

**Instruction Manual
For
ATM-1600
NTSC Broadcast
Television Modulator**

**P/N 0020-5020
Rev.A, February 1992**

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LIST OF EQUIPMENT

Broadcast Television Modulator	5901-2031-XX
PCB Extraction Tool	6099-0027
Cable Power Cord, 3-Cond. Detachable	7923-0023
ATM-1600 Accessory Kit (F)	8000-2610
CABLE, COAX 6.00" F CONN (2 ea.)	5120-1060
TERMINATOR MALE BNC	5211-0026
PACKING SLIP	6910-0015
SCR. PHIL W/NYLON WSHR 10-32 X 5/8" (4 ea.)	7157-1010
PLASTIC BAG, 9" X 12" X 4 MIL RECLOSABLE	7600-0029
TERMINATION, 75 OHM, F DC-550 MHZ	5218-0028
ATM-1600 BROADCAST TV MOD. MANUAL	0020-5020
ATM-1600 Accessory Kit (BNC)	8000-2611
CABLE, COAX 6.00" BNC CONN(2 ea.)	5120-2050
TERMINATOR MALE BNC	5211-0026
PACKING SLIP	6910-0015
SCR. PHIL W/NYLON WSHR 10-32 X 5/8" (4 ea.)	7157-1010
PLASTIC BAG, 9" X 12" X 4 MIL RECLOSABLE	7600-0029
TERMINATION, 75 OHM, F DC-550 MHZ	5218-0028
ATM-1600 BROADCAST TV MOD. MANUAL	0020-5020
Optional Equipment	
Baseband Encoder Interface	9001-2037
Audio Subcarrier Processor	(not available at this printing)

EQUIPMENT SPECIFICATIONS

Video

Input	Composite NTSC video, negative sync.
Input Level	1.0 V p-p for 87.5% modulation. ± 6 dB adjustment range
Input Impedance	High impedance loop-through (for 75 ohm circuit)
Return Loss	30 dB minimum, 25 Hz to 6.0 MHz with 75 Ω , 1% external terminator (supplied)
Frequency Response	± 0.5 dB, 25 Hz to 4.18 MHz
White Level Clipper	Adjustable 85 - 95% (internal adjustment)
Modulation Range	To 95% modulation depth
Differential Gain	2% maximum at 87.5% modulation depth, 10-90% APL
Differential Phase	0.5° maximum at 87.5% modulation depth, 10-90% APL
Video Signal-to-Noise	>63 dB weighted, measured with Tektronix 1450-1
AM Hum and Noise	60 dB Minimum below 87.5% modulation depth
Sync Compression	0.25 dB maximum at 87.5% modulation depth
Tilt	1% maximum on 60 Hz squarewave
K-Factor, 2T Pulse	2%
Group Delay	Meets FCC Regulations Sec. 73.687 (a) (3) requirements for broadcast exciters
Video Sense	TTL Output: HI = 5 V, with Video in; LOW = 0 V, with no Video in

Audio

Input Type	Monaural: High-impedance bridging, (600 Ω (external) balanced or unbalanced) BTSC/MTS: 75 Ω unbalanced input
Input Level	Monaural: 0 dBm, ± 10 dB BTSC/MTS: 1.0 V p-p, ± 10 dB
Capability	Monaural or BTSC/MTS with switchable preemphasis network, or separate inputs. MTS bandwidth to 120 kHz
Frequency Response	Monaural: within ± 0.5 dB of 75 μ s preemphasis, 30 Hz to 15 kHz BTSC/MTS: Defined by stereo encoding unit
THD	Monaural: 0.5% maximum at ± 25 kHz deviation, 30 Hz to 15 kHz BTSC/MTS: Defined by stereo encoding unit
FM Hum and Noise	60 dB minimum below ± 25 kHz deviation, 30 Hz to 15 kHz, monaural
Inter-carrier Frequency Accuracy	4.5 MHz ± 100 Hz, any combination of specified modulation and operating temperature
BTSC/MTS Stereo Channel Separation SCA	40 dB minimum, 50 Hz to 10 kHz
Maximum Input Level	4.0 Volts peak-to-peak
Nominal Input Level (67 kHz Subcarrier)	2.2 Volts peak-to-peak

EQUIPMENT SPECIFICATIONS (CONT.)

IF Output

Output Type	Separate Visual and Aural IF outputs, and a combined IF output
Output Impedance	75 Ω
Output Return Loss	>16 dB
Output Level	+ 40 dBmV, minimum with normal setup, All input/output ports
Frequency Accuracy	± 200 Hz of 45.75 MHz visual or 41.25 MHz aural IF, any combination of specified modulation and operating temperature
ICPM	<3° at 87.5% modulation depth
Aural AM Noise	< -55 dB at 41.25 MHz
IF VSB Output Attenuation	Visual Carrier +0.7 to 4.18 MHz: ± 0.5 dB relative to + 200 kHz
IF Output Attenuation	Visual Carrier -1.25 MHz -38 dBc -2.25 MHz and below -60 dBc +4.75 MHz -38 dBc +5.25 MHz and above -60 dBc

External Signal Sources

IF Reference Signal	45.75 MHz CW carrier
Level	+ 30 to +50 dBmV
Impedance	75 Ω
Options	
Baseband Encoding	Optional interface for Zenith Z-TAC Encoder
4.5 MHz Aural Input	Optional input for 4.5 Mhz aural carrier, monaural or BTSC/MTS from off-air demodulator or stereo generator

Electrical

AC Power Input	90-260 VAC, 47-63 Hz
Maximum Input Power	19 Watts
Fuse	3AG, 1/2 amp slow blow for 115 VAC 3AG, 1/4 amp slow blow for 230 VAC

EQUIPMENT SPECIFICATIONS (CONT.)

Environmental

Operating Temperature	-30° to +50° C
Operating Humidity	95% maximum, non-condensing,

Mechanical

Size	1.75" H x 19" W x 17" D
Weight	12 lbs
Chassis	Steel

Internal Controls

BTSC/Mono audio selection
SCA Input (ON/OFF)
Internal/External 45.75 Mhz reference

Front Panel Controls

Power ON/OFF Switch
Video Modulation Control
Aural Carrier Control (level)
Audio Deviation

Front Panel Indicators

Audio Deviation Meter
Video Modulation Meter
-20 dB IF Test Point

EQUIPMENT SPECIFICATIONS (CONT.)

Rear Panel Connectors

AC Fuse Block
Audio Hi-Z (Input Terminal Block)
BTSC In (BNC)
SCA/ Aural Subcarrier In (BNC)
Video In (BNC)
Video Out (BNC)
Gate In (Z-TAC encoding) (F or BNC)
Aural Out (F or BNC)
Aural In (F or BNC)
Visual Out (F or BNC)
Visual In (F or BNC)
Comp IF Out (F or BNC)
IF Ref (F or BNC)
RF Out (F or BNC)
Video Sense (Terminal Block)

1.0 GENERAL

1.1 Introduction

The purpose of this manual is to introduce Catel's ATM-1600 Broadcast Television Modulator (ATM-1600), explain its options and features, and give some examples of its uses. In addition, detailed sections have been devoted to the installation and operation of the ATM-1600. The manual concludes with a thorough description of its circuitry and a parts list to order spare or replacement parts.

1.2 General Description

The ATM-1600 is a high performance modulator designed for use in broadcast television and broadband applications. Refer to Block Diagram, Figure 1-1. The modulator converts audio/video signals to IF carriers to drive a transmitter upconverter. The configuration described in this manual is for the NTSC format. However, PAL B/G, PAL I, or SECAM D/K versions of the ATM-1600 are available.

The ATM-1600 is composed of a chassis/power supply and two different modules: one for audio and another for video (refer to Figure 1-2). The design is based on the use of plug-in circuit boards which can be removed and/or replaced at will, e.g., an optional 4.5 MHz Audio Subcarrier Processor module could replace the Audio Modulator as required.

The ATM-1600 Broadcast Television Modulator chassis is designed for installation in standard (EIA) 19 inch racks, and occupies one (1) vertical mounting space (1.75 inches high). User adjustments, monitor points and bar graph modulation meters are located on the chassis front panel (refer to Figure 2-2). The input and output connectors are located at the rear along with an AC power input block and fuse holder (refer to Figure 2-3).

The ATM-1600 accepts baseband video and audio signals (monaural or BTSC) which modulate 45.75 and 41.25 MHz carriers respectively. Loop-out connectors for the aural and visual IF carriers are provided on the rear panel. Following the loop, the visual IF signal passes through a surface acoustic wave (SAW) filter to sharply define the passband edges. Next the aural and visual IF carriers are combined, when required, and sent to the composite IF output connector on the rear of the panel.

1.3 Features

1. Broadcast VSB-AM modulation
2. BTSC/MTS compatible
3. Surface acoustic wave (SAW) IF filtering
4. Selectable internal/external 45.75 MHz reference
5. Bar graph modulation meters

1.4 Options

4.5 MHz Audio Subcarrier Processor—Replaces the Audio Modulator when a 4.5 MHz audio subcarrier input is required (monaural or BTSC) versus a baseband audio input.

Zenith Z-TAC—Provides an interface to the video module for scrambling signals.

1.5 Applications

In its standard configuration the ATM-1600 accepts baseband audio and video from sources such as a satellite receiver, off-air demodulator, VCR or a live audio/video input. The audio may be monaural, 30 to 15 kHz, or BTSC/MTS, 30 Hz to 120 kHz. An optional 4.5 MHz Subcarrier Processor replaces the standard Audio Modulator when the audio source is at 4.5 MHz such as from a BTSC generator or off-air demodulator.

For broadcast use the aural and visual IF loops on the chassis rear panel provide access points to excite a transmitter upconverter and RF output amplifier. The same IF

loops allow the user to interface a variety of IF encoders to the ATM-1600 for scrambling purposes. An internal interface for the Zenith Z-TAC scrambling system is available as an option.

The NTSC version of the ATM-1600 may be changed to one of the other currently available versions (PAL B/G, PAL I or SECAM D/K) by ordering the appropriate audio/video modules.

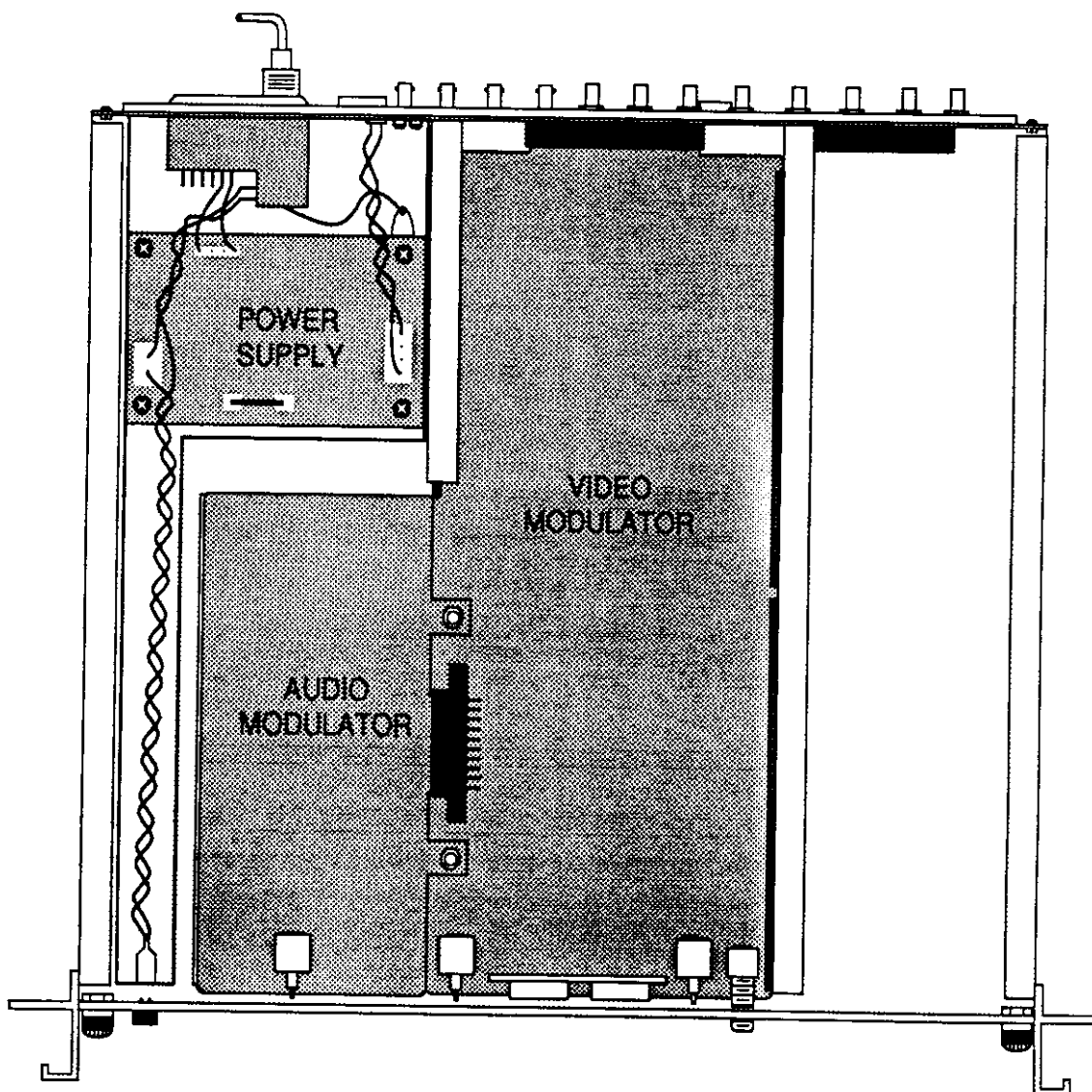


Figure 1-2
ATM-1600
Internal Top View

2.0 INSTALLATION

2.1 Introduction

Proper installation of the ATM-1600 will ensure peak performance, dependability and ease of operation. Installation includes the following steps:

- Receiving and Inspection
- Chassis Installation
- Power Requirements
- Cabling the Equipment

2.2 Receiving and Inspection

Inspect the shipping container for visible damage. If the container or packing materials are damaged, they should be saved in case a claim needs to be filed with the carrier. Any obvious damage to the container, packing materials, or equipment should be noted on the receiving papers at time of delivery. Notify the carrier as soon as reasonably possible in those cases where delivery is taken prior to finding suspected damage to the shipment.

If physical damage to the system is suspected, do not perform any operational test. This is to prevent operator exposure to potential hazards, and further damage to the equipment.

Catel tests every shipped product to ensure that all are operating correctly prior to shipment, and makes every effort to ensure that equipment will arrive in a safe and timely manner. However, if the equipment is not operational upon receipt, and there is no evidence of shipping damage, it may be necessary to return the equipment for repair or replacement. If so, contact the Catel Repair Department and request a return authorization (RA) number.

All returned equipment should be adequately packed with the RA number on the outside of the box. A packing slip should be included, stating the equipment defect, return shipping address and RA number.

2.3 Chassis Installation

The ATM-1600 chassis is intended to be mounted in standard (ELA) 19-inch racks. Installation will be made

from the front of the rack. A rack mount kit (P/N 8000-1601) is provided with each chassis. The chassis cabinet is equipped with handles used for mounting purposes. The handles are capable of supporting a fully loaded chassis provided all four rack mount bolts are used.

2.4 Power Requirements

The ATM-1600 requires a power source of 90 - 260 VAC 47-63 Hz single phase. Switching in the ATM-1600 is not required over this voltage range. Current consumption is less than .150 AC amperes. The unit is fused with a 1/2 amp slow blow for 115 VAC, or 1/4 amp slow blow for 230 VAC. See Figure 2-1 for fuse replacement; the Fuse Pull handle ejects the fuse after the power cord is removed and the fuse cover is slid to the left.

Warning

Before switching on the ATM-1600, its protective ground terminal must be connected to the AC power source ground. The main power cord should be inserted in an outlet with a protective ground contact. Do not negate the grounding protection by using an extension cable, power cord or auto transformer without a protective ground conductor. Failure to ground the ATM-1600 properly could result in serious personal injury.

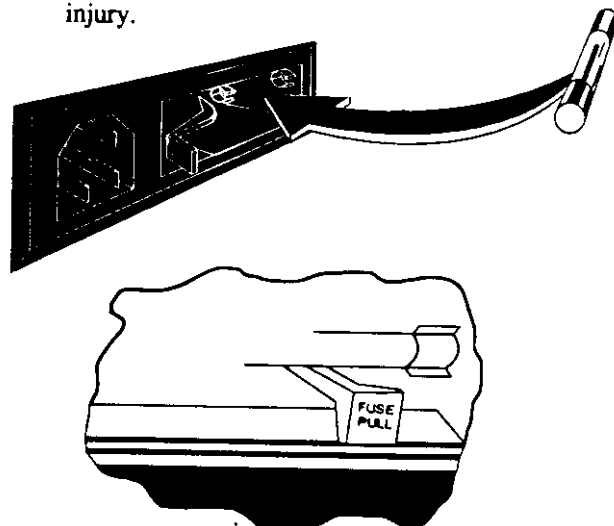


Figure 2-1
ATM-1600
Power & Fuse Assembly

2.5 Front Panel

The ATM-1600 front panel, its indicators, the possible adjustments, and the connectors available are shown in detail in Figure 2-2

- 1 **POWER**—Applies line voltage to the ATM-1600 power supply.
- 2 **AUDIO DEVIATION**—This control sets the aural carrier deviation with a baseband monaural or composite BTSC input.
- 3 **AURAL CARRIER**—This adjustment controls the aural carrier level at the COMPOSITE IF OUT rear panel connector (J13).
- 4 **AUDIO DEVIATION**—Deviation of the audio carrier is indicated on the front panel bar graph.
- 5 **VIDEO MODULATION-%**—This bar graph provides a visual indication of video modulation percentage.
- 6 **VIDEO MODULATION**—Adjust visual carrier modulation depth, with a baseband video input.
- 7 **IF TEST POINT -20 dB**—The “F” type connector allows monitoring of the composite IF output using a spectrum analyzer or other instruments. The signal at this test point is 20 dB down from the output.

2.6 Rear Panel

The ATM-1600 rear panel, its connectors, their uses, and loops required to implement special options are shown in detail in Figure 2-3.

- 1 **INPUT 90-260 VAC, 47-63 Hz**—Input connector for line power. This power module also contains the line fuse.
- 2 **AUDIO HI-Z, J2**—Accepts baseband audio (monaural) for direct FM modulation of the 41.25 MHz VCO in the Audio Modulator. Input level is 0 dBm, ± 10 dB. J2 is terminated externally with a 600 ohm impedance matching resistor, when bridging is not required.
- 3 **BTSC IN, J3**—Accepts a composite BTSC input for direct FM modulation of the 41.25 MHz VCO in the Audio Modulator. Input level is 1.0 V p-p ± 0.5 V.
- 4 **SCA/AURAL SUBCARRIER IN, J4**—Accepts an aural subcarrier at 4.5 MHz for direct upconversion to the 41.25 MHz aural IF carrier. May be used for monaural or stereo sound. Requires an optional 4.5 MHz Audio Subcarrier Processor to replace the Audio Modulator for operation. If the optional 4.5 MHz Audio Subcarrier Processor is not used this connector is used as an SCA input. SCA input level will be 2.5Vp-p, ± 0.5 V.

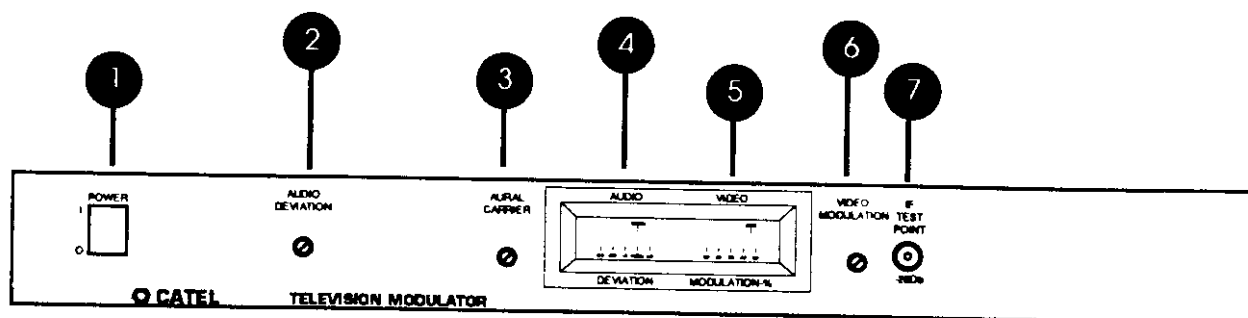


Figure 2-2
ATM-1600 Front Panel

5 VIDEO IN/OUT, J5, J6—Provides high impedance loop-through connections for the baseband video signal source. Connect the video source to J5 and terminate J6 with a supplied 75 ohm terminator, P/N5211-0026 for non-loop through operation.

6 IF REF, J7—Provides either input or output of 45.75 MHz CW IF carrier reference. Impedance in either operating mode is 75 ohms, nominal.

OUTPUT MODE (normal, stand-alone operating mode): Video Modulator switch (SW1) placed in INT. position. J7 provides 45.75 MHz CW output at +40 dBm V level. May be used as a 45.75 MHz source for coherent system operation or may be applied to a frequency counter for measurement of the visual IF frequency. J7 must be terminated with a supplied 75 ohm terminator (P/N 5218-0028, F; P/N 5211-0026, BNC) when not used as a signal source.

INPUT MODE: Video Modulator switch (SW1) placed in EXT. position, J7 accepts a 45.75 MHz CW input at a +40 dBm V level from an HRC comb generator or from another reference unit.

7 GATE IN, J8—Accepts timing pulses from a baseband encoding scrambler such as the Zenith Z-TAC system. Provides necessary timing information to the video modulator for proper clamp operation with scrambled video.

8 AURAL IN/OUT, J9, J10—Normally used as an aural IF source to drive a transmitter upconverter, also provides an interconnection between the modulator's 41.25 MHz aural IF circuits and an IF encoder for pay TV scrambling. Jumper J9 to J10 with supplied cable assembly (P/N 5120-1060, F; P/N 5120-2050, BNC) for IF signal continuity in non-scrambled operation when a composite output is needed at J13 COMP OUT. The aural IF input and output interface level is + 40 dBm V.

9 VIDEO SENSE, J16 —This monitors the presence of video on J5, VIDEO IN. An LED lamp or other alarm circuits may be connected between the Video Sense terminal and ground for remote indication of video status. The video sense output is TTL, with high equaling 5 V with video in, and low equaling 0 V with no video in.

10 VISUAL IF OUT/IN, J11, J12—Provides interconnections between the modulator's 45.75 MHz visual IF circuits and an IF encoder for pay TV scrambling. Jumper J11 to J12 with supplied cable assembly (P/N 5120-1060, F; P/N 5120-2050, BNC) for IF signal continuity in non-scrambled operation. The visual IF input and output interface level is +40 dBm V.

11 COMP IF OUT, J13—Provides a video plus audio composite IF output from the Video Modulator, or visual IF only if the rear panel aural IF loop through is broken. Normally used as an IF source to drive a transmitter upconverter.

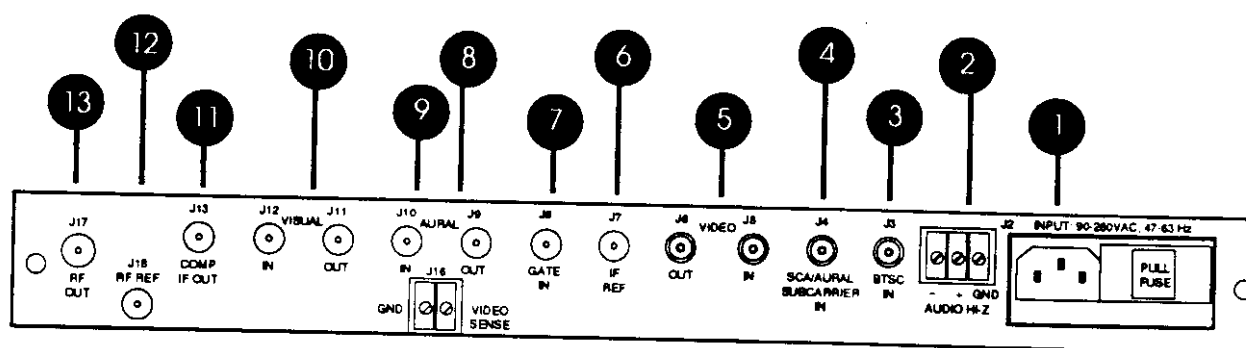


Figure 2-3
ATM-1600 Rear Panel

12 RF REF, J18—Not used

13 RF OUT, J17—Not used

2.7 Switch and Jumper Options

The ATM-1600 is designed with switch and jumper connections on the PC board assemblies which allow the user to select from various options on the assemblies. These options provide flexibility in applying the modules to specific and unique applications. Switch and jumper options on the video and audio modules should be set according to the information shown in their respective table's; Table 2 -1 for audio; Table 2-2 for video. Switch and jumper locations are shown on Figure 2-4 (Audio), Figure 2-5 (Video).

SWITCH/JUMPER	USE	COMMENTS
SW1 and SW2 in mono position	Allows for a baseband audio input, 30 to 15kHz, and enables audio pre-emphasis network.	The baseband audio input is into terminal strip J2 on the rear chassis panel. Input level should be 0dBm $\pm$ 10dB.
SW1 and SW2 in BTSC position	For composite BTSC input, 30 to 120 kHz and disables audio pre-emphasis network.	The composite BTSC input is into BNC connector J3 on the rear chassis panel. Input level should be 1.0 V p-p $\pm$ 0.5V.
J6 ON	Allows for a separate SCA input, mono audio only	SCA input should be on BNC connector J4 on the rear chassis panel.
J6 OFF	No SCA input.	Jumper should be in the OFF position with no SCA input.

Table 2-1
Audio Switch and Jumper Options

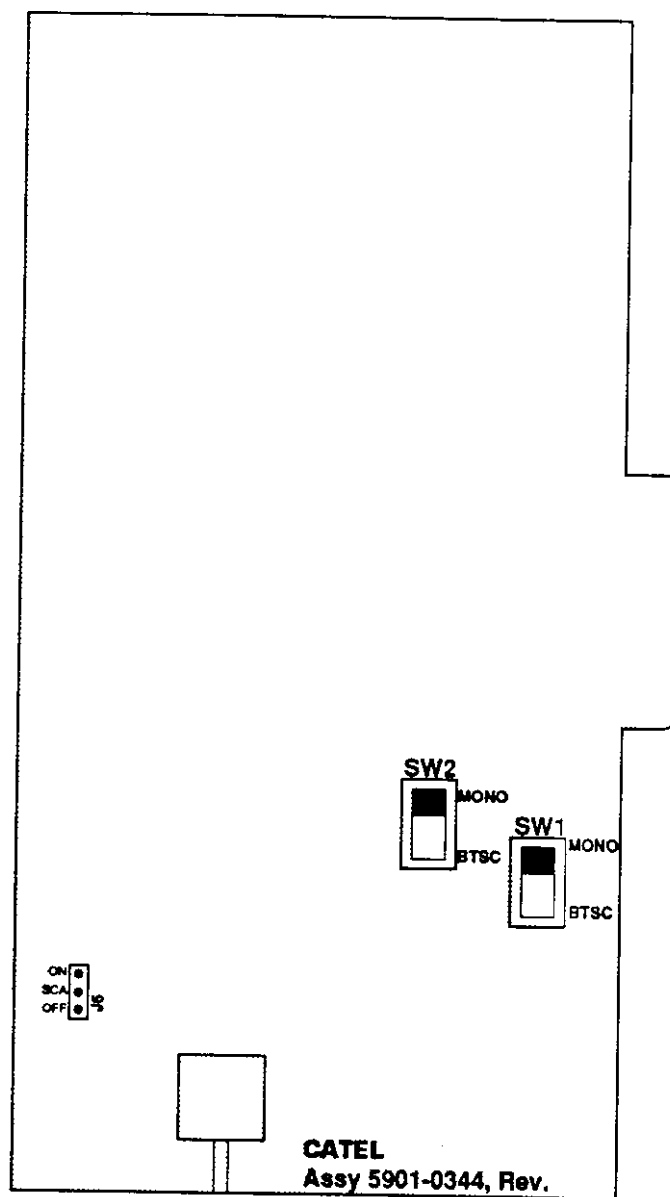


Figure 2-4
Audio Switch and Jumper Locations

SWITCH/JUMPER	USE	COMMENTS
SW1 internal	Selects the internal IF REF Frequency.	Provides 45.75 MHz CW output at +40 dBmV to J7
SW1 External	Selects an external IF REF Frequency.	CW 45.75 MHz signal input is on connector J7. Input level should be 40dBmV $\pm$ 10dB
J8, J2, J9	Used to plug in optional Z-TAC interface board.	This optional board allows use of the Zenith Z-TAC scrambling system.
J10 pins 2 to 1	Combines the visual and aural IF carriers after the IF SAW filter.	Normal.
J10 pins 2 to 3	Combines the visual and aural IF carriers before the IF SAW filter.	An option used in systems where the IF carriers are encoded.

Table 2-2
Video Switch and Jumper Options

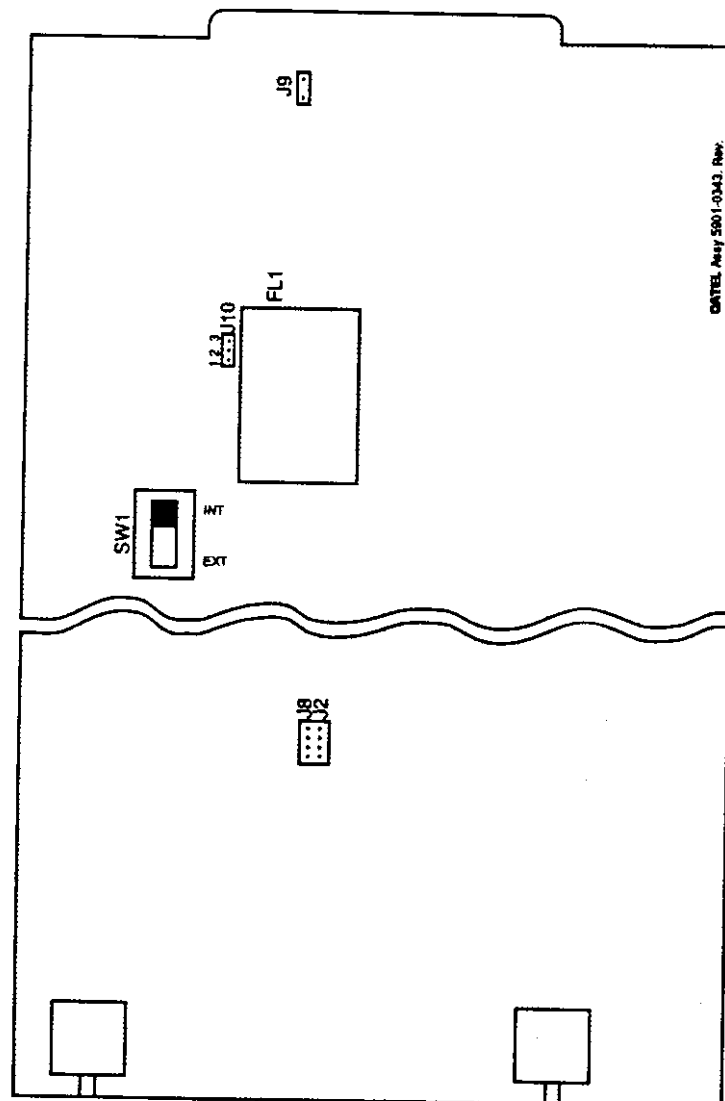


Figure 2-5
Video Switch and Jumper Locations

2.8 Module Removal/Installation

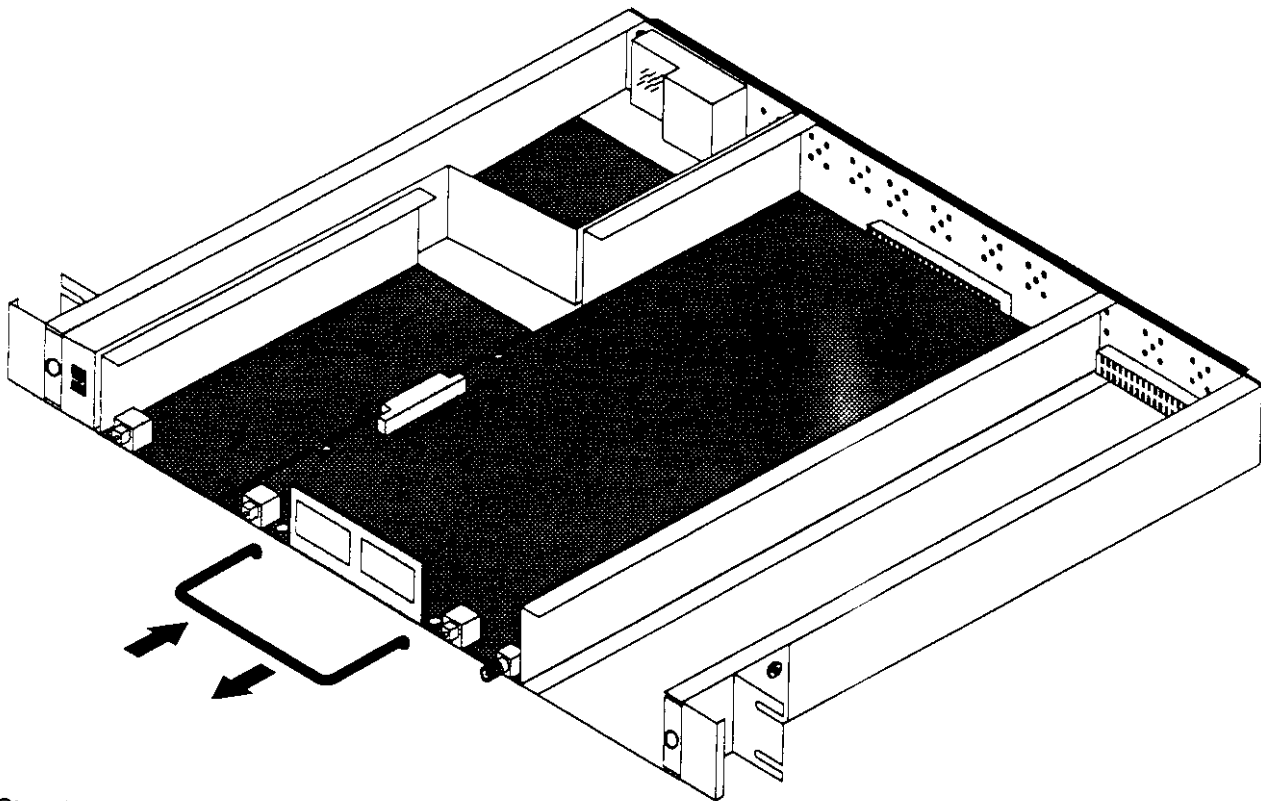
The ATM-1600 modules are configured and installed at the factory, however they may be removed to change internal switch settings or to be replaced, e.g., an optional 4.5 MHz Audio Subcarrier Processor could replace the Audio Modulator if required.

The ATM-1600 ON/OFF power switch must be in the OFF position prior to module removal or installation.

To remove the modules, loosen the two thumb screws and

remove the ATM-1600 front panel. Using the ATM-1600 PCB Extraction Tool (P/N 6099-0027) remove the Audio and Video Modulator modules as one assembly as shown in Figure 2-6. Remove the two bolts holding the modules together; the two modules may now be separated.

To install the modules, insert a module (either the Audio Modulator or 4.5 MHz Audio Subcarrier Processor) into the edge connector of the Video Modulator module, install the two bolts. Reinsert both modules as one assembly into the ATM-1600 chassis. Replace the chassis front panel and secure with the two thumb screws.



Step 1
Insert Extraction Tool from the top of the video board into the holes provided.

Step 2
Remove both video and audio boards at the same time by pulling away from the chassis.

Figure 2-6
PC Board Removal
(Internal View)

2.9 Cabling the Equipment

Input and output connections will vary depending on the user applications. For the most common video, audio, and IF modulator connections refer to the following figures.

Figure 2-7, ATM-1600 rear panel connections with baseband video and audio inputs (monaural) and SCA input (selectable) or composite BTSC audio input (selectable).

Figure 2-8, ATM-1600 rear panel connections with baseband video and 4.5 MHz audio subcarrier input (optional) BTSC or monaural.

Figure 2-9, ATM-1600 rear panel connections, encoded visual/aural IF.

Figure 2-10, ATM-1600 rear panel connections baseband scrambler.

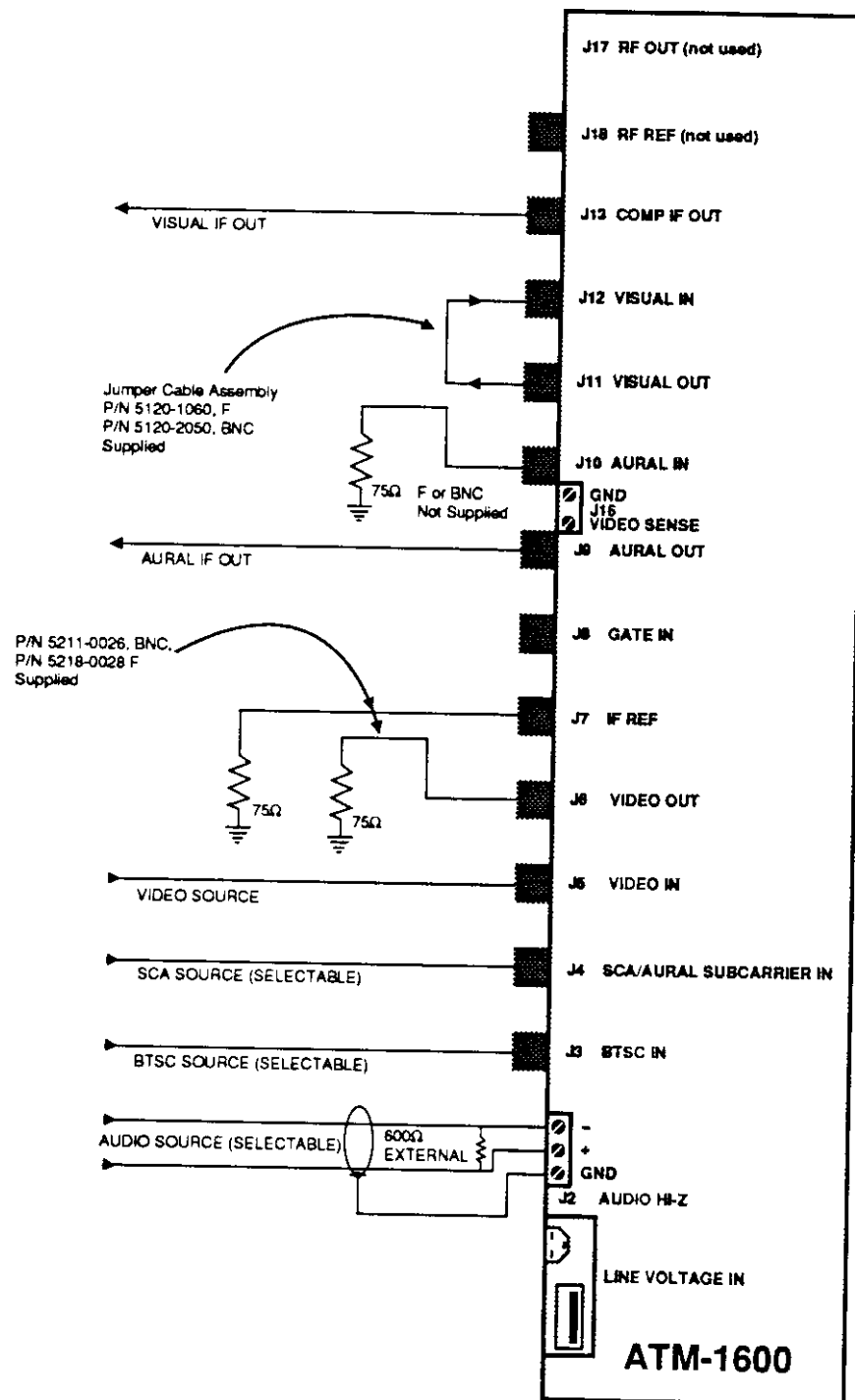


Figure 2-7
Normal Input/Output Connections

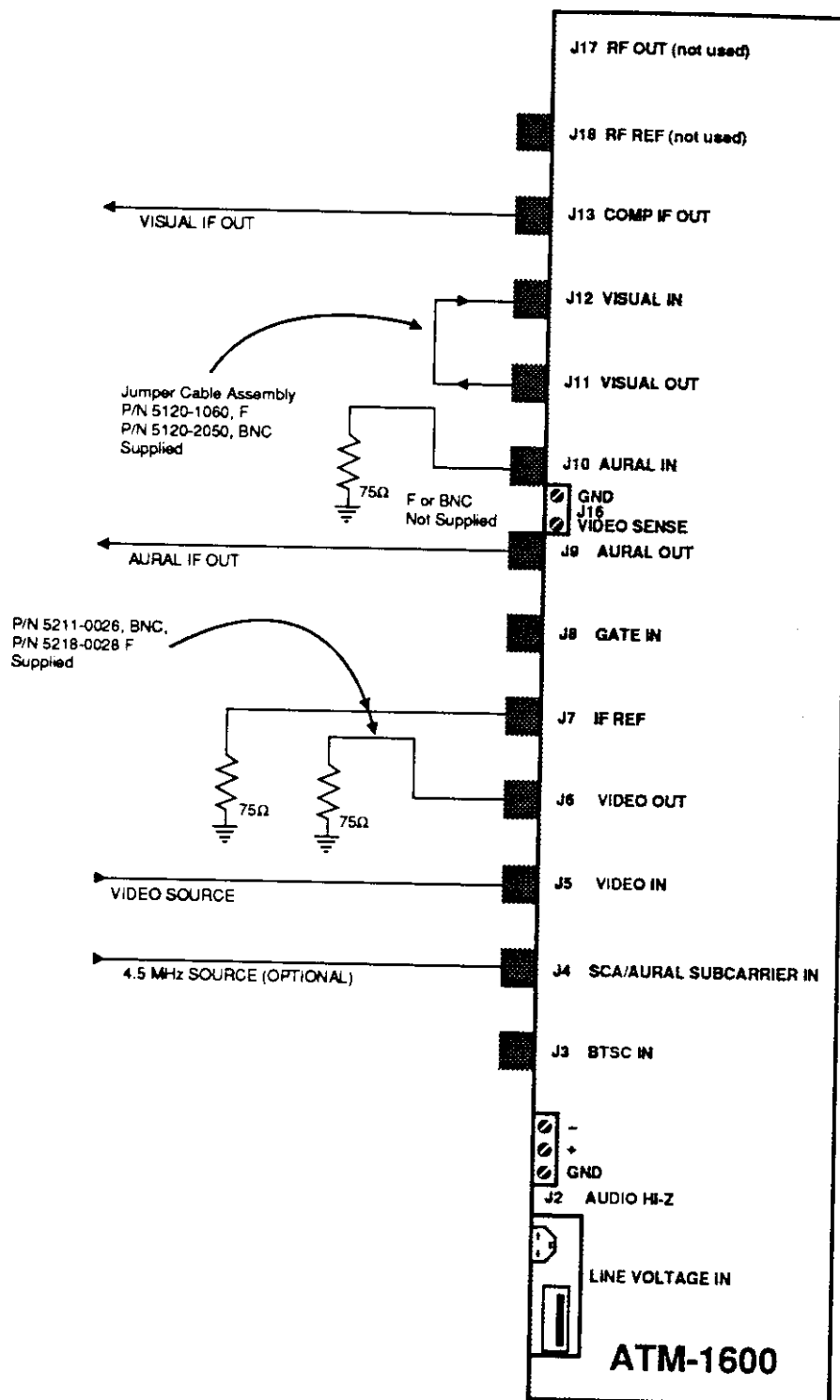


Figure 2-8
Input/Output Connections with Optional 4.5 MHz Audio Subcarrier Input

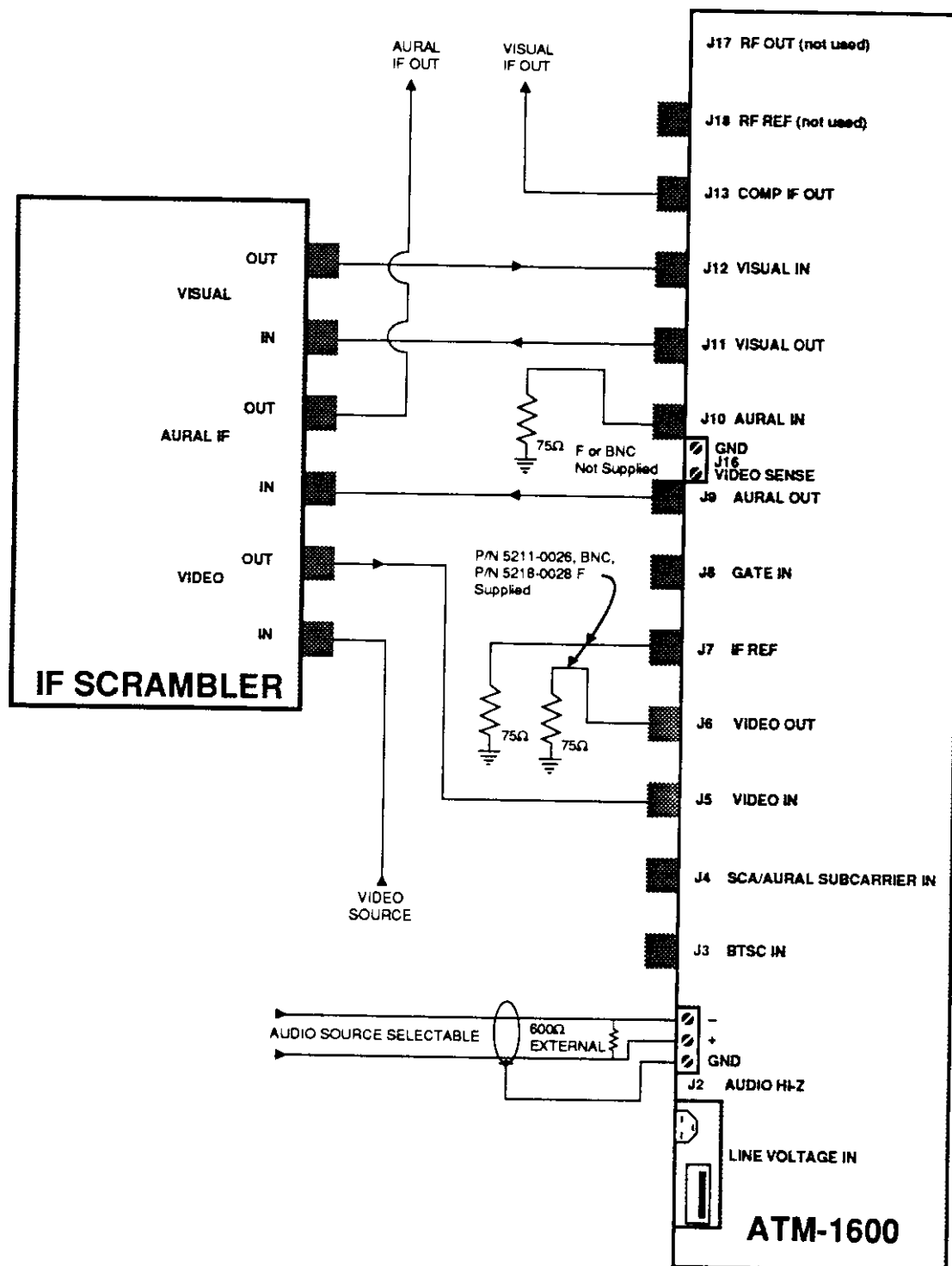


Figure 2-9
 Encoded Visual/Aural IF Connections

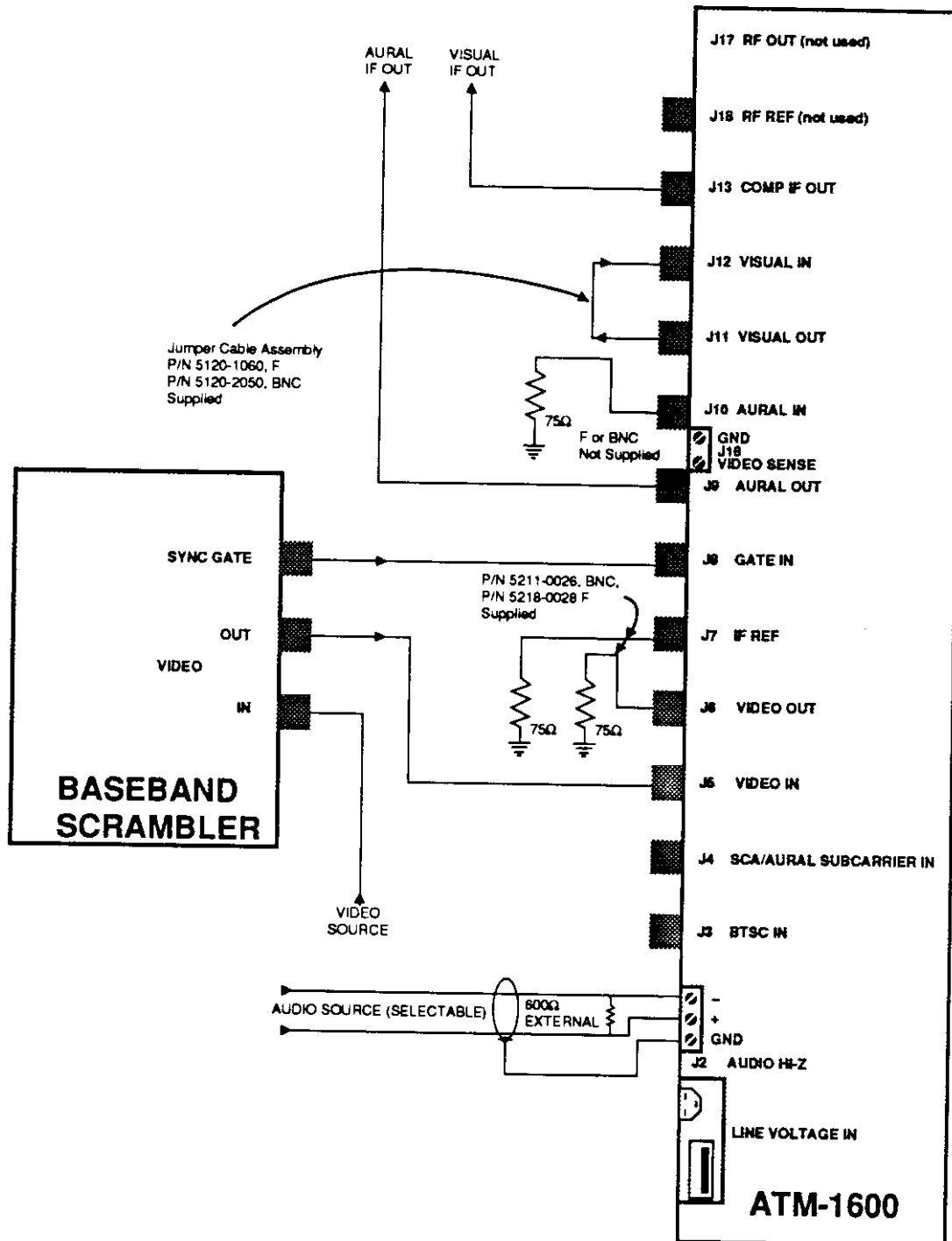


Figure 2-10
Baseband Scrambler Connections

3.0 OPERATION

3.1 Introduction

Procedures in this section describe how to adjust the ATM-1600 for optimum performance. The equipment has been thoroughly tested at the factory and only minor adjustments should be required.

3.2 Setup

Connect coax cables and audio leads to the rear chassis panel in accordance with the instructions in Section 2 of this manual and as user applications dictate.

The following test equipment will be required for proper adjustments of the ATM-1600.

RF Spectrum analyzer, 50 MHz Capability
Video test generator or video source
Audio oscillator or audio source
BTSC generator with composite or 4.5 MHz output
Frequency Counter
TV Demodulator
Waveform Monitor
Vectorscope
Step Attenuator

Plug the AC power cord into the power line module and the AC power source. Place the POWER ON/OFF switch, located on the front panel, in the ON position.

3.3 Video Modulation Adjustment

Connect a video test generator to J5 (VIDEO IN) of the ATM-1600 and set it at a level that is standard for the system. Select a full-field test signal with full video amplitude. A color bars or un-modulated stair-step signal is preferred. Ensure the video loop through at J6 (VIDEO OUT) is terminated.

Connect a spectrum analyzer to the front panel IF TEST POINT. The modulated visual IF carrier signal should be approximately +20 dBmV at this "F" type connector. Use the following spectrum analyzer settings:

Frequency	45.75 MHz for NTSC
Bandwidth	Maximum or > 300 kHz
Scan Width	Zero
Trigger	AC Line
Video Filter	None
Scan time	2 msec/division or adjusted to display at least one picture field.

Fine tune the spectrum analyzer for maximum display peak amplitude of the visual IF signal. Adjust the amplitude and log dB/division controls for nearly a full scale display.

The modulation percentage is read directly in decibels as the difference between the peak (sync tip) and the minimum (peak white) of the video waveform. Use the following table to convert the dB ratio to percentages.

Ratio	Modulation %
14 dB	80
16 dB	84
18 dB	87.5*
20 dB	90

Table 3-1
dB/Modulation Ratio Table

If required, adjust the VIDEO MODULATION control on the ATM-1600 front panel to produce a peak-white video modulation percentage of 87.5% on the spectrum analyzer. The ATM-1600 front panel VIDEO MODULATION indicator should read 87.5% also.

3.4 Audio Deviation Adjustment, Monaural

The AUDIO DEVIATION control on the ATM-1600 front panel is factory adjusted to produce 25 kHz peak deviation with a 400 Hz, 0 dBm audio input. With this test tone input to terminal strip J2 (AUDIO), terminated with a 600 ohm load, the front panel AUDIO MODULATION meter will indicate -6 dB. The AUDIO DEVIATION control can compensate for different audio input levels and should be adjusted to obtain a maximum indication of -6 dB on the front panel meter.

The following procedure has been provided for verification and troubleshooting purposes.

On the ATM-1600 rear panel connect an audio oscillator to J2 (AUDIO), terminated with a 600 ohm load. Set the oscillator output frequency, using a counter, to 10396 Hz, and the output level for -14.2 dBm into 600 ohms.

Connect a spectrum analyzer to J9 (AURAL OUT) on the chassis rear panel. The modulated aural IF carrier should be approximately +40 dBmV at this connector. Use the following spectrum analyzer settings.

Center Frequency:	41.25 MHz
Bandwidth:	3 kHz
Scan width:	20 kHz/division
Trigger:	AC line
Scan time:	2 msec
Video filter:	None

The aural carrier should have multiple sidebands 10396 Hz away. When the deviation is at 25 kHz, the aural carrier power will be zero. The sidebands will contain all the signal energy. This indicates the first Bessel modulation null of the carrier. If required, adjust the AUDIO DEVIATION control on the ATM-1600 front panel for the first Bessel null.

A 400 Hz test tone may now be inserted to J2 (AUDIO) of the ATM-1600. The test tone output level should be 0 dBm

into 600 ohms. The aural IF carrier deviation will be 25 kHz peak and the front panel AUDIO MODULATION meter should indicate -6 dB.

3.5 Audio Deviation Adjustment, Composite BTSC Stereo

Ensure the Audio Modulator switch options are configured for BTSC input. Refer to Table 2-1 of this manual. The AUDIO DEVIATION control on the ATM-1600 is factory adjusted to produce 50 kHz peak deviation with a composite BTSC input of 1.0 V p-p with the BTSC input to J3 (BTSC IN) on the rear panel. The front panel AUDIO MODULATION meter will indicate 0 dB maximum. The AUDIO DEVIATION control can compensate for different BTSC input levels and should be adjusted to get a maximum indication of 0 dB on the front panel meter.

The following procedure has been provided for verification and troubleshooting purposes.

Connect an audio oscillator to J3 (BTSC IN) of the ATM-1600 rear panel. Set the oscillator output frequency, using a counter, to 10396 Hz, and the output level for 0 dBm into 75 ohms.

Connect a spectrum analyzer to J9 (AURAL OUT) on the chassis rear panel. The modulated aural IF carrier should be approximately +40 dBmV at this connector. Use the following spectrum analyzer settings.

Center Frequency:	41.25 MHz
Bandwidth:	3kHz
Scan width:	20 kHz/division
Trigger:	AC line
Scan time:	2 msec
Video filter:	None

The aural carrier should have multiple sidebands 10396 Hz away. When the deviation is at 25 kHz, the aural carrier power will be zero. The sideband will contain all the signal energy. This indicates the first Bessel modulation null of the carrier.

If required, adjust the AUDIO DEVIATION control on the ATM-1600 front panel for the first Bessel null. The front panel meter will indicate -6 dB.

A composite BTSC signal may be inserted into J3 (BTSC IN) of the ATM-1600. The BTSC level should be 1.0 V_p into 75 ohms. The aural IF carrier will deviate as much as ± 50 kHz. The front panel AUDIO MODULATION meter should indicate a maximum of 0 dB.

3.6 Subsidiary Communications Authorization (SCA) input

Ensure the Audio Modulator switch options are configured for monaural/SCA input. Refer to Figure 2-4 and Table 2-1.

Connect the SCA subcarrier source to J4 (SCA/AURAL SUBCARRIER IN) of the ATM-1600 rear panel.

Connect a spectrum analyzer to J9 (AURAL OUT) on the chassis rear panel. The SCA modulated aural IF carrier should be approximately +40 dBmV at this connector. Adjust the analyzer to clearly resolve and display the SCA subcarrier.

Modulation of the aural IF carrier by the SCA subcarrier must not exceed FCC Regulations, (Sec. 73.682 (c)). Normally, the SCA subcarrier is set for approximately -18 dB relative to the 41.25 MHz aural IF carrier level. If required, adjust the SCA subcarrier source to achieve a -18 dB level relative to the 41.25 MHz aural IF carrier. The audio deviation meter does not accurately (understates) display the SCA deviation; therefore, it should not be used to set the SCA levels.

3.7 Audio Carrier Level Adjustment, Monaural/BTSC

The 41.25 MHz aural IF carrier level is adjustable only if the aural IF loop through is connected on the chassis rear panel. The IF output is on J13 (COMP IF OUT) where both the aural and visual IF are present.

Connect a spectrum analyzer to J13 (COMP IF OUT) on the ATM-1600 chassis rear panel. Adjust the analyzer to resolve and display both the aural and visual IF carriers. The visual IF (45.75 MHz, NTSC) carrier level should be +40 dBmV; the aural IF (41.25 MHz, NTSC) carrier level will be dependent on the front panel AURAL CARRIER control.

The maximum aural carrier power is 20% of peak visual carrier power, and the minimum is 10% (see FCC Regulations Sec. 73.1570 (c) (2)). Normally the aural IF carrier is set for -8 dB relative to the visual IF carrier level, in order to comply with Sec. 73. If required, adjust the AURAL CARRIER control to achieve an aural carrier level of -8 dB relative to the visual IF carrier level.

3.8 4.5 MHz Subcarrier Input, Monaural/BTSC

If the 4.5 MHz Audio Subcarrier Processor module has not been installed, refer to Figure 2-6 module removal/installation procedures.

Connect a 4.5 MHz subcarrier source to SCA/AURAL SUBCARRIER IN (J4) on the ATM-1600 rear panel. Subcarrier input level should be +35 dBmV, ± 5 dB into 75 ohms.

The AUDIO DEVIATION meter and the AUDIO DEVIATION control will not be operating. The audio deviation is set by the 4.5 MHz subcarrier source.

The aural IF carrier level at J13 (COMP IF OUT) may be set by the ATM-1600 front panel control AURAL CARRIER.

3.9 External 45.75 MHz Input

Ensure the Video Modulator switch options are configured for an external 45.75 MHz input. Refer to Figure 2-5 and Table 2-2.

On the ATM-1600 rear panel, J7 (IF REF) accepts a 45.75 CW input at a +40 dBmV level from an HRC comb

generator or from another reference standard. The resulting aural and visual IF signals may be monitored on the front panel IF TEST POINT, provided the IF loop outs are connected on the chassis rear panel.

3.10 Visual IF Frequency Calibration

Ensure the video modulator switch SW1 is configured for INT, refer to Figure 2-5 and Table 2-2.

On the ATM-1600 rear panel, remove the 75 ohm terminator from connector J7, IF REF, and connect a frequency counter.

The ATM-1600 visual output frequency should be at $45.75 \text{ MHz} \pm 200 \text{ Hz}$. If not, adjust L12 which is accessible through an opening in the ATM-1600 Top Panel, labeled IF OUTPUT FREQ. See Figure 3-1. Use a plastic inductor (hex head) alignment tool for this adjustment. Remove the frequency counter and replace the 75 ohm terminator.

3.11 Visual Output Level Calibration

Connect a spectrum analyzer to J13 COMP IF OUT. The measured output level of the 45.75 MHz visual IF carrier should be +40 dBmV. If not, adjust R176 which is accessible through an opening in the ATM-1600 Top Panel, labeled IF OUTPUT LEVEL. See Figure 3-1. Use a small (flat bladed) screwdriver for this adjustment.

3.12 Calibration for White Level Clipper, Video Frequency Response and Differential Phase

Connect the test equipment as in Figure 3-2. Set the waveform generator for a COMPOSITE output. Set the demodulator to SYNCHRONOUS, SYNC TIP detection and SOUND TRAPS OUT. Set the step attenuator to 0 dB attenuation.

3.12.1 White Level Clipper

Adjust R42 WHITE LEVEL CLIP, which is accessible through an opening in the ATM-1600 Top Panel, for its maximum counter-clockwise position. See Figure 3-1. Use a small (flat bladed) screwdriver for this adjustment.

Temporarily set the video modulation depth to 100% by adjusting the VIDEO MODULATION control on the ATM-1600 front panel, to a point where the video peaks are at 120 IRE as seen on the waveform monitor. Readjust WHITE LEVEL CLIP (R42), to a point just below amplitude compression. Reset the front panel VIDEO MODULATION control back to 87.5%.

3.12.2 Video Frequency Response

Set the waveform generator for a MULTIBURST WAVEFORM. Adjust R6 VIDEO PEAK, which is accessible through an opening in the ATM-1600 Top Panel, for best multiburst flatness from the lowest frequency burst at 0.5 MHz to the highest frequency burst at 4.18 MHz. See Figure 3-1. Use a small (flat bladed) screwdriver for this adjustment.

3.12.3 Differential Phase

Set the demodulator to SYNCHRONOUS, SYNC TIP detection with ZERO CARRIER REF. ON and sound TRAPS OUT. Set the step attenuator to 1.0 dB attenuation. The right-hand step chroma peak should be at 105 IRE units, with the zero carrier reference at 120 IRE units.

Calibrate the vectorscope vector length to the graticule circle. Set the demodulator to ENV. detector mode, and the vectorscope to DIFF. PHASE.

Adjust DIFF PHASE control C60 which is accessible through an opening in the ATM-1600 top panel, to minimize the differential phase reading. See Figure 3-1. Use a small (flat bladed) screwdriver for this adjustment.

Switch the demodulator between ENV. and SYNCHRONOUS, SYNC TIP detection modes and adjust the DIFF. PHASE control to minimize measured differential phase in both detection modes. The resulting differential phase in both detection modes should be less than 0.3° .

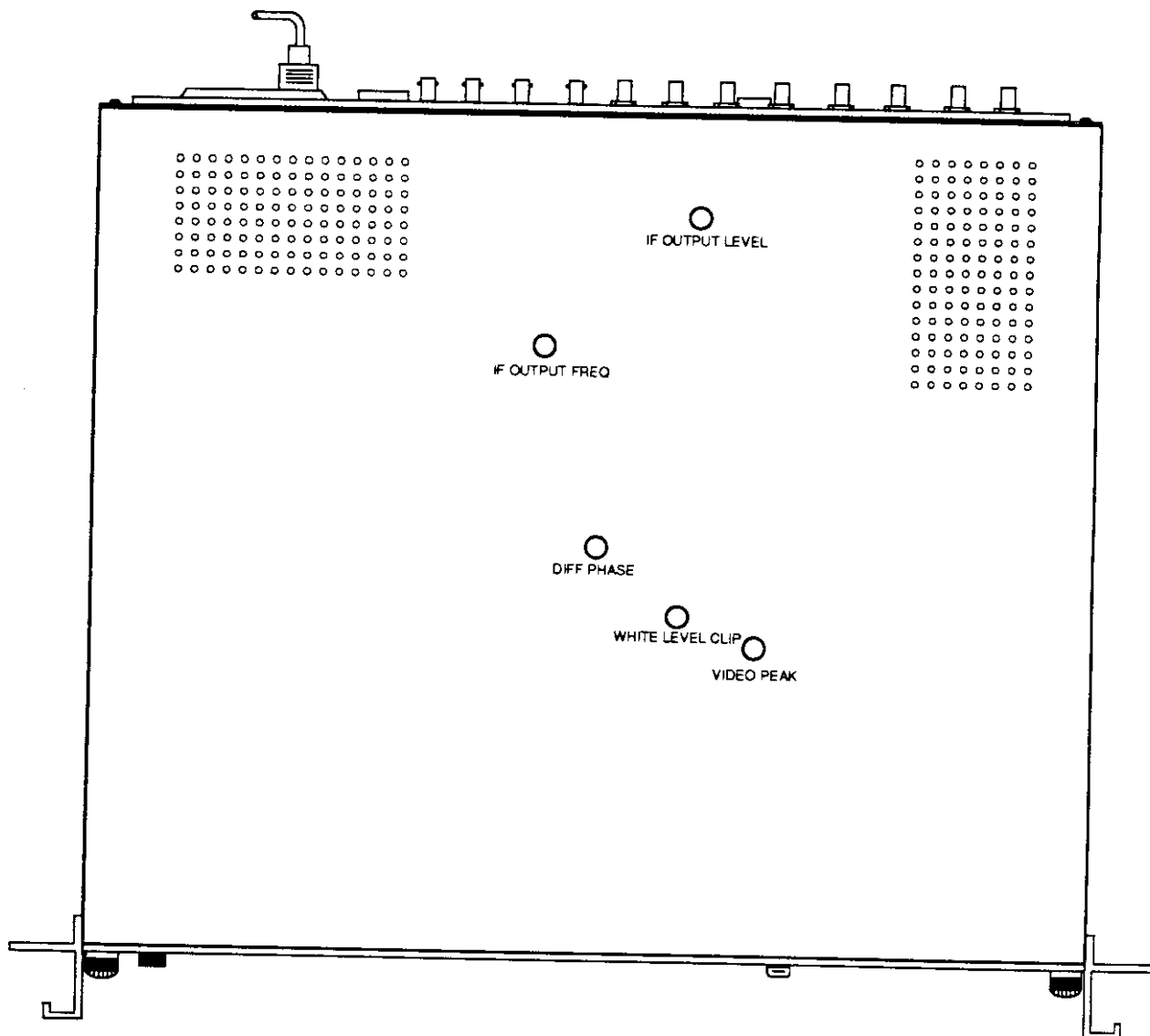


Figure 3-1
Adjustment Access through Top Panel

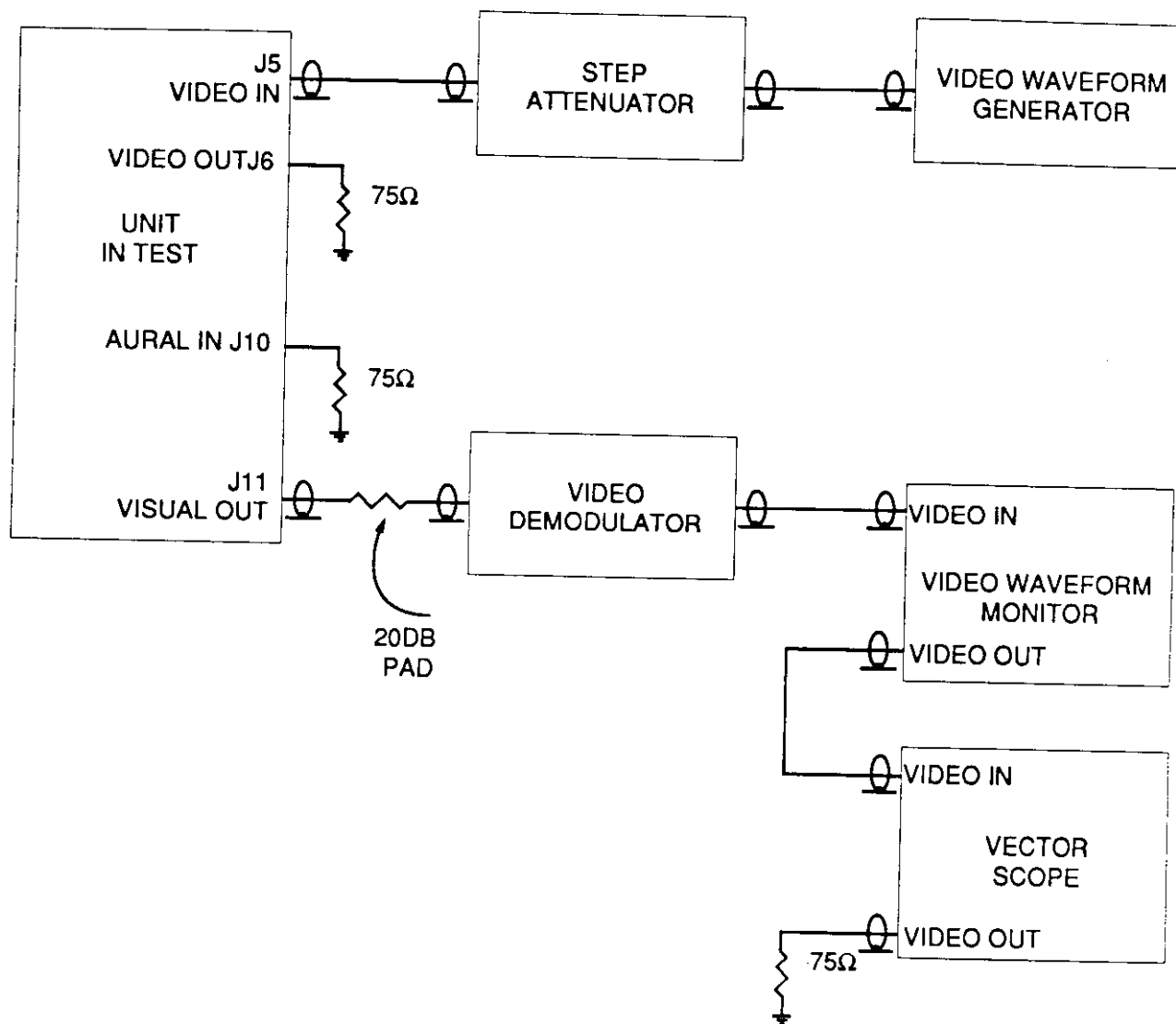


Figure 3-2
Video Modulation Waveform Tests

4.0 CIRCUIT DESCRIPTION

4.1 Introduction

Information in this section describes each module individually. If a module contains PC board switch or jumper options, the locations are illustrated in Section 2. Schematic drawings have been provided in this Section to facilitate understanding of the equipment.

4.2 Chassis

The ATM-1600 chassis consists of the following: basic steel enclosure, removable front panel and removable sub-chassis with +18 VDC universal switching AC power supply and back plane board. The chassis will accept one audio/video assembly with provision for an RF converter assembly.

User adjustments to the audio and video modules are made through openings in the chassis front panel, which also provides for the modulator ON-OFF switch, Modulation Indicators and the IF test point; refer to paragraph 2.5. Two thumb screws allow removal of the front panel for audio/video assembly, access or replacements; refer to paragraph 2.8.

Non-user calibration adjustments for various video and IF parameters are accessible through openings in the Chassis Top Panel; refer to paragraph 3.12

The internal +18 VDC power supply accepts any input from 90 to 260 VAC, 47 to 63 Hz. No switching or adjustments to the sub-chassis or power supply are necessary. The power supply should be properly fused for safe operation; refer to paragraph 2.4.

Refer to the schematic diagram of Figure 4-1 for power supply circuit design information. The input AC line voltage is applied to the input rectifier DB1 and filter C7. The resulting DC voltage passes to the switching transformer T2 and the switching power MOSFET Q1. The switching frequency is 30 kHz with a maximum duty

cycle of 85%. The T2 output voltage is rectified and filtered by D7 and its associated LC network. The resulting +18 VDC output at TB2 is set by VR1. Overvoltage protection is provided by DZ1 and SCR1.

A small portion of the DC voltage is fed back to the output voltage sense circuit IC1 and IC2 which vary the duty cycle of the current mode controller IC3. The controller supplies gate drive to the MOSFET switch. This voltage control loop maintains a constant voltage at the DC output terminal, TB2.

Overload protection is provided by the MOSFET source resistor R3 and the current mode controller IC3. The voltage at pin 3 of IC3 is monitored and compared to a level derived from the output voltage sense circuit IC1 and IC2. Abnormal operating conditions occur when the power supply output is overloaded or if output voltage sensing is lost. Under these conditions the current mode controller, IC3 will shut off the gate drive to MOSFET switch Q1.

Input/output connections as well as internal module connections and DC routing are made through a common back plane board and sub-chassis wiring; refer to Figure 4-2.

4.3 Audio Modulator

Refer to the schematic diagram Figure 4-3 for circuit design and to Figure 2-4 for switch and jumper options locations. The Audio Modulator is a direct FM transmitter designed to supply an aural IF signal at a frequency of 41.25 MHz for NTSC.

Input to the unit is switchable from baseband audio, through a balanced, bridging input, to a composite BTSC signal, through an unbalanced 75 Ω input via SW1 and SW2. The input networks are bridged by an audio amplifier U1A that feeds an audio buffer amplifier U1B through potentiometer R1, used as a level control (AUDIO DEVIATION, front panel). The audio buffer amp drives an AC/DC converter circuit and the modulator VCO, and provides the pre-emphasis characteristic. The 75 μ sec pre-emphasis is removable via SW1.

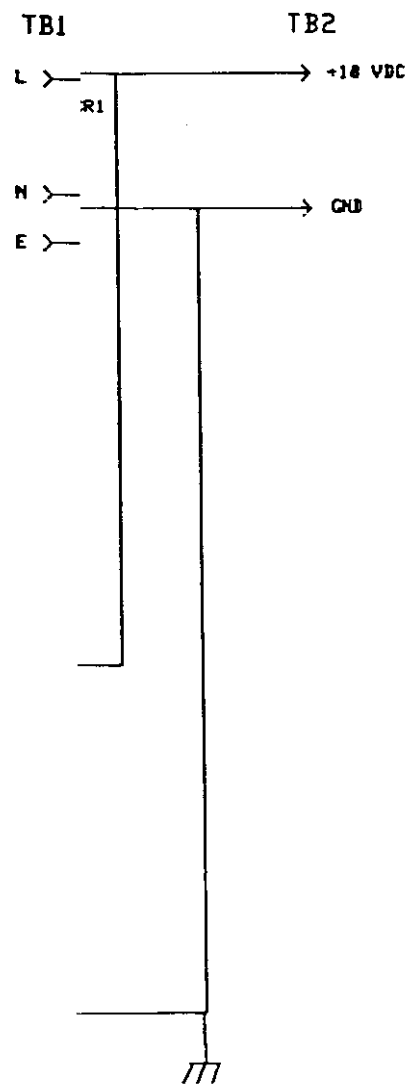


Figure 4-1
Schematic Diagram, Power Supply

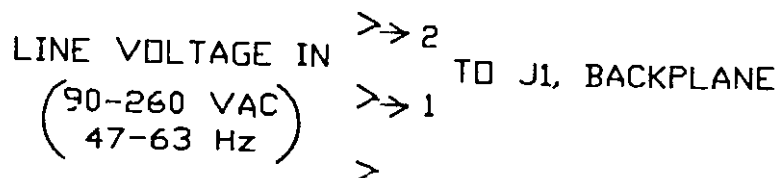
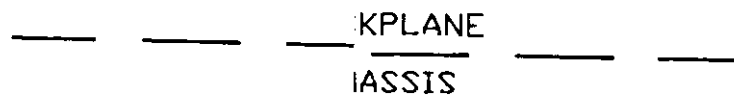
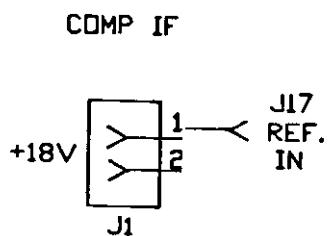
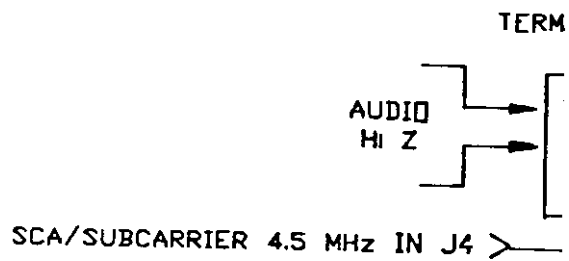


Figure 4-2
Schematic Diagram, Back Plane

A

1. RESISTANCE IS IN OHMS
2. CAPACITANCE IS IN MICROFARADS.
3. INDUCTANCE IS IN MICROHENRYS

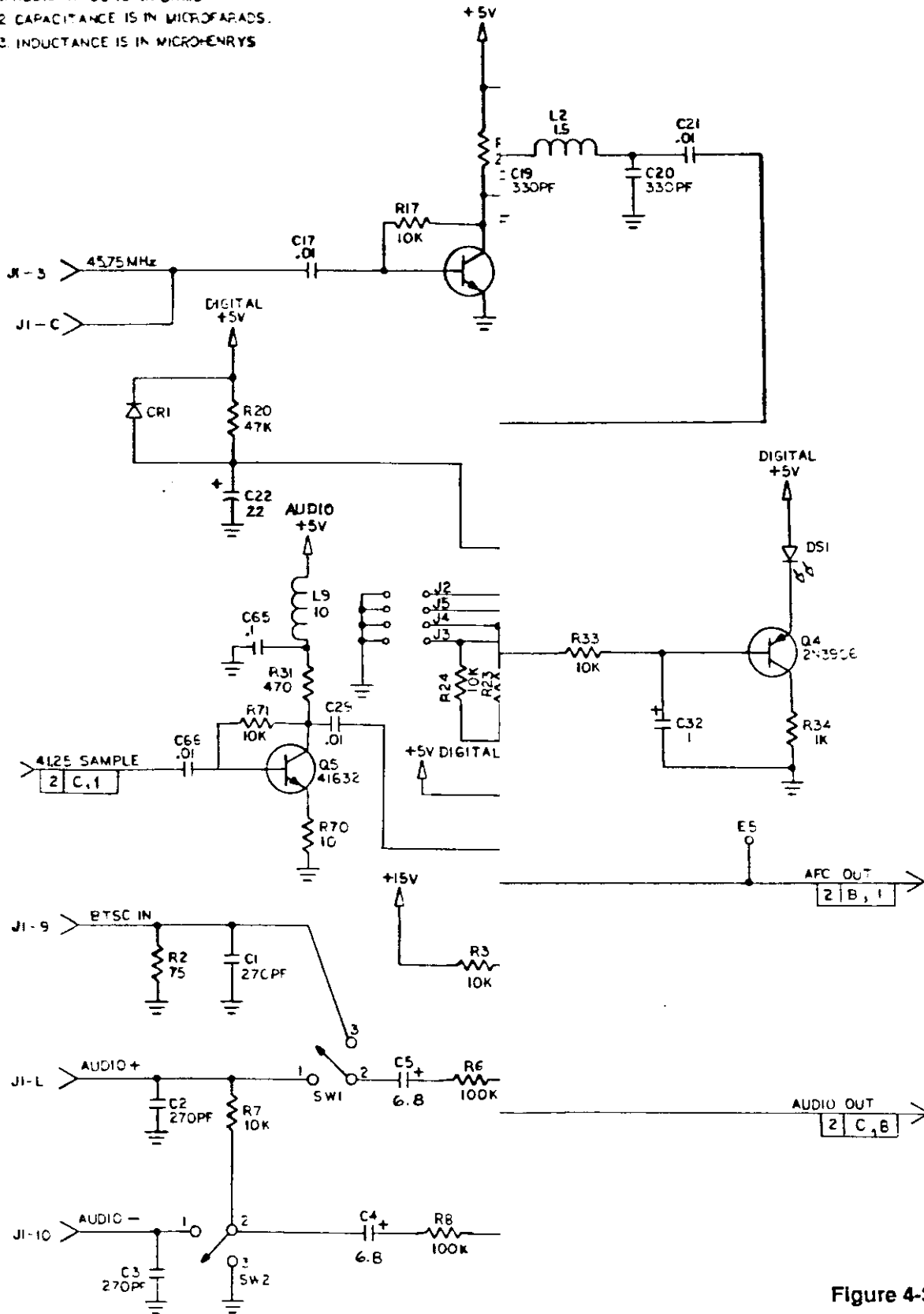


Figure 4-3
Schematic Diagram, Audio Modulator
1 of 2

INSTALLING THE MODULATOR

CONNECTING CABLES

All connections are made on the rear panel of the modulator. The following cable types are recommended:

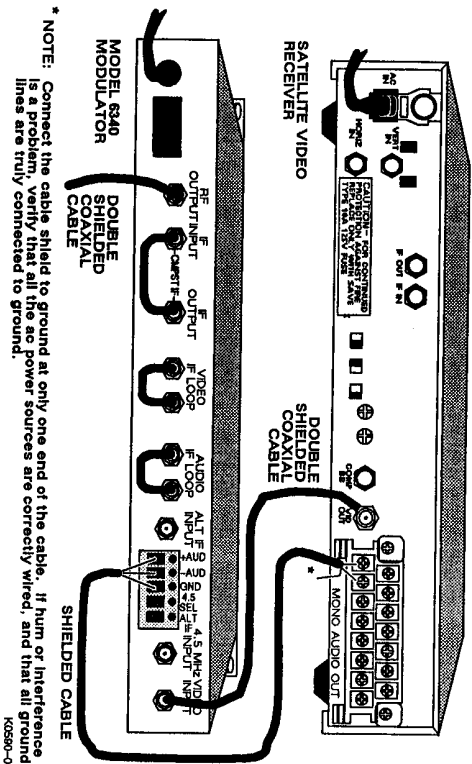
- 75-ohm double shielded coaxial cable with F-type connectors for VIDEO, IF and RF signals
- 2-conductor shielded twisted pair cable for AUDIO to the terminal barrier strip

Extreme care should be taken to ensure that mating F-type connectors are compatible with the female F-type connectors on the modulator chassis. Male connector center conductors or center pin diameters should range between .022 to .047 inches. Conductors or center pins below or above this range should not be used as this condition may result in connectors with insufficient contact normal force to provide a reliable connection.

NOTE

The female F-type connectors are designed to accept a conductor or center pin of .022 to .047 inches in diameter. Once a center conductor with a diameter in the upper part of the acceptable range has been inserted into the female connector, it is unadvisable to return to a smaller conductor size.

The Model 6340 Modulator is connected to a baseband audio and video source, such as a TVRO receiver. The following illustration, showing the connections between the Model 6340 modulator and a satellite video receiver, provides an example of baseband video and audio connections.



* NOTE: Connect the cable shield to ground at only one end of the cable. If hum or interference is a problem, verify that all the ac power sources are correctly wired, and that all ground lines are truly connected to ground.

Figure 2-2. Equipment Connection

Refer to Table 2-1 for connector functions and specifications.

INSTALLING THE MODULATOR

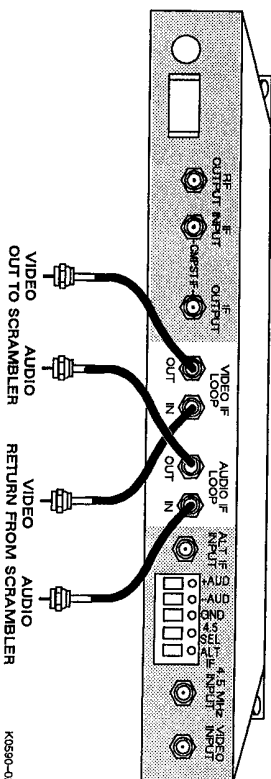
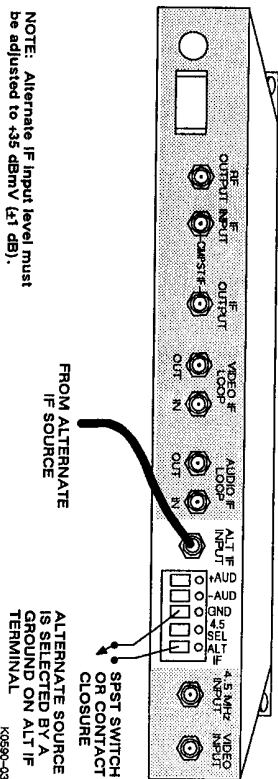


Figure 2-3. DIFL Option Connections



NOTE: Alternate IF input level must be adjusted to +35 dBmV (±1 dB).

Figure 2-4. Alternate IF Switch Connections

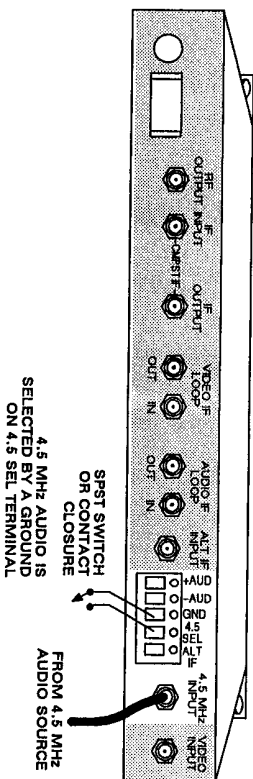


Figure 2-5. 4.5 MHz Audio Connections

INSTALLING THE MODULATOR

1. Connect a 75 ohm double shielded coaxial cable with an F-type connector from the video source to the modulator's VIDEO INPUT.
2. Connect a shielded twisted pair cable from the audio source to the modulator's AUDIO IN terminal block. Connections should be made carefully according to the indications (+, GND, -) as labeled by each terminal. See figure 2-2.
3. Connect a 75 ohm double shielded coaxial cable with an F-type connector from the RF OUTPUT to the headend combiner.
4. Attach a 75 ohm double-shielded coaxial cable jumper from COMPOSITE OUTPUT to COMPOSITE INPUT to complete the IF signal path.
5. Plug the modulator power cord into a power outlet. The power indicator (green light) on the front panel should come on. If it does not, check the wiring to verify that 115 V ac is applied to the modulator. If power is present and the light does not come on, unplug the power cord and check fuse in rear panel fuse holder. If the 1/2 amp fuse has failed, refer servicing to a qualified technician.

Any additional connections that may be needed for the modulator are discussed below.

DIFL Option

If your modulator has the DIFL option, and you desire to scramble the video and/or audio signal, remove the appropriate IF loop cable and connect input and output coaxial cables from your scrambler. See figure 2-3.

If the DIFL option is present but not being used, complete the IF audio and video signal paths by attaching coax jumpers.

Alternate IF Switch Feature

If you want to inject a composite IF signal from an external source, attach the alternate IF source to the ALT IF INPUT. This signal is selected by connecting ground to the ALT IF select terminal on the rear panel. See figure 2-4.

4.5 MHz Feature

If you want to inject the audio signal as a 4.5 MHz audio subcarrier instead of baseband audio, connect a 75 ohm double shielded coaxial cable with an F-type connector from the 4.5 MHz source to the 4.5 MHz INPUT connector. This option is selected by attaching a ground to the 4.5 SEL terminal on the back of the chassis. See Figure 2-5.

INSTALLING THE MODULATOR

If you are installing the Model 6340 Modulator on a shelf or in a closet, no specific mounting instructions are necessary. Simply follow the suggested installation prerequisites previously given. When installing the modulator in a rack, follow the instructions given below. Cable connecting information is also included for typical applications of the product.

EQUIPMENT MOUNTING

The Model 6340 Modulator can be mounted by one of two methods.

1. Mounting by the front bezel.

The unit has been designed to be self-supporting when secured using all bezel mounting holes. It is recommended that the angle support bracket (part number 345763) be used with this method to support the equipment and aid in installation.

2. Mounting using rack slides.

The unit can be mounted using the Universal Rack Slide Kit (part number 275317). This method allows the unit to be extended from the equipment cabinet, for maintenance or adjustment, without removing it. The unit is held in the cabinet by the bezel mounting holes. Refer to the Universal Rack Slide Kit Installation Manual for installation instructions.

Position the modulator in the rack and insert a 10-24 X 1/2 inch screw through the modulator mount and the rack at each of four locations (two on each side of the modulator as shown in figure 2-1). Tighten the screws firmly at each location.

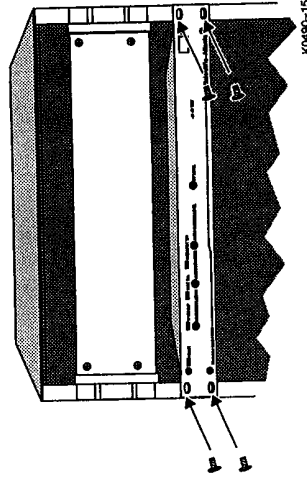


Figure 2-1. Equipment Mounting

INSTALLATION PREREQUISITES

When rack mounting the unit, 3.5 inches of air space should be allowed above and below the unit. If the equipment must be installed using 1.75 inches of spacing, it is recommended that forced-air ventilation be used. When installing the air moving device, care should be taken to ensure air between the units is sufficiently moved. The blower or fan should be installed in a manner that assists the rising warmer air, rather than opposing it.

The fans or blowers chosen to ventilate the cabinet should provide air movement of 200 cubic feet per minute per kilowatt of power dissipated.

CAUTION

Under no circumstance install the unit with less than 1.75 inches of air space above and below. High internal temperature can result in reduced product life.

CABLING

You will need to supply coaxial cables for the modulator's VIDEO INPUT, RF OUTPUT, and any additional cables for use with the optional loop connectors when those options have been included with your order. In addition, an audio input cable is required; this is generally a shielded twisted-pair or standard audio type cable.

STEREO APPLICATIONS

Mono Mode

The Model 6340 Modulator is delivered in a monaural audio mode. The pre-emphasis jumper (labeled J3 on the internal board) is accessible through the top cover and is set in the normal position (toward the front) which uses the pre-emphasis circuit. This is the Monaural (M) position. It also activates the overdeviation LED circuit for mono signals.

Stereo Mode

BTSC stereo sources for the modulator may be baseband or a 4.5 MHz carrier. If a baseband stereo signal is connected, the pre-emphasis jumper (labeled J3 on the internal board) must be positioned to the BTSC stereo position (toward the rear). This is the Stereo (S) Position. This removes the pre-emphasis and activates the BTSC calibration LED circuit, while switching off the mono overdeviation LED circuit.

A 4.5 MHz stereo carrier will operate correctly with the pre-emphasis jumper plug in either position.

INSTALLING THE MODULATOR

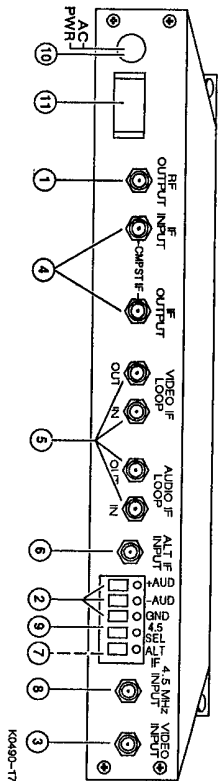


Figure 2-6. Model 6340 Television Modulator - Rear View Connectors

Table 2-1. Model 6340 Modulator Connectors

Reference Number	Item	Function
1	RF OUTPUT connector	Female F-type connector for final RF signal at channel frequency.
2	AUDIO INPUT/GND terminals	Screw terminals for baseband audio input (600 ohm balanced input).
3	VIDEO INPUT connector	Female F-type connector for baseband video input.
4	CMPT IF INPUT/OUTPUT loop connectors	Female F-type connectors serve to loop the composite IF signal from the IF modulator to the output converter. An external composite IF signal can be fed directly to the output converter via the IF INPUT connector.
5	VIDEO IF LOOP OUT/IN connectors (DIPL option only)	Female F-type connectors serve to loop the video IF signal within the IF modulator. Allows connection to and from the scrambler.
6	AUDIO IF LOOP OUT/IN connectors (DIPL option only)	Female F-type connectors serve to loop the audio IF signal within the IF modulator. Allows connection to and from the scrambler.
7	ALTERNATE IF INPUT	Female F-type connector that allows an alternate composite IF signal to be supplied to a solid-state switch located in the modulator. The alternate IF input is manually selected when the IF SELECT terminal on the rear-panel terminal block is grounded. Alternate IF input level must be adjusted to +35 dBmV (+1 dB) to set RF output level.

INSTALLING THE MODULATOR

Table 2-1. Model 6340 Modulator Connectors - continued

Reference Number	Item	Function
7	ALT IF terminal	Screw terminal that selects an alternate IF signal source when grounded.
8	4.5 MHz INPUT connector	Female F-type connector for input of 4.5 MHz audio subcarrier. This input is controlled by the 4.5 MHz SEL terminal.
9	4.5 MHz SEL terminal	Puts the audio modulator in a mode to accept sound on the 4.5 MHz subcarrier input when the terminal is grounded.
10	Power cord	Input line for ac power. Equipped with 3-prong, grounded plug.
11	FUSE holder	Contains ac line fuse (1/2 A, slow blow) for protection of the modulator against overloads.

INSTALLATION PREREQUISITES

SPACE AND PHYSICAL ARRANGEMENT

The Model 6340 Television Modulator measures 1.75 inches height by 19 inches wide by 12.5 inches deep (see the outline drawing shown in figure 1-1). It can be rack mounted or simply set on a shelf or table. When mounting the modulator on a shelf or table, ensure that the unit is safe from falling caused by tangled or strained interconnecting cables.

POWER REQUIREMENTS

WARNING

For reliable operation as well as safety, the Model 6340 Television Modulator requires a good earth ground connection for the third prong on its electrical power plug.

The Model 6340 Television Modulator requires a standard duplex power receptacle capable of supplying 105-125 V ac, 60 Hz at 32 watts.

CAUTION

Damage to Model 6340 Television Modulator will occur if you connect its power cord to a 230 V ac source. Be sure that your line voltage is correct.

FUSE REQUIREMENTS

The fuse holder on the rear panel contains the ac power fuse and should be a 1/2 ampere slow-blow fuse. The fuse is accessed by pressing down on the top of the rectangular housing to release the holder. Pull back on the fuse holder to expose the fuse.

COOLING REQUIREMENTS

The Model 6340 Modulator should be installed in an environmentally controlled location. Although the equipment has been tested over a temperature range of +20°F to +120°F, it is recommended ambient temperature be maintained at +75°F (±5°F).

CAUTION

Prolonged operation of this equipment above the maximum specified operating temperature (120°F) can void the warranty.

UNPACKING AND INSPECTING THE MODULATOR

EQUIPMENT RETURN INFORMATION

Scientific-Atlanta tries to ensure that all items arrive safely and in working order. Occasionally, despite these efforts, equipment will be received which is not in working condition. When this occurs, and it is necessary to return the equipment for repair or replacement, follow the procedure given below.

1. Call Scientific-Atlanta's Customer Service Department and request a Return Material Authorization (RMA) number. The toll-free telephone number is 1-800-722-2009. When you hear the recording, follow the instructions for customer service.
2. Tag or identify the defective equipment, noting the defect or circumstances. Be sure to write the RMA number on the tag. Reference the sales order number and purchase order number, as well as the date the equipment was received.
3. Pack the equipment in its original container and protective packing material if possible. If the original container and packing material are no longer available, pack the equipment in a sturdy corrugated box and cushion it with appropriate packing material.
4. Be sure to include the following information when returning the equipment.

Name
Address
City, State and Zip Code
Telephone Number
RMA Number
Sales Order Number
Purchase Order Number
Date equipment was received
Problem Description

NOTE

Scientific-Atlanta will not accept freight collect. Be sure to ship all items freight prepaid.

Operation

■ EQUIPMENT DESCRIPTION

■ OPERATING THE MODULATOR

■ CIRCUIT DESCRIPTION

UNPACKING AND INSPECTING THE MODULATOR

GENERAL

Scientific-Atlanta thoroughly inspects and carefully packs all equipment before shipment. However, at the time of shipment, the carrier assumes responsibility for its safe delivery. Therefore, do not return damaged units to Scientific-Atlanta. Instead, file a claim with the carrier as noted in this chapter. The initial unpacking procedures are given below.

1. Inspect the shipping carton for visible damage.
2. Open the shipping carton.
3. Remove all packing material.
4. Inspect the unit for visible damage.
5. Gently shake the unit, checking for loose items that may indicate concealed damage.
6. Check for missing items.

WHAT TO DO ABOUT VISIBLE LOSS OR DAMAGE

Make note of any loss or evidence of external damage on the freight bill or receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier refusing to honor a damage claim. The form required to file such a claim will be supplied by the carrier.

WHAT TO DO ABOUT CONCEALED DAMAGE

Concealed damage means damage which does not become apparent until the unit has been unpacked. The contents may be damaged in transit due to rough handling, even though the carton may not show external damage. If you discover damage after unpacking the unit, make a written request for inspection by the carrier's agent within 15 days of the delivery date. File a claim with the carrier since such damage is the carrier's responsibility. If you follow these instructions carefully, Scientific-Atlanta guarantees its full support of your claims to protect you against loss from concealed damage.

HOW TO INVENTORY THE EQUIPMENT RECEIVED

Now that you have inspected the shipment for damage, you need to verify that all items ordered have been received. This is especially important if your order was for more than one piece of equipment or was to include any options on the equipment. Check off each item received against that list on the packing slip included with the shipment, and verify that the list matches your purchase order. If any items are missing, please notify Scientific-Atlanta right away by calling 1-800-722-2009. When you hear the recording, follow the instructions to reach the Sales Department.

EQUIPMENT DESCRIPTION

CONTROLS AND INDICATORS

All operational controls and indicators are located on the front panel of the modulator. Refer to the following illustration for their location. Operation of the modulator follows this descriptive section.

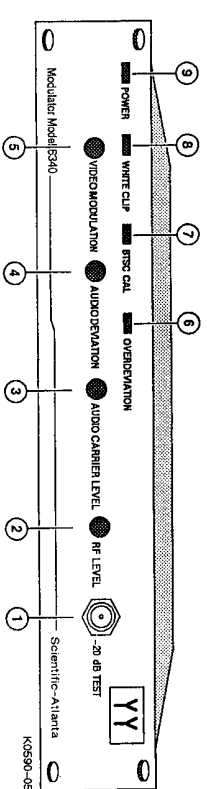


Figure 3-1. Model 6340 TV Modulator Front Panel

The following table describes the controls and indicators on the front panel of the modulator.

Table 3-1. Front Panel Controls and Indicators

Reference Number	Item	Function
1	-20 dB TEST	The -20 dB TEST POINT provides front panel monitoring of the RF output level. This TEST POINT provides a -20 dB access when the RF output is properly terminated with a 75 ohm impedance.
2	RF LEVEL	The RF LEVEL control increases and decreases the RF output level. Turn the control clockwise to increase the output. The maximum output level is +60 dBmV, and the minimum is less than +50 dBmV. The RF LEVEL control adjusts the video and audio RF levels simultaneously.

EQUIPMENT DESCRIPTION

Table 3-1. Front Panel Controls and Indicators - continued

Reference Number	Item	Function
3	AUDIO CARRIER LEVEL 	The AUDIO CARRIER LEVEL control increases and decreases the audio carrier level. Turn the control clockwise to increase the audio carrier in relation to the video carrier.
4	AUDIO DEVIATION 	The AUDIO DEVIATION control increases and decreases the frequency deviation of the audio carrier. Turn the control clockwise to increase the deviation.
5	VIDEO MODULATION 	The VIDEO MODULATION control increases and decreases the video depth of modulation. Turn the control clockwise to increase the modulation depth.
6	OVERDEVIATION 	This indicator is active only when the modulator stereo/mono jumper is in the mono mode. The red OVERDEVIATION LED above the AUDIO DEVIATION control indicates over-deviation. If this light comes on, turn the control counterclockwise until the light just goes out. It is normal for the light to blink on and off occasionally.
7	BTSC CAL 	This indicator is active only when the modulator stereo/mono jumper is in the stereo (BTSC) mode. Operation assumes a stereo encoder capable of generating a calibration tone. The tone amplitude should provide 25 kHz deviation. (The Scientific Atlanta Model 6380A Stereo Encoder and Model 6250 Demodulator with Pulse Count Audio Output Module have this capability.) With the calibration tone switched on in the stereo encoder, adjust the audio deviation until the BTSC CAL LED illuminates. Be sure to turn the calibration tone OFF in the encoder.

Installation

- UNPACKING AND INSPECTING THE MODULATOR
- EQUIPMENT RETURN INFORMATION
- INSTALLATION PREREQUISITES
- INSTALLING THE MODULATOR
- INSTALLATION TESTING

TECHNICAL SPECIFICATIONS

Table 1-1. Model 6340 Television Modulator Technical Characteristics - continued

Characteristic	Specification
Frequency stability FCC channels Non-FCC channels	± 5 kHz ± 10 kHz to 228 MHz (except FCC channels) ± 20 kHz, 400 MHz to 450 MHz
Group delay response	Meets FCC predistortion requirements for color transmission
Vestigial sideband response	-20 dB at channel edge; -40 dB at adjacent picture and sound carrier frequencies and all frequencies farther removed from channel
GENERAL	
Input voltage	105 to 125 V ac, 60 Hz
Input power	24 W, typical at 115 V ac (below 300 MHz) 27 W, typical at 115 V ac (above 300 MHz) 32 W, max
Operating temperature	0°C to +50°C range (+32°F to +120°F)
IF SPECIFICATIONS	
Output impedance	75 ohms, unbalanced (return loss > 16 dB)
IF frequency, video	45.75 MHz
IF frequency, audio	41.25 MHz
Intercarrier frequency	4.5 MHz $\pm$ 50 Hz
Alternate IF input impedance	75 ohms, unbalanced (return loss > 16 dB)
Alternate IF input level	35 dBmV

EQUIPMENT DESCRIPTION

Table 3-1. Front Panel Controls and Indicators - continued

Reference Number	Item	Function
8	WHITE CLIP 	The red WHITE CLIP light above the VIDEO MODULATION control indicates over-modulation and white level clipping. If this light comes on, turn the control counterclockwise until the light goes out.
9	POWER 	The POWER indicator (green light) is lit whenever power is present.

OPERATING THE MODULATOR

TURN-ON PROCEDURE

To turn on the Model 6340 Modulator, plug the power cord into a standard power receptacle. The front panel POWER LED should come on. Perform any of the necessary adjustments as described below.

USER ADJUSTMENTS

The Model 6340 Television Modulator has four user adjustments that may require altering during the course of normal use. These adjustments are:

- Video modulation
- Audio deviation
- Audio carrier level
- RF level

Refer to table 3-1 for the location of each control. The following paragraphs describe how to perform each adjustment.

Output RF Level Adjustment

The final output RF signal level from the Model 6340 Modulator is adjustable from +50 dBmV to +60 dBmV as measured at the rear-panel RF OUTPUT connector. The output signal level needed is based on your particular television network requirements. Adjustment is made with the front panel RF LEVEL control. Adjust as necessary.

Output Audio Level Adjustment

The output level of the audio carrier is factory set to be 15 dB below the output video carrier level. If you need a different audio carrier level, adjust this control as necessary.

Audio Deviation Adjustment (Monaural)

Adjust this control until the front panel AUDIO OVERDEVIATION LED just lights, then back off slightly until the LED just goes out.

Table 1-1. Model 6340 Television Modulator Technical Characteristics - continued

Characteristic	Specification
Harmonic distortion	<0.5% (30 Hz to 105 kHz at 25 kHz deviation) <0.5% (15 kHz to 50 kHz at 50 kHz deviation)
FM hum and noise (mono)	70 dB down with respect to 25 kHz deviation
(stereo 80 kHz bandwidth)	60 dB down with respect to 25 kHz deviation
Overdeviation LED (mono mode)	>25.2 kHz peak dev (± 0.2 dB)
Cal LED (stereo mode)	25 kHz peak dev (± 0.2 dB, ± 0.07 dB window)
4.5 MHz FM Input	
Input level	28 to 45 dBmV
Input impedance	75 ohms, unbalanced (output return loss 16 dB minimum)
Output frequency	RF Any standard channel: VHF; mid-band; superband; hyperband through 450 MHz. Transposed video-sound channels available from spectrum inversion option.
Output impedance	75 ohms unbalanced, (output return loss 16 dB minimum)
Output level	+50 dBmV to +60 dBmV continuously variable
Spurious outputs	>60 dB below video carrier with video carrier at +60 dBmV and sound carrier at +45 dBmV

GENERAL DESCRIPTION

FEATURES

The Model 6340 Television Modulator combines excellent performance and cost effectiveness for all broadband television transmission applications. Some of the features that enhance the operation and flexibility of headed operations are listed below.

- High quality RF output for adjacent channel applications
- Compact stand-alone unit or may be rack mounted
- SAW vestigial filtering
- Composite IF loop-through
- Alternate IF input switching
- FCC pre-distortion group delay
- Output channels available from 54 MHz to 450 MHz
- Output level: +50 to +60 dBmV
- Front panel monitor/test point
- Front panel output level control
- Video, audio and power LED indicators
- Video percent-of-modulation, audio deviation and carrier level adjust
- 4.5 MHz Sound carrier input capability
- BTSC (Broadcast Television Standards Committee) Stereo compatible with a front panel calibration light
- FCC offsets and stability as required on affected FCC/FAA channels

OPTIONS

The option choices for the Model 6340 Television Modulator are as follows:

- DIFL (Type A or B)
- Spectrum Inversion

CIRCUIT DESCRIPTION

MODULATOR/IF BOARD

The video input passes through an FCC delay predistortion network and several buffer circuits. A white clip circuit limits the video modulation to 93.75% and illuminates the front panel White Clip LED when clipping occurs. The video is then applied to an AM modulator circuit. A 45.75 MHz oscillator provides the modulator circuit with the video carrier signal. The video carrier is amplified and vestigial sideband filtered by a SAW filter. The video carrier is combined with the audio carrier by a directional coupler.

Audio inputs are processed and applied to the FM modulator. The audio carrier oscillator is phase-locked to the video carrier. The modulator output is applied to a diode switch. If the input is monaural audio, the audio is pre-emphasized and applied to a peak detector. When peak modulator exceeds 25 kHz, the peak detector illuminates the front panel Overdeviation LED. If the input is a composite BTSC stereo signal, the pre-emphasis network and Overdeviation LED are disabled. The front panel BTSC Cal LED is used to precisely set the deviation to 25 kHz when an external reference calibration tone is applied to the audio input.

A 4.5 MHz audio subcarrier input is limited and mixed with a signal from the video carrier oscillator to generate a 41.25 MHz audio carrier. The 41.25 MHz output signal is filtered and applied to a diode switch. The switch is used to select either the output of the internal audio carrier modulator or output of the 4.5 MHz mixer. A rear panel 4.5 MHz Select terminal is grounded to select the 4.5 MHz source. The switch output is amplified by a circuit whose gain is set by the front panel Audio IF Carrier control. The output is combined with the video carrier.

The combined audio and video carriers are applied to a diode switch. This switch selects the internally generated carriers or an external alternate IF input. A rear panel Alt IF Select terminal is grounded to select the alternate IF input. The switch output is amplified, filtered, and sent to the rear panel IF Output connector.

OUTPUT CONVERTER BOARD

The IF signal from the Modulator Board passes through a front panel RF Level attenuator and is applied to a mixer. A crystal oscillator generates a LO signal for the mixer. The output of the mixer passes through several sections of channel filters and amplifiers. The output is applied to the rear panel RF Output. A coupler feeds the front panel -20 dB Test connector.

POWER SUPPLY

For modulators that operate below channel frequencies of 300 MHz, the power supply is located on the output converter.

For modulators that operate above channel frequencies of 300 MHz, a separate power supply board provides voltages to the Modulator Board and Output Converter Board.

CIRCUIT DESCRIPTION

This section contains a description of the circuitry of the Model 6340 Television Modulator.

NOTE

This section is included as reference material only. Servicing of the modulator should be performed only by a qualified service technicians only.

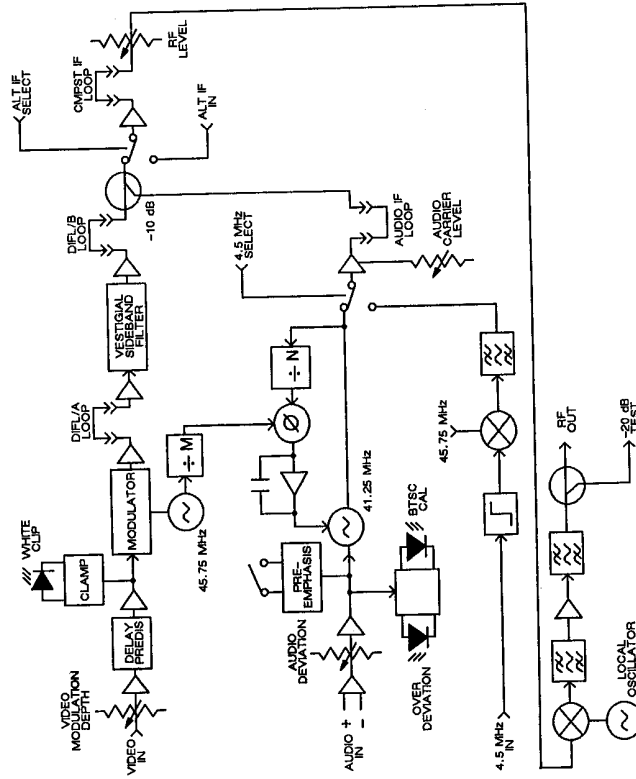


Figure 3-2. Model 6340 Television Modulator Block Diagram

The Model 6340 Modulator accepts audio and video as inputs. The modulator also accepts a 4.5 MHz audio subcarrier and an alternate IF input. The output is a composite RF TV signal on any EIA channel.

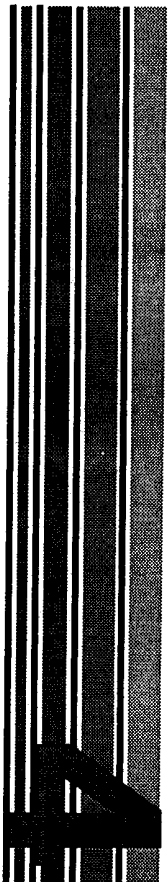
An explanation of each option follows:

Dual IF Loop (Type A or B) Option Package

Two options, Type A or Type B, separate audio and video IF signals before or after the vestigial sideband filter. The DIFL-A option loops video IF out before the vestigial (SAW) filter and the DIFL-B option loops video out of the chassis after the filter. Use Type A with sync-pulse suppression systems and Type B with sinewave suppressed scrambler systems.

Spectrum Inversion

The spectrum inversion option reverses the video and audio carriers, putting the video carrier 4.5 MHz above the audio at RF. Use of this option with set-top converters may also require frequency off-set. Consult with the converter manufacturer and Scientific-Atlanta for the correct crystal frequency.



Maintenance and Service

- MAINTENANCE
- SERVICE
- TROUBLESHOOTING

OVERVIEW

INTRODUCTION

The Model 6340 Television Modulator (also called the modulator in this manual) converts a baseband television signal to the desired channel frequency for distribution on a CATV system. The video source is first modulated to an IF (intermediate frequency) of 45.75 MHz where it is combined with an audio signal IF of 41.25 MHz. The audio IF originates from either a baseband audio source or the 4.5 MHz audio carrier input. This composite signal is then converted to the desired output frequency. The result is a high quality vestigial sideband television signal on any cable television channel from 54 to 450 MHz.

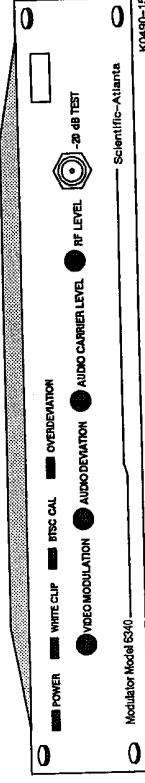


Figure 1-1. Model 6340 Television Modulator

PHYSICAL DESCRIPTION

The Model 6340 Television Modulator is 1.75 inches high, has an overall width of 19 inches, and fits the EIA standard 24-inch rack. The modulator weighs 11 pounds. All input and output connectors are located on the rear panel, along with the power cord and fuse. Chapter 2 describes the rear panel connectors. All operating controls and LED indicators on the front panel are described in Chapter 3.

FUNCTIONAL DESCRIPTION

The Model 6340 Television Modulator provides you with sophisticated versatile features. Advanced circuitry gives the highest picture and sound fidelity. Audio input may be provided at baseband or as a 4.5 MHz carrier. The audio source may be monaural or a BTSC (Broadcast Television Standards Committee) stereo signal. Dual IF loops are available for scrambling the television signal. An Alternate IF input switch provides for selection of an external IF source. A white-level clip circuit protects against over-modulation of the visual carrier. A surface acoustic wave (SAW) filter is used to achieve high quality amplitude and group delay characteristics in the vestigial sideband signal. Front panel controls, indicators and the test point provide access to important operating parameters.

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CHAPTER 4 - MAINTENANCE AND SERVICE

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Cleaning	4-1
Service	4-2
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MAINTENANCE

While maintenance and service should be performed only by qualified personnel, there is a limited amount of maintenance and service that you can perform on the Model 6340 Modulator. This chapter presents maintenance and service information about the Model 6340 that should be useful to anyone performing maintenance functions.

Routine maintenance consists of general cleaning procedures to remove dust and dirt and involves inspection of equipment for possible damage or loose components. The following paragraphs describe these items as they apply to the modulator.

VISUAL INSPECTION

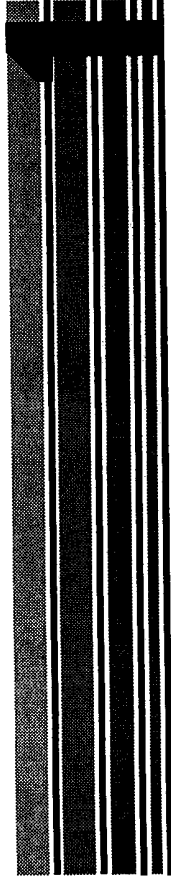
Inspect the modulator's interconnecting cables to be sure that all connections are secure and that there are no cuts or tears on the cable covering. Check that none of the stripped ends of the cables connected to the rear panel barrier strip can make contact with the chassis or another terminal. Make sure that no strain is put on any cable that might cause it to break or pull the unit off its shelf if not rack mounted.

CLEANING

WARNING

Unplug the unit from the wall outlet before cleaning to avoid possible electrical shock or personal injury.

To clean the modulator, wipe exposed surfaces and cable assemblies with a clean damp cloth to remove dust or dirt. Do not use liquid cleaners or aerosol sprays.



General Description

- OVERVIEW
- FEATURES
- OPTIONS
- TECHNICAL SPECIFICATIONS

TROUBLESHOOTING PROCEDURES

Table 4-1. Common Problems and How to Solve Them

Symptom	Probable Cause	Corrective Action
Power indicator does not come on	Modulator power cord unplugged	Plug the power cord into a power outlet with the appropriate electrical power supply.
	Fuse not fully inserted into fuseholder	Fully insert fuse.
	Blown fuse or internal malfunction	Contact qualified service technician.
No RF output	Cable not connected to RF output connector	Make sure that the cable connection is completely secure at the RF output connector.
		Check that cable center conductor is plugged completely into its receptacle.
Poor quality video contrast	Modulation depth not set correctly.	Adjust the VIDEO MODULATION control for best contrast when picture content is reasonably normal. (Do not adjust during high white or black content). For more accurate setting follow adjustment procedure in Chapter 3.
Poor quality audio	Connections not made correctly	Check audio cable connections on the rear audio panel. Reconnect if connections were not made according to the indications on each terminal. Be sure the grounding wire is connected on one end only.

SERVICE

The Model 6340 Television Modulator has no user-serviceable repair parts other than the ac power fuse. Therefore, if a problem develops you should refer service to a qualified repair technician. However, as a user, there are a few simple checks you can make prior to calling for service. Table 4-1 is a fault isolation diagram that will lead you through some simple checks which may avoid a service call when there really is no serious problem.

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FCC COMPLIANCE

This equipment has been tested and found to comply with the applicable limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION

Any changes or modification to this equipment not expressly approved by Scientific-Atlanta could void the user's authority to operate this equipment.

Installation and Operation Guide Model 6340 Television Modulator

Publication Number 69T259B

User's Comments

Please take a few minutes to answer the questions below. Your input will help us in our continuing effort to improve the quality of our publications. This questionnaire has been developed as a self-contained, postage paid mailer for your convenience.

Check the appropriate box.	Excellent	Very Good	Good	Fair	Poor
Accuracy	☐	☐	☐	☐	☐
Completeness	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐
Format	☐	☐	☐	☐	☐

If you checked fair or poor for any of the items above, please specify why. _____

Is the manual clear and comprehensible to your technical and non-technical personnel? _____

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If errors have been found, please reference page #, table # or figure #. _____

Did our publication satisfy your needs? Yes ☐ No ☐

If not, please offer additional comments and suggestions here. _____

Name _____	Title _____
Company _____	Department _____
Address _____	City _____ State _____ Zip Code _____

TROUBLESHOOTING PROCEDURES

Table 4-1. Common Problems and How to Solve Them - continued

Symptom	Probable Cause	Corrective Action
Poor quality audio	Deviation level setting (Monaural Mode)	When the sound is too low: Raise audio deviation level with the AUDIO DEVIATION control on the front panel until just before the OVERDEVIATION indicator lights up. When the sound is distorted or too high: Lower the modulation level with the AUDIO DEVIATION control on the front panel until the OVERDEVIATION indicator goes off.
Audio has no high frequencies	(BTSC Stereo Mode)	Audio deviation can be adjusted only by using an encoder calibration tone.
Adjacent channel has beat	Pre-emphasis is disabled	Use BTSC encoder or enable internal pre-emphasis network.
	Sound carrier level setting is too high	Lower the sound carrier level with the AUDIO CARRIER LEVEL control on the front panel until the beat interference disappears.

WARRANTY

All items that we manufacture are warranted to be free from defects in material and workmanship and to conform to our currently published specifications. The warranty period is one year from the date of shipment. Written notice of defects must be received by us within the warranty period. Our liability is limited to servicing or adjusting any item returned to the factory for that purpose, including replacing any defective parts therein. Customer must pay packing, crating, and transportation costs to and from the factory. At customer's request, we will make reasonable efforts to provide warranty service at the customer's premises, provided the customer pays our then current rates for field services and the associated travel and living expenses. If a fault has been caused by improper installation, maintenance or use, or by abnormal conditions of operation, repairs will be billed at normal rates.

If any fault develops, the following steps should be taken:

- Notify us by giving the item model number, serial number and details of the difficulty. On receipt of this information, you will be given service data or shipping instructions.
- On receipt of shipping instructions, forward the item prepaid. If the item or the fault is not covered by warranty, an estimate of charges will be furnished before work begins.

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IN NO EVENT SHALL SCIENTIFIC-ATLANTA BE LIABLE, IN CONTRACT OR IN TORT OR UNDER ANY OTHER LEGAL THEORY, FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, REGARDLESS OF WHETHER WE WERE INFORMED ABOUT THE POSSIBILITY OF SUCH DAMAGES, AND IN NO EVENT SHALL SCIENTIFIC-ATLANTA'S LIABILITY EXCEED AN AMOUNT EQUAL TO THE SALES PRICE.

IMPORTANT RULES FOR SAFE OPERATION

10. **Power Sources** – This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home or business, consult your appliance dealer or local power company. For products intended to operate from battery power, or other sources, refer to the operating instructions.
11. **Grounding and Polarization** – This product is equipped with a 3-wire grounding-type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.
12. **Power-Cord Protection** – Power-Supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
13. **Lightning** – For added protection for this product during a lightning storm or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.
14. **Power Lines** – An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.
15. **Overloading** – Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.
16. **Object and Liquid Entry** – Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
17. **Servicing** – Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
18. **Damage Requiring Service** – Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - a. When the power-supply cord or plug is damaged.
 - b. If liquid has been spilled, or objects have fallen into the product.
 - c. If the product has been exposed to rain or water.
 - d. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
 - e. If the product has been dropped or the cabinet has been damaged.
 - f. When the product exhibits a distinct change in performance – this indicates a need for service.
19. **Replacement Parts** – When replacement parts are required, be sure the service technician has used replacement parts specified by Scientific-Atlanta or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock or other hazards.

69T259B

Addendum

*Installation and Operation Guide
for the Model 6340 Television Modulator
Publication Number 69T259B*

August 1992

4.5 Input Selections for Model 6340 Television Modulator

Composite or Separate Input Choices for Video and 4.5 MHz Audio

The Model 6340 Modulator provides a separate input connector on the rear of the chassis for 4.5 MHz audio. This 4.5 MHz audio input is sometimes used instead of a baseband audio input. The modulator has been revised to include a Composite selection (video and 4.5 MHz audio combined into the Video input connector). The modulator comes from the factory with the main board jumpers set to provide for a separate 4.5 MHz audio, but they may be easily repositioned for operators wanting to connect a composite signal to the modulator.

In either case (separate or combined), the 4.5 subcarrier is selected by grounding the 4.5 SEL terminal on back of the chassis (figure 2-6 in the operator's manual).

The jumper settings are as follows:

Composite Move jumper plugs P-4 and P-5 on J10, and P-6 on J11 toward rear of chassis.

Separate Move jumper plugs P-4 and P-5 on J10, and P-6 on J11 toward front of chassis.

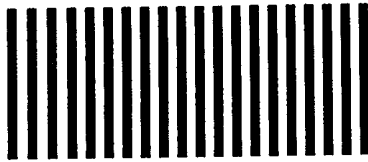
Physical Locations of Jumpers on Main IF Board (largest circuit board)

P4 and P5 plugs for board jumper J10 are located 3/4 in. from the front of the board and 2 2/3 in. from the chassis side.

P6 plug for board jumper J11 is located 5 in. from the back of the board and 2 1/2 in. from the chassis side.



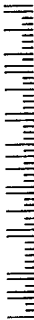
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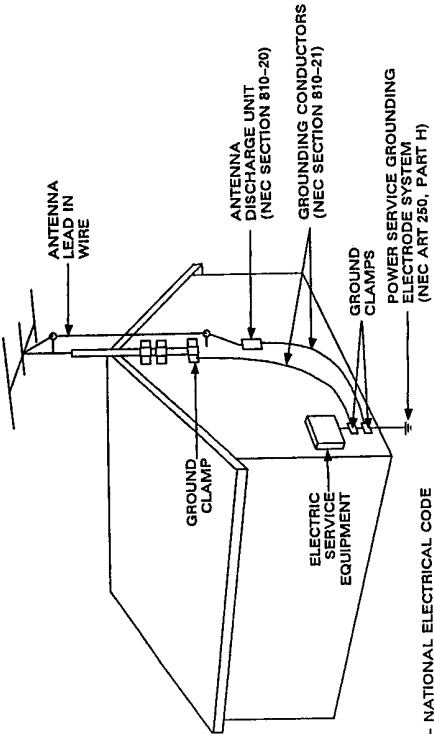


DO NOT TEAR--FOLD HERE AND TAPE

IMPORTANT RULES FOR SAFE OPERATION

20. **Safety Check** - Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in safe operating condition.
21. **Outdoor Antenna Grounding** - If an outside antenna or cable system is connected to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1990, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See figure below.

EXAMPLE OF ANTENNA GROUNDING



NEC - NATIONAL ELECTRICAL CODE

This product is to be mounted within a distance of less than 3 feet of a standard 120 V ac outlet to accommodate the 3-foot power cord furnished.

IMPORTANT RULES FOR SAFE OPERATION

Note to CATV System Installer

This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the CATV cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.



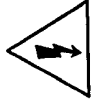
CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN



CAUTION: To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel.

WARNING

TO PREVENT FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.



This symbol is intended to alert you that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of the unit.



This symbol is intended to alert you to important operating, maintenance, servicing, and safety instructions in the literature accompanying the equipment.

1. **Read Instructions** – All the safety and operating instructions should be read before this product is operated.
2. **Retain Instructions** – The safety and operating instructions should be retained for future reference.
3. **Heed Warnings** – All warnings on the product and in the operating instructions should be adhered to.
4. **Follow Instructions** – All operating and use instructions should be followed.
5. **Cleaning** – Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
6. **Attachments** – Do not use attachments not recommended by Scientific-Atlanta as they may cause hazards.
7. **Water and Moisture** – Do not use this product near water – for example, near a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, and the like.
8. **Accessories** – Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury to a child or adult, and

serious damage to the product. Use only with a cart, stand, bracket, or table recommended by Scientific-Atlanta. Any mounting of the product should follow the instructions, and should use a mounting accessory recommended by Scientific-Atlanta.

8A. An appliance and cart

combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.



9. **Ventilation** – Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the instructions have been adhered to.