communications
Aviation Recorders

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Cage Code: 06141

ACCEPTANCE TEST PROCEDURE

for the

AIS (AtoN) Aide to Navigation

Document No. 905-M0945-06
Revision: C

Original signatures on file with EDC:

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Record of Revisions			
Rev	**Description**	**Date**	**Approved By**
A	ECO 12762 add configuration and test instructions for the Zeni daughter board configuration and testing.	4/16/08	D. Laux
B	ECO 12776 add testing of the IEC Port.	4/22/08	D. Laux
C	ECO 12943 provide alternate transmit test frequencies. Eliminated mid transmit frequency test.	7/14/08	C. Costa

1. SCOPE

This procedure describes the acceptance test for the Automatic Identification System (AtoN) "Aide to Navigation". There are currently two types manufactured by L-3 Aviation Recorders Division, Type 1: (Transmit only), Type 3: (full Transmit and Receive). Other types, such as Type 2: (transmit and limited Receive capability) could possibly be added to production futuristically.

2. APPLICABLE DOCUMENTS

IEC 62320-2 CDV
IEC 61993-2 Maritime navigation and radio communication equipment and systems
ITU 1371-1
AtoN Factory Setup (See appendix B)
Watts- to- dBm conversion table (See appendix C)

3. TEST REQUIREMENTS

3.1 General Test Requirements

3.1.1 Upon approval this procedure will become a released document and will be under Engineering Document Center (EDC) control.

3.1.2 If errors or omissions are found which require changes to this test procedure, the current procedure shall be red-lined, dated, and signed by the cognizant Test Engineer and Quality Assurance (QA) Representative. The Test Engineer shall write an ECO in accordance with QAP 5.4 and, within 10 days, submit the ECO for incorporation. This red-lined test procedure shall be valid for only 10 days without an ECO submittal by the Test Engineer. If an ECO has been submitted by the Test Engineer, then the red-lined test procedure shall be valid until the ECO has been incorporated.

3.1.3 Before any data is recorded, the test technician is to verify he/she has the latest revision level of procedure and data record. The technician is also required to complete the first sheet of the data record except completion date. If the system under test consists of more than one unit, list all P/Ns and S/Ns on the Data Record. The data record, when completed will be stored per Operations Directory Policy 3.6 retention period for Test Records or as required per contract. All entries are to be made in INK and must be legible.

3.1.4 If more than one technician is involved in completing the procedure, the following steps will be followed:

a. All technicians involved in testing the Unit Under Test ("UUT") will stamp the first sheet of the data record next to the line "TESTED BY".

b. At the test step where the technician begins testing he/she will stamp the data record. The stamp is to be placed at the far right side of the page, next to the test results.

3.1.5 If the results of a test are out-of-limits, the technician will write the results on the data record and circle the entry. After the out-of-limits condition has been corrected, the technician will make a single strike through the out-of-limits readings, write the new result to the side, and stamp the entry. DO NOT erase the original reading or use "white out" under any circumstances.

3.1.6 When an out-of-limits condition cannot be corrected through normal methods, the technician is instructed to notify his/her supervisor. The problem will be turned over to Test Engineering or Design Engineering for resolution. If management decides to ship the unit with the defect, a Management Review and Disposition form must be completed.

3.1.7 If an error is made while entering data onto the data record, the correction will be made in the following manner: Make a single strike through the entry such that it is still readable. Write the correction at a convenient location and initial or stamp the correction. Notify the QA Representative and she or he will also initial or stamp the correction. DO NOT erase the mistake or use "white out" under any circumstances.

3.1.8 Upon successful completion of testing, review the test data sheets for any out of spec. entries and missing entries. (N/A shall be entered where there is no applicability.) Paragraphs that are applicable, but for which there is no data to be recorded, shall have the word "none" or a dash entered in the space.

3.1.9 Test results which are to be recorded on the data record shall be indicated in the test procedure by the word "**RECORD**" actual data or "**CHECK**" meaning PASS or FAIL.

3.1.10 DANGER, CAUTION and NOTE shall be used to highlight important information as follows:

DANGER-UPPER CASE BOLD LETTERING SHALL BE USED TO HIGHLIGHT PRECAUTIONARY MEASURES, WHICH IF NOT FOLLOWED, COULD RESULT IN INJURY TO PERSONNEL.

CAUTION-UPPER CASE BOLD LETTERING SHALL BE USED TO HIGHLIGHT PRECAUTIONARY MEASURES, WHICH IF NOT FOLLOWED, COULD RESULT IN EQUIPMENT DAMAGE.

NOTE: May be used to reference special instructions.

While performing all alignments, troubleshooting, and/or handling of PWAs, personnel will use static protection, including wrist-straps.

3.2 Test Equipment

3.2.1 Each piece of test equipment used for this procedure shall bear a calibration due label if applicable. No piece of test equipment shall be used which bears a calibration due date which has expired. All calibrations shall be performed by a facility which uses methods and procedures which ensure traceability to the National Institute of Standards and Technology (NIST). Unless otherwise specified, an alternate instrument may be used.

MINIMUM EQUIPMENT REQUIRED

- IBM Compatible PC with 2 serial ports
- Digital Multi-meter
- RF Frequency Counter
- RF Power Meter BIRD 4391A or equiv.
- RF Communications Analyzer
- Spectrum Analyzer FSEA30-B7 or equiv.
- RF Signal Generator
- Sine Qua Non PMG1 Waveform Generator
- Test Cables L3 PN: 024-M0841-00(test configuration cable) 024-M0994-00 (Zeni type test configuration cable), 024-M0992-00 (Zeni type adapter cable), 024-M0991-00 (Zeni type PS adapter cable), 024-M0926-00 L-3 type PS cable.
- 50Ω Dummy Load
- 12V DC Power Supply (3A load rating)
- GPS Source
- AtoN Burn-in test rack
- L-3 Pro-Tec AIS Mobile Radio

3.3 Acronyms and Abbreviation

AIS	Automatic Identification System
AtoN	Aide to Navigation
ECO	Engineering Change Order
EDC	Engineering Document Center
PER	Packet Error Rate
RX	Receive
TX	Transmit
UUT	Unit Under Test
MMSI	Maritime Mobile Service Identity
SRT	Soft Ware Radio Technology
VB	Visual Basic

3.4 Test table

Aton Test Matrix			
Test	**Type 1**	**Type 2**	**Type 3**
Tx Freq. Alignment	X	TBD	X
Tx Mod. Deviation	X	TBD	X
Tx Power	X	TBD	X
Rx Sensitivity PER	N/A	N/A	X

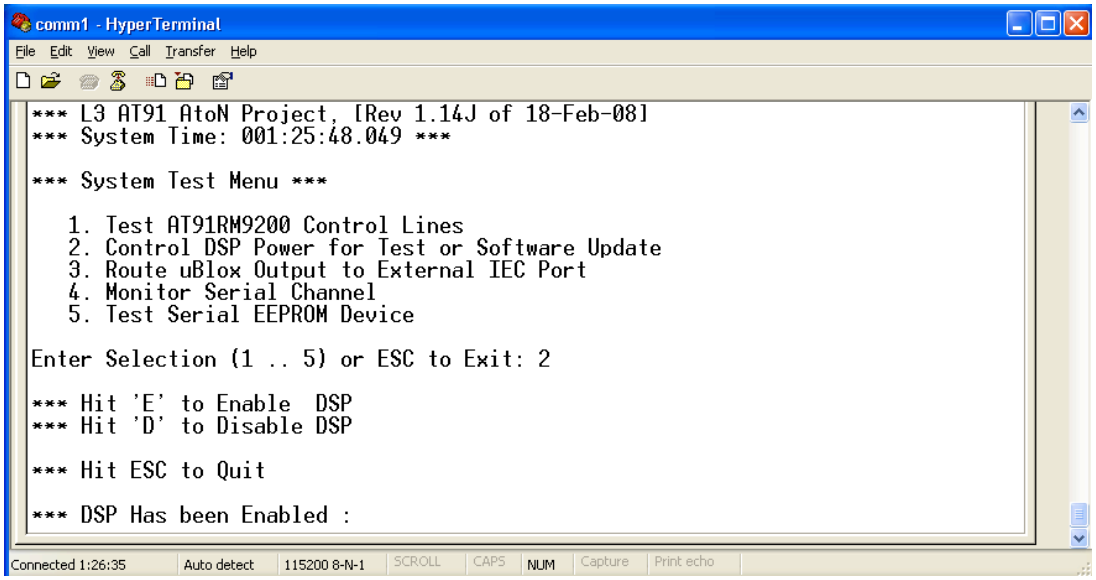
Figure 1

4.0 Software load/ configuration process

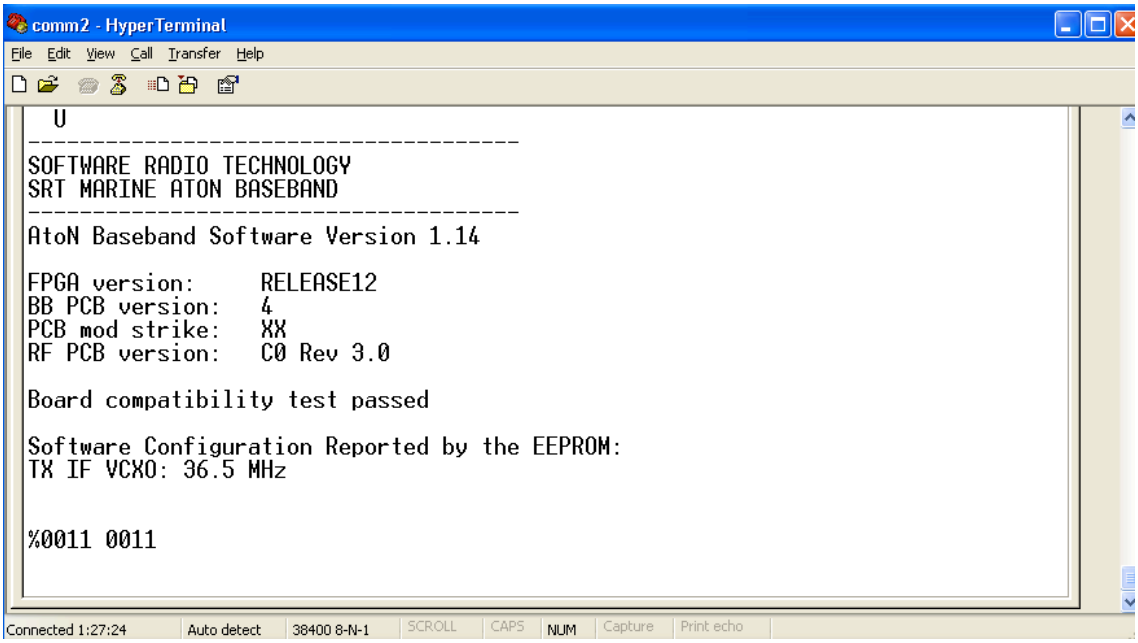
The Aton must have the appropriate version (per BOM) of software loaded into the Arm processor and the DSP before it can be tested. In addition the FPGA code version will need to be documented. This can be found during the DSP code update on the HyperTerminal application screen. This is normally accomplished during the board level bench test of the 205-M0752-00 /-01 Digital Processor pwa The files are located at: **\\Nts3\home\PROMS\Flashld\Images\AtoN**. There are occasions that require the tester to upgrade to a newer released version during final test. The tester can find this process in **Appendix B** of this procedure. In addition the AtoN UUT must be configured to a "Type" (based on part number) and have the serial number entered, this information is then saved into the UUT configuration. The UUT must also be assigned an MMSI number (randomly selected) usually the last 6 digits of the top level serial number for simplicity, a SLOT number (randomly selected) from 0-2249, and a Tx schedule assigned, this information is also saved and retained in memory.

1. Connect the UUT AtoN to the test PC and test power supply per Figure 2 of this document. Turn on the power supply and power on the test PC. Open up two HyperTerminal applications, one for the ARM and one DSP. This can be accomplished by clicking on the specific icons on the test PC desk top. Once the ARM is up and running, type: **"T", "2", "E"** and the ARM version of software will be displayed in the ARM terminal screen as (example) L-3 AT91 AtoN Project Rev. 1.14J. The DSP version will be displayed in the DSP terminal screen as (example) AtoN Baseband software version 1.14 and the FPGA version will also be displayed in the DSP terminal screen as (example) FPGA version RELEASE 12.

ARM version display:



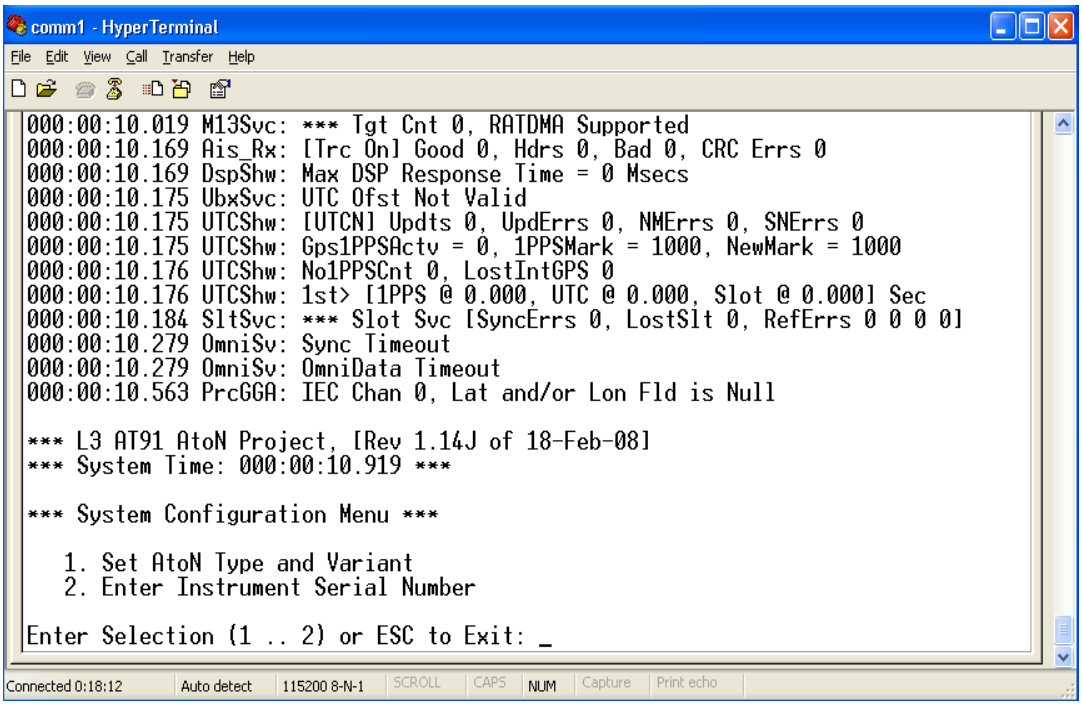
DSP / FPGA version display:



The FPGA version will be recorded only; the FPGA version cannot be updated once the Aton is fully assembled. If the ARM and DSP revisions are the latest released versions per the 205-M0752-00 /01 Digital processor pwa BOM, then the tester will record this on the data sheet. If not the latest versions, the tester will be required at this time to load the latest versions by following the process in **Appendix "B"** of this document specifically the sections titled **"ARM code update", "ARM code update if ARM stand alone Image Already Installed"** as well as **"DSP Code Update"** and then record the versions on the data sheet.

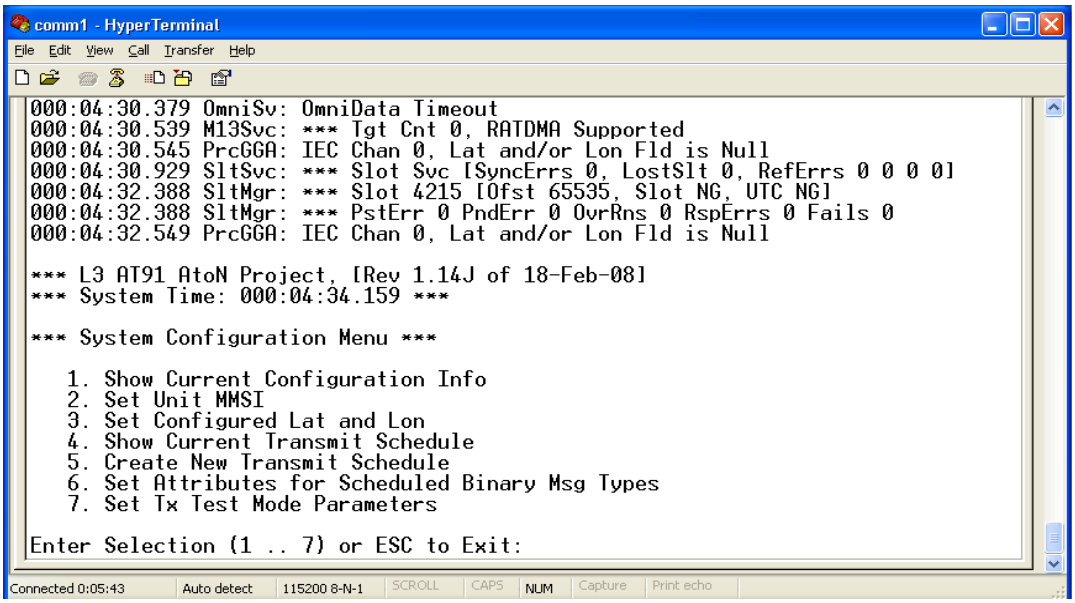
RECORD

2. Now the UUT AtoN will need to be **"Configured".** This can be accomplished by following the process in **Appendix "B"** of this document specifically the section titled **"Unit Type and Serial Number Configuration"** by typing **"S"** in the ARM terminal screen the following menu will be displayed:



The **"Type"** (menu selection # 1) of the unit is based on the PN of the UUT and can be determined by various methods, CICS BOM, the AtoN part number Matrix….. The **Serial Number** (Menu selection #2) is found on the UUT product label. Once the UUT has been configured for Type and Serial Number successfully, the UUT will now need to be assigned a "SLOT", an "MMSI" and a Tx schedule. As previously stated the SLOT # will be a number randomly assigned by the tester from 0-

2249. And the MMSI for simplicity will be the last 6 digits of the UUT Serial number. The Tx schedule will require specific settings in order to test the functionality of the UUT. This can be accomplished by following the process in **Appendix "B"** of this document specifically the section titled **"Setting AtoN Transmit Schedule Using Built-In Schedule Utility"** by typing a **"C"** in the ARM terminal screen the following menu will be displayed:



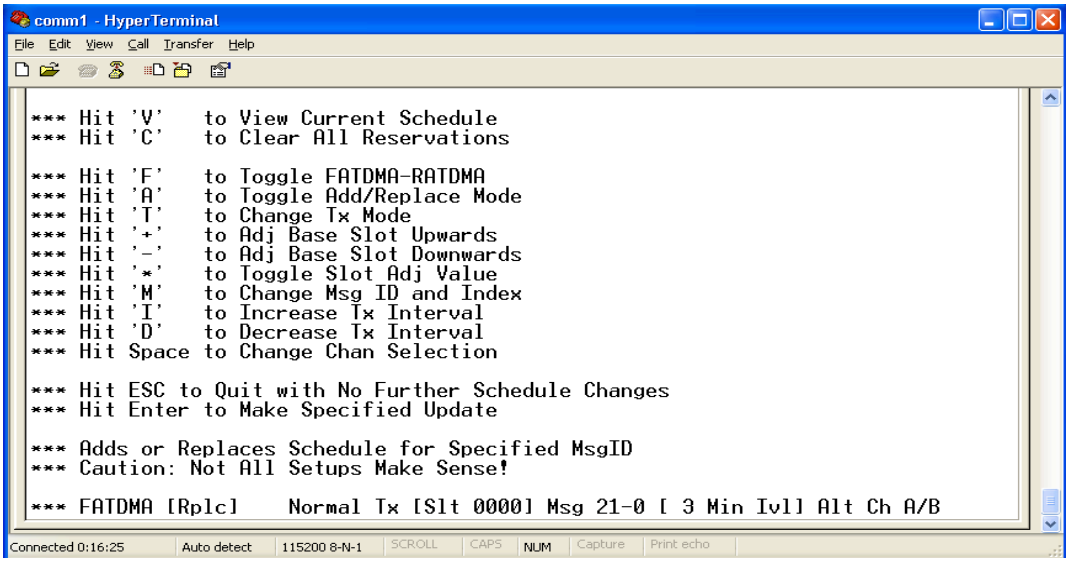
The **MMSI** will be entered under selection #2 (this will be the last 6 digits of the UUT serial number)

The **Slot and the Tx schedule** setting will be set under selection #5.

The following parameters / values **must** be set in all UUT:
FATDMA
Tx Mode = NORMAL
Slot = any 4 digit number between 0-2249
Msg. = 21-0
Transmit Interval = 3 Min.
Channel selection = A/B

The System Configuration Menu is fairly self explanatory!

See example below:



Once the tester has successfully entered the MMSI and SLOT information the MMSI and SLOT # will be recorded on the UUT data sheet.

RECORD

3. The IEC Port Functionality must be checked. To view the IEC trace messages the tester will escape out of the ARM configuration menu until the ARM is running freely and the ARM HyperTerminal screen is displaying the normal messages. Power down the UUT, move the DSP HyperTerminal RS232 connection from test cable position P3 (DSP) to P4 (IEC). Power on the UUT and the IEC Trace messages should be displayed in the 2nd HyperTerminal screen.

CHECK

Power down the UUT and return the RS232 cable back to position P3 (DSP) of the test cable.

After the software is loaded/verified and the AtoN has been configured successfully the Aton must be functional tested. The functional test requires the “Radio Test Mode” software to be utilized.

This windows-based VB Application is utilized to test the AtoN UUT.
This software requires a connection to the DSP serial port of the AtoN. This is the same connection used for the DSP HyperTerminal connection during the DSP software load process. It is important to note that the Radio Test Mode software cannot be active (running and connected to the AtoN DSP Serial port) concurrently with the DSP HyperTerminal connection. The HyperTerminal program must be “disconnected.” This is achieved by clicking on the “disconnect” telephone icon in the HyperTerminal toolbar and minimizing the screen. The connection can be reestablished at some future time by clicking the “connect” telephone icon. The Tester can open the AtoN test software by clicking on the “Radio Test Mode” ICON on the test PC desktop.

In order to run tests on the RF subsystem (such as the Packet Error Test) it is necessary that the DSP be powered up and released from Reset. This is completely under control of the ARM processor, so it is

impossible to run such tests on the DSP unless the ARM is cooperating. Keep in mind that an AtoN Type 3 is capable of transmitting messages during a receiver test if the GPS signal is connected! For this reason, care should be taken when connecting the AtoN RF antenna to external signal sources. Note that the AtoN will not transmit autonomously if the GPS antenna is disconnected (the GPS signal is not required to be connected during testing at this time).

Regardless of how the AtoN is configured, the DSP can be put into the required state using the **ARM HyperTerminal** console. Refer to "**Appendix B**" of this document. The ARM must be up and running in order for this procedure to be possible. Disconnecting the AtoN UUT GPS antenna and powering up the AtoN will ensure that the ARM will not enter "sleep" or "low power consumption" mode.

4.1 Tx. RF alignment

Test setup, **Note: Zeni and other Non L-3 type AtoNs will require appropriate interface cables!**

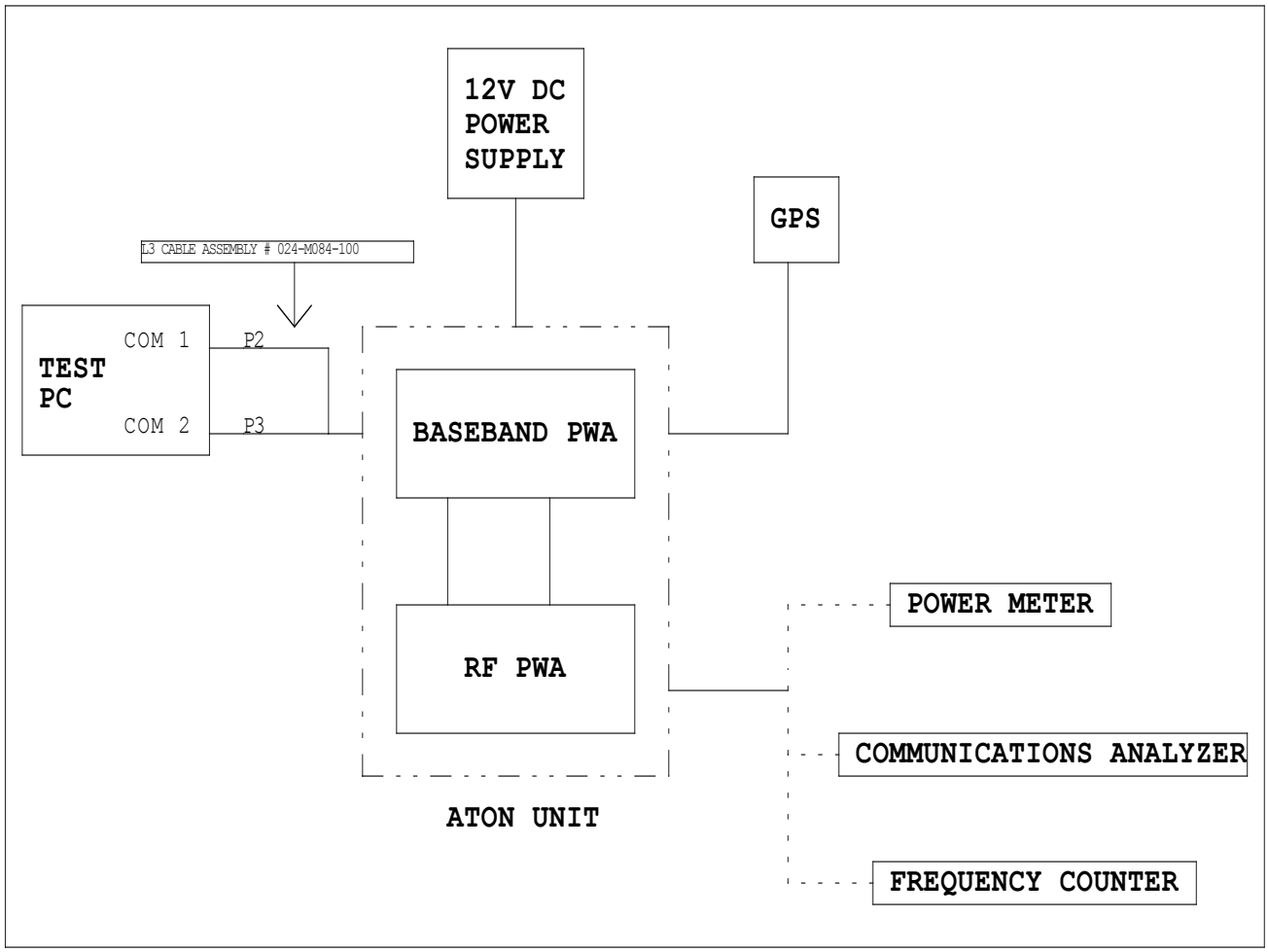


Figure 2

In order to test and align the RF transmitter the following steps should be followed:

1. Configure the test set up per Figure 2 (**Note**: **do not connect the GPS signal to the UUT at this time)** and power on the UUT. Make sure the ARM is running and updating, and following the process in Appendix "B" release the DSP from Reset by typing **"T", "2", "E"** in the ARM HyperTerminal screen. Open the "Radio Test Mode Software"; connect to the appropriate Comm. Port, and click on the "Ping AtoN" button. If successful communications with the UUT has been established an acknowledgement message should appear in the received serial data window. At this point the Test software is ready for use. (see Figure 3 below) Connect the test cable from the RF Type "N" connector of the UUT to the FSEA30-B7 analyzer via an inline power meter (configured to measure FWD PEP Peak Envelope Power) utilizing a 30 dB pad on the input of the FSEA30-B7. Configure the test equipment accordingly to measure transmit frequency, deviation, and output power.

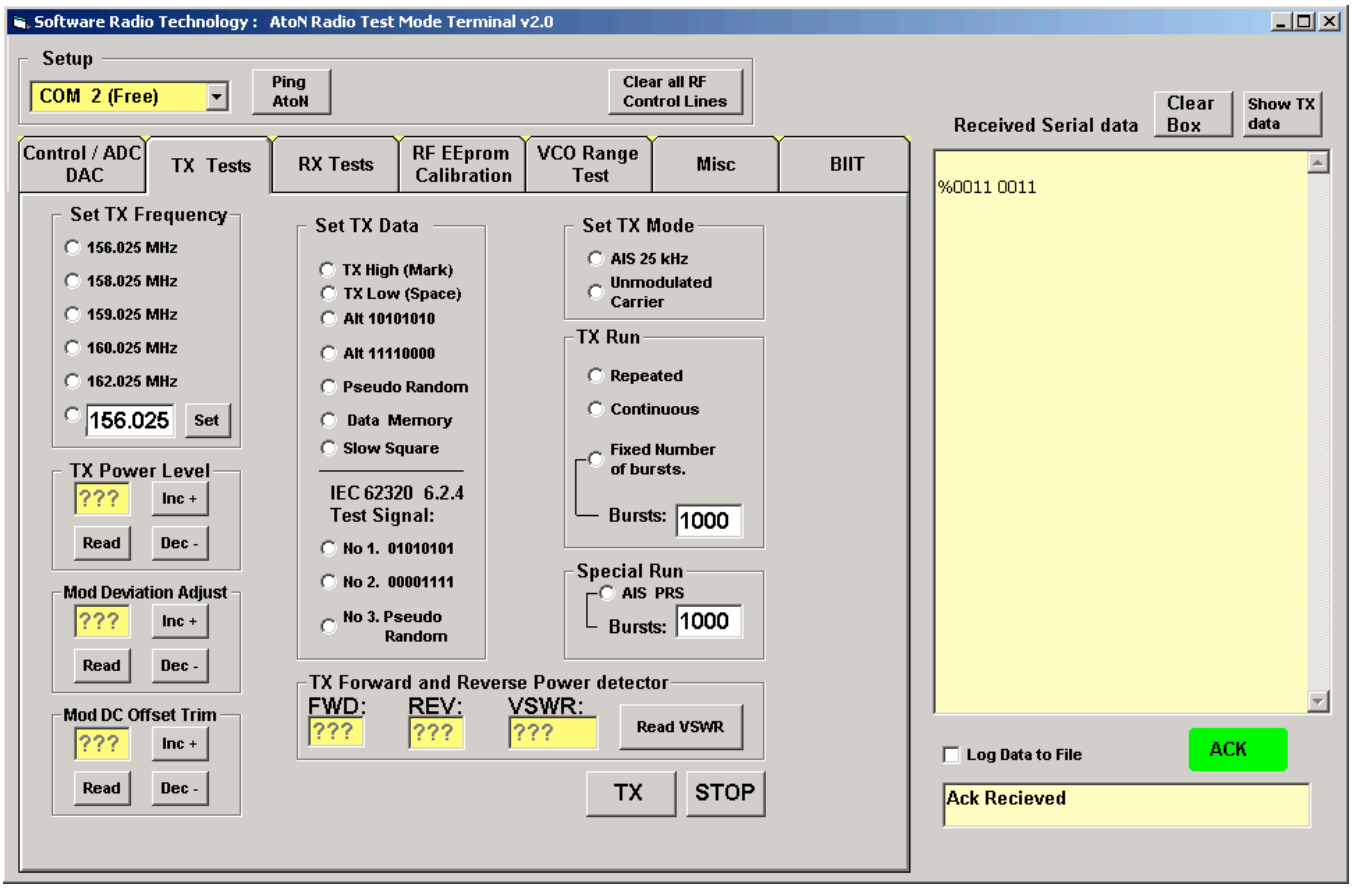


Figure 3

2. Select the ***"RF EEprom Calibration"*** Tab

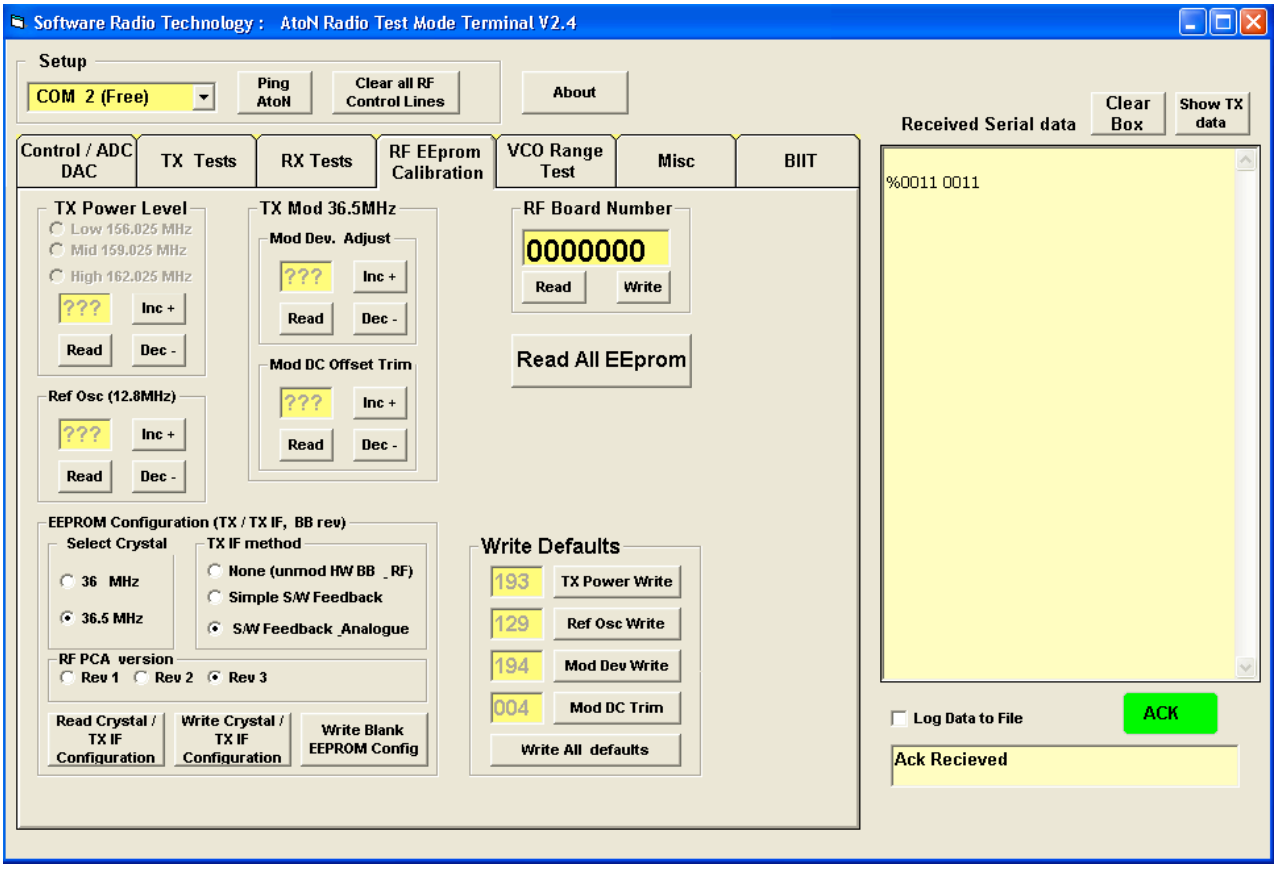


Figure 4

3. Click the "***Read All EEprom***" button and wait for the fields with "???" marks and the RF Board Number (serial number) to be updated. **(Note: These parameters will have been set during the bench alignment of the RF board P/N 205-M0747-00 /01, and stored in its EEprom).**

Note: Alternate frequencies +/- 50kHz may be selected during steps 4-8 to avoid conflicting with adjacent test stations.

4. Select the **"*TX Tests*"** tab and select the following: (per Figure 5). ***Set Tx Frequency*** to 156.025MHz. (Min.) Under ***IEC 62320 6.2.4 Test Signal*** select test signal No. 2 (00001111). ***Set TX Mode*** to AIS 25 kHz. (This will automatically be selected with the selection of test signal No. 2) and set ***TX Run*** to ***Repeated***.

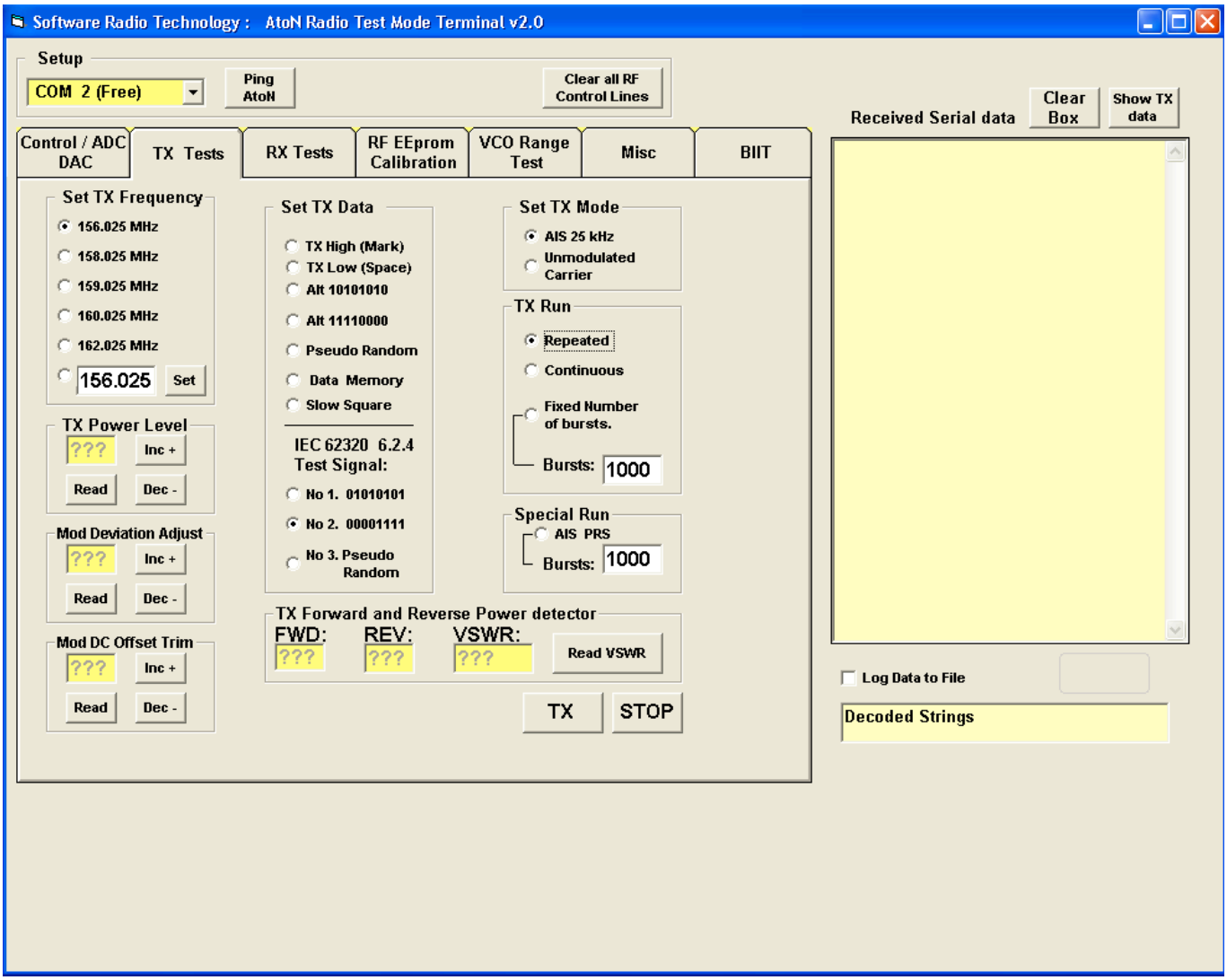


Figure 5

5. Click on the ***TX*** button at the bottom of the screen and verify Frequency, Deviation and Power of the UUT with the appropriate pieces of test equipment. The ***STOP*** button must be clicked on to discontinue transmitting while adjustments are being made. The Center frequency and proper deviation will be validated on the FSEA30-B7 analyzer display. The Center frequency will be entered and the limit lines set to (+) 2.4 kHz and (-) 2.4 kHz. By adjusting the ***"Mod DC Offset Trim"*** and the ***"Mod. Deviation Adjust"*** values with ***Inc +*** and ***Dec -*** on the test software the tester will center the displayed burst signal between the limit lines and verify center frequency accuracy as the midpoint of the peak-to-peak deviation.(See Figure 6)

6. The output power should be +41±1.5 dBm (12.5W) nominal. Care must be taken to account for cable loss and insertion loss of the in-line power meter (-.35 dB) and must be added to the displayed power meter reading. **Example**: (Power meter reading of 11.5 Watts equates to (+) 40.607 dBm, now add the .35 dB loss back in, and it equates to (+) 40.957 dBm or 12.5 Watts. So tuning the Tx power to 11.5 Watts as measured on the in-line power meters display actually equates to 12.5 Watts. See Appendix "C" to convert displayed watts to dBm. If the power

reading is outside of the nominal range, adjust the ***TX Power Level Inc+ / Dec -*** setting to bring it as close as possible to the nominal range.

CHECK

7. The center carrier frequency should be 156.025±0.0005MHz (500Hz). If outside of this range, adjust the ***Mod DC Offset Trim Inc + / Dec -*** setting to bring it into this range utilizing the ***TX*** and ***STOP*** buttons between adjustments and measurements.

CHECK

8. The peak modulation level should be 2.4kHz.± 240Hz. Hz. If outside of this range, adjust the ***Mod Deviation Adjust Inc + / Dec -*** setting to bring the deviation into this range while utilizing the ***TX*** and ***STOP*** buttons between adjustments and measurements.

CHECK

NOTE: Repeat the above process STEPS 5-8 for 162.025 MHz. (Max.). Make sure the FSEA30-B7 Analyzer is configured to the proper test frequency or the display will present a "noise" signal instead of the actual transmitted burst.

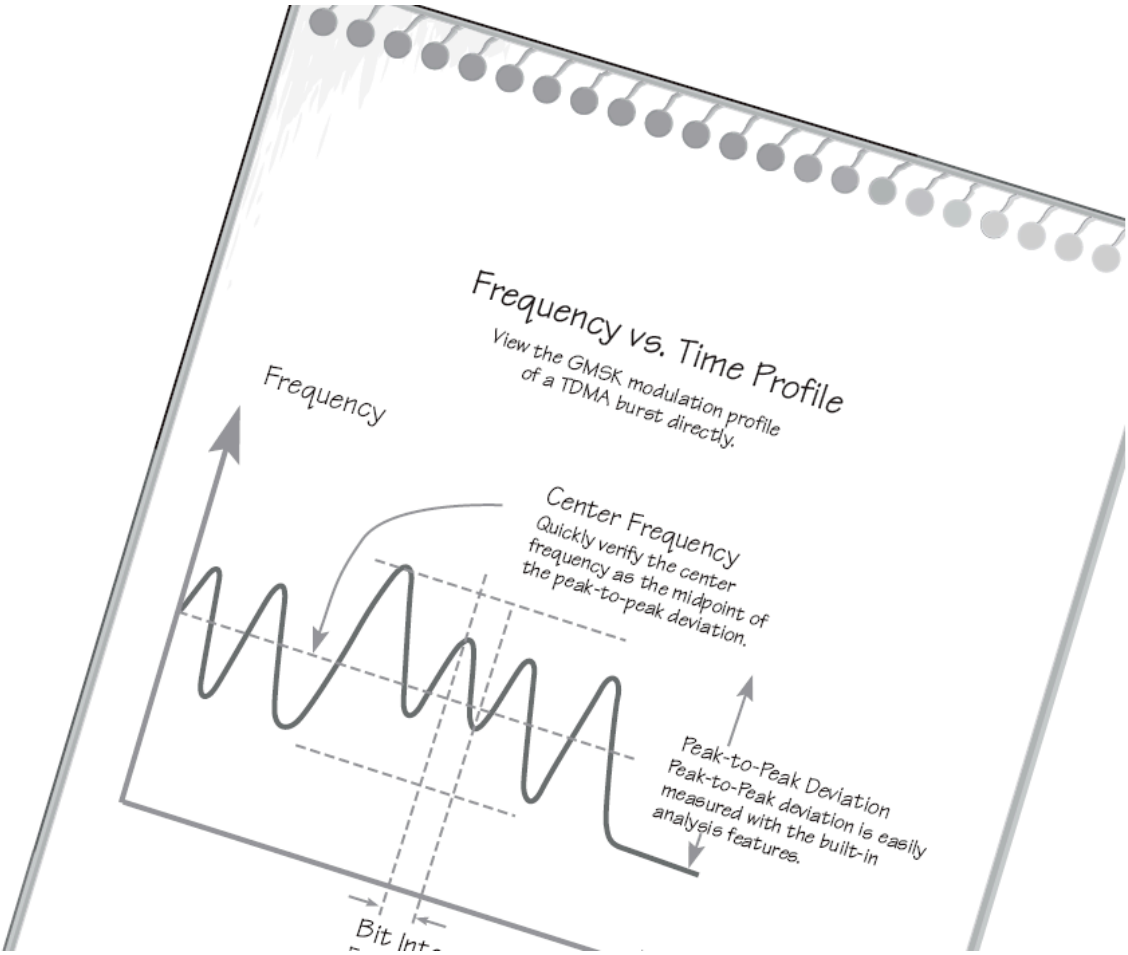


Figure 6

4.2 Rx RF alignment

NOTE: If the UUT is a Type 1(Transmit only) close the RTM software, power down the UUT and proceed to section 4.3

Test set-up **Note: Zeni and other Non L-3 type AtoNs will require appropriate interface cables!**

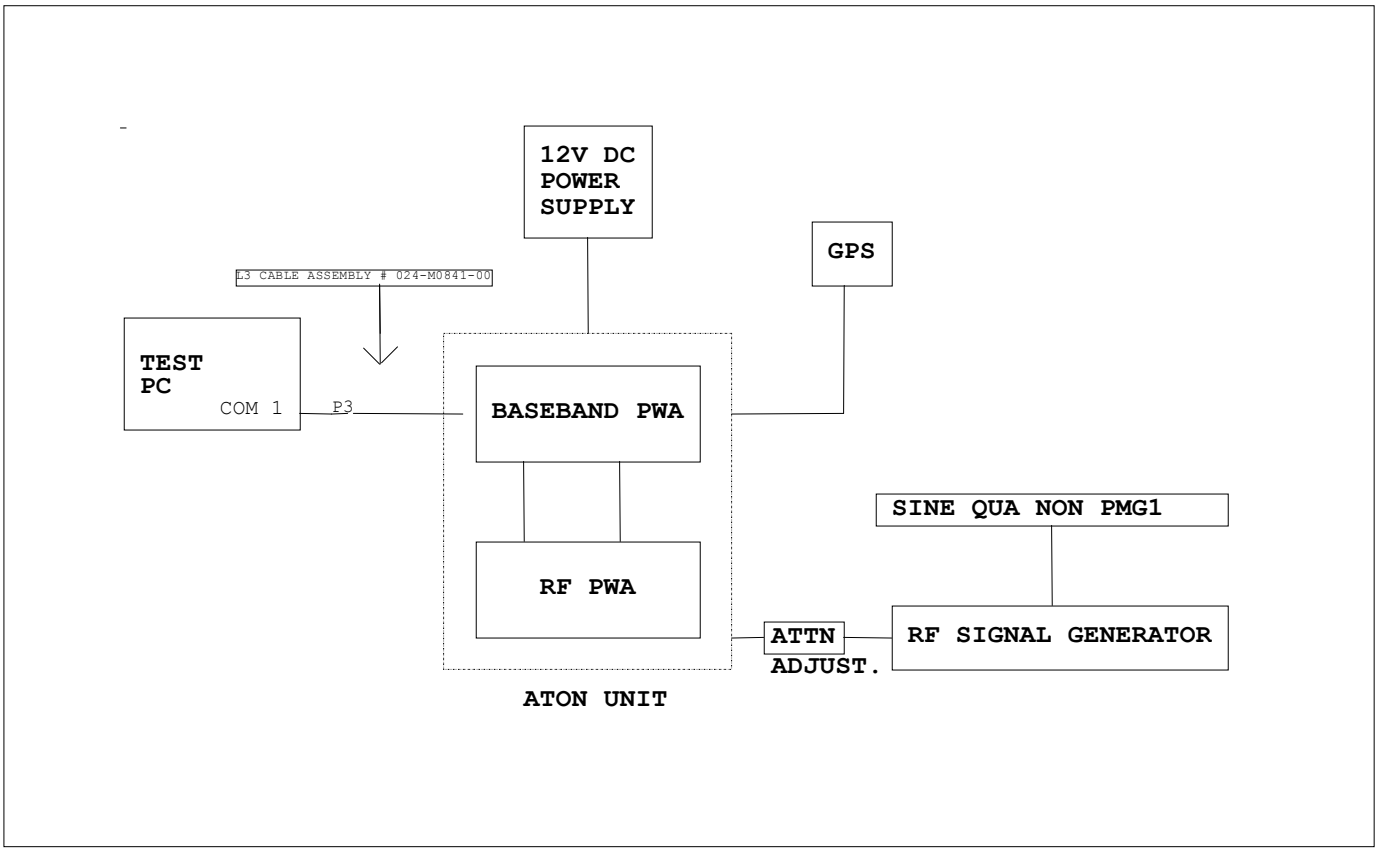


Figure 7

NOTE: Configure the PMG1 and HP8657B Sig. Gen. as follows: Turn ON the PMG1, Press the GEN "A" button until "Test Signal #4 I/D/E" is displayed. Now, press ENTER and the PMG1 will display that it is transmitting packets. During the transmission cycle utilize the INCREMENT and DECREMENT variable buttons on the PMG1 to adjust the PMG1 output amplitude while monitoring the HP8657B Sig. Gen. front panel LO EXT and HI EXT "RED" LEDs. When the correct input amplitude is achieved, neither LED will be ON. (The PMG1 only requires this set-up process upon power cycle.)
On the HP8657B Sig. Gen. make sure the following parameters are set: EXT FM, DC FM, and PULSE. Modulation= 2.4 kHz

The following steps shall be followed to verify receiver functionality of the Type 3 AtoN unit:

1. Configure the UUT per Figure 7 with the exception of: **(Do not connect the GPS signal, connecting the GPS signal while performing a receiver test could cause**

the UUT transmitter to transmit into the test equipment out-put port and cause damage!). Connect the test equipment to the UUT RF type "N" connector; adjust the RF Signal Generator out-put level so that the RF input power level to the UUT input port is at –77dBm and tune the RF signal generator to the appropriate test freq. (**NOTE: This can be accomplished by setting the generator output level to -7dBm and utilizing the adjustable attenuator to achieve the defined levels.**

2. Click on the **"*RX Test*"** tab and configure the "Radio Test Mode" program for AIS 2 (162.025 MHz.) by checking the appropriate fields. (See Figure 8A). Then select **"Start Rx Tests".** After all configuration parameters are updated on the Radio Test Mode software screen, push the ENTER button on the PMG1 to send the 200 packets to the UUT. For the following tests.
3. Verify that the number of messages (VDM) received PASS on the software screen is at minimum 98% of the total number of packets transmitted by the "PMG1" transmitter (196 packets or more must be good). **NOTE:** If an excessive amount of BAD packets are realized it is more than likely due to the interference of other test and alignment benches in the area that are also utilizing the AIS 1&2 frequencies. In this case it is completely acceptable to test the UUT on another frequency for example: 162.000 MHz or 161.950 MHz, and make note of this on the data sheet. The tester will count the BAD packets and record the number.

RECORD

4. Adjust the RF Signal Generator out-put level so that the RF input power level to the UUT input port is at –107dBm and then repeat step 2. (**NOTE: This can be accomplished by setting the generator output level to -7dBm. and utilizing the adjustable attenuator to achieve the defined levels.**
5. Verify that the number of messages (VDM) received PASS on the software screen is at minimum 80% of the total number of packets transmitted by the "PMG1" transmitter (160 packets or more must be good). The tester will count the BAD packets and record the number.

RECORD

6. Utilizing the Adjustable attenuator adjust the level so that the RF input power level to the UUT input port is at -7dBm and then repeat step 2. Verify that the number of messages (VDM) received PASS on the software screen is at minimum 90% of the total number of packets transmitted by the "PMG1" transmitter (180 packets or more must be good). The tester will count the BAD packets and record the number.

RECORD

7. Repeat steps 2 through 6 for AIS 1 (161.975 MHz.) This will require the tester to manually enter the actual freq. in the ***"Set RX1 Freq."*** and the ***"Set Rx2 Freq."*** fields on the Radio Test Mode Software (see Figure 8B) and then click on ***"Set"*** to set the parameters. **Note: (the RF signal generator must be set to the appropriate test freq. and output levels.)**

RECORD

NOTE: Power down the UUT. Close the RTM Test software application, and turn the RF Signal Generator out-put to "OFF" leaving the out-put "ON" can interfere with other AIS product test benches in the immediate area.

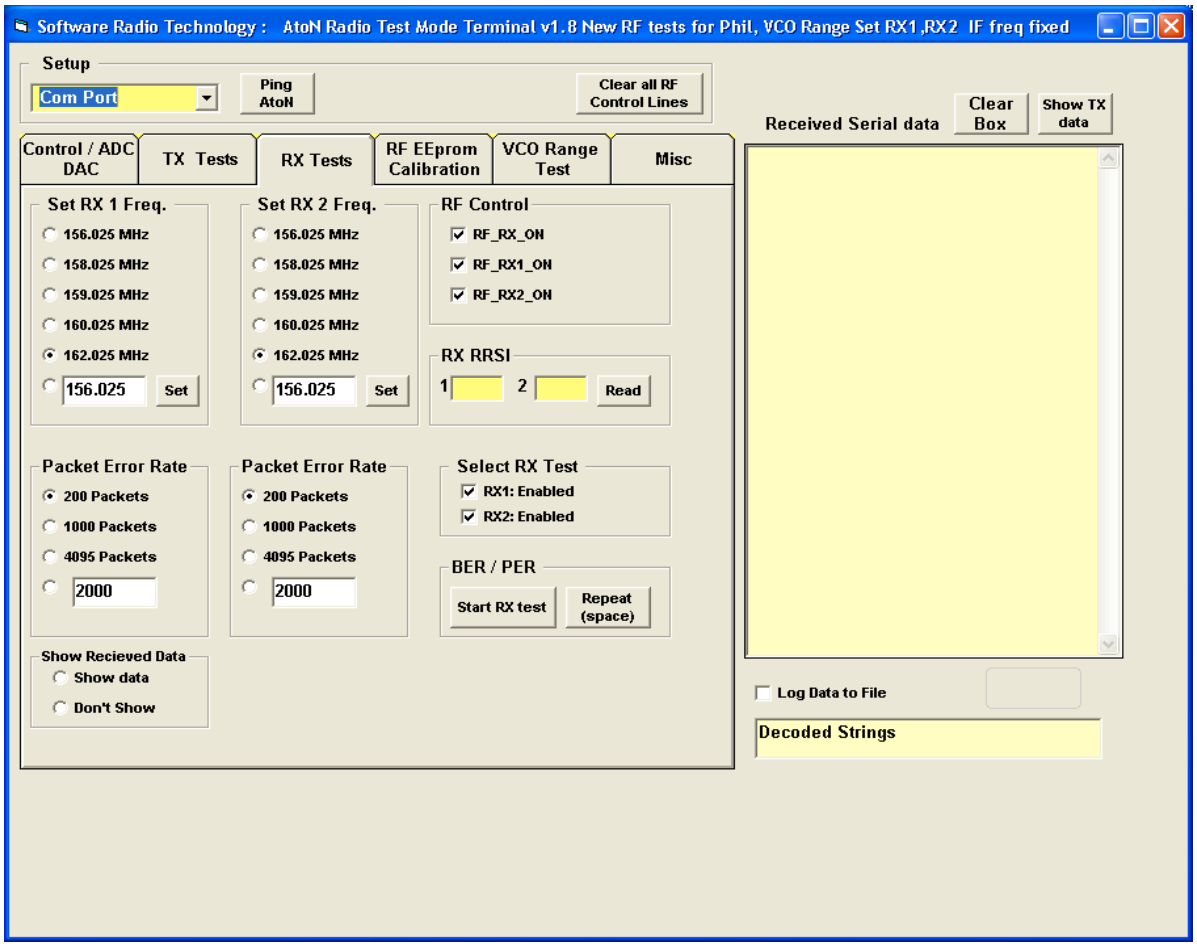

Software Radio Technology : AtoN Radio Test Mode Terminal v1.8 New RF tests for Phil, VCO Range Set RX1,RX2 IF freq fixed
Setup
Com Port
Ping AtoN
Clear all RF Control Lines
Received Serial data
Clear Box
Show TX data
Control / ADC DAC
TX Tests
RX Tests
RF EEprom Calibration
VCO Range Test
Misc
Set RX 1 Freq.
156.025 MHz
158.025 MHz
159.025 MHz
160.025 MHz
162.025 MHz
156.025
Set
Set RX 2 Freq.
156.025 MHz
158.025 MHz
159.025 MHz
160.025 MHz
162.025 MHz
156.025
Set
RF Control
RF_RX_ON
RF_RX1_ON
RF_RX2_ON
RX RRSI
1
2
Read
Packet Error Rate
200 Packets
1000 Packets
4095 Packets
2000
Packet Error Rate
200 Packets
1000 Packets
4095 Packets
2000
Select RX Test
RX1: Enabled
RX2: Enabled
BER / PER
Start RX test
Repeat (space)
Show Recieved Data
Show data
Don't Show
Log Data to File
Decoded Strings

Figure 8A

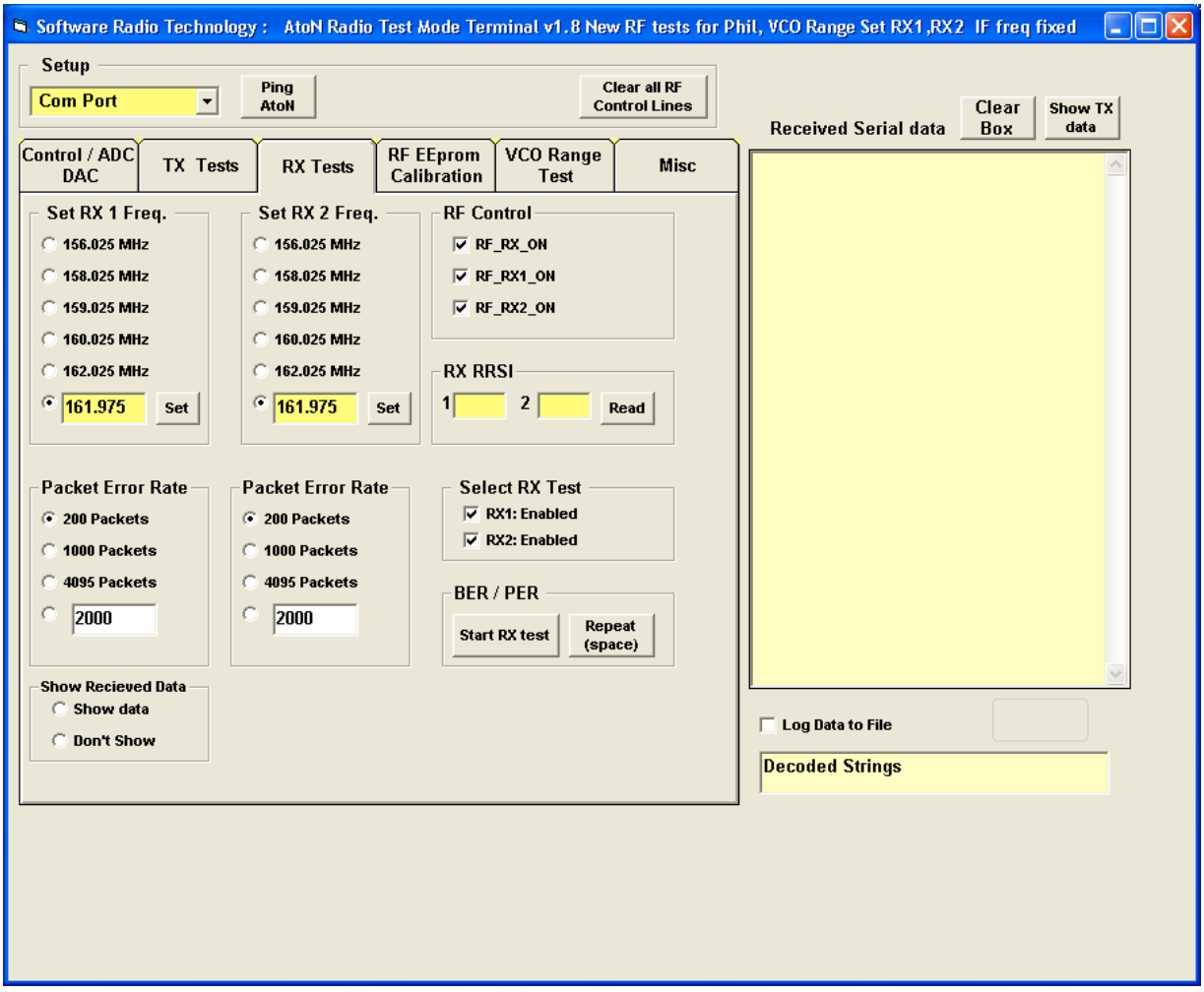
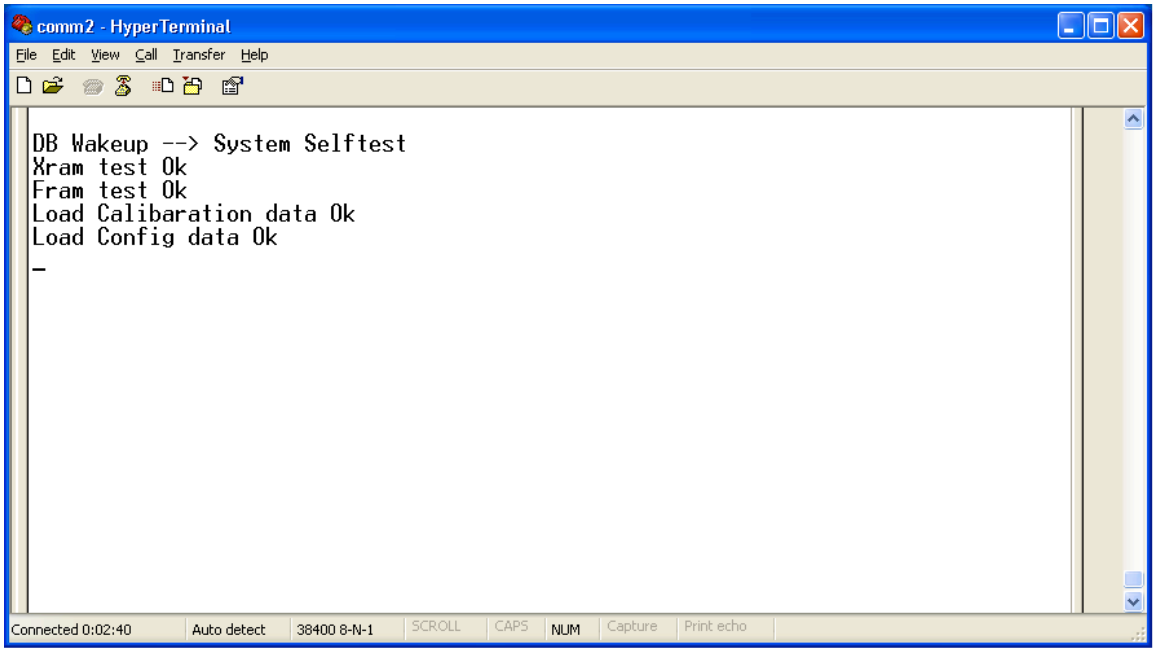

Software Radio Technology : AtoN Radio Test Mode Terminal v1.8 New RF tests for Phil, VCO Range Set RX1,RX2 IF freq fixed
Setup
Com Port
Ping AtoN
Clear all RF Control Lines
Received Serial data
Clear Box
Show TX data
Control / ADC DAC
TX Tests
RX Tests
RF EEprom Calibration
VCO Range Test
Misc
Set RX 1 Freq.
156.025 MHz
158.025 MHz
159.025 MHz
160.025 MHz
162.025 MHz
161.975
Set
Set RX 2 Freq.
156.025 MHz
158.025 MHz
159.025 MHz
160.025 MHz
162.025 MHz
161.975
Set
RF Control
RF_RX_ON
RF_RX1_ON
RF_RX2_ON
RX RRSI
1
2
Read
Packet Error Rate
200 Packets
1000 Packets
4095 Packets
2000
Packet Error Rate
200 Packets
1000 Packets
4095 Packets
2000
Select RX Test
RX1: Enabled
RX2: Enabled
BER / PER
Start RX test
Repeat (space)
Show Recieved Data
Show data
Don't Show
Log Data to File
Decoded Strings

Figure 8B

4.3 Zeni Daughter Board Configuration and Test

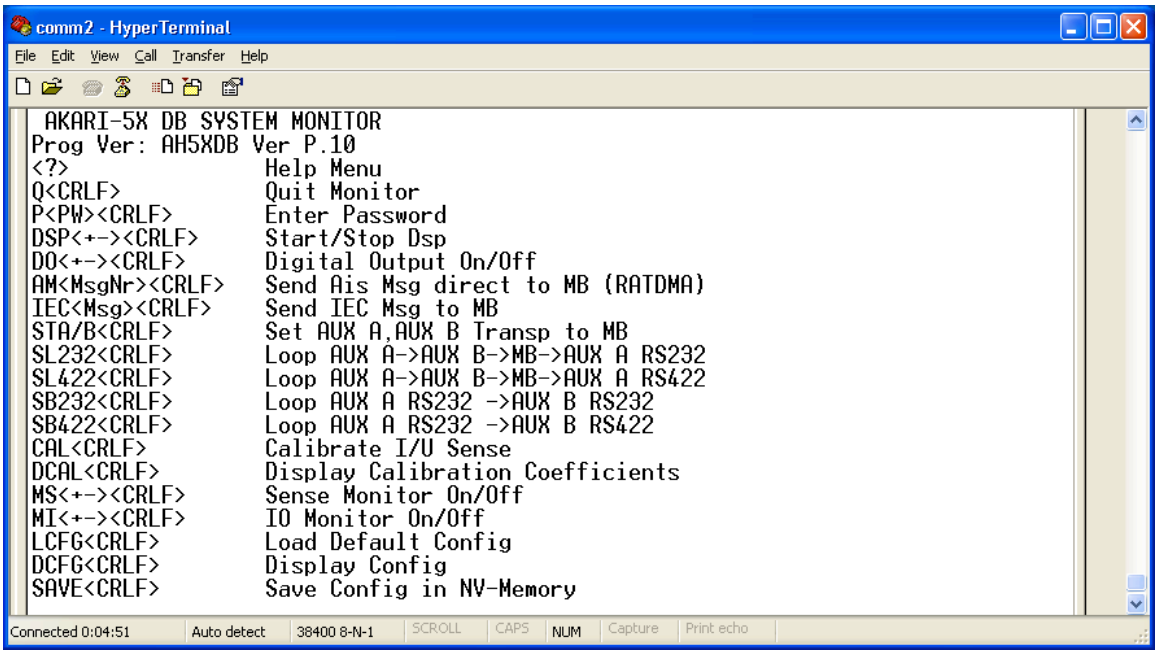
(Perform only for UUT PNs ATN01-121-00 or ATN01-321-00). For all other UUT PNs proceed to section 4.4

Leave the ARM terminal RS232 test cable connected to P2 of **test cable 024-M0994-00. Move the DSP HyperTerminal RS232 test cable from P3 to P5 (Zeni Aux A).**
On the test PC desktop, click on the ARM and DSP HyperTerminal icons to open them. Power on the UUT to observe the ARM traces messages. And observe that the following information is presented in the second HyperTerminal screen:

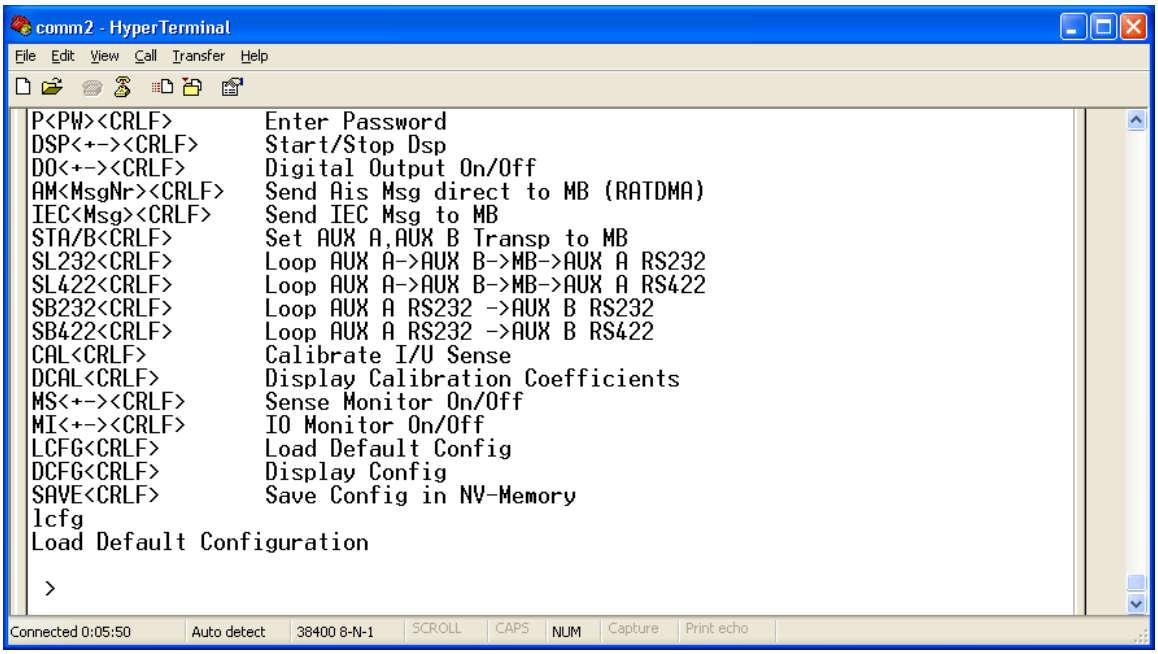


Initialize the Daughter Board to default the configuration

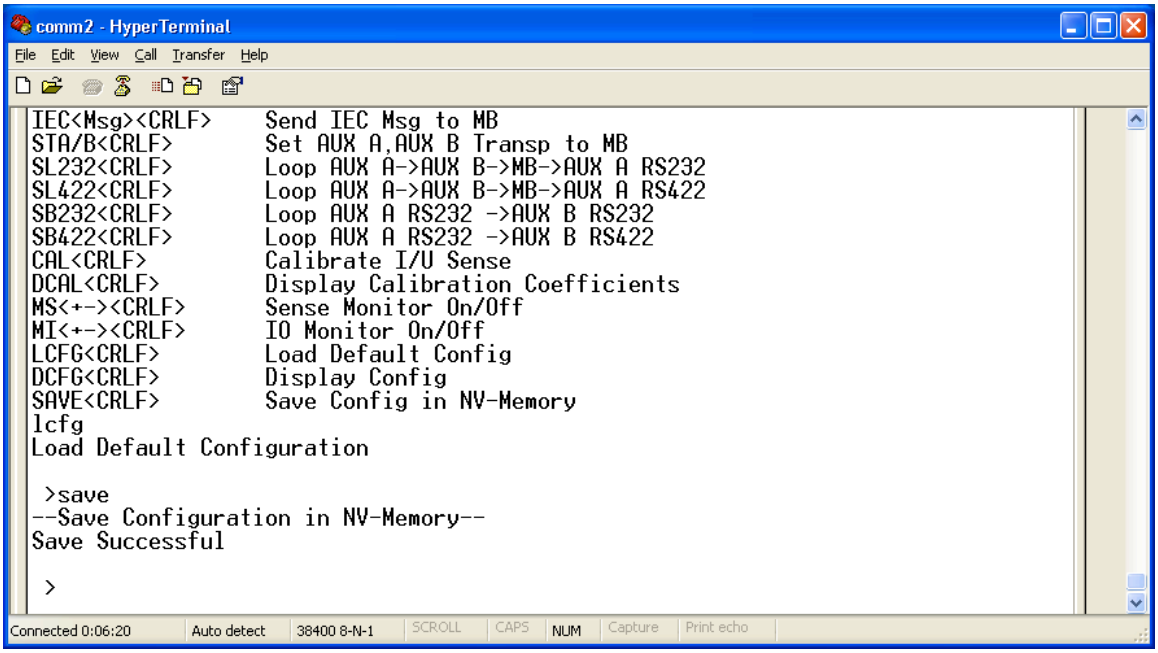
On the second HyperTerminal hit <ESC> to enter monitor mode and the following screen should be displayed:



Type LCFG <Enter> to load default configuration, and the following should be displayed:



Type SAVE <Enter> to save the configuration, and the following screen should be displayed:

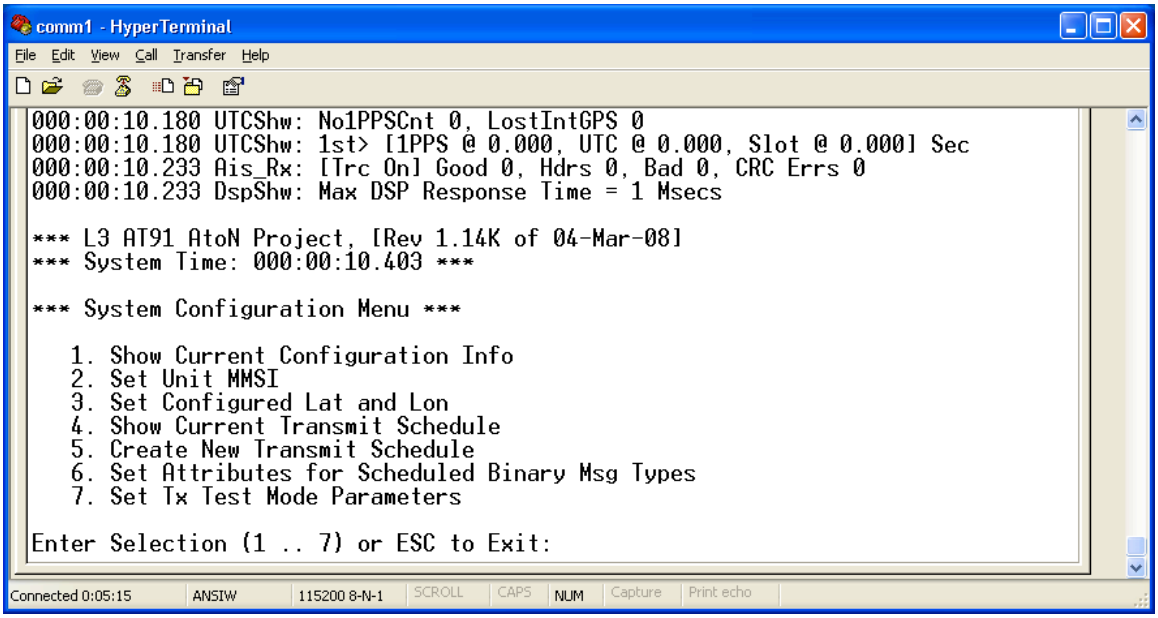


Disconnect the serial port P5 and reconnect it to P3 (DSP) for normal sleep (standby) operation. NOTE: If the serial port connector is connected the DB will not sleep (standby).

CHECK

Configure the AtoN to receive payload from Daughter Board and Tx a MSG 6-1

In the ARM HyperTerminal screen type C to enter the System Configuration. The following screen will be displayed:

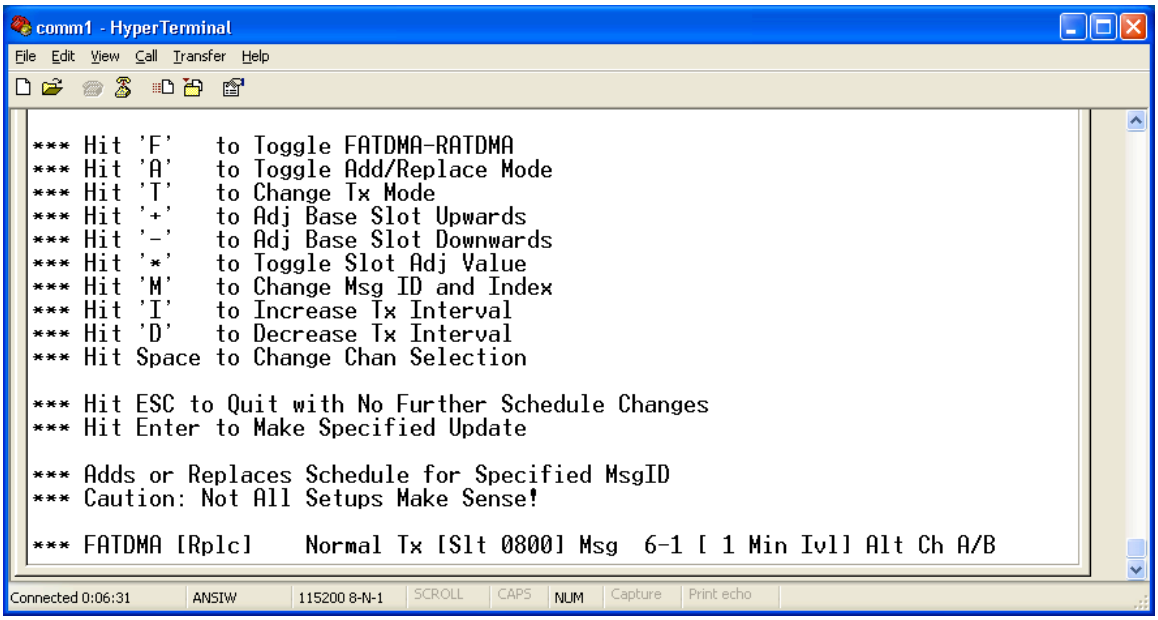


Type a 1 to show the current configuration Info. and confirm that the Zeni daughter board configuration is correct.

Hit ESC to exit.

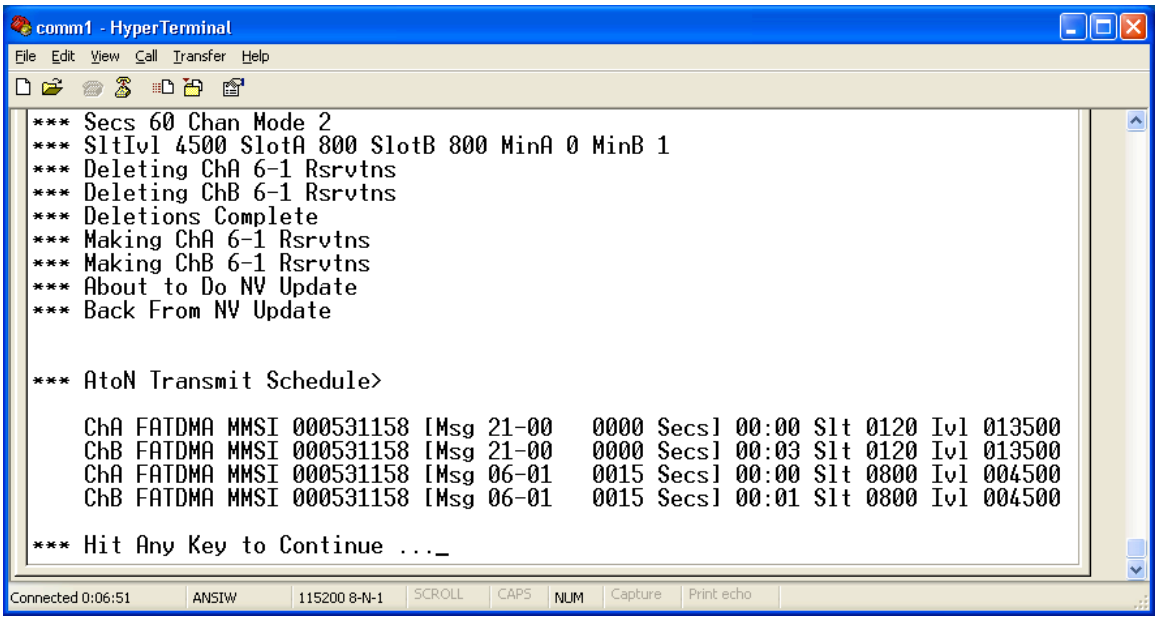
Type a 5 to create a new Tx Schedule and enter the following:

Set	MSG 6-1
Set	Slot (random number assigned by tester)
Set	ALT CH A/B
Set	Interval 1 minute
Set	FATDMA
Set	Normal Tx



Hit ENTER and the following should be displayed:

NOTE:
The previously configured 21-0 message data as well as the newly entered message 6-1 data will be displayed.



Confirm that the schedule is set for MSG 06-01 on channels A and B. Enter the message 6 (tester assigned) slot number on data sheet.

Hit ESC multiple times to exit the configuration menu and allow the ARM trace messages to be displayed.

CHECK

Power down the UUT.

4.4 DC Power Consumption Verification

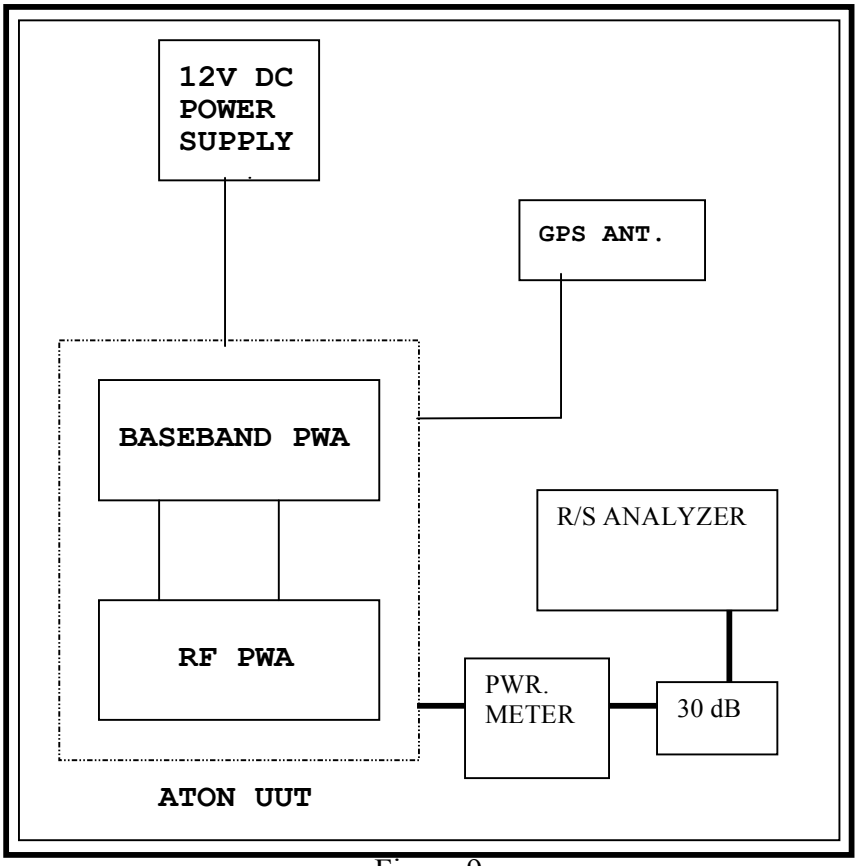


Figure 9

The following steps shall be used to verify the nominal DC Power consumption of an AtoN unit:

1. Connect the RF test cables per Figure 9. Connect a GPS signal to the UUT. Power on the UUT and record the nominal low power stand-by DC current reading **once the UUT has achieved GPS sync. and transmits successfully.** (This mA current value will be rounded up due to the resolution of the bench power supply). **Confirm that the UUT successfully transmits a message 21 on the assigned Tx slot and if the UUT is a ZENI PN: ATN01-121-00 or ATN01-321-00, transmits both a message 21 and a message 6 in the assigned slot(s).** Transmissions status can be monitored by opening 2ea. HyperTerminal applications connected to P2 and P3 and monitoring the UUT ARM and DSP port activity while monitoring the actual message burst signal(s) on the RS Analyzer.
2. Power down the UUT and remove GPS and RF dummy load.

NOTE: Typical current draw is as follows:
1. Type 1 = < 20 mA
2. Type 3 = < 20 mA

RECORD

4.5 BURN IN 12 HRS

The AtoN UUT(s) are integrated into a burn-in test rack. 12VDC power is supplied and an active GPS signal will be connected to validate full functionality. For example: (an AtoN will enter sleep mode, will not transmit until it is time locked to the GPS signal). In addition all UUT AtoNs will be interconnected via an RF network to an L-3 Pro-Tec AIS Mobile radio. Over an extended test period of a minimum of 12 hours the UUT AtoN(s) should maintain presence in the Mobile AIS target map. The test rack also houses a dc current monitoring meter for each test position in the rack. In addition, a HyperTerminal application will be open for each UUT and the Mobile AIS radio. This will allow monitoring of the VDL message traffic and ultimately allow the tester to screen each log to verify that messages are transmitted and received in accordance with each individual UUT(s) time slot and MMSI.

1. Place the UUT(s) onto the AtoN Burn-in test rack, Connect the power supply cable(s), GPS cable(s), RF cable(s) through a 60 dB 25WT attenuator, and connect an I/O test cable to monitor trace messages. The test rack is capable of testing 12ea. units. **Note: Zeni and other non L3 type AtoNs will require the appropriate adapter cables!**
2. Turn on the Rack mount power supply, DC current meter power strip, AC / DC power distribution strips and test PC and monitor.
3. Power on the L-3 Pro-Tec AIS Mobile radio with the external Agilent power supply set to 28VDC (Turn on the supply and select "recall 1", then press the Enter button). Power on and configure the Pro-Tec AIS for Targets Monitoring by completing the following steps: After the radio finishes its power on cycle press ENT until "Ship Name MMSI Target" screen is displayed. Set VDL trace level to 2 by pressing FNC, CLR then arrow down to VDL Trace and press ENT. Once the digit is blinking, arrow up and down to the number 2 and press ENT. Now press ESC and you should be back to the Target Monitoring screen. All AtoN UUT MMSI numbers should be seen in this screen throughout the Burn-in process.
4. On the PC desktop open a HyperTerminal application for each AtoN UUT and the ProTec Mobile AIS radio by clicking on the corresponding numbered Icon and connecting.
5. Each AtoN UUT should display trace message activity that will assist the test operator in determining various functional states and status throughout the Burn-in process.
6. Monitor the current consumption, trace message activity, GPS status and the overall general health of the UUT(s). **CHECK**

4.6 POST BURN-IN

TYPE 1: Tx = Repeat section 4.1 steps 1 through 8 for freq. 162.025 MHz only!

TYPE 3: Tx = Repeat section 4.1 steps 1 through 8 for freq. 162.025 MHz only!
Rx = Repeat section 4.2 steps 1through 6 only!

RECORD

4.7 ALIGNMENT VALUES

On the Radio Test Mode software select the "***RF EEprom Calibration"*** tab and click the ***"Read All EEProm"*** button and wait for the fields to be updated. Record the following alignment settings:
TX Power level, Ref Osc (12.8 MHz), Mod. Dev Adjust, Mod DC Offset Trim.
Power down the UUT and remove all test connections.

RECORD

4.8 FINAL DOCUMENTATION

Review and verify all that all data entries are correct.

STAMP

APPENDIX A
DATA RECORD

The following acceptance test data is supplied as evidence of product quality. Supporting records regarding inspection and tests performed will be retained by L-3 Communications, Aviation Recorders Division for seven years.

Tested P/N: _____ Tested Serial No._____

Date Started:_____ Description: AtoN type:_____

Date Completed:_____ Tested By:_____

Check that all measuring equipment have calibration stickers and are within their calibration periods (check).

List on the Data Record the property number, calibration due dates, and alternate equipment, if used.

Equipment Description	Mfg. & Model No.	Prop. No.	Cal. Due
PC, with Windows 2000/XP	Any		N/A
AIS Pro Tec	L-3		N/A
AtoN Radio Test Mode SW	SRT	N/A	N/A
DVM	Fluke 179 or equiv.		
RF Signal Generator	HP 8657B-003 or equiv.		
Power Meter	Bird 4391A		
Power Supply	Tenma 12VDC 3 Amp.		
PMG1 waveform generator	Sine Qua Non	N/A	N/A
Spectrum Anal.	RSFSEA30-B-7 or Equiv.		
Adjustable Attenuator	Any	N/A	N/A
Test Cable(s)	L-3	N/A	N/A
Power Supply, rack mount	Gen-Tek 20-38-U		

Alternate Equipment Used:

The following data should be recorded for each AtoN unit that is processed using the procedures described in this document.

Para.	Test Description	Expected Results	Actual Results
4.0	**Software load / Configuration process**		
		ARM VERSION	
		DSP VERSION	
		FPGA VERSION	
		MMSI #	
		SLOT #	
	IEC Port test	CHECK	
4.1	**TX. RF Alignment**		
	TX output power 156.025 MHz +41 +/- 1.5dBm TX Freq. 156.025 MHz. +/- 500Hz, Deviation 2.4 kHz +/- 240Hz Alternate Frequency: _____	CHECK	
	TX output power 162.025 MHz. +41 +/- 1.5dBm TX Freq.162.025 MHz +/- 500Hz, Deviation 2.4 kHz +/- 240Hz Alternate Frequency: _____	CHECK	
4.2	**RX RF Alignment (Type 3 only)**		
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -77 dBm Alternate Frequency: _____	Max. 2% bad Out of 200	Good _____ Bad _____
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -107 dBm Alternate Frequency: _____	Max. 20% bad Out of 200	Good _____ Bad _____
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -7 dBm Alternate Frequency: _____	Max. 10% bad Out of 200	Good _____ Bad _____
	Sensitivity/ PER Test 161.975 MHz RX1 and RX2 @ -77 dBm Alternate Frequency: _____	Max. 2% bad Out of 200	Good _____ Bad _____
	Sensitivity/ PER Test 161.975 MHz RX1 and RX2 @ -107 dBm Alternate Frequency: _____	Max. 20% bad Out of 200	Good _____ Bad _____
	Sensitivity/ PER Test 161.975 MHz RX1 and RX2 @ -7 dBm Alternate Frequency: _____	Max. 10% bad Out of 200	Good _____ Bad _____

Para.	Test Description	Expected Results	Actual Results
4.3	**Zeni DB Configuration and Test**		
	Initial daughter board to default configuration	CHECK	
	Configure Daughter Board to Tx message 6 on slot # _____	CHECK	
4.4	**Dc Power Consumption Verification**		
	Current draw w/ GPS synch.	Type 1 < 20mA Type 3 < 20 mA	_____mA _____mA
4.5	**12 Hour Burn-In**	CHECK	_____
4.6	**Post Burn-In**		
	Type 1		
	TX output power 162.025 MHz +41 +/- 1.5dBm	CHECK	
	TX Freq.162.025 MHz +/- 500Hz, Deviation 2.4 kHz +/- 240Hz	CHECK	
	Type 3		
	TX output power @ 162.025 MHz +41 +/- 1.5dBm	CHECK	
	TX Freq.162.025 MHz. +/- 500Hz, Deviation 2.4 kHz +/- 240Hz	CHECK	
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -77 dBm Alternate Frequency: _____	Max. 2% bad Out of 200 packets	Good _____ Bad _____
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -107 dBm Alternate Frequency: _____	Max. 20% bad Out of 200 packets	Good _____ Bad _____
	Sensitivity/ PER Test 162.025 MHz RX1 and RX2 @ -7 dBm Alternate Frequency: _____	Max. 10% bad Out of 200 packets	Good _____ Bad _____
4.7	**Alignment values**		
	TX Power Level	Actual settings	_____
	Ref. Osc. (12.8 MHz)	Actual settings	_____
	Mod Dev Adjust	Actual settings	_____
	Mod DC Offset Trim	Actual settings	_____
4.8	**Final documentation**	STAMP	

APPENDIX B

AtoN Factory Setup
Revision 1.9 of 14-Jan-08

Useful Information and Overview

The AtoN contains two processors, an ARM and a DSP. The ARM has complete control over the DSP power and reset lines. The DSP runs the RF subsystem, but only when the ARM has enabled it to do so.

When the AtoN is up and running, the **ARM DBGU** serial port is used for Trace message output and shows ARM operational status and information. This interface also functions as a menu-based configuration and command and control channel for the unit, with a set of built-in "hot key" sequences for initiating various operations. The interface to this channel is typically a serial console program such as HyperTerminal. The ARM DBGU channel runs at **115200 Baud, 8 Data Bits, and No Parity**.

When Baseband Boards are first received from SRT, they may still be configured with **Micromonitor** in Flash. If Micromonitor is still resident in Flash, the ARM DBGU serial channel is configured at **38400 Baud**. In this case the **ARM Code Update** procedure should be performed as a first step. This puts a standalone version of the ARM code into the AtoN. There is no reason to preserve the Micromonitor configuration, and once the standalone version of ARM code has been loaded the Micromonitor configuration is not likely to be needed again.

AtoNs have the annoying habit of wanting to go to "sleep" (enter standby mode). As of Rev 1.14H of the ARM software, this is the case for both Type 1 and Type 3 units. This may prove to be frustrating when attempting to do anything useful with the AtoN such as running tests, loading code, or otherwise configuring the unit. The simplest way to prevent an AtoN from shutting down is to leave the GPS antenna disconnected. An AtoN will not enter standby mode if it doesn't know what time it is. As of Rev 1.14H of the ARM software, the "Standby Enable" can be toggled on and off using the **^P^P** sequence (Ctrl Key with P, twice) at the ARM console interface. Use of this interface will be detailed later in this document.

In order to run tests on the RF subsystem (such as the SRT Packet Error test) it is necessary that the DSP be powered up and released from Reset. This is completely under control of the ARM processor, so it is impossible to run such tests on the DSP unless the ARM is cooperating. The simplest method of ensuring that the DSP is running is to use the "**T-2-E**" sequence at the ARM console. This will be detailed later in this document.

The ARM DBGU serial interface also provides some user control in the form of Menu and command entry. There are three menus currently implemented, a **System Configuration Menu**, a **General Configuration Menu** and a **Test Menu**. The System Configuration Menu is invoked by typing **'S'**, the General Configuration Menu is invoked by typing **'C'**, and the Test Menu is invoked by typing '**T'**. Upon entry to any of these Menus, **normal AtoN operation is terminated**. Since the operations available in the Setup, Test and Config menus can leave the AtoN in an indeterminate state, a Reboot always follows the exit from these menus. This is automatic upon termination of Menu activity. The

operations associated with these Menus are discussed further in subsequent sections of this document.

Resetting the AtoN from the ARM HyperTerm Console

When the AtoN is up and running and Trace messages are being displayed on the ARM HyperTerm console, the unit can be **Reset** at any time by holding the **Ctrl key** and typing **a pair of 'C' characters** in succession. This avoids the need to cycle power in order to restart the AtoN.

ARM Code Update

If the Baseband Board has not been updated since it was received from SRT, it may still be loaded with **Micromonitor in Flash**. In this case the **ARM code must be updated** as a first step. In order to do this, the ARM DBGU port should be connected to HyperTerm at **115200 Baud**. The **BMS jumper** must be installed on the Baseband Board, and power applied. The BMS jumper is installed on the Baseband Board at **PL10, between pins 13 and 14**. If the BMS jumper connection is made, and power is applied to the AtoN, the HyperTerm console should display **'C'** characters at around one per second. Note that this method of updating the ARM code will work whether Micromonitor is in Flash or not. However, it is the only method that will work for loading an ARM standalone binary image if Micromonitor is still resident.

Once the 'C' characters are being displayed at the HyperTerm console, the ARM code update can begin. On the HyperTerm menu pulldown bar, use **Transfer->Send File**. In the **Protocol box** of this popup window, select **Xmodem**. Then use the "**Browse"** button to locate the ARM binary images. Typically these are contained in a folder called "**Aton Images**". Select the **"SerBoot.bin"** file by double-clicking on it in the file list (or single-click and hit the **"Open"** button). Next hit the "**Send**" button in the "**Send File**" window. This will start the actual transfer. On completion of the transfer the **'C' characters will start again**. At this time, locate the ARM executable binary image in the same folder as the "SerBoot.bin" file. An example would be **AtoN_1_03.bin**. This name corresponds to **Rev 1.03 of the ARM code**. Typically one would select the file with the highest version number, but there may be situations where an older version is to be loaded. Note that the Micromonitor image could also be sent at this point instead of the AtoN binary image. The Micromonitor image is contained in a file named **"CSB_637.bin"** and represents the original Micromonitor image as contained on the Cogent CSB637 development boards that preceded the SRT Baseband board.

Select the binary file to be loaded by double-clicking on it in the file list (or single-click and hit the "**Open**" button). Next hit the "**Send**" button in the "**Send File**" window. This will start the transfer of the binary image. On completion of the transfer the **'C' characters will start again**. **Remove the BMS jumper** and power the board up again. The unit should boot normally and Trace messages will appear in the HyperTerm window. Note that if an ARM standalone image was loaded, the HyperTerm connection must be at 115200 Baud (the same as the download). **However, if the Micromonitor image was restored for some reason (not typical) the HyperTerm connection must be set to 38400 Baud.**

ARM Code Update if ARM Standalone Image Already Installed

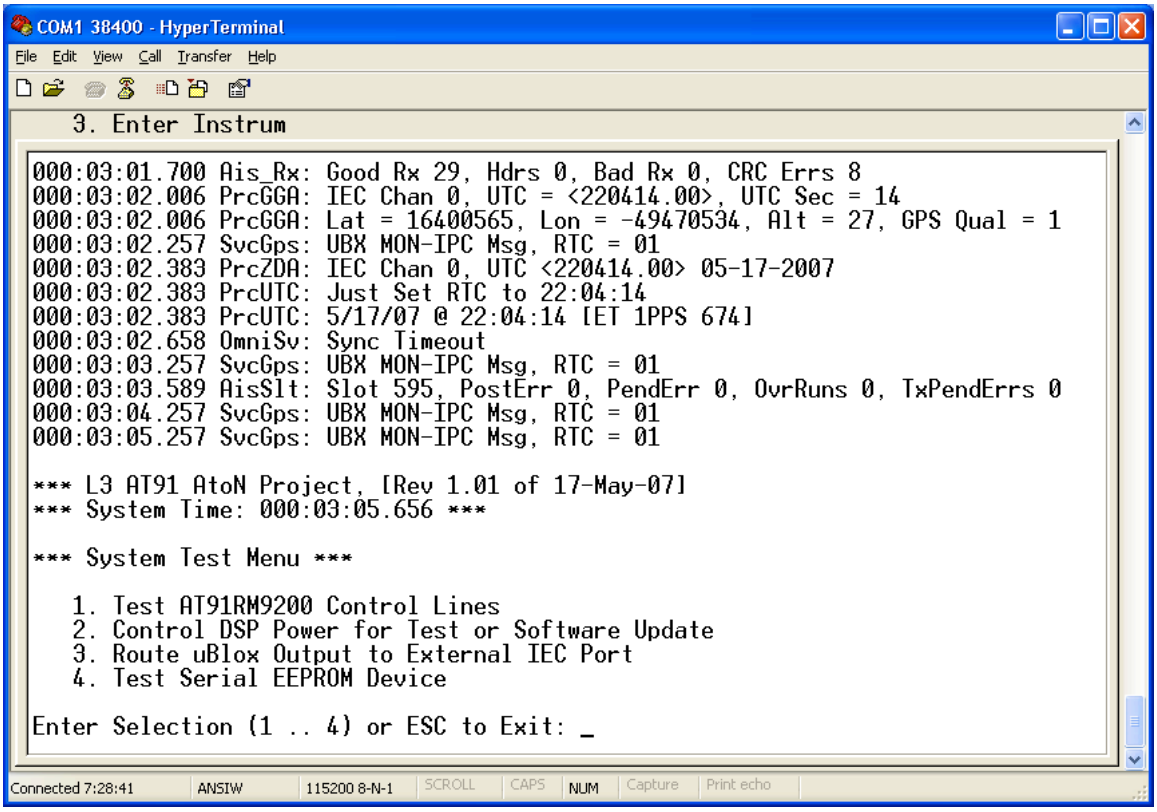
If the unit has already been updated with a standalone binary ARM version (no Micromonitor) it

can be subsequently updated with a different version of ARM code (or Micromonitor) without installing the BMS jumper. This is especially useful if the AtoN boards are already installed in an enclosure. This is done as follows.

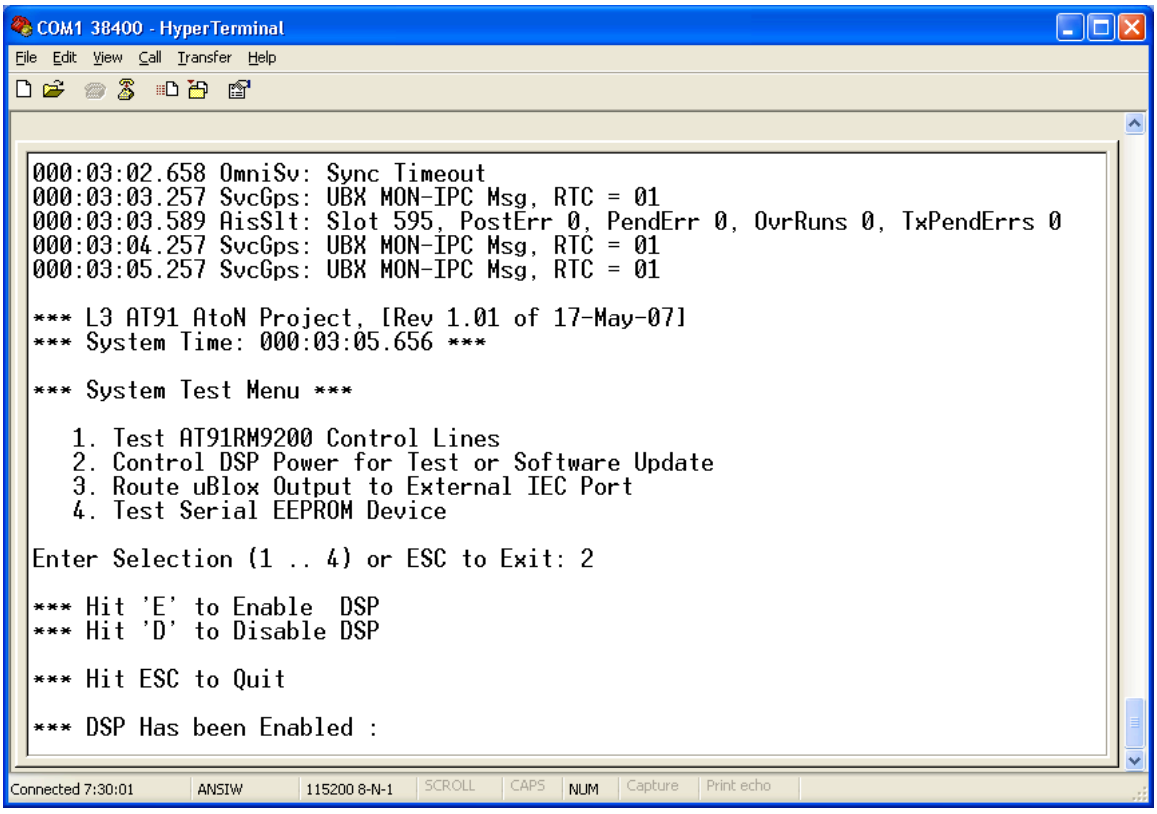
While Trace messages are coming out on the ARM HyperTerm console, hold the **Ctrl key** and type "**FF**". This will put the ARM into the Xmodem update mode exactly as if the "SerBoot.bin" file had already been loaded after powering up with the BMS jumper installed. The procedure is identical to the one described above, beginning with the transfer of the ARM binary image. **The "SerBoot.bin" image should not be sent in this case!** At the end of the transfer of the binary file, the image size is displayed, along with a message to "Hit any key to Reboot".

DSP Code Update

If the DSP code needs to be updated, a second HyperTerm window is needed for the DSP connection. The **DSP HyperTerm** console must be set for **38400 Baud**. Assuming that the ARM is up and running, hit a '**T**' key on the **ARM HyperTerm** console. This will bring up the **System Test Menu** as shown below.



Now select item 2, then **hit the 'E' key**. The result of this is shown below.



At this time the DSP should be powered up. When ‘D’ and ‘E’ are alternately hit at the ARM HyperTerm console, the DSP HyperTerm console should show the DSP boot messages over and over. This demonstrates that the ARM has the appropriate control over the DSP. In fact, just hitting ‘E’ over and over will have a similar effect since each time the DSP is enabled it is also Reset and Released.

In order to load new code into the DSP, **the DSP must be released from Reset with a jumper between the DSP serial Rx and Tx lines**. The AtoN configuration cable has a momentary pushbutton for this purpose. **This is the square button** on the cables that were made for manufacturing. Hold the button while enabling the DSP. Once the signon messages have been displayed in the DSP HyperTerm window, release the button. The DSP should show some additional messages, and will be ready for update.

At this time use the **Transfer->Send Text File** sequence on the **DSP HyperTerm** pulldown bar. In the Send Text File popup window, navigate to the folder containing the DSP image. This folder should also contain a file called “**ERASE.TXT**”. This file must be sent first, and commands the DSP to erase the old image. The file can be sent by double clicking or by single clicking and hitting the “**Open**” button. A message should appear in the DSP HyperTerm window indicating that the image has been erased.

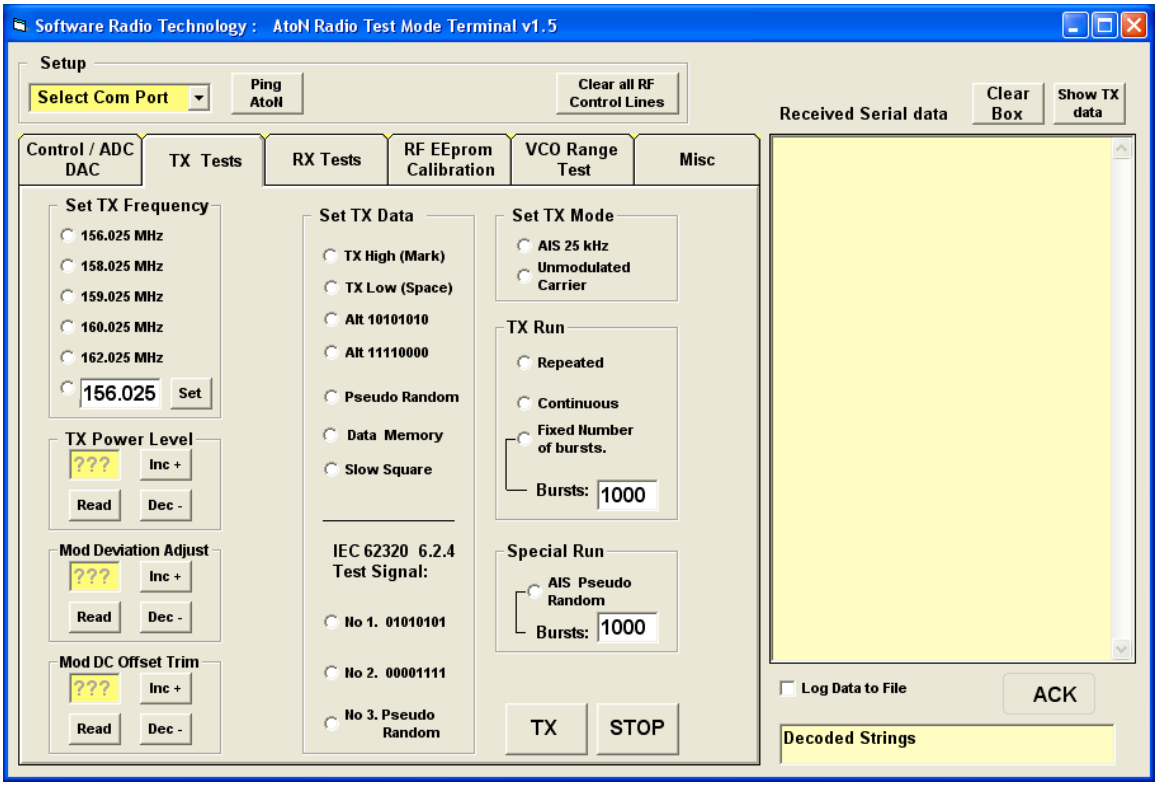
At this time the new DSP image is sent using the same procedure as was used to send the “ERASE.TXT” file. Use the **Transfer->Send Text File** sequence, but this time it may be necessary to use the **“Files of type” pulldown** to select “**All files (*.*)”** in order to see the non-txt files. The DSP image file will have a name similar to “**AtoN-1_6.hex**”. Send this file by double clicking or single clicking and hitting the “Open” button. During the transfer **‘*’** characters will be displayed in the DSP HyperTerm window. Upon completion a set of messages will be shown, along with a checksum for the

image. This should be compared to a reference value to ensure that the transfer was successful. For the **Rev 1.6 DSP code**, the checksum is **CDD8**.

At this point **the AtoN should be powered up fresh**, and should be running the current ARM and DSP code.

Running the SRT RF Setup and Tests with the SRT VB App

SRT has provided a windows-based VB Application that allows the RF subsystem of the AtoN to be aligned and tested. The details of running this application are beyond the scope of this document, but there are some fundamental system issues involved in running the App that are worth covering here. Some of the information was presented in the Overview section at the start of this document, but is being repeated here for convenience. The following screen shot shows one of the setup pages of the SRT VB App.



The SRT VB App requires a connection to the DSP serial port of the AtoN. This is the same connection used for the DSP HyperTerm connection, however it is important to note that the SRT VB App cannot be active (running and connected to the AtoN DSP Serial port) concurrently with the HyperTerm connection. The HyperTerminal program must be closed, or at least "disconnected." The latter is achieved by clicking on the telephone icon in the HyperTerm toolbar. The connection can be reestablished at some future time by clicking the other telephone icon.

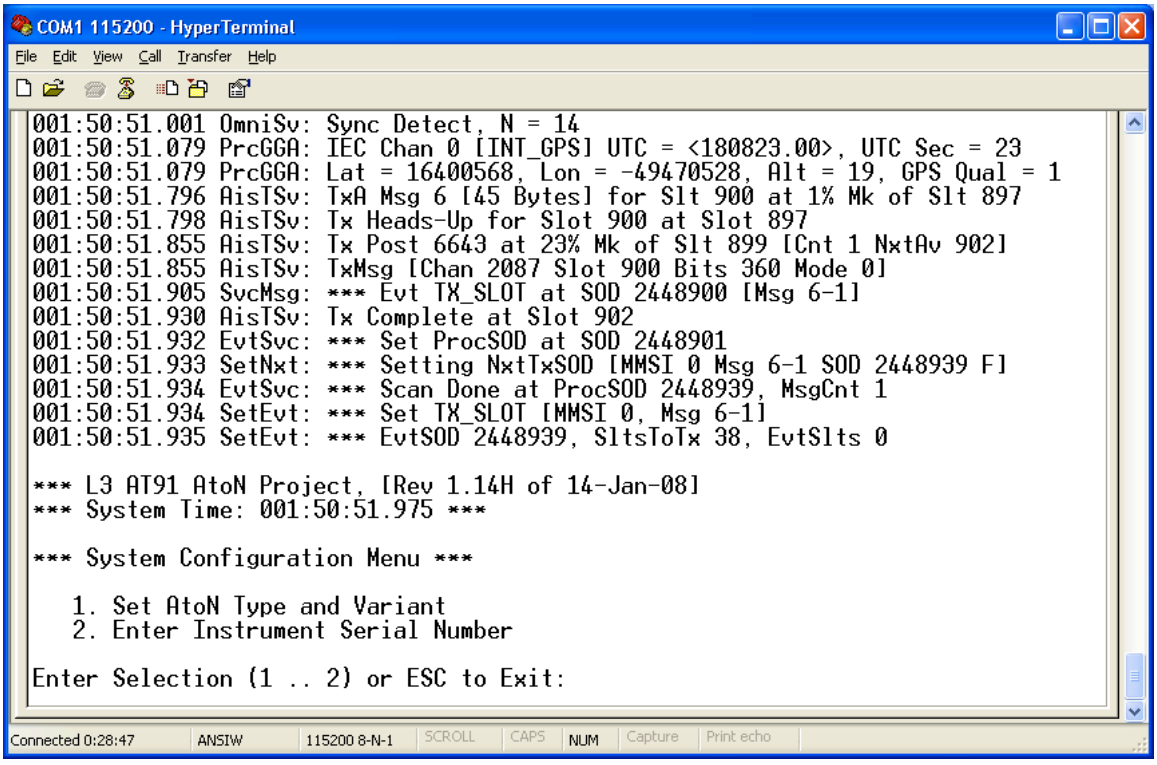
In order to run tests on the RF subsystem (such as the SRT Packet Error test) it is necessary that the DSP be powered up and released from Reset. This is completely under control of the ARM processor, so it is

impossible to run such tests on the DSP unless the ARM is cooperating. If the AtoN is configured as a Type 3 it will allow the DSP to run. Setting the unit up as a Type 3 AtoN may be the easiest way to ensure that the RF tests will execute, but it should be kept in mind that a Type 3 AtoN is capable of transmitting messages. For this reason, care should be taken when connecting the AtoN RF antenna to external signal sources. Note that the AtoN will not transmit if the GPS antenna is disconnected, so this might be useful.

Regardless of how the AtoN is configured, the DSP can be put into the required state using the **ARM HyperTerm** console. Refer to the **DSP Code Update** section and follow the instructions. The ARM must be up and running in order for this procedure to be possible. Disconnecting the AtoN GPS antenna and powering up the AtoN will ensure that the ARM will not enter shutdown mode.

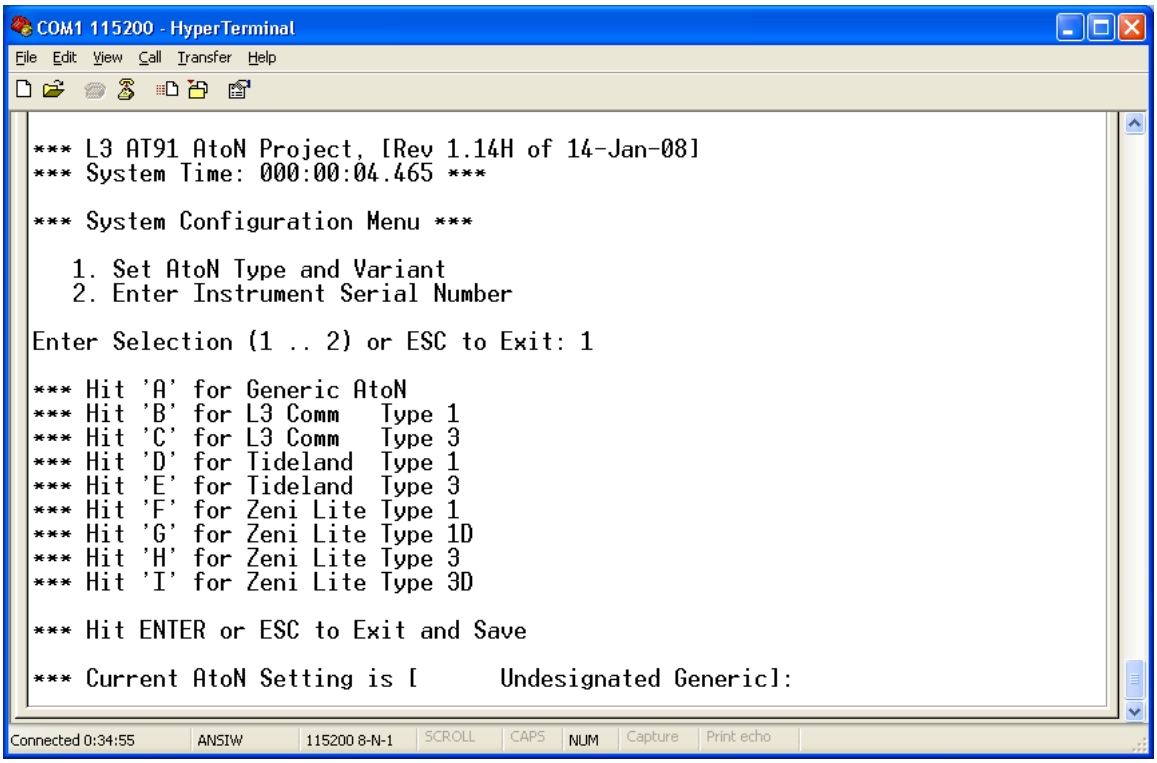
Unit Type and Serial Number Configuration

The next step in setting up the AtoN is to configure the Unit Type and Serial Number. This is done from the ARM HyperTerm console. Assuming that the AtoN has not been previously configured, this simply requires hitting a **'S' key at the ARM HyperTerm** console. This should bring up the **System Configuration Menu** shown below. If the Unit Type has been previously configured, the 'S' key will have no effect. In this case the "unlock" sequences is required. At the ARM HyperTerm console, hold the **Ctrl key** down, and type **UNLOCK** (six characters). This should cause a message to scroll by indicating that the Configuration Menu has been unlocked. The 'S' key should now bring the menu up.



The menu selections are fairly self-evident. The following screen shows the result of selecting item 1. If

the AtoN has been previously configured as anything other than the “Generic” type, a password will be required for entry to the AtoN Type Select screen. **The password is currently hard-coded as the word “WordPass**”, and is **case sensitive**.



Selection ‘A’ is intended primarily for the development environment and allows for broader control over various AtoN configuration characteristics. For production units one of the other choices will be appropriate. Once a selection has been made, hit the **ENTER** or **ESC** key to preserve the selection.

A similar process is used to set the unit Serial Number. Again, if the Serial Number has previously been set, the password will be required to modify it**. Once the Serial Number and AtoN Type have been set to the non-default values, the Configuration Menu will be “hidden”.** That is, the ‘S’ key will have no effect until the “UNLOCK” sequence is used to unlock it. Then intent is to make it difficult to modify the AtoN Type or Serial Number once the unit has been configured in the factory.

Note that as of Rev 1.14H of the ARM software, the Unit Type and Serial Number are preserved in Flash memory rather than in the NV memory that contains the remainder of the system configuration data. This means that the “NV Erase” operation (described later) will not lose the Unit Type and Serial Number settings.

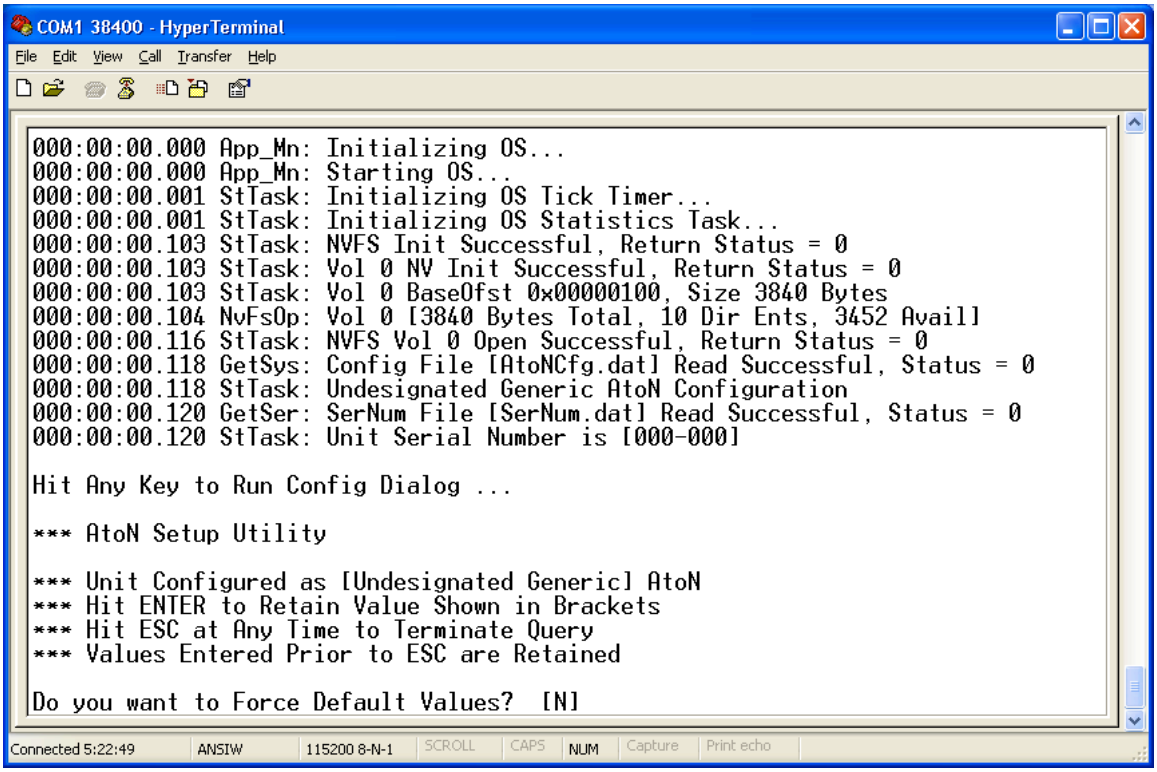
Configuration Using the Config (Startup) Dialog

There are certain AtoN parameters that will need to be configured by the customer as well as during manufacturing test. Some of these are accessible by running the Startup Dialog. In early AtoN units, this dialog was activated by powering up the unit (**or typing “Ctl-C” “CtlC” at the ARM HyperTerm**

console) with a **jumper installed** between the **Tx and Rx lines of the external IEC port.** These pins are available at the AtoN external connector. A pull-up resistor is also required on the Rx signal pin. A special cable is available that provides the required connection and pull-up resistor. Once the unit is powered up with the jumper connected, the AtoN will enter the Startup Dialog mode.

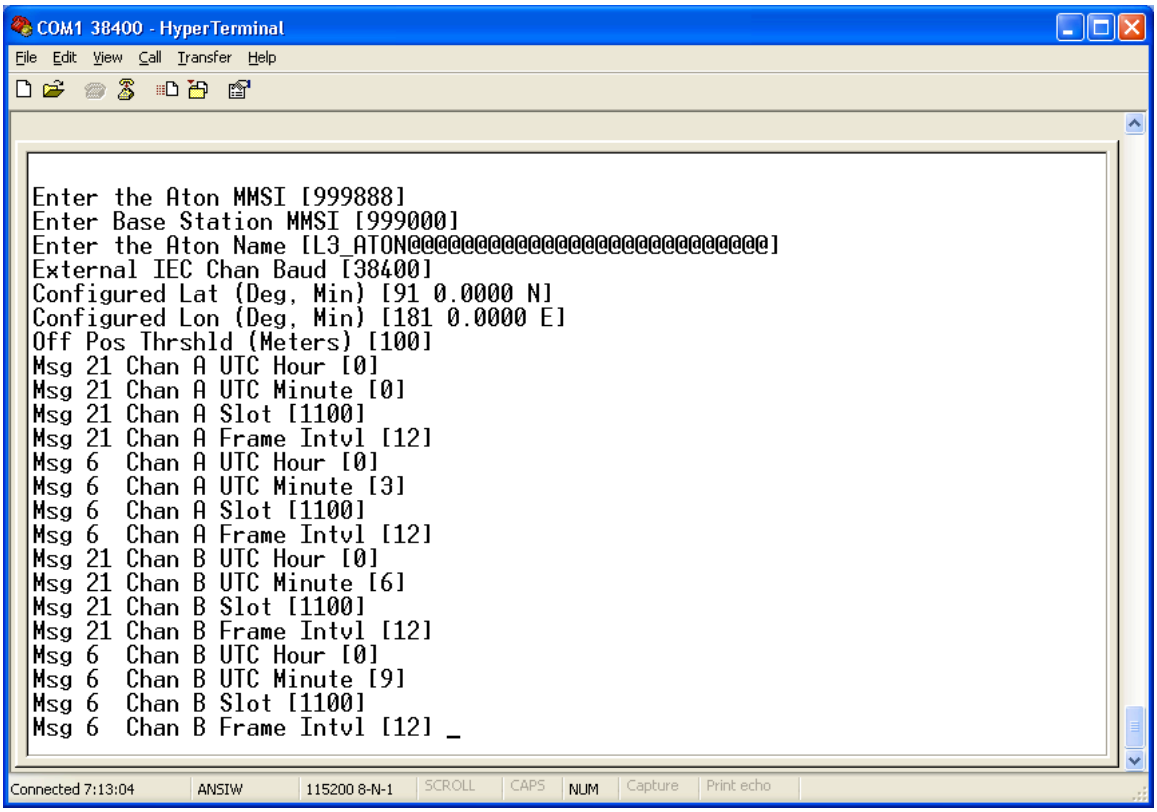
This method of activation is no longer necessary and the dialog can be activated at any time by typing the sequence **^C^F^G** (CFG with the Ctrl Key pressed).

The following screen shot shows the display when the Dialog is activated using the jumper pushbutton on startup. Note that a prompt is displayed**, "Hit Any Key to Run Config Dialog …"**. The user must hit a key within a couple of seconds or the normal startup will proceed. In this case a key was pressed and the AtoN Setup Utility was entered.



The ARM HyperTerm console will present the configuration items, one by one, with a default value shown in brackets. Just hitting the ENTER key will preserve the displayed default value. The dialog query can be aborted at any time by hitting the ESC key. The following screen shot shows a typical list of configuration prompts and the associated current settings. The ability to modify these settings may be of value for setting up various AtoN testing configurations.

Note that it is no longer necessary to use the Dialog mode to set up an AtoN transmit schedule. There is a much more powerful scheduling utility built into the AtoN General Configuration Menu ('C' key) that allows a wide range of schedules to be built. The restricted scheduling capability provided by the Dialog method has been retained for backward compatibility only, and its use is rarely justified.

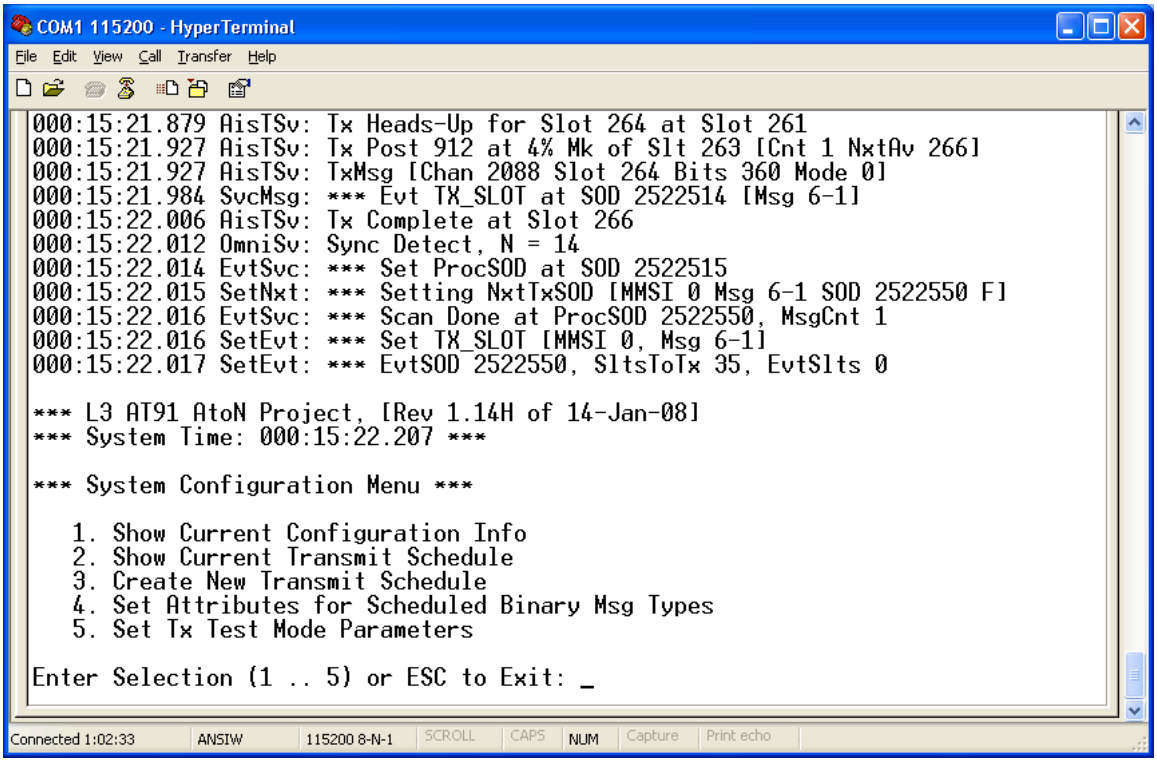


Wiping Out the NV Content

On certain occasions it may be useful to wipe out all NV configuration information for some reason. In fact, this is recommended when an ARM software update is performed because the stored NV configuration structures may not be compatible with the code that has been loaded. Note that the wiping out of the NV content no longer causes the Unit Type and Serial Number to be lost. This operation restores the NV to a fresh state. This is done from the ARM HyperTerm console while Trace messages are being displayed. Hold the **Ctrl key**, and type the sequence, **"NVERAS".** A message should appear indicating that the NV was erased. This will erase any transmit schedule that had been created, and will set all NV values to the appropriate defaults for the configured Unit Type on the next startup.

Setting AtoN Transmit Schedule Using Built-In Scheduling Utility

It is no longer necessary to use the Startup Dialog to create a transmit schedule. A very powerful scheduling utility is now part of the General Configuration Menu. This can be invoked at any time by pressing the 'C' key, then selecting item 3.



The following screen capture shows the control choices for building transmit schedules. The line at the bottom of the screen shows the attributes for a new schedule entry that will be created if the User hits the ENTER key. Reading from left to right across the line, a simple explanation is likely to be helpful.

The first item indicates whether the new schedule item will be FATDMA or RATDMA. Hitting the ‘F’ key will toggle this field.

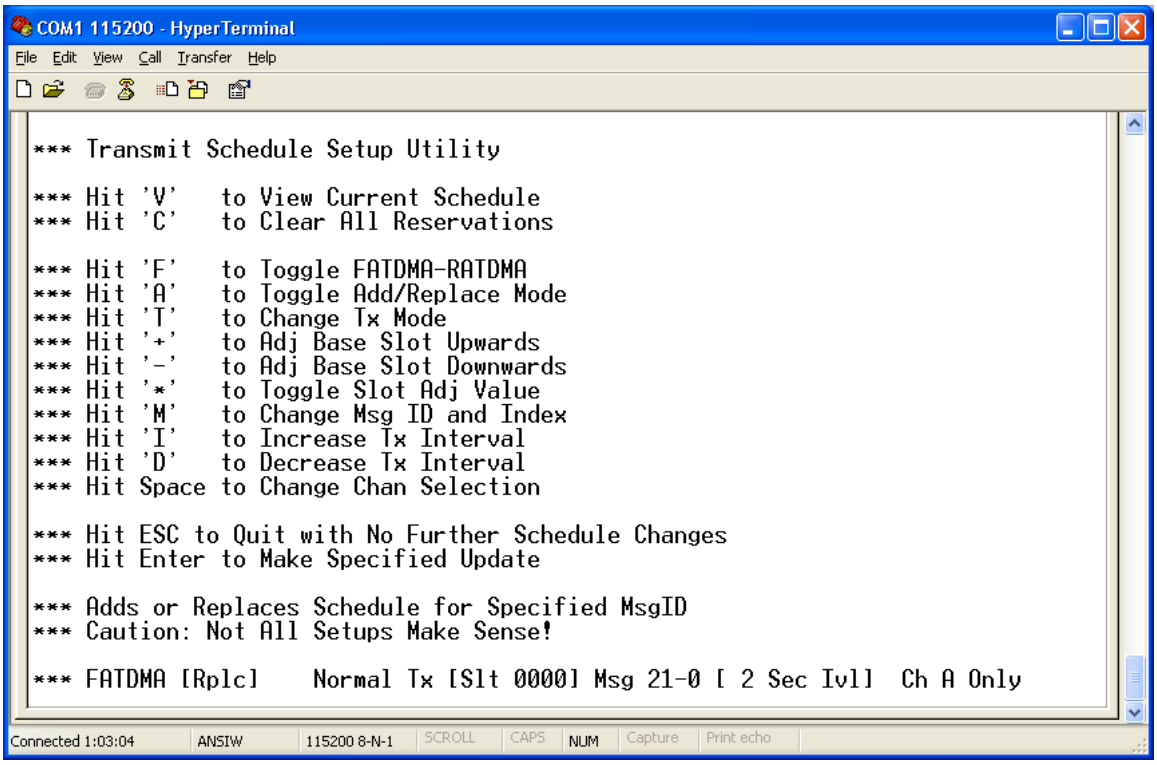
The next item indicates whether the entry will Replace or Add to any entries for the selected Message ID and Index. Hitting the ‘A’ key will toggle this field.

The next field describes the Tx Mode. This is typically set to “Normal”, but special test scenarios might require “Back To Back” transmissions. Hitting the ‘T’ key will toggle this field.

The next field describes the “base” or “anchor” slot for the scheduled transmission. The “plus” and “minus” keys (+, -) adjust this value up and down respectively. Normally the value increments by 10 at each adjustment, but the “*” key will toggle the adjust value between 10 and 1. This allows for fine control over the base slot when needed.

The ‘I’ and ‘D’ keys are used to increase or decrease the transmit interval.

The ‘M’ key will cycle through the choices for the next field, Message ID and Index, and the Space Bar will cycle through the choices for the final field, the Channel Selection.



Standby Operation

As mentioned earlier in this document, all Unit Types now support Standby operation as the default. At one point in time there was an incorrect assumption that only Type 1 Units would enter Standby mode (extreme low power) when there was sufficient time until the next scheduled transmission. It turns out that it is appropriate for all AtoN Unit Types to enter Standby mode when there is sufficient time until the next "event". An "event" may be something other than a scheduled transmission. For example, in the Zeni "Type D" units, there is a smart Daughter Board that requires certain interaction with the AtoN Mother Board (ARM Processor). In these units an "event" may be a required notification to the Daughter Board that construction of a particular message type must commence.

Because it may be annoying and inconvenient for an AtoN to keep entering Standby state on the bench, a couple of enhancements have been provided as of Rev 1.14H of the ARM software. The first enhancement is that the unit can be awakened from Standby by simply hitting a key at the ARM console. There may be a couple of seconds before the unit appears to have responded, and on some occasions it may be necessary to hit a key more than once.

A more persistent solution to the annoying shutdowns is to disable the Standby operation while testing. This can be done by using the **^P^P** sequence (P key twice, with Ctrl key pressed). This sequence toggles the Standby Enable on and off, and it is important that Standby be enabled before a unit leaves the factory.

APPENDIX C

WATTS	dBm		WATTS	dBm			WATTS	dBm	
17.7	42.48		13.8	41.399			12.6	41.004	
17.6	42.455	**(+) 1.5 dB**	13.7	41.367			12.5	40.969	
17.5	42.43		13.6	41.335			12.4	40.934	
17.4	42.405		13.5	41.303			12.3	40.899	
17.3	42.38		13.4	41.271			12.2	40.864	
17.2	42.355		13.3	41.239			12.1	40.828	
17.1	42.33		13.2	41.206			12	40.792	
17	42.304		13.1	41.173			11.9	40.755	
16.9	42.279		13	41.139			11.8	40.719	
16.8	42.253		12.9	41.106			11.7	40.682	
16.7	42.227		12.8	41.072			11.6	40.645	
16.6	42.201		12.7	41.038			11.5	40.607	
16.5	42.175		12.6	41.004			11.4	40.569	
16.4	42.148		**12.5**	40.969	**Nominal**		11.3	40.531	
16.3	42.122		12.4	40.934			11.2	40.492	
16.2	42.095		12.3	40.899			11.1	40.453	
16.1	42.068		12.2	40.864			11	40.414	
16	42.041		12.1	40.828			10.9	40.374	
15.9	42.014		12	40.792			10.8	40.344	
15.8	41.987		11.9	40.755			10.7	40.294	
15.7	41.959		11.8	40.719			10.6	40.253	
15.6	41.931		11.7	40.682			10.5	40.212	
15.5	41.903		11.6	40.645			10.4	40.17	
15.4	41.875		11.5	40.607			10.3	40.128	
15.3	41.847		11.4	40.569			10.2	40.086	
15.2	41.818		11.3	40.531			10.1	40.043	
15.1	41.79		11.2	40.492			10	40	
15	41.761		11.1	40.453			9.9	39.956	
14.9	41.732		11	40.414			9.8	39.912	
14.8	41.703		10.9	40.374			9.7	39.868	
14.7	41.673		10.8	40.344			9.6	39.823	
14.6	41.644		10.7	40.294			9.5	39.777	
14.5	41.614		10.6	40.253			9.4	39.731	
14.4	41.584		10.5	40.212			9.3	39.685	
14.3	41.553		10.4	40.17			9.2	39.638	
14.2	41.523		10.3	40.128			9.1	39.59	
14.1	41.492		10.2	40.086			9	39.542	
14	41.461		10.1	40.043			**8.9**	39.494	**(-) 1.5 dB**
13.9	41.43		10	40			8.8	39.445	