RSI RADIATION SOLUTIONS INC

RS-700 User Manual

With RSX-1/RSN-4 or RSX-3 Detector Packs

CARBORNE SYSTEM

Revision 2.07 – April 2016

RadAssist Software Version 5.6.x.x

Part Number D-1004

Revision History			
Date	**Revision**	**ECO #**	**Description**
May 20,2014	01.00	NA	New PN and Rev in accordance with PN restructuring and QCBD software issues
Aug 14, 2014	01.01	NA	Update Revision History
Oct 15, 2014	01.02	30	Update to reflect new RadAssist software v5.5.0.0
Oct 30, 2014	01.03	NA	Add cable PN K-1117 to parts list
Nov 10, 2014	02.00	42	Reformat manual structure and update graphics
May 27, 2015	02.01	66	Update manual to include improved connector between detector Packs (RSX-1 and 3) to Front Panel
Aug 06, 2015	02.02	73	Add table for RS-700 series power requirements
Sept 29, 2015	02.03	78	Update to reflect new RadAssist software v5.5.7.0. Add Appendices for RSI Mobile Systems POD Install, Wireless Nano Router, and WiFi Bridge
Nov 06, 2015	02.04	87	Update to reflect new RadAssist software v5.5.10.1. Change company address.
Jan 29, 2016	02.05	94	Update to reflect new RadAssist software v5.6.0.0
Mar 16, 2016	02.06	99	Add Section 5.4 Power Input
Apr 14, 2016	02.07	103	Update Section 2.8 Detectors - Mobile Setup – add Option

Product Manual - Disclaimers:

Due to our efforts to continuously improve this product; specifications, dimensions, operating features and procedures described in this manual are subject to frequent changes. The printed version of this manual reflects only the configuration current at the time of printing. The most current version of the manual is provided in electronic format on the Product Support CD supplied with the instrument. Please refer to the electronic version of the manual for the most accurate interpretation.

RSI RADIATION SOLUTIONS INC

CONFIDENTIAL DISCLOSURE

USERS ARE HEREBY NOTIFIED THAT THIS MANUAL CONTAINS TECHNICAL INFORMATION OF A PROPRIETARY NATURE. THIS INFORMATION IS NECESSARY FOR TECHNICALLY KNOWLEDGEABLE USERS TO UNDERSTAND SYSTEM OPERATION AND TO SATISFY THEMSELVES THAT THE SYSTEM IS PERFORMING CORRECTLY.

RADIATION SOLUTIONS INC ACCEPTS THAT IT IS THE RIGHT OF SUCH USERS TO BE PRIVY TO THIS INFORMATION. HOWEVER THIS DOCUMENTATION IS PROVIDED SOLELY FOR THE BENEFIT OF OWNERS OF THE RS-700 SYSTEM AND DISSEMINATION OF THE DETAILED TECHNICAL INFORMATION PROVIDED MAY BE CONSIDERED AS LEGALLY CONTRAVENING THE NORMAL SUPPLIER/CUSTOMER RELATIONSHIP.

UNAUTHORIZED RELEASE OF DETAILED TECHNICAL INFORMATION TO A THIRD PARTY WILL BE CONSIDERED AS A CONTRAVENTION OF USER AGREEMENTS.

Manufactured by Radiation Solutions Inc, 5875 Whittle Road, Mississauga, Ontario, Canada, L4Z 2H4

Table of Contents

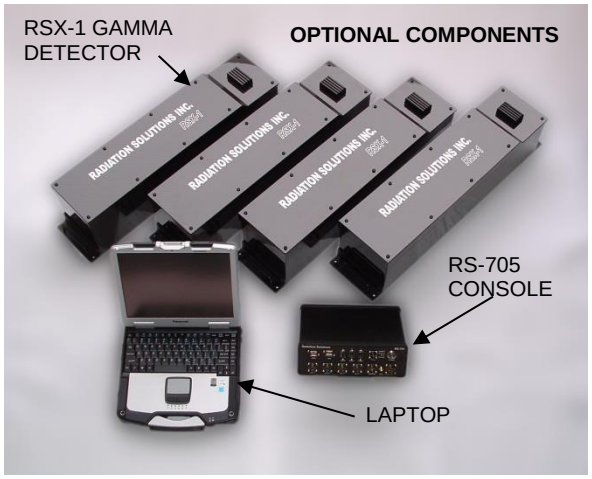
System Configuration

This manual applies to the following system configuration:

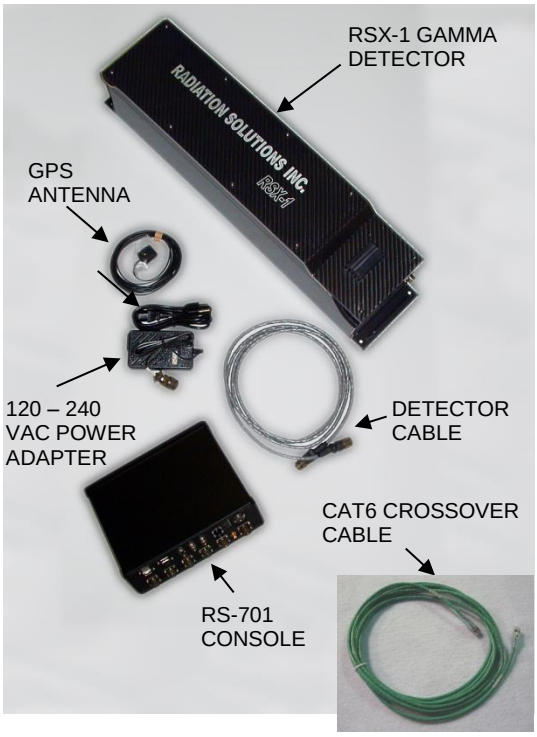
Note: *See RS-700 RadAssist User Manual Part Number D-1013 for details concerning Software Installation and Use.*

Basic Components:

- RS-701 Console
- RSX-1 Gamma Detector (NaI)
- GPS Antenna
- 120-240VAC Power Adapter
- Detector Cable
- Cat6 Crossover Cable
- External DC Power Cable (Not Shown)



BASIC COMPONENTS



Optional Components:

- Laptop
- RS-705 Console
- RSN-4 Neutron Detector (Not Shown)
- Additional RSX-1 Gamma Detector (NaI) (System supports up to 4 detectors)
- GM Detector Tubes (Low and High Ratio)
- Wireless Radio Modem (Not Shown)
- Rooftop Carrier Unit (Not Shown)

System Requirements:

The Laptop Computer must have, at minimum, a configuration similar to the following:

Hardware:

- PC-compatible computer, Standard Laptop (current)
- RJ45 Ethernet Connection

OS Software:

- Microsoft® Windows® 98, NT or 2000
- Microsoft® Windows® XP Professional
- Microsoft® Windows® Vista
- Microsoft® Windows® 7 Professional
- Microsoft® Windows® 8.1 Professional

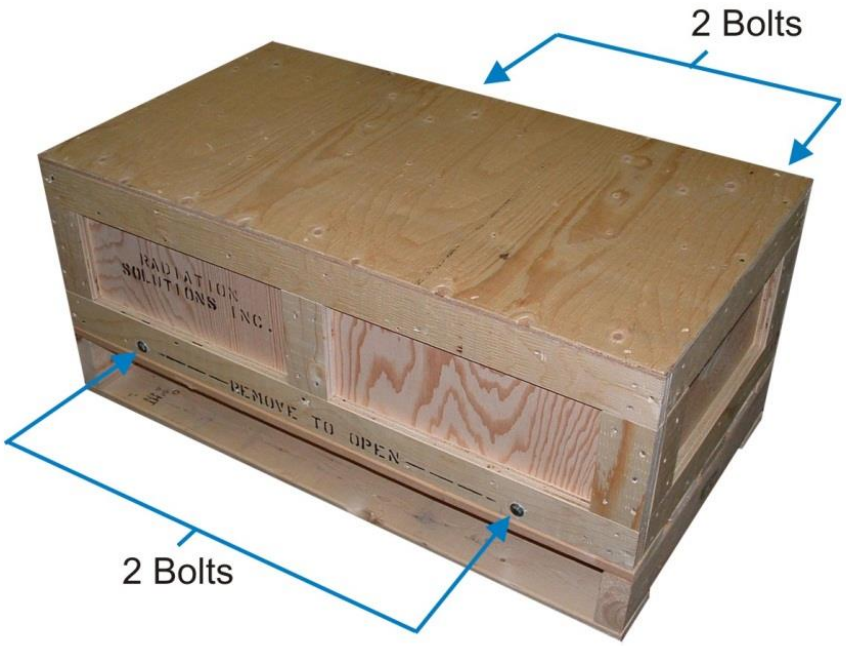
RS-700 System Software:

- RadAssist Software Version 5.6.x.x
- ESRI Software Version 2.0
- Software License

RS-701 Console:

- Console Firmware Version 4.4.0

Caution: The shipping crate is designed to be reusable and easy to remove from the detector pack. To open the crate, remove the 4 bolts around the base of the crate as shown.



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1.0 INTRODUCTION

Note: *This Manual is concerned with the hardware setup and configuration of the RS-700 series console systems with detectors. See the RS-700 RadAssist User Manual PN; D-1013 for details concerning Software Installation, Navigation and Use.*

1.1 General

The RS-700 series is a state-of-the-art Carborne/Airborne and Marine Spectrometer System used for Radiation Monitoring applications. This new system features very advanced components; Digital Signal spectrometers, integrated GPS, Gamma and Neutron Detector systems, Geiger-Muller (GM) Systems and a specially designed Carbon-Fiber detector package construction.

1.2 Acronyms

The following Acronyms are used throughout this manual:

Hardware	**ADS**	Advanced Digital Spectrometer
	CIB	Console Interface Board
	CPU	Computer Processing Unit
	DIB	Detector Interface Board
	DPU	Detector Processing Unit
	DPA	Divider Preamp Assembly
File Extensions	**SBL**	Stabilizing Log
	EVL	Event Log
	SUC	Software Update Control
	RFL	Radiation File Log
Parameters	**DOCH**	Data Output Channel
	LINT	Linearization Table
	OOR	Out of Range
Connections	**AUX**	Auxiliary
	DB9	RS232 9 pin Connector
	RJ45	Ethernet Connector
General Names	**RSI**	Radiation Solutions Inc.
	RSX	Radiation Solutions Detector

1.3 RS-700 System Feature

A more detailed view of the RS-700 system is shown below.

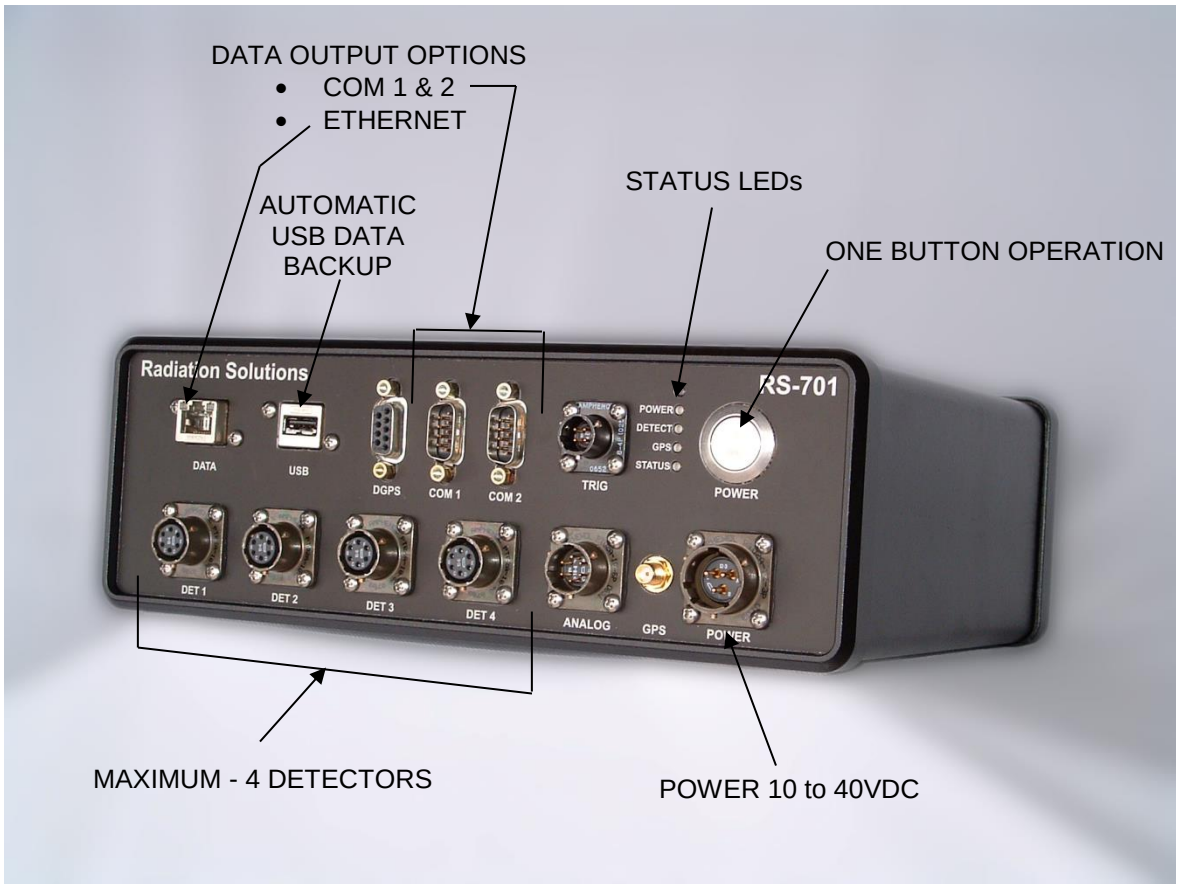
Detector Features are:

1. **State-of-the-art GAMMA detectors**

   The RSX-1 detector consists of a 4L (256 cu in) Sodium-Iodide (NaI) detector coupled to a PMT system which produces high quality analog signals for Digital analysis by the ADS module. The ADS (Advanced Digital Spectrometer) module processes the incoming gamma ray pulses to produce a fully LINEARIZED 1024 channel spectrum for additional analysis with the RadAssist software. These spectra are fed by 1Mbps/sec RS-485 data connections to the system console. The ADS spectrometer is the latest technology in this field and obsoletes all other previous instrumentation in its ability to achieve very clean linearized spectra, at very high throughput data rates and up to 10/sec data sampling. This makes the unit ideal to handle the wide dynamic range of radiation data seen in Airborne and Field Mobile (Carborne) vehicle applications. The RS-700 system supports up to 4 RSX-1 detectors.

2. **State-of-the-art NEUTRON detectors**

   The RSN-4 detector consists of 4 x He3 tubes mounted in a poly moderator. The tubes are mounted in a 2x2 array to give optimum performance. Each tube has an advanced 128-channel spectrometer system with unique design to essentially remove EM and Shock/Vibration interference. In addition each unit has independent HV power supplies. The 4 electronics are bussed together on an RS-485 bus for easy connection to the RS-701 Console.



3. **Integrated Console (RS-701 Console)**

The RS-701 console is a compact unit, physically very small in size but is a fully integrated system with a powerful operational capability as described below:

a. Full AUTOMATIC System Gamma Gain Stabilization

The console uses proprietary analysis techniques to automatically adjust the Gain of the detectors to compensate for changing temperature and aging drift effects.

The system uses Natural Radioactive isotopes present in all ground material to stabilize the system at startup and maintain this gain automatically during system use WITH NO USER INPUT REQUIRED.

Newly developed technology uses multiple peak stabilization for fast accurate gain stabilization typically 10-20 times faster than older systems. A detector typically takes less than 5 minutes to be fully stabilized even in low radiation areas and 1-2 minute stabilization is common.

b. **ONE BUTTON OPERATION**

The RS-700 system is truly a ONE-BUTTON operational system. After connecting all system cables - PRESS and HOLD the **POWER** button until the front panel LEDs come on (typically 10 seconds) – then release the POWER button. On power up the system checks system internal performance and then automatically starts the stabilization process on all connected detectors as well as initializing the GPS etc. Front panel LEDs denote the system status, so typically 3 minutes after power ON, the system LEDs go GREEN to show that the system is now fully operational. See **Section 4.2.4** for detailed information.

Note: After pressing the button ONCE to power **ON** the user has had to perform no other functions.

c. **INTEGRATED GPS**

The system has an internal GPS module so only the external GPS antenna connection is required to enable the system. The GPS provides positional data, time, as well as providing the system synchronization for all detectors.

d. **DIFFERENTIAL GPS**

The system permits connection of an External Differential Signal as required to greatly improve positional accuracy (any RTCM signal may be used).

e. **RS-232 Inputs**

In addition to the Differential GPS RS-232 input there are 2 other COM ports (COM1 and COM2) that permit connection of ancillary equipment to the system.

f. **Analog Inputs**

The system supports two Analog inputs that can be used for Altimeters or Temperature data input as required

g. **Data Format**

The system supports various data formats that permit easy integration of the data. Data formats are user selectable and the system integrates Gamma-Ray, GPS and other input data into an integrated format to suit the application.

The recommended format is:

- To use the RSI data format as data collection and the Analysis/Display on an external system laptop.
- Additional data outputs are available for special applications.

h. **Internal Data Storage**

The RS-701 console has an internal Flash disk that stores all system operational parameters, event logs, stab logs and all raw data on the system when operational. This data is stored in a flash disk that requires no battery backup so the data is permanently stored until the user erases it. 24 hours of data is stored.

4. **Integrated Console (RS-705 Console)**

The RS-705 console is the same as the RS-701 console with the following exceptions as described below:

a. **DIFFERENTIAL GPS**

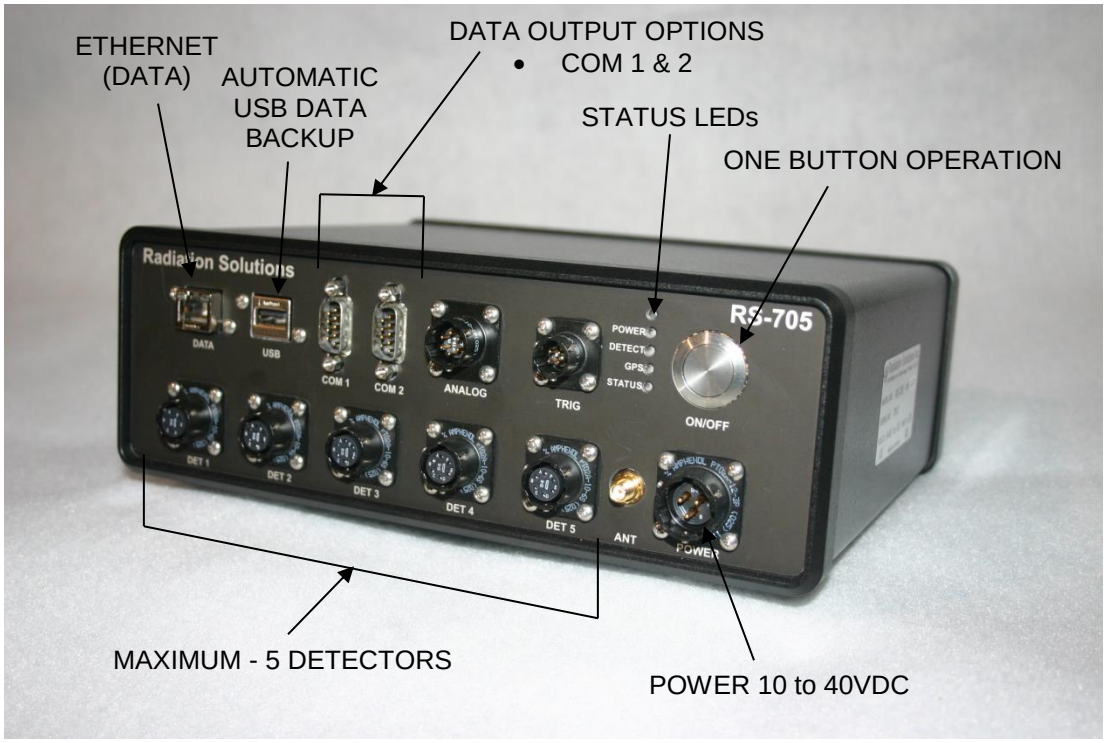
The connector was removed. This function was no longer required.

b. **DETECTORS:**

A connector was added, increasing the maximum to 5 Detectors.

c. **ANALOG INPUT:**

The Analog Input was moved, it is now located next to COM 2.

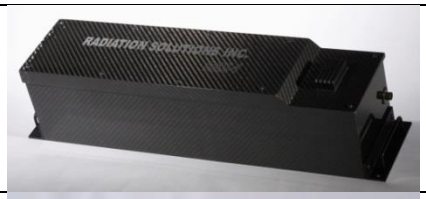


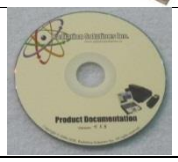
2.0 COMPONENTS

2.1 Basic Parts – Shipped:

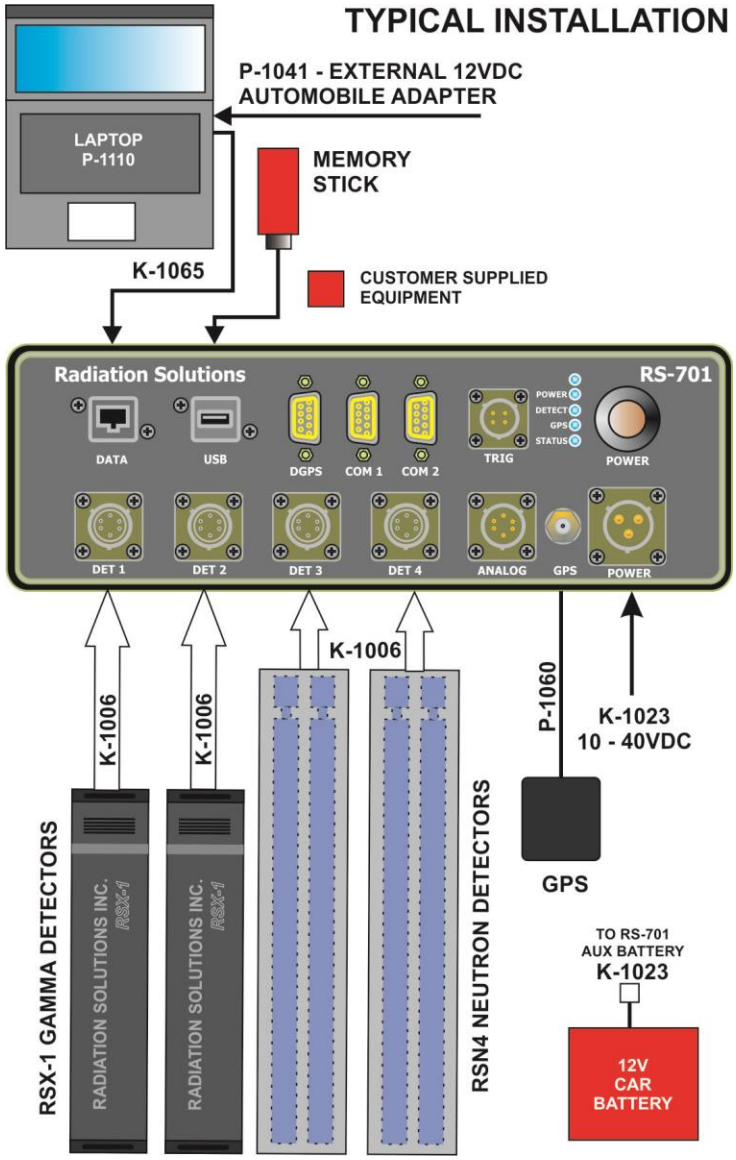
A-1000 RSX-1 Gamma Detector – Standard System Parts Listing (Shipped Parts):

Note: Up to 4 detectors can be used with the **RS-701** console. An option is available to use either the 2x4x16 or 4x4x16 NaI Xtals.

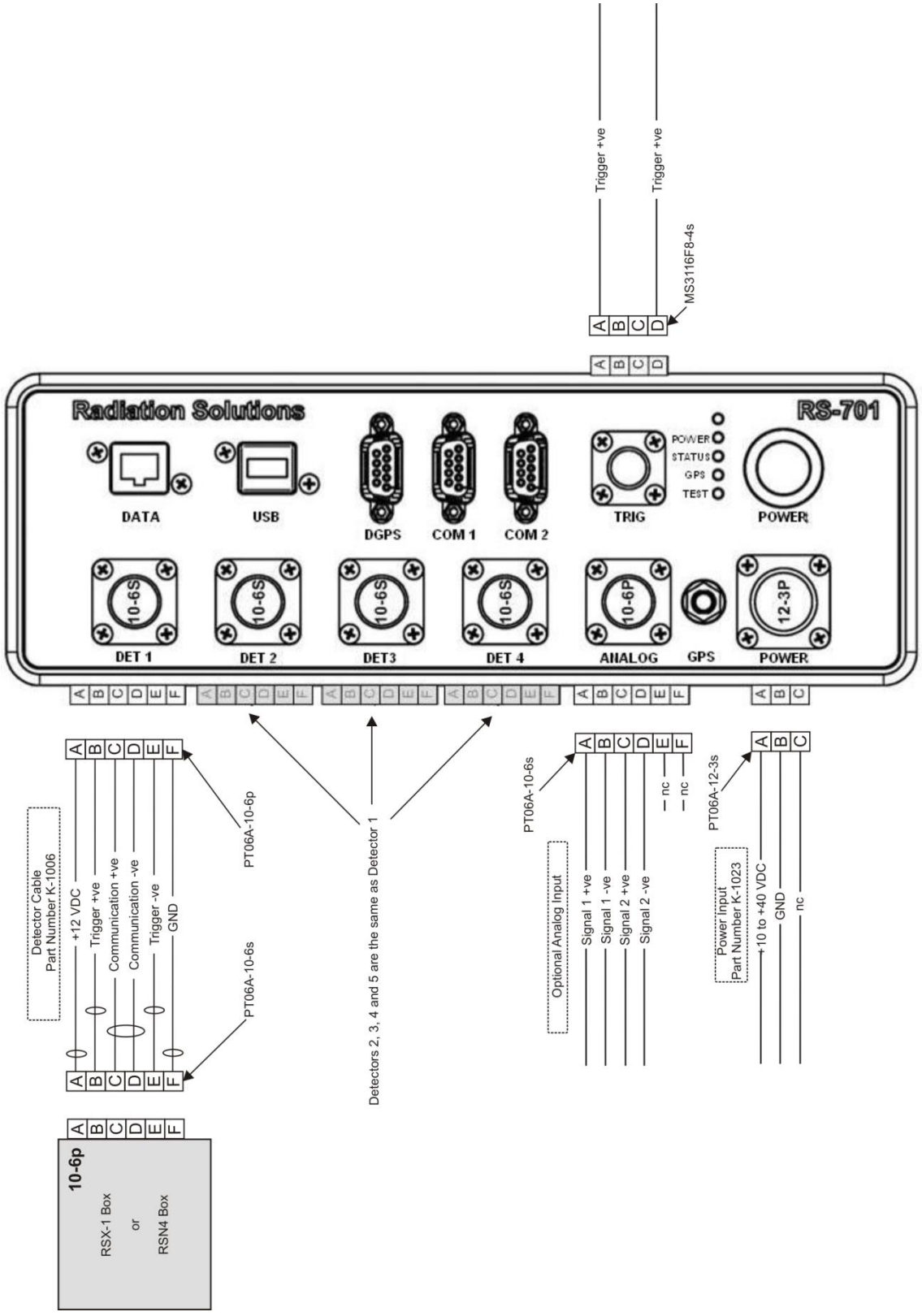
ITEM	PART NUMBER	QTY	DESCRIPTION
	B-1000	1	RSX-1 4x4x16 NaI Xtal
	B-1051	1	RS-701 Console
	K-1006	1	RSX-1 Detector Cable
	K-1065	1	CAT6 Ethernet Crossover Cable
	K1023	1	5m (15ft) DC Power Cable
	C-1078	1	Elpac Converter 120-240VAC – 24VDC Power Adapter
	P-1060	1	Trimble GPS Antenna

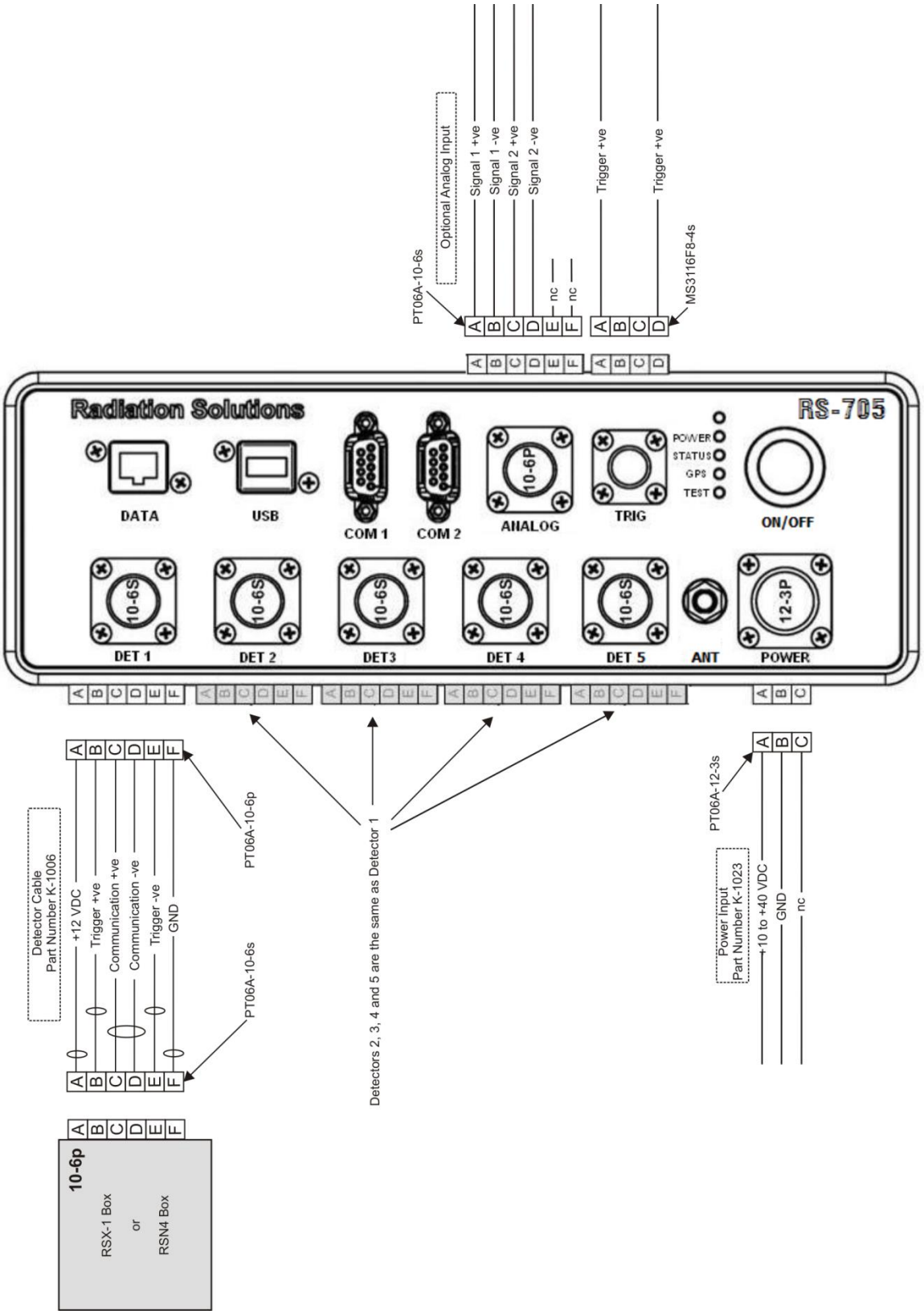
	P-1282	1	Shipping Crate
	XP-1331	1	RS-700 CD containing manual and software

2.2 Typical Installation



2.3 RS-701/705 Interconnect Diagram



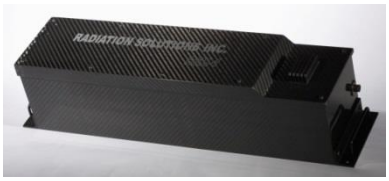


2.4 Carborne Configurations

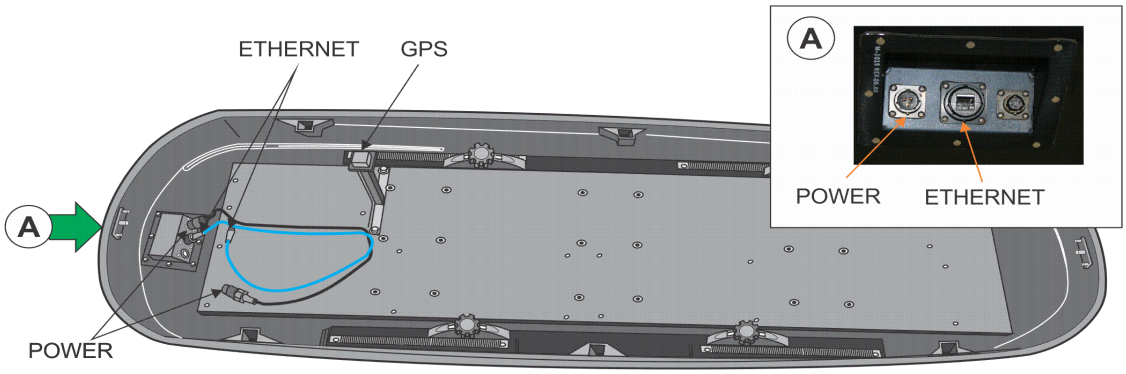
RS-701 series consoles used for mobile detection with RSX-1 and RSN-4 detectors

SHIPPED PARTS – Thule Kit (C-1085)			
ITEM	**PART NUMBER**	**QTY**	**DESCRIPTION**
	C-1085	1	Thule Rooftop Carrier
	K-1021	1	Console Power Cable (Connects to Vehicle Cigarette Lighter)
	K-1044	1	CAT6 Ethernet Patch Cable 5m (16 ft) RED
	K-1045	1	Ethernet Crossover Cable
	K-1117	1	Extension Power Cable
	XL-1251	1	Y-Power Cable (for Laptop & Console) (Connects to Vehicle Cigarette Lighter)
	M-1116	1	Flange Mount – Rear (Use with Thule Carrier)

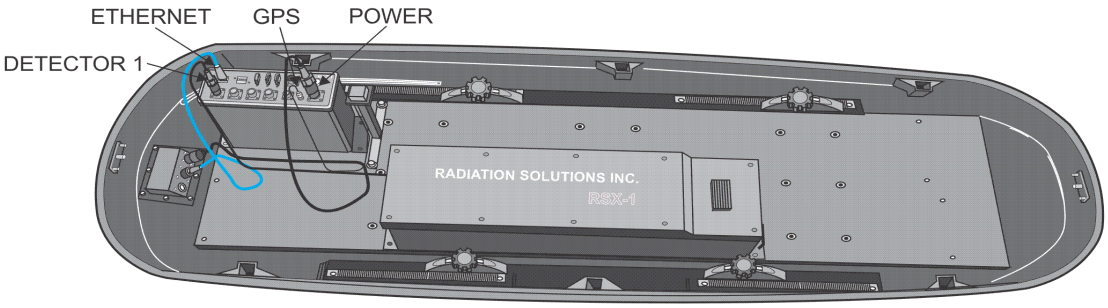
A1014 & A1016 – RSN-4 Neutron Detector			
ITEM	**PART NUMBER**	**QTY**	**DESCRIPTION**
	B-1073	1	RSN-4 Neutron Detector A1014 – RSI supplies Neutron Tubes A1016 – Customer supplied Neutron Tubes
	K-1006	1	RSX-1 Detector Cable

A1100 – RSX-1 Detector			
ITEM	**PART NUMBER**	**QTY**	**DESCRIPTION**
	B-1000	1	RSX-1 4x4x16 NaI Xtal
	K-1006	1	RSX-1 Detector Cable

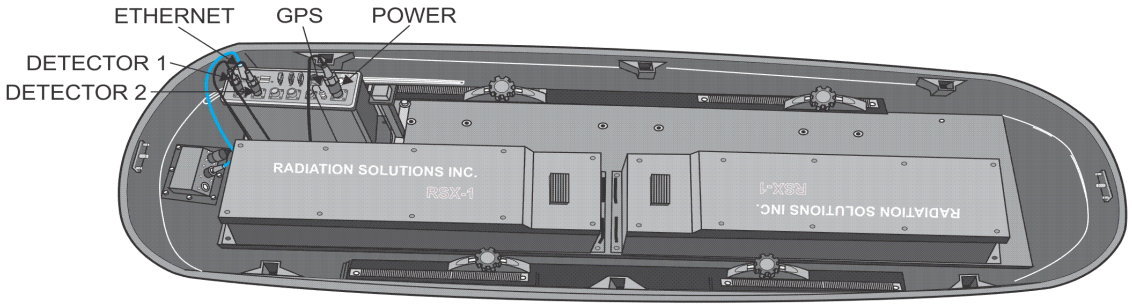
The following diagram shows the various Thule configurations available:



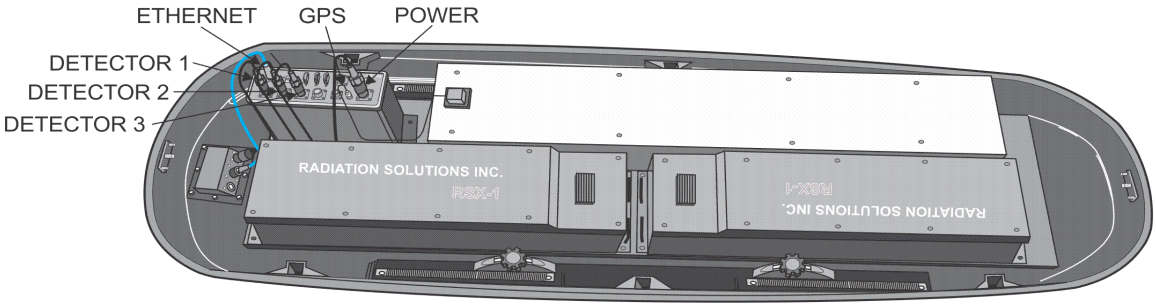
THULE CARRIER - EMPTY



THULE CARRIER - RS-701 & RSX-1 Detector



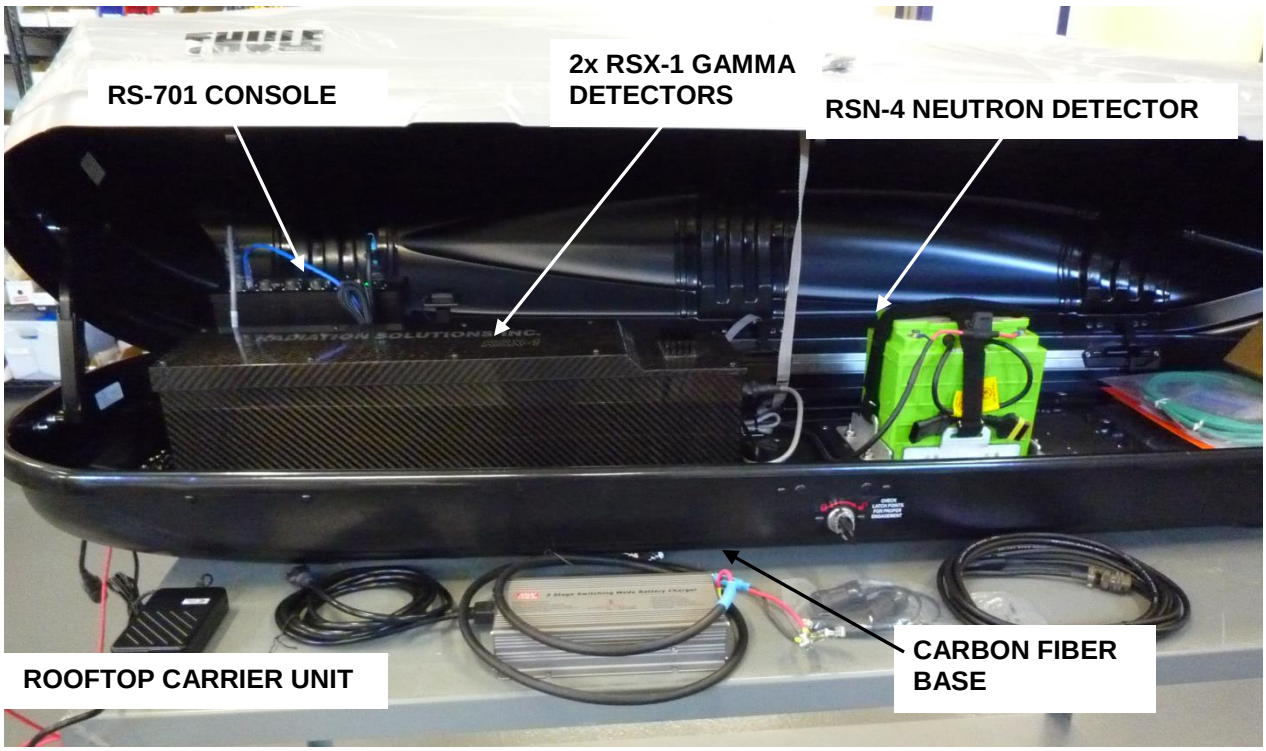
THULE CARRIER - RS-701 & 2 - RSX-1 Detector(s)



THULE CARRIER - RS-701, 2 - RSX-1 AND 1 - RSN-4 Detector(s)

2.5 Hardware Install - Carborne

A typical system installation is shown in the figure below. This shows the ROOFTOP carrier unit installed on the top of a vehicle, with the two side-clamps being used to lock it to the vehicles' rooftop crossbars.



Warning: A structurally reinforced roof rack is required to handle the weight of the detector box. A standard car manufactures' roof rack may be insufficient to handle the load. Check your vehicle owners' manual for weight restrictions before proceeding. The rooftop carrier unit with RSX-1 detector(s), an RSN-4 detector, battery and console + GPS weighs approximately **220lbs (100Kgs)** as shown above.

Mounting the ROOFTOP Carrier Unit:

NOTE: THE ROOF MOUNTING RACKS MUST BE POSITIONED TO THEIR MAXIMUM WIDTH as defined by the Rooftop unit clamps to provide maximum stability and safety.

The Rooftop Carrier Unit may either be mounted using a fork lift truck or manually as described below:

a) **WITH FORK-LIFT** - the system shipping box is designed to permit a **fork-lift truck** to pick up the entire assembly and position it on top of the vehicle, permitting easy connection to the reinforced roof rack.

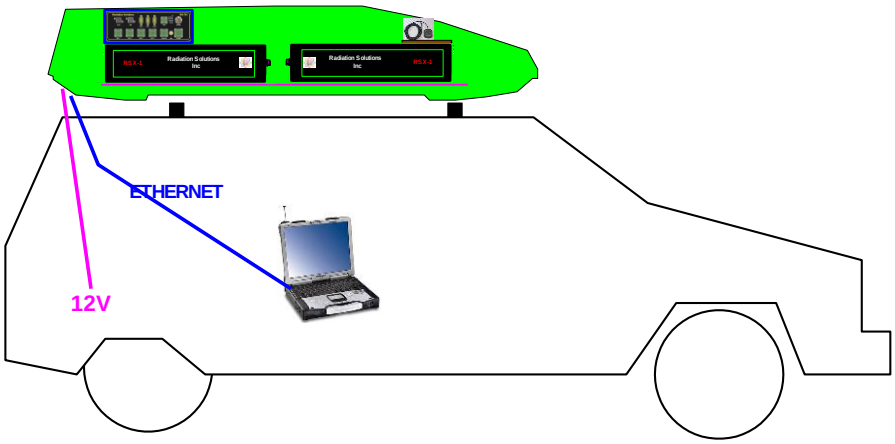
b) **NO FORK LIFT** – in this case the lid of the Rooftop Carrier Unit should be removed along with the 3 detectors (as shown in the figure above). The detectors' screw threads are embedded in the base plate for easy removal. Then install the Rooftop Carrier Unit minus components (approx. 35 (16Kgs) manually and connect it to the reinforced roof rack. Manually install each component in place and connect correctly.

c) Finally replace the Rooftop Carrier Lid.

Note: Once positioned the clamps should be firmly tightened to ensure maximum stability.

2.6 Cable Installation

The Rooftop unit has a 3 connector mounting plate at the rear. Connect the supplied ETHERNET and 12V POWER connectors to this plate, feed then through the windows into the vehicle in a secure manner then connect them to the Laptop and 12V power source



NOTE:

a) The CONSOLE is mounted inside the Rooftop Carrier Unit to minimize cabling.

b) The GPS antenna is mounted inside the Rooftop Carrier Unit to minimize cabling.

Only the Ethernet connection to the laptop and the 12VDC power source cables are connected externally to the Rooftop Carrier Unit.

CABLING

a. **RS-700 POWER** – the system is supplied with 2 power supply systems.

MAIN POWER cable is a 5m (15 ft) cable intended for direct connection to the vehicle (or Aircraft) power system.

Convention is:

WHITE = + 9 to 40VDC. Aircraft are normally 28V and vehicles 12V, so connection to either is possible. Note optional special Power cable to "Cigarette Lighter" plug is available for vehicle users.

BLACK = **GROUND**

TEST POWER SUPPLY – this unit runs off 115VAC and supplies 24VDC to the console and is intended for system testing in the office/lab.

NOTE: Some users prefer to run from a Battery pack/**INVERTER** available at most hardware stores. This system provides 115VAC power for the system and the TEST power supply can be used en-route to power the RS-701 console. The advantage of this is that the system is totally independent of the vehicles' system thus the entire system can be considered as "baggage" requiring ONLY Operator approval to ensure equipment will not become loose en-route and endanger the vehicle.

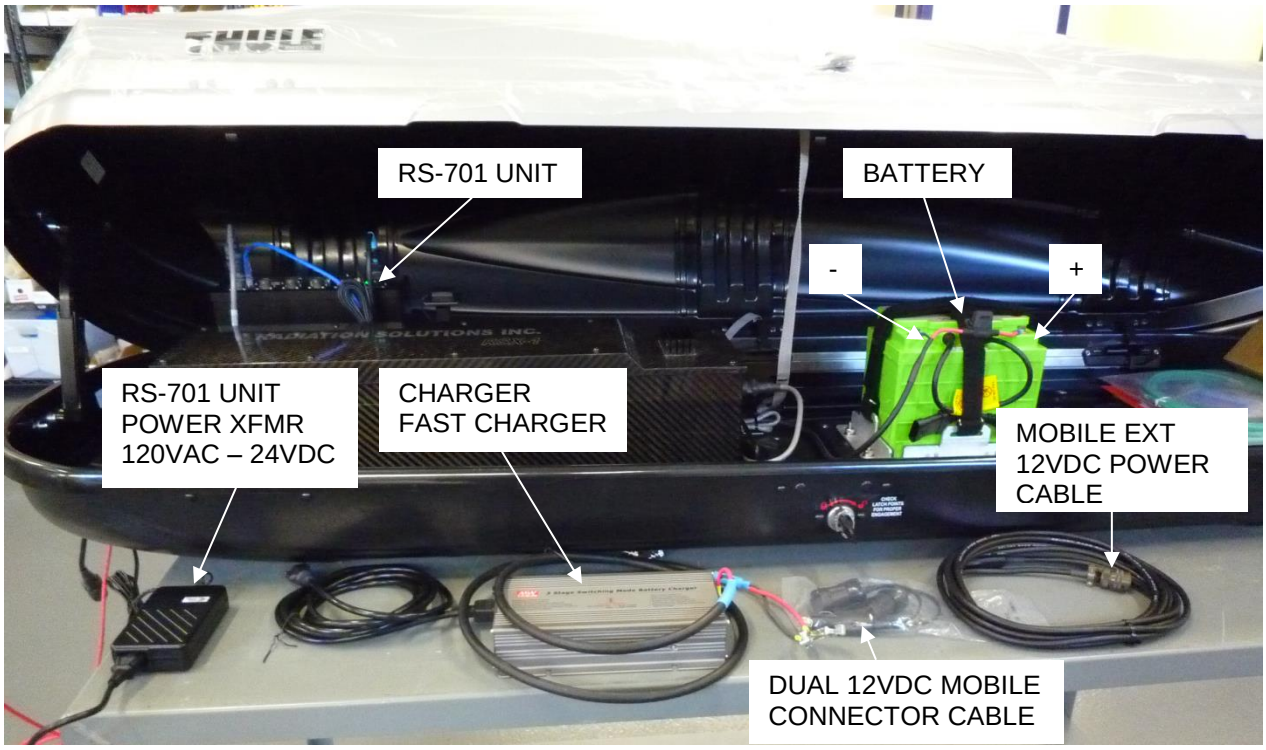
b) **LAPTOP Power**

The Laptop can be used with a special DC power adapter purchased from the computer company OR can be used with its' normal AC power pack if the **INVERTER** systems noted above is used

c) **ETHERNET Connection** – a normal 4m (12ft) Ethernet cable is supplied with the system. This is a special CROSS-OVER cable to let the Computer in the RS-701 Console talk directly to the laptop. The RS-701 uses this cable to connect directly to the laptop Ethernet input.

2.7 Thule Mobile Power Setup

Provided Equipment:



Other Equipment:

The Mobile Laptop power supply connects via the dual 12V Mobile connection. The dual 12V connector as provided is inserted in the vehicles' cigarette lighter and provides a connection for two devices.

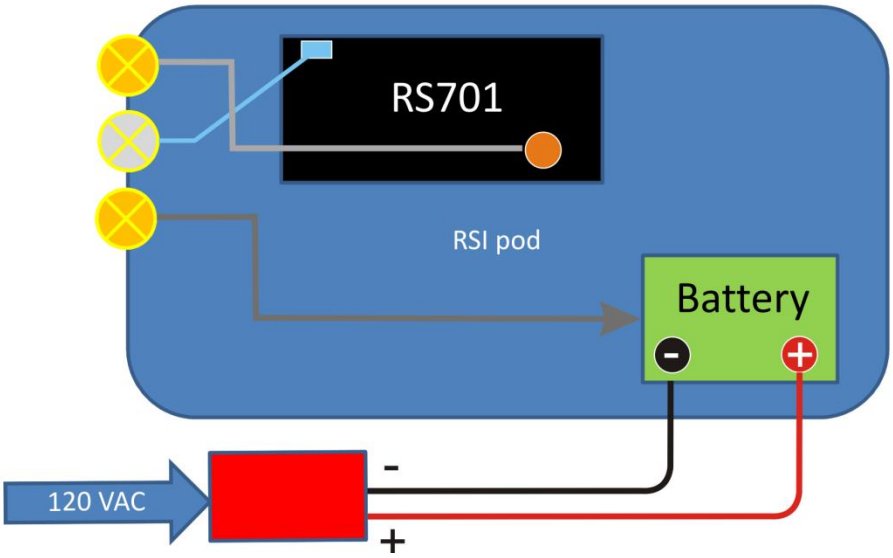
2.7.1 Battery Charging:

The battery can be either charged with a FAST Charge system or SLOW Charge.

Note: The RS-701 System must be turned OFF before charging is attempted.

2.7.1.1 Fast Charge: (charging time – 2 hours)

Connect as follows:



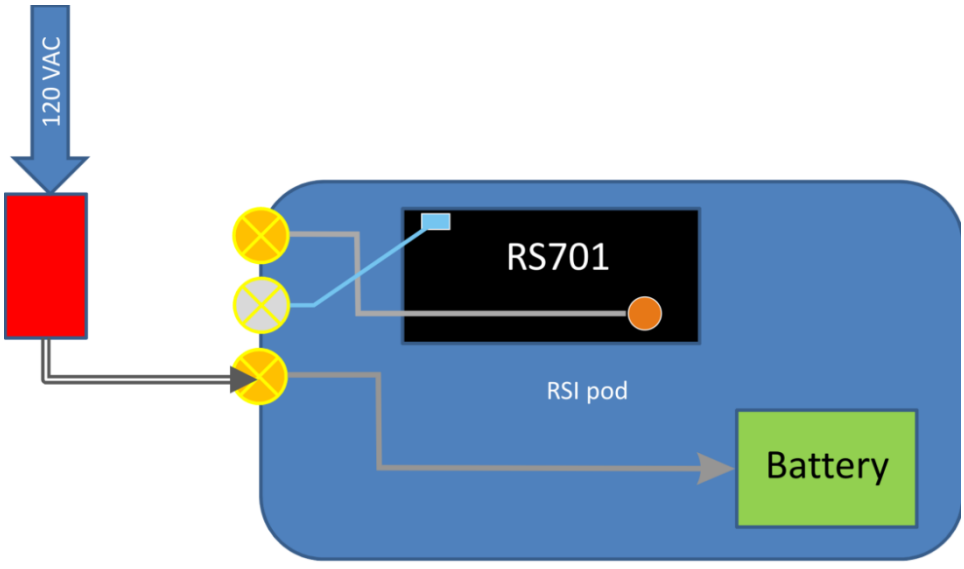
1. Make sure the charger is shut off before starting. Connect the unit to a standard outlet (120VAC/240VAC).
2. Select the correct input voltage range (between 115VAC and 230VAC).

   Note: The selection switch is preset to 230VAC at the factory.
3. Choose the correct polarity, the charger output (+) should be connected to the (+) terminal of the battery and the charger output (-) should be connected to the (-) battery terminal.

   CAUTION: Not following this will severely damage the unit.
4. Set the ON/OFF (0/-) power switch to ON (-) and check that the operation of the LED is correct (Red = Charging, Green = Battery is FULL).

2.7.1.2 Slow Charge: (charging time – approximately 4 hours)

Connect as follows:



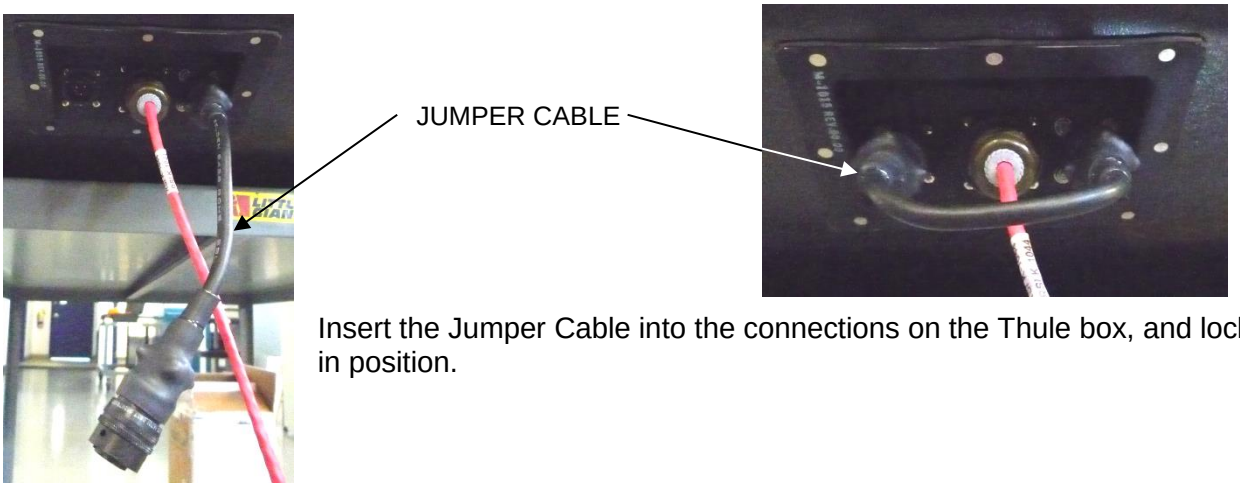
1. Make sure the charger is shut off before starting. Connect the unit to a standard outlet (120VAC).
2. Connect the unit connector to the external battery connection on the Thule box.
3. Turn charger ON and allow the battery to charge.

2.7.2 Power Setups:

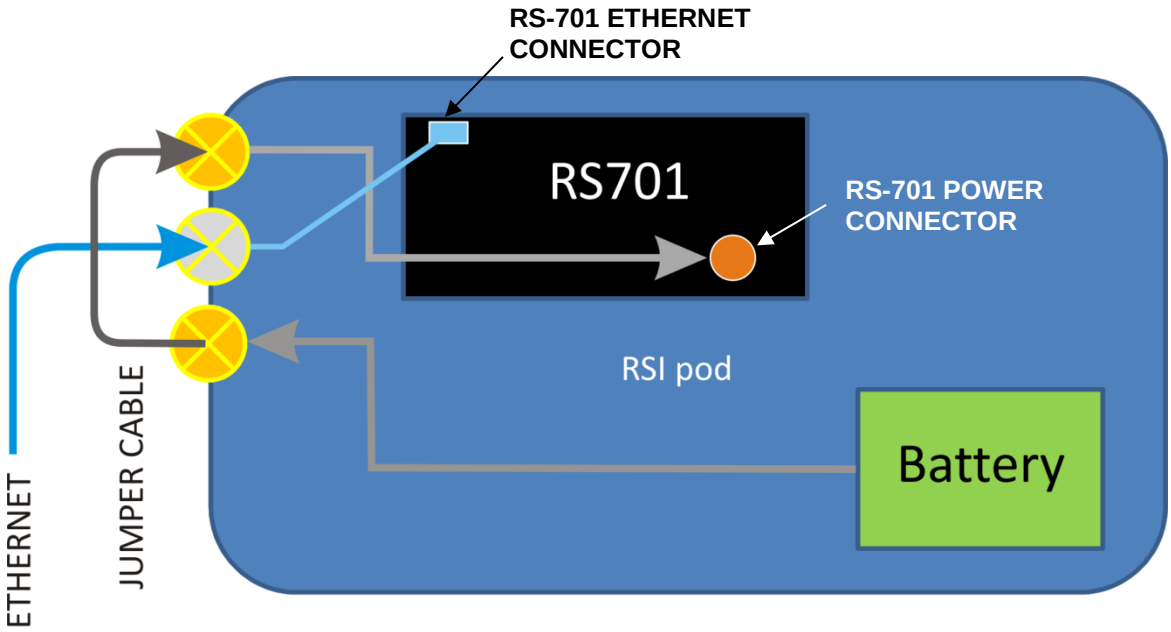
There are three mobile configurations for the power setup with the RS-701.

INTERNAL BATTERY POWER: (Battery provides up to 10 hours of continuous power)

The battery is connected to the RS-701 Unit with the Jumper Cable provided.



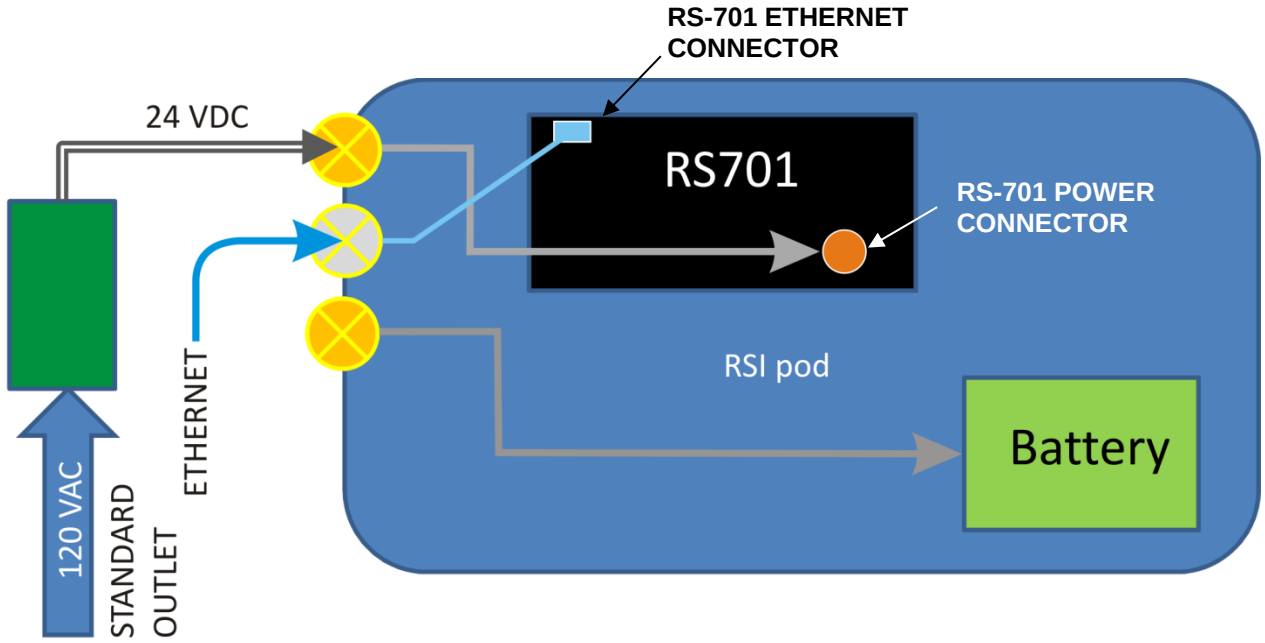
Insert the Jumper Cable into the connections on the Thule box, and lock in position.



2.7.2.1 External Shore Power:

External Power is provided by a transformer. Plug the unit into a standard 120VAC wall outlet and make the connection to the Thule box as shown.

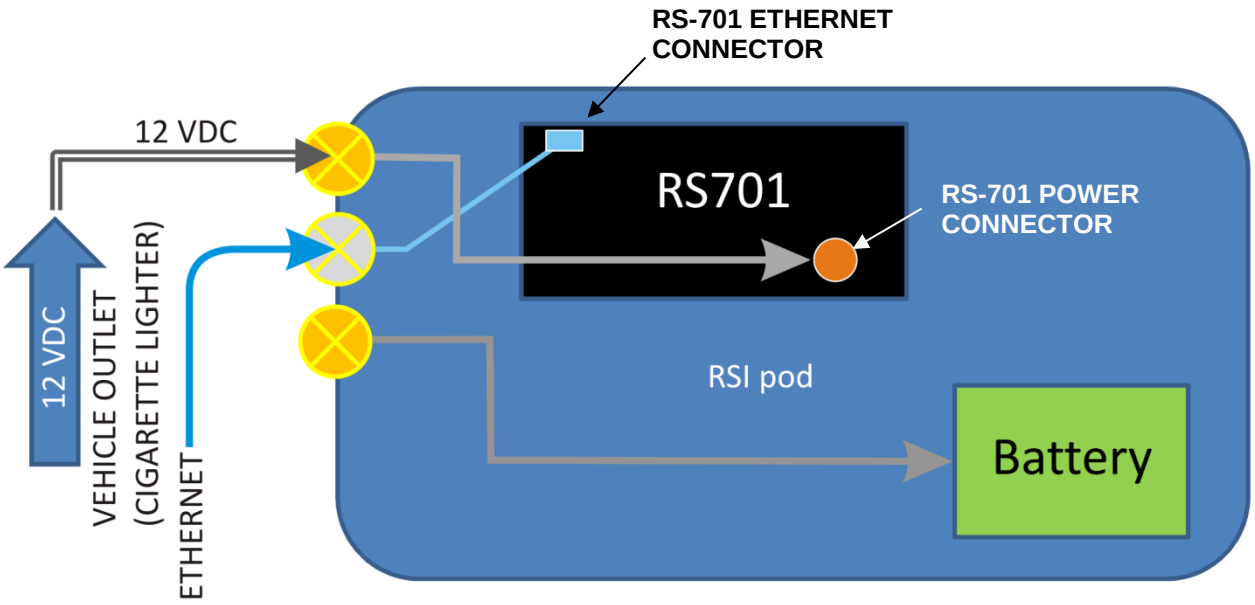
The Transformer provides 24VDC to the RS-701 Unit.



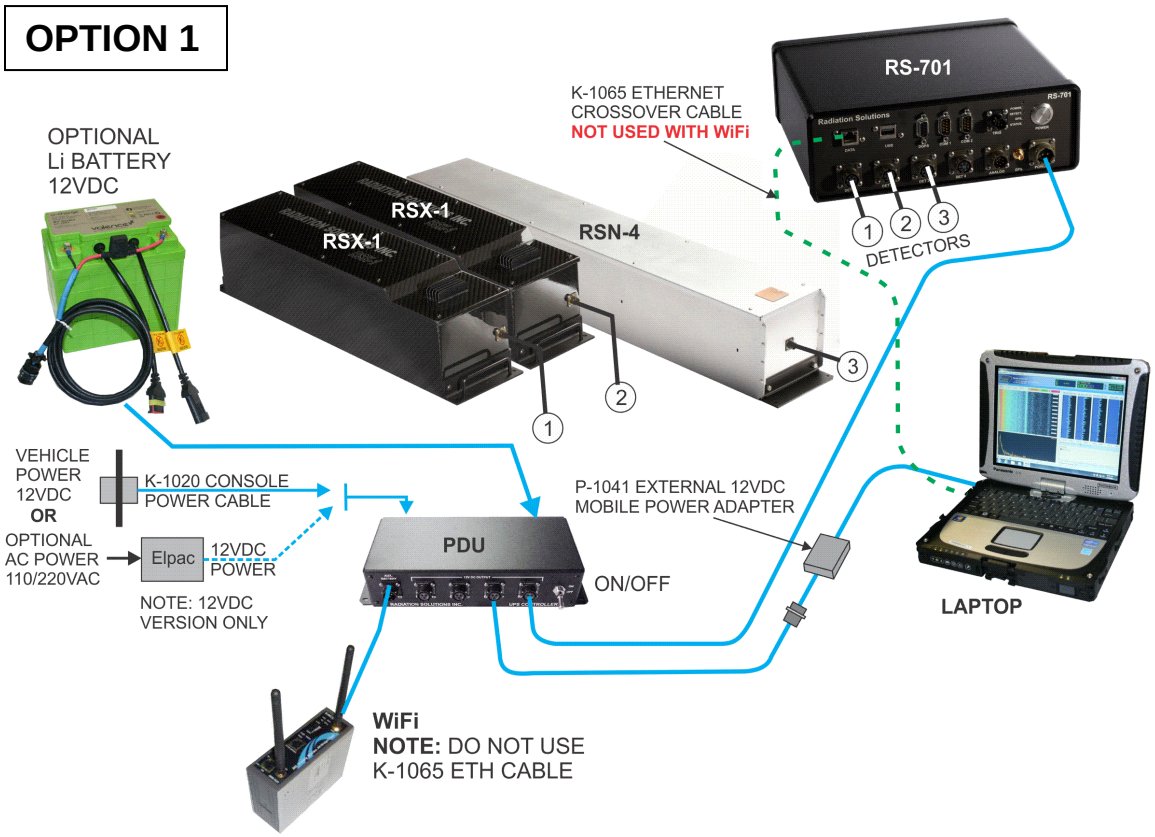
2.7.2.2 Mobile External Power:

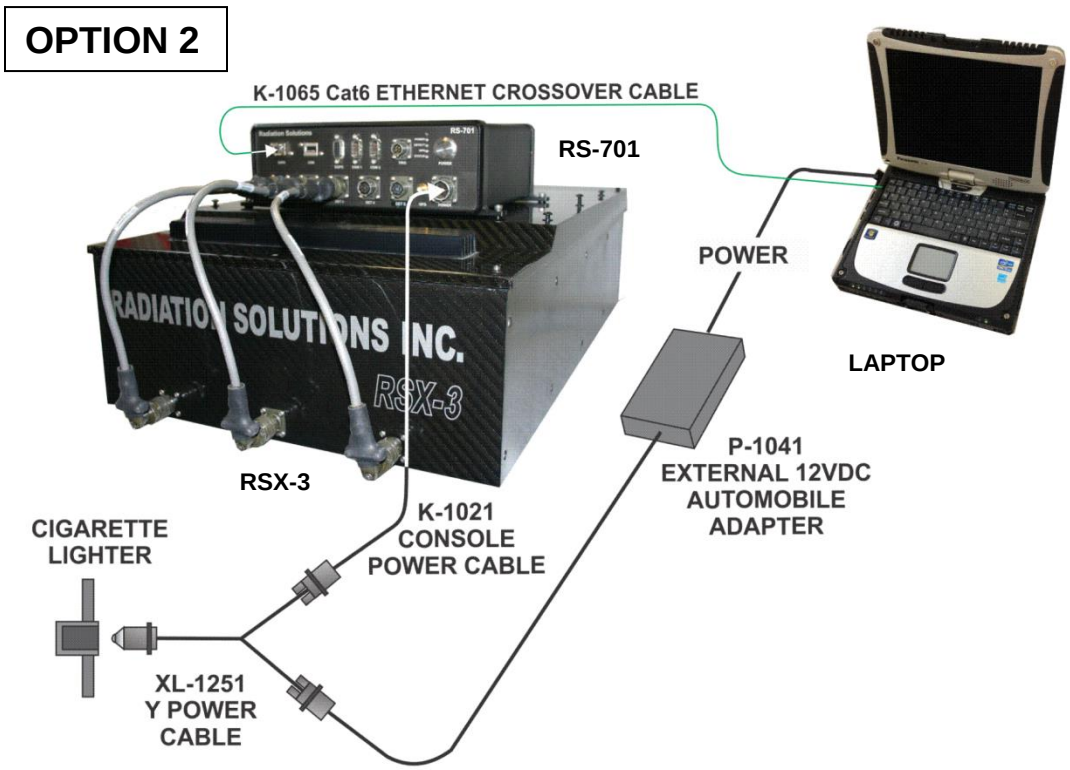
External Power is provided by vehicles' battery. Plug one end of the provided cable into the cigarette lighter of the vehicle. With the other end of the cable make the connection to the Thule box as shown.

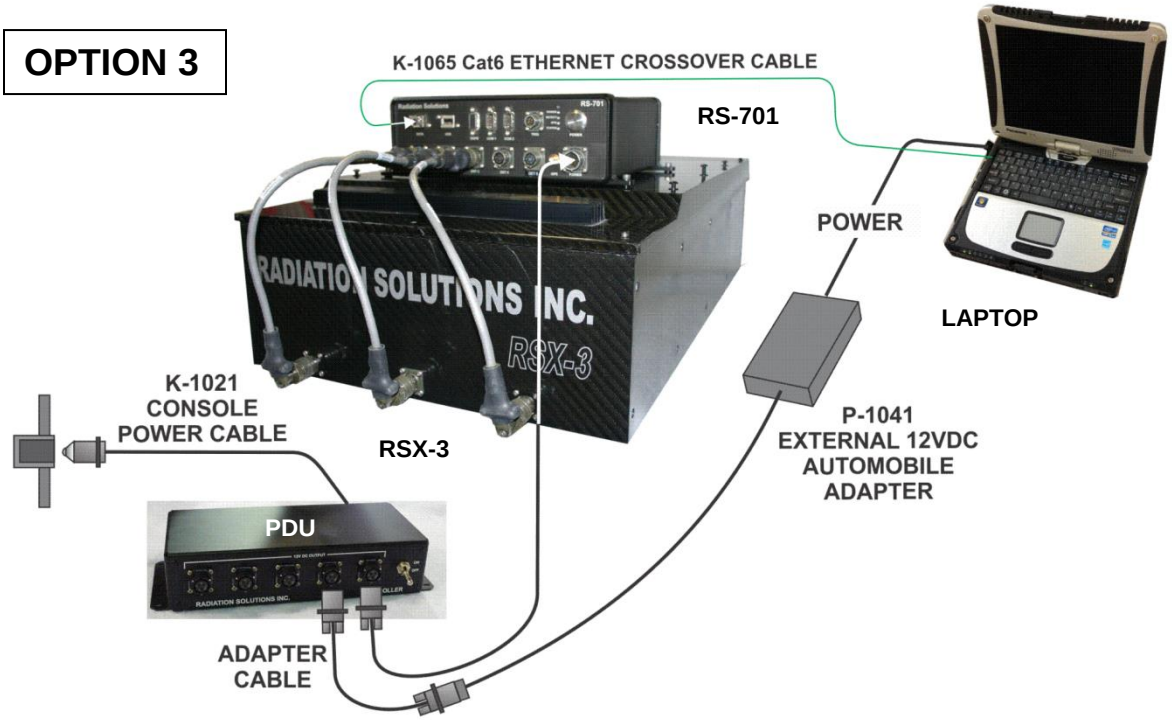
This provides 12VDC to the RS-701 Unit.



2.8 Detectors - Mobile Setup







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3.0 NETWORK SETUP

3.1 Laptop/Network Setup:

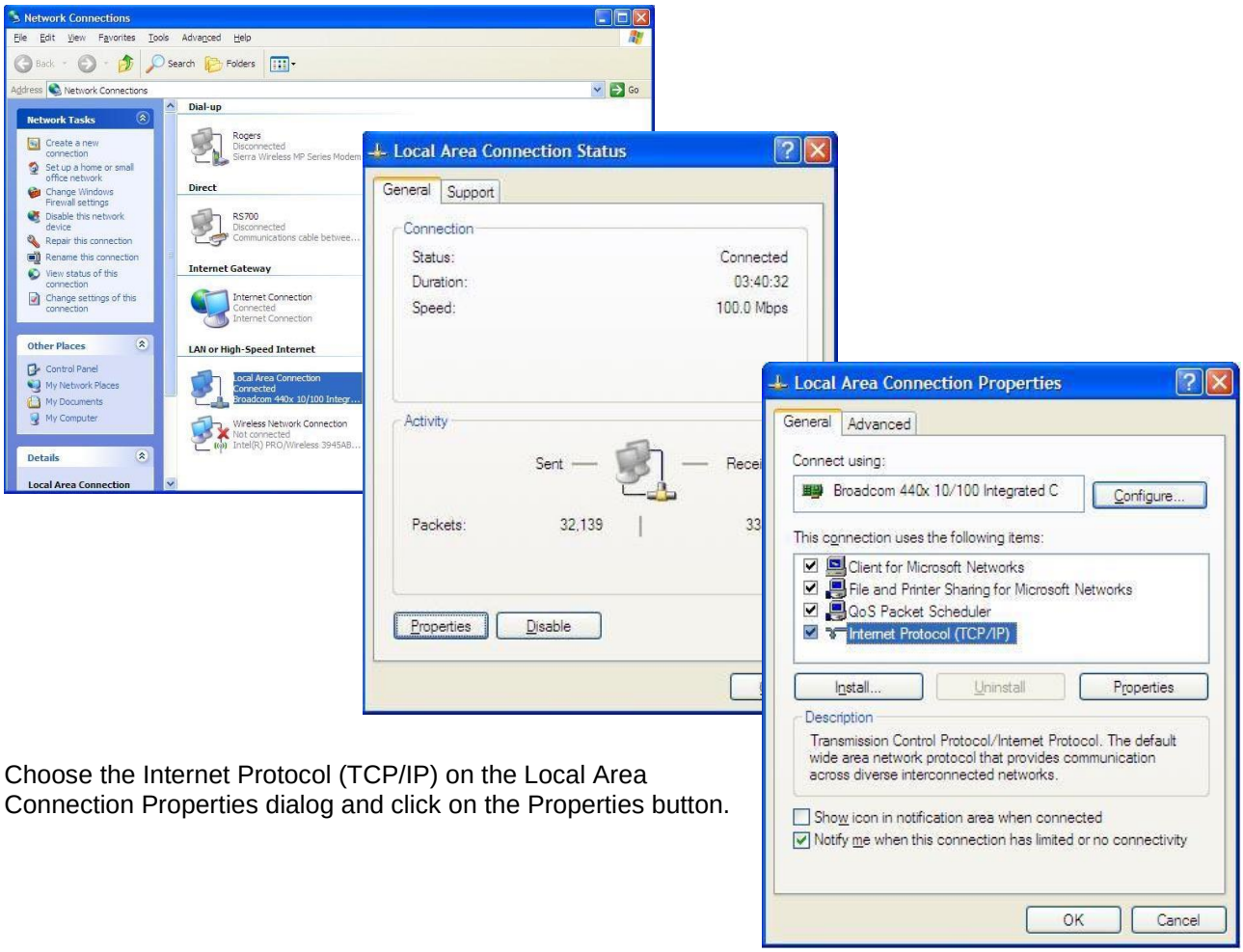
If Laptop to RS-701/705 console has connection problems it is usually because the IP address is not set correctly.

Upon connection to the Console even if the connection fails the Console IP address is displayed on the laptop connection data box and is usually “192.168.1.113” or similar.

Note: All systems prior to shipment are configured with a factory setting - IP Address of 192.168.1.XXX subnet.

For Users with Microsoft® Windows® XP Professional, do the following:

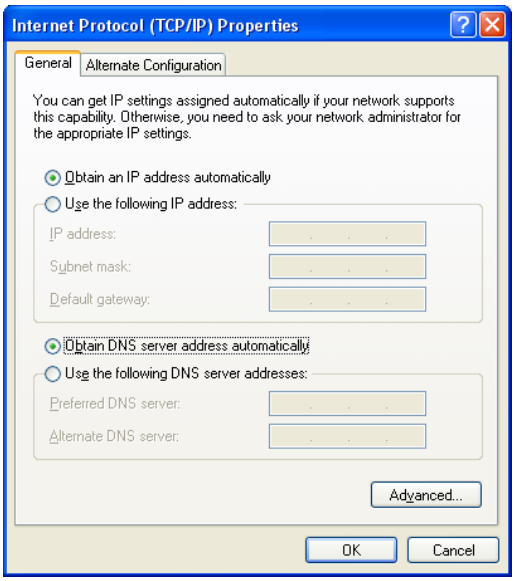
1. On the Laptop select **CONTROL PANEL > NETWORK CONNECTIONS > LOCAL AREA NETWORK CONNECTIONS > PROPERTIES > select INTERNET PROTOCOL (TCP/IP)**



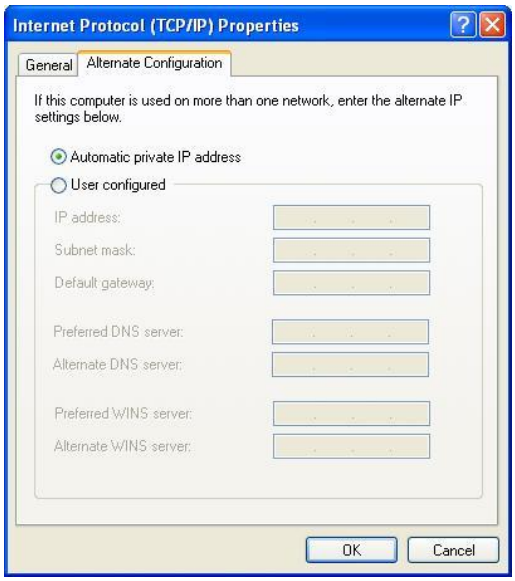
Choose the Internet Protocol (TCP/IP) on the Local Area Connection Properties dialog and click on the Properties button.

The following Internet Protocol (TCP/IP) Properties dialog will be displayed. This screen will show the laptop settings used for “**normal**” office Ethernet connections under “**Use the following IP address**”. Choose the button “**Obtain an IP address automatically**” to enter the correct settings for the console.

Do the following:



Choose "**Alternate Configuration**" and the next screen will pop up.

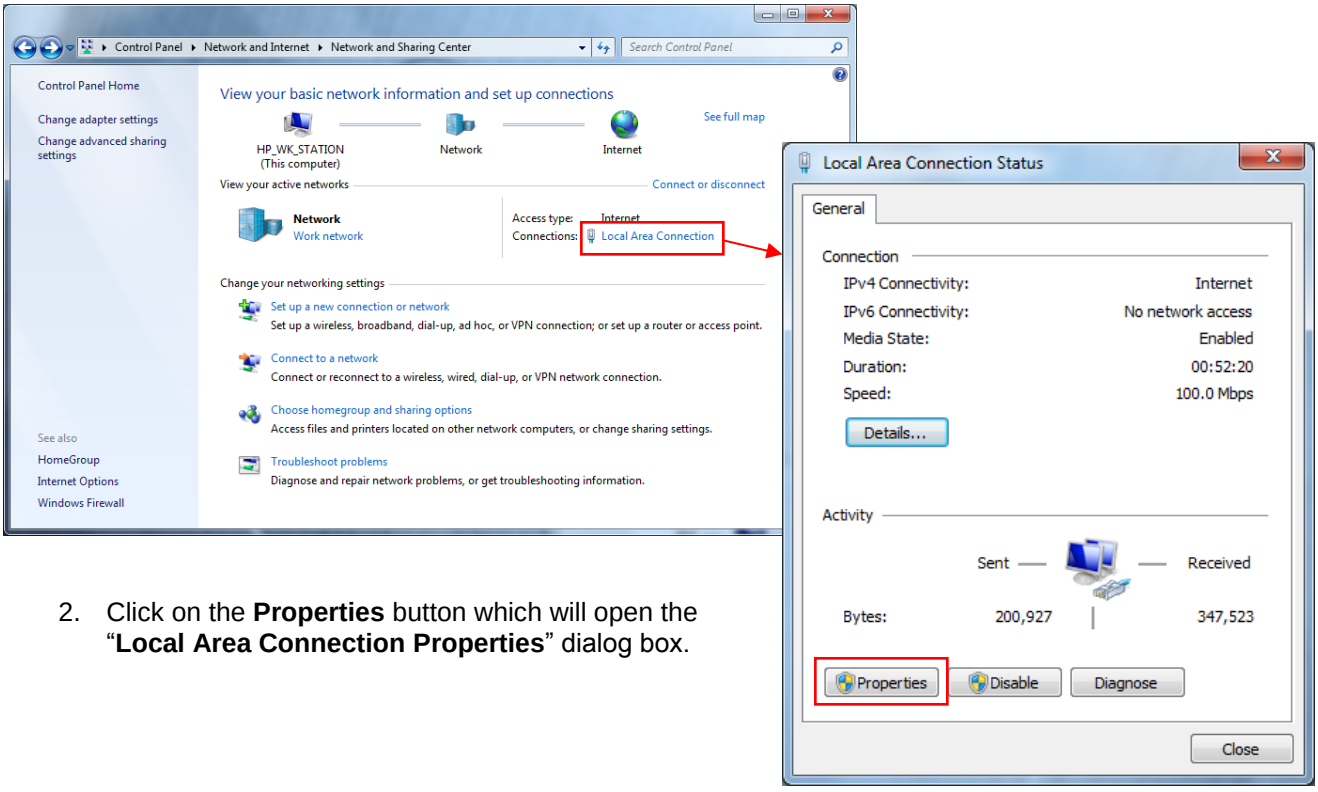


Choose the "**User Configured**" radio button and fill in the settings for the RS-701 Console usage, see details (**RULES**) below.

Modify the selections and entries to the model shown above (right) as per the **RULES** section.

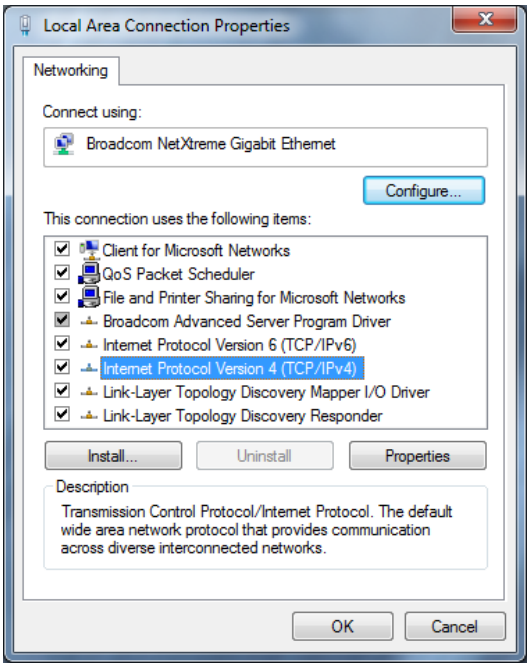
For Users with **Microsoft® Windows® 7 Professional**, do the following:

1. On the Laptop select **CONTROL PANEL > NETWORK CONNECTIONS > LOCAL AREA CONNECTIONS,** this will open the "**Local Area Connection Status**" dialog box.



2. Click on the **Properties** button which will open the "**Local Area Connection Properties**" dialog box.

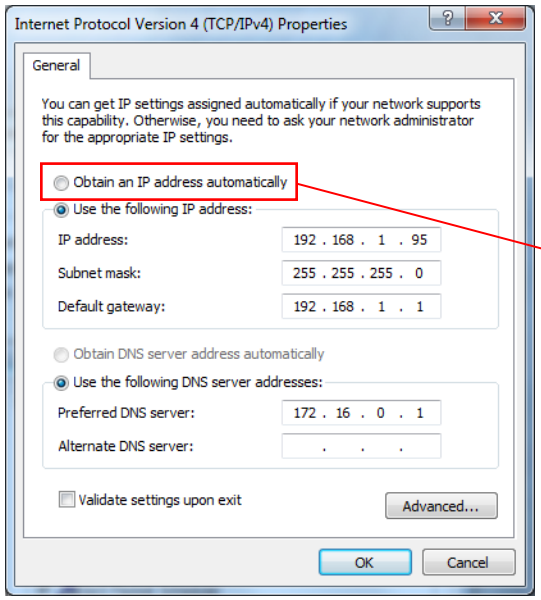
Choose the "**Internet Protocol Version 4 (TCP/IP v4)**" on the Local Area Connection Properties dialog and click on the **Properties** button.

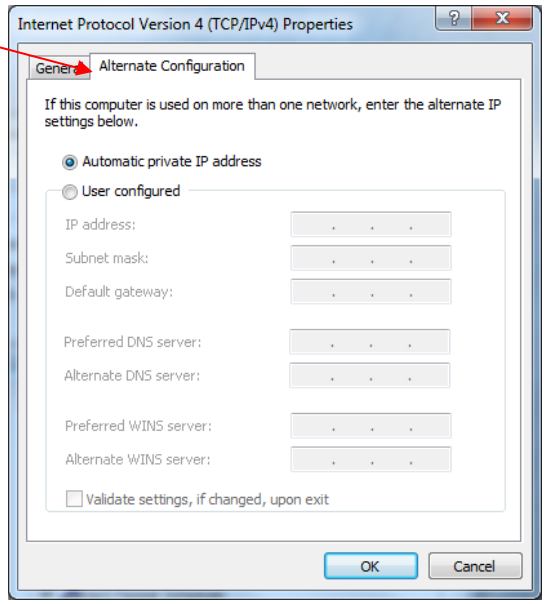


The following **Internet Protocol Version 4 (TCP/IP v4)** Properties dialog will be displayed.

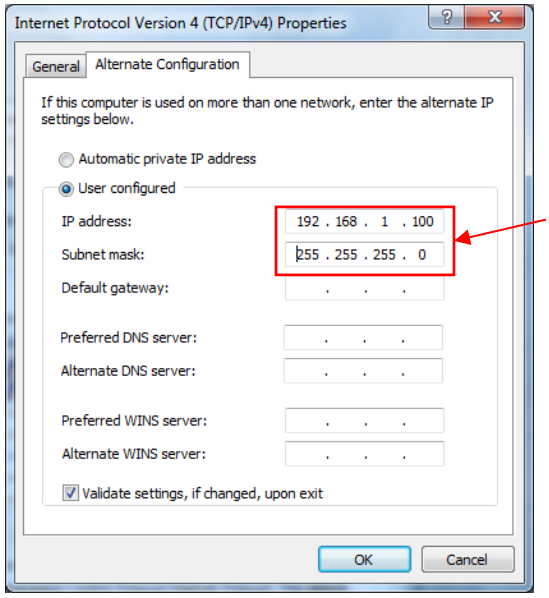
Note: This example shows the laptop settings used for "**normal**" office Ethernet connections. If needs be these settings can be retrieved.

Choose the radio button "**Obtain an IP address automatically**" and the "**Alternate Configuration**" screen will be displayed.





Do the following:



Correct the settings for **INTERNET** usage as shown.

Choose the "**User Configured**" radio button and enter the settings for the RS-701/705 Console usage. **(See details (RULES) below).**

3. Modify the selections and entries to the model shown to the right as per **Rules** and notes below.

RULES:

Using as an example that the RS-701/705 console

IP address is 192.168.1.113 and that the Network Mask is setup as 255.255.255.0 as is the most common

a) IP Address - first 3 numbers the same as the example (192.168.1) last digit ANY number between 2 and 255 but NOT 26 and NOT the same as the 701 (-113) as noted in the example – so perhaps **192.168.1.100** is a good choice.

b) Subnet mask – should be **255.255.255.0** assuming the normal mask.

c) Default gateway = blank not required.

d) Preferred DNS server = blank not required.

e) Alternate DNS server = blank not required.

NOTE: These settings will disable use of the laptop for "normal" office Ethernet connections. Unless the alternate configuration is used otherwise if the unit must also be used on the Internet – when needed change back to the selection shown in the left figure under "**Obtain an IP address automatically**" and then all will function correctly. However the above changes must be repeated for RS-701/705 console connection when required.

4.0 QUICK START

4.1 RS-701/705 Console Start Up

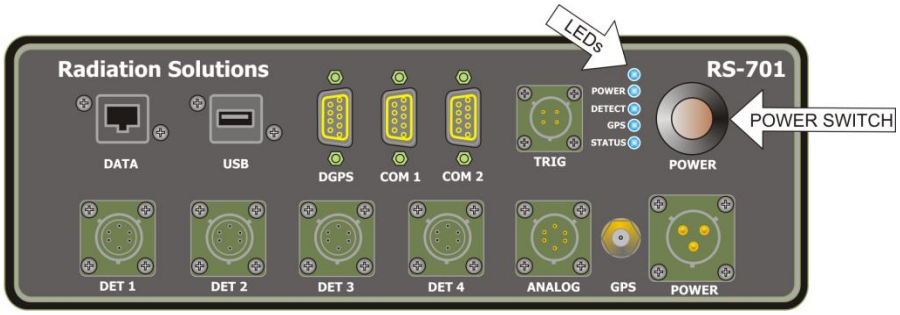
Upon Startup if there is **NO CONSOLE** do the following:

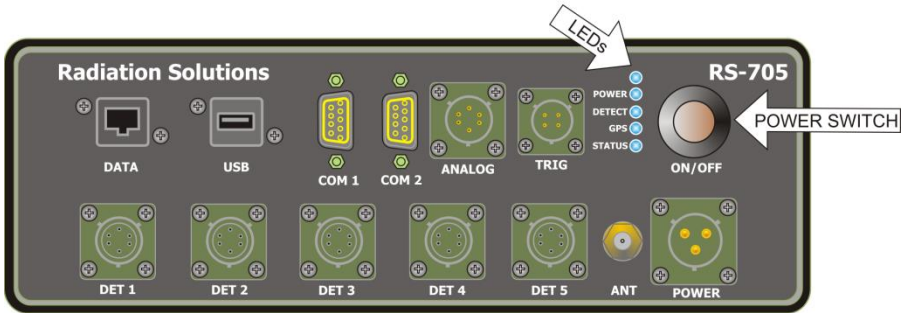
- Check all connections
- Check **Power**
- Check Console **LEDs**
- Click **Query Network** in the **RadAssist** program

Note: This manual describes basic system operation(s) and software usage, for complete software detail(s) and parameter setting(s) refer to the **RS-700 RadAssist User Manual D-1013**.

4.1.1 Power On

Connect power to the RS-701 console then press and HOLD the POWER button until the front panel LEDs come on (typically 10 seconds) – then release the POWER button. Same for the RS-705 console (see below).





NOTE: RE POWER ON/OFF (Aircraft only)

In normal operation most users power the Aircraft from an APU to get the survey systems setup and ready for departure. During this process as noted above the RSX crystal (Xtal) packs auto-stabilize themselves on the local radiation background.

Normally users power all systems down prior to aircraft start to avoid power line transients caused by engine starts.

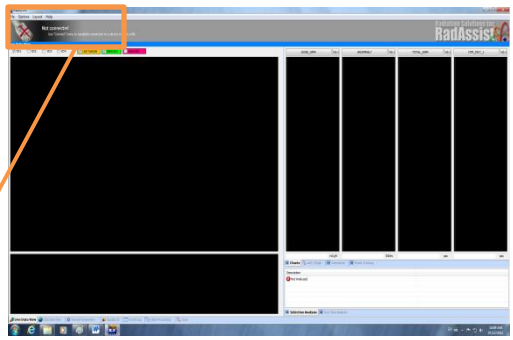
To avoid needing to restart auto-stabilization from scratch the RSX detectors have a special feature integrated. IF POWER ON IS WITHIN 1 HOUR OF POWER OFF THEN IT IS ASSUMED THAT STABILIZATION IS ESSENTIALLY THE SAME SO THE SYSTEM STARTS UP WITH THE “OLD” GAIN SETTINGS. The net effect of this is that the crystals are ready to go immediately. However it should be noted that most users taxi/ferry etc. for at least 15 minutes prior to survey start. In most cases a complete-from-scratch stabilization takes less than 5 minutes so this feature is only of great importance to very local surveys, however after engine start and power on, seeing the LEDs on each pack as ready-to-go is somewhat of a comfort.

4.2 Connecting to the Device with RadAssist

Ensure that the "**RadAssist**" program supplied by RSI is loaded on the Laptop. Connect the Ethernet link between the laptop and the RS-701/705 console and **ensure that the RSX-1 is powered ON.**

Start the software by double-clicking on the RadAssist desktop icon, 

the program opens with the last screen displayed before exiting (e.g. **Live Data Screen**) as shown, figure at right – note top left message shows system is not connected. Go to **Section 4.2.3** for procedure(s) to connect to the device.



NOTE: RadAssist will connect to the device automatically if the option, "**Automatically connect to the latest connected device**" is chosen in the **Options → Preference** menu.

NOTE: By default RadAssist will open in the **Restricted Mode** for the Operator. **Registry Entry** prompts the User to enter a Password to access all the functions of RadAssist. The Operator (Restricted Mode – no password required) opens RadAssist automatically with a limited set of features.

4.2.1 Restricted Mode

In Restricted Mode the application will automatically load and no password is required. No access is given to the Parameter Page or the Menu Items identified in this manual. This manual documents all the necessary Screens and Menu Items needed by the **Operator** (for detailed information pertinent to Administration, Refer to the RS-700 RadAssist User Manual (D-1013) for software information).

4.2.2 Advanced Mode

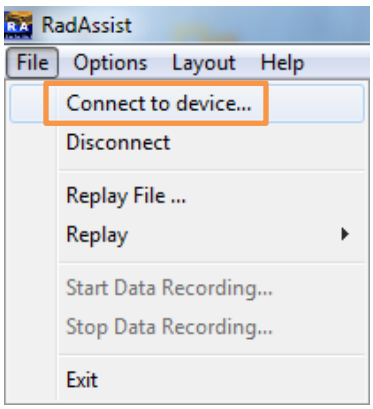
To switch to Advanced Mode the Options menu item "**Go to Advanced Mode**" will open a dialog box requesting the Password. Advanced Mode offers all the functionality currently available in the application "RadAssist" **Tabs** (for further information, Refer to the RS-700 RadAssist User Manual (D-1013) for software information). To switch back the Options menu item "**Go to Restricted Mode**" is available. Note that by exiting the application the Restricted Mode will startup automatically by default.

4.2.3 Device Connection to Laptop

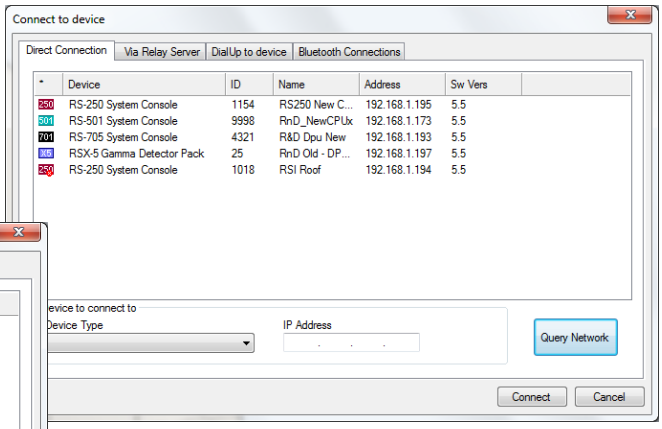
Connect to Device: - Direct Connection

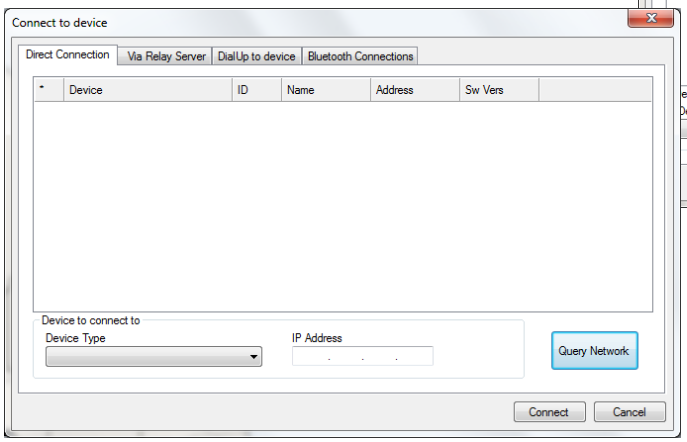
To connect the program to a device, go to the RadAssist menu:

a. Select the "**File**" drop down menu then select "**Connect to device..**" as shown. The Connect to device dialog will appear giving the user four methods of connection; **Direct Connection**, **Via Relay Server**, **DialUp to device** and/or **Bluetooth Connections**. If the RS-701 console is attached to the system and ready to use, the operator shall use Direct Connection. Refer to **Chapter 3.0** for the Network Setup and for other Connection methods.



b. If the device is communicating the next screen should be displayed with the RS-701 console listed. Otherwise the screen will be blank. Select the "**RS-701 Console**" from the list and then click "**Connect**" to activate the system.





c. If the screen is blank, no console is displayed as shown in the figure to the left – click "**Query Network**" to check for connections. If no Console is found, ensure Console Power is **ON** (Green LED), and check the Ethernet connections. If all else fails close the software and restart. Refer to the RS-700 RadAssist User Manual (D-1013) for software information. If the problem persists reboot the console (remove power) and the laptop – if the problem still exists consult RSI.

d. If all is **OK** the top left display should be displayed as shown in the figure.

Connect to Device: - Via Relay Server – (Typically used for remote service)

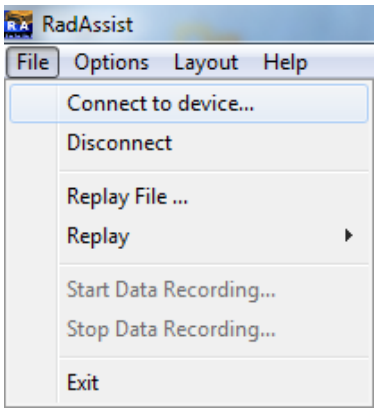
RadAssist Connection:

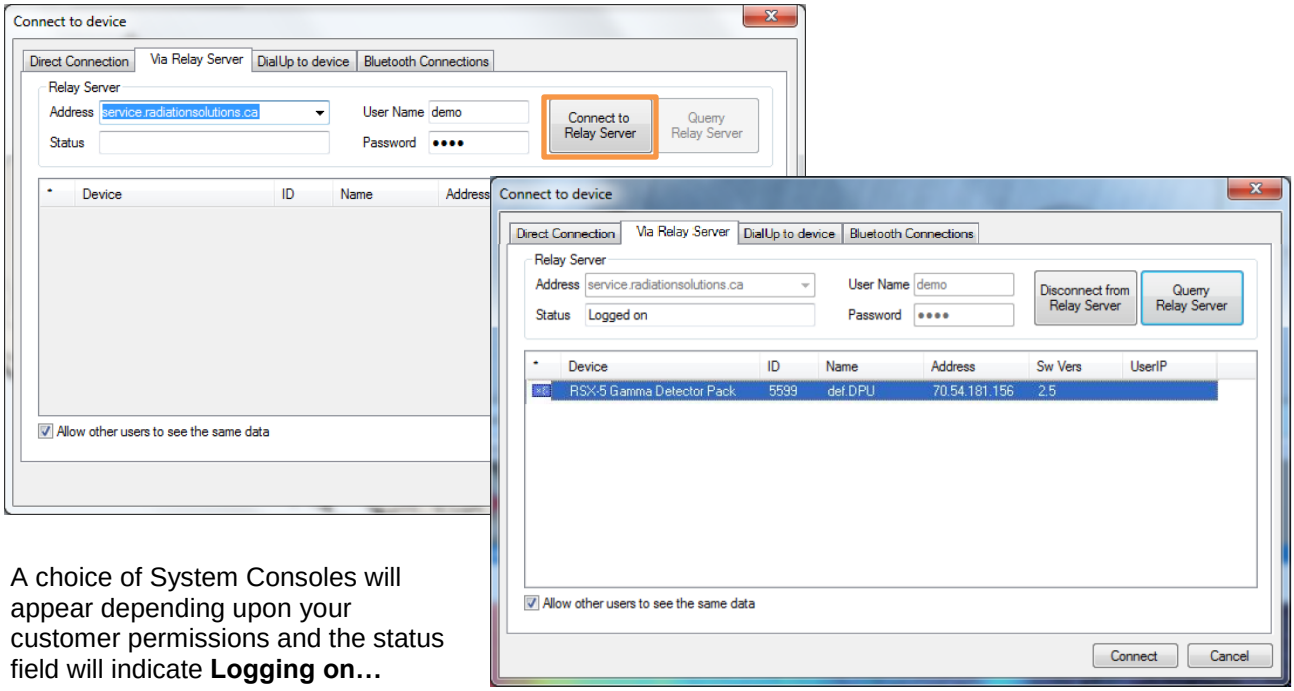
If the user wants to connect to the Relay Server, the operator shall use the **Via Relay Server** method.

Choose the "**Via Relay Server**" tab, enter **User Name** and **Password** and click on the **Connect to Relay Server** Button.

Each user must have their console enabled to view for a specific user. (Demo user, and demo password have been setup to demonstrate this feature).

Note: Be sure the address is set to "**service.radiationsolutions.ca**".





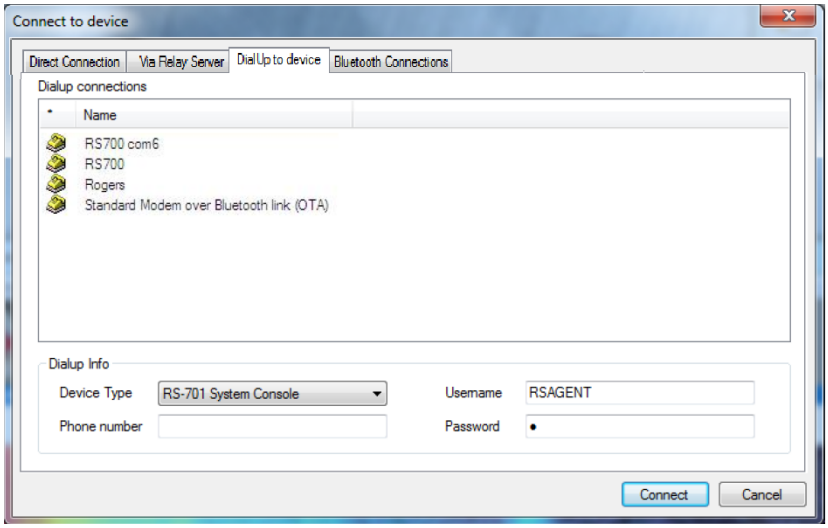
A choice of System Consoles will appear depending upon your customer permissions and the status field will indicate **Logging on…**

Choose the System Console you want to connect to and click on the **Connect** button. The system will connect immediately.

If all is **OK** the top left display should be displayed as shown in the figure.

DialUp to Device –

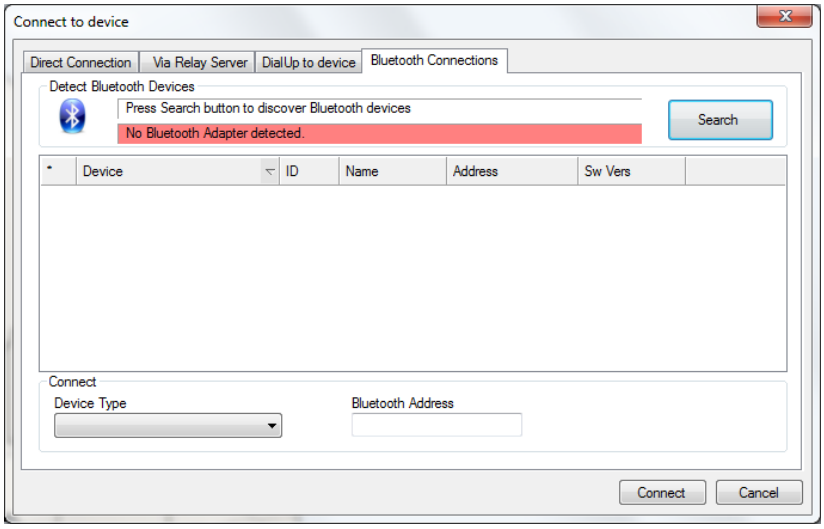
This configuration allows the laptop to connect to the RS-701 console remotely through or a dial-up modem (phone modem), COM cable, radio modem or a cell modem (if the cell modem has a COM port instead of an Ethernet connection). This requires a Custom Agent Configuration file (see agent config page). The console/laptop sets up a TCP connection over the COM/modem.



Bluetooth Connections –

This configuration allows the laptop to connect to the RS-250 console remotely using a Bluetooth connection. The example below shows that No Bluetooth Adapter has been detected, choose the Search Button to confirm that there are no Bluetooth devices in the local area.

Choose another option if nothing is detected.



If successful, choose the device type from the drop-down menu, the Bluetooth address should show immediately then choose the **Connect** button.

If all is **OK** the top left display should be displayed as shown in the figure.

4.2.4 LED System Status Indication

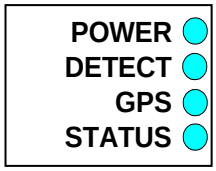
The LEDs are system STATUS indicators which show what is happening within the RS-700 system. Note that this operation is independent of the Laptop, so the laptop does not need to be connected to see this measure of system status. However a laptop is required for data recording of the survey data as well as operational displays as described below. (The console stores the last 24 hrs of operation).

The LEDs are used as follows:

POWER = system power status, **DETECT** = detector status, **GPS**=GPS status, **STATUS** = ERRORS

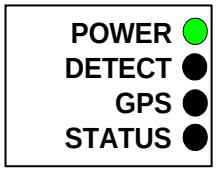
The correct initialization process is described as follows (assuming a Detector and GPS are connected):

a) After Power ON – for approx. 3 seconds ALL LEDs are BLUE as a Lamp Test



POWER = BLUE as a Lamp Test
DETECT = BLUE as a Lamp Test
GPS = BLUE as a Lamp Test
STATUS = BLUE as a Lamp Test

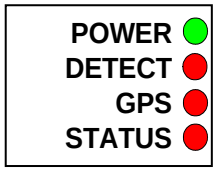
b) After a short time the LED status changes



POWER = Flashing GREEN = Power ON – shows that the system is booting up
DETECT = OFF
GPS = OFF
STATUS= OFF

Since the internal CPU is still booting the actual status is unknown – hence usually OFF but could be any state.

c) After approximately 60 seconds the Console internal computer successfully completes its boot sequence and the display changes to:



POWER = Steady GREEN – shows that power is ON

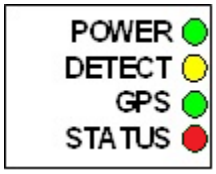
DETECT = RED - DETECTOR not ACTIVE yet (could be GREEN if detector is stabilized)

GPS = RED - GPS has not acquired lock yet

STATUS = RED – system is alive but NO GPS and NO detector stabilization

.....WAIT.....

d) Typically after 30 seconds – display changes to;



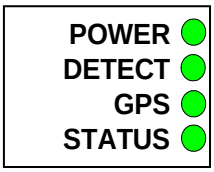
POWER = GREEN – shows that power is ON

DETECT = YELLOW – DETECTOR not STABILIZED yet

GPS = GREEN – GPS has acquired lock

STATUS = RED – Systems are NOT READY

e) After typically 2-4 minutes display changes to:



POWER = GREEN – shows that power is ON

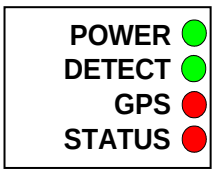
DETECT = GREEN – DETECTOR has stabilized OK

GPS = GREEN – GPS locked in OK

STATUS = GREEN = no errors

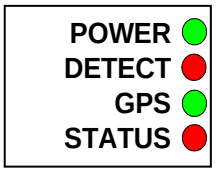
So the rule is – wait until there is no RED LED then all is OK

f) If at any time an error occurs the RED LED will come on - as follows:



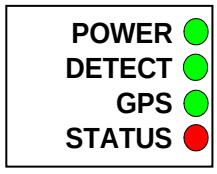
Error with the GPS – refer to the laptop displays for further information

STATUS = RED



Error with the Detector system – refer to the laptop displays for further information

STATUS = RED

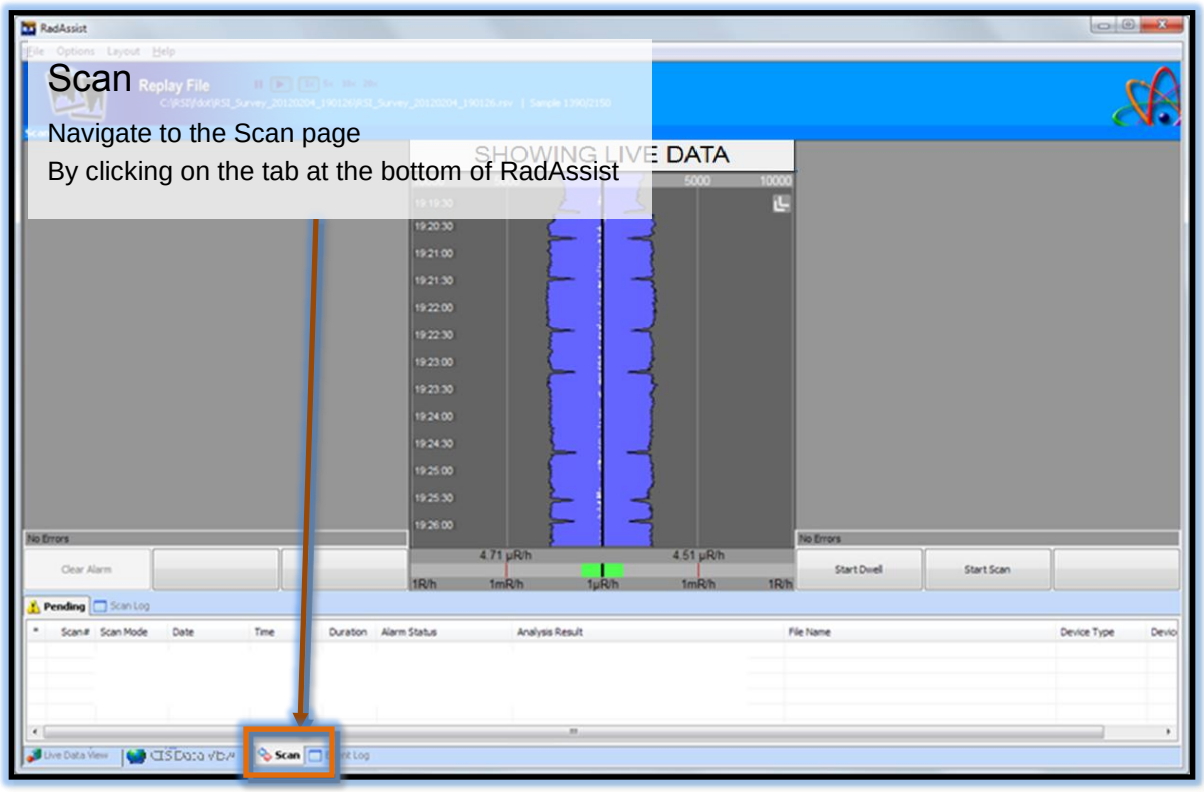


Error with the system – GPS and Detector are OK

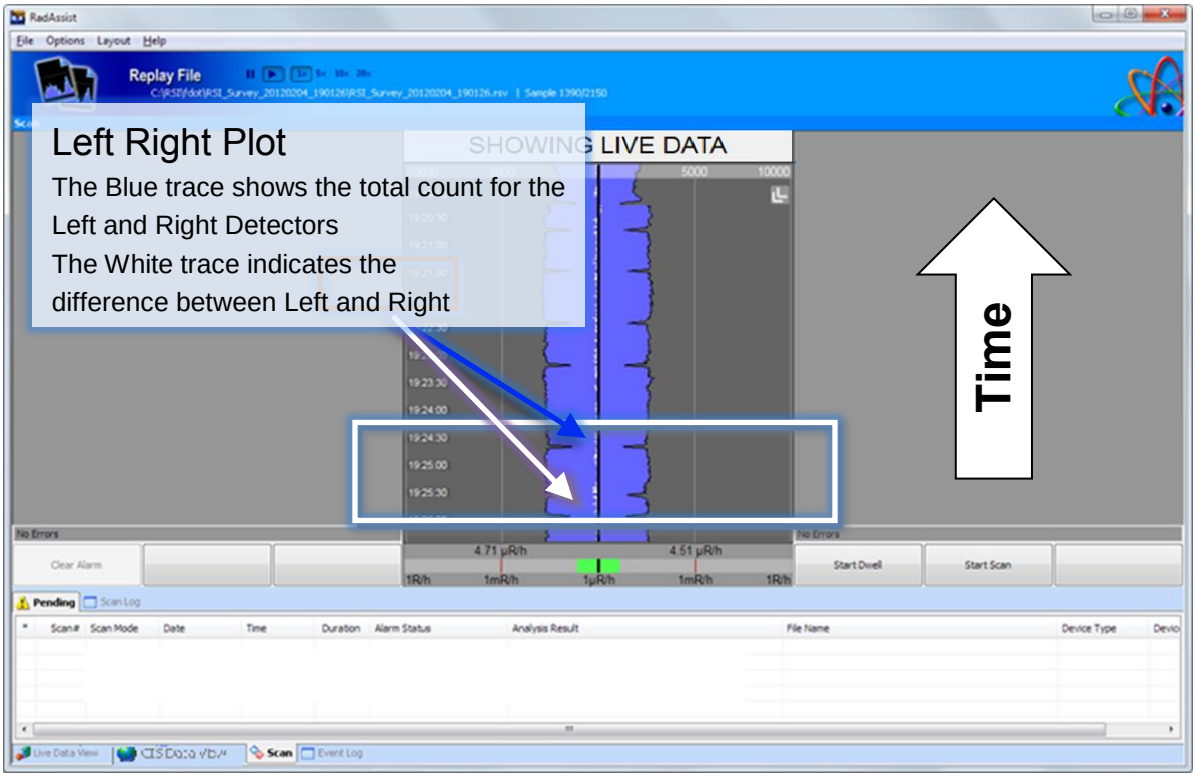
STATUS = RED

Section 4.3 documents the basic Operator function(s) using RadAssist.

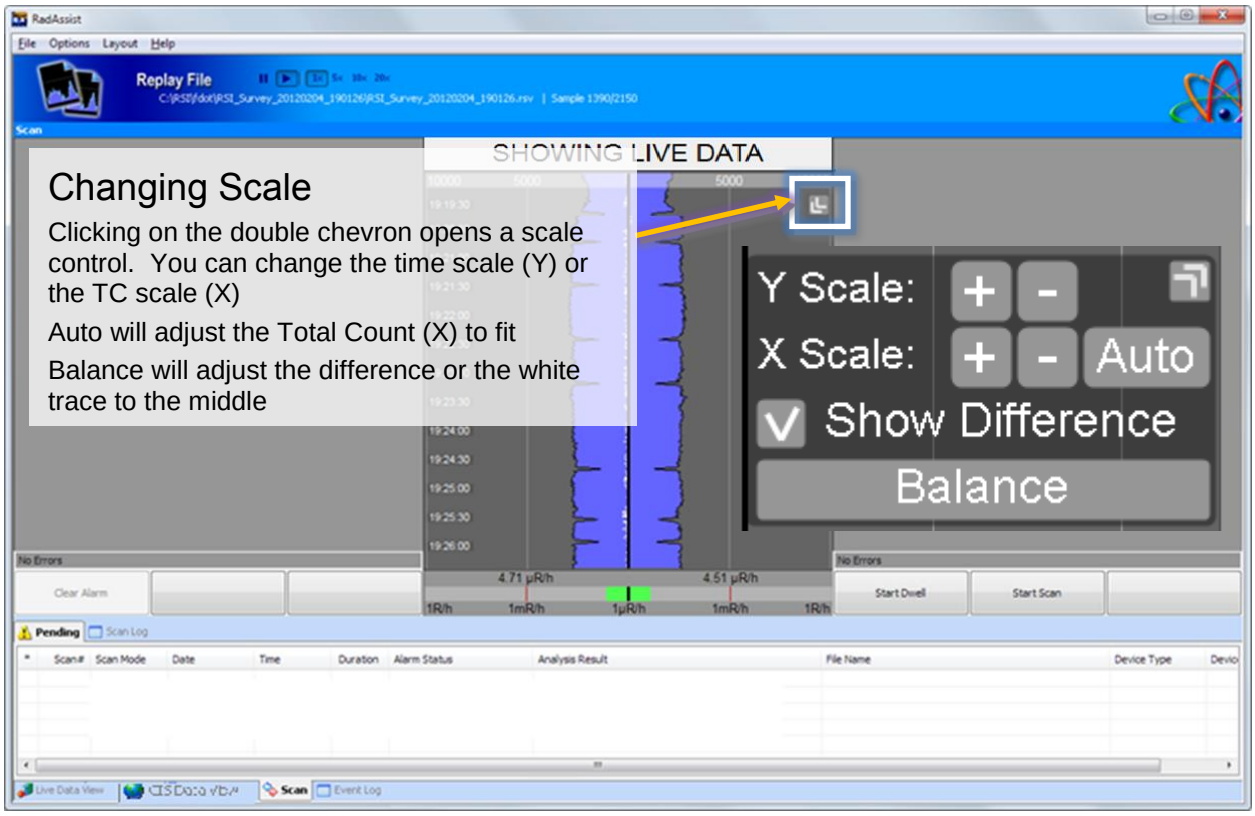
4.3 Operator Use - Scan Page



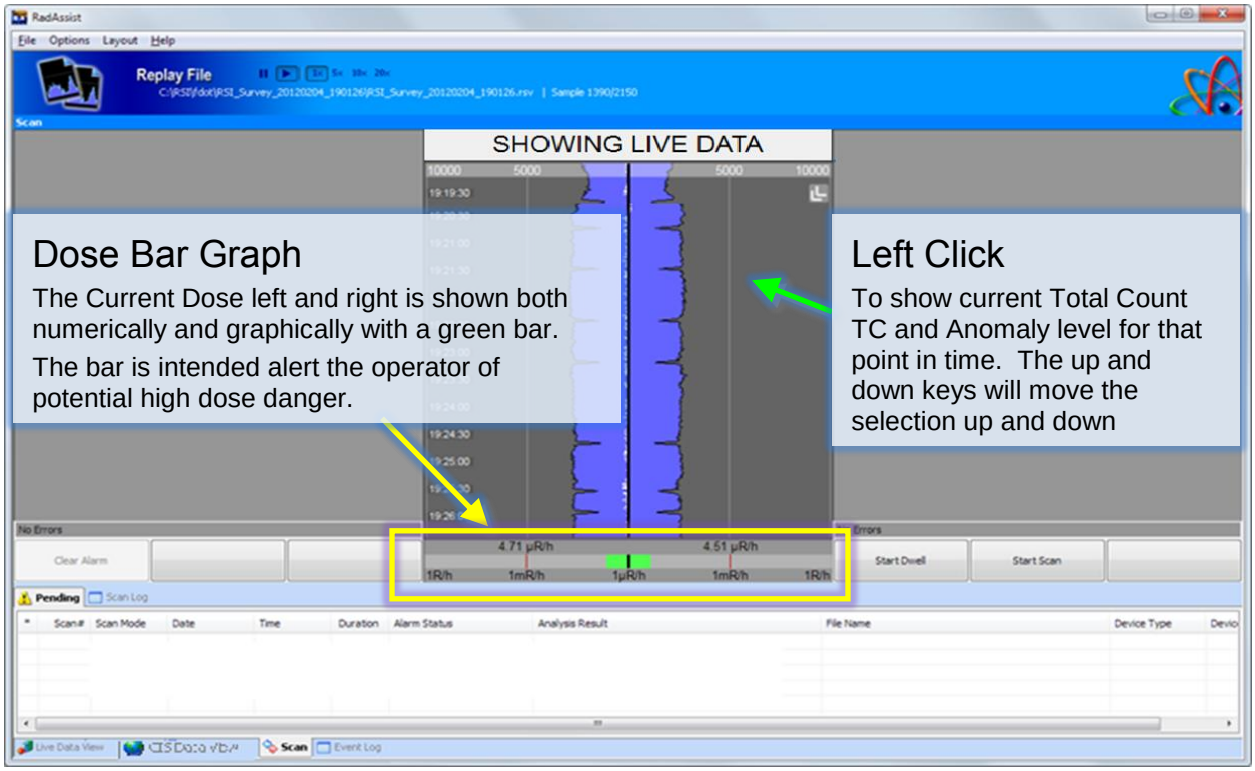
LEFT / RIGHT PLOT SCALING:



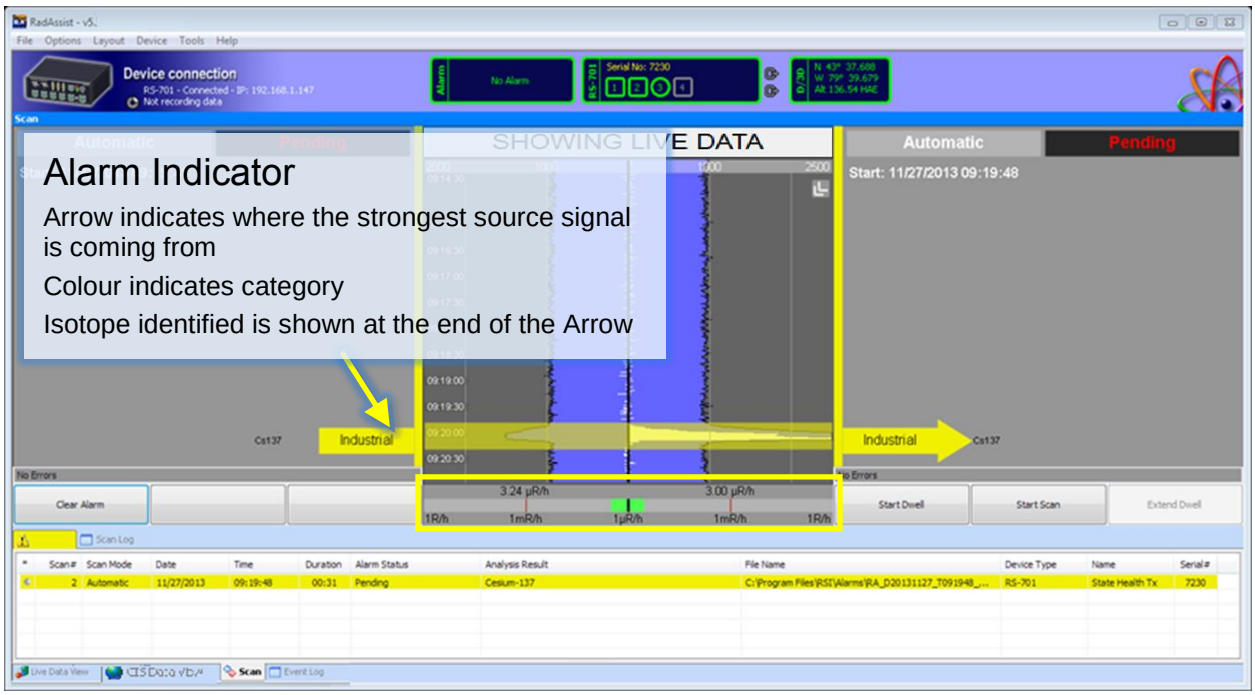
CHANGING SCALE:

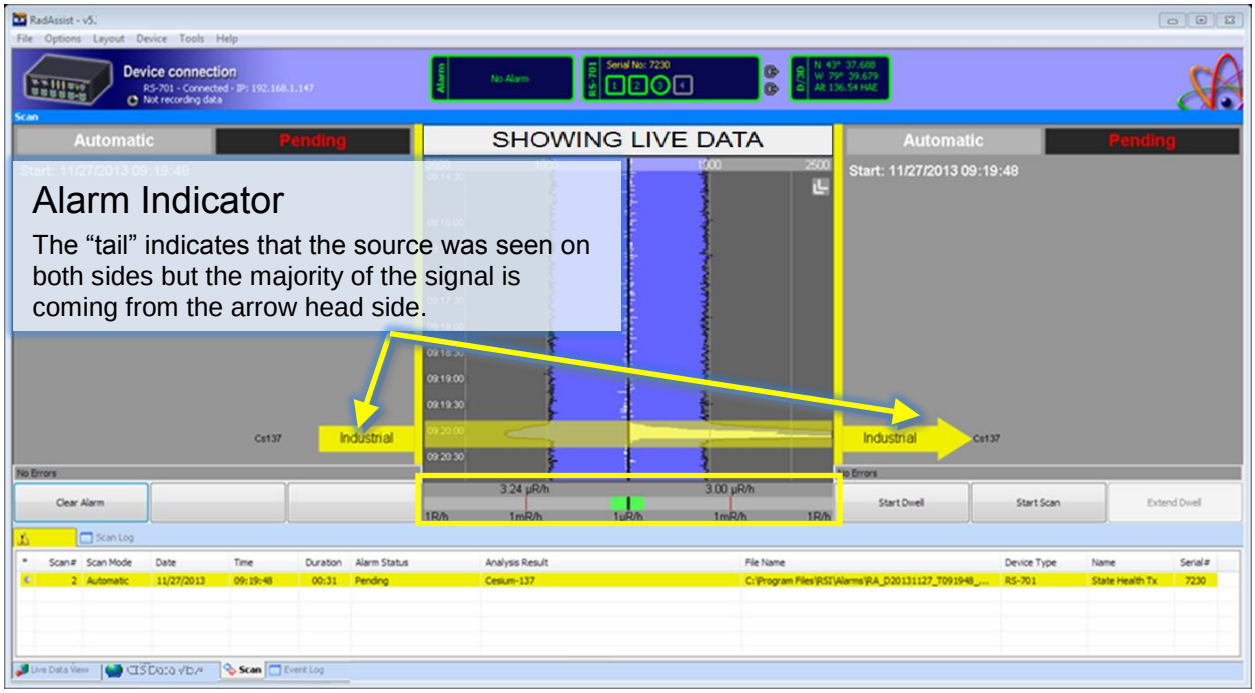


LEFT / RIGHT DOSE BAR:

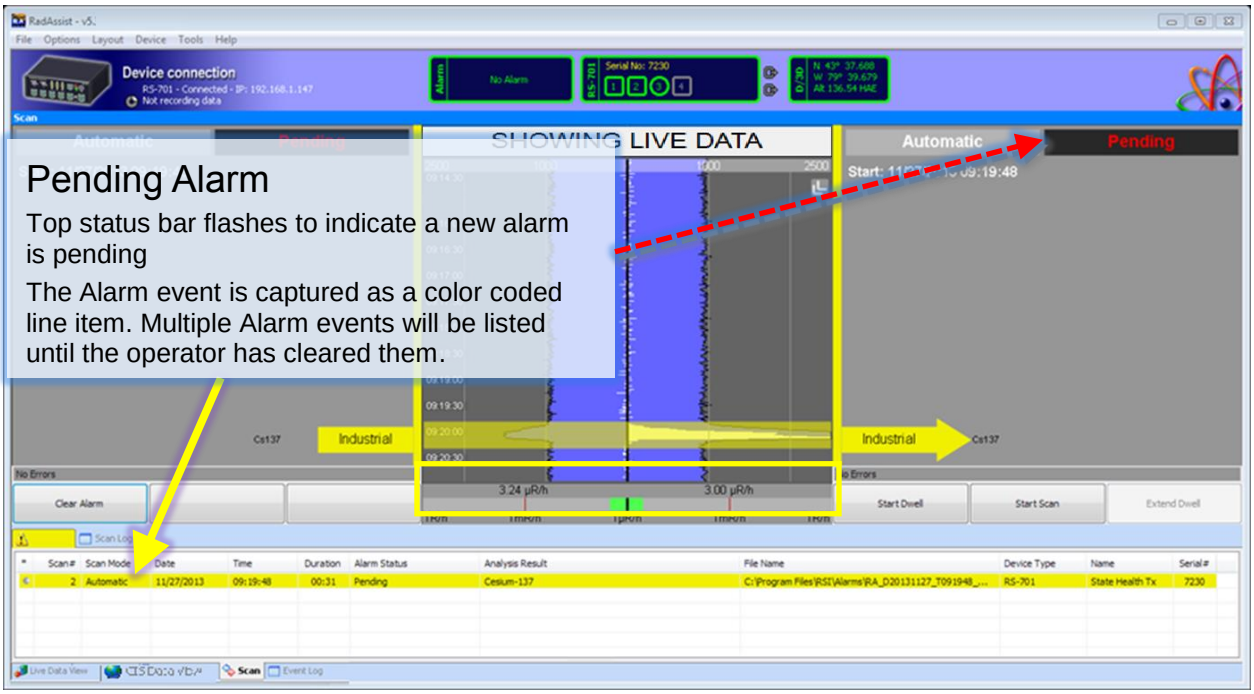


ALARM INDICATION:

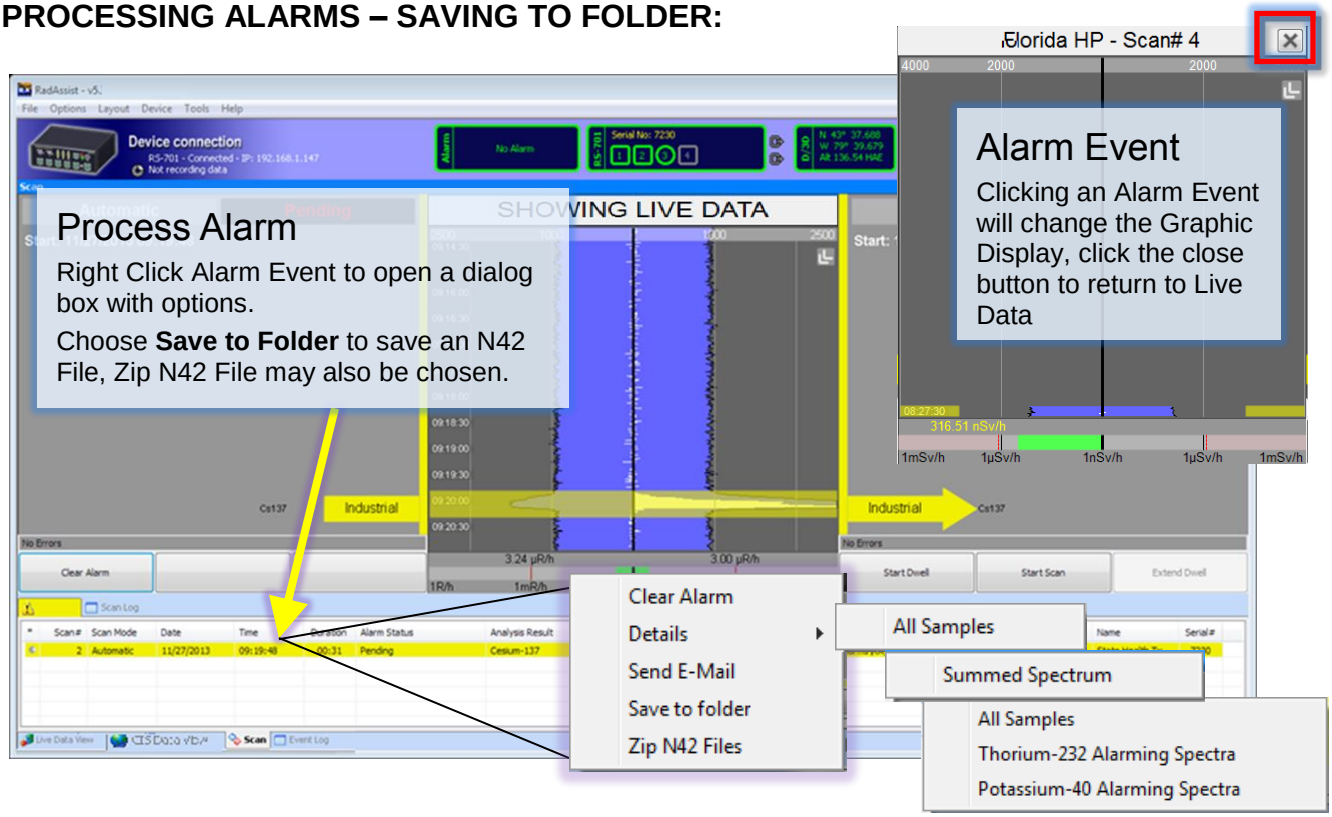




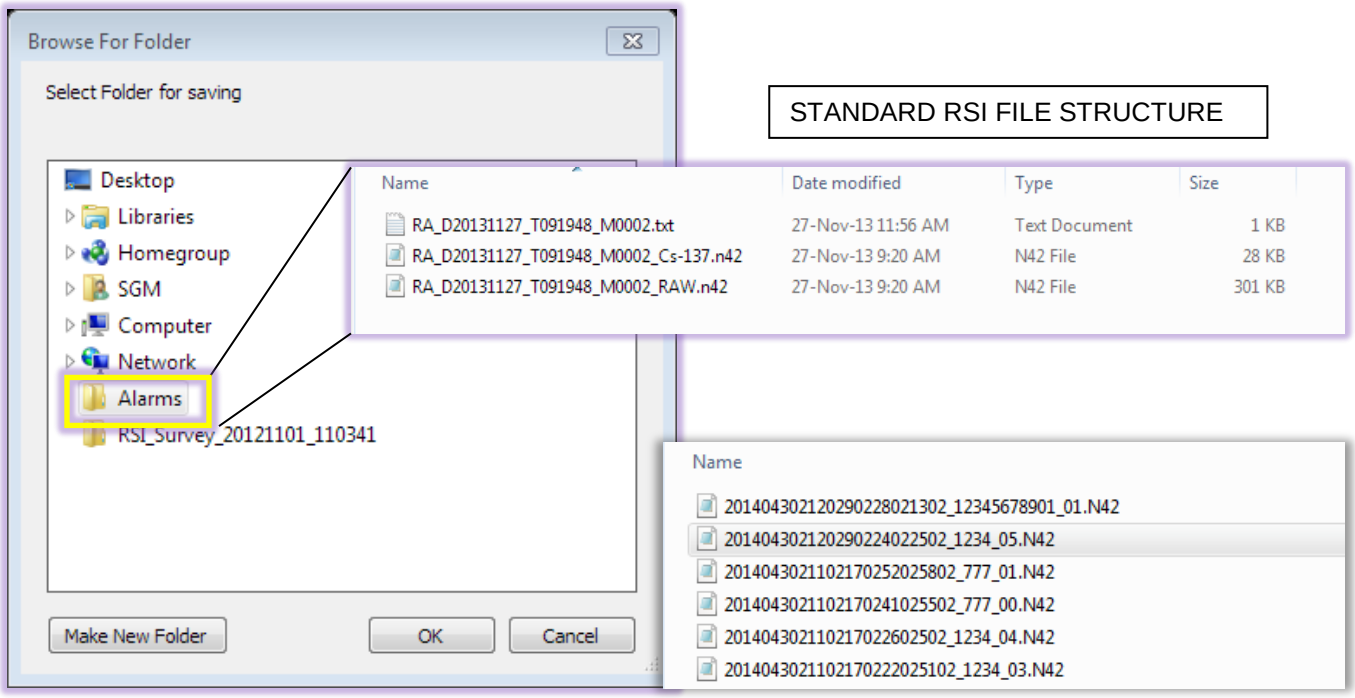
ALARM NOTIFICATION:



PROCESSING ALARMS – SAVING TO FOLDER:



SAVING n42 FILE TO FOLDER:



Choose Make New Folder and name it **MetaData DWELL SCAN**. Only *.n42 files will be saved to this folder using the following **Customer** File Naming Convention

Up to a Maximum of 11 digits

Data File Naming

YYYYMMDDHHMMSS_XXXXXXXXXXX_nn.N42

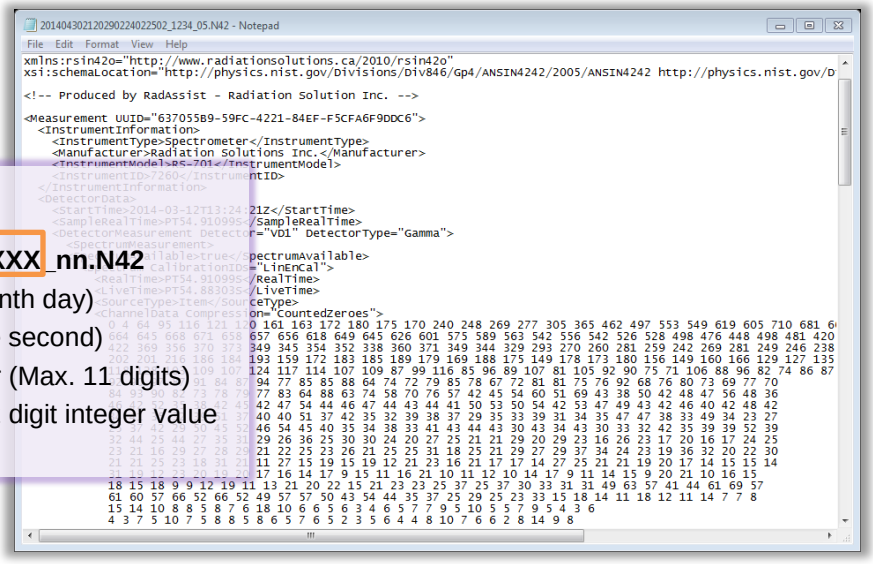
YYYYMMDD – Time Stamp (year month day)

HHMMSS - Time Stamp (hour minute second)

XXXXXXXXXXX – Container Number (Max. 11 digits)

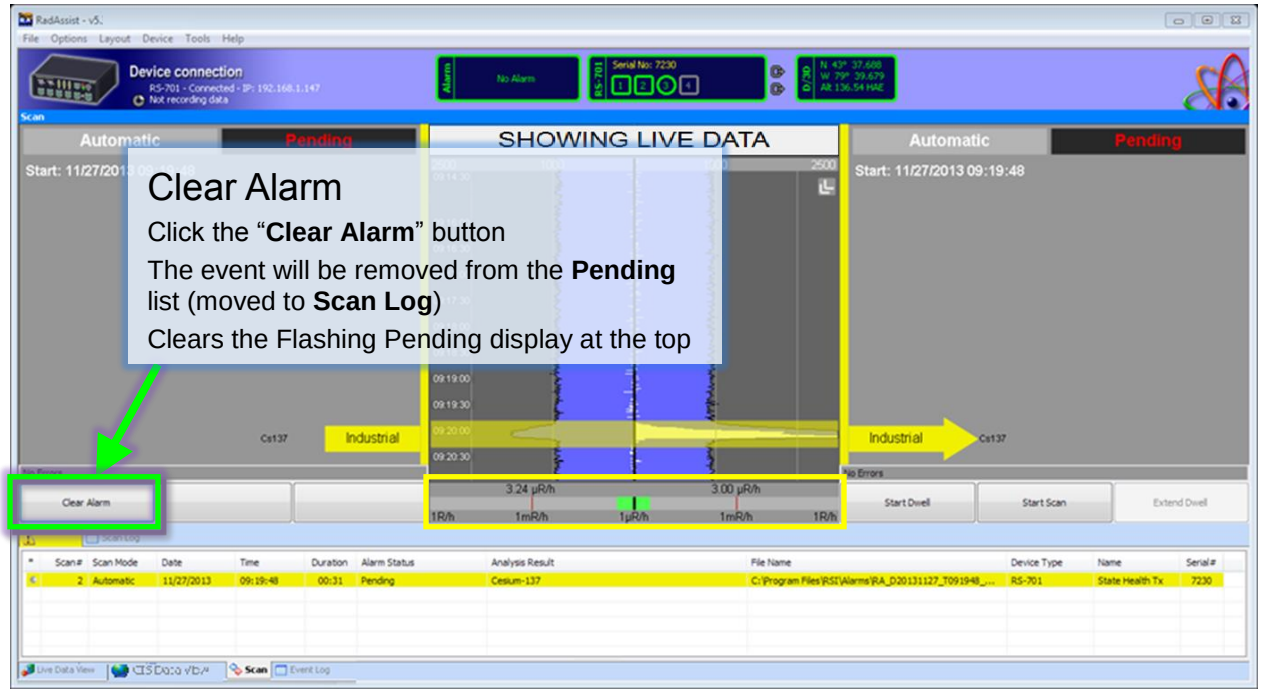
nn - Sequential number fixed length 2 digit integer value

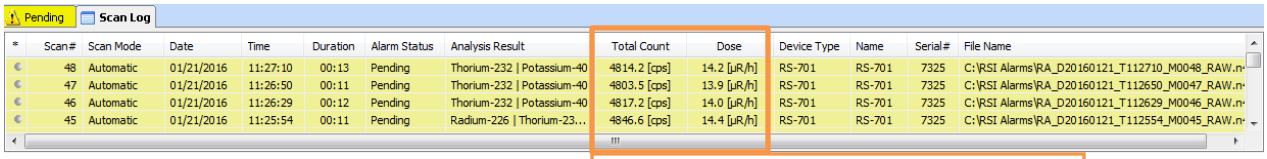
n42 – file extension



NOTE: Choose **Zip N42 Files** to compact large files before saving to a folder (the n42 file format is the same as shown above).

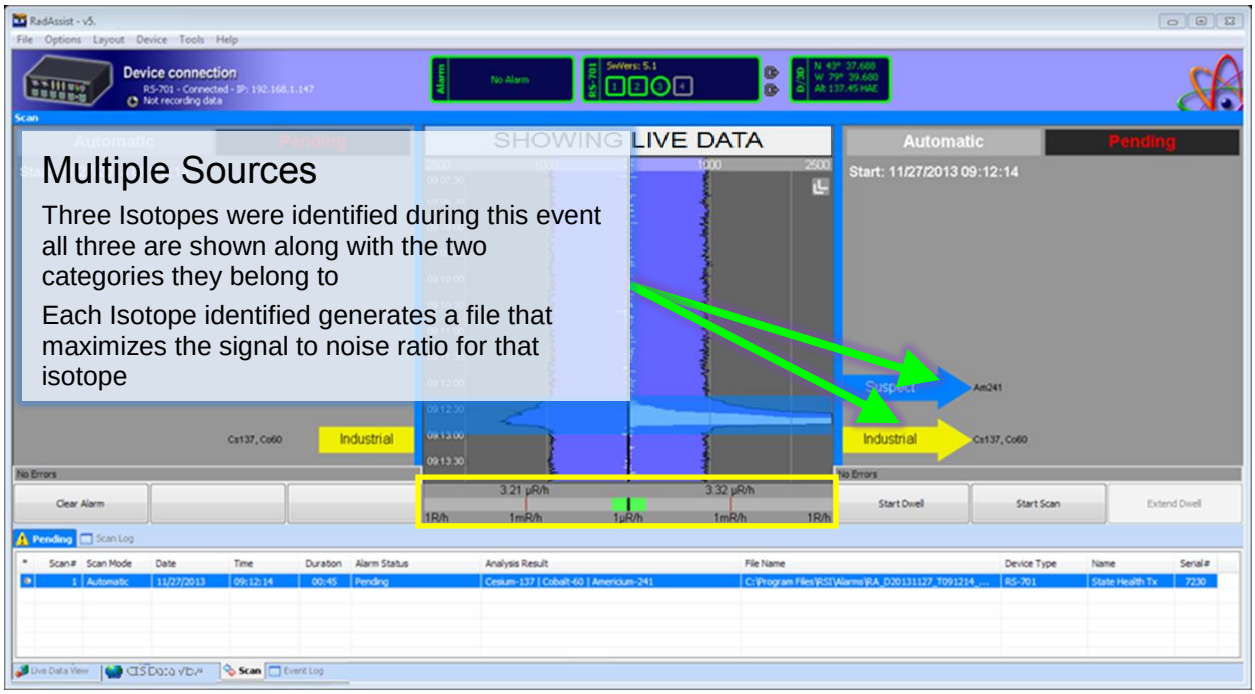
CLEARING THE ALARM:

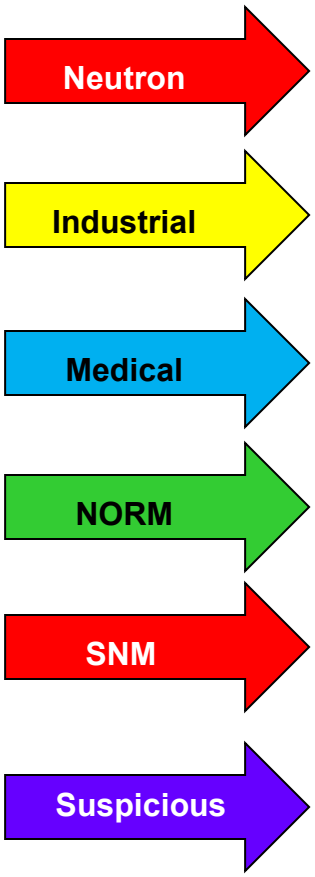




Total Count and Dose are displayed in Pending and Scan Log.

MULTIPLE SOURCE ALARMS:

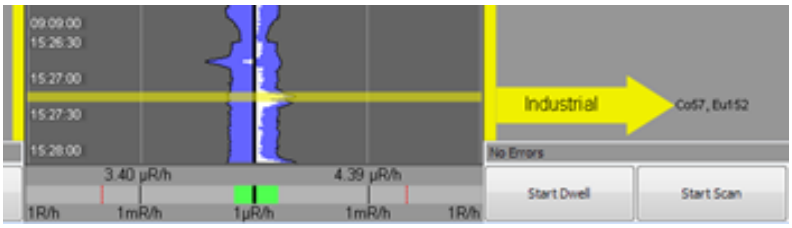




ARROWS:

Depending on the detector configuration the Scan screen displays the alarm on either the right, left and/or both sides of the detector system.

Neutron Alarms will show the sample rate [cps], while the isotopes names will be displayed for Gamma alarms.



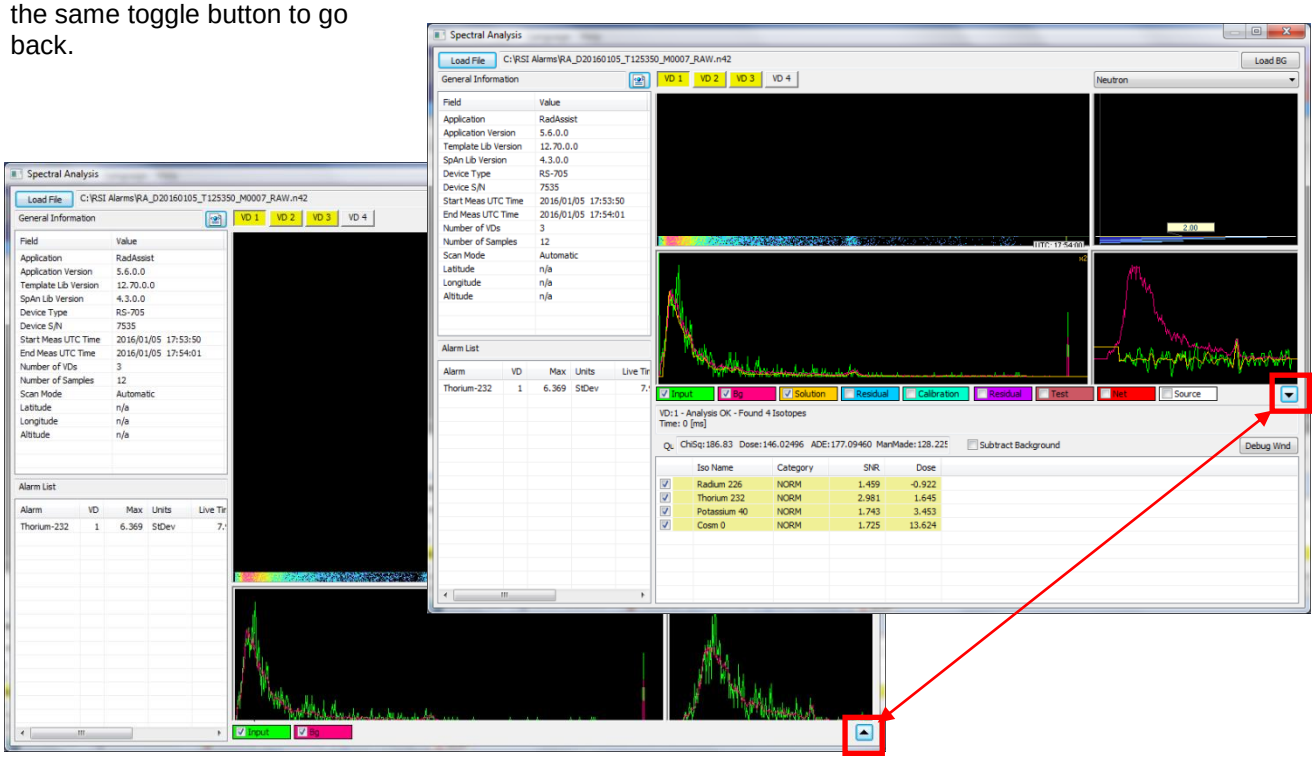
Full Arrow: Indicates the presence of a source on the passenger or driver side.

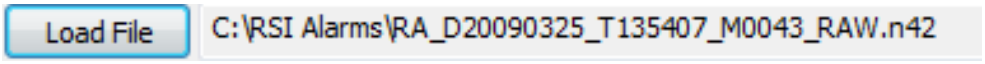
A Line or Tail of an Arrow: Indicates a low hit and may have an arrow on the opposite side indicating the hit.

No Tail or Arrow with an Alarm: Indicates the source is at the center of the vehicle

SPECTRAL ANALYSIS:

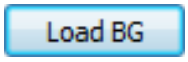
Clicking on the Screen Toggle button  will toggle the screen to display the Isotope Information. Use the same toggle button to go back.





Click on **Load File** to load a (*.n42) file for Spectral Analysis, the file browser will open to search for the file.

Click on Load BG to load a (*.n42) background file for Spectral Analysis, the file browser will open to search for the file.

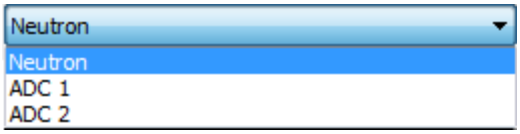


General Information: - This will display information about the RadAssist application and the RS-701 Console.

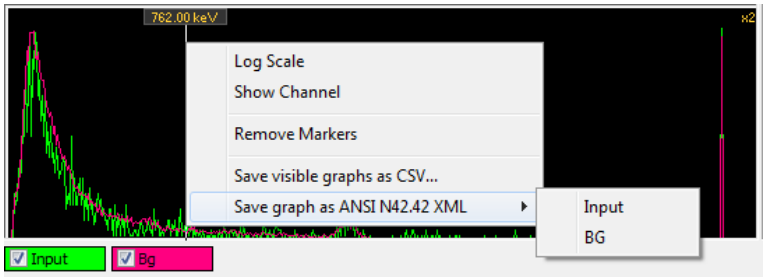
Alarm List: - Displays current alarms with associated information; VD, Max, Units, Live Time, Samples and Start Time.

The Virtual Detector combinations can be chosen using these buttons (VD 1 to VD4). This depends upon the detectors installed.

The drop down menu gives the following options; Neutron, ADC 1 and ADC 2.

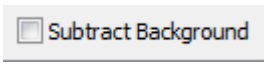


Note: The drop down menu will match the Spectra Options that have been chosen. Eg.

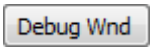


Other Options are available, as follows:

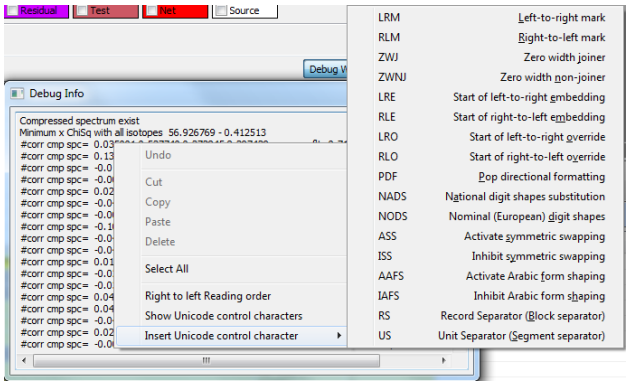
It is an indication of how well the templates match.

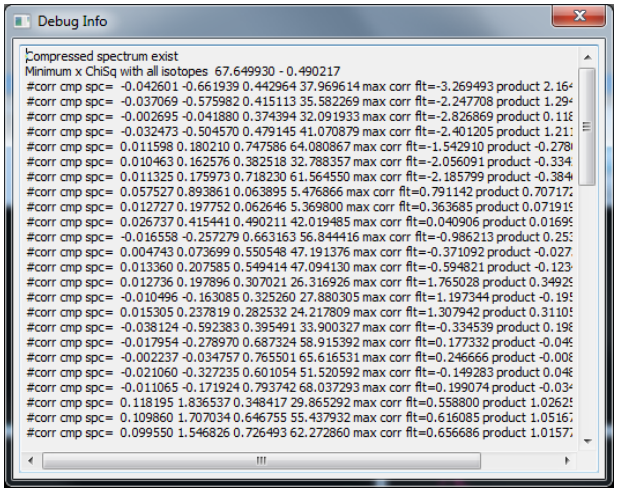


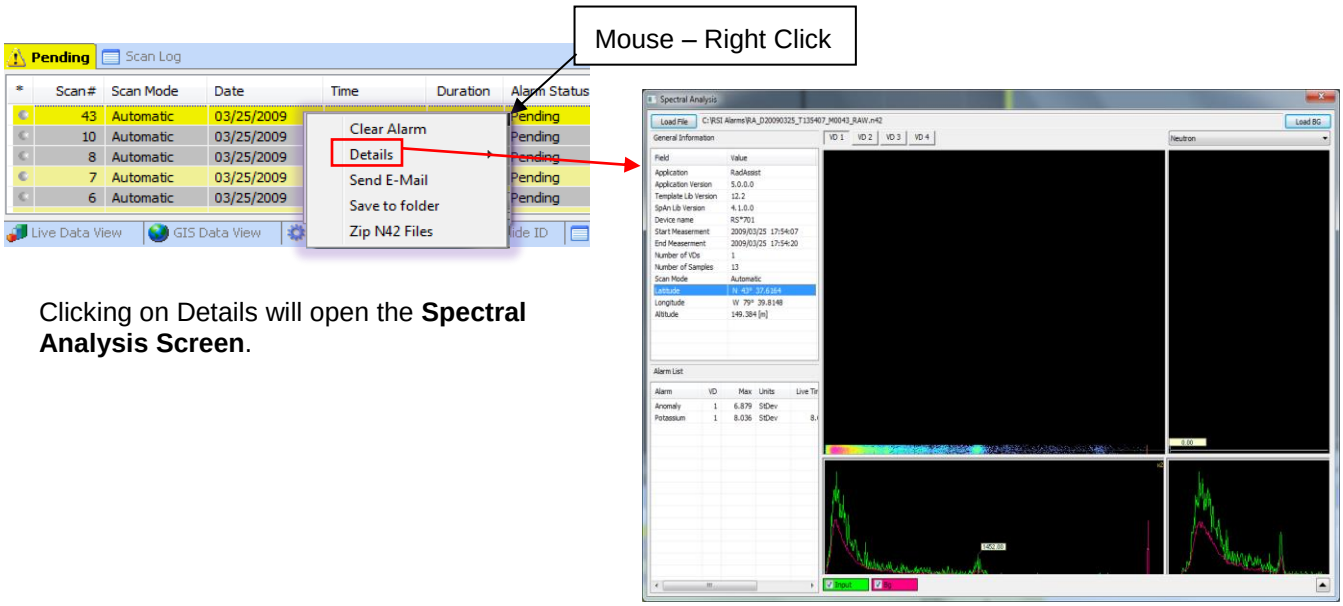
When checked it does a channel by channel subtraction to get spectrum for nuclide ID analysis.



Clicking on the Debug Wnd button will open the Debug Info window.

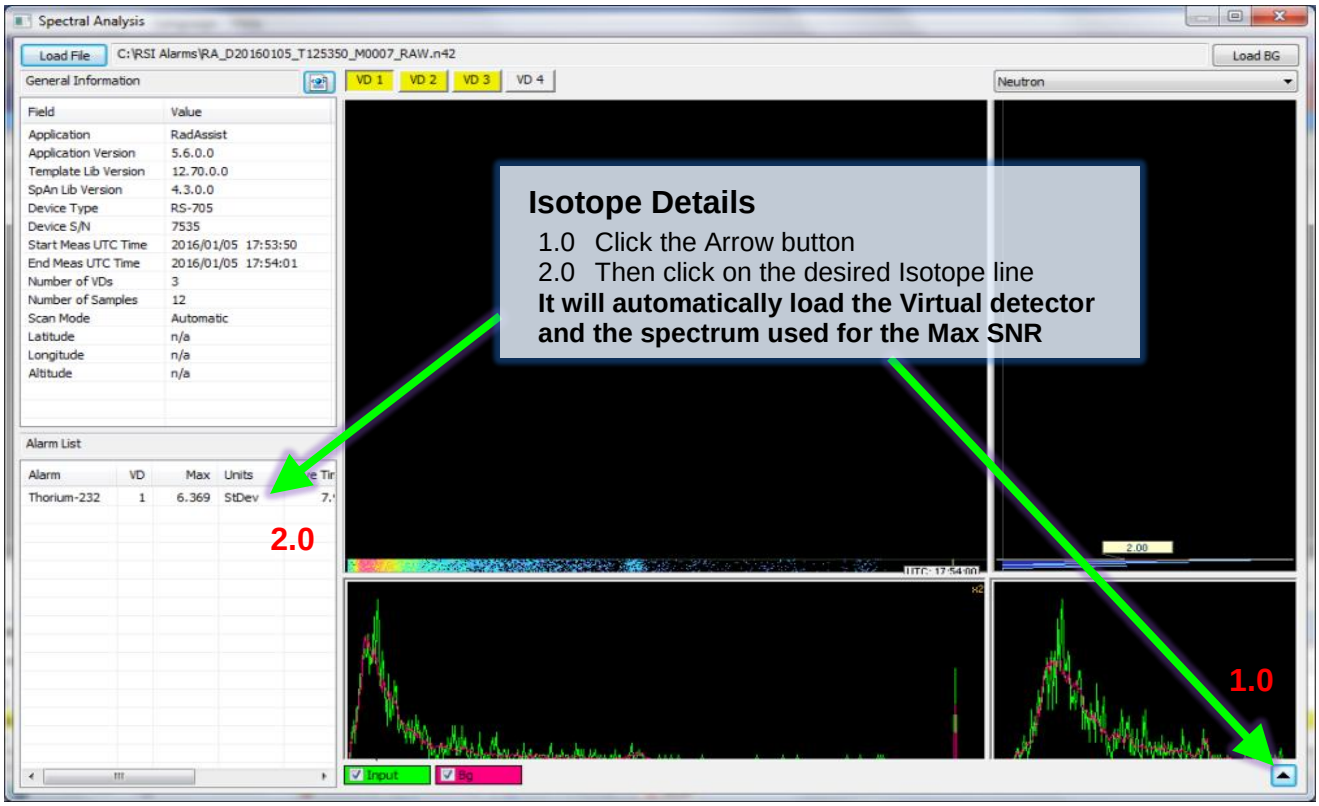


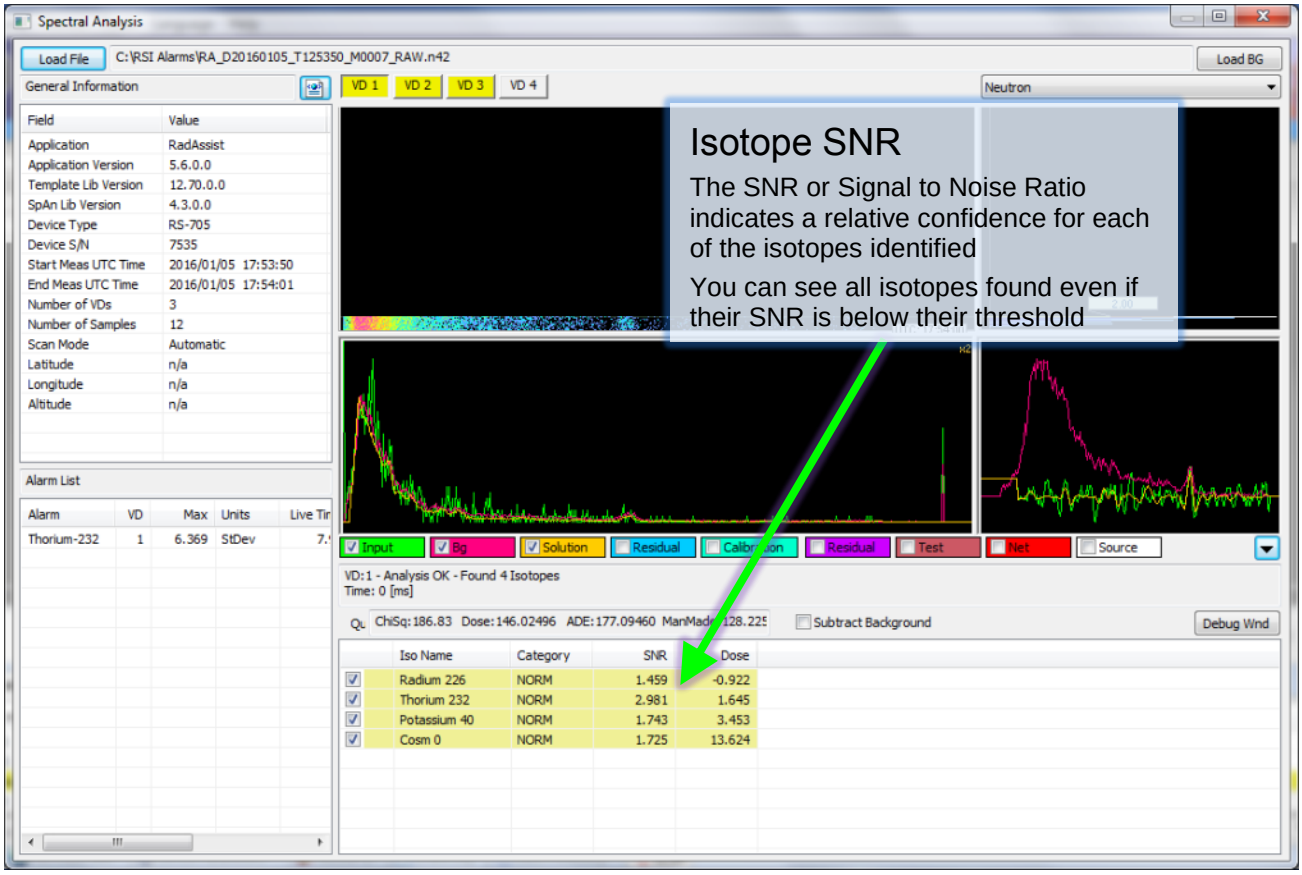




Clicking on Details will open the **Spectral Analysis Screen**.

ALARM DETAILS:

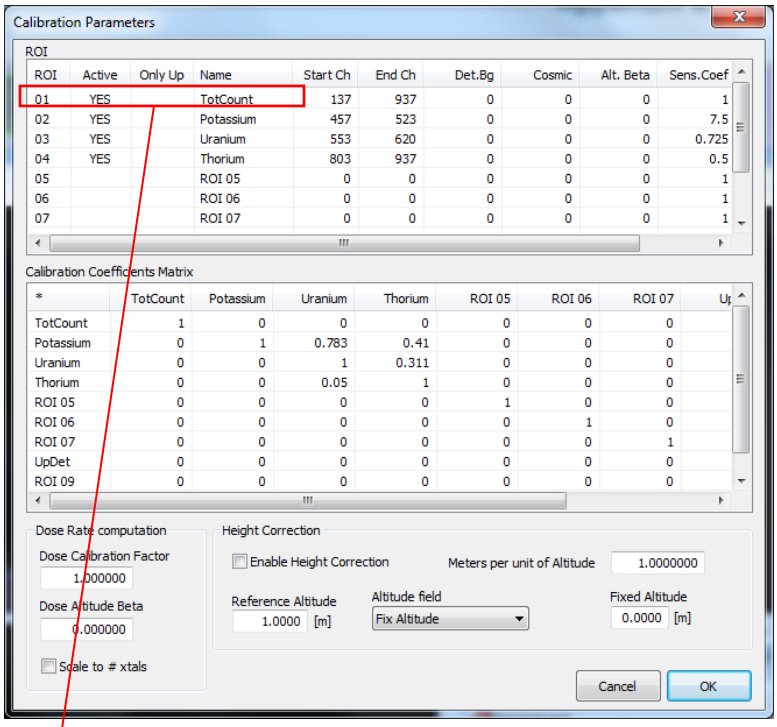



Spectral Analysis
Load File
C:\RSI Alarms\RA_D20160105_T125350_M0007_RAW.n42
Load BG
General Information
VD 1
VD 2
VD 3
VD 4
Neutron
Field
Value
Application
RadAssist
Application Version
5.6.0.0
Template Lib Version
12.70.0.0
SpAn Lib Version
4.3.0.0
Device Type
RS-705
Device S/N
7535
Start Meas UTC Time
2016/01/05 17:53:50
End Meas UTC Time
2016/01/05 17:54:01
Number of VDs
3
Number of Samples
12
Scan Mode
Automatic
Latitude
n/a
Longitude
n/a
Altitude
n/a
Alarm List
Alarm
VD
Max
Units
Thorium-232
1
6.369
StDev
Input
Bg
Solution
Residual
Residual
Test
Net
Source
VD: 1 - Analysis OK - Found 4 Isotopes
Time: 0 [ms]
ChiSq: 186.83 Dose: 146.02496 ADE: 177.09460
Subtract Background
Debug Wnd
Iso Name
Category
SNR
Dose
Radium 226
NORM
1.459
-0.922
Thorium 232
NORM
2.981
1.645
Potassium 40
NORM
1.743
3.453
Cosm 0
NORM
1.725
13.624
Isotope SNR
The SNR or Signal to Noise Ratio indicates a relative confidence for each of the isotopes identified
You can see all isotopes found even if their SNR is below their threshold

5.0 CALIBRATION

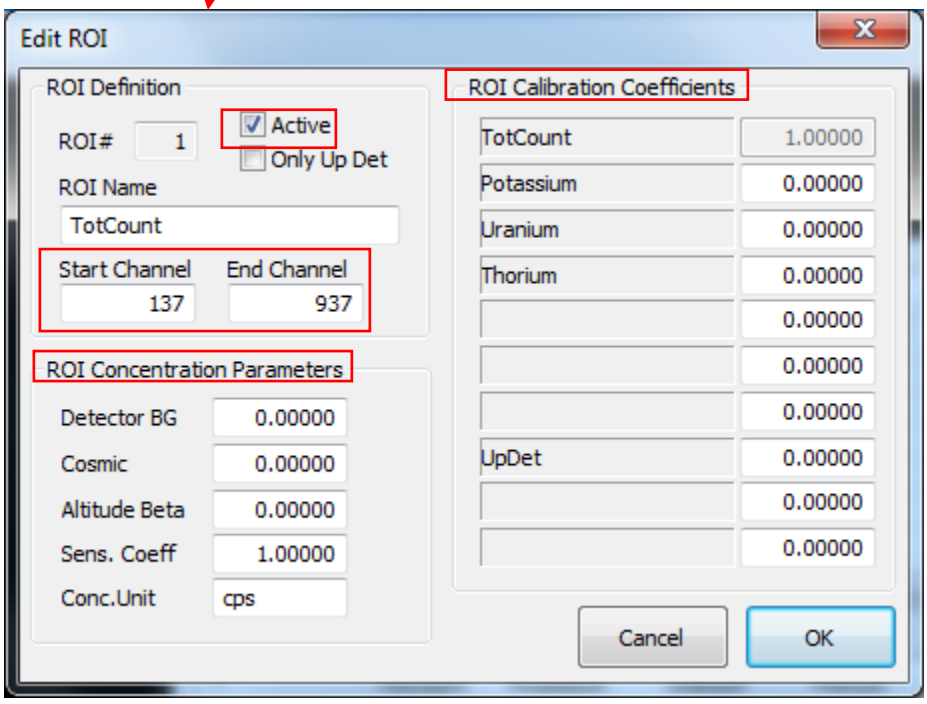
5.1 Calibration Procedure

The RSX detector for the system has been fully calibrated and a Calibration Sheet for the actual detector supplied is sent with the system – labeled **CALIBRATION SHEET (see Figure E-1 for sample)**. Users who require accurate Natural Element Concentrations will use this calibration procedure with the Calibration Sheet. Users should carefully enter the calibration data into the system to permit correct operation.



Note: The calibration parameters are stored on the laptop, all data displayed in RadAssist is recalculated from the spectrum. Upload your calibration to the console.

Double Click each **ROI** in turn (#1 – 4) and enter the data as shown below. Check the ROI **Start** and **End Channel** limits with Sheet, enter **ROI Concentration Params** and check the **ROI Calibration Coefficients** from the **CALIBRATION SHEET**. N.B. Click each ROI as "**ACTIVE**" in the selection box.



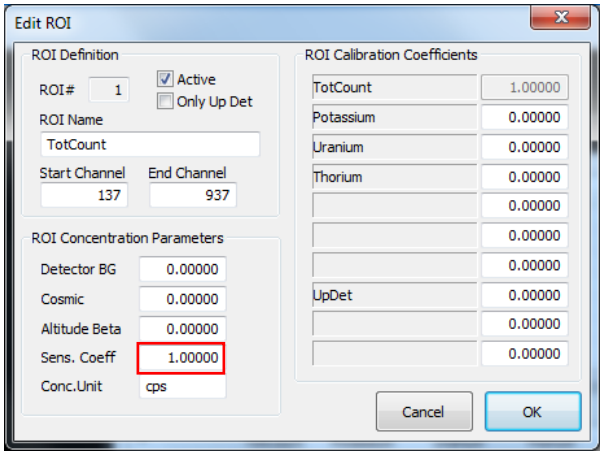
Note ROI#1 = Total Count
ROI#2 = Potassium
ROI#3 = Uranium
ROI#4 = Thorium

Other ROIs can be setup for specialty users as required. Contact RSI agent (See **Appendix Z**) for more information.

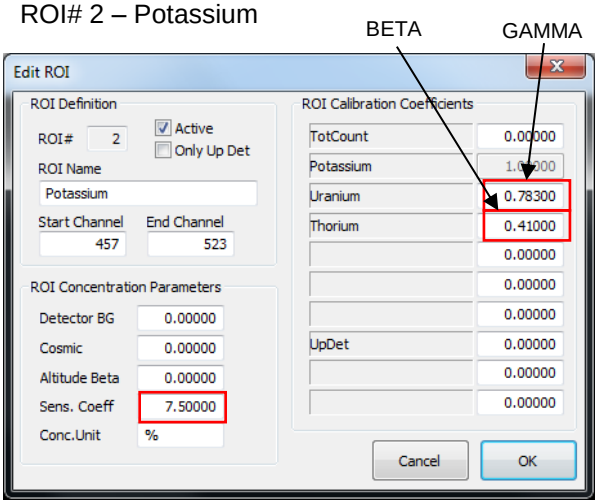
Use the following examples to enter data for ROI#1 – 4, and ensure that the display looks similar to the top figure on this page.

NOTE: The individual coefficients and channel number data may be slightly different but very similar. **"Normal"** values are shown on the Sheet for comparison only. When satisfied click **OK**.

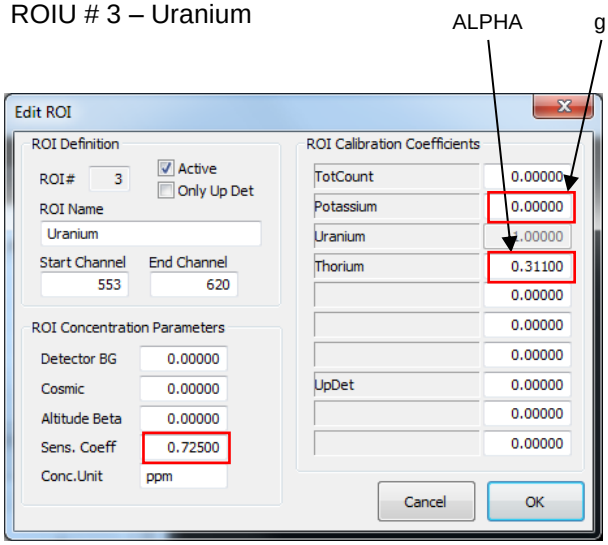
ROI# 1 – Total Count



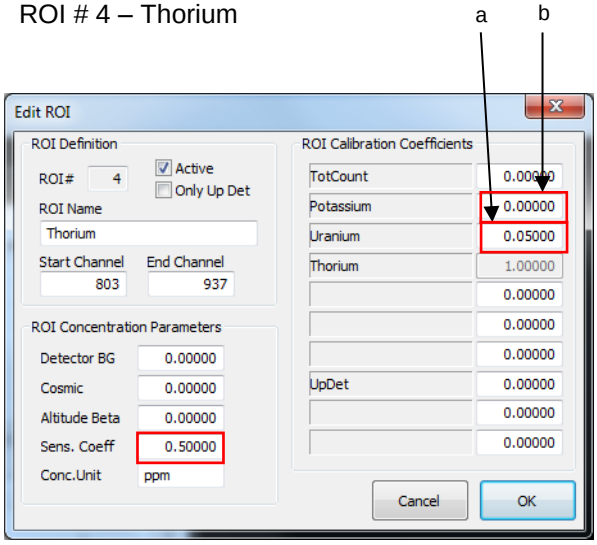
ROI# 2 – Potassium



ROIU # 3 – Uranium



ROI # 4 – Thorium



First enter the Sens. Coeff for each ROI as follows:

TotCount	K	U	Th
1.00000	7.50000	0.72500	0.50000
cps	%	ppm	ppm

See the CALIBRATION SHEET (Figure 5-1):

Stripping Constant	"System"
Alpha	**0.311**
Beta	**0.410**
Gamma	**0.783**
a	**0.050**
b	**0.000**
g	**0.000**

NOTE: Stripping Constant removes the cross contamination between Natural Elements.

RADIATION SOLUTIONS INC

CALIBRATION SHEET

Instrument: **RSX-1**

Customer:
Contact:
Console : xxxx
Detector 1: xxxx
Detector 2: N/A

Date: August 19, 2010
Tech.: GP
Job Order: SO#1693
Customer PO

Channels: 1024 **ADC Offset:** N/A

	A1	A2	A3	A4	A5
High Voltages	681				

Stripping Constant	"this system"	"normal"
Alpha	**0.311**	0.250
Beta	**0.410**	0.400
Gamma	**0.783**	0.810
a	**0.050**	0.060
b	**0.000**	0.000
g	**0.000**	0.003

ROI#	Channel	IAEA Specification [keV]	Label
1	137-937	410-2810	Total Count
2	457-523	1370-1570	Potassium K
3	553-620	1660-1860	Uranium U
4	803-937	2410-2810	Thorium Th
5			
6			
7			
8	553-620	1660-1860	Uranium Upper U

Det#	Peak Cs	Cs FWHM		Peak	Th FWHM
A1	219.59	7.17		871.93	3.95
A2					
A3					
A4					
Sum Dn	**219.59**	**7.17**		**871.93**	**3.95**
Sum Up					

386 Watline Avenue Mississauga ♦ Ontario Canada L4Z 1X2 ♦ Tel (905) 890 1111 ♦ Fax (905) 890 1964 ♦ e-mail sales@radiationsolutions.ca

Figure 5-1 Sample of Calibration Sheet

5.2 HV Calibration Procedure

HV Setup of ADS Board as follows:

HV is used for coarse gain adjustment of the Xtals. In normal operation it is a rare event the HV need to be adjusted, but as Xtals are aging gain will slowly change and small adjustment may be required to keep the gain in the operational range. If a new ADS board or PMT is fitted the HV needs to be set at a correct value before the system is ready to use.

The user has **two options**;

A. AUTOMATIC procedure that requires a **Cs-137** source.
B. MANUAL procedure without the requirement of a source.

A - Automatic HV Calibration using a Cs-137 source: See Figure 5-2

1. Select the [**Device Parameter**] tab and select [**Gamma Detectors**] from the parameter list as shown in Figure 5-2.

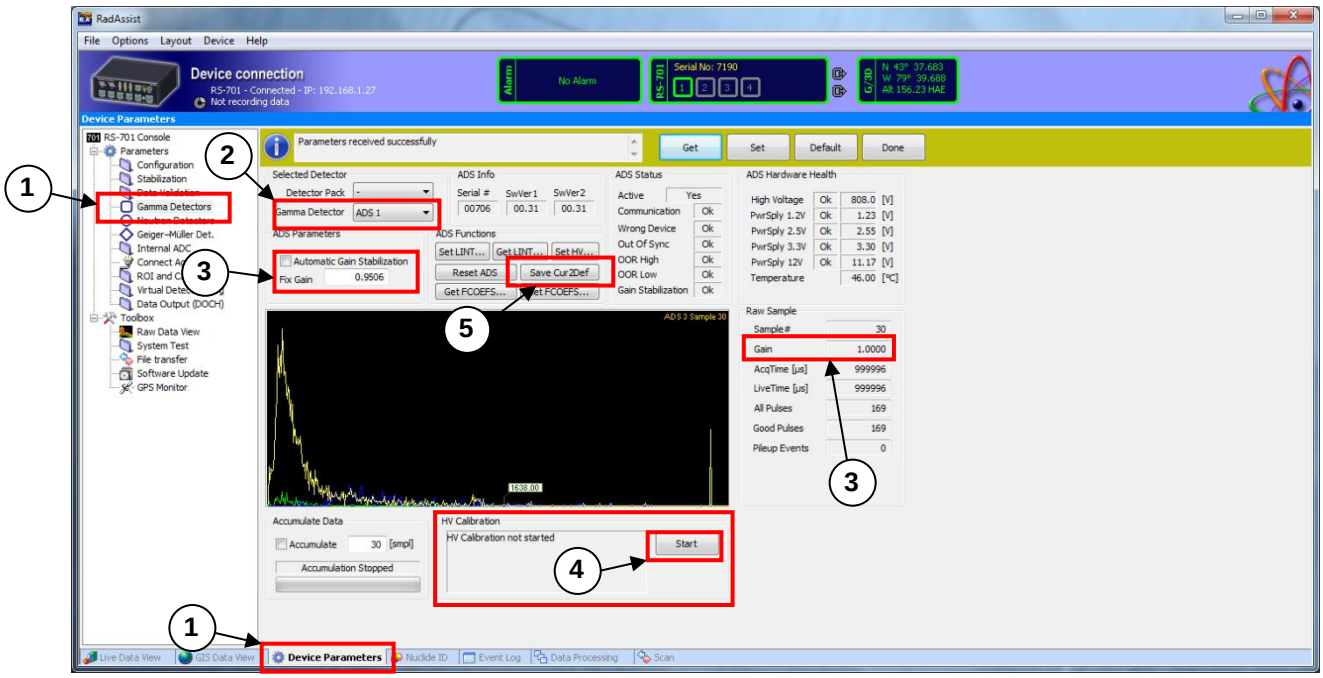


Figure 5-2 - Gamma Detector Screen

2. Select the affected gamma detector (e.g. **ADS 1**) from the pull down menu.

3. Uncheck the [**Automatic Gain Stabilization**] if it is checked and set the gain manually to **0.95** and press [**Set**]. Wait until the **Gain** displays approximately **0.95** before proceeding.

4. Place a **Cs-137** source (use **5 or 10uCi**) **UNDER** the detector pack (approx. ½ to 1 meter away) and press [**Start**] **HV Calibration**. After a short period of time the system will display HV calibration complete.

5. Press the [**SaveCur2Def**] to store the HV setting.

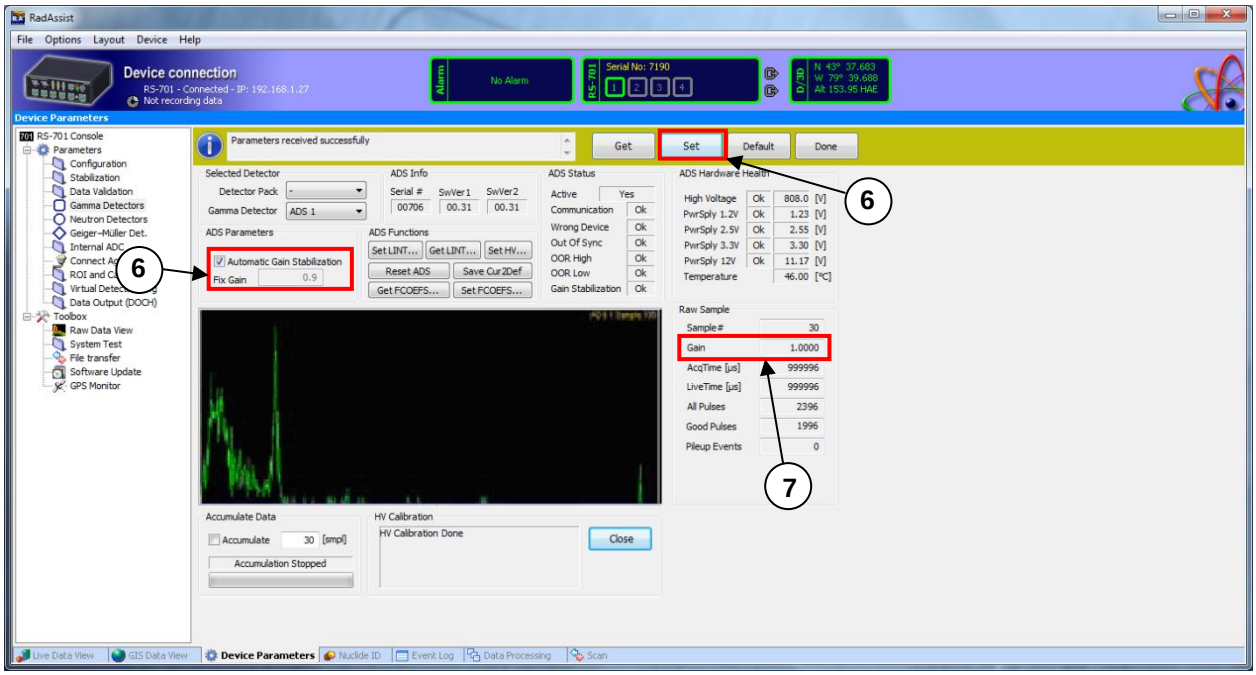


Figure 5-3 - Gamma Detector Screen

See Figure 5-3:

6. Check the [**Automatic Gain Stabilization**] tab and press [**Set**]. The detector should turn yellow indicating the automatic gain stabilization is in progress.

7. When the detector turns green, **Gain** should be approximately **0.95**.

8. Repeat for all detectors.

B - Manual HV Adjustment: See Figure 5-5.

1. Select the [**Device Parameter**] tab and select [**Gamma Detectors**] from the parameter list as shown in Figure 5-5.
2. Select the Gamma Detector **(ADS 1**) from the pull down menu.
3. Uncheck the **Automatic Gain Stabilization** if it is checked and set the gain manually to **0.95** and press [**Set**]. Wait until the gain displays **0.95** before proceeding.

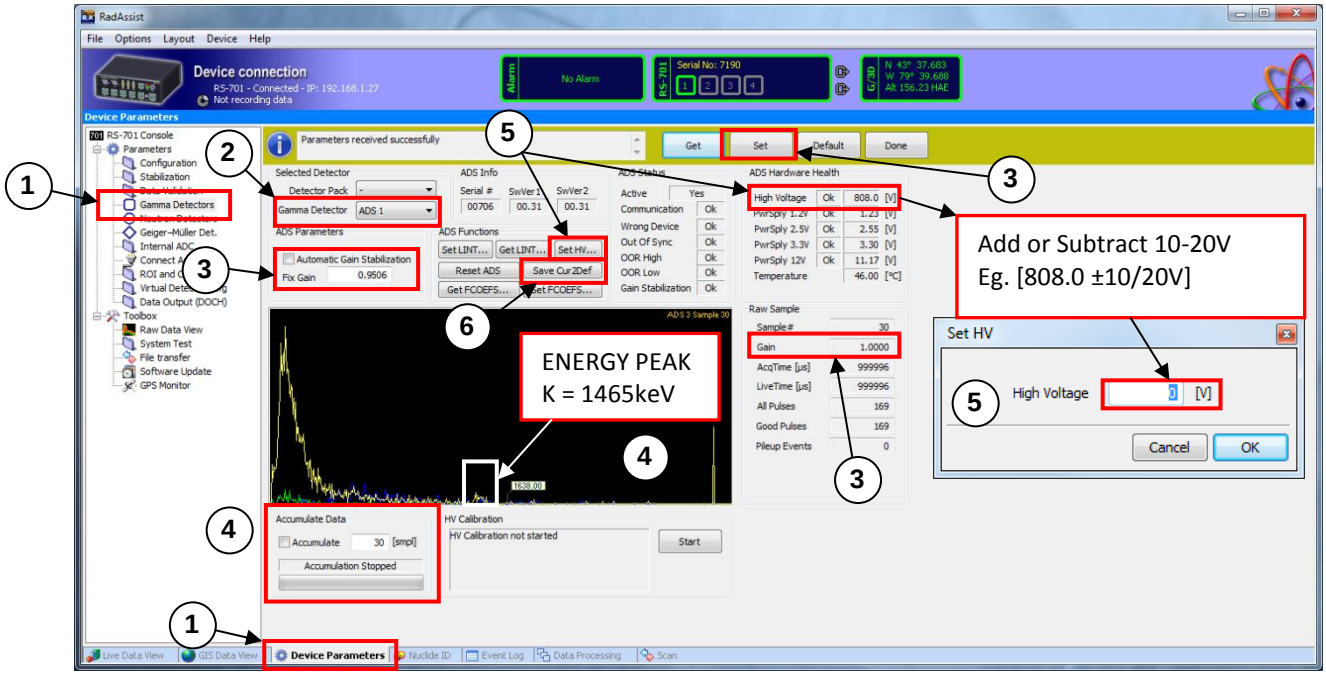


Figure 5-5 - Device Parameters Screen

4. Choose Accumulate Data and set to [300 smpl]. Look at the Potassium Energy Peak and ensure that K is approximately1465keV. If the K peak is higher than 1465Kev, reduce the HV (see **Step 5**), if it is lower increase the HV.
5. Set the HV manually. Make small 10-20V adjustments at a time.
6. Repeat **Step 5** until the alignment is within 5keV. Press the [**SaveCur2Def**] to store the HV setting.
7. Check the **Automatic Gain stabilization** tab and press [**Set**] (**See Figure 5-6**). The detector should turn yellow indicating the automatic gain stabilizations is in progress. When the detector turns green, visually check that all spectra is aligned, if not repeat the procedure.

   NOTE: Gain should be approximately **0.95**
8. Repeat for all detectors.

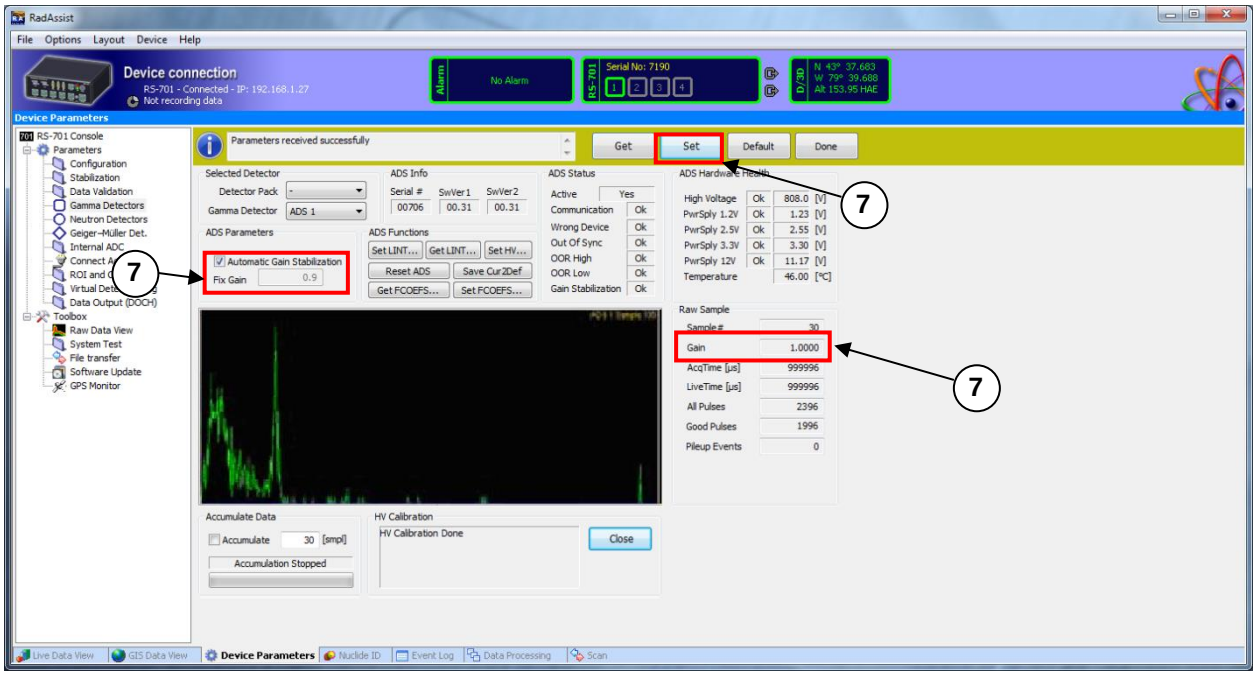
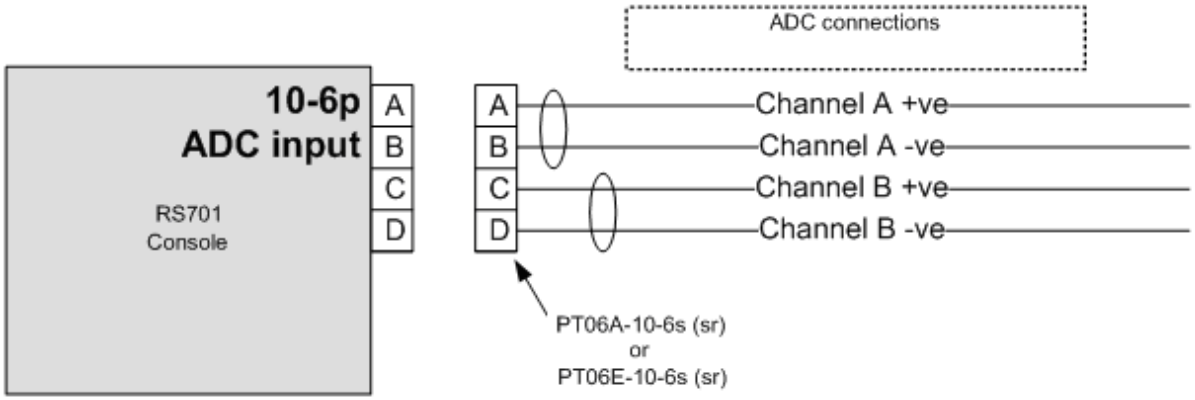


Figure 5-6 - Device Parameters Screen

5.3 ADC Input

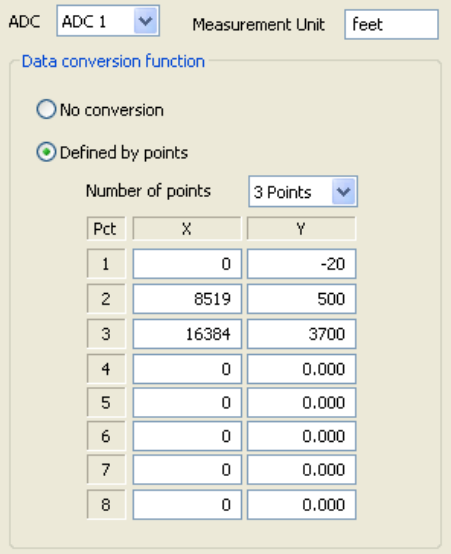
The RS-701/705 each allow for two analog inputs as shown in the following figure.

Note: The connector and connections are the same for either instrument.



ADC Conversion of Voltage:

Below is shown a typical example of a data conversion for 3 points.



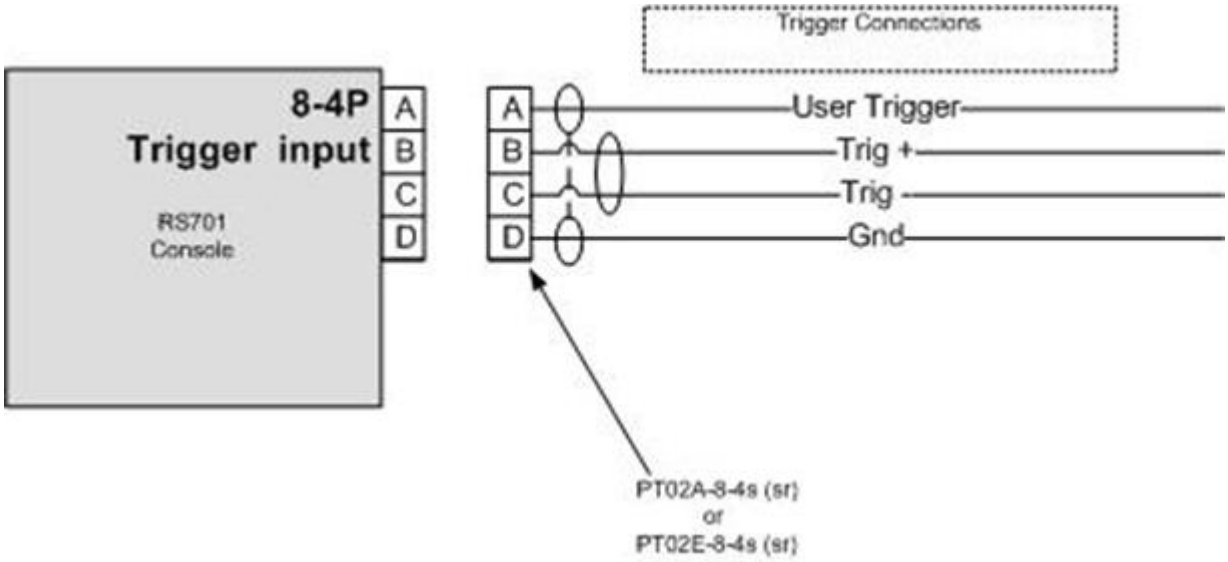
RANGE	OUTPUT OF RALT (X)	RALT EQUIVALENT (Y)
(0V)	0	-20 ft
(10.4V)	8519.68	500 ft
(20V)	16384	3700 ft

Note: the formulae used to find **X** is **ADC#** = $\frac{\text{RANGE x 16384}}{\text{20V}}$ = **X**

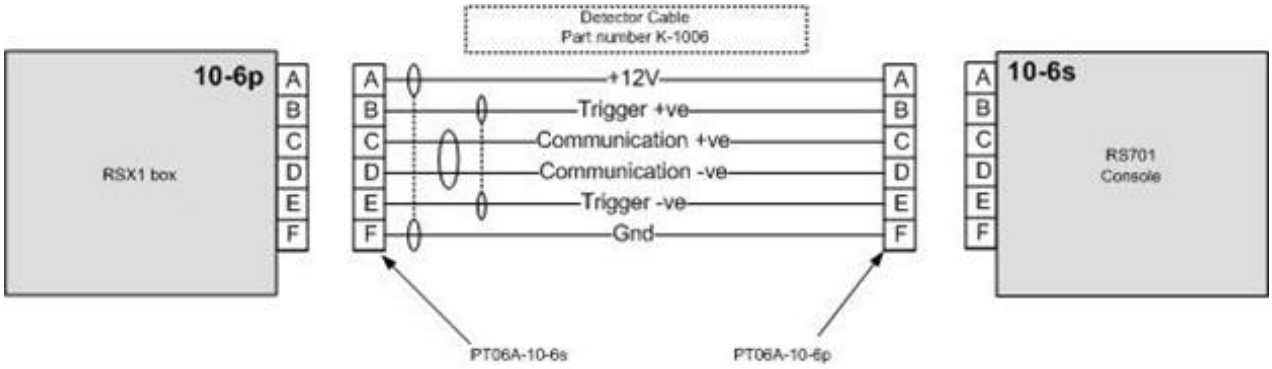
X is the value read from the ADC, **Y** is the converted value. When defining the conversion curve if the value (X) is not in the range defined by the first point the (Y) value is set according to this rule:

For; if (X < X[0]) then Y = Y[0]
If (X > X[N] then Y = Y[N] (where N is the last point)

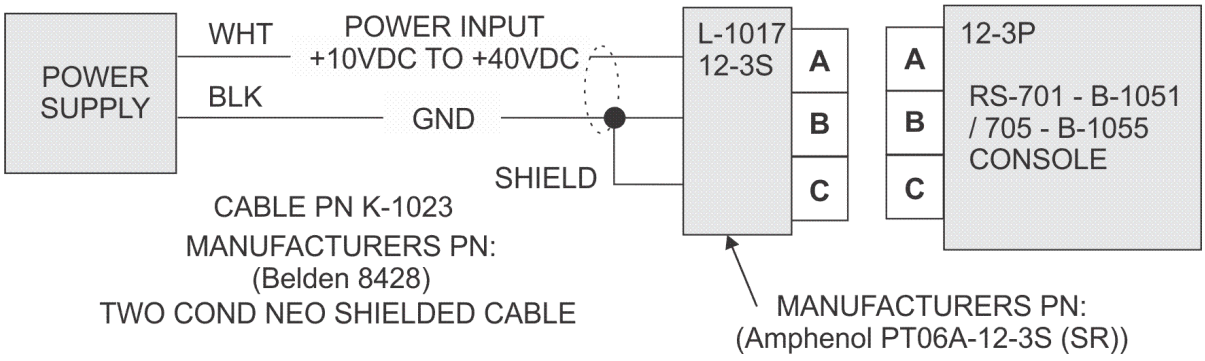
701/705 Trigger Input



701/705 Detector Input



5.4 RS-701/705 Power Input



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6.0 DATA

6.1 Raw Data Retrieval

Note: Download RAW data using a USB memory stick after every survey.

The RS-701 console internally stores the last 24 hrs of operation from the RSX detector, including raw data files, event logs etc. Individual Raw data (spectrum) for each detector is saved and compressed as a "zip file" every 15 minutes into a folder containing 1 hour of information.

In the event of system problems or erratic operation it is very helpful to have some of these files for diagnostic reasons. Some of these files are extremely informative and can be opened using the RadAssist Utility Event Log Viewer (see **RS-700 RadAssist User Manual D-1013** for details) or Stab Log Viewer.

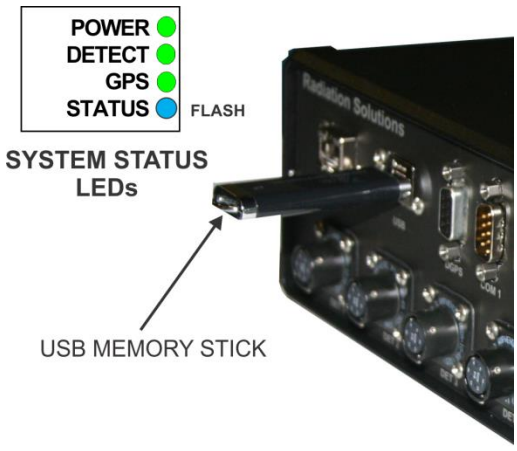
For this reason it is recommended as good practice for the user to back up these files each day. This is achieved as follows:

a) Take a USB memory stick (each download uses approximately 45 Mb).

b) **RSI** folder is created and automatically stored with date and time.

c) With the RS-701 console powered ON, insert the USB stick into the USB service port.

d) Data will immediately be transferred – wait for the flashing stick light to stop showing the completion of data transfer. **NOTE:** The **STATUS LED** will flash **BLUE** while accessing the memory stick and turn SOLID when transfer is complete.



e) The file format is eg. DPU_00000000.RFL.gz, DPU_00000001.RFL.gz etc. – zipped Raw data files.

f) It is recommended that these files then be archived on a CD to protect data and permit future re-evaluation if required.

g) The file structure on the disk is typically as follows:

C:/RSI RS-701 – Date – Time (of the start of data transfer)

Name	Size	Type	Date Modified
DPU_00000000.RFL.gz	254 KB	WinZip File	7/23/2007 6:02 AM
DPU_00000001.RFL.gz	381 KB	WinZip File	7/23/2007 8:48 AM
DPU_00000002.RFL.gz	1,007 KB	WinZip File	7/23/2007 9:49 AM
DPU_00000003.RFL.gz	1,020 KB	WinZip File	7/23/2007 10:49 AM
DPU_00000004.RFL.gz	1,032 KB	WinZip File	7/23/2007 11:49 AM
DPU_00000005.RFL.gz	1,092 KB	WinZip File	7/23/2007 12:49 PM
DPU_00000006.RFL.gz	1,062 KB	WinZip File	7/23/2007 1:49 PM
DPU_00000007.RFL.gz	1,096 KB	WinZip File	7/23/2007 2:49 PM
DPU_00000008.RFL.gz	783 KB	WinZip File	7/24/2007 4:39 AM
DPU_00000009.RFL.gz	1,029 KB	WinZip File	7/24/2007 5:46 AM
DPU_00000010.RFL.gz	1,061 KB	WinZip File	7/24/2007 6:46 AM
DPU_00000011.RFL.gz	1,036 KB	WinZip File	7/24/2007 7:46 AM
DPU_PARTIAL.RFL.gz	1,102 KB	WinZip File	7/24/2007 9:27 AM
DPUCURPAR.DPA	2 KB	DPA File	7/23/2007 9:13 AM
DPUDEFPAR.DPA	2 KB	DPA File	7/24/2007 9:26 AM
DPUEVLOG.EVL	1,049 KB	RSI Event Log Viewer	7/24/2007 9:29 AM
DPUSTAB.GSL.gz	2,598 KB	WinZip File	7/24/2007 9:27 AM

Above is an example;

The **file structure** is as follows:

- DPUSTAB.GSL.gz – Stabilization log ":zipped"
- DPUEVLOG.EVL – Event Log
- DPUCURPAR.DPA – Current Parameters
- DPUDEFPAR.DPA – Default Parameters

h) Refer to **RS-700 RadAssist User Manual D-1013** for the operation of the Event Log Viewer.

SYSTEM PERFORMANCE EVALUATION
For new users of the RS-701 system it may be useful to send some data files back to RSI to check system performance. The best guide to system performance is the EVENT LOG that is stored on disk as "**SYCEVLOG.evl**". It is recommended that for the first few days of system operation that the user email this data file back to RSI (email address service@radiationsolutions.ca). RSI can then use these files to assess system performance and report back any problems.

If the user is experiencing any operational problems these files will help RSI evaluate the problem and offer suggestions to resolve any issues.

6.2 RSI Data Structure

RSI data output messages are packaged using the RSCM specifications:

RSCP Message		
Type	**Field**	**Description**
RSCP_HDR	Hdr	Standard RSCP Header (used by all messages)
Message Data	Msg	Payload of this message
BYTE	DataChk	Data Checksum

RSCP_HDR		
Type	**Field**	**Description**
BYTE	Signature	Always 0x55
WORD	Length	The length of the data following the header including the Data Checksum byte
WORD	Command	Message ID
BYTE	Status	Extra info related to the command
BYTE	Reserved	Reserved for future use
BYTE	ChkSum	Check Sum (XOR all bytes but the ChkSum byte)

Command ID data output messages (used in the Command Field of a RSCP Header):

#define RS_DOCH_MSGID_RSI_1024_ROI 0xA001 // RSI 1024 channel ROI
#define RS_DOCH_MSGID_RSI_1024_ROI_DW 0xA003 // RSI 1024 channel ROI + DW
#define RS_DOCH_MSGID_RSI_1024_ROI_DW_UP 0xA004 // RSI 1024 channel ROI + DW + UP

When you start recording the data is recorded in Binary Format to the laptop.

RS_DOS_STD_HDR (Header & ROI data)		
Type	**Field**	**Description**
WORD	DevType	Device Type
WORD	DevID	Device Serial Number
DWORD	UtcTime	UTC Time
WORD	BiasMin	Reserved for future use
BYTE	SeqNum;	Sample sequence number
DWORD	DwDetBmp	Active down looking detectors bitmap (includes detectors with errors)
DWORD	UpDevBmp	Active up looking detectors bitmap (includes detectors with errors)
DWORD	ErrDetBmp	Active detectors with errors bitmap (spectrum data from detector with errors is not added to the spectrum in this output stream)
DWORD	ROI_1	10 ROIs
DWORD	ROI_2	
DWORD	ROI_3	
DWORD	ROI_4	
DWORD	ROI_5	
DWORD	ROI_6	
DWORD	ROI_7	
DWORD	ROI_8	
DWORD	ROI_9	
DWORD	ROI_10	
WORD	ActNtrBmp	Reserved for future use
WORD	ErrNtrBmp	Reserved for future use
8xBYTE	ReservedNtr	Reserved for future use
BYTE	GpsError	GPS Error Code (if 0 means no error)
float	GpsX	GPS Position in Cartesian Coordinates
float	GpsV	
float	GpsZ	
float	Longitude	GPS Position in WGS 84 Coordinate system
float	Latitude	
float	Altitude	
9xBYTE	Reserved	

RS_DOS_STD_HDR (Header & ROI data)		
Type	**Field**	**Description**
BYTE	DetCount	Number of detectors summed in the bellow spectrum data
DWORD	AcqTime	Acquisition time in microseconds
DWORD	LiveTime	Live time in microseconds
DWORD	GmmTotal	Gamma total count
WORD	Channel 0	Spectrum 1024 Channels (2 bytes per channel)
…	…	
WORD	Channel 1023	

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7.0 TROUBLESHOOTING AND SERVICE

7.1 RS-700 Error Code List

The following are possible error code descriptions found in the status bar.

Error	Description	Type
No Trigger	External trigger has been set but no signal is being received.	
No Active Detectors	No detectors can be found.	
Bad Backup Win CE OS Version	The backup operating system is not compatible or not present.	
Bad Win CE OS Version	The operating system is not compatible or not present.	
Forced Internal Trigger	External trigger has timed out and switched to a force internal trigger.	
Multiple Triggers	More than one trigger per sample period has been received.	
DPU SeqNum OutOfSync	Sequence number does not match (missed trigger).	

GMM errors (detector specific)

```
Gmm # Comm Error – cable, fuse, settings
Gmm # Stabilization Error - settings
Gmm # HV Error – ADS, settings
Gmm # 1.2V PwrSply Error
Gmm # 2.5V PwrSply Error
Gmm # 3.3V PwrSply Error
Gmm # 12V PwrSply Error
Gmm # Sync Error – No problem
Gmm # OOR High – Source settings, ADS, PMT, DPA
Gmm # OOR Low – settings, ADS, PMT, DPA
Gmm # Unknown Err XXXX
```

ADS

Stabilization (detector specific)

```
Gmm # Stabilization Disabled – not an error warning
//////////////////////////////not stable yet
Gmm # Stab Hi Countrate %s – not an error warning
Gmm # Stabilizing – not an error warning
Gmm # Stable in %d[s] %s – not an error warning
//////////////////////////////stable
Gmm # Stab Hi Countrate %s
Gmm # Stabilized – Timeout - settings
Gmm # Stabilized
//////////////////////////////stabilization error
Gmm # No Stab.Params - settings
Gmm # No Ref.Spectra - settings
Gmm # Stab.Gain OOR - HV
Gmm # Stab.Timeout - settings
Gmm # Unknown Stab
Gmm # Unknown Stabilization State 0x02X
```

GPS

```
No Data Recv – antenna problem
Antenna Short – no antenna
Antenna Open - OK
No GPS time yet
Initialization needed
PDOP is too high - canopy
No usable satellites – OK WAIT
Only 1 usable satellite – OK WAIT
Only 2 usable satellites – OK WAIT
Only 3 usable satellites – OK WAIT
Chosen satellite is unusable
BBRAM unavailable at startup
Unknown Error
Unexpected code %d
```

DOCH Error Codes

```
DOCH %u DLL Not Loaded – settings check library selections
DOCH %u Failed to create
DOCH %u Comm Type Not Supported
DOCH %u Msg Buffer Locked
DOCH %u DBLDR Failed To Create
DOCH %u DBLDR DLL Not Loaded
DOCH %u Error

Num:%u
```

7.2 RS-700 Power Requirements

The following table shows the power requirements for the RS-700 series controllers and detectors:

	RS701	RSX1	S40	Wattage
A	1	0	0	18.2
B	1	1	0	22.8
C	1	0	1	21.0
D	1	1	1	25.2
E	1	2	0	26.6
F	1	2	1	29.4

7.3 Service Maintenance

7.3.1 Service Parts:

The following parts are used as replacements to the original part. Alternate parts may be used but they must meet the same specifications as those listed below.

For the CIB Detector Interface Board PN I-1004:

See Figure 7-2 for CIB Detector Interface Board replacement procedures.

RSI PART #		ITEM	MANUFATURER	MANUF. PART #
F1- F5	P-1200	Microfuse - 1A	Littlefuse	273001
F6	P-1202	Microfuse - 3A	Littlefuse	273003
BT1	P1280	3V Lithium Battery	Panasonic	VL1220-1VC

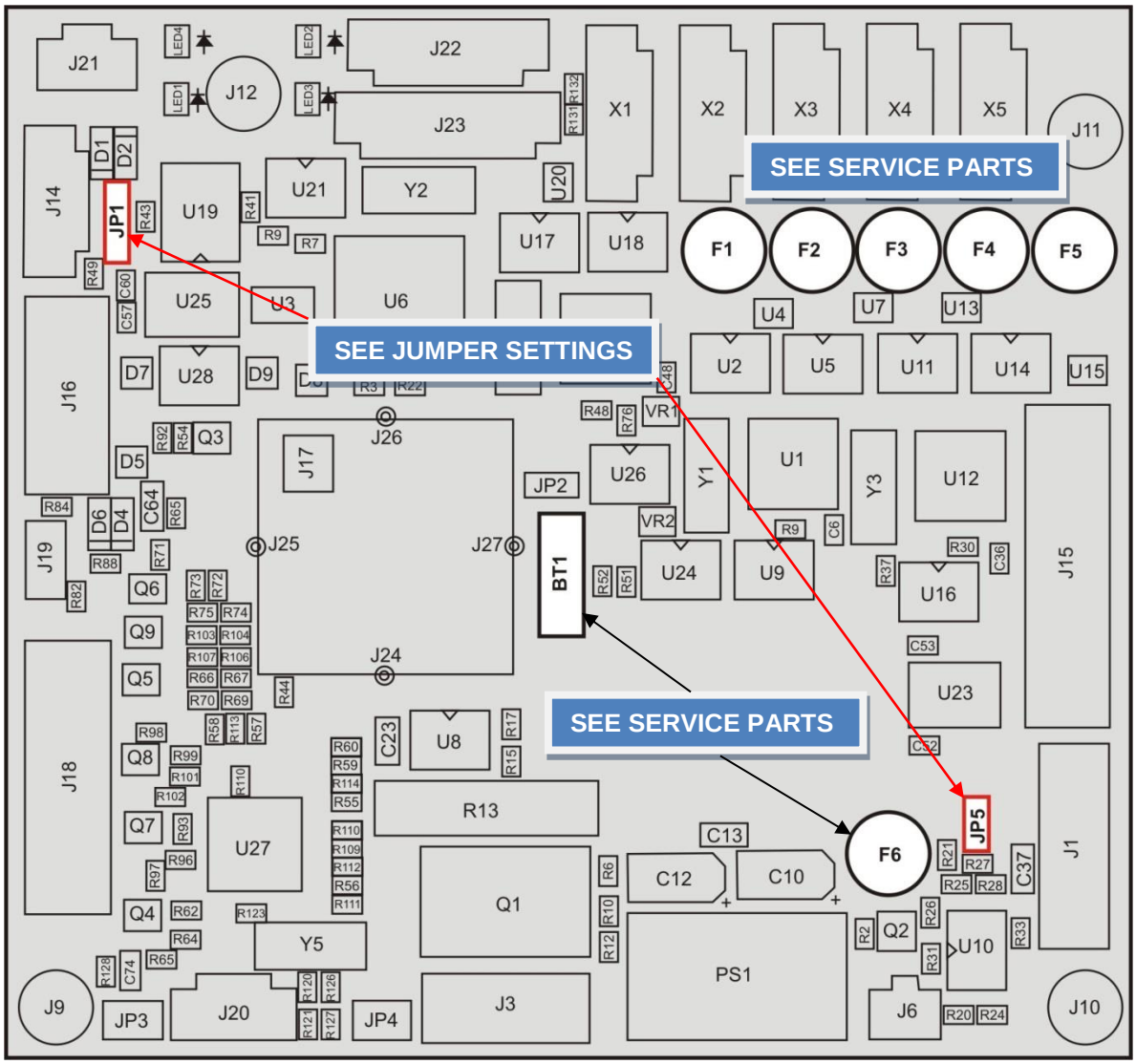


Figure 7-1 – CIB Detector Interface Board PN I-1004

Jumper Settings: see CIB Detector Interface Board Diagram for location

Set jumper **JP1** for trigger:

Negative Pulse (default setting)

Positive Pulse

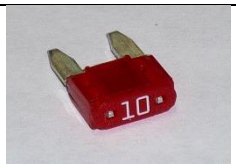
Note: The trigger setting depends upon hardware pulse either positive or negative. Check the direction of the hardware pulse before setting jumper **JP1**, refer to **Section 2-3** for further information.

Set jumper **JP5** for Power ON – bypass the ON/OFF switch by placing jumper to ON. Normally set for Maintenance procedures.

OFF **ON**

7.3.2 Fuse Replacement (See Figure 7-1)

The following procedure documents the methods used to replace the fuses for the CIB Board and/or the Power Supply located in the RS-700 Series Controller(s): Also refer to **Figure 7-1** for Parts Location.

SHIPPED PARTS			
ITEM	**PART NUMBER**	**QTY**	**DESCRIPTION**
	XP-1212	1	Set of Fuses (10A mini auto Fuse) (Set = 4)
	XP-1200	1	Set of Fuses (1A Micro Fuse) (Set = 4)
	XP-1202	1	Set of Fuses (3A Micro Fuse) (Set = 4)

Tools Required: 7/64 Hex Driver, Phillips #2 Screwdriver.

The following procedure(s) instruct the user how to install the shipped parts.

Replace the Controller Fuses, do the following:

To replace fuses do the following:

1. Remove all Power and Detector Cables from the controller front panel.
2. Place the console on the workbench.

Notes:

Follow steps 1 – 9 to replace the 1A and 3A fuses on the CIB Circuit Board.

Follow steps 10 and 11 to replace the 10A fuse on the Power Supply Board.

Fuse Replacement for CIB Circuit Board:

Refer to Figure 7-2

1. Use a 7/64 hex driver remove and retain 4 bolts (item 1) that attach the rear panel to the RS-700 series console assembly.
2. Remove the rear panel. Remove and retain the **Thermal Pad** for later installation.
3. The RS-700 series console housing (item 2) slides off the assembly.
4. Using a Philips #2 screw driver loosen the back screws (item 4) and remove and retain the front screws (item 3) that hold the CPU Board bracket to the RS-700 series side brackets.
5. Swivel the CPU Board bracket on the back screws (item 4) to allow access to the interior of the console (**See Detail A**).

Replace 1A Fuses (PN **XP-1200**) (**See Detail B**)

6. The location is shown on the CIB Board. Remove the fuse by firmly grasping the fuse and tugging upwards.
7. Replace the fuses as required; Care must be taken not to bend the fuse pins when pushing the fuse into the socket.

Replace 3A Fuses (PN **XP-1202**) (**See Detail B**)

8. The location is shown on the CIB Board. Remove the fuse by firmly grasping the fuse and tugging upwards.
9. Replace the fuses as required; Care must be taken not to bend the fuse pins when pushing the fuse into the socket.

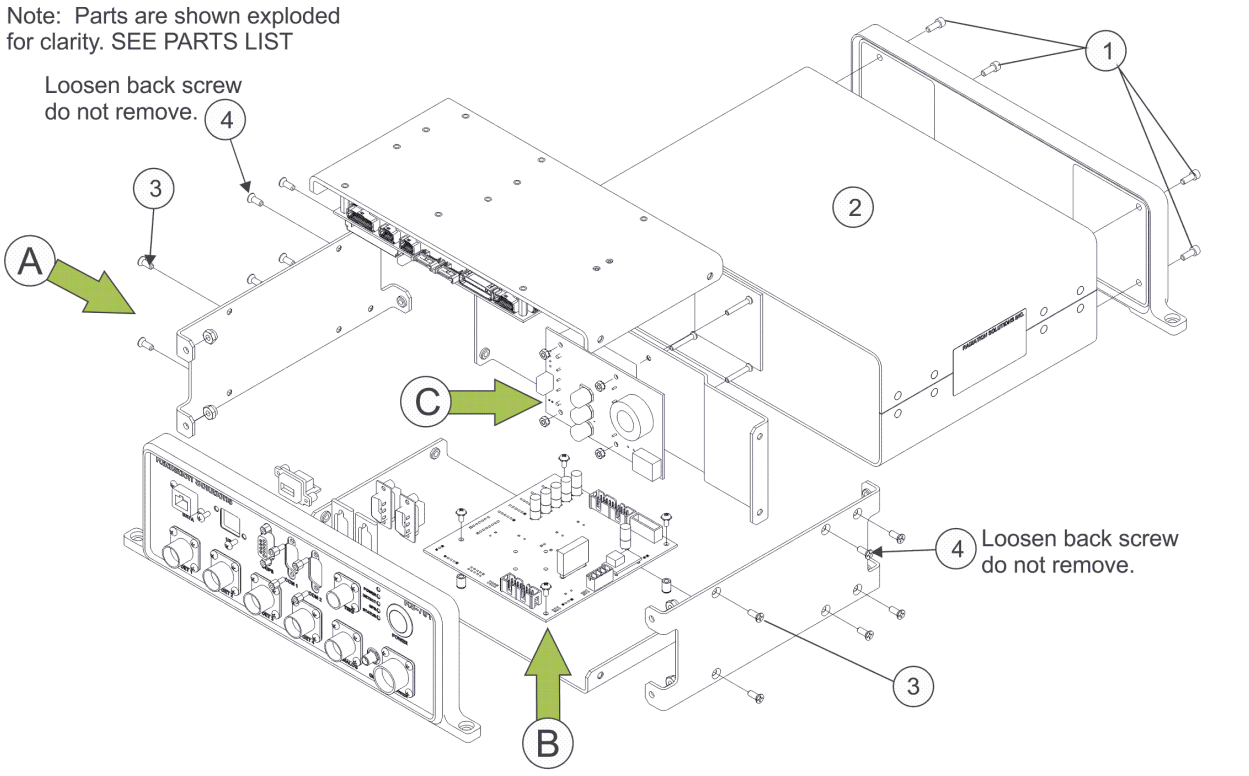
Fuse Replacement for Power Supply:

Refer to Figure 7-2

Replace 10A Fuses (PN **XP-1212**) (**See Detail C**)

NOTE: The CPU Board bracket does not need to be swiveled to replace the Power Supply **10A Fuse** (**PN XP-1212**). The power supply fuse can be accessed from the Rear of the Console (**See Detail C**).

10. The location is shown on the Power Supply Board, access is shown on the rear of the RS-700 series console. Remove the fuse by firmly grasping the fuse and tugging downwards.
11. Replace the fuses as required; simply push the fuse in to seat the prongs.



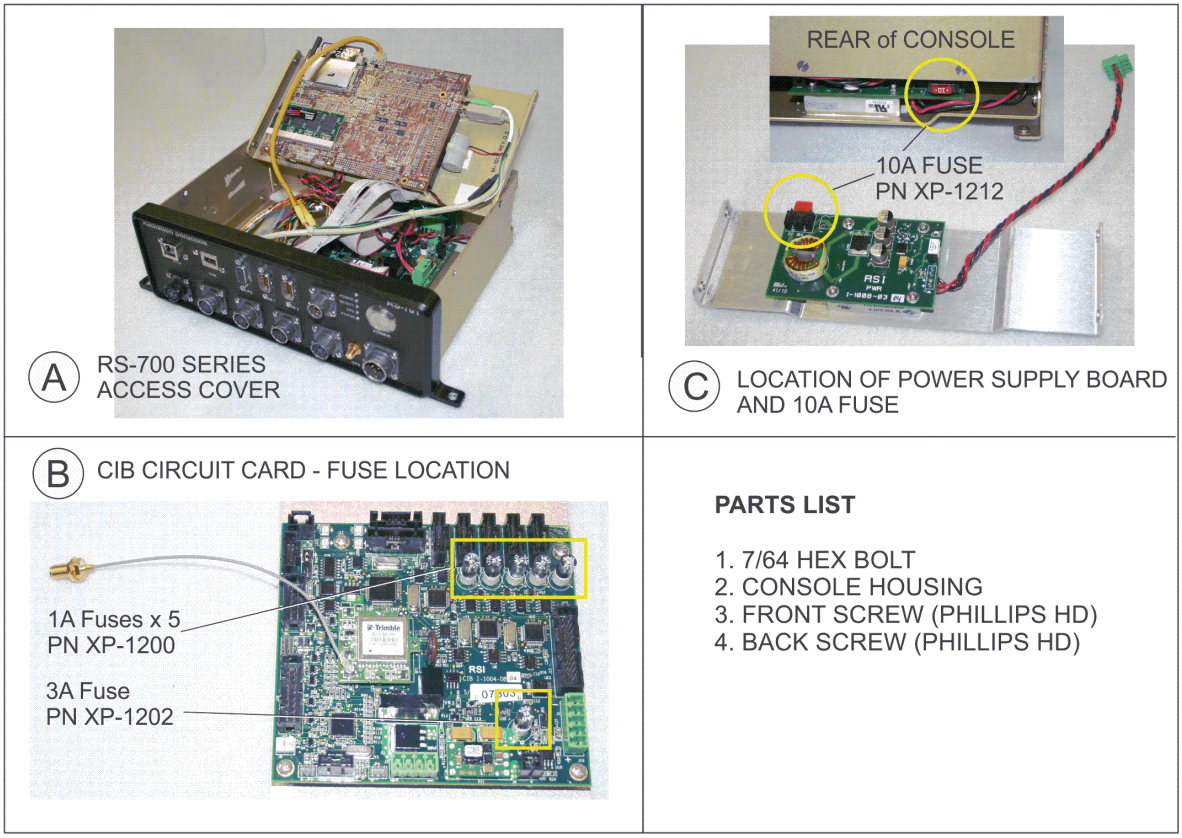


Figure 7-2 – RS-701 Controller Exploded View

Reassemble RS-700 series Controller:

Refer to Figure 7-2

Once the unit has been serviced install the RS-701 console onto the RSX-3 detector pack as follows:

1. If it has been swiveled return the CPU Board bracket to its original position and using the Philips #2 screwdriver fasten it with the retained screws (item 3). Tighten screws (items 3 and 4).
2. Slide the RS-700 series console housing (item 2) back into position.
3. Make sure that the **Thermal Pad** is installed on the PSU bracket.
4. Using the 7/64 hex driver attach the Console Rear Panel with the 4 retained bolts (item 1).

7.3.3 RSX-1 Detector Pack

Tools Required: 1/8, 5/32, and 7/64 Hex Drivers, Phillips #1 and #2 Screwdrivers.

The following procedure(s) instruct the user how to install the replacement part(s).

The IDU assemblies for detectors (RSX-1, RSX-3, RSX-4 and RSX-5) are the same with the following configuration difference(s). Figure 7-3 shows the RSX-1. The RSX-1 and RSX- 3 are connected externally by cable(s) to the RS-700 series console(s). The RSX-4 and RSX-5 are connected internally to their DPU assemblies. Note: Any differences are shown.

Prepare the RSX-1 Detector pack, do the following (Refer to Figure 7-3):

1. Refer to Figure 7-3 remove the RSX-1 detector cable.
2. To gain access you will remove the detector cover.

NOTE: Determine the fault prior to disassembly. Document the last good HV reading prior to HV Manual Calibration.

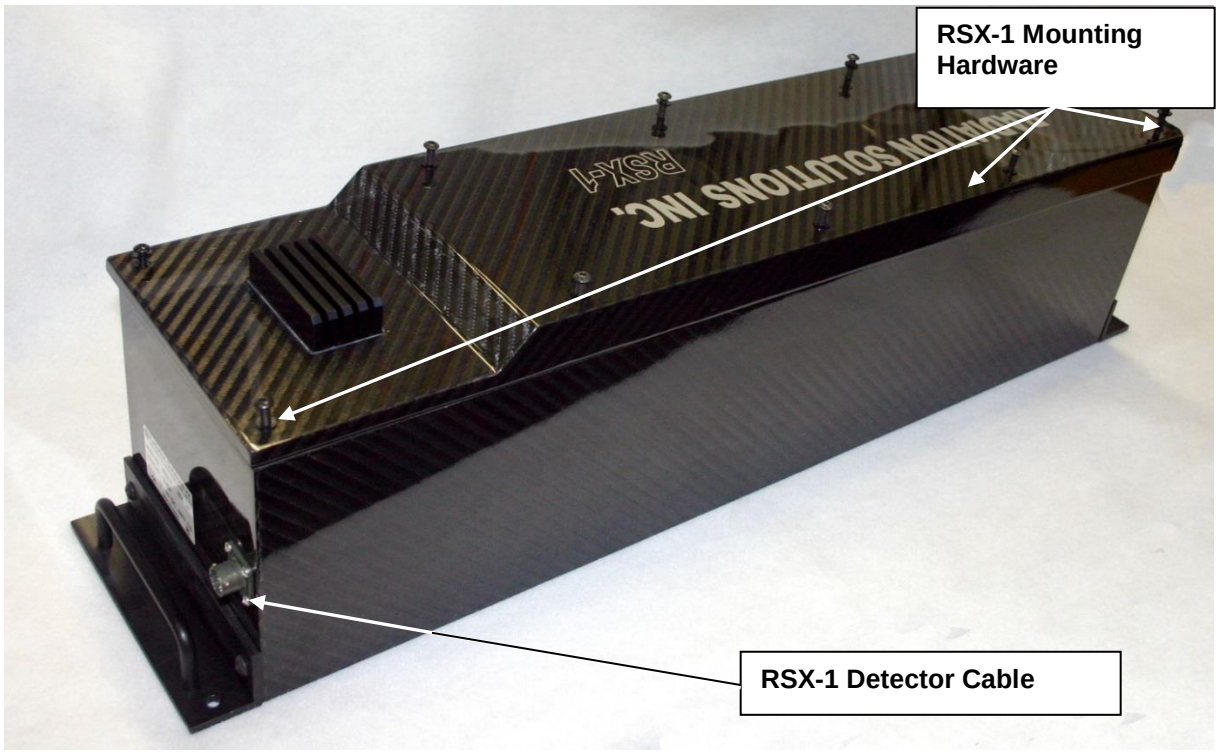


Figure 7-3 – RSX-1 Detector

Replace the IDU and/or the ADS Assembly, do the following (Refer to Figure 7-3):

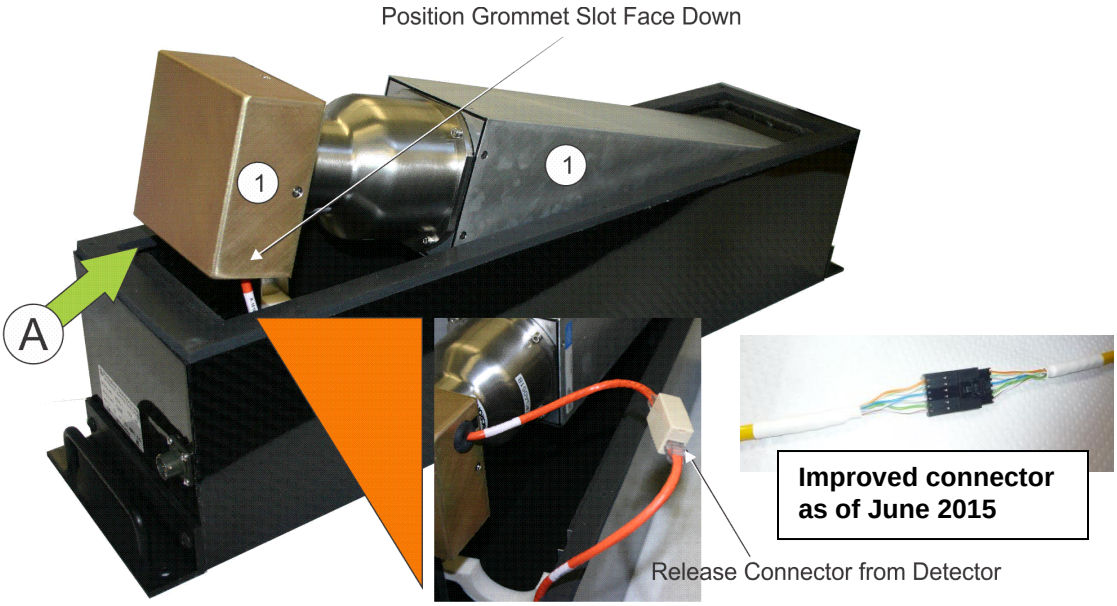
Tools Required: 1/8, 5/32, and 7/64 Hex Drivers, Phillips #1 and #2 Screwdrivers.

NOTE: The assembly and disassembly of the ADS Board to the IDU assembly is the same for all detector assemblies (RSX-1, RSX-3, RSX-4 and RSX-5). The following procedure documents how to replace the ADS Board onto the IDU assembly of the RSX-1 Detector. The procedure will be the same for the RSX-3 detector with the exception of IDU assembly quantities and mounting hardware.

1. Using a 1/8 hex driver remove and retain 8 - 1-½" bolts, 2 - ¾" bolts and washers that fasten the detector cover to the RSX-1 Detector Pack (See **Figure 7-3**).
2. Remove the PMT collar top saddle (Item 4).
3. Tilt the IDU Assembly (item 1) forward and release the detector cable connector coupling (See **Figure 7-4**) from the IDU.

   NOTE: As of June 2015 the connector coupling will be changed from RJ-45 to Molex as shown in Figure 7-4.
4. Using the Phillips #2 screw driver, remove 4 screws from the PMT end can and slide the can from the ADS assembly (item 2). Take care to remove the detector cable grommet when sliding the can from the assembly. Remove and retain the Thermal Pad (item 3) from the face of the ADS Board for later installation.
5. Using the Phillips #1 screw driver, remove and retain 4 screws that attach the ADS Board (item 2) to the PMT assembly. Remove the ADS Board (item 2) from the PMT standoffs.
6. Remove the cables from the detector and the PMT **(See Detail A**).
7. Remove and return the defective ADS Board to RSI.
8. Reconnect the cables from the PMT and the Detector as shown (**See Detail A**) onto the new ADS Board (PN **I-1000**).
9. Position the ADS Board assembly onto the standoffs of the PMT Assembly. Using the Phillips #1 screwdriver fasten the ADS Board (item 2) with the 4 retained screws.
10. Install the thermal pad (item 3) onto the face of the ADS Board prior to replacing the end can.
11. Before installing the detector cable, position the end can with the grommet hole facing down (**See Figure 7-4**). Insert the grommet with the detector cable into the slot on the end can. Slide the end can onto the ADS Assembly, making sure the cable is not pinched.
12. Install 4 screws securing the end can to the ADS/PMT assembly.
13. Position the IDU (PN **C-1048**) into the detector pack. Reconnect the detector cable as shown (**See Detail A**).
14. Make sure to position a thermal pad (item 3) onto the end cap (**See Detail A**) and lay the IDU assembly in place. Make sure that the detector cable is not pinched.
15. Replace the PMT Collar (item 4).
16. Position the Detector Cover (**See Figure 7-3**) over the detector pack and using a 1/8 hex driver secure the cover with 10 washers, 8 - 1-½" bolts, 2 - ¾" bolts and torque to 7.5 in lbs.
17. Replace the Detector Cable coupling to the RSX-1 Detector Pack for the RS-701 Console.

    NOTE: As of June 2015 the connector coupling will be changed from RJ-45 to Molex as shown in Figure 7-4.
18. Perform the **HV Calibration (see Section 5-2).**



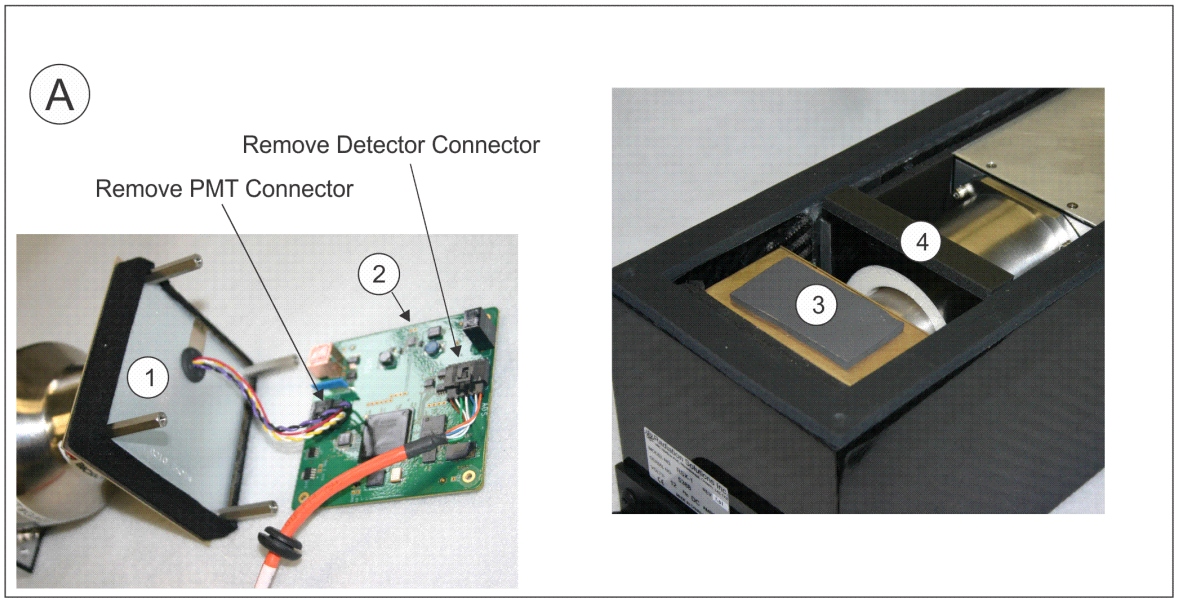


Figure 7-4 - RSX-1 IDU Assembly

7.3.4 Replace the IDU and/or ADS Assembly - RSX-3 Detector

To replace fuses the RS-701 console must be removed from the RSX-3 detector pack as follows: Refer to **Section 7.3.2** for Fuse Replacement procedure.

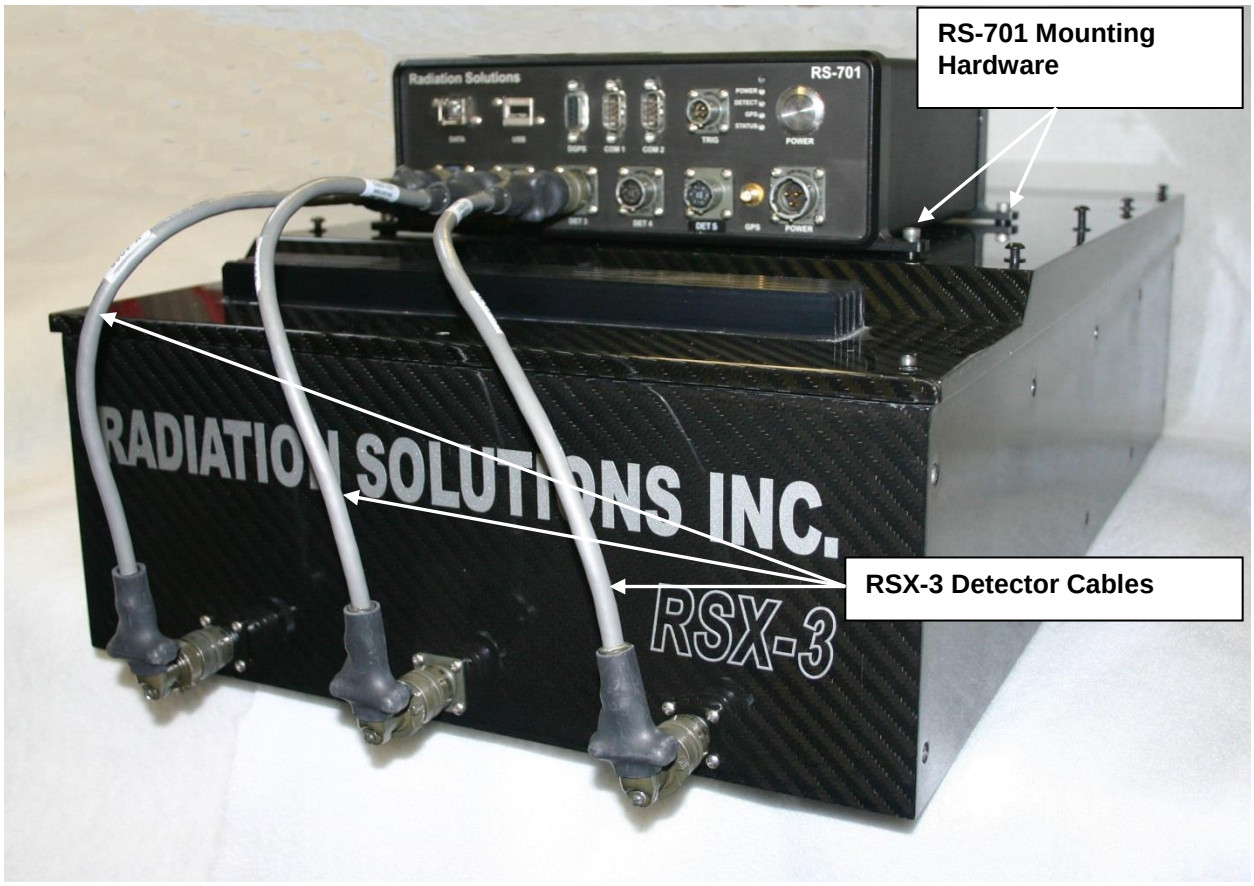


Figure 7-5 RSX-3 Detector Assembly

NOTE: The assembly and disassembly of the ADS Board to the IDU assembly is the same for all detector assemblies (RSX-1, and RSX-3). The following procedure documents how to replace the ADS Board onto the IDU assembly of the RSX-3 Detector. The procedure will be the same for the RSX-1 detector with the exception of IDU assembly quantities and mounting hardware.

Tools Required: 1/8, 5/32, and 7/64 Hex Drivers, Phillips #1 and #2 Screwdrivers.

Replace the ADS Assembly, do the following:

NOTE: Determine the faulty IDU and/or ADS Assembly prior to disassembly. Document the last good HV reading prior to HV Manual Calibration.

1. Remove the RSX-3 Detector Cables from the RS-701 front panel. Refer to **Figure 7-5**.

Refer to Figure 7-6

2. Using a 1/8 hex driver remove and retain 12 bolts (item 2) that fasten the detector cover (item1) to the RSX-3 Detector Pack.

3. The RS-701 Console can remain attached to the detector cover (item 1). Remove the detector cover (item1) and move to a safe location.
4. Remove the packing (foam plate assembly) (item 3).
5. Remove the PMT collar top saddle (Item 4).
6. Tilt the IDU Assembly (item 5) forward and release the detector cable connector coupling (See **Figure 6**) from the IDU.

   NOTE: As of June 2015 the connector coupling will be changed from RJ-45 to Molex as shown in Figure 7-6.
7. Using the Phillips #2 screw driver, remove 4 screws from the PMT end can and slide the can from the ADS assembly (item 6). Take care to remove the detector cable grommet when sliding the can from the assembly. Remove and retain the Thermal Pad (item 7) from the face of the ADS Board for later installation.
8. Using the Phillips #1 screw driver, remove and retain 4 screws that attach the ADS Board (item 6) to the PMT assembly. Remove the ADS Board (item 6) from the PMT standoffs.
9. Remove the cables from the detector and the PMT **(See detail A**).
10. Remove and return the defective ADS Board to RSI.
11. Reconnect the cables from the PMT and the Detector as shown (**See Detail A**) onto the new ADS Board (PN **I-1000**).
12. Position the ADS Board assembly onto the standoffs of the PMT Assembly. Using the Phillips #1 screwdriver fasten the ADS Board (item 6) with the 4 retained screws.
13. Install the thermal pad (item 7) onto the face of the ADS Board prior to replacing the end can.
14. Before installing the detector cable, position the end can with the grommet hole facing down (**See Detail A**). Insert the grommet with the detector cable into the slot on the end can. Slide the end can onto the ADS Assembly, making sure the cable is not pinched.
15. Install 4 screws securing the end can to the ADS/PMT assembly.
16. Position the IDU (PN **C-1048**) into the detector pack. Reconnect the detector cable as shown (**See Detail A**).
17. Make sure to position a thermal pad (item 7) onto the end cap (**See Detail A**) and lay the IDU assembly in place. Make sure that the detector cable is not pinched before reconnecting coupling.

    NOTE: As of June 2015 the connector coupling will be changed from RJ-45 to Molex as shown in Figure 7-6.
18. Replace the PMT Collar (item 4), and Detector packing (foam plate assembly) (item 3).
19. Position the Detector Cover (item 1) over the detector pack and using a 1/8 hex driver secure the cover with 12 bolts (item 2).
20. Replace the Detector Cables from the RSX-3 Detector Pack to the RS-701 Console.
21. Perform the **HV Calibration (Refer to Section 5.2)**.

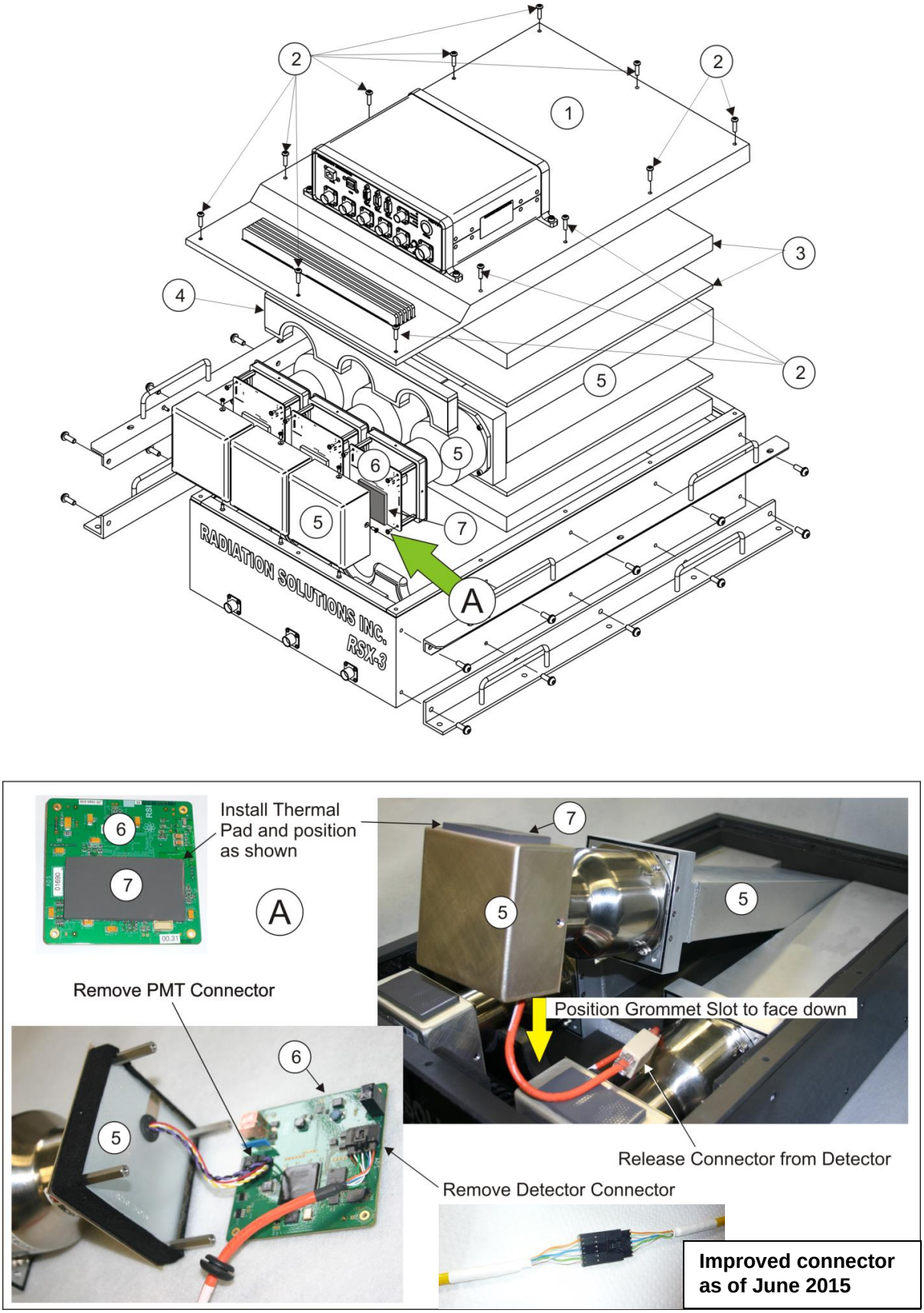
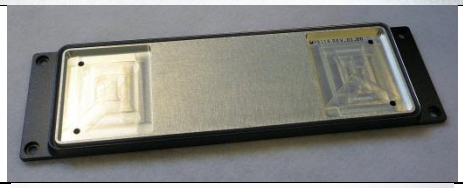
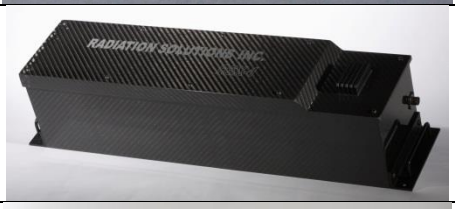
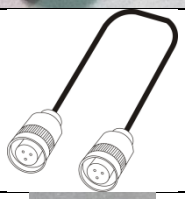


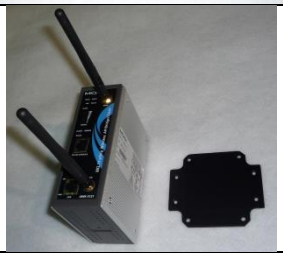
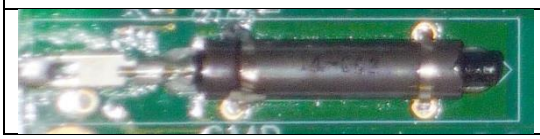
Figure 7-6 – RSX-3 Exploded View

APPENDIX A – OPTIONAL PARTS

ITEM	PART NUMBER	DESCRIPTION
	B-1111	RS-701 Wing Mount (Alternate)
	B-1055	RS-705 Console
	M-1116	Flange Mount – Rear (Use with Thule Carrier)
	B-1069	RSX-1 2x4x16 NaI Xtal
	B-1073	RSN-4 Neutron Detector
	B-1200	GM Detector Tubes (Low and High Rate)
	1 – C-1086 2 – C-1144	1 – Laptop CF30 – Tough Book (Panasonic) 2 – Laptop CF19 – Tough Tab

	P-1272	12VDC Lead Acid Battery
	P-1164	Charger – Fast Charge (Mean Well)
	P-1538	Charger – Slow Charge (Mean Well)
	K-1117	Power Jumper Cable
	M-1263	Adapter Plate – Ethernet/Power POD Connector
	B-1113	UPS Controller
	B-1195	Mobile EDAK with Power Distribution Battery & RS-501
	C-1033	Li Battery with Fast Charger and cables

	C-1085	Thule Rooftop Carrier
	B-1131	Carbon POD Rooftop Carrier
	B-1136	MMX Rack – Single Side
NOT SHOWN	B-1137	MMX Rack – Double Sided
	C-1060	SAGA Directional Tower
	P-1041	(Laptop Only) External 12 VDC Automobile Adapter (connects to the vehicle cigarette lighter)
	K-1012	90^{o} Detector Cable (6m)

	K-1021	Console Power Cable (Connects to Vehicle Cigarette Lighter)
Assembly (SEE BELOW)	C-1192	MOXA Assembly (See Parts Below)
	M-1264	Adapter Plate - WiFi MOXA Bridge
	1 – P-1529 2 – M-1248	1 – MOXA WiFi Modem and 2 – MOXA Mounting Plate
NOT SHOWN	K-1245	Cable MOXA to PDU
	P-1701	GM-Tube

APPENDIX B – RSI MOBILE SYSTEMS POD INSTALL

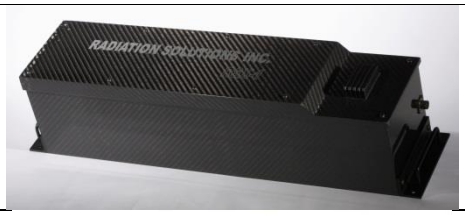
The following document describes the RSI-DART POD Installation with RSX-3/RS-701and RSX-1 detection system(s).

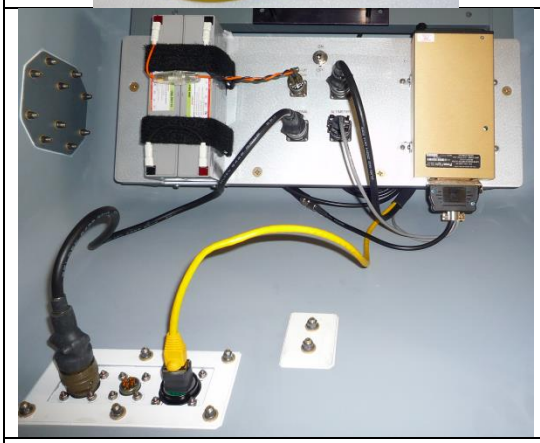
1. DART POD Installation

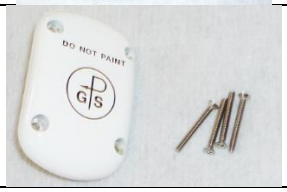
REFER to DART AEROSPACE LTD document D212-601 for complete POD to Heli: installation instructions and for updates to the POD installation. This document is supplied with the equipment.

If the document is missing for any reason, contact DART AEROSPACE LTD.
Tel: 1-613-632-3336, Fax: 1-613-632-4443 or e-mail: heli@dartaero.com
http://www.dartaero.com

2. COMPONENT PARTS

RSI DART POD PARTS		
ITEM	**PART NUMBER**	**DESCRIPTION**
	M-1215	DART Heli-Utility POD Carrier
	B-1000	RSX-1 4x4x16 NaI Xtal
	A-1021	RSX-3 with RS-701 Wing Mount Including 3 K-1068 cables

	T-1017	Detector Installation Hardware: • ¼ -28 x 1” Hex Bolts • ¼” Split Washer • ¼” Flat Washer
	K-1068	RSX-3 Detector Cable (Qty 4)
	K-1117	Extension Power Cable
NOT SHOWN	K-1311	Internal RS-701 Power Cable
	K-1310	Internal RS-701 Ethernet Cable
	B-1234	DART POD Inner Assembly Electronics Tray: • Battery Backup • Altimeter Free Flight TRA 300 • UPS • Power Cable (K-1311) • Cable (Battery Backup)
Assembly (SEE BELOW)	**C-1073**	Altimeter Free Flight TRA 300 Assembly + Cables

	P-1056	Free Flight TRA 300 Altimeter
NOT SHOWN	K-1312	Altimeter Internal Cable (DB25 to BNC, 10-6 and 12-3P)
	K-1308	Altimeter Antenna Cable (2ft)
	K-1065	External Ethernet Cable (Modified cable K-1065 with L-1044 connector)
	K-1023	External DC Power Cable 5m (15ft)
	P-1057	AT575-32W-TNCF-000-03-26-NM GPS Antenna with cable (K-1309)

3. DART POD EQUIPMENT INSTALLATION

NOTE: The DART POD Inner Assembly and Electronics Tray will be factory installed as a complete assembly with the following components:

- Battery Backup
- Altimeter Free Flight TRA 300
- UPS
- Power Cable (K-1117)
- Cable (Battery Backup)

Also the AT575-32W-TNCF-000-03-26-NM GPS Antenna and the Free Flight Altimeter Antenna is factory installed.

a) Install the RSX-3 Detector and RS-701 Assembly onto the POD frame with the supplied hardware.
b) Secure the RSX-3 Detector Assembly with ten ¼" flat washers, ten ¼" split washers and ten ¼-28 x 1" bolts. Tighten as required.
c) If not already installed attach the three RSX-3 cables (K-1068) to the RS-701 Receiver (DET 1, DET 2, & DET 3) as shown in **Figure B-1**.
d) Install the RSX-1 Detector in position on the POD frame with the four ¼" flat washers, four ¼" split washers and four ¼-28 x 1" bolts supplied. Tighten as required.
e) Connect the RSX-1 cable (K-1068) to the connector on the RS-701 Receiver (DET 4) as shown in **Figure B-1**.
f) Go to Step 4 to complete the cable installation.

4. CABLE CONNECTIONS

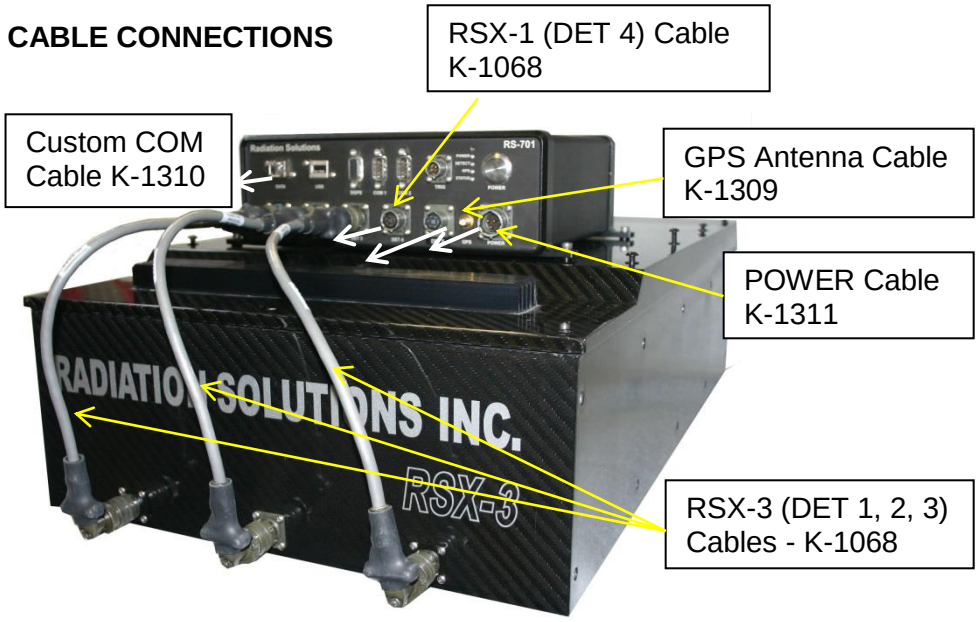


Figure B-1 RSX-3 and RS-701 Cables

Connect the DART POD cables as follows:

Refer to **Figure B-2** for the location of all the DART POD Cables.

DART POD CABLES		
CABLE TYPE	**FROM**	**TO**
A – K-1311	**ELECTRONIC TRAY CONNECTOR (RS-701 POWER)**	**RS-701 CONNECTOR (POWER)**
B – K-1310	**POD ETH CONNECTOR**	**RS-701 CONNECTOR (DATA)**
C – K-1312	**FREE FLIGHT CONNECTOR**	**RS-701 CONNECTOR (ANALOG)**
D - K-1312	**ELECTRONIC TRAY CONNECTOR (ALTIMETER POWER)**	**FREE FLIGHT CONNECTOR**
E – K-1309	**RS-701 CONNECTOR (GPS)**	**POD GPS CONNECTOR**
F – K-1117	**POD EXT POWER CONNECTOR**	**ELECTRONIC TRAY CONNECTOR (EXT POWER)**
G – K-1312	**FREE FLIGHT CONNECTOR**	**FREE FLIGHT ALTIMETER ANTENNA CONNECTOR**

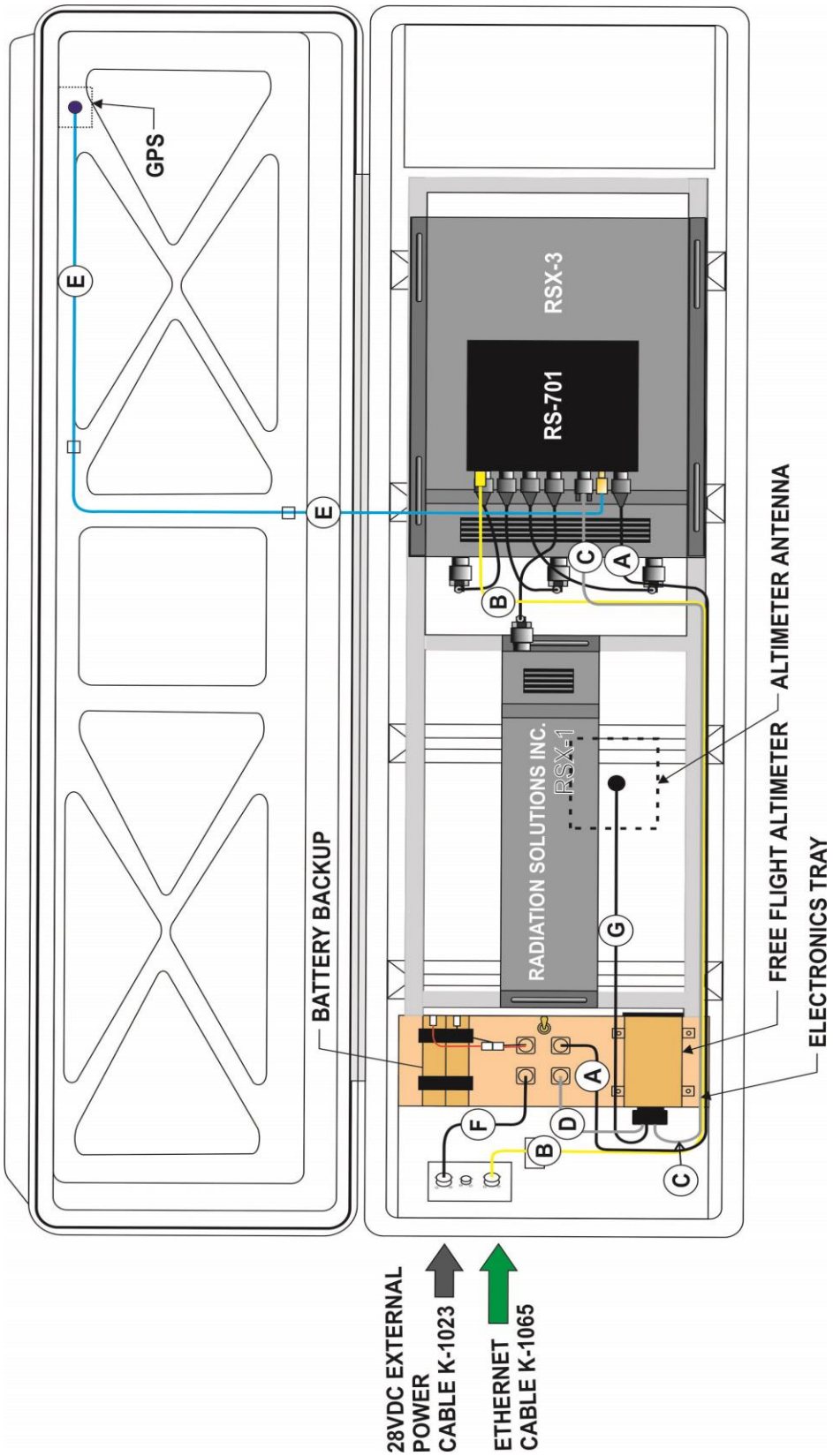


Figure B-2 DART POD Cabling

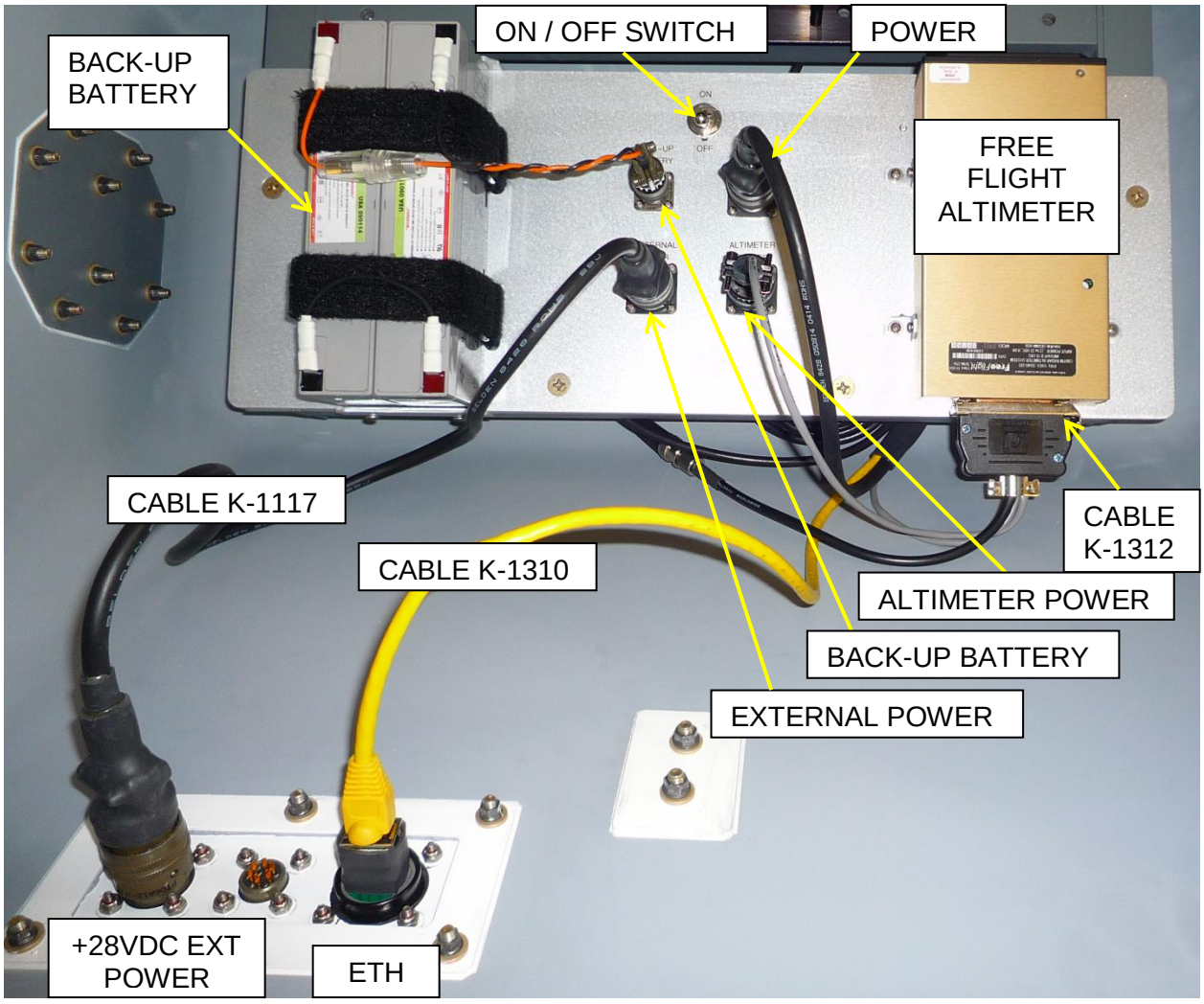


Figure B-3 DART POD Inner Assy – Electronics Tray

5. PARTS REPLACEMENT

If and when replacing components use the following mounting hardware:

Replacement Hardware	
GPS Antenna	6-32 x 1-1/4” Phillips FH (Qty 4)
Free Flight Altimeter Antenna	8-32x1” Hex Cap Head Screws (Qty 8), 8-32 Nylon Lock Nut (Qty 8)
RSX-1 Detector	¼-28 x 1” Hex Bolt (Qty 4), ¼ Split Washer (Qty 4), ¼ Flat Washer (Qty 4)
RSX-3 Detector	¼-28 x 1” Hex Bolt (Qty 10), ¼ Split Washer (Qty 10), ¼ Flat Washer (Qty 10)
Electronics Tray	¼-28 x 1” Flat Head Philips Screw (Qty 4)

6. RS-701 CONNECTIONS

1. POWER BUTTON - PRESS AND HOLD UNTIL THE FRONT PANEL LEDs COME ON (ABOUT 10 SEC)

2. ON POWER ON (LEDs):
   - CHECKS SYSTEM INTERNAL PERFORMANCE
   - INITIALIZE GPS (IF CONNECTED)
   - AUTOMATICALLY BEGINS STABILIZATION ON ALL CONNECTED DETECTORS
   - FRONT PANEL LEDs SHOW SYSTEM STATUS

   3 MINUTES AFTER POWER ON, ALL LEDs SHOULD BE GREEN.

3. TRIG CONNECTOR - ANALOG INPUT

4. COM 1 & COM 2 - PERMITS CONNECTION OF ANCILLARY EQUIPMENT.

5. DGPS - NOT USED.

6. USB - AUTOMATIC DATA BACKUP WITH USB MEMORY STICK.

7. DATA - ETHERNET CONNECTION

8. DET 1 THRU 3 - CONNECT RSX-3 DETECTORS
   DET 4 (CONNECT RSX-1 DETECTOR)

9. ANALOG - USED WITH FREE FLIGHT ALTIMETER etc.

10. ANT - USE WITH GPS ANTENNA

11. POWER - CONNECT POWER (+10 TO 40VDC)

IF NO CONSOLE IS PRESENT DO THE FOLLOWING:
- CHECK ALL CONNECTIONS
- CHECK POWER
- CHECK CONSOLE LEDs
- CLICK ON QUERY NETWORK IN RADASSIST
- CHECK NETWORK SETUP (SEE APPENDIX C IN RS-700 USER MANUAL)

APPENDIX C – SYSTEM PARAMETERS

Parameter Page	Label	Parameter	Range	Recommended	
CONFIGURATION	Sync Signal	Sync Source	Internal, External	Internal	
		Sampling Period	200, 500,1000mS	1000 (1sec)	
	GPS	GPS Active	ON/OFF	ON	
		Active	Internal GPS, External GPS on COM1, External GPS on VCP	Internal GPS	
GAMMA DETECTORS	ADS Parameters	Automatic Gain Stab	ON/OFF	ON	
STABILIZATION	Gain Stabilization Parameters	Channel Count	1024	1024	
		Start Channel	# input	440	
		End Channel	# input	1014	
		Max Count Rate	# input	50,000 cps	
		Max ChiSq	# input	5.00	
		Down Looking Detectors Accumulate TH.	# input	4,000 cps	
		Up Looking Detectors Accumulate TH.	# input	4,000 cps	
		Min Delta Gain	# input	0.04	
		Stab Timeout	# input	30 mins	
VIRT DETECTORS	Virtual Detectors	Left	1,2,3,4,5	1,2	
		Right	1,2,3,4,5	3,4	
		Total	1,2,3,4,5	1,2,3,4,5	
		VdGmm4	1,2,3,4,5	-	
DATA VALIDATION	Gamma Total Validation	Gamma Total Max	# input	1,000,000	
		Gamma Total Min	# input	100	
		Declare error after	# input	5	
		Recover error after	# input	5	
	Neutron Validation	Noise Ratio	# input	20 %	
		Declare error after	# input	50	
		Recover error after	# input	2	
GEIGER MULLER	GM Parameters	GM Tube		High Range	Low Range
		LLD	# input	2000	3000
		Dead Time Corr.	# input	80	180
		Dose Calib [cps/mGy]	# input	1500	180000
		Base Line	# input	4000 mV	

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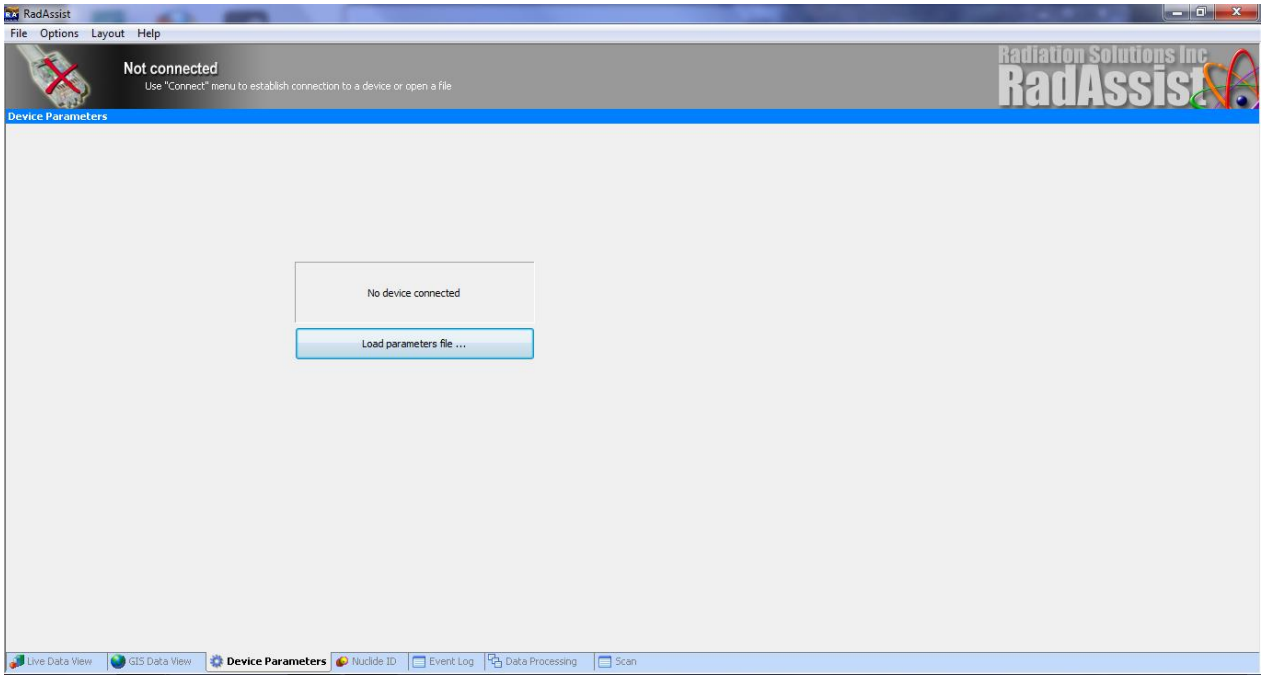
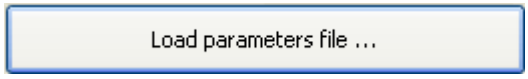
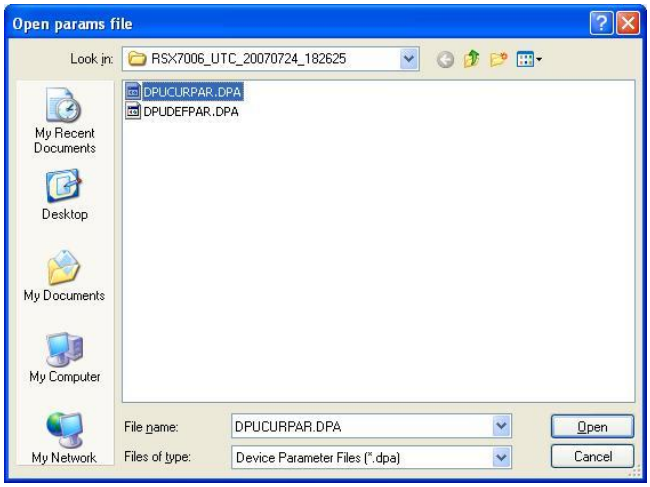
APPENDIX D – LOADING A PARAMETER FILE





Clicking this button will open a dialog box that the user can use to browse the computer for the appropriate .dpa file.



When the user has found the file, the file then can be highlighted and executed using the Open button.

Note: This does not connect the device, so cannot be used for setup purposes, it will however populate the parameter fields with previously saved data. It is used to view parameter data that has been previously stored (archived). The user may wish to view parameter files for comparison purposes to help troubleshoot the system.

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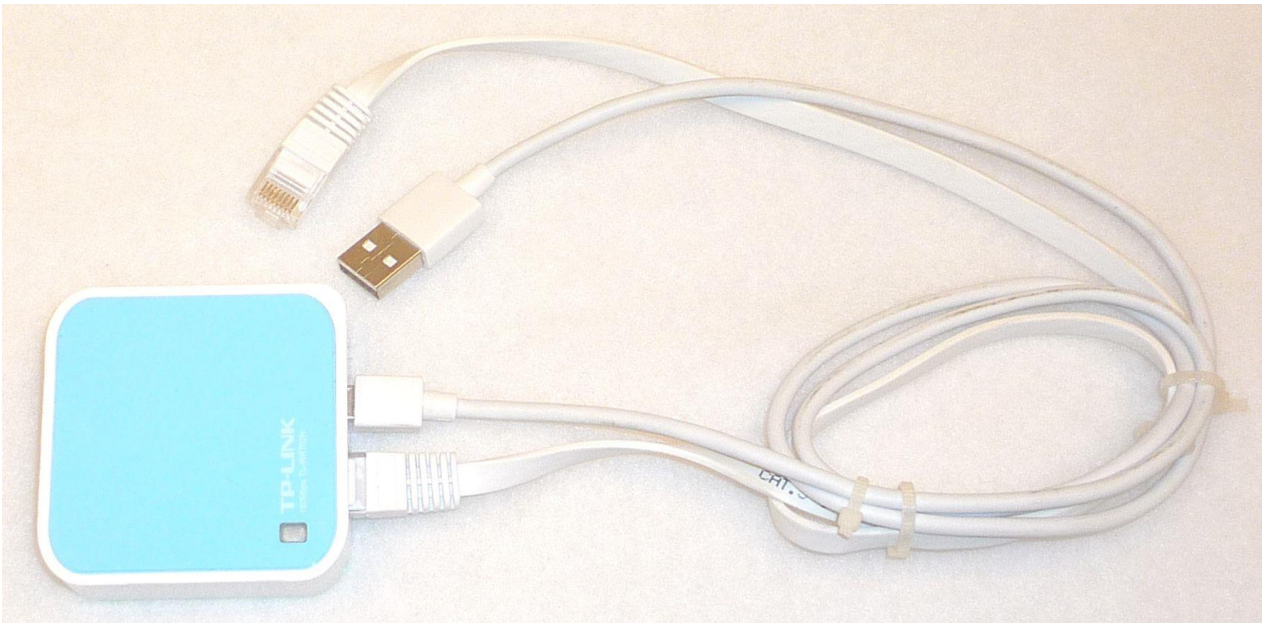
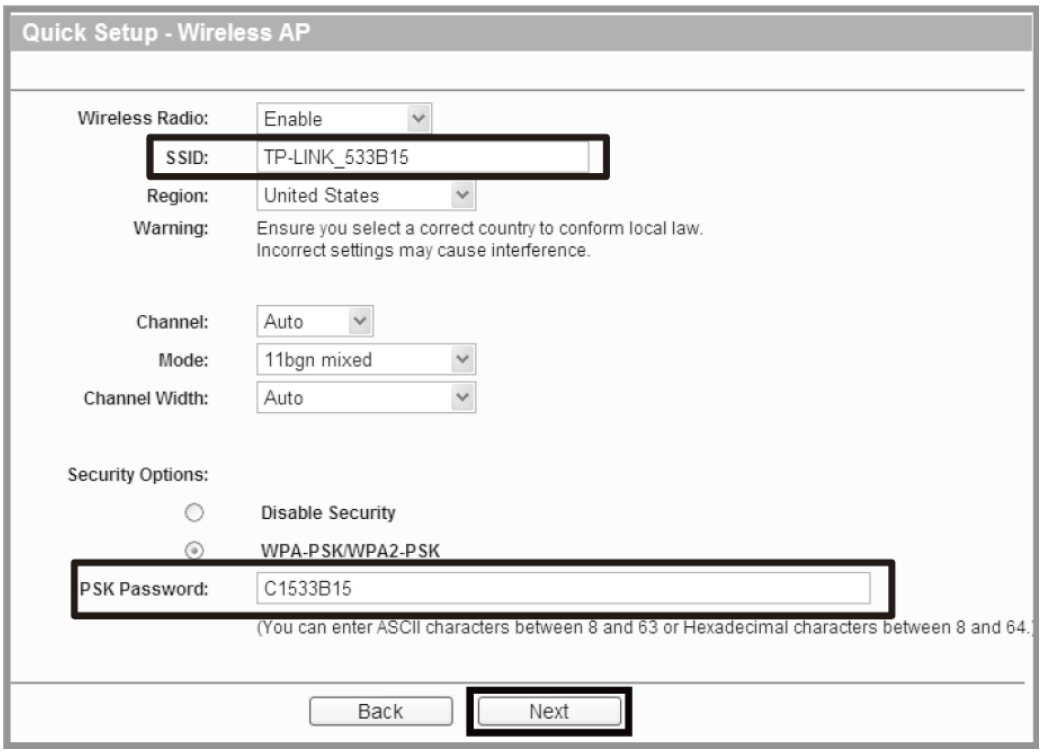
APPENDIX E – INSTALL WIRELESS NANO ROUTER

The following document describes how to install the **RS-701** Mobile Detector System with **TP-LINK Wireless Nano Router (TL-WR702N)**:



Make sure the computer IP address is set to Automatic

1. Plug the **Wireless Nano Router** into a power outlet and use the LAN port to connect the laptop via Ethernet cable
   NOTE: Disconnect from all Wireless Networks and wait for the **Routers' LED** to turn blue.
2. Access http://www.tp-link.com/en/download/TL-WR702N.html using your Internet browser for information and FAQs. You will need to find the configuration utility on the TP-Link site.
3. The User name and password are both ***admin***.
4. Choose **Quick Setup**, and then press **Next**.
5. Choose the **Working Mode** (**AP Mode**), and then press **Next.** Set your Wireless Parameters, click '**Next**' and Reboot.



6. The Target Networks' SSID will be automatically filled into the wireless setting page. Select the Security Mode and enter the password, click '**Next**' and Reboot.
7. After rebooting reconnect the Network according to 'Instant Wireless Connection'.
8. Unplug the **TP-LINK Wireless Nano Router** from the laptop and connect it to the **RS-701 Console** using both **Data** and **USB** ports (see the RS-701 Reference Guide).
9. Connect your laptop to the **WiFi**.

Note: SSID and password are the same as the source hotspot.

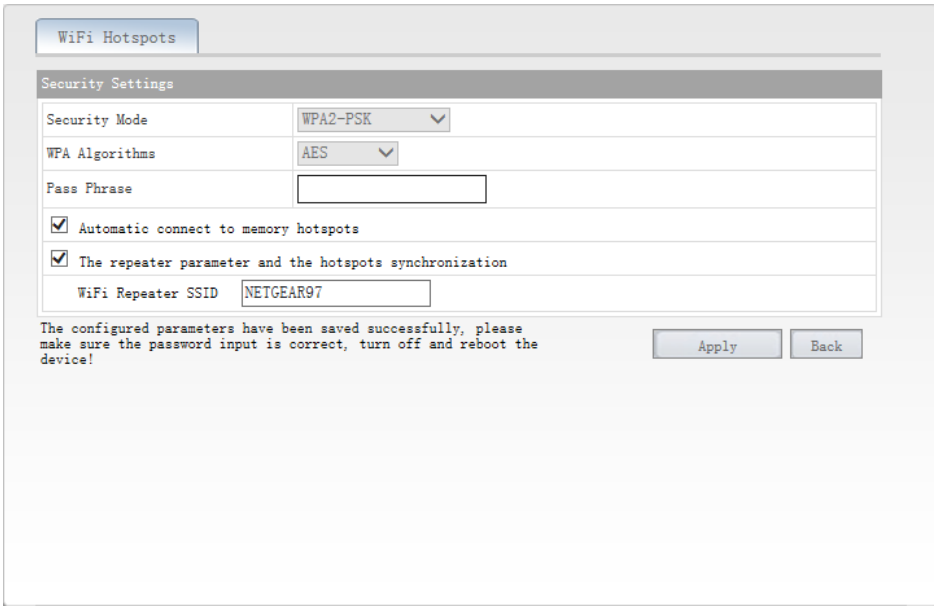
Open the RadAssist application and connect to the device.

APPENDIX F – INSTALL WiFi BRIDGE

The following document describes how to install the **RS-701** Mobile Detector System with **WiFi Bridge (VONETS - VAP11N)**:

Make sure the computer IP address is set to Automatic

1. Connect the **WiFi extender** to the laptop using both **USB** and **RJ45** connectors
2. Access http://www.vonets.com/service.asp using your Internet browser for download information and device driver. You will need to find the configuration utility for User Login.
3. The User name and password are both ***admin***.
4. Select the **WiFi network** you want to extend from the list, and then press **Next**.
5. Enter the correct Network password, and then press **Apply**.



6. Unplug the **WiFi extender** from the laptop and connect it to the **RS-701 Console** using both **Data** and **USB** ports.
7. Connect your laptop to the **WiFi**.

Note: SSID and password are the same as the source hotspot.

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APPENDIX Z – WARRANTY

Radiation Solutions Inc Warranty

RS-700 (Mobile) series products are provided with a two (2) year return to factory limited warranty against defects in materials and workmanship from the date the Products are placed at the disposal of the Buyer at the named place of delivery**. The warranty does not cover damage caused by improper use or unauthorized repairs.**

Repairs of defects will be performed by RSI at no charge to the Buyer, subject to the limitations. To request warranty service, the Buyer must call RSI's service coordinator for a return material authorization (RMA) number.

The Buyer is responsible for all the shipping, customs clearance costs and risk of loss of returning the repaired or replaced Products to the Buyer. RSI will own all parts removed from repaired Products or all Products replaced.

RSI's warranty does not include breakage of the crystal for any reason. RSI does warrant the detectors to be complete and fully operational to their published specifications at the time of delivery and to maintain the minimum resolution and performance for a period of one year under normal operating condition

Complete details of the "*Standard Terms and Conditions"* may be obtained by contacting RSI.

For more information or to make a warranty claim contact RSI.

Contact Information

Phone: **(905) 890-1111**
Fax: **(905) 890-1964**
Email: **service@radiationsolutions.ca**
sales@radiationsolutions.ca