Connecting The SCADAmetrics Bell 202 Modem
To the Tecnet TM-2000 & TM-8000 Series Mobile Radios

Based on laboratory and field testing, SCADAmetrics has verified that the Model B202 modem and the TM-2000/ TM-8000 Series Mobile Radios by Tecnet International are compatible. This document describes the wiring procedures and settings required when connecting the B202 to the TM-2000/8000. Special Thanks to Tecnet International Inc. for its assistance, particularly to Steve Koch for the loaner radio equipment, and to Brad Parkins for technical assistance.
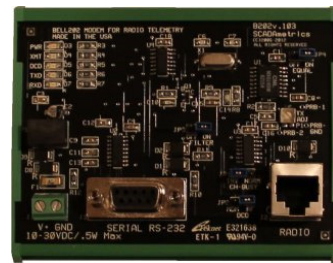
Tecnet TM-2102 Mobile Radio   **SCADAmetrics B202 Modem**

1. When integrating the TM-2000/8000 and the B202, the main step is to create the custom interface cable. This cable connects the HD15F auxiliary port of the TM-2000/8000 radio to the RJ45F interface port of the B202 modem:

   Radio.02 ←→ Modem.01 (Flat Audio Into Radio)
   Radio.08 ←→ Modem.03 (Push To Talk)
   Radio.09 ←→ Modem.02 (Flat Audio From Radio)
   Radio.10 ←→ Modem.04 (Channel Busy)
   Radio.15 ←→ Modem.05 (Ground)

All other pins on the modem and radio should be left unconnected.

Figure 1. Custom Cable For Connecting the B202 Modem to the TM-2000/8000 Radio.

2. On the main motherboard of the TM-2000 radio, a shunt should be installed across the R12 pads, and R79 should be removed. This is a difficult procedure due to small surface mount component sizes. Unless you have experience and equipment for fine-pitch solder re-work, it is highly recommended that this be performed by Tecnet factory personnel.
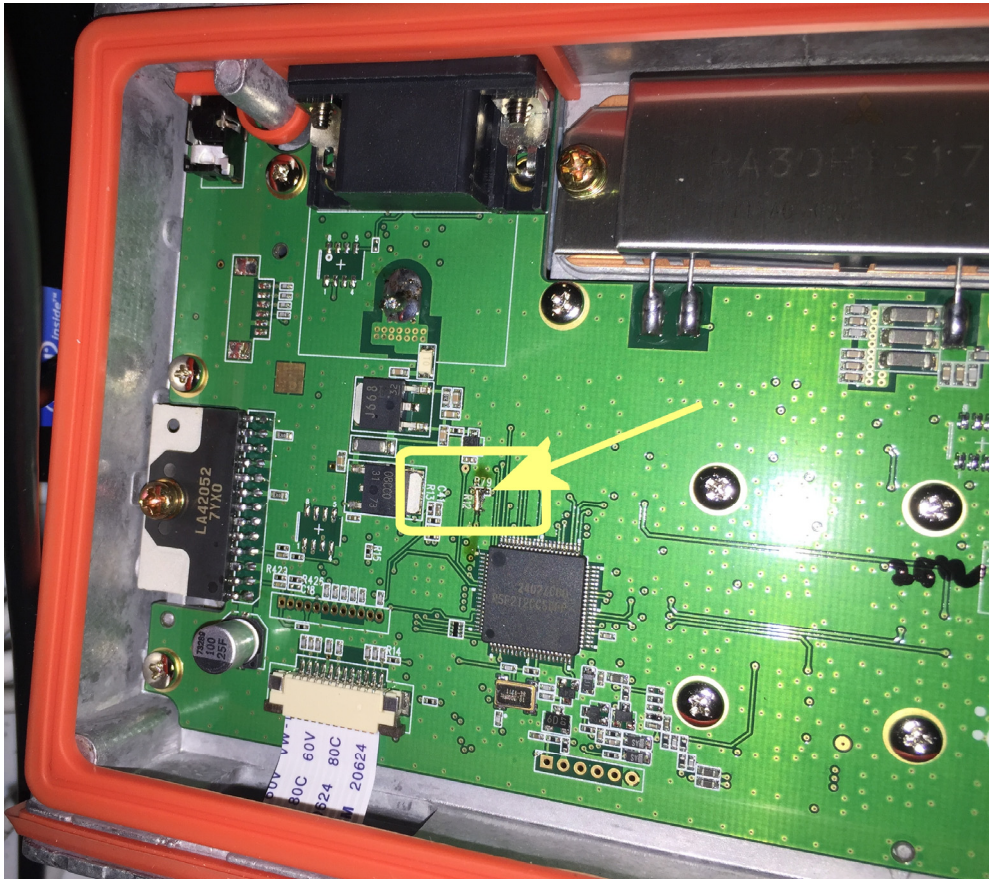

Figure 2. On the TM-2000 Main Motherboard, shunt across the R12 pads, and remove R79.

3. On the B202 modem, the TX-Adjust potentiometer should be set to the maximum (clockwise).

4. The radio should be programmed for the desired frequency and transmit power level using the Tecnet USB programming cable and software. Please note that the radio/modem pair will not function when the USB programming cable is connected to the radio. However, the pair will function when the microphone is connected to the radio, and the pair will function when no microphone is connected.

5. The radio transmitter is controlled by the modem's PTT (push-to-talk) output signal, which in turn is controlled via the RS-232 port. When the RS-232 port's RTS pin is asserted, the modem's PTT pin is grounded, causing the transmitter to key up. For 100% duty cycle applications, RTS should be asserted continuously.

6. The modem configuration jumpers should be set for TM-2000/8000 compatibility:

- JP1=NORM (~5V=BUSY),
- JP2=RADIO or MDM (DCD Source)
- JP3=ON or OFF (DCD Byte Filter)
- JP4=ON or OFF (Receiver Equalizer ON/OFF)

<u>**Laboratory Test Equipment**</u>

The laboratory test equipment is illustrated in Figure 3. Note that there are 2 radios: a Tecnet TM-2102 Mobile Radio (lower right) and a Tecnet SD-170EX Telemetry Radio (upper left). These FM radios are each tuned to the same 12.5kHz narrow-band VHF channel. Each radio has a small antenna, along with signal attenuators, and each is connected to its own B202 modem. The radios and modems are powered by 12VDC power supplies. The modems are each connected to RS-232 serial ports on a desktop computer.

Figure 3. Laboratory Test Setup.

Data Transmission

Bi-Directional Radio Communication Software was initiated on the connected desktop computer. In the present example, a data transmission was sent to the #2 Modem (right), which was connected to the TM-2102 radio. As illustrated in the photo in Figure 4, the red transmit LED on the #2 Modem lit up, and the red transmit LED on the radio also lit up. Note that the receive LED on the #1 Modem (left) is lit up.
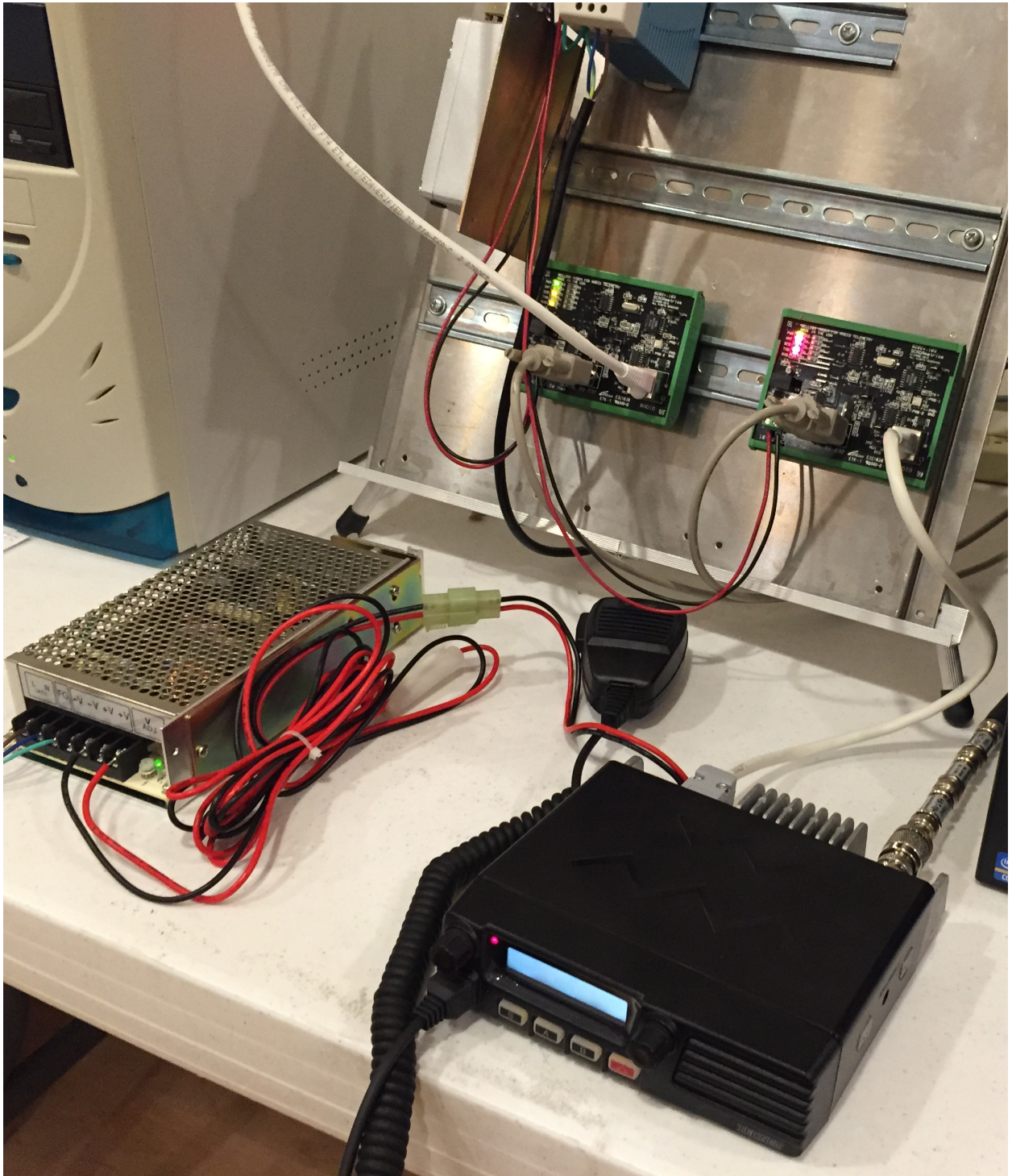
Figure 4. TM-2102 Radio/Modem Transmitting, SD-170EX Radio/Modem Receiving.

Data Reception

In the present example, the Bi-Directional Radio Communication Software correctly received the data transmission from the TM-2102 radio/modem pair, and responded with a handshake response. As illustrated in the photo in Figure 5, the red transmit LED on the #1 Modem (left) lit up, and the yellow receive LED on the #2 Modem (right) is lit up, along with the green receive LED on the TM-2102 radio.
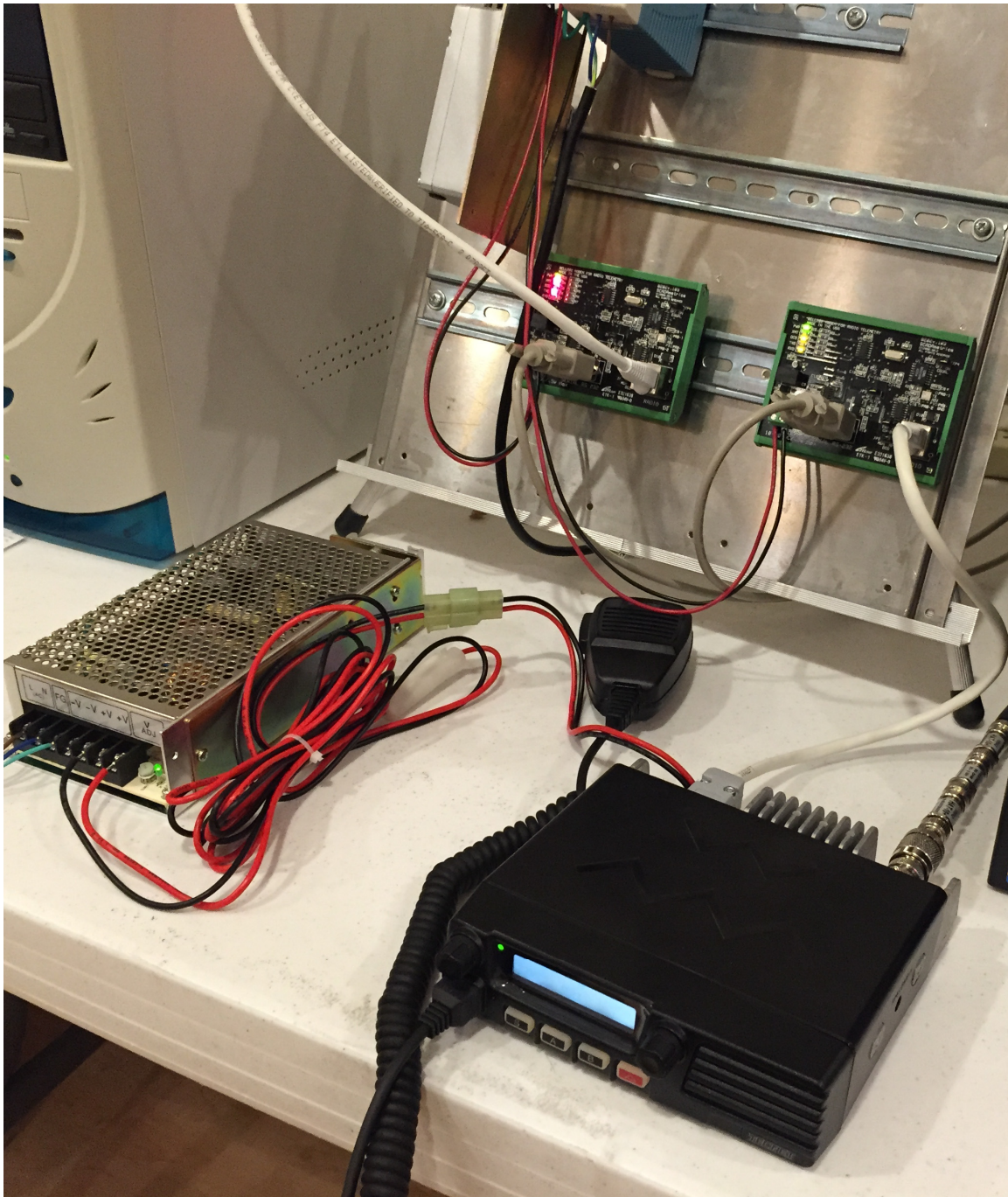

Figure 5. SD170EX Radio/Modem Transmitting, TM-2102 Radio/Modem Receiving.

A screen snapshot of the Bi-Directional Radio Communication Software is shown in Figure 6. Note the handshaking messages shown in the application windows.
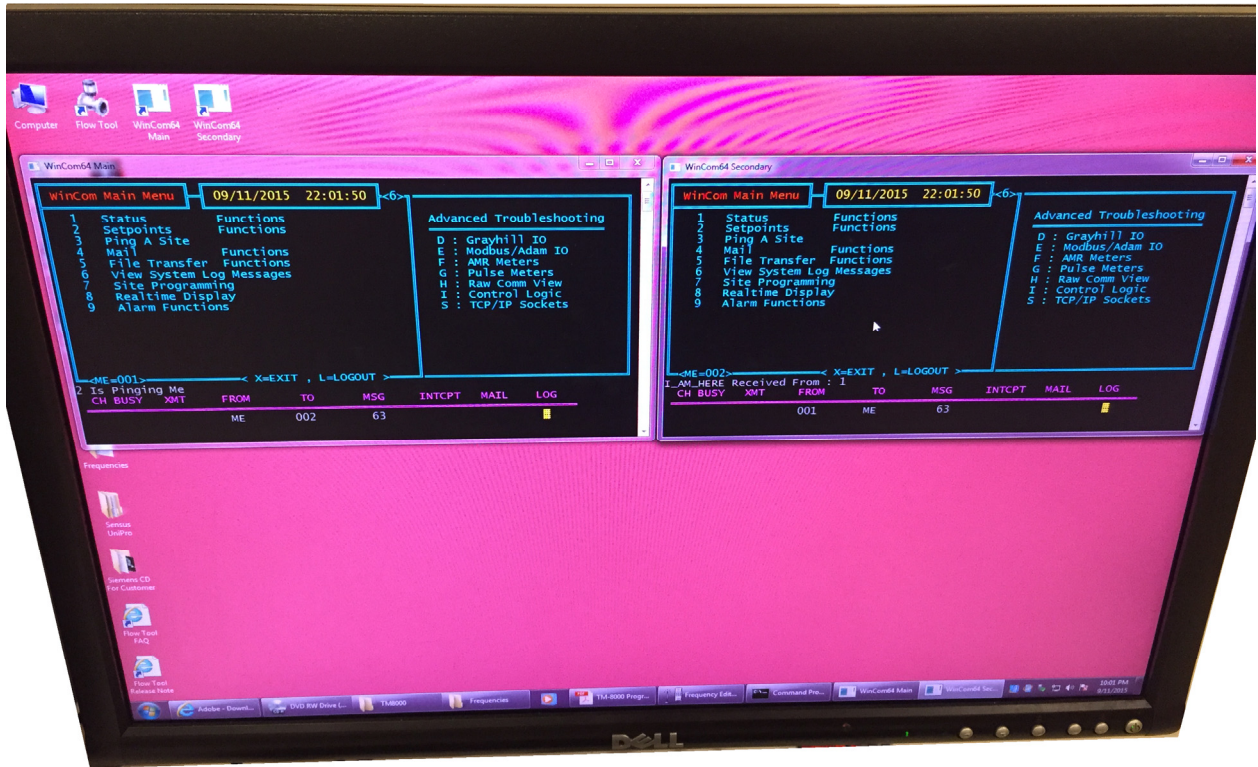

Figure 6. Radio Communication Software Illustrating Successful Data Handshaking.

Appendix
TM-2000/8000 Radio – B202 Modem
Cable Assembly

P/N   **NRI.TECNET-ASSEMBLY.104**
Purpose: Tecnet Mobile Radio Signal Connector –
                       Mates To B202 Modem RJ45 Jack

Connector I: ShowMeCables P/N 1126
                       HD15 VGA Male Solder Connector Kit – Plastic

Extension Cable: Cat5 Patch Cable (Straight-Thru), Shielded, Wired EIA568B

From B202 Modem – EIA 568B Color Codes:

Orange/White	Tx Audio (to Radio)
Orange	Rx Audio (from Radio)
Green/White	PTT
Blue	CD
Blue/White	GND
Green	---
Brown/White	---
Brown	---

DB9F CONNECTIONS (SOLDER):

Pin	Function	Color
1	RSSI	---
2	**Flat Audio In (R_{12} Jumpered)**	**Orange/White**
3	LoudSpeaker Out	---
4	Audio Out	---
5	Audio In	---
6	Tx Serial Data	---
7	Rx Serial Data	---
8	**PTT**	**Green/White**
9	**Flat Audio Out**	**Orange**
10	**CD**	**Blue**
11	Programmable	---
12	5VDC Output	---
13	Horn Alert Output 1	---
14	Horn Alert Output 2	---
15	**GND**	**Blue/White**