7. PARTS LIST/TUNE-UP INFO

7.1 Parts List

The transmitter, can be subdivided as follows:

Transmitter Tray:

- Modulator Module
- IF Processor Module
- L.O. / Upconverter Module
- Control & Monitoring / Power Supply Module
- Power Amplifier Module

7.2 Tune-up Information

The LHV100AT transmitter was aligned at the factory and should not require additional alignments to achieve normal operation.

7.2.1 Transmitter Chassis Assembly

This transmitter takes the baseband audio and video inputs or, if the (Optional) 4.5-MHz composite input kit is purchased, either a single composite video + 4.5-MHz input or separate baseband video and audio inputs, and converts them to the desired VHF On Channel RF Output at the systems output power level.

7.2.2 Modulator Module Assembly

Note: Not present in Translator systems.

The Modulator Assembly has adjustments for video levels and audio modulation levels, and other related parameters.

Connect an NTSC base-band video test signal input (1 Vpk-pk) to the transmitter video input jack J7 on the rear of the tray. Jacks J7 and J17 are loop-through connected; the J17 jack can be used as a video source for another transmitter. Connect a base-band audio input (+10 dBm) to the balanced audio input terminal block TB02-1 [+], TB02-2 [-], and TB02-3 [ground] or, if stereo/composite audio is provided, connect it to BNC jack J3, the composite audio input jack.

Verify that all LEDs located on the front panel of the Modulator are Green. The following details the meaning of each LED:

AURAL UNLOCK (DS5) – Red Indicates that 4.5 MHz Aural IF is unlocked from the 45.75 MHz visual IF.

VISUAL UNLOCK (DS6) – Red Indicates that the 45.75 MHz visual IF is unlocked from the 10 MHz reference.

AUDIO OVER DEVIATION (DS4) – Red Indicates that the input Audio level is too high.

VIDEO LOSS (DS1) – Red Indicates that the input Video level is too low.

OVER MODULATION (DS3) – Red Indicates that the input Video level is too high.

ALTERNATE IF (DS7) – Red Indicates that an external 45.75 MHz IF is not present to the modulator.

10 MHz PRESENT (DS2) – Red Indicates that an external 10 MHz reference in not present to the modulator.
Look at the front panel LCD meter on the Control/Power Supply Module Assembly. Set the LCD screen to the Modulator Details video output level screen, the screen indicates active video from 0 to 1 Vpk-pk. The normal video input level is 1 Vpk-pk on the front panel screen. If this reading is not at the proper level, the overall video level can be changed by adjusting the VIDEO LEVEL control R42 on the front panel of the Modulator to the 1 Vpk-pk level on the front panel screen.

Switch the LCD display to the Modulator Details screen that indicates the AUDIO DEVIATION (modulation level) of the signal from 0 to 100 kHz.

MONO SET UP: The modulator was factory set for a ±25-kHz deviation with a mono, balanced, audio input of +10 dBm. If the reading is not at the correct level, adjust the MONO Audio Gain pot R110, located on the front panel of the modulator, as necessary, to attain the ±25-kHz deviation on the front panel screen.

STEREO SET UP: The modulator was factory set for a ±75-kHz deviation with a stereo, composite, audio input of 1 Vpk-pk. If this reading is not correct, adjust the STEREO Audio Gain pot R132, located on the front panel of the modulator, as necessary, for the ±75-kHz deviation.

SECONDARY AUDIO SET UP: NOTE: Remove any stereo or mono audio modulation input to the transmitter during the set up of the secondary audio. The modulator was factory set for a ±15-kHz deviation with a secondary audio input of 1 Vpk-pk. If this reading is not correct, adjust the SAP/PRO Audio Gain pot R150, located on the front panel of the modulator, as necessary, for the ±15-kHz deviation.

7.2.3 If Processor Module Assembly

Verify that all red LEDs located on the IF Processor front panel are extinguished. The following details the meaning of each LED when illuminated:

- DS1 (input fault) – Indicates that either abnormally low or no visual IF is present at the input of the IF Processor module.

- DS2 (ALC fault) – Indicates that the ALC circuit is unable to maintain the signal level requested by the ALC reference. This is normally due to excessive attenuation in the linearity signal path or the IF phase corrector signal path, or that switch SW1 is in the Manual ALC Gain position.

- DS4 (Mute) – Indicates that a Mute command is present to the system.

Switch the transmitter to Standby. The ALC is muted when the transmitter is in Standby.

Switch the transmitter to Operate. Verify that all LEDs located on the front panel of the visual Upconverter are Green. The following details the meaning of each LED:

PLL 1 Fault (DS1) - Displays the status of the 1 GHz PLL, Green locked or Red unlocked

PLL 2 Fault (DS2) - Displays status of the 1.1-1.9 GHz PLL, Green locked or Red unlocked

AGC Fault (DS7) – NOT USED IN THIS CONFIGURATION.

AGC Override (DS3) **- Displays status of AGC cutback, either Green normal** drive level, no cutback, or Red cutback, too much drive level to driver module.

Manual AGC (DS6) - Displays status of the control of the AGC level, either Green, in AGC, AGC Adj. using R6 or Amber, in manual, Man Gain Adj. using R7.

7.2.4 VHF/UHF Upconverter Module Assembly

Switch the transmitter to Operate. Verify that all LEDs located on the front panel of the Upconverter are Green. The following details the meaning of each LED:

PLL 1 Fault (DS1) - Displays the status of the 1 GHz PLL, Green locked or Red unlocked

PLL 2 Fault (DS2) - Displays status of the 1.1-1.9 GHz PLL, Green locked or Red unlocked
AGC Fault (DS7) - Displays status of AGC, Green normal or Red out of range

AGC Override (DS3) - Displays status of AGC cutback, either Green normal drive level, no cutback, or too much drive level to driver module, Red cutback.

Manual Gain (DS6) - Displays the status of the control of the AGC level, either Green normal, AGC Adj. using R6 or Amber manual, Man Gain Adj. using R7.

7.2.5 Setting Up the Drive Level of the Transmitter Procedure

Setting the Manual AGC

Preset the front panel "MAN GAIN ADJ" pot on the Upconverter full **Counterclockwise**, and the MAN/AUTO AGC Switch to the **Left, Man.** Turn the transmitter to Operate, and slowly adjust the Man Gain pot until the desired % output power, as read on the LCD display, has been reached. The Manual AGC is now set. Normal operation of the Transmitter is in the Auto AGC position.

Setting the Auto AGC

With the transmitter in **Standby**, preset the AGC ADJ pot on the Upconverter full **Counterclockwise**. Preset the AGC Cutback Adj pot on the Upconverter full **Clockwise**. Move the Man/Auto AGC Switch on the Upconverter to the **Right, Auto**. Switch the transmitter to **Operate** and slowly adjust the AGC Adj pot until the desired output power has been reached.

Monitor the output of the transmitter with a Spectrum Analyzer and turn the power up 1 dB higher than the normal desired output using the AGC Adj pot. Enter the Transmitter Set-Up menu on the LCD Control Panel and step through the screens until the screen labeled "Inner Loop Gain U/C" is reached. The inner loop is adjustable from 0-255. Use the + button to increase the Inner Loop Gain until the power on the spectrum analyzer

just begins to decrease. Use the – button to decrease the inner loop gain by 10%. (If it begins to affect power at setting 160, drop it back down to 160-16=144, if it affects power at 100, drop it down by 10 to 90, etc….). Slowly turn the AGC Cutback Pot **Counterclockwise** until the AGC Override light begins to flicker, and the output power begins to drop. Turn the pot **Clockwise** slightly, so the light just goes out and the power stabilizes. Turn the AGC pot down to get back to the desired % output power level. The Auto AGC is now set. Normal operation of the Transmitter is in the Auto AGC position.

7.2.6 Calibration of the Transmitter Forward Output Power Level

Switch the transmitter to Standby and preset R51, the aural null pot on (A44) the visual/aural metering board, fully CCW. Switch the Upconverter sled to Manual Gain. Adjust R48, the null offset pot on the visual/aural metering board, full CW. Adjust CCW until 0% visual output is displayed on the LCD Display in the System Visual Power position. Perform the following adjustments with no aural present by removing the jumper cable, from J9 to J19, the aural IF loop-through, that is connected on the rear of the exciter/driver chassis. Connect a sync and black test signal to the video input jack of the exciter/driver. Switch the transmitter to Operate.

Next, set up the transmitter for the appropriate average output power level using the Manual Gain pot on the Upconverter sled:

Example is for a 100-Watt transmitter.

- Sync + black 0 IRE setup/wattmeter=59.5 watts
- Sync + black 7.5 IRE setup/wattmeter=54.5 watts

NOTE: The transmitter must have 40 IRE units of sync.

Adjust R28, visual calibration, on the (A44) visual/aural metering board for .8V, at TB31-14 and TB31-12 return, on the driver/amplifier assembly, then adjust the display to read 100% on the front panel meter in the System Forward Power position.

With the spectrum analyzer set to zero span mode, obtain a peak reference on the screen. Reconnect aural IF jumper cable, J9 to J19, on the rear of the driver/amplifier. While in the Visual Output Power position, adjust L3 for a minimum visual power reading on the LCD display. Turn the power adjust pot on the Upconverter sled front panel until the original peak reference level is attained. Peak L1 and C8 for a maximum aural power reading, then adjust R20 for .8V, at TB31-15 and TB31-12 return, on the exciter/driver assembly, then adjust LCD display for 100% system aural power reading. Switch to the Visual Output Power position and adjust R51 for 100% visual power on system LCD display. Switch the Upconverter to Auto and adjust the IF ALC Gain Pot for 100% Output.

With the transmitter in **Standby**, preset the AGC pot on the Upconverter full **Counterclockwise**. Preset the AGC Cutback pot on the Upconverter full **Clockwise**. Move the Man/Auto Gain Switch on the Upconverter to the **Right, Auto**. Switch the transmitter to **Operate** and slowly adjust the AGC pot until the desired output power has been reached.

Monitor the output of the transmitter with a Spectrum Analyzer and turn the power up 1 dB higher than desired using the AGC pot. Enter the Transmitter Set-Up menu on the LCD Control Panel and step through the screens until the screen labeled "Inner Loop

Gain" is reached. The inner loop is adjustable from 0-255. Use the **+** button to increase the Inner Loop Gain until the power on the spectrum analyzer just begins to decrease. Use the **–** button to decrease the inner loop gain by 10%. (If it begins to affect power at setting 160, drop it back down to 160-16=144, if it affects power at 100, drop it down by 10 to 90, etc….).

Slowly turn the AGC Cutback Pot **Counterclockwise** until the AGC Override light begins to flicker, and the output power begins to drop. Turn the pot **Clockwise** slightly, so the light just goes out and the power stabilizes. Turn the AGC pot down to get back to the desired % output power level.

The Auto AGC is now set. Normal operation of the Transmitter is in the Auto AGC position.

7.2.7 Calibration of the Transmitter Reflected Output Level

On the meter, in the Visual Power position, turn the power adjust pot to 25%. Move the Reflected cable on the filter coupler assembly to the unused forward port on the filter coupler assembly. Then adjust R39 on (A44) the visual/aural metering board for a .2VDC, at TB31-13 and TB31-12 return, on the exciter/driver assembly. Next, adjust the LED display for 25% reading in the System Reflected Power position. At this 25% reference power reading a reflected power fault should appear on the System Errors Menu. Turn the power adjust pot slightly CCW and the fault should be clearable on the System Error Menu. Turn the pot CW until the Fault appears. The reflected output power is now calibrated.

Switch the transmitter to Standby and move the Reflected power cable on the filter coupler back to the "Reflected Port".

When the transmitter utilizes external amplifier modules, the Forward Power readings for each of the amplifier modules will need to be readjusted to a 100% Forward Power reading. These amplifier readings can be found under the Transmitter Details Main Screen, by arrowing down to each Amp Set and each Module. These adjustments are completed after the System Forward and Reflected Powers have been calibrated to 100% power.

The Driver PA Assembly's Visual Calibration adjust pot should be adjusted for .8V AGC 1 on the Upconverter Details Screen found in the Transmitter Details Screens. After the Amplifiers are all calibrated for 100% Forward Power readings, the AGC 2 voltage found on the same Upconverter Details screen should set for .9V.

Switch the transmitter to Operate and adjust the front panel power pot for a 100% visual power reading. Switch the Upconverter to the Auto AGC position and adjust the ALC Gain adjust pot on the front of the IF Processor module for 100% visual power reading, if needed.

7.2.8 Linearity Correction Adjustment

Refer to Figure 5-1, which shows the top on the exciter chassis assembly and the pots, switches and test points located on the modulator and IF processor boards that are accessed through the top cover.

The IF linearity correction function consists of three non-linear cascaded stages, each

having adjustable threshold or cut-in points. The threshold adjustment determines at what IF signal level the corresponding corrector stage begins to increase gain. Using Figure 5-1, locate the IN PHASE THRESHOLD adjustments for the first through third linearity corrector stages. Because the stages are cascaded, the order of correction is important. The first stage, R294, should cut-in near white level, with the cut-in point of the next stage, R295, toward black and with the last stage, R300, primarily stretching sync.

Check that ALC is set to +0.8 VDC on the LCD display in the set up menu. The ALC will operate to maintain the corresponding peak power level following the correctors. Therefore, the adjustment procedure must be repeated to achieve the correct differential gain pre-distortion. A positive aspect of linearity adjustment with the ALC Enabled is that the control movements will not affect peak power.

Start with the first linearity stage and adjust R294 CW to stretch the signal above the white region. Next, advance the second Threshold Control R295 to stretch the signal above the Black range. Adjust the third Threshold Pot R300 to stretch Sync. Go back through the white through black and sync correctors to touch up the effects of ALC level changes during the adjustment.

If the Transmitter is being driven very hard, it may not be possible to get enough Sync Stretch while maintaining a flat differential gain. In this case, some Video Sync Stretch may be used from the Modulator, R11, accessed through the top cover of the exciter/driver chassis assembly. The Video White Stretch Circuit, R393, can be used to stretch the Luminance portion of the Video Signal. To adjust it, apply a 5 Step Staircase Test Signal to the Transmitter and monitor the Low Frequency Linearity. Adjust R391 until the White portion of Video begins to Stretch. Adjust R393 as needed to control the amount of Stretch. Switch the Waveform Monitor to look at the full Video Signal. Adjust to the proper Depth of Modulation using the LCD screen set up depth of modulation screen, located on the control monitoring module. It may be necessary to repeat the White Stretch and Depth of Modulation adjustments a few times to get both parameters correct at the same time. If the Video Sync Stretch is used, it will need to be readjusted as the Sync Level has been slightly changed.

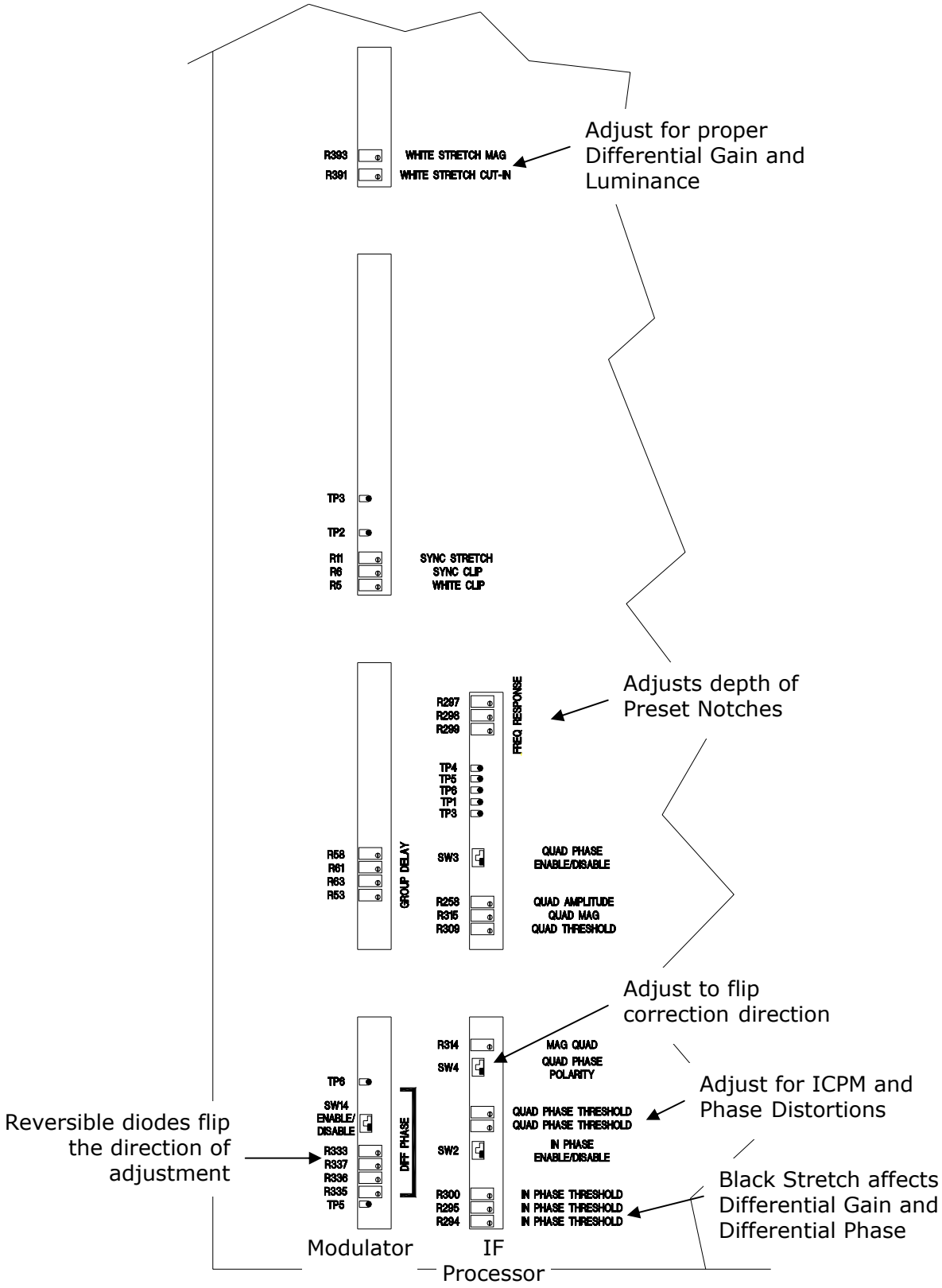

Figure 1-1. Adjustments accessed through the top of the HX Exciter Chassis

7.2.9 Differential Phase and ICPM Corrector Adjustment

The ICPM and phase distortions of the Transmitter are adjusted with the quad phase threshold and magnitude pots accessed through the top cover of the exciter/driver chassis. These pots are adjusted to control the Video Signal towards Sync, the point where the ICPM is Inverted and the Video Signal towards White. Switch SW4 sets up the quad phase polarity of the adjustment that is needed. SW3 enables or disables the quad phase adjustment.

The last step in the set up procedure is to correct whatever differential phase remains after the ICPM correctors are properly adjusted. Monitor the differential phase of the Transmitter Output and switch on the Video Differential Phase Corrector Switch, SW14 accessed through the top of the exciter/driver chassis assembly. The shape of the correction may be changed by the adjustment of the differential phase corrector pots R333, R335, R336 and R337. By reversing the diode adjacent to each pot (each diode is mounted in a plug socket), the direction of adjustment can be changed. The process of adjusting the pot and/or reversing the diode will provide the necessary phase correction.

This completes the set up and adjustment of the transmitter.

7.2.10 Bandpass Filter Assembly

The Bandpass Filter Assembly is tuned to reject unwanted distortion products generated when the signals are diplexed and also during the amplification process.

The Bandpass Filter is factory tuned to the proper bandwidth and should not need tuned.

The Transmitter is ready for normal operation.
This completes the detailed alignment procedures for the HX Series transmitter.