S.C.A. MODULATION MONITOR

MODEL 730A

TFT

TIME AND FREQUENCY TECHNOLOGY, INC.

Instrument Serial#_____
Manual Revision_____A_____

S.C.A. MODULATION MONITOR

MODEL 730A

TIME & FREQUENCY TECHNOLOGY, INC.
3000 OLCOTT STREET
SANTA CLARA, CA 95051

408-246-6365

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SECTION 1

GENERAL INFORMATION

1.1 General Description.

The Model 730A SCA Monitor normally is used in conjunction with the Model 763 FM Modulation Monitor to monitor the characteristics of the SCA transmission in FM broadcasting. It can also be used for recovering the SCA information in the composite signal used in FM broadcasting. The Model 730A measures SCA injection level, SCA modulation percentage, SCA FM signal-to-noise ratio, and crosstalk. The desired function is selected by front-panel pushbutton switches. A six-position, pushbutton-selectable precision attenuator is also provided for use in making these measurements. SCA injection and SCA modulation are indicated by a front-panel meter. SCA subcarrier frequency can be measured by the six-digit counter on the Model 764 or an external counter. The Model 730A can monitor either of two SCA carrier frequencies -- 41 kHz or 67 kHz -- selectable by front-panel pushbutton switches. Other SCA frequencies are available on special orders. Also, either ± 4 kHz or ± 6 kHz can be selected by front-panel pushbutton switches as the deviation that represents 100% modulation.

Other features of the Model 730A include:

- Digitally settable peak modulation flashers that display positive and negative peaks simultaneously.
- Built-in calibration circuits for meter and peak flashers.
- Outputs for Model 704B Remote Meter and Peak Flasher panel and SCA subcarrier alarm.

1.2 Specifications.

SCA Subcarrier Frequency

41 kHz and/or 67 kHz, pushbutton selectable

SCA Frequency Measurement

The selected SCA signal is filtered and returned to the frequency counter input of the Model 764 FM Preselector and displayed on the 6-digit digital readout.

Signal Input Requirement

Accepts composite signal from Model 763, 0.5 V RMS for 100% modulation reading.

1.2 (Continued).

Main Channel Modulation measurement

Deviation for 100%.....	±75 kHz
Modulation Accuracy, 50 Hz to 15 kHz.....	±4%
Out of Band Rejection, 20 kHz to 75 kHz..	56 dB

SCA Injection

Accuracy (30% to 1%).....	±0.5%

SCA Subchannel Modulation Measurement

Deviation for 100%.....	±4 kHz or ±6 kHz
Carrier Frequencies	
#1.....	67 kHz (standard)
#2.....	41 kHz (optional)
Modulation Accuracy (0dB Meter Attenuator Switch Position)	
@1 kHz, 100%.....	±2%
Frequency Response	
Composite Input	
20 Hz to 6 kHz.....	±1dB
20 Hz to 7.5 kHz.....	±2dB
Wideband Input	
20 Hz to 7.5 kHz.....	±0.5dB
Selectivity (Composite Input)	
Narrow	
BW, 3 dB.....	3 kzH (typical)
BW, 60 dB.....	20 kHz (maximum)
Wide	
BW, 3 dB.....	20 kHz (typical)
BW, 60 dB.....	60 kHz (maximum)

Meter

Scale Range.....	0 to 40%, 0 to 133% (-2 dB to + 2 dB)
Attenuator Range.....	0 to -50 dB in 10 dB steps

1.2 (Continued).

Crosstalk Rejection (Composite Input)

Main Channel (50 Hz to 15 kHz) into SCA Subchannel (Narrow).....	66 dB
Stereo (23 kHz to 53 kHz, excluding subharmonics of SCA Subchannel) into SCA Subchannel (#1, Narrow).....	66 dB
SCA Subchannel into Main Channel.....	66 dB

SCA Peak Modulation Indicator

Range.....	50% to 129%
Resolution.....	1%
Accuracy.....	±10%
Response Time.....	1 cycle of 2 kHz

SCA Modulation and Injection Level Calibrator

Built-in modulation and injection level calibrator for calibrating the modulation meter and the positive and negative peak flashers from the front panel.

Outputs

SCA Subcarrier

Level, at 10% SCA Injection.....	500 mV, nominal into 5K ohms
SCA Subcarrier Alarm.....	Contact closure when subcarrier is below muting level

Audio (with or without de-emphasis, 75/150 u sec)

Level (600 ohms), 100% modulation, 400 Hz nominal.....	2 V RMS (8.2 dBm)
Distortion	
Composite input	
±6 kHz at 400 Hz.....	1.5%
±4 kHz at 400 Hz.....	1%
Wideband input	
±6 kHz at 400 Hz.....	0.5%

1.2 (Continued).

Noise Level, relative to 6 kHz deviation (with de-emphasis)

Composite Input, or Wideband Input.	-66 dB
R.F. Input at 10 mV.....	-55 dB

Power

115/230 ±10% VAC, 50 to 400 Hz, 25 watts maximum

Physical and Environmental

Operating Temperature.....	0^{o} to $+50^{o}C$
Size.....	7" high x 19" wide x 16" deep
Weight.....	Approx. 15 lbs.

1.3 Accessory Equipment

1.3.1 Model 704B Remote Meter and Peak Flasher Panel.

Duplicates meter and peak flasher readings of the Model 730A. Fifty feet of cable and plug provided.

1.4 Warranty.

TIME & FREQUENCY TECHNOLOGY, INC., warrants each of the instruments of its manufacture to be produced to meet the specifications delivered to the BUYER; and to be free from defects in material and workmanship and will repair or replace, at its expense, for a period of one year from the date of delivery of equipment, any parts which are defective from faulty material or poor workmanship.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charges prepaid by BUYER. It is expressly agreed that replacement and repair shall be the sole remedy of BUYER with respect to any nonconforming equipment and parts thereof and shall be in lieu of any other remedy available by applicable law. All returns to the factory must be authorized by the SELLER, prior to such returns. Upon examination by the factory, if the insturment is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charges prepaid by SELLER.

Transportation charges for instruments found to be defective within the first thrity (30) days of the warranty period will be paid both ways by the SELLER.

Transportation charges for warranty returns, wherein failure is found not to be the fault of the SELLER, shall be paid both ways by the BUYER.

This warranty does not apply to instruments which, in the opinion of the SELLER, have been altered or misused.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. TFT IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

1.5 Claim for Damage in Shipment.

Your instrument should be inspected and tested as soon as it is received. The instrument is insured for safe delivery. If the instrument is damaged in any way or fails to operate properly, file a claim with the carrier, or if insured separately, with the insurance company.

WE SINCERELY PLEDGE OUR IMMEDIATE AND FULLEST COOPERATION TO ALL USERS OF OUR PRECISION ELECTRONICS INSTRUMENTS.

PLEASE ADVISE US IF WE CAN ASSIST YOU IN ANY MANNER.

Time & Frequency Technology, Inc.
3000 Olcott Street
Santa Clara, CA 95051

408-246-6365

SECTION 2

INSTALLATION

2.1 Unpacking and Inspection.

Upon receiving the instrument, inspect the packing box and instrument for signs of possible shipping damage. Operate the instrument in accordance with the procedures of Section 3 of this manual. If the instrument is damaged or fails to operate properly, file a claim with the transportation company, or with the insurance company if insured separately.

2.2 Power Requirements.

The Model 730A normally operates from a 115 volt AC source; if it is wired for 230 volts, the line cord will be so marked. The line frequency must be between 50 and 400 Hz. Maximum power required is 25 watts.

2.3 Installation With the Model 763.

a. Mount the Model 730A in the equipment rack.

NOTE

If the Model 730 is not mounted in a common rack with the Model 763, a ground wire of 18 AWG or larger must be connected between the two chassis.

b. Connect one of the furnished coaxial cables between COMPOSITE INPUT connector J1 on the rear panel of the Model 730A and SCA MONITOR OUTPUT connector J6 on the rear panel of the Model 763.

c. Connect the other coaxial cable between SUB-CARRIER FREQUENCY connector J4 on the rear panel of the Model 730A and SCA CARR connector J13 on the rear panel of the FM Preselector.

2.4 Model 704B Remote Readout Panel Connection (Optional).

When a Model 704B is to be used with the Model 730A, connect the five-wire cable of the Model 704B to terminals a, C, D, E, and G of terminal strip J7 on the rear panel of the Model 730. The wire color code is given in Section 3.2.2 of this manual under Reference No. 10.

2.5 Subcarrier-Off Alarm Connection.

Connect the external alarm device to SCA SUBCARRIER ALARM banana jacks J2 and J3 on the Model 730A rear panel. These jacks are shorted together when the SCA subcarrier level drops below the threshold set by the SCA MUTE LEVEL control R39 on Board A2 (see Section 3.11). Neither one of the jacks is grounded in the Model 730. Maximum power-handling capability is 1.0 ampere at 115 V AC.

SECTION 3

OPERATION

3.1 General

The Model 730A SCA Monitor is used in conjunction with the Model 763 FM Modulation Monitor to monitor the SCA subcarrier from an FM broadcast transmitter. SCA injection level, SCA modulation percentage, SCA FM signal-to-noise ratio, and crosstalk can be measured on the front-panel meter. No external equipment except the Model 763 is needed for calibrating the meter.

3.2 Controls, Connectors, and Indicators.

3.2.1 Front Panel.

Fig. 3-1 Ref. No.	Name	Function
1	FLASHER CAL control	Used in calibrating the peak flasher (see Section 3.6) in SCA Modulation mode.
2	PWR switch	When depressed, energizes the instrument.
3.	MAIN CHAN switch	When depressed, meter indicates main-channel modulation. 10% represents ± 75 kHz FM deviation.
4	SCA INJ switch	When depressed, meter indicates SCA injection level. 100% = ±75 kHz deviation.
5	SCA MOD switch	When depressed, meter indicates modulation of the SCA subcarrier.
6	SCA SUBCHANNEL #1 switch	This switch is depressed for monitoring a 67 kHz subcarrier.
7	SCA SUBCHANNEL #2 switch	This switch is depressed for monitoring a 41 kHz subcarrier (Optional).

3.2.1 (Continued).

Fig. 3-1 Ref. NO.	Name	Function
8	NARROW SELECTIVITY switch	When depressed, provides a 3-dB bandwidth of 3 kHz and a 60-dB bandwidth of 20 kHz.
9	WIDE SELECTIVITY switch	When depressed, provides a 3-dB bandwidth of 20 kHz.
10	±4 kHz switch	When depressed, meter indicates 100% for an FM deviation of ±4 kHz on SCA subcarrier.
11	±6 kHz switch	When depressed, meter indicates 100 % for an FM deviation of ±6 kHz on SCA subcarrier.
12	METER CAL switch	When depressed, allows calibration of all three modes of operation: Main Channel, SCA Injection, and SCA Modulation. When calibrating the main channel (composite level adjustment), the Calibrate switch on the 763 must also be depressed (see Sections 3.4, 3.5, and 3.6).
13	METER "+" switch	When depressed, meter reads positive SCA or Main Channel modulation peaks.
14	METER "-" switch	When depressed, meter reads negative SCA or Main Channel modulation peaks.
15	SCA INJ CAL control	Used in SCA injection calibration (see Section 3.6).
16	SCA MOD CAL control	Used in SCA modulation calibration (see Section 3.6).
17	Modulation meter	Reads modulation and injection level, both in percent and in dB above and below 100%. Either positive or negative modulation peaks will be indicated, depending on whether the METER "+" or METER "-" switch is depressed. When the 100% METER ATTENUATOR

3.2.1 (Continued).

Fig. 3-1 Ref. No.	Name	Function
		switch is depressed, the meter reads directly; when any other attenuator switch is depressed, the scale factor of the selected switch must be applied.
18	METER ATTENUATOR switches	Depressing one of these switches changes the gain marked thereon in the modulation meter circuit. The resulting measurement is the algebraic sum of the meter reading and the inserted attenuation. For example, a meter indication of - 2 dB with the -30 dB switch depressed would indicate a measurement of - 32 dB below 100% modulation. Three of the switches are marked 1%, 10%, and 100%. These indicate the actual modulation percentage when the meter needle is at the 100% mark. For example, a meter reading of 70% with the 1% switch depressed would indicate a measurement of 0.7% modulation. When in the 0-dB position, the switch selects the output of the peak detector on the Meter Amp Board A1 to drive the MODULATION METER. When in any other position, the switch selects the output of the average detector on the Meter Amp Board to drive a MODULATION METER. When the 730 is operating in the SCA MODULATION mode, any setting of the METER ATTENUATOR setting except "0dB" will switch a 75 u sec or 150 u sec, (selectable by means of an internal jumper), into the audio

3.2.1 (Continued)

Fig. 3-1 Ref. No.	Name	Function
		output circuitry of the Discriminator Board A2 so that the SCA modulation delivered to the Meter Amp Board A1 is de-emphasized. When the switch is in the 0dB position the de-emphasis network is switched out of the circuit.
19	SCA SUBCARRIER indicator	Lights when the SCA subcarrier is present (i.e., when the SCA subcarrier level is above the threshold set by the SCA MUTE LEVEL control).
20	PEAK MODULATION	The switches set the peak modulation percentage at which the indicators will flash. The indicators flash when the modulation peaks exceed the setting of the switches: the + indicator for positive modulation peaks and the - indicator for negative peaks.

3.2.2 Rear Panel.

Fig. 3-2 Ref. No.	Name	Function
1	COMPOSITE INPUT Connector J1	Provides means for introducing a composite signal from the Model 763.
2	COMPOSITE LEVEL SET Control R2	Used to adjust level of incoming composite signal from the Model 763. (See Section 3.4, 3.5, and 3.6)

3.2.2 (Continued).

Fig. 3-2 Ref. No.	Name	Function
3	SCA SUBCARRIER ALARM Connectors J2 and J3	When the SCA subcarrier level drops below the level set by the SCA MUTE LEVEL control, these two connectors are shorted together by an internal relay to operate an external alarm.
4	WIDEBAND INPUT LEVEL R6	Adjusts level of incoming SCA signal for the WIDEBAND INPUT.
5	WIDEBAND INPUT J9	Provides an input which bypasses the I.F. filtering, thus providing desireable modulation characteristics such as flatter frequency response and lower distortion. Can be used when the SCA signal alone is injected onto the main carrier.
6	SCA SUBCARRIER connector J4	Provides SCA subcarrier frequency output.
7	AUDIO OUTPUT connector J5	Delivers the recovered SCA audio signal without de-emphasis. Output is 2 volts RMS for 100% modulation.
8	AUDIO OUTPUT connector J6	Delivers a recovered SCA audio output from the de-emphasis network. Level is 2 volts RMS for 100% SCA modulation at 400 Hz.
9	1A SLO BLO fuse	Fuses the AC power circuit.

3.2.2 (Continued).

Fig. 3-2 Ref. No.	Name	Function
10	115 VAC line cord	For connecting the Monitor to a power source. If the Monitor is wired for 230V input, the line cord will be so marked.
11	Terminal strip J8	Provides the following outputs: A: The same voltage that operates the modulation meter, to operate the Model 704B Remote Readout Panel. Connect 704B red wire. C: The same voltage that operates the front-panel + PEAK MODULATION indicator, for operating the corresponding indicator on the Model 704B brown wire. D: Ground. Connect 704B black wire. E: The same voltage that operates the front-panel-PEAK MODULATION indicator, for operating the corresponding indicator on the Model 704B Remote Readout Panel. Connect 704B white wire. G: +5 V DC. Connect the 704B green wire.

3.3 Turn-On and Warm-Up.

Make sure the Model 730A is cabled to other equipment as described in Section 2. Check the line cord to make sure the Model 730A

3.3 (Continued).

is wired for the line voltage to be used (115 or 230 volts). Plug the line cord into the power source and press the PWR switch. Since the Model 730A is a completely solid-state instrument, warm-up time is very minimal. One or two minutes should be more than adequate to provide consistent readings.

3.4 Main Channel Calibration.

a. Depress the MAIN CHAN switch.

b. Depress the METER CAL switch.

c. Depress the 0dB METER ATTENUATOR switch.

d. On the Model 763, press the CAL switch.

e. Adjust the rear-panel COMPOSITE LEVEL SET control for a 100% reading on the meter.

3.5 SCA Injection Calibration.

a. Depress the METER CAL switch.

b. Depress either the WIDE or NARROW SELECTIVITY switch.

c. Depress the SCA INJ MEASURE/CAL switch.

d. Depress the -20 dB METER ATTENUATOR switch.

e. Adjust the SCA INJ CAL control for a meter reading of 100% (10% injection).

3.6 SCA Modulation Calibration.

a. Depress the 0dB METER ATTENUATOR switch.

b. Depress the SCA MOD MEASURE/CAL switch.

c. Depress the $\pm$6 kHz switch.

d. Adjust the SCA MOD CAL control for a meter reading of 100%.

e. Set Peak Modulation Thumbwheel switches for 100% and adjust FLASHER CAL POT so that flashers just come on.

REVISIONS		
LTR	Description	Date
A	RELEASED TO PRODUCTION PER ECO 206	1-7-75
B	REVISED PER ECO 342	7-16-76

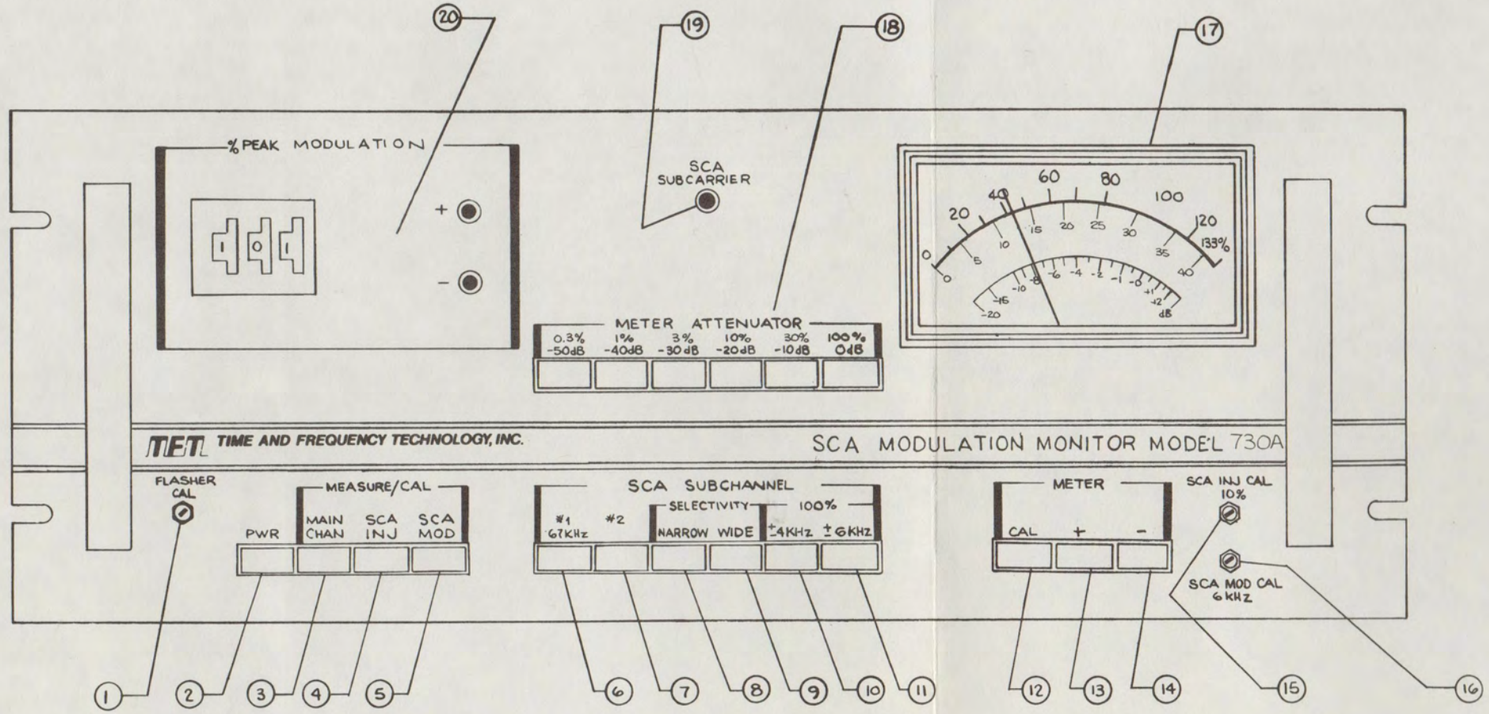

FIGURE 3-1

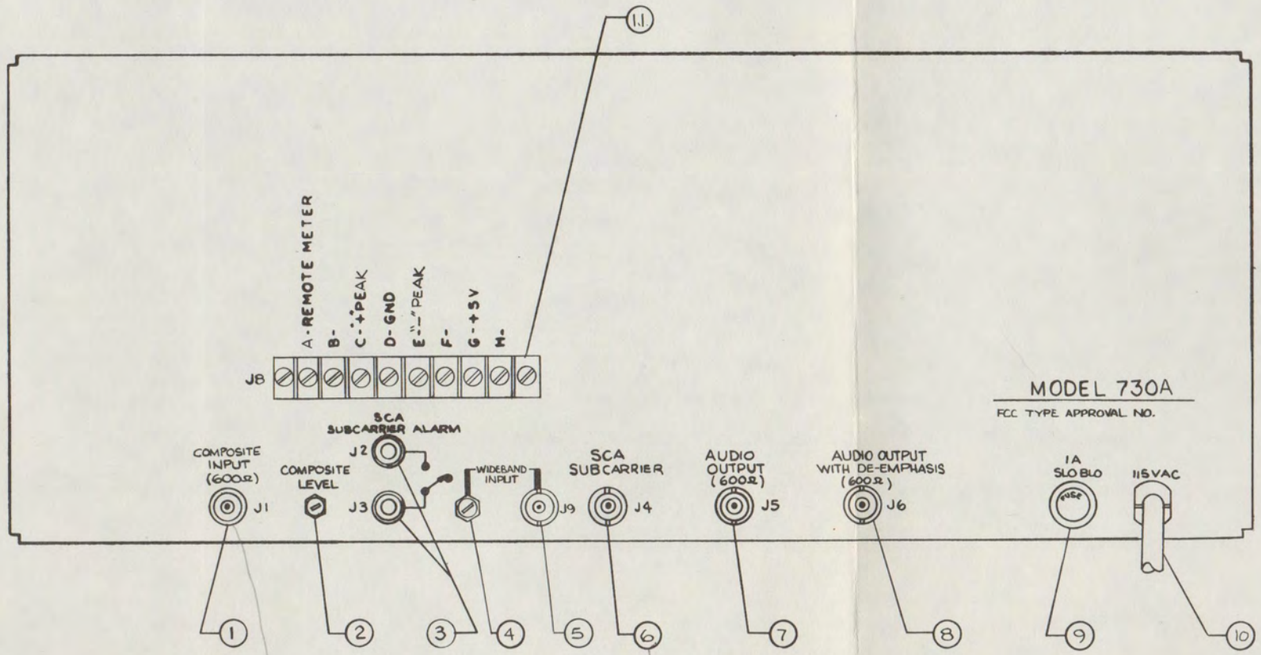

FIGURE 3-2

ITEM NO.	EN NO.	PART NO	DESCRIPTION	REF DES
QTY PER ASSY		LIST OF MATERIALS		

REMOVE ALL BURRS AND SHARP EDGES

TOLERANCES UNLESS OTHERWISE SPECIFIED
.XX ± ANGULAR
.XXX ±

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TITLE: PANEL, FRONT & REAR

SIZE B | DRAWING NO 6600-0290 | REV B

SCALE 1/1 | SHT 1 OF 1

3.7 Measurement of SCA Modulation and Main Channel Modulation Using the Modulation Meter.

3.7.1 SCA Modulation.

a. Depress the SCA MOD switch.

b. Depress either the METER "+" or METER "-" switch, depending on whether positive or negative modulation peaks are to be monitored.

c. Depress the OdB METER ATTENUATOR switch.

d. Depress either the ±4 kHz or the ±6 kHz switch, depending on which is to represent 100% SCA modulation.

e. Depress the WIDE SELECTIVITY to get all sidebands of the modulated signal.

f. Depress SCA #1 or SCA #2 selector switch for the desired subchannel.

g. Read the SCA modulation directly on the meter.

3.7.2 Main Channel Modulation.

a. Depress the MAIN CHAN switch.

b. Depress either the METER + or METER - switch, depending on whether positive or negative modulation peaks are to be monitored.

c. Depress the OdB METER ATTENUATOR switch.

d. Read the main channel modulation directly on the meter.

3.8 Measurement of SCA Modulation Using the Peak Flashers. (Peak Flashers do not work in Main Channel or SCA Injection Modes.)

a. Proceed as in Section 3.7.1 to monitor SCA modulation.

b. Set the PEAK MODULATION thumbwheel switches for the highest desired modulation percentage.

c. Adjust transmitter modulation so that the PEAK MODULATION indicators do not flash.

3.9 Measurement of SCA Injection Using the Modulation Meter.

a. Depress the SCA INJ switch.

b. Depress either the SCA SUBCHANNEL #1 or #2 switch, depending on whether a 67-kHz or a 41-kHz subcarrier is to be measured.

c. Depress the NARROW SELECTIVITY switch if stereo modulation or two closely spaced subchannels are used. Otherwise, depress the WIDE SELECTIVITY switch.

d. Depress the appropriate METER ATTENUATOR switch depending on the nominal SCA injection level (1 to 30 percent).

e. Read the SCA injection level on the meter.

3.10 Audio Output.

The recovered SCA audio signal out of the deemphasis network is available at rear-panel AUDIO OUTPUT connector J6. Its level is 2 volts RMS into 600 ohms for 100-percent modulation at 400 Hz, and it can be fed into a distortion analyzer to measure SCA distortion. It can also be used to operate high-impedance earphones if desired. Either 75-microsecond or 150-microsecond deemphasis can be selected by means of an internal jumper. The audio signal without deemphasis, at the same level, is available at rear-panel AUDIO OUTPUT connector J5.

3.11 Subcarrier-Off Alarm.

When the subcarrier level falls below the threshold set by the SCA MUTE LEVEL control, an internal relay shorts SCA SUBCARRIER connectors J2 and J3 to operate an external alarm. To adjust the SCA MUTE LEVEL control, proceed as follows:

a. Place the Model 730A in the SCA injection mode as described in Section 3.9.

b. At the transmitter, set the SCA injection level to approximately 2% below the desired operating injection level (up to 30 percent).

c. Adjust the SCA MUTE LEVEL control, R39 on Discriminator Board A2, so that the SCA SUBCARRIER ALARM connectors J2 and J3 short, and the front-panel SCA SUBCARRIER indicator goes off.

3.11 (Continued).

d. Increase the SCA injection to the normal operating level.

e. The circuit between J2 and J3 should open and the SCA SUBCARRIER indicator should light.

3.12 Model 704B Remote Readout panel (Optional).

The Model 704B Remote Readout Panel will duplicate the indications of the modulation meter and peak flashers.

3.13 Using the Wideband Input for SCA Measurements.

3.13.1 Calibration of Wideband Input Level.

With the 730A set to the SCA Injection Mode as described in Section 3.9, inject an unmodulated SCA Signal onto the Main Carrier. The SCA Subcarrier should be the only signal present on the main carrier. Adjust the SCA injection level on the Main Carrier to a convenient level of 10% or 31.6% indicated by the Model 730A. Now disconnect the Composite Output of the Model 763 from the Composite Input of the 730A and connect the Composite Output of the 763 to the Wideband Input of the 730A. Now adjust the Wideband Input Level pot R6 on Model 730A rear panel so that 730A indicates the same injection level as read above.

3.13.2 Reading SCA Injection with the Wideband Input

When the 730A Wideband Input Level has been calibrated as described in Section 3.13.3, SCA injection readings may be made by using the procedure described in Section 3.9, except the NARROWBAND/WIDEBAND switches are non functional.

3.13.3 Reading SCA Modulation with the Wideband Input.

With the 730A Wideband Input Level calibrated as described in section 3.13.1, SCA Modulation Measurements may be made as described in Sections 3.7 and 3.8.

SECTION 4

THEORY OF OPERATION

4.1 General Block Diagram Discussion.

The block diagram discussion is divided into four functional descriptions: main channel monitoring (Section 4.1.1), SCA injection monitoring (Section 4.1.2), SCA modulation monitoring (Section 4.1.3), and calibration circuits (Section 4.1.4). Refer to the block diagram, Figure 6-1, for this discussion.

Power to operate the Model 730A comes from three separate power supplies on Board A4. Each of these supplies consists of a bridge rectifier, filter, and regulator. The power supplies deliver +5 volts, + 15 volts, and -15 volts. AC input to the supplies is furnished by a transformer on the main chassis.

NOTE

When one front-panel switch in a group is depressed (closed), the other switches in the same group should be released (open).

4.1.1 Main Channel Monitoring.

Assume that the MAIN CHAN switch is depressed and that the CAL switch is not depressed. The composite signal from the Model 763 at rear-panel connector J1 is fed through a 15-kHz low-pass filter on Board A4, which removes the SCA subcarriers, to Meter Amplifier Board A1. The main channel modulation is applied to threshold detector where it is compared with a DC voltage determined by the setting of the front-panel PEAK MODULATION thumbwheel switches. When the positive modulation peaks exceed the preset level, the resulting output from the threshold detector causes the "+" PEAK MODULATION LED to light. The incoming signal is also inverted and applied to a second threshold detector to operate the "-" PEAK MODULATION LED on negative peaks.

The direct or inverted audio signal is selected by the front-panel METER "+" or METER "-" switch, respectively, and applied to the attenuator. The desired attenuation is selectable in 10-dB steps by the front-panel METER ATTENUATOR switches. The audio signal is then amplified and fed to both a peak detector and an average detector. The 0-dB attenuation switch selects the output of the peak detector to feed to the modulation meter, since this attenuator position is used with the higher level modulation where peak values are significant. The -10 dB, -20 dB, -30 dB, -40 dB, and -50 dB attenuator switches select the output

4.1.1 (Continued).

of the average detector, since average values are more significant when measuring the lower level noise and crosstalk voltage.

4.1.2 SCA Injection Monitoring.

Assume that the SCA INJ switch is depressed and that the CAL switch is not depressed. The composite signal from the Model 763 containing the 41-kHz and/or the 67-kHz SCA subcarriers to be measured, enters the Model 730 at rear-panel COMPOSITE INPUT connector J1. The composite signal is applied to one input of a mixer on Board A3. The L.O. input to the mixer comes from a crystal oscillator on Board A1. The L.O. frequency is either 10.767 MHz (for a 67-kHz SCA subcarrier) or 10.741 MHz (for a 41-kHz SCA subcarrier); the desired L.O. frequency is selected by depressing either the SCA SUBCHANNEL #1 or #2 switch on the front panel, which switches in the appropriate crystal for the L.O. The purpose of the mixer is to convert the SCA subcarrier to a 10.7-MHz signal for ease of filtering out the other components of the composite signal.

Both wide-band and narrow-band filtering are available. When the front-panel WIDE SELECTIVITY switch is depressed, the narrow-band filter is bypassed, and the selectivity is that of the wideband filter, which has a 3-dB bandwidth of 20 kHz. When the NARROW SELECTIVITY switch is depressed, both filters are in the circuit, and the selectivity is determined by the narrow-band filter.

The filtered SCA subcarrier is downconverted to either 67 kHz or 41 kHz by a second mixer whose L.O. input is the same as that of the first mixer. A 95-kHz low-pass filter removes the high -frequency components from the mixer output, and the amplified SCA subcarrier is delivered to Meter Amplifier Board A1, where it is processed in the same way as the main channel signal to drive the modulation meter.

4.1.3 SCA Modulation Monitoring.

Assume that the SCA MOD switch is depressed and that the CAL switch is not depressed. The composite signal at rear-panel connector J1 is upconverted, filtered, and downconverted on Board A3 in the same way as the composite signal was handled for SCA injection monitoring (Section 4.1.2). The filtered SCA subcarrier (either 67 kHz or 41 kHz as selected by the front-panel #1 or #2 switch) from Board A3 is fed to Board A2, where it is demodulated by a one-shot which acts as a pulse-averaging discriminator. The discriminator output contains the audio modulation as well as the subcarrier frequency. The low-pass filter following the one-shot removes the subcarrier frequency. The audio output from the low-pass filter is applied to an operational amplifier. When the front-panel $\pm$4 kHz switch is depressed, a trans-

4.1.3 (Continued).

istor switch parallels an additional resistor to increase the gain of this amplifier. When the front-panel ±6 kHz switch is depressed, the transistor switch is turned off, lowering the gain of the amplifier. These different gains are necessary to deliver the correct audio level to the metering circuits for two conditions -- one where ±4 kHz represents 100 percent modulation and the other where ±6 kHz represents 100 percent modulation. The audio output of this operational amplifier is fed to Board A1, where it is processed to drive the modulation meter and peak flashers as described in Section 4.1.1. The audio output of this amplifier is also fed through two amplifiers, one of which contains a deemphasis network, and delivered to the two rear-panel audio output connectors.

When the 730A is operating in the SCA MODULATION mode, any setting of the METER ATTENUATOR setting except "0dB" will switch a 75 u sec or 150 u sec, (selectable by means of an internal jumper), into the audio output circuitry of the Discriminator Board A2 so that the SCA modulation delivered to the Meter Amp Board A1 is de-emphasized. When the switch is in the "0dB" position, the de-emphasis network is switched out of the circuit.

The subcarrier input to Board A2 is also applied to a comparator which acts as a muting circuit. When the SCA subcarrier level drops below the level set by the SCA Mute level control, the muting circuit performs the following functions:

a. Turns off the front-panel SCA SUBCARRIER LED;

b. Energizes a relay whose contacts close to operate an external alarm circuit through rear-panel connectors J2 and J3; and

c. Shorts out the audio output from Z6 to eliminate noise from the speakers or headset in the absence of an SCA signal.

4.1.4 Calibration Circuits.

In the following discussion, assume that the front-panel METER CAL switch is depressed. There are three calibration circuits in the Model 730A -- one for SCA injection, one for SCA modulation, and one for main-channel modulation. The SCA injection calibration signal is derived from a 2144-kHz crystal oscillator on Board A4. This crystal-oscillator output frequency is divided by 32 to give a 67-kHz calibration signal, which is amplified and applied to the input of the first mixer on Board A3.

4.1.4 (Continued).

The SCA modulation calibration signal is also derived from the 2144-kHz crystal oscillator on Board A4. The crystal-oscillator output frequency is divided by 16 and then by 4 to give a 33.5-kHz signal, and is then divided again by 4 to give an 8.375-kHz signal. These latter two frequencies are applied to a NAND gate whose output is a 33.5-kHz signal gated on and off at an 8.375-kHz rate. This calibration signal is fed to the input of the pulse-averaging discriminator on Board A2.

The third calibration signal is for the main channel. This signal is generated by the Model 763 in the calibration mode. In this mode, the composite signal containing a 5 kHz audio tone from the Model 763 is the right level to cause the modulation meter on the Model 730A to read 100 percent.

SECTION 5

MAINTENANCE

5.1 General.

Since the Model 730A is a solid-state instrument and its power requirements are low, no maintenace problems due to high temperature should be encountered, provided the instrument is installed well away from vacuum-tube and other heat-generating equipment. Likewise, because the operating voltages are low, excessive dust accumulation associated with high-voltage devices should not occur.

5.2 Access.

To gain access to the top-of-chassis components, remove six screws from the top cover, three on each side, and then remove the top cover. Removing six similar screws from the bottom cover provides access to the below-chassis components.

5.3 Periodic Maintenance.

Once a year, or more often in dusty locations, remove the printed-circuit boards and blow off the dust with compressed air.

On a regular basis, check the main-channel, SCA injection, and SCA modulation calibrations as described in Sections 3.4, 3.5, and 3.6, respectively.

5.4 Main-Channel Modulation Accuracy Check.

NOTE

For all of the following maintenance checks and adjustments, depress the following pushbuttons unless otherwise directed in the procedure:

METER ATTENUATOR 100% (0dB)
PWR
MEASURE/CAL SCA MOD
#1 67 kHz
SELECTIVITY WIDE
+6 kHz
METER +

To check the accuracy of the modulation meter readings on the main channel, modulate the monitored transmitter with a 1-kHz sinewave, and increase the modulation percentage until the Model 763 meter reads 100%. Depress the MAIN CHAN pushbutton on the Model 730A. The Model 730A meter should also read 100% ±2%.

Vary the modulating frequency from 50 Hz to 15 kHz, keeping the modulation percentage at 100% on the Model 763 meter. The Model 730A meter should read 100% ±4% at all frequencies.

If the Model 730A meter does not read within the above tolerances, proceed as follows:

a. On the Model 730A, depress the METER CAL and the 0 dB METER ATTENUATOR switches.

b. On the Model 763, depress the CAL switch.

c. On the Model 730A rear panel, adjust the COMPOSITE LEVEL SET control for a 100% reading on the Model 730A meter.

The above procedure calibrates the Model 730A main-channel measurement circuitry against the calibration standard in the Model 763. If calibration against a laboratory standard is desired, a Bessel-null measurement using a spectrum analyzer must be performed.

5.5 SCA Injection Accuracy Check.

To check the accuracy of SCA injection measurements, proceed as follows:

a. Modulate the monitored transmitter with precisely 67 kHz at a level that produces a 10% reading on the Model 763 meter. Use a frequency synthesizer for the modulation source, or measure the modulation with a frequency counter to ensure that the frequency is precisely 67 kHz.

b. On the Model 730A front panel, depress the following buttons:

MEASURE/CAL SCA INJ

Either METER + or METER -

METER ATTENUATOR -20 dB

SELECTIVITY WIDE.

c. The meter should read 100% ±1%, indicating 10% injection. If it does not, adjust the front-panel SCA INJ CAL control until it does.

d. Depress the SELECTIVITY NARROW pushbutton. The meter should still read 100% ±1%. If it does not, adjust GAIN BALANCE potentiometer R27 on Board A3 until the meter reading is the same with either the NARROW or WIDE SELECTIVITY switch depressed.

e. Depress the METER CAL pushbutton. The meter should read 100% ±5%. This represents an SCA injection of 10% ±0.5%.

5.6 SCA Modulation Accuracy Check.

To verify the accuracy of SCA modulation measurements, it is necessary to perform a Bessel-null calibration on the 67-kHz subcarrier using a spectrum analyzer and an audio generator with a frequency counter.

a. Set the audio generator to precisely 1087 Hz, and verify this with a counter. Use the 1087-Hz signal to modulate the 67-kHz SCA subcarrier.

b. Observe the 67-kHz subcarrier on a spectrum analyzer, and increase the amplitude of the 1087-Hz modulation until a second Bessel null is achieved.

c. Modulate the transmitter with this 67-kHz signal, or feed the 67-kHz signal directly into the COMPOSITE INPUT (J1) or WIDEBAND INPUT (J9) of the Model 730A.

d. Depress the following 730A front-panel pushbuttons:

SCA MOD

EITHER METER + or METER -

SELECTIVITY WIDE

±6 kHz

METER ATTENUATOR 100% (0 dB)

e. The meter should read 100% ±4%. If it does not, adjust the SCA MOD CAL control until it does.

f. With the % PEAK MODULATION thumbwheel switches set for 100%, the + and - flashers should be on. If they are not, adjust the FLASHER CAL control so that the flashers just come on.

g. Depress the 730A front-panel METER CAL pushbutton. The meter should read 100% ±4% and the flashers should come on when the thumbwheel switches are set to 100% ±4%.

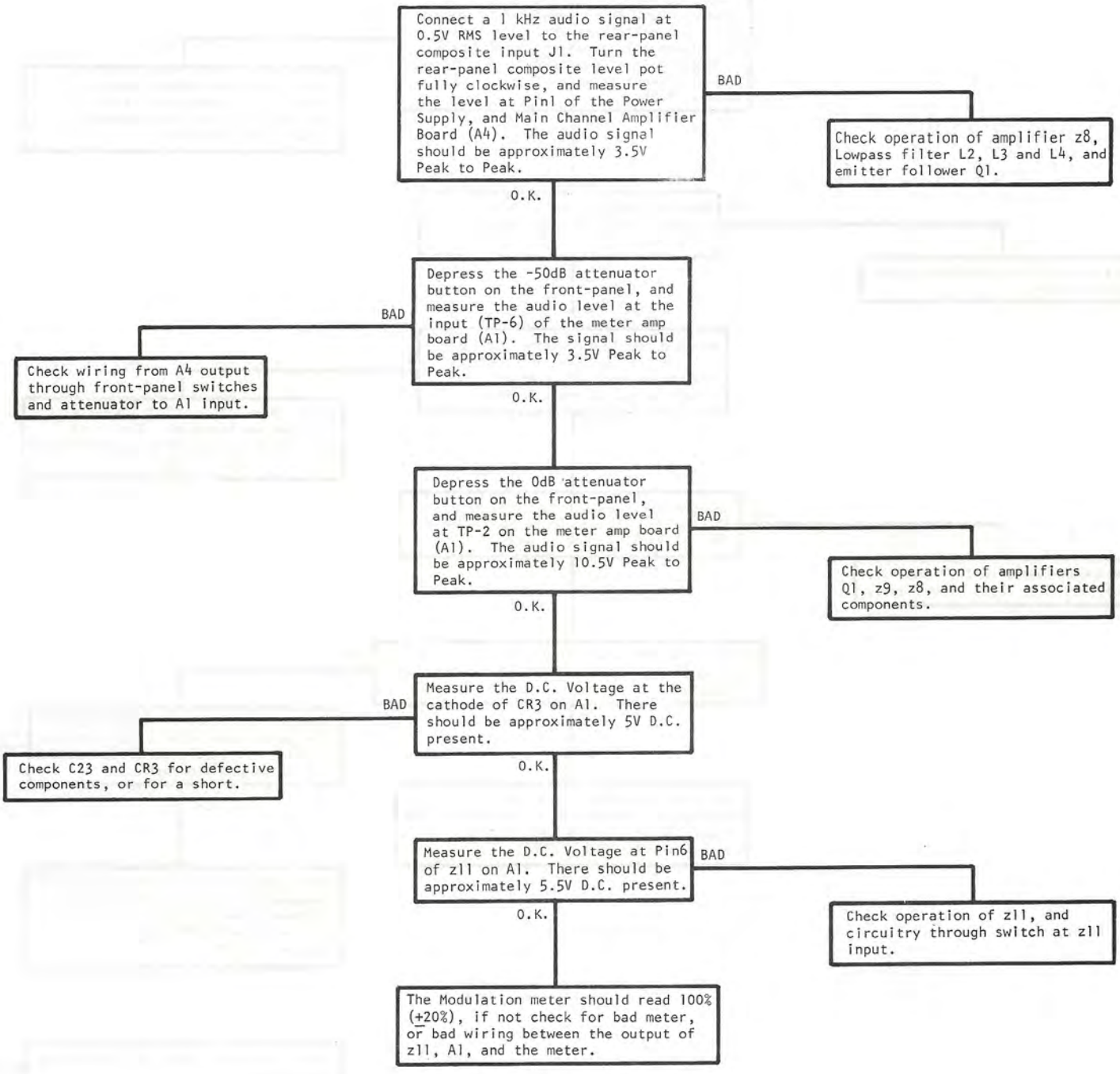
5.7 Troubleshooting Guides.

Four troubleshooting trees are presented in Sections 5.7.1 through 5.7.4 as an aid in isolating the causes of a failure. To use the guides, start at the top and do whatever is required to answer the question in the first box. Then proceed to the next operation along the route determined by the answer to the first question. Continue this sequence until the fault is found.

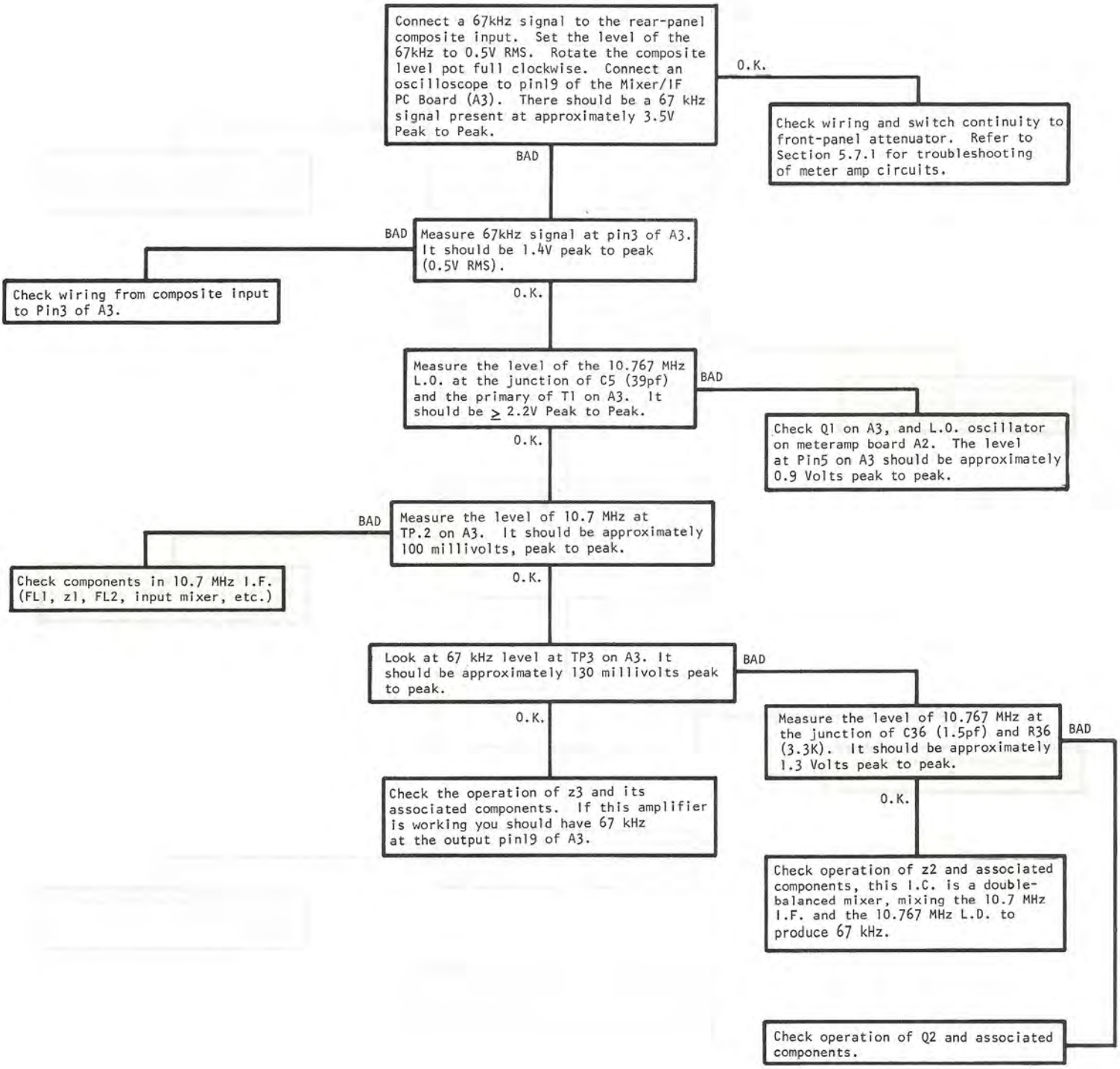
5.7.1 Instrument does not work in any mode.

If the instrument does not work in any mode, first check the power line fuse, and look at all P.C. Boards for obviously "Burned" or defective components. If fuse is blown, remove all P.C. Boards by re-inserting one at a time, starting with the power supply board. If fuse is O.K. go to troubleshooting tree below.

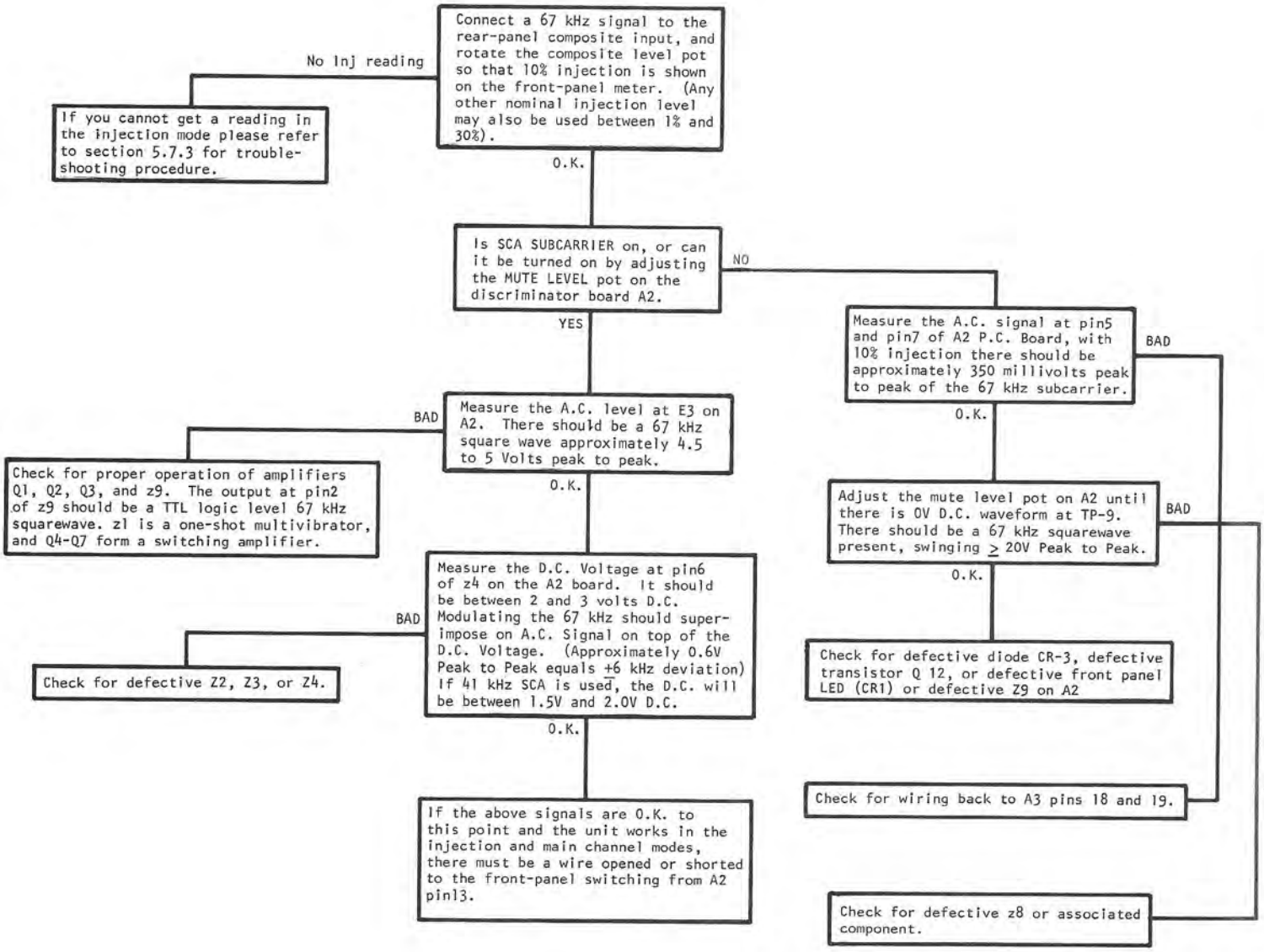
5.7.2 Main Channel (L + R) does not work, but SCA Injection and SCA Modulation functions do work.



5.7.3 SCA Injection does not work, but main channel (L + R) does work.



5.7.4 SCA Modulation does not work but SCA Injection does.



NEXT ASSY	USED ON	REVISIONS				
	730A	SYM	DESCRIPTION	DR	CHK	AUTH	DATE
		B	RELEASED TO PRODUCTION PER EC0204	RG			1-7-75

IF Bd A3

COMPOSITE LEVEL RP-R2

RP-J1

1K

MAIN CHANNEL

CAL

SCA INJECTION

WIDEBAND SCA LEVEL RP-R6

RP-J9

MIXER

WIDEBAND 10.7 MHZ XTAL FILTER

FL1, FL2

Z1 10.7 MHZ AMP

GAIN BALANCE

WIDE

NARROW

NARROW BAND 10.7 MHZ XTAL FILTER

FL3, FL4, FL5

WIDE

NARROW

MIXER Z2

67 OR 41 KHZ

95 KHZ LOWPASS

SCA AMP Z3

67 KHZ

41 KHZ

41 KHZ GAIN

SCA INJ CAL

TO DISCRIMINATOR BOARD A2

+1

10.767 OR 10.741 MHZ

POWER SUPPLY Bd A4

AUDIO AMP Z8

15KHZ LOWPASS

+1

÷16 Z5

134 KHZ

Z4 XTAL OSC

2144 KHZ

Z6 ÷2

67 KHZ

AMP Z4

100Ω

SCA INJ CAL LEVEL

SCA INJ CAL SIG

Z6 ÷4

33.9 KHZ

Z7

SCA MOD CAL SIG

Z6 ÷4

8.375 KHZ

METER AMP Bd A1

XTAL OSC

10.741 MHZ

SCA #2 41 KHZ

10.767 MHZ

SCA #1 67 KHZ

METER AMP Bd A1

SCA INJECTION

MAIN CHANNEL

SCA MODULATION

Z2 -1

THRESHOLD DETECTOR Z5

+ PEAK

+5V

THRESHOLD DETECTOR Z3

- PEAK

+5V

FLASHER CAL

FP 0-70 dB ATTENUATOR

FP THUMBWHEEL SWITCH

I

+15V

Q1 +1

Z9 AUDIO AMP

DISCRIMINATOR Bd A2

CAL

FROM I.F. Bd A3

OPERATE

ONE SHOT Z1

10 KHZ LOWPASS

SCA MOD CAL SIG LEVEL

FP-R3 SCA MOD CAL

Z8 COMPARATOR

+15V

+5V RELAY

+5V SCA CARRIER DETECT

SCA MUTE LEVEL ADJ

-15V

Z5 DE-EMPHASIS

+1

SCA AUDIO

AUDIO AMP Z8

AVERAGE DETECTOR LEVEL

AVERAGE DETECTOR Z10

MAIN CHANNEL CAL SIGNAL ADJUST

CAL

AVERAGE DETECTOR DC AMP Z11

PEAK DETECTOR

% MODULATION METER

LOSS OF SCA DETECT

AUDIO AMP Z6

RP-J5

AUDIO AMP WITH DE-EMPHASIS Z7

RP-J6

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LIST OF MATERIALS

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TITLE BLOCK DIAGRAM FIGURE 6-1

SIZE D | DRAWING NO. 6600-0760 | REV. B

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DWG NO 6600-0760

NEXT ASSY	USED ON	REVISIONS					
	730A	SYM	DESCRIPTION	DR	CHK	AUTH	DATE
		A	RELEASED TO PRODUCTION ECO 2022	RG			11-8-76

CHASSIS WIRING

T1

11	CH-A4-17
12	18 VAC
	CH-A4-18
TO FP-SW1-5 → 1	
7	CH-A4-22
2	9 VAC
8	CH-A4-16
TO RP-TB1-1 → 3	
9	CH-A4-20
4	18 VAC
10	CH-A4-19
5	NC
	140 VAC
6	NC

lamps 7381

A1

	A	1	GND
CH-A3-5&15	B	2	FP-SW5-2
+15V	C	3	
FP-SW6-2	D	4	
	E	5	GND
FP-SW20	F	6	FP-R1
FP-SW21	H	7	-15V
FP-SW2-3	J	8	FP-SW12-1
	K	9	
	L	10	
+15V	M	11	+5V
RP-J8-C	N	12	FP-CR2
RP-J8-E	P	13	FP-CR3
FP-SW19-10	R	14	FP-SW16-10
+15V	S	15	
-15V	T	16	
RP-J8-A	U	17	
FP-M1 +	V	18	
FP-SW18-11	W	19	
FP-SW16-7	X	20	
FP-SW2-10	Y	21	
	Z	22	GND

METER AMP & TRANS. OSC. 6608-0780

A2

1	GND
2	-15V
3	+5V
4	CH-A4-11
5	FP-SW6-5
6	CH-A4-9
7	CH-A3-18
8	
9	FP-CR1
10	RP-J2
11	RP-J3
12	FP-SW4-2
13	FP-R3-1
14	FP-SW11-2
15	FP-R3-2
16	FP-SW9-2
17	RP-J5
18	RP-J6
19	
20	FP-SW19-5
21	+15V
22	GND

DISC. Bd 6608-0800

A3

1	GND
2	-15V
3	FP-SW11-5
4	GND
5	CH-A1-B
6	+15V
7	RP-R6-2
8	FP-SW8-2
9	FP-SW7-5
10	GND
11	FP-R2-2
12	FP-SW3-2
13	-15V
14	GND
15	CH-A1-B
16	GND
17	+15V
18	RP-J4, CH-A2-7
19	FP-SW6-6
20	FP-SW6-4
21	-15V
22	GND

I.F. Bd 6608-0770

A4

1	FP-SW2-2
2	
3	
4	+15V
5	RP-R2-2 & FP-SW11-4
6	-15V
7	GND
8	FP-SW3-5
9	CH-A2-6 & A4-10
10	FP-SW11-10 & CH-A4-9
11	CH-A2-4
12	GND
13	-15V
14	+10V
15	+5V
16	CH-T1-8
17	CH-T1-11
18	CH-T1-12
19	CH-T1-10
20	CH-T1-9
21	+15V
22	CH-T1-7

PWR SUP & CAL OSC 6608-0760

FRONT PANEL

MODULATION METER
CH-A1-V + — GND
GND — +10V
M1

SW1 PWR — RP-TB1-3, CH-T1-1
SW2 MAIN CHANNEL — FP-SW11-5, FR-SW11-4, CH-A1-J & FP-SW3-3, CH-A4-1
SW3 SCA INJ — FP-SW4-3, FP-SW2-3, CH-A3-12, CH-A4-8, FP-SW11-6
SW4 SCA MOD — FP-SW3-3, CH-A2-12, FP-CR2 & CR3, RP-J8-G, +5V
SW5 #1 — +5V, CH-A1-2, FP-SW11-7
SW6 #2 — FP-SW11-12, CH-A1-D, GND; CH-A3-20, CH-A2-5 & FP-R2-1, CH-A3-19
SW7 NARROW — +15V, CH-A3-9, -15V
SW8 WIDE — -15V, CH-A3-8, +15V
SW9 ± 4 kHz — +5V, CH-A2-16, GND
SW10 ± 6 kHz — CH-A1-X

MEASURE/CAL

SCA SUBCHANNEL

SW11 CAL — FP-SW5-1, +5V, CH-A4-9,10, FP-SW3-4, FP-SW2-4 & CH-A3-3, CH-A4-5 & FP-SW2-5, +5V, CH-A2-14, FP-SW6-3, +5V
SW12 (+) — CH-A1-J, FP-SW14-8, CH-A1-8
SW13 (−)

METER

SW14 -50dB — FP-SW2-2
SW15 -40dB — 1370 Ω
SW16 -30dB — 432 Ω, CH-A1-14
SW17 -20dB — 137 Ω
SW18 -10dB — 43.2 Ω
SW19 0dB — 13.7 Ω, GND, CH-A1-R, CH-A1-W, 12.7 Ω, 12.7 Ω, -15V CH-A2-20, +15V

METER ATTENUATOR

SW21: 9% CH-A1-H, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1%, 0%
SW20: 120%, 110%, 100%, 90%, 80%, 70%, A, 60%, 50%, CH-A1-F, 0
(each step 10 Ω)

PEAK FLASHER CAL: CH-A1-6 — R1 1k
SCA INJ CAL: FP-SW6-5 — R2 1k — CH-A3-11
SCA MOD CAL: CH-A2-13 — R3 1k — CH-A2-15; R4 1k

CH-A2-9 — SCA SUBCARRIER CR1 — +5V
CH-A1-12 — CR2 — - PEAK
CH-A1-13 — CR3 — + PEAK — FP-SW4-5

ITEM NO.	EN NO.	PART NO.	DESCRIPTION	REF DES	QTY PER ASSY

LIST OF MATERIALS

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(408) 246-6365

TITLE: FRONT PANEL & CHASSIS WIRING FIGURE 6-2

SIZE D | DRAWING NO 6600-0770 | REV B

SCALE ~ | SHT | OF |

DWG. NO. 6600-0770

NEXT ASSY	USED ON
66608-0780	730A

REVISIONS					
SYM	DESCRIPTION	DR	CHK	AUTH	DATE
A	RELEASED TO PROD PER ECO 206	RG			1-6-75
B	REVISED PER ECO NO. 310	RG			12-18-75
C	REVISED PER ECO 342	TD			7-16-76

COMPONENT DESIGNATOR		
FIRST	LAST	DELETED
C1	C42	
CR1	CR6	
L1	L7	
Q1	Q5	
R1	R53	
Y1	Y2	
Z1	Z11	

DWG. NO. 6601-1410

NOTES: UNLESS OTHERWISE SPECIFIED:
1. RESISTORS - VALUES IN OHMS +5%, 1/4 WATT.
2. CAPACITORS - VALUES IN MICROFARADS.
3. INDUCTORS - VALUES IN MICROHENRYS +10%.
4. *FACTORY SELECT VALUE. TYPICAL VALUE SHOWN.
5. VOLTAGES ARE DC CONDITIONS.
6. OPTIONAL PARTS (41 kHz OPTION)
7. DC VOLTAGE LEVELS ARE TYPICAL FOR INSTRUMENT IN SCA MOD CAL MODE.

ITEM NO.	EN NO.	PART NO.	DESCRIPTION	REF. DES.
QTY PER ASSY		LIST OF MATERIALS		

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TOLERANCES UNLESS OTHERWISE SPECIFIED
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TITLE: METER AMP BOARD A1 FIGURE 6-4

SIZE D | DRAWING NO. 6601-1410 | REV. B

SCALE 6 | SHT 1 OF 1

Model 730A Discriminator BD Assy Assembly # 6608-0800

Ckt. Ref.	Description	TFT Stock No.
C1	Cap Elect 10MFD 450V	1010-0100
C2	Cap Tan 10MFD 20V 10%	1008-0100
C3	Cap Tan 10MFD 20V 10%	1008-0100
C4	Cap Cer Disc .05MFD	1005-5039
C5	Cap Mica 2000PF	1001-0202
C6	Cap Tan 10MFD 20V 10%	1008-0100
C7	Cap Mica 10PF	1001-0100
C8	Cap Mica 10PF	1001-0100
C9	Cap Cer Disc .05MFD	1005-5039
C10	Cap Tan 10MFD 20V 10%	1008-0100
C11	Cap Cer Disc .05MFD	1005-5039
C12	Cap Cer Disc.05MFD	1005-5039
C13	Cap Poly Carb .042MFD 50V	1006-0420
C14	Cap Poly Carb .1 MFD 50V	1006-0101
C15	Cap Tan 10MFD 20V 10%	1008-0100
C16	Cap Poly .0027MFD 100V	1002-0272
C17	Cap Poly Carb .014MFD 50V	1006-0140
C18	Cap Poly Carb .0013MFD 50V	1006-0013
C19	Cap Poly Carb .0059 MFD 50V	1006-0059
C20	Cap Poly Carb .021MFD 50V	1006-0210
C21	Cap Mica 10PF	1001-0100
C22	Cap Tan 10MFD 20V 10%	1008-0100
C23	Cap Cer Disc .2MFD	1005-2029
C24	Cap Mica 750PF	1001-0751
C25	Cap Tan 10MFD 20V 10%	1008-0100
C26	Cap Tan 10MFD 20V 10%	1008-0100
C27	Cap Elect 25MFD 6V	1010-0250
C28	Cap Cer Disc .05MFD	1005-5039
C29	Cap Cer Disc .2MFD	1005-2029
C30	Cap Poly .01MFD 100V	1002-0011
C31	Cap Poly .01MFD 100V	1002-0011
C32	Cap Tan 10MFD 20V 10%	1008-0100
C33	Cap Tan 10MFD 20V 10%	1008-0100
C34	Cap Poly .018MFD 100V	1002-0181
C35	Cap Poly .018MFD 100V	1002-0181
C36	Cap Poly Carb .03MFD 50V	1006-0300
C37	Cap Cer Disc .05MFD	1005-5039
C38	Cap Mica 620PF	1001-0621
CR1	Dio, Hot Carrier, HP 5082-2800	1282-2800
CR3	Dio IN3064	1281-3064
CR5	Dio IN3064	1281-3064
CR6	Dio IN3064	1281-3064

Model 730A Discriminator BD Assy Assembly # 6608-0800

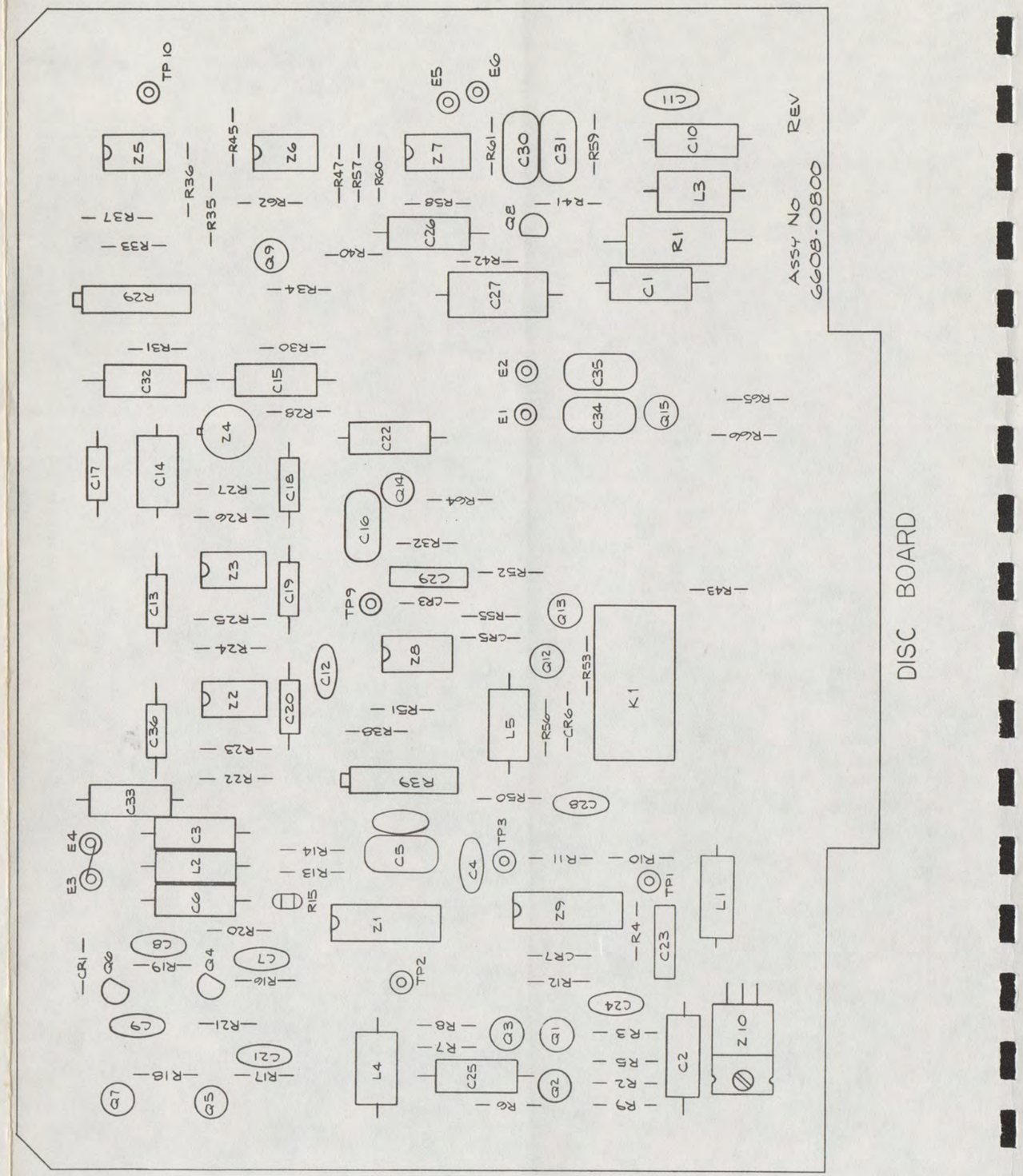
Ckt. Ref.	Description	TFT Stock No.
CR7	Dio IN3064	1281-3064
K1	Relay AZ530-12-1	1880-0002
L1	Choke RF 15UH	1530-0150
L2	Choke RF 15UH	1530-0150
L3	Choke RF 22MH	1530-0223
L4	Choke RF 22MH	1530-0223
L5	Choke RF 22MH	1530-0223
Q1	Xistor 2N3565	1271-3565
Q2	Xistor 2N3565	1271-3565
Q3	Xistor 2N3565	1271-3565
Q4	Xistor 2N4275	1271-4275
Q5	Xistor 2N4275	1271-4275
Q6	Xistor 2N4121	1271-4121
Q7	Xistor 2N4275	1271-4275
Q8	Xistor 2N5089	1271-5089
Q9	Xistor 2N4275	1271-4275
Q12	Xistor 2N4275	1271-4275
Q13	Xistor 2N3643	1271-3643
Q14	Xistor 2N4275	1271-4275
Q15	Xistor 2N4275	1271-4275
R1	Res Car Comp 1W 5% 56	1068-0056
R2	Res Car Comp 1/4W 5% 680	1065-0680
R3	Res Car Comp 1/4W 5% 3.3K	1065-3301
R4	Res Car Comp 1/4W 5% 1K	1065-1001
R5	Res Car Comp 1/4W 5% 10K	1065-1002
R6	Res Car Comp 1/4W 5% 5.1K	1065-5101
R7	Res Car Comp 1/4W 5% 2.7K	1065-2701
R8	Res Car Comp 1/4W 5% 5.1K	1065-5101
R9	Res Car Comp 1/4W 5% 10K	1065-1002
R10	Res Car Comp 1/4W 5% 1K	1065-1001
R11	Res Car Comp 1/4W 5% 5.6K	1065-5601
R12	Res Car Comp 1/4W 5% 10K	1065-1002
R13	Res Car Comp 1/4W 5% 18	1065-0018
R14	Res Car Comp 1/4W 5% 10K	1065-1002
R15	Thermistor 1K	1080-0013
R16	Res Car Comp 1/4W 5% 4.7K	1065-4701
R17	Res Car Comp 1/4W 5% 4.7K	1065-4701
R18	Res Car Comp 1/4W 5% 2.2K	1065-2201
R19	Res Car Comp 1/4W 5% 2.2K	1065-2201
R20	Res Car Comp 1/4W 5% 470	1065-0470
R21	Res Car Comp 1/4W 5% 470	1065-0470
R22	Res MT FLM 1/8W 1% 1.21K	1061-1211

Model 730A Discriminator BD Assy Assembly # 6608-0800

Ckt. Ref.	Description	TFT Stock No.
R23	Res MT FLM 1/8W 1% 1.21K	1061-1211
R24	Res MT FLM 1/8W 1% 1.21K	1061-1211
R25	Res MT FLM 1/8W 1% 1.21K	1061-1211
R26	Res MT FLM 1/8W 1% 1.21K	1061-1211
R27	Res MT FLM 1/8W 1% 1.21K	1061-1211
R28	Res Car Comp 1/4W 5% 270	1065-0270
R29	Res Var PC MT 1K 10T	1069-1001
R30	Res Car Comp 1/4W 5% 1.8K	1065-1801
R31	Res Car Comp 1/4W 5% 51	1065-0051
R32	Res Car Comp 1/4W 5% 10K	1065-1002
R33	Res Car Comp 1/4W 5% 10K	1065-1002
R34	Res Car Comp 1/4W 5% 470	1065-0470
R35	Res MT FLM 1/8W 1% 28.7K	1061-2872
R36	Res MT FLM 1/8W 1% 412K	1061-4123
R37	Res Mt FLM 1/8W 1% 15K	1061-1502
R38	Res Car Comp 1/4W 5% 6.8K	1065-6801
R39	Res Var PC MT 1K 10T	1069-1001
R40	Res Car Comp 1/4W 5% 4.7K	1065-4701
R41	Res Car Comp 1/4W 5% 100K	1065-1003
R42	Res Car Comp 1/4W 5% 3.3K	1065-3301
R43	Res Car Comp 1/4W 5% 10K	1065-1002
R45	Res Car Comp 1/4W 5% 10K	1065-1002
R47	Res Car Comp 1/4W 5% 33K	1065-3302
R50	Res Car Comp 1/4W 5% 22K	1065-2202
R51	Res Car Comp 1/4W 5% 22K	1065-2202
R52	Res Car Comp 1/4W 5% 10K	1065-1002
R53	Res Car Comp 1/4W 5% 3.3K	1065-3301
R55	Res Car Comp 1/4W 5% 3.9K	1065-3901
R56	Res Car Comp 1/4W 5% 150	1065-0150
R57	Res Car Comp 1/4W 5% 620	1065-0620
R58	Res Car Comp 1/4W 5% 3.9K	1065-3901
R59	Res Car Comp 1/4W 5% 620	1065-0620
R60	Res Car Comp 1/4W 5% 7.5K	1065-7501
R61	Res Car Comp 1/4W 5% 7.5K	1065-7501
R62	Res Car Comp 1/4W 5% 15K	1065-1502
R64	Res Car Comp 1/4W 5% 470	1065-0470
R65	Res Car Comp 1/4W 5% 10K	1065-1002
R66	Res Car Comp 1/4W 5% 3.9K	1065-3901
Z1	I/C MC6601P	1100-8601
Z2	1/6 LM 741CN	1100-0741
Z3	1/6 LM 741CN	1100-0741
Z4	I/C LM302	1100-0302

Model 730A Discriminator BD Assy Assembly # 6608-0800

Ckt. Ref.	Description	TFT Stock No.
Z5	1/6 LM 741CN	1100-0741
Z6	1/6 LM 741CN	1100-0741
Z7	1/6 LM 741CN	1100-0741
Z8	1/6 LM 301	1100-0301
Z9	I/C SP380A	1100-0380
Z10	I/C KN340T-05	1100-7805
	PC Card Exect	1650-6100
	Socket, I/C 8 Pin	2250-1008
	Socket, I/C 14 Pin	2250-1014



NEXT ASSY	USED ON
6608-0800	730 A

REVISIONS					
SYM	DESCRIPTION	DR	CHK	AUTH	DATE
A	RELEASED TO PROD PER ECO 206	RG			1-6-75
B	REVISED PER ECO # 240	RM			2-4-75
C	REVISED PER ECO 342	TD			7-16-76

COMPONENT DESIGNATOR		
FIRST	LAST	DELETED
C1	C38	
CR1	CR7	CR2,4
K1	K1	
L1	L5	
Q1	Q15	Q10,11
R1	R66	R44, R46, R48, R49, R52, R63
Z1	Z10	

NOTES: UNLESS OTHERWISE SPECIFIED:
1. RESISTORS - VALUES IN OHMS +5%, 1/4 WATT.
2. CAPACITORS - VALUES IN MICROFARADS.
3. INDUCTORS - VALUES IN MICROHENRYS +10%.
4. *FACTORY SELECT VALUE. TYPICAL VALUE SHOWN.
5. VOLTAGES ARE DC CONDITIONS.
6. DC VOLTAGE LEVELS ARE TYPICAL FOR INSTRUMENT IN SCA MOD CAL MODE.

ITEM NO.	EN NO.	PART NO.	DESCRIPTION	REF. DES.	QTY PER ASSY

LIST OF MATERIALS

REMOVE ALL BURRS AND SHARP EDGES

TOLERANCES UNLESS OTHERWISE SPECIFIED
.XX ± ANGULAR ±
.XXX ±

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MFG. ENG.		
APPD.		
APPD.		
ECO NO.		

TFT TIME & FREQUENCY TECHNOLOGY INC.
3000 Olcott St., Santa Clara, California 95050
(408) 246-6365

TITLE: DISC BOARD (A2)
FIGURE 6-5

SIZE D | DRAWING NO. 6601-1400 | REV. C | SCALE ~ | SHT 1 OF 1

DWG. NO. 6601-1400

Model 730A IF Mixer Bd Assembly # 6608-0770

Ckt. Ref.	Description	TFT Stock No.
C1	Cap Cer Disc .05 Mfd	1005-5039
C2	Cap Cer Disc .05 Mfd	1005-5039
C3	Cap Mica 82 PF	1001-0820
C4	Cap Cer Disc .05 Mfd	1005-5039
C5	Cap Mica 39 PF	1001-0390
C6	Cap Cer Disc .05 Mfd	1005-5039
C7	Cap Cer Disc .05 Mfd	1005-5039
C8	Cap Mica 56 PF	1001-0560
C9	Cap Tub 8.2 PF	1000-0082
C10	Cap Cer Disc .05 Mfd	1005-5039
C11	Cap Cer Disc .05 Mfd	1005-5039
C13	Cap Cer Disc .05 Mfd	1005-5039
C14	Cap Cer Disc .05 Mfd	1005-5039
C15	Cap Cer Disc .05 Mfd	1005-5039
C16	Cap Mica 180 PF	1001-0181
C17	Cap Mica 220 PF	1001-0221
C18	Cap Cer Disc .05 Mfd	1005-5039
C19	Cap Cer Disc .05 Mfd	1005-5036
C22	Cap Cer Disc .05 Mfd	1005-5039
C23	Cap Cer Disc .05 Mfd	1005-5039
C25	Cap Mica 150 PF	1001-0151
C26	Cap Mica 27 PF	1001-0270
C27	Cap Tan 5.6 Mfd 35V 10%	1008-0056
C28	Cap Mica 5100 PF	1001-0512
C29	Cap Mica 6800 PF	1001-0682
C30	Cap Mica 2000 PF	1001-0202
C31	Cap Mica 5100 PF	1001-0512
C33	Cap Cer Disc .05 Mfd	1005-5039
C34	Cap Cer Disc .05 Mfd	1005-5039
C35	Cap Cer Disc .05 Mfd	1005-5039
C36	Cap Tub 1.5 PF	1000-0015
C37	Cap Cer Disc .05 Mfd	1005-5039
C38	Cap Mica 75 PF	1001-0750
C39	Cap Cer Disc .05 Mfd	1005-5039
C40	Cap Cer Disc. 05 Mfd	1005-5039
C41	Cap Cer Disc .05 Mfd	1005-5039
C42	Cap Cer Disc .05 MFd	1005-5039
C43	Cap Cer Disc .2 Mfd	1005-2029
C44	Cap Cer Disc .2 Mfd	1005-2029
C45	Cap Elect 15 Mfd 25V	1010-0150
C46	Cap Cer Disc .2 Mfd	1005-2029
C47	Cap Cer Disc .05 Mfd	1005-5039

Model 730A IF Mixer Bd Assembly # 6608-0770

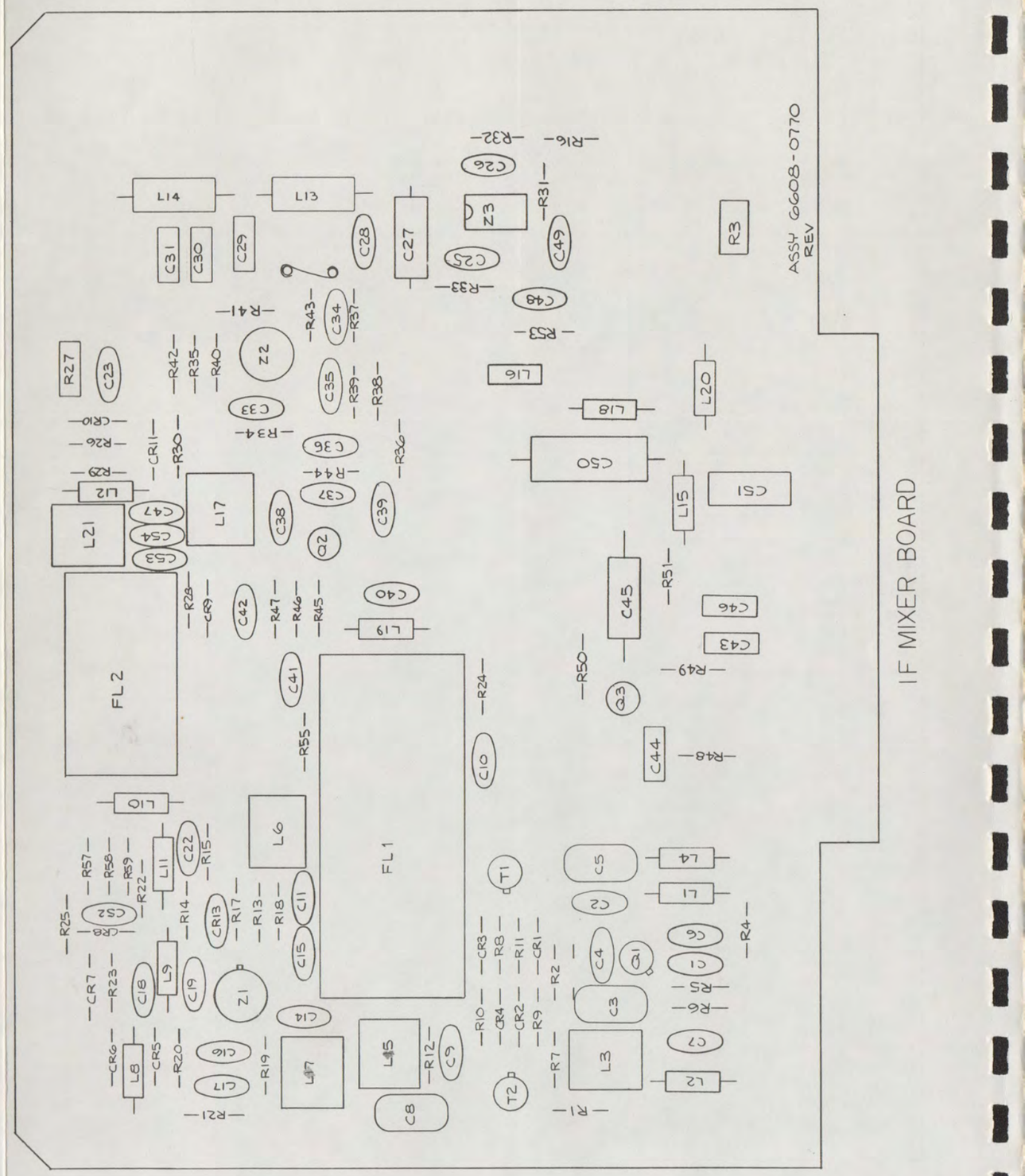
Ckt. Ref.	Description	TFT Stock No.
Q1	Xistor 2N3563	1271-3563
Q2	Xistor 2N3563	1271-3563
Q3	Xistor 2N5089	1271-5089
R1	Res Car Comp 1/4W 5% 560	1065-0560
R2	Res Car Comp 1/4W 5% 1.5K	1065-1501
R4	Res Car Comp 1/4W 5% 33	1065-0033
R5	Res Car Comp 1/4W 5% 1.5K	1065-1501
R6	Res Car Comp 1/4W 5% 1.5K	1065-1501
R7	Res Car Comp 1/4W 5% 150	1065-0150
R8	Res Car Comp 1/4W 5% 51	1065-0051
R9	Res Car Comp 1/4W 5% 51	1065-0051
R10	Res Car Comp 1/4W 5% 51	1065-0051
R11	Res Car Comp 1/4W 5% 51	1065-0051
R12	Res Mt Flm 1/8W 1% 1K	1061-1001
R13	Res Car Comp 1/4W 5% 27K	1065-2702
R14	Res Car Comp 1/4W 5% 1K	1065-1001
R15	Res Car Comp 1/4W 5% 120	1065-0120
R16	Res Car Comp 1/4W 5% 56	1065-0056
R17	Res Car Comp 1/4W 5% 15K	1065-1502
R18	Res Car Comp 1/4W 5% 270	1065-0270
R19	Res Car Comp 1/4W 5% 10K	1065-1002
R20	Res Car Comp 1/4W 5% 1K	1065-1001
R21	Res Car Comp 1/4W 5% 330	1065-0330
R22	Res Car Comp 1/4W 5% 15K	1065-1502
R23	Res Car Comp 1/4W 5% 27	1065-0027
R24	Res Car Comp 1/4W 5% 2.7K	1065-2701
R25	Res Car Comp 1/4W 5% 18K	1065-1802
R26	Res Car Comp 1/4W 5% 27	1065-0027
R27	Pot PC Mt 1K 1T	1072-1001
R28	Res Car Comp 1/4W 5% 15K	1065-1502
R29	Res Car Comp 1/4W 5% 330	1065-0330
R30	Res Car Comp 1/4W 5% 1K	1065-1001
R31	Res Car Comp 1/4W 5% 56	1065-0056
R32	Res Car Comp 1/4W 5% 12K	1065-1202
R33	Res Car Comp 1/4W 5% 390	1065-0390
R34	Res Car Comp 1/4W 5% 1.5K	1065-1501
R35	Res Car Comp 1/4W 5% 82	1065-0082
R36	Res Car Comp 1/4W 5% 3.3K	1065-3301
R37	Res Car Comp 1/4W 5% 390	1065-0390
R38	Res Car Comp 1/4W 5% 1K	1065-1001
R39	Res Car Comp 1/4W 5% 4.7K	1065-4701
R40	Res Car Comp 1/4W 5% 1.5K	1065-1501
R41	Res Car Comp 1/4W 5% 39K	1065-3901

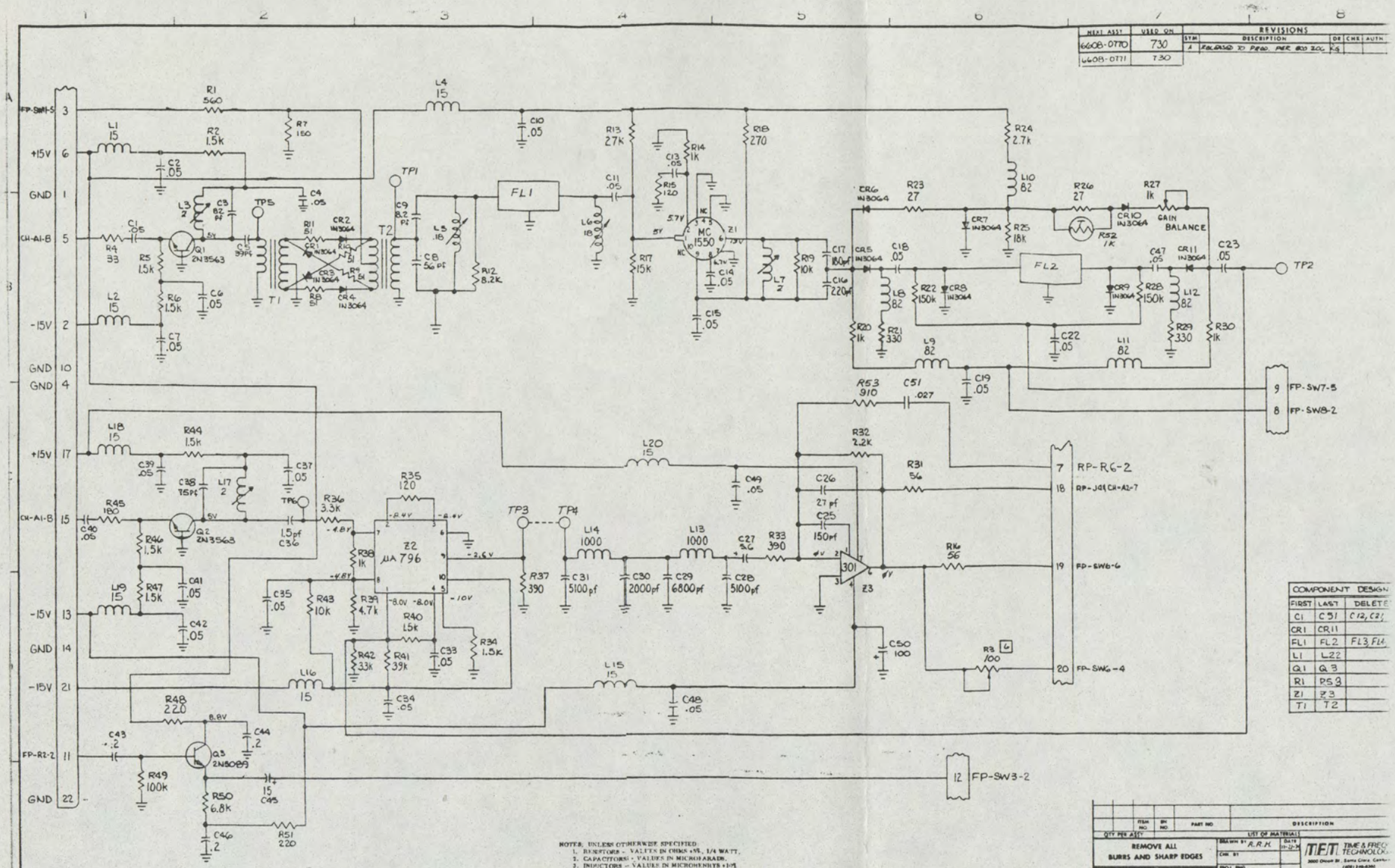
Model 730A IF Mixer Bd Assembly # 6608-0770

Ckt. Ref.	Description	TFT Stock No.
C48	Cap Cer Disc .05 Mfd	1005-5039
C49	Cap Cer Disc .05 Mfd	1005-5039
C50	Cap Elect 100 Mfd 16V	1010-0101
C51	Cap Poly .027 Mfd 100V	1002-0271
C52	Cap Cer Disc .05 Mfd	1005-5039
C53	Cap Cer Disc .05 Mfd	1005-5039
C54	Cap Tub 6.8 PF	1000-0068
CR1	Dio IN3064	1281-3064
CR2	Dio IN3064	1281-3064
CR3	Dio IN3064	1281-3064
CR4	Dio IN3064	1281-3064
CR5	Dio IN3064	1281-3064
CR6	Dio IN3064	1281-3064
CR7	Dio IN3064	1281-3064
CR8	Dio IN3064	1281-3064
CR9	Dio IN3064	1281-3064
CR10	Dio IN3064	1281-3064
CR11	Dio IN3064	1281-3064
FL1	Filter 10.7 MHz/20kHz BW	1052-0051
FL2	Filter 10.7 MHz/3kHz BW	1052-0049
L1	Choke R F 15 UH	1530-0150
L2	Choke R F 15 UH	1530-0150
L3	M/L Ind Var 16T	1550-0016
L4	Choke R F 15UH	1530-0150
L5	M/L Ind Var 42T	1577-0018
L6	M/L Ind Var 42T	1577-0018
L7	M/L Ind Var 16T	1550-0016
L8	Choke RF 82UH	1530-0820
L9	Choke RF 82 UH	1530-0820
L10	Choke RF 82 UH	1530-0820
L11	Choke RF 82 UH	1530-0820
L12	Choke RF 82 UH	1530-0820
L13	Choke RF 1000UH	1530-0102
L14	Choke RF 1000UH	1530-0102
L15	Choke RF 15UH	1530-0150
L16	Choke RF 15UH	1530-0150
L17	M/L Ind Var 16T	1550-0016
L18	Choke RF 15UH	1530-0150
L19	Choke RF 15UH	1530-0150
L20	Choke RF 15UH	1530-0150
L21	M/L Ind Vag 42T	1577-0018

Model 730A IF Mixer Bd Assembly # 6608-0770

Ckt. Ref.	Description	TFT Stock No.
R42	Res Car Comp 1/4W 5% 33K	1065-3302
R43	Res Car Comp 1/4W 5% 10K	1065-1002
R44	Res Car Comp 1/4W 5% 1.5K	1065-1501
R45	Res Car Comp 1/4W 5% 180	1065-0180
R46	Res Car Comp 1/4W 5% 1.5K	1065-1501
R47	Res Car Comp 1/4W 5% 1.5K	1065-1501
R48	Res Car Comp 1/4W 5% 220	1065-0220
R49	Res Car Comp 1/4W 5% 100K	1065-1003
R50	Res Car Comp 1/4W 5% 6.8K	1065-6801
R51	Res Car Comp 1/4W 5% 220	1065-0220
R52	Thermistor 1K	1080-0013
R53	Res Car Comp 1/4W 5% 910	1065-0910
R55	Res Mt Flm 1/8W 1% 1.21K	1061-1211
R57	Res Car Comp 1/4W 5% 1.2K	1065-1201
R58	Res Car Comp 1/4W 5% 330	1065-0330
R59	Res Car Comp 1/4W 5% 1.2K	1065-1201
T1	M/L Ind-Trifilar	1501-0001
T2	M/L Ind-Trifilar	1501-0001
Z1	I/C MC 1550G	1100-1550
Z2	I/C UA796HG	1100-0796
Z3	I/C LM301	1100-0301
	Socket, I/C 8 Pin	2250-1008
	PC Board 730 IF	1600-0770 REVE





NEXT ASSY	USED ON
6608-0770	730
6608-0771	730

REVISIONS				
SYM	DESCRIPTION	DR	CHK	AUTH
A	RELEASED TO PROD. PER ECO 306	KS		

COMPONENT DESIGN		
FIRST	LAST	DELETE
C1	C31	C12, C21
CR1	CR11	
FL1	FL2	FL3, FL4
L1	L22	
Q1	Q3	
R1	R53	
Z1	Z3	
T1	T2	

NOTES: UNLESS OTHERWISE SPECIFIED:
1. RESISTORS - VALUES IN OHMS ±5%, 1/4 WATT.
2. CAPACITORS - VALUES IN MICROFARADS.
3. INDUCTORS - VALUES IN MICROHENRYS ±10%
4. *FACTORY SELECT VALUE. TYPICAL VALUE SHOWN.
5. VOLTAGES ARE DC CONDITIONS.
6. OPTIONAL PART (4 KHz OPTION)
7. D.C. VOLTAGES ARE TYPICAL FOR INSTRUMENT IN SCA MOD CAL MODE

ITEM NO	QTY PER ASSY	BY NO	PART NO	DESCRIPTION
			LIST OF MATERIALS	

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3000 Ocean Dr. Santa Clara, Calif. (408) 246-8300

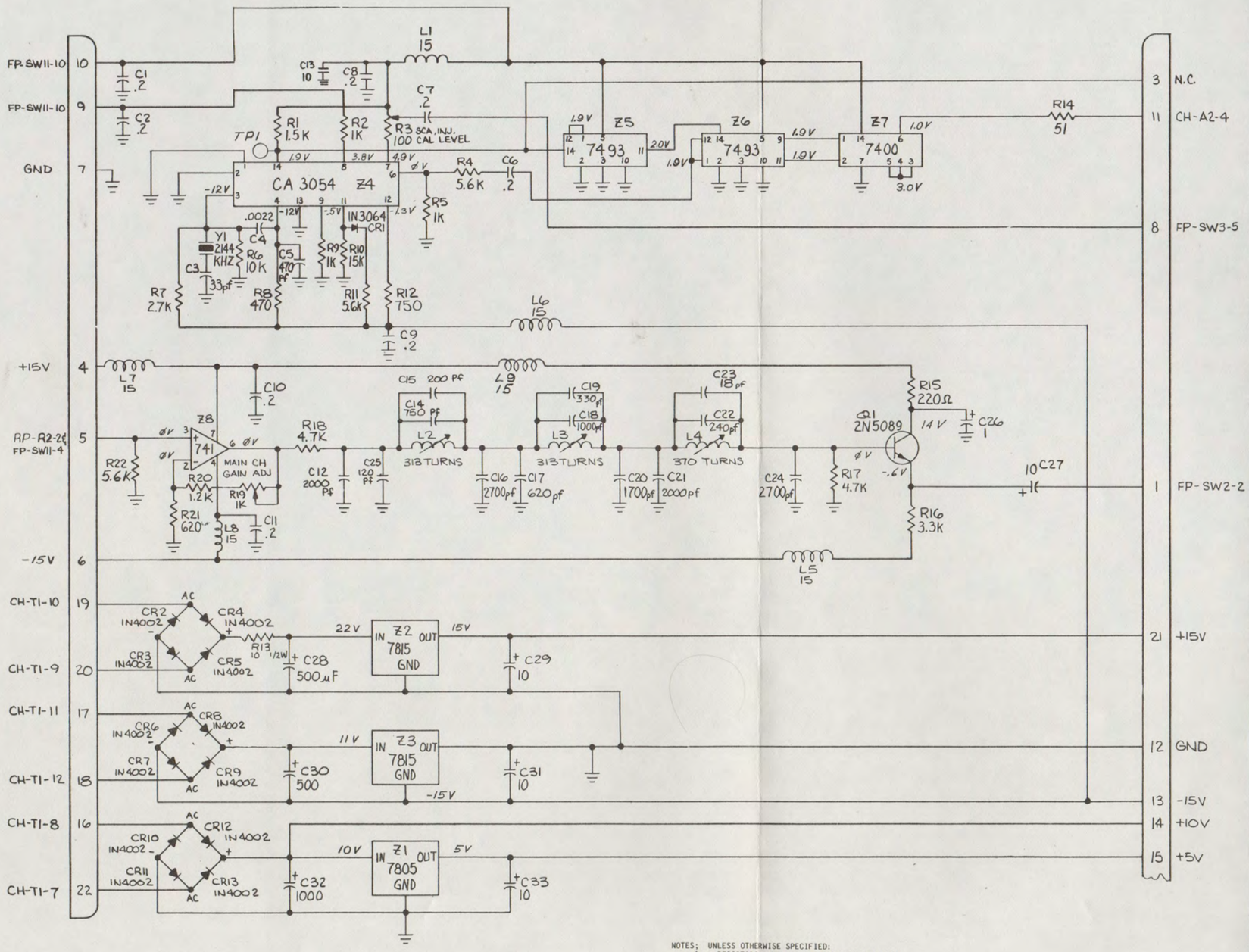
TITLE (A3) MIXER IF BOARD FIGURE 6-2

SIZE D DRAWING NO 6601-1420

SCALE NONE SHT

NEXT ASSY	USED ON
6608-0760	T30A

REVISIONS					
SYM	DESCRIPTION	DR	CHK	AUTH	DATE
A	RELEASED TO PROD PER ECO 206	RS			1-6-75
B	REVISED PER ECO # 282	EI			9-26-75
C	REVISED PER ECO 342	TD			7-16-76



COMPONENT DESIGNATOR		
FIRST	LAST	DELETED
C1	C33	
CR1	CR13	
L1	L9	
Q1	Q1	
R1	R22	
Y1	Y1	
Z1	Z8	

NOTES; UNLESS OTHERWISE SPECIFIED:
1. RESISTORS - VALUES IN OHMS +5%, 1/4 WATT.
2. CAPACITORS - VALUES IN MICROFARADS.
3. INDUCTORS - VALUES IN MICROHENRYS +10%.
4. *FACTORY SELECT VALUE. TYPICAL VALUE SHOWN.
5. VOLTAGES ARE DC CONDITIONS.
6. DC VOLTAGE LEVELS ARE TYPICAL FOR INSTRUMENT IN SCA MOD CAL MODE.

ITEM NO.	EN NO.	PART NO.	DESCRIPTION	REF. DES.
QTY PER ASSY		LIST OF MATERIALS		

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.XXX ±

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TFT TIME & FREQUENCY TECHNOLOGY INC.
3000 Olcott St., Santa Clara, California 95050
(408) 246-6365

TITLE POWER SUPPLY (A4)
MAIN CH. AMP & FILTER
FIGURE 6-7

SIZE D | DRAWING NO. 6601-1390 | REV. C

SCALE | SHT 1 OF 1

DWG. NO. 6601-1390