DCS Radio Service Call
Marina Del Rey Sheriff Station
17 Nov 2017

By Jerry Kendrick, NG6R, T-03, DCS Technical Team member

Executive Summary: Two DCS Tech Team members traveled to Marina Del Rey Sheriff Station on 17 November 2017 in response to operator report of an inoperative two-meter transceiver. The problem was quickly determined to be low power supply output voltage when the radio transmitter was activated; this low voltage was due to the power supply automatically scaling back its output voltage by entering into "current limit" mode. To correct this voltage scale-back, the current limit variable control on the front panel of the power supply was rotated several degrees clockwise to enable full current to be supplied to the radio when operating in its high-output-power mode. This prevented the power supply from current limiting under load and solved the problem; proper control position was marked with a pointer to assure correct positioning in the future. It is unknown how the current limit control set-point changed, as the power supply is remote on a high shelf and well away from normal room activities. After this power supply control adjustment, the radio now operates satisfactorily in both low- and high-power modes.

Discussion of findings: During a recent DCS Monday-evening net, the sole 2-meter radio at MDR station exhibited squeals when the microphone push-to-talk (PTT) switch was activated by the operator. This made checking into the net impossible using this radio; a separate HT was used by the operator to notify net control of the situation. The DCS Tech Team was apprised of this failure and deployed two members (Deane, Staff 50, N5DQ and Jerry, T-03, NG6R) on Friday 17 November 2017 to the MDR station to assess the situation and to implement a fix if it could be done quickly and easily on-site.

This team experienced the same symptom as had been described by the operator when the PTT switch was activated. The tell-tale squeal from the radio speaker was immediately recognized as indicative of low DC power applied to the radio. The power supply is an Astron VS-35M, as shown in the stock photo of Figure 1.

Figure 1. Stock photo of Astron VS-35M, a dual-metered 35-ampere DC power supply with both variable output voltage and variable current limit set-point front-panel adjustments

Note that this power supply has two variable controls on the front panel. The right control labeled VOLTS adjusts the output voltage at the rear terminals. That output voltage is indicated in the meter on the right that has a scale from zero to 15 volts. The left control labeled AMPS actually controls the current set-point at which the power supply will begin to scale back its output voltage. There are applications for which some pre-

determined load current value must not be exceeded, so voltage will be truncated to the point that the current supplied will not exceed the value dialed in by this left AMPS control. However, for almost all (if not all) of our ham radio applications, the amount of current to be drawn by the load is determined solely by what the unit requires at its nominal operating voltage, i.e., there is no need to limit to a pre-determined current value. So, this power supply AMPS control could EITHER be rotated completely clockwise (CW) if excessive current being drawn from the power supply is not a concern OR adjusted just slightly CW from that position which represents the maximum current that the particular unit load will normally draw. For the safety of both the power supply and the electronic unit being powered, we opt for the latter approach.

To begin the testing, we confirmed that the output voltage was set, as precisely as is possible with the supplied meter, to approximately 13.8V (just shy of the 14 volt mark on the meter dial). When this radio was in receive mode, it drew only about 2 amps. Now, when the radio PTT was keyed (with the radio set in the high-power mode), the current meter jumped to 10 amps, but the voltage meter dropped from ~13.8V to about 10V. In other words, the power supply was limiting current to 10A by reducing the output voltage—an undesirable outcome.

Before re-adjusting the variable AMPS control clockwise to a position where this wouldn't occur, we switched from the high-power mode to the low-power mode on the radio to see what would happen. Now activating PTT, the current meter read about 8 amps and the voltage meter dropped only negligibly from 13.8V. In other words, at 8A load, the power supply was not current limiting, but at 10A, it was current limiting. So, we knew that the AMPS current limit control needed to be moved CW, but probably not very much.

While activating the PTT in the high-power mode (and drawing ~10 amps), we moved the AMPS control slowly CW and saw the output voltage increase until it leveled out; we stopped rotating the control when the voltage stabilized at 13.8 volts. Then, to provide some margin (for temperature, humidity, component aging, AC line voltage fluctuations, etc.) we increased the CW rotation another few degrees and marked that point with an arrowhead taped onto the front of the panel, as shown in Figure 2.

Figure 2. After locating the rotational position at which the "current limiting" AMPS control would enable full/desired output voltage of 13.8V without voltage scale-back, the control position was advanced a few more degrees clockwise and marked with a pointer to assure proper positioning in the future. This procedure was performed while drawing current with the radio in the high-power transmit mode.

This completed the fix for the problem that had prompted our radio service trip. But, for completeness we tested the antenna for SWR and the radio for power output in both low- and high-power modes of operation.

Figure 3 shows the measured antenna SWR over a very large spectrum, centered in the 2m band at 146MHz. The character of this data is unexpected. There is no clear resonant frequency and very little variation over this large spectral expanse. This raises suspicion that the antenna is defective. However, SWR being generally less than 2:1 is not causing the transceiver to fold back its output RF power. Furthermore, a simplex RF link test from MDR to Palos Verdes (approximately 16 miles) exhibited fully readable reception on both ends of the link. So, it's working even if the antenna isn't demonstrating "normal" behavior. No antenna action is deemed critical at this time, but it bears watching when an opportunity for future testing occurs at this station.

Figure 3. SWR of outside 2m antenna shows unusual behavior—generally less than 2:1 everywhere and no apparent resonance(s)

Figure 4 shows photos of the power measurement instrument in both the low-power and high-power modes. Low power output into the antenna was approximately 23 watts and in high-power mode approximately 45 watts.

Figure 4. Left and right photos indicate, respectively, output power of ~23 watts in low-power mode, ~45 watts in high-power mode

Other unrelated observations: The Tech Team members observed that the location of the transceiver coupled with the location of the computer monitor made operational access to the radio awkward. If the monitor were moved a couple of feet to the left or right, operator access to the radio would be significantly improved, as can be observed in Figure 5.

Figure 5. DCS radio and companion speaker location under shelf just behind and above computer monitor. Power supply is just off camera on the upper shelf and located roughly above the marine radio at the far left.

Upon approaching the MDR station, the Tech Team members observed what appears to be a damaged CB or other HF antenna, as depicted in Figure 6. The four horizontal radials appear to be intact but the vertical radiating element has been disconnected (probably broken off) and appears to be lying on the roof. This is not DCS related, but we thought it relevant to point this out for whom it might be of interest.

Figure 6. Damaged CB or other HF radio antenna atop the MDR Sheriff Station roof.