TECHNICAL MANUAL
HT EL EXCITER
NICAM SOUND

988-2405-001

T.M. No. 888-2405-001

Printed: November 1996
Rev. B: 12/12/05

Returns And Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Systems Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with HARRIS CORPORATION, Broadcast Systems Division, specify the HARRIS Order Number or Invoice Number.

Unpacking

Carefully unpack the equipment and preform a visual inspection to determine that no apparent damage was incurred during shipment. Retain the shipping materials until it has been determined that all received equipment is not damaged. Locate and retain all PACKING CHECK LISTs. Use the PACKING CHECK LIST to help locate and identify any components or assemblies which are removed for shipping and must be reinstalled. Also remove any shipping supports, straps, and packing materials prior to initial turn on.

Technical Assistance

HARRIS Technical and Troubleshooting assistance is available from HARRIS Field Service during normal business hours (8:00 AM - 5:00 PM Central Time). Emergency service is available 24 hours a day. Telephone 217/222-8200 to contact the Field Service Department or address correspondence to Field Service Department, HARRIS CORPORATION, Broadcast Systems Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. Technical Support by e-mail: *tsupport@harris.com*. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

Replaceable Parts Service

Replacement parts are available 24 hours a day, seven days a week from the HARRIS Service Parts Department. Telephone 217/222-8200 to contact the service parts department or address correspondence to Service Parts Department, HARRIS CORPORATION, Broadcast Systems Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

NOTE

The # symbol used in the parts list means used with (e.g. #C001 = used with C001).

HT EL EXCITER NICAM SOUND 988-2405-001			
Rev.	Date	ECN	Pages Affected
001-A1	05-15-97	41462	Title Page, 7-26 to 7-28 Added MRH-1/MRH-2
001-A2	09-13-99	45114	Title Page, MRH-1/MRH-2 and all of Section VII
001-A3	09-28-99	45134	Title Page, MRH-1/MRH-2 and all of Section VII
001-A4	11-15-01	47702	Title Page, MRH-1/MRH-2 and all of Section VII
001-A5	03-06-02	47941	Title Page, MRH-1/MRH-2 and all of Section VII
001-B	12/12/05	52130	Title Page, MRH-1/MRH-2 and all of Sections IV and VII

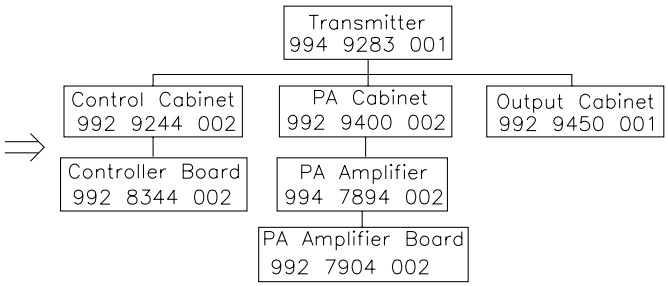
Guide to Using Harris Parts List Information

The Harris Replaceable Parts List Index portrays a tree structure with the major items being leftmost in the index. The example below shows the Transmitter as the highest item in the tree structure. If you were to look at the bill of materials table for the Transmitter you would find the Control Cabinet, the PA Cabinet, and the Output Cabinet. In the Replaceable Parts List Index the Control Cabinet, PA Cabinet, and Output Cabinet show up one indentation level below the Transmitter and implies that they are used in the Transmitter. The Controller Board is indented one level below the Control Cabinet so it will show up in the bill of material for the Control Cabinet. The tree structure of this same index is shown to the right of the table and shows indentation level versus tree structure level.

Example of Replaceable Parts List Index and equivalent tree structure:

Replaceable Parts List Index

Table 7–1.	Transmitter	994 9283 001	7–2
Table 7–2.	Control Cabinet	992 9244 002	7–3
Table 7–3.	Controller Board	992 8344 002	7–6
Table 7–4.	PA Cabinet	992 9400 002	7–7
Table 7–5.	PA Amplifier	994 7894 002	7–9
Table 7–6.	PA Amplifier Board	992 7904 002	7–10
Table 7–7.	Output Cabinet	992 9450 001	7–12



The part number of the item is shown to the right of the description as is the page in the manual where the bill for that part number starts.

Inside the actual tables, four main headings are used:

Table #-#. ITEM NAME - HARRIS PART NUMBER - this line gives the information that corresponds to the Replaceable Parts List Index entry;

HARRIS P/N column gives the ten digit Harris part number (usually in ascending order);

DESCRIPTION column gives a 25 character or less description of the part number;

REF. SYMBOLS/EXPLANATIONS column 1) gives the reference designators for the item (i.e., C001, R102, etc.) that corresponds to the number found in the schematics (C001 in a bill of material is equivalent to C1 on the schematic) or 2) gives added information or further explanation (i.e., “Used for 208V operation only,” or “Used for HT 10LS only,” etc.).

Inside the individual tables some standard conventions are used:

A # symbol in front of a component such as #C001 under the REF. SYMBOLS/EXPLANATIONS column means that this item is used on or with C001 and is not the actual part number for C001.

In the ten digit part numbers, if the last three numbers are 000, the item is a part that Harris has purchased and has not manufactured or modified. If the last three numbers are other than 000, the item is either manufactured by Harris or is purchased from a vendor and modified for use in the Harris product.

The first three digits of the ten digit part number tell which family the part number belongs to - for example, all electrolytic (can) capacitors will be in the same family (524 xxxx 000). If an electrolytic (can) capacitor is found to have a 9xx xxxx xxx part number (a number outside of the normal family of numbers), it has probably been modified in some manner at the Harris factory and will therefore show up farther down into the individual parts list (because each table is normally sorted in ascending order). Most Harris made or modified assemblies will have 9xx xxxx xxx numbers associated with them.

The term “SEE HIGHER LEVEL BILL” in the description column implies that the reference designated part number will show up in a bill that is higher in the tree structure. This is often the case for components that may be frequency determinant or voltage determinant and are called out in a higher level bill structure that is more customer dependent than the bill at a lower level.

HARRIS Broadcast Systems Division
P.O. Box 4290, QUINCY, IL 62305

PARTS ORDER FORM

HARRIS PHONE: 217-222-8200
HARRIS FAX: 217-221-7096

BILLING INFORMATION

CUSTOMER NAME: _____

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

PREFERRED PAYMENT METHOD: _____

SHIPPING INFORMATION

SHIP TO: _____
(if different from billing information)

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

SHIPPING METHOD PREFERRED: _____

FREQUENCY (If required): _____

EQUIPMENT NAME: _____

EQUIPMENT PART NUMBER: _____

EQUIPMENT SERIAL NUMBER: _____

GUIDE FOR ORDERING PARTS

Please use the following parts order form, filling is as much information as possible. The complete informaiton will allow double checking the part number for correctness or locating a substitude if the part is not available.
The equipment name, part number, and serial number will be found on the metal ID plate on the back of the unit. The serial number MUST be included for any parts ordered under warranty.
Describe the part using the description in the parts list if possible. Include the schematic information, schematic number, or number of next higher assembly. The next higher assembly is usually a 992-xxxx-00x type.

ITEM #	QTY ORD	HARRIS PART NUMBER	DESCRIPTION OF PART (PART'S NAME, DESCRIPTION, SPECIFICATION FROM PARTS LIST IF AVAILABLE)	SCHEMATIC REFERENCE REFERENCE NAME (e.g. C001, R100, etc)	ITEM USED ON (NEXT HIGHER ASSEMBLY IF KNOWN) (e.g. C001 used on 992 8025 001, SCHEMATIC 839 8099 991)	COMMENTS

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY WARNINGS, INSTRUCTIONS AND REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as reference:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don’t take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

WARNING

IF OIL FILLED OR ELECTROLYTIC CAPACITORS ARE UTILIZED IN YOUR EQUIPMENT, AND IF A LEAK OR BULGE IS APPARENT ON THE CAPACITOR CASE WHEN THE UNIT IS OPENED FOR SERVICE OR MAINTENANCE, ALLOW THE UNIT TO COOL DOWN BEFORE ATTEMPTING TO REMOVE THE DEFECTIVE CAPACITOR. DO NOT ATTEMPT TO SERVICE A DEFECTIVE CAPACITOR WHILE IT IS HOT DUE TO THE POSSIBILITY OF A CASE RUPTURE AND SUBSEQUENT INJURY.

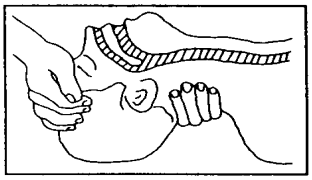
TREATMENT OF ELECTRICAL SHOCK

1. IF VICTIM IS NOT RESPONSIVE FOLLOW THE A-B-CS OF BASIC LIFE SUPPORT.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

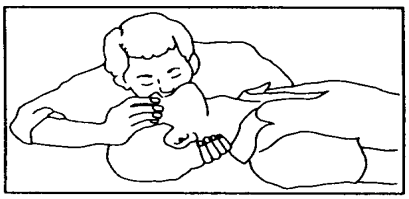
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

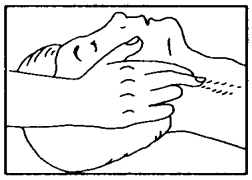
(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL BREATHING



TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL
4 QUICK FULL BREATHS
REMEMBER MOUTH TO MOUTH
RESUSCITATION MUST BE
COMMENCED AS SOON AS POSSIBLE

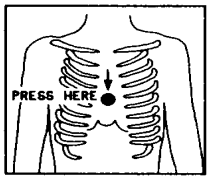
CHECK
CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

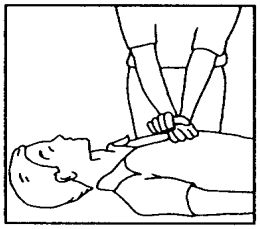
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



APPROX. RATE OF COMPRESSIONS --80 PER MINUTE
- ONE RESCUER
- 15 COMPRESSIONS
- 2 QUICK BREATHS

APPROX. RATE OF COMPRESSIONS --60 PER MINUTE
- TWO RESCUERS
- 5 COMPRESSIONS
- 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

CALL FOR MEDICAL ASSISTANCE AS SOON AS POSSIBLE.

2. IF VICTIM IS RESPONSIVE.

A. KEEP THEM WARM
B. KEEP THEM AS QUIET AS POSSIBLE
C. LOOSEN THEIR CLOTHING
D. A RECLINING POSITION IS RECOMMENDED

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is a brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin
   a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible.
   e. If arms or legs are affected keep them elevated.

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)
   a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
   c. Apply clean dry dressing if necessary.
   d. Treat victim for shock as required.
   e. Arrange transportation to a hospital as quickly as possible.
   f. If arms or legs are affected keep them elevated.

REFERENCE:

ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

Table of Contents

WARNING: Disconnect primary power prior to servicing.

1.1 Introduction

This section contains a general description, block diagram and specifications of a Harris VHF television exciter for broadcasting with NICAM sound. The exciter has provisions to furnish the proper IF signal to an external NICAM encoder. The channel one encoder output is used to modulate the main carrier IF signal. The second channel IF output is combined with the modulated channel one IF. The combined signals are linearity pre-corrected to reduce amplitude linearity and quadrature phase errors.

1.2 Equipment Description

The Harris VHF TV exciter is available in all CCIR standards including B, D, K1, M and N. Both the sound and vision exciters are included in a single package. All operator indicators are front-panel mounted for ease of operation. An analog and an LED digital display provides indications of exciter parameters (see Figure 1-1). Refer to the operations section for a description of the controls and indicators.

Isolated BNC connectors on the front panel allow monitoring of:

- Pre-corrected Video
- Vision IF Modulator
- Pre-corrected Vision IF

All internal circuitry is mounted on plug-in circuit boards with the exception of the two modular final amplifiers, and the power supply. A motherboard provides power and control connections, all RF and IF connections are coaxial. The mother board will accommodate 13 plug-in circuit boards. The meter and control circuit board mounts behind the front panel. The sound and vision final 1 watt amplifiers are mounted in the rear along with the power supply section.

Phase-locked loops in the vision as well as the sound circuits are stabilized from a single reference. Digital control circuits provide simple and precise user interface.

A flushing fan assures cool and reliable operation. The flow of the fan forces air between final vision and sound amplifiers and along side of the main power supply where the regulators are mounted. Cooling air exits on each side of the chassis and from the top cover after passing through the card cage where the plug-in circuit boards are housed.

The internal power supply allows operation from potentials in the 120-volt range as well as the 240-volt range, 50 or 60 Hz.

The unit mounts on slide rails for ease of adjustment. The majority of controls mounted on circuit boards are accessible from the top.

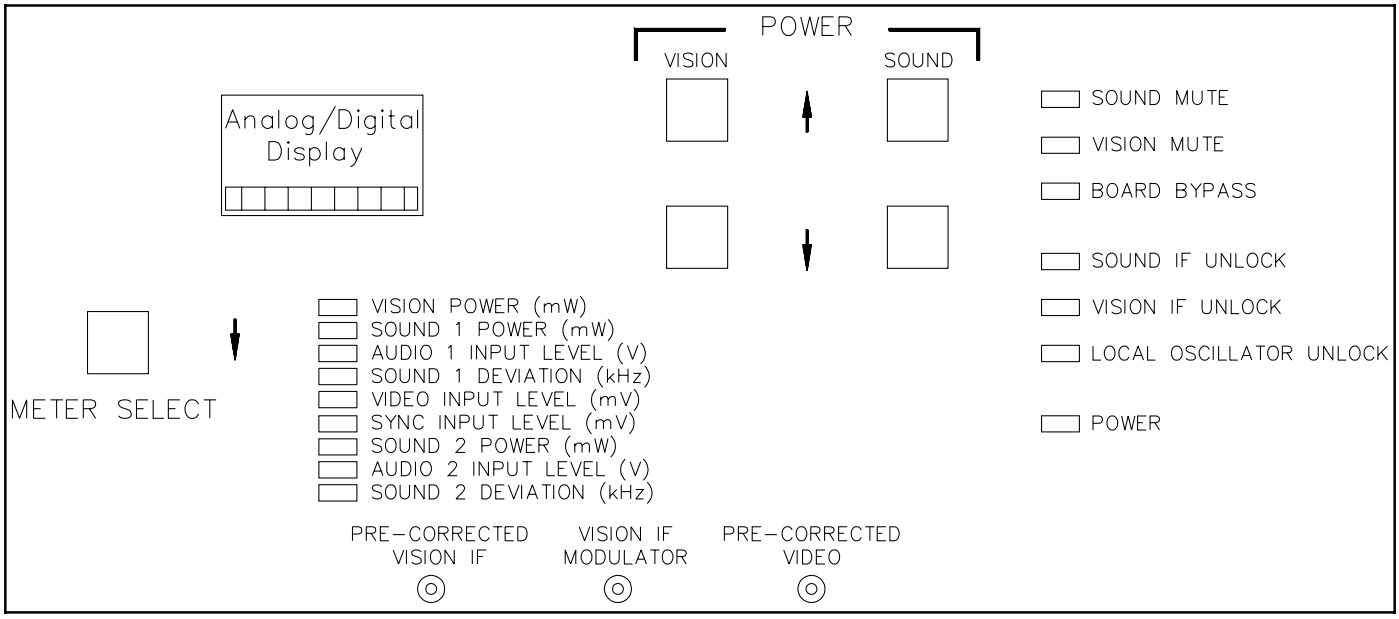


Figure 1-1. 839 8115 020

WARNING: Disconnect primary power prior to servicing.

Figure 1-2. Block Diagram

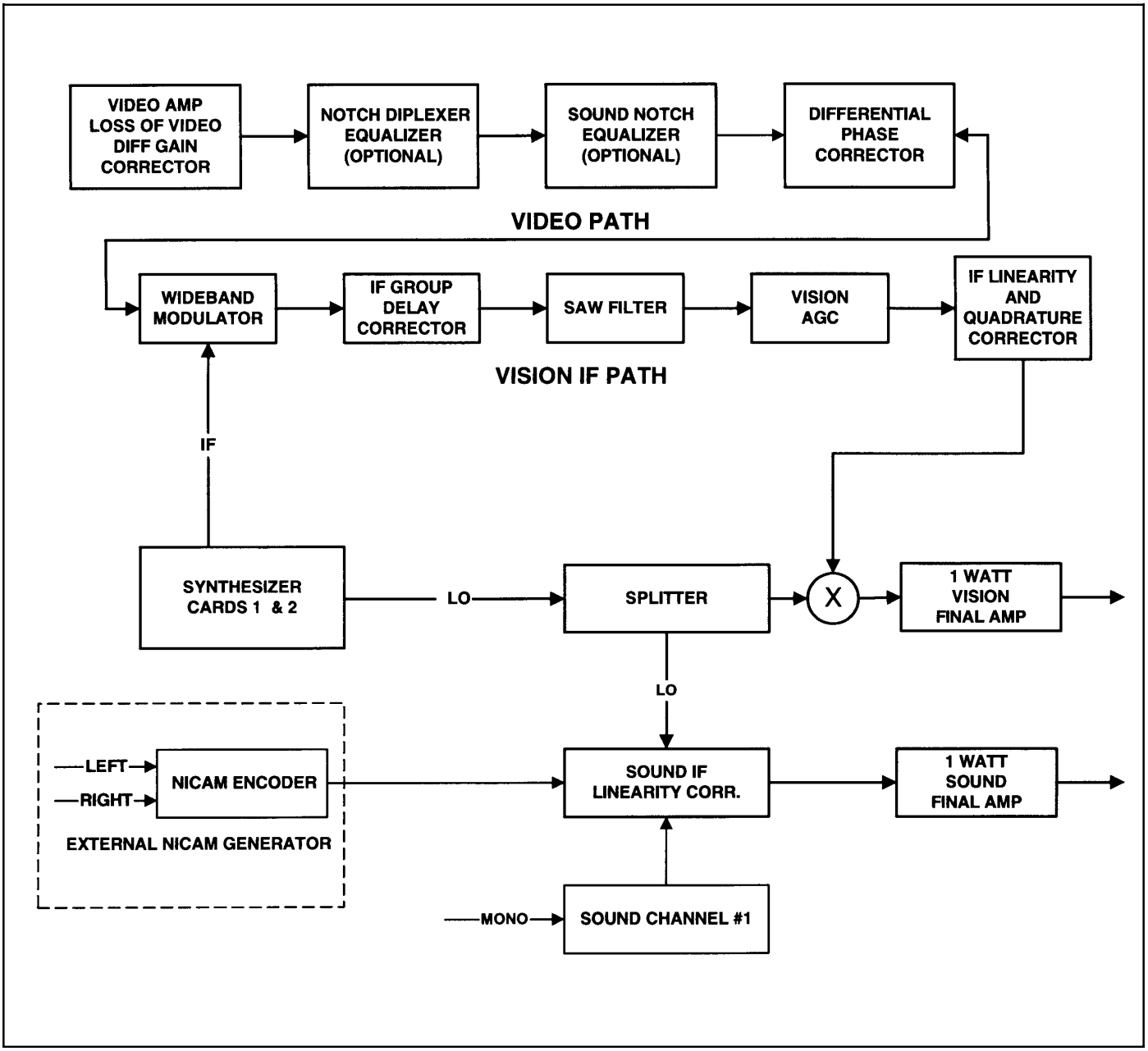


Table 1-1. Specifications

Service Conditions	
Ambient Temperature Range	0 to 50oC
Ambient Humidity Range	1 to 95% non-condensing
Altitude	Sea level to 10,000 ft (3000 m.)
Physical Dimensions	19" W x 22" D x 8.75" H
	487 cm W x 56 cm D x 22 cm H
Weight	51 lbs. (23 kgs.)
AC Mains	110/120 and 198/240 volts 50 or 60 Hz
Power consumption	150 VA

WARNING: Disconnect primary power prior to servicing.

2.1 Introduction

This section contains information required for installation and preliminary checkout of the VHF TV exciter.

2.2 Unpacking

The equipment becomes the property of the customer when the unit is delivered to the carrier. Carefully unpack the unit and perform a visual inspection to determine that no apparent damage has been incurred during shipment. All shipping materials should be retained until it has been determined that the unit was not damaged in shipment. Claims for damaged equipment must be filed promptly or the carrier may not accept the claim.

Each VHF TV exciter shipment consists of the following items in addition to the exciter:

- Technical Manual and drawing package
- Power cord (only with units sold separately)
- Exciter mounting hardware (only with units sold separately)

The contents of the shipment should be as indicated on the packing lists. If the contents are incomplete, or if the unit is damaged electrically or mechanically, notify the Harris Customer Service Department (Phone 217-222-8200) (FAX 217-221-7086)or at the following address:

Harris Corporation, Broadcast Division
P. O. Box 4290
Quincy, IL 62305
ATTEN: Customer Service Department

2.3 Installation in the Transmitter

The exciter is normally installed as part of a transmitter system.

WARNING

ASSURE POWER IS DISCONNECTED BEFORE PROCEEDING.

a. Assure power is disconnected before proceeding.
b. Set the unit on a work surface and remove any packing from the outside of the unit.

2.3.1 Input Power Selection

a. Measure the AC mains voltage for the exciter. If different from the tested voltage proceed with input power selection.

WARNING

ASSURE POWER IS DISCONNECTED BEFORE PROCEEDING.

b. Assure power is disconnected before proceeding.
c. Remove the top cover of the exciter and the cover of the power supply. Check the wiring to the ac terminal strip on the right hand side of the power supply. Refer to Exciter Power Supply schematic 839-7900-504 and assure that the exciter is wired for operation with the primary voltage with which the unit will be used (105 to 125 volt range or 210 to 250 volt range). A tag on the exciter indicates the voltage the exciter was set to when leaving the factory.
d. If the exciter purchased was part of a transmitter, extend both rails fully and lift the exciter onto the rails over the stops. Push the exciter fully into the rack.

2.3.2 Independent Exciter Mounting

The VHF TV exciter may be mounted in any convenient location in a 19 inch (48.3 cm) rack within reach of signal and power cables. The Exciter should not be mounted directly above heat generating equipment such as power amplifier stage, otherwise no special requirements need be observed.

a. Remove the sliding portion of each slide rail from the sides of the exciter.
b. Mount the front edge of each slide rail to its respective side of the cabinet with the hardware supplied.

CAUTION

ASSURE THE SLIDE RAILS ARE PARALLEL AND LEVEL BEFORE DRILLING MOUNTING HOLES IN THE RACK CABINET.

c. Assure the slide rails are parallel and level. Mark and drill holes for mounting the rear of each rail. Hardware is supplied for this purpose.
d. After the slide rails are mounted, extend both rails fully and lift the exciter onto the rails over the stops. Push the exciter fully into the rack.

2.3.3 Exciter Inputs And Outputs

Prepare cabling for the exciter inputs and outputs. The rear-panel connections available for use on the exciter are identified by Figure 2-1 and described by Table 2-1.

The only video input cable shield connection to ground is at the video input card. Jumper plug selection of a balanced or grounded shield is available for common mode rejection.

a. Set P2 to 2-3 for shield grounded or
b. Set P2 to 1-2 for balanced

AC or DC video coupling is selectable with jumper plug P3.

a. Set P3 to 2-3 for DC coupling or
b. Set P3 to 1-2 for AC coupling

2.3.4 Exciter Remote Control Connections

Prepare cabling for the exciter remote controller. The functions available are described by Table 2-2.

2.3.5 Circuit Boards

There are 13 slots in the motherboard for exciter circuit boards. J1 is the slot on the right side when the exciter is viewed from

the front. The circuit boards install in the sequence given in Table 2-3 with the component side to the left when viewed from the front.

Figure 2-1. Exciter Rear Panel

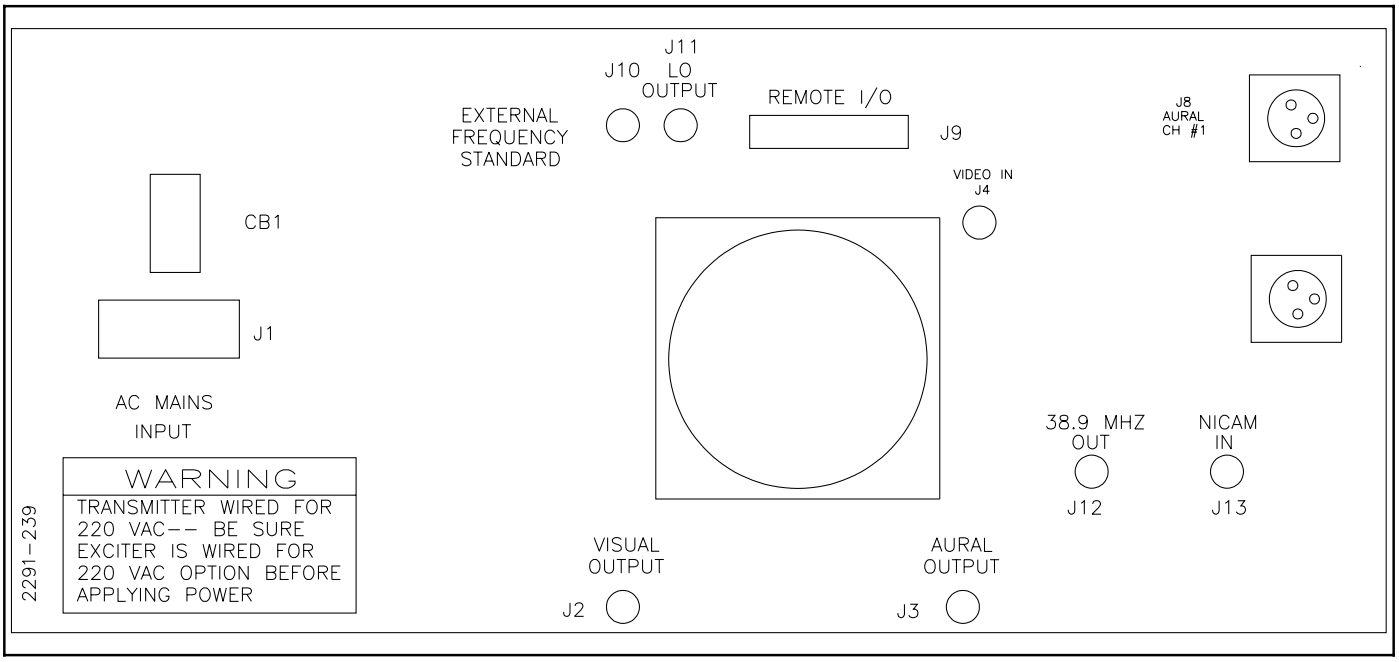


Table 2-1

Connector	Description
J-1	AC POWER
J-2	VISION RF OUTPUT
J-3	SOUND RF OUTPUT
J-4	VIDEO INPUT
J-8	SOUND CHANNEL 1
J-9	REMOTE I/O
J-10	EXTERNAL FREQUENCY STANDARD
J-11	LO OUTPUT
J-12	38.9 MHZ OUTPUT
J-13	NICAM IN

WARNING: Disconnect primary power prior to servicing.

Table 2-2

J9 PIN NO.	FUNCTION	SIGNAL
1	Vision power raise commmand	Active low
2	Vision power lower commmand	Active low
3	Sound power raise commmand	Active low
4	Sound power lower commmand	Active low
5	Sound mute command	Active low
6	Vision mute command	Active low
7	Vision power sample out	Proportional DC voltage
8	Sound power sample out	Proportional DC voltage
9	Vision muted status, open collector	Low = muted
10	Sound muted status, open collector	Low = muted
11	Vision unlocked status, open collector	Low = unlocked
12	Sound unlocked status, open collector	Low = unlocked
13	N.A.	
14	Voltage output, +15 volt DC 10mA maximum	
15	Vision VSWR foldback control voltage	
16	Sound VSWR foldback control voltage	
17-20	Unused	
21	Notch Diplexer Equalizer remote bypass	Low = bypass
22	Not Used	
23-26	GROUND	
27-37	Not Used	

Table 2-3

SLOT	CIRCUIT BOARD
J1	Video Processing/Differential Gain Corrector
J2	Notch Diplexer Equalizer (Optional)
J3	Receiver Equalizer (Optional)
J4	Differential Phase Equalizer
J5	Modulator/IF Delay Compensator
J6	VSB Filter/AGC
J7	IF Linearity/Quadrature Corrector
J8	Synthesizer #3 (Optional)
J9	Synthesizer #2
J10	Synthesizer #1
J11	Available for Option
J12	Sound Linearity Corrector
J13	Sound Channel 1

WARNING: Disconnect primary power prior to servicing.

3.1 Introduction

This section identifies all controls and indicators associated with the exciter.

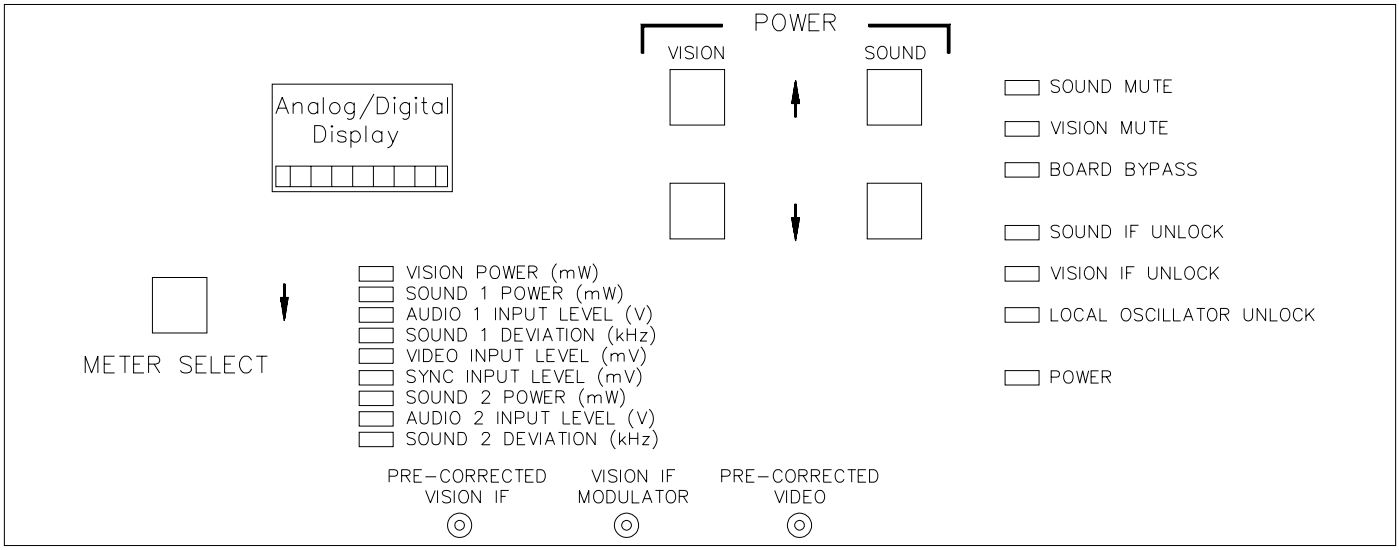
3.2 Control and Indicators

Refer to Figure 839-8115-020 for the location of all controls and indicators that are used for the day to day operation of the exciter. The function of each control and indicator is listed in Table 3-1.

The metering can be used to monitor exciter signals. The three BNC connections on the front can be used to monitor sample video and IF signals. The raise and lower switches are available for bench testing and may be used instead of transmitter switches.

3.3 Bench Testing

The exciter is completely self contained and may be tested on the service bench by applying the correct ac mains voltage.



839-8115-020

Table 3-1

ITEM	FUNCTION
TOP-Digital Multimeter	Digital display of meter reading
BOTTOM-Analog Bargraph	Analog of meter reading
Meter Select	Selects signal to be metered
Metering Indicator	Indicates signal being metered
PRE-CORRECTED VISION IF	Signal sample, IF corrector output
VISION IF MODULATOR	Signal sample, If modulator output
PRE-CORRECTED VIDEO	Signal Sample, modulator input video
Vision/Sound Power	Momentary switch to raise or lower
	Raise Lower exciter output power.
STATUS INDICATORS	
SOUND MUTE	Sound exciter is muted either internally (PLL failure) or externally by main controller
VISION MUTE	Vision exciter is muted either internally (PLL failure) or externally by main controller. Loss of video will also Vision Mute.
BOARD BYPASS	Indicates a correction circuit is in the bypass switch position
SOUND IF UNLOCK	Illuminated if AURAL PLL is unlocked
VISION IF UNLOCK	Illuminated if VISION PLL is unlocked
LOCAL OSCILLATOR UNLOCK	Illuminated if IF conversion PLL is unlocked
POWER	Illuminated when power is present

WARNING: Disconnect primary power prior to servicing.

4.1 Introduction

This section provides VHF TV exciter theory of operation. For purposes of discussion, the circuitry is divided into functional subassemblies in the following text. The main divisions will be:

- Vision Signal Path
- Aural/Sound Path
- Frequecy Synthesis
- Power Supply
- Exciter Control
- Exciter Chassis

Refer to the separately packaged block and schematic diagrams as required for the following description. All circuit boards plug into a mother board that provides interconnections between circuits.

4.2 Vision Theory Of Operation

The theory follows the signal flow of the vision section.

Refer to block diagram below.

4.2.1 Video Processing/Diff Gain Corrector Circuit Board

Refer to 839-7900-703.

The purpose of the video input circuit board is to accept a video input from an external source and provide proper level shifting, gain adjustment, and the drive required by the remainder of the exciter circuitry. This circuit board also contains a sync separator, sync timing circuitry, and generates the pulse which clamps the video signal to a zero-volt reference.

Two jumper selections at the video input determine whether the signal will be ac or dc coupled (P3) and if the input will be balanced or unbalanced (P2). DC coupled input is selected by

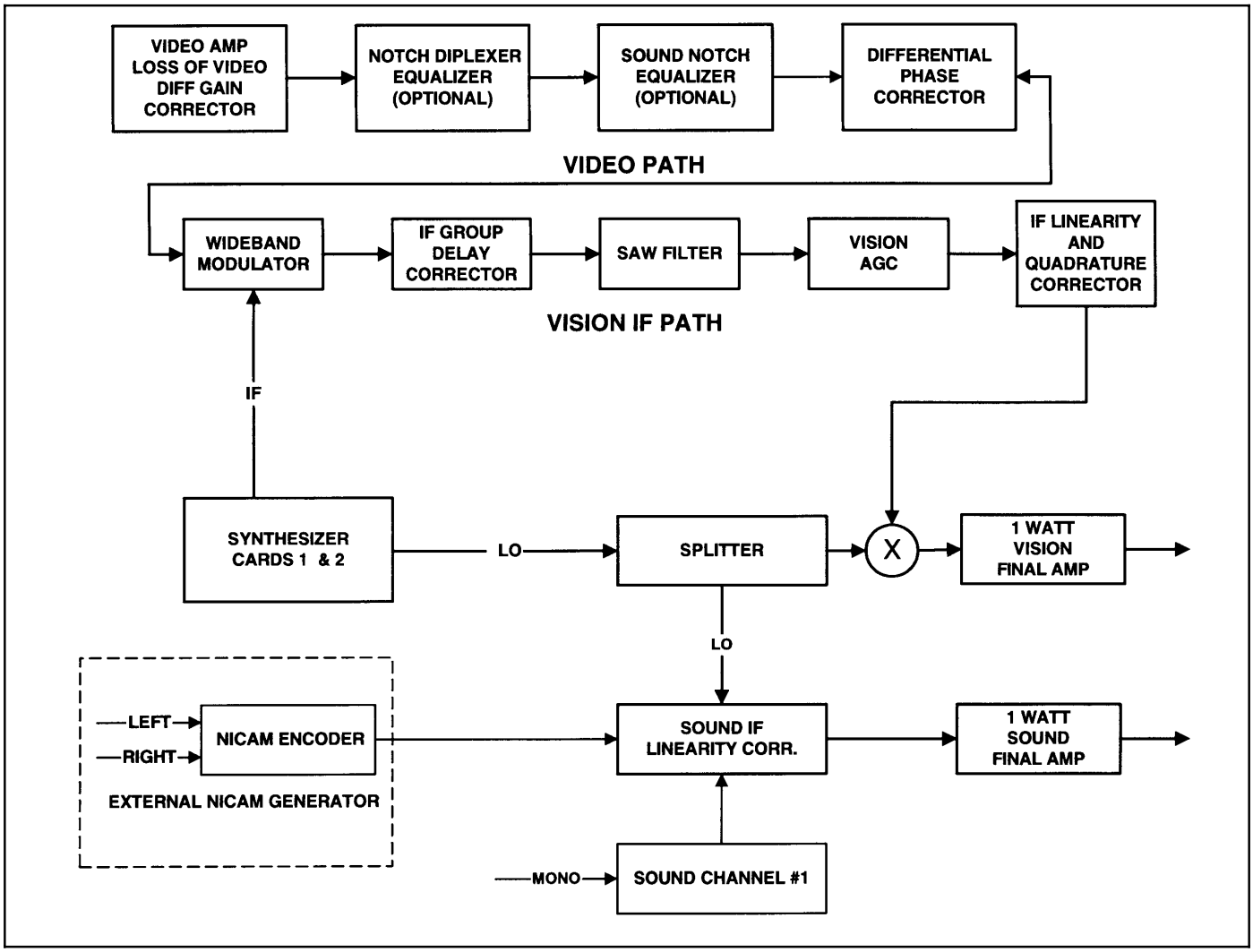


Figure 4-1. Block Diagram

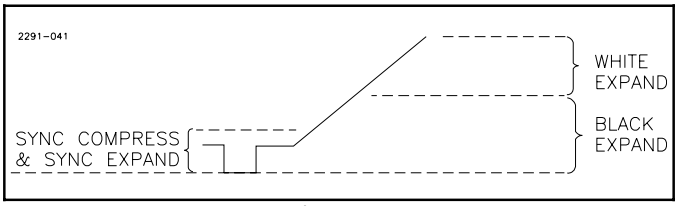


Figure 4-2

positioning P3 from pin 1 to pin 2 and ac coupled input is selected by positioning P3 from pin 2 to pin 3. An unbalanced input is selected by positioning P2 from pin 1 to pin 2 and a balanced input is selected by positioning P2 from pin 2 to pin 3.

Input video is supplied directly to differential video amplifier U1. The amplifier configuration provides rejection of common-mode interference. There are two outputs from this stage. One output feeds the video circuitry and the second output feeds the sync separator.

4.2.1.1 Video Path

The video path output from U1 feeds two emitter-follower buffer stages (Q6 and Q7). R18 at the input buffer Q7 adjusts the video gain. The output of Q7 is applied to FET Q9A/B which forms a high input impedance source follower. At the gate to Q9A, L1 and R22 are connected in parallel. This circuit presents a high impedance to chroma. During the color burst, clamping occurs at this point via Q8 which places the gate of Q9A at zero volts. The output of Q9A/B is routed to the emitter-follower Q17 the input to the Gain Corrector.

4.2.1.2 Video Gain Corrector

The Video Gain Corrector provides pre-correction for differential gain distortion introduced elsewhere in the transmitting system.

The clamped 2V p-p video signal from the output of Q9 A/B is applied to emitter follower Q17. Q17 provides voltage offset and temperature compensation for the base-emitter voltage of Q18. Q18 is a common emitter amplifier whose gain is set by the ratio of the collector resistance (R67) and the emitter resistance. With the DIFF GAIN switch S1 in the OUT (Bypass) position, R70 is connected to the emitter of Q18 producing voltage gain of approximately one.

Differential gain correction is provided when the DIFF GAIN switch S1 is set to the IN (Not Bypassed) position and the emitter of Q18 is connected to correction diodes CR13, CR14, CR15, and CR16. When one of the correction diodes becomes forward biased by the video signal, the emitter resistance of Q18 is decreased and the gain of the stage increases. Transistors Q20, Q21, Q22, and Q23 are the voltage sources for the correction diodes. The voltage outputs, adjusted by potentiometers R84, R89, R95, and R101 determine the turn on point of each correction diode. The sync expand diode CR13 provides a fixed amount of gain increase when it becomes forward biased. Potentiometers R92, R98, and R104 provide a variable amount of gain when the Black Expand and White Expand diodes turn on.

Normally, the SYNC COMP switch S2, when in the OUT position, connects the emitter of Q18 to R71. When sync compression is required the switch is in the IN position and CR12 is connected to the emitter. CR12 becomes forward biased and the gain of Q18 is determined by the effective emitter resistance of R69 and R72. To compress the sync region of the video signal, potentiometer R80 is adjusted so that CR12 is turned off during sync intervals. The gain of Q18 then is lowered and sync amplitude is decreased. Sync compression also intrudes slightly into the Black Expand area of the video signal as shown in Figure 4-2.

The video signal from the collector of Q18 is inverted by Q24 and applied to clamp driver transistor Q25. Q24 has a gain of approximately one and capacitor C38 provides high frequency compensation. The clamp circuit and the output source follower Q27 operate the same as the similar circuit of the video path amplifier. The video output from Q27 is routed through emitter-follower buffer Q10 and current source Q11 which drive the off-the-board circuitry.

4.2.1.3 Sync Path (Clamp Generator)

The sync path output from U1 is fed to emitter-follower Q12 which drives voltage amplifier U2. Diode CR1 at the output of U2 is used to clamp the peak-of-sync to ground. The output of comparator U3 will go HIGH each time sync occurs and therefore functions as the sync separator device. U4A and U4B at the output of U3 are multivibrators which delay the sync pulse which occurs at leading edge of sync to the back porch region of the signal. Q13 and Q14 provide level-shifting and amplitude adjustment of the sync pulse. Q15 is an emitter-follower which drives the video clamp (Q8) and provides a sync pulse for off-the-board circuitry.

4.2.1.4 Video Metering

The positive sync video at the output of source follower Q29A/B is coupled to U9 and U10. The first section of U9 is a precision negative rectifier. Next is a unity gain buffer that drives an output amplifier, the gain adjust is used for calibration of the metering. The time constants are in accordance with industry standards and will indicate the correct level of the highest white, even the white bar in VITS.

The first section of U10 is a precision positive rectifier. In like manner the next sections buffer and amplify the dc for metering the sync level.

4.2.2 Video Group Delay Equalizer

Notch Dip/Rec Eq Bd - 992-8527-001

Refer to 839-7994-080

Block Diagram-Sheet 1
Normal and Bypass Switching-Sheet 2
Delay and Response Correction-Sheet 3

4.2.2.1 Functional Description

This equalizer can be used to correct the group delay of a notch diplexer. Another use is to generate the needed receiver equalization when the saw filter is not designed to provide the correc-

WARNING: Disconnect primary power prior to servicing.

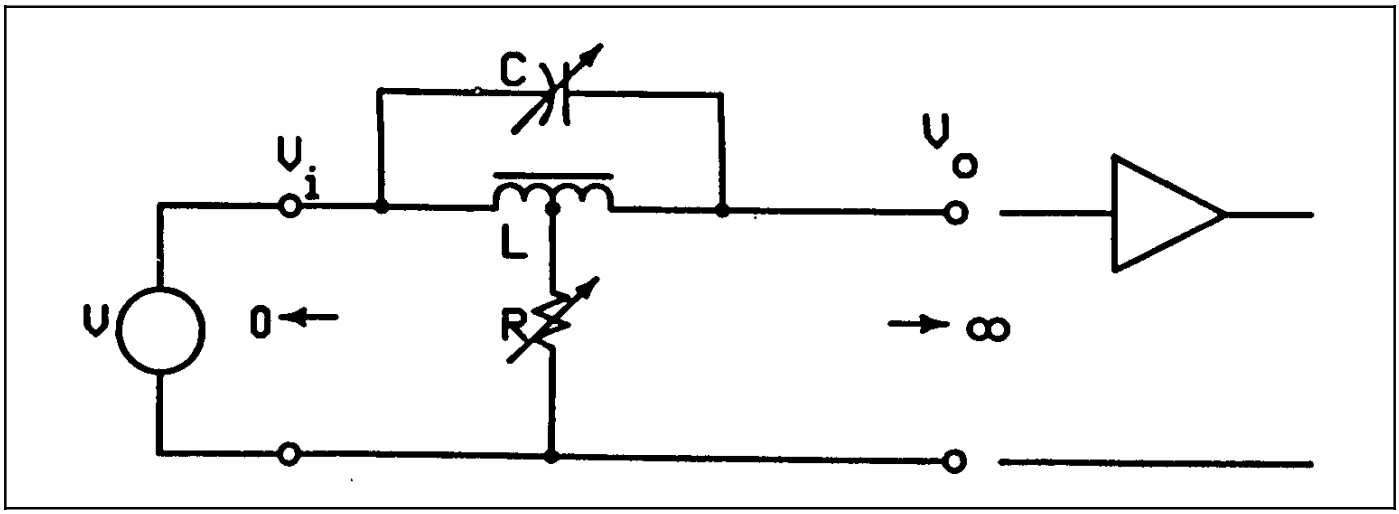


Figure 4-3

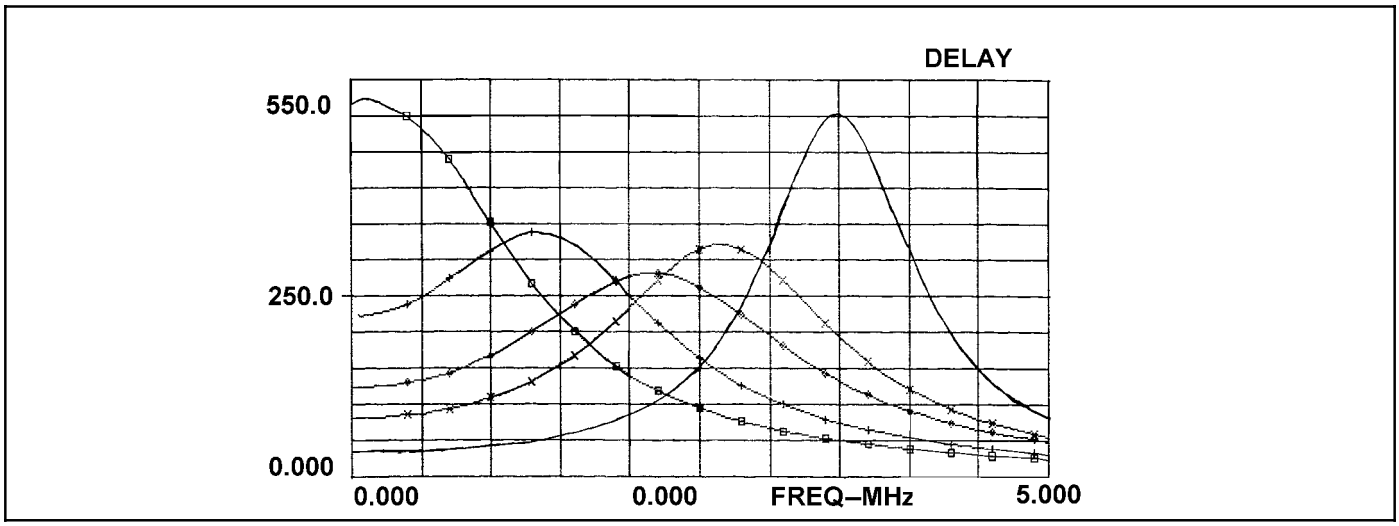


Figure 4-4

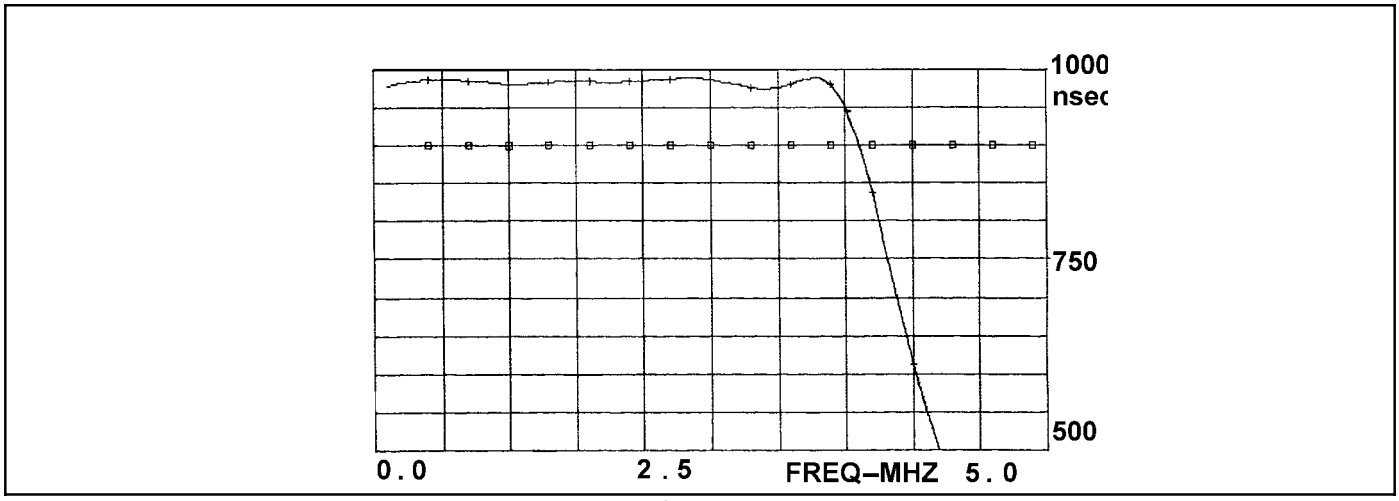


Figure 4-5

WARNING: Disconnect primary power prior to servicing.

tion. In some transmitters two equalizers are needed, one for each type of correction.

The term allpass defines a network which has a changing phase characteristic, with a flat amplitude response. The action of an active allpass can best be explained using a simplified schematic Figure 4-3. This network has a second order delay response and needs only two adjustments, frequency (variable capacitor) and Q (variable resistance). The circuit is ideally driven by a voltage source and drives a load of infinite impedance. This is easy for op-amps with their infinite input and low output impedance.

Figure 4-4 shows the individual delay of each of the four sections and Figure 4-5 shows the combined delay.

4.2.2.2 Video Input and Output Circuitry

The input video is applied to two switchable op-amps U1 and U2. In the bypass mode, the U1 is switched on and the incoming video is buffered and drives the output. The switching and indicator drivers are Q1 through Q4. In the bypass mode, U1 is enabled, U2 and U9 are disabled. In the normal mode U1 is disabled and U2 and U9 are active.

4.2.2.3 Group Delay Sections

Each of the 5 delay sections consists of an op-amp stage. The frequency of the delay is set by the resonant frequency of the input tapped inductor and parallel capacitors. The Q is adjusted by the resistance from the tap of the input coil to ground. U8 is a buffer that drives U9 and the response correction sections U10-U13.

4.2.2.4 Response Correction Circuitry

The response correction sections have a correction amplitude adjustment at the input to the op-amp. The frequency of correction is determined by the series LC output section. The Q is controlled by the shunt Q ADJUST resistor.

The delay correction and amplitude correction signals are summed at the negative input of U9.

4.2.3 Differential Phase Corrector

Refer to 839-7900-490

4.2.3.1 Functional Description

The purpose of the differential phase corrector is to correct transmitter distortions of the color sub-carrier phase with luminance level. It operates at video and predistorts the color phase.

The differential phase corrector consist of a first order all pass network which provides a phase characteristic without disturbing the amplitude response. A clamp pulse generator and clamping circuits are provided to maintain blanking level.

4.2.3.2 Detailed Description

The all pass network consists of two video paths 180 degrees out of phase. The out of phase signals are summed together in a RL network. The ratio of L to R determines the resultant phase. By changing the value of R with video luminance the corresponding phase is changed.

The input video is applied to a back porch clamp consisting of C45 and Q13. Clamping is done during back porch. L3 presents a high impedance to sub- carrier to prevent distortion due to the clamp pulse. A dual JFET Q14 provides a high impedance to the clamp and a low impedance output.

U1 form a differential amplifier and generates the two video paths which are 180 degrees out of phase. Q6 is a current source for the differential amp and also provides bias stabilization. R4 and C1 set the amplifiers frequency response and are set for a flat response. C48 equalizes the two 180 degree outputs for symmetrical response and is set for minimum interaction between differential phase and gain. Q1 and Q2 buffer the two video paths and provide a low impedance drive for the all pass network.

L2 and R17 form the basic all pass network. The two video paths are summed together and buffered by Q3. R17's value is modified as a function of luminance level and creates the desired correction shape.

A Schotky diode network is used to change R17;'s value with luminance level. An adjustable reverse bias (Threshold) is applied to the diode. As the video level increase it will eventually exceed the diode's bias and the diode will become forward biased. When this happens the diode acts as a switch and places an adjustable resistor (Slope) in parallel with R17. There is a total of five diode networks to allow precise correction of differential phase.

The output of the allpass network is passed through a second clamp consisting of C14 and Q4 and buffer amp Q4, it is then applied to the output amplifier.

The output amplifier consists of Q7, Q8 and Q15 provides a 75 ohm drive impedance for the output of the card and for the monitor output connector.

4.2.3.3 Monitoring Circuits

The Output from Q15 is available for monitoring of precorrected video at the BNC connector on the exciter front panel.

4.2.3.4 Clamp Circuitry

Clamp pulses are generated by a sync separator and are timed to coincide with back porch and level shifted to provide back porch clamping to 0 Vdc. U1 provides a inverted video output to drive the clamp pulse generator. Q9 and U4 amplify the inverted video signal to approximately 10V peak to peak. U4 is also band limited by C27 such that sub-carrier is suppressed and only luminance passes. CR11 provides rough peak sync clamping to 0Vdc. U5 is a high speed comparator and separates sync from the band limited video. U6 provides a time delay to correctly position the clamp pulses during back porch. Q10 and Q11 offset the clamp pulse to correctly bias the clamping FETs Q5 and Q13.

4.2.4 Modulator/Delay Compensator Board

Refer to 839-7900-705 (sheet 3)

4.2.4.1 Modulator Circuit

4.2.4.1.1 Functional Description

The Modulator printed circuit uses a double balanced mixer to perform modulation of the IF carrier by the video signal from the Amplifier board. In addition to the mixer, the board contains amplification circuits and a frequency response equalization network.

WARNING: Disconnect primary power prior to servicing.

4.2.4.1.2 Detailed Description

The output signal from the IF Oscillator is applied to the Modulator input jack J1. Since the signal level from the oscillator ranges from 150 to 300 mV rms, the IF Drive potentiometer R1 is used to adjust the level supplied to amplifier Q1. The voltage gain of approximately 4 is determined by the ratio between R5 and the effective impedance at the collector of Q1. This impedance is the parallel combination of R4 and the impedance reflected back to the primary of T1, which is a 4:1 stepdown rf transformer. The output from Q1 and T1 provides the drive signal for the L (pin 3) and L' (pin 1) ports of the mixer U1.

Assuming perfect balance of the mixer diodes and transformers, there will not be an IF output when there is no current input to the X port (pin 5). The Modulator Balance potentiometer R37 is adjusted to cancel any output caused by slight inherent mixer imbalance. The IF output from mixer port R (pin 6) is proportional to the current flowing into the X port (pin 5). Consequently, the video signal amplitude modulates the IF signal. To provide the correct modulation depth, some current must be added to the video signal. The Modulator Bias potentiometer R12 adjusts this current offset to provide the proper modulation depth. The Video Drive potentiometer R10 adjusts the amount of video signal current to the modulator.

The modulated output from the mixer U1 and the Modulator Balance potentiometer R37 are summed in the emitter of the grounded base amplifier Q2. The gain of approximately two is determined by the ratio of the emitter input resistor R16 and the collector impedance. The signal from R37 is added at the low impedance point at the emitter.

A frequency response equalization network is inserted between Q2 and Q3. Capacitors C10 and C11 control the frequency of this series resonant circuit and R20 controls the Q. R40 serves as a slope or tilt control. This permits correction for slight frequency response deviations elsewhere in the exciter circuits. A second harmonic trap, L3 and C12 or C13, is inserted at the input to the common base amplifier Q3. The signal is amplified six times and applied to emitter follower Q4 The output is routed through jumpers at P1 to test jack J2 or to the delay compensator circuit.

4.2.4.2 Monitoring

The response corrected If is sampled by a directional coupler before delay correction. This sample is attenuated and then amplified by U2 and U3. The sample level is a nominal +7 dBm. This smaple is cabled to a BNC connector on the front panel labled MODULATED IF SAMPLE.

4.2.4.3 Delay Compensator Circuit

Refer to 839-7900-705 sheets 1 and 2

4.2.4.3.1 Functional Description

The Delay Compensator board contains two identical active allpass networks in cascade. An allpass network has the characteristic of flat amplitude response and nonlinear phase response. Since group delay is a result of nonlinear phase shift, an allpass network corrects group delay in the transmitter by providing compensation at certain frequencies. Delay errors caused by the notch diplexer (if used) are corrected by the notch diplexer equalizer.

In an active allpass network the signal is split into two paths: a narrow band path and wideband path. The narrow band path is a series tuned circuit with variable Q and frequency controls for adjustment of the amount of group delay correction and the frequency at which it is applied. The wideband path has only an attenuator and fixed phase shift network. For proper allpass operation, the signals must be combined at the output such that the narrow band signal is 6 dB greater and 180 degrees out-of-phase at the resonant frequency of the tuned circuit.

4.2.4.3.2 Detailed Description

The signal is applied to the allpass network through P1-1 and is split into two paths. In the narrow bandpath, emitter follower Q101 provides isolation and power amplification to drive the series resonant circuit of C109, C111 and L105. The Q is determined by the parallel combinations of R145, R147, R149, and R151 selected by the 16 position switch S103. L109, L115, C139 and C122 is a variable phase shift network providing the proper phase relationship between the two signal paths. BALANCE potentiometer R105 is used to obtain the proper amplitude relationship between the two paths. In the wideband path, the signal passes through a fixed phase shift network C103, L101 and C107, and a fixed attenuator R117, R119 and R121. The two signals are combined in T101. The secondary of T101 is the vector difference of the two signals applied to the primary.

When the BYPASS toggle switch S101 is set to the IN position, Q101 receives collector voltage, and PIN diode switches CR101 and CR103 are supplied current to turn them on. When S101 is set to the OUT position, Q101 and CR103 turn off blocking the narrow band path signal. CR101 is also turned off to compensate for a small gain change in the BYPASS mode. The signal still passes through the wideband path, but no group delay compensation is provided by the narrow band path. Q103 is a common base amplifier with a voltage gain of approximately nine to compensate for the loss in the allpass section. The output of the first allpass network is applied to the second network through emitter follower Q105.

Q102, Q104 and Q106 make up the second allpass network. The output of this section and the output of the Modulator/Delay Compensator board are applied to output jack J3.

4.2.5 VSB/AGC Board

Refer to system dependant drawing:

CCIR M 839-7900-491 37 MHz

CCIR B 839-7900-663 38.9 MHz

Other systems can be found in the appropriate drawing package

4.2.5.1 Vestigial Sideband Filter Circuit

The purpose of the vestigial sideband filter circuit board is to provide frequency response shaping that is required in television. This is accomplished in filter FL1 which is a surface acoustic wave device.

In CCIR-M and some other systems the filter also provides the receiver delay equalization.

The video IF signal is input through capacitors C1 and C2. The VSB IN/VSB OUT switch allows switching the VSB filter in or out of the circuit. When the switch is set to VSB IN, the signal

path will be through CR1. When the switch is set to VSB OUT, the signal path will bypass the VSB filter.

4.2.5.1.1 VSB Signal Path

The signal through C1 and CR1 is applied to gain stage Q5 which provides approximately 15 dB of gain to overcome half the 30 dB loss in filter FL1. The signal is inductively coupled from Q5 to emitter-follower Q6. Resistor R23 establishes a 51-Ohm input impedance for filter FL1. The signal is coupled into FL1 by capacitor C16.

The output of the filter is coupled through C10 and applied to gain stage Q3 which provides approximately 15 dB of gain to overcome half the 30 dB loss in filter FL1.

4.2.5.1.2 Bypass Path

When the VSB OUT/VSB IN switch is set to VSB OUT, transistors Q1 and Q2 will bias diode CR2 on and bias diode CR1 off. The signal path will bypass the VSB filter. The arrangement of R6/R7/R8 in the bypass path is a variable attenuator which allows adjustment of the signal level from the bypass path to the same level as the output from the VSB filter path so that a level shift does not occur when the filter is switched in or out.

4.2.5.2 AGC Circuit (Visual)

Refer to drawing 839-7900-491

The visual exciter power is controlled by the IF AGC circuit.

Control voltage from the metering and control board is applied to the + input of comparator U101A. Detector input from the visual amplifier provides the - comparator input through buffer U101B.

In AUTO mode the output of U101A controls the attenuation through a voltage divider formed by PIN diode CR101 and R107. Attenuation is variable from 1 to approximately 40 dB. R116 provides adjustment of the AGC range by limiting the maximum current applied to CR101.

In MAN (manual) mode the control voltage is routed directly to the gain control circuit,and is used for trouble shooting purposes only.

Emitter follower Q101 provides isolation and low impedance drive. Q102 provides 10-11 dB of gain. The net gain of the AGC section is 9-10 dB with CR101 fully turned on.

4.2.6 Linearity/Quadrature Corrector Board

Refer to 839-7900-704

4.2.6.1 Functional Description

The purpose of this circuit board is to adjust the carrier phase and gain as a function of the video level. As the transmitter power output level increases, the amplitude of the signal will compress and the phase of the signal will shift. This circuit board will pre-distort the IF signal to compensate for the shift in phase and amplitude caused by the power amplifiers. The IF Linearity section predistorts the positive and negative cycles of the IF for linearity correction. A similar process in the ICPM section distorts the signal that is in phase quadrature to the linearity signal. The ICPM corrected IF when vector summed with the linearity signal will cause a phase shift as a function of amplitude to cancel the carrier phase shift in the following RF amplifier stages.

4.2.6.2 IF Linearity Corrector

IF Linearity Corrector Circuit

4.2.6.2.1 Functional Description

Refer to sheet 1 of 839-7900-704

It is advantageous from the viewpoint of performance to perform differential gain correction on the IF signal instead of the video signal. The correction circuit uses diodes which are biased to turn on at a variable dc voltage level.

The signal is normally attenuated a fixed amount by using a resistive L-pad. The diodes are normally reverse biased by equal, but opposite polarity, dc voltages. Reducing the dc voltage amplitude permits the diodes to conduct on the signal peaks. This inserts additional resistance in parallel with the series arm of the L pad thereby decreasing the attenuation. Varying the resistance in series with the diodes provides for a variable gain expansion.

4.2.6.2.2 Detailed Description

The input signal is applied through input jack J1 to the 90 degree splitter. One output will be routed by jumpers at E1-4 to the Quadrature Corrector the other output to the Linearity Corrector circuit. Transistor amplifier pair Q1-Q2 amplifies the signal 10 times (20 dB). Q2 is a low impedance emitter follower which drives the initial gain network, CR1 through CR4. Threshold controls (TH1 and TH2) potentiometers R37 and R38 determine the turn on points of the diodes while slope controls (SL1 and SL2) potentiometers R10 and R11 vary the amount of gain expansion or compression achieved during the on period of the diodes. U1A and U1B are unity gain inverting amplifiers, with buffer amplifiers, to provide the opposite polarity dc voltage for biasing of the diodes. The 10 uH inductors, shunted by 2k ohm resistors, isolate the IF signal from the dc circuits. Diode CR9 compensates for temperature drift in CR1-CR8. Jumpers P3 and P2 are provided in both gain networks to allow either expansion or compression functions.

Transistors Q3 and Q4 amplify the signal approximately 8 dB before it is applied to the second expansion network. Threshold controls TH1, 2, and 3 are used to adjust the differential gain in the white to black region, while TH4 adjusts the sync amplitude.

The signal is applied to output through emitter follower Q5, matching resistor R28, and lowpass filter consisting of capacitors C22 and C23 and inductor L9. Jumpers at P6 route the output to the Quadrature Corrector or the test output J4. The linearity correction circuit may be bypassed by setting the toggle switch S1 to the Bypass position.

4.2.6.3 ICPM Corrector

Refer to sheet 2 of 839-7900-444

The gain expansion circuits of the Quadrature Corrector are identical to the Linearity circuit. Signals from the linearity and quadrature circuits are summed together by R162 and R159.

The two signals are 90 degrees apart in phase and the signal from the linearity circuit is much larger due to the low resistance of R162 (16 ohms) compared to R159 (100 ohms).

The resulting output is the vector sum of these two signals. A change of gain on the linearity side produces gain correction with only small change in phase of the sum vector. A change in gain on the Quadrature side produces change in phase of the carrier with little change in the magnitude of the vector sum.

Q106 has approximately 6 dB of gain. The output at J3 feeds the visual mixer.

The Quadrature Correction may be bypassed by setting switch S101 to bypass (out).

4.2.6.4 Monitoring Circuitry

The output of the correction circuitry is sampled with a directional coupler, amplified by U103 and U104. This sample is available on the front panel at the PRE-CORRECTED IF SAMPLE jack.

4.3 Vision Upconversion

The vision IF is up-converted in the mixer by a local oscillator whose frequency is the sum of the desired output and the IF frequency. The output is bandpass filtered before it is aplified by the final amplifier.

4.4 RF Output Amplifiers

4.4.1 1 Watt Final Amplifier

Final Amplifier - 992-8328-001

Circuit Board - 992-7093-001

Refer to schematic 839-7900-023

4.4.1.1 Functional Description

The exciter houses two identical class A final amplifiers. One amplifier is used for the sound output and one amplifier is used for the vision output. The jumper plug P1 is placed between 1 and 2 for sound service and between 1 and 3 for vision service, dual carrier sound or Nicam sound. This plug routes the control voltage to the input attenuator for single carrier sound AGC.

4.4.1.2 Theory Of Operation

4.4.1.2.1 RF Path

RF is input to J1 and applied to gain stage U3 through a capacitor C31. The gain of this stage is 18 dB. The output of this stage is attenuated by a pad consisting of pin diodes CR2, CR3, and CR4. These diodes function as current-controlled resistors. Regulator U5, R1 and CR1 form a bias network for the diodes. When the jumper plug is in the 1-3 position, the fixed diode current reduces the attenuation to the 3dB minimum value. If the jumper plug is in the 1-2 position, the AGC amplifier controls the attenuation.

After signal attenuation by the pad, the signal is then divided into two equal paths by HY1 and each path is amplified again by a 35 dB amplifier (U1 and U2). The signal is then re-combined by HY2 to the 1-Watt power level. The signal output is through a directional coupler with a -10 dB sample port.

4.4.1.2.2 RF Sample Detection

The sample from the directional coupler located in Final Amp is applied to peak detector CR5. The DC output of CR5 will be proportional to the RF output through the directional coupler. This DC potential is applied to buffer U4C.

As diode CR5 becomes warmer with operation, it will increase conduction. This temperature effect is overcome by use of a second diode, CR6, which is of the same type as CR5 and is mounted adjacent to CR5. The potential from CR6 is applied to buffer U4D.

The voltage from U4D is subtracted from the voltage from U4C at the input to summing amplifier U4A. The output is a voltage which remains proportional to the RF output through the directional coupler, but is now compensated for temperature variations.

4.4.1.2.3 AGC Loop (Vision)

The voltage at U4 pin 1 is now routed to the VSB/IF AGC as DETECTOR INPUT where it is the sample input to the AGC differential amplifier U101. Final amplifier attenuation is fixed at minimum.

4.4.1.2.4 AGC Loop (Single Carrier Sound)

Comparator U4B compares the potential from U4A pin 1 on the non-inverting input to a power control input potential on the inverting input which is generated on the metering and control circuit board. This potential is used as a reference to adjust the output level from U4B. This potential adjusts automatic gain control loop of the sound 1 watt amplifier circuit by varying the resistance of the RF interstage pad.

4.4.1.2.5 AGC Loop (Dual Carrier Sound)

The RF power sample DC voltage is routed to the Aural Linearization card as the sample for the AGC differential amplifier U1. Final amplifier attenuation is fixed at minimum.

4.4.1.3 Alignment

There are no adjustments except the change in jumper position that determines the AGC operation. Replacement of the unit may also require realignment of the AGC or the set-up of exciter power limits.

4.5 Frequency Syntheses

4.5.1 VHF Synthesizer Card 1

Refer to schematic 839-7900-528 and Figure 4-6.

4.5.1.1 Circuit description

The VHF synthesizer card 1 performs two basic tasks:

a. Creates all the reference frequencies used by the phase locked loops from on board 10MHz standard or an externally applied 5 or 10MHz PFC input.

b. Creates IF frequency for the modulator of 37MHz for system M or 38.9MHz for system B.

4.5.1.2 Detailed Circuit Description

4.5.1.2.1 10MHz Generation

10MHz is the main reference frequency used by the synthesizer. Used to create all other reference frequencies. The 10MHz has two primary sources, the on board OCXO or the PFC input. On board detection circuits sense the presence of a PFC input and automatic switching is used to select the appropriate 10MHz signal.

PFC input of either 5 or 10MHz applied to J5 is buffered by Q4 and amplified in a class C amplifier Q5. The output of this class C amp is rich in harmonics. A tuned circuit consisting of C20 and L1 and a series tuned 10MHz crystal Y1 selects the 10MHz harmonic. The level of 10MHz is detected by CR5 and compared by U3. If there is sufficient 10MHz level U3's output goes low and drives a PFC indicator DS1. U3 also drives a switchable 15V voltage regulator. When PFC is present the regulator is shut down and consequently shuts down on board 10MHz OCXO Y4. If there is an insufficient level of the PFC input, then U3 will select on board 10MHz OCXO Y4 by powering up the switchable voltage regulator U1, which in turn powers up the OCXO. The actual selection of the 10MHz signal, be it either the PFC input or on board standard, is performed by U4 configured as a SPDT switch. The output of this switch is the primary 10MHz signal and used to create all other reference frequencies.

4.5.1.2.2 5MHz Generation

The primary 10MHz signal from U4 is distributed by a buffer U5 to other parts of the card. One output is applied to J3 for future use. A second output is divided by 2 in U6 to create a 5MHz reference frequency and is applied to J1. The third output creates the 800kHz reference frequency.

4.5.1.2.3 16MHz Generation

10MHz from U5 is divided by 5 in U7. The output of U7 is a 20% duty cycle pulse train at 2MHz. This pulse train has high harmonic content. A tuned circuit consisting of L4 and C26 and a series 8MHz crystal Y2 selects the fourth harmonic or 8MHz. The 8MHz signal is full wave rectified or doubled by U8 to create the 16MHz reference frequency. Tuned circuit L5 and C28 and a series tuned 16MHz crystal Y3 performs further filtering of the 16MHz. The 16MHz signal is buffered by U9 and applied to J4.

4.5.1.2.4 800kHz Generation

A second output of the 8MHz signal is buffered by U9 and then divided by 5 in U10 to create 1.6MHz. This 1.6MHz is divided by 2 in U6 to obtain 800kHz and is then applied to J2.

4.5.1.2.5 IF Generation

A PLL generates the IF carrier for the modulator. This PLL uses a mixing technique where the VCO frequency is mixed with a harmonic of the 10MHz reference and then locked to the 800kHz reference. Using the mixing technique reduces the total divider ratios and improves the phase noise performance.

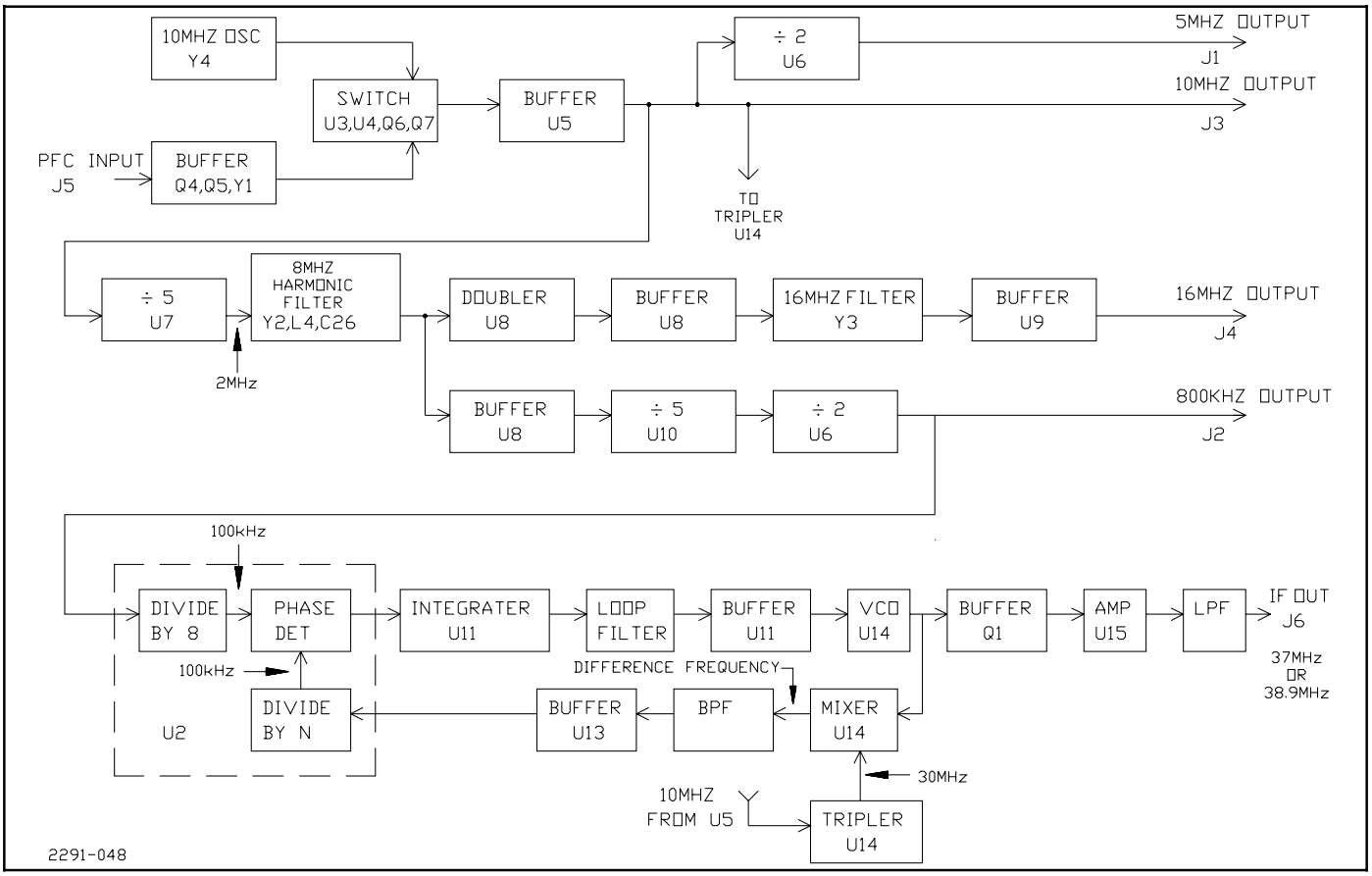


Figure 4-6

WARNING: Disconnect primary power prior to servicing.

U14 contains both the VCO and mixer. The tank for the VCO is formed with L15, C38 and the varactor diodes CR4, CR14 and CR15. The VCO frequency is mixed with the 3rd harmonic of 10MHz. The 10MHz applied to U14 via a square wave with good 3rd harmonic content. Tank circuit L7 and C107 peak the 30MHz level.

The output of U14 is the difference between the 30MHz and the VCO frequency, typical 7MHz for a 37MHz IF or 8.9MHz for a 38.9MHz IF. A band pass filter follows U14 to remove any unwanted mixer products. This filter consists of L6, L8, L20, C110, C111 and C112.

The filtered 7 to 9MHz signal is amplified by U13 and applied to a programmable divider chip U2.

The programmable divider chip U2 also receives the 800kHz reference frequency. Both the 800kHz reference and the mixed VCO frequency are divided down to 100kHz. A phase/frequency comparitor within U2 compares the phase of the two 100kHz signals. Any difference in the frequency or phase is detected and output as a pulse whose duty cycle is equal to the phase difference. U11 integrates these pulses to create a DC control voltage proportional to the phase difference. This DC control voltage is used to lock the VCO to the desired frequency.

A passive low pass filter is used on this control voltage to remove any 100kHz that might be present after the integrator. This filter consists of C121, C123, C125, C126, C122, C124, L9, L10 and L11.

The VCO frequency is sampled and buffered by Q1 and amplified by U15, Q2 and Q3. A low pass filter centered about the desired IF frequency removes any harmonics and unwanted spurs. This band pass filter consists of C138, C137, C134, C139, C140, C135, C136, L17, L18 and L19.

Lock detection is accomplished by U3 and its output mutes the exciter in the event of loss of lock.

4.5.2 VHF Synthesizer Card #2

Refer to schematic 839-7900-529 and Figure 4-7.

In system with Card #3 refer to 839-7900-551

4.5.2.1 Circuit Description

The VHF synthesizer card 2 performs the task of generating the LO used to convert the visual and aural IF's to carrier. It contains a main PLL loop that runs from 150 to 300MHz in 5MHz increments and a rachet PLL loop that runs from 10 to 15MHz in 10kHz increments. The main loop's VCO is offset by the incremental loop in a SSB mixer prior to phase detection. This allows the final frequency to cover the 150 to 300MHz range in 10kHz increments. For low band channels the main loop's output is divided by two yielding a frequency range of 75 to 150MHz in 5kHz increments. In systems with a synthesizer #3 card the incremental loop output is further processed by the third card.

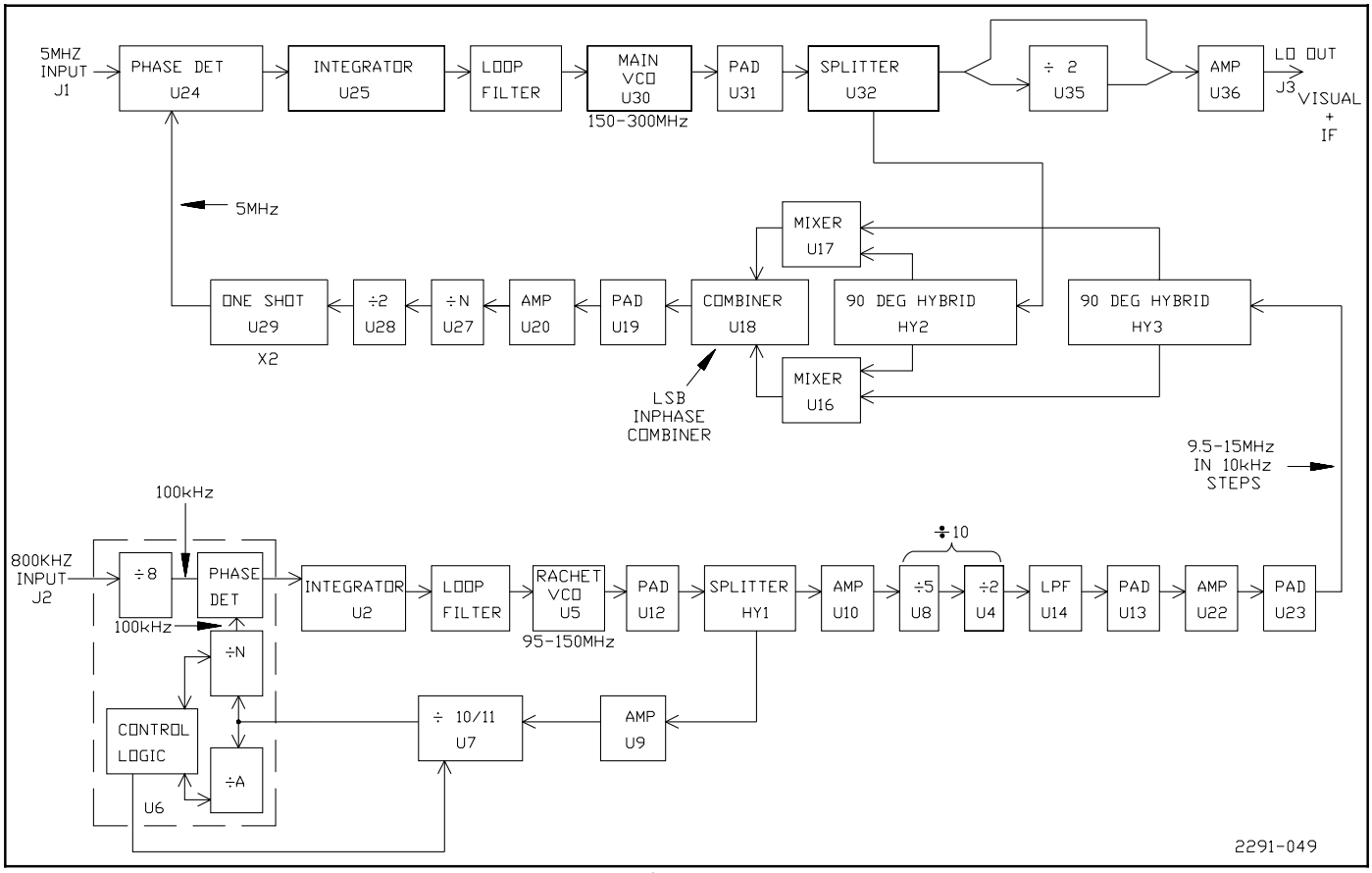


Figure 4-7

WARNING: Disconnect primary power prior to servicing.

4.5.2.1.1 Detailed Circuit Description

10 to 15MHz Rachet Loop

The frequency of the rachet loop is such that the difference of the desired LO minus the rachet frequency yields a frequency divisible by 5MHz.

The primary rf source is a 95 to 150MHz VCO U5. U5's output is buffered by a 6dB pad U12 and split into two paths by hybrid HY1. One path is amplified 18dB by U9 and applied to a divide by 10/11 dual modulus prescaler U7. The output of the prescaler is applied to a programmable divider U6 where the VCO frequency is divided down to 100kHz.

An 800kHz reference signal from card 1 is applied to J2 and then to the programmable divider U6 where it is also divided down to 100kHz. A phase frequency detector within U6 compares the phase of the two 100kHz signals. Any difference in the frequency or phase is detected and output as a pulse whose duty cycle is equal to the phase difference. U2 integrates these pulses to create a DC control voltage proportional to the phase difference. The VCO is locked to the desired frequency by this DC control voltage.

A passive low pass filter is used on this control voltage to remove any 100kHz that might be present after the integrator. This filter consists of C33, C34, C35, C36, C37, L2 and L3.

Potentiometer R13 sets the gain of the loop for best stability and rejection to microphonics.

The other output of hybrid HY1 is amplified 18dB by U10, divided by 5 by U8, and then divided by 2 by U4. This total division of 10 yields a frequency range of 9.5 to 15MHz in 10kHz increments. The divided output of U4 is filtered by a 21.4MHz low pass and then buffered by a 6dB pad U13 and 12dB amplifier U22.

Lock detection is accomplished with U1 and its output is used to mute the exciter in the event of a loss of lock.

SSB Mixer

A single side band mixer is used to offset the main loop VCO's frequency by the rachet loops frequency. This SSB mixer consists of mixers U16 and U17, 90 degree hybrids U2 and U3, a 0 degree power combiner U18, and attenuators U23 and U19.

The main loop's VCO signal is applied to one 90 degree hybrid and the rachet loop's signal to the other 90 degree hybrid. The hybrid outputs are then mixed in the two mixers, which produce two primary outputs at the sum and the difference frequencies. When the mixers create these sums and differences, the sum signals are in phase but the difference frequencies have a 90 degree relationship with each other. This 90 degrees from the mixers plus the 90 degrees from the hybrids add and create a 180 degree difference. By phasing the hybrids correctly the output of the two mixers will have both lower side bands in phase but the upper side bands will be 180 degrees out of phase. When combined in the 0 degree combiner U18 the lower side bands will add and the upper side bands will cancel. The lower side band or difference frequency is then buffered and amplified 18dB by U20.

Main 150 to 300MHz PLL

A 150 to 300MHz VCO U30 is the primary signal source for the main PLL. U30's output is buffered by a 6dB attenuator U32 and then split into two paths by hybrid U32. One path is divided by 1 or 2 by U35, depending on the required frequency, then amplified 12dB by U36 and routed to the LO output J3. The other VCO output from splitter U32 is amplified 12dB by U33 and routed to the SSB mixer.

The output of the SSB mixer is applied to a programmable divider U27 which divides the main VCO frequency to 5MHz. The output of this divider is one pulse for ever N input pulses. This small pulse is to narrow for good phase detection and must be stretched. The output of the counter is divided by 2 in U28 which yields a 50% duty cycle square wave. The square wave is then applied to a one shot monostable multivibrator U29 that triggers on both positive and negative edges. The multivibrator's output is twice the frequency of the input and cancels the divide by 2 of U28, the pulse width is 20nsec. This 5MHz pulse train is applied to the phase frequency comparitor U24.

The 5MHz reference from card 1 is applied to J1 and then to phase frequency comparitor U24 where the phase of the two 5MHz signals is compared. Any difference in the frequency or phase is detected and output as a pulse whose duty cycle is equal to the phase difference. U25 integrates these pulses to create a DC control voltage proportional to the phase difference. It is this DC control voltage that is used to lock the VCO to the desired frequency.

A passive low pass filter is used on this control voltage to remove any 5MHz that might be present after the integrator. This filter consists of C58, C57, C56, C53, C54, C55, L5, L6 and L7.

Potentiometer R44 is used to set the loop gain for best stability and rejection to microphonics.

Lock detection is accomplished with U1 and its output is used to mute the exciter in the event of a loss of lock.

4.5.3 Synthesizer Card 3

Synthesizer Card 3 - # 992-8913-001

Refer to schematic drawing 839-7900-686 and Figure 4-8.

4.5.3.1 Signal Flow And Frequency Programming

4.5.3.1.1 DDS (Direct Digital Synthesis) Circuitry

A direct-digital-synthesis technique is employed to generate a master quartz-crystal oscillator-derived frequency between 400 kHz and 3.2 MHz. The quartz frequency is 10 MHz, so that in theory any signal between DC and 5 MHz can be produced. In practice, however, a lowpass filter is required to suppress image frequencies. The complexity of this filter increases as it is required to generate signals closer and closer to 5 MHz. The trade-off in this approach uses a 3.4 MHz Cauer lowpass filter for simplicity, a more complex filter is not required.

The DDS signal is generated by U9, the frequency programming for this IC is serial TTL. A parallel-TTL bus programming is needed, so that switches can be used to set a frequency code. The code is 32 bits wide, hence 32 switches are needed. These

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switches feed a parallel-to-serial converter made up of U1 through U8. The parallel to serial converter and the DDS chip are clocked by a 10 MHz TTL square wave from one-half of dual-comparator U14.

U10 converts the dynamic 12-bit digital waveform from U9 into a useful analog waveform. This waveform is exactly equivalent to a 12-bit accurate sine wave sampled by an ideal 10 MHz zero-order sample-hold. The output of U10 is filtered, but does not need to be low in spurious or harmonic content, since spurious levels are reduced by exactly the amount of subsequent frequency divisions.

Once the DDS-generated signal has been lowpass filtered, it is converted into a rectangular wave by a comparator (half of U14). This rectangular wave is suitable for driving TTL flip-flop U16B, which divides the frequency by two. U16A divides by two again. Then D-flip-flops U33A and U33B divide by two once more, but triggered by opposing slopes. In this manner, the DDS frequency has been divided by 8, with the pair of outputs from U33A and U33B being orthogonal (90 degrees out of phase with each other). The division of frequency by eight results in an eight-fold increase in frequency resolution. That is, whereas the DDS output signal frequency could be incremented in steps of 0.002328306 Hz (10 MHz divided by 2 to the 32nd power), U33 outputs can step by 0.000291038 Hz. In subsequent processing off-card, this resolution is increased 10 or 20-fold, resulting in the ability to set a desired final transmitter frequency to within 29 micro-Hertz (high band) or 14.55 micro-Hertz (0.00001455 Hz) for low-band channels.

4.5.3.1.2 Programming of Frequency Offset

If the offset frequency is specified when purchasing the transmitter, the Synthesizer Card #3 option comes pre-programmed. If a new offset frequency is needed or a replacement card is installed, refer to the programming chart to obtain the 32 bit code for setting the switches S1 through S8. If another offset frequency is required that is not listed in chart, the 32 bit code may be calculated with the following formula:

$$(f_{OFFSET} \text{ X } 80 \text{ X } 2^{32})/10^7$$

Where f_{OFFSET} is the desired offset frequency in Hertz

This new number will then need to be converted to binary. If your calculator does not have the display capability to convert these large numbers directly to binary, then convert the number to hexadecimal first. Then, convert each of the eight hexadecimal digits to binary separately to obtain the 32 bit binary code. For offsets less than 7,812.5 Hertz, add zero to the S1 position. Example for Line Frequency Offset 7/12:

7/12 of 15625 = 9,115Hz
$(9{,}115 \text{ X } 80 \text{ X } 2^{32})/10^7 = 313{,}189{,}015.2$
Drop any number after the decimal point

Convert 313,189,015 to Hexadecimal = $1\ 2\ A\ A\ E\ 2\ 9\ 7^{HEX}$
Next convert each of the Hexadecimal numbers to Binary

1^{HEX}	2^{HEX}	3^{HEX}	4^{HEX}	5^{HEX}	6^{HEX}	7^{HEX}	8^{HEX}
0001	0010	1010	1010	1110	0010	1001	0111
S1	S2	S3	S4	S5	S6	S7	S8

Please note that the MSB (Most Significant Bit) of the binary code must be programmed low. Program switch 1A is also routed to Q7 which will trigger a fault/low to mute the exciter RF. Other illegal code settings exist that exceed the limits of the filtering or the DDS circuitry, therefore it is recommended to stay within the range of the chart for other offset frequencies.

4.5.3.1.3 SSB Mixing

Phase splitter U33, in combination with an RF quadrature power splitter, permits the generation of a single-sideband (SSB) suppressed-carrier signal at U22 that is higher or lower, by the desired offset amount, than the incoming RF signal frequency at J3. The choice of higher (upper) or lower sideband is established by the installation of either the “ABOVE” (JP22) or the “BE-

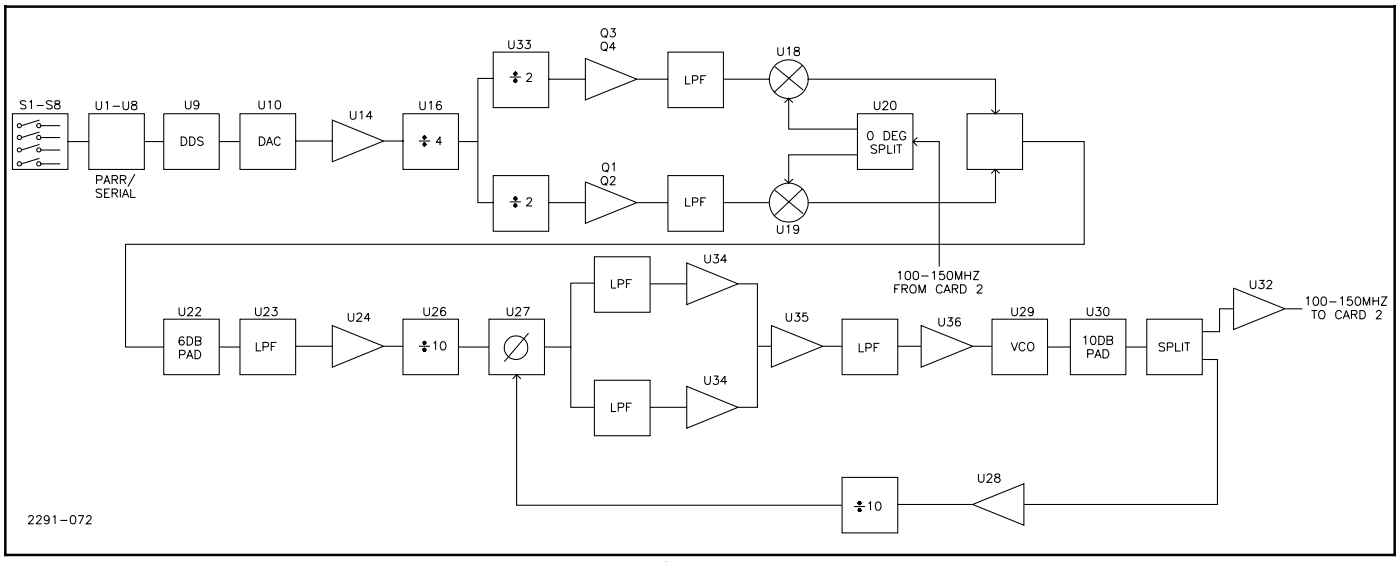

Figure 4-8

WARNING: Disconnect primary power prior to servicing.

LOW" (JP23) jumper, which sets the phase between flip-flops U33A and U33B at either +90 or -90 degrees, respectively.

4.5.3.1.4 Digital PLL Tracking Filter

All of the remaining circuitry after the SSB mixer constitutes a tracking filter, which purifies the SSB signal and eliminates or greatly suppresses unwanted sidebands. These unwanted sidebands occur because of local oscillator leakage in the quadrature mixers, unbalance in the conversion gains of the two mixers, splitters, and low-frequency drive signals, and harmonics of the low-frequency drive signals. Since the low-frequency drive signals are square waves produced by U33A and U33B, many harmonics exist. These harmonics taper off in level according to the Fourier series of a square wave. Since the 3rd harmonic of a square wave is at 3 times the phase angle of the fundamental, the 90 degree phase fundamental (to produce an upper sideband offset) will produce 270 degree (-90) 3rd harmonic energy, which will show up as a LOWER sideband artifact at 3 times the offset frequency, and 10 dB down. The 5th harmonic will be phased at positive 90 degrees, the 7th at negative 90, etc. This will produce a "hop-scotching" or "alternating" sequence of upper, then lower, then upper, then lower, undesired sidebands.

If these sidebands were permitted to include all offset harmonics, the subsequent digital PLL tracking filter would produce aliasing. (The sampling frequency for the tracking filter is 1/10 the SSB RF frequency, or 10 to 15 MHz). The aliasing could, at certain frequency settings, produce spurious signals at the tracking filter output which might fall very close in frequency to the desired signal, making suppression by filtration impossible. For that reason, the low-frequency orthogonal square waves are not permitted to drive the SSB mixer directly, but rather via low-pass filters, whose rate of cutoff assures minimal square-wave harmonic energy above 5 MHz.

The tracking filter PLL operates at 1/10 the output frequency in order to allow a standard ECL phase detector to be used (U27), and to reduce the phase-modulation index due to mechanical shock and vibration so that the PLL will not break lock as easily as if no division were employed. This approach also results in a PC board having only one adjustment potentiometer, a factory-adjusted trim (R102) of the VCO RF output signal level. The PLL tracking filter has an instantaneous bandwidth of about 2700 Hz, with a very sharp cutoff for suppression of sidebands greater than 38 kHz from the main carrier. This permits code settings that produce video - locked offset frequencies as low as (the tracking filter operates at offset frequencies 10 to 20 times those actually output by the final exciter L.O. port).

4.5.3.1.5 Final Synthesizer Output

The 100-150 MHz signal developed originally in card # 2 of the exciter's frequency synthesizer ensemble is normally used locally by card # 2. It is normally divided by 10 and SSB mixed with 200-400 MHz, to yield the final local oscillator frequency for the exciter.

However, when card # 3 (the offset card we have been discussing previously) is installed, card # 2 is re-configured to interrupt the 100-150 MHz signal path. First, prior to division by ten, the 100-150 MHz CW signal is fed over to card # 3, where it drives J3 and serves as the baseline frequency for the SSB mixer in card # 3. Then the SSB mixer in card # 3 adds ten to twenty times the final desired offset frequency to the baseline frequency, the tracking filter removes the old baseline signal as well as sideband artifacts, and the new RF frequency appears at card # 3 connector J4.

The signal from card # 3 connector J4 is now used to replace the old 100-150 MHz signal used by card # 2's divide-by-ten counter and SSB mixer. For low-band VHF channels, an additional division by 2 exists. Therefore, the offset frequency produced by card # 3 must be either 10 (for high band) or 20 (for low band) times the final transmitted offset. For a final offset of 10416.66667 Hz, the frequency produced at the output of U10 must be 40 or 80 times that for high-band or low-band, respectively. Thus, for a low-band transmitter, we require 1.6666666 MHz from U10 or 208.33333334 kHz from U33 output stages A or B. For example, if 120 MHz is applied to J3, then J4 will output 120.20833333334 MHz. When this frequency is divided by twenty in card # 2, a frequency of 6.010416...MHz is produced. Notice this is exactly 8Fh/12 offset from 6 MHz, where F_h = 15625 Hz. This signal is added to additional signal frequencies in card # 2 to determine the final channel frequency.

4.5.3.2 Detailed Circuitry

(Refer To Schematic Diagram 839-7900-686)

4.5.3.2.1 Division By 8 And Quadrature-phasing Circuitry

This has have generated a pulse whose repetition frequency is 400 kHz to 3.2 MHz. When this last frequency is divided by 4 by U16, then further divided by 2 by U33A or U33B, to obtain 50kHz to 400 kHz. The signal at this frequency from U33A is 90 degrees ahead or behind the signal from U33B, depending on jumpers JP22 and JP23. This is due to U33A being clocked by leading edges out of U16A, while trailing edges clock U33B.

4.5.3.2.2 TTL to SSB Mixer Interface Circuitry

The signals out of U33A and U33B are TTL (transistor- transistor-logic), and are unsuitable for direct application to the SSB mixer circuitry. The TTL signals are transformed into analog signals that swing symmetrically positive and negative about ground via transistors Q1 through Q4 and associated bias resistors and diodes. The analog signals appear across 49.9 ohm resistors, making it appear that they were supplied from 50 ohm source impedances. Each analog signal is then filtered by a 3-pole lowpass filter to preclude significant energy above 5 MHz. One filter is formed by C79, L9, and C80, while the other filter is formed by C81, L8, and C82. Loading for the filters is provided by 150 ohm resistors shunting the impedance at the I.F. port of a mixer plus 18 ohms. Diodes D12 and D13 compensate the temperature drift of the analog signal baseline at Q4's collector due to drift of its emitter voltage plus the drift of diode D10. Diodes D8 and D9 provide similar compensation for the other analog signal baseline at Q2's collector. This compensation technique presumes that the two power rails, +15 volts and -15 volts, are equal and opposite, but errors of +/- 5% are easily tolerated.

4.5.3.2.3 SSB Mixer Circuitry

The SSB mixer is composed of two double-balanced mixers (U18 and U19) having very good local oscillator port to RF port feedthrough, a 90 degree power splitter (U17), and an in-phase power splitter (U20). The purpose of the SSB mixer circuitry is to shift the frequency of incoming signal at J3 by an amount equal to that appearing at R72/R73 or R74/R75 and a polarity determined by the installation of either JP22 or JP23.

4.5.3.2.4 Tracking Filter Circuitry

At frequencies between 100 and 150 MHz, the RF 90 degree power splitter U17 is quite accurate, but at harmonics (200 to 300 MHz and 300-450 MHz) the quadrature phasing is poor or completely erroneous. Therefore, SSB performance at harmonics is extremely poor, and we should filter the resulting frequencies. Lowpass filter U23 accomplishes this, assuring that a signal whose behavior resembles a simple stepper motor whose resolution is 90 degrees, and whose stator is revolving at the frequency of the signal at J3, and whose rotor is rotating faster or slower than that by 90 degree jumps at the offset rate. Therefore, relative to DC, the "rotor" is moving at the sum (or difference) of the signal frequency at J3 and the offset frequency.

U24 buffers, amplifies, and limits the output of the SSB mixer "stepper-motor", and applies it to a divide-by-10 counter, U25, whose output feeds one input of phase detector U27.

The other input of phase detector U27 is fed by U26, another divide-by-10 counter operating on the signal from the VCO (U29). U28 buffers that VCO signal before it is fed into U26, and U32 buffers the VCO signal before feeding it to the output connector, J4.

The phase detector outputs a differential signal voltage equal to zero when the phase and frequency of the signals at the outputs of U25 and U26 match. (The differential voltage is converted to a single-ended voltage by U34 and U35). Otherwise, a differential error voltage is produced by the phase detector, which triggers the window comparator (U37A and U37B) to indicate an unlocked condition, while driving U34, U35, and U36 in a direction to move the frequency of VCO (U29) to correct agreement with the output of the SSB "stepper motor" frequency. The jumpy "stepper-motor" action of the SSB mixer creates sidebands, which must be removed. They are filtered out by loop integrator (U36A) and R87, R88, and C73, and by a passive filter connected between U35 pin 6 and U36B pin 5. Thus, the undesired sidebands are not permitted to FM modulate the VCO, and do not appear as sidebands on the VCO output. C72 (and R86) retards the indication of loss of lock, which might shut down the transmitter due to a transient disturbance or microphonics or vibration of the VCO.

Resistor R79 injects a DC offset into the PLL error signal, forcing the loop to cancel it by producing an opposite offset from the phase detector output. This guarantees that the phase detector is operating well away from its dead zone. C57 filters the DC offset injected by R79, so that it is free of random noise and hum.

4.5.3.3 Offset Card (#3) Adjustments

There are no user adjustments that can or should be made to this printed circuit board.

In case of malfunction, check the outputs of all power supply nodes entering this board, and, if OK, continue to check voltages within the board appearing out of regulators U15 and U12.

If you have not read the theory of operation and studied the block diagram and schematic, doing so will enhance the prospect of finding a fault.

Also check to see that RF levels at all connectors are within the range specified on the schematic when loaded in 50 ohms.

R102 adjusts the RF level at J4 to approximately -2 dBm. L10 centers the frequency range of the VCO so that it straddles 100 to 150 MHz with equal guard-band at both ends. A frequency of less than 95 MHz at J4 will typically begin to cause loss-of-lock, indicated by the "FAULT\" signal going low. Above 95 MHz, this FAULT\ line should go high (if a pull-up resistor is present), and remain high for any frequency up to 154 MHz at J4. Above that, (by no more than 8 MHz) FAULT\ should go low. L10 is factory-adjusted and should never need re-adjustment unless U29, D21-23, or R92 or U12 have been replaced.

4.6 NICAM Sound Modulation System

An external NICAM encoder generates a digitally modulated second carrier IF. The monaural input modulates the main channel in the Aural Channel 1 synthesizer. The two IF carriers are combined in the Aural Linearization card. The combined signal is linearity pre-corrected to cancel amplitude and carrier phase errors that occur in the power RF amplifiers. After upconversion, using the Local Oscillator, the carrier signals are amplified by the 1 watt aural exciter final amplifier.

4.6.1 Aural Channel 1 Synthesizer - 992-9012-001

Refer to schematic 839-7900-706

4.6.1.1 Functional Description

The voltage controlled oscillator consists of Q1. The tuned circuit consists of CR1 through CR6, L3, C2 and C4. C6 and C7 establish the feedback ratio across Q1 to sustain oscillation. Use of the varactor diodes in the oscillator allow the frequency of oscillation to be changed simply by changing the bias on the varactors. The oscillator output is applied to buffer Q2 which provides a gain of 15dB. The output of Q2 is routed through a resistive pad and monolithic amplifier U1 to provide high isolation to the VCO.

4.6.1.2 Detailed Circuit Theory

The aural channel #1 phase lock loop (PLL) is U11. With the exception of the prescaler U2, it contains the programmable divide by N counter, divide by R counter, the phase detector and the lock detection circuits.

The VCO frequency is sampled by U2 a divide by 10 or 11 dual modulus prescaler. The output of the prescaler is applied to U11

a multipurpose frequency synthesizer IC. U11 divides the VCO frequency down to 12.5kHz.

U8 prescales the 16MHz input to 800kHz and applies it to U11. U11 then further divides the 800kHz to 12.5kHz. The phase detector within U11 compares the reference to the VCO and controls U10 the loop filter.

U10 processes the phase pulses from U11 and provides a dc control voltage to the VC varactor diodes.

Q3 and Q4 process U11 lock detector output to drive the on board lock LED and the remote output to the metering and control board.

R46, R47 and CR9 from a rf attenuator which are used to hold the rf output of channel #1 at a constant level. CR11 detects the output level and provides a dc voltage to comparator U14. U14 compares the detected rf level with the voltage from R53 and controls the bias to CR9. R53 is used to set the rf output level. U16 a 30dB monolithic amp provides isolation and provides the necessary level to drive the detector. L6, L7, C66, C67 and C68 form a low pass filter to attenuate any harmonics.

Audio inputs are applied to U12 which is configured as a differential amplifier to remove any common mode noise on the audio inputs. U13 is used to form the pre-emphasis network. The exact pre-emphasis curve used is determined by the selection of resistors R42, R43, R44 and R45.

A sample of the output of U12 is precision rectified by U18. The resulting signal is amplified by U18. METER CAL R80 is used to calibrate the audio level front panel metering.

U17, a similar circuit,, monitors signal level modulating the VCO. The deviation metering is calibrated by R72.

4.6.2 Sound Linearization Pre-Corrector

Sound (Aural) Linearization - 992-8293-001

Refer to schematic 839-7900-481

4.6.2.1 Functional Description

The sound linearization board performs the functions of combining the two sound IF carriers, sound exciter AGC to maintain the exciter power at a constant level and sound linearization circuits. the linearization circuits compensate for both magnitude and phase errors generated in the sound power amplifiers.

4.6.2.2 Detailed Theory

The two sound carriers from Sound Channel 1 and Channel 2 or NICAM are input at J1 and J2. The levels are scaled by resistive pads and then combined in U2. The combined sound carriers are applied to the AGC attenuator consisting of CR14, CR15 and CR16 which form a PI pad. The bias for the PIN diodes is controlled by U1, the AGC comparator. samples of the exciter output power and the control DC voltage are compared by U1 and the corresponding bias current is supplied to the AGC attenuator diodes. The range of control of this circuit is over 30 dB.

The two sound carriers are then applied to the linearization circuits. A vector approach is used to correct for both amplitude and phase error. HY1 splits the signal into two paths with a 90 degree phase difference. Two identical linearity corrector circuits then process the two signals. The signals are then combined in a 0 degree combiner. The 90 degree path signal is attenuated approximately 10 dB before combining. This path corrects for phase distortion and the 0 degree path for amplitude distortion generated in the power amplifier stages.

The linearity corrector for path one consists of buffer amp Q2 and a 10 dB gain stage Q1. The pin diodes CR4, CR5, CR6 and CR7 and resistors R38, R39 and R40 form a level controlled attenuator. When the RF level exceeds the bias on the diodes they conduct and effectively place resistors R49 and R50 in the circuit and causes a breakpoint to appear in the power curve. The bias for the diodes is controlled by resistors R51 and R52. U4 provides a low impedance path for the diode bias current.

The linearity corrector for path two operates in the same way as path one. The two paths are combined and amplified by Q7. T1 matches the output of Q7 to 50 ohms. Up conversion to the sound carrier frequency is performed by mixer MX1. L2 and C27 form a trap for the second harmonic of the IF.

4.6.3 Dual Carrier Power Detector

Refer to schematic 839-7900-707

See sheet for systems M, B, G, H, and I

See sheet 2 for system D Nicam

4.6.3.1 Functional Description

The purpose of this board is to demodulate the aural carriers for the purpose of carrier power metering. The aural carrier is processed by a dual-conversion receiver. The first stage is conversion back to the original IF using the exciter local oscillator. The second conversion stage uses a PLL generated second local oscillator. The two sound signals are now separated by filters, precision rectified and available for metering.

4.6.3.2 Detailed Theory

4.6.3.2.1 First Conversion

The aural exciter output is routed through DC1, the sample becomes one input of mixer MX1. The second input is the exciter LO. The exciter LO is routed through a directional coupler DC2. The sample is amplified by 20 dB by U7, and becomes the second input to MX1. The output of MX1 is the input of the second conversion mixer MX2.

4.6.3.2.2 Second Conversion

The LO for the second conversion is 1 MHz higher (1.6 MHz higher in system D Nicam) than aural #1 IF frequency. It is generated by a VCO Q1, which is frequency controlled by PLL U8. The sample of the oscillator output is divided by 20 in U1. U8 divides 10.24 MHz and the required VCO frequency to 5 kHz for phase comparison. The control voltage from U8 changes the bias on varactor CR7, controlling the frequency of the VCO. This VCO output is the LO input to MX2.

4.6.3.2.3 AGC

The output of MX2 is amplified 20 dB by U6. U9 is a voltage controlled amplifier that is the variable gain element of the AGC. The aural carrier sample from DC1 is rectified, filtered and

buffered by U4. This is the sample level input for one input of the differential amplifier section of U4. The output of U9 is rectified in a similar manner and is the other input to the differential amplifier. The output of the differential amplifier is used to control the gain of voltage controlled amp U9.

4.6.3.2.4 Carrier Detectors

The detected signal passes through bandpass and notch filters. Channel 1 is bandpass filtered and then notch filtered, U2 and the diode circuitry are a precision full wave rectifier. The output is further amplified by U5 and the dc voltage is routed to the exciter front panel for metering. In a similar manner the channel 2 signal is filtered, detected and available for metering.

4.6.3.3 Adjustments

The filters are factory adjusted for frequency and bandwidth.

4.7 Exciter Chassis

The chassis is the mechanical frame for supporting the exciter circuitry. The chassis interconnect wiring diagram is 839-7900-723.

4.7.1 Exciter Meter and Control Board 992-9016-001

Refer to schematic 839-7900-708A

The meter board is mounted to the back side of the exciter front panel. The purpose of the metering and control circuit board is to provide status outputs to the user interface, drive the LED's on the front panel of the exciter, it interfaces the switches with the control logic, and provides the exciter power output control.

4.7.1.1 Vision Power Control (Sheet 1)

The Vision power control changes the vision rf output of the exciter. The control voltage value is generated as digital information, this allows remote control to be digital and for digital storage of values during a AC mains failure.

The digital value is determined by digital up-down counters U9, U10 and U11. The counter value is changed by a local or remote raise-lower command. The logic in U1 and U2 controls the application of pulses generated by the VCO in PLL U7 to the counters. The basic frequency of the VCO is controlled by C2 and R5. In addition, the U6 logic allows two speed operation of the VCO. When the raise or low signal is long in duration, the voltage rise in C1 will change gates of U6 causing VCO_IN to go high. This will change the frequency of the gate pulses, causing the rate of power change to increase.

The digital value is changed to an analog voltage by A/D converter U15. This DC voltage is buffered by U17 and then is switched by U19 to implement exciter muting function. Next the voltage is applied to differential amplifier U27 where it is reduced by the vision vswr foldback control voltage. This voltage is normally zero. The resulting control signal is routed through the mother board to the VSB/AGC card for the control of the rf power.

4.7.1.1.1 Sound Power Control (Sheet 2)

The sound power control is performed in a similar manner using U16 as the A/D converter. The output of the metering card is routed to the sound 1 watt final amplifier where it is used as a reference for the amplifier AGC.

4.7.1.2 Metering (Sheet 3)

4.7.1.2.1 Metering Selection

The dc voltages from the RF power detectors are voltage divided for calibration, buffered by op-amps U35 and U37 and then squared by analog multipliers U29, U33 and U34. This squaring is needed because power is a square law function. The other metering routes directly to U30.

Each time switch S5 is closed it pulses the monostable multivibrator U36. This pulse steps the UP/DOWN counter U23, selecting the next input to the three multiplex switches U30, U31 and U32. U30 performs the switching of the analog voltage to the metering. U31 illuminates the LED to indicate the meter function that is active. Jumper plugs at the input to U32 are used to select display blanking for unused positions. The jumper plugs at the input of U22 are used to control the point at which the meter function display resets to the top selection.

4.7.1.2.2 Metering (Sheet 4)

The output of U30, metering select, is applied to two metering circuits. The bargraph meter circuitry U23 and U24 display full scale when the input voltage is 2.550 volts. The digital metering IC U25 is calibrated by R32 to indicate 1000 on the display, DS1 and DS2, at the same 2.550 volts.

4.7.1.2.3 Status Indicators(Sheet 4)

The status logic sums the logic inputs to drive exciter front panel indicators and the exciter mute functions. Transistors are used as open collector output drivers, available for remote control status monitoring.

4.7.2 Main Power Supply

Refer to 839-7900-504

The power supply is located in right rear area of the main chassis. AC power is input to the exciter through an ac line filter and circuit breaker/switch. A fan, connected to the ac input potential, operates whenever power is switched on. Terminal board TB1 and a power transformer with five primary windings allows a wide selection of operational voltages in the 120 and 240 volt range.

All dc supplies in the exciter are full-wave rectified, filtered, and regulated for stable operation. The dc potentials are distributed throughout the exciter for operation of the internal circuitry. Certain potentials are re-regulated on some circuit boards to assure stable operation of certain critical circuits.

4.7.2.1 Positive 24 Volt Supply

A 24-volt winding of transformer T1 is full-wave rectified by bridge rectifier CR1 into a +29.2 volt dc source. This potential is regulated into a stable positive 24-volt supply at 2 amperes by U1. Diode CR9 protects the regulator from a reverse polarity potential applied to the output and diode CR4 protects the regulator from a short circuit on the regulator input. R16 provides

a means to adjust the output of the regulator. Capacitor C6 prevents oscillation of the regulator and the capacitors on the output filter high frequency ac components.

4.7.2.2 Positive and Negative 15 Volt Supplies

A 32-volt winding of transformer T1 is full-wave rectified by bridge rectifier CR2 into a +20.2 and a -20.2 volt dc source. These potentials are regulated into stable positive and negative 15-volt supplies at 2 amperes by U2 and U3. Diodes CR10 and CR11 protect the regulators from a reverse polarity potential applied to the output and diodes CR5 and CR6 protect the regulators from a short circuit on the regulator inputs. R17 provides a means to adjust the output of the positive regulator and R18 provides a means to adjust the output of the negative regulator. Capacitors C7 and C8 prevent oscillation of the regulators and the capacitors on the output filter high frequency ac components.

4.7.2.3 Positive and Negative 5 Volt Supplies

A 17-volt winding of transformer T1 is full-wave rectified by bridge rectifier CR3 into a +10.4 and a -10.4 volt dc source. These potentials are regulated into stable positive and negative 5-volt supplies at 2 amperes by U4 and U5. Diodes CR12 and CR13 protect the regulators from a reverse polarity potential applied to the output and diodes CR7 and CR8 protect the regulators from a short circuit on the regulator inputs. R19 provides a means to adjust the output of the positive regulator and R20 provides a means to adjust the output of the negative regulator. Capacitors C9 and C10 prevent oscillation of the regulators and the capacitors on the output filter high frequency ac components.

4.7.3 Mother Board

Reference drawing 839-7900-709

The mother board is used to provide wiring between the printed wiring boards, jumpers JP1, JP2 and JP3 allow the bypassing of vacant board positions. The only components are bypass capacitors.

4.7.4 CMR Filter

Reference Drawing 839-7900-508

This filter is used bypass RF from the incoming signal wiring. Incoming cables are also wound on ferrite cores to block RF currents on the shields.

4.7.5 Extender Card

Reference Drawing 839-7900-172

Each exciter has an extender card that allows the extension of cards above the card cage for trouble-shooting and adjustment. The extender card also has 5 LEDs that monitor the 5 power supply volages and provide convenient power supply voltage monitoring points.

WARNING: Disconnect primary power prior to servicing.

5.1 Introduction

This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the VHF TV exciter. It is strongly suggested that each procedure be read through completely before attempting any adjustments.

The exciter is factory tuned and normally tested and aligned with the transmitter and is ready for operation in the transmitter.

The maintenance and the adjustment of the exciter is divided into categories.

- Routine maintenance consists of keeping the exciter clean and verifying that the fan is functioning. There is a RFI filter between the fan and the chassis that should be checked regularly for dirt buildup and cleaned when needed.
- Alignment and monitoring calibration of individual subassemblies. This alignment is for the proper functioning of the card or assembly. One example would be the VCO adjustment on a synthesizer card.
- Adjustment of correction circuitry of subassemblies to compensate for the distortions of the transmitter system as a whole. Adjustment of differential gain is a good example.

5.2 Exciter Adjustment Sequence

Normal Exciter adjustments are done after a check of transmitter performance indicates that adjustment is needed to meet specifications. A change in needed correction can indicate a need for troubleshooting to locate the cause of the change. If the transmitter requires more drive, investigate a possible loss in gain due to a partial module failure. A change in transmitter AGC voltage is another indicator of a transmitter gain change. If a change in the exciter is indicated, check the power supply voltages first. A change in supply voltages would cause a shift in many adjustments and calibrations.

Table 5-1. Adjustment Sequence

PROCEDURE:		REFER TO:
1	Check Video Level	Video Input Card
2	Depth of Modulation	Modulator Card
3	Exciter Swept Response	Modulator Response Equalizer
4	Coarse Differential Gain/Luminance Linearity	If Linearity Correction
5	ICPM Adjustment	IF Quadrature Corrector
6	Fine Differential Gain	Video Input Differential Gain
7	Differential Phase	Differential Phase Corrector
8	Group Delay	Primarily Delay Compensation
		Check Notch Diplexer Equalizer
9	Adjust Aural Deviations	Sound Channel Synthesizers
10	Adjust Power Limits	Exciter Meter and Control
11	Transmitter Frequency	Synthesizer 1 or Precise Frequency Standard

5.2.1 Transmitter Adjustment Sequence

NOTE

The transmitter should be operating at a stable temperature. The transmitter AGC should be checked and adjusted if needed. A change in AGC adjustment will change the exciter output power and that will change the correction adjustments.

The pre-correction and level adjustments should be carried out in the order shown in Table 5-1.

5.2.2 Safety Considerations

Only low potentials are present on the circuit boards within the VHF TV exciter (+24, +/-15, +/-5), however primary power is present in the shielded cage in the right rear of the unit. This area should be covered during troubleshooting to prevent accidental contact with the primary line potential. The information contained in this section should be performed by trained and experienced personnel. Good judgement, care, and common sense are the best accident preventives.

5.3 Vision Exciter Video Alignments

A section for each card has an alignment procedure followed by the procedure for system adjustment.

5.3.1 Video Input Card

5.3.1.1 Video Level Alignment

a. Select video input jumper configuration.

JP2 in position 2-3 will ground the video input cable shield.

JP2 in position 1-2 will balance the shield to reduce common mode low frequency signals

a. Connect a 1 V p-p ramp or staircase signal to the exciter video input. Verify the correct levels of this input signal before connecting.
b. Operate both switches S1 and S2 to the OUT position.
c. Connect the PRE-CORRECTED VIDEO sample jack on the exciter front panel to a scope or waveform monitor, terminated in 75 ohms.
d. Adjust video gain control R18 on the video input card for 1 V p-p on the scope.

5.3.1.2 Loss of video mute alignment.

a. Place the video input card on the extender card
b. Monitor with a scope and probe the signal end of R59.

WARNING: Disconnect primary power prior to servicing.

c. Turn the loss of video control R62 to maximum CCW. This is the lowest free running frequency.

d. Adjust R62 clockwise until the first occurrence of a stable positive pulse. There will be a small step transition in the top of the pulse. Adjust R62 to center this small step.

e. Remove video from the exciter and the loss of video indicator should illuminate. Re-apply video and it should extinguish.

5.3.1.3 Clamp Pulse alignment

The clamp pulse is factory set, adjust only if needed.

If necessary, monitor TP6 with the scope and adjust R57 for a value of zero volts dc at the top of the clamp pulse.

5.3.1.4 VIDEO METERING Calibration

5.3.1.4.1 Video Input Level

a. Accurately measure the actual exciter video input voltage from blanking to peak video with an oscilloscope.

b. Select VIDEO INPUT LEVEL metering position

c. Adjust Video Input card R149 for the corresponding video metering level in millivolts.

5.3.1.4.2 Sync Input Level

a. Accurately measure the actual exciter sync input voltage with an oscilloscope.

b. Select SYNC INPUT LEVEL metering position

c. Adjust Video card R145 for the corresponding sync metering level in millivolts.

5.3.1.5 Differential Gain Adjustment (System Precorrection)

The following adjustments should be used to correct for small errors in differential gain that could not be corrected for at IF.

The controls work similar to the IF Linearity controls but will only make small changes in the waveform. In this way it acts as a fine adjustment for differential gain, which is all that is needed at this point if the IF is adjusted properly.

a. Apply a 1v p-p ramp/staircase to the exciter video input.

b. Check to make sure IF Linearity and Quad corrector switches are in normal IN position.

c. Using a vectorscope, observe differential gain of the demodulated transmitter output signal. A waveform monitor with a subcarrier bandpass display may be used although it will be more difficult to view small values of differential gain.

d. Set differential gain switch to the IN position.

e. Set the Sync compress switch to the OUT position.

f. Set all Threshold and Slope controls maximum CCW.

g. Adjust the white threshold control to set the point at which correction begins.

h. Adjust the white slope control CW to increase the amount of correction.

i. Adjust the black threshold and slope controls for proper correction in the black region.

j. If sync stretch is required, adjust the SYNC EXP control for proper sync amplitude.

NOTE

Sync compression may be required in some transmitters.

If required, perform the following steps. If no compression is needed, leave the SYNC COMP switch in the out position.

k. Set sync compression control maximum CW and the sync expand control maximum CCW.

l. Set the SYNC COMP switch to IN position. Sync and black compression should be evident.

m. Adjust the sync compression control CW to reduce the sync amplitude. The sync expand and black controls may be used in conjunction with the compression control to give the proper correction.

5.3.2 Notch Diplexer/Receiver Equalizer

5.3.2.1 Video Level and Response Alignment

Install the equalizer on the extender card and use a scope probe for the following:

a. Note the video level at R10. If the level is not approximately 1 volt p-p, check video input level and Video Input card.

b. Monitor the voltage at R5 and adjust if needed, R97 for unity gain.

5.3.2.2 Frequency Response Alignment

a. Apply a multiburst signal and compare the response at R10 and R5. Adjust C25 to remove any tilt in response.

b. Monitor the waveform at R5, adjust the DC OFFSET to place the blanking portion of the video at zero volts DC when the board is in the ENABLE mode.

5.3.2.3 Delay and Response Adjustments (System Precorrection)

The units have been factory aligned using precision network analyzers. The receiver equalizers should not need adjustment. The notch diplexer equalizers may need a small adjustment of section 5 to match the actual notch diplexer characteristics.

a. Observe the 2T and 12.5T pulses and adjust Q ADJUST R50 to remove any base line error.

b. Observe response and adjust AMPL, FREQ and Q of the NOTCH AMP section of the amplitude corrector.

Refer to the Modulator/Group Delay section for additional group delay information.

5.3.3 Differential Phase Corrector

5.3.3.1 Clamp Pulse Alignment

With a DC coupled scope on TP8, adjust R84 to put the clamp pulse peak at 0V.

5.3.3.2 Frequency response Alignment

Using a multiburst signal or video sideband adapter as a video source, adjust C1 for a flat response as monitored on J2 on the differential phase corrector card.

Adjust C48 for minimum interaction between differential gain and differential phase while switching the NORMAL/BYPASS switch in and out.

5.3.3.3 Differential Phase Adjustment (System Precorrection)
Using envelope detection on the demodulator observe the transmitter's differential phase distortion and adjust as follows (see Figure 5 -1).

a. Set Phase corrector NORMAL/BYPASS (in/out) switch to NORMAL(in) position.
b. Set all slope controls mid range.
c. Set all threshold controls fully CCW.
d. Starting with threshold 1 advance the threshold control to set the first break-in point in the phase corrector, then adjust the slope to increase or decrease the desired amount of correction. If the correction is in the wrong direction adjust threshold 1 and 2 fully CCW and skip to threshold 3.
e. Adjust the slope control CW to increase correction. Adjust the slope control CCW to decrease correction.
f. Use remaining threshold and slope pairs as required to optimize the transmitter differential phase.

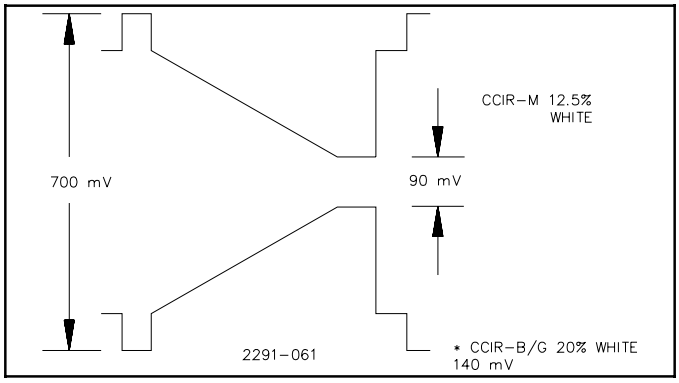

Figure 5-1

5.4 Vision Modulator and IF

5.4.1 Vision Modulator Alignment Procedure

This procedure adjusts the modulator output level and modulation depth. It is assumed that the modulator has not previously been set-up, is badly out of adjustment, or components have been replaced.

1. Set IF drive control fully CW.
2. Set modulator FREQ and Q controls fully CCW.
3. Set VIDEO DR (DRIVE) control and MOD BIAS control to mid-range.
4. Proper adjustment of the MOD BAL (BALANCE) control requires a demodulator with a display of ICPM. If this control has previously been adjusted, do not disturb its setting. Otherwise, set this control for mid-range, then refer to MOD BAL adjustment after completing this level and ratio adjustment.
5. Apply a 1V p-p luminance only ramp/staircase to the exciter video input. Set VIDEO GAIN, R18, on the Video Input/Diff.. Gain board for 1V p-p at J2 on the Diff. Phase board (J2 must be terminated in 75 ohms).
6. Set jumper P1 to the MOD TEST POSITION (P1 2-3) on the MOD/DELAY COMP board. Connect the modulator PC board test output, J2, to the input of a high frequency oscilloscope (BW 50 MHz). Terminate in 50 ohms.
7. Adjust the modulator video level control for 700 mV at peak of sync and mod bias control for 88mV p-p at white for CCIR - M (12.5% ratio) or 70mVp-p at white for CCIR - B (10% ratio). See Figure 5-2. The two controls interact so it will be necessary to go back and forth until both conditions are achieved at the same time.
8. Restore jumpers and cables to normal.

a. Although the setting of the IF DRIVE control is not critical, some adjustment may be desirable to improve linearity. This procedure assumes the modulator ratio is set up properly.
   1. Apply a modulated staircase/ramp to exciter input.
   2. Observe demodulated exciter output on a vector scope (or band-limited sub-carrier on a waveform monitor).
   3. Adjust IF DRIVE, R1, for best differential gain.

b. Modulator Balance

   This adjustment should not normally be required unless a modulator component is replaced or a new

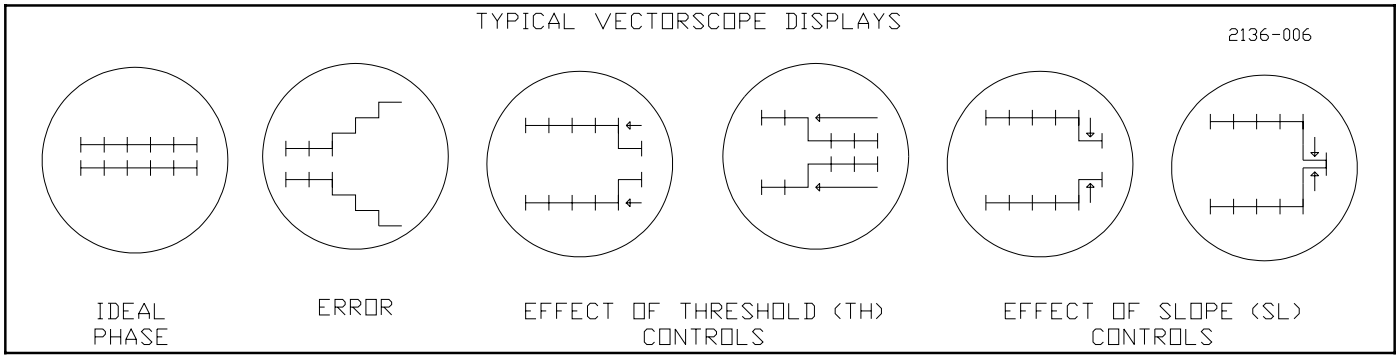

Figure 5-2. Diff. Phase, Effects of TH and SL Controls

WARNING: Disconnect primary power prior to servicing.

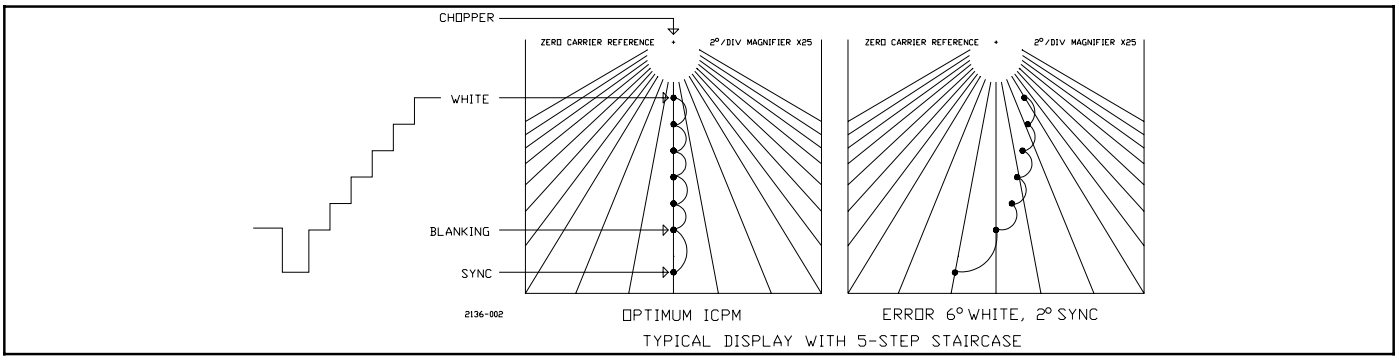

Figure 5-3. ICPM Display

unadjusted PC board is installed. Before attempting this adjustment, insure that the modulator set-up adjustments have been accomplished.

1. Apply a five step staircase to the exciter video input.
2. Switch out all exciter correction by setting to bypass.
3. Demodulate the exciter output and observe incidental phase on a Waveform Monitor.
4. Adjust mod balance control for a minimum incidental phase at white.
5. Readjust MOD BIAS for correct modulation depth at white. See Figure 5-3.
6. If the phase was PREVIOUSLY adjusted, the transmitter differential phase and ICPM may need to be adjusted when the exciter is returned to operation.

c. Check swept response at the output of the exciter and refer to response equalizer adjustments if required.

5.4.1.1 Equalizer Adjustments

Three controls make up the Response equalizer on the Modulator.

a. Slope control - used to tilt the entire sweep waveform.
b. Q and FREQUENCY (the other two controls) work together and are usually used to correct for response problems around the carrier (if needed at all).

These controls should be used only to flatten the exciter frequency response and not to correct response errors elsewhere.

If no equalization is required, the Q and FREQUENCY controls should be set fully CCW. This effectively removes them from the circuit. This adjustment procedure assumes that the modulator has been previously adjusted for the proper output level and modulation depth. If this has not been done, perform modulator set-up before proceeding.

Large amounts of equalization (1dB) are not normally required. However, large amounts of correction (if used) will attenuate the modulator board output level and may require readjusting the video level control to restore the correct modulator output level.

5.4.1.2 Alignment Procedure

a. Apply sync pulse video sweep (0-5 MHz) to the exciter video input.

NOTE

NOTE The lower sideband at IF becomes the upper sideband at vision carrier. This is due to using a local oscillator frequency higher than vision carrier. This is important if the response is monitored at IF instead of monitoring RF on carrier.

b. Observe swept response of exciter output. The VSB IN/OUT switch should be set to OUT. Set DELAY COMP IN/OUT switches to out.
c. Set modulator Q and FREQ controls fully CCW. Swept response should be only slightly tilted at this time.
d. Use the Slope control to take out as much tilt as possible (level up the markers at the desired sideband limits).
e. If response is flat, leave Q and FREQ fully CCW (this effectively takes them out of circuit).
f. If the markers are even but there is a response problem in between them, adjustment of Q and FREQ will be necessary.
g. Adjust modulator Q control partially CW and then adjust the FREQ control until changes in the passband response are evident. Watch the area below carrier, it may take several turns.
h. Using the least possible clockwise rotation of the Q control, alternately adjust Q, FREQ and Slope of the modulator section for the flattest response across the bandpass.
i. Switch in VSB and touch up response if necessary

5.4.1.3 Delay Compensator Adjustment Through Transmitter

NOTE

Measure ICPM and correct if needed before adjusting group delay. Note that when the receiver equalization is active, the receiver sound trap must also be in the circuit.

Generally, the BALANCE and PHASE controls of each section can be used to correct minor frequency response deficiencies without interacting with the group delay adjustments. Refer to Figures 5-4 & 5-5. Correspondingly, moderate adjustments of the group delay Q and FREQ controls will not affect the frequency response adjustment.

a. Set up test equipment per Figure 5-6.
b. Apply video sweep and sync to the exciter input and observe the transmitter output on a sideband analyzer.

WARNING: Disconnect primary power prior to servicing.

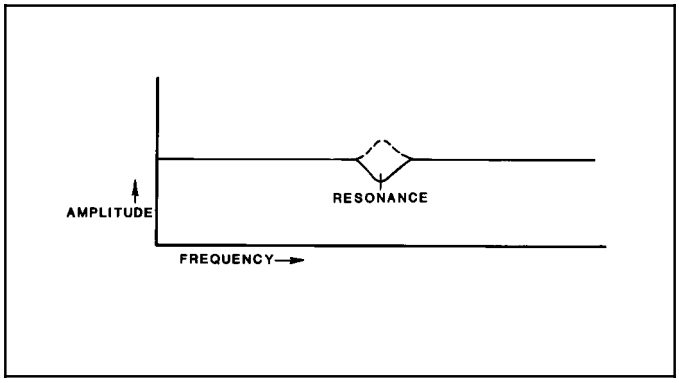

Figure 5-4. Effect of "BAL" Control on Amplitude Response

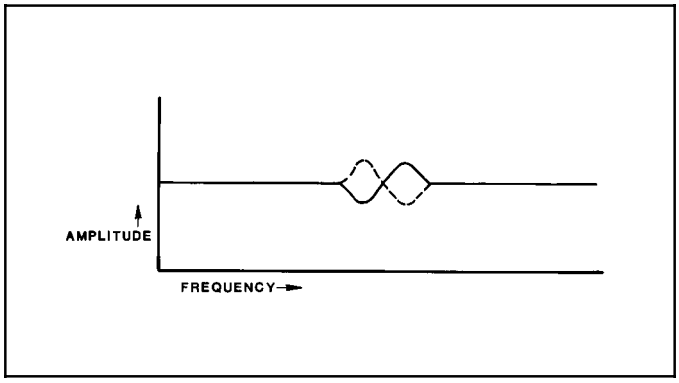

Figure 5-5. Effects of "PHASE" Control on Amplitude Response

c. Sample the transmitter before the notch diplexer (if used) and set Notch Diplexer Equalizer to BYPASS.

d. Set DELAY COMP switches to OUT position.

e. Set VSB IN/OUT switch to OUT position.

f. Ensure that transmitter frequency response is correct with both VSB and delay compensator bypassed.

g. If group delay adjustments not have been previously performed, or the condition of alignment is unknown, perform preliminary adjustments in paragraph entitled Alignment Procedure.

h. Switch the VSB and DELAY COMPS back in.

i. Using the Balance and Phase controls, adjust for the best flat frequency response through the transmitter. The front corrector should control the low end of the band and the rear the high end. The Q and FREQUENCY controls primarily effect the group delay which is observed to be correct when minimum ringing occurs on 2T pulse and minimum baseline distortion is seen on the 12.5 or 20T modulated pulse. See Figure 5-7.

CAUTION

DO NOT TURN THE FREQUENCY CONTROLS MORE THAN ONE OR TWO TURNS FROM THE PRESET OR THEY MAY BE MOVED OUT OF THE PASSBAND AND THE EFFECT WILL NOT BE VISIBLE MAKING IT IMPOSSIBLE TO RECOVER THE DESIRED ALIGNMENT WITHOUT STARTING OVER.

j. Apply composite video test signal to the exciter. Observing 2T adjust the front section FREQ for symmetrical overshoots, and the front Q for minimum ringing and overshoot.

k. Observing 12.5 or 20T adjust rear FREQ for a symmetrical baseline, and the rear Q for best compromise of minimum ringing of window leading edge, 2T symmetry & close in ring, and baseline symmetry of the 12.5 or 20T pulse.

l. Repeat several cycles of amplitude response and pulse adjustments until both conditions are satisfactory.

m. Small changes in differential gain, ICPM, or differential phase may occur as a result of the delay adjustments a quick check of those parameters should be made when completing delay adjustments.

n. Sample transmitter after the notch diplexer and proceed to notch diplexer equalizer adjustments if needed.

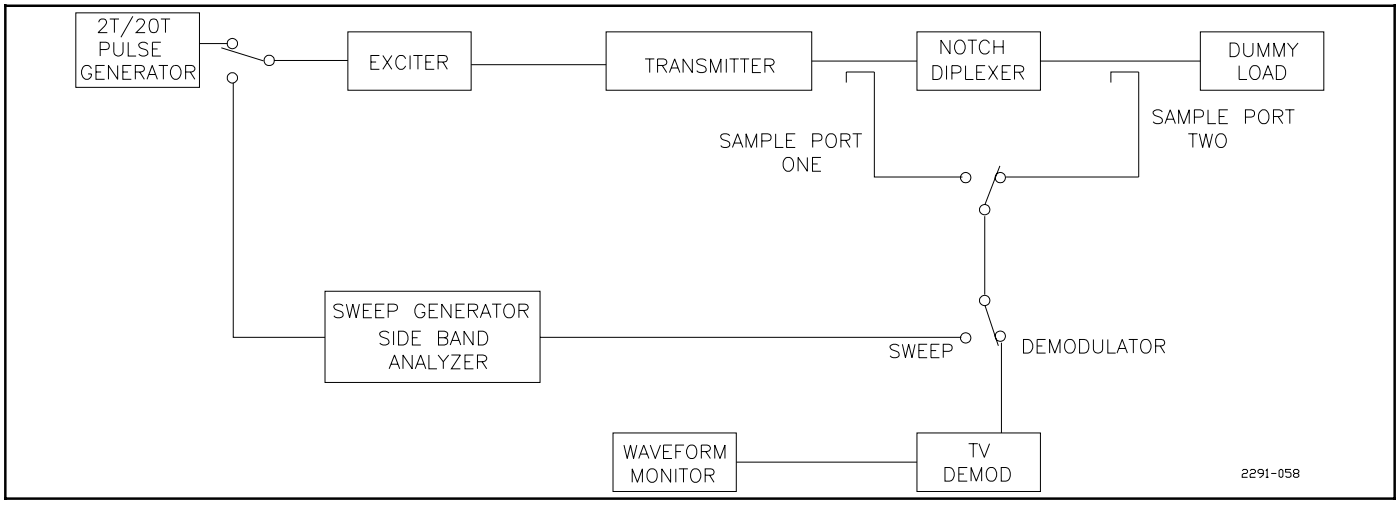

Figure 5-6. Test Equipment for Group Delay and Notch Diplexer Equalizer Adjustments

WARNING: Disconnect primary power prior to servicing.

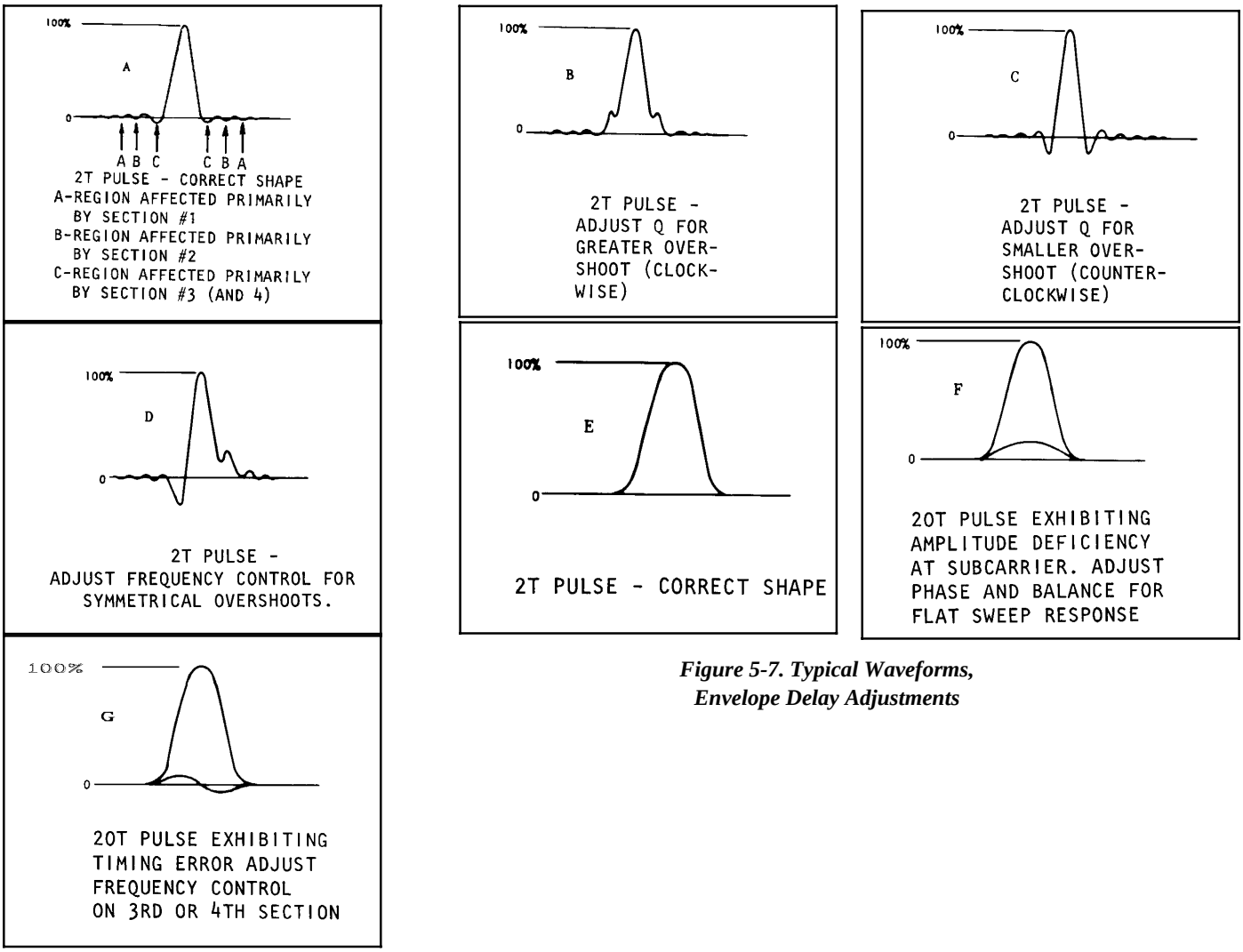

Figure 5-7. Typical Waveforms, Envelope Delay Adjustments

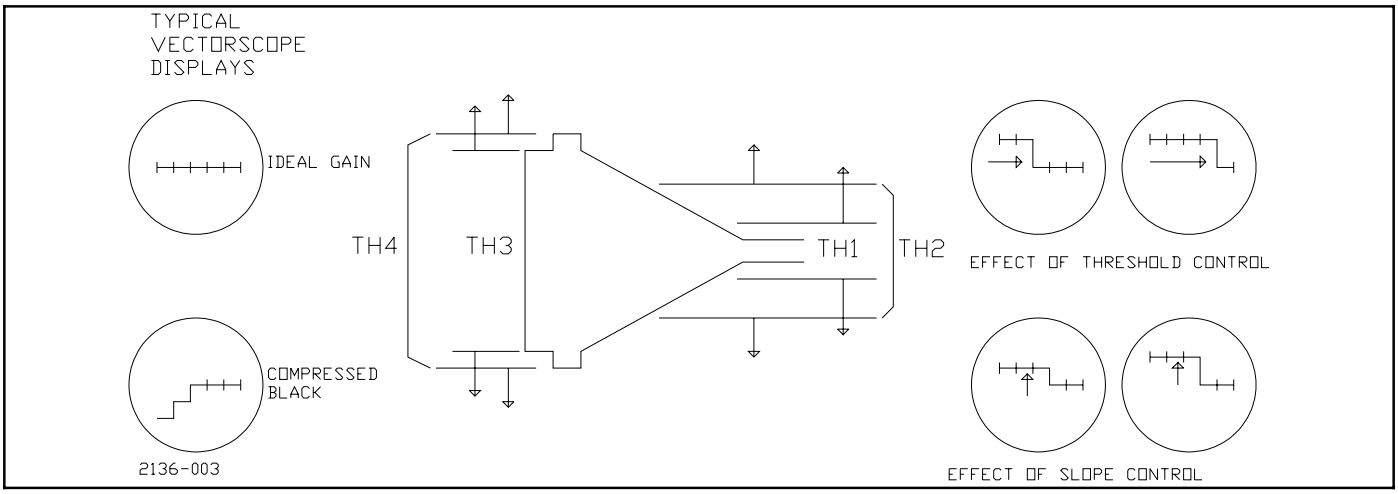

Figure 5-8. Diff. Gain, Effect of TH and SL Controls

WARNING: Disconnect primary power prior to servicing.

5.4.2 VSB and AGC Card

Frequency Response Alignment

Monitor the frequency response between the input and output of the VSB filter and adjust Q, R18 and FREQ, C44 for flat response.

5.4.2.1 VSB Filter Gain Alignment

a. The PAD control, R7, adjusts the VSB filter circuit for unity gain as the filter is switched in and out.
b. Set the exciter for minimum power out.
c. Set jumper J101 to MANUAL position. Raise exciter power to a nominal power. Note the exciter power reading with the VSB filter in.
d. Switch VSB out and set the PAD control, R7, on the VSB/AGC board, for the same power level observed when the filter was in.
e. Switch VSB to IN, and set jumper, J101, back to AUTO.

5.4.2.2 IF AGC Adjustment (Vision)

This adjustment sets the amount of headroom in the IF AGC circuit, and prevents overshoots in drive level after a loss of drive.

a. Connect a DC VOM to TP1 on the VSB/AGC board.
b. Bring the transmitter up to normal operating power.
c. Turn the IF AGC control (on the VSB/AGC board) fully CW for maximum voltage at TP1, and note the voltage.
d. Now turn the IF AGC control CCW until the voltage at TP1 is 20% less than the maximum voltage noted in the previous step.

5.4.3 IF Linearity and Quadrature Correction (Coarse Differential Gain and ICPM)

The following adjustments should be used to correct for differential gain and ICPM that is normally introduced in a transmitter. Keep in mind that the IF linearity adjustment is a coarse adjust. The fine adjust will come from the Video differential gain adjustments on the Video input/Diff. gain board. These adjustments should be made after the transmitter is at operating power, and any AGC or drive attenuator adjustments which might effect drive required have already been accomplished.

a. Apply modulated stairstep signal to the video input.
b. On linearity corrector, set TH-1 through TH-4 (threshold) fully CCW. Set SL-1 through SL-4 (slope) to midrange. Set NORMAL/BYPASS switch to NORMAL.(IN)
c. On Quadrature Corrector, set TH-1, through TH-4 (threshold) fully CCW. Set SL-1 through SL-4 (slope) to midrange. Set NORMAL/BYPASS switch to NORMAL.(IN)
d. Adjust VISION POWER control for 100% power output.
e. The thresholds will become active first in the sync or black region and will appear to walk across the vector scope display as you turn the control clockwise. The objective in this correction sequence is to place the breakpoints at the required level between sync and white then adjust the amount of gain or phase change using the slope control for each section of the corrector.
f. Observe differential gain and perform the following IF Linearity Corrector adjustments (see Figure 5-8).
g. Adjust TH-1 and SL-1 for optimum differential gain in the white to gray region.
h. Adjust TH-2 and SL-2 for optimum differential gain in the gray to black region.
i. Adjust TH-3 and SL-3 for optimum differential gain in the black region.
j. Adjust TH-4 and SL-4 for optimum sync to video ratio at 100% power. Make minor adjustments to vision power as necessary.

NOTE

Plugs P2 and P3 on the Linearity Board are normally set for gain expansion (Pins 2-3). Compression can be accomplished in sections two and four by connecting plugs P3 and P2 to ground (pins 1-2). This may be needed to correct for U shaped gain curves.

Using a synchronous demodulator with a quadrature video output, monitor ICPM and perform the following steps on the Quadrature Corrector:

Since this correction is a parallel system, continue to monitor differential gain while simultaneously observing ICPM.

a. Adjust TH-1 and SL-1 for optimum incidental phase in the white to gray region.
b. Adjust TH-2 and SL-2 for optimum incidental phase in the gray to black region.
c. Adjust TH-3 and SL-3 for optimum incidental phase in the black region.
d. Adjust TH-4 and SL-4 for optimum incidental phase in the sync region.
e. Periodically re-adjust the differential gain using the IF Linearity corrector as required.

- If the direction of phase correction is not in the direction needed to counteract the transmitter shift you may reverse the jumpers at P1 on the IF linearity section of the corrector to reverse the direction of phase shift of all TH and SLOPE CONTROLS. Connecting P1 1-2 and 3-4 generally provides the direction of shift needed to compensate the Harris solid state HT series units.

Jumpers P101 and P102 on the quad section reverse the phase of ONLY TH-2 and TH-4, and may help in case of S shaped phase distortion curves.

Make final adjustments to the IF Linearity Corrector such that Differential gain is within 2 to 4 percent or as close as possible.

5.5 Sound Alignment

5.5.1 Sound Channel 1 Synthesizer Alignments

NOTE

When replacing a board, check the programming with the data on the schematic or the board that is being replaced. Next adjust the VCO frequency.

5.5.1.1 VCO Frequency

a. Connect a dc coupled scope to TP3 (Directly below DS1).
b. Adjust L1 for 8Vdc at TP3.
c. The loop should be locked and DS1 should be off. This centers the frequency in the PLL control range.

The operating frequencies are all determined by the reference oscillator on the Synthesizer Card 1. (Refer to 10MHz Frequency Standard adjustment or PFC frequency adjustments on the VHF synthesizer Card 1).

5.5.1.2 Audio Level Meter Calibration

Apply to the audio input a signal of one volt RMS. Select meter position AUDIO 1 INPUT LEVEL (V). Adjust R80 for a meter indication of 1.00V.

5.5.1.3 Modulation Level Adjust.

Apply a steady 400 Hz tone at the level of peak program material. Using external modulation measuring equipment, adjust MOD LEVEL ADJUST R37 for full deviation level. Another method would be to use a spectrum analyzer and set modulation level. R37 for the appropriate Bessel null.

5.5.1.4 Deviation Metering

At peak deviation by modulation monitoring or Bessel null, adjust peak deviation METER CAL R72 for full deviation indication using meter position SOUND 1 DEVIATION.

5.5.2 Sound Linearization Card

5.5.2.1 Level Adjustment

The following procedure sets the proper transmitter levels of the two sound carriers and pre-correct for the transmitter intermodulation products of the sound carriers.

a. Connect sample of the sound transmitter output through an appropriate attenuator to a spectrum analyzer.
b. Adjust R53 in the sound 2 channel so that the two carriers are the desired level, typically second carrier is 7 dB lower than the main channel.
c. Adjust the sound power of the transmitter to the desired level.

5.5.2.2 Linearization Adjustment

5.5.2.2.1 IF Gain correction

Set all the linearization controls fully CCW. Set P2 and P3 to position 1-2.

a. Switch S1 to IN.
    1. Rotate R49 (gain slope 1) approximately 1 turn CW.
    2. Rotate R51 (gain threshold 1) CW. Observe intermodulation products. If the intermodulation products are reduced, alternately adjust R49 and R51 for the lowest intermodulation. If the product increase, then set the jumper P2 to position 2-3 and repeat steps 1 and 2. If the intermodulations increase in both positions of P2, then no correction is needed. Return R49 and R51 to the full CCW position.
    3. If the intermodulation was improved in step 2 then alternately adjust R50 and R52 for the lowest intermodulation signals.

5.5.2.2.2 Phase Correction

1. Rotate R71 (phase slop 1) approximately 1 turn CW.
2. Rotate R53 (phase threshold 1) CW.
3. Observe intermodulation distortion products. If they are lowered, alternately adjust R71 and R53 for the lowest intermodulation.
4. If the intermodulation increases, set jumper plug P3 to the 2-3 position and repeat steps 1 and 2 above. If the intermodulation again increases then no correction is needed. return R71 and R54 fully CCW.
5. If the intermodulation was improved in step 2 then alternately adjust R72 and R54 for lowest intermodulation.

5.5.3 Dual Sound Detector

The dual sound detector card is factory aligned and calibrated. It has no field adjustments. It should be returned to the factory for re-alignment.

5.6 Exciter Final Amplifier

5.6.1 Alignment

There are no adjustments except the change in jumper position that determines the AGC operation. Replacement of the unit may also require realignment of the AGC or the set-up of exciter power limits.

5.7 Frequency Synthesis

5.7.1 VHF Synthesizer Card 1

5.7.1.1 10MHz Frequency Standard Adjustment

a. Remove power to the exciter.
b. Remove the cover to the synthesizer slot and place card 1 on the extender card. Disconnect the PFC input, J5, from card 1. (If you do not have the PFC option, there won't be a cable connected to J5).
c. Connect a frequency counter to the 10MHz connector J3.
d. Apply power to the exciter and allow 15 minutes warm up minimum.
e. Measure the frequency on the counter. It should be 10.000000MHz exactly. If not adjustment of R1 may be required.
f. Reconnect the PFC input, J5, to card 1 and replace synthesizer card into the RFI enclosure and refit the cover.

5.7.1.2 Internal PFC Adjustment

a. Remove power to the exciter.
b. Verify that the PFC option has been installed in the exciter.
c. Remove the cover to the synthesizer slot and place card 1 on the extender card.
d. Connect a frequency counter to the 10MHz connector J3.

e. Apply power to the exciter and allow 15 minutes warm up minimum.

f. The PFC ON indicator DS1 should be illuminated. If not check that there is a minimum of 1Vpp at the PFC input, J5.

g. Measure the frequency on the counter. It should be 10MHz exactly. If not adjustment of the internal PFC vernier may be required.

h. Replace synthesizer card 1 into the RFI enclosure and refit the cover.

5.7.1.3 External PFC Adjustment

a. Remove power to the exciter.

b. Verify that the PFC option has been installed in the exciter and that the external 5 or 10MHz standard has been applied to the exciter at J10.

c. Remove the cover to the synthesizer slot and place card 1 on the extender card.

d. Connect a frequency counter to the 10MHz connector J3.

e. Apply power to the exciter and allow 15 minutes warm up minimum.

f. The PFC ON indicator DS1 should be illuminated. If not check that there is a minimum of 1Vpp at the PFC input, J5.

g. Measure the frequency on the counter. It should be 10MHz exactly. If not adjustment of the external PFC frequency may be required.

h. Replace synthesizer card 1 into the RFI enclosure and refit the cover.

5.7.1.4 Testing An Untuned Card 1 Synthesizer

In the event that an untuned synthesizer card must be replaced in the field the following test equipment is required for satisfactory alignment:

a. Oscilloscope Tektronix 475 or equivalent.

b. Frequency counter HP5315A or equivalent.

c. Spectrum analyzer HP3585 or equivalent.

d. Modulation monitor HP8901 or equivalent.

5.7.1.4.1 Visual inspection

Visually inspect the printed wiring board for shorts and opens. Visually inspect the printed wiring board for the correct installation of all integrated circuits and semiconductors.

5.7.1.4.2 Programing

a. Refer to the channel assignment and determine what frequency the synthesizer is to be set for.

b. Refer to the programing chart, Table 5-2, and remove the jumpers for the correct IF frequency of operation.

NOTE: IN = LOW = 0
OUT = HIGH = 1

5.7.1.4.3 Test Connections

a. Remove power from the exciter.

b. Remove the cover from the synthesizer slot and place card 1 on the extender card.

c. Turn on the exciter power supply.

5.7.1.4.4 Reference frequency chain setup

a. Disconnect the PFC input to card 1 at J5, if applicable.

b. Connect the frequency counter to the boards 10MHz connector J3. Allow 15 min warm up.

c. Adjust R1 (frequency Adjust) for 10.000000MHz as read on frequency counter.

d. Connect the frequency counter to the boards 5MHz connector. The frequency should be 5.000000MHz.

e. Connect the oscilloscope to TP4. Adjust L4 for maximum peak to peak signal.

f. Connect the frequency counter to the boards 16MHz connector, J4. The frequency should be 16.000000MHz.

g. Connect the frequency counter to the boards 800kHz connector. The frequency should be 800.000kHz.

5.7.1.4.5 PFC Setup

a. Temporarily connect the spectrum analyzers rear panel 10MHz output to card 1's 10MHz PFC input J5.

b. Connect the oscilloscope to TP1. Adjust L1 for maximum dc voltage on scope (Approximately 6VDC).

c. DS1 (PFC ON IND.) should be on.

d. Reconnect the exciter's PFC input to card 1, J5 (if applicable).

5.7.1.4.6 30MHz Peaking Adjustment

a. Connect the spectrum analyzer through a scope probe to TP 6. Set the analyzer for a span of 0 - 40MHz.

b. Adjust L7 for maximum 30MHz signal as seen on the analyzer.

5.7.1.4.7 PLL Lock Adjustment

a. Connect the modulation monitor RF input to the boards IF connector J6. Select frequency on the modulation monitor.

b. Connect the oscilloscope to U11 pin 7.

c. Adjust C38 for + 7Vdc on U11 pin 7. The loop should be locked. Lock is indicated by a stable dc voltage on the scope. The modulation monitor should read the desired IF frequency.

5.7.1.4.8 Output Filter Adjustment

a. Connect the boards IF output J6 to the spectrum analyzers 50 ohm input. Set the analyzer for:

CENTER:	20MHz
SPAN:	40MHz
RBW:	1kHz
REF:	+10dBm
RANGE:	+10dBm
INPUT:	50 OHMS

b. Alternately adjust L17, L18, L19 for maximum IF frequency level. The level should be +7dBm minimum. Spurs should be less than -80dBc.

5.7.1.4.9 FM Noise Measurement

a. Connect the IF output J6 to the modulation monitor RF input.

b. Measure the FM noise relative to 75kHz deviation with 75usec de-emphasis. The noise measured should be less than -80dB.

WARNING: Disconnect primary power prior to servicing.

Table 5-2

SYNTHESIZER CARD 1 PROGRAMMING CHART		
IF FREQUENCY	JUMPER SELECTION	
MHz	7654321	PLL BW
37.0	1000110	001
37.1	1000111	001
37.2	1001000	001
37.3	1001001	001
37.4	1001010	001
37.5	1001011	001
37.6	1001100	001
37.7	1001101	001
37.8	1001110	001
37.9	1001111	001
38.0	1010000	001
38.1	1010001	001
38.2	1010010	001
38.3	1010011	001
38.4	1010100	001
38.5	1010101	001
38.6	1010110	001
38.7	1010111	001
38.8	1011000	001
38.9	1011001	001
39.0	1011010	001
40.0	1011011	001

5.7.2 VHF Synthesizer Card 2

There are no user adjustments required on card 2.

5.7.2.1 Testing A Synthesizer Card 2

In the event that a synthesizer card must be replaced in the field the following test equipment is required for satisfactory alignment:

a. Oscilloscope Tektronix 475 or equivalent.
b. Frequency counter HP 5315A or equivalent.
c. Spectrum analyzer HP3585 or equivalent.
d. Modulation monitor HP8901 or equivalent.

5.7.2.2 Visual Inspection

a. Visually inspect the printed wiring board for shorts and opens.
b. Visually inspect the printed wiring board for the correct installation of all integrated circuits and semiconductors.

5.7.2.3 Programming

a. Refer to the channel assignment and determine what frequency the synthesizer is to be set for.
b. Refer to the programing chart (Table 5-3, 5-4 and 5-5)and remove the jumpers for the correct RACHET (Frach) and LO (Flo) frequency of operation. The “rachet” is the same as an incremental offset loop.

NOTE: All columns except NO-6
Jumper in = low = 0
Jumper out = high = 1
Column NO-6
Jumper in = high = 1
Jumper out = low = 0

5.7.2.4 Test Connections

a. Remove the cover from the synthesizer slot and place card 2 on the extender card.
b. Connect the 5MHz and 800kHz from card 1 card 2 J1 and J2.
c. Turn on the power supply.

5.7.2.5 Incremental Offset PLL Setup

a. Set R13 for mid range.
b. Connect the frequency counter through a scope probe to the junction of L4 and C39. The frequency measured should agree with the programing chart. This is the rachet loop frequency (Frach on programming chart).
c. Connect the spectrum analyzer’s tracking generator output through a 100k resistor to U2 pin 3. Connect the spectrum analyzers RF input through a scope probe to the junction of R15 and R13.
d. Set the analyzer for:

START:	0Hz
STOP:	500kHz
RBW:	1kHz
REF:	-25dBm
RANGE:	-25dBm
INPUT:	1M ohm

e. Adjust L3 for a notch centered at 100kHz.
f. Adjust L2 for a notch centered at 200kHz.
g. Remove the tracking generator and 100k resistor.

5.7.2.6 Main PLL Setup

a. Set R44 to mid range. (This is a 5 turn pot).
b. Connect the frequency counter to the LO output connecter J3. The frequency measured should be the desired LO frequency (Flo on programming chart).
c. Connect the spectrum analyzer’s tracking generator output through a 100k resistor to U25 pin 3. Connect the spectrum analyzers RF input through a scope probe to the junction of R43 and R44.
d. Set the analyzer for:

START:	0Hz
STOP:	500kHz
RBW:	1kHz
REF:	-25dBm
RANGE:	-25dBm
INPUT:	1M ohm

e. Adjust L5 for a notch centered at 100kHz.
f. Adjust L7 for a notch centered at 200kHz.
g. Remove the tracking generator and 100k resistor.

Table 5-3

SYNTHESIZER CARD 2 PROGRAMMING CHART USA CHANNEL PROGRAMMING									
CHAN	F_{LO}	N_{U35}	F_{VCO}	F_{RACH}	1N0-7	1A0-5	F_{SSB}	N_{U27}	N0-6
					76543210	543210			6543210
2-	92.24	2	184.48	14.48	10010000	001000	170	34	1011110
2F	92.25	2	184.50	14.50	10010001	000000	170	34	1011110
2+	92.26	2	184.52	14.52	10010001	000010	170	34	1011110
3-	98.24	2	196.48	11.48	01110010	001000	185	37	1011011
3F	98.25	2	196.50	11.50	01110011	000000	185	37	1011011
3+	98.26	2	196.52	11.52	01110011	000010	185	37	1011011
4-	104.24	2	208.48	13.48	10000110	001000	195	39	1011001
4F	104.25	2	208.50	13.50	10000111	000000	195	39	1011001
4+	104.26	2	208.52	13.52	10000111	000010	195	39	1011001
5-	114.24	2	228.48	13.48	10000110	001000	215	43	1010101
5F	114.25	2	228.50	13.50	10000111	000000	215	43	1010101
5+	114.26	2	228.52	13.52	10000111	000010	215	43	1010101
6-	120.24	2	240.48	10.48	01101000	001000	230	46	1010010
6F	120.25	2	240.50	10.50	01101001	000000	230	46	1010010
6+	120.26	2	240.52	10.52	01101001	000010	230	46	1010010
7-	212.24	1	212.24	12.24	01111010	000100	200	40	1011000
7F	212.25	1	212.25	12.25	01111010	000101	200	40	1011000
7+	212.26	1	212.26	12.26	01111010	000110	200	40	1011000
8-	218.24	1	218.24	13.24	10000100	000100	205	41	1010111
8F	218.25	1	218.25	13.25	10000100	000101	205	41	1010111
8+	218.26	1	218.26	13.26	10000100	000110	205	41	1010111
9-	224.24	1	224.24	14.24	10001110	000100	210	42	1010110
9F	224.25	1	224.25	14.25	10001110	000101	210	42	1010110
9+	224.26	1	224.26	14.26	10001110	000110	210	42	1010110
10-	230.24	1	230.24	10.24	01100110	000100	220	44	1010100
10F	230.25	1	230.25	10.25	01100110	000101	220	44	1010100
10+	230.26	1	230.26	10.26	01100110	000110	220	44	1010100
11-	236.24	1	236.24	11.24	01110000	000100	225	45	1010011
11F	236.25	1	236.25	11.25	01110000	000101	225	45	1010011
11+	236.26	1	236.26	11.26	01110000	000110	225	45	1010011
12-	242.24	1	242.24	12.24	01111010	000100	230	46	1010010
12F	242.25	1	242.25	12.25	01111010	000101	230	46	1010010
12+	242.26	1	242.26	12.26	01111010	000110	230	46	1010010
13-	248.24	1	248.24	13.24	10000100	000100	235	47	1010001
13F	248.25	1	248.25	13.25	10000100	000101	235	47	1010001
13+	248.26	1	248.26	13.26	10000100	000110	235	47	1010001

WARNING: Disconnect primary power prior to servicing.

Table 5-4

SYNTHESIZER CARD 2 PROGRAMMING CHART AUSTRALIAN CHANNEL PROGRAMMING									
CHAN	F_{LO}	N_{U35}	F_{VCO}	F_{RACH}	1N0-7	1A0-5	F_{SSB}	N_{U27}	N0-6
					76543210	543210			6543210
0	85.15	2	170.30	10.30	01100111	000000	160	32	0100000
1	96.15	2	192.30	12.30	01111011	000000	180	36	1011100
2	103.15	2	206.30	11.30	01110001	000000	195	39	1011001
3	125.15	2	250.30	10.30	01100111	000000	240	48	1010000
4	134.15	2	268.30	13.30	10000101	000000	255	51	1001101
5	141.15	2	282.30	12.30	01111011	000000	270	54	1001010
5A	177.15	1	177.15	12.15	01111001	000101	165	33	1011111
6	214.14	1	214.15	14.15	10001101	000101	200	40	1011000
7	221.15	1	212.15	12.15	01111001	000101	200	40	1011000
8	228.15	1	228.15	13.15	10000011	000101	210	42	1010110
9	235.15	1	235.15	10.15	01100101	000101	225	45	1010011
10	248.15	1	248.15	13.15	10000011	000101	235	47	1010001
11	255.15	1	255.15	10.15	01100101	000101	245	49	1001111

Table 5-5

SYNTHESIZER CARD 2 PROGRAMMING CHART EUROPEAN CHANNEL PROGRAMMING									
CHAN	F_{LO}	N_{U35}	F_{VCO}	F_{RACH}	1N0-7	1A0-5	F_{SSB}	N_{U27}	N0-6
					76543210	543210			6543210
E2	87.15	2	174.30	14.30	10001111	000000	160	32	1100000
E2A	88.65	2	176.30	11.30	01110001	000000	165	33	1011111
E3	94.15	2	188.30	13.30	10000101	000000	175	35	1011101
E4	101.15	2	202.30	12.30	01111011	000000	190	38	1011010
E5	214.15	1	214.15	14.15	10001101	000101	200	40	1011000
E6	221.15	1	221.15	11.15	01101111	000101	210	42	1010110
E7	228.15	1	228.15	13.15	10000011	000101	215	43	1010101
E8	235.15	1	235.15	10.15	01100101	000101	225	45	1010011
E9	242.15	1	242.15	12.15	01111001	000101	230	46	1010010
E10	249.15	1	249.15	14.15	10001101	000101	235	47	1010001
E11	256.15	1	256.15	11.15	01101111	000101	245	49	1001111
E12	263.15	1	263.15	13.15	10000011	000101	250	50	1001110

WARNING: Disconnect primary power prior to servicing.

5.7.2.7 FM Noise Measurement

a. Connect the LO output J3 to the modulation monitor RF input.

b. Measure the FM noise relative to 75kHz deviation using 75usec de-emphasis. The noise should be less than -80dB.

5.7.2.8 ICPM Measurement

At the exciter output, J2

a. Adjust R13 for best ICPM and microphonics.

b. Adjust R14 for best ICPM and Microphonics.

c. ICPM should measure less than +/- .5 degree peak to peak.

5.7.2.9 Final Installation

a. Remove card 2 from the extender and place it into the RFI enclosure.

b. Refit the RFI enclosure cover to the synthesizer slot.

c. Refit the exciter lid.

5.7.3 Offset Card (#3) Adjustments

There are no user adjustments that can or should be made to this printed circuit board.

In case of malfunction, check the outputs of all power supply nodes entering this board, and, if OK, continue to check voltages within the board appearing out of regulators U15 and U12.

If you have not read the theory of operation and studied the block diagram and schematic, doing so will enhance the prospect of finding a fault.

Also check to see that RF levels at all connectors are within the range specified on the schematic when loaded in 50 ohms.

R102 adjusts the RF level at J4 to approximately -2 dBm. L10 centers the frequency range of the VCO so that it straddles 100 to 150 MHz with equal guard-band at both ends. A frequency of less than 95 MHz at J4 will typically begin to cause loss-of-lock, indicated by the "FAULT\" signal going low. Above 95 MHz, this FAULT\ line should go high (if a pull-up resistor is present), and remain high for any frequency up to 154 MHz at J4. Above that, (by no more than 8 MHz) FAULT\ should go low. L10 is factory-adjusted and should never need re-adjustment unless U29, D21-23, or R92 or U12 have been replaced.

5.8 Metering and Control

5.8.1 Alignment

If this board is being replaced, check the sound configuration jumper per the chart on sheet 3 of the schematic.

5.8.1.1 Metering

METER POSITION	ADJUSTMENT LOCATION
Vision Power (mW)	Meter Board R60
Sound 1 Power (mW)	Meter Board R61
Audio 1 Input Level (V)	Sound Ch. 1 R80
Sound 1 Dev (kHz)	Sound Ch. 1 R72
Video Input Level (mV)	Video Input R149
Sync Input Level (mV)	Video Input R145
Sound 2 Power (mW)	Meter Board R23
Audio 2 Input Level (V)	Sound Channel 2 R80
Sound 2 Deviation (kHz)	Sound Channel 2 R72

5.8.1.2 Meter Board Calibration

Meter calibrate controls are located along the top-front edge of the exciter on the Meter/Control board.

a. Vision Power Calibrate (RF Wattmeter Method)

1. Connect the vision RF output to a RF wattmeter and disconnect the I/O cable from the exciter.
2. Apply a black picture (no set up) to the video input Proper sync ratio must be maintained for meter calibration by observing demodulated exciter output on a waveform monitor or scope.
3. Increase vision power such that a 0.6W is read on a RF wattmeter. (Adjust VIS LIMIT if required, to obtain 1 watt out of the Exciter).
4. Now adjust the VIS PWR CAL CCW until all bars on the bar graph are lit. Then adjust CW until 3 of the bars go out. The Bar graph is now calibrated.
5. The CAL control sets the reference for the digital meter. It should be set so that both digital and analog bargraph meters agree. Adjust CAL such that % POWER METER reads 1000mW.
6. Lower the Exciter output to zero, and reconnect the RF output and the I/O cable to the Exciter.
7. Turn the transmitter on and raise the power to your normal operating power.
8. If the VIS LIMIT control was moved, it will be necessary to do POWER LIMIT ADJUSTMENTS later in this section.

b. Alternate Vision Power Calibrate (Spectrum Analyzer Method)

1. Apply video to the input of the Exciter.
2. Connect a spectrum analyzer to the output of the exciter with a 10dB pad and disconnect the I/O cable from the back of the Exciter. The 10dB pad will keep you from overloading the input to the analyzer, which is usually rated at 1 watt input.
3. Increase vision power until you have +20dBm on the spectrum analyzer at the peak of sync. (+20dBm with a 10dB pad is +30dBm which is equal to 1 watt. Adjustment of the "VIS LIMIT" control may be required, to obtain 1 watt out of the Exciter).
4. Now adjust the VIS PWR CAL CCW until all bars on the bar graph are lit. Then adjust CW until 3 of the bars go out. The Bar graph is now calibrated.
5. The CAL control sets the reference for the digital meter. It should be set so that both digital and analog bargraph meters agree. Adjust CAL such that % POWER METER reads 1000mW.
6. Lower the Exciter output to zero, and reconnect the RF output and the I/O cable to the Exciter.

7. Turn the transmitter on and raise the power to your normal operating power.
8. If the VIS LIMIT control was moved, it will be necessary to do POWER LIMIT ADJUSTMENTS later in this section.

c. Sound Ch 1 Power Calibrate
1. Connect Sound RF OUT to a RF wattmeter.
2. Remove Channel 2 input cable from J1 on the SOUND LIN card.
3. Adjust SOUND RAISE/LOWER for 1 watt output.
4. Set SOUND 1 POWER calibrate pot R61 for the % POWER METER to read 1000.
5. Reconnect the cable to J1 (removed in step 2.).

d. Sound Ch 2 Power Calibrate
1. Refer to the Sound Linearization Pre-corrector and verify the difference between sound 1 and sound 2. Calculate the power of sound 2 and set SOUND 2 POWER calibrate pot R23 to the correct meter reading.

e. Refer to power limit adjustments if power limit controls were changed during these procedures.

5.8.1.3 Power Limit Adjustments

1. Vision Power Limit

The Vision Power Limit control limits the maximum power available from the vision amplifier of the exciter. The Power Limit control is set such that the maximum power out of the transmitter is 110 percent.

a. Using the VIS LIMIT control, reduce transmitter power output to 50 percent or less.
b. Raise Vision transmitter power until it reaches a maximum or 100% using the Vision Raise button on the front of the Exciter.
c. Repeat steps a and b until the Raise control will no longer increase the transmitter power output.
d. Adjust the VIS LIMIT control until the transmitter power output is 110%.
e. Lower Vision transmitter power output with the VISION lower control on the front of the Exciter to 100% (or your normal operating power).

1. Sound Power Limit

- The Sound Power Limit control limits the maximum power available from the sound amplifier of the exciter.

f. Using the AUR LIMIT control, reduce transmitter power output to 50 percent or less.
g. Raise Sound transmitter power until it reaches a maximum or 100% using the SOUND Raise button on the front of the Exciter.
h. Repeat steps a and b until the Raise control will no longer increase the Sound transmitter power output.
i. Adjust the AUR LIMIT control until the transmitter power output is 110%.
j. Lower Transmitter power output with the Sound lower control on the front of the Exciter to 100% (or your normal operating power).

5.8.1.4 IF AGC Adjustment

This adjustment sets the amount of headroom in the IF AGC circuit, and prevents overshoots in drive level after a loss of drive.

a. Connect a DC VOM to TP1 on the VSB/AGC board.
b. Bring the transmitter up to normal operating power.
c. Turn the IF AGC control (on the VSB/AGC board) fully CW for maximum voltage at TP1, and note the voltage.
d. Now turn the IF AGC control CCW until the voltage at TP1 is 20% less than the maximum voltage noted in the previous step.

5.8.1.5 Final Amp

5.8.1.5.1 Vision/Sound Selection

There are no adjustments in the final amp, only selection of sound or vision service if it is necessary to replace the unit. Remove its cover and place J1 in the appropriate position.

5.8.1.6 VSWR Foldback

A voltage applied to the VSWR inputs on the remote control connector will reduce power by a proportional amount. When used with the Harris transmitter these controls should be fully CW.

5.9 Component Replacement On Circuit Boards

The circuit boards used in the VHF TV exciter are double-sided circuit boards with plated through-holes. Soldering on this circuit board is possible with conventional tools if care is observed.

For repair, a de-soldering station is suggested such as an Air-Vac PVSG-60E De-Soldering System made by Air-Vac Engineering Co., Inc., 100 Gulf St, Milford, CT 06460 (203-874-2541). This de-soldering system utilizes a venturi to develop the suction and therefore requires an air pressure source of approximately 35 PSI. It is relatively inexpensive for such a system and works well.

Techniques must be developed using the de-soldering station. Sometimes, it may be necessary to add solder to the connection to assist heat flow to the connection several times until the solder can be removed in steps. Possibly, removing solder from both sides of the circuit board will assist in clearing the through-holes.

The circuit board used in the VHF TV exciter utilizes plated through-holes. Because of these through-holes, solder fills the holes by capillary action. This condition requires that defective components be removed carefully to avoid damage to the circuit board.

On all circuit boards, the adhesive securing the copper track to the circuit board melts at almost the same temperature at which solder melts. A circuit-board track can be destroyed by excessive heat or lateral movement during soldering. Use of a heat source

no larger than necessary with steady pressure is required for circuit board repair.

To remove a component from a circuit board such as the type used in the VHF TV exciter, cut the leads from the body of the defective component while the device is still soldered to the circuit board.

Carefully grasp each component lead, one at a time with miniature long-nose pliers. Heat each lead independently. When the solder begins to melt, carefully pull the lead from each hole. The holes may then be cleared of solder with vacuum.

Install the new component and solder the component in place.

WARNING

MOST SOLVENTS WHICH WILL REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY THEIR NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL-VENTILATED AREA, AWAY FROM FLAME (INCLUDING CIGARETTES) AND A HOT SOLDERING IRON. OBSERVE THE MANUFACTURERS CAUTIONARY INSTRUCTIONS.

After soldering, remove flux with a cotton swab moistened with a suitable solvent. Rubbing alcohol is highly diluted with water and is not effective. Solvents are available at electronic supply houses which are useful.

The circuit board should be checked to ensure that the flux has been removed from the circuit board and not just smeared about. Rosin flux is not normally corrosive, but rosin can absorb enough moisture in time to become conductive and cause problems.

6.1 Introduction

Most troubleshooting consists of visual checks. Use all of the indicators and metering. Think of the whole system, is the problem in the exciter, the signals feeding the exciter or the transmitter which requires a different amount of RF drive or non-linearity correction. Once the problem has been isolated refer to Section IV for a detailed explanation of the circuit theory and the diagrams in the drawing package. Confirm that there has been no failure of components before making any adjustments.

Troubleshooting assistance is available from the Harris Customer Service Department by:

Letter to- Harris Corporation Broadcast Division
P.O. Box 4290
Quincy Illinois 62305
Attention Customer Service Department

Fax to- Customer Service
(217) 221-7086

Via Internet tsupport@harris.com

Telephone (217) 222-8200
Off Air Telephone Emergency service is available 24 hours a day

It is necessary to have the model and serial number of the unit to retrieve certain information. This information is recorded on the product identification tag affixed to the rear door of the exciter cabinet. Before contacting Harris record all observable symptoms, sequence of events, and meter reading.

6.2 Warranty Returns

To return material to Harris under warranty, a return authorization number must be obtained from the Harris Customer Service Department before returning any unit for warranty purposes. The return authorization will assure speedy and accurate handling of your return. A written description including the following information must accompany all returns.

Return Authorization Number.
Customer name, address, contact and contacts phone number.
A description of the problem or reason for the returning the unit.

Ship or return the product, transportation and insurance prepaid to:

Harris Corporation, Broadcast Division
3200 Wismann Lane
Quincy, IL 62301
Attention: Warranty Return

6.3 Factory Repair

Units that are not under warranty may be returned for repair without a Return Authorization.

Contact the repair department by phone or fax to 217-221-7086 for current rates, estimates and scheduling. If a quick repair is needed for an emergency, consult the repair department supervisor by phone.

6.4 Ordering Parts.

There are thousands of parts in a typical transmitter. To assist in the speedy shipment of parts the following information is needed to identify your unit:

Equipment Name
Equipment Part Number
Equipment Serial Number

To identify your part please furnish as much information as possible:

Quantity needed
Harris part number, include all information from parts list
Schematic reference name and schematic number
Assembly part is used in by description and part number

An order form is included in the front of this manual.

WARNING: Disconnect primary power prior to servicing.

Replaceable Parts List Index

Table 7-1. FORMAT, TUNED EXCITER HP HTEL - 994 9540 001 ((N))

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
988 2403 001	DP, HTEL EXCITER SINGLE CAR	0		
988 2404 001	DP, HTEL EXCITER DUAL CAR IRT	0		
988 2405 001	DP, HTEL EXC DUAL CAR NICAM	0		
992 9023 006	PWA SYSTEM M SAW FILTER 45MHZ	0	EA	WITH ADJUSTABLE RECEIVER CURVE QTY 1 REQ'D
992 9024 005	KIT SOUND SINGLE CARRIER 45MHZ	0	EA	AUR EXCITER SUB-ASSY QTY 1 REQ'D
992 9024 006	KIT SOUND DUAL CARRIER 45 MHZ	0	EA	AUR EXC SUB ASSY QTY 1 REQ'D
992 9025 002	EXC FILTERS, CH-2	0	EA	
992 9025 003	EXC FILTERS, CH-3	0	EA	
992 9025 004	EXC FILTERS, CH-4	0	EA	
992 9025 005	EXC FILTERS, CH-5	0	EA	
992 9025 006	EXC FILTERS, CH-6	0	EA	
992 9025 007	EXC FILTERS, CH-7	0	EA	
992 9025 008	EXC FILTERS, CH-8	0	EA	
992 9025 009	EXC FILTERS, CH-9	0	EA	
992 9025 010	EXC FILTERS, CH-10	0	EA	
992 9025 011	EXC FILTERS, CH-11	0	EA	
992 9025 012	EXC FILTERS, CH-12	0	EA	
992 9025 013	EXC FILTERS, CH-13	0	EA	
992 9025 102	EXC FILTERS, E-2	0	EA	
992 9025 103	EXC FILTERS, E-3	0	EA	
992 9025 104	EXC FILTERS, E-4	0	EA	
992 9025 105	EXC FILTERS, E-5	0	EA	
992 9025 106	EXC FILTERS, E-6	0	EA	
992 9025 107	EXC FILTERS, E-7	0	EA	
992 9025 108	EXC FILTERS, E-8	0	EA	
992 9025 109	EXC FILTERS, E-9	0	EA	
992 9025 110	EXC FILTERS, E-10	0	EA	
992 9025 111	EXC FILTERS, E-11	0	EA	
992 9025 112	EXC FILTERS, E-12	0	EA	
992 9025 200	EXC FILTERS, A-0	0	EA	
992 9025 201	EXC FILTERS, A-1	0	EA	
992 9025 202	EXC FILTERS, A-2	0	EA	
992 9025 206	EXC FILTERS, A-6	0	EA	
992 9025 207	EXC FILTERS, A-7	0	EA	
992 9025 208	EXC FILTERS, A-8	0	EA	
992 9025 209	EXC FILTERS, A-9	0	EA	
992 9025 210	EXC FILTERS, A-10	0	EA	
992 9025 211	EXC FILTERS, A-11	0	EA	
992 9511 223	KIT EXTERNAL LO EXCITER	0	EA	OPTION, QTY 1 REQ'D FOR SINGLE EXCITER OPTION, QTY 2 REQ'D FOR DUAL EXCITER
992 9023 001	SYSTEM M SAW FILTER 37MHZ PWA	0	EA	*WITH FCC RECEIVER CURVEQTY 1 REQUIRED*
992 9023 002	SYSTEM B SAW FILTER PWA	0	EA	*WITH ADJUSTABLE RECEIVER CURVE QTY 1 REQUIRED. USE ONLY FOR AUSTRALIA, DENMARK, NORWAY, SWEDEN*
992 9023 007	KIT, SYS B SAW FLTR W/RCVR EQ	0	EA	*WITH FIXED GENERAL PAL B RECEIVER CURVE QTY 1 REQUIRED*
992 9024 002	KIT SOUND DUAL CARRIER 37MHZ	0	EA	*AUR EXCITER SUB-ASSEMBLIES QTY 1 REQUIRED*

992 9024 003	KIT SOUND NICAM	0	EA	*AUR EXCITER SUB-ASSEMBLIES QTY 1 REQUIRED*
992 9024 007	KIT SOUND NICAM, SYSTEM D	0	EA	*AUR EXCITER SUB-ASSEMBLIES QTY 1 REQUIRED*
992 9025 000	CHANNEL SELECTION PSEUDO	0	EA	*LAST THREE DIGITS=CHAN 002 - 013 USA CHANNELS 102 - 112 E CHANNELS 200 - 211 A CHANNELS 304 - 310 K1 CHANNELS QTY 1 REQ*
992 8323 002	TUNED RFI AURAL GROUP	0	EA	#SINGLE SOUND/NOTCH DIPLEXER TRANSMITTER CONFIGURATION, QTY 1 REQ'D
992 8527 001	NOTCH DIP/REC EQ BD	0	EA	#NOTCH DIPLEXER TRANSMITTER CONFIGURATION QTY 1 REQ'D
994 9175 002	*EXTERNAL PFC HTEL	0	EA	*OPTION QTY 1 REQ*
992 9026 001	BASIC EXCITER, HP HTEL	1	EA	

Table 7-2. KIT EXTERNAL LO EXCITER - 992 9511 223 (B)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
620 3073 000	ADAPTER, JACK-JACK, SMC	1	EA	
917 2100 508	CABLE, PFC 15" W16	1	EA	
939 8203 027	ANGLE, MINI CKT MTG.	1	EA	

Table 7-3. SYSTEM M SAW FILTER 37MHZ PWA - 992 9023 001 (C)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8324 001	VSB/IF AGC BD	1	EA	
992 9009 001	PWB, MOD/DELAY COMP W/IF CPLR	1.00	EA	

Table 7-4. VSB/IF AGC BD - 992 8324 001 (D)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	5	EA	Q003,Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004
380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101
384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	XQ003,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q003,Q005,Q006
478 0392 000	XFMR, RF MODEL T4-1	3	EA	T001,T002,T101
484 0336 000	SAW FILTER ESD	1	EA	FL001
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0398 000	CHOKE RF 10.0UH +/- 10%	2	EA	L001,L003
500 0801 000	CAP, MICA, 2PF 500V +/- .5PF	1	EA	C026
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
500 0844 000	CAP, MICA, 1000PF 100V 5%	1	EA	C008
516 0059 000	CAP, DISC .0015UF 1KV 10%	18	EA	

				C001,C002,C006,C007,C011,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	4	EA	C005,C010,C012,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	3	EA	C015,C105,C111
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 109	RES 12.1 OHM 1/2W 1%	1	EA	R013
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	1	EA	R031
548 2400 169	RES 51.1 OHM 1/2W 1%	3	EA	R001,R021,R023
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025
548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 273	RES 562 OHM 1/2W 1%	1	EA	R017
548 2400 285	RES 750 OHM 1/2W 1%	2	EA	R002,R018
548 2400 301	RES 1K OHM 1/2W 1%	3	EA	R012,R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	8	EA	R003,R004,R015,R016,R102,R103,R108,R115
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R019
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	1	EA	R007
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0045 000	HTR, SAW FILTER 5W 24VDC	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001
604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	P002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	J101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	P101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
817 2100 362	HEATER BLANKET	2		#HR001 ONE ON TOP ONE ON BOTTOM COVER WITH 055-0190-009 TO A MIN OF .12 DEEP
839 7900 491	SCHEM, VSB/IF AGC	0		
843 4999 362	PWB, VSB/IF AGC	1		
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

WARNING: Disconnect primary power prior to servicing.

Table 7-5. PWB, MOD/DELAY COMP W/IF CPLR - 992 9009 001 (L)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	7	EA	Q001,Q003,Q004,Q101,Q102,Q105,Q106
380 0536 000	XSTR, NPN, 2N5179 ESD|	3	EA	Q002,Q103,Q104
382 1225 000	IC, ASK-1 ESD	1	EA	MX001
382 1231 000	IC MWA-130 ESD	1	EA	U003
383 0189 000	*IC, SA5205A ESD	1	EA	U002
384 0361 000	DIODE 5082-3077 ESD	4	EA	CR101,CR102,CR103,CR104
384 0431 000	RECT. 1N4001 ESD	2	EA	CR105,CR106
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR007,CR008
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR009
404 0198 000	SPACER TO-5, TO-9, TO-11	7	EA	XQ001,XQ003,XQ004,XQ101,XQ102,XQ105,XQ106
404 0264 000	HEAT SINK FOR TO-5 CASE	1	EA	XQ001
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU002
404 0873 000	SOCKET ADAPTER SOIC8-DIP8	1.0	EA	#U002
478 0392 000	XFMR, RF MODEL T4-1	4	EA	T001,T002,T101,T102
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	4	EA	L103,L104,L113,L114
494 0375 000	CHOKE RF 0.18UH	1	EA	L003
494 0376 000	CHOKE RF 0.22UH	4	EA	L109,L110,L115,L116
494 0378 000	CHOKE 0.33UH 10% 780MA	2	EA	L101,L102
494 0383 000	CHOKE RF 0.82UH	1	EA	L004
494 0384 000	CHOKE RF 1.00UH	4	EA	L105,L106,L111,L112
494 0388 000	CHOKE RF 2.20UH	1	EA	L002
494 0398 000	CHOKE RF 10.0UH +/- 10%	4	EA	L006,L107,L108,L117
494 0446 000	CHOKE POWER LINE 100UH	2	EA	L001,L005
500 0804 000	CAP, MICA, 10PF 500V +/- .5PF	3	EA	C112,C138,C139
500 0807 000	CAP, MICA, 18PF 500V 5%	1	EA	C013
500 0808 000	CAP, MICA, 20PF 500V 5%	1	EA	C012
500 0809 000	CAP, MICA, 22PF 500V 5%	4	EA	C103,C104,C107,C108
500 0840 000	CAP, MICA, 680PF 300V 5%	1	EA	C020
500 0957 000	CAP, MICA, 7PF 500V +/- .5PF	1	EA	C111
516 0530 000	CAP .01UF 10% 100V X7R	6	EA	C019,C140,C141,C142,C143,C144
516 0736 000	CAP .001UF 10% 100V X7R	41	EA	C001,C002,C003,C005,C007,C008,C009,C014,C016,C018,C021,C023,C025,C027,C029,C101,C102,C105,C106,C113,C114,C115,C116,C117,C118,C119,C120,C123,C124,C125,C126,C127,C128,C129,C130,C131,C132,C133,C134,C136,C137
516 0891 000	CAP 0.100UF 10% 50V	5	EA	C015,C022,C024,C026,C028
518 0045 000	CAP VAR 9-35PF 200V	2	EA	C121,C122
520 0446 000	CAP, VAR .8-10PF	1	EA	C011
520 0448 000	CAP, VAR .8-14PF	2	EA	C109,C110
522 0548 000	CAP 10UF 50V 20%	1	EA	C135
522 0561 000	CAP 100UF 63V 20%	3	EA	C004,C006,C017
548 2400 101	RES 10 OHM 1/2W 1%	5	EA	R005,R135,R136,R139,R140
548 2400 105	RES 11 OHM 1/2W 1%	1	EA	R022
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R019
548 2400 134	RES 22.1 OHM 1/2W 1%	6	EA	R033,R034,R145,R146,R153,R154
548 2400 147	RES 30.1 OHM 1/2W 1%	1	EA	R110
548 2400 158	RES 39.2 OHM 1/2W 1%	2	EA	R021,R029
548 2400 166	RES 47.5 OHM 1/2W 1%	3	EA	R109,R125,R126
548 2400 169	RES 51.1 OHM 1/2W 1%	3	EA	R016,R123,R124
548 2400 181	RES 68.1 OHM 1/2W 1%	3	EA	R006,R119,R120
548 2400 185	RES 75 OHM 1/2W 1%	2	EA	R121,R122

548 2400 189	RES 82.5 OHM 1/2W 1%	2	EA	R155,R157
548 2400 194	RES 93.1 OHM 1/2W 1%	1	EA	R156
548 2400 201	RES 100 OHM 1/2W 1%	5	EA	R009,R018,R025,R101,R102
548 2400 205	RES 110 OHM 1/2W 1%	1	EA	R007
548 2400 209	RES 121 OHM 1/2W 1%	2	EA	R133,R134
548 2400 218	RES 150 OHM 1/2W 1%	2	EA	R103,R104
548 2400 226	RES 182 OHM 1/2W 1%	2	EA	R117,R118
548 2400 230	RES 200 OHM 1/2W 1%	2	EA	R035,R036
548 2400 234	RES 221 OHM 1/2W 1%	4	EA	R141,R142,R143,R144
548 2400 247	RES 301 OHM 1/2W 1%	2	EA	R004,R011
548 2400 251	RES 332 OHM 1/2W 1%	4	EA	R027,R032,R159,R160
548 2400 254	RES 357 OHM 1/2W 1%	1	EA	R158
548 2400 258	RES 392 OHM 1/2W 1%	4	EA	R113,R114,R115,R116
548 2400 262	RES 432 OHM 1/2W 1%	2	EA	R137,R138
548 2400 266	RES 475 OHM 1/2W 1%	2	EA	R008,R013
548 2400 277	RES 619 OHM 1/2W 1%	2	EA	R107,R108
548 2400 293	RES 909 OHM 1/2W 1%	1	EA	R030
548 2400 301	RES 1K OHM 1/2W 1%	1	EA	R017
548 2400 321	RES 1.62K OHM 1/2W 1%	4	EA	R111,R112,R129,R130
548 2400 326	RES 1.82K OHM 1/2W 1%	2	EA	R003,R038
548 2400 330	RES 2K OHM 1/2W 1%	1	EA	R031
548 2400 334	RES 2.21K OHM 1/2W 1%	3	EA	R002,R127,R128
548 2400 366	RES 4.75K OHM 1/2W 1%	6	EA	R014,R015,R023,R024,R026,R028
548 2400 381	RES 6.81K OHM 1/2W 1%	2	EA	R131,R132
550 0841 000	POT 50 OHM 1/2W 10%	3	EA	R001,R105,R106
550 0842 000	POT 200 OHM 1/2W 10%	2	EA	R020,R037
550 0865 000	POT 1K OHM 1/2W 10%	3	EA	R010,R012,R040
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R147,R148
604 0469 000	SW TGL SPDT	2	EA	S101,S102
610 0679 000	PLUG, SHORTING, .25" CTRS	2	EA	JP001,JP002
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	6	EA	P1-1 P1-2 P1-3 P2-1 P2-2 P2-3
620 0700 000	*RECPT, MALE SMB,PC MOUNT	4	EA	J001,J002,J003,J004
620 2518 000	DIR COUPLER, .5-500 MHZ	1	EA	DC-1
839 7900 705	SCH, MOD/DELAY CORR WITH	0		
843 4999 656	PWB, MOD/DELAY WITH IF	1		

Table 7-6. SYSTEM B SAW FILTER PWA - 992 9023 002 (C)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8527 001	NOTCH DIP/REC EQ BD	1	EA	
992 8789 001	VSB/IF AGC 38.9 MHZ	1	EA	
992 9009 001	PWB, MOD/DELAY COMP W/IF CPLR	1	EA	

Table 7-7. NOTCH DIP/REC EQ BD - 992 8527 001 (L)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
000 0000 010	B/M NOTE:	0	DWG	C021,C022,C023 SELECT ON TEST
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0125 000	XSTR, NPN 2N4401 ESD	3	EA	Q001,Q003,Q004
380 0126 000	XSTR, PNP 2N4403 ESD	1	EA	Q002
382 1304 000	IC, HA5020 ESD	13	EA	U001,U002,U003,U004,U005,U006,U007,U008,U009,U010,U011,U012,U013
384 0431 000	RECT. 1N4001 ESD	1	EA	CR004

384 0719 000	TRANSZORB 1N6373 5V 5W ESD	2	EA	CR002,CR003
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	1	EA	CR001
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	2	EA	RFOC1 RFOC2
494 0372 000	CHOKE RF 0.10UH	15	EA	L002,L003,L004,L005,L007,L009,L010,L013,L014,L015,L016,L018,L021,L023,L024
494 0404 000	CHOKE RF 33.0UH	4	EA	L017,L019,L020,L022
500 0787 000	CAP, MICA, 200PF 500V 5%	1	EA	C016
500 0801 000	CAP, MICA, 2PF 500V +/- .5PF	1	EA	C079
500 0809 000	CAP, MICA, 22PF 500V 5%	1	EA	C014
500 0817 000	CAP, MICA, 47PF 500V 5%	2	EA	C003,C013
500 0821 000	CAP, MICA, 68PF 500V 5%	2	EA	C024,C074
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C001
500 0835 000	CAP, MICA, 470PF 500V 5%	1	EA	C010
500 0957 000	CAP, MICA, 7PF 500V +/- .5PF	1	EA	C080
516 0453 000	CAP .1UF 100V 20% X7R	3	EA	C004,C006,C008
516 0530 000	CAP .01UF 10% 100V X7R	26	EA	C026,C028,C030,C032,C034,C036,C038,C040,C042,C044,C046,C048,C050,C052,C054,C056,C058,C060,C062,C064,C066,C068,C070,C072,C075,C076
518 0108 000	CAP, VAR 9-120 PF 100V	10	EA	C002,C009,C011,C012,C015,C017,C018,C019,C020,C025
522 0548 000	CAP 10UF 50V 20%	26	EA	C027,C029,C031,C033,C035,C037,C039,C041,C043,C045,C047,C049,C051,C053,C055,C057,C059,C061,C063,C065,C067,C069,C071,C073,C077,C078
522 0550 000	CAP 100UF 25V 20%	2	EA	C005,C007
548 2400 001	RES 1 OHM 1/2W 1%	4	EA	R011,R020,R029,R031
548 2400 185	RES 75 OHM 1/2W 1%	19	EA	R001,R005,R006,R007,R023,R026,R038,R041,R052,R054,R055,R068,R069,R074,R075,R083,R084,R093,R101
548 2400 201	RES 100 OHM 1/2W 1%	7	EA	R034,R045,R048,R060,R063,R080,R089
548 2400 218	RES 150 OHM 1/2W 1%	8	EA	R002,R024,R025,R039,R040,R053,R094,R099
548 2400 242	RES 267 OHM 1/2W 1%	1	EA	R096
548 2400 266	RES 475 OHM 1/2W 1%	4	EA	R056,R067,R076,R085
548 2400 301	RES 1K OHM 1/2W 1%	23	EA	R010,R017,R022,R032,R033,R046,R047,R058,R059,R065,R066,R077,R078,R086,R087,R090,R091,R092,R095,R098,R100,R102,R103
548 2400 305	RES 1.1K OHM 1/2W 1%	1	EA	R004
548 2400 330	RES 2K OHM 1/2W 1%	3	EA	R003,R062,R104
548 2400 342	RES 2.67K OHM 1/2W 1%	7	EA	R012,R027,R037,R042,R044,R049,R051
548 2400 366	RES 4.75K OHM 1/2W 1%	4	EA	R019,R071,R072,R081
548 2400 385	RES 7.5K OHM 1/2W 1%	3	EA	R013,R030,R035
548 2400 434	RES 22.1K OHM 1/2W 1%	4	EA	R009,R015,R016,R018
548 2400 466	RES 47.5K OHM 1/2W 1%	2	EA	R008,R014
550 0628 000	POT 10K OHM .5W 10%	1	EA	R105
550 0842 000	POT 200 OHM 1/2W 10%	7	EA	R021,R028,R036,R043,R064,R079,R088
550 0865 000	POT 1K OHM 1/2W 10%	1	EA	R061
550 0901 000	POT 500 OHM 1/2W 10%	6	EA	R050,R057,R070,R073,R082,R097
604 0469 000	SW TGL SPDT	1	EA	S001
610 0900 000	HEADER 3 CKT STRAIGHT	5	EA	JP001,JP002,JP003,JP004,JP005
610 0933 000	JUMPER, PWB TEST POINT	7	EA	TP001,TP002,TP003,TP004,TP005,TP006,TP007
612 1184 000	SHUNT JUMPER 0.1" CENTERS	5	EA	
620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J002,J003
839 7994 080	SCHEM, NOTCH DIP/REC EQ	0		

843 4999 463	PWB, NOTCH DIP/REC EQ BD	1		
917 2272 001	INDUCTOR, 20 UHY CT	2	EA	L011,L012 SELECT QTY 2 FOR SYS M,B, QTY 2 FOR SYS D,I,K1,L
917 2272 002	INDUCTOR, 38.5 UHY CT	3	EA	L001,L006,L008 SELECT QTY 3 FOR SYS M,B SELECT QTY 1 FOR SYS D,I,K1,L
917 2272 003	INDUCTOR, 13 UHY CT	0	EA	

Table 7-8. VSB/IF AGC 38.9 MHZ - 992 8789 001 (D)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	4	EA	Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004
380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
382 1231 000	IC MWA-130 ESD	1	EA	U001
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101
384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	U001,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q005,Q006,U001
478 0392 000	XFMR, RF MODEL T4-1	2	EA	T002,T101
484 0411 000	FILTER VSB, CCIR	1	EA	FL001
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0386 000	CHOKE RF 1.50UH	1	EA	L004
494 0398 000	CHOKE RF 10.0UH +/- 10%	3	EA	L001,L003,L005
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
516 0059 000	CAP, DISC .0015UF 1KV 10%	17	EA	C001,C002,C006,C007,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	2	EA	C005,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0530 000	CAP .01UF 10% 100V X7R	4	EA	C012,C015,C026,C043
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
516 0768 000	CAP 18PF 5% 100V C0G	1	EA	C011
516 0769 000	CAP 22PF 5% 100V C0G	1	EA	C010
520 0448 000	CAP, VAR .8-14PF	1	EA	C044
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	2	EA	C105,C111
540 0306 000	*RES 82 OHM 1W 10%	2	EA	R012,R013
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	2	EA	R016,R031
548 2400 162	RES 43.2 OHM 1/2W 1%	1	EA	R023
548 2400 169	RES 51.1 OHM 1/2W 1%	2	EA	R001,R021
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025

548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	3	EA	R015,R017,R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 285	RES 750 OHM 1/2W 1%	1	EA	R002
548 2400 301	RES 1K OHM 1/2W 1%	2	EA	R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	6	EA	R003,R004,R102,R103,R108,R115
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R019
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R007,R018
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0045 000	HTR, SAW FILTER 5W 24VDC	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001
604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	JP002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	JP101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
839 7900 663	SCHEM, VSB/IF AGC 38.9MHZ	0		
843 4999 550	PWB, VSB/IF AGC 38.9 MHZ	1		
917 2100 359	BLANKET, SAW FILTER HEATER	2.0	EA	#HR001, (1) ON TOP & (1) ON BOTTOM
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

Table 7-9. SYSTEM D/K SAW FILTER PWA - 992 9023 003 (D)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8527 004	PWA, NOTCH DIP/REQ EQ, SYS D	1	EA	
992 9009 001	PWB, MOD/DELAY COMP W/IF CPLR	1	EA	

Table 7-10. PWA, NOTCH DIP/REQ EQ, SYS D - 992 8527 004 (A)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
917 2272 001	INDUCTOR, 20 UHY CT	0	EA	MOVE FROM L11, L12 TO L6, L8 AS NEEDED
917 2272 003	INDUCTOR, 13 UHY CT	2	EA	L011,L012 REPLACES
992 8527 001	NOTCH DIP/REC EQ BD	1	EA	

Table 7-11. PWA, VSB/IF AGC CCIR D/K - 992 8899 001 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	4	EA	Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004
380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
382 1231 000	IC MWA-130 ESD	1	EA	U001
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101

384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	U001,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q005,Q006,U001
478 0392 000	XFMR, RF MODEL T4-1	2	EA	T002,T101
484 0422 000	SAW FILTER SYS D/K	1	EA	FL001
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0386 000	CHOKE RF 1.50UH	1	EA	L004
494 0398 000	CHOKE RF 10.0UH +/- 10%	3	EA	L001,L003,L005
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
516 0059 000	CAP, DISC .0015UF 1KV 10%	17	EA	C001,C002,C006,C007,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	2	EA	C005,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0530 000	CAP .01UF 10% 100V X7R	4	EA	C012,C015,C026,C043
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
516 0768 000	CAP 18PF 5% 100V C0G	1	EA	C011
516 0769 000	CAP 22PF 5% 100V C0G	1	EA	C010
520 0448 000	CAP, VAR .8-14PF	1	EA	C044
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	2	EA	C105,C111
540 0306 000	*RES 82 OHM 1W 10%	2	EA	R012,R013
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	2	EA	R016,R031
548 2400 162	RES 43.2 OHM 1/2W 1%	1	EA	R023
548 2400 169	RES 51.1 OHM 1/2W 1%	2	EA	R001,R021
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025
548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	3	EA	R015,R017,R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 285	RES 750 OHM 1/2W 1%	1	EA	R002
548 2400 301	RES 1K OHM 1/2W 1%	2	EA	R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	6	EA	R003,R004,R102,R103,R108,R115
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R019
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R007,R018
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0036 000	HEATER, SAW FILTER	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001

604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	JP002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	JP101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
839 7900 682	SCHEM, VSB/1F AGC, CCIR D/K/K1	0		
843 4999 603	PWB, VSB/1F AGC, CCIR D	1		
917 2501 002	HEATER BLANKET	2	EA	
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

Table 7-12. SYSTEM K1 SAW FILTER PWA - 992 9023 004 (C)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8527 001	NOTCH DIP/REC EQ BD	1	EA	
992 9009 001	PWB, MOD/DELAY COMP W/IF CPLR	1	EA	

Table 7-13. PWA, VSB/IF AGC CCIR K1 - 992 8899 004 (A)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	4	EA	Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004
380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
382 1231 000	IC MWA-130 ESD	1	EA	U001
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101
384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	U001,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q005,Q006,U001
478 0392 000	XFMR, RF MODEL T4-1	2	EA	T002,T101
484 0475 000	SAW FILTER CCIR SYSTEM K1	1	EA	
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0386 000	CHOKE RF 1.50UH	1	EA	L004
494 0398 000	CHOKE RF 10.0UH +/- 10%	3	EA	L001,L003,L005
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
516 0059 000	CAP, DISC .0015UF 1KV 10%	17	EA	C001,C002,C006,C007,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	2	EA	C005,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0530 000	CAP .01UF 10% 100V X7R	4	EA	C012,C015,C026,C043
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
516 0768 000	CAP 18PF 5% 100V C0G	1	EA	C011
516 0769 000	CAP 22PF 5% 100V C0G	1	EA	C010

520 0448 000	CAP, VAR .8-14PF	1	EA	C044
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	2	EA	C105,C111
540 0306 000	*RES 82 OHM 1W 10%	2	EA	R012,R013
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	2	EA	R016,R031
548 2400 162	RES 43.2 OHM 1/2W 1%	1	EA	R023
548 2400 169	RES 51.1 OHM 1/2W 1%	2	EA	R001,R021
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025
548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	3	EA	R015,R017,R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 285	RES 750 OHM 1/2W 1%	1	EA	R002
548 2400 301	RES 1K OHM 1/2W 1%	2	EA	R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	6	EA	R003,R004,R102,R103,R108,R115
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R019
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R007,R018
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0036 000	HEATER, SAW FILTER	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001
604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	JP002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	JP101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
839 7900 682	SCHEM, VSB/1F AGC, CCIR D/K/K1	0		
843 4999 603	PWB, VSB/1F AGC, CCIR D	1		
917 2501 002	HEATER BLANKET	2	EA	
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

Table 7-14. PWA, SYS I SAW FILTER 45MHZ - 992 9023 005 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8527 001	NOTCH DIP/REC EQ BD	1	EA	
992 9009 002	PWA, MOD/DELAY COMP WITH	1	EA	

Table 7-15. PWB, VSB IF AGC CCIR I - 992 8899 005 (A)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	4	EA	Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004

WARNING: Disconnect primary power prior to servicing.

380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
382 1231 000	IC MWA-130 ESD	1	EA	U001
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101
384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	U001,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q005,Q006,U001
478 0392 000	XFMR, RF MODEL T4-1	2	EA	T002,T101
484 0492 000	SAW FILTER CCIR SYSTEM I	1	EA	FL1
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0386 000	CHOKE RF 1.50UH	1	EA	L004
494 0398 000	CHOKE RF 10.0UH +/- 10%	3	EA	L001,L003,L005
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
516 0059 000	CAP, DISC .0015UF 1KV 10%	17	EA	C001,C002,C006,C007,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	2	EA	C005,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0530 000	CAP .01UF 10% 100V X7R	4	EA	C012,C015,C026,C043
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
516 0768 000	CAP 18PF 5% 100V C0G	0	EA	C011 SELECT ON TEST
516 0769 000	CAP 22PF 5% 100V C0G	0	EA	C010 SELECT ON TEST
520 0448 000	CAP, VAR .8-14PF	1	EA	C044
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	2	EA	C105,C111
540 0306 000	*RES 82 OHM 1W 10%	2	EA	R012,R013
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 073	RES 5.62 OHM 1/2W 1%	1	EA	R016
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	1	EA	R031
548 2400 162	RES 43.2 OHM 1/2W 1%	1	EA	R023
548 2400 169	RES 51.1 OHM 1/2W 1%	2	EA	R001,R021
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025
548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 285	RES 750 OHM 1/2W 1%	1	EA	R002
548 2400 293	RES 909 OHM 1/2W 1%	2	EA	R015,R017
548 2400 301	RES 1K OHM 1/2W 1%	2	EA	R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	6	EA	R003,R004,R102,R103,R108,R115

548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 493	RES 90.9K OHM 1/2W 1%	1	EA	R019
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R007,R018
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0036 000	HEATER, SAW FILTER	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001
604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	JP002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	JP101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
843 4999 603	PWB, VSB/1F AGC, CCIR D	1		
843 5400 124	SCH, VSB/IF AGC CCIR SYS I	0		
917 2501 002	HEATER BLANKET	2	EA	
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

Table 7-16. PWA, MOD/DELAY COMP WITH - 992 9009 002 (B)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	7	EA	Q001,Q003,Q004,Q101,Q102,Q105,Q106
380 0536 000	XSTR, NPN, 2N5179 ESD|	3	EA	Q002,Q103,Q104
382 1122 000	OBS, USE FFF 917-2256-048	1	EA	U002
382 1225 000	IC, ASK-1 ESD	1	EA	MX001
382 1231 000	IC MWA-130 ESD	1	EA	U003
384 0361 000	DIODE 5082-3077 ESD	4	EA	CR101,CR102,CR103,CR104
384 0431 000	RECT. 1N4001 ESD	2	EA	CR105,CR106
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR007,CR008
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR009
404 0198 000	SPACER TO-5, TO-9, TO-11	7	EA	XQ001,XQ003,XQ004,XQ101,XQ102,XQ105,XQ106
404 0264 000	HEAT SINK FOR TO-5 CASE	1	EA	XQ001
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU002
478 0392 000	XFMR, RF MODEL T4-1	4	EA	T001,T002,T101,T102
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	4	EA	L103,L104,L113,L114
494 0375 000	CHOKE RF 0.18UH	1	EA	L003
494 0376 000	CHOKE RF 0.22UH	4	EA	L109,L110,L115,L116
494 0378 000	CHOKE 0.33UH 10% 780MA	2	EA	L101,L102
494 0380 000	CHOKE RF 0.47UH	1	EA	L004
494 0383 000	CHOKE RF 0.82UH	2	EA	L105,L106
494 0384 000	CHOKE RF 1.00UH	2	EA	L111,L112
494 0388 000	CHOKE RF 2.20UH	1	EA	L002
494 0398 000	CHOKE RF 10.0UH +/- 10%	4	EA	L006,L107,L108,L117
494 0446 000	CHOKE POWER LINE 100UH	2	EA	L001,L005
500 0803 000	CAP, MICA, 5PF 500V +/- .5PF	2	EA	C111,C112
500 0804 000	CAP, MICA, 10PF 500V +/- .5PF	2	EA	C138,C139
500 0807 000	CAP, MICA, 18PF 500V 5%	1	EA	C013
500 0808 000	CAP, MICA, 20PF 500V 5%	1	EA	C012
500 0809 000	CAP, MICA, 22PF 500V 5%	4	EA	C103,C104,C107,C108
500 0840 000	CAP, MICA, 680PF 300V 5%	1	EA	C020
516 0530 000	CAP .01UF 10% 100V X7R	6	EA	C019,C140,C141,C142,C143,C144
516 0736 000	CAP .001UF 10% 100V X7R	41	EA	

				C001,C002,C003,C005,C007,C008,C009,C014,C016,C018,C021,C023,C025,C027,C029,C101,C102,C105,C106,C113,C114,C115,C116,C117,C118,C119,C120,C123,C124,C125,C126,C127,C128,C129,C130,C131,C132,C133,C134,C136,C137
516 0891 000	CAP 0.100UF 10% 50V	5	EA	C015,C022,C024,C026,C028
518 0045 000	CAP VAR 9-35PF 200V	2	EA	C121,C122
520 0446 000	CAP, VAR .8-10PF	1	EA	C011
520 0448 000	CAP, VAR .8-14PF	2	EA	C109,C110
522 0548 000	CAP 10UF 50V 20%	1	EA	C135
522 0561 000	CAP 100UF 63V 20%	3	EA	C004,C006,C017
548 2400 101	RES 10 OHM 1/2W 1%	5	EA	R005,R135,R136,R139,R140
548 2400 105	RES 11 OHM 1/2W 1%	1	EA	R022
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R019
548 2400 134	RES 22.1 OHM 1/2W 1%	6	EA	R033,R034,R145,R146,R153,R154
548 2400 147	RES 30.1 OHM 1/2W 1%	1	EA	R110
548 2400 158	RES 39.2 OHM 1/2W 1%	2	EA	R021,R029
548 2400 166	RES 47.5 OHM 1/2W 1%	3	EA	R109,R125,R126
548 2400 169	RES 51.1 OHM 1/2W 1%	3	EA	R016,R123,R124
548 2400 181	RES 68.1 OHM 1/2W 1%	3	EA	R006,R119,R120
548 2400 185	RES 75 OHM 1/2W 1%	2	EA	R121,R122
548 2400 189	RES 82.5 OHM 1/2W 1%	2	EA	R155,R157
548 2400 194	RES 93.1 OHM 1/2W 1%	1	EA	R156
548 2400 201	RES 100 OHM 1/2W 1%	5	EA	R009,R018,R025,R101,R102
548 2400 205	RES 110 OHM 1/2W 1%	1	EA	R007
548 2400 209	RES 121 OHM 1/2W 1%	2	EA	R133,R134
548 2400 218	RES 150 OHM 1/2W 1%	2	EA	R103,R104
548 2400 226	RES 182 OHM 1/2W 1%	2	EA	R117,R118
548 2400 230	RES 200 OHM 1/2W 1%	2	EA	R035,R036
548 2400 234	RES 221 OHM 1/2W 1%	4	EA	R141,R142,R143,R144
548 2400 247	RES 301 OHM 1/2W 1%	2	EA	R004,R011
548 2400 251	RES 332 OHM 1/2W 1%	4	EA	R027,R032,R159,R160
548 2400 254	RES 357 OHM 1/2W 1%	1	EA	R158
548 2400 258	RES 392 OHM 1/2W 1%	4	EA	R113,R114,R115,R116
548 2400 262	RES 432 OHM 1/2W 1%	1	EA	R137
548 2400 266	RES 475 OHM 1/2W 1%	2	EA	R008,R013
548 2400 277	RES 619 OHM 1/2W 1%	2	EA	R107,R108
548 2400 285	RES 750 OHM 1/2W 1%	1	EA	R138
548 2400 293	RES 909 OHM 1/2W 1%	1	EA	R030
548 2400 301	RES 1K OHM 1/2W 1%	1	EA	R017
548 2400 321	RES 1.62K OHM 1/2W 1%	4	EA	R111,R112,R129,R130
548 2400 326	RES 1.82K OHM 1/2W 1%	2	EA	R003,R038
548 2400 330	RES 2K OHM 1/2W 1%	1	EA	R031
548 2400 334	RES 2.21K OHM 1/2W 1%	3	EA	R002,R127,R128
548 2400 366	RES 4.75K OHM 1/2W 1%	6	EA	R014,R015,R023,R024,R026,R028
548 2400 381	RES 6.81K OHM 1/2W 1%	2	EA	R131,R132
550 0841 000	POT 50 OHM 1/2W 10%	3	EA	R001,R105,R106
550 0842 000	POT 200 OHM 1/2W 10%	2	EA	R020,R037
550 0865 000	POT 1K OHM 1/2W 10%	3	EA	R010,R012,R040
550 0901 000	POT 500 OHM 1/2W 10%	2	EA	R147,R148
604 0469 000	SW TGL SPDT	2	EA	S101,S102
610 0679 000	PLUG, SHORTING, .25" CTRS	2	EA	JP001,JP002
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	6	EA	P1-1 P1-2 P1-3 P2-1 P2-2 P2-3
620 0700 000	*RECPT, MALE SMB,PC MOUNT	4	EA	J001,J002,J003,J004

620 2518 000	DIR COUPLER, .5-500 MHZ	1	EA	DC-1
843 4999 656	PWB, MOD/DELAY WITH IF	1		
843 5400 122	SCH, MOD/DELAY COMP	0		

Table 7-17. KIT, SYS B SAW FLTR W/RCVR EQ - 992 9023 007 (A)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
992 8324 002	VSB IF AGC PAL B BD	1	EA	
992 9009 001	PWB, MOD/DELAY COMP W/IF CPLR	1	EA	

Table 7-18. VSB IF AGC PAL B BD - 992 8324 002 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	5	EA	Q003,Q005,Q006,Q101,Q102
380 0152 000	XSTR, D40C5 ESD	1	EA	Q004
380 0189 000	XSTR, NPN 2N3904 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U101
384 0321 000	*DIODE 5082-2800 ESD	1	EA	CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR101
384 0361 000	DIODE 5082-3077 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0431 000	RECT. 1N4001 ESD	1	EA	CR007
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR009,CR010
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	XQ003,XQ005,XQ006,XQ101,XQ102
404 0513 000	HEAT SINK PA1-1CB	1	EA	Q004
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU101
404 0725 000	HEAT SINK TO-5 CASE	3	EA	Q003,Q005,Q006
478 0392 000	XFMR, RF MODEL T4-1	3	EA	T001,T002,T101
484 0347 000	FILTER VSB SAW, CCIR-B	1	EA	FL001
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	L102
494 0398 000	CHOKE RF 10.0UH +/- 10%	2	EA	L001,L003
500 0801 000	CAP, MICA, 2PF 500V +/- .5PF	1	EA	C026
500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C107
500 0844 000	CAP, MICA, 1000PF 100V 5%	1	EA	C008
516 0059 000	CAP, DISC .0015UF 1KV 10%	18	EA	C001,C002,C006,C007,C011,C017,C021,C022,C027,C028,C029,C030,C031,C101,C103,C106,C108,C114
516 0067 000	CAP DISC .003UF 1KV 20%	4	EA	C005,C010,C012,C018
516 0074 000	CAP, DISC .005UF 1KV 20%	1	EA	C016
516 0375 000	CAP 0.01UF 50V -20/+80% Z5U	6	EA	C019,C023,C024,C025,C102,C104
516 0453 000	CAP .1UF 100V 20% X7R	5	EA	C003,C004,C013,C014,C112
516 0556 000	CAP .33UF 100V 20%	1	EA	C115
522 0548 000	CAP 10UF 50V 20%	3	EA	C040,C041,C042
526 0342 000	CAP 2.7UF 35V 10%	3	EA	C015,C105,C111
548 2400 042	RES 2.67 OHM 1/2W 1%	1	EA	R114
548 2400 085	RES 7.5 OHM 1/2W 1%	2	EA	R006,R008
548 2400 109	RES 12.1 OHM 1/2W 1%	1	EA	R013
548 2400 118	RES 15 OHM 1/2W 1%	1	EA	R112
548 2400 126	RES 18.2 OHM 1/2W 1%	1	EA	R031
548 2400 169	RES 51.1 OHM 1/2W 1%	3	EA	R001,R021,R023
548 2400 181	RES 68.1 OHM 1/2W 1%	1	EA	R032
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R025
548 2400 201	RES 100 OHM 1/2W 1%	3	EA	R026,R101,R107

548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R022,R024,R110
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R109
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R104,R106
548 2400 266	RES 475 OHM 1/2W 1%	1	EA	R105
548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R113,R118
548 2400 273	RES 562 OHM 1/2W 1%	1	EA	R017
548 2400 285	RES 750 OHM 1/2W 1%	2	EA	R002,R018
548 2400 301	RES 1K OHM 1/2W 1%	3	EA	R012,R128,R132
548 2400 318	RES 1.5K OHM 1/2W 1%	7	EA	R005,R009,R010,R011,R027,R028,R029
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R020,R030
548 2400 401	RES 10K OHM 1/2W 1%	8	EA	R003,R004,R015,R016,R102,R103,R108,R115
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R019
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R120
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R127
550 0901 000	POT 500 OHM 1/2W 10%	1	EA	R007
550 0942 000	POT 100K OHM 1/2 W 10%	1	EA	R116
558 0045 000	HTR, SAW FILTER 5W 24VDC	1	EA	HR001
559 0047 000	THERMISTOR 10K OHM	1	EA	RT001
604 0469 000	SW TGL SPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	P002
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	J101
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 0775 000	JACK, PC MT, .040 PINS	3	EA	E001,E002,E003
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	P101
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
817 2100 362	HEATER BLANKET	2		#HR001 ONE ON TOP ONE ON BOTTOM COVER WITH 055-0190-009 TO A MIN OF .12 DEEP
839 7900 491	SCHEM, VSB/IF AGC	0		
843 4999 362	PWB, VSB/IF AGC	1		
999 2573 002	HARDWARE LIST, VSB IF AGC	1	EA	

Table 7-19. KIT SOUND NICAM - 992 9024 003 (F)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 0950 000	GUIDE. CARD 4.5 IN L	2	EA	
620 1563 000	POWER SPLITTER	1	EA	HY2
620 2827 000	SPLITTER/COMBINER, 3-WAY	1	EA	HY001
839 7900 725	DIAG, EXC NICAM SOUND	0		
917 2100 498	CABLE EXC 5" W2	1	EA	W002
917 2100 500	CABLE EXC 8" W4	4	EA	W004
917 2100 502	CABLE EXC 9" W6	3	EA	W006
917 2100 503	CABLE EXC 10" W7	2	EA	W007
917 2100 505	CABLE EXC 13" W9	2	EA	W009
917 2100 508	CABLE, PFC 15" W16	1	EA	
917 2100 789	CABLE EXC 14" W35	2	EA	W035
917 2100 790	CABLE ASSY, RIBBON 10C	1	EA	
917 2100 821	CABLE, 14", W36	1	EA	W036
943 4999 671	EXC COVER NICAM SOUND	1	EA	
943 5285 204	BRACKET, PCB SLIDE MTG	1	EA	
943 5285 206	PANEL REAR NICAM EXC	1	EA	
992 8293 001	PWB AURAL LINEARIZATION	1	EA	
992 8334 002	CMR FILTER DUAL SOUND	1	EA	
992 9012 001	PWA,AURAL CH1 SYNTHESIZER	1	EA	
992 9015 001	PWA, DUAL CARR PWR DETECT	1	EA	

Table 7-20. KIT SOUND NICAM, SYSTEM D - 992 9024 007 ()

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 0950 000	GUIDE. CARD 4.5 IN L	2	EA	
620 1563 000	POWER SPLITTER	1	EA	HY2
620 2827 000	SPLITTER/COMBINER, 3-WAY	1	EA	HY001
839 7900 725	DIAG, EXC NICAM SOUND	0		
917 2100 498	CABLE EXC 5" W2	1	EA	W002
917 2100 500	CABLE EXC 8" W4	4	EA	W004
917 2100 502	CABLE EXC 9" W6	3	EA	W006
917 2100 503	CABLE EXC 10" W7	2	EA	W007
917 2100 505	CABLE EXC 13" W9	2	EA	W009
917 2100 508	CABLE, PFC 15" W16	1	EA	
917 2100 789	CABLE EXC 14" W35	2	EA	W035
917 2100 790	CABLE ASSY, RIBBON 10C	1	EA	
917 2100 821	CABLE, 14", W36	1	EA	W036
943 4999 671	EXC COVER NICAM SOUND	1	EA	
943 5285 204	BRACKET, PCB SLIDE MTG	1	EA	
943 5285 206	PANEL REAR NICAM EXC	1	EA	
992 8293 001	PWB AURAL LINEARIZATION	1	EA	
992 8334 002	CMR FILTER DUAL SOUND	1	EA	
992 9012 001	PWA,AURAL CH1 SYNTHESIZER	1	EA	
992 9015 003	PWA, DUAL CARR PWR DETECT, NICAM SYS D	1	EA	

Table 7-21. PWB AURAL LINEARIZATION - 992 8293 001 (T)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	4	EA	Q001,Q003,Q004,Q006
380 0536 000	XSTR, NPN, 2N5179 ESD|	2	EA	Q002,Q005
380 0622 000	XSTR, N-JFET U310 ESD	1	EA	Q007
382 0361 000	IC, IFC SRA-1 ESD	1	EA	MX001
382 0415 000	IC, 324 ESD	2	EA	U004,U005
382 0593 000	IC TL072ACP ESD	1	EA	U001
383 0189 000	*IC, SA5205A ESD	1	EA	U003
384 0355 000	DIODE HP5082-3081/A5S139 ESD	3	EA	CR014,CR015,CR016
384 0431 000	RECT. 1N4001 ESD	1	EA	CR018
384 0642 000	*DIODE, 5082-2835 ESD	9	EA	CR004,CR005,CR006,CR007,CR009,CR010,CR011,CR012,CR013
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR001,CR003
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR002
404 0198 000	SPACER TO-5, TO-9, TO-11	4	EA	XQ001,XQ003,XQ004,XQ006
404 0673 000	SOCKET, DIP, 8 PIN (DL)	2	EA	XU001,XU003
404 0674 000	SOCKET, DIP, 14 PIN (DL)	2	EA	XU004,XU005
404 0873 000	SOCKET ADAPTER SOIC8-DIP8	1.0	EA	#U003
478 0392 000	XFMR, RF MODEL T4-1	1	EA	T001
492 0769 000	FIXED RF INDUCTOR 600NH	1	EA	L002
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	2	EA	L007,L008
494 0262 000	CHOKE RF 10UH 10%	8	EA	L003,L004,L005,L006,L011,L012,L013,L014
494 0376 000	CHOKE RF 0.22UH	2	EA	L009,L010
494 0390 000	CHOKE RF 3.30UH	1	EA	L001
494 0446 000	CHOKE POWER LINE 100UH	3	EA	L017,L018,L019
516 0453 000	CAP .1UF 100V 20% X7R	4	EA	C017,C018,C022,C023

516 0530 000	CAP .01UF 10% 100V X7R	42	EA	C001,C002,C006,C010,C011,C012,C013,C014,C015,C024,C025,C026,C028,C029,C030,C031,C032,C033,C034,C035,C036,C041,C042,C043,C044,C047,C048,C050,C051,C052,C053,C054,C055,C056,C057,C058,C061,C062,C073,C074,C075,C076
516 0725 000	CAP 1.0UF 50V 20%	2	EA	C016,C020
516 0736 000	CAP .001UF 10% 100V X7R	9	EA	C077,C078,C080,C081,C082,C083,C085,C086,C087
516 0774 000	CAP 56PF 5% 100V C0G	4	EA	C064,C065,C067,C068
516 0776 000	CAP 82PF 5% 100V C0G	2	EA	C049,C063
516 0777 000	CAP 100PF 5% 100V C0G	1	EA	C079
516 0779 000	CAP 150PF 5% 100V C0G	1	EA	C066
520 0448 000	CAP, VAR .8-14PF	1	EA	C027
522 0548 000	CAP 10UF 50V 20%	3	EA	C003,C007,C084
526 0311 000	CAP 2.2UF 35V 10%	12	EA	C037,C038,C039,C040,C045,C046,C059,C060,C069,C070,C071,C072
540 0323 000	*RES 430 OHM 1W 10%	2	EA	R037,R061
540 1484 000	RES, NETWORK 15K OHM 2%	2	EA	R087,R088
548 2400 101	RES 10 OHM 1/2W 1%	7	EA	R026,R034,R041,R042,R059,R065,R066
548 2400 121	RES 16.2 OHM 1/2W 1%	1	EA	R082
548 2400 147	RES 30.1 OHM 1/2W 1%	1	EA	R017
548 2400 154	RES 35.7 OHM 1/2W 1%	1	EA	R019
548 2400 166	RES 47.5 OHM 1/2W 1%	2	EA	R043,R067
548 2400 169	RES 51.1 OHM 1/2W 1%	3	EA	R024,R057,R080
548 2400 185	RES 75 OHM 1/2W 1%	3	EA	R009,R010,R084
548 2400 189	RES 82.5 OHM 1/2W 1%	3	EA	R012,R013,R014
548 2400 201	RES 100 OHM 1/2W 1%	2	EA	R079,R083
548 2400 212	RES 130 OHM 1/2W 1%	1	EA	R011
548 2400 218	RES 150 OHM 1/2W 1%	6	EA	R005,R020,R021,R039,R063,R081
548 2400 226	RES 182 OHM 1/2W 1%	4	EA	R015,R016,R040,R064
548 2400 237	RES 237 OHM 1/2W 1%	2	EA	R038,R062
548 2400 242	RES 267 OHM 1/2W 1%	1	EA	R018
548 2400 247	RES 301 OHM 1/2W 1%	2	EA	R027,R060
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R046,R070
548 2400 269	RES 511 OHM 1/2W 1%	1	EA	R008
548 2400 281	RES 681 OHM 1/2W 1%	1	EA	R007
548 2400 285	RES 750 OHM 1/2W 1%	2	EA	R022,R055
548 2400 301	RES 1K OHM 1/2W 1%	2	EA	R004,R006
548 2400 318	RES 1.5K OHM 1/2W 1%	2	EA	R085,R086
548 2400 330	RES 2K OHM 1/2W 1%	9	EA	R002,R028,R029,R030,R031,R073,R074,R075,R076
548 2400 334	RES 2.21K OHM 1/2W 1%	4	EA	R035,R036,R047,R048
548 2400 342	RES 2.67K OHM 1/2W 1%	2	EA	R025,R058
548 2400 385	RES 7.5K OHM 1/2W 1%	4	EA	R032,R033,R077,R078
548 2400 393	RES 9.09K OHM 1/2W 1%	2	EA	R023,R056
548 2400 401	RES 10K OHM 1/2W 1%	5	EA	R003,R044,R045,R068,R069
548 2400 442	RES 26.7K OHM 1/2W 1%	1	EA	R001
550 0923 000	POT 1K OHM 1/2W	4	EA	R051,R052,R053,R054
550 0927 000	POT 2K OHM 1/2W	4	EA	R049,R050,R071,R072
604 0859 000	SW, TGL DPDT	1	EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	3	EA	P001,P004 (2)
610 0900 000	HEADER 3 CKT STRAIGHT	2	EA	P002,P003
612 0775 000	JACK, PC MT, .040 PINS	7	EA	P001,P004 FOR &
612 1184 000	SHUNT JUMPER 0.1" CENTERS	2	EA	P002,P003

620 0700 000	*RECPT, MALE SMB,PC MOUNT	5	EA	J001,J002,J003,J004,J005
620 1955 000	HYBRID, QUADRATURE	1	EA	HY001
620 2518 000	DIR COUPLER, .5-500 MHZ	1	EA	U002
839 7900 481	SCHEM,AURAL LINEARIZATION	0		
843 4999 358	PWB, AURAL LINEARIZATION	1		

Table 7-22. CMR FILTER DUAL SOUND - 992 8334 002 (B)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
612 0200 000	*RECP, XLR, 3C CIRCULAR	2	EA	J008,J011
612 1288 000	HOUSING,12 PIN RECEPTACLE	1	EA	J20
839 7900 508	SCHEM, CMR FILTER	0		
843 4999 327	COVER TOP FILTER ASSY	1		
843 4999 328	COVER TOP DUAL SOUND ASSY	1		
917 2100 525	FILTER BOX ASSY DUAL SND	1	EA	
917 2100 526	FIL BOX/TOROID DUAL SND	1	EA	
939 7900 841	CABLE, DUAL SOUND BOX	1	EA	
943 4999 326	COVER, BOTTOM FILTER ASSY	1	EA	
943 4999 329	COVER BOT DUAL SD ASSY	1	EA	

Table 7-23. PWA,AURAL CH1 SYNTHESIZER - 992 9012 001 (N)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	2	EA	
358 1928 000	JUMPER 1/4 LG 1/8H	19	EA	
380 0189 000	XSTR, NPN 2N3904 ESD	3	EA	Q003,Q004,Q005
380 0707 000	XSTR, NPN BFR96 ESD	2	EA	Q001,Q002
382 0428 000	IC, LM358 ESD	1	EA	U014
382 0594 000	*IC TL074ACN ESD	3	EA	U012,U017,U018
382 0749 000	IC NE5532A ESD	2	EA	U010,U013
382 0905 000	IC, 78L08/78L82 ESD	6	EA	U004,U005,U007,U009,U015,U020
382 0907 000	IC MC145152P2 ESD	1	EA	U011
382 1126 000	IC 78L12A ESD	2	EA	U003,U006
382 1200 000	— IC, MAR-8 ESD	1	EA	U016
383 0189 000	*IC, SA5205A ESD	2	EA	U001,U019
383 0346 000	*IC, MC12019 ESD	2	EA	U002,U008
384 0205 000	DIODE SILICON 1N914/4148 ESD	16	EA	CR012,CR013,CR014,CR015,CR016,CR017,CR018,CR019,CR020,CR021,CR022,CR023,CR024,CR025,CR026,CR027
384 0321 000	*DIODE 5082-2800 ESD	2	EA	CR010,CR011
384 0355 000	DIODE HP5082-3081/A5S139 ESD	1	EA	CR009
384 0611 000	*LED, RED T1-3/4 ESD	1	EA	DS001
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR007,CR008
404 0509 000	SOCKET, DIP, 28 PIN (DL)	1	EA	XU011
404 0673 000	SOCKET, DIP, 8 PIN (DL)	7	EA	XU001,XU002,XU008,XU010,XU013,XU014,XU019
404 0674 000	SOCKET, DIP, 14 PIN (DL)	3	EA	XU012,XU017,XU018
404 0873 000	SOCKET ADAPTER SOIC8-DIP8	4	EA	#U001,#U019,XU002,XU008
492 0636 000	COIL, VAR .366-.627UH	1	EA	L003
492 0765 000	FIXED RF INDUCTOR 345NH	4	EA	L006,L007,L009,L010
494 0393 000	CHOKE RF 5.60UH	1	EA	L008
494 0394 000	CHOKE 6.80UH	2	EA	L001,L002
494 0446 000	CHOKE POWER LINE 100UH	2	EA	L004,L005
500 1296 000	CAP 430PF 100V 5%	1	EA	C053

506 0232 000	CAP, 0.01UF 100V 5%	3	EA	C043,C044,C057
506 0244 000	CAP, 0.22UF 63V 5%	2	EA	C089,C091
508 0529 000	CAP .01 UF 63VDCW	1	EA	C050
516 0453 000	CAP .1UF 100V 20% X7R	17	EA	C012,C017,C019,C021,C026,C028,C030,C032,C036,C046,C047,C051,C052,C058,C059,C061,C100
516 0530 000	CAP .01UF 10% 100V X7R	24	EA	C001,C010,C011,C013,C014,C015,C016,C018,C020,C023,C024,C025,C027,C035,C037,C038,C054,C055,C056,C060,C062,C063,C065,C099
516 0725 000	CAP 1.0UF 50V 20%	1	EA	C034
516 0736 000	CAP .001UF 10% 100V X7R	25	EA	C009,C064,C071,C072,C073,C074,C075,C076,C077,C078,C079,C080,C081,C082,C083,C084,C085,C086,C093,C094,C095,C096,C097,C098,C104
516 0767 000	CAP 15PF 5% 100V C0G	2	EA	C048,C049
516 0775 000	CAP 68PF 5% 100V C0G	1	EA	C004
516 0777 000	CAP 100PF 5% 100V C0G	1	EA	C003
516 0778 000	CAP 120PF 5% 100V C0G	4	EA	C066,C068,C101,C103
516 0780 000	CAP 180PF 5% 100V C0G	3	EA	C006,C067,C102
516 0782 000	CAP 270PF 5% 100V C0G	1	EA	C007
516 0783 000	CAP 330PF 5% 100V C0G	1	EA	C005
516 0786 000	CAP 560PF 5% 100V C0G	2	EA	C041,C042
516 0862 000	CAP 680PF 5% 100V C0G	1	EA	C002
522 0417 000	CAP 1000UF 25VDC	2	EA	C029,C031
522 0524 000	CAP 10 UF 100V 20% NON-POLAR	4	EA	C039,C040,C087,C088
522 0548 000	CAP 10UF 50V 20%	1	EA	C033
522 0572 000	CAP 3.3UF 50V 20%	2	EA	C090,C092
526 0311 000	CAP 2.2UF 35V 10%	3	EA	C045,C069,C070
526 0358 000	CAP 22UF 35V 10%	1	EA	C008
528 0036 000	DIODE VARACTOR KV3901	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
540 1342 000	RES NETWORK 10K OHM	1	EA	R062
548 2400 101	RES 10 OHM 1/2W 1%	1	EA	R006
548 2400 109	RES 12.1 OHM 1/2W 1%	1	EA	R060
548 2400 139	RES 24.9 OHM 1/2W 1%	3	EA	R082,R083,R084
548 2400 166	RES 47.5 OHM 1/2W 1%	2	EA	R046,R047
548 2400 169	RES 51.1 OHM 1/2W 1%	2	EA	R011,R085
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R015
548 2400 193	RES 90.9 OHM 1/2W 1%	2	EA	R012,R013
548 2400 201	RES 100 OHM 1/2W 1%	4	EA	R008,R014,R025,R026
548 2400 218	RES 150 OHM 1/2W 1%	2	EA	R034,R035
548 2400 230	RES 200 OHM 1/2W 1%	1	EA	R057
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R036
548 2400 262	RES 432 OHM 1/2W 1%	2	EA	R058,R059
548 2400 266	RES 475 OHM 1/2W 1%	2	EA	R007,R051
548 2400 269	RES 511 OHM 1/2W 1%	3	EA	R041,R069,R078
548 2400 281	RES 681 OHM 1/2W 1%	1	EA	R048
548 2400 301	RES 1K OHM 1/2W 1%	7	EA	R001,R003,R016,R018,R024,R070,R081
548 2400 318	RES 1.5K OHM 1/2W 1%	1	EA	R009
548 2400 321	RES 1.62K OHM 1/2W 1%	1	EA	R004
548 2400 334	RES 2.21K OHM 1/2W 1%	3	EA	R002,R061,R071
548 2400 342	RES 2.67K OHM 1/2W 1%	2	EA	R021,R022
548 2400 351	RES 3.32K OHM 1/2W 1%	2	EA	R005,R010
548 2400 354	RES 3.57K OHM 1/2W 1%	1	EA	R023
548 2400 366	RES 4.75K OHM 1/2W 1%	4	EA	R017,R019,R020,R055
548 2400 369	RES 5.11K OHM 1/2W 1%	2	EA	R043,R045

548 2400 373	RES 5.62K OHM 1/2W 1%	2	EA	R030,R031
548 2400 381	RES 6.81K OHM 1/2W 1%	1	EA	R056
548 2400 386	RES 7.68K OHM 1/2W 1%	2	EA	R042,R044
548 2400 401	RES 10K OHM 1/2W 1%	5	EA	R038,R039,R040,R054,R079
548 2400 466	RES 47.5K OHM 1/2W 1%	2	EA	R032,R033
548 2400 468	RES 49.9K OHM 1/2W 1%	2	EA	R065,R066
548 2400 469	RES 51.1K OHM 1/2W 1%	1	EA	R027
548 2400 485	RES 75K OHM 1/2W 1%	2	EA	R074,R076
548 2400 489	RES 82.5K OHM 1/2W 1%	2	EA	R049,R050
548 2400 501	RES 100K OHM 1/2W 1%	3	EA	R064,R068,R073
548 2400 518	RES 150K OHM 1/2W 1%	1	EA	R077
548 2400 530	RES 200K OHM 1/2W 1%	2	EA	R067,R075
548 2400 534	RES 221K OHM 1/2W 1%	1	EA	R052
548 2400 547	RES 301K OHM 1/2W 1%	2	EA	R028,R029
550 0966 000	TRIMPOT 2K OHM 1/2W 10%	1	EA	R053
550 0970 000	TRIMPOT 1K OHM 1/2W 10%	1	EA	R037
550 1060 000	TRIMPOT 50K OHM 1/2W 10%	2	EA	R072,R080
610 0900 000	HEADER 3 CKT STRAIGHT	2	EA	J004,J005
610 0933 000	JUMPER, PWB TEST POINT	9	EA	TP001,TP002,TP003,TP004,TP005,TP006,TP007,TP008,TP009
612 1184 000	SHUNT JUMPER 0.1" CENTERS	2	EA	#J004,#J005
620 0700 000	*RECPT, MALE SMB,PC MOUNT	3	EA	J001,J002,J003
839 7900 706	SCH, AUR CH1 SYNTHESIZER	0		
843 4999 657	PWB, AUR CH1 SYNTHESIZER	1		
939 7900 113	SHIELD, PC BOARD	1	EA	
943 4999 176	COVER, PC BD	1	EA	

Table 7-24. PWA, DUAL CARR PWR DETECT, NICAM SYS D - 992 9015 003 (A)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
302 0051 000	SCR, 4-40 X 3/16	8.00	EA	8/PCB COVER
302 0054 000	SCR, 4-40 X 3/8	4.00	EA	4/PCB MTG PLATE
310 0003 000	WASHER, FLAT NO. 4	12.00	EA	4/PCB MTG PLATE 8/PCB COVER
314 0003 000	WASHER, SPLIT-LOCK 4	12.00	EA	4/PCB MTG PLATE 8/PCB COVER
358 1928 000	JUMPER 1/4 LG 1/8H	8	EA	N000,N001,N002,N003,N004,N005,N006,N007
380 0622 000	XSTR, N-JFET U310 ESD	1	EA	Q001
382 0361 000	IC, IFC SRA-1 ESD	2	EA	MX001,MX002
382 0749 000	IC NE5532A ESD	2	EA	U005,U010
382 0868 000	IC MC145151P2 ESD	1	EA	U008
382 1276 000	IC LT1058C ESD	1	EA	U004
382 1379 000	*IC CLC522 ESD	1	EA	U009
382 1384 000	IC AD829 VIDEO OP-AMP ESD	2	EA	U002,U003
383 0189 000	*IC, SA5205A ESD	2	EA	U006,U007
383 0346 000	*IC, MC12019 ESD	1	EA	U001
384 0321 000	*DIODE 5082-2800 ESD	6	EA	CR001,CR002,CR003,CR004,CR005,CR006
384 0719 000	TRANSZORB 1N6373 5V 5W ESD	2	EA	CR008,CR009
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR010,CR011
444 2953 000	CRYSTAL 10.2400 MHZ	1	EA	Y001
484 0425 000	FILTER LOW PASS 60MHZ	1	EA	U011
492 0834 000	IND, VAR, 33UH +/-10%	4	EA	L003,L004,L005,L006
492 0837 000	IND, VAR, 270UH +/-10%	2	EA	L001,L002
494 0384 000	CHOKE RF 1.00UH	1	EA	L009
494 0386 000	CHOKE RF 1.50UH	1	EA	L008
494 0393 000	CHOKE RF 5.60UH	1	EA	L013

494 0398 000	CHOKE RF 10.0UH +/- 10%	1	EA	L007
494 0400 000	CHOKE RF 15.0UH	2	EA	L010,L011
494 0403 000	CHOKE RF 27.0UH	1	EA	L012
500 0824 000	CAP, MICA, 91PF 500V 5%	1	EA	C044
500 1264 000	CAP 22PF 100V 5%	1	EA	C022
500 1275 000	CAP 56PF 500V 5%	1	EA	C035
500 1285 000	CAP 150PF 500V 5%	1	EA	C021
500 1287 000	CAP 180PF 500V 5%	2	EA	C023,C036
500 1288 000	CAP 200PF 300V 5%	2	EA	C034,C037
500 1291 000	CAP 270PF 300V 5%	3	EA	C038
500 1292 000	CAP 300PF 300V 5%	1	EA	C033
500 1297 000	CAP 470PF 100V 5%	1	EA	C039
500 1299 000	CAP 560PF 100V 5%	1	EA	C024
506 0234 000	CAP .0022UF 100V 5%	2	EA	C059,C060
506 0244 000	CAP, 0.22UF 63V 5%	1	EA	C041
516 0453 000	CAP .1UF 100V 20% X7R	8	EA	C045,C046,C047,C048,C055,C056,C057,C058
516 0530 000	CAP .01UF 10% 100V X7R	22	EA	C001,C002,C003,C004,C007,C009,C010,C014,C015,C016,C017,C025,C032,C042,C043,C049,C050,C051,C052,C053,C054,C063
516 0725 000	CAP 1.0UF 50V 20%	2	EA	C061,C062
516 0736 000	CAP .001UF 10% 100V X7R	6	EA	C005,C008,C027,C028,C029,C030
516 0765 000	CAP 10PF 5% 100V C0G	2	EA	C026,C031
516 0771 000	CAP 33PF 5% 100V C0G	3	EA	C011,C019,C020
516 0773 000	CAP 47PF 5% 100V C0G	1	EA	C013
516 0777 000	CAP 100PF 5% 100V C0G	2	EA	C006,C040
516 0781 000	CAP 220PF 5% 100V C0G	1	EA	C012
516 0953 000	CAP 1.000UF 10% 50V	1	EA	C018
528 0033 000	DIODE, VARACTOR MV1405	1	EA	CR007
548 2400 073	RES 5.62 OHM 1/2W 1%	1	EA	R023
548 2400 101	RES 10 OHM 1/2W 1%	1	EA	R030
548 2400 109	RES 12.1 OHM 1/2W 1%	2	EA	R004,R009
548 2400 130	RES 20 OHM 1/2W 1%	1	EA	R016
548 2400 168	RES 49.9 OHM 1/2W 1%	1	EA	R015
548 2400 174	RES 57.6 OHM 1/2W 1%	2	EA	R002,R003
548 2400 191	RES 86.6 OHM 1/2W 1%	1	EA	R047
548 2400 201	RES 100 OHM 1/2W 1%	1	EA	R053
548 2400 226	RES 182 OHM 1/2W 1%	1	EA	R017
548 2400 230	RES 200 OHM 1/2W 1%	3	EA	R001,R019,R048
548 2400 234	RES 221 OHM 1/2W 1%	1	EA	R027
548 2400 237	RES 237 OHM 1/2W 1%	1	EA	R021
548 2400 242	RES 267 OHM 1/2W 1%	3	EA	R014,R025,R032
548 2400 254	RES 357 OHM 1/2W 1%	1	EA	R007
548 2400 256	RES 374 OHM 1/2W 1%	1	EA	R031
548 2400 262	RES 432 OHM 1/2W 1%	4	EA	R006,R008,R010 ROO5
548 2400 288	RES 806 OHM 1/2W 1%	4	EA	R033,R034,R045,R046
548 2400 291	RES 866 OHM 1/2W 1%	2	EA	R022,R024
548 2400 301	RES 1K OHM 1/2W 1%	4	EA	R026,R028,R039,R042
548 2400 330	RES 2K OHM 1/2W 1%	1	EA	R052
548 2400 334	RES 2.21K OHM 1/2W 1%	1	EA	R029
548 2400 344	RES 2.8K OHM 1/2W 1%	1	EA	R018
548 2400 401	RES 10K OHM 1/2W 1%	2	EA	R035,R036
548 2400 468	RES 49.9K OHM 1/2W 1%	2	EA	R043,R044
548 2400 501	RES 100K OHM 1/2W 1%	6	EA	R037,R038,R040,R041,R049,R050
548 2400 634	RES 2.21MEG OHM 1/2W 1%	2	EA	R020,R051
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP009

610 0979 000	*HDR 10C VERT 2ROW TOP LATCH	1	EA	J005
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	JPR009
620 0700 000	*RECPT, MALE SMB,PC MOUNT	1	EA	J006
620 1677 000	RECEPTACLE, PC MT, BNC	4	EA	J001,J002,J003,J004
620 2518 000	DIR COUPLER, .5-500 MHZ	2	EA	DC001,DC002
646 0665 000	INSPECTION LABEL	1.00		
839 7900 883	SCH, DUAL CAR PWR DETECT, NICAM D/K		0	
843 4999 659	PWB, DUAL CARR PWR DETECT	1		
943 5285 202	PLATE, PCB MTG	1	EA	
943 5285 203	COVER, PCB	1	EA	

Table 7-25. TUNED RFI AURAL GROUP - 992 8323 002 (B)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
545 0121 000	RES 1M OHM 1/4W 5% 1206	0	EA	R005,R006 ADD FOR SINGLE CAVITY HIGH BAND DIPLEXER QTY 2
992 8323 001	PWB AURAL GROUP DELAY	1	EA	

Table 7-26. PWB AURAL GROUP DELAY - 992 8323 001 (J)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
382 1140 000	IC, PSCQ2-50 ESD	1	EA	HY001
384 0431 000	RECT. 1N4001 ESD	4	EA	CR001,CR002,CR004,CR005
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	1	EA	CR003
494 0483 000	INDUCTOR 1900NH 5%	2	EA	L002,L004
519 0014 000	CAP RF CHIP 3.3PF +-.25PF 500V	2	EA	C003,C004
520 0365 000	CAP, VAR 0.8-10PF 250V	2	EA	C001,C002
545 0121 000	RES 1M OHM 1/4W 5% 1206	0	EA	R005,R006 ADD FOR HIGH BAND SINGLE CAVITY DIPLEXER QTY 2
548 2400 201	RES 100 OHM 1/2W 1%	1	EA	R004
548 2400 273	RES 562 OHM 1/2W 1%	1	EA	R001,R002
550 0882 000	POT 100 OHM 1/2W 10%	1	EA	R003
578 0021 000	RELAY DPDT 12V	1	EA	K001
604 0859 000	SW, TGL DPDT	1	EA	S001
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	P001
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	P001
620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J001,J002
822 0900 023	BRKT, CAP MOUNTING	2		C001,C002
822 0900 183	COIL, L1-L3	2		L001,L003
839 7900 028	COVER	2		
839 7900 492	SCHEM, AUR GROUP DELAY	0		
843 4999 361	PWB, GROUP DELAY CORR.	1		
917 2100 497	CABLE, EXC 3-1/2" W1	1	EA	W001
917 2100 502	CABLE EXC 9" W6	1	EA	W006
917 2100 503	CABLE EXC 10" W7	1	EA	W007
999 2574 002	HARDWARE LIST	1	EA	

Table 7-27. INTERNAL PFC KIT - 994 9155 002 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
306 0016 000	NUT, HEX KEP, 6-32 SST	2	EA	
358 1073 000	BRAKE FOR KNOBPOT	1	EA	#R001
552 0781 000	POT 20K OHM 1.5W	1	EA	R001

700 1251 000	CRYSTAL OSCILLATOR	1	
839 7900 503	SCHEM, INT PFC FREQ STD	0	
917 2100 500	CABLE EXC 8" W4	1	EA
917 2100 503	CABLE EXC 10" W7	1	EA
939 7900 230	BRKT, POT MTG PFC OPTION	1	EA
999 2812 001	WIRE/TUBING LIST, INT PFC	1	EA

Table 7-28. *EXTERNAL PFC HTEL - 994 9175 002 (D)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
917 2100 503	CABLE EXC 10" W7	1	EA	W007
917 2100 508	CABLE, PFC 15" W16	1	EA	W016

Table 7-29. BASIC EXCITER, HP HTEL - 992 9026 001 (Z)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
007 4060 029	BRZ, FINGERS TWIST 97-560	59.500	IN	
007 4060 077	BRZ,PH FGR STK 97-0621-02	12	EA	#NOTES: 24 PIECES 7.7" LG
250 0086 000	PLUG/CORD MOLDED BLACK	1	EA	
300 2817 000	SCR, THUMB 6-32 X 1/4	2	EA	
354 0624 000	TERMINAL, MALE	2	EA	
356 0208 000	CLAMP, FLAT CABLE 2"	1	EA	
358 0165 000	STUD 82 OVAL HEAD	8	EA	
358 0184 000	RETAINER 82 ALL HDS	16	EA	#USE WITH 1/4 TURN FASTENERS
358 1214 000	SCREWLOCK, FEMALE	1	EA	#J009
358 1965 000	STUD 82-11-320-16	8	EA	
358 2104 000	CARD GUIDE	26	EA	
358 2613 000	RECEPTACLE, 82 LEAFSPRING	16	EA	
358 3283 000	SLIDE, FULL EXT DRAWER	1	PR	
382 1636 000	MIXER W/BNC CONNECTOR ESD	1	EA	MX001
402 0020 000	CLIP, FUSE	2	EA	#USE ON 943-4999-346
414 0240 000	CORE BALUN	1	EA	
424 0001 000	GROMMET 3/8 MTG DIA	1	EA	
430 0030 001	FAN 115VAC 106CFM 4.69"SQ	1	EA	
430 0192 000	FINGER GUARD, 119MM FAN	1	EA	
448 0512 000	FILTER SLIMLINE	1	EA	
448 0933 000	HINGE DOOR POSITIONING	2	EA	
556 0049 000	ATTEN, COAX, BNC, 6DB, 2W	1	EA	
610 0738 000	PLUG HOUSING	1	EA	
610 1113 000	PLUG/RECP, D, 37PIN	1	EA	
620 2109 000	JACK, BNC 75 OHM BULKHEAD	1	EA	
822 0900 106	LARGE WINDOW EXCITER	1		
822 0900 371	SHIPPING LABEL	0		
839 7900 050	BRKT, PLUNGER	1		
839 7900 463	COVER DUAL PC BD	1		
839 7900 464	COVER END PC BD	2		
839 7900 465	COVER SINGLE PC BD	9		
839 7900 466	BAR FRONT	1		
839 7900 467	BAR TOP COVER	1		
843 4999 143	PANEL EXCIT MTG-UPPER	1		
843 4999 144	PANEL EXCIT MTG-LOWER	1		
843 4999 350	SUPPORT MTHBOARD	1		
914 8789 002	MIXER PLATE	1	EA	
917 2100 208	CABLE EXC AMP	2	EA	W012 RIBBON

917 2100 497	CABLE, EXC 3-1/2" W1	2	EA	W001
917 2100 498	CABLE EXC 5" W2	1	EA	W002
917 2100 500	CABLE EXC 8" W4	2	EA	W004
917 2100 501	CABLE EXC 7" W5	1	EA	W005
917 2100 502	CABLE EXC 9" W6	4	EA	W006
917 2100 503	CABLE EXC 10" W7	6	EA	W007
917 2100 504	CABLE EXC 12" W8	3	EA	W008
917 2100 505	CABLE EXC 13" W9	4	EA	W009
917 2100 506	CABLE EXC 9" W10	2	EA	W010
917 2100 507	RIBBON CABLE EXC 43" W14	1	EA	W014
917 2100 508	CABLE, PFC 15" W16	4	EA	W016
917 2100 559	CABLE COAX 50 OHM 9"	2	EA	W022
917 2100 560	CABLE COAX 50 OHM 12"	1	EA	W023
917 2100 788	CABLE, EXC METER TO M/B	1	EA	W013
917 2315 185	SHIELD, PCB	1	EA	
917 2456 072	CABLE, VIDEO IN 11" W12	1	EA	CABLE, VIDEO IN 11" W12 COAX
939 7900 051	BRKT, PLUNGER ASSY	1	EA	
939 7900 235	TOOL, EXCITER ALIGNMENT	1	EA	
939 7900 486	BAR, TOP FRONT	1	EA	
939 7900 488	BAR BOTTOM FRONT	2	EA	
943 4999 087	BLANK 19.0" EXTRUSION	2	EA	
943 4999 337	CAGE FRT ASSY	1	EA	
943 4999 338	CAGE REAR ASSY	1	EA	
943 4999 339	DIVIDER CARD CAGE	11	EA	
943 4999 346	COVER TOP REAR	1	EA	
943 4999 356	PLATE PWR AMP ASSY	1	EA	
943 4999 861	CHASSIS EXCITER	1	EA	
943 5285 205	FRT PANEL EXCITER	1	EA	
992 8325 001	PWB, DIFF PHASE CORR.	1	EA	
992 8327 001	POWER SUPPLY EXT	1	EA	
992 8328 001	MODULE FINAL AMPL	2	EA	
992 8329 001	PWB, EXTENDER CARD	1	EA	
992 9010 001	PWB, LIN/QUAD CORR. WITH	1	EA	
992 9016 001	PWA, EXC METER & CONTROL	1	EA	
992 9017 001	PWA, EXCITER MOTHERBOARD	1	EA	
992 9511 421	*PWA, FREQ SYNTH, PLAT VHF	1	EA	
992 9564 001	*PWA, VIDEO BOARD W/VIDEO	1	EA	

Table 7-30. PWB, DIFF PHASE CORR. - 992 8325 001 (N)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0086 000	XSTR, 2N4391 ESD	2	EA	Q005,Q013
380 0189 000	XSTR, NPN 2N3904 ESD	1	EA	Q006
380 0190 000	XSTR, PNP 2N3906 ESD	5	EA	Q008,Q009,Q010,Q011,Q012
380 0246 000	XSTR, 2N2219A ESD	5	EA	Q001,Q002,Q003,Q007,Q015
380 0558 000	XSTR, 2N5566 ESD	2	EA	Q004,Q014
382 0366 000	IC, MC14528BCP ESD	1	EA	U006
382 0371 000	IC, MC7912CT ESD	1	EA	U003
382 0406 000	IC, MC7812CT ESD	1	EA	U002
382 0440 000	IC, 3083 ESD	1	EA	U001
382 0452 000	IC, LM311/CA311 ESD	1	EA	U005
382 0947 000	IC, SE5534 ESD	1	EA	U004
384 0205 000	DIODE SILICON 1N914/4148 ESD	6	EA	CR011,CR012,CR013,CR014,CR015,CR016
384 0321 000	*DIODE 5082-2800 ESD	4	EA	CR017,CR018,CR019,CR020

384 0431 000	RECT. 1N4001 ESD	3	EA	CR006,CR009,CR010
384 0659 000	DIODE HP5082-2811/A2S811 ESD	5	EA	CR001,CR002,CR003,CR004,CR005
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR007,CR008
404 0198 000	SPACER TO-5, TO-9, TO-11	5	EA	#Q001,#Q002,#Q003,#Q007,#Q015
404 0660 000	HEAT SINK	2	EA	XQ004,XQ014
404 0673 000	SOCKET, DIP, 8 PIN (DL)	2	EA	#U004,#U005
404 0675 000	SOCKET, DIP, 16 PIN (DL)	2	EA	#U001,#U006
494 0398 000	CHOKE RF 10.0UH +/- 10%	1	EA	L002
494 0413 000	CHOKE RF 330.0UH	2	EA	L001,L003
500 0817 000	CAP, MICA, 47PF 500V 5%	2	EA	C027,C036
500 0842 000	CAP, MICA, 820PF 300V 5%	1	EA	C033
508 0412 000	CAP .047UF 200V 5%	2	EA	C014,C045
508 0558 000	CAP TRIMMER 5-60 PF	1	EA	C001
508 0559 000	CAP TRIMMER 3.5 - 38 PF	1	EA	C048
516 0453 000	CAP .1UF 100V 20% X7R	13	EA	C020,C026,C028,C029,C031,C032,C034,C035,C037,C040,C041,C042,C049
516 0736 000	CAP .001UF 10% 100V X7R	2	EA	C015,C016
522 0548 000	CAP 10UF 50V 20%	6	EA	C022,C024,C025,C030,C038,C039
522 0550 000	CAP 100UF 25V 20%	19	EA	C002,C003,C004,C005,C006,C007,C008,C009,C010,C011,C012,C013,C017,C018,C019,C043,C044,C046,C047
522 0574 000	CAP 22UF 50V 20%	2	EA	C021,C023
540 0326 000	*RES 560 OHM 1W 10%	2	EA	R066,R110
548 2400 047	RES 3.01 OHM 1/2W 1%	2	EA	R053,R054
548 2400 166	RES 47.5 OHM 1/2W 1%	9	EA	R002,R011,R012,R034,R061,R064,R068,R087,R107
548 2400 185	RES 75 OHM 1/2W 1%	7	EA	R039,R040,R067,R073,R105,R106,R109
548 2400 201	RES 100 OHM 1/2W 1%	8	EA	R008,R009,R037,R041,R043,R099,R101,R103
548 2400 209	RES 121 OHM 1/2W 1%	2	EA	R065,R108
548 2400 230	RES 200 OHM 1/2W 1%	1	EA	R035
548 2400 247	RES 301 OHM 1/2W 1%	2	EA	R006,R007
548 2400 266	RES 475 OHM 1/2W 1%	2	EA	R038,R104
548 2400 269	RES 511 OHM 1/2W 1%	1	EA	R017
548 2400 273	RES 562 OHM 1/2W 1%	1	EA	R005
548 2400 285	RES 750 OHM 1/2W 1%	6	EA	R018,R019,R020,R052,R059,R063
548 2400 301	RES 1K OHM 1/2W 1%	16	EA	R013,R014,R015,R016,R026,R027,R028,R029,R031,R032,R036,R047,R049,R056,R058,R102
548 2400 309	RES 1.21K OHM 1/2W 1%	2	EA	R004,R033
548 2400 318	RES 1.5K OHM 1/2W 1%	1	EA	R071
548 2400 330	RES 2K OHM 1/2W 1%	3	EA	R062,R069,R088
548 2400 342	RES 2.67K OHM 1/2W 1%	1	EA	R077
548 2400 347	RES 3.01K OHM 1/2W 1%	1	EA	R072
548 2400 354	RES 3.57K OHM 1/2W 1%	1	EA	R083
548 2400 358	RES 3.92K OHM 1/2W 1%	1	EA	R080
548 2400 366	RES 4.75K OHM 1/2W 1%	8	EA	R024,R025,R030,R050,R055,R079,R081,R086
548 2400 401	RES 10K OHM 1/2W 1%	9	EA	R001,R003,R010,R042,R070,R074,R075,R076,R100
548 2400 418	RES 15K OHM 1/2W 1%	1	EA	R082
548 2400 466	RES 47.5K OHM 1/2W 1%	1	EA	R085
548 2400 530	RES 200K OHM 1/2W 1%	1	EA	R078
550 0628 000	POT 10K OHM .5W 10%	5	EA	R021,R022,R023,R051,R060
550 0865 000	POT 1K OHM 1/2W 10%	1	EA	R084
550 0899 000	POT 2K OHM 1/2W	5	EA	R044,R045,R046,R048,R057
604 0859 000	SW, TGL DPDT	1	EA	S001
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	J001

610 0933 000	JUMPER, PWB TEST POINT	8	EA	TP001,TP002,TP003,TP004,TP005,TP006,TP007,TP008
612 1184 000	SHUNT JUMPER 0.1" CENTERS	1	EA	P001
620 0700 000	*RECPT, MALE SMB,PC MOUNT	1	EA	J002
839 7900 490	SCHEM DIFF PHASE CORR	0		
843 4999 363	PWB, DIFF PHASE	1		
999 2562 001	HARDWARE LIST	1	EA	

Table 7-31. POWER SUPPLY EXT - 992 8327 001 (J)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
354 0624 000	TERMINAL, MALE	10	EA	
354 0749 000	TERM FOR .250 X .032 TAB	1	EA	
354 0793 000	LUG, .312 RING RED 22-18	5	EA	
358 2995 000	END PLATE, 261 TERM BD	1	EA	
358 3226 000	INSULATING COVER, PLASTIC	5	EA	
382 1031 000	IC, LM338K ESD	3	EA	U001,U002,U004
382 1049 000	IC, LT1033/LM333 ESD	2	EA	U003,U005
410 0391 000	INSULATOR TRANSISTOR T03	5	EA	
414 0240 000	CORE BALUN	10	EA	L001,L002,L003,L004,L005,L006,L007,L008,L009,L010
472 1665 000	TRANSFORMER, POWER TOROID	1	EA	
484 0379 000	RFI POWER LINE FILTER	1	EA	FL001
508 0561 000	EMI FILTER FEEDTHRU	5	EA	FL002,FL003,FL004,FL005,FL006
560 0036 000	MOV, 150WVAC, 80J, 20MM DISC	2	EA	RV001,RV002
606 0834 000	CB, 2 POLE, 4 AMP 250VAC	1	EA	CB001
612 0885 000	RECEPTACLE HOUSING	1	EA	J011
612 0978 000	HOUSING, RECPT 12 CKT	1	EA	
614 0786 000	TERM BD, 2C MODULAR 261	5	EA	#TB001
614 0787 000	TERM BD, 4C MODULAR 261	5	EA	#TB001
839 7900 504	SCHEM, POWER SUPPLY	0		
917 2462 283	CABLES, EXC PWR SUPPLY	1	EA	
939 7900 487	COVER PWR SUPPLY - TOP	1	EA	
943 4999 335	COVER PWR SUPPLY	1	EA	
943 5285 200	PWR SUPPLY EXCITER	1	EA	
943 5285 201	ANGLE, FILTER MTG	1	EA	
992 8021 001	PWB, POWER SUPPLY	1	EA	

Table 7-32. MODULE FINAL AMPL - 992 8328 001 (F)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
302 0053 000	SCR, 4-40 X 5/16	8	EA	#MOUNTS BRACKETS TO HEATSINK
302 0054 000	SCR, 4-40 X 3/8	6	EA	#MOUNTS BD TO HEATSINK
302 0058 000	SCR, 4-40 X 3/4	4	EA	#MOUNTS U1, U2 TO HEATSINK
304 0089 000	NUT, HEX 6-32	6	EA	#USED AS SPACERS FOR PC BOARD TO KEEP OFF OF HEATSINK
306 0003 000	NUT, HEX 4-40	4	EA	#BRACKET ASSEMBLY
310 0003 000	WASHER, FLAT NO. 4	8	EA	
314 0003 000	WASHER, SPLIT-LOCK 4	18.00	EA	
382 1725 000	IC, MHW1345 ESD	2	EA	U001,U002
620 0571 000	RECEP. BNC UG535-U	2	EA	J001,J002
646 0665 000	INSPECTION LABEL	1		
939 7900 499	BRKT GND FINAL AMP	2	EA	
939 7900 500	SPACER CONN/GND BRKT	2	EA	

943 4999 033	HEATSINK, RF AMP	1	EA
943 4999 357	COVER FINAL AMP	1	EA
992 7093 001	PWB, FINAL AMP	1	EA

Table 7-33. PWB, EXTENDER CARD - 992 8329 001 (C)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
358 2612 000	BLOCK, MOUNTING	1	EA	
384 0661 000	LED, GRN, T 1-3/4, RT ANG ESD	5	EA	DS001,DS002,DS003,DS004,DS005
540 1600 210	RES 240 OHM 3W 5%	2	EA	R004,R005
540 1600 222	RES 750 OHM 3W 5%	2	EA	R002,R003
540 1600 303	RES 1.2K OHM 3W 5%	1	EA	R001
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
612 1225 000	CONN, PC EDGE 28 POS DUAL	1	EA	J001
839 7900 172	SCHEM, EXCITER EXTENDER	0		
843 4999 364	PWB, EXTENDER CARD	1		

Table 7-34. PWB, LIN/QUAD CORR. WITH - 992 9010 001 (P)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0114 000	*XSTR, NPN, 2N5109 ESD	6	EA	Q002,Q004,Q005,Q102,Q104,Q105
380 0536 000	XSTR, NPN, 2N5179 ESD|	4	EA	Q001,Q003,Q101,Q103
380 0622 000	XSTR, N-JFET U310 ESD	1	EA	Q106
382 0415 000	IC, 324 ESD	4	EA	U001,U002,U101,U102
382 1231 000	IC MWA-130 ESD	1	EA	U104
383 0189 000	*IC, SA5205A ESD	1	EA	U103
384 0431 000	RECT. 1N4001 ESD	2	EA	CR010,CR011
384 0642 000	*DIODE, 5082-2835 ESD	18	EA	CR001,CR002,CR003,CR004,CR005,CR006,CR007,CR008,CR009,CR101,CR102,CR103,CR104,CR105,CR106,CR107,CR108,CR109
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR013,CR014
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1	EA	CR012
404 0198 000	SPACER TO-5, TO-9, TO-11	7	EA	XQ002,XQ004,XQ005,XQ102,XQ104,XQ105,XU104
404 0660 000	HEAT SINK	1	EA	XQ106
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1	EA	XU103
404 0674 000	SOCKET, DIP, 14 PIN (DL)	2	EA	XU001,XU002
404 0725 000	HEAT SINK TO-5 CASE	6	EA	XQ002,XQ004,XQ005,XQ102,XQ104,XQ105
404 0873 000	SOCKET ADAPTER SOIC8-DIP8	1.0	EA	#U103
478 0412 000	XFMR RF T9-1	1	EA	T101
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	2	EA	L010,L110
494 0262 000	CHOKE RF 10UH 10%	16	EA	L001,L002,L003,L004,L005,L006,L007,L008,L101,L102,L103,L104,L105,L106,L107,L108
494 0376 000	CHOKE RF 0.22UH	2	EA	L009,L109
494 0390 000	CHOKE RF 3.30UH	1	EA	L111
494 0446 000	CHOKE POWER LINE 100UH	2	EA	L011,L012
500 0753 000	CAP, MICA, 56PF 500V 5%	3	EA	C022,C023,C122
500 0759 000	CAP, MICA, 100PF 500V 5%	1	EA	C124
500 0761 000	CAP, MICA, 150PF 500V 5%	1	EA	C024
500 0815 000	CAP, MICA, 39PF 500V 5%	1	EA	C112
500 0817 000	CAP, MICA, 47PF 500V 5%	1	EA	C012
500 0822 000	CAP, MICA, 75PF 500V 5%	2	EA	C011,C111

500 0826 000	CAP, MICA, 120PF 500V 5%	1	EA	C123
516 0453 000	CAP .1UF 100V 20% X7R	16	EA	C006,C007,C008,C009,C015,C016,C017,C018,C106,C107,C108,C109,C115,C116,C117,C118
516 0530 000	CAP .01UF 10% 100V X7R	33	EA	C001,C003,C005,C010,C014,C020,C046,C047,C048,C049,C050,C051,C052,C053,C101,C103,C105,C110,C114,C120,C146,C147,C148,C149,C150,C151,C152,C153,C162,C163,C164,C165,C166
516 0736 000	CAP .001UF 10% 100V X7R	16	EA	C002,C013,C019,C021,C056,C057,C058,C059,C060,C113,C119,C121,C132,C133,C159,C160
516 0891 000	CAP 0.100UF 10% 50V	7	EA	C004,C044,C045,C102,C104,C144,C145
522 0561 000	CAP 100UF 63V 20%	11	EA	C029,C030,C061,C062,C063,C129,C130,C161,C167,C168,C169
526 0049 000	CAP 6.8UF 35V 20%	16	EA	C025,C026,C027,C028,C034,C035,C036,C037,C125,C126,C127,C128,C134,C135,C136,C137
526 0311 000	CAP 2.2UF 35V 10%	4	EA	C038,C039,C138,C139
540 0599 000	*RES 330 OHM 2W 10%	2	EA	R017,R117
540 1334 000	RES NETWORK 15K OHM	2	EA	R057,R157
540 1600 216	RES 430 OHM 3W 5%	2	EA	R007,R107
548 2400 101	RES 10 OHM 1/2W 1%	6	EA	R063,R064,R065,R163,R164,R165
548 2400 121	RES 16.2 OHM 1/2W 1%	1	EA	R162
548 2400 125	RES 17.8 OHM 1/2W 1%	1	EA	R171
548 2400 147	RES 30.1 OHM 1/2W 1%	1	EA	R154
548 2400 166	RES 47.5 OHM 1/2W 1%	2	EA	R028,R128
548 2400 169	RES 51.1 OHM 1/2W 1%	4	EA	R001,R066,R070,R101
548 2400 177	RES 61.9 OHM 1/2W 1%	2	EA	R005,R105
548 2400 185	RES 75 OHM 1/2W 1%	1	EA	R158
548 2400 201	RES 100 OHM 1/2W 1%	2	EA	R159,R160
548 2400 205	RES 110 OHM 1/2W 1%	1	EA	R120
548 2400 218	RES 150 OHM 1/2W 1%	2	EA	R054,R161
548 2400 226	RES 182 OHM 1/2W 1%	1	EA	R008
548 2400 234	RES 221 OHM 1/2W 1%	2	EA	R026,R126
548 2400 237	RES 237 OHM 1/2W 1%	4	EA	R009,R023,R109,R123
548 2400 246	RES 294 OHM 1/2W 1%	2	EA	R170,R172
548 2400 247	RES 301 OHM 1/2W 1%	5	EA	R006,R015,R106,R108,R115
548 2400 251	RES 332 OHM 1/2W 1%	2	EA	R174,R175
548 2400 254	RES 357 OHM 1/2W 1%	1	EA	R173
548 2400 258	RES 392 OHM 1/2W 1%	2	EA	R027,R127
548 2400 262	RES 432 OHM 1/2W 1%	2	EA	R019,R020
548 2400 285	RES 750 OHM 1/2W 1%	5	EA	R004,R014,R104,R114,R119
548 2400 318	RES 1.5K OHM 1/2W 1%	6	EA	R041,R068,R069,R141,R168,R169
548 2400 330	RES 2K OHM 1/2W 1%	16	EA	R029,R030,R031,R032,R033,R034,R035,R036,R129,R130,R131,R132,R133,R134,R135,R136
548 2400 334	RES 2.21K OHM 1/2W 1%	4	EA	R055,R056,R155,R156
548 2400 342	RES 2.67K OHM 1/2W 1%	2	EA	R003,R103
548 2400 358	RES 3.92K OHM 1/2W 1%	2	EA	R013,R113
548 2400 385	RES 7.5K OHM 1/2W 1%	8	EA	R044,R047,R050,R053,R144,R147,R150,R153
548 2400 393	RES 9.09K OHM 1/2W 1%	2	EA	R002,R102
548 2400 401	RES 10K OHM 1/2W 1%	4	EA	R024,R025,R124,R125
548 2400 426	RES 18.2K OHM 1/2W 1%	2	EA	R012,R112
550 0842 000	POT 200 OHM 1/2W 10%	2	EA	R011,R111
550 0865 000	POT 1K OHM 1/2W 10%	14	EA	R010,R021,R022,R037,R038,R039,R040,R110,R121,R122,R137,R138,R139,R140
604 0859 000	SW, TGL DPDT	2	EA	S001,S101
610 0679 000	PLUG, SHORTING, .25" CTRS	5	EA	JP001,JP001A,JP004,JP004A,JP006

610 0900 000	HEADER 3 CKT STRAIGHT	5	EA	JP002,JP003,JP005,JP101,JP102
612 0775 000	JACK, PC MT, .040 PINS	11	EA	P1-2 P1-4 P1-3 P1-1 P4-3 P4-1 P4-4 P4-2 P6-3 P6-1 P6-2
612 1184 000	SHUNT JUMPER 0.1" CENTERS	5	EA	JPR002 JPR003 JPR005 JPR101 JPR102
620 0700 000	*RECPT, MALE SMB,PC MOUNT	5	EA	J001,J002,J003,J004,J005
620 1955 000	HYBRID, QUADRATURE	1	EA	HY001
620 2518 000	DIR COUPLER, .5-500 MHZ	1	EA	DC-1
839 7900 704	SCH, LIN/QUAD CORR WITH	0		
843 4999 655	PWB, LIN/QUAD CORR. WITH	1		

Table 7-35. PWA, EXC METER & CONTROL - 992 9016 001 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 3441 000	SPACER, MTG, T-1.75 LED,	16	EA	
380 0319 000	XSTR, MPS-A14 ESD	1	EA	Q010
380 0713 000	DARLINGTON TRANSISTOR PNP ESD	6	EA	Q003,Q004,Q005,Q006,Q007,Q009
382 0285 000	IC CD4029BE ESD	1	EA	U021
382 0523 000	IC, 4066/14066 ESD	1	EA	U019
382 0587 000	IC, CD4011/MC14011 ESD	4	EA	U001,U002,U004,U005
382 0593 000	IC TL072ACP ESD	5	EA	U017,U018,U027,U035,U037
382 0618 000	IC, 4081/14081 ESD	2	EA	U003,U026
382 0626 000	IC, 4093B/14093B ESD	2	EA	U006,U020
382 0698 000	IC, 74LS85N ESD	1	EA	U022
382 0711 000	*PRECISION IC MULTIPLIER ESD	3	EA	U029,U033,U034
382 0926 000	IC, DG506A ESD	3	EA	U030,U031,U032
382 1008 000	IC, LM3914N ESD	2	EA	U023,U024
382 1026 000	IC, 4046B/14046 ESD	2	EA	U007,U008
382 1028 000	IC, 4516 COUNTER ESD	6	EA	U009,U010,U011,U012,U013,U014
382 1147 000	CONVERTER A/D 3-1/2 DIGIT ESD	1	EA	U025
382 1210 000	IC CD4538B ESD	1	EA	U036
382 1308 000	IC, 7541 (ESD)	2	EA	U015,U016
384 0205 000	DIODE SILICON 1N914/4148 ESD	7	EA	CR001,CR002,CR014,CR015,CR016,CR017,CR018
384 0431 000	RECT. 1N4001 ESD	4	EA	CR003,CR005,CR006,CR007
384 0689 000	LED, RED RECTANGULAR ESD	6	EA	DS006,DS007,DS008,DS009,DS010,DS011
384 0719 000	TRANSZORB 1N6373 5V 5W ESD	2	EA	CR010,CR013
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2	EA	CR011,CR012
384 0823 000	LED 10 SEG BARGRAPH, RED ESD	2	EA	DS003,DS004
384 0824 000	LED DISPLAY .560 INCH ESD	2	EA	DS001,DS002
384 0869 000	LED GREEN RECTANGULAR ESD	10	EA	DS005,DS012,DS013,DS014,DS015,DS016,DS017,DS018,DS019,DS020
386 0085 000	ZENER, 1N4740A 10V ESD	1	EA	CR004
506 0244 000	CAP, 0.22UF 63V 5%	3	EA	C002,C006,C011
506 0246 000	CAP, 0.47UF 63V 5%	1	EA	C010
516 0453 000	CAP .1UF 100V 20% X7R	16	EA	C001,C005,C009,C017,C018,C022,C033,C034,C035,C036,C055,C060,C061,C062,C063,C064
516 0530 000	CAP .01UF 10% 100V X7R	27	EA	C003,C007,C012,C020,C021,C023,C025,C026,C037,C038,C039,C040,C041,C042,C044,C045,C046,C048,C049,C050,C051,C053,C054,C056,C057,C058,C059
516 0725 000	CAP 1.0UF 50V 20%	7	EA	C019,C027,C028,C029,C030,C031,C032
516 0765 000	CAP 10PF 5% 100V C0G	1	EA	C008
522 0548 000	CAP 10UF 50V 20%	5	EA	C013,C014,C015,C016,C047
526 0374 000	CAP 1.0F 5.5V	1	EA	C004
548 2400 130	RES 20 OHM 1/2W 1%	1	EA	R011

548 2400 269	RES 511 OHM 1/2W 1%	2	EA	R057,R080
548 2400 301	RES 1K OHM 1/2W 1%	12	EA	R007,R009,R010,R018,R020,R021,R026,R077,R088,R090,R091,R092
548 2400 305	RES 1.1K OHM 1/2W 1%	1	EA	R029
548 2400 310	RES 1.24K OHM 1/2W 1%	1	EA	R072
548 2400 318	RES 1.5K OHM 1/2W 1%	3	EA	R027,R076,R089
548 2400 337	RES 2.37K OHM 1/2W 1%	1	EA	R030
548 2400 355	RES 3.65K OHM 1/2W 1%	1	EA	R074
548 2400 366	RES 4.75K OHM 1/2W 1%	2	EA	R003,R014
548 2400 401	RES 10K OHM 1/2W 1%	35	EA	R001,R002,R012,R013,R022,R024,R038,R039,R040,R041,R042,R043,R044,R045,R046,R047,R048,R049,R050,R051,R052,R053,R054,R055,R056,R059,R071,R073,R075,R081,R082,R083,R084,R085,R093
548 2400 418	RES 15K OHM 1/2W 1%	1	EA	R033
548 2400 430	RES 20K OHM 1/2W 1%	1	EA	R028
548 2400 446	RES 29.4K OHM 1/2W 1%	2	EA	R094,R095
548 2400 459	RES 40.2K OHM 1/2W 1%	1	EA	R037
548 2400 469	RES 51.1K OHM 1/2W 1%	2	EA	R063,R067
548 2400 477	RES 61.9K OHM 1/2W 1%	1	EA	R036
548 2400 489	RES 82.5K OHM 1/2W 1%	4	EA	R004,R005,R015,R016
548 2400 501	RES 100K OHM 1/2W 1%	14	EA	R006,R017,R025,R031,R062,R065,R066,R068,R069,R070,R078,R079,R086,R087
548 2400 566	RES 475K OHM 1/2W 1%	1	EA	R034
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R035
550 0950 000	TRIMPOT 2K OHM 1/2W 10%	2	EA	R008,R019
550 0953 000	TRIMPOT 20K OHM 1/2W 10%	1	EA	R032
550 0960 000	TRIMPOT 1K OHM 1/2W 10%	5	EA	R023,R058,R060,R061,R064
604 1111 000	SW PB GRAY MOM W/O LED	5	EA	SW001,SW002,SW003,SW004,SW005
610 0900 000	HEADER 3 CKT STRAIGHT	16	EA	#JP001,#JP002 JPR003 JPR004 JPR005 JPR006 JPR007 JPR008 JPR009 JPR010 JPR011 JPR012 JPR013 JPR014 JPR015 JPR016
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP001
610 0984 000	*HDR 34C VERT 2ROW TOP LATCH	1	EA	J001
612 1184 000	SHUNT JUMPER 0.1" CENTERS	16	EA	JP001,JP002,JP003,JP004,JP005,JP006,JP007,JP008,JP009,JP010,JP011,JP012,JP013,JP014,JP015,JP016
612 1295 000	*RECP, D, 37 PIN, STRAIGHT	1	EA	J002
839 7900 708	SCH, EXC MTR & CONTROL	0		
843 4999 660	PWB, EXC METER & CONTROL	1		

Table 7-36. PWA, EXCITER MOTHERBOARD - 992 9017 001 (B)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
516 0736 000	CAP .001UF 10% 100V X7R	16	EA	C003,C006,C009,C012,C013,C014,C015,C020,C021,C022,C023,C024,C025,C026,C027,C028
516 0789 000	NTWK, CAP 100PF 50V 10% SIP	1	EA	C019
516 0790 000	CAP NTWK 1000PF 10% 50V	3	EA	C016,C017,C018
516 0891 000	CAP 0.100UF 10% 50V	5	EA	C002,C005,C008,C010,C011
522 0548 000	CAP 10UF 50V 20%	5	EA	C001,C004,C007,C029,C030
610 0679 000	PLUG, SHORTING, .25" CTRS	3	EA	JPR001 JPR002 JPR003
610 0979 000	*HDR 10C VERT 2ROW TOP LATCH	3	EA	J014,J016,J017
610 0984 000	*HDR 34C VERT 2ROW TOP LATCH	1	EA	J019
610 1027 000	HEADER, 12C, 1ROW, VERTICAL	2	EA	J018,J020

612 0904 000	JACK, PC MT GOLD PLATED	9	EA	JP001,JP002,JP003
612 1309 000	CONN, PC EDGE 56 CONT	13	EA	J001,J002,J003,J004,J005,J006,J007,J008,J009 ,J010,J011,J012,J013
839 7900 709	SCH, EXC MOTHERBOARD WITH	0		
843 4999 661	PWB, EXCITER MOTHERBOARD	1		

Table 7-37. *PWA, FREQ SYNTH, PLAT VHF - 992 9511 421 (E)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
382 1609 000	IC LT1036 ESD	1	EA	U12
408 0367 000	ENCLOSURE 3.25" X 1" X 0.5"	2	EA	Z1,Z2
444 3023 000	CRYSTAL 10.0000 MHZ	1	EA	Y1
444 3063 000	XTAL, 15.991 MHZ	2	EA	Y2,Y3
506 0305 000	CAP 0.68UF 10% 63VDC	6	EA	C54,C55,C56,C111,C112,C113
522 0590 000	CAP 470UF 25V 20%	2	EA	C151,C154
550 0968 000	TRIMPOT 20K OHM 1/2W 10%	1	EA	R4
610 0787 000	HEADER, STRAIGHT 6 POS 1 ROW	1	EA	TB1
610 0877 000	HDR, STR, 2 PIN, SQ	7	EA	JP1,JP2,JP3,JP4,JP5,JP6,JP7
612 1184 000	SHUNT JUMPER 0.1" CENTERS	7	EA	#JP1,#JP2,#JP3,#JP4,#JP5,#JP6,#JP7
620 0700 000	*RECPT, MALE SMB,PC MOUNT	5	EA	J1,J2,J3,J4,J5
700 1271 000	OCXO 10 MHZ	1		U6
861 1130 011	S/W, PROGRAMMING AID, VHF SYTH CARD	0		
992 9511 422	PWA., PLAT FREQ SYNTH CARD SMT	1	EA	

Table 7-38. PWA., PLAT FREQ SYNTH CARD SMT - 992 9511 422 (H)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
000 0000 010	B/M NOTE:	0	DWG	L8,L10,L12,L15,L16,L21,L28,L32,C98,C40,C43,C 49,C76,C85,C130,C92,C125,C93,C126,C97,C13 2,R122,R45,R51,R63,R85,R84,R95,R115,R122, R133,R134,R6,R40,R76 NOT INSTALLED
381 0003 001	XSTR, NPN, 3904 (SMT) ESD	1	EA	Q1
381 0003 002	XSTR, PNP MMBT3906 ESD	1	EA	Q2
381 0017 000	XSTR, NPN BC847 ESD	2	EA	Q3,Q4
382 1220 000	IC 10E016 ESD	1	EA	U1
383 0016 000	IC, 74HC374 ESD	8	EA	U26,U27,U28,U29,U31,U32,U33,U34
383 0102 000	IC, 74HC138D ESD	1	EA	U30
383 0165 000	IC, LM339 DQUAD COMPAR ESD	1	EA	U3
383 0173 000	IC MC10216 ESD	2	EA	U4,U5
383 0179 000	IC, MC10EL16 ESD	1	EA	U35
383 0201 000	IC, 1007 SMT ESD	1	EA	U15
383 0253 000	IC, LM358 ESD	1	EA	U10
383 0367 000	IC, ADM706TAR ESD	1	EA	U2
383 0410 000	IC MAX436 ESD	2	EA	U8,U11
383 0571 000	IC, ILC7082 ESD	1	EA	U16
383 0609 000	IC, 4049/14049 ESD	1	EA	U19
383 0655 000	IC, ERA-59SM ESD	2	EA	U7,U22
383 0670 000	IC, SA8028 ESD	1	EA	U18
383 0671 000	IC, MC100EP139 ESD	2	EA	U14,U21
383 0693 000	IC, AD820 ESD	1	EA	U25
385 0001 000	DIODE, RECT 4148 / 914 ESD	12	EA	CR1,CR2,CR3,CR4,CR5,CR6,CR7,CR8,CR10,C R11,CR12,CR14
385 0027 000	DIODE, 2800 SCHOTTKY SMT ESD	3	EA	CR9,CR13,CR15

389 0010 001	LED, RED, 1.4MM RECT ESD	2	EA	DS1,DS2
444 3012 000	XTAL 3.6864 MHZ SMT	1	EA	Y5
445 0028 000	VCO, 865-1180 MHZ ESD	1	EA	U9
445 0031 000	VCO, 360-410 MHZ	1	EA	U24
496 0013 000	IND, CHIP 0.100 UH 10%	1	EA	L30
496 0014 000	IND, CHIP 0.120 UH 10%	1	EA	L31
496 0028 000	IND, CHIP 1 UH 10%	2	EA	L3,L14
496 0029 000	IND, CHIP 1.2 UH 10%	5	EA	L29,L33,L34,L35,L36
496 0044 000	IND, CHIP 22 UH 10%	3	EA	L1,L2,L4
496 0115 000	INDUCTOR 47UH +/-20% SMT	4	EA	L17,L18,L19,L20
496 0125 000	IND, CHIP 330NH 2% 1008	2	EA	L5,L6
496 0138 000	IND, CHIP 22NH 2% 1008	3	EA	L22,L23,L24
496 0141 000	IND, CHIP 56NH 2% 1008	3	EA	L25,L26,L27
496 0146 000	IND, CHIP 180 NH 2%	4	EA	L7,L9,L11,L13
515 0134 009	CAP 2.2PF 100V +/-.25 0805 C0G	2	EA	C79,C80
515 0134 015	CAP 3.9PF 100V +/-.25 0805 C0G	1	EA	C164
515 0134 019	CAP 5.6PF 100V+/-.5PF 0805 C0G	2	EA	C160,C161
515 0134 023	CAP 8.2PF 100V+/-.5PF 0805 C0G	1	EA	C159
515 0134 101	CAP 10PF 100V 5% 0805 C0G	2	EA	C165,C172
515 0134 103	CAP 12PF 100V 5% 0805 C0G	1	EA	C169
515 0134 105	CAP 15PF 100V 5% 0805 C0G	3	EA	C162,C163,C171
515 0134 107	CAP 18PF 100V 5% 0805 C0G	5	EA	C67,C84,C99,C166,C170
515 0134 109	CAP 22PF 100V 5% 0805 C0G	2	EA	C117,C134
515 0134 111	CAP 27PF 100V 5% 0805 C0G	1	EA	C90
515 0134 113	CAP 33PF 100V 5% 0805 C0G	2	EA	C167,C168
515 0134 115	CAP 39PF 100V 5% 0805 C0G	1	EA	C35
515 0134 117	CAP 47PF 100V 5% 0805 C0G	2	EA	C65,C105
515 0134 123	CAP 82PF 100V 5% 0805 C0G	4	EA	C27,C34,C36,C176
515 0134 201	CAP 100PF 100V 5% 0805 C0G	12	EA	C15,C68,C75,C87,C91,C95,C107,C108,C115,C135,C157,C173
515 0134 203	CAP 120PF 100V 5% 0805 C0G	3	EA	C74,C89,C100
515 0134 207	CAP 180PF 100V 5% 0805 C0G	2	EA	C44,C45
515 0135 301	CAP 1000PF 100V 5% 1206 C0G	3	EA	C116,C121,C174
515 0136 301	CAP 1000PF 100V 10% 0805 X7R	6	EA	C23,C72,C86,C109,C120,C136
515 0136 401	CAP 0.01UF 100V 10% 0805 X7R	71	EA	C1,C2,C4,C5,C6,C7,C8,C9,C11,C12,C14,C16,C17,C18,C19,C20,C21,C24,C25,C26,C28,C29,C30,C32,C37,C39,C42,C46,C48,C50,C51,C52,C53,C57,C58,C60,C62,C66,C69,C70,C77,C78,C83,C88,C94,C101,C102,C103,C106,C114,C118,C122,C124,C129,C137,C138,C139,C140,C141,C142,C143,C144,C145,C146,C147,C149,C152,C153,C155,C156,C175
515 0136 501	CAP 0.1UF 50V 10% 0805 X7R	10	EA	C3,C10,C13,C22,C38,C61,C71,C127,C128,C131
515 0137 601	CAP 1UF 25V 10% 1206 X7R	3	EA	C82,C96,C119
515 0138 517	CAP 0.47UF 100V 10% 1812 X7R	1	EA	C73
515 0158 000	CAP 0.22 UF 50V 20% 1206 Z5U	2	EA	C31,C33
518 0112 000	CAP, TRIM 2-10PF 50V	2	EA	C41,C47
523 0001 305	CAP, 1500UF 6.3V 20% SMT	6	EA	C81,C104,C123,C148,C150,C158
523 0002 117	CAP 47UF 25V 20% SMT	1	EA	C59
523 0002 201	CAP 100UF 25V 20% SMT	4	EA	C63,C64,C110,C133
540 1568 000	RES NETWORK, 10K OHM 5% SMT	8	EA	R125,R126,R127,R128,R129,R130,R131,R132
545 0308 118	RES 51.1 OHM 1% 0.1W 0805	2	EA	R140,R141
545 0308 125	RES 49.9 OHM 1% 0.1W 0805	1	EA	R50
545 0308 201	RES 100 OHM 1% 0.1W 0805	5	EA	R68,R77,R108,R120,R123

545 0308 209	RES 221 OHM 1% 0.1W 0805	1	EA	R66
545 0308 217	RES 475 OHM 1% 0.1W 0805	1	EA	R72
545 0308 301	RES 1K OHM 1% 0.1W 0805	2	EA	R11,R114
545 0308 317	RES 4.75K OHM 1% 0.1W 0805	1	EA	R3
545 0308 320	RES 6.19K OHM 1% 0.1W 0805	3	EA	R49,R56,R100
545 0308 401	RES 10K OHM 1% 0.1W 0805	4	EA	R18,R86,R87,R88
545 0308 408	RES 20K OHM 1% 0.1W 0805	1	EA	R8
545 0308 999	RES ZERO OHM JUMPER 0805	3	EA	R55,R121,R136
545 0309 018	RES 5.11 OHM 1% 1/4W 1206	1	EA	R78
545 0309 101	RES 10 OHM 1% 1/4W 1206	3	EA	R96,R98,R139
545 0309 111	RES 26.7 OHM 1% 1/4W 1206	2	EA	R62,R99
545 0309 112	RES 30.1 OHM 1% 1/4W 1206	4	EA	R60,R61,R91,R92
545 0309 113	RES 33.2 OHM 1% 1/4W 1206	3	EA	R5,R13,R16
545 0309 114	RES 35.7 OHM 1% 1/4W 1206	1	EA	R135
545 0309 115	RES 39.2 OHM 1% 1/4W 1206	4	EA	R67,R69,R97,R109
545 0309 117	RES 47.5 OHM 1% 1/4W 1206	1	EA	R47
545 0309 125	RES 49.9 OHM 1% 1/4W 1206	6	EA	R24,R35,R38,R74,R106,R137
545 0309 201	RES 100 OHM 1% 1/4W 1206	6	EA	R25,R36,R81,R82,R83,R89
545 0309 208	RES 200 OHM 1% 1/4W 1206	2	EA	R41,R48
545 0309 212	RES 301 OHM 1% 1/4W 1206	2	EA	R117,R118
545 0309 217	RES 475 OHM 1% 1/4W 1206	4	EA	R21,R59,R73,R93
545 0309 219	RES 562 OHM 1% 1/4W 1206	17	EA	R14,R15,R17,R22,R26,R30,R37,R39,R53,R64,R65,R70,R71,R103,R104,R105,R138
545 0309 220	RES 619 OHM 1% 1/4W 1206	2	EA	R80,R119
545 0309 301	RES 1K OHM 1% 1/4W 1206	15	EA	R19,R31,R32,R33,R34,R43,R44,R52,R79,R102,R110,R111,R113,R116,R124
545 0309 305	RES 1.5K OHM 1% 1/4W 1206	1	EA	R23
545 0309 317	RES 4.75K OHM 1% 1/4W 1206	2	EA	R1,R20
545 0309 401	RES 10K OHM 1% 1/4W 1206	5	EA	R2,R27,R28,R29,R57,R58,R94
545 0309 408	RES 20K OHM 1% 1/4W 1206	1	EA	R10
545 0309 421	RES 68.1K OHM 1% 1/4W 1206	1	EA	R46
545 0309 501	RES 100K OHM 1% 1/4W 1206	3	EA	R12,R54,R90
545 0309 999	RES ZERO OHM JUMPER 1206	2	EA	R7,R9
551 0017 301	TRIMPOT 1K OHM 1/4W 4MM SQ	4	EA	R42,R75,R101,R112
551 0017 401	TRIMPOT 10K OHM 1/4W 4MM SQ	1	EA	R107
603 0001 000	DIPSWITCH, 10 SPST SMT	6	EA	S2,S3,S4,S5,S6,S7
604 1163 000	SWITCH, PB, SPST MOM, SMT	1	EA	S1
843 5400 761	SCH, FREQ SYNTH CARD, PLAT VHF	0		
843 5400 763	PWB, PLATINUM FREQ SYNTH CARD	1		
843 5400 844	BLOCK DIAG, PLATINUM FREQ SYNTH	0		
917 2517 366	FW/SW, SYNTHESIZER BOARD	1	EA	U23
383 0598 000	IC, MC10EP32 ESD	2	EA	U13,U20

Table 7-39. *PWA, VIDEO BOARD W/VIDEO - 992 9564 001 (P)

Harris PN	*Description*	*QTY*	*UM*	*Reference Designators*
358 1881 000	EJECTOR KIT CARD	1	EA	
380 0189 000	XSTR, NPN 2N3904 ESD	11	EA	Q001,Q002,Q003,Q004,Q005,Q006,Q007,Q008,Q009,Q010,Q016
380 0190 000	XSTR, PNP 2N3906 ESD	2	EA	Q011,Q012
380 0573 000	XSTR, J309 ESD	1	EA	Q014
380 0578 000	XSTR, PN4258 ESD	2	EA	Q013,Q015
382 1379 000	*IC CLC522 ESD	1	EA	U016
382 1568 000	IC LM1881N ESD	1	EA	U011
382 1580 000	IC LT1252 VIDEO OPAMP ESD	9	EA	

				U001,U002,U003,U006,U008,U010,U012,U014,U015
382 1584 000	IC AD8037AN ESD	1	EA	U004
382 1598 000	IC 74AC00 ESD	1	EA	U007
382 1620 000	IC 9631 OPAMP ESD	1	EA	U005
382 1664 000	IC, OP AMP, TL054 ESD	1	EA	U013
383 0384 000	IC, 567D ESD	1	EA	U017
384 0205 000	DIODE SILICON 1N914/4148 ESD	8	EA	CR011,CR012,CR013,CR014,CR015,CR016,CR017,CR018
384 0431 000	RECT. 1N4001 ESD	2	EA	CR009,CR010
384 0659 000	DIODE HP5082-2811/A2S811 ESD	8	EA	CR001,CR002,CR003,CR004,CR005,CR006,CR007,CR008
384 0719 000	TRANSZORB 1N6373 5V 5W ESD	2	EA	CR019,CR020
384 0780 000	LED, RED ESD	1	EA	DS001
404 0682 000	SOCKET, DIP, 24 PIN (DL)	1	EA	XDL001
404 0873 000	SOCKET ADAPTER SOIC8-DIP8	1	EA	#U017
484 0439 000	LINE, DELAY 200NS	1	EA	DL002
484 0445 000	LINE, DELAY 400NS	1	EA	DL001
492 0857 000	INDUCTOR, FIXED RF 197NH	1	EA	L009
494 0394 000	CHOKE 6.80UH	2	EA	L006,L007
494 0397 000	CHOKE RF 8.20UH	1	EA	L001
494 0398 000	CHOKE RF 10.0UH +/- 10%	1	EA	L002
494 0419 000	IND 1000UH 10%	2	EA	L003,L008
506 0232 000	CAP, 0.01UF 100V 5%	1	EA	C074
506 0239 000	CAP, 0.022UF 100V 5%	2	EA	C052,C060
516 0453 000	CAP .1UF 100V 20% X7R	21	EA	C001,C003,C004,C005,C008,C011,C012,C033,C043,C048,C054,C056,C061,C068,C069,C071,C072,C076,C077,C080,C081
516 0530 000	CAP .01UF 10% 100V X7R	3	EA	C028,C036,C073
516 0765 000	CAP 10PF 5% 100V C0G	1	EA	C070
516 0766 000	CAP 12PF 5% 100V C0G	2	EA	C020,C035
516 0769 000	CAP 22PF 5% 100V C0G	1	EA	C042
516 0773 000	CAP 47PF 5% 100V C0G	1	EA	C051
516 0777 000	CAP 100PF 5% 100V C0G	4	EA	C038,C039,C045,C046
516 0881 000	CAP 820PF 5% 100V C0G	1	EA	C015
516 0971 000	CAP 470PF 5% 100V C0G	1	EA	C079
516 0974 000	CAP 1000PF 5% 100V C0G	2	EA	C016,C029
522 0548 000	CAP 10UF 50V 20%	2	EA	C055,C075
522 0550 000	CAP 100UF 25V 20%	1	EA	C027
522 0570 000	CAP 2.2UF 50V 20%	1	EA	C067
522 0578 000	CAP 1.0UF 50V 20%	2	EA	C050,C053
522 0588 000	CAP 100UF 25V 20% NP	1	EA	C037
526 0096 000	CAP 100UF 10V 20%	5	EA	C002,C006,C017,C018,C078
526 0108 000	CAP 4.7UF 35V 20%	24	EA	C007,C009,C010,C013,C014,C019,C022,C023,C024,C030,C032,C034,C040,C041,C047,C049,C057,C058,C059,C062,C063,C064,C065,C066
548 2400 130	RES 20 OHM 1/2W 1%	1	EA	R150
548 2400 168	RES 49.9 OHM 1/2W 1%	3	EA	R069,R093,R112
548 2400 185	RES 75 OHM 1/2W 1%	3	EA	R065,R086,R151
548 2400 187	RES 78.7 OHM 1/2W 1%	1	EA	R080
548 2400 201	RES 100 OHM 1/2W 1%	8	EA	R038,R039,R040,R041,R042,R043,R044,R045
548 2400 209	RES 121 OHM 1/2W 1%	1	EA	R142
548 2400 213	RES 133 OHM 1/2W 1%	2	EA	R052,R053
548 2400 215	RES 140 OHM 1/2W 1%	1	EA	R084
548 2400 218	RES 150 OHM 1/2W 1%	4	EA	R054,R055,R098,R155

548 2400 222	RES 165 OHM 1/2W 1%	1	EA	R087
548 2400 226	RES 182 OHM 1/2W 1%	1	EA	R135
548 2400 228	RES 191 OHM 1/2W 1%	3	EA	R050,R051,R091
548 2400 230	RES 200 OHM 1/2W 1%	4	EA	R048,R049,R108,R156
548 2400 231	RES 205 OHM 1/2W 1%	1	EA	R119
548 2400 234	RES 221 OHM 1/2W 1%	3	EA	R027,R090,R097
548 2400 242	RES 267 OHM 1/2W 1%	1	EA	R072
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R109
548 2400 251	RES 332 OHM 1/2W 1%	1	EA	R073
548 2400 262	RES 432 OHM 1/2W 1%	1	EA	R136
548 2400 266	RES 475 OHM 1/2W 1%	4	EA	R077,R082,R085,R130
548 2400 268	RES 499 OHM 1/2W 1%	15	EA	R019,R020,R021,R022,R023,R024,R025,R026,R064,R067,R107,R114,R117,R118,R121
548 2400 273	RES 562 OHM 1/2W 1%	4	EA	R070,R100,R103,R129
548 2400 285	RES 750 OHM 1/2W 1%	7	EA	R036,R037,R047,R083,R089,R101,R147
548 2400 290	RES 845 OHM 1/2W 1%	9	EA	R056,R057,R058,R059,R060,R061,R062,R063,R102
548 2400 301	RES 1K OHM 1/2W 1%	22	EA	R028,R029,R032,R033,R034,R035,R074,R075,R076,R081,R092,R113,R116,R122,R133,R134,R138,R139,R140,R143,R152,R153
548 2400 313	RES 1.33K OHM 1/2W 1%	1	EA	R128
548 2400 323	RES 1.69K OHM 1/2W 1%	2	EA	R030,R031
548 2400 330	RES 2K OHM 1/2W 1%	2	EA	R127,R154
548 2400 334	RES 2.21K OHM 1/2W 1%	2	EA	R088,R125
548 2400 343	RES 2.74K OHM 1/2W 1%	1	EA	R099
548 2400 351	RES 3.32K OHM 1/2W 1%	1	EA	R137
548 2400 366	RES 4.75K OHM 1/2W 1%	2	EA	R094,R146
548 2400 373	RES 5.62K OHM 1/2W 1%	1	EA	R132
548 2400 401	RES 10K OHM 1/2W 1%	7	EA	R066,R068,R078,R079,R095,R148,R149
548 2400 451	RES 33.2K OHM 1/2W 1%	1	EA	R158
548 2400 573	RES 562K OHM 1/2W 1%	1	EA	R123
548 2400 581	RES 681K OHM 1/2W 1%	1	EA	R126
548 2400 601	RES 1MEG OHM 1/2W 1%	2	EA	R159,R160
550 0398 000	POT 1K OHM 1/2W 10%	3	EA	R071,R115,R157
550 0901 000	POT 500 OHM 1/2W 10%	8	EA	R003,R004,R005,R006,R007,R008,R009,R010
550 0913 000	POT, 5K OHM, 1/2W	1	EA	R120
550 0921 000	POT 100K OHM 1/2W	2	EA	R144,R145
550 0922 000	POT 10K OHM 1/2W	3	EA	R124,R131,R141
550 0923 000	POT 1K OHM 1/2W	1	EA	R001
550 0928 000	POT 20K OHM 1/2W	4	EA	R105,R106,R110,R111
550 1101 000	POT 20KOHM 1/2W	8	EA	R011,R012,R013,R014,R015,R016,R017,R018
550 1102 000	POT 200 OHM 1/2W	1	EA	R002
604 1269 000	SW, TGL SPDT VERT ULTRA-MIN	2	EA	S001,S002
610 0679 000	PLUG, SHORTING, .25" CTRS	1	EA	JP006
610 0900 000	HEADER 3 CKT STRAIGHT	5	EA	JP001,JP002,JP003,JP004,JP005
610 0933 000	JUMPER, PWB TEST POINT	9	EA	TP001,TP002,TP003,TP004,TP005,TP006,TP007,TP008,TP009
612 0775 000	JACK, PC MT, .040 PINS	3	EA	JP6-1,JP6-2,JP6-3
612 1184 000	SHUNT JUMPER 0.1" CENTERS	5	EA	
620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J001,J002
843 5285 411	SCH, VIDEO DIFF GAIN, LFL	0		
843 5285 413	PWB, VIDEO DIFF GAIN, LFL	1		