QUICK START RDC INTERFACING PROCEDURE

Equipment Needed: **RDC (GMSK or LSM version)**
RADIO with Flat Audio interface.
Communications Service Monitor such as IFR 1200 or HP 2920
Oscilloscope
12V supply
Cables, connectors
Hand tools
Dumb terminal or PC emulating dumb terminal.

LEVEL MATCHING AND DEVIATION

It is important to match the TX and RX levels of radio to the RDC modem in order to get optimal performance (range) as well as to prevent excessive deviation of the RF signal.

Excessive deviation is the result of overdriving the TX audio and spreads the signal over too wide a bandwidth, which causes it to interfere with adjacent channels. It is generally illegal in most countries to deviate excessively and is punishable by fines. Excessive deviation often reduces the range of the signal due to distortion.

FLAT AUDIO

GMSK: RDC's require a Flat Audio interface in the radio. Pre-emphasis and de-emphasis must be disabled or the modem will not operate at all. Near DC response of 5 Hz to 10 Hz lower cutoff frequency is required for optimal performance on GMSK modems. A lower cutoff frequency that is higher THAN 5-10 Hz will result in more data errors and degradation in range. For 4800 bps over the air, 3 kHz upper cut off frequency (-3dB) is required. For 9600 bps, a 5 kHz upper cutoff frequency is required.

It is best to do a frequency response of the RX and TX audio as the first thing. This way you will know right away if your going to have problems with the audio response of the radio.

LSM: Although it is not desirable, the 1200 bps LSM may work with pre-emphasis and de-emphasis as long as it is at both ends of the link. i.e. if you have pre-emphasis on TX at one end of the link, you must have de-emphasis on RX at the other end of the link. For 1200 bps LSM, the required lower cutoff frequency is 300 Hz and the required upper cutoff frequency is 3 kHz.

INTERFACING

The attached 25pin (data) and 15 pin (radio) diagrams list the signals that must be interfaced.

The RDC 25 pin connector is DCE (Data Communications Equipment) and will be interfaced to a PC emulating a dumb terminal. Minimal connection is TX, RX, GND, RTS, and CTS. If you want to run without hardware handshake, ins 4 and 13 must be tied together at the RDC and the PC must be setup such that HANDSHAKE=NONE.

The 15 pin connector will be interfaced to the radio. The minimal connections are +12 VDC power, RX Audio, TX Audio, PTT (Push to Talk) and GND. PTT is a low true open collector with internal pull up of 4.7k. Most radios have a DC output to supply power to other devices. This is what is normally used to power the RDC. Otherwise, the RDC must have +12 VDC power from the power supply. Shielded cable is highly recommended.

TERMINAL EMULATION SOFTWARE

 Use Windows TERMINAL (preferred) or other terminal emulation software such as ProComm. Hyperterminal can work as well, but has been problematic for some.   TERMINAL is on Windows 3.1 disks and is a simple exe file that can be copied.   Default settings are 9600,8,N,1 and hardware (RTS-CTS) handshake. The actual serial port settings for your RDC can be found on the firmware settings report that was shipped with your units. A copy of Windows TERMINAL is available for download from the www.aria-glb.com website.

To verify that you are interfaced to dumb terminal correctly, RAPIDLY type 3 and only 3 capital letter U within 1 second to get into command mode. You may have to try this several times if you do not type fast enough. Type only 3 U's and not more or it will not work. You will see prompt " **:** ". If an ENTER is typed at this point the RDC will give you a sign on message similar to the following:

   GLB SNRDS-27 V1.99W3

To get out of command mode, type "MS". To type characters over the radio link for testing, you must NOT be in command mode.

PROGRAMMING

The SNRDS Manual covers programming the RDC. Remember that if you want the commands you entered to be retained after power off, and then you must issue a DU and then a DOC command to program them to the EEPROM. It is very important that the DU command is followed directly by the DOC command, otherwise the parameters that you changed will not be saved to the EEPROM. If you do type something else by accident between these commands, just start over again with the DU command and then DOC.

LEVEL CALIBRATION

GMSK: The preferred method is to use the TX level adjustment in the radio. If this is not available, the TX adjustment potentiometer on the small GMSK daughter board can be used. The attached silk screen shows the location of this pot.

Note that some radios have a balance control for the "2 point modulation" (reference and VCO) and this can be used to optimize the low frequency response of the radio and improve performance. With a 100 Hz square wave into the radio's TX audio signal key the radio and view the demodulated TX audio on the Service Monitor. Adjust the balance to minimize overshoots and undershoots on the square wave pattern. This adjustment is similar to compensating a scope probe.

If a frequency generator is not available, then get the RDC into command and type the command DC. This will cause the radio to key up and have a square wave on it that is 1/16 of the baud rate (600 Hz for 9600 baud). *The DC command suspends after 15 seconds so you will have to press the spacebar to get it to resume. Type "Q" to quit the DC command even if it has timed out.*

LSM: No adjustments in RDC. Levels must be set externally.

TX LEVEL/DEVIATION (Service Monitor Method)

1. Connect radio to service monitor and set up for TX TEST.
2. Enter command mode on RDC by typing "UUU".
3. While observing the deviation meter, type "DC" to put a carrier on the air.
4. Adjust TX level with pot in radio or TX audio pot on GMSK modem (R41) until deviation is 2.5 kHz.

TX LEVEL/Deviation (No service monitor)

1. Take **previously TX calibrated RADIO and RDC combination** and designate as MASTER and another RADIO and RDC and designate as REMOTE.
2. On the REMOTE, get the RDC into command and key up the radio using the "DC" command. Monitor audio level on MASTER at TP1 of the GMSK modem. *The DC command suspends after 15 seconds so you will have to press the spacebar to get it to resume. Type "Q" to quit the DC command even if it has timed out. Type "MS" to get out of command mode.*
3. Adjust TX level with pot in radio or TX audio pot on GMSK modem (R41) on REMOTE radio until 1.5 Vpp is seen on TP1 of GMSK modem on MASTER radio.

RX LEVEL (Service Monitor Method)

1. Set Service monitor for RX test and set 1khz tone with 2.5kHz deviation. The signal level should be –70 dBm.
2. Monitor RX audio on TP1 of GMSK modem and set RX audio adjustment (R21) such that the level is 1.5 Vpp.

RX LEVEL (No service monitor)

1. Take **previously TX calibrated RADIO and RDC combination** and designate as MASTER and another RADIO and RDC and designate as REMOTE.
2. On the MASTER, key up the radio using the "DC" command and monitor audio level on REMOTE as in step 3. *The DC command suspends after 15 seconds so you will have to press the spacebar to get it to resume. Type "Q" to quit the DC command even if it has timed out. Type "MS" to get out of command mode.*
3. Monitor RX audio on TP1 of GMSK modem and adjust RX pot (R21) to give a level of 1.5 Vpp.

SQUELCH LEVEL ADJUST (Service Monitor Method)

1. Set Service monitor for RX test and set 1khz tone with 2.5kHz deviation.
2. Decrease the signal level to about –118 dBm. Adjust the Squelch pot on the GMSK modem (R1) until the RX LED on the RDC motherboard is off completely.
3. Increase the signal level from the Service Monitor to –110 dBm and the RX LED should be on completely. If not readjust the Squelch pot (R1) and repeat steps 2 and 3 until the RX LED acts correctly.

SQUELCH LEVEL ADJUST (No service monitor)

1. Power up the radio and insure that there is no signal being transmitted on the frequency of the receiver. Adjust Squelch pot (R1) until the RX LED is on solid.
2. Adjust the Squelch pot until the RX LED just goes off completely and then continue to turn the pot 1/8 of a turn in the same direction. The RX LED should be off completely still.

3. Key up another radio that has the transmitter on the same frequency as the receiver under test and insure that the RX LED is lit continuously. It is very important that the transmitting radio is connected to a dummy load or an antenna. If it is connected to an antenna it is very important that the transmitting and receiving radios are at least 8 meters apart. This is to insure that no damage is done to the receiving radio.

15 Pin Connector (RADIO)

PIN	SIGNAL	Color
1	Ground	Black
2	TX Audio to Radio (output)	Orange
10	RX Audio from Radio (input)	Green
11	PTT [Push To Talk] (output)	White
13	+ 12 VDC (input)	Red

25 Pin connector (DATA)

This is an industry standard 25 pin cable that would be used to connect a modem (DCE) to a PC (DTE).

PIN	SIGNAL
2	TX (input)
3	RX (output)
4	RTS (input)
5	CTS (output)
6	DSR (output)
7	Ground
20	DTR (input)