Operations and Maintenance Manual

Model 2238 Remote Control Status Unit (RCSU)
2238 Remote Status Display Unit (RSDU)
and 2138 Remote Status Unit (RSU)

572238-0001 Rev. N August, 2018

Selex ES Inc.
11300 West 89th Street
Overland Park, KS U.S.A. 66214

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SAFETY SUMMARY

The following are general safety precautions that are unrelated to specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel should understand and apply during through the many phases of operation and maintenance.

ELECTROSTATIC SENSITIVE DEVICES PRECAUTIONS

Since most modules used in all models of equipment have Electrostatic Discharge (ESD) sensitive devices included in them, all modules should be considered sensitive to electrostatic discharge. Handling in the field shall be the same as in the factory. Each system is shipped with a wrist strap that must be worn while maintaining the equipment. The wrist strap shall be fastened to the equipment chassis either in the designated plug-in or attached to the equipment chassis with the alligator clip. The wrist strap must be used before any modules are removed from the equipment and at all times while handling the modules until they are placed in a protective environment such as an anti-static bag. Modules or boards must not be placed on any non-conducting surface such as wooden work benches, painted metal work benches, plastics, or technical manuals. Any work surface to be used must have a conducting mat placed on it and attached to earth ground. The mat and additional wrist straps can be obtained from Selex ES Inc.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Under no circumstances should any person remove any protective covers that expose lethal voltages. Do not replace components or make adjustments inside the equipment with primary power supply turned on. Under certain conditions, dangerous potentials may exist when the power is in the off position, due to charges retained by capacitors. To avoid casualties, always remove power and allow time for the capacitors to discharge before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

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Selex ES Inc.

This equipment is supplied by Selex ES Inc. For replacement parts and repair service, contact Selex ES Inc. using the contact information provided below.

HOW TO ORDER REPLACEMENT PARTS

When ordering replacement parts, you should contact Selex ES Inc. by fax, phone or email. Please address the following items (as applicable) in your correspondence to enable us to provide the best possible service.

1. Selex ES Inc. model number, type and serial number of equipment.
2. Unit sub-assembly number (where applicable).
3. Item or reference symbol number from parts list or schematic.
4. Selex ES Inc. part number and description.
5. Manufacturer's code, name and part number (where applicable).
6. Quantity of each replacement part required.

HOW TO REQUEST REPAIR SERVICE

In order to ensure prompt attention, parts returned for repair should have the following:

1. RMA number (Return Material Authorization number), assigned prior to return when requesting repair service.
2. Unit part number
3. Site location
4. System information
5. Ship-to address for return
6. Contact name and number
7. Date and time of request

CONTACT INFORMATION

Selex ES Inc.
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Main Switchboard:	(913) 495-2600
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CSM E-mail:	Support@selex-es.us
World Wide Web URL:	www.us.selex-es.com

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1 GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION

This manual provides the data required to operate and maintain the Model 2238 Remote Control Status Unit (RCSU) (Figure 1-1 and Figure 1-2) and the Model 2238 Remote Status Display Unit (RSDU) (Figure 1-3 and Figure 1-4). The 2138 RSU (Figure 1-5) is also supported by the 2238 RCSU, and so it is included in this manual as well. Additionally, the Selex ES Remote Status Monitoring System (RSMS) software application, which is used to periodically poll a number of RCSUs and/or individual Selex ES navaids, is also detailed in this manual.

Included are equipment description and specifications, block diagram level theory of operation, operating procedures, standards and tolerances, periodic maintenance procedures, corrective maintenance procedures, parts lists, schematics, and other diagrams.

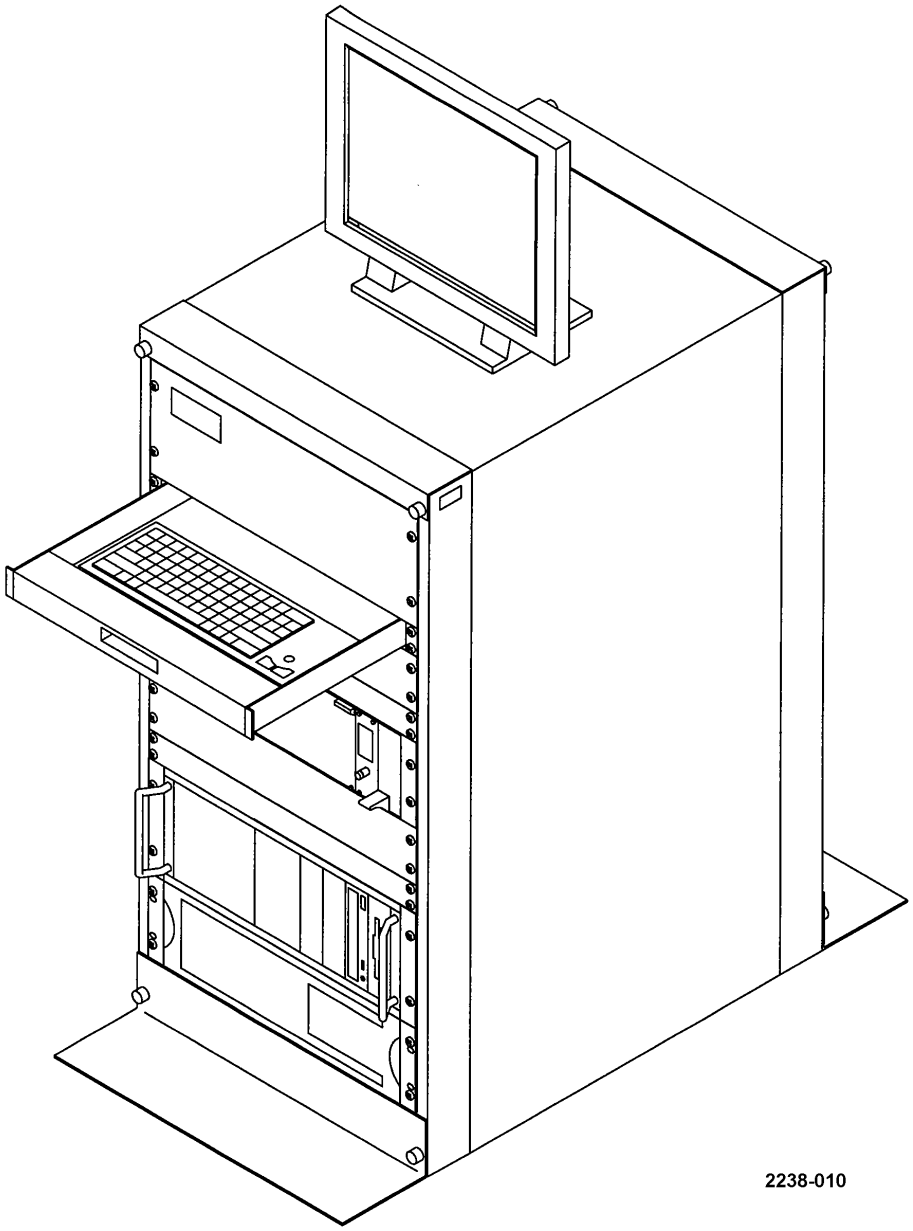

Figure 1-1 Model 2238 Remote Control Status Unit, Industrial Rack Configuration

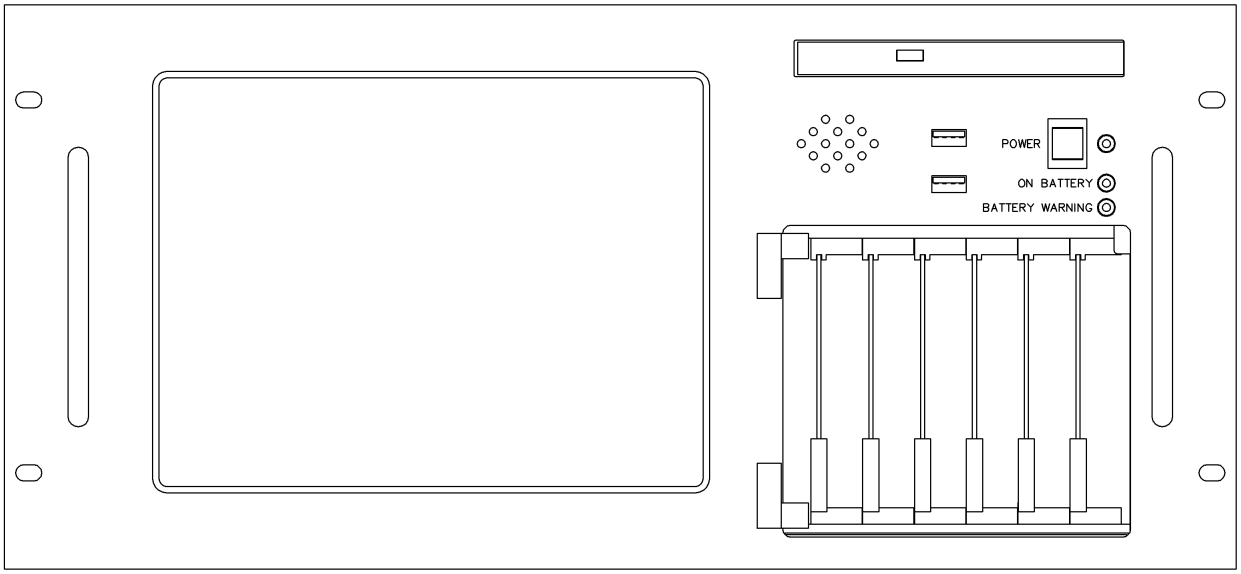

Figure 1-2 Model 2238 Remote Control Status Unit, Small Form Factor Configuration (Access Door removed for clarity)

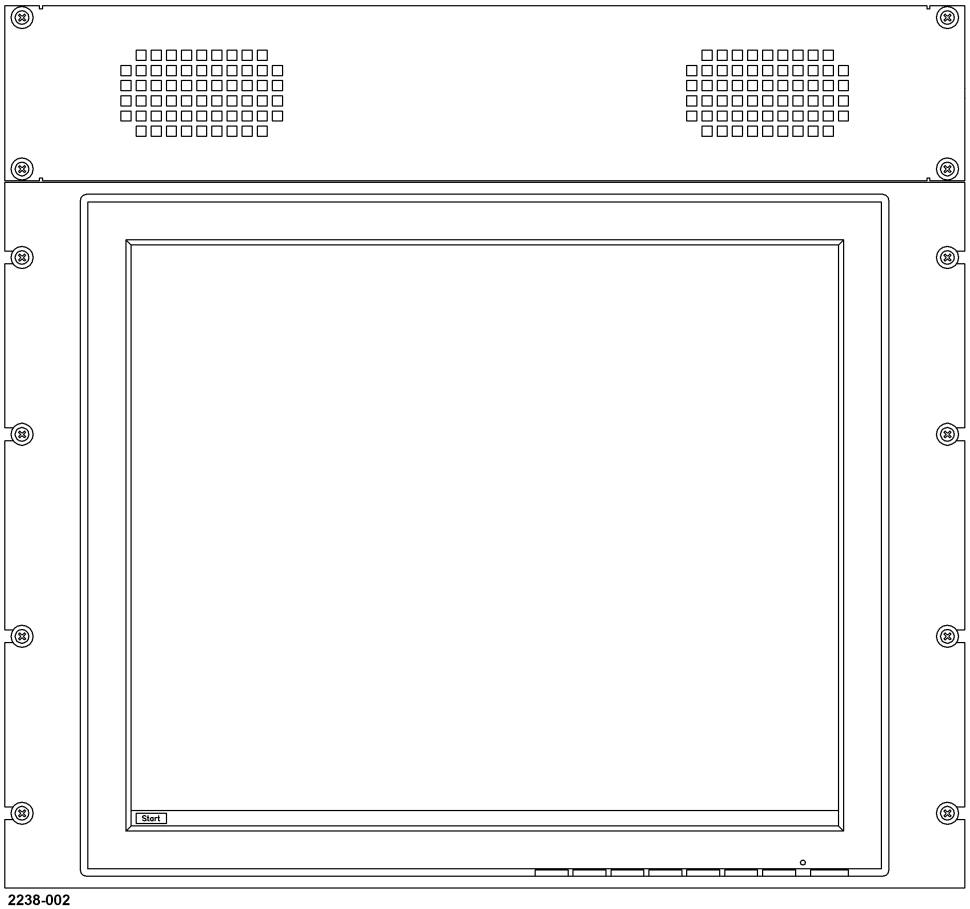

Figure 1-3 Model 2238 Remote Status Display Unit – Touchscreen Panel

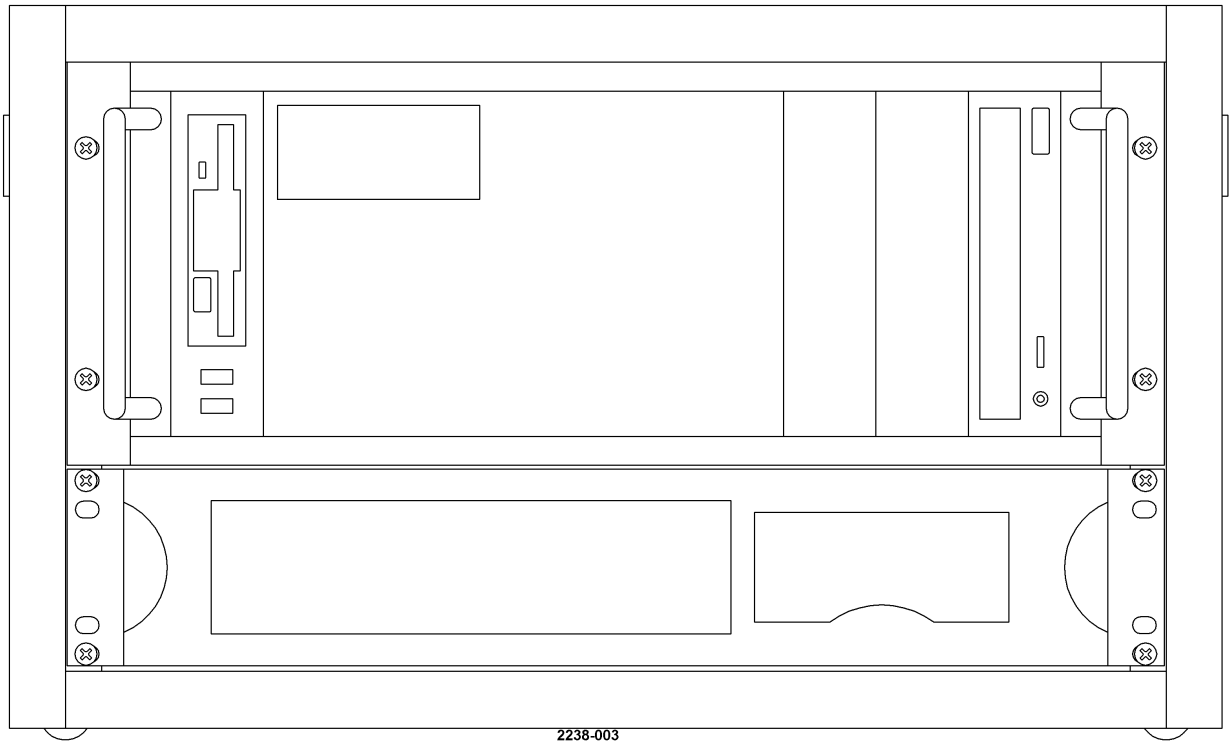

Figure 1-4 Model 2238 Remote Status Display Unit – Base PC

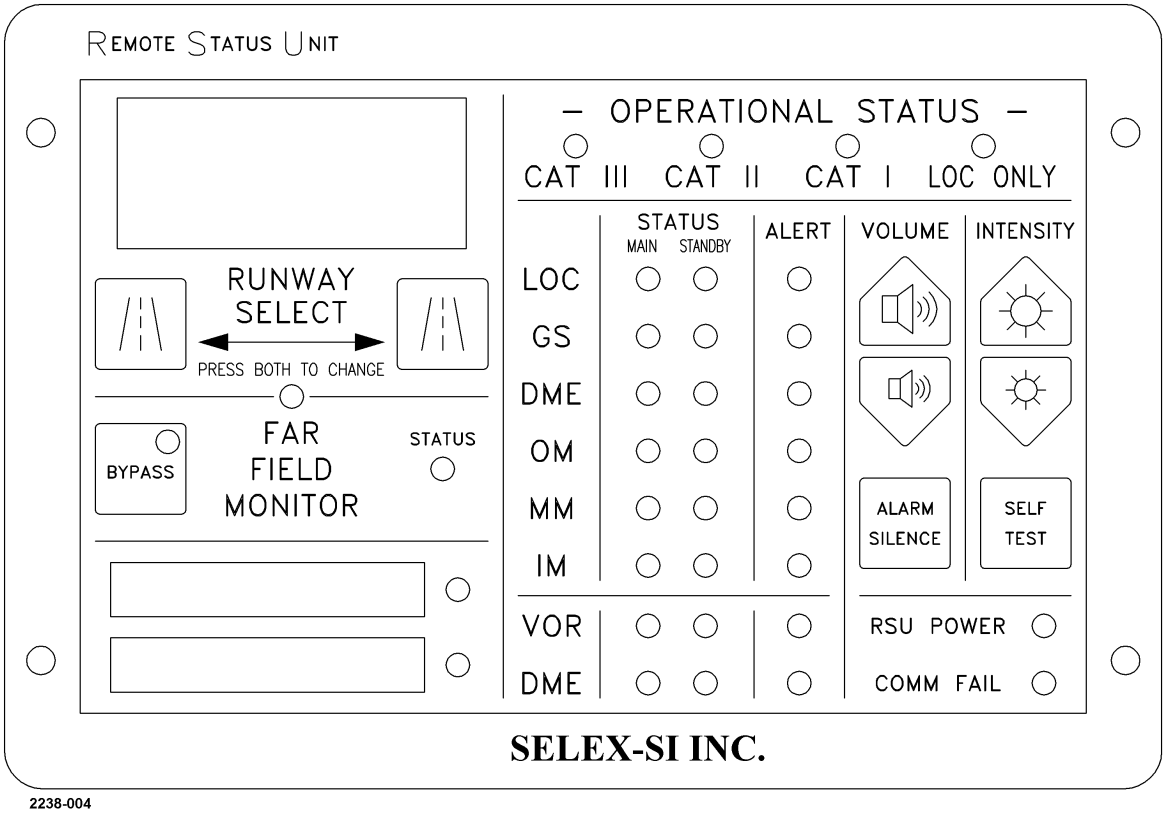

Figure 1-5 2138 Remote Status Unit Module

1.2 EQUIPMENT DESCRIPTION

The 2238 RCSU is used to monitor Selex ES Inc., Cardion, and Fernau navigational aides. Similar to the Selex ES Inc. RCSU, which provides control and status for two approaches to a single, interlocked runway, the 2238 RCSU supports multiple runways and VOR/TACAN/DME installations. It provides visual indications of the status of the configured systems, and an audible alarm when alarm conditions exist. The RCSU provides remote control of each of the associated stations, consisting of Transmitter On, Transmitter Off, and Transfer capabilities (in the case of dual equipment). Also, Near-Field and Far-Field Monitor Bypass can be controlled, as applicable. The RCSU can communicate with the following equipment and navigational aides:

a. Selex ES Inc. 2100 Localizer
b. Selex ES Inc. 2110 Glideslope
c. Selex ES Inc. 1150/1150A VOR
d. Selex ES Inc. 1118*/1119* and 1118A/1119A DME
e. Fernau 2020 DME
f. Fernau 2010 TACAN
g. Cardion AN/FRN-43 VORTAC
h. Cardion AN/FRN-44 VOR
i. Cardion AN/FRN-45 TACAN
j. Cardion AN/FRN-46 DME
k. Localizer/Glideslope status via digital input
l. Rockwell-Collins (RCI) Smart Blade Radio System (SBRS) ATC Comm Radios
m. Network Router, such as Cisco 2811.

* co-located with either the 2100 Localizer, 2110 Glideslope, or 1150 VOR

The 2238 RCSU comes in two distinct form factors, depending on the amount of navaid equipment that needs to be supported. The Industrial Rack configuration is shown in Figure 1-1, while the more compact, Small Form Factor configuration is shown in Figure 1-2.

The Industrial Rack RCSU, normally installed in a maintenance room location, consists of the following equipment:

a. The RCSU Server, running Microsoft Windows
b. One or more card-cage assemblies containing:

    1. The modem and tone-based navaid interface cards
    2. Surge suppression cards
    3. Card-cage power supply

c. Uninterruptible Power Supply (UPS)
d. Integrated Keyboard/Trackball
e. 17” LCD Monitor
f. 4’ tall, 19” rack

The Small Form Factor RCSU is also normally installed in a maintenance room location, but due to its small size, it can easily be located in an ATC tower cab, as a replacement for older equipment. A ruggedized version of the Small Form Factor RCSU is also available as 002238-0412, housed in a shock-mounted enclosure. The Small Form Factor RCSU consists of the following equipment, integrated into the 5U chassis:

a. Embedded PC, running Microsoft Windows
b. Six slot card cage containing any of the following:

    1. Modem and tone-based navaid interface cards
    2. Surge Suppression cards
    3. I/O Controller card

4. Card-cage power supply card

c. UPS, consisting of a battery and Battery Charging Power Supply card
d. 10.4" LCD/Touchscreen Monitor

The 2238 RSDU is normally installed in the ATC tower and consists of the following equipment:

a. The 2238 RSDU Server running Microsoft Windows
b. Uninterrupted Power Supply (UPS)
c. 12.5" tall, 19" rack
d. Keyboard and mouse
e. Rack/Panel mountable 18" Touchscreen LCD Monitor
f. Rack/Panel mountable stereo speakers

Two configurations of the 2138 RSU Modules are available:

470358-0001	RSU, with Battery Back Up
470358-0002	RSU, without Battery Back Up

These 2138 RSU kits contain the following equipment:

a. The 2138 RSU Module
b. Universal AC input Power Supply
c. 250' of cable for the communication link to the RCSU
d. Installation hardware
e. Battery Box (-0001 only)

In addition to the RCSU/RSDU equipment, the following list of optional equipment can be supplied with a 2238 RCSU system:

a.	RSMS	Provides regional maintenance monitoring at a centralized location by periodically polling the region's RCSUs or individual Selex ES navaid stations.
b.	Managed Enclave Router	Provides a secure gateway between the facility LAN and the RCSU's equipment network.
c.	Unmanaged Network Switch	Provides additional Ethernet ports on the RCSU's equipment network.
d.	RF Modem Radio Link Kits	Provide wireless connectivity between the RCSU and its associated navaids.
e.	Remote I/O Kits	Allows for manual control and status of remote devices from the RCSU and RSDU.

1.2.1 2238 RCSU Assembly – Industrial Rack Configuration

1.2.1.1 RCSU Rack Assembly

The RCSU components are packaged in a 19" rack (RCSU Rack Assembly (030763-0001). The RCSU LCD Monitor rests on top of the RCSU Rack Assembly, while the remaining components are installed within the rack.

1.2.1.1.1 RCSU Server

The RCSU Server (950856-0001) is a 4U, 19" rack-mount server chassis containing a server-class motherboard, triple-redundant power supplies, video card, two RAID Level 1 (Mirrored) hard drives, RAID controller, and a serial port expansion card. It measures 7" tall, 19" wide, and 24.5" deep.

1.2.1.1.2 UPS

The RCSU UPS (950741-0021) is a 3U, 19" rack-mount 2200 VA, 120 VAC UPS, providing more than 1 hour of runtime for the 2238 RCSU. The actual time will vary depending upon the particular system configuration. It measures 5.25" tall, 19" wide, and 26" deep.

1.2.1.1.3 Keyboard/Trackball Assembly

The RCSU Server is configured via the integrated Keyboard/Trackball Assembly (950857-0001). This assembly is a 1U, 19" rack-mount drawer containing a PS/2 keyboard with integrated trackball. It measures 1.75" tall, 19" wide, and 12" deep.

1.2.1.1.4 Rack, 19"

The RCSU Rack (950780-0001) is a 21U, 19" rack. It measures 42" tall, 21" wide, and 28" deep.

1.2.1.1.5 LCD Monitor

The RCSU Monitor (950858-0001) is a 17" desktop LCD Monitor. It measures approximately 15" tall, 16.5" wide, and 2" deep.

1.2.1.2 RCSU Card Cage Assembly

The design of the 2238 RCSU allows for one or more RCSU Card Cage Assemblies (030764-0001) in which the various modem or tone-based interface cards are installed. It is a 3U 19" card cage with proprietary backplane which accepts a cPCI Power Supply module and up to eight interface cards. It measures 5.25" tall, 19" wide and 11.5" deep.

1.2.1.2.1 cPCI Power Supply

The cPCI Power Supply (950864-0001) installed in the RCSU Card Cage provides DC power to the Interface CCAs. It measures approximately 5" tall, 1.6" wide, and 7" deep.

1.2.1.2.2 Backplane

The Backplane CCA (012109-0001) installed in the RCSU Card Cage routes the power and other signals between the Interface CCAs and the TVS CCAs. It measures approximately 5.25" tall, 16.7" wide, and 1.7" deep.

1.2.1.3 Dual Modem CCA

A Dual Modem CCA (012110-0001) is installed in the Card Cage Assembly to provide the dedicated modem connection between the RCSU and two modem-based navaids. It measures 4" tall, 0.6" wide, and 6.7" deep.

1.2.1.4 VORTAC CCA

A VORTAC CCA (012108-1001) is installed in the Card Cage Assembly to provide the dedicated tone-based connection between the RCSU and two Cardion navaids. It measures 4" tall, 0.6" wide, and 6.7" deep.

1.2.1.5 Transient Voltage Suppressor (TVS) CCA

A TVS CCA (012107-0001) is installed in the Card Cage Assembly to provide the transient suppression for the dedicated connections between the RCSU and navaids. It measures 5" tall, 0.9" wide, and 5" deep.

1.2.2 2238 RCSU Assembly – Small Form Factor Configuration

1.2.2.1 5U Rack-Mountable Assembly

The small Form Factor 2238 RCSU components are all packaged in a single 5U assembly, designed to be mounted in a 19" rack, with an external 12V power supply integrated into the AC cord. This RCSU assembly measures 8.75" tall, 19" wide, and 15" deep.

1.2.2.1.1 Embedded PC

The Embedded PC is a standardized small Form Factor motherboard, with integrated power supplies, video card, network ports, and serial ports.

1.2.2.1.2 UPS

The UPS for the small Form Factor RCSU consists of an internal battery and an integrated Battery Charger/Power Supply (BCPS) card. The battery is sized to provide at least 4 hours of run-time in the event of an AC power failure.

1.2.2.1.3 Keyboard/Mouse

A separate keyboard and mouse are provided for use during configuration of the small Form Factor RCSU. They are temporarily plugged into the two USB ports on the front of the 5U RCSU chassis, and then stored elsewhere during normal operation.

1.2.2.1.4 LCD Monitor

A 10.4" LCD/Touchscreen is integrated into the front panel of the small Form Factor RCSU. It uses a resistive touchscreen, so that the user may use either their finger, or a plastic stylus to operate the system.

1.2.2.2 RCSU Card Cage Assembly

The design of the small Form Factor 2238 RCSU allows for up to six modem or tone-based interface cards to be installed in the front panel accessible card cage.

1.2.2.2.1 Power Supply/RSU I/F CCA

The Power Supply/RSU I/F CCA (012129-0001) installed in rear of the RCSU Card Cage provides DC power to the Interface CCAs, as well as converting between the RS-232 and RS-422 signal levels for the 2138 RSU Module. It measures approximately 4.5" tall, 1.25" wide, and 6" deep.

1.2.2.2.2 Backplane

The Backplane CCA (012127-0001) installed in the small Form Factor RCSU Card Cage routes the power and other signals between the Interface CCAs and the TVS CCAs. It measures 5.25" tall, 8" wide and 1.7" deep.

1.2.2.2.3 Dual Modem CCA

A Dual Modem CCA (012110-0001) is installed in the Card Cage Assembly to provide the dedicated modem connection between the RCSU and two modem-based navaids. It measures 4" tall, 0.6" wide, and 6.7" deep.

1.2.2.2.4 VORTAC CCA

A VORTAC CCA (012108-1001) is installed in the Card Cage Assembly to provide the dedicated tone-based connection between the RCSU and two Cardion navaids. It measures 4" tall, 0.6" wide, and 6.7" deep.

1.2.2.2.5 Transient Voltage Suppressor (TVS) CCA

A TVS CCA (012107-0002) is installed in the Card Cage Assembly to provide the transient suppression for the dedicated connections between the RCSU and navaids. It measures 5" tall, 0.9" wide, and 6" deep. Note that this assembly differs from the TVS CCA, 012107-0001, used in the Industrial Rack RCSU configuration in that its grounding bracket is longer.

1.2.2.2.6 I/O Controller CCA (Optional)

The optional I/O Controller CCA (012126-1001 or -1002) installed in rear of the RCSU Card Cage provides 8 TTL-level digital inputs and outputs, two 5V analog inputs, as well as optically-isolated External Interlock Input and Output signals. It measures approximately 4.5" tall, 0.5" wide, and 6" deep.

1.2.3 2238 RSDU Assembly

1.2.3.1 2238 RSDU Rack Assembly

The 2238 RSDU Server and UPS are packaged in a 19" rack, referred to as the RSDU Rack Assembly (030765-0001). The RSDU LCD Monitor and Speaker Panel are installed in an existing ATC control console.

1.2.3.1.1 RSDU Server

The RSDU Server (950856-0002) is a 4U, 19" rack-mount server chassis containing a motherboard, redundant power supplies, video card, two RAID Level 1 (Mirrored) hard drives, RAID controller, and a sound card. It measures 7" tall, 19" wide, and 20.4" deep.

A USB keyboard and mouse are supplied with the RSDU Server for use in configuration. Once the system is configured, they may be disconnected from the front-panel USB ports and stored separately from the RSDU Server.

1.2.3.1.2 UPS

The RSDU UPS (950741-0011) is a 2U, 19" rack-mount 1500 VA, 120 VAC UPS, providing more than 1 hour of runtime for the 2238 RSDU. The actual time will vary depending upon the particular system configuration. It measures 3.5" tall, 19" wide, and 18" deep.

1.2.3.1.3 Rack, 19"

The RSDU Rack (950860-1061) is a 6U, 19" rack. It measures 12.5" tall, 21" wide, and 24.5" deep.

1.2.3.2 RSDU Touchscreen LCD

The RSDU Touchscreen LCD Monitor (950859-0001) displays the status of the configured navaid equipment. It is supplied in an 8U, 19" rack mount Form Factor or can be reconfigured to provide standard VESA mounting for a swing-arm installation. A desktop mounting base is also provided. It measures 14" tall, 19" wide, and 3" deep.

1.2.3.3 RSDU Speaker Panel

The RSDU Speaker Panel (950863-0001) contains two stereo speakers in a 2U, 19" rackmount Form Factor. It is typically installed either above or below the RSDU Touchscreen LCD Monitor. It measures approximately 3.5" tall, 19" wide, and 3" deep.

1.2.4 2138 RSU Kits

1.2.4.1 2138 RSU Module

Refer to Figure 1-5. The 2138 RSU Module (030691-0001) displays the status of the active approach being monitored. The 2138 RSU Module is generally located in the control tower for monitoring of the ILS/VOR/DME. Up to three 2138 RSU Modules can be daisy-chained together to provide status-only operation at two other locations. The 2138 RSU Module displays the status of the active Localizer, Glideslope, DME, Outer-, Middle-, and Inner-Marker Beacons, as well as a VOR/DME system. It also displays the active runway's ID, and the status of up to two auxiliary equipment systems. The current Category Status (CAT III, CAT II, CAT I, or Localizer Only) is also displayed on the 2138 RSU Module. The active Localizer's FFM status is displayed, and FFM Bypass can be controlled from the RSU. In an interlocked configuration, either of the two ILS systems can be selected to be active, preventing both ILS systems from operating simultaneously. The 2138 RSU Module is powered by a universal input (120/240 VAC, 50/60 Hz) power supply. The 2138 RSU Module measures 5-3/16" tall, 7-5/8" wide and 2" deep.

1.2.4.2 2138 RSU Battery Box Assembly

The Battery Backed-up RSU kit includes a Battery Box Assembly (030705-0002). This assembly contains NiCd batteries to provide power to the 2138 RSU Module for a minimum of 1 hour in the event of loss of utility power. The RSU Battery Box Assembly measures 3-1/4" tall, 4" wide and 8" deep.

1.2.5 Optional Equipment

1.2.5.1 Remote Status Monitoring System

The Remote Status Monitoring System (RSMS), 470429-0001, is a Windows-based software application that is typically installed in a regional maintenance center. It is used to remotely monitor the status of the region's navaids for maintenance purposes. It runs on a desktop or notebook PC containing one or more modems, or an optional secure TCP/IP network connection. It polls the ILS, VOR, DME, TACAN, and VORTAC equipment for current status, either directly or through an associated 2238 RCSU. The RSMS displays the status graphically using colored icons placed on a top-level regional map, similar to the RCSU and RSDU displays. In order to reduce clutter for multiple airports and regions on the top-level map, multiple layers of maps can be used such that the top level map represents the entire country or region, with Site or RCSU icons representing the individual airports or navaid installations.

1.2.5.2 Managed Enclave Router Kit

The Managed Enclave Router Kit, 470651-0001, includes a Cisco 2811 router which can be either installed in the Industrial Rack RCSU's 19" rack, or a shelf or bench top. It is factory-configured to provide basic routing of in-bound PMDT-RCSU data, either via the facility LAN or through a dial-up networking link into the router's built-in modem. The Cisco 2811 is a 1U rackmount device, measuring 1-3/4" tall, 17-1/4" tall, and 16-1/2" deep.

1.2.5.3 Unmanaged Network Switch Kit

The Unmanaged Network Switch Kit, 470461-0001, includes a small, 5-port industrial Ethernet switch, an AC-DC power supply, and an assortment of installation hardware. The switch and power supply can be installed either on the supplied length of 35mm DIN rail, or to a panel using the supplied brackets. The switch is typically installed near the RSDU, connecting the RSDU to the Managed Enclave Router while providing four additional Ethernet ports into the RCSU equipment network. The switch and power supply each measure approximately 5" tall, 1-1/2" wide, and 3-1/2" deep.

1.2.5.4 RF Modem Radio Link Kits

Various Radio Link kits are available from Selex ES to provide a secure, wireless communications link between the RCSU and the navaid equipment. For most installations, the supplied radios are spread-spectrum 2.4GHz models, although other frequencies are available as required. The kits include the radio modems, power supplies, RF cabling, and assorted installation hardware, drawings, and instructions.

1.2.5.5 Remote I/O Kit

The Remote I/O Kit, 470460-0001, includes a module that connects to the RCSU via Ethernet. It provides 16 low-level digital inputs, and 16 sets of Form-C relay outputs (NO-C-NC). The relay contacts are controlled by the user from the RCSU and RSDU, and optionally from the PMDT. The Remote I/O module measures 19" wide, 5" tall, and 2-1/2" deep.

1.3 EQUIPMENT SPECIFICATION DATA

Equipment specifications are listed in Table 1-1 to Table 1-4.

1.3.1 RCSU and RSU Equipment

1.3.1.1 Remote Control Status Unit

Table 1-1 RCSU Equipment Specifications	
Parameter	**Specification**
Input Power:	
Voltage	120VAC ± 15% (120VAC systems) or 230VAC ± 15% (230VAC systems)
Frequency	50/60 Hz ± 3Hz (auto sensing)
RCSU to RCSU Interface:	
Physical	CAT5 or CAT5E crossover cable
Distance	As supplied, 250 feet
	Longer distances capable with network hubs, switches, and/or fiber
Hardwire RCSU to RMS Interface:	
Physical	Dedicated modem connection over a single modem grade balanced telephone line pair
Distance	As supplied, 2 miles (10,560 feet) maximum. For longer distances consult factory
Optional Radio RCSU to RMS Interface:	
Physical	900MHz or 2.4GHz spread spectrum RF modem link
Distance	As supplied, 2 miles (10,560 feet) maximum, line of site. For longer distances consult factory
# of Navaids	Up to 4 navaids at 9600 bps per shared RF modem link, in order to maintain the < 1 second timing response.
Optional GSM RCSU to RMS Interface:	
Physical	GSM digital modem
Distance	Limited by local coverage

1.3.1.2 2238 Remote Status Display Unit

Table 1-2 2238 RSDU Equipment Specifications	
Parameter	**Specification**
Input Power:	
Voltage	120VAC ± 15% (120VAC systems) or 230VAC ± 15% (230VAC systems)
Frequency	50/60 Hz ± 3Hz (auto sensing)

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Table 1-3 2138 RSU Module Equipment Specifications	
Parameter	**Specification**
Input Power:	
Voltage	120VAC ± 15% (120VAC systems) or 230VAC ± 15% (230VAC systems)
Frequency	50/60 Hz ± 3Hz (auto sensing)

1.3.1.3 Mechanical and Electrical

Table 1-4 RCSU/RSDU Equipment Specifications (Mechanical and Electrical)	
Parameter	**Specification**
Size of Cabinet:	
RCSU – Rack Configuration (excluding monitor)	42” height, 21” width, 28” depth
RCSU – Small Form Factor Configuration	8.75” height (5U), 19” width, 15” depth
2238 RSDU (excluding touchscreen and speakers)	12.5” height, 21” width, 24.5” depth
2138 RSU Module	5.19” height, 7.63” width, 2” depth.
Weight of Cabinet:	
RCSU – Rack Configuration (excluding monitor)	280 pounds
RCSU – Small Form Factor Configuration	35 pounds
2238 RSDU (excluding touchscreen and speakers)	145 pounds
2138 RSU Module	3 pounds
Primary Power:	120/230VAC ±15%
Standby Power:	
Rack Configuration RCSU/RSDU	UPS provides at least 1 hour backup
Small Form Factor RCSU	UPS provides at least 4 hour backup
2138 RSU Module	Battery Box option provides at least 1 hour backup
Power Consumption:	
RCSU – Rack Configuration	290 VA typical
RCSU – Small Form Factor Configuration	120 VA typical
2238 RSDU (including touchscreen)	190 VA typical
2138 RSU Module	24 VA typical
Duty Cycle:	Continuous

1.3.2 Environmental

The components of the RCSU system are designed to meet the following environmental conditions:

Table 1-5 RCSU/RSDU Equipment Specifications (Environmental)	
Parameter	**Specification**
Operating Temperature	+10°C to +50°C
Relative Humidity	30% to 80% (non-condensing) at +50° C.

1.4 EQUIPMENT AND ACCESSORIES SUPPLIED

Table 1-6 is a list of all major equipment and accessories supplied.

Table 1-6 Equipment Supplied

Quantity	Nomenclature	Dimensions	Weight
1	2238 RSDU Touchscreen	14” height, 19” width, 3” depth	21 pounds
1	2238 RSDU Speaker Panel	3.5” height, 19” width, 3” depth	3 pounds
1	RCSU Monitor	15” height, 16.5” width, 2” depth	4.5 pounds

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Table 1-7 is a list of all equipment that is not supplied but is required for installation or to make the equipment operational.

Table 1-7 Required Equipment, not Supplied

Quantity	Nomenclature
1	CAT5 10BaseT Network Modular Plug Crimper
1	Straight-slot screwdriver Approximately 1/10” blade

1.6 OPTIONAL EQUIPMENT

Table 1-8 is a list of optional equipment that can aid a technician in maintenance and troubleshooting. Equivalent test equipment can be substituted for that recommended.

Table 1-8 Optional Equipment

Quantity	Nomenclature	Part No.
2	Oscilloscope	n/a
1	Digital Multimeter	950257-0000
	3 1/2 Digit	
1	Network Cable Tester	n/a

2 TECHNICAL DESCRIPTION

2.1 INTRODUCTION

This section contains a technical description of the 2238 RCSU system. This includes a simplified system block diagram theory, and detailed circuit theory of the circuit card assemblies contained in the 2238 RCSU.

SYSTEM BLOCK DIAGRAM Figure 2-1 is a block diagram of a typical 2238 RCSU system. The RCSU block is representative of either the Industrial Rack RCSU configuration, or the Small Form Factor RCSU.

The RCSU assembly is typically mounted in the equipment room and connects to either the 2238 RSDU Rack, or 2138 RSU Module, mounted in the tower cab. All of the navaid connections are made to the RCSU, as well as a dial-up telephone connection used for remote PMDT access. The touchscreen and speaker panel connect to the 2238 RSDU Server in the tower.

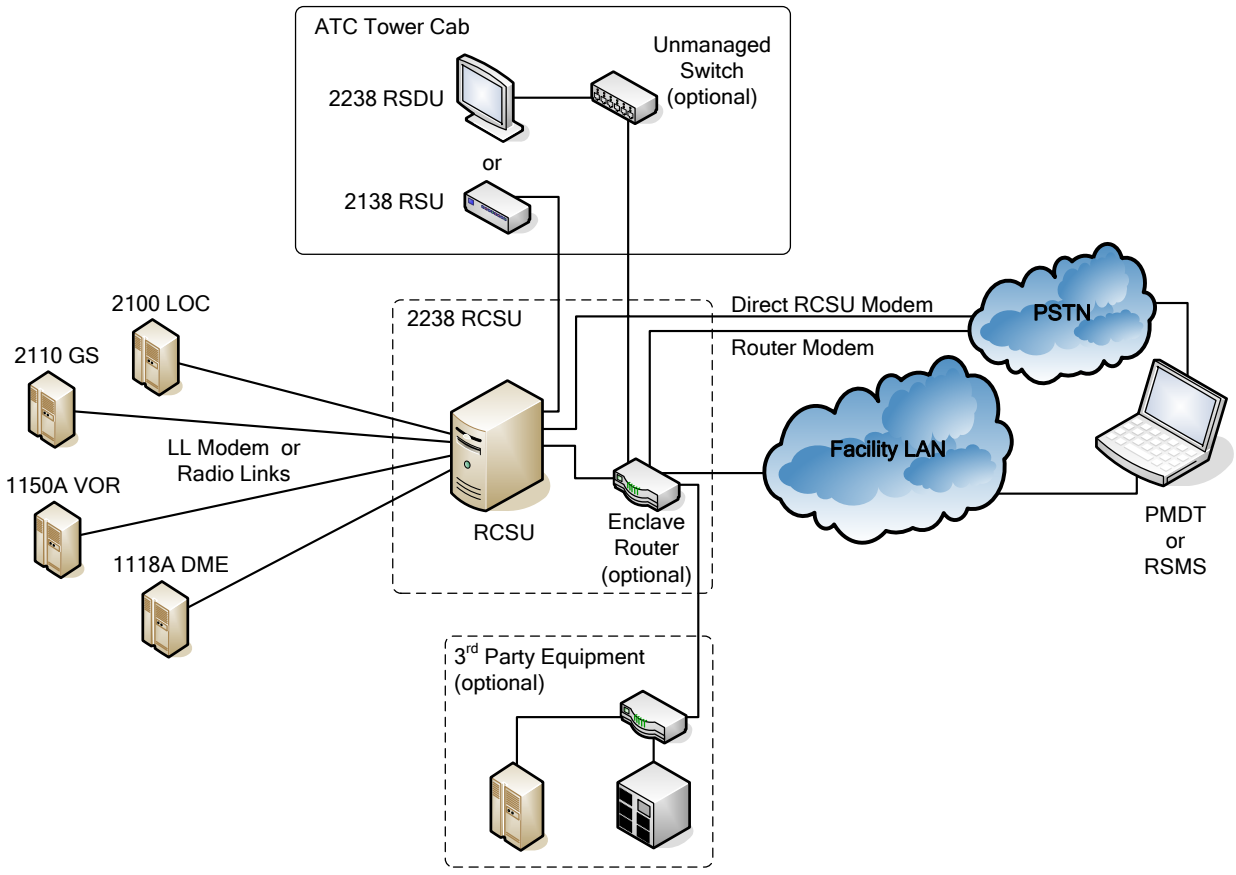

Figure 2-1 Model 2238 RCSU Block Diagram

2.2 THEORY OF OPERATION

The following paragraphs provide a technical description of the Model 2238 RCSU and its individual components and accessories.

2.2.1 2238 RCSU – Industrial Rack Configuration (002238-0112)

The RCSU Server Assembly includes the following:

a. 4 foot tall 19" four-post rack with side panels
b. Uninterruptible Power Supply (UPS)
c. RCSU Server
d. Card Cage Assembly with cPCI Power Supply and interface boards
e. Keyboard and trackball tray
f. 17" LCD monitor

2.2.1.1 RCSU Server (950856-0001)

The RCSU Server is a 4U, 19" rack-mount server chassis containing a server-class motherboard, triple-redundant power supplies, video card, two RAID Level 1 (Mirrored) hard drives, RAID controller, and serial eight port expansion card. The RCSU operates on Windows software.

2.2.1.2 UPS (950741-0021)

The RCSU UPS provides one hour of battery backup for the RCSU system. The RCSU uses an APC Smart-UPS XL 2200VA RM 3U. The part number for the 120V version is SU2200RMXL3U. For the 230V version the part number is SU2200RMXLI3U. Details on the manufacturer's specifications can be found in the accompanying technical information or on the internet.

2.2.1.3 LCD Monitor (950858-0001)

The RCSU Monitor is a standard 17" LCD monitor. Details on the manufacturer's specifications can be found in the accompanying technical information.

2.2.1.4 cPCI Power Supply (950864-0001)

Refer to Figure 2-2 Backplane and Power Supply Block Diagram. The cPCI Power Supply provides +3.3V, +5V, +12V, and -12V to the Backplane CCA and any CCAs plugged into the Backplane CCA. The supply is a fully compatible compact PCI supply with a visual indicator on the front panel of operational status.

The supply is power-factor corrected and will accept AC input of 120 or 240 volts, 50 or 60 Hertz. The DC outputs of the supply may be shutdown by an external inhibit jumper but this feature is not used for the 2238 RCSU. The power supply has a startup delay of a few seconds once AC voltage is applied.

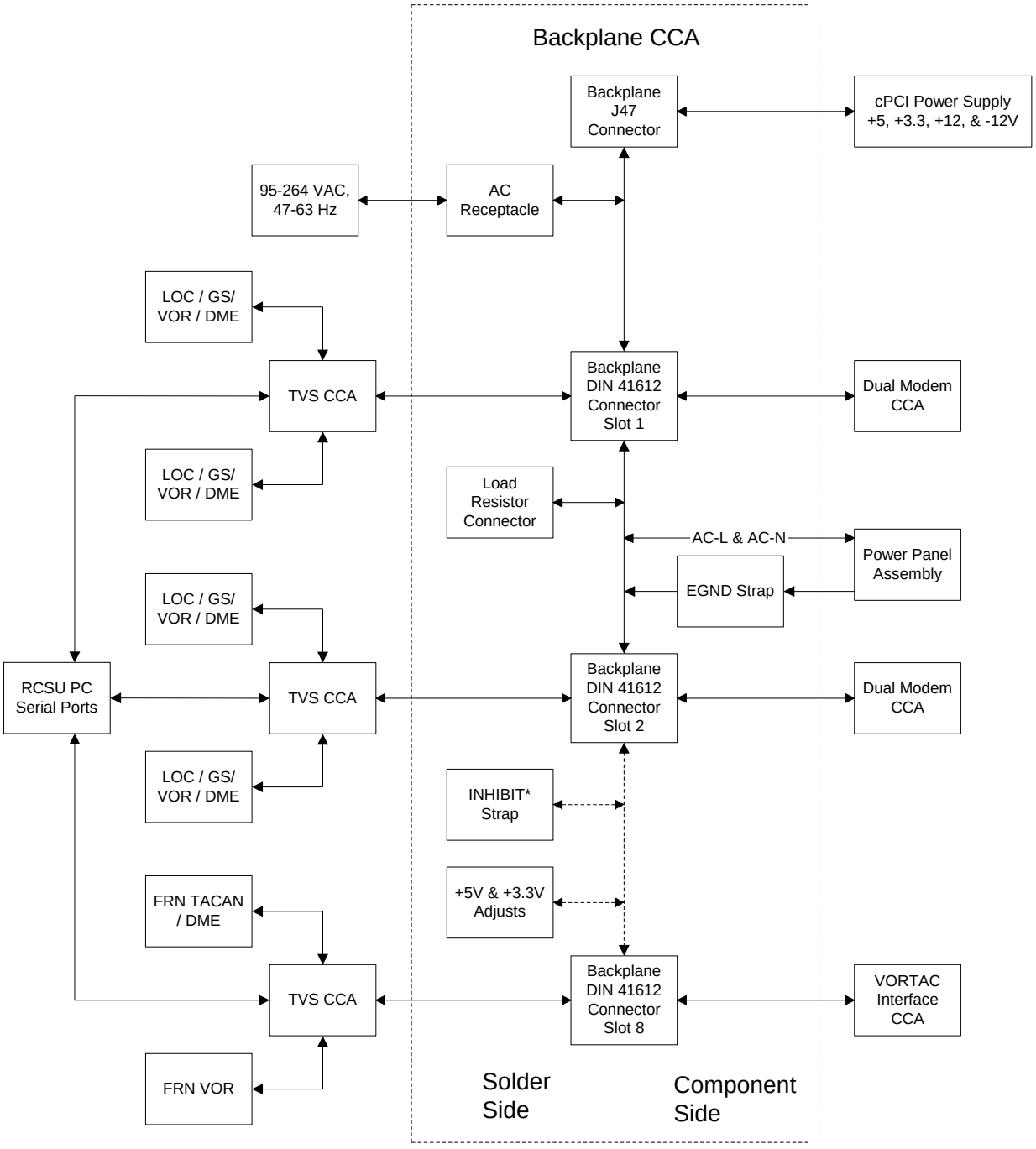

Figure 2-2 Backplane and Power Supply Block Diagram

2.2.1.4.1 Detailed Circuit Theory

Since the Backplane Power Supply is a commercial-off-the-shelf product purchased as an assembly, there is not a schematic available for detailed circuit theory. Details on the manufacturer's specifications can be found on the internet.

2.2.1.5 Backplane CCA (012109-0001)

Refer to Figure 2-2. The Backplane CCA provides power distribution and signal distribution for the Model 2238 Card Cage Assembly. The Backplane CCA is position independent with the exception of the cPCI Power Supply, i.e. the Dual Modem CCA or Cardion VORTAC Interface CCAs may plug into any of the eight slots available.
The cPCI Power Supply plugs into the J47 connector. The cPCI Power Supply is a universal AC-input supply with power factor correction. The outputs of the supply are +3.3VDC, +5 VDC, +12 VDC, and -12 VDC. These voltage outputs are distributed throughout the Backplane CCA.

The AC voltage for the cPCI Power Supply enters the Backplane CCA via receptacle J9. The AC voltage lines are passed to and from the Power Panel Assembly along with the ESD ground strap. The Power Panel Assembly has a combination switch / circuit breaker for power cycling and over-current protection.

The voltage outputs of the cPCI Power Supply may be shutdown by strapping the INHIBIT* header JP1. The +5 VDC output may be loaded with an external resistor via the TB1 terminal block. The +5 VDC and +3.3 VDC outputs may also be adjusted by potentiometers R1 and R2.

Connectors J1/J10 through J8/J80 provide interconnection between TVS CCAs and either Dual Modem CCAs or Cardion VORTAC Interface CCAs. Each Dual Modem or Cardion VORTAC Interface CCA is coupled with a TVS CCA through the Backplane CCA.

2.2.1.5.1 Detailed Circuit Theory

Refer to Figure 11-9a. The cPCI Power Supply connects to the Positronic J47 connector. The cPCI Power Supply is a universal AC-input supply with power factor correction. The outputs of the supply are +3.3VDC, +5 VDC, +12 VDC, and -12 VDC. These voltage outputs are distributed throughout the Backplane CCA. The +5 VDC and +3.3 VDC outputs are protected by fuses F1 and F2 before distribution.

The AC voltage for the cPCI Power Supply enters the Backplane CCA via receptacle J9. The AC voltage lines are passed to and from the Power Panel Assembly via lugs E1through E4. The Power Panel Assembly contains a combination switch / circuit breaker which the customer will use to cycle power to the Card Cage Assembly. The circuit breaker will also shut off power in an over-current situation. The cPCI Power Supply will have a noticeable delay from the time AC is applied until the DC voltages appear at the outputs. An ESD ground strap connects to the Power Panel Assembly which drains to lug E5 on the Backplane CCA.

The voltage outputs of the cPCI Power Supply may be shutdown by strapping the JP1 header. This signal is referred to as INHIBIT* and is also distributed to DIN41612 connectors J1/J10 to J8/J80 for possible future diagnostics or control. The cPCI Power Supply has two other signals distributed to J1/J10 through J8/J80, FAULT* and DEGRADE*. FAULT* indicates the cPCI Power Supply has lost its AC input while DEGRADE* indicates an over-temperature condition.

The +5 VDC and +3.3 VDC outputs of the cPCI Power Supply may be adjusted by potentiometers R1 and R2. These are not normally not populated along with wires W1, W2, and header JP1.

Terminal block TB1 is not currently used. It is included to support any change in power supplies requiring an external load resistor to the +5 VDC output. Some cPCI power supplies require a minimum load to maintain regulation of the voltage outputs. A service bulletin would be issued should this event occur.

DIN41612 connectors J1/J10 through J8/J80 pass signals through the Backplane CCA between TVS CCAs and either Dual Modem CCAs or Cardion VORTAC Interface CCAs. Each Dual Modem CCA or Cardion VORTAC Interface CCA must be coupled with a TVS CCA for protection and control purposes. Connectors J1 through J8 are female DIN41612 on the component side while J10 through J80 are the male DIN41612 matching connectors on the solder side of the Backplane CCA.

Refer to Figure 11-9a to determine which signals are distributed to all J1/J10 through J8/J80 connectors and which signals are passed directly through the Backplane CCA. Signals RESV0 through RESV15 are distributed but have no definition and are reserved for future use. Signal DCDA, for example, is passed directly through and not distributed.

2.2.1.6 Dual Modem CCA (012110-0001)

Refer to Figure 2-3. The Dual Modem CCA provides the bridge for communications between the RCSU computer and 2100 ILS and 1150 VOR navaid equipment.

The Dual Modem CCA has two modems which convert the modem signals of the navaid to RS232 levels required by the RCSU computer. Since each channel of communications operates identically, only one channel shall be discussed.

TIPA and RINGA modem signals from the navaid connect directly (hard-wired, not a dial-up phone line) to the TVS CCA, pass through the Backplane CCA, through on-board connector P1, and arrive at Embedded Modem Module U1. The U1 Embedded Modem Module feeds audio through enable header JP1 to audio amplifier U5. The U5 amplifier drives speaker SPK1. The SPK1 speaker audio may be used for troubleshooting purposes.

The U1 Embedded Modem Module converts the modem signals to TTL-level signals. The TTL-level signals are routed to converter U3, which translates the signals to RS232 levels. The RS232 signals are then routed to connector P1, through the Backplane CCA, through the TVS CCA, and finally to the RCSU computer serial port.

The U1 Embedded Modem Module RESET* line routes to the Backplane CCA via connector P1. For stand-alone configurations (no Backplane CCA), power may be routed to the board via connector J1. A daisy-chain of Dual Modem CCAs may be powered using connectors J2 and J3 and flat cables.

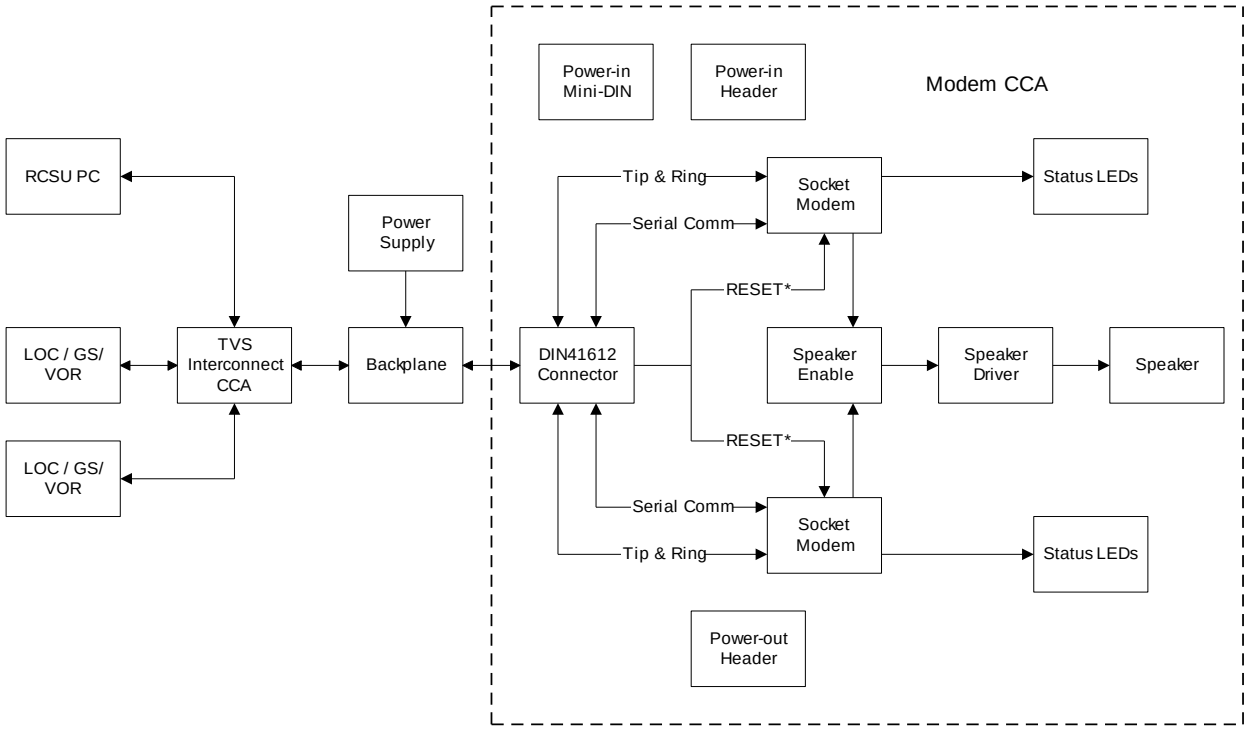

Figure 2-3 Dual Modem CCA Block Diagram

2.2.1.6.1 Detailed Circuit Theory

Refer to Figure 11-10. Since each channel of communications operates identically, only one channel shall be discussed.

Modem TIPA and RINGA signals from the navaid pass through the TVS CCA, the Backplane CCA, onto the Dual Modem CCA via DIN41612 connector P1, and finally to Embedded Modem Module U1 tip and ring. Resistors R5 and R7 simulate the loop battery voltage of a POTS (Plain Old Telephone System) phone line, providing a DC offset voltage for the direct-connected modems. Resistor R26 is not populated.

Embedded Modem Module U1 uses indicators CR3, CR4, CR5, and CR6 for status of DCD, RX, DTR, and TX control / data lines. The indicators are current limited by resistors R9, R10, R11, and R12. Power is supplied to U1 through resistor R24 and filtered by capacitor C4. Resistor R25 is not populated.

The SPKR output of U1 feeds audio through current limiting resistors R21 and R17 as well as coupling capacitor C5 to audio amplifier U5. The audio may be disabled by removing jumpers on header JP1. Removing the jumper between pins 1 and 2 of JP1 disables MODEMA audio. Removing the jumper between pins 3 and 4 of JP1 disables MODEMB audio. Removing the jumper between pins 5 and 6 of JP1 disables the audio of both modems. Audio amplifier U5 power is filtered by inductor L1 and capacitors C12 and C11. Resistors R20 and R23 act as pull-ups for the U5 shutdown input while capacitor C13 establishes zero DC gain. Resistor R19 sets the AC gain (volume) of U5. The amplified audio is finally heard at speaker SPK1.

Embedded Modem Module U1 has an active low reset input which is pulled-up by resistors R1 and R3. Diode CR1 prevents the unintentional powering of the CCA by the off-board MRESET* signal.

The TTL level control / data signals of the U1 Embedded Modem Module are converted to RS232 levels by converter U3. The RS232-level signals are routed off-board by DIN41612 connector P1, through the Backplane CCA, through the TVS CCA, and finally to the RCSU computer. Converter U3 power is filtered by capacitors C1, C2, and C3.

Connector J1 is a mini-DIN type which could be used for power connection in a stand-alone configuration (no Backplane CCA). Diode CR11 provides transient protection while capacitors C20 and C14 provide filtering for the +5 VDC supply. Diode CR12 provides transient protection while capacitors C18 and C15 provide filtering for the +12 VDC supply. Diode CR13 provides transient protection while capacitors C19 and C16 provide filtering for the -12 VDC supply. Resistor R28 is not populated.

Connectors J2 and J3 could also be used for power routing in a stand-alone configuration.

2.2.1.7 Cardion VORTAC Interface CCA (012108-1001)

Refer to Figure 2-4. The Cardion VORTAC Interface CCA is one application of the universal Tone Interface CCA (012108-1001). It provides up to two channels of communication between the RCSU PC in the control tower and runway-located FRN TACANs, DMEs, or VORs. The Cardion VORTAC Interface CCA is located in a card cage within the RCSU 19" rack-mount enclosure. The Cardion VORTAC Interface CCA replaces and executes most of the functions of the Cardion Remote Status Indicator; performing the tone-based interface to Cardion equipment.

Power to the Cardion VORTAC Interface CCA is routed from the cPCI power supply via the backplane. All connections to and from the Cardion VORTAC Interface CCA are transient protected via the TVS CCA. The RCSU communicates via RS232-level serial lines while the VOR/TAC equipment utilizes tone-based signals; all routed to the Cardion VORTAC Interface CCA through the TVS and Backplane CCAs.

The Cardion VORTAC Interface CCA has analog duplexer circuitry which de-multiplexes and multiplexes the transmit/receive tones of the VOR/TAC equipment to/from the stereo coder/decoder (CODEC). The CODEC performs analog-digital and digital-to-analog conversions as directed by the Digital Signal Processor (DSP). A low pass filter removes noise from the receive tone before presentation to the CODEC.

The DSP has a flash ROM memory which is factory programmed via the emulator header. An oscillator provides the

heartbeat clock for the DSP while visual indicators are also provided for checking communications status by the customer. An RS232-TTL converts the serial signal levels between the Cardion VORTAC Interface CCA and the RCSU computer.

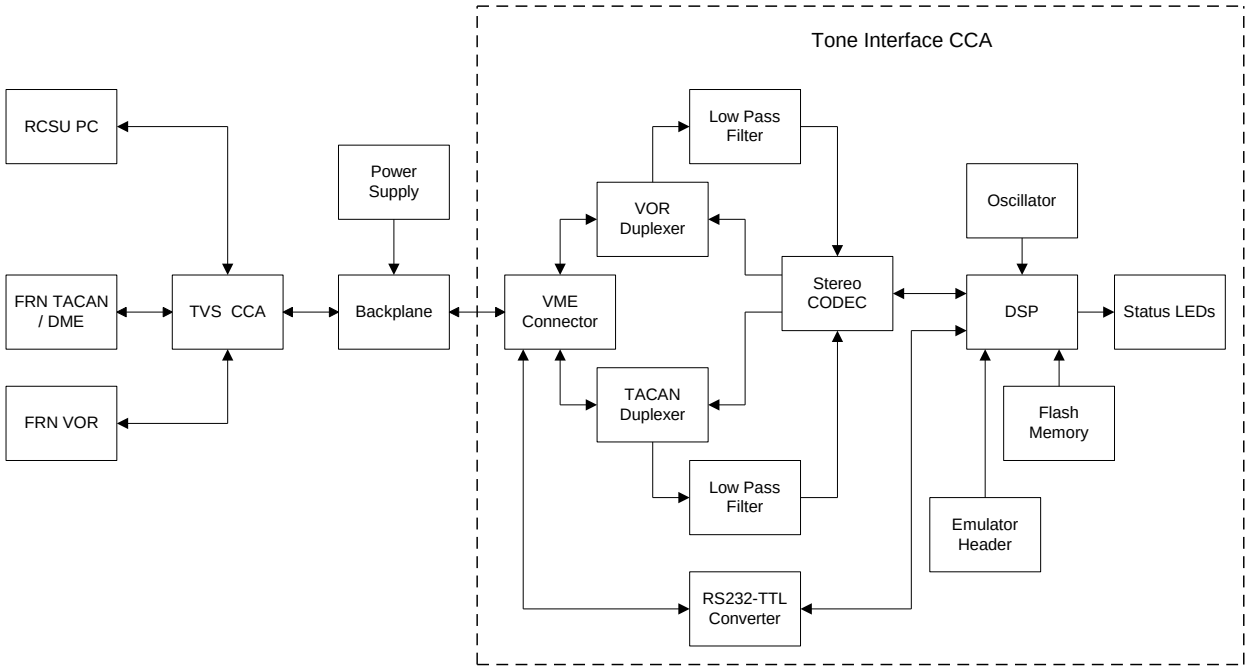

Figure 2-4 Cardion VORTAC Interface CCA Block Diagram

2.2.1.7.1 Detailed Circuit Theory

Refer to Figure 11-8. A 32.768 MHz oscillator, Y1-3, clocks the U1 DSP and a divide-by-2 counter U11B, which in turn clocks the U2-13 CODEC. Damping resistors R66 and R67 limit overshoot and undershoot of the clock signals to the U1-13 DSP and the U11B-11 counter.

The U1 DSP multiplies the 32.768 MHz clock internally by a factor of 8, resulting in an operating frequency of 262.144 MHz. The DSP core, U1-18, is powered by 1.8 volt regulator U8 while the rest of the U1 DSP is powered by 3.2 volt regulator U10 at U1-15. The U10 regulator 3.2 volt output, called DVCC, also powers the remaining digital I/O circuitry and can be measured at test point TP13.

Voltage supervisor / watchdog U7-2 monitors DVCC and activates a U1-44 DSP and a U3-10 ROM reset with the U7-7 watchdog output if DVCC falls below a reliable operating level or if the U1-86 DSP doesn't periodically strobe the U7-6 watchdog input. Resistor R65 insures proper power-down of the U7-7 output while resistor R64 provides pull-up for the U7-1 reset input. The U7-1 reset input is diode-OR'd with both the mreset* signal from connector P1-A24 by diode CR21 and the U7-8 WDO signal by CR22. The watchdog feature is enabled at the factory by the shunt jumper at header JP1.

The U1 DSP program is stored in flash ROM U3. The flash ROM size is 512K by 8 bits. The DSP could also access the SW1 DIP switches as a memory location. The DIP switches do not have a function at the time of this writing but are reserved for future configuration options.

The U1 DSP utilizes pins PF0 (U1-94) through PF6 (U1-29) for two purposes. During power-up the PF lines are inputs pulled low by resistors R17 through R22 and program the U1 DSP's mode of operation. After power-up the PF lines are programmed as outputs and control switching of transistors Q1 through Q8; which turn on and off visual indicators CR1 through CR8.
The DSP uses PF3 (U1-88) for received serial data and FL0 (U1-87) for transmitted serial data from/to the RCSU PC.

The TTL-level PF3 and FL0 signals connect to converter U4-8 and U4-7. These signals are translated to RS232 levels by converter U4 and route from U4-13 and U4-14 to connector P1-A16 and P1-A14.

DSP control signals DT1 (U1-37), TFS1 (U1-38), RFS1 (U1-39), DR1 (U1-40), SCLK1 (U1-42), FL2 (U1-85), and PF7 (U1-30) are used to control the U2 stereo CODEC at a 16 KHz rate for tone-based communications.. The CODEC derives its power from analog 3.2 volt regulator U9 and DVCC. The analog 3.2 volts is called AVCC and may be measured at TP11.

Since each channel of tone-based communications operates identically, only one channel shall be discussed.

The U2 CODEC performs A-D conversions on the processed tone-based signals presented by the U5A, U5B, U5C, and U5D duplexer. Tower (RCSU) to navaid tones are 2759 Hz carrier modulated by either 66 or 74Hz. The navaid-to-tower tones are 2500 Hz carrier modulated by either 39 Hz or 47 Hz. Operational amplifiers U5B and U5C condition the tower-to-navaid tones and route them to connector P1-C17, P1-A21, and P1-A22 as signals OPTA_OUT, TIPA, and RINGA. TIPA and RINGA are transformer-coupled signals on the TVS CCA and will be the most commonly used while the OPTA signals are intended for connection to an optical modem.

Operational amplifier U5A filters the navaid-to-tower tones by nulling (minimizing) the tower-to-navaid signal in the receive channel. This is accomplished by use of null adjust potentiometer R75 and can be measured at A_IN test point TP1. The output of U5A is summed into gain amplifier U5D along with optical modem signal OPTA_IN from connector P1-C15.

Op amp U5D amplifies the navaid-to-tower tones while resistors R38 and R39 act as voltage dividers for re-sizing. Diodes CR25 and CR26 provide voltage clamping to prevent overload of the CODEC inputs. Capacitor C19 and resistor R40 couple the signal to the single-ended to differential signal converter circuitry of R41, C20, R42, R43, and C21. The mostly navaid-to-tower signal is then presented to CODEC pins VINP1 (U2-1), VFBP1 (U2-2), VINN1 (U2-3), VFBN1 (U2-4), and VOUTP1 (U2-23) for A-D conversion.

The proprietary J1 emulator header signals are voltage-clamped to DVCC by diodes CR9 through CR20. The emulator header is used in the factory to program the flash ROM U3.

Analog ground and digital ground are referenced to each other by inductor L1 and may be measured at test points TP14 and TP15. Diodes CR24 and CR25 insure the grounds do not drift very far from each other.

2.2.1.8 Transient Voltage Suppressor (TVS) CCA (012107-0001)

Refer to Figure 2-5. The Transient Voltage Suppression (TVS) CCA transient protects all RS232 and modem/audio signals before they enter the Backplane CCA.

The TVS CCA provides protection for two channels of communications between the RCSU computer and navaid equipment. Each channel consists of RS232 serial communications between the RCSU computer and the Dual Modem or VORTAC CCA as well as modem or audio signals between the navaid device and the Dual Modem or VORTAC CCA.

Since each channel of communications is protected identically, only one channel shall be discussed. The modem or audio signals enter via connector TB1. The signals are current limited by RT1 and RT2 as well as over-voltage protected by V1. Transformer T1 isolates the signals before they are filtered by capacitors C1 and C2.

Sidactor Q1 provides further over-voltage protection before the signals are transitioned out connector P10. The signals pass through the Backplane CCA for connection to either the Dual Modem or Cardion VORTAC Interface CCA.

The Dual Modem or Cardion VORTAC Interface CCA converts these modem or audio signals to RS232 levels. The RS232 signals transition back through the Backplane CCA and through connector P10 to the TVS CCA.
Diodes CR1 through CR7 provide voltage clamping to the RS232 signals before they exit connector J1 and eventually connect to the RCSU computer.

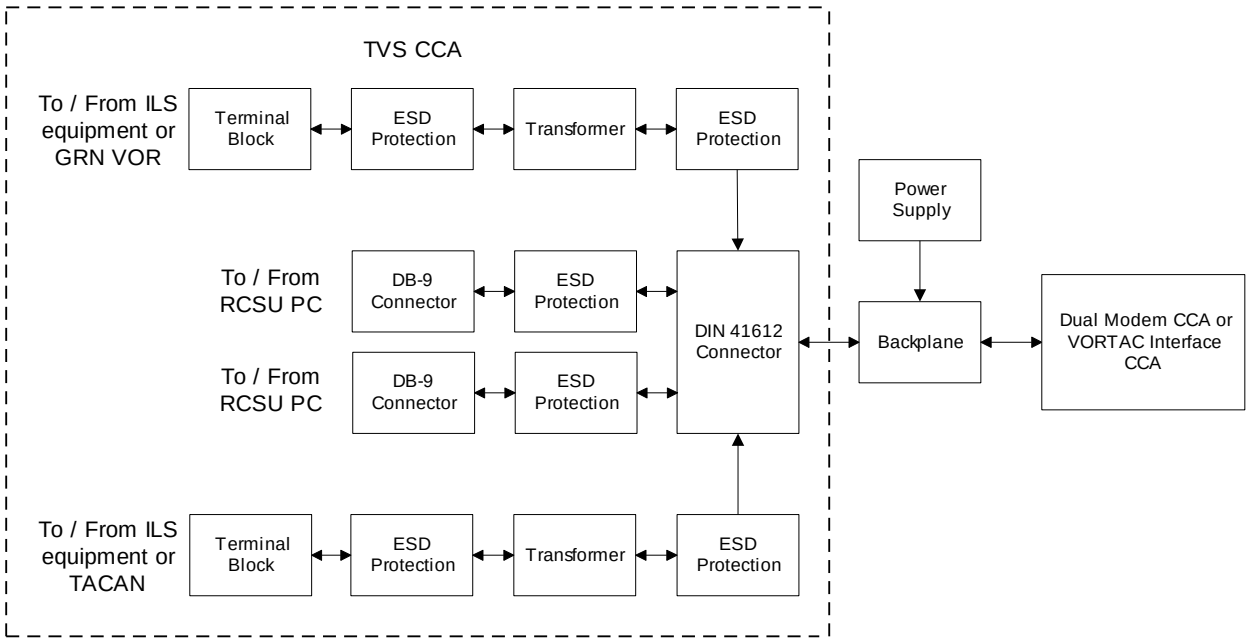

Figure 2-5 TVS CCA Block Diagram

2.2.1.8.1 Detailed Circuit Theory

Refer to Figure 11-7. Since each channel of communications is protected identically, only one channel shall be discussed.

Modem or audio signals from the navaid device enter the TVS CCA via terminal block TB1. Resistors RT1 and RT2 provide surge current protection while spark gap V1 provides over-voltage protection. Resistors RT1 and RT2 are positive temperature coefficient devices which act as self-resetting fuses during and after a surge current event.

The modem or audio signals are then ground isolated by transformer T1 and noise filtered by capacitors C1 and C2. Transformer T1 also removes common mode noise from the signals. Common mode noise is typically a problem in signal lines routed a long distance between communication devices.

Sidactor Q1 provides further over-voltage protection of the modem or audio signals before they exit the TVS CCA via DIN41612 connector P10. These signals eventually connect to either a Dual Modem CCA or a Cardion VORTAC Interface CCA through the Backplane CCA. The Dual Modem or Cardion VORTAC Interface CCA is controlled by the RCSU computer, whose serial lines are also protected by the TVS CCA.

These serial lines of RS232 levels from the RCSU computer enter via DB9 connector J1 and are over-voltage protected by diodes CR1 through CR7. The signals are transitioned out the DIN41612 connector P10 where they will eventually connect to either a Dual Modem CCA or a Cardion VORTAC Interface CCA through the Backplane CCA.

The transient protection devices shunt current to earth ground during an over-voltage event. Earth ground is referenced to circuit ground through inductor L1. The inductor provides a low DC resistance and a high AC resistance between the grounds. During a transient event, the surge current is returned to earth ground. The earth ground connection is made through bracket E1.

2.2.2 2238 RCSU – Small Form Factor Configuration (002238-0312/-0412)

The Small Form Factor RCSU Assembly consists of a 5U rackmount sub-assembly, 030863-0001. This RCSU sub-assembly includes of the following items:

a. Embedded PC
b. Battery Charger Power Supply (BCPS) and Battery
c. 10.4" Touchscreen LCD monitor
d. Card Cage Assembly, with Power Supply/RSU I/F and interface boards
e. Keyboard and Mouse tray
f. USB Modem (56k)
g. Optional serial port expansion card
h. External AC/DC Power Supply (950902-0000)

2.2.2.1 Embedded PC (950890-0003)

The RCSU's embedded PC is a small Form Factor motherboard, comprised of industry standard peripherals:

a. 4GB DDR3 RAM
b. 2.5" Hard disk drive
c. ATX Power Supply card
d. Slimline CD-ROM or DVD-RW

The embedded PC is a low-power system, running the Windows. It is powered via the ATX Power Supply card, which in turn is driven by a switched 12VDC line from the BCPS CCA.

2.2.2.2 BCPS (012128-0002)

The BCPS CCA, in conjunction with the 35 AHr battery (235013-0001) provides at least 4 hours of battery backup for the RCSU system. The BCPS maintains the battery's charge while the supply voltage is present. It controls the switchover to the battery in the event that either AC voltage is lost, or the external AC/DC power supply should fail. The BCPS then monitors the battery voltage and the system will be automatically shutdown by the BCPS CCA at the end of the battery's capacity. Once supply power is restored, the system will restart and recharge the battery.

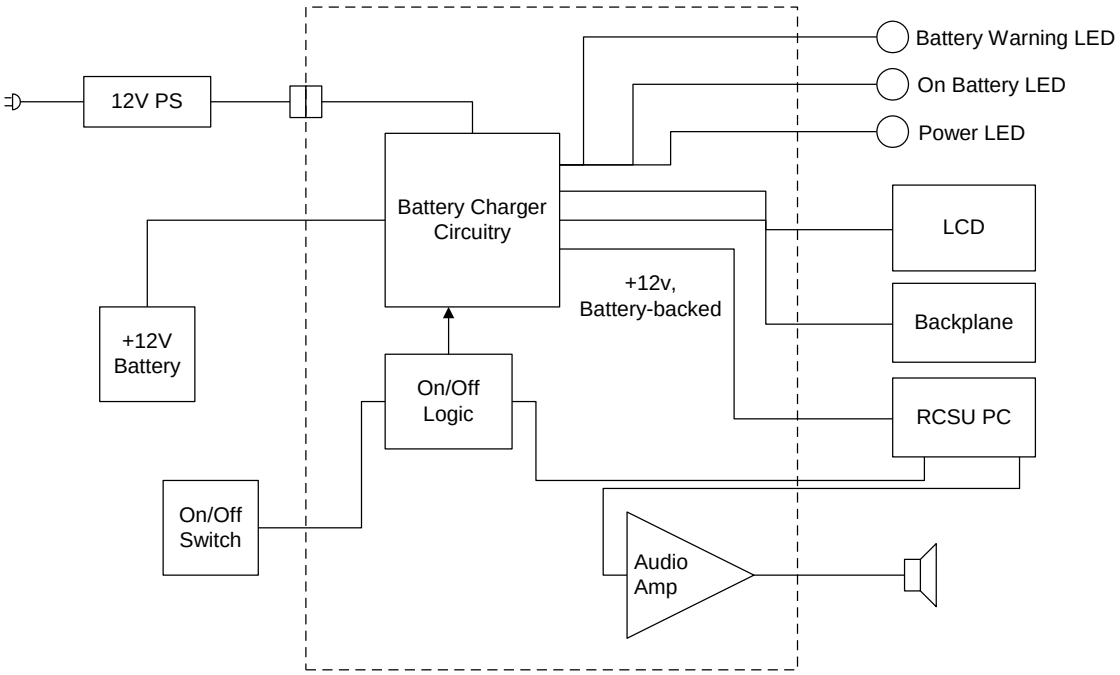

Figure 2-6 BCPS Block Diagram

2.2.2.2.1 Detailed Circuit Theory

Refer to Figure 2-6 and Figure 11-13. The +12VDC comes into the CCA from the external AC/DC switching supply on J3. This +12Vraw signal supplies the battery charge current source circuitry which includes PS1, a 12V to 15V DC-DC converter. The output of this DC-DC converter is trimmed up to approximately 15.7V, as measured on TP7. This voltage is fed into a parallel pair of LT1086 voltage regulators, which supply a maximum 1.25A of battery charge current each. A jumper block, JP3, is provided to select either 2.5A when it is installed, or 1.25A if removed. For the large, 35AHr battery supplied with the -0312 RCSU, the 2.5A charge current is selected. It must be removed for the -0412 RCSU, which contains the smaller 7 AHr battery.

The +12Vraw signal is also fed through transistor Q10 and distributed to the RCSU system as VSUM thru P4. VSUM will be in the range of approximately 9.5 – 14.5 VDC. It is derived from either the AC/DC supply or from the Battery if the AC/DC supply is not detected. Photovoltaic optoisolators U12 and U3, as well as the N-channel power MOSFETs Q10 and Q1/Q2 are used to switch between either +12Vraw, or VBat. These switches are driven by the micro-controller (uC), U8. This uC provides the various logic functions required of the BCPS design.

For the pulsed current battery charger functions, the uC monitors the outputs from the battery and Raw supply voltage comparators, U5-U7. It turns on the battery charger via the CHARGE* output signal when the NEEDS_CHG* signal is activated. It turns off the battery charger, raising the CHARGE* output, when the BAT_FULL signal is activated. When the RAW_2_LO* signal is activated, indicating that the +12Vraw supply has dropped too low, the uC asserts the ON_BATTERIES signal, which switches the battery voltage into the VSUM output, and then switches off the ON_RAW_DC signal, disconnecting the +12Vraw supply. The MOSFET Driver, U13 is used to bridge this transition, providing a very quick-response charge pump supply for a few milliseconds until U3 has fully turned on Q1 and Q2. U13 is supplied by VAlways, which is a diode-ORed sum of VRAW and VBat. VAlways also powers the 5V reference, U4, which supplies +5VDC to the comparators and uC on this CCA.

The uC also controls the PWR_BN+ signal to the RCSU PC's motherboard. In response to the user pressing the Power switch on the front panel (PWR_SWCH*), the BCPS momentarily grounds the PWR_BN+ signal, which tells the RCSU PC to start shutting down. The BCPS starts flashing the front panel's Power LED and waits up to 60 seconds for the PWR_LED- signal from the RCSU motherboard to drop, indicating that the RCSU PC has shut down. Once that signal drops, or the 60 seconds expires, the BCPS turns off the +12V output to the motherboard, RCSU card cage, and LCD, by turning off Q1/Q2 and Q10.

The uC also drives several LED outputs, three of which are on the RCSU's front panel: Power (DC_OK), Battery Warning, and On Batteries. The On Raw DC and Battery Charging LEDs are only viewable on the CCA itself. Battery Warning LED is turned on by the uC if the battery is disconnected or otherwise fails.

The BCPS CCA sums the Left and Right audio channels through an audio amplifier and out to the front panel speaker. This audio amp is typically powered by the +5V supplied by the motherboard, although provisions are provided for a simple 5V regulator, U8, if needed.

2.2.2.3 10.4" Touchscreen LCD (950892-0000)

The main user interface to the RCSU is through its 10.4" Touchscreen LCD. This is a panel-mounted LCD with 800x600 SVGA resolution. A resistive touchscreen is installed on top of the LCD to relay user inputs back to the RCSU software. The LCD is connected to the Embedded PC's video output, as well as using COM1 for the Touchscreen interface. It is powered by a switched 12VDC line from the BCPS CCA.

2.2.2.4 Backplane CCA (012127-0001)

Refer to Figure 2-7. The Backplane CCA provides power distribution and signal distribution for the Model 2238 Card Cage Assembly. The Backplane CCA is position independent, i.e. the Power Supply/RSU I/F CCA, Dual Modem CCA, Cardion VORTAC Interface CCA, and I/O Controller CCA may plug into any of the eight slots available. However, due to the width of the Power Supply/RSU I/F CCA (012129-0001), it should only be installed in the J20 slot so it does not interfere with any adjacent cards.

Connectors J3/J30 through J8/J80 provide interconnection between TVS CCAs and either Dual Modem CCAs or Cardion VORTAC Interface CCAs. Each Dual Modem or Cardion VORTAC Interface CCA is coupled with a TVS CCA through the Backplane CCA.

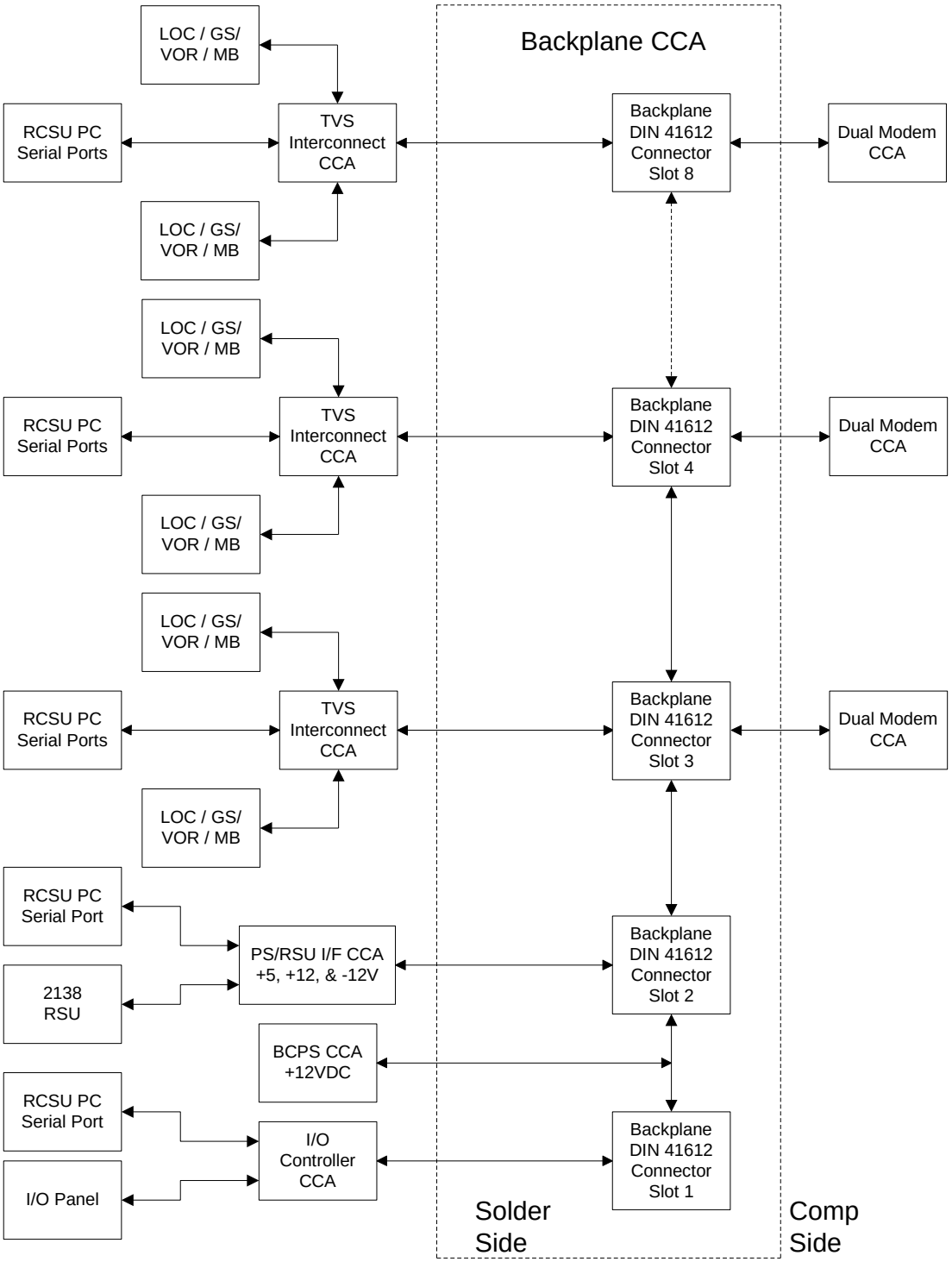

Figure 2-7 Backplane and Power Supply Block Diagram

2.2.2.4.1 Detailed Circuit Theory

Refer to Figure 11-9b. The Backplane CCA is powered by the switched 12VDC voltage supplied by the BCPS. This voltage is routed from E2 through the 10 amp fuse, F1, through the backplane to the Power Supply/RSU I/F CCA (012127-0001). This CCA converts the switched 12VDC to +5 VDC, +12 VDC, and -12 VDC. The +3.3 VDC signal lines shown in Figure 11-9b are for future enhancements.

Terminal lugs E3/E4 are provided for future enhancements and may be used to attach an external load resistor to the +5 VDC output. Some, but not all, power supply modules require a minimum load to maintain regulation of the voltage outputs. The external load resistor will normally not be supplied.

DIN41612 connectors J3/J30 through J8/J80 pass signals through the Backplane CCA between TVS CCAs and either Dual Modem CCAs or Cardion VORTAC Interface CCAs. Each Dual Modem CCA or Cardion VORTAC Interface CCA must be coupled with a TVS CCA for protection and control purposes. Connectors J1 through J8 are female DIN41612 on the component side while J10 through J80 are the male DIN41612 matching connectors on the solder side of the Backplane CCA. Note that connectors J1 and J2 on the component side are not normally populated. Their companion connectors, J10 and J20 on the solder side are for the Power Supply/RSU I/F CCA and the optional I/O Controller CCA.

Refer to Figure 11-9b to determine which signals are distributed to all J1/J10 through J8/J80 connectors and which signals are passed directly through the Backplane CCA. Signals RESV0 through RESV15 are distributed but have no definition and are reserved for future use. Signal DCDA, for example, is passed directly through and not distributed.

2.2.2.5 Power Supply/RSU I/F CCA (012129-0001)

Refer to Figure 2-7. The Power Supply/RSU I/F CCA provides +5V, +12V, and -12V to the Backplane CCA and any CCAs plugged into the Backplane CCA. It also provides the level translation circuitry to convert between RS-232 and RS-422 for the 2138 RSU Module communication link.

2.2.2.5.1 Detailed Circuit Theory

Refer to Figure 11-14. The +12V from the backplane is used to derive +5V_FILTRD using the +5V DC-DC converter, PS2, -12V_FLTRD using the -12V DC-DC converter, PS1, and +12V_FLTRD. Each of these voltage lines contains a Pi filter network to filter out any switching noise in the signal. These power supply voltages are then returned to the backplane for distribution throughout the RCSU cardcage.

This CCA also contains the surge suppression and level translation circuitry required for the 2138 RSU Module communication link. U2 converts the RCSU PC's RS-232 signals to TTL levels, and U1 converts the TTL signals to differential RS-422 signals.

2.2.2.6 Dual Modem CCA (012110-0001)

Refer to Figure 2-3. The Dual Modem CCA provides the bridge for communications between the RCSU computer and 2100 ILS and 1150 VOR navaid equipment.

The Small Form Factor RCSU configuration uses the same Dual Modem CCAs as the Industrial Rack RCSU configuration. Refer to Section 2.2.1.6 for the details of this CCA.

2.2.2.7 Cardion VORTAC Interface CCA (012108-1001)

Refer to Figure 2-4. The Cardion VORTAC Interface CCA is one application of the universal Tone Interface CCA (012108-1001). It provides up to two channels of communication between the RCSU PC in the control tower and runway-located FRN TACANs, DMEs, or VORs.

The Small Form Factor RCSU configuration uses the same Cardion VORTAC Interface CCA as the Industrial Rack RCSU configuration. Refer to Section 2.2.1.7 for the details of this CCA.

2.2.2.8 Transient Voltage Suppressor (TVS) CCA (012107-0002)

Refer to Figure 2-5. The Transient Voltage Suppression (TVS) CCA transient protects all RS232 and modem/audio signals before they enter the Backplane CCA.

The TVS CCA provides protection for two channels of communications between the RCSU computer and navaid equipment. Each channel consists of RS232 serial communications between the RCSU computer and the Dual Modem or VORTAC CCA as well as modem or audio signals between the navaid device and the Dual Modem or VORTAC CCA.

The Small Form Factor RCSU configuration uses the same base TVS CCA (012107) as the Industrial Rack RCSU configuration, with the exception that it has a longer Earth Grounding bracket due to the physical mounting differences in the two RCSU configurations. Refer to Section 2.2.1.8 for the details of this CCA.

2.2.2.9 I/O Controller CCA (012126-1001)

Refer to Figure 2-7. The optional I/O Controller CCA is installed in the rear of the RCSU card cage. It provides 8 digital inputs and 8 digital outputs, as well as an optically-isolated input and an optically-isolated input. The inputs can be used either for an External Interlock In signal, or general purpose status inputs. The outputs can be used either for an External Interlock Out signal, or general purpose control signals. The microprocessor on this CCA communicates with the RCSU application via a dedicated COM port. The interface to the external equipment is done through a 40-pin header connector, to which external signal conditioning modules may be connected, as required by the specific application.

The RCSU uses the External Interlock I/O as follows:

External Interlock In:
A switch connecting the two INTLK_IN signals will cause the navaid equipment controlled by this RCSU to be Interlocked On. Opening these inputs will cause these navaids to be Interlocked Off.

External Interlock Out:
To Interlock On an external system, the 2238 RCSU will effectively short the two INTLK_OUT signals together. To Interlock Off the external system, these two lines will be opened.

2.2.2.9.1 Detailed Circuit Theory

Refer to Figure 11-15. The core of the I/O Controller CCA is the PIC microprocessor (uP), U1. It is connected with the RCSU PC and communicates with the RCSU application via the RS-232 serial port connector, J1, and RS-232 transceiver, U3. It receives commands that tell it how to set the various output pins on P2, and relays status of the input pins of P2. The outputs are protected from voltage surges, and pulled down through 10K resisters in RN1. The inputs are protected from voltage surges, and pulled up through 10K resistors in RN2. This provides a fail-safe I/O scheme, requiring active-low inputs. The two analog inputs are unfiltered, 0-5v inputs to the uP. However, since the VRef+ input to U1, pin 6, is derived from the +5 V power line through CR7, the full scale analog voltage will actually be closer to 4.5 V due to the diode drop. The MRESET* signal is generated by the uP in response to a specific command from the RCSU application, then distributed throughout the cardcage.

U4 and U5 provide the opto-isolated Interlock I/O signals. Note that R15 actually ties INTLK_IN- to the RCSU's ground, bypassing the isolation provided by U5. This is to simplify external connections, allowing for either a single active low input, or by removing R15, an actual differential input.

J2 is used for In-System Programming at the factory. Once programmed, the uP will flash CR9 at a ½ Hz rate (1 second on, 1 second off) when the CCA is powered up, indicating a healthy system.

U2 is a supervisory reset chip that holds the uP in reset until the supply voltage is above approximately 4.5 VDC.

2.2.3 2238 RSDU (470560-0001)

The 2238 RSDU includes the following:

a. 6U tall 19" equipment rack
b. Uninterruptible Power Supply (UPS)
c. RSDU Server
d. USB keyboard and optical mouse
e. 18" touchscreen monitor
f. Speaker panel

2.2.3.1 RSDU Server (950856-0002)

The RSDU Server is a 4U, 19" rack-mount server chassis containing a motherboard, redundant power supplies, video card, two RAID Level 1 (Mirrored) hard drives, RAID controller, and a SoundBlaster card. The RSDU operates on Windows software.

A USB keyboard and mouse are supplied with the RSDU Server for use in configuration. Once the system is configured, they may be disconnected from the front-panel USB ports and stored separately from the RSDU Server.

2.2.3.2 UPS (950741-0011)

The RSDU UPS provides one hour of battery backup for the RSDU system and the touchscreen. The RSDU uses an APC Smart-UPS 1500VA USB & Serial RM 2U. The part number for the 120V version is SUA1500RM2U. For the 230V version the part number is SUA1500RMI2U. Details on the manufacturer's specifications can be found in the accompanying technical information or on the internet.

2.2.3.3 RSDU Touchscreen LCD (950859-0001)

The RSDU Touchscreen LCD Monitor displays the status of the configured navaid equipment. It is supplied in an 8U, 19" rackmount Form Factor, or can be reconfigured to provide standard VESA mounting for a swing-arm installation. A desktop mounting base is also provided.

The touchscreen is a combination of an 18 inch LCD monitor plus a MicroTouch™ ClearTek™ capacitive touch screen manufactured by 3M Touch Systems. The touchscreen responds to input from a finger and will ignore hard objects such as pencils, pens, paper, and long finger nails. Cotton or leather gloves may prevent the touchscreen from detecting key presses. Details on the manufacturer's specifications can be found on the internet.

2.2.3.4 RSDU Speaker Panel (950863-0001)

The RSDU Speaker Panel contains two stereo speakers that connect to the amplified speaker output of the SoundBlaster card located in the RSDU server. The speakers are not powered and will not generate sufficient sound intensity when connected to a line-level audio output.

2.2.4 2138 RSU Kits (470358-0001/-0002)

The 2138 RSU kits contain the following assemblies:

2138 RSU Module
Optional Battery Backup Box

2.2.4.1 2138 RSU Module (030691-0001)

The 2138 RSU Module is a remote display station intended for installation in the airport control tower. Airport tower personnel may monitor status of ILS, VOR, FFM, Marker Beacons, and DME equipment as well as initiate switching of primary/secondary runway selection. The RSU module is connected to an RCSU controller located in the base of the tower up to 1/2 mile away.

The 2138 RSU Module is normally powered by an external +12VDC power supply. The +12VDC supply also maintains charge to an optional external battery back-up. The battery back-up will supply up to one hour of operation during AC power failure.

The 2138 RSU Module is controlled by and connected to the RCSU via an RS-422 link. The RCSU periodically writes data to and receives status from the RSU. A Self Test button on the 2138 RSU Module lights all indicators, sounds the aural alarm, and verifies integrity of the RS-422 link.

Up to three 2138 RSU Modules may be daisy-chained along the RS-422 link to an RCSU controller, with one of them being capable of reporting status and runway select requests.

A 2138 RSU Module contains two circuit card assemblies (CCAs). The Interconnect CCA (012046-0001) provides interconnection, power supply regulation, battery charging/switch-over, and drives the alpha-numeric display. The Keypad CCA (012047-1001) provides keyboard interface, serial communications interface, aural alarm, and discrete display control. Following are detailed descriptions of each of these CCAs.

2.2.4.2 RSU Interconnect CCA (012046-0001)

Refer to Figure 2-8 and Figure 11-11. The Interconnect CCA provides interconnection, power supply regulation, battery charging/switch-over, and drives the alpha-numeric display. All external connections to/from the 2138 RSU module are made via the Interconnect CCA. Transient protection is also provided for all external switch controls and power supply inputs.

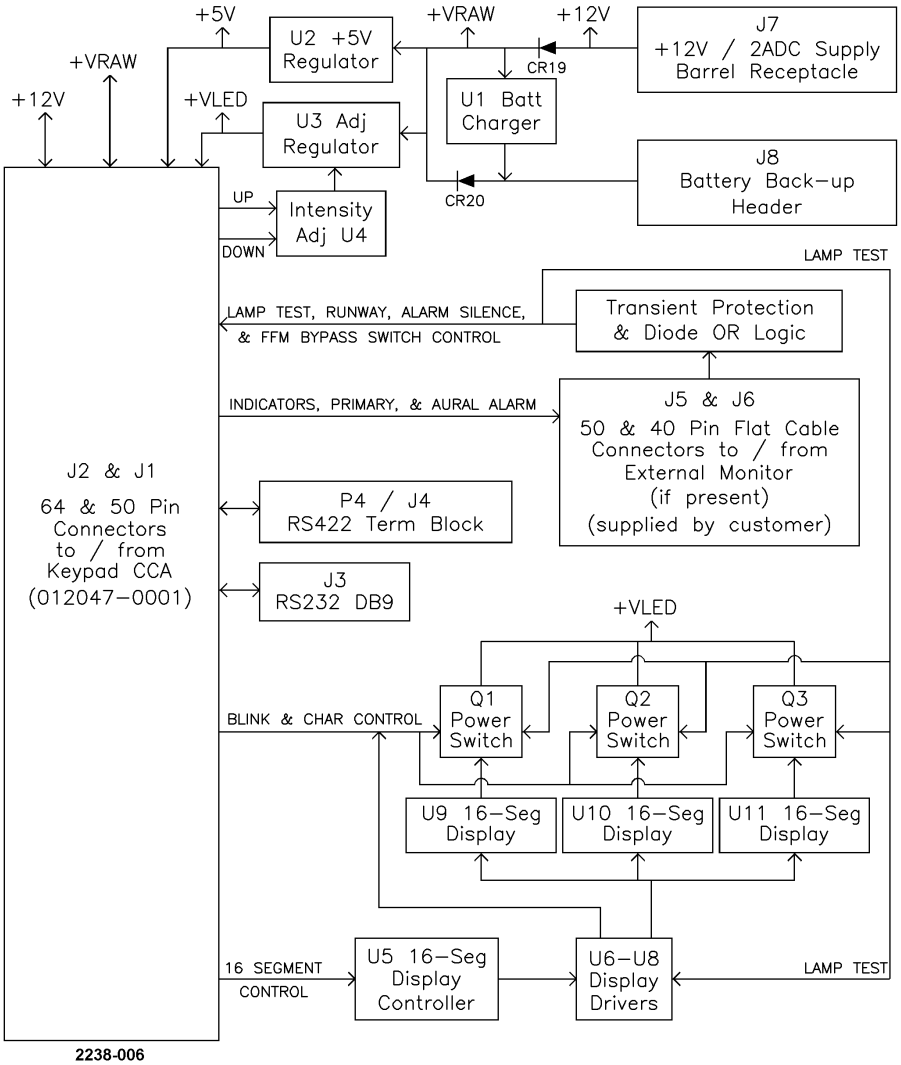

Figure 2-8 RSU Interconnect CCA Block Diagram

2.2.4.2.1 Detailed Circuit Theory

Refer to Figure 2-8 and Figure 11-11. Either the +12VDC supply connected to the J7 barrel connector or the battery back-up connected to the J8 header supplies power to the CCA. Test points TP2 and TP1 may be used to measure the +12VDC and battery voltage level compared to digital ground at TP3.

Diodes CR19 and CR20 are Schottky steering diodes used to switch the proper voltage source to the rest of the CCA. CR20 is reversed biased and U1, R1, and R2 provide trickle charge to the Ni-Cad battery back-up as long as +12VDC is present. CR19 is reversed biased and CR20 forward biased when the +12VDC supply is absent or below the level of the battery voltage.

Inductor L1 provides a DC "short" and an AC "open" between digital ground and chassis ground. Chassis ground is connected through E1 to earth ground as a current path for all transient protection devices while digital ground is the reference for all remaining components. CR18 provides transient protection to the diode OR'ed +12V / +VBATT supplies and named +VRAW.

Capacitors C1, C3, C4, and C9 provide bulk filtering and high frequency bypass for fixed output regulator U2. The +5V regulated output may be measured at TP5. The +5V output powers all integrated circuits as well as red and amber LEDs on both the Interconnect and Keypad CCAs.

Capacitors C2 and C5 provide bulk filtering and high frequency bypass for adjustable output regulator U3. R6 provides a constant load to U3 to insure regulation. Resistors R3, R5, and integrated circuit U4 form a resistor network that determine the output voltage of regulator U3. The output voltage is named +VLED and measured at test point TP6. Capacitor C8 provides filtering and "soft-starting" for regulator U3. U4 is an electrically erasable potentiometer (EEPOT) which emulates the action of a discrete linear potentiometer.

Intensity Up (U4-1) and Intensity Down (U4-2) from the Keypad CCA via connector J2-4 and J2-5 are pulled up with resistors R7 and R8. These control lines change the resistance of the U4 EEPOT which in turn determines +VLED. The variable output +VLED powers all green discrete LEDS and alpha-numeric displays and determines the intensity of the green light. Diode CR24 and capacitor C6 form a small power supply reservoir to insure the EEPOT will have sufficient time to save its resistance value in internal EEPROM upon RSU system power-down. The EEPOT will automatically restore its resistance value upon RSU system power-up.

Connectors J5 and J6 interface the Interconnect CCA to an external monitor (optionally supplied by the customer). The external monitor may initiate any of FFM_BYPASS*, RUNWAY_1*, RUNWAY_2*, SILENCE*, and TEST* requests by connecting any of J5-31 through J5-36 to digital ground (J5-43 through J5-50, J6-37 through J6-40). Diodes CR9, CR11, CR13, CR15, and CR17 prevent the external monitor from accidentally powering the RSU during power-down. Diodes CR1, CR10, CR12, CR14, and CR16 provide transient protection. These switch control lines are routed to the Keypad CCA via connector J1-31 through J1-36.

The remaining signals of J5 and J6 are all open collector outputs that require individual pull-ups to a +5V volt supply of the external monitor. CAT_THREE* of J5-1 is typical and will be the only output discussed. The external monitor may determine the state of CAT_THREE* as shown in Figure 2-9. The RSU front panel LED labeled CAT III is lighted green when the CAT_THREE* signal is low or sinking current. The RSU front panel LED labeled CAT III is off when the CAT_THREE* signal is high or not sinking current.

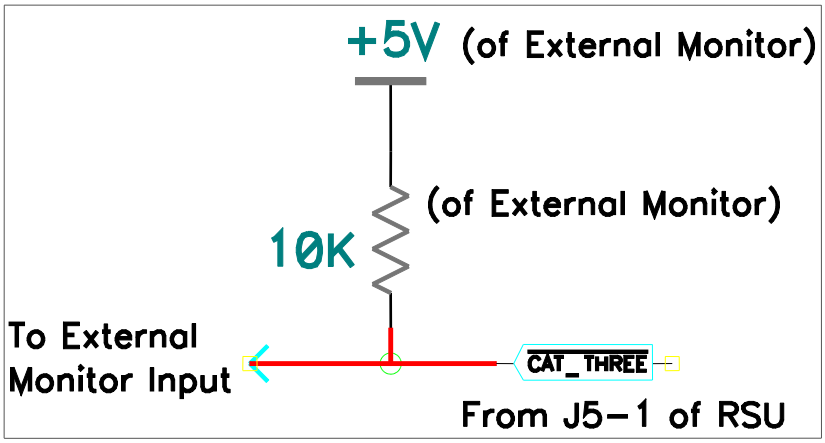

Figure 2-9 Typical External Monitor Output Circuitry

All of the signals of J5 and J6 arrive at the Interconnect CCA via connectors J1 and J2. Connector P4/J4 routes the RS-422 signals from the RCSU to the Keypad CCA via J1-26, J1-30, J2-26, J2-31, and J2-33. Connector P4-1 is shorted to P4-2 for end-of-line termination. The short connects a termination resistor internal to the RSU. Connector J3 directs RS232 signals from an external terminal to the Keypad CCA via J2 and is normally not connected. Diodes CR5-CR8, CR25, and CR26 provide transient protection for the RS232 and RS-422 signals.

Alpha-numeric display controller U5 receives its control signals from the Keypad CCA via connector J2-37 through J2-46. U5 is strapped at pin 31 and pin 28 to act as a write-only, three character, random access memory with each character being 6 bits wide; D0 through D5 (U5-10 through U5-16). The character address is determined by address lines A0 and A1 (U5-30 and 29). After character data is written, U5 scans the alpha-numeric displays (U9-11) at approximately a 400 hertz rate with character data.

Darlington drivers U6-U8, resistor networks RN1-RN3, resistors R15-R30, and resistor R35 establish the current sinking side of the display scanning. Resistor networks RN1 and 2 set base drive current to the Darlington drivers. Resistors R15-R30 set the individual segment current and help determine the light intensity. Resistor network RN3 and resistor R35 act as pull-ups. LAMP_TEST* is connected to each Darlington driver at pin 9. All display segments light when LAMP_TEST* is a logic zero. Transistors Q1-3 act as power switches for the current sourcing side of the alpha-numeric displays. The following table illustrates the control priority of the power switches:

LAMP_TEST*	16SEGS_OFF*	CHAR1*	CHAR2*	CHAR3*	STATE
low	X (1)	X	X	X	All On (2)
high	low	X	X	X	All Off
high	high	low	high	high	Q1/U9 On
high	high	high	low	high	Q2/U10 On
high	high	high	high	low	Q3/U11 On

Notes:

(1) 16SEGS_OFF will always be forced high if LAMP_TEST* is low by EPLD logic of the 012047 CCA.
(2) Displays are scanned (turned on) when corresponding CHARx* is low.

The gates of Q1-Q3 and drains of Q4-Q6 are pulled-up by R9, R10, and R14. When LAMP_TEST* is low, Drivers U6-U8 are all turned on and the displays appear continuously lighted. Signal 16SEGS_OFF* determines display status when LAMP_TEST* is high.

Signal 16SEGS_OFF* is coupled to the gates of Q4-6 by diodes CR2-4. The gates of Q4-6 are pulled-up by R31, R32, and R4. When 16SEGS_OFF* is low, transistors Q4-6 are off; forcing transistors Q1-3 and the displays off. Signal 16SEGS_OFF* is also used to control blinking/flashing of the displays. Signals CHAR1*, CHAR2*, and CHAR3* determine display status when both LAMP_TEST* and 16SEGS_OFF* are high.

Signals CHAR1*, CHAR2*, and CHAR3* operate identically so only CHAR3* shall be discussed. Signal CHAR3* originates at U5-24, is pulled-up by R37, and connects to the source of transistor Q4. When CHAR3* is high, transistor Q4 is off; forcing transistor Q1 and display U9 off. Transistors Q1 and Q4 are both on when signal CHAR3* is low. Display U9 individual segments are on or off depending on the individual segment current sinks. For example, the segment named Cathode_A1 of U9-2 is lighted when Seg_A1 of U5-8 is high.

Display controller U5 sequences CHAR1*, CHAR2*, and CHAR3* in a round-robin fashion such that none are ever high at the same time. U5 also inserts some off-time between each CHARx* active to prevent "ghosting". Resistors R11-R13 act as pull-downs to the sources of transistors Q1-Q3 and the common anodes of U9-U11, also to help reduce "ghosting" of the displays.

2.2.4.3 RSU Keypad CCA (012047-1001)

Refer to Figure 2-10 and Figure 11-12. The RSU Keypad CCA provides keyboard interface, serial communications interface, aural alarm, alpha-numeric and discrete display control. The Keypad CCA receives power and many of its inputs/outputs to/from the Interconnect CCA (012046-0001) via connectors P1 and P2. The RSU module, which includes the Keypad CCA, is ultimately controlled by the RCSU via an RS-422 link.

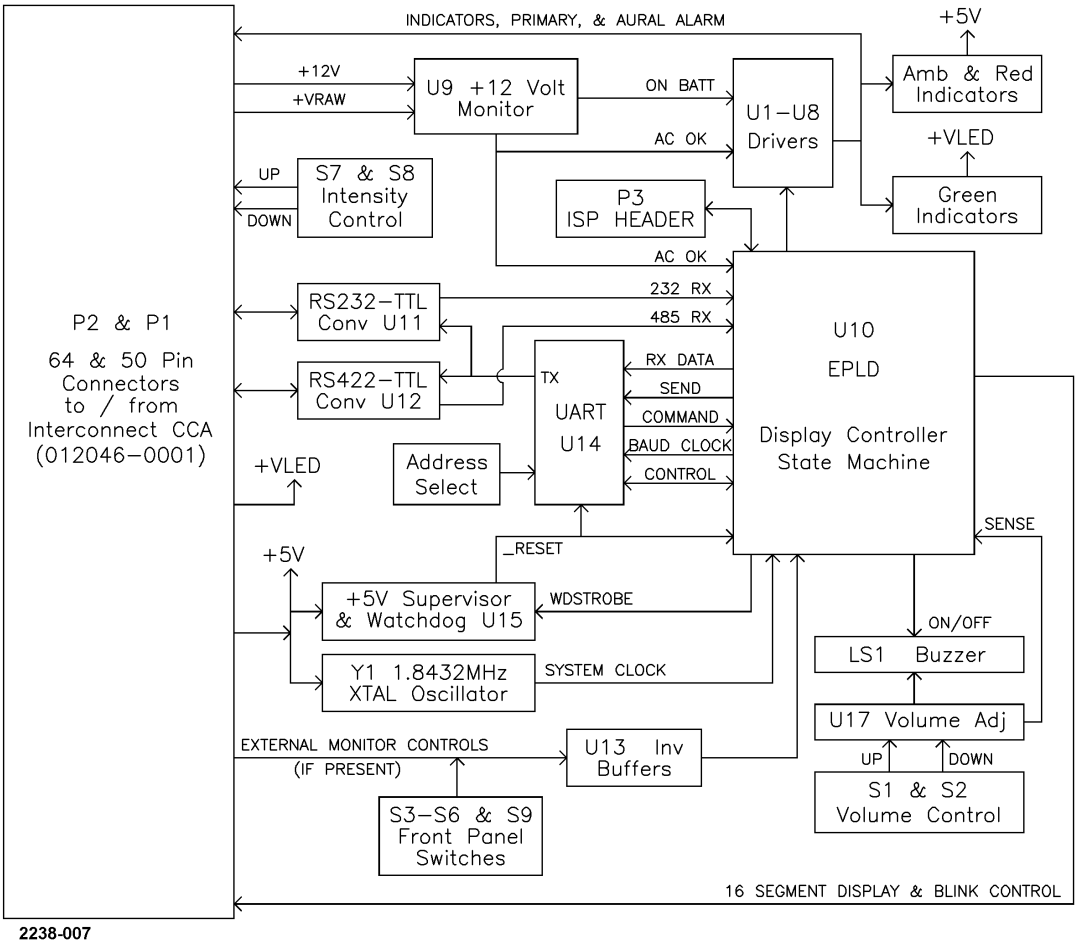

Figure 2-10 RSU Keypad CCA Block Diagram

2.2.4.3.1 Detailed Circuit Theory

Refer to Figure 2-10 and Figure 11-12. Power +5V enters via P1-39 through P1-42 and is available at test point TP2. Digital ground enters via P1-47 through P1-50 and P2-59 through P2-64. Digital ground is accessible at test points TP7 and TP8. The +5V powers all integrated circuits as well as red and amber LEDs. Power +VLED enters the CCA via P1-43 and P1-44. Power +VLED powers all green discrete LEDS on the Keypad CCA.

Crystal oscillator Y1 supplies the heart-beat to EPLD U10-139 and can be measured at TP4. EPLD U10 is a programmable device that controls all actions within the RSU module. A quick check to determine if the EPLD U10 is programmed and functional is to verify a 60 hertz square-wave at SYNCH test point TP1.

Voltage monitor U15, diodes CR35 & 36, and resistors R8 & R20 generate an active low reset (RESET*) if either the +5V is too low or a watchdog pulse has not been received within one second. Watchdog pulses are generated whenever UART U14 receives a valid address from the RCSU. RESET* forces UART U14-3 and EPLD U10-141 to a known starting state. RESET* may be forced manually by shorting test point TP5 to digital ground and monitored at test point TP6.

UART U14 may transmit and receive serial data via either RS-422 interface U12 or RS232 interface U11. Normally, serial data is only RS-422 from the RCSU. Receive data from both possible sources (U10-117 and U10-127) is AND'ED inside the EPLD and routed to U14-19. Only one source (RS-232 or RS-422) may be used at a time.

UART U14 is hard-wired to address hex A3 on pins 4-10 and 11-18. A valid address pulse (VAP) is generated at U14-31 whenever address hex A3 is received during a serial transmission. VAP (U10-142) is converted to WDSTROBE (U10-7) and pulses the watchdog at U15-6. The watchdog U15 will not generate RESET* as long as a valid address is received by U14 at least once per second.

UART U14 looks at the byte immediately following the address byte as a command byte. The command byte (U14-33 through U14-39) is passed to EPLD U10 along with COMMAND_STROBE (U14-32). The EPLD responds with a send byte (U14-22 through U14-29) and SEND_STROBE (U14-30). The send byte is serial transmitted out U14-21, inverted by U13:F, and sent to both the RS-422 and RS232 ports. UART U14 is clocked by BAUD_CLK U14-1. BAUD_CLK is a derivative of crystal oscillator Y1 from EPLD U10-88.

RS-422 converter U12 signals RSU_RX+, RSU_RX-, RSU_TX+, and RSU_TX- route to connector P1-26, P2-26, P2-31, and P2-33. Resistors R9 and R19 insure U12-2 is high if no connection exists at the RS-422 port. Resistor R1 connects between U12-12 and P1-30 (RSU_RX+_TERM). Resistor R1 is an end-of-line termination and will only be connected if this RSU module is at the farthest end of the RS-422 link away from the RCSU.

RS232 converter U11 signals RSU_TX and RSU_RX connect to P1-45 and P1-46. Capacitors C15-18 store charges created by the internal voltage doublers and inverters of U11. An internal pull-down resistor of U11 insures U11-13 is high if no connection exists at the RS232 port.

Connector P3 and pull-up resistors R21-23 provide an in-system programming port for EPLD U10. Programming of U10 should only be done at the factory or by factory trained personnel.

Aural alarm signals BUZZER_ON* and BUZZER_CLOCK are supplied by EPLD U10 to NOR gates U16-5, U16-12, and U16-11 as well as inverters U18-5 and U18-13. Inverter U18:F converts BUZZER_ON* to AURAL_ALARMU and routes to resistor network RN8. BUZZER_CLOCK is approximately 4000 hertz which is the resonant frequency of piezo buzzer LS1. NOR gates U16:B and U16:D drive buzzer LS1 in a bipolar fashion with a 4KHz square-wave when BUZZER_ON* is low. Resistors R10, R24, and EEPOT U17 help determine the volume of buzzer LS1.

EEPOT U17 resistance is changed by Volume Up (S1) and Volume Down (S2) switches pulled up with resistors R25 and R26. Diode CR29 and capacitor C7 form a small power supply reservoir to insure the EEPOT will have sufficient time to save its resistance value in internal EEPROM upon RSU system power-down. The EEPOT will automatically restore its resistance value upon RSU system power-up. Diodes CR30, CR31, resistor R29, and inverter U18:B form a diode NAND signal named VOLUME_ADJ. VOLUME_ADJ is connected to EPLD U10-77 and signals the EPLD when volume adjustment is requested so the EPLD will turn on the buzzer.

External switch control lines FFM_BYP_SWCH* (P1-31), ALARM_SILENCE* (P1-34), RUNWAY_SEL_1* (P1-32), RUNWAY_SEL_2*(P1-33), and LAMP_TEST* (P1-35) connect to front panel switches S3-6 and S9. LAMP_TEST* also connects to drivers U1-8. Resistors R2-5 and R17 provide pull-ups to the signals. All signals are buffered and inverted by U13:A-E and routed to EPLD U10. Either the external switch control line low or the front panel switch closed requests action by the EPLD. RUNWAY_SEL_1 (U10-158) and RUNWAY_SEL_2 (U10-84) are internally AND'ED in the EPLD so both must be active before the EPLD initiates action. All switches are internally debounced by the EPLD.

Signals 16SEG_D0 through 16SEG_D5, 16SEG_A0, 16SEG_A1, 16SEG_CS, 16SEG_WR*, and 16SEGS_OFF* of EPLD U10 route to connector P2-36 through P2-46. These signals direct action of the alpha-numeric display controller on the Interconnect CCA (012046-0001). The EPLD only writes to the alpha-numeric controller after the right-most character data is written into the EPLD by the RCSU. A momentary flash or blip of the alpha-numeric display may be noticeable when this refresh occurs.

Control of on-board discrete LEDs and off-board external monitoring begins at EPLD U10. Resistor networks RN8-14 set the current drive from EPLD U10 (except for signal AURAL_ALARMU from U18:F) to the bases of Darlington drivers U1-8. All collector outputs of Darlington drivers U1-8 connect to discrete LEDs through pull-ups except driver outputs U1-16 (AURAL_ALARM*) and U3-16 (PRIMARY*) which are pull-up only.

Also all collector outputs of Darlington drivers U1-8 connect to connectors P1 and P2 for eventual connection to an external monitor (optionally supplied by the customer). Refer to the Interconnect CCA theory of operation for more detail of the interface for the external monitor.

Comparator U9:A acts as an "AC" voltage monitor for the RSU module. Power signal +VRAW from P2-51 powers U9. Power signal +12V is voltage divided and filtered by resistors R15, R16, capacitor C5, and may be monitored at test point TP3 (labeled MIN VIN). Comparator U9:A compares the level of MIN VIN to the level of +5V (buffered/filtered by resistor R7 and capacitor C6). Resistor R6 programs hysteresis while resistor R18 provides a pull-up to the open collector output of comparator U9:A. Inverters U18:E and U18:D buffer and invert the output of the comparator.

The U18:E inverter output is named AC_OKU and is high when MIN VIN level is above approximately nine volts. The U18:D inverter output is named ON_BATTU and is inverted from AC_OKU. Both inverter outputs eventually control the state of the front panel LED indicator labeled RSU POWER. Signal AC_OKU is also routed to EPLD U10-147 for internal state machine control.

Front panel switches S7 and S8 control the intensity of the green discrete LEDs on the Keypad CCA and the alpha-numeric displays on the Interconnect CCA. INTENSITY_UP (S7) is pulled-up by resistor R27 and connected to P2-4 while INTENSITY_DOWN (S8) is pulled-up by resistor R28 and routed to connector P2-5. Switch closures of S7 & S8 vary +VLED voltage level on the Interconnect CCA. Power supply +VLED returns to the Keypad CCA via connector P1-43 and P1-44.

2.2.4.4 2138 RSU Battery Box Assembly (030705-0002)

The RSU Battery Box Assembly contains seven "C" size NiCd batteries, all connected in series. A fuse is placed in series with the "+" lead to prevent overcurrent situations. The RSU Battery Box Assembly is designed to connect to J8 on the 2138 RSU Module to provide up to one hour of operation during AC power failure. Circuitry on the RSU Interconnect CCA charges the NiCd batteries and controls the switch-over to battery power. For details pertaining to this circuitry, refer to the RSU Interconnect CCA Detailed Theory section above.

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3 OPERATION

3.1 INTRODUCTION

The 2238 RCSU equipment provides a visual indication of the operational status of an airfield's navaid equipment – 2100 Localizers, 2110 Glideslopes, 1118/1119 DMEs, Fernau DMEs, 1150 VORs, Cardion VORs and VORTACs, Cardion DMEs, and Cardion TACANs. An optional I/O Controller CCA is available to provide On/Off status and control via discreet inputs/outputs. The RCSU equipment permits the systems being monitored to be turned on and off, or to be transferred to standby equipment if the system is a dual equipment system. The RCSU equipment also can interlock opposing ILS systems for operation of a Primary and Secondary approach. The previous 2138 RCSU system supported only one runway and one VOR/DME site. The 2238 RCSU can support multiple runways and VOR/DME/TACAN sites – each with their own status icon overlaid graphically on a map of the airfield.

This section provides maintenance personnel with standard turn-on and turn-off procedures, identification, explanation, and operation of all controls and indicators associated with the 2238 RCSU system.

3.2 RCSU HARDWARE CONTROLS AND INDICATORS

The 2238 RCSU consists of the RCSU (in either the Rack or Small Form Factor configuration) and the RSDU Server. The controls and indicators on each of these subassemblies are detailed below.

3.2.1 RCSU

The two basic configurations of the RCSU system are detailed below.

3.2.1.1 Industrial Rack RCSU Configuration

3.2.1.1.1 RCSU Server

The controls and indicators on the RCSU Server are arranged on the left and right sides of its front panel. The following controls and indicators are located down the left side:

a.	Power Switch	Momentary switch to turn on the RCSU Server.
b.	Power LED (green)	Indicates that the RCSU Server is powered up.
c.	Reset Switch	Momentary switch to reset the RCSU Server.

WARNING

The Reset Switch is for use only when the RCSU Server's OS is non-responsive. Otherwise, the RCSU Server's file system may be corrupted.

d.	Hard Disk Drive LED (yellow)	Indicates hard disk drive activity.

The RCSU Server contains a triple-redundant power supply. The RCSU can continue to operate even if two of the three supplies fail. The redundant power supply controls and indicators are located down the right side:

a.	Power Supply Fault LED (yellow)	One or two of the power supplies has failed. This also starts the redundant power supply audible alarm.
b.	Audible Alarm Silence Switch	Momentary switch to silence the redundant power supply audible alarm.

Additional power supply controls and indicators are on the RCSU Server's rear panel. Each of the three power supply modules includes:

a.	Power Switch	Controls that module's power output. "1" is on, "0" is off.
b.	Module Status LED (green)	Normal, Off: No DC Output.

The redundant power supply has a green LED status indicator on the rear panel below the three power supply modules. During normal operation the LED will be on. If one of the modules is not operating the LED will flash once per second. If two modules are not operating the indicator will flash twice per second.

3.2.1.1.2 Uninterruptible Power Supply

The UPS allows the RCSU Server to operate in the event of an AC failure. The front panel of the UPS contains controls and indicators for its operation. Additionally, the RCSU Server contains PowerChute software that is used to monitor the UPS. Refer to the User Manual supplied with the RCSU Server's UPS for details of these controls, indicators, and software application.

3.2.1.1.3 LCD Monitor

The RCSU Server's LCD Monitor is a standard desktop LCD monitor. It has standard, front panel accessible monitor controls and indicators. Refer to the User Manual supplied with this monitor for the details of these controls and indicators.

3.2.1.1.4 Card Cage Assembly

The RCSU Card Cage Assembly contains one or more Interface CCAs, as well as a power supply. The controls and indicators of these sub-assemblies are detailed below.

3.2.1.1.4.1 Dual Modem Interface CCA

Each Dual Modem Interface CCA installed in the RCSU Card Cage contains a set of four Modem Status Indicators for each of the two embedded modems on the card. These LEDs are identified as follows, from the top down:

a.	TxA (CR6)	Transmit Data, Channel A
b.	DTRA (CR5)	Data Terminal Ready, Channel A
c.	RxA (CR4)	Receive Data, Channel A
d.	DCDA (CR3)	Data Carrier Detect, Channel A
e.	TxB (CR10)	Transmit Data, Channel B
f.	DTRB (CR9)	Data Terminal Ready, Channel B
g.	RxB (CR8)	Receive Data, Channel B
h.	DCDB (CR7)	Data Carrier Detect, Channel B

The Dual Modem Interface CCA also contains a jumper block, JP1 that controls the speaker output. The modem audio signals are useful for troubleshooting communication link issues. The usage of this jumper block is as follows:

a.	JP1-1 and JP1-2	Enables the speaker output for Channel A
b.	JP1-3 and JP1-4	Enables the speaker output for Channel B
c.	JP1-5 and JP1-6	Enables both channels.

So, to enable the modem speaker output for a particular channel, pins 5 and 6 must be connected together, as well as either 1 and 2, or 3 and 4 for the desired channel.

3.2.1.1.4.2 Cardion Interface CCA

Each Cardion Interface CCA installed in the RCSU Card Cage contains a set of four status indicators for each of the two channels on the card. These LEDs are identified as follows, from the top down:

a.	A OFF (CR1)	Navaid is Off, Channel A
b.	A ON(CR2)	Navaid is On, Channel A
c.	A BYP (CR3)	Navaid is Bypassed, Channel A
d.	A COMMF (CR4)	Communications Fault, Channel A
e.	B OFF (CR5)	Navaid is Off, Channel B
f.	B ON(CR6)	Navaid is On, Channel B
g.	B BYP (CR7)	Navaid is Bypassed, Channel B
h.	B COMMF (CR8)	Communications Fault, Channel B

The DIP switches, SW1, on the Cardion Interface CCA are not used in this application.

3.2.1.1.4.3 Power Supply

The Card Cage Power Supply has a single green status LED on it that indicates whether or not the power supply is operational. The card cage power switch is located to the left of the power supply, as is an ESD Ground Lug for use when servicing the RCSU.

3.2.1.2 Small Form Factor RCSU Configuration

3.2.1.2.1 5U RCSU Assembly

The physical controls and indicators on the 5U RCSU assembly are accessible on its front panel:

a.	Power Switch	Momentary switch to turn on the RCSU.
b.	Power LED (green)	Indicates that the RCSU is powered up. Flashes during shutdown process.
c.	On Battery LED (red)	Indicates that the RCSU is operating on battery backup
d.	Battery Warning (red)	Indicates a detected fault with the battery, ie. will not maintain a charge. The battery connections should be checked, or the battery replaced.

Other RCSU and Navaid-related controls are available through the RCSU software's graphical user interface (GUI). These are detailed in the following sections.

3.2.1.3 Touchscreen LCD, 10.4"

The Small Form Factor RCSU's Touchscreen LCD has a series of on-screen display (OSD) controls, providing standard monitor adjustments, as well as a single LED indicating that the LCD is turned on. These controls are located just inside the RCSU's front panel door, on the right side of the LCD. The switches, from top to bottom, are as follows:

a. Select/Adjust –
b. Select/Adjust +
c. LCD On/Off
d. Menu/Next
e. Menu/Previous

To adjust any of the LCD's settings, press either Menu/Next or Menu/Previous to display the OSD menu. Select the desired parameter using either of these two buttons again. Adjust that parameter using either the Select/Adjust – or Select/Adjust + buttons. Return to the OSD menu by pressing either of the Menu buttons. Exit the OSD by either selecting the Save and Exit or Cancel and Exit menu options.

3.2.1.3.1 Touchscreen Calibration

In addition to the standard monitor controls, a software driver is installed on the RCSU PC for the touchscreen device. Prior to using the RCSU, and periodically throughout its use, the touchscreen must be calibrated. Optimally, a 9-point calibration should be used, as detailed below.

a. Install the RCSU's keyboard and mouse in the front-panel USB ports on the RCSU.
b. Minimize the RCSU application if it is running.
c. From the Windows menu, select the Start>>Programs>>UPDD>>Settings program to start the MicroTouch Universal Pointing Device Driver application.
d. Click on the Calibration tab. The window in Figure 3-1 will be displayed.
e. Set the Calibration Points parameter to 9, as shown in this figure.
f. Press the "Apply" button to save these settings.
g. Press the "Calibrate" button. The screen will blank, and a single calibration target will be displayed, as shown in Figure 3-2.
h. Follow the prompts, touching and releasing each of the targets in series, to calibrate the touchscreen.

i. Once the calibration is complete, press OK to accept the calibration settings, followed by OK again to close the touchscreen settings application.

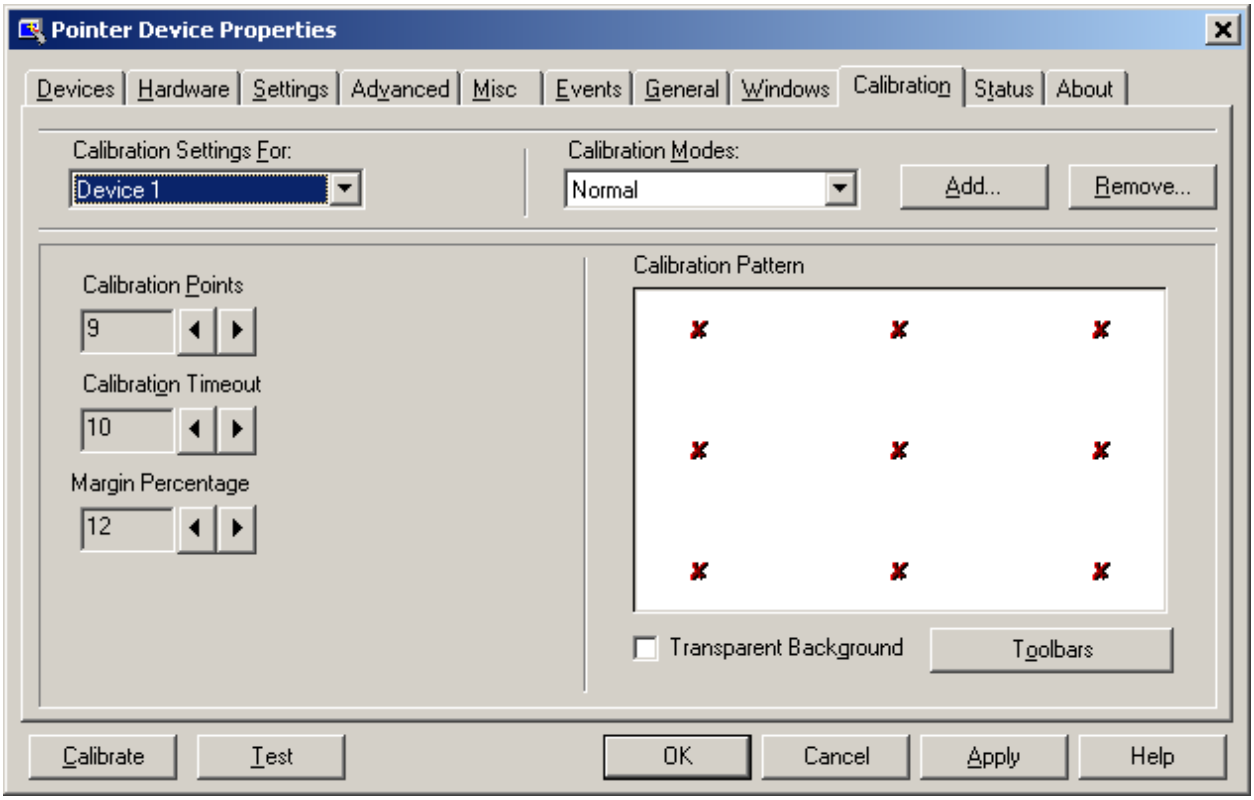


Figure 3-1 Touchscreen Calibration Settings

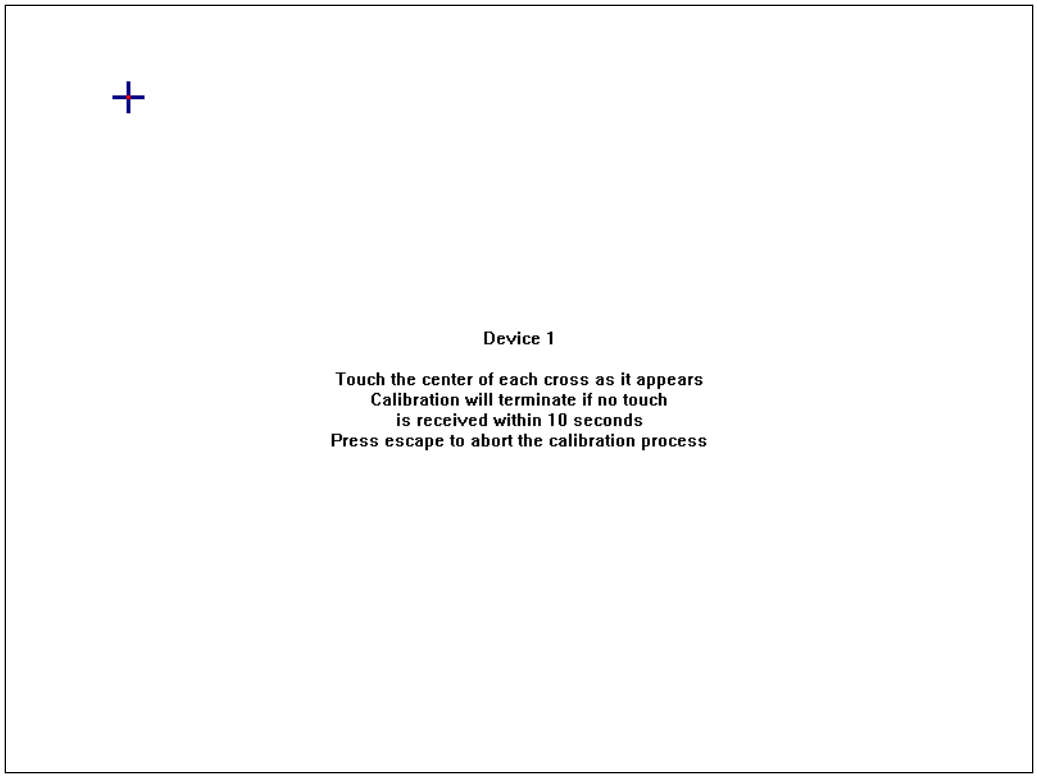


Figure 3-2 Touchscreen Calibration

3.2.1.4 Card Cage Assembly

The RCSU Card Cage Assembly contains one or more Interface CCAs, as well as a power supply and optional I/O Controller CCA. The controls and indicators of these sub-assemblies are detailed below.

3.2.1.4.1 Dual Modem Interface CCA

The Small Form Factor RCSU uses the same Dual Modem Interface CCA as the Industrial Rack RCSU Configuration. Refer to Section 3.2.1.1.4.1 for the details of that CCA.

3.2.1.4.2 Cardion Interface CCA

The Small Form Factor RCSU uses the same Cardion Interface CCA as the Industrial Rack RCSU Configuration. Refer to Section 3.2.1.1.4.2 for the details of that CCA.

3.2.1.4.3 I/O Controller CCA (012126-0002)

The optional I/O Controller CCA is installed in the rear of the RCSU's card cage, typically in slot J10. It has a single green status LED. Under normal conditions it indicates that the I/O controller is active, by flashing at a 1/2 Hz rate (on for 1 second, off for 1 second). This LED will be off if the power to the backplane fails, or on but not flashing if the I/O controller hardware has a fault.

3.3 2238 RSDU HARDWARE CONTROLS AND INDICATORS

The 2238 RSDU hardware consists of a rack-mounted server-class computer and UPS, a touchscreen LCD monitor, speakers, and separate keyboard and mouse. The controls and indicators on each of these subassemblies are detailed below

3.3.1 RSDU Server

The controls and indicators on the RSDU Server are arranged on the left and right sides of its front panel. The following controls and indicators are located down the left side:

a.	Power Switch	Momentary switch to turn on the RSDU Server.
b.	Power LED (green)	Indicates that the RSDU Server is powered up.
c.	Reset Switch	Momentary switch to reset the RSDU Server.

WARNING

The Reset Switch is for use only when the RCSU Server's OS is non-responsive. Otherwise, the RCSU Server's file system may be corrupted.

d.	Hard Disk Drive LED (yellow)	Indicates hard disk drive activity.

The RSDU Server contains a dual-redundant power supply. The RSDU can continue to operate if one of its power supplies fail. The redundant power supply controls and indicators are located down the right side:

a.	Power Supply Fault LED (green)	Normal operation
	(red)	One the power supplies have failed. This also starts the redundant power supply audible alarm.
b.	Audible Alarm Silence Switch	Momentary switch to silence the redundant power supply's audible alarm.

Additional power supply controls and indicators are on the RSDU Server's rear panel. Both of the power supply modules include:

a.	Power Switch	Controls that module's power output. "1" is on, "0" is off.
b.	Module Status LED (green)	Normal, Off: No DC Output.

The redundant power supply also has another Audible Alarm Silence Switch in the form of a small red button on the rear panel. Pressing this momentary switch silences the redundant power supply's audible alarm.

3.3.2 Uninterruptible Power Supply

The UPS allows the RSDU Server to operate in the event of an AC failure. The front panel of the UPS contains controls and indicators for its operation. Additionally, the RSDU Server contains PowerChute software that is used to monitor the UPS. Refer to the User Manual supplied with the RSDU Server's UPS for details of these controls, indicators, and software application.

3.3.3 Touchscreen LCD Monitor

The RSDU Server's Touchscreen is a rack-mounted LCD monitor. It has standard, front panel accessible monitor controls and indicators. Refer to the User Manual supplied with this monitor for the details of these controls and indicators. In addition to these controls, a software driver is installed on the RSDU Server for the Touchscreen device. The driver's controls are detailed below.

3.3.3.1 Touchscreen Calibration

Prior to using the RSDU, and periodically throughout its use, the touchscreen must be calibrated. Optimally, a 4-point calibration should be used, as detailed below.

a. Install the RSDU's keyboard and mouse in the front-panel USB ports on the RSDU Server.
b. Close the RSDU application with ALT-F4 if it is running.
c. From the Windows menu, select the Start>>Programs>>Touchware>>Touchware program to start the Touchware tools application.
d. Click on the Tools tab and then click on the "Options…" button.
e. Click on the "Advanced…" button. The window in Figure 3-3 will be displayed.
f. Select the 4-point Calibration Style from this window and click on the "Close" button.
g. Click on the Option window's "Close" button.
h. Select the Calibration tab and press the "Calibrate" button. The screen will blank, and four calibration targets will be displayed, as shown in Figure 3-4.

i. Follow the prompts, touching each of the targets in series, to calibrate the touchscreen.
j. Once the calibration is complete, close the Touchware application and restart the RSDU application.

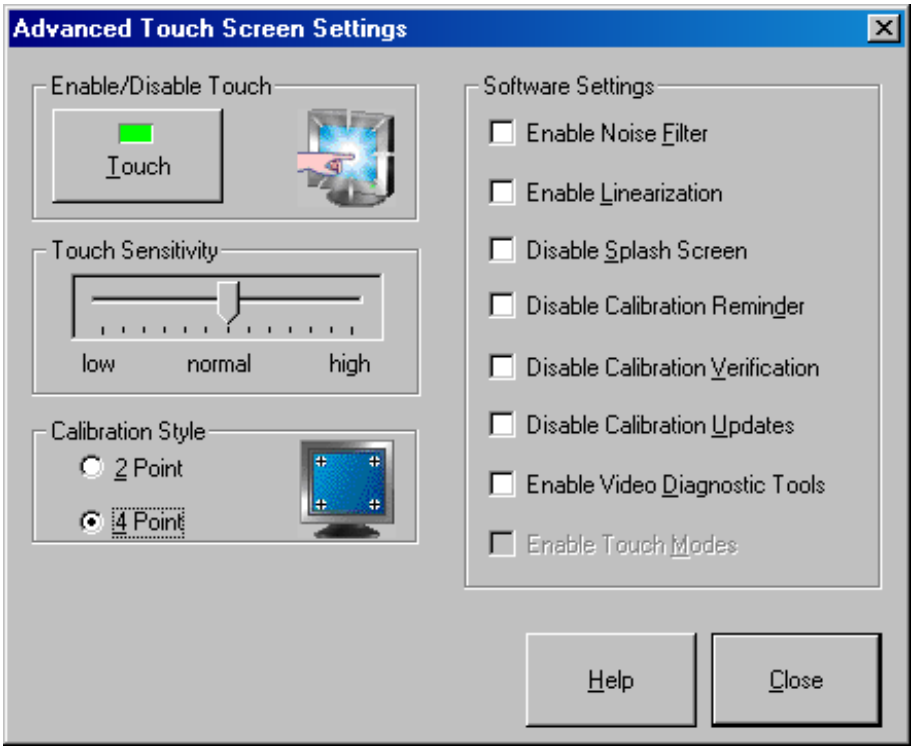


Figure 3-3 Advanced Touch Screen Settings

Figure 3-4 4-Point Touch Screen Calibration

3.4 RCSU SECURITY ACCESS

There are three separate areas of security access restrictions that apply to the RCSU system of which the operator must be aware – RCSU Enclave Authentication, Windows Security, and the RCSU/RSDU Application's Security Levels. Each of these is discussed below.

3.4.1 Managed Enclave Router Authentication

When installed and configured in conjunction with a 2238 RCSU and optionally, some additional 3rd party equipment such as a RCI SBRS ATC Radio system, the optional Enclave Router provides a secure gateway between the RCSU Enclave and the facility LAN. The router supports in-bound network links from the facility LAN and through its built-in modem. Facility LAN authentication is the responsibility of the facility IT personnel, and is therefore outside the scope of this manual.

Authentication of the dial-in connections is done through a local user database that must be maintained in the router. The procedures for adding, deleting, and editing user account information are detailed in the Enclave Router Installation Instructions, 561098-0013, which are supplied with the router.

Once a user's account information has been configured in the router, the user must connect into the router using a Dial-Up Networking connection, supplying the appropriate credentials and the phone number associated with the Enclave Router. Note that this is not the same phone number that is associated with the RCSU's direct modem link. Once authenticated, the router will assign an IP address to this PPP network link, and the user may then access the desired resources from the RCSU Enclave. A typical session would include connecting the Selex ES PMDT to the RCSU via this new network link.

3.4.2 Windows Security

Access to either the RCSU or RSDU Server is restricted through Windows Security. The servers are factory-configured with two separate Windows accounts.

The Administrator account is only used during installation of updates or maintenance to the server. As initially configured, the case-sensitive account information is as follows:

User Name: RCSU_Admin
Password: Selex 2238 RCSU

Normally, the RCSU and RSDU Applications are running while logged on as the "2238 RCSU" user. As initially configured, the case sensitive account information is as follows on both servers:

User Name: 2238 RCSU
Password: Selex 2238 RCSU

For security reasons, these default passwords should be changed by the authorized personnel.

Note that in order to comply with the facility's specific IT security protocols, additional security mechanisms may be enabled in the RCSU and RSDU servers, such as time-based password expiration and password complexity rules. The implementation, enforcement, and maintenance of these security measures are the responsibility of the facility's IT personnel.

3.4.3 RCSU and RSDU Application Security Levels

Access to the RCSU and RSDU applications' configuration features is restricted through the use of five security levels. Level 0 is the lowest security level, and Level 4 is the highest security level. These security levels are accessed as shown in Table 3-1:

Table 3-1 RCSU/RSDU Application Security Levels

Security Level	Accessed by	Permissions
Level 0	Running the RCSU or RSDU Program	View navaid status and issue commands (On, Off, Transfer, Runway Select, etc)
Level 1	Logging on with: User Name of "GUEST", without a password.	Same as Level 0.
Level 2	Logging on with: A valid Level 2 User Name and Password	Same as Level 0, plus read-only access to the Configuration settings.
Level 3	Logging on with: A valid Level 3 User Name and Password	Same as Level 0, plus read/write access to the Configuration settings.
Level 4	Logging on from either Level 1, 2, or 3 with: The configured Level 4 User Name and the corresponding password.	Same as Level 3, plus read/write access to the Security settings.

The default Level 3 case sensitive user account information is:

User Name: SEC3
Password: THREE

The default Level 4 case sensitive user account information is:

User Name: SEC4
Password: FOUR

To maintain system security, this default user account information should be changed by the authorized personnel. Note that the RCSU and RSDU applications contain an Activity Detector feature that will automatically log off a user after 15 minutes of inactivity (either mouse or keyboard activity), reverting to Security Level 0.

3.5 RCSU APPLICATION OPERATION

3.5.1 Overview

The RCSU application is a Microsoft Windows program. Refer to Figure 3-5. The main RCSU screen contains three sections: the Sidebar, the Map Display, and the Status Bar. To the left of the screen, the Sidebar contains buttons to control to the RCSU system during its normal operation. The Map Display contains the status icons of the configured navaids. The Status Bar at the bottom of the screen displays the current Security Level, User ID, the number of active RSDU and Remote PMDT connections, and date/time, as well as the status of the Caps Lock and Num Lock buttons along the bottom of the RCSU window.

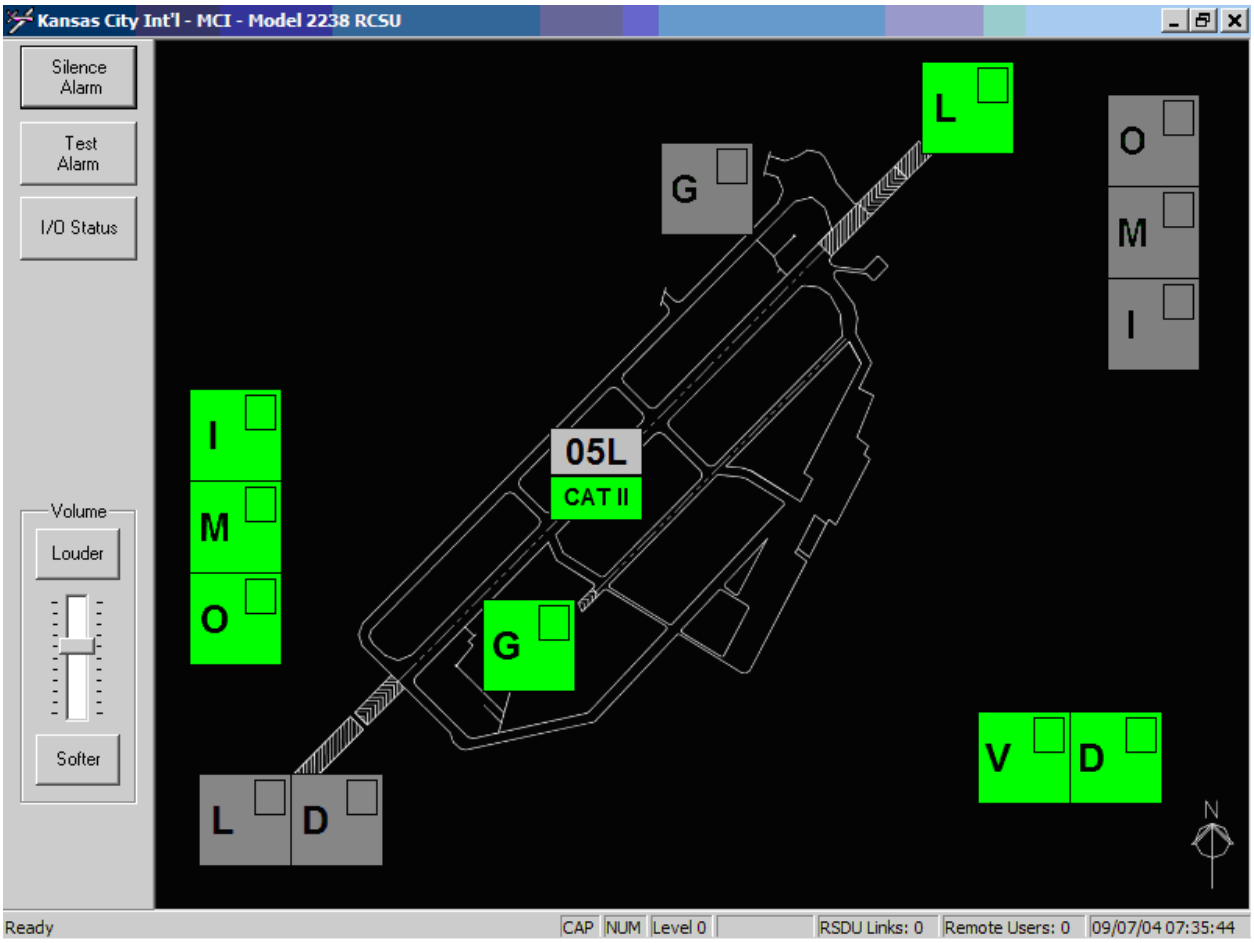


Figure 3-5 Model 2238 Remote Control Status Unit

3.5.2 Basic RCSU Control

The RCSU can be used either on a normal PC Monitor, as in the Industrial Rack RCSU Configuration, or on a Touchscreen LCD, as in the Small Form Factor RCSU Configuration. Throughout this manual, references to either "left-click" or "press" are synonymous. Likewise, to "double-click" using the Touchscreen LCD, quickly tap the same point on the screen twice.

In the case of the Small Form Factor RCSU configuration, the RCSU application has been designed to be used solely through the touchscreen interface for normal, day-to-day operations. Whenever any configuration tasks must be performed on this system – whether displaying the current settings, or actually changing the configuration – the keyboard and mouse must be temporarily installed into the two front panel USB ports. Any references to using the keyboard in this manual assume that the user has already installed the keyboard.

The RCSU has a few user-selectable functions relating to configuring the system. They are arranged in context menus, accessed by right-clicking in an empty area in the Map Display area.

Note that throughout this manual, the nomenclature used to indicate the navigation through the RCSU application's menus and selections is as follows:

System >> Logon	Using the mouse (left-click) or keyboard (highlight and press Enter), select the System menu, then the Logon menu item.

The RCSU's Sidebar displays user-selectable buttons according to the current Security Level and installed equipment. The Silence Alarm button can also be accessed by pressing the F4 button on the keyboard.

If the RCSU PC includes a sound card, as in the Small Form Factor RCSU Configuration, the RCSU's Sidebar will display several volume controls and indicators as shown in Figure 3-6. Pressing the "Louder" button will move the Volume Indicator up by one step and make the audible alarm louder. Pressing the "Softer" button will move the Volume Indicator down by one step, making the audible alarm quieter. As a safety precaution, the red "Low Volume" indicator is displayed as shown in Figure 3-7 if the Volume is turned all the way down.

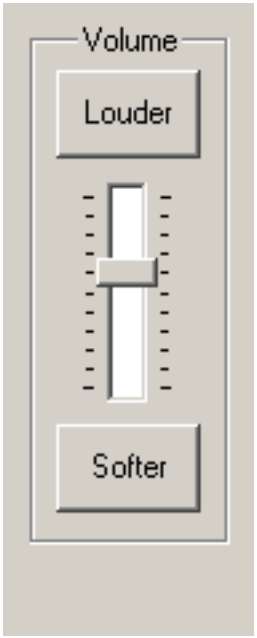


Figure 3-6 RCSU Volume Controls

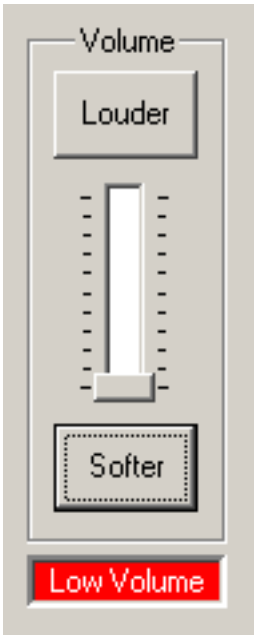


Figure 3-7 RCSU Volume Controls - Low Volume Indicator

Double-clicking on any of the navaid or runway icons will open a new window displaying more detailed current status of the associated item. Clicking on the "Close" button in this window will close this detailed status window.

3.5.3 Configuration

The RCSU software must be configured for the specific site prior to operation. This is done through the various RCSU, Runway, and Equipment Configuration Screens, as detailed below.

3.5.3.1 Logon/Logoff

As detailed above in Section 3.4.3, access to the RCSU's System Configuration and Security Access Configuration screens is restricted through the use of username and passwords. To configure the RCSU, select System>>Login and enter the username and corresponding password for a Security Level 3 user. By default, this will be SEC3/THREE. Figure 3-8 displays the logon prompt.

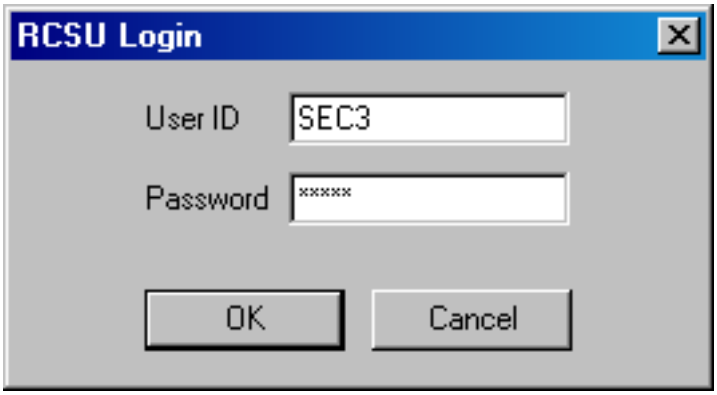


Figure 3-8 RCSU Login Prompt

Once the RCSU validates the username and password, the "Configure Airfield" button will be displayed on the Sidebar, and the username and security level will be displayed in the Status bar.

To logoff of the RCSU, select the System>>Logoff menu item. The "Configure Airfield" button will be hidden and the Status bar will indicate that no one is logged in.

3.5.3.2 RCSU System Configuration

Once logged in at either Security Level 3 or Security Level 4, configuration changes to the RCSU or the exiting Airfield Equipment can be made. To configure the RCSU System select the System>>Configure menu item.

3.5.3.2.1 RCSU Local Configuration Options

Figure 3-9 displays the RCSU's Local Configuration screen.

The time stamp on the Configuration Screen indicates the time and date of the last change to the configuration of the RCSU. Once the user has updated the RCSU Configuration screen, clicking the "OK" button will save the new configuration. Clicking the "Cancel" button will close the window without changing the configuration.

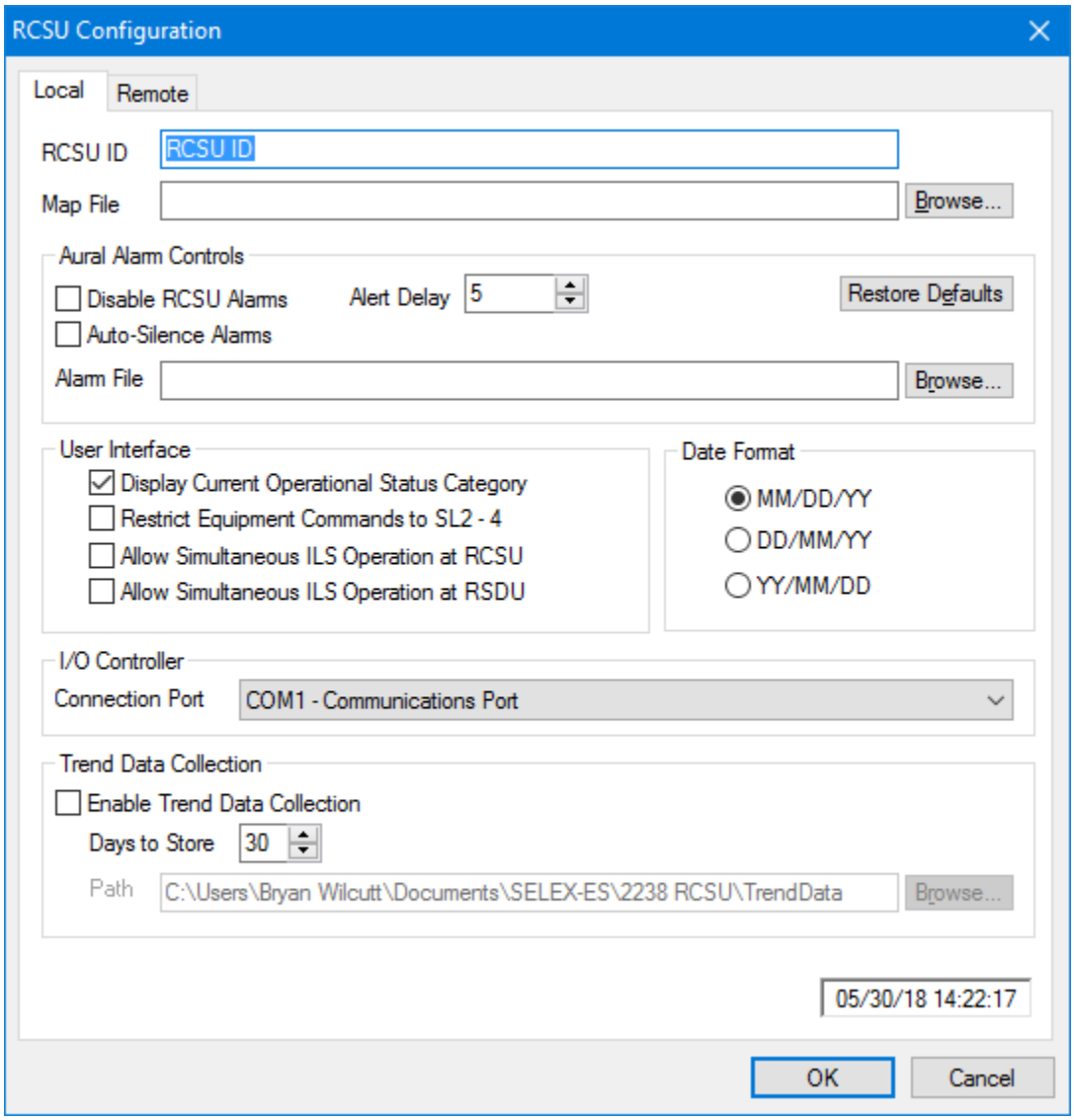


Figure 3-9 RCSU Local System Configuration Screen

3.5.3.2.1.1 Date Format

The RCSU date format field allows the selection of Month-Day-Year, Day-Month-Year and Year-Month-Day. Where the date is displayed on RCSU, the selected format will be used.

3.5.3.2.1.2 RCSU ID and Airfield Map Selection

The RCSU ID is a 32 character string that is used to identify this RCSU installation. Typically, this field contains the name and standard abbreviation for the airfield.

The background map shown in the RCSU's main display is specified in the Map File field. Clicking on the "Browse" button opens the Select Map File screen shown in Figure 3-10.

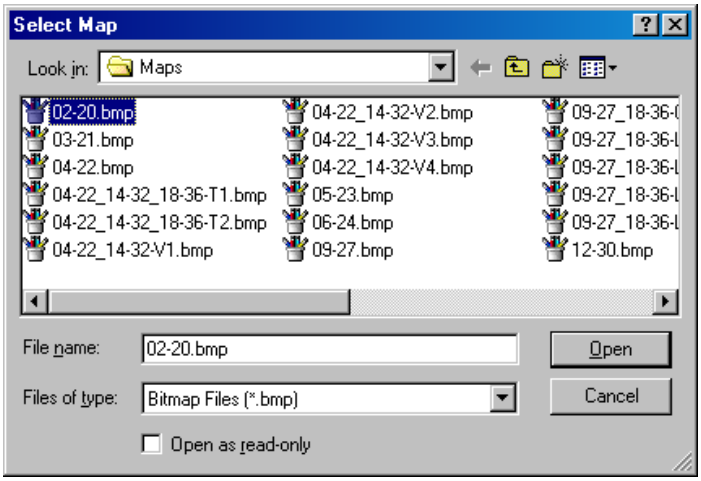


Figure 3-10 Select Map File Screen

A selection of generic airfield layout maps are provided with the RCSU, located in the Maps sub-folder of the RCSU installation. The filename of each supplied map file indicates the approach or approaches depicted. These map files are standard Windows bitmaps.

If so desired, the user can substitute a bitmap that is more specific to their airfield layout. If this is done, the following recommendations should be followed:

a. Although the RCSU will automatically scale supplied bitmap to fit in the Map Display screen area, the recommended size is 1180 x 1024 pixels for the Industrial Rack RCSU, and 700 x 560 pixels for the Small Form Factor RCSU.
b. To enhance the status of the navaid and runway icons which can be green, red, or yellow, the bitmap should be grayscale, preferably with a black background.

3.5.3.2.1.3 Audible Alarm Controls

The RCSU Configuration screen contains several controls pertaining to the RCSU's Audible Alarm. If the "Disable RCSU Alarms" parameter is checked, the RCSU will not turn on its audible alarm, which is a periodic beep approximately once per second. This setting has no effect on the RSDU's audible alarm. If this parameter is not checked, the RCSU emits a tone when any alarm or alert condition is detected. Once started, this audible alarm is silenced with the Alarm Silence button in the RCSU Sidebar.

If the RCSU's audible alarms are enabled, the Alert Delay parameter specifies how long a maintenance alert at one of the navaid sites must persist before the audible alarm is started. This is used to filter out very short-duration alerts.

If the "Auto-Silence Alarms" option is enabled in the RCSU Configuration Screen, the RCSU's audible alarm will be automatically silenced when all of its status indicators revert to normal.

The Small Form Factor RCSU configuration includes a sound card. In these systems, the default sound file used to indicate an alarm condition may be overridden by the user. To change the alarm sound, press the related Browse button and select the desired WAV file. The following recommendations should be followed when changing the default alarm sound:

a. The RCSU application will automatically loop the wave file, so only one cycle is needed.
b. The wave file's volume should be normalized so that it's neither too loud nor too soft for the operating environment.

Pressing the associated "Restore Defaults" button will revert the Aural Alarm Controls to their default settings.

3.5.3.2.1.4 Runway Indicator Configuration

The Runway status icons on the RCSU and RSDU can be displayed in either of two formats: with and without the current operational status category. This display setting is configured within the RCSU Configuration screen.

If the "Display Current Operational Status Category" option is checked, the Runway Status icons will display the active Approach ID and its Operational Status Category. If this option is not enabled, only the Approach ID will be displayed.

3.5.3.2.1.5 I/O Controller Configuration

If the optional I/O Controller CCA is installed in the RCSU system it must be enabled in the RCSU System Configuration screen. Select the COM port associated with this CCA. Selecting the "None" option disables this card and its functionality.

3.5.3.2.2 RCSU Remote Configuration Options

The 2238 RCSU includes Remote Access capability; a remote PMDT can connect to the RCSU via dial-up modem or network connection. Once connected, the PMDT displays the status of all of the configured navaids. Also, the PMDT user can "pass-through" to one of the RCSU's hosted Selex ES navaids, and access this equipment as if he was at the equipment site.

By default, this Remote Access is disabled. To enable this capability, select the Remote tab on the RCSU System Configuration screen. Figure 3-11 displays the RCSU's Remote Configuration screen.

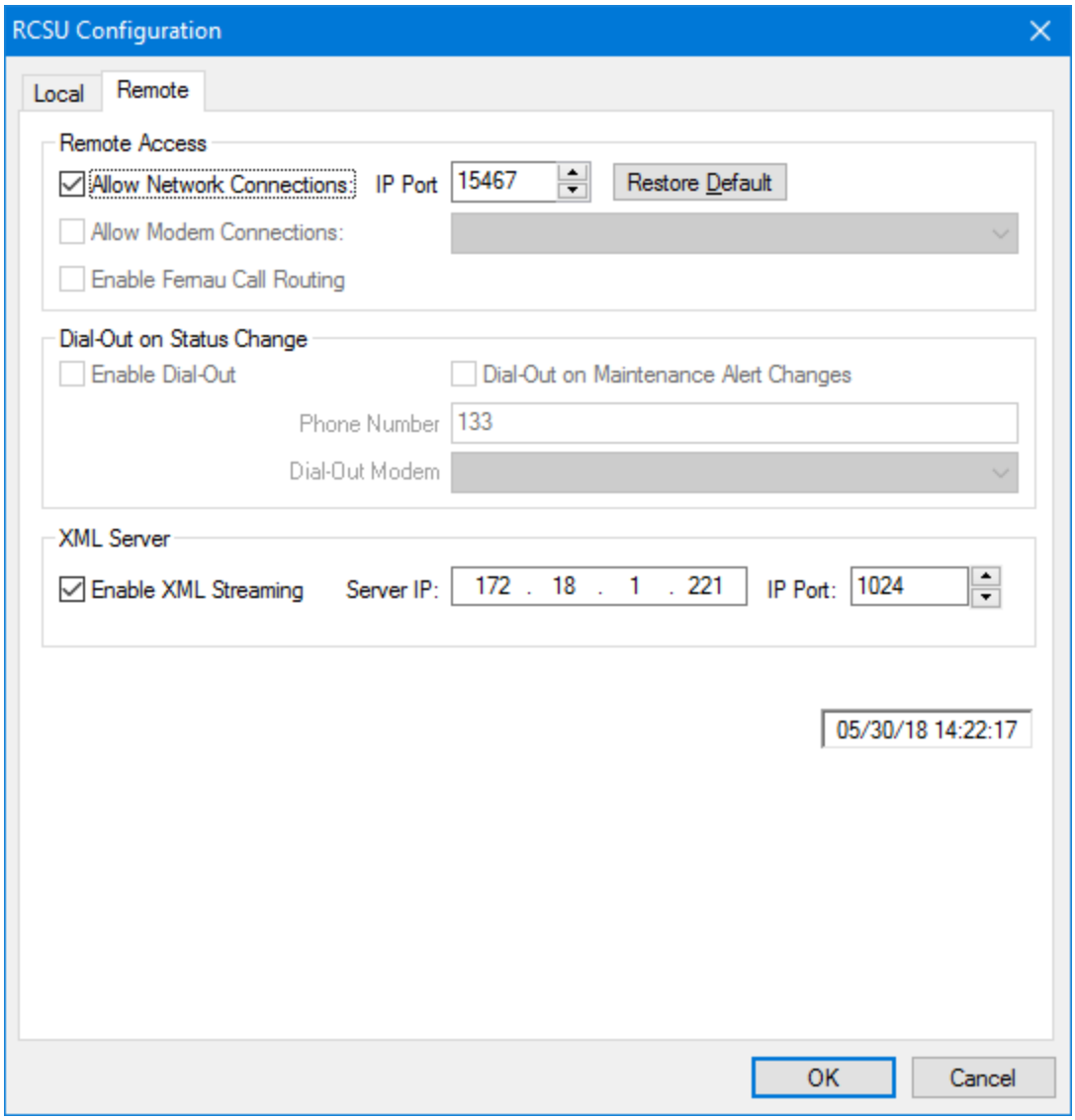


Figure 3-11 RCSU Remote System Configuration Screen

3.5.3.2.2.1 Remote Access Configuration

To enable Remote Access to the RCSU, check the desired connection method, either Network and/or Modem. **Note that Remote Access via Network MUST be enabled if a 2238 RSDU is installed with this RCSU,** since the 2238 RSDU connects to the RCSU through a TCP/IP network**.**

For Network connections, the default IP Port is 15467. This should work in most installations, but can be modified if desired. Note that the 2238 RSDU's and PMDT's connection configuration must match this setting for the Remote Access connection to be established via the network. Clicking on the "Restore Default" button will reset the IP Port back to its default value.

Remote Access via a network will not work if a firewall is established between the RCSU and PMDT. This includes either external hardware-based, or software-based firewalls such as Windows Firewall. Windows Firewall will prompt to allow or block the RCSU application when the network connection is enabled. Pressing the "Accept" button will add the exception and allow proper in-bound communications to the RCSU application.

If used, any external firewall device must be specifically configured to forward requests via the configured RCSU IP Port to the RCSU Server for the Remote Access to be operational. Consult the facility's IT staff for any maintenance required to any firewall systems.

For Modem connections the RCSU's modem, typically on COM3 for the internal modem of the Industrial Rack RCSU systems, and COM port as assigned by the system for the USB modem of the Small Form Factor RCSU systems, must be selected and the telephone line must be connected. Note that the embedded Socket Modems on each of the Dual Modem CCAs may be included in drop-down list of modems if the RCSU PC has detected their presence. These modems cannot be used for Remote Access.

3.5.3.2.2.2 XML Server

The RCSU can send XML based ADIDS-c information to an ADIDS-c client. To set up an ADIDS-c server, enable the XML Streaming feature and indicate the server's IP address and Port number that the listen listens. The RCSU adheres to the following ADIDS-c phases:

3.5.3.2.2.3 Connection Shutdown Service

The RCSU will drop connect if a client disconnects for any reason. For orderly shutdown the RCSU will transmit a shutdown message as indicated below.

```
<RMMC-STOP-REQ/>
```

3.5.3.2.2.4 Equipment Status

The RCSU ADIDS-c server transmits the following status messages:

```
<RMMC IssuedAt="{time stamp}" <{DME or VOR} Identifier>="{ID}"
status="{status message}" maintenance="{maintenance mode}"
datacom="{datacom status}" > </{DME or VOR}> </RMMC>"
```

Status may be:

"WARNING"	When local mode is active, Transmitter 1 is off or Transmitter 2 is off.
"ALARM"	When communication has failed failed or when one of the active transmitters are without an antenna and the unit is not in bypass mode.
"UNKNOWN"	RCSU is not present.
"NORMAL"	All other conditions

Maintenance may be:

"UNKNOWN"	Communications has failed.
"MAINTENANCE"	Unit is in maintenance/local mode.
"NO MAINTENANCE"	Communication has failed.

Datacom may be:

"DATACOM"	Communication is active.
"NO DATACOM"	Communication has failed.

Examples:

```
<RMMC IssuedAt="2018-02-10T15:23:59" <DME Identifier="myDME"
status= "NORMAL" maintenance="MAINTENANCE"
datacom="DATACOM"></DME></RMMC>"

<RMMC IssuedAt="2018-01-19T02:14:04" <VOR Identifier="myVOR"
status= "WARNING" maintenance="MAINTENANCE"
datacom="DATACOM"></VOR></RMMC>"
```

3.5.3.2.2.5 Dial-Out on Status Change

The RCSU can dial-out to a Selex ES Remote Maintenance Status Monitor (RSMS) system to report any change in status. This allows the RSMS to be set to a polling rate that matches the worst-case status update rate desired such as once every 2 hours. Then, if the status of any of the RCSU's navaids changes during that period, the RCSU will dial out to the RSMS, alerting the remote maintenance personnel within a minute of the issue.

To enable this feature, the "Enable Dial-Out" option must be set, as well as enabling the dial-out option for each of the desired navaids in the RCSU's Equipment Configuration screen, as detailed in Section 3.5.3.7.3.

The Dial-Out on Maintenance Alert Changes option allows the user to configure the RCSU to dial-out only on Alarm events, or both Alarm and Alert events as desired. The phone number for the RSMS must be entered in the Phone Number field, and the Dial-Out Modem must be selected. Typically, this modem setting is the same as the Dial-In modem setting in the Remote Access section above. This option allows for the situations where more than one PSTN modems are installed in the RCSU, and one is dedicated for inbound connections and the other is dedicated for outbound connections. Note that the embedded Socket Modems on each of the Dual Modem CCAs may be included in drop-down list of modems if the RCSU PC has detected their presence. These modems cannot be used for Dial-Out.

3.5.3.3 User Accounts Configuration

As detailed in Section 3.4.3, access to the RCSU is restricted through the use of User Accounts. To configure these User Accounts, login to Security Level 4 and select the System>>Security menu item. This will display the Security Codes screen, as shown in Figure 3-12. Note that the time stamp on this screen indicates the time and date of the last change to the user accounts.

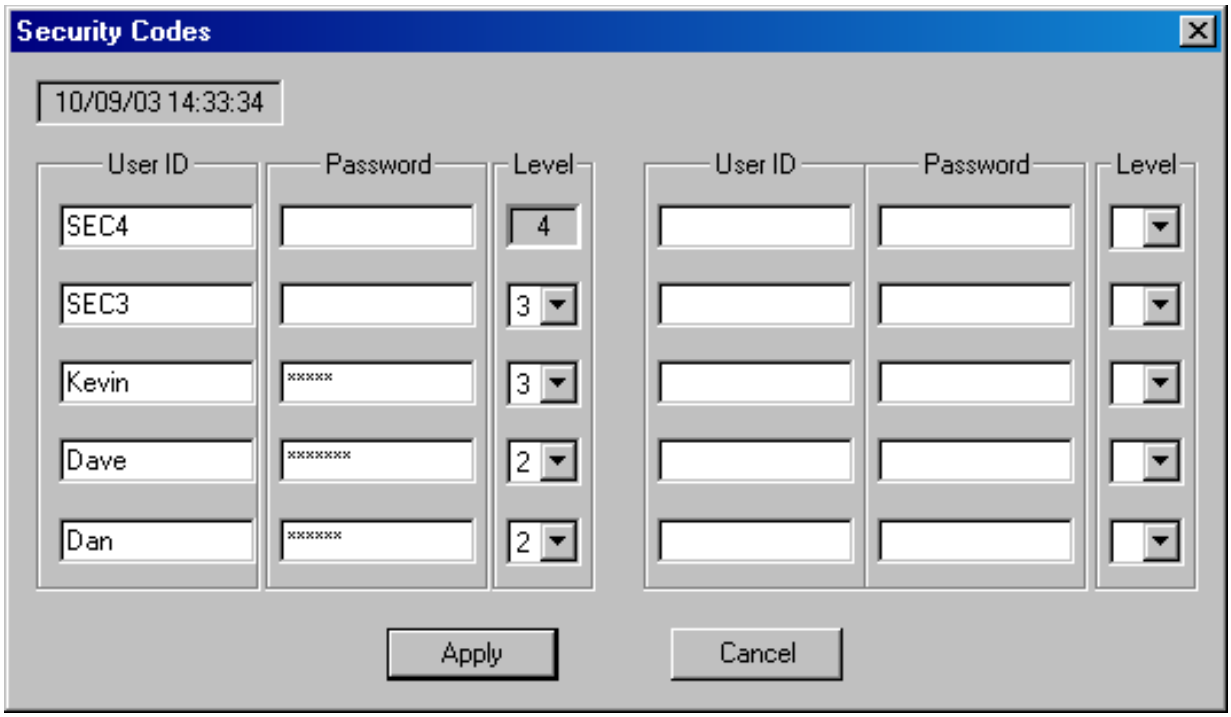


Figure 3-12 Security Codes Screen

This screen is used to configure the security access passwords for each user, including User ID, Password, and Security Level. This User ID/Password information is encrypted and stored in a file on the RCSU Server. This screen is only available to the Level 4 user. As part of initial configuration, several user accounts should be setup, corresponding to the access levels required.

3.5.3.4 Add a User Account

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Click on any empty User ID field.
c. Enter the desired User ID. Note that the User ID must be 4 to 8 characters in length, is case-sensitive, and can contain any alphanumeric characters.
d. Press TAB to move to the associated Password field.
e. Enter the desired Password. Asterisks will hide the password on the display. Note that the password must be 4 to 8 characters in length, is case-sensitive, and can contain any alphanumeric characters.
f. Select the desired Security Level for this user.
g. Repeat these steps for any additional users.
h. When all users have been configured, press the Apply button to save the new User Account data.

3.5.3.5 Change a User's Password

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Select the Password field associated with the desired User ID.
c. Enter the desired Password, which is case-sensitive. Asterisks will hide the password on the display. Note that the password must be 4 to 8 characters in length, and can contain any alphanumeric characters.
d. Press the Apply button to save the new User Account data.

3.5.3.6 Delete a User's Account

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Select the desired User ID field.
c. Delete the User ID in this field, leaving it blank.
d. Press the Apply button to save the new User Account data.

3.5.3.7 Site-Specific Configuration

The RCSU application uses two classifications to distinguish types of navaid equipment:

a. Runway-based equipment

1. Localizer
2. Glideslope
3. Marker Beacon

b. Non-Runway-based equipment

1. VOR
2. VORTAC
3. Stand-alone DME or TACAN
4. Optional equipment like an Enclave Router or Remote I/O Module

Before using the RCSU, all of the runways, their associated equipment, and other non-runway equipment must be added to the configuration while in Configuration Mode. This configuration of each type of navaid equipment is described below.

3.5.3.7.1 Configuration Mode and Normal Mode

The RCSU application operates in two modes:

a.	Normal Mode	Status of all configured navaids is polled and displayed on the RCSU and RSDU displays. No configuration changes are allowed.
b.	Configuration Mode	Status polling of the navaids is stopped and the communication links to the navaids are disconnected. Runways, Runway Equipment, and Non-Runway Equipment may be added, deleted, or edited. Status icons may be moved, docked, and undocked.

Upon starting the RCSU application, it comes up operating in Normal Mode. To enter Configuration Mode, the user must login to Security Level 3 or 4 and then press the "Configure Airfield" button on the Sidebar. While in Configuration Mode, the Status icons on both the RCSU and RSDU applications will turn gray as shown in Figure 3-13. Also, the "Configure Airfield" button will be changed to "Exit Config and Restart".

WARNING

While the system is in Configuration Mode, the navaid status will not be available to ATC personnel via the RSDU application. The proper authorities should be notified prior to entering Configuration Mode.

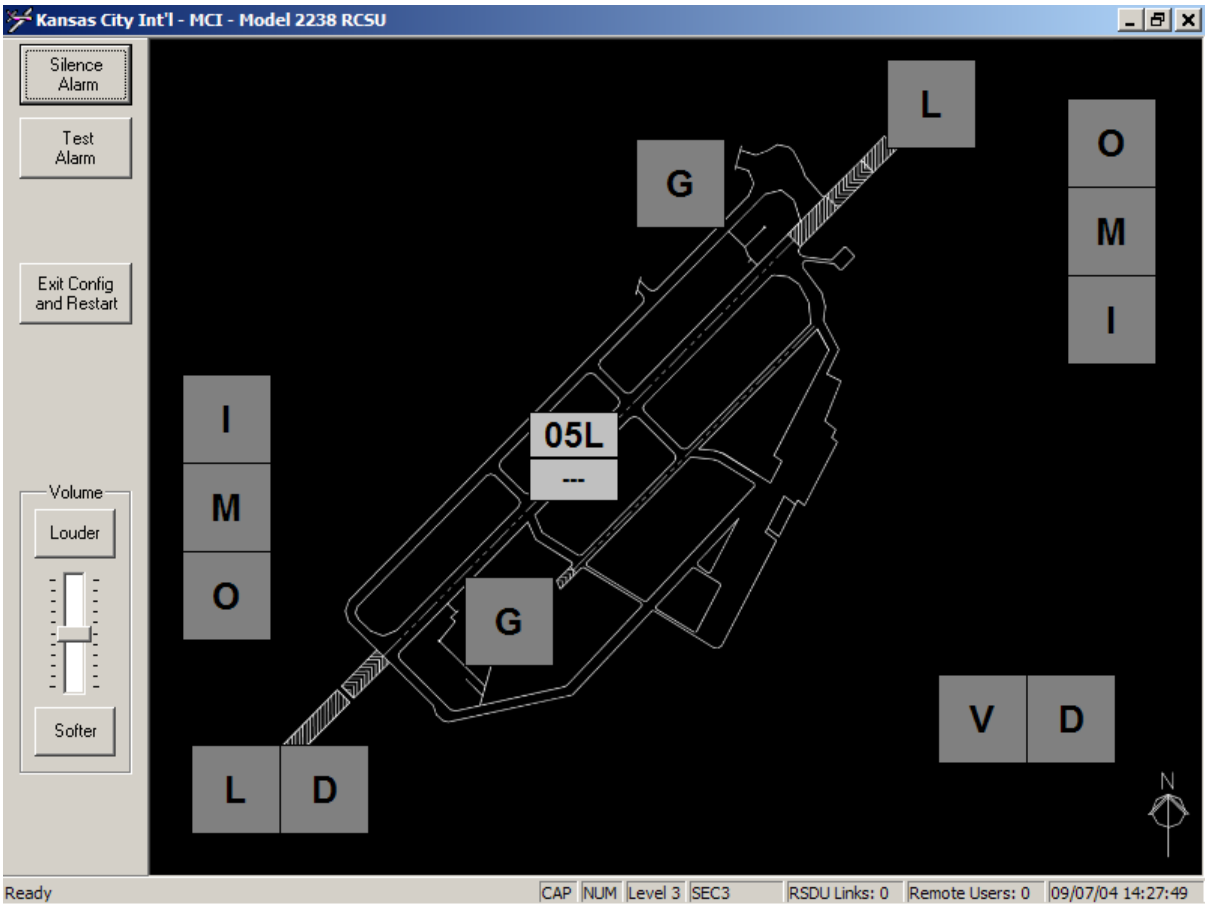


Figure 3-13 Configuration Mode Operation

Once the desired configuration changes have been made, the system must be returned to Normal Mode. This is done by clicking on the "Exit Config and Restart" button on the Sidebar. The status icons will be displayed as Comm Fail (yellow) while each of the communication links is re-established. Then the status polling will restart and the navaid's status will be indicated with the corresponding Status icon.

3.5.3.7.2 Adding a New Runway

Prior to configuring any Runway equipment such as a Localizer or Glideslope, the runway itself must be added to the RCSU configuration. The RCSU display contains an airfield layout map with one or more runways depicted. To add a new runway, the following procedure should be used:

a. First, login to Security Level 3 and press the "Configure Airfield" button on the Sidebar to enter Configuration Mode. Configuration changes are now allowed.
b. Position the cursor near the center of the desired runway and right-click.
c. Select the "Add Runway" menu item from the pop-up context menu. The New Runway Configuration window will be displayed. Refer to Figure 3-14.
d. Configure the new runway as desired and then press the OK button to save this new runway. Pressing the Cancel button at any time will close this window without saving the configuration.
e. When a new runway has been added to the configuration, the runway status icon will be displayed on the map at the point that the user right-clicked. This location can be fine tuned at this point. While in configuration mode, the user can drag-and-drop the runway and equipment icons anywhere on the map. If a status icon is dropped near another icon, it will automatically be docked to the other icon. To undock an icon, simply drag-and-drop it away from the other icon.

f. If this is the last item to be added to the configuration, press the "Exit Config and Restart" button on the Sidebar. This will place the RCSU in Normal Mode using the new configuration, and locking out any further configuration changes.

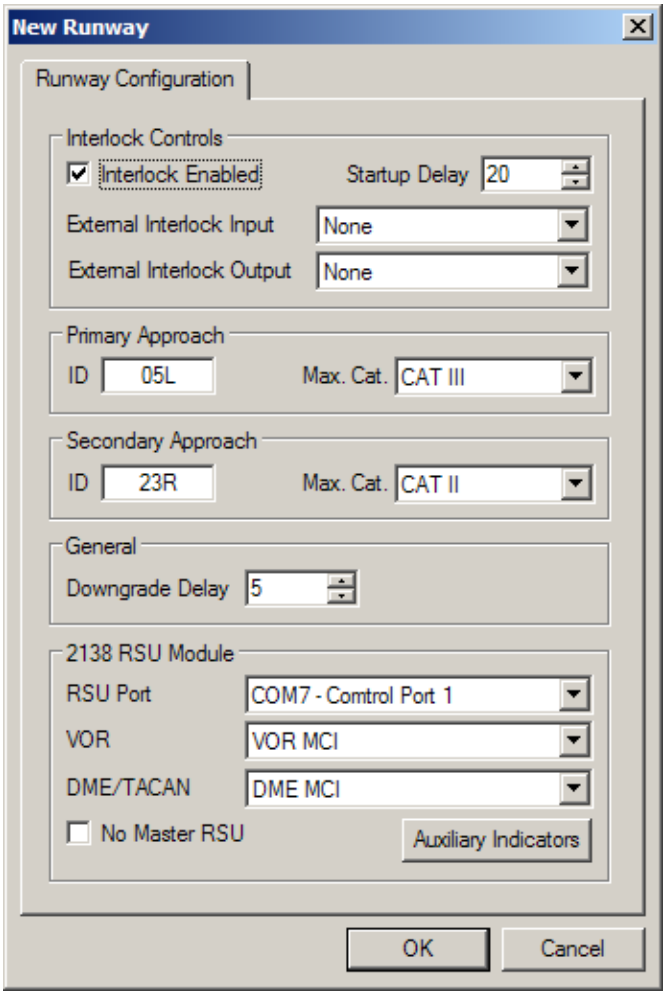


Figure 3-14 New Runway Screen

3.5.3.7.2.1 Runway Configuration Controls

Referring to Figure 3-14, the New Runway configuration controls are used as follows:

If the new runway is to be interlocked, with a navaid system on each end, check the "Interlock Enabled" box. This will enable the Secondary Approach for configuration, as well as the Startup Delay parameter and External Interlock I/O options, if the optional I/O Controller CCA is installed.

The Startup Delay defines how many seconds will elapse between the active approach being shutdown and the other approach being turned on when the operator initiates the Runway Select process.

The External Interlock Input/Output control allows the user to specify one of the optional I/O Controller CCA's inputs or outputs as the source of the External Interlock signal. If this RCSU is to be controlled by an external system, an External Interlock Input should be defined. If this RCSU is to control another external system, an External Interlock Output should be defined. Selecting the "None" option for either of these disables that functionality.

The ID fields should be set to the corresponding approach id. This is typically a two-digit number, optionally followed

by L, R, or C for Left, Right, or Center to differentiate parallel approaches.

The Max Cat field should be set to the maximum operational status category achievable with the corresponding navaid equipment, either CAT III, CAT II, CAT I, or Localizer Only. This setting is used in determining whether the approach has been downgraded during operation of the RCSU.

The Downgrade Delay parameter specifies the number of seconds that a downgrade condition must exist before the RCSU system actually downgrades the approach's Operational Status. This value is typically 5 seconds.

In addition to the 2238 RSDU, the 2238 RCSU also supports the 2138 RSU Module for single-runway applications. If a 2138 RSU Module is going to be installed with this 2238 RCSU, the RSU Port should be set to the corresponding COM Port.

The 2138 RSU Module can display the status of a single approach's active ILS equipment, as well as the status of a VOR/DME installation. To display the VOR/DME status on the 2138 RSU Module, first add the VOR/DME equipment to the configuration, as detailed below in Section 3.5.3.7.4, then return to this Runway Configuration screen and select the desired VOR/DME stations from the list of available equipment. Once the RCSU returns to Normal Mode, the VOR and DME status will be displayed on the 2138 RSU Module.

The "No Master RSU" should normally be unchecked, which enables bidirectional communications between the RCSU and RSU. If the 2138 RSU Module is going to be used only to display status, this option can be selected. However, this will inhibit any commands being sent from the RSU Module, such as the Runway Select, FFM Bypass, and Self Test.

The Auxiliary Indicators button is available to the user if a 2138 RSU Module is enabled, and the optional I/O Controller CCA is installed. Pressing this button displays the Auxiliary Indicator Configuration screen, shown in Figure 3-15. Select the desired condition for each RSU Auxiliary Indicator from the list of available conditions and press Apply to save the setting.

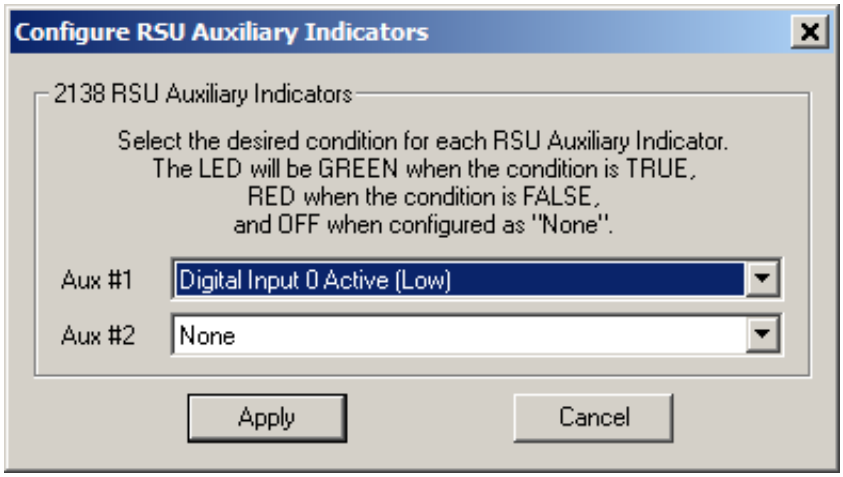


Figure 3-15 RSU Auxiliary Indicators Configuration Screen

3.5.3.7.3 Adding Runway Equipment

Once a runway has been added to the RCSU, the associated ILS equipment can be added as follows:

a. First, login to Security Level 3 and press the Configure Airfield button on the Sidebar to enter Configuration Mode. Configuration changes are now allowed.
b. Position the cursor on the map display where the equipment is installed and right-click.

c. Select the "Add Runway Equipment" menu item from the pop-up context menu. The "Select Runway Equipment to Add" window will be displayed, listing all ILS equipment that is currently not configured. Refer to Figure 3-16.

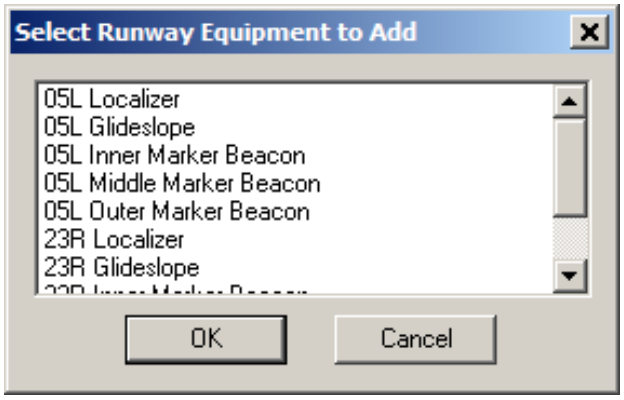


Figure 3-16 Select Runway Equipment Screen

d. Select the desired runway equipment and press the OK button. The "New Runway Equipment Configuration" window will be displayed, similar to that shown in Figure 3-16.

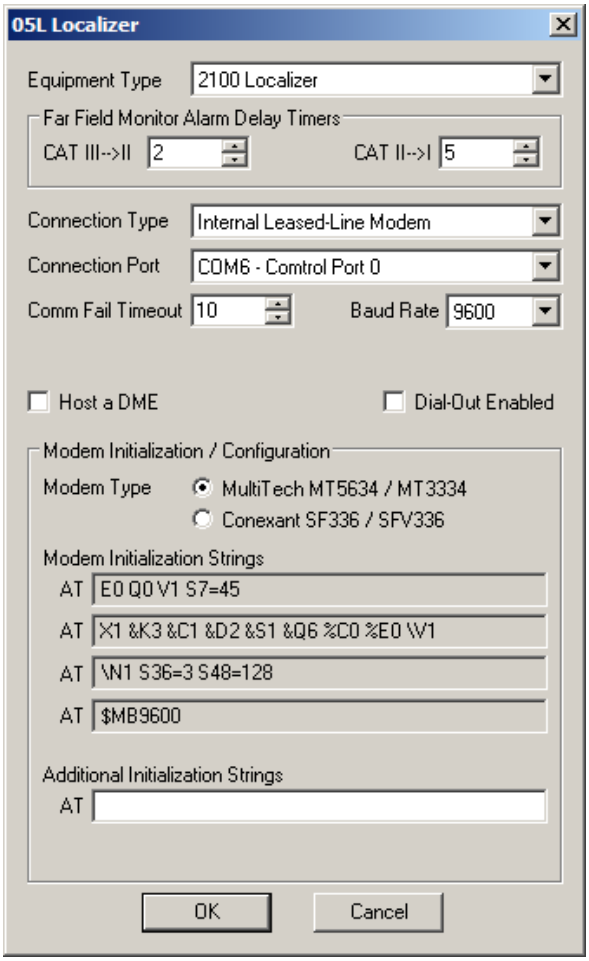


Figure 3-17 ILS Equipment Configuration Screen

e. Configure the new runway equipment as detailed below in Section 3.5.3.7.3.1 and then press the OK button to save this new runway. Pressing the Cancel button at any time will close this window without saving the configuration.

f. When the new navaid has been added to the configuration, its status icon will be displayed on the map at the point that the user right-clicked. This location can be fine tuned at this point. While in configuration mode, the user can drag-and-drop the runway and equipment icons anywhere on the map. If a status icon is dropped near another icon, it will automatically be docked to the other icon. To undock an icon, simply drag-and-drop it away from the other icon.

3.5.3.7.3.1 Runway Equipment Configuration Controls

Referring to Figure 3-16, the New Runway Equipment configuration controls are used as follows.

The Equipment Type field contains a list of applicable ILS Equipment types, which can include 2100 Localizer, 2110 Glideslope, 1118A DME, 2130 Marker Beacon, 1130 RMS Marker Beacon, or Digital Input. The "None" option is used to disable this equipment temporarily.

The "Digital Input" option will be displayed if the optional I/O Controller CCA is installed in the RCSU. This Equipment Type option allows the RCSU to display a Green/Red status icon for a navaid. No control or Comm Fail status is available for this type of equipment.

For a 2100 Localizer, the associated Far Field Monitor Alarm Delay Timers can be configured. These are only applicable if a Far Field Monitor is actually installed. The CAT III-II Delay specifies the delay from the start of a FFM Alarm until the RCSU downgrades the ILS system from CAT III to CAT II. This parameter is adjustable from 1 to 10 seconds, with the default setting of 2 seconds. The CAT II-I Delay specifies the delay from the start of a FFM Alarm until the RCSU downgrades the ILS system from CAT II to CAT I. This parameter is adjustable from 1 to 120 seconds, with the default setting of 5 seconds.

The Connection Type field should typically be set to Dedicated, referring to the combination of the embedded modems on the Dual Modem CCAs and their dedicated lines to the navaid equipment. If an RF Modem link such as the 470356 RF Modem Kit is to be used for the RCSU-Navaid communications, the RF Modem option must be selected. When configured for RF Modems, all of the navaids associated with a runway can share a single communications channel on the RCSU end of the link. The remaining Connection Type options, Direct and Dial-Up are reserved for factory testing.

On the 1118A/1119A DME, the Connection type may be set to TCP/IP Network. When the connection type is set to TCP/IP Network, the modem controls are replaced by TCP/IP controls. The IP Address 1 field is the address of the of the Navaid. The IP Port 1 is the TCP port number monitored by the Navaid. Section 9.5.7 details configuration of the RCSU and Navaid for TCP/IP on Ethernet networks.

The Connection Port field must be set to correspond with the cabling connections made between the RCSU Server's COM Port cables, the Dual Modem CCAs, and the dedicated navaid wiring. If this parameter is not set properly, the RCSU application will not be able to establish communications with the specified navaid. When setting this parameter, trace the dedicated modem line coming into the RCSU's TVS CCA to its corresponding COM Port cable and note the label on that cable, which ranges from P0 to P7. These are indicated in the Connection Port field with the "Comtrol Port X" label.

The Baud Rate field specifies the baud rate used for this communications link. Typically, the baud rate should be 9600 bps. Reducing it can improve the communication link in areas subjected to excessive link interference, indicated by frequent Comm Faults.

The Comm Fail Timeout value sets the duration (in seconds) that a problem with the communications link between the RCSU and the equipment must persist before declaring a Comm Fault. The default value is 10 seconds, but the operator can vary it from 10 to 60 seconds.

The Packet Timeout value sets the duration (in tenths of seconds) that the RCSU uses to identify a packet transmission failure. The default value is 2.5 seconds and the operator can vary the value from 1 to 10 seconds.

For Localizer and Glideslope equipment, the "Host a DME" checkbox will be available. This option should only be checked if an 1118, 1119, or Fernau DME is co-located with this particular navaid. Otherwise, it should be left disabled.

For Glideslope and Marker Beacon equipment, the "Interlock Enabled" checkbox will be available. This option should typically be checked, so that this new equipment is turned on/off when opposing approaches are selected. If this new equipment should not be interlocked off with the rest of the associated navaids, then clear this checkbox.

For 1118A/1119A DME equipment, the "Primary/Secondary Shared" checkbox will be available. This option allows a single DME station to be used for both Primary and Secondary approaches of an interlocked runway. In this case, the DME must also be configured with the appropriate Primary and Secondary Ident codes through the PMDT.

The Dial-Out Enabled option allows this device to trigger a dial-out, if the Dial-Out on Status Change option is enabled in the RCSU's System Configuration.

The Modem Initialization/Configuration section of this window should normally be left with the Conexant SF336/SFV336 option selected and the Additional Initialization Strings field empty. These controls are available to allow for flexibility in various installations and should not be changed without consultation with the factory.

3.5.3.7.4 Adding New Non-Runway Equipment

This process should be used to add one of the following pieces of equipment to the RCSU configuration:

- 1150/1150A VOR
- 1118A/1119A DME
- Cardion VOR/VORTAC,
- Cardion DME or TACAN (Stand-alone)
- RCI SBRS ATC Radio System
- Network Router
- Remote I/O Controller

a. First, login to Security Level 3 and press the Configure Airfield button on the Sidebar to enter Configuration Mode. Configuration changes are now allowed.
b. Position the cursor on the map display where the equipment is installed and right-click.
c. Select the "Add Other Equipment" menu item from the pop-up context menu. The "Select Type of Equipment to Add" window will be displayed, listing the types of non-runway equipment. Refer to Figure 3-18. Note that the DME/TACAN option should only be used for stand-alone equipment. If an 1118/1119 DME or Fernau DME/TACAN is co-located with a VOR, the VOR should be selected.

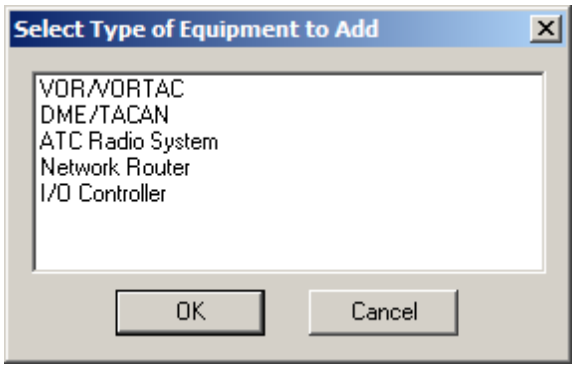


Figure 3-18 Add Non-Runway Equipment Screen

d. Select the desired equipment and press the OK button. The corresponding window will be displayed. The following figures illustrate some example New Equipment screens.

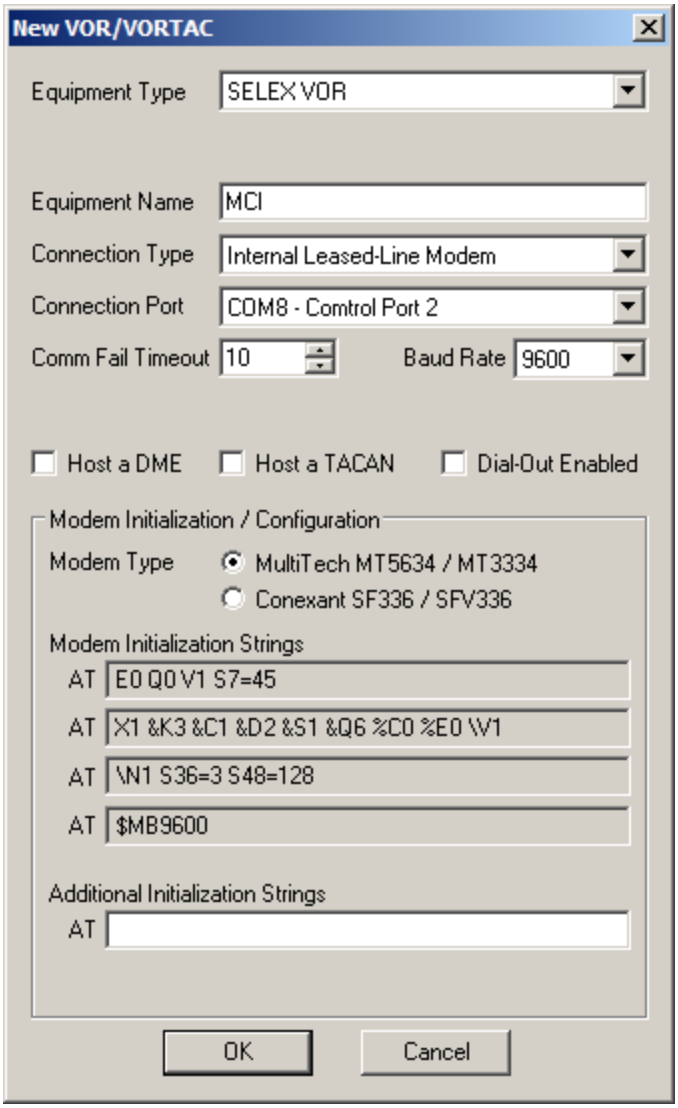


Figure 3-19 New Selex ES 1150A VOR Configuration Screen

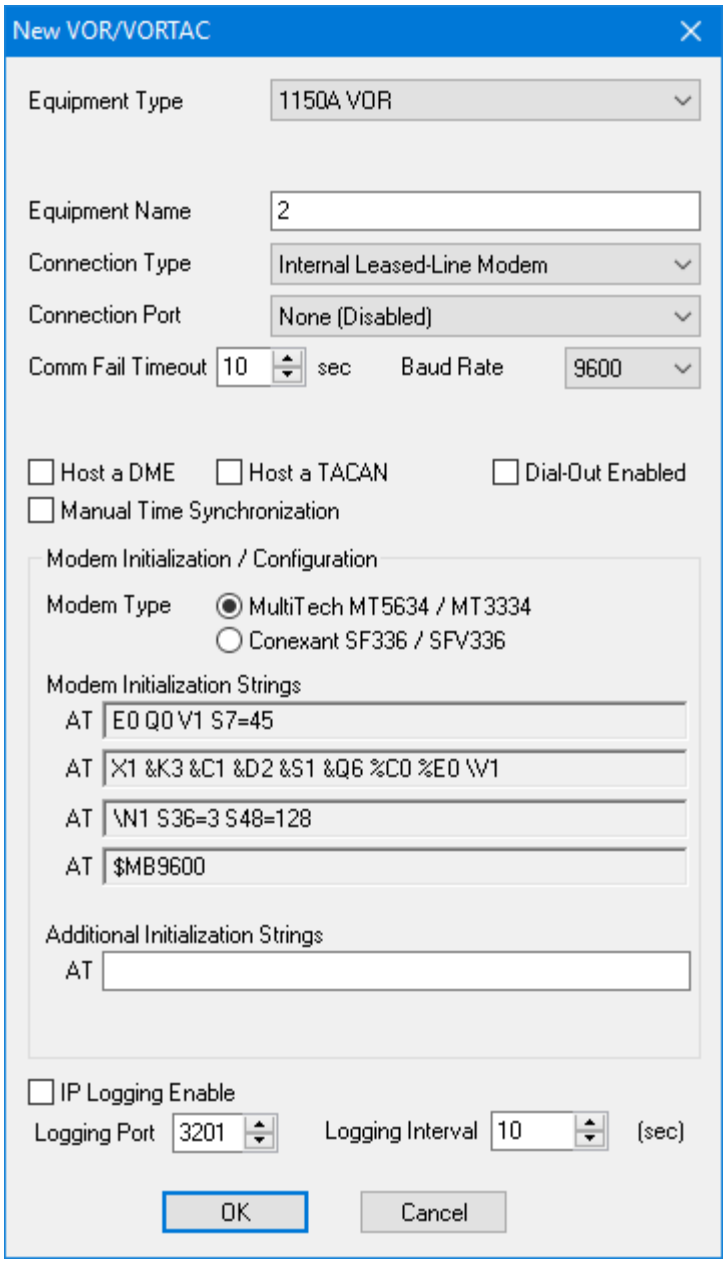


Figure 3-20 New Cardion VORTAC Configuration Screen

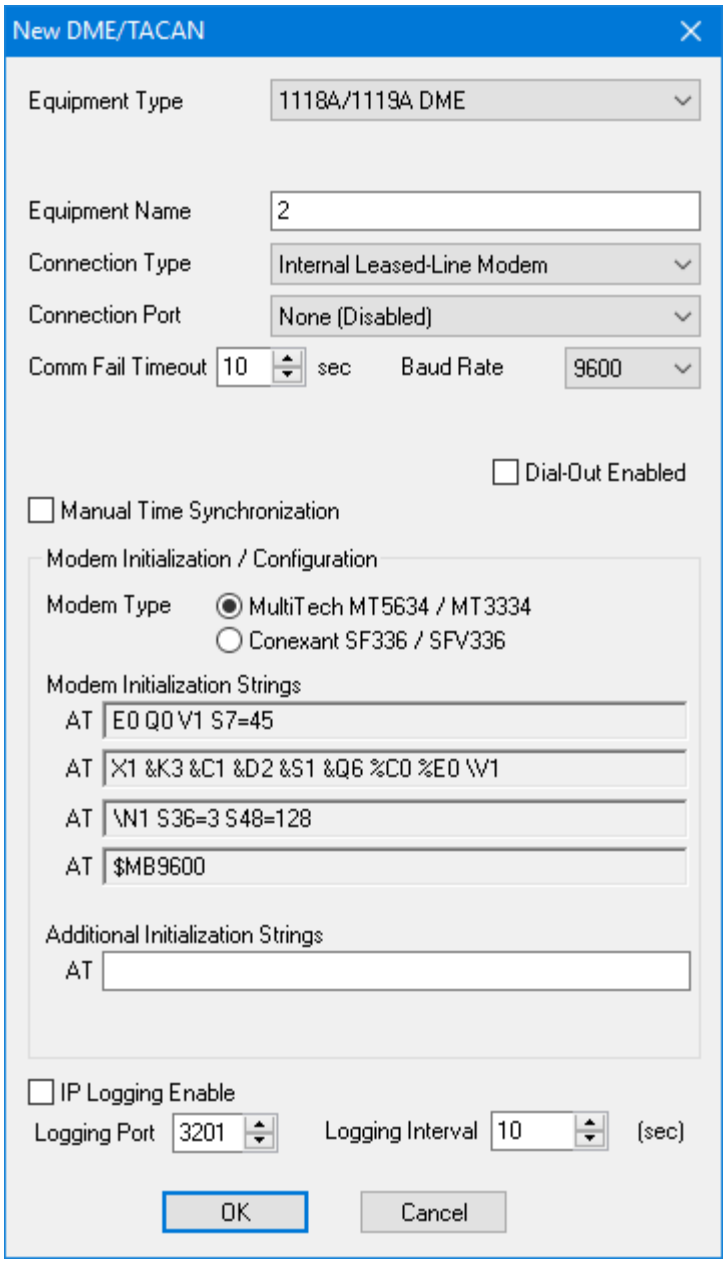


Figure 3-21 New Selex ES 1118A/1119A DME Configuration Screen

e. Configure the new runway equipment as detailed in Section 3.5.3.7.4.1 below and then press the OK button to save this new runway. Pressing the Cancel button at any time will close this window without saving the configuration.

f. When the new navaid has been added to the configuration, its status icon will be displayed on the map at the point that the user right-clicked. This location can be fine tuned at this point. While in configuration mode, the user can drag-and-drop the runway and equipment icons anywhere on the map. If a status icon is dropped near another icon, it will automatically be docked to the other icon. To undock an icon, drag-and-drop it away from the other icon.

g. When IP Logging is enabled, status and configuration information in the form of CSV (comma separated values) are broadcast from the navaid component over the specified port and at the specified interval. Upon connected to the port by a terminal, the navaid first transmits the header information of the follow-on CSV

data. The CSV data is then transmitted based on the interval specified.

3.5.3.7.4.1 Equipment Configuration Controls for Navaid Equipment

Referring to Figure 3-19 through Figure 3-21, the Equipment Configuration controls are used as detailed below. Note that not all controls are applicable to all Equipment Configuration windows.

The Equipment Type contains a list of supported equipment types. This selection should match the installed equipment. Note that "SELEX VOR" should be used for the 1150A VOR, and "SELEX DME" should be used for the 1118A/1119A DME. Do not select "SELEX VOR" when installing an older Selex ES 1150 VOR.
The Connection Type field should typically be set to Dedicated, referring to the combination of the embedded modems on the Dual Modem CCAs and their dedicated lines to the navaid equipment. Note that for Cardion equipment, this parameter is not available since the RCSU connects directly to the Cardion Interface CCA instead of using one of the Dual Modem CCAs. If an RF Modem link is to be used for the RCSU-Navaid communications, the RF Modem option must be selected. When configured for RF Modems, all of the navaids associated with a runway can share a single communications channel on the RCSU end of the link. The remaining Connection Type options, Direct and Dial-Up are reserved for factory testing.

On the 1118A/1119A DME and 1150A VOR, the Connection type may be set to TCP/IP Network. When the connection type is set to TCP/IP Network, the modem controls are replaced by TCP/IP controls. The IP Address 1 field is the address of the Navaid. The IP Port 1 is the TCP port number monitored by the Navaid. Section 9.5.7 details configuration of the RCSU and Navaid for TCP/IP on Ethernet networks.

The Connection Port field must be set to correspond with the cabling connections made between the RCSU Server's COM Port cables, the Dual Modem CCAs, and the dedicated navaid wiring. If this parameter is not set properly, the RCSU application will be able to establish communications with the specified navaid. When setting this parameter, trace the dedicated modem line coming into the RCSU's TVS CCA to its corresponding COM Port cable and note the label on that cable, which ranges from P0 to P7. These are indicated in the Connection Port field with the "Comtrol Port X" label.

The Baud Rate field specifies the baud rate used for this communications link. Typically, the baud rate should be 9600 bps. Reducing it can improve the communication link in areas subjected to excessive link interference, indicated by frequent Comm Faults. Cardion equipment links must be set to 9600 bps.

The Comm Fail Timeout value sets the duration (in seconds) that a problem with the communications link between the RCSU and the equipment must persist before declaring a Comm Fault. The default value is 10 seconds, but the operator can vary it from 2 to 60 seconds.

The DME Present checkbox should only be checked if a DME is co-located with this VOR. Otherwise, it should be left disabled.

The TACAN Present checkbox should only be checked if a Cardion TACAN is co-located with this Cardion VOR. Otherwise, it should be left disabled.

The Dial-Out Enabled option allows this device to trigger a dial-out, if the Dial-Out on Status Change option is enabled in the RCSU's System Configuration.

The Modem Initialization/Configuration section of this window should normally left with the Conexant SF336/SFV336 option selected and the Additional Initialization Strings field empty. These controls are available to allow for flexibility in various installations and should not be changed without consultation with the factory.

3.5.3.7.4.2 Equipment Configuration Controls for RCI SBRS ATC Radio Equipment

Referring to Figure 3-22, the Equipment Configuration controls for the RCI SBRS equipment are used as detailed below.

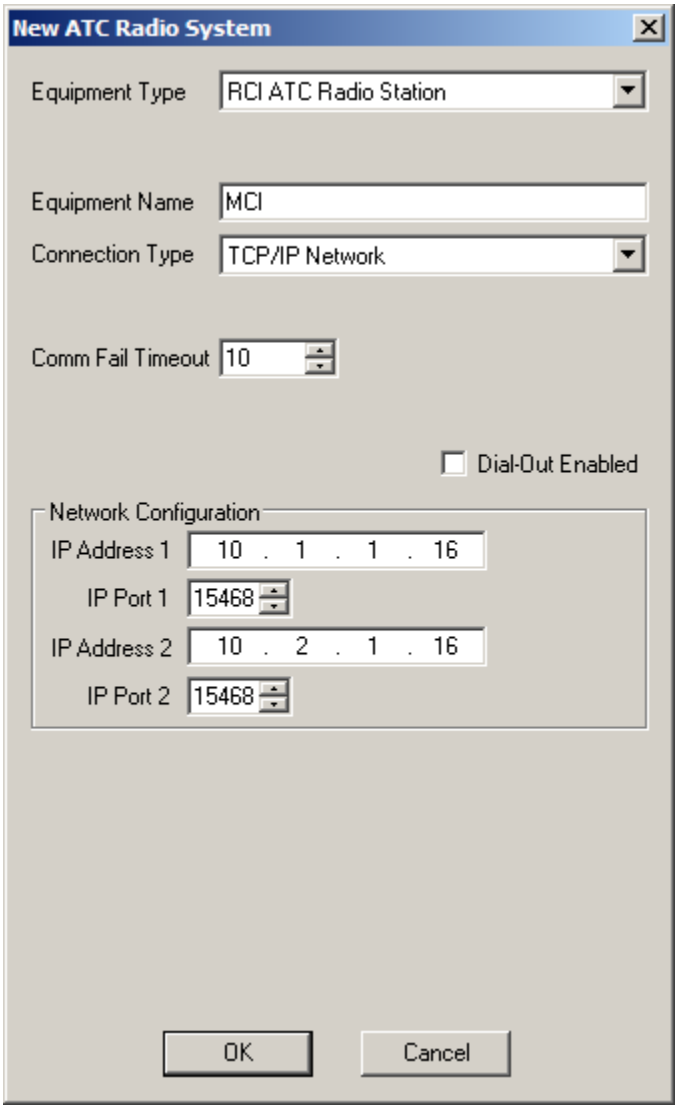


Figure 3-22 New RCI SBRS ATC Radio System Configuration Screen

The Equipment Type field should typically be set to "RCI ATC Radio Station". The "None" option is used to disable this equipment temporarily.

The Equipment Name should be set to something appropriate for this installation.

The only applicable Connection Type is TCP/IP Network.

Set the Comm Fail Timeout to the value desired. In response to a loss of communications to the Primary RCI equipment, the RCSU will attempt to establish contact with the Secondary RCI equipment. If that fails, a Comm Fault alert will be displayed with no audible alarm. This Comm Fail Timeout timer will be started while the RCSU attempts to establish contact with either RCI station, primary or secondary. Once this Comm Fail Timeout timer expires, the RCSU will start the audible alarm, which will also be signaled at the RSDU.

The Dial-Out Enabled option allows this device to trigger a dial-out, if the Dial-Out on Status Change option is enabled in the RCSU's System Configuration.

The two IP Addresses for the Primary and Secondary RCI SBRS Controllers must be entered in the associated fields, as well as the assigned IP Port. Consult the RCI SBRS Controller documentation for these values.

3.5.3.7.4.3 Equipment Configuration Controls for Network Router Equipment

Referring to Figure 3-23, the Equipment Configuration controls for the Network Router equipment are used as detailed below.

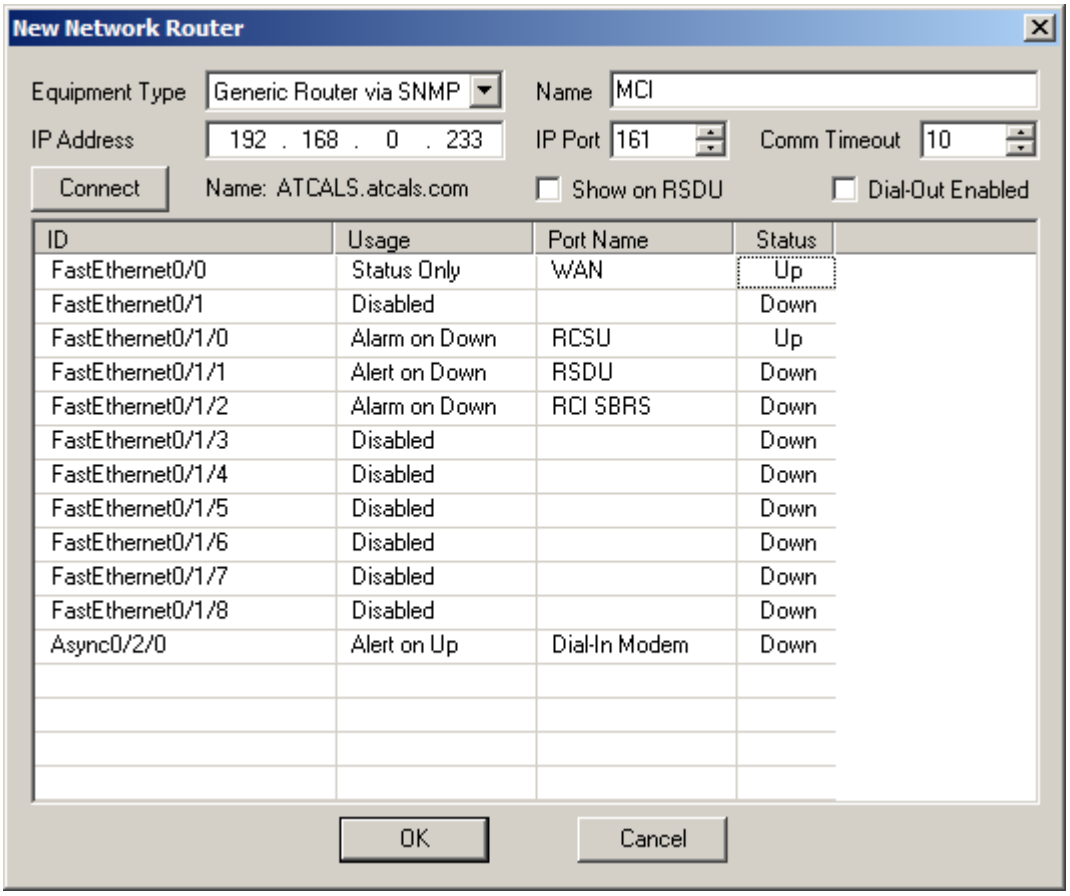


Figure 3-23 New Network Router Configuration Screen

The Equipment Type field should typically be set to "Generic Router via SNMP". The "None" option is used to disable this equipment temporarily.

The Equipment Name should be set to something appropriate for this installation.

Enter the IP Address of the router, and leave the IP Port set to 161, the default SNMP port. Press the "Connect" button to establish the connection with the router and poll it for its current number and type of ports. These installed hardware ports will be displayed, along with the router's hostname and domain name.

The Comm Fail Timeout value sets the duration (in seconds) that a problem with the communications link between the RCSU and the equipment must persist before declaring a Comm Fault. The default value is 10 seconds, but the operator can vary it from 2 to 60 seconds.

The Show on RSDU option allows the user to configure the system so that the Network Router summary-level status icon to be displayed on the RSDU in addition to the RCSU. By default, this option is disabled since the status of the Network Router is typically seen as maintenance level status, and not ATC related.

The Dial-Out Enabled option allows this device to trigger a dial-out, if the Dial-Out on Status Change option is enabled in the RCSU's System Configuration.

For each router port that will be monitored, enter the desired Port Name, and set the Usage as desired. The current Port Status (up/down) is displayed for reference. The Usage setting determines how the port's status will be displayed on the Network Router's detailed status screen:

Disabled	The port will not be displayed at all. All unused ports would typically be set to Disabled.
Status Only	Only UP/DOWN status will be displayed, without any alarm/alert colorization. This is the most commonly used setting for the Async/Modem ports.
Alert on Up	An Alert/Yellow indication will be displayed when this port is up. This setting is typically only used for the Async/Modem ports, to create an alert condition while a Remote Access session is active.
Alert on Down	An Alert/Yellow indication will be displayed when this port is down. This is the most commonly used setting for any of the FastEthernet ports.
Alarm on Up	An Alarm/Red indication will be displayed when this port is up. This setting is typically only used for the Async (Modem) ports, to create an Alarm condition while a Remote Access session is active.
Alarm on Down	An Alarm/Red indication will be displayed when this port is down.

3.5.3.7.4.4 Equipment Configuration Controls for Remote I/O Equipment

Referring to Figure 3-24, the Equipment Configuration controls for the Remote I/O equipment are used as detailed below.

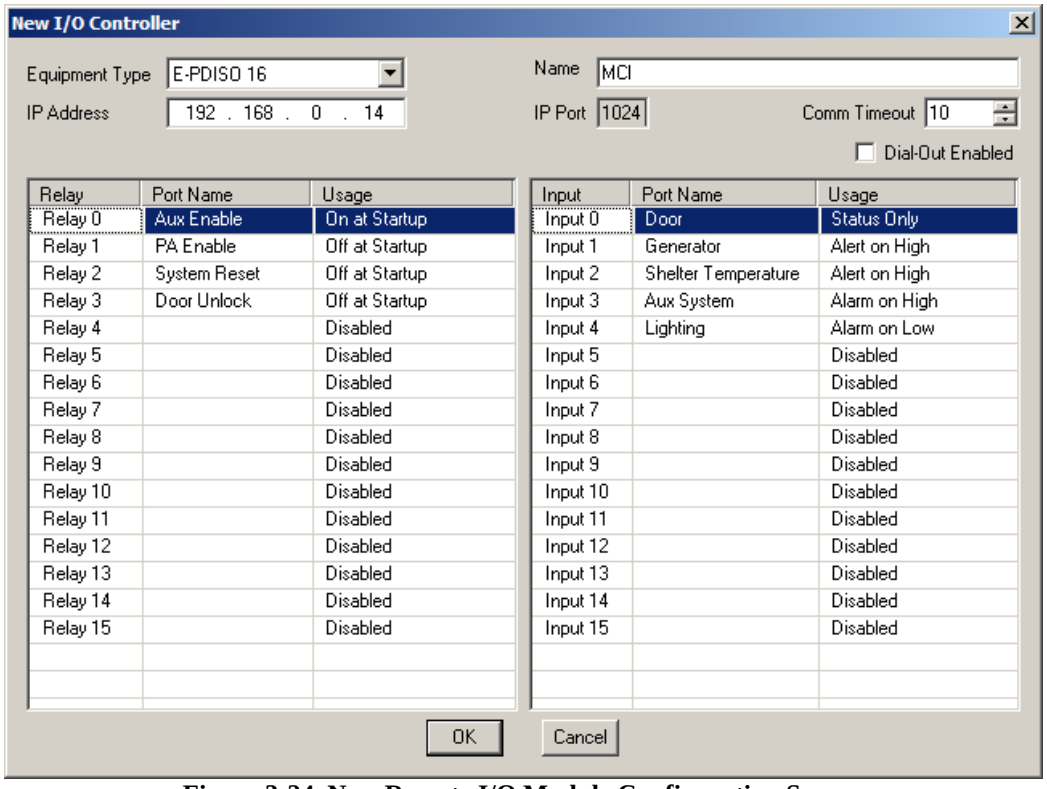


Figure 3-24 New Remote I/O Module Configuration Screen

The Equipment Type field should typically be set to "E-PDISO 16". The "None" option is used to disable this equipment temporarily.

The Equipment Name should be set to something appropriate for this installation.

Enter the IP Address of the Remote I/O Module. The associated IP Port is displayed for reference. It cannot be changed.

The Comm Fail Timeout value sets the duration (in seconds) that a problem with the communications link between the RCSU and the equipment must persist before declaring a Comm Fault. The default value is 10 seconds, but the operator can vary it from 2 to 60 seconds.

The Dial-Out Enabled option allows this device to trigger a dial-out, if the Dial-Out on Alarm Status Change option is enabled in the RCSU's System Configuration.

For each Relay port that will be controlled, enter the desired Signal Name, and set the Usage as desired. The Usage setting determines how the output's status will be set when the RCSU application starts running.

Disabled	The output will not be displayed at all. All unused inputs would typically be set to Disabled.
On at Startup	The Normally Open (NO) contacts will be closed on startup.
Off at Startup	The Normally Open (NO) contacts will be left open on startup.

For each input port that will be monitored, enter the desired Port Name, and set the Usage as desired. The Usage setting determines how the input's status will be displayed on the Remote I/O Equipment's detailed status screen:

Disabled	The input will not be displayed at all. All unused inputs would typically be set to Disabled.
Status Only	Only High/Low status will be displayed, without any alarm/alert colorization.
Alert on High	An Alert/Yellow indication will be displayed when this input is high.
Alert on Low	An Alert/Yellow indication will be displayed when this input is low.
Alarm on High	An Alarm/Red indication will be displayed when this input is high
Alarm on Low	An Alarm/Red indication will be displayed when this input is low.

3.5.4 Operation

Once the RCSU has been configured, it will operate in Normal Mode. In Normal Mode, the RCSU requests the status of each navaid, embedding any pending commands such as Runway Select in the status poll, twice per second. The navaid responds with the status, which is used to update the RCSU, RSDU, and 2138 RSU Module. This poll/response protocol provides status updates at least once per second.

3.5.4.1 Summary-Level Equipment Status Display

In normal operation, all Equipment and Runway Status Icons will be green, or dark grey for interlocked off equipment. Refer to Figure 3-5. When the status of any of the configured navaids changes, it is indicated by the corresponding Navaid Equipment Status Icon. Refer to Figure 3-25.

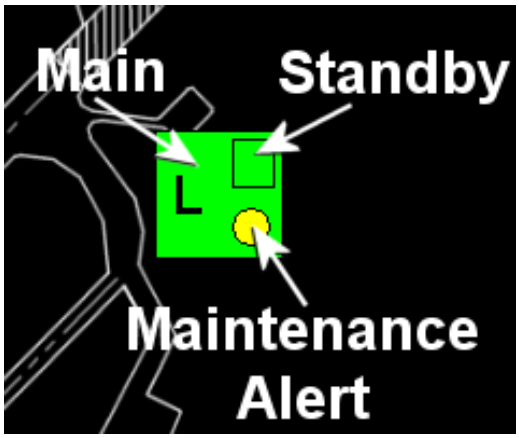


Figure 3-25 Equipment Status Icon Legend

The Navaid Equipment Status Icons contain several features to quickly and efficiently convey the summary-level status of the associated navaid equipment. As shown in Figure 3-25, the status of the Main transmitter is indicated by the background color of the icon. For dual transmitter systems, the status of the Standby transmitter is indicated by the color of the square in the upper right corner of the icon.

The status colors for the Main and Standby icon sections are as follows:

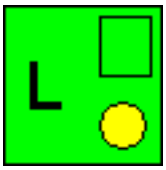
Green	Normal operation
Red	In Alarm Shutdown Bypass Local Mode Interlocked off, but forced on
Yellow	RCSU Comm Fault
Gray	Interlocked off, normal operation Cold Standby (dual only) Configuration Mode enabled

The yellow circle in the lower right corner of the icon will be displayed to indicate a Maintenance Alert condition, such as an AC Failure, a parameter's pre-alarm has been tripped, the smoke detector alert is active, etc. If no Maintenance Alerts are active, the yellow circle will not be displayed.

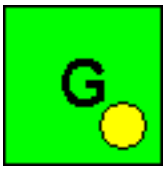
A single, upper-case letter is used to represent the type of navaid associated with this icon. The letters used are as follows:

L	Localizer
G	Glideslope
I	Inner Marker Beacon
M	Middle Marker Beacon
O	Outer Marker Beacon
D	DME
V	VOR
T	TACAN

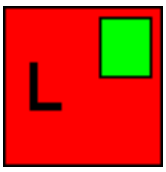
The following figures illustrate various status examples. NOTE: For grayscale printouts of this page, the following abbreviations are used: (Main Tx Color/Stanbdy Tx Color)



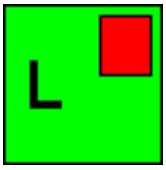
This indicates that both Main and Standby transmitters of a Dual Localizer are operating normally, however a Maintenance Alert exists. (Green/Green)



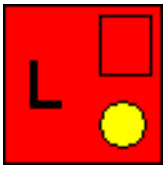
This indicates that the Single Glideslope transmitter is operating normally, however a Maintenance Alert exists. (Green/Not Applicable)



This indicates that the Dual Localizer's Main Transmitter is in alarm, and its Standby transmitter is operating normally. (Red/Green)



This indicates that the Dual Localizer's Main Transmitter is operating normally, however its Standby transmitter is in Alarm. (Green/Red)



This indicates that the Dual Localizer has shut down. (Red/Red)

This indicates a Dual Localizer, which has a co-located Dual DME, have been interlocked off. (Gray/Gray, for both icons)

3.5.4.2 Detailed Status Display and Navaid Controls

While the Navaid Status Icons provide summary-level status for the associated navaid, more detailed status for each navaid is available by either double-clicking on the Status Icon, or right-clicking and selecting the "Show Status" menu item from the pop-up context menu.

Figure 3-26 shows the detailed status window for a Dual 2100 Localizer in normal operation. Note that the Near-/Far-Field Monitor controls and indicators will only be displayed if the associated Field Monitor is actually installed.

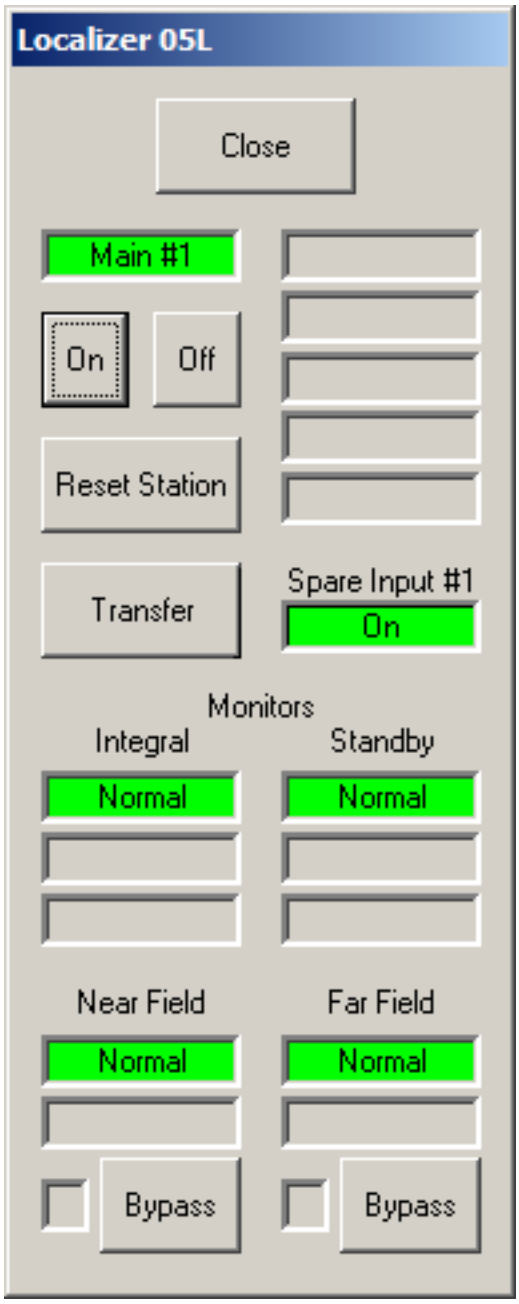


Figure 3-26 2100 Localizer Detailed Status Indicators

Figure 3-27 shows the various alarm and alert indicators available for 2100 ILS equipment.

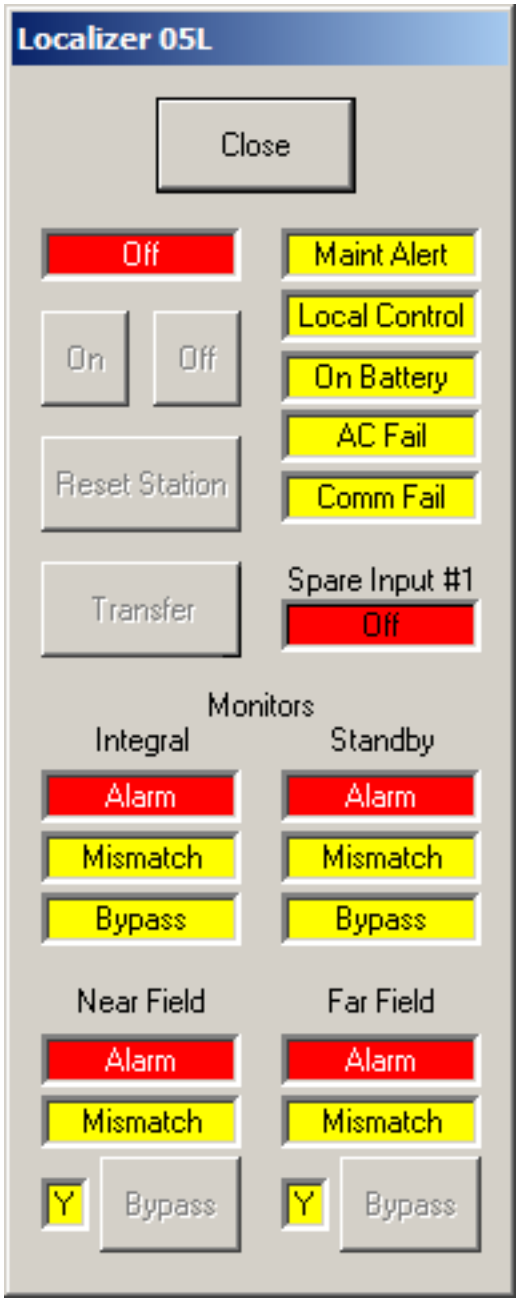


Figure 3-27 Alarm and Alert Indicators

Figure 3-28 shows the detailed status display for a 2100 Localizer that is currently interlocked off. Note that the On, Off, and Transfer buttons are disabled. Only the Reset Station control is available while a system is interlocked off.

The monitor status fields all indicate an alarm condition since the transmitters are not radiating. When a system shuts down, its monitors' status is still displayed.

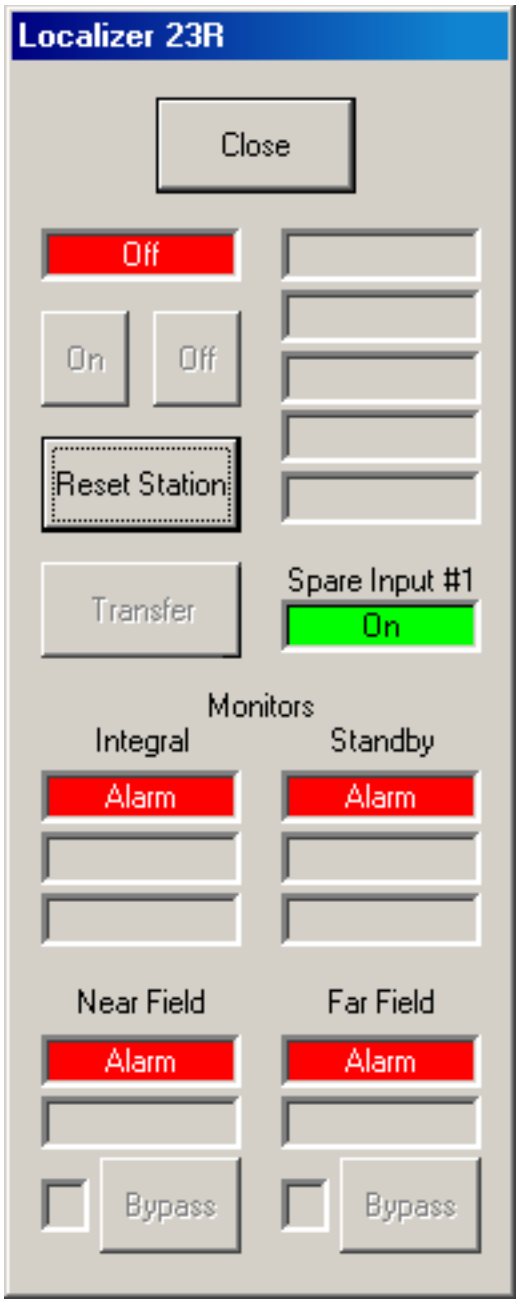
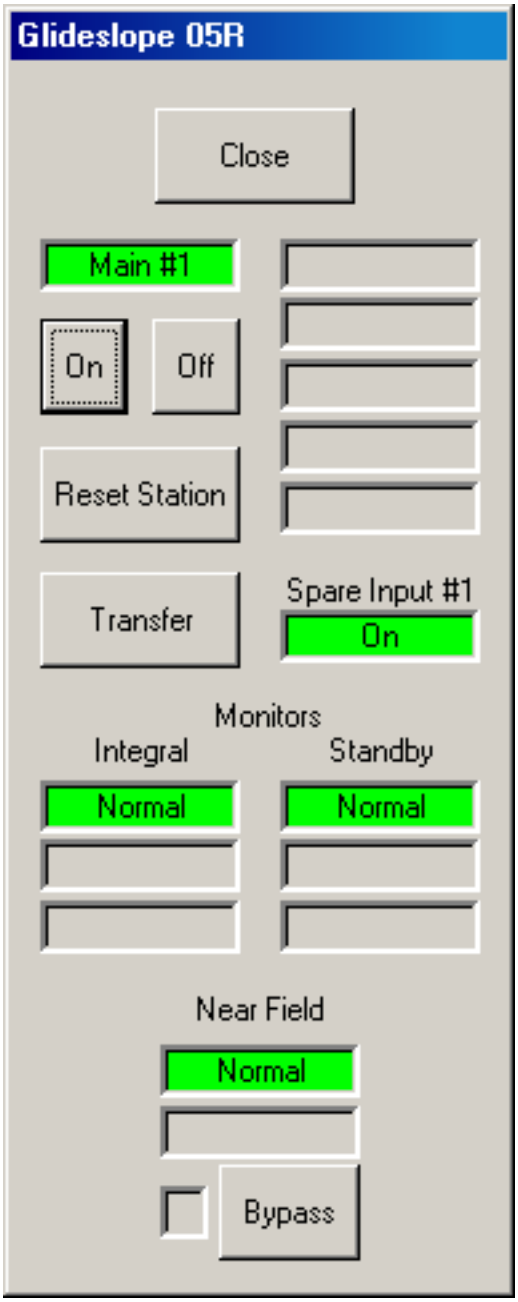


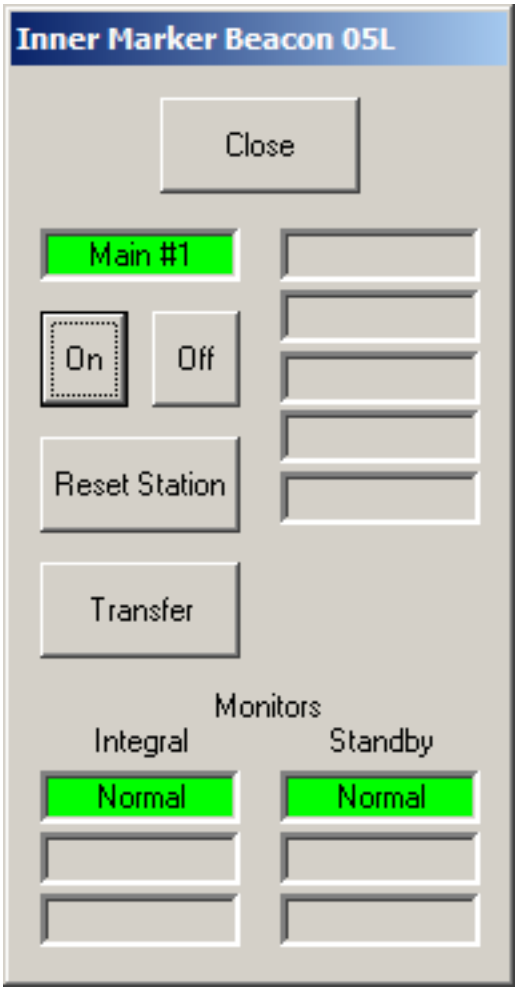
Figure 3-28 Interlocked Off Navaid Status

The detailed status displays for other types of navaid equipment are shown below.



This is the detailed status display for a 2110 Glideslope. Its controls and status indicators are similar to the 2100 Localizer.

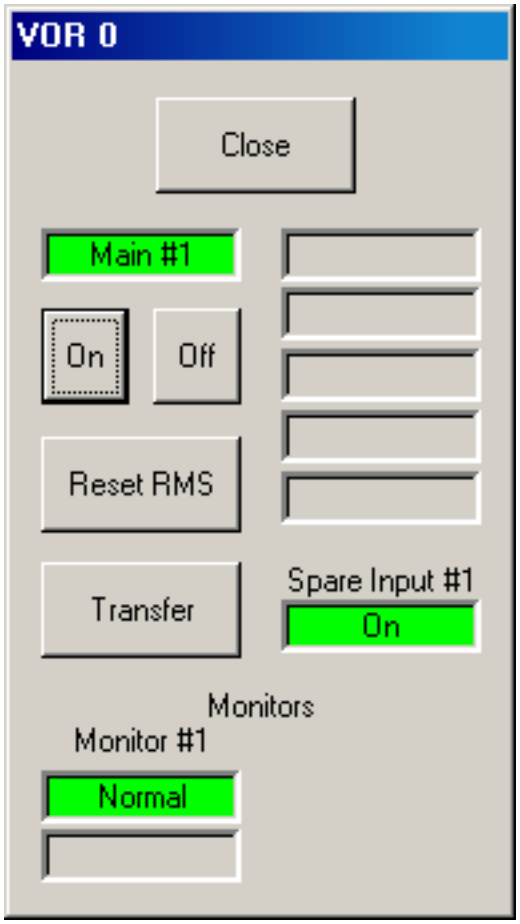
Note that the Near Field Monitor controls and indicators will only be displayed if one is actually installed at the Glideslope site.



This is the detailed status display for a 2130 Inner Marker Beacon. Middle and Outer Marker Beacons are identical, except for the title bar.

Its controls and status indicators are similar to the 2100 Localizer.

This is the detailed status display for an 1118/1119/Fernau DME, which would typically be co-located with a Localizer, Glideslope, or 1150 VOR. The three status fields under the Transfer button are, from top to bottom, the Comm Fail, On Battery, and AC Fail indicators.



This is the detailed status display for an 1150 VOR. The status indicators are similar to those of the 2100 ILS equipment. In VOR systems with dual monitors, a second set of Monitor #2 indicators will also be displayed.

These figures illustrate the detailed status displays for a Cardion VOR and TACAN. The field at the top of the display indicates the status of the Cardion equipment: On (Green), Off (Red), or Bypass (Yellow). The next field indicates the Comm Fail condition in Yellow.

The Start button is used to turn on the associated Cardion navaid. The Stop button is used to turn off the associated Cardion navaid. The Close button is used to close this detailed status screen.

3.5.4.2.1 Navaid Equipment Controls and Status Indicators

The controls and indicators in the various navaid equipment detailed status windows are used as follows:

2100 Localizer, 2110 Glideslope, 2130 Marker Beacons, and 1150 VOR

Close	Control, closes the detailed status screen.	
Transmitter Status	Main (green)	Operating on the Main Tx, On a dual station, the transmitter number (#1 or #2) will also be displayed for reference
	Standby (yellow)	Operating on the Standby Tx (dual stations only). the transmitter number (#1 or #2) will also be displayed for reference.
	Off (red)	Not transmitting.
Maintenance Alert	Maint. Alert (yellow)	One or more Maintenance Alerts is active.
	Off (gray, no text)	No Maintenance Alerts are active.
Tx On	Control, Turns on the Main Tx, transmitting on the antenna, and if configured for a Hot Standby, turns on the Standby Tx, transmitting into the load.	
Tx Off	Control, Turns off the Main and Standby (dual stations) transmitters.	
Transfer	Control (Dual only), Selects the Standby Tx as Main, and the Main Tx as Standby. Turns on the new Main Tx, transmitting on the antenna, and if configured for a Hot Standby, turns on the new Standby Tx, transmitting into the load.	
Reset Station/RMS	Control, When the RCSU is connected to a 012057 RMS CCA in a 2100 Localizer or 2110	

Glideslope, this button is labeled "Reset Station" and resets all of the hardware in the ILS station. When the RCSU is connected to an earlier 012015 RMS CCA or an 1150 VOR, this button is labeled "Reset RMS" and resets only the RMS CCA.

On Battery	On Battery (red)	Navaid is operating on batteries.
	Off (gray, no text)	Navaid is operating on DC Power Supplies.
AC Fail	AC Fail (yellow)	The AC Voltage to the Navaid is not available.
	Off (gray, no text)	The AC Voltage to the Navaid is present.
Comm Fail	Comm Fail (yellow)	No communications between the RCSU and navaid.
	Off (gray, no text)	RCSU/Navaid communications are established.
Spare Input #1	On (green)	Spare Digital Input #1 is on/normal.
	Off (red)	Spare Digital Input #1 is off/alarmed.
	Off (gray, no text)	Spare Digital Input #1 is not configured.

NOTE

For 2100 ILS equipment, this refers to the Spare Input #1 on the Cabinet I/F CCA. For 1150 VOR equipment, this refers to the Spare Input #1 found on TB17-1 in the VOR Cabinet.

Integral/Standby/NFM/FFM Monitors:

Monitor Status	Normal (green)	Monitor is normal.
	Alarm (red)	Monitor is detecting an alarm condition.
	Cold (yellow)	(Dual Only) Standby Tx is configured as Cold, and therefore it is off and not being monitored.
	Off (gray, no text)	Not applicable (a Standby Monitor in a single station, for example)
Monitor Mismatch	Mismatch (yellow)	Monitor Mismatch detected.
	Off (gray, no text)	No Monitor Mismatch.
Monitor Bypass (Indicator)	Bypass (yellow)	Monitor is bypassed.
	Off (gray, no text)	Monitor is not bypassed.
Monitor Bypass (Control)	Control (NFM/FFM Only) Toggles the NFM/FFM Monitor Bypass mode.	

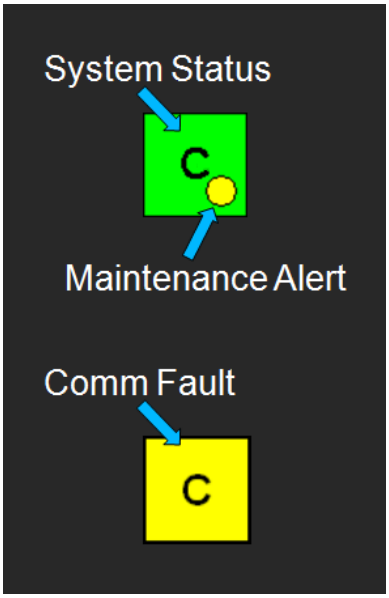
1118/1119/Fernau DME (co-located with 2100 Localizer, 2110 Glideslope, or 1150 VOR)

Close	Control, closes the detailed status screen.	
Transmitter Status	Main (green)	Operating on the Main Tx, On a dual station, the transmitter number (#1 or #2) will also be displayed for reference.
	Standby (yellow)	Operating on the Standby Tx (dual stations only). The transmitter number (#1 or #2) will also be displayed for reference.
	Off (red)	Not transmitting.
Tx On	Control, Turns on the DME Transmitter(s)	
Tx Off	Control, Turns off the DME Transmitter(s).	
Transfer	Control (Dual only), Transfers between Main and Standby transmitters.	

Reset Station/RMS	Control, When the RCSU is connected to a 012057 RMS CCA in a 2100 Localizer or 2110 Glideslope, this button is labeled "Reset Station" and resets all of the hardware in the ILS station. When the RCSU is connected to an earlier 012015 RMS CCA or an 1150 VOR, this button is labeled "Reset RMS" and resets only the RMS CCA.	
Comm Fail	Comm Fail (yellow)	The DME station is turned off.
	Off (gray, no text)	The DME station is operating.
On Battery	On Battery (red)	The DME is operating on batteries.
	Off (gray, no text)	The DME is operating on DC Power Supplies.
AC Fail	AC Fail (yellow)	The AC Voltage to the DME is not available.
	Off (gray, no text)	The AC Voltage to the DME is present.
Monitor Status	Normal (green)	Monitor is normal.
	Alarm (red)	Monitor is detecting an alarm condition.
	Cold (yellow)	(Dual Only) Standby Tx is configured as Cold, and therefore it is off and not being monitored.
	Off (gray, no text)	Not applicable (a Standby Monitor in a single station, for example)
Monitor Mismatch	Mismatch (yellow)	Monitor Mismatch detected.
	Off (gray, no text)	No Monitor Mismatch.
Monitor Bypass (Indicator)	Bypass (yellow)	Monitor is bypassed.
	Off (gray, no text)	Monitor is not bypassed.
Monitor Bypass (Control)	Control (NFM/FFM Only) Toggles the NFM/FFM Monitor Bypass mode.	

3.5.4.2.2 RCI SBRS ATC Radio Equipment Status Indicators

The summary-level status indicator for an RCI SBRS ATC Radio system is similar to that of the navaids, as shown below. The "C" identifies the icon as a "Comm Radio Station"



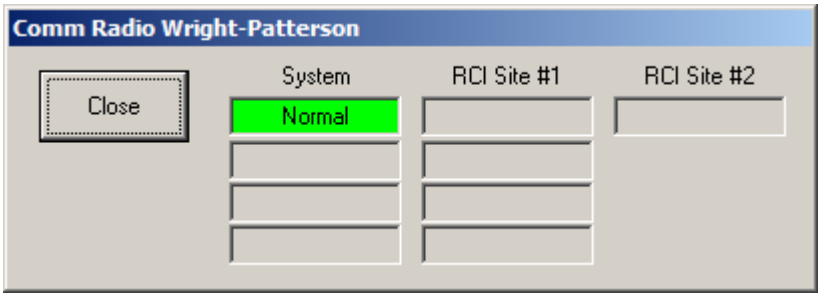
The RCI SBRS system status is indicated by the background color:

Green	All comm radio frequencies are available. One or more may be on its spare/backup radio, however.
Red	One or more comm radio frequencies is not available. The Primary and Spare/Backup radios have been shutdown.
	Command Mode – RMM user can make configuration changes
Yellow	Comm Fault between the RCSU and the RCI SBRS Controllers.

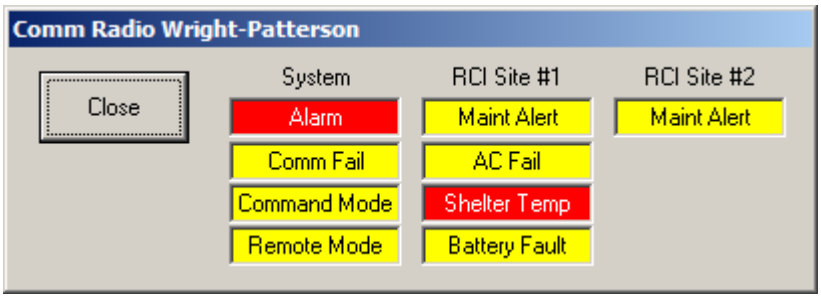
The yellow Maintenance Alert indicator is displayed for the following conditions:

RSDU	RCSU	System Condition
X	X	Command Mode
X	X	AC Fail
X	X	Shelter Temperature Alarm
-	X	Shelter Temperature Alert
-	X	Remote Access – RMM user is logged into the system
-	X	Battery Fault
-	X	Other general maintenance alert.

A typical detailed status display for an RCI SBRS ATC Radio System in its normal state is shown below. Only two sites are shown here; up to six sites are possible.



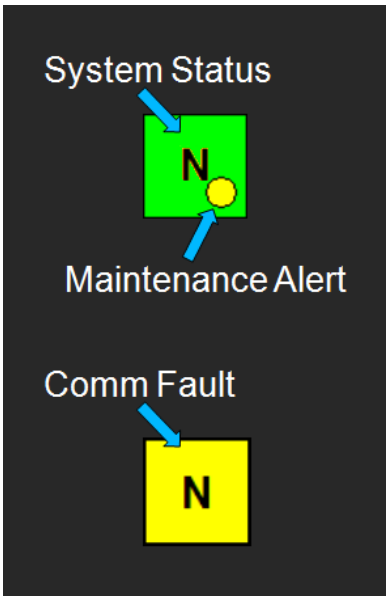
The four System Status fields displayed are, from top to bottom, Operational Status, Comm Fail, Command Mode, and Remote Mode. The four Site Status fields displayed are, from top to bottom, Maintenance Alert, AC Fail, Shelter Temp (Alert/Alarm), and Battery Fault. Sites without UPS equipment, such as Site #2 in the example shown below, do not have the associated indicators - AC Fail, Shelter Temp (Alert/Alarm), and Battery Fault.



Close	Control, closes the detailed status screen.	
System Status	Normal (green)	All comm radio frequencies are available.
	On Spare (yellow)	All comm radio frequencies are available, however one or more of the system's primary radios has been shutdown and one or more of the spare radios is in use.
	Alarm (red)	One or more of the comm radio frequencies is no longer available. The primary and spare radio(s) have been shutdown.
Comm Fail	Comm Fail (yellow)	No communications between the RCSU and either of the two RCI SBRS Controllers.
	Off (gray, no text)	Normal RCSU-RCI SBRS Communications.
Command Mode	Command Mode (yellow)	The RCI SBRS user has placed the system into Command Mode.
	Off (gray, no text)	The RCI SBRS is not in Command Mode.
Remote Mode	Remote Mode (yellow)	An RCI SBRS user has connected in to the system remotely.
	Off (gray, no text)	No remote RCI SBRS users are currently logged in.
Maintenance Alert	Maint Alert (yellow)	One or more Maintenance Alerts is active
	Off (gray, no text)	No Maintenance Alerts are currently active.
AC Fail	AC Fail (yellow)	The AC Voltage to the RCI SBRS system has failed.
	Off (gray, no text)	The AC Voltage to the RCI SBRS system is normal.
Shelter Temperature	Shelter Temp (yellow)	The RCI SBRS site shelter temperature is between the system's alert limits and alarm limits.
	Shelter Temp (red)	The RCI SBRS site shelter temperature is outside the system's alarm limits.
	Off (gray, no text)	The RCI SBRS site shelter temperature is normal.
Battery Fault	Battery Fault (yellow)	The RCI SBRS site UPS is reporting that its batteries have failed.
	Off (gray, no text)	The RCI SBR site UPS's batteries are normal.

3.5.4.2.3 Network Router Status Indicators

The summary-level status indicator for a Network Router is similar to that of the navaids, as shown below. The "N" identifies the icon as a "Network Router". By default, no summary-level icon will be displayed at the RSDU, only at the RCSU since all status monitoring for a Network Router is considered to be for maintenance purposes and not ATC function related. As detailed above in Section 3.5.3.7.4.3, this option is user-configurable.



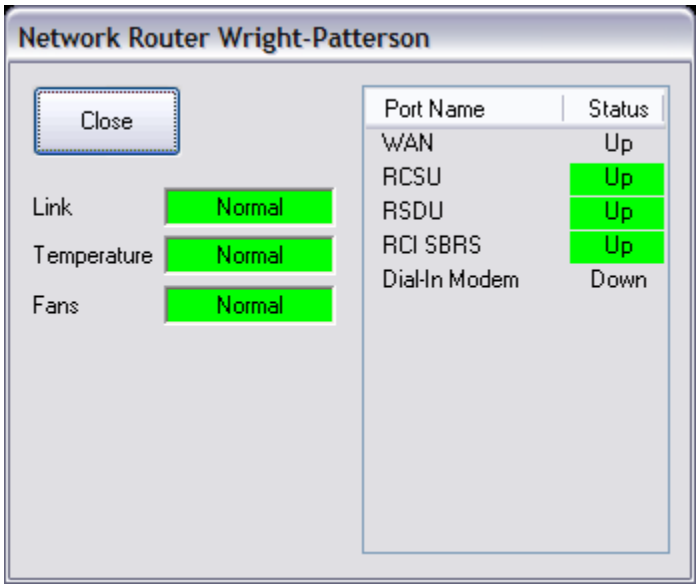
The summarized Network Router status is indicated by the background color:

Green	All monitored links are normal/operational
Red	One or more monitored links are in alarm
Yellow	Comm Fault between the RCSU and the Network Router

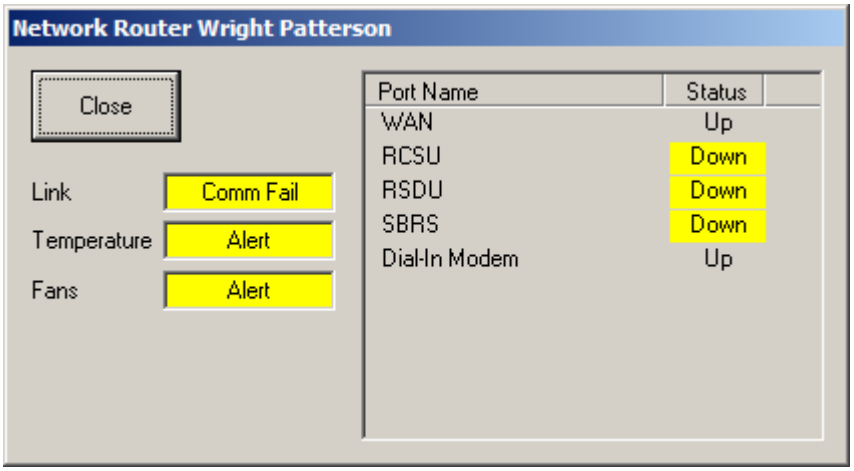
The yellow Maintenance Alert indicator is displayed for the following conditions:

- One or more of the monitored ports is in its Alert state.
- The router is indicating a Temperature alert condition.
- The router is indicating one or more of its fans has failed.

A typical detailed status display for a Network Router in its normal state is shown below.



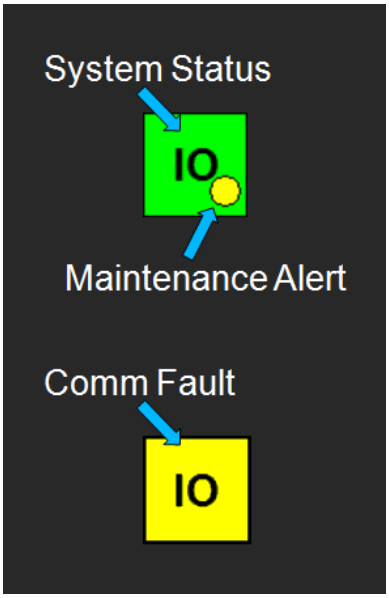
The Network Router's General Status fields displayed on left are, from top to bottom, Comm Fail, Temperature Alert, Fan Alert. Note that Temperature and Fan Alerts are only displayed for routers that support those features. The current status of the various enabled router ports are displayed in the right panel.



Close	Control, closes the detailed status screen.	
Link	Comm Fail (yellow)	No communications between the RCSU and the Network Router. Note that this condition will also result in Comm Faults to any other equipment that is connected to the RCSU through this router.
	Off (gray, no text)	Normal RCSU-Router Communications.
Temperature	Normal (green)	The Router's internal temperature is normal.
	Alert (yellow)	The Router's internal temperature is outside its factory-set limits.
Fans	Normal (green)	All of the Router's fans are operating.
	Alert (yellow)	One or more of the Router's fans has failed.
Port Status	Up	The associated network port connection is operational.
	Down	The associated network port connection is not operational.
	Up/Down (gray)	The port is configured as "Status Only". No normal/alert/alarm logic will be applied to this port.
	Up/Down (yellow)	The port's current status is in its Alert condition, creating a maintenance alert for the Network Router device.
	Up/Down (red)	The port's current status is in its Alarm condition, creating an alarm for the Network Router device.

3.5.4.2.4 Remote I/O Module Controls and Status Indicators

The summary-level status indicator for a Remote I/O Module is similar to that of the navaids, as shown below. The "IO" identifies the icon as an "I/O Module".

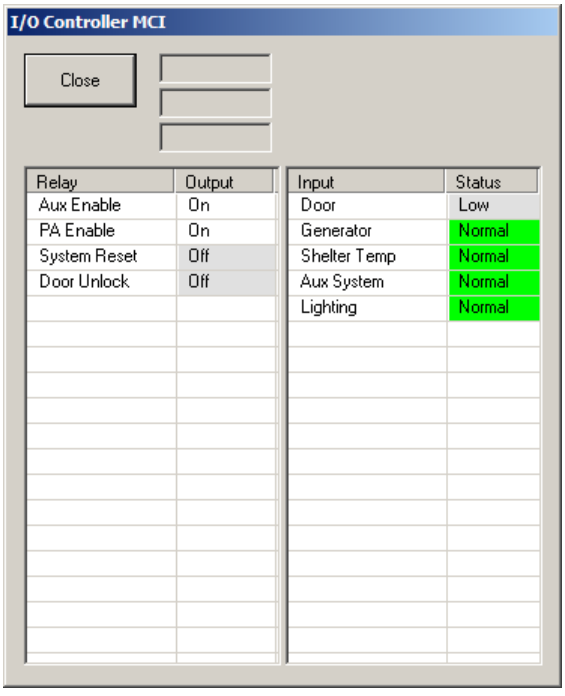


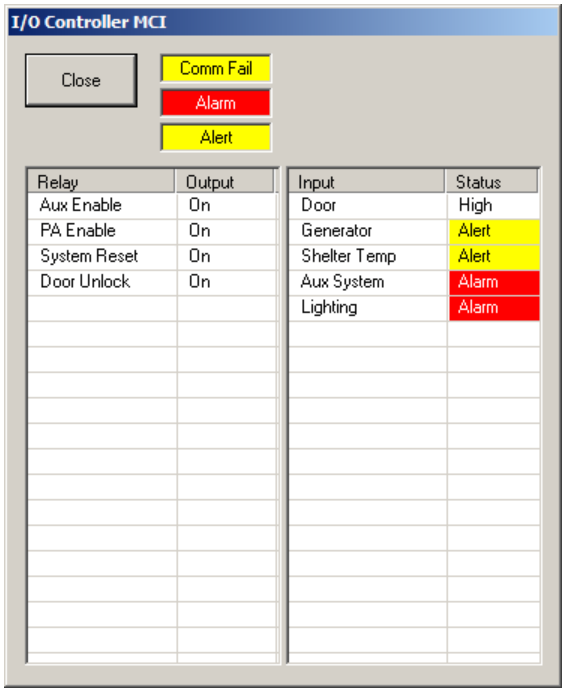
The summarized Remote I/O Module status is indicated by the background color:

Green	All monitored inputs are in their normal states
Red	One or more monitored inputs are in their Alarm state
Yellow	Comm Fault between the RCSU and the Remote I/O Module

The yellow Maintenance Alert indicator is displayed if one or more of the monitored inputs is in its Alert state.

A typical detailed status and alarm test display for a Remote I/O Module in its normal state is shown below. Also, the alarm/alert indications available for the Remote I/O inputs are displayed for reference.





Close	Control	Closes the detailed status screen.
Comm Fail	Comm Fail (yellow) Off (gray, no text)	No communications between the RCSU and the IO Controller. Normal RCSU to IO Controller Communications.
Alarm	Alarm (red) Off (gray, no text)	An alarm is asserted on one or more of the configured alarm inputs. All alarm inputs are normal.
Alert	Alert (yellow) Off (gray, no text)	An alert is asserted on one or more of the configured alert inputs. All alert inputs are normal.
Relay - Output	On Off	The associated relay is in the "On State" (Open for a normally closed relay and Closed for a normally open relay). The associated relay is in the "Off State" (Closed for a normally closed relay and Open for a normally open relay).
Input – Status	Low High High/Low (white) Normal (green) Alert (yellow) Alarm (red)	Less than 1.5 Volts between the two associated input terminals. Greater than 4.9 Volts between the two associated input terminals. (30 Volts DC Max) The associated input is configured as "Status Only". No Normal/Alert/Alarm logic is associated with this input. The associated input in its normal High/Low state, and is configured as an Alert or Alarm. The associated input is configured to generate an Alert on Low or Alert on High and is Low or High respectively. The associated input is configured to generate an Alarm on Low or Alarm on High and is Low or High respectively.

3.5.4.3 Runway Status Display

If the "Display Current Operational Status Category" option is enabled in the RCSU Configuration screen, the Runway Status icons will be displayed similar to that shown in Figure 3-29. The Approach ID is displayed in the top half of the icon, while the Operational Status Category is displayed below.

Figure 3-29 Runway Status, with Operational Status

Refer to Table 3-2 for the possible Operational Status Categories that are displayed in the lower half of the Runway Status icons. The Operational Status is also displayed in more detail in the Runway Status screen, shown in Figure 3-33.

Table 3-2 Operational Status Categories

Equipment Type	Operational Status	Category
Single	Localizer and Glideslope equipment On	CAT I
	Glideslope equipment Off, Localizer equipment On	LOC ONLY
Dual	Localizer and Glideslope subsystems operating normally (main transmitters connected to the antenna systems, no monitor alarms or alerts, no Localizer or Glideslope subsystem-to-RCSU communication faults)	CAT III
	Monitor mismatch condition at Localizer or Glideslope (CAT III downgrade condition)	CAT II
	FFM detects Localizer course misalignment in excess of CAT III tolerance for nominal 2 seconds (adjustable from 1 to 10 seconds) (CAT III downgrade condition)	
	Localizer operating normally and Glideslope operating on Standby equipment (CAT III downgrade condition)	
	Localizer operating on Standby equipment; Glideslope operating on either Main or Standby.	
	FFM detects Localizer course misalignment in excess of CAT III tolerance for nominal 5 seconds (adjustable from 1 to 120 seconds)	CAT I
	Glideslope Main and Standby equipment OFF; Localizer on Main or Standby	LOC ONLY

The background color of the Operational Status Category section of the icon indicates any downgraded condition. If the approach is currently operating at its maximum configured category, the background is green as shown in Figure 3-29. If it has been downgraded to a lesser category, the background will be yellow. If the approach is fully downgraded – the Localizer is not available, for example – the background will be red and the category of "---" will be displayed as shown in Figure 3-30.

Figure 3-30 Runway Status, Fully Downgraded

If the "Display Current Operational Status Category" option is not enabled in the RCSU Configuration screen, the Runway Status icons will be displayed as shown in either Figure 3-31, for an Interlocked Runway, or Figure 3-32, for a Non-Interlocked Runway. For an Interlocked Runway, the Primary Approach ID is on top, and the Secondary Approach ID is on the bottom.

Figure 3-31 Runway Status - Interlocked

Figure 3-32 Runway Status – Non-Interlocked

The background color of the Runway Status icon indicates which approach is currently Active (for Interlocked Runways), as well as its Operational Status condition. If the approach is currently operating at its maximum configured category, the background is green as shown above. If it has been downgraded to a lesser category, the background will be yellow. If the approach is fully downgraded – the Localizer is not available, for example – the background will be red. For an Inactive Interlocked Approach, the background will be dark gray, as shown for the "23R" approach in Figure 3-31.

3.5.4.4 Runway Status

Double-clicking on the Runway Status Icon will display the detailed status window, as shown in Figure 3-33. The Operational Status of the active approach is displayed. If this approach has been downgraded, the "Approach 05L Normal" text will be changed to "Approach 05L Downgraded", and the cause of the downgrade will be displayed below that.

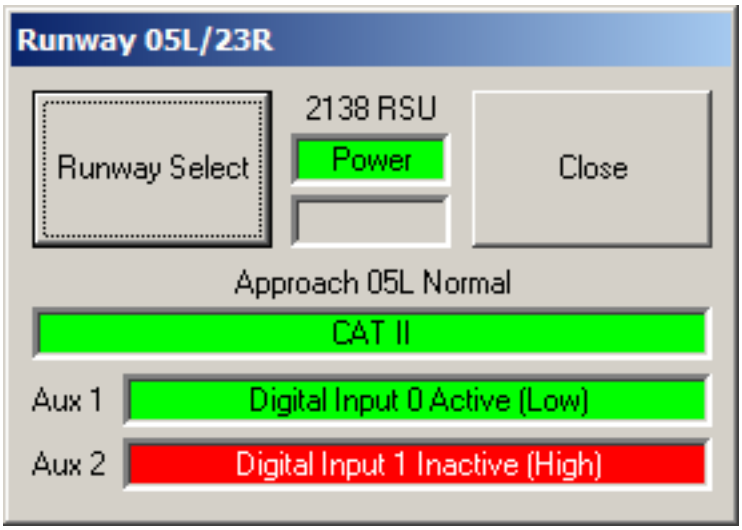


Figure 3-33 Runway Selection Window

This window also contains the status indicators for an optional 2138 RSU Module, if one is installed and the "No Master RSU" option is disabled.

The Power field indicates the status of the 2138 RSU Module's AC Power, with either "Power" in green under normal conditions, or "On Batteries" in red if the power supply for the 2138 RSU Module is not providing power and the module is running on batteries.

Located below the Power status field, the Comm Fail field indicates the status of the communications link between the RCSU and the 2138 RSU Module. If this link is not established, this field will contain "Comm Fail" with a yellow background.

If either of the 2138 RSU's Auxiliary Indicators has been enabled, the current status of the associated Digital Input will be displayed as shown above.

For interlocked runways, only one approach can be active at a time – the other must be interlocked off. This is controlled at either the RCSU or RSDU. To start the Interlock process, click on the Runway Select button. This will display the window shown in Figure 3-34. Note that the Runway Select button only be enabled if all of the following conditions are true:

a. All of the associated navaid systems are in communications with the RCSU.
b. None of them are currently in Local Mode.
c. External Interlock Input is not enabled for this runway.

Otherwise, changing the active runway via the Runway Select button is inhibited.

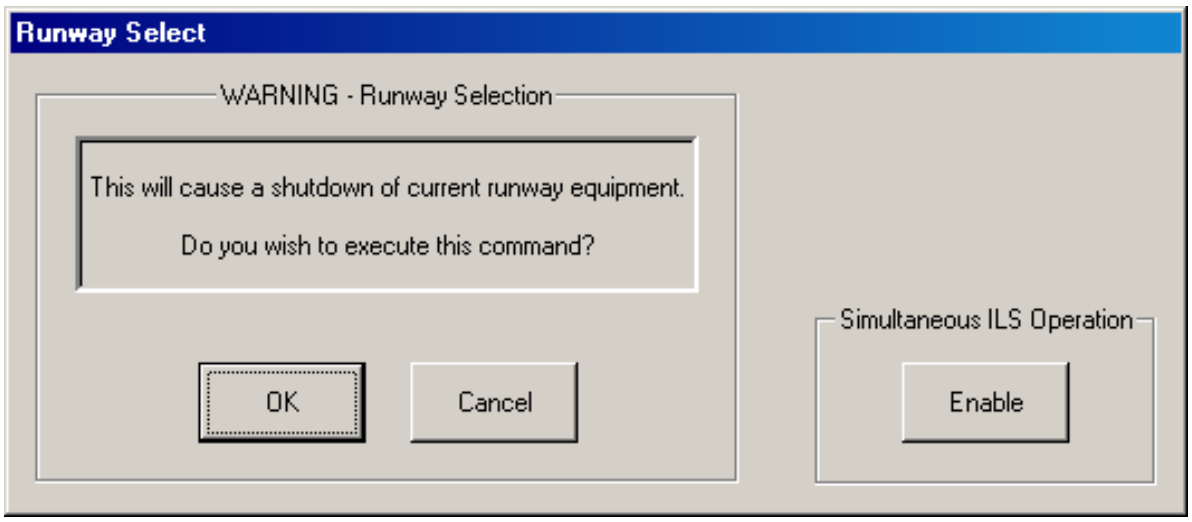


Figure 3-34 Runway Selection Prompt

To continue with the normal Interlock process, click on the "OK" button. This will cause the RCSU to shutdown the currently active ILS systems, delay per the Startup Delay parameter in the Runway's Configuration screen, then turn on the opposite approach's ILS systems.

For airport maintenance reasons, the operator may wish to bypass the interlock capability that the RCSU provides and turn on all of the navaids on two opposing approaches. This feature must first be enabled in the RCSU's System Configuration screen. It can be enabled for the RCSU and RSDU individually.

WARNING

Operating the ILS systems in Simultaneous ILS Operation Mode may cause interference in the ILS navigational signals.

The proper authorities must be notified prior to enabling this mode of operation.

This is done by clicking on the "Enable" button in the above window. If Simultaneous ILS Operation is selected, a further warning message is displayed:

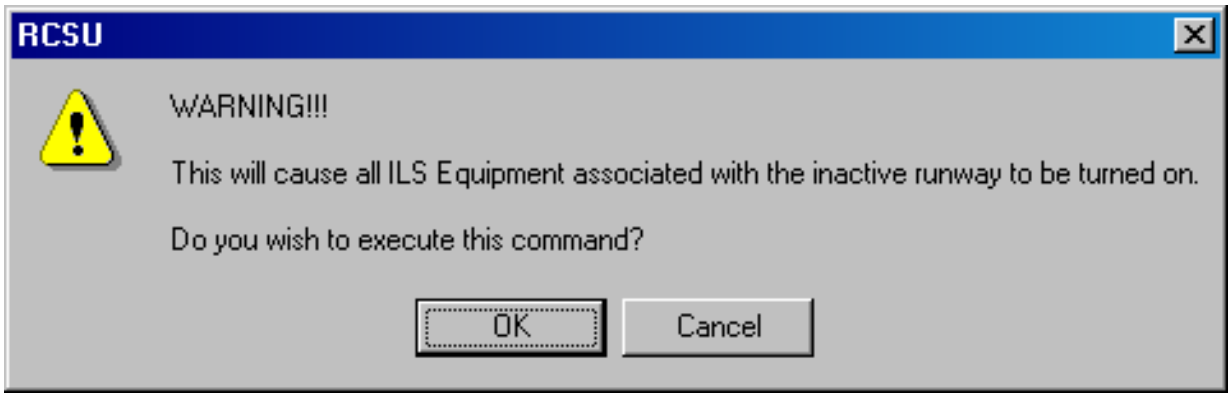


Figure 3-35 Simultaneous ILS Operation Warning

Clicking on the "Cancel" button will abort the operation, leaving the systems operating normally. Clicking on the "OK" button will turn on the navaids associated with the inactive runway, and change their Status Icons to red to indicate the abnormal mode.

To cancel the Simultaneous ILS Operation mode, click the corresponding Runway Select button again. The following prompt message will be displayed:

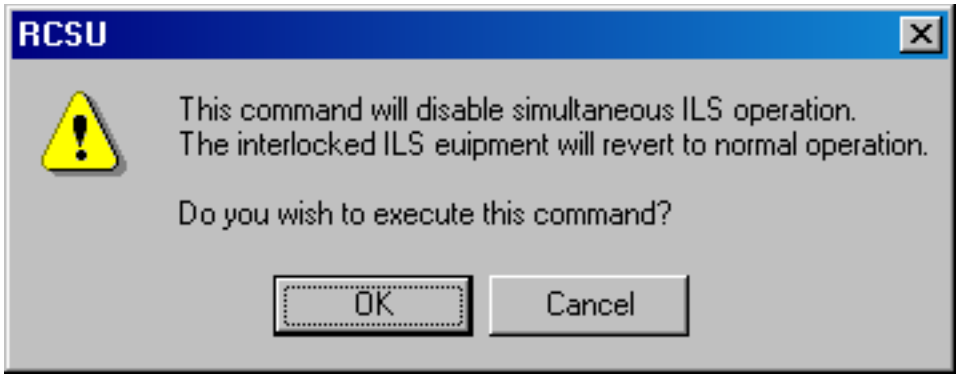


Figure 3-36 Canceling Simultaneous ILS Operation

Clicking on the "Cancel" button will keep the system operating in the Simultaneous ILS Operation mode. Clicking on the "OK" button will cause the RCSU to shutdown the navaids associated with the inactive approach, reverting back to normal interlocked operation.

3.5.4.5 Determining the Version/Part Number Information

To determine the version and Selex ES Inc. Part Number of the RCSU application, select the Info>>About RCSU menu item. The following window will be displayed:

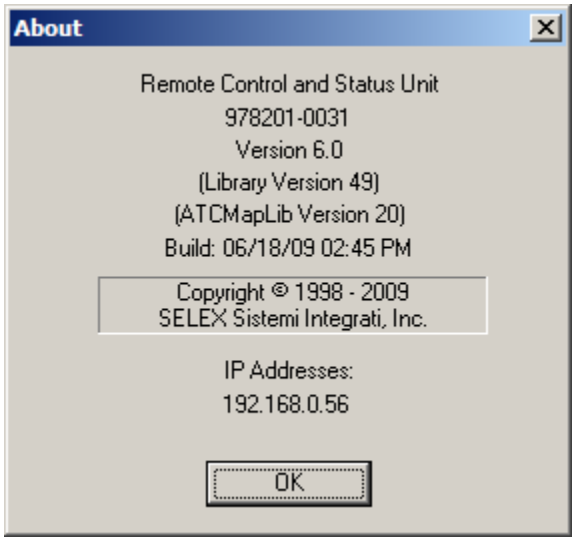


Figure 3-37 RCSU Application Information

This window displays information that is useful when discussing support issues with Selex ES Customer Service. It displays the Selex ES Inc. part number for the RCSU application, its software version, as well as additional revision information pertaining to the RCSU application.

Note that the RCSU PC's IP Address is also displayed for use when establishing Remote Access network communications with the RCSU. In certain instances, two IP addresses will be displayed since the RCSU can have two network interface jacks.

3.5.4.6 Closing the RCSU Application

Normally, the RCSU application is left running on the RCSU server indefinitely. If it should need to be closed, however, either select the System>>Exit RCSU menu item or click on the "X" in the upper right corner of the application. A warning message will be displayed, indicating that this will stop the status monitoring link. Clicking on the "Cancel" will abort the close operation, leaving the RCSU application operating normally. Clicking on the "OK" button will continue to close the RCSU application.

3.6 RSDU APPLICATION OPERATION

3.6.1 Overview

The Remote Status Display Unit (RSDU) application is a Microsoft Windows program that runs on the RSDU Server. Refer to Figure 3-38. The main RSDU screen contains two sections: the Sidebar, and the Map Display. To the left of the screen, the Sidebar contains buttons that perform the specified functions, such as adjusting the volume, or silencing the aural alarm. The Map Display contains the status icons of the configured navaids.

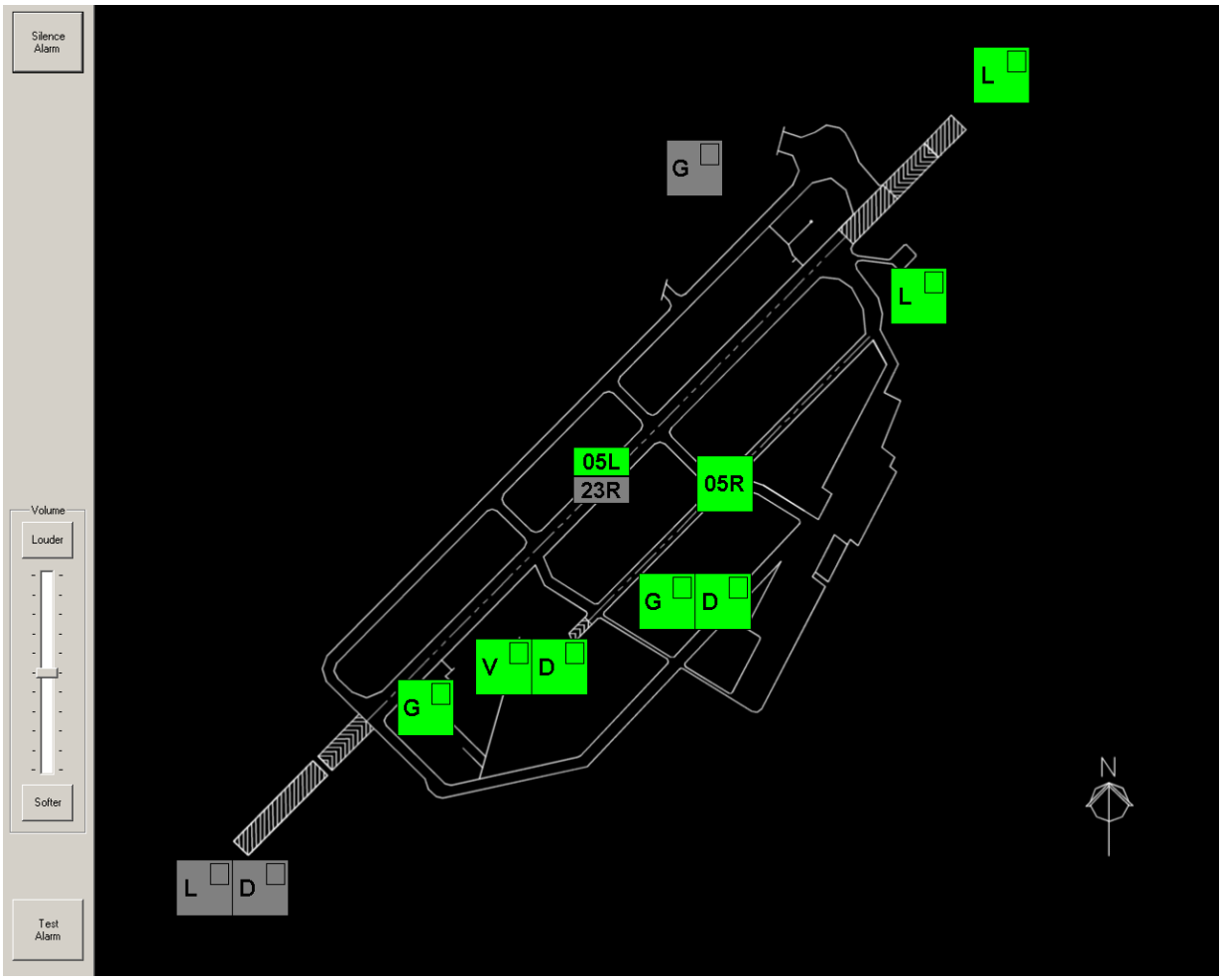


Figure 3-38 Model 2238 Remote Status Display Unit

3.6.2 Basic RSDU Control

Since the RSDU has been designed to run on the RSU Touchscreen LCD Monitor, the term "Press" will be used throughout this manual to refer to either touching the specified button or icon with a finger, or clicking the left mouse button while the cursor is over the specified button or icon.

Pressing any of the navaid or runway icons will open a new window displaying more detailed current status of the associated item. Pressing the "Close" button at the top of this window will close this detailed status window.

Other than during configuration, the RSDU is operated without the keyboard or mouse installed. Therefore, the normal Windows cursor is hidden to enhance the RSDU display. If desired, the cursor can be turned on by pressing CTRL-ALT-SHIFT-C on the keyboard. The cursor will be automatically turned off again once the user logs off of the RSDU by pressing the Log Off button on the Sidebar.

The RSDU's Sidebar displays user-selectable buttons according to the current Security Level. Pressing each button will perform the specified command.

The "Test Alarm" button will start the RSDU's audible alarm so that the volume can be set to the desired level. The "Silence Alarm" button will turn off the audible alarm.

The RSDU Sidebar also contains several volume controls and indicators as shown in Figure 3-39. Pressing the "Louder" button will move the Volume Indicator up by one step and make the audible alarm louder. Pressing the "Softer" button will move the Volume Indicator down by one step, making the audible alarm quieter. As a safety precaution, the red "Low Volume" indicator is displayed as shown in Figure 3-40 if the Volume is turned all the way down.

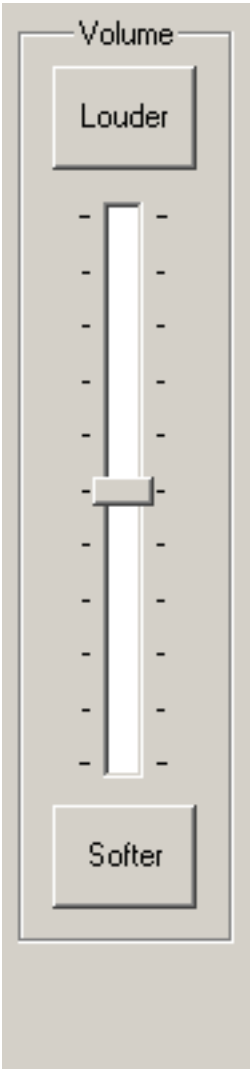


Figure 3-39 RSDU Volume Controls

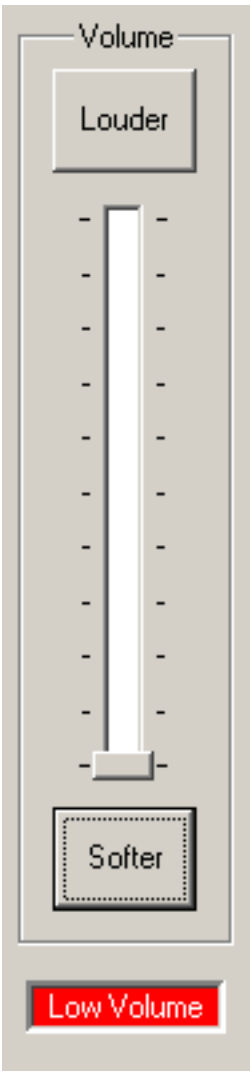


Figure 3-40 RSDU Volume Controls - Low Volume Indicator

3.6.3 Configuration

The RSDU software must be configured with the same Airfield Map used on the RCSU, as well as the RCSU connection information, as detailed below.

3.6.3.1 Logon/Logoff

As detailed above in Section 3.4.3, access to the RSDU's System Configuration and Security Access Configuration screens is restricted through the use of username and passwords. To configure the RSDU, install the keyboard and mouse in the USB ports. Press CTRL-ALT-SHIFT-L to display the Login Prompt, and enter the username and corresponding password for a Security Level 3 user. By default, this will be SEC3/THREE. Figure 3-41 displays the logon prompt.

Figure 3-41 RSDU Login Prompt

Once the RSDU validates the username and password, the "Configure" button will be displayed on the Sidebar.

To access the Security Codes screen, available only through a Security Level 4 login, press CTRL-ALT-SHIFT-L again and login with the Level 4 user ID and password. This will add a "Security" button to the Sidebar. The full Sidebar is shown below in Figure 3-42.

To logoff of the RSDU, press the "Logoff" button on the Sidebar. The "Logoff", "Configure", and "Security" buttons will be hidden.

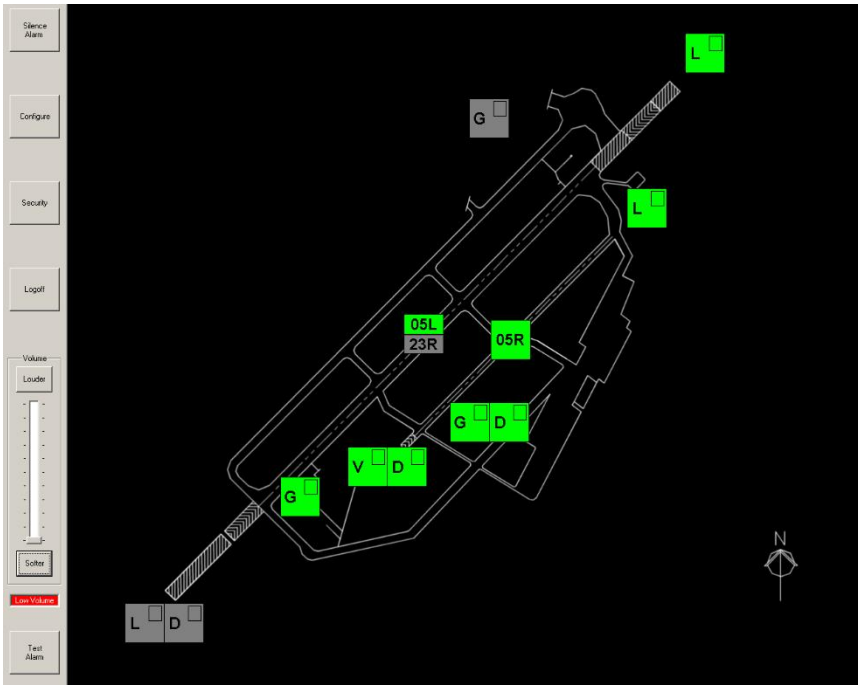


Figure 3-42 RSDU with all Sidebar Controls

3.6.3.2 RSDU System Configuration

Once logged in at either Security Level 3 or Security Level 4, configuration changes can be made. To configure the RSDU System, press the "Configure" button on the Sidebar. Figure 3-43 displays the RSDU Configuration screen. Once the user has updated the RSDU Configuration screen, pressing the "OK" button will save the new configuration. Pressing the "Cancel" button will close the window without changing the configuration. Pressing the "Restore Defaults" button will restore the default the Map and Wave files, as well as the Network Connection type settings.

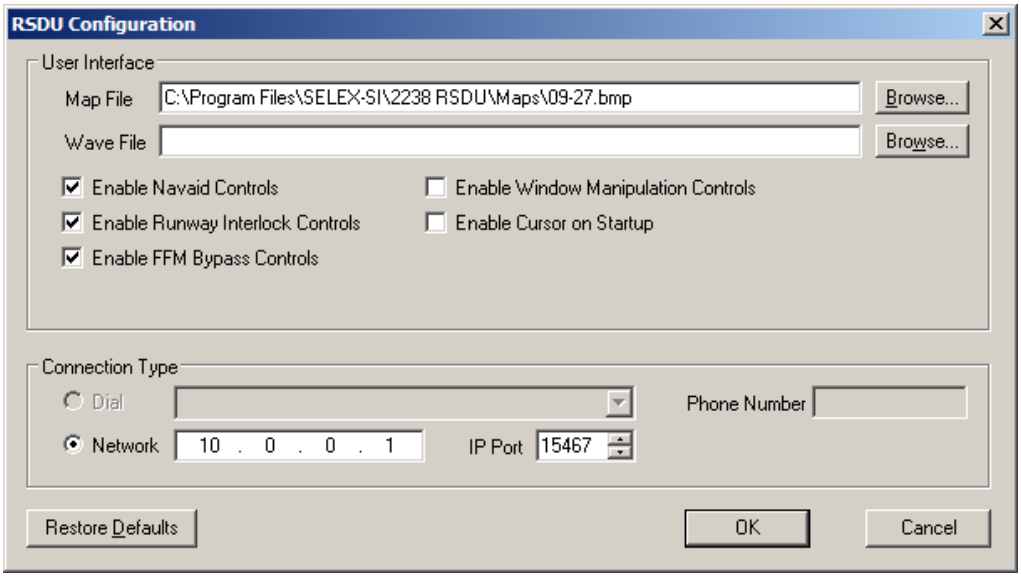


Figure 3-43 RSDU Configuration Screen

3.6.3.2.1 Airfield Map Selection

The background map shown in the RSDU's main display is specified in the Map File field. Pressing the "Browse" button opens the Select Map File screen shown in Figure 3-44.

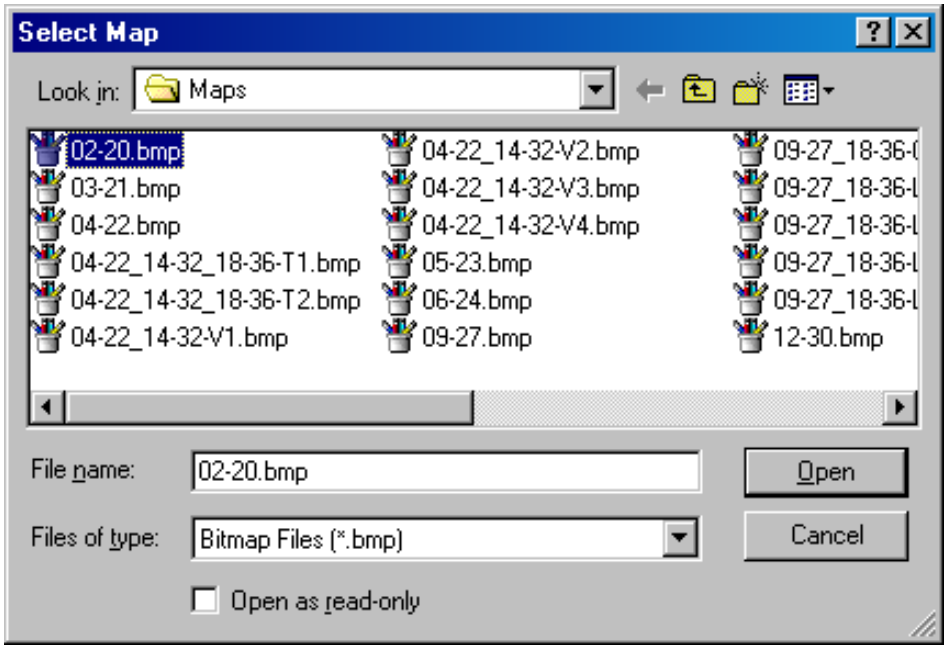


Figure 3-44 Select Map File Screen

A selection of generic airfield layout maps are provided with the RSDU, located in the Maps sub-folder of the RCSU

installation. The filename of each supplied map file indicates the approach or approaches depicted. These map files are standard Windows bitmaps.

If so desired, the user can substitute a bitmap that is more specific to their airfield layout. If this is done, the following recommendations should be followed:

a. Although the RSDU will automatically scale supplied bitmap to fit in the Map Display screen area, the recommended size is 1180 x 1024 pixels.
b. To enhance the status of the navaid and runway icons, which can be green, red, or yellow, the bitmap should be grayscale, preferably with a black background.

3.6.3.2.2 Alarm File Selection

The audible alarm that is activated by the RSDU is a standard WAV file. The default alarm file can be replaced by the one specified in the Alarm File field of the RSDU Configuration screen. Pressing the "Browse" button opens the Select Alarm File screen shown in Figure 3-45.

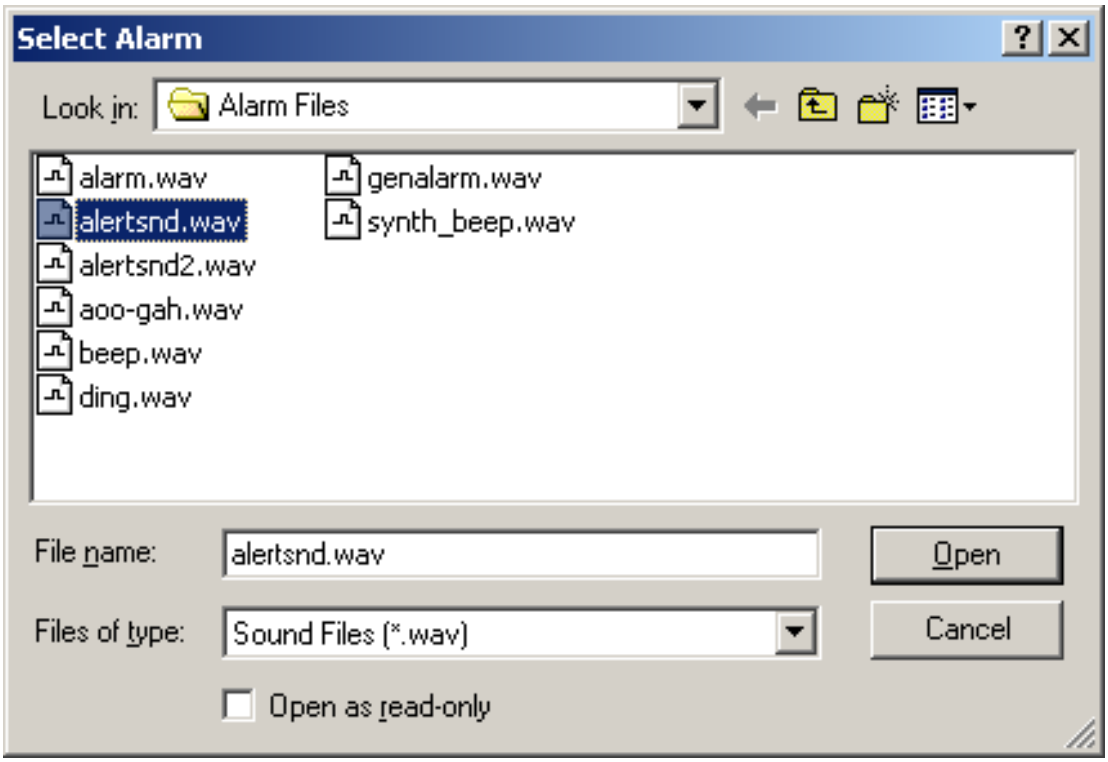


Figure 3-45 Select Alarm File Screen

A selection of wave files are provided with the RSDU, located in the Alarm Files sub-folder of the RSDU installation. These map files are standard Windows WAV files. The default Alarm File is named "ALERTSND.WAV".

If so desired, the user can substitute another wave file. If this is done, the following recommendations should be followed:

a. The RSDU application will automatically loop the wave file, so only one cycle is needed.
b. The wave file's volume should be normalized so that it's neither too loud nor too soft for the operating environment.

3.6.3.2.3 RSDU User Interface Configuration

The following controls are available to allow the user to customize the RSDU's user interface:

Three controls are provided to allow multiple RSDUs to be used throughout the airfield for status display, while maintaining only one control point. The "Enable Navaid Controls" option can be disabled to remove all control capability from the navaid detailed status screens, such as On, Off, Transfer, and Reset. The "Enable Runway Interlock Controls" option can be disabled to remove the Runway Interlock capability from the RSDU. The "Enable FFM Bypass Controls" option can be disabled to remove the FFM Bypass control from a Localizer's detailed status screen.

Two controls are provided to allow the RSDU to be used in either a touchscreen-only environment, or a more traditional monitor/mouse configuration. With the "Enable Window Manipulation Controls" option set, the RSDU will run in a standard resizable window, with minimize, maximize, and close buttons in the upper right corner. Otherwise, the RSDU runs in fullscreen mode, which is appropriate for a touchscreen. With the "Enable Cursor on Startup" option set, the RSDU's mouse cursor is displayed as expected for a standard PC system. For a touchscreen system, this option is typically disabled. Pressing Ctrl-Alt-Shift-C toggles the cursor on and off at any time, regardless of this configuration setting.

3.6.3.2.4 RCSU Connection Configuration

The RSDU currently supports a connection to the RCSU over a TCP/IP network – the Dial fields in the Configuration Screen are for future enhancements via a dial-up telephone line.

The Network IP Address field in the RSDU's Configuration Screen must be set to the IP Address of the RCSU. By default, the RCSU's IP Address is 10.0.0.1, and the RSDU is 10.0.0.2. The operational settings for these IP Addresses must be coordinated with the facility IT personnel prior to system installation.

The IP Port field must be set to the same value used in the RCSU's Remote Access section of its System Configuration screen. This is 15467 by default.

Note that the RSDU connection to the RCSU will not work if a firewall is between the RCSU and RSDU. The firewall must be specifically configured to forward port 15467 requests to the RCSU Server for the RSDU connection to be operational.

3.6.3.3 User Accounts Configuration

As detailed in Section 3.4.3, access to the RSDU is restricted through the use of User Accounts. To configure these User Accounts, login to Security Level 4 and press the "Security" button on the Sidebar. This will display the Security Codes screen, as shown in Figure 3-46. Note that the time stamp on this screen indicates the time and date of the last change to the user accounts.

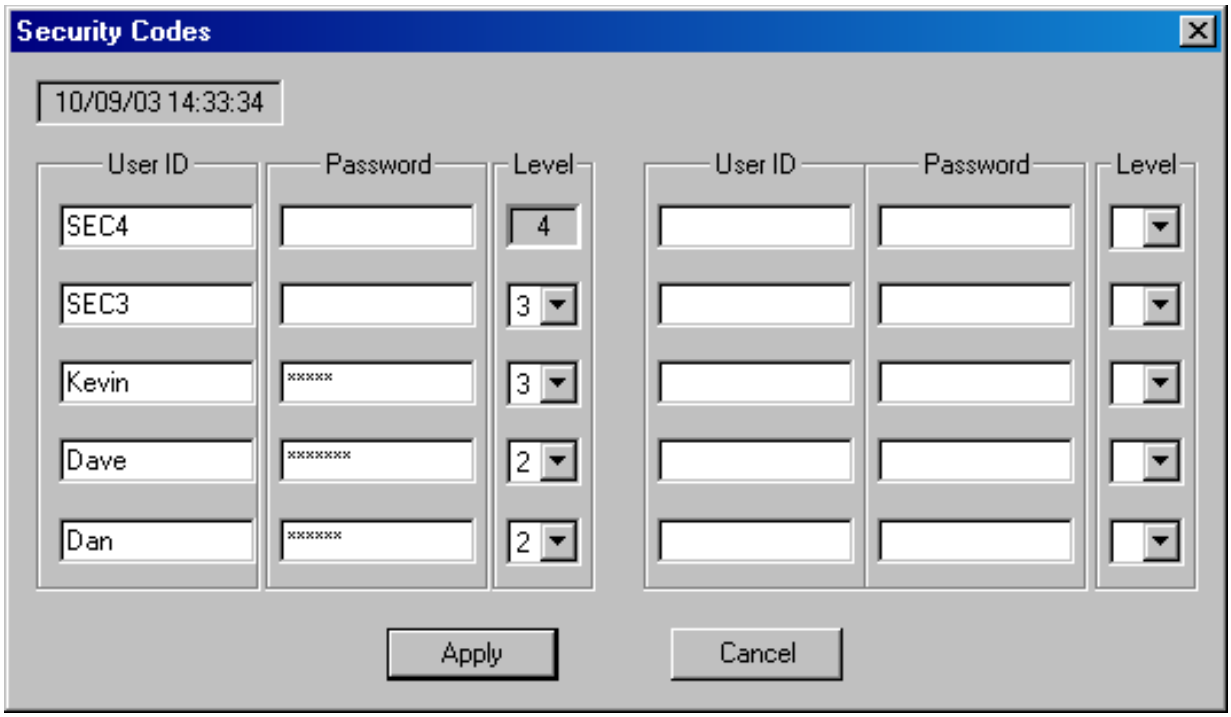


Figure 3-46 Security Codes Screen

This screen is used to configure the security access passwords for each user, including User ID, Password, and Security Level. This User ID/Password information is encrypted and stored in a file on the RSDU Server. This screen is only available to the Level 4 user. As part of initial configuration, several user accounts should be setup, corresponding to the access levels required.

3.6.3.4 Add a User Account

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Click on any empty User ID field.
c. Enter the desired User ID. Note that the User ID must be 4 to 8 characters in length, is case-sensitive, and can contain any alphanumeric characters.
d. Press TAB to move to the associated Password field.
e. Enter the desired Password. Asterisks will hide the password on the display. Note that the password must be 4 to 8 characters in length, is case-sensitive, and can contain any alphanumeric characters.
f. Select the desired Security Level for this user.
g. Repeat these steps for any additional users.
h. When all users have been configured, press the Apply button to save the new User Account data.

3.6.3.5 Change a User's Password

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Select the Password field associated with the desired User ID.
c. Enter the desired Password, which is case-sensitive. Asterisks will hide the password on the display. Note that the password must be 4 to 8 characters in length, and can contain any alphanumeric characters.
d. Press the Apply button to save the new User Account data.

3.6.3.6 Delete a User's Account

a. Log on to Security Level 4 and select the System>>Security menu item.
b. Select the desired User ID field.
c. Delete the User ID in this field, leaving it blank.
d. Press the Apply button to save the new User Account data.

3.6.4 Operation

Once the RSCU has been configured, it will connect to the RCSU via the network cable and display the status of all configured navaids. Operation of the RSDU is identical to that of the RCSU for most of its features. Refer to Section 3.5.4 covering the RCSU Operation. Only the few operational differences between the RCSU and RSDU applications are detailed below.

3.6.4.1 Equipment Status Display – Maintenance Alerts

The Equipment Status Icon, shown in Figure 3-47, displays the status of the associated equipment.

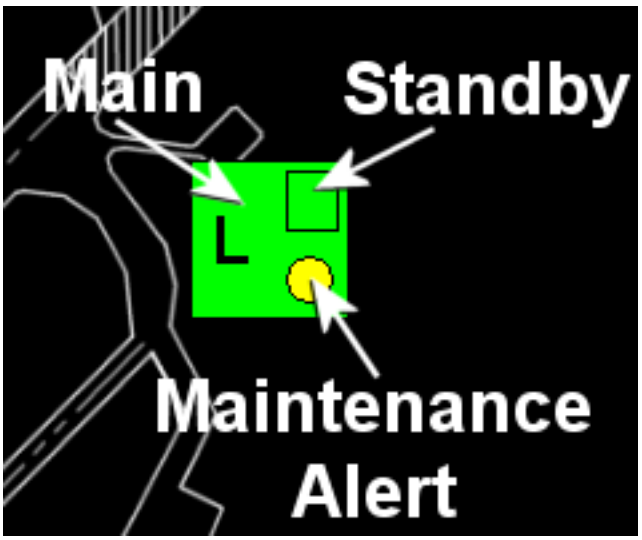


Figure 3-47 Equipment Status Icon Legend

The yellow circle in the lower right corner of the icon will be displayed to indicate a Maintenance Alert condition. Since the RSDU is designed primarily for use by ATC personnel for current operational status indications and not maintenance issues, this Maintenance Alert indicator is only activated for the following conditions at the navaid site:

a. AC Failure
b. System operating on Batteries
c. Local Mode is enabled

In addition to these conditions that should be indicated to ATC personnel, all other maintenance alerts (such as pre-alarms, smoke detector, etc) activate the Maintenance Alert indicator at the RCSU.

3.6.4.2 Runway and Equipment Controls

While the Equipment Status Icons provide summary-level status for the associated equipment, more detailed status for each system is available by pressing the Status Icon.

Figure 3-48 shows the RSDU's detailed status window for a Dual 2100 Localizer in normal operation. All of the detailed equipment screens and their controls and indicators on the RSDU are the same as those detailed above in Section 3.5.4 for the RCSU application.

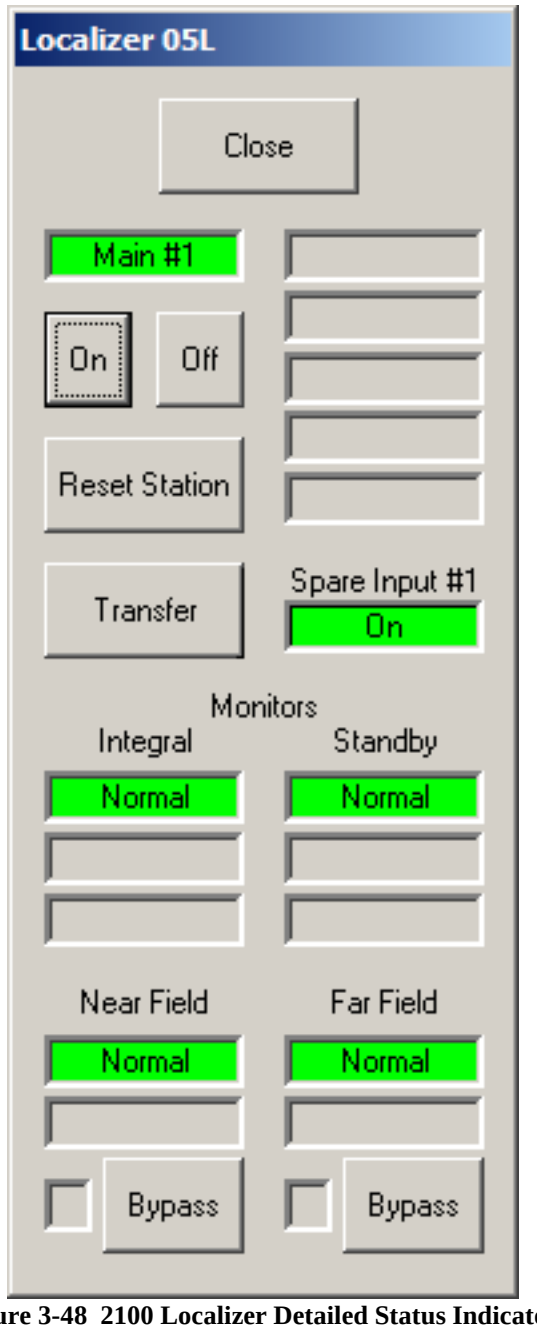


Figure 3-48 2100 Localizer Detailed Status Indicators

3.6.4.3 Alternate RSDU Displays

Under normal system operation, the RSDU displays the status of all configured equipment, as shown in Figure 3-38. However when the RCSU is in Configuration Mode, it is no longer polling the equipment for their status. To indicate this loss of current equipment status, the RSDU display changes as shown in Figure 3-49, with the yellow "Config" indicator in the upper left corner, and all of the status icons grayed out. Once the RCSU is returned to Normal Mode, the RSDU display will be updated with the new configuration, and the status icons will again be active.

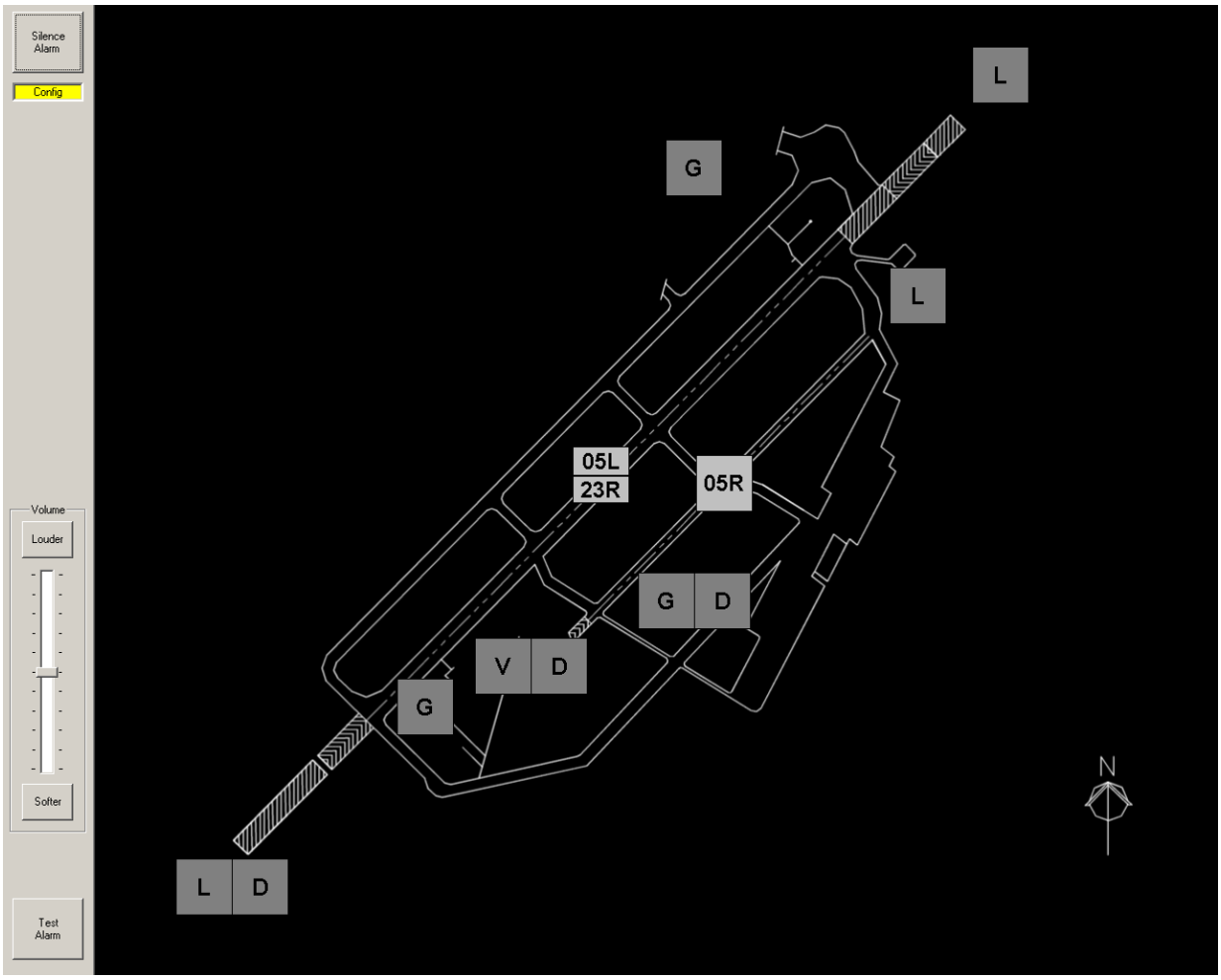


Figure 3-49 RSDU Display with RCSU in Configuration Mode

Similarly, if the communications link between the RSDU and the RCSU is broken, the RSDU display will change as shown in Figure 3-50. The yellow “Comm Fail” indicator is displayed in the upper left corner, and all of the status icons are grayed out. Once the link is re-established between the RSDU and RCSU, the RSDU display will revert to being active.

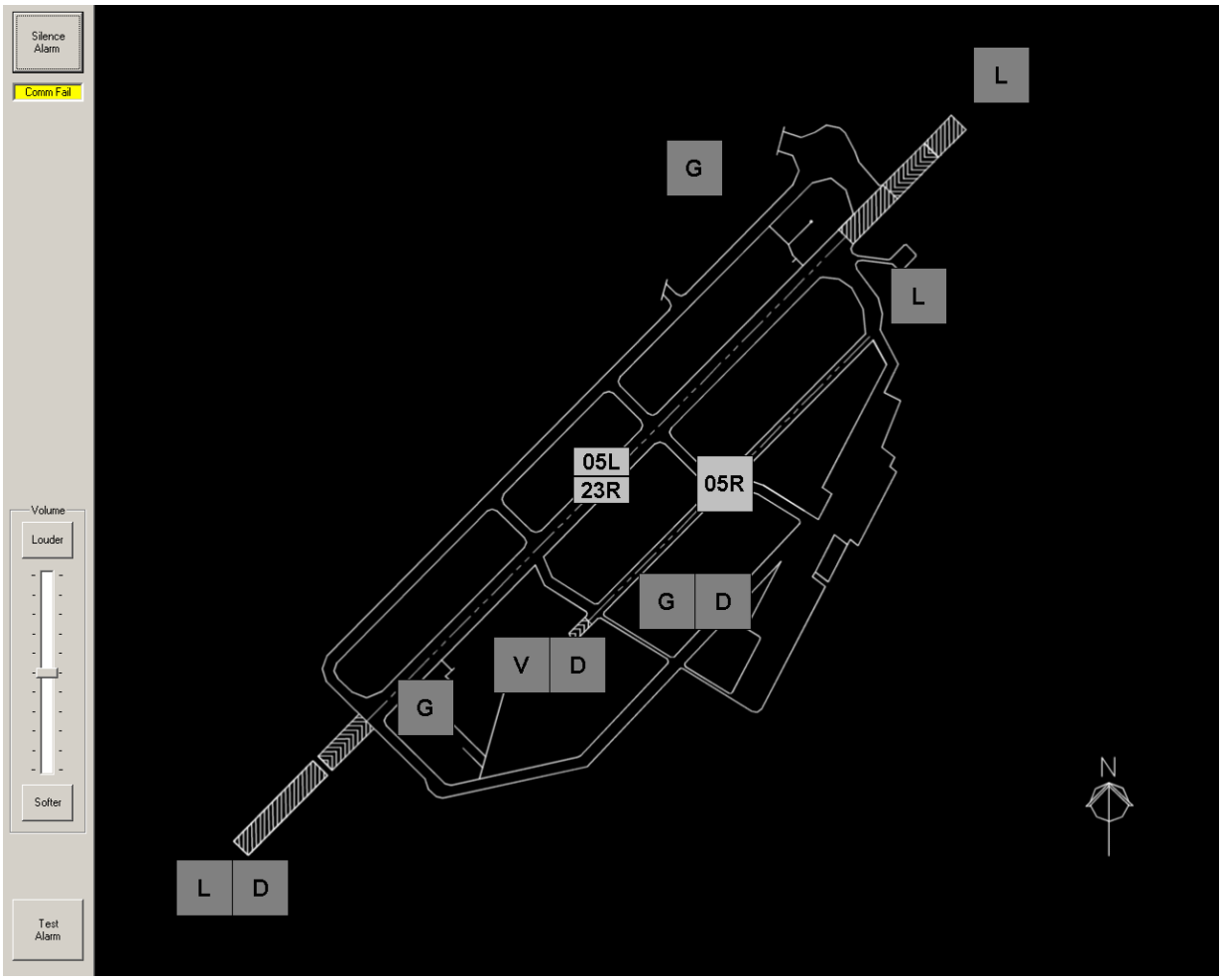


Figure 3-50 RSDU Display with RCSU Comm Fail

3.6.4.4 Determining the Version/Part Number Information

To determine the version and Selex ES Inc. Part Number of the RSDU application, install the keyboard in one of the front-panel USB ports and press CTRL-ALT-SHIFT-A to display the RSDU's About window. The following window will be displayed:

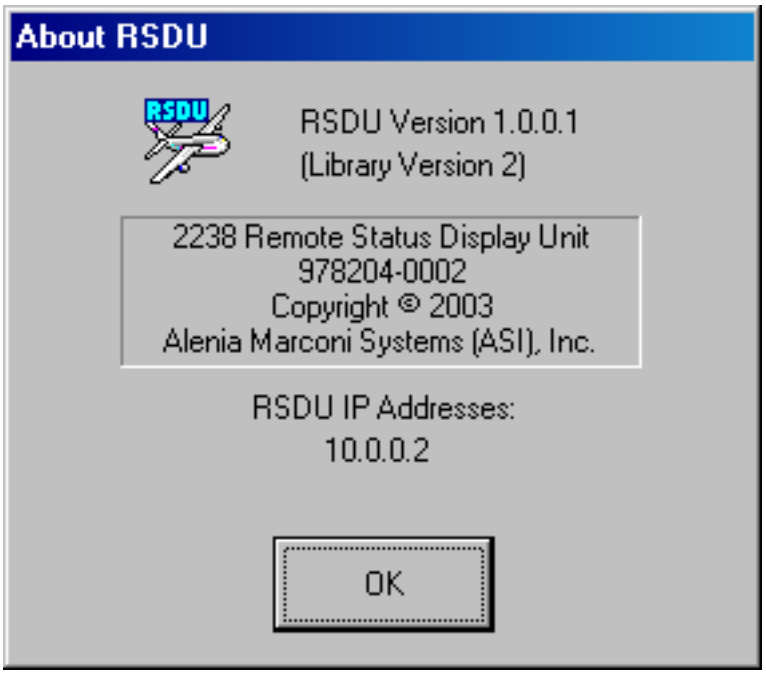


Figure 3-51 RSDU Application Information

3.6.4.5 Closing the RSDU Application

Normally, the RSDU application is left running on the RSDU server indefinitely. If it should need to be closed, however, install the keyboard in one of the front-panel USB ports and press ALT-F4. A warning message will be displayed, indicating that this will stop the RSDU application. Pressing the "Cancel" will abort the close operation, leaving the RSDU application operating normally. Pressing the "OK" button will continue to close the RSDU application.

3.7 2138 RSU MODULE CONTROLS AND INDICATORS

In addition to the 2238 RSDU Server, the 2238 RCSU can support a 2138 RSU Module, which provides status and Runway Selection control for a single runway. The 2138 RSU Module is a small, panel mount device. Refer to Figure 3-52 for the layout of the controls and indicators on the 2138 RSU Module.

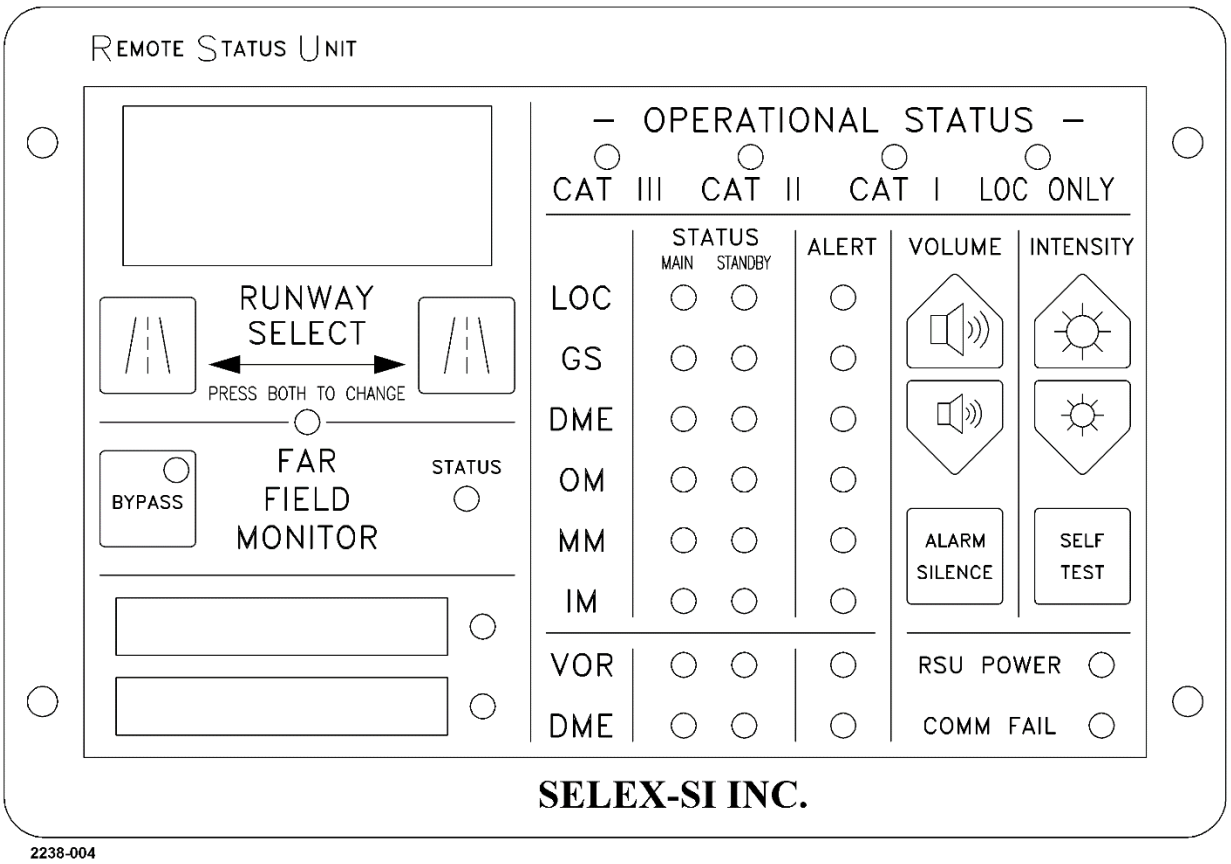


Figure 3-52 2138 RSU Module

The controls and indicators on the 2138 RSU are detailed as follows:

Active Runway - 3 digit alphanumeric LED display used to indicate the Active Runway ID, as specified in the Runway Configuration Screen.

Runway Select - Control, Turns off the active runway's ILS systems and turns on the inactive runway's ILS systems, interlocking the two ends of the runway so that they can never be radiating at the same time. As a safety mechanism, both Runway Select buttons must be pressed simultaneously to switch runways. When both Runway Select buttons have been pressed, the RCSU will immediately send the "RCSU Off" command to each active navaid, and the RSU's Active Runway display will flash the currently active runway ID until that equipment turns off. Then, the RCSU will delay for the duration of the Interlock Delay as configured by the user, which is 20 seconds by default. The RSU Module's Active Runway display will flash the new runway ID during this period, until that equipment is turned on. Once the Interlock Delay expires, the RCSU sends the "RCSU On" command to each of the newly activated navaids to turn them on. Once the new active runway equipment is on, its runway ID will be displayed continuously.

Note that the 2138 RSU will display an error message if it cannot process the Runway Select command and initiate the Interlock transition. These messages are as follows:

RSU Error Message	Cause
ERR LCL ERR	Any of the ILS stations are in Local Mode
ERR COM ERR	Communications Fault to any of the ILS stations
ERR BSY ERR	Interlock transition is already in process
ERR CFG ERR	External Interlock enabled, or Interlock disabled

Far-Field Monitor

Status -	Green	FFM is normal
	Red	FFM detecting an alarm
	Off	Not configured present
Bypass - (Indicator)	Yellow	FFM is bypassed
	Off	FFM is not bypassed

Bypass - (Control) Toggles the FFM Monitor Bypass Mode. Note that the 2138 RSU will display an error message if it cannot process the FFM Bypass command and toggle the FFM Bypass Mode. These messages are as follows:

RSU Error Message	Cause
ERR LCL ERR	The Localizer station is in Local Mode
ERR COM ERR	Communications Fault to the Localizer station
ERR BSY ERR	Interlock transition is in process
ERR CFG ERR	Either no FFM or no Localizer configured present

Auxiliary Status

The 2138 RSU Module has two Auxiliary Equipment indicators, with writeable areas to label the equipment. These indicators display the current status of the Auxiliary Inputs, as set in the Runway Configuration Screen. If configured for any condition except "None", a text message will indicate the status of the selected condition and the background color of the indicator will be either:

Green	The selected Auxiliary Condition is True.
Red	The selected Auxiliary Condition is False.
Gray	The Auxiliary Condition is set to "None".

Operational Status

CAT III, CAT II, CAT I, LOC ONLY - Displays the current Category Level of the active runway's ILS systems, based on the Maximum Category parameter in the Runway Configuration Screen, and the current status of the ILS equipment as shown in Table 3-3:

Table 3-3 Operational Status Categories – 2138 RSU		
Equipment Type	**Operational Status**	**Category**
Single	Localizer and Glideslope equipment On	CAT I: CAT III: OFF CAT II: OFF CAT I: ON LOC ONLY: OFF
	Glideslope equipment Off, Localizer equipment On	Loc Only: CAT III: OFF CAT II: OFF CAT I: OFF LOC ONLY: ON
Dual	Localizer and Glideslope subsystems operating normally (main transmitters connected to the antenna systems, no monitor alarms or alerts, no Localizer or Glideslope subsystem-to-RCSU communication faults) * For CAT II installations, the CAT III LED will be OFF for this condition.	CAT III: CAT III: ON* CAT II: ON CAT I: ON LOC ONLY: OFF
	Monitor mismatch condition at Localizer or Glideslope (CAT III downgrade condition)	CAT IID: CAT III: OFF CAT II: ON CAT I: ON LOC ONLY: OFF
	FFM detects Localizer course misalignment in excess of CAT III tolerance for nominal 2 seconds (adjustable from 1 to 10 seconds) (CAT III downgrade condition)	CAT IIC: CAT III: OFF CAT II: ON CAT I: ON LOC ONLY: OFF
	Localizer operating normally and Glideslope operating on Standby equipment (CAT III downgrade condition) * For CAT II installations, the CAT III LED will be OFF for this condition.	CAT IIB: CAT III: BLINK* CAT II: BLINK CAT I: OFF LOC ONLY: ON
	Localizer operating on Standby equipment; Glideslope operating on either Main or Standby. (CAT II downgrade condition)	CAT II: CAT III: OFF CAT II: BLINK CAT I: OFF LOC ONLY: ON
	FFM detects Localizer course misalignment in excess of CAT III tolerance for nominal 5 seconds (adjustable from 1 to 120 seconds)	CAT I: CAT III: OFF CAT II: OFF CAT I: ON LOC ONLY: OFF
	Glideslope Main and Standby equipment OFF; Localizer on Main or Standby	Loc Only: CAT III: OFF CAT II: OFF CAT I: OFF LOC ONLY: ON

Equipment Status

Main Status -	Green	Main station is operating normal
	Red	Main station is in alarm
	Off	Not Configured, Comm Fail, Local Mode, or Bypassed
Standby Status -	Green	Main and Standby stations are operating normal
	Red	Standby station is in alarm, or Main is not transmitting
	Off	Not Configured, Comm Fail, Local Mode, or Bypassed
Alert -	Yellow	For 2100 ILS/1150 VOR: Integral Monitor Bypass, Local Mode, Comm Fail, AC Failure, or On Battery For DME (co-located w/2100 or 1150): Main Monitor Bypass, Comm Fail, AC Failure, or On Battery
	Off	None of these alert conditions exist

Miscellaneous

Volume Control - Up, Turns on the audible alarm and increases the volume.
Down, Turns on the audible alarm and decreases the volume.
Press Alarm Silence to turn off the alarm following adjustments.

Intensity Control - Up, Increases the intensity of the green LED indicators.
Down, Decreases the intensity of the green LED indicators.

Alarm Silence - Control, Silences the current audible alarm. Note that any future audible alarms will not be automatically silenced. 2138 RSU modules containing v2.0 or higher firmware support Auto-Silence Alarms. If the "Auto-Silence Alarms" option is enabled in the RCSU Configuration Screen, the audible alarm on the 2138 RSU module will be automatically silenced when all of its status indicators are "normal".

Self Test - Control, Turns on all indicators while the Self Test button is depressed. When released, the RCSU/RSU communication link is verified through a specific sequence of indicators. Pressing the Self Test button again during the communication link test will cancel the test and cause the RSU to resume normal operation. Refer to Section 6.2.6 for the details of the self test.

RSU Power -	Green	RSU is operating on its DC Power Supply
	Red	RSU is operating on its batteries
Comm Fail -	Yellow	No communications between RCSU and 2138 RSU
	Off	RCSU/RSU communication established

3.8 RSMS APPLICATION OPERATION

3.8.1 Overview

The Remote Status Monitoring System (RSMS), 470429-0001, is a Windows-based software application that is typically installed in a regional maintenance center. It is used to remotely monitor the status of the region's navaids for maintenance purposes. It runs on a desktop or notebook PC containing one or more modems, or an optional secure TCP/IP network connection. It polls the ILS, VOR, DME, TACAN, and VORTAC equipment for current status, either directly or through an associated 2238 RCSU.

The RSMS displays the status graphically using colored icons placed on a top-level regional map, similar to the RCSU and RSDU displays. Refer to Figure 3-53. In order to reduce clutter for multiple airports and regions on the top-level map, multiple layers of maps can be used such that the top level map represents the entire country or region, with Site or RCSU icons representing the individual airports or navaid installations.

The main RSMS screen layout contains four general sections. Along the top of the RSMS is the System Menu and the various Site tabs, one for each Site or RCSU that is currently being monitored. To the left of the screen, the Sidebar contains buttons to control to the RSMS system during its normal operation. The Map Display contains the status icons of the configured equipment. The Status Bar at the bottom of the screen displays the current Security Level, User ID, and the time of the last and next status polls.

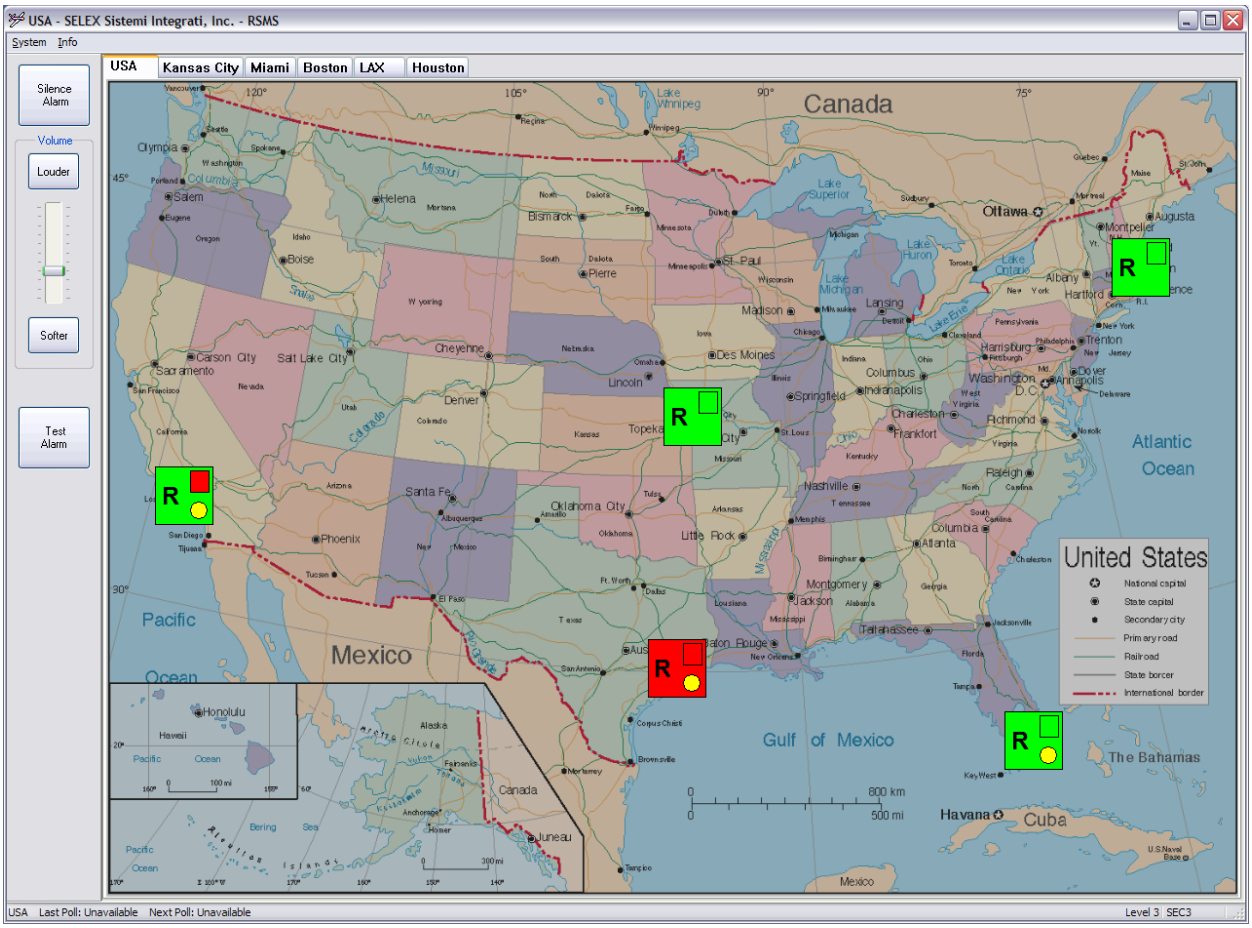


Figure 3-53 RSMS Top-level Map Status Display

The top-level map display shows the summary-level status for the configured equipment. Double-clicking on any of the Site or RCSU icons will bring up the associated airfield map, displaying status icons for each of the related navaid stations at that site as shown in Figure 3-54. The Site tabs along the top of the RSMS screen can also be used to display the site's airfield map.

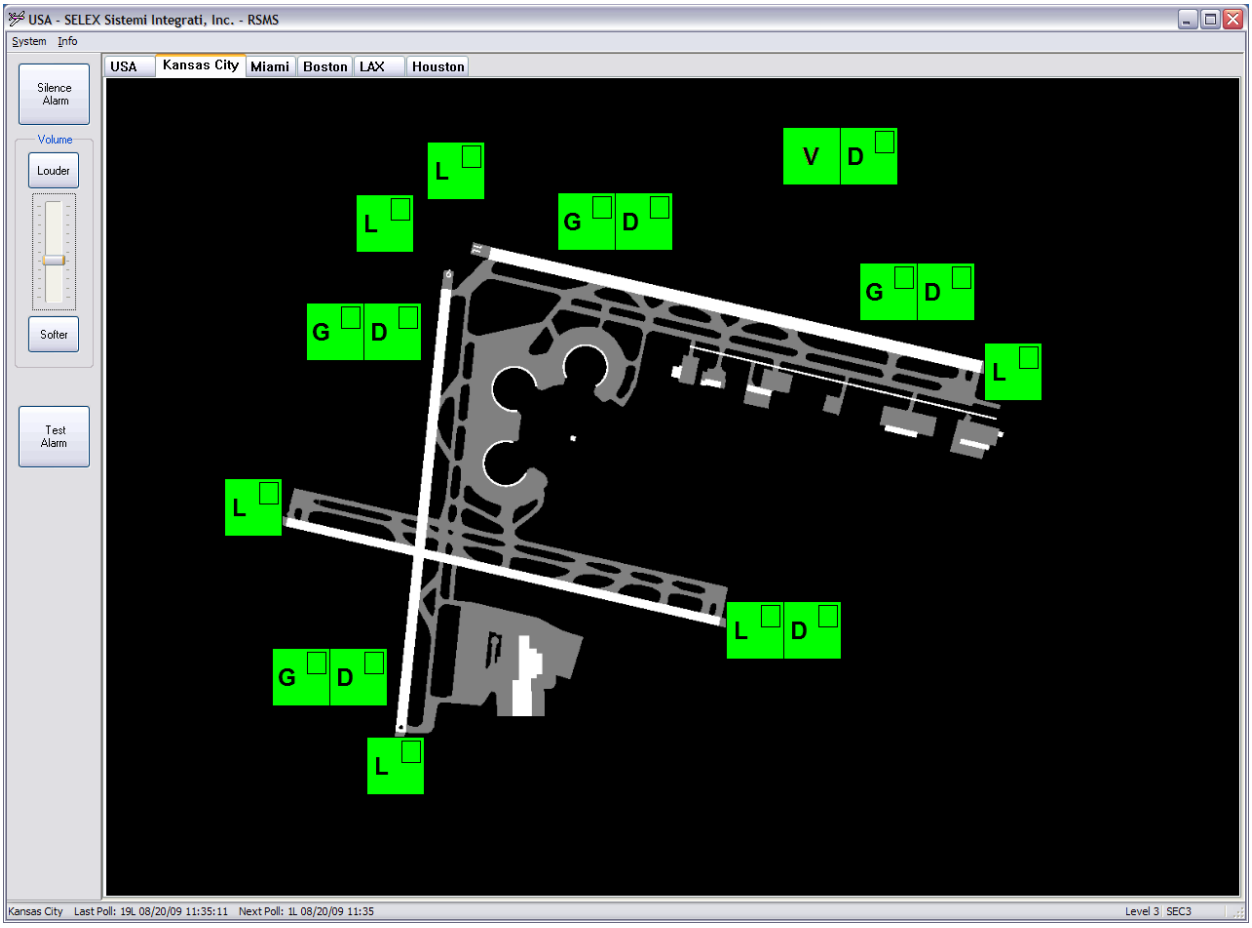


Figure 3-54 RSMS RCSU/Site Status Display

Double clicking on a navaid icon displays a text-based representation of the station's status. Note that the equipment controls (On, Off, Transfer, Reset, etc) that are found on the RCSU and RSDU are not available from the RSMS. The RSMS is designed for status monitoring for maintenance purposes only.

3.8.2 RSMS Controls

Typically, the RSMS is running in Normal Mode, in which it polls each of the RCSUs or navaids at the specified time. In this mode, the user can use the Test Alarm and Volume controls on the sidebar to adjust the RSMS's audible alarm volume level. The Silence Alarm button is used to acknowledge an alarm event and silence the audible alarm.

The Info menu option is used to display the RSMS version and other build information.

3.8.3 Operational Notes

The RSMS displays high-level maintenance status for the associated equipment. To determine the exact cause of equipment alarms or alerts, the PMDT software should be used to dial the equipment directly or dial the 2238 RCSU connected to the equipment and use the PDMT pass-though feature.

Modem-based RCSU and Equipment status can be updated manually at any time by right-clicking on the associated icon and selecting “Update Now”.

The Poll Time/Interval options allow the user to specify when the polling takes place. For example, if the Poll Time is set for 7:55 AM and the interval is 1 hour, then calls will be made each day starting at 12:55 AM, and then repeat every hour at 5 minutes before the hour.

For modem-based 2238 RCSU connections, the Poll Interval should be set no higher than the worst-case delay between an equipment failure and the user’s need to know about that failure. If enabled for “Dial-out on Status Change”, the RCSU will call out to the RSMS upon a status change from any associated navaid.

The RSMS will retry a modem-based connection within two minutes if it experiences a communications failure.

The RSMS can use one or more TAPI modems. Multiple pieces of equipment can use the same start time and will be handled sequentially until all sites are contacted. If multiple TAPI modems and phone lines are available then connection to sites can occur simultaneously.

While a modem-based Navaid or RCSU is being polled, its icon turns blue. An orange RCSU icon means that the RSMS was unable to connect to the RCSU equipment. The RCSU icon will be yellow if any of the Navaid equipment connected to the RCSU has a communications fault.

A grey icon is displayed when a station is disabled from polling.

3.8.4 Configuration

The RSMS typically operates in Normal Mode, with its Configuration Mode only being used during the initial configuration of the application. To enter Configuration Mode, the user must first log in to Security Level 3 or higher using the System>>Logon menu option. Once logged in, the user must select the System>>Enter Configuration Mode menu option.

3.8.4.1 RSMS System Configuration

Before any navaids or RCSUs can be configured in the RSMS, the RSMS System Configuration must be established. With Configuration Mode active, select the System>>Edit System Configuration menu option to display the RSMS Configuration screen.

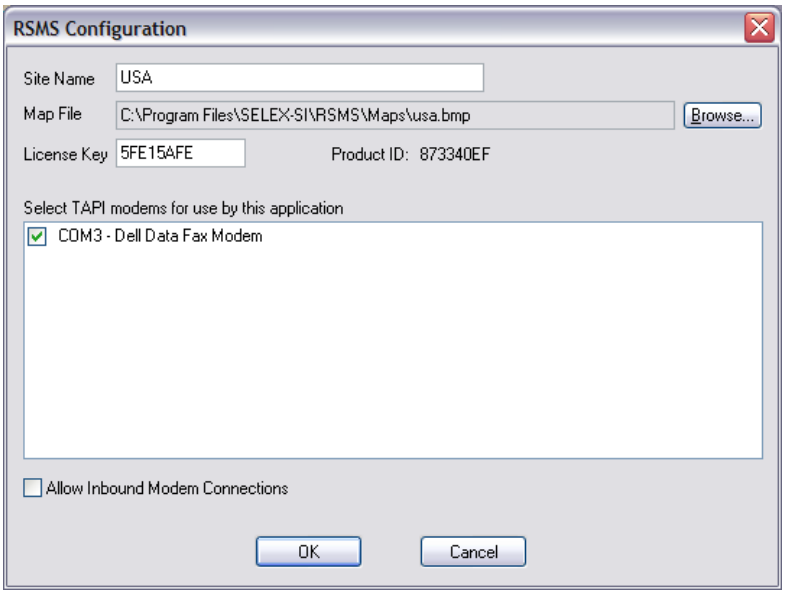


Figure 3-55 RSMS System Configuration

An appropriate name for this RSMS installation should be entered into the Site Name field. Typically, this is the name of the region to be displayed on the top-level map.

The Browse button is used to select the main map for the RSMS. Although any bitmap (BMP) file can be used, a map following these guidelines will provide the best display:

- Resolution: 1170 x 920 or greater
- Aspect Ratio: 1.27:1 – this allows for a full-screen display on a standard 4:3 monitor
- Color Scheme: Dark, muted, or low-contrast colors, so that the Red/Green/Yellow equipment icons are easily visible at a glance.

The RSMS License Key provided by Selex ES Customer Service for this installation should be entered into the License Key field. Without a valid license key, the RSMS will run in Demonstration Mode, displaying random equipment status.

One or more of the PC's TAPI modems should be selected for modem-based polling connections.

The "Allow inbound modem connections" option should be enabled if the RSMS will be receiving status update modem calls from a 2238 RCSU as a result of its "Dial-out on Status Change" option enabled.

Pressing the OK button saves the configuration. Pressing the Cancel button discards any changes.

3.8.4.2 Adding a 2238 RCSU

Typically, a group of navaids installed at an airport are connected to a common RCSU. RCSUs will be displayed on the RSMS map with an "R" icon, and have a separate tab to display the status of all associated navaids.

The RSMS can then connect directly to this RCSU and retrieve the status of all associated navaids, without having to poll each navaid individually. Also, if so configured, the RCSU can dial out to the RSMS upon a status change and report the new status without having to wait for the next RSMS polling time to occur.

To add a 2238 RCSU to the RSMS, the user must first login to Security Level 3 or higher and enter Configuration Mode. Right-click on the main map at the location where the 2238 RCSU is located and select "Add Equipment Here" to display the first of several equipment configuration screens.

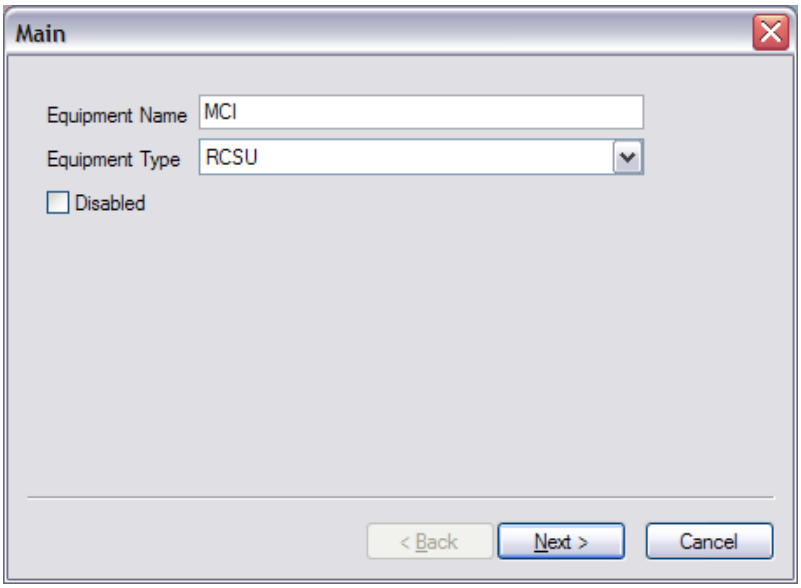


Figure 3-56 Main Equipment Configuration Screen

An appropriate name should be entered in the Equipment Name field. Typically, this is the name of the airport where the RCSU is located. The Equipment Type should be set to "RCSU" for 2238 RCSUs. The other equipment types are available to add an individual navaid to the RSMS, instead of an RCSU.

The Disabled option is normally left disabled. It is used to temporarily keep the RSMS from polling a piece of equipment, for when it's known that a particular station or RCSU is undergoing maintenance for an extended period of time, and is therefore unavailable. The disabled equipment's icon will be gray instead of having a Comm Fault being indicated with a bright yellow icon in this example.

Pressing the Next button will move on to the next configuration screen.

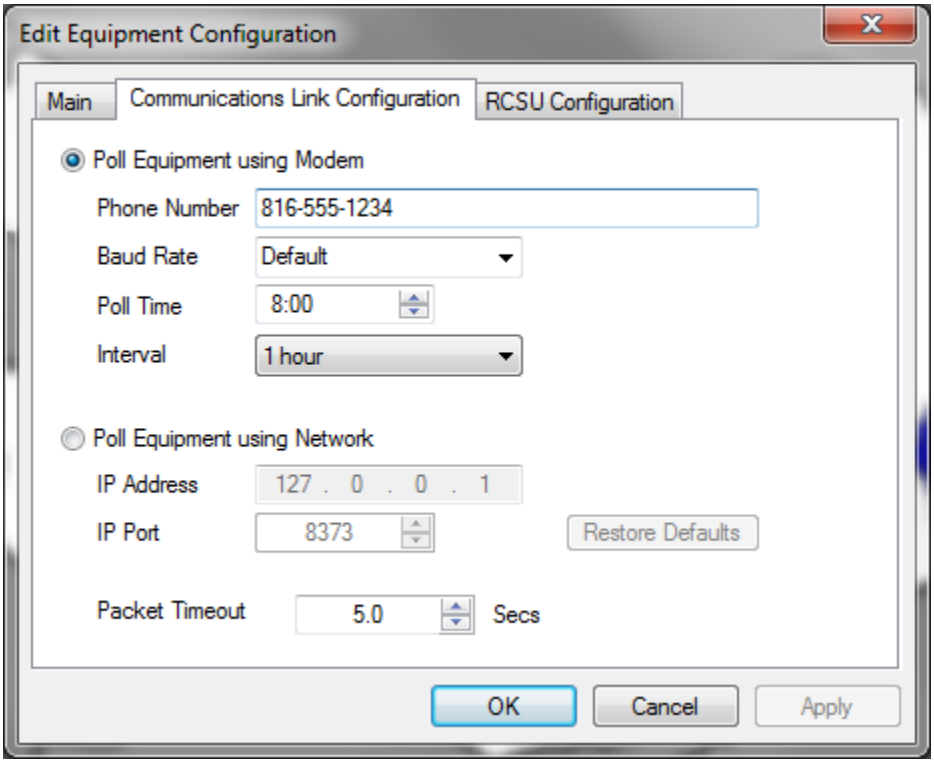


Figure 3-57 Communications Link Configuration Screen

The comm link details are configured on the Communications Link configuration screen, either for a dial-up modem link, or a TCP/IP Network connection.

For modem connections, the phone number associated with the equipment or RCSU should be entered, including any dialing prefixes required. The Baud Rate should be left at the "Default" setting unless otherwise instructed by Selex ES Customer Service. The desired Poll Time and Polling Interval should be set using the associated controls.

For network connections, the IP Address and IP Port associated with the equipment or RCSU should be entered. The Restore Defaults button will reset the IP Port back to its default value for convenience.

For both connections, the Packet Timeout identifies the wait period before failing an individual packet transfer.

Pressing the Next button will move on to the next configuration screen.

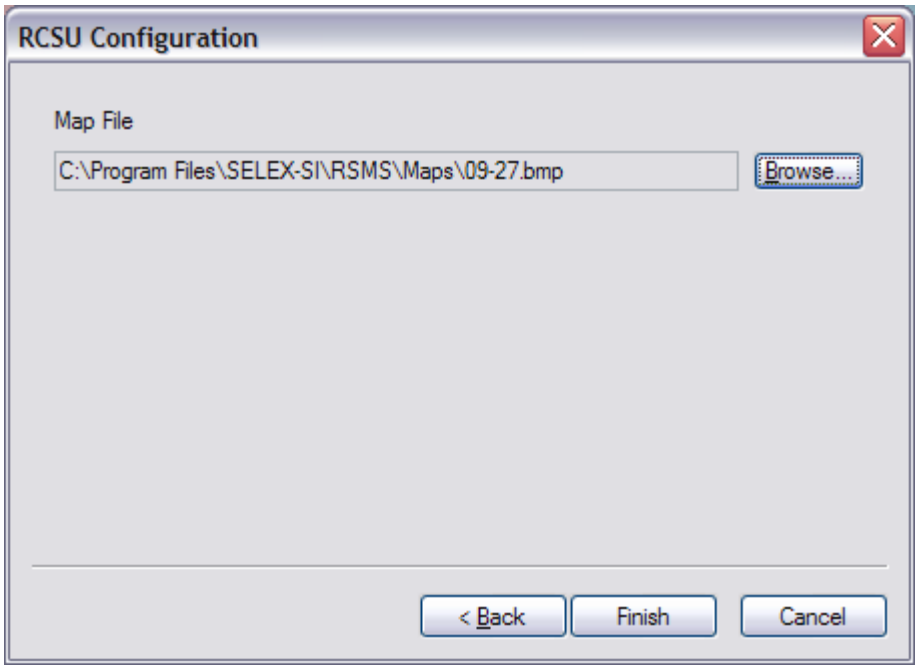


Figure 3-58 RCSU Configuration Screen

For an RCSU, the only remaining configuration detail is the Map File. The same bitmap used on the 2238 RCSU should be copied to the RSMS PC. Then, the Browse button should be used to locate that file.

Pressing the Finish button will complete the configuration task. Pressing the Back button will allow the user to review the configuration settings. The Cancel button is used to discard any configuration changes.

Once configured, the new RCSU site tab will appear in the RSMS's main screen. After the status polling connection is made to the RCSU, all equipment connected to the RCSU will be displayed on the associated RCSU tab. Note that unlike a "Site" map, no other equipment can be added to an RCSU tab.

3.8.4.3 Adding a Site

Sites are similar to RCSUs in that they result in a new tab at the top of the RSMS display. A site is generally a region that is smaller in size than that shown on the top-level map. It can be a smaller region containing RCSUs, or a single airport or navaid installation without any RCSUs. Multiple sites can be added to the RSMS's top-level map to provide support for navaids in areas that do not have RCSU connections. Also, sites can be added to an existing site tab, providing a hierarchal display. Sites will be displayed on the map with an "S" icon, and have a separate tab to display the status of all associated RCSUs and navaids.

To add a Site to the RSMS, the user must first login to Security Level 3 or higher and enter Configuration Mode. Right-click on the main map at the location where the site is located and select "Add Site Here" to display the Site Configuration screen.

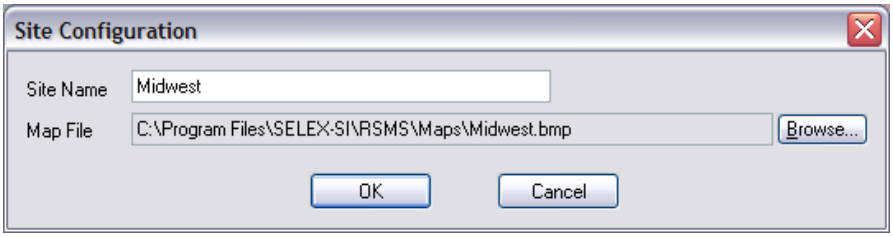


Figure 3-59 Site Configuration Screen

An appropriate name for the site should be entered into the Site Name field. Typically, this is the name of the region or facility to be covered by the site's map. The Browse button is used to locate a map file for this site.

The OK button is used to save the new configuration. The Cancel button is used to discard any configuration changes.

Once configured, the new Site tab will appear in the RSMS's main screen. The site tab will be empty until equipment is added as detailed below.

3.8.4.4 Adding Equipment to a Site

To add any equipment to an existing Site on the RSMS, the user must first login to Security Level 3 or higher and enter Configuration Mode, then click on the Site's tab to display its map. Right-click on the map at the location where the equipment is located then select "Add Equipment Here" to display the first of several equipment configuration screens. The first two screens are similar to those shown above for the RCSU – the Equipment Type and Comm Link screens. The final Equipment Configuration screen will vary depending on the type of equipment being added and should be set as follows:

- If adding an 1150 VOR, select "1150 VOR – RMS" if the VOR is configured using the PMDT, or "1150 VOR-SCIP" if not.
- If co-located 1118/1119 DME is present, select the "Co-Located DME" checkbox. Note that this should be left disabled for the newer 1118A/1119A Selex ES DMEs.

The Finish button is used to save this new configuration.

3.8.4.5 Modifying the Site/Equipment Configuration

Once a Site or Equipment has been added to the RSMS, its configuration can be modified much the same way. With Configuration Mode active, the user should right-click on the site or equipment icon and select the "Edit Equipment Configuration" menu option. Use the Next/Back controls to move through the existing configuration screens, and make the desired changes. Use the Finish button on the last screen to save the changes.

Note that the Site, RCSU, and individual Navaid icons on the main map can be relocated while within Configuration Mode by simply clicking on it and dragging it to the new location.

To delete a Site, RCSU, or individual Navaid from the RSMS configuration, right-click on its icon and select "Delete this Equipment", followed by "Yes".

3.8.4.6 User Account Configuration

Like the other Selex ES applications, the RSMS supports 4 levels of security:

- Security Level 1 (GUEST) provides read-only access to the RSMS Status.
- Security Level 2 provides read-only access to the RSMS Status and Configuration
- Security Level 3 provides read/write access to the RSMS Status and Configuration
- Security Level 4 provides read/write access to the RSMS Status, Configuration, and User Accounts

3.9 MANAGED ENCLAVE ROUTER CONTROLS AND INDICATORS

The Managed Enclave Router is an optional module that may be included in an RCSU installation. It is supplied as a kit, 470651-0001, which includes the router hardware, installation instructions, and miscellaneous mounting hardware. It is factory-configured to provide basic routing of in-bound PMDT-RCSU data, either via the facility LAN or through a dial-up networking link into the router's built-in modem. Refer to the associated installation instructions, 561098-0013, for the router configuration details.

The Cisco 2811 Router contains several slots that accept various network modules. The base chassis contains the following controls and indicators:

FE0/0 – 0/1 Ethernet Jacks

A Indicates network activity on this port
F Indicates Full Duplex (on) and Half Duplex (off) network connections.
S Indicates 100Mbps (on) and 10Mbps (off) network connections.
L On when the link is up (connected to another network device)

Front Panel Indicators

Sys Pwr Indicates the standard power supply status.
Aux Pwr Indicates the optional Auxiliary power supply status.
Sys Act Indicates network activity on any of the router's ports.

Front Panel Controls

Power On/Off Turns the router on/off.

The 9-port Ethernet Switch Module supplied with in the Managed Enclave Router kit contains the following indicators:

Each RJ-45 (0x – 8x)

LNK Indicates that the port is up (connected to another network device)
PWR Indicates that Power Over Ethernet (PoE) is available on that port. Note that as typically supplied, PoE is not available for any of the ports.

The PSTN Modem Module supplied with in the Managed Enclave Router kit contains the following indicators:

LINE0

SP Indicates modem connection speed, High (V.56/V.90) = ON, Low (V.32/V.34) = OFF
CN Indicates modem connection (Carrier Detect)
OH Indicates Off-Hook status

3.10 UNMANAGED SWITCH CONTROLS AND INDICATORS

The Unmanaged Switch is an optional module that may be included in an RSDU installation. It is supplied as a kit, 470461-0001, which includes the switch, a power supply, installation instructions, and miscellaneous mounting hardware. The Unmanaged Switch contains the following controls and indicators:

5-Port Ethernet Switch

PWR Indicates that the switch is powered up.
LINK Indicates that the associated RJ-45 Ethernet jack is connected to another network device.
SPD Indicates 100Mbps (on) and 10Mbps (off) network connections.

12VDC Power Supply

DC OK Indicates that the +12VDC output is valid
+V ADJ Control used to adjust the DC output voltage (approximately 11.5 – 15.5 VDC)

3.11 RCSU TREND DATA COLLECTION

Starting with version 6.2, the 2238 RCSU supports Trend Data Collection for the following Log Files:

- Maintenance Alert Log
- Alarm Log
- Parameter Change Log
- Activity Log

To use this feature, the following system software versions must be installed:

- 2238 RCSU v6.2.1.0, or greater
- 2100 Localizer/2110 Glideslope RMS, v2.5.0.3, or greater
- 1118A DME/1119A DME RMS. V2.0.0.6 or greater
- 1150A VOR RMS, v5.2.0.3 or greater
- PMDT v8.6, or greater

When Trend Data Collection is enabled, the RCSU retrieves the log files from the associated ILS stations every 10 minutes and stores them to its hard drive in a text-based, comma-delimited format (csv) for analysis or plotting in external applications such as Microsoft Excel. This data can then be retrieved either locally, through Windows Explorer, or remotely using the PMDT. Any stored Trend Data that is older than the specified number of days is automatically deleted every day at 12:00AM.

To enable Trend Data Collection functionality, open the RCSU's System>>Configuration>>Local screen, and check the Enable Trend Data Collection option as shown in Figure 3-60:

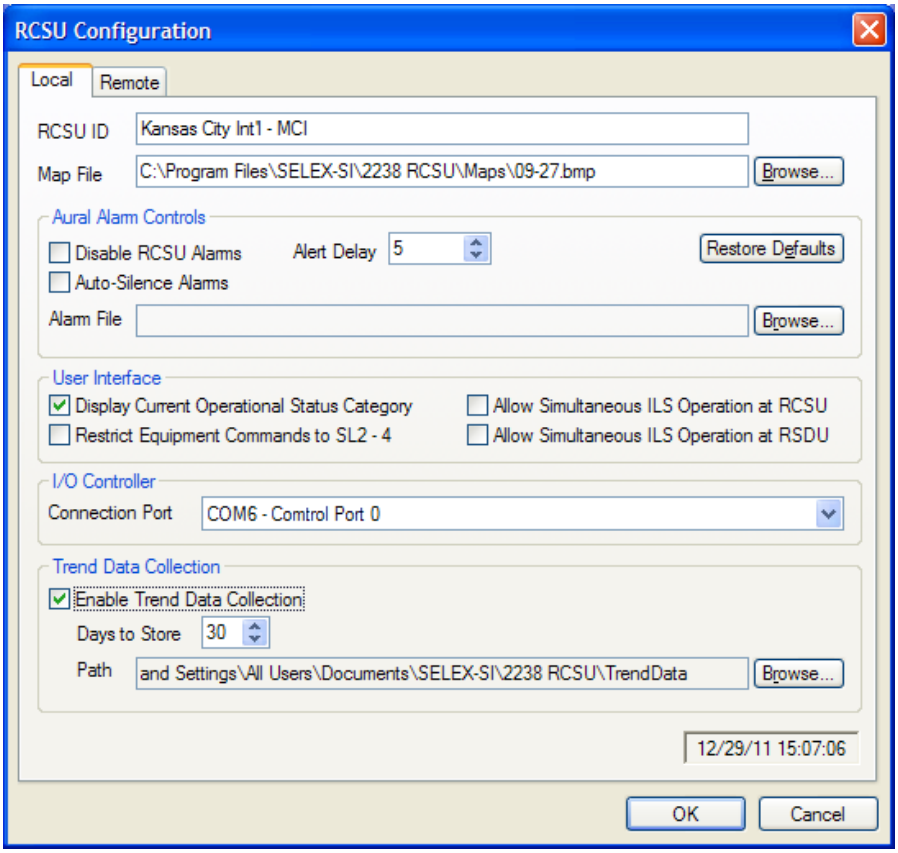


Figure 3-60 Enabling Trend Data Collection in the RCSU

Set the Days to Store value to the desired number of days' worth of data to store. Use the Browse button to select where to store the resulting csv files.

Once the RCSU has collected some Trend Data, the data can be accessed either directly, using Windows Explorer, or remotely downloading it using the PMDT. To remotely download the Trend Data, start the PMDT and connect in to the RCSU, either using the dial-up modem or a network connection, as applicable. On the PMDT's RCSU Status page, press the Trend Data button under the status fields for the desired navaid, as shown in Figure 3-61.

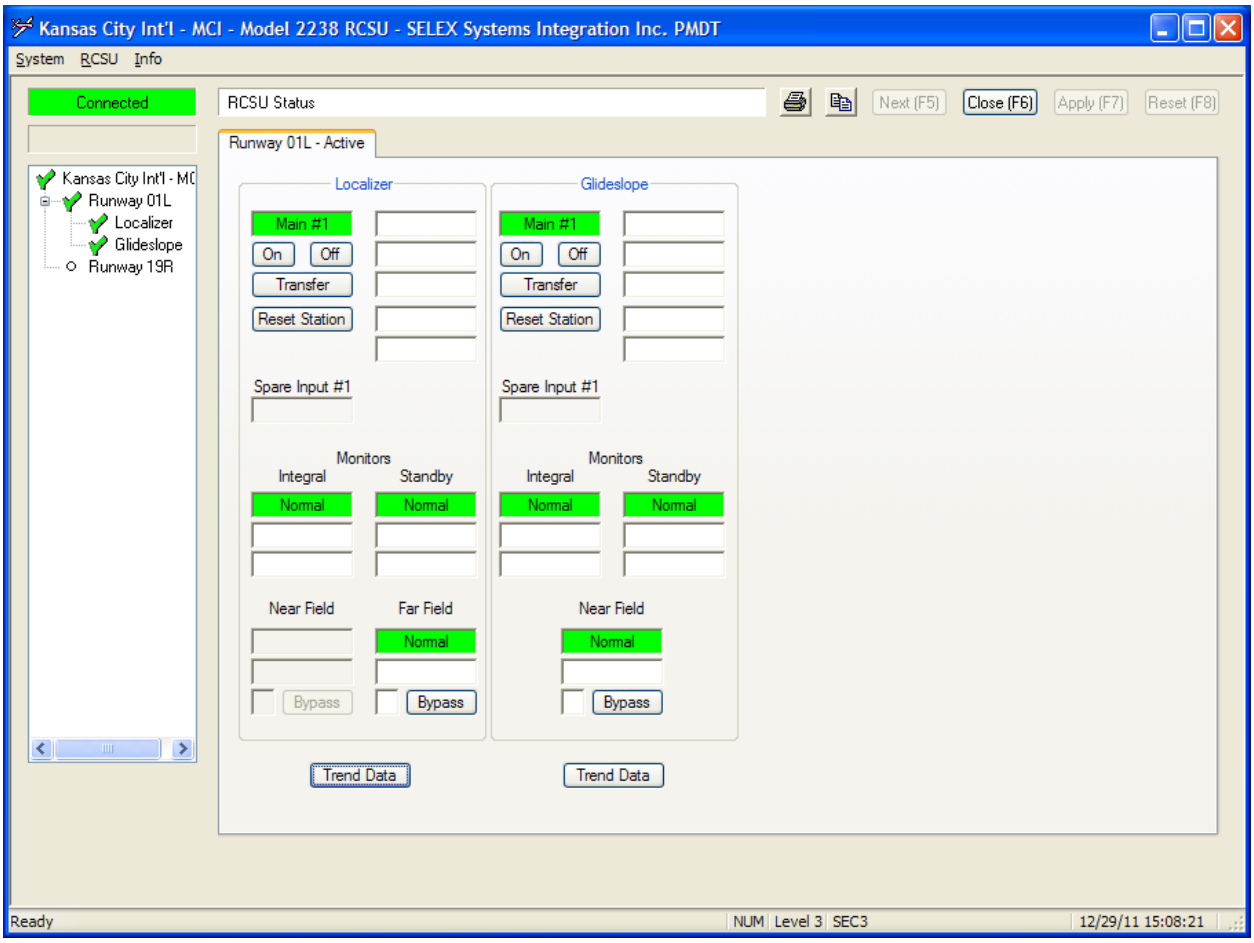


Figure 3-61 PMDT Trend Data Retrieval

The Trend Data management screen for this navaid will be displayed, as shown in Figure 3-62. This screen shows the current amount of Trend Data that has been collected on the RCSU. The desired number of days of data can be downloaded to the specified folder on the PMDT. Additionally, the RCSU's Trend Data can be manually deleted, if so desired.

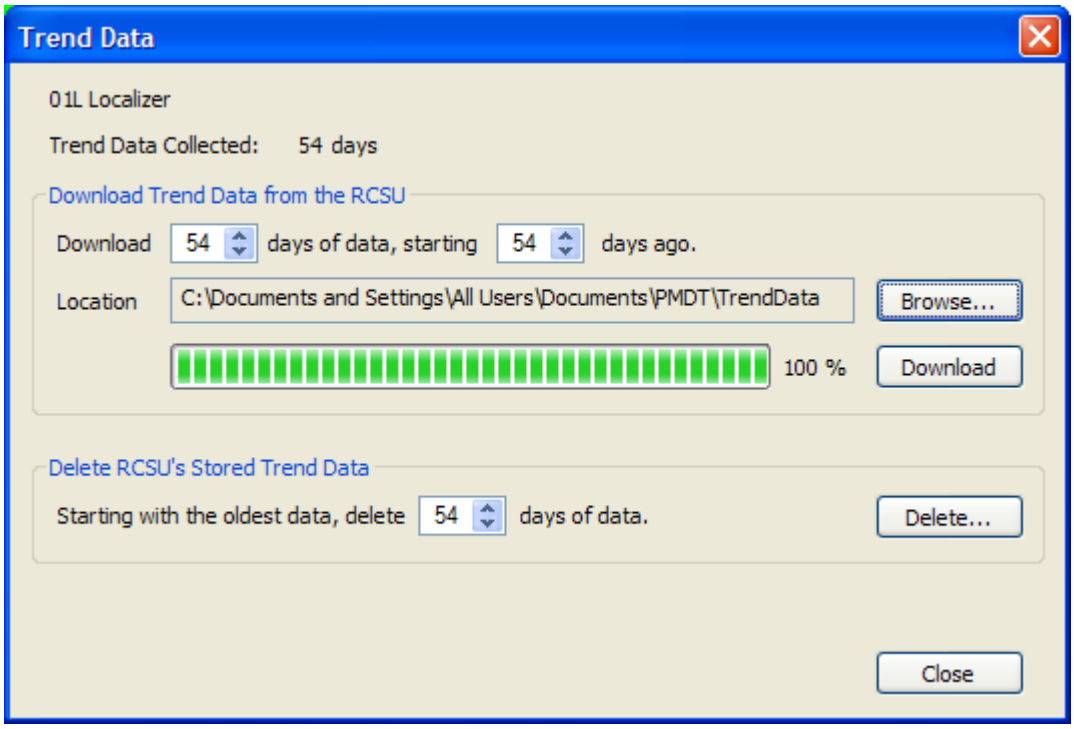


Figure 3-62 Trend Data Management Screen

4 STANDARDS AND TOLERANCES

4.1 INTRODUCTION

Table 4-1 is a list of equipment parameters, their standards, and their limits. In the Parameter column, each parameter measured or adjusted is listed. The paragraphs of Section 6 that describe the procedures used to establish the values of the parameters are listed in the Reference Paragraph column. In the Standard column are listed the optimum values of the parameters. The Tolerance column is the maximum possible deviation, above or below the standard value, when the 2238 RCSU equipment is commissioned initially or subsequent to any modification.

Table 4-1 Standards and Tolerances

Parameter	Standard	Tolerance	Reference Paragraph
AC Voltage			
120V System	120VAC	102 to 138VAC	6.3.1
230V System	230VAC	196 to 264VAC	6.3.1
2138 RSU Module			
RSU Power Supply Voltage	+12V	10.8 to 13.2V	6.3.3
RSU Battery Voltage	+8.4V	6.3 to 9.1V	6.4.1.2
RSU Battery Charge Current	83mA	75 to 91mA	6.4.1.3

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5 PERIODIC MAINTENANCE

5.1 INTRODUCTION

This section contains instructions for system level performance testing and maintenance of the 2238 RCSU. The RCSU is capable of continuous, unattended operation. Maintainability is based on a schedule consisting of a monthly, quarterly, semi-annual and annual performance checks. The performance checks are described in the following paragraphs.

5.2 PERFORMANCE CHECK SCHEDULE

Table 5-1 is a summary of the various performance checks and their recommended intervals. Supervising personnel are responsible for scheduling these checks based on the recommended intervals. Information contained in Table 5-1 is limited to equipment specifically covered in this manual.

Table 5-1 Performance Check Schedule

Performance Check		Reference Paragraph	
		Standards & Tolerances	Maintenance Procedures
MONTHLY			
a.	Clean RCSU/RSU Touchscreen	N/A	6.2.1
QUARTERLY			
a.	Visual Inspection	N/A	6.2.2
b.	Transmitter Control Check	N/A	6.2.3
c.	Station Alarm Check	N/A	6.2.4
ANNUAL			
a.	UPS Battery Test	N/A	6.2.5

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6 MAINTENANCE PROCEDURES

6.1 INTRODUCTION

This section contains procedures for the performance checks and other maintenance tasks listed in Section 5. In order to assure the safety of aviation users of the facility, only properly trained and certified technicians may be allowed to make adjustments to this equipment. Some tasks covered in this section may require removal of the equipment from service for brief periods. When this is necessary, maintenance personnel shall notify the appropriate air traffic control in accordance with established airport procedures.

Before beginning any procedure covered in this section, read the instructions, and then assembles the necessary tools, test equipment, and materials required to complete the task. Review appropriate performance standards and tolerances listed in Section 4 for each task to ensure familiarity. If the expected results of a procedure are out of tolerance, refer to the corrective maintenance action in Section 7.

6.2 PERFORMANCE CHECK PROCEDURES

The following procedures place the RCSU in a normal operating mode, and include the necessary steps to determine that the system meets the minimum performance requirements. To ensure maximum system performance, these tests are to be performed at the intervals stated in Section 5 and after completing repairs. Refer to Section 3 for description of controls and indicators.

6.2.1 Touchscreen Cleaning

The touchscreens on the Small Form Factor RCSU and 2238 RSDU can be cleaned as often as needed. Water, isopropyl alcohol, and similar non-abrasive cleaners can be used.

Start cleaning the screen by pressing a damp cloth on an area of the screen that does not contain any icons or control buttons. Continue holding the cloth against the screen while cleaning.

6.2.2 Visual Inspection

a. Visually inspect RCSU Card Cage Power Supply, Dual Modem CCAs, and Cardion VORTAC Interface CCAs for signs of overheating.
b. Visually inspect RCSU TVS CCAs for signs of overheating and/or damage caused by electrical surges.
c. Visually inspect all cables for corrosion, cracks, or breaks. Make sure connections are tight and secure.
d. Check all RCSU and RSDU cooling fans and power supplies for proper operation. This includes any supplementary equipment associated with the RCSU, such as an Enclave Router.
e. Remove dust accumulation on the equipment especially at fan inlets and cooling fan blades.

6.2.3 Transmitter Control Check

The following sections detail the procedures for checking dual 2100 transmitter systems, single 2100 transmitter systems, and Cardion VOR/TACAN/DME systems. Refer to the appropriate sections for the installed equipment.

6.2.3.1 Dual 2100 Transmitter Control Check

Test equipment required - None.

a. On the RCSU or RSDU, open the detailed status window then click the OFF button for the desired ILS station. The green "Main" indicator for that station will change to red and indicate "Off".
b. Click on the Silence Alarm button on the RCSU or RSDU to cancel the audible alarm.
c. On the RCSU or RSDU, click on the ON button for the desired ILS station. The red "Off" indicator for that station will change to green and indicate "Main".
d. On the RCSU or RSDU, click on the TRANSFER button for the desired ILS station. The green "Main" indicator for that station will change from Main #1 to Main #2 or vice-versa.
e. Click on the Silence Alarm button on the RCSU or RSDU to cancel the audible alarm.

6.2.3.2 Single 2100 Transmitter Control Check

Test equipment required - None.

a. On the RCSU or RSDU, open the detailed status window then click the OFF button for the desired ILS station. The green "Main" indicator for that station will change to red and indicate "Off".
b. Click on the Silence Alarm button on the RCSU or RSDU to cancel the audible alarm.
c. On the RCSU or RSDU, click on the ON button for the desired ILS station. The red "Off" indicator for that station will change to green and indicate "Main".

6.2.3.3 Cardion VOR, TACAN and DME Control Check

Test equipment required - None.

a. On the RCSU or RSDU, open the detailed status window then click the Stop button for the desired Cardion station. The green "On" indicator for that station will change to red and indicate "Off".
b. Click on the Silence Alarm button on the RCSU or RSDU to cancel the audible alarm.
c. On the RCSU or RSDU, click on the Start button for the desired ILS station. The red "Off" indicator for that station will change to green and indicate "On".

6.2.4 Station Alarm Check

Test equipment required - None.

a. At the RCSU or RSDU press the Test Alarm button.
b. Verify an audible alarm is generated.
c. Press the Silence Alarm button on the RCSU or RSDU to cancel the audible alarm.

6.2.5 UPS Battery Test

The BCPS CCA in the Small Form Factor RCSU continuously validates the status of the internal battery, indicating a battery fault condition with the “Battery Warning” LED on the front panel. There is no other battery test available.

In the case of the Industrial Rack RCSU Configuration, and the 2238 RSDU, the supplied UPS performs a self-test automatically when turned on and every two weeks (336 hours) thereafter. This procedure provides additional verification of battery integrity and communication between all UPS and server equipment.

Test equipment required - None.

At the RCSU

a. Press and hold the On/Test button for a few seconds to initiate the UPS self test.
b. If the "Replace Battery LED" on the RCSU UPS is on after the test, refer to the User Manual supplied with the UPS for further troubleshooting and/or battery replacement
c. If the UPS passed the self test and returned to on-line operation, unplug the RCSU AC supply.
d. Wait at least five minutes then verify the RCSU is still functioning properly and the RCSU UPS fan is operating.
e. Verify that an alert message was generated by the RCSU UPS and is displayed on both the RCSU and RSDU screens. Clear the alert boxes.

At the 2238 RSDU:

a. Press and hold the On/Test button for a few seconds to initiate the UPS self test.
b. If the "Replace Battery LED" on the RSDU UPS is on after the test, refer to the User Manual supplied with the UPS for further troubleshooting and/or battery replacement
c. If the UPS passed the self test and returned to on-line operation, unplug the RSDU AC supply.
d. Wait at least five minutes then verify the RSDU and touchscreen are still functioning properly and the RSDU UPS fan is operating.

e. Verify that an alert message was generated by the RSDU UPS and is displayed on both the RCSU and RSDU screens. Clear the alert boxes and restore AC power to both units.

6.2.6 2138 RSU Self Test

This test validates all of the indicators on the 2138 RSU, and the RCSU/RSU communications link.

Test equipment required - None.

a. Click on and hold the SELF TEST button on the 2138 RSU Assembly.
b. Verify that all of the indicators on the 2138 RSU illuminate and the audible alarm turns on.
c. Release the SELF TEST button on the 2138 RSU Assembly.
d. Verify that the 2138 RSU indicators illuminate in the following sequence, and then revert to the previous display when completed:

1. Sequence through each row of equipment LEDs (Loc, G/S....etc.)
2. Sequence through each row of equipment status LEDs (Main, Standby, Alert)
3. Sequence through each row of Category LEDs
4. Sequence through each row of FFM LEDs
5. Sequence through each row of Aux LEDs
6. Runway indicator displayed with " * 0 *"
7. Runway indicator displayed with "0 * 0"

e. Click on the ALARM SILENCE button on the 2138 RSU to cancel the audible alarm.

6.3 OTHER MAINTENANCE PROCEDURES

6.3.1 System AC Voltage Check

The system's AC Voltage is checked to verify that the 2238 RCSU equipment is operating properly. Lower than normal voltages can cause failures. Voltages higher than normal can cause equipment damage.

Test equipment required - Digital Voltmeter (DVM).

Small Form Factor RCSU Configuration:

a. Using the DVM, check for 102 to 138 VAC (120 VAC systems) or 196 to 264 VAC (230 VAC systems) across an AC power output on the same circuit as the 2238 RCSU.
b. If the measurement is out of tolerance, determine the cause of the facility power issue.

Industrial Rack RCSU Configuration:

a. Using the DVM, check for 102 to 138 VAC (120 VAC systems) or 196 to 264 VAC (230 VAC systems) across the AC power output of the UPS.
b. If the measurement is out of tolerance, refer to the User Manual supplied with the UPS for further troubleshooting and/or battery replacement.

6.3.2 Power Supply/RSU I/F CCA Voltage Check

Test equipment required - Digital Voltmeter (DVM).

a. Power up the Small Form Factor RCSU Assembly.
b. Using a DVM with its Ground lead on the E1 Grounding Bracket of the Power Supply/RSU I/F CCA, check for the following voltages:

TP5 (Bottom of L3)	+5VDC ± 5%
TP4 (Top of L4)	+12VDC ± 10%

TP3 (Top of L2) -12VDC ± 10%

c. If any of the output voltages are not within tolerance, replace the CCA.

6.3.3 2138 RSU Power Supply Voltage Check

Test equipment required - Digital Voltmeter (DVM).

a. Disconnect the DC power supply from the 2138 RSU (J7).
b. Using a DVM, check for +12V ± 10% across the DC power supply's output connector (the Tip is +12V, the Ring is Ground).
c. If the output voltage is not within tolerance, replace the supply.
d. Reconnect the DC power supply to the 2138 RSU (J7).
e. Click on ALARM SILENCE to cancel the audible alarm.

6.4 SPECIAL MAINTENANCE PROCEDURES

6.4.1 Checking 2138 RSU Battery Box

The following procedures should be used to troubleshoot problems associated with the 2138 RSU Battery Box.

6.4.1.1 RSU Fuse

The output of the optional 2138 RSU Battery Box Assembly is fused. This fuse should be checked and replaced if necessary.

Test equipment required - Digital Volt-Ohm Meter (DVOM).

a. Disconnect the 2138 RSU Battery Box Assembly from the 2138 RSU (J8).
b. Remove the fuse from the fuseholder.
c. Visually inspect and measure the resistance of the fuse to insure that it is not opened. If it is opened, replace it.
d. Re-insert the fuse and fuseholder into the 2138 RSU Battery Box.

6.4.1.2 RSU NiCd Batteries

Test equipment required - Digital Voltmeter (DVM).

The NiCd batteries should be checked and replaced if necessary as follows:

a. Using a DVM, measure the output of the 2138 RSU Battery Box. The Battery Box contains seven NiCd batteries, each of which should produce between 0.9 V and 1.3 V, depending on its current charge level. Therefore if the voltage measured across the Battery Box connector is less than 6.3 volts and the fuse is intact, one or more of the NiCd batteries is faulty.
b. Remove the cover from the Battery Box. Locate and replace any faulty batteries.

6.4.1.3 RSU Battery Charging Circuit

Test equipment required - Digital Voltmeter (DVM).

The output of the 2138 RSU's battery charging circuit should be verified as follows:

a. Remove the Battery Box from the 2138 RSU.
b. With 2138 RSU operating on the DC power supply, connect a DVM set to measure current (300 mA range) to the Battery Box connector (J8) on the RSU, with the + lead on pin 1, and the - lead on pin 2.
c. Verify that the Battery Charge Current is 83 mA ± 8 mA. If not, the NiCd batteries in the Battery Box will not be properly charged and the Battery Box should not be used. Repair the battery charging circuitry in the 2138 RSU.
d. Reconnect the Battery Box to the 2138 RSU.

7 CORRECTIVE MAINTENANCE

7.1 INTRODUCTION

This section contains procedures required to diagnose, isolate, and repair faults in the 2238 RCSU and RSDU system. The procedures include test equipment required, general troubleshooting information, and a troubleshooting chart which is to be used as a guide to isolate malfunctions.

The replacement of assemblies and/or circuit cards in this manual is accomplished at the station level (on-site). Repair of assemblies and electronic component replacement is accomplished at the depot level (off-site repair) and is not covered in this manual.

This section is to be used in conjunction with the schematics and diagrams provided in Section 11.

7.2 TEST EQUIPMENT REQUIRED

Table 9-1 contains a list of test equipment required to perform troubleshooting procedures.

7.3 ONSITE CORRECTIVE MAINTENANCE

Section 7.3.1 provides general troubleshooting information and Figure 7-1 RCSU Diagnostics Flow Chart is the troubleshooting chart. The troubleshooting chart lists a possible fault, a possible cause, a troubleshooting procedure, and a paragraph that references a maintenance procedure found in Section 6. The troubleshooting chart is intended only as a guide and does not give all possible symptoms or all possible causes of trouble.

7.3.1 General Troubleshooting Information

a. Identify the symptom.
b. List the symptoms that you find or a field technician describes. If someone else describes the symptoms to you, check the symptoms yourself or have that person demonstrate the symptoms to make sure the problem is not an operator error.
c. Do a careful visual inspection of the suspected assembly, including the following suggestions:

    1. Check for excessive heat.
    2. Check that all integrated circuits (ICs) are firmly seated in their sockets and that the ICs have no bent pins.
    3. Check that printed circuit board edge connectors are clean and seated properly.
    4. Check for cable continuity. Check for tight terminal board connections and serial port connections.

d. Check the power supplies for low voltage or excessive ripple.

7.4 2238 REMOTE FAULT DIAGNOSTICS

This section contains instructions for identifying a faulty RCSU through the use of flow charts and the automated Fault Isolation capabilities incorporated into the PMDT and RCSU software. These procedures require no external test equipment.

Automated fault isolation can be performed locally or remotely using a PMDT connection to the 2238 RCSU. Diagnostics performs an analysis of the RCSU configuration, status, and diagnostics files to identify a faulty LRU or identify a problem with communications lines.

Figure 7-1 shows how to perform RCSU diagnostics. The RCSU diagnostics routines are intended to be performed on a 2238 RCSU system with a fault. The first step in the diagnostics flow chart is to determine the symptom, then proceed down the correct path. If there is no symptom then no path should be taken.

When replacing LRU=s identified by the fault isolation flowcharts, remove power from the system by turning off the appropriate front panel switch or shutting down the computer equipment.

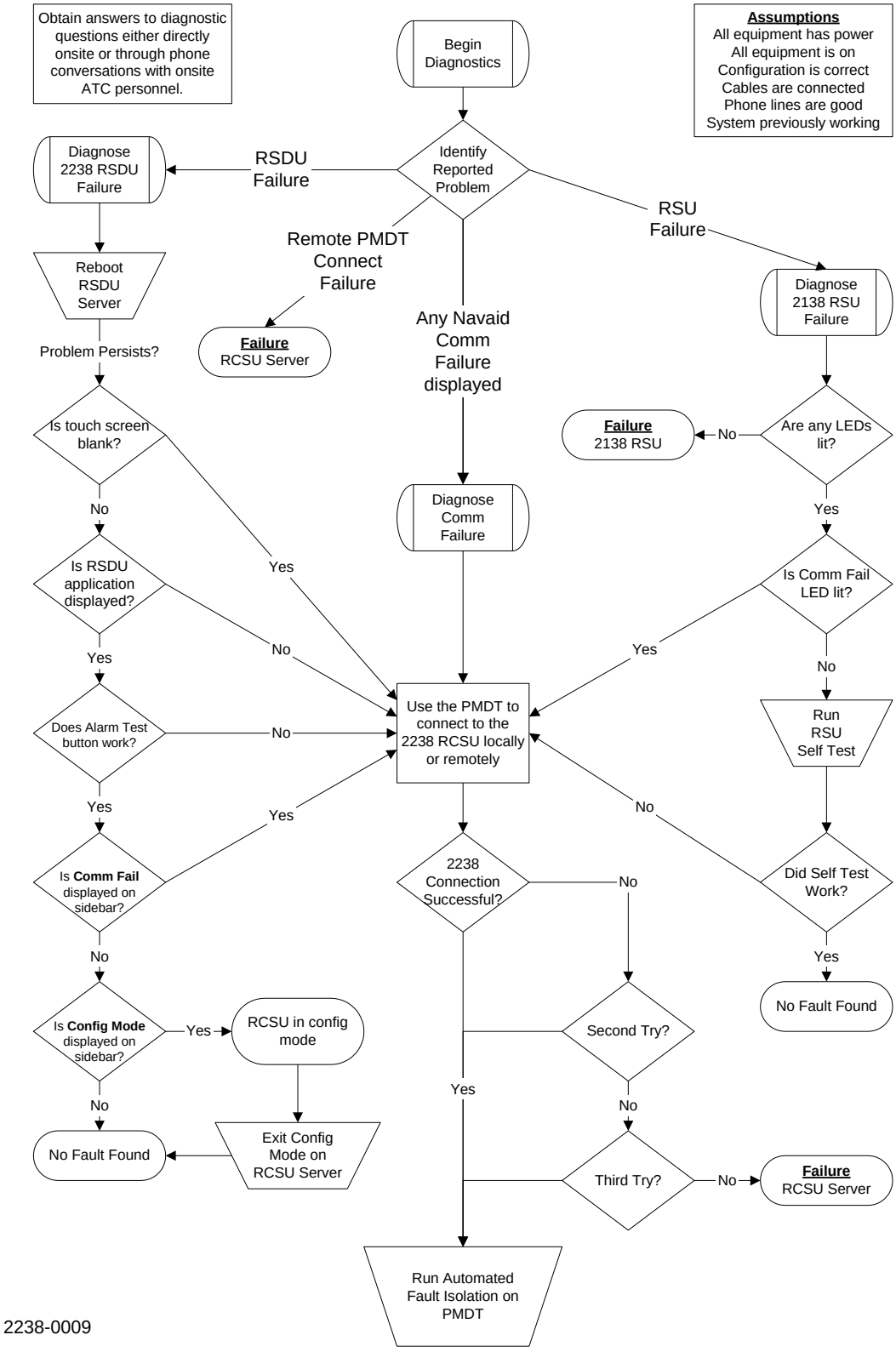

Figure 7-1 RCSU Diagnostics Flow Chart

Table 7-1 On-Site Corrective Maintenance		
Symptom	**Possible Causes**	**Corrective Action**
2238 RCSU (Rack Configuration) and 2238 RSDU		
Compact PCI power supply Status LED off	RCSU Card Cage Assembly switched off	Check circuit breaker switch located on front of RCSU Card Cage Assembly.
	Unplugged AC cord.	Check AC power connection from RCSU UPS to Card Cage Assembly
Communications fault with all equipment	RCSU Card Cage Assembly switched off	Check circuit breaker switch located on front of RCSU Card Cage Assembly.
	Blown fuse on Backplane CCA	Check fuses F1 and F2 on 012109-0001 Backplane CCA located behind Card Cage Assembly circuit breaker panel.
No serial communications to the ILS through the RCSU program.	The COM port specified in the Configuration screen is incorrect.	Identify the COM port attached to the modem connected to the ILS. Refer to Section 3.5.3.7.3.1 to change the ILS COM port number.
	The COM port specified in the Configuration screen is in use by another application.	Verify that no other applications are currently using the specified COM port.
	The RCSU Card Cage Assembly is not powered on.	Verify that the RCSU Card Cage Assembly is powered on.
	The Tip and Ring signals between the RCSU and ILS are not properly connected.	Check for continuity in the Tip/Ring lines between the RCSU and the ILS.
Communications fault with Cardion VOR/TACAN/DME equipment.	The COM port specified in the Configuration screen is incorrect.	Likely if COM FAIL LEDs are not lit on the Cardion VORTAC Interface CCA. Identify the COM port attached to the Cardion VORTAC Interface then refer to Section 3.5.3.7.4 to change the port number.
	The signals between the RCSU and Cardion equipment are not properly connected.	Check for continuity in the lines between the RCSU and the Cardion equipment.
	Cardion VORTAC Interface CCA and/or Cardion equipment not aligned properly.	Refer to Section 9.5.2.7.1 for alignment of the Cardion VORTAC Interface CCA and Cardion equipment.
Having trouble selecting touchscreen controls	Touchscreen needs recalibration	Refer to Section 3.3.3.1 to calibrate the touchscreen.
UPS On Battery Power indicator lit or UPS is generating an audible alert	UPS is running on batteries	Restore AC power to the RCSU and/or RSDU equipment
UPS Replace Battery indicator lit	UPS battery need replacing	Refer to UPS documentation for procedures to replace the battery assembly.
	UPS battery unplugged	Refer to UPS documentation for connecting the batteries.

Table 7-1 On-Site Corrective Maintenance		
Symptom	**Possible Causes**	**Corrective Action**
The RCSU or RSDU server will not operate on batteries	The UPS batteries are faulty.	Run a UPS Battery Test as detailed in Section 6.2.5.
	The UPS not properly configured.	Refer to Section 9.5.2.2 or Section 9.5.4.2 for the proper configuration of the UPS hardware. Refer to the UPS documentation for information on the UPS software.
Inadequate or no alarm sound from RSDU speaker panel	Audible alarm muted or turned down	Refer to Section 3.6.2 to turn up the RSDU audible alarm volume
	Speaker panel disconnected or connected incorrectly	Refer to Section 9.5.4.5 for proper connection of speaker panel to RSDU SoundBlaster card.
No alarm sound from RCSU server	RCSU alarm may be disabled	Refer to Section 3.5.3.2.1.3 to enable RCSU alarms by unselecting Disable RCSU Alarms.
	RCSU alarm silenced by controller at RSDU	By design the RCSU alarm is silenced whenever the RSDU Silence Alarm button is pressed.
The RCSU does not make connection on Dial-In	Remote modem access may not be enabled.	Verify remote modem access is enabled. Refer to Section 3.5.3.2.
	Faulty phone line connection.	Unplug the phone cord from the modem's line connector and check for dial tone using telephone test equipment.
	Incorrect modem selected in configuration.	Refer to Section 3.5.3.2 for details on selecting the modem.
RCSU LCD or RSDU Touchscreen intensity too low	Backlight intensity decays over time	Use the LCD front panel controls to increase the brightness.
	Automatic brightness control malfunctioning	Turn off automatic brightness control.
RCSU trackball not responsive or jittery	Inadequate contact force	Press down on trackball while moving the RCSU cursor.
	Trackball needs cleaning	Remove the trackball. Clean the ball and the two plastic rollers it contacts.
RCSU or RSDU server audible alert or Power Status indicator displays a fault	Failure of redundant server power supply	Silence the alert using the Silence switch then check power supply cables. Faulty power supplies can be identified using the rear status indicators.
Excessive noise from power supply, server, or UPS cooling fan	Eminent failure of cooling fan	Contact Selex ES Inc. customer service for replacement
Software notification of RAID or Hard Disk failures.	Failure of redundant hard disk drive	Contact Selex ES Inc. customer service for replacement
Unexplained RCSU or RSDU server restarts	Windows detected a System Failure caused by the RAM, the motherboard, or other computer hardware.	Contact Selex ES Inc. customer service for analysis of Windows event logs and replacement hardware

2238 RCSU (Small Form Factor Configuration)		
System will not power up – Power LED always off.	External Power Supply disconnected.	Check DC power connection from external power supply to RCSU assembly.
Communications fault with all equipment	Blown fuse on Backplane CCA	Check fuse F1 on 012127-0001 Backplane CCA located behind Card Cage Assembly.
	Power Supply/RSU I/F CCA has failed.	Refer to Section 6.3.2 for verifying the outputs of this CCA.
No serial communications to the ILS through the RCSU program.	The COM port specified in the Configuration screen is incorrect.	Identify the COM port attached to the modem connected to the ILS. Refer to Section 3.5.3.7.3.1 to change the ILS COM port number.
	The COM port specified in the Configuration screen is in use by another application.	Verify that no other applications are currently using the specified COM port.
	Blown fuse on Backplane CCA	Check fuse F1 on 012127-0001 Backplane CCA located behind Card Cage Assembly.
	Power Supply/RSU I/F CCA has failed.	Refer to Section 6.3.2 for verifying the outputs of this CCA.
	The Tip and Ring signals between the RCSU and ILS are not properly connected.	Check for continuity in the Tip/Ring lines between the RCSU and the ILS.
Communications fault with Cardion VOR/TACAN/DME equipment.	The COM port specified in the Configuration screen is incorrect.	Likely if COM FAIL LEDs are not lit on the Cardion VORTAC Interface CCA. Identify the COM port attached to the Cardion VORTAC Interface then refer to Section 3.5.3.7.4 to change the port number.
	The signals between the RCSU and Cardion equipment are not properly connected.	Check for continuity in the lines between the RCSU and the Cardion equipment.
	Cardion VORTAC Interface CCA and/or Cardion equipment not aligned properly.	Refer to Section 9.5.2.7.1 for alignment of the Cardion VORTAC Interface CCA and Cardion equipment.
Having trouble selecting touchscreen controls	Touchscreen needs recalibration	Refer to Section 3.3.3.1 to calibrate the touchscreen.
On Battery indicator lit on Front Panel	System is running on batteries	Restore AC power to the RCSU equipment
Battery Warning indicator lit on Front Panel	RCSU's battery needs replacing	Refer to Sections 7.7 and 9.5.3.1.2 for procedures to replace the RCSU's internal battery.
	RCSU's battery is unplugged	Refer to Section 9.5.3.1.2 for connecting the internal battery
The RCSU or RSDU server will not operate on batteries	The UPS batteries are faulty.	Refer to the Battery Warning indicator issues above.

2238 RCSU (Small Form Factor Configuration)		
Inadequate or no alarm sound from RCSU's front panel speaker.	Audible alarm muted or turned down	Refer to Section 3.5.2 to turn up the RCSU audible alarm volume
	RCSU alarm may be disabled	Refer to Section 3.5.3.2.1.3 to enable RCSU alarms by unselecting Disable RCSU Alarms.
	RCSU alarm silenced by controller at 2238 RSDU	By design the RCSU alarm is silenced whenever the RSDU Silence Alarm button is pressed.
The RCSU does not make connection on Dial-In	Remote modem access may not be enabled.	Verify remote modem access is enabled. Refer to Section 3.5.3.2.
	Faulty phone line connection.	Unplug the phone cord from the modem's line connector and check for dial tone using telephone test equipment.
	Incorrect modem selected in configuration.	Refer to Section 3.5.3.2 for details on selecting the modem.
RCSU LCD Touchscreen intensity too low	Backlight intensity decays over time	Use the LCD front panel controls to increase the brightness.
Excessive noise from power supply or RCSU cooling fan	Eminent failure of cooling fan	Contact Selex ES Inc. customer service for replacement
Unexplained RCSU restarts	Windows detected a System Failure caused by the RAM, the motherboard, or other computer hardware.	Contact Selex ES Inc. customer service for analysis of Windows event logs and replacement hardware
2138 Remote Status Unit		
No lamps light when power is applied	AC power is not available to the 2138 RSU.	Check AC Mains circuit breaker. Verify the power cord to the unit is connected and functional.
Only RSU POWER and COMM FAIL indicators are on.	Faulty 2138 RSU/RCSU communications.	Check RS-422 connections between RCSU and 2138 RSU. Refer to Section 9.5.5 for proper configuration of this serial data channel.
	The 2138 RSU is not configured correctly in RCSU.	Refer to Section 3.5.3.7.2.1 for proper configuration of the serial data port.
Status lamps indicate incorrect status	There is a faulty connection between RCSU and 2138 RSU.	Verify correct connection between RCSU and 2138 RSU.
	There is a faulty connection between RCSU and 2138 RSU.	If more than one 2138 RSUs are daisy-chained together, remove all of the Slave RSUs and determine if the Master operates properly. Re-install the slave RSUs, one at a time, to locate the faulty 2138 RSU.
	There is a faulty connection between RCSU and 2138 RSU.	Perform a 2138 RSU Self Test to check RCSU/RSU communication. Refer to Section 6.2.6.
2138 RSU will not operate on optional RSU Battery Box	The 2138 RSU batteries are faulty.	Check the 2138 RSU Battery Box. Refer to Section 6.4.1.

2238 RCSU (Small Form Factor Configuration)		
Miscellaneous Optional Equipment		
RCSU reports a Comm Fault with any Network-based device (e.g. RCI SBRS) ***but not*** the Network Router	Faulty Ethernet connection between the Router and the Network-based device.	Check for loose Ethernet cable connections on the router and device. Verify that the link indicators on the router and network-based device are on. Verify/replace the Ethernet cable connecting the router and device.
RCSU reports a Comm Fault with any Network-based device (e.g. RCI SBRS) ***and*** the Network Router	Faulty Ethernet connection between the RCSU and the Network Router.	Check for loose Ethernet cable connections on the router and RCSU. Verify that the link indicators on the router and RCSU PC are on. Verify/replace the Ethernet cable connecting the router and RCSU PC.
	Power Fault to the Network Router	Verify that the Network Router is powered on.
RCSU reports a Fan Fault for the Network Router	Dirty or failed fan(s) in Network Router.	Power down Router. Use low-pressure compressed air to clean router fans. Restart Router. Replace router if problem persists. Contact Selex ES Inc. customer service for replacement.
RCSU reports a Temperature Fault for the Network Router with no Fan Fault indicated.	Insufficient air circulation around Network Router	Relocate router so that it is exposed to adequate air circulation.
Communications fault with the RCSU indicated at the RSDU, and the Network Router indicates the RSDU link status as "up".	Faulty Ethernet connection between the RSDU PC and the Unmanaged Switch.	Check for loose Ethernet cable connections on the Unmanaged Switch and RSDU. Verify that the link indicators on the switch and RSDU PC are on. Verify/replace the Ethernet cable connecting the switch and RSDU PC.
Communications fault with the RCSU indicated at the RSDU, and the Network Router indicates the RSDU link status as "down".	Faulty Ethernet connection between the Managed Network Router and the Unmanaged Switch.	Check for loose Ethernet cable connections on the Unmanaged Switch and Managed Network Router. Verify that the link indicators on the switch and router are on. Verify/replace the Ethernet cable connecting the switch and router.
	Power Fault at the Unmanaged Switch	Verify that the PWR LED on the Unmanaged Switch is on. Verify that the DC OK LED on the 12VDC power Supply is on. Disconnect the switch's DC power input. Using a DVMM, verify the AC input to the Power Supply, and the +12VDC output from the Power Supply. Replace if the Power Supply is found to be defective. Replace the Switch if the Power Supply is OK.

7.5 OFF-SITE REPAIR

This manual has no provision for off-site repairs. Defective modules are to be returned to the depot or factory. Repair to component level may require an external power source, signal generating equipment, and special analyzers in some cases. Module repairs are beyond the scope of this manual. In all cases where the module or circuits are damaged, the module or component is to be returned to the proper repair facility.

7.6 OVERHAUL, MAINTENANCE AND REPAIR STANDARDS

When a performance step results in an abnormal indication, stop and correct the problem while referring to the standards and tolerances in Section 4.

7.7 PACKING INSTRUCTIONS

Equipment requiring shipment from the site for repair shall be packaged and marked. Components sensitive to electrostatic discharge shall be properly marked and packed in accordance with DOD-STD-1686, Electrostatic Discharge Control Programs for Protection of Electrical and Electronic Parts.

When transporting the UPS or Small Form Factor RCSU, always **DISCONNECT THE BATTERY** before shipping to be in compliance with U.S. Department of Transportation (DOT) regulations.

UPS:

The battery may remain in the UPS; it does not have to be removed. To disconnect the battery, shutdown and disconnect the UPS from the AC supply then remove the front bezel and unplug the battery connector by pulling firmly on the white battery cord.

Small Form Factor RCSU:

The 35 AHr battery must be removed from the 002238-0312 RCSU chassis prior to shipment. The smaller 7Ahr battery in the 002238-0412 RCSU chassis should remain installed in its bracket for shipping. To remove the 002238-0312 RCSU's internal battery:

a. Shutdown and disconnect the RCSU from the AC supply.
b. Remove the top cover of the RCSU.
c. Remove the in-line fuse from the battery's ground lead.
d. Disconnect the two wires from the battery, reconnecting the loose hardware to the battery.
e. Remove the battery hold-down strap.
f. Remove the battery from the RCSU chassis
g. Replace the battery hold-down strap and the RCSU's top cover.

8 PARTS LIST

Table 8-1 is a list of materials for the major components of the 2238 RCSU.

Table 8-1 Model 2238 RCSU Parts List		
Part Number	**Description**	**Quantity**
Industrial Rack RCSU Configuration		
002238-0112	**2238 RCSU, Industrial Rack Configuration, 120V with UPS**	
030763-0001	Rack Assembly 2238 RCSU	1
030764-0001	Card Cage Assembly 2238 RCSU	1
978201-XXXX	2238 RCSU Software Assembly	1
030763-0001	**Rack Assembly 2238 RCSU**	
950856-0001	RCSU Server, 4U Rackmount, 10 COM Ports and Modem	1
950741-0121	UPS Power Supply, APC Smart-UPS XL, 2200VA RM 3U	1
950857-0001	Keyboard Assembly with Trackball	1
950858-0001	17” LCD Desktop Monitor	1
950780-0001	19” Rack, 42” (21U) Tall	1
030764-0001	**Card Cage Assembly 2238 RCSU**	
950864-0001	Compact PCI Power Supply, Silver Face	1
012109-0001	Backplane CCA	1
242006-0001	Fan, Blower, 5W, 5 Volt	2
Small Form Factor RCSU Configuration		
002238-0312/-0412	**2238 RCSU, Small Form Factor Configuration**	
030863-0001	5U RCSU Chassis	1
978201-XXXX	2238 RCSU Software Assembly	1
030863-0001	**5U RCSU Chassis**	
950890-0005	PC Kit, Embedded, MB, HDD, CDROM, RAM	1
012128-0002	Battery Charger Power Supply CCA	1
950892-0000	LCD, 10.4” w/Touchscreen	1
012127-0001	Backplane CCA	1
950865-0002	3U Sub-rack Assembly	1
235013-0001	Battery, 12V, 35 AHr (-0312 RCSU)	1
235000-0000	Battery, 12V, 7 AHr (-0412 RCSU)	1
950902-0000	Power Supply	1
2238 Remote Status Display Unit		
470560-0001	**2238 Remote Status Display Unit Kit, 120V**	
030765-0001	Rack Assembly 2238 RSDU	1
950859-0002	18” Touchscreen Monitor Assembly	1
950863-0001	Dual Speaker Panel Assembly	1
146038-0250	CAT5 Cable, 250 feet	1
978204-XXXX	2238 RSDU Software Assembly	1
030765-0001	**Rack Assembly 2238 RSDU**	
950856-0002	RSDU Server, 4U Rackmount with SoundBlaster Card	1
950741-0011	UPS Power Supply, APC Smart-UPS, 1500VA RM 2U	1

Table 8-1 Model 2238 RCSU Parts List		
Part Number	**Description**	**Quantity**
950860-1061	19” Rack, 12” (6U) Tall	1
2138 Remote Status Unit		
470358-0001	**2138 Remote Status Unit Kit, with Battery Backup**	
030691-0001	2138 RSU Module Assembly	1
030705-0002	2138 RSU Battery Backup Assembly	1
950747-0000	Power Supply 12V 2A Universal AC Input	1
030691-0001	**2138 RSU Module Assembly**	
012046-0001	2138 RSU Interconnect CCA	1
012047-1001	2138 RSU Keypad CCA	1
978176-XXXX	2138 RSU Firmware Assembly	1

Table 8-2 lists the optional equipment associated with the 2238 RCSU systems.

Table 8-2 Model 2238 RCSU Optional Equipment	
Part Number	**Description**
Industrial Rack RCSU Configuration	
012110-0001	Dual Modem I/F CCA
012108-1001	Cardion Navaid I/F CCA
012107-0001	Transient Voltage Suppression CCA, w/short bracket
012746-0001	Extender Card, 3U
950727-0001	RocketPort8 Serial Card, PCI
012126-1002	I/O Controller CCA (Industrial Rack ONLY)
Small Form Factor RCSU Configuration	
012110-0001	Dual Modem I/F CCA
012108-1001	Cardion Navaid I/F CCA
012107-0002	Transient Voltage Suppression CCA, w/long bracket
012746-0001	Extender Card, 3U
950727-0002	RocketPort8 Serial Card, PCI
012129-0001	Power Supply/RSU I/F CCA
012126-1001	I/O Controller CCA (Small Form Factor ONLY)
950900-0001	USB-RS232 Serial Adapter, 1 Serial Port
950900-0002	USB-RS232 Serial Adapter, 2 Serial Ports
950900-0004	USB-RS232 Serial Adapter, 4 Serial Ports
Any 2238 RCSU Configuration	
470429-0001	**Remote Status Monitoring System (RSMS) Application**
030853-0001	**Managed Enclave Router**
950978-0001	Cisco 2811 Router w/Security Bundle
950978-0002	Cisco Switch Module, 9-ports
950978-0003	Cisco Modem Module
470461-0001	**Unmanaged Switch Kit**
950976-0000	Unmanaged Ethernet Switch
950975-0003	AC-DC Power Supply, 12V @ 60W
470460-0001	**Remote I/O Kit**
950977-0000	Ethernet I/O Module
950976-0000	Unmanaged Ethernet Switch

Table 8-3 lists the spares kits associated with the 2238 RCSU systems.

Table 8-3 Model 2238 RCSU Spares Kits	
Part Number	**Description**
Industrial Rack RCSU Configuration	
	No spares kits for this configuration
Small Form Factor RCSU Configuration	
480153-0016	Spares Kit, SFF RCSU, Full
480153-0012	Spares Kit, SFF RCSU, Full with Dual Modem
480153-0008	Spares Kit, SFF RCSU, Recommended
480153-0004	Spares Kit, SFF RCSU, Recommended with Dual Modem
480153-0003	Spares Kit, SFF RCSU, Minimum

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9 INSTALLATION, INTEGRATION, AND CHECKOUT

9.1 INTRODUCTION

This section contains installation procedures for both of the Model 2238 RCSU Configurations, as well as the 2238 RSDU and 2138 RSU Module.

9.2 SITE INFORMATION

Prior to installation of the 2238 RCSU, the desired installation location should be prepared. The dedicated modem lines between the RCSU and each of the navaid shelters should be installed and verified to be of modem-quality. The Industrial Rack RCSU Assembly requires a 30A circuit with the appropriate plug. Refer to the UPS's User Manual supplied with that RCSU system for the specifics regarding the AC connection.

If a 2238 RSDU is to be installed, the network cable that connects it to the RCSU Server must be installed. This can be done using a cross-over Ethernet cable for a direct RCSU PC to RSDU PC connection. Alternatively, the RSDU-RCSU connection can be implemented using an authorized segment of the facility's LAN, or through the use of an Unmanaged Ethernet Switch kit (470461-0001) and/or Enclave Router kit (470651-0001). The 2238 RSDU's touchscreen LCD monitor is typically panel mounted, although 19" rack or VESA mounting configurations are also available. The desired installation location should be prepared.

If a 2138 RSU is to be installed, the two twisted pair lines that connect it to the RCSU must be installed. One very common source of installation errors, and therefore initial communication faults with the navaids, comes from incorrectly connecting the communication lines between the navaids and the RCSU, or incorrectly configuring the RCSU's COM Ports with the associated equipment. Use the form on the following page to document the various equipment connections as the installation progresses. This will greatly reduce the amount of time spent troubleshooting connection problems.

In the COM Port column, note the desired COM Port in the RCSU PC that is used for each connection. Add the RocketPort Connector label (P0-P7) for this port in the next column. Typically, these ports are assigned as follows:

	Industrial Rack RCSU	**Small Form Factor RCSU**
P0	COM4	COM6
P1	COM5	COM7
P2	COM6	COM8
P3	COM7	COM9
P4	COM8	COM10
P5	COM9	COM11
P6	COM10	COM12
P7	COM11	COM13

These settings can be verified in the RCSU PC's Device Manager:

Multi-port Serial Adapters>>RocketPort-8 PCI>>Properties>>Main Setup window.

The next column can be used to identify which pair of dedicated facility wiring goes to the associated navaid and the final column can be used for any installation notes.

Once the COM ports have been determined and documented, make the required COM port connections, using the specified P0-P7 connectors, as well as the DB9M-F serial cables supplied with the RCSU hardware.

2238 RCSU Equipment Connections				
Equipment	**Com Port**	**Connector**	**Demark Pair**	**Notes**
USB Modem				
2138 RSU Module				
I/O Controller CCA				
Runway #1:				
Primary Localizer				
Primary Glideslope				
Primary IMB				
Primary MMB				
Primary OMB				
Secondary Localizer				
Secondary Glideslope				
Secondary IMB				
Secondary MMB				
Secondary OMB				
Runway #2:				
Primary Localizer				
Primary Glideslope				
Primary IMB				
Primary MMB				
Primary OMB				
Secondary Localizer				
Secondary Glideslope				
Secondary IMB				
Secondary MMB				
Secondary OMB				
Runway #3:				
Primary Localizer				
Primary Glideslope				
Primary IMB				
Primary MMB				
Primary OMB				
Secondary Localizer				
Secondary Glideslope				
Secondary IMB				
Secondary MMB				
Secondary OMB				

2238 RCSU Equipment Connections				
Equipment	**Com Port**	**Connector**	**Demark Pair**	**Notes**
Runway #4:				
Primary Localizer				
Primary Glideslope				
Primary IMB				
Primary MMB				
Primary OMB				
Secondary Localizer				
Secondary Glideslope				
Secondary IMB				
Secondary MMB				
Secondary OMB				
Other Equipment				
VOR/TACAN/DME				
VOR/TACAN/DME				
VOR/TACAN/DME				

9.3 UNPACKING AND REPACKING

The RCSU shipping box contains a packing list which details the equipment enclosed in the box. Unpack the equipment and visually inspect each item for accuracy and damage, but do not remove any ESD protective wrapping. Report any damage immediately. After inspection, repack each item to prevent damage. During installation, unpack items as they are needed.

9.3.1 Environmental Considerations

The environmental conditions must not exceed those listed in the Specifications of Table 1-5.

9.4 INPUT REQUIREMENT SUMMARY

The requirements for input power must not exceed those listed in the Specification of Table 1-1.

9.5 INSTALLATION PROCEDURES

9.5.1 Tools and Test Equipment Required

Refer to Table 9-1 for a list of tools and test equipment required to install and checkout the 2238 RCSU.

Table 9-1 Tools and Test Equipment
Phillips Head Screwdriver (#2)
Standard Head Screwdriver (1/4”, 1/8”, and 1/10”)
Spade-Lug Crimper
Fluke 87 DVM (or equivalent)
CAT5 10BaseT Network Modular Plug Crimper
Wire Cutters
Oscilloscope
Potentiometer Adjustment Tool

9.5.2 Industrial Rack RCSU Configuration (002238-01XX) Installation

The 2238 RCSU Server is typically installed in a maintenance room in the ATC tower as detailed in this section. Refer to the supplied 2238 RCSU Schematic 002238-9001 and Assembly Drawing 002238 during this procedure.

9.5.2.1 Rack Assembly

The main RCSU rack assembly is shipped from the Selex ES Inc. factory with only the keyboard and card cage installed. The rack should be removed from any palette and placed in the desired location. Note that this should be within 4 feet of the required 30A AC outlet. Using the 25 feet of green, 10AWG wire (item 5, 146024-5555), connect the rack assembly to a facility earth ground point. The ground lug below the AC connector on the back of the card cage should be used for this.

9.5.2.2 UPS

The UPS supplied with the 2238 RCSU must be installed in the RCSU rack prior to operation. This unit is quite heavy, so several installers should be utilized during this process to avoid injury.

a. Remove the top of the UPS box and remove all of its documentation and accessories from the box.
b. Tip the UPS up and remove the screws retaining the battery module.
c. Remove the UPS's battery module and set it aside.
d. Install the UPS into the lowest position in RCSU rack from the front, making sure that the AC cord is not pinched during installation.
e. Re-install the UPS's battery module into the UPS and secure it with the associated screws.
f. Plug the battery module into the UPS.
g. Install the faceplate onto the UPS.
h. Plug the UPS into the AC outlet and turn it on. Verify that the Site Wiring Fault indicator on the UPS's rear panel is not on. If it is, correct the facility AC wiring issue before continuing. Refer to the User Manual supplied with the UPS for details of its controls and indicators.
i. Connect the serial cable supplied with the UPS between the UPS and the RCSU server COM1 connector.

Note that if the UPS should need to be shipped in the future, the batteries must be disconnected prior to shipping the unit.

9.5.2.3 RCSU Server

The RCSU Server is installed into the RCSU rack as follows:

a. Remove the RCSU Monitor from its packing material.
b. Install it on top of the RCSU Rack. Note that hook-and-loop tape is supplied with the 2238 RCSU to secure the monitor to the rack, if desired.
c. Connect the monitor's power supply between the monitor and one of the UPS's outlets.
d. Remove the RCSU Server from its packing material.
e. Install it into the RCSU Rack between the card cage and the UPS, making sure that its rails are properly engaged into the rack's slides.
f. Referring to the 2238 RCSU Schematic, 002238-9001, make each of the following connections between the RCSU Server and its peripherals:

    1. UPS, two separate AC connections to the RCSU Server's redundant power supplies.
    2. UPS, black serial cable between COM1 on the RCSU Server and the serial port on the rear panel of the UPS.
    3. Keyboard/Trackball, Keyboard connector is violet, Trackball connector is green.
    4. LCD Monitor, SVGA plug to the DB-15 connector on the RCSU Server's rear panel.
    5. Modem, to the facility telephone jack using the supplied phone line.
    6. 8-port serial cable, install in the associated connector on the RCSU Server's rear panel. These ports will be connected to the TVS CCAs in the card cage.
    7. 2238 RSDU, using the appropriate network cable routed between the RSDU and RCSU. Note that this should be connected to NIC1, which is Ethernet port on the left, when looking at the RCSU's rear panel. NIC2 is used to optionally connect the RCSU to an existing LAN. Refer to the RSDU Kit Drawing, 470560, for the wiring chart for a cross-over Ethernet cable if required. Once both ends of this Ethernet cable have been crimped, use an appropriate network cable tester to validate the connections.

If a Managed Enclave Router Kit (470651-0001) is supplied, refer to the associated Installation Instructions (561098-

0013) supplied with the kit for its installation details.

If an Unmanaged Ethernet Switch Kit (470461-0001) is supplied, refer to the associated Assembly Drawing (470461-8001) supplied with the kit for its installation details.

If a Remote I/O Kit (470460-0001) is supplied, refer to the associated Installation Instructions (561098-0012) supplied with the kit for its installation details.

9.5.2.4 Card Cage

The card cage is factory-installed, containing the power supply and switch panel. In addition to the earth ground connection installed above, connect the card cage's AC cord to an available outlet on the UPS. Then, install the various cards supplied for this site into the card cage as follows:

9.5.2.5 TVS CCAs

The Dual Modem Interface CCA and Cardion VORTAC CCAs all use the TVS CCAs for their connections to the associated navaid equipment and the RCSU Server.

a. Unpack each TVS CCA.
b. Install the TVS CCAs into the card cage from the rear, starting with the right-most slot and working to the left.
c. Secure the TVS CCAs to the card cage with their thumbscrews.
d. Remove the green terminal block connector from each of the TVS CCAs, noting the connector's orientation.
e. Using a small, 1/10" wide screwdriver, connect each pair of signal wires from the installed navaid stations to the terminal block connectors in an orderly fashion. The two terminals at the top of the connector when it's installed in the TVS CCA are for Channel A, the two at the bottom are for Channel B. For example, install connect one approach's Localizer to Channel A, and the associated Glideslope to Channel B. Note that for Cardion navaids, the VOR equipment MUST be installed on Channel A, and TACAN and DME equipment MUST be installed on Channel B. Therefore, for sites with a Cardion TACAN and a Cardion DME, two separate sets of TVS and Cardion Interface CCAs will be used, leaving the Channel A ports unused.
f. Install each of the green terminal block connectors into the corresponding TVS CCA, again in an orderly fashion. It is recommended that the 2100 ILS equipment is connected to the right-most TVS CCAs, followed by the Cardion equipment to the left, as viewed from the rear of the RCSU rack.

9.5.2.6 Dual Modem Interface CCAs

For each pair of 2100 ILS navaids, a Dual Modem Interface CCA will be installed in the card cage:

a. Remove the Dual Modem Interface CCAs from their packing material.
b. Install each of them into the card cage from the front of the RCSU rack, starting on the left side of the card cage and working to the right.

9.5.2.7 Cardion VORTAC CCAs

For each pair of Cardion navaids, a Cardion Interface CCA will be installed in the card cage:

a. Remove the Cardion Interface CCAs from their packing material.
b. Install each of them into the card cage from the front of the RCSU rack, starting with the slot to the right of the last Dual Modem CCA and working to the right.

9.5.2.7.1 Cardion Equipment Alignment

In order to align the Cardion Interface CCA two technicians will be required. Technician A will work in the equipment shelter for the Cardion equipment and Technician B will work at the 2238 RCSU. A telephone or radio communication link must be established between the two technicians for coordinated work throughout this section. Refer to the appropriate Technical Orders for the Cardion VOR, TACAN, and DME equipment for module identification and location of controls and indicators.

Test equipment required – Oscilloscope with X10 probe and ground clip (2 required).

Alignment of Cardion Control Indicator Interface 2A2A1 and CODEC 6A1

a. (A: Technician) Set monitor A and B timebase interface switch 2A3/A4A10 S1 to BYPASS position.
b. (A: Technician) Select master menu item EC "Remove Identification".
c. (A: Technician) Set control indicator interface switch 2A2A1 S1 to REMOTE position.
d. (A: Technician) Adjust control indicator interface 2A2A1 R1 (DETECTED AUDIO ATTENUATOR ADJ) fully CCW.
e. (A: Technician) Set oscilloscope channel 1 VOLTS/DIV to 0.5 VAC and TIME/DIV to 5 ms.
f. (A: Technician) Connect oscilloscope probe ground lead to control indicator interface 2A2A1 TP6 (GND).
g. (A: Technician) Connect oscilloscope channel 1 to control indicator interface 2A2A1 TP5 (TELEPHONE LINE OUTPUT).
h. (A: Technician) Adjust control indicator interface 2A2A1 R16 (AUDIO LEVEL ADJ) for a 3.0 ± 0.2 V peak-to-peak signal level.
i. (B: Technician) Set 2238 RCSU Card Cage power On/Off circuit breaker to OFF position.
j. (A: Technician) Connect oscilloscope channel 1 to control indicator interface 2A2A1 TP4 (RECEIVE LEVEL).
k. (A: Technician) Adjust control indicator interface 2A2A1 R72 (CANC ADJ) for a minimum signal level.
l. (B: Technician) Set 2238 RCSU Card Cage power On/Off circuit breaker to ON position.
m. (A: Technician) Set VOR or TACAN/DME power On/Off circuit breaker 2A2 CB1 to OFF position.
n. (B: Technician) Connect oscilloscope probe ground lead to Cardion Interface CCA TP3 (AGND).
o. (B: Technician) For VOR alignment, connect oscilloscope channel 1 to Cardion Interface CCA TP1 (A IN). For TACAN/DME alignment, connect oscilloscope channel 1 to Cardion Interface CCA TP2 (B IN).
p. (B: Technician) Set oscilloscope channel 1 VOLTS/DIV to 0.1 VAC and TIME/DIV to 5 ms.
q. (B: Technician) For VOR alignment, adjust Cardion Interface CCA R1 (A NULL ADJ) for a minimum signal level. For TACAN/DME alignment, adjust Cardion Interface CCA R2 (B NULL ADJ) for a minimum signal level.
r. (A: Technician) Set VOR or TACAN/DME power On/Off circuit breaker 2A2 CB1 to ON position.
s. Repeat this procedure for all Cardion equipment connected to the 2238 RCSU.
t. Restore equipment to normal operating configuration.

9.5.2.8 Equipment Configuration

Now that the 2238 RCSU hardware is installed, the RCSU software can be configured and put into service.

a. Turn on the UPS (all rear panel switches, as well as the one on the UPS's front panel), card cage, LCD Monitor, and RCSU Server (all rear panel switches, as well as pressing the RCSU Server's front panel Power switch). The RCSU Server will boot up, log into the RCSU account, and start the RCSU application.
b. Referring to Section 3.5.3, configure all of the RCSU's system parameters, ie. Site Name, Map File, etc, and then configure each of the runways, and navaid equipment. Refer to Section 9.5.7 to configure any Ethernet-based Navaids.
c. Exit Configuration Mode to start the RCSU's normal operation.

9.5.3 Small Form Factor RCSU Configuration (002238-0312/-0412) Installation

The Small Form Factor 2238 RCSU is typically installed in a maintenance room in the ATC tower as detailed in this section. Throughout this procedure, refer to the 2238 RCSU Schematic, 002238-9001, and Assembly Drawing, 002238, supplied with the 2238 RCSU.

9.5.3.1 5U RCSU Chassis

The Small Form Factor RCSU consists of mainly a 5U assembly that's designed to be installed into a standard 19" rack, or simply placed on a table top, as detailed below.

9.5.3.1.1 RCSU PC Connections

Several cables must be connected to the RCSU PC prior to operating the system.

a. Two cables are stored inside the rear of the card cage assembly during shipment – the LCD's video cable and the Touchscreen's serial cable. Unpack these cables from the RCSU card cage area.
b. Connect the LCD's video cable to the video connector on the rear of the RCSU chassis.
c. Connect the Touchscreen's DB9 serial cable to COM1 on the rear of the RCSU chassis. COM1 is located near the video connection.
d. Unpack and connect the Keyboard and Mouse to the two front panel USB ports. They are normally only installed during configuration, then unplugged and stored during normal operation.

9.5.3.1.2 Battery Installation (-0312 RCSU Only)

Prior to installing the 5U RCSU assembly into the rack, the battery must be installed since it is shipped separately from the main unit.

a. Using a Phillips screwdriver, remove the top cover from the RCSU assembly.
b. Remove the Battery Hold-down Strap, located immediately behind the LCD.
c. Unpack the supplied battery and lower it into place, with the GROUND (-) terminal towards the left side of the chassis, and the POSITIVE (+) terminal near the center of the chassis. When installing the battery, be careful not to pinch any of the internal cabling with the battery.
d. Securely connect the red battery wire coming from E1 on the BCPS CCA to the POSITIVE (+) terminal on the battery.
e. Slide the red rubber battery terminal cover into place to protect against inadvertently shorting the battery terminals.
f. Securely connect the black battery wire coming from E2 on the BCPS CCA to the GROUND (-) terminal on the battery. Once power is applied, the RCSU system will automatically turn on when the battery is connected. This feature allows the system to automatically recover from an AC power failure.
g. Verify that the system boots up, then press the Power switch on the front panel and wait until the system shuts down.
h. Slide the black rubber battery terminal cover into place.
i. Verify that the in-line fuse is installed in the black GROUND lead.
j. Reinstall the top cover on the RCSU assembly.

Note that if the RCSU assembly should need to be shipped in the future, the battery must be disconnected and removed prior to shipping the unit.

9.5.3.1.3 Power and Ground

Once the battery is installed, the RCSU assembly may be installed into the facility's rack.

a. Install the RCSU assembly into the facility's rack location, using hardware appropriate for that rack.
b. Connect the supplied AC/DC power supply (950902-0000) to the DC jack on the rear panel of the RCSU, routing the DC cable through the strain relief provided near the DC jack.
c. Connect the green ground wire (146024-5555) supplied with the 2238 RCSU between the ground lug on the rear of the RCSU chassis and a suitable facility Earth ground point.
d. Plug the AC/DC power supply into an AC outlet using the supplied AC power cord (950598-0000). Once power is applied the RCSU system will automatically turn on when the battery is connected. This feature allows the system to automatically recover from an AC power failure.
e. Verify that the system boots up, then press the Power switch on the front panel and wait until the system shuts down.

9.5.3.1.4 Optional Equipment Connections

Depending on the external equipment installed at each site, the following connections must be made:

a. Based on the number of associated navaids, the RCSU may be shipped with an eight-port serial expansion card installed. If so, the "octopus" cable supplied with the RCSU must be connected to the rear of the RCSU, with its jackscrews securely tightened down.
b. Based on the number of associated navaids, the RCSU may be shipped with one or more USB-to-RS232 Serial Adapters, 950900-0001, -0002, or -0004. If so, install these adapters into the USB jacks on the rear panel of the RCSU.
c. The RCSU's USB modem must be connected to the facility's telephone system using the supplied RJ-11 telephone cord if the RCSU's dial-in feature is to be used. This feature allows a remote user to call into the RCSU system using the PMDT application and access the RCSU and its connected navaids remotely.
d. If the 2238 RSDU is to be installed at this facility, the point-to-point cross-over Ethernet cable between these two systems must be installed in the RCSU's NIC-1 port. This is the left-most Ethernet port, nearest the COM1 serial port connector, on the rear panel of the RCSU assembly. Refer to the 2238 RSDU Kit Drawing, 470560, for the wiring chart for this cable. Once both ends of this Ethernet cable have been crimped, use an appropriate network cable tester to validate the connections. Alternatively, the RSDU-RCSU connection can be implemented using an authorized segment of the facility's LAN, or through the use of an Unmanaged Ethernet Switch kit, 470461-0001, and/or a Managed Enclave Router kit, 470651-0001.
e. If the 2238 RCSU is to be connected to the facility LAN, providing remote access to the RCSU via the PMDT across the LAN, an appropriate facility Ethernet cable must be connected to the RCSU's NIC-2 port, to the right of the NIC-1 port on the rear panel of the RCSU assembly.
f. If a Managed Enclave Router kit (470651-0001) is supplied, refer to the associated installation instructions (561098-0013) supplied with the kit for its installation details.
g. If an Unmanaged Ethernet Switch kit (470461-0001) is supplied, refer to the associated assembly drawing (470461-8001) supplied with the kit.
h. If a Remote I/O Kit (470460-0001) is supplied, refer to the associated installation instructions (561098-0012) supplied with the kit for its installation details.

9.5.3.2 Card Cage CCAs

The following sections detail the installation procedures for each of the various optional CCAs that can be installed in the RCSU's card cage.

Prior to installing any card cage CCAs, verify that the green Power LED on the front panel is off. If not, press the Power switch on the front panel to start the shutdown process. The green Power LED will flash for up to 60 seconds indicating that the system is shutting down, then the BCPS will turn off the power to the embedded PC, card cage, and LCD.

9.5.3.2.1 Power Supply/RSU I/F CCA

The Power Supply/RSU I/F CCA (012129-0001) is included with the 2238 to power the other CCAs in the card cage and provide the RS-422 interface for the 2138 RSU Module.

a. Unpack the Power Supply/RSU I/F CCA.
b. Install this CCA into the rear of the card cage, in the PS slot. Electrically, it can be located in any of the slots in the backplane, but due to height of its components, it must be installed in the PS slot.

9.5.3.2.2 I/O Controller CCA

The I/O Controller CCA provides digital I/O connections that can be used for status, control, and interlock functionality.

a. Unpack the I/O Controller CCA.
b. Install this CCA into the rear of the card cage, in the I/O slot. Electrically, it can be located in any of the slots in the backplane, but for commonality between RCSU systems it should be installed in the I/O slot.

9.5.3.2.3 TVS CCAs

The Dual Modem Interface CCA and Cardion VORTAC CCAs all use the TVS CCAs for their connections to the associated navaid equipment and the RCSU Server.

a. Unpack each TVS CCA.
b. Install the TVS CCAs into the card cage from the rear, starting with the right-most slot and working to the left.
c. Secure the TVS CCAs to the card cage with their thumbscrews.
d. Remove the green terminal block connector from each of the TVS CCAs, noting the connector's orientation.
e. Using a small, 1/10" wide screwdriver, connect each pair of signal wires from the installed navaid stations to the terminal block connectors in an orderly fashion. The two terminals at the top of the connector when it's installed in the TVS CCA are for Channel A, the two at the bottom are for Channel B. For example, install connect one approach's Localizer to Channel A, and the associated Glideslope to Channel B. Note that for Cardion navaids, the VOR equipment MUST be installed on Channel A, and TACAN and DME equipment MUST be installed on Channel B. Therefore, for sites with a Cardion TACAN and a Cardion DME, two separate sets of TVS and Cardion Interface CCAs will be used, leaving the Channel A ports unused.
f. Install each of the green terminal block connectors into the corresponding TVS CCA, again in an orderly fashion. It is recommended that the 2100 ILS equipment is connected to the right-most TVS CCAs, followed by the Cardion equipment to the left, as viewed from the rear of the RCSU rack.

9.5.3.2.4 Dual Modem Interface CCAs

For each pair of 2100 ILS navaids, a Dual Modem Interface CCA will be installed in the card cage:

a. Remove the Dual Modem Interface CCAs from their packing material.
b. Install each of them into the card cage from the front of the RCSU rack, starting on the left side of the card cage and working to the right. Each Dual Modem Interface CCA should be paired up with a corresponding TVS CCA.

9.5.3.3 Cardion VORTAC CCAs

For each pair of Cardion navaids, a Cardion Interface CCA will be installed in the card cage:

a. Remove the Cardion Interface CCAs from their packing material.
b. Install each of them into the card cage from the front of the RCSU rack, starting with the slot to the right of the last Dual Modem CCA and working to the right. Each Cardion VOARTA CCA should be paired up with a corresponding TVS CCA.

Refer to Section 9.5.2.7.1 above for the Cardion Interface CCA alignment procedure.

9.5.3.4 Equipment Configuration

Now that the 2238 RCSU hardware is installed, the RCSU software can be configured and put into service.

a. Turn on the RCSU by pressing the Power switch on the front panel. The RCSU's embedded PC will boot up, log into the RCSU account, and start the RCSU application.
b. Referring to Section 3.2.1.3.1, calibrate the RCSU's touchscreen.
c. Referring to Section 3.5.3, configure all of the RCSU's system parameters, ie. Site Name, Map File, etc, and then configure each of the runways, and navaid equipment. Refer to Section 9.5.7 to configure any Ethernet-based Navaids.
d. Exit Configuration Mode to start the RCSU's normal operation.

9.5.4 2238 RSDU Installation

The 2238 RSDU Server is typically installed in the top floor of the airfield's tower, with the touchscreen LCD monitor located in the console as detailed in this section. Throughout this procedure, refer to the 2238 RSDU Schematic, 030765-9001, and 2238 RSDU Kit Drawing, 470560, supplied with the 2238 RSDU.

9.5.4.1 Rack Assembly

The RSDU rack assembly is shipped from the Selex ES Inc. factory with the RSDU Server and UPS already installed. The rack should be removed from any packing material and placed in the desired location. If the tower facility already includes provisions for 19" rack-mount equipment, this space may be used instead of the standard RSDU rack. The RSDU Server and UPS require 6U of rack space.

9.5.4.2 UPS

Although the UPS supplied with the 2238 RSDU is factory-installed in the RSDU rack, its internal batteries must be connected prior to operation.

a. Remove the face plate from the front of the UPS.
b. Connect the battery to the UPS.
c. Re-install the face plate on the front of the UPS.
d. Plug the UPS into the AC outlet and turn it on. Verify that the Site Wiring Fault indicator on the UPS's rear panel is not on. If it is, correct the facility AC wiring issue before continuing. Refer to the User Manual supplied with the UPS for details of its controls and indicators.
e. Connect the serial cable supplied with the UPS between the UPS and the RSDU Server's COM1 connector.

Note that if the UPS should need to be shipped in the future, the batteries must be disconnected prior to shipping the unit.

9.5.4.3 RSDU Server

The RSDU Server is factory-installed into the RSDU rack. Refer to the 2238 RSDU Schematic 030765-9001 to make each of the following connections between the RSDU Server and its peripherals.

a. UPS, two separate AC connections to the RSDU Server's redundant power supplies.
b. UPS, black serial cable between COM1 on the RSDU Server and the serial port on the rear panel of the UPS.
c. Keyboard and Mouse, temporarily using the two front-panel USB ports on the RSDU Server. Typically, the keyboard and mouse are only installed during configuration, and then removed and stored separately throughout the normal operation of the RSDU, since the touchscreen LCD monitor is the main input control.
d. 2238 RCSU, using the cross-over cable routed between the RSDU and RCSU. Refer to the RSDU Kit Drawing, 470560, for the wiring chart for this cable. Once both ends of this Ethernet cable have been crimped, use an appropriate network cable tester to validate the connections. Alternatively, the RSDU-RCSU connection can be implemented using an authorized segment of the facility's LAN, or through the use of an Unmanaged Ethernet Switch kit, 470461-0001, and/or the Managed Enclave Router kit, 470651-0001.

9.5.4.4 Touch Screen LCD Monitor

The Touchscreen LCD Monitor supplied with the 2238 RSDU can be installed several ways:

a. 19" Rack Mount (8U of rack space required).
b. Panel mounted (in a panel cutout measuring 14" tall and 16.2" wide).
c. Swing-arm mounted (via standard VESA mounting holes).
d. Desktop mounted (with supplied base).

To install the touchscreen:

a. Determine the mounting style and location for the Touchscreen LCD Monitor. Note that the supplied cables to the RSDU Server are approximately 12' long, including the extension cables.
b. Route the AC power cord to an available outlet on the RSDU UPS.
c. Route the SVGA and Touchscreen Serial Port cables to the RSDU Server, using COM2 for the Touchscreen Serial Port.
d. Using the thumbscrews and other captive hardware, secure the cables to the monitor to prevent them from being inadvertently disconnected during use.
e. Turn on the monitor's master power switch, which is located on the left side of the monitor.
f. Secure the monitor in its mounting location using the trim washers (item 10, 136522-0001) and either the screws supplied with the monitor for rack or VESA mount installations, or the #6 screws (item 11, 327626-0000) for either wood or metal panel mounting.

9.5.4.5 Speaker Panel

The stereo Speaker Panel supplied with the 2238 RSDU is typically installed either above or below the Touchscreen LCD Monitor.

a. Determine the mounting location for the speaker panel. Note that the supplied cables to the RSDU Server are approximately 12' long, including the extension cables. A panel-mounted speaker installation requires a panel cutout measuring 3.5" tall and 17.5" wide.
b. Using the audio extension cable if necessary, route the audio line from the Speaker Panel to the black 1/8" speaker output connector on the back of the RSDU Server. Note that this connection must be made to the add-in sound card's amplified speaker output, which is black and located near the right side of the RSDU Server's rear panel. It should NOT be connected to any of the motherboard's audio jacks, which are aligned horizontally near the middle of the RSDU Server's rear panel.
c. Secure the Speaker Panel in its mounting location using the trim washers (item 10, 136522-0001) and either the screws supplied with the monitor for rack mount installations, or the #6 screws (item 11, 327626-0000) for either wood or metal panel mounting.

9.5.4.6 Equipment Configuration

Now that the 2238 RSDU hardware is installed, the RSDU software can be configured and put into service.

a. Turn on the UPS (all rear panel switches, as well as the one on the UPS's front panel), Touchscreen LCD Monitor, and RSDU Server (all rear panel switches, as well as pressing the RSDU Server's front panel Power switch). The RSDU Server will boot up, log into the RCSU account, and start the RSDU application.
b. Referring to Section 3.3.3, perform the 4-point touchscreen calibration.
c. Referring to Section 3.6.3.2, configure all of the RSDU's system parameters, ie. Map File, RCSU Connection, etc., and then apply the configuration.
d. Exiting Configuration Mode should place the RSDU into normal operation, displaying the status of the installed navaids.

9.5.5 2138 RSU Module Installation

A 2138 RSU Module can be installed with the 2238 RCSU to provide status and Interlock Control for two interlocked approaches. The 2238 RCSU communicates with the 2138 RSU Module via two pair of RS-422 signals, one pair for Transmit Data (TxD), and one pair for Received Data (RxD). In the Industrial Rack RCSU Configuration (002238-0112), the RS-422 signals are converted to RS-232 using an in-line RS-232/RS-422 Adapter. For the Small Form Factor RCSU Configuration (002238-0312/-0412), the RS-422 signals are converted to RS-232 using circuitry on the Power Supply/RSU I/F CCA (012129). The required connectors for this RS-422 link are supplied with the RCSU/RSU equipment.

Up to three 2138 RSU Modules may be daisy-chained together on the TxD signal pair coming from the RCSU, providing system status to multiple points. Only one of these RSUs can be connected via the RxD signal lines to the RCSU, providing a single point of control via a "Master" RSU. Note that if no Master RSU is installed, the "No Master RSU" option should be enabled in the RCSU's Runway Configuration Screen. With this option enabled, the RCSU application will not display an RSU Comm Fault due to the loss of the communications link with the non-existent Master RSU.

The 2138 RSU Modules should be connected as follows:

a. (002238-0112 Only) Set the switch on the RS-232/RS-422 Adapter (185391-0001) to "DCE". NOTE: The "DCE" setting is selected on the adapter when the slot on the switch is lined up with the DCE indicator. Therefore, rotating the switch Counter-Clockwise until it stops selects DCE.
b. (002238-0112 Only) Connect this Adapter to the RCSU PC's COM2 port. Note that if the COM ports on the RCSU PC are not labeled, refer to the documentation supplied with the RCSU PC to determine the correct connector positions.
c. (002238-0312/-0412 Only) Connect the supplied DB9M-DB9F serial cable (950429-4006) between the RCSU PC's COM2 port and J1 on the Power Supply/RSU I/F CCA installed in the rear of the cardcage.
d. Using either the wire (443092-0003) supplied with the 2138 RSU Module, or existing facility unconditioned twisted pairs, such as CAT5 network cable, connect the terminals on the RS-422 Adapter (002238-0112 Only) or the Power Supply/RSU I/F CCA (002238-0312/-0412 Only) to P1 on the 2138 RSU Modules as follows:

Table 9-2 2138 RSU Module Connections

Twisted Pair	RS-422 Adaptor	Controlling RSU (Master)	All Other RSUs (Slaves)
Pair #1	TxD+	Rx+	Rx+
	TxD-	Rx-	Rx-
Pair #2	RxD+	Tx+	No Connect
	RxD-	Tx-	No Connect

e. In addition to these connections, on the 2138 RSU Module farthest away from the RCSU Server in the chain, connect P4-2, the Rx+ pin, to P4-1, the RS-422 Terminator pin, with an additional piece of wire. This terminates the RS-422 bus and must be in place for proper operation of the RSU's RS-422 bus.
f. Crimp the spade lug (412008-0001) supplied with the 2138 RSU Module to the supplied green ground wire. Connect this to E1 on the 2138 RSU Module and an appropriate earth ground point.
g. Using the AC power cable supplied with the 2138 RSU Module, connect the RSUs Universal Power supply (950747-0000) to AC voltage. Connect this power supply's DC plug to the DC input (J7) on the RSU. Route the DC power cord through the strain-relief provided.
h. If supplied, connect the optional RSU Battery Box Assembly (030705-0002) to the BATT input (J8) on the RSU. Route the Battery cable through the strain-relief provided.
i. For most installations, the two External I/O ports (J5 & J6) and the RS-232 port (J3) will not be used.

The RSU is now ready for operation.

9.5.6 ILS Equipment Configuration

In order to communicate with the RCSU, the ILS station must be connected to the RCSU wires, and configured via the PMDT. In addition to this basic functionality, the additional capabilities of the RCSU require some additional configuration.

9.5.6.1 Basic RCSU Functionality

The following sections detail the ILS Equipment Configuration for enabling basic RCSU functionality.

9.5.6.1.1 Hardware Connection

The specific hardware connection to the ILS depends on whether a Dual Modem Interface CCA in the RCSU Rack Assembly or an RF Modem is used.

9.5.6.1.1.1 Dual Modem Interface/TVS CCAs

The RMS CCA in each ILS contains the modem used to connect the ILS station to the RCSU's embedded modem on the Dual Modem Interface CCA. The Tip and Ring lines are routed through the ILS's backplane and surge suppression circuitry on the Cabinet Interface CCA, to the RCSU's TVS CCA and on to the Dual Modem Interface CCA.

Connect the Tip and Ring lines from the corresponding channel on the TVS CCA to TB2-10 (Tip) and TB2-11 (Ring) on the ILS's Cabinet Interface CCA.

9.5.6.1.1.2 RF Modem

Refer to the Installation Instructions (561098-0001) in the Radio Modem Kit (470356-0002) for installation details of the RF Modem, its power and RF cabling, and antenna mounting hardware.

a. Connect the ILS's RCSU Radio Modem to J6 (EXT MODEM) on the Cabinet Interface CCA.
b. To enable the EXT MODEM port (instead of the embedded modem module on the RMS) on the Cabinet Interface, set S1-8 on the ILS station's backplane to the ON position.

9.5.6.1.2 ILS Configuration via PMDT

By default, the RCSU channel is not enabled at the ILS station. This must be enabled as follows:

a. Log on to the ILS using the PMDT to Security Level 3.
b. Open the RMS >> Configuration screen.
c. Select the General tab.
d. In the "Modem Configuration" section, set the following parameters:

RCSU Present:	Enabled (checked)
RCSU Connection Type:	Hardwired (Typical, using Dual Modem CCAs)
or	
Radio Modem (Using 470356 RF Modem Kits)	
Primary/Secondary Runway:	Select the appropriate option. This setting is fairly arbitrary, except that all navaids associated with one approach must be set the same, and all the navaids associated with the opposing approach must be set to the opposite setting. Also, the RCSU must be configured properly so that it uses the appropriate comm link for the corresponding navaids.

e. Press the "Apply" button to save changes and apply the configuration. The "Remote Communications Fault" indicator on the ILS's LCU Panel should now be on (yellow). Once the RCSU connects with the ILS, it will turn off, indicating the successful communication link.

NOTE

As a fail-safe mechanism, whenever the RCSU link is enabled in the RMS, that navaid will boot up and be locked into an "Interlocked OFF" state, with the Maintenance Alert indicator on the navaid's LCU panel flashing, until communications are established with the RCSU. Once that happens, the RCSU will command the system to be either Interlocked ON, or Interlocked OFF, whichever is the current configuration at that time. To bypass this fail safety mechanism so that maintenance can be done on the system, the RCSU Present option must be disabled in the RMS using the PMDT.

9.5.6.2 Remote DME Keying

An 1118/1119/Fernau DME can be co-located with a 2100 Localizer or 2110 Glideslope. When co-located with the 2110 Glideslope, the DME's ident keying must be synchronized with that of the 2100 Localizer at the opposite end of the runway. This synchronization is done via the communication channels between the Localizer, RCSU, Glideslope, and DME. The RCSU Application and Localizer RMS software communicate timing information and ident keying status to the Glideslope, which does the actual keying of the DME.

To enable this Remote DME Keying capability, the following configuration of the ILS must be done:

a. Using the PMDT, log on to the Localizer RMS to Security Level 3.
b. Select the RMS >> Configuration screen.
c. Verify that both of the "DME Present" and "DME Dual" items in the DME Configuration/Status and Control area are not checked. These boxes are only checked at the ILS site where the DME is physically located.
d. Select the desired Keying Output mode in the DME Configuration area.
e. Press "Apply" to store the changes.
f. Select the Monitors >> Configuration screen.
g. Enter the Ident Code assigned to this ILS equipment in the associated field.
h. Press "Apply" to store the change.
i. Select RMS >> Config Backup to store the changes into the RMS's NVRAM.
j. Log out of the PMDT.
k. Move to the Glideslope site, where the DME is co-located.
l. Using the PMDT, log on to the Glideslope RMS to Security Level 3.
m. Select the RMS >> Configuration screen.
n. Select the "DME Present" option in the DME Configuration/Status and Control area. If the co-located DME is a dual system, also select the "DME Dual" option. Note that the Keying Output field is not available at the Glideslope station - this parameter is set by the Localizer only.
o. Press Apply to store the changes.
p. Select the Monitors >> Configuration screen.
q. Enter the Ident Code assigned to this ILS equipment in the associated field. This will be the Ident Code used by the Glideslope to key the DME. Note that this should be the same as that entered at the Localizer site.
r. Select the "Windowed DME Keying" option if the DME equipment requires an indication of the DME Keying time-slot instead of a keyed Morse code signal.
s. Press "Apply" to store the change.
t. Select RMS >> Config Backup to store the changes into the RMS's NVRAM.
u. Log out of the PMDT.

Once both the Localizer and Glideslope systems connect to the RCSU, the DME keying will be synchronized with that of the Localizer.

9.5.7 Configuration of Ethernet between RCSU and Navaids

The 2238 RCSU v6.0 or later supports communications to the 1118A/1119A DME, the 1150A VOR, and the 2100 ILS (must be equipped with an 012096-0002 or later cabinet interface board) via an airport wide facilities local area network (LAN). This section details configuration of both the Navaid and the RCSU.

While communications between the RCSU and Navaids operates on a standard TCP/IP network, it is required that the Navaid facilities network be logically separated and inaccessible from publicly accessible networks. It is recommended that the Navaid facilities network be physically separated from publicly accessible networks and logically separated from other airport infrastructure networks.

9.5.7.1 Configuration of Navaid Ethernet Communications

In order to enable the RCSU-Navaid connection, the Navaid must be configured as follows:

a. For 2100 ILS equipment, set DIP Switch S1-8 on the ILS's Backplane CCA to the Right/On position (EXT MODEM) to enable the J6 "EXT MODEM" connector. For 1118A/1119A DME Equipment, set S2-1 to the Right/On position (External RF/Fiber) and S2-2 to the Left/Off position (Embedded). No DIP switch settings are applicable to the 1150A VOR.
b. Using the PMDT, log into the Navaid to Security Level 3.
c. Select the RMS>>Configuration>>General screen and set the following parameters:

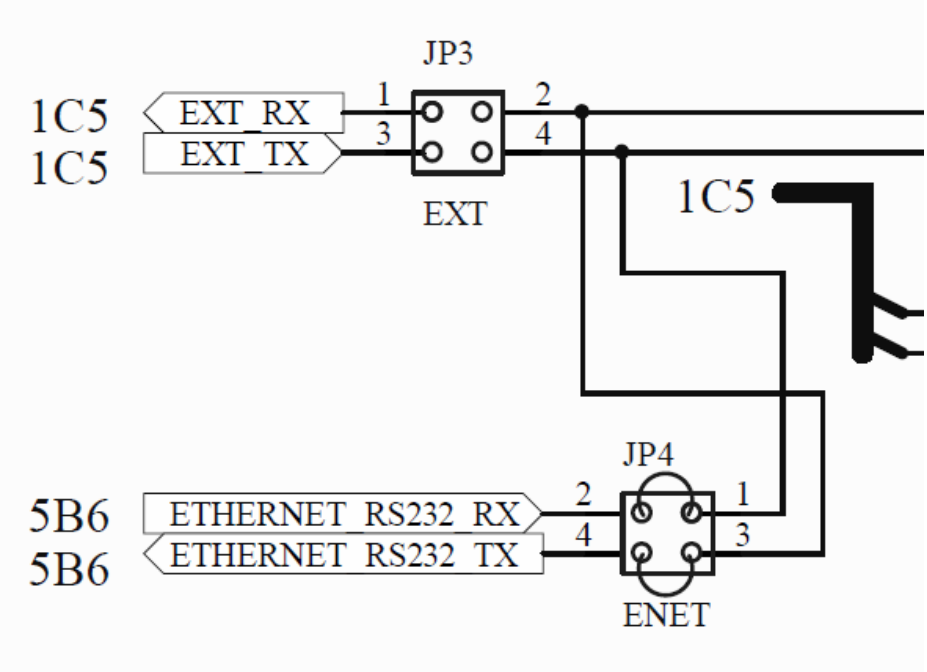
- For 2100 ILS Equipment:
  1. Enable the "RCSU Present" option
  2. Select Primary Runway or Secondary Runway as appropriate for this Navaid approach
  3. Set the "Connection Type" to "RF Modem/Fiber".

- For 1150A VOR Equipment:
  1. Set the "RCSU Type" option to "2138/2238 RCSU"
  2. Set the "Connection Type" option to "RF Modem/Fiber" if equipped with a 012167-0001 interface board
  3. If equipped with a 012167-0002 interface board:
     a. Set the "Connection Type" option to "Ethernet9210"
     b. Under the Network Configuration section, configure the IP Address, Subnet Mask, and Gateway as desired

- For 1118A/1119A DME Equipment:
  1. Enable the "RCSU Present" option
  2. Set the Interlock Control settings as appropriate for the runway configuration
  3. Set the "Connection Type" option to "Ethernet" if equipped with a 012167-0001 interface board
  4. If equipped with a 012167-0002 interface board:
     a. Set the "Connection Type" option to "Ethernet9210"
     b. Under the Network Configuration section, configure the IP Address, Subnet Mask, and Gateway as desired

d. Press Apply to save this new configuration.
e. Select RMS>>Config Backup to save this configuration to non-volatile memory.
f. Select System>>Configuration Save and save this configuration to the PMDT PC's harddrive.
g. Log out of the PMDT.
h. Cycle power on the Navaid.

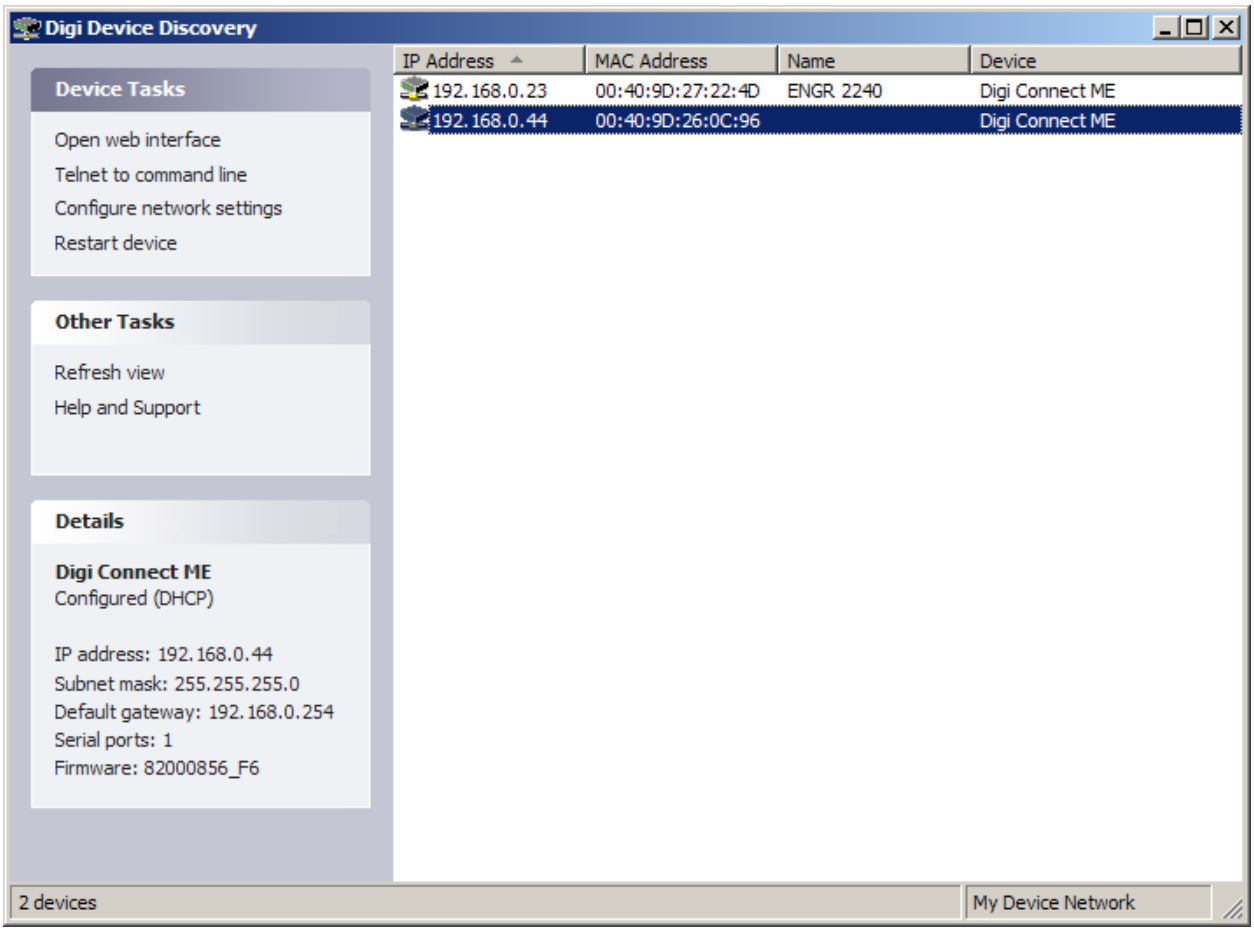
To enable the Digi Ethernet Module on the 2100 ILS, the JP4 header on the 012096-9002 board must have shunts from pins 1 to 2 and 3 to 4 with no shunts on J3, as pictured below.



9.5.7.2 Configuration of Digi Ethernet Module for Ethernet Communications

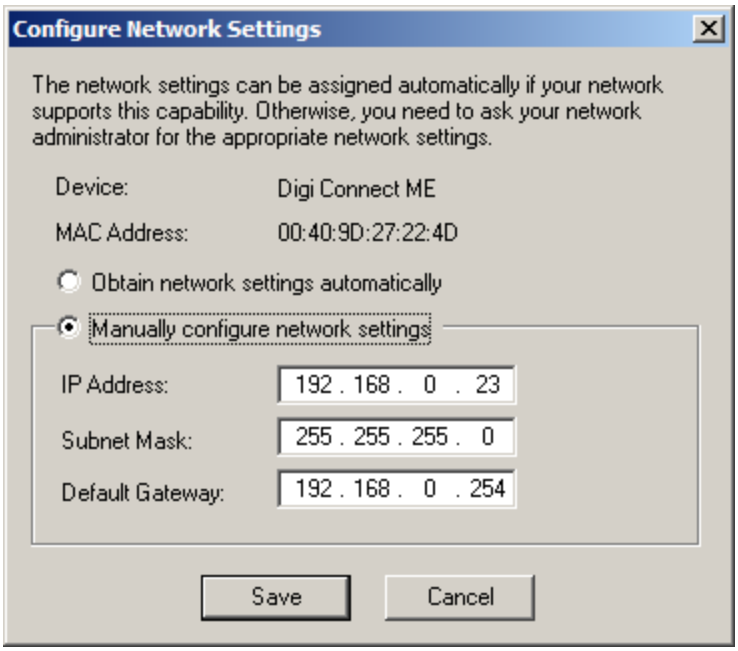
An 1118A/1119A DME with RMS processor software version 2.0.0.4 or newer, an 1150A VOR with RMS processor software version 5.0.0.3 or newer, or a 2100 LOC or GS with RMS processor software version 3.3 or newer may be configured to communicate with the RCSU via an airport wide local area network (LAN). PMDT v8.0 or newer is required. A static IP Address is recommended for all Navaids. DME and VOR Navaids equipped with the 012167-0002 interface board are configured in section 9.5.7.1 and do not need these steps.

a. At the Navaid, locate the Digi Connect ME on the Interface Board (J9 of 012167-0001 or J7 of 012096-0002 for ILS).
b. Record the MAC address listed on the Digi Connect ME Label.
c. Connect an Ethernet cable from the facilities LAN to the Digi Connect ME.
d. Connect the PMDT Laptop to the facilities LAN.
e. On the PMDT Laptop, navigate to the "c:\Program Files\SELEX\PMDT\Digi Device Discovery" directory.
f. Double click on the "dgdiscvr" application.
g. As shown below select the Digi Connect whose MAC address matches the Navaid MAC address.



h. Click on “Configure network settings” in the “Device Tasks” pane.

i. Similar to below, set the Navaid specific network settings.



j. After entering the appropriate settings, press the "Save" button.
k. If requested, Select "OK" to restart the Digi Connect ME.
l. Select "Refresh view" from the "Other Tasks" pane and verify the Digi Connect appears with the correct network settings. If the Digi Connect had to be reset, it may take as long as five minutes for it to be detected.
m. Once the Digi Connect appears with the correct network settings, select the Digi Connect whose MAC address matches the Navaid MAC address.
n. Select "Open web interface" from the "Device Tasks" pane.
o. A web browser will open and connect to the Digi Connect Me as shown below.
p. Enter "root" and "dbps" as the username and password and press the "Login" button.
q. Select "Serial Ports" from the Configuration menu on the left hand side of the screen.
r. Select "Port 1".
s. If the "Serial Port Configuration" page appears, select "Change Profile".
t. On the "Select Port Profile" page, select TCP Sockets and press apply.
u. On the "Serial Port Configuration, Port Profile Settings" page, deselect "Enable Telnet.." and "Enable Secure Sockets…".
v. Select "Enable Raw TCP access using TCP port:".
w. Set the port number to 15467.
x. Deselect "Enable TCP Keep-Alive".
y. Deselect "Automatically establish TCP connections".
z. Press Apply.
aa. Select "Basic Serial Settings".
bb. On the "Serial Port Configuration, Basic Serial Settings" page, set the Baud Rate to 57600 (DME/VOR) or 9600 (ILS), the Data Bits to 8, the parity to None, the Stop Bit to 1, and the Flow Control to None.
cc. Press Apply.
dd. Select "Advanced Serial Settings".
ee. On the "Serial Port Configuration, Advanced Serial Settings" page deselect all options with the exception of "Close connection after the following number of idle seconds".
ff. Enable "Close connection after the following number of idle seconds".
gg. Set the Timeout value to 30 seconds.
hh. Press Apply.
ii. Close the web browser.
jj. Connect with the PMDT to the Navaid through the front panel USB port.

kk. Select RMS >> Configuration >> General.
ll. Enable RCSU Present.
mm. Select “Ethernet” from the “Connection Type” control.
nn. Press the Apply button.
oo. Select RMS >> Config Backup.
pp. Select System >> Logoff.
qq. Reset the Navaid with the front panel Reset button.

9.5.7.3 Configuration of RCSU Ethernet Communications

To allow the RCSU to display the status of the 1118A DME, 1150A VOR, or 2100 ILS Equipment over Ethernet, that equipment must be added to the RCSU’s configuration as follows:

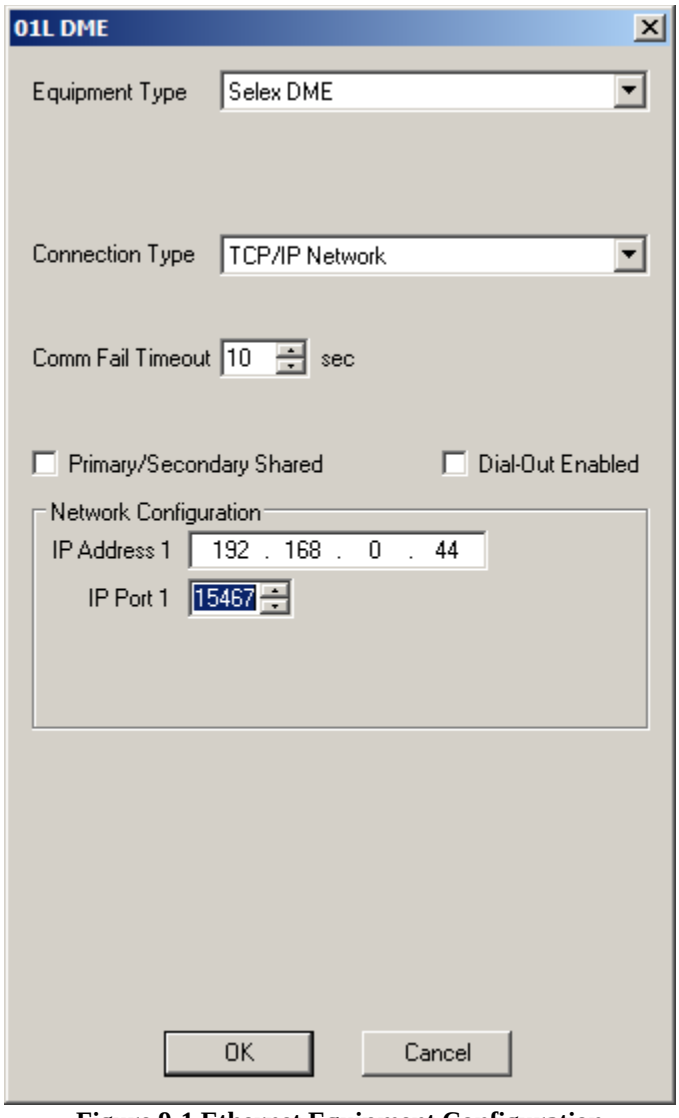


Figure 9-1 Ethernet Equipment Configuration

a. With the RCSU in Configuration Mode, right-click on the location of the Equipment on the map and select Add Runway Equipment or Add Other Equipment as appropriate.

b. Select the VOR/VORTAC for the 1150A VOR, DME/TACAN for the 1118 DME System, or Localizer or Glideslope for the 2100 ILS and press OK to display the Navaid Configuration screen.
c. Enter appropriate information in the Equipment Name field.
d. Set the Connection Type to TCP/IP Network.
e. Enter the IP Addresses for the Navaid equipment.
f. Typically, the IP Port is set to the default value of 15467 (for Navaids equipped with 012167-0002 interface boards, the IP Address and RCSU Port can be viewed or changed in the PMDT RMS >> Configuration screen).
g. If the RCSU should dial-out to an RSMS upon status change for this device, check the Dial-Out Enabled option.
h. Press OK to store this configuration.
i. Exit Configuration Mode by pressing the Exit Config and Restart button.
j. The Navaid's summary-level status icon will be Yellow and display a Comm Fault until the Navaid is installed and configured at the equipment shelter.

9.5.8 Configure SNMP Traps and Notifications

The following instructional steps summarize the process of changing the 012167-0002 Digi ME 9210 module's direction of SNMP Traps and Notifications. These steps will require an *ssh* interface to the Digi ME 9210 from a PC, such as Linux Shell.

a) Using a terminal, log into the ME board with the module's IP address—
`> ssh root@192.168.51.53`
At the password prompt: `selexes`

b) Back up the snmp.conf file before changing it—
`> cp /etc/snmp/snmp.conf /etc/snmp/snmp.conf.backup`

c) Edit the snmp.conf configuration file.
`> vi /etc/snmp/snmp.conf`

At or near the end of the file (line 433) insert the following:
`trap2sink aaa.bbb.ccc.ddd`

Where aaa.bbb.ccc.ddd represents the IP address of the trap receiver on your network. Note that you can specify multiple `trap2sink` lines to send the same trap to multiple locations.

d) Save and reboot.
Save your changes and reboot the machine with the following command—
`> reboot`

9.6 INSPECTION

9.6.1 Visual Inspection

The visual inspection is made prior to operating or energizing the equipment.

a. Visually inspect wire, coaxial cables, and connectors for corrosion, loose connectors, and improperly assembled connectors.
b. Inspect rear of RCSU and RSDU Servers for foreign objects, remove as necessary.
c. Inspect all peripheral equipment connected to the RCSU and RSDU Servers for proper connections.

9.7 INSTALLATION VERIFICATION TEST

a. Perform verification procedures of Section 6.
b. Perform the Site Acceptance Test Procedure as documented in Selex ES Inc. DOP F-02-02.

10 SOFTWARE

10.1INTRODUCTION

The 2100 ILS is implemented through a distributed processor architecture composed of three embedded microprocessors: the Monitor Digital Signal Processor (MDSP), the Monitor Central Processor Unit (MCPU), and the Remote Maintenance Subsystem (RMS). In addition the Portable Maintenance Data Terminal (PMDT) is installed on a laptop computer running Microsoft Windows. An optional software component is the Remote Control and Status Unit (RCSU) which runs on a Microsoft Windows computer and communicates to the 2100 ILS via a dedicated modem line or an RF modem link.

The 2238 RCSU is designed to communicate with an unlimited number of navigational aids associated with one or more runways. It supports multiple VOR/DME facilities as well as Cardion VOR, VORTAC, TACAN, and DME equipment. The 2238 RCSU can connect to a 2238 RSDU computer that displays status on a touchscreen and provides full remote control from the touchscreen interface. The 2238 RCSU can also connect to a 2138 RSU Module, that provides the status of a single active approach, as well as interlock control between two opposing approaches.

10.2 2238 REMOTE CONTROL AND STATUS UNIT (RCSU)

The primary purpose of the RCSU software is to provide a central monitoring station for the entire ILS. The 2238 RCSU connects to each ILS subsystem and polls it for status. The status of the entire ILS is displayed on the RCSU. The 2238 RCSU software also processes this status information and sends it to the RSDU software running on the 2238 RSDU server. Through the RCSU, the RSDU also allows the user to change the interlocked runway approach, bypass the Localizer Far Field Monitor (FFM), bypass the Localizer or Glideslope Near Field Monitor (NFM), turn transmitter On and Off, perform remote equipment reset, and transfer main transmitter control.

The 2238 RCSU provides security for the ILS by requiring a valid user ID and password to access any configuration or diagnostics functions. If a PMDT is attached to the RCSU, it can be used to monitor and control the attached subsystems. In this case, the connected subsystem validates the security information and replies with the security level of the user. The PMDT uses this security level to restrict access to subsystem functions.

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11 TROUBLESHOOTING SUPPORT

11.1 INTRODUCTION

This section contains a list of drawings useful during installation and maintenance. Drawings that are needed during installation are provided in paper form within the appropriate kit. Paper copies of all drawings can be purchased by contacting the Selex ES Inc. Customer Service organization.

Table 11-1 Drawings and Schematic Diagrams

Description	Schematic No.	Figure	Page
2238 RCSU Family Tree	502067	11-1	11-3
2238 RCSU Assembly Drawing	002238	11-2	11-5
2238 RCSU Schematic	002238-9001	11-3	11-17
2238 RSDU Rack Assembly Drawing	030765	11-4	11-21
2238 RSDU Rack Assembly Schematic	030765-9001	11-5	11-25
2238 Remote Status Display Unit Kit	470560	11-6	11-27
Transient Voltage Suppressor CCA Schematic	012107-9001	11-7	11-31
Cardion VORTAC Interface CCA Schematic	012108-9001	11-8	11-33
Backplane CCA Schematic:			
Industrial Rack Configuration	012109-9001	11-9a	11-37
Small Form Factor Configuration	012127-9001	11-9b	11-41
Dual Modem CCA Schematic:	012110-9001	11-10	11-45
2138 Remote Status Unit Kits (470358)			
RSU Interconnect CCA Schematic	012046-9001	11-11	11-47
RSU Keypad CCA Schematic	012047-9001	11-12	11-51
Battery Charger Power Supply CCA Schematic	012128-9001	11-13	11-57
Power Supply/RSU I/F CCA Schematic	012129-9001	11-14	11-61
I/O Controller CCA Schematic	012126-9001	11-15	11-63
Extender, CCA 3U	012746-9001	11-16	11-65

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