



# product modification

050-0651-01  
M21814

See Below

## U745\* IC REPLACEMENT

For the following TEKTRONIX® Oscilloscopes

Type 7844	Serial Numbers	B040234 - Up
Type R7844	Serial Number	B010137 - Up
Type R7903	Serial Numbers	B100368 - Up
Type 7904	Serial Numbers	B154160 - Up
Type R7912	Serial Numbers	B090342 - Up

Parts Replacement Kit, PN 050-0651-00, replaces U745, a 155-0065-00 IC. The new IC is not a direct replacement for the old IC due to variations in the gain characteristics of the IC. Use of the new IC necessitates replacing R741 and R756 unless the code numbers of the old and new IC's are the same.

\* Except 7844/R7844. Beam 1 IC is U1745 and Beam 2 IC is U2745.

## PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt. No.	Quantity	Part Number	Description
U745, U1745 or U2745	1 ea	155-0065-00	IC, monolithic, HF Amplifier
C736 <sup>2</sup>	1 ea	283-0160-00	Capacitor, 1.5pF
R741, R1741 or R2756	1 ea	317-XXXX-00 <sup>1</sup>	Resistor, 1/8W 5%
R756, R1756 or R2756	1 ea	317-XXXX-00 <sup>1</sup>	Resistor, 1/8W 5%
R736 <sup>2</sup>	1 ea	317-0101-00	Resistor, comp 100Ω 1/8W 5%

## INSTRUCTIONS:

- ( ) 1. Replace U745, U1745 or U2745, a monolithic high frequency amplifier IC located on the Vertical Amplifier Circuit Board, with the new IC.
- ( ) 2. Replace R741, R1741 or R2741 and R756, R1756 or R2756, two 1/8W 5% resistors (on the Vertical Amplifier Circuit Board) as shown in the chart below:

Code #	Value of R741-R756, R1741-R1756, R2741-R2756	Part Number
1	110Ω	317-0111-00
2	130Ω	317-0131-00
3	160Ω	317-0161-00
4	220Ω	317-0221-00
5	300Ω	317-0301-00
6	510Ω	317-0511-00
7	1000Ω	317-0102-00

Refer to the Recalibration procedure in the Instruction Manual Insert and recalibrate as necessary.

- <sup>1</sup> This kit contains two 1/8W 5% resistors selected from the above chart depending on the code number on the IC.
- <sup>2</sup> C736 & R736 are test selected components used in the R7903, 7904, and R7912 only. Refer to Recalibration Instructions in the Instruction Manual Modification Insert step 6D.

# INSTRUCTION MANUAL

MODIFICATION INSERT

## U745 IC REPLACEMENT

Type R7903	Serial Numbers	B100368 - Up
Type 7904	Serial Numbers	B154160 - Up
Type R7912	Serial Numbers	B090342 - Up
Type 7844	Serial Numbers	B040234 - Up
Type R7844	Serial Numbers	B010137 - Up

Installed in Type \_\_\_\_\_ SN \_\_\_\_\_ Date \_\_\_\_\_

This modification insert is provided to supplement the Instruction Manual for the above listed products. The information given in this insert supersedes that given in the Manual.

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## GENERAL INFORMATION

Parts Replacement Kit, PN 050-0651-01, replaces U745, U1745\* or U2745\*, a 155-0065-00 IC.

\*7844/R7844 ONLY

**RECALIBRATION EQUIPMENT REQUIRED:**

1. 7B92 Dual Time Base Plug-in.
  2. 067-0587-01 Calibration Test Fixture.
  3. 067-0650-00 Constant Amplitude Signal Generator.
- 1) ADJUST VERTICAL AMPLIFIER GAIN
    - A. Set the REP RATE at 1MHz.
    - B. Set the TEST switch on the Cal fixture to GAIN.
    - C. Adjust the TIME/DIV to get an appropriate display.
    - D. Adjust R730\* (Vertical Gain Adjustment) for one line per division.
  - 2) ADJUST VERTICAL CENTERING
    - A. Change Calibration fixture TEST switch to the COMMON MODE position.
    - B. Adjust R172 so the trace coincides with the graticule center line.
  - 3) SET READOUT CENTERING, (if present).
    - A. Adjust R107 so that the Readout lies between the third and fourth Vertical Graticule lines.
  - 4) ADJUST LOW FREQUENCY OR TEMPERATURE COMPENSATION.
    - A. Change the TEST Switch to STEP RESONSE.
    - B. Change the REP RATE to 100Hz.
    - C. Adjust the sweep speed for a simple display.
    - D. Adjust the amplitude of the Cal Fixture for approximately six divisions of display.
    - E. Adjust R764 and R749 for a flat top on the waveform with no readout bounce. On instruments without readout, the only adjustment you can make is for optimum falt top. Continue to adjust R764 and R749 until there is no interaction.

\*Except 7844/R7844. For Beam I Vertical add 1000 (R730 becomes R1730) and for Beam 2 add 2000 (R730 becomes R2730).

## ELECTRICAL PARTS LIST

The value of R741, R1741 or 2741, R756, R1756 or R2756 is selected to match the Code number as shown below:

U745 Code No.	Resistors	Part Number
1	110 $\Omega$	317-0111-00
2	130 $\Omega$	317-0131-00
3	160 $\Omega$	317-0161-00
4	220 $\Omega$	317-0221-00
5	300 $\Omega$	317-0301-00
6	510 $\Omega$	317-0511-00
7	1000 $\Omega$	317-0102-00

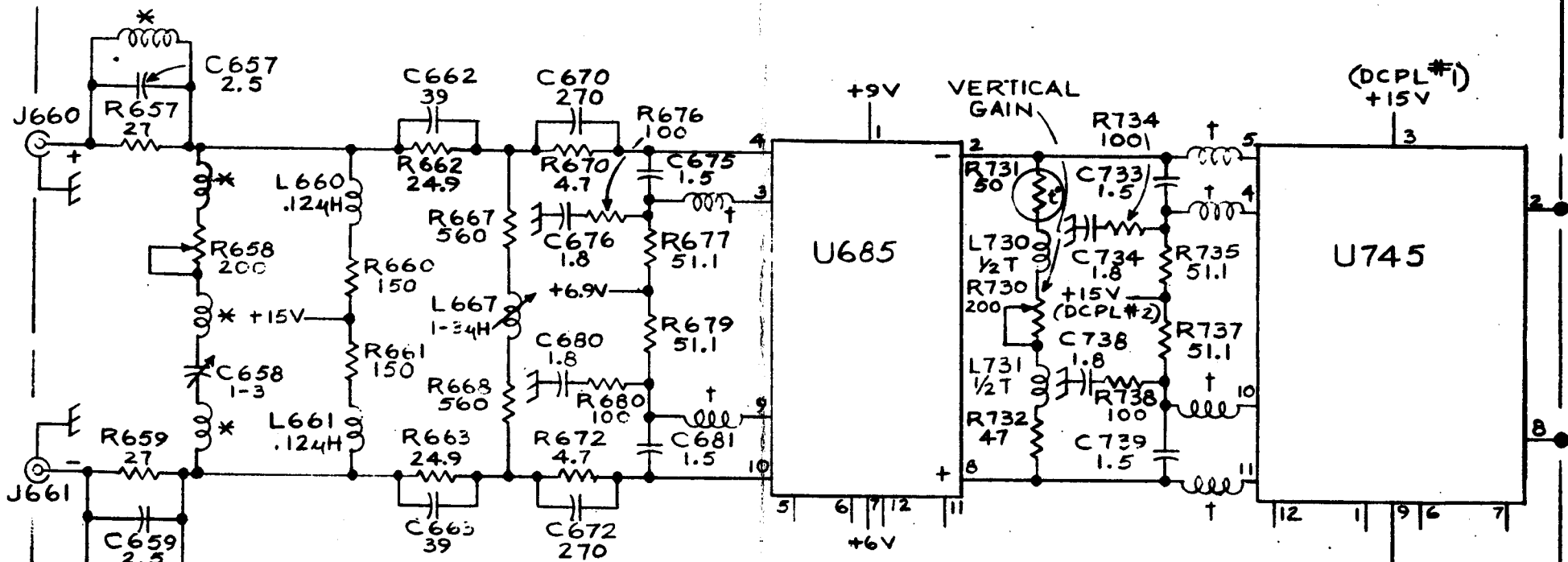
## Capacitors

C736*	283-0160-00	1.5pF
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## Resistors

R736	317-0101-00	100 $\Omega$ 1/8W 5%
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\* Used in R7903, 7904 and R7912 only!



\*INDUCTANCE DUE TO LEAD LENGTH

†INDUCTANCE IS PART OF CIRCUIT BOARD

PARTIAL-  
VERTICAL AMPLIFIER



050-0651-01

5) ADJUST MEDIUM FREQUENCIES COMPENSATION

- A. Change Cal Fixture TEST Switch to STEP RESPONSE.
- B. Change the REP RATE to 1MHz.
- C. Change the TIME/DIV to get a suitable display.
- D. Adjust R758 and R743 for optimum flat top at 1MHz REP RATE. R758 and R743 interact so go back and forth until interaction is minimized.

6) PRESET TO HIGH FREQUENCY RESPONSE

- A. Set L667 as close as possible, to bottoming out. Speed up the Sweep speed a bit so that we can see the effect. L667 effects the level of the display about 5Ns past the front corner.
- B. Peak C658 for maximum spike on the front corner.
- C. Adjust R658 with minimum valley, you will notice that the valley that just follows the leading edge, there's a point where that valley comes up to the highest point and starts down again and the aberration increases as you continue to adjust it. Make that adjustment so that it is right at the peak at minimum valley.

**D.\* If the waveform has a large overshoot, in excess of the 5% specification, remove the Vertical circuit board and install C736 - R736. C736 - R736 are test selected components with a nominal value of 1.5pF and 100Ω. Install C736 - R736 in series between pins 5 and 11 of U745.**

7) FINE HIGH FREQUENCY RESPONSE ADJUSTMENTS

We're striving for a compromise between bandwidth and aberration.

- A. Adjust the length of the inductor between R658 and C658. They call this circuit the boat rocker, Series resonant circuit that is designed to compensate for the losses in the delay line. R658 and C658 and this piece of wire that connects the two is actually, in the UHF range, an inductor. By varying the lengths of that wire, L658, we can either raise or lower the front corner, and the level just following it. If you have too, you can even put a loop in it.
- B. Adjust the parallel LCR network, LCR657 and LCR659. L657 and L659 are the leads that are attached to C657 and C659. Varying the length of those leads at the point where you solder them together, effects the level of the base line just following the valley which follows the leading edge of the waveform. Start with leads about 3/8 inch in length.

\* Used in R7903, 7904, and R7912 only!

- C. Adjust the length of L730 and L731. They are located underneath U685. Lengthing L730, L731 raises the front corner of the display. Now go back over the boat rocker circuit, which is C658 and R658, and readjust the boat rocker circuit to specification. Again we adjust the R for the maximum height of the valley, and adjust C658 for the largest spike.
- D. Adjust the spacing between the leads that go from U745 to the deflection plates of the CRT. Varying the spacing between these leads, either pushing them apart or bringing them together, we can affect the front corner and aberration of the waveform. You can go ahead and just stick your fingers in there, there's only about 15 volts back in there and by pushing them together, we should bring the front corner down and raise the valley a bit. Again there's a compromise here you vary the spacing between the leads and continue to adjust the length of those two transistor leads inductors, L730 and L731, until you bring aberration down to under 7%, which at six division of deflection is .42 divisions. You may have to go back to the boat rocker and back off, C658 a bit. This isn't something that you want to do as a matter of practice, but you can do it. This is mainly affected by individual IC parameters. We can also adjust the area of the display approximately 5 to 7nsec behind the leading edge, by adjusting the spacing of the termination resistor leads, you can effect the level of that portion of the display. By spreading them we bring it up by pushing them together we bring it down. ~~By going over this same set of adjustments with the transistor leads the spacing between the deflection plate leads, the spacing between the termination resistor leads and the boat rocker circuit,~~ you should be able to bring aberration to within speck.

## 8) FREQUENCY RESPONSE

- A. Set the Cal Fixture to the AUXILIARY in position.
- B. Connect the Constant Amplitude Signal Generator, and set it for six division at 9MHz.
- C. Switch to 500MHz, you should have at least 4.5 divisions of signal. If, you are slightly down on bandwidth, you should go back and slightly readjust the deflection plate leads and termination leads. This should have a minimum effect on the aberration of the waveform. Now that you have verified that the amplifier makes the 500MHz Frequency Response Test within 3db, you should sweep on down to the lower frequencies to verify that there are no major holes in the response curve. The most critical area seems to be around 400MHz.