HARRIS

STM-1

AM Stereo Modulation Monitor

- **Meets FCC AM Stereo modulation monitoring requirements**
- **Provides accurate monitoring of Harris Linear AM Stereo signal**
- **RF/IF inputs for thorough exciter and transmitter testing**
- **Built-in circuitry eliminates the need for spectrum analyzer during transmitter interface**
- **Three large, legible meters make monitoring easy**
- **Four convenient front panel BNC audio jacks provide quick test equipment connection, plus stereo phono jack**
- **Pilot frequency injection and calibration monitoring for quick system checks**

The Harris STM-1 AM Stereo Modulation Monitor provides accurate monitoring of the Harris Linear AM Stereo signal. The STM-1 complements the Harris STX-1 AM Stereo Exciter. When used with your current mono modulation monitor, it fulfills all FCC AM Stereo modulation monitoring requirements.

RF/IF BASED MONITORING

To ease checkout of both exciter and transmitter, RF and IF input jacks are provided. The IF baseband signal can be monitored, and provides additional checks and alignment on the exciter. The RF input accepts transmitter generated signals for complete system monitoring. The dual RF/IF inputs provide flexibility in system test and alignment.

TRANSMITTER SETUP

By utilizing a unique sideband detection circuit in the monitor, your transmitter can be aligned without the use of an expensive spectrum analyzer. A front panel switch permits convenient meter display of upper sideband (USB) and lower sideband (LSB) alignment signals.

PEAK READING METERS

The STM-1 incorporates three 3½" meters, two of which monitor left and right channel modulation. A quasi-peak reading circuit drives each modulation meter with accuracy approaching that of a peak flasher.

SYNCHRONOUS DETECTORS

One of the outstanding characteristics of the Harris Linear AM Stereo System is the capability to use synchronous detection for signal demodulation. The synchronous detector/demodulator used in the STM-1 improves monitoring accuracy when compared with other detection methods.

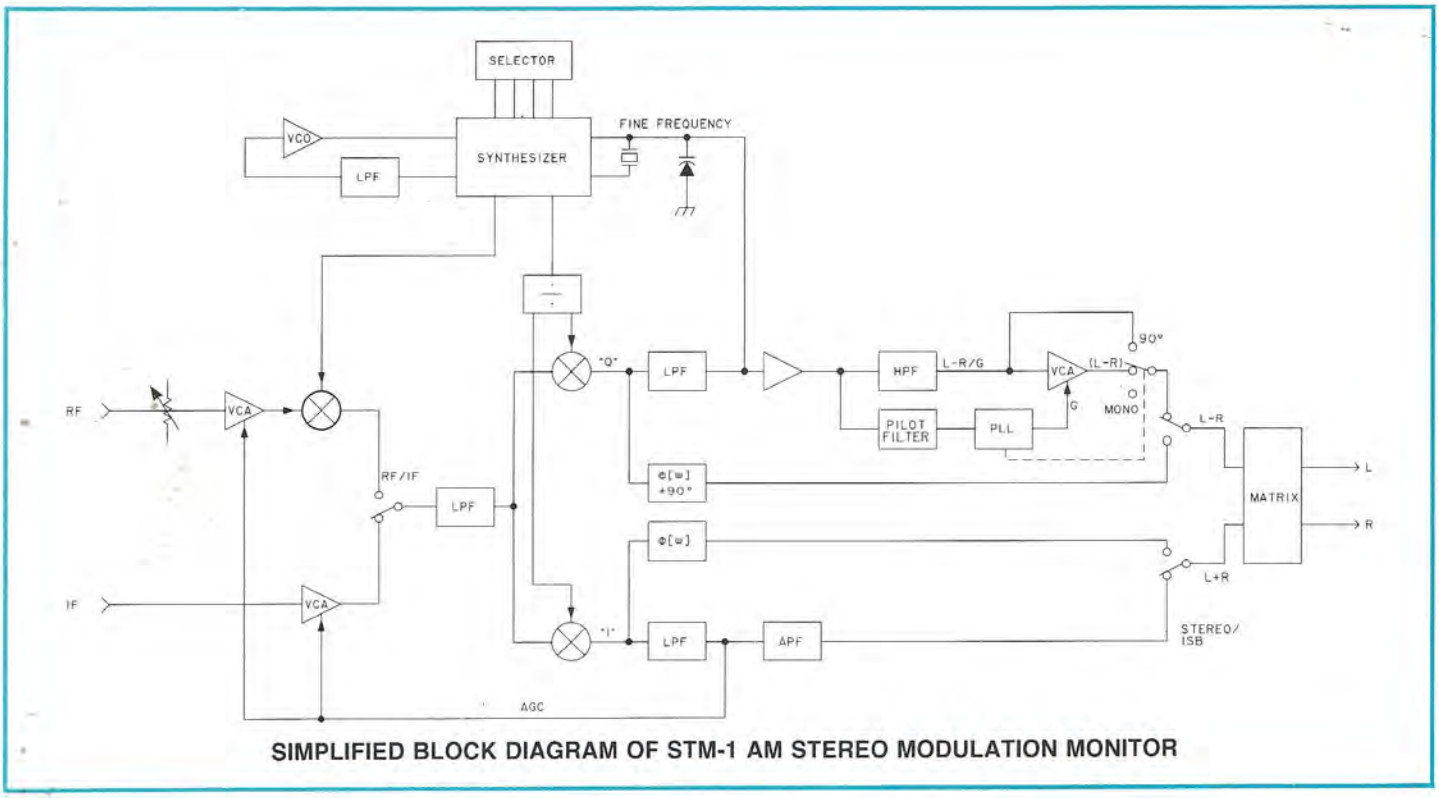
Front panel selector switches enable the operator to monitor left channel, right channel, I-channel (in-phase) information, Q-channel (Quadrature) information, and the pilot signal.

MULTIMETER AND STATUS LEDs

One of the three STM-1 front panel meters also serves as a multimeter. A front panel selector switch allows you to conveniently check RF input level and pilot injection level, as well as to calibrate the pilot frequency. Front panel LEDs also allow quick status checks of transmitter pilot presence and the monitor's internal PLL lock.

ADDITIONAL OPERATIONAL BENEFITS

The Harris STM-1 Modulation Monitor provides left channel, right channel, I and Q audio outputs with sufficient level to drive most monitor amplifiers. A convenient front panel stereo headphone jack is included to drive a pair of stereo headphones. Panel connections to a monotor amplifier and remote outputs of I, Q and pilot injection are also provided.



SIMPLIFIED BLOCK DIAGRAM OF STM-1 AM STEREO MODULATION MONITOR

STM-1 AM STEREO MODULATION MONITOR SPECIFICATIONS

GENERAL

FREQUENCY RANGE: 535 kHz to 1710 kHz in 1 kHz increments; synthesized.

RF INPUT: Input impedance 1K ohms, 1 VRMS to 10 VRMS, Female BNC.

IF INPUT: IF for direct monitoring of STX-1's IF AM Stereo signal, 0.25 to 1.0 VRMS at 256 kHz. Female BNC.

MODULATION METERS: Two modulation meters with 0-100% scales, selectable metering functions (L, R, LSB, USB). Quasi-peak reading.

MULTIMETER: 0-10% pilot injection, RF level, AGC, and pilot frequency calibration position.

SIZE: 19"W x 7.5"H x 15"D (48.3cmW x 19.1cmH x 38.1cmD).

AMBIENT TEMPERATURE RANGE: 0°C to 50°C.

OPERATING ALTITUDE RANGE: Up to 13,000 feet (4000 meters).

HUMIDITY: 95% non-condensing.

POWER INPUT: 115 VRMS ± 13%; 230 VRMS ± 13%, 47 Hz to 63 Hz.

FRONT PANEL

L AND R OUTPUT: 10 Vpp into 10K ohm at 70% modulation @ 400 Hz, BNC connector.

L AND R RESPONSE: ±0.5 dB, 400 Hz to 15 kHz.

L AND R SEPARATION: 35 dB, 400 Hz to 5000 Hz;
30 dB, 5000 Hz to 12,500 Hz.

L AND R THD: 0.5% @ 70% modulation, 50 Hz to 15 kHz.

L AND R S/N: 60 dB, reference 70% modulation @ 400 Hz.

PILOT FREQUENCY CALIBRATION: Provisions to set pilot within ±0.1 Hz.

PILOT INJECTION: 0-10% scale, ±0.5%.

USB AND LSB OUTPUT: 10 Vpp into 10K ohm.

STEREO DECODER MODES: 90° and variable angle controlled by switch.

MONITOR MODES: Switch controlled: forced stereo, auto stereo, mono.

HEAD PHONE JACK: 10 Vpp for driving high impedance head phones.

I AND Q OUTPUT: 1 Vpp into 10K ohm.

REAR PANEL

L AND R OUTPUT: 10 dBm into 600 ohm, balanced outputs.

I AND Q OUTPUT: 1 Vpp into 10K ohm, typical.

INDICATORS

PILOT: LED for stereo pilot presence.

PLL: LED for indicating internal lock of Phase Locked Loop to the RF/IF signal.

Harris maintains a policy of continuous improvement on its equipment and therefore reserves the right to change specifications without notice.

ORDERING INFORMATION

Harris STM-1 AM Stereo Modulation Monitor **994-8731-001**

HARRIS CORPORATION BROADCAST DIVISION
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200

ADV. 626A PTD. IN U.S.A.

TECHNICAL MANUAL

STM-1 AM STEREO MONITOR

994 8731 003

HARRIS CORPORATION
Broadcast Division

T.M. No. 888-2172-001

Printed: July 1983

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY 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 references:

- 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.

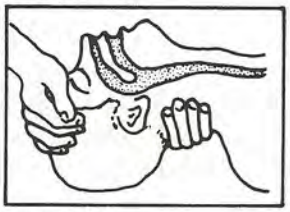
Treatment of Electrical Shock

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

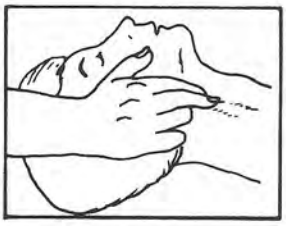
IF NOT BREATHING,
BEGIN ARTIFICIAL
BREATHING

TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION
MUST BE COMMENCED AS SOON AS POSSIBLE

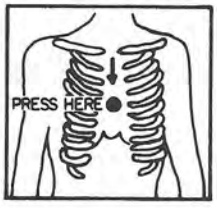
CHECK CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

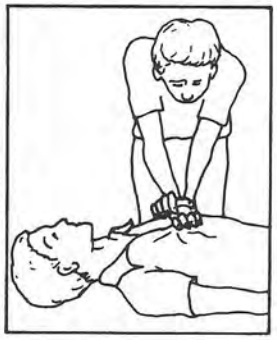
(C) CIRCULATION

DEPRESS STERNUM 1 1/2" TO 2"



APPROX. 80 SEC. { ONE RESCUER, 15 COMPRESSIONS, 2 QUICK BREATHS

APPROX. 60 SEC. { 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
      (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 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)

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WARNING: Disconnect primary power prior to servicing.

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SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This technical manual contains all the information necessary to install and maintain the STM-1 AM STEREO MONITOR. Figure 1-1 depicts the STM-1 AM STEREO MONITOR. The various sections of this technical manual provide the following types of information.

a. SECTION I, GENERAL DESCRIPTION, provides an introduction to technical manual contents. Please refer to brochure at front of manual for general description and specifications for the STM-1 AM STEREO MONITOR.

b. SECTION II, INSTALLATION, provides information relative to incoming inspection, power requirements, input/output connections, and initial setup procedures.

c. SECTION III, OPERATION, provides identification and functions of panel or board mounted controls and indicators, along with information necessary to setup and operate the STM-1 AM STEREO MONITOR.

d. SECTION IV, PRINCIPLES OF OPERATION, provides detailed theory of operation of the STM-1 AM STEREO MONITOR.

e. SECTION V, MAINTENANCE, provides guidelines for preventive maintenance on the STM-1 AM STEREO MONITOR.

f. SECTION VI, TROUBLESHOOTING, provides troubleshooting procedures and guidelines.

g. SECTION VII, PARTS LIST, provides information on the replaceable parts available for the STM-1 AM STEREO MONITOR.

h. SECTION VIII, DIAGRAMS, provides diagrams of the STM-1 AM STEREO MONITOR.

i. APPENDIX A, DATA FORMS, provides a list of typical audio proof forms for FCC and instructions for taking the measurements required to fill out the forms.

j. APPENDIX B, FREQUENCY SYNTHESIZER AND VCO PROGRAMMING, provides tables and examples for setting Frequency Synthesizer and VCO to frequency of operation.

k. APPENDIX C, COMPONENT OUTLINES, provides outline drawings for selected electrical components used in the STM-1 AM STEREO MONITOR.

SECTION II

INSTALLATION

2-1. INTRODUCTION

2-2. This section of the manual describes the incoming inspection and unpacking procedures that should be followed when the HARRIS STM-1 AM STEREO MONITOR is received. Installation instructions and initial turn on procedures are also provided in this section of the technical manual.

2-3. INCOMING INSPECTION AND UNPACKING

2-4. The HARRIS STM-1 AM STEREO MONITOR is usually shipped via private carrier. Upon delivery, the shipping container should be examined for indications of possible mishandling. If damage has occurred, immediately notify the carrier and HARRIS CORPORATION (refer to paragraph 2-6, Returns and Exchanges).

2-5. When unpacking the shipping container, care should be exercised to prevent equipment damage. The control numbers on the Packing List should be checked to verify completeness of the shipment. Any discrepancy is to be reported immediately to HARRIS CORPORATION.

2-6. RETURNS AND EXCHANGES

2-7. Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast 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 Division, specify the Factory Order Number or Invoice Number.

2-8. INSTALLATION INSTRUCTIONS

2-9. The STM-1 AM Stereo Modulation Monitor is designed to be rack mounted for testing the output of a transmitter generating the HARRIS AM stereo signal. The modulation monitor should be mounted securely in a 19 inch rack with adequate ventilation. The monitor can operate on either 115 V or 235 VAC. The monitor is normally set for operation on 115 VAC and can be reprogrammed for operation at 230 VAC by removing the PC board fused holder on 1F1. The monitor should be connected to a suitable source of AC power and will draw less than 100 W. Input connections are made to the RF INput and/-or the IF INput. For transmitter testing, an RF sample is used and for exciter testing only an IF sample from the HARRIS AM Stereo Exciter is connected. The RF INput (20 VRMS max) is the sample signal from the transmitter and the IF INput is a sample taken from the exciter IF output. Rotate

the RF LEVEL control on the front panel fully counterclockwise before applying the RF signal. Gradually rotate the RF LEVEL control clockwise until LOCK is obtained. Set the RF LEVEL control for a mid-range reading for RF Input.

2-10. CONNECTIONS

2-11. The rear panel connections are AC mains, RF INput, IF INput, LEFT AUDIO OUTPUT, RIGHT AUDIO OUTPUT, I CHANNEL OUTPUT, Q CHANNEL OUTPUT and PILOT INJection. The RF INput BNC is to be connected to the transmitter output sample (modulation monitor sample point). The IF INput is to be connected to the exciter IF output if desired. The AC input is to be connected to a suitable source of AC power.

2-12. The terminal strip 1TB1 has the remote connections for the mod monitor. Outputs on this terminal strip are the audio outputs identified as LT+, LT-, AUDIO and RT+, RT-, AUDIO. These are balanced outputs, suitable for driving monitor amplifiers. Also available on 1TB1 is the I CHANNEL and Q CHANNEL outputs. The I CHANNEL and Q CHANNEL outputs can be used to remotely determine the stereo parameters of the HARRIS system before matrixing. The I (in-phase) channel is comprised of (L + R) information and the Q (quadrature) channel contains (L - R) information. The terminal labeled PILOT INJ permits determination of the pilot injection level on a remote indicator.

2-13. FRONT PANEL SWITCHES

2-14. There are five front panel switches and under normal operation these switches are in the following modes: POWER switch is ON, the ISB/STEREO switch is in the STEREO mode, the STEREO/AUTO/MONO switch would be in the AUTO mode, the 90° or VAR (variable angle) switch would be in the 90° mode and the multimeter switch would be on the PILOT INJ mode. By maintaining these switches in these positions, the maximum amount of information can be obtained at a glance. The switches perform the following functions:

a. The POWER switch turns on and off the AC power.

b. The STEREO/ISB switch allow selection of either quadrature detection or ISB detection and have the meters display that information accordingly.

c. The ISB circuit used in the HARRIS AM Stereo Monitor is utilized to make a conventional AM transmitter behave as a linear transmitter, thus easing transmitter setup for stereo. By placing the switches in a STEREO mode, the operation is normal.

d. The STEREO/AUTO/MONO switch allows selection of the operating decoding modes in the mod monitor. When the switch is in the MONO mode it forces the decoder to detect in mono synchronous detection. When the switch is in the AUTO mode the mod monitor will switch between mono detection or stereo detection depending

on the presence of a stereo pilot. When the switch is in the STEREO mode the decoder is forced into stereo decoding with or without the presence of a pilot.

e. The 90°-VAR switch determines the angle for which the decoder is set. Under normal programming material, the switch can be placed in the 90° mode. For test purposes the VAR (variable angle) position should be used. For additional information about 90° and variable operation, refer to the STX-1 Exciter Technical Manual.

f. The multimeter switch has three positions. In the PILOT FREQ CAL position the meter allows setting of the pilot frequency in the STX-1 exciter accurately to 55 Hz. When the switch is in the PILOT INJ position, it reads the pilot injection level on a 0 - 10% scale. When the switch is on RF INPUT it allows reading of the AGC level for setting the RF LEVEL control.

2-15. FRONT PANEL OUTPUTS

2-16. Several outputs are available on the front panel of the mod monitor. These permit various forms of measurement or monitoring of the stereo signal. The HEADPHONE jack is for use with a pair of stereo headphones for listening to the off the air signal and determining the quality of the processed signal (suitable signal is present to drive medium to high Z headphones). The modulation left and right BNC's are samples of the right or left modulation output for measurement. These outputs can be used to determine distortion, response, or other audio performance parameters. When the selector switch is in the ISB mode these outputs indicate the upper or lower sideband modulation. The I and Q output BNC's are samples of the I and Q synchronous detectors. These signals (L+R, L-R + PILOT) can be used to help to determine the quality of the transmitter in initial setup when the transmitter is in mono. By measuring the ratio of I to Q (incidental quadrature), the ability of a transmitter to produce AM stereo can be determined.

2-17. FRONT PANEL INDICATORS

2-18. Two front panel LED's are used to indicate the status of two phase lock loops in the stereo mod monitor. The yellow LED named LOCK indicates the status of the RF synthesizer lock to the transmitter carrier. Whenever the monitor has acquired lock and generated the proper RF carrier, the LOCK light will come on. The PILOT LED which is red, indicates the presence of a stereo pilot.

2-19. FRONT PANEL METERS

2-20. Three meters are used on the front of the monitor. The multimeter has three uses and is associated with a three position switch. The meter indicates the amount of pilot injection on a 0 - 10% scale. It also indicates the AGC level and tells whether or not the RF level is too high or too low or in an OK region for the range of AGC circuits. By using the meter as an indicator of the frequency difference between an internal 55 Hz reference

and the exciter Pilot, a pilot frequency calibration position is also obtained. There are also two modulation meters which have scales for indicating the amplitude modulation of the right and left stereo signals. The modulation is given in percentage (%) and in dB.

2-21. FRONT PANEL ADJUSTMENT

2-22. There is only one front panel adjustment and that is the RF LEVEL control which allows setting of the RF level to an appropriate amount for acquiring by the RF synthsizer PLL. This knob should be rotated to give a suitable level as indicated on the multimeter.

SECTION III

OPERATION

3-1. INTRODUCTION

3-2. This section of the Technical Manual provides an introduction to the controls and indicators on the HARRIS STM-1 AM STEREO MONITOR as well as operating procedures to follow in using the HARRIS STM-1 AM STEREO MONITOR.

3-3. CONTROLS AND INDICATORS

3-4. Refer to figure 3-1 through 3-5 for information on the controls and indicators on the HARRIS STM-1 AM STEREO MONITOR.

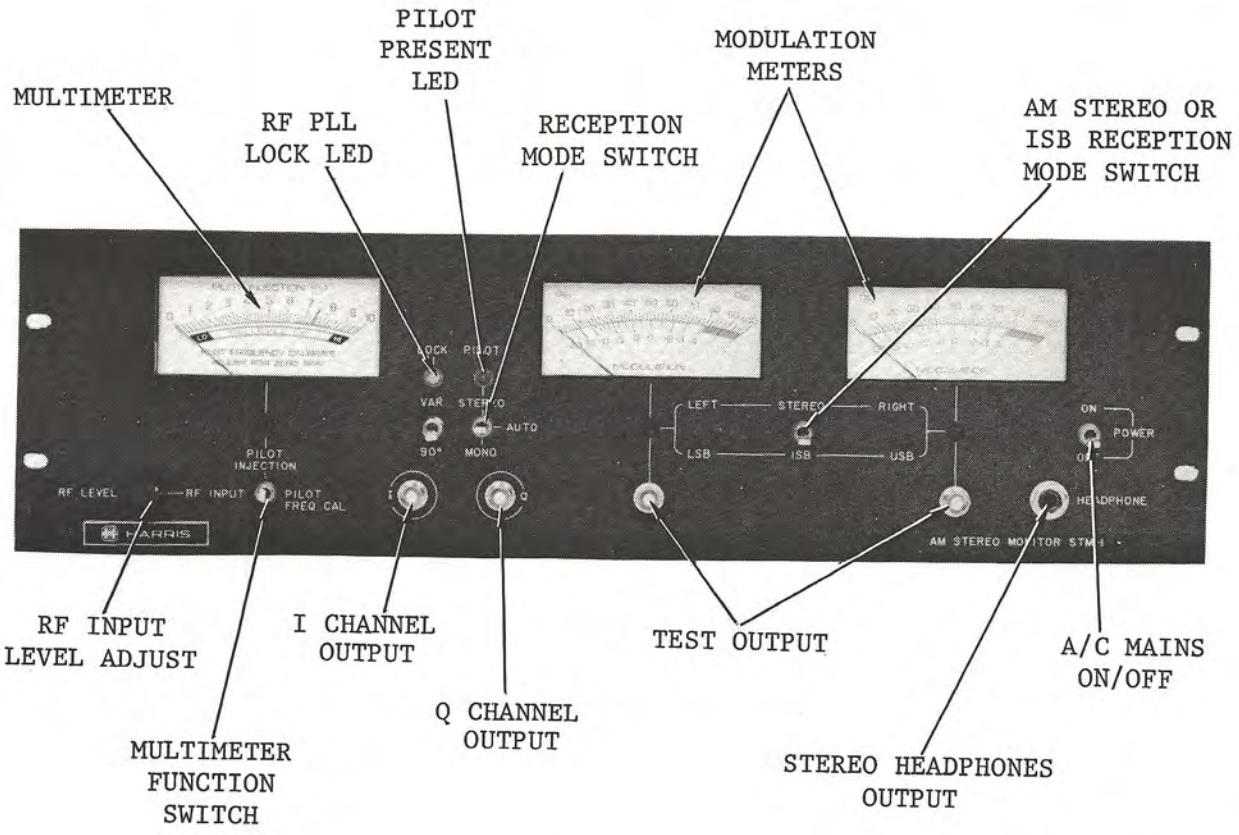


Figure 3-1. STM-1 Front View, Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

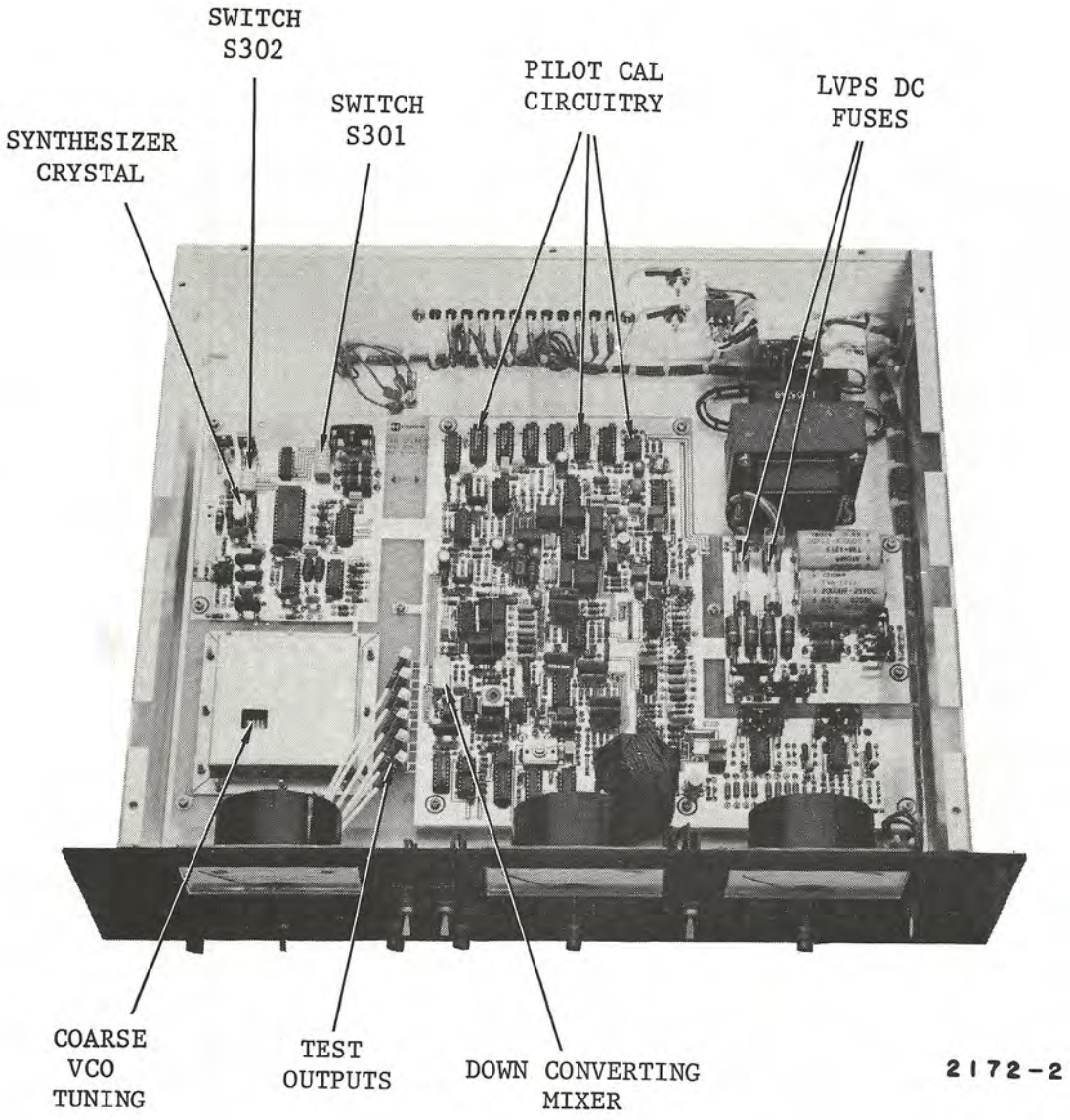


Figure 3-2. STM-1 Interior View As Viewed From Front, Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

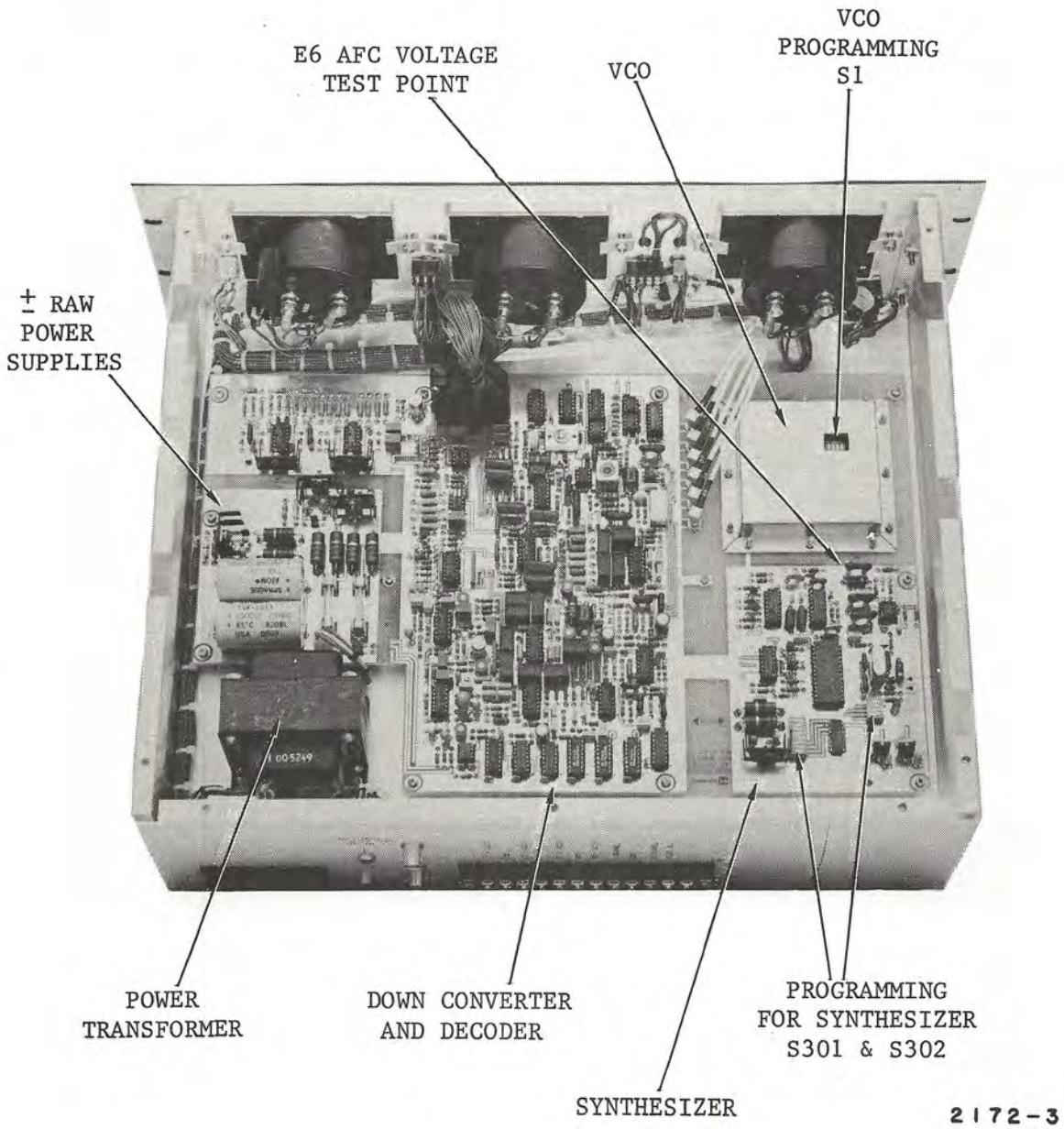


Figure 3-3. STM-1 Interior View As Viewed From Rear, Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

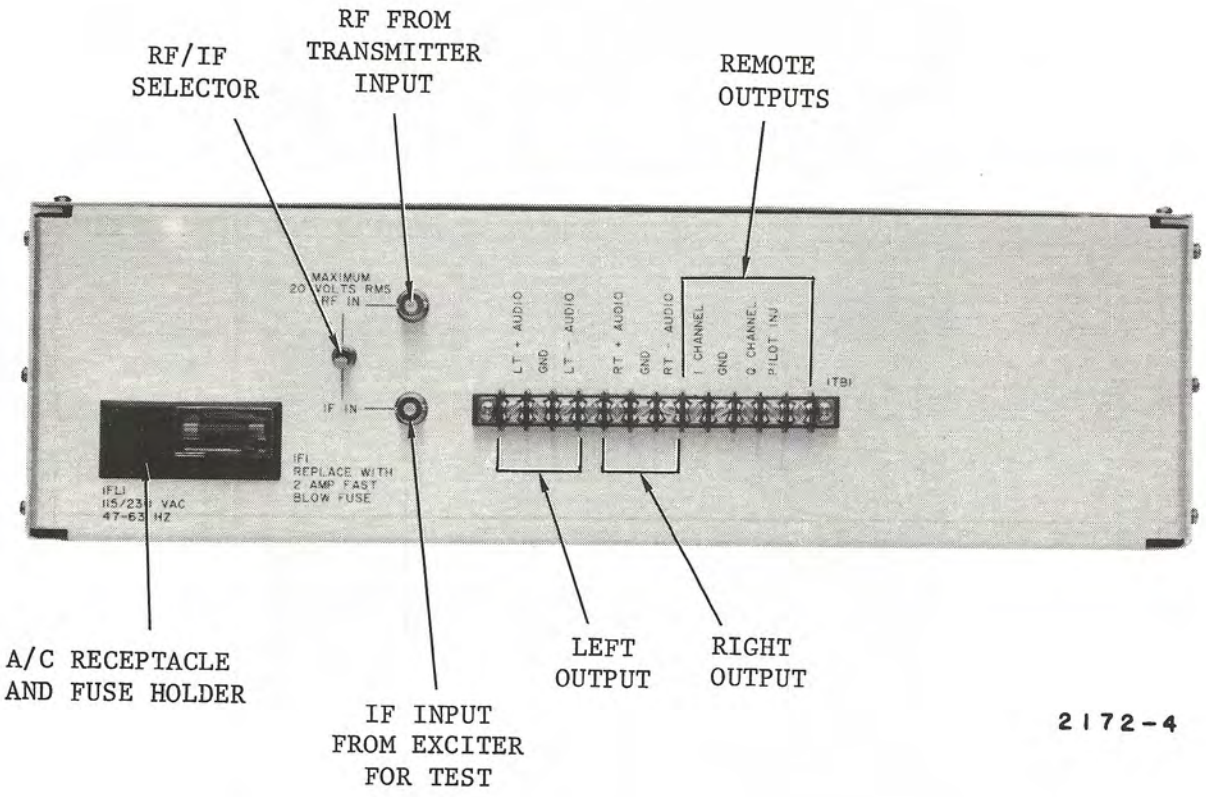


Figure 3-4. STM-1 Rear Panel, Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

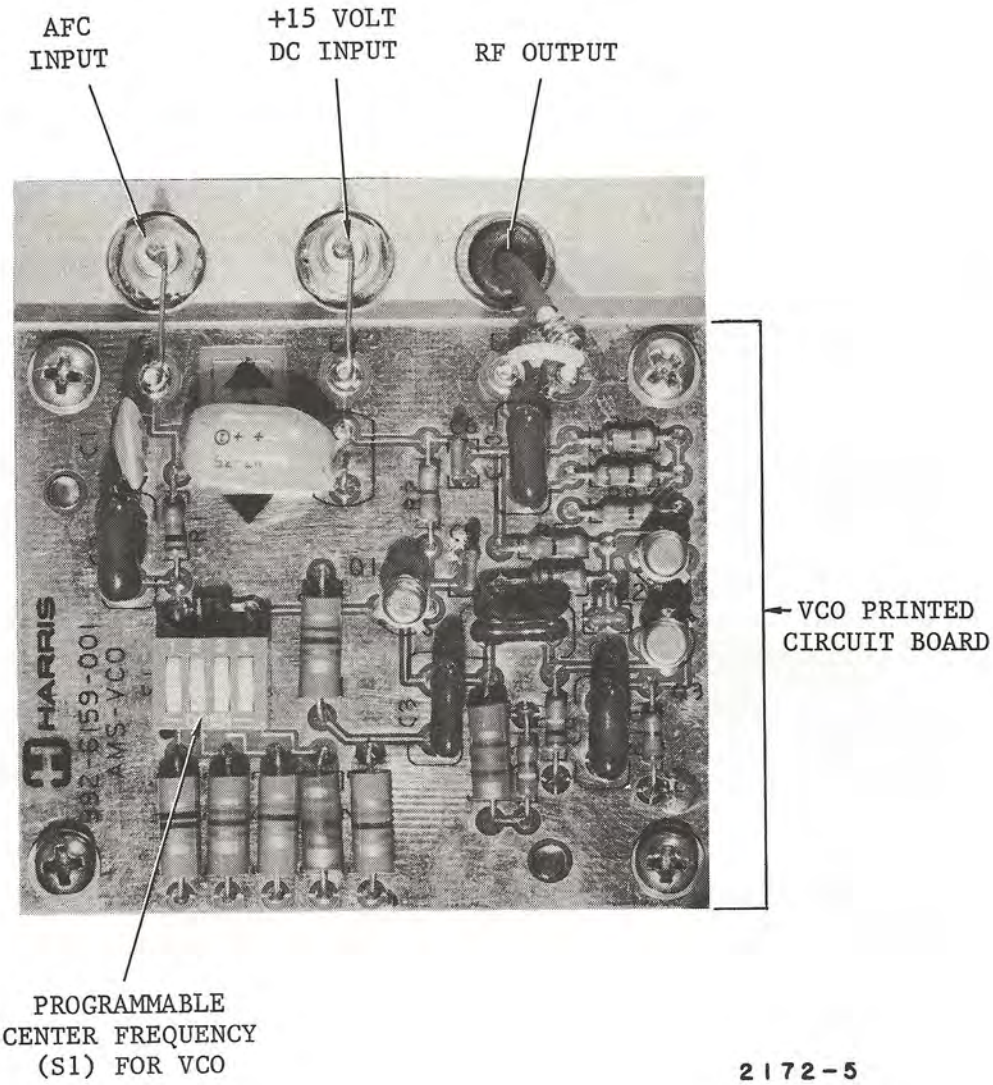


Figure 3-5. STM-1 VCO Board With Cover Removed, Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

3-5. OPERATION OF MOD MONITOR

3-6. The AM stereo mod monitor after installation and preliminary checkout is now ready for operational use. The transmitter RF signal sample should be connected and if desired, the Exciter IF signal can be connected. The mod monitor can either check out a transmitter by use of the RF signal input or it can use the IF signal from the exciter to aid in exciter set-up or diagnosing problems. Operation of the monitor with a transmitter RF signal will be described first.

3-7. TRANSMITTER TEST

3-8. The monitor should be connected to the RF transmitter output sample and the rear panel switch set to RF INPUT. The various AM stereo parameters may now be measurd by the modulation monitor. To complete the full performance measurements, an envelope detector modulation monitor is also necessary and is recommended to be used during these tests.

3-9. When the RF sample from the transmitter is connected to the mod monitor the RF LEVEL adjustment should be set to give a reading in the center of the multimeter dial. When the RF level is in the "RF LEVEL OK" range, lock should occur and the yellow LOCK light should illuminate. Illumination of the yellow LOCK light indicates that the internal phase lock loop has acquired the carrier of the incoming signal and is ready for demodulation of an AM stereo signal.

3-10. Pilot injection level should be checked to see that adequate pilot is present. Move the multimeter switch to the PILOT INJ position and read the pilot injection level. The pilot should be between 6-1/2% and 8-1/2% injection and should be set to 7.5%. If adequate pilot is present, the pilot should be indicated by a red PILOT LED on the front panel.

3-11. Having determined that the pilot injection level is correct, now the pilot frequency must be set. Set the multimeter switch to PILOT FREQ CAL and observe the waving needle of the multimeter. The needle should oscillate back and forth at the rate of the difference of the precise 55 Hz generated inside the mod monitor and the pilot signal generated by the exciter. By zero beating these signals, the exciter pilot frequency can be set to 55 Hz ($\pm$0.1 Hz). The exciter pilot frequency control should be adjusted until the PILOT FREQ CAL indicator is virtually not moving. Return the multimeter switch position to pilot injection and proceed with the next set of tests.

3-12. The fundamental parameter that determines the adequacy of many transmitters for AM stereo performance is incidental quadrature modulation (IQM). This parameter can be measured by using the I and Q outputs on the front panel. Using a 1 kHz tone, envelope modulate the transmitter in mono to 95%. Then connect an audio voltmeter to the I output and set to 0 dB. Then connect the voltmeter to the Q output and read the incidental quadrature level in dB. Normally a good transmitter should attain -35 to -40 dB of incidental quadrature modulation. This is the amount of signal coupled from the envelope signal (L+R) into the quadrature channel (L-R). Ideally

there will be no incidental quadrature component but given the imperfect nature of PA neutralization, with RF bandwidth limited circuits, and other factors; there will be incidental quadrature modulation on all transmitters. If the incidental quadrature modulation is between -20 and -30 dB, more optimizing of the transmitter is suggested. By adjusting neutralization, output tuning, grid loading, RF stage(s), power supply ripple, and other such factors; incidental quadrature can be reduced to an acceptable level. At levels of -20dB, marginally acceptable performance in AM stereo can be obtained.

3-13. The performance of the transmitter can now be checked with a single audio channel modulation signal. Using a suitable audio source to drive the exciter left and/or right input, parameters such as separation, distortion, and IMD can be measured. Two different modulation levels are important to recognize. One is the modulation of the envelope and the other is the modulation of a stereo channel. The measurement of modulation of the envelope should be accomplished by using an envelope detector monitor such as the HARRIS AM 90. The STM-1 can be used to measure the individual stereo channel modulation levels.

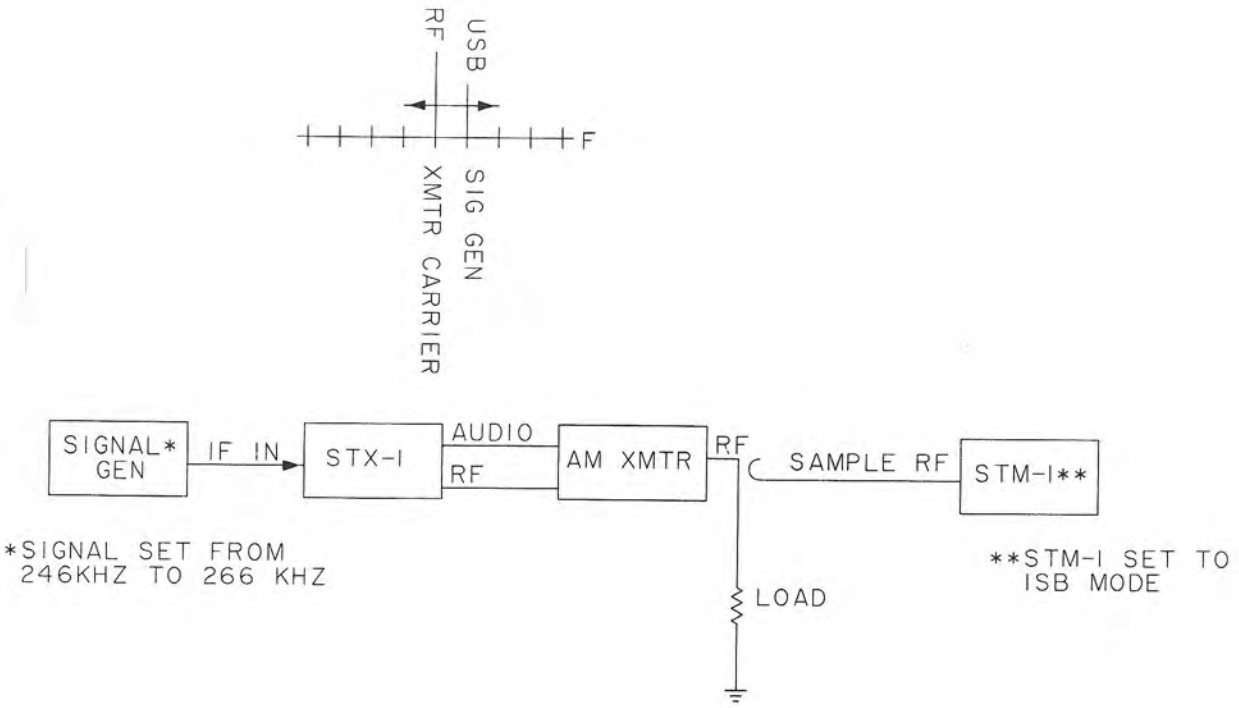
3-14. EXCITER IF TEST

3-15. The exciter can also be tested by using the IF output into the monitor IF INPUT. This permits testing of the exciter without passing the signal through an operating transmitter. The exciter can be aligned and/or trouble shot by using the IF signal. A coax should be used to interconnect the two IF signal ports, the proper switch thrown in the rear of the monitor, and the monitor is operating on the IF of the exciter. Similar to the RF signal, the IF signal is AGCed and likewise, the phase lock loop also acquires the 256 kHz IF and regenerates the appropriate signals for demodulation. The IF signals can be anlayzed in a manner similar to that of the RF.

3-16. INDEPENDENT SIDEBAND MODE

3-17. The STM-1 monitor can also be made to operate as an independent sideband modulation monitor. This finds use in aligning AM power transmitters for linear performance. Operation in this mode will now be described. The STX-1 exciter is connected to the transmitter as outlined in the exciter manual. The monitor is connected to the RF transmitter sample output. A signal from a good quality function generator is then injected in the IF input of the HARRIS STX-1 Stereo Exciter at about 256 kHz. This injected signal and the 256 KHz internal carrier create a single sideband signal. This SSB is regenerated by the transmitter and the circuitry in the exciter will make the transmitter behave as a linear power amplifier. The 256 kHz IF and the SSB injected signal (from 246 kHz to 266 kHz) cover a reasonable portion of an RF AM channel. The mod monitor detects the upper and lower sidebands. The SSB modulation can be observed on the two modulation meters. When the injected signal is above 256 kHz, all the information should appear on the upper sideband and thus indications on the modulation meter should only be on the USB. The LSB meter should indicate minimal signal. The LSB modulation should be "nulled" when modulating the upper sideband. When the

transmitter is operating ideally, with an upper sideband only, there should be nothing in the lower sideband. Thus, transmitter tuning and adjustment should be made to minimize the signal in the lower sideband when modulating with an upper sideband. And conversely, when modulating with a lower sideband (frequencies below 256 kHz), one should try for minimum upper sideband.



TEST SET-UP FOR ISB BASED ALIGNMENT FOR AM TRANSMITTER

(829 9387 001)

Figure 3-6. Test Set-Up For ISB Based Alignment For AM Transmitter

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

4-2. This section of the maintenance manual will present the principles of operation for the STM-1 AM STEREO MONITOR.

4-3. GENERAL

4-4. The STM-1 is an AM Stereo Mod Monitor designed to decode and monitor a transmitter signal producing HARRIS AM Stereo. The features in the STM-1 make it possible to establish all stereo parameters for set-up and measurement for the HARRIS system. However, to complete the FCC required data, it is also necessary to have an envelope detector (the ordinary monitor found in any radio station). The STM-1 AM Stereo monitor has metering for left, right, pilot injection, pilot frequency, and RF level input. It also demodulates special test signals for easing test set-up of the transmitter.

4-5. BLOCK DIAGRAM DESCRIPTION

4-6. Refer to Figure 8-1, Block Diagram, STM-1 Modulation Monitor, for the following discussion. The STM-1 accepts either an RF sample from the transmitter or the IF signal from the STX-1 exciter for demodulation. The RF signal is coupled into an AGC circuit and then down converted to the 256 KHz IF. The system is, therefore, an IF based demodulation method which provides the means for aligning and troubleshooting the IF signal in the STX-1 exciter. Referring to the block diagram in Section VIII, there are several major operating areas in the modulation monitor. First, the RF signal is down converted to IF at 256 kHz. The incoming RF is below the local oscillator signal. To compute the frequency of the STM-1 local oscillator, add the transmitter frequency to 256 kHz.

4-7. The reference source of the local oscillator is a crystal controlled synthesizer that is phase locked to the carrier of the incoming RF signal. The output of the down converting mixer is coupled into two demodulating switches which form synchronous detectors. These two switches output the "I" and "Q" signals. The I signal is the in-phase component (L + R) of the modulation and the Q signal is the quadrature phase component of the modulation ([L-R]/G + Pilot).

4-8. The output from the I channel detector is also used to provide the feedback for the AGC circuit. The AGC circuit maintains a constant RF level into the mixer over a reasonable range of RF input levels. This AGC signal is metered and displayed on the multimeter. The I channel modulation is the L + R signal and is used in the stereo matrix decoder. The Q channel modulation contains the information (L - R)/G plus pilot. The output of the Q channel provides the reference feedback for the voltage controlled crystal oscillator in the phase locked loop.

4-9. The Q channel information contains both (L - R)/G and the variable pilot frequency. The Q channel is passed into a dual path network: one part which low pass filters the pilot frequency; and other part which high pass filters the (L - R)/G information.

4-10. The pilot frequency is between 55 and 96 Hz depending upon the modulation. A phase locked loop (PLL) integrated circuit tracks the incoming pilot and provides a DC level output proportional to the incoming frequency. This DC level, which is proportional to the pilot frequency (G factor), is then used to drive an amplifier whose gain varies with applied DC (VCA).

4-11. The (L - R)/G signal is then multiplied (xG) by this variable gain amplifier to give (L - R). The (L + R) signal only needs to be delayed to equalize the time in the (L - R)/G channel. Thus an all pass filter consisting of the amount of time delay equal to the (L - R)/G time delay is placed in the (L + R) channel. After both (L - R) and (L + R) are suitably filtered, they are then matrixed in summing amplifiers to provide right (R) and left (L) audio outputs.

4-12. The balance of the circuitry in this stereo modulation monitor provides for calibration of the pilot, monitoring of key signals, synthesizing of the local oscillator, and the power supply. Each one of these areas will be described in detail in the following paragraphs.

4-13. INPUT AND AGC SECTION

4-14. The RF input from the transmitter is coupled to a potentiometer to permit operation over a wide range of RF levels. A sample of the RF signal is coupled into an AGC circuit formed by a light dependent resistor (LDR) and a control signal from the I channel detector output.

4-15. The RF signal is down converted in a double balanced mixer and the resultant IF is low pass filtered. The filtered IF signal is then amplified by a bandpass amplifier for routing to the two synchronous detectors formed by electronic switches in U3. The AGC action is slow and is intended to track out slow variations in the RF level. It will not track the audible amplitude modulation.

4-16. After I channel detection, the AGC circuit sends a slowly varying DC level to the LDR at the RF input forming a closed loop AGC system. The AGC level is metered and by adjusting the front panel RF LEVEL control the amount of RF can be set in the "RF LEVEL OK" region.

4-17. SYNCHRONOUS DETECTORS

4-18. Detection of the HARRIS AM Stereo information is done by synchronous detection (also called product detection). The synchronous detectors are formed by FET switches. These FET switches are driven by square waves derived from the STM-1 synthesizer. The synthesizer is phase locked to the RF carrier of the transmitter or the IF of the exciter. The synchronous detectors demodulate the in-phase and quadrature modulation components. The

in-phase detector, I, detects that information which is in phase with the RF carrier of the transmitter. The quadrature detector, Q, detects information which is 90 degrees with respect to the transmitter carrier phase. The I and Q demodulators are driven by signals which are 90 degrees phased from one another. The signals which drive these switches are digital. Two signals are required to drive each demodulator switch. Both a Q and a Q signal are used to properly operate each I or Q demodulator.

4-19. Q CHANNEL

4-20. The Q channel signal contains the (L - R)/G information and pilot information. The STM-1 separates the (L - R)/G information from the pilot. The Q channel output from the detector is divided into two paths. One path filters the pilot from the signal, the other filters the (L - R)/G information. The pilot is low pass filtered in an active filter and then demodulated by a phase locked loop (PLL) integrated cricuit.

4-21. A PLL integrated circuit tracks the pilot frequency and behaves as a frequency detector. The PLL output is a DC level proportional to the input pilot frequency. This output DC level is the "G" factor for multiplying by a voltage controlled amplifier (VCA). As the pilot frequency varies from 55 Hz to 96 Hz, the PLL output DC level varies, and the gain of the voltage controlled amplifier varies. The signal passing through the voltage controlled amplifier is the (L - R)/G information. A signal pilot at 55 Hz has a unity gain effect on the voltage controlled amplifier (G = 1). When the pilot is at 96 Hz the voltage controlled amplifier is at maximum gain (G = 3.96).

4-22. The other branch of the Q channel contains a high pass filter. The high pass filter rejects the pilot information and passes the (L - R)/G information. The (L - R)/G information from this branch of the Q channel is coupled into the voltage controlled amplifier. The output of the voltage controlled amplifier (L - R) is then coupled to the stereo L/R matrix.

4-23. I CHANNEL DETECTION

4-24. The I channel contains the (L + R) information and only needs to be time delayed to arrive at the matrix for proper combining with the (L - R) signal. The (L + R) signal is time delayed by a circuit that is of the same delay as the high pass filter of the (L - R)/G signal. The (L + R) all pass filter is formed with active circuits.

4-25. MATRIX

4-26. The matrix for the stereo demodulator combines the (L + R) and (L - R) suitably to give Left and Right output. The matrix thus sums (L + R) and (L - R) to give 2L and differences (L + R) and (L - R) to give -2R. The matrix outputs are coupled to stereo headphone jacks, to rear panel connectors, to the metering, and to front panel connectors.

4-27. SYNTHESIZER

4-28. The synthesizer provides two signals: first, a signal to down convert the incoming transmitter signal to 256 kHz and second, a pair of quadrature signals to the synchronous detectors for demodulation of the AM stereo. The major circuit components in the synthesizer is the VCO, a large scale integrated circuit (LSI) synthesizer chip, a voltage controlled crystal oscillator, and two sets of frequency dividers (see figure 4-1).

4-29. The incoming RF signal is down converted in a mixer circuit with the local oscillator (LO) from the synthesizer. The synthesizer LO signal is simply the VCO signal counted down to the incoming frequency plus 256 kHz. Since the IF is always at 256 kHz, the signal that is provided by synthsizer for the synchronous detectors is 256 kHz. The demod signal is provided by a voltage controlled crystal oscillator which operates on 4.096 MHz, which is associated with the synthesizer LSI IC. The 4.096 MHz crystal oscillator signal is simply divided down to 256 kHz for the stereo demodulator. The AFC voltage for the VCO is provided by the phase detector internal to the synthesizer LSI IC. The AFC voltage for the VCXO is provided for by the Q channel output of the synchronous detector. Thus the incoming signal is locked to the VCXO which in turn locks the VCO. This synthesizer has two phased locked loops.

4-30. POWER SUPPLY

4-31. Power for the modulation monitor is provided from DC power supplies. The power supply voltages are derived from full wave rectified signals at $\pm$19V. These raw DC signals are then regulated by several solid state regulators to the appropriate voltages. The voltage regulators are internally thermally protected and short circuit proof.

4-32. METERING

4-33. The metering of the left and right modulation signal are "averaging" peak detector circuits. These detector circuits display peaks of continuous sine wave modulation and "averages" program modulation.

4-34. PILOT FREQUENCY CAL

4-35. To accurately determine the frequency of the pilot in the exciter, a 55 Hz signal is derived from the crystal oscillator at 4.096 MHz. The crystal derived 55 Hz is then compared to the transmitter pilot frequency as filtered from the Q channel. A mixer multiplies these signals and outputs a difference signal. If the difference between these signals is great, then the meter movement is fast moving. This feature is connected via the PILOT FREQ CAL meter position and the multimeter. As the transmitter pilot becomes closer and closer to 55 Hz, the pilot frequency the meter will slow (zero beating). This permits accurate setting of the pilot in the exciter.

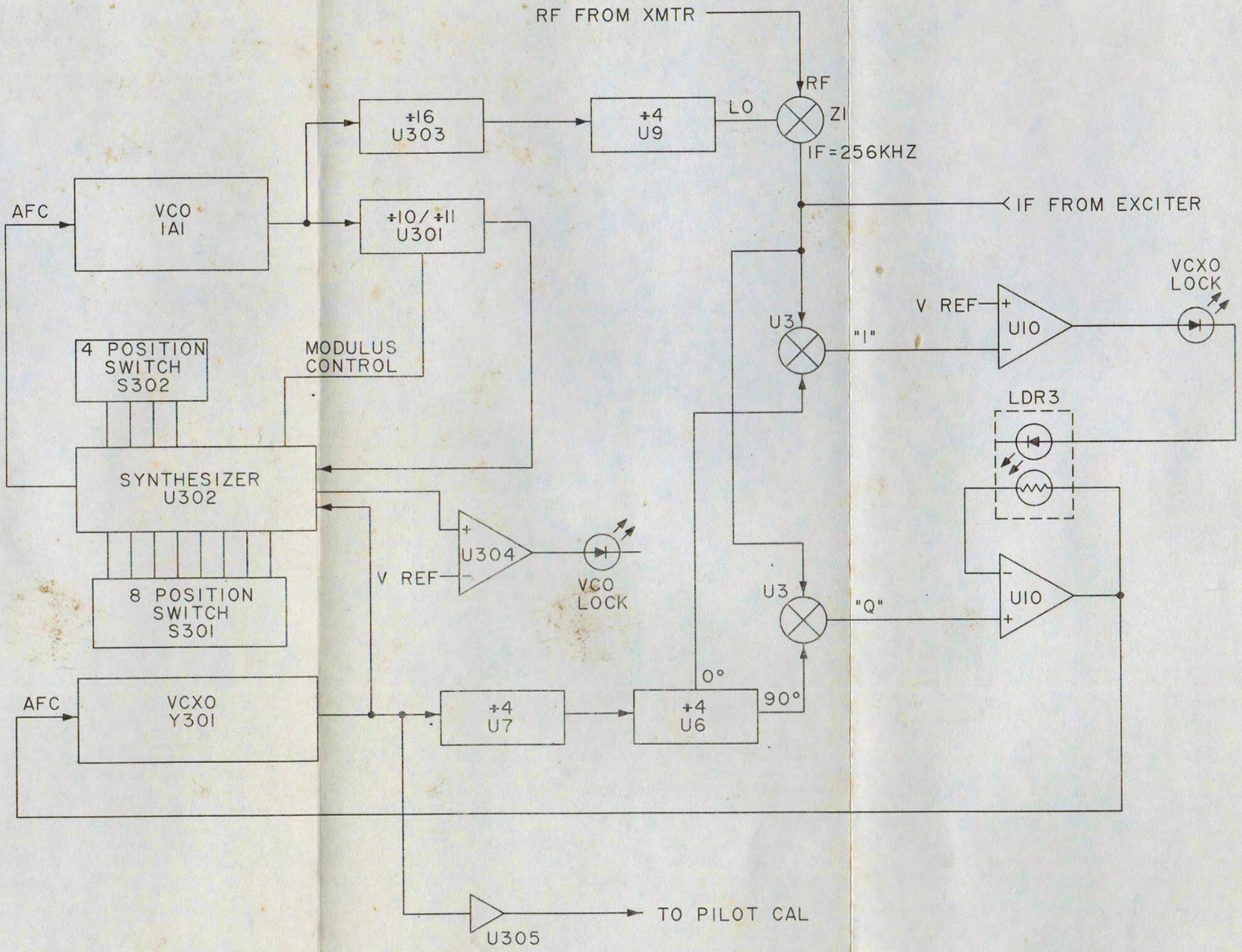


FIGURE 4-1. BLOCK DIAGRAM OF SYNTHESIZER
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4-36. IF INPUT

4-37. Provisions have been made in the demodulator and exciter to operate at IF. The 256 kHz IF used in the STM-1 demodulator and the STX-1 exciter are compatible and permit checking of the IF signal from the exciter. To use this signal, a switch must be thrown in the rear of the monitor, a joining cable installed, and the signal will be appropriately coupled into the IF of the stereo demodulator. Its complete use will be explained in paragraphs elsewhere.

4-38. DETAILED CIRCUIT DESCRIPTION OF STM-1

4-39. The following describes the circuits in the STM-1 when decoding the HARRIS linear AM stereo signal. It is designed to operate with any AM transmitter converted for AM stereo use or for testing the IF signal of the STX-1 HARRIS stereo generator.

4-40. RF INPUT AND AGC CIRCUITS

4-41. Rear panel connector J3 is connected through a capacitor to a 1000 ohm bridging potentiometer for termination of the RF signal input. The RF signal should not exceed 20 VRMS. The rear panel selector switch S5 determines whether the RF INput or IF INput is used. When the switch S5 is in RF INput, the circuit is connected for RF and when in IF INput the IF portion is operative. The RF signal is sampled from potentiometer R1 and connected to a matching transformer in parallel with a light dependent resistor (LDR). The light dependent resistor is placed in shunt with the RF signal to perform the necessary AGC action. As the RF signal increases the light dependent resistance decreases as determined by the AGC loop, thus holding the output of the IF signal at a constant level over a wide range of RF input levels.

4-42. The RF signal is down converted in double balance mixer, Z1, whose LO is provided by the synthesizer and whose IF is centered at 256 kHz. The LO signal is always the input frequency +256 kHz (high side LO). At the IF output of mixer, Z1, an RLC network of low pass form is made to filter the local oscillator, RF, and other high frequency signals that come from the mixer IF port. The low pass filtered IF is then coupled into an amplifier formed by U2. U2 is a bandpass amplifier centered at 256 kHz with a Q of approximately 5. It can be tuned by inductor L2 and is peaked for the 256 kHz IF signal.

4-43. Amplifier U2 also provides the input for the external IF signal. The IF signal input is coupled from the rear panel by way of a BNC connector to another AGC LDR circuit in a manner similar to that on the RF input. The IF AGC LDR, however, is series connected but has an AGC function identical to that of the RF input. The AGC action will occur whether the IF INPUT or RF INPUT is used.

4-44. The modulated 256 kHz IF signal is coupled into FET switches which are driven by 256 kHz synthesizer switching signals. This circuit forms synchronous detectors. The synchronous detector switches are driven by

quadrature signals provided from integrated circuit U2. The output of the two synchronous detectors are called I and Q. The I component is the in phase signal and the Q component is the quadrature signal.

4-45. Mathematically, synchronous detection multiplies the incoming signal stereo by sin $w_c t$ or cos $w_c t$:

$$I = [\sin w_c t] \times [(1 + L + R) \sin w_c t + ((L-R)/G + \text{pilot}) \cos w_c t]$$

$$I = (1 + L + R)$$

and

$$Q = [\cos w_c t] \times [(1 + L + R) \sin w_c t + ((L-R)/G + \text{pilot}) \cos w_c t]$$

$$Q = (L-R)/G + \text{pilot}$$

4-46. The I component is the (L+R) modulation and the Q component is ([L-R]/G + pilot). The I component could be called the mono or main channel while the Q component is called the sub or stereo channel.

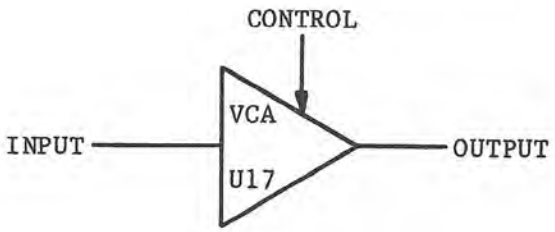
4-47. The output of the synchronous detector switches in U3 is coupled to buffer amplifier stages. The I signal is coupled into integrated circuit U10 for filtering and amplification. The I signal output also provides the AGC signal. The AGC for the RF loop is outputted from U10 for direct coupling into U1. As the signal output of U10 rises the signal level to the LDR increases, thus decreasing the resistance and maintaining the AGC action required to hold the IF output at a constant signal level.

4-48. The output of the Q channel is amplified by U10 and is a part of the automatic frequency control. The Q channel output is the feedback to the voltage controlled crystal oscillator (VCXO) in the synthesizer, causing locking of the voltage controlled crystal oscillator to the phase of the incoming RF or IF carrier. The Q channel amplifier for the VCXO control is unique in that it has a variable gain element formed by LDR3. Prior to lock, the bandwidth is wide for quick acquisition and the signal level out of the U13 amplifier allows quick lock to the carrier frequency. Upon acquiring lock, the loop bandwidth is narrowed by virtue of LDR3 resistance change and subsequent narrowing of the loop bandwidth.

4-49. Q CHANNEL FILTERING

4-50. The Q channel is filtered by two different paths. One path removes the pilot from the (L-R) information; the other path recovers the pilot. Amplifier U11, Pin 8 divides the Q signal into the high pass and low pass filter paths. The active low pass filter is formed by U11 and U12 with a low pass cutoff of 200 Hz. The signal provided by the low pass filter is the pilot which varies from 55 Hz to 96 Hz.

4-51. The pilot is frequency detected to a proportionate DC level to control a voltage controlled amplifier. This accomplished by an integrated circuit phase lock loop (PLL) U15 which drives a voltage controlled amplifier (VCA) U17. The PLL (U15) has as an output a DC level which tracks the incoming pilot frequency. This DC output is amplified by U14 and filtered for integration and controlling the multiplying action in VCA U17. At 55 Hz, the output of the VCA multiplication is such that the gain of U17 is equal to unity (1.0). At 96 Hz, the output of the PLL is such that the VCA multiplier gain is 3.96. The PLL linearly tracks the pilot frequency and provides a direct proportional DC level for the (G factor) multiplying times the (L-R)/G signal. Mathematically, the VCA performs the following:



Input = (L-R)/G
Control = G
Output = [(L-R)/G] x G = L-R

2172-6

Figure 4-2. U17

4-52. I CHANNEL FILTERING

4-53. The I channel modulation comes from the demodulator switches in U3 and is buffered and filtered by amplifiers in U10. The output of the I channel is the (1+L+R) information and supplies the signal for the AGC voltage. The output of the I channel has a DC component and is the signal for the AGC loop. Whenever an IF or RF signal is used, after proper AGC action; the I channel signal is then coupled to amplifiers in U13 for filtering. The only filtering necessary for the I signal is time delay. The I signal is the (1+L+R) signal and to prepare it for the stereo matrix it only needs to be delayed in time. The amount of time delay is the same as the Q channel filter. All pass networks are used and are formed by amplifiers in U13.

4-54. STEREO MATRIX

4-55. The L+R and L-R signals are suitable for stereo de-matrixing into left and right. By algebraically adding these signals, the corresponding LEFT and RIGHT output can be obtained. The L-R and L+R signal are summed in amplifier U19 and give the resultant of 2L out. The L-R and L+R are differenced in U20 and give the result of -2R out. The LEFT and RIGHT signals are then amplified in buffer amplifiers and coupled to the various outputs.

4-56. METER DETECTORS AND DRIVERS

4-57. The audio signals generated by the Left and Right modulation are peak detected and displayed on the modulation meters on the front panel. The audio signal is full wave rectified by U31. The output of U31 is then coupled into amplifier U33. The peak detector formed by amplifier U33 and diode CR17 is a controlled capacitor charge and controlled discharge type of peak detector. The controlled capacitor charge technique involves CR17, R232 and charge holding capacitor C128. The amplifier charges rapidly through the diode and capacitor and peaks are held during periods of low modulation levels. The capacitor then discharges through R231 forming a controlled decay time. The metering thus acts like a control charging and discharging circuit (about 100 times faster charging than discharging) giving the meter a usable characteristic with sinusiodal and program materials. Amplifier U33 forms a unity gain buffer for driving the meter.

4-58. FREQUENCY SYNTHESIZER

4-59. The operation of the synthesizer in the stereo monitor can best be understood by referring to the simplified block diagram of the synthesizer in figure 4-1. In this block diagram the heart of the synthesizer is a LSI chip, U302, which contains frequency divider circuits, oscillator, phase detector and modulus control circuits. Two VCO's are also an important part of the complete synthesizer. One VCO operates from 60 to 90 MHz and another VCO operates at 4.096 MHz. The 4.096 MHz VCO is crystal controlled (VCXO) and provides the signal for the demodulation of the 256 kHz IF. Additionally, the VCXO provides the stable reference for the RF down converter PLL.

4-60. Following the block diagram in figure 4-1, the RF in the transmitter is down donverted in the mixer, Z1, to a 256 kHz IF. The local oscillator for this down conversion process is provided by the VCO which operates at 60 to 90 MHz. This VCO has as its reference the crystal oscillator at 4.096 MHz. THe VCO output is frequency divided by two integrated circuit U303 and U9 to give the LO frequency of 256 kHz. A reference signal from the VCO is provided to controlled modulus frequency divider U301. As determined by the synthesizer, U301 either divides by 10 or divides by 11. After frequency division, this signal is fed into U302 for further frequency division and for phase comparision against the crystal oscillator. The VCO frequency is divided inside the synthesizer by virtue of circuits controlled by the 8 position switch (S301) and the 4 position switch (S302). By closing the appropriate positions on the switches, the proper reference frequency can be obtained for phase comparision with the 4.096 MHz crystal frequency. The U302 LSI chip contains a phase detector which determines the AFC voltage to tune the VCO. Once VCO lock is achieved, a reference signal is provided to U304 which illuminates the on-board green lock light.

4-61. The other phase lock loop is formed by the VCXO and additionally provides the calibration signals for the pilot frequency detector and the switch signals for the synchronous detectors. The VCXO frequency is divided by 4 in U7 and divided by 4 in U6 to provide a 256 kHz reference signal for synchronous demodulating the incoming 256 kHz IF. This PLL regenerates the carrier of the IF signal. The carrier signal is maintained on frequency and

properly phased by an AFC voltage which is derived from the Q channel synchronous detector. The incoming RF that is down converted to 256 kHz is synchronously detected by U3 and outputted as the "Q" signal. A variable bandwidth and gain circuit formed by U10 low pass filters the Q signal and couples an AFC voltage to the VCXO. Upon acquiring the incoming frequency, lock is determined by the I channel DC output. A lock LED is illuminated and the bandwidth of the PLL is narrowed for improved AM stereo demodulation performance. The front panel yellow LOCK light and the on board yellow lock light indicate that the VCXO has phase locked to the incoming RF carrier. Since it is necessary that the VCO be on frequency and locked before the VCXO is on the correct frequency and phase, it is only necessary to display the yellow LOCK light of the VCXO on the front panel. (Note that the I and Q channel synchronous detectors are also the phase detectors for the phase lock loop.)

4-62. POWER SUPPLY

4-63. The AC input to the STM-1 is either 117 VAC or 235 VAC (43 to 67 Hz). The transformer output signal is coupled to full wave rectifiers formed by CR401 and filtered by capacitors C401 and C402. These capacitors supply raw $\pm$19V supplies for further regulation in the mod monitor. Positive supply voltages are supplied by integrated circuit regulator U401 which provides +5 VDC for most of the logic functions and by U402 (a programmable regulator) which provides +7 1/2 VDC. A negative supply voltage is also provided for by U403 at -7 1/2 VDC. To further regulate and protect, the raw $\pm$19 supplies are also coupled through fuses F403 and F402 to the other parts of the printed circuit board for local regulation. Additional regulators are provided on the printed circuit board by U306, U307 and U29 for positive voltages. Negative supply voltages are provided by U308 and U30. Each of these regulators are a solid state type which are internally thermally protected and short circuit proof.

4-64. VCO OSCILLATOR CIRCUIT

4-65. A high frequency VCO is formed on 1A1 (the VCO module) to provide the signal for down converting the incoming RF. The VCO is a Colpitts oscillator formed by MOSFET, Q1. The MOSFET Q1 gate signal has programmable inductors to cover the channel assignments (see Appendix B). The VCO can be programmed for one of 4 different positions or in parallel combinations by switch S1. The oscillator is varied in frequency by varactor diode, CR1, and is AFCed by the signal on pin E1. The output of the oscillator is coupled into two transistor buffer stages to isolate the oscillator from external pulling effects. The RF output on pin E3 is coupled into the divider circuitry.

4-66. PILOT CAL CIRCUITRY

4-67. The PILOT CAL circuitry operates by accepting a signal from the 4.096 MHz crystal oscillator and comparing it to the pilot signal as filtered from the Q channel detector. The 4.096 MHz signal is coupled into divider circuit, U21. U21 then outputs the divided by 4 signal for further division by counters U22, U23, U24, U25 and U26. The output of U26 is buffered in

amplifier U28 and mixed in multiplexer chip U27. The 4.096 MHz VCXO signal is divided by 74472 to give 55 Hz. The filtered pilot is buffered by amplifier U28 and coupled into multiplexer chip U27. The multiplexer chip U27 acts as a simple mixer. Its output is the difference between the 55 Hz and the incoming pilot frequency. The multiplexer behaves as a mixer, the output of which when combined with the inertia of the meter creates a slowly time varying signal. This causes the needle to wander back and forth at the difference frequency. To adjust the exciter Pilot signal to 55 Hz precisely only requires zero beating the indication.

4-68. PILOT INJECTION

4-69. The pilot injection level is measured by coupling the pilot through the multiplexer chip U27 and using the diode action to rectify the 55 Hz pilot signal. The detected pilot signal is integrated by the capacitor C84 and displayed on the multimeter as the pilot injection level.

SECTION V

MAINTENANCE

5-1. INTRODUCTION

5-2. This section provides preventive maintenance information and corrective maintenance procedures. The information contained in this section is to provide guidance for establishing a comprehensive maintenance program to promote operational readiness and eliminate downtime. Particular emphasis is placed on preventive maintenance and record-keeping functions.

5-3. STATION RECORDS

5-4. The importance of keeping station performance records cannot be overemphasized. Separate logbooks should be maintained by operation and maintenance activities. These records can provide data for predicting potential problem areas and analyzing equipment malfunctions.

5-5. MAINTENANCE LOGBOOK

5-6. The maintenance logbook should contain a complete description of all maintenance activities required to keep the equipment in operational status. A listing of maintenance information to be recorded and analyzed to provide a data base for a failure reporting system is as follows:

DISCREPANCY	Describe the nature of the malfunction including all observable symptoms and performance characteristics.
CORRECTIVE ACTION	Describe the repair procedure used to correct the malfunction.
DEFECTIVE PART(S)	List all parts and components replaced or repaired and include the following details: a. TIME IN USE b. PART NUMBER c. SCHEMATIC NUMBER d. ASSEMBLY NUMBER e. REFERENCE DESIGNATOR
SYSTEM ELAPSED TIME	Total time on equipment.
NAME OF REPAIRMAN	Person who actually made the repair.
STATION ENGINEER	Indicates Chief Engineer noted and approved the repair of the equipment.

5-7. PREVENTIVE MAINTENANCE

5-8. Preventive maintenance is a systematic series of operations performed periodically on equipment. Because these procedures cannot be applied indiscriminately, specific instructions are neccessary. Preventive maintenance consists of six operations: inspecting, feeling, tightening, cleaning, adjusting, and painting.

a. INSPECT. Inspection is the most important preventive maintenance operation because it determines the necessity for the others. Become thoroughly acquainted with normal operating conditions in order to recognize and identify abnormal conditions readily. Inspect for the following:

   1. Overheating, which is indicated by discoloration, buldging of parts, and peculiar odors.

   2. Oxidation.

   3. Dirt, corrosion, rust, mildew, and fungus growth.

b. FEEL. Use this operation to check parts for overheating, especially rotating parts such as blower motors. By this means, the need for lubrication, the lack of proper ventilation, or the existence of some defect can be detected and corrected before serious trouble occurs. Become familiar with operating temperatures in order to recognize deviations from the normal range.

c. TIGHTEN. Tighten loose screws, bolts, and nuts. Do not tighten indiscriminately as fittings that are tightened beyond the pressure for which they are designed may be damaged or broken.

d. CLEAN. Clean parts only when inspection shows that cleaning is required and only use approved cleaning solvent.

e. ADJUST. Make adjustments only when inspection shows that they are necessary to maintain normal operation.

f. PAINT. Paint surfaces with the original type of paint (using prime coat if necessary) whenever inspection shows rust, or worn or broken paint film.

5-9. MAINTENANCE OF COMPONENTS

5-10. The following paragraphs provide information necessary for the maintenance of components.

5-11. TRANSISTORS. Preventive maintenance of transistors is accomplished by performing the following steps:

a. Inspect the transistors and surrounding area for dirt as accumulations of dirt or dust could form leakage paths.

b. Use compressed dry air to remove dust from the area.

WARNING

ALWAYS WEAR SAFETY GOGGLES WHEN USING COMPRESSED AIR.

c. Examine all transistors for loose connections or corrosion.

5-12. INTEGRATED CIRCUITS. Preventive maintenance of integrated circuits is accomplished by performing the following steps:

CAUTION

USE CARE TO AVOID THE BUILDUP OF STATIC ELECTRICITY WHEN WORKING AROUND INTEGRATED CIRCUITS.

a. Inspect the integrated circuits and surrounding area for dirt as accumulations of dirt or dust could form leakage paths.

b. Use compressed dry air to remove dust from the area.

WARNING

ALWAYS WEAR SAFETY GOGGLES WHEN USING COMPRESSED AIR.

5-13. CAPACITORS. Preventive maintenance of capacitors is accomplished by performing the following steps:

a. Examine all capacitor terminals for loose connections or corrosion.

b. Ensure that component mountings are tight.

c. Examine the body of each capacitor for swelling, discoloration, or other evidence of breakdown.

d. Use standard practices to repair poor solder connections with a low-wattage soldering iron.

e. Clean cases and bodies of all capacitors.

5-14. FIXED RESISTORS. Preventive maintenance of fixed resistors is accomplished by performing the following steps:

a. When inspecting a chassis, printed-circuit board, or discrete component assembly, examine resistors for dirt or signs of overheating. Discolored, cracked, or chipped components indicate a possible overload.

b. When replacing a resistor, ensure that the replacement value corresponds to the component designated by the schematic diagram and parts list.

c. Clean dirty resistors with a small brush.

5-15. VARIABLE RESISTORS. Preventive maintenance of variable resistors is accomplished by performing the following steps:

a. Inspect the variable resistors and tighten all loose mountings, connections, and control knob setscrews (do not disturb knob alignment).

b. If necessary, clean component with a dry brush or a lint-free cloth.

c. When dirt is difficult to remove, clean component with a lint-free cloth moistened with an approved cleaning solvent.

5-16. FUSES. Preventive maintenance is accomplished by performing the following steps:

WARNING

ALWAYS REMOVE ALL POWER AND USE GROUNDING STICK BEFORE TOUCHING ANY OF THE COMPONENTS IN THE FOLLOWING STEPS.

a. When a fuse blows, determine the cause before installing a replacement.

b. Inspect fuse caps and mounts for charring and corrosion.

c. Examine clips for dirt, improper tension, and loose connections.

d. If necessary, tighten fuse clips and connections to the clips. The tension of the fuse clips may be increased by pressing the clip sides closer together.

e. Clean fuses and clips with a small brush.

f. Remove corrosion with crocus cloth.

5-17. SWITCHES. Preventive maintenance of switches is accomplished by performing the following steps:

a. Inspect switch for defective mechanical action or looseness of mounting and connections.

b. Examine cases for chips or cracks. Do not disassemble switches.

c. Inspect accessible contact switches for dirt, corrosion, or looseness of mountings or connections.

d. Check contacts for pitting, corrosion, or wear.

e. Operate the switches to determine if they move freely and are positive in action. In gang and wafer switches, the movable blade should make good contact with the stationary member.

f. Tighten all loose connections and mountings.

5-18. INDICATORS AND INDICATOR SWITCHES. Preventive maintenance of indicator lamps and indicator switches is accomplished by performing the following steps:

a. Examine indicator sockets for corrosion, loose nuts, and condition of rubber grommets.

b. Remove indicator switch by pulling the plastic cover, indicator assembly, from the case and rotating the assembly 90 degrees.

c. Inspect indicator assemblies for broken or cracked covers, loose envelopes, loose mounting screws, and loose or dirty connections.

d. Tighten loose mounting screws. Solder loose connections. If connections are dirty or corroded, clean with crocus cloth before soldering.

e. Clean indicator covers, bases, and glass bulbs with a dry cloth.

f. Clean corroded socket contacts and connections with crocus cloth. Low operating voltages require clean contact and connections.

5-19. PRINTED-CIRCUIT BOARDS. Preventive maintenance of printed-circuit boards is accomplished by performing the following steps:

a. Inspect the printed-circuit boards for cracks or breaks.

b. Inspect the wiring for open circuits or raised foil.

c. Check components for breakage or discoloration due to overheating.

d. Clean off dust and dirt with a clean, dry lint-free cloth.

e. Use standard practices to repair poor solder connections with a low-wattage soldering iron.

SECTION VI

TROUBLESHOOTING

6-1. INTRODUCTION

6-2. This section of the technical manual will contain troubleshooting aids to facilitate maintenance of the HARRIS STM-1 AM STEREO MONITOR.

6-3. Prior to starting a troubleshooting procedure check all switches, power cord connections, connecting cables, and power fuses.

6-4. TECHNICAL ASSISTANCE

6-5. HARRIS Technical and Troubleshooting assistance is available from HARRIS Field Service during normal business hours (8:00 a.m - 5:00 p.m. Central Standard 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 Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. The HARRIS factory may also be contacted through a TWX facility (910-246-3312) or a TELEX service (40-4347).

6-6. The AM stereo mod monitor is an accurate piece of test equipment not to be recalibrated in the field. It is suggested that recalibration of this unit not be attempted in the field by station personnel. However, it is possible to troubleshoot the unit, find specific problems and repair. If extensive troubleshooting and problem solving is encountered it is recommended that the unit be returned to HARRIS for servicing and recalibration.

6-7. Several problems however can be identified and fixed in the field. The symptoms of these generalized problems are listed and some approaches to finding solutions follow.

6-8. GENERAL

WARNING

ENSURE ALL AC POWER IS REMOVED FROM STM-1 BY UNPLUGING AC POWER CORD BEFORE CHECKING AND/OR REPLACING FUSES.

6-9. If the unit is essentially dead then: 1. The a/c fuses should be checked, 2. The ±19 Vdc power supply should be checked for proper operating voltages, 3. Check the three terminal regulators for correct output voltages, 4. Activity at the various signal points should be checked.

6-10. UNIT WILL NOT LOCK

6-11. No signal lock can be traced to several areas. First, an adequate amount of input signal must be present at the RF or IF input jack. The jack that is in use (RF or IF) must be in enabled by the appropriate switch position. The RF input is also connected to the front panel RF LEVEL control and may be set too low.

6-12. If the unit will not lock after determining that the RF/IF is okay, then the channel assignment of the synthesizer should be checked by observing the positions of frequency select switches S301 and S302. The synthesizer programming codes are found Appendix B in this manual. It is also necessary that the VCO be properly programmed by switch, S1. The VCO code should be checked against the appropriate frequency selection table in Appendix B at the rear of this manual.

6-13. If the incoming RF signal is sufficiently off in frequency, it is impossible for the VCXO phase locked loop to pull onto the transmitter frequency. It may be that the exciter signal has drifted far enough off that it is impossible for the monitor to lock on to the incoming carrier. It may be that the crystal in the monitor has also drifted in such a manner as to make lock impossible or a combination may make lock impossible.

6-14. If possible, it is desirable to check for RF output of both the VCXO and the VCO. It is not necessary to look directly at the VCO or VCXO outputs but can be accomplished by observing the divider chains.

6-15. PILOT LIGHT

6-16. If the unit locks to the RF and the operation seems normal but the pilot light is not on, the following should be checked:

1. Is the pilot on in the stereo exciter?

2. The pilot injection level should be determined by use of the STM-1 multimeter and the pilot frequency should be determined. The pilot injection level should be between 6-1/2 and 8-1/2% and the frequency set to 55 Hz by zero beating.

6-17. DC PARAMETERS

6-18. A table of typical values of DC parameter are given in table 6-1. These are not to be used as exact requirements but give insight to what normal operating levels should be.

6-19. AC WAVEFORMS

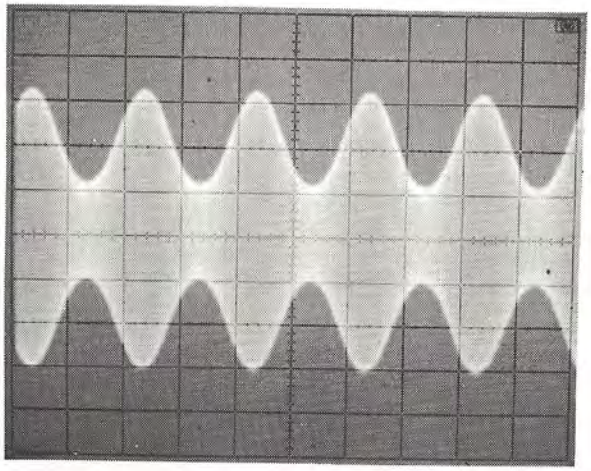
6-20. A set of typical operating waveforms for the monitor is given in the following figures.

Table 6-1. Typical DC Parameters

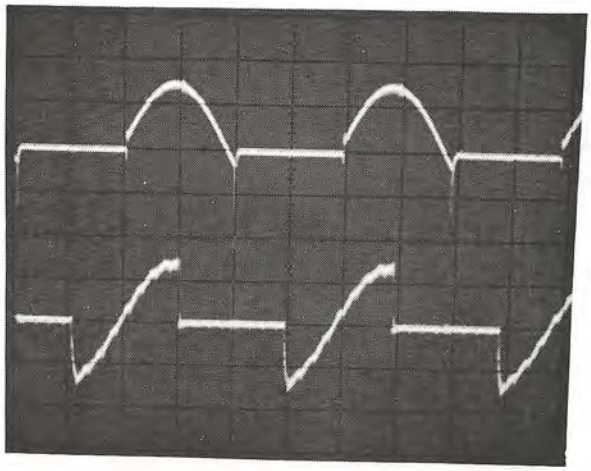
Conditions: 1 kHz, 50% LEFT only signal (unless otherwise noted).

	Signal Description	Location	Typical Voltage
1.	AGC & I	U10, Pin 6	0.97 VDC
2.	AGC to LDR	U1, Pin 7	10.6 VDC
3.	Q Channel	U10, Pin 14	0.0 VDC
4.	VCXO AFC	U13, Uin 1	1.5 VDC
5.	VCXO AFC	L304	8.5 VDC
6.	VCO AFC	E6	(3.9 to 11 VDC)
7.	Pilot Detector	U18, Pin 12	2.3 VDC
8.	Lock Signal	U18, Pin 13	0.95 VDC
9.	"G" Factor	U14, Pin 7	5.2 VDC
10.	"G" Factor	U14, Pin 7	2.4 VDC @ 0% modulation

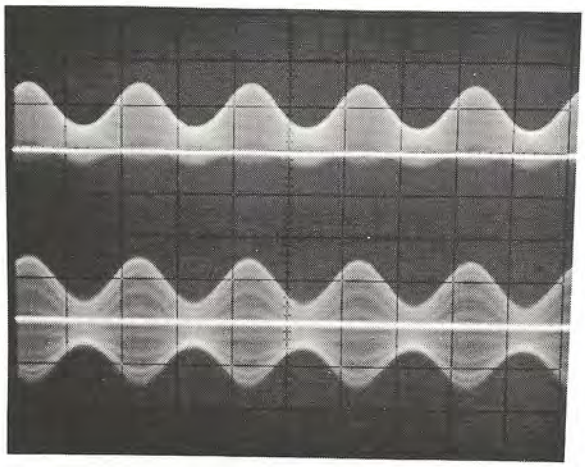
WARNING: Disconnect primary power prior to servicing.



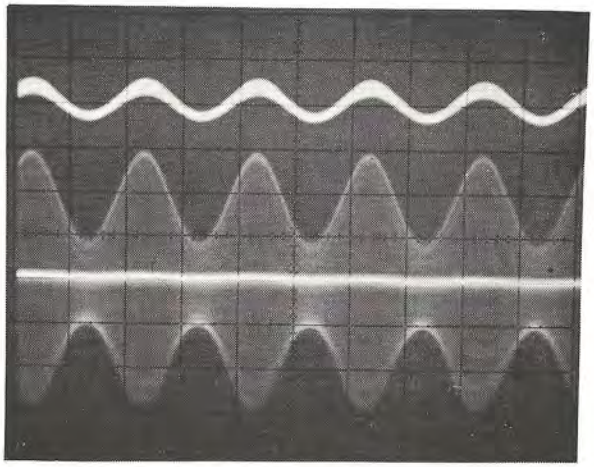
MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 0.5 v/division
HORIZONTAL SCALE: 0.5 ms/division
COMMENT: U2, Pin 6
TITLE: IF Signal



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 1 us/division
UPPER TRACE: U3 Pin 4, (I)
LOWER TRACE: U3, Pin 13, (Q)
TITLE: I and Q at Detector



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 0.5 ms/division
UPPER TRACE: U3, Pin 4 (I)
LOWER TRACE: U3, Pin 13 (Q)
TITLE: I and Q at Detector



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 0.5 v/division
HORIZONTAL SCALE: 0.5 ms/division
UPPER TRACE: R132 (I)
LOWER TRACE: R139 (Q)
TITLE: I and Q

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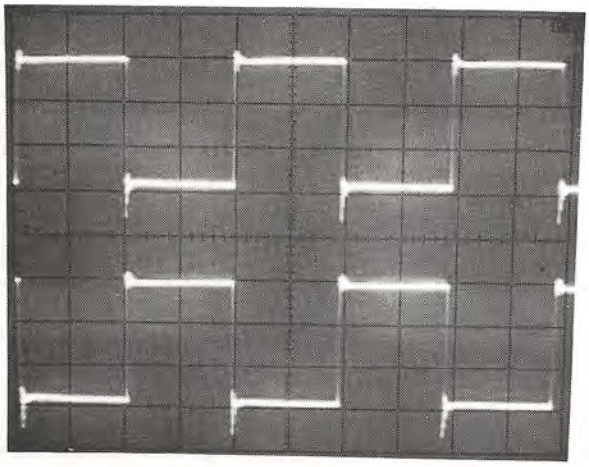
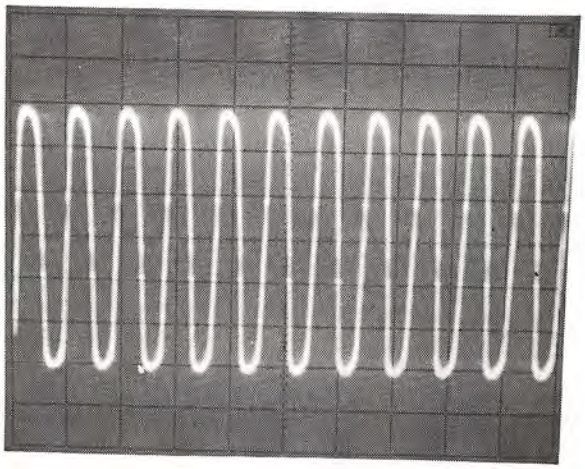
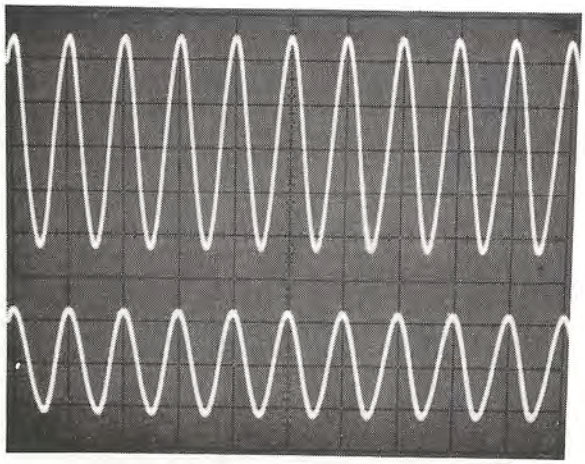
Figure 6-1. Waveforms (Sheet 1 of 5)



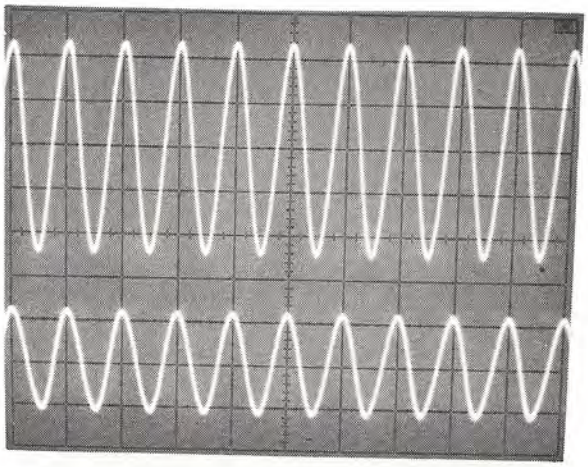
1 kHz, 50% Single Channel
VERTICAL SCALE: 5 v/division
HORIZONTAL SCALE: 1 us/division
UPPER TRACE: U5, Pin 5
LOWER TRACE: U5, Pin 7
TITLE: Synchronous Detector Drive Signals



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 0.5 v/division
HORIZONTAL SCALE: 1 us/division
UPPER TRACE: R109/R91
TITLE: LO Signal



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 1 ms/division
UPPER TRACE: U13, Pin 7 (I)
LOWER TRACE: U11, Pin 8 (Q)
COMMENT: Pilot OFF
TITLE: I and Q Before Filter



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 1 ms/division
UPPER TRACE: U13, Pin 14 (I)
LOWER TRACE: U18, Pin 1 (Q)
TITLE: I and Q After Filters

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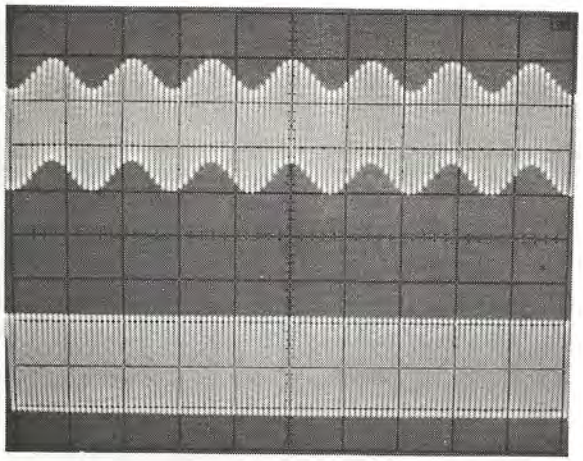
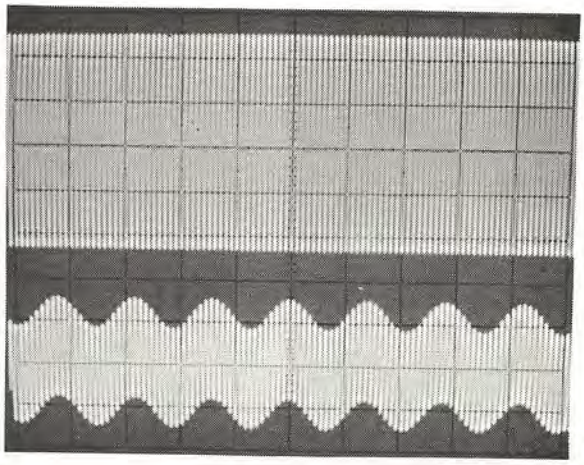
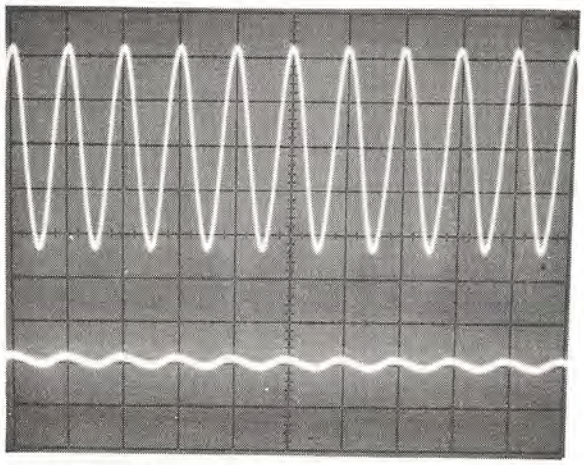
Figure 6-1. Waveforms (Sheet 2 of 5)



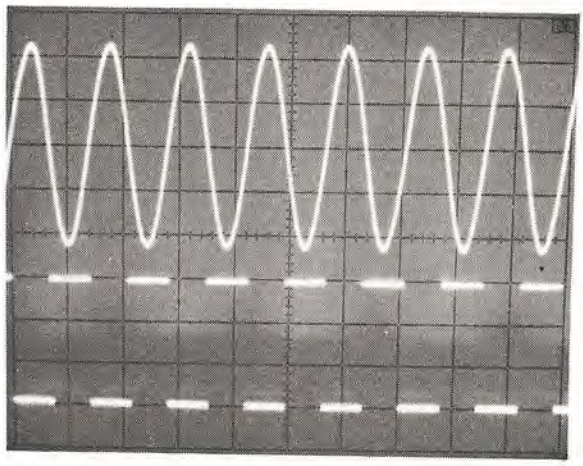
1 kHz, 50% Single Channel
VERTICAL SCALE: 1.0 v/division
HORIZONTAL SCALE: 10 ms/division
UPPER TRACE: U11, Pin 8 (Q)
LOWER TRACE: U16, Pin 7 (Q)
COMMENT: Pilot ON
TITLE: Q Channel Filtering



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 10 ms/division
UPPER TRACE: U13, Pin 7 (I)
LOWER TRACE: U11, Pin 8 (Q)
COMMENT: Pilot ON
TITLE: I and Q Before Filtering



MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 1 ms/division
UPPER TRACE: U19, Pin 1 (R)
LOWER TRACE: U20, Pin 1 (L)
TITLE: De-Matrixing



MODULATION: 1 kHz, 50% Single Chan.
HORIZONTAL SCALE: 10 ms/division
UPPER TRACE: U12, Pin 7 1v division
LOWER TRACE: U28, Pin 1 5v division
COMMENT: Pilot ON, Variable Angle
TITLE: Pilot CAl Waveforms

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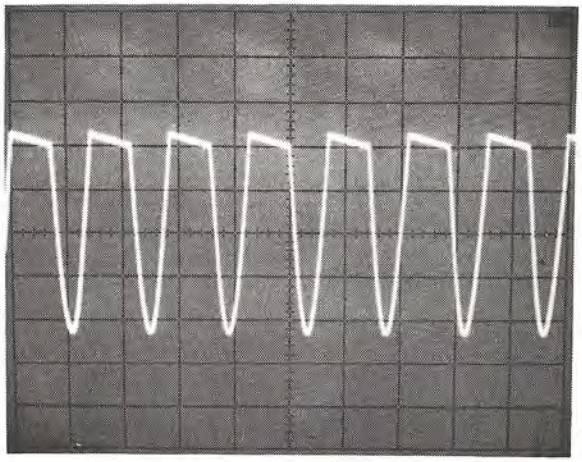
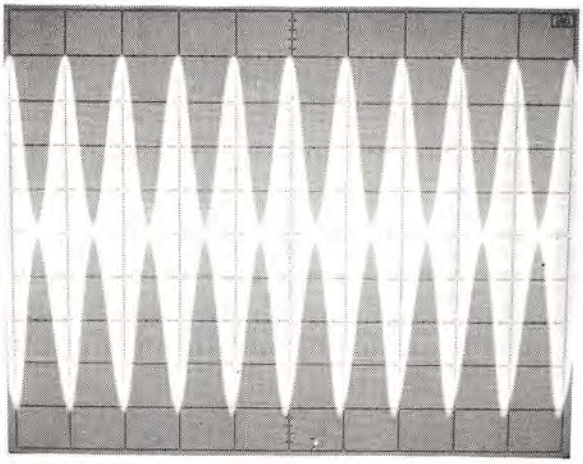
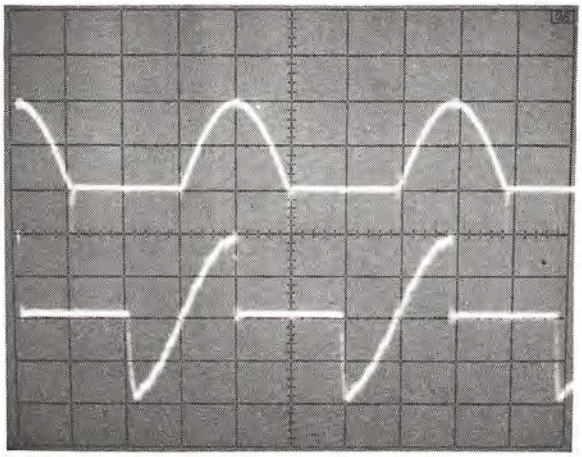
Figure 6-1. Waveforms (Sheet 3 of 5)



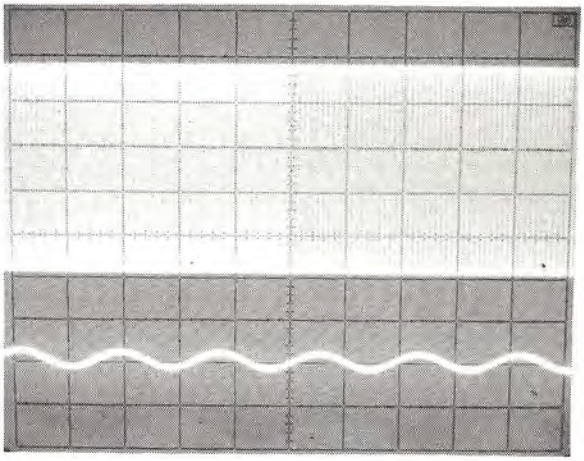
MODULATION: 1 kHz, 50% Single Chan.
VERTICAL SCALE: 0.5 v/division
HORIZONTAL SCALE: 10 ms/division
UPPER TRACE: U27, Pin 14
TITLE: Pilot Cal Output



MODULATION: 1 kHz, L+R, 100%
VERTICAL SCALE: 0.5 v/division
HORIZONTAL SCALE: 1 ms/division
UPPER TRACE: U2, Pin 6
TITLE: IF Signal, Mono



MODULATION: 1 kHz, L+R, 100%
VERTICAL SCALE: 1 v/division
HORIZONTAL SCALE: 1 us/division
UPPER TRACE: U13, Pin 4 (I)
LOWER TRACE: U13, Pin 13 (Q)
TITLE: I and Q at Detector



MODULATION: 1 kHz, L+R, 100%
VERTICAL SCALE: 2 v/division
HORIZONTAL SCALE: 10 ms/division
UPPER TRACE: U13, Pin 7 (I)
LOWER TRACE: U11, Pin 8 (Q)
COMMENT: Pilot ON
TITLE: I and Q Before Filtering

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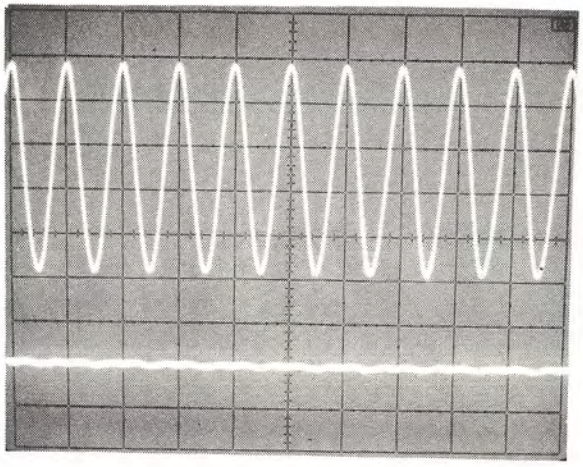
Figure 6-1. Waveforms (Sheet 4 of 5)



MODULATION: 1 kHz, L+R, 100%
VERTICAL SCALE: 2 v/division
HORIZONTAL SCALE: 1 ms/division
UPPER TRACE: U13, Pin 7 (I)
LOWER TRACE: U11, Pin 8 (Q)
COMMENT: Pilot OFF
TITLE: I and Q Before Filtering

2172-11

Figure 6-1. Waveforms (Sheet 5 of 5)

SECTION VII

PARTS LIST

7-1. INTRODUCTION

7-2. This section of the technical manual contains the information necessary to order replaceable parts for the STM-1 AM STEREO MONITOR.

7-3. REPLACEABLE PARTS SERVICE

7-4. 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 Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. The HARRIS factory may also be contacted through a TWX facility (910-246-3312) or a TELEX service (40-4347).

Table 7-1. REPLACEABLE PARTS LIST INDEX

WARNING: Disconnect primary power prior to servicing.

Table 7-2. STM-1 AM STEREO MOD MON 994 8731 003

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
	888 2172 001	T.M. STM-1 AM STEREO MON	1	
	994 8731 004	BASIC AM STEREO MOD MON	1	

Table 7-3. BASIC AM STEREO MOD MON 994 8731 004

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
1C1	516 0411 000	CAP .1UF 50V DISC	1.0	
1DS1	384 0611 000	LED, RED	1.0	
1DS2	384 0679 000	LED, YELLOW	1.0	
1FL001	484 0296 000	FILTER, RFI POWER LINE	1.0	
1F1	398 0019 000	FUSE FAST CART 2A 250V	1.0	
1J2,1J3	612 0317 000	RECEPTACLE BNC UG-1094/U	2.0	
1J4	612 0744 000	JACK, PHONE MOLDED 3-C	1.0	
1J5,1J6,1J7,1J8	612 0317 000	RECEPTACLE BNC UG-1094/U	4.0	
1M1	632 1047 000	METER, PILOT INJECTION	1.0	
1M2,1M3	632 1048 000	METER, MODULATION	2.0	
1R1	550 1030 000	POT 1K OHM 2W 10% CERMET	1.0	
1ST1	614 0127 000	TERM STRIP SGLE	1.0	
1S1,1S2	604 1009 000	SW, TOGGLE 4PDT SUBMINI	2.0	
1S3	604 0791 000	SW, TOGGLE SPDT	1.0	
1S4	604 0808 000	SW, TOGGLE DPDT	1.0	
1S5,1S6	604 0792 000	SW, TOGGLE 3PDT	2.0	
1TB1	614 0753 000	TERM STRIP 12 POS QUICK	1.0	
1TS2	614 0130 000	TERM STRIP 2 LT 1 GD	1.0	
1T1	472 0799 000	XFMR, LOW VOLTAGE	1.0	
	054 0014 063	CARTON A7142-156	1	
	250 0274 000	POWER CORD 7-1/2 FT	1	
#1TS2	350 0046 000	RIVET POP .156X.254	1	
	350 0105 000	RIVET 3/16 ALUM .126/.25	6	
	354 0154 000	SOLDER LUG .375 MTG	1	
	354 0319 000	TERM LUG .375 HOLE	5	
	354 0584 000	TERM, SQ WIRE	3	
	612 0536 000	RECP 09-50-3031	1	
	646 0665 000	PN PLT 827 3729 001	1	
	646 1078 000	NAMEPLATE, HARRIS	1	
	650 0255 000	KNOB, ROUND B1-127	1	
	817 1375 001	CLIP METER SUPPORT	6	
	817 1440 001	RUNNING SHEETS	0	
	829 9208 001	FAMILY TREE	0	
	829 9387 001	TEST SETUP AM XMTR	0	
	839 6360 002	SCHEM, MOD MON	0	
	839 6500 001	WIRING DIAG., MOD. MON	0	
	839 6522 001	DIAG, BLOCK STM-1 MOD MON	0	
	839 6540 001	BLOCK DIAG SYNTHSIZER	0	
	929 9356 001	CABLE, MOD MONITOR	1	
	939 6403 001	COVER TOP	1	
	943 4148 001	CHASSIS	1	
	943 4149 001	FRONT CHASSIS	1	
	992 6160 004	PC BD, AM MOD MONITOR	1	
	992 6268 001	STM-1 PACKING CHECK LIST	0	

Table 7-4. CABLE, MOD MONITOR 929 9356 001

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
	829 9356 001	CABLE ASSY	0	
	852 9007 001	CABLE LAYOUT MOD MON	0	
	252 0002 000	WIRE STRD 22AWG GRN	104	FT
	618 0213 000	COAX CABLE RG188A/U	23	FT
	354 0627 000	CONTACT, SOCKET	32	
	296 0264 000	TUBING SHRINKABLE .5	.2	FT
	358 2036 000	STRAIN RELIEF 36 CKT	1	
	612 0888 000	HOUSING, SKT 36CKT	1	
	620 0699 000	CON, RT ANGLE	6	
	354 0003 000	TERM LUG RED RING 10	7	
	354 0669 000	TERM FOR .250 X .032 TAB	10	
	354 0001 000	TERM LUG RED RING 6	6	
	296 0261 000	TUBG SHRINKABLE .125	2	FT
	336 0481 000	SCREW 6 X .375	1	
	296 0253 000	TUBG, SHRINKABLE 3/16	.6	FT

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
CR001,CR002	384 0205 000	DIODE SILICON 1N914		
CR003,CR004				
CR008,CR009				
CR010,CR011				
CR012,CR013				
CR014,CR015				
CR016,CR017			14.0	
CR019	386 0093 000	ZENER 1N4728 3.3V	1.0	
CR301	528 0030 000	DIODE, VARACTOR	1.0	
CR302	384 0205 000	DIODE SILICON 1N914	1.0	
CR303	528 0030 000	DIODE, VARACTOR	1.0	
CR401	384 0677 000	RECTIFIER, BRIDGE	1.0	
CR403,CR404	384 0431 000	RECT. 1N4001		
CR405,CR406				
CR407,CR408			6.0	
C001	506 0244 000	CAP .22UF 63V 5%	1.0	
C002	506 0230 000	CAP .001UF 63V 5%	1.0	
C003	506 0233 000	CAP .1UF 63V 5%	1.0	
C004,C005	506 0226 000	CAP 82,000 PF 50V 1%	2.0	
C006	506 0232 000	CAP .01UF 63V 5%	1.0	
C007,C008,C009	506 0233 000	CAP .1UF 63V 5%		
C010,C011,C012			6.0	
C013	526 0049 000	CAP 6.8UF 35V 20%	1.0	
C014	526 0342 000	CAP 2.7UF 35V 10%	1.0	
C015	526 0047 000	CAP 220UF 10V 20%	1.0	
C016	506 0230 000	CAP .001UF 63V 5%	1.0	
C017	526 0331 000	CAP .33UF 35V 20%	1.0	
C018	526 0050 000	CAP 1 UF 35V 20%	1.0	
C019	506 0245 000	CAP .33UF 63V 5%	1.0	
C020	506 0232 000	CAP .01UF 63V 5%	1.0	

WARNING: Disconnect primary power prior to servicing.

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
C021	506 0245 000	CAP .33UF 63V 5%	1.0	
C022	526 0049 000	CAP 6.8UF 35V 20%	1.0	
C023,C024,C025	506 0226 000	CAP 82,000 PF 50V 1%		
C026,C027,C028			6.0	
C029	506 0244 000	CAP .22UF 63V 5%	1.0	
C030	506 0230 000	CAP .001UF 63V 5%	1.0	
C031,C032,C033	506 0226 000	CAP 82,000 PF 50V 1%		
C034			4.0	
C035	516 0453 000	CAP .1UF 100V 20%	1.0	
C037	500 0848 000	CAP TRIMMER 9 180UUF	1.0	
C039,C040,C041	516 0453 000	CAP .1UF 100V 20%		
C042,C043,C044				
C045,C046			8.0	
C047	506 0233 000	CAP .1UF 63V 5%	1.0	
C048	500 0834 000	CAP, MICA 430PF 500V 5%	1.0	
C049,C050,C051	516 0453 000	CAP .1UF 100V 20%		
C052,C053,C054			6.0	
C055	526 0049 000	CAP 6.8UF 35V 20%	1.0	
C056	522 0524 000	CAP 10 UF 25V 20%	1.0	
C057	500 0839 000	CAP, MICA 620PF 300V 5%	1.0	
C058	500 0913 000	CAP 1200PF 500V 5%	1.0	
C059	500 0833 000	CAP, MICA 390PF 500V 5%	1.0	
C061	500 1201 000	CAP 2400PF 500V 5%	1.0	
C062	506 0243 000	CAP .15UF 63V 5%	1.0	
C063	500 0913 000	CAP 1200PF 500V 5%	1.0	
C064	500 0834 000	CAP, MICA 430PF 500V 5%	1.0	
C065	500 0838 000	CAP, MICA 560PF 300V 5%	1.0	
C066	506 0246 000	CAP .47UF 63V 5%	1.0	
C067	522 0524 000	CAP 10 UF 25V 20%	1.0	
C068,C069	526 0049 000	CAP 6.8UF 35V 20%	2.0	
C073,C074	516 0453 000	CAP .1UF 100V 20%	2.0	
C075,C076	526 0049 000	CAP 6.8UF 35V 20%	2.0	
C080	516 0453 000	CAP .1UF 100V 20%	1.0	
C081	522 0524 000	CAP 10 UF 25V 20%	1.0	
C082,C083	516 0453 000	CAP .1UF 100V 20%	2.0	
C084	526 0049 000	CAP 6.8UF 35V 20%	1.0	
C085,C086,C087	516 0453 000	CAP .1UF 100V 20%		
C088,C089,C090				
C091,C092,C093				
C094,C095,C096				
C097,C098,C099				
C100,C101,C102				
C103,C104,C105				
C106,C107,C108				
C109,C110,C111				
C112,C113,C114			30.0	
C115,C117	506 0232 000	CAP .01UF 63V 5%	2.0	
C118	506 0233 000	CAP .1UF 63V 5%	1.0	
C119,C120	506 0232 000	CAP .01UF 63V 5%	2.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
C121	500 1201 000	CAP 2400PF 500V 5%	1.0	
C122	526 0050 000	CAP 1 UF 35V 20%	1.0	
C123	500 0759 000	CAP, MICA 100PF 500V 5%	1.0	
C124	526 0350 000	CAP 3.9 UF 35V 10%	1.0	
C125,C126	516 0453 000	CAP .1UF 100V 20%	2.0	
C127	500 0759 000	CAP, MICA 100PF 500V 5%	1.0	
C128	526 0350 000	CAP 3.9 UF 35V 10%	1.0	
C131,C132,C133	508 0543 000	CAP .1UF 160V 1%	3.0	
C134,C135	508 0547 000	CAP .01UF 160V 1%	2.0	
C136,C137,C138	508 0543 000	CAP .1UF 160V 1%	3.0	
C139,C140	508 0547 000	CAP .01UF 160V 1%	2.0	
C142,C143	516 0453 000	CAP .1UF 100V 20%	2.0	
C144	500 0817 000	CAP MICA 47UUF 500V	1.0	
C145	500 0761 000	CAP, MICA 150PF 500V 5%	1.0	
C146	500 0755 000	CAP, MICA 270PF 500V 5%	1.0	
C147	500 0833 000	CAP, MICA 390PF 500V 5%	1.0	
C301,C302	516 0375 000	CAP .01UF 50V	2.0	
C303	500 0806 000	CAP MICA 15UUF 500V	1.0	
C304,C305,C306	516 0453 000	CAP .1UF 100V 20%	3.0	
C307	516 0074 000	CAP, DISC .005UF 1KV 20%	1.0	
C308	500 0903 000	CAP 2700PF 500V 5%	1.0	
C309	506 0232 000	CAP .01UF 63V 5%	1.0	
C310,C311	516 0453 000	CAP .1UF 100V 20%	2.0	
C312	506 0232 000	CAP .01UF 63V 5%	1.0	
C313	500 0903 000	CAP 2700PF 500V 5%	1.0	
C314	516 0074 000	CAP, DISC .005UF 1KV 20%	1.0	
C315	500 0814 000	CAP MICA 36UUF 500V	1.0	
C317	500 0833 000	CAP, MICA 390PF 500V 5%	1.0	
C318	506 0233 000	CAP .1UF 63V 5%	1.0	
C319,C320	506 0232 000	CAP .01UF 63V 5%	2.0	
C321	516 0453 000	CAP .1UF 100V 20%	1.0	
C322	500 1164 000	CAP 1800 PF 500V 5%	1.0	
C323,C324,C325	526 0311 000	CAP 2.2UF 35V 10%		
C326,C327,C328			6.0	
C329	516 0453 000	CAP .1UF 100V 20%	1.0	
C401,C402	522 0384 000	CAP 2000UF 25V	2.0	
C403	526 0108 000	CAP 4.7UF 35V 20%	1.0	
C404	526 0050 000	CAP 1 UF 35V 20%	1.0	
C405	526 0108 000	CAP 4.7UF 35V 20%	1.0	
C406	516 0453 000	CAP .1UF 100V 20%	1.0	
C407	526 0050 000	CAP 1 UF 35V 20%	1.0	
C408	526 0108 000	CAP 4.7UF 35V 20%	1.0	
C409	516 0453 000	CAP .1UF 100V 20%	1.0	
C410	526 0050 000	CAP 1 UF 35V 20%	1.0	
DS001	384 0679 000	LED, YELLOW	1.0	
DS301	384 0610 000	LED, GREEN	1.0	
F402,F403	398 0079 000	FUSE SLOW CART 1.50A 125V	2.0	
J001	610 0740 000	HEADER, PIN 36CKT	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
J002	610 0777 000	CONN 3 PIN PC MOUNT	1.0	
J003,J004,J005	620 0700 000	RECPT, MALE		
J006,J007,J008			6.0	
K001	578 0021 000	RELAY DPDT	1.0	
LDR001	670 0045 000	LDR VTL5C4	1.0	
LDR002,LDR003	670 0033 000	LED, LDR	2.0	
L001	494 0407 000	CHOKE, RF 82.0UH	1.0	
L002	492 0627 000	INDUCTOR, VARIABLE	1.0	
L003	494 0405 000	CHOKE RF 56.0UH	1.0	
L004,L005	494 0238 000	CHOKE, RF 39UH	2.0	
L301,L302	494 0218 000	CHOKE WIDE BAND	2.0	
L303	494 0190 000	CHOKE, RF 3300 UH 80 MA	1.0	
L304	494 0416 000	CHOKE RF 560.0UH	1.0	
Q001	380 0189 000	TRANSISTOR 2N3904	1.0	
Q002	380 0125 000	TRANSISTOR 2N4401	1.0	
Q003	380 0126 000	TRANSISTOR 2N4403	1.0	
Q004	380 0125 000	TRANSISTOR 2N4401	1.0	
Q301,Q302,Q303	380 0421 000	TRANSISTOR PN4258-18		
Q304			4.0	
R001	540 0921 000	RES .25W 2400 OHM 5%	1.0	
R002	540 0958 000	RES .25W 82K OHM 5%	1.0	
R003	540 0923 000	RES .25W 3000 OHM 5%	1.0	
R004	540 0938 000	RES .25W 12K OHM 5%	1.0	
R006,R007	540 0958 000	RES .25W 82K OHM 5%	2.0	
R009	540 0936 000	RES .25W 10K OHM 5%	1.0	
R010	540 0953 000	RES .25W 51K OHM 5%	1.0	
R012	540 0947 000	RES .25W 30K OHM 5%	1.0	
R013	540 0933 000	RES .25W 7500 OHM 5%	1.0	
R014	540 0958 000	RES .25W 82K OHM 5%	1.0	
R016	540 0947 000	RES .25W 30K OHM 5%	1.0	
R017	540 0969 000	RES .25W 240K OHM 5%	1.0	
R018	548 0313 000	RES 4990 OHM 1/4W 1%	1.0	
R019	540 0947 000	RES .25W 30K OHM 5%	1.0	
R021	540 0919 000	RES .25W 2000 OHM 5%	1.0	
R022	540 0963 000	RES .25W 130K OHM 5%	1.0	
R023,R024,R025	540 0912 000	RES .25W 1000 OHM 5%	3.0	
R026,R027	540 0923 000	RES .25W 3000 OHM 5%	2.0	
R028	540 0934 000	RES .25W 8200 OHM 5%	1.0	
R029	550 0958 000	POT 10K OHM 1/2 W 10%	1.0	
R030,R031	540 0977 000	RES .25W 510K OHM 5%	2.0	
R032	540 0945 000	RES .25W 24K OHM 5%	1.0	
R033	540 0977 000	RES .25W 510K OHM 5%	1.0	
R034	540 0923 000	RES .25W 3000 OHM 5%	1.0	
R035	550 0958 000	POT 10K OHM 1/2 W 10%	1.0	
R036	540 0943 000	RES .25W 20K OHM 5%	1.0	
R037	540 0977 000	RES .25W 510K OHM 5%	1.0	
R038	540 0959 000	RES .25W 91K OHM 5%	1.0	
R039	540 0977 000	RES .25W 510K OHM 5%	1.0	
R040	540 0979 000	RES .25W 620K OHM 5%	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
R041	540 0952 000	RES .25W 47K OHM 5%	1.0	
R042	550 0936 000	POT 500K OHM 1/2W	1.0	
R043	540 0952 000	RES .25W 47K OHM 5%	1.0	
R044	540 0914 000	RES .25W 1200 OHM 5%	1.0	
R045	540 0915 000	RES .25W 1300 OHM 5%	1.0	
R046	550 0958 000	POT 10K OHM 1/2 W 10%	1.0	
R047	540 0936 000	RES .25W 10K OHM 5%	1.0	
R048	540 1000 000	RES .25W 4.7M OHM 5%	1.0	
R049	540 0972 000	RES .25W 330K OHM 5%	1.0	
R050	540 0952 000	RES .25W 47K OHM 5%	1.0	
R051	548 0280 000	RES 3740 OHM 1/4W 1%	1.0	
R052	540 0945 000	RES .25W 24K OHM 5%	1.0	
R053	550 0913 000	POT, 5K OHM	1.0	
R054	548 0414 000	RES 8870 OHM 1/4W 1%	1.0	
R057	548 0816 000	RES 10.5K OHM 1/4W 1%	1.0	
R059	548 0280 000	RES 3740 OHM 1/4W 1%	1.0	
R061	548 1440 000	RES 25.5K OHM 1/4W 1%	1.0	
R062	548 0414 000	RES 8870 OHM 1/4W 1%	1.0	
R065	548 0816 000	RES 10.5K OHM 1/4W 1%	1.0	
R067	540 0921 000	RES .25W 2400 OHM 5%	1.0	
R068	540 0958 000	RES .25W 82K OHM 5%	1.0	
R069	540 0923 000	RES .25W 3000 OHM 5%	1.0	
R070	540 0938 000	RES .25W 12K OHM 5%	1.0	
R071	548 1361 000	RES 10K OHM 1/4W 1%	1.0	
R072	548 1440 000	RES 25.5K OHM 1/4W 1%	1.0	
R073	548 1361 000	RES 10K OHM 1/4W 1%	1.0	
R074	548 0382 000	RES 12.7K OHM 1/4W 1%	1.0	
R076	548 0689 000	RES 5230 OHM 1/4W 1%	1.0	
R077,R078	548 1361 000	RES 10K OHM 1/4W 1%	2.0	
R079	548 1400 000	RES 17.8K OHM 1/4W 1%	1.0	
R080	548 0414 000	RES 8870 OHM 1/4W 1%	1.0	
R082	540 0938 000	RES .25W 12K OHM 5%	1.0	
R083	550 0935 000	POT 2K OHM 1/2W 10%	1.0	
R084	550 0921 000	POT 100K OHM 1/2W	1.0	
R085	540 0960 000	RES .25W 100K OHM 5%	1.0	
R086	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R087	550 0949 000	POT 100K OHM 1/2W 10%	1.0	
R088	550 0858 000	POT 5K OHM .5W 10%	1.0	
R089	540 0977 000	RES .25W 510K OHM 5%	1.0	
R090	550 0959 000	POT 20K OHM 1/2 W 10%	1.0	
R091	540 0936 000	RES .25W 10K OHM 5%	1.0	
R092	548 0997 000	RES 20K OHM 1/4W 1%	1.0	
R094	548 1361 000	RES 10K OHM 1/4W 1%	1.0	
R095,R096,R097	548 0997 000	RES 20K OHM 1/4W 1%	3.0	
R098,R099	548 1361 000	RES 10K OHM 1/4W 1%	2.0	
R100,R101	540 0925 000	RES .25W 3600 OHM 5%	2.0	
R102,R104	540 0898 000	RES .25W 270 OHM 5%	2.0	
R105,R106	540 0925 000	RES .25W 3600 OHM 5%	2.0	
R107	540 0930 000	RES .25W 5600 OHM 5%	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
R108	540 0923 000	RES .25W 3000 OHM 5%	1.0	
R109	540 0889 000	RES .25W 110 OHM 5%	1.0	
R110	540 0887 000	RES .25W 91 OHM 5PCT	1.0	
R111	540 0929 000	RES .25W 5100 OHM 5%	1.0	
R122	540 0967 000	RES .25W 200K OHM 5%	1.0	
R123	540 0915 000	RES .25W 1300 OHM 5%	1.0	
R124	540 0942 000	RES .25W 18K OHM 5%	1.0	
R125	540 0875 000	RES .25W 30 OHM 5PCT	1.0	
R126	540 0871 000	RES .25W 20 OHM 5PCT	1.0	
R128	540 0904 000	RES .25W 470 OHM 5%	1.0	
R129	540 0922 000	RES .25W 2700 OHM 5%	1.0	
R130,R131	540 0902 000	RES .25W 390 OHM 5%	2.0	
R132	548 1144 000	RES 5620 OHM 1/4W 1%	1.0	
R133	548 1126 000	RES 4020 OHM 1/4W 1%	1.0	
R134	548 2097 000	RES 4640 OHM 1/4W 1%	1.0	
R135,R136	540 0902 000	RES .25W 390 OHM 5%	2.0	
R137	548 1147 000	RES 4750 OHM 1/4W 1%	1.0	
R138	548 1361 000	RES 10K OHM 1/4W 1%	1.0	
R139	548 1144 000	RES 5620 OHM 1/4W 1%	1.0	
R140	548 1126 000	RES 4020 OHM 1/4W 1%	1.0	
R141	548 2097 000	RES 4640 OHM 1/4W 1%	1.0	
R142	548 1147 000	RES 4750 OHM 1/4W 1%	1.0	
R143	548 1361 000	RES 10K OHM 1/4W 1%	1.0	
R144	540 0936 000	RES .25W 10K OHM 5%	1.0	
R145	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R146	540 0964 000	RES .25W 150K OHM 5%	1.0	
R147	550 0921 000	POT 100K OHM 1/2W	1.0	
R148	540 0964 000	RES .25W 150K OHM 5%	1.0	
R149,R150	540 0954 000	RES .25W 56K OHM 5%	2.0	
R151	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R152	540 0945 000	RES .25W 24K OHM 5%	1.0	
R153	540 0916 000	RES .25W 1500 OHM 5%	1.0	
R157	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R159	540 0920 000	RES .25W 2200 OHM 5%	1.0	
R161	540 0896 000	RES .25W 220 OHM 5%	1.0	
R165,R166	540 0912 000	RES .25W 1000 OHM 5%	2.0	
R167,R168	540 0936 000	RES .25W 10K OHM 5%	2.0	
R170	540 0922 000	RES .25W 2700 OHM 5%	1.0	
R171	540 0921 000	RES .25W 2400 OHM 5%	1.0	
R172	540 0932 000	RES .25W 6800 OHM 5%	1.0	
R173	550 0913 000	POT, 5K OHM	1.0	
R178	540 0932 000	RES .25W 6800 OHM 5%	1.0	
R180	540 0887 000	RES .25W 91 OHM 5PCT	1.0	
R181,R182	540 1434 000	RES NETWORK 330 OHM 2%	2.0	
R184,R185	540 0926 000	RES .25W 3900 OHM 5%	2.0	
R186,R187	550 0958 000	POT 10K OHM 1/2 W 10%	2.0	
R188,R189,R190	548 1361 000	RES 10K OHM 1/4W 1%		
R191,R192,R193				
R194,R195			8.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
R200	540 0971 000	RES .25W 300K OHM 5%	1.0	
R201	540 0917 000	RES .25W 1600 OHM 5%	1.0	
R202	540 0929 000	RES .25W 5100 OHM 5%	1.0	
R203	540 0331 000	RES 1W 910 OHM 5PCT	1.0	
R204	540 0919 000	RES .25W 2000 OHM 5%	1.0	
R205,R206	540 0970 000	RES .25W 270K OHM 5%	2.0	
R207	540 0331 000	RES 1W 910 OHM 5PCT	1.0	
R208	540 0883 000	RES .25W 62 OHM 5PCT	1.0	
R209	540 0885 000	RES .25W 75 OHM 5PCT	1.0	
R210,R211,R212	540 0896 000	RES .25W 220 OHM 5%		
R213			4.0	
R214	540 0960 000	RES .25W 100K OHM 5%	1.0	
R215	540 0335 000	RES 1W 1300 OHM 5%	1.0	
R216	540 0917 000	RES .25W 1600 OHM 5%	1.0	
R217	540 0928 000	RES .25W 4700 OHM 5%	1.0	
R220	540 1201 000	RES 1/2W 910 OHM 5%	1.0	
R221	548 2088 000	RES 93.1K OHM 1/4W 1%	1.0	
R224,R225	540 0970 000	RES .25W 270K OHM 5%	2.0	
R226	540 0915 000	RES .25W 1300 OHM 5%	1.0	
R227	540 0919 000	RES .25W 2000 OHM 5%	1.0	
R228	540 0916 000	RES .25W 1500 OHM 5%	1.0	
R229	559 0043 000	THERMISTOR 2K OHM	1.0	
R230,R231	540 0970 000	RES .25W 270K OHM 5%	2.0	
R232	540 0915 000	RES .25W 1300 OHM 5%	1.0	
R233	540 0919 000	RES .25W 2000 OHM 5%	1.0	
R234,R235	540 0916 000	RES .25W 1500 OHM 5%	2.0	
R236,R237,R238	548 1121 000	RES 10K OHM 1/4W 1%		
R239,R240,R241			6.0	
R242	548 2087 000	RES 14.7K OHM 1/4W 1%	1.0	
R243	548 1131 000	RES 1620 OHM 1/4W 1%	1.0	
R244	548 1093 000	RES 5110 OHM 1/4W 1%	1.0	
R245	548 2084 000	RES 2550 OHM 1/4W 1%	1.0	
R246	548 2082 000	RES 536 OHM 1/4W 1%	1.0	
R247	548 2068 000	RES 24.9K OHM 1/4W 1%	1.0	
R248,R249,R250	548 1121 000	RES 10K OHM 1/4W 1%		
R251,R252,R253			6.0	
R254	548 2085 000	RES 6340 OHM 1/4W 1%	1.0	
R255	548 2083 000	RES 698 OHM 1/4W 1%	1.0	
R256	548 1120 000	RES 2000 OHM 1/4W 1%	1.0	
R257	548 1094 000	RES 1000 OHM 1/4W 1%	1.0	
R258	548 2081 000	RES 154 OHM 1/4W 1%	1.0	
R259	540 0916 000	RES .25W 1500 OHM 5%	1.0	
R260	548 2086 000	RES 7320 OHM 1/4W 1%	1.0	
R261	548 2079 000	RES 3160 OHM 1/4W 1%	1.0	
R262	540 0929 000	RES .25W 5100 OHM 5%	1.0	
R270	559 0043 000	THERMISTOR 2K OHM	1.0	
R300	540 0876 000	RES .25W 33 OHM 5PCT	1.0	
R301	540 0884 000	RES .25W 68 OHM 5PCT	1.0	
R302	540 1331 000	RES NETWORK 1K OHM	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
R314,R315,R316	540 0916 000	RES .25W 1500 OHM 5%		
R317			4.0	
R318,R319	540 0939 000	RES .25W 13K OHM 5%	2.0	
R321	540 0906 000	RES .25W 560 OHM 5%	1.0	
R322,R323	540 0896 000	RES .25W 220 OHM 5%	2.0	
R324	540 0906 000	RES .25W 560 OHM 5%	1.0	
R325	540 0878 000	RES .25W 39 OHM 5PCT	1.0	
R326	540 0984 000	RES .25W 1.0M OHM 5%	1.0	
R327	540 0923 000	RES .25W 3000 OHM 5%	1.0	
R328	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R329	540 0920 000	RES .25W 2200 OHM 5%	1.0	
R330,R331	540 0900 000	RES .25W 330 OHM 5%	2.0	
R332,R333	540 0919 000	RES .25W 2000 OHM 5%	2.0	
R334	540 0904 000	RES .25W 470 OHM 5%	1.0	
R335,R336	540 0919 000	RES .25W 2000 OHM 5%	2.0	
R337	540 0920 000	RES .25W 2200 OHM 5%	1.0	
R338	540 0908 000	RES .25W 680 OHM 5%	1.0	
R339	540 0897 000	RES .25W 240 OHM 5%	1.0	
R340	540 0902 000	RES .25W 390 OHM 5%	1.0	
R341	540 0897 000	RES .25W 240 OHM 5%	1.0	
R342,R343	540 0585 000	RES 2W 82 OHM 5PCT	2.0	
R344,R345	540 0920 000	RES .25W 2200 OHM 5%	2.0	
R346	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R401,R402	540 0588 000	RES 2W 110 OHM 5PCT	2.0	
R403,R404	540 0591 000	RES 2W 150 OHM 5PCT	2.0	
R405	540 1177 000	RES 1/2W 180 OHM 5%	1.0	
R406	540 1224 000	RES 1/2W 39 OHM 5%	1.0	
R407,R408	540 0591 000	RES 2W 150 OHM 5PCT	2.0	
R409	540 1218 000	RES 1/2W 43 OHM 5%	1.0	
R410	540 1177 000	RES 1/2W 180 OHM 5%	1.0	
S001	604 0852 000	SWITCH, ROCKER DIP 4-SPST	1.0	
S301	604 0851 000	SWITCH 8PST	1.0	
S302	604 0852 000	SWITCH, ROCKER DIP 4-SPST	1.0	
T001	478 0412 000	XFMR, R. F., T9-1	1.0	
T002	929 9472 001	XFMR MOD MON	1.0	
U001	382 0552 000	IC TL074CN3	1.0	
U002	382 0472 000	IC LM318	1.0	
U003	382 0664 000	IC SD5000N	1.0	
U004,U005	382 0726 000	IC DS0026J-8/MMH0026CP1	2.0	
U006	382 0363 000	IC 74574/9S74	1.0	
U007	382 0561 000	IC 74LS74	1.0	
U008	382 0726 000	IC DS0026J-8/MMH0026CP1	1.0	
U009	382 0363 000	IC 74574/9S74	1.0	
U010,U011,U012	382 0552 000	IC TL074CN3		
U013,U014			5.0	
U015	382 0267 000	IC NE565N	1.0	
U016	382 0552 000	IC TL074CN3	1.0	
U017	382 0711 000	IC AD534-JH	1.0	
U018	382 0552 000	IC TL074CN3	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
U019,U020	382 0749 000	IC NE5532AN	2.0	
U021	382 0561 000	IC 74LS74	1.0	
U022,U023,U024	382 0623 000	IC 74LS161AN		
U025			4.0	
U026	382 0561 000	IC 74LS74	1.0	
U027	382 0443 000	IC CD4053BE	1.0	
U028	382 0522 000	IC LM393N/CA3290E	1.0	
U029	382 0359 000	IC 7815	1.0	
U030	382 0360 000	IC 7915	1.0	
U031,U032,U033	382 0552 000	IC TL074CN3	3.0	
U301	382 0908 000	IC 11C90DC	1.0	
U302	382 0907 000	IC MC145152P	1.0	
U303	382 0541 000	IC MC10178L	1.0	
U304	382 0593 000	IC TL072ACP	1.0	
U305	382 0558 000	IC 74LS04N, TTL INV	1.0	
U306	382 0359 000	IC 7815	1.0	
U307	382 0184 000	IC 340T-5/7805 +5V REG	1.0	
U308	382 0360 000	IC 7915	1.0	
U401	382 0184 000	IC 340T-5/7805 +5V REG	1.0	
U402	382 0471 000	IC MC7806CT	1.0	
U403	382 0470 000	IC MC7906CT	1.0	
XF402,XF403	402 0129 000	CLIP FUSE	2.0	
XU001	404 0674 000	SOCKET, IC 14 CONT	1.0	
XU002	404 0673 000	SOCKET, IC 8 CONT	1.0	
XU003	404 0675 000	SOCKET, IC 16 CONT	1.0	
XU004,XU005	404 0673 000	SOCKET, IC 8 CONT	2.0	
XU006,XU007	404 0674 000	SOCKET, IC 14 CONT	2.0	
XU008	404 0673 000	SOCKET, IC 8 CONT	1.0	
XU009,XU010	404 0674 000	SOCKET, IC 14 CONT		
XU011,XU012				
XU013,XU014				
XU015,XU016				
XU018			9.0	
XU019,XU020	404 0673 000	SOCKET, IC 8 CONT	2.0	
XU021	404 0674 000	SOCKET, IC 14 CONT	1.0	
XU022,XU023	404 0675 000	SOCKET, IC 16 CONT		
XU024,XU025			4.0	
XU026	404 0674 000	SOCKET, IC 14 CONT	1.0	
XU027	404 0675 000	SOCKET, IC 16 CONT	1.0	
XU028	404 0673 000	SOCKET, IC 8 CONT	1.0	
XU029,XU030	404 0513 000	HEAT SINK PA1-1CB	2.0	
XU031,XU032	404 0674 000	SOCKET, IC 14 CONT		
XU033			3.0	
XU301	404 0675 000	SOCKET, IC 16 CONT	1.0	
XU302	404 0509 000	SOCKET, IC 28 PIN	1.0	
XU303	404 0675 000	SOCKET, IC 16 CONT	1.0	
XU304	404 0673 000	SOCKET, IC 8 CONT	1.0	
XU305	404 0674 000	SOCKET, IC 14 CONT	1.0	

Table 7-5. PC BD, AM MOD MONITOR 992 6160 004 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
XU307,XU401	404 0513 000	HEAT SINK PA1-1CB		
XU402,XU403			4.0	
Y301	444 2781 000	CRYSTAL 4.0960 MHZ	1.0	
Z001	382 0904 000	IC TAK-3H	1.0	
1A1	992 6159 001	PC BD, VCO	1.0	
1A1C011,1A1C012	516 0450 000	CAP 1000PF 500V 20%	2.0	
	304 0087 000	NUT HEX 4-40	12	
	312 0045 000	4 SPLIT WASHER. BRZ	12	
	335 0104 000	WASHER PLAIN .156 ID	4	
	358 0477 000	NUT, WELL 6-32	4	
	424 0012 000	GROMMET 1/4 MTG DIA	1	
	829 9212 001	PLATE SHLD.	1	
	839 6360 004	SCHEMATIC	0	
	839 6385 001	COVER, VCO BD	1	
	943 4136 004	PWB STEREO MON	1	

Table 7-6. PC BD, VCO 992 6159 001

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
CR001	528 0030 000	DIODE, VARACTOR	1.0	
C001	516 0054 000	CAP, DISC .001UF 1KV 10%	1.0	
C002	500 0842 000	CAP, MICA 820PF 300V 5%	1.0	
C003	500 0804 000	CAP, MICA 10PF 500V 5%	1.0	
C004	516 0453 000	CAP .1UF 100V 20%	1.0	
C005	526 0097 000	CAP 47 UF 35V 20%	1.0	
C006	516 0453 000	CAP .1UF 100V 20%	1.0	
C007	500 0804 000	CAP, MICA 10PF 500V 5%	1.0	
C008	516 0453 000	CAP .1UF 100V 20%	1.0	
C009	500 0833 000	CAP, MICA 390PF 500V 5%	1.0	
C010	500 0840 000	CAP, MICA 680PF 300V 5%	1.0	
L001	494 0374 000	CHOKE, RF 0.15 UH	1.0	
L002	494 0375 000	CHOKE, RF 0.18 UH	1.0	
L003	494 0388 000	CHOKE RF 2.20 UH	1.0	
L004	494 0372 000	CHOKE, RF 0.10UH	1.0	
L005	494 0374 000	CHOKE, RF 0.15 UH	1.0	
L006	494 0375 000	CHOKE, RF 0.18 UH	1.0	
L007	494 0381 000	CHOKE, RF 0.56 UH	1.0	
Q001	380 0622 000	TRANSISTOR U310	1.0	
Q002	380 0536 000	TRANSISTOR 2N5179	1.0	
Q003	380 0622 000	TRANSISTOR U310	1.0	
R001	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R002	540 0910 000	RES .25W 820 OHM 5%	1.0	
R003	540 0897 000	RES .25W 240 OHM 5%	1.0	
R004	540 0894 000	RES .25W 180 OHM 5%	1.0	
R005	540 0919 000	RES .25W 2000 OHM 5%	1.0	
R006	540 0912 000	RES .25W 1000 OHM 5%	1.0	
R007	540 0960 000	RES .25W 100K OHM 5%	1.0	
R008	540 0869 000	RES .25W 16 OHM 5PCT	1.0	
R009	540 0882 000	RES .25W 56 OHM 5PCT	1.0	

Table 7-6. PC BD, VCO 992 6159 001 (Continued)

REF. SYMBOL	HARRIS PART NO.	DESCRIPTION	QTY	UM
R010	540 0894 000	RES .25W 180 OHM 5%	1.0	
S001	604 0852 000	SWITCH, ROCKER DIP 4-SPST	1.0	
	939 6384 001	PWB ASSY, VCO MODULE	1	

SECTION VIII

DIAGRAMS

8-1. INTRODUCTION

8-2. This section of the technical manual for HARRIS STM-1 AM STEREO MONITOR contains schematics pertaining to the HARRIS STM-1 AM STEREO MONITOR.

WARNING: Disconnect primary power prior to servicing.

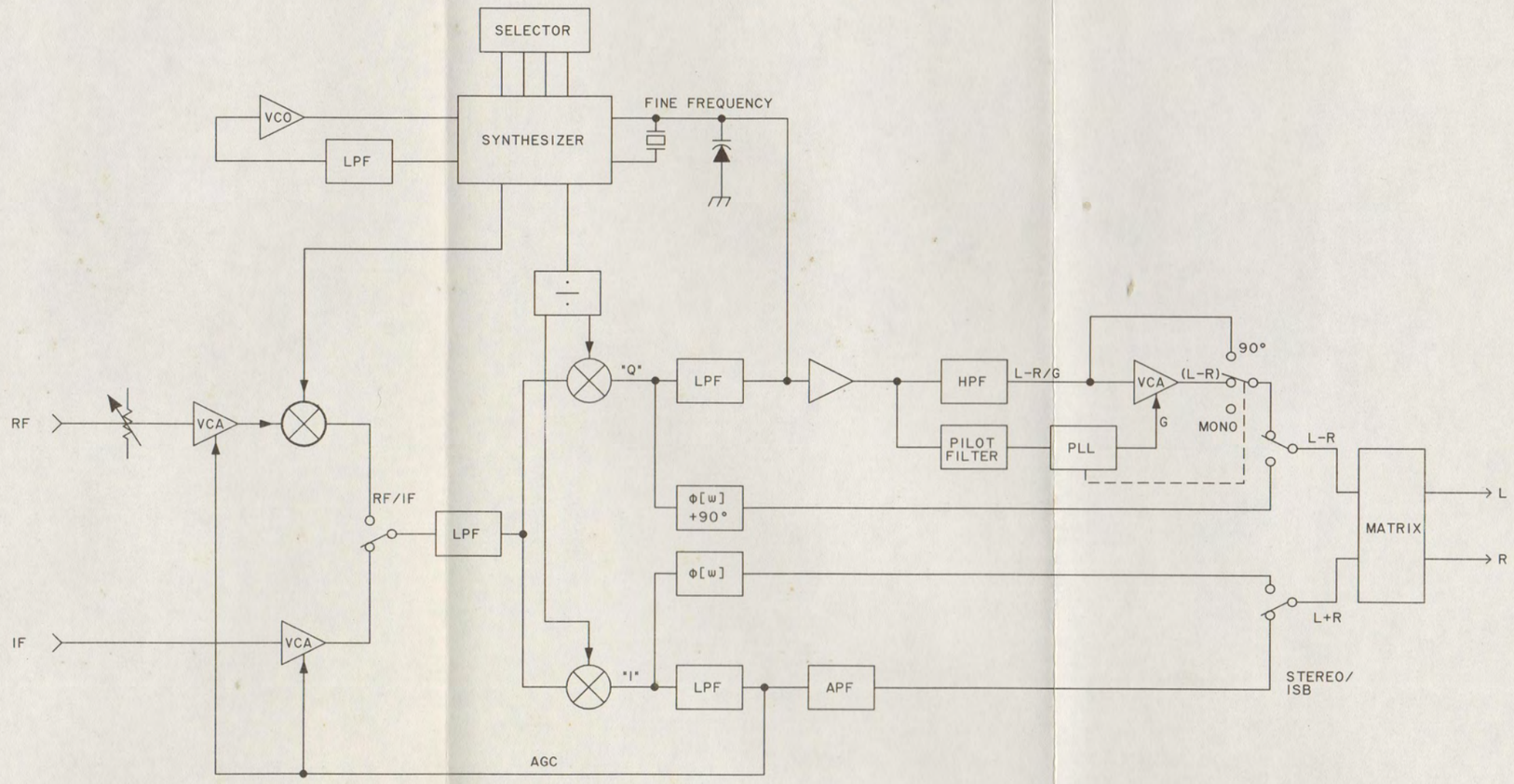


FIGURE 8-1. BLOCK DIAGRAM
STM-1 AM STEREO MONITOR
839 6522 001

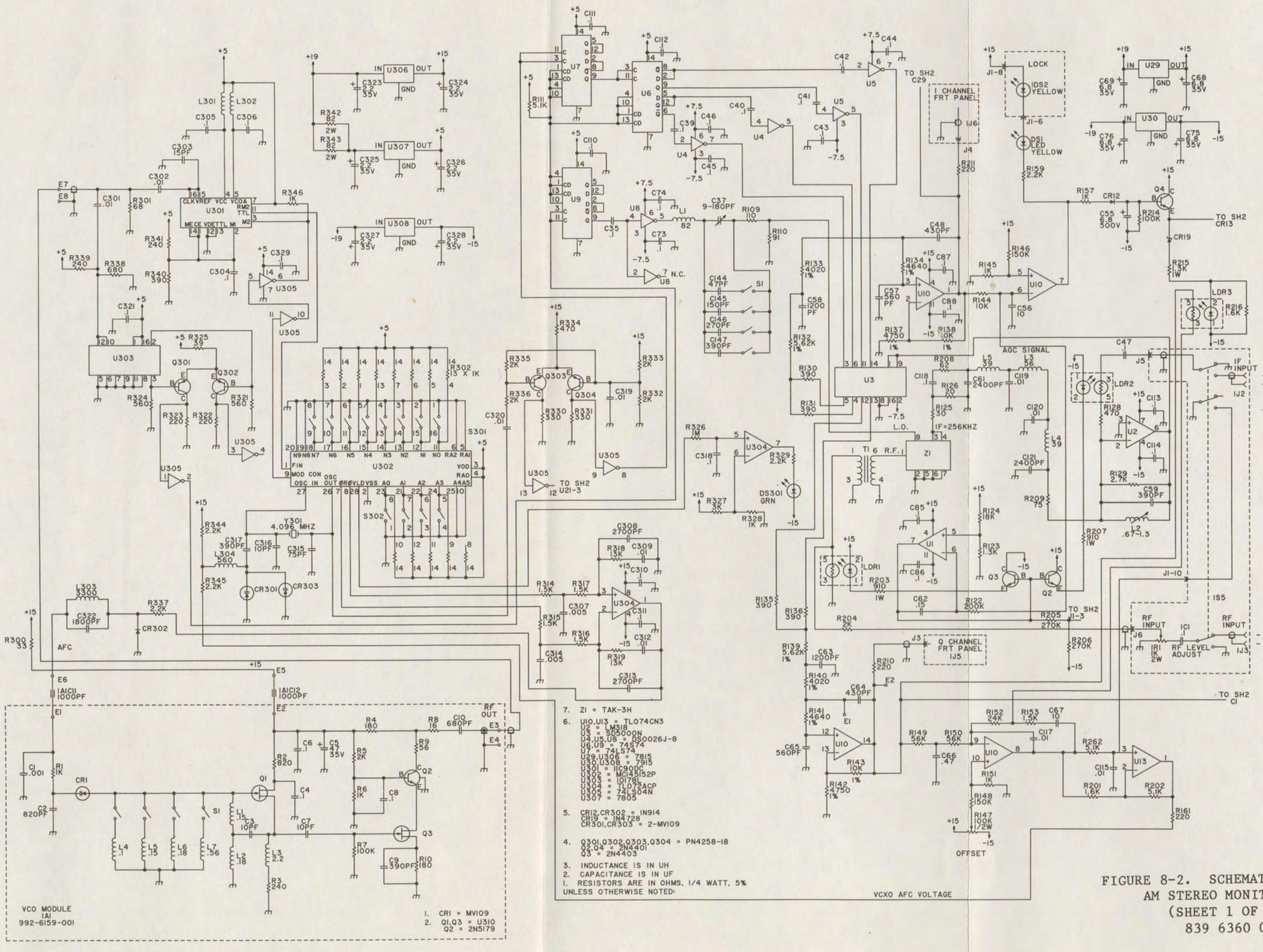


FIGURE 8-2. SCHEMATIC
AM STEREO MONITOR
(SHEET 1 OF 2)
839 6360 002

8-5/8-6

Q CHANNEL (ITBI-11)
JI-7
TO SH 1 U10-14

NOTES:
1. UI,UII-UI4,UI6,UI8 U31,U33 = TL074N3
UI5 = NE565N
UI7 = AD534-JH
UI9,U20 = NE5532AN
U21,U26 = 74LS74
U22,U23,U24,U25 = 74LS161
U27 = CD-4053BE
U28 = LM393
U32 = TL072ACP
U401 = MC7805
U402 = MC7806CT
U403 = MC7906CT
2. CRI-CR4,CR8-CRI7 = IN914
CR401 = MDA920-6
CR403-CR408 = IN4004
3. QI = 2N3904

I CHANNEL (ITBI-8)
JI-14
TO SH 1 U10-1

G FACTOR MULTIPLIER
L-R GAIN
OFFSET
(L-R)/G

PILOT INJ (ITBI-12)
JI-15

VAR/90°
VAR
JI-25
JI-23
JI-26
90° IS3

(L-R)
L-R LEVEL
(L+R)

METER CAL

ANGLE CONTROL B.W.

RIGHT MODULATION
IM3
VU
JI-27

STEREO
AUTO MONO
IS2
IDSI PILOT
JI-33
JI-26
JI-36
TO SH 1 U4 EMITTER

RIGHT OR USB
J8
LEFT OR LSB
J7

USB OR RIGHT AUDIO +
USB OR RIGHT AUDIO -
ITBI-5 JI-11
JI-13 ITBI-7

JI-34
JI-35
IJ4 HEADPHONE

LSB OR LEFT AUDIO +
LSB OR LEFT AUDIO-
ITBI-3 JI-18
JI-17 ITBI-1

LEFT MODULATION
IM2
JI-31

IS6
STEREO/ISB

TO SH 1 U305-12
TO SH 1 R205

PILOT INJECTION
JI-29
JI-30
PILOT FREQ CAL
RF INPUT
ISI
MI
JI-3

AC FROM ITI
J2

TO SH 1 U306-1
TO SH 1 U308-2

FIGURE 8-2. SCHEMATIC
AM STEREO MONITOR
(SHEET 2 OF 2)
839 6360 002

8-7/8-8

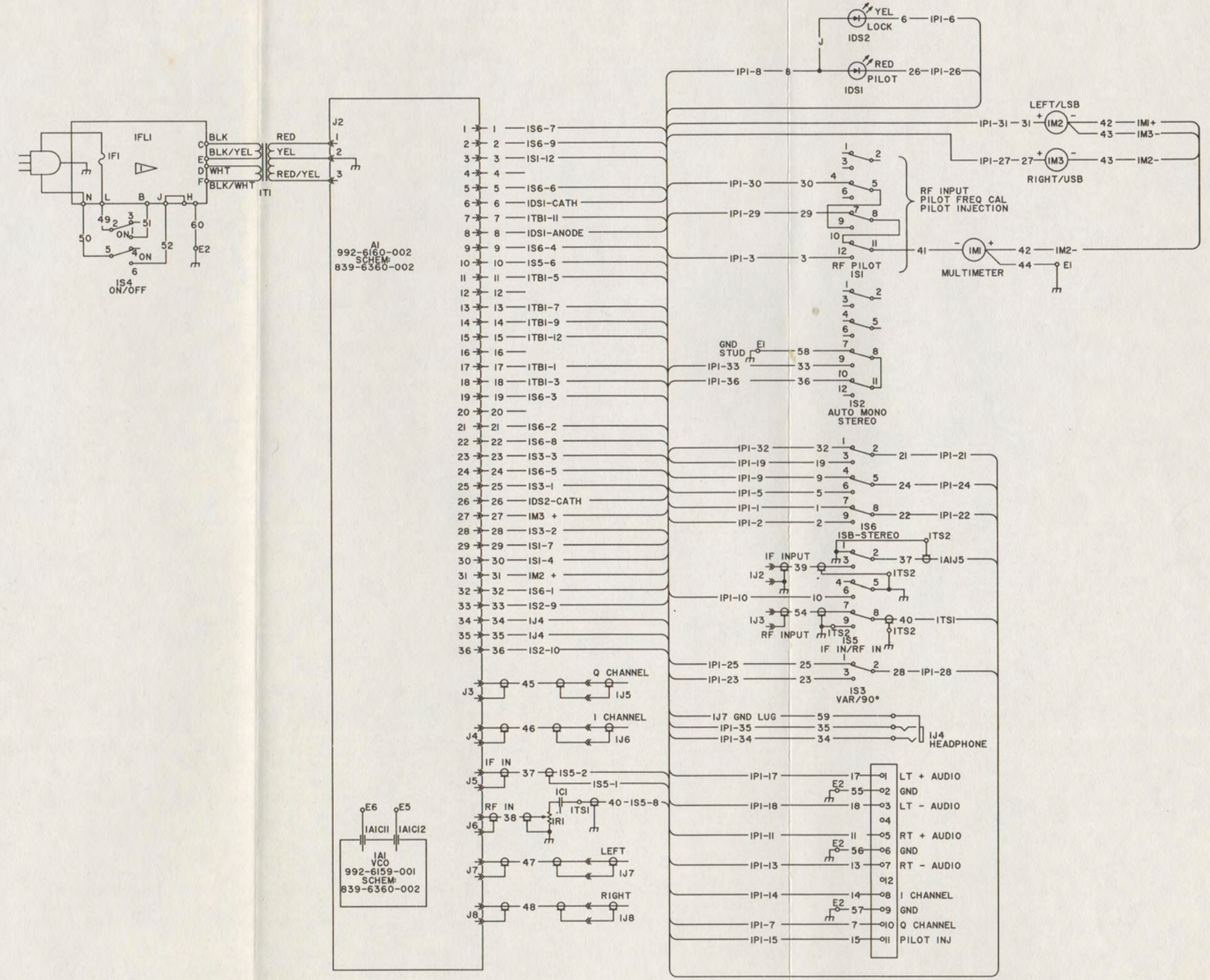


FIGURE 8-3. WIRING DIAGRAM
STM-1 AM STEREO MONITOR
839 6500 001

8-9/8-10

APPENDIX A

DATA FORMS

A-1. INTRODUCTION

A-2. The data required for the FCC has been reviewed by HARRIS. HARRIS believes the following data to be adequate for the FCC AM Stereo Rules. HARRIS suggests that these sheets be phototyped and the origials be left intact and in this technical manual for futher proofs. Following the forms are instructions for making the required measurements.

Table A-1. Recommended Test Equipment

Audio Oscillator Patomac Instruments AG-51 or equivalent
Distortion Analyzer/Voltmeter Patomac Instruments AA-51 or equivalent
Oscilloscope 10 MHz to 15 MHz vertical bandwidth Dual Trace Preferable Single Trace Acceptable
AM Envelope Modulation Monitor HARRIS AM-90 or equivalent
AM Stereo Modulation Monitor HARRIS STM-1 NO EXCEPTION
Volt/Ohm Meter Simpson 260 or equivalent

STEREO PERFORMANCE

Frequency Response, Separation, and Distortion

The conditions for these tests are:

a. Left or right channel modulation only.
b. 75% modulation level as read on the STM-1.
c. Reference level is the level at 1kHz = 0dB.
d. S/N is taken at 1000Hz, 75% modulation, left channel then right channel.
e. The pilot is turned on.
f. Exciter in stereo mode.

FREQUENCY (HZ)	RESPONSE (dB)		SEPARATION (dB)		DISTORTION (%)	
	L	R	L	R	L	R
400	_____	_____	_____	_____	_____	_____
1000	_____	_____	_____	_____	_____	_____
2500	_____	_____	_____	_____	_____	_____
5000	_____	_____	_____	_____	_____	_____
7500	_____	_____	_____	_____	_____	_____
10,000	_____	_____	_____	_____	_____	_____

Left S/N _____ dB
Right S/N _____ dB

NOTE

The FCC does not require separation above 5 KHz nor below 400 Hz. The minimum separation is 15 dB.

WARNING: Disconnect primary power prior to servicing.

STEREO PERFORMANCE

Crosstalk

The conditions for these tests are:

a. L = R for main to subchannel test (L-R=0).
b. L = -R for sub to main channel test (L+R=0).
c. 95% modulation level as read on STX-1 mod meter.
d. Pilot on.
e. Exciter in stereo mode.

	400 Hz	1000 Hz	5000 Hz
(L + R) into (L - R)	_____ dB	_____ dB	_____ dB
(L - R) into (L + R)	_____ dB	_____ dB	_____ dB

Carrier Shift

The conditions for this test are:

a. L = R, 400Hz.
b. 95% modulation.
c. Pilot on.
d. Exciter in stereo mode.

Carrier shift = _____ % from Envelope monitor.

Incidental Quadrature Modulation

The conditions for this test are:

a. L = R, 400Hz.
b. 95% modulation.
c. Exciter in mono.
d. Pilot off.
e. IQM is a ratio of I channel output to the Q channel output.

IQM = _____ dB

Pilot

a. Pilot Injection = _____%

b. Pilot Frequency = _____ (check indicates ok)

MONO (ENVELOPE DETECTOR) PERFORMANCE

Frequency Response and Distortion

The conditions for these tests are:

a. Equal left and right channel modulation (L = R).
b. Peak limiter is bypassed.
c. 100% modulation level (envelope) (or maximum attainable).
d. Reference level is the level at 1kHz = 0dB
e. The pilot is turned on.
f. Exciter in stereo mode.

FREQUENCY (Hz)	RESPONSE (dB)	DISTORTION (%)
50	_____	_____
100	_____	_____
400	_____	_____
1000	_____	_____
2500	_____	_____
5000	_____	_____
7500	_____	_____
10,000	_____	_____
12,500	_____	_____
15,000	_____	_____

S/N _____ dB @ 95% Modulation @ 1000 Hz

NOTE

The FCC does not require data above 5000 Hz. This data should be completed for 25%, 50%, and 75% modulation also.

MONO (ENVELOPE DETECTOR) PERFORMANCE

Frequency Response and Distortion:

The conditions for this test are:

a. Left or right channel modulation only.
b. Modulation level of 75% as read on STM-1.
c. Reference level is 1kHz = 0dB.
d. S/N taken at 1000Hz, 75% modulation, left channel.
e. Pilot on.
f. Exciter in stereo mode.

FREQUENCY (Hz)	RESPONSE (dB)		DISTORTION (%)	
	L	R	L	R
400	_____	_____	_____	_____
1000	_____	_____	_____	_____
2500	_____	_____	_____	_____
5000	_____	_____	_____	_____
7500	_____	_____	_____	_____
10,000	_____	_____	_____	_____
12,500	_____	_____	_____	_____
15,000	_____	_____	_____	_____

S/N _____ dB @ 75% Modulation @ 1000 Hz

NOTE

The FCC requires data only to 5000 Hz. This data should be taken for 25% and 50% modulation levels also.

A-3. To adequately assure the successful completion of a system proof or to document the operation of the AM stereo system, there are certain testing procedures that should be followed in order to obtain valid results.

A-4. Below, is an approach one may use as a procedure of establishing modulation references and data acquisition. This procedure will be the basis of the measurement technique needed throughout the proof or to spot check the system periodically.

Step	Function
1	Select desired test frequency.
2	Place STX-1 exciter into a MONO mode.
3	Adjust audio drive to obtain modulation level.

NOTE

LEFT and RIGHT only STEREO modulation levels for a proof are 25%, 50% and 75%.

4	Place the exciter into STEREO mode.
5	Measure the desired parameter.
6	After measurements are taken; switch exciter into MONO mode.
7	Select the next desired test frequency.
8	Adjust audio drive to desired modulation level.
9	Place the exciter into STEREO mode.
10	Measure desired parameter.

A-5. For the purpose of establishing an accurate level of modulation, use the station's AM modulation monitor. As a comparison, the ENV position of the modulation multimeter of the STX-1 will indicate the amount of IF amplitude modulation which should be the same as the modulation indicated on the station's AM modulation monitor.

A-6. For the proof or spot check procedure, all levels of modulation are referenced to the station's AM modulation monitor. The AM Stereo Modulation monitor, STM-1 may also be used to monitor the LEFT or RIGHT channels of modulation from the system. For a LEFT EQUAL TO RIGHT and/or a LEFT EQUAL TO MINUS(-) RIGHT modulating condition, the LEFT and RIGHT channel modulation meters will indicate one half of the total modulation present.

A-7. The AM Stereo demodulator, STM-1, is used to measure the following information. While these measurements are being taken, insure that switch 1S2, is in the AUTO or STEREO mode and that switch 1S6, is in the STEREO mode, not in the ISB mode.

PARAMETER	SIGNAL SOURCE
Left Distortion	Front panel LEFT BNC or rear panel barrier strip.
Right Distortion	Front panel RIGHT BNC or rear panel barrier strip.
Left to Right Separation	LEFT BNC or rear panel barrier strip for reference level and RIGHT BNC or rear panel barrier strip for right channel residual signal.
Right to Left Separation	RIGHT BNC or rear panel barrier strip for reference level and LEFT BNC or rear panel barrier strip for left channel residual signal.
Left Channel Signal to Noise	LEFT BNC or rear panel barrier strip.
Right Channel Signal to Noise	RIGHT BNC or rear panel barrier strip.
Right Channel Response and Left Channel Response	LEFT BNC or rear panel barrier strip for LEFT channel response and RIGHT BNC or rear panel barrier strip for RIGHT channel response.
Left plus Right INTO Left minus Right Crosstalk	I BNC or rear panel barrier strip for the L+R reference level and the Q BNC or rear panel barrier strip for the L-R crosstalk residual signal.
Left minus Right INTO Left plus Right Crosstalk	Q BNC or rear panel barrier strip for the L-R reference level and the I BNC or rear panel barrier strip for the L+R crosstalk residual signal.
PILOT FREQUENCY MEASURED ON STX-1	Front panel BNC connector on the AM Stereo Exciter, STX-1, with the modulation selector switch set to the PILOT position. This will allow the use of a frequency counter, able to resolve 55.00 Hz, to directly measure the pilot frequency.

PARAMETER	SIGNAL SOURCE
PILOT FREQUENCY MEASURED ON STM-1	While measuring the RF from the transmitter on the STM-1, place the Multimeter function switch, 1S1, in the PILOT FREQ CAL position. The meter needle will fluctuate back and forth at a rate representing the difference between the broadcasted pilot frequency and the highly accurate internal 55.00 Hz reference signal. Adjust the PILOT FREQ potentiometer, A5R151, on the A5 card in the STX-1 for a stationary indication. See Table 3-4 in the STX-1 technical manual for location details.
PILOT INJECTION	Pilot injection should be maintained at 7.5%, ±1% and is measured on the STM-1 by placing the Multimeter function switch in the PILOT INJECTION position. The multimeter will read the injection percentage directly. Adjust the PILOT INJECTION potentiometer, A5R152, on the A5 card in the STX-1 for the desired pilot injection level. See Table 3-4 in the STX-1 technical manual for location details.

A-8. The stereo measurements are measured at three (3) different levels of modulation; 25%, 50% and 75%, and four (4) modulating audio frequencies 400Hz, 1,000Hz, 5,000Hz and 7,500Hz. These are the required audio modulating frequencies established by the FCC for the proof. It is advisable to select several intermediate frequencies between 1,000 Hz and 7.500 Hz to improve the knowledge level of the system's performance because stereo separation is pronounced in this region. Establish the reference level on the station's AM modulation monitor while the STX-1 AM Stereo Exciter is in the MONO mode of operation and the actual measurement is taken after the exciter is placed into the Stereo mode of operation.

A-9. To stream line the procedure of data acquisition from the system, try to group the various measurement together under one modulation reference to prevent the duplication of procedures.

As an example;

a. Establish a modulation reference for LEFT channel, and note the audio drive level in MONO.

b. Switch to Stereo and measure the LEFT channel distortion.

c. Establish a LEFT channel revovered audio level with the audio voltmeter, then switch the distortion analyzer/audio voltmeter to the RIGHT channel to measure LEFT into RIGHT channel separation.

d. **At 400 Hz after taking the above data, make a signal-to-noise measurement and measure the amount of carrier regulation (carrier shift). These two measurements are taken only at the 75% modulation level LEFT and RIGHT channels only.**

e. At audio frequencies other than 400 Hz, after making the above LEFT into RIGHT channel separation measurement, the audio signal generator may then be switched to the opposite, or in the example given, RIGHT channel and repeat steps one, two, three, and four, as required, at the same modulating level originally established in step one.

A-10. After completing the separate channel stereo proof parameters at the required audio frequency points and modulating levels, the distortion analyzer/audio voltmeter input is connected to the AM Stereo Modulation Monitor I (inphase) BNC on the front panel or I channel output on the rear panel barrier strip. The Q (quadrature) signal from the front panel BNC or rear panel barrier strip can be made available for later use or if the analyzer in use has two inputs, assign the I to one channel input and the Q to the other channel. The audio signal generator is then configured for a LEFT EQUAL TO RIGHT audio signal to the AM Stereo Exciter, STX-1, audio inputs.

A-11. The next series of Stereo measurements will be L+R into L-R or Main into Sub channel crosstalk and L-R into L+R or Sub into Main channel crosstalk.

a. Modulate the transmitter to 95% with an L+R audio signal at one of the three required crosstalk test frequencies and establish an I (inphase) channel reference on the audio voltmeter. Switch the audio voltmeter to the Q (quadrature) channel and measure the residual or crosstalk audio.

b. Reverse the RIGHT channel audio signal generator phase to create an L-R signal to the exciter; establish a Q channel reference then measure the I channel residual audio.

NOTE

Repeat steps a. and b. two more times for the required audio modulating frequencies.

A-12. Always measure the L+R into L-R crosstalk first because the L-R signal is the quadrature modulated RF signal that will be transparent to the envelope detector within the station's AM modulation monitor.

A-13. When an audio signal of LEFT equal to RIGHT is established and then the phase of the right channel is reversed as referenced to the left, the amount of carrier quadrature modulation will be equivalent in respect to the amplitude modulation. Therefore, do not alter the amplitude of the audio signal of L-R for the L-R into L+R crosstalk measurement.

a. Main or L+R channel carrier regulation and signal to noise. Measurements can be measured at the same time as follows:

NOTE

Carrier regulation will be measured on the station's AM envelope modulation monitor.

1. Connect the distortion analyzer/audio voltmeter to the audio output port of the station's AM envelope modulation monitor.

2. Without audio applied to the system, establish a carrier reference point on the station's AM envelope modulation monitor.

3. Modulate the system in STEREO with a 400 Hz, L+R tone, to 95% envelope modulation.

4. Note the amount of carrier shift present from the transmission system.

5. Establish a 400 Hz reference level on the audio voltmeter.

6. Remove the audio drive signal and terminate the audio inputs to the system. Gradually increase the input sensitivity of the audio voltmeter to measure the residual noise floor.

A-14. Modulation levels at which the following AM stereo data will be taken are: 25%, 50%, and 75% LEFT or RIGHT channels only. The frequencies to be used are 400 Hz, 1,000 Hz, 5,000 Hz, and 7.500 Hz.

A-15. For LEFT or RIGHT only stereo response and distortion measurements, measure 10,000 Hz and 12,500 Hz when attainable within the specifications established.

MEASUREMENT	METHOD
RESPONSE; STEREO LEFT OR STEREO RIGHT CHANNELS ONLY Specifications: ±2dB as referenced to 1,000 Hz	Stereo response of the individual LEFT and RIGHT channels is measured from the LEFT or RIGHT front panel BNC connectors or the rear panel of the STM-1. DATA ACQUIRED FROM THESE MEASUREMENTS WILL BE PLOTTED ON A GRAPH AS WELL AS TABULATED. Establish a modulation reference at one of the three required percentages (25%, 50% or 75%) at 1,000 Hz. Using the audio voltmeter, measure or establish a reference level from the audio signal generator which will be considered the zero dB reference. At all other modulating frequencies, increasing or decreasing the audio drive level from the signal generator in order to obtain the same modulation level established as the reference will be the indication of system response. If the audio drive signal is greater than the established benchmark value, then the dB difference will be noted as a minus (-) value. (The drive level had to be increased to overcome the roll-off or attenuation presented by the system.) If the audio drive had to be reduced below the benchmark value, then the dB difference will be noted as a plus (+) value. (The drive level had to be reduced to accomodate the gain presented by the system.)
LEFT INTO RIGHT AND RIGHT INTO LEFT SEPARATION Specifications: One to five years of operation: 15 dB separation 400 Hz to 5,000 Hz After five years: 20 dB separation; 400 Hz to 7,500 Hz	Separation of channel signals is measured by establishing a reference audio level from the driven channel's respective signal port on the AM Stereo Modulation Monitor, STM-1, then measuring the residual component on the undriven channel signal port. The value of separation is in dBm, referenced to 600 ohms, below the driven channel signal level reference.

MEASUREMENT	METHOD
LEFT OR RIGHT CHANNEL DISTORTION Specifications: 5% THD maximum, 400 Hz to 5,000 Hz After five years: 5% THD maximum, 400 Hz to 7,500 Hz.	Total harmonic distortion of the individual LEFT and RIGHT stereo channels is measured from the LEFT or RIGHT front panel BNC connectors or the rear panel barrier strip of the STM-1. The measurements are referenced to the modulation levels of 25%, 50% or 75% only. THIS DATA MUST BE PLOTTED ON A GRAPH AS WELL AS BEING TABULATED.
LEFT OR RIGHT SIGNAL-TO-NOISE Specifications: -45 dB minimum as measured on the AM Stereo demodulator Left and Right channel outputs.	LEFT and RIGHT channel stereo signal-to-noise measurements are taken at 400 Hz and 75% modulation only. After establishing the proper level of modulation with the exciter in the MONO mode, switch to STEREO mode, establish an audio reference level from the respective channel being driven, remove audio drive and terminate the input channel under test then increase the audio voltmeters input sensitivity to measure the residual noise floor level from the system. This procedure is identical to the signal-to-noise measurement method used for a standard stereo FM proof except the measurement is now being performed on an AM Stereo system.
LEFT EQUAL TO RIGHT SIGNAL SIGNAL-TO-NOISE Specifications: -45 dB minimum as measured on the station's AM modulation monitor	A LEFT equal to RIGHT, or main channel, signal-to-noise measurement is accomplished by equally modulating the left and right channels at 400 Hz to a reference level of 95% on the station's AM modulation monitor. (The exciter can be left in the STEREO mode.)

MEASUREMENT	METHOD
LEFT EQUAL TO RIGHT SIGNAL SIGNAL-TO-NOISE (Continued)	A reference signal is then obtained from the station's AM modulation monitor, the audio drive signals removed, the inputs terminated; then increase the input sensitivity of the audio volt-meter to determine the residual noise floor of the system. The signal-to-noise level, in dBm, will be the sum of the absolute values measured. This measurement is the same as the signal-to-noise measurement method used for a monaural AM proof.
CARRIER REGULATION LEFT, RIGHT AND LEFT PLUS RIGHT Specifications: 5% maximum	Carrier regulation, or carrier shift is measured on LEFT and RIGHT channels in stereo at a maximum modulation of 75% and the main or LEFT equal to RIGHT and SUB or LEFT equal to MINUS RIGHT at a maximum of 95% modulation. The stereo LEFT and RIGHT channel's modulation is established in the MONO mode, the exciter is then switched to Stereo mode. A carrier reference level is then established on the AM envelope modulation monitor, the audio signal is then removed, the input terminated and the amount of carrier regulation or shift is then measured on the station's AM envelope modulation monitor carrier level meter. For Main, or LEFT equal to RIGHT, and SUB, or LEFT EQUAL TO MINUS(-) RIGHT, channel carrier regulation the measurements are in the same manner as outlined above for LEFT ONLY or RIGHT ONLY conditions.

MEASUREMENT	METHOD
CROSSTALK L+R INTO L-R AND L-R INTO L+R Specifications: Frequencies: 400Hz, 1,000Hz and 5,000Hz Modulation Level: 95% as measured on the station's AM envelope modulation monitor and the AM Stereo Modulation Monitor, STM-1	Crosstalk is measured with the exciter in the Stereo mode of operation at all times. The modulation reference level will first be established by modulating with a LEFT equal in phase and amplitude to RIGHT to a 95% modulation as indicated on the station's AM modulation monitor. Measure the main, or LEFT equal to RIGHT, parameter first to establish the proper modulation level of the system because the sub, or LEFT equal to minus RIGHT, signal will be transparent to the envelope detector of the AM modulation monitor thereby removing the ability to measure the amount of modulation. As outlined in paragraph (A-4), the Am Stereo Modulation Monitor may be used to monitor the amount of Sub channel modulation.
This measurement is yet unspecified but it is required as a part of the AM Stereo proof.	The main, or LEFT equal to RIGHT, signal is measured from the I BNC or I signal terminals from the rear panel barrier strip. The sub, or LEFT equal to MINUS (-) RIGHT, signal is measured from the Q BNC or Q signal terminals from the rear panel barrier strip of the STM-1. The crosstalk parameter will then be the absolute difference, in dB, between the I reference signal and Q residual signal. This measurement will indicate to what degree the sideband components of the stereo signal are suppressed and is a direct indication of the amount of peak phase deviation taking place within the RF chain while the transmission system is operating with a fixed angle RF source (crystal oscillator within the transmitter) or from the

MEASUREMENT	METHOD
CROSSTALK L+R INTO L-R AND L-R INTO L+R (Continued)	external RF signal of the STX-1 while operating in the MONO mode of operation. The Main (L+R) channel into Sub (L-R) channel crosstalk indicates to what extent the amplitude modulating audio signal is causing the RF component to be deviated in phase. Sub (L-R) channel into Main (L+R) channel crosstalk indicates to what extent the Sub channel PM products are creating an aysyncronous AM byproduct.

A-16. The remaining measurements for the AM Stereo proof are to be taken from the station's AM envelope modulation monitor. All signals are to be LEFT equal to RIGHT.

A-17. Modulation levels at which the following data will be taken are: 25%, 50%, 75% and 95%. The frequencies to be used are: 50 Hz, 100 Hz, 400 Hz, 1,000 Hz, 5,000 Hz and 7,500 Hz.

MEASUREMENT	METHOD
RESPONSE; MONAURAL Specifications: ±2 dB as referenced to an audio drive signal of 1,000 Hz.	The system response measurements will be taken in the same manner commonly established for a standard monaural AM proof. During the test there is no need to switch the STX-1 exciter to a mono mode of operation to establish the desired modulation level because the LEFT equal to RIGHT audio signal will be interpreted by the AM envelope modulation monitor as though it were measuring a standard AM signal. THIS DATA MUST BE PLOTTED ON A GRAPH AS WELL AS BEING TABULATED. Once a reference level at an audio signal of 1,000 Hz is established, at 25%, 50%, 75% or 95% AM modulation, the audio drive signal is measured by the audio voltmeter and this drive level is then considered as the Zero dB reference. At all

MEASUREMENT	METHOD
RESPONSE; MONAURAL (Continued)	other modulating frequencies, increasing or decreasing the audio drive level from the signal generator in order to obtain the same modulation level as established, will be the indication of system response. Measure the audio drive signal from the generator with the audio voltmeter and compare this value to the benchmark value established at 1,000 Hz. If the audio drive signal is greater than the established benchmark value, then the dB difference will be noted as a minus (-) value. (The drive level had to be increased to overcome the roll-off attenuation presented by the system.) If the audio drive had to be reduced below the banchmark value, then the dB difference will be noted as a plus (+) value. (The drive level had to be reduced to accomodate the gain presented by the system.)
DISTORTION; THD Specifications: 5% THD maximum at all modulation levels.	Total harmonic distortion measurements for the system will be taken in the same manner commonly established for a standard AM proof. During these tests there will be NO need to switch the STX-1 exciter to the mono mode of operation to establish the desired modulation level of 25%, 50%, 75% or 95% because the LEFT equal to RIGHT audio signal will be interpreted by the AM modulation monitor as though it were measuring a standard AM signal. THIS DATA MUST BE PLOTTED ON A GRAPH AS WELL AS TABULATED.

A-18. The final measurement using the test equipment setup is Incidental Quadrature Modulation or IQM. IQM measurements on the HARRIS AM Stereo System is a means of determining the instantaneous peak phase modulation of the RF carrier generated by the transmission system. This measurement will require the use of the internal crystal oscillator of the transmitter because this source of RF is considered to be a non deviated or fixed angle RF signal source.

A-19. The signal sources to be measured will be the I and Q output from the front panel BNC connectors or the rear panel barrier strip of the STM-1.

A-20. Modulate the transmitter directly, bypassing all processing gear to a modulation level of 90% with an audio signal of 1,000 Hz.

A-21. Measure the I component from the STM-1 with the audio voltmeter and establish a reference level then measure the Q component to determine the difference in dB the Q component is below the I component.

A-22. An alternate method of measuring IQM with an oscilloscope is outlined as follows:

A-23. After establishing the proper test setup and drive levels as outlined, measure the peak-to-peak I signal and the peak-to-peak Q signals as derived from the STM-1. Divide the I peak-to-peak into the Q peak-to-peak value, take the $\log_{10}$ of the resultant then multiply the $\log_{10}$ ratio by 20 to arrive at the IQM of the system.

$$IQM = \log_{10} \frac{Q}{I} \times 20$$

A-24. Note that that the Q component will probably have a fuzzy appearance to it which is the HF noise component of the carrier. To compensate for this, observe the peak-to-peak signal from the Q source of the STM-1 without any audio drive signal applied to the transmitter. Next, modulate the transmitter and adjust the vertical deflection of the Q signal to establish a reference point, on a horizontal base line of the screen, to the lowest negative excursion of the Q signal. Mentally reducing the positive portion of the Q signal by the amount measured without audio drive will give a very close approximated peak positive measurement point for the peak-to-peak Q signal.

A-25. To simply describe what is being measured, one may equate the I (inphase) signal directly to the amplitude modulated portion of the transmitted signal. The Q (quadrature) signal is the equivalent to the phase deviated RF carrier by the modulating signal.

A-26. The Q component of this test can be minimized by one or all of the following variables of the transmitting system:

a. PA grid tuning.

b. IPA tuning and loading.

c. PA plate tuning and loading.

d. Efficiency resonators (if present).

e. PA neutralization.

f. Reduction of power supply ripple to:

1. Low level RF drive circuits

2. AC and or RF ground loops

3. Incoming AC phase imbalance if a 3 phase service is used

4. Bias supplies (if present)

5. High voltage plate supplies

g. RF feedback from high level to low level RF stages.

h. Weak or low emission tubes.

i. Asymmetrical load or loads. (Matching/Attenuation Networks, Antenna System "Q".)

j. High "Q" traps installed for RFI reduction at frequencies other than the fundamental.

k. Ground loops within the audio system.

A-27. Of the above listed areas for concern, neutralization, RF feedback, IPA tuning and loading and PA grid tuning variables will have the most effect upon the quadrature component followed by power supply ripple, asymmetrical load or loads, High "Q" tuned traps, ground loops, efficiency resonators and low-emission tubes.

A-28. During the coarse of time, as each of the above are eliminated as a problem, go back and spot check the operating characteristics of the system and optimize the audio output card adjustments for best parameters obtainable and document the results to provide a point of reference for future measurements.

A-29. The final part of the proof involves the measurement of Spurious and Harmonic Radiation Observations from the transmitting facilities.

A-30. These measurements may be taken by using a general coverage shortwave or communications receiver at some distance from the transmitter site to prevent RF overload of the receiver front end.

A-31. The transmitter should be modulated with an audio signal of 5,000 Hz to 75% on LEFT and RIGHT only and 95% for LEFT equal to RIGHT and LEFT equal to minus RIGHT conditions.

A-32. The receiver should have some means to adequately determine the the frequency being tuned and some sort of built in metering device to quantify the strength of the received signal.

A-33. What is required is during each of the modulating conditions listed as a requirement, tune across the bands, up to at least the third (3rd) harmonic of the fundamental operating frequency, listening for the modulating tone, and determining the quantity of the received spurrious or harmonic signal as referenced to the fundamental signal.

A-34. In order to validate this measurement, the general coverage or communications receiver should incorporate some means of adjusting the RF sensitivity such that the fundamental signal reference level can be established without overdriving the the metering device.

APPENDIX B

FREQUENCY SYNTHESIZER AND VCO PROGRAMMING

B-1. INTRODUCTION

B-2. This appendix provides information for setting switches S301 and S302 on the Frequency Synthesizer and S1 on the VCO.

B-3. VCO PROGRAMMING

B-4. The VCO resonator must be programmed to the correct value for proper operation. Switch S1 on 1A1 connects four different inductors in various combinations. More than one combination will usually be found that will permit LOCK to occur. The VCO AFC voltage (available at terminal E6 to rear of VCO board enclosure - see figure 3-3) should range between 3.9VDC and 10.5VDC for normal operation. Ideally the AFC voltage should be between 6 and 7VDC. The following table serves as a guide in setting the VCO inductors.

Frequency (KHz)	SWITCH S1 S1	S2	S3	S4
500	1	1	1	1
600	1	1	1	1
700	1	1	1	0
800	1	1	1	0
900	1	1	0	0
1000	1	1	0	0
1100	1	1	0	0
1200	1	0	0	0
1300	0	1	0	0
1400	0	1	0	0
1500	0	1	0	0
1600	0	0	0	0
1700	0	0	0	1

Note: Open = 1
Closed = 0

EXAMPLE: The transmitter is operating on 850 KHz. Since either a 1110 or 1100 code may work, the AGC voltage at terminal E6 should be monitored. After LOCK is achieved, the AFC voltage should be between 3.9 and 10.5 VDC. If the AFC voltage after LOCK is not between 6 and 7 VDC, try another code near the one in the above chart and again monitor the AFC voltage after LOCK is achieved.

Note that other S1 code combinations may give better results than those in the above chart due to component tolerances.

Final selection should be the code that gives the voltage closest to the ideal of 6 to 7 VDC but if LOCK is achieved by only one combination, remember that any voltage between 3.9VDC and 10.5VDC is acceptable.

B-5. FREQUENCY SYNTHESIZER PROGRAMMING

B-6. The following example shows how to use the tables that follow to program the Frequency Synthesizer:

For an RF carrier frequency of 500 Khz and a local oscillator frequency of 756 Khz proceed as follows;

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
500	756	0	1	0	0	1	0	1	1	0	1	1	0

Under first column (RF) locate 500

Immediately to the right of 500 find 756 the LO frequency

The next eight columns to the right (S1 thru S8) give the switch positions for S301 - in this case S1=0 so S301 switch number 1 should be switched to closed position (away from OPEN nomenclature on switch)

S2=1 so S301 switch position number 2 should be switched to OPEN position

S3 and S4 = 0 so S301 switch positions number 3 and 4 should be switched to closed position

S5=1 so S301 switch postion number 5 should be switched to OPEN position

S6=0 so S301 switch position number 6 should be switched to closed position

S7 and S8 = 1 so S301 switch positions number 7 and 8 should be switched to OPEN position

The next four columns (S4 thru S1) give switch positions for S302

S4=0 so S302 switch position number 4 should be switched to closed position

S3 and S2 = 1 so S302 switch positions number 3 and 2 should be switched to OPEN position

S1=0 so S302 switch position number 1 should be switched to closed position

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
500	756	0	1	0	0	1	0	1	1	0	1	1	0
501	757	0	1	0	0	1	0	1	1	0	1	1	1
502	758	0	1	0	0	1	0	1	1	1	0	0	0
503	759	0	1	0	0	1	0	1	1	1	0	0	1
504	760	0	1	0	0	1	1	0	0	0	0	0	0
505	761	0	1	0	0	1	1	0	0	0	0	0	1
506	762	0	1	0	0	1	1	0	0	0	0	1	0
507	763	0	1	0	0	1	1	0	0	0	0	1	1
508	764	0	1	0	0	1	1	0	0	0	1	0	0
509	765	0	1	0	0	1	1	0	0	0	1	0	1
510	766	0	1	0	0	1	1	0	0	0	1	1	0
511	767	0	1	0	0	1	1	0	0	0	1	1	1
512	768	0	1	0	0	1	1	0	0	1	0	0	0
513	769	0	1	0	0	1	1	0	0	1	0	0	1
514	770	0	1	0	0	1	1	0	1	0	0	0	0
515	771	0	1	0	0	1	1	0	1	0	0	0	1
516	772	0	1	0	0	1	1	0	1	0	0	1	0
517	773	0	1	0	0	1	1	0	1	0	0	1	1
518	774	0	1	0	0	1	1	0	1	0	1	0	0
519	775	0	1	0	0	1	1	0	1	0	1	0	1
520	776	0	1	0	0	1	1	0	1	0	1	1	0
521	777	0	1	0	0	1	1	0	1	0	1	1	1
522	778	0	1	0	0	1	1	0	1	1	0	0	0
523	779	0	1	0	0	1	1	0	1	1	0	0	1
524	780	0	1	0	0	1	1	1	0	0	0	0	0
525	781	0	1	0	0	1	1	1	0	0	0	0	1
526	782	0	1	0	0	1	1	1	0	0	0	1	0
527	783	0	1	0	0	1	1	1	0	0	0	1	1
528	784	0	1	0	0	1	1	1	0	1	0	0	0
529	785	0	1	0	0	1	1	1	0	0	1	0	1
530	786	0	1	0	0	1	1	1	0	0	1	1	0
531	787	0	1	0	0	1	1	1	0	0	1	1	1
532	788	0	1	0	0	1	1	1	0	1	0	0	0
533	789	0	1	0	0	1	1	1	0	1	0	0	1
534	790	0	1	0	0	1	1	1	1	0	0	0	0
535	791	0	1	0	0	1	1	1	1	0	0	0	1
536	792	0	1	0	0	1	1	1	1	0	0	1	0
537	793	0	1	0	0	1	1	1	1	0	0	1	1
538	794	0	1	0	0	1	1	1	1	0	1	0	0
539	795	0	1	0	0	1	1	1	1	0	1	0	1
540	796	0	1	0	0	1	1	1	1	0	1	1	0
541	797	0	1	0	0	1	1	1	1	0	1	1	1
542	798	0	1	0	0	1	1	1	1	1	0	0	0
543	799	0	1	0	0	1	1	1	1	1	0	0	1
544	800	0	1	0	1	0	0	0	0	0	0	0	0
545	801	0	1	0	1	0	0	0	0	0	0	0	1
546	802	0	1	0	1	0	0	0	0	0	0	1	0
547	803	0	1	0	1	0	0	0	0	0	0	1	1
548	804	0	1	0	1	0	0	0	0	0	1	0	0
549	805	0	1	0	1	0	0	0	0	0	1	0	1
550	806	0	1	0	1	0	0	0	0	0	1	1	0
551	807	0	1	0	1	0	0	0	0	0	1	1	1
552	808	0	1	0	1	0	0	0	0	1	0	0	0
553	809	0	1	0	1	0	0	0	0	1	0	0	1
554	810	0	1	0	1	0	0	0	1	0	0	0	0
555	811	0	1	0	1	0	0	0	1	0	0	0	1
556	812	0	1	0	1	0	0	0	1	0	0	1	0
557	813	0	1	0	1	0	0	0	1	0	0	1	1
558	814	0	1	0	1	0	0	0	1	0	1	0	0
559	815	0	1	0	1	0	0	0	1	0	1	0	1
560	816	0	1	0	1	0	0	0	1	0	1	1	0
561	817	0	1	0	1	0	0	0	1	0	1	1	1
562	818	0	1	0	1	0	0	0	1	1	0	0	0
563	819	0	1	0	1	0	0	0	1	1	0	0	1
564	820	0	1	0	1	0	0	1	0	0	0	0	0
565	821	0	1	0	1	0	0	1	0	0	0	0	1
566	822	0	1	0	1	0	0	1	0	0	0	1	0
567	823	0	1	0	1	0	0	1	0	0	0	1	1
568	824	0	1	0	1	0	0	1	0	0	1	0	0
569	825	0	1	0	1	0	0	1	0	0	1	0	1
570	826	0	1	0	1	0	0	1	0	0	1	1	0
571	827	0	1	0	1	0	0	1	0	0	1	1	1
572	828	0	1	0	1	0	0	1	0	1	0	0	0
573	829	0	1	0	1	0	0	1	0	1	0	0	1
574	830	0	1	0	1	0	0	1	1	0	0	0	0
575	831	0	1	0	1	0	0	1	1	0	0	0	1
576	832	0	1	0	1	0	0	1	1	0	0	1	0
577	833	0	1	0	1	0	0	1	1	0	0	1	1
578	834	0	1	0	1	0	0	1	1	0	1	0	0
579	835	0	1	0	1	0	0	1	1	0	1	0	1
580	836	0	1	0	1	0	0	1	1	0	1	1	0
581	837	0	1	0	1	0	0	1	1	0	1	1	1
582	838	0	1	0	1	0	0	1	1	1	0	0	0
583	839	0	1	0	1	0	0	1	1	1	0	0	1
584	840	0	1	0	1	0	1	0	0	0	0	0	0
585	841	0	1	0	1	0	1	0	0	0	0	0	1
586	842	0	1	0	1	0	1	0	0	0	0	1	0
587	843	0	1	0	1	0	1	0	0	0	0	1	1
588	844	0	1	0	1	0	1	0	0	0	1	0	0
589	845	0	1	0	1	0	1	0	0	0	1	0	1
590	846	0	1	0	1	0	1	0	0	0	1	1	0
591	847	0	1	0	1	0	1	0	0	0	1	1	1
592	848	0	1	0	1	0	1	0	0	1	0	0	0
593	849	0	1	0	1	0	1	0	0	1	0	0	1
594	850	0	1	0	1	0	1	0	1	0	0	0	0
595	851	0	1	0	1	0	1	0	1	0	0	0	1
596	852	0	1	0	1	0	1	0	1	0	0	1	0
597	853	0	1	0	1	0	1	0	1	0	0	1	1
598	854	0	1	0	1	0	1	0	1	0	1	0	0
599	855	0	1	0	1	0	1	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
600	856	0	1	0	1	0	1	0	1	0	1	1	0
601	857	0	1	0	1	0	1	0	1	0	1	1	1
602	858	0	1	0	1	0	1	0	1	1	0	0	0
603	859	0	1	0	1	0	1	0	1	1	0	0	1
604	860	0	1	0	1	0	1	1	0	0	0	0	0
605	861	0	1	0	1	0	1	1	0	0	0	0	1
606	862	0	1	0	1	0	1	1	0	0	0	1	0
607	863	0	1	0	1	0	1	1	0	0	0	1	1
608	864	0	1	0	1	0	1	1	0	0	1	0	0
609	865	0	1	0	1	0	1	1	0	0	1	0	1
610	866	0	1	0	1	0	1	1	0	0	1	1	0
611	867	0	1	0	1	0	1	1	0	0	1	1	1
612	868	0	1	0	1	0	1	1	0	1	0	0	0
613	869	0	1	0	1	0	1	1	0	1	0	0	1
614	870	0	1	0	1	0	1	1	1	0	0	0	0
615	871	0	1	0	1	0	1	1	1	0	0	0	1
616	872	0	1	0	1	0	1	1	1	0	0	1	0
617	873	0	1	0	1	0	1	1	1	0	0	1	1
618	874	0	1	0	1	0	1	1	1	0	1	0	0
619	875	0	1	0	1	0	1	1	1	0	1	0	1
620	876	0	1	0	1	0	1	1	1	0	1	1	0
621	877	0	1	0	1	0	1	1	1	0	1	1	1
622	878	0	1	0	1	0	1	1	1	1	0	0	0
623	879	0	1	0	1	0	1	1	1	1	0	0	1
624	880	0	1	0	1	1	0	0	0	0	0	0	0
625	881	0	1	0	1	1	0	0	0	0	0	0	1
626	882	0	1	0	1	1	0	0	0	0	0	1	0
627	883	0	1	0	1	1	0	0	0	0	0	1	1
628	884	0	1	0	1	1	0	0	0	0	1	0	0
629	885	0	1	0	1	1	0	0	0	0	1	0	1
630	886	0	1	0	1	1	0	0	0	0	1	1	0
631	887	0	1	0	1	1	0	0	0	0	1	1	1
632	888	0	1	0	1	1	0	0	0	1	0	0	0
633	889	0	1	0	1	1	0	0	0	1	0	0	1
634	890	0	1	0	1	1	0	0	1	0	0	0	0
635	891	0	1	0	1	1	0	0	1	0	0	0	1
636	892	0	1	0	1	1	0	0	1	0	0	1	0
637	893	0	1	0	1	1	0	0	1	0	0	1	1
638	894	0	1	0	1	1	0	0	1	0	1	0	0
639	895	0	1	0	1	1	0	0	1	0	1	0	1
640	896	0	1	0	1	1	0	0	1	0	1	1	0
641	897	0	1	0	1	1	0	0	1	0	1	1	1
642	898	0	1	0	1	1	0	0	1	1	0	0	0
643	899	0	1	0	1	1	0	0	1	1	0	0	1
644	900	0	1	0	1	1	0	1	0	0	0	0	0
645	901	0	1	0	1	1	0	1	0	0	0	0	1
646	902	0	1	0	1	1	0	1	0	0	0	1	0
647	903	0	1	0	1	1	0	1	0	0	0	1	1
648	904	0	1	0	1	1	0	1	0	0	1	0	0
649	905	0	1	0	1	1	0	1	0	0	1	0	1
650	906	0	1	0	1	1	0	1	0	0	1	1	0
651	907	0	1	0	1	1	0	1	0	0	1	1	1
652	908	0	1	0	1	1	0	1	0	1	0	0	0
653	909	0	1	0	1	1	0	1	0	1	0	0	1
654	910	0	1	0	1	1	0	1	1	0	0	0	0
655	911	0	1	0	1	1	0	1	1	0	0	0	1
656	912	0	1	0	1	1	0	1	1	0	0	1	0
657	913	0	1	0	1	1	0	1	1	0	0	1	1
658	914	0	1	0	1	1	0	1	1	0	1	0	0
659	915	0	1	0	1	1	0	1	1	0	1	0	1
660	916	0	1	0	1	1	0	1	1	0	1	1	0
661	917	0	1	0	1	1	0	1	1	0	1	1	1
662	918	0	1	0	1	1	0	1	1	1	0	0	0
663	919	0	1	0	1	1	0	1	1	1	0	0	1
664	920	0	1	0	1	1	1	0	0	0	0	0	0
665	921	0	1	0	1	1	1	0	0	0	0	0	1
666	922	0	1	0	1	1	1	0	0	0	0	1	0
667	923	0	1	0	1	1	1	0	0	0	0	1	1
668	924	0	1	0	1	1	1	0	0	0	1	0	0
669	925	0	1	0	1	1	1	0	0	0	1	0	1
670	926	0	1	0	1	1	1	0	0	0	1	1	0
671	927	0	1	0	1	1	1	0	0	0	1	1	1
672	928	0	1	0	1	1	1	0	0	1	0	0	0
673	929	0	1	0	1	1	1	0	0	1	0	0	1
674	930	0	1	0	1	1	1	0	1	0	0	0	0
675	931	0	1	0	1	1	1	0	1	0	0	0	1
676	932	0	1	0	1	1	1	0	1	0	0	1	0
677	933	0	1	0	1	1	1	0	1	0	0	1	1
678	934	0	1	0	1	1	1	0	1	0	1	0	0
679	935	0	1	0	1	1	1	0	1	0	1	0	1
680	936	0	1	0	1	1	1	0	1	0	1	1	0
681	937	0	1	0	1	1	1	0	1	0	1	1	1
682	938	0	1	0	1	1	1	0	1	1	0	0	0
683	939	0	1	0	1	1	1	0	1	1	0	0	1
684	940	0	1	0	1	1	1	1	0	0	0	0	0
685	941	0	1	0	1	1	1	1	0	0	0	0	1
686	942	0	1	0	1	1	1	1	0	0	0	1	0
687	943	0	1	0	1	1	1	1	0	0	0	1	1
688	944	0	1	0	1	1	1	1	0	0	1	0	0
689	945	0	1	0	1	1	1	1	0	0	1	0	1
690	946	0	1	0	1	1	1	1	0	0	1	1	0
691	947	0	1	0	1	1	1	1	0	0	1	1	1
692	948	0	1	0	1	1	1	1	1	0	0	0	0
693	949	0	1	0	1	1	1	1	1	0	0	0	1
694	950	0	1	0	1	1	1	1	1	1	0	0	0
695	951	0	1	0	1	1	1	1	1	1	0	0	1
696	952	0	1	0	1	1	1	1	1	1	0	1	0
697	953	0	1	0	1	1	1	1	1	1	0	1	1
698	954	0	1	0	1	1	1	1	1	1	1	0	0
699	955	0	1	0	1	1	1	1	1	1	1	0	1

WARNING: Disconnect primary power prior to servicing.

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
700	956	0	1	0	1	1	1	1	1	0	1	1	0
701	957	0	1	0	1	1	1	1	1	0	1	1	1
702	958	0	1	0	1	1	1	1	1	1	0	0	0
703	959	0	1	0	1	1	1	1	1	1	0	0	1
704	960	0	1	1	0	0	0	0	0	0	0	0	0
705	961	0	1	1	0	0	0	0	0	0	0	0	1
706	962	0	1	1	0	0	0	0	0	0	0	1	0
707	963	0	1	1	0	0	0	0	0	0	0	1	1
708	964	0	1	1	0	0	0	0	0	0	1	0	0
709	965	0	1	1	0	0	0	0	0	0	1	0	1
710	966	0	1	1	0	0	0	0	0	0	1	1	0
711	967	0	1	1	0	0	0	0	0	0	1	1	1
712	968	0	1	1	0	0	0	0	0	1	0	0	0
713	969	0	1	1	0	0	0	0	0	1	0	0	1
714	970	0	1	1	0	0	0	0	1	0	0	0	0
715	971	0	1	1	0	0	0	0	1	0	0	0	1
716	972	0	1	1	0	0	0	0	1	0	0	1	0
717	973	0	1	1	0	0	0	0	1	0	0	1	1
718	974	0	1	1	0	0	0	0	1	0	1	0	0
719	975	0	1	1	0	0	0	0	1	0	1	0	1
720	976	0	1	1	0	0	0	0	1	0	1	1	0
721	977	0	1	1	0	0	0	0	1	0	1	1	1
722	978	0	1	1	0	0	0	0	1	1	0	0	0
723	979	0	1	1	0	0	0	0	1	1	0	0	1
724	980	0	1	1	0	0	0	1	0	0	0	0	0
725	981	0	1	1	0	0	0	1	0	0	0	0	1
726	982	0	1	1	0	0	0	1	0	0	0	1	0
727	983	0	1	1	0	0	0	1	0	0	0	1	1
728	984	0	1	1	0	0	0	1	0	0	1	0	0
729	985	0	1	1	0	0	0	1	0	0	1	0	1
730	986	0	1	1	0	0	0	1	0	0	1	1	0
731	987	0	1	1	0	0	0	1	0	0	1	1	1
732	988	0	1	1	0	0	0	1	0	1	0	0	0
733	989	0	1	1	0	0	0	1	0	1	0	0	1
734	990	0	1	1	0	0	0	1	1	0	0	0	0
735	991	0	1	1	0	0	0	1	1	0	0	0	1
736	992	0	1	1	0	0	0	1	1	0	0	1	0
737	993	0	1	1	0	0	0	1	1	0	0	1	1
738	994	0	1	1	0	0	0	1	1	0	1	0	0
739	995	0	1	1	0	0	0	1	1	0	1	0	1
740	996	0	1	1	0	0	0	1	1	0	1	1	0
741	997	0	1	1	0	0	0	1	1	0	1	1	1
742	998	0	1	1	0	0	0	1	1	1	0	0	0
743	999	0	1	1	0	0	0	1	1	1	0	0	1
744	1000	0	1	1	0	0	1	0	0	0	0	0	0
745	1001	0	1	1	0	0	1	0	0	0	0	0	1
746	1002	0	1	1	0	0	1	0	0	0	0	1	0
747	1003	0	1	1	0	0	1	0	0	0	0	1	1
748	1004	0	1	1	0	0	1	0	0	0	1	0	0
749	1005	0	1	1	0	0	1	0	0	0	1	0	1
750	1006	0	1	1	0	0	1	0	0	0	1	1	0
751	1007	0	1	1	0	0	1	0	0	0	1	1	1
752	1008	0	1	1	0	0	1	0	0	1	0	0	0
753	1009	0	1	1	0	0	1	0	0	1	0	0	1
754	1010	0	1	1	0	0	1	0	1	0	0	0	0
755	1011	0	1	1	0	0	1	0	1	0	0	0	1
756	1012	0	1	1	0	0	1	0	1	0	0	1	0
757	1013	0	1	1	0	0	1	0	1	0	0	1	1
758	1014	0	1	1	0	0	1	0	1	0	1	0	0
759	1015	0	1	1	0	0	1	0	1	0	1	0	1
760	1016	0	1	1	0	0	1	0	1	0	1	1	0
761	1017	0	1	1	0	0	1	0	1	0	1	1	1
762	1018	0	1	1	0	0	1	0	1	1	0	0	0
763	1019	0	1	1	0	0	1	0	1	1	0	0	1
764	1020	0	1	1	0	0	1	1	0	0	0	0	0
765	1021	0	1	1	0	0	1	1	0	0	0	0	1
766	1022	0	1	1	0	0	1	1	0	0	0	1	0
767	1023	0	1	1	0	0	1	1	0	0	0	1	1
768	1024	0	1	1	0	0	1	1	0	0	1	0	0
769	1025	0	1	1	0	0	1	1	0	0	1	0	1
770	1026	0	1	1	0	0	1	1	0	0	1	1	0
771	1027	0	1	1	0	0	1	1	0	0	1	1	1
772	1028	0	1	1	0	0	1	1	0	1	0	0	0
773	1029	0	1	1	0	0	1	1	0	1	0	0	1
774	1030	0	1	1	0	0	1	1	1	0	0	0	0
775	1031	0	1	1	0	0	1	1	1	0	0	0	1
776	1032	0	1	1	0	0	1	1	1	0	0	1	0
777	1033	0	1	1	0	0	1	1	1	0	0	1	1
778	1034	0	1	1	0	0	1	1	1	0	1	0	0
779	1035	0	1	1	0	0	1	1	1	0	1	0	1
780	1036	0	1	1	0	0	1	1	1	0	1	1	0
781	1037	0	1	1	0	0	1	1	1	0	1	1	1
782	1038	0	1	1	0	0	1	1	1	1	0	0	0
783	1039	0	1	1	0	0	1	1	1	1	0	0	1
784	1040	0	1	1	0	1	0	0	0	0	0	0	0
785	1041	0	1	1	0	1	0	0	0	0	0	0	1
786	1042	0	1	1	0	1	0	0	0	0	0	1	0
787	1043	0	1	1	0	1	0	0	0	0	0	1	1
788	1044	0	1	1	0	1	0	0	0	0	1	0	0
789	1045	0	1	1	0	1	0	0	0	0	1	0	1
790	1046	0	1	1	0	1	0	0	0	0	1	1	0
791	1047	0	1	1	0	1	0	0	0	0	1	1	1
792	1048	0	1	1	0	1	0	0	0	1	0	0	0
793	1049	0	1	1	0	1	0	0	0	1	0	0	1
794	1050	0	1	1	0	1	0	0	1	0	0	0	0
795	1051	0	1	1	0	1	0	0	1	0	0	0	1
796	1052	0	1	1	0	1	0	0	1	0	0	1	0
797	1053	0	1	1	0	1	0	0	1	0	0	1	1
798	1054	0	1	1	0	1	0	0	1	0	1	0	0
799	1055	0	1	1	0	1	0	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
800	1056	0	1	1	0	1	0	0	1	0	1	1	0
801	1057	0	1	1	0	1	0	0	1	0	1	1	1
802	1058	0	1	1	0	1	0	0	1	1	0	0	0
803	1059	0	1	1	0	1	0	0	1	1	0	0	1
804	1060	0	1	1	0	1	0	1	0	0	0	0	0
805	1061	0	1	1	0	1	0	1	0	0	0	0	1
806	1062	0	1	1	0	1	0	1	0	0	0	1	0
807	1063	0	1	1	0	1	0	1	0	0	0	1	1
808	1064	0	1	1	0	1	0	1	0	0	1	0	0
809	1065	0	1	1	0	1	0	1	0	0	1	0	1
810	1066	0	1	1	0	1	0	1	0	0	1	1	0
811	1067	0	1	1	0	1	0	1	0	0	1	1	1
812	1068	0	1	1	0	1	0	1	0	1	0	0	0
813	1069	0	1	1	0	1	0	1	0	1	0	0	1
814	1070	0	1	1	0	1	0	1	1	0	0	0	0
815	1071	0	1	1	0	1	0	1	1	0	0	0	1
816	1072	0	1	1	0	1	0	1	1	0	0	1	0
817	1073	0	1	1	0	1	0	1	1	0	0	1	1
818	1074	0	1	1	0	1	0	1	1	0	1	0	0
819	1075	0	1	1	0	1	0	1	1	0	1	0	1
820	1076	0	1	1	0	1	0	1	1	0	1	1	0
821	1077	0	1	1	0	1	0	1	1	0	1	1	1
822	1078	0	1	1	0	1	0	1	1	1	0	0	0
823	1079	0	1	1	0	1	0	1	1	1	0	0	1
824	1080	0	1	1	0	1	1	0	0	0	0	0	0
825	1081	0	1	1	0	1	1	0	0	0	0	0	1
826	1082	0	1	1	0	1	1	0	0	0	0	1	0
827	1083	0	1	1	0	1	1	0	0	0	0	1	1
828	1084	0	1	1	0	1	1	0	0	0	1	0	0
829	1085	0	1	1	0	1	1	0	0	0	1	0	1
830	1086	0	1	1	0	1	1	0	0	0	1	1	0
831	1087	0	1	1	0	1	1	0	0	0	1	1	1
832	1088	0	1	1	0	1	1	0	0	1	0	0	0
833	1089	0	1	1	0	1	1	0	0	1	0	0	1
834	1090	0	1	1	0	1	1	0	1	0	0	0	0
835	1091	0	1	1	0	1	1	0	1	0	0	0	1
836	1092	0	1	1	0	1	1	0	1	0	0	1	0
837	1093	0	1	1	0	1	1	0	1	0	0	1	1
838	1094	0	1	1	0	1	1	0	1	0	1	0	0
839	1095	0	1	1	0	1	1	0	1	0	1	0	1
840	1096	0	1	1	0	1	1	0	1	0	1	1	0
841	1097	0	1	1	0	1	1	0	1	0	1	1	1
842	1098	0	1	1	0	1	1	0	1	1	0	0	0
843	1099	0	1	1	0	1	1	0	1	1	0	0	1
844	1100	0	1	1	0	1	1	1	0	0	0	0	0
845	1101	0	1	1	0	1	1	1	0	0	0	0	1
846	1102	0	1	1	0	1	1	1	0	0	0	1	0
847	1103	0	1	1	0	1	1	1	0	0	0	1	1
848	1104	0	1	1	0	1	1	1	0	0	1	0	0
849	1105	0	1	1	0	1	1	1	0	0	1	0	1
850	1106	0	1	1	0	1	1	1	0	0	1	1	0
851	1107	0	1	1	0	1	1	1	0	0	1	1	1
852	1108	0	1	1	0	1	1	1	0	1	0	0	0
853	1109	0	1	1	0	1	1	1	0	1	0	0	1
854	1110	0	1	1	0	1	1	1	1	0	0	0	0
855	1111	0	1	1	0	1	1	1	1	0	0	0	1
856	1112	0	1	1	0	1	1	1	1	0	0	1	0
857	1113	0	1	1	0	1	1	1	1	0	0	1	1
858	1114	0	1	1	0	1	1	1	1	0	1	0	0
859	1115	0	1	1	0	1	1	1	1	0	1	0	1
860	1116	0	1	1	0	1	1	1	1	0	1	1	0
861	1117	0	1	1	0	1	1	1	1	0	1	1	1
862	1118	0	1	1	0	1	1	1	1	1	0	0	0
863	1119	0	1	1	0	1	1	1	1	1	0	0	1
864	1120	0	1	1	1	0	0	0	0	0	0	0	0
865	1121	0	1	1	1	0	0	0	0	0	0	0	1
866	1122	0	1	1	1	0	0	0	0	0	0	1	0
867	1123	0	1	1	1	0	0	0	0	0	0	1	1
868	1124	0	1	1	1	0	0	0	0	0	1	0	0
869	1125	0	1	1	1	0	0	0	0	0	1	0	1
870	1126	0	1	1	1	0	0	0	0	0	1	1	0
871	1127	0	1	1	1	0	0	0	0	0	1	1	1
872	1128	0	1	1	1	0	0	0	0	1	0	0	0
873	1129	0	1	1	1	0	0	0	0	1	0	0	1
874	1130	0	1	1	1	0	0	0	1	0	0	0	0
875	1131	0	1	1	1	0	0	0	1	0	0	0	1
876	1132	0	1	1	1	0	0	0	1	0	0	1	0
877	1133	0	1	1	1	0	0	0	1	0	0	1	1
878	1134	0	1	1	1	0	0	0	1	0	1	0	0
879	1135	0	1	1	1	0	0	0	1	0	1	0	1
880	1136	0	1	1	1	0	0	0	1	0	1	1	0
881	1137	0	1	1	1	0	0	0	1	0	1	1	1
882	1138	0	1	1	1	0	0	0	1	1	0	0	0
883	1139	0	1	1	1	0	0	0	1	1	0	0	1
884	1140	0	1	1	1	0	0	1	0	0	0	0	0
885	1141	0	1	1	1	0	0	1	0	0	0	0	1
886	1142	0	1	1	1	0	0	1	0	0	0	1	0
887	1143	0	1	1	1	0	0	1	0	0	0	1	1
888	1144	0	1	1	1	0	0	1	0	0	1	0	0
889	1145	0	1	1	1	0	0	1	0	0	1	0	1
890	1146	0	1	1	1	0	0	1	0	0	1	1	0
891	1147	0	1	1	1	0	0	1	0	0	1	1	1
892	1148	0	1	1	1	0	0	1	0	1	0	0	0
893	1149	0	1	1	1	0	0	1	0	1	0	0	1
894	1150	0	1	1	1	0	0	1	1	0	0	0	0
895	1151	0	1	1	1	0	0	1	1	0	0	0	1
896	1152	0	1	1	1	0	0	1	1	0	0	1	0
897	1153	0	1	1	1	0	0	1	1	0	0	1	1
898	1154	0	1	1	1	0	0	1	1	0	1	0	0
899	1155	0	1	1	1	0	0	1	1	0	1	0	1

WARNING: Disconnect primary power prior to servicing.

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
900	1156	0	1	1	1	0	0	1	1	0	1	1	0
901	1157	0	1	1	1	0	0	1	1	0	1	1	1
902	1158	0	1	1	1	0	0	1	1	1	0	0	0
903	1159	0	1	1	1	0	0	1	1	1	0	0	1
904	1160	0	1	1	1	0	1	0	0	0	0	0	0
905	1161	0	1	1	1	0	1	0	0	0	0	0	1
906	1162	0	1	1	1	0	1	0	0	0	0	1	0
907	1163	0	1	1	1	0	1	0	0	0	0	1	1
908	1164	0	1	1	1	0	1	0	0	0	1	0	0
909	1165	0	1	1	1	0	1	0	0	0	1	0	1
910	1166	0	1	1	1	0	1	0	0	0	1	1	0
911	1167	0	1	1	1	0	1	0	0	0	1	1	1
912	1168	0	1	1	1	0	1	0	0	1	0	0	0
913	1169	0	1	1	1	0	1	0	0	1	0	0	1
914	1170	0	1	1	1	0	1	0	1	0	0	0	0
915	1171	0	1	1	1	0	1	0	1	0	0	0	1
916	1172	0	1	1	1	0	1	0	1	0	0	1	0
917	1173	0	1	1	1	0	1	0	1	0	0	1	1
918	1174	0	1	1	1	0	1	0	1	0	1	0	0
919	1175	0	1	1	1	0	1	0	1	0	1	0	1
920	1176	0	1	1	1	0	1	0	1	0	1	1	0
921	1177	0	1	1	1	0	1	0	1	0	1	1	1
922	1178	0	1	1	1	0	1	0	1	1	0	0	0
923	1179	0	1	1	1	0	1	0	1	1	0	0	1
924	1180	0	1	1	1	0	1	1	0	0	0	0	0
925	1181	0	1	1	1	0	1	1	0	0	0	0	1
926	1182	0	1	1	1	0	1	1	0	0	0	1	0
927	1183	0	1	1	1	0	1	1	0	0	0	1	1
928	1184	0	1	1	1	0	1	1	0	0	1	0	0
929	1185	0	1	1	1	0	1	1	0	0	1	0	1
930	1186	0	1	1	1	0	1	1	0	0	1	1	0
931	1187	0	1	1	1	0	1	1	0	0	1	1	1
932	1188	0	1	1	1	0	1	1	0	1	0	0	0
933	1189	0	1	1	1	0	1	1	0	1	0	0	1
934	1190	0	1	1	1	0	1	1	1	0	0	0	0
935	1191	0	1	1	1	0	1	1	1	0	0	0	1
936	1192	0	1	1	1	0	1	1	1	0	0	1	0
937	1193	0	1	1	1	0	1	1	1	0	0	1	1
938	1194	0	1	1	1	0	1	1	1	0	1	0	0
939	1195	0	1	1	1	0	1	1	1	0	1	0	1
940	1196	0	1	1	1	0	1	1	1	0	1	1	0
941	1197	0	1	1	1	0	1	1	1	0	1	1	1
942	1198	0	1	1	1	0	1	1	1	1	0	0	0
943	1199	0	1	1	1	0	1	1	1	1	0	0	1
944	1200	0	1	1	1	1	0	0	0	0	0	0	0
945	1201	0	1	1	1	1	0	0	0	0	0	0	1
946	1202	0	1	1	1	1	0	0	0	0	0	1	0
947	1203	0	1	1	1	1	0	0	0	0	0	1	1
948	1204	0	1	1	1	1	0	0	0	0	1	0	0
949	1205	0	1	1	1	1	0	0	0	0	1	0	1
950	1206	0	1	1	1	1	0	0	0	0	1	1	0
951	1207	0	1	1	1	1	0	0	0	0	1	1	1
952	1208	0	1	1	1	1	0	0	0	1	0	0	0
953	1209	0	1	1	1	1	0	0	0	1	0	0	1
954	1210	0	1	1	1	1	0	0	1	0	0	0	0
955	1211	0	1	1	1	1	0	0	1	0	0	0	1
956	1212	0	1	1	1	1	0	0	1	0	0	1	0
957	1213	0	1	1	1	1	0	0	1	0	0	1	1
958	1214	0	1	1	1	1	0	0	1	0	1	0	0
959	1215	0	1	1	1	1	0	0	1	0	1	0	1
960	1216	0	1	1	1	1	0	0	1	0	1	1	0
961	1217	0	1	1	1	1	0	0	1	0	1	1	1
962	1218	0	1	1	1	1	0	0	1	1	0	0	0
963	1219	0	1	1	1	1	0	0	1	1	0	0	1
964	1220	0	1	1	1	1	0	1	0	0	0	0	0
965	1221	0	1	1	1	1	0	1	0	0	0	0	1
966	1222	0	1	1	1	1	0	1	0	0	0	1	0
967	1223	0	1	1	1	1	0	1	0	0	0	1	1
968	1224	0	1	1	1	1	0	1	0	0	1	0	0
969	1225	0	1	1	1	1	0	1	0	0	1	0	1
970	1226	0	1	1	1	1	0	1	0	0	1	1	0
971	1227	0	1	1	1	1	0	1	0	0	1	1	1
972	1228	0	1	1	1	1	0	1	0	1	0	0	0
973	1229	0	1	1	1	1	0	1	0	1	0	0	1
974	1230	0	1	1	1	1	0	1	1	0	0	0	0
975	1231	0	1	1	1	1	0	1	1	0	0	0	1
976	1232	0	1	1	1	1	0	1	1	0	0	1	0
977	1233	0	1	1	1	1	0	1	1	0	0	1	1
978	1234	0	1	1	1	1	0	1	1	0	1	0	0
979	1235	0	1	1	1	1	0	1	1	0	1	0	1
980	1236	0	1	1	1	1	0	1	1	0	1	1	0
981	1237	0	1	1	1	1	0	1	1	0	1	1	1
982	1238	0	1	1	1	1	0	1	1	1	0	0	0
983	1239	0	1	1	1	1	0	1	1	1	0	0	1
984	1240	0	1	1	1	1	1	0	0	0	0	0	0
985	1241	0	1	1	1	1	1	0	0	0	0	0	1
986	1242	0	1	1	1	1	1	0	0	0	0	1	0
987	1243	0	1	1	1	1	1	0	0	0	0	1	1
988	1244	0	1	1	1	1	1	0	0	0	1	0	0
989	1245	0	1	1	1	1	1	0	0	0	1	0	1
990	1246	0	1	1	1	1	1	0	0	0	1	1	0
991	1247	0	1	1	1	1	1	0	0	0	1	1	1
992	1248	0	1	1	1	1	1	0	0	1	0	0	0
993	1249	0	1	1	1	1	1	0	0	1	0	0	1
994	1250	0	1	1	1	1	1	0	1	0	0	0	0
995	1251	0	1	1	1	1	1	0	1	0	0	0	1
996	1252	0	1	1	1	1	1	0	1	0	0	1	0
997	1253	0	1	1	1	1	1	0	1	0	0	1	1
998	1254	0	1	1	1	1	1	0	1	0	1	0	0
999	1255	0	1	1	1	1	1	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1000	1256	0	1	1	1	1	1	0	1	0	1	1	0
1001	1257	0	1	1	1	1	1	0	1	0	1	1	1
1002	1258	0	1	1	1	1	1	0	1	1	0	0	0
1003	1259	0	1	1	1	1	1	0	1	1	0	0	1
1004	1260	0	1	1	1	1	1	1	0	0	0	0	0
1005	1261	0	1	1	1	1	1	1	0	0	0	0	1
1006	1262	0	1	1	1	1	1	1	0	0	0	1	0
1007	1263	0	1	1	1	1	1	1	0	0	0	1	1
1008	1264	0	1	1	1	1	1	1	0	0	1	0	0
1009	1265	0	1	1	1	1	1	1	0	0	1	0	1
1010	1266	0	1	1	1	1	1	1	0	0	1	1	0
1011	1267	0	1	1	1	1	1	1	0	0	1	1	1
1012	1268	0	1	1	1	1	1	1	0	1	0	0	0
1013	1269	0	1	1	1	1	1	1	0	1	0	0	1
1014	1270	0	1	1	1	1	1	1	1	0	0	0	0
1015	1271	0	1	1	1	1	1	1	1	0	0	0	1
1016	1272	0	1	1	1	1	1	1	1	0	0	1	0
1017	1273	0	1	1	1	1	1	1	1	0	0	1	1
1018	1274	0	1	1	1	1	1	1	1	0	1	0	0
1019	1275	0	1	1	1	1	1	1	1	0	1	0	1
1020	1276	0	1	1	1	1	1	1	1	0	1	1	0
1021	1277	0	1	1	1	1	1	1	1	0	1	1	1
1022	1278	0	1	1	1	1	1	1	1	1	0	0	0
1023	1279	0	1	1	1	1	1	1	1	1	0	0	1
1024	1280	1	0	0	0	0	0	0	0	0	0	0	0
1025	1281	1	0	0	0	0	0	0	0	0	0	0	1
1026	1282	1	0	0	0	0	0	0	0	0	0	1	0
1027	1283	1	0	0	0	0	0	0	0	0	0	1	1
1028	1284	1	0	0	0	0	0	0	0	0	1	0	0
1029	1285	1	0	0	0	0	0	0	0	0	1	0	1
1030	1286	1	0	0	0	0	0	0	0	0	1	1	0
1031	1287	1	0	0	0	0	0	0	0	0	1	1	1
1032	1288	1	0	0	0	0	0	0	0	1	0	0	0
1033	1289	1	0	0	0	0	0	0	0	1	0	0	1
1034	1290	1	0	0	0	0	0	0	1	0	0	0	0
1035	1291	1	0	0	0	0	0	0	1	0	0	0	1
1036	1292	1	0	0	0	0	0	0	1	0	0	1	0
1037	1293	1	0	0	0	0	0	0	1	0	0	1	1
1038	1294	1	0	0	0	0	0	0	1	0	1	0	0
1039	1295	1	0	0	0	0	0	0	1	0	1	0	1
1040	1296	1	0	0	0	0	0	0	1	0	1	1	0
1041	1297	1	0	0	0	0	0	0	1	0	1	1	1
1042	1298	1	0	0	0	0	0	0	1	1	0	0	0
1043	1299	1	0	0	0	0	0	0	1	1	0	0	1
1044	1300	1	0	0	0	0	0	1	0	0	0	0	0
1045	1301	1	0	0	0	0	0	1	0	0	0	0	1
1046	1302	1	0	0	0	0	0	1	0	0	0	1	0
1047	1303	1	0	0	0	0	0	1	0	0	0	1	1
1048	1304	1	0	0	0	0	0	1	0	0	1	0	0
1049	1305	1	0	0	0	0	0	1	0	0	1	0	1
1050	1306	1	0	0	0	0	0	1	0	0	1	1	0
1051	1307	1	0	0	0	0	0	1	0	0	1	1	1
1052	1308	1	0	0	0	0	0	1	0	1	0	0	0
1053	1309	1	0	0	0	0	0	1	0	1	0	0	1
1054	1310	1	0	0	0	0	0	1	1	0	0	0	0
1055	1311	1	0	0	0	0	0	1	1	0	0	0	1
1056	1312	1	0	0	0	0	0	1	1	0	0	1	0
1057	1313	1	0	0	0	0	0	1	1	0	0	1	1
1058	1314	1	0	0	0	0	0	1	1	0	1	0	0
1059	1315	1	0	0	0	0	0	1	1	0	1	0	1
1060	1316	1	0	0	0	0	0	1	1	0	1	1	0
1061	1317	1	0	0	0	0	0	1	1	0	1	1	1
1062	1318	1	0	0	0	0	0	1	1	1	0	0	0
1063	1319	1	0	0	0	0	0	1	1	1	0	0	1
1064	1320	1	0	0	0	0	1	0	0	0	0	0	0
1065	1321	1	0	0	0	0	1	0	0	0	0	0	1
1066	1322	1	0	0	0	0	1	0	0	0	0	1	0
1067	1323	1	0	0	0	0	1	0	0	0	0	1	1
1068	1324	1	0	0	0	0	1	0	0	0	1	0	0
1069	1325	1	0	0	0	0	1	0	0	0	1	0	1
1070	1326	1	0	0	0	0	1	0	0	0	1	1	0
1071	1327	1	0	0	0	0	1	0	0	0	1	1	1
1072	1328	1	0	0	0	0	1	0	0	1	0	0	0
1073	1329	1	0	0	0	0	1	0	0	1	0	0	1
1074	1330	1	0	0	0	0	1	0	1	0	0	0	0
1075	1331	1	0	0	0	0	1	0	1	0	0	0	1
1076	1332	1	0	0	0	0	1	0	1	0	0	1	0
1077	1333	1	0	0	0	0	1	0	1	0	0	1	1
1078	1334	1	0	0	0	0	1	0	1	0	1	0	0
1079	1335	1	0	0	0	0	1	0	1	0	1	0	1
1080	1336	1	0	0	0	0	1	0	1	0	1	1	0
1081	1337	1	0	0	0	0	1	0	1	0	1	1	1
1082	1338	1	0	0	0	0	1	0	1	1	0	0	0
1083	1339	1	0	0	0	0	1	0	1	1	0	0	1
1084	1340	1	0	0	0	0	1	1	0	0	0	0	0
1085	1341	1	0	0	0	0	1	1	0	0	0	0	1
1086	1342	1	0	0	0	0	1	1	0	0	0	1	0
1087	1343	1	0	0	0	0	1	1	0	0	0	1	1
1088	1344	1	0	0	0	0	1	1	0	0	1	0	0
1089	1345	1	0	0	0	0	1	1	0	0	1	0	1
1090	1346	1	0	0	0	0	1	1	0	0	1	1	0
1091	1347	1	0	0	0	0	1	1	0	0	1	1	1
1092	1348	1	0	0	0	0	1	1	0	1	0	0	0
1093	1349	1	0	0	0	0	1	1	0	1	0	0	1
1094	1350	1	0	0	0	0	1	1	1	0	0	0	0
1095	1351	1	0	0	0	0	1	1	1	0	0	0	1
1096	1352	1	0	0	0	0	1	1	1	0	0	1	0
1097	1353	1	0	0	0	0	1	1	1	0	0	1	1
1098	1354	1	0	0	0	0	1	1	1	0	1	0	0
1099	1355	1	0	0	0	0	1	1	1	0	1	0	1

WARNING: Disconnect primary power prior to servicing.

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1100	1356	1	0	0	0	0	1	1	1	0	1	1	0
1101	1357	1	0	0	0	0	1	1	1	0	1	1	1
1102	1358	1	0	0	0	0	1	1	1	1	0	0	0
1103	1359	1	0	0	0	0	1	1	1	1	0	0	1
1104	1360	1	0	0	0	1	0	0	0	0	0	0	0
1105	1361	1	0	0	0	1	0	0	0	0	0	0	1
1106	1362	1	0	0	0	1	0	0	0	0	0	1	0
1107	1363	1	0	0	0	1	0	0	0	0	0	1	1
1108	1364	1	0	0	0	1	0	0	0	0	1	0	0
1109	1365	1	0	0	0	1	0	0	0	0	1	0	1
1110	1366	1	0	0	0	1	0	0	0	0	1	1	0
1111	1367	1	0	0	0	1	0	0	0	0	1	1	1
1112	1368	1	0	0	0	1	0	0	0	1	0	0	0
1113	1369	1	0	0	0	1	0	0	0	1	0	0	1
1114	1370	1	0	0	0	1	0	0	1	0	0	0	0
1115	1371	1	0	0	0	1	0	0	1	0	0	0	1
1116	1372	1	0	0	0	1	0	0	1	0	0	1	0
1117	1373	1	0	0	0	1	0	0	1	0	0	1	1
1118	1374	1	0	0	0	1	0	0	1	0	1	0	0
1119	1375	1	0	0	0	1	0	0	1	0	1	0	1
1120	1376	1	0	0	0	1	0	0	1	0	1	1	0
1121	1377	1	0	0	0	1	0	0	1	0	1	1	1
1122	1378	1	0	0	0	1	0	0	1	1	0	0	0
1123	1379	1	0	0	0	1	0	0	1	1	0	0	1
1124	1380	1	0	0	0	1	0	1	0	0	0	0	0
1125	1381	1	0	0	0	1	0	1	0	0	0	0	1
1126	1382	1	0	0	0	1	0	1	0	0	0	1	0
1127	1383	1	0	0	0	1	0	1	0	0	0	1	1
1128	1384	1	0	0	0	1	0	1	0	0	1	0	0
1129	1385	1	0	0	0	1	0	1	0	0	1	0	1
1130	1386	1	0	0	0	1	0	1	0	0	1	1	0
1131	1387	1	0	0	0	1	0	1	0	0	1	1	1
1132	1388	1	0	0	0	1	0	1	0	1	0	0	0
1133	1389	1	0	0	0	1	0	1	0	1	0	0	1
1134	1390	1	0	0	0	1	0	1	1	0	0	0	0
1135	1391	1	0	0	0	1	0	1	1	0	0	0	1
1136	1392	1	0	0	0	1	0	1	1	0	0	1	0
1137	1393	1	0	0	0	1	0	1	1	0	0	1	1
1138	1394	1	0	0	0	1	0	1	1	0	1	0	0
1139	1395	1	0	0	0	1	0	1	1	0	1	0	1
1140	1396	1	0	0	0	1	0	1	1	0	1	1	0
1141	1397	1	0	0	0	1	0	1	1	0	1	1	1
1142	1398	1	0	0	0	1	0	1	1	1	0	0	0
1143	1399	1	0	0	0	1	0	1	1	1	0	0	1
1144	1400	1	0	0	0	1	1	0	0	0	0	0	0
1145	1401	1	0	0	0	1	1	0	0	0	0	0	1
1146	1402	1	0	0	0	1	1	0	0	0	0	1	0
1147	1403	1	0	0	0	1	1	0	0	0	0	1	1
1148	1404	1	0	0	0	1	1	0	0	0	1	0	0
1149	1405	1	0	0	0	1	1	0	0	0	1	0	1
1150	1406	1	0	0	0	1	1	0	0	0	1	1	0
1151	1407	1	0	0	0	1	1	0	0	0	1	1	1
1152	1408	1	0	0	0	1	1	0	0	1	0	0	0
1153	1409	1	0	0	0	1	1	0	0	1	0	0	1
1154	1410	1	0	0	0	1	1	0	1	0	0	0	0
1155	1411	1	0	0	0	1	1	0	1	0	0	0	1
1156	1412	1	0	0	0	1	1	0	1	0	0	1	0
1157	1413	1	0	0	0	1	1	0	1	0	0	1	1
1158	1414	1	0	0	0	1	1	0	1	0	1	0	0
1159	1415	1	0	0	0	1	1	0	1	0	1	0	1
1160	1416	1	0	0	0	1	1	0	1	0	1	1	0
1161	1417	1	0	0	0	1	1	0	1	0	1	1	1
1162	1418	1	0	0	0	1	1	0	1	1	0	0	0
1163	1419	1	0	0	0	1	1	0	1	1	0	0	1
1164	1420	1	0	0	0	1	1	1	0	0	0	0	0
1165	1421	1	0	0	0	1	1	1	0	0	0	0	1
1166	1422	1	0	0	0	1	1	1	0	0	0	1	0
1167	1423	1	0	0	0	1	1	1	0	0	0	1	1
1168	1424	1	0	0	0	1	1	1	0	0	1	0	0
1169	1425	1	0	0	0	1	1	1	0	0	1	0	1
1170	1426	1	0	0	0	1	1	1	0	0	1	1	0
1171	1427	1	0	0	0	1	1	1	0	0	1	1	1
1172	1428	1	0	0	0	1	1	1	0	1	0	0	0
1173	1429	1	0	0	0	1	1	1	0	1	0	0	1
1174	1430	1	0	0	0	1	1	1	0	1	0	1	0
1175	1431	1	0	0	0	1	1	1	1	0	0	0	1
1176	1432	1	0	0	0	1	1	1	1	0	0	1	0
1177	1433	1	0	0	0	1	1	1	1	0	0	1	1
1178	1434	1	0	0	0	1	1	1	1	0	1	0	0
1179	1435	1	0	0	0	1	1	1	1	0	1	0	1
1180	1436	1	0	0	0	1	1	1	1	0	1	1	0
1181	1437	1	0	0	0	1	1	1	1	0	1	1	1
1182	1438	1	0	0	0	1	1	1	1	1	0	0	0
1183	1439	1	0	0	0	1	1	1	1	1	0	0	1
1184	1440	1	0	0	1	0	0	0	0	0	0	0	0
1185	1441	1	0	0	1	0	0	0	0	0	0	0	1
1186	1442	1	0	0	1	0	0	0	0	0	0	1	0
1187	1443	1	0	0	1	0	0	0	0	0	0	1	1
1188	1444	1	0	0	1	0	0	0	0	0	1	0	0
1189	1445	1	0	0	1	0	0	0	0	0	1	0	1
1190	1446	1	0	0	1	0	0	0	0	0	1	1	0
1191	1447	1	0	0	1	0	0	0	0	0	1	1	1
1192	1448	1	0	0	1	0	0	0	0	1	0	0	0
1193	1449	1	0	0	1	0	0	0	0	1	0	0	1
1194	1450	1	0	0	1	0	0	0	1	0	0	0	0
1195	1451	1	0	0	1	0	0	0	1	0	0	0	1
1196	1452	1	0	0	1	0	0	0	1	0	0	1	0
1197	1453	1	0	0	1	0	0	0	1	0	0	1	1
1198	1454	1	0	0	1	0	0	0	1	0	1	0	0
1199	1455	1	0	0	1	0	0	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1200	1456	1	0	0	1	0	0	0	1	0	1	1	0
1201	1457	1	0	0	1	0	0	0	1	0	1	1	1
1202	1458	1	0	0	1	0	0	0	1	1	0	0	0
1203	1459	1	0	0	1	0	0	0	1	1	0	0	1
1204	1460	1	0	0	1	0	0	1	0	0	0	0	0
1205	1461	1	0	0	1	0	0	1	0	0	0	0	1
1206	1462	1	0	0	1	0	0	1	0	0	0	1	0
1207	1463	1	0	0	1	0	0	1	0	0	0	1	1
1208	1464	1	0	0	1	0	0	1	0	0	1	0	0
1209	1465	1	0	0	1	0	0	1	0	0	1	0	1
1210	1466	1	0	0	1	0	0	1	0	0	1	1	0
1211	1467	1	0	0	1	0	0	1	0	0	1	1	1
1212	1468	1	0	0	1	0	0	1	0	1	0	0	0
1213	1469	1	0	0	1	0	0	1	0	1	0	0	1
1214	1470	1	0	0	1	0	0	1	1	0	0	0	0
1215	1471	1	0	0	1	0	0	1	1	0	0	0	1
1216	1472	1	0	0	1	0	0	1	1	0	0	1	0
1217	1473	1	0	0	1	0	0	1	1	0	0	1	1
1218	1474	1	0	0	1	0	0	1	1	0	1	0	0
1219	1475	1	0	0	1	0	0	1	1	0	1	0	1
1220	1476	1	0	0	1	0	0	1	1	0	1	1	0
1221	1477	1	0	0	1	0	0	1	1	0	1	1	1
1222	1478	1	0	0	1	0	0	1	1	1	0	0	0
1223	1479	1	0	0	1	0	0	1	1	1	0	0	1
1224	1480	1	0	0	1	0	1	0	0	0	0	0	0
1225	1481	1	0	0	1	0	1	0	0	0	0	0	1
1226	1482	1	0	0	1	0	1	0	0	0	0	1	0
1227	1483	1	0	0	1	0	1	0	0	0	0	1	1
1228	1484	1	0	0	1	0	1	0	0	0	1	0	0
1229	1485	1	0	0	1	0	1	0	0	0	1	0	1
1230	1486	1	0	0	1	0	1	0	0	0	1	1	0
1231	1487	1	0	0	1	0	1	0	0	0	1	1	1
1232	1488	1	0	0	1	0	1	0	0	1	0	0	0
1233	1489	1	0	0	1	0	1	0	0	1	0	0	1
1234	1490	1	0	0	1	0	1	0	1	0	0	0	0
1235	1491	1	0	0	1	0	1	0	1	0	0	0	1
1236	1492	1	0	0	1	0	1	0	1	0	0	1	0
1237	1493	1	0	0	1	0	1	0	1	0	0	1	1
1238	1494	1	0	0	1	0	1	0	1	0	1	0	0
1239	1495	1	0	0	1	0	1	0	1	0	1	0	1
1240	1496	1	0	0	1	0	1	0	1	0	1	1	0
1241	1497	1	0	0	1	0	1	0	1	0	1	1	1
1242	1498	1	0	0	1	0	1	0	1	1	0	0	0
1243	1499	1	0	0	1	0	1	0	1	1	0	0	1
1244	1500	1	0	0	1	0	1	1	0	0	0	0	0
1245	1501	1	0	0	1	0	1	1	0	0	0	0	1
1246	1502	1	0	0	1	0	1	1	0	0	0	1	0
1247	1503	1	0	0	1	0	1	1	0	0	0	1	1
1248	1504	1	0	0	1	0	1	1	0	0	1	0	0
1249	1505	1	0	0	1	0	1	1	0	0	1	0	1
1250	1506	1	0	0	1	0	1	1	0	0	1	1	0
1251	1507	1	0	0	1	0	1	1	0	0	1	1	1
1252	1508	1	0	0	1	0	1	1	0	1	0	0	0
1253	1509	1	0	0	1	0	1	1	0	1	0	0	1
1254	1510	1	0	0	1	0	1	1	1	0	0	0	0
1255	1511	1	0	0	1	0	1	1	1	0	0	0	1
1256	1512	1	0	0	1	0	1	1	1	0	0	1	0
1257	1513	1	0	0	1	0	1	1	1	0	0	1	1
1258	1514	1	0	0	1	0	1	1	1	0	1	0	0
1259	1515	1	0	0	1	0	1	1	1	0	1	0	1
1260	1516	1	0	0	1	0	1	1	1	0	1	1	0
1261	1517	1	0	0	1	0	1	1	1	0	1	1	1
1262	1518	1	0	0	1	0	1	1	1	1	0	0	0
1263	1519	1	0	0	1	0	1	1	1	1	0	0	1
1264	1520	1	0	0	1	1	0	0	0	0	0	0	0
1265	1521	1	0	0	1	1	0	0	0	0	0	0	1
1266	1522	1	0	0	1	1	0	0	0	0	0	1	0
1267	1523	1	0	0	1	1	0	0	0	0	0	1	1
1268	1524	1	0	0	1	1	0	0	0	0	1	0	0
1269	1525	1	0	0	1	1	0	0	0	0	1	0	1
1270	1526	1	0	0	1	1	0	0	0	0	1	1	0
1271	1527	1	0	0	1	1	0	0	0	0	1	1	1
1272	1528	1	0	0	1	1	0	0	0	1	0	0	0
1273	1529	1	0	0	1	1	0	0	0	1	0	0	1
1274	1530	1	0	0	1	1	0	0	1	0	0	0	0
1275	1531	1	0	0	1	1	0	0	1	0	0	0	1
1276	1532	1	0	0	1	1	0	0	1	0	0	1	0
1277	1533	1	0	0	1	1	0	0	1	0	0	1	1
1278	1534	1	0	0	1	1	0	0	1	0	1	0	0
1279	1535	1	0	0	1	1	0	0	1	0	1	0	1
1280	1536	1	0	0	1	1	0	0	1	0	1	1	0
1281	1537	1	0	0	1	1	0	0	1	0	1	1	1
1282	1538	1	0	0	1	1	0	0	1	1	0	0	0
1283	1539	1	0	0	1	1	0	0	1	1	0	0	1
1284	1540	1	0	0	1	1	0	1	0	0	0	0	0
1285	1541	1	0	0	1	1	0	1	0	0	0	0	1
1286	1542	1	0	0	1	1	0	1	0	0	0	1	0
1287	1543	1	0	0	1	1	0	1	0	0	0	1	1
1288	1544	1	0	0	1	1	0	1	0	0	1	0	0
1289	1545	1	0	0	1	1	0	1	0	0	1	0	1
1290	1546	1	0	0	1	1	0	1	0	0	1	1	0
1291	1547	1	0	0	1	1	0	1	0	0	1	1	1
1292	1548	1	0	0	1	1	0	1	0	1	0	0	0
1293	1549	1	0	0	1	1	0	1	0	1	0	0	1
1294	1550	1	0	0	1	1	0	1	1	0	0	0	0
1295	1551	1	0	0	1	1	0	1	1	0	0	0	1
1296	1552	1	0	0	1	1	0	1	1	0	0	1	0
1297	1553	1	0	0	1	1	0	1	1	0	0	1	1
1298	1554	1	0	0	1	1	0	1	1	0	1	0	0
1299	1555	1	0	0	1	1	0	1	1	0	1	0	1

WARNING: Disconnect primary power prior to servicing.

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1300	1556	1	0	0	1	1	0	1	1	0	1	1	0
1301	1557	1	0	0	1	1	0	1	1	0	1	1	1
1302	1558	1	0	0	1	1	0	1	1	1	0	0	0
1303	1559	1	0	0	1	1	0	1	1	1	0	0	1
1304	1560	1	0	0	1	1	1	0	0	0	0	0	0
1305	1561	1	0	0	1	1	1	0	0	0	0	0	1
1306	1562	1	0	0	1	1	1	0	0	0	0	1	0
1307	1563	1	0	0	1	1	1	0	0	0	0	1	1
1308	1564	1	0	0	1	1	1	0	0	0	1	0	0
1309	1565	1	0	0	1	1	1	0	0	0	1	0	1
1310	1566	1	0	0	1	1	1	0	0	0	1	1	0
1311	1567	1	0	0	1	1	1	0	0	0	1	1	1
1312	1568	1	0	0	1	1	1	0	0	1	0	0	0
1313	1569	1	0	0	1	1	1	0	0	1	0	0	1
1314	1570	1	0	0	1	1	1	0	1	0	0	0	0
1315	1571	1	0	0	1	1	1	0	1	0	0	0	1
1316	1572	1	0	0	1	1	1	0	1	0	0	1	0
1317	1573	1	0	0	1	1	1	0	1	0	0	1	1
1318	1574	1	0	0	1	1	1	0	1	0	1	0	0
1319	1575	1	0	0	1	1	1	0	1	0	1	0	1
1320	1576	1	0	0	1	1	1	0	1	0	1	1	0
1321	1577	1	0	0	1	1	1	0	1	0	1	1	1
1322	1578	1	0	0	1	1	1	0	1	1	0	0	0
1323	1579	1	0	0	1	1	1	0	1	1	0	0	1
1324	1580	1	0	0	1	1	1	1	0	0	0	0	0
1325	1581	1	0	0	1	1	1	1	0	0	0	0	1
1326	1582	1	0	0	1	1	1	1	0	0	0	1	0
1327	1583	1	0	0	1	1	1	1	0	0	0	1	1
1328	1584	1	0	0	1	1	1	1	0	0	1	0	0
1329	1585	1	0	0	1	1	1	1	0	0	1	0	1
1330	1586	1	0	0	1	1	1	1	0	0	1	1	0
1331	1587	1	0	0	1	1	1	1	0	0	1	1	1
1332	1588	1	0	0	1	1	1	1	0	1	0	0	0
1333	1589	1	0	0	1	1	1	1	0	1	0	0	1
1334	1590	1	0	0	1	1	1	1	1	0	0	0	0
1335	1591	1	0	0	1	1	1	1	1	0	0	0	1
1336	1592	1	0	0	1	1	1	1	1	0	0	1	0
1337	1593	1	0	0	1	1	1	1	1	0	0	1	1
1338	1594	1	0	0	1	1	1	1	1	0	1	0	0
1339	1595	1	0	0	1	1	1	1	1	0	1	0	1
1340	1596	1	0	0	1	1	1	1	1	0	1	1	0
1341	1597	1	0	0	1	1	1	1	1	0	1	1	1
1342	1598	1	0	0	1	1	1	1	1	1	0	0	0
1343	1599	1	0	0	1	1	1	1	1	1	0	0	1
1344	1600	1	0	1	0	0	0	0	0	0	0	0	0
1345	1601	1	0	1	0	0	0	0	0	0	0	0	1
1346	1602	1	0	1	0	0	0	0	0	0	0	1	0
1347	1603	1	0	1	0	0	0	0	0	0	0	1	1
1348	1604	1	0	1	0	0	0	0	0	0	1	0	0
1349	1605	1	0	1	0	0	0	0	0	0	1	0	1
1350	1606	1	0	1	0	0	0	0	0	0	1	1	0
1351	1607	1	0	1	0	0	0	0	0	0	1	1	1
1352	1608	1	0	1	0	0	0	0	0	1	0	0	0
1353	1609	1	0	1	0	0	0	0	0	1	0	0	1
1354	1610	1	0	1	0	0	0	0	1	0	0	0	0
1355	1611	1	0	1	0	0	0	0	1	0	0	0	1
1356	1612	1	0	1	0	0	0	0	1	0	0	1	0
1357	1613	1	0	1	0	0	0	0	1	0	0	1	1
1358	1614	1	0	1	0	0	0	0	1	0	1	0	0
1359	1615	1	0	1	0	0	0	0	1	0	1	0	1
1360	1616	1	0	1	0	0	0	0	1	0	1	1	0
1361	1617	1	0	1	0	0	0	0	1	0	1	1	1
1362	1618	1	0	1	0	0	0	0	1	1	0	0	0
1363	1619	1	0	1	0	0	0	0	1	1	0	0	1
1364	1620	1	0	1	0	0	0	1	0	0	0	0	0
1365	1621	1	0	1	0	0	0	1	0	0	0	0	1
1366	1622	1	0	1	0	0	0	1	0	0	0	1	0
1367	1623	1	0	1	0	0	0	1	0	0	0	1	1
1368	1624	1	0	1	0	0	0	1	0	0	1	0	0
1369	1625	1	0	1	0	0	0	1	0	0	1	0	1
1370	1626	1	0	1	0	0	0	1	0	0	1	1	0
1371	1627	1	0	1	0	0	0	1	0	0	1	1	1
1372	1628	1	0	1	0	0	0	1	0	1	0	0	0
1373	1629	1	0	1	0	0	0	1	0	1	0	0	1
1374	1630	1	0	1	0	0	0	1	1	0	0	0	0
1375	1631	1	0	1	0	0	0	1	1	0	0	0	1
1376	1632	1	0	1	0	0	0	1	1	0	0	1	0
1377	1633	1	0	1	0	0	0	1	1	0	0	1	1
1378	1634	1	0	1	0	0	0	1	1	0	1	0	0
1379	1635	1	0	1	0	0	0	1	1	0	1	0	1
1380	1636	1	0	1	0	0	0	1	1	0	1	1	0
1381	1637	1	0	1	0	0	0	1	1	0	1	1	1
1382	1638	1	0	1	0	0	0	1	1	1	0	0	0
1383	1639	1	0	1	0	0	0	1	1	1	0	0	1
1384	1640	1	0	1	0	0	1	0	0	0	0	0	0
1385	1641	1	0	1	0	0	1	0	0	0	0	0	1
1386	1642	1	0	1	0	0	1	0	0	0	0	1	0
1387	1643	1	0	1	0	0	1	0	0	0	0	1	1
1388	1644	1	0	1	0	0	1	0	0	0	1	0	0
1389	1645	1	0	1	0	0	1	0	0	0	1	0	1
1390	1646	1	0	1	0	0	1	0	0	0	1	1	0
1391	1647	1	0	1	0	0	1	0	0	0	1	1	1
1392	1648	1	0	1	0	0	1	0	0	1	0	0	0
1393	1649	1	0	1	0	0	1	0	0	1	0	0	1
1394	1650	1	0	1	0	0	1	0	1	0	0	0	0
1395	1651	1	0	1	0	0	1	0	1	0	0	0	1
1396	1652	1	0	1	0	0	1	0	1	0	0	1	0
1397	1653	1	0	1	0	0	1	0	1	0	0	1	1
1398	1654	1	0	1	0	0	1	0	1	0	1	0	0
1399	1655	1	0	1	0	0	1	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1400	1656	1	0	1	0	0	1	0	1	0	1	1	0
1401	1657	1	0	1	0	0	1	0	1	0	1	1	1
1402	1658	1	0	1	0	0	1	0	1	1	0	0	0
1403	1659	1	0	1	0	0	1	0	1	1	0	0	1
1404	1660	1	0	1	0	0	1	1	0	0	0	0	0
1405	1661	1	0	1	0	0	1	1	0	0	0	0	1
1406	1662	1	0	1	0	0	1	1	0	0	0	1	0
1407	1663	1	0	1	0	0	1	1	0	0	0	1	1
1408	1664	1	0	1	0	0	1	1	0	0	1	0	0
1409	1665	1	0	1	0	0	1	1	0	0	1	0	1
1410	1666	1	0	1	0	0	1	1	0	0	1	1	0
1411	1667	1	0	1	0	0	1	1	0	0	1	1	1
1412	1668	1	0	1	0	0	1	1	0	1	0	0	0
1413	1669	1	0	1	0	0	1	1	0	1	0	0	1
1414	1670	1	0	1	0	0	1	1	1	0	0	0	0
1415	1671	1	0	1	0	0	1	1	1	0	0	0	1
1416	1672	1	0	1	0	0	1	1	1	0	0	1	0
1417	1673	1	0	1	0	0	1	1	1	0	0	1	1
1418	1674	1	0	1	0	0	1	1	1	0	1	0	0
1419	1675	1	0	1	0	0	1	1	1	0	1	0	1
1420	1676	1	0	1	0	0	1	1	1	0	1	1	0
1421	1677	1	0	1	0	0	1	1	1	0	1	1	1
1422	1678	1	0	1	0	0	1	1	1	1	0	0	0
1423	1679	1	0	1	0	0	1	1	1	1	0	0	1
1424	1680	1	0	1	0	1	0	0	0	0	0	0	0
1425	1681	1	0	1	0	1	0	0	0	0	0	0	1
1426	1682	1	0	1	0	1	0	0	0	0	0	1	0
1427	1683	1	0	1	0	1	0	0	0	0	0	1	1
1428	1684	1	0	1	0	1	0	0	0	0	1	0	0
1429	1685	1	0	1	0	1	0	0	0	0	1	0	1
1430	1686	1	0	1	0	1	0	0	0	0	1	1	0
1431	1687	1	0	1	0	1	0	0	0	0	0	1	1
1432	1688	1	0	1	0	1	0	0	0	1	0	0	0
1433	1689	1	0	1	0	1	0	0	0	1	0	0	1
1434	1690	1	0	1	0	1	0	0	1	0	0	0	0
1435	1691	1	0	1	0	1	0	0	1	0	0	0	1
1436	1692	1	0	1	0	1	0	0	1	0	0	1	0
1437	1693	1	0	1	0	1	0	0	1	0	0	1	1
1438	1694	1	0	1	0	1	0	0	1	0	1	0	0
1439	1695	1	0	1	0	1	0	0	1	0	1	0	1
1440	1696	1	0	1	0	1	0	0	1	0	1	1	0
1441	1697	1	0	1	0	1	0	0	1	0	1	1	1
1442	1698	1	0	1	0	1	0	0	1	1	0	0	0
1443	1699	1	0	1	0	1	0	0	1	1	0	0	1
1444	1700	1	0	1	0	1	0	1	0	0	0	0	0
1445	1701	1	0	1	0	1	0	1	0	0	0	0	1
1446	1702	1	0	1	0	1	0	1	0	0	0	1	0
1447	1703	1	0	1	0	1	0	1	0	0	0	1	1
1448	1704	1	0	1	0	1	0	1	0	0	1	0	0
1449	1705	1	0	1	0	1	0	1	0	0	1	0	1
1450	1706	1	0	1	0	1	0	1	0	0	1	1	0
1451	1707	1	0	1	0	1	0	1	0	0	1	1	1
1452	1708	1	0	1	0	1	0	1	0	1	0	0	0
1453	1709	1	0	1	0	1	0	1	0	1	0	0	1
1454	1710	1	0	1	0	1	0	1	1	0	0	0	0
1455	1711	1	0	1	0	1	0	1	1	0	0	0	1
1456	1712	1	0	1	0	1	0	1	1	0	0	1	0
1457	1713	1	0	1	0	1	0	1	1	0	0	1	1
1458	1714	1	0	1	0	1	0	1	1	0	1	0	0
1459	1715	1	0	1	0	1	0	1	1	0	1	0	1
1460	1716	1	0	1	0	1	0	1	1	0	1	1	0
1461	1717	1	0	1	0	1	0	1	1	0	1	1	1
1462	1718	1	0	1	0	1	0	1	1	1	0	0	0
1463	1719	1	0	1	0	1	0	1	1	1	0	0	1
1464	1720	1	0	1	0	1	1	0	0	0	0	0	0
1465	1721	1	0	1	0	1	1	0	0	0	0	0	1
1466	1722	1	0	1	0	1	1	0	0	0	0	1	0
1467	1723	1	0	1	0	1	1	0	0	0	0	1	1
1468	1724	1	0	1	0	1	1	0	0	0	1	0	0
1469	1725	1	0	1	0	1	1	0	0	0	1	0	1
1470	1726	1	0	1	0	1	1	0	0	0	1	1	0
1471	1727	1	0	1	0	1	1	0	0	0	1	1	1
1472	1728	1	0	1	0	1	1	0	0	1	0	0	0
1473	1729	1	0	1	0	1	1	0	0	1	0	0	1
1474	1730	1	0	1	0	1	1	0	1	0	0	0	0
1475	1731	1	0	1	0	1	1	0	1	0	0	0	1
1476	1732	1	0	1	0	1	1	0	1	0	0	1	0
1477	1733	1	0	1	0	1	1	0	1	0	0	1	1
1478	1734	1	0	1	0	1	1	0	1	0	1	0	0
1479	1735	1	0	1	0	1	1	0	1	0	1	0	1
1480	1736	1	0	1	0	1	1	0	1	0	1	1	0
1481	1737	1	0	1	0	1	1	0	1	0	1	1	1
1482	1738	1	0	1	0	1	1	0	1	1	0	0	0
1483	1739	1	0	1	0	1	1	0	1	1	0	0	1
1484	1740	1	0	1	0	1	1	1	0	0	0	0	0
1485	1741	1	0	1	0	1	1	1	0	0	0	0	1
1486	1742	1	0	1	0	1	1	1	0	0	0	1	0
1487	1743	1	0	1	0	1	1	1	0	0	0	1	1
1488	1744	1	0	1	0	1	1	1	0	0	1	0	0
1489	1745	1	0	1	0	1	1	1	0	0	1	0	1
1490	1746	1	0	1	0	1	1	1	0	0	1	1	0
1491	1747	1	0	1	0	1	1	1	0	0	1	1	1
1492	1748	1	0	1	0	1	1	1	0	1	0	0	0
1493	1749	1	0	1	0	1	1	1	0	1	0	0	1
1494	1750	1	0	1	0	1	1	1	1	0	0	0	0
1495	1751	1	0	1	0	1	1	1	1	0	0	0	1
1496	1752	1	0	1	0	1	1	1	1	0	0	1	0
1497	1753	1	0	1	0	1	1	1	1	0	0	1	1
1498	1754	1	0	1	0	1	1	1	1	0	1	0	0
1499	1755	1	0	1	0	1	1	1	1	0	1	0	1

WARNING: Disconnect primary power prior to servicing.

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1500	1756	1	0	1	0	1	1	1	1	0	1	1	0
1501	1757	1	0	1	0	1	1	1	1	0	1	1	1
1502	1758	1	0	1	0	1	1	1	1	0	0	0	0
1503	1759	1	0	1	0	1	1	1	1	0	0	0	1
1504	1760	1	0	1	1	0	0	0	0	0	0	0	0
1505	1761	1	0	1	1	0	0	0	0	0	0	0	1
1506	1762	1	0	1	1	0	0	0	0	0	0	1	0
1507	1763	1	0	1	1	0	0	0	0	0	0	1	1
1508	1764	1	0	1	1	0	0	0	0	0	1	0	0
1509	1765	1	0	1	1	0	0	0	0	0	1	0	1
1510	1766	1	0	1	1	0	0	0	0	0	1	1	0
1511	1767	1	0	1	1	0	0	0	0	0	1	1	1
1512	1768	1	0	1	1	0	0	0	0	1	0	0	0
1513	1769	1	0	1	1	0	0	0	0	1	0	0	1
1514	1770	1	0	1	1	0	0	0	1	0	0	0	0
1515	1771	1	0	1	1	0	0	0	1	0	0	0	1
1516	1772	1	0	1	1	0	0	0	1	0	0	1	0
1517	1773	1	0	1	1	0	0	0	1	0	0	1	1
1518	1774	1	0	1	1	0	0	0	1	0	1	0	0
1519	1775	1	0	1	1	0	0	0	1	0	1	0	1
1520	1776	1	0	1	1	0	0	0	1	0	1	1	0
1521	1777	1	0	1	1	0	0	0	1	0	1	1	1
1522	1778	1	0	1	1	0	0	0	1	1	0	0	0
1523	1779	1	0	1	1	0	0	0	1	1	0	0	1
1524	1780	1	0	1	1	0	0	1	0	0	0	0	0
1525	1781	1	0	1	1	0	0	1	0	0	0	0	1
1526	1782	1	0	1	1	0	0	1	0	0	0	1	0
1527	1783	1	0	1	1	0	0	1	0	0	0	1	1
1528	1784	1	0	1	1	0	0	1	0	0	1	0	0
1529	1785	1	0	1	1	0	0	1	0	0	1	0	1
1530	1786	1	0	1	1	0	0	1	0	0	1	1	0
1531	1787	1	0	1	1	0	0	1	0	0	1	1	1
1532	1788	1	0	1	1	0	0	1	0	1	0	0	0
1533	1789	1	0	1	1	0	0	1	0	1	0	0	1
1534	1790	1	0	1	1	0	0	1	1	0	0	0	0
1535	1791	1	0	1	1	0	0	1	1	0	0	0	1
1536	1792	1	0	1	1	0	0	1	1	0	0	1	0
1537	1793	1	0	1	1	0	0	1	1	0	0	1	1
1538	1794	1	0	1	1	0	0	1	1	0	1	0	0
1539	1795	1	0	1	1	0	0	1	1	0	1	0	1
1540	1796	1	0	1	1	0	0	1	1	0	1	1	0
1541	1797	1	0	1	1	0	0	1	1	0	1	1	1
1542	1798	1	0	1	1	0	0	1	1	1	0	0	0
1543	1799	1	0	1	1	0	0	1	1	1	0	0	1
1544	1800	1	0	1	1	0	1	0	0	0	0	0	0
1545	1801	1	0	1	1	0	1	0	0	0	0	0	1
1546	1802	1	0	1	1	0	1	0	0	0	0	1	0
1547	1803	1	0	1	1	0	1	0	0	0	0	1	1
1548	1804	1	0	1	1	0	1	0	0	0	1	0	0
1549	1805	1	0	1	1	0	1	0	0	0	1	0	1
1550	1806	1	0	1	1	0	1	0	0	0	1	1	0
1551	1807	1	0	1	1	0	1	0	0	0	1	1	1
1552	1808	1	0	1	1	0	1	0	0	1	0	0	0
1553	1809	1	0	1	1	0	1	0	0	1	0	0	1
1554	1810	1	0	1	1	0	1	0	1	0	0	0	0
1555	1811	1	0	1	1	0	1	0	1	0	0	0	1
1556	1812	1	0	1	1	0	1	0	1	0	0	1	0
1557	1813	1	0	1	1	0	1	0	1	0	0	1	1
1558	1814	1	0	1	1	0	1	0	1	0	1	0	0
1559	1815	1	0	1	1	0	1	0	1	0	1	0	1
1560	1816	1	0	1	1	0	1	0	1	0	1	1	0
1561	1817	1	0	1	1	0	1	0	1	0	1	1	1
1562	1818	1	0	1	1	0	1	0	1	1	0	0	0
1563	1819	1	0	1	1	0	1	0	1	1	0	0	1
1564	1820	1	0	1	1	0	1	1	0	0	0	0	0
1565	1821	1	0	1	1	0	1	1	0	0	0	0	1
1566	1822	1	0	1	1	0	1	1	0	0	0	1	0
1567	1823	1	0	1	1	0	1	1	0	0	0	1	1
1568	1824	1	0	1	1	0	1	1	0	0	1	0	0
1569	1825	1	0	1	1	0	1	1	0	0	1	0	1
1570	1826	1	0	1	1	0	1	1	0	0	1	1	0
1571	1827	1	0	1	1	0	1	1	0	0	1	1	1
1572	1828	1	0	1	1	0	1	1	0	1	0	0	0
1573	1829	1	0	1	1	0	1	1	0	1	0	0	1
1574	1830	1	0	1	1	0	1	1	1	0	0	0	0
1575	1831	1	0	1	1	0	1	1	1	0	0	0	1
1576	1832	1	0	1	1	0	1	1	1	0	0	1	0
1577	1833	1	0	1	1	0	1	1	1	0	0	1	1
1578	1834	1	0	1	1	0	1	1	1	0	1	0	0
1579	1835	1	0	1	1	0	1	1	1	0	1	0	1
1580	1836	1	0	1	1	0	1	1	1	0	1	1	0
1581	1837	1	0	1	1	0	1	1	1	0	1	1	1
1582	1838	1	0	1	1	0	1	1	1	1	0	0	0
1583	1839	1	0	1	1	0	1	1	1	1	0	0	1
1584	1840	1	0	1	1	1	0	0	0	0	0	0	0
1585	1841	1	0	1	1	1	0	0	0	0	0	0	1
1586	1842	1	0	1	1	1	0	0	0	0	0	1	0
1587	1843	1	0	1	1	1	0	0	0	0	0	1	1
1588	1844	1	0	1	1	1	0	0	0	0	1	0	0
1589	1845	1	0	1	1	1	0	0	0	0	1	0	1
1590	1846	1	0	1	1	1	0	0	0	0	1	1	0
1591	1847	1	0	1	1	1	0	0	0	0	1	1	1
1592	1848	1	0	1	1	1	0	0	0	1	0	0	0
1593	1849	1	0	1	1	1	0	0	0	1	0	0	1
1594	1850	1	0	1	1	1	0	0	1	0	0	0	0
1595	1851	1	0	1	1	1	0	0	1	0	0	0	1
1596	1852	1	0	1	1	1	0	0	1	0	0	1	0
1597	1853	1	0	1	1	1	0	0	1	0	0	1	1
1598	1854	1	0	1	1	1	0	0	1	0	1	0	0
1599	1855	1	0	1	1	1	0	0	1	0	1	0	1

RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1600	1856	1	0	1	1	1	0	0	1	0	1	1	0
1601	1857	1	0	1	1	1	0	0	1	0	1	1	1
1602	1858	1	0	1	1	1	0	0	1	1	0	0	0
1603	1859	1	0	1	1	1	0	0	1	1	0	0	1
1604	1860	1	0	1	1	1	0	1	0	0	0	0	0
1605	1861	1	0	1	1	1	0	1	0	0	0	0	1
1606	1862	1	0	1	1	1	0	1	0	0	0	1	0
1607	1863	1	0	1	1	1	0	1	0	0	0	1	1
1608	1864	1	0	1	1	1	0	1	0	0	1	0	0
1609	1865	1	0	1	1	1	0	1	0	0	1	0	1
1610	1866	1	0	1	1	1	0	1	0	0	1	1	0
1611	1867	1	0	1	1	1	0	1	0	0	1	1	1
1612	1868	1	0	1	1	1	0	1	0	1	0	0	0
1613	1869	1	0	1	1	1	0	1	0	1	0	0	1
1614	1870	1	0	1	1	1	0	1	1	0	0	0	0
1615	1871	1	0	1	1	1	0	1	1	0	0	0	1
1616	1872	1	0	1	1	1	0	1	1	0	0	1	0
1617	1873	1	0	1	1	1	0	1	1	0	0	1	1
1618	1874	1	0	1	1	1	0	1	1	0	1	0	0
1619	1875	1	0	1	1	1	0	1	1	0	1	0	1
1620	1876	1	0	1	1	1	0	1	1	0	1	1	0
1621	1877	1	0	1	1	1	0	1	1	0	1	1	1
1622	1878	1	0	1	1	1	0	1	1	1	0	0	0
1623	1879	1	0	1	1	1	0	1	1	1	0	0	1
1624	1880	1	0	1	1	1	1	0	0	0	0	0	0
1625	1881	1	0	1	1	1	1	0	0	0	0	0	1
1626	1882	1	0	1	1	1	1	0	0	0	0	1	0
1627	1883	1	0	1	1	1	1	0	0	0	0	1	1
1628	1884	1	0	1	1	1	1	0	0	0	1	0	0
1629	1885	1	0	1	1	1	1	0	0	0	1	0	1
1630	1886	1	0	1	1	1	1	0	0	0	1	1	0
1631	1887	1	0	1	1	1	1	0	0	0	1	1	1
1632	1888	1	0	1	1	1	1	0	0	1	0	0	0
1633	1889	1	0	1	1	1	1	0	0	1	0	0	1
1634	1890	1	0	1	1	1	1	0	1	0	0	0	0
1635	1891	1	0	1	1	1	1	0	1	0	0	0	1
1636	1892	1	0	1	1	1	1	0	1	0	0	1	0
1637	1893	1	0	1	1	1	1	0	1	0	0	1	1
1638	1894	1	0	1	1	1	1	0	1	0	1	0	0
1639	1895	1	0	1	1	1	1	0	1	0	1	0	1
1640	1896	1	0	1	1	1	1	0	1	0	1	1	0
1641	1897	1	0	1	1	1	1	0	1	0	1	1	1
1642	1898	1	0	1	1	1	1	0	1	1	0	0	0
1643	1899	1	0	1	1	1	1	0	1	1	0	0	1
1644	1900	1	0	1	1	1	1	1	0	0	0	0	0
1645	1901	1	0	1	1	1	1	1	0	0	0	0	1
1646	1902	1	0	1	1	1	1	1	0	0	0	1	0
1647	1903	1	0	1	1	1	1	1	0	0	0	1	1
1648	1904	1	0	1	1	1	1	1	0	0	1	0	0
1649	1905	1	0	1	1	1	1	1	0	0	1	0	1
1650	1906	1	0	1	1	1	1	1	0	0	1	1	0
1651	1907	1	0	1	1	1	1	1	0	0	1	1	1
1652	1908	1	0	1	1	1	1	1	0	1	0	0	0
1653	1909	1	0	1	1	1	1	1	0	1	0	0	1
1654	1910	1	0	1	1	1	1	1	1	0	0	0	0
1655	1911	1	0	1	1	1	1	1	1	0	0	0	1
1656	1912	1	0	1	1	1	1	1	1	0	0	1	0
1657	1913	1	0	1	1	1	1	1	1	0	0	1	1
1658	1914	1	0	1	1	1	1	1	1	0	1	0	0
1659	1915	1	0	1	1	1	1	1	1	0	1	0	1
1660	1916	1	0	1	1	1	1	1	1	0	1	1	0
1661	1917	1	0	1	1	1	1	1	1	0	1	1	1
1662	1918	1	0	1	1	1	1	1	1	1	0	0	0
1663	1919	1	0	1	1	1	1	1	1	1	0	0	1
1664	1920	1	1	0	0	0	0	0	0	0	0	0	0
1665	1921	1	1	0	0	0	0	0	0	0	0	0	1
1666	1922	1	1	0	0	0	0	0	0	0	0	1	0
1667	1923	1	1	0	0	0	0	0	0	0	0	1	1
1668	1924	1	1	0	0	0	0	0	0	0	1	0	0
1669	1925	1	1	0	0	0	0	0	0	0	1	0	1
1670	1926	1	1	0	0	0	0	0	0	0	1	1	0
1671	1927	1	1	0	0	0	0	0	0	0	1	1	1
1672	1928	1	1	0	0	0	0	0	0	1	0	0	0
1673	1929	1	1	0	0	0	0	0	0	1	0	0	1
1674	1930	1	1	0	0	0	0	0	1	0	0	0	0
1675	1931	1	1	0	0	0	0	0	1	0	0	0	1
1676	1932	1	1	0	0	0	0	0	1	0	0	1	0
1677	1933	1	1	0	0	0	0	0	1	0	0	1	1
1678	1934	1	1	0	0	0	0	0	1	0	1	0	0
1679	1935	1	1	0	0	0	0	0	1	0	1	0	1
1680	1936	1	1	0	0	0	0	0	1	0	1	1	0
1681	1937	1	1	0	0	0	0	0	1	0	1	1	1
1682	1938	1	1	0	0	0	0	0	1	1	0	0	0
1683	1939	1	1	0	0	0	0	0	1	1	0	0	1
1684	1940	1	1	0	0	0	0	1	0	0	0	0	0
1685	1941	1	1	0	0	0	0	1	0	0	0	0	1
1686	1942	1	1	0	0	0	0	1	0	0	0	1	0
1687	1943	1	1	0	0	0	0	1	0	0	0	1	1
1688	1944	1	1	0	0	0	0	1	0	0	1	0	0
1689	1945	1	1	0	0	0	0	1	0	0	1	0	1
1690	1946	1	1	0	0	0	0	1	0	0	1	1	0
1691	1947	1	1	0	0	0	0	1	0	0	1	1	1
1692	1948	1	1	0	0	0	0	1	0	1	0	0	0
1693	1949	1	1	0	0	0	0	1	0	1	0	0	1
1694	1950	1	1	0	0	0	0	1	1	0	0	0	0
1695	1951	1	1	0	0	0	0	1	1	0	0	0	1
1696	1952	1	1	0	0	0	0	1	1	0	0	1	0
1697	1953	1	1	0	0	0	0	1	1	0	0	1	1
1698	1954	1	1	0	0	0	0	1	1	0	1	0	0
1699	1955	1	1	0	0	0	0	1	1	0	1	0	1

WARNING: Disconnect primary power prior to servicing.

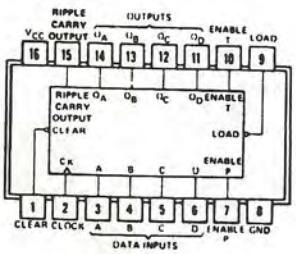
RF	LO	S1	S2	S3	S4	S5	S6	S7	S8	S4	S3	S2	S1
1700	1956	1	1	0	0	0	0	1	1	0	1	1	0
1701	1957	1	1	0	0	0	0	1	1	0	1	1	1
1702	1958	1	1	0	0	0	0	1	1	1	0	0	0
1703	1959	1	1	0	0	0	0	1	1	1	0	0	1
1704	1960	1	1	0	0	0	1	0	0	0	0	0	0
1705	1961	1	1	0	0	0	1	0	0	0	0	0	1
1706	1962	1	1	0	0	0	1	0	0	0	0	1	0
1707	1963	1	1	0	0	0	1	0	0	0	0	1	1
1708	1964	1	1	0	0	0	1	0	0	0	1	0	0
1709	1965	1	1	0	0	0	1	0	0	0	1	0	1
1710	1966	1	1	0	0	0	1	0	0	0	1	1	0
1711	1967	1	1	0	0	0	1	0	0	0	1	1	1
1712	1968	1	1	0	0	0	1	0	0	1	0	0	0
1713	1969	1	1	0	0	0	1	0	0	1	0	0	1
1714	1970	1	1	0	0	0	1	0	1	0	0	0	0
1715	1971	1	1	0	0	0	1	0	1	0	0	0	1
1716	1972	1	1	0	0	0	1	0	1	0	0	1	0
1717	1973	1	1	0	0	0	1	0	1	0	0	1	1
1718	1974	1	1	0	0	0	1	0	1	0	1	0	0
1719	1975	1	1	0	0	0	1	0	1	0	1	0	1
1720	1976	1	1	0	0	0	1	0	1	0	1	1	0
1721	1977	1	1	0	0	0	1	0	1	0	1	1	1
1722	1978	1	1	0	0	0	1	0	1	1	0	0	0
1723	1979	1	1	0	0	0	1	0	1	1	0	0	1
1724	1980	1	1	0	0	0	1	1	0	0	0	0	0
1725	1981	1	1	0	0	0	1	1	0	0	0	0	1
1726	1982	1	1	0	0	0	1	1	0	0	0	1	0
1727	1983	1	1	0	0	0	1	1	0	0	0	1	1
1728	1984	1	1	0	0	0	1	1	0	0	1	0	0
1729	1985	1	1	0	0	0	1	1	0	0	1	0	1
1730	1986	1	1	0	0	0	1	1	0	0	1	1	0
1731	1987	1	1	0	0	0	1	1	0	0	1	1	1
1732	1988	1	1	0	0	0	1	1	0	1	0	0	0
1733	1989	1	1	0	0	0	1	1	0	1	0	0	1
1734	1990	1	1	0	0	0	1	1	1	0	0	0	0
1735	1991	1	1	0	0	0	1	1	1	0	0	0	1
1736	1992	1	1	0	0	0	1	1	1	0	0	1	0
1737	1993	1	1	0	0	0	1	1	1	0	0	1	1
1738	1994	1	1	0	0	0	1	1	1	0	1	0	0
1739	1995	1	1	0	0	0	1	1	1	0	1	0	1
1740	1996	1	1	0	0	0	1	1	1	0	1	1	0
1741	1997	1	1	0	0	0	1	1	1	0	1	1	1
1742	1998	1	1	0	0	0	1	1	1	1	0	0	0
1743	1999	1	1	0	0	0	1	1	1	1	0	0	1
1744	2000	1	1	0	0	1	0	0	0	0	0	0	0
1745	2001	1	1	0	0	1	0	0	0	0	0	0	1
1746	2002	1	1	0	0	1	0	0	0	0	0	1	0
1747	2003	1	1	0	0	1	0	0	0	0	0	1	1
1748	2004	1	1	0	0	1	0	0	0	0	1	0	0
1749	2005	1	1	0	0	1	0	0	0	0	1	0	1
1750	2006	1	1	0	0	1	0	0	0	0	1	1	0

APPENDIX C

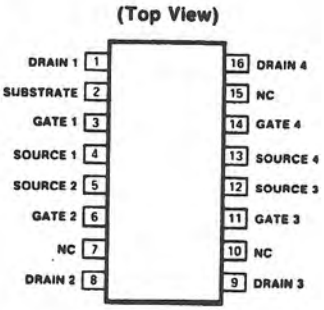
COMPONENT OUTLINES

C-1. INTRODUCTION

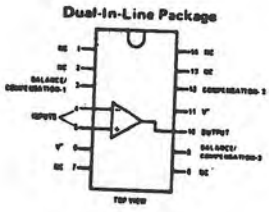
C-2. This appendix contains component outlines for selected electrical components used in the STM-1 AM STEREO MONITOR.



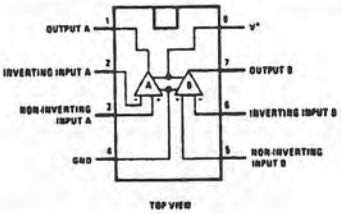
IC 74LS161AN



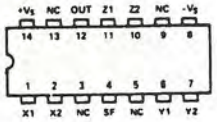
IC QUAD FET, SD5000N



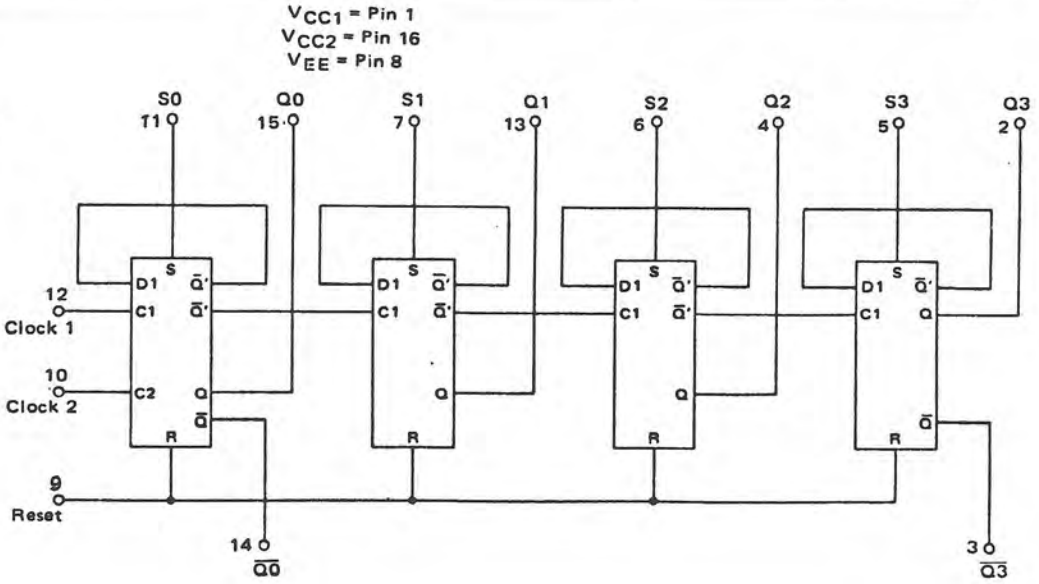
IC LM318



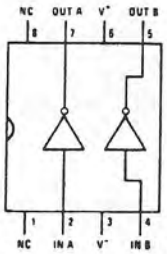
IC LM393N/CA3290E



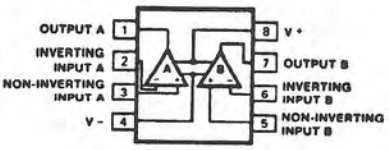
IC AD534 TH



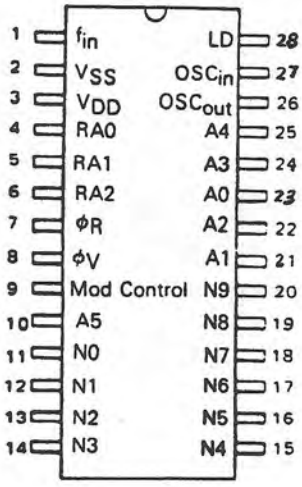
IC MC10178L



IC D500267-5/MMH00260P1



IC NE5532AN



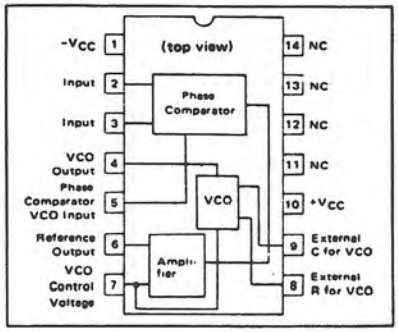
IC MC145152P

WARNING: Disconnect primary power prior to servicing.

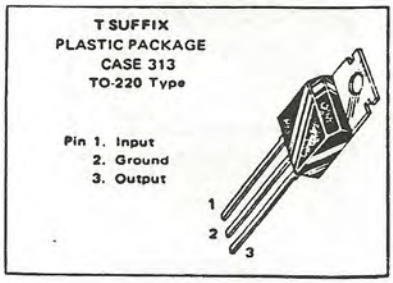
TRANSISTOR 2N4401

TRANSISTOR 2N4403

TRANSISTOR 2N3904

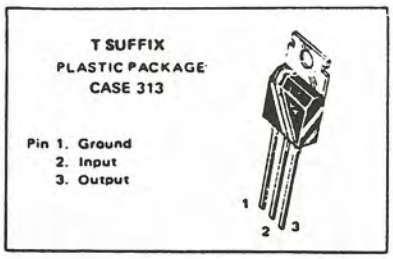


IC NE565N



IC MC7806CT

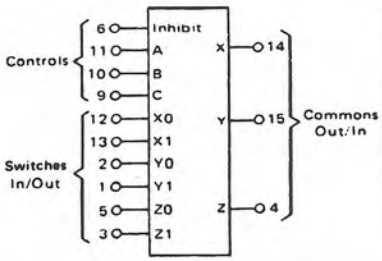
IC 7815



IC MC7906CT

IC 7915

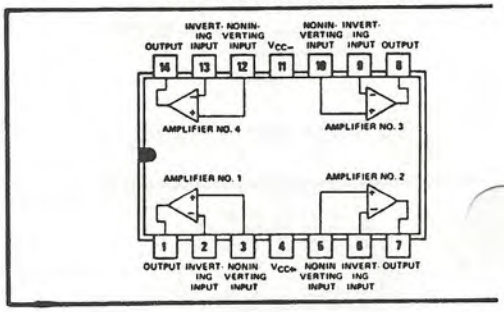
Triple 2-Channel Analog Multiplexer/Demultiplexer



V_{DD} = Pin 16
V_{SS} = Pin 8
V_{EE} = Pin 7

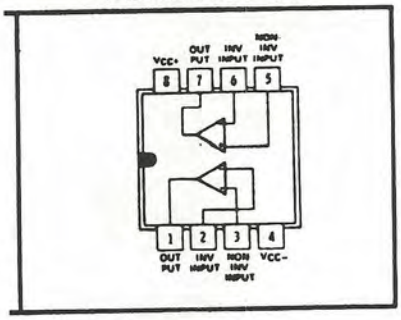
IC CD-4053BE, MC14053B

TL074, TL074A, TL074B
J OR N DUAL-IN-LINE
OR W PACKAGE (TOP VIEW)

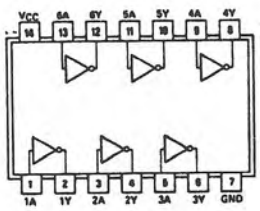


IC TL074CN3

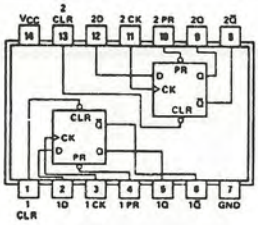
TL072, TL072A, TL072B
JG OR P DUAL-IN-LINE
PACKAGE (TOP VIEW)



IC TL072ACP

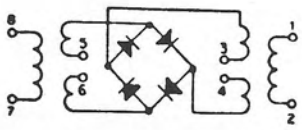


IC 74L604N, TTL INV



IC 74L674

WARNING: Disconnect primary power prior to servicing.



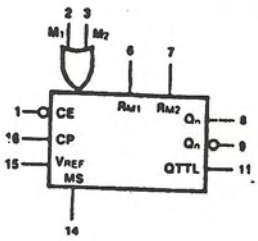
PIN LAYOUT

Model	Fig. 1 -1H -3H	Fig. 2 -1WH
LO	8	8
RF	1	1
IF	3,4	3,4
Ground	2,5,6,7	2,5,6,7
Case Ground	2	2,5,6,7

NOTE: PIN 3 AND 4 MUST BE CONNECTED TOGETHER

MIXER, DOUBLE BAL TAK-3H

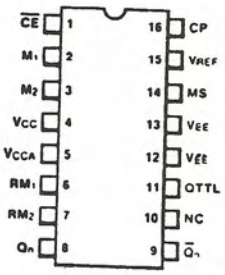
LOGIC SYMBOL



11C90. Q_n = Pin 4
11C91. Q_n = Pin 3

V_{CC} = Pin 4
V_{CCA} = Pin 5
V_{EE} = Pin 12
V_{EE} (TTL) = Pin 13

CONNECTION DIAGRAM DIP (TOP VIEW)



IC 11C90DC

WARNING: Disconnect primary power prior to servicing.

HARRIS

SERVICE BULLETIN
MAINTENANCE AND MODIFICATION DATA
Broadcast Group

Bulletin No. AM-198-JRN

Date July 1984

Equipment: STX-1A AM Stereo Exciter
STM-1 AM Stereo Modulation Monitor

Purpose:

Change pilot tone frequency to 25Hz.

Background:

Harris Corporation announced at the 1984 NAB Convention that it was going to move the pilot tone on it's Linear AM Stereo System from 55Hz to 25Hz. This change will now permit the Harris system to be received by all AM Stereo receivers including the Delco automobile units.

The modification described below falls under the FCC's Class I permissive changes and does not alter or affect type acceptance. The modification does not change the operation of the Harris system in any way.

Tools and Test Equipment Required:

Low wattage soldering iron for PC board work, small hand tools, frequency measuring device, audio generator.

Time Required:

Approximately two hours.

Procedure:

STX-1A Exciter:

1. Set the Exciter front panel modulation meter switch to the "Pilot" position. Set the Modulation Monitor meter switch to the "Pilot Injection" position and also the rear panel switch to "IF IN". (Be sure that the "IF OUT" of the exciter is connected to the "IF IN" of the monitor.) With the exciter turned on and in the stereo mode, observe and record both Monitor and Exciter pilot injection levels meter readings for later reference. Leave the switches set in these positions.

2. Remove AC power from STX-1A stereo exciter.

Procedure - Continued:

3. Remove Quad board from the exciter and take it to a clean work area for modification.

4. Remove C-68, a .22uF/63V 5% metalized film capacitor. This capacitor is located near IC U-26.

5. Replace C-68 with a .47uF/63V 5% metalized film capacitor. This capacitor can be identified in your modification kit as Harris part number 506-0246-000.

6. Insert the Quad board into the exciter, then restore AC power.

7. Connect the frequency measuring device to the "Meter Out" BNC connector on the front panel of the exciter, then adjust R151 (Pilot Frequency Adjust) on the front edge of the Quad board, for 25 Hz as observed on the frequency measuring device.

8. Compare the present modulation meter reading of the Exciter with the reading recorded in step number 1 (above). If necessary, adjust R152 (Pilot Amp) on the front edge of the Quad board so that they are identical.

Proceed to the STM-1 Modulation Monitor Modifications.

STM-1 Modulation Monitor:

1. Remove AC power from the monitor.

2. Move the monitor to a convenient work bench location, and remove the top cover.

3. Remove the PC board assembly as follows (use attached PC board drawing for reference):

   a. Disconnect Molex connector J2 and large A-MP connector J1.

   b. Disconnect the RF connectors plugged into jacks J3 through J8.

   c. Remove the 12 #6 screws (with locking hardware) that hold the PC board to the chassis.

   d. Lift the PC board out of the chassis and take to a clean work surface for modification.

Procedure - Continued:

STM-1 Modulation Monitor

4. Change the capacitor and resistors as indicated below. Use the attached PC Board drawing to locate components.

Capacitor	Old Value	New Value
C17	.33 uf	1.0 uf

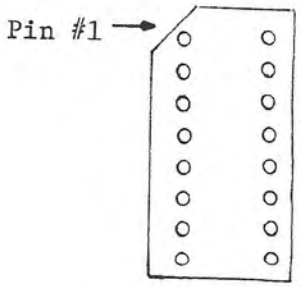
Note: Observe polarity when replacing.

Resistor	Old Value	*New Value
R6	82 K	200 K
R7	82 K	200 K
R12	30 K	180 K
R13	7.5 K	11 K
R14	82 K	390 K
R16	30 K	180 K
R18	4990, 1%	11 K
R17	240 K	390 K
R19	30 K	180 K
R21	2 K	11 K
R22	130 K	390 K

*All replacement resistors are 1/4 watt, 5%.

5. Locate IC's numbered U22, U23, U24 and U25. Pay careful attention to how pin #1 is identified on the IC's and then remove them from their sockets and set them aside. (Refer to PC board diagram for pin #1 identification) These are all the same type of IC so it is not important that they return to the same circuit location. Pin #1 identification is important however, to prevent reinserting the IC in reverse.

6. Locate the four (4) white sockets which were included with the modification kit. Insert the (4) IC's that were removed from the PC board, into these sockets. Pay close attention that pin #1 on the sockets lines up with pin #1 on the IC's.



Socket Top View

Procedure - Continued:

STM-1 Modulation Monitor

7. Take note that one of the replacement sockets has a red mark on its side. Install this socket into the PC board at U25 (Piggy back style). Again pay close attention to make sure that pin #1 is aligned.

   Care should be taken not to bend the legs of the new socket when inserting into the existing socket.

8. The remaining three (3) new sockets are identical and should be installed into PC board positions U22, U23 and U24 using the same precautions as in step #7.

9. Reinstall the PC board into the chassis using the reverse of the procedure outlined in step #3.

10. Take the monitor to it's working location and make all the appropriate connections, but leave the top cover off of the unit.

11. Restore AC power to the unit and set the rear panel switch to "IF IN." Be sure that the "IF OUT" of the exciter is connected to the "IF IN" of the monitor.

12. Set the RF meter switch to the "Pilot Freq. Cal" position, and observe the meter reading. The meter needle should swing slowly from 0 to 10. The closer to 25 Hz the pilot frequency is, the slower the needle will swing. If the needle is making quick short swings in the center of the scale, readjust R152 on the front edge of the Quad board. Careful adjustment of R152 will provide a meter movement that is barely perceptable, indicating a pilot frequency that is exactly 25 Hz.

Procedure - Continued:

STM-1 Modulation Monitor

13. With the RF meter switch in the "Pilot Injection" position observe the present meter reading. This reading should agree with the reading recorded in step #1 of the Exciter modifications. If this reading needs to be adjusted, use R173 in the Modulation Monitor to achieve the required meter reading.

14. Locate pots R29 and R35. Use the attached PC board drawing. Set R29 full CW, and set R35 full CCW.

15. Set front panel switches as follows:

    90°/VAR to 90°
    STEREO/AUTO/MONO to STEREO
    STEREO/ISB to STEREO

16. Apply a 1KHz LEFT only audio tone to the exciter. Adjust the audio input level to obtain a LEFT meter reading above mid-scale.

17. Set the front panel 90°/VAR switch to VAR.

18. Adjust R35 CW until the meter indicates the same needle deflection as when switched to 90°. Careful adjustment of R35 should achieve identical meter readings with no needle movement while switching between VAR and 90°.

19. Set the front panel 90°/VAR switch in 90°. Set the rear panel RF/IF switch to "RF IN". Replace the cover on the unit, return it to its permanent location, and restore to normal operation.

    This completes the modification to the AM Stereo Modulation Monitor and Stereo Exciter.

Receivers:

The following information is supplied for those customers who purchased the Harris modified Sansui receivers.

Change C26 and C27 as follows:

Now: .1uF/63V 5% metalized capacitor.
Change to: .22uF/63V metalized capacitor.

These caps are the yellow square types located near R55 and R60 (multi-turn pots) on the Harris decoder board.

NOTE: These capacitors were not included in the 25HZ modification kit but can be acquired from Harris upon request.

Harris Part #506-0244-000 - Quantity 2

Motorola Decoder Boards:

The following information relates to the Harris supplied Stereo Decoder boards which utilized the Motorola MC13020 Decoder IC.

Change C5 and C6 as follows:

Now: .22uF/63V 5% Metalized capacitor.
Change to: .47uF/63V 5% Metalized capacitor.

NOTE: These capacitors were not included in the 25Hz modification kit but can be acquired from Harris upon request.

Harris Part # 506-0246-000 - Quantity 2

Sansui Model TU-S77AMX Receivers:

The production model receivers, TU-S77AMX, from Sansui have been reported to have a limited high-end response characteristic. Sansui Engineering has informed Harris Corporation that the following modification can be made to the receivers to achieve better high-end response.

Cut the following capacitors out of the receiver circuit.

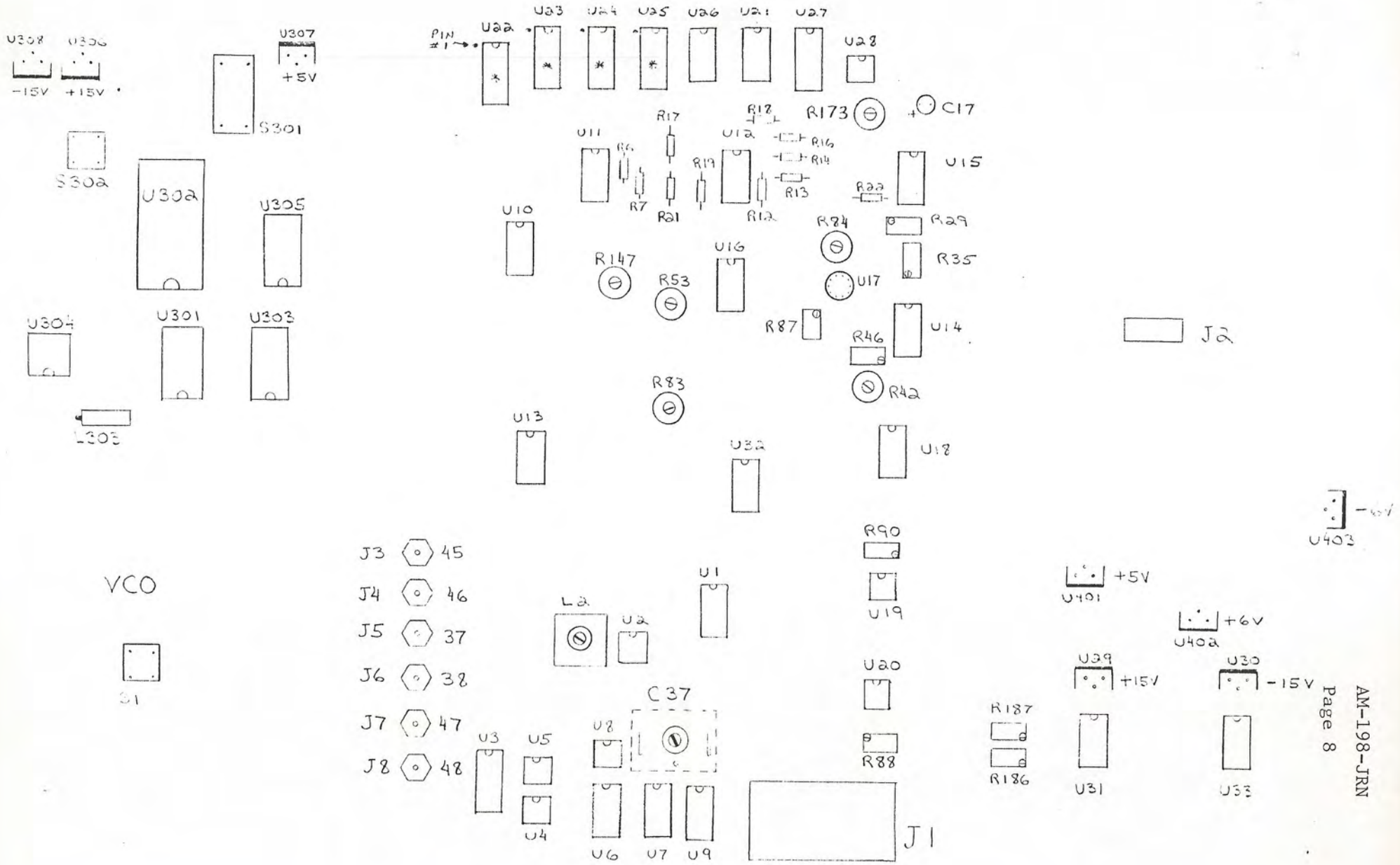
C32L C32R

These capacitors can be found in the bottom, front right-hand corner of the receiver as viewed from the front top of the unit.

Should you have any questions relative to the enclosed material, please direct your inquiries to:

Harris Corporation
Radio Field Service
P. O. Box 4290
Quincy, IL 62305-4290

lkh
0145Y



AM-198-JRN
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HARRIS

HARRIS CORPORATION BROADCAST GROUP
P.O. BOX 4290 QUINCY, IL 62305

INSTRUCTION BOOK ADDENDUM

6/12/84

EQUIPMENT: STM-1 Stereo Monitor

SERIAL NO. _____

I. B. NO. 888-

DATE: _____

It has always been the policy of the Harris Corporation, Broadcast Products Division, to give our customers the advantage of the latest product improvements. This addendum insures you that the latest improvements have been incorporated in your equipment. This way we can provide up to date information without a delay due to printing new instruction manuals.

Please make the necessary corrections as listed below. Please use ink for a permanent record.

This addendum may be removed after corrections have been made.

Thank you for your cooperation.

Page/Drawing No.	Changes	
7-4	Change line C017 from:	Qty
	526-0331-000 cap. .33 uf, 35V, 20% to:	1.0
	526-0050-000 cap. 1 uf, 35V, 20%	1.0
7-7	Change R006, R007 from:	
	540-0958-000 resistor, ¼ watt, 82K ohm, 5% to:	2.0
	540-0967-000 resistor, ¼ watt, 200K ohm, 5%	2.0
	R012 from:	
	540-0947-000 resistor, ¼ watt, 30K ohm, 5% to:	1.0
	540-0966-000 resistor, ¼ watt, 180K ohm, 5%	1.0
	R013 from:	
	540-0933-000 resistor, ¼ watt, 7500 ohm, 5% to:	1.0
	540-0937-000 resistor, ¼ watt, 11K ohm, 5%	1.0
	R014 from:	
	540-0958-000 resistor, ¼ watt, 82K ohm, 5% to	1.0
	540-0974-000 resistor, ¼ watt, 390K ohm, 5%	1.0
	R016 from:	
	540-0947-000 resistor, ¼ watt, 30K ohm, 5% to:	1.0
	540-0966-000 resistor, ¼ watt, 180K ohm, 5%	1.0
	R017 from:	
	540-0969-000 resistor, ¼ watt, 240K ohm, 5% to:	1.0
	540-0974-000 resistor, ¼ watt, 390K ohm, 5%	1.0
	R018 from:	
	548-0313-000 resistor, 4990 ohm, ¼ watt, 1% to:	1.0
	540-0937-000 resistor, ¼ watt, 11K ohm, 5%	1.0
	R019 from:	
	540-0947-000 resistor, ¼ watt, 30K ohm, 5% to:	1.0
	540-0966-000 resistor, ¼ watt, 180K ohm, 5%	1.0

Rev. # 112 377 0330

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INSTRUCTION BOOK ADDENDUM

EQUIPMENT: STM-1 Stereo Monitor (cont.) SERIAL NO. _____

I. B. NO. 888- DATE: _____

It has always been the policy of the Harris Corporation, Broadcast Products Division, to give our customers the advantage of the latest product improvements. This addendum insures you that the latest improvements have been incorporated in your equipment. This way we can provide up to date information without a delay due to printing new instruction manuals.

Please make the necessary corrections as listed below. Please use ink for a permanent record.

This addendum may be removed after corrections have been made.

Thank you for your cooperation.

Page/Drawing No.	Changes
7-7	R021 from: Qty 540-0919-000 resistor, ¼ watt, 2000 ohm, 5% to: 1.0 540-0937-000 resistor, ¼ watt, 11K ohm, 5% 1.0 R022 from: 540-0963-000 resistor, ¼ watt, 130K ohm, 5% to: 1.0 540-0974-000 resistor, ¼ watt, 390K ohm, 5% 1.0
8-7/8-8	Change the values of components on the schematic as indicated: C17 to 1 R6, R7 to 200K R12, R16, R19 to 180K R13, R18, R21 to 11K R14, R17, R22 to 390K Change the pin layout of the following IC's as indicated: U22 pins 3,4,6 to +5V U23 pins 3,5 to +5V U24 pin 5 to +5V U25 pins 3,5 to ground U25 pin 4 to +5V The following pages and indicated paragraphs, contain one or more references to pilot frequency. Change any reference to pilot frequency: From 55Hz To 25Hz
2-3	Para 2-14, Subpara "F"
2-3	" 2-20
3-7	" 3-11
4-3	" 4-21
4-4	" 4-35
4-8	" 4-50
4-9	" 4-51

WHITE — ORIGINAL PINK — SALES GREEN — CENTRAL FILES CANARY — TEST DEPT.

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INSTRUCTION BOOK ADDENDUM

EQUIPMENT: STM-1 Stereo Monitor (cont.) SERIAL NO. _____

I. B. NO. 888- DATE: _____

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Page/Drawing No.	Changes
4-12 6-2 A-12 A-13	Para 4-61 " 6-15 The bottom paragraph in the "Signal Source" column The top paragraph in the "Signal Source" column.

WHITE — ORIGINAL PINK — SALES GREEN — CENTRAL FILES CANARY — TEST DEPT.

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INSTRUCTION BOOK ADDENDUM

6/12/84 cj

EQUIPMENT: Stereo Exciter SERIAL NO. _____

I. B. NO. 888- DATE: _____

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Page/Drawing No.	Changes
8-9/8-10	Change C68, associated with U26, from .22 to .47.
7-25	Change line C068 from: Harris part No. Description Qty. 506-0244-000 Cap. .22uf, 63V, 5% 1 to: 506-0246-000 Cap. .47uf, 63V, 5% 1 The following pages and indicated paragraphs contain one or more references to pilot frequency. Change any reference to pilot frequency: From 55Hz to 25Hz
4-12	Para 4-42
5-8	Para 5-28; Sub para "F"

WHITE — ORIGINAL PINK — SALES GREEN — CENTRAL FILES CANARY — TEST DEPT.