ALIGNMENT & INSTALLATION

RECOMMENDED TEST EQUIPMENT

Daniels Subrack SR-39-1 with System Monitor
Daniels Extender Card Kit EC-48RK
Power Supply Regulated 13.8VDC @ 10A
Current Meter 5.0A
DC Voltmeter
RF Coupler (eg. Bird 4275)
Wattmeter (eg. Bird 4421)
VSWR Meter (eg. Bird 4421)
Dummy Loads 50 Ohm, 3:1 (50W)
Spectrum Analyzer (eg. IFR 2975)

AMPLIFIER BOARD ALIGNMENT

Refer to the VHF 30W Power Amplifier Board Component Layout Diagram for the location of the adjustment capacitors, potentiometers, air-core coils and test points.

This procedure assumes the use of a single subrack with an EC-48RK extender card kit for both the exciter and the power amplifier such that their internal adjustment points are easily accessible.
Step 1: Remove the top extrusion cover from the transmitter exciter. Set the exciter frequency to either 143MHz or 162MHz depending upon whether you are tuning a lowband or highband unit, respectively.

Step 2: Install one of the extender cards in the designated location for the exciter within the subrack. Connect the exciter to this extender card using the gray connector cable provided with the extender card kit.

Step 3: Refer to the 'VHF 30W Power Amplifier Exploded View' on page 15 for help on the following procedures. Remove the power amplifier 14HP case. Next, unplug the cooling fan from the control board and remove the front panel. Using suitable male connectors or a test jig, apply the following signals directly to the amplifier board:

- 13.8V : J3 - Pin1, Pin 2
  Note: Ensure an ammeter is connected in series with this line.
- Gnd : J3 - Pin 3, Pin 4
- 9.5V : J4 - Pin 4
- Gnd : J4 - Pin 8 (RF Input Sample)

Step 4: While monitoring the current on the 13.8V line and without an RF input to the power amplifier, slowly adjust the potentiometer RV1 until the current reads 230mA. As a check, measure the voltage at TP1. It should read between 2.5V and 3.0V.

Step 5: Now connect the output of the exciter to the input of the power amplifier. Connect the output of the power amplifier through a suitable RF coupler then through a power meter and finally terminate the output with a 50 Ohm load. The low power output from the RF coupler should be connected to the input of a spectrum analyzer. The spectrum analyzer should have an output tracking generator capable of putting out at least a +6dBm signal. This output should be connected to the input of the exciter amplifier which is first disconnected from the exciter's local oscillator.

Step 6: Before enabling the tracking generator, the output power of the exciter amplifier should be disabled by turning its potentiometer fully counterclockwise (~12 Turns). Now turn the exciter on by setting the front panel switch to 'Key Tx'. Set the center frequency on the spectrum analyzer to the same frequency the exciter was set to in Step 1. Next, set the span to 0 Hz and enable the tracking generator with a +6dBm output.

Step 7: While monitoring the output on the power meter and ensuring 13.8V on the PA amplifier board, slowly increase the exciter amplifier output until 30W is reached. Increase the span on the spectrum analyzer to 20MHz. Next, remove the cover on the low-pass filter shield (10601-01) on the amplifier PCB to allow access to the air-core inductors, L5 to L8. Monitoring the output response on the spectrum analyzer, tune these inductors by altering the spacing between the windings with a plastic adjusting tool for maximum flatness and gain across the desired band (136 - 150MHz for lowband, 150 - 174MHz for highband). Then capacitor C12 should be adjusted for maximum flatness and gain also.

Step 8: Set the span on the spectrum analyzer to 0 Hz and check that output VSWR is below 1.20 on the band edges and the center frequency of the band.

Step 9: As a final check, replace the low-pass filter shield and using the spectrum analyzer again, search the band (either 136 - 150MHz or 150 - 174 MHz) for any unwanted spurious emissions.

CONTROL BOARD ALIGNMENT

Refer to the VHF 30W Power Amplifier Control Board Component Layout Diagram for the location of the adjustment potentiometers and test points.

This procedure assumes the use of 1/2 wavelength RF output cables between all pieces of test equipment after the PA output for accurate power readings during mismatched load conditions.

Step 1: Once the amplifier board alignment is complete, the exciter can be turned off and its amplifier re-connected to the local oscillator. Next, the male connectors or test jig can be removed from the amplifier board and the control board along with the front panel can be re-connected to the power amplifier. The power amplifier can then be connected via the gray cable to the second extender card which should be installed in the designated location within the subrack for the power amplifier.

Step 2: With the exciter's output still connected to the input of the power amplifier and the output of the power amplifier still connected through an RF coupler into a wattmeter and 50 Ohm load, set the transmitter to the desired frequency. Next, adjust the output power of the exciter such that the PA output is 10W. Then adjust potentiometer RV1 until LED1, or the 'RF POWER' indicator, just turns on. This threshold may be adjusted to any RF output power level between 10W and 30W.

Step 3: Set the exciter output power such that the output power from the PA is equal to that under normal operating conditions. Replace the 50 Ohm load with a suitably rated 3:1 mismatched load. Adjust potentiometer RV2 until LED2, or the 'HIGH VSWR' indicator, just turns on.

Step 4: As a check, terminate the power amplifier once again with a 50 Ohm load and ensure that LED2 is now off. If it is not off, adjust RV2 until LED2 just turns off. Doublecheck that the LED still activates when the output is terminated with a 3:1 load. This threshold may be adjusted with a 3:1 on the output of the PA anywhere from 10W to 30W out.

Step 5: Disconnect the RF termination on the PA such that the output is an open load. Activate the exciter then adjust potentiometer RV3 until LED3, or the 'OVERLOAD' indicator, just turns on. When this occurs the output power is also substantially reduced to help protect the RF transistor. If the overload LED is turning on without having to adjust RV3, power down the exciter re-adjust RV3 and re-activate the exciter. This confirms that antenna VSWR overload protection works correctly.

NOTE: The above three pots, RV1 to RV3, on the control board should be re-checked and possibly re-adjusted if any of the following changes are applied to the unit:

- The output power level is changed
- The frequency is changed
- The output cable length is changed

POWER AMPLIFIER INSTALLATION

The AMP-3/150 RF power amplifier is designed for operation with any of the Daniels MT-2, MT-3 or MT-4 VHF transmitter exciters. A complete SR-3 subrack shipped directly from the factory is normally set to the appropriate options and output power calibration as requested by the customer. These units require no tuning.

For AMP-3/150 amplfiiers shipped separately from the SR-3 subrack, install as outlined:
- Connect +13.8V DC Power Supply to subrack
- Connect the output of the exciter to the input of the VHF 30W PA with the cable provided
- Connect the antenna system (using a 1/2 wavelength cable if possible), turn on the PA and key the transmitter. The 'RF POWER' LED should light and the other three LED indicators should remain off.

The LED indicators will only illuminate when the power amplifier is on and are defined as follows:

-RF POWER - Indicates that the minimum preset RF power level is present at the power amplifier output. The threshold is internally adjustable for RF output levels in the 10-30 watt range (Factory set at 10W).

- HIGH VSWR - Alarm indicating that the load impedance mismatch is higher than the preset level. The threshold is internally adjustable for load mismatches from 2:1 to an open output (Factory set at 3:1).

Note: The proper setting of this indicator cannot be guaranteed if a non-1/2 wavelength cable is used between the output of the PA and the antenna.

- OVERLOAD - (VSWR Overload Alarm) is used to indicate that the load impedance mismatch is extremely high and could potentially damage the RF transistor. Under this condition, the gate voltage to the transistor is dropped thus reducing the RF output power and preventing damage to the MOSFET. The factory threshold level is set when the load terminal is open.

- OVER TEMP - (Over Temperature alarm) a thermostat control switch interrupts the DC supply voltage to the PA when the RF transistor body temperature exceeds 80ºC (175ºF). Utilizing circuit hysteresis, the thermostat will reset at 75ºC (167ºF).

The fan is activated automatically when the RF transistor body temperature reaches approximately +40ºC (104ºF). The fan's operating temperature range is -20ºC (68ºF) to +60ºC (140ºF). It will not operate when the ambient temperature is below -20ºC (68ºF).