - (2) Adjust L3 and L4 for maximum power and a 3-db bandwidth of ± 5 kc $\pm 10\%$ at J5. Use the H-P 400D and TEK 543/B, as required, at J5.
 - (3) The power output at J5 should be 0 dbm ±1 db. If it is not, refer to the schematic diagram and select a value of R13 that will satisfy this requirement.
- e. Adjust the output at J6 as follows:
 - Remove the generator H-P 606A and connect an audio oscillator H-P 200CD to J2. Adjust its signal into J2 to 10 kc at 0 dbm.
 - (2) Adjust L9 and L10 for maximum power and a 3-db bandwidth of $\pm 1 \text{ kc} \pm 10\%$ at J6. Use the H-P 400D and TEK 543/B, as required, at J6.
 - (3) The power output at J6 should be 0 dbm ±1 db. If it is not, refer to the schematic diagram and select a value of R43 that will satisfy this requirement.
- 5-53. -12 VDC POWER SUPPLY 1A2PS2
- 5-54. The power supply may be adjusted in the equipment drawer.
 - a. Connect a digital voltmeter (Cimeron 7200A) of pin 1 of TB5 (-12 vdc) and pin 4 of TB-5 (-12 vdc return).
 - b. Adjust PS2 R1 for -12 vdc ±0.1 vdc.

5-55. ±15 VDC POWER SUPPLY 1A2PS1

- 5-56. The power supply may be adjusted in the equipment drawer.
 - a. Check that the input power to PS1 is 115 ±10 vac at pins 1 and 5 of connector P13.
 - b. Connect a digital voltmeter (Cimeron 7200A) to TB2-6 (+15v) and any terminal on TB1 (+15 volt return). Adjust R19 for +15 vdc ± 37 mv.
 - c. Connect the voltmeter to TB4-5 (-15v) and any terminal on TB1 (-15 volt return). Adjust R20 for -15 vdc ± 37 mv.

5-57. SUBASSEMBLY REMOVAL

5-58. These procedures contain instructions which enable the removal and replacement of PM Receiver subassemblies (fig. 1-4). 5-59. 23 MC VCO AND X96 MULTIPLIER 1A2A1

5-60. Tools required to remove and replace subassembly Al are as follows: one medium Philips screwdriver and one small common screwdriver.

- a. Extend and lock the equipment drawer.
- b. Remove the equipment drawer dust cover.
- c. Extend subassemblies A3 through A11 and stand them on end on the plastic barrier strip cover.
- d. Remove all electrical connections to 1A2A1 (except cabling between A1J5 and A1J6).
- e. Remove the four Philips-head screws, washers, and lock washers. Lift the subassembly from the equipment drawer.

5-61. S-BAND MIXER AND 50 MC PREAMPLIFIER 1A2A2

5-62. Tools required to remove and replace subassembly A2 are as follows: one medium Philips screwdriver and one 5/16 inch open-end wrench.

a. Extend and lock the equipment drawer.

b. Remove the equipment drawer dust cover.

- c. Extend subassemblies A3 through A11 and stand then on end on the plastic barrier strip cover.
- d. Remove all electrical connections.
- e. Remove the four Philips-head screws, washers, lock washers, and 5/16 inch nuts, which fasten the subassembly mounting brackets to the drawer support plate. Withdraw the subassembly from the equipment drawer.
- 5-63. SUBASSEMBLIES A3 THROUGH A11

5-64. Removal and installation procedures for subassemblies A3 through All are identical. A small common screwdriver is the only tool required to remove and install subassemblies A3 through All.

- a. Extend and lock the equipment drawer.
- b. Remove the equipment drawer dust cover.
- c. Extend the subassembly, which is to be replaced, on its wire tracks.
- d. Slide the connector cover off the right-hand (facing the drawer front panel) end of the module.
- e. Lift and turn the subassembly until it is 90 degrees from the extended position, and withdraw the subassembly from the equipment drawer.
- f. Installation of subassemblies A3 through All is accomplished by reversing this procedure.

NOTE

Access to the circuitry of subassemblies A3 through All is obtained by removing the small Philips-head screw at the end of each module section and sliding the section cover open (see figure 1-4.)

5-65. -12 VDC POWER SUPPLY, 1A2PS2

5-66. Tools required to remove and replace subassembly PS2 are as follows: one medium Philips screwdriver; one 3/8 inch spintight, and one 40-watt soldering iron.

- a. Extend and lock the equipment drawer.
- b. Remove the equipment drawer dust cover.
- c. Remove the eight Philips-head screws, washers, and lock washers fastening the plastic barrier strip cover to the equipment drawer. Remove the barrier strip cover.
- d. Tag the following wires connected to the module for identification: the 115 vac inputs (black), the 115 vac returns (white), the -12 vdc output (green, connected to the -- terminals), and the -21 vdc return (black, connected to the + + terminals) (fig. 5-21).
- e. Unsolder the wires tagged in step d, above.
- f. Support the subassembly and remove the four 3/8 inch nuts, washers, and lock washers.
- g. Remove the subassembly through the bottom of the equipment drawer.
- h. Installation of subassembly A12 is accomplished by reversing this procedure.

5-67. -15 VDC POWER SUPPLY, 1A2PS1

5-68. Tools required to remove and replace subassembly PS1 are as follows: one medium Philips screwdriver and one small common screwdriver.

- a. Extend and lock the equipment drawer.
- b. Remove the equipment drawer dust cover.
- c. Remove the eight Philips-head screws, washers, and lock washers fastening the plastic barrier strip cover to the equipment drawer. Remove the barrier strip plastic cover.



SENSITIVITY ADJUSTMENT



GREEN

- d. Remove all electrical connections.
- e. Support the subassembly and remove the four Philips-head screws, washers, and lock washers.
- f. Remove the subassembly through the bottom of the equipment drawer.
- g. Installation of subassembly A13 is accomplished by reversing this procedure.

SECTION VI. PARTS LISTS AND DRAWINGS

6-1. GENERAL

6-2. This section contains parts lists of electronic parts for the assembly and subassemblies of the PM Receiver. The associated drawings are included and follow the applicable parts lists as shown below.

TABLE 6-1. Related Parts Lists and Drawings

Title	Figure No.	Page
PM Receiver, Block Diagram	6-1	6-7
PM Receiver, Interconnecting Diagram	6-2	6-9
23 MC VCO and X96 Multiplier Al, Schematic Diagram	6-3	6-17
S-Band Mixer and 50 MC Preamplifier A2, Schematic Diagram	6-4	6-21
50 MC Mixer and 10 MC AGC Amplifier A3, Schematic Diagram	6-5	6-27
10 MC Distribution Amplifier A4, Schematic Diagram	6-6	6-31
10 MC IF Amplifier A5, Schematic Diagram	6-7	6-37
Loop Phase Detector and Loop Filter A6, Schematic Diagram	6-8	6-43
20 MC Reference Oscillator and X3 Multiplier A7, Schematic Diagram	6-9	6-49
X 1/2 Multiplier and 10 MC Reference Distribution Amplifier A8, Schematic Diagram	6-10	6-55
Coherent Amplitude Detector, AGC Amplifier, and Relay Driver A9, Schematic Diagram	6-11	6-61
10 MC Wideband Phase Detector, and 10 MC Narrowband Discriminator AlO, Schematic Diagram	6-12	6-71
Video Distribution Amplifier All, Schematic Diagram	6-13	6-77
±15 VDC Power Supply PS1, Schematic Diagram	6-14	6-79

ITEM	DESCRIPTION	PART NUMBER
	PM RECEIVER ASSEMBLY	
AT1	ATTENUATOR: variable 0-30 db	58-29914B37
AT2	ISOLATOR: coax 2.1-2.3 Gc	58-29914B36
AT3	Same as AT2	
C1	CAPACITOR: fixed mylar, 100 mf $\pm 3\%$, 50 vdc	08-22551D
C2	Same as Cl	
DS1	INDICATOR: operator	01-29938B27
DS2	INDICATOR: operator	01-29938B23
DS3	INDICATOR: operator	01-29938B26
DS4, DS5	Same as DS3	이 같아. 그는 그 것 좋아봐.
F1	FUSE: 1.5 amp	65-15160A09
J1	CONNECTOR: recp, elec AC	28-29965F45
J2	CONNECTOR: recp, elec	28-29909F04
J3	CONNECTOR: recp, elec BNC	28-29965F42
thru J10		
M1	METER: volt null static Ø error	72-23023G01
M2	METER: milliampere fm tuning	72-29957A65
M3	METER: volt signal strength	72-29957A66
P1	CONNECTOR: recp, elec DEM-9S	28-14046A11
thru		그 아파 이 작 방송법
P13		
PS2	POWER SUPPLY: -12 vdc	01-29938B22
R1	RESISTOR: variable comp 5K ±10% 2w	18-15090A55
R2	RESISTOR: variable ww, 10k ohms, 10 turn (Bourns 3500S-2-103)	18-29925A98
R3	RESISTOR: fixed comp 2700 ohms $+5\%$. $1/4\%$	06-15021A64
R4	RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$	06-15021A40
R5	RESISTOR: fixed comp 51 ohms +5%, 1/4w	06-15021A03
R6	RESISTOR: fixed comp 220 ohms +5%, 1/4w	06-15021A25
S1	SWITCH: pushbutton	40-29928B02
S2	SWITCH: pushbutton	40-29928B01
thru		
S4		
S5	SWITCH: selector	40-29928B03
	그는 그는 그는 것을 못했어요. 그는 것을 물었는 것	

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ITEM	DESCRIPTION	PART NUMBER		
PM RECEIVER ASSEMBLY (Cont)				
W 1	CABLE: assembly	30-22747H01		
W2	▲	30-22747H02		
٧3	· · · · · · · · · · · · · · · · · · ·	30-22747H03		
74		30-22747H04		
5	- 1997년 1 1997년 1997년 1997	30-22747H05		
76		30-22747H06		
77		30-22747H07		
78		30-22747H08		
79		30-22747H09		
710	그는 것 같아요. 그는 것 같아요. 생활을 받을 것 같아.	30-22747H10		
/11	그는 그는 것이 같은 감독적 감독적으로 가지 않는다.	30-22747H11		
/12		30-22747H12		
V13		30-22747H13		
714		30-22747H14		
715	그는 그는 그의 그는 것은 것 같아? 것 같아? 것 같아? 물로 물로	30-22747H15		
V16	전 방법들이 집 가면 성격이 나라 물건이	30-22747H16		
17	이 그 것 같은 것 같은 동안 것은 동안 것을 가지 않는	30-22747H17		
/18	그는 것이 모두 모양감감 관람 나는 것이 가지?	30-22747H18		
/19	그는 그는 것이 그는 물건을 물건을 얻었다. 가격	30-22747H19		
720	그는 그는 그는 것은 것은 않으면 생각해.	30-22747H20		
721	그는 것 같은 것 같	30-22747H21		
/22		30-22747H22		
723		30-22747H23		
124	그는 것에서 이야가 생각했는 것도 많이 같이.	30-22747H24		
125	그는 그 같은 것은 눈물 수양형 방송을 가 없어?	30-22747H25		
126	그는 것 그는 것 같아요. 아이는 바람에 바람을 줄 것 같아.	30-22747H26		
V27	그는 그는 가슴에 걸려 한 감독을 선생님을 보았다.	30-22747H27		
V28		30-22747H28		
129	그는 그는 것이 아니는 것이 생각을 가셨는 것	30-22747H29		
730	· · · · · · · · · · · · · · · · · · ·	30-22747H30		
31	그는 그는 것이 그 말을 가슴은 건강을 물렸다.	30-22747H31		
732		30-22747H32		
733		30-22747H33		
/34	그는 말에서 가지 않는 것이 아니는 것을 생각을 했다.	30-22747H34		
735		30-22747H35		
V36	CABLE: assembly	30-22747H36		

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ITEM	DESCRIPTION		PART NUMBER			
PM RECEIVER ASSEMBLY (Cont)						
W 37 W 38	CABLE: assembly CABLE: assembly		30-22747H37 30-22747H38			
	•					
	4					

NOTES:

1. FOR SCHEMATICS OF SUBASSEMELIES REFER TO:







DETAIL A

69-26654G

6-9-6-10

ITEM	D	ESCRIPTION	PART NUMBER	
23 MC VCO & X96 MULTIPLIER				
C1, C2	CAPACITOR: f	fixed cer diel, 1000 pf $\pm 20\%$,	21-15144A17	
C3	CAPACITOR: f	ixed elec, 47 mf \pm 20%,	23-14152D67	
C4	CAPACITOR: f	ixed cer diel, .01 mf \pm 20%,	21-15144A29	
C5	CAPACITOR: f	ixed mica diel, 82 pf $\pm 2\%$,	21-14032G21	
C6, C7	CAPACITOR: f	fixed cer diel, 4700 pf $\pm 20\%$,	21-15144A25	
C8 C9 C10 C11	CAPACITOR: v Same as C6 Same as C1 Same as C6	variable gl diel, 0.8-18.0	20-14020A04	
C12 C13	Same as C1 Same as C6			
C14	CAPACITOR: f 500 vdc	ixed mica diel, 100 pf $\pm 2\%$,	21-14032G23	
C15 C16 C17	Same as C6 Same as C8 Same as C6			
C18 C19	Same as C6 Same as C6			
C20 C21	Same as C6 Same as C6			
C22	CAPACITOR: f 500 vdc	ixed mica diel, 68 pf $\pm 2\%$,	21-14032G19	
C23	CAPACITOR: f 500 vdc	ixed mica diel, 51 pf $\pm 2\%$,	21-14032G16	
C24 C25	Same as C6 CAPACITOR: f	ixed 10 +0.5 pf, 500 vdc	21-14032G02	
C26 C27	Same as Cl Same as C6			
	CAPACITOR: f	ixed mica diel, 5 ± 0.5 pf,	21-14032G01	
229	Same as Cl	ernelika a filo		

8

ITEM	DESCRIPTION	PART NUMBER		
23 MC VCO & X96 MULTIPLIER (Cont)				
C30	Same as Cl			
C31	CAPACITOR: fixed cer diel, tub, 1.0 ± 0.25 pf, 600 vdc	21-23422H01		
C32	CAPACITOR: fixed mica diel, 15 ± 0.5 pf, 500 vdc	21-14032G04		
C33	CAPACITOR: fixed mica diel, 27 pf $\pm 2\%$, 500 vdc	21-14032G09		
C34	CAPACITOR: fixed mica diel, 150 pf $\pm 2\%$, 500 vdc	21-14032G27		
C35 C36	Same as C25 Same as C1			
C37 C38	Same as C28 CAPACITOR: fixed mica diel, 220 pf $\pm 2\%$,	21-14032G31		
C 39	500 vdc Same as C4			
C40 C41	Same as C38 Same as C38			
C42 C43	Same as C38 CAPACITOR: fixed cer diel, tub, 0.5	21-23421H01		
C44	<u>+</u> 0.25 pf, 600 vdc Same as C25			
C45 C46	Same as C38 Same as C25			
C47 C48	Same as C22 Same as C38			
C49	Same as C25			
C51	Same as C32 Same as C38	21-14032607		
C52	500 vdc CAPACITOR: fixed mice diel, 22 <u>+</u> 0.5 pl,	21-14032007		
C53	500 vdc C_{20}	21-14032G13		
C54 C55	Same as $C38$ CAPACITOR: fixed mica diel, 56 pf $\pm 2\%$,	21-14032G17		
C56	CAPACITOR: variable gl diel, 0.8-10 pf	19-20469D22		

ITEM	DESCRIPTION	PART NUMBER
	23 MC VCO & X96 MULTIPLIER (Cont)	
C57	CAPACITOR: made from	
	housing	15-23047G01
	housing diode	15-23050G01
CR1	DIODE	PC128
CR2	Same as CR1	
CR3	DIODE: step recovery	48-29900E75
J1	CONNECTOR: recp elec 9-pin (DEM-9P	28-14046A01
	C-33)	
J2	CONNECTOR: recp elec (Selectro 51-027-	28-29965E21
thru	3196)	
J4		
J5	CONNECTOR: recp elec (GRFF 2019A)	28-29532A11
J6. J7	CONNECTOR: recp elec (GRFF 2088A)	28-29532A07
	COIL: rf fixed 4.7 uh (value selected in	24-14198A
	test)	
L2. L3	COIL: rf fixed 3.3 uh	24-14198A13
L4. L5	COIL: rf tun-shld 3.2-8.3 uh	24-14204A04
L6. L7	Same as L2	
L8	COIL: rf variable 0.50-0.95 uh	24-22704H01
L9	Same as L2	
L10	COIL: rf variable 0.25-0.40 uh	24-27705H01
L11	Same as L2	
L12. L13	COIL: rf variable 0.15-0.20 uh	24-22706H01
L14	COIL: rf variable 0.08-0.12 uh	24-22707H01
L15	COIL: rf variable 0.10-0.12 uh	24-22708H01
L16	COIL: rf fixed 1.0 uh	24-14198A07
L17	Same as L2	
L18	COIL: rf variable 0.09 - 0.11	24-22709H01
L19	Same as L16	
L20	Same as L16	
L21	COIL: rf variable 0.10-0.12 uh	24-22710H01
L22	COIL: rf variable 0.11-0.14 uh	24-22711H01
L23	COIL: rf fixed 0.1 uh	24-22718H01
L24	COIL: rf fixed 2.2 uh	24-14198A11
L25	Same as L23	
L26	COIL: rf fixed 0.023 uh	24-22719H01
	그는 그는 그는 것이 아니는 것이 같아. 말에 가지 않는 것을 하는 것이 같아. 가지 않는 것을 가지 않는 것을 가지 않는 것을 가지 않는 것이 같아. 가지 않는 것이 않는 것이 같아. 가지 않는 것이 같아. 가지 않는 것이 같아. 가지 않는 것이 않는 것 않는 것	

ITEM	DESCRIPTION	PART NUMBER
	23 MC VCO & X96 MULTIPLIER (Cont)	
Q1	TRANSISTOR: 2N708	2N708
thru	the second second second second second	
Q6		
Q7, Q8	TRANSISTOR: 2N707	2N707
R1	RESISTOR: fixed comp, 18 k ohm $\pm 5\%$, $1/4w$	06-15021A94
R2	RESISTOR: fixed comp 470 ohms $\pm 5\%$,	06-15021A37
R3	RESISTOR: fixed comp 5600 ohms $\pm 5\%$, $1/4w$	06-15021A76
R4	RESISTOR: fixed comp 100 k ohms $\pm 5\%$, $1/4w$	06-15021B22
R5	RESISTOR: fixed comp 2700 ohms $\pm 5\%$, $1/4w$	06-15021A64
R6, R7	RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$	06-15021A61
R8	RESISTOR: fixed comp 220 ohms $\pm 5\%$,	06-15021A25
R9	RESISTOR: fixed comp 270 ohms $\pm 5\%$,	06-15021A28
R10	RESISTOR: fixed comp 100 ohms $\pm 5\%$,	06-15021A13
R11, R12	RESISTOR: fixed comp 1200 ohms $\pm 5\%$, $1/4w$	06-15021A52
R13	RESISTOR: fixed comp 3300 ohms $\pm 5\%$,	06-15021A67
R14	Same as B10	
R15	RESISTOR: fixed comp 15 ohms +5% 1/4w	06-15021C15
R16	RESISTOR: fixed comp 56 ohms +5% 1/4w	06-15021A04
R17	Same as R15	
R18, R19	RESISTOR: fixed comp 4700 ohms $\pm 5\%$, $1/4w$	06-15021A73
R20	RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$	06-15021A43
R21	RESISTOR: fixed comp 22 ohms +5% 1/4m	06-15021021
R22, R23	RESISTOR: fixed comp 33 ohms $\pm 5\%$, 1/4w	06-15021C27
		, A

ITEM	DESCRIPTION	PART NUMBER		
23 MC VCO & X96 MULTIPLIER (Cont)				
R24	Same as R13			
R25	Same as R18			
R26	Same as R2	이 물건 것 같아요.		
R27	Same as R18			
R28	Same as R13			
R29	RESISTOR: fixed comp 390 ohms +5%, 1/4w	06-15021A34		
R 30	Same as R18			
R31	Same as R2			
R 32	Same as R10			
R33	Same as R18			
R35 R34	Same as R20			
R34 R35	BESISTOR: fixed comp 47 ohms $\pm 5\%$ 1/4w	06-15021 A01		
R36	Same as B18			
R30 R37	Same as R20			
R38	Same as R35			
R30	Same as R10	17.11.21 · · · · · · · · · · · · · · · · · · ·		
R37 R40	BESISTOR: fixed comp 4.7 ohms $\pm 5\%$ 1/2w	06-15022		
1140	(Selected in test approximate value only)	00-19022		
D/1	RESISTOR: fixed comp 150 obms +5% 1/2w	06-15022		
<u>K</u> 4 1	(Selected in test approximate value only)	00-15022		
D12	Some as P40			
<u>Γ</u> (42) Τ 1	TRANSFORMER, 10.2 turns ratio	24-22871401		
11 TT2	TRANSFORMER, 10:2 turns ratio	24-2280401		
	DIODE: sever	111750 4		
VRI	DIODE: zener	1N759A		
V RZ	DIODE: zener	1N/5/A		
ΎΙ	CRISIAL UNII: quartz, (ML/6J	48-29900E76		
	23.307292 MC)			
	그는 아이는 것이 이렇게 집에 가지 않는 것이 가 많은 것을 했다.			
	그는 그는 그는 그는 옷한 동안 집에서 다 가슴을 가지?			
	그는 그는 그는 그는 것을 가지 않는 것을 가지 않는 것을 수 없다. 것을 가지 않는 것을 못했다. 것을 가지 않는 것을 수 있다. 물건을 가지 않는 것을 가지 않는 것을 수 있다. 물건을 가지 않는 것을 것을 것을 것을 것을 수 있다. 물건을 것을 것을 것을 것을 것을 수 있다. 물건을 것을			
	이 같은 것 같은 것 같은 것을 알았는 것 같이 많은 것을 알았다.			
	동네 그는 그는 것은 사람이 없을 것이 한 것이 같아. 말했다. 것이 같아.			
	그는 그는 것이 말에 대한 갖추락 밖에 가지 않는 것을 수있는 것이			
	그는 것 같은 것 같은 강화적 방법을 얻는 것 같이 못 많은 것 같은 것이다.			
	그는 그는 것 같은 것을 못했다. 말 것 같은 것은 것을 보았다.			

NOTES:

5

1.	PARTIAL	REFERENCE	DESIGNA	TIONS
	ARE SHOW	IN. FOR C	OMPLETE	DESIG-
	NATIONS	PREFIX WI	TH	

2. FOR REFERENCE DRAWINGS REFER TO:

3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ± 5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.

- 4. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- 5. VALUES TO BE SELECTED IN TEST

REFERENCE DESIGNATIONS	APPROXIMATE VALUE	MANUAL VOLTAG CONTRO
L1	4.7	USLILLA
R4 0	4.7	3-
R41	4.7	
R42	150	G



6-17, 6-18

C1 thru C3 C4 thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	-BAND MIXER AND 50 MC PREAMPLIFIER CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	A2
C1 thru C3 C4 thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	
thru C3 C4 thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	 1000 pf CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4 	
C3 C4 thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	
C4 thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	CAPACITOR: fixed feed-thru, ceramic, 1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	· • • • • • • • • • • • • • • • • • • •
thru C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	1000 pf CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	· · · · · · · · · · · · · · · · · · ·
C6 C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C1 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	· · · · · · · · · · · · · · · · · · ·
C7, C8 C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	CAPACITOR: fixed mica, 1500 pf Same as C1 Same as C4 Same as C1 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	
C9 C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	Same as C1 Same as C4 Same as C1 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	• • • • • • • • • • • • • • • • • • •
C10 C11 C12, C13 C14 C15 C16 C17 C18 C19	Same as C4 Same as C1 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	··••.
C11 C12, C13 C14 C15 C16 C17 C18 C19	Same as C1 Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	
C12, C13 C14 C15 C16 C17 C18 C19	Same as C4 CAPACITOR: fixed 0.022 mf Same as C4	
C14 C15 C16 C17 C18 C19	CAPACITOR: fixed 0.022 mf Same as C4	
C15 C16 C17 C18 C19	Same as C4	
C16 C17 C18 C19		
C17 C18 C19	Same as C7	
C18	Same as C7	
C19	Same as C14	
	Same as C4	
C20	Same as C7	
C21	Same as C14	
C22	Same as C4	
C R I	DIODE: 1N416F	
CR2	Same as CB1	
T1	CONNECTOR: recp. elec	
T2 T3	(Integral with Crystal Mixer)	
T4	CONNECTOR: recp. elec 9-pin	
T.1	CHOKE: rf fixed 3 ub	김 아이는 것 같아요.
thru	offortia. If, fixed 5 un	기 중심 것 같은 것 같아?
1.8		
L9	COIL: rf variable 0.35-0.70 ub	집 같은 것 같은
L10	Same as Ll	
thru		and the second
L14		
L15	COIL: rf variable	a second of the second
Q1	TRANSISTOR: 2N2996	
02	TRANSISTOR: 2N1143	

ITEM	DESCRIPTION	PART NUMBER
S-BA	AND MIXER AND 50 MC PREAMPLIFIER A2 (C	Cont)
Q3 R1, R2 R3, R4 R5 R6 R7 R8 R9 R10 R11 R12 F13 R14 R15 R14 R15 R16 T1 T2, T3 VR1, VR2 Z1	Same as Q2 RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 39 ohms $\pm 10\%$, 1w RESISTOR: fixed comp 6800 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 270 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 3000 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 2000 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 2000 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 620 ohms $\pm 5\%$, 1/4w Same as R7 RESISTOR: fixed comp 750 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 750 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 220 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 62 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 62 ohms $\pm 5\%$, 1/4w CRYSTAL MIXER: (Includes CR1 and CR2)	
.

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
- 2. FOR REFERENCE DRAWINGS REFER TO:
- 3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ± 5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.
- 4. TERMINATIONS CODED WITH THE SAME LETTERS ARE ELECTRICALLY CONNECTED.

JB 10 >0-

J2



ITEM	DESCRIPTION	PART NUMBER	
50 MC MIXER			
Cl thru	CAPACITOR: fixed cer, 1000 pf $\pm 20\%$, 200 vdc	21-15144A17	
C4, C5	CAPACITOR: fixed cer, 4700 pf $\pm 20\%$, 200 vdc	21-15144A25	
C6 C7	CAPACITOR: variable air, 0.8-10.0 pf Same as C4	19-20469D22	
thru C9			
C10 C11 C12 C13 thru	CAPACITOR: fixed mica 120 pf $\pm 2\%$, 500 vdc CAPACITOR: fixed mica 240 pf $\pm 2\%$, 500 vdc Same as C10 Same as C4	21-14032G25 21-14032G32	
C26	CARACITOR: fixed cor 1200 pf - AMV-350	21-14071 414	
C29	CAPACITOR: fixed mica 180 pf $\pm 2\%$, 500 vdc	21-14032G29	
C30 C31 C32	CAPACITOR: fixed mica 390 pf ±2%, 500 vdc Same as C29 Same as C1	21-14032A37	
C33	CAPACITOR: fixed mica 33 pf $\pm 2\%$, 500 vdc	21-14032G11	
C34, C35 CR1 thru C 84	DIODE: switching 1N3064	48-14189A03	
CR5 thru	DIODE: FD700	48-29900D91	
J1	CONNECTOR: recp elec 9-pin (DEM-9P C-33)	28-14046A01	
J2 thru J6	CONNECTOR: recp elec (Sealectro 51- 027-3196)	28-29965E21	

.

ITEM	DESCRIPTION	PART NUMBER		
50 MC MIXER (Cont)				
L1, L2	1, L2 COIL: rf fixed 0.68 uh			
L3	COIL: rf fixed 6.8 uh	24-14198A17		
thru				
L5 ·	· [1] - [1] · [2]			
L6, L7	Deleted			
L8	Same as L3	here the set		
L9, L10	COIL: rf fixed 1.0 uh	24-14198A07		
Q1	TRANSISTOR: NPN sil 2N708	48-14319A01		
Q2	TRANSISTOR: PNP sil 2N3304	48-14294A01		
Q3	TRANSISTOR: NPN sil 2N918	48-14310A01		
Q4	Same as Q2			
25	Same as Q3			
26	Same as O2			
27	Same as O_3			
28 09	TRANSISTOR NPN sil 2N930	48-14258411		
20, 27	TRANSISTOR: PNP sil 2N3799	48-29900E81		
	TRANSISTOR: DND sil 2N1132	48-14194 402		
R1	RESISTOR: fixed comp 56 obms ±5%	06-15021 404		
	$\frac{1}{4}$	00-15021A04		
D2 D3	PESISTOP: fixed comp 1500 obms +5%	06-15021455		
K2, K3	$\frac{1}{4}$	00-15021A55		
P.A	DESISTOP: fixed comp 47 obmes +5% 1/4m	06 15021 401		
D 5	RESISTOR: fixed comp 47 onnis $\pm 5\%$, 174w	06-15021A01		
	RESISTOR: fixed comp 1200 onms $\pm 5\%$,	00-15021A52		
D.6	1/4W	06 15021464		
	RESISTOR: fixed comp 2700 onms $\pm 5\%$,	06-15021A64		
7	1/4W	0/ 1502145/		
κ /	RESISTOR: fixed comp 5600 ohms $\pm 5\%$,	06-15021A76		
0.0				
10	RESISTOR: fixed comp 820 ohms $\pm 5\%$,	06-15021A46		
20				
3.9	KESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w	06-15021C09		
K10	RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w	06-15021A10		
K11	RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/4w$	06-15021A31		
R12	RESISTOR: fixed comp 680 ohms $\pm 5\%$,	06-15021A43		
	1/4w			

ITEM	DESCRIPTION	PART NUMBER	
	50 MC MIXER (Cont)		
R13	Same as R11		
R14	Same as R1		
R15	RESISTOR: fixed comp 27 ohms $\pm 5\%$, $1/4w$	06-15021C24	
R16	RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/4w$	06-15021A28	
R17	RESISTOR: fixed comp 18 ohms $\pm 5\%$, $1/4w$	06-15021C18	
R18	Same as R16		
R19	Same as R1	and the second second	
R20	Same as R6		
R21	Same as R7		
R22	Same as R9		
R23	Same as R6		
R24	Same as R11		
R25	Same as R8		
R26	Same as R1		
R27	Same as R11		
R28	Same as R12		
R29	Same as R15		
R30	Same as R1		
R31	Same as R6		
R 32	Same as R7		
R33	Same as R9		
R34	Same as R6		
R35	Same as R8		
R 36	Same as R1		
R37	Same as R11		
R 38	Same as B11		
R 39	Same as B12		
R40	Same as B15	그는 것 같아. 옷 같아?	
R41	Same as R7	2012년 11월 21일	
R42	RESISTOR: fixed comp 56 k ohms +5%, 1/4w	06-15021B13	
R43	RESISTOR: fixed film 1000 ohms $\pm 1\%$. $1/4w$	06-14225	
	(Selected in test, nominal value only)		
R44	RESISTOR: fixed comp 10 k ohms +5%, 1/4w	06-15021A85	
R45	RESISTOR: fixed comp 3300 ohms +5%.	06-15021A67	
	1/4w		
R46	RESISTOR: fixed comp 15 k ohms +5%. 1/4w	06-15021A91	

ITEM	DESCRIPTION	PART NUMBER	
50 MC MIXER (Cont)			
R47	Same as R1		
R48	RESISTOR: fixed comp 10 k ohms $\pm 5\%$,	06-15021A85	
R49	Same as R12		
R50	Same as R6		
R51	RESISTOR: variable comp 2500 ohms $\pm 10\%$, $1/2w$	18-15089A21	
R52	RESISTOR: fixed comp 3900 ohms $\pm 5\%$, $1/4w$	06-15021A70	
R53	RESISTOR: fixed comp 1000 ohms $\pm 5\%$, $1/4w$	06-15021A49	
R54	RESISTOR: fixed comp 120 ohms ±5%, 1/4w	06-15021A16	
R55	Same as R54		
R56	RESISTOR: fixed comp 39 ohms $\pm 5\%$, $1/4w$	06-15021C30	
R57	RESISTOR: fixed comp 150 ohms $\pm 5\%$,	06-151021A19	
	1/4w		
C 0	Same as R56	4.8	
R60	RESISTOR: fixed comp 10 k obmo +5% 1/4m	06 15021 495	
Г1	TRANSFORMER: 10:10 10 turns ratio	24-22880H01	
Γ2	TRANSFORMER: 12:12, 8 turns ratio	24-22881H01	
ГЗ	TRANSFORMER: 22:10, turns ratio	24-22882H01	
VR1	DIODE: zener sil 1N936B	1N936B	
VR2	Same as VR1	111/002	
	집 같은 것 같은		
	그는 그는 그는 것은 것은 것을 위해 맞춰져 있는 것을 했는다.		
	3 : [2] 2013 2017 2017 2018 2017 2017 2017 2017 2017 2017 2017 2017		
	: 이 가 가 가 가 같은 것이 가 가 가 가 가 가 가 가 있는 것이 가 가 가 가 가 가 가 가 가 가 가 가 가 가 가 가 가 가		
	에는 가슴 이 부모님은 인생한 이 것이라는 것이 가지 않아 있었다. 것은 것이 가지 않는 것이다. 		
	가 있는 것은 것이 있는 것이 있는 것이 같은 것이 있는 것이 있는 것이 있는 것이 있는 것이 있다. 가지 않는 것이 있는 것이 있는 같은 것이 같은 것이 있는 것 같은 것이 같은 것이 있는 것		

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
- 2. FOR REFERENCE DRAWINGS REFER TO:
- 3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ±5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.
- 4. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.





Figure 6-5. 50 MC Mixer and 10 MC AGC Amplifier A3, Schematic Diagram

6-27, 6-28

ITEM	DESCRIPTION	PART NUMBER	
10 MC DISTRIBUTION AMPLIFIER			
Cl C2 thru C22	CAPACITOR: fixed cer 1200 pf amv-350 CAPACITOR: fixed cer 0.01 mf <u>+</u> 20%, 200 vdc	21-14071A14 21-15144A29	
J1	CONNECTOR: recp elec 9-Pin (DEM-9P C-33)	28-14046A01	
J2 thru J6	CONNECTOR: recp elec (Sealectro 51-027- 3196)	28-29965E21	
L1 Q1 Q2 Q3 Q4 Q5	COIL: rf fixed 10 uh TRANSMITTER: NPN sil 2N918 TRANSMITTER: NPN sil 2N708 Same as Q2 Same as Q1 Same as Q2	24-14198A19 48-14310A01 48-14319A01	
thru Q8	Company Ol		
R1	RESISTOR: fixed comp 56 ohms $\pm 5\%$, $1/4w$	06-15021A04	
R2	RESISTOR: fixed comp 3300 ohms $\pm 5\%$, $1/4w$	06-15021A67	
R3	RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$	06-15021A61	
R4	RESISTOR: fixed comp 120 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021A	
R5 R6 R7 R8	RESISTOR: fixed comp 820 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w RESISTOR: fixed comp 470 ohms $\pm 5\%$, 1/4w Same as R3	06-15021A46 06-15021A01 06-15021A37	
R9 R10 R11 R12	Same as R5 Same as R6 RESISTOR: fixed comp 100 ohms ±5%, 1/4w Same as R11	06-15021A13	
R13 R14	Same as R6 Same as R5		

ITEM	DESCRIPTION	PART NUMBER		
10 MC DISTRIBUTION AMPLIFIER (Cont)				
R15	Same as R6			
R16	Same as R6			
R17	Same as R5	11、注意的代表:		
R18	Same as R6	101-		
R19	Same as R2	一个"自己"。		
R20	Same as R11			
R21	Same as R3			
R22	RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)	06-15021A		
R23	Same as R5			
R24	Same as R6			
R25	Same as R6			
R26	Same as R5			
R27	Same as R6			
R28	Same as R11			
R29	RESISTOR: fixed comp 330 ohms +5%, 1/4w	06-15021A31		
R30	RESISTOR: fixed comp 1000 ohms $\pm 5\%$, $1/4w$	06-15021A49		
R31	Same as R6			
R32	Same as R5			
233	Same as R6			
R34	Same as R5			
R35	Same as R6			
R36	Same as R6	ten .		
R37	Same as R2			
R38	Same as R3			
R39	Same as R5			
R40	Same as R6			
R41	RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$	06-15021A		
	(Selected in test, nominal value only)			
842	Same as R29			
843	Same as R30			
	A Contraction of the Contraction	一、 人口 建气体		
	그는 것 같은 것 같			
	이 그는 것 같은 것이 가지 않는 것 같은 것 같아요. 나는 것 않아요. 나는 않아요. 나는 것 않아요. 나는 않아			
	그는 것 같은 것 같아? 아파 가지 않는 것 같은 것 같아? 나는 것 같아?			

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- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
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- 4. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- VALUES TO BE SELECTED IN TEST. REFERENCE APPROXIMATE DESIGNATIONS VALUE R4 120 R22 47 R41 47



Figure 6-6. 10 MC Distribution Amplifier A4, Schematic Diagram

$$\begin{array}{c}
 J5 \\
 J0 MC5 \\
 -200 BM
 \end{array}$$

$$\begin{array}{c}
 J6 \\
 J6 \\
 J0 MC5 \\
 -200 BM
 \end{array}$$

6-31, 6-32

ITEM		DESCRIPTION	PART NUMBER
	10	MC IF. AMPLIFIER	
C1	CAPACITOR:	fixed cer 0.01 mf $\pm 20\%$.	21-15144A29
	200 vdc		
C2	CAPACITOR:	fixed mica 10 ± 0.5 pf,	21-14032G02
	500 vdc		States States
C3	Same as Cl		
C4	Same as Cl		
C5	CAPACITOR:	variable air 0.8-10 pf	19-20469D22
C6	Same as Cl	가는 그는 그는 것 그는 가지, 가장 않는 것이다.	
C7	Same as Cl		
C8	CAPACITOR:	fixed mica 51 pf $\pm 2\%$,	21-14032G16
	500 vdc	아이지 않는 것 같아. 이 집중 중 관계	
C9	Same as Cl		
C10	Same as Cl		
C11	Same as C2		
C12	Same as C5		
C13	Same as Cl		
C14	CAPACITOR:	fixed cer 1200 pf amv 350 vdc	21-14071A14
C15	Same as Cl		그는 것 같은 것이다.
C16	Same as C5		
C17	Same as Cl		
C18	Same as Cl		
C19	Same as Cl	성격 전에 걸려 있는 것 같은 전 방송 같은	그는 것 같은 그가?
C20	CAPACITOR:	fixed cer 1000 pf $\pm 20\%$,	21-15144A17
C21	Sama ag Cl		
C22	Same as C2		
C23	Same as C1		
C24	Same as C5		
C25	Same as Cl		
C26	Same as C1		
C27	CAPACITOR:	fixed mica 220 pf $\pm 2\%$.	21-14032G31
	500 vdc	P /0;	
C28	Same as C1	명하는 것은 것은 것은 것을 가지 않았다. 같은 것은	
C29	Same as Cl	성격 문화 집에 가지 않는 것을 걸었다.	
C30	Same as C2		

ITEM	DESCRIPTION	PART NUMBER
	10 MC IF. AMPLIFIER (Cont)	
C32	Same as Cl	
C33	Same as Cl	
C34	Same as Cl	
CR1	DIODE: 1N916	48-29900C66
CR2	Same as CR1	
J1	CONNECTOR: recp elec 9-pin (DEM-9P	28-14046A01
	C-33)	
J2	CONNECTOR: recp elec (Sealectro 51-027- 3196)	28-29965E21
J3. J4	Same as J2	
L1. L2	COIL: rf fixed 10 uh	24-14198A19
L3	COIL: rf fixed 100 uh	24-14198A39
L4, L5	Same as Ll	
Q1, Q2	TRANSISTOR: NPN sil 2N708	48-14319A01
Q3, Q4	TRANSISTOR: NPN sil 2N2369	48-14268A01
Q5	Same as Q1	
R1	RESISTOR: fixed comp 1200 ohms $\pm 5\%$, $1/4w$	06-15021A52
R2	RESISTOR: fixed comp 820 ohms $\pm 5\%$,	06 - 15021A46
R3	RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/4w$	06-15021A28
R4	Same as R2	
R5	RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$	06-15021A01
R6	RESISTOR: fixed comp 56 ohms $\pm 5\%$, $1/4w$	06-15021A
i je konsta	(Selected in test, nominal value only)	
R7	RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$	06-15021A40
R8	RESISTOR: fixed comp 2200 ohms ±5%,	06-15021A61
DO	DECICEOD: Grad come 2200 character	04 15021447
КУ	π Lolo I UK: lixed comp 3300 ohms $\pm 5\%$,	00-15021A07
P10	DESIGTOD: fined some 2000 share 150	06 15021 4 70
K10	1/4	00-15021A70
D11	Samo as P5	
R11 D12	Deleted	
D13	Deleted	
K15	Derefed	
	이 이 가 편지, 같아요. 이 가는 것 같아.	

ITEM	DESCRIPTION	PART NUMBEI		
10 MC IF. AMPLIFER (Cont)				
R14	Deleted			
R15	Same as R1			
R16	Same as R5			
R17	Same as B2			
R18	RESISTOR: fixed comp 470 ohms $\pm 5\%$.	06-15021A37		
	1/4w			
R19	RESISTOR: fixed comp 1000 ohms +5%	06-15021A49		
	1/4 w			
R20	Same as R5			
R21	Same as R18			
R22	RESISTOR: fixed comp 56 ohms ±5% 1/4w	06-15021A04		
R23	Same as R2			
R24	Same as B1			
R25	RESISTOR: fixed comp 1500 ohms +5%	06-15021455		
	1/4m	00-150211155		
226	Same as R5			
R27	Same as R8			
R28	BESISTOR: fixed comp 10 k ohms +5%	06-15021485		
1(20	1/4m	00 150211105		
R20	BESISTOR: fixed comp 22 obms +5% 1/4w	06-15021022		
R 30	RESISTOR: fixed comp 33 ohms ±5%, 1/4w	06-15021022		
R31	RESISTOR: fixed comp 120 ohms ±5%, 1/4w	06-15021021		
R32	Same as R8	00-15021410		
R32	Same as R5			
R34	BESISTOR: fixed comp 100 obms +5%	06-150214		
	1/4w (Selected in test nominal value only)	00-15021A		
R35	RESISTOR: fixed comp 47 ohms +5% 1/4w	06-15021A		
1(5)5	(Selected in test nominal value only)	00-15021A		
R36	BESISTOR: fixed comp 100 obms ±5% 1/4w	06-150214		
100	(Selected in test nominal value only)	00-150214		
R 37	RESISTOR: fixed comp 220 obms +5% 1/4w	06-15021425		
R 38	Same as R1	00-15021A25		
R 39	RESISTOR: fixed comp 68 ohms $\pm 5\%$ 1/4m	06-15021407		
T1	TRANSFORMER: 65:10 turns ratio	24-22883401		
T2	TRANSFORMER: 65:9 turns ratio	24_22884101		
Τ2	Same as T1	27-220041101		
10	Baine as 11			

ITEM	DESCRIPTION	PART NUMBER
	10 MC IF. AMPLIFIER (Cont)	
Γ4 Γ5	TRANSFORMER: 65:7 turns ratio TRANSFORMER: 65:15 turns ratio	24-22885H01 24-22886H01
	에 가지 않는 것이 있는 것이 있는 것이 있는 것이 있는 것이 있다. 같은 것이 있는 것 같은 것이 같은 것이 같은 것이 있는 것	
		1. A A A A A A A A A A A A A A A A A A A
	그는 그는 없는 것 것, 정말 관심을 했다.	
	· · · · · · · · · · · · · · · · ·	
	에 가지 않는 것이 가지 않는 것이 가지 않는 것이 가지 않는 것이다. 이 가지 않는 것이 가지 않는 것이 가지 않는 것이 가지 않는 것이다. 이 가지 않는 것이 같은 것이 가지 않는 것이 하는 것이 같이 많이 있다.	
	이는 이상은 영국은 영상을 가입니다. 이 그는 아방에서 전쟁을 수 없는 것을 받았다. 	
	n an the second of	
		성의 이미 등을 이상을 통하는 것 같은 이미를 알려 있는 것이다. 같은 이미를 알려 있는 것이다.

14

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- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
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- 3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ± 5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.
 - VALUE TO BE SELECTED IN TEST. REFERENCE APPROXIMATE DESIGNATIONS VALUE 56 **R6** R34 100 R35 47 100 R36
- 5. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.



Figure 6-7. 10 MC IF Amplifier A5,

Schematic Diagram

63-22807G

6-37, 6-38

ITEM	DESCRIPTION	PART NUMBER	
LOOP PHASE DETECTOR AND LOOP FILTER			
C1	CAPACITOR: fixed cer 0.01 mf $\pm 20\%$,	21 - 15144A29	
C2	CAPACITOR: fixed mica 120 pf $\pm 2\%$, 500 vdc (Selected in test, nominal value only)	21 - 14032G	
C3	Deleted		
C4	Deleted		
C5	Same as Cl		
thru			
C8			
C9	CAPACITOR: fixed mica 39 pf $\pm 2\%$, 500 vdc	21-14032G	
C 10	(Selected in test, nominal value only)		
	Same as CI	10 204/0722	
	CAPACITOR: Variable air 0.8-10 pi	19-20409022	
C12	Same as C_1	21-140320	
015	vdc (Selected in test. nominal value only)	21-140320	
C14	Same as Cl		
C15	Same as Cll		
C16, C17	Same as Cl		
C18	Same as Cll	요즘 왜 이야지 못 못했다.	
C19	CAPACITOR: fixed mica 130 pf $\pm 2\%$, 500	21-14032G	
	vdc (Selected in test, nominal value only)		
C20	CAPACITOR: fixed mica 130 pf $\pm 2\%$, 500	21-14032G	
	vdc (Selected in test, nominal value only)	t in the state of the	
C21	Same as Cll	이 아이는 것은 것을 가지?	
C22	CAPACITOR: fixed mica 68 pf $\pm 2\%$, 500 vdc	21-14032G19	
C23	Same as Cll		
C24	Same as Cl	- 2011 - 2014 · 2022	
C25	Same as Cl		
C26	CAPACITOR: fixed mica 51 pf $\pm 2\%$, 500 vdc	21-14032G16	
C27, C28	CAPACITOR: fixed mica 43 pf $\pm 2\%$, 500 vdc	21-14032G14	
C29	Same as Cll		
C30, C31	CAPACITOR: fixed mica 240 pf $\pm 2\%$, 500	21-14032G32	
	vdc		
032		21 15144405	
033	CAPACITOR: fixed cer 100 pf $\pm 20\%$, 200 vdc	21-15144A05	

ITEM	DESCRIPTION	PART NUMBER
LOC	P PHASE DETECTOR AND LOOP FILTER (C	ont)
C34	CAPACITOR: fixed cer 1200 pf amv-350	21-14071A14
C35	Same as C34	22.141525/5
C_{36}, C_{37}	CAPACITOR: fixed elec 47 mf $\pm 20\%$, 20 vdc	23-14152D67
C 30	CAPACITOR: fixed elec 47 mf $\pm 20\%$, 35 vdc	23-14152068
C40	Same as C1 CAPACITOR: fixed elec 150 mf $\pm 20\%$,	23-14152D81
CR1 CR2	DIODE: sil IN916 (Fairchild)	48-29900C66
CR3	DIODE: sil 1N914	48-14309A11
thru		
CR5	and the star of the star star with the	
J1	CONNECTOR: recp elec 15-pin	28-14046A02
J2	CONNECTOR: recp elec (Sealectro 51-027-	28-29965E21
	3196)	
J3	CONNECTOR: recp elec	28-29965E23
J4	Same as J2	
thru		
J6		
K1, K2	RELAY: (HI-G Inc. 2K-1B-112)	80-
L1	COIL: fixed rf 47 uh	24-14198A31
L2, L3	COIL: fixed rf 100 uh	24-14198A39
L4	Same as L1	
thru	김 씨는 그는 것이 잘 물었는 한쪽하였는 것을 통하는	이 이 이 방송을 받는
L6	그는 아이는 그는 것은 것을 많은 것을 많을 것을 수 있다.	
Q1	TRANSISTOR: NPN sil 2N708	48-14319A01
Q2, Q3	TRANSISTOR: NPN sil 2N1613	48-14120A11
Q4	TRANSISTOR: PNP sil 2N1132	48-14194A02
Q5	Same as Q2	
RI	RESISTOR: fixed comp 120 ohms $\pm 5\%$, 1/4w	06-15021A
D 2	(Selected in test, nominal value only)	
KZ	RESISTOR: fixed comp 18 ohms $\pm 5\%$, $1/4w$	06-15021C18
R3	RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w	06-15021A01.
K4	RESISTOR: fixed comp 1500 ohms $\pm 5\%$, $1/4w$	06-15021A55
R5	Same as R3	

ITEM	DESCRIPTION	PART NUMBER
LC	OOP PHASE DETECTOR AND LOOP FILTER (C	ont)
R6	RESISTOR: fixed comp 180 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021A
R7	RESISTOR: fixed comp 18 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021C
R8	$BESISTOR:$ fixed comp 330 ohms $\pm 5\%$ 1/4w	06-15021A31
DO	RESISTOR: fixed comp 1 mag abm +5%	06-15021B58
K9	1/4	00-15021050
R10	RESISTOR: fixed comp 22 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021G
R11, R12	RESISTOR: fixed comp 3300 ohms $\pm 5\%$, $1/4w$	06-15021A67
R13, R14	RESISTOR: fixed film 31.6 k ohms $\pm 1\%$, $1/4w$	06-14098D39
R15	Same as R3	
R16, R17	RESISTOR: fixed comp 10 k ohms $\pm 5\%$, $1/4w$	06-15021A85
R18	RESISTOR: fixed comp 1000 ohms $\pm 5\%$, $1/4w$	06-15021A49
R19 R20	Same as R16 Deleted	
R21	RESISTOR: fixed comp 100 k ohms $\pm 5\%$, $1/4w$	06-15021B22
R22	RESISTOR: fixed comp 120 k ohms $\pm 5\%$, $1/4w$	06-15021B25
R23	RESISTOR: fixed comp 39 ohms $\pm 5\%$, $1/4w$	06-15021C30
R24	RESISTOR: fixed comp 12 k ohms $\pm 5\%$, $1/4w$	06-15021A88
R25	RESISTOR: variable comp 50 k ohms $\pm 10\%$, $1/2w$	18-15089A25
R26	Same as R23	
R27	RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$	06-15021A58
R28	RESISTOR: fixed comp 39 k ohms +5%, 1/4w	06-15021B07
R29	RESISTOR: fixed comp 15 k ohms +5%. 1/4w	06-15021A91
R30	RESISTOR: fixed comp 22 k ohms $\pm 5\%$, 1/4w	06-15021A97

ITEM	DESCRIPTION	PART NUMBER
LOC	OP PHASE DETECTOR AND LOOP FILTER (Co	ont)
R31	RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/2w	06-15022A37
R32	RESISTOR: fixed comp 56 k ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)	06-15021B
R33	RESISTOR: fixed comp 12 meg ohms $\pm 5\%$, lw (Selected in test, nominal value only)	06-15023
R34	Same as R23	
R35	RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$	06-15021A13
R36	Same as R31	
R37	Same as R30	
R38, R39	Same as R29	
R40	RESISTOR: variable WW 200 ohms $\pm 5\%$, lw	18-1412A08
R41	RESISTOR: variable WW 50 ohms $\pm 5\%$, 25	18-29925A92
	turn 1w (Bourns 3250L-1-500)	
T1	TRANSFORMER: rf 34:5 turns ratio	24-22887H01
T2	TRANSFORMER: rf 5:20, 20 turns ratio	24-22888H01
Т3	TRANSFORMER: rf 10, 25:6 turns ratio	24-22889H01
14	TRANSFORMER: rf 6:30 turns ratio	24-22890H01
VRI, VRZ	DIODE: zener IN754A	48-14131A01
		요즘 이야지 않는 것이 같이 많이 많이 많이 했다.
• «		· · · · · · · · · · · · · · · · · · ·
	2012 : 2014년 1월 1998년 2월 2월 2월 1999년 1998년 2월 2014년 2	Section 1
	집 이 가슴 옷에 가슴을 다 가슴 집을 걸려 가지 않는 것을 많이 했다.	
	그 의사 영향 가슴을 감독하는 것은 가슴을 가지 않는다.	

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
- 2. FOR REFERENCE DRAWINGS REFER TO:
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/4. VALUES TO BE SELECTED IN TEST.

APPROXIMATE VALUE
120
39
100
130
130
120
180
18
22
56K
12MEG

5. TERMINATIONS CODED WITH THE SAME LETTERS ARE ELECTRICALLY CONNECTED.

6. CR1 AND CR2 ARE A MATCHED PAIR.

- A C18 MAY BE CONNECTED TO ANODE OF CR1 AND CR2 AS REQUIRED IN TEST.
- /8] C23 MAY BE CONNECTED TO CATHODE OF CR1 AND CR2 AS REQUIRED IN TEST.
- 9. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- 10 K1 AND K2 ARE SHOWN IN DE-ENERGIZED STATE. BANDWIDTH RELAY LOGIC: 400 CPS BANDWIDTH: NO RELAYS ENERGIZED. 21.2 CPS BANDWIDTH: K1 ENERGIZED.



Figure 6-8. Loop Phase Detector and Loop Filter A6, Schematic Diagram

63-22812G

6-43.6-44

20 MC REFERENCE OSCILLATOR AND X3 MULTIPLIER	
C1 CAPACITOR: fixed cer 1200 pf ANV-350 21-14071A	14
C2 CAPACITOR: fixed mica 200 pf ±2%, 500 21-14032G3	\$0
C3, C4 CAPACITOR: fixed cer 0.01 mf $\pm 20\%$, 21-15144A2	:9
C5 CAPACITOR: fixed cer 4700 pf ±20%,200vdc 21-15144A2	25
C6 CAPACITOR: variable air 0.8-10 pf 19-20469D2 (JMC-2954)	22
C7 CAPACITOR: fixed mica 10 ±0.5 pf, 21-14032G0)2
C8 CAPACITOR: fixed mica 20 ±0.5 pf, 21-14032G0)6
Cy Same as C3 C10 CARACITOR: fixed mice 75 $pf + 2\%$ 500 rdc 21-14032G2	20
Cit CAPACITOR: fixed mica 75 pi $\pm 2\%$, 500 vac $21-1405202$.0
C12 Same as $C3$	
C13 Same as C6	
C14 Same as C3	
C15 CAPACITOR: fixed mica 68 pf $\pm 2\%$, 500 vdc 21-14032G	
(Selected in test, nominal value only)	
C16 Same as C3	
thru	
C20	
C21 Same as C6	
C22 CAPACITOR: fixed mica 33 pf ±2%, 500 vdc 21-14032G1	.1
C23, C24 Same as C3	
C25 CAPACITOR: fixed cer 1000 pf $\pm 20\%$, 21-15144A1	.7
200 vdc	
C26 CAPACITOR: fixed G1, 6.8 pf ±5%, 500 vdc 21-15087D2	:6
C27, C28 Same as C6	
C29 Same as C3	
C30, C31 CAPACITOR: fixed mica 27 pf $\pm 2\%$, 500 vdc 21-14032G0	19
C32 Same as C3	
C33 CAPACITOR: fixed mica 39 pf $\pm 2\%$, 500 vdc 21-14032GJ	.3
C34 CAPACITOR: fixed mica 110 pf ±2%, 21-14032G2	:4

ITEM	DESCRIPTION	PART NUMBER
20 MC	REFERENCE OSCILLATOR AND X3 MULTIPLIE	ER (Cont)
C35	CAPACITOR: fixed mica 39 pf $\pm 2\%$, 500 vdc	21-14032G13
J1	CONNECTOR: recp elec 9-pin (DEM-9P C-33)	28-14046A01
J2	CONNECTOR: recp elec (Selectro 51-043- 4300)	28-29965E23
J3, J4	CONNECTOR: recp elec (Selectro 51-027- 3196)	28-29965E21
Ll	COIL: rf fixed 100 uh	24-14198A31
L2	COIL: rf fixed 4.7 uh	24-14198A15
L3	COIL: rf variable 7.0-7.9 uh	24-22712H01
L4	COIL: rf fixed 1.98 uh	24-22713H01
L5	COIL: rf fixed 47 uh	24-14198A31
thru		
L7		
L8	COIL: rf fixed 10 uh	24-14198A19
L9	COIL: rf fixed 0.205 uh	24-22714H01
L10	COIL: rf variable 1.6-3.6 uh	24-22715H01
L11	COIL: rf fixed 2.2 uh	24-14198A11
L12	COIL: rf fixed 1.9 uh	24-22716H01
Q1	TRANSISTOR: NPN sil 2N915	2N915
Q2	TRANSISTOR: NPN sil 2N708	48-14319A01
thru	· · · · · · · · · · · · · · · · · · ·	
Q4	· · · · · · · · · · · · · · · · · · ·	
Q5	TRANSISTOR: NPN sil 2N918	2N918
R1	RESISTOR: fixed ∞ mp 3900 ohms ±5%, 1/4w	06-15021A70
R2	RESISTOR: fixed comp 1500 ohms $\pm 5\%$, $1/4w$	06-15021A55
R3	RESISTOR: fixed comp 5600 ohms $\pm 5\%$, $1/4w$	06-15021A76
R4	RESISTOR: fixed comp 470 ohms $\pm 5\%$. $1/4w$	06-15021A37
R5	RESISTOR: fixed comp 22 k ohms ±5%, 1/4w	06-15021A97
R6	RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$	06-15021A61
R7	RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021A

20 MC REFERENCE OSCILLATOR AND X3 MULTIPLIER (Cont)R8RESISTOR: fixed comp 1200 ohms $\pm 5\%$, $1/4w$ 06-15021A52R9RESISTOR: fixed comp 3300 ohms $\pm 5\%$, $1/4w$ 06-15021A67R10RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021A13R11RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021AR12RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R13Same as R4R4R14RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R21Same as R606-15021C24R17, R18Same as R906-15021A01R22Same as R906-15021A01R23Same as R1406-15021CR24Same as R1906-15021CR25RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021A01R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A07R24R22R23R24-2282101T2TRANSFORMER: 16:6 turns ratio24-2289101	ITEM	DESCRIPTION	PART NUMBER
R8 RESISTOR: fixed comp 1200 ohms $\pm 5\%$, 1/4w 06-15021A52 R9 RESISTOR: fixed comp 3300 ohms $\pm 5\%$, 1/4w 06-15021A67 R10 RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w 06-15021A13 R11 RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w 06-15021A1 R12 RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w 06-15021A R12 RESISTOR: fixed comp 180 ohms $\pm 5\%$, 1/4w 06-15021A R13 Same as R4 06-15021A4 R14 RESISTOR: fixed comp 180 ohms $\pm 5\%$, 1/4w 06-15021A40 R15 RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w 06-15021A40 R15 RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w 06-15021A40 R15 RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w 06-15021A40 R16 Same as R6 06-15021C24 R17 R18 Same as R19 06-15021A01 R22 Same as R19 06-15021C 06-15021A01 R23 Same as R19 06-15021C 06-15021A R24 Same as R19 06-15021C 06-15021A01 R25 RESISTOR: fixed comp 10 ohms $\pm 5\%$,	20 MC RE	FERENCE OSCILLATOR AND X3 MULTIPLIE	CR (Cont)
R9RESISTOR: fixed comp 3300 ohms $\pm 5\%$, $1/4w$ 06-15021A67R10RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021A13R11RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ 06-15021AR12RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$ 06-15021AR13Same as R406-15021AR14RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$ 06-15021AR15RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ 06-15021A40R16Same as R406-15021C24R17R18Same as R6R17, R18Same as R606-15021A01R22Same as R606-15021A01R23Same as R1406-15021A01R24Same as R1906-15021CR25RESISTOR: fixed comp 15 ohms $\pm 5\%$, $1/4w$ 06-15021AR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021CR27RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22891H01	R8	RESISTOR: fixed comp 1200 ohms $\pm 5\%$,	06-15021A52
R10RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021A13R11RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021AR12RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021AR13Same as R4 RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R15RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R16Same as R4 R17, R1806-15021C24R17, R18Same as R9 R19, R20R22Same as R6 R22R23Same as R14 R24R24Same as R19 R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)R26RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)R27RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test, index comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test, index comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test)R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test)R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test)R20RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ (Selectal in test)R21TRANSFORMER: 16:6 turns ratio (Z4-22892H01	R9	RESISTOR: fixed comp 3300 ohms $\pm 5\%$, $1/4w$	06-15021A67
R11RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021AR12RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021AR13Same as R406-15021A40R14RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ (Selected in test, nominal value only)06-15021A40R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, $1/4w$ 06-15021C2406-15021C24R16Same as R6	R10	RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$	06-15021A13
R12RESISTOR: fixed comp 180 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)06-15021AR13Same as R4R14RESISTOR: fixed comp 560 ohms $\pm 5\%$, 1/4w06-15021A40R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w06-15021C24R16Same as R61/4w06-15021C24R17, R18Same as R906-15021A01R21Same as R906-15021A01R22Same as R906-15021A01R23Same as R1406-15021A01R24Same as R1906-15021CR25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021CR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021A01R27RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021A01R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A01R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TBANSFORMER: 8: 2 turns ratio24-22892H01	R11	RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w (Selected in test, nominal value only)	06-15021A
R13Same as R4R14RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$ 06-15021A40R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, $1/4w$ 06-15021C24R16Same as R6	R12	RESISTOR: fixed comp 180 ohms ±5%, 1/4w (Selected in test, nominal value only)	06-15021A
R14RESISTOR: fixed comp 560 ohms $\pm 5\%$, 1/4w06-15021A40R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w06-15021C24R16Same as R606-15021C24R17, R18Same as R906-15021A01R21Same as R606-15021A01R22Same as R906-15021A01R23Same as R1406-15021CR25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021CR26RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021AR26RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A01R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A07T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R13	Same as R4	
R15RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w06-15021C24R16Same as R6R17, R18Same as R9R19, R20RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4w06-15021A01R21Same as R6R22Same as R9R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021CKelected in test, nominal value only)06-15021CR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021A01R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TBANSFORMER: 8:2 turns ratio24-22892H01	R14	RESISTOR: fixed comp 560 ohms $\pm 5\%$, 1/4w	06-15021A40
R16Same as R0R17, R18Same as R9R19, R20RESISTOR: fixed comp 47 ohms $\pm 5\%$, 1/4wR21Same as R6R22Same as R9R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4wR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4wR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4wR20RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4wR21RANSFORMER: 16:6 turns ratioR24RANSFORMER: 8:2 turns ratio	R15	RESISTOR: fixed comp 26 ohms $\pm 5\%$, 1/4w	06-15021C24
R17, R18Same as R9R19, R20RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$ 06-15021A01R21Same as R6822Same as R9Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, $1/4w$ 06-15021CR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$ 06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, $1/4w$ 06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R10	Same as Rb	
R19, R20RESISTOR: fixed comp 47 onms $\pm 5\%$, 1/4w06-15021A01R21Same as R6R22Same as R9R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021C(Selected in test, nominal value only)RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R17, R18	DECISION fine 1 come 47 character 1/4	0(15021.001
R21Same as R0R22Same as R9R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4wR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4wR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4wR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4wR20RANSFORMER: 16:6 turns ratioR21RANSFORMER: 8:2 turns ratioR24-22892H01	R19, K20	RESISTOR: fixed comp 47 onms $\pm 5\%$, $1/4W$	00-15021A01
R22Same as R14R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w(Selected in test, nominal value only)R26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w(Selected in test, nominal value only)R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4wT1TRANSFORMER: 16:6 turns ratioT2TRANSFORMER: 8:2 turns ratio24-22892H01	R41	Same as Ro	
R23Same as R14R24Same as R19R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4wR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4wR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4wR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4wR29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4wR20RESISTOR: fixed R20R20R20R20R20 </td <td>R22</td> <td>Same as Ry</td> <td></td>	R22	Same as Ry	
R24Same as R17R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021CR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R25	Same as R14	
R25RESISTOR: fixed comp 15 ohms $\pm 5\%$, 1/4w06-15021CR26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R24 D25	DESISTOP: fixed comp 15 chmc +5% 1/4m	04 150210
R26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	K25	(Selected in test, nominal value only)	00-150210
R26RESISTOR: fixed comp 100 ohms $\pm 5\%$, 1/4w06-15021AR27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	D24	DESISTOR: fixed come 100 characters	04 150214
R27RESISTOR: fixed comp 10 ohms $\pm 5\%$, 1/4w06-15021C09R28RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021A07R29RESISTOR: fixed comp 82 ohms $\pm 5\%$, 1/4w06-15021A10T1TRANSFORMER: 16:6 turns ratio24-22891H01T2TRANSFORMER: 8:2 turns ratio24-22892H01	R20	RESISTOR: fixed comp 100 onms $\pm 5\%$, 174w	00-15021A
R27 RESISTOR: fixed comp 10 onms ±5%, 1/4w 06-15021C09 R28 RESISTOR: fixed comp 68 ohms ±5%, 1/4w 06-15021A07 R29 RESISTOR: fixed comp 82 ohms ±5%, 1/4w 06-15021A10 T1 TRANSFORMER: 16:6 turns ratio 24-22891H01 T2 TRANSFORMER: 8:2 turns ratio 24-22892H01	D27	DESISTOP: fixed comp 10 chrsc 15% 1/4m	06 15021000
R28 RESISTOR: fixed comp 08 online ±5%, 1/4w 06-15021A07 R29 RESISTOR: fixed comp 82 ohms ±5%, 1/4w 06-15021A10 T1 TRANSFORMER: 16:6 turns ratio 24-22891H01 T2 TRANSFORMER: 8:2 turns ratio 24-22892H01	D28	RESISTOR: fixed comp 10 onms ±5%, 1/4w	06-15021009
T1TRANSFORMER:16:6 turns ratio24-22891H01T2TRANSFORMER:8:2 turns ratio24-22892H01	R20	RESISTOR: fixed comp 82 chmg ±5%, 1/4w	06-15021A07
T2 TRANSFORMER: 8:2 turns ratio 24-22892H01	TT 1	TRANSFORMER: 16:6 turns ratio	24-22801 HO1
	Т2	TRANSFORMER. 8.2 turns ratio	24-22802401
VRI DIODE: zener USN 1N757A	VRI	DIODE: zener USN 1N757A	1N757A
Y1 CRYSTAL: 20.00000 mc (Midland) 48-	Y1	CRYSTAL: 20.000000 mc (Midland)	48-

6

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
- 2. FOR REFERENCE DRAWINGS REFER TO:
- 3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ± 5 PCT, 1/4 WATT: ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.

VALUES TO	BE	SELECTED	IN	TEST
REFERENCE DESIGNATIO	NS	APPROX VALU	IMA JE	ATE
C15 R7		68 100	3	
R11		47	7	
R12		180)	
R25 R26		100)	

5. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.

+ISV RETURN



Figure 6-9. 20 MC Reference Oscillator and X3 Multiplier A7, Schematic Diagram

63-22817G



ITEM		DESCRIPTION	PART NUMBER
X 1/2 MULTIP	LIER AND 10 N	AC REFERENCE DISTRIBUTIO	N AMPLIFIER
C1	CAPACITOR:	fixed mica 680 pf $\pm 2\%$, 300	21-14032A43
C2	CAPACITOR:	fixed mica 180 pf $\pm 2\%$, 500	21-14032G29
C3	CAPACITOR: vdc	fixed mica 100 pf $\pm 2\%$, 500	21-14032G23
C4	CAPACITOR: vdc	fixed cer 0.01 mf $\pm 20\%$, 200	21-15144A29
C5 C6	CAPACITOR: Same as C4	variable air 0.8-0 pf	19-20469D22
C7	CAPACITOR: vdc	fixed mica 15 ± 0.05 pf, 500	21-14032G04
C8 C9 C10	Same as C3 CAPACITOR: Same as C4	fixed mica 5 ± 0.05 pf, $500 vdc$	21-14032G01
thru C14			
C15	CAPACITOR:	fixed mica 270 pf $\pm 2\%$, 300	21-14032G33
C16 thru C19	Same as C4		
C20	CAPACITOR: vdc	fixed cer 1000 pf $\pm 20\%$, 200	21-15144A17
C21 thru C23	Same as C20		
C24 C25	Same as C4 CAPACITOR:	fixed mica 68 pf $\pm 2\%$, 500 vdc	21-14032G19
C26 C27 C28 thru	Same as C4 Same as C25 Same as C4		
C30 C31	Same as C25		

ITEM	DESCRIPTION	PART NUMBER
X 1/2 MULTIPL	IER AND 10 MC REFERENCE DISTRIBUTION	AMPLIFIER (Cont)
C32, C33	Same as C4	
C34	Same as C25	
C35	Same as C4	
C36	CAPACITOR: fixed mica 82 pf $\pm 2\%$, 500 vdc	21-14032G21
C37	Same as C36	
C38	Same as C4	
C39	Same as C20	
C40	Same as C4	
C41	Same as C20	
C42, C43	Same as C4	
C44	Same as C25	1. 公司 法任任内书
C45, C46	Same as C4	
C47	Same as C25	
C48	Same as C4	
C49	CAPACITOR: fixed cer 1200 pf AMV-350vdc	21-14071A14
CR1	DIODE: sil 1N916	48-29900C66
CR2, CR3	DIODE: PC112	48-14175A07
J1	CONNECTOR: recp elec 9-pin (DEM-9P	28-14046A01
	C-33)	
J2	CONNECTOR: recp elec (Selectro 51-027-	28-29965E21
thru	3196)	
J6		이 제품을 알았는
L1	COIL: rf fixed 0.33 uh	24-14198A03
L2	COIL: rf fixed 15 uh	24-14198A21
L3	COIL: rf fixed 1.0 uh	24-14198A07
L4	Same as L2	
thru	그는 그는 것은 것이 같은 것이 생각을 가지 않는 것이다.	
L7	그는 것 같아요. 나는 방법 동안 집 것이는 것 같아?	
L8	COIL: rf fixed 3.3 uh	24-14198A13
thru	이 같은 것이 같은 것이 같은 것은 것을 물었다. 것은 것은 것은 것은 것이 같은 것이 같은 것이 같이 없다. 것이 같은 것이 같은 것이 같은 것이 같이 없다. 것이 같은 것이 없는 것이 없는 것이 없다. 것이 없는 것이 없 않는 것이 없는 것이 않는 것이 없는 것이 없는 것이 없는 것이 없는 것이 없는 것이 않는 것이 없는 것이 없는 것이 없는 것이 없는 것이 없는 것이 없는 것이 않이 않는 것이 없는 것이 없 않이	
L11	전 것은 것이 많은 것이 걸렸다. 방법을 받을 것 같아.	
L12	COIL: rf fixed 0.85 uh	24-22717H01
thru	그는 사람은 그 것은 것은 그 정말했다. 공간적권을 받았다.	
L15		
L16, L17	Same as L8	
L18	COIL: rf fixed 100 uh	24-14198A39
		(
	이 그 것이 아니는 것이 많은 것 같아. 나는 것 같아. 것이 같아.	

ITEM	DESCRIPTION	PART NUMBER
X 1/2 MULTIPL	IER AND 10 MC REFERENCE DISTRIBUTION	AMPLIFIER (Cont)
Q1, Q2 Q3 thru	TRANSISTOR: NPN sil 2N915 TRANSISTOR: NPN sil 2N918	48-14257A01 48-14310A01
Q6 Q7, Q8 R1	TRANSISTOR: NPN sil 2N708 RESISTOR: fixed comp 68 ohms ±5%, 1/4w (Selected in test, nominal value only)	48-14319A01 06-15021A
R2 R3 R4	RESISTOR: fixed comp 470 ±5%, 1/4w RESISTOR: fixed comp 10 k ohms ±5%, 1/4w RESISTOR: fixed comp 6800 ohms ±5%,	06-15021A37 06-15021A85 06-15021A79
R5, R6	1/4w RESISTOR: fixed comp 1000 ohms ±5%, 1/4w	06-15021A49
R7	RESISTOR: fixed comp 100 ohms ±5%, 1/4w	06-15021A13
R9	RESISTOR: fixed comp 1.0 meg ohm \pm 5%, $1/4w$	06-15021B58
R10 R11	Same as R4 RESISTOR: fixed comp 15 k ohms ±5%, 1/4w	06-15021A91
R12	RESISTOR: fixed comp 560 ohms $\pm 5\%$, $1/4w$	06 - 15021A40
R15 thru R16 R17	Same as R7	
thru R20 R21	Same as R11	
R22 R23	Same as R4 Same as R11	
R24, R25 R26 R27 R28	Same as R4 Same as R11 Same as R4 Same as R11	
and the second second		

ITEM	DESCRIPTION	PART NUMBER
X 1/2 MULTIPI	LIER AND 10 MC REFERENCE DISTRIBUTION	AMPLIFIER (cont)
R29	RESISTOR: fixed comp 330 ohms +5% 1/4w	06-15021A31
R 30	RESISTOR: fixed comp 12 ohms $\pm 5\%$ 1/4w	06-15021C12
R31	Same as R5	
R32	Same as R29	
R33	Same as R30	
R34	Same as R5	
thru		
R37	- 19월 20일 : 19일 : 19일 - 19일 : 19	
R38	Same as R30	
R39	Same as R29	
R40	Same as R5	
R41	Same as R30	
R42	Same as R29	
R43, R44	Same as R5	
R45, R46	RESISTOR: variable comp 2500 ohms +10%	18-15089A21
	1/2w	
R47	Same as R4	
R48	Same as R11	
R49	Same as R4	
R50	Same as R11	
R51	Same as R5	
R52	RESISTOR: fixed comp 22 ohms +5% 1/4w	06-15021C21
R53	Same as R29	
R54	Same as R5	
R55	Same as R52	
R56	Same as R29	
R57, R58	Same as R5	
T 1	TRANSFORMER: 30:7 turns ratio	24-22893H01
Т2	TRANSFORMER: 22, 22:2 turns ratio	24-22894H01
T3, T4	TRANSFORMER: 5:10 turns ratio	24-22895H01
	이 이 가지 않는 것이 있는 것이 있는 것이 가지 않는 것이 있는 것이 있다. 같은 것이 같은 것이 같은 것이 같은 것이 같은 것이 같은 것이 같은 것이 같이	
	이는 것이 같은 것이다. 이는 것은 것은 것은 것은 것은 것은 것은 것이다.	
	- 그는 것은 것은 것을 알려요. 그는 것은 것은 것은 것을 가지 않는 것을 했다.	

6-54

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4.

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
- 2. FOR REFERENCE DRAWINGS REFER TO:
- 3. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, ±5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UUF. ALL INDUCTORS ARE IN UH. ALL VOLTAGES ARE DC.
 - VALUES TO BE SELECTED IN TEST.REFERENCE
DESIGNATIONSAPPROXIMATE
VALUER168R3312R3012R3812R4112
- 5. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- 6. TP INDICATES TEST POINT AND IS NOT A REFERENCE DESIGNATION.



ITEM	DESCRIPTION	PART NUMBER
	CAD	
ARl	AMPLIFIER: DC (Burr-Brown 1507)	01-29938B08
C1	CAPACITOR: fixed, ceramic 0.01 mf $\pm 20\%$ 200 vdc	21-15144A29
C2	CAPACITOR: fixed mica, 120 pf $\pm 2\%$ 500 vdc (selected in test, nominal value only	21-14032G
C3	Deleted	
C4	Deleted	
C5	CAPACITOR: fixed mica 39 pf $\pm 2\%$, 500 vdc (selected in test, nominal value only)	21-14032G
C6	Same as Cl	
thru		
C10		
C11	CAPACITOR: variable air 0.8 - 10 pf (JMC 2954)	19-20469D22
C12	Same as Cl	
C13	CAPACITOR: fixed mica 100 pf $\pm 2\%$,	21-14032G
	500 vdc (selected in test, nominal value only	
C14	Same as Cl	
C15	Same as CII	
C16, C17	Same as Cl	
C18	Same as CII	22.24022.5
C19	CAPACITOR: fixed mica 130 pf $\pm 2\%$, 500 vdc (selected in test, nominal value only	21-14032G
C20	Same as C19	
C21	Same as C11	
C22	CAPACITOR: fixed mica 68 pf $\pm 2\%$, 500 vdc	21-14032G19
C23	Same as Cll	
C24, C25	Same as Cl	
C26	CAPACITOR: fixed mica 51 pf $\pm 2\%$ 500 vdc	21-14032G16
C27	CAPACITOR: fixed mica 43 pf <u>+</u> 2% 500 vdc	21-14032G14
C28	Same as C27	
C29	Same as Cll	
C30	CAPACITOR: fixed mica 240 pf <u>+</u> 2% 500 vdc	21-14032G32

ITEM	DESCRIPTION	PART NUMBER
	CAD (Cont)	
C31	Same as C30	
C32	CAPACITOR: fixed mica 100 pf $\pm 2\%$ 500 vdc	21-14032G23
C33	CAPACITOR: fixed mica 470 pf $\pm 2\%$ 300 vdc	21-14032A39
C34	CAPACITOR: fixed ceramic 1200 pf AMV- 350	21-14071A14
C35	Same as C34	
C36	CAPACITOR: fixed mylar 5.0 mf ±10% 100 vdc (Electron Products 2DG1-505E)	08-
C37	CAPACITOR: fixed elec 47 mf $\pm 20\%$ 20 vdc	23-14152D67
C38	Same as C37	
C39	CAPACITOR: fixed elec 10 mf $\pm 20\%$ 20 vdc	23-14152D42
CR 1	DIODE: sil 1N916	1N916
CR2	Same as CR1	
CR3	DIODE: sil 1N914	48-14309A11
CR4	Same as CR3	
thru		
CR6		
J 1	CONNECTOR: recp elec 15-pin (DEM- 15P C-33)	28-14046A02
J2	CONNECTOR: recp elec (Selectro 51- 027-3196)	28-29965E21
J 3	CONNECTOR: recp elec (Selectro 51- 043-4300)	28-29965E23
J4	Same as J2	
thru	이 같은 것이 있는 것은 것이 같은 것이 같은 것이 가지 않을까?	
J6	이 지수는 것이 많은 것은 것이 같은 것 같은 것을 못했다.	
Kl	RELAY: (HI-G, Inc. 2K-1B-112)	80-
К2	Same as Kl	
Ll	COIL: rf fixed 47 uh	24-14198A31
L2	COIL: rf fixed 100 uh	24-14198A39
L3	Same as L2	
L4	Same as Ll	
thru	에는 이번 것은 것은 것은 것은 가장 관련적으로 가지 않는다. 것은 것은 것은 것을 통합니다. 같은 것은 것을 많은 것은 것을 많은 것은 것을 통합니다.	
L6	이 이 이 것 같은 것 같은 것을 걸었다. 그는 것 것 같은 것을 수 없을	
	그는 그는 그는 그는 것은 것을 가지 않는 것이 없는 것이 없는 것이 없을 것이 없을 것이 없다.	

ITEM	DESCRIPTION	PART NUMBER	
CAD (Cont)			
L7	Deleted		
Q1	TRANSISTOR: NPN sil	48-14319A01	
Q2	TRANSISTOR: NPN sil	48-14120A11	
Q3	TRANSISTOR: NPN sil	48-14194A02	
Q4, Q5	Same as Q3		
Rl	RESISTOR: fixed comp 120 ohms +5%	06-15021A	
	1/4w (selected in test, nominal value only)		
R2	RESISTOR: fixed comp 18 ohms $\pm 5\%$ 1/4w	06-15021C18	
R 3	RESISTOR: fixed comp 47 ohms $\pm 5\%$ 1/4w	06-15021A01	
R4	RESISTOR: fixed comp 1500 ohms $\pm 5\%$ 1/4w	06-15021A55	
R5	Same as R3		
R6	RESISTOR: fixed comp 180 ohms $\pm 5\%$ 1/4w (selected in test, nominal value only)	06-15021A	
R7	RESISTOR: fixed comp 18 ohms <u>+</u> 5% 1/4w (selected in test, nominal value only)	06-15021C	
R8	RESISTOR: fixed comp 1.0 meg ohm $\pm 5\%$ 1/4w	06-15021B58	
R 9	RESISTOR: fixed comp 330 ohms $\pm 5\%$ 1/4w	06-15021A31	
R10	RESISTOR: fixed comp 22 ohms $\pm 5\%$ 1/4w (selected in test, nominal value only)	06-15021C	
R 1 1	RESISTOR: fixed comp 3300 ohms $\pm 5\%$ 1/4w	06-15021A67	
R12	Same as R11		
R13	RESISTOR: fixed film 31.6 k ohms $\pm 1\%$ 1/4w	06-14098D39	
R14	Same as R13		
R15	Same as R3		
R16	RESISTOR: fixed comp 10k ohms $\pm 5\%$ 1/4w	06-15021A85	
R17, R18	Same as R16		
R19	Deleted		
R20	Deleted		
R21	Deleted		
	일 이 이 이 가 좀 걸렸다. 나는 것 같은 것 같은 것		

ITEM	DESCRIPTION	PART NUMBER
	CAD (Cont)	
R22	RESISTOR: fixed comp 82 k ohms $\pm 5\%$ 1/4w	06-15021B19
R23	Deleted	101
R24	RESISTOR: fixed comp 6.8 meg ohms $\pm 5\%$ lw	06-15023B
R25	RESISTOR: variable comp 50 k ohms +10% 1/2w	18-15089A25
R26	RESISTOR: fixed comp 5600 ohms $\pm 5\%$ 1/4w	06-15021A76
R27	RESISTOR: fixed comp 6800 ohms $\pm 5\%$ 1/4w	06-15021A79
R28	Same as R4	
R29	RESISTOR: fixed comp 39 ohms $\pm 5\%$ 1/2w	06-15022A22
R30	RESISTOR: fixed comp 100 ohms $\pm 5\%$ 1/2w	06-15022A37
R 3 1	Same as R30	
Tl	TRANSFORMER: 34:5 turns ratio	24-22896H01
T2	TRANSFORMER: 5:20,20 turns ratio	24-22897H01
Т3	TRANSFORMER: 10, 25:6 turns ratio	24-22898H01
T4	TRANSFORMER: 6:30 turns ratio	24-22899H01
VR1	DIODE: zener 400 mw, 1N746A	48-14131A37
VR2	DIODE: zener 1N2976R	48-14146A56
	- 1997년 1 1997년 1997년 199 1997년 1997년 199	
	에 있는 것이 이야한 것이 있는 것이 있는 것이 있는 것이 있는 것이 있다. 가지 않는 것은 것이 있는 것이 있다. 가지 않는 것은 것이 있는 것이 있다. 가지 않는 것은 것이 있는 것이 없는 것이 있는 것이 없는 것이 없 않이 없는 것이 없 않 것이 않아? 것이 않아? 것이 것이 없는 것이 없 않이 않이 않아? 않아? 않아? 않아? 않아? 않이 않아? 않아? 않아? 않아? 않아? 않아? 않아? 않이 않이 않이 않아? 않이 않이 않이 않이 않이 않이 않이 않이 않아? 않이 않이 않이 않이 않이 않이 않이 않	
	그는 그 가는 가슴도 좀 가지 않을 것 같아. 나무는 것은 것을 가슴을 가슴을 가슴을 다 들었다.	



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ITEM	DESCRIPTION	PART NUMBER	
NB DETECTOR WB DISCRIMINATOR			
C1	CAPACITOR: fixed ceramic 0.01 mf $\pm 20\%$, 200 vdc	21-15144A29	
C2	Same as Cl		
C3	CAPACITOR: fixed mica 100 pf $\pm 2\%$, 500 vdc	21-14032G23	
C4	Same as Cl		
thru	· · · · · · · · · · · · · · · · · · ·		
C7			
C8	CAPACITOR: variable air 0.8 - 10 pf, (JMC 2954)	19-20469D22	
C9	CAPACITOR: fixed mica 15 ± 0.5 pf, 500 vdc	21-14032G04	
C10	CAPACITOR: fixed mica 22 ± 0.5 pf, 500 vdc	21-14032G07	
C11	Same as C8		
C12	Same as Cl		
thru			
C14			
C15	CAPACITOR: fixed elec 22 mf +20%, 15 vdc	23-14152D54	
C16	Same as C15		
C17	CAPACITOR: fixed ceramic 0.1 mf $\pm 20\%$, 50 vdc (Sprague 5C50)	21-29907C93	
C18	Same as C15		
C19	Same as Cl		
C20	Same as C17		
C21	Same as C15		
C22	CAPACITOR: fixed elec 68 mf $\pm 20\%$, 15 vdc	23-14152D72	
C23	Same as C22		
C24	CAPACITOR: fixed elec 330 mf +20%, 6 vdc	23-14152D86	
C25, C26	Same as C15		
C27	Same as C22		
C28	Same as Cl	19.	
thru			
C33	의 관객을 받으면 가지 않는 것이 있는 것이 있는 것이 있는 것이 있다. 1993년 2월		
	그는 것이 아이는 것을 바람이 없는 것이 많이		

ITEM	DESCRIPTION	PART NUMBER	
NB DETECTOR WB DISCRIMINATOR (Cont)			
C34	CAPACITOR: fixed mica 270 pf $\pm 2\%$, 300 vdc	21-14032G33	
C35	Same as C17		
C36	CAPACITOR: fixed mica 1000 pf $\pm 2\%$, 500 vdc	21-14032B47	
C37	Same as C3	1	
C38	CAPACITOR: fixed mica 22 ± 0.5 pf, 500 vdc	21-14032G	
C39	Same as C17		
C40	Same as C22		
C41	CAPACITOR: fixed elec $1 \text{ mf} \pm 20\%$, 35 vdc	23-14152D07	
C42	Same as C41		
C43	CAPACITOR: fixed elec 100 mf $\pm 20\%$, 10 vdc	23-14152D76	
C44	Same as C41		
C45	Same as Cl		
C46	CAPACITOR: fixed elec 22 mf $+20\%$,	23-14152D54	
	15 vdc		
C47	Same as C46		
C48	CAPACITOR: fixed ceramic 1200 AMV- 350	21-14071A14	
C49	Same as C48		
C50	Same as Cl		
C51	Same as C46		
C52	CAPACITOR: fixed mica 180 pf $\pm 2\%$, 500 vdc	21-14032G29	
C53	CAPACITOR: fixed Gl 0.8 - 18 pf (IFD VC23GY)	20-14020A04	
C54, C55	Same as C17		
C56	CAPACITOR: fixed elec 10 mf $\pm 20\%$,	23-14152D42	
C 5 7	Sama an C15		
C59	Same as C1		
C50	Same as C1		
C59	Same as CL		
00	Same as CI		

ITEM	DESCRIPTION	PART NUMBER
	NB DETECTOR WB DISCRIMINATOR (Cont)	
CRI	DIODE: 1N914	48-14309A11
CR2	Same as CR1	
CR3	DIODE: FD700	48-29900D91
CR4	DIODE: FD700	48-29900D91
CR5	DIODE: FD700	48-29900D91
CR6	Same as CR5	
CR7. CR8	Same as CR1	
CR9	DIODE: 1N831	48-14132A01
CR10	Same as CR9	
thru		
CR12		
CR13	DIODE: sil 1N777	48-29900C65
CR14	Same as CR13	
II	CONNECTOR: recp elec 9-pin (DEM-9P	28-14046A01
	C-33)	
.T2	CONNECTOR: recp elec (Selectro 51-	28-29965E23
	043-4300)	
.T3	CONNECTOR: recp elec (Selectro 51-	28-29965E21
00	027-3196)	
.14	Same as J2	
15. 16	Same as J3	
17	Same as J2	
L	COIL: rf fixed 33 uh	24-14198A27
L2	Same as Ll	
 L3	Deleted	
L4	Deleted	김 사람은 것이 가격했다.
L5	COIL: rf fixed 10 uh	24-14198A19
L6	COIL: rf fixed 2.2 uh	24-14198A11
L7	COIL: rf fixed 22 uh	24-14198A23
1.8	Same as L7	
L9	COIL: rf fixed 10 mh	24-14198A87
L10	Same as L9	
LII	COIL: rf variable set to 10.85 uh	24-25240H01
L12	Same as L11	
L13. L14	Same as L9	
01	TRANSISTOR: NPN sil 2N708	48-14319A01
× *		10 1101/1101
	물건이 있는 것이 아주 방송 방송 것이 있는 것이 같은 것이 많은 것이 없다.	
ITEM	DESCRIPTION	PART NUMBER
--------	---	---
	NB DETECTOR WB DISCRIMINATOR (Cont)	
Q2	Same as Ql	Contraction of the second s
Q3	TRANSISTOR: NPN sil 2N2484 (Keystone	2N2484
	Carbon Co.)	
Q4 .	Same as Q1	
Q5	TRANSISTOR: NPN sil 2N2218	2N2218
Q6	TRANSISTOR: PNPsil 2N2905	2N2905
Q7	TRANSISTOR: NPN sil 2N918	2N918
Q8, Q9	Same as Ql	11111111111111111111111111111111111111
Q10	TRANSISTOR: NPN sil 2N2222	48-14267A13
Q11	TRANSISTOR: PNP sil 2N3307	48-29900E68
Q12	Same as Q10	
Q13	Same as Q11	
Q14	Same as Q10	
Q15	Same as Q11	
R1	RESISTOR: fixed comp 3300 ohms +5%,	06-15021A67
	1/4w	이 아이는 것 같아?
R2	RESISTOR: fixed comp 2200 ohms +5%.	06-15021A61
	1/4w	06-15021A61
R3	RESISTOR: fixed comp 470 ohms +5%.	06-15021A37
1.0	1/4w	
R4	RESISTOR: fixed comp 1000 ohms +5%	06-15021A49
1(1	$1/4_{\rm MZ}$	00-15021117
D 5	RESISTOR: fixed comp 2700 ohms +5%	06-15021464
	$1/4_{\rm W}$	00-15021404
DA	PESISTOP: fixed comp 8200 chmg +5%	06 15021492
	1/4w (selected in test, nominal value only)	00-15021802
D 7	DESISTOR: fixed comp 10 obms 15%	06 150210
K /	RESISTOR: fixed comp to onms $\pm 5\%$,	06-150210
0 0	1/4w (selected in test, nominal value only)	06 15021455
K o	RESISTOR: fixed comp 1500 onms $\pm 5\%$,	00-15021A55
DO	1/4W DESIGNOD: fined come 120 charge 150	0(1502141(
R9	RESISTOR: fixed comp 120 onms $\pm 5\%$,	06-15021A16
D 1 0		0()500) 44
K10	RESISTOR: fixed comp 820 ohms $\pm 5\%$,	06-15021A46
	1/4w	
RII	Same as R4	
	이 같은 것 같은 것 같은 것은 것은 것은 것 같은 것 같은 것 같이 많이 있다. 것은 것은 것은 것은 것은 것은 것은 것을 가지?	

ITEM	DESCRIPTION	PART NUMBER	
NB DETECTOR WB DISCRIMINATOR (Cont)			
R12	RESISTOR: fixed comp 68 k ohms $\pm 5\%$, $1/4w$	06-15021B16	
R13	Same as R12		
R14	RESISTOR: fixed comp 3900 ohms $\pm 5\%$, $1/4w$	06-15021A70	
R15	RESISTOR: fixed comp 150 ohms <u>+</u> 5%, 1/4w (selected in test, nominal value only)	06-15021A	
R16	RESISTOR: fixed comp 6800 ohms ±5%, 1/4w (selected in test, nominal value only) Same as R1	06-15021A	
RIS	Same as R2		
thru			
R20			
R21	RESISTOR: fixed comp 47 ohms $\pm 5\%$, $1/4w$	06-15021A01	
R22	Same as R21		
R23, R24	Same as R5		
R25	Same as R21		
R26	RESISTOR: fixed comp 22 ohms $\pm 5\%$, $1/4w$	06-15021C21	
R27	Same as R26		
R28	Same as R21		
R29	RESISTOR: fixed comp 56 ohms $\pm 5\%$, $1/4w$	06-15021A04	
R 30	Same as Rl		
R 3 1	Same as R2		
R 32	RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/4w$	06-15021A31	
R33	RESISTOR: fixed comp 47 ohms +5%	06-15021	
	1/4w (selected in test, nominal value only)		
R34	Same as R10		
R35	Same as R21		
R36	Same as R4		
R37	Same as R10		
R38	RESISTOR: fixed comp 100 ohms $\pm 5\%$, $1/4w$	06-15021A13	

NB DETECTOR WB DISCRIMINATOR (Cont)R39, R40Same as R21R41Same as R10R42Same as R21R43RESISTOR: fixed comp 82 ohms $\pm 5\%$,1/4w1/4wR44Same as R3R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$,1/4wR46RESISTOR: fixed comp 680 ohms $\pm 5\%$,1/4wR47RESISTOR: fixed comp 330 ohms $\pm 5\%$,1/2wR48RESISTOR: fixed comp 390 ohms $\pm 5\%$,1/4wR49RESISTOR: fixed comp 56 k ohms $\pm 5\%$,1/4wR49RESISTOR: fixed comp 2200 ohms $\pm 5\%$,1/4w (selected in test, nominal value only)R51Same as R24R52RESISTOR: fixed comp 68 ohms $\pm 5\%$,1/4wR54RESISTOR: fixed comp 270 ohms $\pm 5\%$,1/2wR55Same as R48R56RESISTOR: fixed comp 2200 ohms $\pm 5\%$,1/2 wR55R6RESISTOR: fixed comp 2200 ohms $\pm 5\%$,1/2 wR55R6RESISTOR: fixed comp 2200 ohms $\pm 5\%$,1/2 wR55R6RESISTOR: fixed comp 2200 ohms $\pm 5\%$,1/2 wR55R6R12 wR55R6R6R6R6R6R6R6R6R6R6R6R6R6R6R6R6R6 </th <th>10 58 43</th>	10 58 43
R39, R40Same as R21R41Same as R10R42Same as R21R43RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021AR44Same as R3R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021AR46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR47RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/2w$ 06-15021AR49RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR50RESISTOR: fixed comp 56 k ohms $\pm 5\%$, 	10 58 43
R41Same as R10R42Same as R21R43RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021AR44Same as R3R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021AR46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR47RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR48RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ 06-15021AR49RESISTOR: fixed comp 390 ohms $\pm 5\%$, 	10 58 43
R42Same as R21R43RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021AR44Same as R306-15021AR45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021AR46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR47RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 30 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR50RESISTOR: fixed comp 200 ohms $\pm 5\%$, 	10 58 1 3
R43RESISTOR: fixed comp 82 ohms $\pm 5\%$, $1/4w$ 06-15021AR44Same as R3R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021AR46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR47RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/2w$ 06-15021AR48RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/4w$ 06-15021AR49RESISTOR: fixed comp 390 ohms $\pm 5\%$, 	10 58 1 3
R44Same as R3R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021AR46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021AR47RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/2w$ 06-15022AR48RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ 06-15021AR49RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021BR50RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR51Same as R2406-15021AR52RESISTOR: fixed comp 390 ohms $\pm 5\%$, 	58 13
R45RESISTOR: fixed comp 1800 ohms $\pm 5\%$, $1/4w$ 06-15021A: $1/4w$ R46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021A: 	58 43
R46RESISTOR: fixed comp 680 ohms $\pm 5\%$, $1/4w$ 06-15021A- 06-15022A: $1/2w$ R47RESISTOR: fixed comp 330 ohms $\pm 5\%$, 	43
R47RESISTOR: fixed comp 330 ohms $\pm 5\%$, $1/2w$ 06-15022A!R48RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ 06-15021A: $1/4w$ R49RESISTOR: fixed comp 56 k ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021B $1/4w$ (selected in test, nominal value only)R50RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A $1/4w$ (selected in test, nominal value only)R51Same as R24 RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A $1/4w$ R53RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ 06-15021A $1/4w$ R54RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/2w$ 06-15021A $1/2w$ R55Same as R48 RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2w$ 06-15021A $1/4w$ (selected in test, nominal value only)	
R48RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ 06-15021A.R49RESISTOR: fixed comp 56 k ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021BR50RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR51Same as R2406-15021AR52RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/2 w$ 06-15021AR55Same as R4806-15022AR55Same as R4806-15021AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	55
R49RESISTOR: fixed comp 56 k ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021BR50RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR51Same as R2406-15021AR52RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/4w$ 06-15021AR54RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2 w$ 06-15022AR55Same as R4806-15021AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	34
R50RESISTOR: fixed comp 2200 ohms $\pm 5\%$, 1/4w (selected in test, nominal value only)06-15021AR51Same as R24R52RESISTOR: fixed comp 390 ohms $\pm 5\%$, 1/4w (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/4w06-15021AR54RESISTOR: fixed comp 68 ohms $\pm 5\%$, 1/2 w06-15022AR55Same as R4806-15022AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, 1/2 w06-15021A	
R51Same as R24R52RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/4w$ 06-15021AR54RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2 w$ 06-15022ASR55Same as R4806-15021AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	
R52RESISTOR: fixed comp 390 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021AR53RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/4w$ 06-15021AR54RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2 w$ 06-15022AR55Same as R4806-15021AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	
R53RESISTOR: fixed comp 68 ohms $\pm 5\%$, $1/4w$ 06-15021A0R54RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2 w$ 06-15022A9R55Same as R4806-15021AR56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	
R54RESISTOR: fixed comp 270 ohms $\pm 5\%$, $1/2 w$ 06-15022AR55Same as R48R56RESISTOR: fixed comp 2200 ohms $\pm 5\%$, $1/4w$ (selected in test, nominal value only)06-15021A	07
R55Same as R48R56RESISTOR: fixed comp 2200 ohms ±5%, 1/4w (selected in test, nominal value only)06-15021A	52
R56 RESISTOR: fixed comp 2200 ohms +5%, 06-15021A 1/4w (selected in test, nominal value only)	
R57, R58 Same as R21	
R59 RESISTOR: fixed comp 220 ohms $\pm 5\%$, 06-15023A7	70
R60 Same as R4	
R61 Same as R32	
R62 RESISTOR: fixed comp 39 ohms $\pm 5\%$, 06-15021C3	30

ITEM	DESCRIPTION	PART NUMBER	
NB DETECTOR WB DISCRIMINATOR (Cont)			
R63	RESISTOR: fixed comp 180 ohms $\pm 5\%$, $1/4w$	06-15021A22	
R64	Same as R63		
R65	RESISTOR: fixed comp 33 ohms $\pm 5\%$, 1/4w (selected in test, nominal value only)	06-15021C	
R66	RESISTOR: fixed comp 8200 ohms $\pm 5\%$, 1/4w	06-15021A82	
R67	RESISTOR: fixed comp 5600 ohms $\pm 5\%$, $1/4w$	06-15021A76	
R68	Same as Rl		
R69	Same as R2		
R70	Same as R29		
R71	RESISTOR: fixed film 46.4 ohms $\pm 1\%$, 1/4w	06-14098A07	
R /Z	Same as R/1		
R73 D74 D75	Same as R52		
Υ Ξ , ΥΙ	TRANSFORMER: 10.5 turns ratio	24-22702H01	
т2	TRANSFORMER: 18:4 turns ratio	24-22701H01	
T3	Deleted		
Τ4	TRANSFORMER: 5:14:14 turns ratio	24-22703H01	
Τ5	Same as T4	24 222001101	
	TRANSFORMER: 30 turns C. T.	24-22799H01	
VRI	DIODE: Zener USN 1N7494	48-14131A07	
VR3	DIODE: zener USN 1N751A	48-14131A42	
VR4	Same as VR1	10-111311112	
	그는 것 같은 것 같		
	그는 그는 그는 것을 위한 것을 하는 것을 통했다.		
2 All Cart	이 그는 그는 것이 가려져야 한 것이 없는 것 같아? 정말했다.		

NOTES:

- 1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIG-NATIONS PREFIX WITH
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- 14 VALUES TO BE SELECTED IN TEST.

REFERENCE DESIGNATION	APPROXIMATE VALUE
C38	22
R7	10
R15	150
R16	6800
R33	47
R 50	2200
R52	390
R56	2200
R65	33
R49	56 K

- DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- TERMINATIONS CODED WITH THE SAME LETTERS ARE ELECTRICALLY CONNECTED.



ITEM	(c) All Product sciences in a start frame of a start science of the start science of the start science of the science of the start science of the start s	DESCRIPTION	PART NUMBER
VIDEO DISTRIBUTION AMPLIFIER A11			
Cl Classic	CAPACITOR:	fixed elec 4.7 mf \pm 20%, 35	23-14152D31
C2	CAPACITOR: vdc	fixed cer 0.1 mf \pm 20%, 50	21-29907C93
C3	CAPACITOR:	fixed mica 1500 pf \pm 2%, 500	21-14032B51
C4	CAPACITOR:	fixed mica 56 pf \pm 2%, 500	21-14032G17
C5	Same as C3		
C6	Same as C2		
C7	Same as C2	가지 않는 것은 것을 알려요. 이 가지 않는 것은 것을 가지 않는 것을 것을 했다. 같은 것은 것은 것은 것은 것은 것은 것은 것을 같은 것을 같은 것을 같은 것을 같은 것을 같이 없다. 것은 것을 같은 것을 같은 것을 같은 것을 알려요. 것은 것을 같은 것을 알려요. 것은 것을 알	
C8	Same as C2		
C9	Same as Cl		
C10	Same as C2		
C11	CAPACITOR:	fixed mica $4300 \text{ pf} \pm 2\%$, 500	21-14032B62
C12	CAPACITOR:	fixed mica 330 pf \pm 2%, 500	21-14032A35
C13	Same as C11		
C14	Same as C2		
C15	Same as C2		
C16	Same as C2	신상품학 그는 것이 가 있는 것 같은 물건물건을 받았다.	
C17	Same as Cl		
C18	CAPACITOR:	fixed cer 0.01 mf \pm 20%, 200	21-15144A29
C19	CAPACITOR:	fixed mica 1000 pf \pm 2%, 500	21-14032B47
C20	CAPACITOR:	fixed mica 12 ± 0.5 pf, 500	21-14032G03
C21	Same as C19	· 바람은 영상 관계 · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
C22	Same as C18		
C23	Same as C18	한 성지 않는 것 같은 것 같은 것이 나갔어요?	
C24	Same as C18		
C25	Same as Cl	지 않은 것 같아요. 그는 것 같은 것 같은 것 같은 것이 없다.	
C26	Same as C18		
C27	Same as C3		
	Estanosyik J.S	2N (Sam) providence and a	

ITEM	DESCRIPTION	PART NUMBER
	VIDEO DISTRIBUTION AMPLIFIER All (Cont)
C28	CAPACITOR: fixed mica 22 ± 0.5 pf, 500 vdc	21-14032G07
C29	Same as C3	I di seconda di second
C30	Same as C18	
C31	Same as C18	
C32	Same as C18	
C33	Same as Cl	
C34	CAPACITOR: fixed elec 1.0 mf \pm 20%, 35	23-14152D07
C35	CAPACITOR: fixed paper . 022 mf \pm 10%, 500 vdc (Kemet KR022-ML35J)	08-
C36	Same as Cll	
C37	Same as C35	
C38	Same as C34	
C39	Same as C34	
C40	Same as C34	
C41	CAPACITOR: fixed cer AMV-350	21-14071A14
C42	Same as C41	
J 1	CONNECTOR: recp elec 9-pin (DEM-9P C-33)	28-14046A01
J 2	CONNECTOR: recp elec (Selectro 51-027- 3196)	28-29965E21
J 3	Same as J2	
thru	이 같은 것은 것은 것이 같은 것이 같은 것이 같아.	
J 7		
J8	CONNECTOR: recp elec (Selectro 51-043- 4300)	28-29965E23
Ll	COIL: rf var shld 66-160 uh	24-14204A08
	(Cambridge Thermionic Corp. No. 1505-8)	
L2	Same as L1	
L3	COIL: rf var shld 400-1000 uh	24-14204A10
	(Cambridge Thermionic Corp. No. 1505-10)	
L4	Same as L3	
L5	COIL: rf var shld 14.5-33 uh	24-14204A06
thru	(Cambridge Thermionic Corp. No. 1505-6)	
L8		
L9	Coil: rf var 12 mh (WEE VEE-L Nytronics)	24-
The second se		

ITEM	DESCRIPTION	PART NUMBER
	VIDEO DISTRIBUTION AMPLIFIER All (Cont)
L10	Same as L9	
Q1	TRANSISTOR: NPN sil 2N708	48-14319A01
Q2	Same as Q1	
Q3	TRANSISTOR: NPN sil 2N2222	48-14267A13
Q4, Q5	Same as Ql	
Q6	Same as Q3	
Q7, Q8	Same as Ql	
Q9	Same as Q3	
Q10, Q11	Same as Ql	
Q12	Same as Q3	
Q13, Q14	Same as Ql	
Q15	Same as Q3	
R 1	RESISTOR: fixed comp 6800 ohms ±5%,	06-15021A79
	1/4 w	
R2	Same as Rl	
R 3	RESISTOR: var ww 2000 ohms \pm 5%, 1 w	18-14142A15
R4	RESISTOR: fixed comp 1000 ohms ± 5%,	06-15021A49
	1/4 w	
R 5	RESISTOR: fixed comp 10 k ohms + 5%,	06-15021A85
	1/4 w	
R6	Same as R5	
R7	RESISTOR: fixed comp 2200 ohms ± 5%,	06-15021A61
	1/4 w	
R 8	RESISTOR: fixed comp 120 ohms ± 5%,	06-15022A40
	1/2 w	
R9	RESISTOR: fixed comp 56 ohms \pm 5%, 1/2 w	06-15022A28
R10	RESISTOR: fixed comp 39 ohms + 5%, 1/4 w	06-15021C30
R11	Same as R1	
R12	Same as R1	
R13	RESISTOR: fixed comp 1000 ohms ± 5%,	06-15021A
	1/4 w (Selected in test, nominal value only.)	
R14	Same as R4	
R15, R16	Same as R5	
R17	Same as R7	
R18	Same as R8	
R19	Same as R9	

ITEM	DESCRIPTION	PART NUMBER	
	VIDEO DICERTINICA AMDITETER ALL (Cont)		
	VIDEO DISTRIBUTION AMPLIFIER ATT (Cont)		
R20	Same as R10		
R21, R22	Same as R1		
R23	RESISTOR: fixed comp 1000 ohms + 5%,	06-15021A	
	1/4 w (Selected in test, nominal value only.)		
R24	Same as R4		
R25, R26	Same as R5		
R27	Same as R7		
R28	Same as R8		
R29	Same as R9		
R 30	Same as R10		
R31, R32	Same as Rl		
R33	RESISTOR: fixed comp 1000 ohms ± 5%,	06-151021A	
	1/4 w (Selected in test, nominal value only.)		
R34	Same as R4		
R35, R36	Same as R5		
R 37	Same as R7		
R 38	Same as R8		
R 39	Same as R9		
R40	Same as R10		
R41, R42	Same as R1		
R43	RESISTOR: fixed comp 1000 ohms ± 5%,	06-15021A	
	1/4 w (Selected in test, nominal value only.)		
R44	Same R4		
R45, R46	Same as R5		
R47	Same as R7		
R48	Same as R8		
R49	Same as R9		
R 5 0	Same as R10		
	· · · · · · · · · · · · · · · · · ·		
	이 이 이 것 같은 귀에서 가져야 봐야지 않는 것이라. 가지 않는 것 같은 것 같은 것 같은 것 같은 것이다. 같은 것 같은 것은 것은 것은 것은 것을 알려야 한다. 것은		
	이 엄마 에는 것 같아요. 강경감 여기가 안 많이 못 알았다. 것 같아.		
	이 그는 것이 있는 것을 알았는 것이 같은 것이 같은 것이 같이 했다.		

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- 4. DC VOLTAGES ARE MEASURED UNDER NORMAL OPERATING CONDITIONS.
- 5. VALUES TO BE SELECTED IN TEST VIDEO

JI

+15Y

GRD (

-15V +1

REFERENCE	APPROXIMATE
DESIGNATION	VALUE
R13	1K
R23	1K
R33	1K
R43	1K



Schematic Diagram

6- 77, 6-78

*

0

- ALL RESISTORS ARE IN OHMS ±5 PCT, 1/4 WATT. ALL CAPACITORS ARE IN UF.

BEAD MOTOROLA P/N 76-15169A01.



+ISVDC RETURN -15VDC RETURN 63-28081

Figure 6-14. ±15 VDC Power Supply PS1, Schematic Diagram

6-79, 6-80

PAL 41V ILIVIT. 1410001 #2 #1 H R.F. = R.F. = ____+ <u>31.25</u> = +31.25 = E=____ PWR=____ ____ I= ____ Pur R = ____ E = 10 Л R.F. = +31.25?.F. = + <u>31.25</u> = == _ I = ____ PWA = _ E = ____ I= ____ RNA=_ MOD MOD. HIGH FMOD VIMS RADS HIGH VIMS RADS Smoo VIMS rads rads YMMS 50 K.C. 50 K.C. 00 K.C. 500K.C. 768K.C. 768K.C. .024M.C.____ 1.024M.C. .50 M.L ____ 1.50 M.C. LO HIGH LO HIGH PECTRUM = 25 m.e. SPECTRUM ± 25 m.C. WEPT RESP. SWEPT RESP. r