

3 T858/859 Initial Adjustment



Caution: This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to [Section 1.2](#) in Part A for more information on anti-static procedures when handling these devices.

The following section describes the full adjustment procedure to be carried out before operating the T858/859, both with and without RF power modules.

[Section 3.1](#) describes the older design T858/859 without RF power modules, while [Section 3.2](#) describes the newer design T858/859 with RF power modules. [Figure 1.1](#) shows how to identify your PA design without having to remove the side cover.

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3.1 T858/859 Without RF Power Modules

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components. Refer also to [Figure 3.4](#) and [Figure 3.6](#) which show the location of the main tuning and adjustment controls.

3.1.1 Test Equipment Required

- DC power supply capable of delivering the following at 13.8V:

T858	>16A (e.g. Tait T807)
T859	>25A (e.g. Tait T808).
- Multimeter or DMM (e.g. Fluke 77).
- RF power meter (e.g. HP 435 series or Bird Wattmeter).
- 250W 30dB 50 ohm pad (e.g. Weinschel 40-20-34), or other suitable load.
- 300W 3dB 50 ohm pad (e.g. Weinschel 40-3-34).
- 'BNC' to 'N' type adaptors (e.g. Amphenol, Greenpar).
- Appropriate trimming tools.

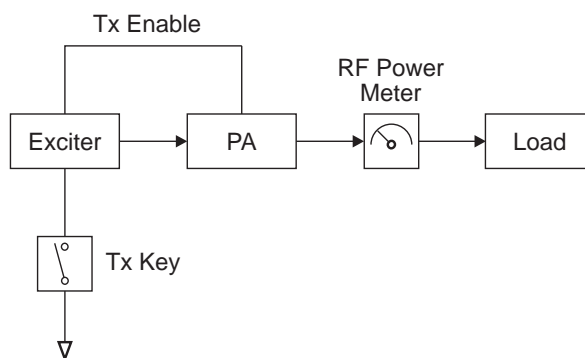


Figure 3.1 T858/859 Test Equipment Set-up

3.1.2 Preliminary Checks

Check for short circuits between the positive rail and earth.

Set up the test equipment as in [Figure 3.1](#).

Connect the T858/859 to a 13.8V DC supply.

Check that the quiescent current is approximately 45mA.

To key the transmitter, earth the key line (D-range 1 pin 13) on the exciter.

Check that the power supply is still at 13.8V under load.

Check that the regulated power control supply is approximately 7V (pin 1 of IC2).

Note: The output power and alarm levels should be set with the cover shield on. If the cover is removed for other adjustment procedures, make a final check of the output power and alarm levels with the cover shield on.

3.1.3 RF Alignment

3.1.3.1 Standard Tuning Procedure

T859 Only: For sets with serial numbers following 217262, set RV69 (driver power level) fully clockwise.

Preset the tuning controls as shown in [Figure 3.2](#).

Set RV63 (front panel power control) fully clockwise.

Key on the drive source.

T859 Only: Adjust CV1 for maximum output.

Adjust CV8 for maximum output.

Adjust CV32 for maximum output.

Adjust CV51 and CV57 for maximum output.

Adjust CV34 and CV35 for maximum output.

Recheck all settings. The power output should exceed:

T858	60W
T859	110W.

T859 Only: For sets with serial numbers following 217262, adjust RV69 (driver power level) until the output power drops to 110W.

Adjust RV63 to reduce the power output to the required level (e.g. 50W for T858, 100W for T859).

3.1.3.2 Tuning Control Settings

After alignment the settings of the tuning controls should approximate those shown in [Figure 3.2](#)










	450MHz	485MHz	520MHz
CV32, CV51, CV57			
CV34, CV35			
CV8, CV1			

Figure 3.2 T858/859 Tuning Control Settings

3.1.3.3 Tuning For Best Efficiency

Retune CV32, CV51 and CV57 towards maximum capacitance to obtain minimum supply current, but do not exceed a maximum drop of 0.5A per control.

Check that the supply current is:

T858 <12A for 50W output power
T859 <22A for 100W output power.

Note: These control settings are normally very close to minimum supply current. If the current is reduced too far, maximum power output will drop and 2f rejection may degrade.

3.1.4 Setting The Output Power



Caution: If the high temperature shutdown power level has not yet been set or is unknown, check that the unit does not overheat while setting the output power.

Note 1: Cables and connectors can easily cause a power loss of several watts if either too long or poorly terminated. Always use the shortest possible leads (or connectors instead of leads) between the T858/859 and power meter set-up.

Note 2: You will need appropriate extension leads if you wish to carry out the adjustment procedures with the T858/859 withdrawn from the rack in the latched position. Alternatively, disconnect and withdraw the T858/859 and reconnect it behind the rack.

Note 3: The actual power used may be limited by regulatory requirements.

Connect the exciter output to the PA input via a thru-line wattmeter with a 5W full scale reading. Special BNC/N leads will be required.

Connect an RF power meter to the PA output.

Set RV63 (front panel power control) fully clockwise.

Key on the drive source.

Check that the exciter power is 700mW to 1.3W.

Check that the power output exceeds:

T858	60W
T859	110W.

Adjust RV63 to reduce the power output to the required level (e.g. 50W for T858, 100W for T859).

3.1.5 T858 High Temperature Shutdown Power Level

Note 1: The temperature shutdown circuit is factory set to approximately 130°C and 20W. RV69 and RV74 should not be readjusted if normal operation is required.

Note 2: This Section applies *only* to T858 PAs, and T859 PAs with serial numbers prior to 217262.

Power up the T858 and adjust RV63 (front panel power control) for the normal operating power level.

Turn RV69 (shutdown temperature) fully anticlockwise to avoid RF power cycling between the levels set by RV63 and RV74.

Apply heat to the NTC (R72) with the tip of a soldering iron.

Adjust RV74 (shutdown power level) to the desired level. For continuous operation during fault conditions, set the shutdown power to 20W.

Adjust RV69 so that the voltage at IC1 pin 13 is 380mV.

3.1.6 T859 High Temperature Shutdown Power Level

Note 1: The temperature shutdown circuit is factory set to approximately 130°C and 40W. RV74 should not be readjusted if normal operation is required. Temperature adjustment is not provided on the T859.

Note 2: This Section applies *only* to T859 PAs with serial numbers from 217263 onwards. For T859s with serial numbers prior to this refer to [Section 3.1.5](#) above.

Power up the T859 and adjust RV69 (driver power level) and RV63 (front panel power control) for the normal operating power level.

Apply heat to the NTC (R72) with the tip of a soldering iron.

Adjust RV74 (shutdown power level) to the desired level. For continuous operation during fault conditions, set the shutdown power to 40W

3.1.7 Remote Forward Power Meter Calibration

If a remote meter is connected, adjust RV43 (forward power meter calibration control) for the remote reading to agree with the RF power meter reading.

3.1.8 Remote Reverse Power Meter Calibration

If a remote meter is connected, connect a 50 ohm 3dB pad (with the output open circuit) to the PA output.

Apply RF drive and Tx-Key.

Adjust RV57 (reverse power meter calibration control) for a quarter of the forward power reading.

3.1.9 Setting Alarm Levels

Note: If forward and reverse power metering is being used, set up their calibration ([Section 3.1.7](#) and [Section 3.1.8](#)) before setting the alarm levels.

3.1.9.1 Forward Power

Power up the T858/859 and adjust RV63 (front panel power control) so that the output power is at the alarm level required (e.g. 40W if the PA normally operates at 50W).

Adjust RV48 (forward power alarm set) so that the forward power alarm LED lights.

Check the alarm level setting by adjusting the power up and down and observing the alarm LED. A few watts hysteresis can be expected.

Readjust RV63 for the normal operating level.

Note: Remote indication is available at D-range pin 3.

3.1.9.2 Reverse Power

Power up the T858/859 and adjust RV63 (front panel power control) for the normal operating power level.

Place a known mismatch of the required value (e.g. 3:1 VSWR) and adjust RV52 (reverse power alarm set) so that the reverse power alarm LED lights.

Example: A VSWR of 3:1 can be simulated by connecting an unterminated 3dB pad to the PA output. This will result in a return loss of 6dB.

Note: Remote indication is available at D-range pin 4.

3.2 T858/859 With RF Power Modules

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components. Refer also to [Figure 3.5](#) and [Figure 3.7](#) which show the location of the main adjustment controls.

Note 1: The T858/859 with RF power modules require no RF tuning or alignment.

Note 2: Where the same component has different circuit references in the T858 and T859, in this and following sections the T858 circuit reference is given first, followed by the T859 circuit reference in brackets, e.g. Q137 [Q128].

3.2.1 Test Equipment Required

- DC power supply capable of delivering >16A (T858) or >20A (T859) at 13.8V.
- Multimeter or DMM (e.g. Fluke 77).
- RF power meter (e.g. HP 435 series or Bird Wattmeter).
- 150W 30dB attenuator (T858) or 250W 50dB attenuator (T859).
- 150W 3dB 50 ohm pad.
- 'BNC' to 'N' type adaptors (e.g. Amphenol, Greenpar).
- Appropriate trimming tools.

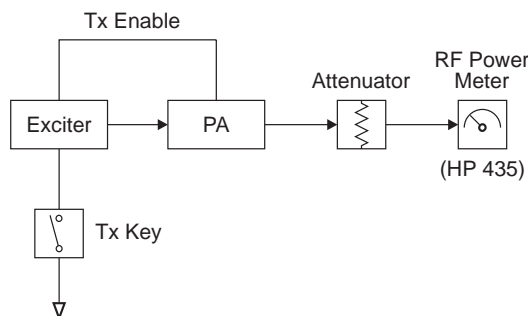


Figure 3.3 T858/859 Test Equipment Set-up



Caution: Do not connect attenuators or DC blocks between the T857 and T858/859 or the cyclic keying circuitry will not function correctly.

3.2.2 Shorting Links

There are seven shorting links on PL110 in the control section circuitry, as described in the table below. Ensure that these links are set as standard before starting and after completing the adjustment procedure.

Link Pins	Standard Setting	Function
1-2, 3-4, 7-8, 9-10	not linked	Not used.
5-6	not linked	Pins 5-6 are provided for simulating high operating temperatures during initial adjustment. Bridging this link shorts out R215 [R200] and R210 (NTCs), thus turning on the thermal protection circuitry. They should not be linked for normal operation.
11-12 13-14	linked	Pins 11-12 and 13-14 are provided for factory testing only. The PA will not function correctly if these settings are changed.

3.2.3 Preliminary Checks

Check for short circuits between the positive rail and earth.

Set up the test equipment as in [Figure 3.3](#).

Connect the T858/859 to a 13.8V DC supply.

Check that the quiescent current is <50mA.

To key the transmitter, earth the key line (pin 13) on the exciter.

Check that the power supply is still at 13.8V under load.

Check that the regulated power control supply is approximately 7V.

Note: The output power and alarm levels should be set with the side cover on. If the cover is removed for other adjustment procedures, make a final check of the output power and alarm levels with the side cover on.

3.2.4 Setting The Output Power



Caution: If the high temperature shutdown power level has not yet been set or is unknown, check that the unit does not overheat while setting the output power.

Note 1: You must set up the T858/859 according to the following instructions *before* operation in a radio system. *Do not* use the factory default settings as they may not suit your operating frequency.

To obtain optimum performance from the T858/859, ensure that the exciter used in this set-up procedure is the one that will be used with the PA in the radio system.

Note 2: Cables and connectors can easily cause a power loss of several watts if either too long or poorly terminated. Always use the shortest possible leads (or connectors instead of leads) between the T858/859 and power meter set-up.

You will need appropriate extension leads if you wish to carry out the adjustment procedures with the T858/859 withdrawn from the rack in the latched position. Alternatively, disconnect and withdraw the T858/859 and reconnect it behind the rack.

Note 3: The actual power used may be limited by regulatory requirements.

Set the exciter to the required operating frequency.

Connect the exciter output to the PA input via a thru-line wattmeter with a 1W full scale reading. Special BNC/N leads will be required.

Connect an RF power meter to the PA output connector via a suitable attenuator:

T858 -	30dB
T859 -	50dB.

With the exciter *not* keyed, remove the label over the adjustment hole for RV115 (driver power clamp) and set RV115 to maximum (fully clockwise).

Set %RV109 (front panel power control) to maximum (fully clockwise).

Key on the exciter.

Quickly (within 30 seconds) adjust RV115 until the output power is:

T858 -	60W
T859 -	110W.

Adjust %RV109 to set the power output to the following levels (or less if required):

T858 -	50W
T859 -	100W.



Caution: *Do not* allow the output power to exceed these levels as this will seriously reduce the reliability of the PA.

Do not use RV115 to set the output power as this will disable the thermal protection circuitry. The power clamp must always be 10W (T858)/20W (T859) above the set output power.

Replace the label over the adjustment hole for RV115.

3.2.5 High Temperature Shutdown Power Level

Set %RV109 (front panel power control) to the required output power.

Simulate high operating temperatures by placing a shorting link on PL110 pins 5-6 (*do not* use either of the links from PL110 pins 11-12 or 13-14 to do this).

Adjust RV113 (shutdown power level) for an output power of:

T858 -	20W
T859 -	40W.

Remove the shorting link from PL110 pins 5-6 to return the PA to normal operation.

3.2.6 Remote Forward Power Meter Calibration

If a remote meter is connected, adjust RV103 (forward power meter calibration) for the remote reading to agree with the RF power meter reading.

3.2.7 Remote Reverse Power Meter Calibration

If a remote meter is connected, connect a 50 ohm 3dB pad (with the output open circuit) to the PA output.

Apply RF drive and Tx-Key.

Adjust RV107 (reverse power meter calibration) for a quarter of the forward power reading.

3.2.8 Setting Alarm Levels

Note: If forward and reverse power metering is being used, set up their calibration ([Section 3.2.6](#) and [Section 3.2.7](#)) before setting the alarm levels.

3.2.8.1 Forward Power

Power up the T858/859 and adjust %RV109 (front panel power control) so that the output power is at the alarm level required (e.g. 40W if the T858 normally operates at 50W).

Adjust RV101 (forward power alarm set) so that the forward power alarm LED lights.

Check the alarm level setting by adjusting the power up and down and observing the alarm LED. A few watts hysteresis can be expected.

Readjust %RV109 for the normal operating level.

Note: Remote indication is available at pin 3 of D-range 1.

3.2.8.2 Reverse Power

Power up the T858/859 and adjust %RV109 (front panel power control) for the normal operating power level.

Place a known mismatch of the required value (e.g. 3:1 VSWR) and adjust RV105 (reverse power alarm set) so that the reverse power alarm LED lights.

Example: A VSWR of 3:1 can be simulated by connecting an unterminated 3dB pad (50W) to the PA output. This will result in a return loss of 6dB.

Note: Remote indication is available at pin 4 of D-range 1.

