



**OTM-4000 I**

**FREQUENCY AGILE 750MHz PAL I  
TELEVISION MODULATOR**

**INSTRUCTION MANUAL**

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# OTM-4000-I SPECIFICATIONS

## RF

Output Frequency Range.....	48.25MHz to 751.25MHz, selectable by frequency in 12.5KHz increments, displayed and controlled by front panel menu screen or by the remote control option.
RF Output Level.....	+60dBmV @ 75 OHMS. On/Off control by front panel menu screen or by the remote control option.
Frequency Accuracy.....	±5KHz
Spurious Output.....	>60dB below video carrier level.
Out-of-Band C/N Ratio.....	>80dB
Phase Noise.....	>78dBc/Hz @ 10kHz offset
Audio/Video Ratio.....	-12dB to -21dB below video carrier level by front panel adjustment

## Video

Video Baseband Input	
Level Range.....	5 to 1.5 Volts P-P (75 Ohms)
Video Performance.....	1V P-P Measured @ 87.5% modulation
	Differential gain <3%
	Differential Phase <2°
	Frequency response ±1dB, 30Hz to 4.8MHz
Video AGC.....	On/Off control by front panel menu screen or by remote control option

## Audio

Audio Baseband	
Input Level Range.....	-10 to +10dBm, 600 Ohm balanced, Hi Z unbalanced
Audio	Hi Z unbalanced
Intercarrier Stability.....	±1KHz
Audio Performance.....	1% maximum THD (.2% typical)
Frequency Response.....	50Hz to 15KHz, ±1dB
Pre-emphasis.....	50µs, defeated by internal jumper.
Audio Sub-Carrier Input.....	+25dBmV to +45dBmV input level @ 75 Ohm

## Dual I.F. Loops

Video I.F. ....	Visual carrier +38dBmV @ 38.9MHz
Audio I.F. ....	32.9MHz carrier adjustable, -12 to -21dB relative to video carrier from front panel A/V ratio adjustment

## AUXiliary I.F. Input

Input Level.....	+38dBmV ±5dB
4 Modes of Control.....	Loss of video to modulator, rear panel contact closure screws for EAS compatibility, front panel menu control, or by remote control option.

## External Features

Front Panel Adjustments.....	Video and audio modulation levels. Audio to video carrier ratio. RF output level. Front panel LCD contrast control. Push button LCD menu controls include Up/Down Left, Right and enter for menu selections.
Front Panel LED's.....	RF on, AUX I.F. in use, remote control in use, Video Carrier unlocked, Video and audio overmodulation.
Rear Panel Connectors.....	Type "F" RF test point, RF output, Aux i.f. input, video input, Video and Audio i.f. inputs and outputs and audio subcarrier. Screw terminals for contact closure and audio baseband.

## General Characteristics

Power Supply.....	Universal 90VAC to 240 VAC, 50 to 60Hz with IEC 320 power connector.
Physical Size.....	1.75in. H x 19in. W x 10in. D
Weight .....	9 lbs.
Power Consumption.....	24 watts
Operating Temperature.....	0° C to 50° C

## Remote Control Option

Control.....	Controlled by serial RS-232 or RS-422 or RS-485 daisy-chain interface method.
Features.....	Frequency selection in 12.5KHz steps. RF Carrier ON/OFF Video AGC ON/OFF I.F. input, INT./EXT. AUX Transfer, OFF/AUTO Command Mode, LOCAL/REMOTE Tuning Mode, FREQ/CHAN. Channel Plan, STD, HRC, IRC, EIA. Unit Name Text Audio Sub-carrier, INT./EXT. Baud Rate, 300 to 38,400 Address Change

# **OTM-4000 I**

## **FREQUENCY AGILE 750MHz**

### **PAL I TELEVISION MODULATOR**

#### **1) INTRODUCTION**

The Olson Technology OTM-4000 I is a frequency agile television modulator. This microprocessor-controlled unit is capable of operation on any frequency from 48MHz to 750MHz and output frequency selection is possible in 0.0125MHz increments.

The OTM-4000 I is one of several available versions of the OTM-4000 series of modulators. This PAL I version of the OTM-4000 should not be tuned by "CHANNEL". Instead, use the tune by FREQUENCY method to set its output carrier frequency and ignore any reference to channel numbers in the display.

An RF output level of +60dBmV is possible over the operating frequency range of the OTM-4000 I.

SAW filtering and Olson Technology system design factors insure an out-of-band carrier-to-noise ratio greater than 80dB. This allows unlimited numbers of these units to be combined.

The OTM-4000 I has many advanced features including a menu/button control system, front panel display of unit ID text, a manual or loss-of-video controlled auxiliary I.F. input with AGC, selectable video AGC, external audio subcarrier input, configurable audio input, dual I.F. loops, optional remote control, and more.

#### **2) LOCAL CONTROL OF THE OTM-4000 I**

##### **A.) FRONT PANEL ADJUSTMENTS:**

Video and audio modulation levels, video-to-audio carrier ratio, and the RF output level are adjustable by means of slotted controls accessible through the front panel. There is also a control for the LCD panel contrast which should be adjusted for proper viewing once the unit is installed.

See section 4 of this manual for more information on these adjustments.

## B.) FRONT PANEL MENU ITEM CONTROLS:

Most features of the OTM-4000 I are configurable from the front panel by means of the menu/button system which includes an LCD panel and 5 buttons. The LCD panel displays the menu(s) and the currently selected configuration or value.

The “UP”, “DOWN”, “LEFT”, and “RIGHT” buttons are used to move between menus, to select configurations, and to change values. All items except tuning mode and output frequency will instantly change to match the display. A new frequency takes effect only when you press the “ENTER” button. To make other changes **permanent**, press the “ENTER” button.

Note that when changing the output frequency, the unit’s digital synthesizer may become unlocked momentarily which could result in operation on an undesired frequency until it re-locks. The OTM-4000 I will turn it’s RF output off anytime the unit is in an unlocked state, thus preventing unwanted interference when changing channels.

As illustrated on page 7, there are two menu trees; the main menu tree (on the left) and the sub-menu tree (on the right). The arrows indicate which buttons to press to move around the menus. Review each menu and the information below to become familiar with the various functions.

## C.) CHANGING MENU ITEMS:

To change a function or value, select the menu containing the item to change using the “UP”, “DOWN”, “RIGHT”, and “LEFT” buttons. After selecting the correct menu, press the “RIGHT” button to change a menu item. If part or all of the bottom row starts flashing, you can change that item.

If the entire bottom row flashes (most items), press the “UP” or “DOWN” button to change it. These buttons have auto-repeat. Press left to cancel change.

For tuning or unit ID (NAME) values, only one character in the bottom row will flash. The “LEFT” and “RIGHT” buttons select the position to change and the “UP” and “DOWN” buttons change the value. When the leftmost position is flashing, press “LEFT” to exit the change mode.

When you are through with the change (or if there is no change), pressing the “ENTER” button will enable the displayed parameter or value, the change mode is exited, and the display will stop flashing. If you do not press the “ENTER” key, the parameter will return to the original value after a time-out of about 15 seconds.

## 3.) SOME MENU-SPECIFIC INFORMATION

### A.) Display of NAME and TUNING:

This is the normal (default) display and is the menu shown as the top left menu on page 5 of this manual. You can not make any change from this menu. The NAME is programmable from the NAME menu and the tuning is programmable from the TUNING menu. The display will return to this default after about 30 seconds of button inactivity

If the programmed TUNING MODE is CHAN, the display will be the channel number. If the programmed TUNING MODE is FREQ, the display will be the frequency in MHz.

For the OTM-4000 I, The tuning MODE should be set-to FREQUENCY.

B.) IF INPUT:

This indicates the preferred choice of the normal IF source. A rear panel input or an automatic transfer could switch to the AUX IF input.

C.) CHANNEL PLAN:

This menu is not used with the OTM-4000 I, because this unit should be tuned by FREQUENCY only.

D.) NAME:

This menu allows you to program the NAME that appears at the top of the normal (default) display. Upper case and lower case letters as well as numbers and various symbols are available for use. Name may be used to identify each modulator by function (channel, service, etc.)

E.) COMMAND MODE, BAUD RATE, and ADDRESS:

These functions are only used when the OTM-4000 I is configured with the optional remote control feature.

Default display of name and tuning. Comes here after 20 sec inactive. No right arrow.

Display of RF output status. Right arrow to turn on/off.

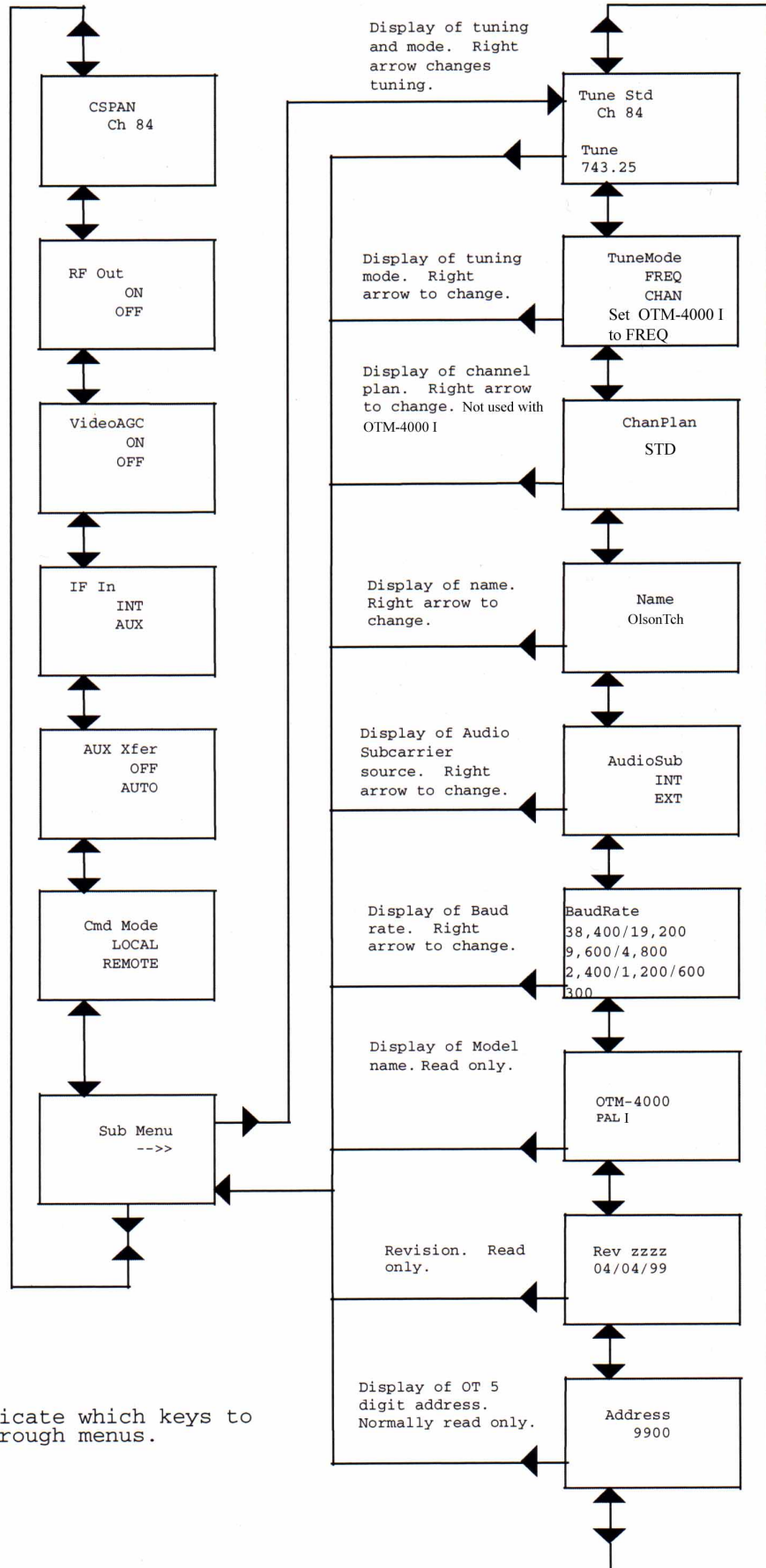
Display of Video AGC status. Right arrow to change.

Display of IF input preference. Right arrow to change. Source will stay at AUX if rear aux input is grounded.

Display of automatic transfer status. Right arrow to change. If AUTO then IF source will transfer to AUX when video is absent.

Display of command mode. If command mode is REMOTE, must change it here to local before making any local changes. Right arrow to change. If no remote is installed, mode is always LOCAL.

Sub-menu entry point. Right arrow to enter sub-menu.



NOTE: Arrows indicate which keys to press to move through menus.

## 4.) FRONT PANEL CONTROLS AND INDICATORS

### REMOTE

When an OTM-4000 I is equipped with the optional remote control feature, this LED when on, indicates that this unit is in the remote control mode.

### UNLOCKED

This LED when on, indicates that one of the digital synthesizers is not locked. This condition will result in shutdown of the RF output as long as the condition exists. Note that this LED will usually flash on momentarily when changing a channel or frequency. This momentary shutdown of the output prevents undesired interference to other channels if the OTM-4000 I is connected to a system or network when it's channel is changed.

### VIDEO LEVEL

This control adjusts the video depth-of-modulation. Choose a bright scene (commercials are usually excellent) and set it carefully while observing the VIDEO O/M LED. This control should be advanced to a point JUST SHORT of where the VIDEO O/M LED flashes-on.

### VIDEO O/M

This LED, when on, indicates a depth-of-modulation greater than 87-1/2%. It should never be on continuously but might be on for short periods during bright scenes. See VIDEO LEVEL above.

This LED will stay on for several seconds when power is first applied to the OTM-4000 I.

### AUDIO LEVEL

This control adjusts the audio deviation of the OTM-4000 I. Choose program material that is of high average volume when setting this control and adjust it so the AUDIO O/M LED just blinks-on during program audio level peaks.

### AUDIO O/M

This LED, when on, indicates that the peak deviation of the OTM-4000 I is at  $\pm 50$ KHz. It should only flash-on occasionally during normal operation. See AUDIO LEVEL, above.

### A/V

This control adjusts the aural carrier level relative to the video carrier level. It is typically adjusted for an A/V ratio of 15-17dB when the OTM-4000 I is connected to a cable system or network that is configured with adjacent channels.

### LEFT, RIGHT, UP, DOWN, ENTER

These buttons are used in selecting and changing menu items as displayed on the LCD panel.

### CONTRAST

This control adjusts the LCD panel contrast. Adjust it for best display legibility when the OTM-4000 I is placed in operation.

## AUX IF

This LED, when on, indicates that the current IF source is the AUX input at the rear panel.

## LCD DISPLAY PANEL

This displays menu and status information.

## OUTPUT RF LEVEL

This control is used to set the RF output level. If the OTM-4000 I is feeding a system or network with many channels, it is suggested that it be operated at an output level of +55dBmV minimum to prevent degradation of the C/N ratio of that channel. If lower output levels are required, place an in-line attenuator at the RF output.

Note that the OTM-4000 I may be capable of output levels greater than +60dBmV on some channels. The specifications for spurious performance, etc are based on a maximum operating level of +60dBmV. This unit may not meet its full specification if operated at greater than +60dBmV out.

## RF ON

This LED indicates the output RF status.

## 5.) REAR PANEL CONNECTIONS

### RF TEST

This output is approximately 20dB below the main RF output and may be used for monitoring or test.

### RF OUT

This is the main RF output connector.

### REMOTE LOOP-THRU

These RJ connectors are only present when the optional remote control module is installed and it is the remote control loop-thru for the modulator.

### AUX IN

This is the AUX IF input. This input is before the SAW IF section and normally expects an IF input level of +38 dBmV. It has AGC which will allow levels to vary as much as  $\pm 5$ dB while holding the RF output level constant.

This input may be enabled by shorting the AUX SELECT terminals on the rear panel, by front panel control, by loss of video, or by (optional) remote control.

### VIDEO IF IN

This is the video IF input to the SAW filter / output converter section. The AUX IF switch is AFTER this input. The video IF level at this point should be +38 dBmV.

In normally-configured applications this input is usually connected to the VIDEO IF OUT connector. The OTM-4000 I is shipped from the factory with this jumper in place.

## AUDIO IF IN

This is the aural IF input to the SAW filter / output converter section. The AUX IF switch is AFTER this input. The aural IF level at this point is relative to the video IF level as at the unit RF output. IE: If the A/V ratio at the output is 15dB, then the aural IF level at this point would be approximately 15 dB below the video IF level at the VIDEO IF IN connector (approximately +23dBmV).

In normally configured applications this input is usually connected to the AUDIO IF OUT connector. The OTM-4000 I is shipped from the factory with this jumper in place.

## AUDIO IF OUT

This is the aural IF output from the IF modulator section. The aural IF level here is relative to the video IF level as at the unit RF output. IE: If the A/V ratio at the output is 15dB, then the aural IF level at this point would be approximately 15 dB below the video IF level at the VIDEO IF IN connector (approximately +23dBmV).

In normally configured applications this output is usually connected to the AUDIO IF IN connector. The OTM-4000 I is shipped from the factory with this jumper in place.

## VIDEO IF OUT

This is the video IF output from the IF modulator section. The video IF level here is +38dBmV.

In normally configured applications this output is usually connected to the VIDEO IF IN connector. The OTM-4000 I is shipped from the factory with this jumper in place.

## VIDEO IN

1 Volt P-P baseband video input to the OTM-4000 I. When VIDEO AGC is enabled, the modulation will remain constant for input level changes of  $\pm 3$ dB.

## AUX SELECT

When these two terminals are connected together, the AUX IF IN is enabled. This is a "hard" control and will override any other function that instructs the internal IF to be selected. The left terminal is chassis ground and the right terminal is grounded to activate the function.

## AUDIO IN

Baseband audio input to the OTM-4000 I.

This input is configurable for 600 $\Omega$  balanced or high impedance unbalanced applications. When configured for high impedance input, ground should be connected to the right-side terminal.

To change from 600 $\Omega$  to high-impedance input, disconnect the unit from AC power, remove the top cover and locate jumper "JMP1" near the front left corner of the circuit board. Move the jumper from the position marked "BAL" to the position marked "UNBAL".

If it is desired to defeat the audio pre-emphasis for some reason, locate the jumper marked "JMP2" and move it from the position marked "PRE-EMPH" to the position marked "BYPASS".

## EXT SUB IN

External aural subcarrier input. This input is selectable from the front panel or (optional) remote control. The input level (at 6.0MHz for PAL I units) should be +25 to +45dBmV (measured into 75 $\Omega$ ). The OTM-4000 I has limiter circuitry to keep the aural carrier constant when the external subcarrier signal level is within the above range.

## AC LINE POWER INPUT

The OTM-4000 I may be powered by 90 to 240 VAC and 47-63 HZ and it draws about 24 Watts.

## 5.) MISCELLANEOUS

- A) When mounting the OTM-4000 in an equipment rack, it is best to leave a blank space above and below the unit to allow for adequate flow of cooling air.
- B.) This unit is equipped with a 0.5A slo-blo fuse, which is located at the IEC power input module at the rear panel. For continued safety and to maintain proper performance of the unit, please replace only with an equivalent fuse.