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SUBJECT: RC3000 Antenna Controller with an iDirect 7000 Satellite Router
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The RC3000 antenna controller can use an iDirect iNFINITY™ 7000 series satellite router to automatically locate and track satellites. Configured as a mobile remote, the satellite router can provide received signal strength and lock information from its console port. The RC3000 antenna controller can use this information to overcome inherent compass errors and quickly point an antenna at the correct satellite without user intervention.

The RC3000 antenna controller (ACU) provides the GPS data and transmitter mute control required by the iDirect satellite router (router). In exchange, the router provides receive RF power and carrier lock to the ACU. Figure 1 illustrates this relationship, as well as other components of a satellite antenna base station.

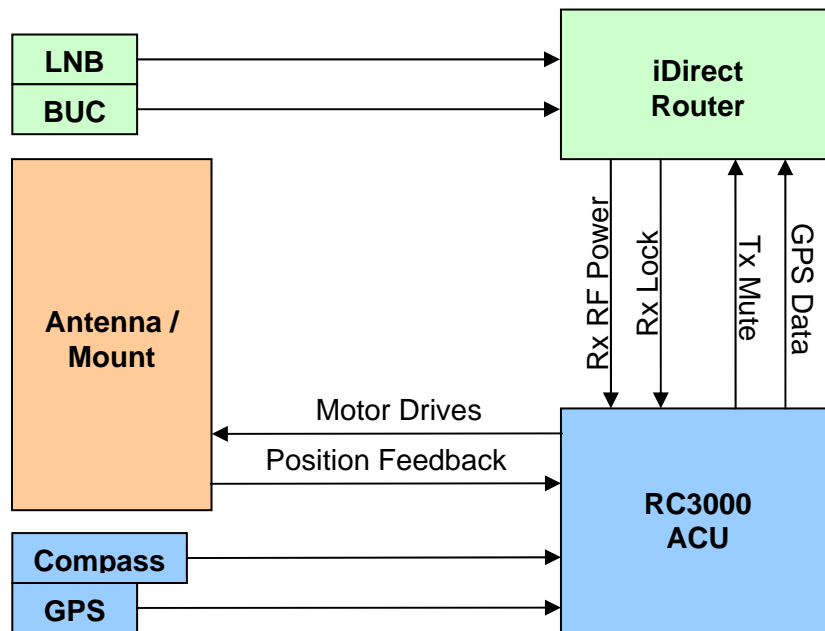


Figure 1 –Base Station Relationships

1 Hardware Connections

1.1 Router Interface Connections

Table 1 shows the pin out of the router console port. Pins 3 and 6 form a RS-232 serial port. Only pin 6 is needed for the GPS data input. The DTR signal is used as an active-low, external output representing receive carrier lock. The DSR signal is used as active-high, external input to control the transmitter mute. These associations are further illustrated in Figure 2. Pin 8 outputs 0-5 volts indicating receive signal strength (RSS).

| RJ-45 Pin | Signal | Function |
|-----------|-------------|----------|
| 1 | RTS | |
| 2 | DTR | TDM_LOCK |
| 3 | TXD | |
| 4 | GND | |
| 5 | GND | |
| 6 | RXD | GPS-DATA |
| 7 | DSR | MUTE |
| 8 | Rx-Rf-Power | RSS |

Table 1 – Router Console Port Pin Out

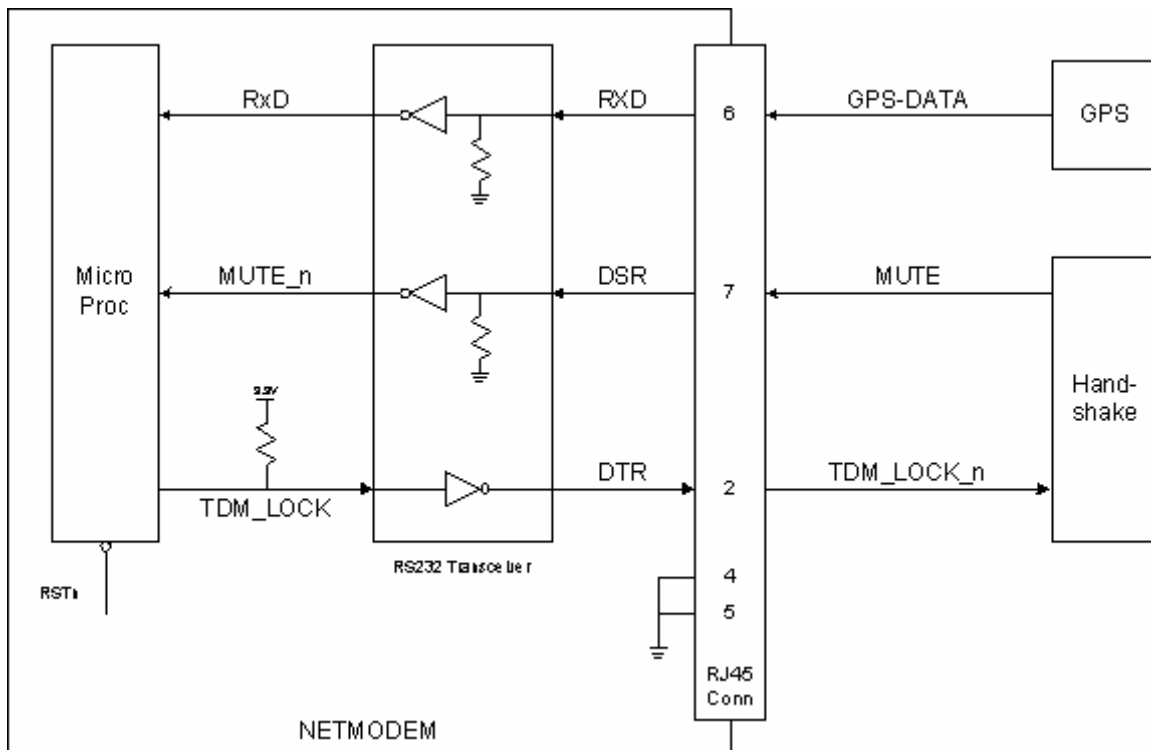


Figure 2 – Router Console Port Connections¹

It should be noted at this point that the RS-232 transceiver that drives the handshaking signals is powered by rectifying the signal on the pin 6 (RXD). **The handshaking signals are NOT useable unless a true RS-232 source is connected to pin 6.**

1.2 ACU Interface Connections

Table 2 shows the pin out of several RC3000 connectors. J13 is the GPS data input to the ACU. This connection is electrically equivalent to J15, the GPS loop out. J2 provides RSS input along with a signal lock qualifier. J8 provides a normally open, high-powered amplifier (HPA) control, which can be used to disable a transmitter until the antenna is pointing toward the correct satellite. Figure 3 illustrates the position of these connectors on the back panel of the RC3000.

| Pin | Signal | Function |
|-------|--------------------|----------|
| J2,2 | Signal Lock 2 | TDM_LOCK |
| J2,5 | GND | |
| J2,6 | +5V | |
| J2,10 | GND | |
| J2,15 | AGC_2 | RSS |
| J15,2 | TXD1 | GPS-DATA |
| J15,5 | GND | |
| J8,1 | HPA Disable NO | MUTE |
| J8,15 | HPA Disable Common | |

Table 2 - RC3000 ACU Connections

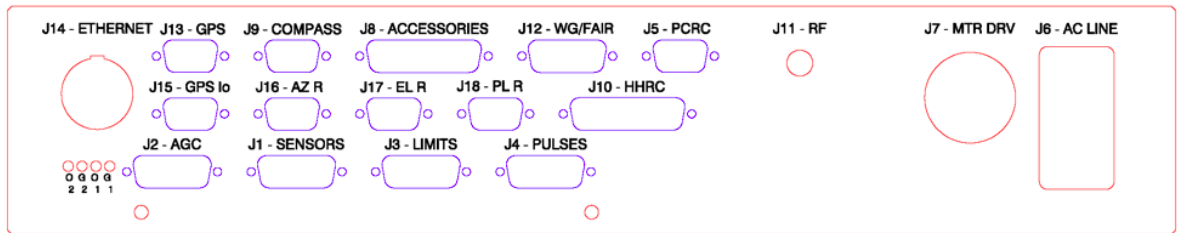


Figure 3 – ACU Back Panel

1.3 Router-To-ACU Interface Cable

Table 3 lists the connections between the router and the ACU. This list forms the basis of an interface cable to join the router with the ACU. In practice, some embedded components were needed for level conditioning. A complete schematic diagram of the interface cable is shown in figure 4.

| RJ-45 Pin | Signal | Function | Pin | Signal |
|-----------|-------------|----------|-------|----------------|
| 1 | RTS | | | |
| 2 | DTR | TDM_LOCK | J2,2 | Signal Lock 2 |
| 3 | TXD | | | |
| 4 | GND | | J2,5 | GND |
| 5 | GND | | J15,5 | GND |
| 6 | RXD | GPS-DATA | J15,2 | TXD1 |
| 7 | DSR | MUTE | J8,1 | HPA Disable NO |
| 8 | Rx-Rf-Power | RSS | J2,15 | AGC_2 |

Table 3 – Router-To-ACU Connections

Again, the handshaking signals are not usable unless a true RS-232 source is connected to pin 6 on the router console port. Since pin 6 is connected to the GPS loop out on the controller, a GPS receiver with a true RS-232 output must be connected to J13 of the ACU. Research Concepts part numbers GPS-3 and GPS-4 are acceptable GPS receivers.

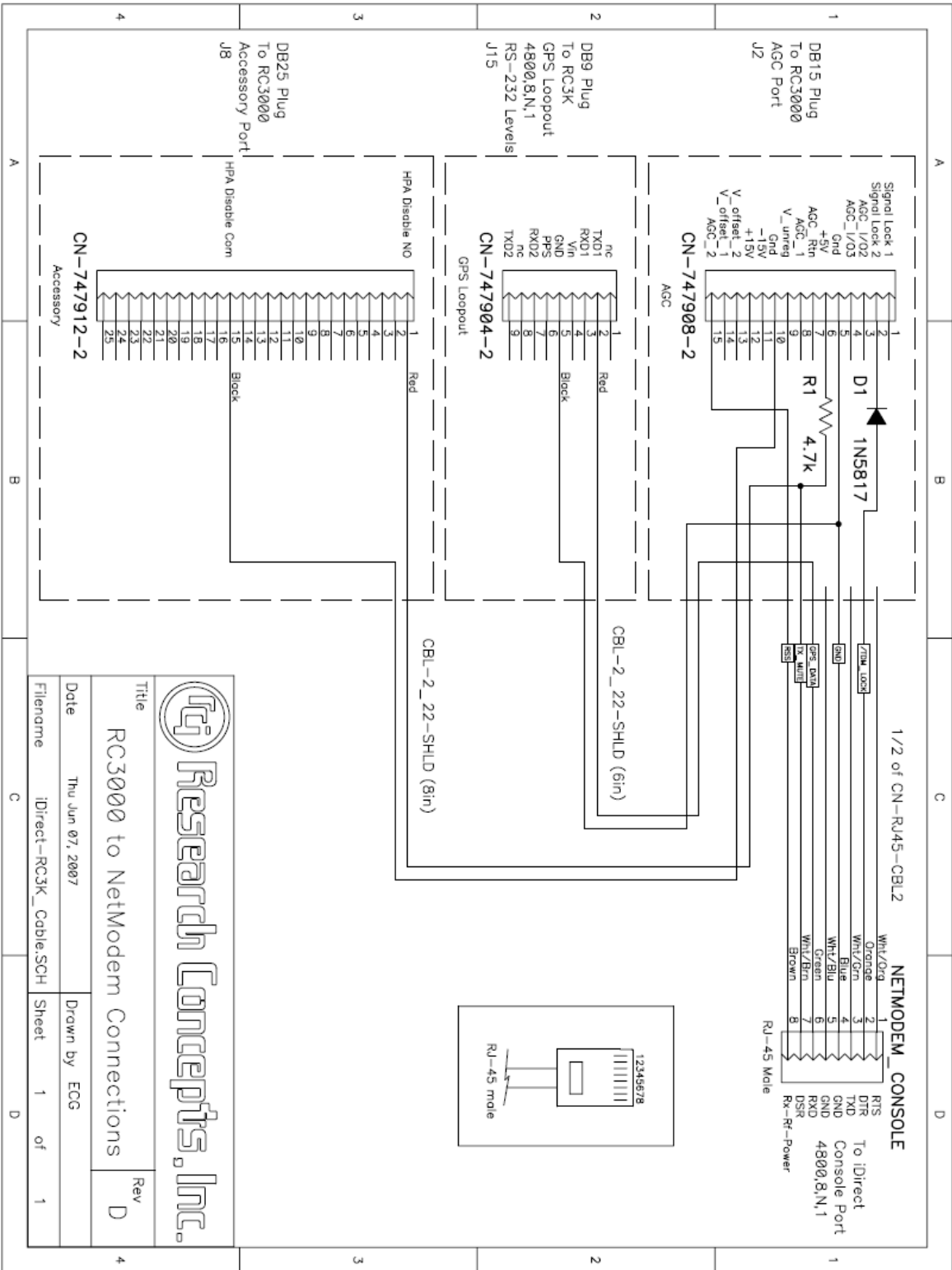


Figure 4 – Interface Cable Schematic

2 Software Configuration

The following sections describe how to configure the router and ACU. It is assumed that all equipment has been properly installed and configured for normal independent operation. The ACU must be able to operate the satellite antenna, and the router must be able to establish a connection with appropriate network before proceeding. See the router installation quick reference guide² and the ACU user's manual³ for instruction.

2.1 Configure the iDirect Satellite Router

The router must be configured as a mobile remote with handshaking enabled. Modify the MOBILE group in the options file to match the text snippet below:

```
[MOBILE]
    is_mobile = 1
    tx_handshake_enabled = 1
```

Load the modified options file into the router. The router must be reset before the new settings will take place. See the router installation guide for more information.

2.2 Configure the RC3000 Antenna Controller

2.2.1 Adjust RC3000 AGC 2

See section 2.4.3.3 of the RC3000 user's manual for instruction on adjusting the AGC offset and gain.

2.2.1.1 Tune AGC 2 Offset

Make sure the controller is powered on. Measure between J2 pin 13 (V_offset_2) and the chassis ground. Adjust O2 until the voltage equals -60mV.

2.2.1.2 Tune AGC 2 Gain

Make sure the controller is powered on. Put 5V between J2 pin 15 (AGC_2) and the chassis ground. Adjust G2 until SS2 equals 650.

2.2.2 Adjust CONFIG Mode Items

Set the following CONFIG mode to the values given. See section 3.3.1.2.5-3.3.1.2.6 of the RC3000 user's manual for instruction.

2.2.2.1 SIG FACTORS

Set SS2 LOCK to LO. Set SS2 TH to 200.

2.2.2.2 AUTOPEAK

Set ON to +PEAK. Set SIG to SS2.

In summary, using a RC3000 Antenna Controller with an iDirect 7000 Satellite Router to automatically locate and track satellites is a fairly straight-forward process. The RC3000 antenna controller (ACU) provides the GPS data and transmitter mute control required by the iDirect satellite router (router). In exchange, the router provides receive RF power and carrier lock to the ACU.

Additional appendices will be attached to this document more information becomes available on the performance of this configuration.

¹ iDirect Technologies™, *iNFINITY iConnex™ Electrical/Mechanical Specification*, 29 September, 2005

² iDirect Technologies™, *Quick Reference Guide for Installing and Commissioning iDirect iNFINITY series™ Satellite Routers*, 14 September, 2005, Release 6.X.

³ Research Concepts, Inc., *RC3000 Mobile Antenna Controller User's Manual*, 1 December, 2005.