VS1 Transmitter

Installation Manual

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The comparisons and other information provided in this document have been prepared in good faith based on publicly available information. The reader is encouraged to consult the respective manufacturer's most recent published data for verification.

Contents

Release control record vii

Preparing for installation 1-1

Mounting the transmitter 2-1

Connecting to station reference ground 3-1

Installing the RF feed line 4-1

Connecting AC power 5-1

Installing program inputs 6-1
- Planning 6-1
- Connecting cables 6-1

Installing control and monitoring wiring 7-1
- Planning 7-1
- Connecting cables 7-1

Commissioning 8-1
- Pre-Commissioning 8-2
- Commissioning 8-3
- Network Setup 8-7
- Changing the OS Password 8-9

Parts and tools 9-1
Contacting Nautel 9-1
Parts supplied by Nautel 9-2
Parts not supplied by Nautel 9-2
Parts ordering 9-2
Module replacement program 9-3
Tools for installation 9-3

Pre-installation / Installation assistance 10-1
Pre-installation consulting 10-1
Installation and commissioning service 10-1
Online documentation 10-3
On-site support 10-3
Training 10-4
Standard warranty 10-5
Extended warranties 10-8

List of terms 11-1

Release control record

Issue	Date	Reason
11.0	2019-01-04	Hardware Release 11 (NARF65J/02 and NARF65J/03). Supports software version VS SW 5.2 and higher.

Section 1: Preparing for installation

Before installing your VS1 transmitter, perform the following steps:

1. Ensure that you have performed the pre-installation tasks described in the VS1 Pre-installation Manual.

2. Inspect the shipping box for damage. Report any damage immediately to your Nautel sales representative and the carrier.

3. Unpack the box. Remove all items from packing and place them on a suitable work area. Check your packing list to make sure that you received all the components, including the VS1, VS1 Quick Start Guide, VS1 USB device (contains technical manual set and unpacking/installation video), installation kit and ancillary kit.

4. Assemble your parts and tools. For a list of required tools, see "Parts and tools" on page 9-1.

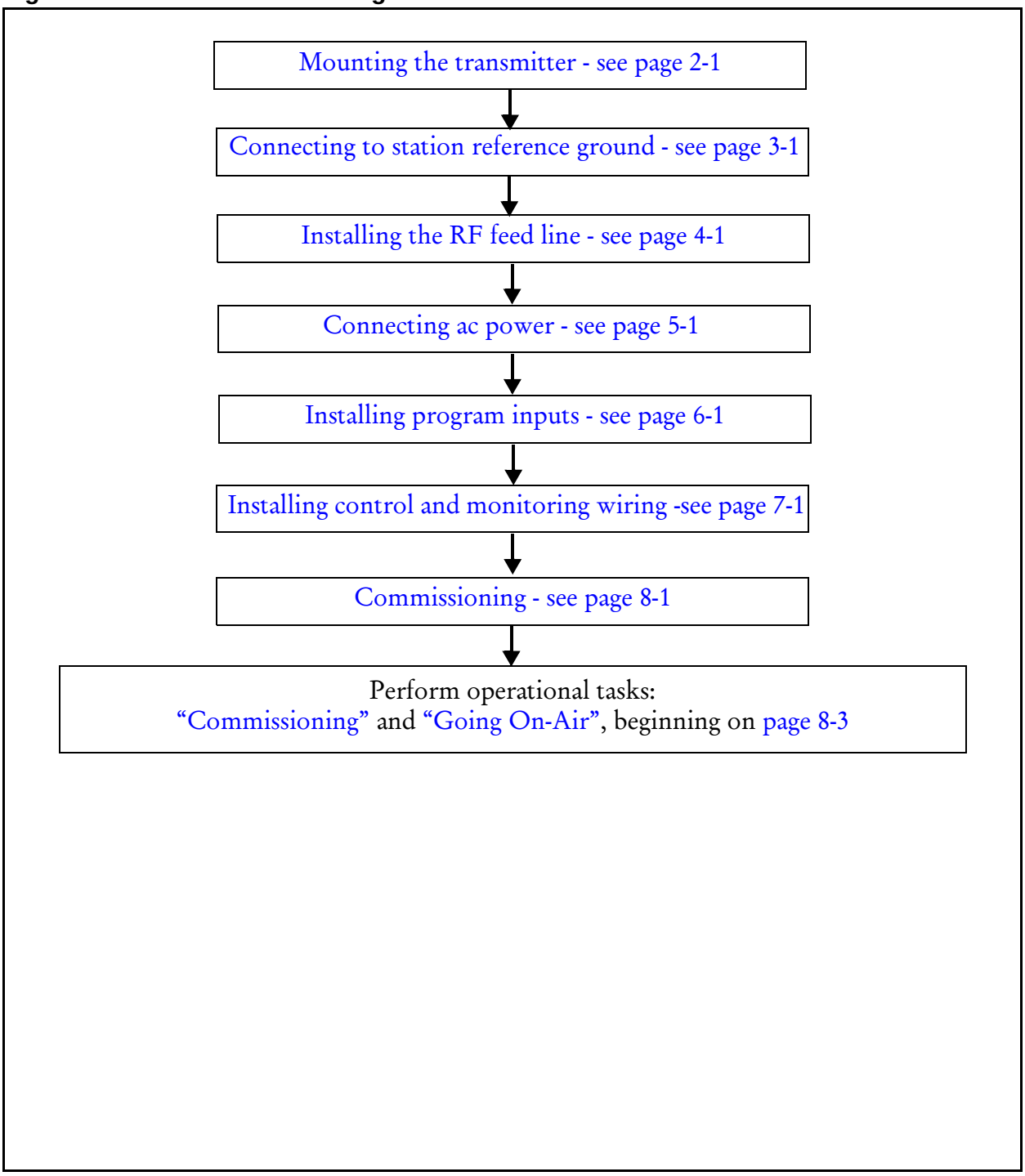
5. When you are ready to install the VS1 transmitter, follow the steps shown in Figure 1.1 on page 1-2.

TIP When you have completed a task or step, put a check mark beside the step number.

Note:
The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.

CAUTION:
FAILURE TO COMPLY WITH RECOMMENDATIONS MAY VOID YOUR MANUFACTURER'S WARRANTY. FOR MORE INFORMATION, REVIEW YOUR WARRANTY DOCUMENTS.

Figure 1.1: Flowchart - Installing the transmitter



Section 2: Mounting the transmitter

To mount the VS1 transmitter in a cabinet, refer to the following installation aids provided with the VS1 transmitter:

- Unpacking/Installation Video (IS15009, located on the USB device that also contains the technical documentation suite): step-by-step video that shows how to unpack your VS1 and properly mount it in a cabinet.

- VS1 Quick Start Guide: full-colour foldout guide that provides instructions to install the VS1 in a cabinet and achieve on-air operation

Note:
Unless otherwise specified, all hardware referenced in the Unpacking/Installation video or the VS1 Quick Start Guide is included in the VS1*'s installation kit (Nautel Part # 211-8978-05).*

Section 3: Connecting to station reference ground

Note:
The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.

To connect to the station reference ground, perform the following steps:

See Figure 3.1 on page 3-2 as an installation guide.

1. Locate the VS1's safety ground stud (E1) on the rear panel of the VS1.

2. Attach a continuous, low impedance copper conductor (minimum 3/4" braid) between the station reference ground and safety ground stud E1. Ensure the station reference ground conductor is at least 3 mm (1/8 in) from the exterior of the transmitter or host cabinet.

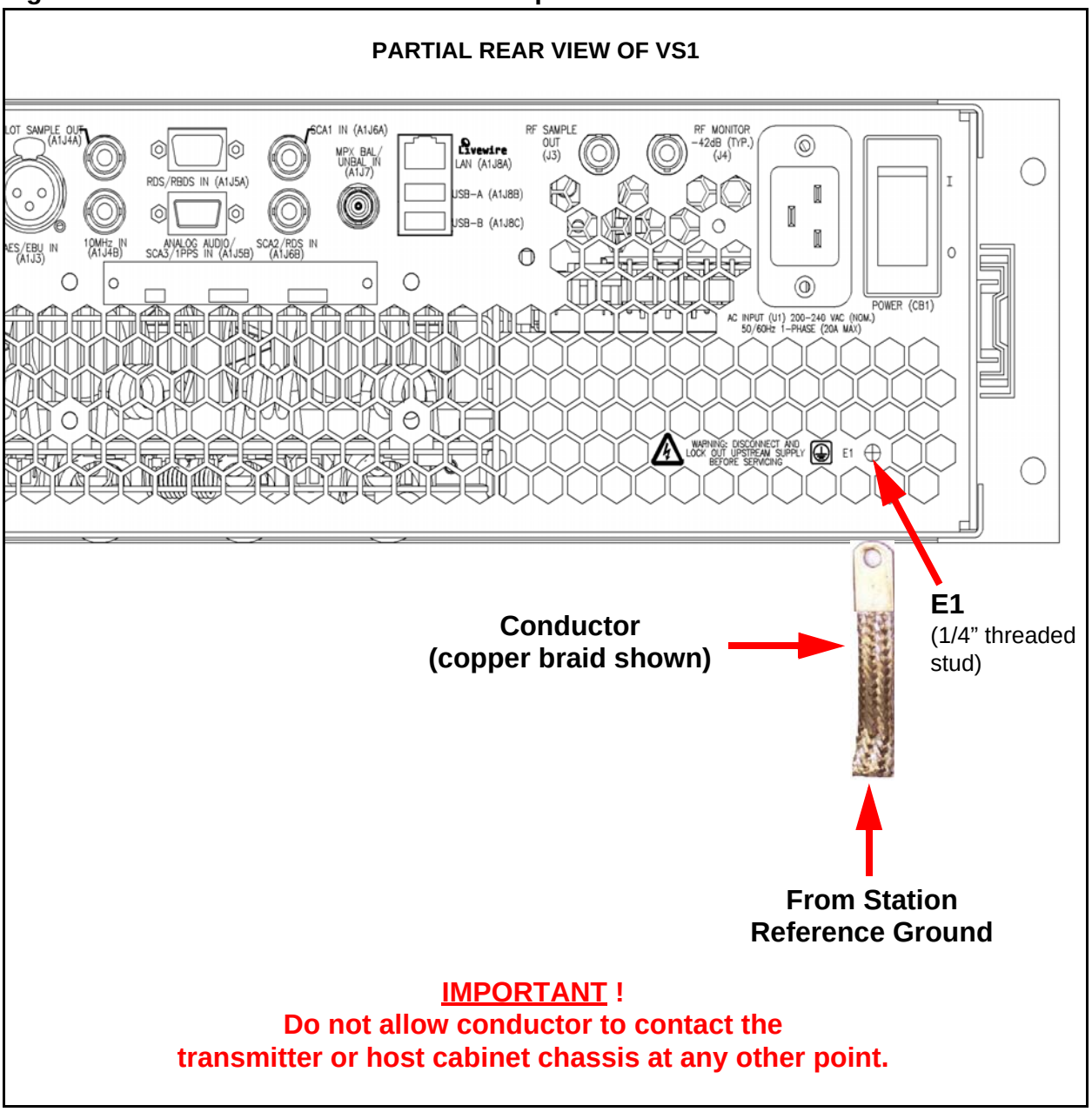
CAUTION:
It is important that the conductor attached to E1 does not contact the transmitter chassis or host cabinet at any other point.

3. For information about grounding the lightning protection, see the *VS1 Pre-Installation Manual.*

   For detailed information about lightning protection, see the *Recommendations for Transmitter Site Preparation* manual, available from your Nautel sales agent, or online from the Nautel website.

4. Firmly tighten all hardware.

Figure 3.1: Station Reference Ground Strap Connection



Section 4: Installing the RF feed line

> *Note:*
> *The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.*

Prepare and install an RF feed coaxial line as follows:

> *Note:*
> *Nautel recommends that you perform the commissioning procedure in Section 8, "Commissioning" before connecting the transmitter to its antenna system.*

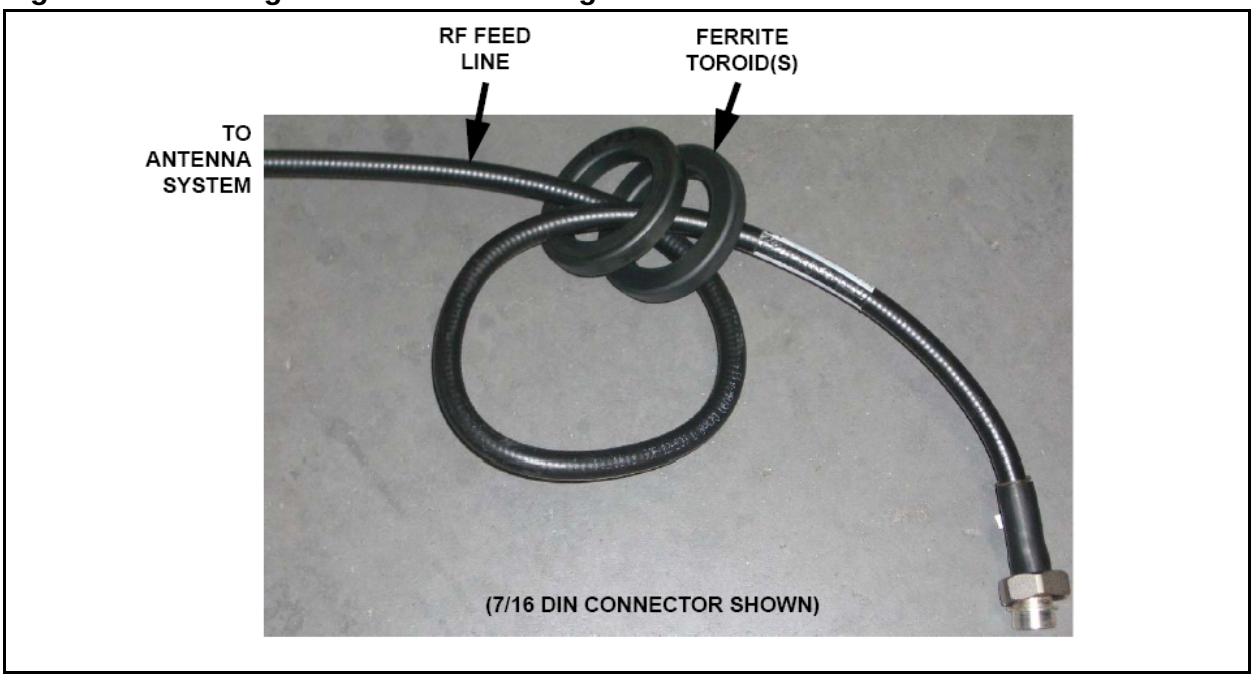
1. Connect the VS1's RF output to a dummy load, if available, during the commissioning procedure's initial turn on. If the RF feed line is not connected to a switching circuit that permits antenna/dummy load selection, connect the RF feed line for the dummy load to the transmitter's RF output until transmitter commissioning is complete.

2. Verify the RF feed line to the antenna system is in place and is cut to the required length. Do not install the feed line's mating connector (7/8-inch EIA or 7/16 DIN) at this point.

> *Note:*
> *The VS1's RF output connector is a 7/8-inch EIA connector or 7/16 DIN connector, which is user-specified.*

3. Obtain one or two ferrite toroids (Nautel Part # LP23, 85.7 mm) from the ancillary kit. Install the ferrite toroid(s) on the VS1 end of the RF feed line. If practical, the RF feed line should pass through a minimum of two times (one turn) (see Figure 4.1).

Figure 4.1: Routing RF Feed Line Through Ferrite Toroid



4. Install the appropriate size connector (7/8-inch EIA or 7/16 DIN) on the RF feed line.
5. Mate the RF feed line's connector to the RF OUT (J2) connector on the rear of the VS1.

Section 5: Connecting ac power

Note:
The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.

To connect ac power to the transmitter, perform the following steps:

1. Switch off the ac power at the service entrance.
2. Obtain the ac power cord (Nautel Part # JN57) and two 85.7 mm ferrite toroids (Nautel Part # LP23) from the installation kit.
3. Pass the ac power cord through the ferrite toroids. If practical, the ac power cord should pass through a minimum of two times (two turns).
4. Connect the ac power cord to the AC INPUT receptacle (U1) on the rear of the VS1.
5. Connect the other end of the ac power cord to the 200 to 240 V ac input source.
6. Verify that the station reference ground is connected to the safety ground stud at the rear of the VS1.

Section 6: Installing program inputs

> *Note:*
> *The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.*

This section describes how to connect program input wiring to the VS1.

Planning

Make sure you have read and fully understood the program input options described in the *VS1 Pre-installation Manual* before proceeding. The *VS1 Pre-installation Manual* also includes the connector type and gender (male or female) of the transmitter's interfacing connectors.

> *Note:*
> *With the exception of D-sub connectors, all program input mating connectors must be provided by the user.*

Connecting cables

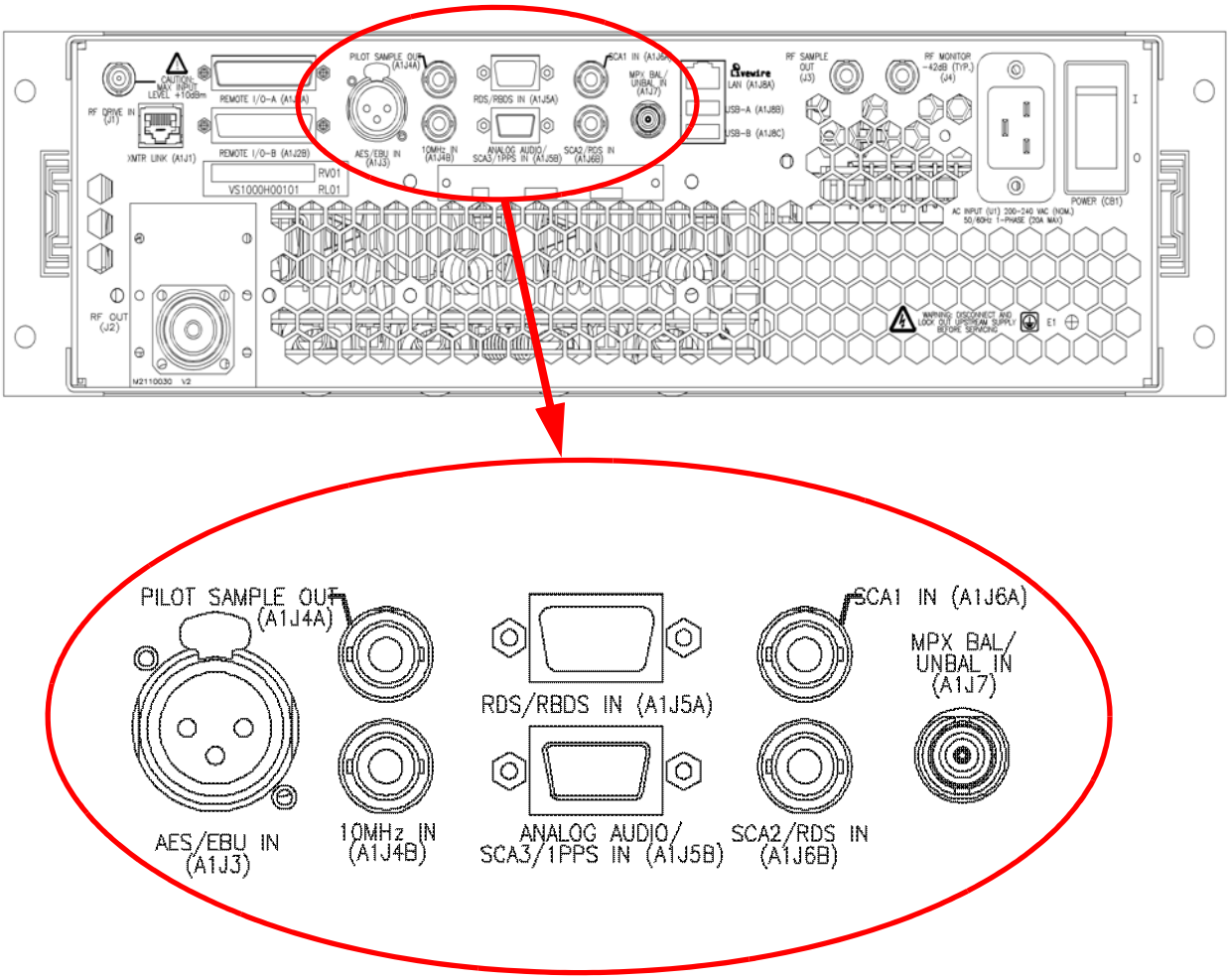
1. Obtain a ferrite toroid [85.7 mm (Nautel Part # LP23) or 38 mm (Nautel part # LXP38), as appropriate] from the Installation Kit.

2. Route program input cable(s) through the ferrite toroid, then to the rear of the VS1. If practical, pass the cable through the ferrite toroid twice (two turns).

3. Connect the appropriate program input cable(s) between the program source(s) and the connector(s) described in "Analog inputs" or "Digital inputs" in the VS1 Pre-installation Manual (see Figure 6.1 on page 6-2).

Figure 6.1: Program Input Connections

VS1 TRANSMITTER REAR VIEW



NOTE: D-Sub mating connectors are provided in the ancillary kit. Other connector types must be provided by the user.

Section 7: Installing control and monitoring wiring

> *Note:*
> *The VS1 Quick Start Guide provides a more streamlined method to unpack, install and commission your transmitter. If you used the Quick Start Guide to successfully commission your transmitter, Nautel recommends you use the information in this Installation Manual to verify your installation or for more in-depth information, as required.*

This section describes how to route wiring associated with the remote control and monitoring of the VS1 transmitter.

Planning

Make sure you fully understand the control and monitoring options described in the *VS1 Pre-installation Manual* before proceeding.

Connecting cables

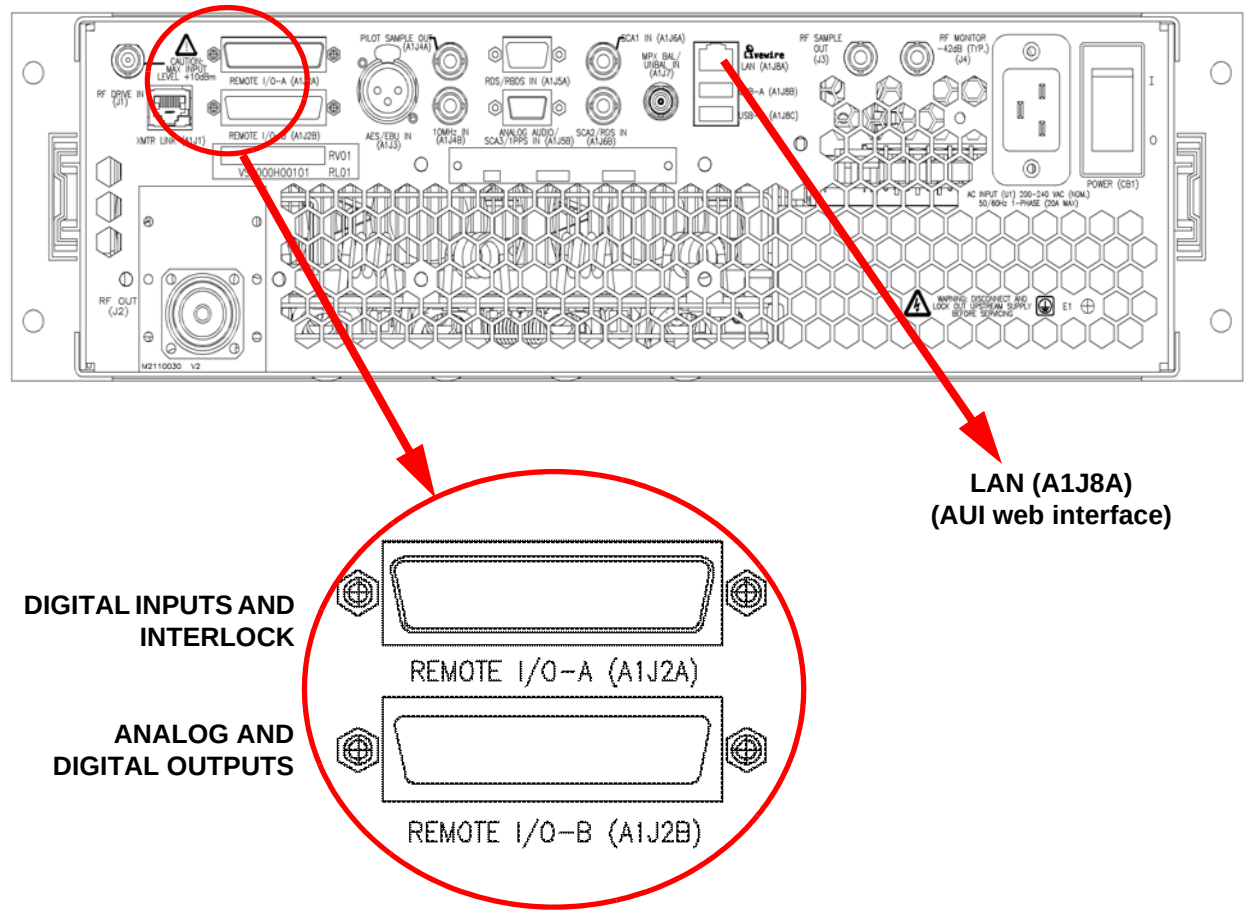
1. Obtain a ferrite toroid [85.7 mm (Nautel Part # LP23) or 38 mm (Nautel part # LXP38), as appropriate] from the Installation Kit.

2. Route the remote control and monitor cables through the ferrite toroid, then to the rear of the VS1. If practical, pass the cables through the ferrite toroid a minimum of two times (two turns).

3. Connect the appropriate control/monitor cable(s) to the connector(s) described in the "Remote inputs", "Remote outputs" or "Analog outputs" section of the *VS1 Pre-installation Manual* (see Figure 7.1 on page 7-2). To facilitate customer connections, Nautel provides mating plugs (Nautel Part # JS28 and JS31) in the ancillary kit for the REMOTE I/O-A (A1J2A) and REMOTE I/O-B (A1J2B) D-sub connectors on the rear of the VS1.

4. If you are using web based control for the transmitter, connect your network or laptop through an Ethernet (shielded Cat5) cable to the LAN (A1J8A) connector (see Figure 7.1 on page 7-2).

Figure 7.1: Control and Monitoring Connections



5. If you are using an external interlock for the transmitter, route a shielded cable to the rear of the VS1. Connect the shielded cable between pins 19 and 20 of the D-sub connector that mates with REMOTE I/O-A (A1J2A) (see Figure 7.1 on page 7-2). To facilitate customer connections, Nautel provides a mating plug (Nautel Part # JS28) in the ancillary kit for the REMOTE I/O-A (A1J2A) D-sub connector on the rear of the VS1.

> *Note:*
> *An interlock jumper (Nautel Part # 211-5060) is provided in the Installation Kit. It is intended to plug into the* REMOTE I/O-A (A1J2A) *connector on the rear of the VS1. This jumper cannot be used if you are using a D-sub connector to make other remote I/O connections. Instead, you must solder a jumper between pins 19 and 20 of the mating connector (Nautel Part # JS28, provided in the ancillary kit).*

Section 8: Commissioning

WARNING: Before applying AC power and turning on the transmitter, you must customize some circuits to the station's power source and operating requirements. Do not perform pre-commissioning unless you are a station engineer or a competent electronics technician.

The transmitter contains solid-state devices that may be damaged if subjected to excessive heat or high-voltage transients. Ensure that circuits are not overdriven or disconnected from their loads while turned on.

The transmitter was precisely calibrated and tested during manufacturing. Do not change any adjustments other than those specified.

This section contains the following procedures:

- Pre-Commissioning - see page 8-2
- Commissioning - see page 8-3
  - Turning on the transmitter - see page 8-3
  - Going On-Air - see page 8-6
- Network Setup - see page 8-7
- Changing the OS Password - see page 8-9

Pre-Commissioning

1. Terminate the transmitter's RF output into a precision, 50 Ω, resistive dummy load that is able to dissipate 1400 W.

2. If you are using an external FM exciter as the RF drive source, configure the VS1 as follows:

   - Remove the VS1's top cover.
   - Disconnect BNC connector W5P1 from A1J14 of the exciter/control PWB and connect it to RF DRIVE IN (J1) on the inside of the rear panel.
   - Install the VS1's top cover.
   - Use an appropriate coaxial cable to connect the RF drive output of the external exciter to the RF DRIVE IN (J1) connector. Observe the maximum RF drive input restriction [+10 dBm (10 mW)] on the label next to the connector.
   - Configure the VS1's front panel UI for an external exciter (see "Turning on the transmitter" on page 8-3).

3. Verify all required program inputs are connected to the rear of the VS1.

WARNING:
IF A JUMPER IS PLACED BETWEEN EXTERNAL INTERLOCK PINS 19 AND 20 OF THE REMOTE I/O-A (A1J2A) CONNECTOR ON THE REAR OF THE VS1, SAFETY FEATURES CONTROLLED BY THE EXTERNAL INTERLOCKS WILL BE DISABLED. A FAIL SAFE METHOD OF ALERTING PERSONNEL TO THIS FACT SHOULD BE IMPLEMENTED. VOLTAGES WHICH ARE DANGEROUS TO LIFE WILL BE PRESENT ON THE RF OUTPUT STAGES AND THE ANTENNA SYSTEM IF THE TRANSMITTER IS TURNED ON.

4. Close the external interlock (if installed). If an external interlock is not installed, simulate the closing of the external interlocks by applying a short circuit between pins 19 and 20 of the REMOTE I/O-A (A1J2A) connector on the rear of the VS1.

Note:
An interlock jumper (Nautel Part # 211-5060) is provided in the installation kit. It is intended to plug into the REMOTE I/O-A (A1J2A) *connector on the rear of the VS1. This jumper cannot be used if you are using a D-sub connector to make other remote I/O connections. Instead, you must solder a jumper between pins 19 and 20 of the mating connector (Nautel Part # JS28, provided in the ancillary kit).*

Commissioning

Turning on the transmitter

1. Switch on the ac power at the service entrance. Turn on the transmitter by toggling the POWER switch on the rear of the VS1 to the **I** position.

2. Follow the instructions on the front panel display (see Figure 8.1) to perform the first-time setup of the VS1, including selecting the frequency, output power and audio source.

Figure 8.1: First Time Setup Initial Screen

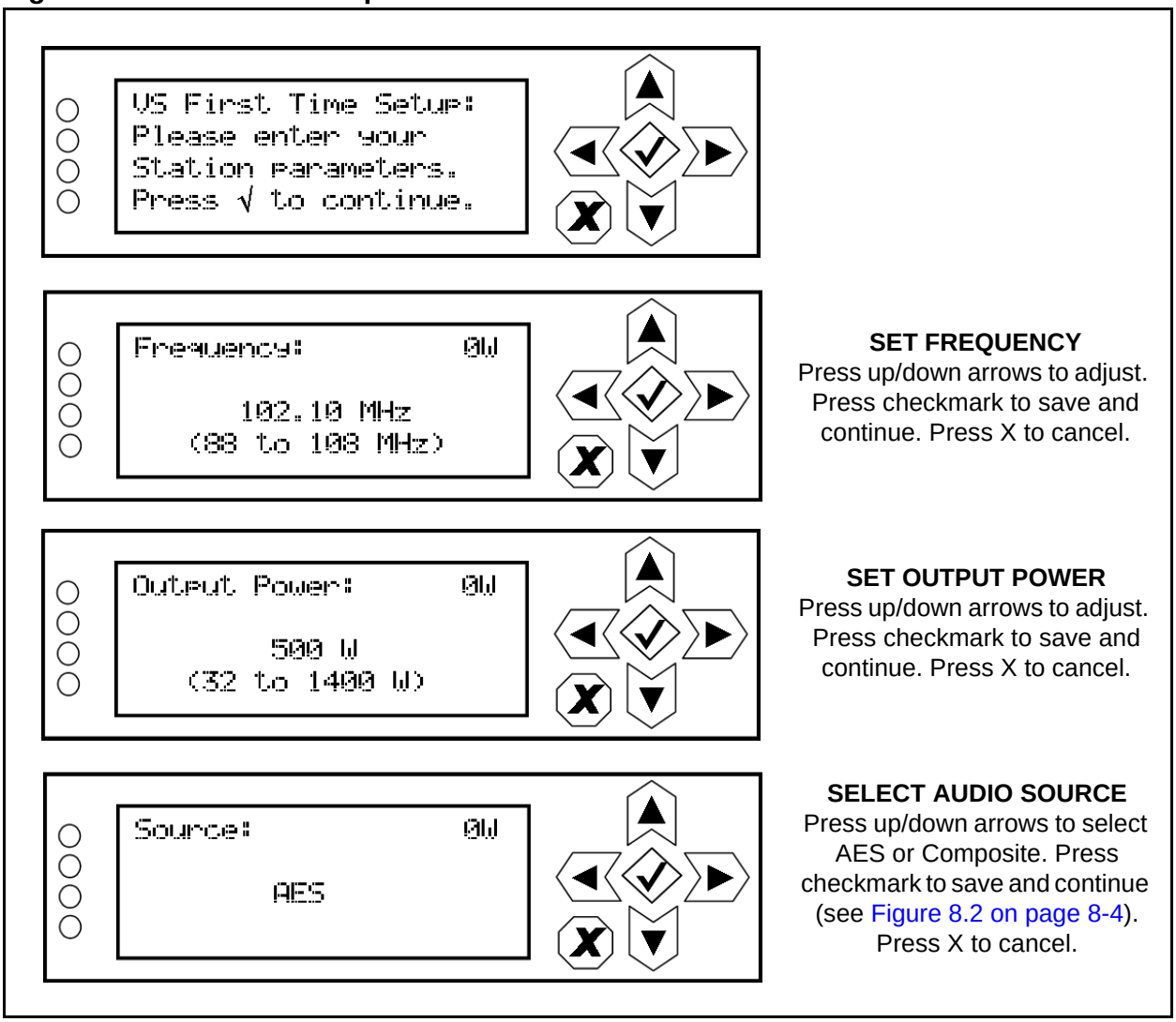
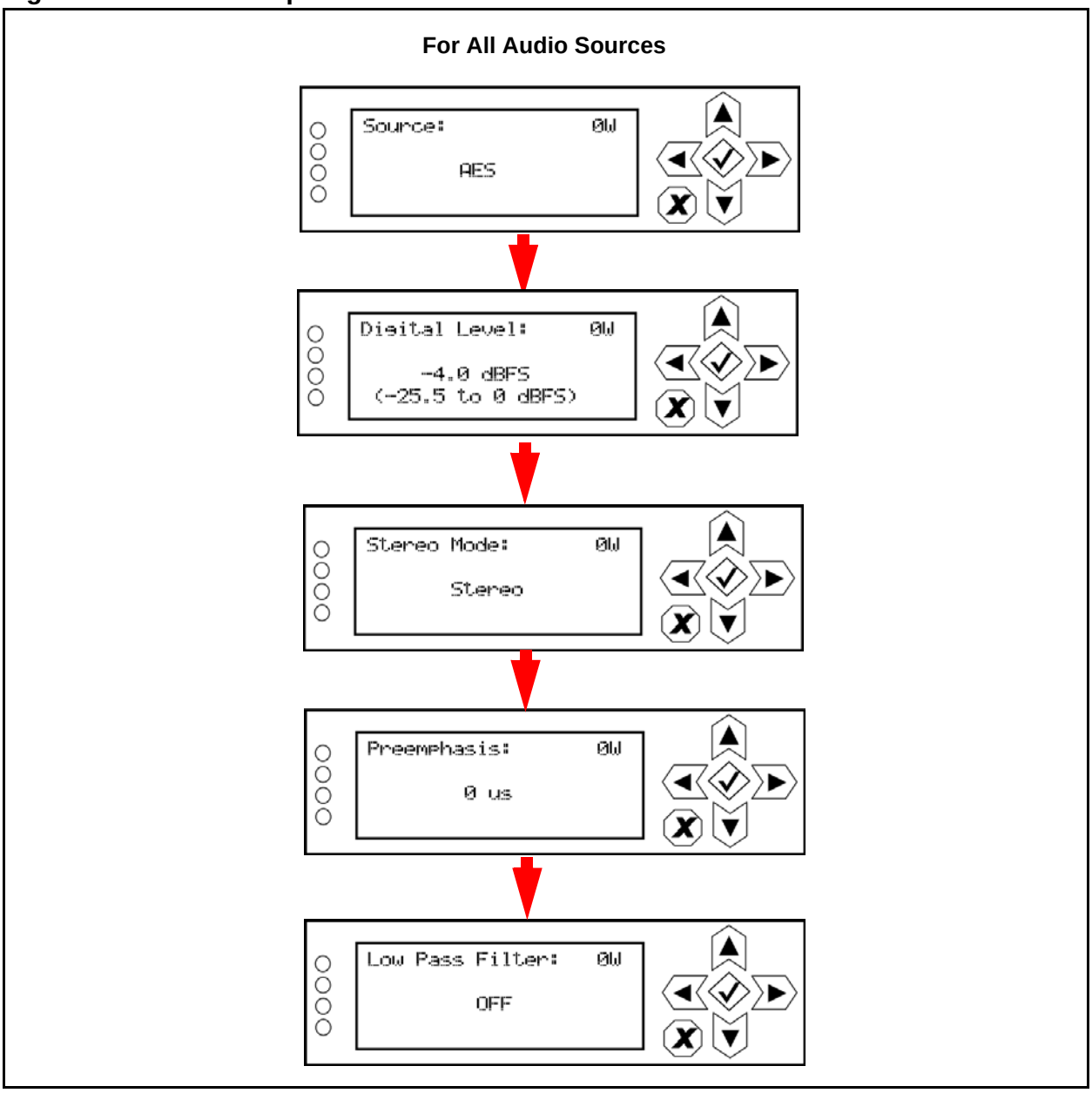
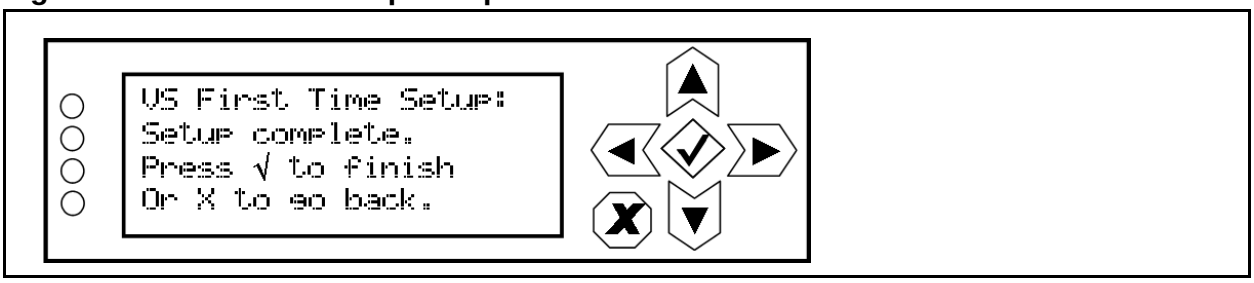


Figure 8.2: Audio Setup Screens



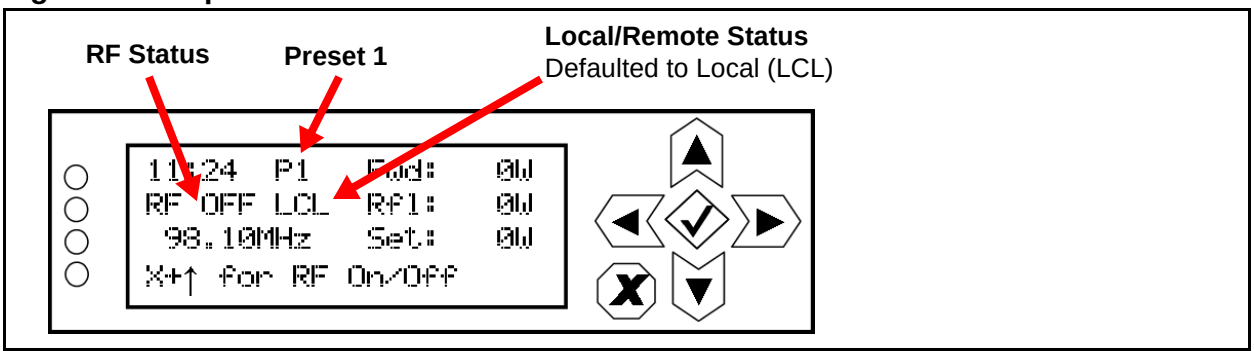
3. When selecting the audio source from the initial start-up screens, users have three options - AES, MPX over AES, and Audio Player. Use the up and down arrows to toggle between source options, then press the checkmark button to select the desired source. Continue to the next associated audio screens, noting they are different depending on the audio source type (see Figure 8.2). Edit values using the up and down arrows, and select using the checkmark button.

Figure 8.3: First Time Setup Completion Screen



4. When the audio setup in Step 3 is complete, the front panel should display a setup completion screen (see Figure 8.3). Press the cancel (X) button to go back to the editing screens. Press the checkmark button to finish the setup, which creates a new preset for the VS1 (preset 1 or P1). The top level screen (see Figure 8.4) will be displayed.

Figure 8.4: Top Level Screen



5. Enable the VS1's RF output by pressing the cancel (X) button and the up arrow button simultaneously. The RF status displayed on line 2 of the top level screen should change to RF ON. The VS1 should be operating at the preset parameters defined for preset 1 (P1).

6. Check the four LEDs on the left-hand side of the front panel display. They should all be green, indicating normal operation. If not, check for alarms on the front panel's Main Menu -> View Status -> View Alarms screen. See the *VS1 Operation and Maintenance Manual* for detailed information.

7. Go to the Main Menu -> System Settings -> Factory Settings -> Calibration -> Cal Values screen. Enter Fwd Scale (forward power scale factor) and Rfld Scale (reflected power scale factor) screens and record the scale factor calibration value for each. Store this information in case you need to replace the exciter/control PWB.

8. If you are using an external exciter (connected in "Pre-Commissioning" on page 8-2), navigate to the Main Menu -> System Settings -> HW Config-> Installed Exc screen. Select External FM Exciter and press checkmark to save and continue.

Going On-Air

WARNING:
If a jumper is placed between external interlock pins 19 and 20 of the REMOTE I/O-A (A1J2A) connector on the rear of the VS1, safety features controlled by the external interlocks will be disabled. A fail safe method of alerting personnel to this fact should be implemented. Voltages which are dangerous to life will be present on the RF output stages and the antenna system if the transmitter is turned on.

Important: Before going on the air, if you want the safety interlocks to operate properly, the shorting jumper installed in "Pre-Commissioning" on page 8-2, Step 4 should be removed.

1. Switch off the ac power using the POWER switch on the rear of the VS1.
2. Connect the transmitter's RF output to an antenna system.
3. Switch on the ac power using the POWER switch on the rear of the VS1.
4. Use the front panel display to begin transmitter operations. For detailed instructions, refer to the *VS1 Operation and Maintenance Manual.*

WARNING:
If you are not planning to use DHCP (i.e., your network does not have a DHCP server or you are connecting directly to a laptop) users should set DHCP to OFF. This action will remove the alarm: ARM Network Down. This action can be completed via the following path from the front UI panel path: User Settings -► Network Setting -► DHCP.

Network Setup

If you wish to remotely control the transmitter via a network or directly through a laptop, configure your network parameters as follows:

> *Note:*
> *Network setup is also required to change the OS password (see "Changing the OS Password" on page 8-9).*

1. Verify that the networking (DHCP on or off) decisions outlined in Section 2, "Pre-installation tasks" of the Pre-Installation Manual have been made. To use DHCP, you must have a visible DHCP server on your network. If you are not planning to use DHCP (i.e., your network does not have a DHCP server), you must obtain an IP address and netmask from your network administrator as well as gateway and nameserver(s) as applicable

2. From the front panel UI, go the Main Menu -> User Settings -> Network Settings screen (see Figure 8.5 on page 8-8).

3. Ensure your network or laptop is connected to the LAN (A1J8A) connector on the rear of the VS1.

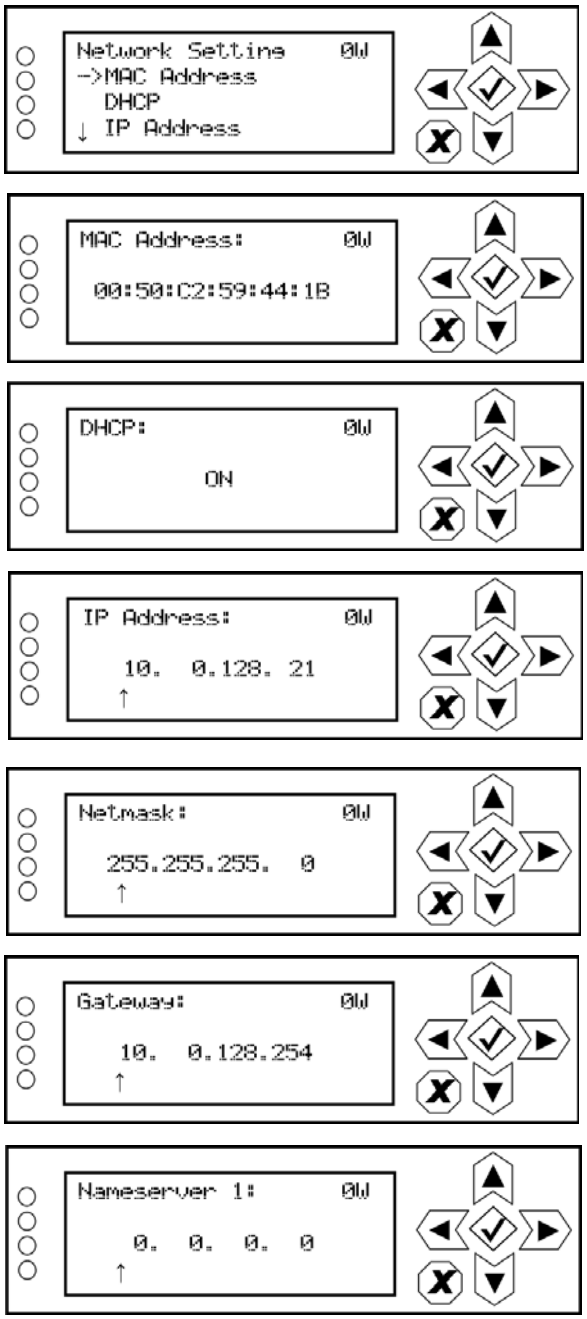
4. If your network has a DHCP server and DHCP is set to ON (factory default), IP addresses will be automatically assigned. Verify this has occurred by viewing the IP Address and Netmask address sub-menus (Gateway and Nameserver addresses are optional; view as applicable). The MAC Address field cannot be modified.

5. If your network does not have a DHCP server or you wish to assign static IP addresses (i.e., direct connection with a laptop), set DHCP to OFF. Enter the appropriate addresses in the IP Address, Netmask, Gateway and Nameserver sub-menus, as applicable.

> *Note:*
> *Refer to "Network Setup" on page 2-127 of the Operations and Maintenance Manual for more information.*

6. Once you have established an IP address, you can login to the VS1's advanced user interface (AUI), which allows you to remotely control and monitor the VS1. See the "Operating the transmitter" section of the *Operations and Maintenance Manual* for detailed AUI information).

Figure 8.5: Network Settings screen



Set during factory testing; cannot be modified

Set to ON if your network has a DHCP server. Automatically assigns IP, netmask, gateway and nameservers.
Set to OFF if you do not have a DHCP server or if you wish to assign static addresses.

Typical netmask address shown. Consult with your network administrator.

Specify a nameserver (or DNS) to enable the use of host names. If no nameserver is entered, only direct IP addresses can be used to configure the email server and any live streams such as Livewire or Shoutcast.

All addresses shown are for reference purposes only

Changing the OS Password

For security purposes, the OS (operating system) password must be changed. To do this, you will need a way to remotely connect to a Linux computer using SSH. PuTTY is a common utility for Windows users (available at ftp://www3.nautel.com/Utilities/puTTy/putty.exe; if unable to open this link, use a search engine to find new URL), while Linux users can use 'ssh' from the command line. Change the OS password as follows:

1. Connect to the transmitter IP address using your selected SSH client.

2. Login with username root and the OS Password recorded in your Proof of Performance documents.

3. At the prompt, type the command passwd. This is the Linux command to change your password.

4. Enter and confirm your new password.

5. Record your new password on the Proof of Performance document provided with the transmitter. If you would like Nautel to track your password for support purposes, please email support@nautel.com with your new information.

6. Close the console window.

Section 9: Parts and tools

This section describes parts associated with the VS1 transmitter, and tools needed during installation and routine operation. Topics include:

- Parts supplied by Nautel - see page 9-2
- Parts not supplied by Nautel - see page 9-2
- Parts ordering - see page 9-2
- Module replacement program - see page 9-3
- Tools for installation - see page 9-3

Contacting Nautel

You can reach Nautel to order parts or for technical assistance at:

Nautel Limited
10089 Peggy's Cove Road
Hackett's Cove, NS Canada B3Z 3J4
Phone: +1.877.628.8353 (Canada/US)
+1.902.823.5100 (International) Fax: +1.902.823.3183

Email: support@nautel.com

Web: www.nautel.com

Parts supplied by Nautel

Installation kit

An installation kit is shipped with the VS1. This kit contains items needed during the installation process. The kit includes toroids, an interlock jumper, ac power cord, and miscellaneous transmitter mounting hardware.

Ancillary parts kit

An ancillary parts kit is shipped with the VS1. This kit contains items that may be needed for future maintenance. The kit includes spare fuses, D-sub mating connectors, miscellaneous hardware, tyraps and some installation tools.

Documentation

See “VS1 transmitter manuals” on page xii.

Parts not supplied by Nautel

Some parts and materials required to complete installation are not supplied by Nautel. The parts you need vary with the installation requirements. The list of parts you normally provide yourself during installation include:

- A suitable 50 Ω RF output coaxial cable, terminated by the proper connector, complete with center male connector at the transmitter end.
- All external control and monitor wiring, including the associated terminating devices, conduit and conduit clamps.
- All electrical power cables, including conduit, terminating devices, and conduit clamps.

Parts ordering

You can order replacement parts from your Nautel sales agent, or directly from Nautel through the Nautel website.

Module replacement program

Nautel offers a module replacement program for customers who require expedited servicing and replacement of faulty modules. The module replacement program provides immediate replacement of failed modules with refurbished modules.

- The replacement module is shipped to the customer as soon as the customer reports the failure. The customer then returns the failed module to Nautel using the same shipping package.

Tools for installation

The tools you need during transmitter installation include the following:

- Philips screwdrivers, size #2 (suitable for M5 hardware)
- 8 mm nut driver (suitable for M5 hardware)
- Pliers
- Wire cutters
- Electrician's knife

Section 10: Pre-installation / Installation assistance

Nautel provides a number of support options to help you during pre-installation planning and preparation:

- Pre-installation consulting
- Installation and commissioning service
- Online documentation - see page 10-3
- On-site support - see page 10-3
- Training - see page 10-4
- Standard warranty - see page 10-5
- Extended warranties - see page 10-8

Pre-installation consulting

Nautel field support specialists are available to answer questions and work with you to ensure that your site will be ready for the installation of your VS1 transmitter. For support, contact Nautel Customer Service and request assistance ("On-site support" on page 10-3).

Installation and commissioning service

Nautel offers an installation and commissioning service to customers who want assistance with configuring and commissioning a new Nautel transmitter. After the customer completes the transmitter assembly and installation, Nautel technical personnel will spend up to three days on-site to help make the ac power, RF and remote connections, and to assist with the configuration and testing of Nautel equipment.

The customer is responsible for ensuring that the following stages of installation have been completed, prior to the arrival of Nautel personnel:

- Ac power wiring for the transmitter has been installed and connected at the breaker panel or the building's service entrance. If local electrical codes allow Nautel personnel to connect the transmitter to the ac supply, using the customer's cable, that task is included in this service. Otherwise, the customer must ensure that an approved electrician is present for this task.

- The customer has prepared the RF coaxial cable – used to connect the transmitter to the antenna – and installed the required connector. The customer has also installed the RF coaxial cable in place and connected it to the antenna, while leaving the transmitter end of the cable unconnected.

- Where required, all remote control and monitoring cables have been installed and connected to the station equipment (e.g., modulation monitor, frequency monitor, and power meter).

- The site has been made ready for the equipment, and adequate protection against lightning and lightning-induced transients has been provided.

- The transmitter has been unpacked, closely checked for any damage caused by shipping, and then assembled.

- The following test equipment has been made available at the site:

  - Two-channel oscilloscope (with probes)
  - Audio signal generator
  - Distortion analyzer
  - Spectrum analyzer
  - Modulation monitor
  - Frequency counter
  - 50 Ω test load (rated for 150% of carrier power, VSWR less than 1.1:1)

Nautel's service representative takes full responsibility for commissioning the transmitter, validating all external interfaces (i.e., the ac supply, RF output, remote control and monitoring equipment) and checking out the equipment prior to activation. The service representative turns on the transmitter, performs all adjustments and set-up procedures, and carries out *proof of performance* tests at the site. These tests ensure that the transmitter is operating normally in compliance with its specifications. The service representative also provides a demonstration and a short explanation of the operation of the transmitter. Finally, the customer signs an *Acceptance of Installation Certificate* that provides feedback to Nautel regarding the commissioning service.

Online documentation

Nautel provides documentation online to customers, letting you familiarize yourself with specifications, operation, maintenance and troubleshooting prior to the delivery of your equipment. (Documentation is provided standard on USB and optionally in paper binders that are delivered with the transmitter.)

On-site support

If you require on-site assistance, Nautel's field support specialists can help you prepare your site and ensure that your VS1 transmitter installation can proceed as quickly as possible. For more information about on-site support, including scheduling and pricing, contact Nautel Customer Service:

- Telephone: +1.902.823.5100
- Fax: +1.902.823.3183
- Email: support@nautel.com

After business hours (Atlantic time or Eastern time in North America), requests sent by fax or email will be acknowledged within one working day.

Training

Nautel's SBE-certified broadcast training programs satisfy your day-to-day knowledge requirements. Students participating in Nautel's broadcast transmitter or RF basics training programs earn one SBE credit for each completed day of training.

Nautel's comprehensive selection of training programs will help customer staff develop valuable skill sets, reduce downtime, and make the most of the customer's technology investment.

Nautel training programs are made up of individual modules that can be 'mixed and matched' to meet the customer's specific training needs. All Nautel training courses are available at the Nautel Training Center. Training can also be provided at the customer's facility, and training the customer's technical staff on the customer's transmitter.

All training courses at the Nautel Training Centre combine classroom and hands-on laboratory work to ensure a balanced learning experience.

Nautel training courses feature:

- Limited class sizes to ensure maximum student participation and access to equipment
- Emphasis on need-to-know, day-to-day knowledge
- Labs that focus on the tasks most often performed at the transmitter site.

Many of our classes also include diagnostic lab exercises.

Standard warranty

Nautel guarantees all mechanical and electrical parts of Nautel Transmitters for a period of forty-eight months, and all other Nautel manufactured equipment (including Importers and Exporters) 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 sub-assembly 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 or 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.

Technical assistance

Nautel's field service department provides telephone technical assistance on a 24 hour, seven days a week basis. Requests by other media (fax 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:

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10089 Peggy's Cove Road
Hackett's Cove, NS Canada B3Z 3J4
Phone: +1.902.823.3900 or
Toll Free: +1.877.6NAUTEL (6628835) (Canada & USA only)
Fax: +1.902.823.3183

Nautel Inc.
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Fax: +1.207.947.3693

Customer Service (24 hour support)
+1.877.628.8353 (Canada & USA only)
+1.902.823.5100 (International)

Email: support@nautel.com
Web: 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 provides - for North American customers only - a factory rebuilt, module exchange service which takes full advantage of the high degree of module redundancy in Nautel equipment.

For complete details on this service, see http://support.nautel.com/policies/repairs-exchange/

Extended warranties

Nautel's standard four-year warranty provides excellent coverage and satisfies most customers' needs. However, if you want extended coverage, Nautel offers one and two-year Extended Warranty Plans to cover electrical and mechanical repairs or replacements for all Nautel equipment.

Coverage

The Extended Warranty Plan includes:

- A module exchange program for many common modules and circuit boards (North America only)
- Toll-free hotline (North America only)
- Necessary labor performed by Nautel authorized personnel to repair the product back to factory specifications
- Necessary components
- Modifications to correct performance problems
- Return shipping.

Details

Extended Warranty Plans must be purchased prior to the expiration of original four-year warranty.

One-year Extended Warranty Plans add an additional year (12 months) of coverage after the end of the customer's standard four-year warranty. The two-year plan adds an additional two years (24 months).

Only repairs done at Nautel's facilities or by Nautel authorized personnel will be covered by the Extended Warranty Plans.

You must ship faulty products back to Nautel, prepaid, and in the original package or in a package that provides equivalent protection.

Nautel can choose to repair or replace equipment.

Purchasing a one or two-year Extended Warranty Plan

If the transmitter is still covered by its original four-year warranty period, you can contact Nautel by telephone, fax, mail, or email with the model number, serial number and date of purchase.

Once you purchase a Nautel Extended Warranty Plan, you receive an extended warranty plan certificate, plan number, and a toll-free number (North America only) to call for any service-related issues.

Using the Extended Warranty Plan

Contact Nautel's Canadian or U.S. service facility by phone, fax, or email as soon as a problem occurs. The following will be required when contacting Nautel:

- Extended warranty plan number
- Product model number
- Serial number
- Brief description of the problem

If Nautel's service technicians are unable to solve the problem over the telephone, Nautel will give you an RMA number. You then return the module or circuit board to a Nautel service facility so that Nautel can provide a replacement. (Do not ship a component back to Nautel until you have an RMA number.)

Section 11: List of terms

This section defines some of the terms that are used in Nautel documentation.

AES-EBU. Audio Engineering Society/European Broadcasting Union (AES/EBU) is the name of a digital audio transfer standard. The AES/EBU digital interface is usually implemented using 3-pin XLR connectors (the same type connector used in professional microphones). One cable carries both left-channel and right-channel audio data to the receiving device.

ARM. Advanced RISC (Reduced Instruction Set Computer) Machine. The specific ARM used in VS transmitters is ARM926, and is used for remote AUI functionality.

AUI. The Advanced User Interface is the web interface that allows for extensive control and monitoring of the transmitter.

Cutback. A reduction in RF output power, caused by the occurrence of multiple shutbacks within a pre-defined period.

Cycling ac power. Turning off (disabling), then turning on (enabling) the ac power source.

DHCP. Dynamic Host Carrier Protocol.

DSP. Digital Signal Processing. Used for transmitter control and signal processing.

EEPROM. Electrically Erasable Programmable Read-Only Memory.

Foldback. A reduction in RF output power, caused by adverse load conditions (high VSWR). No shutbacks or cutbacks have occurred.

Intermediate Power Amplifier (IPA). Refers to circuitry within the transmitter that amplifies the exciter's RF output to a level sufficient to drive the final RF amplifiers.

Latching alarm. An alarm that, while active, keeps the transmitter in an 'RF inhibited' state. This type of alarm (e.g., High SWR Shutdown) require a reset - via the front panel or remote AUI - to attempt to restore transmitter operation.

LED. Light Emitting Diode (also referred to as lamp).

LUT. Look-Up Table.

MPX. Refers to the multiplexed baseband signal. Also referred to as the composite signal.

Preset. A setting that controls power level, frequency and audio parameters. The VS1 allows you to pre-program multiple presets.

PWB. Printed Wiring Board.

Shutback. A complete, but temporary loss of RF output power, caused by any one of a variety of faults, including high VSWR, high reject load power, RF drive failure, or an open external interlock.

Shutdown. A complete and permanent loss of RF output power. Typically follows repeated cutback, foldback or shutback events.

SPI. Serial Peripheral Interface. A synchronous serial data link standard that operates in full duplex mode. Devices communicate in master/slave mode where the master device initiates the data frame. Multiple slave devices are allowed with individual slave select (chip select) lines. Also referred to as a "four wire" serial bus.

Surge protection panel. An electrical panel that protects equipment from electrical surges in the ac power supply, antenna or site ground caused by lightning strikes.

VSWR. Voltage standing wave ratio. This is an expression of the ratio of forward voltage to reverse voltage on the feedline and antenna system. An ideal VSWR of 1:1 provides maximum transmitter-antenna efficiency.

VS1 PRE-INSTALLATION MANUAL

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