MODEL 715i SIGNAL LEVEL METER

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MODEL 715i SIGNAL LEVEL METER

1.0 SPECIFICATIONS:

Frequency Range ……	46 MHz to 860 MHz
Frequency Tuning Resolution ……..	0.125 MHz (frequency mode) 6, 7, 8 MHz (channel mode)
Amplitude Measurement Range …….	- 20 to +40 dBmV
Amplitude Accuracy …….	± 1.0 dB at 25°C. ± 2.5 dB from -17°C. to 55°C.
IF Bandwidth ……..	280 KHz at 3 dB points
Size ……	3.25” x 8.5” x 6.5”
Weight ……..	4.5 lbs.
Battery Life ……..	8 hours typical
Operating Temperature Range ……	-17°C. to 55°C.

2.0 UNIT CONTROLS, INDICATORS, AND CONNECTIONS

1. Dual Reading Amplitude Display - This L.C.D. displays video carrier amplitude (dBmV) and relative audio carrier amplitude (dB difference) simultaneously while in the channel format, and displays the single carrier amplitude while in the frequency format.

2. Frequency/Channel Display - Indicates either the channel number selected or the frequency selected depending on tuning format.

3. Frequency/Channel Tuning Format Selector - Toggles the bottom display between frequency (MHz) and channel number readout.

4. Range Selector - Selects amplitude range.

5. Range Indicating L.E.D.s - L.E.D. lights to show current range.

6. ON/OFF Switch - Controls power to the unit.

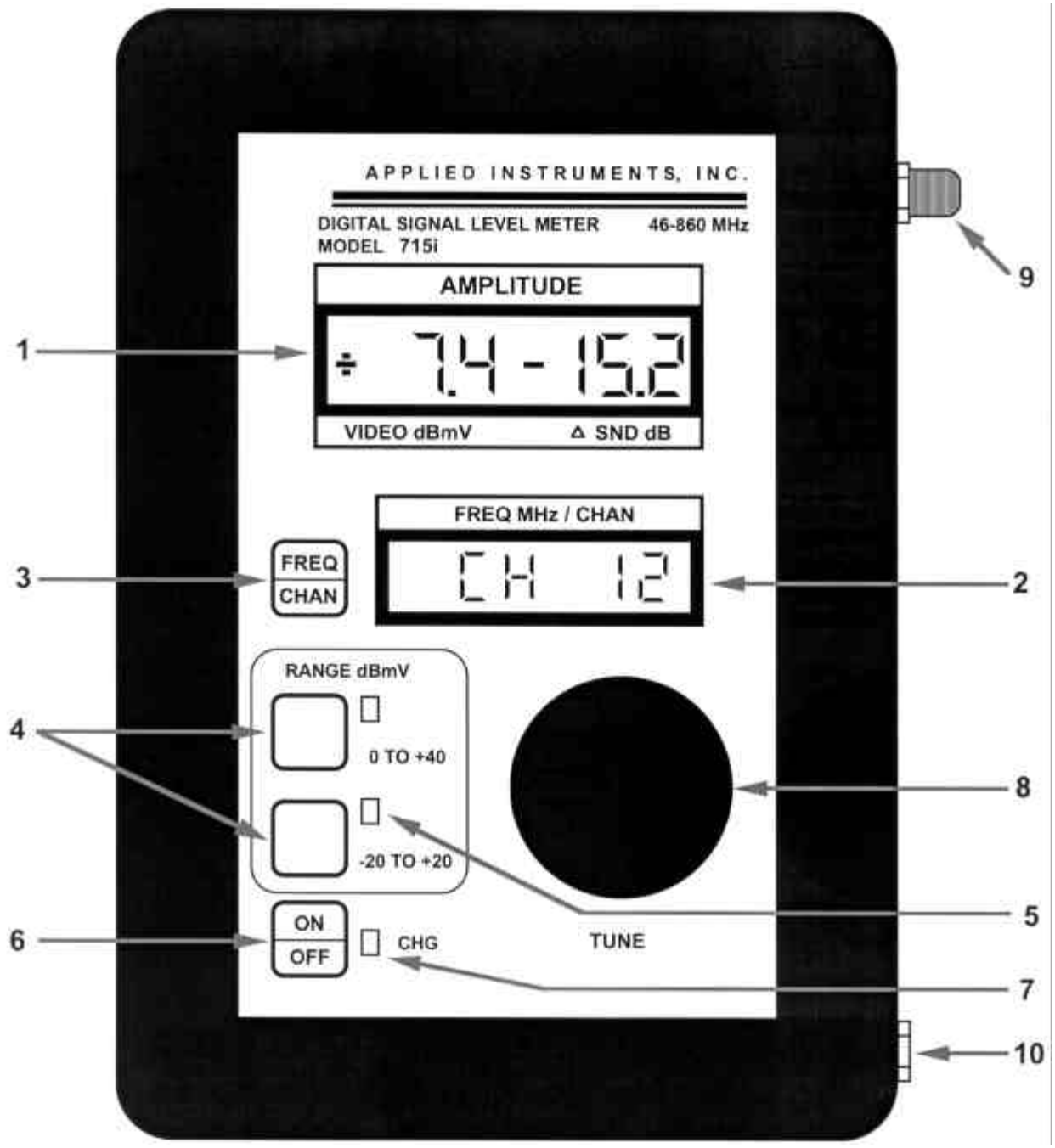
7. Charge Indicator - Lights when battery is being charged.

8. Tuning Knob - Tunes in either frequency (0.125 MHz increments) or channel (channel increments) depending on tuning format.

9. RF Input Connection - RF Input type "F" connector for the signal to be measured.

10. Charge Source Connection - Input jack to receive external AC power (via supplied wall transformer accessory).

(See next page for illustration)


APPLIED INSTRUMENTS, INC.
DIGITAL SIGNAL LEVEL METER 46-860 MHz
MODEL 715i
AMPLITUDE
÷ 7.4 - 15.2
VIDEO dBmV
Δ SND dB
FREQ MHz / CHAN
CH 12
FREQ
CHAN
RANGE dBmV
0 TO +40
-20 TO +20
ON
OFF
CHG
TUNE
1
2
3
4
5
6
7
8
9
10

MODEL 715i SIGNAL LEVEL METER

3.0 DESCRIPTION

The Applied Instruments Model 715i Signal Level Meter has been designed with you in mind. It is compact and lightweight. With rugged internal components and a molded, weather-resistant case, your working environment has been kept in mind. You control the detented knob tuning speed. There's no waiting for the microprocessor to click through each channel. A single keystroke toggles between tune-by-channel and tune-by-frequency formats. Synthesized tuning eliminates channel selection guesswork. The non-volatile memory 'remembers' what channel or frequency was last set and returns there upon powering up. Several tuning plans are available with a mere spin of the tuning knob.

The Model 715i meter gives the amplitude readings you need. In the tune-by-channel format, it displays the video carrier amplitude (dBmV) and the relative audio carrier amplitude (dB difference). No mathematics to do, no series of keys to push. The readings are there when you want them, displayed the way you need them.

Range keys control the amplitude scale. By selecting the highest expected range, signal levels are displayed on the amplitude readout. Automatic up-ranging selects the higher attenuation needed when encountering an unexpected over-range signal level.

Ninety-nine field programmable memory slots in non-volatile memory are available for high-use (Priority) frequencies. These allow quick testing of pilot frequencies, pay channels, offset channels, or other critical frequencies. Eight initial frequencies are programmed at the factory. These may be changed, deleted, or new frequencies may be added. In additional to the field programmable priority channels, there are several factory programmed standard channel plans. These channel plans are accessible, one at a time, via a channel plan "menu". This menu is accessible within the tune-by-channel mode.

NOTE: See the section on Field Programming for information regarding changing the programmed frequency of the user-programmable and CAL frequencies, and selecting a channel tuning plan.

3.1 OPERATION

Operating the Model 715i has been kept as simple as possible, without sacrificing functions, capabilities, or accuracy. To begin operation, first press the ON/OFF switch to energize unit. Upon turn on, the unit will display all segments on the L.C.D. displays as well as light all attenuator L.E.D.s for approximately three seconds (the charge L.E.D. lights only upon application of power to the external power jack). The settings of the unit as it was before last power down will be 'reloaded' from non-volatile memory, and the unit will return to service.

Next, select the amplitude range sufficient to measure the highest amplitude signal to be encountered, and connect the signal to be measured to the RF input type "F" connector.

AMPLITUDE RANGE SELECTION

Measurement Range = 0 dBmV to +40 dBmV
Measurement Range = -20 dBmV to +20 dBmV

3.11 TUNING TV CHANNEL FREQUENCIES (TUNE-BY-CHANNEL)

The tune-by-channel format will tune all channels within the selected channel plan throughout the frequency range of the meter. By using the Freq/Chan key, select the tune-by-channels format. In this mode, the bottom display will show a channel indicator plus the channel number being received, the top display will show the amplitude levels. Using the tuning knob, simply tune to the desired channel to be measured. (The tune-by-channel format will tune according to the specific channel plan selected.) The top amplitude display will show the video level (dBmV) on the left hand three-digit section and the relative video-audio level (video *minus* audio) (dB) on the right hand three-digit section. Both the video and delta video-audio readings are continuously updated about three times a second. See Fig. 1

In the tune-by-channel mode, the Model 715i will tune through all channels within the frequency range of the unit. In addition to these channels, user-programmable Priority frequencies, a calibrate (CAL) frequency, a battery check position, and a channel plan tuning selection position are available. See Fig 2. These positions are explained in the following section.

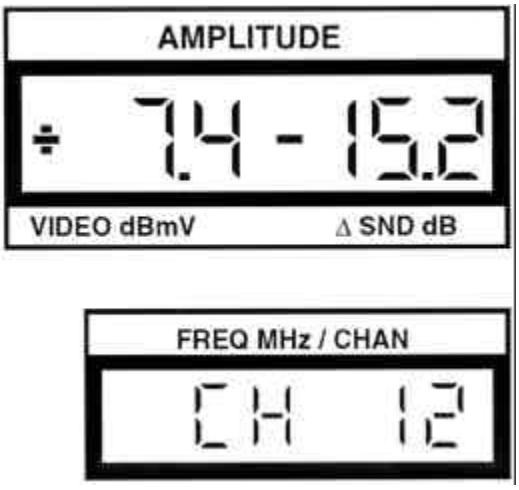


Fig. 1 Sample displays for tune-by-channel

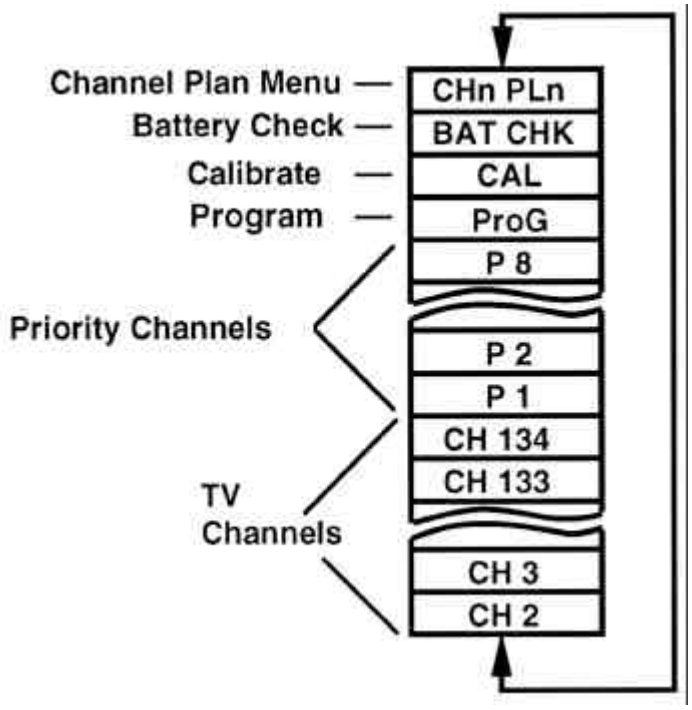


Fig. 2 Tune-by-channel tuning illustration

NOTE: *When selecting tune-by-channel, the unit will tune the closest channel to the frequency previously selected while in the tune-by-frequency mode. Conversely, when changing to the tune-by-frequency mode, the unit will tune the video carrier frequency of the channel previously selected in the tune-by-channel mode. Also, when tuning channels, only the particular channels within the selected channel plan will appear (Fig. 2 shows NCTA Standard). The number of Priority Channels that will appear depends on the number programmed. See the section on Field Programming for information regarding selecting a channel tuning plan.*

3.12 TUNING SPECIAL FREQUENCIES

Accessible only in the tune-by-channel format are the user-programmable 'tuning slots' as well as a CALibrate tuning frequency position. Although found only in the tune-by-channel mode, these are single tuned frequencies and do **not** tune in the dual video-audio frequency pair (video + audio offset) as do the normal TV channels. In the tune-by-channel mode, these are accessible far easier than tuning through the entire tune-by-frequency range.

To measure signals at the user-programmable and CAL frequencies, use the tuning knob to tune the desired P-Channel position. (These special P-Channel frequencies are unaffected by the specific channel plan selected.) The display will show the amplitude level (dBmV) on the left hand three-digit section of the amplitude display. The right hand three-digit section of the amplitude display will show **P01-P99** (for **P**riority-programmable frequency one through ninety-nine) or CAL (for **Cal**ibrate frequency). Also, the lower frequency/channel display will show the frequency in MHz rather than a channel number as displayed when tuning TV channels. See Fig. 3.

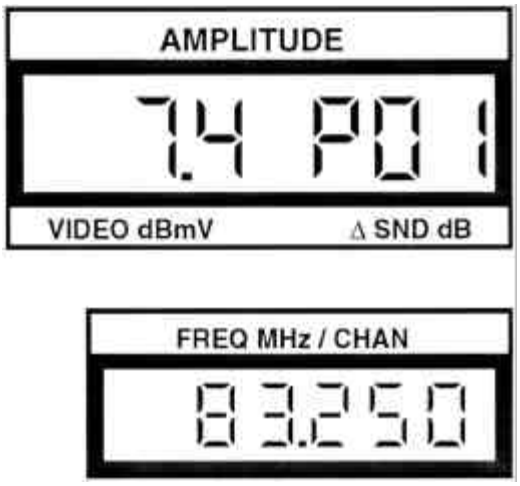


Fig. 3 Sample display for tune special frequencies

NOTE: *See the section on Field Programming for information regarding changing the programmed frequency on the user-programmable and CAL frequencies. See the section on Calibration Verification and Correction for information regarding calibration of the Model 715i at the CAL frequency.*

3.13 TUNING ANY FREQUENCY (TUNE-BY-FREQUENCY)

The tune-by-frequency format will tune all frequencies throughout the range of the meter. By using the Freq/Chan key, select the tune-by-frequency format. In this mode, the bottom display will show the exact frequency being received, the top display will show the amplitude level. Using the tuning knob, simply tune to the desired frequency to be measured. The Model 715i will tune by 0.125 MHz steps in this mode. The top amplitude display will show the signal level (dBmV) on the left hand three-digit section and the right hand three-digit section will remain blank. See Fig. 4.

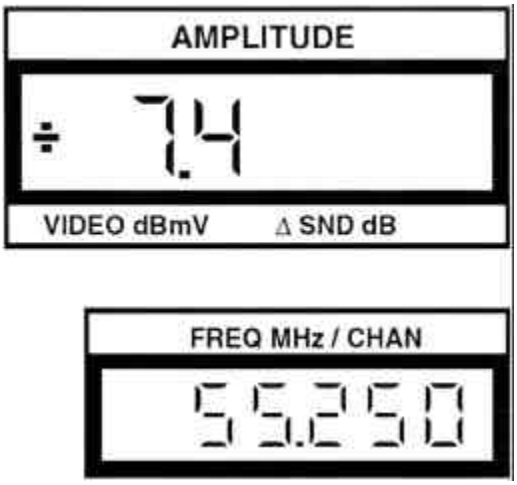


Fig. 4 Sample display for tune-by-frequency

NOTE: *When selecting tune-by-channel, the Model 715i will tune the closest channel to the frequency previously selected while in the tune-by-frequency mode. Conversely, when changing to the tune-by-frequency mode, the unit will tune the video carrier frequency of the channel previously selected in the tune-by-channel mode.*

3.14 CALIBRATION VERIFICATION AND CORRECTION

All test equipment should, from time to time, have its calibration measured against a known accurate standard. The basis of accuracy of a signal level meter is its calibration to a reference signal of known level. The accuracy of the meter is then as accurate as the stated level of the calibration signal. The Model 715i has a calibrate tuning position (accessible in the tune-by-channel mode) which automatically tunes to a programmable calibrate frequency. In this position, the user can enter a calibration correction factor which will recalibrate the Model 715i, if necessary, to agree with the known standard. The calibration operation using the Applied Instruments Model PC-1 pocket calibrator is as follows: the PC-1 has a carrier frequency of 150 MHz and an amplitude of +35.0 dBmV. Connect the PC-1 to the RF input through whatever normal length of patch cable that you use (approximately 3 feet). Switch on the PC-1 and the Model 715i. Set the max-scale attenuator to 40 dBmV. Tune the meter to the CAL position and

read the amplitude from the left side of the top display. The reading should be +35 dBmV, but, for example, assume it actually reads +34.6 dBmV. Press and hold the Freq/Chan key as CAL begins to flash indicating entering the re-calibrate mode. (The Freq/Chan key in this case is used to enter the calibration mode and store the new calibration factor. Holding the key while changing the calibration is to prevent accidental reprogramming). Turn the tuning knob clockwise four clicks and the amplitude display will increment, 34.7, 34.8, 34.9, and with the fourth click 35.0 dBmV.

Release the Freq/Chan key and CAL stops flashing, indicating that the correction has been stored in non-volatile memory. The 0.4 dB amplitude correction setting has now been made to all frequencies within the tuning range of the Model 715i. The range of the calibration correction setting is +/- 3 dB. If the required correction is greater than 3 dB, the unit should be returned for factory recalibration. See Fig. 5.

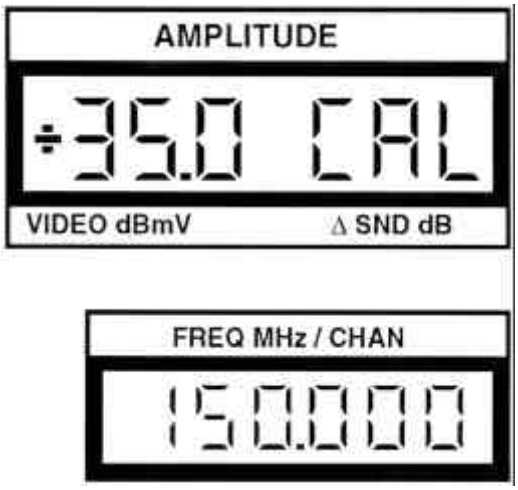


Fig. 5 Sample display for calibrate amplitude

3.15 CHECKING THE BATTERY

Nickel-Cadmium batteries will last for 300 to 1000 charge-discharge cycles if properly cared for. In a well-designed piece of equipment this means only that the battery not be recharged more often than it needs to be. The Model 715i is very efficient and its battery will last for about eight (8) hours of actual operation. This sometimes means that it will last for many days of normal usage. Recharging every night under these conditions will reduce the number of charge - discharge cycles that you will realize from a given battery pack. The Model 715i has a battery check mode that is one of the positions on the tuning knob (in the tune-by-channel format). In this position the bottom display reads BAT CH and the top display shows, by a series of bars, the approximate charge remaining in the battery. For the first few hours of operation the display will show 8 bars. As the charge is used the bars will disappear from the right at a rate of one bar per 30 minutes. It is easy to estimate the time remaining until recharge will be necessary. If the user fails to check the battery for charge remaining, the unit still has a method of conveniently informing the user of a low battery condition. The microprocessor looks at the charge level every

minute and when there is about 30 minutes of operation remaining, a LO BAT message flashes in the bottom frequency display. The flashing LO BAT allows the frequency display to be easily used while still constantly reminding the user the battery is in need of recharging. The AC wall transformer will completely recharge the battery overnight (12 Hours). See Figs. 6 & 7.

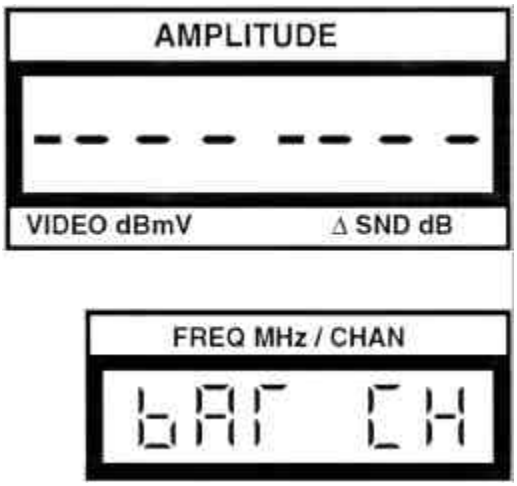


Fig. 6 Sample display for Battery Check

Fig. 7 Sample display for Lo Bat flash

4.0 FIELD PROGRAMMING

This section describes how to select the desired frequency-tuning plan, how to field program any of the ninety-nine Priority frequencies into memory, and how to change the calibration frequency.

4.1 SELECTING CHANNEL TUNING PLANS

The Model 715i has many tuning plans stored in memory. Only one tuning plan is used at any one time. You may select any desired plan by the following procedure.

1) With the unit in the Tune-by-Channel mode, dial to the Channel Plan menu. This menu position is denoted by the top display showing **CHn PLn** for Channel Plan. The bottom display shows a channel plan mnemonic. This label is a brief identification of the channel plan, shown in a manner that can be displayed within the limitations of displaying alpha characters on a seven-segment display. The chart below lists the tuning plans and their associated mnemonic:

Mnemonic	Channel Plan	Appendix
STd	NCTA Standard 860 (all channels to 860 MHz)	B
STd600	NCTA Standard 600 (all channels to 600 MHz)	B
STd450	NCTA Standard 450 (all channels to 450 MHz)	B
Hrc	NCTA HRC 860 (all channels to 860 MHz)	B
HrC600	NCTA HRC 600 (all channels to 600 MHz)	B
HrC450	NCTA HRC 450 (all channels to 450 MHz)	B
IrC	NCTA IRC 860 (all channels to 860 MHz)	B
IrC600	NCTA IRC 600 (all channels to 600 MHz)	B
IrC450	NCTA IRC 450 (all channels to 450 MHz)	B
JrdSTd	JERROLD Standard 860 (all channels to 860 MHz)	C
JrS600	JERROLD Standard 600 (all channels to 600 MHz)	C
JrS450	JERROLD Standard 450 (all channels to 450 MHz)	C
JrdHrc	JERROLD HRC 860 (all channels to 860 MHz)	C
JrH600	JERROLD HRC 600 (all channels to 600 MHz)	C
JrH450	JERROLD HRC 450 (all channels to 450 MHz)	C
Air	NCTA Off-Air (Channels 2-13, UHF 14-70)	D
PAL I	PAL I (all channels to 600 MHz)	E
PALb-G	PAL B&G (all channels to 600 MHz)	F

NOTE: *The abbreviated channel plans may be used in systems without full channel coverage. This will save time by eliminating tuning through channels not present on the system. The abbreviated channel plans do not decrease the actual tuning range of the unit.*

2) Once in the menu position, press and hold the Freq/Chan key. This will cause the **PLn** of **CHn PLn** to flash. This shows the tuning plans can now be changed. While continuing to hold down the Freq/Chan key, turn the tuning knob. The channel plan mnemonics will appear with each click of the tuning knob.

3) To select the desired new plan, simply stop at the desired mnemonic and release the Freq/Chan key. This will cause the **PLn** of **CHn PLn** to no longer flash. The newly selected plan is immediately available for use.

4.2 STORING SPECIAL FREQUENCIES IN MEMORY

The ninety-nine programmable Priority frequencies as well as the calibrate frequency are programmed using the following procedures:

1) With the unit in the Tune-by-Channel mode, dial to the Program menu. This menu position is denoted by the top display showing **P rog** for Program. The bottom display remains blank.

2) Once in this menu position, press and hold the Freq/Chan key. This will cause the **rog** of **P rog** to flash, showing the unit is entering the Program mode. Once the unit has entered the Program mode, the first programmable channel P01 will be displayed. The unit is now ready to add / delete / change P-Channels.

3) To exit the Program mode, dial to the **donE** position and press the Freq/Chan key. All programming changes are stored and the unit returns to the normal operating mode. *Note: The* **donE** *position ONLY appears in the tuning menu while in the program mode.*

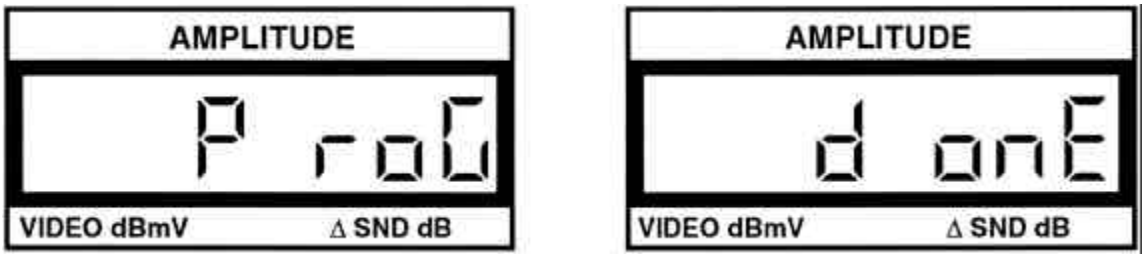


Fig. 8 Display samples for entering and exiting Program mode.

4.21 CHANGING FREQUENCIES

To select any of the existing P-Channels or CAL frequency to change, use the tuning knob to increment / decrement through the P-Channel positions. Only those positions currently programmed will be accessible. (To add or delete channels, see the following section.) Stop at the P-Channel to be changed.

Once in the Program mode, to change a P-Channel:

1. To initiate a change, press and hold (for >1 second) the Freq/Chan key. This delay is to avoid accidental reprogramming. Once the unit has sensed a key press of sufficient length, the P-Channel number will flash. This indicates a frequency change can now be made. The tuning knob will now increment or decrement the frequency display. Tune to the desired frequency. Another press of the Freq/Chan key will instantly program the indicated frequency into the selected P-Channel. The P-Channel indicator will no longer flash, indicating this change has been accepted. This new frequency will be saved in non-volatile memory. If a change is initialized and then not desired, pressing the on/off key twice (off then on) will cancel the frequency change and return to the selected P-Channel. Any existing P-Channel as well as the CAL frequency can be changed in this manner.

4.22 ADDING FREQUENCIES

New P-Channels can be added to the "top" of the P-Channel list or to any point within the currently programmed positions. Please note, however, if a P-Channel is inserted within an existing channel set, all channels above the added channel will be pushed up one P-Channel slot. For example, assume there are twenty P-Channels programmed. If a channel is added at position 15, channels that occupied positions 15 through 20 will now occupy positions 16 through 21, respectively.

Once in the Program mode, to add a P-Channel:

1. Once in the programming mode, tune the tuning knob to the P-Channel position one position below the channel position to be added. For example, to add new position twenty, begin at existing position nineteen. If a channel is to be added to the top of the P-Channel list, then start at that point, i.e. position twenty-five of a twenty-five-position list. Then, to **add** a channel, press and hold the up-attenuator key (which is now an "add channel key") for >1 second. This delay is to avoid accidental reprogramming. Note that the current P-Channel display will flash. This indicates the unit will add a new P-Channel after one second. To cancel the channel addition, remove pressure from the up-attenuator key within one second. Once the unit has sensed a key press of sufficient length, the P-Channel number is incremented to the next higher number, and the display will no longer flash. The new P-Channel is now programmed. The frequency that the unit uses to store in the new position is the previous channel frequency plus six MHz. This addition is to assist in adding P-Channels with the same channel spacing. Once a channel is added, following the change procedure can change this frequency. There is a limit of ninety-nine P-Channels.

4.23 DELETING FREQUENCIES

Existing P-Channels can be deleted from the "top" of the P-Channel list or at any point within the currently programmed positions. If a P-Channel is deleted from an existing channel set, all channels above the added channel will be pulled down one P-Channel slot. For example, assume their are twenty P-Channels programmed. If a channel is deleted at position 15, channels that occupied positions 16 through 20 will now occupy positions 15 through 19, respectively.

Once in the Program mode, to delete a P-Channel:

1. Once in the programming mode, tune the tuning knob to the P-Channel position at the channel position to be deleted. For example, to delete present position twenty, begin at position twenty. If a channel is to be deleted from the top of the P-Channel list, then start at that point, i.e. position twenty-five of a twenty-five-position list. Then, to **delete** a channel, press and hold the down-attenuator key (which is now a "delete channel key") for >1 second. This delay is to avoid accidental reprogramming. Note that the current P-Channel display will flash. This indicates the unit will delete the current P-Channel after one second. To cancel the channel deletion, remove pressure from the down-attenuator key within one second. Once the unit has sensed a key press of sufficient length, the P-Channel number is decremented to the next lower number, and the display will no longer flash. The current P-Channel is now deleted, and the display shows the P-Channel that was below the deleted channel. If there are channels above the deleted channel, a tuning knob increment will show the next channel will have the P-Channel number and frequency of the channel that was above the deleted channel.

5.0 ACCESSORIES

5.1 CANVAS CARRYING/OPERATING BAG

The padded canvas bag provides additional protection to the Model 715i while being transported and the cover flap can be quickly unzipped and folded open for access to the front panel operating controls and indicators. The inside of the cover flap contains a small pocket suitable for storing a three or four foot patch cable.

5.2 AC WALL TRANSFORMER

For 117VAC applications, the wall transformer is rated at 117 VAC, 50-60 Hz primary and 16VAC at 0.375 Ampere secondary. For 240VAC applications, a wall transformer is rated at 240VAC, 50Hz primary may be supplied if requested. Using a transformer with a lesser or greater rating may damage the transformer and the Model 715i.

CAUTION: The external charge jack is to receive power from the provided AC wall transformer. Any attempt to charge the Model 715i on an external power source other than the provided AC wall transformer may result in poor operation or damage to the Model 715i.

6.0 MAINTENANCE

6.1 RF INPUT CONNECTOR REPLACEMENT

Since the RF input connector receives many insertions per day of the drop wire, the life of the connector is fairly short. The connector is a common type "F" double female that can be replaced with only a 7/16-inch wrench. No case disassembly is required; however, it is easier to get to if the Model 715i is removed from its canvas bag. If necessary, replacement type "F" connectors are available from Applied Instruments.

6.2 BATTERY PACK REPLACEMENT

Nickel-Cadmium batteries will last for 300 to 1000 charge-discharge cycles if properly cared for. However after the normal lifetime of service the battery pack will need to be replaced. This requires some disassembly of the unit. To replace the battery pack, perform the following steps:

1. Remove the unit from its canvas bag.
2. Release the latches on the right side of the unit.
3. Open the panel cover and carefully unplug the ribbon cable connector from the lower printed circuit board.
4. Use a pin punch or similar tool to partially slide the hinge pins out of the hinges. Use pliers to completely remove the hinge pins. Lay the panel assembly aside.
5. Remove the two Phillips head screws on each side of the lower case. (Total of four screws.) Also remove the RF input type "F" connector.
6. Carefully unplug the two-wire plug at the upper left edge of the printed circuit board.
7. Turn the unit upside down while keeping your fingers over the case opening so as not to drop the assembly as it slides out of the case. (While holding the unit inverted slightly flex the plastic case and let gravity slide the assembly out of the case). Unplug the connector on the wire from the battery pack at the printed circuit board. The old battery pack will now slide out of the chassis.
8. Insert new battery pack (Applied Instruments part number: 990-02200) into the battery holder portion of the chassis, making sure the wires leaving the protective fish paper box are towards the **bottom** of the chassis.

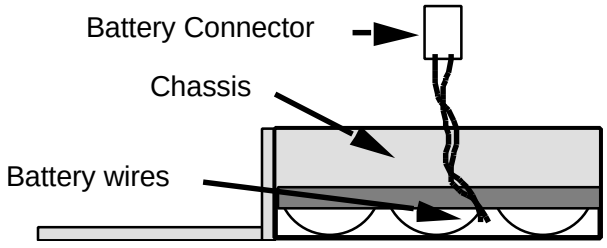


Fig. 9 Battery wire installation.

9. To reinstall the chassis into the case, turn the chassis on its side (hinges up, latches down) and slide the chassis assembly into the case. (Make sure the threaded F-connector hole aligns with the case hole).
10. To finish reassembly, reinstall the type "F" connector, chassis screws. Attach the removed front panel assembly and reconnect the 2-pin external power connector to the printed circuit board.

Upon completion of reassembly, turn the unit on and switch to the battery check position. If no bars are showing, indicating that the battery is nearly discharged, plug the unit into the AC wall transformer and allow the battery to charge at least 12 hours.

6.3 WARRANTY

The Applied Instruments Model 715i is warranted against defects in material and workmanship for a period of twelve months. Applied Instruments agrees to repair or replace any assembly or component found to be defective under normal use during this period. Our obligation under this warranty is limited solely to repairing the instrument that proves to be defective within the scope of the warranty when returned to the factory. Transportation to the factory is to be prepaid by the customer. Authorization by Applied Instruments is required prior to shipment.

Applied Instruments assumes no liability for secondary charges or consequential damages and, in any event, Applied Instruments' liability for breach of warranty under any contract shall not exceed the purchase price of the Model 715i shipped and against which a claim is made.

Any application recommendation made by Applied Instruments for the use of its products are based upon tests believed to be reliable, but Applied Instruments makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Applied Instruments any liability in connection with the sale of our products other than set forth herein.

7.0 APPENDICES

The following pages contain useful channel plan information as well as a dBmV conversion chart.

Appendix A - dBmV - mV - mW conversion chart
Appendix B - NCTA Channel Plan, Standard, HRC, IRC
Appendix C - Jerrold Channel Plan, Standard, HRC
Appendix D - NCTA Channel Plan, Off-Air
Appendix E - PAL I Channel Plan
Appendix F - PAL B&G Channel Plan
Appendix G - Sub Channel Plan