TYPE 575 TRANSISTOR-CURVE TRACER

F A C T O R Y

C A L I B R A T I O N P R O C E D U R E

First make a visual mechanical inspection. Check for long ends, unsoldered joints, wire dress, etc. Preset all pots and trimmers to mid-range, and preset front panel control as follows:

PEAK VOLTS RANGE	0-20
PEAK VOLTS	Full Left (ccw)
INTENSITY	Full Left (ccw)
STEP SELECTOR	.01 VOLTS/STEP
VERTICAL CURRENT OR VOLTAGE/DIV	.01 COLLECTOR MA.
BASE STEP GENERATOR	OFF
DISSIPATION LIMITING RESISTOR	0 Ω

1. CHECK RESISTANCE TO GROUND OF TRANSFORMER PRIMARY AND LOW-VOLTAGE SUPPLIES

   -150 v (6.5KΩ), +100 v (100Ω), 300 v (20KΩ), -15 v (on the heat sink) (150Ω), +15 v (junction of 1KΩ 2W and 100Ω 5W near V254) (20Ω). Resistance of the 15-v supplies will vary with the setting of the STEP SELECTOR control. Check transformer primary for infinite resistance to ground.

2. SET -150 ADJ. AND CHECK SUPPLIES FOR REGULATION AND RIPPLE

   Set the -150 v ADJ. for exactly (±.5%) 150v. Check the 100-v and the 300-v supplies for ±2% of their rated values. Check the plus and minus 15-v supplies for not more than 3 v away from their values.

   Ripple will not exceed 10 mv for the -150 v and the +100 v supplies. The 300-v supply will have approximately 25 mv of ripple. Check all supplies for regulation from 103 vac to 130 vac.

3. ADJUST THE HIGH VOLTAGE SUPPLY

   Set the -1700 ADJ. for that voltage at the -1700 TEST PT.

4. CHECK OPERATION OF THE HORIZONTAL AND VERTICAL CONTROLS

   Advance the INTENSITY control and position the spot to the central area of the graticule and check the FOCUS and ASTIGMATISM controls for proper operation. Obtain a horizontal trace by switching HORIZONTAL VOLTS/DIV to .5 COLLECTOR VOLTS. Advance PEAK VOLTS to obtain sufficient trace to align with the graticule. Push crt forward against graticule and align trace with the horizontal graticule lines. Tighten crt clamp.

5. ADJUST PHASE A AND PHASE B

   Obtain a vertical bar pattern on the crt by switching:

HORIZONTAL VOLTS/DIV	0.01 BASE VOLTS
VERTICAL VOLTS/DIV	0.01 COLLECTOR MA
BASE STEP GENERATOR	REPETITIVE
STEP SELECTOR	0.01 VOLTS/STEP

5. (Continued)

COLLECTOR SWEEP POLARITY	minus (-)
DISSIPATION LIMITING RESISTOR	0
PEAK VOLTS RANGE	0-20

Ground terminal C on the test panel and switch to TRANSISTOR A. Advance PEAK VOLTS for approximately 6-8 divisions of deflection. Adjust for 6 to 10 bars with the STEPS/FAMILY control. Place the STEPS/SEC switch up to the 120 position and adjust PHASE ADJ A for optimum flatness at the top of the waveform. Place the STEPS/SEC switch down to the 120 position and adjust PHASE ADJ B for optimum flatness at the bottom of the waveform. Check for alternate switching in the 240 STEPS/SEC position.

6. SET CRT GEOM. ADJ.

With the same display as in STEP 5 adjust GEOM. ADJ. for minimum curvature of the vertical traces.

7. ADJUST HORIZONTAL DC BAL.

Switch BASE STEP GENERATOR from REPETITIVE to OFF and remove the jumper from terminal C. Switch HORIZONTAL VOLTS/DIV to .5 BASE VOLTS. Hold AMPLIFIER CALIBRATION in ZERO CHECK and position the spot to the center of the graticule. Now switch HORIZONTAL VOLTS/DIV to .01 BASE VOLTS. With the AMPLIFIER CALIBRATION still held in the ZERO CHECK position, return the spot to the center of the graticule with DC BAL.

8. ADJUST VERTICAL DC BAL

Switch VERTICAL VOLTS/DIV to .5 BASE VOLTS. Hold AMPLIFIER CALIBRATION in ZERO CHECK and position the spot to the center of the graticule. Now switch VERTICAL VOLTS/DIV to .01 BASE VOLTS. With the AMPLIFIER CALIBRATION still held in the ZERO CHECK position, return the spot to the center of the graticule with DC BAL.

9. ADJUST VERTICAL AND HORIZONTAL DIFF. BAL.

Switch VERTICAL CURRENT OR VOLTAGE/DIV to EXT and HORIZONTAL VOLTS/DIV to EXT. Apply a 10-v signal from a square-wave calibrator simultaneously to the four (4) external inputs on the back of the instrument. Adjust R359 (HORIZONTAL DIFF BAL) and R459 (VERTICAL DIFF BAL) for a single spot. Switch the calibrator from 10 v to 5 v, 2 v, and 1 v to see that the amplifier remains balanced. Recheck DC BAL as DIFF BAL may affect DC BAL. Check polarity with ohm meter at INPUTS on rear of scope, + INPUTS move the spot to the left or down.

10. ADJUST HORIZONTAL GAIN

Switch the HORIZONTAL VOLTS/DIV to .1 BASE VOLTS. Hold AMPLIFIER CALIBRATION switch to ZERO CHECK and position the spot to the last right hand graticule line. Now switch AMPLIFIER CALIBRATION to -10 DIVISIONS and adjust MIN. GAIN ADJ. for exactly 10 divisions of deflection. Now switch HORIZONTAL VOLTS/DIV to .01 BASE VOLTS, switch to -10 DIVISIONS and adjust for exactly 10 divisions of deflection, with MAX. GAIN ADJ. (R334) on switch. Check back and forth several times between MAX. and MIN. GAIN ADJ. After the gain has been properly adjusted, switch HORIZONTAL VOLTS/DIV to .5 BASE VOLTS

10. (Continued)

and check the gain in that position. If there is any error recheck DIFF. BAL. It may be necessary to shunt R347 (60K precision on the switch) with a value other than the 3.3 meg that is now being used. If it is necessary to shunt the precision resistor with other than 3.3 meg, readjust and recheck this step. Check gain in all positions of the HORIZONTAL BASE VOLTS range.

Check HORIZONTAL COLLECTOR VOLTS range by switching:

HORIZONTAL VOLTS/DIV.	.01 COLLECTOR VOLTS
PEAK VOLTS RANGE	0-20
POLARITY	minus (-)

Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to .02 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to .05 COLLECTOR VOLTS and you should obtain 4 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to .1 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to .2 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to .5 COLLECTOR VOLTS and you should obtain 4 divisions.

PEAK VOLTS RANGE 0 - 200

Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to 1 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to 2 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch 5 COLLECTOR VOLTS and you should obtain 4 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to 10 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.
Switch to 20 COLLECTOR VOLTS and you should obtain 5 divisions.
Advance PEAK VOLTS to obtain 10 divisions of deflection.

11. CHECK COLLECTOR SWEEP POLARITY

With the controls in the same position as the last step, switch the COLLECTOR SWEEP POLARITY switch from minus (-) to plus (+). In the positive position the trace should sweep to the right and in the negative position the trace should sweep to the left.

12. ADJUST COLLECTOR SWEEP BALANCE

With HORIZONTAL COLLECTOR VOLTS switch at 20 VOLTS/DIV, switch VERTICAL CURRENT to .01 COLLECTOR MA and PEAK VOLTS control full right (cw). With the COLLECTOR SWEEP POLARITY minus (-) adjust C735 (just to the rear of the power switch) for a minimum trace width. Switch COLLECTOR SWEEP POLARITY to plus (+) and adjust C706 (on COLLECTOR SWEEP chassis) for a minimum tracewidth. NOTE: Transistor Test Lever should be switched to TRANSISTOR A.

13. CHECK COLLECTOR SWEEP PEAK VOLTS RANGE

Switch HORIZONTAL VOLTS/DIV to 10 COLLECTOR VOLTS and adjust the PEAK VOLTS control to obtain 10 divisions of deflection. Switch HORIZONTAL VOLTS/DIV to 1 COLLECTOR VOLTS and the PEAK VOLTS RANGE to 0-20. There should be approximately 10 divisions of deflection.

14. ADJUST BASE STEP GENERATOR ZERO ADJ.

Display a horizontal trace of about six dots by switching:

HORIZONTAL VOLTS/DIV	.01 BASE VOLTS
STEP SELECTOR	.01 VOLTS/STEP
BASE STEP GENERATOR	REPETITIVE
STEP ZERO	mid-range

Switch the BASE STEP GENERATOR POLARITY alternately plus and minus while adjusting STEP ZERO for symmetrical switching around the first dot.

15. ADJUST BASE STEP GENERATOR ±ADJ.

With the same settings as in the last step, move the AMPLIFIER CALIBRATION switch to ZERO CHECK and horizontally position the spot under the center graticule line. With the ± ADJ. move the first dot of the display under the center graticule line.

16. CHECK STEP ZERO CONTROL

The STEP ZERO control should move the display approximately 0.5 division each side of mid-range. Recenter STEP ZERO control.

17. CHECK BASE STEP GENERATOR POLARITY

Switch the BASE STEP GENERATOR POLARITY switch from minus (-) to plus (+). In the positive position the display should step to the right and in the negative position the display should step to the left.

18. ADJUST VOLTS/STEP ADJ. (POLARITY -)

With HORIZONTAL VOLTS/DIV at .01 BASE VOLTS and the STEP SELECTOR at .01 VOLTS/STEP, adjust the VOLTS/STEP ADJ. for one dot per graticule division. Check STEP SELECTOR VOLTS/STEP ranges against HORIZONTAL BASE VOLTS ranges both + and - POLARITY.

18a. ADJ. R204 for same display with POLARITY + .

19. ADJUST MIN. NO. STEPS AND MAX. NO. STEPS

Turn STEPS/FAMILY control full left (ccw) and adjust MIN. NO. STEPS for 5 dots. Turn STEPS/FAMILY control full right (cw) and adjust MAX NO. STEPS for 13 dots. Check for interaction between the two adjustments.

20. ADJUST VERTICAL GAIN

Switch the VERTICAL CURRENT OR VOLTAGE/DIV to .1 BASE VOLTS and switch the BASE STEP GENERATOR from REPETITIVE to OFF. Hold AMPLIFIER CALIBRATION switch to ZERO CHECK and position the spot to the top graticule line. Switch AMPLIFIER CALIBRATION to -10 DIVISIONS and adjust MIN. GAIN ADJ. for exactly 10 divisions of deflection. Switch VERTICAL VOLTS/DIV to .01 BASE VOLTS, switch to -10 DIVISIONS and adjust for exactly 10 divisions of deflection with MAX. GAIN ADJ. (R434 on switch). Check back and forth several times between MAX. and MIN. GAIN ADJ. After the gain has been properly adjusted switch VERTICAL VOLTS/DIV to .5 BASE VOLTS and check the gain in that position. If there is any error, recheck DIFF BAL. It may be necessary to shunt

20. (Continued)

R447 (60KΩ precision on switch) with a value other than the 3.3 meg that is now being used. If it is necessary to shunt the precision resistor with other than 3.3 meg, readjust and recheck this step. Check gain in all positions of the VERTICAL BASE VOLTS range.

21. CHECK STEP SELECTOR SWITCH

Readjust VOLTS/STEP ADJ. with VERTICAL BASE VOLTS at .01 and STEP SELECTOR at .01. Set up a display of one dot per division by switching:

HORIZONTAL VOLTS/DIV	EXT.
VERTICAL CURRENT OR VOLTAGE/DIV	.2 BASE VOLTS
STEP SELECTOR	.2 VOLTS/STEP
BASE STEP GENERATOR	REPETITIVE

Check the VOLTS/STEP range of the STEP SELECTOR against the VOLTS/DIV range of the VERTICAL BASE VOLTS range. There should always be a display of one dot per division (±2%). Recheck Step 18 to correct for any error. To check the MA/STEP range of the STEP SELECTOR, plug the Series Resistor comparison switch into the transistor test panel and switch to TRANSISTOR B. Switch the Series Resistor to the 10K position and the STEP SELECTOR to .001 MA/STEP. Switch to .01 VERTICAL BASE VOLTS. Check as follows:

VERTICAL BASE VOLTS	STEP SELECTOR	SPECIAL TEST UNIT
.01	.001	10K
.02	.002	10K
.05	.005	10K
.01	.01	1K
.02	.02	1K
.05	.05	1K
.01	.1	100Ω
.02	.2	100Ω
.05	.5	100Ω
.01	1	10Ω
.02	2	10Ω
.05	5	10Ω

22. CHECK BASE STEP GENERATOR SERIES RESISTOR

Position the VERTICAL CURRENT OR VOLTAGE/DIV to .01 BASE VOLTS and the STEP SELECTOR to .2 VOLTS/STEP. Progressively switch the same resistance in the comparison switch as in the SERIES RESISTOR switch. There should always be 10 divisions between dots (±5%). (±8% at 1Ω)

23. CHECK VERTICAL CURRENT MEASURING RESISTORS

Recheck vertical gain. Then obtain a vertical display of one dot per division by switching:

PEAK VOLTS	0
DISSIPATION LIMITING RESISTOR	0
COLLECTOR SWEEP POLARITY	minus (-)
VERTICAL CURRENT/DIV	.01 COLLECTOR MA
STEP SELECTOR	.01 MA/STEP
BASE STEP GENERATOR POLARITY	plus (+)

Jumper terminal C and B on the test panel.

23. (Continued)

Compare the VERTICAL COLLECTOR MA/DIV ranges from .01 to 200 MA with the identical range of the STEP SELECTOR from .01 to 200 MA PER STEP. In the 500 COLLECTOR MA/DIV range there will be 2.5 dots per division and in the 1000 COLLECTOR MA/DIV range there will be 5 dots per division.

24. MEASURE STEP AMPLIFIER IMPEDANCE

With the same starting settings as in the previous step switch HORIZONTAL VOLTS/DIV to 5 COLLECTOR VOLTS and advance the PEAK VOLTS control to 10 volts. With the COLLECTOR SWEEP POLARITY minus (-) observe a display of horizontal lines with a slight tilt. This tilt or slope should be between 10% and 40%. (With no slope the check would indicate an infinite impedance, if the line was straight up and down, the amplifier would have zero impedance). Switch to the opposite polarity in both the STEP GENERATOR and the COLLECTOR SWEEP and observe a similar display with approximately the same slope.

25. CHECK THE BASE CURRENT OR BASE SOURCE VOLTS RANGE

With the HORIZONTAL VOLTS/DIV in EXT. switch VERTICAL CURRENT or VOLTAGE PER DIVISION to the BASE CURRENT or BASE SOURCE VOLTS RANGE. Switch the BASE STEP GENERATOR STEP SELECTOR through the VOLTS/STEP range. Observe a vertical display of 1 dot per division. Switch VERTICAL CURRENT OR VOLTAGE PER DIVISION to EXT. and HORIZONTAL VOLTS/DIV to the BASE CURRENT OR BASE SOURCE VOLTS range. Switch the BASE STEP GENERATOR STEP SELECTOR through the VOLTS/STEP range. Observe a horizontal display of 1 dot per division.

26. CHECK DISSIPATION LIMITING RESISTOR SWITCH

Turn the instrument off and connect an ohm meter between the C terminal on the test panel and the brown red wire on the COLLECTOR SWEEP POLARITY switch. Check through all positions of the DISSIPATION LIMITING RESISTOR switch for the same resistance as indicated on the front panel.

27. CHECK THE ZERO VOLTS AND ZERO CURRENT SWITCH

Resistance from terminal B to ground in the ZERO CURRENT position should be infinite. Resistance in the ZERO VOLTS position should be zero.

28. SET UP A DISPLAY OF AVERAGE COLLECTOR CHARACTERISTICS

CONTROL	2N109 TYPE TRANSISTOR	2N277 TYPE TRANSISTOR
HORIZONTAL VOLTS/DIV	1 COLLECTOR VOLT	0.5 COLLECTOR VOLT
VERTICAL CURRENT/DIV	20 COLLECTOR MA	1000 COLLECTOR MA
BASE STEP GENERATOR	.2 MA PER STEP	20 MA PER STEP
BASE STEP GENERATOR POLARITY	minus (-)	minus (-)
DISSIPATION LIMITING RESISTOR	50Ω	0Ω
COLLECTOR SWEEP POLARITY	minus (-)	minus (-)
PEAK VOLTS	10	5

Insert into either socket on the test panel a 2N109 transistor and display a family of curves. Try both sockets. Switch the configuration switch on the test panel from GROUNDED EMITTER to GROUNDED BASE, increase the STEP SELECTOR to 2 MA PER STEP and switch POLARITY to + to observe a typical grounded base display.

29. CHECK FOR SINGLE FAMILY

Switch the BASE STEP GENERATOR from REPETITIVE to SINGLE FAMILY and observe a single display of the curves.

30. RECORD CRT TYPE AND SERIAL NUMBER ON CALIBRATION RECORD.

7-19-62

CALIBRATION CHECK FOR 575 SCOPES

The following checks should be made each morning prior to use of the 575:

I. Horizontal DC Balance Adjust

A. Switch Vertical Current or Voltage/Div. to Collector Ma. 1.

B. Switch Base Step Generator to Off.

C. Switch Horizontal Volts/Div. to .5 Base Volts.

D. Hold Horizontal Amplifier Calib. switch in zero check and position the spot to the center of the graticule.

E. Switch Horizontal Volts/Div. to .01 Base Volts and with the Horizontal Amplifier Calibration switch still held in zero check position, return the spot to the center of the graticule with the Horizontal DC Bal control.

II. Vertical DC Balance Adj.

A. Switch Horizontal Volts/Div. to Collector Volts 20.

B. Switch Base Step Generator to Off.

C. Switch Vertical Volts/Div. to .5 Base Volts.

D. Hold Amplifier Calib. switch in zero check and position the spot to the center of the graticule.

E. Switch Vertical Volts/Div. to .01 Base volts and with the Amplifier Calibration Switch still held in Zero check return the spot to the center of the graticule.

III. Horizontal Gain Check

A. Switch Vertical Current or Voltage/Div. to Collector M A. 1.

B. Switch Horizontal Volts/Div. to .01 Base Volts.

C. Hold Horizontal Amplifier Calibration switch in Zero Check and position the spot to the last right hand graticule line.

D. Switch Horizontal Amplifier Calibration switch to -10 div. and check for 10 divisions of deflection.

E. Switch Horizontal Volts/Div. to .5 Base Volts and repeat steps C & D.

IV. Vertical Gain Checks

A. Switch Horizontal Volts/Div. switch to Collector Volts 20.

B. Switch Vertical Current or Voltage/Div. to .01 Base volts.

C. Hold Vertical Amplifier Calib. switch in Zero check and position spot to the top ~~of the~~ graticule line.

D. Switch Vertical Amplifier Calibrator switch to -10 div. and check for 10 divisions of deflection.

E. Switch Vertical Current or Voltage/Div. to .5 Base Volts and repeat steps C and D.

V Return all controls to normal operation settings.