VX N+1/Main-Standby FM Broadcast Transmitter Systems

Technical Instruction Manual

Kit #: 235-8960-01 (3+1)
Kit #: 235-8960 (4+1)
Kit #: 235-8950 (Main-Standby)

ASTRO MALAYSIA, Malaysia

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Warranty

by Nautel Limited/Nautel Inc. (herein after referred to as **Nautel**)

Nautel guarantees all mechanical and electrical parts of Nautel Transmitters for a period of forty-eight months, and all other Nautel manufactured equipment for a period of twelve months from date of shipment, provided the equipment has been installed, operated and maintained in accordance with Nautel's recommendations, and the equipment has not been misused, neglected or modified. Nautel's liability is limited, at the absolute discretion of Nautel, to repairing or replacing returned equipment that to the satisfaction of Nautel has been found defective.

Warranty for third-party items is provided by the Original Equipment Manufacturer. Exercise of such warranty shall be between the Buyer and the Third-Party.

1. Properly qualified technical personnel must install, maintain, and repair the equipment in accordance with Nautel recommendations and good engineering practice.

2. A "Part Failure" shall be deemed to have occurred when the part has become defective, or does not have the characteristics required for the specified equipment performance:

    a. when the equipment is operated within the design parameters, and
    b. when the equipment is installed and adjusted according to Nautel's prescribed procedures as stated in the instruction manual.

3. Nautel shall provide replacements for all "Parts" to the Buyer when they become defective during the warranty period, and upon the return of the defective part. Replacement parts warranty to be 90 days or end of original warranty; whichever comes first.

4. If the Buyer receives a replacement module, as part of Nautel's module exchange program, the old module must be returned to Nautel within 30 days of receipt of the new module, at the buyers expense. If the old module is not received after 30 days, the customer will be invoiced. The buyer is responsible for installing the replacement/repaired module in the transmitter.

5. In the event that a "Part" fails during the warranty period and causes damage to a subassembly which cannot be readily repaired in the field, the entire subassembly so damaged may be returned to Nautel for repair. The repairs will be made without charge to the Buyer.

6. Written authorization must be obtained before returning any equipment or goods for any reason. Equipment or goods returned under this warranty shall be delivered to Nautel's premises at the Buyer's expense. Where no-charge warranty replacements or repairs are provided under items 2, 3, 4, or 5, Nautel will pay that part of the shipping costs incurred in returning the part/assembly to the Buyer. Note: the Buyer is responsible for any and all import fees, duties or taxes.

7. Nautel does not warrant or guarantee, and will not be liable for:

    a. defects or failures caused in whole or in part by abuse, misuse, unauthorized repair attempts, unauthorized alteration or modification of the equipment;
    b. equipment built to customer specifications that is later found not to meet customer needs or expectation;
    c. performance of equipment when it is used in combination with other equipment not purchased, specified, or approved by Nautel;
    d. damages and performance limitations due to outside forces such as lightning, excessive heat or cold, excessive AC surges or high corrosive environments;
    e. changes made by personnel other than Nautel authorized personnel, including charges incurred; and
    f. for any costs for labor performed by the customer without Nautel's prior written approval.

8. Nautel does not warrant that software:

    a. is free of errors, bugs or defects;
    b. will be compatible with third party software;
    c. results, output or data provided through or generated by the software are accurate, complete, or reliable; and
    d. errors found will be corrected.

9. Nautel shall have the right and shall be provided full access to investigate whether failures have been caused by factors beyond its control.

10. In no event shall Nautel be liable for any consequential damages arising from the use of this equipment

11. This warranty is in lieu of all other express warranties of Nautel, whether express or implied, and Nautel does not assume, nor is any other person authorized to assume on Nautel's behalf, any other obligation or liability.

12. Third party items ordered, the guarantee/warranty of these items will be from the manufacturer of these items. Exercise of such warranty shall be between the Buyer and the third party provider.

13. Nautel provides telephone and email support for its products for the life of the product at no charge. After the warranty period, parts and on-site support for the equipment are offered at a rate to be determined upon request.

Customer Service Notice

A 'Technical Assistance' and 'Plug-in Module Exchange' service is available to Nautel users.

All equipment being returned to Nautel and all requests for repairs or replacements should be marked with a Nautel provided RMA number and addressed to the appropriate Nautel facility:

Nautel Limited
10089 Peggy's Cove Road
Hackett's Cove, NS, Canada B3Z 3J4
Tel: 902-823-2233/Fax: 902-823-3183

24 Hour Answering Service (902) 823-3900

Nautel Inc.
201 Target Industrial Circle
Bangor, ME, USA 04401
Tel: 207-947-8200/Fax: 207-947-3693

Toll Free (877) 662-8837

Factory Support

TECHNICAL ASSISTANCE
Nautel's field service department provides telephone technical assistance on a 24 hour, seven days a week basis. Requests by other media (facsimile or e-mail) will be responded to the next working day if received after Nautel's normal working hours. Contact the appropriate field service centre from the following:

U.S.A. customers use:	Nautel Incorporated 201 Target Industrial Circle Bangor, Maine 04401	Telephone Facsimile	207-947-8200 (24 hours) 207-947-3693
All other customers use:	Nautel Limited 10089 Peggy's Cove Road, Hackett's Cove, NS, Canada B3Z 3J4	Telephone Facsimile E-Mail Web	902-823-3900 (24 hours) 902-823-3183 support@nautel.com www.nautel.com

MODULE EXCHANGE SERVICE
In order to provide Nautel customers with a fast and efficient service in the event of a problem, Nautel operates a factory rebuilt, module exchange service which takes full advantage of the high degree of module redundancy in Nautel equipment. This module exchange service is operated from Nautel's factory in Bangor, Maine and Hackett's Cove, Nova Scotia. These two locations allow us to provide a quick turn around service to keep our customers on the air. During the transmitter's warranty period, up to thirteen months from shipment, repair and exchange of modules is at no charge to the customer. When the warranty has expired, a charge of 80% of the list price for all exchanged modules is made. If the faulty module is returned to Nautel within 30 days, a credit is issued reducing this charge by one half to 40% of the list price. U.S.A. customers are required to contact our Bangor, Maine facility. Canadian and overseas customers should contact our Nova Scotia, Canada facility.

EQUIPMENT BEING RETURNED TO NAUTEL
For all equipment being returned to Nautel and all requests for repairs or replacements:

Obtain an RMA number from Nautel (you must have an RMA number to return equipment)
Mark the item as 'field return'
Mark the item with the RMA number assigned by Nautel
Address the item to the appropriate Nautel facility

Complete and accurate information regarding the equipment being returned will ensure prompt attention and will expedite the dispatch of replacements. Refer to the nameplate on the transmitter and/or the appropriate module/assembly to obtain name, type, part and serial number information. Refer to the parts list of this manual or the appropriate service instruction manual for additional ordering information.

The following information should accompany each request:

* Model of Equipment
* Serial number of Equipment
* Name of Part/Assembly
  Serial number of Part/Assembly
* Complete reference designation of Part/Assembly
* Nautel's part number of Part/Assembly
* OEM's part number of Part/Assembly
  Number of hours in Use
  Nature of defect
* Return shipping address

* Denotes minimum information required to order spare/replacement parts

Safety

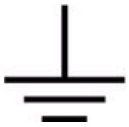
Symbols

General definitions of safety symbols used on equipment or in manuals.

DANGER – HIGH VOLTAGE

Indicates dangerous voltages (in excess of 72 volts), capable of causing a fatal electrical shock, are present on or near parts bearing this label.

GROUND (EARTH)



Used with wiring terminals to indicate the terminal must be connected to earth ground before operating equipment. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electrical shock. Also used on electrical schematics to indicate a part that is connected to earth ground.

GROUND (PROTECTIVE or SAFETY)

Used with protective (safety) conductor terminals to indicate the terminal must be connected to ground before operating the equipment. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electrical shock.

ELECTROSTATIC SENSITIVE

Indicates part or assembly is or contains devices that are electrostatic sensitive. To prevent damage to these devices, ensure the handling procedures outlined in this manual are observed.

WARNING A **WARNING** denotes a hazard. It identifies an operating procedure, condition, etc. which, if not strictly observed or adhered to, could result in injury or death to personnel. Throughout the technical manual, a **WARNING** shall immediately precede the text to which it applies.

CAUTION A **CAUTION** denotes a hazard. It identifies an operating procedure, condition, etc., which, if not strictly observed or adhered to, could result in damage to, or destruction of the equipment. Throughout the technical manual, a **CAUTION** shall immediately precede the text to which it applies.

NOTE A **NOTE** denotes important information pertaining to an operating procedure, condition, statement, etc., which is essential to highlight. A **NOTE** may precede or follow the text to which it applies.

Artificial Respiration (Mouth-to-Mouth)

(a) START MOUTH-TO-MOUTH BREATHING IMMEDIATELY. SECONDS COUNT. Do not wait to loosen clothing, warm the casualty, or apply stimulants.

(b) ASSESS RESPONSIVENESS OF CASUALTY. Do not jar casualty or cause further physical injury (**Figure 1).**

(c) IF POSSIBLE, SEND A BYSTANDER TO GET MEDICAL HELP. Do not leave casualty unattended (**Figure 2).**

(d) CHECK CAROTID PULSE (Figure 3).

(e) LAY CASUALTY ON HIS/HER BACK and place any available jacket or blanket under his/her shoulders.

(f) TILT THE HEAD BACK AND LIFT THE CHIN to open the airway (**Figure 4)**

(g) PINCH CASUALTY'S NOSE AND EXHALE TWO SLOW BREATHS INTO CASUALTY (Figure 5)

(h) REMOVE YOUR MOUTH and check for breathing **(Figure 6)**

(i) CONTINUE GIVING ONE BREATH EVERY FIVE SECONDS without interruption. If any air is retained in the stomach after exhalation by casualty, press gently on stomach to expel air.

(j) IF CHEST DOES NOT RISE CHECK for obstruction in casualty's mouth: clear foreign material using your finger, tissues, etc. Use chin lift and recommence mouth-to-mouth breathing.

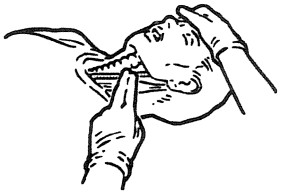
(k) WHILE MOUTH-TO-MOUTH BREATHING IS CONTINUED have someone else:
- Loosen casualty's clothing.
- Keep the casualty warm.

(l) DON'T GIVE UP. Continue without interruption until the casualty is revived, or until a doctor pronounces the casualty dead. Four hours or more may be required.

(m) DO NOT PROVIDE ANYTHING ORALLY while victim is unconscious.

1

2



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6

General Rules for Treatment for Burns, Bleeding, and Shock

1. After casualty has revived, treat for injuries and shock.
2. Reassure casualty.
3. Try to make him comfortable.
4. Keep him reasonably warm but do not apply heat.
5. If thirsty, liquids may be given but no alcohol (no liquids should be given in cases of severe burns).
6. Treat burns or wounds. Infection danger in treating burns or wounds is very great so ensure hands are clean and do not handle affected areas more than necessary.
7. Do not apply salves, grease, etc. to burns.
8. Do not remove burned clothing that adheres to the skin or breaks blisters.
9. Cover the burn with a dry sterile dressing, piece of sheeting, etc.
10. Bandage lightly over blisters where care must be taken to cover and not to break.
11. If severe bleeding of wound, elevate affected area, except in the case of a fracture.
12. Expose wound and apply pressure.
13. Apply dressing, pad and bandage.
14. For burns and bleeding, immobilize injured part using splints if necessary and keep patient in restful position during removal to hospital or expert medical attention.
15. In all cases, send for medical aid immediately.

Electric Shock - Rescue Methods

Electricity can damage the body in a number of ways. It may interfere with the proper functioning of the nervous system and the heart action, it can subject the body to extreme heat and can cause severe muscular contractions. The path that the current of electricity takes through the body is important. Currents that pass from hand to hand or from hand to foot may pass directly through the heart and upset its normal functioning. This threat to life is related to the amount of current or amperage that flows through a victim's body. Very little current (as little as 10 mA) can result in severe shock or death.

Speed in the application of first aid measures is absolutely essential in cases of electrical injury. As soon as the victim is freed safely from the source of the electrical current, if breathing has stopped, artificial respiration should be commenced immediately. If the carotid pulse cannot be felt, external cardiac massage should be commenced simultaneously. Resuscitation should be continued until the patient is breathing on his own or until medical aid arrives. Survival rates can be quite high if cardiopulmonary resuscitation is started within 3 to 4 minutes of the injury being received.

Act At Once - Delay or Indecision May Be Fatal

1. Turn **OFF** the electrical source.
2. Commence artificial respiration immediately.
3. Treat for burns, bleeding and shock.

Removing a Casualty From Electrical Contact

LOW VOLTAGE - 0 to 240 volts (household use)

Switch off the current, if possible and time permits. If the switch cannot be located immediately and the supply is through a flexible cord or cable, the current may be shut off by removing the plug or even breaking the cable or wrenching free. Never attempt to shut off current by cutting cord with a knife or scissors.

If the current cannot be shut off, the greatest care is necessary in removing the casualty. Household rubber gloves, rubber or plastic hose (if there is no water in them), a dry unpainted stick or a clean dry rope can be used to free victim.

HIGH VOLTAGE - 240 volts and up (industrial machines and power lines)

Do not touch any person or equipment in contact with a wire.

Use a dry unpainted pole, clean dry rope, dry rubber or plastic water hose to separate the casualty from the contact.

Keep as far away as possible.

Do not touch the casualty until the casualty is free.

Toxic Hazard Warning

There are devices used in this equipment containing beryllium oxide ceramic, which is non-hazardous during normal device operation and under normal device failure conditions. These devices are specifically identified in the equipment manual's parts list(s).

DO NOT cut, crush or grind devices because the resulting dust may be **HAZARDOUS IF INHALED**. Unserviceable devices should be disposed of as harmful waste.

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Release Control Record

Issue	Date	Reason
1.0	12 Dec 2023	First approved release for VX N+1 and main-standby systems for Astro – Malaysia

VX N+1 and Main-Standby Transmitter System
TECHNICAL INSTRUCTION MANUAL

Section 1 GENERAL INFORMATION

1.1 INTRODUCTION
This manual includes two types of transmitter systems – N+1 and main-standby. Each is a totally solid state, VHF, frequency modulated broadcast transmitter system that uses multiple Nautel VX FM broadcast transmitters, RF coaxial switches and a control module.

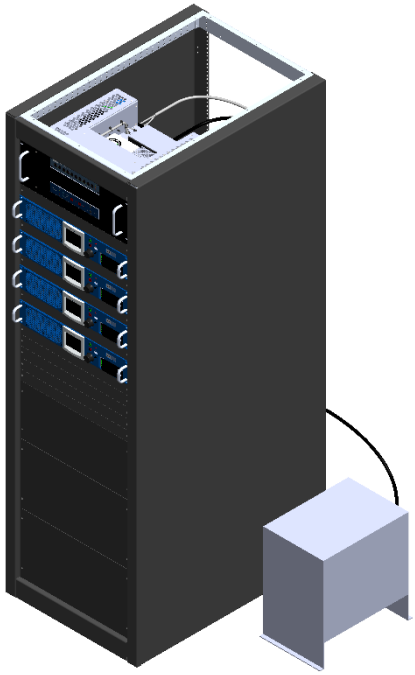
Detailed information unique to the transmitter system (i.e., site preparation, system installation, operating instructions, theory of operation, troubleshooting, parts/wiring lists and electrical schematic/assembly detail drawings) is provided in this manual. Refer to the VX documentation for information specific to each VX transmitter.

1.1.1 N+1 Systems
There are two configurations of N+1 systems – 3+1 and 4+1 (see Figure 1-1). 3+1 systems contain three main transmitters that operate into their respective antenna systems, plus one backup transmitter. The 3+1 system allows the standby transmitter to act as the backup for either of the main transmitters in the event of a main transmitter failure. 4+1 systems function in the same way as 3+1 systems but use four main transmitters with a backup.

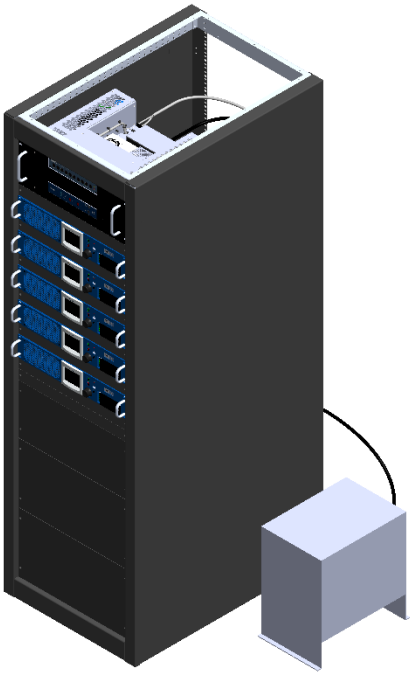
The primary control for the N+1 systems is the N+1 control module, which includes an SC4 System Controller that provides all the control and monitoring for the system and an audio switcher that routes the appropriate audio to the backup transmitter, as required. The power transfer threshold for each main (N) transmitter is user configurable. Refer to Section 3 – Operating Instructions for more detailed information.

1.1.2 Main-Standby Systems
Main-standby systems (see Figure 1-2) contain two transmitters – a main and a standby. The main-standby system allows the standby transmitter to act as the backup for the main transmitter in the event of a main transmitter failure.

The primary control for the main-standby systems is the main-standby control module, which includes an SC4 System Controller that provides all the control and monitoring for the system. The main-standby power transfer threshold is user configurable. Refer to Section 3 – Operating Instructions for more detailed information.



3+1 System



4+1 System

Figure 1-1 – VX N+1 Transmitter System

NOTE: Cabinet and test load for all systems are examples only. Actual cabinets and test loads to be provided by end user.

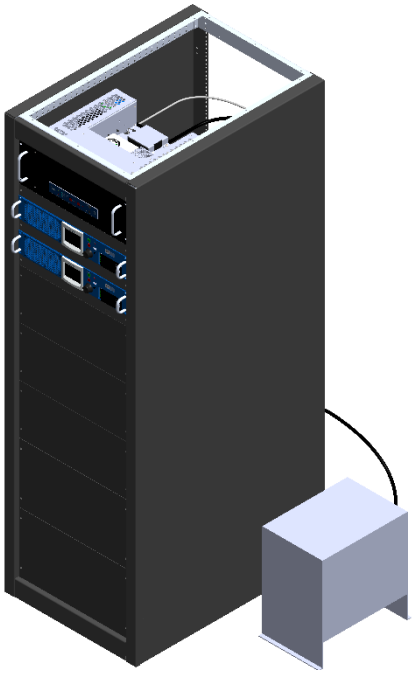


Figure 1-2 – VX Main-Standby Transmitter System

1.2 ABOUT THIS MANUAL

This manual provides information about preparing for the delivery and installation of the transmitter systems. This manual is intended for use by field technicians, site managers and installation planners.

1.2.1 Transmitter System Manuals

The transmitter system documentation suite contains or references the following documents:

VX N+1 and Main/Standby Transmitter System Technical Instruction Manual
VX Transmitter Installation Manual
VX Transmitter Operations and Maintenance Manual
VX Transmitter Troubleshooting Manual

The full suite of documents is also provided in Acrobat (PDF) format on the Nautel website (www.nautel.com), in the Nautel Users' Group (NUG) section.

1.2.2 Online Resources

support@nautel.com provides useful resources to keep you up to date on your equipment.

NOTE

To login to the Nautel Users' Group (NUG), go to support@nautel.com and log in at the top right corner.

1.2.2.1 Nautel Users' Group

The website includes a special section that customers can log into in order to access the Nautel customer newsletter, product manuals, frequently asked questions (FAQ), information sheets, and information about field upgrades.

1.2.2.2 Online Documentation

The website's NUG section provides online access to all the documentation for your N+1 transmitter system. Documentation is provided in Acrobat (PDF) format. You can use the documentation online or print the sections that you need.

VX N+1 FM and Main-Standby Broadcast Transmitter System

TECHNICAL INSTRUCTION MANUAL

Section 2 PREPARATION FOR USE AND INSTALLATION

2.1 INTRODUCTION

The pre-installation information in the VX Installation Manual is applicable to the VX N+1/ main-standby system. This section contains pre-installation and installation information specific to a VX N+1/main-standby transmitter system.

NOTE

Failure to comply with recommendations and instructions in this section may void the manufacturer's warranty. Please review Nautel's warranty terms.

2.2 PREPARATION FOR USE

The site should be prepared to receive the transmitter system prior to its delivery and/or installation. The following must be taken into consideration when preparing new sites and should be used as the evaluating criteria at existing sites. Nautel recommends that all requirements be incorporated to ensure optimum reliability and performance.

2.2.1 Transmitter System Room Requirements

The following must be addressed when finalizing the transmitter system site.

2.2.1.1 System Dimensions

Refer to Figure 1-1, Figure 1-2, and Mechanical Drawings in Section 9 of this manual for basic site layout for the transmitter system and user provided rack and test load. Identify room entry and floor space requirements for determining cable lengths and routing.

2.2.1.2 System Clearances

See the VX transmitter's Installation Manual, also noting the system dimensions in paragraph 2.2.1.1 of this manual.

2.2.1.3 Air Flushing

See the VX transmitter's Installation Manual.

2.2.1.4 Cooling

See the VX transmitter's Installation Manual. Determine the waste heat being produced by each transmitter. Sum the waste heat for the transmitters to determine the waste heat that will be produced by the transmitter system.

2.2.1.5 Heating

See the VX transmitter's Installation Manual.

2.2.1.6 Work Area

See the VX transmitter's Installation Manual.

2.2.2 Lightning Protection
See the VX transmitter's Installation Manual.

2.2.3 Electrical Power and Station Reference Ground
See the VX transmitter's Installation Manual for electrical power requirements for the VX transmitters (Units 1, 2, etc.).

The NAX281 N+1 Control Module (Unit 6) or NAX282 Main-Standby Control Module (Unit 3) requires an external 196-280 Vac, 47-63 Hz, single phase source, which connects to J1 on the rear of the control module. This provides the ac power input for the UPS (U3) and the +12 V dc Adapter (U7). The UPS provides the ac power to the two power supplies inside the NAX281/282 assembly (U4 and U6).

The SC4 operates from the +5/+12 V dc Power Supply (U6) which has a 4-pin XLR connector to mate with the SC4. The SC4 takes approximately 80 seconds to power up and be ready for operation.

A customer provided test load may require an external ac power source.

2.2.4 Antenna System
See the VX transmitter's Installation Manual.

2.2.5 Test Load
A customer provided a precision 50 Ω, resistive test load is to be used with the transmitter system. This load should be rated for a minimum of 2.2 kW continuous duty. This load is intended to dissipate the power for the backup transmitter or the transmitter that the backup is replacing.

2.2.6 System Interface
When used in a Main-Standby transmitter system configuration, the SC4 System Controller interfaces with a variety of Ethernet and digital signals from two transmitters and a RF coaxial switch.

When used in an N+1 transmitter system configuration, the SC4 System Controller interfaces with a variety of Ethernet and digital signals from multiple transmitters, Audio Switcher and an RF coaxial switch matrix.

All connections are at the rear of the VX Control Module (see Figure 2-1 and Figure 2-2).

2.2.6.1 Transmitter Interface
The interface to each transmitter is made to the D-sub connector on the rear panel. Connections should be made as follows:

NOTE

Transmitter interface wiring to the VX Control Module is factory configured. Normally the user does not need to install additional wiring. The following paragraphs are provided for reference only or if repairs are required.

2.2.6.2 Transmitter Interlocks

The SC4 uses the associated transmitter interlock connection to inhibit the associated transmitter's RF output for control and protection purposes on the NAX281/NAX282 rear panel D-sub connector. The transmitter interlocks are connected to J3 as follows for N+1 applications:

- transmitter A uses connector P200
- transmitter B uses connector P201
- transmitter C uses connector P202
- transmitter D uses connector P203 (for 4+1 systems)
- standby transmitter uses connector P203 (for 3+1 systems) and P204 (for 4+1 systems)

The transmitter interlocks are connected to J2 as follows for main-standby applications:

- transmitter A uses connector P200
- transmitter B uses connector P201

This provides a closed circuit between the interlock pins to enable the associated transmitter (interlock closed) and an open circuit to disable it (interlock open).

NOTE

Each VX transmitter is shipped with a mating connector and shorting jumper for its rear panel interlock connection. Retain the shorting jumper for possible use in the Emergency Bypass Procedure (see paragraph 3.5).

2.2.6.3 RF Coaxial Switches

The SC4 interfaces to motorized switch(s) to provide the transfer function via the Remote I/O Module (U9), using switch position commands.

NOTE

Wiring that interfaces with the motorized switch matrix is factory configured. Normally, the user does not need to install additional wiring. The following paragraphs are for reference only or if repairs are required.

2.2.6.3.1 Switch Position Commands

The switch position commands are connected to the Remote I/O Module (U9) on connectors J1(P405) and J2 (P406) and exit the NAX281/282 Control Module via the rear panel D-sub connectors.

Position 1 places the transmitter to the antenna and Position 2 is routed to the standby transmitter in an N+1 configuration or to the test load in a main-standby configuration and a common ground for all switch commands.

2.2.6.3.2 Switch Position Status

The position of the RF coaxial switches is provided to the SC4 via the switch position status inputs. The switch position status inputs are connected as follows:

- Switch 1
  - Position 1 between pins 1A01 and 1A01 GND
  - Position 2 between pins 1A02 and 1A01 GND

- Switch 2
  - Position 1 between pins 1A03 and 1A03 GND
  - Position 2 between pins 1A04 and 1A03 GND
- Switch 3
  - Position 1 between pins 1A05 and 1A05 GND
  - Position 2 between pins 1A06 and 1A03 GND
- Switch 4
  - Position 1 between pins 1A07 and 1A07 GND
  - Position 2 between pins 1A08 and 1A03 GND

Each position status provides a ground when the switch is in that position and an open circuit when it is not.

2.2.7 System Control

The transmitter system is controlled by the SC4 System Controller (U1), located in the NAX281 VX N+1 Control Module or the NAX282 Main-Standby Control Module. This manual contains SC4 information (controls, indicators, and alarms) that is specific to the VX transmitter system.

2.2.8 Safety Interlocks

2.2.8.1 System Interlock

This is a customer made connection used to enable or inhibit all transmitters in the system based on the state of the connection between TB1 pins 1 and 2 on the control module's rear panel. To enable all transmitters in the system, the customer system interlock connection should provide a closed circuit (<100 Ω) between TB1-1 and TB1-2. To inhibit all transmitters in the system, the customer system interlock connection should provide an open circuit (>10 kΩ) between TB1-1 and TB1-2.

2.2.8.2 Test Load Interlock

This is a customer made connection used to enable or inhibit the transmitter applied to the test load based on the state of the connection between TB1 pins 3 and 4 on the control module's rear panel. To enable the transmitter applied to the test load, the customer test load interlock connection should provide a closed circuit (<100 Ω) between TB1-3 and TB1-4. To inhibit the transmitter applied to the test load, the customer test load interlock connection should provide an open circuit (>10 kΩ) between TB1-3 and TB1-4.

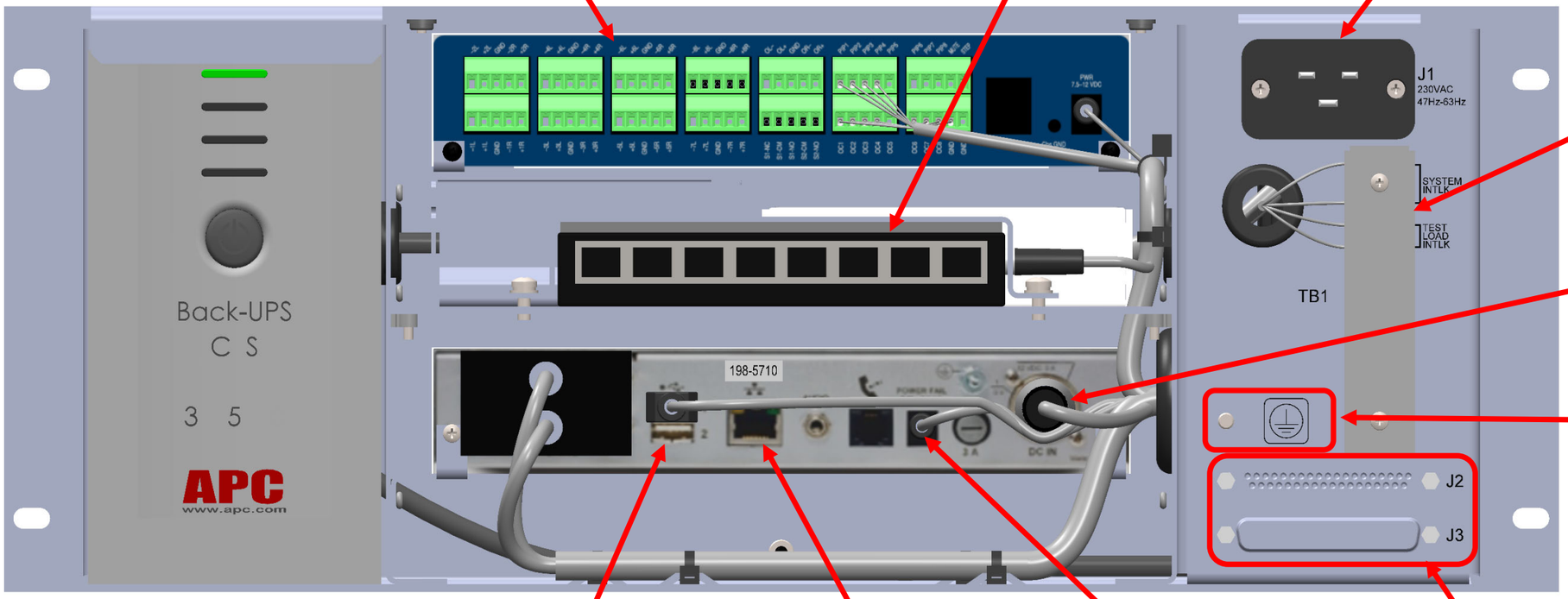
2.2.9 Remote Alarm/Status Indications

The remote monitoring circuitry identified in the VX transmitter's installation instructions is still applicable. A complete, independent set of remote alarm/status indications can be used for each transmitter. Alarm and status indications that are specific to the transmitter system are available on the remote user interface web page of the control module, available at the SC4 IP address.

Audio Switcher
Routes the main audio to the standby transmitter in the event of a failure (used in N+1 applications only).

Ethernet Switch
Provides LAN connections to all transmitters (main-standby applications use a 5-port device).

AC Input
Accepts nominal 230 Vac, 1 Ø, 60 Hz power source.



Terminal Block
Facilitates connections for the System and Test Load interlocks (shown with cover installed).

DC IN jack
XLR connector accepts +12 V dc power input to the SC4.

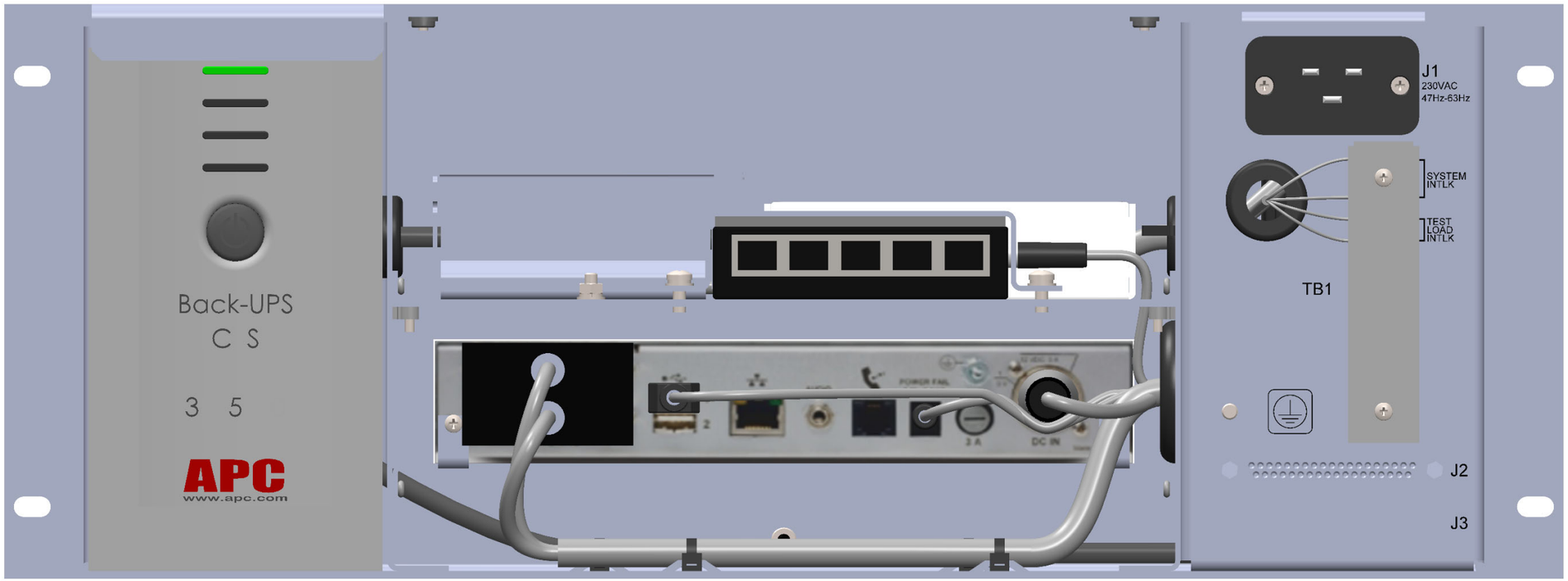
Ground Screw
Connect a low impedance conductor to the station's reference ground to provide lightning protection.

USB Port
Provides data transfer from USB to RS-485 to the Remote I/O Module.

Ethernet Port
Provides IP access to the SC4 via the Ethernet Switch.

Power Fail
Monitors the presence of the main Ac power using an external +12 V dc adapter.

I/O Connectors
37 pin D-sub connectors facilitates interconnections to the transmitter system. These connectors control the transmitter interlocks, switch positions, and monitor switch status (J3 not used in main-standby applications).



NOTE:
All connectors have the same functionality as in the N+1 Control Module. Refer to Figure 2-1 for connector descriptions.

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nautel

VX Main-Standby Control Module Connections (rear)			
Issue 0.1	Not to Scale	Figure 2-2	Page 2-6

2.3 NON-TECHNICAL PRE-COMMISSIONING

Upon delivery of the VX transmitter system, complete the following non-technical procedures.

NOTE

Non-technical procedures are defined as being those procedures that do not require technical knowledge of transmitter circuits or their operation to complete.

2.3.1 Accepting the Shipment

All shipments should be inspected for transit damage prior to acceptance.

CAUTION

Sufficient manpower or mechanical assistance should be on hand when removing the transmitter cabinet pieces from their packing crate. Refer to the VX transmitter's Installation Manual for cabinet and crate weights.

2.3.2 Unpacking Instructions

The unpacking instructions are dictated by the method of packaging for shipment. System components that are not shipped by electronic equipment moving specialists may be packed in wooden crates, with the number of crates determined by the extent of disassembly for shipment. Instructions accompany any crate that requires special unpacking information.

Remove all items from packing and place on a suitable work area. Verify shipped contents with packing lists, which provide detailed listings of shipment contents.

NOTE

The transmitter system will be partially disassembled for shipment. The extent of any additional disassembly will be dictated by the shipping method, site information provided by the user and the handling equipment of the mover.

(a) It is recommended the shipping boxes be positioned near the system's final assembly location prior to unpacking.

(b) The VX transmitters, control module and RF switches are all packed separately.

2.3.3 Positioning the Cabinet and Test Load

Refer to Mechanical Drawings in Section 9. Position the user-provided equipment cabinet which will house the VX transmitters (Units 1, 2, etc.), NAX281 N+1 Control Module (Unit 6) or NAX282 Main-Standby Control Module (Unit 3), RF switches and test load in their final location.

2.3.4 Installing the Transmitters and Control Module

Install the VX transmitters in the user provided rack, refer to Mechanical Drawings MD-1 to MD-7 in Section 9 as installation aids.

The end user must provide hardware to secure each transmitter and the control module in the cabinet.

NOTE

Transmitter A is the highest priority transmitter in N+1 systems. The user must physically install and connect their highest priority transmitter in the Xmtr A position (upper most transmitter in the cabinet); if priority is not necessary, the transmitters can be connected as desired.

2.3.5 Installing the Switches and Interconnecting RF Coaxial Cables

Install the provided switches and the interconnecting rigid line sections as follows (see Mechanical Drawings in Section 9 as installation aids):

NOTE

Nautel provides coaxial cables that consist of 7/16 DIN connectors that provide interconnection between the transmitters and the RF coaxial switches.

(a) For N+1 systems only, install the provided RF coaxial switch mounting bracket with switches installed, on the inside of the customer provided equipment rack using the ten (10) preinstalled M5 screws. Spare M5 hardware (Nautel part # HMSP32F) is found in the Ancillary kit. Refer to Mechanical Drawings as installation aids.

(b) For main-standby systems only, install the provided RF coaxial switch mounting bracket with switch installed, on the inside of the customer provided equipment rack using the two (2) preinstalled M5 screws. Spare M5 hardware (Nautel part # HMSP32F) is found in the Ancillary kit. Refer to Mechanical Drawings as installation aids.

NOTE

RF coaxial switches are pre-installed on a mounting bracket and must be installed by the end user. Brackets can be mounted in any standard EIA equipment rack and contain slotted mounting holes to allow for height adjustment.

(c) Install the RF coaxial cables for the transmitter system as follows:

For 3+1 systems only:

- connect W500P1 to RF output of transmitter A (Unit 1) and W500P2 to RF coaxial switch S1 port 2.
- connect W501P1 to RF output of transmitter B (Unit 2) and W501P2 to RF coaxial switch S2 port 2.
- connect W502P1 to RF output of transmitter C (Unit 3) and W502P2 to RF coaxial switch S3 port 2.
- connect W503P1 to RF output of the standby transmitter (Unit 5) and W503P2 to RF coaxial switch S3 port 4.
- connect W504P1 to RF coaxial switch S2 port 4 and W504P2 to RF coaxial switch S3 port 3.
- connect W505P2 to RF coaxial switch S1 port 4 and W505P1 to RF coaxial switch S2 port 3.
- connect W506P1 to RF coaxial switch S1 port 3 and W506P2 to the test load.

For 4+1 systems only:

- connect W500P1 to RF output of transmitter A (Unit 1) and W500P2 to RF coaxial switch S1 port 2.
- connect W501P1 to RF output of transmitter B (Unit 2) and W501P2 to RF coaxial switch S2 port 2.
- connect W502P1 to RF output of transmitter C (Unit 3) and W502P2 to RF coaxial switch S3 port 2.
- connect W503P1 to RF output of transmitter D (Unit 4) and W503P2 to RF coaxial switch S4 port 2.

- connect W504P1 to RF output of the standby transmitter (Unit 5) and W504P2 to RF coaxial switch S4 port 4.
- connect W505P1 to RF coaxial switch S1 port 4 and W505P2 to RF coaxial switch S2 port 3.
- connect W506P1 to RF coaxial switch S2 port 4 and W506P2 to RF coaxial switch S3 port 3.
- connect W507P1 to RF coaxial switch S3 port 4 and W507P2 to RF coaxial switch S4 port 3.
- connect W508P1 to RF coaxial switch S1 port 3 and W508P2 to the test load.

For Main-Standby systems only:

- connect W500P1 to RF output of transmitter A (Unit 1) and W500P2 to RF coaxial switch S1 port 2.
- connect W501P1 to RF output of transmitter B (Unit 2) and W501P2 to RF coaxial switch S1 port 4.
- connect W502P1 to S1 port 3 and W502P2 to the test load.

2.3.6 Installing the Antenna RF Feed Lines

Provide and connect suitable RF feed lines, cut to the required lengths and terminated with 7/16 DIN connectors, between port 1 of each switch to their respective antenna.

2.3.7 Completing the VX Transmitter Installation

Refer to the VX transmitter's Installation Manual to complete the installation for each transmitter, noting that the RF output connection was completed in paragraph 2.3.5.

2.3.7.1 Connecting the UPS Battery

Perform the following steps to reconnect the UPS battery:

NOTE

The UPS battery (U3) in the Control Module (Unit 6 for N+1 or Unit 3 for main-standby applications) is disconnected for shipment.

(a) Remove the Control Module's top cover.

(b) Disconnect the UPS input ac connection (W601P2).

(c) Disconnect the UPS output connections (W603P1 and W604P1).

(d) Remove the UPS from the Control Module and remove the battery cover (located on the bottom) by sliding the cover off.

(e) Use the battery "pull strip" to partially remove the battery (see Figure 2-3).

(f) Push the UPS quick disconnect onto the battery tab (see Figure 2-3).

(g) Reverse steps (a) to (e) to complete the procedure.

NOTE

UPS output connection cables W603P1 and W604P1 must be pushed in firmly when reconnecting the UPS to the Control Module.

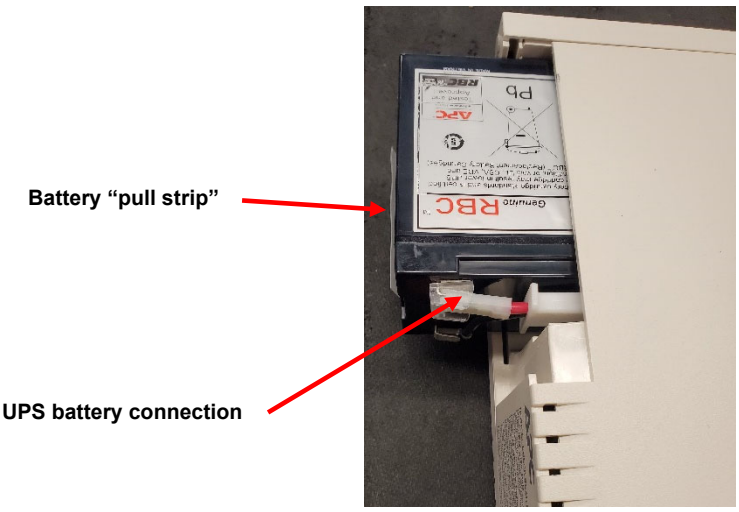

Figure 2-3 – UPS battery connection

2.3.7.2 Connecting System Cable Harness

(a) See Section 8 - Electrical Schematics for wiring details for the system interlock connection between pins 1A09 and GND of the **Metering** connector.

(b) Cut securing tyraps and route cabling to the transmitter system as follows:

For 3+1 systems only:

- connect P100 to J2 on the NAX281 N+1 Control Module (Unit 6).
- connect P101 to J3 on the NAX281 N+1 Control Module (Unit 6).
- connect P200 to Interlock, W300P1 to the Ethernet Switch (U5) and W300P2 to LAN in transmitter A (Unit 1).
- connect P201 to Interlock, W301P1 to the Ethernet Switch (U5) and W301P2 to LAN in transmitter B (Unit 2).
- connect P202 to Interlock, W302P1 to the Ethernet Switch (U5) and W302P2 to LAN in transmitter C (Unit 3).
- connect P203 to Interlock, W303P1 to the Ethernet Switch (U5) and W303P2 to LAN in the standby transmitter (Unit 5).
- connect P700 to the Analog Left audio inputs (A2J3) and P701 to the Analog Right (A2J4) on the standby transmitter.
- connect P407 to terminal block TB5 TOP on the Audio Switcher (U8), noting that wiring has been pre-installed on P407 to connect as follows:
  - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
  - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3

- connect the analog audio input from each transmitter, with user-provided wiring, to the appropriate input of the audio switcher (U8) as follows:
  - Transmitter A (Unit 1) analog (L+R) audio to U8-TB1 BOTTOM
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
  - Transmitter B (Unit 2) analog (L+R) audio to U8-TB1 TOP
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
  - Transmitter C (Unit 3) analog (L+R) audio to U8-TB2 BOTTOM
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3

For 4+1 systems only:

- connect P100 to J2 on the NAX281 N+1 Control Module (Unit 6).
- connect P101 to J3 on the NAX281 N+1 Control Module (Unit 6).
- connect P200 to Interlock, W300P1 to the Ethernet Switch (U5) and W300P2 to LAN in transmitter A (Unit 1).
- connect P201 to Interlock, W301P1 to the Ethernet Switch (U5) and W301P2 to LAN in transmitter B (Unit 2).
- connect P202 to Interlock, W302P1 to the Ethernet Switch (U5) and W302P2 to LAN in transmitter C (Unit 3).
- connect P203 to Interlock, W303P1 to the Ethernet Switch (U5) and W303P2 to LAN in transmitter D (Unit 4).
- connect P204 to Interlock, W304P1 to the Ethernet Switch (U5) and W304P2 to LAN in the standby transmitter (Unit 5).
- connect P700 to the Analog Left audio inputs (A2J3) and P701 to the Analog Right (A2J4) on the standby transmitter.
- connect P407 to terminal block TB5 TOP on the Audio Switcher (U8), noting that wiring has been pre-installed on P407:
  - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
  - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
- connect the analog audio input from each transmitter, with user-provided wiring, to the appropriate input of the audio switcher (U8) as follows:
  - Transmitter A (Unit 1) analog (L+R) audio to U8-TB1 BOTTOM
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
  - Transmitter B (Unit 2) analog (L+R) audio to U8-TB1 TOP
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
  - Transmitter C (Unit 3) analog (L+R) audio to U8-TB2 BOTTOM
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3
  - Transmitter D (Unit 4) analog (L+R) audio to U8-TB2 TOP
    - Analog Left Output: (-) to pin 1, (+) to pin 2, shield to pin 3
    - Analog Right Output: (-) to pin 4, (+) to pin 5, shield to pin 3

For Main-Standby systems only:

- connect P100 to J2 on the NAX282 Main-Standby Control Module (Unit 3).
- connect P200 to Interlock, W300P1 to the Ethernet Switch (U5) and W300P2 to LAN in transmitter A (Unit 1).
- connect P201 to Interlock, W301P1 to the Ethernet Switch (U5) and W301P2 to LAN in transmitter B (Unit 2).

NOTE

Do not route switches cabling along the rigid coaxial line sections installed previously.

(c) Route the customer provided system interlock wires between the antenna system and terminal block TB1 pins 1 and 2 on the NAX281/NAX282 Control Module's rear panel.

(d) Route the customer provided test load interlock wires between the test load and terminal block TB1 pins 3 and 4 on the NAX281/NAX282 Control Module's rear panel.

2.3.8 Ac Power Source Wiring and Station Reference Ground

Connect ac power source wiring as follows:

WARNING

Switch off the ac power source at the service entrance. If not, voltages that may cause serious injury or death will be present on the ac input.

NOTE

Using individual ac power sources for each transmitter allows independent operation of each transmitter during maintenance procedures.

2.3.8.1 Ac Power to Transmitters

Connect the ac power source wiring to each transmitter (Units 1, 2, etc) as described in the VX Installation Manual.

2.3.8.2 Ac Power to Miscellaneous Components

Connect an external 196-280 Vac, 47-63 Hz, single phase source (230 Vac nominal) to the NAX281 N+1 Control Module (Unit 6) or NAX282 Main-Standby Control Module (Unit 3) at its ac input connector J1. A female C19 ac plug (Nautel part JD43) is provided in the ancillary kit.

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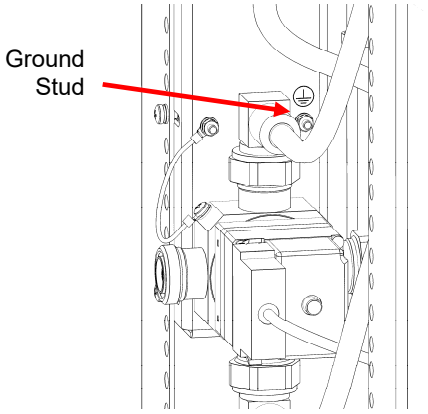
2.3.8.3 Station Reference Ground

Connect low-impedance conductors (3/4” braid or 1 AWG wire), as described in the *'Lightning Protection for Radio Transmitter Stations'* section of Nautel's *Recommendations for Transmitter Site Preparation* booklet, between the station reference ground point and the station reference ground connection on the rear of the equipment rack.

(a) Connect low impedance conductors between the station reference ground point and each VX transmitter separately. See Section 1.10 of the VX Installation Manual.

(b) Connect a low impedance conductor between the rear of the equipment rack and the ground stud on the rear of the VX Control Module. See Figure 2-1 to locate the ground stud; M5 nut and washers must be provided by the user).

(c) Connect a low impedance conductor between the rear of the equipment rack and the ground stud on the switch bracket (see Figure 2-4; M4 nut and washers provided on switch bracket).



NOTE: switch bracket for VX 4+1 system shown

Figure 2-4: Switch Bracket Ground Stud

NOTE

For best lightning protection, the station reference ground connections to the main-standby rack and each transmitter should not be shared; there should be a separate connection between the station reference ground point and each component.

2.3.8.4 Ac Power to Test Load

Connect an external ac power source to the customer provided test load.

2.3.9 Control and Monitor Wiring

The VX transmitter remote I/O (remote outputs (digital and analog) and control wiring is available to use but note that it may result in N+1 and M/S transfer functions not working properly if incorrectly set up.

2.4 PRELIMINARY CHECKS AND CONFIGURATION

This section provides procedures to prepare the transmitter system for initial turn. See the VX transmitter's Installation Manual to perform all necessary preparations for each main and standby VX transmitter in the system.

2.4.1 Apply Ac Power

(a) Apply ac power to all components of the transmitter system (main transmitters, standby transmitter, and control module. Confirm that the RF power for all transmitters is set to **RF Off**. On the rear of the control module, press the **UPS ON** button.

NOTE

The on/off switch for the Control Module is the power button on the rear panel of the UPS.

2.4.2 Configure VX Transmitters Preset, IP, Program Inputs

(a) Confirm or configure the IP address of each VX transmitter to a static IP address, as detailed in the VX transmitter's documentation.

NOTE

All transmitter IP addresses must be static, not DHCP.

(b) On each VX transmitter, log in to the remote AUI by entering the Nautel supplied parameters in the login window (see Figure 2-5).

In the Username field, enter the administrator username 'Admin'.
In the Password field, enter the password. Default is 'change_me'. Click 'Connect'.

Figure 2-5: VX Transmitter Login Screen

(c) Configure each VX transmitter's preset (frequency, output power and program input parameters), as detailed in the VX transmitter's documentation.

(d) Connect/copy the program inputs to each transmitter and the audio switcher (U8) using user provided cables from the audio source.

NOTE

The VX transmitters cannot use Backup Presets (for N+1 systems only). Backup Audio or Audio Player cannot be used in either N+1 or main-standby systems because there is only one backup source for the audio switcher.

2.4.3 Configure System Ethernet Connections and Settings

(a) Ensure the control module network switch is not connected to the transmitter site LAN.

NOTE

A PC or laptop is required to access the SC4 user interface. The PC/laptop must have Windows 10 or 11 and a web browser installed.

(b) Connect an Ethernet cable between a laptop computer and the network switch on the rear of the control module. Configure the network settings on the laptop as follows:

- IP: 192.168.1.115
- Subnet Mask: 255.255.255.0

(c) Open a web browser and log in to the SC4 at 192.168.1.210 using username “admin01” and password “aaaaaaaa”.

(d) From the top menus, select **System** -> **IP Configuration** (see Figure 2-6). The IP Configuration screen in Figure 2-7 will display.

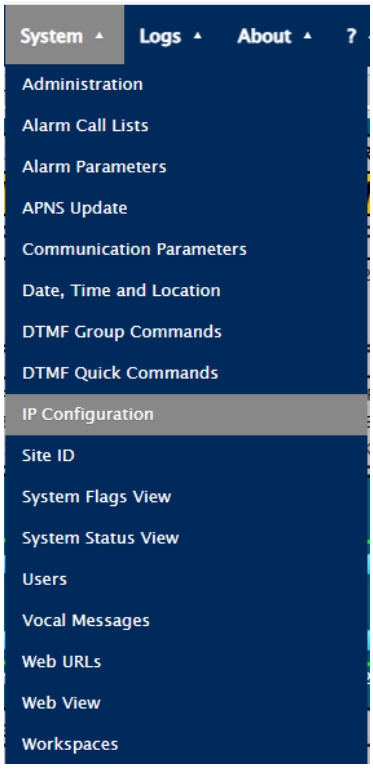


Figure 2-6: System -> IP Configuration selection

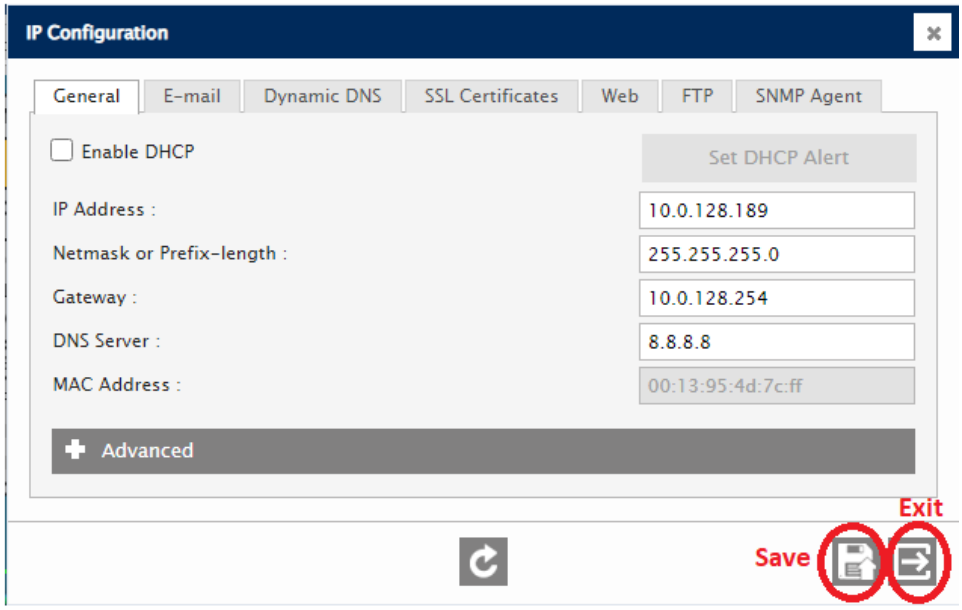


Figure 2-7: System -> IP Configuration screen

(e) In the General tab, configure the IP Address, Netmask, Gateway, and DNS server as desired based on the parameters of the transmitter site network. ***Record the IP address before saving***. When complete, press the Save button, then the Exit button. You will be prompted to confirm the change to the IP address.

NOTE

*The SC4's default IP address is 192.1.68.210. After initial login, change the IP address to the transmitter system site's network. Nautel recommends using a static IP address for the SC4. All transmitters **must** have static IP addresses.*

Installers should contact their IT group to obtain the appropriate addresses and network information (e.g., subnet mask, gateway etc.).

Once the IP address has been changed you will be disconnected from the SC4.

(f) Configure your laptop IP settings to DHCP. Connect a cable from the network switch to the transmitter site LAN.

(g) On the laptop open a web browser and log in to the SC4 at the new IP address, recorded in step (e), using username "admin01" and password "aaaaaaaa".

2.4.4 Set Date, Time and Location

(a) From the top menus, select **System -> Date, Time and Location** (see Figure 2-8). The Date, Time and Location screen in Figure 2-9 will display.

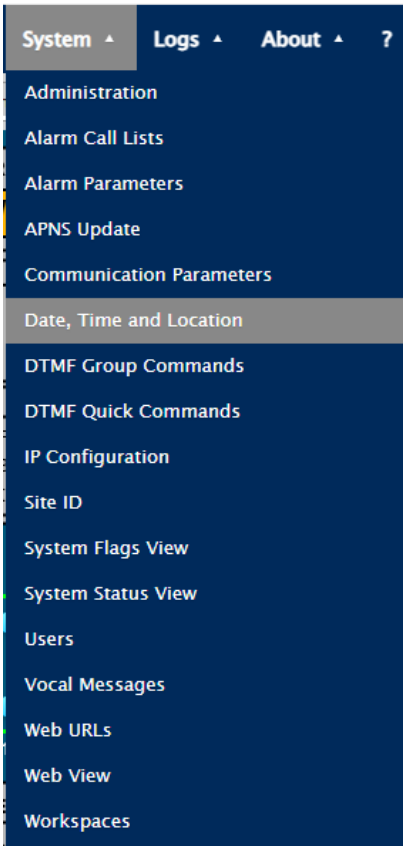


Figure 2-8: System -> Date, Time and Location selection

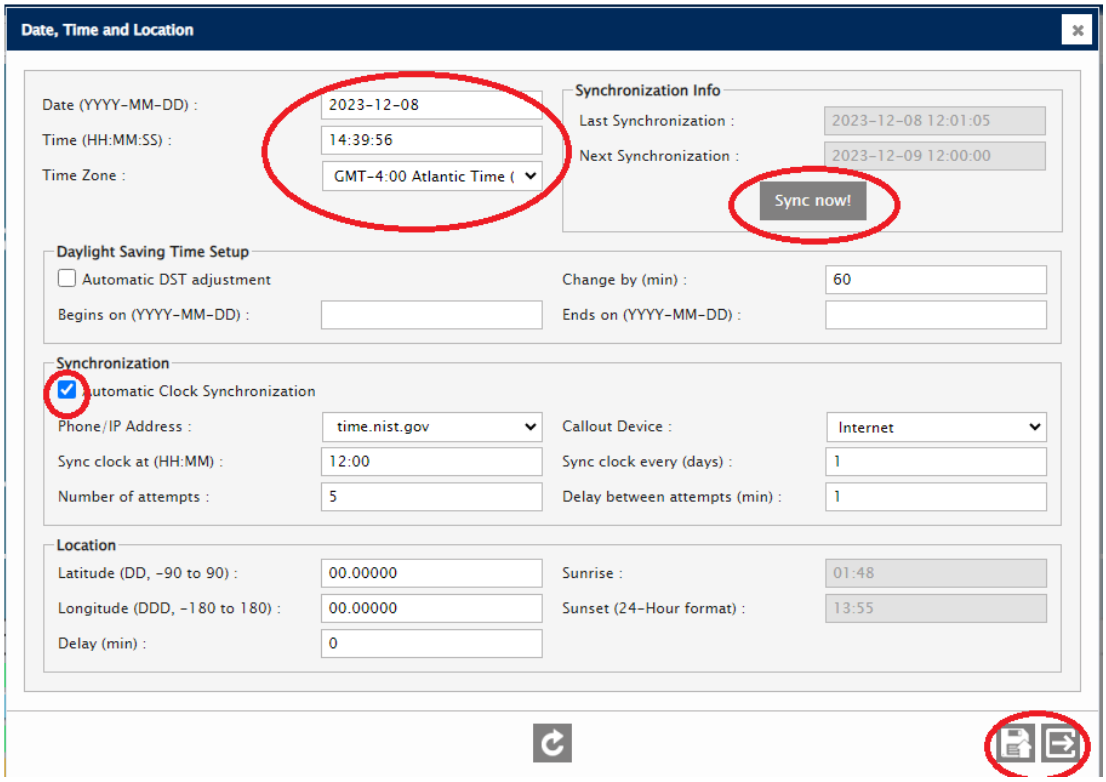


Figure 2-9: System -> Date, Time and Location screen

(b) Configure the date, time and time zone:

- Time may be set manually or select Automatic clock synchronization to synchronize the clock to an external standard (similar to NTP). If automatic clock synchronization is used, select the **Sync Now!** button to set the clock immediately.
- Set the time zone manually from the dropdown.
- Select Automatic DST adjustment if desired.
- When date, time and location are set as desired, select the Save and Exit buttons.

NOTE

If automatic clock synchronization is used, the SC4 must be able to access an NTP server either on their internal network or on the Internet.

2.4.5 Set Site ID

(a) From the top menus, select **System** -> **Site ID** (see Figure 2-10). The Site ID screen in Figure 2-11 will display.

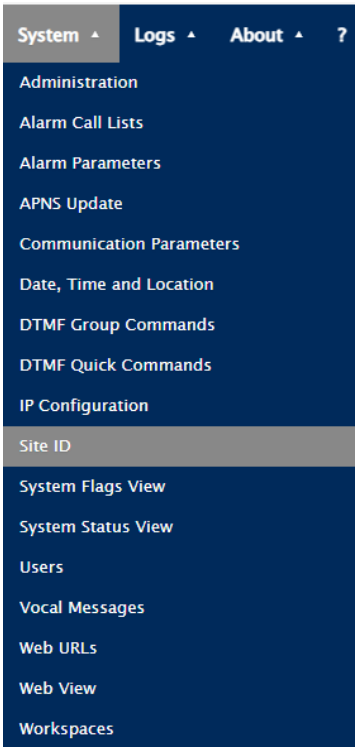


Figure 2-10: System -> Site ID selection

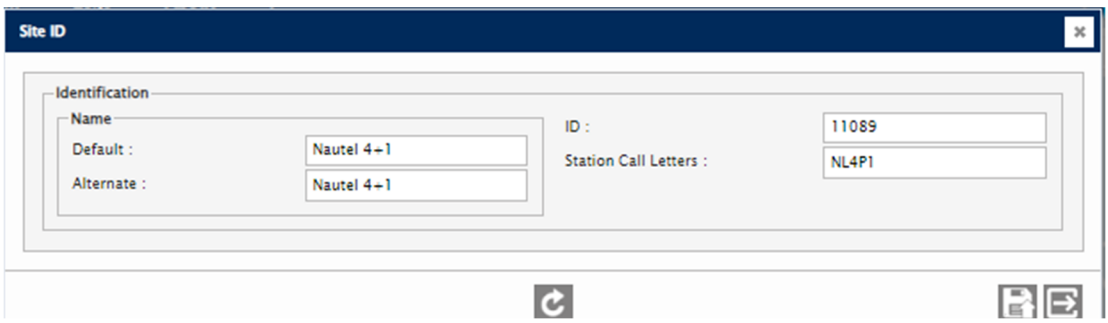


Figure 2-11: System - Site ID screen (4+1 System shown)

(b) Enter the desired Name in the Default and Alternate fields, noting that this name/ID will appear as the webpage browser tab title.

(c) Enter the desired ID and Station Call Letters.

(d) Select the Save button to save the changes and select the exit button to close the Site ID menu.

2.4.6 Configure Input Pings

(a) From the top menus, select **Input** -> **Pings** (see Figure 2-12). The Pings screen in Figure 2-13 will display.

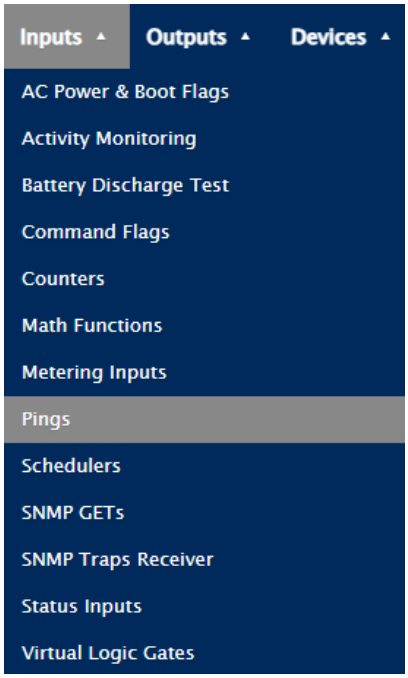


Figure 2-12: Input -> Pings selection

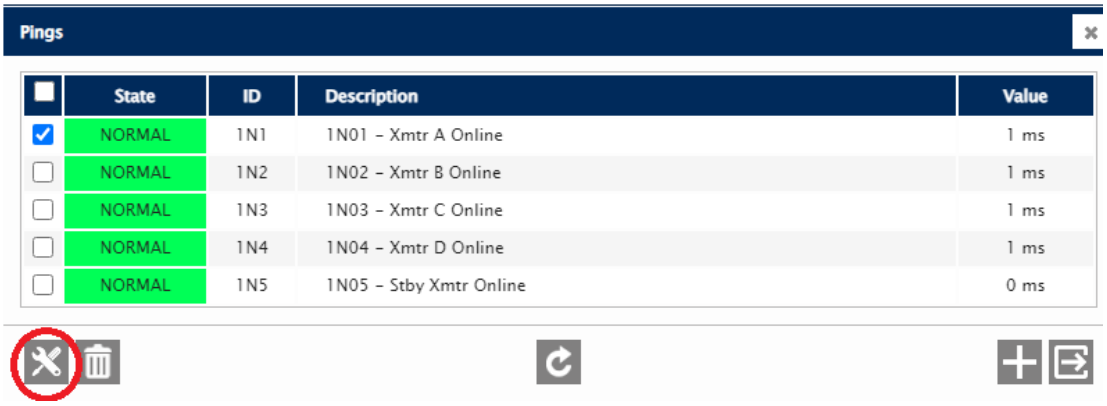


Figure 2-13: Input - Pings screen

(b) Select the 1N1 checkbox and select the configuration (tools icon) button. The Ping configuration – 1N1 screen will display (see Figure 2-14).

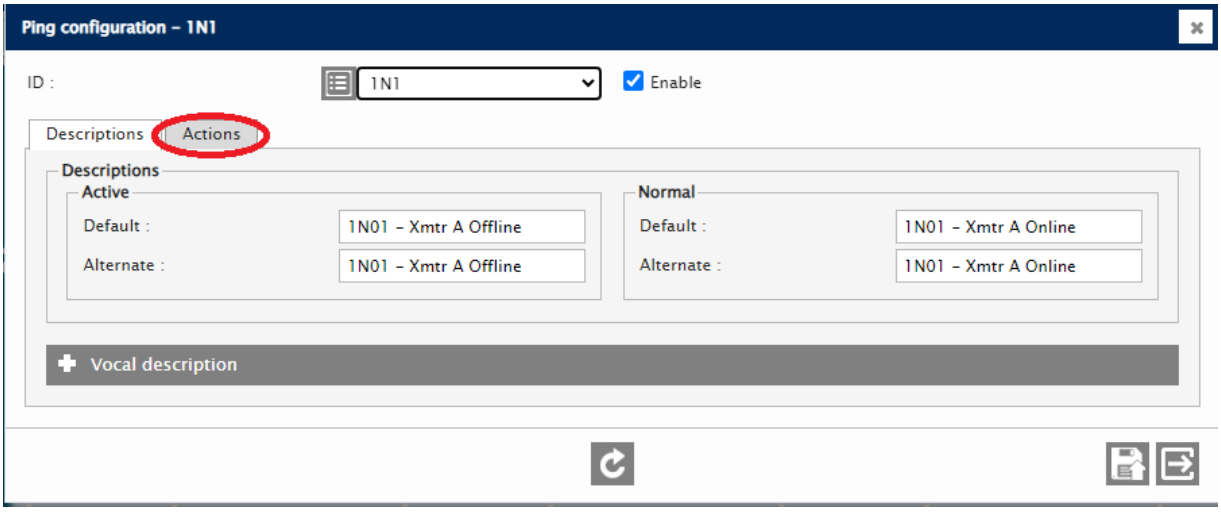


Figure 2-14: Input - Pings configuration – 1N1 screen

(c) Select the Actions tab. The screen in Figure 2-15 will display.

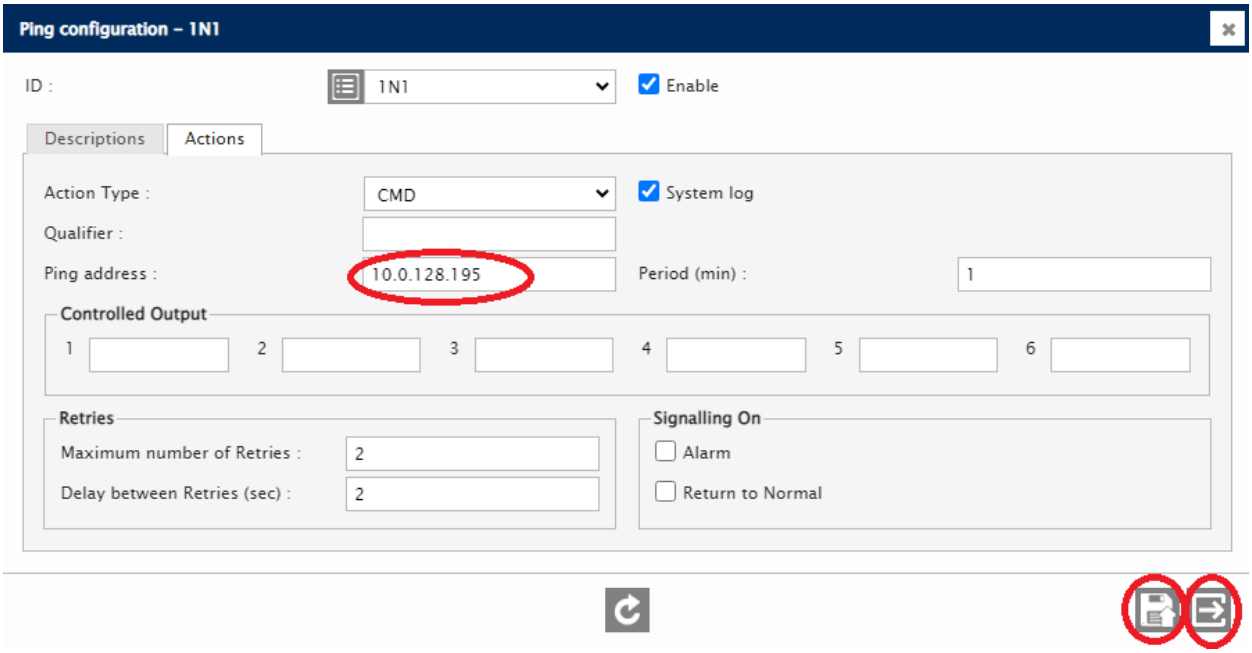


Figure 2-15: Input - Pings configuration – 1N1 - Actions tab

(d) Set the Ping address to transmitter A's IP address. When complete, select the save and exit buttons.

(e) Repeat steps (a) thru (d) for each connected transmitter as follows:

- 4+1 systems:
  - 1N1 - Transmitter A IP address
  - 1N2 - Transmitter B IP address
  - 1N3 - Transmitter C IP address
  - 1N4 - Transmitter D IP address
  - 1N5 – Standby Transmitter B IP address

- 3+1 systems:
  - 1N1 - Transmitter A IP address
  - 1N2 - Transmitter B IP address
  - 1N3 - Transmitter C IP address
  - 1N5 – Standby Transmitter B IP address

- Main-Standby Systems:
  - 1N1 - Transmitter A IP address
  - 1N2 - Transmitter B IP address

2.4.7 Configure SNMP Devices

(a) From the top menus, select **Devices** -> **SNMP Devices** (see Figure 2-16). The SNMP Devices screen in Figure 2-17 will display.

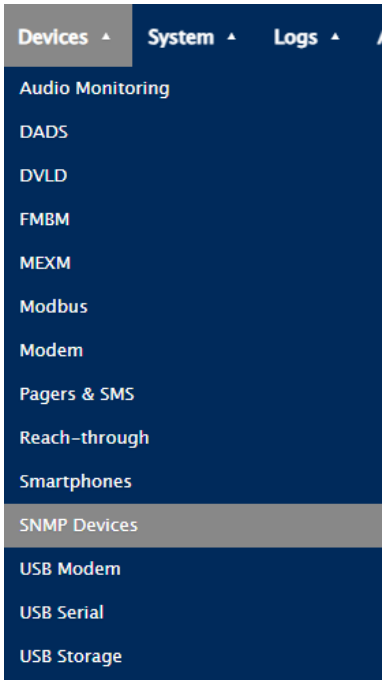


Figure 2-16: Devices -> SNMP Devices selection

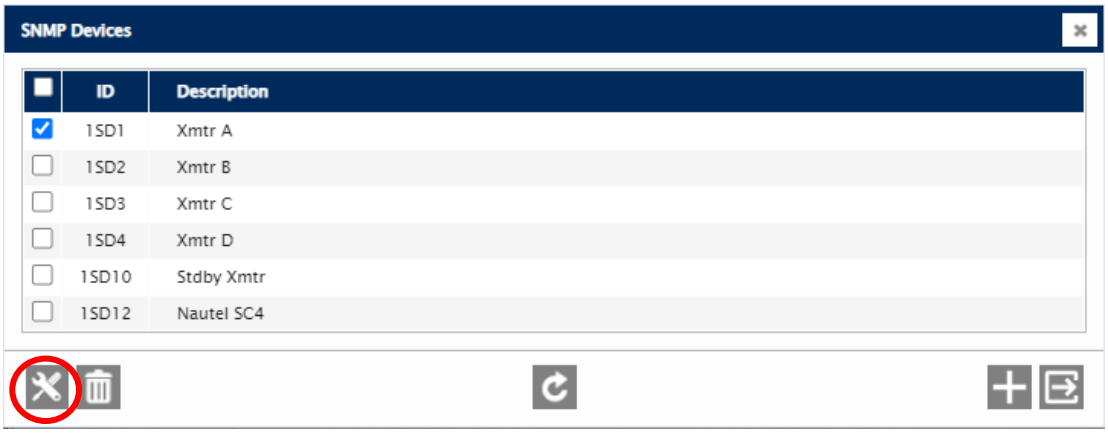


Figure 2-17: Devices – SNMP Devices menu (4+1 system shown for reference)

(b) Select the 1SD1 (Xmtr A) checkbox and select the configuration (tools icon) button. The SNMP Device Configuration screen in Figure 2-18 will appear.

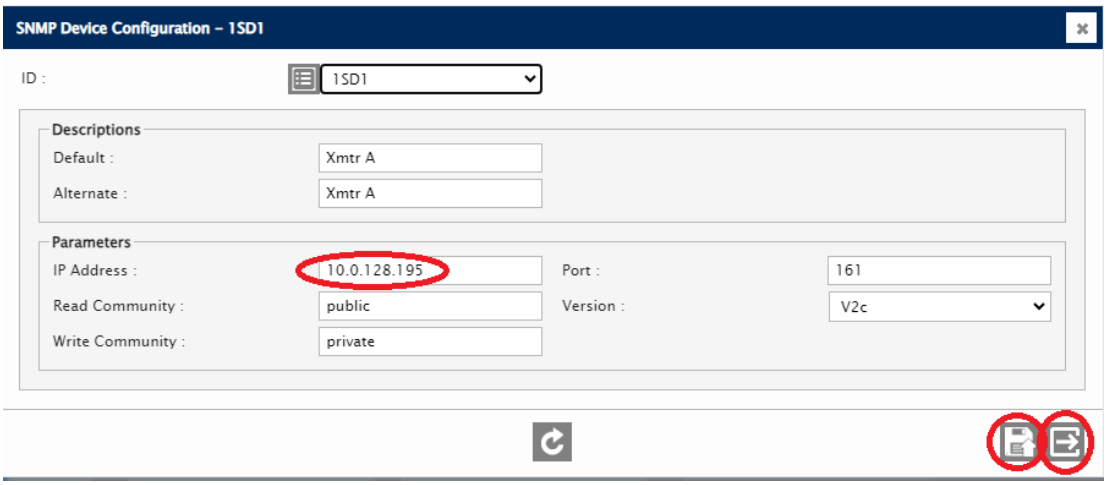


Figure 2-18: Devices – SNMP Device Configuration (Xmtr A shown for reference)

(c) Set the IP Address to transmitter A's IP address. When complete, select the Save and Exit buttons.

(d) Repeat steps (a) thru (c) for each connected transmitter as follows:

- 4+1 systems:
  - 1SD1 - Transmitter A IP address
  - 1SD2 - Transmitter B IP address
  - 1SD3 - Transmitter C IP address
  - 1SD4 - Transmitter D IP address
  - 1SD10 – Standby Transmitter IP address

- 3+1 systems:
  - 1SD1 - Transmitter A IP address
  - 1SD2 - Transmitter B IP address
  - 1SD3 - Transmitter C IP address
  - 1SD10 – Standby Transmitter IP address

- Main-Standby Systems:
  - 1SD1 - Transmitter A IP address
  - 1SD2 - Transmitter B IP address

IMPORTANT!

Only the system transmitters require SNMP configuration in this menu. Do not adjust the 'Nautel SC4' SNMP settings.

(e) Logout of the SC4 remote user interface session (see Figure 2-19).

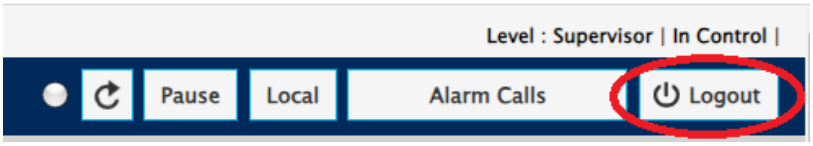


Figure 2-19: Logout of the Remote User Interface

2.4.8 Configure User Accounts

The SC4 is factory configured with user accounts and passwords set to default values as in Table 2-1. It is strongly recommended that the passwords be changed to values known only to equipment users for security purposes. This procedure details the password change procedure. It should be completed by a site administrator.

IMPORTANT!

The network switch is "unmanaged", meaning the data traffic is not encrypted and your username/password could become compromised. For security reasons, attempt to limit access to these devices and establish proper firewall protection.

Table 2-1: SC4 Default User Passwords

Username	Level	Default Password
viewer01	Viewer	vvvvvvvv
oper01	Operator	oooooooo
admin01	Administrator	aaaaaaaa
super01	Supervisor	ssssssss
direc01	Director	mocivad9

(a) Devise five unique passwords for the five user accounts:

- Director (username direc01)
- Supervisor (username super01)
- Administrator (username admin01)
- Operator (username oper01)
- Viewer (username viewer01)

NOTE that each password must be:
- Up to 8 alphanumeric characters
- Not case-sensitive

(b) Record the passwords and store them in a safe location.

(c) Log into the SC4 using the username 'direc01' and password 'mocivad9'.

(d) From the top menus select **System** -> **Users** (see Figure 2-20). The Users menu in Figure 2-21 will display.

(e) Select the Director 01 user checkbox and press the configuration (tools icon) button.

(f) Update the director password to the value determined in step (a) and press the save and exit buttons. ***Do not alter any other parameters related to this user at this time***.

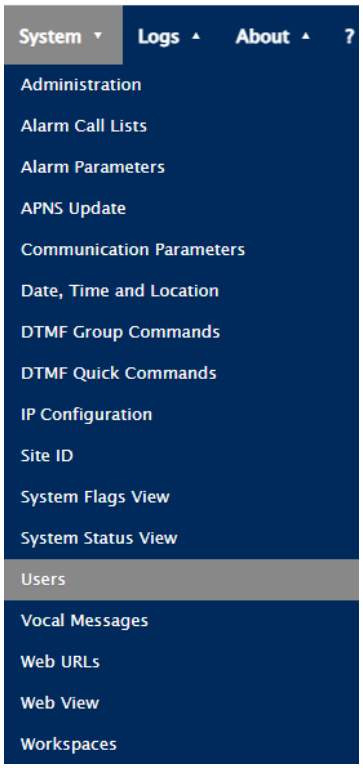


Figure 2-20: System -> Users selection

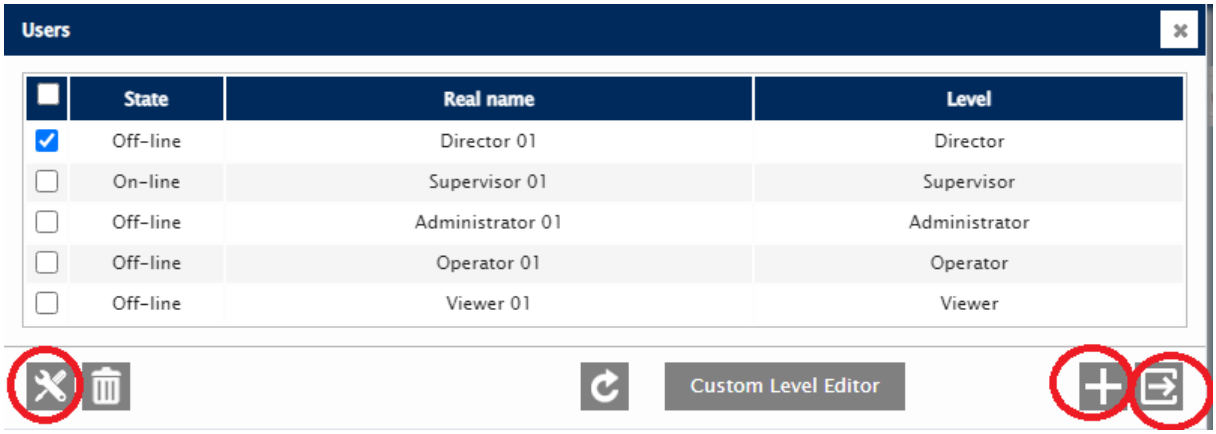


Figure 2-21: System -> Users screen

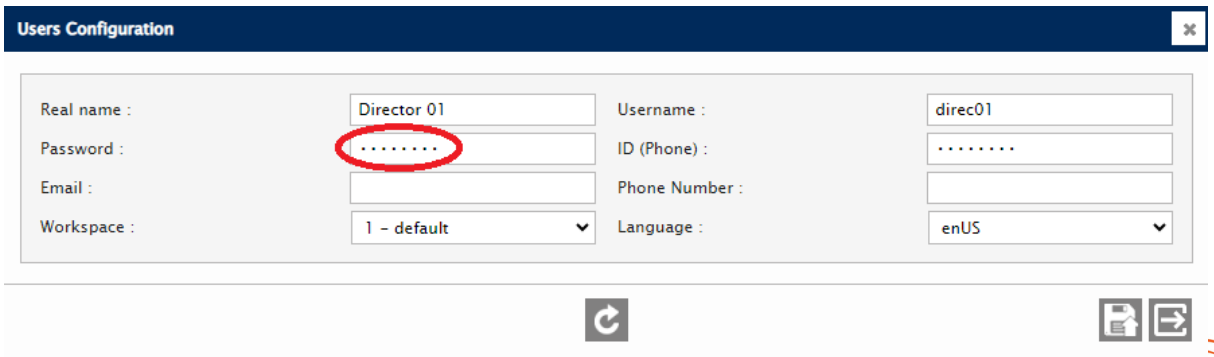


Figure 2-22: System -> Users Configuration screen – Director selected

(g) Log out of the SC4 remote user interface session.

(h) Log back in to the SC4 as username direc01 and with the new password, to confirm a successful login.

(i) From the top menus select **System** -> **Users**, select the Supervisor 01 checkbox and select the configuration (tools icon) button. The supervisor user configuration screen in Figure 2-23 will display.

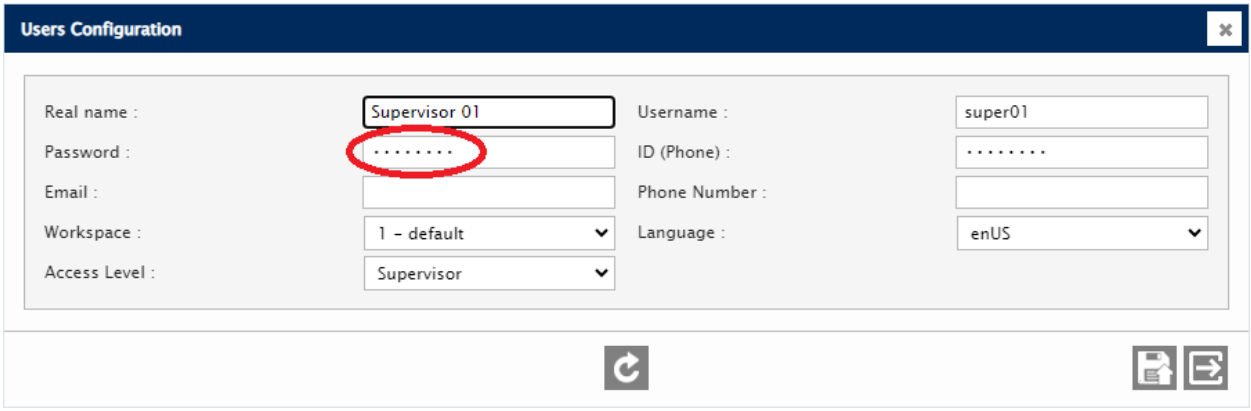


Figure 2-23: System -> Users Configuration screen – Supervisor selected

(j) Update the supervisor password to the value determined in step (a) and press the save and exit buttons. ***Do not alter any other parameters related to this user at this time***.

(k) Remaining logged in as Director 01 and repeats step (i) for the Administrator 01, Operator 01, and Viewer 01 user configurations.

NOTE

It is recommended that local site personnel use the Administrator, Operator or Viewer accounts. The Supervisor and Director accounts should not be used under normal circumstances.

2.5 TECHNICAL COMMISSIONING

The commissioning procedures are presented in a step-by-step format to permit a person who is unfamiliar with the transmitter system to perform a commissioning check. Procedures should be completed in sequence, as each procedure contains prerequisites for subsequent procedures.

NOTE

The transmitter system was calibrated and subjected to an extensive burn-in. It should not be necessary to change the setting of any adjustment, other than those specified in the following procedures.

Unless otherwise stated, all referenced controls and indicators are located on, or are accessible from, the SC4 System Controller and the VX transmitters' front panels. The VX transmitter Installation Manual will be required.

2.5.1 Precautions to Observe

The transmitter system contains many solid-state devices that may be damaged if they are subjected to excessive heat or high voltage transients. Take every effort to ensure that the circuits are not overdriven, and that they are not disconnected from their loads while turned on.

You should read and fully understand the precautionary information included in the VX transmitter's Operations and Maintenance Manual before applying power. Observe these precautions during operation.

2.5.2 Preliminary Settings

Verify that the transmitter system is ready to turn on as follows:

(a) Verify that the preliminary requirements in this document and the pre-commissioning requirements for all transmitters (part of the VX Installation Manual) have been completed.

(b) Verify that the ac power to all transmitters is turned off.

WARNING

If a jumper is placed between the **SYSTEM INTERLOCK** *pins on the SC4 System Controller (U1), safety features provided by the external interlocks will be disabled. A fail-safe method of alerting personnel to this fact should be implemented. Voltages that are dangerous to life will be present on RF output stages and the antenna system if the transmitter is turned on.*

(c) Close the **SYSTEM INTERLOCK** or temporarily connect a jumper wire between terminal block TB1 pins 1 and 2 of the Control Module (Unit 6 for N+1 or Unit 3 for main-standby) Ensure the system interlock is closed.

(d) Close the **TEST LOAD INTERLOCK** or temporarily connect a jumper wire between terminal block TB1 pins 3 and 4 of the Control Module (Unit 6 for N+1 or Unit 3 for main-standby). Ensure the test load interlock is closed.

2.5.3 Initial Turn-On Procedure

Perform paragraph 2.5.3.1 for 3+1 or 4+1 systems and perform paragraph 2.5.3.2 for main-standby systems.

2.5.3.1 N+1 Systems

See Figure 3-5a or 3-5b for the SC4 remote user interface Dashboard.

(a) Confirm all installations tasks in paragraph 2.3 are complete.

(b) Confirm all preliminary checks and configurations in paragraph 2.4 are complete.

(c) Log in the SC4 as admin01.

(d) From the SC4 remote user interface's Dashboard tab, confirm that all transmitter **ONLINE** lamps are green.

(e) From each VX transmitter front panel or remote AUI, confirm that:

i. each main transmitter frequency, power and program input is configured correctly.
- Place each main transmitter in remote mode.
- Confirm RF is OFF.

ii. the standby transmitter preset 1 thru N are configured to match transmitter A thru N.
- Place the standby transmitter in remote mode.
- Confirm RF is OFF.

(f) On the Dashboard, confirm all transmitters **REMOTE** lamps are green.

(g) Confirm that all antenna connections have been made and all antennas are ready to receive RF power.

(h) Close the system interlock or connect a jumper between the **SYSTEM INTERLOCK** terminals on the rear of the control module (TB1 pins 1 and 2). On the Dashboard, confirm the **SYSTEM INTERLOCK** lamp is green.

(i) On the Dashboard, set the system operating mode to normal (double click the blue **NORMAL** button).

i. Confirm all switches indicate position 1.
ii. Confirm transmitter A thru N **INTERLOCK** lamps are green. Confirm the standby transmitter **INTERLOCK** lamp is red.

(j) Enable the test load interlock (e.g., turn on test load fans) or connect a jumper between the test load interlock terminals on the rear of the control module (TB1 pins 3 and 4). On the Dashboard, confirm the **TEST LOAD INTERLOCK** lamp is green.

(k) On the Dashboard, set **OFF-AIR TEST** to **ON** (double click the blue **ON** button).

i. Confirm standby transmitter **INTERLOCK** lamp is green.

(l) On the Dashboard, set **OFF-AIR TEST** to **OFF** (double click the blue **OFF** button).

(m) On the Thresholds tab, configure the transfer threshold (e.g., 1000 W for VX2) and the transfer delay (at least 5 seconds) for each transmitter) (see paragraph 3.4.5.1).

(n) On the Dashboard, set the system operating mode to **TRANSFER A** (double click the blue **TRANSFER A** button).

i. Confirm switch 1 indicates position 2 and all other switches indicate position 1.
ii. Confirm transmitter A **INTERLOCK** lamp is red.
iii. Confirm on the standby transmitter that the:
- **INTERLOCK** lamp is green.
- Standby preset is 1
- Program router set to 1
- Standby transmitter frequency matches transmitter A

(o) On the Dashboard, set the system operating mode to **TRANSFER B** (double click the blue **TRANSFER B** button).

i. Confirm switch 2 indicates position 2 and all other switches indicate position 1.
ii. Confirm transmitter B **INTERLOCK** lamp is red.
iii. Confirm on the standby transmitter that the:
- **INTERLOCK** lamp is green.
- Standby preset is 2
- Program router set to 2
- Standby transmitter frequency matches transmitter B

(p) On the Dashboard, set the system operating mode to **TRANSFER C** (double click the blue **TRANSFER C** button).

i. Confirm switch 3 indicates position 2 and all other switches indicate position 1.
ii. Confirm transmitter C **INTERLOCK** lamp is red.
iii. Confirm on the standby transmitter that the:
- **INTERLOCK** lamp is green.
- Standby preset is 3
- Program router set to 3
- Standby transmitter frequency matches transmitter C

(q) For 4+1 systems only: On the Dashboard, set the system operating mode to **TRANSFER D** (double click the blue **TRANSFER D** button).

i. Confirm switch 4 indicates position 2 and all other switches indicate position 1.
ii. Confirm transmitter D **INTERLOCK** lamp is red.
iii. Confirm on the standby transmitter that the:
- **INTERLOCK** lamp is green.
- Standby preset is 4
- Program router set to 4
- Standby transmitter frequency matches transmitter D

(r) On the Dashboard, set the system operating mode to **NORMAL** (double click the blue **NORMAL** button).

(s) If priority transfer is desired, set **PRIORITY TRANSFER** to **ENABLED** (double click the blue **ENABLE** button).

(t) Turn all main transmitters RF on from the transmitter front panel or remote UI.

(u) Turn standby transmitter RF on from the transmitter front panel or remote UI.

(v) Confirm on the Dashboard:

i. All main transmitters operating at the correct power level.
ii. All main transmitter **FWD POWER** lamps and power meter lamps are green.

(w) The transmitter system is operating correctly.

2.5.3.2 Main-Standby Systems

See Figure 3-5c for the SC4 remote user interface Dashboard.

(a) Confirm all installations tasks in paragraph 2.3 are complete.

(b) Confirm all preliminary checks and configurations in paragraph 2.4 are complete.

(c) Log in the SC4 as admin01.

(d) From the SC4 remote user interface's Dashboard tab, confirm that all transmitter **ONLINE** lamps are green.

(e) From each VX transmitter front panel or remote AUI, confirm that:

i. each main transmitter frequency, power and program input is configured correctly.
- Place each main transmitter in remote mode.
- Confirm RF is OFF.

(f) On the Dashboard, confirm all transmitters **REMOTE** lamps are green.

(g) Confirm the antenna connection has been made and the antenna is ready to receive RF power.

(h) Close the system interlock or connect a jumper between the **SYSTEM INTERLOCK** terminals on the rear of the control module (TB1 pins 1 and 2). On the Dashboard, confirm the **SYSTEM INTERLOCK** lamp is green.

(i) On the Dashboard, set the **MAIN** transmitter to A (double click the blue **Select A Main** button).

i. Confirm switch indicates position 1.
ii. Confirm transmitter A **INTERLOCK** lamp is green. Confirm transmitter B **INTERLOCK** lamp is red.

(j) Enable the test load interlock (e.g., turn on test load fans) or connect a jumper between the test load interlock terminals on the rear of the control module (TB1 pins 3 and 4). On the Dashboard, confirm the **TEST LOAD INTERLOCK** lamp is green.

(k) On the Dashboard, set **OFF-AIR TEST** to **ON** (double click the blue **ON** button).

i. Confirm transmitter B **INTERLOCK** lamp is green.

(l) On the Dashboard, set **OFF-AIR TEST** to **OFF** (double click the blue **OFF** button).

(m) On the Thresholds tab, configure the transfer threshold (e.g., 1000 W for VX2) and the transfer delay (at least 5 seconds) for each transmitter (see paragraph 3.4.5.1).

(n) On the Dashboard, set the **MAIN** transmitter to B (double click the blue **Select B Main** button).

i. Confirm switch indicates position 2.
ii. Confirm transmitter B **INTERLOCK** lamp is green. Confirm transmitter A **INTERLOCK** lamp is red.

(o) On the Dashboard, set the **MAIN** transmitter to A (double click the blue **Select A Main** button):

(p) Set **AUTO TRANSFER** to **ENABLED** (double click the blue **ENABLE** button).

(q) Turn transmitter A RF on from the transmitter front panel or remote UI.

(r) Turn transmitter B RF on from the transmitter front panel or remote UI.

(s) Confirm on the Dashboard:

i. Transmitter A operating at the correct power level.
ii. Transmitter A **FWD POWER** and power meter lamps are green.

(t) The transmitter system is operating correctly.

VX N+1 and Main-Standby FM Broadcast Transmitter System

TECHNICAL INSTRUCTION MANUAL

Section 3 OPERATING INSTRUCTIONS

3.1 INTRODUCTION

This section contains instructions that are primarily intended for persons involved in operating or maintaining of the transmitter system.

- Emergency Shutdown – see 3.2
- Controls and Indicators – see 3.3
- Remote User Interface – see 3.4
- Emergency Bypass Procedure – see 3.5

3.2 EMERGENCY SHUTDOWN

Perform an emergency shutdown on the transmitter system by inhibiting the system's RF output. Remove the closed circuit at the System Interlock inputs (pins 1 and 2 on terminal block TB1 on the control module

3.3 CONTROLS AND INDICATORS

Nautel recommends that the operator/maintainer be familiar with the controls and indicators of the transmitter system and the associated VX transmitters before operating the transmitter system or attempting to perform fault diagnostics. In most cases, controls and indicators are presented in an assembly-by-assembly format. A mechanical drawing and an associated table are provided as aids to locating and understanding the assembly's controls and indicators.

NOTE

On some mechanical drawings, reference designation callouts are provided to cross-reference the control/indicator to the description table.

The names used in the **PANEL MARKING** *column of the controls and indicators tables are intended to be the closest possible representation to the item's label/silkscreen.*

3.3.1 SC4 Front Panel

The front panel of the SC4, located in the VX N+1 or VX M-S Control Module, is the primary local user interface for the transmitter system. Control and indicators are shown in Figure 3-1 and described in Table 3-1.

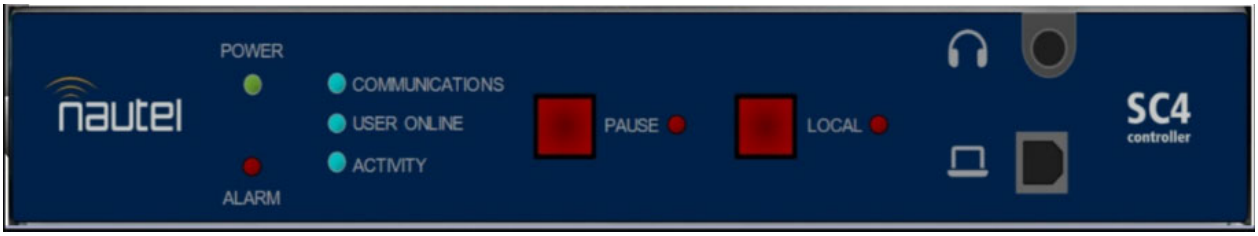


Figure 3-1: SC4 Front Panel

Table 3-1: SC4 Front Panel – Controls and Indicators

CONTROL OR INDICATOR	DESCRIPTION
POWER LED	Indicates the status of the unit's power. LED is illuminated when power is applied via the rear panel.
ALARM LED	When illuminated, may indicate one or more faults in the system's output, transfer switch, test load interlock or standby test. Check the SC4 remote diagnostic display to determine the specific cause of the alarm.
COMMUNICATIONS LED	When illuminated, indicates the unit's call-out status, (i.e., makes an outside call via telephone, email, SMNP, Trap, etc).
USER ONLINE LED	Is illuminated when one or more users are remotely connected to the unit.
ACTIVITY LED	The LED flashes at a rate of one (1) pulse per second which indicated that the CPU is functioning normally.
PAUSE button and LED	Push-button that stops the transmission of alarms. Associated LED is illuminated when activated.
LOCAL button and LED	Push-button that blocks outside actions and control to allow maintenance and repair to the transmitter system. Associated LED is illuminated when activated.
Audio Jack	Provides audio for monitoring purposes. Active only when audio is applied to the SC4's rear connector audio input pins.
Laptop USB	USB port to allow the user to locally connect to a laptop/PC (this feature is not used in this transmitter system)

3.3.2 Audio Switcher Front Panel (N+1 Systems only)

The front panel of the audio switcher, located in the VX N+1 Control Module, allows for manual control. Control and indicators are shown in Figure 3-2 and described in Table 3-2.

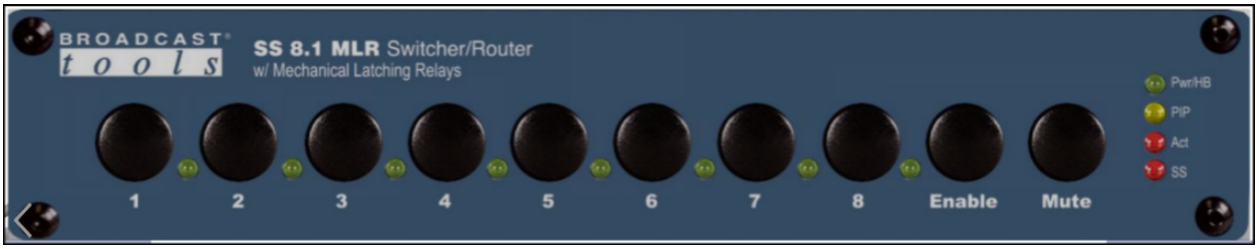


Figure 3-2: Audio Switcher Front Panel

Table 3-2: Audio Switcher Front Panel – Controls and Indicators

CONTROL OR INDICATOR	DESCRIPTION
1 - 8 button and LED	Represents audio input channel to be routed to the switcher's output. Each channel has an LED that is illuminated when that channel is selected.
Enable button	Provides a safety interlock for the front panel selection push buttons.
Mute button	Allow the user to turn off all audio.
Pwr/HB LED	Indicates the status of the unit's power. LED is illuminated when power is applied and blinks when serial data active.
PIP LED	Flashes to indicate PIP/trigger activity.
Act LED	Illuminates when audio is detected on the output.
SS LED	Silence Sensor indicator which indicates no audio is present. Illuminated when silence is detected, if enabled.

NOTE

The SC4 will control the setting of the audio switcher automatically. Manual adjustment of the audio switcher is not recommended except as part of the emergency bypass procedure.

3.4 REMOTE USER INTERFACE

The SC4 unit in the Control Module has unique software coding that provides a remotely accessible user interface. This interface is the primary means of operation for the transmitter system.

The SC4 uses a combination of SNMP data and physical I/O to implement the N+1 and main-standby control functions. The user can perform a variety of control and monitoring functions, such as setting RF transfer forward power thresholds and delay periods for the transmitter system.

NOTE

Some remote user interface screens, tabs, and drop-down menu may contain functions that are not accessible to the user, regardless of account permissions, and may be 'greyed' out or faded on the display.

You can access the remote user interface using a PC and a web browser, directly or through a switch or network, via the Ethernet connector on the rear of the SC4 unit (see Figure 3-3).

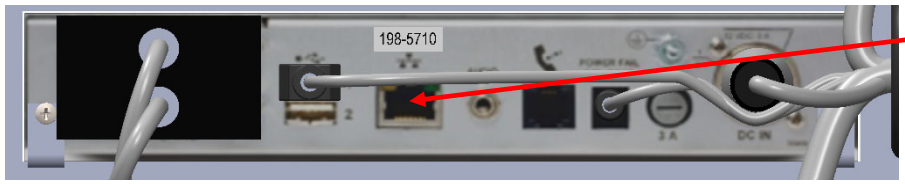


Figure 3-3: SC4 Ethernet Connection

NOTE

It is recommended the browser history be cleared before viewing the remote user interface.

3.4.1 PC/Laptop Requirements

PC or laptop must have Windows 10 or 11 installed and a web browser.

3.4.2 Logging in to the Remote User Interface

Initial login to the remote interface occurs during installation. See Section 2 for instructions to log in to the remote interface.

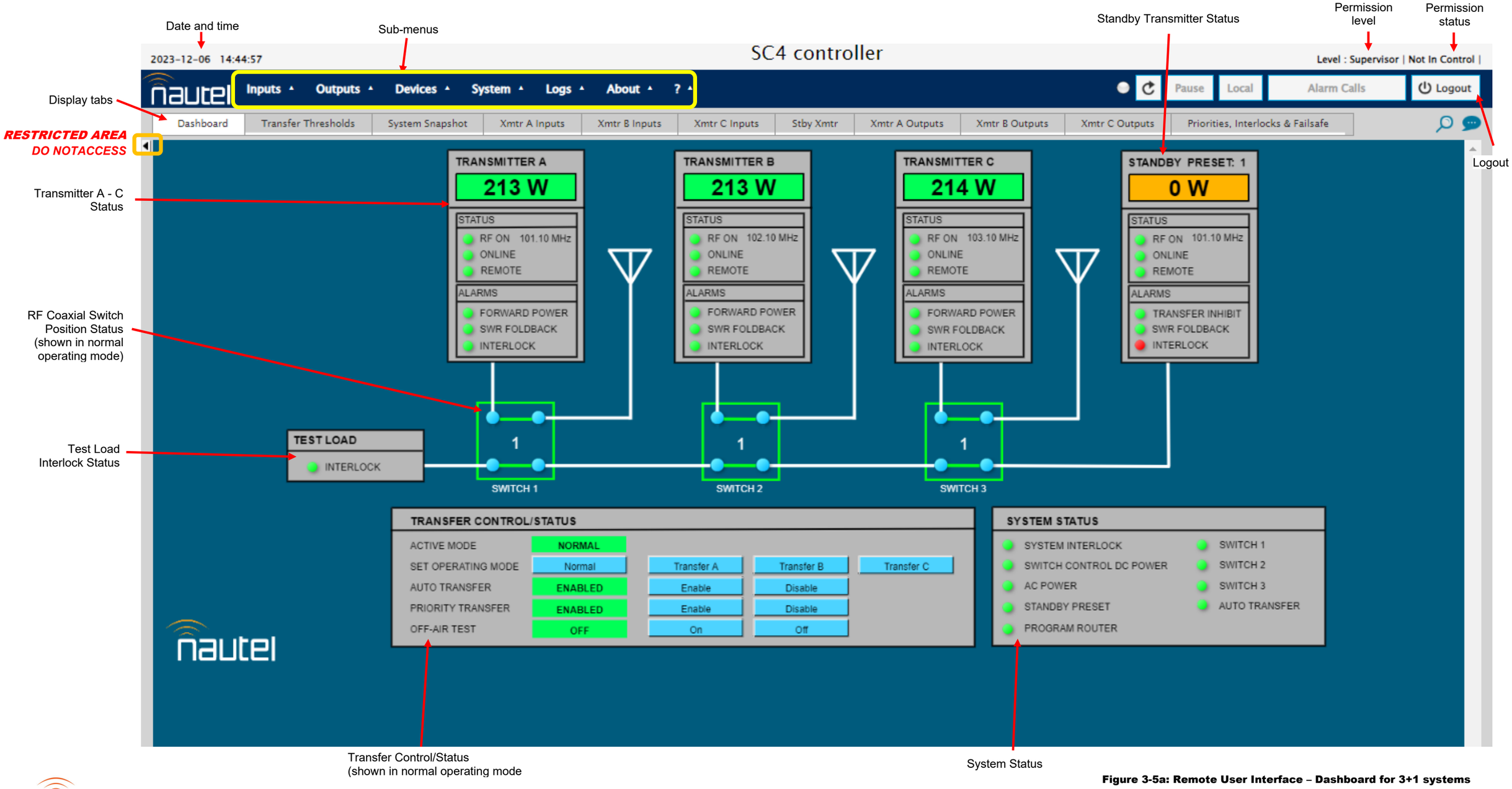


Figure 3-5a: Remote User Interface – Dashboard for 3+1 systems

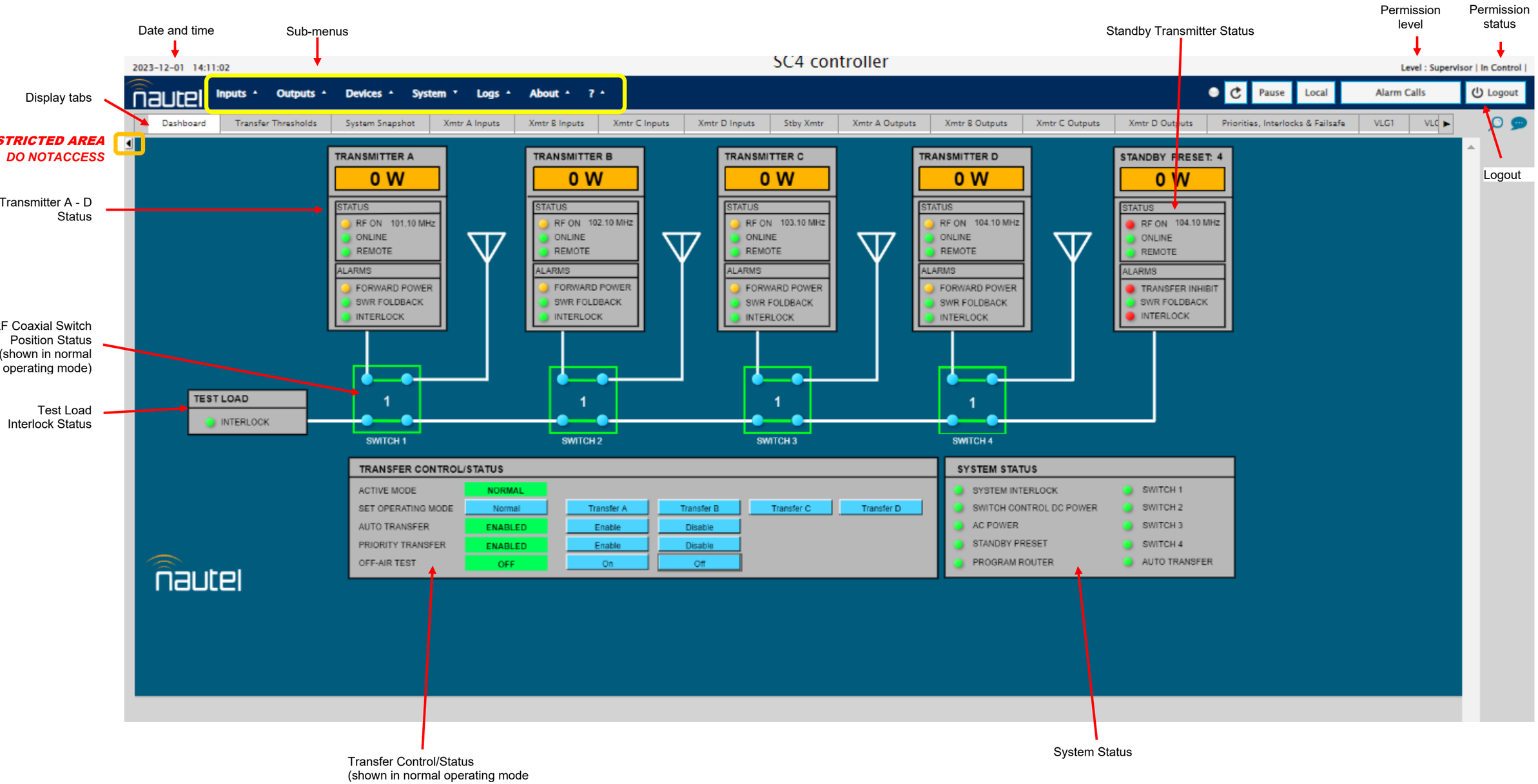


Figure 3-5b: Remote User Interface – Dashboard for 4+1 systems

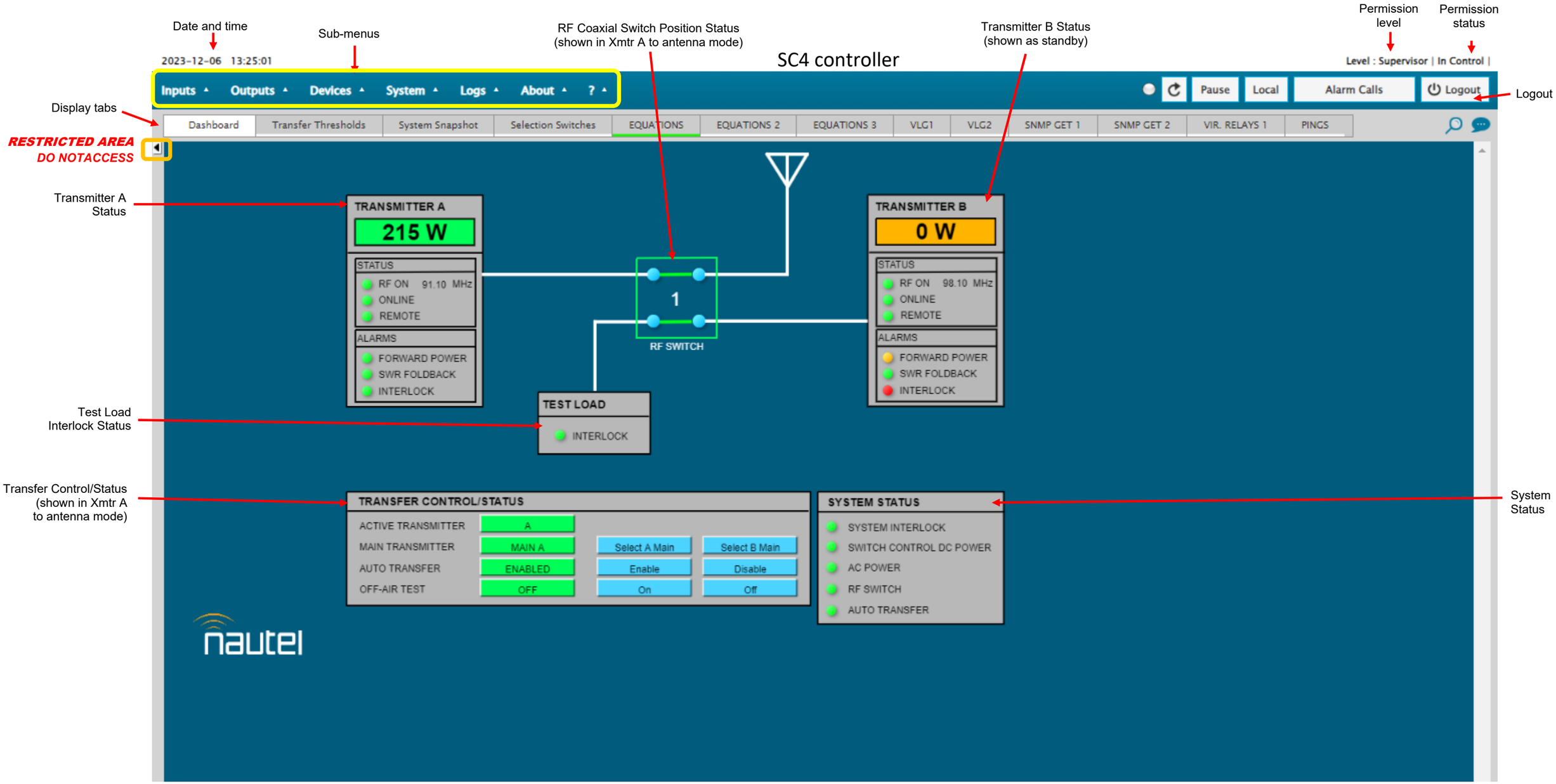


Figure 3-5c: Remote User Interface – Dashboard for Main-Standby systems

3.4.3 Describing the Remote User Interface

The remote user interface begins with the Dashboard screen (see Figures 3-5a for 3+1 systems, Figure 3-5b for 4+1 systems, and Figure 3-5c for main-standby systems).

All navigation starts from this screen. Any user can view the Dashboard, regardless of the login status; however, only users with the appropriate permission level (admin01 and operator01 users) can access functions that alter the transmitter control settings.

NOTE

*Users are advised **NOT** to adjust parameters in the drop-down menus beyond those described in the pre-installation instructions and as described in the manual. Unauthorized adjustments may cause undesired system behavior and/or damage to the equipment.*

The graphic section of the Dashboard features an RF routing diagram (white lines) that shows how the RF outputs of the main and standby transmitters of the system are connected to the antennas and test load, via RF switches. Figures 3-5a through 3-5c show the various system types in normal operating mode. In this mode, the RF outputs of the main transmitters are routed through the RF switches in position 1, which routes them to their respective antennas. The RF output of the standby transmitter is routed to the test load.

Each section of the Dashboard provides information about a specific system function.

- Date and time: Displays the date (including year, month, and day) and current time (set during preliminary checks in 2.4.3.4).
- Sub-menus: Shows the various drop-down menus that can be viewed. Only **System –> System Log View** is used after installation.
- Display tabs: Shows the various tabs (displays) that can be viewed. The existing display (e.g., Dashboard) is highlighted. Only Dashboard, Transfer Thresholds and System Snapshot are required for the end user.
- Permission level: Displays the current user's permission level
- Permission status: Displays the remote AUI user's status (In Control or Not in Control)
- Refresh button
- Pause button
- Local button
- Alarms Calls button
- Logout button: Click to log out of the remote session.
- Transmitter Status: one window for each main transmitter in the system (A to D for 4+1 system, A to C for 3+1 system, A for main-standby system); see paragraph 3.4.3.1.
- Standby Transmitter Status: see paragraph 3.4.3.2.
- RF Switch Position Status: displays the position of the RF switches, which control RF routing for the transmitter system. See paragraph 3.4.3.3.
- Test load: displays the interlock status of the test load. See paragraph 3.4.3.4.
- Transfer Control/Status: see paragraph 3.4.3.5
- System Status: see paragraph 3.4.3.6

CAUTION

*Do not click the left arrow identified as **RESTRICTED AREA** in Figures 3-5a to 3-5c. This menu should never be accessed by an end user. Failure to observe this caution may result in system malfunction.*

3.4.3.1 Transmitter Status Windows

Each main transmitter in the system has a **TRANSMITTER** window on the Dashboard (see Figure 3-6).

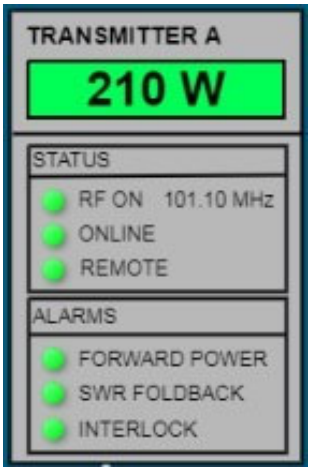


Figure 3-6: Transmitter Status Window

- Forward power section: the transmitter's forward power is displayed in the upper section.

- **STATUS** section

  - **RF ON:** indicator is green when transmitter's RF is on; indicator is amber (N+1) or red (main-standby) when off; carrier frequency of transmitter shown.
  - **ONLINE:** indicator is green when the transmitter's Ethernet is connected via SNMP; indicator is red when transmitter is offline or disconnected.
  - **REMOTE:** indicator is green when transmitter is in remote control mode; indicator is amber (N+1) or red (main-standby) when in local control mode.

- **ALARMS** section
  - **FORWARD POWER**: indicator is green when the transmitter is on and the forward power is greater than the associated transfer threshold; indicator is amber when the transmitter forward power is less than associated transfer threshold, and has remained below the threshold for a time greater than the transfer delay, or the transmitter is off.
  - **SWR FOLDBACK**: indicator is green when the transmitter is on and not reporting an SWR foldback alarm; indicator is amber when the transmitter is reporting an SWR foldback alarm.
  - **INTERLOCK**: indicator is green when the transmitter's interlock circuit is closed (intact); indicator is red when the transmitter's interlock circuit is open, disabling the transmitter's RF output.

3.4.3.2 Standby Transmitter Status Window

The standby transmitter in the system has a **STANDBY** window on the Dashboard (see Figure 3-7).

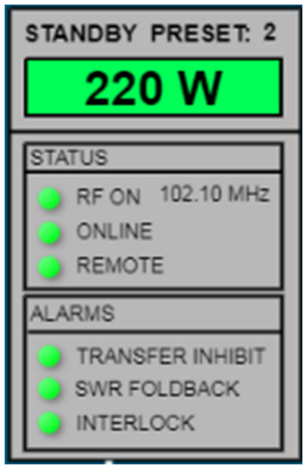


Figure 3-7: Standby Transmitter Status Window

- Forward power section: the standby transmitter's forward power is displayed in the upper section, along with the preset number currently assigned to the standby transmitter. The standby transmitter's preset is determined by the main transmitter to which it is assigned to replace (e.g., Preset 1 for Transmitter A, Preset 2 for Transmitter B, etc.).

- **STATUS** section

  - **RF ON:** indicator is green when transmitter's RF is on; indicator is red when off; carrier frequency of transmitter shown, noting it matches the preset frequency for the last main transmitter it backed up.

  - **ONLINE:** indicator is green when the transmitter's Ethernet is connected via SNMP; indicator is red when transmitter is offline or disconnected.

  - **REMOTE:** indicator is green when transmitter is in remote control mode; indicator is red when in local control mode.

- **ALARMS** section

  - **TRANSFER INHIBIT**: indicator is green when the standby transmitter is available for transfer; indicator is red when the transmitter is not available for automatic transfer (manual transfer may still be available).

  - **SWR FOLDBACK**: indicator is green when the transmitter is on and not reporting an SWR foldback alarm; indicator is red when the transmitter is reporting an SWR foldback alarm.

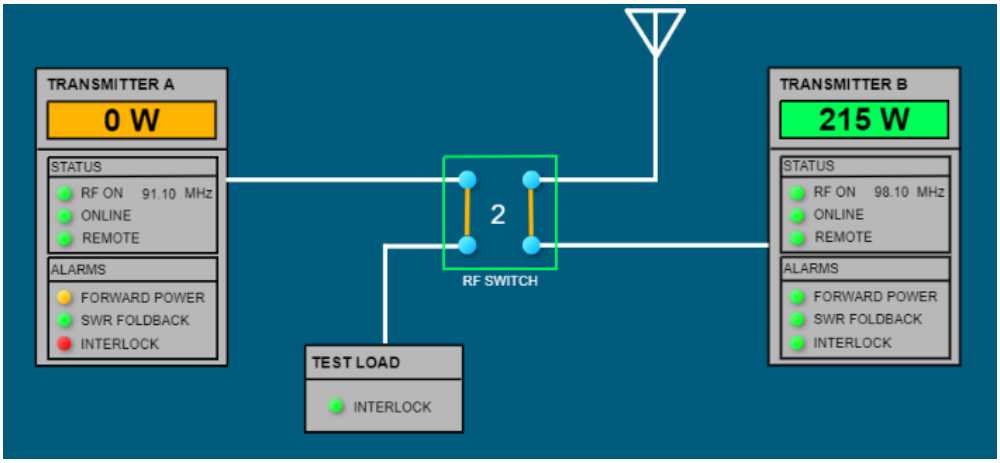
  - **INTERLOCK**: indicator is green when the transmitter's interlock circuit is closed (intact); indicator is red when the transmitter's interlock circuit is open, disabling the transmitter's RF output.

3.4.3.3 RF Switch Position Status

The positions of the RF switches are shown on the Dashboard (see Figure 3-5a/b/c). For any system type (N+1 or main-standby), switch position 1 is considered the normal operating position (i.e., main transmitter to antenna, standby/backup transmitter to test load).

If a transfer occurs, the appropriate transmitter's RF switch will move to position 2, routing the standby/backup transmitter to the appropriate antenna, and the main transmitter to the test load.

If a transfer occurs and a switch position has changed from position 1 to position 2, the RF Switch position status in the Dashboard will indicate "2" and the switch connection lines will change color from green to amber. See Figure 3-5a/b/c and 3-8 for the differences in the display.



Main-standby system Dashboard shown

Figure 3-8: RF Coaxial Switch Position Status (RF Switch in Position 2)

3.4.3.4 Test Load Interlock Status

The test load interlock status is indicated in the **TEST LOAD** section of the Dashboard (see Figure 3-9). The indicator is green when the test load's interlock circuit is closed (intact); indicator is red when the test load's interlock circuit is open. RF transfers are inhibited when the test load interlock is open.

Figure 3-9: Test Load Interlock Status Window

3.4.3.5 Transfer Control/Status Window

The **TRANSFER CONTROL/STATUS** window (see Figure 3-10 for N+1 systems or Figure 3-11 for main-standby systems) on the Dashboard provides a means to control and monitor the status of the transmitter's system operating mode.

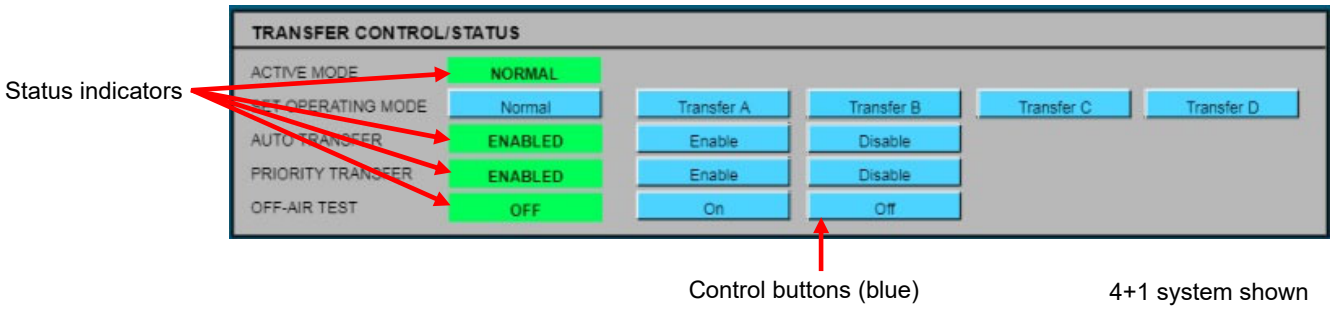


Figure 3-10: Transfer Control/Status Section (N+1 Systems)

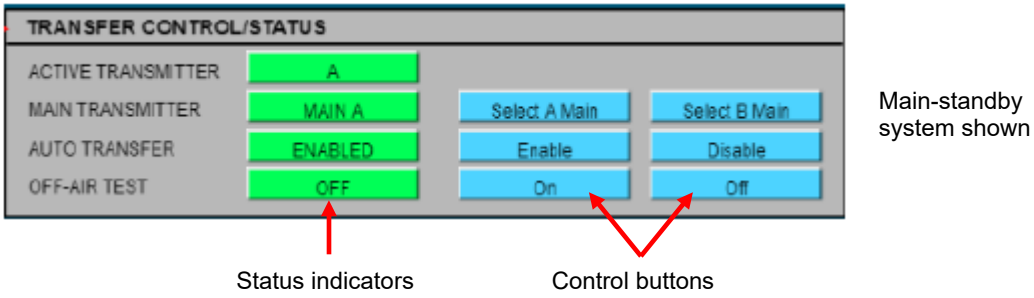


Figure 3-11: Transfer Control/Status Section (Main-Standby Systems)

NOTE

Blue boxes in the Transfer Control/Status section represent control buttons. Green boxes represent the 'normal' status; colour changes to amber for an error or abnormal state.

- **ACTIVE MODE (N+1 systems only):** Status indicator that displays the active operating mode (NORMAL, TRANSFER A, TRANSFER B, etc.), directly above its associated control button in the **SET OPERATING MODE** row.
    - In NORMAL mode, all main transmitters are routed to their respective antennas.
    - In TRANSFER mode, the associated main transmitter (e.g., A) has been transferred to the test load and the standby transmitter is operating in its place.
- **ACTIVE TRANSMITTER (main-standby systems only):** Status indicator that displays the transmitter currently applied to the antenna port.
- **MAIN TRANSMITTER (main-standby systems only):** Status indicator that displays the selected main transmitter. Associated control buttons (Select A Main and Select B Main), when double-clicked, selects the desired main transmitter for the system. The selected main transmitter will be applied to the antenna port and monitored by the system. If the main transmitter fails, the system will automatically transfer the off-air transmitter to the antenna port.

- **SET OPERATING MODE (N+1 systems only):** Control button that, when double-clicked, requests the active operating mode (NORMAL, TRANSFER A, TRANSFER B, etc.). When the transfer is complete, the ACTIVE MODE row will display the operating mode above the control button. **NOTE:** Figure 3-11 shows the control buttons for a 4+1 transmitter system; less buttons are displayed for 3+1 and main-standby systems.

NOTE

Setting the operating mode to NORMAL will automatically enable AUTO TRANSFER. Setting the operating mode to TRANSFER A, B, etc. (i.e., performing a manual transfer) will automatically disable AUTO TRANSFER.

- **AUTO TRANSFER:**
  - The status indicator indicates if auto transfer is Enabled (green) or Disabled (amber).
  - The **Enable** and **Disable** control buttons, when double-clicked, set the auto transfer state.

    Auto transfer will trigger if the standby transmitter is ready (i.e., capable….on, not offline, in remote) and any of the following conditions apply:
    - if a main transmitter goes offline (not communicating with the SC4 via Ethernet connection)
    - if a main transmitter's forward power drops below the associated transfer threshold for a time greater than the associated transfer delay

- **PRIORITY TRANSFER (N+1 systems only):**
  - The status indicator (green or amber) indicates if priority transfer is Enabled or Disabled.
  - The Enable and Disable control buttons, when double-clicked, set the priority transfer state. When enabled, the system will transfer the first failed transmitter. If a higher priority transmitter fails subsequently (priority is A-B-C-D), the system will transfer the higher priority transmitter and place the previously failed transmitter back on-air. When disabled, the system operates on a first-come-first-served basis and will transfer only the first failed transmitter. When priority transfer is disabled, the operating mode must be reset to NORMAL in order to re-arm the auto transfer.

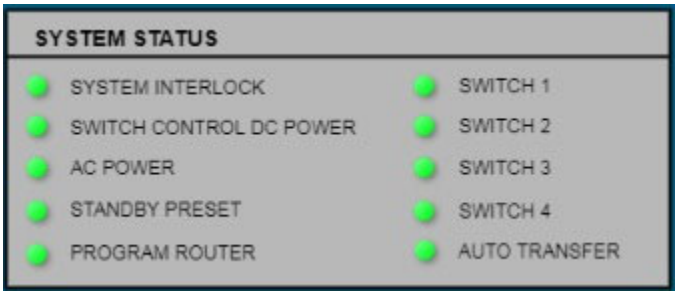
- **OFF-AIR TEST:**
  - The status indicator (green or amber) indicates if the off-air test is On or Off.
  - The On and Off control buttons, when double-clicked, set off-air test state. (from SC4): OFF-AIR TEST is used to enable (un-interlock) the transmitter applied to the test load for testing/troubleshooting purposes (set to On). Transfers are disabled while a standby test is in progress. Set to Off when testing is completed to re-enable transfers, as desired.

NOTE

If a transfer (automatic or manual) is performed while OFF-AIR TEST is set to On, OFF-AIR TEST will automatically be set to Off, to allow the transfer to occur.

3.4.3.6 System Status Window

The **SYSTEM STATUS** window (see Figure 3-12) on the Dashboard provides a means to monitor the status of key parameters of the transmitter system.



4+1 system shown

Figure 3-12: System Status Window

NOTE

The indicators in the **SYSTEM STATUS** *section are green when there are no faults associated with the parameter, and will change to red or amber depending on fault severity.*

- **SYSTEM INTERLOCK:** Indicates the status of the system interlock circuit connected between TB1-1 and TB1-2 on the rear of the Control Module. Indicator is green when the system interlock is intact (closed) (< 100 Ω). Indicator is red when the system interlock is open (> 10 kΩ).
    - When the system interlock is open, all transmitters are disabled; auto transfers are not permitted.
- **SWITCH CONTROL DC POWER:** Indicates the status of the 27 V dc power source for the RF switches. Indicator is green when the dc power source voltage is greater than 21.6 V dc. Indicator is red when the dc power source voltage is less than 21.6 V dc. All transfers are inhibited while the indicator is red.
- **AC POWER:** Indicates the status of the ac power source, monitored at the input of the UPS. Indicator is green when the ac power source voltage is within acceptable limits (180 to 266 V ac). Indicator is amber when the ac power source voltage is less than 85 V ac, meaning that the system is running on power supplied by the UPS only After approximately 30 minutes, the UPS battery capacity will be depleted, and the system will shut down.
- **STANDBY PRESET** (for N+1 systems only): Indicator is green when the active preset read from the standby transmitter matches the system standby preset setting. Indicator is red when the active preset read from the standby transmitter does not match the system standby preset setting.
- **PROGRAM ROUTER** (for N+1 systems only)**:** Indicator is green when the program select status read from the audio switcher matches the system audio switcher program input selection. Indicator is red when the program select status read from the audio switcher does not match the system audio switcher program input selection.

- **RF SWITCH/SWITCH 1 through 4** (four switches for 4+1 systems, three switches for 3+1 systems, one switch for main-standby systems)**:** Indicator is green when the switch is in the requested position. Indicator is red when the switch is not in the requested position; The affected transmitter(s) and the standby transmitter will be interlocked off.

- **AUTO TRANSFER**: Indicator is green when the automatic transfer function is enabled and ready to transfer. Indicator is amber when an automatic transfer has occurred. An automatic transfer occurs if auto transfer is enabled and a main transmitter:
  - Forward power drops below the transfer threshold for longer than the transfer delay
  - Transmitter is offline (not communicating with the SC4).

3.4.4 Drop-Down Menus

The top banner of the Dashboard has six sub-menus, each with drop-down lists that contain user-configurable settings, parameters, etc.

NOTE

Not all sub-menu options are intended for the end user. Some options may be greyed out and therefore not selectable. Only the items in the following paragraphs should be selected.

- Inputs – used during installation (Section 2), but not required for the operator
- Outputs – not required for the end user
- Devices – see 3.4.4.1
- System – see 3.4.4.2
- Logs – see 3.4.4.3
- About – not required for the end user

3.4.4.1 Devices

The Devices drop-down menu displays the options shown in Figure 3-13.

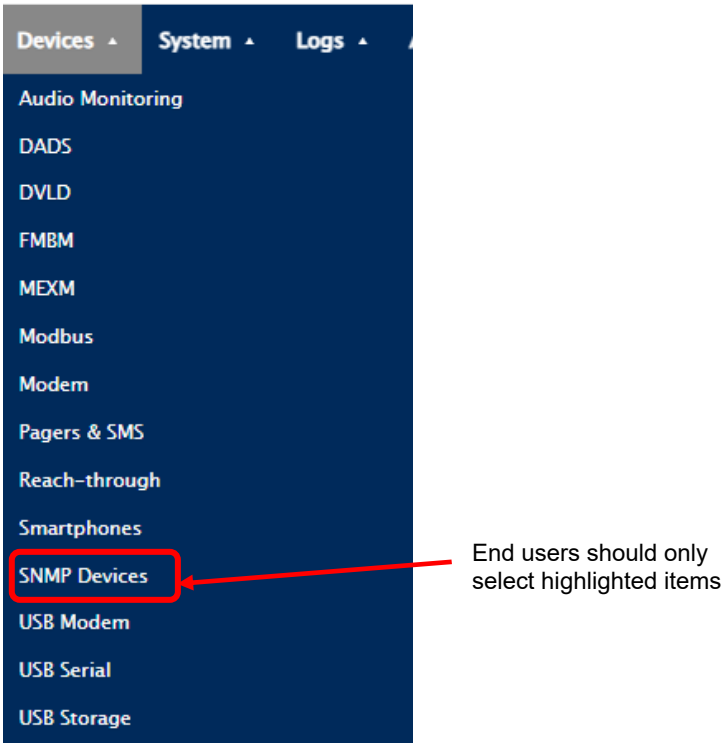


Figure 3-13: Devices drop-down list

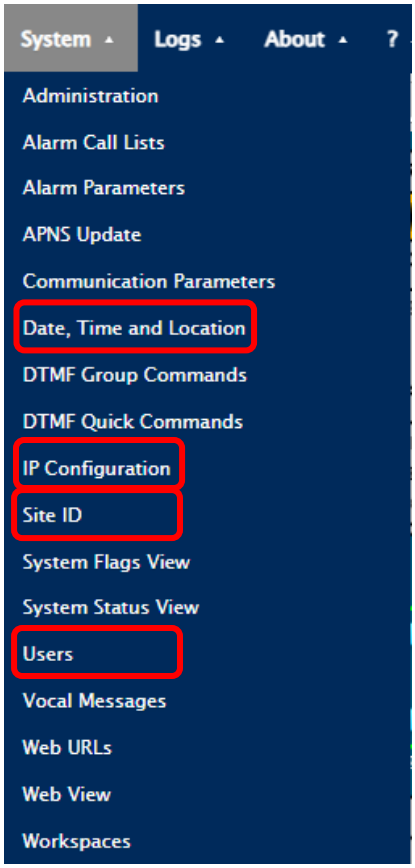
IMPORTANT!

Only the highlighted items are intended for use for these transmitter systems. Other items are beyond the scope of this manual and are therefore not included.

- SNMP Devices - performed during installation (see Section 2)

3.4.4.2 System

The System drop-down menu displays the options shown in Figure 3-14.



End users should only select highlighted items

Figure 3-14: System drop-down list

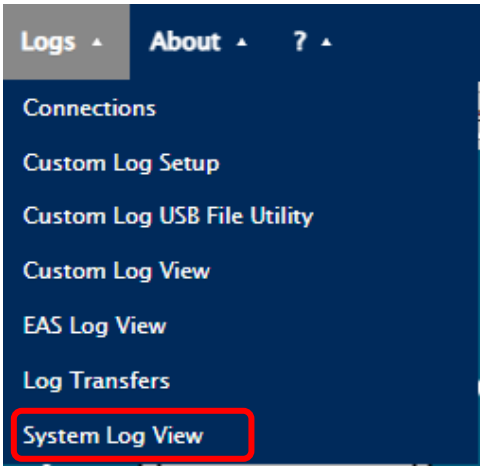
IMPORTANT!

Only the highlighted items are intended for use for these transmitter systems. Other items are beyond the scope of this manual and are therefore not included.

- Date, Time and Location – performed during installation (see Section 2)
- IP Configuration – performed during installation (see Section 2)
- Site ID – performed during installation (see Section 2)
- Users – performed during installation (see Section 2)

3.4.4.3 Logs

The Logs drop-down menu displays the options shown in Figure 3-15.



End users should only select highlighted items

Figure 3-15: Logs drop-down list

IMPORTANT!

Only the highlighted items are intended for use for these transmitter systems. Other items are beyond the scope of this manual and are therefore not included.

- System Log View – see 3.4.4.5.1

3.4.4.3.1: System Log View

Allows the user to view all logged events from the transmitter system.

NOTE

The System Log View screen is for viewing purposes only. Information in this screen can also assist with troubleshooting faults.

(a) Select **System Log View** from the **Logs** drop-down menu. The screen in Figure 3-16 will display.

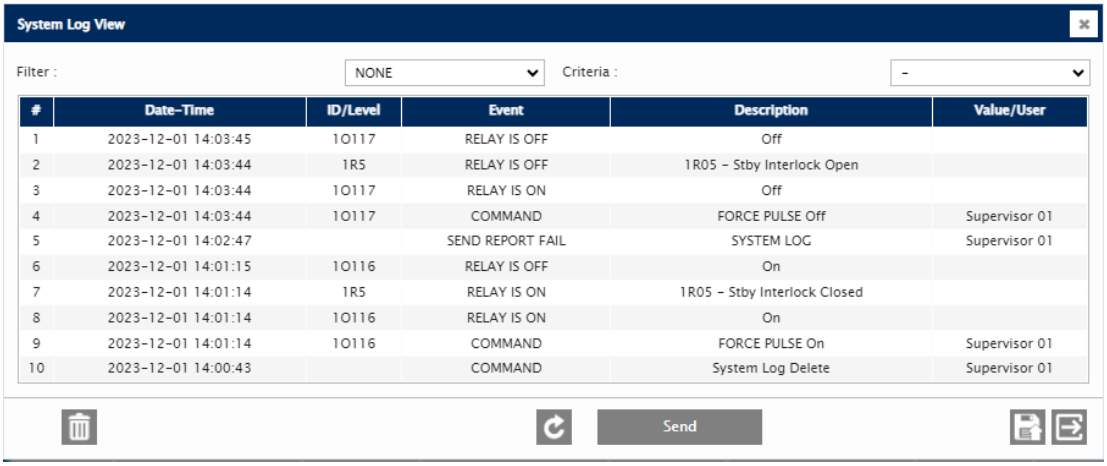


Figure 3-16: Logs – System Log View

(b) The System Log View screen lists all system events in chronological order, starting t\with the most recent. Use the various screen options as follows:

- Delete (trash can icon): allows deletion of the logs
- Refresh: refreshes the log list
- Send: not functional
- Save (disk icon): allows the log list to be saved to a zipped system log list available in the Downloads folder on the connected PC/laptop
- Exit (right arrow): exits to Dashboard

3.4.5 Display Tabs

In addition to the Dashboard tab (see paragraph 3.4.3), there are several other tabs, each with their own displays, that contain user-configurable settings, parameters, etc.

NOTE

Not all display tabs are intended for the end user. Only the items in the following paragraphs should be used/selected.

- Dashboard – see 3.4.3
- Transfer Thresholds – see 3.4.5.1
- System Snapshot – see 3.4.5.2

3.4.5.1 Transfer Thresholds

The Transfer Thresholds tab (see Figure 3-17) allows the user to set the transfer thresholds and time delay for each main transmitter in the system.

NOTE

The number of transmitters shown is dependent on the system type. 4+1 systems show four transmitters (A to D), 3+1 systems show three transmitters (A to C), and main-standby systems show two transmitters (A and B).

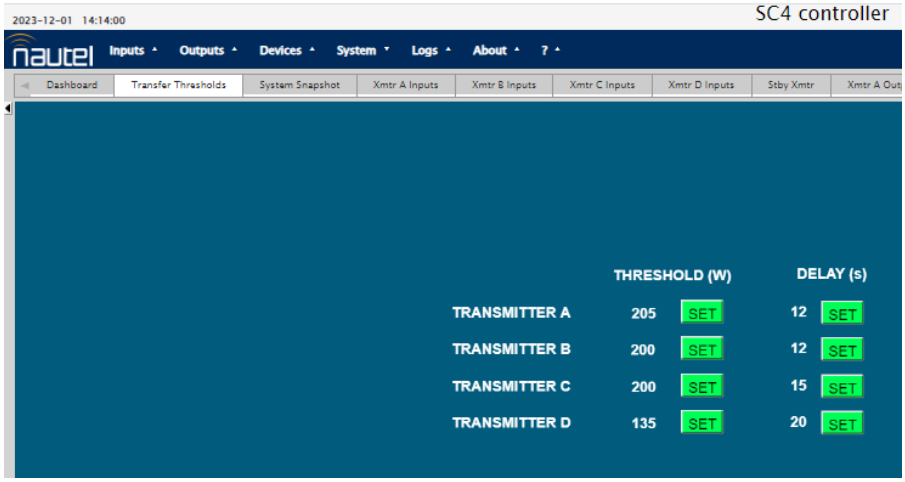


Figure 3-17: Transfer Thresholds Tab (4+1 System shown)

(a) To change a transfer threshold level, right click on the appropriate transmitter's **THRESHOLD (W) - SET** button and select (double-click) **Configure** (see Figure 3-18). This will display the screen shown in Figure 3-19.

(b) Click the **Actions** tab to access the threshold setting (see Figure 3-20). Enter the new value in both the **Value when Normal** and **Value when Active** fields. Click **Save** to accept the changes. Click the exit button to return to the Transfer Threshold screen.

(c) Double-click the **SET** button to enact the change. The new threshold value will be displayed.

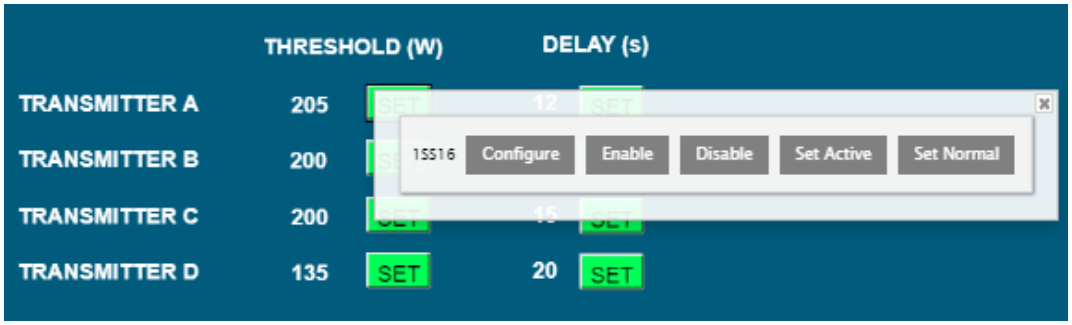


Figure 3-18: Transfer Thresholds – Right-Click on SET button

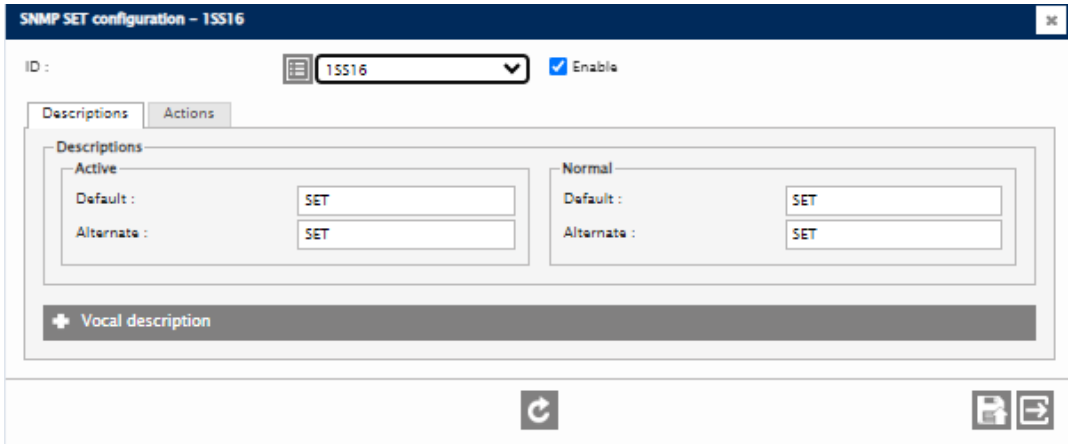


Figure 3-19: Transfer Thresholds – Configure Screen (Descriptions tab)

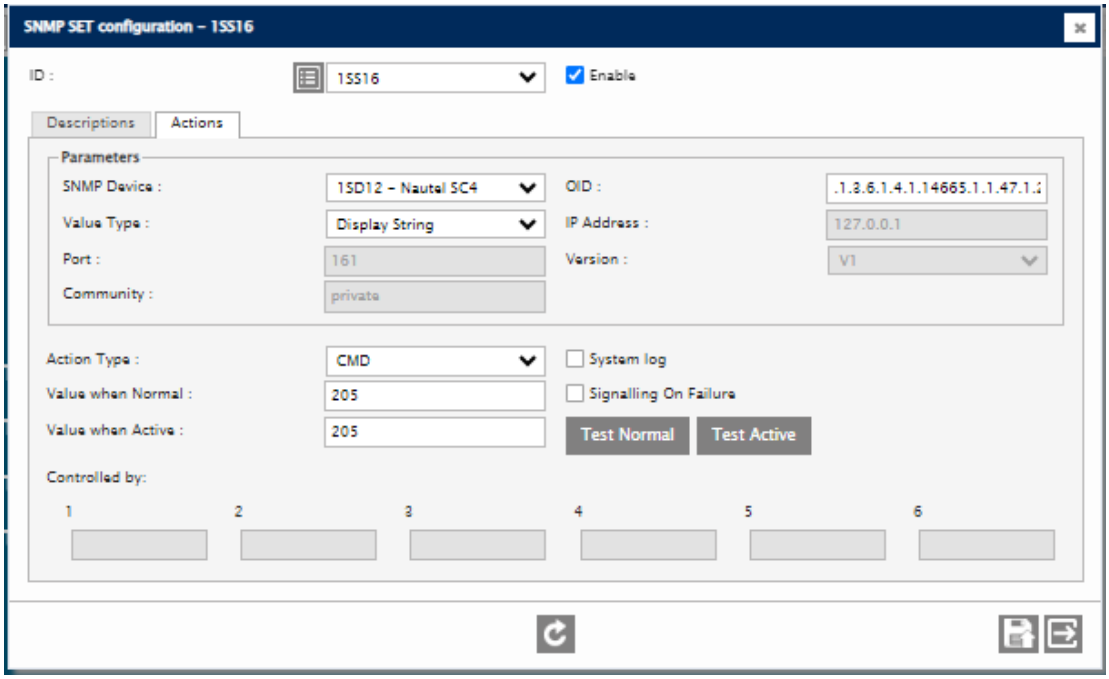


Figure 3-20: Transfer Thresholds – Configure Screen (Descriptions tab)

NOTE

The example in Figure 3-20 indicates that the low power transfer threshold is 205 W. When the associated transmitter's power is below 205 W, a transfer to the standby transmitter is initiated, assuming the standby transmitter is available for transfer.

Nautel recommends a transfer threshold of 3 dB (1000 W for a VX2 transmitter).

Nautel recommends a transfer delay of at least 6 s.

(d) To change a transfer delay period, right click on the appropriate transmitter's **DELAY (s) - SET** button and select (double-click) **Configure** (similar to the threshold level setting).

(e) Click the **Actions** tab to access the delay setting. Enter the new value in both the **Value when Normal** and **Value when Active** fields. The value selected represents the time delay after which a transfer will occur. Click **Save** to accept the changes. Click exit to return to the **Transfer Threshold** screen.

(f) Double-click the **SET** button to enact the change. The new delay value will be displayed.

NOTE

If the transfer threshold level is set to 80% of the normal operating setpoint or higher, using a delay of less than 5 s may cause unexpected transfers to occur, due to the ramp-up nature of the VX transmitter. If the transfer threshold level is 50% of the normal operating setpoint (factory default), a shorter (5 s) delay is acceptable.

(g) Repeat steps (a) through (f) for all transmitters shown on the **Transfer Thresholds** screen.

3.4.5.2 System Snapshot

The **System Snapshot** tab provides a visual display of the transmitter system's critical information, including information that is also provided on the Dashboard. See Figure 3-21a (for 3+1 systems), Figure 3-21b (for 4+1 systems) or Figure 3-21c (for main-standby systems) for a general layout of this screen. The System Snapshot includes:

- Transmitters
  - Remote status
  - SWR OK status
  - RF on/off status
  - Power level
  - Operating frequency
  - Low power threshold (limit)
  - Transfer delay period
  - Online status
  - Interlock status
- Standby Transmitter (N+1 systems only)
  - Remote status
  - SWR OK status
  - RF on/off status
  - Power level
  - Operating frequency
  - Ready status
  - Active preset
  - Online status
  - Interlock status
  - Preset OK status
- RF Switch(es) (multiple RF switches for N+1 systems)
  - Switch command
  - Switch position
  - Switch OK status
  - Switch dc supply OK status
- System
  - Master reset delay
  - Auto transfer status (enabled/disabled)
  - Priority transfer status (enabled/disabled) (N+1 systems only)
  - Active transmitter (main-standby systems only)
  - Main transmitter (main-standby systems only)
  - Off-air test status
  - System interlock status
  - Test load interlock status
  - AC power OK status
  - Switch DC supply OK status (N+1 systems only)
  - Failsafe
- Active Mode (N+1 systems only)
- Program Router (N+1 systems only)
  - Active router program
  - Router OK status
- Version (software version)

Figure 3-21a: Remote User Interface – System Snapshot for 3+1 systems

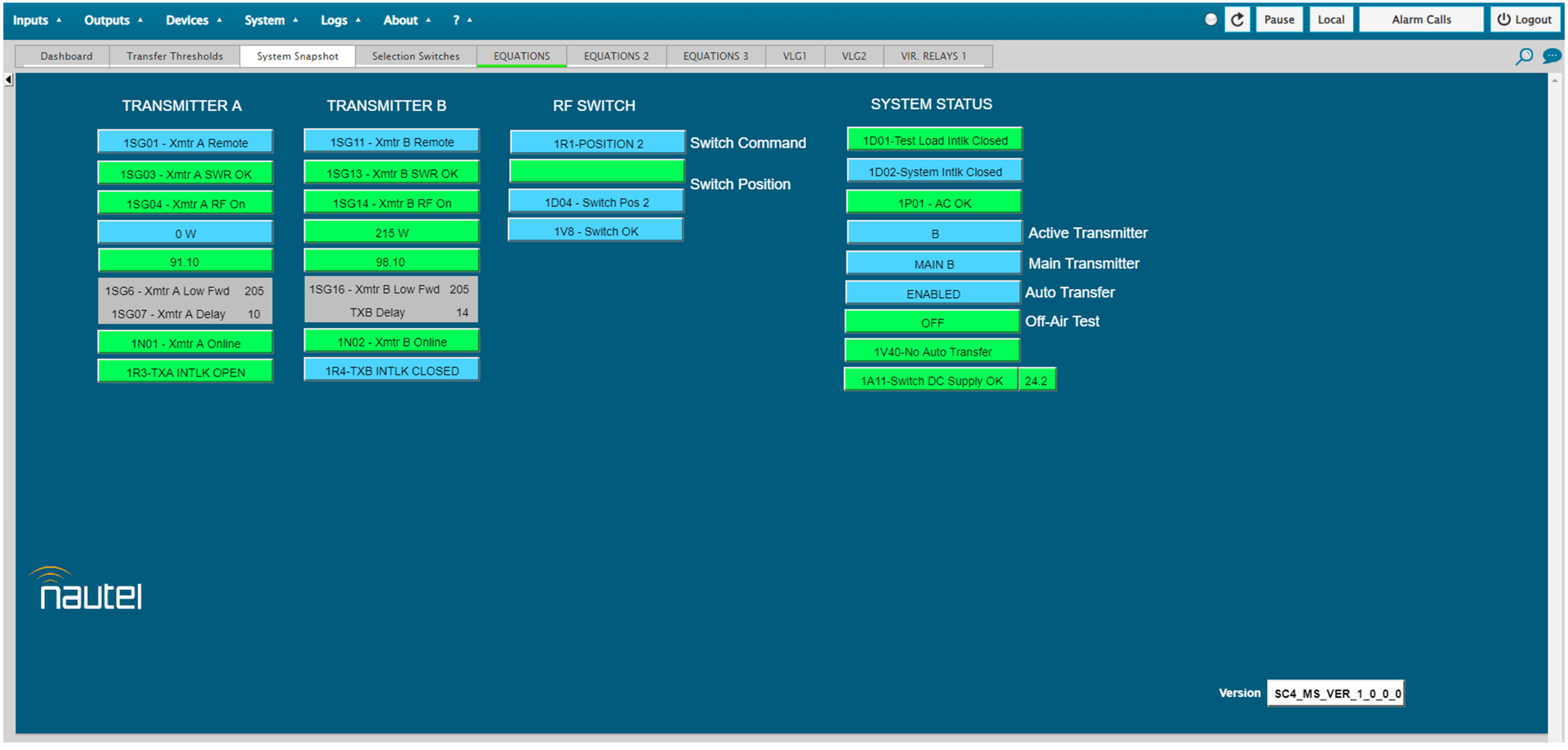


Figure 3-21b: Remote User Interface – System Snapshot for 4+1 systems

SC4 controller

Figure 3-21c: Remote User Interface – System Snapshot for Main-Standby systems

3.5 EMERGENCY BYPASS PROCEDURE

In the event of an SC4 failure, RF coaxial switches can be moved manually to allow continued system operation.

(a) For N+1 systems: the control module should remain powered to provide power to the audio switcher.

(b) Turn all system transmitters RF off.

(c) Remove the interlock connections from the **INTLK** terminal block on the rear of each transmitter and replace with the shorting jumpers supplied with the transmitters.

(d) Disconnect the D-sub connectors from each RF coaxial switch.

- P102 through P104 from switches S1 through S3 for 3+1 systems
- P102 through P105 from switches S1 through S4 for 4+1 systems
- P101 from switch S1 for main-standby systems

(e) Using Figure 3-22 as a guide, note the positions of each RF coaxial switch. The dot indicator on each adjustment knob will indicate either position 1 or position 2.

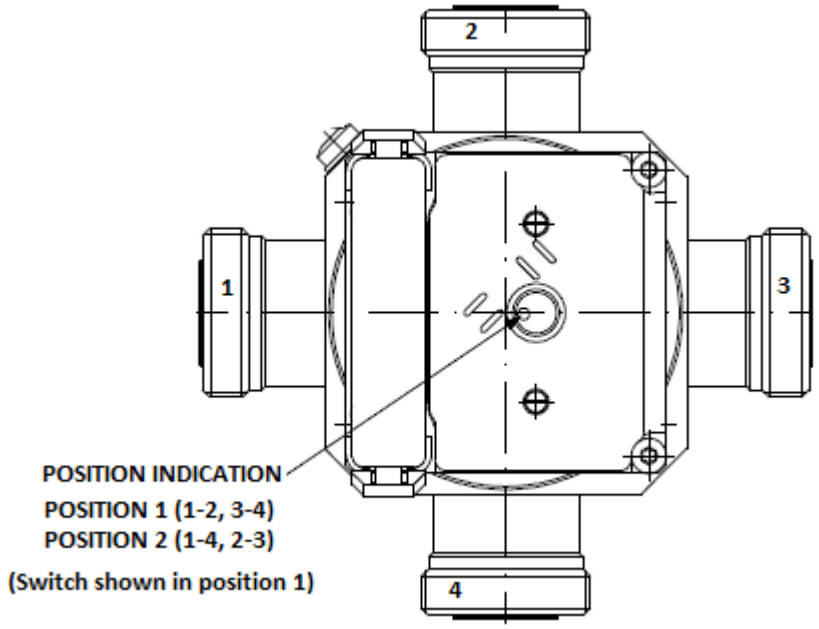


Figure 3-22: RF Coaxial Switch – Position Indicator

(f) Manually configure the coaxial switches to the desired operating mode by rotating the adjustment knob on each switch to the desired position as indicated in Table 3-3.

Table 3-3: RF Coaxial Switch Positions for Various Operating Modes

Mode	Switch 1	Switch 2	Switch 3	Switch 4
N+1 Normal	Pos 1	Pos 1	Pos 1	Pos 1 (4+1 only)
N+1 Transfer A	Pos 2	Pos 1	Pos 1	Pos 1 (4+1 only)
N+1 Transfer B	Pos 1	Pos 2	Pos 1	Pos 1 (4+1 only)
N+1 Transfer C	Pos 1	Pos 1	Pos2	Pos 1 (4+1 only)
4+1 Transfer D	Pos 1	Pos 1	Pos 1	Pos 2
Main/Standby A Active	Pos 1	N/A	N/A	N/A
Main Standby B Active	Pos 2	N/A	N/A	N/A

(g) For N+1 systems: manually select the correct program on the audio switcher based on the desired operating mode by pressing the appropriate front panel button as indicated in Table 3-4. Observe the front panel lamps on the audio switcher to confirm the correct program selected.

Table 3-4: Audio Switcher Program Selection (N+1 systems only)

Mode	Setting
N+1 Normal	N/A
N+1 Transfer A	A
N+1 Transfer B	B
N+1 Transfer C	C
4+1 Transfer D	D

(h) For N+1 systems: manually select the correct preset on the standby transmitter based on the desired operating mode as indicated in Table 3-5.

Table 3-5: Standby Transmitter Preset Selection (N+1 systems only)

Mode	Standby Preset
N+1 Normal	N/A
N+1 Transfer A	1
N+1 Transfer B	2
N+1 Transfer C	3
4+1 Transfer D	4

(i) When steps (f) through (h) are complete (as applicable), manually set the RF on/off status of the transmitters based on the desired operating mode, as indicated in Table 3-6.

Table 3-6: Transmitter RF On/Off Status

Mode	Transmitter A	Transmitter B	Transmitter C	Transmitter D
N+1 Normal	RF ON	RF ON	RF ON	RF ON (4+1 only)
N+1 Transfer A	RF OFF *	RF ON	RF ON	RF ON (4+1 only)
N+1 Transfer B	RF ON	RF OFF *	RF ON	RF ON (4+1 only)
N+1 Transfer C	RF ON	RF ON	RF OFF *	RF ON (4+1 only)
4+1 Transfer D	RF ON	RF ON	RF ON	RF OFF *
Main/Standby A Active	RF ON	RF OFF *	N/A	N/A
Main Standby B Active	RF OFF *	RF ON	N/A	N/A
NOTE: * If OFF-AIR TEST is desired, verify the test load is capable of dissipating RF (e.g., load fans are enabled) and then manually set the desired off-air transmitter to RF ON. Set the off-air transmitter to RF OFF when the off-air test is concluded				

(j) When repairs are complete and it is desired to return to normal operation, complete the following steps:

(k) Manually set all transmitters to RF OFF.

(l) Remove the interlock jumpers installed in step (c) and re-connect the interlock connectors from the control module to each transmitter.

(m) Re-connect the RF coaxial switch control connectors removed in step (d).

(n) Power up the control unit (if it is not already powered)

(o) Log in to the SC4 user interface web page. From the Dashboard, select the desired operating mode.

(p) Manually set all transmitters to RF on as follows:
   i. Transmitter A
   ii. Transmitter B
   iii. Transmitter C (3+1, 4+1 systems only)
   iv. Transmitter D (4+1 systems only)
   v. Standby Transmitter (3+1, 4+1 systems only)

VX N+1 and Main-Standby FM Broadcast Transmitter System

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Section 4 TROUBLESHOOTING

4.1 GENERAL

This section contains scheduled and corrective maintenance information for the transmitter system, particularly the SC4 (U1) in the N+1 or Main-Standby Control Module (NAX281 or NAX282). Fault symptoms should be analyzed to determine the corrective action required. Troubleshooting information (see paragraph 4.4) is presented based on the SC4's front panel's diagnostic information or the associated SNMP interface.

4.2 SCHEDULED MAINTENANCE

Scheduled maintenance consists of performing a visual inspection of the transmitter system at scheduled intervals. The recommended minimum time between scheduled maintenance visits is three months. Local operating and environmental conditions may dictate more frequent visits and in remote sites, less frequent visits may be acceptable. Experience and system reliability determines the most practical schedule for a specific installation.

4.3 CORRECTIVE MAINTENANCE

Corrective maintenance procedures consist of identifying and correcting defects or deficiencies that arise during operation of the transmitter system. Local/remote alarm signals are generated when a malfunction occurs. The nature of the fault and station policy dictates whether immediate maintenance response is necessary. Fault analysis and rectification may be conducted from three different levels with a different technical competence level required for each.

4.3.1 On-Air Troubleshooting

On-air troubleshooting can be performed from a remote location or locally at the transmitter site.

4.3.2 Remote Troubleshooting

Remote on-air troubleshooting consists of monitoring the host transmitter system's output using an on-air monitor and observing the status of remote fault alarm indicators. The information obtained from these sources should enable an operator to decide if response may be deferred to a more convenient time or if immediate corrective action must be taken. It is recommended that the significance of remote indications and the appropriate responses be incorporated into a station's standard operating procedures. Refer to paragraph 4.4 to determine the remedial action required for a given fault.

4.4 RESPONDING TO ALARMS

This section is not available at time of system installation.

Nautel will provide an update when it is available.

4.5 CONTROL MODULE ASSEMBLY REPLACEMENT PROCEDURES

Table 4-1 lists the assemblies in the Control Module that are deemed replaceable should a failure occur.

Table 4-1: Assembly Replacement Procedures

NAX281/NAX282 Control Module Assembly	Nautel Part #
+27 Vdc Power Supply (U4)	UG139
+5/+12 Vdc Power Supply (U6)	UG151
+5 Vdc Power Supply (U7)	UG119

4.5.1 +27 Vdc Power Supply Replacement

Refer to Figure 4-2 to locate the defective power supply. To replace the UG139 Power Supply (U4), perform the following steps:

WARNING

Lethal voltages exist inside the Control Module when the power is turned on. Follow replacement procedures carefully to ensure safety for maintenance personnel.

(a) Disconnect power cord, Interlocks from TB1 and D sub connectors from connectors J2 (if applicable) and J3, from the Control Module, noting locations.

(b) Remove and retain the four (4) sets of mounting hardware securing the Control Module in the rack (if required) and place on a suitable workbench.

(c) Remove and retain the fifteen (15) M3 screws securing the top cover. Remove cover.

NOTE

The Main-Standby Control Module (NAX282) does not have the Audio Switcher (U8) installed. Steps (d) and (e) are to be completed if using the N+1 Control Module (NAX281).

(d) If applicable, disconnect the cabling to the terminal blocks and the power cable, on the Ethernet Switch (U8), noting connections. See Figure 4-1 for reference.

(e) If applicable, remove and retain the two (2) screws securing the Ethernet Switch to the chassis. See Figure 4-1.

(f) Using a small Phillips screwdriver, remove the line and voltage connections on the front of the power supply, noting connections.

(g) Remove and retain the two (2) sets of M4 hardware securing the power supply to the chassis. See Figure 4-2.

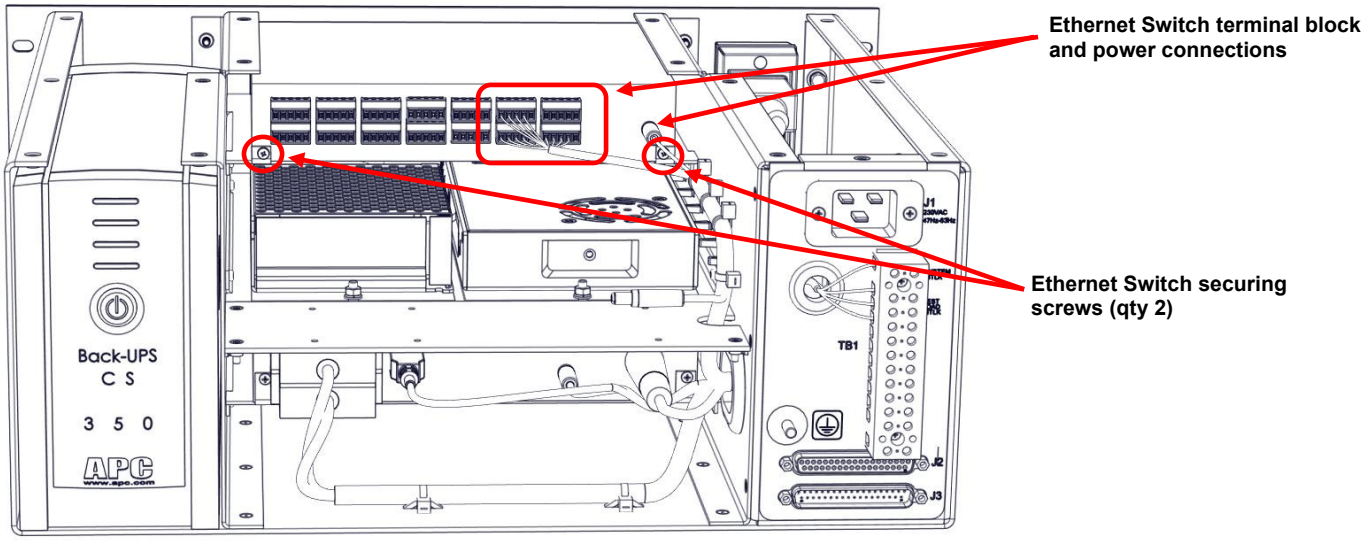

Figure 4-1: Ethernet Switch securing hardware and connections

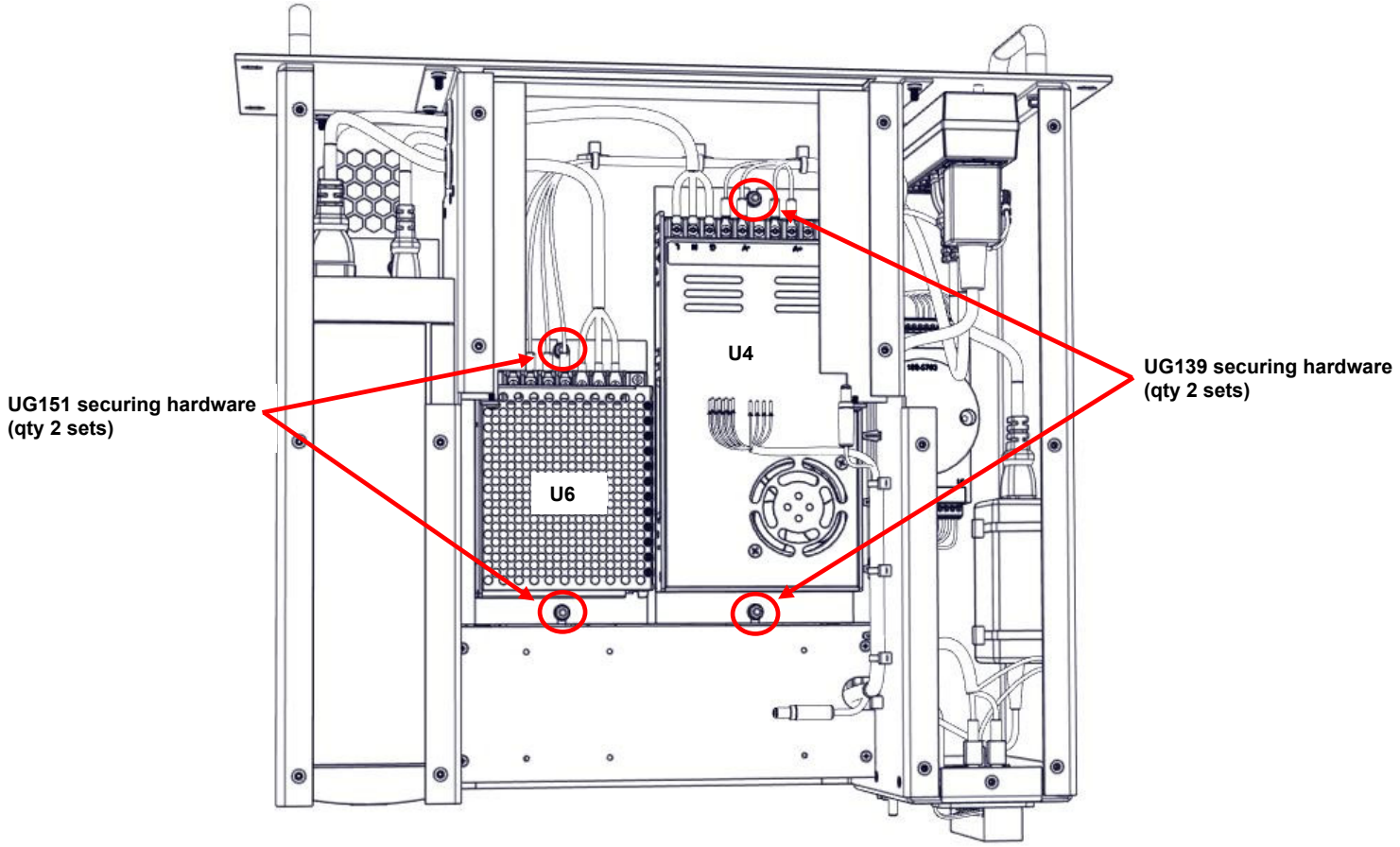

Figure 4-2: Power Supply Mounting Hardware

(h) Remove power supply and mounting bracket assembly.

(i) From the underside of the bracket, remove and retain the four (4) M4 screws securing the power supply to the mounting bracket. Discard power supply.

(j) Obtain a new UG139 power supply.

(k) Install the new power supply by reversing steps (a) to (i).

(l) Install the Control Module in the rack and return to operation.

4.5.2 +5/+12 Vdc Power Supply Replacement

Refer to Figure 4-2 to locate the defective power supply. To replace the UG151 Power Supply (U6), perform the following steps:

WARNING

Lethal voltages exist inside the Control Module when the power is turned on. Follow replacement procedures carefully to ensure safety for maintenance personnel.

(a) Disconnect power cord, Interlocks from TB1 and D sub connectors from connectors J2 (if applicable) and J3, from the Control Module, noting locations.

(b) Remove and retain the four (4) sets of mounting hardware securing the Control Module in the rack (if required) and place on a suitable workbench.

(c) Remove and retain the fifteen (15) M3 screws securing the top cover. Remove cover.

NOTE

The Main-Standby Control Module (NAX282) does not have the Audio Switcher (U8) installed. Steps (d) and (e) are to be completed if using the N+1 Control Module (NAX281).

(d) If applicable, disconnect the cabling to the terminal blocks and the power cable, on the Ethernet Switch (U8), noting connections. See Figure 4-1 for reference.

(e) If applicable, remove and retain the two (2) screws securing the Ethernet Switch to the chassis. See Figure 4-1.

(f) Using a small Phillips screwdriver, remove the line and voltage connections on the front of the power supply, noting connections.

(g) Remove and retain the two (2) sets of M4 hardware securing the power supply to the chassis. See Figure 4-2.

(h) Remove power supply and mounting bracket assembly.

(i) From the underside of the bracket, remove and retain the two (2) M3 screws securing the power supply to the mounting bracket. Discard power supply.

(j) Obtain a new UG151 Power Supply.

(k) Install the new power supply by reversing steps (a) to (i).

(l) Install the Control Module in the rack and return to operation.

4.5.3 +5 Vdc Power Supply Replacement

Refer to Figure 4-3 to locate the defective power supply. To replace the UG119 Power Supply (U7), perform the following steps:

WARNING

Lethal voltages exist inside the Control Module when the power is turned on. Follow replacement procedures carefully to ensure safety for maintenance personnel.

(a) Disconnect power cord, Interlocks from TB1 and D sub connectors from connectors J2 (if applicable) and J3, from the Control Module, noting locations.

(b) Remove and retain the four (4) sets of mounting hardware securing the Control Module in the rack (if required) and place on a suitable workbench.

(c) Remove and retain the fifteen (15) M3 screws securing the top cover. Remove cover.

(d) Cut the two (2) tyraps securing the power supply to the chassis. See Figure 4-3.

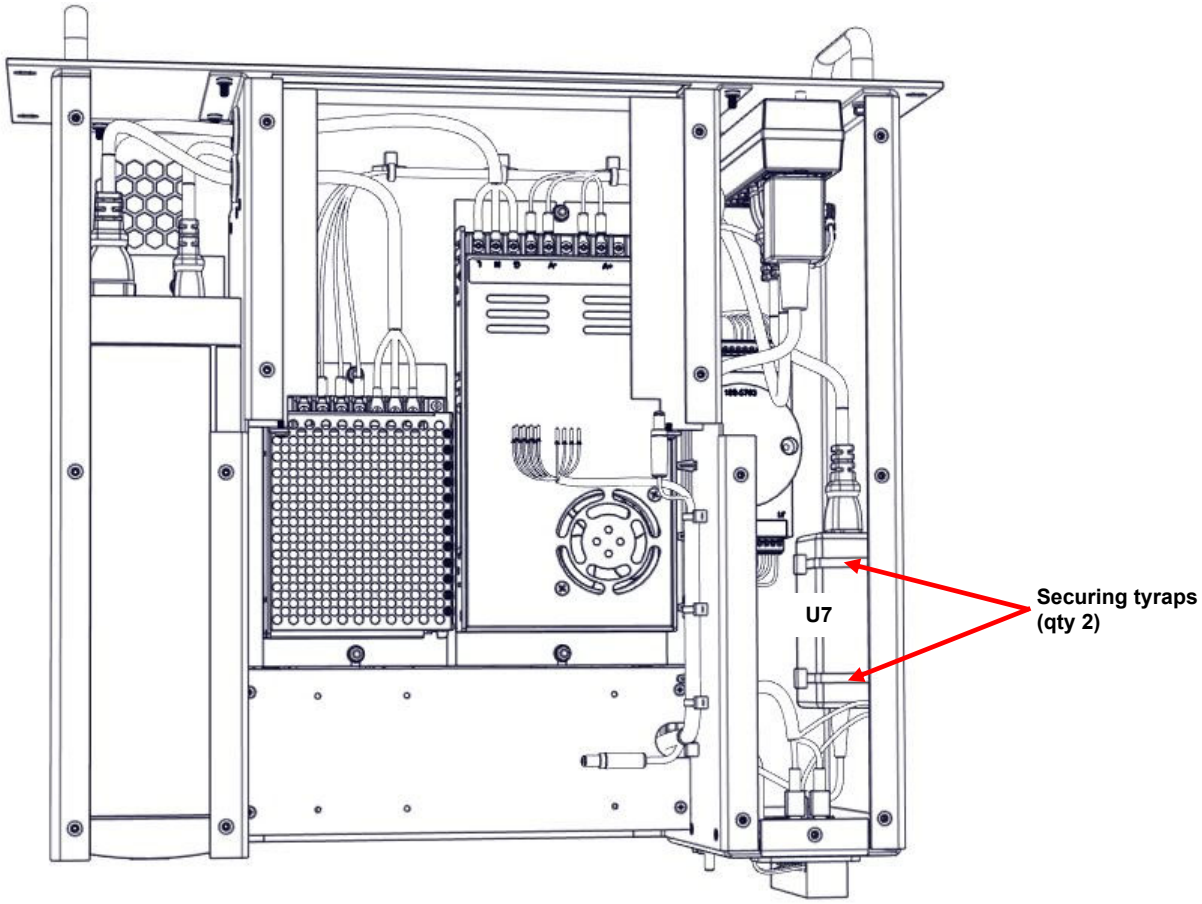

Figure 4-3: Power Supply securing tyraps

(m) Disconnect P602P1 from the Ac Distribution Strip (U2).

(n) Disconnect the Power Fail connector (U7P1) from the rear panel of the SC4 System Controller (U1).

(o) Cut any tyraps securing the power supply cabling, if necessary.

(p) Remove power supply, noting orientation.

(q) Obtain a new UG119 Power Supply.

(r) Install the new power supply by reversing steps (a) to (g). Obtain two (2) HT79 tyraps from the Ancillary kit to secure the power supply to the chassis.

(s) Install the Control Module in the rack and return to operation.

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Section 5 THEORY OF OPERATION

5.1 SYSTEM DESCRIPTION

The VX N+1 transmitter system uses multiple FM broadcast transmitters - each operating individually at one frequency between 87.5 MHz and 108.0 MHz – and one backup/standby FM broadcast transmitter. The system is designed to allow the backup/standby transmitter to be used in place of either of the main transmitters. A path to the test load is provided so that any one of the transmitters can be routed for testing or maintenance.

This type of system is commonly used in FM multi-station sites, where a tuneable FM transmitter is provided as a backup, should one of the main transmitters fail.

The system may be operated locally, where the subject transmitter system and studio are co-located, or remotely where the system and studio are located at different sites.

See electrical schematics SD-1 through SD-7. The system, housed in a Nautel-provided or user-provided 19-inch equipment cabinet, consists of multiple VX FM broadcast transmitters [A (Unit 1) and B (Unit 2), etc.], a backup/standby VX FM broadcast transmitter (Unit 5), Control Module (Unit 6, NAX281 for N+1 systems; NAX282 for main-standby systems), and the necessary RF switches and cabling for the system.

For technical information on the VX transmitter, refer to its documentation suite.

5.2 N+1 OR MAIN-STANDBY CONTROL MODULE

The Control Module (U6) controls the routing of the RF output of each VX transmitter. Refer to Electrical Schematics SD-1 , SD-2, SD-4, SD-5 and SD-7 in Section 8 and Mechanical Drawings MD-4 and MD-5 in Section 9. This module contains:

- **SC4 System Controller (U6U1):** The SC4 System Controller provides all the control, monitoring and metering circuitry for the VX N+1 or main-standby transmitter system. It controls the position of the RF coaxial switches to route the transmitter RF outputs. The SC4's uses an SNMP-based remote interface, which facilitates all user control and monitoring (see Section 3 for detailed operating instructions). All connections to the SC4 are made to connectors on its rear panel. For N+1 systems, it also selects the appropriate program source from the audio switch for use by the backup transmitter.
- **Ac Distribution Strip (U6U2):** Capable of powering up to 4 devices and requires an external 187-240 V ac, 50-60 Hz power source. The distribution strip is circuit protected with a total current capacity of 10 A.

- **UPS (U6U3):** Provides power to the +5/+12 Vdc and +27 Vdc power supplies (U4 and U6). The UPS get its power source from the Ac Distribution Strip (U2) and is rated at 210 W/350 VA.
- **+27 Vdc Power Supply (U6U4):** 320 W power supply that powers the RF switches.
- **Ethernet Switch (U6U5):** An 8-port device which provides remote access to the SC4 and all transmitters over an IP network. A web browser is required to view status and modify transmitter operation.
- **+5V/+12 Vdc Power Supply (U6U6):** Supplies power to the Ethernet Switch (U5) and the Audio Switcher/Router (U8).
- **+12 Vdc Adapter (U6U7):** Provides the +12 Vdc supply for the SC4 System Controller (U1).
- **Audio Switcher/Router (U6U8):** See Electrical Schematic SD-1. All user-provided audio inputs are applied to the provided Broadcast Tools SS 8.1 MLR Audio Program Switcher/Router (U2). The audio switcher/router provides switching of the correct program information to the backup transmitter to ensure consistent programming between the backup transmitter and the main transmitter it is replacing. All audio signals are applied to each of the main transmitters and to the program switcher. If the backup transmitter is transferred manually or automatically, the SC4 System Controller provides the necessary 'program select' control signal to the switcher to select the appropriate program inputs to apply to the backup transmitter. Dc power for the audio switcher is supplied by the +12 Vdc Power Supply (U6).
- **Remote I/O Module (U6U9):** The Adam 4000 Data Acquisition Module is an RS-485 protocol adapter that is used to interface between SC4, Audio Switcher/Router and the RF switches. See the Adam 4000 Data Acquisition Module Technical Instruction Manual for detailed information.
- **USB to RS485 Cable (U6U10):** Changes the data signal transfer protocol from the USB port on the SC4 to the Remote I/O Module's RS485 input.

5.3 RF COAXIAL SWITCHES

During normal operation when the main transmitters are being routed to their respective antenna outputs, the switches are in position 1 (ports 1 and 2 connected; ports 3 and 4 connected). If a manual changeover is selected or if an automatic changeover occurs, the backup transmitter will transfer with one of the main transmitters and the associated switch will move to position 2 (ports 1 and 4 connected; ports 2 and 3 connected). The switches provide switch position status outputs back to the SC4 for monitoring. Interlock microswitches within each motorized coaxial switch provides a means of determining switch position by microswitch contact closures.

5.4 OTHER AC POWER SOURCES

See Electrical Schematics SD-1 to SD-6. A dedicated ac power source for the Ac Distribution Strip (U2) and the customer provided test load must be supplied by the user. The UPS (U3) provides power to the power supplies (U4 and U6). The Audio Switcher/Router (U8), Ethernet Switch (U5) and the RF coaxial switches (S1, S2, etc) obtain their power source from power supplies (U4 and U6).

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Section 6 PARTS INFORMATION

6.1 INTRODUCTION

This section contains reference designation lists that provide descriptive and provisioning information for all electrical and mechanical parts that have an assigned reference designation and form a part of the subject equipment.

Topics in this section include:

- Family Tree
- How to Locate Information about a Specific Part
- Column Content

6.2 HOW TO LOCATE INFORMATION ABOUT A SPECIFIC PART

To locate the information for a specific part, the assigned reference designation for the part must be known. In addition, the Nautel nomenclature (e.g., NAX281) assigned to the assembly containing the part or the full reference designation, including the reference designation of all higher assemblies, must be known.

6.3 WHEN THE NAUTEL NOMENCLATURE IS KNOWN

Refer to the Family Tree and identify the block(s) associated with the Nautel nomenclature. Locate the part's reference designation in the identified reference designation list in this section, noting they are sorted alphanumerically.

6.4 WHEN THE REFERENCE DESIGNATION IS KNOWN

- Refer to the Family Tree depicted in Figures 6-1 through 6-3 with the full reference designation.
- Follow the Family Tree branches to the block that represents the lowest level assembly assigned a Nautel configuration control number, then locate the reference designation information for that Nautel configuration control number.
- Locate the part's reference designation number and associated Nautel part # in the list provided at the end of this section. In a PDF manual, use Ctrl-F (find) to quickly locate the reference designation.

6.4.1 Reference Designation Lists

Reference Designation Lists are provided for:

- assemblies that are assigned an alpha-prefixed Nautel nomenclature (e.g., NAX281).
- cable harnesses that are assigned a numbered Nautel part (e.g., 235-8950)
- optional kits that are assigned a numbered Nautel part.

To obtain the full reference designation for a specific part, the Nautel configuration control number must be located in the family tree (Figures 6-1 through 6-3) to include the reference designation of all higher-level assemblies. The reference designation lists are presented in alphanumeric order for each component level of the system and are divided into columns to aid in locating specific information.

6.5 COLUMN CONTENT

The following paragraphs provide an explanation of the purpose and contents of each column in the part number indexes.

6.5.1 Component Level, Stock Code Column

This column contains the *Component Level* number (01 through 10, as required) and the Nautel *Stock Code* (part number) assigned to each part.

6.5.1.1 Component Level

This number represents the level of a component in relation to the highest-level parts list. In this case the highest-level parts list is the Main/Standby System's overall parts list, or the top block in the family trees shown in Figures 6-1 through 6-3.

Components that are directly descended from the highest-level parts list are component level 01. The associated stock code and description for level 01 items appear in bold text in the reference designation list, followed by their sub-assembly components, as applicable. Level 01 items are sorted alphanumerically.

Components that are directly descended from component level 01 items are component level 02. The associated stock code and description for level 02 items appear below their associated level 01 component, slightly indented, followed by their sub-assembly components, as applicable. Level 02 items are sorted alphanumerically.

Component level 03 through 10 items, as applicable, descend similarly to component level 02 items, with continuing indentations to identify each new level.

6.5.1.2 Stock Code

This number is Nautel's drawing number for Nautel manufactured parts, Nautel's configuration control number for assemblies that are under configuration control management, or Nautel's inventory management number for purchased parts. When a Nautel configuration control number (e.g., NAPC*) is shown in this column, its sub-assembly reference designation items are listed below it.

NOTE

This section includes Nautel part numbers only. It does not include original equipment manufacturer (OEM) information (i.e., vendor part numbers). Some vendor information is provided in the Responding to Alarms section of this manual, otherwise contact Nautel to order a replacement part or to request assistance to find a suitable replacement.

6.5.2 Description Column

The *Description* column contains the name and descriptive information for each part. The key word is presented first, followed by the adjective identifiers.

6.5.3 Reference Designation Column

The *Reference Designation* column contains the reference designation(s) for a specific part. When multiple reference designations apply to a part, they are sorted alphanumerically. These designations are assigned in accordance with the requirements of *American Society of Mechanical Engineers ASME Y14.44-2008*.

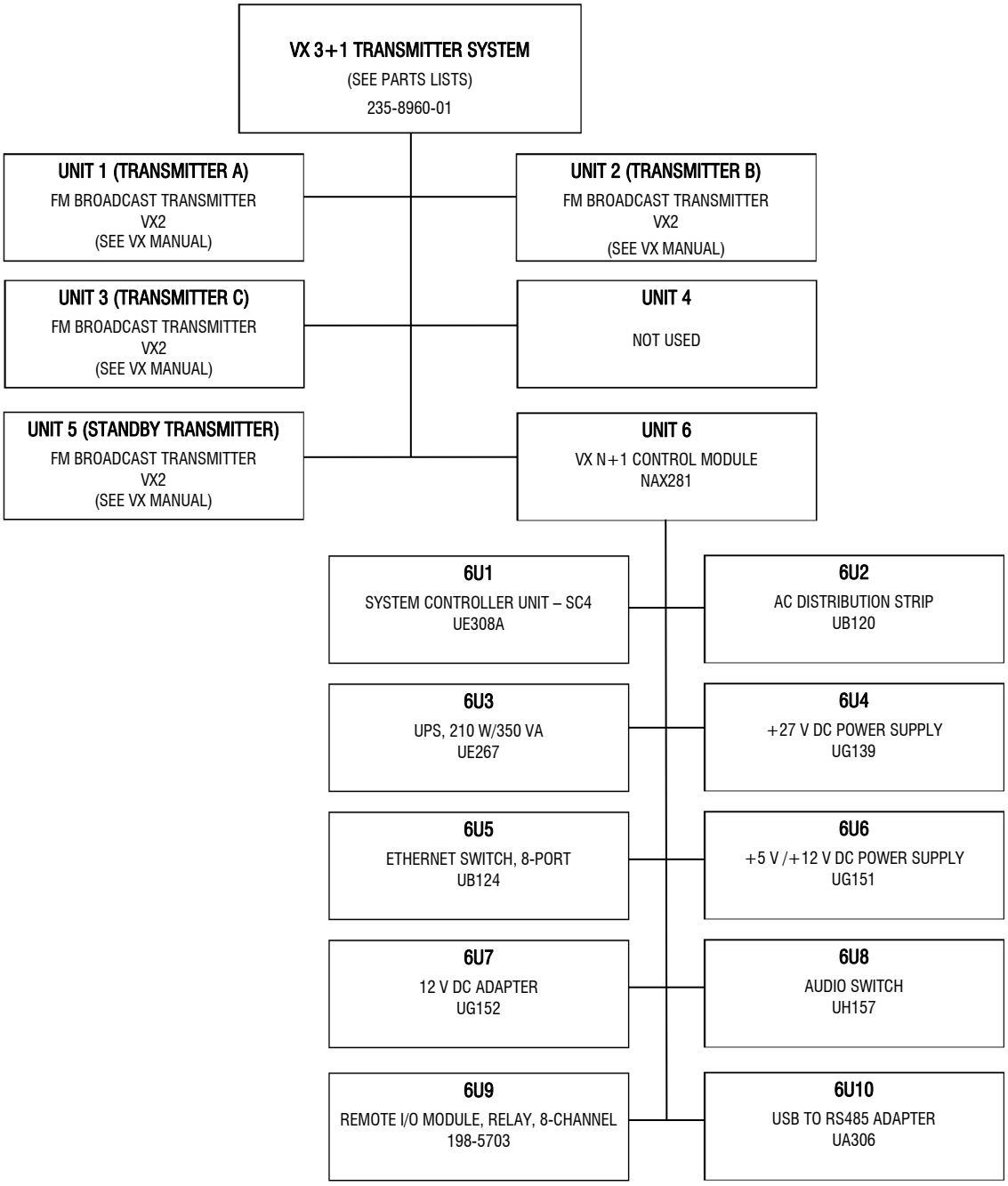


Figure 6-1 – Family Tree – VX 3+1 Transmitter System

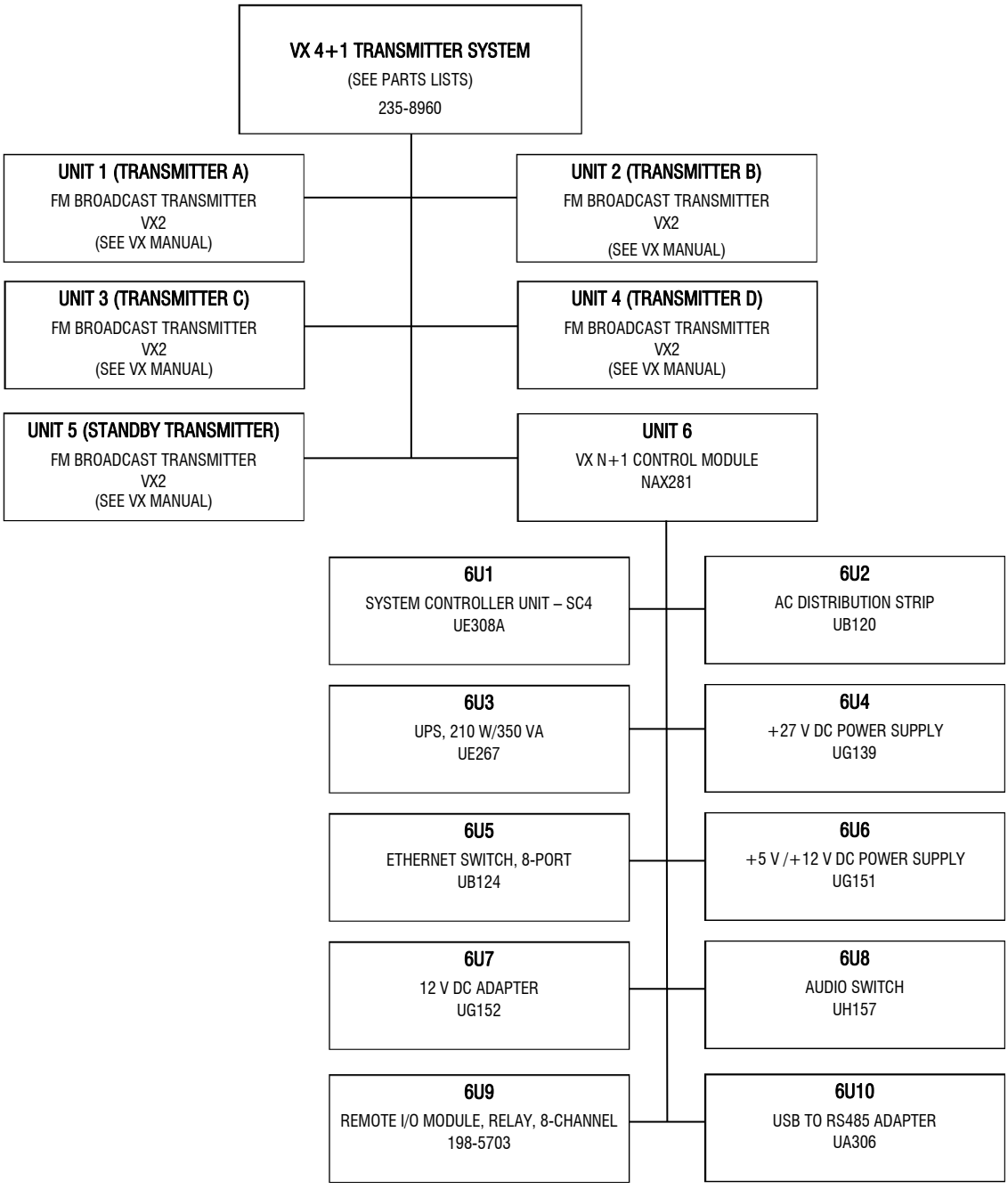


Figure 6-2 – Family Tree – VX 4+1 System

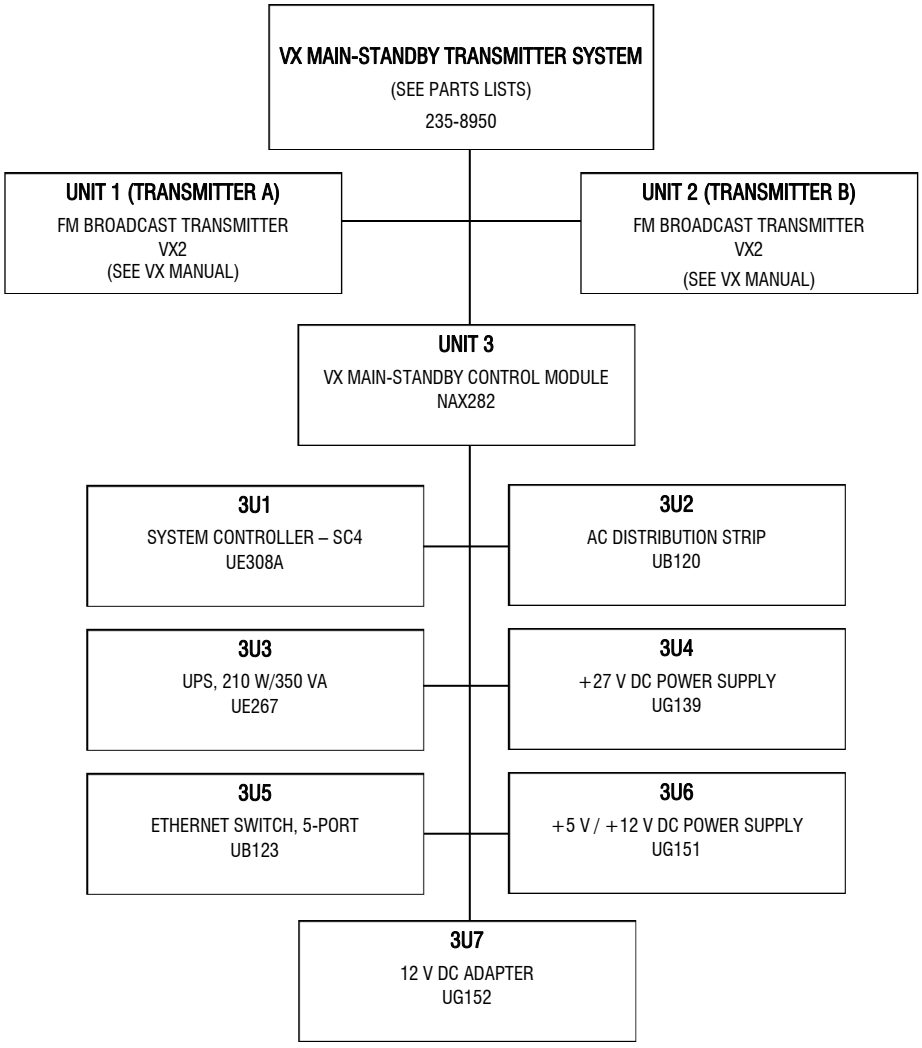


Figure 6-3 – Family Tree – VX Main-Standby Transmitter System

StockCode: 235-8950
Description: Malaysia M/S System Kit (UM95),

Component Lvl. StockCode	Description	Reference Designation
01 **235-8951**	**VXLP M/S Cableform (UM95) - Rackless**	
02 HAR28	Lug, Crimp, Joint, Butt, 22-18 AWG, Red	E100, E101
02 JR36	Conn, Plug, D-Sub, HDP-20, 37 pin	P100
02 JR52	Terminal Block,2-pos,screw, clamp	P200, P201
02 JS36	Conn, Shell, D-Sub, 37 pin	P100
02 JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P100
01 **235-8964**	**Ethernet Cable Set - VX Main/Standby (Rackless)**	
02 UA164	Cable, Cat5e, 3ft, Shld, Black , 75C, 26AWG	W302
02 UA167	Cable, Cat5e, 7ft, Shld, Black , 75C, 26AWG	W300, W301
01 **235-8966**	**RF Cable Set - VX Main/Standby (Rackless)**	
02 UA385	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W500
02 UA386	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W501
02 UA387	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W502
01 **235-8987**	**Main/Standby Ancillary Kit**	
01 **NAX282**	**SC4 Main/Standby Assembly**	UNIT 3
02 198-5761	NAX282 Main/Standby Assembly Cableform	
03 HAM69	Conn,Quick-Dis,F,1/4 Tab 14-16 Shrink	P01, P02
03 JDP48	Conn, IEC C13, rewireable, 250 Vac, 15A	P03
03 JN113	Cord, AC, 3-Cond, 250Vac, 15A, 2ft, C14 to C13, 14	W601
03 JN114	Cord, AC, 3-Cond, 250Vac, 15A, 3ft, C14 to C13, 14	W603, W604
03 JN116	Cord, AC, 3-Cond, 250Vac, 15A, 1ft, C14 to C13, 14	W602
03 JR37	Conn, Socket, D-Sub, HDP-20, 37 pin	J02
03 JR38	Conn, Socket, D-Sub, HDP-20, 2 5 pin	P400, P401
03 JS32	Conn, Lock Screw, D-Sub, Femal e	J02

Component Lvl. StockCode	Description	Reference Designation
03 JS35	Conn, Shell, D-Sub, 25 pin	P400, P401
03 JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P400, P401
03 JT265	Conn, Barrel-Power, 5.5mm/2.1mm, Plug	P403
02 JF51	Terminal Block, 12 Pos, Dbl, 30A, 300V, G 5/12	TB01
02 JT80	Conn,Recept,AC,250V,20A, Quick-Dis	J01
02 UB120	Power Strip, 1-In (C14), 4-Out (Sheet F), 10A,250V	U02
02 UB123	Switch, Ethernet, Unmanaged, 5-Port 10/100/1000	U05
02 UE267	UPS, 210W/350VA, 230V/230V, 6 hours	U03
02 UG139	Power Supply, 27V, 320W, Univ.Input, PFC, w/Fan	U04
02 UG151	Power Supply, +5V, +12V, 66W, Univ Input	U06
02 UG152	Power Supply, Desktop, +12Vdc, 18W, Univ Input, C1	U07
01 **UM95**	**Switch, Coax, 4 Port, 7/16 DIN , DPDT, 24Vdc 24V C**	S01

END OF ITEM

Component Lvl. StockCode	Description	Reference Designation
01 **235-8961**	**VXLP 4+1 Cableform (UM95) - Rackless**	
02 HAR28	Lug, Crimp, Joint, Butt, 22-18 AWG, Red	E100, E101, E102, E103, E104, E105, E106, E107
02 JR36	Conn, Plug, D-Sub, HDP-20, 37 pin	P100
02 JR37	Conn, Socket, D-Sub, HDP-20, 37 pin	P101
02 JR52	Terminal Block,2-pos,screw, clamp	P200, P201, P202, P203, P204
02 JS36	Conn, Shell, D-Sub, 37 pin	P100, P101
02 JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P100, P101
01 **235-8964-01**	**Ethernet Cable Set - VX 4+1 (Rackless)**	
02 UA164	Cable, Cat5e, 3ft, Shld, Black , 75C, 26AWG	W305
02 UA167	Cable, Cat5e, 7ft, Shld, Black , 75C, 26AWG	W300, W301, W302, W303, W304
01 **235-8966-01**	**RF Cable Set - VX 4+1**	
02 UA388	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W500, W501, W502, W503, W504
02 UA389	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W505, W506, W507
02 UA390	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W508
01 **235-8968**	**VX N+1 Standby Tx XLR Cables**	
02 JN02	Conn, XLR, 3-Pin, Straight, Audio, Male	P700, P701
01 **235-8987-01**	**N+1 Ancillary Kit (Up to 4+1)**	
01 **NAX281**	**VX N+1 Control Module (up to 4+1)**	UNIT 6
02 198-5703	ADAM-4068 MOD	U09
02 198-5751	NAX281 Cable Harness	
03 HAM69	Conn,Quick-Dis,F,1/4 Tab 14-16 Shrink	P01, P02
03 HAR29	Lug, Crimp, Joint, Butt, 16-14 AWG, Blue	E10, E11

Component Lvl.	StockCode	Description	Reference Designation
03	JDP48	Conn, IEC C13, rewireable, 250 Vac, 15A	P03
03	JN113	Cord, AC, 3-Cond, 250Vac, 15A, 2ft, C14 to C13, 14	W601
03	JN114	Cord, AC, 3-Cond, 250Vac, 15A, 3ft, C14 to C13, 14	W603, W604
03	JN116	Cord, AC, 3-Cond, 250Vac, 15A, 1ft, C14 to C13, 14	W602
03	JR36	Conn, Plug, D-Sub, HDP-20, 37 pin	J03
03	JR37	Conn, Socket, D-Sub, HDP-20, 37 pin	J02
03	JR38	Conn, Socket, D-Sub, HDP-20, 2 5 pin	P400, P401
03	JS32	Conn, Lock Screw, D-Sub, Femal e	J02, J03
03	JS35	Conn, Shell, D-Sub, 25 pin	P400, P401
03	JT113	Conn, Barrel-Power, 5.5mm/2.5m m, Plug	P404
03	JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P400, P401
03	JT265	Conn, Barrel-Power, 5.5mm/2.1mm, Plug	P403
02	JF51	Terminal Block, 12 Pos, Dbl, 30A, 300V, G 5/12	TB01
02	JS32	Conn, Lock Screw, D-Sub, Femal e	J02, J03
02	JT80	Conn,Recept,AC,250V,20A, Quick-Dis	J01
02	UA306	Cable, USB to RS485, 1.8m, USB A plug to wire	U10
02	UB120	Power Strip, 1-In (C14), 4-Out (Sheet F), 10A,250V	U02
02	UB124	Switch, Ethernet, Unmanaged, 8-Port 10/100/1000	U05
02	UE267	UPS, 210W/350VA, 230V/230V, 6 hours	U03
02	UG139	Power Supply, 27V, 320W, Univ.Input, PFC, w/Fan	U04
02	UG151	Power Supply, +5V, +12V, 66W, Univ Input	U06
02	UG152	Power Supply, Desktop, +12Vdc, 18W, Univ Input, C1	U07
02	UH157	Switcher/Router, Audio, 8 in 1 out, Relays, 220Vac	U08
01	**UM95**	**Switch, Coax, 4 Port, 7/16 DIN , DPDT, 24Vdc 24V C**	S01, S02, S03, S04

END OF ITEM

Component Lvl. StockCode	Description	Reference Designation
01 **235-8961-01**	**VXLP 3+1 Cableform (UM95) - Rackless**	
02 HAR28	Lug, Crimp, Joint, Butt, 22-18 AWG, Red	E100, E101, E102, E103, E104, E105
02 JR36	Conn, Plug, D-Sub, HDP-20, 37 pin	P100
02 JR37	Conn, Socket, D-Sub, HDP-20, 37 pin	P101
02 JR52	Terminal Block,2-pos,screw, clamp	P200, P201, P202, P203
02 JS36	Conn, Shell, D-Sub, 37 pin	P100, P101
02 JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P100, P101
01 **235-8964-02**	**Ethernet Cable Set - VX 3+1 (Rackless)**	
02 UA164	Cable, Cat5e, 3ft, Shld, Black , 75C, 26AWG	W305
02 UA167	Cable, Cat5e, 7ft, Shld, Black , 75C, 26AWG	W300, W301, W302, W303
01 **235-8966-02**	**RF Cable Set - VX 3+1**	
02 UA388	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W500, W501, W502, W503
02 UA389	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W504, W505
02 UA390	Cable, Jumper, 1/2" Superflex, 7/16" DIN(M) RA to	W506
01 **235-8968**	**VX N+1 Standby Tx XLR Cables**	
02 JN02	Conn, XLR, 3-Pin, Straight, Audio, Male	P700, P701
01 **235-8987-01**	**N+1 Ancillary Kit (Up to 4+1)**	
01 **NAX281**	**VX N+1 Control Module (up to 4+1)**	UNIT 6
02 198-5703	ADAM-4068 MOD	U09
02 198-5751	NAX281 Cable Harness	
03 HAM69	Conn,Quick-Dis,F,1/4 Tab 14-16 Shrink	P01, P02
03 HAR29	Lug, Crimp, Joint, Butt, 16-14 AWG, Blue	E10, E11

Component Lvl.	StockCode	Description	Reference Designation
03	JDP48	Conn, IEC C13, rewireable, 250 Vac, 15A	P03
03	JN113	Cord, AC, 3-Cond, 250Vac, 15A, 2ft, C14 to C13, 14	W601
03	JN114	Cord, AC, 3-Cond, 250Vac, 15A, 3ft, C14 to C13, 14	W603, W604
03	JN116	Cord, AC, 3-Cond, 250Vac, 15A, 1ft, C14 to C13, 14	W602
03	JR36	Conn, Plug, D-Sub, HDP-20, 37 pin	J03
03	JR37	Conn, Socket, D-Sub, HDP-20, 37 pin	J02
03	JR38	Conn, Socket, D-Sub, HDP-20, 2 5 pin	P400, P401
03	JS32	Conn, Lock Screw, D-Sub, Femal e	J02, J03
03	JS35	Conn, Shell, D-Sub, 25 pin	P400, P401
03	JT113	Conn, Barrel-Power, 5.5mm/2.5m m, Plug	P404
03	JT16	Conn, Lock Screw, D-Sub, 4-40, Male, Kit	P400, P401
03	JT265	Conn, Barrel-Power, 5.5mm/2.1mm, Plug	P403
02	JF51	Terminal Block, 12 Pos, Dbl, 30A, 300V, G 5/12	TB01
02	JS32	Conn, Lock Screw, D-Sub, Femal e	J02, J03
02	JT80	Conn,Recept,AC,250V,20A, Quick-Dis	J01
02	UA306	Cable, USB to RS485, 1.8m, USB A plug to wire	U10
02	UB120	Power Strip, 1-In (C14), 4-Out (Sheet F), 10A,250V	U02
02	UB124	Switch, Ethernet, Unmanaged, 8-Port 10/100/1000	U05
02	UE267	UPS, 210W/350VA, 230V/230V, 6 hours	U03
02	UG139	Power Supply, 27V, 320W, Univ.Input, PFC, w/Fan	U04
02	UG151	Power Supply, +5V, +12V, 66W, Univ Input	U06
02	UG152	Power Supply, Desktop, +12Vdc, 18W, Univ Input, C1	U07
02	UH157	Switcher/Router, Audio, 8 in 1 out, Relays, 220Vac	U08
01	**UM95**	**Switch, Coax, 4 Port, 7/16 DIN , DPDT, 24Vdc 24V C**	S01, S02, S03

END OF ITEM

VX N+1 FM Broadcast Transmitter System

TECHNICAL INSTRUCTION MANUAL

Section 7 WIRING INFORMATION

7.1 INTRODUCTION

This section contains wiring information for hard-wired assemblies of the subject unit. Refer to Table 7-1 for an itemized listing of assemblies that have wiring lists.

Table 7-1: Wiring Lists Provided

Table	Title
Table 7-2	Wiring List - VX 3+1 System (User Provided Cabinet)
Table 7-3	Connector Mating - VX 3+1 System (user Provided Cabinet)
Table 7-4	Connector Mating – Ethernet Cable Set (3+1 System)
Table 7-5	Connector Mating – RF Cable Set (3+1 System)
Table 7-6	Wiring List – Switch Bracket (3+1 and 4+1 Systems)
Table 7-7	Wiring List – Standby Transmitter XLR Cables (3+1 and 4+1 Systems)
Table 7-8	Connector Mating - Standby Transmitter XLR Cables (3+1 and 4+1 Systems)
Table 7-9	Wiring List - VX 4+1 System (User Provided Cabinet)
Table 7-10	Connector Mating - VX 4+1 System (user Provided Cabinet)
Table 7-11	Connector Mating – Ethernet Cable Set (4+1 System)
Table 7-12	Connector Mating – RF Cable Set (4+1 System)
Table 7-13	Wiring List - VX Main-Standby System (User Provided Cabinet)
Table 7-14	Connector Mating - VX Main-Standby System (user Provided Cabinet)
Table 7-15	Connector Mating – Ethernet Cable Set (Main-Standby System)
Table 7-16	Connector Mating – RF Cable Set (Main-Standby System)
Table 7-17	Wiring List – Switch Bracket (Main-Standby System)
Table 7-18	Wiring List – NAX281 VX N+1 Control Module
Table 7-19	Connector Mating– NAX281 VX N+1 Control Module
Table 7-20	Wiring List – NAX282 VX Main-Standby Control Module
Table 7-21	Connector Mating– NAX282 VX Main-Standby Control Module

Table 7-2: Wiring List - VX 3+1 System (User Provided Cabinet)

Source	Destination	Wire #	Colour	Size	Remarks
P101-19	P102-5	1	White	22	
P101-20	P102-8	2	White	22	
P100-13	E100-A	3	Black	22	
E100-B	P102-13	4	Black	22	
E100-B	P102-7	5	Black	22	
E100-B	P102-2	6	Black	22	
P100-9	P102-20	7	White	20	
P100-18	P102-3	8A	White	22	2-Conductor
P100-19	P102-24	8B	Black	22	Shielded
P100-20	E101-B	8	Shield	22	
P101-31	E101-A	9	Black	22	
E101-B	P102-23	10	Black	22	
E101-B	P102-17	11	Black	22	
P102-18	P102-6	12	Black	22	
P102-21	P102-9	13	Black	22	
P101-21	P103-5	14	White	22	
P101-22	P103-8	15	White	22	
P100-14	E102-A	16	Black	22	
E102-B	P103-13	17	Black	22	
E102-B	P103-7	18	Black	22	
E102-B	P103-2	19	Black	22	
P100-10	P103-20	20	White	20	
P100-21	P103-3	21A	White	22	2-Conductor
P100-22	P103-24	21B	Black	22	Shielded
P100-23	E103-B	21	Shield	22	
P101-32	E103-A	22	Black	22	
E103-B	P103-23	23	Black	22	
E103-B	P103-17	24	Black	22	
P103-18	P103-6	25	Black	22	
P103-21	P103-9	26	Black	22	
P101-23	P104-5	27	White	22	
P101-24	P104-8	28	White	22	
P100-15	E104-A	29	Black	22	
E104-B	P104-13	30	Black	22	
E104-B	P104-7	31	Black	22	
E104-B	P104-2	32	Black	22	
P100-11	P104-20	33	White	20	
P100-24	P104-3	34A	White	22	2-Conductor
P100-25	P104-24	34B	Black	22	Shielded
P100-26	E105-B	34	Shield	22	
P101-33	E105-A	35	Black	22	
E105-B	P104-23	36	Black	22	
E105-B	P104-17	37	Black	22	
P104-18	P104-6	38	Black	22	

Table 7-2: Wiring List - VX 3+1 System (User Provided Cabinet) (Continued))

Source	Destination	Wire #	Colour	Size	Remarks
P104-21	P104-9	39	Black	22	
P101-1	P200-1	53	Centre	22	1-Conductor
P101-2	P200-2	53	Shield	22	Shielded
P101-3	P201-1	54	Centre	22	1-Conductor
P101-4	P201-2	54	Shield	22	Shielded
P101-5	P202-1	55	Centre	22	1-Conductor
P101-6	P202-2	55	Shield	22	Shielded
P101-9	P203-1	57	Centre	22	1-Conductor
P101-10	P203-2	57	Shield	22	Shielded
P104-21	P104-9	39	Black	22	1-Conductor
P101-1	P200-1	53	Centre	22	Shielded

Table 7-3: Connector Mating – VX 3+1 System (User Provided Cabinet)

Connector	Mate	Notes
P100	6U1J2	
P101	6U1J3	
P102	S1J1	
P103	S2J1	
P104	S3J1	
P200	1-INTLK	
P201	2-INTLK	
P202	3-INTLK	
P204	5-INTLK	

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 3 – Transmitter C
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-4: Connector Mating – Ethernet Cable Set (3+1 System)

Connector	Mate	Notes
W300P1	6U5-LAN1	Either end of cable can be P1
W300P2	1LAN	Either end of cable can be P2
W301P1	6U5-LAN2	Either end of cable can be P1
W301P2	2LAN	Either end of cable can be P2
W302P1	6U5-LAN3	Either end of cable can be P1
W302P2	3LAN	Either end of cable can be P2
W303P1	6U5-LAN4	Either end of cable can be P1
W303P2	4LAN	Either end of cable can be P2
W305P1	6U5-LAN6	Either end of cable can be P1
W305P2	6LAN	Either end of cable can be P2

Table 7-5: Connector Mating – RF Cable Set (3+1 System)

Connector	Mate	Notes
W500P1	1-RF_OUT	P1 represents straight connector
W500P2	S1-2	P2 represents R/A connector
W501P1	2-RF_OUT	P1 represents straight connector
W501P2	S2-2	P2 represents R/A connector
W502P1	3-RF_OUT	P1 represents straight connector
W502P2	S3-2	P2 represents R/A connector
W503P1	5-RF_OUT	P1 represents straight connector
W503P2	S3-4	P2 represents R/A connector
W504P1	S2-4	P1 represents straight connector
W504P2	S3-3	P2 represents R/A connector
W505P1	S2-3	P1 represents straight connector
W505P2	S1-4	P2 represents R/A connector
W506P1	S1-3	Either end can be P1
W506P2	TEST LOAD RF IN	Either end can be P2

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 3 – Transmitter C
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-6: Wiring List – Switch Bracket (3+1 and 4+1 Systems)

Source	Destination	Wire #	Colour	Size	Remarks
S1-GND	BRKT-S1-GND	-	GRN/YEL	14	
S2-GND	BRKT-S2-GND	-	GRN/YEL	14	
S3-GND	BRKT-S3-GND	-	GRN/YEL	14	
S4-GND	BRKT-S4-GND	-	GRN/YEL	14	
S1-GND	BRKT-S1-GND	-	GRN/YEL	14	
S2-GND	BRKT-S2-GND	-	GRN/YEL	14	
S3-GND	BRKT-S3-GND	-	GRN/YEL	14	

Table 7-7: Wiring List – Standby Transmitter XLR Cables (3+1 and 4+1 Systems)

Source	Destination	Wire #	Colour	Size	Remarks
P407-1	P700-3	1A	Black	24	2-Conductor
P407-2	P700-2	1B	Red	24	Shielded
P407-3	P700-1	1	Shield	24	
P407-4	P701-3	2A	Black	24	2-Conductor
P407-5	P701-2	2B	Red	24	Shielded
P407-3	P701-1	2	Shield	24	

Table 7-8: Connector Mating – Standby Transmitter XLR Cables (3+1 and 4+1 Systems)

Connector	Mate	Notes
P407	6U8TB5-TOP	
P700	5A2J3	
P701	5A2J4	

Unit Mapping
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-9: Wiring List - VX 4+1 System (User Provided Cabinet)

Source	Destination	Wire #	Colour	Size	Remarks
P101-19	P102-5	1	White	22	
P101-20	P102-8	2	White	22	
P100-13	E100-A	3	Black	22	
E100-B	P102-13	4	Black	22	
E100-B	P102-7	5	Black	22	
E100-B	P102-2	6	Black	22	
P100-9	P102-20	7	White	20	
P100-18	P102-3	8A	White	22	2-Conductor
P100-19	P102-24	8B	Black	22	Shielded
P100-20	E101-B	8	Shield	22	
P101-31	E101-A	9	Black	22	
E101-B	P102-23	10	Black	22	
E101-B	P102-17	11	Black	22	
P102-18	P102-6	12	Black	22	
P102-21	P102-9	13	Black	22	
P101-21	P103-5	14	White	22	
P101-22	P103-8	15	White	22	
P100-14	E102-A	16	Black	22	
E102-B	P103-13	17	Black	22	
E102-B	P103-7	18	Black	22	
E102-B	P103-2	19	Black	22	
P100-10	P103-20	20	White	20	
P100-21	P103-3	21A	White	22	2-Conductor
P100-22	P103-24	21B	Black	22	Shielded
P100-23	E103-B	21	Shield	22	
P101-32	E103-A	22	Black	22	
E103-B	P103-23	23	Black	22	
E103-B	P103-17	24	Black	22	
P103-18	P103-6	25	Black	22	
P103-21	P103-9	26	Black	22	
P101-23	P104-5	27	White	22	
P101-24	P104-8	28	White	22	
P100-15	E104-A	29	Black	22	
E104-B	P104-13	30	Black	22	
E104-B	P104-7	31	Black	22	
E104-B	P104-2	32	Black	22	
P100-11	P104-20	33	White	20	
P100-24	P104-3	34A	White	22	2-Conductor
P100-25	P104-24	34B	Black	22	Shielded
P100-26	E105-B	34	Shield	22	
P101-33	E105-A	35	Black	22	
E105-B	P104-23	36	Black	22	
E105-B	P104-17	37	Black	22	
P104-18	P104-6	38	Black	22	

Table 7-9: Wiring List - VX 4+1 System (User Provided Cabinet) (Continued))

Source	Destination	Wire #	Colour	Size	Remarks
P104-21	P104-9	39	Black	22	
P101-25	P105-5	40	White	22	
P101-26	P105-8	41	White	22	
P100-16	E106-A	42	Black	22	
E106-B	P105-13	43	Black	22	
E106-B	P105-7	44	Black	22	
E106-B	P105-2	45	Black	22	
P100-12	P105-20	46	White	20	
P100-27	P105-3	47A	White	22	2-Conductor
P100-28	P105-24	47B	Black	22	Shielded
P100-29	E107-B	47	Shield	22	
P101-34	E107-A	48	Black	22	
E107-B	P105-23	49	Black	22	
E107-B	P105-17	50	Black	22	
P105-18	P105-6	51	Black	22	
P105-21	P105-9	52	Black	22	
P101-1	P200-1	53	Centre	22	1-Conductor
P101-2	P200-2	53	Shield	22	Shielded
P101-3	P201-1	54	Centre	22	1-Conductor
P101-4	P201-2	54	Shield	22	Shielded
P101-5	P202-1	55	Centre	22	1-Conductor
P101-6	P202-2	55	Shield	22	Shielded
P101-7	P203-1	56	Centre	22	1-Conductor
P101-8	P203-2	56	Shield	22	Shielded
P101-9	P204-1	57	Centre	22	1-Conductor
P101-10	P204-2	57	Shield	22	Shielded

Table 7-10: Connector Mating – VX 4+1 System (User Provided Cabinet)

Connector	Mate	Notes
P100	6U1J2	
P101	6U1J3	
P102	S1J1	
P103	S2J1	
P104	S3J1	
P105	S4J1	
P200	1-INTLK	
P201	2-INTLK	
P202	3-INTLK	
P203	4-INTLK	
P204	5-INTLK	

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 3 – Transmitter C
4 represents Unit 4 – Transmitter D
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-11: Connector Mating – Ethernet Cable Set (4+1 System)

Connector	Mate	Notes
W300P1	6U5-LAN1	Either end of cable can be P1
W300P2	1LAN	Either end of cable can be P2
W301P1	6U5-LAN2	Either end of cable can be P1
W301P2	2LAN	Either end of cable can be P2
W302P1	6U5-LAN3	Either end of cable can be P1
W302P2	3LAN	Either end of cable can be P2
W303P1	6U5-LAN4	Either end of cable can be P1
W303P2	4LAN	Either end of cable can be P2
W304P1	6U5-LAN5	Either end of cable can be P1
W304P2	5LAN	Either end of cable can be P2
W305P1	6U5-LAN6	Either end of cable can be P1
W305P2	6LAN	Either end of cable can be P2

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 3 – Transmitter C
4 represents Unit 4 – Transmitter D
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-12: Connector Mating – RF Cable Set (4+1 System)

Connector	Mate	Notes
W500P1	1-RF_OUT	P1 represents straight connector
W500P2	S1-2	P2 represents R/A connector
W501P1	2-RF_OUT	P1 represents straight connector
W501P2	S2-2	P2 represents R/A connector
W502P1	3-RF_OUT	P1 represents straight connector
W502P2	S3-2	P2 represents R/A connector
W503P1	4-RF_OUT	P1 represents straight connector
W503P2	S4-2	P2 represents R/A connector
W504P1	5-RF_OUT	P1 represents straight connector
W504P2	S4-4	P2 represents R/A connector
W505P1	S1-4	P1 represents straight connector
W505P2	S2-3	P2 represents R/A connector
W506P1	S2-4	P1 represents straight connector
W506P2	S3-3	P2 represents R/A connector
W507P1	S3-4	P1 represents straight connector
W507P2	S4-3	P2 represents R/A connector
W508P1	S1-3	Either end can be P1
W508P2	TEST LOAD RF IN	Either end can be P2
W500P1	1-RF_OUT	P1 represents straight connector
W500P2	S1-2	P2 represents R/A connector
W501P1	2-RF_OUT	P1 represents straight connector
W501P2	S2-2	P2 represents R/A connector

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 3 – Transmitter C
4 represents Unit 4 – Transmitter D
5 represents Unit 5 – Standby Transmitter
6 represents Unit 6 – N+1 Control Module

Table 7-13: Wiring List - VX Main-Standby System (User Provided Cabinet)

Source	Destination	Wire #	Colour	Size	Remarks
P100-1	P101-5	1	White	22	
P100-2	P101-8	2	White	22	
P100-5	E100-A	3	Black	22	
E100-B	P101-13	4	Black	22	
E100-B	P101-7	5	Black	22	
E100-B	P101-2	6	Black	22	
P100-4	P101-20	7	White	20	
P100-7	P101-3	8A	White	22	2-Conductor
P100-8	P101-24	8B	Black	22	Shielded
P100-9	E101-B	8	Shield	22	
P100-16	E101-A	9	Black	22	
E101-B	P101-23	10	Black	22	
E101-B	P101-17	11	Black	22	
P101-18	P101-6	12	Black	22	
P101-21	P101-9	13	Black	22	
P100-11	P200-1	14	Centre	22	1-Conductor
P100-12	P200-2	14	Shield	22	Shielded
P100-13	P201-1	15	Centre	22	1-Conductor
P100-14	P201-2	15	Shield	22	Shielded

Table 7-14: Connector Mating – VX Main-Standby System (User Provided Cabinet)

Connector	Mate	Notes
P100	3J2	
P101	S1-J1	
P200	1-INTLK	
P201	2-INTLK	

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B
3 represents Unit 6 – Main-Standby Control Module

Table 7-15: Connector Mating – Ethernet Cable Set (Main-Standby System)

Connector	Mate	Notes
W300P1	3U5-LAN1	Either end of cable can be P1
W300P2	1LAN	Either end of cable can be P2
W301P1	3U5-LAN2	Either end of cable can be P1
W301P2	2LAN	Either end of cable can be P2
W302P1	3U5-LAN3	Either end of cable can be P1
W302P2	3U1-LAN	Either end of cable can be P2

Table 7-16: Connector Mating – RF Cable Set (Main-Standby System)

Connector	Mate	Notes
W500P1	1-RF_OUT	P1 represents straight connector
W500P2	S1-1	P2 represents R/A connector
W501P1	2-RF_OUT	P1 represents straight connector
W501P2	S2-1	P2 represents R/A connector
W502P1	S1-4	
W502P2	TEST LOAD INPUT	Customer Connection

Unit Mapping
1 represents Unit 1 – Transmitter A
2 represents Unit 2 – Transmitter B

Table 7-17: Wiring List – Switch Bracket (Main-Standby Systems)

Source	Destination	Wire #	Colour	Size	Remarks
S1-GND	BRKT-S1-GND		GRN/YEL	14	

Table 7-18: Wiring List – NAX281 VX N+1 Control Module

Source	Destination	Wire #	Colour	Size	Remarks
U4 (+)	P401-1	1	White	22	
U4 (-)	P401-2	2	Black	22	
U4 (-)	E2	3	Black	22	
U6V1 (+)	P403-Center	4	White	22	
U6V1 (C)	P403-Shield	5	Black	22	
U6V1 (C)	E2	6	Black	22	
U6V2 (+)	P402-4	7	White	22	
U6V2 (+)	P404-Center	8	White	22	
U6V2 (C)	P404-Shield	9	Black	22	
U6V2 (C)	P402-1	10	Black	22	
U6V2 (C)	E2	11	Black	22	
P406-3	J3-19	12	White	22	RL0-NC
P406-1	J3-20	13	White	22	RL0-NO
E2	P406-2	14	Black	22	RL0-COM
P406-6	J3-21	15	Black	22	RL1-NC
P406-4	J3-22	16	White	22	RL1-NO
E2	P406-5	17	Black	22	RL1-COM
P406-9	J3-23	18	White	22	RL2-NC
P406-7	J3-24	19	White	22	RL2-NO
E2	P406-8	20	Black	22	RL2-COM
P405-7	J3-25	21	White	22	RL7-NC
P405-5	J3-26	22	White	22	RL7-NO
E2	P405-6	23	Black	22	RL7-COM
P401-11	J2-18	24A	White	22	2-Conductor
P401-24	J2-19	24B	Black	22	Shielded
P401-12	J2-20	24	Shield	22	
P401-9	J2-21	25A	White	22	2-Conductor
P401-22	J2-22	25B	Black	22	Shielded
P401-10	J2-23	25	Shield	22	
P401-7	J2-24	26A	White	22	2-Conductor
P401-20	J2-25	26B	Black	22	Shielded
P401-8	J2-26	26	Shield	22	
P401-5	J2-27	27A	White	22	2-Conductor
P401-18	J2-28	27B	Black	22	Shielded
P401-6	J2-29	27	Shield	22	
U4 (+)	P405-12	28	White	22	(R) +Vs
U10-Black	-	-	-	-	(B) GND 10
U10-Yellow	P405-11	-	Yellow	22	(Y) DATA (-)
U10-Brown	P405-11	-	Brown	22	(Y) DATA (-)
U10-Orange	P405-10	-	Orange	22	(G) DATA (+)
U10-Green	P405-10	-	Green	22	(G) DATA (+)
U10-Red	-	-	Red		
E2	P405-13	29	Black	22	(B) GND 10

Table 7-18: Wiring List – NAX281 VX N+1 Control Module (continued)

Source	Destination	Wire #	Colour	Size	Remarks
P406-11	P408-1	30	Centre	22	RL3 NO
P406-10	E10-A	30	Shield	22	RL3 COM
P406-13	P408-2	31	Centre	22	RL4 NO
P406-12	E10-A	31	Shield	22	RL4 COM
P405-1	P408-3	32	Centre	22	RL5 NO
P405-2	E10-A	32	Shield	22	RL5 COM
P405-3	P408-4	33	Centre	22	RL6 NO
P405-4	E10-A	33	Shield	22	RL6 COM
E10-B	P410-4	34	Black	22	
P409-1	P400-21	35	Centre	22	1-Conductor
E11-A	P400-22	35	Shield		Shielded
P409-2	P400-19	36	Centre	22	1-Conductor
E11-A	P400-20	36	Shield		Shielded
P409-3	P400-17	37	Centre	22	1-Conductor
E11-A	P400-18	37	Shield		Shielded
P409-4	P400-15	38	Centre	22	1-Conductor
E11-A	P400-16	38	Shield		Shielded
P410-5	E11-B	39	Black	22	
U4 (+)	J2-9	40	White	22	
U4 (-)	J2-13	41	Black	22	
U4 (+)	J2-10	42	White	22	
U4 (-)	J2-14	43	Black	22	
U4 (+)	J2-11	44	White	22	
U4 (-)	J2-15	45	Black	22	
U4 (+)	J2-12	46	White	22	
U4 (-)	J2-16	47	Black	22	
E2	J3-31	48	Black	22	
E2	J3-32	49	Black	22	
E2	J3-33	50	Black	22	
E2	J3-34	51	Black	22	
P400-12	J3-1	52	Centre	22	1-Conductor
P400-13	J3-2	52	Shield	22	Shielded
P400-11	J3-3	53	Centre	22	1-Conductor
P400-10	J3-4	53	Shield	22	Shielded
P400-6	J3-5	54	Centre	22	1-Conductor
P400-7	J3-6	54	Shield	22	Shielded
P400-5	J3-7	55	Centre	22	1-Conductor
P400-4	J3-8	55	Shield	22	Shielded
P400-3	J3-9	56	Centre	22	1-Conductor
P400-2	J3-10	56	Shield	22	Shielded
P401-3	TB1-1 (A)	57	Centre	22	1-Conductor
P401-4	TB1-2 (A)	57	Shield	22	Shielded
P401-16	TB1-3 (A)	58	Centre	22	1-Conductor
P401-17	TB1-4 (A)	58	Shield	22	Shielded

Table 7-18: Wiring List – NAX281 VX N+1 Control Module (continued)

Source	Destination	Wire #	Colour	Size	Remarks
P1	P3-L	59	Grey	14	
P2	P3-N	60	Grey	14	
E1	P3-G	61	Grn/Yel	14	
E1	P3-G	62	Grn/Yel	14	
W604P1-L	U6-L	-	Blk/Bwn	14	
W604P1-N	U6-N	-	Wht/Bl	14	
W604P1-G	U6-GND	-	Grn/Yel	14	
W603P1-L	U4-L	-	Blk/Bwn	14	
W603P1-N	U4-N	-	Wht/Bl	14	
W603P1-G	U4-GND	-	Grn/Yel	14	

Table 7-19: Connector Mating– NAX281 VX N+1 Control Module

Connector	Mate	Notes
P1	J1-L	AC INPUT JACK LINE
P2	J1-N	AC INPUT JACK L/N
P3	U2-INPUT	AC DIST INPUT
P400	U1-Relays/Status	SC4 RELAYS/STATUS DSUB
P401	U1-Metering	SC4 METERING DSUB
P402	U1-DC Input	SC4 DC INPUT (XLR)
P403	U5-DC Input	ETH SWITCH DC INPUT
P404	U8-DC Input	AUDIO SWITCHER DC INPUT
P405	U9J1	ADAM 4068 J1
P406	U9J2	ADAM 4068 J2
P407	U8-TB5 TOP	
P408	U8-TB6 TOP	
P409	U8-TB6 BOTTOM	
P410	U8-TB7 BOTTOM	
U7P1	U1-POWER FAIL	POWER FAIL MONITOR ON SC4
W601P1	U2-OUTPUT1	AC DIST OUTPUT 1
W601P2	U3-INPUT	UPS INPUT
W602P1	U2-OUTPUT2	AC DIST OUTPUT 2
W602P2	U7J1	U7 AC INPUT
W603P1	U3-OUTPUT1	UPS OUTPUT 1
W604P1	U3-OUTPUT2	UPS OUTPUT 2

Table 7-20: Wiring List – NAX282 VX Main-Standby Control Module

Source	Destination	Wire #	Colour	Size	Remarks
P400-25	J2-1	1	White	22	
P400-12	J2-2	2	White	22	
U4 (-)	P400-13	3	Black	22	
U4 (-)	E2	4	Black	22	
U4 (-)	P401-6	5	Black	22	
U4 (+)	P401-5	6	White	22	
U4 (+)	J2-4	7	White	22	
E2	J2-16	8	Black	22	
P400-17	J2-7	9A	White	22	2-Conductor
P400-15	J2-8	9B	Black	22	Shielded
P400-18	J2-9	9	Shield	22	
U6V1(-)	E2	10	Black	22	
U6V1(+)	P403-CENTER	11	White	22	
U6V1(-)	P403-SHIELD	12	Black	22	
U6V2(+)	P402-4	13	White	22	
U6V2(-)	P402-1	14	Black	22	
U6V2(-)	E2	15	Black	22	
P400-6	J2-11	16	Centre	22	1-Conductor
P400-7	J2-12	-	Shield	22	Shielded
P400-5	J2-13	17	Centre	22	1-Conductor
P400-4	J2-14	-	Shield	22	Shielded
P400-19	TB1-1 (TOP)	18	Centre	22	1-Conductor
P400-20	TB1-2 (TOP)	-	Shield	22	Shielded
P400-21	TB1-3 (TOP)	19	Centre	22	1-Conductor
P400-22	TB1-4 (TOP)	-	Shield	22	Shielded
P1	P3-L	20	Grey	14	
P2	P3-N	21	Grey	14	
J1-G	E1	22	Grn/Yel	14	
P3-G	E1	23	Grn/Yel	14	
W604P1-L	U6-L	-	Blk/Bwn	14	
W604P1-N	U6-N	-	Wht/Bl	14	
W604P1-G	U6-GND	-	Grn/Yel	14	
W603P1-L	U4-L	-	Blk/Bwn	14	
W603P1-N	U4-N	-	Wht/Bl	14	
W603P1-G	U4-GND	-	Grn/Yel	14	

Table 7-21: Connector Mating– NAX282 VX Main-Standby Control Module

Connector	Mate	Notes
P1	J1-L	
P2	J1-N	
P3	U2-AC INPUT	
P400	U1-RELAY/STATUS	
P401	U1-METERING	
P402	U1-DC INPUT	
P403	U5-DC IN	
U7P1	U1-POWER FAIL	
W601P1	U2-OUTPUT1	
W601P2	U3-INPUT	
W602P1	U2-OUTPUT2	
W602P2	U7-J1	
W603P1	U3-OUTPUT1	
W604P1	U3-OUTPUT2	

VX N+1 FM Broadcast Transmitter System
TECHNICAL INSTRUCTION MANUAL

Section 8 ELECTRICAL SCHEMATICS

8.1 INTRODUCTION
This section contains electrical schematics/logic diagrams for the subject equipment. Block diagrams, simplified electrical schematics and/or logic diagrams may be included. Refer to Table 8-1 for an itemized listing.

8.2 COMPONENT VALUES
Unless otherwise specified on the logic/schematic diagram:

- Resistor values are shown in ohms.
- (K = 1000 and M = 1 000 000).
- Resistor power ratings are not shown when less than 0.5 W.
- Capacitor values are shown in microfarads (μF).
- Unidentified diodes are part number 1N4938.

8.3 GRAPHIC SYMBOLS
The graphic symbols used on electrical schematics are in accordance with American National Standard ANSI Y32.2-1975 - Graphic Symbols for Electrical and Electronic Diagrams.

8.4 LOGIC SYMBOLS
The logic symbols used on electrical schematics and logic diagrams are in accordance with American National Standard ANSI Y32.14-1975 - Graphic Symbols for Logic Diagrams.

8.5 REFERENCE DESIGNATIONS
Reference designations were assigned in accordance with American Society of Mechanical Engineers ASME Y14.44-2008 - Reference Designations for Electrical and Electronic Parts and Equipment. Each electrical symbol has been identified with its basic reference designation. To obtain the full reference designation for a specific part, this basic identifier must be prefixed with the reference designation assigned to all higher assemblies.

8.6 UNIQUE SYMBOLOGY
Nautel utilizes unique symbology on electrical schematics to describe two-state (logic) inputs/outputs that differ from those inputs/ outputs having only one distinct state or multiple states (analog).

8.6.1 Type of Inputs/Outputs
On electrical schematics, names used to describe two-state (logic) inputs/outputs are prefixed by a '#'. Those inputs/outputs representing a one-state or analog signal will have no prefix.

8.6.2 Logic Level/Convention

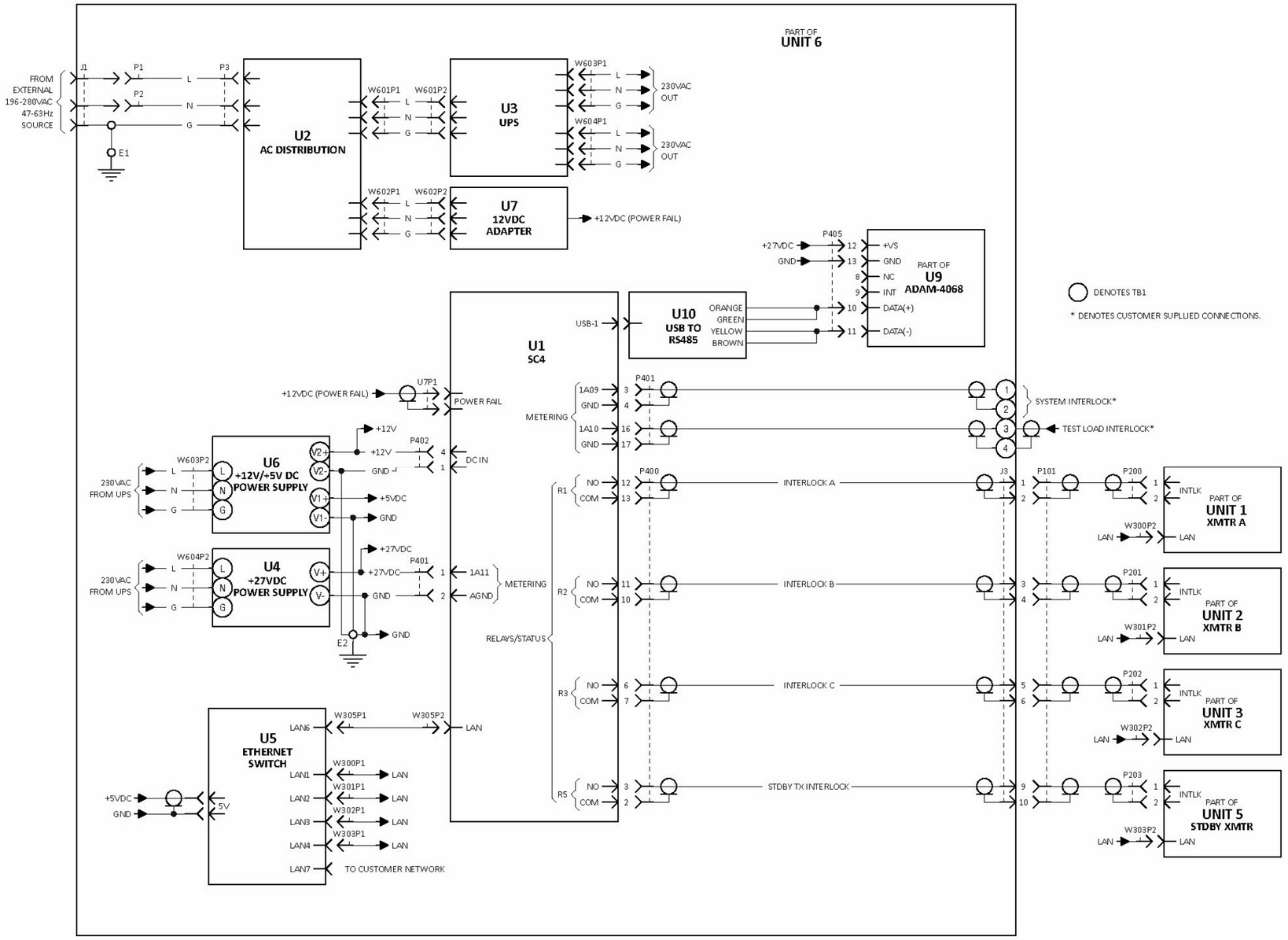
The '#' prefix identifies an input/output that has two distinct states - 'high' and 'low'. A suffix, '+' or '-', identifies the active (true) state of the input/output. The 'high' (+) will be the more positive of the two levels used to represent the logic states. The 'low' (-) will be the less positive of the two levels used to represent the logic states. Two types of logic, positive and negative, may be represented on a particular schematic. In positive logic, 'high' represents the active (true) state and 'low' represents the inactive (false) state. In negative logic, 'low' represents the active state and 'high' represents the inactive state.

8.7 IDENTIFICATION OF SCHEMATIC DIAGRAMS

A number that is both the figure number and the page number identifies each illustration in this section. The numbers are assigned sequentially and are prefixed by the letters 'SD-'. The electrical schematics/logic diagrams included in this section are listed in Table 8-1.

Table 8-1: List of Electrical Schematics

Figure #	Description
SD-1	Electrical Schematic – VX 3+1 Transmitter System (Sheet 1 of 3)
SD-2	Electrical Schematic – VX 3+1 Transmitter System (Sheet 2 of 3)
SD-3	Electrical Schematic – VX 3+1 Transmitter System (Sheet 3 of 3)
SD-4	Electrical Schematic – VX 4+1 Transmitter System (Sheet 1 of 3)
SD-5	Electrical Schematic – VX 4+1 Transmitter System (Sheet 2 of 3)
SD-6	Electrical Schematic – VX 4+1 Transmitter System (Sheet 3 of 3)
SD-7	Electrical Schematic – VX Main-Standby Transmitter System



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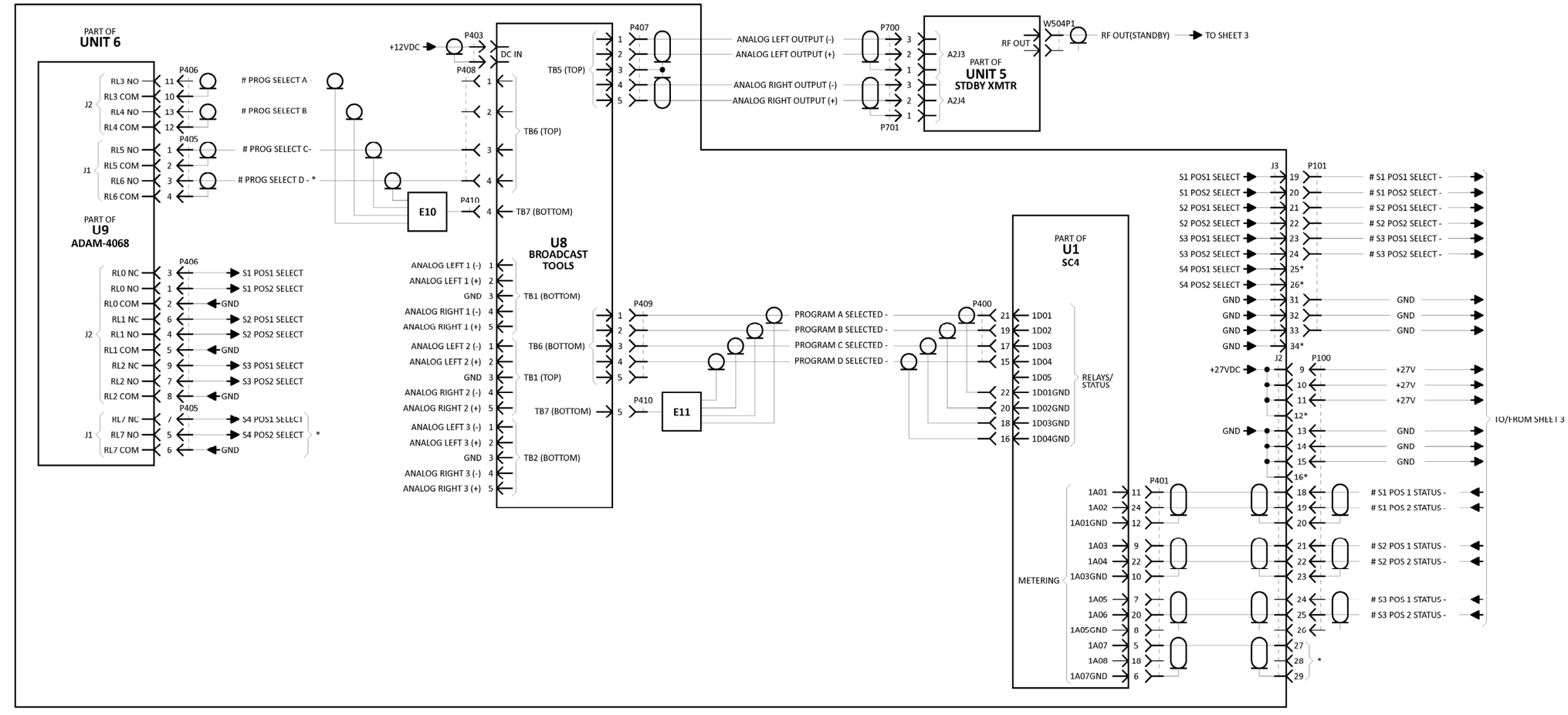
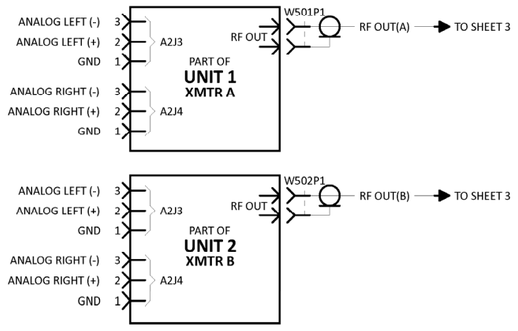
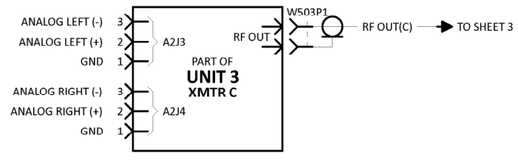
Electrical Schematic – VX 3+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-1	Sheet 1 of 3



* DENOTES WIRES INSTALLED BUT ONLY USED IN 4+1 SYSTEM.





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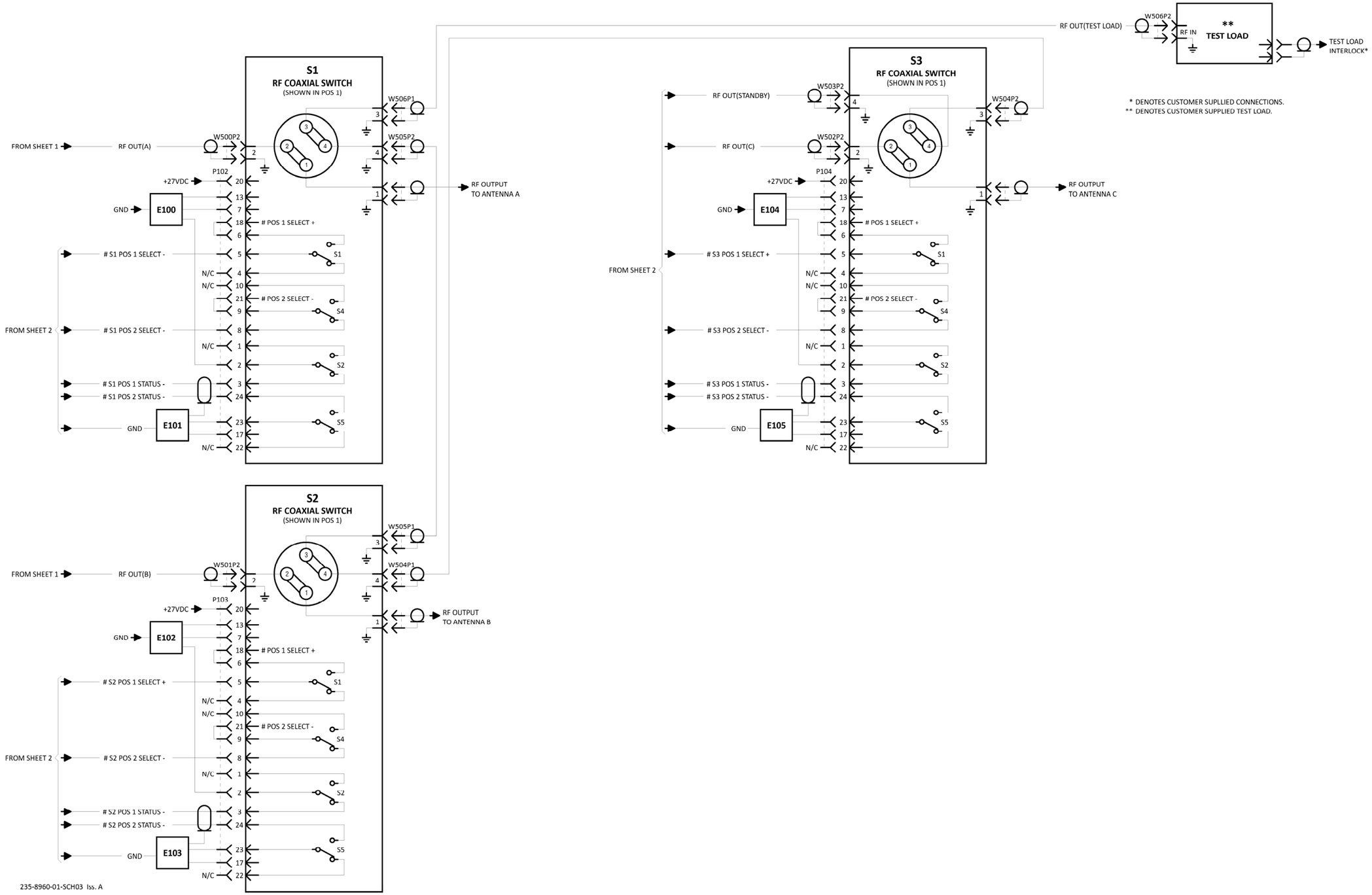
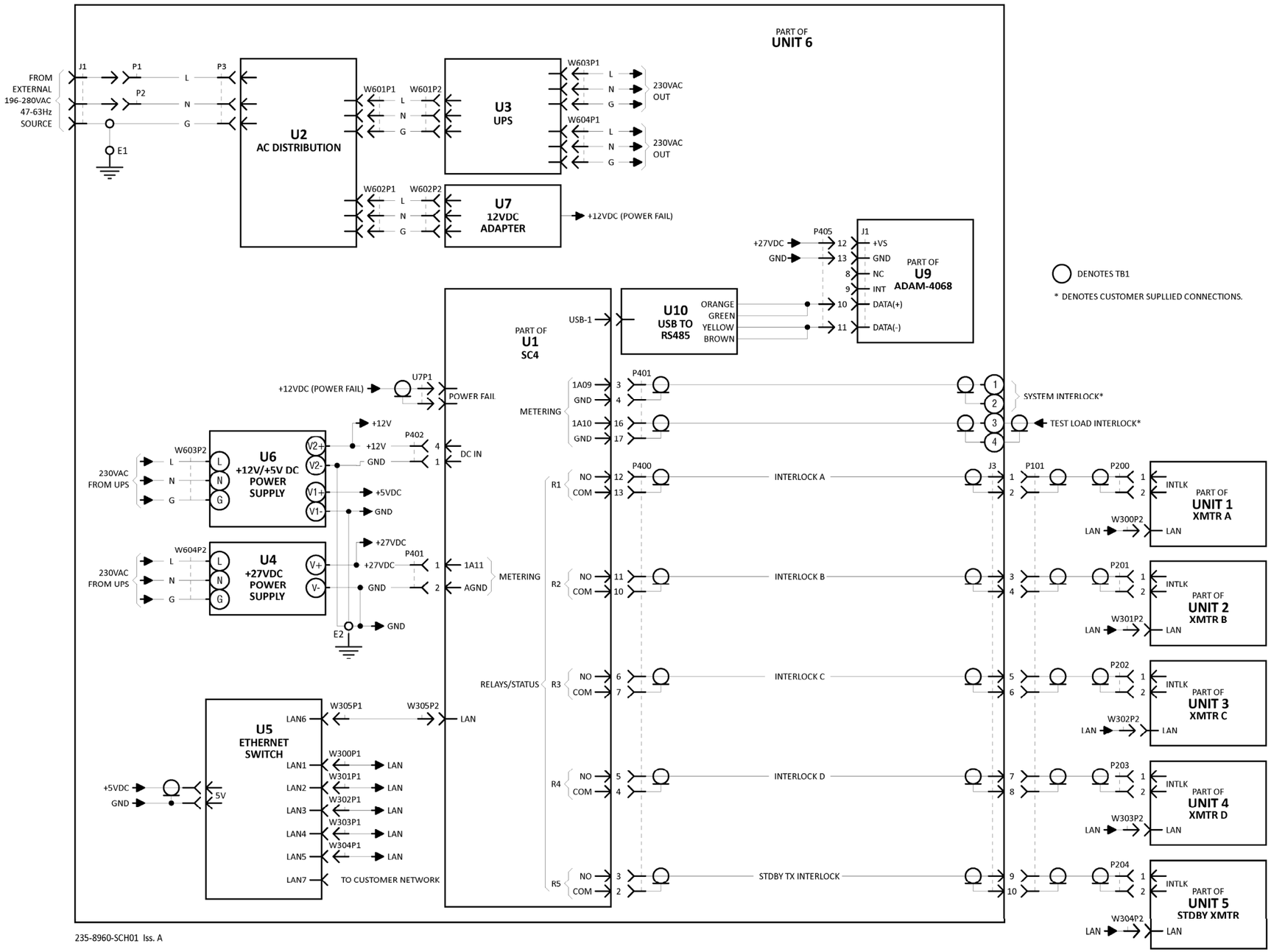
Electrical Schematic – VX 3+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-2	Sheet 2 of 3



Electrical Schematic – VX 3+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-3	Sheet 3 of 3



235-8960-SCH01 Iss. A

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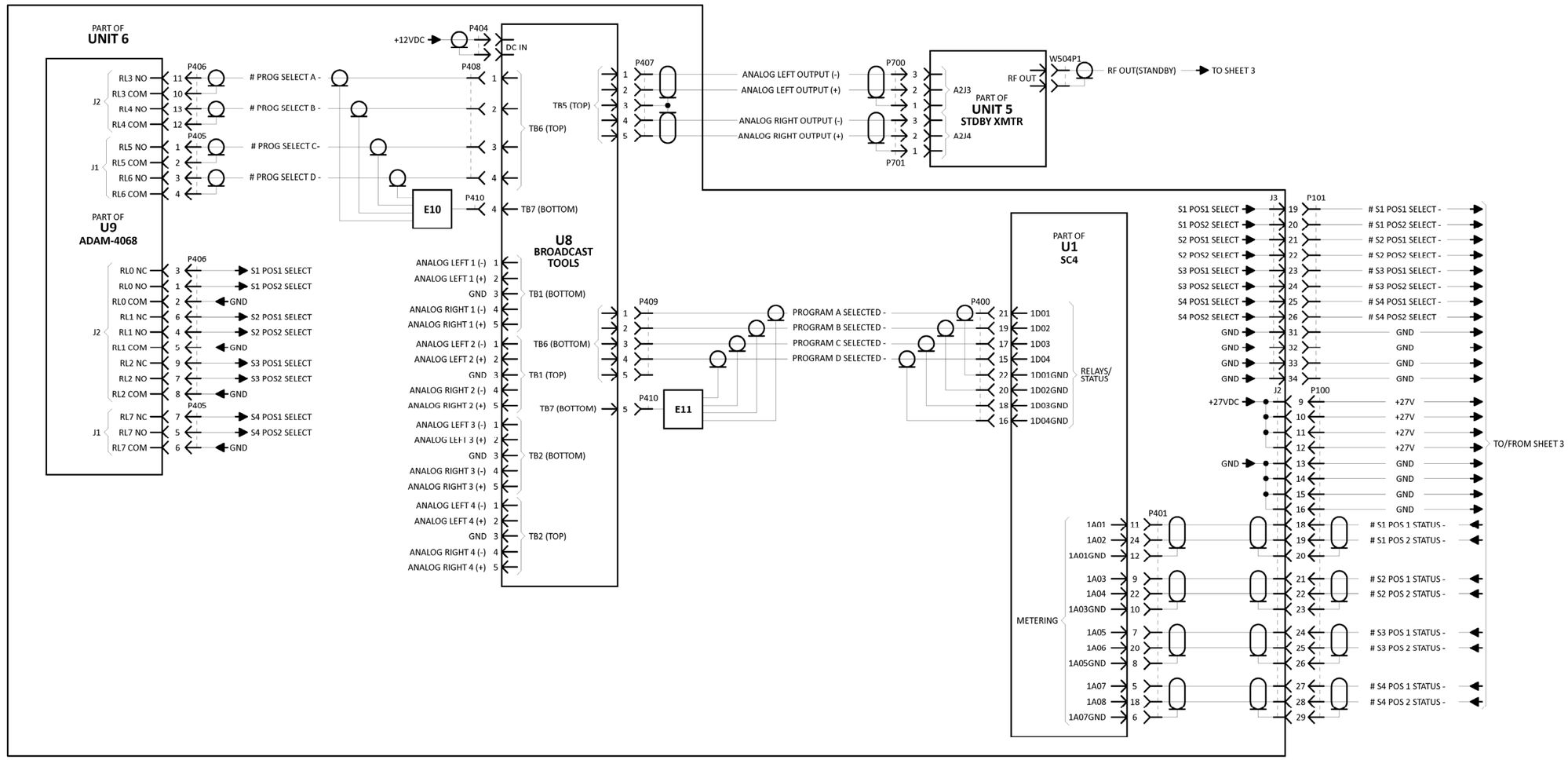
Electrical Schematic – VX 4+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-4	Sheet 1 of 3



235-8960-SCH02 Iss. A

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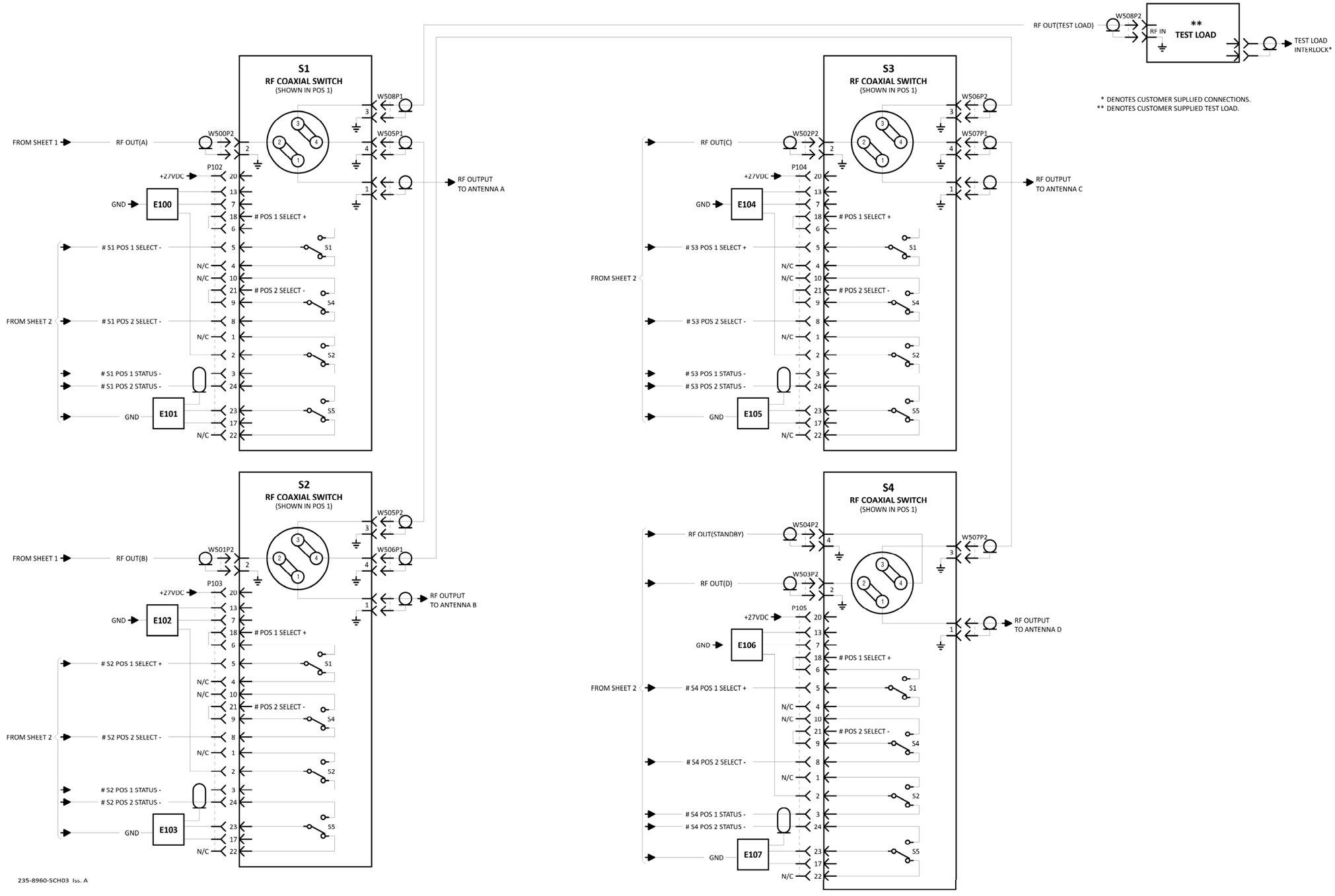
Electrical Schematic – VX 4+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-5	Sheet 2 of 3



* DENOTES CUSTOMER SUPLLIED CONNECTIONS.
** DENOTES CUSTOMER SUPPLIED TEST LOAD.

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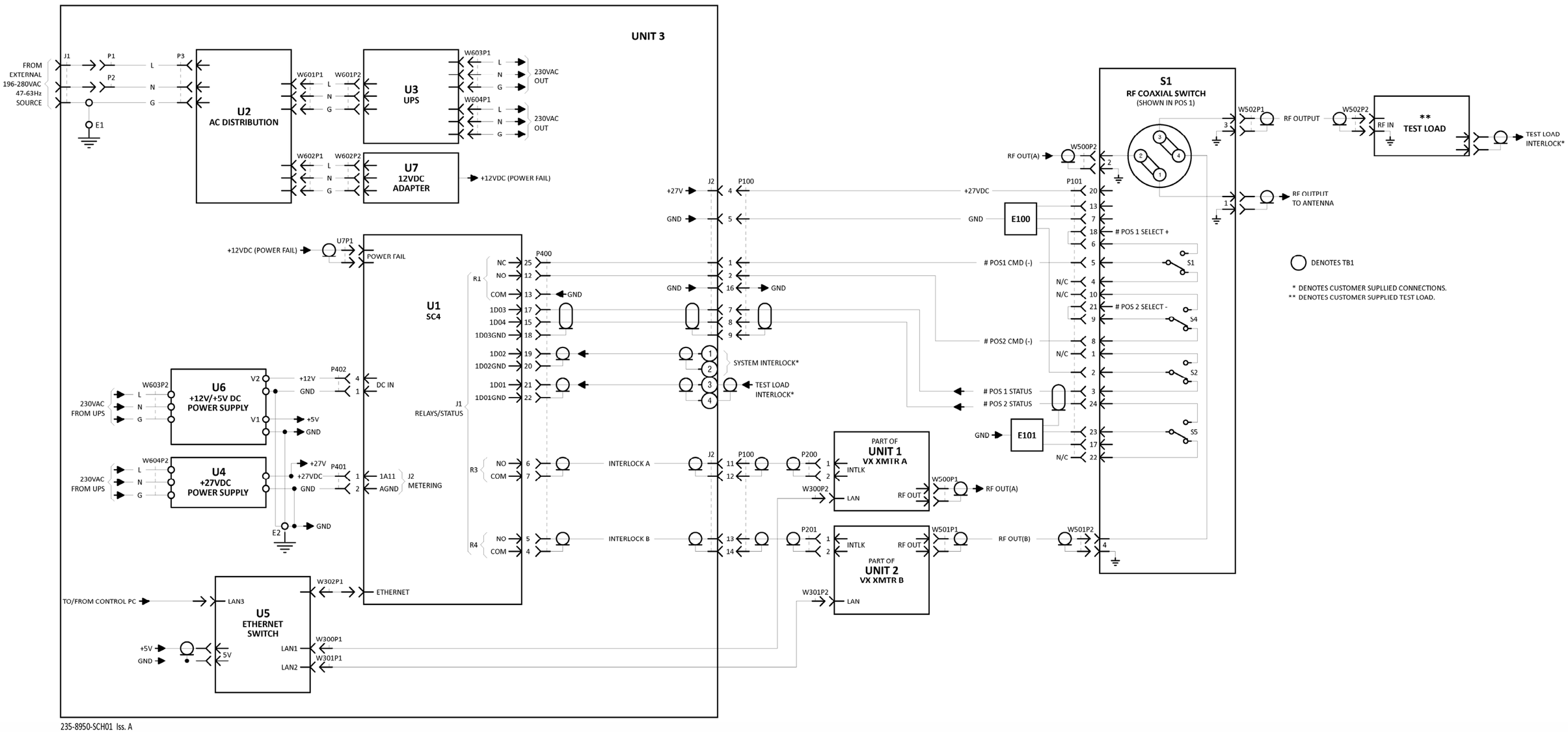
Electrical Schematic – VX 4+1 Transmitter System			
Issue 1.0	Not to Scale	Figure SD-6	Sheet 3 of 3



235-8950-SCH01 Iss. A

Electrical Schematic – VX Main-Standby Transmitter System			
Issue 1.0	Not to Scale	Figure SD-7	Sheet 1 of 1

VX N+1 FM Broadcast Transmitter System
TECHNICAL INSTRUCTION MANUAL

Section 9 MECHANICAL DRAWINGS

9.1 INTRODUCTION
This section contains mechanical drawings for assemblies of the subject equipment. Dimensional drawings may be included. Refer to Table 9-1 for an itemized listing. Assembly detail drawings for assemblies/ modules that have separate maintenance manuals are not included. Refer to the appropriate maintenance manual for the assembly detail of these assemblies.

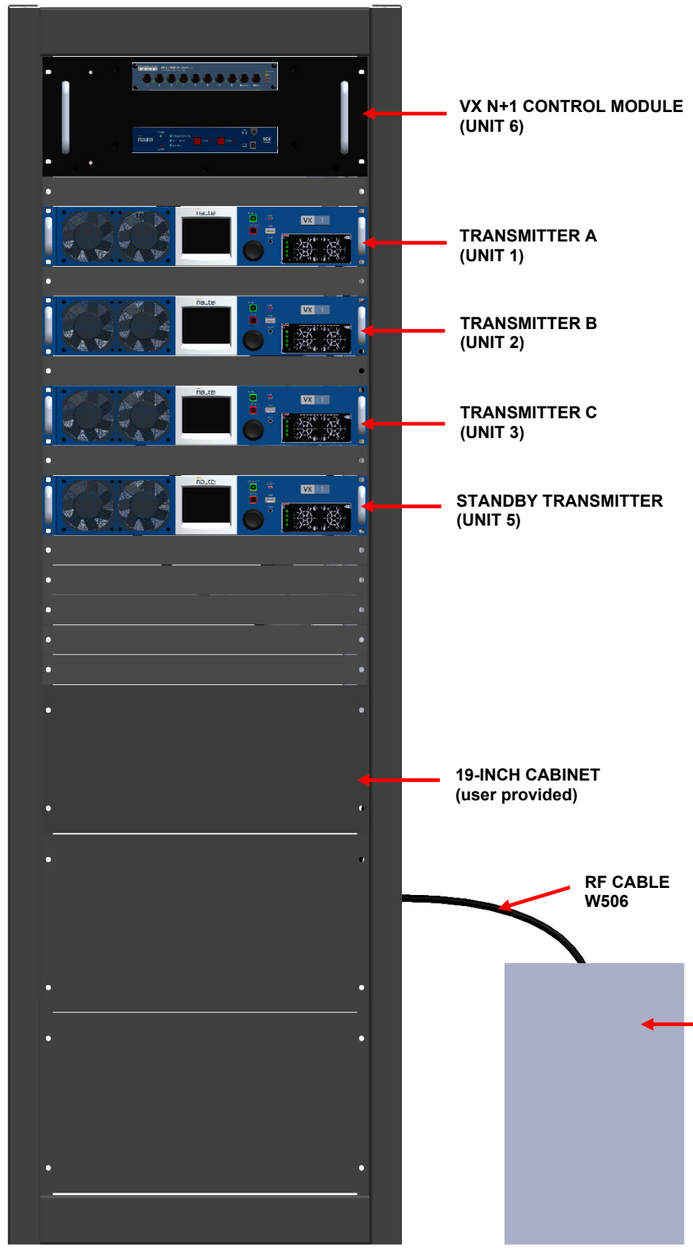
9.2 LOCATING ASSEMBLY DETAIL DRAWINGS
Each illustration in this section is identified by a number that is both the figure number and the page number. The numbers are assigned sequentially and are prefixed by the letters *MD-*. Drawings in this section are listed in Table 9-1.

9.3 CONTENT OF MECHANICAL DRAWINGS
Mechanical drawings are illustrations that depict the location of electrical components and show assembly outline detail. Dimensional information will be included where applicable.

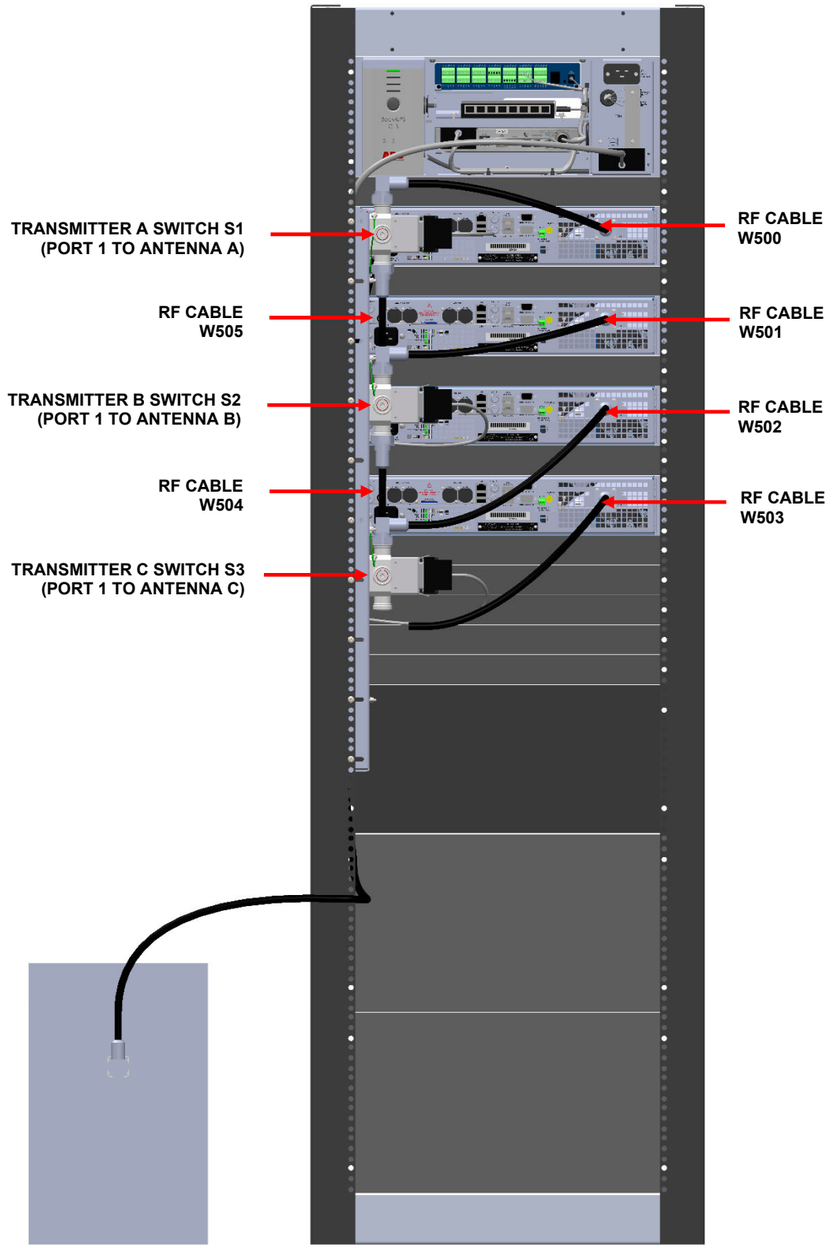
When a module/assembly is the subject of its own assembly detail drawing and it is also shown in a higher-level assembly, the detail depicted in the higher-level assembly may have minor differences from the actual module/assembly installed. In this case, always refer to the assembly detail drawing for the module/assembly for detailed information.

Table 9-1: List of Mechanical Drawings

Figure #	Description
MD-1	Assembly Detail – VX 3+1 Transmitter System (235-8960-01)
MD-2	Assembly Detail – VX 4+1 Transmitter System (235-8960)
MD-3	Assembly Detail – VX Main-Standby Transmitter System (235-8950)
MD-4	Assembly Detail – NAX281 VX N+1 Control Module
MD-5	Assembly Detail – NAX282 VX Main-Standby Control Module



FRONT VIEW



REAR VIEW

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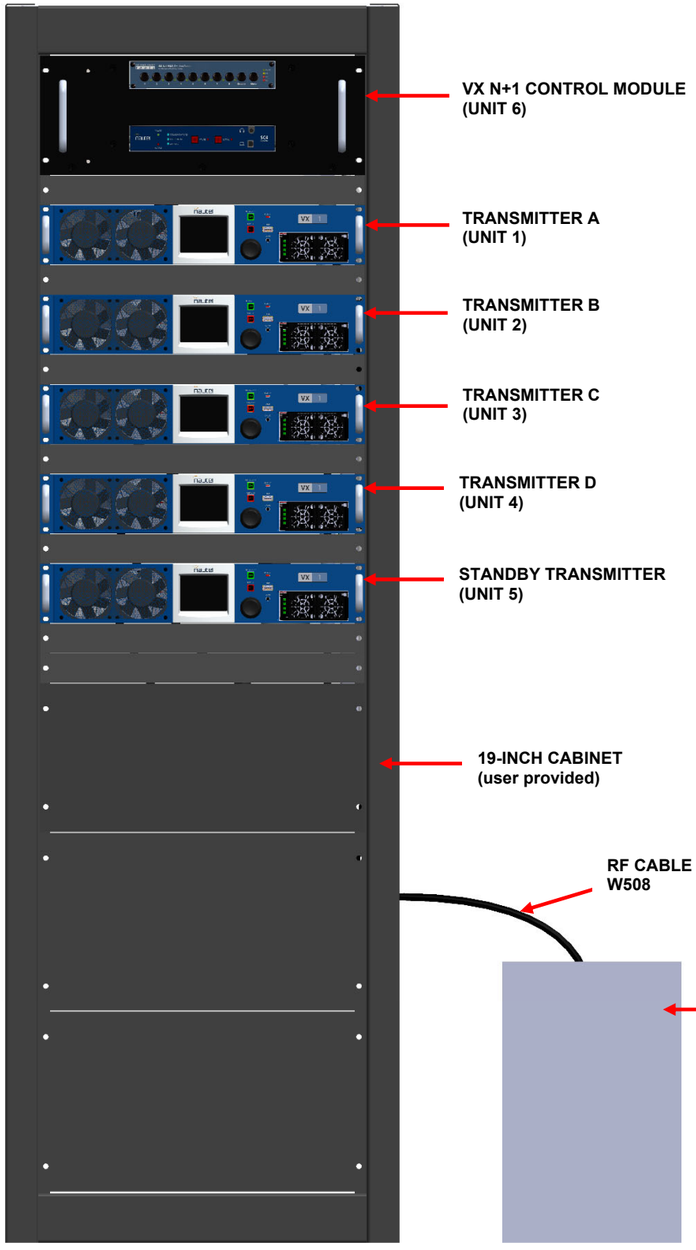
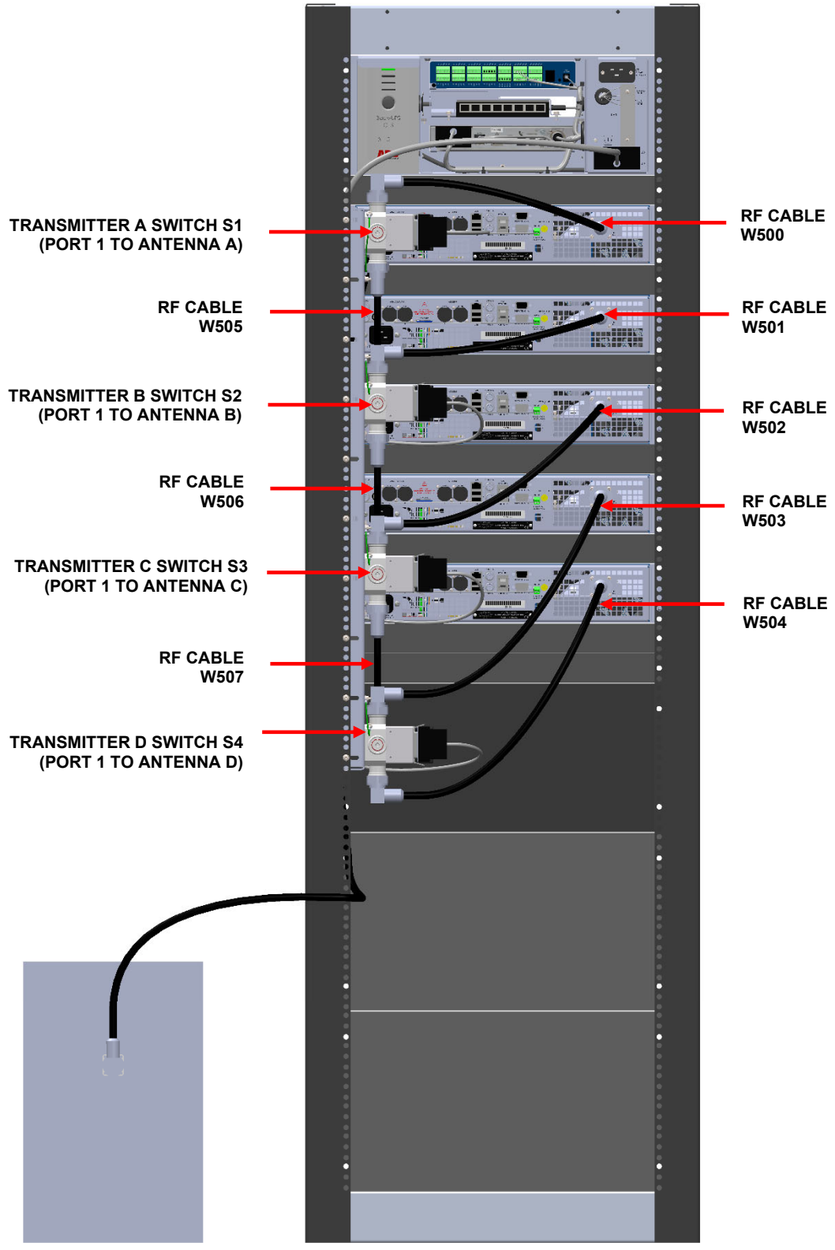
Assembly Detail – VX 3+1 Transmitter System (235-8960-01)			
Issue 1.0	Not to Scale	Figure MD-1	Sheet 1 of 1

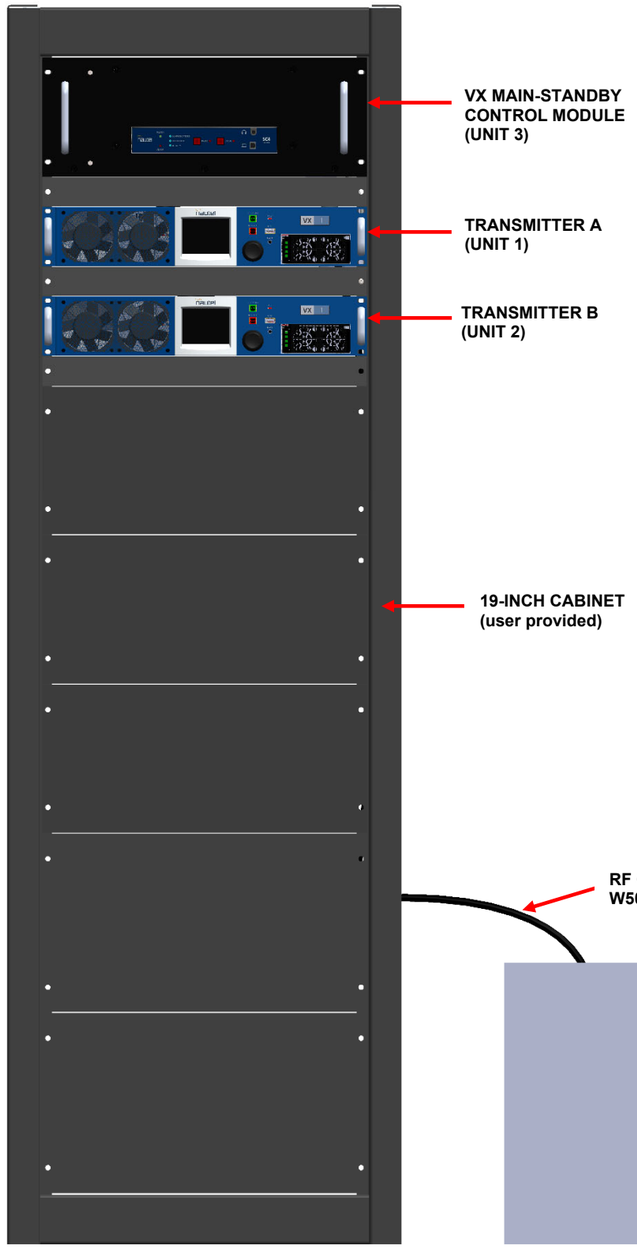


FRONT VIEW

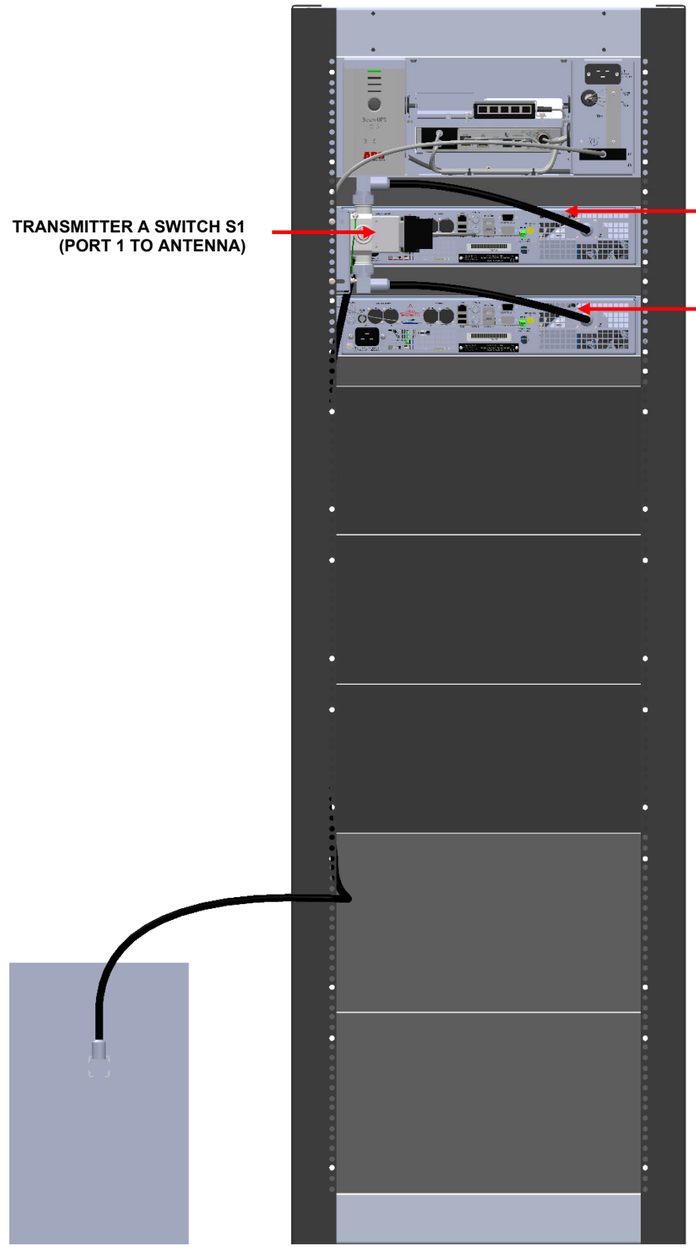


REAR VIEW

Assembly Detail – VX 4+1 Transmitter System (235-8960)			
Issue 1.0	Not to Scale	Figure MD-2	Sheet 1 of 1



FRONT VIEW



REAR VIEW

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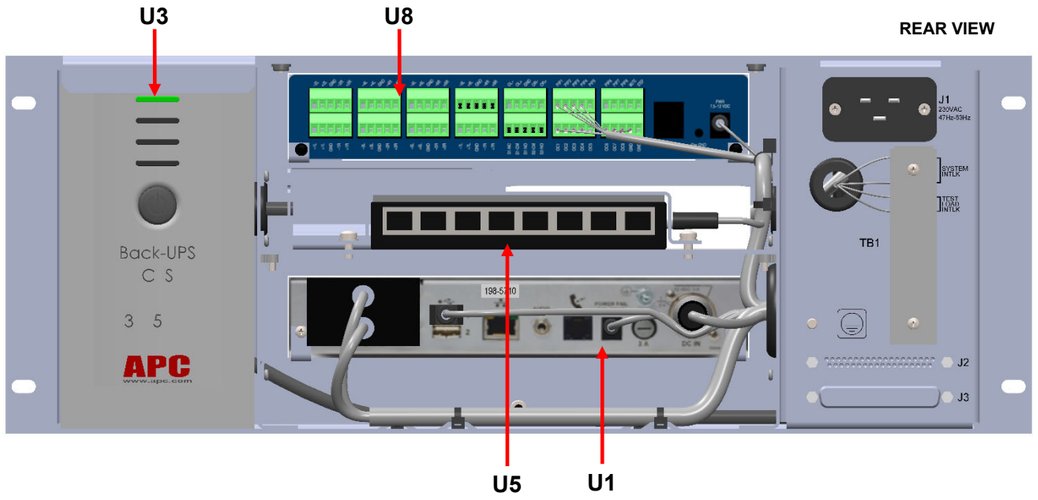
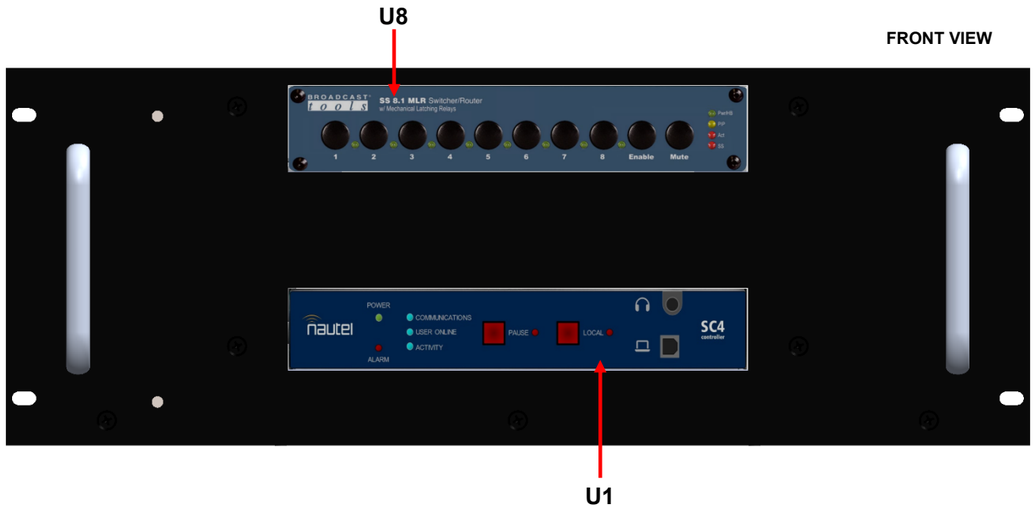
Assembly Detail – VX Main-Standby Transmitter System (235-8950)			
Issue 1.0	Not to Scale	Figure MD-3	Sheet 1 of 1

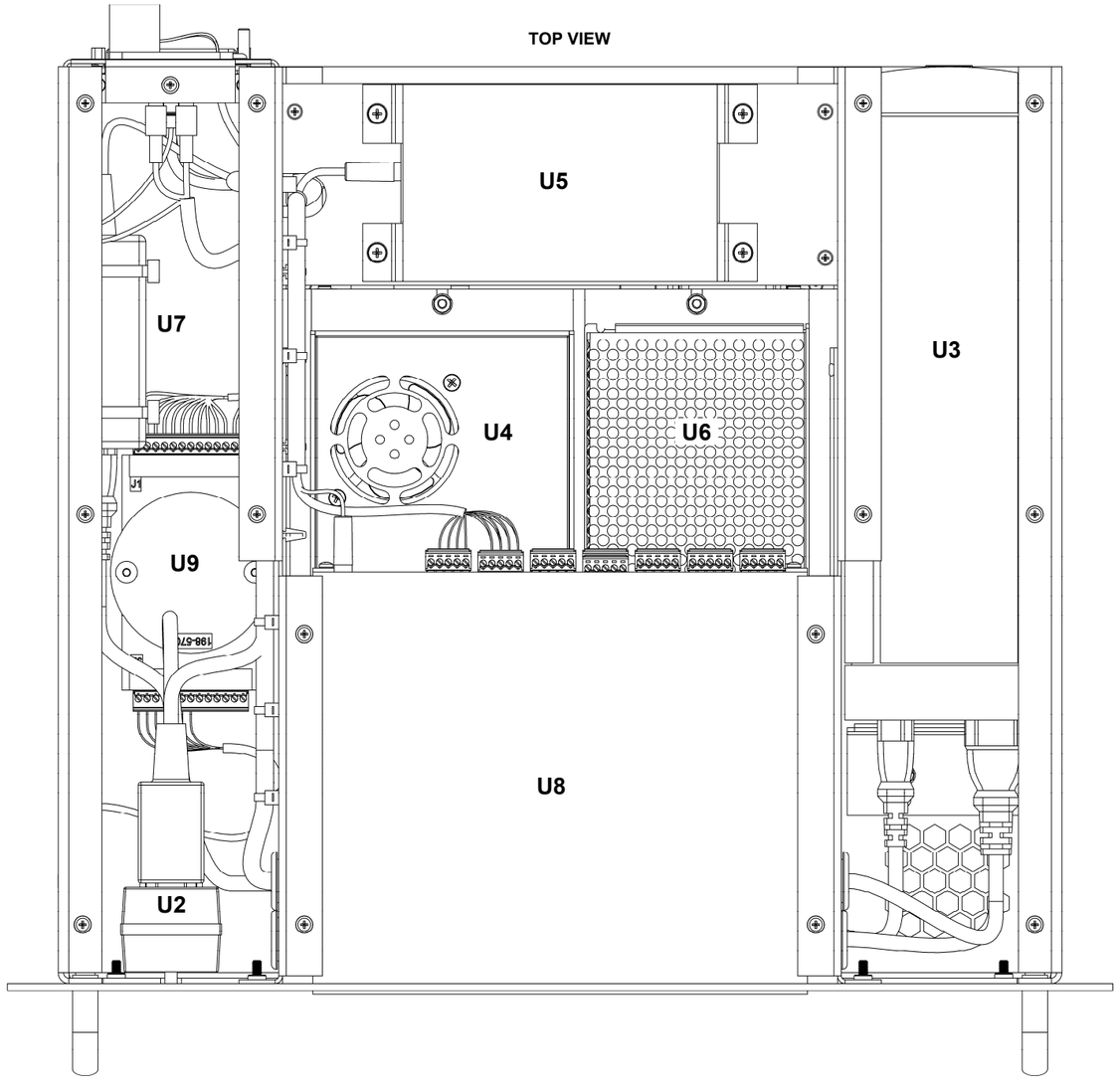
REAR VIEW



FRONT VIEW



TOP VIEW



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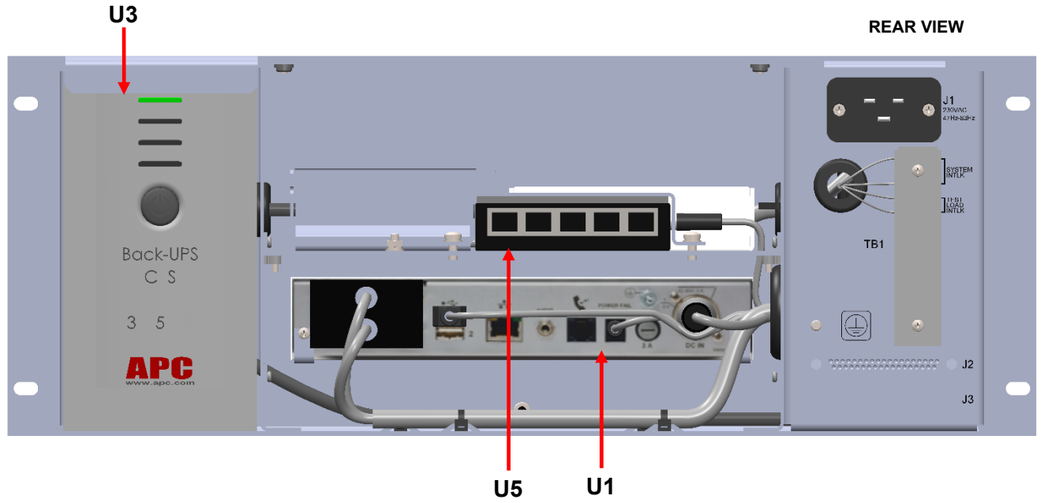
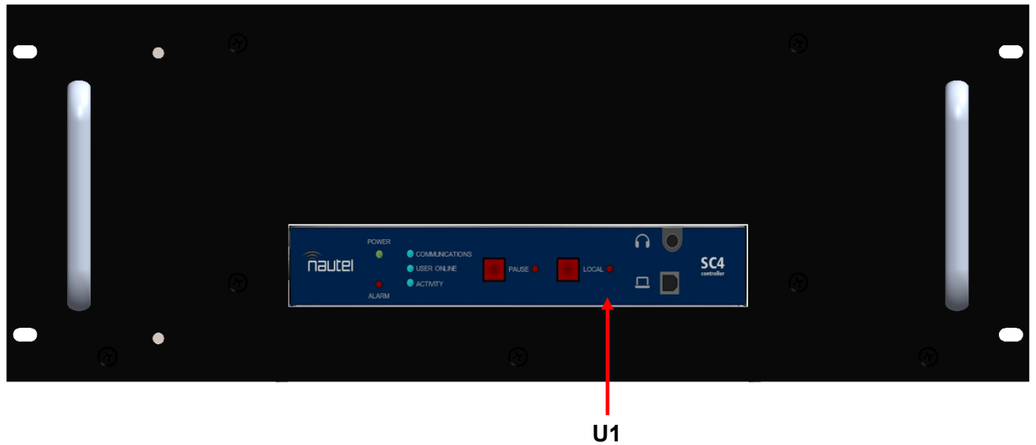
Assembly Detail – NAX281 VX N+1 Control Module			
Issue 1.0	Not to Scale	Figure MD-4	Sheet 1 of 1

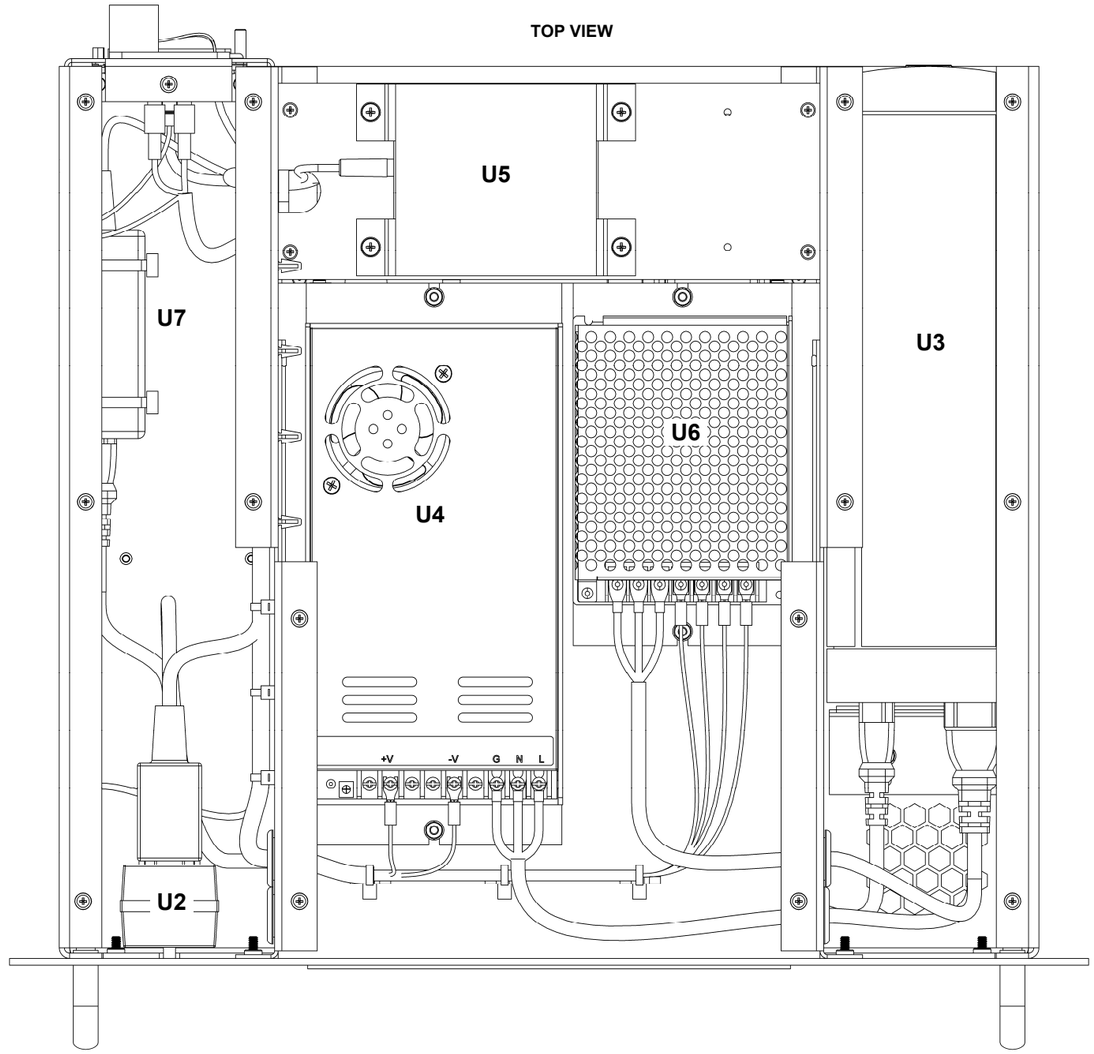
REAR VIEW



FRONT VIEW



TOP VIEW



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Assembly Detail – NAX282 VX Main-Standby Control Module			
Issue 1.0	Not to Scale	Figure MD-5	Sheet 1 of 1