

**TECHNICAL MANUAL
FOR
MODEL ASM-1
C-QUAM® AM STEREO
MODULATION MONITOR**

[®]C-QUAM IS A REGISTERED TRADEMARK OF
MOTOROLA, INC. DELTA C-QUAM SYSTEM EQUIPMENT
IS MANUFACTURED UNDER LICENSE FROM MOTOROLA, INC.

THIS TECHNICAL MANUAL
APPLIES TO MODEL ASM-1 UNITS
WITH SERIAL NUMBERS 373
AND HIGHER

Delta Electronics, Inc.
5730 General Washington Drive
Alexandria, Virginia 22312
703-354-3350
www.deltaelectronics.com

CERTIFICATE OF WARRANTY

Delta warrants to Purchaser that the product it delivers will be free of defects in materials and be of good quality and workmanship.

This warranty applies to the period of one year from the date of delivery except for component parts purchased from other sources and assembled in Delta's production. Such component parts bear only the warranty of the manufacturer thereof in effect at the time of shipment to Purchaser.

Delta will, at its own expense and, after written notice has been received and acknowledged by Delta, repair or replace any product which proves to be defective (according to the usage of the trade) during the above designated warranty period when such product is received by Delta at its Alexandria address with shipment costs prepaid by Purchaser.

Delta will not be liable for consequential damages.

No other warranty is expressed or implied.

CUSTOMER INFORMATION

SAFETY PRECAUTIONS

This Manual is intended for use by trained and qualified operating or service personnel who are familiar with handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of safety precautions which should be observed.

Avoid risking electrical shock in handling all circuits where substantial currents or voltages may be present.

LIABILITY

The information in this Manual is based on data available at the time of publication. However, the manufacturer cannot assume liability with respect to technical application of the contents and shall, under no circumstances, be responsible for damage or injury (whether to person or property) resulting from use of the subject equipment.

REPLACEMENT PARTS

To obtain service replacement or warranty items, write or call Delta at the address shown on the cover. Please supply product Model Number and Serial Number and replacement part identification (including Order Number and description). Shipping of replacements may be unduly delayed if the necessary information is not supplied. A complete List of Materials is provided in this Manual.

EQUIPMENT DAMAGED IN TRANSIT

The equipment should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. Report all shortages and damage to Delta at the address shown on the cover.

Delta will file all claims for loss and damage on this equipment so long as the inspection report is obtained. Disposition of the damaged items will be determined by Delta.

FIELD ENGINEERING SERVICE

Requests for installation, field engineering or service assistance should be directed to Delta.

TABLE OF CONTENTS

SECTION	TITLE	PAGE
	CERTIFICATE OF WARRANTY	ii
	CUSTOMER INFORMATION	iii
1	INTRODUCTION	1-1
	1.1 Scope	1-1
	1.2 What is C-QUAM	1-1
	1.3 AM and PM Modulation	1-1
	1.4 Generating C-QUAM	1-4
	1.5 Decoding C-QUAM	1-6
2	EQUIPMENT CHECKOUT AND INSTALLATION	2-1
	2.1 Delivery Inspection	2-1
	2.2 Equipment Damaged in Transit	2-1
	2.3 Mechanical Checkout	2-1
	2.4 Replacement Parts	2-1
	2.5 Functional Checkout	2-1
	2.6 Field Engineering Service	2-3
	2.7 Installation	2-3
	2.8 Day RF Sample Level	2-3
	2.9 Night RF Sample Level	2-3
	2.10 Operational Checkout	2-4
3	SPECIFICATIONS AND EQUIPMENT DESCRIPTION	3-1
	3.1 Scope	3-1
	3.2 Specifications	3-1
	3.3 Front and Rear Panel Description	3-3
4	OPERATION AND PROOF OF PERFORMANCE	4-1
	4.1 General	4-1
	4.2 Monitor Features	4-1
	4.3 L+R Indications	4-1
	4.4 L-R Indications	4-1
	4.5 Left Only Indications	4-2
	4.6 Right Only Indications	4-2
	4.7 Carrier Shift Measurements	4-2
	4.8 Noise Level Measurements	4-2
	4.9 Incidental Phase Modulation Measurements	4-3
	4.10 Single Channel Separation Measurements	4-3
	4.11 Pilot Tone Level and Frequency	4-3

TABLE OF CONTENTS (CONTINUED)

SECTION	TITLE	PAGE
5	THEORY OF OPERATION	5-1
	5.1 General	5-1
	5.2 Circuit Card Functions	5-1
	5.2.1 AVC Assembly	5-1
	5.2.2 Meter Control Assembly	5-1
	5.2.3 Decoder Assembly	5-1
	5.2.4 Frequency Converter Assembly	5-2
	5.2.5 Power Supply Assembly	5-2
	5.3 Power Attenuator Assembly	5-2
	5.4 Frequency Converter Assembly	5-2
	5.5 Decoder Assembly	5-3
	5.5.1 Decoder II Assembly	5-4
	5.6 AVC Assembly	5-5
	5.7 Meter II Assembly	5-8
	5.8 Power Supply Assembly	5-9
6	MAINTENANCE	6-1
	6.1 General	6-1
	6.2 General Cleaning	6-1
	6.3 Power Supply Check	6-1
	6.4 Reference Oscillator Adjustment	6-2
	6.5 Front Panel Meter Lamp Replacement	6-2
7	LIST OF MATERIALS	7-1
	7.1 Introduction	7-1
	7.2 ASM-1 System Components	7-2
	7.3 ASM-1 Final Assembly	7-3
	7.4 AVC Assembly	7-6
	7.5 Frequency Converter Assembly	7-20
	7.6 Power Attenuator	7-53
	7.7 Power Supply Assembly	7-54
	7.8 Switch Panel Assembly Left	7-56
	7.9 Switch Panel Assembly Right	7-57
	7.10 Left and Right Thumbwheel Switch Assembly	7-58
	7.11 Decoder II Assembly	7-59
	7.12 Meter II Assembly	7-79
8	SCHEMATIC DIAGRAMS	8-1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1-1	Amplitude Modulation	1-2
1-2	Phase Modulation	1-3
1-3	C-QUAM Transmission Method	1-5
1-4	Decoding C-QUAM	1-7
2-1	Component Locations, Top View	2-2
3-1	Front Panel	3-7
3-1	Rear Panel	3-9

LIST OF TABLES

TABLE	TITLE	PAGE
3-1	Front Panel Controls	3-4
3-2	Rear Panel Outputs	3-8

SECTION 1

INTRODUCTION

1.1 SCOPE

This Technical Manual describes the Model ASM-1, AM Stereo Modulation Monitor, manufactured by Delta Electronics, Inc. The ASM-1 monitors modulation using the C-QUAM method of AM stereo transmission.

1.2 WHAT IS C-QUAM?

C-QUAM is the Compatible Quadrature Amplitude Modulation method of stereo transmission by which a main (L+R) and a subchannel (L-R) signal are transmitted on a single carrier. This is accomplished by using two modulation modes to transmit the main and stereo information channels. Stereo receivers separate the signals to ultimately produce left and right channel audio while typical monophonic receivers detect only the L+R (mono) content of the C-QUAM signal. The most important feature of C-QUAM is that no compromises are made in the monophonic performance in order to transmit stereo. It is truly a compatible stereo transmission system.

1.3 AM AND PM MODULATION

To ensure a full understanding of C-QUAM, a quick presentation of modulation characteristics is in order.

Amplitude modulation is the process in which one signal's amplitude is varied by another signal. An oscilloscope display depicts the amplitude variation versus time of the AM signal. This is the familiar RF envelope display illustrated in Figure 1-1A. The AM signal can also be described in the frequency domain with an amplitude versus frequency plot. Figure 1-1B illustrates a typical spectrum analyzer display of an AM signal. The display reveals a carrier and two sidebands separated from the carrier by the modulating frequency. In AM, as the modulation is increased, the sidebands amplitudes increase but the average carrier level remains constant.

Phase modulation results in very different time and frequency domain plots. PM is generated by varying the phase of the carrier signal, and thus, its instantaneous frequency, while the amplitude remains constant. Figure 1-2A illustrates a PM signal RF envelope. The spectrum analyzer plot of a PM signal reveals sidebands spaced at multiples of the modulation frequency from the carrier. Since the amplitude of the PM signal is constant, the phasing of the sidebands is such that they add and subtract to produce a constant amplitude. Figure 1-2B illustrates the PM signal spectrum plot.

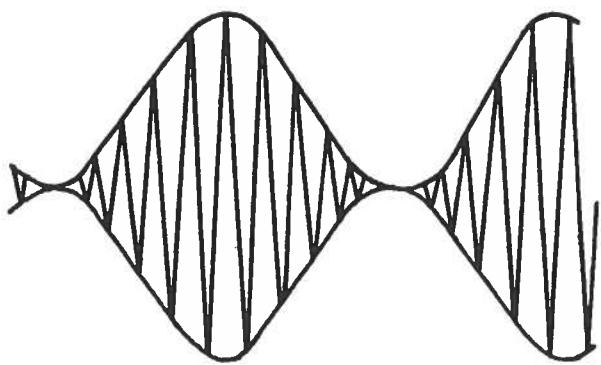


FIGURE 1-1A

ENVELOPE



FIGURE 1-1B

SPECTRUM

FIGURE 1-1

AMPLITUDE MODULATION

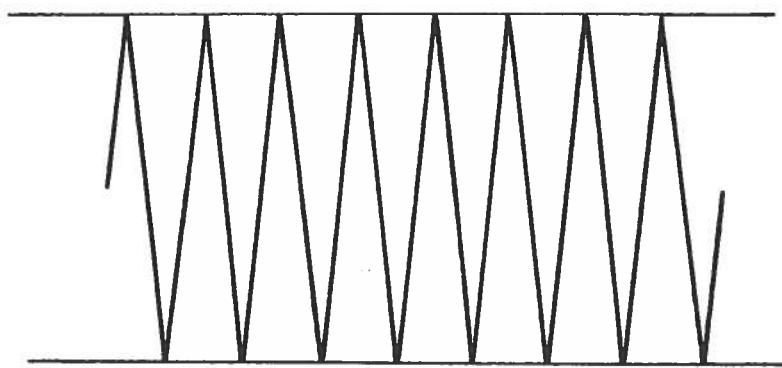


FIGURE 1-2A

ENVELOPE

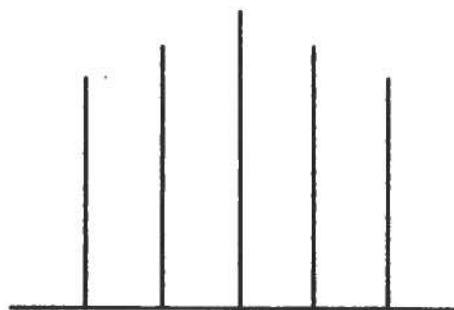


FIGURE 1-2B

SPECTRUM

FIGURE 1-2

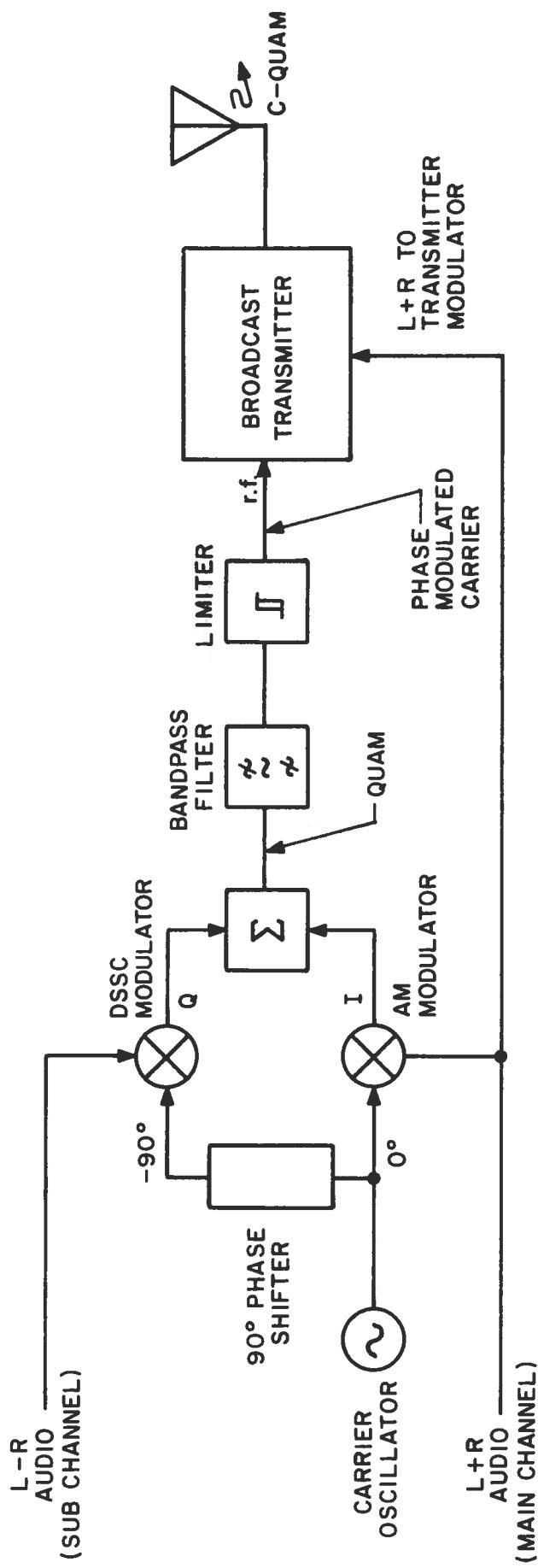
PHASE MODULATION

Since the phase of the carrier is not affected by amplitude variations, a phase detector output is zero when an AM signal is input. Similarly, an envelope detector does not detect phase variations of the PM signal; all the sidebands add and subtract according to their phasing to produce a constant amplitude RF signal. Thus, a phase modulated carrier can also be amplitude modulated producing a signal that carries two channels of information easily separated at the receiver. Most important is the fact that neither modulation mode affects the output of the other mode detector. This effect allows C-QUAM to be perfectly compatible with all AM receivers. C-QUAM transmits the L+R (mono) information with AM while the L-R (stereo) information is contained on the PM signal. The millions of existing envelope detector type radios now in use detect only the L+R AM signal, producing a clear undistorted mono audio signal that is completely unaffected by the L-R stereo subchannel information sent on the same carrier. Stereo decoders detect the L+R and L-R separately and dematrix them to produce left and right stereo audio.

1.4 GENERATING C-QUAM

The AM/PM method of stereo transmission discussed can be achieved by several methodologies. C-QUAM uses the L+R information to produce an in phase, I, AM signal while the L-R information is used to generate a quadrature (-90° phase shifted), Q, double sideband suppressed carrier (DSSC) signal. Summing the I and Q signals results in a signal that is both amplitude modulated and phase modulated. This quadrature amplitude modulated (QUAM) signal is not compatible with envelope detector receivers because the Q channel amplitude affects the amplitude of the sum of the I and Q channels. The QUAM signal is thus passed through a limiter to strip off the amplitude variations leaving only a phase modulated carrier. This phase modulated carrier generated from quadrature amplitude modulation replaces the carrier normally generated by the crystal oscillator in the broadcast transmitter. The I information (L+R) can then be used to amplitude modulate the phase modulated carrier in the broadcast transmitter as is done in conventional AM. The output of the transmitter is thus the C-QUAM signal.

Figure 1-3 illustrates the C-QUAM transmission methodology. The block diagram of Figure 1-3A shows how the I and Q signals are derived and summed to produce the QUAM signal. The vector diagram of Figure 1-3B shows the QUAM signal as the vector sum of the I and Q signals with a corresponding phase shift. After bandpass filtering and limiting, a constant amplitude phase modulated carrier remains as shown in Figure 1-3C. Finally, this carrier is fed to the transmitter where it is modulated by main channel audio to produce C-QUAM as shown in Figure 1-3D. Note that the amplitude of the C-QUAM signal is exactly the same as an AM signal for complete compatibility.



A) SIMPLIFIED BLOCK DIAGRAM

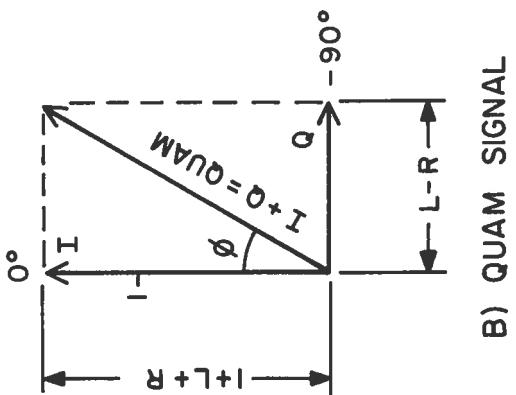
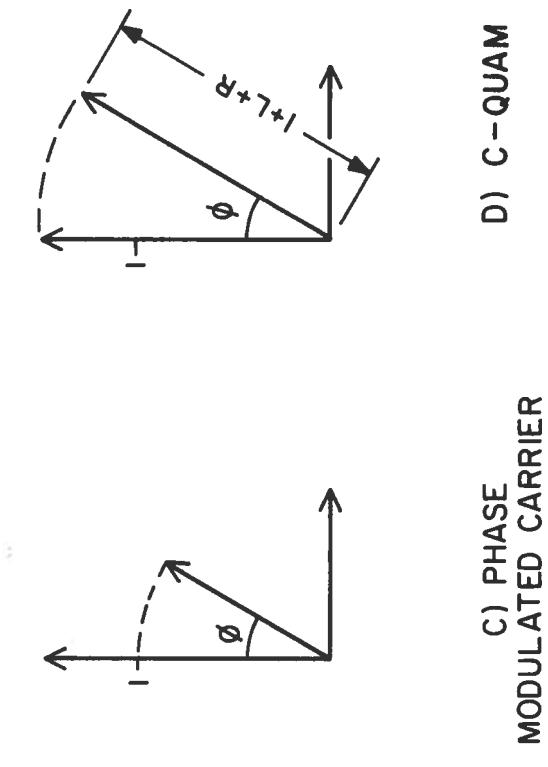
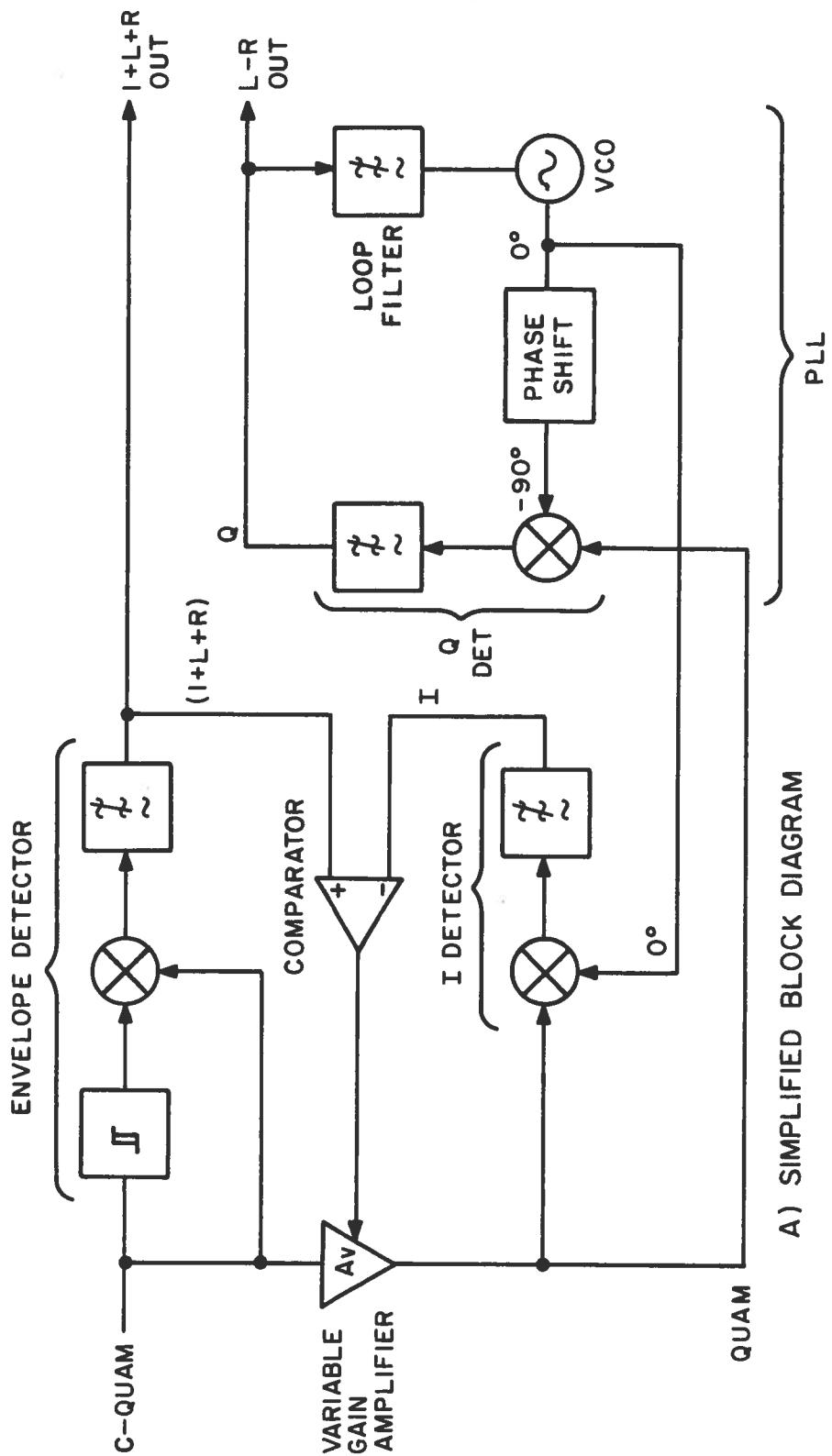


FIGURE I-3

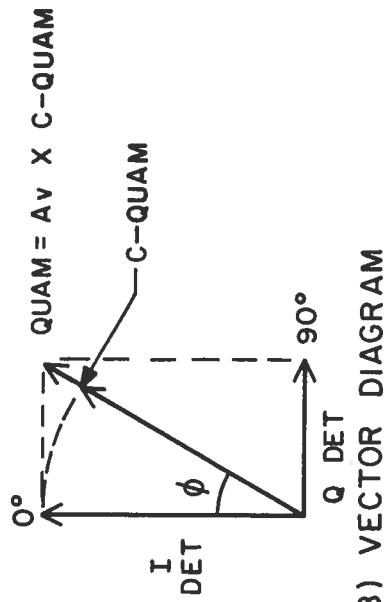
C-QUAM TRANSMISSION METHOD

Decoding C-QUAM signals is substantially the reverse of the encoding process. Referring to Figure 1-4A, note that the C-QUAM signal passes through a variable gain amplifier and is fed to a Q (quadrature) detector. The long term average output of the Q detector (DC component) is zero. Any variation from zero of the DC component will appear at the output of the loop filter and cause the VCO to correct phase to eliminate the variation. Thus the VCO is phase locked to the average carrier phase, zero degrees. The VCO signal is used to drive an in phase synchronous (I) detector which decodes the zero degree vector component of the amplified C-QUAM signal. Similarly, a ninety degree phase shifted VCO signal drives a quadrature phase synchronous (Q) detector which decodes the quadrature (-90°) vector component of the amplified C-QUAM signal.

The length of the C-QUAM vector of Figure 1-4B appears at the output of the envelope detector. It is apparent from Figure 1-4B that by appropriately amplifying the C-QUAM vector, the in phase (I detector) component can be made equal in magnitude to the magnitude of the C-QUAM vector. This is the function of the comparator which adjusts the variable gain amplifier to restore a QUAM signal for the I and Q detectors. Note that Figure 1-4B now becomes the same diagram as Figure 1-3B and that the outputs of the I and Q detectors are the desired L+R and L-R signals.



A) SIMPLIFIED BLOCK DIAGRAM



B) VECTOR DIAGRAM

FIGURE 1-4

DECODING C-QUAM

SECTION 2

EQUIPMENT CHECKOUT AND INSTALLATION

2.1 DELIVERY INSPECTION

The shipping cartons for the Monitor are designed to protect the equipment for normal handling during shipment. Unpack and thoroughly inspect the equipment for any evidence of mishandling. Report damage to the carrier immediately. Identify all deliverable items including card extender and Technical Manual. Check for mechanical integrity of the unit and overall outer appearance.

2.2 EQUIPMENT DAMAGED IN TRANSIT

The equipment should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. Report all shortages and damages to Delta.

Delta will file all claims for loss and damage on this equipment so long as the inspection report is obtained. Disposition of the damaged items will be furnished by Delta.

2.3 MECHANICAL CHECKOUT

CAUTION

Complete the below procedure before applying power to the unit.

Remove top panel screws from the Monitor and check that all circuit cards are properly seated in their sockets. Cards may be reseated by operating the cam levers to open each card socket and firmly pressing down on the card edge while closing the socket using the cam lever. Normal card complement and placement are shown in Figure 2-1. Secure the top cover.

2.4 REPLACEMENT PARTS

To obtain service replacement or warranty items, write or call Delta. Please supply product identification (Model Number and Serial Number) and replacement part identification (including Stock Number and Description). Shipping of replacements may be unduly delayed if the necessary information is not supplied. A complete List of Materials is provided in this Technical Manual.

2.5 FUNCTIONAL CHECKOUT

Plug the unit line cord into a suitable AC outlet. Verify meter functions and indicator light functions.

Unplug unit before proceeding.

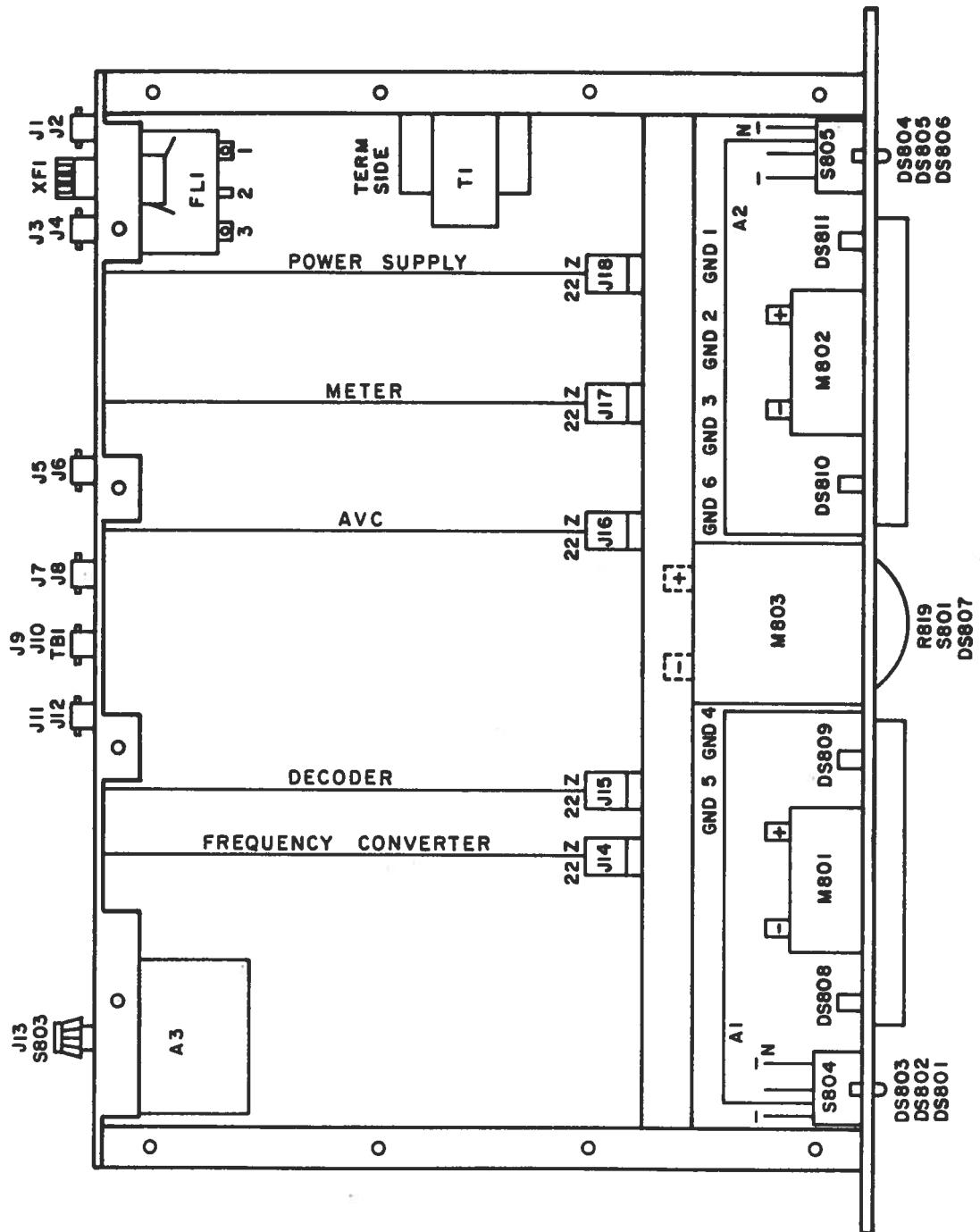


FIGURE 2-1

COMPONENT LOCATIONS

TOP VIEW

NOTE

There is no power switch for the Monitor. Therefore, unplug the line cords to turn the unit off.

2.6 FIELD ENGINEERING SERVICE

Requests for installation, field engineering or service assistance should be directed to Delta.

2.7 INSTALLATION

The installation of the AM Stereo Modulation Monitor, Model ASM-1, is a very straight-forward operation.

After completing the equipment checkout as outlined in Section 2.3, install and secure the unit in a standard 19" rack avoiding areas of excessive heat. Apply power.

CAUTION

Before connecting the transmitter's RF sample to the Monitor, ensure the sample level is between 1 to 10 Vrms (28 Vp-p maximum) into a 50 ohm load at 100% AM. Serious damage will result if this level is exceeded.

2.8 DAY RF SAMPLE LEVEL

Before connecting the RF sample to the unit, turn the RF Attenuator on the rear panel to maximum attenuation (fully counterclockwise while facing the rear panel). Turn the CARRIER SET pot on the front panel fully counterclockwise (maximum attenuation). Set the PILOT/CARRIER switch on the front panel to the CARRIER position.

Remove the 50 ohm load from the transmitter's carrier sample and connect the carrier sample to the RF input (J13) on the rear panel.

Adjust the CARRIER SET pot on the front panel to approximately the center of its range. Decrease the step attenuator on the rear panel one step (10 dB) at a time until a carrier indication is seen on the carrier meter. Again adjust the CARRIER SET pot to fine tune the carrier level so that the meter's display rests in the center at the SET position. The Monitor is now ready for operation.

2.9 NIGHT RF SAMPLE LEVEL

If transmitter power levels and/or patterns change, ensure RF sample levels from the transmitter remain constant for each power or pattern change.

2.10 OPERATIONAL CHECKOUT

Modulate the transmitter with either tones or program material and watch the modulation meters on the Monitor. Ensure the Monitor's modulation indications are correct beyond a reasonable doubt. To verify correct indications, view the RF sample going to the Monitor on a scope; in the envelope pattern, modulation levels can be confirmed.

SECTION 3
SPECIFICATIONS AND EQUIPMENT DESCRIPTION

3.1 SCOPE

This section describes the Model ASM-1 AM Stereo Modulation Monitor specifications and details front and rear panel descriptions and functions.

3.2 SPECIFICATIONS

3.2.1 RF Input

RF Sensitivity	1-10 Vrms
Input Impedance	50 Ohms
Input Attenuation	0-50 dB in 10 dB steps
Connector	BNC

3.2.2 Rear Panel Detector Outputs

Envelope Detector (J5)	2V p-p at 100% AM
L-R Detector (J7)	2V p-p at 100% PM
I Detector (J8)	2V p-p at single channel, 50%
Pilot (J6)	25 Hz at 2.5 Vrms
Connectors	BNC

3.2.3 Rear Panel Audio Outputs

Balanced (TB1):	
Left	0 dBm into 600 @ L+R = 100%
Right	0 dBm into 600 @ L+R = 100%
Connector	Terminal Block
Unbalanced:	
L+R	1.5 Vrms at 100% L+R
L-R	1.5 Vrms at 100% L-R
Left	1V RMS at 50% Left Only
Right	1V RMS at 50% Right Only
Connectors	BNC

3.2.4 Remote Flasher and Meter Outputs

L+R Flasher (J1)	+13 VDC Triggered
L-R Flasher (J3)	+13 VDC Triggered
L+R Meter (J2)	+0.45 VDC at 100% L+R 60 Ohm Source
L-R Meter (J4)	+0.45 VDC at 100% L-R 60 Ohm Source
Connectors	BNC

3.2.5	<u>Front Panel Meters</u>	
3.2.5.1	<u>Modulation Meters</u>	
	Positive Range	0 to 140%
	Negative Range	0 to 100%
	Attenuation Range	0 to - 50 dB
	Measuring Functions	+L+R, -L+R, +L, -L, +L-R, -L-R, +R, -R
	Meter Scales	% of Modulation and dB Levels
	dB Scale Range	+3 to -20 dB
	Meter Size	3" H X 4.5" W
3.2.5.2	<u>Carrier/Pilot Meter</u>	
	Carrier Scale Range	-20% to +20%
	Carrier Shift Indication	Direct Reading
	Pilot Level	Direct Reading
	Meter Functions	Switchable
	Meter Size	0.7" H X 2.6" L
3.2.6	<u>Peak Flashers</u>	
	+/- L or +/- L+R	1 to 199% Programmable Thumbwheel Controlled
	+/- R or +/- L-R	1 to 199% Programmable Thumbwheel Controlled
3.2.7	<u>Flashers</u>	
	-100% L+R	LED Indicator Fixed Calibration
	+125% L+R	LED Indicator Fixed Calibration
	L-R 100% (L-R Limit)	LED Indicator Fixed Calibration
	High Angle (OL-R Neg Limit)	LED Indicator Fixed Calibration
	Pilot Tone Indicator	LED Indicator Fixed Calibration
3.2.8	<u>Physical Characteristics</u>	
	Front Panel	19" Rack Mount
	Unit Dimensions	19"W x 5.25"H x 14.7"D
	Unit Weight	24 lbs.
	Operating Temperatures	0°C to +50°C

3.2.9	<u>Electrical Characteristics</u>	
	Intermediate Frequency	450 kHz
	Residual Noise L+R	-60 dB (referenced to 100% L+R)
	Residual Noise L-R	-55 dB (referenced to 100% L-R)
3.2.9.1	<u>Distortion vs. Frequency</u>	
	L+R: 95%, 50 Hz to 10 kHz	0.5%
	L-R: 100%, 50 Hz to 10 kHz	1%
3.2.9.2	<u>Response vs. Frequency</u>	
	95%, L+R, 50 Hz to 10 kHz	< ±0.2 dB
	100%, L-R, 50 Hz to 5 kHz	< ±0.1 dB
	100%, L-R, 5 kHz to 10 kHz	< ±0.3 dB
	75%, L or R, 50 Hz to 5 kHz	< ±0.1 dB
	75%, L or R, 5 kHz to 10 kHz	< ±0.3 dB
3.2.9.3	<u>Separation vs. Frequency</u>	
	50%, L or R only, 50 Hz to 1 kHz	45 dB
	50%, L or R only, 1 kHz to 5 kHz	40 dB
	50%, L or R only, 5 kHz to 10 kHz	35 dB
	75%, L or R only, 50 Hz to 5 kHz	35 dB
	75%, L or R only, 5 kHz to 10 kHz	30 dB
3.2.9.4	<u>Crosstalk vs. Frequency</u>	
	95%, L+R, 50 Hz to 5 kHz	45 dB
	95%, L+R, 5 kHz to 10 kHz	40 dB
	100%, L-R, 50 Hz to 1 kHz	50 dB
	100%, L-R, 1 kHz to 5 kHz	45 dB
	100%, L-R, 5 kHz to 10 kHz	35 dB
3.2.10	<u>Power Requirement</u>	
	Line Voltage	100/120/200/240 VAC
	Line Frequency	50/60 Hz
	Power	61 Watts

3.3 FRONT AND REAR PANEL DESCRIPTION

In the following tables, the front panel controls and rear panel inputs and outputs are described.

TABLE 3-1

MODEL ASM-1 AM STEREO MODULATION MONITOR

FRONT PANEL CONTROLS

<u>REF</u>	<u>DESCRIPTION</u>	<u>FUNCTION</u>
M801, M802	Large Front Panel Meters	These meters indicate modulation levels as selected by S801 and S802.
S801	Left Meter Attenuation Range Setting Switches	These switches select appropriate attenuation levels in 10 dB steps for the left-hand modulation meter
S802	Right Meter Attenuation Range Setting Switches	These switches located directly below the right-hand modulation meter and selects appropriate attenuation levels in 10 dB steps for the meter
S801A	Left Meter Modulation Function Switches	These four switches select what the left meter displays: +L+R, -L+R, +L or -L. They also control the left peak flasher's operation (DS803) as to what they will trigger on.
S802A	Right Meter Modulation Function Switches	These four switches select what the right meter displays: +L-R, -L-R, +R or -R. They also control the right peak flasher's operation (DS804) as to what they will trigger on.
DS803	Left Programmable Peak Flasher	The Left peak flasher modulation range is set via the left-hand thumbwheel switch. Its function depends upon the modulation switch setting of S801A.
S804	Left Thumbwheel Switch	This switch controls the level of modulation for which the Left flasher, DS803, fires.

TABLE 3-1

MODEL ASM-1 AM STEREO MODULATION MONITOR

FRONT PANEL CONTROLS

(CONTINUED)

<u>REF</u>	<u>DESCRIPTION</u>	<u>FUNCTION</u>
DS802	L+R +125% Flasher	This peak flasher indicates the presence of +125% envelope modulation. It is not programmable and does not depend upon S801A's setting. It is a fixed factory calibration.
DS801	L+R -100% Flasher	This is a peak reading flasher which indicates negative 100% envelope modulation. This flasher is not programmable and does not depend on S801As setting It is a fixed factory calibration.
DS804	Right Peak Flasher	The Right peak flasher modulation range is set via the right-hand thumbwheel switch. Its function depends upon the modulation switch settings of S802A.
S805	Right Thumbwheel Switch	This switch controls the level of modulation for which the right flasher, DS804, fires.
DS805	L-R Limit Flasher (100% L-R)	The flasher gives indication of a 100% sub channel modulated signal. It has no external settings and is a fixed factory adjustment.
DS806	L-R Negative Limit Flasher (high angle)	The L-R negative limit flasher gives indication that the L-R signal is overmodulating the combined modulation envelope. It indicates peaks of 90% or greater single channel modulation. This flasher has no external settings and is a fixed factory adjustment.
DS807	Pilot Tone Indicator	Indicates presence of 25 Hz pilot tone.

TABLE 3-1

MODEL ASM-1 AM STEREO MODULATION MONITOR

FRONT PANEL CONTROLS

(CONTINUED)

M803	Carrier Level Meter	Establishes a carrier reference level necessary to insure that the circuits driving the modulation meters are affected only by modulation changes. The carrier level meter indicates the average RF signal level input to the monitor decoder circuits. The RF signal input is set to a level (indicated on the meter and determined by the manufacturer) by means of the carrier set control R819. As long as the carrier level indication is within the range of the meter (+/-20% change of RF level), the modulation circuits will be within their design accuracy.
S803	Switch	Two position calibration meter function switch. In the pilot tone position, the carrier meter must indicate in the black square (pilot) position. This is a fixed factory adjustment which does not have an external setting.
R819	Carrier Set Control	In the carrier set position, the meter must indicate in the center on (set). The set position can be adjusted with the carrier set and rear panel (RF attenuator) controls.

SECTION 4

OPERATION AND PROOF OF PERFORMANCE

4.1 GENERAL

Although the FCC has deregulated the AM monaural proof of performance requirements, the AM stereo proof of performance is still required. For AM stereo proofs, certain FCC rules apply. The characteristics to be measured are described in Section 73.1590 and the minimum performance specifications are described in Sections 74.40 and 73.128.

The following text outlines procedures on how to perform a full stereo as well as mono proof using the Delta AM Stereo Modulation Monitor.

4.2 MONITOR FEATURES

The Modulation Monitor is capable of accurately demodulating and indicating amplitude modulation, left minus right modulation, left channel modulation, right channel modulation, carrier shift, right or left channel noise levels, separation, and level of pilot tone. In addition, the level of incidental phase modulation can be readily calculated from the left minus right modulation indication when modulating with pure AM. The frequency of pilot tone modulation can be measured with instruments connected to rear panel ports on the Modulation Monitor. The distortion and noise levels of the Modulation Monitor are sufficiently low that the measurements made of the various performance characteristics will be reflective of the limits of the broadcast transmitter/stereo encoder performance.

4.3 L+R INDICATIONS

The main L+R modulation percentage indicator can be read directly on the Monitor by selecting L+R on the left modulation selector switch, S801A, and viewed on the left-hand meter. By using the +/- function of S801A, either positive or negative L+R modulation will be indicated on the meter.

4.3.1 L+R Distortion Measurements

The L+R distortion can be measured by connecting a coaxial cable from the rear panel port (J10) labeled L+R to a distortion analyzer.

4.4 L-R INDICATIONS

The subchannel L-R modulation percentage indication can be read directly on the Monitor by selecting L-R on the right modulation selector switch, S802A, and viewed on the right-hand meter. By using the +/- function of S802A, either positive or negative L-R modulation will be indicated on the meter.

4.4.1 L-R Distortion Measurements

The L-R distortion can be measured by connecting a coaxial cable from the rear panel port (J12) labeled L-R to a distortion analyzer.

4.5 LEFT ONLY INDICATIONS

The left (L) only modulation percentage indication can be read directly on the Monitor by selecting L on S801A and viewed on the left-hand meter. By using the +/- function of S801A, either positive or negative left modulation will be indicated on the meter.

4.5.1 Left Only Distortion Measurement

The left channel distortion can be measured by connecting a coaxial cable from the rear panel port (J9) labeled LEFT to a distortion analyzer.

4.6 RIGHT ONLY INDICATIONS

The right (R) only modulation percentage indication can be read directly on the Monitor by selecting R on S802A and viewed on the right-hand meter. By using the +/- function of S802A, either positive or negative right modulation will be indicated on the meter.

4.6.1 Right Only Distortion Measurement

The right channel distortion can be measured by connecting a coaxial cable from the rear panel port (J11) labeled RIGHT to a distortion analyzer.

4.7 CARRIER SHIFT MEASUREMENT

The carrier shift can be read by observing the carrier level indicator on the C-QUAM AM Stereo Modulation Monitor. With no modulation applied, the carrier level indicator should be carefully set to the SET position. The next step is to modulate the transmitter with L+R at 25%, 50%, 85% and, if possible, 100% at 400 Hz. While viewing the carrier level indicator on the Monitor, the amount of carrier shift can be directly determined.

4.8 NOISE LEVEL MEASUREMENTS

The main (L+R), sub (L-R), left (L) and right (R) channel noise levels can be directly read on the Monitor by selecting the appropriate mode for the left or right meters, and depressing the meter range buttons until an on scale reading is obtained. The noise level is obtained by adding the meter range value with the indication of the red dB scale on the meter. It is already calibrated against 100 percent modulation. Noise level measurements can also be made from the respective rear panel ports. The recommended method of measurement is using the respective rear panel ports.

4.9

INCIDENTAL PHASE MODULATION MEASUREMENT

Under main channel modulation only (AM modulation or L-R), any incidental phase modulation (IPM) will result in L-R meter readings related to the degree of incidental phase modulation. The peak angle of incidental phase modulation in radians is approximately equal to the voltage ratio of the L-R meter reading to 100% for low levels of IPM typically encountered in AM transmitters. Thus, an L-R reading of -40 dB indicates an IPM phase angle of about 0.01 radians (0.57 degrees).

For best stereo transmission, IPM should be reduced by proper neutralization and power supply regulation in the transmitter. A good rule of thumb is that stereo separation is no better than subchannel (L-R) to main channel (L+R) crosstalk.

4.10

SINGLE CHANNEL SEPARATION MEASUREMENTS

For measurement of separation, modulate the transmitter with left only audio at 50%, 1 KHz. The left channel is modulated with a tone and a distortion meter or audio voltmeter is used to measure the audio output voltage from the left channel output of the Modulation Monitor. The audio voltage from the right channel output of the Modulation Monitor is then measured. The difference in dB is the separation. The reverse process is used to measure the separation of a modulated right channel into the left.

The front panel meters can be used directly when set to "L" and "R". The separation can be read directly on the panel meters by subtracting the readings in dB of the two meters added to the respective pushbutton settings. Note that of the two methods for measuring separation, the method utilizing the rear panel ports will be the most accurate and is the preferred method.

4.11

PILOT TONE LEVEL AND FREQUENCY

The relative pilot tone level may be measured directly on the Modulation Monitor by setting the PILOT/CARRIER switch under the carrier meter to the PILOT position and reading the level of pilot tone on the carrier level panel meter. When the correct level of pilot tone is present, the meter's indication will rest in the black block on the meter's face. To accurately measure the pilot level, remove all other modulation and set the L-R attenuator pushbutton to -20. The meter should indicate just below -26 dB.

Pilot tone frequency may be measured from the PILOT TONE port (J6) on the back of the Modulation Monitor. Pilot tone should be $25 \text{ Hz} \pm 0.1 \text{ Hz}$.

SECTION 5

THEORY OF OPERATION

5.1 GENERAL

A brief description of the function of each printed circuit board assembly in the Model ASM-1 is contained in section 5.2 below. Section 5.3 through 5.8 describe the operation of each assembly in greater detail.

5.2 CIRCUIT CARD FUNCTIONS

5.2.1 AVC Assembly (D33-328, Reference Designation A100)

The AVC Assembly controls the level of the L+R and L-R audio signals from the decoder assembly allowing these audio signals to be used as an instantaneous indication of the modulation level. This assembly also contains the carrier level detector and carrier meter drive circuitry, along with the pilot detector and meter drive circuits. With the exception of the two peak flashers, the five remaining flasher drives on the AVC panel are:

1. L+R 125% positive envelope peak indicator
2. L+R 100% envelope pinch off indicator
3. L-R 100% indicator
4. HIGH ANGLE (of phase modulation)
5. PILOT TONE present indicator

5.2.2 Meter Control Assembly (D33-379 Reference Designation A300)

The Meter Assembly contains the audio amplifiers and peak detectors which drive the left and right front panel meters. Additionally, it provides the circuitry to drive both left and right peak flashers operating in conjunction with the front panel mounted thumbwheels. This assembly provides the audio matrix circuitry for the balanced and unbalanced outputs to the rear panel ports. Pilot rejection filters are included on this circuit card which eliminates the 25 Hz pilot tone from the meters when making measurements of the left and right channel.

5.2.3 Decoder Assembly (D33-363, Reference Designation A 500)

The Decoder Assembly receives a 450 kHz intermediate frequency signal from the Frequency Converter Assembly, then detects and separates the envelope -(1+L+R) and quadrature -(L-R) audio signals which are sent to the AVC card. For test purposes, it provides three detected outputs to the rear panel ports:

1. Envelope detector output, J5
2. In-phase detector, J8
3. L-R quadrature detector, J7

5.2.4 Frequency Converter Assembly, (D33-482, Reference Designation A700)

The station radio frequency signal from the input attenuator is converted to 450 kHz intermediate frequency (IF) on this board using a double balanced mixer and local oscillator 450 kHz above the station frequency. The local oscillator signal is derived from a crystal reference by a phase lock loop (PLL) set to the correct frequency by an eight position DIP switch. The output of the mixer is filtered and fed through a transistor buffer amplifier to the input of the decoder board.

5.2.5 Power Supply Assembly (D33-330, Reference Designation A900)

The power supply works from either 100 volts or 200 volts AC source. A line filter is used to filter the AC line of unwanted signals or line interference. The Power Supply Assembly is protected by fuse and provides +5, +15, -15 volts regulated DC outputs and +24 and -24 volt unregulated DC outputs.

5.3 POWER ATTENUATOR ASSEMBLY

The RF sample of the transmitter's signal is fed into J13 on the rear panel. The Power Attenuator Assembly's ladder attenuator is adjusted via the attenuator rotary switch S803 to reduce the level of the RF sample bringing it within the control range of the CARRIER SET potentiometer, R819, on the front panel. Care should be exercised when installing the unit to ensure that high level samples are not fed into the attenuator when switched to low attenuation settings. The fully counterclockwise setting of S803 disconnects the attenuator input from J13.

5.4 FREQUENCY CONVERTER ASSEMBLY

This assembly converts the carrier frequency C-QUAM signal from the carrier set potentiometer to a C-QUAM signal at an intermediate frequency, usually 450 kHz. A double balance mixer, U701, mixes the carrier frequency C-QUAM signal with a local oscillator signal that is higher in frequency by the intermediate frequency. The output of this mixer if filtered by double tuned section of L701 and L703 to select only the difference frequency at the intermediate frequency. This intermediate frequency signal is buffered by transistor stage Q704 providing a C-QUAM signal to the decoder assembly.

The operating frequency of the ASM-1 is determined by setting the local oscillator frequency to a frequency at the carrier frequency plus the intermediate frequency. This local oscillator signal is generated by a phase lock loop acting through divider U704 which produces two square waves out of phase with each other to drive the differential input of the LO port of mixer U701. The input to the divider at four times the local oscillator frequency derives from a buffer amplifier formed by the circuitry of U702D, U702E, and Q703. The input to this buffer amplifier comes from the voltage controlled oscillator (VCO) of Q701 and associated components.

The VCO of Q701 is part of a phase lock loop (PLL) and its frequency is referenced to a crystal oscillator of Y701 and U701. The frequency of Y701 is divided inside U701 to produce either a 40 kHz internal reference signal for 10 kHz frequency spacing or a 36 kHz internal reference signal for 9 kHz frequency spacing depending upon the frequency of Y701. For 10 kHz spacing, Y701 is 10.24 MHz and for 9 kHz spacing Y701 is 9.216 MHz.

The VCO signal from Q701 connects through C714 to the input of U701 at pin 1. This signal is internally divided by a number determined by the settings of the eight switches of S701. The result of this division is a signal that is compared to the reference signal derived from Y701. The phase lock loop acts to bring these two divided signals to the same frequency and phase. Thus, when the PLL is locked, the VCO frequency is a multiple of the reference frequency derived from Y701, either 40 kHz or 36 kHz.

If the PLL is not locked or the phase difference between the two internal signals is not zero, error signals are generated from U701 pins 8 and 9. These pulse signals drive a charge pump circuit formed by U702A, U702B, U702C, and Q702. The output of this charge pump drives a loop filter of R721, C721, C720, and R720. The voltage from this loop filter determines the capacitance of varactor diode CR704 which determines the operating frequency of the VCO.

To determine the correct setting of the DIP switch, first determine the required local oscillator frequency. If the station frequency is 1314 kHz and the intermediate frequency is 450 kHz, the required local oscillator frequency is 1764 kHz. The step frequency is 9 kHz because Y701 is 9.216 MHz. Therefore the VCO is divided by $196 = 1764 \text{ kHz} / 9 \text{ kHz}$. 196 is the binary number 11000100. Thus switch positions of S701 from S701-8 to S701-1 are: open, open, closed, closed, closed, open, closed, and closed. An open switch is a binary one and a closed switch (to ground) is a binary zero.

5.5 DECODER ASSEMBLY

The Decoder Assembly functions to reduce the intermediate frequency (IF) C-QUAM signal from the Frequency Converter Assembly to audio frequency (baseband) main channel -(1+L+R) and subchannel -(L-R) components. The basic operation of the circuit is described in Section 1.4 which should be reviewed before proceeding.

5.5.1 Decoder II Assembly, D33-363

The intermediate frequency C-QUAM signal passes through the tuned circuits of L502 and L501 and is fed to three balanced signal paths. The first path takes the signal through transistor buffer stages of U516 (in pins 13 and 16 and out pins 2 and 3) to a limiter circuit of U510 (in pins 9 and 10). The output of U510 (pins 2 and 3) is a constant amplitude, intermediate frequency signal containing C-QUAM phase information. This signal feeds the high level input port of balanced mixer U505, pins 8 and 10. The second IF C-QUAM path takes the signal directly to the low level input port of mixer U505 (pins 1 and 4) forming an envelope detector. The output circuit of this mixer, at pins 6 and 12 of U505, contains a second harmonic trap circuit of L503 to eliminate the 900 KHz sum signal leaving the desired baseband signal ($L+L+R$) predominant. This balanced output is buffered through the follower circuits of U511 (in pins 3 and 6, out pins 4 and 8) and is filtered and converted to an unbalanced main audio channel signal, $-(L+L+R)$, by the operational amplifiers U514A and U514B. This signal is the Envelope Detector output appearing at TP515 and the rear panel BNC port, J5.

The third IF C-QUAM signal path is to a variable gain RF amplifier with an input at pins 6 and 9 of U501. This circuit is composed of U501, U502, Q501 through Q504 and associated components. The output of this variable gain amplifier appears on the emitters of Q503 and Q504 feeding the low level inputs of balanced mixers U508 and U509 at pins 1 and 4 of each chip.

Mixer U508 is an in-phase synchronous (I) detector demodulating the zero degree component of the amplified IF C-QUAM signal. Its output circuit, pins 6 and 12, contains a second harmonic trap to remove the 900 KHz mixing product leaving a predominant baseband output. This signal is fed through the follower circuits of U511 (in pins 10 and 13 and out pins 11 and 12) to operational amplifier circuits of U503A and U503B which filter and convert the signal to unbalanced form. This is the I Detector output appearing at TP505 and the rear panel BNC port, J8.

U509 is a quadrature (Q) detector demodulating the minus ninety degree component of the amplified IF C-QUAM signal. Its output, pins 6 and 12, contain a second harmonic trap to remove the 900 KHz mixing product leaving a predominant baseband signal. This signal is filtered and converted to unbalanced form by operational amplifiers U514C and U514D and appears at TP510 and the rear panel L-R Detector BNC port, J7.

The quadrature detector output signal from TP510 is fed to a 25 Hz inverting bandpass filter of U504A. A 25 Hz pilot signal at TP513 will be 180 degrees out of phase with the same signal at TP510. These two signals are summed at TP514 so that any 25 Hz pilot signal component cancel. The remaining quadrature detector signal is fed to a phase lock loop filter of U504B. The output of this filter controls the frequency of the voltage controlled crystal oscillator of Q513. The output of this oscillator is buffered by Q514 and divided (in frequency) by two in U513. The signal is

further divided by four in the dual D flip flop, U512. The signals from U512 are a pair of balanced square waves in quadrature. The 0 degree balanced signal from U512, pins 2 and 3, feeds the high level port of the I detector, U508 pins 8 and 10. The -90 degree balanced signal from U512 pins 15 and 14 feeds the high level port of the Q detector, U509 pin 8 and 10.

The phase lock loop (PLL) described above acts to keep the average (DC) voltage of the quadrature detector output at zero. This can only occur when the signals from U512 are in proper phase relationship with the IF C-QUAM signal. If the signal at the high level port of the Q detector is not in quadrature (-90 degrees) with the in phase (carrier) component of the IF C-QUAM signal (a phase error), the output of the quadrature detector would contain a DC component. This DC signal would integrate in the loop filter causing a correction voltage to appear at the VCO to reduce the phase error.

The PLL has a narrow capture range which may not be sufficient during start-up to acquire lock on the IF C-QUAM signal. Under this condition, the I detector output at TP505 will swing wildly beyond the levels encountered in normal operation. Whenever this occurs, operational amplifier U503C will charge C566 through CR505 which will cause operational amplifier U503D to cut on K501. R651 is then placed in the loop filter circuit widening the PLL capture range.

As described in Section 1.4, the RF variable gain amplifier is controlled by an error signal derived from comparing the envelope detector signal with the I detector signal. The buffered output signals from these detectors are taken from U511 and converted to unbalanced signals by U506 and U507. These unbalanced signals from TP516 and TP517 are compared by the differential amplifier circuit of Q511 and Q512 producing the error or correction signal. This signal is buffered through Q510 feeding the correction line and controlling the variable RF amplifier gain.

The gain of the variable gain RF amplifier increases with negative voltage until, at a very high gain corresponding to large phase angles, the gain versus control voltage curve reverses slope. Under this condition, the decoder may "lockup". A voltage limiter circuit of U515 and Q509 on the correction line prevents "lockup". As the correction line approaches a protective voltage limit set by R501, U515A output (pin 7) comes off the negative rail and brings the positive input of U515B above the negative input. The output of U515B swings from the negative rail to the positive rail cutting on Q509 through CR507. Q509 shunts some of the differential signal to Q511 and Q512 reducing the loop gain. As the correction line voltage continues to fall, the output of U515A will rise until CR504 conducts for hard limiting on the correction lines.

5.6 AVC ASSEMBLY

The AVC Assembly regulates the level of the main channel -(l+L+R) and subchannel -(L-R) audio from the Decoder Assembly for proper metering. This is done by feeding the envelope detector -(l+L+R) and Q detector -(L-R) signals through two carefully adjusted four quadrant multipliers acting as matched variable amplifiers controlled by a common feedback signal. The

feedback signal is derived from comparing the DC output of the envelope four quadrant multiplier (regulated envelope) with a DC standard voltage. Any difference between the two DC voltages will generate a feedback (error) signal adjusting the gain of both multipliers to re-establish a correct regulated envelope signal.

U102 and U104C together are the envelope multiplier. Its output is fed to U104A which compares this regulated envelope signal to the DC reference voltage from U104B. U104D filters the error signal and provides the gain control feedback voltage to maintain regulated signals from both multiplier circuits. If, for instance, the transmitter's power drops 5%, then the DC component of the envelope detector output and the AC components of the envelope and Q detectors would drop by 5%. If no correction were taken, our modulation meters would read 5% low. However, since the regulator circuit will increase the gain of both multipliers by 5% to restore the DC component level, the AC components are also increased by 5%, restoring correct meter reading.

Since the DC level from the regulated envelope signal is now fixed, it is easily removed by the circuit of U105C yielding main channel audio ($L+R$) for positive peak meter readings. This signal is inverted by U105B for $-(L+R)$ peak meter readings. The output of the regulated quadrature multiplier, U103 and U106A, is inverted by U106C for $+(L-R)$ peak meter readings and inverted again by U106D for $-(L-R)$ meter readings. The $+(L+R)$, $-(L+R)$, $+(L-R)$ and $-(L-R)$ signals are dematrixed by U111 producing $+L$, $-L$, $+R$ and $-R$ signals for peak meter readings. These eight peak meter reading signals are routed to the front panel switch decks, S801 and S802, where they are selected and attenuated before traveling to the appropriate meter circuit and peak flasher (thumbwheel controlled) circuit.

The reference voltage (equal to regulated envelope DC component) from U104B is buffered by U105D and fed to the $+(L+R)$ 125% comparator, U117C, and the $(L-R)$ 100% comparator, U117A. The regulated envelope signal, $(1+L+R)$, is buffered by U105A and fed to the $+(L+R)$ 125% comparator circuit. R161, R162 and R255 divide the regulated envelope signal such that the regulated envelope signal must reach +125% in order for the voltage on U117C pin 8 to exceed the reference voltage on pin 9. When this occurs, the output of U117C will go low, triggering one-shot U108 which flashes the front panel +125% modulation indicator, DS802.

The regulated quadrature signal from U106C drives an absolute value circuit, U106B, which converts both positive and negative voltages to positive voltages. Whenever this absolute value signal exceeds the magnitude of the reference voltage, $(L-R)$ is greater than 100% and the output of comparator U117A goes low. This triggers one-shot U107 flashing the front panel L-R LIMIT ($L - R$ 100%) indicator, DS805.

Whenever the regulated envelope signal from U105A drops below zero volts, the negative envelope modulation is more than 100% (overmodulation) and the output of comparator U117D goes low. This triggers one-shot U109 firing the front panel L+R -100% indicator, DS801.

Comparator U117B functions to detect high phase angles of the C-QUAM signal by analyzing the absolute value of the regulated quadrature signal from U106B and a divided version of the regulated envelope signal. For high angles to occur, the regulated envelope signal must be small (negative envelope modulation) while the quadrature signal is large. This can be confirmed by observing Figure 1-3. R258 is adjusted so that the output of U117B goes low whenever the phase angle reaches 83 degrees, equivalent to 90% single channel modulation. A low output from U117B triggers one-shot U110 flashing the front panel NEGATIVE LIMIT (High Angle) indicator, DS806. If this flasher fires, corrective action should be taken since integrated circuit decoders in receivers cannot decode such high angle modulation.

The regulated quadrature signal from U106C is filtered by four 25 Hz bandpass sections of U113 to isolate the pilot signal. The output of this filter is fed to the rear panel pilot tone connector, J6, for pilot frequency checks. The PLL tone decoder, U114, will lock on the presence of a pilot signal illuminating the front panel PILOT indicator, DS807. CR103 and C136 peak detect the pilot signal for meter amplifier U115A and U115D which drives the carrier (pilot) meter, M803, through the meter function switch, S803.

The envelope detector output (unregulated) is filtered by U112D to remove modulation components. The output of U112D (positive DC) is compared to a -1.2 volt DC reference from U101A by summing amplifier U112C. Its output will be zero volts for a nominal signal level from the envelope detector (-1.000 VDC) which results in a SET reading (0 ma) on the carrier level meter, M803. U115C buffers and amplifies the output of the summing amplifier providing carrier level meter current through R264 and the meter function switch, S803. The circuits of U112A and U112B are protection circuits for the carrier level meter preventing excessive current flow in the meter circuit.

METER II ASSEMBLY

The Meter II Assembly contains the meter drive circuitry, the variable flasher circuitry, the pilot reject circuitry for the meter, output and flasher circuits, the matrices and buffers to drive the rear panel unbalanced outputs, and the balanced output drivers which include the selectable NRSC deemphasis and pilot reject circuits.

Quad operational amplifiers U309 and U310, resistors R338 through R335, resistor networks R3120 and R3121 and capacitors C315 through C320 work together to matrix the $-(l+L+R)$ and the $(L-R)$ signals from the Decoder II Assembly into the unbalanced L-R, L+R, L and R audio signals. The unbalanced audio signals appear on the associated rear panel outputs. The L and R signals are input to operational amplifiers U312A and U311A respectively. Integrated circuit U311, resistors R358 through R360 and capacitor C324 form the NRSC deemphasis circuit for the R audio signal. When jumper W1 is in the 2-3 position, the circuit deemphasizes the R signal. With jumper W1 in the 1-2 position, the R signal bypasses the deemphasis circuit. Integrated circuit U312, resistors R361 through R363, capacitor C325 and jumper W2 perform the same function for the L audio signal. The outputs from the deemphasis circuit are input to the L and R Output Pilot Reject circuits. The circuits are identical, so only the right circuit will be explained. Operational amplifiers U313A, U313B and U313D, resistors R364 through R368, resistors R3110A, R3111A, R3111B and R3111C and capacitors C326 and C327 form a tunable notch filter. Variable resistor R368 tunes the filter so it removes the 25 Hz pilot signal from the single channel R audio signal. Operational amplifier U313C and resistor R3110B invert the R signal, creating the $-R$ audio signal input to the R output circuit on sheet 2 of the schematic diagram.

The R and L output circuits are identical, so only the R output circuit will be described. The $-R$ signal from U313-8 is output on J17-30 to the unbalanced right output connector on the back panel. DC blocking capacitor C330 prevents the DC bias voltage from feeding back into the preceding circuitry. Operational amplifier U315B and resistors R374 and R375 amplify and invert the signal. DC blocking capacitor C333 filters the signal again, putting a $+R$ audio signal on J17-39. Operational amplifier U315A buffers the $-R$ signal. DC blocking capacitor C332 filters the signal, putting a $-R$ audio signal on J17-40. The $+R$ and $-R$ signals appear as the balanced Right output on terminal block TBL on the back panel.

The pilot signal would interfere with correct operation of the peak flashers and the meter readings of the single channel audio signals if present. The Left and Right Meter Pilot Reject circuits remove the 25 Hz pilot signal from the single channel audio signals. Because the Left and Right circuits are identical, only the Left circuit will be explained. Either the $+L$ or $-L$ signal is input from the Left Pushbutton Switch Assembly. The $+L$ or $-L$ signal passes through the Left Meter Pilot Reject circuit, a quad operational amplifier, U301, configured as a 25 Hz notch filter. The filter removes the pilot signal from the $+L$ or $-L$ signal, then the single channel audio signal returns to the Left Pushbutton Switch Assembly.

The Left and Right Peak Flasher circuits drive the two adjustable front panel peak flashers. Because the Left and Right circuits are identical, only the Left circuit will be explained. The reference for the peak flasher circuit is derived from voltage reference CR301. Operational amplifiers U303A and U303B amplify the reference voltage and convert it to a reference current. The Left Thumbwheel Switch on the front panel, which sets the modulation threshold that triggers the flasher, controls a programmable resistance current shunt. The operational amplifiers and the shunt form a user programmable voltage reference for buffer U304A. Operational amplifier U304C buffers the unattenuated audio signal from the Left Pushbutton Switch Assembly. U305 is a comparator. When the output of audio buffer U304C exceeds the output of reference buffer U304A, the output pulse of U305 triggers 555 one-shot U307. U307 stretches the output pulse, ensuring the pulse lights the Left peak flasher long enough for the flash to be visible. The 13V (active) signal from U307 drives both the peak flasher LED and the rear panel flasher port.

The Left and Right Meter Drive circuits are identical, so only the Left circuit will be explained. Capacitor C340 and resistor R386 on the Meter Drive circuit filter any DC voltage from the attenuated signal from the Left Pushbutton Switch Assembly. Operational amplifiers U317A and U317B then amplify the signal. Capacitor C336 and resistor R391 filter the amplified signal. Operational amplifiers U317C and U317D are configured as a positive peak detector to allow the DC meter to display the AC audio signal. Capacitor C337 and resistor R393 control the meter decay time. Operational amplifier U319A buffers the peak detector output to drive the rear panel left remote meter port.

Operational amplifier U310D is configured as a 3.0 VDC voltage source. It is used as the bias voltage for the Matrix circuit and the output circuit.

5.8 POWER SUPPLY ASSEMBLY

The Power Supply Assembly converts the dual secondary AC voltages of the power transformer to regulated +5 VDC, +15 VDC and -15 VDC. The low voltage AC secondary from the power transformer is fed to a bridge rectifier circuit composed of CR904, CR905, CR907 and CR908. For units Serial Numbers 51 and below, the power transformer secondary is center tapped and diodes CR907 and CR908 are omitted. The rectified voltage charges filter capacitor C906 which supplies current to voltage regulator VR901 generating +5 VDC. VR901 is mounted on the side panel for heat sinking.

A higher voltage, center tapped, power transformer secondary feeds a second bridge rectifier composed of diodes CR900 through CR903. The positive side of this bridge rectifier charges filter capacitor C900 supplying current to the +15 VDC regulator, VR900, mounted on the side panel for heat sinking. The negative side of the bridge rectifier charges filter capacitor C901 which supplies current for the -15 VDC regulator, VR902, mounted on the side panel for heat sinking. The unregulated voltages from C900 and C901, appearing on J18 pin J and pin R respectively, are unused.

SECTION 6

MAINTENANCE

6.1 GENERAL

This section describes on-site maintenance procedures. The ASM-1 AM Stereo Modulation Monitor is a self-contained unit requiring little maintenance. The following paragraphs outline maintenance procedures that can be performed on-site.

CAUTION

When servicing the Monitor, absolutely no internal adjustments should be made (unless discussed in the following paragraphs). The ASM-1 Monitor is a precision instrument and factory calibrated using specialized test equipment under a precisely controlled and sequential procedure. Internal tampering of any adjustment will hinder many operating parameters and seriously effect its measuring/operating capability. If a problem exists that cannot be corrected and does not apply to the procedures outlined in this section, factory attention is necessary.

6.2 GENERAL CLEANING

It is obvious that when cleaning the front panel, any abrasive cleaning agent can do damage to the painted surface as well as to the meter faces. It is recommended that a liquid glass cleaner on a soft, clean cloth be used. The interior of the unit must be free of foreign objects. To clean it, power down the unit and remove carefully all printed circuit assemblies. With the unit upside down, wipe out all foreign objects. Forced, low pressure air can also be used. After the cleaning is complete, reseat all printed circuit assemblies in their proper card edge connectors as shown in Figure 2-1.

6.3 POWER SUPPLY CHECK

The DC outputs of the Power Supply Assembly can be checked and verified at the following locations on the Power Supply's card edge connector, J18:

<u>Regulated Voltage</u>	<u>Tolerance</u>	<u>Location</u>	<u>Ripple</u>
+5V	<u>± 0.25V</u>	J18-B, 2, 16	< 25 mV
+15V	<u>± 0.50V</u>	J18-F, 6	< 25 mV
-15V	<u>± 0.50V</u>	J18-P, 13	< 25 mV

<u>Unregulated Voltage</u>	<u>Tolerance</u>	<u>Location</u>	<u>Ripple</u>
+24V	<u>± 4.0V</u>	J18-J	N/A
-24V	<u>± 4.0V</u>	J18-R	N/A

6.4 REFERENCE OSCILLATOR ADJUSTMENT

The capture range of the PLL on the Decoder Assembly is ± 20 Hz. This is a very small window in which the Decoder Assembly operates. It may be necessary to adjust the output of the reference oscillator on the Frequency Converter Assembly (D33-324) to keep the PLL on the Decoder at or near the center of the capture range. To accomplish this, probe the banded side of CR506 on the Decoder Assembly with an accurate DC voltmeter, referenced to ground. Adjust C701 on the Frequency Converter Assembly for 5 to 6 volts DC. Extreme caution must be given not to touch any other adjustments on the Decoder and Frequency Converter Assemblies.

6.5 FRONT PANEL METER LAMP REPLACEMENT

The internal drive circuitry for the front panel meter lamps was designed as to afford long life for the meter lamps. However, if it becomes necessary to change out a meter lamp, power down the unit and remove it from its rack mounting. Disconnect the front panel assembly by the four #10 machine screws on the front panel. Remove the bad meter lamp from its meter housing and desolder its leads from the terminal strip. Solder the leads of the new lamp to the terminal strip and reseat the new lamp into its meter housing. Carefully reinstall the front panel, insuring that no harness wires are being pinched or cut. Reinsert the four #10 machine screws on the front panel.

SECTION 7

LIST OF MATERIALS

7.1 INTRODUCTION

Maintenance parts in the ASM-1 are identified by reference designations. These designations are used on the photographs, schematic diagrams, and lists of material to identify the components. The component reference designation is also marked adjacent to the component on the printed circuit assemblies. The letter(s) in the reference designation identifies the class of item such as a resistor, relay or transistor or identifies a subassembly such as a printed circuit assembly. The number differentiates between parts or subassemblies of the same class.

Reference designations for the parts of a subassembly are grouped in a hundreds series with some subassemblies having two hundreds series. For instance, the AVC assembly has both 100s and 200s series of parts. R104 and R264 are both resistors on the AVC assembly.

The List of Material for the Model ASM-1 AM Stereo Modulation Monitor and for the maintenance significant assemblies are presented as follows:

Title	Section	Page
ASM-1 System Components	7.2	7-2
Final Assembly, ASM-1	7.3	7-3
AVC Assembly	7.4	7-6
Frequency Converter Assembly	7.5	7-20
-----	7.6 / 7.7	Omit
Power attenuator	7.8	7-53
Power Supply Assembly	7.9	7-54
Left Switch Panel Assembly	7.10	7-56
Right Switch Panel Assembly	7.11	7-57
Left and Right Thumbwheel Switch Assembly	7.12	7-58
Decoder II Assembly	7.13	7-59
Meter II Assembly	7.14	7-79

7.2 LIST OF MATERIAL, MODEL ASM-1 SYSTEM COMPONENTS

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
Unit 1	Model ASM-1 AM Stereo Modulation Monitor	Delta	D15-12	015-0012
-----	Power Cord	Belden	17280	678-0001
-----	Extender Card	Delta	D33-337	033-0337
-----	Technical Manual	Delta	D93-345	093-0345

7.3 LIST OF MATERIAL, FINAL ASSEMBLY, MODEL ASM-1 AM STEREO MONITOR, D15-12, REV. K

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
A1	Switch Panel, Left	Delta	D33-327	033-0327
A2	Switch Panel, Right	Delta	D33-326	033-0326
A100	AVC Assembly	Delta	D33-328	033-0328
A300	Meter Control Assembly	Delta	D33-329	033-0329
A500	Decoder Assembly	Delta	D33-332	033-0332
A500	Decoder II Assembly	Delta	D33-363	033-0363
A700	Frequency Converter Assembly (10 KHz Frequency Spacing)	Delta	D33-324-3	033-0324-003
A700	Frequency Converter Assembly (9 KHz Frequency Spacing)	Delta	D33-324-4	033-0324-004
A800	Power Attenuator Assembly	Delta	D33-333	033-0333
A900	Power Supply Assembly	Delta	D33-330-2	033-0330-002
DS801	LED, Red, 5V	Dialight	507-4757-3731-500	646-0001
DS802 thru DS807	Same as DS801			
DS808	Bulb, 28 VDC, 40MA, T1-3/4, 6 Inch Wire Leads	Micro Lamp	M2187	644-0018
DS809 thru DS811	Same as DS808			

7.3 LIST OF MATERIAL, FINAL ASSEMBLY, MODEL ASM-1 AM STEREO MONITOR, D15-12, REV. K CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
F1	Fuse, Type 3AG, Slo-Blo, 1A (Use For 100 VAC Operation)	Littelfuse	313001	632-1020
F1	Fuse, Type 3AG, Slo-Blo, 0.5A (Use For 200 VAC Operation)	Littelfuse	313.500	632-1015
F11	Filter, Line	Corcan RTtron	2K4 RNF-2P6	630-0002
J14	Connector, Card Edge, zero Insertion Force, Side Entry	Amp	531025-3	618-0077
J15 thru J18	Same as J14			
M801	Meter, Modulation Level	Meter-Master	591C42-20A	002-0051
M802	Same as M801			
M803	Meter, Carrier/Pilot Level	Meter-Master	591B42-19	002-0050
M819	Resistor, Variable, 200 Ohm	Allen-Bradley	RV4WA YSD201A	240-0035
S801	Switch, SPDT, Panel Mount	American Switch	ST1-1KMZQ	660-0049
S804	Thumbwheel Assembly, Left and Right	Delta	D34-69	034-0069
S805	Same as 804			
T1	Transformer, Power, Dual Primary, Dual Secondary	Signal	DMT8-15	362-0031
TB1	Terminal Block, 6 Position	Kulka	599-2004-6	670-0010-006
W1	Cord, Line, 3 Cond, 13 AWG	Belden	17280	678-0001

7.3 LIST OF MATERIAL, FINAL ASSEMBLY, MODEL ASM-1 AM STEREO MONITOR, D15-12, REV. K CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
XDS801	Socket, LED, Panel Mount	Dialight	250-8738-14-504	648-0004
XDS802 thru XDS807	Same as XDS801			
XF1	Fuseholder	Littelfuse	342014AL	364-0010
XR819	Knob, Black, Matte Finish	Raytheon	90-1-2G	730-0028

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C106	Capacitor, Fixed, Electrolytic, 100 uF, 25V	Nichicon	ULB1E101M	320-0067
C107	Capacitor, Fixed, Film, .047 uF	Nichicon	QYA2A473K	330-0020
C108	Same as C106			
C109	Capacitor, Fixed, Monolithic, Ceramic, .47 uF, 50V	Sprague	1C20Z5U474M050B	310-0052
C110	Capacitor, Fixed, Film, .01 uF, 100V	Nichicon	QYA2A103K	330-0015
C111	Same as C109			
C112	Same as C110			
C113	Same as C109			
C114	Same as C110			
C115	Same as C109			
C116	Same as C110			
C117	Capacitor, Fixed, Tantalum, 4.7 uF, 50V	Sprague	CSR13G475KM	326-0009-001
C118	Capacitor, Fixed, Electrolytic, 2.2 uF, 50V	Nichicon	ULB1H2R2M	320-0062
C119	Capacitor, Fixed, Film, 0.1 uF	Nichicon	QYA2A104K	330-0021

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C120	Same as C119			
C121	Same as C119			
C122	Capacitor, Fixed, Polycarb, NPO, 0.1 uF, 1%, 100V	S & EI	22RB104F	330-0033
C123	Capacitor, Fixed, Mica, 82 PF, 500V		CM05ED820J03	302-0820
C124	Same as C107			
C125	Capacitor, Fixed, Polyester Film, .001 uF	Nichicon	QYA2A102K	330-0012
C126	Same as C119			
C127	Same as C110			
C128	Same as C122			
C129	Same as C123			
C131	Same as C106			
C133	Same as C117			
C134	Same as C117			
C135	Capacitor, Fixed, Electrolytic, 10 uF, 25V	Nichicon	ULB1E100M	320-0064
C136	Same as C117			
C137	Same as C117			

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C138	Same as C119			
C139	Same as C119			
C141	Same as C119			
C142	Same as C135			
C143 thru C146	Same as C109			
C148	Same as C106			
CR101	IC, Diode, Zener, 1.2V	LM385H-1.2	548-0025	
Q1	TRANSISTOR, SIL. GEN PURP., NPN	2N3904	420-3904	
CR103	Diode, Silicon	IN4148	410-4148	
CR104	Same as CR103			
CR106 thru CR109	Same as CR103			
CR113	Same as CR103			
CR114	Same as CR103			
R104	Resistor, Fixed, Film, 3.3K Ohm, 5% 1/4W	RL07S332J	202-0332	
R109	Resistor, Fixed, Film, 8.2K Ohm, 5%, 1/4W	RL07S822J	202-0822	

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R110	Resistor, Fixed, Film, 10K Ohm, 5%, 1/4W	RL07S103J		202-0103
R111	Same as R104			
R112	Resistor, Fixed, Film, 4.75K Ohm, 1%		RN55D4751F CCF554751F	212-4751
R113	Same as R112			
R114	Resistor, Fixed, Film, 27K Ohm, 5%, 1/4W	RL07S273J		202-0273
R115	Resistor, Fixed, Film, 330K Ohm, 5%, 1/4W	RL07S334J		202-0334
R116	Same as R115			
R117	Same as R114			
R118	Resistor, Fixed, Film, 15K Ohm, 5%, 1/4W	RL07S153J		202-0153
R119	Resistor, Fixed, Film, 22K Ohm, 5%, 1/4W	RL07S223J		202-0223
R120	Same as R109			
R121	Same as R110			
R122	Same as R104			
R123	Same as R112			
R124	Same as R112			

7.4 LIST OF MATERIAL, AWC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R125	Same as R114			
R126	Same as R115			
R127	Same as R115			
R128	Same as R114			
R129	Same as R118			
R130	Same as R119			
R131	Resistor, Fixed, Film, 10K Ohm, 5%, 1/4W		RL07S103J	202-0103
R132	Resistor, Variable, 5K Ohm	Bourns	3299Y-1-502	244-0076
R133 thru R135	Same as R132			
R136	Same as R131			
R137	Same as R109			
R138	Same as R110			
R139	Resistor, Fixed, Film, 12K Ohm, 5%, 1/4W		RL07S123J	202-0123
R140	Same as R109			
R141	Same as R118			
R142	Resistor, Fixed, Film, 4.3K Ohm, ±5%. 1/4W		RL07S432J	202-0432

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R147	Same as R115			
R148	Same as R110			
R149	Resistor, Fixed, Film, 82K Ohm, 5%, 1/4W	RL07S823J		202-0823
R150	Resistor, Fixed, Film, 24.9K Ohm, 1%	RN55D2492F CCF552492F		212-2492
R151	Same as R150			
R152	Resistor, Fixed, Film, 10.0K Ohm, 1%	RN55D1002F CCF551002F		212-1002
R153	Same as R152			
R154	Same as R119	RL07S333J		202-0333
R155	Resistor, Fixed, Film, 33K Ohm, 5%, 1/4W			
R156	Resistor, Fixed, Film, 33.2K Ohm, 1%	RN55D3322F CCF553322F		212-3322
R157	Same as R156			
R158	Same as R156			
R159	Same as R118			
R160	Resistor, Fixed, Film, 820 Ohm, 5%, 1/4W	RL07S821J		202-0821
R161	Same as R110			

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. A CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R162	Resistor, Fixed, Film, 6.8K Ohm, 5%, 1/4W		RL07S682J	202-0682
R163	Same as R118			
R164	Same as R160			
R165	Same as R160			
R166	Same as R118			
R167	Same as R160			
R170	Same as R160			
R171	Same as R118			
R172	Same as R160			
R173	Same as R160			
R174	Resistor, Fixed, Film, 100 Ohm, 5%, 1/4W		RL07S101J	202-0101
R175	Same as R118			
R176	Resistor, Fixed, Film, 180 Ohm, 5%, 1/4W		RL07S181J	202-0181
R177	Resistor, Fixed, Film, 180K Ohm, 5%, 1/4W		RL07S184J	202-0184
R178	Resistor, Fixed, Film, 330 Ohm, 5%, 1/2W		RL20S331J	204-0331

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. A CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R179	Same as R177			
R180	Same as R178			
R181	Same as R177			
R182	Same as R178			
R183	Same as R177			
R184	Same as R178			
R185	Same as R162			
R186	Same as R162			
R187	Same as R132			
R188	Resistor, Fixed, Film, 3.9K Ohm, 5%, 1/4W	RL07S392J	202-0392	
R189	Same as R152			
R190	Same as R152			
R191	Same as R162			
R192	Same as R162			
R193	Same as R132			
R194	Same as R188			
R195	Same as R152			

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R196	Same as R152			
R197	Resistor, Fixed, Film, 150K Ohm, 5%, 1/4W	RL07S154J		202-0154
R198	Same as R149			
R199	Same as R177			
R201	Resistor, Fixed, Film, 5.6K Ohm, 5%, 1/4W	RL07S562J		202-0562
R202	Resistor, Fixed, Film, 120K Ohm, 5%, 1/4W	RL07S124J		202-0124
R203	Resistor, Fixed, Film, 7.5K Ohm 15% 1/4W	RL07S752J		202-0752
R204	Resistor, Fixed, Film, 39K Ohm, 5%, 1/4W	RL07S393J		202-0393
R205	Resistor, Fixed, Film, 1.3K Ohm, 5%, 1/4W	RL07S133J		202-0133
R206	Resistor, Fixed, Film, 1.2K Ohm, 5%, 1/4W	RL07S122J		202-0122
R207	Same as R139			
R208	Same as R204			
R209	Same as R205			
R210	Same as R206			
R211	Same as R139			

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R212	Resistor, Fixed, Film, 1.21M Ohm, 1%	RN55D1214F CCF551214F		212-1214
R213	Resistor, Fixed, Film, 1M Ohm, 1%	RN55D1004F CCF551004F		212-1004
R214	Resistor, Fixed, Film, 4.75M Ohm, 1%	RN55D4754F CCF554754F		212-4754
R215	Same as R212			
R216	Resistor, Fixed, Film, 562K Ohm, 1%	RN55D5623F CCF555623F		212-5623
R217	Resistor, Fixed, Film, 2.21M Ohm, 1%	RN55D2214F CCF552214F		212-2214
R219	Resistor, Fixed, Film, 390K Ohm, 5%, 1/4W	RL07S394J		202-0394
R220	Resistor, Fixed, Film, 270K Ohm, 5%, 1/4W	RL07S274J		202-0274
R221	Resistor, Fixed, Film, 1.2M Ohm, 5%, 1/4W	RL07S125J		202-0125
R222	Same as R212			
R223	Same as R213			
R224	Resistor, Fixed, Film, 560 Ohm, 5%, 1/4W	RL07S561J		202-0561
R225	Same as R132			

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R226	Resistor, Fixed, Film, 470 Ohm, 5%, 1/4W		RL07S471J	202-0471
R227	Same as R104			
R228	Same as R201			
R229	Resistor, Fixed, Film, 1K Ohm, 5%, 1/4W		RL07S102J	202-0102
R230	Same as R132			
R231	Same as R178			
R232	Same as R109			
R233	Same as R109			
R234	Same as R202			
R235	Same as R202			
R236	Same as R162			
R237	Same as R204			
R238	Same as R139			
R239	Same as R206			
R240	Same as R139			
R241	Same as R110			
R242	Same as R132			

7.4 LIST OF MATERIALS, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. Q CONTINUED

Reference Designation	Description	Manufacturer Part Number	Manufacturer Part Number	Delta Order Number
R243	SAME AS R132			
R244	Resistor, Fixed, Film 3k Ohm, 5%, 1/4W	RL07S302J	RL07S302J	202-0302
R245 thru R247	SAME AS R132			
R250	SAME AS R201			
R251	SAME AS R104			
R252	SAME AS R132			
R254	SAME AS R214			
R255	SAME AS R132			
R256	SAME AS R132			
R257	SAME AS R174			
R258 thru R260	SAME AS R132			
R261	SAME AS R156			
R262 thru R269	SAME AS R110			
R270	Resistor, Fixed, Film 15k Ohm, 5%, 1/4W	RL07S153J	RL07S153J	202-0153
R271	Resistor, Fixed, Film 47k Ohm, 5%, 1/4W	RL07S473J	RL07S473J	202-0473
U101	IC, Dual, Op Amp, 8 pin	T. I.	TL082CP	540-0028

7.4 LIST OF MATERIAL, AVC ASSEMBLY, REFERENCE DESIGNATION A100, D33-328, REV. A CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
U102	Integrated Circuit, Modulator	Motorola	MC1495L	548-0024
U103	Same as U102			
U104	Integrated Circuit, Quad Op-Amp	T. I.	TL084CN	540-0026
U105	Same as U104			
U106	Same as U104			
U107	Integrated Circuit, Timer, 8 Pin	Motorola	MC1455P1	548-0001
U108 thru U110	Same as U107			
U111 thru U113	Same as U104			
U114	Integrated Circuit, PLL, 8 Pin	National Semiconductor	NE567N	548-0027
U115	Same as U104			
U116	Integrated Circuit, Op-Amp, 8 Pin	Motorola	MC1741CP	540-0002
U117	Integrated Circuit, Comparator, 14 Pin	Motorola	MC3302P	540-0014
W1	Header, Test/Operate Jumper, 3 Position	Berg	65507-103	
XW1	Jumper, Test/Operate	Berg	65474-001	642-0013

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
C701	Capacitor, Mica, 330 pF, 5%	-	CM05FD331J03	302-0331
C702	Capacitor, Ceramic, 0.1uf, 50V, 20%	Sprague	1C20Z5U104M050B	310-0051
C703	Capacitor, Polyester, 0.001uf, 10%	Nichicon	QYA2A102K	330-0012
C704	Same as C703			
C705	Same as C702			
C706	Same as C701			
C707	Capacitor, Electrolytic, 10uf, 25V	Nichicon	ULB1E100M	320-0064
C708	Same as C702			
C709	Capacitor, Mica, 5pf	-	CM05CD0050D03	302-0050
C710	Capacitor, Variable, 6-25pf, NPO	Erie	DV11PS25A	346-0006
C711	Capacitor, Ceramic., 47pf, N750	CRL	DTN-47	312-0012
C712	Same as C707			
C713	Same as C702			
C714	Capacitor, Polyester, 0.01uf, 100V, 10%	Nichicon	QYA2A103K	330-0015
C715	Same as C714			

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
C716	Capacitor, Mica, 47 pf, 5%	-	CM05ED470J03	302-0470
C717	Same as C714			
C718	Same as C702			
C719	Same as C714			
C720	Capacitor, Poly, 0.022uf, 100V, 10%	Nichicon	QYA2A223K	330-0018
C721	Capacitor, Ceramic, 0.68uf, 50V, X7R	muRata	RPE113X7R68K50V	310-0074
C722	Capacitor, Electrolytic, 100uf, 25V	Nichicon	ULB1E101M	320-0067
C723	Same as C707			
C724	Same as C702			
C725	Same as C702			
C726	Capacitor, Polyester, 0.033uf, 10%	Nichicon	QYA2A333K	330-0019
C727	Capacitor, Mica, 220pf, 5%	-	CM05FD221J03	302-0221
C728	Same as C702			
C729	Same as C702			
C730	Same as C702			
C731	Capacitor, Ceramic, 47pf, N2200	Sprague	10TCY-Q47	312-0009

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
C732	Unassigned			
C733	Capacitor, Ceramic, 6.8 pf, NPO	Sprague	10TCC-V68	312-0015
CR701	Diode, Silicon, Signal	-	IN4148	410-4148
CR702	Same as CR701			
CR703	Same as CR701			
CR704	Diode, Varactor	Motorola	MVAM109	416-0029
CR705	Same as CR701			
CR706	Same as CR701			
L701	Transformer, Mixer Output	Delta	D05-130	005-0130
L702	Transformer, Input	Minicircuits	T2.5-6T	364-0007
L703	Inductor, Output Filter	Delta	D05-128	005-0128
L704	Coil, VCO	Delta	D05-157	005-0157
Q701	Transistor, JFET	-	J310	436-0008
Q702	Transistor, PNP	-	2N3906	410-3906
Q703	Transistor NPN	-	2N3904	410-3904
Q704	Same as Q703			

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
R701	Resistor, 392Ω, 1/4W, 1%	-	RN55D3920F	212-3920
R702	Resistor, 562Ω, 1/4W, 1%	-	RN55D5620F	212-5620
R703	Resistor, 825Ω, 1/4W, 1%	-	RN55D8250F	212-8250
R704	Resistor, 22.1Ω, 1/4W, 1%	-	RN55D22R1F	212-0221
R705	Same as R704			
R706	Resistor, 332Ω, 1/4W, 1%	-	RN55D3320F	212-3320
R707	Resistor, 68.1Ω, 1/4W, 1%	-	RN55D68R1F	212-0681
R708	Same as R707			
R709	Resistor, 1000Ω, 1/4W, 1%	-	RN55D1001F	212-1001
R710	Resistor, 8250Ω, 1/4W, 1%	-	RN55D8251F	212-8251
R711	Resistor, 100Ω, 1/4W, 1%	-	RN55D1000F	212-1000
R712	Resistor, 432Ω, 1/4W, 1%	-	RN55D4320F	212-4320
R713	Same as R711			
R714	Resistor, 2740Ω, 1/4W, 1%	-	RN55D2741F	212-2741
R715	Resistor, 2210Ω, 1/4W, 1%	-	RN55D2211F	212-2211
R716	Resistor, 127Ω, 1/4W, 5%	-	RN55D1270F	212-1270

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer Part Number	Manufacturer Part Number	Delta Order Number
R717	Same as R701			
R718	Resistor, 100kΩ, 1/4W, 1%	-	RN55D1003F	212-1003
R719	Resistor, 10.0kΩ, 1/4W, 1%	-	RN55D1002F	212-1002
R720	Resistor, 1.62kΩ, 1/4W, 1%	-	RN55D1621F	212-1621
R721	Resistor, 681Ω, 1/4W, 1%	-	RN55D6810F	212-6810
R722	Same as R716			
R723	Same as R706			
R724	Resistor, 3650Ω, 1/4W, 1%	-	RN55D3651F	212-3651
R725	Same as R706			
R726	Same as R711			
R727	Resistor, 39Ω, 1/4W, 5%	-	RL07S390J	202-0390
R728	Resistor, 240Ω, 1/4W, 5%	-	RL07S241J	202-0241
R729	Resistor, 6.8kΩ, 1/4W, 5%	-	RL07S682J	202-0682
R730	Resistor, 3.32kΩ, 1/4W, 1%	-	RN55D3321F	212-3321
R731	Same as R711			
R732	Resistor, 182Ω, 1/4W, 1%	-	RN55D1820F	212-1820

7.5 List of Materials, Synthesized Frequency Converter Assembly, D33-482 Revision C, Reference Designation A700

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
R733	Resistor, $2K\Omega$, 1/4W, 5%	-	RL07S202J	202-0202
R734	Resistor, 47.5Ω , 1/4W, 1%	-	RN55D47R5F	212-0475
R735	Resistor, 560Ω , 1/4W, 5%	-	RL07S561J	202-0561
R736	Same as R721			
R737	Resistor, 22.1Ω , 1/4W, 1%	-	RN55D22R1F	212-0221
R738	Same as R730			
S701	Switch, DIP, 8 Position	Grayhill	76SB08S	666-0032
U701	I.C., Balanced Modulator	Motorola	MC1496L	548-0010
U702	I.C., Transistor Array	RCA	CA3183E	542-0013
U703	I.C., Frequency Synthesizer	Motorola	MC145151BCP	548-0034
U704	I.C., Dual D Flip Flop, ECL	Motorola	MC10131L	516-0006
Y701	Crystal, 10.24MHz for 10kHz Spacing	Cinox	CD051096-1	624-0056
Y701	Crystal, 9.216MHz for 9 kHz Spacing	Cinox	CD051096-2	624-0058
XU701	Socket, DIP, 14 Pin	AMP	2-641599-1	736-0054
XU702 & XU704	Socket, DIP, 16 Pin	AMP	2-641600-1	736-0056
XU703	Socket, DIP, 28 Pin	AMP	2-641605-1	736-0058

7.8 LIST OF MATERIAL, POWER ATTENUATOR ASSEMBLY, REFERENCE DESIGNATION A800, D33-333, REV. D

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R839	Resistor, Fixed, Film, 82 Ohm, 5%, 2W	RL42S820J		208-0820
R840	Resistor, Fixed, Film, 82 Ohm, 5%, 1/4W	RL07S820J		202-0820
R841	Same as R840			
R842	Same as R840			
R844	Resistor, Fixed, Film, 100 Ohm, 5%, 2W	RL42S101J		208-0101
R845	Resistor, Fixed, Film, 51 Ohm, 5%, 1/2W	RL20S510J		204-0510
R846	Same as R845			
R847	Same as R845			
R848	Resistor, Fixed, Film, 33 Ohm, 5%, 1/4W	RL07S330J		202-0330
R857	Same as R348			
S803	Switch, Rotary	Centralab	PA7007	662-0024

7.9 List of Materials, Power Supply Assembly, D333-330 Revision L, Reference Designation A900

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
C900	Capacitor, Electrolytic 2000 μ F, 50 V	Mallory	TC50200	320-0069
C901	Same as C900			
C902	Capacitor, Polyester, 0.1 μ F, 100 V	Nichicon	QYA2A104K	330-0021
C903	Unassigned			
C904	Same as C902			
C905	Unassigned			
C906	Same as C900			
C907	Unassigned			
C908	Capacitor, Polyester, 0.47 μ F, 50V	Panasonic	ECQ-V1IH474JZ	330-0065
C909	Capacitor, Electrolytic, 5 μ F, 25 V	Sprague	TE-1202	320-0013
C910	Capacitor, Polyester, 0.33 μ F, 250 V	Nichicon	QXM2E334K	330-0025
CR900	Diode, Silicon, Rectifier	Motorola	1N4720	410-4720
CR901	Same as CR900			
CR902	Same as CR900			
CR903	Same as CR900			
CR904	Same as CR900			

7.9 List of Materials, Power Supply Assembly, D33-330 Revision L, Reference Designation A900

Reference Designation	Description	Manufacturer	Manufacturer Part Number	Delta Order Number
CR905	Same as CR900			
CR906	Unsigned			
CR907	Same as CR900			
CR908	Same as CR900			
VR900	Voltage Regulator, +15 V, TO-220	Motorola	MC7815CT	544-003-015
VR901	Voltage Regulator, +5 V, TO-220	Motorola	MC7805CT	544-0003-005
VR902	Voltage Regulator, -15 V, TO-220	Motorola	MC7915CT	544-0004-015
XVR900	Socket, Transistor, Crimp Type	Molex	10-01-2031	736-0045
XVR901	Same as XVR900			
XVR902	Same as XVR900			
XVR900E1	Terminal, Crimp, 3 each	Molex	08-50-0108	622-0078
XVR901E1	Same as XXVVR900E1			
XVR902E1	Same as XXVVR900E1			

7.10 LIST OF MATERIAL, SWITCH PANEL ASSEMBLY, LEFT, REFERENCE DESIGNATION A1, D33-327, REV. G

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Delta Order No.</u>
R803	Resistor, Fixed, Film, 2.21K Ohm, 1%, 1/4W	RN55D2211F CCF552211F	212-2211
R805	Resistor, Fixed, Film, 681 Ohm, 1%, 1/4W	RN55D6810F CCF556810F	212-6810
R807	Resistor, Fixed, Film, 221 Ohm, 1%, 1/4W	RN55D2210F CCF552210F	212-2210
R809	Resistor, Fixed, Film, 68.1 Ohm, 1%, 1/4W	RN55D68R1F CCF5568R1F	212-0681
R811	Resistor, Fixed, Film, 22.1 Ohm, 1%, 1/4W	RN55D22R1F CCF5522R1F	212-0221
R813	Resistor, Fixed, Film, 10.0 Ohm, 1%, 1/4W	RN55D10R0F CCF5510R0F	212-0100
R817	Resistor, Variable, 5K Ohm	Picher Murata	PT15ZB-5K RVA-1214H-102-10- 502-M
SW1	Switch Assembly, 12 Position, DPDT	Delta	D05-113-2
SW2 thru SW12	Same as SW1		005-0113-002

7.11 LIST OF MATERIAL, SWITCH PANEL ASSEMBLY, RIGHT, REFERENCE DESIGNATION A2, D33-326, REV. F

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Delta Order No.</u>
<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Delta Order No.</u>
R804	Resistor, Fixed, Film, 2.21K Ohm, 1%, 1/4W	RN55D2211F CCF552211F	212-2211
R806	Resistor, Fixed, Film, 681 Ohm, 1%, 1/4W	RN55D6810F CCF556810F	212-6810
R808	Resistor, Fixed, Film, 221 Ohm, 1%, 1/4W	RN55D2210F CCF552210F	212-2210
R810	Resistor, Fixed, Film, 68.1 Ohm, 1%, 1/4W	RN55D68R1F CCF5568R1F	212-0681
R812	Resistor, Fixed, Film, 22.1 Ohm, 1%, 1/4W	RN55D22R1F CCF5522R1F	212-0221
R814	Resistor, Fixed, Film, 10.0 Ohm, 1%, 1/4W	RN55D10R0F CCF5510R0F	212-0100
R818	Resistor, Variable, 5K Ohm	Picher Murata	PT15ZB-5K RVA-1214H-102-10- 502-M
R819	Resistor, Fixed, Film, 56 Ohm, 5%, 1/4W	RL07S560J	202-0560
R820	Resistor, Fixed, Film, 24 Ohm, 5%, 1/4W	RL07S240J	202-0240
SW1	Switch Assembly, 12 Position, All DPDT	Delta	D05-113-1
SW2 thru SW12	Same as SW1		005-0113-001
W1	Jumper, #22 AWG Bus Wire, Teflon Sleeving		

7.12 LIST OF MATERIAL, LEFT AND RIGHT THUMBWHEEL ASSEMBLY, REFERENCE DESIGNATION S804, S805, D34-69, REV. A

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R801	Resistor, Fixed, Film, 1K Ohm, 1%, 1/4W		RN55D1001F	212-1001
R802	Resistor, Fixed, Film, 301 Ohm, 1%, 1/4W		RN55D3010F	212-3010
R803	Resistor, Fixed, Film, 402 Ohm, 1%, 1/4W		RN55D4020F	212-4020
R804	Resistor, Fixed, Film, 100 Ohm, 1%, 1/4W		RN55D1000F	212-1000
R805	Same as R804			
R806	Resistor, Fixed, Film, 30.1 Ohm, 1%, 1/4W		RN55D30R1F	212-0301
R807	Resistor, Fixed, Film, 40.2 Ohm, 1%, 1/4W		RN55D40R2F	212-0402
R808	Resistor, Fixed, Film, 10.0 Ohm, 1%, 1/4W		RN55D10R0F	212-0100
R809	Same as R808			
S801	Thumbwheel Switch Assembly	Interswitch	IS02135	005-0111
W801	Wire, Buss, #22 AWG	Alpha	298	674-0001
W802	Same as W801			
XW801	Tubing, Teflon, #22 AWG	Alpha	TFT200-22	684-0007-022
XW802	Same as XW802			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C501	Capacitor, Fixed, Chip, 100 pF, 10%, NPO, 50V, Pretinned	RMC Murata-Erie	0805C101BKDZU00 GRM40NPO101K50VFB	318-0001
C502	Same as C501			
C503	Capacitor, Fixed, Polyester, 0.047 uF, 10%, 100V	Nichicon	QYA2A473K	330-0020
C504	Same as C503			
C508	Same as C501			
C510	Same as C503			
C512	Capacitor, Fixed, Polycarbonate, 0.022 uF, 2%, 50V	Elpac Components	C5A223G	330-0042
C513	Capacitor, Fixed, Chip, 0.001 uF, 10%, NPO, 50V, Pretinned	RMC Murata-Erie	1812C102BKDZU00 GRM422NPO102R50VFB	318-0002
C514	Capacitor, Fixed, Polycarbonate, 0.001 uF, 1%, 50V	Elpac Components	C5A102F	330-0064
C515	Same as C514			
C516	Capacitor, Fixed, Polyester, 0.1 uF, 5%, 100V	Nichicon	QYA2A104J	330-0021-001
C517	Same as C516			
C518	Same as C514			
C519	Same as C514			
C524	Capacitor, Fixed, Mylar, 1.0 uF, 10%, 63V	REI	MKT-1822-510-6-5	330-0005

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C525	Capacitor, Fixed, Polyester, 6.8 uF, 5%, 63V	REI	MKG1862-568-6-5	330-0038
C527	Same as C514			
C530	Same as C503			
C533	Same as C503			
C534	Same as C514			
C539	Capacitor, Fixed, Chip, 30 pF, 10%, NPO, 50V, Pretinned	RMC	0805C3000BKDU00 GRM40NPO200K50VPB	318-0003
C540	Same as C503			
C541	Same as C539			
C542	Same as C503			
C548	Capacitor, Fixed, Ceramic Disk, 100 pF, 5%, NPO, 500V	Sprague	10rCC-T10	312-0021
C549	Same as C548			
C553	Capacitor, Fixed, Polypropylene, 0.0047 uF, 1%, 50V	Elpac Components	P5B472F	330-0039
C554 thru C556	Same as C553			
C557	Same as C503			
C559	Capacitor, Fixed, Polyester, 0.01 uF, 10%, 100V	Nichicon	QYA2A103K	330-0015

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C560	Same as C503			
C561	Capacitor, Fixed, Mica, 180 pF, 5%, 500V	QMO5FD181J03		302-0181
C562	Same as C561			
C564	Same as C553			
C565	Same as C553			
C566	Same as C503			
C568	Same as C503			
C570 thru C573	Same as C503			
C581 thru C583	Same as C503			
C584	Same as C539			
C585	Same as C539			
C586	Capacitor, Fixed, Polyester, 0.0018 uF, 10%, 100V	Nichicon	QYA2A182K	330-0028
C587	Capacitor, Fixed, Polystyrene, 330 pF, 2.5%, 33V	Mallory	SXK333	330-0041
C588	Capacitor, Fixed, Polyester, 0.001 uF, 10%, 100V	Nichicon	QYA2A102K	330-0012
C590	Capacitor, Fixed, Ceramic, 0.47 uF, 20%, 50V	Sprague	1C20Z5U474M050B	310-0052

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C591	Capacitor, Fixed, Ceramic Disk, 33 pF, 1KV, N075	Sprague	10TCC-Q33	312-0017
C592	Same as C503			
C593	Same as C501			
C594	Same as C501			
C601	Capacitor, Fixed, Polycarbonate, 0.0022 uF, 1%, 50V	Elpac Components	C5A222F	330-0040
C602	Same as C601			
C603	Same as C503			
C604	Same as C601			
C605	Same as C601			
C606	Same as C503			
C607	Same as C601			
C608	Same as C601			
C609	Capacitor, Fixed, Polyester, 0.022 uF, 10%, 100V	Nichicon	QYA2A223K	330-0018
C610 thru C612	Same as C503			
C613	Same as C512			
C614	Same as C512			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C615	Capacitor, Fixed, Electrolytic, 3.3 uF, 20%, 50V	Nichicon	UIB1HR3M	320-0072
C616	Same as C615			
C617	Capacitor, Fixed, Ceramic, 10 pF, 5%, NPO, 63V	Sprague	10TCC-Q10	312-0016
C618	Same as C617			
C619	Same as C512			
C620 thru C624	Same as C501			
C625	Same as C539			
C626	Same as C539			
C627 thru C631	Same as C501			
C632	Same as C503			
C633 thru C637	Same as C501			
C638 thru C640	Same as C503			
C641	Capacitor, Fixed, Chip, 68 pF, 10%, NPO, 50V, Pretinned	RMC Murata-Erie	0805C680BKDZU00 GRM40NPO680R50VFB	318-0004
C642	Capacitor, Fixed, Mica, 5%, 500V, Value TBD Per 7D33-363		CM05	302-XXXX

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C643	Capacitor, Variable, Ceramic, 7-40 pF	Tucsonix	513-011G7-40	346-0002
CR501	Diode, Silicon, Signal		1N4148	410-4148
CR503	Diode, Varactor	Motorola	MV1404	416-0017
CR504 thru CR508	Same as CR501			
E1	Inductor, Ferrite Bead	Stackpole	57-0181	388-0002
E2 thru E18	Same as E1			
K501	Relay, SPST, 24V, SIP	Gordos	741A7	654-0072
L501	Inductor, Variable	Delta	D05-126	005-0126
L502	Inductor, Variable	Delta	D05-129	005-0129
L503	Inductor, Variable	Delta	D05-127	005-0127
L504	Same as L503			
L505	Same as L503			
L506	Inductor, Variable	Delta	D05-131	005-0131
Q501	Transistor, PNP	Motorola	MPS6517	426-0009
Q502	Same as Q501			
Q503	Transistor, NPN	Motorola	MPS6513	426-0008

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
Q504	Same as Q503			
Q509	Transistor, FET	Motorola	U310 J310	436-0002
Q510	Same as Q503			
Q511	Same as Q501			
Q512	Same as Q501			
Q513	Same as Q509			
Q514	Same as Q503	Bourns	3299Y-001-103	244-0082
R501	Resistor, Variable, 10K Ohm, 25 Turn, Cermet	Bourns	3299Y-001-504	244-0083
R502	Resistor, Variable, 500K Ohm, 25 Turn, Cermet	Bourns	3299Y-001-101	244-0084
R503	Resistor, Variable, 100 Ohm, 25 Turn, Cermet	Bourns		
R504	Same as R503			
R505	Resistor, Variable, 500 Ohm, 25 Turn, Cermet	Bourns	3299Y-001-501	244-0072
R509	Resistor, Fixed, Film, 267 Ohm, 1%, 1/4W		RN55D2670F	212-2670
R510	Same as R509			
R511	Resistor, Fixed, Film, 475 Ohm, 1%, 1/4W		RN55D4750F	212-4750

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R512	Resistor, Fixed, Film, 2.74K Ohm, 1%, 1/4W	RN55D2741F		212-2741
R513	Same as R511			
R514	Same as R512			
R515	Resistor, Fixed, Film, 2.43K Ohm, 1%, 1/4W	RN55D2431F		212-2431
R516	Same as R515			
R517	Resistor, Fixed, Film, 3.92K Ohm, 1%, 1/4W	RN55D3921F		212-3921
R518	Resistor, Fixed, Film, 3.01K Ohm, 1%, 1/4W	RN55D3011F		212-3011
R519	Resistor, Fixed, Film, 1K Ohm, 1%, 1/4W	RN55D1001F		212-1001
R520	Same as R519			
R521	Same as R518			
R522	Resistor, Fixed, Film, 1.5K Ohm, 1%, 1/4W	RN55D1501F		212-1501
R523	Same as R522			
R524	Resistor, Fixed, Film, 1.62KOhm, 1%, 1/4W	RN55D1621F		212-1621
R525	Resistor, Fixed, Film, 2.37K , 1%, 1/4W	RN55D2371F		212-2371

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R526	Same as R519			
R527	Same as R519			
R528	Same as R512			
R529	Same as R512			
R530	Resistor, Fixed, Film, 100 Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D1000F		212-1000
R531	Resistor, Fixed, Film, 750 Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D7500F		212-7500
R532	Resistor, Fixed, Film, 1M Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D1004F		212-1004
R533	Resistor, Fixed, Film, 1.82K Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D1821F		212-1821
R534	Resistor, Fixed, Film, 681 Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D6810F		212-6810
R535	Same as R524			
R536	Same as R525			
R537	Same as R519			
R538	Resistor, Fixed, Film, 3.32K Ohm, 1 $\frac{1}{2}$, 1/4W	RN55D3321F		212-3321
R539	Same as R519			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R540	Resistor, Fixed, Film, 5.11K Ohm, 1%, 1/4W	RN55D5111F		212-5111
R541	Resistor, Fixed, Film, 1.21K , 1%, 1/4W	RN55D1211F		212-1211
R542	Same as R515			
R543	Same as R515			
R544	Same as R511			
R545	Same as R511			
R546	Resistor, Fixed, Film, 6.19K Ohm, 1%, 1/4W	RN55D6191F		212-6191
R547	Same as R512			
R548	Same as R512			
R549	Resistor, Fixed, Film, 4.75K Ohm, 1%, 1/4W	RN55D4751F		212-4751
R550	Resistor, Fixed, Film, 2.67K Ohm, 1%, 1/4W	RN55D2671F		212-2671
R552	Same as R550			
R553	Resistor, Fixed, Film, 1.62K Ohm, 1%, 1/4W	RN55D1621F		212-1621
R555	Same as R512			
R556	Same as R512			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R557	Resistor, Fixed, Film, 9.09K Ohm, 1%, 1/4W	RN55D9091F		212-9091
R558	Resistor, Fixed, Film, 39.2K Ohm, 1%, 1/4W	RN55D3922F		212-3922
R559	Same as R558			
R560	Resistor, Fixed, Film, 11.0K Ohm, 1%, 1/4W	RN55D1102F		212-1102
R561	Same as R534			
R562	Resistor, Fixed, Film, 82.5K Ohm, 1%, 1/4W	RN55D8252F		212-8252
R563	Resistor, Fixed, Film, 2.2M Ohm, 5%, 1/4W	RL07S225J		202-0225
R564	Same as R512			
R565	Same as R541			
R566	Resistor, Fixed, Film, 39.2 Ohm, 1%, 1/4W	RN55D39R2F		212-0392
R567	Same as R566			
R568	Same as R538			
R569	Resistor, Fixed, Film, 910K Ohm, 5%, 1/4W	RL07S914J		202-0914
R570	Resistor, Fixed, Film, 61.9K Ohm, 1%, 1/4W	RN55D6192F		212-6192

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R571	Resistor, Variable, 5K Ohm, 25 Turn, Cermet	Bourns	3299Y-001-502	244-0076
R572	Same as R538			
R573	Same as R511			
R574	Resistor, Fixed, Film, 100K Ohm, 1%, 1/4W		RN55D1003F	212-1003
R575	Resistor, Fixed, Film, 43.2K Ohm, 1%, 1/4W		RN55D4322F	212-4322
R576	Same as R560			
R577	Same as R557			
R578	Same as R558			
R579	Same as R558			
R580	Same as R512			
R581	Same as R512			
R582	Same as R558			
R583	Same as R558			
R584	Same as R557			
R585	Same as R560			
R586	Same as R511			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R587	Same as R511			
R588	Same as R512			
R589	Same as R503			
R590	Same as R534			
R591	Same as R512			
R593	Same as R553			
R594	Resistor, Fixed, Film, 47K Ohm, 1%, 1/4W	RN55D4753F	212-4753	
R595	Resistor, Fixed, Film, 150K Ohm, 1%, 1/4W	RN55D1503F	212-1503	
R596	Same as R595			
R597	Same as R512			
R598	Same as R553			
R599	Same as R534			
R601	Resistor, Fixed, Film, 22.1 Ohm, 1%, 1/4W	RN55D22R1F	212-0221	
R602	Same as R601			
R603	Resistor, Fixed, Film, 332 Ohm, 1%, 1/4W	RN55D33320F	212-3320	
R604	Same as R601			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R605	Same as R601			
R606	Same as R603			
R607	Same as R541			
R608	Same as R541			
R609	Same as R524			
R610	Same as R524			
R611	Same as R512			
R612	Resistor, Fixed, Film, 51.1 Ohm, 1%, 1/4W	RN55D51R1F		212-0511
R613	Same as R612			
R614	Resistor, Fixed, Film, 2.21K Ohm, 1%, 1/4W	RN55D2211F		212-2211
R615	Same as R549			
R616	Resistor, Fixed, Film, 6.81K Ohm, 1%, 1/4W	RN55D6811F		212-6811
R617	Same as R603			
R618	Same as R603			
R619	Same as R512			
R620	Same as R512			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R621	Same as R612			
R622	Same as R612			
R623	Same as R512			
R624	Same as R512			
R625	Same as R612			
R626	Same as R612			
R627 thru R630	Same as R549			
R636	Same as R511			
R637	Same as R511			
R638	Same as R512			
R639	Same as R512			
R640	Same as R530			
R643	Same as R519			
R644	Resistor, Fixed, Film, 68.1 Ohm, 1%, 1/4W	RN55D68R1F	212-0681	
R645 thru R648	Same as R644			
R649	Same as R512			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference</u>	<u>Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R650		Same as R616			
R651		Same as R614			
R661		Same as R511			
R663		Same as R616			
R664		Same as R644			
R665		Resistor, Fixed, Film, 121K Ohm, 1%, 1/4W		RN55D1213F	212-1213
R666		Resistor, Fixed, Film, 19.2K Ohm, 1%, 1/4W		RN55D1822F	212-1822
R667		Same as R594			
R668		Same as R519			
R671		Same as R501			
R672		Same as R574			
R673		Same as R574			
R674		Same as R530			
R675		Resistor, Fixed, Film, 121 Ohm, 1%, 1/4W		RN55D1210F	212-1210
R676		Same as R530			
R677		Same as R530			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R678	Same as R519			
R679	Same as R519			
R680	Same as R644			
R681	Same as R509			
R682	Same as R601			
R683	Same as R601			
R684	Same as R644			
R685	Same as R530			
R686	Same as R530			
R687	Resistor, Fixed, Film, 825 Ohm, 1%, 1/4W	RN55D8250F	212-8250	
R688	Same as R687			
R689	Same as R519			
R690	Same as R525			
R691	Same as R524			
R692	Same as R519			
R693	Resistor, Fixed, Film, 10K Ohm, 1%, 1/4W	RN55D1002F	212-1002	
R694	Same as R558			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R695	Resistor, Fixed, Film, 332K Ohm, 1%, 1/4W		RN55D3323F	212-3323
R696	Same as R665			
R697	Same as R693			
R698	Resistor, Fixed, Film, 221K Ohm, 1%, 1/4W		RN55D2213F	212-2213
R699	Resistor, Fixed, Film, 5.62K Ohm, 1%, 1/4W		RN55D5621F	212-5621
TP501	Test Point	Vector	K24C	672-0060
TP502 thru TP520	Same as TP501			
U501	IC, Transistor Array	RCA	CA3045	542-0011
U502	Same as U501			
U503	IC, Quad WB JFET OP AMP	National	LF347N	540-0031
U504	IC, Dual JFET OP AMP	TI	TL082C	540-0028
U505	IC, Balanced Modulator	Motorola	MC1596L	548-0010-001
U506	Same as U501			
U507	Same as U501			
U508	Same as U505			
U509	Same as U505			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
U510	IC, Line Receiver, ECL	Motorola	MC10116L	516-0005
U511	IC, Transistor Array	RCA	CA3183	542-0013
U512	IC, Dual D Flip-Flop, ECL	Motorola	MC10131L	516-0006
U513	Same as U512			
U514	Same as U503			
U515	Same as U504			
U516	Same as U511			
W501	Jumper, Wire, Bus, 22 AWG	Alpha	298	674-0001
W502 thru W511	Same as W1			
W512	Jumper, Coaxial	Delta	D51-49-1	051-0049-001
W513	Jumper, Coaxial	Delta	D51-49-2	051-0049-002
XC642	Socket, Spring, 0.018-0.040 DIA	Amp	380598-3	736-0042
XU501	Socket, IC, 14 Pin Dip	Samtech	ICO-314-SGT	736-0025
XU502	Same as XU501			
XU503	Same as XU501			
XU504	Socket, IC, 8 Pin Dip	Samtech	ICO-308-SGT	736-0036
XU505 thru XU509	Same as XU501			

7.13 LIST OF MATERIAL, DECODER II ASSEMBLY, D33-363, REV E
FOR ASM-1 SERIAL NUMBERS 092 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
XU510	Socket, IC, 16 Pin Dip	Samtech	ICO-316-SGT	736-0026
XU511 thru XU513	Same as XU510			
XU514	Same as XU501			
XU515	Same as XU504			
XU516	Same as XU510			
Y501	Crystal, 3.6 MHz, HC-6/U	Delta	D05-110-37	005-0110-037

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C301	Capacitor, Fixed, Polyester, 1 uF, 10%, 50V	Westlake	168105K50G	330-0049
C302 thru C308	Same as C301			
C309 thru C310	Unassigned			
C311	Capacitor, Fixed, Polyester, 0.1 uF, 10%, 63V	Westlake	168104K63B	330-0047
C312	Same as C311			
C313	Capacitor, Fixed, Polyester, 0.47 uF, 10%, 63V	Westlake	168474K63F	330-0048
C314	Same as C313			
C315	Capacitor, Fixed, Electrolytic, 47 uF, 16V	Mallory Nichicon	VTL47S16 ULB1C470M	320-0076
C316 thru C320	Same as C315			
C321	Same as C301			
C322	Same as C301			
C323	Same as C315			
C324	Capacitor, Fixed, Polyester, 0.01 uF, 5%, 100V	Westlake Nichicon	168103J100A QYA2A103J	330-0046 330-0015-001
C325	Same as C324			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
C326 thru C329	Same as C301			
C330	Same as C315			
C331	Same as C315			
C332	Capacitor, Fixed, Electrolytic, 220 uF, 16V	Mallory Nichicon	VTL220S16 ULB1C221M	320-0077
C333 thru C335	Same as C332			
C336	Same as C301			
C337	Capacitor, Fixed, Polyester, 0.047 uF, 10%	Westlake Sprague	168473K63A 450P473X9063C	330-0020
C338	Same as C301			
C339	Same as C337			
C340	Same as C301			
C341	Same as C301			
C342	Capacitor, Fixed, Ceramic, 0.47 uF, 20%, 50V	Sprague	1C20Z5U474M050B	310-0052
C343 thru C350	Same as C342			
CR301	IC, Lin, Voltage Reference, 2.5V	National	LM336Z-2.5	548-0033

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
CR302	Diode, Silicon		IN4148	410-4148
CR303 thru CR305	Same as CR302			
R301	Resistor, Fixed, Film, 31.6K Ohm, 1%, 1/4W	RN55D3162F		212-3162
R302	Same as R301			
R303	Unassigned			
R304	Resistor, Fixed, Film, 6.2K Ohm, 5%, 1/4W	RL07S622J		202-0622
R305	Resistor, Variable, Trimmer, 5K Ohm, 10%	Bourns	3386P-1-502	244-0090
R306	Same as R301			
R307	Same as R301			
R308	Unassigned			
R309	Same as R304			
R310	Same as R305			
R311	Resistor, Fixed, Film, 12K Ohm, 5%, 1/4W	RL07S123J		202-0123
R312	Resistor, Fixed, Film, 2.7K Ohm, 5%, 1/4W	RL07S272J		202-0272

**7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED**

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R313	Resistor, Fixed, Film, 1.6K Ohm, 5%, 1/4W		RL07S162J	202-0162
R314	Resistor, Variable, 1K Ohm, 10%	Bourns	3386P-1-102	244-0092
R315	Unassigned			
R316	Same as R312			
R317	Same as R313			
R318	Same as R314			
R319	Resistor, Fixed, Film, 820K Ohm, 5%, 1/4W		RL07S824J	202-0824
R320	Resistor, Fixed, Film, 11K Ohm, 5%, 1/4W		RL07S113J	202-0113
R321	Resistor, Fixed, Film, 560 Ohm, 5%, 1/4W		RL07S561J	202-0561
R322	Resistor, Fixed, Film, 2K Ohm, 5%, 1/4W		RL07S202J	202-0202
R323	Resistor, Fixed, Film, 15K Ohm, 5%, 1/4W		RL07S153J	202-0153

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R324	Resistor, Fixed, Film, 750K Ohm, 5%, 1/4W	RL07S754J		202-0754
R325	Resistor, Fixed, Film, 180K Ohm, 5%, 1/4W	RL07S184J		202-0184
R326	Resistor, Fixed, Composition, 510 Ohm, 5%, 1/2W	RCR20G511JS		204-0511-100
R327	Same as R326			
R328	Same as R319			
R329	Same as R321			
R330	Same as R320			
R331	Same as R322			
R332	Same as R324			
R333	Same as R323			
R334	Same as R325			
R335	Same as R326			
R336	Same as R326			
R337	Unsigned			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R338	Resistor, Fixed, Film, 9.53K Ohm, 1%, 1/4W	RN55D9531F		212-9531
R339	Same as R314			
R340	Resistor, Fixed, Film, 180 Ohm, 5%, 1/4W	RL07S181J		202-0181
R341	Resistor, Fixed, Film, 20K Ohm, 5%, 1/4W	RL07S203J		202-0203
R342	Same as R314			
R343	Resistor, Fixed, Film, 6.81K Ohm, 1%, 1/4W	RN55D6811F		212-6811
R344	Same as R314			
R345	Same as R340			
R346	Same as R341			
R347	Same as R314			
R348	Same as R343			
R349	Same as R314			
R350	Same as R340			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R351	Same as R341			
R352	Resistor, Fixed, Film, 4.7K Ohm, 5%, 1/4W	RL07S472J		202-0472
R353	Same as R314			
R354	Same as R340			
R355	Same as R341			
R356	Resistor, Fixed, Film, 120K Ohm, 5%, 1/4W	RL07S124J		202-0124
R357	Resistor, Fixed, Film, 30K Ohm, 5%, 1/4W	RL07S303J		202-0303
R358	Resistor, Fixed, Film, 100K OHM, 5%, 1/4W	RL07S104J		202-0104
R359	Resistor, Fixed, Film, 5.62K Ohm, 1%, 1/4W	RN55D5621F		212-5621
R360	Resistor, Fixed, Film, 1.82K, 1%, 1/4W	RN55D1821F		212-1821
R361	Same as R358			
R362	Same as R359			
R363	Same as R360			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R364	Same as R301			
R365	Same as R301			
R367	Same as R304			
R366	Unassigned			
R368	Same as R305			
R369	Same as R301			
R370	Same as R301			
R371	Unassigned			
R372	Same as R304			
R373	Same as R305			
R374	Resistor, Fixed, Film, 18K Ohm, 5%, 1/4W	RL07S183J	202-0183	
R375	Same as R374			
R376	Resistor, Fixed, Film, 300 Ohm, 5%, 1/4W	RL07S301J	202-0301	
R377	Same as R376			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R378	Resistor, Fixed, Film, 4.3K Ohm, 5%, 1/4W		RL07S432J	202-0432
R379	Same as R378			
R380	Same as R374			
R381	Same as R374			
R382	Same as R376			
R383	Same as R376			
R384	Same as R378			
R385	Same as R378			
R386	Same as R319			
R387	Same as R322			
R388	Resistor, Fixed, Film, 33K Ohm, 5%, 1/4W		RL07S333J	202-0333
R389	Same as R322			
R390	Same as R388			
R391	Same as R319			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R392	Resistor, Fixed, Film, 10K Ohm, 5%, 1/4W		RL07S103J	202-0103
R393	Resistor, Fixed, Film, 22M Ohm, 5%, 1/4W		RL07S226J	202-0226
R394	Same as R304			
R395	Same as R392			
R396	Resistor, Fixed, Film, 5.6K Ohm, 5%, 1/4W		RL07S562J	202-0562
R397	Resistor, Fixed, Film, 9.1K Ohm, 5%, 1/4W		RL07S912J	202-0912
R398	Same as R319			
R399	Same as R322			
R3100	Same as R388			
R3101	Same as R322			
R3102	Same as R388			
R3103	Same as R319			
R3104	Same as R392			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
R3105	Same as R393			
R3106	Same as R304			
R3107	Same as R392			
R3108	Same as R396			
R3109	Same as R397			
* R3110	Resistor, Network, SIP, 4.7K Ohm, 2%	CITS Beckman	750-83-R4.7K 784-3-R4.7K	230-0006
* R3111 thru R3121	Same as R3110			
U301	IC, Quad FET Op Amp	TL084C	540-0026	
U302 thru U304	Same as U301			
U305	IC, Comparator, 8 Pin DIP	LM311N	540-0011	
U306	Same as U305			
U307	IC, Timer, 8 Pin DIP	MC1455	548-0001	
U308	Same as U307			
U309	Same as U301			

* FOR +10dBm BALANCED OUTPUT, REPLACE NETWORK RESISTORS R3110 AND R3112 WITH THE FOLLOWING:
RESISTOR, 4.75k OHM, 1%, METAL FILM FOR POSITIONS R3110A, R3110C, R3110D, R3112A, R3112C AND R3112D;
RESISTOR, 15.0k OHM, 1%, METAL FILM FOR POSITIONS R3110B AND R3112B.

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
U310	Same as U301			
U311	IC, Dual Op Amp, 8 Pin DIP	MC1458	540-0013	
U312	Same as U311			
U313	Same as U301			
U314	Same as U301			
U315	Same as U311			
U316	Same as U311			
U317	Same as U301			
U318	Same as U301			
U319	IC, LIN, OP AMP, DUAL	TL082CP	548-0028	
W1	Header, De-Emphasis, 3 Position Jumper	Berg	65507-103	
W2	Same as W1			
XW1	Jumper, De-Emphasis	Berg	65474-001	642-0013
XW2	Same as XW1			

7.14 LIST OF MATERIAL, METER II ASSEMBLY, D33-379, REV. D
FOR ASM-1 SERIAL NUMBERS 168 AND HIGHER CONTINUED

<u>Reference Designation</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Manufacturer Part No.</u>	<u>Delta Order No.</u>
XU301	Socket, IC, 14 Pin DIP	Samtech	IC0-314-SGT	736-0025
XU302 thru XU304	Same as XU301			
XU305	Socket, IC, 8 Pin DIP	Samtech	IC0-308-SGT	736-0036
XU306 thru XU308	Same as XU305			
XU309	Same as XU301			
XU310	Same as XU301			
XU311	Same as XU305			
XU312	Same as XU305			
XU313	Same as XU301			
XU314	Same as XU301			
XU315	Same as XU305			
XU316	Same as XU305			
XU317	Same as XU301			
XU318	Same as XU301			
XU319	Same as XU305			

SECTION 8

SCHEMATIC DIAGRAMS

8.1 LIST OF SCHEMATIC DIAGRAMS

This section contains an overall function block diagram of the Monitor and schematic diagrams of the major assemblies. The diagrams are presented in the following order:

FIGURE	TITLE	PAGE
8-1A	Functional Block Diagram	8-2A
8-1B	Functional Block Diagram (continued)	8-2B
8-1C	Functional Block Diagram (continued)	8-2C
8-2	Schematic Diagram, Power Attenuator Assembly	8-3
8-3	Schematic Diagram, Frequency Converter Assembly	8-4
8-4	Schematic Diagram, Decoder II Assembly	8-5
8-5	Schematic Diagram, AVC Assembly	8-6
8-6A	Schematic Diagram, Left Pushbutton Switch Assembly	8-7A
8-6B	Schematic Diagram, Right Pushbutton Switch Assembly	8-7B
8-7A	Schematic Diagram, Meter II Assembly	8-8A
8-7B	Schematic Diagram, Meter II Assembly (continued)	8-8B
8-8	Schematic Diagram, Thumbwheel Switch Assembly	8-9
8-9	Schematic Diagram, Power Supply Assembly	8-10

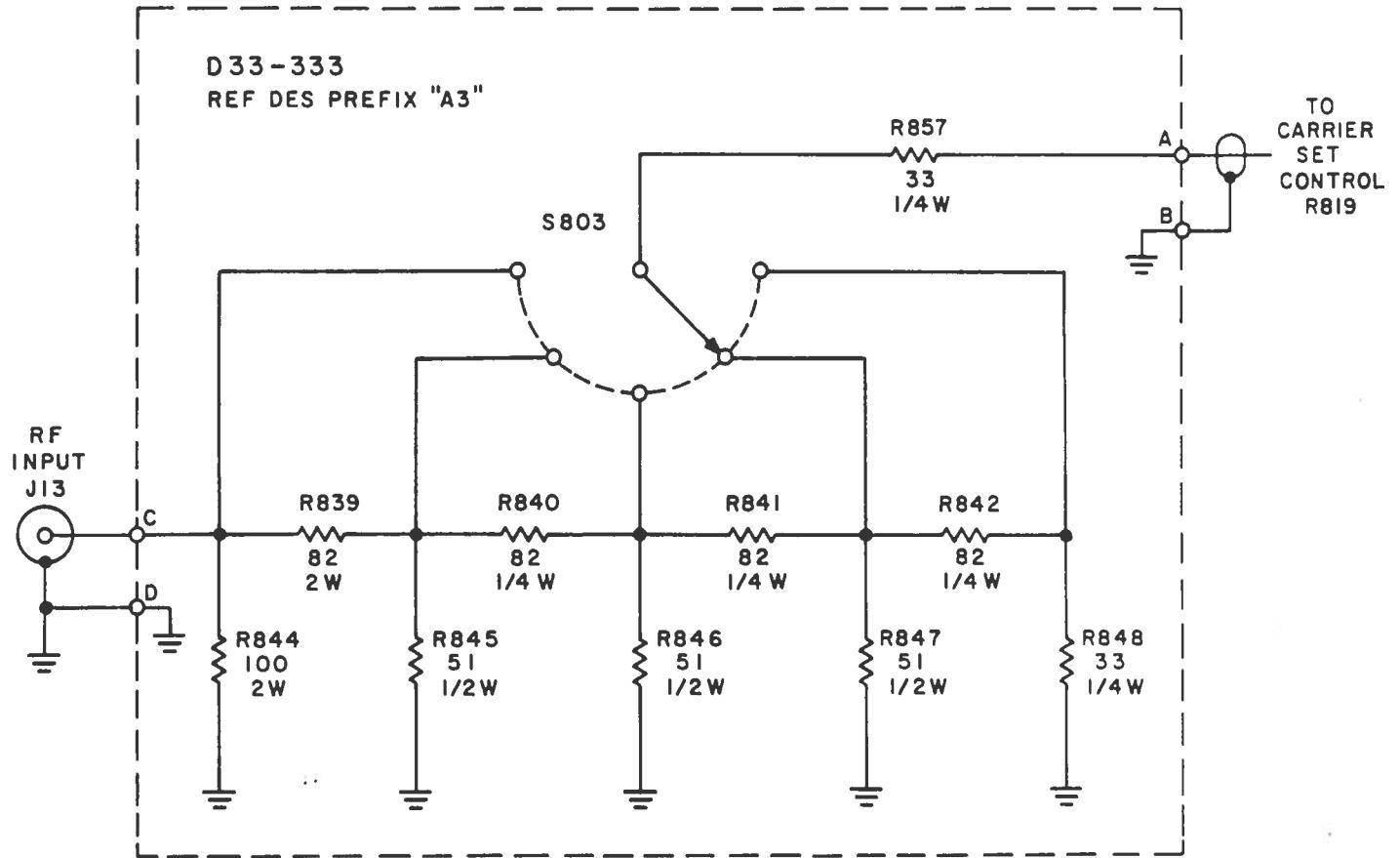


FIGURE 8-2

SCHEMATIC DIAGRAM
POWER ATTENUATOR
ASSEMBLY

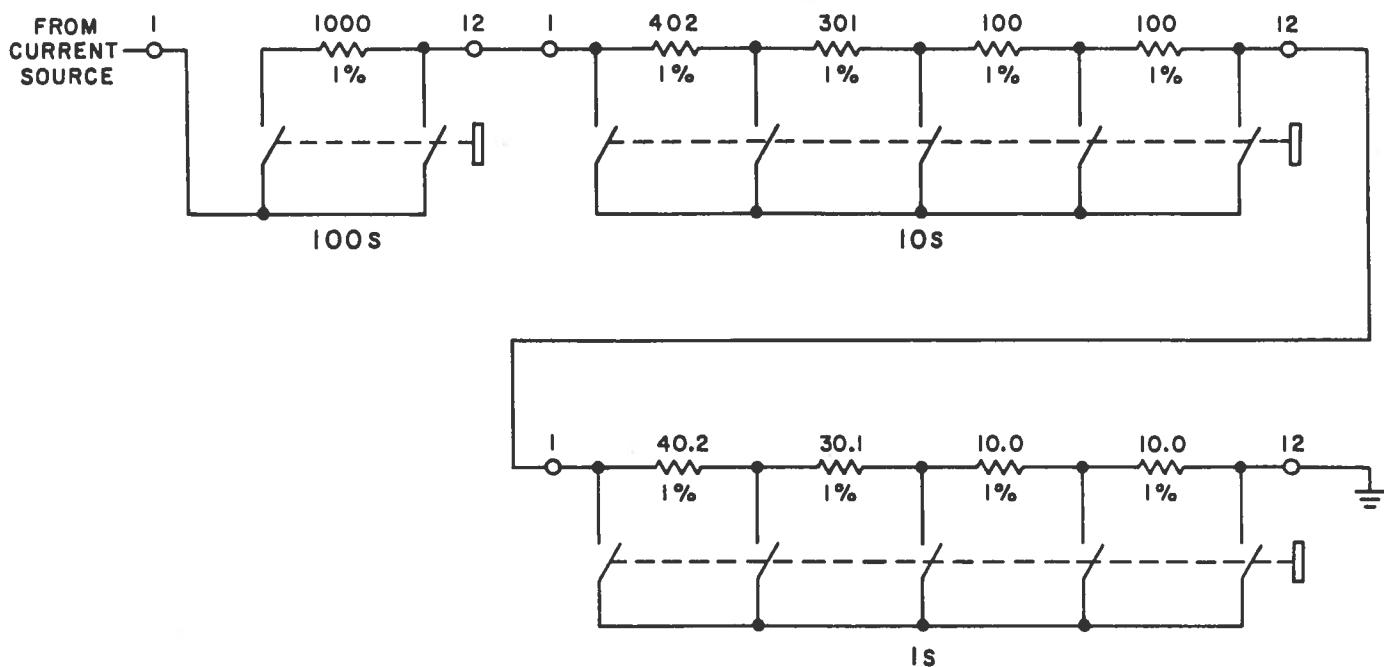


FIGURE 8-8

SCHEMATIC DIAGRAM
THUMBWHEEL SWITCH
ASSEMBLY

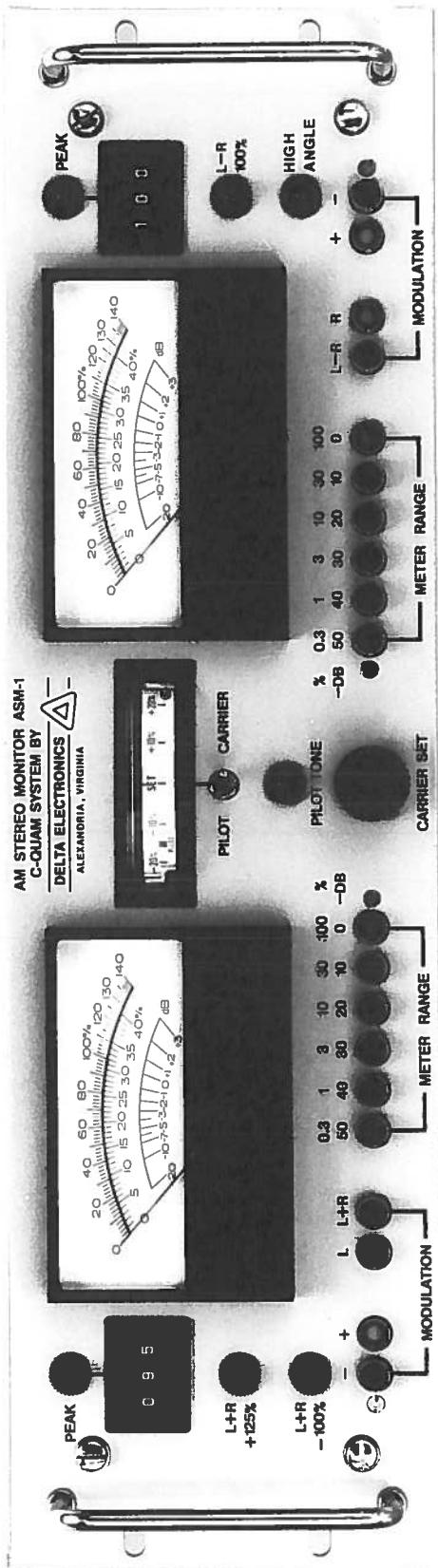


FIGURE 3-1
MODEL ASM-1
FRONT PANEL

TABLE 3-2
MODEL ASM-1 AM STEREO MODULATION MONITOR
REAR PANEL OUTPUTS

<u>REF</u>	<u>DESCRIPTION</u>	<u>FUNCTION</u>
J1	Remote Peak Flasher L+R	Drive signal for remote operation of flasher
J2	Remote Modulation Meter L+R	DC drive current for remote panel meter operation
J3	Remote Peak Flasher L-R	Drive signal for remote operation of flasher
J4	Remote Modulation Meter L-R	DC drive current for remote panel meter operation
J5	Envelope Detector	Test output to evaluate monitor decoder
J6	Pilot Tone Output	Connection for measurement of pilot frequency and level
J7	L-R Detector	L-R (quad) detector test output to evaluate monitor decoder
J8	In Phase Detector (I Det)	Test output to evaluate monitor decoder operation
J9	Unbalanced Output Left	For distortion measurements of left audio channel
J10	L+R	L+R (mono) output for transmitter testing of monaural signal
J11	Unbalanced Output Right	For distortion measurements of right audio channel
J12	L-R	L-R Output for transmitter testing of stereo signal
J13	RF Input	RF input from transmitter (10V RMS Max)
S803 (Assembly A800)	RF Atten	A 50 dB step attenuator in 10 dB steps used with the front panel carrier set control to calibrate the monitor
TB1	600 Balanced	Balanced 600 Ohm Stereo audio output

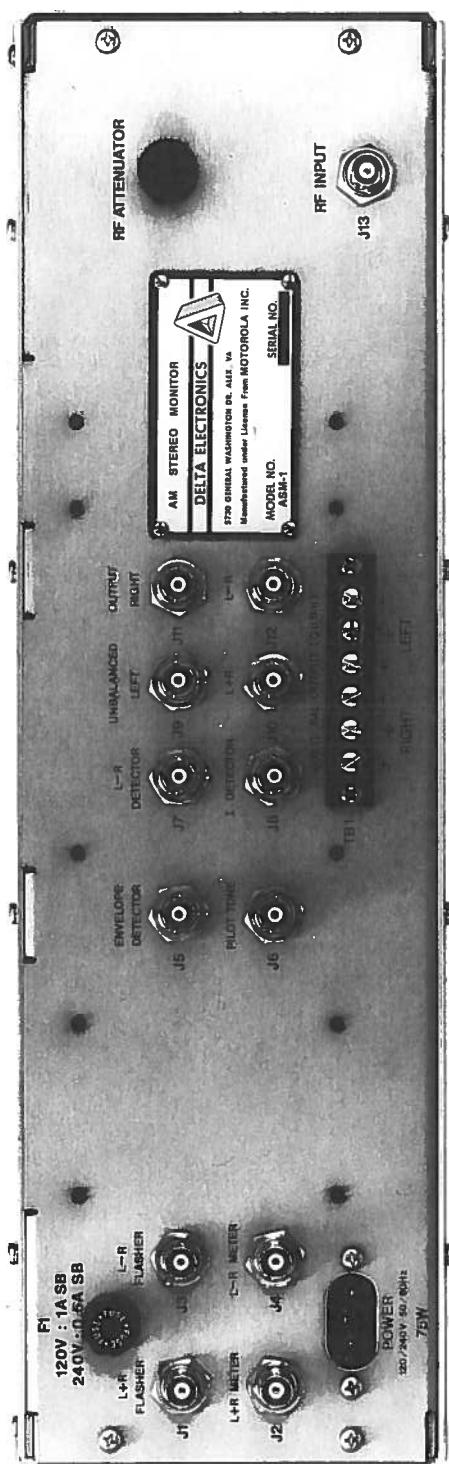


FIGURE 3-2
MODEL ASM-1
REAR PANEL