RFR-02 READER TEST PROCEDURE

Note: You shall refer to **ERP** to determine the **Rev.** of assembly.

1.0 PURPOSE

This document provides instructions for testing assembly #1000052365 (12 VDC Power) and 1000053245 (10-30 VDC Power)

2.0 SCOPE

This document applies to any of the above items that have the potential of being shipped to a customer in order to fulfill a sample request or a normal sale. It shall be used by ASI production when being assembled, set-up or tested at ASI. At the discretion of the appropriate ASI personnel, it can also be used by outside vendors.

3.0 RESPONSIBILITY

Primary: Production

Support: Manufacturing Engineering

4.0 REFERENCES

GU-ERP-019	Guide to Quality Module Data Entry
SF-QAF-006	Parts Return Reject Repair Tag
SP-QAF-005	Control of Nonconforming Product
WI-QAF-015	In-Process Inspection
1000052365	RFR-02 (12VDC Powered) Assembly BOM
1000053245	RFR-02 (10-30VDC Powered) assembly BOM

5.0 DEFINITIONS

6.0 REQUIREMENTS

Tools Required

RFID Spectrum Analyzer
Universal Counter
3/16” Nut Driver
Variable Power Supply
Philips Screwdriver
Flat Screwdriver
RFA-02 ASI Antenna 5” x 7”
Test Leads (“Jumper Cables”)

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Tools Required (cont.)

BNC – BNC Test Cable
Test Laptop or PC (Win32)
RFR-02 Power Supply w/AC Cord
ISO 15693 RFID Tag
RFID Tag 7" Test Stand
Input Test Wiring Harness
Output Test Wiring Harness
Serial Cable (9pin Male – 9pin Female) w/Pins 2, 3, and 5 Straight
B&B Electronics Model #485PTBR RS232-RS422 Converter

7.0 PROCEDURE

7.1 Remove the lid from the RFR-02.

7.2 Check external and internal hardware tightness and cable installation (make sure the wiring harnesses are correctly aligned on their headers, off a pin, etc.).

7.3 Remove the metal cover from the RF section of the board with a flat screw driver.

7.4 **Inspect**. Visually inspect component soldering quality, particularly the inductor area.

7.5 Install shield over RF section, ensure that all fingers alternate around cover and are gripping tight.

7.6 Plug in serial cable (RS232) from COM1 of Test PC to the "SETUP" port on the RFR-02.

7.7 On the Test PC, run the program "rfr02setup.exe".

7.8 Plug in AC power to the RFR-02 reader.

7.9 In the rfr02setup program, go to "Update Firmware".

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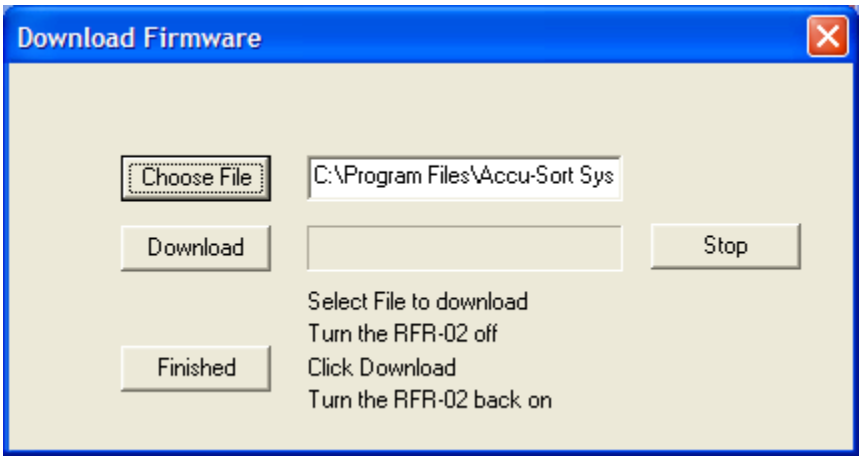

7.9.1 Go to "Choose File". The above screen capture shows an example of what happens after you choose a file. Location of file may vary on from shown.

7.9.2 Select "R02STD05.HEX", or current released version of firmware.

7.9.3 Click on "Download"; turn on power after a one second delay. (The network LED (RED) should be flashing which indicates serial activity). Also, when the RFR-02 is being flashed, the progress bar to the right of the "Download" button will progress from left to right. When the process is complete, you will notice that the Valid LED and the Network LED on the RFR-02 will flash three times simultaneously.

7.9.4 Click "OK".

7.9.5 Close program.

7.10 The BNC connector cable shouldn't be plugged into any device. Short the inner conductor to the outside ground of the cable to discharge any electrical build-up.

7.11 Plug the BNC connector cable into the input of the spectrum analyzer. Make sure the Spectrum Analyzer has been powered-on for at least 1 hour prior to testing. Now we will set up the Spectrum Analyzer for testing.

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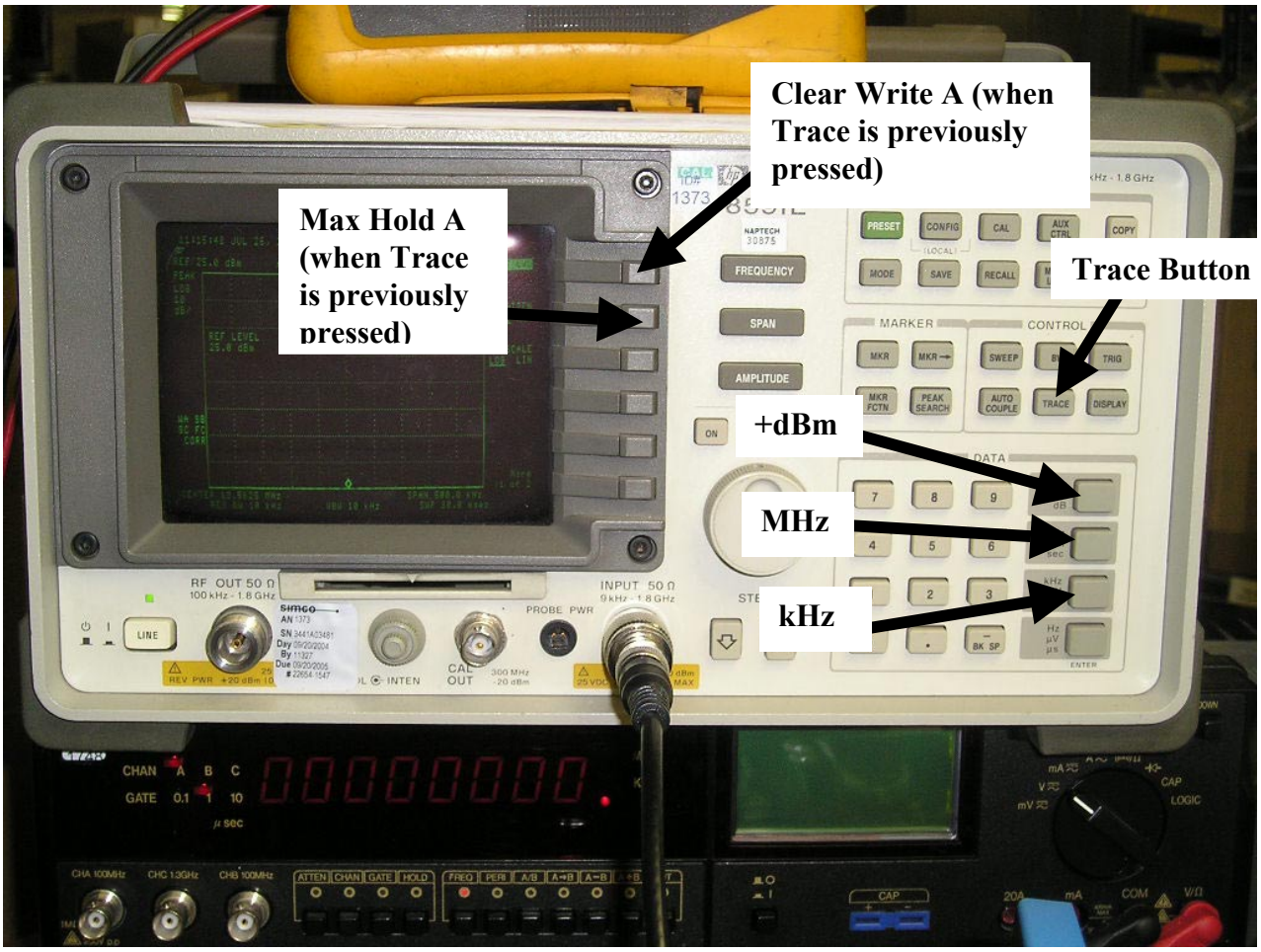

7.12 Setting Amplitude On the Spectrum Analyzer (see above picture):
- 7.12.1 Press "Amplitude".
- 7.12.2 Press "**2**","**5**".
- 7.12.3 Press +dbm (top softkey in the "DATA" section of the Spectrum Analyzer). Reference Level is now set.

7.13 Setting Frequency (13.56MHz) On the Spectrum Analyzer:
- 7.13.1 Press "FREQUENCY".
- 7.13.2 Press "**1**","**3**","**.**","**5**","**6**" then "MHz" (softkey in the "DATA" section). Center Frequency is now set.

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7.14 Setting Span (500 KHz) On the Spectrum Analyzer:
- 7.14.1 Press "SPAN".
- 7.14.2 Press "**5**","**0**","**0**" then "KHz". Span is now set.

7.15 Plug the BNC cable to antenna input #1.

7.16 Verify that the amplitude is +22 dBm. (tolerance ±1.5 dB)

7.17 Press "TRACE".

7.18 Press the soft key (to the immediate right of the display on the Spectrum Analyzer) "MAX HOLD A". This freezes the amplitude.

7.19 Press "PEEK SEARCH".

7.20 Record the amplitude value.

7.21 Press CLEAR WRITE A. (Top soft key)

7.22 Change the frequency to 27.12 MHz. (This is the 2nd harmonic)

7.23 View the 2nd harmonic amplitude. Refer to step 7.13 for setting frequency.
- 7.23.1 Press "MAX HOLD A", and then "PEAK SEARCH".
- 7.23.2 Record the 2nd harmonic amplitude. (Always on the negative dBm as small as possible)
- 7.23.3 **Inspect.** Verify that the level is less than -30dBm.

7.24 Press "TRACE".

7.25 Press the soft key "CLEAR WRITE A". (This turns off max hold)

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7.26 Measure the frequency.

7.26.1 Plug the BNC connector into the universal counter on port "CHA 100 MHz".
7.26.2 Frequency light must be lit.
7.26.3 Make sure channel A is lit and the gate is at 1 μsec.
7.26.4 **Record the frequency.** The frequency should be 13.56MHz ± 500Hz.

7.27 Plug the BNC connector back into the input port on the Spectrum Analyzer.

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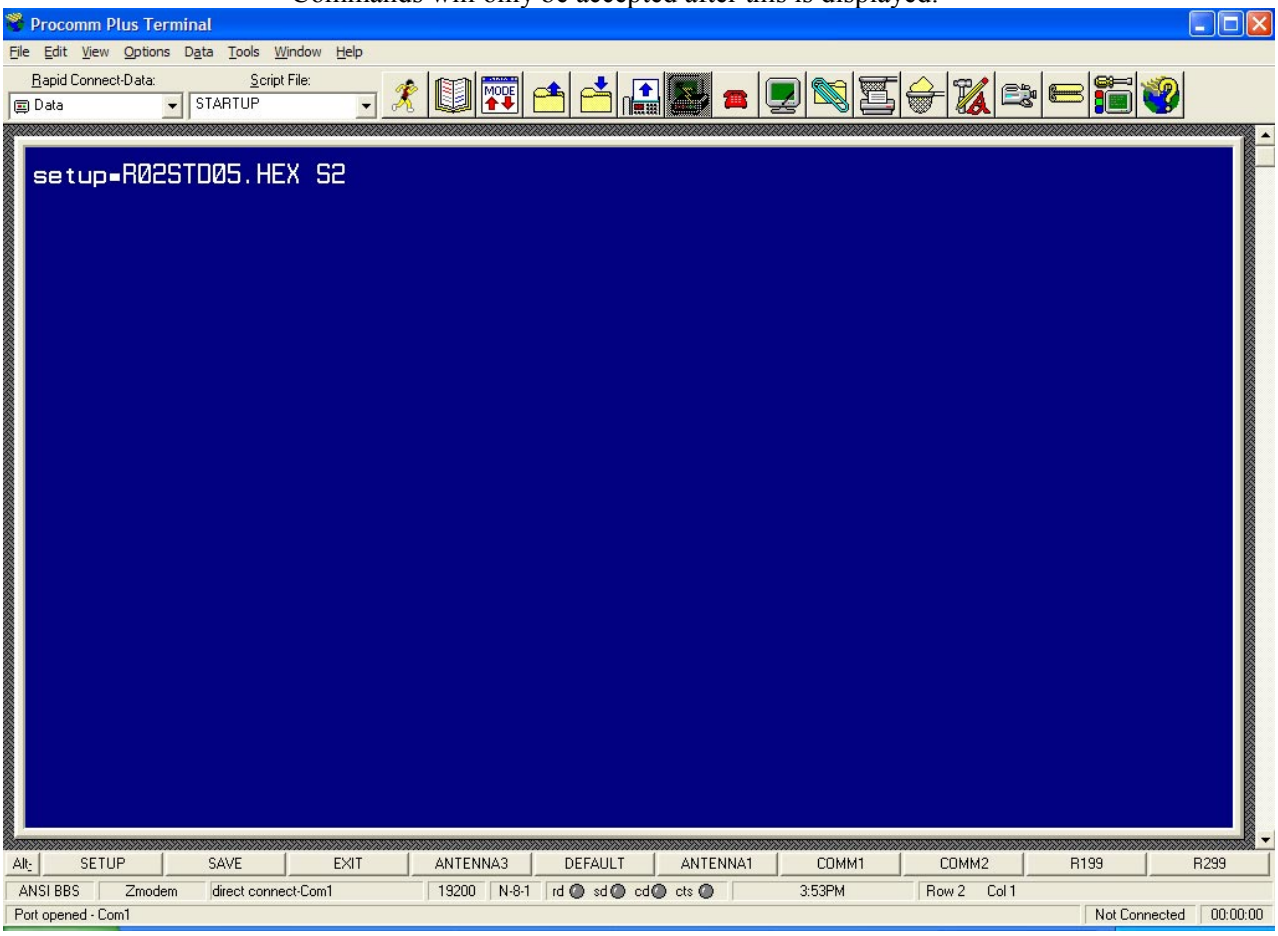
7.28 Checking Antenna 2 Port.

7.28.1 If "Antenna LED" is lit on the RFR-02, antenna 1 is selected.
7.28.2 Connect the BNC cable to antenna 2 on the RFR-02.

7.29 Go into Procomm.
7.29.1 Set/verify baud rate is 19.2 k and to the correct COM port on the Test PC. (The RFR-02 always defaults to setup port after we flash the RFR-02)
7.29.2 After flash is complete, type "setup" in lower case letters. (The firmware version will be displayed) Also note that whenever you reboot the RFR-02, you will see an ACK (♠ or 0x06) transmitted from the RFR-02 about 3 seconds from power-on. Commands will only be accepted after this is displayed.



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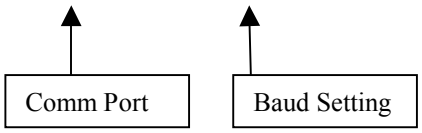
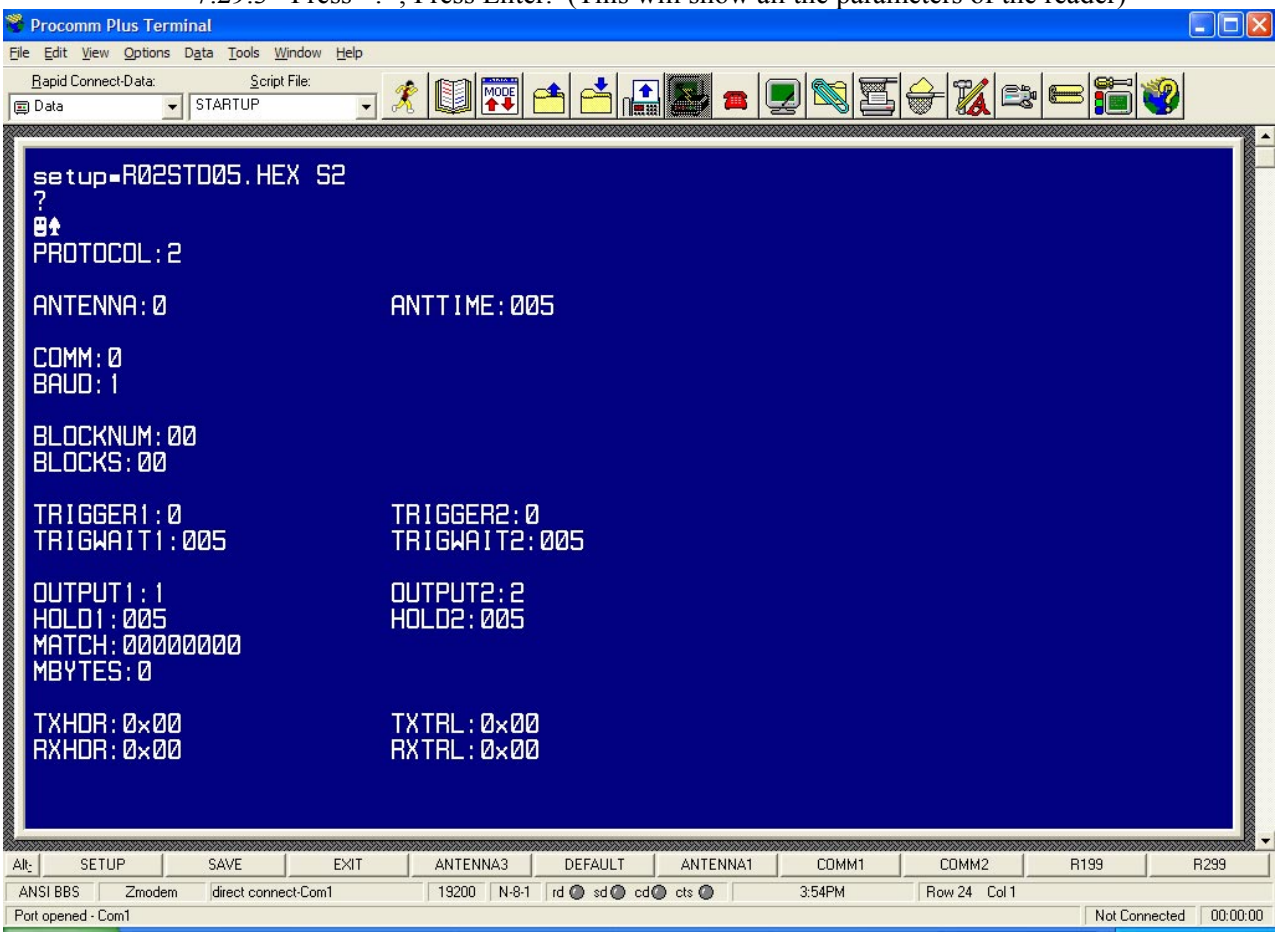


7.29.3 Press "?"; Press Enter. (This will show all the parameters of the reader)



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Note: All commands must be in CAPS.

7.29.4 Type "ANTENNA3" (press enter) to switch to dual antenna mode. An accepted command returns a STX and ACK ((☻) 0x02 and (♠) 0x06, respectively). An INvalid command yields a STX and NAK ((☻) 0x02 and 0x15, respectively). You can see from the above example that I have both presented.

7.29.5 Type "SAVE"; press enter. (Saves information)

7.29.6 Type "EXIT"; press enter. (Exits out of setup mode)

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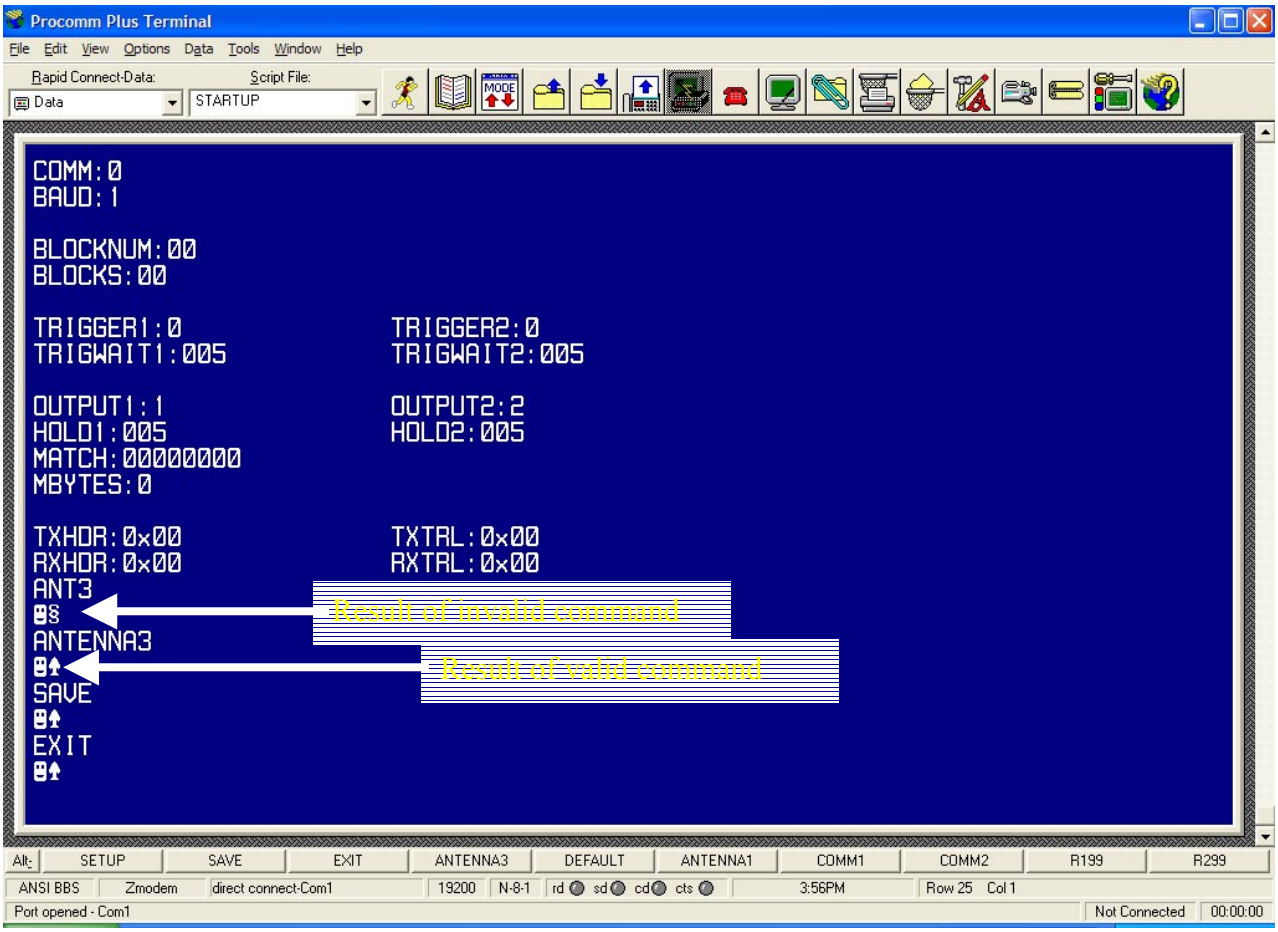

7.30 Type "R299" to get to 2nd antenna. (Note: Antenna status LED should be off)

7.31 Repeat steps 7.17 to 7.25 for antenna 2 measurements.

7.32 Take voltage measurement on pin 1 of U2 from chassis ground. (Result should be +11.30VDC to +11.40VDC)

7.33 Turn antenna 1 back on by typing "R199".

7.34 Read Rate Test.

7.34.1 Unplug the RFR-02's cable from the spectrum analyzer and plug it into the test RFA-02 antenna.

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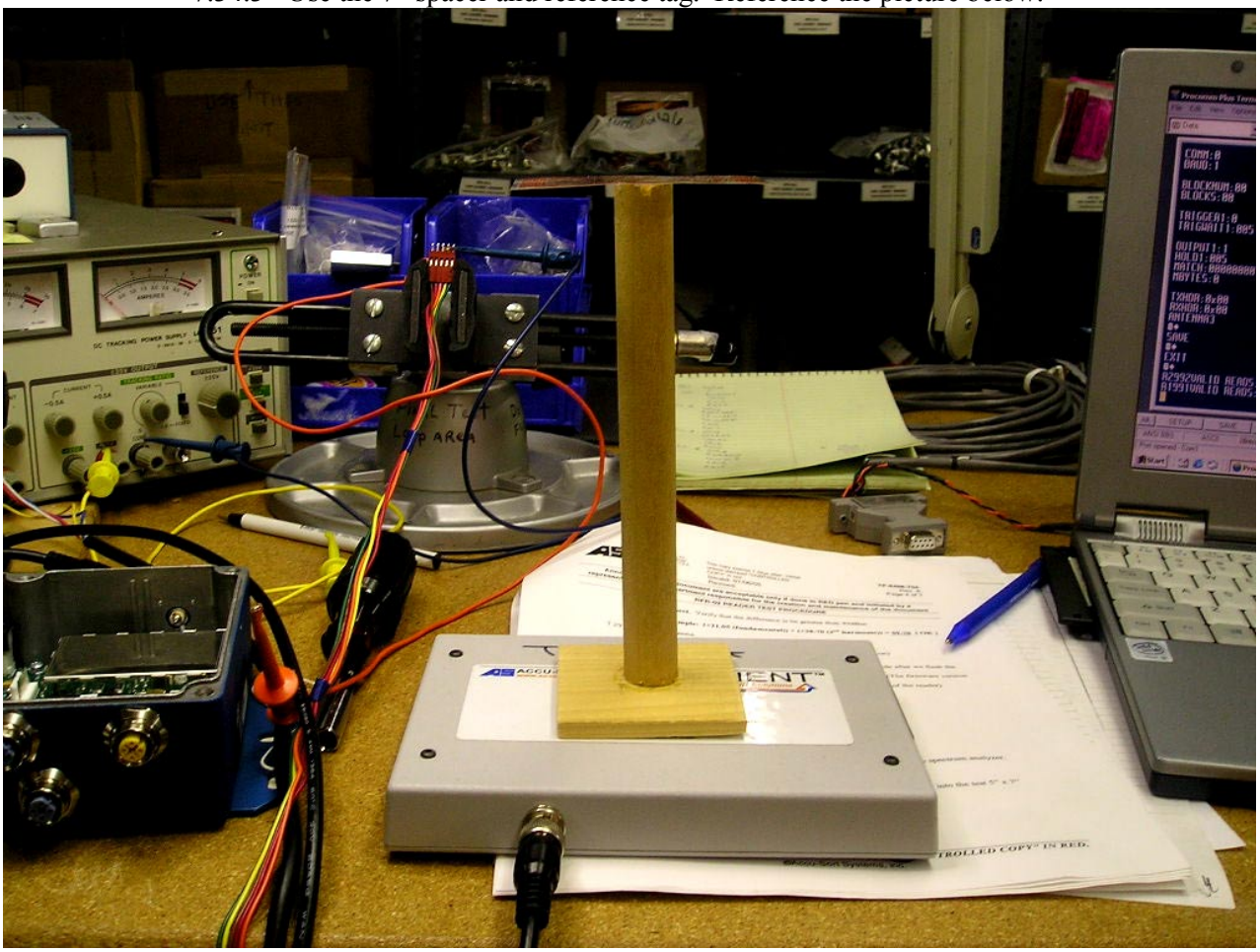
7.34.2 Remove cable from antenna 2 and plug into antenna 1 of the RFR-02.
7.34.3 Use the 7" spacer and reference tag. Reference the picture below.



7.34.4 Center the spacer on the antenna; ensure that long axis of test tag is parallel with the long axis of the antenna.
7.34.5 Type "R199" on the PC five times.
7.34.6 **Inspect.** Verify that you are always reading 100/100. Note sometimes a 99/100 reading will show up this is acceptable as long as it happens no more than 1 time out of the five.
7.34.7 Record read rate %.
7.34.8 Change cable to antenna 2 on the RFR-02.
7.34.9 Repeat for antenna 2 by typing "R299" five times.
7.34.10 Record read rate %.

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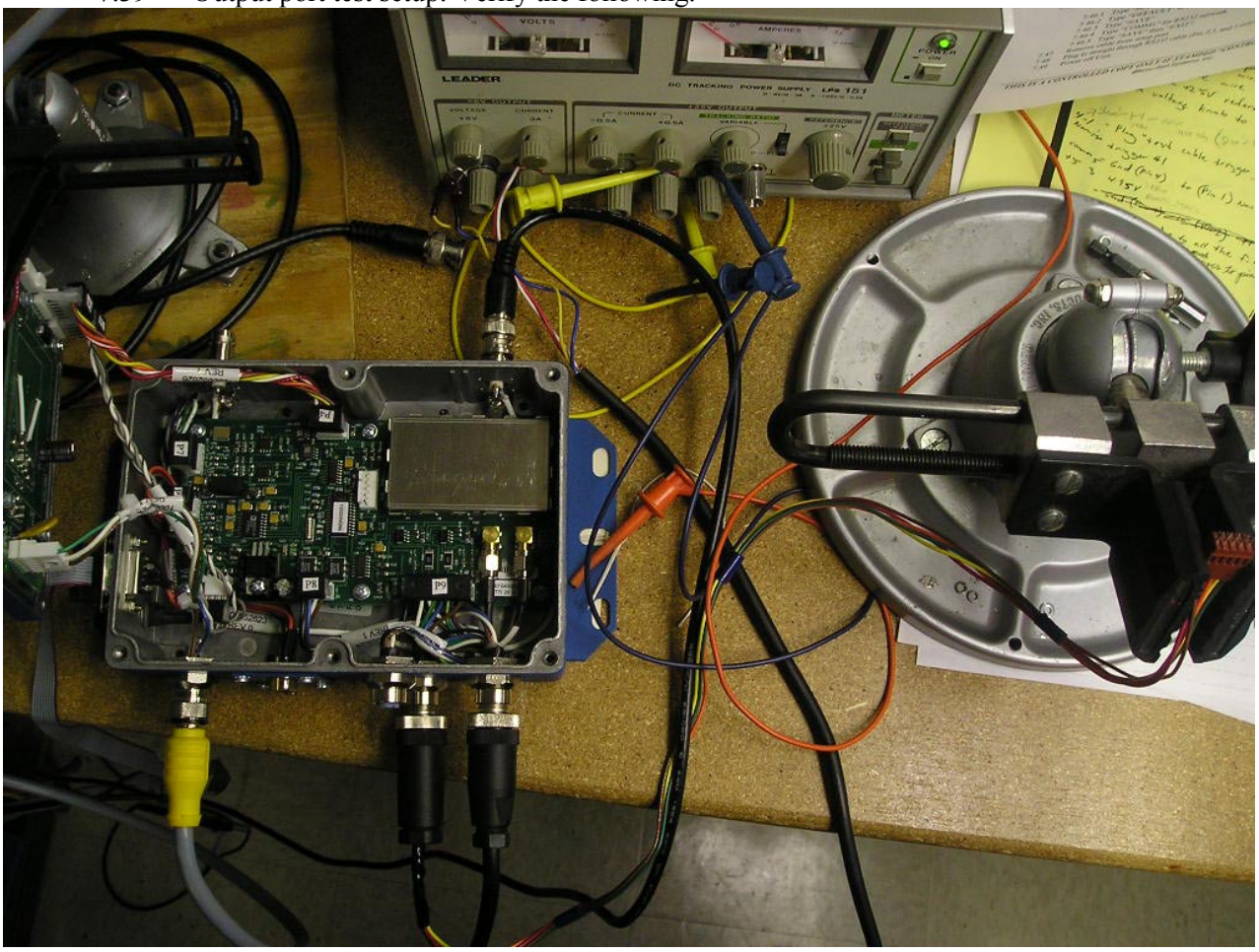
7.35 Testing Input 1 and 2 Triggers.

7.36 Go to setup mode by typing “setup”.

7.37 Type “ANTENNA1”; press enter. (For trigger switching)

7.38 Type “TRIGGER13”; press enter. Type “TRIGGER 23”; press enter. Type “SAVE”; press enter. Type “EXIT”; press enter.

7.39 Output port test setup. Verify the following.



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7.39.1 On the variable power supply, the cable from the fixed voltage section (+6VDC) should be connected to the output port on the reader.

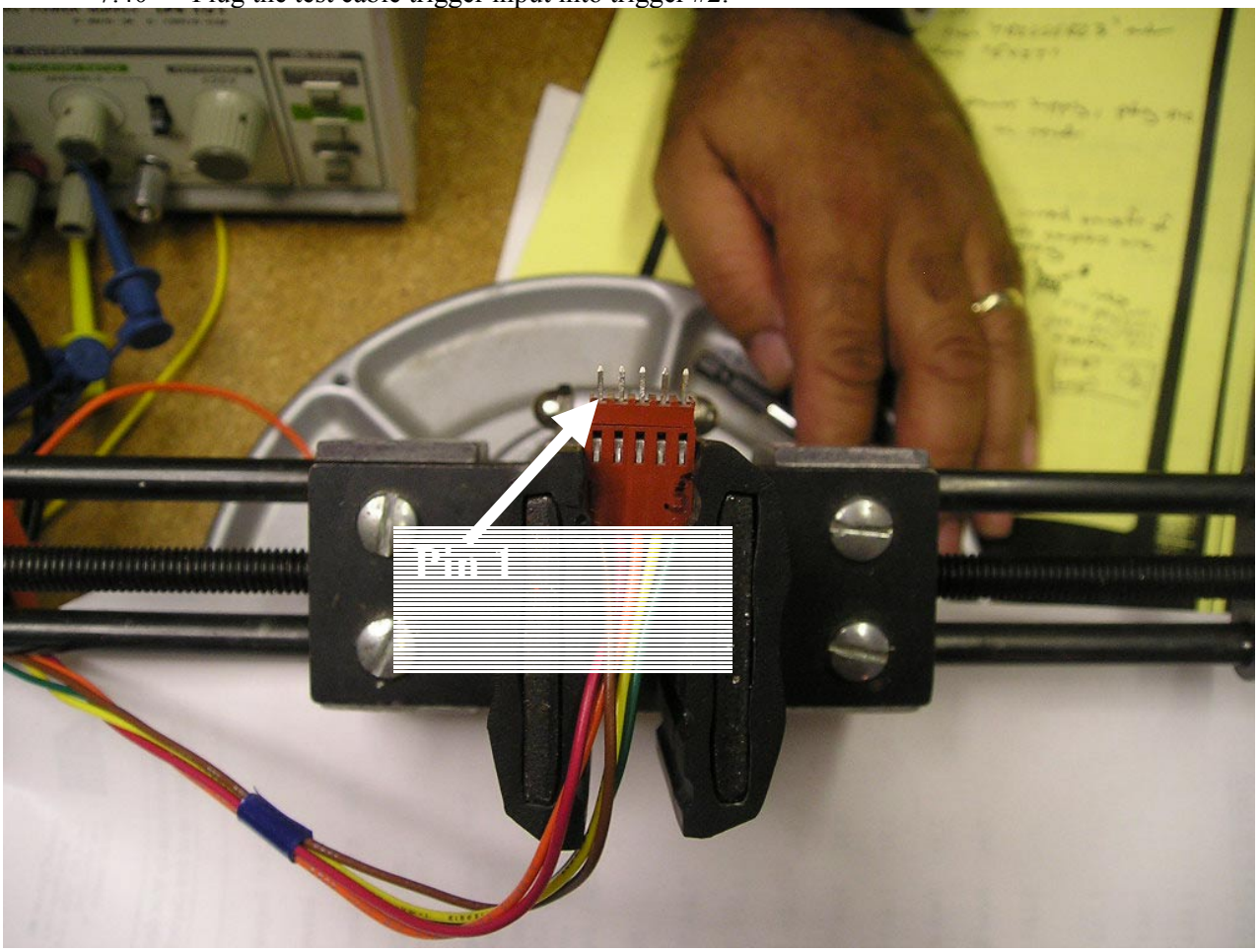
7.39.2 LED Output 2 – yellow wire to anode LED, cathode of LED to negative side of +6V output (variable voltage output section).

7.39.3 LED Output 1 – blue wire to anode LED, cathode of LED to negative side of +6V output (variable voltage output section).

7.39.4 Meter is set on +25V reference with voltage set at 5VDC using reference knob to adjust.

7.39.5 +6V output is set to 5VDC using voltage adjust knob on +6VDC side of power supply. To check level push Meter button to +6V read bottom scale of voltage display.

7.40 Plug the test cable trigger input into trigger #2.



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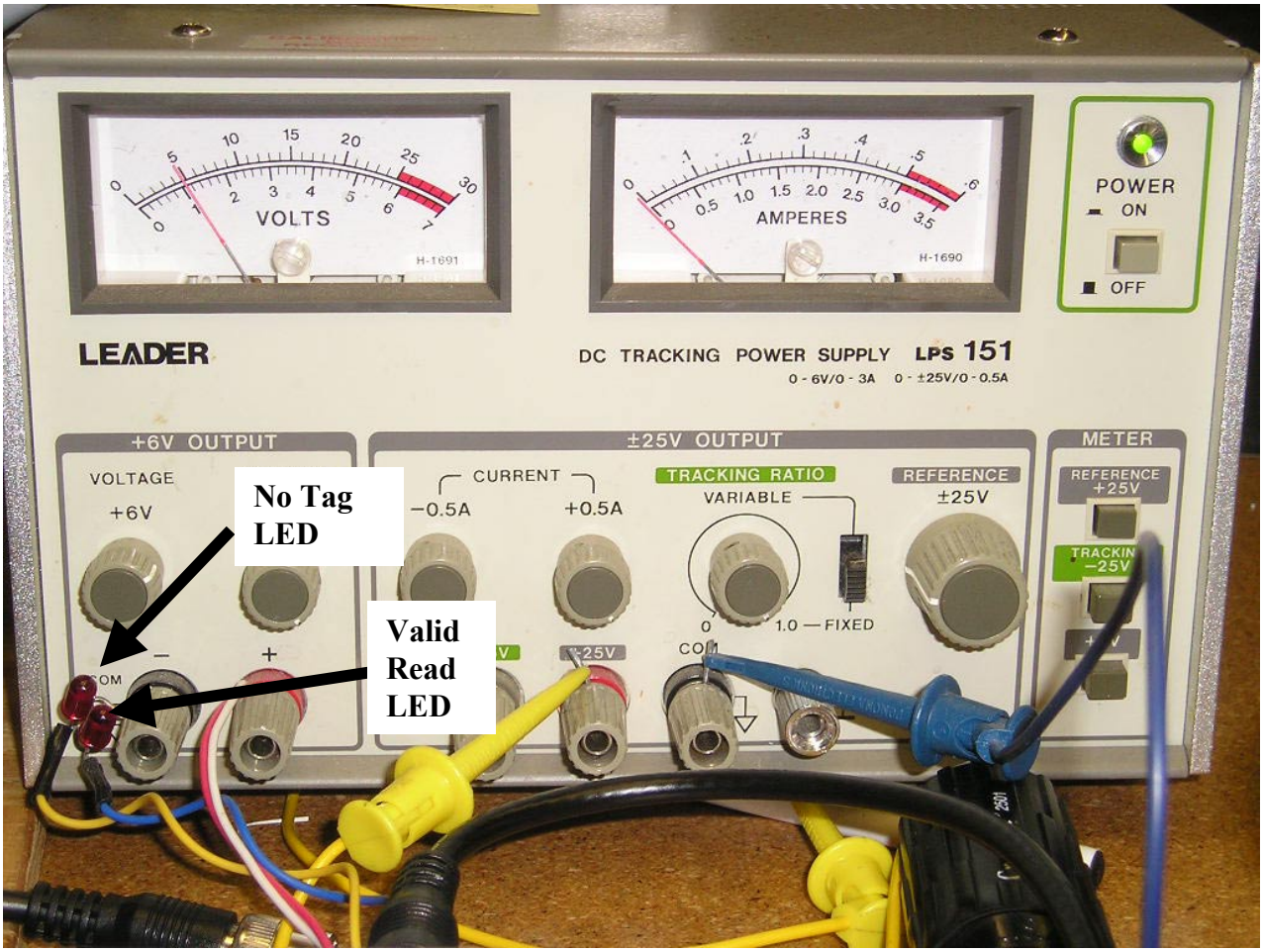
7.41 Measure the voltage between pins 2 and 4 of the test header, voltage should fall between 11.30 and 11.40 VDC.

7.42 Short pin 4 to pin 1 (tapping) on test header using the orange jumper wire cable, this tests the non-isolated input (+5VDC). For every tap you should again get 20000 on the Procomm display and the blue LED on the lid should flash as well.

7.43 To test the output of the RFR-02, when you get a valid read, the bottom LED (LED Output 1) will light on the Variable Power Supply. When you get an invalid read, the top LED (LED Output 2) will light on the Variable Power Supply. Please see image below for reference.



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7.44 Remove tag and repeat step 7.42, Procomm should display 2NO TAG and the LED connected between the yellow wire and the power supply should light. Note the blue LED on the lid should not light.

7.45 Connect Blue jumper wire between common of power supply and pin 5 of the test header.

7.46 Connect Yellow wire to +25V of power supply and tap pin 3 of test header, for every tap you should again get 20000 on the Procomm display and the blue LED on the lid should flash. This test evaluates the Isolated input of RFR-02's Input 2.

7.47 If steps 7.42 through 7.46 pass, the RFR-02's Input 2 and the Outputs are deemed functional. Record as passed.

7.48 Move the BNC cable from antenna 2 to antenna 1 and move test connector from input 2 to input 1 on the RFR-02.

7.49 Repeat steps 7.42 through 7.47 with the only difference being that Procomm will show 10000 with a tag in the field and 1NO TAG when the tag is removed from the antenna field.

7.50 To Test RS232 + RS422 Network Port.

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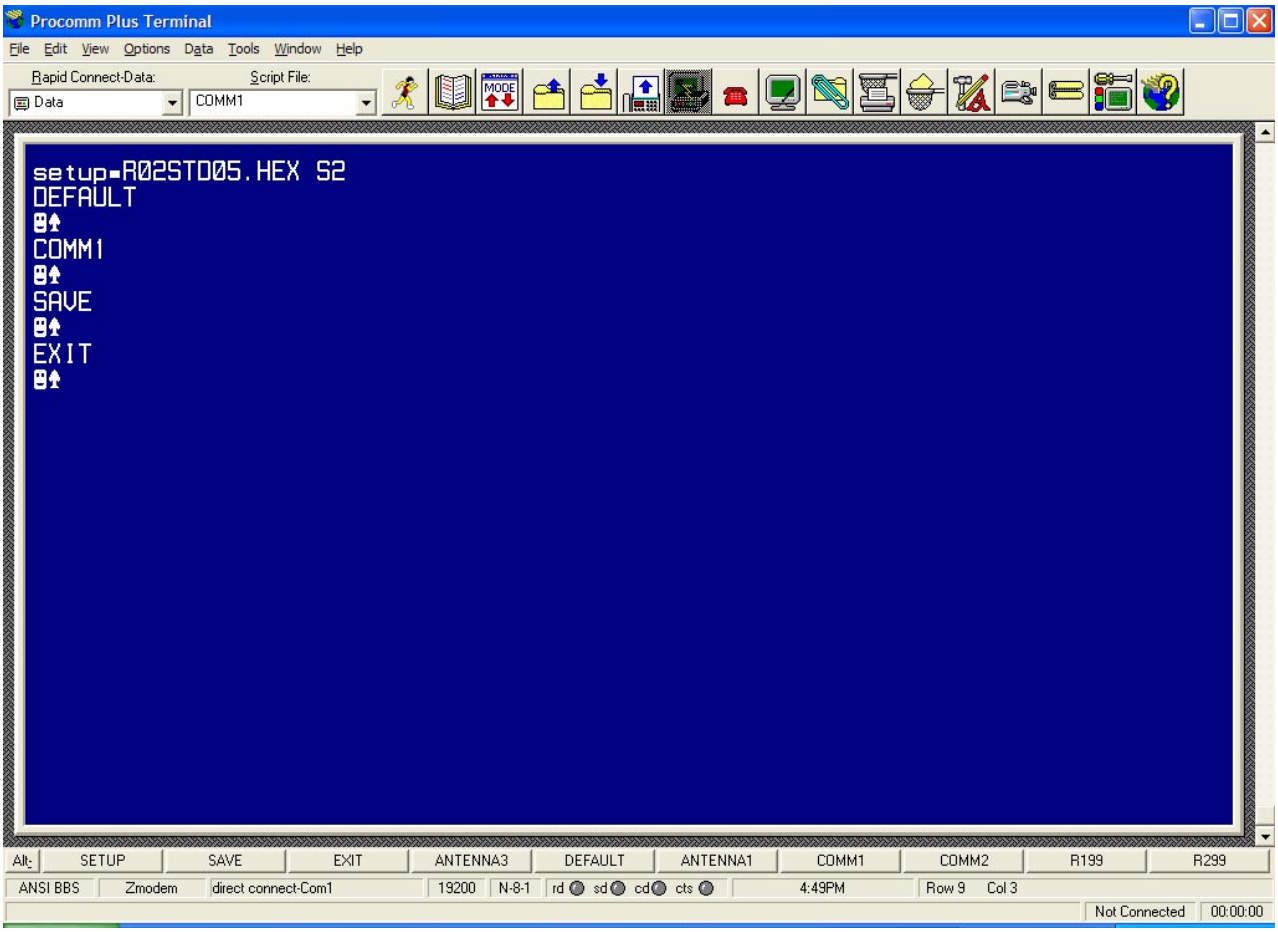

7.50.1 Type “setup”.
7.50.2 Type “DEFAULT” to default all parameters.
7.50.3 Type “COMM1” for RS232 network.
7.50.4 Type “SAVE” then “EXIT”.

7.51 Power off RFR-02.

7.52 Remove serial cable from setup port.

7.53 Remove test cables from Input 1 and Output connectors.

7.54 Plug in straight through RS232 cable (Pin 2, 3, and 5 only). to the RFR02’s Network port

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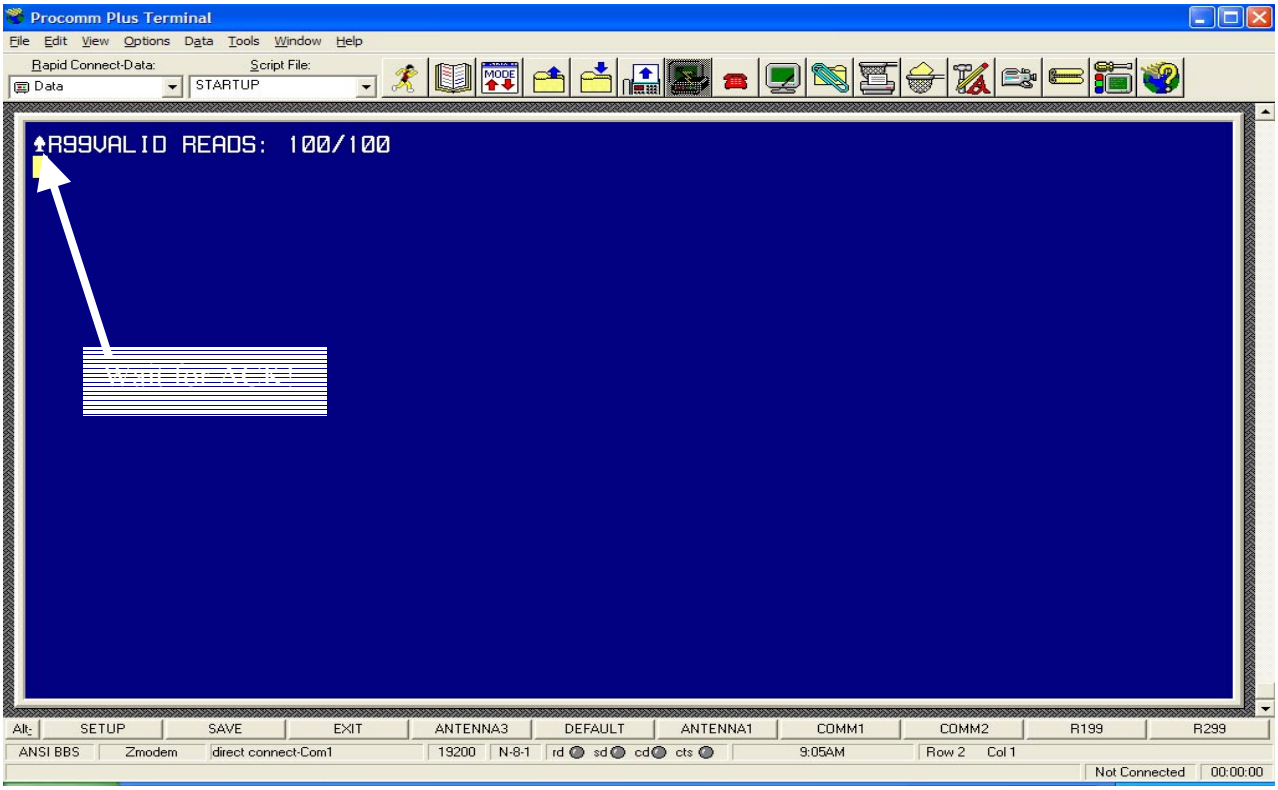
7.55 Power RFR-02 on.

7.56 Type "R99" on Procomm after the RFR-02 powers on. Remember, wait for the ACK (♠) before inputting any commands to the RFR-02. Procomm should display VALID READS: 100/100. This checks the communication for the RS232 section of the Network port. Record as passed.



7.57 Type "setup", then "COMM2", then "SAVE", then "EXIT".

7.58 Turn off the RFR-02.

7.59 Remove serial cable from Network port and connect it to the RS233 to RS485 converter (B&B Electronics Model #485PTBR). See wiring diagram below.

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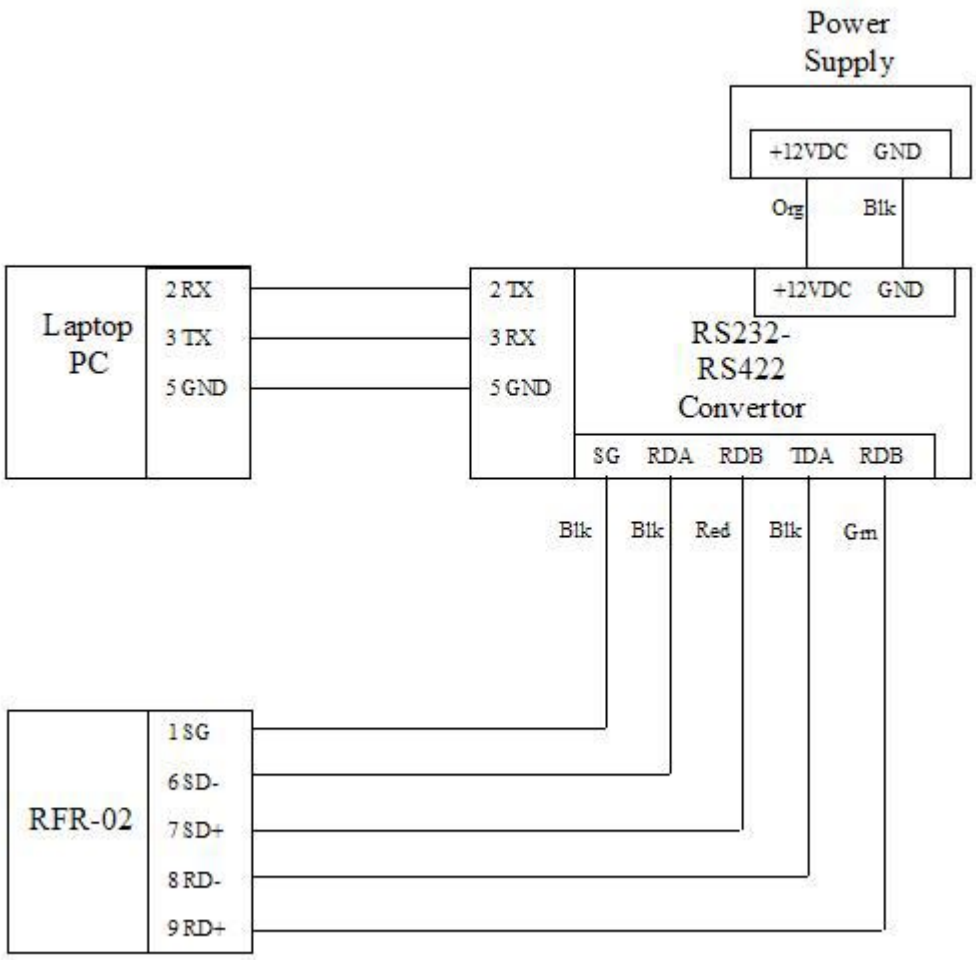

7.60 Plug the cable connected to the RS422 side of the converter to the RFR-02's network port.

7.61 Power on RFR-02.

7.62 Type "R99" a few times. Procomm should display VALID READS: 100/100, this checks the communication for the RS422 section of the Network port. Record as passed.

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7.63 Type "setup", DEFAULT, SAVE, EXIT. This sets the RFR-02's parameters back to the default values.

7.64 Power down RFR-02.

7.65 Disconnect all cables from RFR-02.

7.66 Attach Lid to RFR-02 making sure that the metal gasket is properly seated around the perimeter of the RFR-02 and no internal cables are being pinched. P3 & P2 cables must be separated for consistency.

7.67 Transfer RFR-02 to burn-in rack, connect power supply to RFR-02, and connect BNC cable from reader antenna 1 to RFA-02 test antenna. Connect serial cable to setup port of RFR-02.

7.68 Power on RFR-02 and ensure that the Network and Antenna LED blink 3 times. Type "R99" to make sure that Procomm displays VALID READS: 100/100.

7.69 To exercise the continuous read during burn-in Type "R050063". Screen should be continuously being updated with the following data on next page. (Note: Data may vary with tag used):

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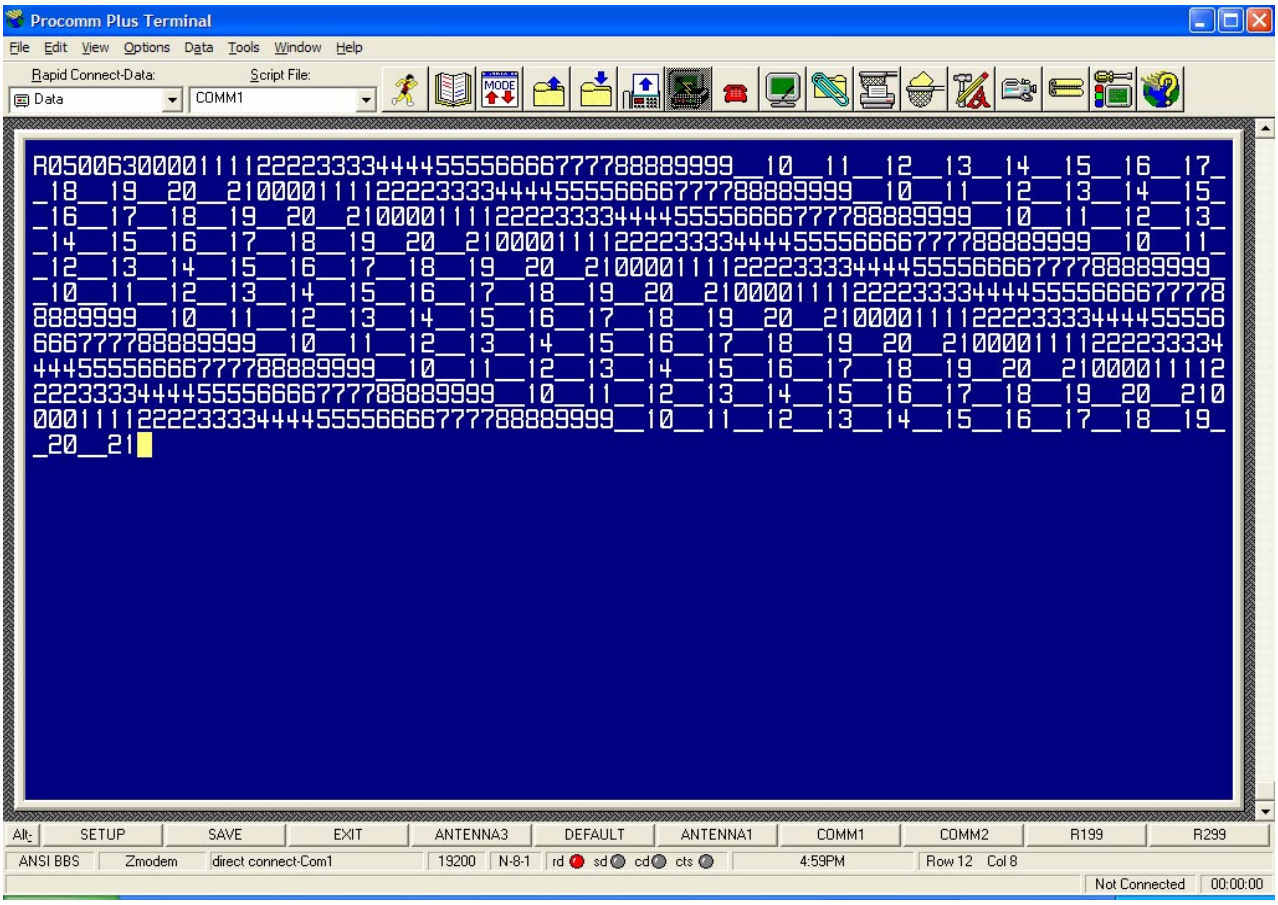

7.70 Disconnect serial and BNC cable from RFR-02.

7.71 Enter RFR-02s test data into Check-Out Sheet for RFR02.

7.72 Repeat for all assemblies.

7.73 Post over night hour Burn-In test.

7.73.1 Power down and remove RFR-02 from burn in.
7.73.2 Connect RFR-02 to test power supply.
7.73.3 Connect serial cable to the Setup Port.
7.73.4 Connect the RFR-02's antenna #1 port to the Spectrum Analyzer using the BNC cable.

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7.73.5 Ensure that there is no signal present on the spectrum analyzer before applying power to the RFR-02. If there is a signal press the following buttons. TRACE, CLEAR WRITE A.

7.73.6 Ensure that the Spectrum Analyzer is setup correctly per steps 7.12 through 7.14.

7.73.7 Power on RFR-02 and record max amplitude of the 13.56 Mhz signal, tolerance is 22 dBm +/- 1.5 dB. This is for antenna 1. Record Max amplitude.

7.73.8 For antenna 2 repeat steps 7.29 and 7.30. Record max amplitude of the 13.56 Mhz signal.

7.73.9 Remove BNC cable from Spectrum Analyzer and connect to RFA-02 (5 x 7 Test antenna).

7.73.10 Type R299 a few times, Procomm display should show VALID READS: 100/100, record this data. Minimum acceptable read rate is 99/100.

7.73.11 Move BNC cable from the RFR-02's antenna port 2 to 1 and type "R199". Procomm display should show VALID READS: 100/100, record this data.

7.73.12 Type "setup", DEFAULT, ENTER, SAVE.

7.73.13 Cycle power on the RFR-02 then type "R99". Procomm should display VALID READS: 100/100.

7.73.14 Record Post-Burn-In data in check out sheet.

8.0 REVISION HISTORY

REVISION	DATE	INITIATED BY	REASON
A	08/03/05	RRH , MR	Initial Release

Approved By_____ Approved By_____

Please Print_____ Please Print_____

Quality Assurance Representative Production Representative

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