FACTORY CALIBRATION PROCEDURE

FOR

TYPE 525 TELEVISION WAVEFORM MONITOR

Quick check for long ends, unsoldered joints, poor wire dress, misaligned knobs, etc. Check to see that the crt pin connections are tight. Preset all pots to mid-range except the INTENSITY and SCALE ILLUM controls which are preset full left (ccw).

STEP 1. CHECK RESISTANCE TO GROUND OF TRANSFORMER PRIMARY AND ALL SUPPLIES

The power transformer primary must have infinite resistance to ground. The 120v supply should be approximately 5KΩ and the 280v supply should be approximately 8KΩ to ground.

STEP 2. SET +280 ADJ. MEASURE VOLTAGES AND CHECK RIPPLE AND REGULATION OF LOW-VOLTAGE SUPPLIES.

Turn the scope ON and adjust the 280v supply with the 280 ADJ. Measure the 120v supply and insure a voltage deviation of not more than ±3 volts. Check for proper operation of the scope and make necessary repairs to correct any existing operational defects.

With the test scope measure the ripple of both power supplies at 117v ac line. Ripple should not exceed 15mv on any supply. Regulation is checked by observing the ripple at 105v and 125v line. The ripple should not exceed 15mv on either supply at these line voltage extremes.

STEP 3. SET CAL. ADJ.

With 117v line and the VERTICAL RESPONSE switch at the FLAT position, INPUT SELECTOR to any CAL RANGE position, remove V245 and adjust CAL.ADJ. for 100v measured at pin 8 of V30B. Replace V245.

STEP 4. SET -1350 ADJ AND CHECK HV REGULATION

Set the -1350 ADJ. for -1350v measured at the rear end of the 10K resistor which returns to the plate of V941. While monitoring this voltage, rotate the INTENSITY control and note that the reading remains reasonably constant indicating proper regulation of the high voltage supply. (It is normal for the voltage to change after approximately 18 sec.) Install the high-voltage shield.

STEP 5. SET GEOM ADJ.

With no vertical deflection, rotate the crt until the trace lies perfectly horizontal in the center of the graticule. Clamp the crt in this position. Position the trace to the top and then to the bottom of the graticule, noting the deviation from a straight horizontal line. Set the GEOM. ADJ. for minimum geometric distortion at these positioning extremes. The maximum allowable deviation from a straight horizontal line is 1 mm. Display sufficient calibrator waveform for about 35 cm of vertical deflection. Observe the dim vertical lines, (the trailing edge of the calibrator waveform). Deviation from straight vertical lines must not exceed 1 mm.

STEP 6. ADJUST MAG. CENTERING

Adjust horizontal rate for four cycles of calibrator waveform, then set the MAGNIFIER to 25X. Position the trailing edge of the second cycle to the center of the graticule. Switch the MAGNIFIER to 1X and adjust MAG. CENTERING to bring the trailing edge of the second cycle to the graticule center. Repeat several times to compensate for interaction.

STEP 7. ADJUST HORIZ. SWEEP GAIN

Set the MAGNIFIER to 1X and the HORIZONTAL RATE control cw. Adjust the HORIZ. SWEEP GAIN for sufficient horizontal deflection to fill the graticule.

STEP 8. ADJUST SWEEP AMPLIFIER HIGH FREQUENCY COMPENSATION (C332)

Set the MAGNIFIER to 5X and with the calibrator waveform applied, position the beginning of the trace near the center of the graticule. Adjust C332 for minimum jump at the beginning of the trace as the HORIZONTAL RATE control is rotated. (Use low intensity for a more accurate setting).

STEP 9. SET MAG. CAL. ADJ.

Apply a signal from a TYPE 190 SIGNAL GENERATOR to either vertical input. Set the SIGNAL switch to the proper input and set the INPUT SELECTOR switch to NORM. or INV. Set the MAGNIFIER switch to 5X and the HORIZONTAL RATE control cw. Adjust the Type 190 for 10 cycles of display (about 650KC). Check the horizontal linearity by placing a 530-Series graticule over the standard graticule (±2%). Set the MAGNIFIER switch to 25X and set the MAG. CAL. ADJ. for 2 cycles over the graticule. Repeat the Type 190 adjustment at 5X and the MAG. CAL. ADJ. at 25X several times to compensate for interaction. Switch to 1X where there should be approximately 50 cycles of display. (Count approximately 5 cycles over 1 cm).

STEP 10. ADJUST VERTICAL DC BAL 1ST STAGE

With no signal applied to the vertical amplifier, and VERTICAL GAIN cw, rapidly rotate the vertical ATTENUATOR switch and note the ensuing vertical jump. Adjust the DC BAL 1ST STAGE for absence of trace movement while the switch is rotated.

STEP 11. ADJUST VERTICAL DC BAL 2ND STAGE

With vertical ATTENUATOR at 1X, rapidly rotate the variable VERTICAL GAIN control and adjust the DC BAL 2ND STAGE for absence of trace movement during rotation.

STEP 12. ADJUST VERTICAL LF COMP.

Apply a 100-cycle square wave from a TYPE 105 SQUARE-WAVE GENERATOR to the vertical amplifier. Set the VERTICAL RESPONSE switch to FLAT and the HORIZONTAL DISPLAY switch to the INT. TRIG. FIELD position. Adjust the LF COMP. for a flat topped square wave.

STEP 13. SET AMPLITUDE CALIBRATOR KNOB

Set the vertical ATTENUATOR to 1X and rotate the VERTICAL GAIN control cw. Set the INPUT SELECTOR to 1.5v and turn the DC REST OFF. Rotate the AMPLITUDE CALIBRATOR fully cw and position the display such that the top of the calibrator waveform is visible. Slowly rotate the AMPLITUDE CALIBRATOR in a ccw direction until the display exhibits its first change. Set the AMPLITUDE CALIBRATOR knob such that it indicates precisely full scale (1.5) at this point.

STEP 14. ADJUST VERT. GAIN SET

Set the vertical ATTENUATOR switch to 1X and the VERTICAL GAIN control fully cw. Switch the INPUT SELECTOR to .05v and the AMPLITUDE CALIBRATOR to .45v. Adjust the VERT. GAIN SET for 3 cm of deflection (0-60).

STEP 15. CHECK VERTICAL COMPRESSION

Position 3 cm of vertical deflection to the top of the graticule and note the change in gain. Position the display to the bottom of the graticule and again observe the change in gain. The change in either case must not exceed .5mm.

STEP 16. CHECK HUM AND MICROPHONICS

Set the HORIZONTAL DISPLAY switch to INT. TRIG. FIELD, the HORIZONTAL RATE control fully ccw, and the MAGNIFIER to 1X. Set the vertical ATTENUATOR to 1X and the VERTICAL GAIN control fully cw. With no signal applied and the input grounded, check for hum and microphonics.

STEP 17. INSURE CONSTANT VERTICAL GAIN WITH CHANGING LINE VOLTAGE

Apply sufficient calibrator waveform for 7cm (-40 to 100) of deflection. Reduce the line voltage to 105 volts and allow ample time for tube filaments to drop in temperature. Note the change in vertical gain. Increase the line voltage to 125 volts and again allow time for tube change, and observe the change in gain. The total change must not exceed 2%.

Check for vertical drift as the line voltage is changed from 105v to 125v. The total drift should not exceed .5cm.

STEP 18. ADJUST VERTICAL POSITION RANGE (R137)

Switch the DC REST. OFF and set the VERTICAL POSITION and VERNIER controls fully cw. With no signal into the vertical amplifier, adjust the vertical position range (R137) such that the trace positions at the top of the graticule.

STEP 19. CHECK AMPLITUDE CALIBRATOR FOR LINEARITY AND CHECK CAL. RANGE VOLTAGE STEPS

Set the AMPLITUDE CALIBRATOR fully cw and present a 6 cm display. Rotate the AMPLITUDE CALIBRATOR to indicate .5 at lower end. There should be exactly 2 cm of deflection. If not, break the seal on R38 and adjust for exactly 2 cm of deflection and reseal. Recheck Step 13 before disturbing R38. With the AMPLITUDE CALIBRATOR set at 1 there should be 4 cm of deflection. The calibrator range is checked as follows:

STEP 19. (Continued)

CAL. RANGE	Adjust between AMPLITUDE CALIBRATOR and VERTICAL SENSITIVITY for:	Switch CAL. RANGE to:	Resulting deflection should be:
1.5 v	6 cm	.5 v	2 cm
.5 v	5 cm	.15 v	1.5 cm
.15 v	6 cm	.05 v	2 cm

Tolerance of the calibrator attenuator is specified as 1%.

STEP 20. ADJUST VERTICAL 2X 5X ATTENUATOR (R47 AND R48)

Set the vertical ATTENUATOR to 2X and the VERTICAL GAIN control fully cw. Set the INPUT SELECTOR to .15v and the AMPLITUDE CALIBRATOR to .45. Adjust R47 for 4.5 cm of deflection (0-90). Switch the vertical ATTENUATOR to 5X and the INPUT SELECTOR to .5v. Adjust R48 for 6 cm of deflection (-20 to 100).

STEP 21. ADJUST VERTICAL AMPLIFIER HF COMPENSATIONS

Apply a signal from a TYPE 190 Signal Generator to the vertical amplifier. Turn the DC REST. OFF and adjust the vertical amplifier high frequency compensations as follows:

VERTICAL RESPONSE	Generator Frequency	Vertical ATTENUATOR	Variable VERTICAL GAIN	Adjust	Deflection
FLAT	450 kc	1X	ccw	Sig. Gen. Ampl.	7 cm
FLAT	2.5 mc	1X	ccw	L 191	7 cm
FLAT	5 mc	1X	ccw	L 84, L 87	7 cm
FLAT	450 kc	1X	cw	Sig. Gen. Ampl.	7 cm
FLAT	5 mc	1X	cw	L 80	7 cm
FLAT	450 kc	2X	cw	Sig. Gen. Ampl.	7 cm
FLAT	5 mc	2X	cw	L 47	7 cm
FLAT	450 kc	5X	cw	Sig. Gen. Ampl.	7 cm
FLAT	5 mc	5X	cw	L 49	7 cm
LOW PASS	3.58 mc	1X	cw	C 158	Minimum
HIGH PASS	3.58 mc	1X	cw	L 163	Maximum
FLAT	3.58 mc	1X	cw	Sig. Gen. Ampl.	1 cm
HIGH PASS	3.58 mc	1X	cw	H.P. GAIN ADJ.	5 cm

The settings of C158 and L163 can be checked by varying the frequency of the Type 190 and checking the frequency at which the minimum or maximum occurs.

Recheck the setting of R137.

STEP 22. ADJUST HIGH VOLTAGE NEUTRALIZING CAPACITOR (C915)

Apply a composite video signal to INPUT A or B and set the INPUT SELECTOR and SIGNAL switches to properly accommodate the signal (sync pulses pointing down). Set the HORIZONTAL DISPLAY switch to INT. TRIG. FIELD and the HORIZONTAL RATE control cw. Switch the MAGNIFIER to 25X and position the display horizontally until the vertical sync block is observed. Adjust the high voltage neutralizing capacitor (C915) for minimum vertical and velocity modulation of the display due to high voltage oscillator radiation.

STEP 23. ADJUST DC RESTORER KEYING PULSE WIDTH (C259)

Display 7 cm of video waveform and switch the DC REST. ON. Adjust C259 for a keying pulse width of from .8 to 1 μsec as observed with a test scope at either end of R278 (across V275B).

STEP 24. CHECK DC RESTORER FOR PROPER OPERATION

With video signal presented and the DC REST. ON, position the display so the sync pulses rest at -40. The sync pulses must remain at -40 while the amplitude of the display is varied from 3 cm to 35 cm. The dc restorer must operate equally well on both INT. TRIG. and EXT. TRIG. (slight readjustment of C259 may be necessary).

STEP 25. CHECK EXT. TRIG. INPUT

From the connector which is in parallel with the connected video signal, connect a jumper to the EXT. TRIG. input and set the TRIG. POL. switch to properly accommodate the applied signal. (TRIG. POL. to + with positive-going sync and to - with negative-going sync). Set the HORIZONTAL DISPLAY switch to EXT. TRIG. and insure proper synchronization on both LINE and FIELD rates with an input peak-to-peak sync-pulse amplitude as low as .4 volts.

STEP 26. CHECK INPUT A, B, DIFF., NORM and INV.

Apply a 10-μsec positive-going pulse from a TYPE 180 TIME MARK GENERATOR to INPUT A. Set the HORIZONTAL DISPLAY switch to INT. TRIG. LINE and the MAGNIFIER to 1X. Set the INPUT SELECTOR to INV. and note polarity reversal of the display. Transfer the signal from INPUT A to INPUT B. Set the INPUT SELECTOR to NORM. and the SIGNAL switch to B. Positive-going pulses should be observed. Rotate the SIGNAL switch to DIFF. and observe NEGATIVE going markers. Repeat above B procedure, applying the signal to the other INPUT B.

Connect a jumper from INPUT A to the INPUT B in parallel with the applied signal. With the SIGNAL switch in the DIFF. position no signal should be observed.

STEP 27. CHECK CRT CATHODE INPUT

Display approximately 5 cm of calibrator waveform on crt and with the ground link open, connect a test lead between CRT CATHODE and pin 8 of V30B. The top half of the calibrator waveform should be blanked.

STEP 28. MAKE A NOTE OF CRT TYPE AND SERIAL NUMBER AND RECORD ON CALIBRATION RECORD.