Using Freewave Radios to Connect to an SEL-2030 to a remote SCADA HMI Unit

This application consists of a substation protected by multiple SEL relays all connected to an SEL-2030 communication processor. The SEL-2030 collects meter, target, and event data from the connected relays every 2 seconds using SEL binary Extended Fast Meter protocol. The SEL-2030 concentrates this data in its Port 14 user data region for periodic collection by via Modbus protocol over Spread Spectrum wireless radio available within the FreeWave radio sets.

Follow the procedure below to use the FreeWave radio equipment in the above application.

Procedure for Configuring FreeWave Radio Equipment

1. Designate which FreeWave radio will be the Modbus Master, which will be the Modbus Slave, and which will be the Repeater (if applicable). Record the Serial number of each.

2. Connect the FreeWave cable labeled 'COMPUTER TO RADIO' (available from FreeWave) from the computer to the FreeWave radio that will be designated as the **Modbus Master**. Using a PC and terminal software, connect to the radio with a 19200 baud rate, 8 data bits, no parity, 1 stop bit, and no flow control. Once connected in HyperTerminal, depress the setup button on the back of the radio, this action will bring up the 'SET MODEM MODE' screen.

- Select '0' for 'Set Operation Mode' and then select '0' for 'Point to Point Master'.
- Select 'ESC' to return to the main menu.
- Select '1' for 'Set Baud Rate' and then select '4' for '38,400'.
- Select 'B' for 'MODBus RTU' and then '1' to select 'MODBus RTU'.
- Select 'ESC' to return to the main menu.
- Select '5' for 'Edit MultiPoint Parameters' then select '1' for 'Master Packet Repeat'. Enter '3' for this value.
- Select 'ESC' to return to the main menu.
- Finally select '2' for 'Edit Call Book' then select '0' for 'Entry' 0. When prompted, enter the Serial Number of the Modbus Slave. If a repeater is to be used, enter the serial number here, otherwise select 'ESC'.
- Press 'ESC' two more times to exit setup.

3. Connect the FreeWave cable labeled 'COMPUTER TO RADIO' from the computer to the FreeWave radio that will be designated as the **Modbus Slave**. Using a PC and terminal software, connect to the radio with a 19200 baud rate, 8 data bits, no parity, 1 stop bit, and no flow control. Once connected in HyperTerminal, depress the setup button on the back of the radio, this action will bring up the 'SET MODEM MODE' screen.

- Select '0' for 'Set Operation Mode' and then select '1' for 'Point to Point Slave'.
- Select 'ESC' to return to the main menu.
- Select '1' for 'Set Baud Rate' and then select '4' for '38,400'.
- Select 'B' for 'MODBus RTU' and then '1' to select 'MODBus RTU'.
- Select 'ESC' to return to the main menu.
- Select '5' for 'Edit MultiPoint Parameters' then select '1' for 'Master Packet Repeat'.
- Enter '3' for this value.
- Select 'ESC' to return to the main menu.
- Finally select '2' for 'Edit Call Book' then select '0' for 'Entry' 0. When prompted, enter the Serial Number of the Modbus Master. If a repeater is to be used, enter the serial number here, otherwise select 'ESC'.

- Press ‘ESC’ two more times to exit setup.

4. Connect the FreeWave cable labeled ‘COMPUTER TO RADIO’ from the computer to the FreeWave radio that will be designated as the **Repeater** if one is used, otherwise skip this step. Using a PC and terminal software, connect to the radio with a 19200 baud rate, 8 data bits, no parity, 1 stop bit, and no flow control. Once connected in HyperTerminal, depress the setup button on the back of the radio, this action will bring up the ‘SET MODEM MODE’ screen.

- Select ‘0’ for ‘Set Operation Mode’ and then select ‘5’ for ‘Point to Point Repeater’.
- Select ‘ESC’ to return to the main menu.
- Select ‘1’ for ‘Set Baud Rate’ and then select ‘4’ for ’38,400’.
- Select ‘B’ for ‘MODBus RTU’ and then ‘1’ to select ‘MODBus RTU’.
- Select ‘ESC’ to return to the main menu.
- Select ‘5’ for ‘Edit MultiPoint Parameters’ then select ‘1’ for ‘Master Packet Repeat’.
- Enter ‘3’ for this value.
- Press ‘ESC’ two more times to exit setup.

5. Connect the Modbus slave (SEL-2030 in this case) to the FreeWave Radio designated as Modbus Slave with the ‘SEL RELAY’ to ‘FREEWAVE’ cable.

6. Connect the communications port of the Modbus master (Touchscreen in this case) to the FreeWave Radio designated as Modbus Master. The cable required to make this connection varies depending on the type of Touchscreen or other HMI being used. The FreeWave radio utilizes the following RS232 pin assignments:

Pin Assignment	**Signal**
1	Carrier Detect Output
2	Transmit Data Output
3	Receive Data Input
4	DTR Input
5	Ground
6	Data Set Ready Output
7	RTS Input
8	Clear to Send Output
9	Ground

7. Once connected as described in the previous steps, no further configuration is required.