

# FULL COMPLIANCE WITH BTSC RECOMMENDED PRACTICES.

The Model 850 BTSC TV Stereo Aural Modulation Monitor is specifically designed to monitor and measure the performance characteristics of the BTSC stereo composite signal as defined by the EIA/BTSC System Multichannel Television Sound (MTS) Recommended Practices.

The 850's Monitoring capabilities include: Total Modulation, Stereo Channel modulation, Left and Right channel modulation and Peak modulation of the Total, Stereo, and Main Channels. Relative RF level can also be monitored as an aid to antenna orientation.

More than 20 different parameters may be analyzed with the companion Model 860 plug-in Distortion Analyzer/AC Voltmeter (as shown).

Modulation Levels are easily read on two analog meters with quasi-peak ballistics. Additionally, user-settable Peak Flashers are included. A remote Meter & Peak Flasher Panel is available separately.

The single-chassis 850 offers these important benefits for the TV engineer:

- Perform a complete "Proof" of the entire Main and Stereo Channel from the studio through the over-air

antenna- including the critical transmitter IF stages (see diagram);

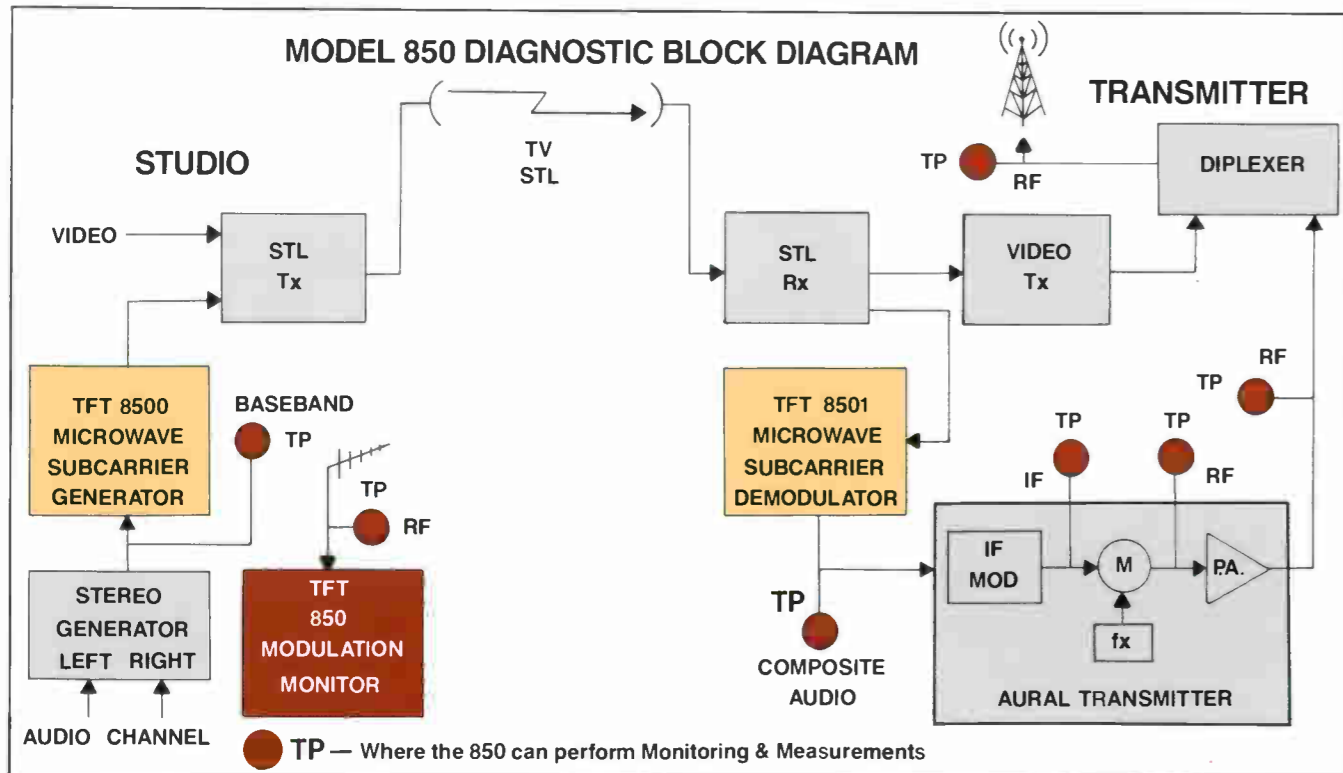
- Because the 850 isn't dependent on other video instrumentation for its full BTSC monitoring and measurement capabilities, there's no requirement to "share" other important video test equipment.

- The operator-friendly meters and peak flashers may be easily removed (an inexpensive, useful option; see Accessories & Options).

- The 850, when equipped with the 860 plug-in Analyzer, is less than half the cost of a competitive system which cannot perform the 850's full-range of critical functions.

TFT, Inc. has been designing and manufacturing Aural Modulation monitors for more than 16 years and has sold over 10,000. The popular 701/702 Monitors are de facto standards for most TV broadcasters because of their accuracy, versatility and reliability. The new Model 850 BTSC Stereo Monitor joins these field-proven instruments.

TFT's participation on the BTSC Systems Committee ensures that all factors crucial to monitoring the BTSC aural signal have been embodied in the design of the Model 850.



The 850 is a precision instrument specifically designed to measure more than 20 different parameters in the TV broadcaster's entire BTSC signal transmission chain.

# 850 SPECIFICATIONS

## RF Input (except Model 851)

Frequency Range ..... Preset Channel 2 through 83 (NTSC Standard); visual and aural carrier or aural carrier only

Input Signal Level  
 Low Level ..... Approx. 200  $\mu$ V to 5 mV  
 High Level ..... Approx. 2 V to 10 V

Image Rejection ..... -60 dB (low level input via channel filter)  
 Input Impedance ..... 50 ohms  
 Input Connector ..... BNC

## Composite Input

Minimum 1 Vrms  $\pm$  73 kHz deviation, 75 ohms

## IF Input (except Model 851)

200 mV-1 Vrms, 41.25 and 32.5 MHz, switch-selectable, 50 ohms

Video Loop-Thru ..... 1 V p-p, unbalanced bridging input/output

## Outputs

LEFT, RIGHT, MAIN CHANNEL ..... Balanced audio outputs, 1.5 Vrms each, 600 ohms

COMPOSITE OUTPUT ..... 1.5 Vrms, 75 ohms  
 TELEMETRY MUX 1 & 2 ..... Bandpass filtered, undemodulated composite outputs, 25 Vrms each, 75 ohms (requires optional Alarm and MUX board)

TO SAP MONITOR ..... Composite signal feed to TFT SAP/Pro Monitor 1.5 Vrms, 75 ohms  
 RS-232 ..... Type DB-25 connector for external computer control

REMOTE METER/PEAK FLASHER ..... Barrier strip terminals for option, TFT P/N 7100-4020

MODULATION and CARRIER ALARM ..... Relay contact closures for external alarm; (requires optional Alarm and MUX board)

FUNCTION OUTPUT/LEVEL TO BUILT-IN ANALYZER TO BARGRAPH DISPLAY ..... 730 mV  $\pm$  73 kHz deviation  
 Connects to external bargraph display unit

## Peak Flashers

Six peak flasher lights indicate plus and minus peaks simultaneously for Total, Stereo, and Main Channel modulation. Peak levels are digitally set by thumbwheel switches, in 1% increments from 0% to 199% peaks. LEDs remain lit for approximately 2 seconds after triggering by peaks.

## Modulation Calibrator

Built-in frequency synthesized calibrator for meter and peak flasher calibration (100% modulation) from the front panel. Accuracy  $\pm$  0.5%.

SPECIFICATIONS SUBJECT TO CHANGE.

## Left Meter Functions

CAL ..... 100% =  $\pm$  73 kHz deviation  
 TOTAL MODULATION (+) ..... 100% = + 73 kHz deviation  
 STEREO ..... 100% =  $\pm$  55 kHz deviation  
 LEFT CH ..... 100% = full left channel modulation ( $\pm$  12.5 kHz deviation)  
 (L-R) ..... 100% =  $\pm$  50 kHz deviation

## Right Meter Functions

CAL ..... 100% = + 73 kHz deviation  
 TOTAL MODULATION (-) ..... 100% = - 73 kHz deviation  
 MAIN (L + R) ..... 100% =  $\pm$  25 kHz deviation  
 RIGHT CHANNEL ..... 100% = full right channel modulation ( $\pm$  12.5 kHz deviation)  
 RF LEVEL ..... Greater than 20% reading indicates adequate RF level for full IF limiting  
 PHASE CAL ..... Minimum reading indicates best calibration of internal PLL circuitry

## Measurement Capabilities

(With Distortion Analyzer/AC Level Meter, TFT Model 860, or equivalent)

Total Modulation .....  $\pm$  0.1 dB, 50 Hz to 50 kHz  
 $\pm$  0.5 dB, 30 Hz to 120 kHz  
 Stereo Channel .....  $\pm$  0.1 dB, 50 Hz to 47 kHz  
 Main Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz  
 L-R Channel .....  $\pm$  0.1 dB, 16 kHz to 47 kHz  
 Left Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz  
 Right Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz  
 Signal/Noise Ratio ..... 50 dB Wideband, 70 dB de-emphasized, ref 5 mV input RF

Stereo Separation (without companding) ..... 48 dB (below 8 kHz), 45 dB (8 kHz or higher)  
 Pilot Injection level ..... -23.3 dB ( $\pm$  0.2 dB) from 100% Total Modulation

Stereo Subcarrier Suppression, 31.468 kHz ..... -55 dB ref 100% Total Modulation  
 Inter-Carrier Noise ..... -65 dB ref 100% Total Modulation  
 Pilot Interference Ratio ..... -40 dB ref normal pilot level  
 AM Noise ..... Measures AM modulation on the aural carrier, read out in mV  
 Multipath ..... To minimize multipath distortion when using Low Level RF input

## Mechanical and Environmental

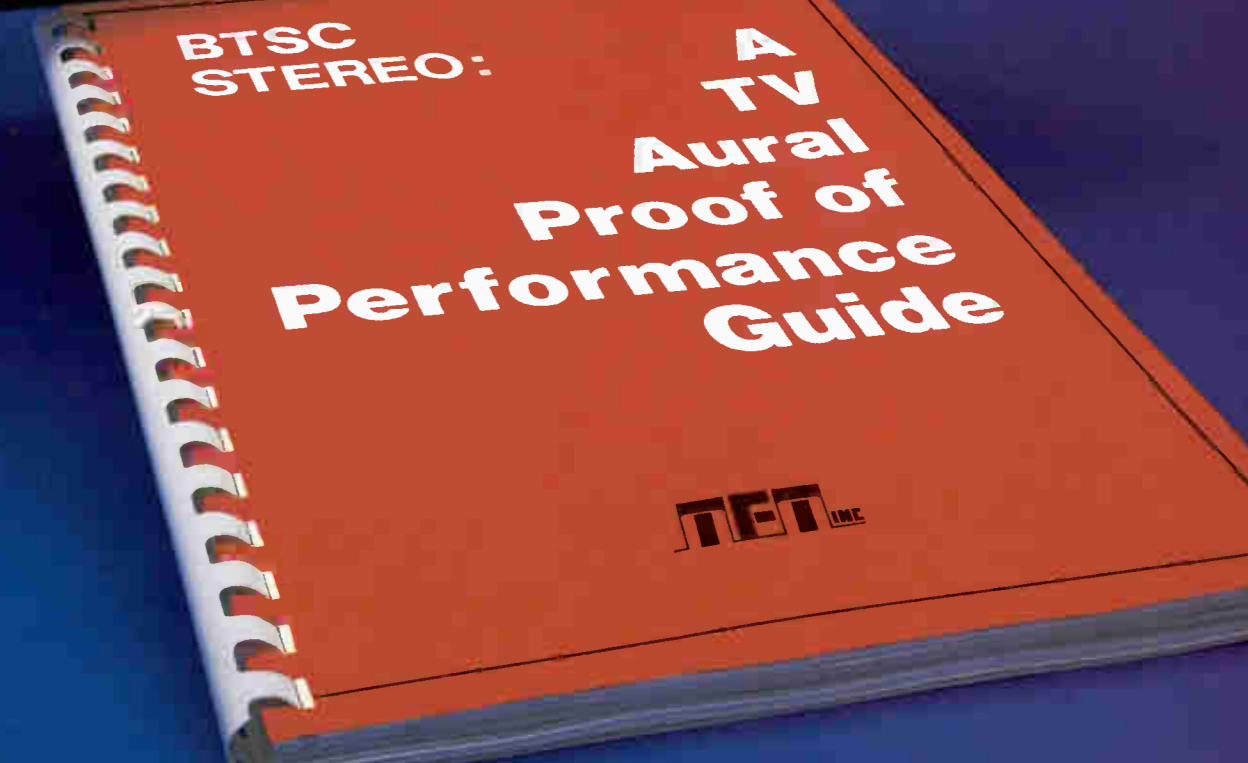
Input Power ..... 117/230 VAC  $\pm$  10%, 50/60 Hz, 70 Watts Max  
 Operating Temperature ..... 0 $^{\circ}$  C to 50 $^{\circ}$  C (32 $^{\circ}$  F to 122 $^{\circ}$  F)  
 Size ..... 19" (48.26 cm) Wide by 7" (17.78 cm) High by 15- $\frac{1}{2}$ " (39.7 cm) Deep  
 Net Weight ..... 23 lbs. (10.4kg) Add 5 lbs. (2.3kg) for Analyzer  
 Shipping Weight ..... 38 lbs. (17.2kg) Add 5 lbs. (2.3kg) for Analyzer



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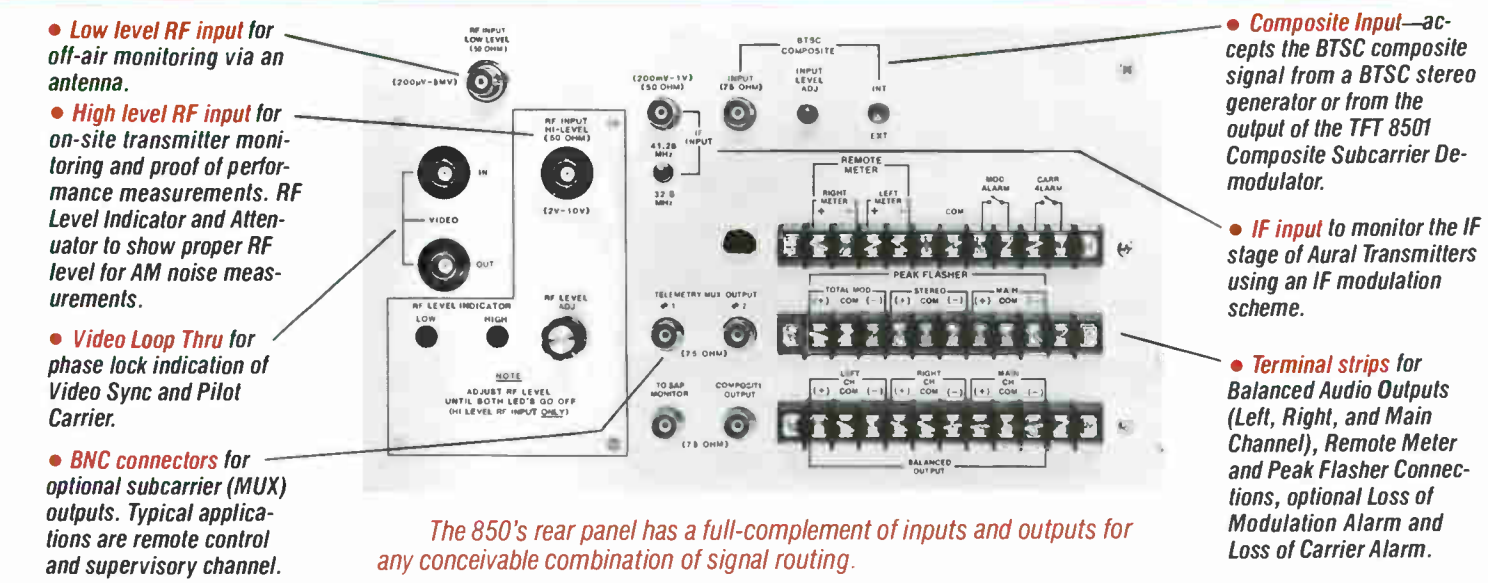
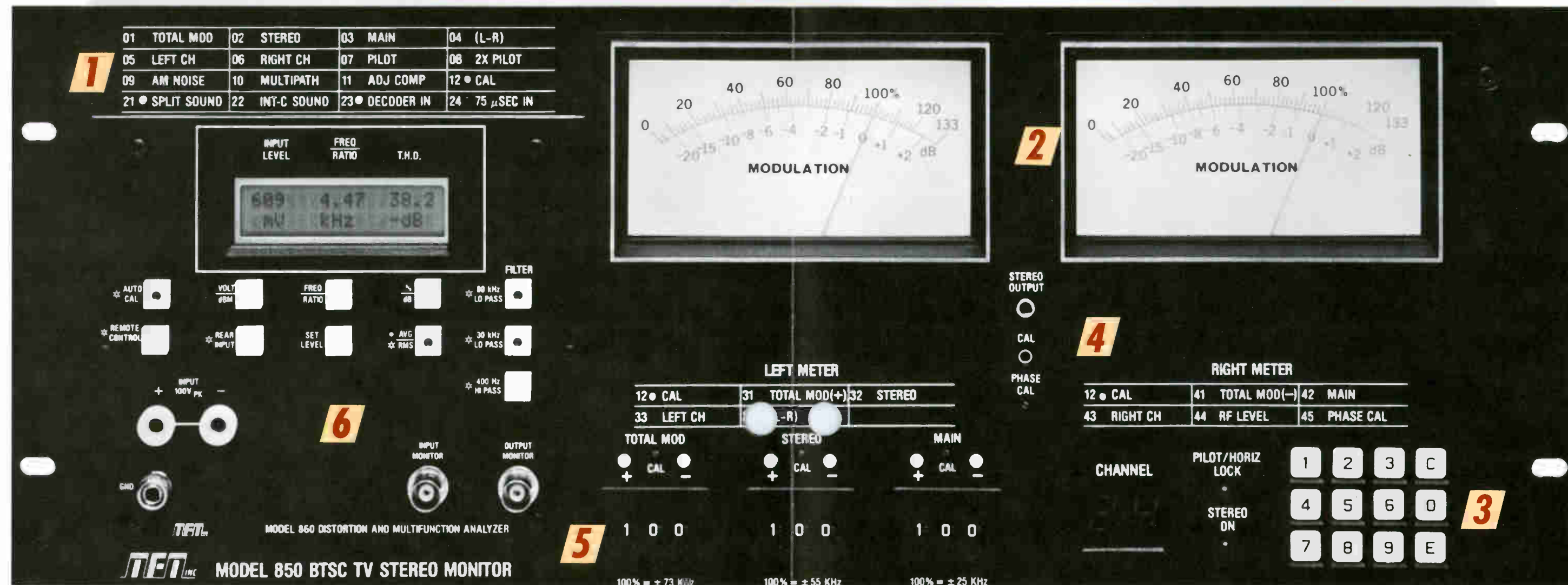
# 850 BTSC TV Stereo Aural Modulation Monitor





COMPREHENSIVE MEASUREMENT

COMPLETE BTSC MONITORING



The 850's rear panel has a full-complement of inputs and outputs for any conceivable combination of signal routing.

ACCESSORIES and OPTIONS

- Model 860 Plug-in Digital Distortion Analyzer/AC Level Meter/Ratio Meter for models 850/851 or 852. Separate detailed technical data is available.
- Remote Metering and Peak Flasher Panel. TFT part number: 7100-4020. This meter panel duplicates the front panel meters of the 850/851 as well as the peak flashers for remote monitoring. A 50-foot cable is provided.
- Alarm and MUX board. TFT part number: 7100-4110. This plug-in card consists of circuitry to

detect the loss of carrier and modulation and also provides relay contact closures for activating an external alarm. Additionally, one or two band-pass filters can be provided for multiplex subcarriers (39 kHz or 102.3 kHz). These subcarriers are then available at the rear panel outputs of the 850/851.

□ A comprehensive, 40 page TV Aural Proof-Of-Performance Guide is available exclusively from TFT. This Guide is included with the 850 Series Operations Manual or available separately.

851

The Model 851 is for installations which have a precision TV demodulator (such as the Tektronix 1450; the wideband, updated version). The 851 is available as a lower cost version which omits the RF/IF circuitry. Connection to an external demodulator is made through the 851's Composite input.

852

The Model 852 is specifically designed for use at CATV headends. It has a built-in, frequency-agile frontend and is keyboard tunable across all IR-5 Cable Television Channels. It will also accept an IF of 4.5 MHz or 41.25 MHz from a headend demodulator. Special applications information is available by contacting TFT.

855

Separate SAP/Pro Channel monitor deriving its signal from the 850/851. Contact TFT for a separate brochure.



**1** LED display matrix indicates the operating status of the 850 in one of the monitoring or measurement modes. Complete Aural Proof-Of-Performance measurements and all BTSC modes are easily and quickly accessed by two-digit keyboard entries (see #3).

- Genuine dbx\* Decoder and 75 usec Modes. Facilitates set-up and measurements with and without BTSC companding.
- Split-Sound and Intercarrier Modes. Permits measurement of intercarrier noise due to ICPM; monitor visual transmission influences on aural transmission.

**2** Stereo modulation and reference levels are precisely displayed with large, lighted, user-friendly analog meters. Meter functions are selected by keyboard and displayed on LED matrix.

**3** Microprocessor-controlled Switching with Keyboard Command Entry. Electronic routing of internal signal paths to meters or 860 Analyzer. Also controls Monitor Mode Switching (Split-Sound, Intercarrier, Decoder in, 75 usec, and Calibrate).

**4** Built-in Frequency Synthesized Type Modulation Calibrator for front panel calibration of Modulation Meters and Peak Flashers; a two-digit

keyboard entry. Better than 0.5% accuracy without performing Bessel Null Calibration.

- Stereo "On" Indicator, Pilot to Synthesized Lock Indicator, Loop-through, and stereo ear phone jack are provided for convenience.

**5** Individual thumbwheel switches set Main channel, Stereo channel, and total modulation level for Peak Flasher indications. False triggering is eliminated with an exclusive, patent-pending circuit (PMDD—Peak Modulation Duration Differentiator).

**6** Model 860 Plug-in Digital Distortion Analyzer/AC Level Meter/Ratio Meter. An LCD display indicates Input Level, Frequency Voltage, Ratio and Total Harmonic Distortion (THD).

- Accurate measurements to 0.1 dB ( $\pm$  500 kHz deviation) for Frequency Response (Total, Stereo, Main, Left or Right Channels), Signal-to-Noise Ratio, THD, Pilot Injection, Subcarrier Suppression, Crosstalk, AM Noise, and Multipath. Front panel connectors permit the 860 to be used separately as a stand-alone general purpose test instrument.
- Front panel access to demodulated signals for scope display via BNC connector. 860 can also be used as a conventional test instrument.

**7** Extensive RF shielding.

\*dbx is a registered trademark of dbx, Inc.



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**Model 844**

**FM/Stereo Modulation Monitor.** The industry's newest FM base-band and stereo monitor . . . in one 7" package. The 844 features a 2-channel preselector for off-air monitoring and comprehensive front-panel measuring capabilities. Auxiliary composite input allows stereo generator and composite STL checks. The 844's unique Peak Modulation Duration Differentiator (PMDD) circuit (patent pending) detects **only** true over-modulation spikes and ignores those created by transients, multi-path, and overshoot. Companion SCA Monitor: Model 845 (Available Fall 1985).

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**Model 850**

**Aural Modulation Monitor for BTSC TV Stereo.** Complies fully with the BTSC Aural Modulation Monitor Standards for recommended measurements and more. Look at total modulation, main channel, left or right channel. Microprocessor-controlled switching permits measurement of over 20 parameters. Both split-sound and quasi-parallel (intercarrier mode) demodulation schemes are used to recover the aural baseband signal. Accommodates optional AA501 Distortion Analyzer.



**Model 8500**

**Composite Subcarrier Generator for BTSC Stereo.** The 8500 Generator combines the output of a BTSC Stereo Generator, SAP Generator, Pro-Channel Generator, and SCA Generator or Remote Control link, for transmission via a single video microwave subchannel.

**Model 8501**

**Composite Subcarrier Demodulator for BTSC Stereo.** The 8501 Demodulator routes the composite stereo and SAP to the aural exciter; the remaining channels are then available for station use.

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**Model 8300 STL**

**Aural STL and Inter City Relay.** When it comes to transporting the cleanest, most transparent audio via microwave, the 8300 system is ahead of the rest . . . even in dense RF environments. If multihop links are involved, the 8300 with its unique IF repeater circuitry ensures the audio quality at the origin is relayed through 3, 4, 5 hops to the RF transmitter. The 8300's economical counterpart is the 7700 STL. Available in mono, dual mono, or composite configurations, without degrading separation, deteriorating signal-to-noise or adding distortion.

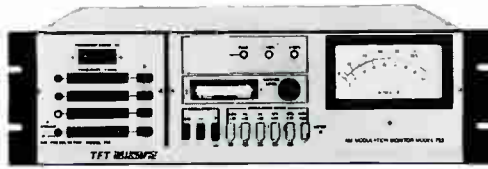


**Model 8100 TSL**

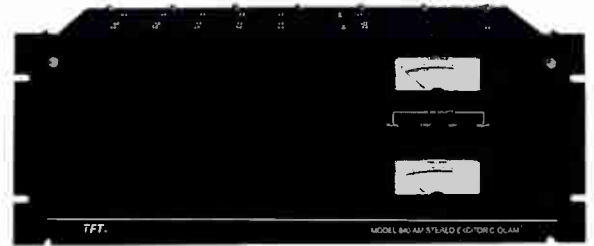
**Transmitter-Studio Data Link (TSL).** The 8100 provides a cost-effective data return link without occupying a revenue-producing SCA channel. Operates in 450 MHz band, 4 watts nominal output. Optional Morse Code identifier available.

See Reverse

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**Model 753**  
**AM Modulation Monitor.** Shown with the optional 754 4-channel preselector. The 753 guarantees you the most out of your AM transmitter . . . right up to the legal limit.



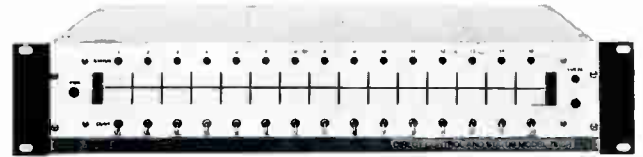
**Model 840**  
**C-Quam® Exciter for AM Stereo.** Second-generation design with ease of utility and maintainability at a competitive price to make **you** competitive in the rough world of AM Stereo radio.

C-Quam® is a registered trademark of Motorola, Inc.

**Model 701**  
**TV Monitor.** The 701 still outsells its rivals after 15 years! A precision monitor for visual and aural carrier frequencies and aural modulation. CCIR option available.



**System 7610**  
**Remote Control System.** The most economical method of manipulating your transmitter via TELCO or STL. Basic system provides 10 channels each of Raise, lower, and telemetry. Flexible expansion capability by adding subsidiary units.



**System 7815**  
**Remote Control and Status Monitoring System.** Offers 15 on/off control and 15 status indication channels. The 7815 is expandable to 45 channels of control and 79 channels of status indications.



**Series 760 EBS**  
**EBS System.** The most popular EBS Receiver/Generator/Decoder system . . . literally thousands in use daily. Meets FCC requirements. Complete system or fractional packages are available.

REMOTE CONTROL  
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## BTSC TV SAP/Pro Channel Monitor

### FEATURES

- Independent SAP and Professional Channel Sections
- Separate Meters for Modulation and Injection
- Off-Frequency LED Indicators
- Selectable Operating Modes:
  - Switchable bandpass filter for operation with sub-carriers individually (when performing a Proof) or with entire composite signal.
  - Switchable dbx\* decoder or 75  $\mu$ sec de-emphasis, or flat response (15 kHz bandwidth) in SAP Channel.
  - Switchable de-emphasis (150  $\mu$ sec de-emphasis or flat, 6 kHz bandwidth, in Pro Channel for data or voice applications.
- Peak Modulation Flashers with Thumbwheel Switch Presets.
- Built-in Frequency-Synthesized Modulation Calibrator.
- Demodulated Signals available via Front Panel BNC.

### GENERAL DESCRIPTION

#### COMPLETE BTSC MONITORING/FULL COMPLIANCE WITH BTSC RECOMMENDED PRACTICES

The TFT Model 855 BTSC SAP and Pro Channel Modulation Monitor was designed for those broadcasters who utilize the Second Audio Program (SAP) and/or Professional Channel (Pro) as part of their BTSC broadcast signal. It is designed

\*dbx is a registered trademark of dbx, Corp.

to monitor and measure SAP and Pro Channel performance characteristics as defined by the EIA/BTSC System Multi-channel Television Sound Recommended Practices. It can also be used to check the performance of SAP/Pro generators.

The 855 can accept signals from any source of BTSC composite signal consisting of SAP/Pro—such as the feed from the TFT Models 850 or 851 BTSC stereo monitors or other wideband audio demodulator—or can accept signals from SAP and Pro generators directly.

The 855 incorporates independent SAP and Pro Channel sections. Each section includes separate modulation and injection meters and peak modulation flashers. Switchable modes permit extensive monitoring and measurement flexibility. A front panel BNC output provides convenient connection of monitored signals to ancillary test equipment, such as TFT's Model 860 Multifunction Audio Analyzer which plugs into the TFT 850/851 BTSC Stereo Modulation Monitors.

Positive and negative peak flashers with thumbwheel presets incorporate TFT's exclusive PMDD™ (Peak Modulation Duration Differentiator) circuitry to accurately register signal peaks.

Off-frequency LED's warn of carrier drift beyond  $\pm 500$  Hz.

The 855 incorporates a built-in synthesized type modulation calibrator to ensure monitor accuracy, year after year. Separate injection calibration trimmers aid in monitor set-up.

# SPECIFICATIONS

## INPUT

Composite Audio	75 ohms unbalanced, 0.5 – 2.0 VRMS (from TFT Models 850 or 851, Tektronix 1450, etc.), BNC.
Frequency Range	50 kHz to 125 kHz.

## METERS

SAP Channel Modulation	Meter ballistics meet BTSC requirements, 0–130% calibration.
Pro Channel Modulation	Same as above.
SAP Channel Injection Error	Zero center meter, calibrated in $\pm$ 30% error from BTSC standard of 15 kHz injection.
Pro Channel Injection Error	Same as above, except reference injection is 3 kHz.

## PEAK MODULATION INDICATORS

Four peak flasher LED's indicate plus or minus peaks simultaneously for SAP and Pro Channels. Peak limits set by thumbwheel switches in 1.0% increments from 0% to 199%. Accuracy,  $\pm$  1.0%.

## MODULATION LEVEL CALBRATOR

Built-in frequency-synthesized type calibrator for meter and peak flasher calibration (100% modulation) from the front panel. Accuracy,  $\pm$  1.0%.

## OUTPUTS

### Front Panel BNC

SAP Carrier	260 mV into 5k ohms, for external frequency counter, etc.
Pro Channel Carrier	Same as above.
Composite Input	Buffered input signal; approx. 1.5 VRMS into 5k ohms.
SAP Channel Modulation	1.77 VRMS, 75 ohms unbalanced at 100% modulation, follows decoder/75 $\mu$ sec/flat pushbutton selection.
Pro Channel Modulation	Same as above, follows 6 kHz flat/150 $\mu$ sec pushbutton selection.

### Rear Panel

SAP Channel Audio	3.54 VRMS, balanced 600 ohms, rear panel barrier strip.
Pro Channel Audio	Same as above.

Contents subject to change without notice.

## ALARMS

Separate alarm outputs for SAP and Pro Channels.

Off-Frequency	+ 12 VDC output when subcarrier is off-frequency by more than 500 Hz.
Carrier Alarm	Relay contact closure when subcarrier falls below muting level.
Modulation Alarm	Relay contact closure when modulation drops below 10% for more than 30 seconds.
Remote Meter Panel	Barrier strip terminals.

## SUBCARRIER MEASUREMENTS

*Frequency Response:	
SAP Channel	30 Hz to 10 kHz, $\pm$ 0.5 dB
Pro Channel	30 Hz to 3 kHz, $\pm$ 1.0 dB
*Distortion	0.5%
*Signal-to-noise Ratio:	
SAP Channel	60 dB, de-emphasized
	85 dB, with dbx decoding
Pro Channel	55 dB, de-emphasized
*Crosstalk:	
Stereo to SAP Channel	60 dB
Stereo to Pro Channel	60 dB
SAP to Stereo	66 dB
Pro Channel to Stereo	66 dB

\*Measurements taken using wideband mode.

## MECHANICAL & ENVIRONMENTAL

Input Power	115/230 $\pm$ 10% VAC, 50 to 400 Hz, 30 watts max.
Operating Temperature	0° to 50° C (32° to 122° F)
Size	5 1/4" (13.3 cm) High $\times$ 19" (48.3 cm) Wide $\times$ 14 3/4" (37.5 cm) Deep.
Net Weight	Approximately 11 pounds
Shipping Weight	Approximately 14 pounds.

## ORDERING GUIDE

Model 855 SAP/Pro Modulation Monitor  
Option 01 (TFT Part Number 7100-4133) Remote Meter & Flasher Panel  
Option 02 (TFT Part Number 7100-4134) Spare Parts Kit

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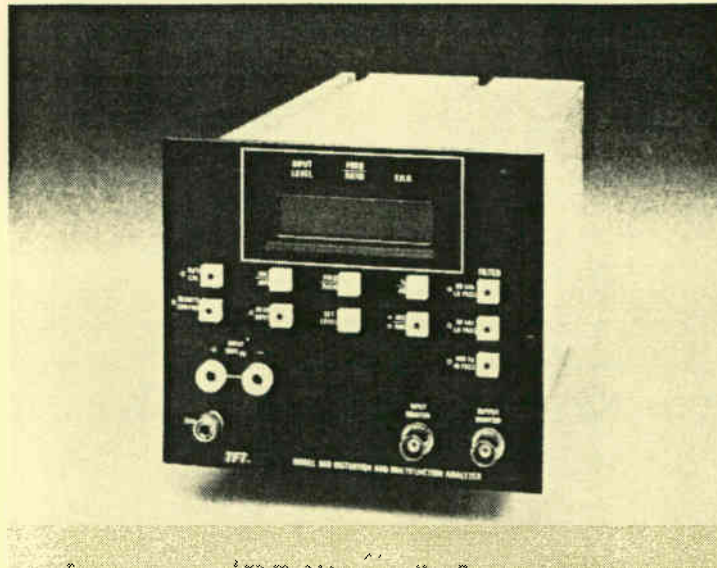
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# MODEL 860 (Preliminary)

**DISTORTION ANALYZER/A.C. VOLTMETER AND RATIO VOLTMETER**



## Features

- **Microprocessor Performs Controls and Computations**
- **Audio Frequency Counter Built-in**
- **Fully Automatic: No Level Setting, Tuning or Nulling**
- **Digital AC Voltmeter displays V, mV,  $\mu$ V or dBm**
- **Total Harmonic Distortion and dB Ratio Measurements**
- **Total System Harmonic Distortion Plus Noise (0.0025%)**
- **(3  $\mu$ V Residual Noise**
- **Automatic Calibration of AC Level**

## Description

The Model 860 is a microprocessor-controlled Distortion Analyzer, AC Level Voltmeter and Ratio Meter. The microprocessor in the Model 860 is programmed to read level and frequency of the signal being tested and to compute the level in dBm, harmonics to fundamental signal ratio, and to display the computed THD, dBm and frequency. It provides completely automatic measurement of level, total harmonic distortion plus noise (THD + N), ratio of two voltages, and audio frequency. Automatic set level, automatic tuning, automatic nulling of the fundamental, and autoranging of the display all combine to permit completely hands-off operation once the mode is selected. Just apply the signal of interest and read the 16 digit alphanumeric LCD display.

DB ratio measurements may be referenced either to 774.6 millivolts (1 milliwatt in 600 ohms) or to a selected applied signal. The 0 dB reference memory remembers the selected level, and all subsequent measurements are referenced to that level. The Model 860 allows readings to be expressed in true RMS or average response, RMS calibrated. Although true RMS is more accurate in most applications, the average response permits comparisons with measurements previously taken with older instrumentation.

The fundamental frequency range of the Model 860 is 10 Hz to 100 kHz, with harmonics measured out to 300 kHz.

Any one of the built-in 400 Hz high pass, 80 kHz low pass and 30 kHz low pass filters may be switched into the signal paths for preconditioning of the signal to be measured.

An Input Monitor connector and a Function Output connector are provided to permit oscilloscope display of the input signal or the result of the filter in the THD + N measurement.



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# DOMESTIC PRICE LIST TELEVISION BROADCAST EQUIPMENT

Effective  
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MONITORS	DESCRIPTION	Price (U.S. Dollars)
<b>MODEL 850 (5116-0850)</b>	<b>BTSC AURAL MODULATION MONITOR , Rack Mount</b> Specify Channel and De-emphasis	<b>\$10,350.00</b>
Option 01 (7100-4010)	Distortion Analyzer	\$ 2,990.00
Option 02 (7100-4020)	Remote Meter & Flasher Panel for Model 850	\$ 595.00
Option 03 (7100-4050)	Spare Parts Kit for Model 850	\$ 1,025.00
Option 04 (7100-4110)	Alarm (Carrier & Modulation) with 2 MUX filters	*\$ 840.00
<b>MODEL 851 (5116-0851)</b>	<b>BTSC AURAL MODULATION MONITOR, Rack Mount</b> Baseband input only . Specify De-emphasis.	<b>\$ 8,750.00</b>
Option 01 (7100-4010)	Distortion Analyzer	\$ 2,990.00
Option 02 (7100-4020)	Remote Meter & Flasher Panel for Model 851	\$ 595.00
Option 03 (7100-4132)	Spare Parts Kit for Model 851	\$ 824.00
Option 04 (7100-4110)	Modulation Alarm with 2 MUX filters	*\$ 815.00
<b>MODEL 855 (5116-0855)</b>	<b>SAP/PRO MODULATION MONITOR, Rack Mount</b>	<b>\$ 3,950.00</b>
Option 01 (7100-4133)	Remote Meter & Flasher Panel for Model 855	\$ 590.00
Option 02 (7100-4134)	Spare Parts Kit for Model 855	\$ 410.00
<b>NOTE: WHEN AN 850 OR 851 IS PURCHASED TOGETHER WITH AN 855, A \$1,000.00 ALLOWANCE OFF THE 850 OR 851 LIST PRICE IS MADE.</b>		
<b>MODEL 701 (5116-0701)</b>	<b>TV FREQUENCY &amp; AURAL MODULATION MONITOR</b> Rack Mount. Specify Channel & Offset	<b>\$ 8,950.00</b>
Option 02 (7100-0050)	Alarm (frequency and modulation)	*\$ 625.00
Option 03 (7100-0010)	SCA Output	\$ 585.00
Option 06 (7100-4060)	Automatic Logging Output (BCD)	\$ 420.00
Option 07 (7100-0030)	CCIR Format	*\$ 1,255.00
Option 08 (7100-0060)	Spare Parts Kit	\$ 885.00
<b>MODEL 704 (5116-0704)</b>	<b>REMOTE METER AND PEAK FLASHER PANEL FOR 701</b>	<b>\$ 540.00</b>

## TELEVISION BROADCAST PRODUCTS

### COMPOSITE SUBCARRIER SYSTEM

Subcarrier system for video STL to convey BTSC stereo, SAP and Pro channels on a single video subcarrier. A system comprises one (1) 8500 and one (1) 8501.

MODEL 8500 (5116-8500)	Subcarrier Generator only. Specify frequency of 6.2, 6.8, or 7.5 MHz. Others between 5 MHz and 10 MHz, special order.	\$ 2,580.00
MODEL 8501 (5116-8501)	Subcarrier Demodulator only. Specify frequency of 6.2, 6.8, or 7.5 MHz. Others between 5 MHz and 10 MHz, special order.	\$ 3,870.00
Option 01 (7100-4040)	Spare Parts Kit for 8500 System	\$ 595.00

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

TFT, 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge prepaid by the 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

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

Transportation charges for warranty returns and repair costs, wherein failure is found not 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OR PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES.

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O-TV 3/87





# WHY ARE MORE STATIONS BUYING TFT STL'S?

## HIGHER RELIABILITY & TWICE THE WARRANTY.

We love to see the surprised expressions on a seasoned engineer's face when they look inside our STL's:

"Where's all the complicated daisy-chained modules like other STL's?"

Because TFT's patent pending STL design achieves high performance with much fewer components (doing lots of very clever things), it also provides higher reliability too. Our low component count means a higher MTBF. Our extensive 9 step Quality Control and lengthy, 144 hour burn-in is an additional guarantee you're getting the most reliable STL's made.

We back-up this claim with an exclusive two year warranty — twice as long as any other!

## COMPREHENSIVE SELECTION

We have the largest selection of high-performance aural STL systems. . . . including the Model 8300 & 7700B Composites, discrete versions, the economical new 8600, exclusive IF repeaters and On-Channel boosters, and all the accessory gear you need for a complete, state-of-the-art, aural microwave system.

If we don't have it, you don't need it!

## ON-CALL SUPPORT, 24 HOURS-A-DAY.

Behind all our STL's is a responsive support and service team you may never need—but it's nice to know the factory has technically knowledgeable people to help you—24 hours a day, 7 days a week.

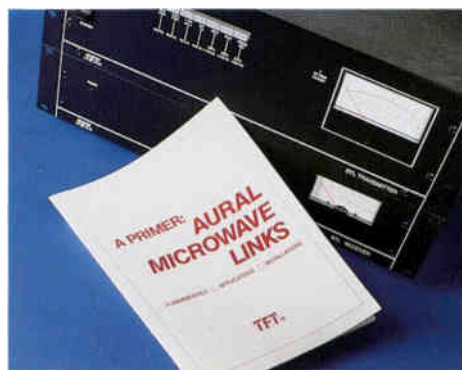
## PERFORMANCE & FEATURES.

Our higher reliability, comprehensive selection and responsive support system is meaningless if our STL's didn't give you the performance you demand. Compare our spec's and features with our competitors.

A TFT STL is equal or better—in every critical parameter, at a very competitive price!

Contact us or your favorite TFT dealer now for full technical information including our free STL Engineering Guide,

*A Primer: Aural Microwave Links.*



To make your own STL Path Analysis, ask for our free, 30 page Engineering Guide.

**Today's** **TFT** INC

3090 Oakmead Village Drive  
Santa Clara, California 95052  
Tel: (408) 727-7272  
Telex: 910 338-0594  
Fax: (408) 727-5942

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# A SUPERIOR AURAL STL SYSTEM FOR EVERY JOB.



## « **MODEL 8300 COMPOSITE STL**

When it comes to transporting the cleanest, most transparent audio via microwave, the 8300 Composite STL system is ahead of the rest.. even in dense RF environments. If multihop links are involved, the 8300 features exclusive IF repeater circuitry to ensure audio quality at the origin is relayed and maintained through 34, (or more!) hops to the transmitter.

## **MODEL 7700B STL** »

The 7700B is the 8300's economical counterpart. Available in composite, mono, or dual mono configurations without degradation to separation, deteriorated signal-to-noise or added distortion. As with the 8300 Series, an AM Stereo Decoder is optional and provides L & R channel outputs when used with a standard FM Stereo Generator.



## « **MODEL 8600 DISCRETE STL**

The Model 8600 STL is an economical, discrete 950 MHz system derived from our top-of-the-line 8300 Composite system. Ideal for congested area drop-ins. Designed for either single or dual monaural operation, it features a built-in subcarrier generator and demodulator for voice or data, spurious-free power amp, built-in mic and headphone jacks and the capability to properly match phase and gain between dual links for either AM stereo or FM stereo applications.

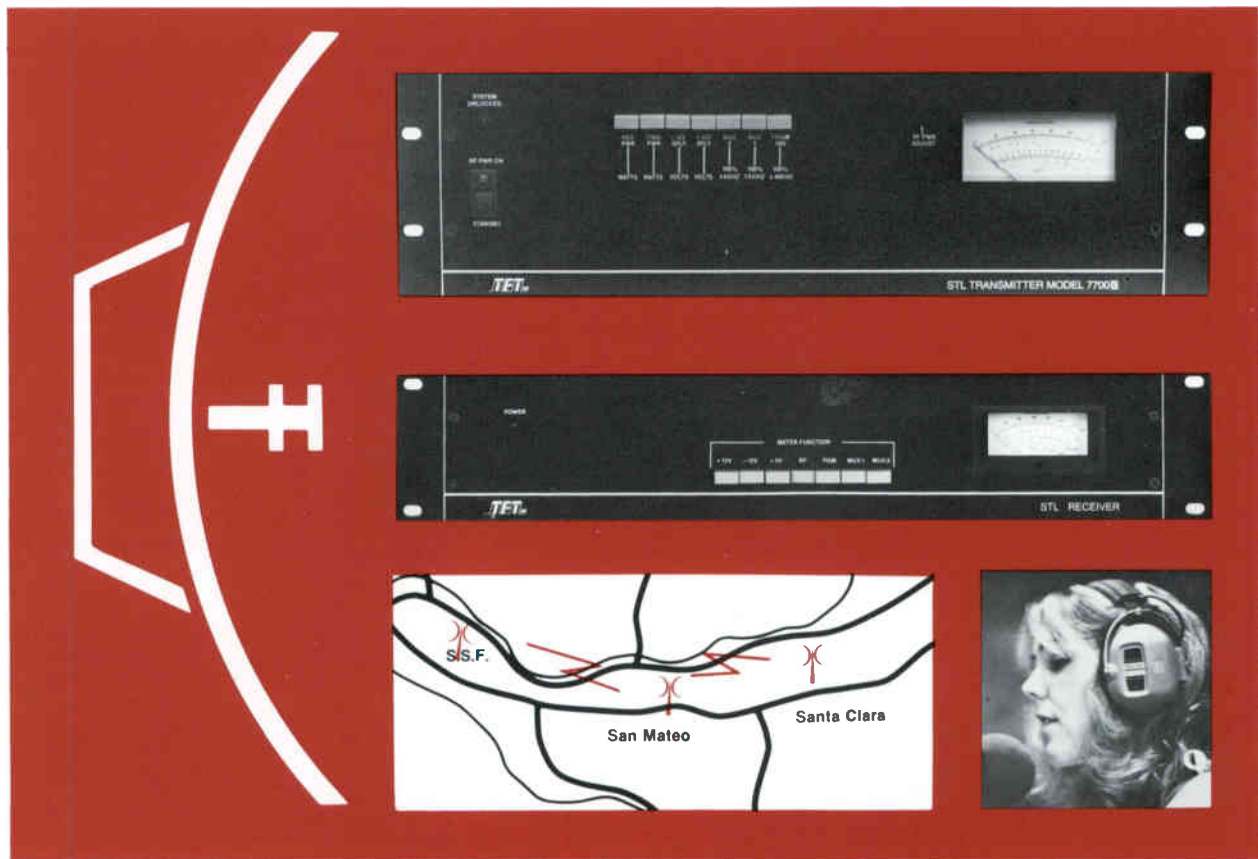


In addition to the above systems, we have:

- I.F Repeaters
- On-Channel Boosters
- High-Isolation Transmitter Combiner & Receiver Splitters
- Hot-Standby with Automatic Crossover Units
- TSL 450 MHz Return Links
- All accessories including antennas, transmission lines, connectors, pigtailed, isocouplers, etc.



# 7700B SERIES BROADCAST QUALITY AURAL STUDIO TRANSMITTER LINK AND INTER-CITY RELAY SYSTEM



For: 140-175 MHz\*,  
200-240 MHz\*, 300-330 MHz,  
400-470 MHz, 806-960 MHz

\*Customized order



# Innovation helps make TFT a performance leader in Studio-Transmitter-Links and Inter-City Relays

TFT designs, manufactures, markets and services Broadcast Quality STL's and Inter-City Relays for Stereo, Monaural, and Multi-Channel program audio applications.

Since the introduction of the 7700 Series, over a thousand units have been installed and operational in the United States and worldwide. This equipment is also frequently used for voice and data transmission where low intermodulation and superior group delays are required. It is the best performing equipment in its price range. The 7700B is the third generation of this Series.

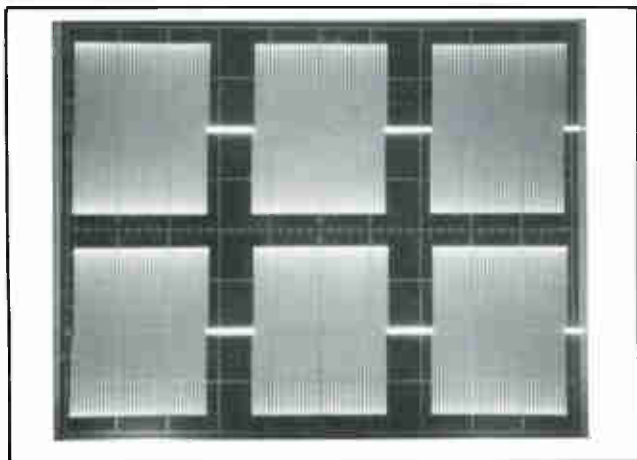
## Why STL?

STL represents the best alternative to telephone lines in three important areas:

1. **Quality:** Since telephone lines were designed primarily for voice transmission, their audio quality is minimal. Even the compensated lines are not adequate for most of today's stereo performance requirements. TFT's STL and Inter City Relays, on the other hand, are designed primarily for broadcast and take into account the many specialized requirements of that medium.
2. **Reliability:** With STL you are no longer at the mercy of telephone companies which you cannot control.
3. **Economy:** The cost of telephone lines are increasing. Once you own an STL, level amortization and small maintenance costs are all you pay.

All of these factors make owning an STL both a practical and economically sound decision.

Tone burst test of the STL system demonstrates true signal reproduction with no overshoot. Top trace: 15 kHz tone burst input to the transmitter. Bottom trace: output from the receiver.



## Why 7700B Series?

The full fidelity performance of today's receivers and FM Stereo and AM Stereo receivers has put new requirements on broadcast equipment. The link between the broadcast studio and the transmitter is as important as the broadcast transmitter itself. TFT STL's are designed with broadcast applications in mind using state-of-the-art RF and digital technology. Some of the innovations in the 7700B Series STL include:

**IF Modulated Transmitter:** Improves signal to noise ratio and stereo performance by providing low distortion and high stereo performance.

**Hot Standby:** A fully redundant receiver and transmitter are available, both with automatic transfer and alarm, which provides maximum security across the system.

**Modular Construction:** Modular construction in the transmitter and receiver contribute to low maintenance cost and ease of field servicing.

**Ease of Maintenance:** All tuning adjustments are easily accessible through top of transmitter and receiver modules.

**Front Panel Metering:** Audio output level, sub-carrier level and RF input level in microvolts may all be monitored directly from the front panel.

**RFI Protected:** In the last six years, the 7700 Series has been field tested in the most adverse environments at transmitter sites worldwide. All have achieved excellent field test results.

**A Wide Selection of Frequency Ranges:** Provides STL capability for most foreign and domestic systems.

\*Field test data and results are available upon request.

# Specifications

## System

Frequency Ranges .....	140-175 MHz, 200-240 MHz *Customized Order 300-330 MHz, 400-470 MHz 806-960 MHz	Signal-to-Noise Ratio .....	Greater than 70 dB below (500 $\mu$ V RF input) 100% modulation, de- emphasized left or right channel.
Baseband Frequency Response:		Crosstalk Suppression, .....	Greater than 60 dB, 150 kHz subcarrier
Program Audio .....	Composite: 50 Hz - 75 kHz Monaural: 50 Hz - 15 kHz	Composite System (subchannel to main channel)	
Multiplex .....	Composite: 110 to 220 kHz Monaural: 39 to 67 kHz	Modulation Capability (deviation for 100% modulation):	
Harmonic and Intermodulation Distortion .....	Composite: 0.2% at 1 kHz; 25% from 30 Hz to 75 kHz Monaural: 0.2% from 30 Hz to 15 kHz *Custom order. Specifications same as 300-330 MHz.	Program Channel .....	$\pm$ 48 kHz
		Multiplex Channel 1 .....	$\pm$ 12 kHz
		Multiplex Channel 2 .....	$\pm$ 12 kHz

## Receiver

806-960 MHz .....		<b>Composite Models</b>	<b>Monaural Models</b>
400-470 MHz .....		Model 7707	Model 7705
300-330 MHz .....		Model 7713	Model 7711
200-240 MHz .....		Model 7723	Model 7721
140-175 MHz .....		Model 7753	Model 7751
RF Input Connector .....		Model 7743	Model 7741
Sensitivity (de-emphasized) 60 dB S/N Min. ....		50 ohm, Type "N" Female	50 ohm, Type "N" Female
Signal to Noise		Below 40 $\mu$ V	Below 20 $\mu$ V
1 mV RF input without de-emphasis .....		60 dB Min. (75 kHz B.W.)	65 dB Min. (15 kHz B.W.)
1mV input with 75 $\mu$ Sec de-emphasis .....		70 dB Min.	70 dB Min.
Selectivity (3-dB BW) .....		320 kHz Min.	170 kHz Min.*
Selectivity (80-dB BW) .....		2.4 MHz Max.	1.4 MHz Max.*
AM Rejection (400 Hz @ 10%) .....		55 dB Min.	55 dB Min.
Spurious and Image Rejection .....		60 dB Min.	60 dB Min.
Demodulated Outputs Program .....		+10 dBm (2.48 V RMS) into 600 ohm balanced, +4 dBm (1.24 V RMS) into 600 ohm unbalanced,	+10 dBm (2.48 V RMS) into 600 ohms balanced +4 dBm (1.24 V RMS) into 600 ohm unbalanced,
		50 Hz to 75 kHz	50 Hz to 15 kHz
		-3.7 dBm (0.50 V RMS), 600 ohms, 110 to 220 kHz	-3.7 dBm (0.50 V RMS), 600 ohms, 39 to 67 kHz
		25% max	20% max
		45 dB at 1 kHz (50 dB typical), 40 dB from 50 Hz to 15 kHz	
Multiplex .....		46 dB Min.	46 dB Min.
Harmonic Distortion .....		46 dB Min.	46 dB Min.
Stereo Separation .....		50 Hz to 60 kHz	—
		—	30 Hz to 15 kHz
		20 Hz to 75 kHz	—
Crosstalk		<b>COMMON TO COMPOSITE AND MONAURAL MODELS</b>	
Main to Sub .....		1 A at 24 VDC, 0.5 A at 115 VAC	
Sub to Main .....		-10°C to +50°C	
Baseband Response		120/240 V AC, 50-60 Hz, 12 W	
$\pm$ 0.1 dB .....		3.25" (8.3 cm) H x 19" (48.3 cm) W x 15.5" (39.4 cm) D	
$\pm$ 0.2 dB .....		10 1/2 lb.	
$\pm$ 0.5 dB .....			*Other narrow band available on special order.
Alarm Output (Relay Closure) .....			
Temperature Range .....			
Power Requirements .....			
Dimensions .....			
Weight .....			

## Transmitter

Frequency Range (MHz) .....		<b>Model 7700B</b>	<b>Others</b>
RF Power Output (watts, max) .....		806-960	140-470
Output Connector .....		12	20
		50-ohm	50-ohm
		Type N	Type N
		Female	Female
		$\pm$ 1	$\pm$ 1
Frequency Stability (ppm/yr) .....		$\pm$ 0.0001%	$\pm$ 0.0001%
Frequency Accuracy:		$\pm$ 0.0005%	$\pm$ 0.0005%
0°C to +50°C .....			
-10°C to +50°C .....			
Spurious Signal Suppression:			
Non-Harmonically Related (dB) .....		65	60
Harmonically Related (dB) .....		65	55
AM Noise (dB below carrier) .....		65	70
Freq. Dev. for 100% Mod:			
Composite % Monaural (kHz) .....		$\pm$ 48	$\pm$ 48
Multiplex Channels (kHz) .....		$\pm$ 12	$\pm$ 12
Modulation Input Levels:**			
Composite .....		1.24	1.24
Monaural (V rms) .....		+10 dBm	+10 dBm
Multiplex (Vrms) .....		0.53	0.53
AC Line Power (watts)** .....		70	150
Operating Temperature Range (°C)		-10 to +50	0 to +50
Dimensions:			
Height .....		5.25" (13.3 cm)	5.25" (13.3 cm)
Width .....		19" (48.3 cm)	19" (48.3 cm)
Depth .....		13" (33 cm)	13" (33 cm)
Weight (pounds) .....		29"	29"
(kilograms) .....		13.1	13.1



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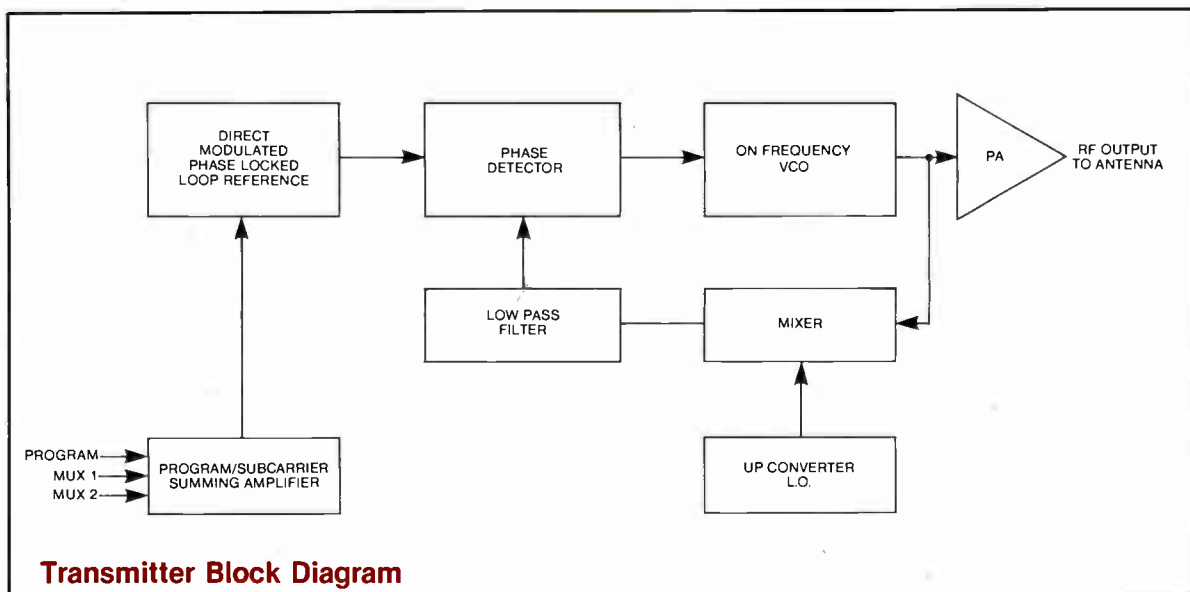
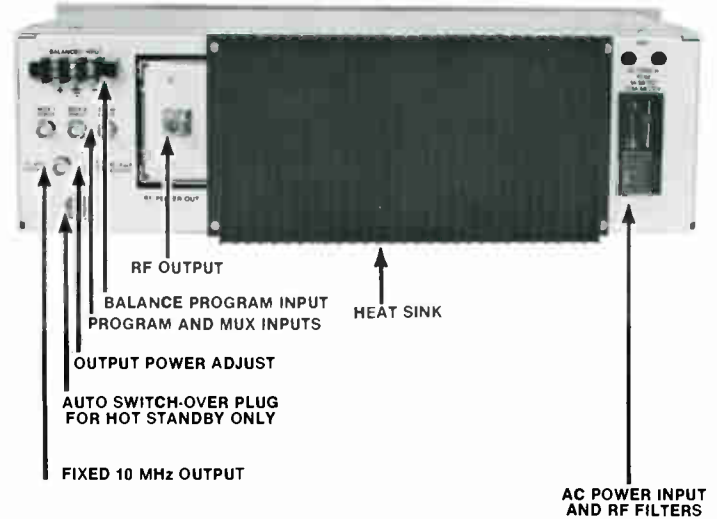
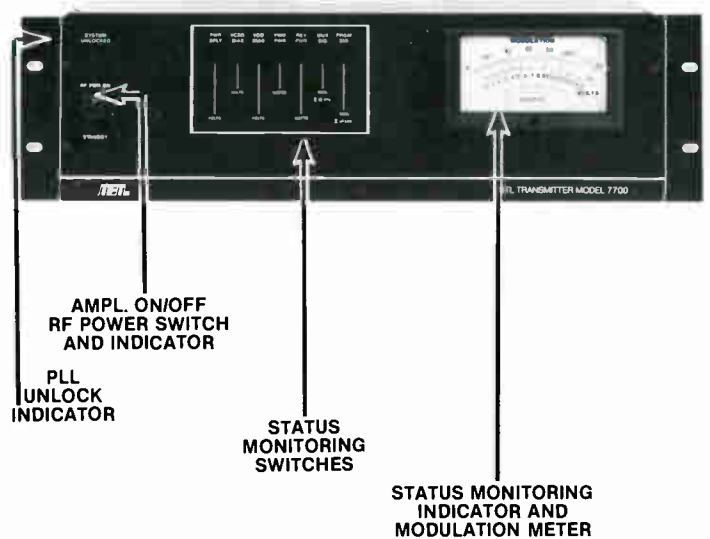
\* 10 k-ohm input.  
\*\* 120/240 VAC, 50-60 Hz.

# The Transmitter

The rugged TFT 7700B Series transmitter represents a new approach to STL transmitter design, providing a vast improvement in S/N ratio and frequency stability over conventional systems. Outstanding features include:

## Features

- **IF Modulation:** The carrier modulation is applied to an IF frequency between 38 MHz and 48 MHz to achieve excellent signal to noise ratio and stereo performance. The final carrier frequency is obtained by heterodyning the IF against a stable frequency source.
- **High Output Power:** The 12-watt output at 960 MHz (20 watts at other frequencies) generates more useable signal for long or difficult transmission paths and provides higher fade margins.
- **Adjustable Output:** Power can be adjusted from 3 watts to maximum power output, allowing you to meet your exact requirements.
- **Fully Protected:** The output is fully protected against short circuits and high VSWR.
- **Excellent Frequency Stability:** Frequency synthesized carrier provides frequency stability of  $\pm 1$  ppm/year as well as making it easier to change operating frequencies in the field.
- **Accommodates Two Additional Subcarriers:** Two FM subcarriers can be inserted in addition to the main and stereo channels.
- **No Subcarrier Beats:** 19 kHz harmonically related subcarrier frequencies are chosen in order to eliminate subcarrier intermodulation products.



**Transmitter Block Diagram**



# The Receiver



POWER ON INDICATOR

STATUS MONITORING INDICATOR AND MODULATION METER

STATUS MONITORING SWITCHES



RF INPUTS

PROGRAM AND MUX OUTPUTS

AUDIO INPUT/OUTPUT WIRING TERMINALS

AC POWER INPUT AND RF FILTERS

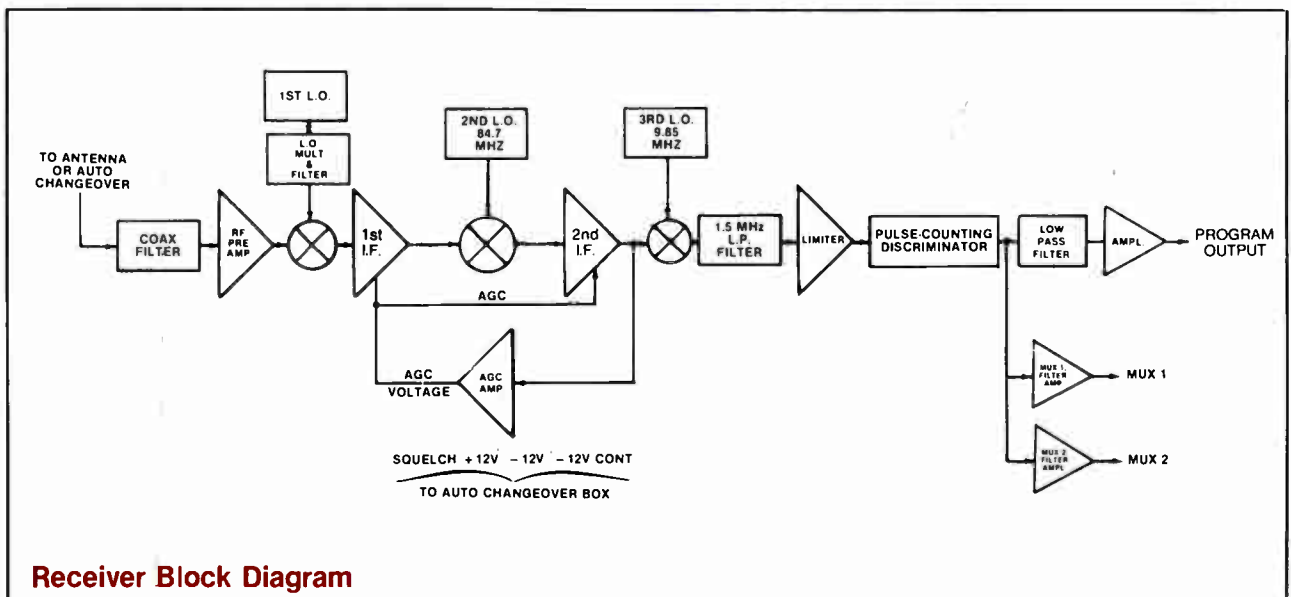
AUDIO INPUT/OUTPUT CONNECTOR TABLE

AUDIO CHANGEOVER JACK FOR HOT STANDBY ONLY

The design of the all-new TFT 7700B Series receiver incorporates several unique features that provide low noise, high gain and great versatility. All receivers allow for automatic change-over to stand-by in the event of a detected malfunction.

## Features

- **Crystal controlled triple conversion superheterodyne design:** This provides selectivity, gain and stability in the receiver.
- **Low Noise RF Amplifier:** A high gain, low noise RF amplifier provides a 3.5 dB noise figure.
- **Pulse-counting Discriminator:** A unique pulse-counting discriminator circuit provides ultra-linear FM demodulation to achieve low harmonic and intermodulation distortion.
- **Receiver Automatic Changeover:** Switching to the hot standby receiver is done automatically if a failure occurs.
- **Remote Operation and Status Check:** Studio engineers can interrogate the receiver over existing remote control equipment to determine receiver change-over and ascertain which receiver is operational. Receiver switching can also be done by remote command.
- **Wide and Narrow Bandwidth IF:** Both wide-band and narrow band IF are available for either composite or monaural applications. Super sharp IF filters are available for 125 kHz channel spacings.



# Applications

The broadband characteristics of the TFT 7700B Series STL system allow for many specialized applications beyond the standard aural studio-transmitter link for a composite stereo baseband signal. Among these are:

- **Intercity Relay Systems:** By interconnecting a number of STL systems in series, broadcast quality audio links between cities may be achieved, providing high quality stereo or multi-channel audio service to each city.
- **Remote Control:** With the addition of an FM subcarrier, 7700B series STL can carry remote control signals from the studio to the transmitter site.
- **SCA Channel:** A background music service or data channel can be transmitted via the 7700B Series STL by using the second FM Subcarrier.
- **AM Stereo:** With a TFT designed built-in stereo decoder (Opt. 15), the 7700B Series can provide L and R channel output when the transmitter is used in conjunction with a standard FM stereo generator.

A TFT STL Application Guide for equipment selection and path calculations is available upon request.

# Accessories & Options

**Model 7770 Transmitter Automatic Change-over:** This is a 1-3/4" rack mount unit which monitors critical parameters in the transmitters. If a fault is detected, it automatically switches to the hot standby transmitter. Change-over can also be accomplished by a front panel switch or relay contact closure in the remote control equipment. The unit is self-powered and switches RF output to the antenna.



**Model 7773 Receiver Automatic Change-over:** Similar to the Model 7770, Model 7773 monitors the parameters in the receivers. The unit switches the program channel output as well as both subcarrier outputs.

**Frequency Division Multiplex (FDM) Baseband Encoder and Decoder:** Multiple broadcast programs can be transmitted with full audio bandwidth by using the FDM encoder and decoder. A data sheet for the FDM equipment is available upon request.

**Other Accessories:** TFT carries a full line of accessories such as coaxial cable, type N connectors and antennas to meet STL system installation requirements. Please refer to STL price list for detailed information.

**Stereo Decoder (option 15):** Built-in stereo board for decoding left and right channels. (For AM stereo application.)

## STL EQUIPMENT SELECTION GUIDE

SYSTEM DESCRIPTION	NUMBER OF TRANSMITTERS REQUIRED	NUMBER OF RECEIVERS REQUIRED	FOR HOT STANDBY SWITCH	
			7770 For Transmitter	7773* For Receiver
A SINGLE COMPOSITE	1	1		
B DUAL COMPOSITE (WITH ONE AS HOT STANDBY)	2	2	1	1
C SINGLE MONAURAL	1	1		
D DUAL MONAURAL (WITH ONE AS HOT STANDBY)	2	2	1	1
E DUAL CHANNEL IN PARALLEL OPERATION	2	2		

\*Model 7773 includes a power splitter for parallel operation of dual monaural receivers



## FM Stereo Modulation Monitor

### FEATURES

- Three major sub-systems in one package:
  - Frequency-Agile RF Pre-Selector
  - Baseband Demodulator
  - Stereo Demodulator
- Complete Stereo Measurements:
  - L + R, L - R, Pilot, 38 kHz, L, R
  - SNR, Phase, AM Noise, Multipath
- Built-in Frequency-Synthesized Type Modulation Calibrator
- Exclusive Peak Modulation Duration Differentiator and Counter (P.M.D.D.™)
- Carrier & Pilot Frequency Measurement via front panel connector

### GENERAL DESCRIPTION

To maximize your FM station's market coverage, TFT designed the Model 844 FM Stereo Modulation Monitor to help you reach all of your listeners—especially those in fringe areas with maximum allowable modulation levels.

The Model 844 can be used for off-air monitoring of modulation level or for direct transmitter Proof-of-Performance measurements. To accommodate all U.S. and International broadcast standards, the 844 Monitor features a two channel frequency-synthesized pre-selector having 50 kHz tunable steps.

For remote meter reading and peak flasher display, an optional panel with peak flashers and meters is available (see Options).

### COMPLETE STEREO MEASUREMENTS

The 844 makes complete measurements of total modulation, Right channel modulation, Left channel modulation, channel separation, Main and Sub-channel crosstalk, L + R, L - R, 38 kHz carrier suppression and 19 kHz injection level. All measurements can be made with front panel push-buttons and are read on a large test meter.

### COMPETITIVE MODULATION COMPARISON

Because the 844 is equipped with two digitally tunable RF pre-selectors, you can precisely select any one of two FM stations. This feature gives you a quick, easy way to check on how your modulation compares with other stations in your market.

### PLL STEREO

The 844 provides superior stereo separation measurements. The phase-locked-loop (PLL) regenerates the 38 kHz carrier from the 19-kHz pilot carrier. This technique ensures precise accuracy and long-term stability of the phase relationship between the transmitter's pilot carrier and the regenerated 38 kHz subcarrier and therefore provides superior stereo demodulating characteristics. This also eliminates the need for phase adjustment during stereo measurements.



## SIMULTANEOUS L & R MONITORING

Two separate meters permit simultaneous monitoring of Left and Right channel modulation. A third meter provides Total modulation readings. The Left meter also acts as the Test Meter.

## LOWEST T.H.D. & SNR

The 844 utilizes a pulse-counting FM discriminator to optimize frequency-to-voltage conversions. Consequently, the total harmonic distortion is less than 0.1% and the signal-to-noise ratio is better than 80 dB.

## SCOPE OUTPUTS

BNC connectors are provided on the front panel to monitor the demodulated signals under test. The signals can be fed to external test equipment such as an oscilloscope. For example, the phase relationship of the Left and Right channels can be observed and/or adjusted with the use of these front panel connections.

## FREQUENCY-SYNTHESIZED TYPE MODULATION CALIBRATOR

A frequency synthesized type FM modulation calibrator is built-in for calibration of the modulation meters and peak flashers. The highest stability and accuracy are achieved with crystal oscillators which remain stable well within the required accuracy regardless of temperature or age. No external equipment is required to use the modulation calibrator. Accuracy exceeds 1.0 percent, year after year. This feature eliminates the need for Bessell Null calibration.

## I.F. BANDWIDTH SELECTION

The appropriate bandwidth is automatically selected when changing between off-air monitoring and on-site measurements. This feature eliminates bandwidth restrictions for Proof-of-Performance measurements.

## ACCURATE PEAK DETECTION—P.M.D.D.™

The 844 includes the exclusive, Peak Modulation Duration Differentiator (P.M.D.D.). This feature is incorporated

into a peak modulation detecting circuit to identify true modulation peaks and distinguish them from other peaks caused by transient noise, overshoot and multipath distortion. Only those peaks which exceed user-set values for modulation and duration will trigger the 844's P.M.D.D. peak flashers (simultaneous positive and negative modulation). A large LED display indicates the number of peaks per minute and is refreshed every sixty seconds.

## ADJUSTABLE PEAK FLASHERS

Dual LED Peak Flashers may be adjusted over a broad range: 50% to 199% modulation. A thumbwheel-type switch eliminates the ambiguity and imprecision of potentiometer type controls.

## BUILT-IN VOLTMETER & ATTENUATOR

For low-level modulation and noise measurements, a switchable 50 dB attenuator is built-in (10 dB steps). To perform a complete Proof, the only other equipment you need is a distortion analyzer and an audio generator.

## DIRECT AM NOISE MEASUREMENTS

A convenient front panel switch allows you to use the 844 for direct measurement of incidental and residual AM on your transmitted carrier. The dynamic range of this measurement is 75 dB from 100% modulation.

## SWITCHABLE DE-EMPHASIS

When measuring AM or low-level noise and modulation, a 75  $\mu$ sec de-emphasis circuit can be easily switched into the meter circuit. Other time constants are available on request.

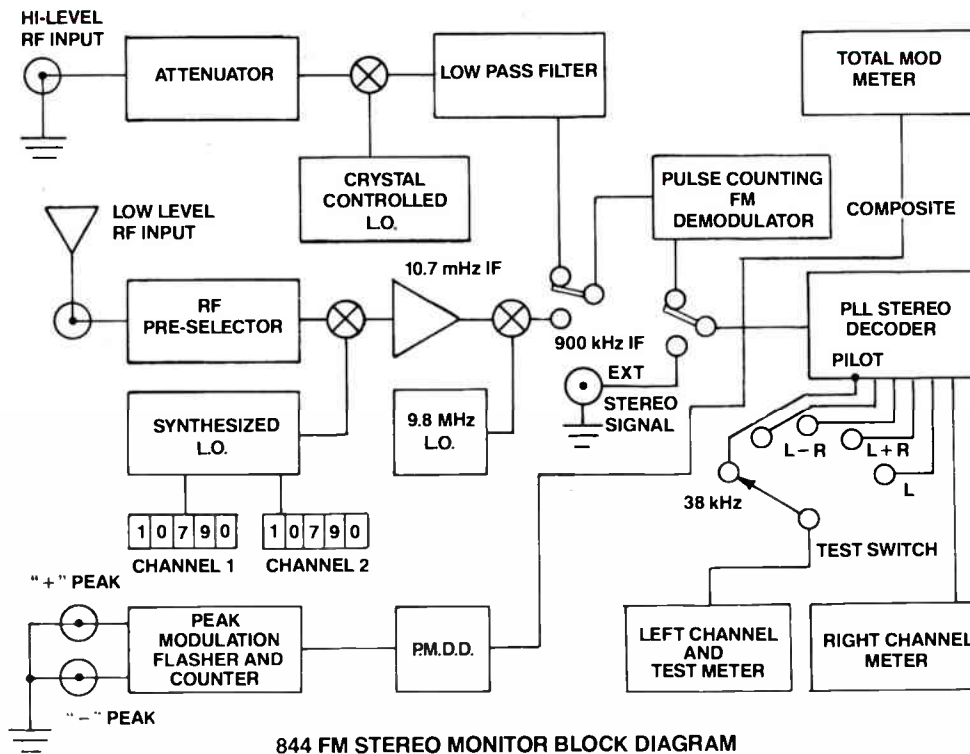
## BUILT-IN MULTIPATH DETECTOR

When monitoring off-air, multipath can be read on the test meter so you can properly orient the monitor's receive antenna for maximum signal and minimum multipath interference.



Companion 3-Channel SCA Monitor, Model 845. See separate brochure.

# FM Stereo Modulation Monitor



## OPTIONS

### Model 804 Remote Meter Panel.

This rack mount panel (19" x 5 1/4") duplicates the peak flashers and meters on the 844's front panel. 50 feet of cable is provided.

TFT Part number: 5116-0804.

### Option 01

Absence of Modulation Alarm & Carrier-Fail Alarm

The Absence of Modulation Alarm is triggered when the composite signal drops below 30% modulation. Time is user-adjustable between 2 seconds and 1 minute.

The Carrier-Fail Alarm is triggered when the RF carrier drops below 50% of nominal.

TFT Part Number: 7100-3870.

## SPECIFICATIONS

### RF SECTION

Frequency Range ..... 88-108 MHz, tunable in 50 kHz steps

High Level Transmitter  
RF input voltage..... 1 to 10 volts RMS

Antenna input voltage  
& Impedance ..... 250  $\mu$  V to 100 mV; 75 ohms, BNC

Tuning ..... Two 4-digit thumbwheel switches  
and a pushbutton switch for select-  
ing station A or station B.

AGC range ..... 60 dB

Composite Input ..... 3.5 v P-P, 1.0 k ohms potentiometer,  
BNC.

### MODULATION METER, TOTAL

Deviation for  
100% indication .....  $\pm$  75 kHz, peak-to-peak.

Meter Range ..... 0 to 133% modulation.

AC voltmeter range ..... 0 to - 50 dB in 10 dB steps.

Accuracy (5 kHz tone) .....  $\pm$  2% at all modulation levels.

Frequency Response .....  $\pm$  0.1 dB typical, from 50 Hz to  
75 kHz;  $\pm$  0.5 dB max from  
30 Hz to 120 kHz.

### MODULATION METER, RIGHT

Right channel  
modulation ..... Indicates and measures right  
channel modulation.

Frequency Response .....  $\pm$  0.25 dB, 50 Hz to 15 kHz.

(Specifications continued—over)

# SPECIFICATIONS

(continued from previous page)

## MODULATION METER, LEFT/TEST

<b>Left channel modulation</b> .....	Indicates and measures left channel modulation.
<b>Right channel modulation</b> .....	Same as right modulation meter.
<b>Total Modulation</b> .....	Same as total modulation meter.
<b>L + R</b> .....	± 0.25 dB, 50Hz to 15 kHz
<b>L - R</b> .....	± 0.35 dB, 23 kHz to 53 kHz
<b>Pilot Level &amp; 38 kHz level</b> .....	Measures down to - 60 dB.
<b>Phase Calibration</b> .....	For optimization of stereo measurements.
<b>AM Noise</b> .....	Measures transmitter AM noise down to - 75 dB from 100% modulation.
<b>Multipath indicator</b> .....	For adjustment of antenna to minimize multipath distortion.

## PEAK MODULATION INDICATORS

<b>Deviation for 100% indication</b> .....	± 75 kHz
<b>Peak Level</b> .....	Set by a front panel 3-digit thumb-wheel switch in 1% steps from 50% to 199% on both positive and negative peaks.
<b>Accuracy (5 kHz tone)</b> .....	± 1% at 100% modulation
<b>Frequency Response</b> .....	± 2% from 30 Hz to 120 kHz.
<b>Response Time Accuracy</b> .....	Adjustable, 10 cycles of 10 kHz or faster.
<b>Peak Counter</b> .....	Registers number of true peaks of modulation per minute.

## MODULATION CALIBRATOR

Built-in frequency synthesized calibrator for meter and peak flasher calibration of 100% modulation (± 75 kHz) from the front panel. Accuracy, ± 0.5%.

## OUTPUTS, FRONT & REAR PANEL

<b>Main channel output with 75 µsec de-emphasis</b> .....	5 volts RMS into 5K ohms at 400 Hz.
<b>*Signal-to-Noise Ratio</b> .....	78 dB at 400 Hz with de-emphasis.
<b>*Harmonic Distortion</b> .....	0.1% max (de-emphasized).
<b>*Intermodulation Distortion</b> .....	0.1% max per SMPTE standard.

<b>Balanced audio output level</b> .....	0 dBm into 600 ohms.
<b>*Balanced audio Frequency Response</b> .....	± 0.5 dB from 30 Hz to 120 kHz.
<b>Composite output for SCA Monitor</b> .....	1 volt RMS into 600 ohms.
<b>Pilot carrier (19 kHz)</b> .....	600 mV RMS, available on front panel.
<b>Composite</b> .....	5 VRMS, 10k ohms at 100% modulation.
<b>Connectors</b> .....	BNC
<b>Meter output</b> .....	Main meter selected signal available on front panel.
<b>Carrier-fail Alarm (option)</b> .....	Relay drive output capable of sinking 50 mA at 30 VDC when RF carrier drops below 50% of nominal.
<b>Absence of Modulation Alarm (option)</b> .....	An output capable of sinking 50 mA at 30 VDC when composite signal drops below 30% modulation for a period of time between 2 seconds and 1 minute, internally adjustable.

\* High Level RF input conditions.

## STEREO SEPARATION AND CROSSTALK

<b>Separation:</b> <b>L to R &amp; R to L</b> .....	60 dB typical, 55 dB minimum, 50 Hz to 15 kHz.
<b>Crosstalk:</b> <b>(L + R) to (L - R) or, (L - R) to (L + R)</b> .....	65 dB minimum.
<b>Crosstalk:</b> <b>SCA to (L + R) or, SCA to (L - R)</b> .....	70 dB minimum.
<b>Pilot carrier measurement level accuracy</b> .....	± 0.5% from 6% to 12% injection.

## MECHANICAL AND ENVIRONMENTAL

<b>Input power</b> .....	115/230 VAC, ± 10%, 50 to 400 Hz, 40 watts maximum.
<b>Operating Temperature</b> .....	0° C to 50° C (32° F to 122° F).
<b>Size and Net weight</b> .....	19" (48.26 cm) Wide × 7" (17.78 cm) High × 15" (38.10 cm) Deep; 18.5 lbs. (8.4 kg) net.

Today's **TFT** INC

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088  
☎ (408) 727-7272  
TWX: 910-338-0584  
FAX: (408) 727-5942

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## DIGITAL TELEMETRY CONTROL & STATUS MONITORING

### FEATURES

- Modular, field-expandable design.
- Fully digital, built-in FSK modems.
- Links can be established by Telco, wire line, subcarrier, TSL, or SCA.
- Convenient, one person system calibration.
- 10 channels each for RAISE, LOWER, TELEMETRY & STATUS.
- Built-in relay interface—no external relay panels needed!
- Complete line of transmitter interfacing accessories.

### GENERAL DESCRIPTION

The TET 8610 System permits any size AM, FM and TV station or other facility to have direct digital control of remote transmitters and facilities. Designed to meet today's growing needs, the system is totally modular for tailoring it to your own specific control and budget requirements.

Start with an economical and easy-to-operate stand-alone system with 10 channels each of RAISE, LOWER, TELEMETRY and STATUS. When required, add up to 60 more channels of RAISE/LOWER in increments of 20 channels and an additional 32 channels of STATUS monitoring. The system's telemetry and status channels may be easily field expanded to meet the needs of even the largest stations.

### CHOICE OF INTERCONNECT METHODS

Interconnection can be made with telephone lines and/or radio links. Radio links include: STL subcarriers, FM SCA or dedicated TSL.

### MAXIMUM DATA INTEGRITY

Data accuracy and error-free operations are ensured by TET proprietary digital data filtering and closed-loop automatic verification systems. With digital data filtering, each control command is sent twice. The two commands are then compared at the remote point, bit by bit. Only if the two commands match exactly will the commands be initiated. A closed feedback scheme automatically verifies the selection of the interrogated channel.

Frequency Shift Keying (FSK) is employed for data transmission and digital data modems are included.

### ONE PERSON CALIBRATION

The Model 8611 (transmitter site—remote point) has a front panel DVM and scaling potentiometers so that one person can calibrate the system on-site without assistance from the studio (control point). For local operations, a switch will lock out the studio and override the telemetry and control failsafes. The Model 8631 Channel Expander contains its own set of scaling potentiometers, but utilizes the DVM in the 8611. The Model 8633 Status Expander contains its own set of tally LED's to verify operation.

### OPERATION

Individual channels on the Model 8610 are selected by using a thumbwheel switch. Once selected, the channel number is fed back from the Model 8611 and displayed on the front panel of the Model 8610 for verification. The system then addresses this channel and displays the telemetry data on a front panel 3½" digit DVM. The readings are updated 3 times per second. (continued)

## DIGITAL TELEMETRY CONTROL & STATUS MONITORING

Control commands are initiated by pushing either the RAISE/ON or LOWER/OFF switches on the front panel of the 8610. This activates built-in momentary relays in the 8611. When a command is activated at the control point, a signal is fed back from the remote point. This signal verifies receipt of the command by illuminating the LED associated with the switch that was depressed.

Failsafe indicators on the front panels of both units give indications of up-link and down-link integrity for quick troubleshooting of problems.

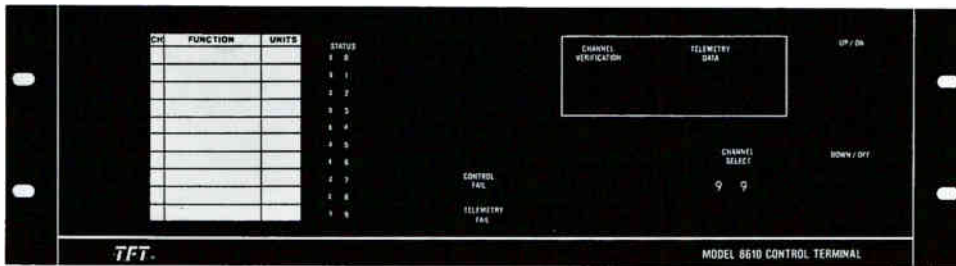
### SYSTEM COMPONENTS

The Models 8610 and 8611 are the basic building blocks of the versatile 8610 System. The Model 8610 resides at the studio (control point) and the Model 8611 is installed at the

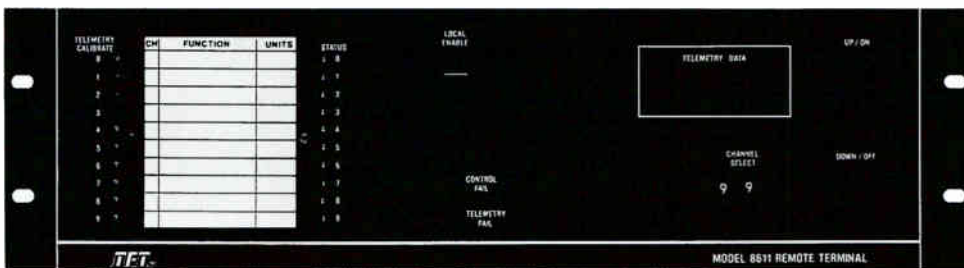
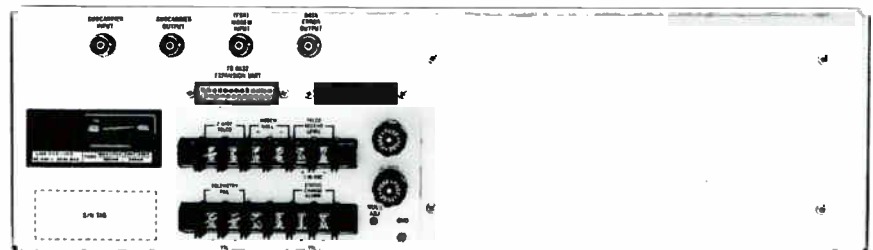
transmitter site (remote point). Although it is a fully stand-alone, 10 channel digital system with RAISE/LOWER functions and 10 channels of TELEMETRY and STATUS, it can be field-expanded to meet the needs of even the largest station by adding the Models 8631 Channel Expander and 8632/8633 Status/Alarm to increase the number of telemetry and status channels (described below).

### LOCATIONS

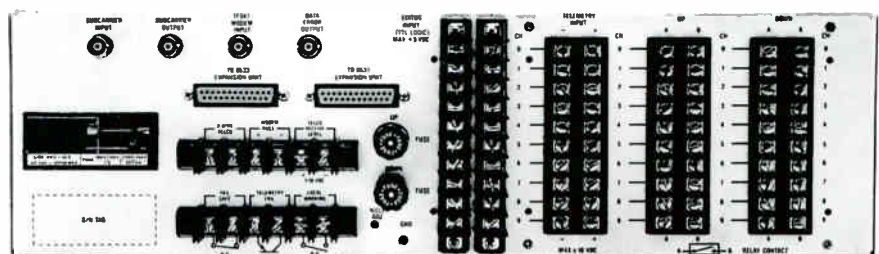
- Model 8610—Studio site (control point)
- Model 8611—Transmitter site (remote point)
- Model 8631—Channel expander: transmitter site (remote point)
- Model 8632—Status expander: studio site (control point)
- Model 8633—Status expander: transmitter site (remote point)



## STUDIO



## TRANSMITTER

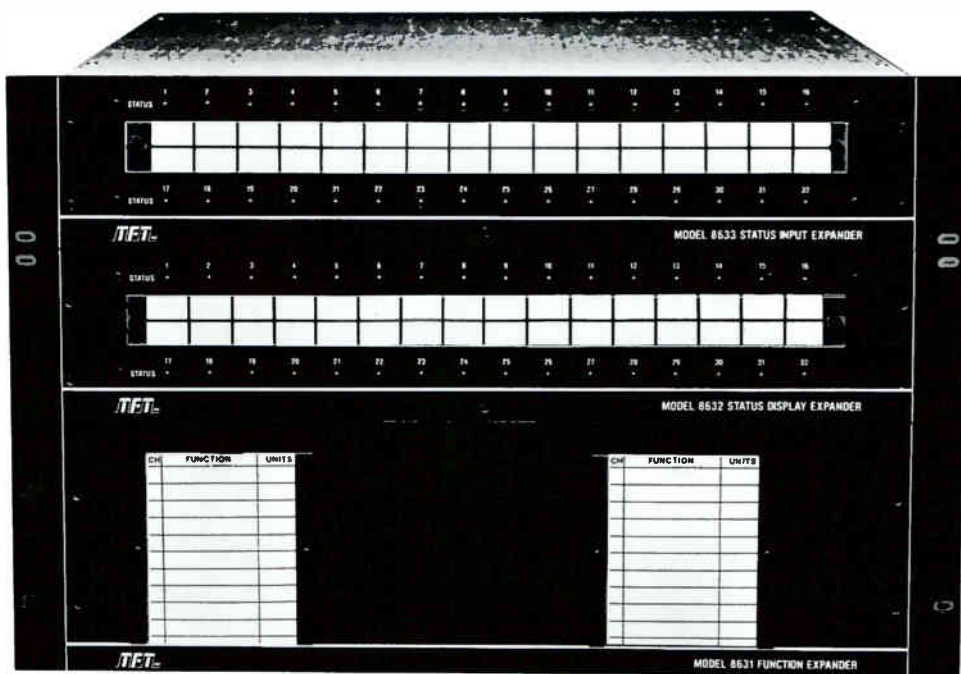


## MODEL 8632/33 STATUS/ALARM

The 8632 and 8633 provide 32 additional channels of status and alarm to the 8610 system. This expanded system provides a maximum of 42 channels of STATUS/ALARM. Only one 8632/33 pair can be added.

## MODEL 8631—CHANNEL EXPANDER

The Model 8631, when added to the 8611, expands the RAISE/LOWER and TELEMETRY functions of the system from 10 to 30 channels. A single 8610 accommodates as many as three Model 8631's for a maximum system capacity of 70 RAISE/LOWER and TELEMETRY functions.



## ORDERING INFORMATION

Model 8610/8611 (specify method of uplink and downlink)

Model 8631 Channel Expander

Model 8632/33 Status Expander

### OPTIONS: MODEL 8610/11

Option 01—Subcarrier Decoder for operation in RF link (specify subcarrier frequency)

Option 02—Subcarrier Generator for operation in RF link (specify subcarrier frequency)

Option 03—Generator/Decoder on same assembly for bi-directional RF links. (specify subcarrier frequencies)

Option 07—Spare Parts Kit (TFT P/N 7100-4136)

### OPTIONS: MODEL 8631

Option 01—Spare Parts Kit (TFT P/N 7100-4137)

### OPTIONS: MODEL 8632/8633

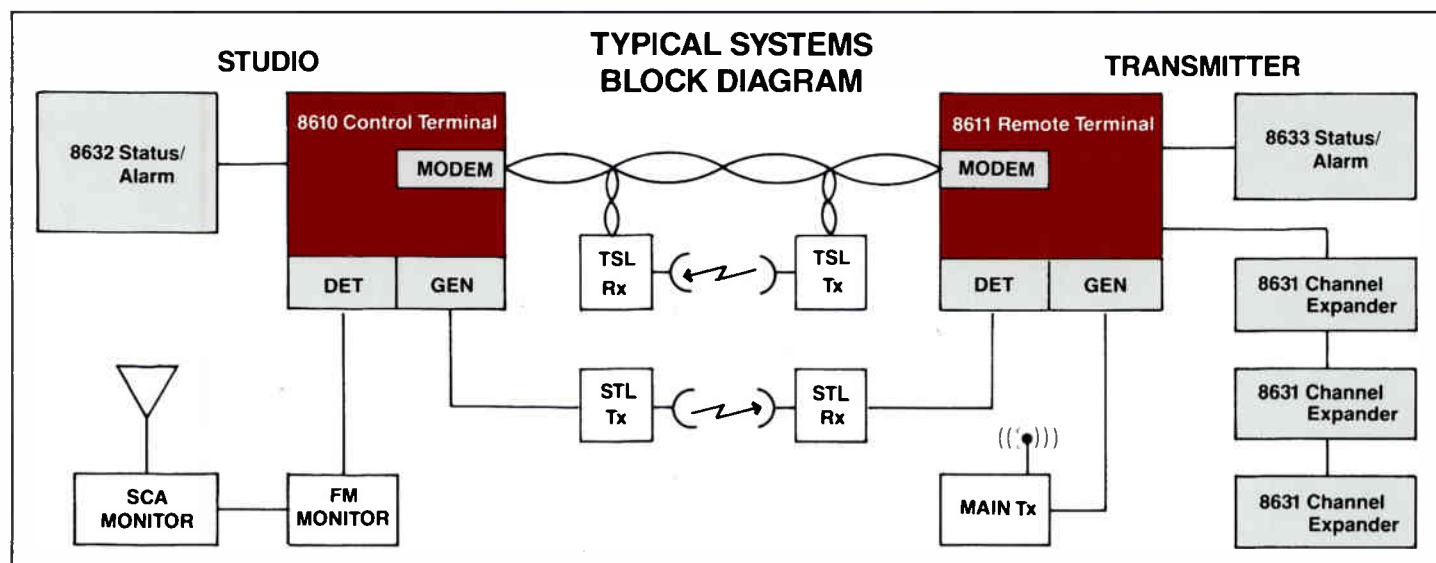
Option 01—Spare Parts Kit (TFT P/N 7100-4138)

## ACCESSORIES

A full line of accessories for interfacing with transmitters and transmitting site facilities are available. Please refer to the Remote Control Accessories Data Sheet.

Stepping relays or latching relays can be used for ON/OFF control functions.

Complete system configurations are available for both Telco and RF links or any combination thereof. These systems can be specifically tailored for your particular needs.





**System Capacity** ..... 10 channels each of momentary up/down (on/off), telemetry, and status using one pair of Models 8610 and 8611.

Expandable to 70 channels of up/down (on/off) and telemetry by adding up to 3 each Model 8631 (20 channels each).

Expandable to 42 channels of status/alarm by adding one pair of Models 8632 and 8633.

## Telemetry

**Accuracy** ..... 0.1% of reading,  $\pm 1$  count  
**Update** ..... Three updates per second  
**Analog Input Voltage** .....  $\pm 10$  VDC Maximum input to rear panel telemetry input.  
  
 $\pm 4$  VDC maximum input to internal A/D converter.  
  
 $\pm 3400$  maximum count on DVM display.  
**Input Common-Mode Voltage**  $\pm 350$  VDC  
**Input Impedance** ..... 50 kilohms  
**Input Isolation** ..... Optically isolated

## Control Outputs

**8611 and 8631 (up/down-on/off; rear barrier strip)** ..... Isolated, contact closure relay, AC/DC rated, non-inductive load; 1A at 115 VAC or 2A at 26 VDC.

**Data Transmission** ..... Digital pulse-code-modulated FSK modems; 600-baud control, 300 baud telemetry.

## Communication Link Requirements

**Telephone Line** ..... Two-wire unconditioned, Series 3002 Data circuit.  
**Audio Channel** ..... Any voice-grade channel having a bandwidth of 300 Hz to 3 kHz. Maximum attenuation of -30 dB. Example: TSL or hard-wire.  
**Radio (STL)** ..... Plug-in FM subcarrier modulator and demodulator for command link.  
**Radio (off-air)** ..... SCA frequencies (Consult Factory).  
**SCA/Subcarrier Modulator Output** ..... Adjustable 0-800 mV rms.  
**SCA/Subcarrier Demodulator Input Range** ..... 20 mV to 700 mV rms.

## Fail Safe Provisions

**8610: Uplink Control Failure** .. Front panel red LED indicator —no relay closures available.

**Downlink Telemetry Failure** ..... After a 10 second delay, a Telemetry Fail output on the rear panel is activated (+ 5V TTL), and a front panel LED is illuminated.

**8611: Uplink Control Failure** .. Normally-closed relay contacts rated (non-inductive load) for .5 A at 115 VAC or 1A at 26 VDC. Adjustable delay of approximately 20-55 seconds. LED indicator on Front Panel.

**Downlink Telemetry Failure** ..... 10 second nominal delay. Output for driving external one-hour timer and TV fail-safe units for full compliance with FCC Rule 73.676. LED indicator on Front Panel.

**Local Mode Indication (8611 Rear Panel)** ..... Relay contact closure for external alarm device. Contacts rated (non-inductive load) for 0.5A at 115 VAC or 1A at 26 VDC.

## Power Required

**Model 8610** ..... 115 VAC/220 VAC  $\pm 10\%$ , 50 to 400 Hz, 15 watts maximum.  
**Model 8611** ..... 115 VAC/220 VAC  $\pm 10\%$ , 50 to 400 Hz, 25 watts maximum.  
**Model 8631** ..... From Model 8611.  
**Model 8632** ..... 115 VAC/220 VAC  $\pm 10\%$ , 50 to 400 Hz, 15 watts maximum.  
**Model 8633** ..... 115 VAC/220 VAC  $\pm 10\%$ , 50 to 400 Hz, 15 watts maximum.

**Operating Temperature** ..... 0° to 50° C.  
**Humidity** ..... to 95% non-condensing.  
**Mounting** ..... 19 inch rack.

## Dimensions and Net Weights

**Model 8610** ..... 5¼" H x 19" W x 13" D, 12 lbs.  
**Model 8611** ..... 5¼" H x 19" W x 13" D, 16 lbs.  
**Model 8631** ..... 5¼" H x 19" W x 13" D, 6 lbs.  
**Model 8632 & 8633** ..... 3½" H x 19" W x 13" D, 10 lbs.

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... Where New Things  
Are Happening!!!

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**DOMESTIC PRICE LIST**

**STL SYSTEMS**

**SELECTION TABLE**

**OPTIONS & ACCESSORIES**



**TSL SYSTEMS**

# STL SYSTEMS

MODEL	PART NUMBER	DESCRIPTION	SUGGESTED LIST PRICE (U.S. Dollars)
8300	5116-8300	All solid state <i>composite transmitter</i> including self-contained power supply and tested to customer specified operating frequency.	\$ 4,550.00
8301	5116-8301	All solid state <i>composite receiver</i> including self-contained power supply and tested to customer specified operating frequency.	\$ 4,400.00
8301B	5116-8301B	All solid state narrow band (250 kHz) <i>composite receiver</i> including self-contained power supply and tested to customer specified operating frequency.	\$ 4,400.00
7700B	5116-7700B	All solid state <i>transmitter</i> including self-contained power supply and tested to customer specified operating frequency. For composite or monaural use.	\$ 3,850.00
7707	5116-7707	All solid state <i>composite receiver</i> including self-contained power supply and tested to customer specified operating frequency.	\$ 3,145.00
7705	5116-7705	All solid state <i>monaural receiver</i> including self-contained power supply and tested to customer specified operating frequency.	\$ 3,395.00
8600	5116-8600	All solid state <i>monaural transmitter</i> including 39 kHz SCA generator, self-contained power supply and tested to customer specified operating frequency.	\$ 1,600.00
8601	5116-8601	All solid state <i>monaural receiver</i> including 39 kHz SCA detector, self-contained power supply and tested to customer specified operating frequency.	\$ 1,595.00
7770	5116-7770	<i>Automatic Transmitter Changeover Unit</i> , for hot-standby use. Use with two STL transmitters. Contains coaxial changeover relay; power combiner not required. Self-contained power supply.	\$ 960.00
7773	5116-7773	<i>Automatic Receiver Changeover Unit</i> , for hot-standby use with two STL receivers; built-in power splitter. Unit derives DC power from STL receivers.	\$ 900.00

## STL OPTIONS

Option 01	7100-3780	Spare Parts Kit for 8300 Series.	\$ 565.00
Option 04	7100-3500	Spare Parts Kit for 7700B Series.	\$ 375.00
Option 05	7100-4135	Spare Parts Kit for 8600 Series.	\$ 310.00
Option 06	7100-3770	Non-standard frequency for STL or TSL. (Specify exact frequency desired). For transmitter/receiver pair. Consult TFT if in doubt.	*\$ 335.00
Option 15	7100-3710	Stereo decoder module, for composite receivers.	*\$ 225.00
Option 16	7100-3790	Extended Baseband Response, permits Composite STL to convey 92 kHz SCA channel.	*\$ 415.00
Option 20	7100-3640	Narrow Band IF for 7705 monaural receiver. Total carrier frequency deviation $\pm 25.5$ kHz.	*\$ 385.00
Option 21	7100-3650	Narrow Band IF for 7705 monaural receiver. Total carrier frequency deviation $\pm 11.5$ kHz.	*\$ 385.00
Option 22	7100-4070	IF Repeater (63 MHz) circuits installed in 8300/8301 STL. One (1) required for each intermediate site. Specify operating frequency for each path segment (hop)	*\$ 1,290.00
Option 23	7100-4148	12 Volts option for 8600 / 8601. (price per unit)	\$ 75.00

## STL ACCESSORIES

SCA-1	5116-SCA1	Standalone Subcarrier Generator for data transmission (specify operating frequency).	\$ 840.00
SCA-2	5116-SCA2	Standalone Subcarrier Detector for data reception (specify operating frequency).	\$ 840.00
SCA-3	5116-SCA3	Standalone Subcarrier Generator and Detector for data transmission and reception (specify two operating frequencies).	\$ 1,100.00
COMBINER	7100-4145	Combines 2 transmitter outputs to one antenna. (80 dB isolation). Specify two operating frequencies.	\$ 1,565.00
SPLITTER	3500-0021	2-way power splitter for 2 receivers using one antenna.	\$ 115.00

\* Not field installable



# STL Systems Product Selection Table

T R A N S M I T T E R S	SYSTEM DESIGNATION	Composite Systems				Discrete Systems (Monaural)			
				With Hot-Standby				With Hot-Standby	
	Components	8300C	7700C	8300CH	7700CH	7700M	8600M	7700MH	8600MH
	8300 Composite (5116-8300)	1		2					
	7700B Discrete or Composite (5116-7700B)		1		2	1		2	
	8600 Discrete (5116-8600)						1		2
R E C E I V E R S	8301 Composite (5116-8301)	1*		2*					
	7707 Composite (5116-7707)		1		2				
	7705 Discrete (5116-7705)					1		2	
	8601 Discrete (5116-8601)						1		2
C H A N G E	Transmitter Change-Over, 7770 (5116-7770)			1	1			1	1
	Receiver Change-Over, 7773 (5116-7773)			1	1			1	1
<b>SYSTEM TOTALS</b>		\$8,950	\$6,995	\$19,760	\$15,850	\$7,245	\$3,195	\$16,350	\$8,250

\* ALSO AVAILABLE: 8301B NARROWBAND RECEIVER, (5116-8301B). SUCH SYSTEMS DESIGNATED 8300CN OR 8300CHN.

Key: C=Composite  
M= Mono  
H= Hot Standby  
N= Narrowband

## SYSTEM DESCRIPTIONS

**HOT-STANDBY SYSTEM** consists of two Transmitters, one Transmitter Automatic Changeover Unit, two Receivers and one Receiver Changeover Unit. Transmitter Automatic Changeover Unit has built-in coaxial changeover relay; therefore, combiners are not necessary to interface two transmitters (one on hot-standby) to one antenna. Receiver Automatic Changeover Unit has built-in power combiner for interfacing with two receivers (one on hot-standby).

**DUAL MONAURAL SYSTEMS:** The 8600 series STL is ideal for dual monaural applications (discrete stereo). Separation between operating frequencies should be at least 125 kHz.

For dual transmit/dual receive system using one antenna each at studio and broadcast transmitter sites, an STL transmitter combiner and receiver splitter are necessary, and must be ordered separately. See STL accessories section.

**MULTI-HOP SYSTEMS:** Any of the systems shown in the table can be used for conventional multi-hop STL links.

**IF REPEATER:** 8300 Transmitter and 8301 (or 8301B) Receiver can be used as a unique IF Repeater combination. Order Option 22 for each 8301 receiver and 8300 transmitter combination used at all intermediate sites.

**OTHER SYSTEMS:** TFT and your dealer can assist you with almost any conceivable variation of STL equipment, options, and accessories as well as custom work, to meet your STL needs. Please contact your dealer or TFT with your requirements.

## STL/TSL ANTENNAS, COAXIAL TRANSMISSION LINE AND CONNECTOR KITS

MODEL	PART NUMBER	DESCRIPTION	PRICE
P972GRN-M1	3500-0016	ANIXTER-MARK Grid Parabolic Antenna, six-foot diameter, for 890-960 MHz, type N female connector, 50 ohm (1.3:1 VSWR standard/1.5:1 special order), non-pressurized feed, vertical or horizontal polarization for mounting to 1.9 to 3.5 inch O.D. pipe. (Other mounts on special order). Gain 22.0 dBi-midband.	**
PR-450U	3500-0001	SCALA Paralector <TM>, Parabolic Antenna, for 350-1000 MHz, type N female connector, 50 ohm, universal mounting for vertical or horizontal polarization, gain 20.1 dBi at 950 MHz; 16.6 dBi at 450 MHz.	**
SH872GN	3500-0017	ANIXTER-MARK Multi-element Grid Parabolic Section Antenna (72" x 36"), for 675-960 MHz, type N female connector, 50 ohm, vertical or horizontal polarization, for mounting on up to 3.5 inch O.D. pipe. Gain 19.6 dBi at 950 MHz.	**
MF960	3500-0002	SCALA Miniflector <TM> Antenna for 940-960 MHz, 16.1 dBi gain, type N female connector, university mounting for vertical or horizontal polarization, fully anodized. (Not recommended for congested areas.)	**
MG-944GN	3500-0018	ANIXTER-MARK Mini Grid Parabolic Section Antenna (44" x 13.5"), for for 890-960 MHz, type N female connector, 50 ohm vertical or horizontal polarization, for mounting on up to 3.5 inch O.D. pipe. Gain 13.5 dBi at 950 MHz.	**
LDF4-50	3500-0003	ANDREW Heliax LDF4-50 Transmission Line : 1/2" foam Dielectric, 50 ohm, jacketed. Specify length.	**
L44N	3500-0004	Andrew L44N type N female connector for LDF4-50 Andrew Heliax. Order two (2) for both ends of transmission line. Two (2) PTL-1 or equivalent needed for normal installation.	**
LDF5-50	3500-0005	ANDREW Heliax LDF5-50 Transmission Line : 7/8" foam Dielectric, 50 ohm, jacketed. Specify length.	**
L45N	3500-0006	Andrew L45N type N female connector for LDF5-50 Andrew Heliax. Order two (2) for both ends of transmission line. Two (2) PTL-1 or equivalent needed for normal installation.	**
PTL-1	4750-0208	3' pigtail assembly of RG 214 with type N male connector on each end. Required for strain relief on either end of transmission line.	**
ISOCOUPLER	3500-0008	Permits installation of STL/TSL antennas on AM tower. 950/450/150 MHz band. Mfr.: Kintronic Labs (Specify frequency).	**
CA5-450	3500-0009	SCALA CA5-450 5-element Yagi for 10dB gain (cut to frequency). Specify frequency (216-1000 MHz)	**
CA7-460	3500-0010	SCALA CA7-460 7-element Yagi for 10dB gain (broadband). Specify 450-470 MHz or 406-420 MHz	**

WE RESERVE THE RIGHT TO SUBSTITUTE NON-PROPRIETARY ITEMS WITH OTHER MANUFACTURERS' EQUIVALENT.

\*\*Contact TFT for latest prices.

### 450 MHZ TRANSMITTER-STUDIO LINK

Model 8100 / 8101 Telemetry Return Link. One (1) system consists of one (1) 8100 and one (1) 8101.

MODEL	PART NUMBER	DESCRIPTION	PRICE
MODEL 8100	5116-8100	450 MHz Transmitter-Studio Voice/Data Link. Specify FCC Group P frequency.	\$ 2,035.00
MODEL 8101	5116-8101	450 MHz Receiver-Studio Voice/Data Link. Specify FCC Group P frequency.	\$ 2,035.00
Option 01	7100-3460	Automatic ID (Specify ID code)	\$ 320.00

NOTE: For non-standard frequencies, contact TFT.

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

TFT, 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 (STL's: 2 years) from the date of delivery of equipment, any parts which are defective from faulty material or workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge prepaid by the 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER. Transportation charges for instruments found to be defective within the first thirty (30) days of warranty period will be paid both ways by the SELLER. Transportation charges for warranty returns and repair costs, wherein failure is found not 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OR PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES.

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# DOMESTIC PRICE LIST RADIO MONITORING EQUIPMENT

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<b>FM PRODUCTS</b>	<b>DESCRIPTION</b>	<b>Suggested List Price (U.S. Dollars)</b>
<b>MODEL 844</b> (5116-0844)	FM BASEBAND/STEREO MODULATION MONITOR (Specify frequency for high level monitoring.) (75 usec de-emphasis supplied standard.)	\$ 4,250.00
Option 01 (7100-3870)	Absence of Modulation/Carrier Fail Alarm	\$ 275.00
Option 02 (7100-3890)	Spare Parts Kit	\$ 475.00
<b>MODEL 804</b> (5116-0804)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 844	\$ 525.00
<b>MODEL 845</b> (5116-0845)	3-CHANNEL SCA MODULATION MONITOR, 67 kHz supplied standard	\$ 2,265.00
Option 01 (7100-3880)	RF Module-Preselector (Specify frequency)	\$ 710.00
Option 02 (7100-3900)	SCA Channel (41 kHz)	\$ 235.00
Option 03 (7100-3910)	SCA Channel (92 kHz)	\$ 235.00
Option 04 (7100-3920)	Spare Parts Kit	\$ 230.00
<b>MODEL 805</b> (5116-0805)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 845	\$ 495.00
 <b>AM PRODUCTS</b>		
<b>MODEL 753</b> (5116-0753)	AM MODULATION MONITOR	\$ 1,525.00
Option 02 (7100-2440)	Carrier Power Alarm	\$ 90.00
Option 03 (7100-2410)	10 kHz Whistle Filter	\$ 340.00
Option 04 (7100-2420)	30 Hz Telemetry Lowpass Filter	\$ 260.00
Option 05 (7100-2430)	Absence of Modulation Alarm	\$ 290.00
Option 06 (7100-2460)	230 VAC	*\$ 60.00
Option 07 (7100-2560)	Spare Parts Kit	\$ 225.00
<b>MODEL 755A</b> (5116-0755A)	AM RF PRESELECTION (TUNABLE IN 1kHz INCREMENTS)	*\$ 1,610.00
Option 01 (7100-2470)	Narrow Band Filter	\$ 485.00
Option 04 (7100-2500)	Spare Parts Kit	\$ 290.00
<b>MODEL 704E</b> (5116-704E)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 753	\$ 495.00

\* Not field installable



## RADIO MONITORING EQUIPMENT

### EBS PRODUCTS

MODEL 760-1A (5116-760-1A)	TUNABLE AM RECEIVER/ENCODER/DECODER	\$ 1,420.00
MODEL 760-1B (5116-760-1B)	SINGLE CHANNEL FM RECEIVER/ENCODER/DECODER Specify one receive frequency	\$ 1,420.00
MODEL 760-1C (5116-760-1C)	DUAL CHANNEL FM RECEIVER/ENCODER/DECODER Specify two receive frequencies	\$ 1,675.00
MODEL 8010 (5116-8010)	FM E-ALERT RECEIVER, Specify frequency	\$ 275.00
MODEL 8020 (5116-8020)	AM E-ALERT RECEIVER, Specify frequency	\$ 275.00

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

TFT, 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge prepaid by the 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

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

Transportation charges for warranty returns and repair costs, wherein failure is found not 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OR PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES.

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O-RM 3/87



# DOMESTIC PRICE LIST REMOTE CONTROL EQUIPMENT

Effective  
**2 MAR 87**

MODEL/DESCRIPTION	APPLICATION	Suggested List Price (U.S. Dollars)
<b>MODEL 8610/8611:</b> 10 Channel RAISE/LOWER Plus 10 Channel TELEMETRY and STATUS digital remote control system. Expandable by adding Models 8631, 8632/33, to a 112 channel system. To provide digital remote control systems for AM, FM & medium size TV stations. Minimum system comprises one (1) 8610 and one (1) 8611.		
<b>MODEL 8610</b> (5116-8610)	Control portion only of 8610/8611 system	\$ 1,650.00
<b>MODEL 8611</b> (5116-8611)	Remote portion only of 8610/8611 system	\$ 2,150.00
Option 01 (7100-2610) Sub-carrier (SCA) Detector. Frequencies from 26 kHz to 185 kHz available. Mounts within 8610 or 8611.	To provide demodulation of the SCA subcarrier (Specify frequency and whether for uplink or downlink.)	\$ 280.00
Option 02 (7100-2620) Sub-carrier (SCA) Generator. Frequencies from 26 kHz to 185 kHz available. Mounts within 8610 or 8611.	To generate the SCA subcarrier (Specify frequency and whether for uplink or downlink.)	\$ 280.00
Option 03 (7100-2600) SCA Generator/Detector in one module.	Single module combines functions of Option 01 & 02 (Specify frequencies and whether for uplink or downlink.)	\$ 610.00
Option 07 (7100-4136) Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repairs	\$ 475.00
<b>MODEL 8631</b> (5116-8631) Channel Expander (20 channels)	To expand the RAISE/LOWER and TELEMETRY channels of the Model 8610/8611 by 20 additional channels. (to be installed at the Remote Terminal only) Up to 3 Model 8631's can be added (for 70 channels, total).	\$ 1,690.00
Option 01 (7100-4137) Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	\$ 240.00
<b>MODEL 8632/8633</b> 32 Channel Status/Alarm Expander. Provides an additional 32 channels of STATUS/ALARM to 8610/8611 system, for a total of 42 channels.		
<b>MODEL 8632</b> (5116-8632)	Control portion only of 8632/8633 system (One 8633 is also required for full operation)	\$ 1,375.00
<b>MODEL 8633</b> (5116-8633)	Remote portion only of 8632/8633 system (One 8632 is also required for full operation)	\$ 1,455.00
Option 01 (7100-4136) Spare Parts Kit	To provide spare parts such as relays, I.C.'s, and other critical components for emergency repair.	\$ 390.00

MODEL/DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7815 (STANDALONE UNIT)</b> Status and Control System with 15 ON/OFF control and 15 STATUS indication channels, consisting of a Control and Remote unit. For ON/OFF control and STATUS indications only. Expandable to 47 channels of status by the addition of 8632 and 8633.		
<b>MODEL 7815-C</b> (5116-7815)	Control portion of 7815 system (One 7815-R is also required for full operation)	\$ 1,860.00
<b>MODEL 7815-R</b> (5116-7816)	Remote portion of 7815 system (One 7815-C is also required for full operation)	\$ 2,155.00
Option 02 (7100-3100)	Spare Parts Kit. To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	\$ 455.00
Option 03 (7100-3130) Momentary Switch Kit	8 momentary switches and instructions for replacing front panel toggle switches. Field Installation Only.	\$ 90.00

### REMOTE CONTROL INTERFACE ACCESSORIES

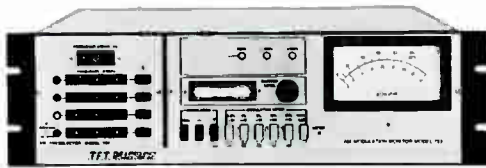
MODEL/DESCRIPTION	APPLICATION	PRICE
<b>FSU-01</b> Fail-Safe Unit for TV (5116-0FSU)	To provide full compliance with FCC Rules by monitoring 4 critical parameters, plus aural power and visual power.	\$ 1,360.00
<b>ADS-01</b> Alternate Data Path Selector (5116-0ADS)	Switch from main to alternate data path when invalid data is detected from either the Control or the Remote terminal. Both local and remote units are included.	\$ 1,860.00
<b>CSA-01</b> Chopper Amplifier (5116-0CSA)	To provide isolation from a floating circuit to a grounded circuit. DC gain is also provided.	\$ 560.00
<b>PLC-01</b> Power-to-Linear Converter (5116-0PLC)	To linearize power readings from log scale to linear scale.	\$ 715.00
<b>TLK-01</b> Tower Light Monitor (5116-0TLK)	To monitor AC line current	\$ 315.00
<b>LVK-01</b> Line Voltage Monitor (5116-0LVK)	To monitor AC line Voltage	\$ 245.00
<b>PVK-01</b> Plate Voltage Monitor (5116-0PVK)	To monitor plate voltage up to 20 kV	\$ 240.00
<b>TSK-01</b> Temperature Sensing Kit (5116-0TSK)	To monitor temperature of air or components	\$ 425.00
<b>MBB-01</b> Isolation amp (high voltage) (5116-0MBB)	For monitoring voltage and current at 10 kV above ground and translate reading in reference to ground voltage to suit the input of the Remote Control terminals.	\$ 375.00
<b>SCA1</b> , SCA Generator (5116-SCA1)	Standalone unit converts FSK from modem to SCA frequency. (Specify operating frequency)	\$ 840.00
<b>SCA2</b> , SCA Detector (5116-SCA2)	Standalone unit converts SCA frequency to FSK. (Specify operating frequency)	\$ 840.00
<b>SCA3</b> , SCA Generator/Detector (5116-SCA3)	Standalone unit combines functions of SCA1 and SCA2 (Specify two operating frequencies)	\$ 1,110.00

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AM  
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TV



**Model 753**

**AM Modulation Monitor.** Shown with the optional 755A preselector. The 753 guarantees you the most out of your AM transmitter . . . right up to the legal limit.



**Model 840**

**C-Quam® Exciter for AM Stereo.** Second-generation design with ease of utility and maintainability at a competitive price to make **you** competitive in the rough world of AM Stereo radio.

C-Quam® is a registered trademark of Motorola, Inc.



**Model 701**

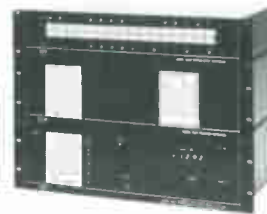
**TV Monitor.** The 701 still outsells its rivals after 17 years! A precision monitor for visual and aural carrier frequencies and aural modulation. CCIR option available.

REMOTE CONTROL  
•  
EBS



**System 7610**

**Remote Control System.** The most economical method of manipulating your transmitter via TELCO or STL. Basic system provides 10 channels each of Raise, Lower, and telemetry. Flexible expansion capability by adding subsidiary units.



**System 7815**

**Remote Control and Status Monitoring System.** Offers 15 on/off control and 15 status indication channels. The 7815 is expandable to 45 channels of control and 79 channels of status indications.



**Series 760 EBS**

**EBS System.** The most popular EBS Receiver/Generator/Decoder system . . . literally thousands in use daily. Meets FCC requirements. Complete system or fractional packages are available.

**SHORT FORM CATALOG**



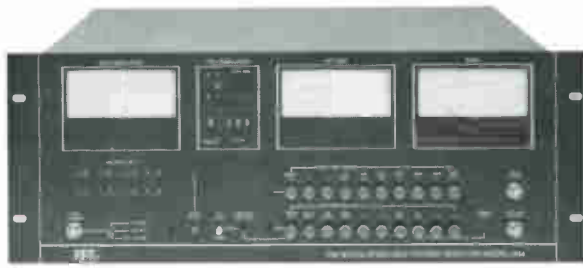
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- AM/FM/TV MONITORS
- BTSC AURAL TV
- STL/TSL
- REMOTE CONTROL
- EBS



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M



**Model 844**

**FM/Stereo Modulation Monitor.** The industry's newest FM baseband and stereo monitor . . . in one 7" package. The 844 features a 2-channel preselector for off-air monitoring and comprehensive front-panel measuring capabilities. Auxiliary composite input allows stereo generator and composite STL checks. The 844's unique Peak Modulation Duration Differentiator (PMDD) circuit detects only true over-modulation spikes and ignores those created by transients, multi-path and overshoot. Companion SCA Monitor: Model 845.

BTSC

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**Model 850**

**Aural Modulation Monitor for BTSC TV Stereo.** Complies fully with the BTSC Aural Modulation Monitor Standards for recommended measurements and more. Look at total modulation, main channel, left or right channel. Microprocessor-controlled switching permits measurement of over 20 parameters. Both split-sound and quasi-parallel (intercarrier mode) demodulation schemes are used to recover the aural baseband signal. Accommodates optional Distortion Analyzer (model 860). Model 851 available for baseband input only.



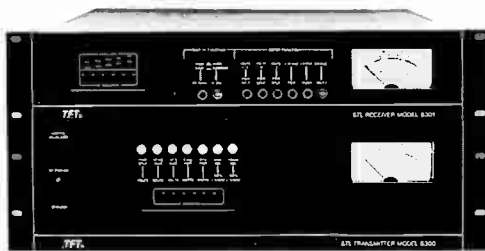
**Model 8500**

**Composite Subcarrier Generator for BTSC Stereo.** The 8500 Generator combines the output of a BTSC Stereo Generator, SAP Generator, Pro-Channel Generator, and SCA Generator or Remote Control link, for transmission via a single video microwave subchannel.

**Model 8501**

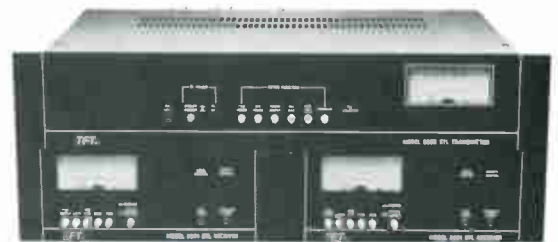
**Composite Subcarrier Demodulator for BTSC Stereo.** The 8501 Demodulator routes the composite stereo and SAP and Pro channels to the aural exciter.

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**Model 8300 STL**

**Aural STL and Inter City Relay.** When it comes to transporting the cleanest, most transparent audio via microwave, the 8300 system is ahead of the rest . . . even in dense RF environments. If multihop links are involved, the 8300 with its unique IF repeater circuitry ensures the audio quality at the origin is relayed through 3, 4, 5 hops to the RF transmitter. The 8300's economical counterpart is the 7700 STL. Available in mono, dual mono, or composite configurations, without degrading separation, deteriorating signal-to-noise or adding distortion.



**Model 8600 STL**

**Aural STL.** An economical, discrete 950 MHz system derived from our 8300 system. Designed for either single or dual monaural operation. Built-in subcarrier generator and demodulator for voice and data linking, spurious-free power amp, built-in mic and headphone jacks, and capability to properly match phase and gain between dual links for either FM or AM stereo applications.



## 8600 Aural STL System (950 MHz)

### FEATURES

- Designed to utilize the new FCC narrowband spectrum allocations.
- Optimized for single channel or dual monaural operation.
- Front panel accessible subcarrier SCA generator and demodulator for supervisory or data link.
- Spurious-free, on-channel power amplification.
- Built-in adjustments for phase and gain matching between dual links.
- Interfaces to optional Automatic Changeover Units.
- Two Year Limited Warranty.

### GENERAL DESCRIPTION

The Model 8600/8601 is an economical, high-quality Studio-To-Transmitter (STL) system which is specifically designed for either single channel or dual monaural channel radio broadcast applications.

FCC rulings permit 100 kHz "drop-ins" in the 950 MHz STL band. The 8600 system meets the FCC criteria which permits broadcasters to use a monaural link between two composite links. It is an ideal narrowband system which is optimized for operation in congested STL environments. The system is designed to deliver superlative audio quality without signal degradation or adjacent channel interference.

Based upon TFT's 10+ year's experience with STL designs (like our sophisticated 8300 and 7700B Series of Composite STL's), the 8600 System incorporates the latest microwave components and LSI devices.

The nominal 6-watt power output is generated by direct, on-channel amplification which yields greater efficiency and introduces no harmful, spurious emissions like those in a varactor diode multiplier.

The built-in 39 kHz FM subcarrier generator and demodulator may be utilized for either data transmission or supervisory channel. The supervisory channel may be used for studio-to-transmitter voice communications via the transmitter front panel microphone input and the headphone jack on the receiver. This voice channel temporarily interrupts the data link.

When two systems are used for stereo, provision is made for properly matching phase and gain between the dual links by an internal adjustable phase and amplitude compensation circuit.

Both Transmitter (8600) and Receiver (8601) feature comprehensive front panel metering for monitoring of system performance.

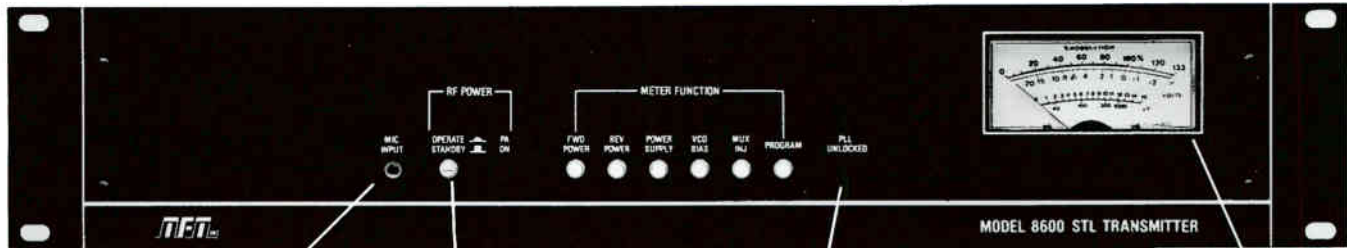
The 8601 Receivers occupy only a half-width, 3 1/2" high rack space; thus, two may be mounted side-by-side. A mounting bracket and a front panel cover plate are included with the single Receiver System.

System shown above shows dual-link, redundant receivers. At the studio or transmitter, only 3 1/2" of rack space is required.



# 8600

## TRANSMITTER



**Microphone input jack** for voice communication via built-in subcarrier channel (interrupts rear panel MUX input).

**Front panel switch** to control RF power amplifier status.

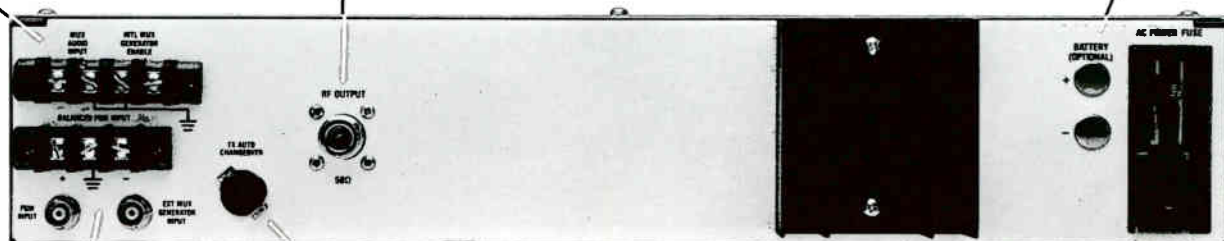
**LED indicator** alerts the loss of PLL-lock.

**Multi-scale analog meter** monitors program modulation, MUX injection and other critical operating parameters. Meter function is selected by pushbuttons.

**Terminal strip** for disabling internal subcarrier generator, and a BNC connector for an external unit.

**Type "N" antenna output.**

**Optional battery input terminals.**



**Balanced and unbalanced program audio and MUX inputs** via terminal strips and BNC connectors.

**Receptacle** for interfacing with TFT Model 7770, Transmitter Automatic Changeover Unit.

**AC power line input assembly** with RFI filtering, power line fuse and simple changeover from 115 VAC to 230 VAC.

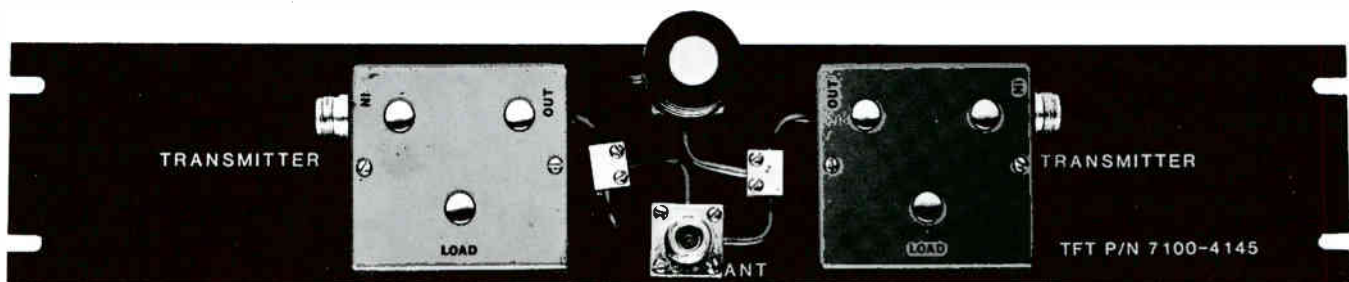
### Transmitter Combiner and Receiver Splitter.

For stereo installations where two 8600 Series Transmitters and Receivers each share a common antenna, TFT can furnish a high isolation combiner and a low-loss splitter.

The Transmitter Combiner features more than 80 dB isolation between transmitters. Intermodulation components, (which cause harmful emissions that interfere with other

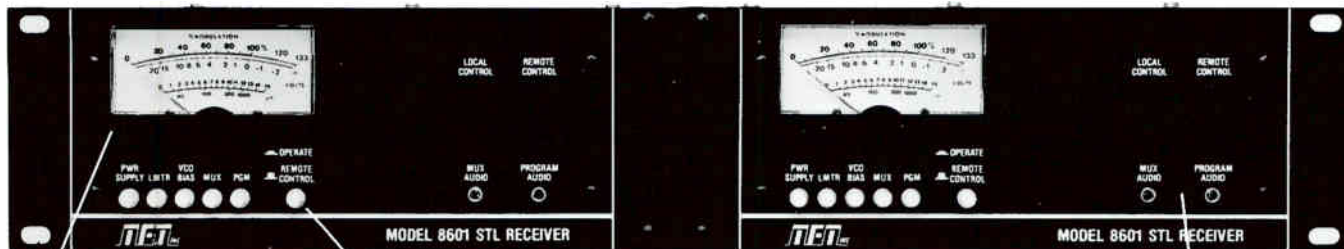
radio users and thereby negate the advantages of narrowband STL's) are virtually eliminated.

This rugged, compact unit provides all required filtering between transmitters for harmonic and intermodulation suppression. There is nothing to tune after initial installation. The use of semi-rigid cable and a minimum of connectors ensure reliable protection.



# 8601

## RECEIVER



**Multi-scale analog meter for monitoring de-modulated program and MUX levels and critical operating parameters. Meter function is selected by pushbuttons.**

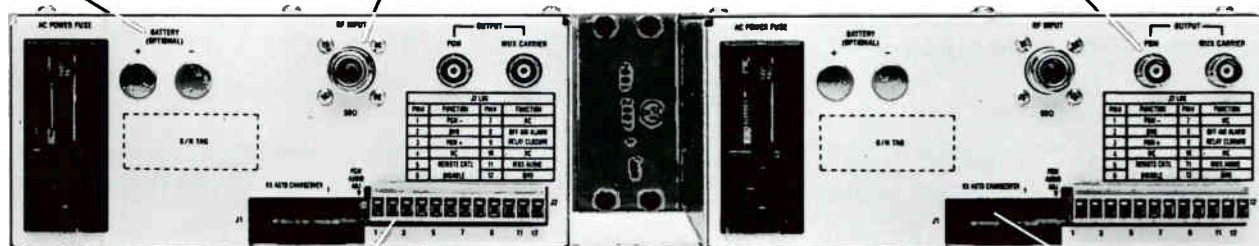
**In Remote Control position, the receiver is selected by Automatic Changeover unit (TFT Model 7770) or remote control equipment.**

**Monitor program audio and MUX audio via front panel jacks.**

**Optional battery operation input.**

**Type "N" antenna input.**

**Unbalanced program audio and MUX carrier outputs via BNC connectors.**



**AC power line input assembly with RFI filtering, power line fuse and simple changeover from 115VAC to 230 VAC.**

**Balanced program audio, MUX signal output, off-air alarm contact closures and remote control interface via quick-disconnect terminal block.**

**Connector for interfacing with TFT Model 7773 Receiver Automatic Changeover Unit.**

System shown above features dual-link, redundant receivers.

### ACCESSORIES

Model 7770 Transmitter Automatic Changeover unit is a 1 $\frac{3}{4}$ " high rack mount unit which monitors critical parameters in the transmitters. If a fault is detected, it automatically switches the antenna to the hot standby transmitter. Changeover can also be accomplished by a front panel switch or relay contact closure in the remote control equipment.

Model 7773 Receiver Automatic Changeover unit. Similar to the Model 7770, it monitors the parameters in the receivers. The unit switches the program channel output as well as subcarrier output.

### Other Accessories

TFT carries a full line of accessories such as coaxial cable, type "N" connectors and antennas to meet STL system installation requirements. Please refer to the STL Accessories brochure for detailed information.

### ORDERING GUIDE

**8600 System "C":** Part Number: 5115-8600C:  
Monaural transmitter and receiver. Specify one operating frequency.

**8600 System "E":** Part Number: 5115-8600E:  
Two monaural transmitters (2) and two receivers (2) for separate left and right channel. System "E" requires one transmitter combiner and one receiver splitter for single transmit/single receive antenna operation. Specify two operating frequencies.

Transmitter Combiner: TFT Part Number 7100-4145  
Receiver Splitter: TFT Part Number 3500-0021  
Spare Parts Kit: TFT Part Number 7100-4135  
Model 7770 Transmitter Automatic Changeover Unit.  
Model 7773 Receiver Automatic Changeover Unit.

## SYSTEM

<b>Frequency Range</b> .....	940-960 MHz standard Other frequencies available on request.
<b>Frequency Response</b> .....	Program: $\pm 0.2$ dB or better, 30 Hz to 15 kHz. MUX: $\pm 3$ dB, 50 Hz to 5 kHz.
<b>Distortion (THD &amp; IMD)</b> .....	0.2% or less at 1 kHz.
<b>Signal-to-Noise Ratio</b> .....	65 dB or better below 100% modulation, de-emphasized.

## TRANSMITTER/8600

<b>RF Power Output</b> .....	6 Watts.
<b>RF Output Connector</b> .....	Type N Female, 50 ohms.
<b>Deviation for 100% Program Modulation</b> .....	$\pm 22$ kHz.
<b>Deviation for 100% Subcarrier Modulation</b> .....	$\pm 3$ kHz.
<b>Subcarrier Injection into Main Carrier</b> .....	$\pm 3$ kHz.
<b>Frequency Stability</b> .....	Better than .0001%, 0° C to 50° C.
<b>Spurious and Harmonic Emission</b> .....	60 dB or more below carrier level.
<b>Modulation Capability</b> .....	One monaural program and one subcarrier (built-in or external).
<b>Modulation Inputs</b> .....	Program: 1.24 VRMS for 100% modulation, 3k ohms, balanced and unbalanced, BNC and terminal strip.  MUX audio: 0.775 VRMS for 100% modulation of internal subcarrier generator, 1k ohms.  External Subcarrier: 0.53 VRMS for 100% injection, 10k ohms.
<b>Power Source</b> .....	115/230 VAC, $\pm 10\%$ , 50/60 Hz, 75 Watts. 12 VDC optional.
<b>Monitoring Capability</b> .....	One 2½" analog meter for monitor- ing forward and reflected RF power, power supply current, multiplex and program modula- tion, and VCO bias.

## RECEIVER/8601

<b>RF Input Connector</b> .....	Type N Female, 50 ohm.
<b>Sensitivity</b> .....	14 microvolts required for 55 dB SNR, de-emphasized. 100 micro- volts for 65 dB SNR, de-emphasized.
<b>Selectivity (6 dB BW)</b> .....	125 kHz maximum.
<b>(40 dB BW)</b> .....	300 kHz maximum.

Contents subject to change without notice.

<b>Modulation Outputs</b> .....	Program: 1.24 VRMS, 600 ohm balanced and unbalanced, BNC and terminal strip.  Multiplex Subcarrier: 0.53 VRMS, 75 ohm BNC.  Multiplex Audio: 0.775 VRMS, 600 ohms, unbalanced.
<b>Power Source</b> .....	115/230 VAC $\pm 10\%$ , 50/60 Hz, 10 Watts. 12 VDC optional.
<b>Monitoring Capability</b> .....	One 2½" analog meter for monitor- ing power supply, 1 to 120% modu- lation for program and multiplex channels, RF input level, and VCO bias.
<b>Dimensions and Weight</b> .....	8600: 3½" x 19" x 1½" (14 lbs. net). 8601: 3½" x 19½" x 1½" (7 lbs. net).  Dual receivers occupy 19" width. Single receiver includes hardware to extend width to 19".

## Transmitter Combiner, TFT Part Number 7100-4145

<b>Frequency Range</b> .....	950 MHz band.
<b>Impedance</b> .....	50 ohms.
<b>Isolation</b> Transmitter to Transmitter .....	Greater than 80 dB.
Antenna to Transmitter .....	Greater than 45 dB.
<b>Insertion Loss</b> .....	3.5 dB.
<b>Attenuation, Harmonic and IM Products</b> .....	30 dB.
<b>Input Power, Each Channel</b> .....	25 Watts.
<b>Input VSWR, Ref. 50 Ohms</b> .....	1.25:1.
<b>Frequency Separation, Transmitter to Transmitter</b> .....	2MHz maximum.
<b>Temperature Range</b> .....	-30° C to +60° C.
<b>Connector Type</b> .....	N Female.
<b>Dimensions and Weight</b> .....	19" x 3½" x 3½" 4 lbs., net.

## Receiver Splitter, TFT Part Number 3500-0021

<b>Insertion Loss</b> .....	3.2 dB.
<b>Impedance</b> .....	50 ohms.
<b>VSWR</b> .....	1.3:1.
<b>Isolation</b> .....	20 dB.
<b>Connector Type</b> .....	N Female.
<b>Dimensions and Weight</b> .....	1½" x 1¼" x 3½" 4.5 oz., net.



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## TV STL Composite Subcarrier System

### FEATURES & BENEFITS

- Designed specifically for MTS/BTSC Stereo transmission; transparent to the Composite Baseband signal.
- Transmits entire Composite Signal on a single Subcarrier above Video; frees-up one to three Subcarriers.
- Keeps all BTSC equipment at the studio; eliminates maintenance trips to the transmitter site.
- Saves on BTSC equipment costs; no duplication of generators and audio processors for Multi-Point TV sites.
- Automatic Modulation Control (AMC) maintains precise modulation levels for best BTSC stereo separation.
- Loop-thru connection; compatible with today's video microwave equipment.
- 700 kHz Subcarrier spacing; compatible with conventional microwave subcarrier systems.

### GENERAL DESCRIPTION

The 8500 Series is a composite subcarrier system consisting of an ultralinear wideband subcarrier generator, Model 8500 and its companion demodulator, Model 8501. The system transmits the entire BTSC composite baseband—Stereo, SAP and Professional Channel—from the studio to the transmitter site using only one microwave subcarrier frequency. This subcarrier, centered between 4.5 MHz and 10 MHz, modulates the video microwave STL in conjunction with the video signal and existing subcarriers.

Conventional monaural subcarrier system can only accept a single 15 kHz audio channel; thus, up to four separate monaural subcarrier generators and demodulators are needed to convey the Left, Right, SAP and Professional channels. This transmission method also inhibits convenient access for routine adjustments because it requires that the BTSC generators and associated audio processing equipment be located at the transmitter site.

### KEEP BTSC STEREO EQUIPMENT AT THE STUDIO

The TFT 8500 system approach allows the BTSC composite signal to be generated at the studio.

(continued—over)



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This signal remains in composite form and is transparent from the output of the BTSC generators to the input of the aural transmitter. The only remaining influence—amplitude variation of the composite signal itself due to the video STL link—is eliminated by a digital Automatic Modulation Control (AMC) circuit in the Model 8501 Subcarrier Demodulator. Other “wide-band” systems derived from conventional subcarrier systems lack this crucial feature and thus cannot maintain optimum stereo separation performance.

## **COMPOSITE OFFERS HIGH-PERFORMANCE, RELIABILITY, AND CONVENIENCE**

The success of transmitting an entire high-quality FM stereo composite signal on one subcarrier has been demonstrated by its frequent use and reliable performance for over 20 years in radio broadcasting. These same benefits of superior performance, reliability and convenience are now available for TV audio.

## **COMPATIBLE WITH EXISTING VIDEO STL SYSTEMS**

The generous bandwidth of video microwave STL and the wide spacing of the commonly-used subcarrier frequencies easily accommodate the composite 8500 system. The wideband signal “fits” in the 700 kHz subcarrier space normally occupied by ordinary monaural subcarrier systems without interference or sacrifice in performance.

## **IDEAL FOR MULTI-POINT SYSTEMS**

In a multi-point microwave system where the BTSC transmission format is used, a single set of BTSC generators is all that is needed at the head-end to drive the entire system.

At each receive site, only the Model 8501 is required; redundant (and expensive) additional generators and audio processing equipment is unnecessary before final broadcast.

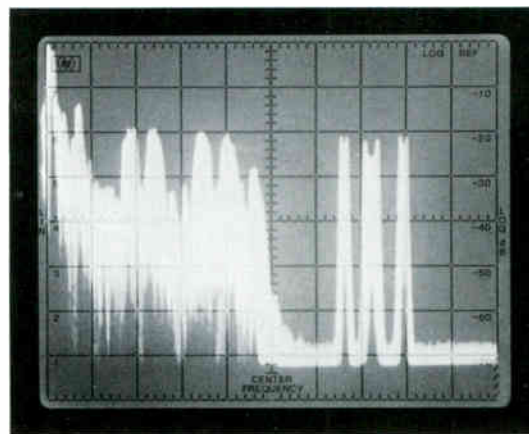
## **8500 COMPOSITE SUBCARRIER GENERATOR**

The 8500 Composite Subcarrier Generator includes separate inputs to combine any or all the outputs from a BTSC generator, SAP Generator and Professional Channel Generator—or a source of composite signal where the signals are already combined. The 8500 output is a single FM subcarrier in the range of 4.5 MHz to 10 MHz. Separate controls adjust the level of each input; an output level control is also provided. The subcarrier loop-thru configuration facilitates connection to most popular video STL's and their subcarrier generators. A test meter with selectable functions aids in set-up and diagnostics. A rear-panel alarm output is provided for loss-of-modulation or subcarrier.

## **8501 COMPOSITE SUBCARRIER DEMODULATOR**

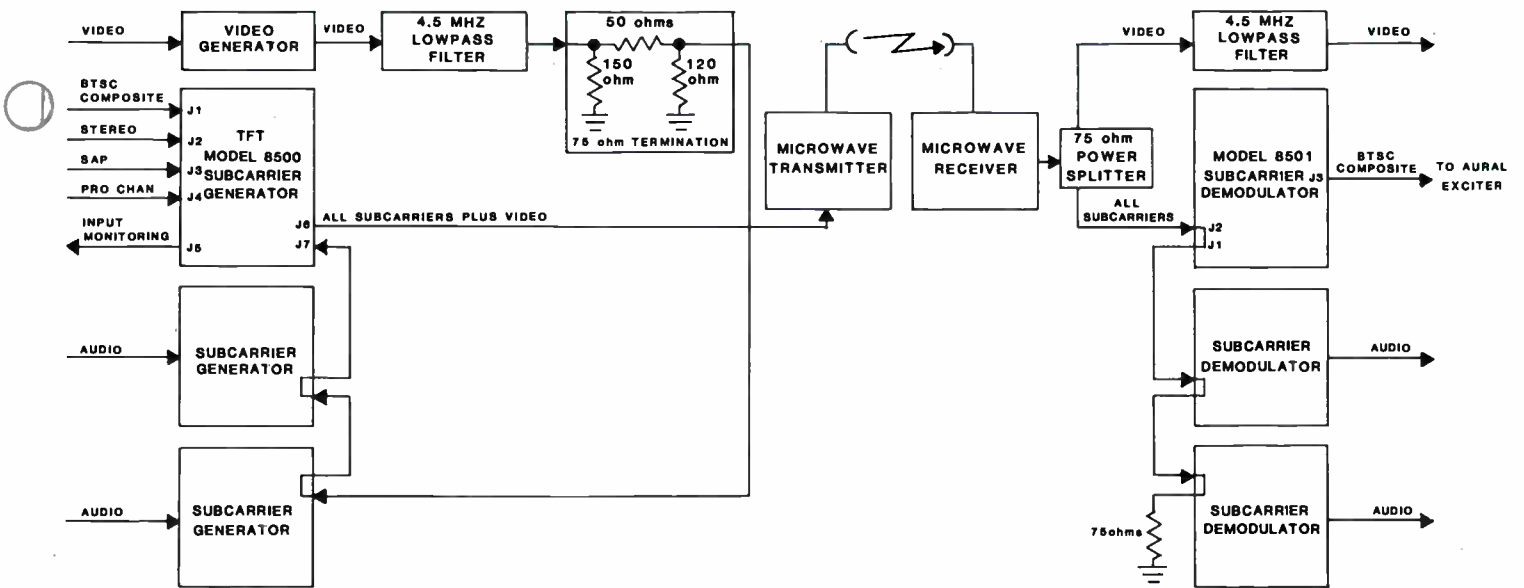
The Model 8501 Composite Subcarrier Demodulator derives the BTSC composite baseband signal from the video microwave receiver's subcarrier output to directly feed the aural exciter input. A digital Automatic Modulation Control (AMC) circuit provides a constant modulation level to the aural exciter. Any level variations of the composite signal due to modulation, demodulation, component aging, or temperature changes in the associated STL equipment are automatically corrected by the AMC circuit.

Set-up is accomplished from the front panel or by remote control via the rear panel connectors. The set-up is retained in non-volatile memory and is unaffected by power interruptions. Both input and output level controls are provided; the input is made via a convenient subcarrier loop-thru connection. A test meter with selectable functions aids in set-up and diagnostics and a rear-panel alarm output is provided for loss-of-modulation or subcarrier.



Multi-burst video and the modulated subcarriers at 6.2 MHz, 6.8 MHz and 7.5 MHz. 6.8 MHz is the composite subcarrier.

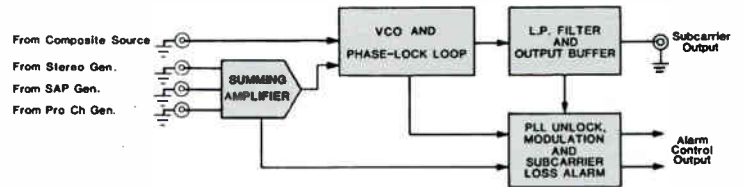
# TV STL Composite Subcarrier System



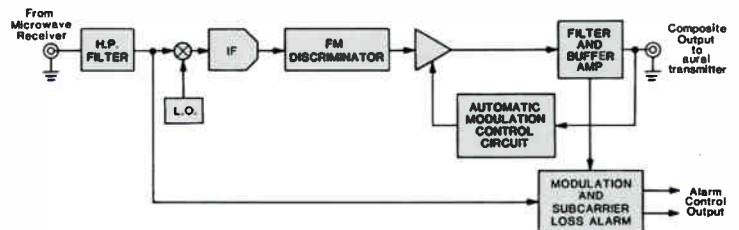
8500 System Connection for Microwave transmission into a combined Video and Subcarrier Input.



Model 8500 Composite Subcarrier Generator Block Diagram



Model 8501 Composite Subcarrier Demodulator Block Diagram



## SYSTEM

<b>Subcarrier Frequencies</b> .....	4.5, 6.2, 6.8 or 7.5 MHz standard; others between 4.5 MHz and 10 MHz available on special order.
<b>Frequency Accuracy &amp; Stability</b> .....	± 0.01% of center frequency, phase-locked to an internal crystal oscillator.
<b>Type of Modulation</b> .....	Direct FM, ± 150 kHz deviation.
<b>Stereo Separation</b> .....	45 dB from 50 Hz to 15 kHz 50 dB from 100 Hz to 10 kHz
<b>Signal-to-Noise Ratio:</b>	
<b>Stereo Channel</b> .....	70 dB (de-emphasized)
<b>SAP Channel</b> .....	55 dB (de-emphasized)
<b>Professional Channel</b> .....	40 dB (3 kHz bandwidth)
<b>Baseband Frequency Response</b> .....	± 0.2 dB, 50 Hz to 50 kHz ± 1.0 dB, 50 kHz to 120 kHz
<b>Total Harmonic Distortion (THD)</b> .....	0.2% 1 kHz (de-emphasized)

## MODEL 8500 SUBCARRIER GENERATOR

<b>Input Requirements:</b>	
<b>Composite Signal</b> .....	1.0 VRMS for ± 150 kHz deviation.
<b>Stereo Channel</b> .....	1.0 VRMS for ± 113 kHz deviation.
<b>SAP Channel</b> .....	1.0 VRMS for ± 30.8 kHz deviation.
<b>Professional Channel</b> .....	1.0 VRMS for ± 6.2 kHz deviation.
<b>Input Impedances</b> .....	75 ohms, BNC.
<b>Subcarrier Output</b> .....	20 mV to 150 mV p-p variable into 75 ohms load, preset at the factory to 100 mV.
<b>Output Impedance</b> .....	1.5 k ohms, BNC Loop-thru, bridging.
<b>Controls</b> .....	Input Levels, Subcarrier Output Level.
<b>Indicators</b> .....	Loss-of-Modulation, Loss-of-Subcarrier and PLL Unlock LED's.

### Metering

<b>Composite Modulation</b> .....	100% = ± 150 kHz deviation
<b>Stereo Channel Modulation</b> .....	100% = ± 113 kHz deviation
<b>SAP Channel Modulation</b> .....	100% = ± 30.8 kHz deviation
<b>Professional Channel Modulation</b> .....	100% = ± 6.2 kHz deviation
<b>Subcarrier Output Level</b> .....	100% = 100 mV p-p
<b>Phase-Lock Loop</b> .....	PLL Control Voltage

## MODEL 8501 SUBCARRIER DEMODULATOR

<b>Input</b> .....	20 mV to 500 mV p-p, 1 k ohms bridging, BNC, loop-thru.
<b>Composite Output Level</b> .....	1 VRMS for ± 150 kHz deviation, + 6 dB to - 12 dB adjustable range, across 75 ohms, BNC.
<b>Automatic Modulation Control (AMC)</b> .....	An automatic level control circuit to maintain composite signal level to the TV aural exciter within ± 0.5% when the variation in the composite level to the microwave link varies up to ± 10%.
<b>Metering</b> .....	Input Level, Output Level and Automatic Modulation Control Voltage Level.
<b>Controls</b> .....	Input Level, Output Level and Automatic Modulation Control Adjustment (local and remote access).
<b>Indicators</b> .....	Automatic Modulation Control Defeat and Subcarrier & Modulation Alarms.

## MECHANICAL AND ENVIRONMENTAL (Models 8500 & 8501)

<b>Operating Temperature</b> .....	0°C to 50°C
<b>Size and Net Weight</b> .....	19" (48.6 cm) Wide × 1.75" (4.4 cm) High × 12" (30.4 cm) Deep; 10 lbs (4.5 kg) net.
<b>Input Power</b> .....	115/230 VAC, ± 10%, 50-400 Hz, 25 watts maximum.

## ORDERING GUIDE

TFT Model 8500 Television Microwave Subcarrier Generator, P/N 5116-8500.  
 TFT Model 8501 Television Microwave Subcarrier Demodulator, P/N 5116-8501  
 Please specify the desired subcarrier frequency: 4.5, 6.2, 6.8 or 7.5 MHz standard; others available between 4.5 MHz and 10 MHz on special order.

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# SCRAP LEFT & RIGHT. LISTEN TO YOUR PEERS.

**KHON—Honolulu, Hawaii**  
**Mr. Bill Hayes, Chief Engineer**

"... we can now feed the cable system directly from the studios with a fully encoded BTSC signal. . . . for a very low cost we'll be able to convert the Maui transmitter to stereo. . . . We have *excellent phase response* throughout the broadcast chain . . . the aural quality is superior to what we were using before."



**KUTV—Salt Lake City, Utah**  
**Mr. Reid Carpenter, Chief Engineer**

"... it's much easier to get everything right at the source with the 8500 system. It's *very stable*; the *AMC circuit works very well*. It's proven itself to be *true to TFT's specs*. . . ."

**WTMV—Lakeland, Florida**  
**Mr. Bill Brister, Chief Engineer**

"I've been using it for approximately one year now and *I think it's great!* I can get to it easily because it's in the studio; I can set levels and not worry about the signal quality at the transmitter."



**WYFF—Greenville, South Carolina**  
**Mr. Mike LaBoone, Chief Engineer**

"I like the idea of having the control here; *audio processing belongs at the studio*, not the transmitter. The 8500 system freed-up 2 other subcarriers for me; one is for mono standby while the other is for remote. My recent tests have shown that *the only thing better is a straight wire.*"

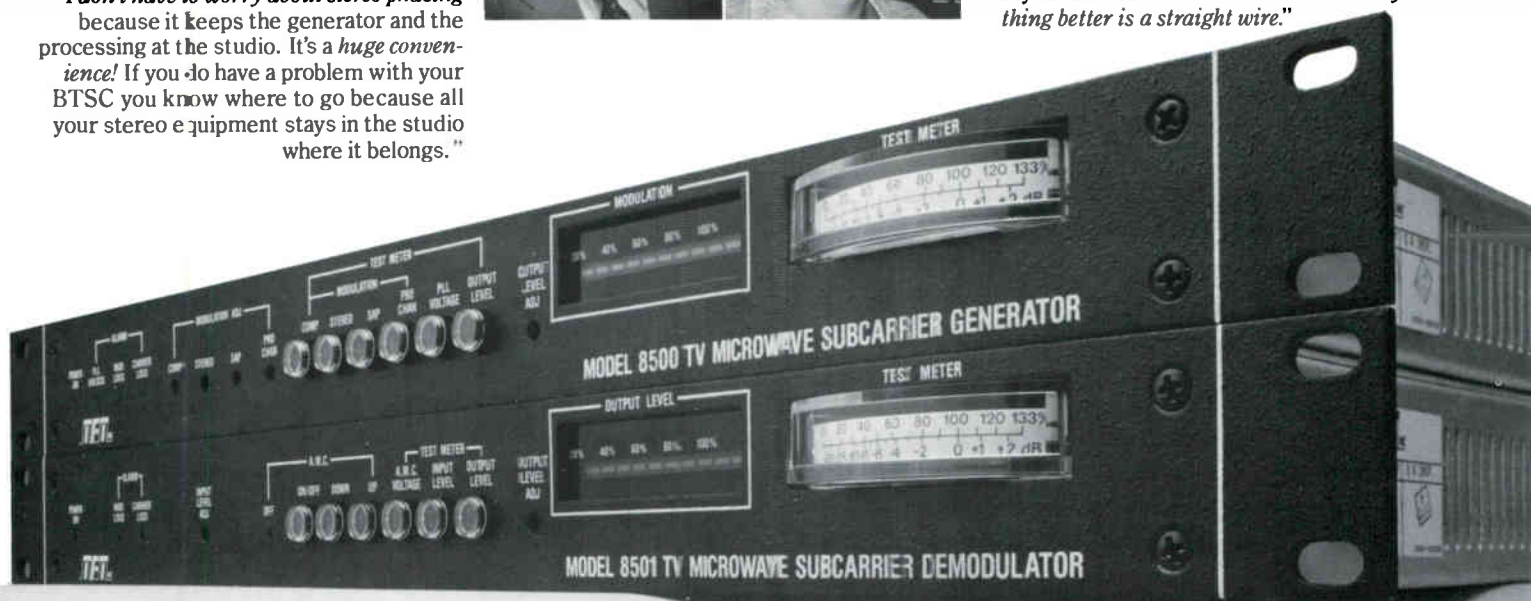


**KTGF—Great Falls, Montana**  
**Mr. Roy Dasher, Chief Engineer**

"I'm very satisfied with the quality. It also frees-up the internal subcarrier channels on the existing system; one for control, the other two are for future use. I'm also able to *feed a microwave link to the cable head* without problems."

**KXTV—Sacramento, California**  
**Mr. Rod Robinson, Chief Engineer**

"It's *transparent*, with no problems at all; *I don't have to worry about stereo phasing* because it keeps the generator and the processing at the studio. It's a *huge convenience!* If you do have a problem with your BTSC you know where to go because all your stereo equipment stays in the studio where it belongs."



These candid comments were compiled from an extensive list of satisfied TFT Model 8500 Series TV STL Composite Subcarrier System users.

For full technical information on the 8500 Series System and our comprehensive line of precision BTSC Monitoring equipment please contact us or your favorite TFT dealer.

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P.O. Box 58088  
3090 Oakmead Village Drive  
Santa Clara, California 95052-8088  
Tel: (408) 727-7272 Telex: 910-338-0584  
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## FM SCA Monitor

### FEATURES

- Multiple Subcarrier Capability
- Full Monitoring and Measurement Capability
- Built-in Modulation Calibrator
- Optional RF Pre-Selector
- Optional Service Channels for continuous signal monitoring information

### GENERAL DESCRIPTION

To accommodate today's multi-channel SCA operations, the 845 FM SCA Monitor is designed to handle up to three (3) user-specified FM-subcarrier frequencies, selectable from the front panel.

Applications include: Independent off-air SCA Monitoring, SCA Proof-of-Performance measurements, and checking the specifications of a subcarrier generator.

In addition, one or two optional Service Channel plug-in boards provide uninterrupted SCA program or data output(s) separate from the monitor portion of the 845.

The 845 will allow you to maintain high quality FM broadcasting while providing the capability to check the quality of your SCA broadcast. With the optional Service Channel plug-in board the 845 provides uninterrupted subcarrier output and demodulated signal of the subcarriers. A Loss-of-Modulation alarm is also provided with this option.

### INDEPENDENT OFF-AIR SCA MONITOR

An optional RF Module allows the Model 845 to be used as a stand-alone off-air SCA Monitor. The RF Module consists of a crystal-controlled, single channel RF pre-selector and high-quality FM demodulator circuit. The output of the FM

demodulator feeds the input of the Model 845 when this option is ordered.

### FREQUENCY-SYNTHESIZED TYPE MODULATION CALIBRATOR

A frequency-synthesized type FM modulation calibrator is built-in for calibration of the modulation meter and peak flashers. The highest stability and accuracy are determined by crystal oscillators which remain stable regardless of temperature or age. No external equipment is required to use the modulation calibrator. Accuracy exceeds 1.0%, year-after-year. This feature eliminates the need for Bessell null calibration.

### ACCURATE PEAK MODULATION DETECTION—P.M.D.D.™

The 845 features an exclusive Peak Modulation Duration Differentiator (P.M.D.D.™). This feature is incorporated into a peak modulation detecting circuit to identify true modulation peaks and separate them from other peaks caused by transient noise, overshoot and multipath distortion.

### ADJUSTABLE PEAK MODULATION FLASHERS

Dual LED Peak Modulation Flashers may be digitally set in 1.0% steps over a broad range: 50% to 199% modulation (simultaneous positive and negative modulation). A thumbwheel switch eliminates the ambiguity and imprecision of potentiometer type controls.

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## BUILT-IN VOLTMETER & ATTENUATOR

For low-level modulation and noise measurements, a switchable 50 dB attenuator is built-in (in 10 dB steps) to perform a complete Proof. The only other equipment you need is a distortion analyzer and an audio generator.

### OPTIONS

#### Model 805 Remote Metering Panel

This rack mount panel (19") duplicates the peak flashers and meters on the 845's front panel. 50 feet of cable is provided.

TFT Part Number: 5116-0805.

#### Option 01

An RF Pre-selector and FM Demodulator module allows use of the 845 as a stand-alone monitor/receiver for off-air monitoring of SCA channels. RF input sensitivity is better than 20  $\mu$ v.

TFT Part Number: 7100-3880.

### Option 02

#### OPTIONAL SERVICE CHANNELS

The Model 845 can be augmented with one or two optional plug-in Service Channels. These provide SCA data quality demodulated audio (independent of the operation of the channel selector of the monitor). This permits uninterrupted audio or data output. For example, this feature will allow remote control telemetry information on one of the subcarriers to pass through when checking the performance of other SCA channels without interruption to the others.

### ORDERING INFORMATION

#### Model 845 FM-SCA Subcarrier Modulation Monitor

Optional Factory installed and tested RF Pre-Selector and FM Demodulator Assembly: TFT Part No. 6608-3573, specify RF frequency.

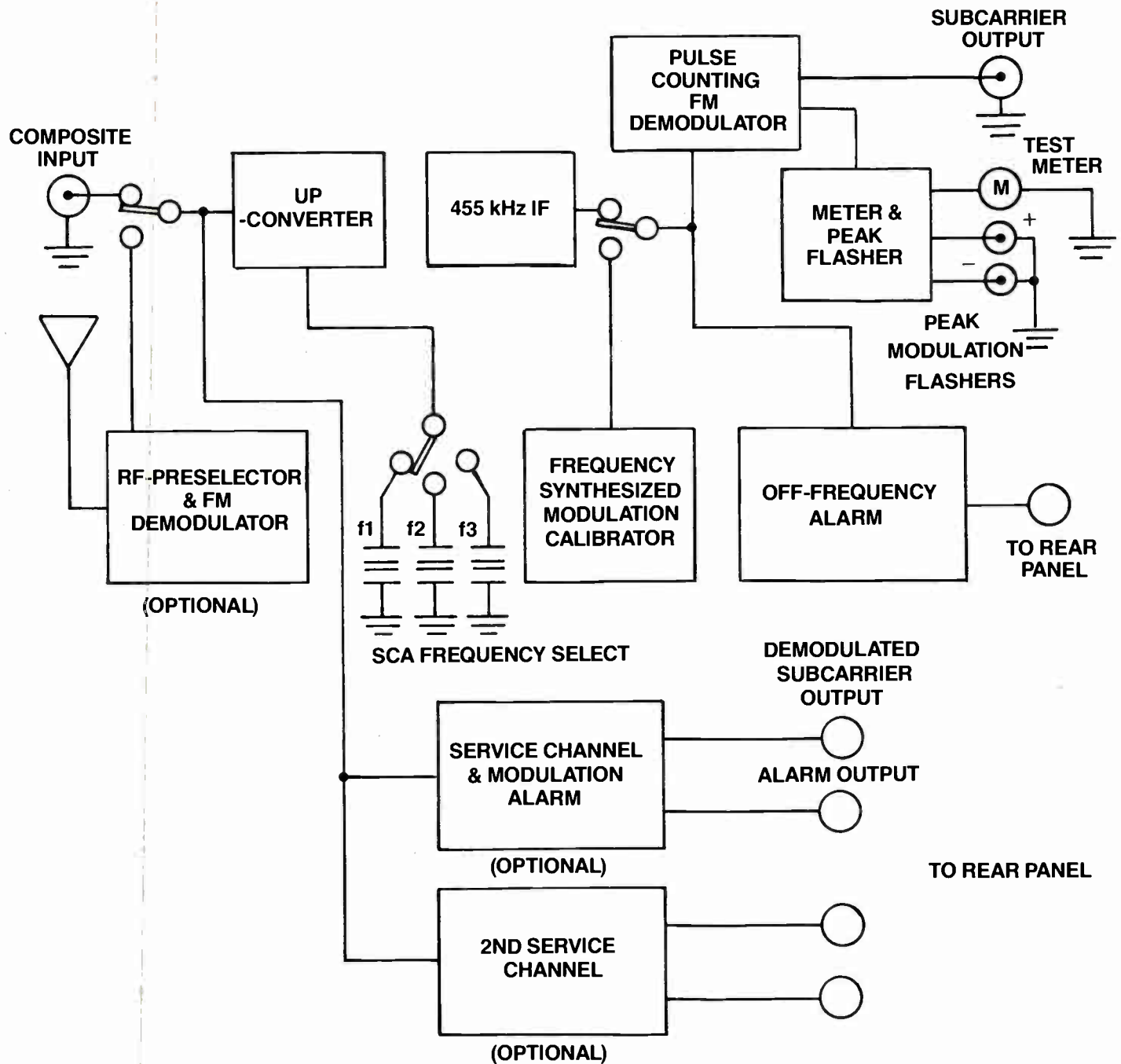
Optional Service Channel Plug-in Board: TFT Part No. 6608-3572, specify FM-subcarrier frequency.



Model 845 shown with companion Model 844 Baseboard/Stereo Modulation Monitor. See separate brochure for Model 844.

# FM SCA Monitor

MODEL 845 SUBCARRIER MODULATION MONITOR  
BLOCK DIAGRAM





# SPECIFICATIONS

## INPUT, COMPOSITE BASEBAND

Input Signal	Composite or single subcarrier selectable from front panel switch.
Signal Level, Connector	1.0 V, 600 ohms unbalanced, BNC.
Frequency Range	49 kHz to 125 kHz.
Subcarrier Frequencies	Three crystal-controlled frequencies selectable from front panel switch, 67 kHz supplied standard.

## METER MEASUREMENTS

Meter range	0 to 133%, and dB scale.
Meter characteristics	3½" illuminated scale.
Meter attenuator range	50 dB in 10 dB steps, pushbutton selectable.
Total Modulation Measurement:	
100% modulation	± 75 kHz
Modulation Accuracy	± 4%
Injection Accuracy	± 0.5%, 5% to 30% injection level.
SCA Subchannel Measurement:	
100% modulation	± 4kHz or ± 6kHz, pushbutton selectable.
Modulation accuracy (100% modulation, 1 kHz tone)	± 2%.
Audio Frequency Response:	

Composite input (bandpass filter in)	± 2.0 dB, 40 Hz to 6.0 kHz or ± 3.0 dB, 20 Hz to 7.5 kHz.
*Subcarrier input (bandpass filter out)	± 0.5 dB, 20 Hz to 7.5 kHz.

## INTERNAL CROSSTALK

\*Main to SCA; Stereo to SCA; and SCA to Main - 66 dB.

\*Wideband input measurement.

## SCA PEAK MODULATION INDICATORS

Variable Peak Indicators	Positive and negative modulation LED flashers, peak limit set by thumbwheel switches in 1.0% increments from 50% to 199%.
Accuracy	± 1.0%

## SCA MODULATION AND INJECTION LEVEL CALIBRATOR

Built-in modulation and injection level calibrator for calibrating modulation meter and the peak flashers from the front panel. Accuracy: ± 1.0%.

Contents subject to change without notice.

## SUBCARRIER FREQUENCY MEASUREMENT

SCA carriers	Available on front panel for external frequency counter.
Off-frequency Indicator	LED on when SCA carrier frequency is ± 500 Hz off.

## OUTPUTS

SCA subcarrier	500 mV, into 5K ohms (front panel).
Audio (with 150 μsec de-emphasis)	2 VRMS, 600 ohms balanced at 400 Hz, 100% modulation, follows subchannel selected by front panel switch.
*Audio Distortion	0.5% at ± 6 kHz.
*Signal-to-noise	66 dB with de-emphasis.
*Single subcarrier input only, measurement made without bandpass filter.	

## OUTPUTS, OPTIONAL SERVICE CHANNEL

Audio	2 VRMS, 600 ohms unbalanced at 400 Hz, 100% modulation.
Audio Distortion	3.0% maximum.
Signal-to-Noise ratio	50 dB with de-emphasis.
Loss of Modulation	Relay contact closures.

## OUTPUTS, FRONT AND REAR PANEL

Audio (without de-emphasis)	2 V RMS, 600 ohms unbalanced at 100% modulation, follows subchannel selected by front panel switch.
Remote meter and flashers	For Model 805 remote meter and flasher panel.
Connectors	BNC on front panel, terminal block on rear panel.

## MECHANICAL AND ENVIRONMENTAL

Input power	115/230 VAC, ± 10%; 50 to 400 Hz, 40 watts maximum.
Operating Temperature	0°C to 50°C (32°F to 122°F).
Size	3½" (8.89 cm) high × 19" (48.26 cm) wide × 14.75" (37.47 cm) deep
Net weight	Approximately 9.5 pounds (4.3 kg)
Shipping Weight	Approximately 12.5 pounds (5.6 kg)

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3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088  
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## BTSC TV SAP/Pro Channel Monitor

### FEATURES

- Independent SAP and Professional Channel Sections
- Separate Meters for Modulation and Injection
- Off-Frequency LED Indicators
- Selectable Operating Modes:
  - Switchable bandpass filter for operation with sub-carriers individually (when performing a Proof) or with entire composite signal.
  - Switchable dbx\* decoder or 75 μsec de-emphasis, or flat response (15 kHz bandwidth) in SAP Channel.
  - Switchable de-emphasis (150 μsec de-emphasis or flat, 6 kHz bandwidth, in Pro Channel for data or voice applications.
- Peak Modulation Flashers with Thumbwheel Switch Presets.
- Built-in Frequency-Synthesized Modulation Calibrator.
- Demodulated Signals available via Front Panel BNC.

### GENERAL DESCRIPTION

#### COMPLETE BTSC MONITORING/FULL COMPLIANCE WITH BTSC RECOMMENDED PRACTICES

The TFT Model 855 BTSC SAP and Pro Channel Modulation Monitor was designed for those broadcasters who utilize the Second Audio Program (SAP) and/or Professional Channel (Pro) as part of their BTSC broadcast signal. It is designed

\*dbx is a registered trademark of dbx, Corp.

to monitor and measure SAP and Pro Channel performance characteristics as defined by the EIA/BTSC System Multi-channel Television Sound Recommended Practices. It can also be used to check the performance of SAP/Pro generators.

The 855 can accept signals from any source of BTSC composite signal consisting of SAP/Pro—such as the feed from the TFT Models 850 or 851 BTSC stereo monitors or other wideband audio demodulator—or can accept signals from SAP and Pro generators directly.

The 855 incorporates independent SAP and Pro Channel sections. Each section includes separate modulation and injection meters and peak modulation flashers. Switchable modes permit extensive monitoring and measurement flexibility. A front panel BNC output provides convenient connection of monitored signals to ancillary test equipment, such as TFT's Model 860 Multifunction Audio Analyzer which plugs into the TFT 850/851 BTSC Stereo Modulation Monitors.

Positive and negative peak flashers with thumbwheel presets incorporate TFT's exclusive PMDD™ (Peak Modulation Duration Differentiator) circuitry to accurately register signal peaks.

Off-frequency LED's warn of carrier drift beyond  $\pm 500$  Hz.

The 855 incorporates a built-in synthesized type modulation calibrator to ensure monitor accuracy, year after year. Separate injection calibration trimmers aid in monitor set-up.

# SPECIFICATIONS

## INPUT

- Composite Audio** ..... 75 ohms unbalanced, 0.5 – 2.0 VRMS (from TFT Models 850 or 851, Tektronix 1450, etc.), BNC.
- Frequency Range** ..... 50 kHz to 125 kHz.

## METERS

- SAP Channel Modulation** ..... Meter ballistics meet BTSC requirements, 0–130% calibration.
- Pro Channel Modulation** ..... Same as above.
- SAP Channel Injection Error** ..... Zero center meter, calibrated in  $\pm$  30% error from BTSC standard of 15 kHz injection.
- Pro Channel Injection Error** ..... Same as above, except reference injection is 3 kHz.

## PEAK MODULATION INDICATORS

Four peak flasher LED's indicate plus or minus peaks simultaneously for SAP and Pro Channels. Peak limits set by thumbwheel switches in 1.0% increments from 0% to 199%. Accuracy,  $\pm$  1.0%.

## MODULATION LEVEL CALBRATOR

Built-in frequency-synthesized type calibrator for meter and peak flasher calibration (100% modulation) from the front panel. Accuracy,  $\pm$  1.0%.

## OUTPUTS

### Front Panel BNC

- SAP Carrier** ..... 260 mV into 5k ohms, for external frequency counter, etc.
- Pro Channel Carrier** ..... Same as above.
- Composite Input** ..... Buffered input signal; approx. 1.5 VRMS into 5k ohms.
- SAP Channel Modulation** 1.77 VRMS, 75 ohms unbalanced at 100% modulation, follows decoder/75  $\mu$ sec/flat pushbutton selection.
- Pro Channel Modulation** Same as above, follows 6 kHz flat/150  $\mu$ sec pushbutton selection.

### Rear Panel

- SAP Channel Audio** ..... 3.54 VRMS, balanced 600 ohms, rear panel barrier strip.
- Pro Channel Audio** ..... Same as above.

Contents subject to change without notice.

## ALARMS

- Separate alarm outputs for SAP and Pro Channels.**
- Off-Frequency** ..... + 12 VDC output when subcarrier is off-frequency by more than 500 Hz.
- Carrier Alarm** ..... Relay contact closure when subcarrier falls below muting level.
- Modulation Alarm** ..... Relay contact closure when modulation drops below 10% for more than 30 seconds.
- Remote Meter Panel** ..... Barrier strip terminals.

## SUBCARRIER MEASUREMENTS

- \*Frequency Response:**
- SAP Channel** ..... 30 Hz to 10 kHz,  $\pm$  0.5 dB
- Pro Channel** ..... 30 Hz to 3 kHz,  $\pm$  1.0 dB
- \*Distortion** ..... 0.5%
- \*Signal-to-noise Ratio:**
- SAP Channel** ..... 60 dB, de-emphasized
- 85 dB, with dbx decoding
- Pro Channel** ..... 55 dB, de-emphasized
- \*Crosstalk:**
- Stereo to SAP Channel** ... 60 dB
- Stereo to Pro Channel** ... 60 dB
- SAP to Stereo** ..... 66 dB
- Pro Channel to Stereo** ... 66 dB

\*Measurements taken using wideband mode.

## MECHANICAL & ENVIRONMENTAL

- Input Power** ..... 115/230  $\pm$  10% VAC, 50 to 400 Hz, 30 watts max.
- Operating Temperature** ..... 0° to 50° C (32° to 122° F)
- Size** ..... 5 1/4" (13.3 cm) High  $\times$  19" (48.3 cm) Wide  $\times$  14 3/4" (37.5 cm) Deep.
- Net Weight** ..... Approximately 11 pounds
- Shipping Weight** ..... Approximately 14 pounds.

## ORDERING GUIDE

- Model 855 SAP/Pro Modulation Monitor
- Option 01 (TFT Part Number 7100-4133) Remote Meter & Flasher Panel
- Option 02 (TFT Part Number 7100-4134) Spare Parts Kit

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## TV Frequency & Aural Modulation Monitor

### FEATURES

- Pretuned to any VHF or UHF Channel
- 250  $\mu$ volt Sensitivity
- Peak Modulation Flashers
- Off-Air Monitoring of Visual and Aural Carrier Frequencies
- Usable as a 6-Digit Precision Frequency Counter up to 10MHz
- Built-in Aural Modulation Calibrator
- Optional Loss-of-Modulation Alarm

### GENERAL DESCRIPTION

The Model 701 Monitor is designed and optimized for off-air monitoring of aural modulation of VHF and UHF TV transmitters without the need of an external RF amplifier. Adequate RF shielding of the circuitry is provided for accurate and reliable operation in a strong RF environment when the instrument is directly connected to the transmitter.

The RF input of the monitor consists of a narrow band coaxial filter, tuned to the desired frequency, and a double-balanced Schottky barrier diode mixer. As a result, intermodulation products generated in the instrument due to undesirable interfering signals are several orders of magnitude lower than in an RF amplifier front end.

The 701 measures visual, aural and intercarrier frequencies and displays the frequency errors on two separate displays. One of the two counters can be selected to display either aural carrier or intercarrier frequency error by a front panel switch. The internal frequency reference is provided by a 5 MHz crystal oscillator housed in a controlled oven which offers excellent long and short term frequency stability. Local

oscillators are frequency synthesized and therefore exhibit the same stability as the 5 MHz time base oscillator.

In addition to using a fast attack modulation meter, the 701 includes two peak flashers which display positive and negative peak modulation levels simultaneously. Thumb-wheel switches set the peak modulation level for the flashers in 1.0% increments from 50% to 199% and eliminate the ambiguity of conventional potentiometer type controls. A built-in frequency synthesized modulation calibrator allows the modulation meter and peak flashers to be checked and recalibrated at any time when the front panel pushbutton calibration switch is depressed.

The 701 can also be used as a precision audio demodulator for making Proof-of-Performance measurements of the aural transmitter.

### OPTIONS

#### Option 02

Frequency and Modulation Alarm. Off-Frequency Alarm is factory set at  $\pm 500$  Hz. Other settings are available if specified at time of ordering.

#### Option 03

SCA output to provide a filtered 39 kHz subcarrier for use in remote control operation.

#### Option 07

CCIR format for use in CCIR television systems.

#### Option 08

Spare Parts Kit

#### Model 704 Remote Meter and Flasher Panel

A rack mount panel (5 1/4"  $\times$  19") which duplicates the modulation meter and peak modulation flashers of the 701.



# SPECIFICATIONS

## RF INPUT

Frequency Range	Channels 2 through 83 (54-890 MHz).
Sensitivity	Approx 250 $\mu$ v; 60 dB automatic gain control range and 40 dB fixed attenuator for monitoring directly off transmitter.
Image Rejection	- 60 dB.
Spurious Response	- 80 dB.
Local Oscillator Radiation	Conforms to FCC requirements.
Input Impedance & Connector	75 ohms, BNC.

## AURAL MODULATION METER

Modulation Range	Meter reads full scale for 33.3 kHz deviation. Scale calibrated to 100% at 25 kHz deviation (50 kHz on CCIR Model), 133% at 33.3 kHz deviation. Also includes dB scale (0 dB = 100%).
Frequency Response	$\pm$ 0.2 dB, 50 Hz to 15 kHz.
Accuracy	$\pm$ 4.0% over entire scale for modulation frequencies between 50 Hz and 15 kHz.
Meter Characteristics	Peak-reading circuit.
Remote Metering	Output provided.

## AURAL MODULATION PEAK INDICATORS

Peak flasher lights indicate plus and minus peaks simultaneously. Peak levels are set by thumbwheel switches, in 1% increments from 50% to 129%.

Response Time	5 $\mu$ sec pulse having 1 $\mu$ sec rise and fall time.
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## MODULATION CALBRATOR

Built-in aural modulation calibrator indicates  $\pm$  100% modulation with  $\pm$  2% accuracy.

## OUTPUTS

Output Level	Two volts RMS minimum into 600 ohms at 100% modulation and 1 kHz. Distortion is 0.25% at 100% modulation. Residual noise is at least 65 dB below two volts RMS. 75 $\mu$ sec de-emphasis network provided.
39 kHz Output	One volt RMS into 600 ohms at 10% injection.

## AURAL & VISUAL FREQUENCY MEASUREMENT

Digital Display (LED)	Zero to $\pm$ 9.99 kHz in 10 or 1 Hz increments from assigned center frequency.
Accuracy:	
Channels 2 - 13	$\pm$ 500 Hz/18 months.
Channels 14 - 69	$\pm$ 500 Hz/6 months.
Frequency Standard:	
Internal	Uses a high precision, oven-controlled, 5 MHz crystal oscillator. One(1) MHz output is provided on the front panel for calibration against WWV or a precision frequency source.
External	5 MHz input connector on rear panel.

## INTERCARRIER FREQUENCY ERROR MEASUREMENT

Digital Display (LED)	Zero to $\pm$ 9.99 kHz in 10 or 1 Hz increments from 4.5 MHz.
Accuracy	$\pm$ 100 Hz/5 years.
Frequency Standard	Same as Aural & Visual Frequency Measurement.

## SIX-DIGIT FREQUENCY COUNTER

Frequency Range & Resolution	10 Hz to 10 MHz: $\pm$ 1 Hz.
Input Sensitivity & Impedance	200 mV to 2 volts RMS; 500 k Ohms. Shunted by 15 pF.
Display Accuracy	$\pm$ 1 count.
Time Base Aging Rate	$1 \times 10^{-8}$ /day.

## PHYSICAL & ENVIRONMENTAL

Size & Weight	19" W x 8 $\frac{3}{4}$ " H x 15" D; 22 lbs net. (includes rack mounting adapter)
Power	115/230 VAC, 50-400 Hz, 45 watts maximum.
Operating Temperature	0° C to 50° C.

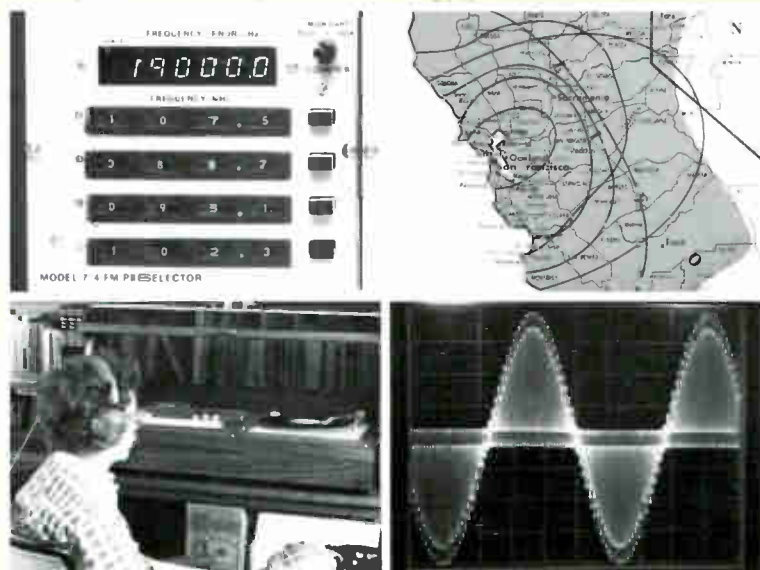
## ORDERING GUIDE

The 701 Monitor is fixed-tuned to your specified channel frequency by TFT. When ordering, please specify the channel number, carrier frequencies and frequency offsets, if any.

Today's **TFT** INC

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088  
(408) 727-7272  
TWX: 910-338-0584  
FAX: (408) 727-5942

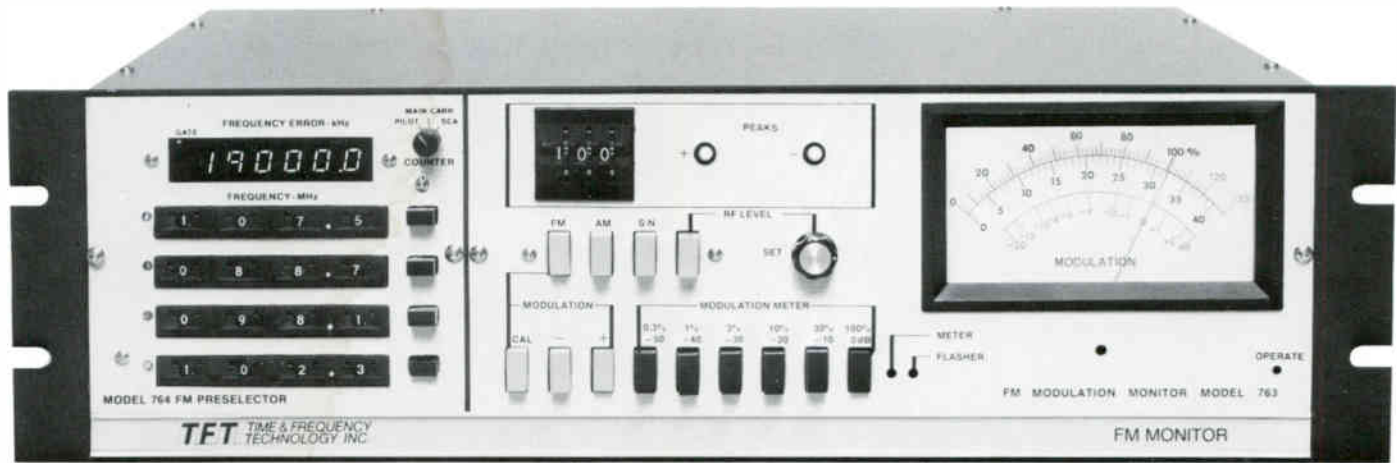
# The FM Modulation Extender from TFT



**An accurate modulation monitor with  
tuneable RF Preselector modules.**

- Maximum legal modulation with absolute confidence
- Fast, accurate competitive comparison
- Direct or off-the-air operation
- Improved coverage
- Full FCC compliance

**TFT** TIME & FREQUENCY  
TECHNOLOGY INC.



Model 763 FM Modulation Monitor with Model 764 tuneable RF Preselector option

## An Accurate Monitor for “No-Risk” High Modulation

To make your FM station worth listening to, you need more than a powerful transmitter. You also need all the modulation you're legally entitled to. Then you can deliver the "clean" sound your listeners expect, even in fringe areas you might now be losing. That's why TFT designed the Model 763 FM modulation monitor (FCC Type Approval No. 3-236). It's so precise, you can modulate your transmitter to the maximum legal limit in absolute confidence. Accuracy is better than 1%.

In addition, you get everything you need for complete proof-of-performance measurements (except distortion) right on the front panel. FCC-approved stereo and SCA monitor add-ons are also available. Plug-in options and accessories for the Model 763 are described on the back cover.

What's more, the Model 763 costs about the same as other monitors on the market while giving you convenience and flexibility that no other monitor can match. It's also adaptable to Automatic Transmission System (ATS) use.

### RF Preselector Expansion

Although the basic Model 763 is designed for direct transmitter connection, you can use it off-the-air by adding either of two, tuneable RF Preselector modules: Model 764 or Model 765. Both also give you the ability to quickly and accurately compare your modulation with that of competing stations.

### Model 764 Preselector

With this unit, you can pre-tune any four FM stations via thumbwheel switches. Then you can precisely monitor, off-the-air, the modulation and carrier frequency error of any one of the four. For convenience, one of them can be your own. Besides reading carrier frequency error, the 6-digit counter in the Model 764 can also be used to read Stereo Pilot Frequency and SCA subcarrier frequency when the Stereo and/or SCA monitors are used with the Model 763.

### Model 765 Preselector

The Model 765 has only one set of thumbwheel switches instead of four, and doesn't have frequency readout. Otherwise, it does the same thing as the Model 764. Carrier frequency can be checked by using a TCXO option and an external counter.

## PERFORMANCE FEATURES

### Digitally-Settable Peak Flasher

A digitally-settable peak flasher on the Model 763 (a TFT first) displays plus and minus modulation peaks simultaneously. This gives you quick, visual monitoring and catches peak modulation transients that are too fast for the meter. Flasher limits are adjustable from 30% to 150% in 1% increments. Limits are set by thumbwheel switches to eliminate the ambiguities of potentiometer-type controls.

Both the modulation meter and the peak flasher can be checked at any time by a built-in, pushbutton-activated modulation calibrator which uses frequency markers generated by the frequency synthesizers.

### Direct AM Measurements

An AM switch on the front panel of the Model 763 allows you to use the instrument for direct measurement of incidental and residual AM on your transmitted carrier. Measurements are read on the modulation meter with the AM switch pushed in.

### Built-In Voltmeter

For making complete proof-of-performance measurements, the Model 763 has a built-in 50 dB attenuator, with 10 dB steps. It allows you to make low-level modulation and noise measurements on the modulation meter. In fact, the only additional instrument you need, to perform a complete proof, is a distortion analyzer.

### Switchable De-Emphasis

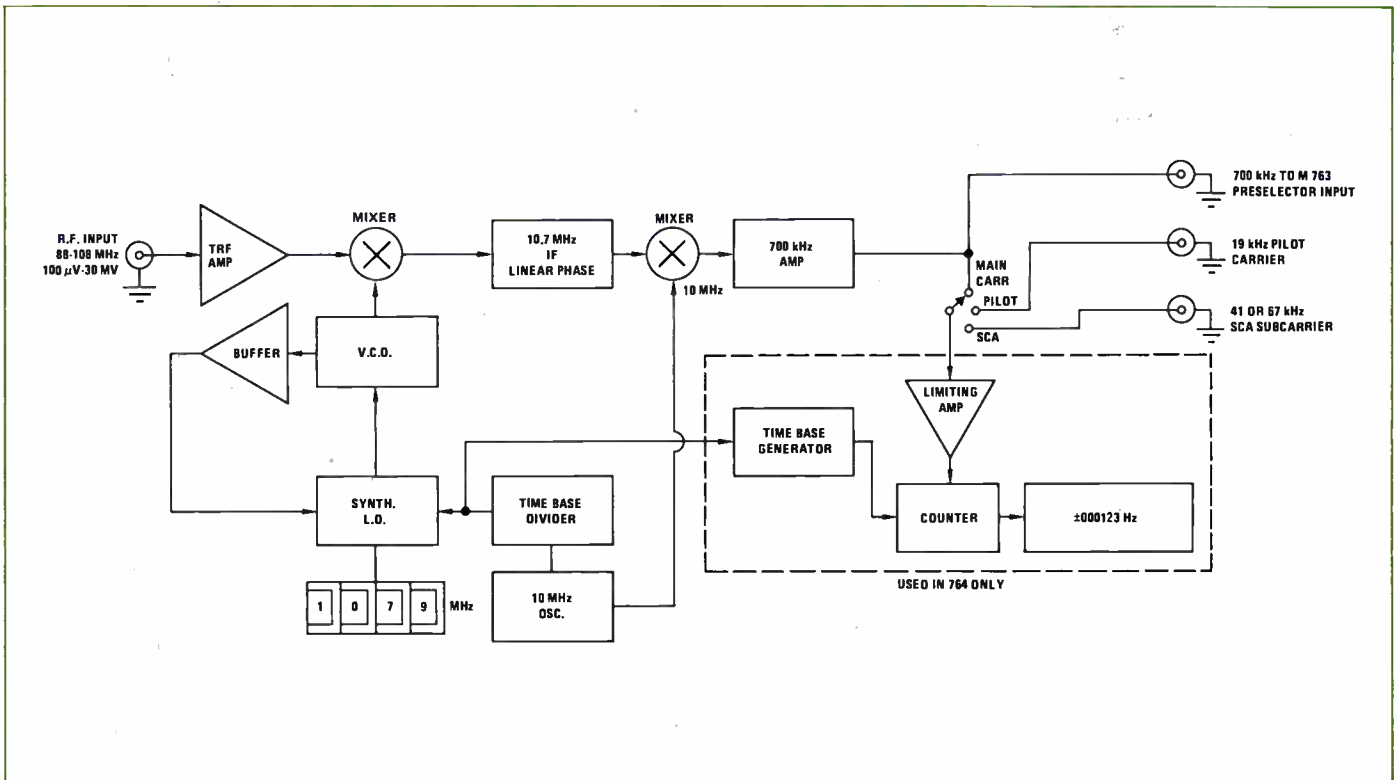
When the Model 763 is being used for AM or low-level noise and modulation measurement, a 75  $\mu$ sec de-emphasis circuit can be switched into the meter circuit (other time constants available on request). This is done by pushing the S/N switch on the Model 763 front panel.

### Plug-In-Options

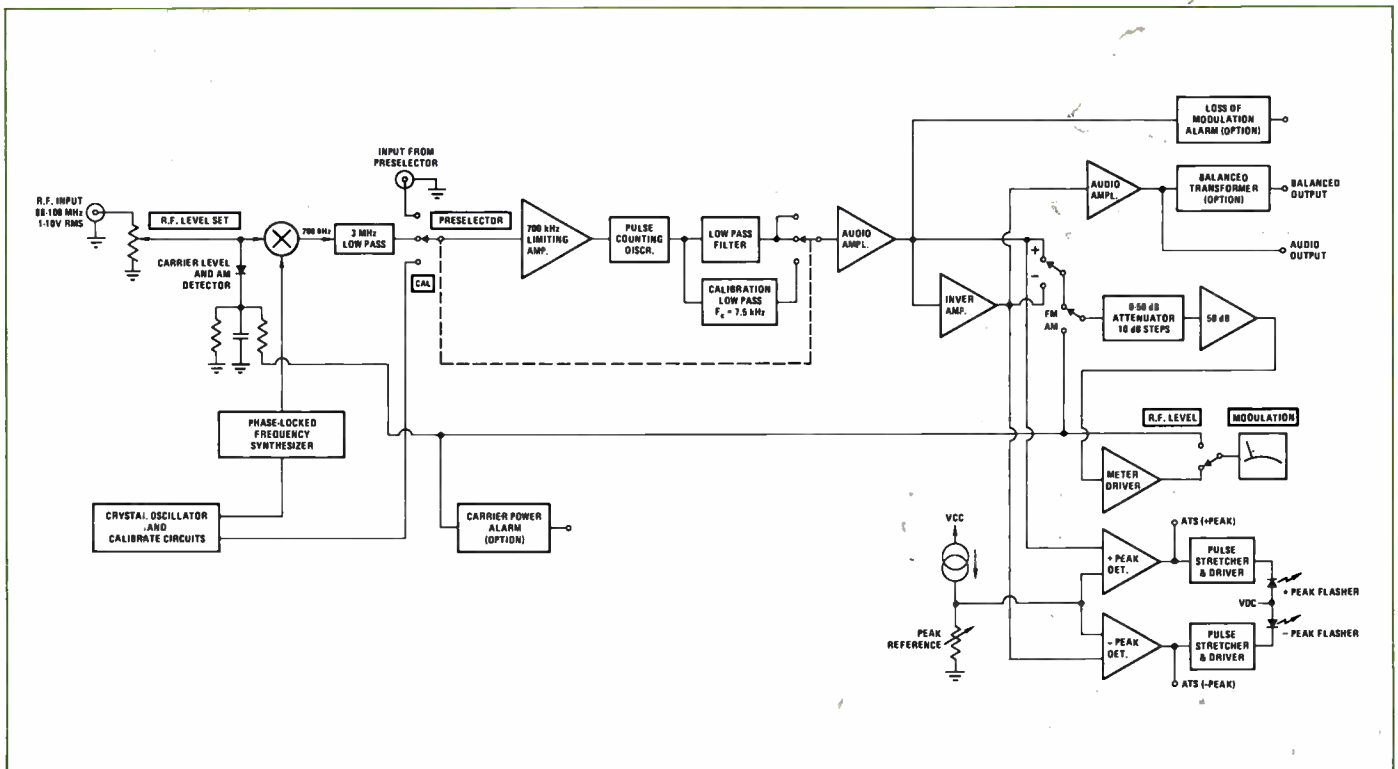
A choice of four options on separate, plug-in pc boards increases the versatility of the Model 763. These options, which can be added at any time, include: Carrier Power Alarms (either +5% and -10% or +10% and -20%), Modulation Level Alarm, and Balanced Audio Output or BCD output from the frequency counter in the Model 765.

### Accessories

Accessories for the Model 763 include a Remote Meter and Peak Flasher Panel, Model 704F. It duplicates the meter and peak flashers at remote locations and comes with 50 feet of cable. A WWV Receiver, Model 735, is also available for frequency calibration of the Model 764 Preselector against the standard NBS signals.

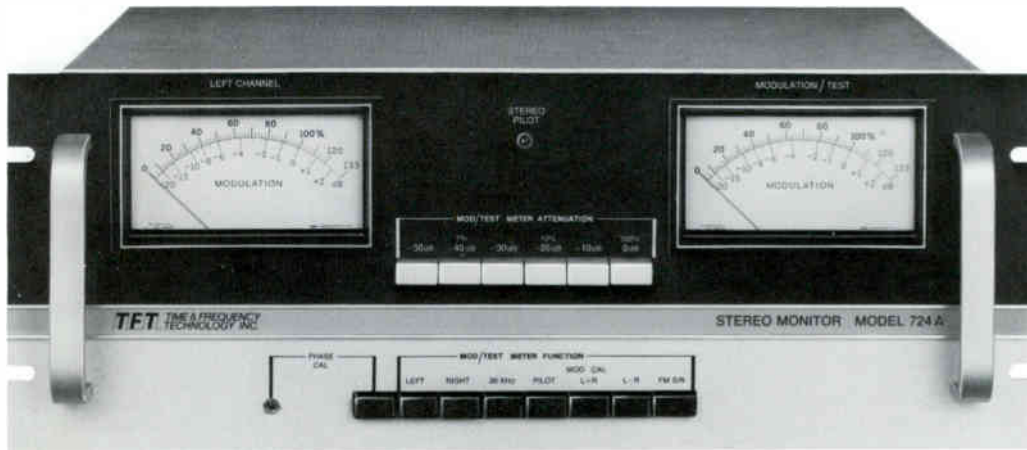


MODEL 764/765 BLOCK DIAGRAM



MODEL 763 BLOCK DIAGRAM





Model 724A Stereo Monitor (FCC Type Approval No. 3-237)

## ... plus PLL Stereo Monitor

The Model 724A, when combined with the Model 763, meets or exceeds all stereo monitoring and proof-of-performance measurement requirements (except distortion) specified by the FCC. When an SCA subcarrier is also used, a TFT Model 730A SCA monitor (see facing page) can be added to the Model 763.

### Complete Measurement Capability

With the Model 724A, you can make complete measurements of right channel modulation, left channel modulation, channel separation, cross talk between main and sub-channels, L+R, L-R, 38 kHz carrier suppression and 19 kHz injection level. These measurements are selected by front-panel push-buttons, and are read on the right hand Modulation/Test Meter. The front panel also includes a precision, 50 dB attenuator in 10 dB steps for measuring low level signals. It has six pushbutton-selectable ranges. In addition, the Model 724A has computer-designed filters in the measuring circuitry to ensure highly accurate separation and crosstalk measurements.

### PLL Demodulator

The Model 724A provides superior separation measurements by using a phase-locked loop (PLL) to regenerate the 38 kHz suppressed carrier from the 19 kHz pilot carrier. This technique ensures precise accuracy and long-term stability for the phase relationship between the two signals, and eliminates the need for phase alignments of the two signals when accurate separation measurements are to be made.

### Simultaneous L and R Monitoring

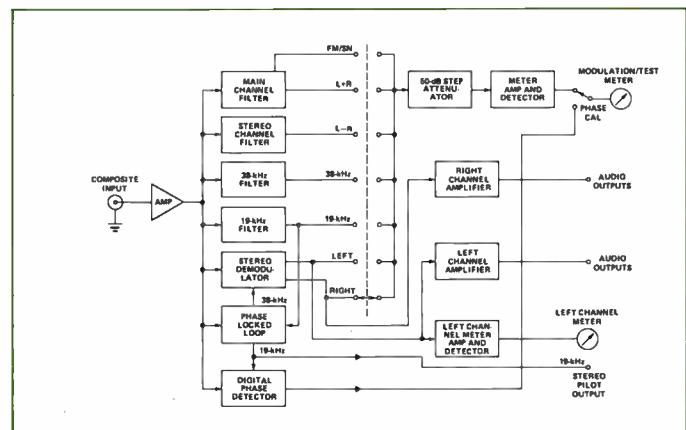
Two separate meters on the Model 724A permit simultaneous monitoring of left and right channel modulation. Total modulation is read on the Model 763 meter.

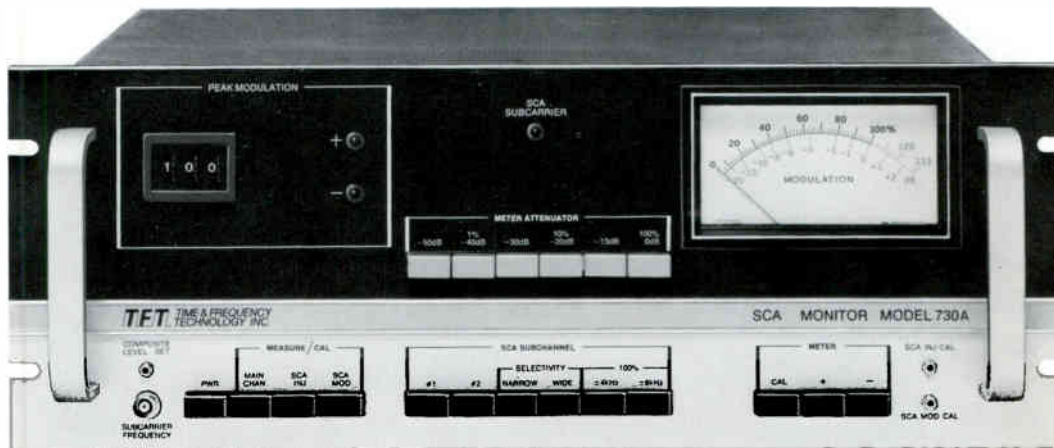
### Frequency Display

The pilot carrier frequency of the Model 724A can be measured by the 6-digit counter on the Model 764 Preselector (where it's used with the baseband monitor). Accuracy and resolution is 0.1 Hz. Frequency can also be measured by connecting an external frequency counter to an output on the rear panel of the Model 724A.

### Remote Metering

Remote metering outputs are available at the rear panel of the Model 724A for use with the Model 704C remote panel accessory. The 704C duplicates the left and right modulation meters, and comes with 50 feet of cable.





Model 730A SCA Monitor (FCC Type Approval No. 238)

## and SCA Monitor add-ons

The TFT Model 730A Monitor is designed for use with the Model 763 to provide complete measurement of SCA transmission characteristics, and to meet all proof-of-performance requirements (except distortion).

### Complete Measurement Capability

With the Model 730A, you can make complete, accurate measurements of injection level, modulation, S/N ratio and crosstalk. Measurement modes are selected by front panel pushbuttons. For added convenience, a 50 dB pushbutton attenuator is included, similar to that used on the Model 763 baseband monitor. In addition, for true proof-of-performance measurements (at the transmitter), a wideband input is provided. It allows you to make unrestricted distortion and frequency response measurements. Measurement accuracy is ensured by upconverting the baseband signal to 10.7 MHz and extracting the SCA sub-channel through precision crystal filters. Pushbutton selection of either  $\pm 4$  kHz or  $\pm 6$  kHz as the frequency deviation to represent 100% modulation is a standard feature of the Model 730A.

### Digitally-Settable Peak Flashers

In addition to a peak reading modulation meter, which can be switched to display either plus or minus modulation peaks, the Model 730A also has two digitally-settable peak flashers.

They measure and display the plus and minus peak modulation of the SCA signal simultaneously. Limits are set by front panel thumbwheel switches, from 50% to 129% in 1% increments. Flasher and meter accuracy can be checked at any time using an internal, precision calibration signal. The signal source is activated by a front panel pushbutton. Calibration adjustments, if needed, can be made on the front panel of the Model 730A.

### Frequency Display

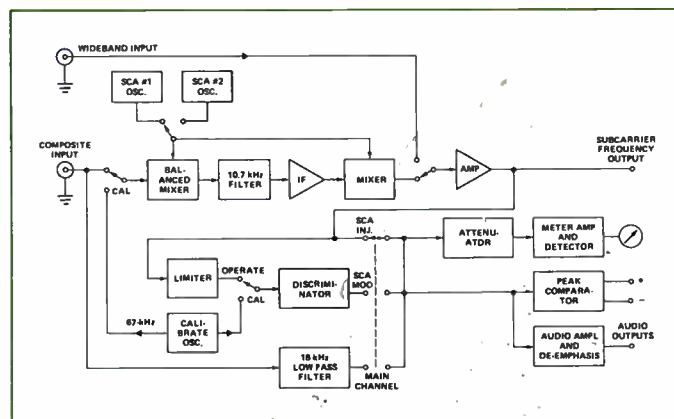
When the Model 764 RF Preselector is used with the Model 763 baseband monitor, its 6-digit counter can be used to measure, and digitally display, the SCA sub-carrier frequency which is extracted from a filter in the Model 730A. An output connector is also provided on the rear panel of the Model 730A for connection to an external frequency counter.

### Choice of Carrier Frequencies

The Model 730A can be furnished for monitoring either the 47 kHz or the 67 kHz sub-carrier frequency, both frequencies, or other customer specified frequencies. When two carrier frequencies are included, selection is made by a front panel pushbutton.

### Remote Monitoring

Outputs are provided on the rear panel of the Model 730A for remote display of the meter and peak flashers. This is done using the same Model 704B Remote Panel used for the Model 763 baseband monitor.



# SPECIFICATIONS

## Model 763 FM Modulation Monitor

### RF INPUT

Frequency Range . . . . . 88 to 108 MHz  
 RF Input Voltage Range . . . . . 1 to 10 volts rms  
 Input Impedance . . . . . 50 ohms nominal

### MODULATION METER

Deviation for 100% indications . . . . . ±75 kHz  
 Meter Range . . . . . 0 to 133%  
 Attenuator Range . . . . . 0 to -50 dB in 10-dB steps  
 Accuracy (5-kHz tone) . . . . . ±2% at all modulation levels  
 Frequency Response . . . . . ±0.1 dB typical ±0.25 dB max.  
 from 100 Hz to 75 kHz.  
 ±0.25 dB typical ±0.4 dB max.  
 from 50 Hz to 100 kHz.

Characteristics . . . . . Quasi-peak reading circuit, scale and ballistics conform to FCC requirements.

Remote Output . . . . . Suitable for driving two Model 704F Remote Readout Meter Panels

### PEAK MODULATION INDICATORS

Deviation for 100% indication . . . . . ±75 kHz  
 Peak Level . . . . . Set by a front-panel three digit thumbwheel switch in 1% steps from 50% to 150% on both positive and negative peaks.  
 Accuracy (5-kHz tone) . . . . . ±2% at 100% modulation  
 Frequency Response . . . . . ±2% from 50 Hz to 75 kHz  
 ±4% from 50 Hz to 100 kHz

Response Time Accuracy (1 cycle of 50 kHz) . . . . . ±2%  
 Remote Output . . . . . Suitable for driving two Model 704F Remote Readout Panels.

### MODULATION CALIBRATOR

Built in for calibration of modulation meter and peak flashers from the front panel.

### MEASUREMENT OF RESIDUAL AM

Range . . . . . 0 to 70 dB  
 Accuracy (at -30 dB) . . . . . ±1 dB

### AUDIO AND COMPOSITE OUTPUTS (at 100% modulation)

Composite Output . . . . . 5 volts rms into 5000 ohms (Audio Output with 75-μs de-emphasis). . . . . 5 volts rms into 5000 ohms at 400 Hz

Signal-to-Noise Ratio (400 Hz with de-emphasis) . . . . . 75 dB  
 Harmonic Distortion . . . . . 0.1% max.  
 Intermodulation Distortion . . . . . 0.1% max. per SMPTE standard  
 Frequency Response (W/O de-emphasis) . . . . . ±0.25 dB from 50 Hz to 75 kHz  
 Audio Monitor Output . . . . . 0 dBm into 600 ohms  
 Stereo Monitor Output . . . . . 1 volt rms into 600 ohms  
 SCA Monitor Output . . . . . 1 volt rms into 600 ohms

CARRIER-FAIL ALARM . . . . . Relay drive output capable of sinking 50 mA at 30 V DC when RF carrier drops below 50% of nominal.

PRESELECTOR INPUT . . . . . Direct input to discriminator for use with Model 764 or Model 765 FM Preselector

Frequency . . . . . 700 kHz  
 Input Level . . . . . 100 mV rms for full limiting

### OPTIONAL FEATURES

Carrier Power Alarm\* . . . . . Two relay-drive outputs, one for carrier level changes of ±5% and the other for ±10%. Each output is capable of sinking 50 mA at 30V DC.

Modulation Level Alarm . . . . . An output capable of sinking 50 mA at 30 V DC when composite signal drops below 30% modulation for a period of time between 2 seconds and 1 minute, internally adjustable.

Balanced Audio Output Level . . . . . 0 dBm into 600 ohms  
 Frequency Response . . . . . ±1 dB from 50 Hz to 50 kHz

### PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS

Power . . . . . 117/230 VAC ±10% 50 to 400 Hz.  
 Operating Temperature . . . . . 0°C to 50°C  
 Dimensions . . . . . 19"W x 5½"H x 14"D  
 Weight . . . . . 14 lbs.  
 Cabinet . . . . . Rack mountable

\* Because of the AGC circuitry, Carrier Power Alarm applies only when Model 763 is used without a preselector.

### FCC TYPE APPROVAL NUMBER

Model 763 . . . . . 3-236

### Model 764 & Model 765 FM RF Preselectors

#### Specifications Common to Both 764 and 765

Frequency Range . . . . . 88-108 MHz  
 Input Sensitivity  
 for 56 dB S/N . . . . . 100 μV  
 for 66 dB S/N . . . . . 1000 μV  
 Audio Frequency Response,  
 50 Hz-75 kHz . . . . . ±0.5 dB  
 IF Selectivity  
 3 dB BW . . . . . 375 kHz (nominal)  
 40 dB BW . . . . . 800 kHz (max)  
 Input Impedance . . . . . 75 ohm, nominal  
 Tuning . . . . . 4 Digit Thumbwheel  
 AGC Range . . . . . 60 dB  
 Manual Gain Control . . . . . 20 dB

#### Specifications Pertaining to Model 764 Only

Frequency Readout . . . . . 6 Digits  
 Main Carrier Frequency  
 Error  
 Range . . . . . ±199.999 kHz  
 Resolution . . . . . 1 Hz  
 Accuracy . . . . . ±100 Hz/year  
 Stereo Pilot Frequency . . . . . 19.0000 kHz  
 Resolution . . . . . 0.1 Hz  
 Accuracy . . . . . ±0.1 Hz 5/years  
 SCA Subcarrier Frequency . . . . . 23-100 kHz  
 Resolution . . . . . 1 Hz  
 Accuracy . . . . . ±1 Hz

### FCC TYPE CERTIFIED

#### Model 724A Stereo Monitor

### INPUTS

Composite . . . . . 500 mV RMS, 600 ohms unbalanced  
 Input Connector . . . . . BNC

### MODULATION MEASUREMENTS

Meter Range . . . . . 0 to 133%, 0 to 40%, and dB scale  
 Meter Characteristics . . . . . 4½" (11.43 cm) illuminated scale, scale and ballistics conform to FCC requirements.

Attenuator Range . . . . . 50 dB in 10 dB steps, pushbutton selectable

### Frequency Response

Left, Right and (L+R)  
 Channels . . . . . ±4% (±0.35 dB, 50 Hz to 15 kHz)  
 (L-R) Channel . . . . . ±4% (±0.35 dB), 23 kHz to 53 kHz  
 Accuracy . . . . . ±4% over entire range

### MODULATION CALIBRATION

Deviation . . . . . 100% modulation equals ±75 kHz deviation.  
 Calibrator . . . . . Calibration signal from baseband monitor is used for calibration of meter.

Model 724A (cont.)

**INTERNAL SEPARATION AND CROSSTALK**

<b>Separation</b>	
L-to-R and R-to-L . . . . .	45 dB min., 55 dB typical, 50 Hz to 15 kHz
<b>Crosstalk</b>	
(L+R) to (L-R) or (L-R) to L+R . . . . .	60 dB min.
SCA to (L+R) or SCA to (L-R) . . . . .	66 dB min. 10% SCA injection

**PILOT CARRIER MEASUREMENT**

Level Accuracy . . . . .	±0.5% from 6% to 12% injection
Frequency Measurement . . . . .	Measured by the frequency counter in the Model 764 to an accuracy and resolution of ±0.1 Hz or can be measured by an external frequency counter.

**OUTPUTS**

<b>Audio, (with de-emphasis)</b>	
Left and Right . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, ±0.35 dB, 50 Hz to 15 kHz. Distortion; less than 0.25%. Signal-to-noise: 60 dB below 100% modulation.
<b>Audio (without de-emphasis)</b>	
Left and Right . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, ±0.35 dB, 50 Hz to 15 kHz.
Pilot Carrier (19 kHz) . . . . .	200 mV RMS, 50 ohms
Composite . . . . .	1V RMS, 10K ohms at 100% modulation
Remote Meter . . . . .	For Model 704C Remote Meter Panel.
Connectors . . . . .	BNC
Meter Output . . . . .	Approx. 10V peak-to-peak equals 100%

**INPUT POWER**

24 VAC supplied by the baseband monitor

**FCC TYPE APPROVAL NUMBER**

Model 724A . . . . . 3-237

**MODEL 730A SCA Monitor**

**INPUTS**

Composite . . . . .	1V, 600 ohms unbalanced.
Wideband . . . . .	1V, 600 ohms unbalanced.
Connectors . . . . .	BNC

**MODULATION MEASUREMENTS**

Meter Range . . . . .	0 to 133%, 0 to 40%, and dB scale
Meter Characteristics . . . . .	4½" (11.43 cm) illuminated scale. Scale and ballistics conform to FCC requirements.
Attenuator Range . . . . .	50 dB in 10 dB steps, pushbutton selectable.
<b>Main Channel Modulation Measurement</b>	
100% Modulation . . . . .	±75 kHz
Modulation Accuracy (50 Hz to 15 kHz) . . . . .	±4%
Out-of-Band Rejection (20 kHz to 75 kHz) . . . . .	56 dB
<b>SCA Injection Measurement</b>	
Accuracy (1% to 30% injection) . . . . .	±0.5%
<b>SCA Subchannel Modulation Measurement</b>	
100% Modulation . . . . .	±4 kHz or ±6 kHz, pushbutton selectable
Modulation Accuracy (100% Modulation, 1 kHz tone) . . . . .	±2%
Frequency Response, Composite input . . . . .	±1 dB, 20 Hz to 6 kHz ±2 dB, 20 Hz to 7.5 kHz
Frequency Response, Wideband input . . . . .	±0.5 dB, 20 Hz to 7.5 kHz
Selectivity, Composite input . . . . .	Narrow: 3 dB bandwidth, 3 kHz 60 dB bandwidth, 20 kHz Wide: 3 dB bandwidth, 21 kHz 60 dB bandwidth, 38 kHz

**INTERNAL CROSSTALK**

Main to SCA . . . . .	66 dB
Stereo to SCA . . . . .	66 dB
SCA to main . . . . .	66 dB

**SCA PEAK MODULATION INDICATORS**

Variable Peak Indicators . . . . . Positive and negative peak modulation LED flashers. Peak limit set by thumbwheel switches in 1% increments from 50% to 129%.

Accuracy . . . . .	±10%
Response Time . . . . .	1 cycle at 2 kHz

**SCA MODULATION AND INJECTION LEVEL CALIBRATOR**

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

**SUBCARRIER FREQUENCY MEASUREMENT**

Sub-Carrier #1 . . . . .	67 kHz (standard)
Sub-Carrier #2 . . . . .	41 kHz (optional)
Frequency Measurement . . . . .	Measured by the frequency counter in the Model 764 or by an external frequency counter.

**OUTPUTS**

SCA Subcarrier . . . . .	500 mV, into 5K ohms
SCA Subcarrier alarm . . . . .	Contact closure when subcarrier is below muting level.
Audio (with de-emphasis) . . . . .	2V RMS, 600 ohms unbalanced at 100% modulation. De-emphasis internally selectable to 75 or 150 μsec.
Distortion . . . . .	Wideband input: 0.5% at ±6 kHz Composite input: 1% at ±4 kHz, 1.5% at ±6 kHz
Signal-to-Noise . . . . .	Composite or wideband input, 66 dB
Audio (without de-emphasis) . . . . .	2V RMS, 600 ohms unbalanced at 100% modulation.
Remote Meter and Flashers . . . . .	For Model 704B Remote Meter and Flasher Panel.
Connectors . . . . .	BNC

**INPUT POWER**

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

**FCC TYPE APPROVAL NUMBER**

Model 730A . . . . . 3-238

**Models 724A and 730A**

**PHYSICAL AND ENVIRONMENTAL**

Operating Temperature . . . . .	0° to 50°C (32° F to 122° F)
Size . . . . .	7" (17.78 cm) high x 19" (48.26 cm) wide x 17" (43.18 cm) deep
Weight . . . . .	approx. 15 pounds (6.8 kg)

Specifications subject to change without notice.



## TFT: Quality and Innovation

Since its start in 1971, TFT has become the major supplier of frequency and modulation monitors for AM, FM, FM Stereo, SCA and VHF/UHF TV. This success has come about because TFT builds beyond the FCC requirements to provide equipment that always leads the state of the art in accuracy, convenience and reliability. Among other things, TFT has pioneered such broadcast monitoring advances as frequency synthesizers, direct NBS calibration, remote monitoring without RF amplifiers, phase-lock-loop technology, digital frequency readout and tuneable preselectors.

TFT also manufactures the 7600 Series Digital Remote Control System, first modular all-digital system for remote control of AM, FM and TV transmitters.

Completing the TFT product family is a line of Emergency Broadcast equipment which is currently being used by about 50 percent of the EBS-equipped radio and TV stations in the United States.

In fact, about 75 percent of the radio and TV stations in the U.S. plus a large and growing number of stations in Canada, Europe, Latin America and Africa, use a TFT instrument for monitoring, controlling or testing.

For more information about, and a demonstration of, TFT monitors and/or other TFT products, contact your local sales representative. Or contact TFT in Santa Clara, California. All TFT products carry a one-year warranty on workmanship and materials.

**TFT** **TIME AND FREQUENCY TECHNOLOGY, INC.**  
3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584

## BROADCAST MONITORING EQUIPMENT

### FM PRODUCTS

May 1, 1978

<b>MODEL 753</b>	FM Modulation Monitor (Specify Frequency)	\$1,210.00
Option 01	Balanced Audio Output	29.00
Option 02	Carrier Power Alarm, +5% - 10% (does not work with preselector)	105.00
Option 04	Absence-of-Modulation Alarm	140.00
Option 06	230 VAC	N/C
Option 07	Spare Parts Kit	165.00
<b>MODEL 764</b>	FM Preselector with Frequency Readout	\$1,530.00
Option 01	BCD Output	160.00
Option 02	Frequency Alarm ( $\pm 2$ kHz)	105.00
Option 03	Spare Parts Kit	185.00
<b>MODEL 765</b>	FM Preselector Modulation Only)	895.00
Option 01	TCXO Time Base	140.00
Option 02	Spare Parts Kit	135.00
<b>MODEL 704F</b>	Remote Meter and Peak Flasher Panel	275.00
<b>MODEL 724.A</b>	STEREO MONITOR	1,580.00
Option 01	Spare Parts Kit	160.00
<b>MODEL 704C</b>	Remote Meter Panel	390.00
<b>MODEL 730A</b>	SCA MONITOR, 67 kHz	\$1,610.00
Option 01	SCA Channel (41 kHz)	105.00
Option 02	Spare Parts Kit	135.00
<b>MODEL 704B</b>	Remote Meter Panel	275.00

### EBS PRODUCTS

<b>MODEL 760-1A</b>	AM Receiver/Encoder/Decoder	\$ 598.00
<b>MODEL 760-1B</b>	Single Channel FM Receiver/Encoder/Decoder	598.00
<b>MODEL 760-1C</b>	Dual Channel FM Receiver/Encoder/Decoder	620.00
<b>MODEL 760-3</b>	Encoder/Decoder	395.00
<b>MODEL 760-2A</b>	AM Receiver/Decoder	340.00
<b>MODEL 760-5A</b>	Single Channel FM Receiver/Decoder	340.00
<b>MODEL 760-5B</b>	Dual Channel FM Receiver/Decoder	385.00
<b>MODEL 761-1A</b>	AM Receiver/Decoder (Desk Top)	460.00
<b>MODEL 761-1B</b>	Single Channel FM Receiver/Decoder	400.00
<b>MODEL 761-5B</b>	Dual Channel FM Receiver/Decoder (Desk Top)	470.00

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

Time and 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 workmanship.

Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

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

Transportation charge for warranty returns and repair costs, 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. We are not liable for consequential damages.

# TFT

## TIME AND FREQUENCY TECHNOLOGY, INC.

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 (408)246-6365 TWX 910-338-0584

**PRICE SCHEDULE  
BROADCAST MONITORING EQUIPMENT****TV PRODUCTS**

May 1, 1978

<b>MODEL 701</b>	TV FREQUENCY & AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$5,590.00
Option 02	Alarm (frequency and modulation)	215.00
Option 03	SCA Output	215.00
Option 04	AGC Meter (visual/aural carrier level)	170.00
Option 06	Automatic Logging Output (BCD)	160.00
Option 07	CCIR Format	395.00
Option 08	Spare Parts Kit	560.00
<b>MODEL 702</b>	TV AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$2,650.00
Option 02	Alarm (modulation)	130.00
Option 03	SCA Output	215.00
Option 04	AGC Meter (visual/aural carrier level)	170.00
Option 05	Spare Parts Kit	265.00
<b>MODEL 704</b>	Remote Meter and Peak Flasher Panel	275.00
<b>MODEL 725D</b>	Automatic Logging Adapter (D to A Converters)	955.00

**AM PRODUCTS**

<b>MODEL 753</b>	AM Modulation Monitor	1,040.00
Option 01	Balanced Audio Output	29.00
Option 02	Carrier Power Alarm (does not work with preselector)	105.00
Option 03	10 kHz Whistle Filter	105.00
Option 04	30 Hz Telemetry Lowpass	48.00
Option 05	Absence-of-Modulation Alarm	140.00
Option 06	230 VAC	N/C
Option 07	Spare Parts Kit	135.00
<b>MODEL 754</b>	AM RF Preselector with Frequency Readout	\$1,420.00
Option 01	Narrow Band Filter	235.00
Option 02	BCD Output	160.00
Option 03	Frequency Alarm ( $\pm 20$ Hz)	105.00
Option 04	Spare Parts Kit	160.00
<b>MODEL 755</b>	AM RF Preselector (Modulation Only)	785.00
Option 01	Narrow Band Filter	235.00
Option 02	TCXO Time Base	140.00
Option 03	Spare Parts Kit	80.00
<b>MODEL 704E</b>	Remote Meter and Peak Flashers	275.00

## PRICE SCHEDULE REMOTE CONTROL EQUIPMENT

May 1, 1978

MODEL	DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7601</b>	10-channel Raise and Lower functions plus 10 channels of digital telemetry, consisting of a control terminal and a remote terminal.	To provide economical digital remote control to AM & FM stations (up to a maximum of 10 channels)	\$1,995.00
Option 01	Sub-carrier (SCA) Detector, for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	\$150.00 (specify frequency)
Option 02	Sub-carrier (SCA) Generator; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote Terminal.	To generate the SCA subcarrier	\$150.00 (specify frequency)
Option 03	Extender Cable Kit for Remote Terminal.	A kit to provide rear wiring extension such that the 7601 can be removed from the rack for service without having to disconnect wirings to and from the transmitter and sensors. Three foot cable.	\$25.00
Option 04	Spare Parts Kit.	To provide spare parts such as relays, and I.C.'s for emergency repair	\$320.00
Option 05	10 channel Status Light	To provide 10 channels of independent status light indicators at both the control and remote terminals.	\$495.00
<b>MODEL 7601-C</b>	Control portion only of 7601 system	To provide an alternate control location for 7601	\$860.00
Option 01	Dual control modification	Modifies control unit to permit assignable control units. (See Application Bulletin 77-01 12-14-77)	\$200.00
<b>MODEL 7601R</b>	Remote portion only of 7601 system	For use at each additional remote site (up to 16)	\$1,220.00
<b>MODEL 7610</b>	10 channel RAISE/LOWER Plus 10 channel Telemetry digital remote control system. Expandable by adding Model 7615, 7620, 7630 to a 110-channel system	To provide digital remote control systems for medium and large size AM, FM & TV stations. Also suitable for controlling multi-site operations.	\$2,795.00
Option 01	Sub-carrier (SCA) Detector; for TV application, specify 39 kHz, for FM 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	\$150.00 (specify frequency)
Option 02	Sub-carrier (SCA) Generator; for TV use, specify 39 kHz; for FM, 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote terminal	To generate the SCA sub-carrier	\$150.00 (specify frequency)
Option 03	BCD parallel data inputs (for the Remote Terminal)	To provide two channels of parallel BCD inputs to accept external digital data such as the readings from a digital frequency monitor or frequency counter.	\$150.00
Option 04	Parallel BCD Data Output Cable Kit (for 7610C Control Terminal)	A cable kit to provide external control of channel selection, RAISE/LOWER function and parallel BCD output of the channel identification and DVM reading	\$175.00



## REMOTE CONTROL INTERFACING ACCESSORIES

MODEL	DESCRIPTION	APPLICATION	PRICE
FSU-01	Fail-Safe Unit for TV application	To provide full compliance with FCC Rules by monitoring 4 critical parameters: aural plate voltage, aural plate current, aural power and visual power.	\$475.00
ADS-01	Alternate Data Path Selector	Switch from SCA to phone line when invalid data is detected from either the Control or the Remote terminal. Both local and remote units are included.	\$900.00
CSA-01	Chopper Amplifier	To provide isolation from a floating circuit to a grounded circuit. DC gain is also provided.	\$145.00
PLC-01	Power-to-Linear Converter	To linearize power readings from log scale to linear scale.	\$245.00
TLK-01	Tower Light Monitor	To monitor AC line current	\$65.00
LVK-01	Line voltage Monitor	To monitor AC line voltage	\$50.00
PVK-01	Plate Voltage Monitor	To monitor plate voltage up to 20 kv	\$65.00
TSK-01	Temperature Sensing Kit	To monitor temperature of air or components	\$95.00
MBB-01	Isolation amplifier (High Voltage)	For monitoring voltage and current at 10kv above ground and translate reading in reference to ground voltage to suit the input of the Remote Terminals	\$95.00
RFK-01	AM RF Transmission Line Voltage Sampling Kit	For monitoring RF voltages and translating to DC output voltage.	(later)
RFK-02	RF Transmission Line Voltage Sampling Kit for 3 1/8" line (FM & TV)	For monitoring RF Voltages and translating to D.C. output voltage	\$45.00
RFK-03	RF Transmission Line Voltage Sampling Kit for 1 5/8" line (FM & TV)	For monitoring RF Voltages and translating to D.C. output voltage	\$45.00

### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

### WARRANTY

Time and 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 workmanship.

Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

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

Transportation charge for warranty returns and repair costs, 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. We are not liable for consequential damages.



## TIME AND FREQUENCY TECHNOLOGY, INC.

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 (408)246-6365 TWX 910-338-0584

# TFT

## MODEL 701 TV FREQUENCY AND MODEL 702 AURAL MODULATION MONITORS



MODEL 701

## UHF and VHF OFF-THE-AIR MONITORING FREQUENCIES and AURAL MODULATION

### FEATURES (Model 701 and Model 702)

- Covers all UHF and VHF Channels
- Off Air Monitoring of Aural Modulation
- 250  $\mu$ V Sensitivity
- Digitally Set Peak Modulation Flashers
- Built-in Aural Modulation Calibrator
- Optional Over-Modulation Alarm
- FCC-Type Approved
- Portable or Rack Mount

### FEATURES (Model 701 Only)

- Off-the air Monitoring of Visual and Aural Carrier Frequencies
- Usable as a 6-Digit Precision Frequency Counter up to 10 MHz
- Optional Off-Frequency Alarm

### GENERAL DESCRIPTION

Both the Model 701 and Model 702 are state-of-the-art TV Monitors designed and optimized for off air monitoring of aural modulation in UHF and VHF TV transmitters without the need of an external RF amplifier. Adequate RF shielding of the circuitry is provided in the Model 701 and 702 for accurate and reliable operation in a strong RF environment when the instrument is directly connected to the transmitter through an RF attenuator supplied by TFT.

The RF input of the monitors consists of a narrow band coaxial filter tuned to the desired frequency and a double-balanced Schottky barrier diode mixer. As a result, intermodulation products generated in the instrument due to undesirable interfering signals are several orders of magnitudes lower than that in an RF amplifier front end.

Both the Model 701 and 702 have, in addition to a fast attack modulation meter, two peak flashers which measure and display positive and negative peak modulation simultaneously. The peak flashers can be calibrated from 50% to 129% in one percent increments. The digital thumbwheel switches that set the peak modulation level for the flashers eliminates the ambiguity of conventional potentiometer-type controls. Built-in frequency synthesizer-type modulation calibrator allows modulation meter and peak flashers to be checked and recalibrated at any time when the front panel pushbutton calibration switch is depressed.

In addition to serving as an off air modulation monitor for maintaining the highest degree of transmitter modulation and constant loudness in audio level, the Model 701 and 702 can be used as a precision audio demodulator for making proof-of-performance measurements in the aural transmitter.

Model 701 and Model 702 are FCC-type approved carrying FCC-type Approval No. 3-187 and 3-189, respectively.

The Model 701 has all the features as in the Model 702. In addition, it also measures the visual, aural and intercarrier frequencies and displays the frequency errors on two separate frequency error counters. One of the two counters can be selected to display either aural carrier or intercarrier frequency error by a front panel switch. The internal frequency reference is provided by a 5-MHz crystal oscillator housed in a proportionally-controlled oven which offers excellent long and short term frequency stabilities. Local oscillators are frequency synthesized and therefore exhibit the same stabilities as the 5-MHz time base oscillator.

### ORDERING INFORMATION

The monitors are fixed tuned to your specified channel frequency in the factory. Please specify the channel number, carrier frequencies, and frequency offsets, if any.

## OPTIONS

- Option 01** – 19 in. rack monitoring adapter (standard with each instrument)
- Option 02** – Over modulation and off frequency alarm which is factory set at  $\pm 500$  Hz, other settings available if specified in the order.
- Option 03** – SCA output to provide filtered 39-kHz subcarrier for use in remote control operation.

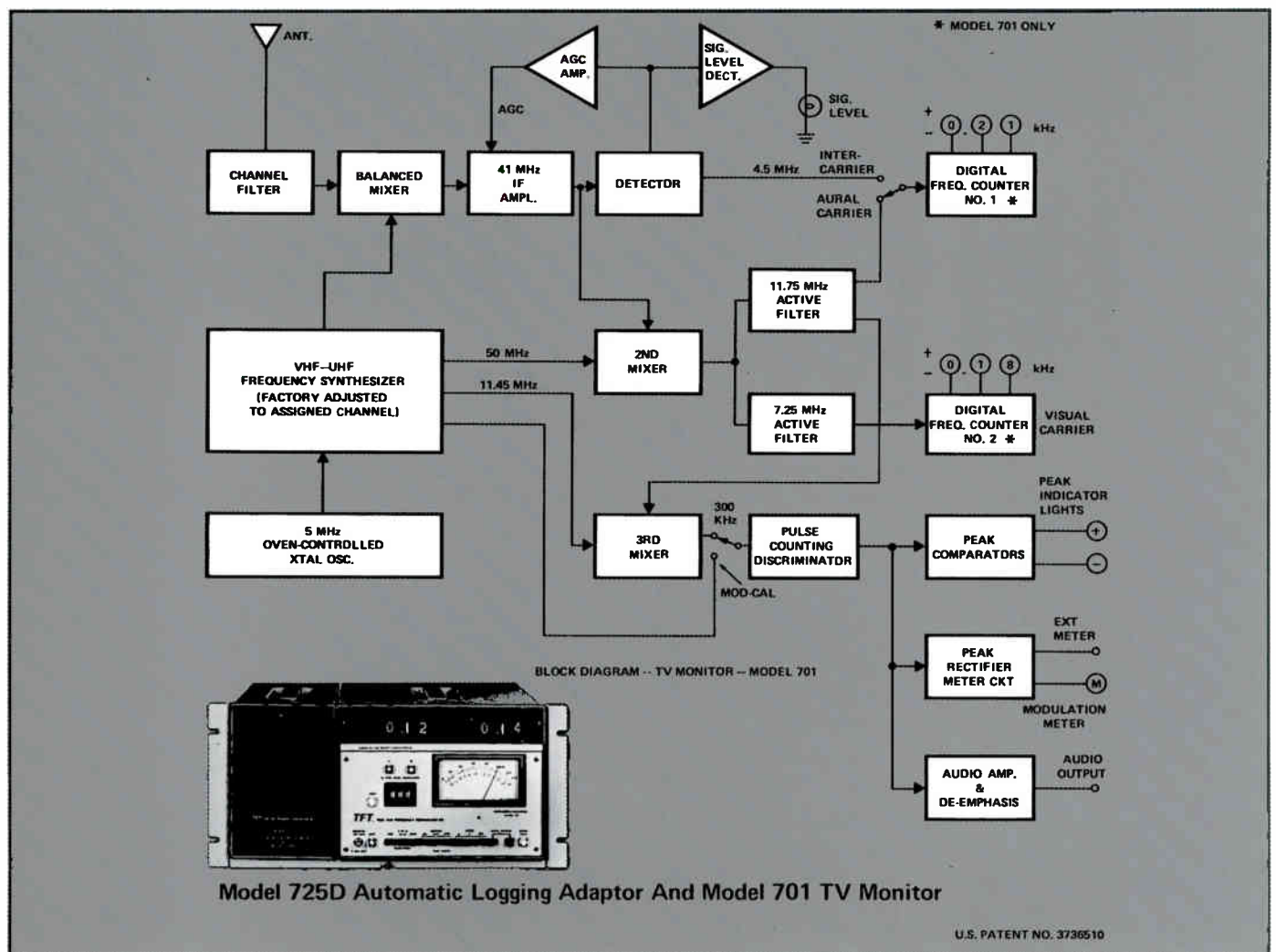
- Option 04** – AGC meter to provide relative signal strength when used in off air mode.
- Option 06** – Automatic logging output to provide BCD outputs of the frequency counter for Model 725D automatic logging adapter.
- Option 07** – CCIR format for use in CCIR television system.

## ACCESSORY EQUIPMENT

**Model 704 Remote Meter and Flasher Panel**, 19" W x 5-1/4" H x 3" D rack monitoring panel that duplicates the modulation meter and peak modulation flashers of the Model 701 and Model 702.

**Model 725D Automatic Logging Adapter**, 5.6" W x 8" H x 15" D. The instrument is a precision digital-to-analog converter which converts the frequency counter readings in the Model 701 to analog signal outputs. These signals can then be used for data logger that accepts only analog signals.

**Model 730B SCA Modulation and Injection Level Monitor**, 19" W x 7" H x 17" D. An add-on instrument to Model 701 or Model 702 for monitoring the 39-kHz and 67-kHz subcarrier transmission characteristics and also for proof-of-performance measurements.



## MODEL 701 and 702 SPECIFICATIONS

### RF Input

Frequency range . . . . .	Channels 2 through 83 (54 MHz - 890 MHz)
Sensitivity . . . . .	Approx 250 $\mu$ v, 60 dB automatic gain control range and 40 dB fixed attenuator for monitoring at transmitter site
Image rejection . . . . .	-60 dB
Spurious response . . . . .	-80 dB
Local oscillator radiation . . . . .	Conforms to FCC rules
Input impedance . . . . .	75 ohms
Input connector . . . . .	BNC

### Aural Modulation Meter

Modulation range . . . . .	Meter reads full scale on 33.3 kHz deviation. Scale calibrated to 100% at 25 kHz deviation (50 kHz on CCIR Model), 133% at 33.3 kHz deviation. Also includes dB scale (0 dB = 100%).
Frequency response . . . . .	$\pm$ 0.2 dB, 50 Hz to 15 kHz
Accuracy . . . . .	$\pm$ 4% over entire scale for modulation frequencies between 50 Hz and 15 kHz
Meter characteristics . . . . .	Peak reading circuit scale and ballistics conform to FCC requirements
Remote metering . . . . .	Output provided

### Aural Modulation Peak Indicators

Peak flasher lights indicate plus and minus peaks simultaneously. Peak levels are digitally set by thumb-wheel switches, in 1% increments from 50% to 129%	
Response time . . . . .	5 $\mu$ sec pulse having 1 $\mu$ sec rise and fall time

### Modulation Calibrator

Built-in aural modulation calibrator indicates $\pm$ 100% modulation	
Accuracy . . . . .	$\pm$ 2%

### Audio Output

Output level . . . . .	Two volt RMS minimum into 600 ohms at 100% modulation and 1 kHz. Distortion is 0.25% at 100% modulation. Residual noise at least 65 dB below two volts RMS. 75 $\mu$ s de-emphasis network provided
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### SCA Output (Option 03)

39 kHz Output . . . . .	One volt RMS into 600 ohms at 10% injection
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### AGC Meter (Option 04)

External AGC Meter mounted to the left of the Model 701 or Model 702 to indicate relative signal level when the instrument is used for off-air monitoring.

## MODEL 701 SPECIFICATIONS

### Off-Frequency and Over-Modulation Alarm (Option 02)

Available as an option . . . . .	Includes circuit to actuate user-supplied aural or visual alarm
Frequency limits . . . . .	$\pm$ 1 kHz
Modulation limits . . . . .	$\pm$ 100%



## MODEL 701 SPECIFICATIONS (CON'T)

### Aural and Visual Frequency Measurement

Digital display . . . . . Zero to  $\pm 9.99$  kHz in 10 or 1 Hz increments from assigned center frequency

#### Accuracy:

Channels 2 through 13 . . . . .  $\pm 500$  Hz/18 months  
Channels 14 through 69 . . . . .  $\pm 500$  Hz/6 months

#### Frequency standard:

Internal . . . . . Uses a high-precision, oven-controlled, 5-MHz crystal oscillator. One MHz output is provided on the front panel, for calibration against WWV or a precision frequency source.

External . . . . . 5 MHz input connector on rear panel

### Inter-Carrier Frequency Measurement

Digital display . . . . . Zero to  $\pm 9.99$  kHz in 10 or 1 Hz increments from 4.5 MHz

Accuracy . . . . .  $\pm 100$  Hz/5 years

Frequency standard . . . . . Same as Aural and Visual Frequency measurement

### BCD Output (Option 06)

BCD equivalent of the carrier frequency error readings are brought out to the rear panel for automatic logging of the carrier frequency errors. Model 725D may be required if logging equipment used does not accept parallel BCD in TTL logic level.

### Six-Digit Frequency Counter

Frequency range . . . . . 10 Hz to 10 MHz

Input sensitivity . . . . . 200 mv to 2 V RMS

Input impedance . . . . . 500k ohms. Shunt by 15 pF

Resolution . . . . . 1 Hz

Display accuracy . . . . .  $\pm 1$  count

Time base aging rate . . . . .  $1 \times 10^{-8}$ /day

### Physical and Environmental Specifications (Model 701 and Model 702)

Size . . . . . 11" w x 8" h x 15" d

Weight . . . . . 22 pounds (approximately)

Power . . . . . 115/230 V, 50-400 Hz, 45 watts maximum

Cabinet . . . . . Portable or rack mount (with adapter)

Operating temperature . . . . .  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$

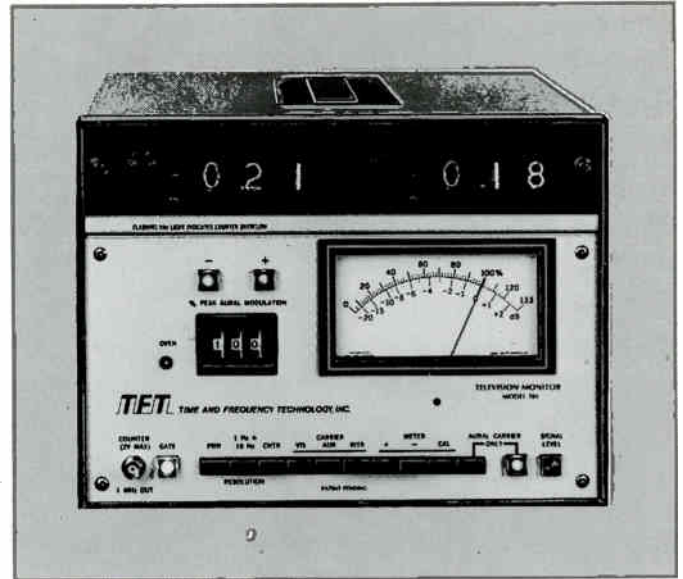
For more information and/or a demonstration, contact the factory, address below, or your local representative.

Represented By:

**TFT** TIME AND FREQUENCY TECHNOLOGY, INC.  
3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584

# TET

## MODEL 701 TV FREQUENCY AND AURAL MODULATION MONITOR



## UHF and VHF OFF-THE-AIR MONITORING, UP TO 18 MONTHS BETWEEN CALIBRATIONS

### FEATURES

- Covers All UHF and VHF Channels
- Off-the-Air Monitoring of Visual and Aural Frequency, and Percent Aural Modulation  
250  $\mu$ v Sensitivity
- Up to 18 Months Between Calibrations (VHF)
- Digital Display of Frequency Errors
- Internal Frequency Standard Can Be Calibrated Directly Against WWVB, with Optional WWVB Receiver
- Built-In Aural Modulation Calibrator
- Digitally Settable Peak Flashers Display Plus and Minus Peaks Simultaneously
- Silicon Transistor and IC Design
- Provision for Automatic Logging
- Usable as a 6-digit Precision Frequency Counter to 10 MHz
- Portable or Rack Mount
- Optional, Super-Stable Oscillator Provides Transmitter Stability of  $1 \times 10^{-9}$  per Day
- Optional Off-Frequency and Over-Modulation Alarm
- FCC Type Approved #3-187

### GENERAL DESCRIPTION

The Model 701 is a state-of-the-art VHF-UHF TV Monitor designed and optimized for off-the-air monitoring of aural, visual and inter-carrier frequency and percent aural modulation. The input of the monitor consists of a channel filter and a double-balanced Schottky barrier diode mixer. As a result, intermodulation products generated in the instrument due to strong undesirable signals are several orders of magnitude lower than in an RF amplifier front end.

What's more, the Model 701 requires frequency calibration only every six months for UHF and only every 18 months for VHF. This is accomplished by the use of a precision, 5-MHz, oven-controlled crystal oscillator which synthesizes the local oscillators and which has a typical aging rate of 1 PPM/year.

Even greater stability can be provided by an accessory super stable 5-MHz crystal oscillator (Model 703) which has an aging rate of  $1 \times 10^{-9}$  per day.

When the Model 701 and the Model 703 or Model 725A are used in conjunction with a VLF Comparator, the system is capable of monitoring trans-

mitters to within 1 Hz accuracy for precise frequency off-set control.

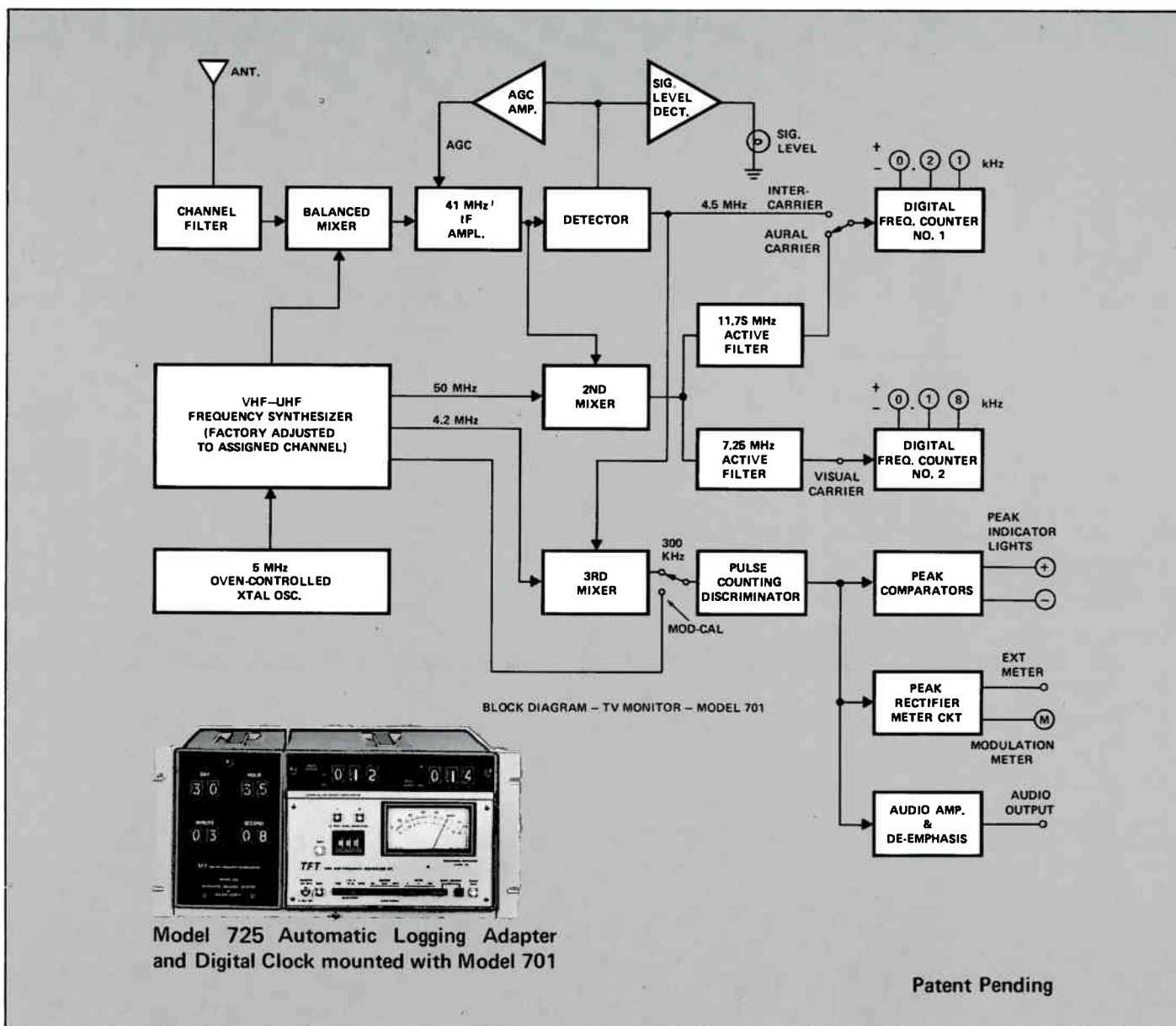
Another advantage of the Model 701 is that it has, in addition to a peak reading modulation meter, two peak flashers which measure and display plus and minus peak modulation simultaneously. Flashers are calibrated from 50% to 129%, in one percent increments, with front panel thumbwheel switches. Calibration accuracy can be checked at any time with the front panel pushbutton modulation calibrator. The aural modulation is demodulated from the inter-carrier. An "AURAL CARRIER ONLY" switch enables the user to check the inter-carrier noise due to visual modulation. The model 701 complies fully with Sections 73.693 and 73.694 of the FCC Rules and Regulations pertaining to frequency accuracy, crystal aging, frequency response, distortion, peak indication and meter ballistics.

### OPERATION

When the incoming signal is received, the visual car-

rier is converted to an IF of 42.75 MHz and the aural carrier is converted to an IF of 38.25 MHz. The second mixer then converts the visual carrier to 7.25 MHz and the aural carrier to 11.75 MHz. Then, these signals are fed into two separate differential counters which digitally display the respective carrier deviations. A front panel switch allows use of one of the counters to measure inter-carrier frequency.

The frequency counters in the Model 701 can also be used as a six-digit 10-MHz general purpose frequency counter for measuring the chromatic carrier frequency and for other general applications. Conversion is made by depressing a single front panel pushbutton. Since the color subcarrier of the network programs is generated from a rubidium frequency standard, the stations receiving network originated programs can use the color subcarrier to calibrate the frequency standard in the Model 701 by using the monitor as a frequency counter.



## SPECIFICATIONS

### RF Input

Frequency range	Channels 2 through 69
Sensitivity	Approx 250 $\mu$ v, 60 dB automatic gain control range and 40 dB fixed attenuator for monitoring at transmitter site
Image rejection	-60 dB
Spurious response	-80 dB
Local oscillator radiation	Conforms to FCC rules
Input impedance	75 ohms
Input connector	BNC

### Aural and Visual Frequency Measurement

Digital display	Zero to $\pm$ 9.99 kHz in 10 or 1 Hz increments from assigned center frequency
Accuracy:	
Channels 2 through 13	$\pm$ 500 Hz/18 months
Channels 14 through 69	$\pm$ 500 Hz/6 months
Frequency standard	
Internal	Uses a high precision, oven-controlled 5 MHz crystal oscillator. One MHz output is provided on the front panel, for calibration against WWVB or a precision frequency source.
External	5 MHz input connector on rear panel

### Inter-Carrier Spacing Frequency Measurement

Digital display	Zero to $\pm$ 9.99 kHz in 10 or 1 Hz increments from 4.5 MHz
Accuracy	$\pm$ 100 Hz/5 years
Frequency standard	Same as Aural and Visual Frequency measurement

### Aural Modulation Meter

Modulation range	Meter reads full scale on 33.3 kHz deviation. Scale calibrated to 100% at 25 kHz deviation, 133% at 33.3 kHz deviation. Also includes dB scale (0 dB = 100%)
Frequency response	$\pm$ 0.2 dB, 50 Hz to 15 kHz
Accuracy	$\pm$ 4% over entire scale for modulation frequencies between 50 Hz and 15 kHz
Meter characteristics	True peak reading circuit scale and ballistics conform to FCC requirements
Remote metering	Output provided

### Aural Modulation Peak Indicators

Peak flasher lights indicate plus and minus peaks simultaneously. Peak levels are digitally set by thumb-wheel switches, in 1 percent increments from 50% to 129%	
Response time	5 $\mu$ sec pulse with 1 $\mu$ sec rise and fall time

### Modulation Calibrator

Built-in aural modulation calibrator indicates $\pm$ 100% modulation	
Accuracy	$\pm$ 2%

### Audio Output

Output level	Two volt RMS minimum into 600 ohms at 100% modulation and 1 kHz. Distortion is 0.25% at 100% modulation. Residual noise at least 65 dB below two volts RMS. 75 $\mu$ s de-emphasis network provided
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### SCA Output

39 KHz output	One volt RMS into 600 ohms at 10% injection;
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## SPECIFICATIONS (cont.)

### Off-Frequency and Over-Modulation Alarm

Available as an option	Includes circuit to actuate user-supplied aural or visual alarm
Frequency limits	±1 kHz
Modulation limits	±100%

### Six-Digit Frequency Counter

Frequency range	10 Hz to 10 MHz
Input sensitivity	200 mv to 2 V RMS
Input impedance	500 k ohms. Shunt by 15 pF
Resolution	1 Hz
Display accuracy	±1 count
Time base aging rate	1 x 10 <sup>-8</sup> /day

### Physical and Environmental Specifications

Size	11" w x 8" h x 15" d
Weight	22 pounds (approx)
Power	115/230 V, 50-400 Hz, 45 watts max.
Cabinet	Portable or rack mount (with adapter)
Operating temperature	0° C to 50° C

## ACCESSORY EQUIPMENT

Model 703 super stable time base, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

Model 704 Remote Meter and Flasher Panel, 19" w x 5-1/4" h x 3" d. Duplicates the Modulation Meter and Peak Modulation Flashers of the Model 701. FCC type approved.

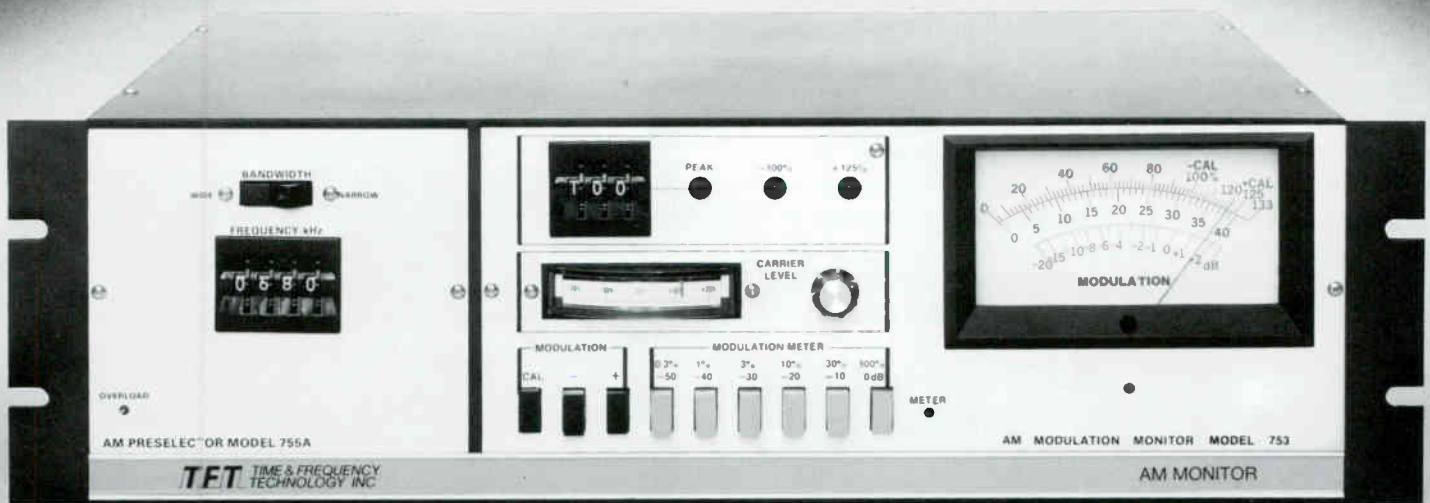
Model 725 Automatic Logging Adapter and Digital Clock, Analog Voltage Outputs of Visual and Intercarrier Frequency Errors, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

Model 725A Combination of Model 703 and Model 725, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

For more information and/or a demonstration, contact the factory at the address below, or your local representative.

Represented By

**TET** TIME AND FREQUENCY TECHNOLOGY, INC.  
2950 SCOTT BLVD. - SANTA CLARA, CA. 95050 - (408) 246-6365



## AM Modulation Monitor

### FEATURES

- No Overshoot Linear Phase Filtering
- Broadband Demodulation, 500 kHz to 4 MHz
- Digital Peak Indicators
- Built-in Voltmeter
- Carrier-Level Measurement Metering
- Wide Frequency Response, 20 Hz to 25 kHz
- Self-Calibrating
- Wide Range of Plug-In Options Including:
  - Carrier Power Level Alarm;
  - Absence of Modulation Alarm;
  - 10 kHz Whistle Filter;
  - 35 kHz Low-pass Filter (sub-audio telemetry)
- Remote Meter & Peak Flasher Panel Available

### GENERAL DESCRIPTION

The TET Model 753 AM Modulation Monitor is a precision instrument which permits extremely accurate Proof-of-Performance measurements and transmission monitoring. The accuracy is better than 1.0%. The Model 753 is also fully adaptable to Automatic Transmission Systems (ATS).

### RF PRESELECTOR EXPANSION

Although the basic 753 is designed for direct transmitter connection, you can use it off-air by adding the 755A Tunable Preselector Module. In addition to offering off-air monitoring, the frequency-synthesized digital tuning 755A Preselector allows you to easily compare the modulation performance of competitive stations. The only requirement for this off-air operation is an antenna; no external RF amplifiers are needed.

The Preselector permits tuning in 1.0 kHz increments with a 4-digit front panel thumbwheel switch.

For the highest accuracy when performing Proof-of-Performance measurements, TET recommends that only the basic baseband unit be used at the transmitter site. This minimizes the off-air noise pick-up through the Preselector.

### NO OVERSHOOT PERFORMANCE

The Model 753 is designed with linear phase filters to eliminate transient filter overshoot which results from the heavy amplitude clipping of today's audio processing devices. Because of this exclusive design, overshoot problems caused by fast rise and fall time modulation are eliminated. The oscilloscope photo demonstrates the demodulated waveform of a square wave modulated RF carrier (top trace); note the complete absence of overshoot. Even in off-air use, overshoot is nearly non-existent due to a proprietary IF filter design (patent pending) in the Preselector. In the presence of clipped audio signals, the 753 provides sharp selectivity as well as negligible overshoot (less than 3.0% with a 25  $\mu$ sec rise and fall time).

### BROADBAND DEMODULATION

The Model 753 operates on any RF frequency between 500 kHz and 4 MHz with a 1 to 10 volt input while meeting all specifications. Operation to as low as 250 kHz is possible with very little degradation. With a simple change to the input transformer, the 753 can operate as high as 200 MHz. This factory modification is available on request at the time of ordering.

(continued—over)

## DIGITAL PEAK INDICATORS

The Model 753 contains three peak flashers which provide quick visual monitoring. These indicators "catch" modulation transients which would normally not register on the Modulation Meter. The  $-100\%$  and  $+125\%$  indicators are factory set at the modulation extremes specified by the FCC. The third indicator is digitally programmable to eliminate the ambiguities of potentiometer-type controls. To measure actual peak modulation, this indicator can be set for positive or negative peaks from 1 to 150% in 1.0% increments. Both the peak flashers and the modulation meter are self-calibrating to maintain their accuracy over a  $\pm 40\%$  carrier level change.



Digitally-settable Peak Flasher and Carrier Level Metering

## CARRIER LEVEL MEASUREMENTS

When connected to the transmitter, the 753 will directly measure changes in carrier power and carrier shift when modulation is applied. These measurements are read on the carrier level meter.

## WIDE AUDIO RESPONSE

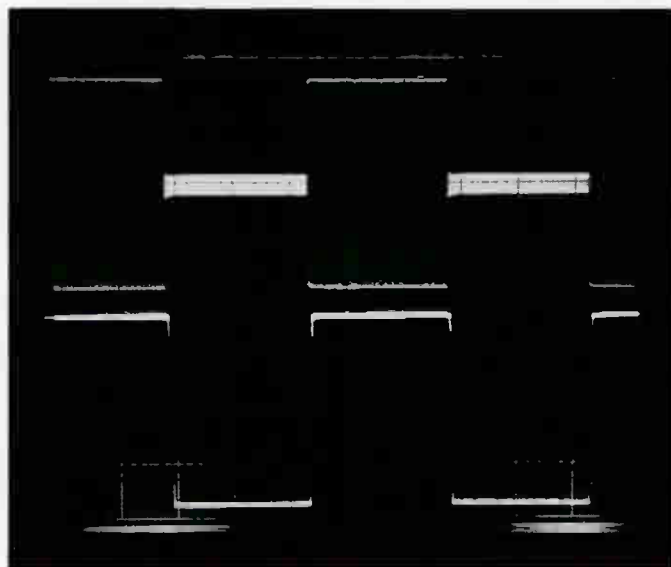
The Audio Response of the 753 is virtually flat from 20 Hz to 25 kHz (with a 3 dB roll-off at 80 kHz). The Total Harmonic Distortion (THD) is less than 0.15% at 99% modulation.

## INTERNAL SELF-CALIBRATION

The 753 also contains a built-in AM Calibrator which provides both the  $-100\%$  and  $+125\%$  peak modulation reference levels. The signal used for the calibration is a true amplitude modulated RF carrier generated internally by digital circuitry. The AM calibrator provides a thorough check-out of the 753's performance from input to output.

## BUILT-IN VOLTMETER

The 753 includes a built-in 50 dB attenuator calibrated in 10 dB steps for making Proof-of-Performance measurements. From the front panel, frequency response measurements as well as residual hum and noise (to  $-70$  dB) can be made.



Top: Demodulated audio output. Bottom: 1 kHz square wave modulated RF carrier at 1 MHz applied to the input. Note the complete absence of overshoot under both operating conditions.

## PLUG-IN OPTIONS

A wide range of field-installable options increases the versatility of the 753. Included in these are: Carrier Power Level Alarm; Absence-of-Modulation Alarm; 10 kHz Whistle Filter; and a 35 Hz Low Pass Filter for sub-audio telemetry. All of these options are on plug-in circuit boards and can be added at any time to the 753.

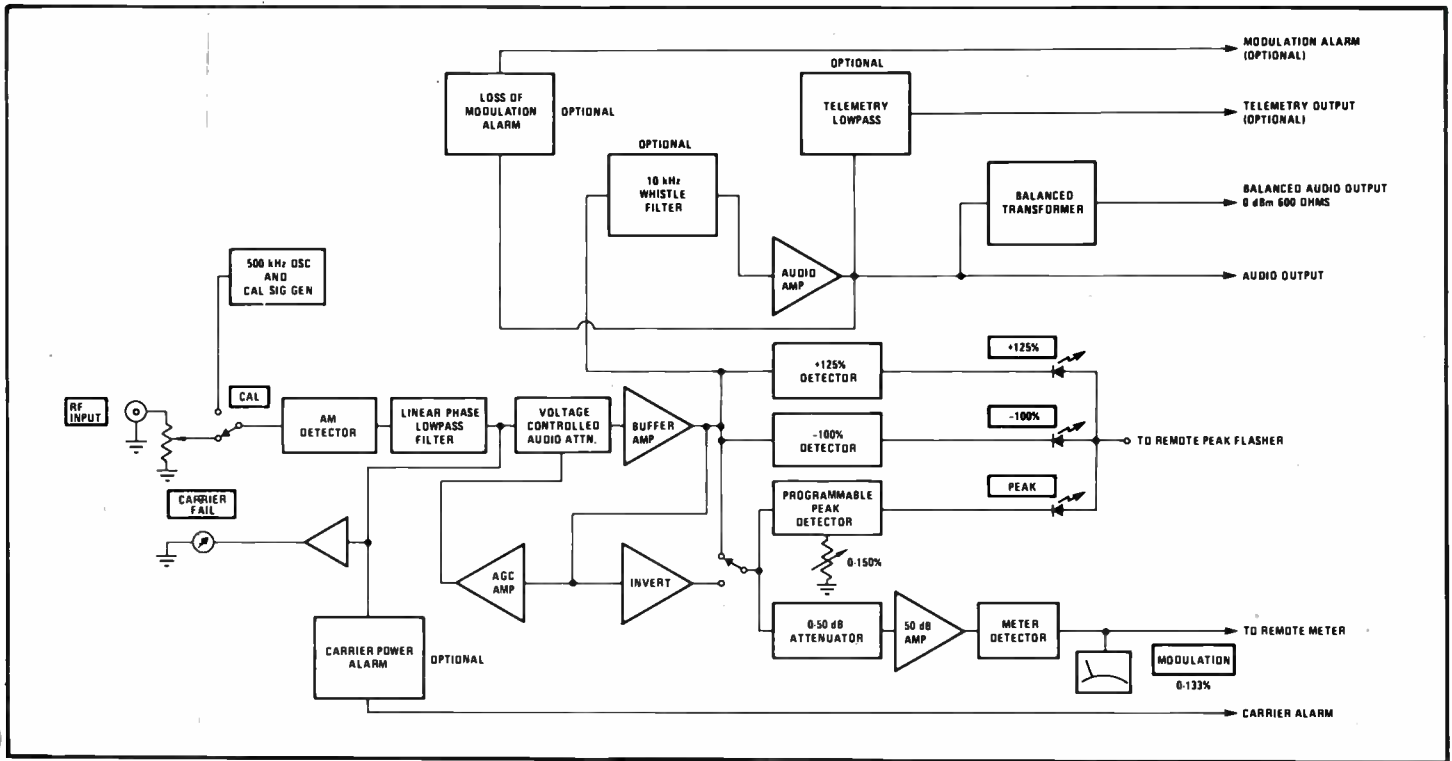
## ACCESSORY EQUIPMENT

In addition to the plug-in options, the 753 can also be ordered with an the Model 704E Remote Meter and Peak Flasher Panel which duplicates the 753's meter and peak flashers. This accessory panel includes 50 feet of cable.

Additionally, the rear panel external meter output can be modified to provide an opposite modulation polarity signal to drive the 704E Remote Panel. This modification offers the convenience of having two meters to display positive and negative modulation simultaneously.

# AM Modulation Monitor

## MODEL 753 BLOCK DIAGRAM



## SPECIFICATIONS

### RF INPUT

Frequency Range ..... 500 kHz to 4 MHz\*

Level Range ..... 1.0 V to 10 V RMS

Impedance, nominal ..... .50 ohms

\*Higher frequency ranges available on request.

### MODULATION METER

Meter Range ..... 0 to 133%, switchable "+" or "-"

Attenuator Range ..... 0 to -50 dB in 10 dB steps

Accuracy (at 100% mod.,  
400Hz) .....  $\pm 2.0\%$

Frequency Response ..... 50 Hz to 10 kHz,  $\pm 2.0\%$   
30 Hz to 25 kHz,  $\pm 5.0\%$

### PEAK MODULATION INDICATORS

- 100% Indicator ..... Internally set to flash when modulation exceeds -99%

+ 125% Indicator ..... Internally set to flash when modulation exceeds +125%

Accuracy  
(both indicators) .....  $\pm 1.0\%$  at 400 Hz

Frequency Response  
(both indicators) .....  $\pm 5.0\%$ , 20 Hz to 25 kHz

(Specifications continued—over)



# SPECIFICATIONS

(continued from previous page)

<b>Peak Indicator</b> .....	30% to 150% switchable positive or negative peaks
<b>Accuracy</b> .....	± 2.0% at 400 Hz
<b>Frequency Response</b> .....	± 5.0%, 20 Hz to 25 kHz
<b>Remote Flasher Output (to drive Model 704E Remote Panel)</b>	
<b>Audio Output</b> .....	5 V RMS into 5 k ohms
<b>THD, 99% modulation, 400 Hz</b> .....	0.15% typical, 0.25% max
<b>Signal-to-Noise Ratio</b> .....	>75 dB below 100%
<b>Transient Response</b> .....	<1.0% overshoot
<b>Frequency Response</b> .....	± 0.5 dB, 20 Hz to 15 kHz

## AUDIO OUTPUTS

### Audio Monitor Outputs

<b>Impedance</b> .....	600 ohms, balanced and unbalanced
<b>Level</b> .....	0 dBm
<b>THD, 99% Modulation, 400 Hz</b> .....	0.15% typical, 0.25% max.
<b>Signal-to-Noise Ratio</b> .....	>75 dB below 100%
<b>Transient Response</b> .....	<1.0% overshoot

## FREQUENCY RESPONSE

<b>Unbalanced</b> .....	± 0.5 dB, 20 Hz to 25 kHz
<b>Balanced</b> .....	± 1.0 dB, 50 Hz to 15 kHz

## CARRIER FAIL OUTPUT

Indicates loss-of-carrier by sinking a maximum 30 V, 50 mA load to ground. Open collector output is normally "Off" when carrier is present.

## MODULATION

<b>Calibrator</b> .....	Built-in Calibrator generates a -100%, +125% modulated carrier which is automatically switched into the detector input by the "CAL" button
<b>Accuracy</b> .....	± 1.0%

## OPTIONS

<b>02-Carrier Power Alarm</b> .....	Activates Carrier Fail Output if carrier changes by more than 5%,-10%. Does not work with Preselector
-------------------------------------	---

Contents subject to change without notice.

877532M Printed in U.S.A.

<b>03-10 kHz Whistle Filter</b> .....	Switchable; 10 kHz Rejection = >40 dB
<b>04-Telemetry Low Pass Filter (35 Hz)</b> .....	0 dBm for 5.0% modulation, 20 Hz to 30 Hz
<b>05-Absence of Modulation Alarm</b> .....	Open collector output for sinking 30 V, 50 mA load. When modulation drops below 10%, output goes low after an internally adjusted time of approximately 2 to 30 seconds

## PHYSICAL

<b>Size &amp; Weight</b> .....	19" W X 5 1/4" H X 14" D; 14 lbs net
<b>Power</b> .....	115/230 VAC, 50—400Hz, 30 watts maximum
<b>Operating Temperature</b> .....	0° to 50°C

## MODEL 755A PRESELECTOR

<b>Frequency Range</b> .....	500 kHz to 1.99 MHz in 1.0 kHz increments
<b>RF Sensitivity</b> .....	100 μV for 35 dB, 1.0 mV for 50 dB S/N, Ref. to 100%
<b>Input Impedance</b> .....	50 ohms nominal
<b>Bandwidth (Wideband Standard)</b> .....	± 10 kHz, 1.0 dB ± 20 kHz, 3.0 dB ± 30 kHz, 40 dB
<b>Transient Response</b> .....	<3.0% overshoot for 25 μsec rise and fall times on RF envelope
<b>Bandwidth (narrow band, optional selectable by front panel switch)</b> .....	± 5.0 kHz, 1.0 dB ± 10 kHz, 3.0 dB ± 20 kHz, 40 dB
<b>Transient Response</b> .....	3.0% overshoot for 50 μsec rise and fall times on RF envelope
<b>Image Rejection</b> .....	>60 dB
<b>AGC Range</b> .....	50 dB (100 μV to 32 mV)
<b>Output</b> .....	450 kHz, 1.0 V RMS into 50 ohms

## PHYSICAL

<b>Power (independent of Model 753)</b> .....	115/230 VAC, 50-400 Hz, 15 watts maximum
<b>Operating Temperature</b> .....	0°C to 50°C.

Today's **TFT** INC

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088  
☎ (408) 727-7272  
TWX: 910-338-0584  
FAX: (408) 727-5942

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## PRICE SCHEDULE BROADCAST MONITORING EQUIPMENT

### TV PRODUCTS

October 1, 1979

<b>MODEL 701</b>	TV FREQUENCY & AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$5,980.00
Option 02	Alarm (frequency and modulation)	\$315.00
Option 03	SCA Output	\$275.00
Option 04	AGC Meter (visual/aural carrier level)	\$250.00
*Option 06	Automatic Logging Output (BCD)	\$280.00
*Option 07	CCIR Format	\$500.00
Option 08	Spare Parts Kit	\$595.00
<b>MODEL 702</b>	TV AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$2,850.00
Option 02	Alarm (modulation only)	\$150.00
Option 03	SCA Output	\$275.00
Option 04	AGC Meter (visual/aural carrier level)	\$250.00
Option 05	Spare Parts Kit	\$295.00
<b>MODEL 704</b>	Remote Meter and Peak Flasher Panel	\$295.00

### FM PRODUCTS

<b>MODEL 763</b>	FM Modulation Monitor (Specify Frequency)	\$1,400.00
Option 01	Balanced Audio Output (Standard)	N/C
Option 02	Carrier Power Alarm, +5% - 10% (does not work with preselector)	\$125.00
Option 04	Absence-of-Modulation Alarm	\$175.00
Option 06	230 VAC	N/C
Option 07	Spare Parts Kit	\$195.00
<b>*MODEL 764A</b>	FM Preselector with Frequency Readout, Tunable	\$1,650.00
*Option 01	BCD Output	\$215.00
*Option 02	Frequency Alarm ( $\pm 2$ kHz)	\$150.00
Option 03	Spare Parts Kit	\$220.00
<b>*MODEL 765A</b>	FM Preselector (Modulation Only), Tunable	\$1,000.00
Option 01	TCXO Time Base	\$250.00
Option 02	Spare Parts Kit	\$150.00
<b>MODEL 785</b>	Single Channel FM Preselector	\$295.00
<b>MODEL 704F</b>	Remote Meter and Peak Flasher Panel	\$295.00
<b>MODEL 724.A</b>	STEREO MONITOR	\$1,690.00
Option 01	Spare Parts Kit	\$175.00
<b>MODEL 704C</b>	Remote Meter Panel	\$410.00
<b>MODEL 730A</b>	SCA MONITOR, 67 kHz	\$1,675.00
Option 01	SCA Channel (41 kHz)	\$145.00
Option 02	Spare Parts Kit	\$160.00
<b>MODEL 704B</b>	Remote Meter Panel	\$295.00

\*Not Field Installable

## BROADCAST MONITORING EQUIPMENT

### AM PRODUCTS

<b>MODEL 753</b>	AM Modulation Monitor	\$1,145.00
Option 01	Balanced Audio Output (Standard)	N/C
Option 02	Carrier Power Alarm (does not work with preselector)	\$145.00
Option 03	10 kHz Whistle Filter	\$145.00
Option 04	30 Hz Telemetry Lowpass	\$95.00
Option 05	Absence-of-Modulation Alarm	\$175.00
Option 06	230 VAC	N/C
Option 07	Spare Parts Kit	\$140.00
<b>*MODEL 754</b>	AM RF Preselector with Frequency Readout	\$1,570.00
Option 01	Narrow Band Filter	\$275.00
*Option 02	BCD Output	\$200.00
*Option 03	Frequency Alarm ( $\pm 20$ Hz)	\$155.00
Option 04	Spare Parts Kit	\$180.00
<b>*MODEL 755</b>	AM RF Preselector (Modulation Only)	\$850.00
Option 01	Narrow Band Filter	\$275.00
Option 02	TCXO Time Base	\$250.00
Option 03	Spare Parts Kit	\$95.00
<b>MODEL 704E</b>	Remote Meter and Peak Flashers	\$295.00

### EBS PRODUCTS

<b>MODEL 760-1A</b>	AM Receiver/Encoder/Decoder	\$760.00
<b>MODEL 760-1B</b>	Single Channel FM Receiver/Encoder/Decoder	\$760.00
<b>MODEL 760-1C</b>	Dual Channel FM Receiver/Encoder/Decoder	\$795.00
<b>MODEL 760-3</b>	Encoder/Decoder	\$575.00
<b>MODEL 760-2A</b>	AM Receiver/Decoder	\$525.00
<b>MODEL 760-5A</b>	Single Channel FM Receiver/Decoder	\$525.00
<b>MODEL 760-5B</b>	Dual Channel FM Receiver/Decoder	\$580.00
<b>MODEL 761-1A</b>	AM Receiver/Decoder (Desk Top)	\$550.00
<b>MODEL 761-1B</b>	Single Channel FM Receiver/Decoder	\$550.00
<b>MODEL 761-5B</b>	Dual Channel FM Receiver/Decoder (Desk Top)	\$555.00
	AM Receiver Module, Frequency Synthesized	\$230.00
	FM Receiver Module, Single Channel, Crystal Controlled	\$230.00
	FM Receiver Module, Dual Channel, Crystal Controlled	\$290.00
	Two-Tone Generator Module	\$280.00
	Two-Tone Decoder Module	\$190.00

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

Time and 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

Transportation charges for instruments found to be defective within the first thirty (30) days of the warranty period will be paid both ways by the SELLER. Transportation charges for warranty returns and repair costs, 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. We are not liable for consequential damages. Price subject to change without notice.

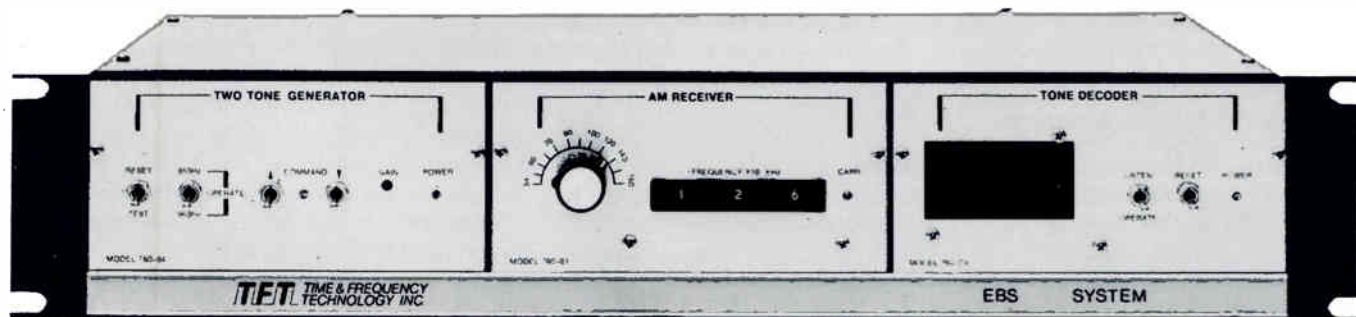
# TFT

## TIME AND FREQUENCY TECHNOLOGY, INC..

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 (408)246-6365 TWX 910-338-0584

# EBS 760

EMERGENCY  
BROADCAST  
SYSTEM



READY  
WHEN IT  
COUNTS

**TET** INC



# EBS SYSTEM



## FCC TYPE ACCEPTED AND CERTIFIED

The Model 760 EBS System is designed for broadcasters to meet Parts 73.940, 73.941 and 73.942 of the FCC Rules and Regulations for decoding and encoding the two-tone EBS alert signal. The modular construction of the system provides for maximum versatility and consists of a cabinet assembly, AM or FM receiver, two-tone decoder and a two-tone generator. Two or three of these modules can be combined into a cost-effective operational EBS System.

### Model 760-00 Cabinet Assembly

The Model 760-00 Cabinet Assembly is designed to accept up to three of the EBS modules described below. Stand alone units may be constructed by ordering the Model 760-00 cabinet and any particular module. A fully loaded cabinet would consist of the Two-Tone Generator on the left, either AM or FM Receiver in the center, and the Two-Tone Decoder on the right. Blank panels are used as fillers where modules are not installed.

### Tunable, Frequency Synthesized AM Receiver

The AM receiver, Model 760-01, is a continuously tunable AM broadcast receiver using a frequency synthesized local oscillator which is phase locked to a 5 MHz crystal oscillator. The local oscillator is tuned by means of a 3 digit front panel thumbwheel switch in 10 kHz steps. The stability of the receiver is that of the crystal oscillator regardless of which AM channel is being received. Positive tuning to any desired station is accomplished by dialing the frequency of the selected station and peaking the RF amplifier tuning. The CARRIER light will come on only when the desired station is received. A rear panel terminal is provided for activating external carrier-off alarm circuitry.

In addition to broadcast station use, the AM Receiver provides a low cost monitor for all emergency service agencies, such as police, fire, Civil Defense, hospitals, etc. These services can listen to key EBS participating stations in the local area during any emergency.

### Crystal Controlled, Dual Channel FM Receiver

The FM Receiver, Model 760-02, is a high performance dual channel, fixed frequency FM broadcast receiver. Channel selection is accomplished by a push-button switch. Both chan-

nels are fixed tuned and the crystals are factory installed. A one channel version is also available. The CARRIER light will come on only when the desired station is received. A rear panel terminal is provided for activating external carrier-off alarm circuitry. Specify number of channels and frequency with order.

The latest MOS FET and LSI integrated circuits are used to achieve simplicity in circuit design and reliability. The 10.7 MHz IF consists of two ceramic filters for excellent selectivity.

The FM Receiver is ideally suited for FM intercity relay networks. These networks are a key link in the EBS alerting procedure. The quality built into the FM Receiver modules makes it possible to pick-up and re-broadcast emergency programming without degradation of signal quality.

### Two-Tone EBS Decoder

The TFT Two-Tone Decoder, Model 760-03, decodes the 853 Hz and 960 Hz EBS signaling tones from the demodulated output of a receiver. It may be used in conjunction with TFT's Model 760-01 AM Receiver, Model 760-02 FM Receiver, or any audio source which has the EBS Two-Tone signal at 100 mV rms or greater. Stable piezoelectric tuning fork filters are used to achieve  $\pm 5$  Hz bandwidth from the center frequency of each tone. The timing circuit for the 10 second delay is a signal averaging integrator which eliminates false turn-on by noise. An amplifier and loudspeaker are built-in for audio monitoring. Volume control is internally preset.

### Two-Tone EBS Generator

The Two-Tone EBS Generator, Model 760-04, generates the 853 Hz and 960 Hz tones simultaneously with an accuracy of  $\pm 0.25$  Hz. The frequency and stability of the tones are accomplished by synthesizing the tones from a single crystal oscillator.

Model 760-04 should be installed in the program audio line before the audio limiter. A single channel of audio can be routed through the Generator. (For multichannel routing, see the application note below right.) When the generator is activated, program audio is automatically interrupted, the EBS tones inserted, and The Emergency Program Audio is connected to the output. Program audio is restored by the RESET switch.

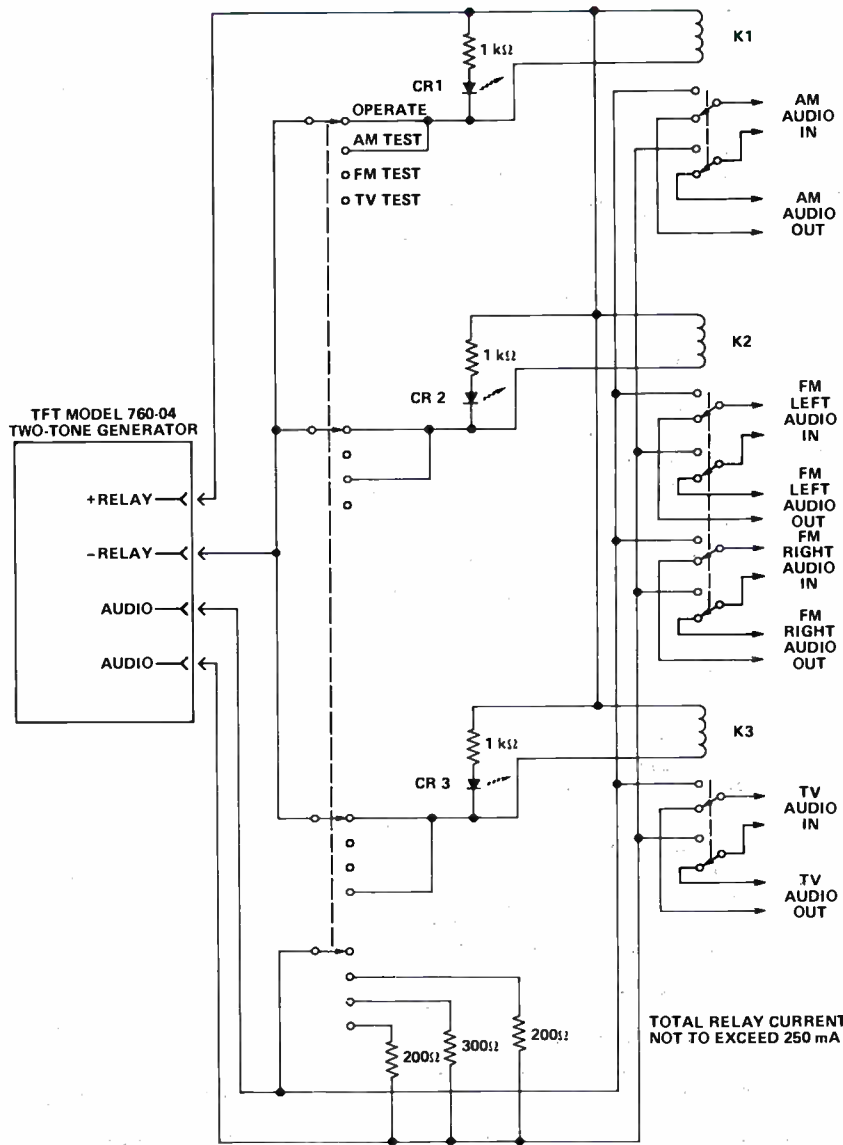
The generator is activated by two front panel COMMAND switches which need to be simultaneously operated to prevent accidental activation. COMMAND and RESET functions can be remotely controlled through rear panel wiring. The amplitude of each tone can be checked and adjusted individually.

**Order Information**

- MODEL 760-1A, AM Receiver/Encoder/Decoder
- MODEL 760-1B, Single Channel FM Receiver/Encoder/Decoder

- MODEL 760-1C, Dual Channel FM Receiver/Encoder/Decoder
- MODEL 760-3, Encoder/Decoder
- MODEL 760-00, Chassis Assembly
- MODEL 760-01, EBS AM Receiver
- MODEL 760-02, EBS Single Channel FM Receiver
- MODEL 760-03, EBS Tone Decoder
- MODEL 760-04, EBS Two Tone Generator (available with or without power supply)
- MODEL 760-06, EBS Dual Channel FM Receiver

**MODEL 760 EBS SYSTEM  
TYPICAL COMBINED AM-FM-TV APPLICATION**



K1, K3: POTTER & BRUMFIELD R10-E1-Y2-V185  
 K2: POTTER & BRUMFIELD R10-E1-Y4-V185  
 CR1, CR2, CR3: HPA 5082-4487

# SPECIFICATIONS

## Model 760-00, EBS Cabinet Assembly

Model Capacity	Will accept up to three EBS modules (01, 02, 03, 04) Blank panels provided for less than three models.
** Input Power	115 ±15% VAC, 50/60 Hz, 20 watts maximum
** Operating Temperature	0° to 50° C
Size	3.5" high x 19" wide x 12" deep
Weight	Approx. 10 pounds (4.5 kg)

## Model 760-01, Frequency-Synthesized AM Receiver

Frequency Range	540 – 1620 kHz
Local Oscillator	
Stability	±500 Hz per year
Tuning Method	Channel frequency digitally set in 10 kHz steps by thumbwheel switches.
Antenna Input	75 ohms nominal, unbalanced.
Sensitivity	30 µV for 20 dB S/N at 30% modulation.
Image Rejection	50 dB
AGC	70 dB
IF Bandwidth, 6dB	±5 kHz
Harmonic Distortion	Less than 3% at 90% modulation.
Noise	45 dB or greater below 100% modulation with 10 MV RF
Audio Outputs, 600 ohms	Balanced: +8 dBm Unbalanced: 1 V rms
Carrier-Off Output	Active pullup to 10 V, 10 ma

## Model 760-02, Crystal Controlled FM Receiver

Frequency Range	88 – 108 MHz
Channel Frequency	Specify frequency, either one or two channel versions available.
Antenna Input	75 ohms nominal, unbalanced
Sensitivity	2 µV for 30 dB of quieting.
IF Bandwidth, 6dB	±150 kHz
Image Rejection	40 dB
AGC	80 dB
Audio Frequency	
Response	±1 dB, 50 Hz – 15 kHz
Harmonic Distortion	1%
S/N Ratio	60 dB or greater below 100% modulation at 50 µV RF input
De-emphasis	75 µ sec
Audio Outputs, 600 ohms	Balanced: +8 dBm Unbalanced: 1 V rms
Carrier-Off Output	Active pullup to 10V, 10ma.

## Model 760-03, Two-Tone Decoder

Input Level Required	100 mV into 600 ohms
Tone Frequencies	853 Hz and 960 Hz
Bandwidth	±5 Hz
Listen Operate Switch	In Operate mode the loudspeaker is muted until an EBS alert is decoded. In Listen mode, the loudspeaker is demuted.
Audio Output	1 Watt, internal loudspeaker
Reset Switch	Resets decoder and mutes loudspeaker

Remote Operation	The RESET switch wiring is brought out to the rear panel
Time Delay for De-muting	12 seconds ±4 seconds
External Alarm Contacts	SPDT relay contacts brought out to rear panel.

## Model 760-04, Two-Tone Generator

Output Frequencies	853 Hz and 960 Hz
Frequency Accuracy	±0.25 Hz, crystal controlled
Output Level	+8 dBm nominal (per tone)
Output Impedance	600 ohms, balanced
Harmonic Distortion	Less than 2%
Tone Duration	23.4 seconds, ±0.15 seconds
Tone Level Adjust	Front panel pot, -2 dBm to +8 dBm
Program Audio Routing*	Rear panel DPDT relay contacts. Balanced input and output. Switch-over and latch to EBS programming is automatic.
Emergency Program Audio Input	Unbalanced input. Internally inserted into program line.
Test Switch	Connects Generator to Decoder for testing without interrupting program audio.
Tone Switch	Enables one tone at a time for setting level and checking distortion.
Command Switches	2 toggle switches. Must be activated in opposite directions to turn on Generator.
Reset Switch	Releases latch to restore normal program audio.
Remote Operation	The COMMAND and RESET switch wiring is brought to the rear panel.

\*For multichannel audio switching, see diagram on page 3.

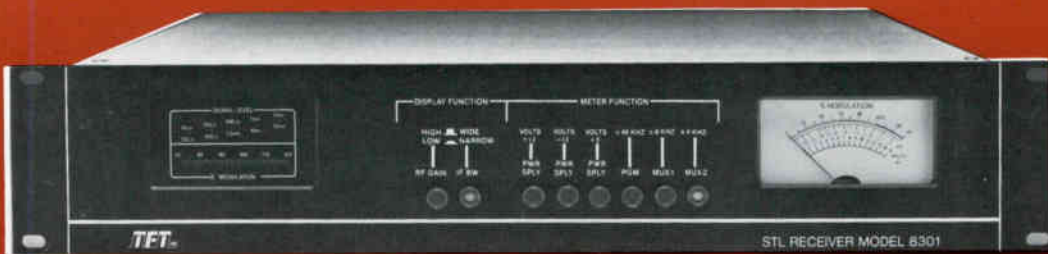
SPECIFICATIONS ARE TYPICAL AND SUBJECT TO CHANGE WITHOUT NOTICE.

\*\* SPECIFICATION APPLIES TO ALL MODULES.

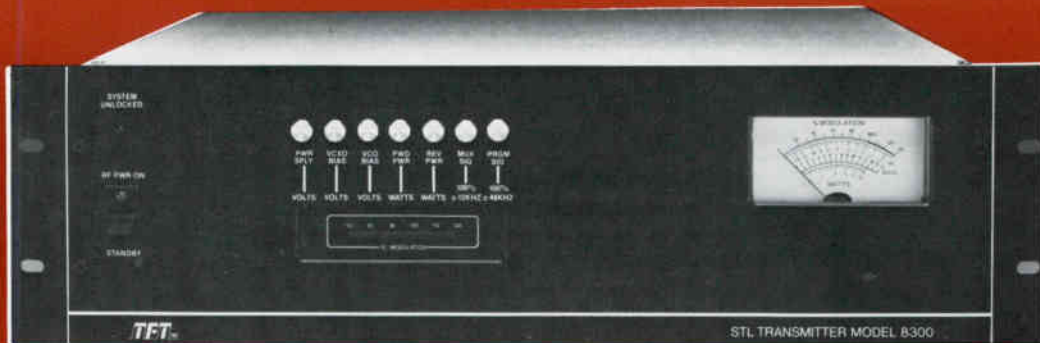




# 8300 Series



MODEL 8301 RECEIVER



MODEL 8300 TRANSMITTER

## WIDEBAND-COMPOSITE BROADCAST QUALITY AURAL STUDIO-TRANSMITTER LINK AND INTER-CITY RELAY SYSTEM

110 MHz - 250 MHz

300 MHz - 375 MHz

400 MHz - 500 MHz

800 MHz - 960 MHz



# The Leading Edge of STL Technology

TFT 8300 broadcast quality aural Studio Transmitter Link and inter-city relays open a new generation of superior STL technology keyed to the increasing demand for system performance and versatility. They are the result of years of experience in STL and FM transmitter monitoring technology. To meet today's demands for improved signal-to-noise ratio, better stereo separation, reliable operation in dense RF signal environments, AM stereo applications and automatic "hot-standby" switch over, such state-of-the-art features are all incorporated into the revolutionary design of the new TFT 8300 Series.

## System Features

- **Superior System Performance** — better than 75 dB signal-to-noise ratio, 50 dB stereo separation, three-to-one protection against adjacent channels.
- **Full Front Panel Metering** — Diagnostic metering capabilities facilitate key system performance checks and monitoring.
- **Bargraph Display of Modulation** — A bargraph display is used in both transmitter and receiver for displaying percentage of modulation.
- **Hot Standby** — Fully automatic switch-over to hot standby receiver or transmitter.
- **Modular Construction** — For low maintenance cost and ease of field servicing.
- **IF Repeater** — For difficult path problems

## For Major Market's RF Signal Environment

The 8300 is specifically designed for the major market's RF signal environment where it becomes increasingly difficult to operate composite STLs with the large number of signals present in the 940-960 MHz band. By using the latest technology and components, such as S.A.W. filters, selectable RF front end gain, variable bandwidth IF amplifiers and cast aluminum RF shielded housings for critical circuits; TFT engineers were able to design one of the best STL systems available to the broadcast industry for aural program transmission.

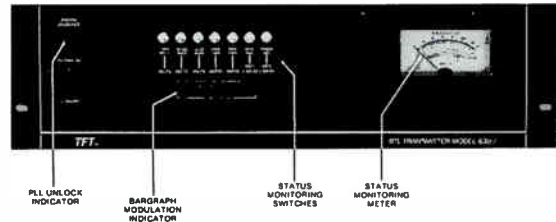
## The Transmitter

The RF carrier is generated by a UHF VCO which is phase locked to another VCO operating at an intermediate frequency (IF) of 60 to 80 MHz. Composite modulation is taking place at the IF VCO which is also frequency synthesized to a stable crystal source. Since no multiplier is used in the entire transmitter, the RF carrier is therefore the exact reproduction of the IF VCO.

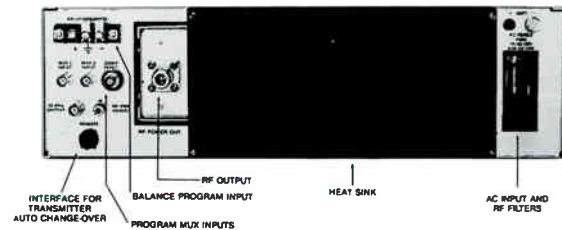
## Features

- **Direct Locked RF Carrier** — RF carrier is directly generated, without multiplication, by a UHF VCO which is phase locked to an IF VCO.
- **IF Modulation** — The carrier modulation is applied to an IF frequency between 60 and 80 MHz to achieve excellent signal-to-noise ratio and stereo performance.
- **Fully Protected** — The output is fully protected against short and open circuits as well as high VSWR.
- **Wide Baseband Bandwidth** — Two additional FM subcarriers may be inserted into the baseband in addition to the main and stereo channels.

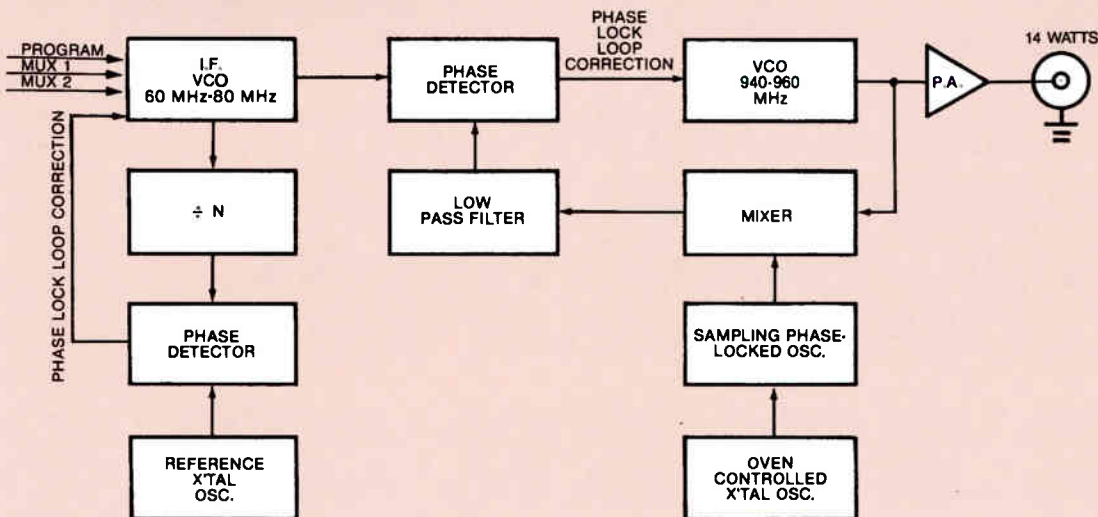
FRONT VIEW OF TRANSMITTER



REAR VIEW OF TRANSMITTER



## TRANSMITTER BLOCK DIAGRAM



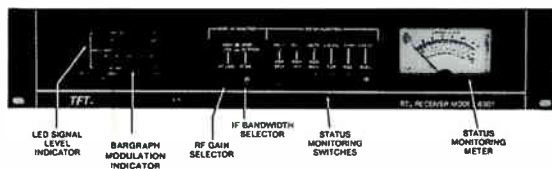
## The Receiver

The design of the 8300 receiver incorporates several unique features that provide low noise, high gain and great versatility. All receivers allow for automatic change-over to "Hot Standby" in the event of a detected malfunction.

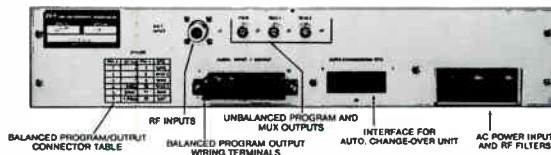
### Features

- **S.A.W. Filter** — Surface Acoustic Wave (S.A.W.) filter is used at the first IF amplifier to provide superior selectivity and, at the same time, to eliminate phase distortion for excellent stereo performance and frequency response.
- **Pulse-Counting Discriminator** — A unique pulse-counting discriminator circuit provides ultra-linear FM demodulation to achieve low harmonic and inter-modulation distortion.
- **Selectable IF Bandwidth**—Two IF bandwidths are available, depending on signal conditions. The wide band is used in normal environment operation and the narrow band is used where adjacent channel interference is high.
- **Hi-Low Gain RF Amplifier** — A selectable HI or LOW gain RF amplifier protects the amplifier from being overdriven by strong input signals.

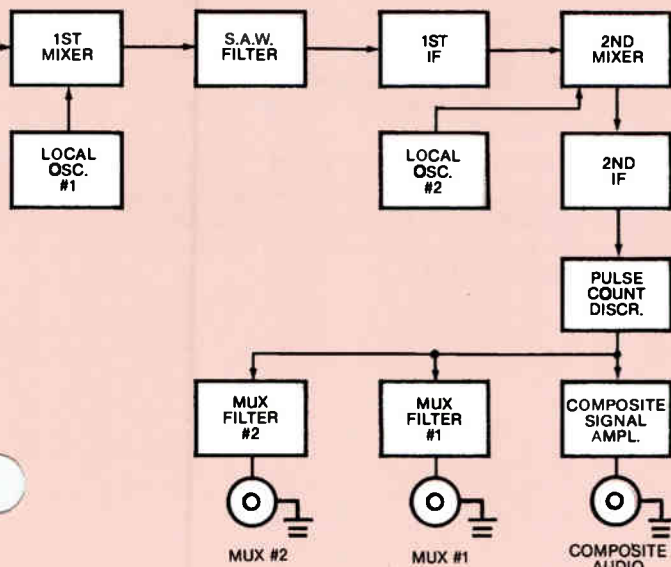
FRONT VIEW OF RECEIVER



REAR VIEW OF RECEIVER



RECEIVER BLOCK DIAGRAM



## Applications

- **Dense RF Environment** — Designed to meet the stringent requirements of top-market stations which are located in congested RF environments.
- **Inter-City Relay Systems** — By interconnecting a number of STL systems in series, broadcast quality audio links between cities may be achieved, providing high quality stereo or multi-channel audio service to each city.
- **Multiple Program Channels** — Superior TFT 8300 performance allows the use of FM subcarriers or FDM in addition to the composite stereo signal. (Subchannel audio can respond to 15 KHz).
- **AM Stereo** — With a TFT designed stereo optional decoder, the 8300 provides L and R channel outputs when the STL transmitter is used in conjunction with a standard FM stereo generator.
- **Multihops** — To overcome long path lengths and to circumvent physical obstructions.

## Accessories and Options

**92 kHz SCA Capability (option 16):** Allows the 8300 System to transmit a 92 kHz SCA channel through the entire STL System (SCA generator located at studio). Consult factory for full details and specifications.

**Stereo Decoder (option 15):** Built-in stereo board for decoding left and right channels. (For AM stereo applications).

**IF Repeater (option 22):** Additional relay receiver circuitry to retransmit the program material without disturbing the audio baseband on multi-hop STL systems.

**Model 7770 Transmitter Automatic Changeover:** This is a 1 $\frac{3}{4}$ " rack mount unit which monitors critical parameters in the transmitters. If a fault is detected, it automatically switches to the hot standby transmitter. Change-over can also be accomplished by a front panel switch or relay contact closure in the remote control equipment. The unit is self-powered and switches RF output to the antenna.

**Model 7773 Receiver Automatic Change-over:** Similar to the Model 7770, Model 7773 monitors the parameters in the receivers. The unit switches the program channel output as well as both subcarrier outputs.

**Frequency Division Multiplex (FDM) Baseband Encoder and Decoder:** Multiple broadcast programs can be transmitted with full audio bandwidth by using the FDM encoder and decoder.

**Other Accessories:** TFT carries a full line of accessories such as coaxial cable, type N connectors and antennas to meet STL system installation requirements. Please refer to STL Price List for detailed information.

# Specifications

## System

Frequency Ranges	110 - 250 MHz 300 - 375 MHz 400 - 500 MHz 800 - 960 MHz
Frequency Response	± .1 dB or better 30 Hz to 53 kHz ± .3 dB or better 53 to 75 kHz
Distortion (THD & IMD)	0.2% or less 30 Hz to 75 kHz (Typically less than 0.1% at 1 kHz)
Stereo Separation	50 dB or better, 400 Hz to 10 kHz; 45 dB or better, 50 Hz to 400 Hz and 10 kHz to 15 kHz; (Minimum 45 dB Narrow Selectivity)
Stereophonic Subchannel to Main Channel Crosstalk	50 dB or better
Main Channel to Stereophonic Subchannel Crosstalk	50 dB or better
Signal-to-Noise Ratio	75 dB or better below 100% modulation de-emphasized left or right

## Transmitter

RF Power Output	4 Watts minimum 14 Watts maximum
RF Output Connector	Type N Female, 50 ohms
Deviation for 100% Modulation	± 50 kHz
Frequency Stability	Better than .0001%, 0°C to 50°C
Spurious and Harmonic Emission	60 dB or more below carrier level
Modulation Capability	One Stereo Composite Program and Two Subcarrier Channels.
Modulation Inputs	Composite: 3.5V peak to peak. 10K ohms balanced and unbalanced, BNC and terminal strip. Multiplex: 1.5V peak-to-peak, 10K ohms BNC, (2 each), frequency range 130 to 300 kHz
Power Source	115/230 VAC ± 10%, 50/60 Hz, 80 Watts 24 VDC optional
Monitoring Capability	One 2" analog meter for monitoring power output, power supply, bias voltages, multiplex and program modulation. LED bargraph for monitoring 70 to 120% program channel modulation.

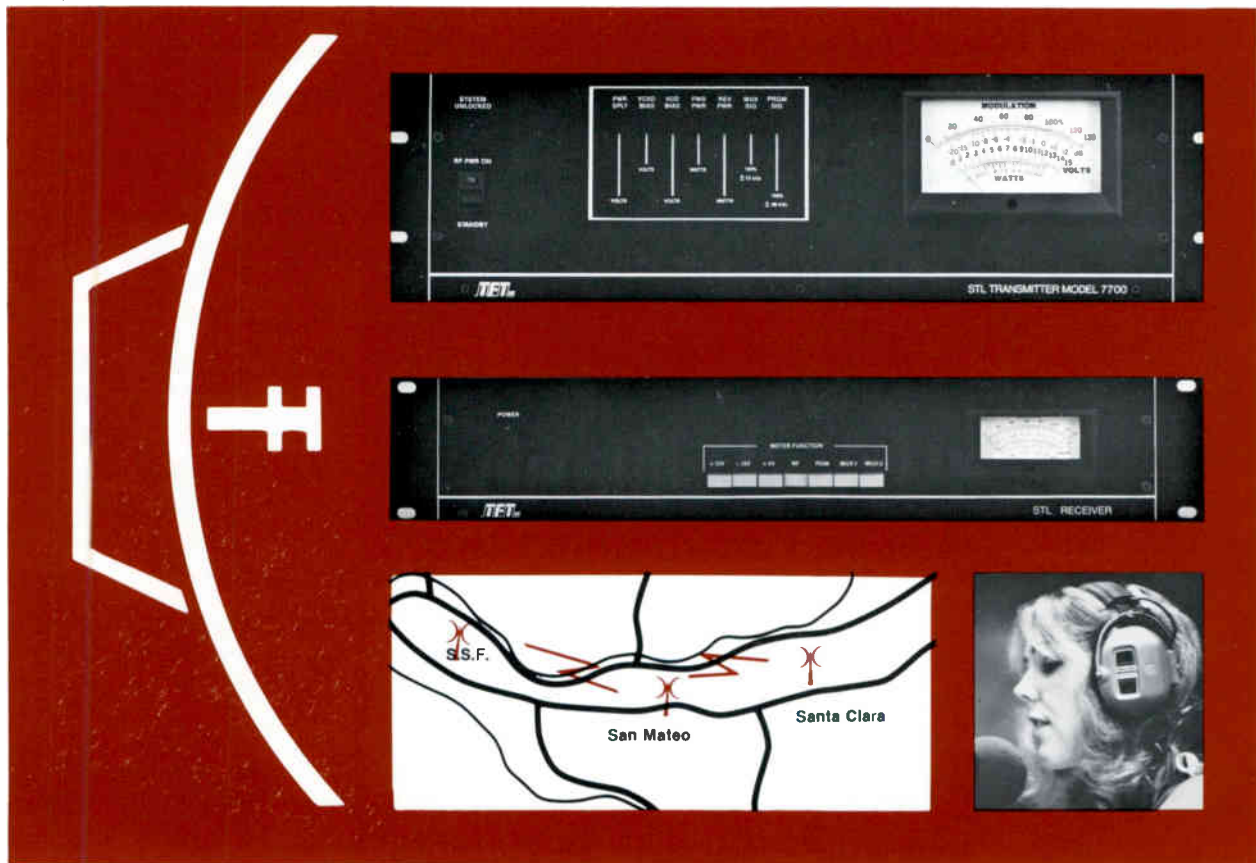
## Receiver

RF Input Connector	Type N Female, 50 ohm
Sensitivity	40uV or less required for 60 dB SNR broadband, de-emphasized. 100uV or less required for 60 dB SNR left or right channel demodulated.
Selectivity (wide)	3 dB IF bandwidth ± 200 kHz 60 dB IF bandwidth ± 700 kHz 80 dB IF bandwidth ± 1.2 MHz
Selectivity (narrow)	3 dB IF bandwidth ± 150 Khz 60 dB IF bandwidth ± 500 kHz 80 db IF bandwidth ± 1.2 MHz
Modulation Outputs	Composite: 3.5V peak-to-peak, 75 ohm balanced and unbalanced, BNC and clip lead. Multiplex: 1.5V peak-to-peak, 75 ohm BNC and terminal strip barrier.
Power Source	115/230 VAC ± 10%, 50/60 Hz, 10 watts
Monitoring Capability	One 2" analog meter for monitoring power supplies, 0 to 120% modulation for program and multiplex channels. LED bargraph for monitoring input RF level and modulation 70 to 120%





# 7700 SERIES BROADCAST QUALITY AURAL STUDIO TRANSMITTER LINK AND INTER-CITY RELAYS



For: 35-50 MHz, 143-174 MHz\*,  
203-240 MHz\*, 302-330 MHz,  
446-488 MHz, 940-960 MHz

\*Customized order



# Innovation helps make TFT a performance leader in Studio-Transmitter-Links and Inter-City Relays

TFT designs, manufactures, markets and services Broadcast Quality STL's and Inter-City Relays for Stereo, Monaural, and Multi-Channel program audio applications.

Since the introduction of STL's in 1977, over a thousand units have been installed and operational in the United States and worldwide. This equipment is also frequently used for voice and data transmission where low intermodulation and superior group delays are required. It is the best performing equipment in its price range.

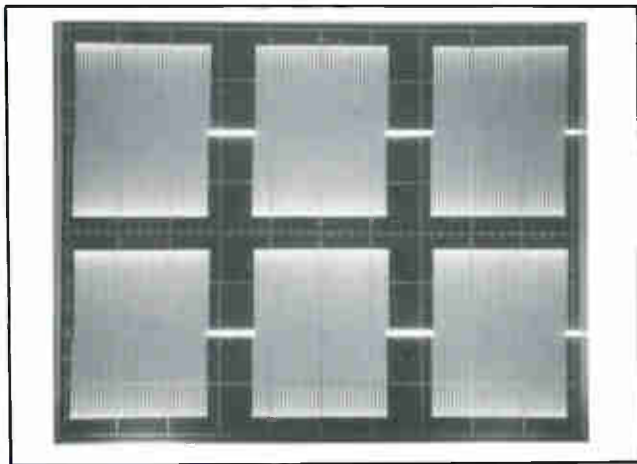
## Why STL?

STL represents the best alternative to telephone lines in three important areas:

1. **Quality:** Since telephone lines were designed primarily for voice transmission, their audio quality is minimal. Even the compensated lines are not adequate for most of today's stereo performance requirements. TFT's STL and Inter City Relays, on the other hand, are designed primarily for broadcast and take into account the many specialized requirements of that medium.
2. **Reliability:** With STL you are no longer at the mercy of telephone companies which you cannot control.
3. **Economy:** The cost of telephone lines are increasing. Once you own an STL, level amortization and small maintenance costs are all you pay.

All of these factors make owning an STL both a practical and economically sound decision.

Tone burst test of the STL system demonstrates true signal reproduction with no overshoot. Top trace: 15 kHz tone burst input to the transmitter. Bottom trace: output from the receiver.



## Why 7700 Series?

The full fidelity performance of today's HI-FI receivers and tomorrow's AM Stereo receivers has put new requirements on broadcast equipment. The link between the broadcast studio and the transmitter is as important as the broadcast transmitter itself. TFT STL's are designed with broadcast applications in mind using state-of-the-art RF and digital technology. Some of the innovations in the 7700 Series STL include:

**IF Modulated Transmitter:** Improves signal to noise ratio and stereo performance by providing low distortion and high stereo performance.

**Hot Standby:** A fully redundant receiver and transmitter are available, both with automatic transfer and alarm, which provides maximum security across the system.

**Modular Construction:** Modular construction in the transmitter and receiver contribute to low maintenance cost and ease of field servicing.

**Ease of Maintenance:** All tuning adjustments are easily accessible through top of transmitter and receiver modules. P.C. boards are of slide-out design for easy replacement.

**Front Panel Metering:** Audio output level, sub-carrier level and RF input level in microvolts may all be monitored directly from the front panel.

**RFI Protected:** In the last five years, the 7700 Series has been field tested in the most adverse environments such as transmitter farms in Houston, Los Angeles, San Francisco and Denver. All have achieved excellent field test results.

**A Wide Selection of Frequency Ranges:** Provides STL capability for most foreign and domestic systems.

\*Field test data and results are available upon request.

# Specifications

## System

Frequency Ranges ..... *Customized Order	35-50 MHz (monaural only), 143-174 MHz*, 203-240 MHz* 302-330 MHz, 446-480 MHz, and 940-960 MHz.	Signal-to-Noise Ratio ..... (500 $\mu$ v RF input)	Greater than 70dB below 100% modulation, de- emphasized left or right channel.
Baseband Frequency Response:		Crosstalk Suppression ..... (subchannel to main channel)	Greater than 46 dB
Program Audio .....	Composite: 50 Hz - 75 kHz Monaural: 50 Hz - 15 kHz	Modulation Capability ..... (deviation for 100% modulation):	
Multiplex .....	Composite: 110 to 220 kHz Monaural: 39 to 67 kHz	Program Channel .....	$\pm$ 48 kHz
Harmonic and Intermodu- lation Distortion .....	Composite: 0.2% at 1 kHz; 0.25% from 30 Hz to 60 kHz Monaural: 0.2% from 30 Hz to 15 kHz	Multiplex Channel 1 .....	$\pm$ 12 kHz
		Multiplex Channel 2 .....	$\pm$ 60 kHz

## Receiver

940-960 MHz .....		<b>Composite Models</b>	<b>Monaural Models</b>
450-485 MHz .....		Model 7707	Model 7705
300-330 MHz .....		Model 7713	Model 7711
35-50 MHz .....		Model 7723	Model 7721
RF Input Connector		NOT AVAILABLE	Model 7731
Sensitivity (de-emphasized) 60 dB S/N Min. ....		50 ohm, Type "N"	50 ohm, Type "N"
Signal to Noise		40 $\mu$ V	20 $\mu$ V
1 mV RF input without de-emphasis			
1 mV RF input with 75 $\mu$ Sec de-emphasis			
Selectivity (3-dB BW) .....		60 dB Min.	60 dB Min.
Selectivity (80-dB BW) .....		70 dB Min.	70 dB Min.
AM Rejection (400 Hz @ 10%)		320 kHz Min.	170 kHz Min.
Spurious and Image Rejection		2.4 MHz Max.	1.4 MHz Max.
Demodulated Outputs Program		55 dB Min.	55 dB Min.
		60 dB Min.	60 dB Min.
		+ 4 dBm (1.24 V RMS) into 600 ohms, unbalanced, 50 Hz to 75 kHz	+ 10 dBm (2.48 V RMS) into 600 ohms, balanced, 50 Hz to 15 kHz
Multiplex .....		- 3.7 dBm (0.50 V RMS), 600 ohms, 110 to 220 kHz 0.1% max.	- 3.7 dBm (0.50 V RMS), 600 ohms, 39 to 67 kHz .150% max.
Harmonic Distortion .....		45 dB at 1 kHz (50 dB typical), 40 dB from 50 Hz to 15 kHz	
Stereo Separation .....			
Crosstalk		46 dB Min.	46 dB Min.
Main to Sub .....		46 dB Min.	46 dB Min.
Sub to Main .....			
Baseband Response		50 Hz to 60 kHz	30 Hz to 15 kHz
$\pm$ 0.1 dB .....		-	-
$\pm$ 0.2 dB .....		20 Hz to 75 kHz	-
$\pm$ 0.5 dB .....			
Alarm Output (Relay Closure)			
Temperature Range .....			
Power Requirements .....			
Dimensions .....			
Weight .....			

### COMMON TO COMPOSITE AND MONAURAL MODELS

1 A at 24 VDC, 0.5 A at 115 VAC  
-10°C to +50°C  
120/240 V AC, 50-60 Hz, 12 W  
3-1/4" (8.3 cm) H x 19" (48.3 cm) W x 15.5" (39.4 cm) D  
10 1/2 lb.

## Transmitter

	Model 7700	Model 7710	Model 7720	Model 7730
Frequency Range (MHz) .....	940-960	446-480	302-330	35-50
RF Power Output (watts, max)	12	20	20	40
Output Connector	50-ohm Type N Female	50-ohm Type N Female	50-ohm Type N Female	50-ohm Type N Female
Frequency Stability (ppm/yr)	$\pm$ 1	$\pm$ 1	$\pm$ 1	$\pm$ 1
Frequency Accuracy:				
0°C to +50°C .....	$\pm$ 0.0001%	$\pm$ 0.0001%	$\pm$ .0001%	$\pm$ 0.0001%
-10°C to +50°C .....	$\pm$ .0005%	$\pm$ .0005%	$\pm$ .0005%	$\pm$ 0.0005%
Spurious Signal Suppression:				
Non-Harmonically Related (dB)	65	60	60	65
Harmonically Related (dB)	65	55	55	65
AM Noise (dB below carrier)	65	70	70	70
Freq. Dev. for 100% Mod:				
Composite & Monaural (kHz)	$\pm$ 48	$\pm$ 48	$\pm$ 48	$\pm$ 48
Multiplex Channels (kHz)	$\pm$ 12	$\pm$ 12	$\pm$ 12	$\pm$ 12
Modulation Input Levels:				
Composite & Monaural (V rms)	1.24	1.24	1.24	1.24
Multiplex (V rms)	0.53	0.53	0.53	0.53
AC Line Power (watts)**	70	150	150	200
Operating Temperature Range (°C)	- 10 to +50	0 to +50	0 to +50	0 to +50
Dimensions:				
Height .....	5.25" (13.3 cm)	5.25" (13.3 cm)	5.25" (13.3 cm)	5.25" (13.3 cm)
Width .....	19" (48.3 cm)	19" (48.3 cm)	19" (48.3 cm)	19" (48.3 cm)
Depth .....	13" (33 cm)	13" (33 cm)	13" (33 cm)	13" (33 cm)
Weight (pounds)	29	29	29	35
(kilograms)	13.1	13.1	13.1	15.8

\* 10 k-ohm input.  
\*\* 120/240 VAC, 50-60 Hz.

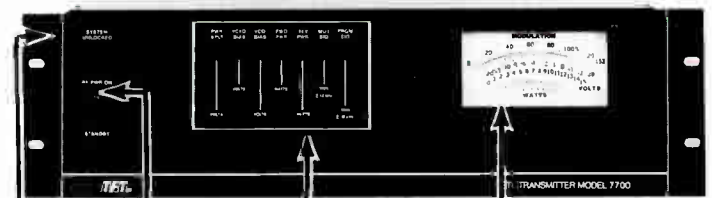


# The Transmitter

The rugged TFT 7700 Series transmitter represents a new approach to STL transmitter design, providing a vast improvement in S/N ratio and frequency stability over conventional systems. Outstanding features include:

## Features

- **IF Modulation:** The carrier modulation is applied to an IF frequency between 38 MHz and 48MHz to achieve excellent signal to noise ratio and stereo performance. The final carrier frequency is obtained by heterodyning the IF against a stable frequency source.
- **High Output Power:** The 12-watt output at 960 MHz (20 watts at 300 MHz) generates more useable signal for long or difficult transmission paths and provides higher fade margins.
- **Adjustable Output:** Power can be adjusted from 3 watts to maximum power output, allowing you to meet your exact requirements.
- **Fully Protected:** The output is fully protected against short circuits and high VSWR.
- **Excellent Frequency Stability:** Frequency synthesized carrier provides frequency stability of  $\pm 1$  ppm/year as well as making it easier to change operating frequencies in the field.
- **Accommodates Two Additional Subcarriers:** Two FM subcarriers can be inserted in addition to the main and stereo channels.
- **No Subcarrier Beats:** 19 kHz harmonically related subcarrier frequencies are chosen in order to eliminate subcarrier intermodulation products.

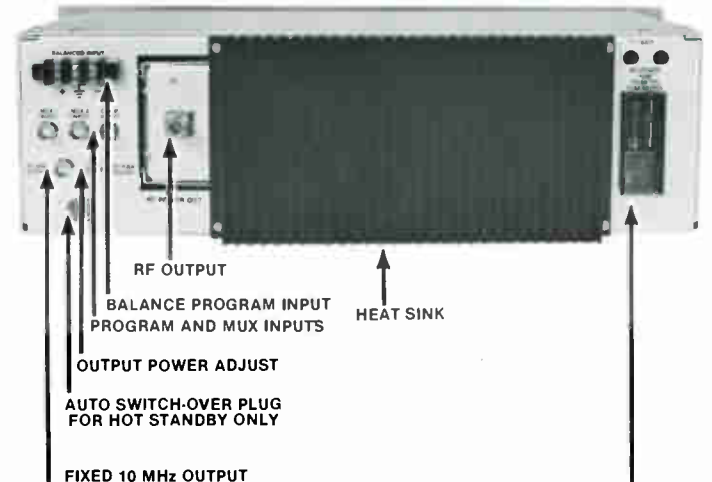


AMPL. ON/OFF  
RF POWER SWITCH  
AND INDICATOR

PLL  
UNLOCK  
INDICATOR

STATUS  
MONITORING  
SWITCHES

STATUS MONITORING  
INDICATOR AND  
MODULATION METER



RF OUTPUT

BALANCE PROGRAM INPUT  
PROGRAM AND MUX INPUTS

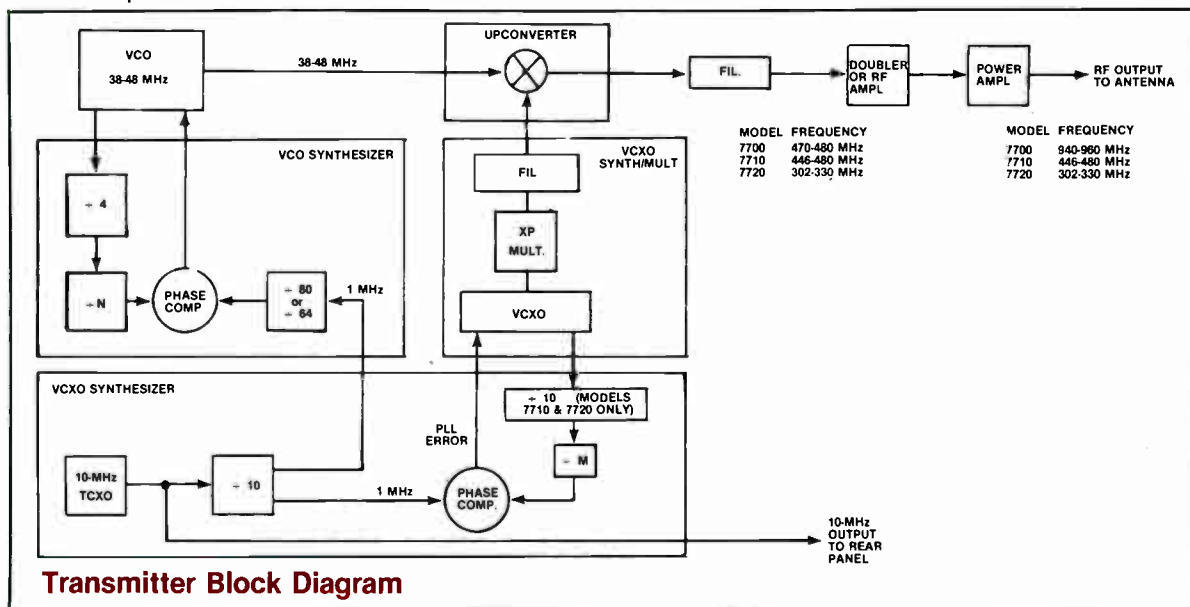
HEAT SINK

OUTPUT POWER ADJUST

AUTO SWITCH-OVER PLUG  
FOR HOT STANDBY ONLY

FIXED 10 MHz OUTPUT

AC POWER INPUT  
AND RF FILTERS



# The Receiver

The design of the all-new TFT 7700 Series receiver incorporates several unique features that provide low noise, high gain and great versatility. All receivers allow for automatic change-over to stand-by in the event of a detected malfunction.

## Features

- **Crystal controlled triple conversation superheterodyne design:** This provides selectivity, gain and stability in the receiver.
- **Low Noise RF Amplifier:** A high gain, low noise RF amplifier provides a 3.5 dB noise figure.
- **Pulse-counting Discriminator:** A unique pulse-counting discriminator circuit provides ultra-linear FM demodulation to achieve low harmonic and intermodulation distortion.
- **Receiver Automatic Changeover:** Switching to the hot standby receiver is done automatically if a failure occurs.
- **Remote Operation and Status Check:** Studio engineers can interrogate the receiver over existing remote control equipment to determine receiver change-over and ascertain which receiver is operational. Receiver switching can also be done by remote command.
- **Wide and Narrow Bandwidth IF:** Both wide-band and narrow band IF are available for either composite or monaural applications. Super sharp IF filters are available for 125 kHz channel spacings.



POWER ON INDICATOR

STATUS MONITORING SWITCHES

STATUS MONITORING INDICATOR AND MODULATION METER



RF INPUTS

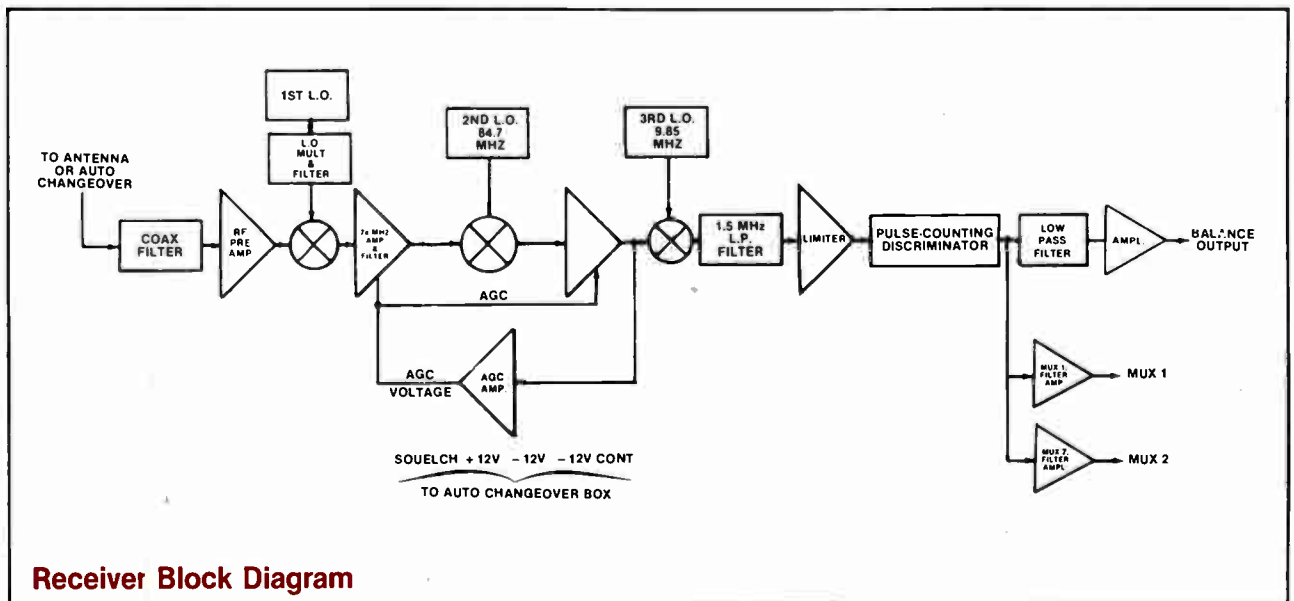
PROGRAM AND MUX OUTPUTS

AUDIO INPUT/OUTPUT WIRING TERMINALS

AUDIO CHANGEOVER JACK FOR HOT STANDBY ONLY

AC POWER INPUT AND RF FILTERS

AUDIO INPUT/OUTPUT CONNECTOR TABLE



Receiver Block Diagram



# Applications

The broadband characteristics of the TFT 7700 Series STL system allow for many specialized applications beyond the standard aural studio-transmitter link for a composite stereo baseband signal. Among these are:

- **Intercity Relay Systems:** By interconnecting a number of STL systems in series, broadcast quality audio links between cities may be achieved, providing high quality stereo or multi-channel audio service to each city.
- **Remote Control:** With the addition of an FM subcarrier, 7700 series STL can carry remote control signals from the studio to the transmitter site.
- **SCA Channel:** A background music service or data channel can be transmitted via the 7700 Series STL by using the second FM Subcarrier.

**AM Stereo:** With a TFT designed built-in stereo decoder, the 7700 Series can provide L and R channel output when the transmitter is used in conjunction with a standard FM stereo generator.

**A TFT STL Application Guide for equipment selection and path calculations is available upon request.**

# Accessories & Options

**Model 7770 Transmitter Automatic Change-over:** This is a 1-3/4" rack mount unit which monitors critical parameters in the transmitters. If a fault is detected, it automatically switches to the hot standby transmitter. Change-over can also be accomplished by a front panel switch or relay contact closure in the remote control equipment. The unit is self-powered and switches RF output to the antenna.



**Model 7773 Receiver Automatic Change-over:** Similar to the Model 7770, Model 7773 monitors the parameters in the receivers. The unit switches the program channel output as well as both subcarrier outputs.

**Frequency Division Multiplex (FDM) Baseband Encoder and Decoder:** Multiple broadcast programs can be transmitted with full audio bandwidth by using the FDM encoder and decoder. A data sheet for the FDM equipment is available upon request.

**Other Accessories:** TFT carries a full line of accessories such as coaxial cable, type N connectors and antennas to meet STL system installation requirements. Please refer to STL price list for detailed information.

**Stereo Decoder (option 13):** Built-in stereo board for decoding left and right channels. (For AM stereo applications).

**STL EQUIPMENT SELECTION GUIDE**

SYSTEM DESCRIPTION	TRANSMITTERS REQUIRED	RECEIVERS* REQUIRED	RECEIVER OPTION			FOR HOT STANDBY SWITCH	
			10	11	12	7770** For Transmitter	7773 For Receiver
A SINGLE COMPOSITE	1	1					
B DUAL COMPOSITE (WITH ONE AS HOT STANDBY)	2	2				1	1
C SINGLE MONAURAL	1	1	AS REQ'D.	AS REQ'D.	AS REQ'D.		
D DUAL MONAURAL (WITH ONE AS HOT STANDBY)	2	2	AS REQ'D.	AS REQ'D.	AS REQ'D.	1	1
E DUAL CHANNEL IN PARALLEL OPERATION	2	2	AS REQ'D.	AS REQ'D.	AS REQ'D.		

\* All receivers provide a balanced audio output at +10 dB  
 \*\* Model 7770 includes a power splitter for parallel operation of dual monaural receivers  
 Standard Mux is: 39-67 kHz for Monaural signal  
 110-220 kHz for Composite signal

OPTION: Receivers can be factory equipped with 75 µsec de-emphasis  
 Receiver Option 10 includes: 15 kHz low pass filter  
 Receiver Option 11 includes: 24-88 kHz Mux filter amplifier  
 Receiver Option 12 includes: 12-108 kHz Mux filter amplifier



# 8300



**BROADCAST QUALITY AURAL  
STUDIO TRANSMITTER LINK  
AND INTER-CITY RELAY SYSTEM**

# The Leading Edge of STL Technology

TFT 8300 broadcast quality aural Studio Transmitter Link and inter-city relay opens a new generation of superior STL technology keyed to the increasing demand for system performance and versatility. It is the result of years of experience in STL and FM transmitter monitoring technology. To meet today's demands for improved signal-to-noise ratio, better stereo separation, reliable operation in dense RF signal environments, AM stereo applications and automatic "hot-standby" switch over; these state-of-the-art features are all incorporated into the revolutionary design of the new TFT 8300.

## System Features

- **Superior System Performance** – better than 75 dB signal-to-noise ratio, 50 dB stereo separating, three-to-one protection against adjacent channels.
- **Full Front Panel Metering** – Diagnostic metering capabilities facilitate key system performance checks and monitoring.
- **Bargraph Display of Modulation** – A bargraph display is used in both transmitter and receiver for displaying percentage of modulation.
- **Hot Standby** – Fully automatic switch-over to hot-standby receiver or transmitter.
- **Modular Construction** – For low maintenance cost and ease of field servicing.

## For Major Market's RF Signal Environment

The 8300 is specifically designed for the major market's RF signal environment where it becomes increasingly difficult to operate composite STLs with the large number of signals present in the 940-960 MHz band. By using the latest technology and components, such as S.A.W. filters, selectable RF front end gain, variable bandwidth IF amplifiers and cast aluminum RF shielded housings for critical circuits; TFT engineers were able to design one of the best STL systems available to the broadcast industry for aural program transmission.

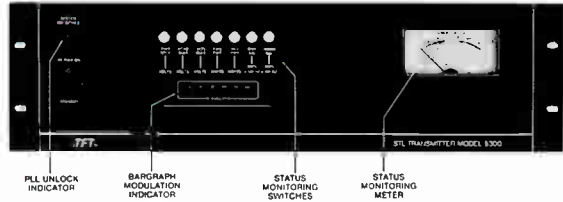
## The Transmitter

The RF carrier is generated by a UHF VCO which is phase locked to another VCO operating at an intermediate frequency (IF) of 60 to 80 MHz. Composite modulation is taking place at the IF VCO which is also frequency synthesized to a stable crystal source. Since no multiplier is used in the entire transmitter, the RF carrier is therefore the exact reproduction of the IF VCO.

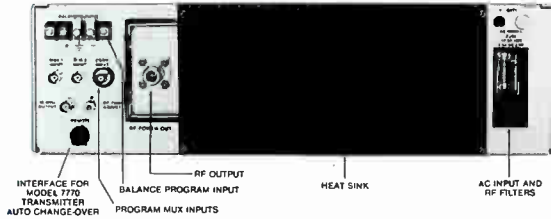
## Features

- **Direct Locked RF Carrier** – RF carrier is directly generated, without multiplication, by a UHF VCO which is phase locked to an IF VCO.
- **IF Modulation** – The carrier modulation is applied to an IF frequency between 60 and 80 MHz to achieve excellent signal-to-noise ratio and stereo performance.
- **Fully Protected** – The output is fully protected against short and open circuits as well as high VSWR.
- **Wide Base Band Bandwidth** – Two additional FM subcarriers can be inserted into the baseband in addition to the main and stereo channels.

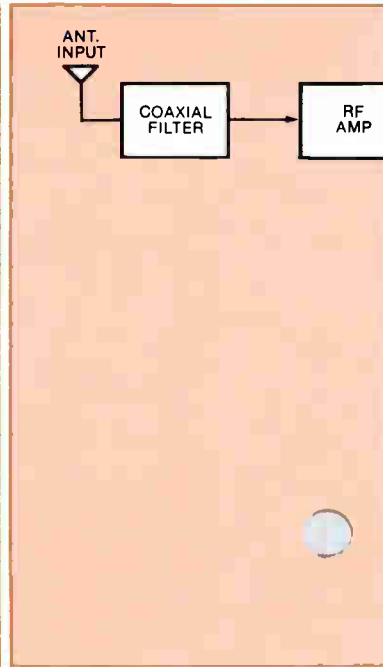
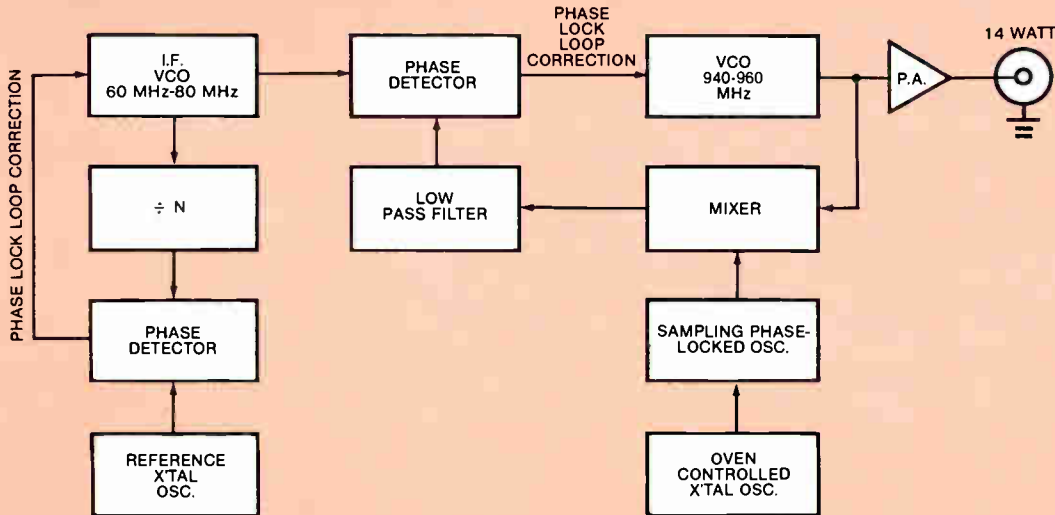
FRONT VIEW OF TRANSMITTER



REAR VIEW OF TRANSMITTER



## TRANSMITTER BLOCK DIAGRAM



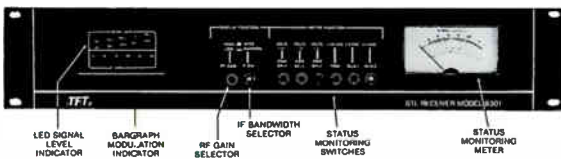
## The Receiver

The design of the 8300 receiver incorporates several unique features that provide low noise, high gain and great versatility. All receivers allow for automatic change-over to "Hot Standby" in the event of a detected malfunction.

### Features

- **S.A.W. Filter**—Surface Accoustic Wave (S.A.W.) filter is used at the first IF amplifier to provide superior selectivity and, at the same time, to eliminate phase distortion for excellent stereo performance and frequency response.
- **Pulse-Counting Discriminator** — A unique pulse-counting discriminator circuit provides ultra-linear FM demodulation to achieve low harmonic and inter-modulation distortion.
- **Selectable IF Bandwidth**—Two IF bandwidths are available, depending on signal conditions. The wide band is used in normal environment operation and the narrow band is used where adjacent channel interference is high.
- **Hi-Low Gain RF Amplifier** — A selectable HI or LOW gain RF amplifier protects the amplifier from being overdriven by strong input signals.

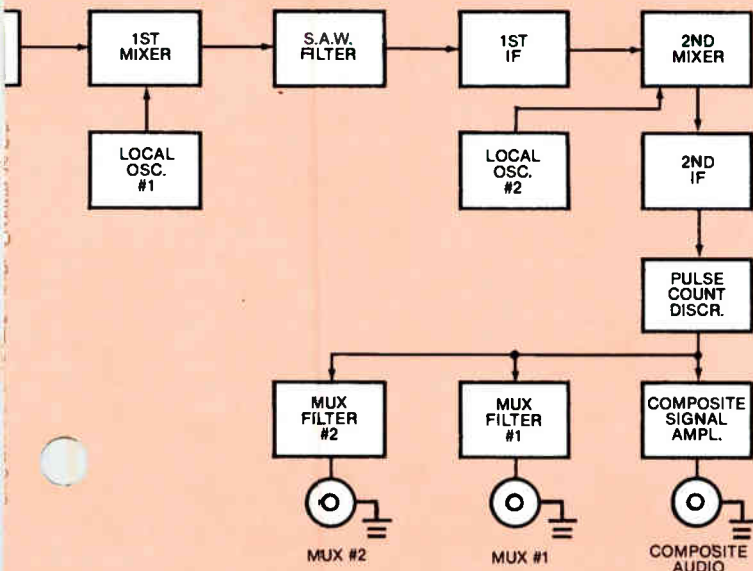
FRONT VIEW OF RECEIVER



REAR VIEW OF RECEIVER



### RECEIVER BLOCK DIAGRAM



## Applications

- **Dense RF Environment**—Designed to meet the stringent requirements of top-market stations which are located in congested RF environments.
- **Inter-City Relay Systems** — By interconnecting a number of STL systems in series, broadcast quality audio links between cities may be achieved, providing high quality stereo or multi-channel audio service to each city.
- **Multiple Program Channels**—Superior TFT 8300 performance allows the use of FM subcarriers or FDM in addition to the composite stereo signal. (Sub-channel audio can respond to 15 KHz.)
- **AM Stereo** — With a TFT designed built-in stereo decoder, the 8300 can provide L and R channel output when the STL transmitter is used in conjunction with a standard FM stereo generator.

## Accessories and Options

**92 kHz SCA Capability (option 16):** Allows the 8300 System to transmit a 92 kHz SCA channel through the entire STL System (SCA generator located at studio). Consult factory for full details and specifications.

**Stereo Decoder (option 15):** Built-in stereo board for decoding left and right channels. (For AM stereo applications).

**Model 7770 Transmitter Automatic Changeover:** This is a 1 $\frac{3}{4}$ " rack mount unit which monitors critical parameters in the transmitters. If a fault is detected, it automatically switches to the hot standby transmitter. Change-over can also be accomplished by a front panel switch or relay contact closure in the remote control equipment. The unit is self-powered and switches RF output to the antenna.

**Model 7773 Receiver Automatic Change-over:** Similar to the Model 7770, Model 7773 monitors the parameters in the receivers. The unit switches the program channel output as well as both subcarrier outputs.

**Frequency Division Multiplex (FDM) Baseband Encoder and Decoder:** Multiple broadcast programs can be transmitted with full audio bandwidth by using the FDM encoder and decoder. A data sheet for the FDM equipment is available upon request.

**Other Accessories:** TFT carries a full line of accessories such as coaxial cable, type N connectors and antennas to meet STL system installation requirements. Please refer to STL Price Schedule for detailed information.



# Specifications

## System

Frequency Range	940-960 MHz standard Other frequencies available on request
Frequency Response	$\pm .1$ dB or better 30 Hz to 53 kHz $\pm .3$ dB or better 53 to 75 kHz
Distortion (THD & IMD)	0.2% or less 30 Hz to 53 kHz (Typically less than 0.1% at 1 kHz)
Stereo Separation	50 dB or better, 50 Hz to 15 kHz (Typically 55 dB or better; Minimum 45 dB Narrow Selectivity)
Stereophonic Subchannel to Main Channel Crosstalk	50 dB or better
Main Channel to Stereophonic Subchannel Crosstalk	50 dB or better
Signal-to-Noise Ratio	75 dB or better below 100% modulation de-emphasized left or right

## Transmitter

RF Power Output	4 Watts minimum 14 Watts maximum
RF Output Connector	Type N Female, 50 ohms
Deviation for 100% Modulation	$\pm 50$ kHz
Frequency Stability	Better than .0001%, 0°C to 50°C
Spurious and Harmonic Emission	60 dB or more below carrier level
Modulation Capability	One Stereo Composite Program and Two Subcarrier Channels.
Modulation Inputs	Composite: 3.5V peak to peak. 10K ohms balanced and unbalanced, BNC and terminal strip. Multiplex: 1.5V peak-to-peak, 10K ohms BNC, (2 each), frequency range 130 to 300 kHz
Power Source	115/230 VAC $\pm 10\%$ , 50/60 Hz, 80 Watts 24 VDC optional
Monitoring Capability	One 2" analog meter for monitoring power output power supply, bias voltages, multiplex and program modulation. LED bargraph for monitoring 70 to 120% program channel modulation.

## Receiver

RF Input Connector	Type N Female, 50 ohm
Sensitivity	30uV or less required for 60 dB SNR broadband, de-emphasized. 100uV or less required for 60 dB SNR left or right channel demodulated.
Selectivity (wide)	3 dB IF bandwidth $\pm 200$ kHz 60 dB IF bandwidth $\pm 700$ kHz 80 dB IF bandwidth $\pm 1.2$ MHz
Selectivity (narrow)	3 dB IF bandwidth $\pm 150$ Khz 60 dB IF bandwidth $\pm 500$ kHz 80 db IF bandwidth $\pm 1.2$ MHz
Modulation Outputs	Composite: 3.5V peak-to-peak, 75 ohm balanced and unbalanced, BNC and clip lead. Multiplex: 1.5V peak-to-peak, 75 ohm BNC and terminal strip barrier.
Power Source	115/230 VAC $\pm 10\%$ , 50/60 Hz, 10 watts, 24 VDC optional
Monitoring Capability	One 2" analog meter for monitoring power supplies, 0 to 120% modulation for program and multiplex channels. LED bargraph for monitoring input RF level and modulation 70 to 120%

Represented by:



3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 • (408) 727-7272 TWX 910-338-0584



## FM Stereo Modulation Monitor

### FEATURES

- Three major sub-systems in one package:
  - Frequency-Agile RF Pre-Selector
  - Baseband Demodulator
  - Stereo Demodulator
- Complete Stereo Measurements:
  - L + R, L - R, Pilot, 38 kHz, L, R
  - SNR, Phase, AM Noise, Multipath
- Built-in Frequency-Synthesized Type Modulation Calibrator
- Exclusive Peak Modulation Duration Differentiator and Counter (P.M.D.D.™)
- Carrier & Pilot Frequency Measurement via front panel connector

### GENERAL DESCRIPTION

To maximize your FM station's market coverage, TFT designed the Model 844 FM Stereo Modulation Monitor to help you reach all of your listeners—especially those in fringe areas with maximum allowable modulation levels.

The Model 844 can be used for off-air monitoring of modulation level or for direct transmitter Proof-of-Performance measurements. To accommodate all U.S. and International broadcast standards, the 844 Monitor features a two channel frequency-synthesized pre-selector having 50 kHz tunable steps.

For remote meter reading and peak flasher display, an optional panel with peak flashers and meters is available (see Options).

### COMPLETE STEREO MEASUREMENTS

The 844 makes complete measurements of total modulation, Right channel modulation, Left channel modulation, channel separation, Main and Sub-channel crosstalk, L + R, L - R, 38 kHz carrier suppression and 19 kHz injection level. All measurements can be made with front panel push-buttons and are read on a large test meter.

### COMPETITIVE MODULATION COMPARISON

Because the 844 is equipped with two digitally tunable RF pre-selectors, you can precisely select any one of two FM stations. This feature gives you a quick, easy way to check on how your modulation compares with other stations in your market.

### PLL STEREO

The 844 provides superior stereo separation measurements. The phase-locked-loop (PLL) regenerates the 38 kHz carrier from the 19-kHz pilot carrier. This technique ensures precise accuracy and long-term stability of the phase relationship between the transmitter's pilot carrier and the regenerated 38 kHz subcarrier and therefore provides superior stereo demodulating characteristics. This also eliminates the need for phase adjustment during stereo measurements.

## SIMULTANEOUS L & R MONITORING

Two separate meters permit simultaneous monitoring of Left and Right channel modulation. A third meter provides Total modulation readings. The Left meter also acts as the Test Meter.

## LOWEST T.H.D. & SNR

The 844 utilizes a pulse-counting FM discriminator to optimize frequency-to-voltage conversions. Consequently, the total harmonic distortion is less than 0.1% and the signal-to-noise ratio is better than 80 dB.

## SCOPE OUTPUTS

BNC connectors are provided on the front panel to monitor the demodulated signals under test. The signals can be fed to external test equipment such as an oscilloscope. For example, the phase relationship of the Left and Right channels can be observed and/or adjusted with the use of these front panel connections.

## FREQUENCY-SYNTHESIZED TYPE MODULATION CALIBRATOR

A frequency synthesized type FM modulation calibrator is built-in for calibration of the modulation meters and peak flashers. The highest stability and accuracy are achieved with crystal oscillators which remain stable well within the required accuracy regardless of temperature or age. No external equipment is required to use the modulation calibrator. Accuracy exceeds 1.0 percent, year after year. This feature eliminates the need for Bessel Null calibration.

## I.F. BANDWIDTH SELECTION

The appropriate bandwidth is automatically selected when changing between off-air monitoring and on-site measurements. This feature eliminates bandwidth restrictions for Proof-of-Performance measurements.

## ACCURATE PEAK DETECTION—P.M.D.D.™

The 844 includes the exclusive, Peak Modulation Duration Differentiator (P.M.D.D.). This feature is incorporated

into a peak modulation detecting circuit to identify true modulation peaks and distinguish them from other peaks caused by transient noise, overshoot and multipath distortion. Only those peaks which exceed user-set values for modulation and duration will trigger the 844's P.M.D.D. peak flashers (simultaneous positive and negative modulation). A large LED display indicates the number of peaks per minute and is refreshed every sixty seconds.

## ADJUSTABLE PEAK FLASHERS

Dual LED Peak Flashers may be adjusted over a broad range: 50% to 199% modulation. A thumbwheel-type switch eliminates the ambiguity and imprecision of potentiometer type controls.

## BUILT-IN VOLTMETER & ATTENUATOR

For low-level modulation and noise measurements, a switchable 50 dB attenuator is built-in (10 dB steps). To perform a complete Proof, the only other equipment you need is a distortion analyzer and an audio generator.

## DIRECT AM NOISE MEASUREMENTS

A convenient front panel switch allows you to use the 844 for direct measurement of incidental and residual AM on your transmitted carrier. The dynamic range of this measurement is 75 dB from 100% modulation.

## SWITCHABLE DE-EMPHASIS

When measuring AM or low-level noise and modulation, a 75  $\mu$ sec de-emphasis circuit can be easily switched into the meter circuit. Other time constants are available on request.

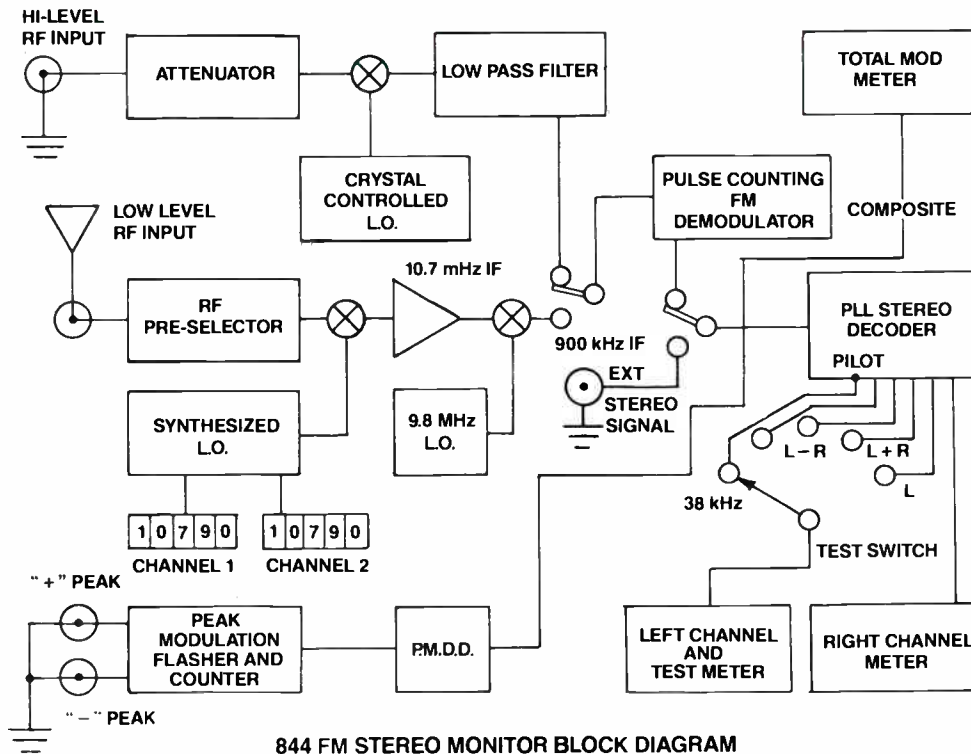
## BUILT-IN MULTIPATH DETECTOR

When monitoring off-air, multipath can be read on the test meter so you can properly orient the monitor's receive antenna for maximum signal and minimum multipath interference.



Companion 3-Channel SCA Monitor, Model 845. See separate brochure.

# FM Stereo Modulation Monitor



844 FM STEREO MONITOR BLOCK DIAGRAM

## OPTIONS

### Model 804 Remote Meter Panel.

This rack mount panel (19" x 5 1/4") duplicates the peak flashers and meters on the 844's front panel. 50 feet of cable is provided.

TFT Part number: 5116-0804.

### Option 01

Absence of Modulation Alarm & Carrier-Fail Alarm

The Absence of Modulation Alarm is triggered when the composite signal drops below 30% modulation. Time is user-adjustable between 2 seconds and 1 minute.

The Carrier-Fail Alarm is triggered when the RF carrier drops below 50% of nominal.

TFT Part Number: 7100-3870.

## SPECIFICATIONS

### RF SECTION

Frequency Range ..... 88-108 MHz, tunable in 50 kHz steps

High Level Transmitter  
RF input voltage ..... 1 to 10 volts RMS

Antenna input voltage  
& Impedance ..... 250  $\mu$  V to 100 mV; 75 ohms, BNC

Tuning ..... Two 4-digit thumbwheel switches and a pushbutton switch for selecting station A or station B.

AGC range ..... 60 dB

Composite Input ..... 3.5 v P-P, 1.0k ohms potentiometer, BNC.

### MODULATION METER, TOTAL

Deviation for  
100% indication .....  $\pm$  75 kHz, peak-to-peak.

Meter Range ..... 0 to 133% modulation.

AC voltmeter range ..... 0 to - 50 dB in 10 dB steps.

Accuracy (5 kHz tone) .....  $\pm$  2% at all modulation levels.

Frequency Response .....  $\pm$  0.1 dB typical, from 50 Hz to 75 kHz;  $\pm$  0.5 dB max from 30 Hz to 120 kHz.

### MODULATION METER, RIGHT

Right channel  
modulation ..... Indicates and measures right channel modulation.

Frequency Response .....  $\pm$  0.25 dB, 50 Hz to 15 kHz.

(Specifications continued—over)



# SPECIFICATIONS

(continued from previous page)

## MODULATION METER, LEFT/TEST

<b>Left channel modulation</b> .....	Indicates and measures left channel modulation.
<b>Right channel modulation</b> .....	Same as right modulation meter.
<b>Total Modulation</b> .....	Same as total modulation meter.
<b>L + R</b> .....	± 0.25 dB, 50Hz to 15 kHz
<b>L - R</b> .....	± 0.35 dB, 23 kHz to 53 kHz
<b>Pilot Level &amp; 38 kHz level</b> .....	Measures down to - 60 dB.
<b>Phase Calibration</b> .....	For optimization of stereo measurements.
<b>AM Noise</b> .....	Measures transmitter AM noise down to - 75 dB from 100% modulation.
<b>Multipath indicator</b> .....	For adjustment of antenna to minimize multipath distortion.

## PEAK MODULATION INDICATORS

<b>Deviation for 100% indication</b> .....	± 75 kHz
<b>Peak Level</b> .....	Set by a front panel 3-digit thumb-wheel switch in 1% steps from 50% to 199% on both positive and negative peaks.
<b>Accuracy (5 kHz tone)</b> .....	± 1% at 100% modulation
<b>Frequency Response</b> .....	± 2% from 30 Hz to 120 kHz.
<b>Response Time Accuracy</b> .....	Adjustable, 10 cycles of 10 kHz or faster.
<b>Peak Counter</b> .....	Registers number of true peaks of modulation per minute.

## MODULATION CALIBRATOR

Built-in frequency synthesized calibrator for meter and peak flasher calibration of 100% modulation ( ± 75 kHz) from the front panel. Accuracy, ± 0.5%.

## OUTPUTS, FRONT & REAR PANEL

<b>Main channel output with 75 µsec de-emphasis</b> .....	5 volts RMS into 5K ohms at 400 Hz.
<b>*Signal-to-Noise Ratio</b> .....	78 dB at 400 Hz with de-emphasis.
<b>*Harmonic Distortion</b> .....	0.1% max (de-emphasized).
<b>*Intermodulation Distortion</b> .....	0.1% max per SMPTE standard.

<b>Balanced audio output level</b> .....	0 dBm into 600 ohms.
<b>*Balanced audio Frequency Response</b> .....	± 0.5 dB from 30 Hz to 120 kHz.
<b>Composite output for SCA Monitor</b> .....	1 volt RMS into 600 ohms.
<b>Pilot carrier (19 kHz)</b> .....	600 mV RMS, available on front panel.
<b>Composite</b> .....	5 VRMS, 10k ohms at 100% modulation.
<b>Connectors</b> .....	BNC
<b>Meter output</b> .....	Main meter selected signal available on front panel.
<b>Carrier-fail Alarm (option)</b> .....	Relay drive output capable of sinking 50 mA at 30 VDC when RF carrier drops below 50% of nominal.
<b>Absence of Modulation Alarm (option)</b> .....	An output capable of sinking 50 mA at 30 VDC when composite signal drops below 30% modulation for a period of time between 2 seconds and 1 minute, internally adjustable.

\* High Level RF input conditions.

## STEREO SEPARATION AND CROSSTALK

<b>Separation:</b>	
<b>L to R &amp; R to L</b> .....	60 dB typical, 55 dB minimum, 50 Hz to 15 kHz.
<b>Crosstalk:</b>	
<b>(L + R) to (L - R) or, (L - R) to (L + R)</b> .....	65 dB minimum.
<b>Crosstalk:</b>	
<b>SCA to (L + R) or, SCA to (L - R)</b> .....	70 dB minimum.
<b>Pilot carrier measurement level accuracy</b> .....	± 0.5% from 6% to 12% injection.

## MECHANICAL AND ENVIRONMENTAL

<b>Input power</b> .....	115/230 VAC, ± 10%, 50 to 400 Hz, 40 watts maximum.
<b>Operating Temperature</b> .....	0° C to 50° C (32° F to 122° F).
<b>Size and Net weight</b> .....	19" (48.26 cm) Wide × 7" (17.78 cm) High × 15" (38.10 cm) Deep; 18.5 lbs. (8.4 kg) net.

Today's **TFT** INC

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088  
☎ (408) 727-7272  
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FAX: (408) 727-5942

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# DOMESTIC PRICE LIST RADIO MONITORING EQUIPMENT

Effective  
16 May 88

FM PRODUCTS	DESCRIPTION	Suggested List Price (U.S. Dollars)
<b>MODEL 844</b> (5116-0844)	FM BASEBAND/STEREO MODULATION MONITOR <del>includes Absence of Modulation/Carrier Fail Alarm</del> (75 $\mu$ sec de-emphasis supplied standard.)	\$ 4,425.00
Option 02 (7100-3890)	Spare Parts Kit	\$ 475.00
<b>MODEL 804</b> (5116-0804)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 844	\$ 525.00
<b>MODEL 884</b> (5116-0884)	FM BASEBAND/STEREO MODULATION MONITOR (75 $\mu$ sec de-emphasis supplied standard)	\$ 3,200.00
<b>MODEL 845</b> (5116-0845)	3-CHANNEL SCA MODULATION MONITOR, 67 kHz supplied standard	\$ 2,325.00
Option 01 (7100-3880)	RF Module-Preselector (Specify frequency)	\$ 750.00
Option 02 (7100-3900)	SCA Channel (41 kHz)	\$ 250.00
Option 03 (7100-3910)	SCA Channel (92 kHz)	\$ 250.00
Option 04 (7100-3920)	Spare Parts Kit	\$ 250.00
<b>MODEL 805</b> (5116-0805)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 845	\$ 520.00
<b>AM PRODUCTS</b>		
<b>MODEL 753</b> (5116-0753)	AM MODULATION MONITOR	\$ 1,600.00
Option 02 (7100-2440)	Carrier Power Alarm	\$ 100.00
Option 03 (7100-2410)	10 kHz Whistle Filter	\$ 380.00
Option 04 (7100-2420)	30 Hz Telemetry Lowpass Filter	\$ 300.00
Option 05 (7100-2430)	Absence of Modulation Alarm	\$ 315.00
Option 06 (7100-2460)	230 VAC	*\$ 60.00
Option 07 (7100-2560)	Spare Parts Kit	\$ 245.00
<b>MODEL 755A</b> (5116-0755A)	AM RF PRESELECTOR (TUNABLE IN 1kHz INCREMENTS)	*\$ 1,680.00
Option 01 (7100-2470)	Narrow Band Filter	\$ 520.00
Option 04 (7100-2500)	Spare Parts Kit	\$ 325.00
<b>MODEL 704E</b> (5116-704E)	REMOTE METER AND PEAK FLASHER PANEL FOR MODEL 753	\$ 525.00

\* Not field installable

## RADIO MONITORING EQUIPMENT

### EBS PRODUCTS

MODEL 760-1A (5116-760-1A)	TUNABLE AM RECEIVER/ENCODER/DECODER	\$ 1,485.00
MODEL 760-1B (5116-760-1B)	SINGLE CHANNEL FM RECEIVER/ENCODER/DECODER Specify one receive frequency	\$ 1,485.00
MODEL 760-1C (5116-760-1C)	DUAL CHANNEL FM RECEIVER/ENCODER/DECODER Specify two receive frequencies	\$ 1,735.00
MODEL 8010 (5116-8010)	FM E-ALERT RECEIVER, Specify frequency	\$ 275.00
MODEL 8020 (5116-8020)	AM E-ALERT RECEIVER, Specify frequency	\$ 275.00

#### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

#### WARRANTY

TFT, 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge prepaid by the 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

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

Transportation charges for warranty returns and repair costs, wherein failure is found not 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OR PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES.

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INC

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O-RM 5/88

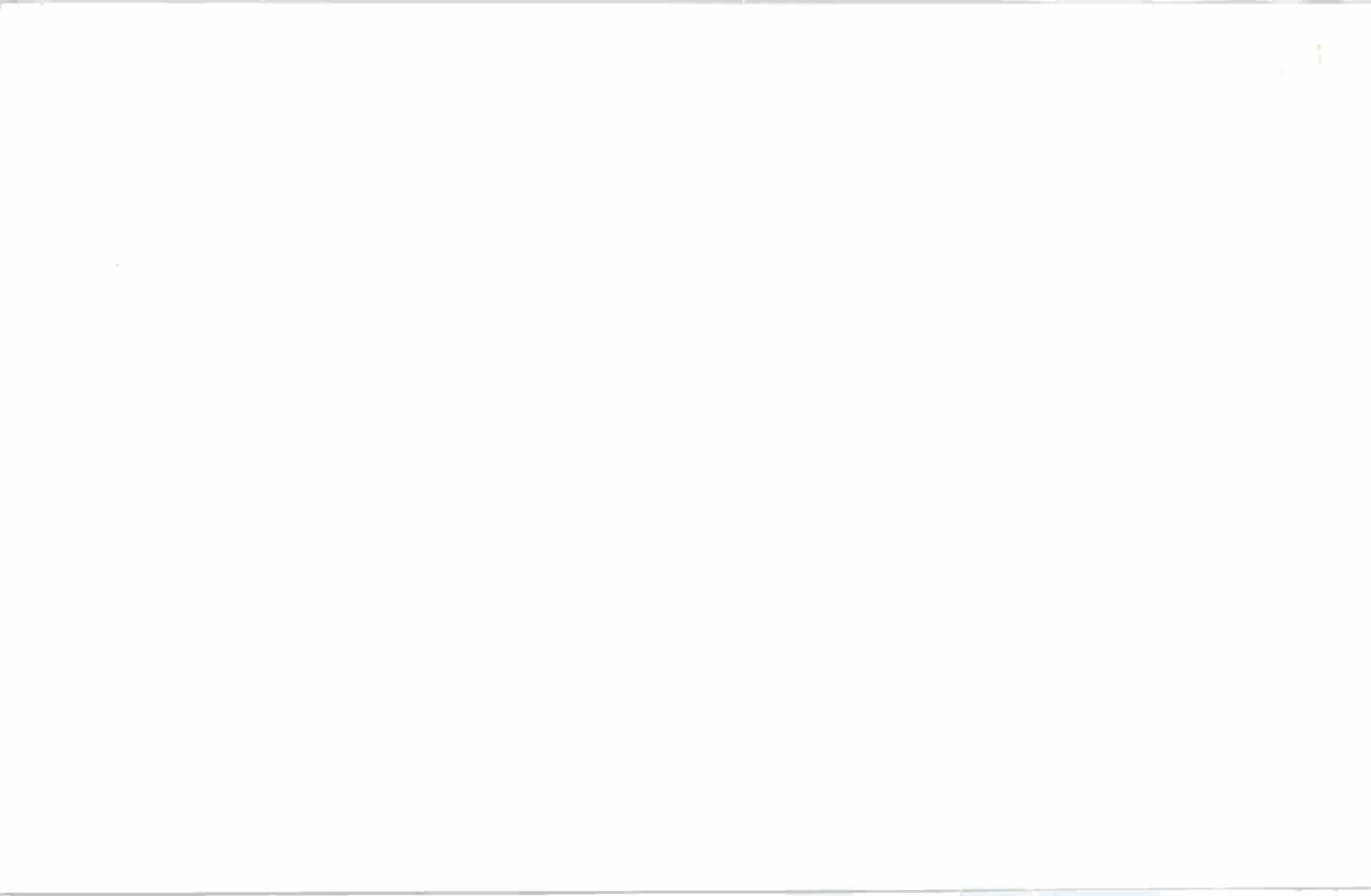
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		<b>Utah:</b>	Media-West, Inc.	(801) 295-3308
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		<b>Washington:</b>	Broadcast Supply West	(800) 426-8434
		<b>Wisconsin:</b>	Electronic Industries Inc.	(414) 235-8930
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			Nortec West (Western Provinces)	(604) 872-8525

## **TFT** INC

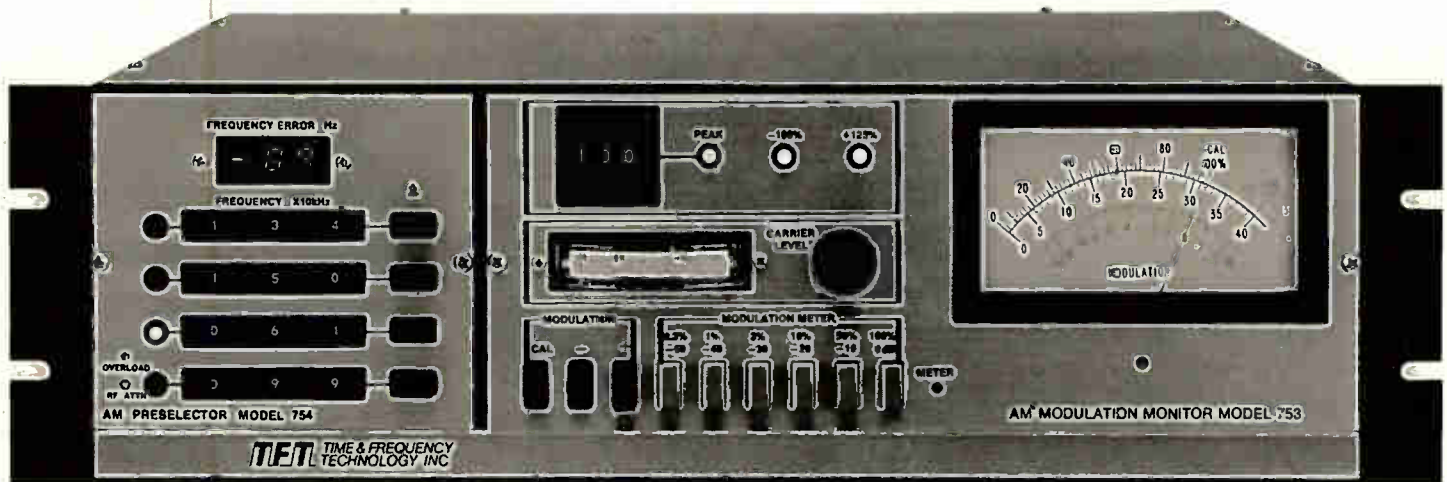
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# Precision AM Modulation Monitor and Tunable RF Preselectors

**MODEL 753**  
**MODEL 754**  
**MODEL 755**



## MODULATION MONITOR

- Linear phase filter eliminates transient overshoot.
- Built-in meter amplifier/attenuator for noise measurements.
- Modulation meter and peak flashers calibrate automatically over a  $\pm 40\%$  carrier level change.
- Separate digital flasher for 100% negative modulation peaks and 125% positive modulation peaks.
- Built-in  $-100\%$  and  $+125\%$  modulation calibrators.
- FCC Type Approval No. 3-234

## RF PRESELECTORS

- Frequency synthesized digital tuning.
- Digital read-out of carrier frequency deviation (Model 754 only).
- Unique IF filter design for optimum off-the-air monitoring.

**MET** TIME & FREQUENCY  
TECHNOLOGY INC.

## EXTENDS COVERAGE POTENTIAL

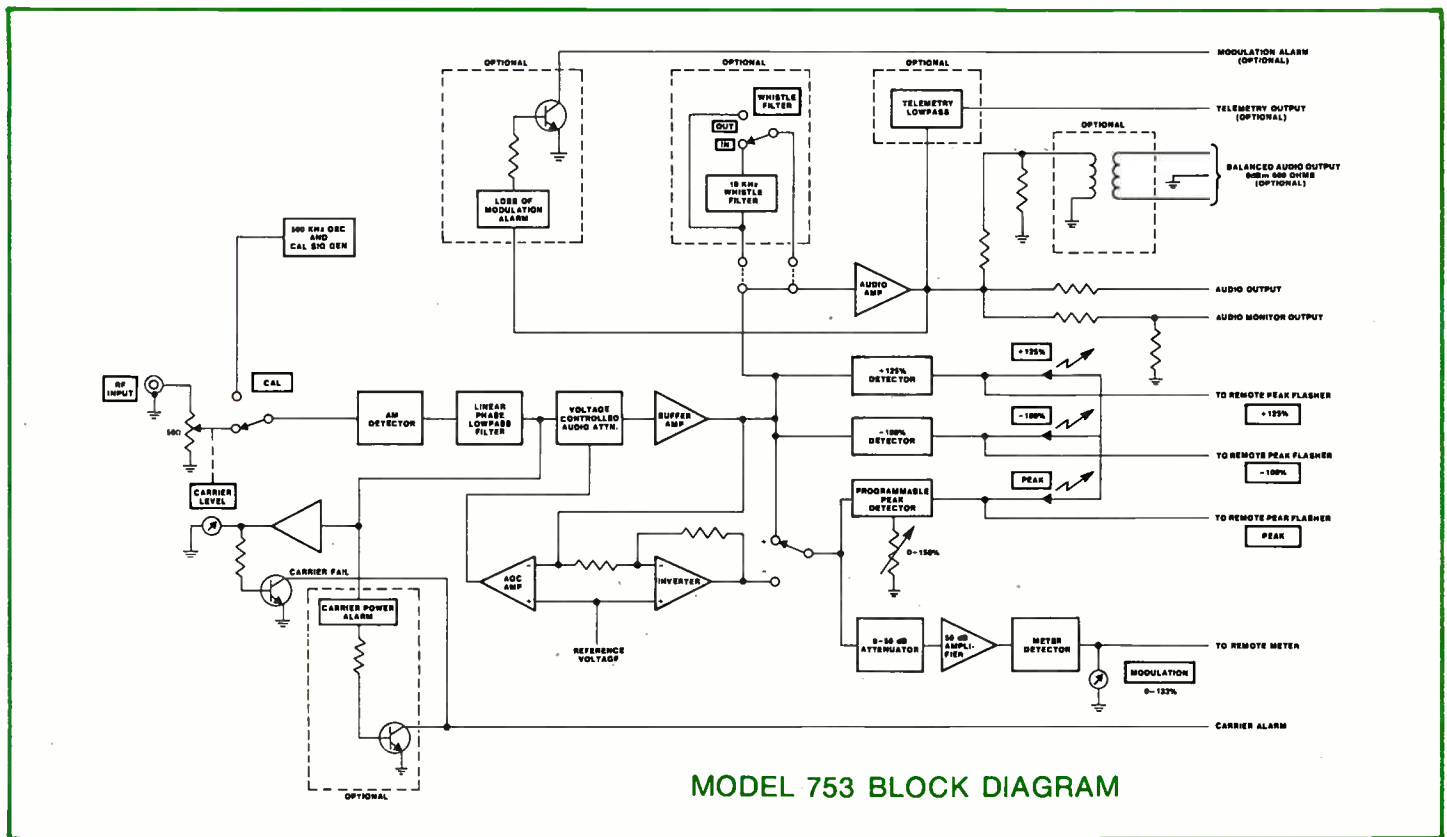
The Model 753 ultra-accurate broadband AM Modulation Monitor is designed for direct connection to the RF transmission line at the transmitter site. It is designed with linear-phase filter to eliminate transient overshoot in the filter due to the heavy amplitude clipping in today's audio limiters. A built-in 50-dB meter attenuator in 10-dB steps is provided for proof-of-performance measurements. Both Modulation Meter and peak flashers are self-calibrated to maintain their accuracy over a  $\pm 40\%$  carrier level change. In addition to the fixed +125% and -100% peak modulation lights, a variable peak indicator light settable by a front panel thumbwheel switch is provided to measure peak modulation up to 150% in 1% increments. The ambiguities in peak light settings are eliminated because of the use of the digital thumbwheel switch. Two separate

peak modulation calibration points, +125% and -100%, are provided by generating an internal RF signal modulated with asymmetrical peaks for calibrating the entire instrument directly from the input. The Model 753 is competitively priced and it allows you to achieve maximum transmitter modulation to the outer limits.

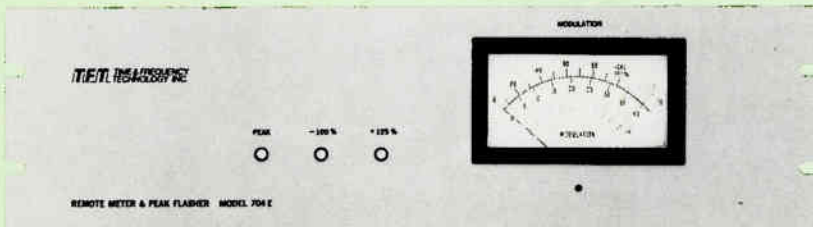
Optional features include Carrier Power Level Alarm, Absence of Modulation Alarm, Balance Audio Output, 10-kHz whistle filter, 35-Hz low pass filter for subaudio telemetry. The Model 753 is fully adaptable for Automatic Broadcast Transmission System (ATS) applications.

## EXTENDS MONITORING CAPABILITY

By adding the Model 754 Preselector, broadcast stations, consultants, and regulatory agencies can pre-tune any AM stations via thumbwheel switches and



MODEL 753 BLOCK DIAGRAM



## ACCESSORY

Model 754, RF Preselector /Frequency Co  
tion off the air.

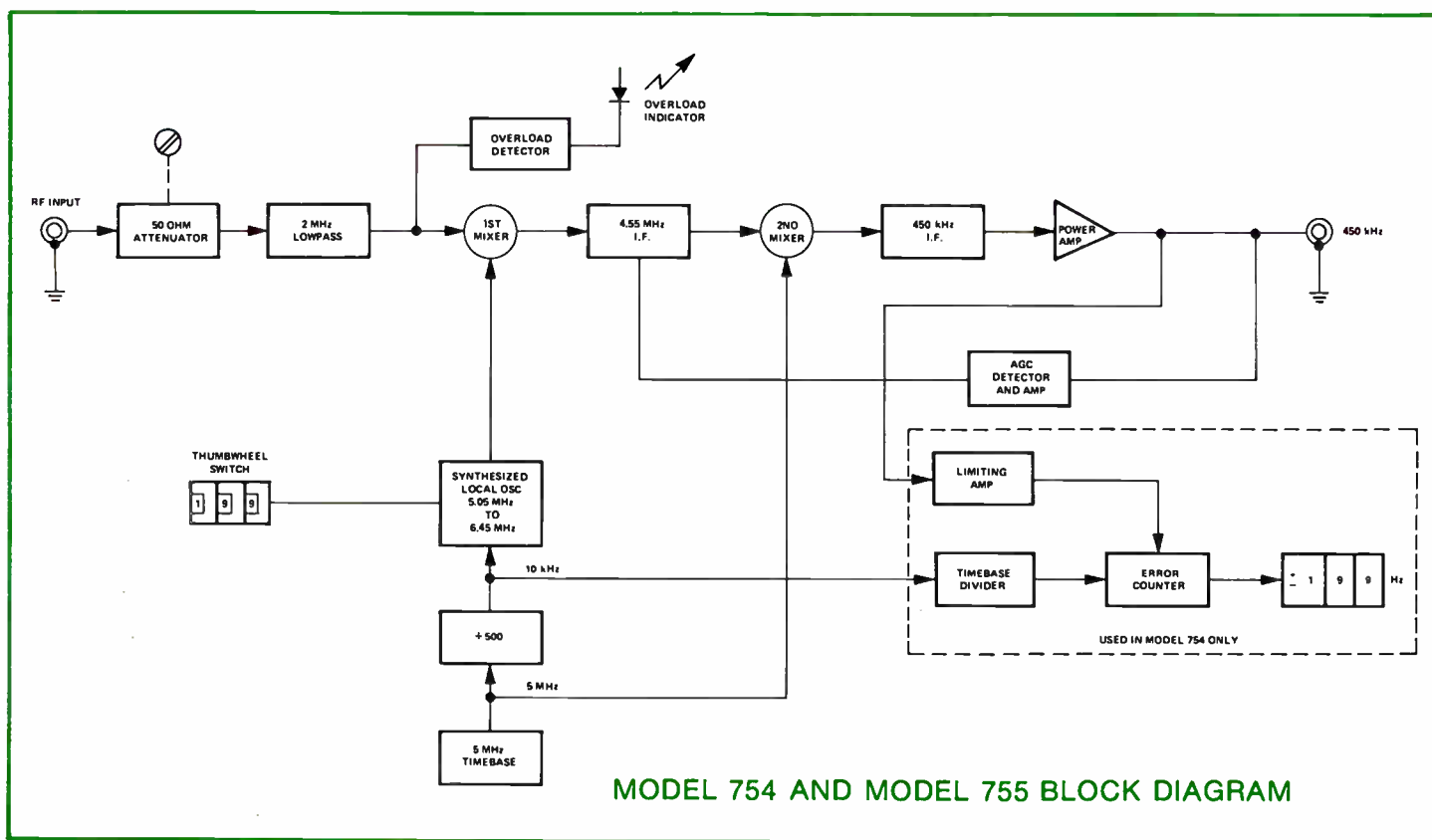
Model 755, RF Preselector, for monitori

Model 704E, Remote Meter and Peak Fla  
and peak flashers at a remote location. 50

Model 735, WWV Receiver, for calibrati  
National Bureau of Standards by comparin  
quencies; 10, 15 or 20 MHz.

monitor any one of four stations' modulation and carrier frequency off-the-air by push-button switch selection. A temperature compensated crystal oscillator (TCXO) time base is used in the frequency synthesized local oscillator circuit to achieve a  $\pm 2$  Hz per year aging accuracy. Additionally, a patent pending design is used in the IF amplifier which offers sharp selectivity as well as negligible overshoot in off-the-air monitoring application when it responds to clipped audio signals.

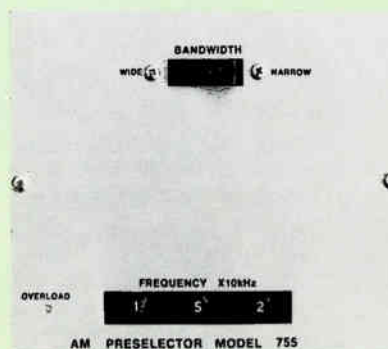
The Model 755 is essentially the same as Model 754 without the frequency measurement capability. By selecting the TCXO time base option, the model 755 IF output jack at the rear panel can be used to monitor carrier frequency with an external frequency counter having an accurate time base. There is only one set of thumbwheel switches on the Model 755 front panel instead of four.



MODEL 754 AND MODEL 755 BLOCK DIAGRAM

**EQUIPMENT**

counter, for monitoring frequency and modulation off the air. The front panel, for duplicating modulation meter, is 1 ft. of cable if provided with the panel. The time base of the monitor is adjustable against any one of the three standard fre-





## SPECIFICATIONS

### Model 753 Precision AM Modulation Monitor

#### RF Input

Frequency Range ..... 500 kHz to 4 MHz\*  
 Level Range ..... 1V to 10V RMS  
 Impedance, nominal ..... 50 ohms

#### MODULATION METER

Meter Range ..... 0 to 133%, switchable "+" or "-"  
 Attenuator Range ..... 0 to -50 dB in 10 dB steps  
 Accuracy .....  
     At 100% Mod. 400 Hz .. ±2%  
 Frequency Response .....  
     50 Hz to 10 kHz ..... ±2%  
     30 Hz to 25 kHz ..... ±5%

#### PEAK MODULATION INDICATORS

-100% Indicator ..... Internally set to flash when modulation exceeds -99%  
     Accuracy ..... ±1% at 400 Hz  
     Frequency Response ... ±5%, 20 Hz to 25 kHz  
 +125% Indicator ..... Internally set to flash when modulation exceeds +125%  
     Accuracy ..... ±1% at 400 Hz  
     Frequency Response ... ±5%, 20 Hz to 25 kHz  
 Peak Indicator ..... 30% to 150% switchable positive or negative peaks  
     Accuracy ..... ±2% at 400 Hz  
     Frequency Response ... ±5%, 20 Hz to 25 kHz

#### AUDIO OUTPUTS

##### Audio Monitor Output

Impedance ..... 600 ohms, unbalanced  
 Level ..... 0 dBm, 600 ohms  
 THD, 99% Modulation  
     400 Hz ..... 0.15% typical, 0.25% max.  
 Signal-to-noise Ratio ... ≥75 dB below 100%  
 Transient Response .... ≤1% overshoot  
 Frequency Response ... ±0.5 dB, 20 Hz to 25 kHz

Remote Flasher Output to drive Model 704E

##### Audio Output

5 V RMS into 5k ohms  
 THD, 99% Modulation,  
     400 Hz ..... 0.15% typical, 0.25% max.  
 Signal-to-noise Ratio ... ≥75 dB below 100%  
 Transient Response .... ≤1% overshoot  
 Frequency Response ... ±0.5 dB, 20 Hz to 25 kHz

CARRIER FAIL OUTPUT .. Indicates loss of carrier by sinking a maximum 30 V, 50 mA load to ground. Open collector output is normally "OFF" when carrier is present.

#### MODULATION

Calibrator ..... Built-in-calibrator generates a -100%, +125% modulated carrier which is automatically switched into the detector input by the "CAL" button.  
 Accuracy ..... ±1%

#### OPTIONS

01 - Balanced Audio  
     Monitor Output ..... 0 dBm, 600 ohms balanced  
 02 - Carrier Power Alarm .. Activates Carrier Fail Output when the carrier changes by more than 5%, -10%.

03 - 10 kHz Whistle Filter.. Switchable  
     10 kHz Rejection ..... ≥40 dB  
 04 - Telemetry Lowpass  
     (35 Hz) ..... 0 dBm into 600 ohms for 5% modulation, 20 Hz to 30 Hz  
 05 - Absence-of-  
     Modulation Alarm .... "Open Collector" output for sinking 30 V, 50 ma load. When modulation drops below 10%, output goes low after an internally adjusted time of approximately 2 to 30 seconds.

#### PHYSICAL REQUIREMENTS

Power ..... 117 VAC, 50—400 Hz 30 VA 230 VAC available.  
 Operating Temperature ... 0°C to 50°C  
 Cabinet ..... 19" Rack Mount  
 Dimensions ..... 19"W x 5 1/4"H x 14"D  
 Weight ..... 14 Pounds

### Model 754 and Model 755 Preselectors Common Specifications

Frequency Range ..... 500 kHz to 1.99 MHz  
 RF Sensitivity ..... 100 μV for 35 dB, 1 MV for 50 dB S/N, Ref. to 100%  
 Input Impedance..... 50 ohm nominal  
 Tuning ..... 3 digit thumbwheel switch, 10 kHz resolution  
 Bandwidth (wideband, standard) ..... ±10 kHz, 1 dB  
     ±20 kHz, 3 db  
     ±40 kHz, 40 dB  
 Transient Response .... ≤3% overshoot for 25 μsec rise and fall times on R.F. envelope  
 Bandwidth (narrow band, optional selectable by front panel switch) ..... ±5 kHz, 1 db  
     ±10 kHz, 3 db  
     ±20 kHz, 40 db  
 Transient Response .... ≤3% overshoot for 50 μsec rise and fall times on R.F. envelope  
 Image Rejection ..... ≥60 dB  
 AGC Range ..... 50 db (100 μV to 32 mV)  
 Output ..... 450 kHz, 1 V RMS into 50 ohms

#### PHYSICAL REQUIREMENTS

Power (independent from Model 753) ..... 117 VAC, 50—400 Hz, 15 VA 230 VAC available  
 Operating Temperature ... 0°C to 50°C

### SPECIFICATIONS APPLIED TO MODEL 754 PRESELECTOR ONLY

Frequency Counter  
     Time Base ..... ±2 Hz per year aging,  
     ±2 Hz 0°C to 50°C  
     Range ..... ±199 Hz about dialed-in frequency  
     Tuning ..... Determined by pushbutton selection of one of four sets of thumbwheel switches

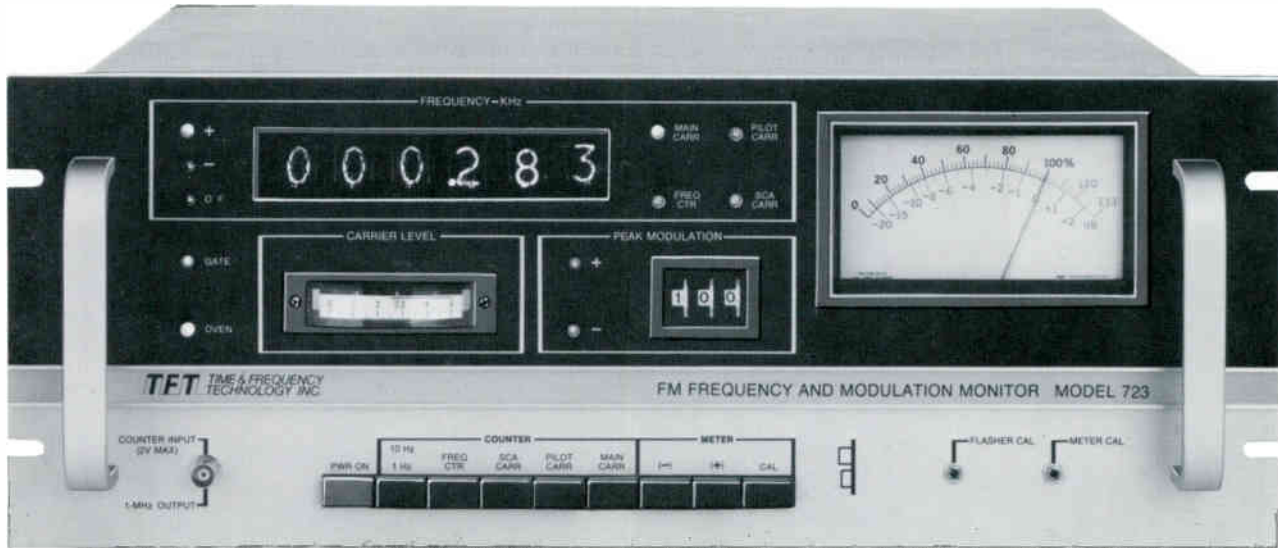
\*Higher frequency ranges available upon special request.

# FM Monitors for Frequency and Modulation, Modulation Only, Stereo and SCA

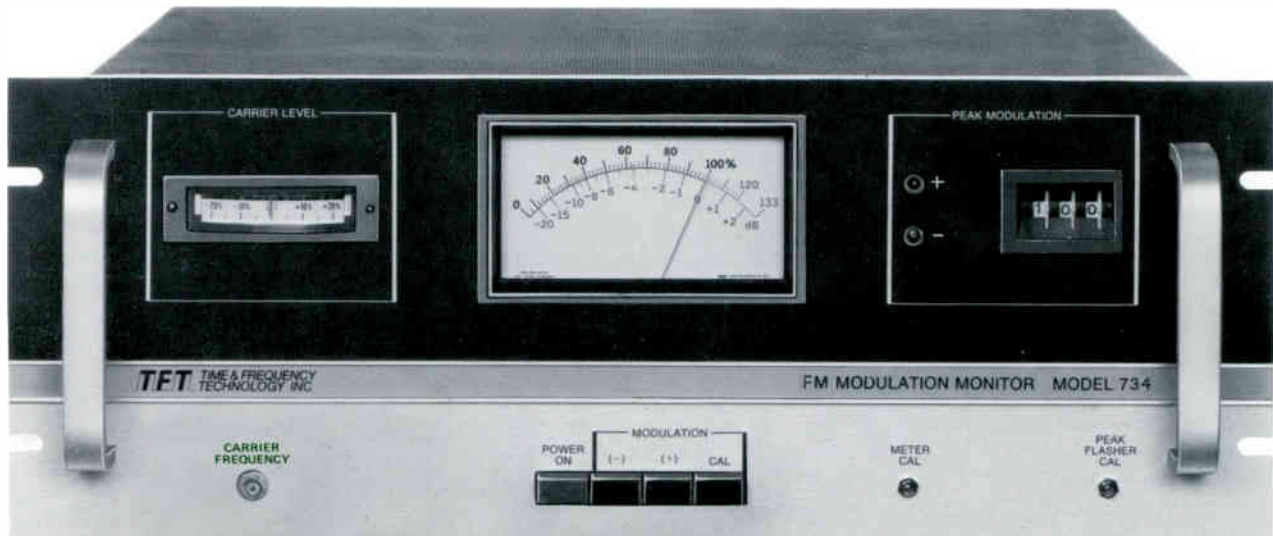
- Built-in, off-the-air capability
- Frequency accuracy of 100 Hz per year
- Complete proof-of-performance measurements
- Alarm and logging outputs for remote control
- Phase-locked loop in stereo demodulator
- Precision crystal filters for SCA measurements



# Two Baseband Monitors Op



**Model 723 FM Frequency and Modulation Monitor**



**Model 734 FM Modulation Only Monitor**

TFT baseband monitors are superheterodyne receiver/monitors using advanced design and construction techniques. Two models are available: frequency *and* modulation (Model 723) and modulation only (Model 734). Stereo and/or SCA monitoring can be added to either one.

Although both instruments are optimized for off-the-air monitoring (250 microvolt sensitivity), they also provide high-level RF inputs for direct connection to the FM transmitter.

In off-the-air applications, there's no need for an RF amplifier. This results in an exceptionally clean demodulated signal.

Both models have a quasi-peak-reading modulation meter, and digitally-settable peak flashers which display plus and minus modulation peaks simultaneously. Flasher limits are

adjustable from 50% to 129% in 1% increments, and are set by front-panel thumbwheel switches. This eliminates ambiguities common to potentiometer-type controls.

The high accuracy and resolution of the peak flashers provides indication of, and protection against, over-modulation. Calibration of the meter and peak flashers may be checked at any time with a high accuracy, pushbutton-activated modulation calibrator which generates a precise,  $\pm 75$  kHz signal derived from crystal oscillators. A 60-dB AGC range prevents overload in the IF amplifier, and ensures uniform gain and phase characteristics important to stereo monitoring.

Additional features include a carrier-off alarm, and an AM detector output for AM signal-to-noise measurements. Installation is fast and straightforward with no tuning or tweaking necessary.



# timized for Remote Control

## Model 723 Frequency and Modulation Monitor

The top-of-the-line in FM baseband monitors, Model 723 provides both carrier frequency error display and modulation measurement in a single, state-of-the-art instrument. Complete proof-of-performance measurements at the FM transmitter are easily accomplished, and the accuracy of the 723 exceeds FCC requirements.

For example, Model 723 uses a 5-MHz master oscillator with an aging rate of less than 1 ppm/year at the carrier frequency. This eliminates the need for individual channel crystals, and reduces the number of frequency calibrations per year. This stability is accomplished by synthesizing the local oscillator from the oven-controlled, 5-MHz oscillator. So, users can be assured of accuracy at all times, and save the cost of frequent outside calibration services.

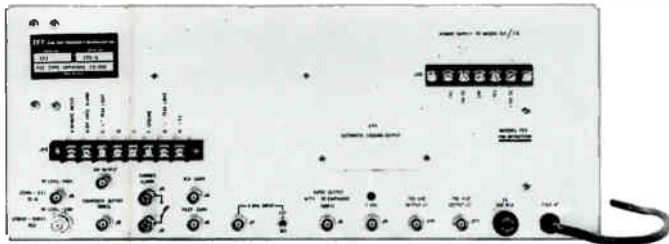
An outstanding advantage of Model 723 is the flexibility of its digital display. Carrier frequency error is shown on a 6-digit readout. At the push of a button, the display can be converted

to a 10 MHz, general purpose frequency counter. The Model 724 Stereo Monitor pilot frequency and the Model 730 SCA Monitor sub-carrier frequency can also be measured and displayed on this versatile monitor.

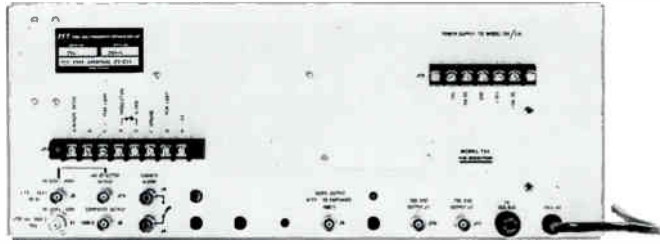
Model 723 can also be rapidly calibrated against the National Bureau of Standards, using the TFT Model 735 Standard Time and Frequency Receiver. A 1-MHz signal, counted down from the master oscillator, is available at the front panel of the Model 723 for this purpose. This method meets the FCC requirements for frequency calibration.

## Model 734 FM Modulation-Only Monitor

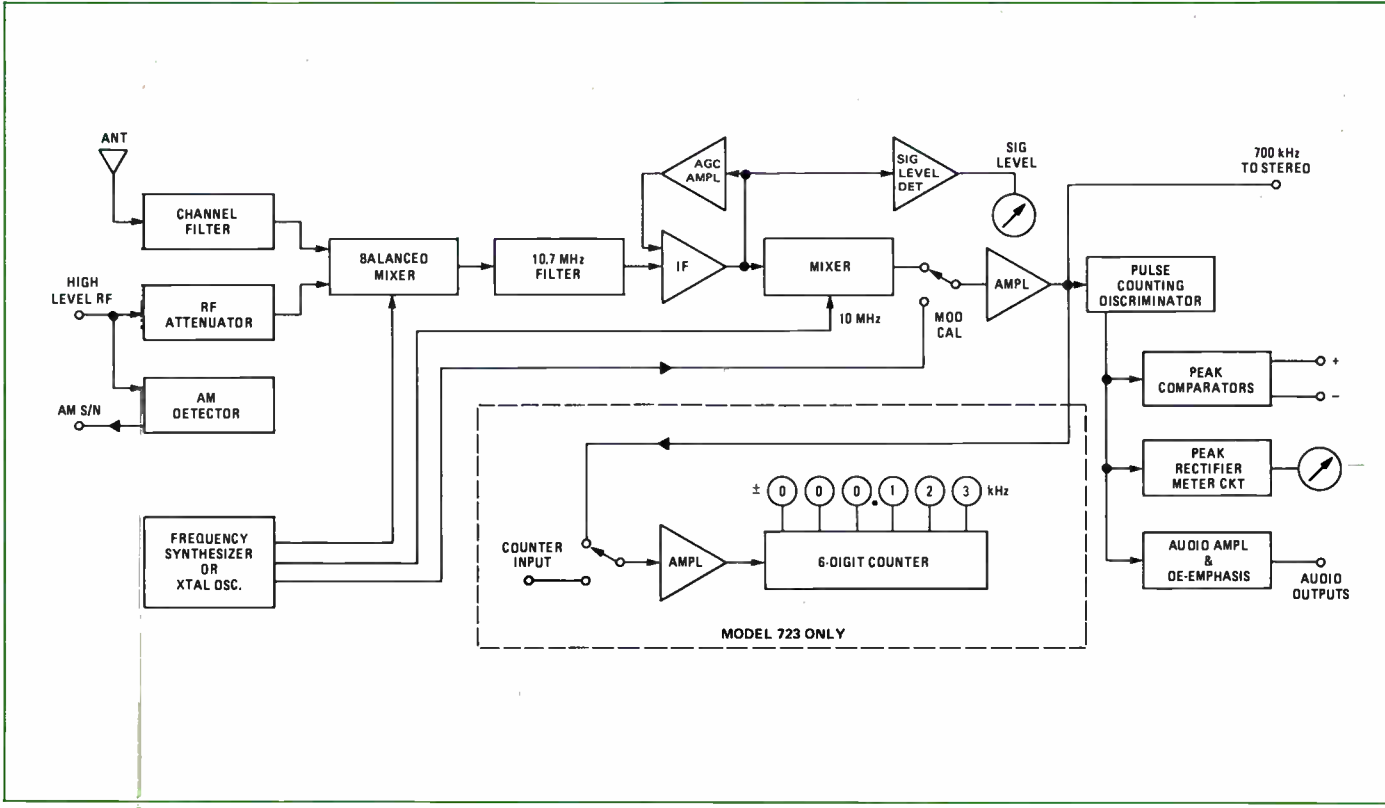
This economical, easy-to-use instrument meets the minimum FCC requirements for FM modulation monitoring. Model 734 provides no carrier frequency-error measurement or display. However, an optional Carrier Frequency Output allows bringing the RF carrier out to the front panel for connection to an external frequency counter.



MODEL 723 REAR PANEL

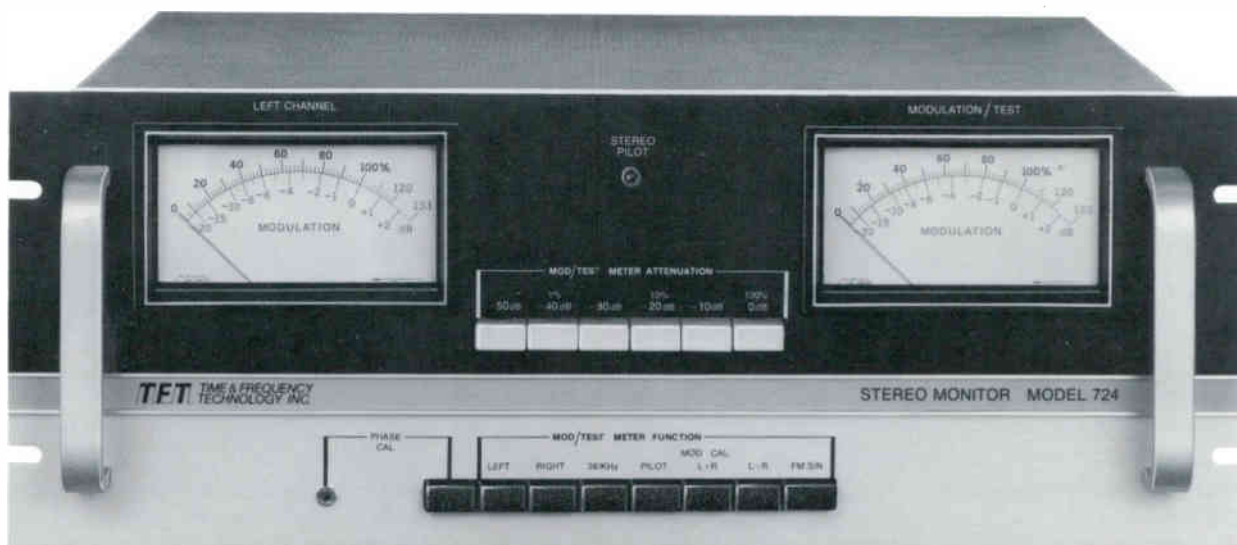


MODEL 734 REAR PANEL





# Expand to Increase Cap



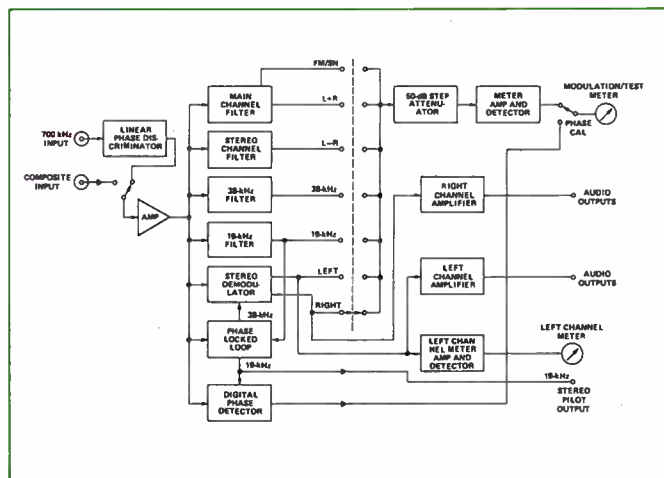
## Model 724 Stereo Monitor

Used with either Model 723 or Model 734, Model 724 meets all stereo monitoring and proof-of-performance measurement requirements specified by the FCC. Power for the 724 is supplied by the baseband monitor.

Superior separation measurements are achieved by the use of a phase-locked-loop to regenerate the 38-kHz suppressed carrier from the 19-kHz pilot carrier. Excellent accuracy and long-term stability of the phase relationship of the two signals results. Computer-designed filters ensure accurate crosstalk measurements.

Two separate meters monitor left and right channel modulation simultaneously. The right channel meter is also used to indicate channel separation, crosstalk between main and sub-channels, 38-kHz carrier suppression, and 19-kHz injection levels. Measurement modes are selected with convenient front panel pushbuttons. A 50-dB pushbutton attenuator is also included to help make these measurements. Pilot carrier

frequency can be measured by the 6-digit counter on the Model 723 baseband monitor or by an external frequency counter via a rear panel connector on Model 724.



### OPTIONS FOR MODEL 723

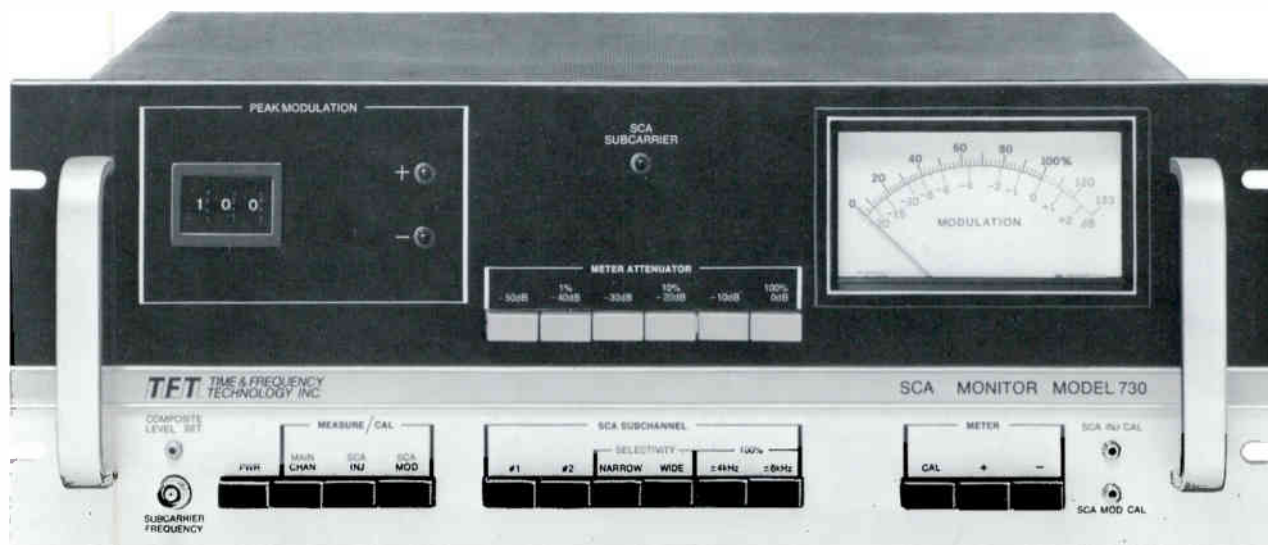
**Automatic Logging Output (BCD):** The 6-digit frequency display is brought out to the rear panel in parallel BCD form, capable of driving standard DTL and TTL loads.

**Automatic Logging Output (Analog):** The digital frequency display is converted to analog and brought out to the rear panel. Voltage range of  $\pm 1$  volt represents carrier frequency error of  $\pm 1$  kHz.

**Off-Frequency Alarm:** Closes a relay contact when carrier frequency error exceeds limits of  $\pm 1$  kHz. Alarm for other frequency limits also available on special order.

**Absence-of-Modulation Alarm:** Closes a relay contact when modulation is lost. Adjustable response time from 2 to 60 seconds.

# ability and Convenience



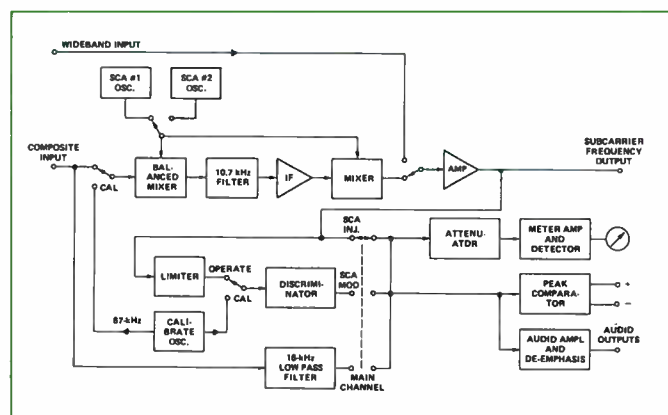
## Model 730 SCA Monitor

The Model 730 can be used with either baseband unit for monitoring SCA transmission characteristics: injection level, modulation, signal-to-noise ratio and crosstalk. The baseband signal is up-converted to 10.7 MHz. Then the SCA sub-channel is extracted through precision crystal filters. This technique ensures accurate measurements. Convenient, front panel push-button switches select measurement modes; a 50-dB push-button attenuator (similar to Model 724) helps make these measurements.

For true SCA proof-of-performance measurements (at the transmitter), a wideband input is provided. It allows unrestricted distortion and response measurements.

Additionally, SCA subcarrier frequency may be measured by the 6-digit frequency counter in the Model 723 baseband monitor, or by an external frequency counter. Monitoring of the 67 kHz sub-channel is standard. Additionally, an optional crystal is available for monitoring the 41 kHz sub-channel. Frequency deviation of either  $\pm 4$  kHz or  $\pm 6$  kHz modulation is pushbutton selectable.

Like the baseband monitors, the Model 730 has plus and minus peak flashers which can be digitally set from 50% to 129% in 1% increments. The accuracy of the peak flashers, and the modulation meter, can be checked at any time using the internal precision calibration signal.



### OPTIONS FOR MODEL 734

**Absence-of-Modulation Alarm:** Closes a relay contact when modulation is lost. Adjustable response time from 2 to 60 seconds.

**Carrier Frequency Output:** The RF carrier is extracted from the input signal and brought to the front panel.

### ACCESSORIES

**Model 704B Remote Meter and Peak Flasher Panel:** For use with baseband monitors, Model 723 or Model 734; or SCA Monitor, Model 730. Duplicates modulation meter and peak flashers. Includes 50' cable. 19" x 5 1/4" panel.

**Model 704C Remote Meter and Peak Flasher Panel:** For use with Stereo Monitor, Model 724. Duplicates left and right channel modulation meters. Includes 50' cable. 19" x 5 1/4" panel.

**Model 735 Standard Time and Frequency Receiver:** Receives National Bureau of Standards broadcasts on 10, 15 and 20 MHz. Accepts 1 MHz from Model 723. Calibrates Model 723 using zero-beat method. Includes speaker and meter for nulling.

## SPECIFICATIONS

### Model 723 FM Frequency and Modulation Monitor

### Model 734 FM Modulation Only Monitor

The following are common to both instruments:

#### RF INPUT

Frequency Range . . . . .	88 to 108 MHz (other freq. on special order)
Low Level RF Input . . . . .	250 $\mu$ V to 250 mV, 75 ohms, 60 dB AGC range
High Level RF Input . . . . .	1V to 10V, 50 ohms
Selectivity . . . . .	3 dB bandwidth, 375 kHz; 40 dB bandwidth, 800 kHz
Input Connectors . . . . .	BNC
Image Rejection . . . . .	60 dB
Carrier Level Meter . . . . .	Front panel meter to indicate relative signal level.

#### MODULATION MEASUREMENTS

Meter Range . . . . .	0 to 133%, switchable positive or negative peaks, dB scale also provided.
Meter Characteristics . . . . .	4½" (11.43 cm) illuminated scale, Scale and ballistics conform to FCC requirements.
Frequency Response . . . . .	$\pm$ 0.1 dB from 50 Hz to 75 k Hz
Accuracy . . . . .	$\pm$ 4% over entire scale

#### PEAK MODULATION INDICATORS

Variable Peak Indicators . . . . .	Positive and negative peak modulation LED flashers. Peak limit set by thumbwheel switches in 1% increments from 50% to 129%.
Accuracy . . . . .	$\pm$ 4%
Response Time . . . . .	1 cycle at 50 kHz

#### MODULATION CALIBRATION

Deviation . . . . .	100% modulation equals $\pm$ 75 kHz deviation. (Other calibrations available on special order)
Calibrator . . . . .	Built-in signal source produces precise, $\pm$ 75 kHz signal for calibration of meter and peak flashers.

#### OUTPUTS

700 kHz IF . . . . .	Output to drive Model 724 Stereo Monitor
Audio (with de-emphasis) . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, $\pm$ 0.5 dB, 50 Hz to 15 k Hz, noise 72 dB below 100% modulation at 400 Hz and 500 $\mu$ V RF signal. Distortion: 0.1%.
Composite . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, $\pm$ 0.1 dB, 50 Hz to 75 kHz.
AM Detector . . . . .	Residual AM measurements up to 20%, with de-emphasis, 70 dB signal-to-noise below 100%, level depends on input level.
Carrier-off Alarm . . . . .	Relay contact closure provided when loss of carrier.
Remote Meter and Peak Flashers . . . . .	For Model 704B Remote Meter and Flasher Panel.
Output Connectors . . . . .	BNC

#### INPUT POWER

115/230  $\pm$ 10% VAC, 50 to 400 Hz, 30W (max)

#### FCC TYPE APPROVAL NUMBER

Model 723 . . . . .	3-202
Model 734 . . . . .	3-214

### Model 723 FM Frequency and Modulation Monitor

These specifications apply to the Model 723 only:

#### CARRIER FREQUENCY ERROR MEASUREMENT

Digital Readout . . . . .	0 to $\pm$ 100 kHz in 1-Hz increments from assigned carrier frequency
Accuracy . . . . .	$\pm$ 100 Hz per year
Internal Frequency Standard . . . . .	Precision, 5-MHz crystal oscillator in a proportionally controlled oven.
Frequency Standard . . . . .	
Outputs . . . . .	1 kHz, TTL level (rear panel); 1 MHz (front panel)

#### SIX-DIGIT FREQUENCY COUNTER

Frequency Range . . . . .	10 Hz to 10 MHz
Inputs . . . . .	General purpose counter; Stereo pilot carrier from Model 724; SCA Subcarrier from Model 730.
Input Sensitivity . . . . .	200 mV to 2V RMS
Input Impedance . . . . .	500 kohms shunted by 25 pF
Resolution . . . . .	1 Hz or 10 Hz, front-panel switchable
Display Accuracy . . . . .	$\pm$ 1 count, plus time base accuracy
Time-Base Aging Rate . . . . .	1 x 10 <sup>-8</sup> /day after 30 days of operation

### Model 724 Stereo Monitor

#### INPUTS

Composite . . . . .	500 mV RMS, 600 ohms unbalanced
I.F. . . . .	700 kHz modulated, 100 mV RMS, 50 ohms from baseband monitor
Input Connector . . . . .	BNC

#### MODULATION MEASUREMENTS

Meter Range . . . . .	0 to 133%, 0 to 40%, and dB scale
Meter Characteristics . . . . .	4½" (11.43 cm) illuminated scale, scale and ballistics conform to FCC requirements.
Attenuator Range . . . . .	50 dB in 10 dB steps, pushbutton selectable
Frequency Response . . . . .	
Left, Right and (L+R) Channels . . . . .	$\pm$ 4% ( $\pm$ 0.35 dB), 50 Hz to 15 kHz
(L-R) Channel . . . . .	$\pm$ 4% ( $\pm$ 0.35 dB), 23 kHz to 53 kHz
Accuracy . . . . .	$\pm$ 4% over entire range

#### MODULATION CALIBRATION

Deviation . . . . .	100% modulation equals $\pm$ 75 kHz deviation.
Calibrator . . . . .	Calibration signal from baseband monitor is used for calibration of meter.

#### INTERNAL SEPARATION AND CROSSTALK

Separation . . . . .	
L-to-R and R-to-L . . . . .	45 dB min., 55 dB typical, 50 Hz to 15 kHz
Crosstalk . . . . .	
(L+R) to (L-R) or (L-R) to L+R . . . . .	60 dB min.
SCA to (L+R) or SCA to (L-R) . . . . .	66 dB min. 10% SCA modulation

## PILOT CARRIER MEASUREMENT

Level Accuracy . . . . .	±0.5% from 6% to 12% injection
Frequency Measurement . .	Measured by the frequency counter in the Model 723 to an accuracy and resolution of ±0.1 Hz or can be measured by an external frequency counter.

## OUTPUTS

Audio, (with de-emphasis)	
Left and Right . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, ±0.35 dB, 50 Hz to 15 kHz. Distortion; less than 0.5%. Signal-to-noise: 60 dB below 100% modulation.
Audio (without de-emphasis)	
Left and Right . . . . .	1V RMS, 600 ohms unbalanced at 100% modulation, ±0.35 dB, 50 Hz to 15 kHz.
Pilot Carrier (19 kHz) . . . . .	200 mV RMS, 50 ohms
Composite . . . . .	1V RMS, 10K ohms at 100% modulation
Remote Meter . . . . .	For Model 704C Remote Meter Panel.
Connectors . . . . .	BNC

## INPUT POWER

±15 and +10 volts supplied by the baseband monitor

## FCC TYPE APPROVAL NUMBER

Model 724 . . . . . 3-217

## Model 730 SCA Monitor

### INPUTS

Composite . . . . .	1V, 600 ohms unbalanced.
Wideband . . . . .	1V, 600 ohms unbalanced.
Connectors . . . . .	BNC

### MODULATION MEASUREMENTS

Meter Range . . . . .	0 to 133%, 0 to 40%, and dB scale
Meter Characteristics . . . . .	4½" (11.43 cm) illuminated scale. Scale and ballistics conform to FCC requirements.
Attenuator Range . . . . .	50 dB in 10 dB steps, pushbutton selectable.
Main Channel Modulation Measurement	
100% Modulation . . . . .	±75 kHz
Modulation Accuracy (50 Hz to 15 kHz) . . . . .	±4%
Out-of-Band Rejection (20 kHz to 75 kHz) . . . . .	56 dB
SCA Injection Measurement Accuracy (1% to 30% injection) . . . . .	±0.5%
SCA Subchannel Modulation Measurement	
100% Modulation . . . . .	±4 kHz or ±6 kHz, pushbutton selectable
Modulation Accuracy (100% Modulation, 1 kHz tone) . . . . .	±2%
Frequency Response, Composite input . . . . .	±1 dB, 20 Hz to 6 kHz ±2 dB, 20 Hz to 7.5 kHz

Frequency Response, Wideband input . . . . .	±0.5 dB, 20 Hz to 7.5 kHz
Selectivity, Composite input . . . . .	Narrow: 3 dB bandwidth, 3 kHz 60 dB bandwidth, 20 kHz Wide: 3 dB bandwidth, 21 kHz 60 dB bandwidth, 38 kHz

## INTERNAL CROSSTALK

Main to SCA . . . . .	66 dB
Stereo to SCA . . . . .	66 dB
SCA to main . . . . .	66 dB

## SCA PEAK MODULATION INDICATORS

Variable Peak Indicators . . . . .	Positive and negative peak modulation LED flashers. Peak limit set by thumbwheel switches in 1% increments from 50% to 129%.
Accuracy . . . . .	±10%
Response Time . . . . .	1 cycle at 2 kHz

## SCA MODULATION AND INJECTION LEVEL CALIBRATOR

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

## SUBCARRIER FREQUENCY MEASUREMENT

Sub-Carrier #1 . . . . .	67 kHz (standard)
Sub-Carrier #2 . . . . .	41 kHz (optional)
Frequency Measurement . . . . .	Measured by the frequency counter in the Model 723 or by an external frequency counter.

## OUTPUTS

SCA Subcarrier . . . . .	500 mV, into 5K ohms
SCA Subcarrier alarm . . . . .	Contact closure when subcarrier is below muting level.
Audio (with de-emphasis) . . . . .	2V RMS, 600 ohms unbalanced at 100% modulation. De-emphasis internally strappable to 75 or 150 μsec.
Distortion . . . . .	Wideband input: 0.5% at ±6 kHz Composite input: 1% at ±4 kHz, 1.5% at ±6 kHz
Signal-to-Noise . . . . .	Composite or wideband input, 66 dB through baseband monitor, 55 dB at 10 MV RF
Audio (without de-emphasis) . . . . .	2V RMS, 600 ohms unbalanced at 100% modulation.
Remote Meter and Flashers . . . . .	For Model 704B Remote Meter and Flasher Panel.
Connectors . . . . .	BNC

## INPUT POWER

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

## FCC TYPE APPROVAL NUMBER

Model 730 . . . . . 3-225

## ALL UNITS

### PHYSICAL AND ENVIRONMENTAL

Operating Temperature . . . . .	0° to 50°C (32°F to 122°F)
Size . . . . .	7" (17.78 cm) high x 19" (48.26 cm) wide x 17" (43.18 cm) deep
Weight . . . . .	approx. 15 pounds (6.8 kg)

Specifications subject to change without notice.



# About TFT

Since its start in 1971, TFT has become a major supplier of frequency and modulation monitors, setting new standards of convenience and accuracy. The reason for this rapid growth and wide acceptance by the broadcast industry is due primarily to the company's leadership in technical development and quality design. TFT builds beyond the minimum FCC requirements to provide a complete line of monitoring equipment—FM, AM, and VHF/UHF TV—that always leads the state-of-the-art in performance and reliability. Among other things, TFT has pioneered such broadcast monitoring

advances as frequency synthesizers, direct calibration to NBS, remote monitoring without RF amplifiers, phase-lock-loop technology and digital frequency display.

All TFT instruments carry a one year warranty on workmanship and materials, and service is available nationwide.

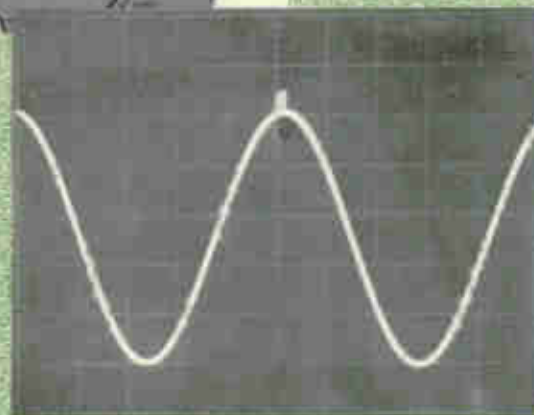
For more information, or a demonstration, of the TFT Monitor that is best for your application, contact your local sales representative. Or, contact TFT at the address listed below.

**TFT** TIME & FREQUENCY  
TECHNOLOGY INC.

3000 Olcott St., Santa Clara, California 95050 (408) 246-6365

# FM/Stereo/SCA Modulation Monitors

## Maximum modulation for maximum coverage





# Peak modulation with absolute confidence

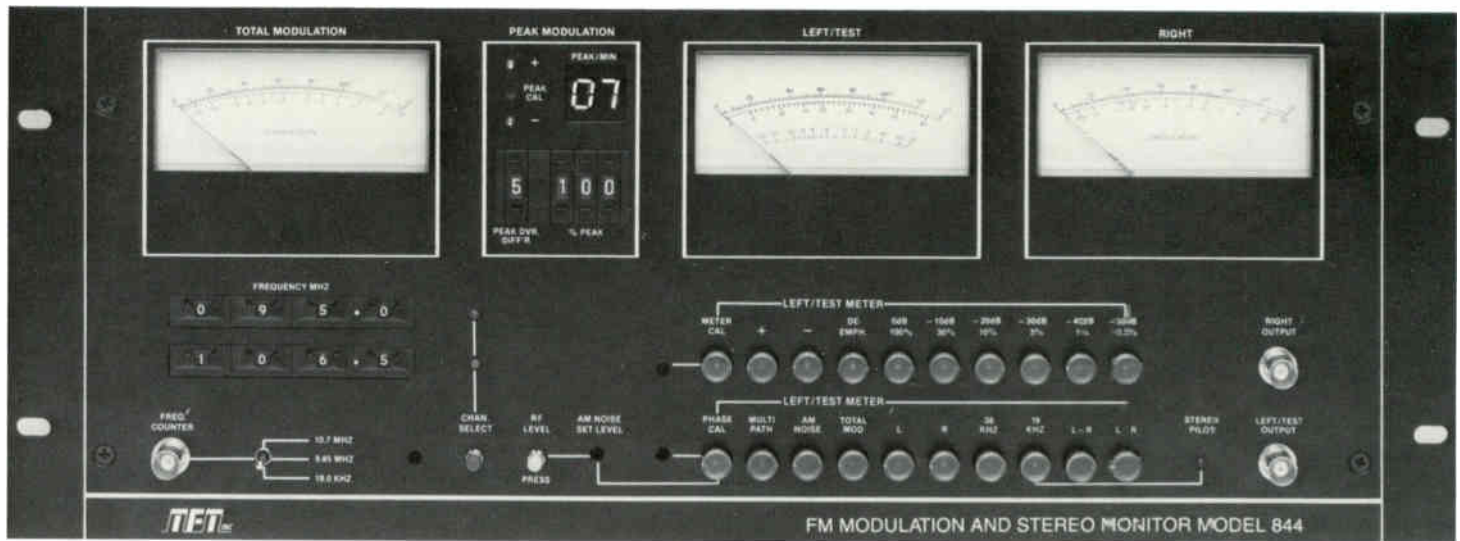


Figure 1: Model 844 FM/Stereo modulation monitor

To maximize your FM station's market coverage, you need more than a powerful transmitter. You also need all the modulation you're legally entitled to. Then you can reach all of your potential listeners, including those in fringe areas you might now be losing. TFT designed the Model 844 FM/Baseband/Stereo and Model 845 SCA Modulation Monitors for just that reason. They give you the ability to modulate your transmitter to the maximum legal limit—with absolute confidence.

Based on TFT's 14 years of engineering experience—with over 5,000 modulation monitors operating worldwide—these third generation instruments bring you innovations that solve today's modulation problems, using today's advanced technology. You get everything you need for complete proof-of-performance measurements (for distortion, an external analyzer is needed) right on the front panels, plus accuracy, versatility and convenience no other monitors can match.

The Model 844 combines a tuneable RF preselector, a baseband monitor and a stereo monitor in one compact instrument. The Model 845 SCA monitor is a multi-frequency instrument designed for use with the Model 844. With an optional receiver module, the 845 can be used as a stand-alone unit, for both off-air and direct transmitter monitoring.

Both the Model 844 and the Model 845 can be used for remote, off-air monitoring or for direct transmitter measurements. Both are also adaptable to Automatic Transmission System (ATS) use. Additionally, the Model 844 features 50 kHz, frequency synthesized channel tuning, to accommodate all U.S. and international standards.

State-of-the-art design, for optimum monitor performance, includes the use of linear phase filters, large scale integrated circuits (LSI) and toroidal power transformers to reduce hum and power line noise. Modular PC cards make service and routine calibrations easy, and high quality, industrial grade electronic components and parts are used throughout.

## The Most Accurate Peak Detection Available

A technique originated by TFT—the use of digitally-settable peak flashers to display plus and minus modulation peaks simultaneously—has now been made even more accurate and useful. The Model 844 and Model 845 both have a unique (patent pending) Peak Modulation Duration Differentiator (P.M.D.D.) This device is incorporated into the peak modulation detecting circuit to separate true modulation peaks from those caused by transient noise, overshoot and multipath distortion.

The TFT P.M.D.D. allows you to digitally set a "window" (see Figure 2) to the peak width you determine at your transmitter output. Once the window is set, only peaks of that width, or wider, will trigger the peak flashers. As a result, the peak flashers respond only to over-modulation that is truly caused by your transmitter.



Figure 2: P.M.D.D. allows user to set peak width digitally.

## Features

### Model 844 & 845

In addition to the peak flashers and peak differentiator, the 844 and 845 share several other advanced features:

# Specifications

## Model 845

### INPUT

Signal level	1 V, 600 ohms unbalanced
Connector	BNC
Frequency range	25 kHz to 125 kHz
Type of input	Composite of subcarrier selectable from front panel switch

### MODULATION MEASUREMENTS

Meter range	0 to 133%, 0 to 40%, and dB scale
Meter characteristics	3½" illuminated scale
Meter attenuator range	50 dB in 10 dB steps, push-button selectable

#### Main Channel Measurement:

100% modulation	± 75 kHz
Modulation accuracy (50 Hz to 15 kHz)	± 4%
Out-of-band rejection (20 kHz to 75 kHz)	56 dB
SCA Injection Accuracy	± 0.5%, 5% to 30% injection level

#### SCA Subchannel Measurement:

100% modulation	± 4 kHz or ± 6 kHz, push-button selectable
Modulation accuracy (100% modulation, 1 kHz tone)	± 2%

#### Frequency Response:

Composite input	± 1 dB, 40 Hz to 6 kHz or ± 2 dB, 20 Hz to 7.5 kHz
* Subcarrier input	± 0.5 dB, 20 Hz to 7.5 kHz

### INTERNAL CROSSTALK

*Main to SCA	66 dB
*Stereo to SCA	66 dB
*SCA to main	66 dB

\* Wideband input measurement

### SCA PEAK MODULATION INDICATORS

Variable peak indicators	Positive and negative modulation LED flashers, peak limit set by thumbwheel switches in 1% increments from 50% to 199%
Accuracy	± 1%
Response time	Variable pulse width discrimination, adjustable from the front panel thumbwheel switch

### SCA MODULATION AND INJECTION LEVEL CALIBRATOR

Built-in modulation and injection level calibrator for calibrating modulation meter and the peak flashers from the front panel. Accuracy ± 1%.

### SUBCARRIER FREQUENCY MEASUREMENT

SCA carriers	Available on front panel for external frequency counter
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### OUTPUTS, FRONT AND REAR PANEL

SCA subcarrier	500 mV, into 5K ohms
SCA subcarrier alarm	Contact closure when subcarrier is below muting level
Audio (with de-emphasis)	2 V RMS, 600 ohms unbalanced at 100% modulation, de-emphasis internally selectable to 75 or 150 sec
*Distortion	Subcarrier only input 0.5% at ± 6 kHz
*Signal-to-noise	66 dB with de-emphasis
Audio (without de-emphasis)	2 V RMS, 600 ohms unbalanced at 100% modulation
Remote meter and flashers	For Model 805 remote meter and flasher panel
Connectors	BNC

### MECHANICAL AND ENVIRONMENTAL

Input power	115/230 ± 10% VAC, 50 to 400 Hz, 40 watts max
Operating temperature	0°C to 50°C (32°F to 122°F)
Size	3½" (8.89 cm) high × 19" (48.26 cm) wide × 14.75" (37.47 cm) deep
Net weight	Approximately 9.5 pounds (4.3 kg)
Shipping weight	Approximately 12.5 pounds (5.6 kg)

*For more information about, and a demonstration of, TFT monitors and/or other TFT products, call your local TFT sales representative. Or contact TFT in Santa Clara, California.*



**Committed to keeping you, on the air!**

3090 Oakmead Village Dr., Santa Clara, CA 95051 ■ (408) 727-7272 ■ TWX 910-338-0584



**Frequency Synthesized Modulation Calibrator:** A frequency synthesized-type FM modulation calibrator is built-in for calibration of the modulation meters and peak flashers. The stability and accuracy of this type of calibrator are determined by the crystal oscillators. They do not change with temperature and aging. The use of the modulation calibrator requires only the push of a front panel button: no external equipment is needed. Accuracy is better than 1 percent, year after year.

#### **Automatic I.F. Bandwidth**

**Selection:** The appropriate bandwidth is selected automatically when you change between remote and on-site monitoring. This eliminates bandwidth restriction, for proof-of-performance measurements, and makes the monitor easier to use.

**Adjustable Peak Flashers:** Flashers are adjustable from 50 percent to 199 percent. Digital thumbwheel switches eliminate the ambiguity of potentiometer-type controls.

**Built-In Voltmeter and Attenuator:** A 50 dB attenuator, with 10 dB steps, allows you to make low-level modulation and noise measurements on the modulation meter. The only other instruments you need, to perform a complete proof, is a distortion analyzer and an audio generator.

**Multipath Detector:** This built-in feature allows you to manipulate your monitor's antenna to minimize multipath distortion when you're monitoring off-air.

**Digital Peak Counter:** A special convenience for ATS operation, this built-in counter accumulates the actual modulation peaks and updates the display every one minute.

**Frequency Counter Output:** Front panel outputs are provided for frequency measurement of the main carrier and subcarriers using an external counter.

**Compact Size:** Panel height for the Model 844 is only 7 inches; for the Model 845, the panel height is 3 inches.

## **Model 844 FM/Stereo Monitor**

### **Modulation Comparison**

**Capability:** The built-in preselector in the Model 844 allows you to digitally select any two FM stations, then precisely monitor, off-air, the modulation and carrier frequency error of either one. This gives you a quick, easy way to check on how your modulation measures up to that of other stations in your market.

### **Complete Stereo Measurements:**

The Model 844 makes complete measurements of right channel modulation, left channel modulation, channel separation, cross talk between main and sub-channels, L + R, L - R, 38 kHz carrier suppression and 19 kHz injection level. Measurements are selected by front-panel pushbuttons, and are read on the Modulation/Test Meter. A front panel BNC connector provides an output of the signal displayed on the Modulation/Test Meter.



**Figure 3:** Model 844 permits front panel waveform monitoring.

**PLL Demodulator:** The Model 844 provides superior separation measurements by using a phase-locked loop (PLL) to regenerate the 38 kHz suppressed carrier from the 19 kHz pilot carrier. This ensures precise accuracy and long-term stability for the phase relationship between the two signals. It also eliminates the need for phase alignments of the two signals when accurate separation measurements are needed.

**Simultaneous L and R Monitoring:** Two separate meters on the Model 844 permit simultaneous monitoring of left and right channel modulation.

Total modulation is read on a third front panel meter.

**Direct AM Measurements:** An AM switch on the front panel of the Model 844 allows you to use the instrument for direct measurement of incidental and residual AM on your transmitted carrier. Measurements are read on the modulation meter.

### **Wide Baseband Frequency**

**Response:** Response is greater than 100 kHz to cover the 92 kHz sub-carrier allowed by the FCC.

**Excellent Stereo Separation:** Separation of 55 dB, via the use of linear phase filters, is provided from 50 Hz to 15 kHz.

**Switchable De-Emphasis:** When the Model 844 is measuring AM or low-level noise and modulation, a 75  $\mu$ sec de-emphasis circuit can be switched into the meter circuit (other time constants available on request). This is done by pushing the S/N switch on the Model 844 front panel.

**Low T.H.D.:** The Model 844 uses a pulse-counting FM discriminator circuit to optimize frequency to voltage conversion. Consequently, total harmonic distortion is less than 0.1 percent.

**Scope Outputs:** Outputs are provided on the front panel of the Model 844 for external oscilloscope connection. Signals feeding the meter displays are accessible for external uses. The phase relationship of the L and R channels can be observed or adjusted through the use of these connectors.

**Remote Metering:** Outputs are available on the rear panel of the Model 844 for use with an optional, TFT Model 804 Remote Panel.

## Model 844 Options

**Remote Metering Panel, Model 804:** Panel duplicates flasher and meter readings and comes with 50 feet of cable. TFT Part No. 5116-0804.

**Absence of Modulation Alarm, Option 01:** Plug in circuit board. Alarm triggered when composite signal drops below 30 percent modulation for a period of time between 2 seconds and 1 minute. Time is user adjustable.

**Carrier-Fail Alarm, Option 01:** Plug in circuit board. Alarm triggered when RF carrier drops below 50 percent of nominal.

*Note:* Both alarm options are furnished together as Option 01. TFT Part No. 7100-3870.

## Model 845 FM SCA Monitor

**Multiple SCA Frequencies:** Up to three customer-specified frequencies are selectable from the front panel of the Model 845, to accommodate today's multi-channel operations.

wideband input is provided. It gives you an unrestricted bandwidth for making distortion and frequency response measurements.

### High Measurement Accuracy:

Accuracy is ensured by upconverting the baseband signal to an I.F. frequency and extracting the SCA sub-channel through precision filters. Pushbutton selection of either  $\pm 4$  KHz or  $\pm 6$  KHz as the frequency deviation to represent 100 percent modulation is standard.

**Remote Metering:** Remote metering outputs are available at the rear panel of the Model 845 for use with a TFT Remote Panel accessory.

## Model 845 Options

**Remote Metering Panel, Model 805:** Panel duplicates the meters and peak flashers and comes with 50 feet of cable. TFT Part No. 5116-0805.

**RF Module, Option 01:** Allows use of the Model 845 as a stand-alone unit for off-air monitoring of SCA channels. TFT Part No. 7100-3880.

## TFT: Quality and Innovation

Since 1971, TFT has been the major supplier of frequency and modulation monitors for AM, FM, FM/Stereo,

lock-loop technology, phase linear filters and tuneable preselectors.

TFT also manufactures the 7600 Series Digital Remote Control System, the first modular all-digital system for remote control of AM, FM and TV transmitters.

STL is another area of TFT innovation. The TFT 8300 STL outperforms any other, even in the densest RF environment. Features include a 75 dB SNR, stereo separation of 50 dB or better, and IF modulation for low distortion and high stereo performance. The system carries a two-year warranty.

In addition, TFT provides complete service support for all of the company's products. Key management and technical personnel are always available by phone, 24 hours-per-day, 7 days-a-week to help customers with technical problems or spare parts requirements. Additional support is provided by a network of factory trained sales representatives.

Today, about 80 percent of the radio and TV stations in the U.S., plus a large and growing number of stations in Canada, Europe, Latin America and Africa, use a TFT instrument for monitoring, controlling or testing.



Figure 4: Model 845 SCA modulation monitor

**Complete SCA Measurements:** The Model 845 makes complete, accurate measurements of injection level, modulation, S/N ratio, crosstalk and T.H.D. (using an external analyzer). Measurement modes are selected by front panel pushbuttons. In addition, for true proof-of-performance measurements (at the transmitter), a

SCA and VHF/UHF TV. TFT builds beyond FCC requirements to provide equipment that always leads the state-of-the-art in accuracy, convenience and reliability. TFT has pioneered such broadcast monitoring advances as frequency synthesized FM calibration, off-air monitoring with frequency synthesized RF amplifiers, phase-

# Specifications

## Model 844

### RF SECTION

Frequency range	88–108 MHz, tunable in 50 kHz steps
On-site RF input voltage	1 to 10 volts rms
Antenna input voltage	250 $\mu$ V to 100 mV
Tuning	Two 4-digit switches and a push-button switch for selecting A or B station
AGC range	60 dB
Input impedance, antenna	75 ohms
Input connector, antenna	Type F

### MODULATION METERS, TOTAL

Deviation for 100% indication	$\pm 75$ kHz peak to peak
Meter range	0 to 133% modulation
AC voltmeter range	0 to $-50$ dB in 10 dB steps
Accuracy (5-kHz tone)	$\pm 2\%$ at all modulation levels
Frequency response	$\pm 0.1$ dB typical, $\pm 0.25$ dB max, from 50 Hz to 120 kHz
Characteristics	Quasi-peak reading circuit
Remote output	Suitable for driving external remote readout meter panels

### MODULATION METER, RIGHT

Right channel modulation	Indicates and measures right channel modulation
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### MODULATION METER, LEFT/TEST

Left channel modulation	Indicates and measures left channel modulation
Right channel modulation	Same as right modulation meter
Main channel	Same as total modulation meter
L + R	$\pm 0.35$ dB, 50 Hz to 15 kHz
L - R	$\pm 0.35$ dB, 23 kHz to 53 kHz
38 kHz level	Measure down to $-60$ dB
Pilot level	Measure down to $-60$ dB
Phase calibration	For optimization of stereo measurements
AM noise	Measures AM noise
Multipath indicator	For adjustment of antenna to minimize multipath distortion

### PEAK MODULATION INDICATORS

Deviation for 100% indication	$\pm 75$ kHz
Peak level	Set by a front panel 3-digit thumbwheel switch in 1% steps from 50% to 199% on both positive and negative peaks
Accuracy (5-kHz tone)	$\pm 2\%$ at 100% modulation
Frequency response	$\pm 2\%$ from 30 Hz to 120 kHz
Response time accuracy	Adjustable, 10 cycles of 10 kHz or faster
Remote flasher output	Suitable for driving two remote meter panels
Peak counter	Registers number of peaks per minute

### MODULATION CALIBRATOR

Built in frequency synthesized calibrator for meter and peak flasher calibration of 100% modulation from the front panel. Accuracy  $\pm 1\%$ .

### MEASUREMENT OF RESIDUAL AM

Range	0 to 70 dB
Accuracy (at $-30$ dB)	$\pm 1$ dB

### OUTPUTS, FRONT AND REAR PANEL

Main channel output with 75 sec de-emphasis	5 volts rms into 5K ohms at 400 Hz
*Signal to noise ratio	78 dB at 400 Hz with de-emphasis
*Harmonic distortion	0.1% max (de-emphasized)
*Intermodulation distortion	0.1% max per SMPTE standard
*Frequency response	$\pm 0.25$ dB from 30 Hz to 120 kHz composite
Balanced audio output level	0 dBm into 600 ohms
*Balanced audio frequency response	$\pm 0.5$ dB from 30 Hz to 120 kHz
SCA output at rear panel	1 volt rms into 600 ohms
Audio (with de-emphasis) left and right	1 V RMS, 600 ohms unbalance at 100% modulation (400 Hz)
Audio (without de-emphasis) left and right	1 V RMS, 600 ohms unbalanced at 100% modulation
Pilot carrier (19 kHz)	600 mV RMS, available on front panel
Composite	5 V RMS, 10K ohms at 100% modulation
Remote meter	For Model 804 remote meter panel
Connectors	BNC
Meter output	Main meter selected signal available on front panel
Carrier-fail alarm, optional	Relay drive output capable of sinking 50 mA to 30 V DC when RF carrier drops below 50% of nominal
Absence of modulation alarm, optional	An output capable of sinking 50 mA at 30 V DC when composite signal drops below 30% modulation for a period of time between 2 seconds and 1 minute, internally adjustable

### STEREO SEPARATION AND CROSSTALK

Separation L-to-R and R-to-L	60 dB typical, 55 dB minimum, 50 Hz to 15 kHz
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Crosstalk (L + R) to (L - R) or (L - R) to (L + R)	65 dB min
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Crosstalk SCA to (L + R) or SCA to (L - R)	70 dB min
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Pilot carrier measurement level accuracy	$\pm 0.5\%$ from 6% to 12% injection
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### MECHANICAL AND ENVIRONMENTAL

Input power	115/230 $\pm 10\%$ VAC, 50 to 400 Hz, 40 watts max
Operating temperature	0°C to 50°C (32°F to 122°F)
Size	7" (17.78 cm) high $\times$ 19" (48.26 cm) wide $\times$ 15" (38.10 cm) deep
Net weight	Approximately 18.5 pounds (8.4 kg)
Shipping weight	Approximately 22.5 pounds (10.2 kg)

\* High level RF input



# PRICE SCHEDULE BROADCAST MONITORING EQUIPMENT

## TV PRODUCTS

Effective November 26, 1984

<b>MODEL 701</b>	TV FREQUENCY & AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$ 7,985.00
Option 02 (7100-0050)	Alarm (frequency and modulation)	**\$ 565.00
Option 03 (7100-0010)	SCA Output	**\$ 530.00
*Option 07 (7100-0030)	CCIR Format	\$ 1,110.00
Option 08 (7100-0060)	Spare Parts Kit	**\$ 785.00
<b>MODEL 702</b>	TV AURAL MODULATION MONITOR, Rack Mount Specify Channel & Offset	\$ 4,790.00
Option 02 (7100-0230)	Alarm (Modulation only)	**\$ 270.00
Option 03 (7100-0010)	SCA Output	**\$ 535.00
Option 05 (7100-0240)	Spare Parts Kit	**\$ 525.00
*Option 06 (7100-0070)	CCIR Format	\$ 995.00
<b>MODEL 704</b>	Remote Meter and Peak Flasher Panel	**\$ 510.00

## FM PRODUCTS

<b>MODEL 844</b>	FM/Stereo Modulation Monitor (Specify Frequency)	\$ 5,250.00
Option 01 (7100-3870)	Absence of Modulation/Carrier Fail Alarm	\$ 275.00
Option 02 (7100-3890)	Spare Parts Kit	\$ 475.00
<b>MODEL 804</b>	Remote Metering and Peak Flasher Panel for Model 844	\$ 525.00
<b>MODEL 845</b>	FM SCA Modulation Monitor	\$ 2,200.00
Option 01 (7100-3880)	RF Module-Preselector	TBA
Option 02 (7100-3900)	SCA Channel (41 kHz)	\$ 225.00
Option 03 (7100-3910)	SCA Channel (92 kHz)	\$ 225.00
Option 04 (7100-3920)	Spare Parts Kit	\$ 220.00
<b>MODEL 805</b>	Remote Metering and Peak Flasher Panel for Model 845	\$ 475.00
<b>MODEL 763</b>	FM Modulation Monitor (Specify Frequency)	\$ 1,985.00
Option 04 (7100-2430)	Absence-of-Modulation Alarm	**\$ 275.00
*Option 06 (7100-2460)	230 VAC	\$ 50.00
Option 07 (7100-2880)	Spare Parts Kit	**\$ 275.00
<b>MODEL 704F</b>	Remote Meter and Peak Flasher Panel for 763	**\$ 475.00
<b>*MODEL 764A</b>	FM Preselector with Frequency Readout, Tunable	\$ 1,495.00
Option 03 (7100-2510)	Spare Parts Kit	\$ 320.00
<b>*MODEL 785</b>	Single Channel FM Preselector	\$ 600.00
<b>MODEL 724A</b>	STEREO MONITOR	\$ 2,125.00
Option 01 (7100-1060)	Spare Parts Kit	**\$ 250.00
*Option 02 (7100-2460)	230 VAC	\$ 50.00
<b>MODEL 704C</b>	Remote Meter Panel for 724A	**\$ 525.00
<b>MODEL 730A</b>	SCA MONITOR, 67 kHz	\$ 2,425.00
Option 01 (7100-1510)	SCA Channel (41 kHz)	**\$ 230.00
Option 02 (7100-1520)	Spare Parts Kit	**\$ 210.00
*Option 03 (7100-1530)	For direct FSK Data Transmission	\$ 230.00
*Option 04 (7100-2460)	230 VAC	\$ 50.00
*Option 05 (7100-3730)	SCA Channel (92 kHz)	* \$ 285.00
<b>MODEL 704B</b>	Remote Meter and Peak Flasher Panel for 730A	**\$ 475.00

\*Not Field Installable

(Additional retrofit charge, contact factory or Representative)

\* For new equipment only. On older equipment, price is \$375.00 including recalibration.

\*\* Add 15% to list price of options when ordered separately.



## BROADCAST MONITORING EQUIPMENT

### AM PRODUCTS

<b>MODEL 753</b>	AM Modulation Monitor	\$ 1,425.00
Option 03 (7100-2410)	10 kHz Whistle Filter	**\$ 325.00
Option 04 (7100-2420)	30 Hz Telemetry Lowpass	**\$ 245.00
Option 05 (7100-2430)	Absence-of-Modulation Alarm	**\$ 275.00
*Option 06 (7100-2460)	230 VAC	\$ 50.00
Option 07 (7100-2560)	Spare Parts Kit	**\$ 215.00
<b>*MODEL 754</b>	AM RF Preselector with Frequency Readout	\$ 1,950.00
Option 01 (7100-2470)	Narrow Band Filter	**\$ 465.00
Option 04 (7100-2500)	Spare Parts Kit	**\$ 275.00
<b>MODEL 704E</b>	Remote Meter and Peak Flashers	\$ 475.00

### EBS PRODUCTS

<b>MODEL 760-1A</b>	AM Receiver/Encoder/Decoder	\$ 1,195.00
<b>MODEL 760-1B</b>	Single Channel FM Receiver/Encoder/Decoder	\$ 1,195.00
<b>MODEL 760-1C</b>	Dual Channel FM Receiver/Encoder/Decoder	\$ 1,395.00

### FM-SCA PRODUCTS

<b>MODEL 830</b>	FM-SCA Subcarrier Generator	\$ 1,575.00
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\*Not Field Installable

(Additional retrofit charge, contact factory or Representative.

\*\* Add 15% to list price of options when ordered separately.

### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

### WARRANTY

TFT, 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT, Inc. are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

Transportation charges for instruments found to be defective within the first thirty (30) days of the warranty period will be paid both ways by the SELLER. Transportation charges for warranty returns and repair costs, 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OF PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. Price subject to change without notice.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.



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# PRICE SCHEDULE

## REMOTE CONTROL EQUIPMENT November 26, 1984

MODEL/DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7610</b>		
(5115-7610) 10 Channel RAISE/LOWER Plus 10 channel Telemetry digital remote control system. Expandable by adding Model 7830, 7832, 7620R to a 110-channel system	To provide digital remote control systems for medium and large size AM, FM & TV stations. Also suitable for controlling multi-site operations	\$3,250.00
Option 01 (7100-2610) Sub-carrier (SCA) Detector; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	**\$ 250.00 (specify frequency)
Option 02 (7100-2620) Sub-carrier (SCA) Generator; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote Terminal.	To generate the SCA subcarrier	**\$ 250.00 (specify frequency)
Option 03 (7100-2600) SCA generator/detector in one module.	Single module combines functions of options 01 and 02	**\$ 500.00
Option 04 (7100-2650) BCD parallel data inputs (for the Remote Terminal)	To provide two channels of parallel BCD inputs to accept external digital data such as the readings from a digital frequency monitor or frequency counter.	**\$ 250.00
Option 05 (7100-2730) Parallel BCD Data Output Cable Kit. (for 7610C Control Terminal)	A cable kit to provide external control of channel selection, RAISE/LOWER function and parallel BCD output of the channel identification and DVM reading.	**\$ 150.00
Option 06 (7100-2720) Components for Remote Terminal Extender Cable	To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter sensors. (Wire not included)	**\$ 100.00
Option 07 (7100-2740) Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	**\$ 395.00
Option 08 (7100-2460)	230 VAC	\$ 50.00
<b>MODEL 7610-C</b>		
(5116-7610) Control portion only of 7610 system	To provide an alternate control location for 7610	\$1,500.00
<b>MODEL 7610-R</b>		
(5116-7620) Remote portion only of 7610 system	For use at each additional remote site up to 16	\$2,000.00
<b>MODEL 7630-R</b>		
(5116-7630) Channel Expander (20 channels)	To expand the RAISE/LOWER and Telemetry channels of the Model 7610 from 10 each to 30 each (to be installed at the Remote Terminal only)	\$1,450.00
Option 01 (7100-2760) Spare Parts Kit	To provide spare parts such as relays, I.C.'s critical components for emergency repair	**\$ 195.00
Option 02 (7100-2720) Components for Remote Terminal Extender Cable	To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter and sensors. (Wire not included)	**\$ 100.00

\* Not Field Installable  
(Additional Retrofit Charge, Contact Factory or Representative)

\*\*Add 15% to List Price of Options When Ordered Separately

MODEL/DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7815 (STAND ALONE UNIT)</b> (5115-7815) Status and Control System with 15 ON/OFF control and 15 status indication channels, consisting of a Control and Remote unit.	For ON/OFF control and status indications only. Expandable from 15 to 45 channels of control and from 15 to 79 channels of status by the addition of Models 7830 and 7832.	\$3,500.00
Option 01 (7100-3050C) (7100-3060R) Time Share Capability	Timeshare to Telco link on STL/SCA links is possible through an existing remote control system without affecting remote operation.	**\$ 545.00
Option 02 (7100-3100) Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	**\$ 380.00
Option 03 (7100-3130) Momentary Switch Kit	8 momentary switches and instructions for replacing front panel toggle switches. Field Installation Only	\$ 75.00
* Option 04 (7100-2460)	230 VAC	\$ 50.00
<b>7815-C</b> (5115-7815) Control portion of 7815 system	To provide an alternate control location for 7815	\$1,725.00
<b>MODEL 7815-R</b> (5116-7816) Remote portion only of 7815 system	For use at each additional remote site (up to 16)	\$1,950.00
<b>MODEL 7830</b> (5115-7830) Direct ON/OFF Control and Status monitoring	When operated in conjunction with the Model 7610, it provides 15 channels of direct ON/OFF control plus 15 channels of status indicators. Also acts as expansion unit to 7815 providing 15 to 30 additional control and status channels.	\$2,850.00
Option 01 (7100-3080) Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	**\$ 350.00
Option 02 (7100-3130) Momentary Switch Kit	The kit consists of 8 momentary switches and instructions for replacing front panel toggle switches. Field Installation Only	**\$ 75.00
* Option 03 (7100-2460)	230 VAC	\$ 50.00
<b>MODEL 7830-C</b> (5116-7830) Control portion only of 7830 system	For use at an alternate control location	\$1,350.00
<b>MODEL 7830-R</b> (5116-7831) Remote portion only of 7830 system	For use at each additional remote site	\$1,600.00
<b>MODEL 7832</b> (5115-7832) 32 Channel Status/Alarm	Can be used with Models 7610 or 7815 to provide an additional 32 to 64 channels of Status/Alarm.	\$2,500.00
Option 01 (7100-3190) Spare Parts Kit	To provide spare parts such as relay's, I.C.'s and other critical components for emergency repair.	**\$ 315.00
* Option 02 (7100-2460)	230 VAC	\$ 50.00
<b>MODEL 7832-C</b> (5116-7832) Control portion only of 7832 system	For use at an alternate control location	\$1,275.00
<b>MODEL 7832-R</b> (5116-7833) Remote portion only of 7832 system	For use at each additional remote site	\$1,350.00

\* Not Field Installable  
(Additional Retrofit Charge. Contact Factory or Representative)

\*\*Add 15% to List Price of Options When Ordered Separately

**MODEL 7900**

<b>MODEL/DESCRIPTION</b>	<b>APPLICATION</b>	<b>PRICE</b>
<b>MASTER CONTROL TERMINALS</b>		
<b>MODEL 7900</b> (5116-7900) Master Control Unit	Master Control terminal has full display of site, channel, full 4-digit data with alpha-numeric units of measure, time, date, and Self Test LEDs. Also includes 16-key double function keyboard.	\$ 7,250.00
<b>MODEL 7910</b> (5116-7910) Direct Analog Control Unit	Allows operator to bypass keyboard for instant access to critical UP/DOWN controls.	\$ 2,500.00
<b>MODEL 7920</b> (5116-7920) Direct Control/Status Unit	Provides 16 status and 16 ON/OFF controls and alarm	\$ 2,000.00
<b>MODEL 7930</b> (5116-7930) Status Unit	Provides 32 status and alarm	\$ 1,625.00
<b>OPTION 41</b> (7100-3690)	CRT - Beehive with P42 green phosphor RS232 current interface	\$ 2,200.00
<b>OPTION 42*</b> (7100-3691)	IBM Personal Computer with asynchronous communications interface, 128K memory, dual disk drive and monochrome monitor.	\$ 6,250.00
<b>OPTION 43</b> (7100-3692)	Autologger, TTY43	\$ 2,200.00
<b>OPTION 44*</b> (7100-3693)	Auto-Dial, Auto-Answer	\$ 1,500.00
<b>OPTION 45*</b> (7100-3694)	Acoustically Coupled Modem	\$ 815.00
<b>REMOTE TRANSMITTER CONTROL TERMINALS</b>		
<b>MODEL 7901</b> (5116-7901) Remote Control Terminal	Remote terminal has full display of site, channel, full 4-digit data with alpha-numeric units of measure, time, date, and Self Test LEDs. Also includes 16-key double function keyboard.	\$ 7,250.00
<b>MODEL 7911</b> (5116-7911) Analog Telemetry & Control Unit	Provides 16 channels of UP/DOWN control with analog monitoring	\$ 2,500.00
<b>MODEL 7921</b> (5116-7921) Remote Control and Status Unit	Monitor 16 Status inputs and provides 160 ON/OFF controls in remote site	\$ 2,000.00
<b>MODEL 7931</b> (5116-7931) Remote Status Unit	Monitor 32 status inputs in remote site	\$ 1,625.00
<b>OPTION 46*</b> (7100-3690)	CRT - Beehive with P42 green phosphor screen, RS232 current interface	\$ 2,200.00
<b>OPTION 47*</b> (7100-3692)	Autologger, TTY43	\$ 2,200.00
<b>OPTION 48*</b> (7100-3693)	Auto-Dial, Auto-Answer	\$ 1,500.00
<b>MODEL 7971</b> (5116-7971) Transmitter Interface	Provides facilities to hold 16 ea. OPT-01 or -02 or 8 ea. OPT -03 or -04. Mounts on 19" equipment rack	\$ 120.00
<b>MODEL 7973</b> (5116-7973) Transmitter Interface Panel and Power Supply	Provides power supply (110 VAC to 12 VDC) to power relays when other source is not available. Also provides mounting facilities for holding 6 ea. OPT-01 or -02 or 3 ea. -03 or -04.	\$ 250.00
<b>OPTION 01</b> (7100-3390)	12 VDC to TTL	\$ 40.00
<b>OPTION 02</b> (7100-3400)	120 VAC to TTL	\$ 45.00
<b>OPTION 03</b> (7100-3410)	Momentary Relay	\$ 50.00
<b>OPTION 04</b> (7100-3480)	Magnetic Latching Relay	\$ 60.00

\* Software options are required



**7900 SYSTEM SOFTWARE OPTION PRICES**

<b>SOFTWARE OPTIONS</b>	<b>SOFTWARE FEATURES</b>	<b>PRICES</b>
<b>7900</b> Basic Software	Provides two I/O ports to support external CRT with full remote control capability and a teletype for auto logging.	Included
<b>7901</b> Basic Software	No interface to peripheral hardwares.	Included
<b>7900 OPT. 57</b> (7100-3592)	An extra S I/O module is included in this option to provide two additional I/O ports to interface with IBM PC and an Auto-Dial/Auto-Answer Modem.	\$ 7,000.00
<b>7900 OPT. 59</b> (7100-3596)	An extra S I/O module is included in this option to provide two additional I/O ports to interface with IBM PC and an RS-232 interface at 300 BAUD for a second CRT display.	\$ 7,000.00
<b>7901 OPT. 61</b> (7100-3610)	Provides two I/O ports to support an external CRT (display only) and a teletype for auto-logging or an Auto-Dial/Auto-Answer Modem.	\$ 3,000.00
<b>7901 OPT. 62</b> (7100-3620)	An extra S I/O module is included in this option to provide a total of 3 ports to support an external CRT (display only), a teletype for auto-logging and an Auto-Dial/Auto-Answer Modem.	\$ 5,000.00
<b>IBM OPT. 70</b> (7100-3700)	Provides software for IBM Personal Computer on 5 1/4" disk to interface with TFT 7900 System to provide full control and data acquisition from IBM keyboard.	\$ 4,000.00
<b>IBM OPT. 71</b> (7100-3701)	Provides software for IBM Personal Computer on 5 1/4" disk to allow operator to acquire store and down-load as needed for all operating parameters for the 7900 Remote Control System.	\$ 2,000.00
<b>IBM OPT. 72</b> (7100-3702)	Provides a library of software sub-routines on 5 1/4" disk for IBM Personal Computer to aid 7900 System users to write custom system control software.	\$ 4,000.00

**REMOTE CONTROL INTERFACING ACCESSORIES**

<b>MODEL/DESCRIPTION</b>	<b>APPLICATION</b>	<b>PRICE</b>
<b>FSU-01</b> (5116-0FSU) Fail Safe Unit for TV	To provide full compliance with FCC Rules by monitoring 4 critical parameters: aural power and visual power	\$ 1,155.00
<b>ADS-01</b> (5116-0ADS) Alternate Data Path Selector	Switch from SCA to phone line when invalid data is detected from either the Control or the Remote terminal. Both local and remote units are included.	\$ 1,565.00
<b>CSA-01</b> (5116-0CSA) Chopper Amplifier	To provide isolation from a floating circuit to a grounded circuit. DC gain is also provided.	**\$ 485.00
<b>PLC-01</b> (5116-0PLC) Power-to-linear Converter	To linearize power readings from log scale to linear scale	**\$ 620.00
<b>TLK-01</b> (5116-0TLK) Tower Light Monitor	To monitor AC line current	**\$ 270.00
<b>LVK-01</b> (5116-0LVK) Line Voltage Monitor	To monitor AC line Voltage	**\$ 210.00
<b>PVK-01</b> (5116-0PVK) Plate Voltage Monitor	To monitor plate voltage up to 20 kv	**\$ 210.00
<b>TSK-01</b> (5116-0TSK) Temperature Sensing Kit	To monitor temperature of air or components	**\$ 315.00
<b>MBB-01</b> (5116-0MBB) Isolation amplifier (high voltage)	For monitoring voltage and current at 10 kv above ground and translate reading in reference to ground voltage to suit the input of the Remote Terminals.	**\$ 315.00
<b>SCA1</b> (5115-SCA1) SCA Generator	Unit converts FSK from modem to SCA frequency	\$ 725.00
<b>SCA2</b> (5115-SCA2) SCA Detector	Unit converts SCA frequency to FSK	\$ 725.00
<b>SCA3</b> (5115-SCA3) SCA Generator/Detector	Unit combines functions of SCA1 and SCA2	\$ 950.00

**TERMS OF SALE**

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**WARRANTY**

Time and 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

Transportation charges for instruments found to be defective within the first thirty (30) days of the warranty period will be paid both ways by the SELLER. Transportation charges for warranty returns and repair costs, wherein failure is found not 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OF PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. Price subject to change without notice.

\*\*Add 15% to List Price of Options When Ordered Separately



# PRICE SCHEDULE

## STL/TSL ANTENNAS, COAXIAL TRANSMISSION LINE AND CONNECTOR KITS

MODEL	PART NUMBER	DESCRIPTION	PRICE
P972GRN-M1	3500-0016	ANIXTER-MARK Grid Parabolic Antenna, six-foot diameter, for 890-960 MHz, type N female connector, 50 ohm (1.3:1 VSWR standard/1.15:1 special order), non-pressurized feed, vertical or horizontal polarization for mounting to 1.9 to 3.5 inch diameter O.D. pipe. (Other mounts on special order.) Gain 22.0 dBi-midband.	\$ 1,060.00
PR-450U	3500-0001	SCALA Paraflector™, Parabolic Antenna, for 350-1000 MHz, type N female connector, 50 ohm, universal mounting for vertical or horizontal polarization. Gain 20.1 dBi at 950 MHz; 16.6 dBi at 450 MHz.	\$ 500.00
SH872GN	3500-0017	ANIXTER-MARK Multi-element Grid Parabolic Section Antenna (72" x 36"), for 675-960 MHz, type N female connector, 50 ohm, vertical or horizontal polarization, for mounting up to 3.5 inch round member. Gain 19.6 dBi at 950 MHz.	\$ 485.00
MF 960	3500-0002	SCALA Miniflector™ Antenna for 940-960 MHz, 16.1 dBi gain, type N female connector, universal mounting for vertical or horizontal polarization, fully anodized. (Not recommended for congested areas.)	\$ 300.00
MG-944GN	3500-0018	ANIXTER-MARK Mini Grid Parabolic Section Antenna (44" x 13.5"), for 890-960 MHz, type N female connector, 50 ohm, vertical or horizontal polarization, for mounting up to 3.5 inch round member. Gain 13.5 dBi at 950 MHz.	\$ 245.00
COX-01	3500-0003	ANDREW Heliax* LDF4-50 Transmission Line 1/2" foam Dielectric, 50 ohm, jacketed.	\$ 1.70 per ft.
CON-01	3500-0004	Connector Kit for LDF4-50 Andrew Heliax* consisting of two (2) Andrew type L44N female connectors. Two (2) PTL-1 or equivalent needed for normal installation.	\$ 42.00
COX-03	3500-0012	CABLEWAVE FLC-12-505 1/2" Low Loss Foam Wellflex Coaxial Cable, foam Dielectric, 50 ohm, jacketed.	\$ 1.50 per ft.
CON-03	3500-0013	Connector Kit for FLC-12-505 Cablewave, consists of two (2) Cablewave Part No. 738801, type N female connectors. Two (2) PTL-1 or equivalent needed for normal installation. One kit required for each length of FLC-12-505.	\$ 40.00
COX-02	3500-0005	ANDREW Heliax* LDF5-50 Transmission Line 7/8" foam Dielectric, 50 ohm, jacketed.	\$ 4.30 per ft.
CON-02	3500-0006	Connector Kit for LDF-50 Andrew Heliax* consisting of two (2) Andrew type female connectors. Two (2) PTL-1 or equivalent needed for normal installation. ONE KIT REQUIRED FOR EACH LENGTH OF LDF5-50.	\$ 99.00
COX-04	3500-0014	CABLEWAVE FLC-78-505 7/8" Low Loss Wellflex Coaxial Cable, foam Dielectric, 50 ohm, jacketed.	\$ 4.70 per ft.
CON-04	3500-0015	Connector Kit for Cablewave FLC-78-505, consists of two (2) Cablewave Part No. 738829, type N female connectors. Two (2) PTL-1 or equivalent needed for normal installation. One kit required for each length of FLC-78-505.	\$ 99.00
PTL-1	4750-0208	3" pigtail assembly of RG-8/U with type N male connector on each end. TWO REQUIRED FOR EACH CON-0X KIT.	\$ 29.00
DIPLEXER	3500-0007	A Diplexer for combining 2 transmitter outputs to one antenna, ferrite-type. Contact factory for details. (DB4391)	\$ 1,109.00
ISOCOUPLER	3500-0008	Permits installation of STL/TSL antennas on AM tower. 950/450/150 MHz band. (Specify frequency.)	\$ 845.00
ANT-TSL-1	3500-0009	SCALA CA5-450 5 element Yagi for 10dB gain (cut to frequency). 406-420/450-470/480-500 MHz.	\$ 160.00
ANT-TSL-2	3500-0010	SCALA CA7-460 7-element Yagi for 10dB gain (broad band). 406-420/450-470/480-500 MHz.	\$ 160.00
ANT-TSL-3	3500-0011	ANIXTER-MARK H450L (left hand polarization) and H450R (right hand polarization) Heliax antenna, circular polarization, operates 450-470 band, 12 dB gain. Recommended for areas where ice, snow and windloading are of concern.	\$271.00 Antenna \$ 40.00 Mount

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PRICES SUBJECT TO CHANGE WITHOUT NOTICE.



**INC**

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA 95051  
(408) 727-7272 TWX 910-338-0584





# PRICE SCHEDULE

## AURAL STUDIO-TRANSMITTER LINK & ASSOCIATED EQUIPMENT

### DOMESTIC

Effective November 26, 1984

MODEL	PART NUMBER	DESCRIPTION	PRICE
SYSTEM A	Series 7700: 5115-7700A Series 8300: 5115-8300A	STL-All solid state composite transmitter and receiver, including self-contained power supplies, crystals, and tested to standard operating frequency. Specify exact operating frequency.	\$ 6,715.00 \$ 8,150.00
SYSTEM B	Series 7700: 5115-7700B Series 8300: 5115-8300B	STL-All solid state composite transmitter and receiver with "HOT" standby transmitter and receiver with 7770/7773 automatic switching, including self-contained AC power supplies, crystals, and tested to standard operating frequency. (Only two antennas required.) Specify exact operating frequency.	\$14,895.00 \$17,765.00
SYSTEM C	5115-7700C	STL-All solid state single channel transmitter and receiver including self-contained AC power supplies, crystals, and tested to operating standard frequency. Specify exact operating frequency.	\$ 6,350.00
SYSTEM D	5115-7700D	STL-All solid state channel transmitter and receivers with HOT standby transmitter and receiver with 7770/7773 automatic switching-including self-contained AC power supplies, crystals and tested to standard operating frequency. (Only two antennas required.) Specify exact operating frequency.	\$14,150.00
SYSTEM E	5115-7700E	STL-All solid state dual single channel transmitters (2) and receivers (2) for separate left and right channel, including self-contained AC power supplies, crystals, and tested to standard operating frequencies. System E requires three antenna—two transmit, one receiver (power divider included). See below for transmitter combiner for single transmit antenna operation. Specify exact operating frequencies.	\$12,700.00
NOTE: For non-standard frequencies see below.			
MODEL 8100	5115-8100	450 MHz Transmitter - Studio Voice/Data Link. Specify FCC Group P frequency.	\$ 3,995.00
MODEL 8100	7100-3460	Option - 01 Automatic ID.	\$ 295.00
NOTE: For non-standard frequencies see below.			
7700	5116-7700	Transmitter, only	\$ 3,475.00
8300	5116-8300	Transmitter, only	\$ 4,250.00
7707	5116-7707	Composite Receiver, only	\$ 3,275.00
8301	5116-8301	Composite Receiver, only	\$ 4,050.00
7705	5116-7705	Monaural Receiver, only	\$ 2,925.00
7770	5116-7770	Transmitter Automatic Changeover Unit, with coaxial changeover relay, and three-foot interconnecting cables to transmitter.	\$ 815.00
7773	5116-7773	Receiver Automatic Changeover Unit, with RF power divider, and three foot interconnect cables to receivers.	\$ 760.00
Option 15	7100-3710	Stereo demodulator module, for 8301, 7707, 7713, or 7723 receivers.	\$ 400.00
Option 16	7100-3790	Extended Baseband Response, permits Composite STL to convey 92 kHz SCA channel, for 8301, 7707, 7713, or 7723.	\$ 350.00*
Option 20	7100-3640	Narrow Band IF (Canada). Total carrier frequency deviation $\pm$ 25.5 KHz.	\$ 325.00
Option 21	7100-3650	Narrow Band IF (Canada). Total carrier frequency deviation $\pm$ 11.5 KHz.	\$ 325.00
SCA-01	5116-SCA1	Standalone Subcarrier Generator for data transmission (specify frequency).	\$ 725.00
SCA-02	5116-SCA2	Standalone Subcarrier Detector for data transmission (specify frequency).	\$ 725.00
SCA-03	5116-SCA3	Standalone Subcarrier Generator and Detector for data transmission (specify frequency).	\$ 950.00
	7100-3760	Non-standard frequency for 7700 Series (specify exact frequency desired). For transmitter/receiver pair.	\$ 230.00*
	7100-3700	Non-standard frequency for 8300 Series (specify exact frequency desired). For transmitter/receiver pair.	\$ 260.00*
Option 04	7100-3500	Spare parts kit for 7700 Series, contains field replaceable parts	\$ 305.00
Option 01	7100-3780	Spare parts kit for 8300 Series, contains field replaceable parts	\$ 420.00
For other Options, such as, use of TFT STL equipment with that manufactured by others contact factory direct.			

\* Not Field Installable  
(Additional Retrofit Charge. Contact Factory or Representative.)

\*\*Add 15% to List Price of Options When Ordered Separately.



## PRICE SCHEDULE REMOTE CONTROL EQUIPMENT

October 1, 1979

MODEL	DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7601</b>	10-channel Raise and Lower functions plus 10 channels of digital telemetry, consisting of a control terminal and a remote terminal.	To provide economical digital remote control to AM&FM stations (up to a maximum of 10 channels)	\$2,195.00
Option 01	Sub-carrier (SCA) Detector; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	\$ 185.00 (specify frequency)
Option 02	Sub-carrier (SCA) Generator; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote Terminal.	To generate the SCA subcarrier	\$ 185.00 (specify frequency)
Option 03	Components for Remote Terminal Extender Cable	To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter and sensors. (Wire not included)	\$ 50.00
Option 04	Spare Parts Kit	To provide spare parts such as relays, and I.C.'s for emergency repair	\$ 320.00
Option 05	10 channel Status Light	To provide 10 channels of independent status light indicators at both the control and remote terminals.	\$ 545.00
<b>MODEL 7601-C</b>	Control portion only of 7601 system	To provide an alternate control location for 7601	\$1,100.00
<b>MODEL 7601R</b>	Remote portion only of 7601 system	For use at each additional remote site (up to 16)	\$1,320.00
<b>MODEL 7610</b>	10 channel RAISE/LOWER Plus 10 channel Telemetry digital remote control system. Expandable by adding Model 7615, 7620, 7630 to a 110-channel system	To provide digital remote control systems for medium and large size AM, FM & TV stations. Also suitable for controlling multi-site operations	\$3,495.00
Option 01	Sub-carrier (SCA) Detector; for TV application, specify 39 kHz, for FM 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	\$ 185.00 (specify frequency)
Option 02	Sub-carrier (SCA) Generator; for TV use, specify 39 kHz; for FM, 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote terminal	To generate the SCA sub-carrier	\$ 185.00 (specify frequency)
Option 03	BCD parallel data inputs (for the Remote Terminal)	To provide two channels of parallel BCD inputs to accept external digital data such as the readings from a digital frequency monitor or frequency counter.	\$ 190.00
Option 04	Parallel BCD Data Output Cable Kit (for 7610C Control Terminal)	A cable kit to provide external control of channel selection, RAISE/LOWER function and parallel BCD output of the channel identification and DVM reading.	\$ 75.00
Option 05	Components for Remote Terminal Extender Cable	To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter sensors. (Wire not included)	\$ 50.00

MODEL	DESCRIPTION	APPLICATION	PRICE
<b>7610 (con't)</b> Option 06 Spare Parts Kit		To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	\$ 395.00
<b>MODEL 7610-C</b> Control portion only of 7610 system		To provide an alternate control location for 7610	\$1,750.00
<b>MODEL 7610-R</b> Remote portion only of 7610 system		For use at each additional remote site up to 16	\$2,100.00
<b>MODEL 7616</b> Manual Site Selector		Selects one of sixteen sites and performs command and telemetry functions on Model 7610 system without causing interference from one site to the other.	\$2,950.00
<b>MODEL 7620-R</b> Channel Expander (10 channels)		To expand the RAISE/LOWER and Telemetry channels of the Model 7610 from 10 each to 20 each (to be installed at the Remote Terminal only)	\$ 975.00
Option 01 Spare Parts Kit		To provide spare parts such as relays, I.C.'s and other critical components for emergency repair	\$ 155.00
Option 02 Components for Remote Terminal Extender Cable		To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter and sensors. (Wire not included)	\$ 50.00
<b>MODEL 7630R</b> Channel Expander (20 channels)		To expand the RAISE/LOWER and Telemetry channels of the Model 7610 from 10 each to 30 each (to be installed at the Remote Terminal only)	\$1,450.00
Option 01 Spare Parts Kit		To provide spare parts such as relays, I.C.'s critical components for emergency repair	\$ 220.00
Option 02 Components for Remote Terminal Extender Cable		To provide mating connector and PC boards for customer constructed extension cable. Remote Terminal may be removed from the rack without having to disconnect wirings to and from the transmitter and sensors. (Wire not included)	\$ 50.00
<b>MODEL 7641</b> Automatic Sequential Site Selector		Selects multiple remote sites in sequence for Model 7840 up to 4 sites automatically	\$2,950.00
<b>MODEL 7815</b> Status and Control System with 15 ON/OFF control and 15 status indication channels, consisting of a Control and Remote unit.		For ON/OFF control and status indications only. Expandable from 15 to 45 channels of control and from 15 to 79 channels of status by the addition of Models 7830 and 7832.	\$2,250.00
Option 01 Time Share Capability		Timeshare to Telco link on STL/SCA links is possible through an existing remote control system without affecting remote operation.	RPO
Option 02 Spare Parts Kit		To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	\$ 325.00
Option 03 Momentary Switch Kit		8 momentary switches and instructions for replacing front panel toggle switches. Field Installation Only	\$ 35.00
*Option 04 Inverting Status Input		To provide inverting status to the inputs of the status lights.	\$ 125.00
*Option 05 Electronic Interlock		To provide electronic interlocking capabilities in two groups of two to eight channels to failsafe human error.	\$ 545.00

\*Not Field Installable

MODEL	DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7815-C</b>	Control portion of 7815 system	To provide an alternate control location for 7815	\$1,125.00
<b>MODEL 7815-R</b>	Remote portion only of 7815 system	For use at each additional remote site (up to 16)	\$1,350.00
<b>MODEL 7830</b>	Direct ON/OFF Control and Status monitoring	When operated in conjunction with the Model 7610, it provides 15 channels of direct ON/OFF control plus 15 channels of status indicators. Also acts as expansion unit to 7815 providing 15 to 30 additional control and status channels.	\$2,075.00
Option 01 Spare Parts Kit		To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.	\$ 275.00
Option 02 Inverting Status Input		To provide inverting logic to the inputs of the status lights.	\$ 120.00
Option 03 Momentary Switch Kit		The kit consists of 8 momentary switches and instructions for replacing front panel toggle switches. Field Installation Only	\$ 35.00
<b>MODEL 7830-C</b>	Control portion only of 7830 system	For use at an alternate control location	\$1,040.00
<b>MODEL 7830-R</b>	Remote portion only of 7830 system	For use at each additional remote site	\$1,245.00
<b>MODEL 7832</b>	32 Channel Status/Alarm	Can be used with Models 7610 or 7815 to provide an additional 32 to 64 channels of Status/Alarm.	\$1,700.00
Option 01 Spare Parts Kit		To provide spare parts such as relay's, I.C.'s and other critical components for emergency repair.	\$ 220.00
*Option 02 Inverting Status Input		To provide inverting logic to the inputs of the status lights.	\$ 120.00
<b>MODEL 7832-C</b>	Control portion only of 7832 system	For use at an alternate control location	\$ 850.00
<b>MODEL 7832-R</b>	Remote portion only of 7832 system	For use at each additional remote site	\$1,020.00
<b>MODEL 7840</b>	COMPUSCAN (CPU, Printer and Scanner)	A micro-computer based data acquisition, limit alarm and logging system. Capable of 20-60 channels of logging, the 7840 may be used to assist existing remote control equipment or as a stand alone system.	\$8,300.00
Option 01 CTR & Keyboard		A 15-inch B & W CRT displays 120 channels of data in groups of 30 per page. Instructions are entered through accompanying typewriter keyboard.	\$5,000.00
Option 02 CRT Rack Mount		Allows rack mount of CRT data terminal	\$ 175.00
Option 03 Spare Parts Kit (7840 C & R)		Spare parts for CPU and Scanner	\$ 450.00
Option 04 Channel Scanner Board		One required for every 10 telemetry channels monitored	\$ 275.00
<b>MODEL 7840-C</b>	CPU	Microprocessor based CPU	\$4,800.00

\*Not Field Installable



MODEL	DESCRIPTION	APPLICATION	PRICE
<b>MODEL 7840-R</b> Scanner		For use at each additional remote site (up to 16)	\$4,200.00

**REMOTE CONTROL INTERFACING ACCESSORIES**

MODEL	DESCRIPTION	APPLICATION	PRICE
<b>FSU-01</b> Fail Safe Unit for TV application		To provide full compliance with FCC Rules by monitoring 4 critical parameters: aural plate voltage, aural plate current, aural power and visual power.	\$ 520.00
<b>ADS-01</b> Alternate Data Path Selector		Switch from SCA to phone line when invalid data is detected from either the Control or the Remote terminal. Both local and remote units are included. Single ADS also available	\$ 965.00 \$ 500.00
<b>CSA-01</b> Chopper Amplifier		To provide isolation from a floating circuit to a grounded circuit. DC gain is also provided.	\$ 175.00
<b>PLC-01</b> Power-to-Linear Converter		To linearize power readings from log scale to linear scale.	\$ 295.00
<b>TLK-01</b> Tower Light Monitor		To monitor AC line current	\$ 95.00
<b>LVK-01</b> Line Voltage Monitor		To monitor AC line voltage	\$ 80.00
<b>TSK-01</b> Temperature Sensing Kit		To monitor temperature of air or components	\$ 145.00
<b>MBB-01</b> Isolation amplifier (High Voltage)		For monitoring voltage and current at 10kv above ground and translate reading in reference to ground voltage to suit the input of the Remote Terminals	\$ 135.00

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Price subject to change without notice.



**TIME AND FREQUENCY TECHNOLOGY, INC.**

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 (408)246-6365 TWX 910-338-0584

# PRICE SCHEDULE

## STL/TSL ANTENNAS, COAXIAL TRANSMISSION LINE AND CONNECTOR KITS

MODEL	PART NUMBER	DESCRIPTION	PRICE
P972GRN-M1	3500-0018	ANIXTER-MARK Grid Parabolic Antenna, six-foot diameter, for 890-960 MHz, type N female connector, 50 ohm (1.3:1 VSWR standard/1.15:1 special order), non-pressurized feed, vertical or horizontal polarization for mounting to 1.9 to 3.5 inch diameter O.D. pipe. (Other mounts on special order.) Gain 22.0 dBi-midband.	\$ 1,060.00
PR-450U	3500-0001	SCALA Paraffector™, Parabolic Antenna, for 350-1000 MHz, type N female connector, 50 ohm, universal mounting for vertical or horizontal polarization. Gain 20.1 dBi at 950 MHz; 18.6 dBi at 450 MHz.	\$ 500.00
SH872GN	3500-0017	ANIXTER-MARK Multi-element Grid Parabolic Section Antenna (72" x 36"), for 675-960 MHz, type N female connector, 50 ohm, vertical or horizontal polarization, for mounting up to 3.5 inch round member. Gain 19.6 dBi at 950 MHz.	\$ 485.00
MF 960	3500-0002	SCALA Miniflector™ Antenna for 940-960 MHz, 16.1 dBi gain, type N female connector, universal mounting for vertical or horizontal polarization, fully anodized. (Not recommended for congested areas.)	\$ 300.00
MG-944GN	3500-0018	ANIXTER-MARK Mini Grid Parabolic Section Antenna (44" x 13.5"), for 890-960 MHz, type N female connector, 50 ohm, vertical or horizontal polarization, for mounting up to 3.5 inch round member. Gain 13.5 dBi at 950 MHz.	\$ 245.00
COX-01	3500-0003	ANDREW Hellax* LDF4-50 Transmission Line 1/2" foam Dielectric, 50 ohm, jacketed.	\$ 1.70 per ft.
CON-01	3500-0004	Connector Kit for LDF4-50 Andrew Hellax* consisting of two (2) Andrew type L44N female connectors. Two (2) PTL-1 or equivalent needed for normal installation.	\$ 42.00
COX-03	3500-0012	CABLEWAVE FLC-12-505 1/2" Low Loss Foam Wellflex Coaxial Cable, foam Dielectric, 50 ohm, jacketed.	\$ 1.50 per ft.
CON-03	3500-0013	Connector Kit for FLC-12-505 Cablewave, consists of two (2) Cablewave Part No. 738801, type N female connectors. Two (2) PTL-1 or equivalent needed for normal installation. One kit required for each length of FLC-12-505.	\$ 40.00
COX-02	3500-0005	ANDREW Hellax* LDF5-50 Transmission Line 7/8" foam Dielectric, 50 ohm, jacketed.	\$ 4.30 per ft.
CON-02	3500-0006	Connector Kit for LDF-50 Andrew Hellax* consisting of two (2) Andrew type female connectors. Two (2) PTL-1 or equivalent needed for normal installation. ONE KIT REQUIRED FOR EACH LENGTH OF LDF5-50.	\$ 99.00
COX-04	3500-0014	CABLEWAVE FLC-78-505 7/8" Low Loss Wellflex Coaxial Cable, foam Dielectric, 50 ohm, jacketed.	\$ 4.70 per ft.
CON-04	3500-0015	Connector Kit for Cablewave FLC-78-505, consists of two (2) Cablewave Part No. 738829, type N female connectors. Two (2) PTL-1 or equivalent needed for normal installation. One kit required for each length of FLC-78-505.	\$ 99.00
PTL-1	4750-0208	3" pigtail assembly of RG-8/U with type N male connector on each end. TWO REQUIRED FOR EACH CON-0X KIT.	\$ 29.00
DIPLEXER	3500-0007	A Diplexer for combining 2 transmitter outputs to one antenna, ferrite-type. Contact factory for details. (DB4391)	\$ 1,109.00
ISOCOUPLER	3500-0008	Permits installation of STL/TSL antennas on AM tower. 950/450/150 MHz band. (Specify frequency.)	\$ 845.00
ANT-TSL-1	3500-0009	SCALA CA5-450 5 element Yagi for 10dB gain (cut to frequency). 406-420/450-470/480-500 MHz.	\$ 160.00
ANT-TSL-2	3500-0010	SCALA CA7-480 7-element Yagi for 10dB gain (broad band). 406-420/450-470/480-500 MHz.	\$ 160.00
ANT-TSL-3	3500-0011	ANIXTER-MARK H450L (left hand polarization) and H450R (right hand polarization) Hellax antenna, circular polarization, operates 450-470 band, 12 dB gain. Recommended for areas where ice, snow and windloading are of concern.	\$ 271.00 Antenna \$ 40.00 Mount

### TERMS OF SALE

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

### WARRANTY

TFT, 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 workmanship. Equipment, accessories, tubes and batteries not manufactured by TFT, Inc. are subject to only such warranties as those listed by the manufacturer.

Instruments found to be defective during the warranty period shall be returned to the factory with transportation charge 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 instrument is found to be defective, the unit will be repaired and returned to the BUYER, with transportation charge prepaid by SELLER.

Transportation charges for instruments found to be defective within the first thirty (30) days of the warranty period will be paid both ways by the SELLER. Transportation charges for warranty returns and repair costs, 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. SELLER SPECIFICALLY EXCLUDES AND DISCLAIMS ANY WARRANTY FOR FITNESS OF PURPOSE AND MERCHANTABILITY. IN NO EVENT SHALL SELLER BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. Price subject to change without notice.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.



**INC** 3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA 95051  
(408) 727-7272 TWX 910-338-0584





# PRICE SCHEDULE

## AURAL STUDIO-TRANSMITTER LINK & ASSOCIATED EQUIPMENT

### DOMESTIC

Effective November 26, 1984

MODEL	PART NUMBER	DESCRIPTION	PRICE
SYSTEM A	Series 7700: 5115-7700A	STL-All solid state composite transmitter and receiver, including self-contained power supplies, crystals, and tested to standard operating frequency. Specify exact operating frequency.	\$ 6,715.00
	Series 8300: 5115-8300A		\$ 8,150.00
SYSTEM B	Series 7700: 5115-7700B	STL-All solid state composite transmitter and receiver with "HOT" standby transmitter and receiver with 7770/7773 automatic switching, including self-contained AC power supplies, crystals, and tested to standard operating frequency. (Only two antennas required.) Specify exact operating frequency.	\$14,895.00
	Series 8300: 5115-8300B		\$17,765.00
SYSTEM C	5115-7700C	STL-All solid state single channel transmitter and receiver including self-contained AC power supplies, crystals, and tested to operating standard frequency. Specify exact operating frequency.	\$ 6,350.00
SYSTEM D	5115-7700D	STL-All solid state channel transmitter and receivers with HOT standby transmitter and receiver with 7770/7773 automatic switching-including self-contained AC power supplies, crystals and tested to standard operating frequency. (Only two antennas required.) Specify exact operating frequency.	\$14,150.00
SYSTEM E	5115-7700E	STL-All solid state dual single channel transmitters (2) and receivers (2) for separate left and right channel, including self-contained AC power supplies, crystals and tested to standard operating frequencies. System E requires three antenna—two transmit, one receiver (power divider included). See below for transmitter combiner for single transmit antenna operation. Specify exact operating frequencies.	\$12,700.00
NOTE: For non-standard frequencies see below.			
MODEL 8100	5115-8100	450 MHz Transmitter - Studio Voice/Data Link. Specify FCC Group P frequency.	\$ 3,995.00
MODEL 8100	7100-3460	Option - 01 Automatic ID.	\$ 295.00
NOTE: For non-standard frequencies see below.			
7700	5116-7700	Transmitter, only	\$ 3,475.00
8300	5116-8300	Transmitter, only	\$ 4,250.00
7707	5116-7707	Composite Receiver, only	\$ 3,275.00
8301	5116-8301	Composite Receiver, only	\$ 4,050.00
7705	5116-7705	Monaural Receiver, only	\$ 2,925.00
7770	5116-7770	Transmitter Automatic Changeover Unit, with coaxial changeover relay, and three-foot interconnecting cables to transmitter.	\$ 815.00
7773	5116-7773	Receiver Automatic Changeover Unit, with RF power divider, and three foot interconnect cables to receivers.	\$ 760.00
Option 15	7100-3710	Stereo demodulator module, for 8301, 7707, 7713, or 7723 receivers.	\$ 400.00
Option 16	7100-3790	Extended Baseband Response, permits Composite STL to convey 92 kHz SCA channel, for 8301, 7707, 7713, or 7723.	\$ 350.00
Option 20	7100-3640	Narrow Band IF (Canada). Total carrier frequency deviation $\pm 25.5$ KHz.	\$ 325.00
Option 21	7100-3650	Narrow Band IF (Canada). Total carrier frequency deviation $\pm 11.5$ kHz.	\$ 325.00
SCA-01	5116-SCA1	Standalone Subcarrier Generator for data transmission (specify frequency).	\$ 725.00
SCA-02	5116-SCA2	Standalone Subcarrier Detector for data transmission (specify frequency).	\$ 725.00
SCA-03	5116-SCA3	Standalone Subcarrier Generator and Detector for data transmission (specify frequency).	\$ 950.00
	7100-3760	Non-standard frequency for 7700 Series (specify exact frequency desired). For transmitter/receiver pair.	\$ 230.00
	7100-3700	Non-standard frequency for 8300 Series (specify exact frequency desired). For transmitter/receiver pair.	\$ 260.00
Option 04	7100-3500	Spare parts kit for 7700 Series, contains field replaceable parts	\$ 305.00
Option 01	7100-3780	Spare parts kit for 8300 Series, contains field replaceable parts	\$ 420.00

For other Options, such as, use of TFT STL equipment with that manufactured by others contact factory direct.

\* Not Field Installable (Additional Retrofit Charge. Contact Factory or Representative.)

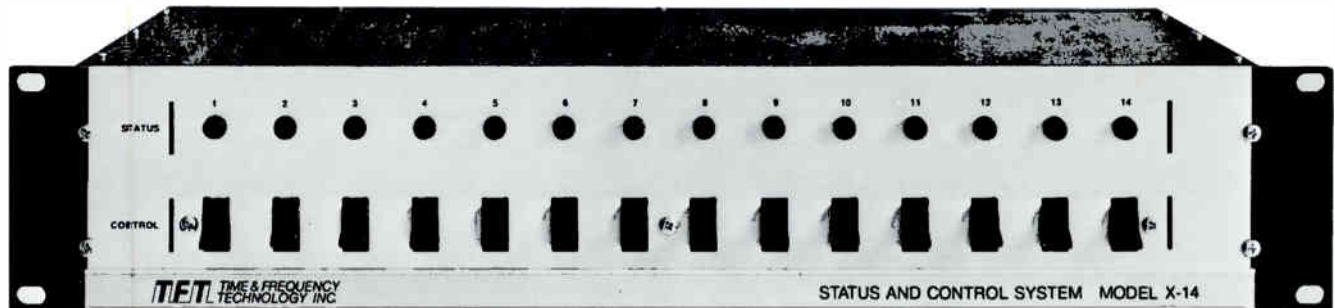
\*\* Add 15% to List Price of Options When Ordered Separately.





# TFT For Remote Control

## Model X-14 Status and Control System



- 14 status channels
- 14 control functions
- Full digital circuitry
- 2 wire or 4 wire operation
- Unique "double-check" circuitry prevents false data
- Optional filter allows use on the same phone line as your Moseley Model TRC-15 AW Remote Control Equipment

### DESCRIPTION

The TFT X-14 is a completely digital Status and Control System for remote monitoring and control applications in AM, FM and TV broadcasting. It consists of two, compact units: one for the control point and one for the remote point. Both have fourteen status channels, each with its own independent LED indicator. Either a switch closure or a logic level will trigger the status monitoring circuitry and cause the appropriate LED to go on. Any combination of ON/OFF can occur.

In addition, both units have fourteen front panel toggle switches for easy control of fourteen different ON/OFF functions. The remote unit also has a switch that converts it to local control for on-site work. Each toggle switch controls an individual, electronically latched relay. Relay contacts are Form A, and are uncommitted (not grounded). They are rated for AC or DC at 50 watts.

The X-14 uses FSK transmission techniques and transmits full duplex (simultaneously in both directions). However, since frequency division multiplex circuitry is built-in, you only need a half-duplex telephone line for actual transmission. Data modems are also built-in, and both control and status information are updated every 600 MS.

Data integrity is maintained by a unique system of "double scan/compare" logic. In operation, each digital

word is sent twice to the remote unit, and both words are compared, bit for bit, in parallel. The output register is then updated *only* if every bit matches. This virtually eliminates the possibility of error in the status or control data.

Both the remote unit and the control unit of the X-14 system are housed in 3½" high rack-mounted enclosures. Barrier strips are provided on the remote unit for status input and control output connections. Additionally, a switch on the remote unit converts it to local control for on-site work.

### APPLICATIONS

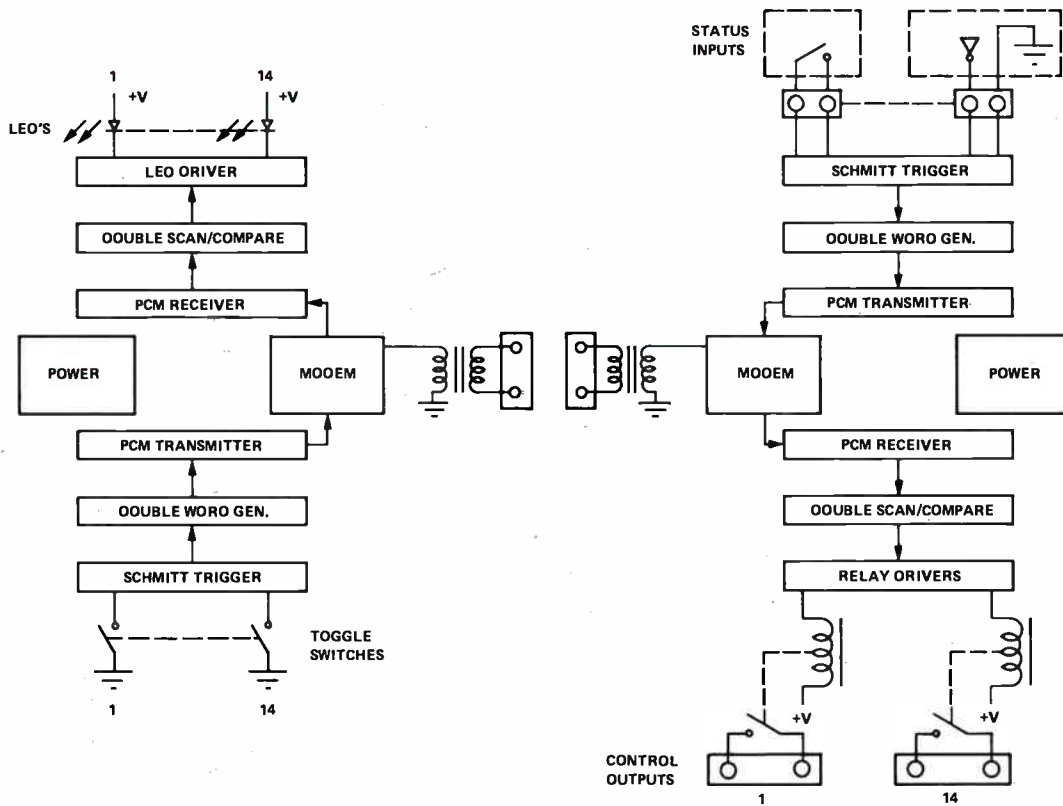
The TFT X-14 can be used wherever you need remote monitoring of operating parameters which have been reduced to go/no go, such as voltages, temperatures, pressures and levels. At the same time, it gives you the ability to directly control up to fourteen, separate ON/OFF functions at the remote point. These include things like filament voltage, plate voltage, main power, overload reset, tower lights and program source selection. Controls can be used either with the monitoring channels or independently.

The X-14 can also be used to economically expand monitoring and control in installations already using Moseley TRC-15 AW remote control equipment. An optional TFT line Multiplex Filter allows you to connect and operate both units on the same telephone line.

The TFT X-14 is just one of the all-digital TFT instruments designed to simplify and improve remote control in broadcast operations. Models are also available with 32 monitoring/control channels and for remote control of ENG antennas. TFT also manufactures a complete line of frequency and modulation monitors for AM, FM, FM Stereo and TV as well as receivers, encoders and decoders for Emergency Broadcast use. For a demonstration, contact your TFT representative or the factory.

## SPECIFICATIONS

Command Channels . . . 14, toggle switch  
Status Channels . . . . . 14, LED indicator  
Relay Outputs . . . . . 50 watt rating, 1A, max. for 28 VDC  
Status Inputs . . . . . Dry contact closure, or TTL logic zero  
Interconnect . . . . . Voice grade channel, 300 to 2600 Hertz, max. attenuation -30 dB.  
2 wire or 4 wire interconnect.  
Interconnect . . . . . 0 dBm, 600 ohm impedance  
Power . . . . . 120 VAC  $\pm$  10%, 50 to 400 Hertz  
Temperature . . . . . 0°C (32°F) to 50°C (122°F)  
Dimensions . . . . . 19" W (48.3 cm) x 3½" H (8.9 cm) x 10½" D (26.7 cm)



REPRESENTED BY

**TFT** TIME AND FREQUENCY TECHNOLOGY, INC.  
3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584



# Broadcast Monitoring Equipment Price List

## TV PRODUCTS

Effective July 15, 1975

* MODEL 701 TV FREQUENCY & AURAL MODULATION MONITOR, Rack Mount	\$4,975	6-8 weeks
Options:		
02-Alarm (frequency and modulation)	150	stock
03-SCA Output	150	stock
04-AGC Meter (visual/aural carrier level)	125	stock
05-Additional 5MHz Master Oscillator Assembly	320	stock
06-Automatic Logging Output (BCD)	125	stock
Model 725B Automatic Logging Adapter (analog output)	650	6-10 weeks
MODEL 702 TV AURAL MODULATION MONITOR, RACK MOUNT	2,380	6-8 weeks
Options:		
02-Alarm (modulation)	90	stock
03-SCA Output	150	stock
04-AGC Meter (visual/aural carrier level)	125	stock
MODEL 704 Remote Meter and Peak Flasher Panel	250	stock
MODEL 735 STANDARD TIME & FREQUENCY RECEIVER, WWV/WWVH	485	4-6 weeks

## AM PRODUCTS

MODEL 713 AM FREQUENCY AND MODULATION MONITOR	2,150	6-8 weeks
Options:		
01-Automatic Logging Output (BCD)	90	stock
02-Automatic Logging Output (analog)	190	stock
03-Telemetry Output (sub-audible)	90	stock
04-Carrier-Level and Carrier-Off Alarm	90	stock
05-Off-Frequency Alarm ( $\pm 20$ Hz standard)	90	stock
06-Off-Frequency Alarm (special; specify with order)	125	stock
07-Absence-of-Modulation Alarm	175	stock
08-10kHz Filter	90	stock
Model 704A Remote Meter and Peak Flasher Panel	250	stock
MODEL 732 AM MODULATION MONITOR	1,390	6-8 weeks
Options:		
03-Telemetry Output (sub-audible)	90	stock
04-Carrier-Level and Carrier-Off Alarm	90	stock
07-Absence-of-Modulation Alarm	175	stock
08-10-kHz Filter	90	stock
09-Carrier Frequency Output	175	stock
Model 704D Remote Meter and Peak Flasher Panel	250	stock
MODEL 751 RF Amplifier	130	6-8 weeks
* MODEL 735 STANDARD TIME & FREQUENCY RECEIVER, WWV/WWVH	485	4-6 weeks

## FM PRODUCTS

* MODEL 723 FM FREQUENCY AND MODULATION MONITOR	2,250	6-8 weeks
Options:		
01-Automatic Logging Output (BCD)	90	stock
02-Automatic Logging Output (analog)	190	stock
05-Off-Frequency Alarm ( $\pm 1$ kHz standard)	90	stock
06-Off-Frequency Alarm (special; specify with order)	125	stock
07-Absence-of-Modulation Alarm	175	stock
* MODEL 734 FM MODULATION MONITOR	1,485	6-8 weeks
Options:		
01-Absence-of-Modulation Alarm	175	stock
02-Carrier Frequency Output	175	stock
MODEL 704B Remote Meter and Peak Flasher Panel	250	stock
* MODEL 724 STEREO MONITOR	1,320	8-10 weeks
Model 704C Remote Meter Panel	350	stock
MODEL 730 SCA MONITOR, 67 kHz	1,350	6-8 weeks
Options: 01-Crystal for SCA #2, 41 kHz	95	stock
* MODEL 735 STANDARD TIME & FREQUENCY RECEIVER, WWV/WWVH	485	4-6 weeks

WITH ORDER, PLEASE SPECIFY OPTIONS, CHANNEL NUMBER AND OFFSET OR FREQUENCY  
All prices are F. O. B., Santa Clara, California and subject to change without notice.

Additional Manuals \$10.00 per copy.



## TIME AND FREQUENCY TECHNOLOGY INC.

3000 OLCOTT STREET SANTA CLARA, CA. 95051 (408) 246-6365



## **TERMS OF SALE**

All shipments are made F.O.B. Santa Clara, California. Terms are net 30 days to customers who have a satisfactory established line of credit with us. Others should arrange with the factory for payment at the time of shipment.

## **WARRANTY**

TIME AND 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 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 instrument 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 thirty (30) days of the warranty period will be paid both ways by the SELLER.

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

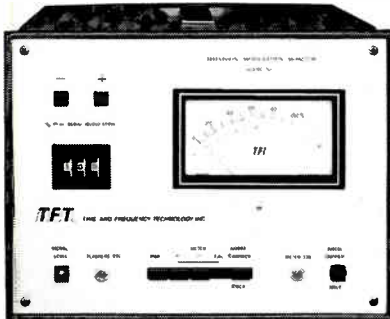
This warranty does not apply to instruments which, in the opinion of the SELLER, have been altered or misused.

No other warranty is expressed or implied. We are not liable for consequential damages.

# TV MONITORS FROM TET



Model 701 FCC Type Approval 3-187



Model 702 FCC Type Approval 3-189



Model 709

## GENERAL

TFT monitors are all-solid-state, and are optimized for off-the-air or direct-connection monitoring. Since an RF amplifier isn't needed for off-the-air use, interference from intermodulation products is virtually eliminated.

### Modulation: Models 701 and 702

Both the Model 701 and the Model 702 have a peak reading modulation meter as well as two digitally settable flashers that display plus and minus peaks simultaneously. Flasher accuracy and resolution are such that modulation can be set at the maximum allowable without fear of exceeding FCC limits. A Remote Meter and Flasher Panel is available as an accessory (Model 704).

### Frequency: Models 709 and 701

These instruments monitor aural, visual and intercarrier frequency. Very high stability is provided by a proportional-

## Frequency and Modulation: Model 701

- Remote monitoring of UHF & VHF channels
- 250 uv sensitivity
- Complete in-house monitoring for maximum convenience
- Eliminates outside service costs and allows self-checking at any time for absolute certainty.

## Aural Modulation

- Digitally settable peak flashers display plus and minus peaks simultaneously
- Built-in high accuracy aural modulation calibrator
- Remote meter and flasher outputs provided
- Optional SCA output
- Provision for checking aural carrier only
- Illuminated meter scale

## Frequency

- Digitally displays frequency errors
- Needs calibration only every 6 months (UHF) or every 18 months (VHF)
- Can be calibrated directly against NBS with WWV receiver
- Digital or analog automatic logging outputs available
- Usable as precise, 6 digit frequency counter to 10 MHz.

## Modulation Only: Model 702

- Combines all modulation features of Model 701 in a single, portable or rack mount instrument

## Frequency Only: Model 709

- Combines all frequency features of Model 701 in a single, rack mount instrument

oven crystal oscillator with an aging rate of  $3 \times 10^{-8}$ /day or 1 ppm/year. An accessory, super stable oscillator with an aging rate of  $1 \times 10^{-9}$ /day is also available. Both the Model 709 and the Model 701 can be calibrated directly against WWV using a TFT Model 735, any WWV receiver or the color subcarrier transmitted by the networks. A rubidium standard can also be used as the time base via rear panel connectors.

Accessories include the Super Stable Time Base (Model 703); an Automatic Logging Adapter (Model 725B); and a WWV Receiver (Model 735).

## FOR MORE INFORMATION

For full data sheets and/or a demonstration, just complete and return the enclosed postage-free card. Or contact us direct. TFT representatives are located throughout the U.S. and Canada.

**TET** TIME AND FREQUENCY TECHNOLOGY, INC.  
3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365



# TFT

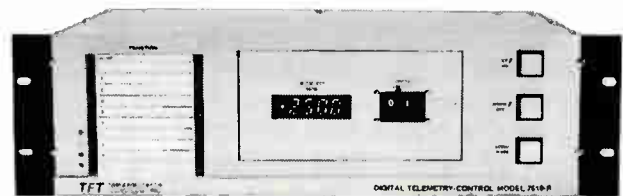
## MODEL 7610 • MODEL 7615 MODEL 7630 • MODEL 7640

MODEL 7610, DIGITAL TELEMETRY / CONTROL SYSTEM

MODEL 7615, STATUS AND DIRECT CONTROL SYSTEM

MODEL 7630, CHANNEL EXPANDER

MODEL 7640, MULTI-CHANNEL DATA DISPLAY,  
LIMIT ALARM AND AUTOMATIC LOGGING



### FEATURES

- Fully digital, pulse code modulated FSK modems
- 10 channels of RAISE/LOWER and TELEMETRY functions, expandable to 50 channels
- Up to 30 channels of direct control ON/OFF functions
- Up to 30 channels STATUS and ALARM
- Linked by telephone wire line, STL and SCA, or sub-audible telemetry
- Multi-channel data display
- Limit alarms and automatic logging
- Quick disconnect of Barrier-strip board for ease of service
- Provision for ATS Operation

### GENERAL

TFT's 7600 series of digital transmitter remote control equipment is designed to meet the needs of both small and large broadcast facilities. It is a modular system starting with a low cost basic 10 channels of TELEMETRY & RAISE/LOWER, and expandable to 50 channels. Expansion includes 30 channels of direct ON/OFF control functions and

30 channels of STATUS/ALARM. Automatic logging is optionally available. Furthermore, tolerance alarm and multi-channel data display can be added on as accessory equipment.

The 7600 series can be interconnected by a telephone line or radio links including STL, SCA and sub-audible telemetry. The system uses Pulse Code Modulation for data transmission including built-in data modems. A TFT proprietary scheme of digital data filtering is incorporated to provide maximum data integrity. This technique employs a method of sending each control command twice and checking for a match of each redundant data before updating the control relays. The TFT Model 7600 series meets both the FCC control and telemetry failsafe requirements.

Another TFT first in providing good human engineering in its design is the "quick disconnect" capability of the remote units. This feature allows the remote units to be removed from the rack without disconnecting any of the wires to or from the transmitting facilities. The rear panel of the remote units can be removed from the chassis by loosening 4 thumbscrews, should servicing of the chassis become necessary.

# TFT

**TIME AND FREQUENCY TECHNOLOGY, INC.**

3000 Olcott Street, Santa Clara, California 95051 (408) 246-6365



## SYSTEM SPECIFICATIONS

Data Transmission . . . . Digital pulse code modulated FSK Modems

System Capacity . . . . Up to 50 channels of momentary RAISE/LOWER and TELEMETRY. Up to 30 channels of on/off direct control and status/alarm

Telemetry Accuracy . . . . 0.1% of reading

Resolution . . . . . one part in 1000.

Telemetry Update . . . . 3 up dates per second. Up date every 3 seconds with sub-audible telemetry.

Telemetry Input

Input Voltage . . . . . 1 V DC with a 200% overrange

Common mode voltage . . . . ±350 V DC

Input impedance . . . . . 50 k ohms

Input isolation . . . . . optically isolated

## Interconnect Requirements

Telephone line . . . . . 2 wire unconditioned, Series 3002 Data Circuit.

Audio channel . . . . . Any voice grade channel having 300 Hz to 3 kHz bandwidth

Radio (STL) . . . . . Plug-in FM subcarrier modulator and demodulator for command link.

Radio (off-air) . . . . . SCA frequencies or sub-audible for the telemetry return.

Control Output . . . . . Relay contact closure, isolated, AC / DC rated, 50-watt non-inductive.

Fail-safe Control . . . . . 30-second delay, normally closed relay contacts.

Fail-safe telemetry . . . . . Output for driving external one-hour timer and TV fail-safe units for full compliance with FCC Rule 73.676

Power . . . . . 120/240 V AC 50-400 Hz

Operating Temperature . . . . 0° to 50° C.

## SIZE AND WEIGHT

Model	19" rack size	Weight in lbs.	Power in watts	No. of Units
7610	3½ H	14	12	2
7615	3½ H	12	10	2
7630	5¼ H	6	from Model 7610	1
7650	7¼ H	20	30	2

REPRESENTED BY:

## SYSTEM

<b>Frequency Ranges</b> .....	140–175 MHz, 200–240 MHz, 300–330 MHz, 440–470 MHz, 806–960 MHz
<b>Baseband Frequency Response</b> .....	Program Audio Composite: 50 Hz–75 kHz (105 kHz optional) Monaural: 50 Hz–15 kHz
	Multiplex Composite: 110 to 220 kHz Monaural: 39 to 67 kHz
<b>Harmonic and Inter-modulation Distortion</b> .....	Composite: 0.2% from 30 Hz to 15 kHz; 0.3% other frequencies Monaural: 0.2% from 30 Hz to 15 kHz
<b>Signal-to-Noise Ratio</b> .....	Greater than 70 dB below 100% modulation ( $\pm 75$ kHz RF Carrier deviation and with 75 $\mu$ s de-emphasized left and right channel.)
<b>Modulation Capability</b> (deviation for 100% modulation) .....	Program Channel: $\pm 75$ kHz Multiplex Channel 1: $\pm 6$ kHz Multiplex Channel 2: $\pm 6$ kHz

## RECEIVER

<b>RF Input Connector</b> .....	50 ohm, Type "N" Female
<b>Sensitivity</b> .....	Composite Models: 40 $\mu$ V for 60 dB SNR, de-emphasized Monaural Models: 20 $\mu$ V for 60 dB SNR, de-emphasized
<b>1 mV RF input without de-emphasis</b> .....	Composite Models: 60 dB Min. (75 kHz B.W.) Monaural Models: 65 dB Min. (15 kHz B.W.)
<b>1 mV input with 75 <math>\mu</math>s de-emphasis</b> .....	Composite Models: 800 $\mu$ V for 70 dB SNR with de-emphasis 800 $\mu$ V for 60 dB SNR without de-emphasis Monaural Models: 400 $\mu$ V for 70 dB SNR with de-emphasis 400 $\mu$ V for 60 dB SNR without de-emphasis
<b>Selectivity</b> (3 dB Bandwidth) .....	Composite Models: 320 kHz Min. Monaural Models: 170 kHz Min.
<b>Selectivity</b> (60 dB Bandwidth) .....	Composite Models: 2.4 MHz Max. Monaural Models: 1.4 MHz Max.
<b>Demodulated Audio Program Output</b> .....	Composite Models: +10 dBm (2.48V RMS) into 600 ohm balanced, +4 dBm (1.24V RMS) into 600 ohm unbalanced, 500 Hz to 105 kHz

<b>Multiplex</b> .....	Composite Models: -3.7 dBm (0.50V RMS), 600 ohms, 110 to 220 kHz unbalanced Monaural Models: -3.7 dBm (0.50V RMS), 600 ohms, 39 to 67 kHz unbalanced
<b>Stereo Separation</b> .....	Composite Models: 48 dB at 1 kHz (50 dB typical), 40 dB minimum at other audio frequencies.
<b>Crosstalk</b> .....	Main to Sub: Composite Models: 46 dB Min Monaural Models: 46 dB Min Sub to Main: Composite Models: 46 dB Min Monaural Models: 46 dB Min
<b>Baseband Response</b> .....	$\pm 0.1$ dB: Composite Models: 50 Hz to 60 kHz $\pm 0.2$ dB: Monaural Models: 30 Hz to 15 kHz $\pm 0.5$ dB: Composite Models: 20 Hz to 75 kHz

<b>Alarm Output</b> (Relay Closure) .....	1 A at 24 VDC, 0.5 A at 115 VAC
<b>Temperature Range</b> .....	0°C to +50°C
<b>Power Requirements</b> .....	120/240V AC, 50–60 Hz, 12 W
<b>Dimensions</b> .....	3.25" (8.3 cm) H $\times$ 19" (48.3 cm) W $\times$ 15.5" (39.4 cm) D
<b>Weight</b> .....	11 lbs (5 kg) net; 15 lbs (6.8 kg) shipping

## TRANSMITTER

<b>RF Power Output</b> (max) .....	10–12 watts 806–960 MHz (15–20 watts, other bands)
<b>Output Connector</b> .....	50 ohm, Type "N" Female
<b>Frequency Stability</b> .....	1 ppm/yr
<b>Frequency Accuracy</b> .....	0°C to +50°C, 0.0001%
<b>Spurious Signal Suppression</b> .....	Harmonically and Non-harmonically Related: 65 dB
<b>Modulation Input Levels</b> .....	Composite: 1.24V rms into 10 K ohms Monaural: 1.24V rms into 10 K ohms or +10 dBm (2.48V rms) into 600 ohms balanced Multiplex: 0.53V rms into 10 K ohms
<b>AC Line Power</b> .....	70 watts, (120/240 VAC, 50, 60 Hz)
<b>Operating Temperature Range</b> .....	0°C to +50°C
<b>Dimensions</b> .....	5.25" (13.3 cm) H $\times$ 19" (48.3 cm) W $\times$ 13" (33 cm) D
<b>Weight</b> .....	29 lbs (13 kg) net, 34 lbs (15.3 kg) shipping

Monaural Models: +10 dBm (2.48V RMS) into 600 ohms balanced, +4 dBm (1.24V RMS) into 600 ohms unbalanced, 50 Hz to 15 kHz.

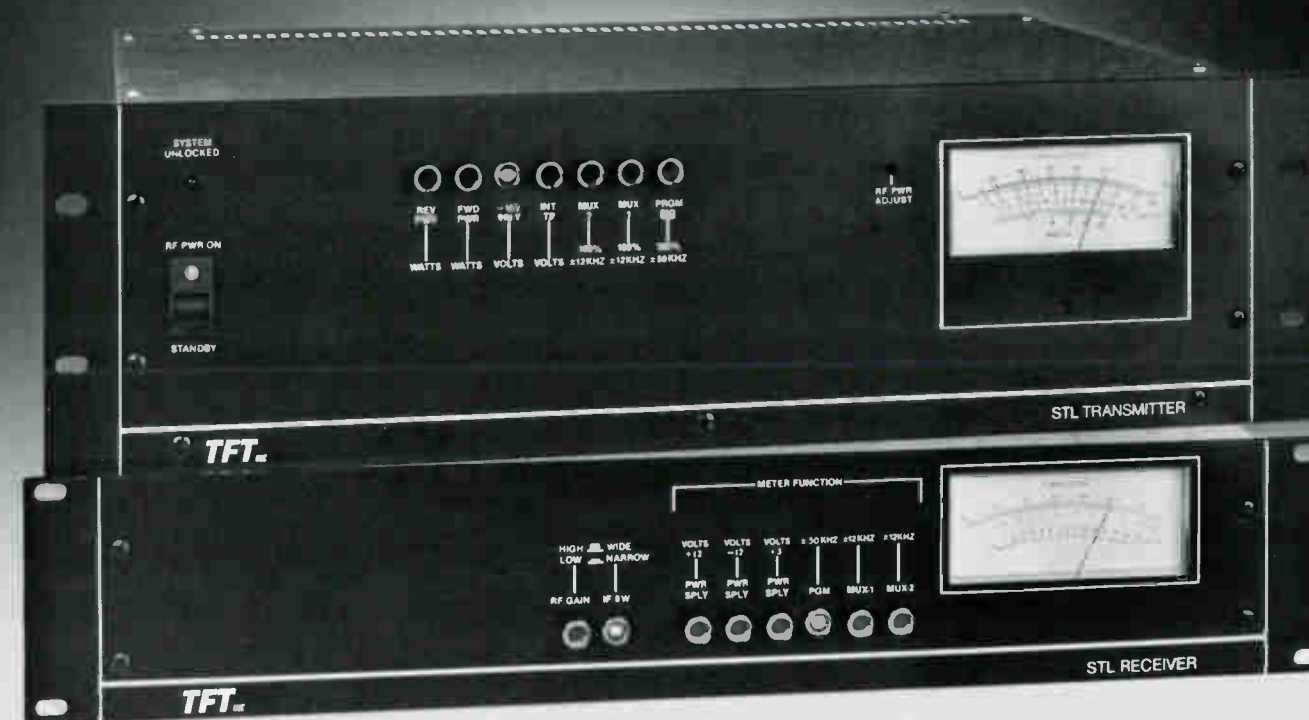
Composite Models: -3.7 dBm (0.50V RMS), 600 ohms, 110 to 220 kHz unbalanced  
Monaural Models: -3.7 dBm (0.50V RMS), 600 ohms, 39 to 67 kHz unbalanced

Composite Models: 48 dB at 1 kHz (50 dB typical), 40 dB minimum at other audio frequencies.

Main to Sub:  
Composite Models: 46 dB Min  
Monaural Models: 46 dB Min  
Sub to Main:  
Composite Models: 46 dB Min  
Monaural Models: 46 dB Min

$\pm 0.1$  dB:  
Composite Models: 50 Hz to 60 kHz  
 $\pm 0.2$  dB:  
Monaural Models: 30 Hz to 15 kHz  
 $\pm 0.5$  dB:  
Composite Models: 20 Hz to 75 kHz

1 A at 24 VDC, 0.5 A at 115 VAC  
0°C to +50°C  
120/240V AC, 50–60 Hz, 12 W  
3.25" (8.3 cm) H  $\times$  19" (48.3 cm) W  $\times$  15.5" (39.4 cm) D  
11 lbs (5 kg) net; 15 lbs (6.8 kg) shipping



## Aural STL System

## THE STL PERFORMANCE LEADER

TFT, Inc. is an industry leader in broadcast quality Studio-Transmitter Links (STL) and Intercity Relays for Stereo, Monaural, and Multi-channel program audio applications. Several U.S. Letters Patent pertaining to the design of RF equipment and STL transmitters have been granted to TFT.

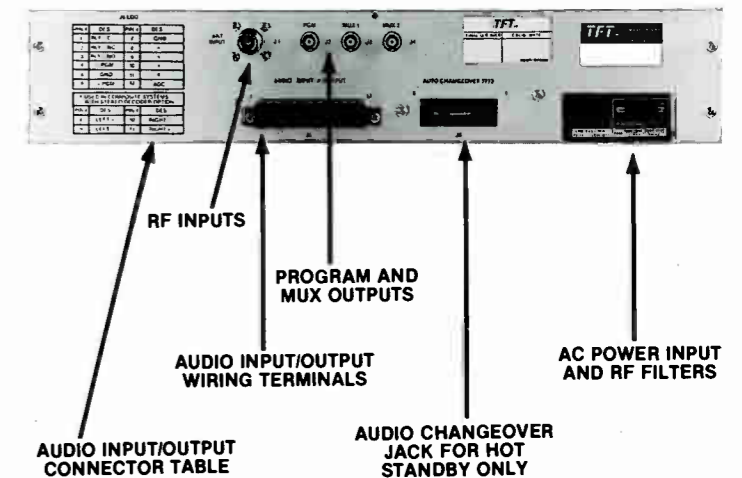
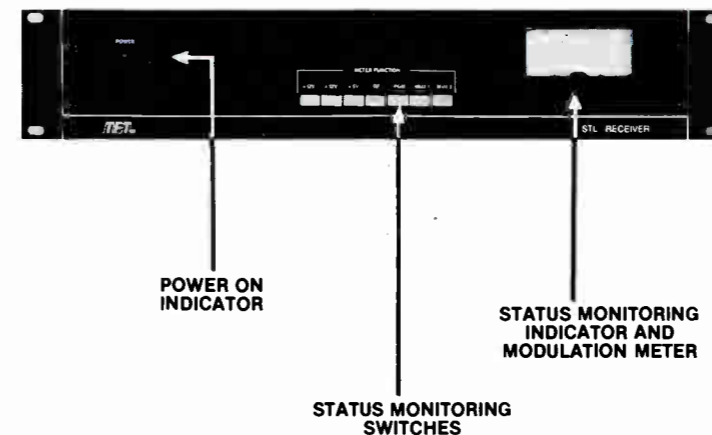
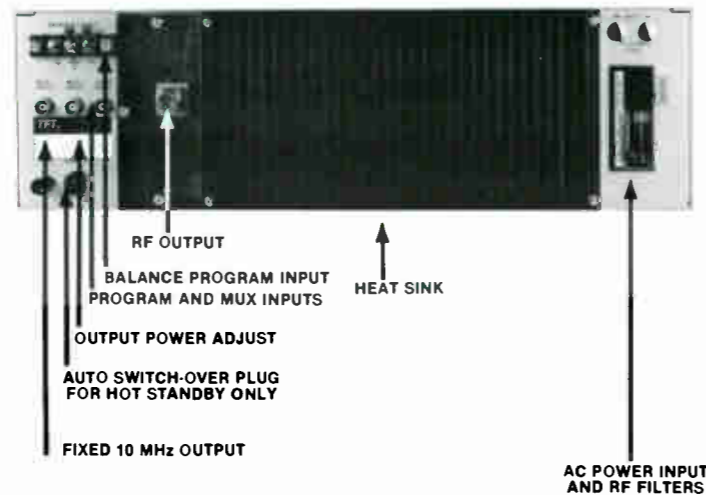
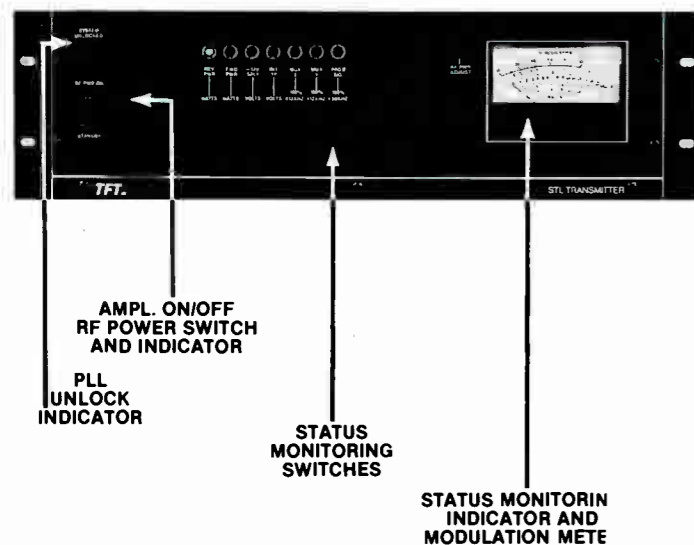
Since the introduction of the 7700B Series, thousands of units have been installed and are operational in the United States and worldwide. This equipment is also frequently used for direct-to-line multiplexing of broadcast programs, voice and data transmission where low intermodulation and excellent group delay characteristics are required.

## FEATURES

TFT STL's are designed for transmission of high quality broadcast programs using state-of-the-art RF and digital technology. Some of the innovations in the 7700B Series STL include:

**IF Modulated Transmitter**—Increases signal-to-noise ratio and stereo performance by providing low distortion and high stereo separation.

- Hot Standby**—A fully redundant receiver and transmitter are available, both with automatic transfer and alarm, which provide maximum system reliability in transmission of broadcast programs.
- Modular Construction**—Modular construction in the transmitter and receiver contribute to low maintenance cost and ease of field servicing.
- Ease of Maintenance**—Calibration of both the transmitter and receiver are easily accessible.
- Front Panel Metering**—Forward and reverse power, audio levels, modulation, subcarrier injection and RF input level in microvolts, and other important circuit parameters may all be monitored directly from the front panel.
- RFI Protected**—The 7700B Series was designed and field-tested in the most adverse RF environments at many high power broadcast transmitter sites for RFI protection verification.
- Wide Selection of Frequency Ranges**—Provides STL capability for most worldwide applications.



## THE TRANSMITTER

The rugged TFT 7700B Series transmitter represents an innovative approach to STL transmitter design, providing a vast improvement in S/N ratio, frequency stability, and audio performance.

## FEATURES

- **IF Modulation**—The transmitter's modulation is applied to an IF frequency to achieve excellent signal-to-noise ratio and stereo performance. The final carrier frequency is obtained by heterodyning the carrier frequency against a stable frequency source and the carrier is then phase-locked to the IF.
- **Fully protected**—The output is fully protected against open and short circuits as well as high VSWR.
- **Excellent Frequency Stability**—Frequency synthesized carrier provides frequency stability of  $\pm 1$  ppm/year as well as making it easier to change operating frequencies in the field.
- **Accommodates Multiple Subcarriers**—Two FM subcarriers can be inserted in addition to the main and stereo channels for SCA broadcast. One more can be added for remote control or order wire for non-broadcast use.
- **No Subcarrier Beats**—19 kHz harmonically related frequencies are chosen for use as subcarriers to eliminate intermodulation products in the baseband.

## APPLICATIONS

The broadband characteristics of the TFT 7700B Series STL Systems allow for many specialized applications beyond the standard aural studio-transmitter link for a composite stereo baseband signal. Among these are:

- **Intercity Relay Systems**—By linking a number of STL transmitters and receivers in series, broadcast quality audio links between cities may be achieved, providing high quality stereo or multi-channel audio service to each city.
- **Remote Control**—With the addition of an FM subcarrier, the 7700B series STL can carry remote control signals from the studio to the transmitter site.
- **Multi-channel Audio**—Up to 4 channels of high quality radio programs or a mixture of audio and data can be transmitted via the 7700B Series STL by using FM Subcarriers and/or direct-to-line multiplex baseband equipment.
- **Stereo Decoder and AM Stereo**—An optional built-in stereo decoder can be installed in the 7700B Receiver to provide L and R channel outputs for monitoring purposes or AM stereo program transmission when the transmitter is used in conjunction with a standard FM stereo generator.

## FACTORY ASSISTANCE

Application Engineering and STL Application Guides for equipment selection and path calculations are available upon request.

## THE RECEIVER

The design of the TFT 7700B Series receiver incorporates several unique features that provide low noise, high gain and great versatility. All receivers allow for automatic changeover to hot standby in the event of a detected malfunction.

## FEATURES

- **Crystal Controlled Triple Conversion Superheterodyne Design**—Provides excellent SNR and frequency stability.
- **Low Noise RF Amplifier**—A high gain and wide dynamic range RF front end provides a 2.0 dB noise figure.
- **Pulse-counting Discriminator**—A unique pulse-counting discriminator circuit provides ultra-linear FM demodulation to achieve low harmonic and intermodulation distortion.
- **Remote Operation and Status Check**—The receiver can be interrogated by existing remote control equipment to determine receiver change-over status. Receiver switching can also be activated by remote command when it is used in conjunction with the Model 7773, Receiver change-over unit.

## ACCESSORIES AND OPTIONS

**Model 7770 Transmitter Automatic Changeover:** A 1 $\frac{3}{4}$ " rack mount unit which monitors critical parameters in the transmitters. If a malfunction occurs in the main transmitter, it automatically switches to the hot standby transmitter. Changeover can also be accomplished by a front panel switch or a pair of relay contact closures in the remote control equipment. The unit is self-powered and has a built-in coaxial relay rated at 1 KW.

**Model 7773 Receiver Automatic Changeover:** Similar to the Model 7770, Model 7773 monitors critical parameters in the receivers. The unit switches the program channel output as well as both subcarrier outputs.

**Stereo Decoder (Option 15):** Plug-in FM stereo board for decoding left and right channels. (For external audio monitoring or providing L and R channels for AM stereo broadcast.)

**Frequency Division Multiplex (FDM) Baseband Encoder and Decoder:** Multiple broadcast programs can be transmitted with full audio bandwidth by using optional FDM encoders and decoders. Please consult the factory.

**CALL FOR SERVICE**

**ELECTRONIC INDUSTRIES, INC.**

TOLL FREE:

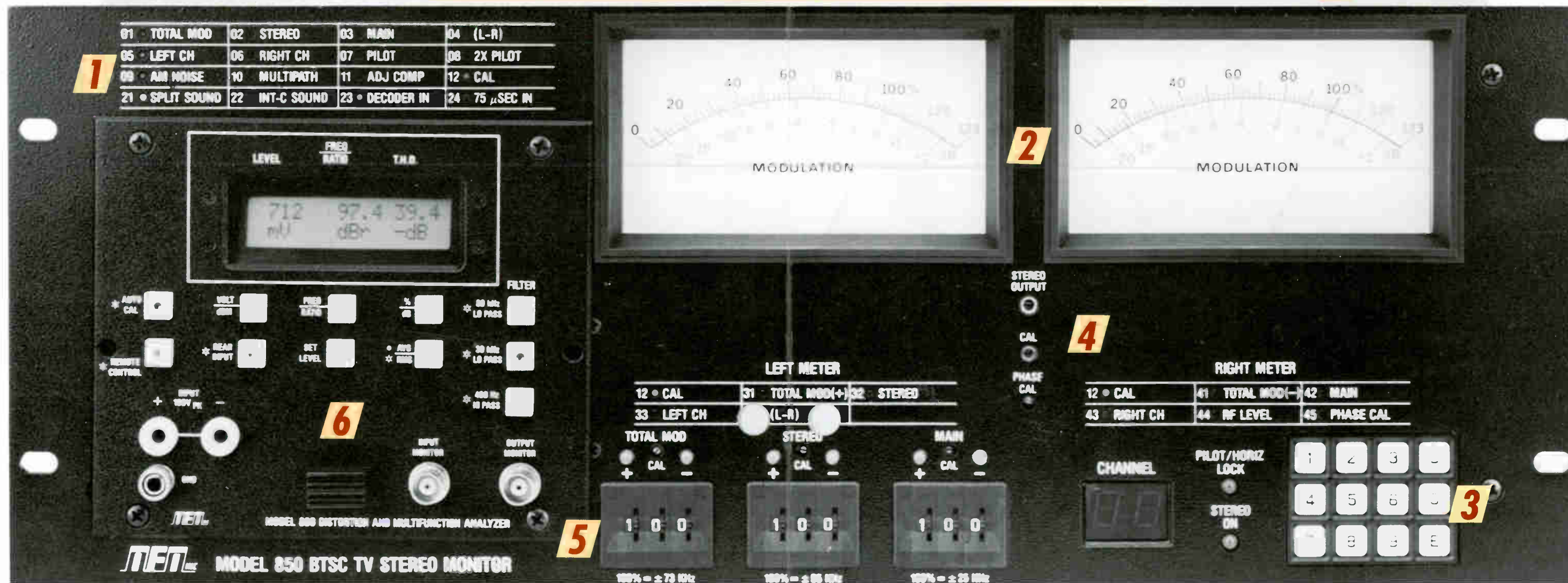
IN STATE 1-800-445-0222

OUT OF STATE 1-800-558-0222

**TFT** INC

3090 Oakmead Village Drive P.O. Box 58088 Santa Clara, CA 95052-8088  
 TEL (408) 727-7272 FAX (408) 727-5942 TWX 910-338-0584



COMPREHENSIVE  
MEASUREMENTCOMPLETE BTSC  
MONITORING

**1** LED display matrix indicates the operating status of the 850 in one of the monitoring or measurement modes. Complete Aural Proof-Of-Performance measurements and all BTSC modes are easily and quickly accessed by two-digit keyboard entries (see #3).

● **Genuine dbx\* Decoder and 75 usec Modes.** Facilitates set-up and measurements with and without BTSC companding.

● **Split-Sound and Intercarrier Modes.** Permits measurement of intercarrier noise due to ICPM; monitor visual transmission influences on aural transmission.

\*dbx is a registered trademark of dbx, Inc.

**2** Stereo modulation and reference levels are precisely displayed with large, lighted, user-friendly analog meters. Meter functions are selected by keyboard and displayed on LED matrix.

**3** Microprocessor-controlled Switching with Keyboard Command Entry. Electronic routing of internal signal paths to meters or 860 Analyzer. Also controls Monitor Mode Switching (Split-Sound, Intercarrier, Decoder in, 75 usec, and Calibrate).

**4** Built-in Frequency Synthesized Type Modulation Calibrator for front panel calibration of Modulation Meters and Peak Flashers; a two-digit

keyboard entry. Better than 0.5% accuracy without performing Bessel Null Calibration.

● **Stereo "On" Indicator, Pilot to Synthesized Lock Indicator, Loop-through, and stereo ear phone jack** are provided for convenience.

**5** Individual thumbwheel switches set Main channel, Stereo channel, and total modulation level for Peak Flasher indications. False triggering is eliminated with an exclusive, patent-pending circuit (PMDD—Peak Modulation Duration Differentiator).

**6** Model 860 Plug-in Digital Distortion Analyzer/AC Level Meter/Ratio Meter. An LCD display indicates Input Level, Frequency Voltage, Ratio and

Total Harmonic Distortion (THD).

● **Accurate measurements to 0.1 dB (+ 500 kHz deviation) for Frequency Response (Total, Stereo, Main, Left or Right Channels), Signal-to-Noise Ratio, THD, Pilot Injection, Subcarrier Suppression, Crosstalk, AM Noise, and Multipath.** Front panel connectors permit the 860 to be used separately as a stand-alone general purpose test instrument.

● **Front panel access to demodulated signals** for scope display via BNC connector. 860 can also be used as a conventional test instrument.

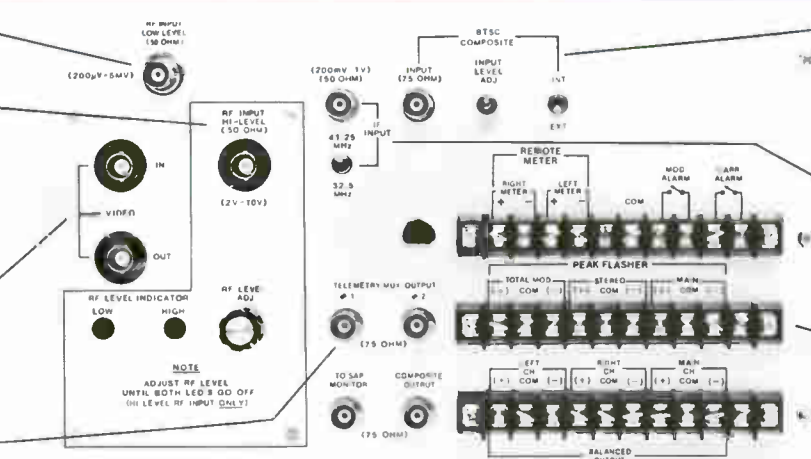
**7** Extensive RF shielding.

● **Low level RF input** for off-air monitoring via an antenna.

● **High level RF input** for on-site transmitter monitoring and proof of performance measurements. RF Level Indicator and Attenuator to show proper RF level for AM noise measurements.

● **Video Loop Thru** for phase lock indication of Video Sync and Pilot Carrier.

● **BNC connectors** for optional subcarrier (MUX) outputs. Typical applications are remote control and supervisory channel.



The 850's rear panel has a full-complement of inputs and outputs for any conceivable combination of signal routing.

● **Composite Input**—accepts the BTSC composite stereo signal from a BTSC stereo generator or from the output of the TFT 8501 Composite Subcarrier Demodulator.

● **IF input** to monitor the IF stage of Aural Transmitters using an IF modulation scheme.

● **Terminal strips** for Balanced Audio Outputs (Left, Right, Remote and Main Channel), Remote Meter and Peak Flasher Connections, optional Loss of Modulation Alarm and Loss of Carrier Alarm.

## ACCESSORIES and OPTIONS

□ **Model 860 Plug-in Digital Distortion Analyzer/AC Level Meter/Ratio Meter** for models 850/851 or 852. Separate detailed technical data is available.

□ **Remote Metering and Peak Flasher Panel.** TFT part number: 7100-4020. This meter panel duplicates the front panel meters of the 850/851 as well as the peak flashers for remote monitoring. A 50-foot cable is provided.

□ **Alarm and MUX board.** TFT part number: 7100-4110. This plug-in card consists of circuitry to

detect the loss of carrier and modulation and also provides relay contact closures for activating an external alarm. Additionally, one or two band-pass filters can be provided for multiplex subcarriers (39 kHz or 102.3 kHz). These subcarriers are then available at the rear panel outputs of the 850/851.

□ **A comprehensive, 40 page TV Aural Proof-Of-Performance Guide** is available exclusively from TFT. This Guide is included with the 850 Series Operations Manual or available separately.

## 851

The Model 851 is for installations which have a precision TV demodulator. The 851 is available as a lower cost version which omits the RF/IF circuitry. Connection to an external demodulator is made through the 851's Composite input.

## 852

The Model 852 is specifically designed for use at CATV headends. It has a built-in, frequency-agile frontend and is keyboard tunable across all IS-6 Cable Television Channels. It will also accept an IF of 4.5 MHz or 41.25 MHz from a headend demodulator. Special applications information is available by contacting TFT.

## 855

Separate SAP/Pro Channel monitor deriving its signal from the 850/851. Contact TFT for a separate brochure.





# FULL COMPLIANCE WITH BTSC RECOMMENDED PRACTICES.

The Model 850 BTSC TV Stereo Aural Modulation Monitor is specifically designed to monitor and measure the performance characteristics of the BTSC stereo composite signal as defined by the EIA/BTSC System Multichannel Television Sound (MTS) Recommended Practices.

The 850's Monitoring capabilities include: Total Modulation, Stereo Channel modulation, Left and Right channel modulation and Peak modulation of the Total, Stereo, and Main Channels. Relative RF level can also be monitored as an aid to antenna orientation.

More than 20 different parameters may be analyzed with the companion Model 860 plug-in Distortion Analyzer/AC Voltmeter (as shown).

Modulation Levels are easily read on two analog meters with quasi-peak ballistics. Additionally, user-settable Peak Flashers are included. A remote Meter & Peak Flasher Panel is available separately.

The single-chassis 850 offers these important benefits for the TV engineer:

- Perform a complete "Proof" of the entire Main and Stereo Channel from the studio through the over-air

antenna- including the critical transmitter IF stages (see diagram);

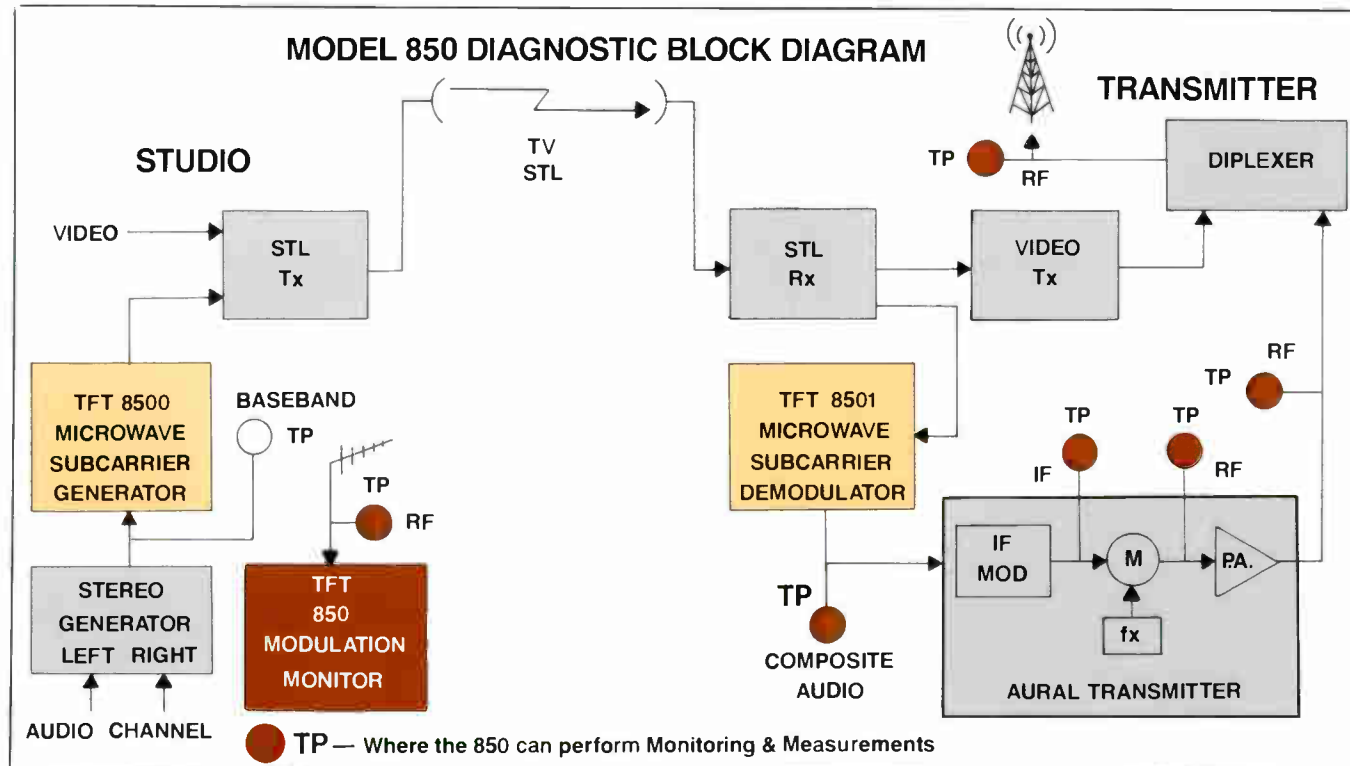
- Because the 850 isn't dependent on other video instrumentation for its full BTSC monitoring and measurement capabilities, there's no requirement to "share" other important video test equipment.

- The operator-friendly meters and peak flashers may be easily remotet (an inexpensive, useful option; see Accessories & Options).

- The 850, when equipped with the 860 plug-in Analyzer, is less than half the cost of a competitive system which cannot perform the 850's full-range of critical functions.

TFT, Inc. has been designing and manufacturing Aural Modulation monitors for more than 16 years and has sold over 10,000. The popular 701/702 Monitors are de facto standards for most TV broadcasters because of their accuracy, versatility and reliability. The new Model 850 BTSC Stereo Monitor joins these field-proven instruments.

TFT's participation on the BTSC Systems Committee ensures that all factors crucial to monitoring the BTSC aural signal have been embodied in the design of the Model 850.



The 850 is a precision instrument specifically designed to measure more than 20 different parameters in the TV broadcaster's entire BTSC signal transmission chain.

# 850 SPECIFICATIONS

## RF Input (except Model 851)

Frequency Range ..... Preset Channel 2 through 83 (NTSC Standard); visual and aural carrier or aural carrier only

Input Signal Level  
Low Level ..... Approx. 200  $\mu$ V to 5 mV  
High Level ..... Approx. 2 V to 10 V

Image Rejection ..... -60 dB (low level input via channel filter)  
Input Impedance ..... 50 ohms  
Input Connector ..... BNC

## Composite Input

Minimum 1 Vrms  $\pm$  73 kHz deviation, 75 ohms

## IF Input (except Model 851)

200 mV-1 Vrms, 41.25 and 32.5 MHz, switch-selectable, 50 ohms

Video Loop-Thru ..... 1 V p-p, unbalanced bridging input/output

## Outputs

LEFT, RIGHT, MAIN CHANNEL ..... Balanced audio outputs, 1.5 Vrms each, 600 ohms

COMPOSITE OUTPUT ..... 1.5 Vrms, 75 ohms  
TELEMETRY MUX 1 & 2 ..... Bandpass filtered, undemodulated composite outputs, 25 Vrms each, 75 ohms (requires optional Alarm and MUX board)

TO SAP MONITOR ..... Composite signal feed to TFT SAP/Pro Monitor 1.5 Vrms, 75 ohms  
RS-232 ..... Type DB-25 connector for external computer control

REMOTE METER/PEAK FLASHER ..... Barrier strip terminals for option, TFT P/N 7100-4020

MODULATION and CARRIER ALARM ..... Relay contact closures for external alarm; (requires optional Alarm and MUX board)

FUNCTION OUTPUT/LEVEL TO BUILT-IN ANALYZER ..... 730 mV  $\pm$  73 kHz deviation

TO BARGRAPH DISPLAY ..... Connects to external bargraph display unit

## Peak Flashers

Six peak flasher lights indicate plus and minus peaks simultaneously for Total, Stereo, and Main Channel modulation. Peak levels are digitally set by thumbwheel switches, in 1% increments from 0% to 199% peaks. LEDs remain lit for approximately 2 seconds after triggering by peaks.

## Modulation Calibrator

Built-in frequency synthesized calibrator for meter and peak flasher calibration (100% modulation) from the front panel. Accuracy  $\pm$  0.5%.

SPECIFICATIONS SUBJECT TO CHANGE.

## Left Meter Functions

CAL ..... 100% =  $\pm$  73 kHz deviation  
TOTAL MODULATION (+) ..... 100% = + 73 kHz deviation  
STEREO ..... 100% =  $\pm$  55 kHz deviation  
LEFT CH ..... 100% = full left channel modulation ( $\pm$  12.5 kHz deviation)  
(L-R) ..... 100% =  $\pm$  50 kHz deviation

## Right Meter Functions

CAL ..... 100% =  $\pm$  73 kHz deviation  
TOTAL MODULATION (-) ..... 100% = - 73 kHz deviation  
MAIN (L + R) ..... 100% =  $\pm$  25 kHz deviation  
RIGHT CHANNEL ..... 100% = full right channel modulation ( $\pm$  12.5 kHz deviation)  
RF LEVEL ..... Greater than 20% reading indicates adequate RF level for full IF limiting  
PHASE CAL ..... Minimum reading indicates best calibration of internal PLL circuitry

## Measurement Capabilities

(With Distortion Analyzer/AC Level Meter, TFT Model 860, or equivalent)

Total Modulation .....  $\pm$  0.1 dB, 50 Hz to 50 kHz  
 $\pm$  0.5 dB, 30 Hz to 120 kHz

Stereo Channel .....  $\pm$  0.1 dB, 50 Hz to 47 kHz  
Main Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz

L-R Channel .....  $\pm$  0.1 dB, 16 kHz to 47 kHz  
Left Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz

Right Channel .....  $\pm$  0.1 dB, 50 Hz to 15 kHz  
Signal/Noise Ratio ..... 50 dB Wideband, 70 dB de-emphasized, ref 5 mV input RF

Stereo Separation (without companding) ..... 48 dB (below 8 kHz), 45 dB (8 kHz or higher)

Pilot Injection level ..... -23.3 dB ( $\pm$  0.2 dB) from 100% Total Modulation

Stereo Subcarrier Suppression, 31.468 kHz ..... -55 dB ref 100% Total Modulation

Inter-Carrier Noise ..... -65 dB ref 100% Total Modulation

Pilot Interference Ratio ..... -40 dB ref normal pilot level

AM Noise ..... Measures AM modulation on the aural carrier, read out in mV

Multipath ..... To minimize multipath distortion when using Low Level RF input

## Mechanical and Environmental

Input Power ..... 117/230 VAC  $\pm$  10%, 50/60 Hz, 70 Watts Max

Operating Temperature ..... 0 $^{\circ}$  C to 50 $^{\circ}$  C (32 $^{\circ}$  F to 122 $^{\circ}$  F)

Size ..... 19" (48.26 cm) Wide by 7" (17.78 cm) High by 15- $\frac{1}{2}$ " (39.7 cm) Deep

Net Weight ..... 23 lbs. (10.4kg) Add 5 lbs. (2.3kg) for Analyzer

Shipping Weight ..... 38 lbs. (17.2kg) Add 5 lbs. (2.3kg) for Analyzer

# TFT INC

3090 Oakmead Village Drive  
Santa Clara, California 95051  
Tel: (408) 727-7272 Telex: 910-338-0584  
Fax: (408) 727-5942

# 850 BTSC TV Stereo Aural Modulation Monitor



**BTSC STEREO: A TV Aural Proof of Performance Guide**

TFT INC



## UHF RPU System

### FEATURES

- Frequency Agile Transmitter and Receiver
- Selectable FM Deviation
- Selectable Receiver Bandwidth
- 25 watts RF Power; 2 other ranges from 0 to 18 watts
- DTMF Signaling for System Security and Cueing Command
- Front Panel Diagnostics Metering
- Transmitter Portable or Rack Mount

### GENERAL DESCRIPTION

The TFT Model 8888 RPU Transmitter and 8889 RPU Receiver bring new levels of performance and convenience to Remote Pickup equipment for remote broadcast. Frequency agility, selectable FM deviation, selectable receiver bandwidth for applications in the N1, N2 and S frequency bands, and DTMF control are among the advances that TFT has brought to RPU for high quality audio performance and convenience.

### MODEL 8888 RPU TRANSMITTER

The TFT 8888 frequency-agile RPU Transmitter is a compact portable or rack mountable unit (with optional adapter). It incorporates designs that enable flexible applications and high quality audio performance. U.S. Patent No. 4,710,970 has been granted to the transmitter design.



## FREQUENCY AGILE

The TFT RPU Transmitter is frequency-synthesized for maximum versatility. Two operating frequencies are programmed by means of internal DIP switches. (See specifications for details.) The frequencies must be within 6 MHz of each other and each is programmable within a 1 MHz bandwidth in steps of 2.5 kHz. A front panel switch permits convenient selection of two user-programmed channels.

## SELECTABLE FM DEVIATION

Hand-in-hand with frequency agility is selectable carrier frequency deviation to conform with occupied bandwidth limits in the FCC designated N1, N2 and S frequency bands. Maximum FM deviations of the 8888 in these bands are  $\pm 5$  kHz,  $\pm 10$  kHz, and  $\pm 25$  kHz, respectively.

## HIGH POWER

To ensure adequate fade margin and maximum distance, nominal RF power is 25 watts (+ 44 dBm) with medium and low power ranges of 6-18 watts and 8 watts maximum respectively.

## THREE AUDIO INPUTS

Three microphone/line level selectable inputs minimize the need for an external mixer. Built-in peak limiting circuit prevents overmodulation without introducing harmonic distortion. A headphone output with volume control is provided for local monitoring of the mixed audio signal.



## EXTERNAL PROCESSOR PATCHING

Audio companding or sophisticated signal processing can be used with the 8888 RPU system. The Transmitter incorporates patching facilities on the rear panel to route the mixed audio signal through an external processor.

## COMPREHENSIVE FRONT PANEL DIAGNOSTICS

A multi-position switch and test meter allow monitoring of critical circuit parameters. An audio bargraph display is provided to continuously monitor the modulation level.

## FAULT INDICATORS

An Antenna Fault indicator and warning buzzer on the transmitter alert the operator of potential antenna or interconnect problems. A wrong polarity indicator and warning buzzer alert the operator of incorrect battery polarity.

## BUILT-IN TEST TONE

A built-in 400 Hz test oscillator can be activated by a front panel switch for aligning the path as well as for calibrating the modulation meter for 100% modulation.

## ACCESSORIES



An Optional Rack Mount (Part No. 2001-2937) allows you to install two transmitters side-by-side for stereo or redundant mono applications. The mount occupies three standard EIA rack units.

## MODEL 8889 RPU RECEIVER

The TFT Model 8889 is a microprocessor-controlled, frequency synthesized triple conversion receiver. As a companion to the Model 8888 RPU Transmitter, it is suited for use at repeater sites as well as at the studio.

## MICROPROCESSOR CONTROL AFFORDS FULL SECURITY

An on-board microprocessor is the nerve center of the receiver. After receiving the DTMF user input (security code and commands) via the RF or telco path, or via the front panel control, it switches the operating channels and IF bandwidth. Unauthorized interruptions of the system are thereby negated.

## SELECTABLE BANDWIDTH

The TFT 8889 features 3 front panel or DTMF controlled selectable IF bandwidths for 25 kHz, 50 kHz, or 100 kHz spacing, allowing for maximum flexibility of audio quality and availability of RF spectrum.

## REPEATER TRANSMITTER ENABLE

A rear panel contact closure is provided to activate a repeater transmitter upon the recognition of a security code via the DTMF signaling and when the received RF signal is above the selected squelch threshold.

## RECEIVED SIGNAL STRENGTH INDICATION (RSSI)

A calibrated DC voltage at the rear panel is available for RSSI for use in conjunction with remote control equipment.

## BUILT-IN DTMF SYSTEM

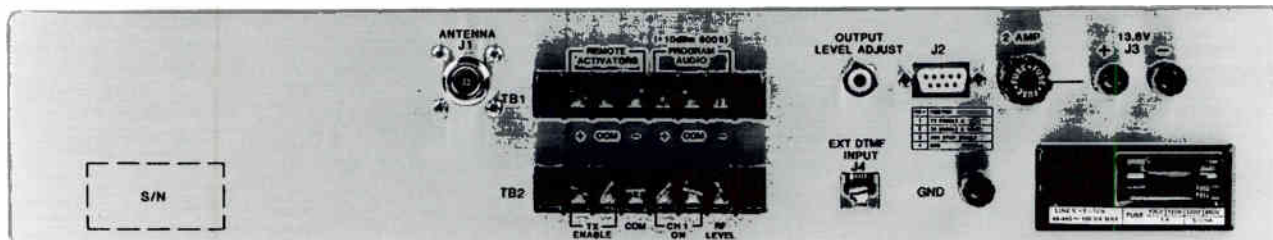
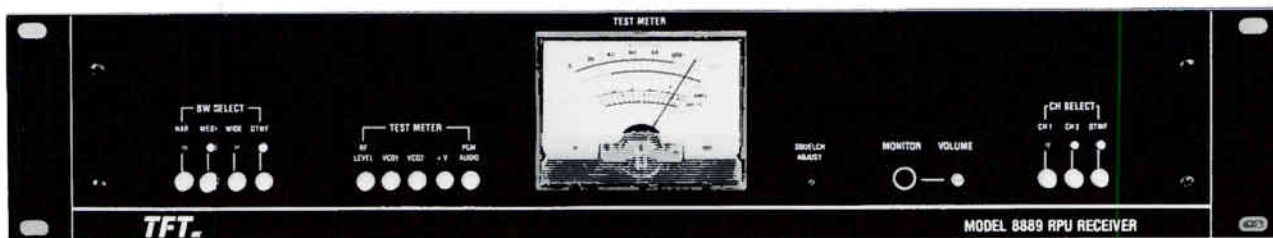
User convenience is greatly enhanced by being able to control the receiver from a remote location via DTMF signals.

Using a standard touch-tone telephone plugged into the modular phone jack on the front panel of the RPU Transmitter, the Receiver's channel and IF bandwidth can be remotely selected by entering a unique 6-digit code. Furthermore, the DTMF codes can activate a repeater transmitter. Multiple repeaters can be individually addressed.

The DTMF tone protocol is 8 digits long. In addition to start and stop, 4 digits are a user-definable security code; the remaining 2 digits are the pre-defined execution codes.

## ALTERNATE CONTROL INPUT

In case DTMF tones are unavailable from the RF path, an alternate DTMF input is provided via a rear panel phone jack. This input takes priority over the RF path.





# SPECIFICATIONS

## TRANSMITTER

<p><b>Frequency Range</b> ..... 400–470 MHz. Two MHz frequencies within 6 MHz of each other.</p> <p><b>RF Channels</b> ..... Two pre-programmed carrier frequencies are front panel selectable. The frequencies can be located up to 6 MHz apart and each carrier is programmable within its 1 MHz bandwidth in 2.5 kHz steps by internal DIP switches.</p> <p><b>Power Output</b> ..... High level 25 watts nominal; mid-range 6–18 watts; low range 0–8 watts; normal reduction with 13.8V external battery. (50 ohms, type N female connector)</p> <p><b>Maximum Frequency Deviation</b> ..... <math>\pm 5</math> kHz, <math>\pm 10</math> kHz, and <math>\pm 25</math> kHz</p> <p><b>Signal-to-Noise Ratio</b> ..... 65 dB with microphone input at <math>\pm 25</math> kHz deviation 70 dB or better with line input at <math>\pm 25</math> kHz deviation</p> <p><b>Frequency Stability</b> ..... 0.00025% (0° to 50°C)</p> <p><b>VSWR</b> ..... Withstands infinite VSWR</p> <p><b>Spurious Output</b> ..... 60 dB below carrier</p> <p><b>Harmonic &amp; Intermodulation</b> ..... 60 dB below RF carrier</p>	<p><b>Audio Inputs</b> ..... Three microphone inputs at – 70 dBm to – 40 dBm, 150–500 ohms balanced, XLR-3 connector and transformer coupled input, level control provided. Switchable to high level line inputs. – 20 dBm to + 10 dBm, 600 ohms balanced.</p> <p><b>Audio Frequency Response</b> (1 dB rolloff) ..... 50 Hz to 16 kHz, for <math>\pm 25</math> kHz deviation. 50 Hz to 10 kHz, for <math>\pm 10</math> kHz deviation. 50 Hz to 6 kHz, for <math>\pm 5</math> kHz deviation.</p> <p><b>External Audio Processor Patching</b> ..... Rear panel connectors for external unity gain companding or processing; input level 10K, 2V RMS; output level 1V RMS, 600 ohm balanced, XLR connectors.</p> <p><b>Peak Modulation Limiter</b> ..... Built-in peak modulation limiter to prevent over-deviation.</p> <p><b>Front Panel Bargraph</b> ..... Monitors modulation level</p> <p><b>Power Requirements</b> ..... 115 Vac, 60 Hz, 100 watts or 13.8V dc external battery, 7 amps; switchable. 230 Vac, 50 Hz optional.</p> <p><b>Size</b> ..... 1/2 rack mount: 5 1/2" (13.3 cm) H <math>\times</math> 8 1/2" (21.6 cm)W <math>\times</math> 14 1/2" (36.8 cm)D</p> <p><b>Weight</b> ..... 14.5 lbs net (6.7 kg); shipping wt: 18 lbs (8.3 kg)</p> <p><b>FCC ID</b> ..... BI09CJ8888RPU</p>
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## RECEIVER

<p><b>Frequency Range</b> ..... 400–470 MHz.</p> <p><b>RF Channels</b> ..... Two pre-programmed carrier frequencies are front panel selectable. Two carrier frequencies can be located up to 6 MHz apart and each carrier is programmable within its 1 MHz bandwidth in 2.5 kHz steps by internal DIP switches.</p> <p><b>RF Input</b> ..... 10 <math>\mu</math>V for 20 dB quieting <math>\pm 5</math> kHz deviation de-emphasized audio. 50 <math>\mu</math>V for 50 dB. (Type N female connector, 50 ohms.)</p> <p><b>IF and Image Rejection</b> ..... 80 dB</p> <p><b>Frequency Stability</b> ..... 0.00025% (0°–50°C)</p> <p><b>Spurious Rejection</b> ..... 70 dB</p> <p><b>Audio Response</b> (400 Hz reference) ..... IF B.W.    – 1 dB    – 3 dB Narrow 40 Hz to 6 kHz 30 Hz to 7 kHz Medium 40 Hz to 8 kHz 30 Hz to 10 kHz Wide 40 Hz to 12 kHz 30 Hz to 15 kHz</p> <p><b>Program Audio Output</b> ..... + 10 dBm, 600 ohm balanced, with squelch, barrier strip.</p>	<p><b>Front Panel Meter</b> ..... Monitors received signal strength, program audio level, power supply, VCO voltages.</p> <p><b>DTMF Decoder</b> ..... Allows remote control of receiver band-width, channel frequency selection, and repeater transmitter enable.</p> <p><b>External DTMF</b> ..... Overrides input DTMF signal from air link. Phone jack connector</p> <p><b>Received Signal Strength DC Output</b> ..... 1 VDC to 5 VDC for 1 <math>\mu</math>V to 200 <math>\mu</math>V of RF</p> <p><b>Transmitter Enable</b> ..... Relay contact closure enables external repeater transmitter</p> <p><b>Security Code</b> ..... User programmable 4-digit security code, set by internal DIP switches.</p> <p><b>AC Power</b> ..... 115/230 Vac, 60/50 Hz, 30 watts.</p> <p><b>Optional Battery Power</b> ..... 12 to 13.8 Vdc, approx 2 amps</p> <p><b>Operating Temperature</b> ..... 0°C to 50°C</p> <p><b>Size</b> ..... 3 1/2" (8.9 cm)H <math>\times</math> 19" (48.3 cm)W <math>\times</math> 11" (27.9 cm)D</p> <p><b>Weight</b> ..... 10 1/2 lbs (4.8 kg); shipping wt: 13 lbs (6.0 kg)</p>
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### Receiver Bandwidth, SNR, THD, and Adjacent Channel Rejection

Channel Spacing (FCC Description)	F	IF BW	THD (400 Hz)	S/N (De-emp)	Adj. Ch Rej
25 kHz (25KOF3)	$\pm 5$ kHz	Narrow	<2.0%	>55 dB	50 dB
25 kHz (25KOF3)	$\pm 5$ kHz	Medium	<1.0%	>55 dB	6 dB
25 kHz (25KOF3)	$\pm 5$ kHz	Wide	<0.5%	>55 dB	0 dB
50 kHz (50KOF3)	$\pm 10$ kHz	Medium	<2.0%	>60 dB	55 dB
50 kHz (50KOF3)	$\pm 10$ kHz	Wide	<1.0%	>60 dB	6 dB
100 kHz (100KOF3)	$\pm 25$ kHz	Wide	<1.0%	>68 dB	26 dB 60 dB*

\*for 150 kHz spacing

Contents subject to change without notice

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, California 95052-8088

TFT  
INC

(408) 727-7272  
TWX: 910-338-0584  
FAX: 408-727-5942



## AM/FM EBS System

### FEATURES

- Frequency Synthesized AM or FM Receivers
- LED Display of Days Since Last Transmission & Last Reception
- Programmable Encoding and Decoding Tone
- L and R or Composite Signal Loop-Through
- FCC Certified

### GENERAL DESCRIPTION

The Models 886 and 887 Emergency Broadcast System (EBS) receivers are designed for broadcasters to meet Parts 73.940, 73.941 and 73.942 of the FCC Rules and Regulations.

The AM receiver, Model 886, is tunable across the AM broadcast band, using a frequency synthesized local oscillator. Tuning is accomplished with a 3-digit, front-panel push-button switch in 10 kHz increments. The stability of the receiver is that of the crystal oscillator,  $\pm 500$  Hz per year.

The FM receiver, Model 887, is a high-performance, digitally tunable receiver, using a 4-digit front-panel push-button switch in 100 kHz increments. The Model 887 is ideally suited to FM

intercity relay networks, key links in the EBS alerting procedure, allowing pickup and rebroadcast of emergency programming without degradation of signal quality.

Both receivers have built-in two-tone decoders for the 853 Hz and 960 Hz EBS signaling tones from demodulated audio outputs. Stable piezoelectric tuning fork filters are used to achieve a bandwidth of  $\pm 5$  Hz from each tone frequency. The receiver squelch is controlled by a programmable delay circuit in 2, 4 or 8 seconds after receipt of the two-tone attention signal.

There are separate 2-digit LED displays on the front panels. They show the number of days, up to twelve, since EBS test transmissions were last received and/or sent. On the 12th day, the displays start flashing. This assists in avoiding FCC citations for incorrect use or non-use of the EBS system. Bargraphs are provided on the front panel for both audio level and RF signal strength observations. A front panel loudspeaker is standard in each receiver for audio monitoring, with its volume control located on the rear panel.

The integral two-tone EBS Generator, using crystal oscillators, produces the 853 Hz and 960 Hz tones simultaneously, with an accuracy of  $\pm 0.25$  Hz. The duration of the two-tone signal is also programmable by internal DIP switches in 6, 12 or 24 second intervals. Tone amplitudes may be observed and adjusted individually. Test and on-air transmission switches are provided on the front panels of each receiver. Stereo and composite signal loop-through are provided on the rear panel. Remote activation and reset are available via opto-isolators.

# SPECIFICATIONS

## Common Specifications

Decoder Bandwidth	± 5 Hz
Generator Output Level	+ 8 dBm nominal
Encoder Frequency Stability	± 0.25 Hz, crystal controlled
Audio Output Level	250 mw, internal loudspeaker
Output Impedance	600 ohms, balanced
Harmonic Distortion	Less than 2%
Tone Duration	6, 12 or 24 seconds, programmable
Tone Level Adjust	Internal
Remote Activation and Reset	Opto isolators via rear panel strip
Time Delay for De-muting	Programmable, 2, 4 or 8 seconds
Audio Loop-through	Balanced: L and R channel Floating: Composite
Loss of Carrier Alarm	Transistor collector active pull up to 10 V, 10 ma
Received Signal Strength Indicator (RSSI)	5-element LED bargraph
Receiver Audio Level Indicator	5-element LED bargraph
Receiver Audio Outputs (600 ohm)	Balanced: + 8 dBm Unbalanced: 1 Vrms
External Alarm	SPDT relay contacts to rear panel strip after receipt of alert.
Receiver a.c. Power	115 v.a.c. ± 15%, 50/60 Hz, 20 watts maximum
Operating Temperature	0° to 50° C
Size	1¾" high, 19" wide, 10" deep
Weight	6 lbs (2.7 kg); 10 lbs (4.5 kg) shipping

## Front Panel Description

Day Display	Two digital displays to record number of days since last transmission or reception of two-tone transmission. Flashing after 12 days.
ON/STAND-BY Switch	Two-position toggle switch.  In ON mode, the loudspeaker is demuted.  In STAND-BY mode, the loudspeaker is muted until an EBS alert is received.
TEST/RESET Switch	Three-position, spring-loaded toggle switch initiates EBS transmission in Test position and interrupts in Reset position.

ON AIR Switch ..... Two, three-position spring-loaded toggle switches. Must be held in opposing positions to prevent accidental activation.

853 Hz OPERATE/960 Hz Switch ..... Three-position, spring-loaded toggle switch. Tests individual tones and connects both tones to output for test purposes.

## Model 886 AM Receiver

Frequency Range	540 kHz to 1720 kHz
Local Oscillator Stability	± 500 Hz per year
Tuning Method	Push-button stepswitch in 10 kHz increments
Antenna Input	75 ohms nominal, unbalanced
Sensitivity	30 µV for 20 dB S/N at 30% modulation
AGC	55 dB
IF Bandwidth, 6 dB	± 5 kHz
Harmonic Distortion	Less than 3% at 50% modulation with 10 mV/meter RF signal level
Noise	45 dB or greater below 90% modulation with 10 mV/ meter RF signal level

## Model 887 FM Receiver

Frequency Range	88 MHz to 108 MHz
Tuning Method	Push-button stepswitch in 100 kHz increments
Antenna Input	75 ohms nominal, unbalanced
Sensitivity	2 µV for 20 dB quieting
AGC	60 dB
Audio Frequency Response	± 1 dB, 50 Hz to 7.5 kHz
Harmonic Distortion	1% at 33% modulation
S/N Ratio	60 dB or greater below 100% modulation at 50 µV RF input
De-emphasis	75 usec

# TFT<sup>INC</sup>

3090 Oakmead Village Drive  
P.O. Box 58088  
Santa Clara, CA 95052-8088  
(408) 727-7272

Encoder/Decoder FCC ID Number:  
BI0886 (AM); BI0887 (FM)

 <b>CALL FOR SERVICE</b>	<b>ELECTRONIC INDUSTRIES, INC.</b> TOLL FREE IN STATE 1-800-445-0222 OUT OF STATE 1-800-558-0222
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## REMOTE CONTROL ACCESSORIES

**MODEL FSU-01:  
FAILSAFE UNIT**

Designed primarily for television applications, Model FSU-01 monitors four critical parameters required by the FCC. These include: Aural transmitter plate voltage, plate current, aural power output and visual transmitter power output. A fifth input is also provided to monitor the telemetry failure signal from the remote control equipment Model 7601R. Any failure occurring in one of these five monitored functions will activate the one-hour timer. Two separate sets of relay contact closures are provided; one to turn off the transmitter by opening the relay contact closures one hour after activation of the timer, and one to provide contact closures when OVERRIDE switch on the front panel is energized. In addition, a status output of logic level "zero" is available to alert the operator upon the activation of the one-hour timer. Either 6 seconds or 60 seconds delay can be programmed into the status indication. The FSU-01 is a 3½" rackmount unit, 10" deep. Power requirements are 115/230 VAC 50-60 Hz.

**MODEL CSA-01:  
CHOPPER-  
STABILIZED  
AMPLIFIER**

Chopper-stabilized, solid state DC amplifier samples sensitive DC meter circuits and without effecting normal meter readings. Floating input allows sampling of positive, negative or isolated circuits. Source circuit may be up to 350 volts above ground potential. An output of 1.5 VDC is produced from 15 microamps flowing through the 2200 ohm input termination resistor. Gain and offset controls are also provided. The temperature range for stabilized operation of CSA-01 is 0° to 50°C. Power requirements are 115/230 VAC, 50-60 Hz.

**MODEL PLC-01:  
POWER TO LINEAR  
CONVERTER**

The PLC-01 accepts a low-level DC current sample from the reflectometer representing the power output of the broadcast transmitter and amplifies it to the required level suitable for driving remote control and logging equipment. Logarithmic and linear outputs are provided by the PLC-01. The logarithmic output provides a linear voltage with respect to transmitter power, therefore the power of the transmitter can be indicated by a linear meter scale. Operating temperature range is 0° to 50°C. Power requirements are 115/230 VAC, 50-60 Hz.

**MODEL TLK-01:  
TOWER LIGHT KIT**

The TLK-01 is designed to sample AC line current, including tower lights or deicers. A current transformer allows sampling over a wide current range. The incorporation of the current transformer makes it unnecessary to establish physical connection with the circuit being sampled.

**MODEL PVK-01:  
PLATE VOLTAGE KIT**

This kit will sample plate voltages from 1,000 VDC to 20,000 VDC. A well-insulated resistor network assures accuracy and continued reliability.

**MODEL LVK-01:  
LINE VOLTAGE KIT**

The LVK-01 observes AC line voltages or other AC circuits. AC voltages from 6.3 VAC to 440 VAC may be sampled.

**MODEL MBB-01:  
UNIVERSAL PLATE  
CURRENT KIT**

Either plate current or plate voltage may be sampled with the MBB-01. It is widely used in cases where neither side of a circuit is at ground potential or where positive ground is employed. The unit is designed to operate at ±15% of normal plate voltage or current and will withstand peak voltages up to 10,000 VDC above ground potential. External shunt or series resistance is required.

**MODEL TSK-01:  
TEMPERATURE  
SENSING KIT**

Senses air temperatures from -20° to 60°C. Provides a linear reading of temperature with no conversion table or graph required when read on an appropriate meter scale. Self contained power supply provides operation from 115/230 VAC 50-60 Hz power source.

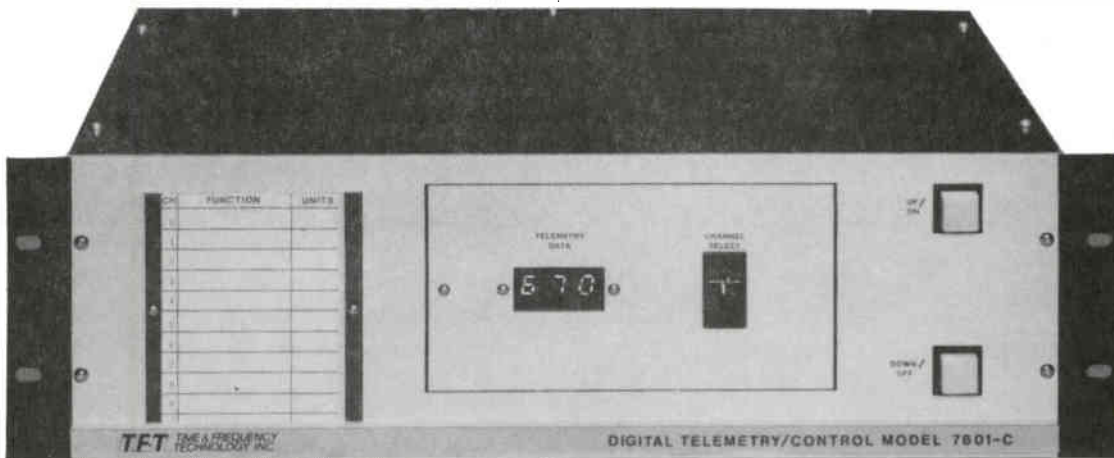
**MODEL ADS-01:  
ALTERNATE DATA  
PATH SELECTOR**

The ADS-01 monitors the output of the Double-Scan-Comparison circuitry in the Model 7610C and 7610R data modems. Should there be consecutive invalid data output, the ADS-01 will automatically switch from the primary data path to an alternate data path such as a standby phone line. This allows the remote control equipment to remain in operation should there be a failure in the primary data link. One each of the ADS-01 is required to equip the Control Terminal and the Remote Terminal. The ADS-01 is a 1¾" rackmount unit. Power requirements are 115/230 VAC 50-60 Hz.





# TFT 7601



## DIGITAL CONTROL/TELEMETRY SYSTEM

### FEATURES:

- Fully digital, pulse code modulated FSK modems
- Interconnected by telephone wire line or STL and SCA
- One man calibration
- 10 channels of RAISE/LOWER and TELEMETRY functions
- Quick-disconnect barrier-strip boards for easy field service
- Complete digital system for under \$2000

### DESCRIPTION:

The new TFT Model 7601 now makes it possible for any broadcast station with a minimum budget to enjoy the accuracy and reliability of full DIGITAL remote control system — eliminating guess-work and reducing operator error.

### Choice of Transmission Methods

With the 7601, interconnection can be via telephone line(s) or radio links which include STL and SCA. Pulse Code Modulation (PCM) is used for data transmission, with built-in digital data modems.

### Maximum Data Integrity

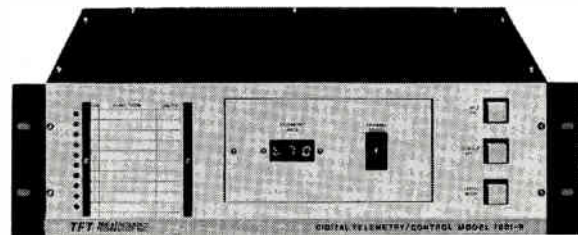
Data accuracy and greatly reduced operator errors are assured by TFT-proprietary digital data filtering and closed-loop automatic verification systems. In digital data filtering, each control command is sent twice. The two are then compared at the remote point, bit by bit. Only if they match exactly are the commands carried out.

### Minimal Service Downtime

The advanced, solid state design of 7601 components ensures dependable, long-life operation. In addition, the remote units at the transmitter have rear panel quick-disconnect barrier strip boards that can be removed by simply loosening four thumbscrews — a TFT exclusive. This allows you to remove the unit from the rack in the event service may be required, without disconnecting any of the wiring between the remote control unit and the transmitter or alarm sampling points. If service is needed on a 7601, a standby unit can quickly be installed to keep you operating.

### One-Man Calibration

The front panel of the Model 7601R has a DVM and scaling potentiometers so that just one man on site can calibrate the system. For such local operations, a switch on the remote unit locks out the studio and overrides the telemetry and control fail-safes.



*Model 7601 remote unit with lock-out switch to override studio functions.*

For ordering information and technical specifications refer to Model 7600 data sheet.



# **MEET** TIME & FREQUENCY TECHNOLOGY INC.

3000 Olcott St., Santa Clara, California 95050 (408) 246-6365

## REMOTE CONTROL USER'S LIST

### ARKANSAS

Fort Smith KFSA

### CALIFORNIA

Los Angeles KGBS  
Los Angeles KSCI-TV  
Merced KUBB  
Oakland KNEW  
San Francisco KDTV-TV  
San Luis Obispo KCPR

### COLORADO

Boulder KADE

### CONNECTICUT

Avon WTIC

### FLORIDA

Miami Beach WMBM/WWWL

### INDIANA

Ft. Wayne WMEE

### KANSAS

Topeka WREN  
Wichita KARD

### KENTUCKY

Jackson WEKG

### LOUISIANA

Sulphur KLQQ

### MAINE

Portland WGAN  
Portland WPOR

### MASSACHUSETTS

Boston WILD

### MICHIGAN

Bad Axe WLEW-FM

### MINNESOTA

Minneapolis KQRS

### NEVADA

Reno KOLO-TV

### NEW HAMPSHIRE

Laconia WLNH

### NEW JERSEY

Livingston WVNJ

### NEW YORK

Buffalo WNEJ  
New Rochelle WVOX

### NORTH CAROLINA

Boone WATA  
Hickory WIRC/WXRC  
North Wilkesboro WKBC

### OHIO

Lima WIMA

### OKLAHOMA

Tulsa KAKC

### OREGON

Medford KTVL-TV

### PENNSYLVANIA

Corry WVCB  
Pittsburg WAMO  
Philadelphia WCAU

### PUERTO RICO

Ponce WLEO  
Ponce WZAR

### SOUTH DAKOTA

Rapid City KKLS

### TEXAS

Houston KPFT

### UTAH

Provo KBYU-TV

### WEST VIRGINIA

Logan WLOG





# INTRODUCING: TELESCAN™

TFT'S COMPUTERIZED  
NERVE CENTER FOR  
MONITORING AND LOGGING  
UP TO 110 REMOTE FUNCTIONS

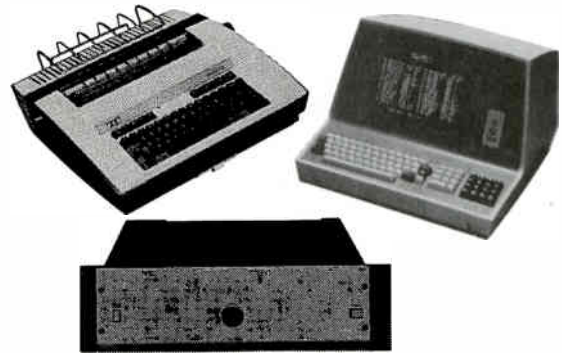
- CRT display allows simultaneous monitoring of up to 30 channels per page.
- Custom computer program brackets critical status limits and alerts operator when limits are exceeded.
- Automatic logging system provides both periodic and on-command print-outs of selected parameters.
- Standard typewriter keyboard allows operator annotations to log outputs.
- Multi-site operation capacity built-in.
- Compatible with Model 7600 Digital Remote Control equipment or as independent system.

## DESCRIPTION

The TFT Model 7640 TELESCAN is a computer assisted option for the Model 7600 Remote Control System. It can also be used to assist the operation of any remote control equipment or used as an independent system in data acquisition, status monitoring and logging. Both telemetry and ON/OFF status functions for up to 10 channels can be clearly displayed, on command, on the 12-inch CRT. Up to 30 control channels may be called up simultaneously via the keyboard on the CRT unit. But TELESCAN is far more than a passive display system. A built-in microprocessor and special software package allow you to pre-program two sets of upper and lower limits of the parameter being monitored, so that central control can be instantly alerted when these parameters are exceeded. The additional feature of automatic or call-up logging provides a permanent record. The TELESCAN System consists of four major components, Remote Scanner, CPU, Video Display and Printing Terminal.

## REMOTE SCANNER

Model 7640R is a remotely located unit which continuously scans the data inputs from various sensors, such as temperature, power, voltages, currents and contact closures. It converts dc signals to digital data and transmits the data to the CPU via built-in FSK modems by means of phone line or audio link at a rate of 15 channels per second.



## CENTRAL PROCESSING UNIT (CPU)

A microprocessor based CPU provides direct interaction with the computer programs and tolerance limits stored in the non-volatile memories. It processes the telemetry data consisting of channel identification and meter readings via the FSK modem. A built-in alerting feature will cause the appropriate video display to flash on and off when any pre-programmed limits have been exceeded. In addition to the information storage and processing capabilities, the CPU also provides a Julian Time Clock, which consists of calendar and time information for display and logging purposes.

## VIDEO DISPLAY

A 12-inch CRT screen can display as many as 25 characters per channel for 30 telemetry or status channels simultaneously. These displays are presented in page-type format with 80 character column widths. Any combination of status channels from any remote location may be called up via a standard typewriter keyboard at the central location. This same keyboard may also be used for inputs and to annotate printed material from the logging system. Additional displays can be connected in parallel with the main CRT.

## AUTOMATIC LOGGING

A data printing terminal is standard equipment on the TELESCAN. This terminal will provide automatic periodic print-outs of selected telemetry information on a pre-scheduled basis or give instant hard copy output on separate command. Up to 20 columns of data can be printed on the character printer. Typewriter keyboard also comes as standard equipment for annotation purposes.

## SOFTWARE

A standard software package is provided with each TELESCAN for basic interface functions normally required. However, customized software programs can also be added at any time to satisfy specific requirements of the user.



**PRICE SCHEDULE  
REMOTE CONTROL EQUIPMENT (CON'T)**

MODEL NO.	DESCRIPTION	APPLICATION	PRICE
7610 Option 05	Extender Cable Kit for 7610R	A cable kit to provide rear panel wiring extension such that the 7610R can be removed from the rack for service without having to disconnect wirings to and from the transmitter and sensors.	\$ 25.00
7610 Option 06	Spare Parts Kit	To provide spare parts such as relays, I.C.'s and other critical components for emergency repair	\$ 370.00
7615	Direct ON/OFF Control and Status monitoring	When operated in conjunction with the Model 7610, it provides 15 channels of direct ON/OFF control plus 15 channels of status indicators	\$ 1,850.00*
7620R	Channel Expander (10 channels)	To expand the RAISE/LOWER and Telemetry channels of the Model 7610 from 10 each to 20 each (to be installed at the Remote Terminal only)	\$ 900.00
7630R	Channel Expander (20 channels)	To expand the RAISE/LOWER and Telemetry channels of the Model 7610 from 10 each to 30 each (to be installed at the Remote Terminal only)	\$ 1,350.00*
7640	TELESCAN SYSTEM (CPU, CRT, Printer and Scanner)	To provide computer option to the remote control system. Functions include multi-channel CRT data display, tolerance alarm, and logging	\$12,000.00
7641	TELESCAN SYSTEM (CPU, Printer and Scanner)	Same as 7640 without CRT display	\$10,500.00
<b>REMOTE CONTROL INTERFACING ACCESSORIES</b>			
FSU-01	Fail-Safe Unit for TV application	To provide full compliance with FCC Rules by monitoring 4 critical parameters, aural plate voltage, aural plate current, aural power and visual power	\$ 475.00
ADS-01	Alternate Data Path Selector	Switch from SCA to phone line when invalid data is detected from either the Control or the Remote terminal. Two are required per system.	\$ 450.00
CSA-01	Chopper Amplifier	To provide isolation from a floating circuit to a grounded circuit. DC gain is also provided.	\$ 145.00
PLC-01	Power-to-Linear Converter	To linearize power readings from log scale to linear scale.	\$ 245.00
TLK-01	Tower Light Monitor	To monitor AC line current	\$ 65.00
LVK-01	Line Voltage Monitor	To monitor AC line voltage	\$ 50.00
PVK-01	Plate Voltage Monitor	To monitor plate voltage up to 20 kv	\$ 65.00
TSK-01	Temperature Sensing Kit	To monitor temperature of air or components	\$ 95.00
MBB-01	Isolation Amplifier (High Voltage)	For monitoring voltage and current at 10 kv above ground and translate reading in reference to ground voltage to suit the input of the Remote Terminals	\$ 95.00

**NOTE:**

1. For terms of sale and warranty, see Broadcast Monitoring Equipment Price List.
2. \* Price increase effective November 1, 1977.
3. All prices are F.O.B. Santa Clara, California and subject to change without notice.
4. Please specify options with order.



**TIME AND FREQUENCY TECHNOLOGY, INC.**

3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584





# PRICE SCHEDULE REMOTE CONTROL EQUIPMENT

September 30, 1977

MODEL NO.	DESCRIPTION	APPLICATION	PRICE
X-14	Status and Control System having 14 ON/OFF, plus 14 status indication channels. Consisting of a Control and Remote unit.	For ON/OFF control and status indications only. Telemetry is not required.	\$ 1,895.00
X-14 Option 01	Full duplex Input and Output of 4 wire interconnection	Two separate pairs of wires to interconnect the control terminal and remote terminal	\$ 75.00
X-14 Option 02	Single set of Subcarrier Generator and Demodulator	To provide SCA generator and demodulator at either the control terminal or the remote terminal.	\$ 300.00
X-14 Option 03	Two sets of Subcarrier Generator and Demodulator	To provide SCA generators and demodulators at both the control terminal and remote terminal	\$ 600.00
714	Data Channel Line Multiplex consisting of two units	To enable X-14 to share a command phone line with other remote control equipment such as Moseley TRC-15.	\$ 570.00
7601	10-channel Raise and Lower functions plus 10 channels of digital telemetry, consisting of a control terminal and a remote terminal.	To provide economical digital remote control to AM & FM stations (up to maximum 10 channels)	\$ 1,995.00
7601 Option 01	Sub-carrier (SCA) Detector; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote Terminal	To provide demodulation of the SCA subcarrier	\$ 150.00 (specify frequency)
7601 Option 02	Subcarrier (SCA) Generator; for FM use 67 kHz. Other frequencies from 26 kHz to 185 kHz available. Mounts within 7601 Control or Remote terminal	To generate SCA subcarrier	\$ 150.00 (specify frequency)
7601 Option 03	Extender Cable Kit for Remote Terminal	To extend the rear panel connections from the rack to a work bench if service is required	\$ 25.00
7601 Option 04	Spare Parts Kit	To provide spare parts such as relays, and I.C.'s for emergency repair	\$ 320.00
7610	10 channel RAISE/LOWER plus 10 channel Telemetry digital remote control system. Expandable by adding Model 7615, 7620, and 7630 to a 110-channel system	To provide digital remote control systems for medium and large size AM, FM & TV stations. Also suitable for controlling multi-site operations.	\$ 2,795.00*
7610 Option 01	Sub-carrier (SCA) Detector; for TV application, specify 39 kHz; for FM, 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote Terminal.	To provide demodulation of the SCA subcarrier	\$ 150.00 (specify frequency)
7610 Option 02	Sub-carrier (SCA) Generator; for TV use, specify 39 kHz; for FM, 67 kHz. Other frequencies 26 kHz to 185 kHz available. Mounts within 7610 Control or Remote terminal	To generate SCA sub-carrier	\$ 150.00 (specify frequency)
7610 Option 03	BCD parallel data inputs (for the Remote Terminal)	To provide two channels of parallel BCD inputs to accept external digital data such as the readings from a digital frequency monitor or frequency counter.	\$ 150.00
7610 Option 04	Parallel BCD Data Output Cable Kit (for 7610C Control Terminal)	A cable kit to provide external control of channel selection, RAISE/LOWER function and parallel BCD output of the channel identification and DVM reading	\$ 175.00

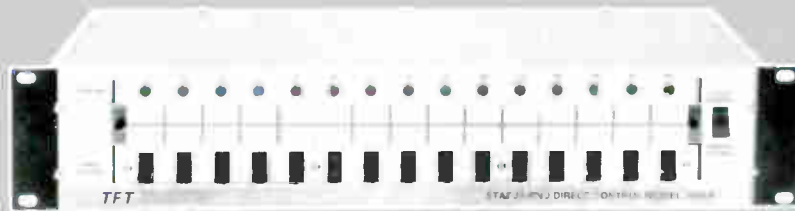
**TIME AND FREQUENCY TECHNOLOGY, INC.**

3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584

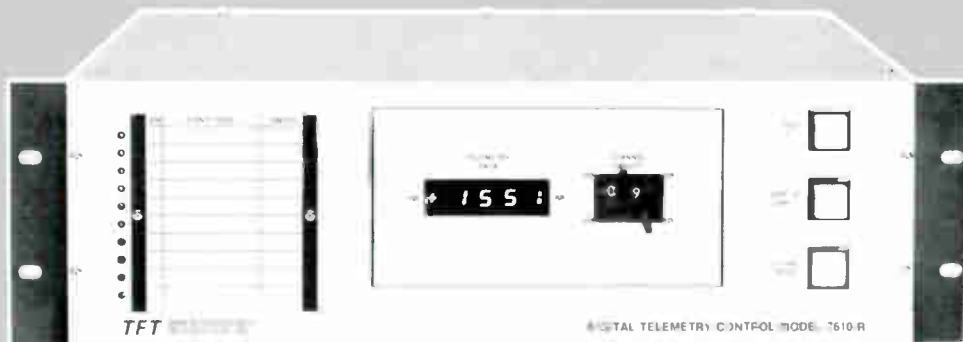
# TFT



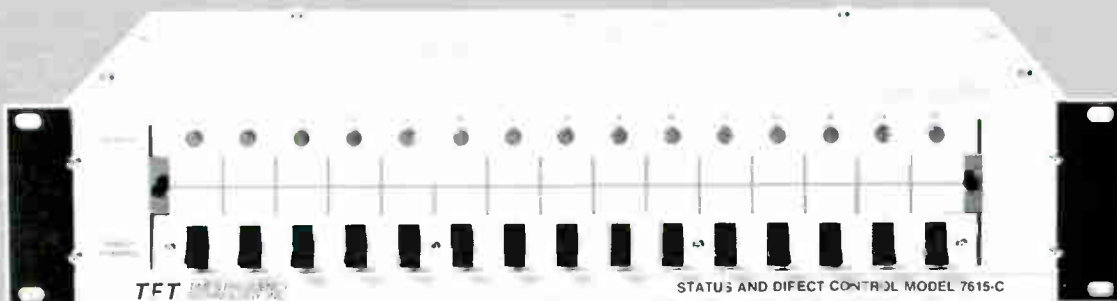
# 7600



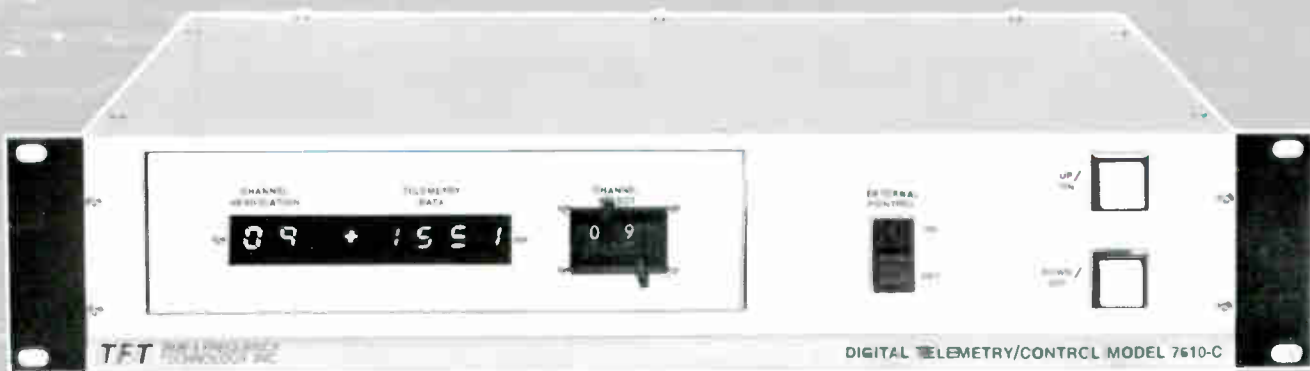
**THE FIRST FULLY MODULAR**



**DIGITAL REMOTE CONTROL SYSTEM**



**THAT CAN BE EXPANDED TO FIT YOUR**

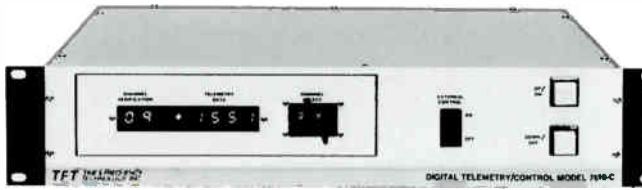


**GROWING AM, FM OR TV TRANSMISSION NEEDS**

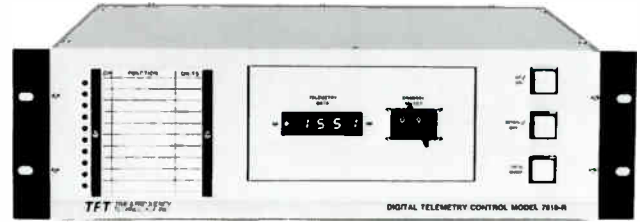
## TFT

**TIME AND FREQUENCY TECHNOLOGY, INC.**

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Model 7610-C Control Unit



Model 7610-R Remote Unit

## Provides both digital control/telemetry

### FEATURES:

- Modular, field expandable design
- Fully digital, pulse code modulated FSK modems
- Linked by telephone wire line or STL and SCA
- One man calibration
- 10 to 80 channels of RAISE/LOWER AND TELEMETRY functions
- Up to 30 channels of direct ON/OFF control in addition
- Up to 30 channels of STATUS and ALARM monitoring
- Digital display of up to 30 parameters simultaneously
- Limit alarms and optional automatic logging
- Quick-disconnect barrier-strip boards for easy service of remote units
- Provision for Automatic Transmission System (A.T.S.) operation built-in.
- Complete line of components for transmitter and sampling point interface

### GENERAL DESCRIPTION

Start with a stand-alone, 10-channel TELEMETRY and RAISE/LOWER system that's price-competitive with less versatile analog systems. Then, if you want, add up to 70 more channels of RAISE/LOWER plus up to 30 channels of direct ON/OFF control and up to 30 channels of STATUS/ALARM monitoring. You can even add a microprocessor-controlled multi-channel data display that gives you a digital readout of 30 simultaneous meter readings. Automatic logging is also available, as is a provision for external control by a computer, an A.T.S. monitor or similar devices. All components, both at the control point and the remote point, fit in a standard 19-inch rack.

The TFT 7600 System makes it possible for any-size AM, FM

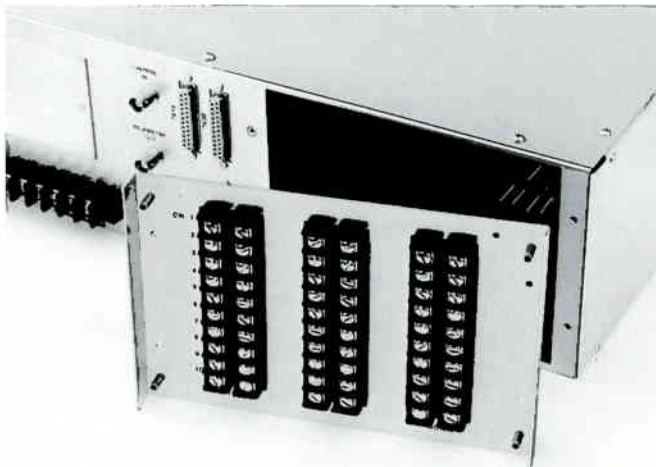


Figure 1: Quick-disconnect rear panel allows removal of remote units without disconnecting any wiring to transmitter or sampling points.

and TV station to have direct, digital control of remote transmitters. Designed to meet today's needs, as well as those of future A.T.S. operations, the system is totally modular so that you can tailor it to your specific control and budget requirements.

### Choice of Interconnect Methods

With the 7600 series, interconnection can be via telephone lines or radio links. Radio links include STL and SCA or TSL. Pulse Code Modulation (PCM) is used for data transmission, and the system has built-in digital data modems.

### Maximum Data Integrity

Data accuracy and greatly reduced operator errors are ensured by TFT-proprietary digital data filtering and closed loop automatic verification systems. In digital data filtering, each control command is sent twice. The two are then compared at the remote point, bit by bit. Only if they match exactly are the commands carried out.

### Minimal Service Downtime

The advanced, solid state design of 7600 System components ensures dependable and long-life operation. In addition, the remote units at the transmitter have rear-panel, quick-disconnect barrier-strip boards—a TFT exclusive. So, you can remove the units from the rack without disconnecting any of the wiring between the remote control system and the transmitter or alarm sampling points. If service is needed on one of the units, a standby can be quickly installed to keep you operating. If servicing of the chassis is necessary, rear panels can be removed by simply loosening four thumbscrews.

### One-Man Calibration

The remote telemetry/control unit used in the 7600 System has a front panel DVM and scaling potentiometers so that one man can calibrate the system on-site. For such local operations, a switch on the remote unit locks out the studio and overrides the telemetry and control failsafes.

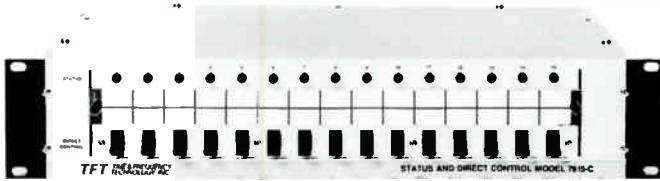
### Multi-Site Operation

Both site and channel identification are coded in the TFT 7600 data transmission. This allows transmitters located in up to sixteen different places to be controlled from a centralized point.

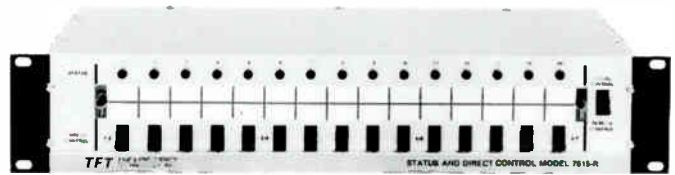
## SYSTEM COMPONENTS

### Model 7610, Digital Control/Telemetry System

The Model 7610 is the basic building block of the versatile 7600 system. Although it is a fully stand-alone, 10 channel digital system with RAISE/LOWER functions and 10-channels of telemetry, it can be field expanded to meet



Model 7615-C Status On/Off Control System



Model 7615-R Status On/Off Remote System

## and direct control/status monitoring

the needs of even the largest station by merely adding additional modules.

Individual channels on the Model 7610 are selected by using a thumb-wheel switch. Once selected, the channel number is fed back to the control point and displayed on the front panel for verification. The system then addresses this channel and displays the meter reading on a front panel-mounted 3½ digit DVM. Meter readings are updated 3 times/second.

Control commands are initiated by pushing either the RAISE/ON or the LOWER/OFF buttons on the front panel. When a command is activated at the control point, a signal is fed back from the remote point. This signal verifies receipt of the command by illuminating the active command button.

For external control, a rear panel connector on the 7610 can be enabled by a front panel switch (Option 04 cable kit required). It allows external selection of channel number and command by a computer or an A.T.S. monitor.

### Model 7615, Direct On/Off Control and Status Monitoring System

Adding a Model 7615 to the Model 7610 gives you direct, ON/OFF control of up to 15 different functions, such as filament voltage, plate voltage, main power, overload reset, tower lights, and program source selection. No longer is it necessary to dial them in one-at-a-time. ON/OFF commands are initiated by front panel toggle switches.

The Model 7615 also gives you fifteen status channels, each with its own independent LED indicator. These can monitor such go/no-go functions and/or alarms as: power, voltages, temperatures, intrusion, VSWR, and tower lights. You get a complete display of status and alarms, at-a-glance. The status indicators can also be used to verify ON/OFF functions. Status outputs can be used to drive external devices and alarms.

For even more control, two Model 7615's can be used simultaneously with one Model 7610. This gives you 30 ON/OFF control channels and 30 status monitoring channels.

### Model 7620/7630, Channel Expander

The Model 7620 or 7630 installed at the remote point expands the RAISE/LOWER and TELEMETRY functions of the Model 7610 from 10 to 20 or 30 channels. As many as three Model 7630's and one Model 7620 can be added to the Model 7610 to give you a total of 80 RAISE/LOWER and TELEMETRY functions.

### Model 7640 Telescan System (Optional)

Finally, the Model 7600 System may be automated with the 7640 Telescan System. Up to 30 channels can be instantly accessed and monitored on the 7640 CRT located

at the control point. What's more, a built-in computer system automatically brackets critical limits and instantly alerts the control point when they are exceeded. Automatic logging via a line printer provides hard copy at regular intervals or on command.

Complete specifications on Model 7640 Telescan are available on a separate data sheet.

## ORDERING INFORMATION

Complete system configurations are available for both telephone link and RF link. These systems are specifically tailored for either AM, FM or TV. Your local TFT Representative or the factory will be happy to layout such a system for you.

## OPTIONS

- Option 01— Detector for subcarrier operation in RF link (specify frequency)
- Option 02— Generator for subcarrier operation in RF link (specify frequency)
- Option 03— 2 Parallel input channels for 3½ digit BCD sources.
- Option 04— Data outputs and cable kit for readout from 7610C in BCD format by external command.
- Option 05— Extended Cable assembly for bench servicing of Remote Units
- Option 06 thru 08— Spare Parts Kits (See Price List)

## TFT 7600 ACCESSORIES

A full line of accessories for telemetry and remote control are designed to interface directly into the 7600 system. These include Temperature Sensing Kit, Tower Light Kit, Fail-safe Unit and Chopper Stabilized D.C. amplifier. Complete specifications on these accessories are available on a separate data sheet.

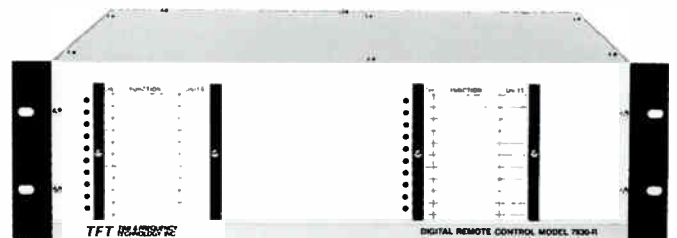


Figure 2: Model 7620/30 Channel Expander provides up to 20 additional control and telemetry functions at the remote point.



## SPECIFICATIONS

Data Transmission . . . . . Digital pulse code modulated FSK Modems

System Capacity . . . . . Up to 80 channels of momentary RAISE/LOWER and TELEMETRY. And 30 channels of ON/OFF direct control and STATUS/ALARM

Telemetry Accuracy . . . . . 0.1% of reading

Resolution . . . . . one part in 1000.

Telemetry Update . . . . . 3 updates per second

Telemetry Input  
Input Voltage . . . . . ±1 VDC differential for full scale (±1000) display. Accepts 200% over-range capability with 3 VDC differential to display ±3000.

Common mode voltage . . . . . ±350 VDC

Input impedance . . . . . 50 k ohms

Control Output . . . . . Relay contact closure, isolated, AC/DC rated, 50-watt non-inductive.

Interconnect Requirements  
Telephone line . . . . . 2 wire unconditioned, Series 3002 Data Circuit.

Audio channel . . . . . Any voice grade channel having 300 Hz to 3 kHz bandwidth

Radio (STL) . . . . . Plug-in FM subcarrier modulator and demodulator for command link.

Radio (off-air) . . . . . SCA frequencies or TSL

Control Fail-safe . . . . . Provides open relay contact closure 30 seconds after control signal fails.

Telemetry Fail-safe . . . . . Output for driving external one-hour timer and TV fail-safe units for full compliance with FCC Rule 73.676

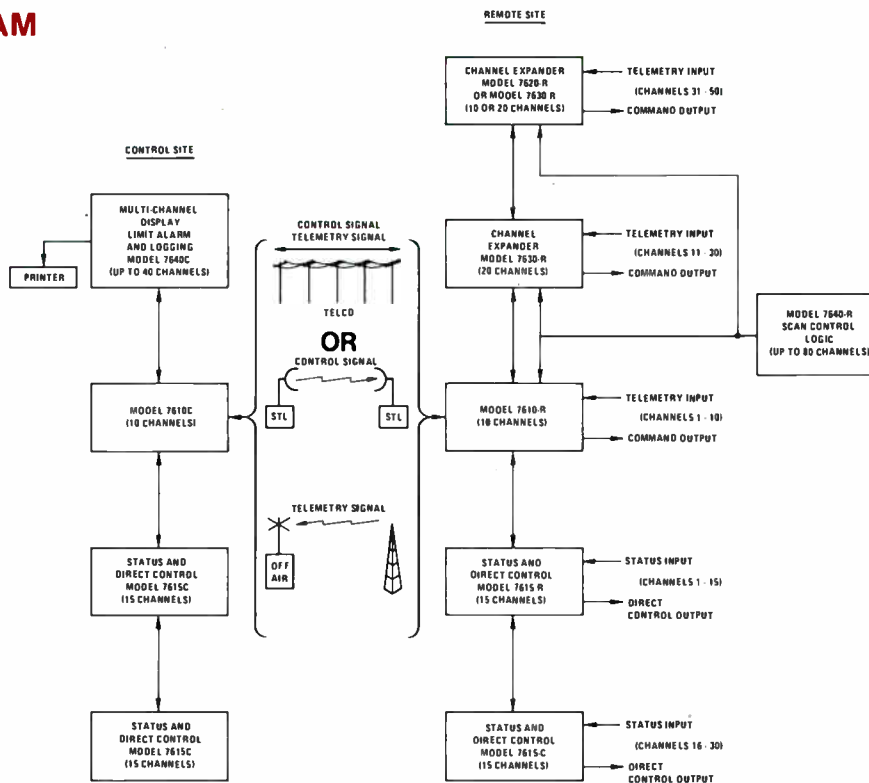
Power . . . . . 120/240 VAC 50-400 Hz

Operating Temperature . . . . . -10° to +50° C

## SIZE AND WEIGHT

Model	19" rack size	Depth	Weight in lbs.	Power in watts	No. of Units
7610	3½ H	13"	14	12	2
7615	3½ H	10½"	12	10	2
7620/ 7630	5¼ H	13"	6	from Model 7610	1

## BLOCK DIAGRAM

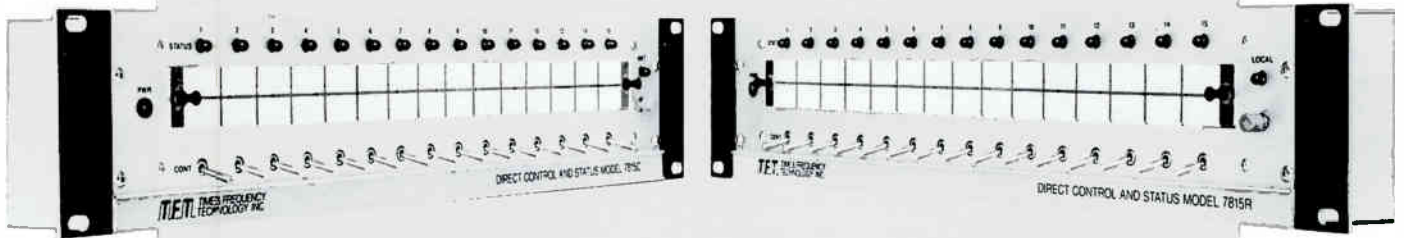


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# TFT

# 7815



## INDEPENDENT

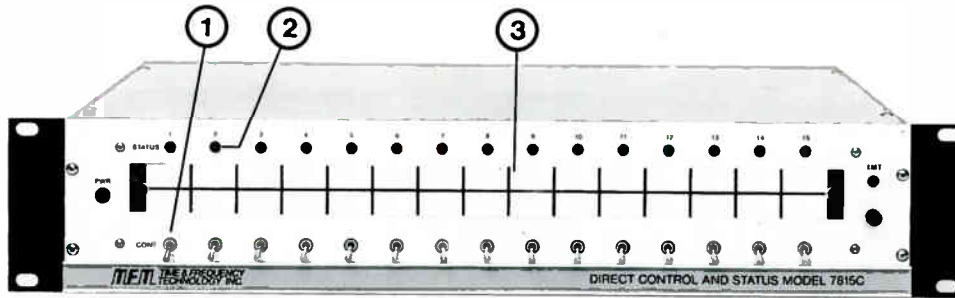
### Remote Control and Status Monitoring System

- 15 Control/ Status Channels
- Expandable to 45 Control/ Status or 79 Status Only
- Full Digital Data
- Parity Check Performed on Each Data Word
- Built-in Crystal Controlled Data Modems
- Double Scan Compares Each Data Bit
- Interconnection by Land Wire or Radio

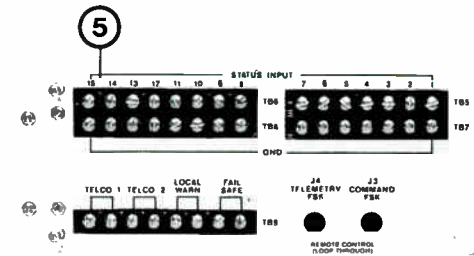
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**TIME AND FREQUENCY TECHNOLOGY, INC.**

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**MODEL 7815C DIRECT CONTROL AND STATUS**



**MODEL 7815 R RE/**

## DESCRIPTION

The TFT Model 7815 is a remote control and status monitoring system using digital data transmission techniques. It is intended for the remote control and monitoring of electrical apparatus including broadcast transmitters via a 3 kHz communications link. The system consists of two compact units; one for the control point and one for the remote point. The Control Unit has 15 independent front panel toggle switches for easy control of 15 different ON/OFF functions. A momentary action switch is available on any one of the 15 positions if specified when ordering. The 7815 also includes 15 Status Channels, each with its own independent LED status indicator. The Remote Unit has the identical number of channels and indicators and also has a Local Control switch for on-site operation. Each toggle switch on the front panel of both Control and Remote Units commands an individual, electronically latched relay. Relay contacts are Form A floating from ground and are rated for AC or DC at 50 watts each. Either a switch closure or a change in logic level at the input of each channel (on the rear panel of the Remote Unit) will trigger the status monitoring circuitry and cause the appropriate LED indicator to turn on. Any ON/OFF combination of up to 15 channels can occur. The 7815 uses FSK data transmission techniques and transmits full duplex (simultaneously in both directions) via telephone line. Data modems are also built-in, and both control and status information are updated approximately every 300 milliseconds.

Data integrity, is maintained by a unique system of "double scan/compare" logic. In operation, each command digital word is sent twice via the data modem, and both words are compared, bit for bit, in parallel. The output register is then updated *only* if every bit matches. This virtually eliminates the possibility of error in the control functions. The Model 7815 can be operated without telephone lines by using external subcarrier generators and demodulators for interconnection. Barrier strips are provided on the Remote Unit for status input and control output connections.

## COMPLETE "ROUND TRIP"

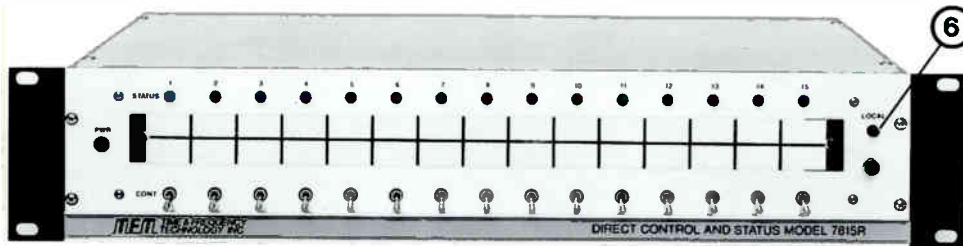
### MODEL 7815 FUNCTION

1. **CONTROL TOGGLE SWITCH** activation causes specific digital command to be transmitted to Remote Unit where it's decoded. The toggle switch contacts can be wired externally through the rear barrier strip. Momentary action switches are also available if specified.
2. **STATUS LIGHTS** for each control channel provide verification that function was performed at remote location. External alarm device can also be connected through rear barrier strip and actuated simultaneously with Status Light.
3. **REMOVABLE INDEXING PANEL** is provided for writing or typing various control and status information.

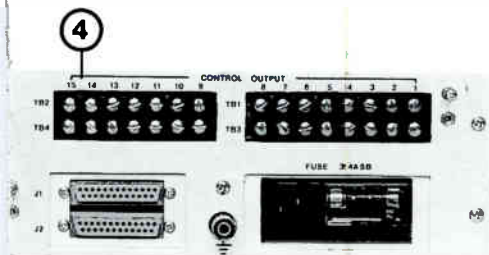
### CHANNEL EXPANSION

**Model 7830, Channel Expander**—By connecting one or two Model 7830's to the Model 7815 the control and status channels may be extended to 30 or 45 each, respectively. The specifications of the Model 7830 are the same as that of the Model 7815. Digital data of the 7830 is transmitted via the UART and FSK modems in the Model 7815.

**Model 7832, Channel Expander**—The addition of one 7832 will provide 32 status only channels to the 7815. Up to two Model 7832's or combination of a Model 7830 and Model 7832 may be added to the Model 7815.



**MODEL 7815R DIRECT CONTROL AND STATUS**



**REAR PANEL**

## P" DIGITAL OPERATION

### OPERATIONAL DESCRIPTION

4. **CONTROL RELAY CONTACTS** on the rear panel of the Remote Unit are bridged when a specific digital command is received. Relay closure activates remote function.
5. **STATUS INPUT** occurs when function under control is activated. This causes a digital word to be transmitted back to the Control Unit which illuminates Status Light.
6. **LOCAL CONTROL SWITCH** on the Remote Unit allows override of the Control Unit so that full operation including command and status can be performed at remote location.

### TIME SHARING COMMUNICATION LINK WITH OTHER REMOTE CONTROL EQUIPMENT

The addition of Option 01 to the Model 7815 enables it to share a communications link with another remote control system. Depressing the Transmit switch on the front panel momentarily interrupts the data link between control point and remote site. (Approximately two seconds.) During this interruption the Model 7815C communicates with the Model 7815R to exchange control and status data. During operation the link is interrupted periodically every one to five minutes (user adjustable) for updating the status report.

A front panel switch can prevent interruptions while the remote control equipment is performing control functions.

### APPLICATIONS

- Broadcast
- Process Control
- Pipeline
- Microwave Link
- Antenna Control
- Telephone Companies
- Power Transmission Equipment
- Dam Flood Gate Control

The 7815 has the ability to directly control up to 15 ON/OFF functions remotely. These may include such go/no-go operations as filament voltage, plate voltage, main power, overload reset, tower lights, program source selection and others. It can also be used to economically expand status monitoring and control in installations already using analog remote control equipment.

### MULTI-SITE OPERATION

Up to 16 sites can be controlled and monitored by a Model 7815C through the use of the Model 7616 Site Selector. The Model 7616 Manual Site Selector selects one of the sixteen sites and performs command and status functions without interference from one site to the other.

### ORDERING INFORMATION

Specify number of momentary switches required and the type of interconnection to be used (two-wire, four-wire, full-duplex radio or other). Specify subcarrier frequency or frequencies when ordering option 01.

### OPTIONS

- Option 01: Time Share Capability — Timeshare of Telco link or STL/SCA links is possible through an existing remote control system without affecting remote operation.
- Option 02: Spare Parts Kit — To provide spare parts such as relays, I.C.'s and other critical components for emergency repair.
- Option 03: Momentary Switch Kit — 8 momentary switches and instructions for replacing front panel toggle switches.



# SPECIFICATIONS

## COMMAND TERMINAL

Number of Command Channels . . .15 to 45 in groups of 15  
 Number of Status Indicators (LED) . . . . . 15 to 45 with control or 79 status only  
 Command Inputs . . . . . Front panel ON/OFF toggle switches (momentary action switches available) or rear panel wiring through terminal strips.  
 External Status Indicator or Alarm . . . . . External indicator or alarm can be wired through the rear panel strip for each status channel. Circuit is capable of driving TTL loads.  
 Command Response Time . . . . . Less than 350 milliseconds.

## REMOTE TERMINAL

Number of Local Command Channels . . . . . 15 to 45 in groups of 15  
 Number of Local Status Indicators . . . . . 15 to 45 with Control or 79 Status only.  
 LOCAL/REMOTE Switch . . . . . Converts Remote Control to Local Control for on site operation. Local control warning light.  
 Command Output. . . . . Individual isolated, floating dry relay contacts normally open. Contacts rated for 1/2 A at 120 VAC/VDC noninductive load.  
 Command Output Connector . . . Barrier strip on the rear panel  
 Status Input . . . . . External (user-supplied) dry contacts or TTL level logic "0" for each individual channel to turn on the Status Light  
 Status Input Connector . . . . . Barrier strip on the rear panel  
 Status Response Time . . . . . Less than 350 Milliseconds

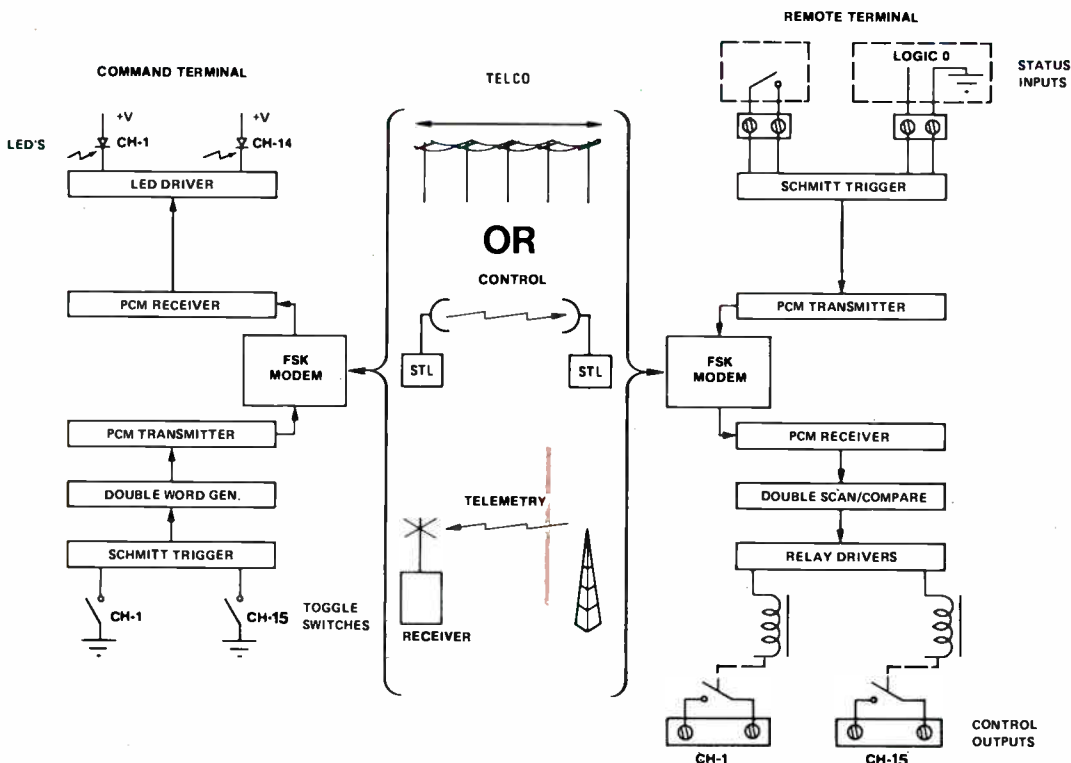
## SYSTEM SPECIFICATIONS

### Interconnections

Phone Line Option . . . . . Series 3002 Data Circuit, C-2 conditioning; maximum allowable attenuation 30 dB, 600 ohm impedance, send level -6 dBm.  
 Radio Option . . . . . External Subcarrier Generator and Demodulator required.  
 Command and Telemetry Failsafe . . . . . Built-in detector to open relay contacts after detection of failure.

Delay time adjustable from 20 to 55 seconds.  
 Operating Temperature Range . . . . . -10°C (14°F) to +50°C (122°F)  
 Physical Size . . . . . 19" x (48.3 cm) x 3 1/2" H (8.9 cm) x 13 1/2" D (33 cm)  
 Power Requirement System . . . . . 120/240 VAC ± 10%, 50/60 Hz. 12 watts per terminal.  
 Shipping Weight . . . . . .35 lbs. (15.9 kGm)

# SYSTEM BLOCK DIAGRAM

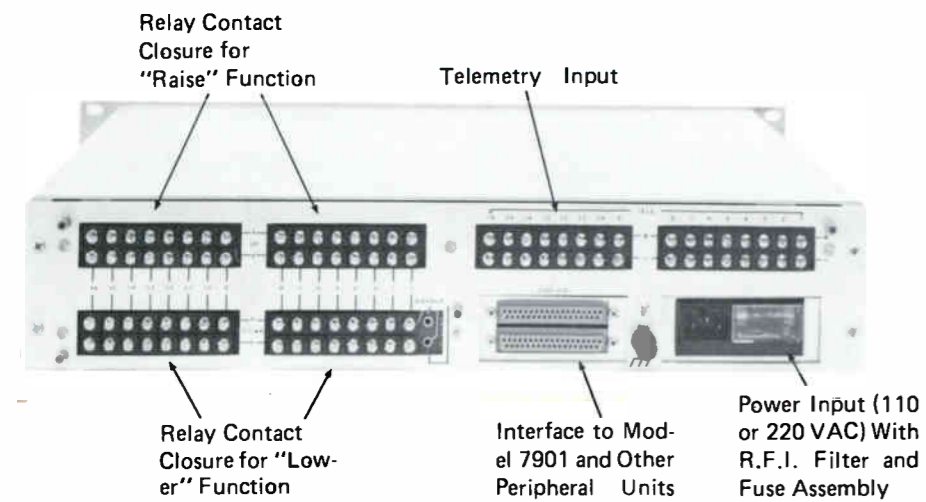


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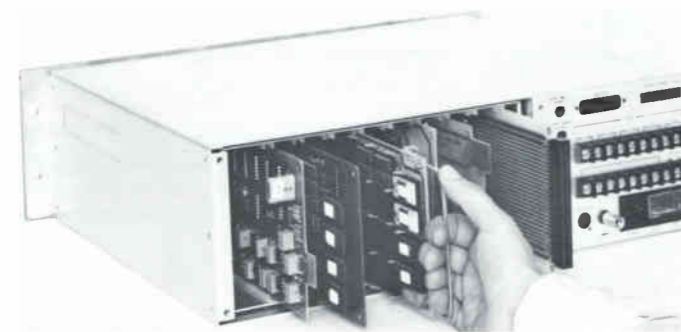
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## Easy Installation and Maintenance



Exclusive Quick-Disconnect barrier boards on the rear panel (shown above) allow removal of units from the rack without disconnecting any of the wiring between the remote system and the transmitter. If service is needed on one of the units, a standby can be quickly installed to keep your system in operation.

In addition to the service convenience provided by the Quick-Disconnect barrier-strip boards, Series 7900's fully modular design allows removal of any individual component plug-in circuit boards for maintenance or testing.



Plug-In Circuit Boards for Added Convenience

## A Full Complement of Options and Accessories

In addition to the basic system components of Series 7900, many special options provide additional control and operator convenience. These include:

Option 01 — Detector Board for subcarrier operation in RF link (specify frequencies)

Option 02 — Generator Board for subcarrier operation in RF link (specify frequencies)

Option 03 — Model 400E CRT Terminal and Keyboard

Option 04 — Model 43 Printer

Option 05 — Spare Parts Kit

Option 06 — Rack Mount Kit for CRT

Option 07 — 2nd Printer and interface P.C. Board and software



Model 400E CRT Terminal



Model 43 Printer

## 7900 SERIES SPECIFICATIONS

Type of System . . . . .	Microprocessor-Based	Control Channels	
Front Panel		Output . . . . .	Relay contact closure, 25 watts. Rear panel barrier strip connection.
Display . . . . .	Site, Channel, Time, Data (with 4 full digits, $\pm$ 9999 and floating decimal point), a 4 character alphanumeric units of measure.	Expandability . . . . .	16 channel increment, expandable up to 96 channels per site.
System Condition . . . . .	Complete self test of Master & Remote Modems, and the Data Link by LED indication. Also visual and audible alarms.	Control . . . . .	Front panel individual channel toggle switch control with feedback status indicators.
Keyboard . . . . .	Identical, 16-key, dual function keyboard at both control & remote sites.	Interconnections	
Channel Index . . . . .	Front panel channel index card compartment.	Telephone line . . . . .	2-wire, Series 3002 Data Circuit. Type C2 conditioning.
Remote Site Capability . . . . .	1 to 4 sites standard-expandable to 63 max.	Radio (STL, SCA or TSL) . . . . .	Plug-in FM subcarrier modulator and demodulator are available on customer frequencies. State specific frequencies.
Remote Channel Capacity . . . . .	96 channels per site in increments of 16 or 32 channels.	Control Failsafe . . . . .	Built-in controls to open relay contacts after detection of failure.
Alarm Response Time . . . . .	2 seconds typical for a single site system.	Telemetry Failsafe . . . . .	Built-in detectors in both control and remote terminals to provide rear panel TTL logic signal output after telemetry signal fails.
Telemetry Channels		Data Transmission . . . . .	1200 BPS half duplex, Crystal Controlled FSK Modems.
Capacity . . . . .	16 channel increments, up to 96 per site with RAISE/LOWER control. $\pm$ 4 VDC differential max.	Power . . . . .	120/240 VAC, 50/60 Hz.
Input Voltage . . . . .	$\pm$ 4 VDC differential max.	Operating Temperature . . . . .	0°c to +50°c
Accuracy . . . . .	0.1% of full scale.	Physical Size	
Scan Rate . . . . .	4 analog channels per second/16 status or direct control channels per second.	Model 7900 & 7901 . . . . .	H: 5.25" (13.3cm) W: 19" (48cm) D: 15.5" (39.4cm)
Calibration . . . . .	Software calibration with automatic drift correction.	Model 7910, 7911, 7920, 7921, 7930 & 7931 . . . . .	H: 3.25" (8.3cm) W: 19" (48cm) D: 15.5" (39.4cm)
RAISE/LOWER Control . . . . .	Relay contact closures isolated 50 watt non-inductive.	Status Channels	
Input . . . . .	TTL compatible	Input . . . . .	TTL compatible
Expandability . . . . .	Expandable up to 96 channels in increments of 16 w/control or 32 status only.	Expandability . . . . .	Expandable up to 96 channels in increments of 16 w/control or 32 status only.

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LITHO IN U.S.A.

TFT INC

# 7900

## A Remote Control/Data Acquisition System So Advanced IT ALMOST THINKS FOR ITSELF!



- $\mu$ P Design at Remote and Control Sites
- Powerful Front Panel
- Full 4-Digit Telemetry Display
- Alphanumeric Units of Measure
- Direct ON/OFF and RAISE/LOWER Controls
- Status Reporting
- 1200 BPS Half Duplex Crystal Controlled FSK Modems
- Up to 96 Channels per Site
- Up to 63 Remote Sites
- Self Calibrating
- Four Levels of Alarm Limits
- RS 232 CRT & Teletype Interface
- ATS Operation



# Supervisory Control, Data Acquisition, and More

## GENERAL DESCRIPTION

Model 7900 Series Remote Control is a microprocessor-based supervisory, control and data acquisition system that provides intelligence at both the control and remote sites. It has the capability of interfacing with a variety of sensors and transducers for data acquisition. It also provides reliable relay closures for controlling functions, even in hostile environments.

Software features of the Series 7900 include computations, interfaced with special instrumentation and measurement apparatus, self calibration, remote interrogation through acoustic coupler to telephone lines and many additional features.

The 7900 Series is expandable due to its modular construction and it ideal for use in AM, FM and TV broadcasting, satellite communications, industrial control, energy management and security monitoring.

## VERSATILE FRONT PANELS

Model 7900's comprehensive front panel allows for full operation without a CRT or teletype. Intelligence at both the control and remote terminals with keyboard control functions and full display at both ends makes this possible. Both programming and operations are executed through a 16-key, dual function keyboard — no cumbersome entry code is required for routine operations. Additional features incorporated in the front panel are detailed in the call-out illustration on the following page.

## HIGH SPEED COMMUNICATIONS

Model 7900's communications format employs 1200 BPS time-division multiplexing methods. This means for example, that if RAISE/LOWER control is not being used, the entire bandwidth is used for the telemetry monitoring function, which allows for fast operation. Transmission errors are detected and corrected by re-transmission automatically. Model 7900 also provides an interface for automatic switch-over to an alternate data path (TFT Model ADS-01) in the event of link failure.

## MULTI-SITE OPERATION

Support for many remote sites tied to a single Master Terminal, has been built into Model 7900. It can monitor and control up to 63 remote sites from a single control site.

## LOGGING & DISPLAY

Normally displayed as four pages of thirty channels each with English titles and units, a special CRT "condensed display" allows you to view all 96 channels for any selected remote site.

Model 7900 can handle a CRT and two printers at the control point as well as a printer at each remote site, simultaneously.

## SELECTIVE CHANNEL MUTING

A group of up to 16 data channels can be assigned to any one of six CHANNEL DISABLE inputs on the rear panel of the Remote Terminal, Model 7901. Each can be controlled by a built-in time clock or external contact closures. In addition, three rear panel programmable time clock outputs are provided for time-of-day ON and OFF controls.

## COMPUTATION

Algebraic computation of derived values, from software formulas applied to data collected, is just another of Model 7900 capabilities. Direct Power, Indirect Power and Actual Efficiency are provided, as well as converting voltage to power readings.

Computation is performed at the remote unit. This both frees the studio unit from having to do all computations for all sites, and also makes the computed result available at the remote site itself, an aid during maintenance and calibration. Each remote site can define up to 80 result channels (within the limit of 96 total channels per site). Computations can be displayed on the front panel, printed on the TTY, or displayed on the CRT, simply by referencing its channel number.

## REMOTE INTERROGATION

Full system interrogation from a remote location can be provided for mini or micro computer interaction via acoustically coupled modems operating at 300 baud over telephone land lines.

## INTERFACE WITH EXTERNAL COMPUTERS

Optional interface hardware and software will soon be available for interfacing the 7900 System to a computer, thereby allowing external computer control and interrogation, custom software, and mass data storage. This will provide data management and format manipulation capabilities.

## AUTOMATIC TRANSMISSION SYSTEM (ATS)

Model 7900 can monitor and control the direct and/or indirect power of the transmitter and also provide alarm/shut-down automatically. It can also monitor and control the modulation when it is used in conjunction with a Modulation Controller.

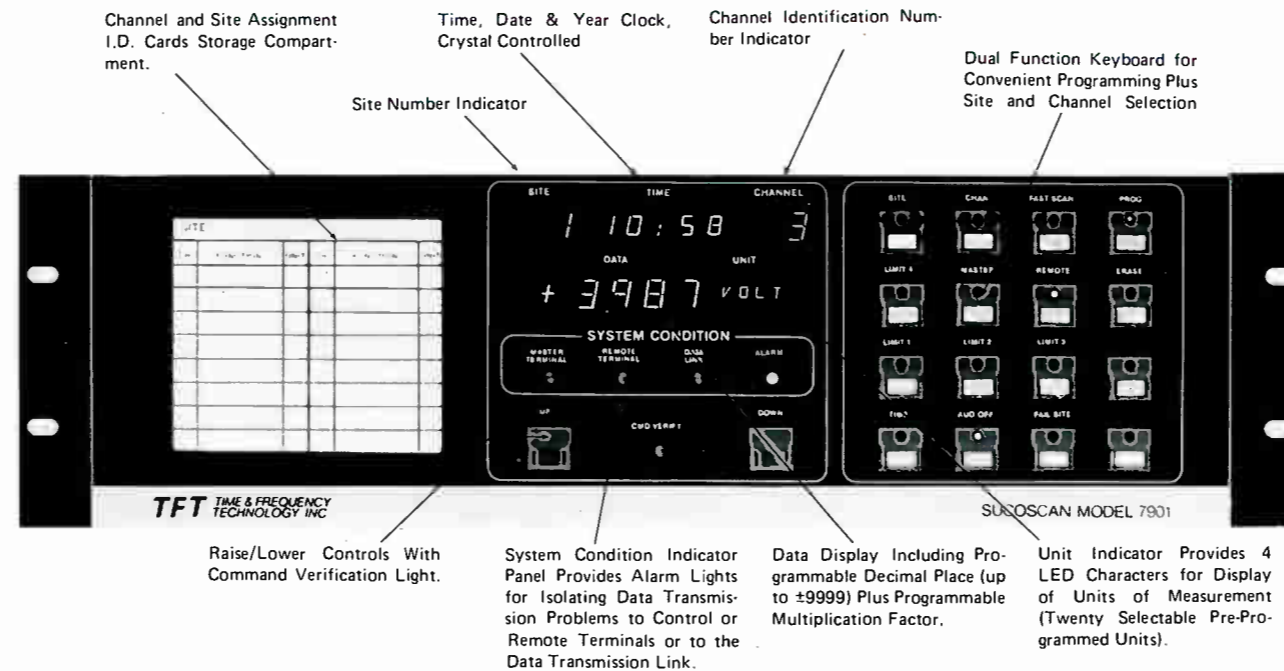
## SATELLITE EARTH STATION SYSTEMS

The 7900 system can provide uplink control for systems sharing the same transponder assignment. The 7901 remote terminal can perform the housekeeping functions at the remote site and provide a full record of activity at both the remote and the master control stations. In large and small systems, the use of intelligent remote terminals under the coordinated control of one master station will enhance operation with fewer personnel, thereby generating significant cost savings.

## SITE SECURITY AND ENERGY MANAGEMENT

The 7900 system can provide data acquisition to report and record the status of smoke and heat alarms, infrared and ultrasonic sensors, perimeter security sensors and door/window alarms. It can also provide control signals for door entry, lighting, heating and air conditioning, etc. by room or zone, thereby serving as both a security and an energy management system.

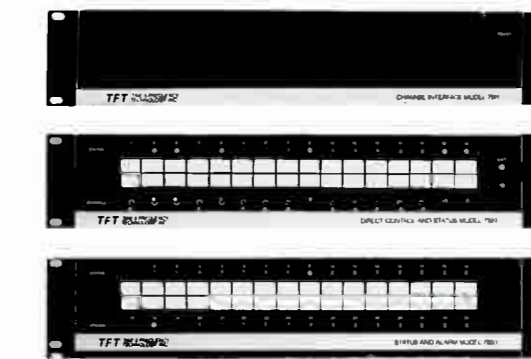
# Fingertip Front Panel Command Plus Instantaneous Status



# Fully Expandable to Fit Your Growth Needs

As shown in the system block diagram below, Series 7900 can be configured in a variety of ways. Up to sixty-three Model 7901s can be operated from a central Model 7900. Each 7901 controls a remote site and is assigned a unique "site number" via internal programming.

MODEL 7900 provides four separate communication lines, so that separate links can be connected to each of four remote sites. A Multi-Site Communication Expander provides



Model 7911 provides 16 floating inputs for analog signals from sensors and transducers. It also digitizes these signals before sending them to the 7901. 32 RAISE/LOWER control channels are provided through momentary relay contact closures. Up to six 7911's can be daisy-chain connected to a 7901.

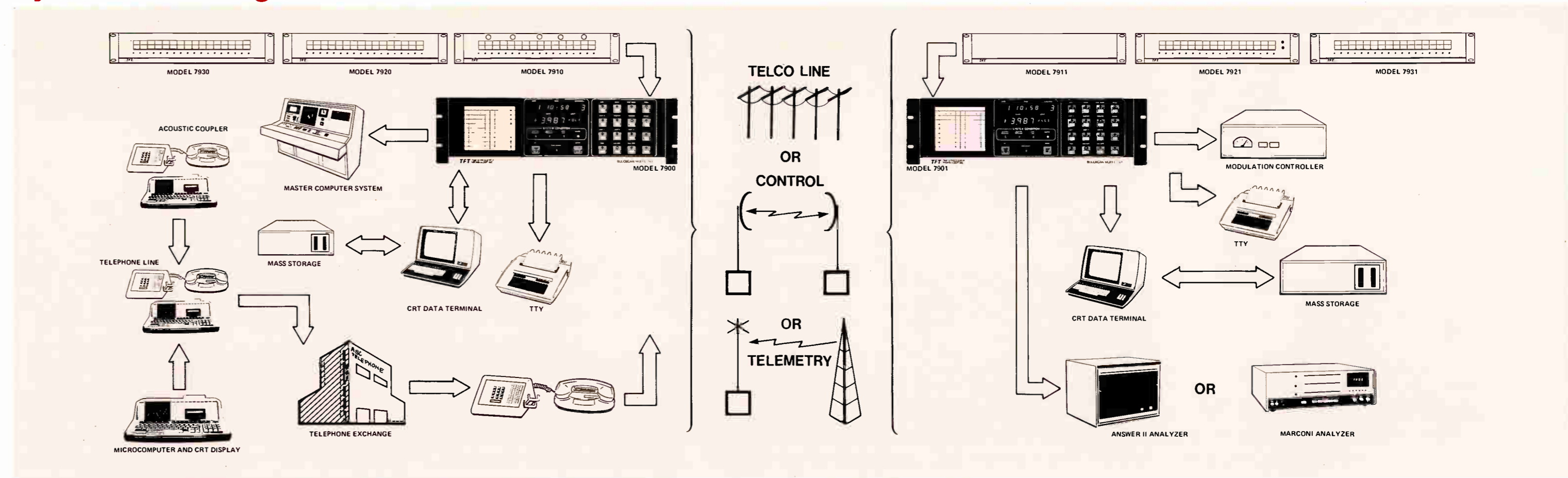
Model 7920/21 provides 16 status monitors by reacting to a contact closure or TTL logic "0". It also provides 16 TFT exclusive DIRECT ON/OFF control channels through relay contact closures. Up to six 7921's can be daisy-chain connected to a 7901.

Model 7930/31 provides 32 status monitor channels by reacting to a control closure or TTL logic "0". It does not have control channels. Up to three 7931's can be daisy-chain connected to a 7901.

At the master control site, a 7920 provides studio control and display for a corresponding 7921 at the remote site. Likewise, the 7930 provides studio display for the corresponding 7931 at the remote site. The 7920 and 7930 units at the master

control site are associated with which ever remote site is selected on the front panel of the 7900. So, if there are several remote sites (each with two 7921s) only two 7920s would be needed at the control site.

# System Block Diagram



# TFT

## BROADCAST MONITORS

### For Television . . .



#### MODEL 701

- Remote monitoring through antenna input
- Digitally settable modulation peak flashers
- Digitally displays visual and aural frequency errors
- Covers all UHF and VHF channels
- Built-in high accuracy aural modulation calibrator

#### MODEL 702

- Combines all modulation features of Model 701 in an economical package.
- 19-inch rack mounting adapter furnished

#### MODEL 701 Frequency and Modulation

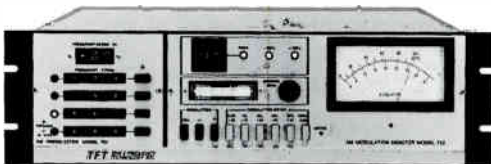
The Model 701 is an all-solid-state broadcast monitor optimized for off-the-air or on-site monitoring of all VHF and UHF broadcast transmitters. Digitally settable peak flashers display plus and minus aural modulation peaks simultaneously. Frequency measurement accuracy can be calibrated directly against NBS with a WWV receiver.

Additional features include an illuminated meter scale, remote meter and flasher outputs, optional SCA output and built-in high accuracy aural modulation calibrator. Sensitivity is 250 uV. FCC TYPE APPROVED.

#### MODEL 702 Aural Modulation

Model 702 is the modulation only version of Model 701. All features including digitally settable peak flashers, built-in modulation calibrator, remote meter and flasher outputs, illuminated meter scale and a 250 uV sensitivity are included. Model 702 is specifically designed for those applications not requiring frequency monitoring. FCC TYPE APPROVED.

### For AM Broadcast . . .

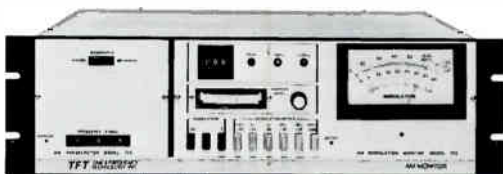


- Direct off-the-air operation
- Accuracy better than 1%
- Excellent transient response (no overshoot)
- Fast, accurate competitive comparisons
- Built-in modulation calibrators
- Digitally settable modulation peak flashers

#### MODEL 753 with 754 Preselector

TFT Model 753 not only makes extremely accurate AM proof-of-performance measurements, but with the Model 754 Preselector addition, it allows you to monitor local competitors at the touch of a button and accurately measure modulation and carrier frequencies. Built-in high accuracy allows you to modulate the transmitter to the maximum legal limits of +125% and -100% in absolute confidence.

As with all TFT broadcast monitors, operation is simple and precise. Just dial in the appropriate frequency, set the carrier level and get instant read-out at the touch of a button. Digitally settable modulation peak flashers are also provided and are activated when modulation exceeds pre-set limits. Key features of the Preselector include frequency synthesized digital tuning, digital readout of frequency error and a unique IF filter design for optimum off-the-air modulation monitoring. MODEL 753 FCC TYPE APPROVED.



#### MODEL 755 Preselector

The Model 755 Preselector is essentially the same as the Model 754, without the frequency measurement, and has one set of thumbwheel selectors. With a TCXO timebase option, the Model 755 can be used for carrier frequency monitoring by using an external frequency counter that has an accurate time base.



## For FM Broadcast . . .



- Direct off-the-air operation with Preselector
- Digital display of carrier and subcarrier frequencies
- Two RF inputs for local or remote use
- Preselector option for competitive comparisons
- Built-in modulation calibrator



- Phase-locked-loop stereo demodulation
- Separate left and right modulation monitoring
- Pushbutton selection of functions and ranges
- Remote metering outputs



- Precision filters for SCA performance measurements
- Digitally settable peak flashers
- Built-in modulation calibrator
- Multiple SCA channel capability

### MODEL 763 with 764 Preselector

Model 763 provides the same features for FM broadcast monitoring as Model 753 does for AM. In addition, both stereo and SCA monitoring capability can easily be added on. A high sensitivity preselector can also be added to Model 763 to provide fast, accurate off-the-air monitoring of local broadcast stations.

A full complement of modular plug-in options lets you tailor the 763 Monitor to your precise operational needs, building capability as you grow. All controls and calibrations are highly precise and easy to operate. Accuracy is within 1%. FCC TYPE APPROVED.

### MODEL 724A Stereo Monitor

The Model 724A is designed for use with Model 763 to provide all stereo monitoring requirements and proof-of-performance measurements. In addition to the latest linear and digital ICs, computer designed filters provide highly accurate separation and crosstalk measurements. With the Model 724A, you can make complete measurements of right channel modulation, left channel modulation, channel separation, crosstalk between main and sub channels, L+R, L-R, 38 kHz carrier suppression and 19 kHz injection level. Superior separation measurements are achieved through the use of a phase-locked-loop (PPL) to regenerate the 38 kHz suppression carrier from the 19 kHz pilot carrier. FCC TYPE APPROVED.

### MODEL 730A SCA Monitor

With Model 730A you can make complete and accurate measurements of injection level, modulation, S/N ratio and crosstalks. All measurement modes are selected by convenient front panel pushbuttons and, for added convenience, a 50 dB pushbutton meter attenuator is included. Furthermore, a wideband input is provided which allows you to make unrestricted distortion and frequency response measurements of the base band signal at the transmitter.

Model 730A also offers the user a choice of carrier frequencies for monitoring either the 41 kHz or 67 kHz subcarrier or other specified frequencies. When two subcarrier frequencies are included, selection is made by a front panel pushbutton. FCC TYPE APPROVED.

## For Emergency Broadcast . . .



- Complete modular design
- Frequency synthesized tunable AM receiver
- Dual channel FM receiver available

### MODEL 760 EBS System

The Model 760 EBS System is designed for broadcasters to meet Parts 73.940, 73.941 and 73.942 of the FCC Rules and Regulations for decoding and encoding the two-tone EBS alert signal. The modular construction of the system provides for maximum versatility and consists of a cabinet assembly, AM or FM receiver, two-tone decoder and two-tone generator. Two or three of these modules can be combined into a cost-effective operational EBS System. FCC TYPE ACCEPTED AND CERTIFIED.

**TFT** TIME AND FREQUENCY TECHNOLOGY, INC.  
3000 OLCOTT STREET, SANTA CLARA, CA 95051 (408) 246-6365 TWX No. 910-338-0584

## SPECIFICATIONS (cont.)

### Off-Frequency and Over-Modulation Alarm

Available as an option .....	Includes circuit to actuate user-supplied aural or visual alarm
Frequency limits .....	±1 kHz
Modulation limits .....	±100%

### Six-Digit Frequency Counter

Frequency range .....	10 Hz to 10 MHz
Input sensitivity .....	200 mv to 2 V RMS
Input impedance .....	500 k ohms. Shunt by 15 pF
Resolution .....	1 Hz
Display accuracy .....	±1 count
Time base aging rate .....	1 x 10 <sup>-8</sup> /day

### Physical and Environmental Specifications

Size .....	11" w x 8" h x 15" d
Weight .....	22 pounds (approx)
Power .....	115/230 V, 50-400 Hz, 45 watts max.
Cabinet .....	Portable or rack mount (with adapter)
Operating temperature .....	0° C to 50° C

## ACCESSORY EQUIPMENT

Model 703 super stable time base, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

Model 704 Remote Meter and Flasher Panel, 19" w x 5-1/4" h x 3" d. Duplicates the Modulation Meter and Peak Modulation Flashers of the Model 701. FCC type approved.

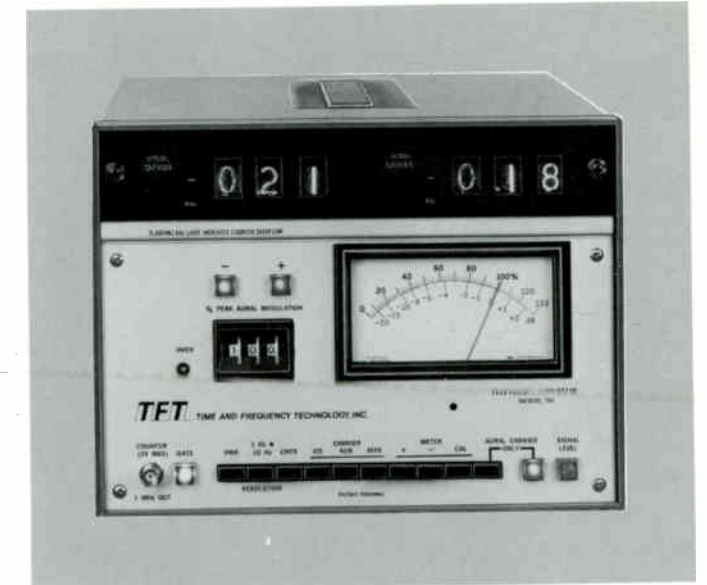
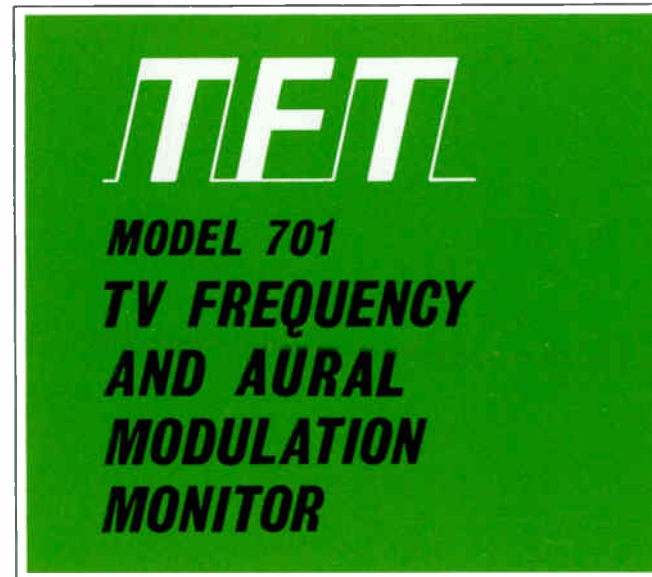
Model 725 Automatic Logging Adapter and Digital Clock, Analog Voltage Outputs of Visual and Inter-carrier Frequency Errors, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

Model 725A Combination of Model 703 and Model 725, 5.6" w x 8" h x 15" d. Mounts next to Model 701.

For more information and/or a demonstration, contact the factory at the address below, or your local representative.

Represented By

**TFT** TIME AND FREQUENCY TECHNOLOGY, INC.  
2950 SCOTT BLVD. - SANTA CLARA, CA. 95050 - (408) 246-6365



## UHF and VHF OFF-THE-AIR MONITORING, UP TO 18 MONTHS BETWEEN CALIBRATIONS

### FEATURES

- Covers All UHF and VHF Channels
- Off-the-Air Monitoring of Visual and Aural Frequency, and Percent Aural Modulation 250 μv Sensitivity
- Up to 18 Months Between Calibrations (VHF)
- Digital Display of Frequency Errors
- Internal Frequency Standard Can Be Calibrated Directly Against WWVB, with Optional WWVB Receiver
- Built-In Aural Modulation Calibrator
- Digitally Settable Peak Flashers Display Plus and Minus Peaks Simultaneously
- Silicon Transistor and IC Design
- Provision for Automatic Logging
- Usable as a 6-digit Precision Frequency Counter to 10 MHz
- Portable or Rack Mount
- Optional, Super-Stable Oscillator Provides Transmitter Stability of 1 x 10<sup>-9</sup> per Day
- Optional Off-Frequency and Over-Modulation Alarm
- FCC Type Approved #3-187

### GENERAL DESCRIPTION

The Model 701 is a state-of-the-art VHF-UHF TV Monitor designed and optimized for off-the-air monitoring of aural, visual and inter-carrier frequency and percent aural modulation. The input of the monitor consists of a channel filter and a double-balanced Schottky barrier diode mixer. As a result, intermodulation products generated in the instrument due to strong undesirable signals are several orders of magnitude lower than in an RF amplifier front end.

What's more, the Model 701 requires frequency calibration only every six months for UHF and only every 18 months for VHF. This is accomplished by the use of a precision, 5-MHz, oven-controlled crystal oscillator which synthesizes the local oscillators and which has a typical aging rate of 1 PPM/year.

Even greater stability can be provided by an accessory super stable 5-MHz crystal oscillator (Model 703) which has an aging rate of 1 x 10<sup>-9</sup> per day.

When the Model 701 and the Model 703 or Model 725A are used in conjunction with a VLF Comparator, the system is capable of monitoring trans-

