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.
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## Release Control Record

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<th>Date</th>
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<tr>
<td>0.1</td>
<td>2010-10-01</td>
<td>Initial release of manual</td>
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</tbody>
</table>
ABOUT THIS MANUAL

This manual provides technical information needed when operating, maintaining and troubleshooting an VS2.5 transmitter. This manual is intended for use by transmitter operators and field technicians.

USING THIS MANUAL

If you are responsible for configuring or operating a transmitter, see Section 2, “Operating the transmitter” on page 2-1 and Section 3, “Using the event log” on page 3-1.

If you are performing scheduled maintenance, or planning your maintenance schedule, see Section 3, “Routine maintenance” on page 3-1.

If you are performing non-standard maintenance such as a software upgrade, see Section 4, “Non-standard maintenance” on page 4-1.

PERFORMING PROCEDURES

When using procedures in this manual, perform each step in sequence.

- If you are asked to see another section of this manual, or another document, refer to that section or document for additional information, then continue the procedure.

- If you are asked to go to another step within the procedure, jump directly to that step without performing the intervening steps.

- If you are asked to go to another section or document, stop the procedure and perform the tasks described in the other section or document.

- If you are asked to check a voltage, use a digital voltmeter and test the voltage relative to ground (unless otherwise instructed).

- If you are asked to check a signal, use an oscilloscope and test the signal relative to ground (unless otherwise instructed).
Technical Support

Nautel offers technical support to customers over the Internet and by telephone. Nautel’s customer support team will answer your questions and work with you to identify and resolve problems.

For 24-hour technical support, call toll free at 1.877.628.8353 (in USA and Canada only) or call 1.902.823.5100 (international) or find us on the Internet at http://www.nautel.com.

For parts and tools information, see “Parts and tools” on page 9-1 of the VS2.5 Pre-Installation Manual.

For extended warranty information, see “Pre-installation assistance” on page 10-1 of the VS2.5 Pre-Installation Manual.

VS2.5 Transmitter Manuals

The VS2.5 documentation suite includes the following documents:

**VS2.5 Pre-installation Manual, VS2.5-PREINST.** Provides instructions and reference information needed when planning and preparing for the installation of a VS2.5 transmitter.

**Nautel Site Protection Manual.** Provides detailed information about protecting your site from lightning-related hazards.

**VS2.5 Installation Manual, VS2.5-INST.** Provides instructions and reference information needed when installing a VS2.5 transmitter.

**VS2.5 Operating and Maintenance Manual, VS2.5-OPS-MAINT.** Provides instructions for operating, maintaining and troubleshooting a VS2.5 transmitter. It also provides reference information needed when performing diagnostic procedures.
VS2.5 Operations and Maintenance Manual

VS2.5 Troubleshooting Manual, VS2.5-TROUBLE. Provides detailed technical information about the VS2.5 transmitter, including electrical schematics and mechanical drawings.

Nautel Website / Online Resources

The Nautel website provides useful resources to keep you up to date on your VS2.5.

Nautel User Group (NUG)

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.

Documentation: Online and Printed

The website’s NUG section provides online access to all the documentation for your VS2.5. Documentation is provided in Acrobat (PDF) format. You can use the documentation online or print the sections that you need.

When using online documents:

- Click on blue text (hyperlinks) to jump to a related section, or to get additional information (e.g., view a term’s definition).
- To search a document to find keywords, use Find in Acrobat Reader’s Edit menu.
- To quickly find a specific section, click the section in the PDF file’s Bookmarks list.

When using printed documents:

- To find a specific term, go to the List of Terms section near the end of the manual.
ABOUT SAFETY

All Nautel transmitters are designed to meet the requirements of *EN60215, Safety Requirements for Radio Transmitters*.

The philosophy of *EN60215* is that the removal of any cover or panel that can only be opened using a tool is a maintenance activity, and that any person performing a maintenance activity is expected to be trained for that activity. Under *EN60215*, it is assumed that trained personnel will be knowledgeable and will take precautions such as removing all power to the transmitter before accessing its components.

ELECTRICAL HAZARDS

To remove power from the transmitter, switch off and lock out the ac power.

**DANGER - HIGH VOLTAGE**

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

**WARNING: IT IS NOT ENOUGH TO SWITCH OFF RF POWER. THE POWER LINE IS STILL CONNECTED. DISCONNECT AND LOCK OUT THE UPSTREAM SUPPLY BEFORE SERVICING.**

After turning off the ac power, always perform a measurement to confirm that the power is off before touching anything within the transmitter. If the wrong breaker was opened, the equipment will be live.

**WARNING: DO NOT USE AN ORDINARY MULTIMETER TO CHECK FOR VOLTAGE, SINCE IT MAY HAVE BEEN LEFT INADVERTENTLY ON THE AMP (A) RANGE, TRIGGERING A SHORT AND AN ARC BLAST THAT COULD RESULT IN SEVERE BURNS AND EVEN DEATH.**

Use only a non-contact voltage probe or a safety voltmeter (available from vendors such as Fluke, Ideal, and Teagam).

Use a proper lockout procedure to ensure that another worker cannot accidentally reapply power while you are performing maintenance on any part of the transmitter or site.
LIGHTNING HAZARDS

Before opening the transmitter and touching internal parts, remove and solidly ground the antenna connection.

**WARNING:** IT IS NOT ENOUGH TO GROUND THE ANTENNA TERMINAL WITH THE ANTENNA STILL CONNECTED. EVEN A SMALL IMPEDANCE IN THE GROUND STRAP WILL RESULT IN LETHAL VOLTAGES DURING A LIGHTNING STRIKE.

RF HAZARDS

A serious RF hazard and very high voltages exist in the vicinity of the antenna and its networks during normal operations.

TOXIC HAZARDS

Some devices used in this equipment contain beryllium oxide ceramic, which is non-hazardous during normal device operation and under normal device failure conditions. These devices are specifically identified with “(BeO)” in the Description column of the Troubleshooting 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.

PHYSICAL HAZARDS

**DANGER - MOVING BLADES**

Fan blades can cause injury. Lock out power before removing safety features.

OTHER HAZARDS

Ensure that appropriate fire alarms and fire extinguishers are available. Extinguishers must be suitable for use on electrical fires.

Many other site safety risks exist. It is beyond the scope of this manual to identify all the risks and procedures.
SAFETY PRECAUTIONS

This section provides very important information about protecting the safety of personnel and equipment:

- Personal safety - see page xv
- Site safety - see page xvi
- Equipment safety - see page xviii

PERSONAL SAFETY

TRAINING

The training of any personnel who will have physical access to the site or the transmitter is very important. Personnel must be familiar with the transmitter, so that they can avoid physical danger, and be aware of hazards to themselves and the equipment.

Nautel offers a number of training courses covering the basic fundamentals of RF systems and transmitters, and the operation and maintenance of the transmitter. For more information about available courses and schedules, go to the Nautel website at http://www.nautel.com/Training.aspx, or ask your Nautel sales representative.

SITE ORIENTATION

When you give personnel access to the transmitter site (e.g., hiring new personnel, or giving access keys to personnel), perform a site orientation to ensure that they are familiar with the site, on-site procedures, and on-site hazards. Cover the following topics:

- Securing the site (locking doors and fences) to prevent unauthorized access
- How and when to call for technical support or emergency assistance
- Areas of the site and pieces of equipment that are off limits
Voltage awareness

Ensure that all personnel that are able to access areas with high voltage circuits or high field strengths are aware of the hazards associated with high voltage. Cover the following topics:

- High voltage or high field strength areas where caution is required
- Physical risks of electric shock
- Risks for personnel with pacemakers or other medical implants
- Induced voltages in high field strength areas
- On-site risks during thunderstorms and lightning strikes
- Operation of safety interlocks (if installed)

First aid

Nautel does not offer first aid training, since the hazards associated with high voltage and RF energy are not specific to the transmitter. However, the customer should provide first aid training to all personnel who have access to the transmitter site. First aid training should include CPR, care of burns, artificial respiration, and defibrillation if specific equipment is available on-site.

Site safety

Controlling access

Transmitters and antennas generate and carry dangerous voltages that can be harmful or fatal. It is very important that you control access to the site and its equipment. To secure your transmitter site, use:

- Locking steel or security doors to prevent casual access
- A perimeter fence to keep trespassers away from the antenna system and feedline
- “No Trespassing” signs
- An alarm system
**Marking hazards**

Place warning signs close to any hazardous areas or systems (e.g., the feedline or the antenna system). Make the signs large enough that they cannot be missed. Provide signage in all languages used in the region. These signs are intended not only for authorized personnel, but also for emergency responders or accidental trespassers.

**Qualifying site personnel**

Make sure that personnel who have access to the site are qualified to work around electronics and high voltage systems.

**AC power protection**

You should take steps to protect equipment from surges (over-voltage spikes) on the ac power lines. Surges may occur during thunderstorms, or because of malfunctions in the electrical distribution grid. Surge suppressors and ac power conditioners can prevent serious damage to your on-site equipment, including the transmitter.

**RF protection**

Transmitters and their antenna systems create intense radio frequency fields at the transmitter site, particularly near the feedline, antenna and tower. At some sites, these fields may cause biological effects, including the heating of body tissues. Intense fields can also create dangerous high voltages on ungrounded, conductive surfaces and objects. At certain points where high voltage conductors come close to grounded conductors (e.g., at feedline junctions or on the tower), dangerous electrical arcing or flashovers can occur. It is very important that you take the following steps to prevent damage to equipment or personnel due to RF fields:

- Use safety interlocks to de-energize transmitters if personnel open doors or panels accessing high field areas
- Place warning signs in any locations where high fields can occur
- Train personnel about the short-term and long-term hazards of RF radiation
- Physically block access to the area around the antenna system, feedline and tower
- Ground all exposed conductive surfaces or objects in high field areas

The RF connection to the transmitter output can be a serious safety hazard. Connect a 50 Ω test load during installation and commissioning. It is recommended that a switch be used to automatically connect the transmitter to the antenna system without human contact with the transmitting conductors.
Saf ety Interlocks
The transmitter contains an electrical interlock, which is an external circuit that turns off the RF output if any of its switches are opened.

Equipment Safety

Electrostatic Protection
The transmitter’s systems are very rugged and resistant to damage. However, it is possible for damage to occur because of high voltage electrostatic discharges during servicing. Train all service personnel to ground themselves to bleed off any static charge before opening the transmitter or touching any exposed components. Provide a grounding wand or known ground (e.g., a grounded metal table) that personnel can use to discharge themselves.

Surge Protection
Surge protection is recommended for your entire site. However, even if you do not use a surge protector on the service entrance to the site, you should install a surge protector in the transmitter’s ac power feed to prevent over-voltage from entering the transmitter.

Lightning Protection
The transmitter is designed to resist lightning strike damage. However, intense or repeated strikes could damage the transmitter. We recommend that you install lightning suppression on the antenna, tower and feedline to reduce the effect of lightning strikes on the transmitter itself (and to protect the rest of your site equipment and your personnel). For detailed information about lightning protection, see the Nautel Site Preparation Manual, available from your Nautel sales agent, or online from the Nautel website.

Physical Protection
Consider physical hazards to equipment at your site, including the transmitter. Ensure that equipment is protected from weather (e.g., rain or flooding), even during extreme weather events. Place equipment so that it is not in the path of swinging doors or high-traffic areas. Do not allow wheeled items like office chairs or tables with wheels in the transmitter room, as these may damage equipment if accidentally pushed or knocked over. Do not place the transmitter under water pipes, drains, or sprinklers. Keep any equipment that generates heat, like the transmitter, away from flammable materials like ceiling panels, cubicle dividers, and curtains.
SECTION 1: DESCRIPTION

Refer to the functional block diagram: Block Diagram - VS2.5 Transmitter - see page 1-7.

This section provides a high-level description of the transmitter’s key sections. The transmitter circuitry is subdivided into four basic stages:

- Ac-dc power stage
- Exciter/control stage - see page 1-3
- RF drive stage - see page 1-4
- RF power stage - see page 1-4

VS2.5 ELECTRICAL SCHEMATICS

Some descriptions in this section refer to electrical schematics (SD-#s). These are located in Section 5 of the VS2.5 Troubleshooting Manual.

AC-DC POWER STAGE

See also electrical schematic Figure SD-1.

The ac-dc power stage converts the ac power source to a positive dc voltage (PA volts) for the transmitter’s PA PWBs. The transmitter accepts a 1-phase ac input voltage that is between 180 and 264 V ac (208 V ac nominal).

The ac-dc power stage provides +48 V to operate the RF power stage’s pre-amp/IPA PWB, as well as the cooling fans and the low level dc voltages (+15 V and +5 V) for the control/monitoring circuitry used throughout the transmitter.

The ac-dc power stage consists of three ac power entrance terminal blocks (TB1, TB2 and TB3), circuit breaker CB1, three power supply modules (U1, U2 and U3), +48 V power supply module U4 and PS distribution PWB A2.
POWER SUPPLY MODULES

See also electrical schematic Figure SD-1. The power supply modules (U1, U2 and U3) convert the ac input voltage to a regulated dc supply (PA volts) for the PA PWBs (A6 through A9) in the RF power stage. The power supply module is rated for a nominal 2000 W and provides an output voltage between 7 and 53 V (typically 48 V). The module regulates the output voltage based on a PA Volts Control input from the exciter/control PWB (A1). The module has a built-in cooling fan, senses excessive temperature conditions, and applies a PS Temp alarm signal to the exciter/control PWB. The module also senses out-of-regulation on the ac input and dc output, and applies PS Ac Fail and PS Fail alarm signals to the exciter/control PWB. All three alarm conditions cause the power supply to shut itself down, thus inhibiting the transmitter’s RF output.

+48 V POWER SUPPLY

See also electrical schematic Figure SD-1. The +48 V power supply module (U4) converts the ac input voltage to a regulated +48 V dc supply for the pre-amp/IPA PWB, cooling fans, and the dc-dc converters on the power supply distribution PWB, which provide +5 V and +15 V to circuitry throughout the transmitter.

PS DISTRIBUTION PWB

See also electrical schematics Figures SD-1 and SD-3. The PS distribution PWB (A2) interfaces between the dc power supplies (power supply module and +48 V supply) and the rest of the transmitter. It distributes the power supply module output to the PA PWB, and distributes the +48 V output to the pre-amp/IPA PWB and the cooling fans.

Dc current samples of the PA, pre-amp and IPA power supplies are measured on the PS distribution PWB and provided to the exciter/control PWB over an SPI bus.

Status and alarm outputs from the power supply modules (U1, U2 and U3), consisting of PS Present, PS Ac Fail, PS Temp and PS Fail, are applied to the PS distribution PWB and provided to the exciter/control PWB over an SPI bus.

A fan enable circuit on the PS distribution PWB controls the application of +48 V to the cooling fans in the RF power stage. The exciter/control PWB (A1) provides a Fan Enable signal that enables or disables the fan voltage when the RF power stage is on or off, respectively.

Dc-dc converters on the PS distribution PWB convert the +48 V provided by the +48 V supply to +5 V and +15 V, which is then distributed to circuitry throughout the transmitter.
Exciter/control stage

See also electrical schematic Figure SD-1. Detailed schematics are not included in the Troubleshooting Manual.

The exciter/control stage performs many critical functions for the transmitter. The primary component of this stage is the exciter/control PWB (A1).

The exciter portion of the exciter/control PWB performs the following functions:

- accepts the audio inputs and generates the RF drive signal required to modulate the audio signal at the desired carrier frequency.
- measures the audio input level.
- provides the status of any exciter fault conditions.

The control portion of the exciter/control PWB performs the following functions:

- contains monitoring and protection circuits to prevent transmitter damage under adverse or fault conditions, including high speed SWR protection and interlock/muting.
- monitors the current value of various parameters including cooling fan tachometer outputs, transmitter output forward and reflected power, PA temperature, PA current levels, and PA power supply status signals.
- measures and monitors the output voltage from the power supply modules as well as the low voltage supplies (+15 V and +5 V) and +48 V power supply.
- generates the dc bias signals for the pre-amp, IPA and PA PWBs.
- generates the signals that enable the power supply modules and control its output voltage.
- provides the status of any controller fault conditions.
- an integral DSP performs all audio processing including filtering and FM baseband modulation.
- interfaces with the RF and power supply sections of the transmitter to perform control and monitoring functions.
• provides local and remote interfacing for the transmitter. Local interfacing is performed via the front panel display (U5) - a 4 x 20 character LCD display - and its adjacent keypad. The UI contains a menu-based series of pages that serve specific functions. Similar interfacing, as well as more advanced functionality, is available on a remotely accessed AUI.

Except for the RF drive signal, all signals going between the exciter, RF drive and RF power stages are passed through the interface PWB (A3).

---

**RF Drive Stage**

See also electrical schematics Figure SD-2 and SD-4.

The RF drive stage is comprised of exciter circuitry within the exciter/control PWB (A1), the pre-amp/IPA PWB (A5) and the splitter PWB (A4).

The pre-amp/IPA PWB accepts the low level RF Drive output from the exciter/control PWB (A1). Its RF output is generated by the Pre-Amp V input (set at +48 V) and IPA V input (set at +48 V), as well as the and Pre-Amp Bias output and IPA Bias output from the exciter/control PWB (A1). The RF output level is controlled by the RF input level, generated by the exciter/control PWB. The output of the pre-amp/IPA PWB (nominal 18 W) is applied to a directional coupler on the combiner PWB (A10), which monitors this output level. The directional coupler's sample is applied to the combiner interface PWB (A12). The IPA output is then applied to the input of the splitter PWB (A4). The splitter PWB splits the RF drive signal into four outputs, which are applied to the RF power stage’s PA PWBs (A6 through A9). Cooling air for the pre-amp PWB is provided by fan B3.

---

**RF Power Stage**

See also electrical schematics Figure SD-2 and SD-5.

The RF power stage accepts the intermediate RF drive signal from the RF drive stage and generates the final RF output. It consists of four PA (power amplifier) PWBs (A6 through A9), the combiner PWB (A10), the low pass filter PWB (A11), and the combiner interface PWB (A12).

**PA PWB**

See Figure SD-5. Each PA PWB (A6 through A9) is a push-pull RF power amplifier. It is capable of providing 850 W of RF power in the FM broadcast band (87.5 to 108.0 MHz). The RF output is controlled by the PA V level generated by the power supply module, and the PA Bias output from the exciter/control PWB (A1). The RF output of each PA PWB is applied to an input of the combiner PWB. Cooling air for the PA PWB is provided by fans B3 through B7.
**Combiner PWB**

See Figure SD-2. The combiner PWB (A10) accepts the RF outputs of the four PA PWBs and, along with a hybrid coupler, combines them into a single output. This single output is applied to the low pass filter PWB (A11).

The output of the low pass filter PWB (A11) is then applied to the power probe section of the combiner PWB. Here, three directional couplers monitor the RF signal before it is passed to the output connector (J2). Due to each coupler's proximity and orientation to the RF output signal, RF voltages are induced in these directional couplers.

The first coupler provides forward and reflected power signals to the combiner/interface PWB (A12) for signal conditioning purposes.

A second coupler provides an **RF Sample** output (J4, accessible on the rear panel of the transmitter) for use by an external exciter, if applicable.

A third coupler provides an **RF Monitor** output (J3, accessible on the rear panel of the transmitter), which is a nominal -42 dBc (2 V rms @ 1250 W). This signal is intended for use with a modulation monitor or spectrum analyzer.

**Low pass filter PWB**

See Figure SD-2. The low pass filter PWB (A11) accepts the output of the combiner PWB and attenuates harmonics before applying a filtered RF signal to the output power probe, located on the combiner PWB.

**Combiner interface PWB**

See Figure SD-2. The combiner interface PWB (A12) accepts the output of the IPA forward power coupler and converts it to a dc voltage that is proportional to the RF level through the probe. This signal is then applied to the exciter/control PWB as the **IPA Fwd Pwr** sample.

Similarly, the combiner interface PWB accepts the outputs of the transmitter’s output forward and reflected power couplers and converts them to dc voltages that are proportional to the RF levels measured by the couplers. These signals are then applied to the exciter/control PWB as the **Fwd Pwr** and **Refld Pwr** samples.
Figure 1.2: Block Diagram - VS2.5 Transmitter
SECTION 2: OPERATING THE TRANSMITTER

This section provides information about operating the VS2.5 transmitter:

- User interface - see page 2-7
  - Front panel UI - see page 2-7
  - Turning RF on and off - see page 2-8
  - Saving settings - see page 2-8
  - Advanced user interface - see page 2-12

- Logging in to the AUI - see page 2-14

- Menu page - see page 2-16

- Viewing transmitter log - see page 2-18
  - Managing the log - see page 2-19

- Viewing tool menu panels - see page 2-25

- Viewing real-time meters - see page 2-32

- Setting time and date - see page 2-35

- Managing presets - see page 2-37

- Setting local/remote control - see page 2-57

- Resetting alarms - see page 2-57

- Viewing transmitter status - see page 2-58

- Setting user accounts - see page 2-59
  - Setting user role - see page 2-60
  - Editing account information - see page 2-60

- Software configuration - see page 2-62
  - Network setup - see page 2-64
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  - Email configuration - see page 2-69
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  - Upload files - see page 2-72
  - Audio player - see page 2-73
• Changing hardware settings - see page 2-77
  – Configuring ARM watchdog - see page 2-78
  – Calibrating exciter TCXO - see page 2-79
  – Calibrating audio inputs - see page 2-81
  – Configuring RF drive source - see page 2-83
    – ARM reset - see page 2-83
    – ARM reset - see page 2-83
    – OS recovery - see page 2-84

• Configuring remote inputs and outputs - see page 2-85

• Setting pilot sample level - see page 2-91

• Front panel display settings - see page 2-92

• Configure test signal generator - see page 2-94

• Setting station ID parameters - see page 2-96

• Using an external 10 MHz input - see page 2-98
Figure 2-2: VS Transmitter Front Panel Display Menu Tree - Edit Presets (Sheet 2 of 2)
Figure 2-3: VS Transmitter AUI Flow Diagram
USER INTERFACE

The user can interface with the VS2.5 using one of two methods:

- Locally, using the front panel display and navigational buttons (see “Front panel UI”).
- Remotely, via a LAN connection, using the advanced user interface (AUI) pages (see “Advanced user interface” on page 2-12).

See the complete menu hierarchy illustrated in Figures 2.1 and 2.2 (for the local front panel menu) and Figure 2.3 (for the remote AUI menu). When a user interfacing function can be performed from both the front panel display and the remote AUI, both are described in this section.

FRONT PANEL UI

The front panel UI is a 4 x 20 character LCD display (see Figure 2.5). The UI can be controlled by its adjacent keypad. The UI contains a menu-based series of pages that serve specific functions. Similar interfacing, as well as more advanced functionality, is available on the remotely accessed AUI (see “Front panel UI screens” on page 2-9).

LCD DISPLAY

This display shows all the UI screens. The display’s top level screen, used for viewing purposes only, is shown in Figure 2.4.

Figure 2.4: Top Level Screen

The top level screen displays the following information:

- Line 1: current time, active preset (P#) and the transmitter’s actual forward power.
- Line 2: RF operating status (ON or OFF), the local (LCL) or remote (RMT) control status and the transmitter’s reflected power level.
- Line 3: operating frequency and the desired power setpoint.
- Line 4: instructions to turn the transmitter’s RF power stage on or off.
Main menu
This main menu is the starting point for navigating through the UI screens. See Table 2.1 on page 2-9 for a list of screens and their basic functions.

Figure 2.5: Main Menu

Navigational buttons
There are six push-buttons on the right-hand side of the LCD display that allow navigation through the UI pages, as well as modifying selected settings.

- Up and down - on menu and list screens, moves cursor up and down through the associated page; on edit screens, increases and decreases the value of a parameter being modified.
- Left - on menu and list screens, exits to the next higher level screen; on edit screens, moves the editing cursor left, as applicable.
- Right - on menu and list screen, goes to the next lower level screen; on edit screens, moves the editing cursor right, as applicable.
- Checkmark - on menu screens, goes to the next lower level screen; on edit screens, acts as an “accept” or “save” function; in some cases the display will prompt its use.
- X - on menu and list screens, exits to the next higher level screen; on edit screens, acts as a “cancel” function; in some cases the display will prompt its use.

Turning RF on and off
From any UI screen, pressing X and the up arrow simultaneously, toggles the RF on/off status. You can also use the Main Menu -> RF On/Off screen to toggle the status.

Saving settings
Many of the UI screens allow for modifying a selected setting. Use the checkmark button to save a change. Use the X button to cancel a change and revert back to the previously stored value.

LEDs
There are four LEDs on the left-hand side of the LCD display that provide the operational status of various sections of the transmitter - Exciter, Power Amplifier, Output Network and Power Supply (see Figure 2.5 on page 2-8). The LEDs can glow green, amber or red. Typically, green indicates normal operation, amber indicates a warning, and red indicates a fault or error. Refer to the Troubleshooting section for more detailed information on LED status.
# Front Panel UI Screens

Table 2.1 defines the available front panel display screens.

## Table 2.1: Front Panel UI Screens

<table>
<thead>
<tr>
<th>UI Screen</th>
<th>Function</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Time Setup Screens</td>
<td>Guides the user through initial setup of the transmitter. Provides prompts to set frequency, output power and audio input. Refer to the VS Series Quick Start Guide, provided in the transmitter’s packing box, for details.</td>
<td>VS Series Quick-Start Guide</td>
</tr>
<tr>
<td>Main Menu</td>
<td>Choose options and navigate to other screens.</td>
<td>page 2-8</td>
</tr>
<tr>
<td>Select Preset</td>
<td>Select and activate a user-defined preset.</td>
<td>page 2-40</td>
</tr>
<tr>
<td>User Settings</td>
<td>Edit various transmitter user settings (see other User Settings options in this table).</td>
<td>-</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit various parameters for a user-defined preset (see the following rows for all Edit Presets options).</td>
<td>page 2-40</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s output power.</td>
<td>page 2-42</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s operating frequency.</td>
<td>page 2-42</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s main audio characteristics such as source, stereo mode, pre-emphasis and low pass filtering.</td>
<td>page 2-42</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s audio input type.</td>
<td>page 2-38</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s pilot settings such as level, phase and 1 PPS synchronization.</td>
<td>page 2-45</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s SCA settings such as SCA reduction, MPX SCAs, MPX SCA input and internal SCA (1 and 2) generator characteristics.</td>
<td>page 2-46</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s RDS settings such as enable/disable, data source, baud rate, level, phase, program type, alternate frequency data, etc.</td>
<td>page 2-48</td>
</tr>
<tr>
<td>User Settings - Edit Presets</td>
<td>Edit the selected preset’s limiter settings. Limiter types include hard limiter, AGC limiter or 2-slope limiter.</td>
<td>page 2-52</td>
</tr>
<tr>
<td>UI Screen</td>
<td>Function</td>
<td>See Page</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>User Settings - Edit Presets - Audio Loss</td>
<td>Edit the selected preset's audio loss functionality, such as enable/disable, setting threshold, setting timeout period, setting resulting action and selecting a backup preset.</td>
<td>page 2-54</td>
</tr>
<tr>
<td>User Settings - Edit Presets - Audio Delay</td>
<td>Edit the selected preset's audio delay.</td>
<td>page 2-56</td>
</tr>
<tr>
<td>User Settings - Edit Presets - Copy Another Preset</td>
<td>Copy the selected preset's settings to another preset.</td>
<td>page 2-56</td>
</tr>
<tr>
<td>User Settings - Remote I/O</td>
<td>Configure the remote inputs and outputs for the transmitter.</td>
<td>page 2-85</td>
</tr>
<tr>
<td>User Settings - Set Clock</td>
<td>Set precise time and date.</td>
<td>page 2-36</td>
</tr>
<tr>
<td>User Settings - Network Settings</td>
<td>View and/or set network information such as MAC address (view only), DHCP on/off status, IP address, netmask and gateway.</td>
<td>page 2-64</td>
</tr>
<tr>
<td>User Settings - Pilot Sample</td>
<td>Set the pilot sample level for the rear panel BNC connector.</td>
<td>page 2-91</td>
</tr>
<tr>
<td>User Settings - LCD Settings</td>
<td>Set the front panel display’s contrast, backlight and timeout.</td>
<td>page 2-92</td>
</tr>
<tr>
<td>User Settings - Signal Gen</td>
<td>Enable/disable and setup the internal signal generator.</td>
<td>page 2-94</td>
</tr>
<tr>
<td>User Settings - Station ID</td>
<td>Set station ID parameters for re-broadcasting primary information as a secondary station.</td>
<td>page 2-96</td>
</tr>
<tr>
<td>User Settings - Ext. 10 MHz Inp</td>
<td>Enable/disable the use of an external 10 MHz signal.</td>
<td>page 2-99</td>
</tr>
<tr>
<td>Local/Remote</td>
<td>Select local or remote control of the transmitter.</td>
<td>page 2-57</td>
</tr>
<tr>
<td>View Status</td>
<td>View various transmitter parameters (see other View Status options in this table).</td>
<td>page 2-24</td>
</tr>
<tr>
<td>View Status - View Alarms</td>
<td>View all active transmitter alarms.</td>
<td>page 2-24</td>
</tr>
<tr>
<td>View Status - View Meters</td>
<td>View the levels of various transmitter parameters, including forward power, reflected power, PA voltage, PA current and low level dc supply voltages.</td>
<td>page 2-34</td>
</tr>
<tr>
<td>View Status - View Log</td>
<td>View the transmitter’s events log, including alarms, commands, etc.</td>
<td>page 2-24</td>
</tr>
</tbody>
</table>
### Table 2.1: Front Panel UI Screens

<table>
<thead>
<tr>
<th>UI Screen</th>
<th>Function</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>View Status - Clear Log</td>
<td>Clear the transmitter’s events log.</td>
<td>page 2-24</td>
</tr>
<tr>
<td>View Status - View SW Versions</td>
<td>View the versions of software installed on the transmitter.</td>
<td>-</td>
</tr>
<tr>
<td>Reset Alarms</td>
<td>Initiate an attempt to reset all alarms controlled by latched protection circuits.</td>
<td>page 2-57</td>
</tr>
<tr>
<td>System Settings</td>
<td>Edit various transmitter system settings (see other System Settings options in this table).</td>
<td>-</td>
</tr>
<tr>
<td>System Settings - Thresholds</td>
<td>Factory set; no user adjustments required.</td>
<td>-</td>
</tr>
<tr>
<td>System Settings - ARM Watchdog</td>
<td>Enable, disable or force a reset of the ARM watchdog feature.</td>
<td>page 2-78</td>
</tr>
<tr>
<td>System Settings - Console Select</td>
<td>Factory set; no user adjustments required.</td>
<td>-</td>
</tr>
<tr>
<td>System Settings - Calibration</td>
<td>Set calibration values or run calibration routines for various parameters (e.g., TCXO offset, forward/reflected power, program input levels, etc.).</td>
<td>page 2-79</td>
</tr>
<tr>
<td>System Settings - RF Drive Source</td>
<td>Select either internal or external exciter.</td>
<td>page 2-83</td>
</tr>
<tr>
<td>System Settings - ARM Reset</td>
<td>Initiate a reset of the exciter/control PWB’s ARM processor</td>
<td>page 2-83</td>
</tr>
<tr>
<td>System Settings - OS Recovery</td>
<td>Initiate a recovery reset of the operating system in the event of a failed software upgrade.</td>
<td>page 2-84</td>
</tr>
</tbody>
</table>
ADVANCED USER INTERFACE

The VS2.5's advanced user interface (AUI) (see Figure 2.6) is available via remote connection only. To access the AUI, you need a PC (and a web browser) that is connected to the VS2.5 - directly or through a switch - via its rear panel \texttt{LAN} connection (A1J8A). The AUI has a wide range of displays, including:

- Tool menu panels (spectrum analyzer, signal constellation, Lissajous plot, etc.)
- Real-time meters
- Detailed transmitter status and events log
- Presets
- Hardware configuration
- User accounts
- Software configuration
- Remote input/output configuration

Each AUI page provides information about a specific transmitter function. All navigation through the AUI pages begins on the main screen (or Home page), shown in Figure 2.6.

Figure 2.6: Using the AUI (Home page shown)
The top banner is permanent on all AUI pages and includes:

**Nautel Logo:** From any AUI page, click the Nautel logo to return to the Home page.

**Date & Time:** Displays day, month, year and current time. Click on date or time to shortcut to the *Set Time and Date* window (see Setting time and date on page 2-35).

**Active Preset:** Displays the name of the active preset, power set point based on the active preset, current forward power and reflected power levels, as well as the operating mode and carrier frequency.

**Active Exciter:** Displays the active exciter (internal or external) and the FM modulation, with rms (yellow) and peak (red) values.

The bottom banner is also permanent on all AUI pages and includes:

**RF On:** Click to enable the transmitter’s RF power stage.

**RF Off:** Click to disable the transmitter’s RF power stage.

**Activity Window:** Displays various messages to reflect specific user interface commands, such as RF on/off, local/remote control, or reset.

**Menu:** Click to open the *Menu* page, which allows navigation to various other pages (see Menu page on page 2-16).

**Status:** Click to shortcut to the *Transmitter Status* page (see Viewing transmitter status on page 2-35), which provides current alarm and status details for the transmitter. When the *Status* button is red, one or more alarms of severity level 10 is currently being reported, and the transmitter is in an ‘off-air’ state. When the *Status* button is orange, one or more alarms of severity level 5 (but none of severity level 10) is currently being reported, but the transmitter is still ‘on-air’, possibly at reduced power. When the *Status* button is green, the transmitter is operating normally. In this case, there are no alarms being reported, or there is one or more alarms of severity level 1 (but none of severity level 5 or 10). This page is also available through the Menu page.

**Log:** Click to shortcut to the *Transmitter Log* page, which displays historical alarm and status records for the transmitter (see Viewing transmitter log on page 2-18).
Local/Remote: Displays the operational control status of the transmitter. Click the desired button to select local or remote. If Local is highlighted, remote users cannot change any settings. Similarly, if Remote is highlighted, local users cannot change the transmitter status, except for RF Off and Local/Remote. To change the local/remote status from the front panel display, see “Setting local/remote control” on page 2-57.

Reset: Resets protection circuits and power supplies that were inhibited, but are now alarm-free. To initiate an alarm reset from the front panel display, see “Resetting alarms” on page 2-57.

Change User: Click to display a login menu. Using your remote keyboard, enter your Username and Password, then click OK. If you do not have a user account, see “Setting user accounts” on page 2-59.

The displays between the top and bottom menus, contains user selected pages. These pages provide access to a variety of AUI functions such as transmitter status and hardware settings. The following paragraphs describes how to use these pages.

**Logging in to the AUI**

The transmitter’s remote AUI provides a means to restrict access of transmitter control functions to authorized users only.

To access the AUI using a web browser, you must configure your network settings (see “Network setup” on page 2-64). On the computer being used to remotely access the AUI, enter the VS2.5’s IP address into the Internet browser’s address bar and then log in to the AUI application via the login menu (see Figure 2.3).

**Figure 2.3: AUI Login Menu**

![AUI Login Menu](image)

Enter your User name (default is “Nautel”) and Password (default is blank), then click Submit. If you do not have a user account, see “Setting user accounts” on page 2-59.
AUI PAGES

Table 2.2 defines the available AUI pages.

<table>
<thead>
<tr>
<th>AUI Page</th>
<th>Function</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>View meters, tool menu panels, choose options and navigate to other pages</td>
<td>page 2-12</td>
</tr>
<tr>
<td>Menu</td>
<td>Choose options and navigate to other pages</td>
<td>page 2-16</td>
</tr>
<tr>
<td>Log</td>
<td>View and analyze transmitter events</td>
<td>page 2-18</td>
</tr>
<tr>
<td>Tool Menu</td>
<td>Choose tool menu panel options</td>
<td>page 2-25</td>
</tr>
<tr>
<td>System Review</td>
<td>Choose meters for display</td>
<td>page 2-32</td>
</tr>
<tr>
<td>Set Time &amp; Date</td>
<td>Set precise time and date</td>
<td>page 2-35</td>
</tr>
<tr>
<td>Presets</td>
<td>Activate and edit user-defined presets</td>
<td>page 2-37</td>
</tr>
<tr>
<td>Transmitter Status</td>
<td>View transmitter’s current active faults and operational status</td>
<td>page 2-58</td>
</tr>
<tr>
<td>User Accounts</td>
<td>Set user permission rights and define user account information</td>
<td>page 2-59</td>
</tr>
<tr>
<td>Software</td>
<td>Calibrate and refresh the AUI screen, restart the server, set network information, perform software upgrades and configure email and alarm notification parameters</td>
<td>page 2-62</td>
</tr>
<tr>
<td>Hardware</td>
<td>Define system configuration and set/calibrate transmitter parameters and thresholds</td>
<td>page 2-79</td>
</tr>
<tr>
<td>Remote I/O</td>
<td>Define remote digital inputs and outputs</td>
<td>page 2-85</td>
</tr>
</tbody>
</table>
**Menu page**

From the home page, click the **Menu** button to view the **Menu** page (see Figure 2.4). From this page, you can select one of the following sub-menus:

**Figure 2.4: Menu Page**

Select **Home** to return to the home page (see Figure 2.6 on page 2-12).

Select **Presets** to load, edit, or save presets (see “Managing presets” on page 2-37).

Select **System Review** to view the meters of various parameters relating to the controller, exciter, power supplies and RF components (see “Viewing real-time meters” on page 2-32).

Select **Hardware** to access pages that allow system configuration, setting/calibrating transmitter parameters and thresholds, setting IBOC parameters and storing LUT data to active exciter (see “Changing hardware settings” on page 2-64).
Select **User Accounts** to access a page that displays a list of users with access to the AUI and, depending on permission level, allows editing of user accounts (see “Setting user accounts” on page 2-59).

Select **Software** to access a page that provides help with performing network configuration, software upgrades, email configuration, alarm notifications, uploading files, audio player setup and livewire setup (see “Software configuration” on page 2-62).

Select **Remote I/O** to access a page that allows assignment of remote digital inputs and digital outputs (see “Configuring remote inputs and outputs” on page 2-82).
**VIEWING TRANSMITTER LOG**

You can view transmitter log information using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-24).

**USING THE AUI**

You can view the VS2.5’s events log using the AUI’s Log page - see Figure 2.5. This page shows a configurable log of all transmitter events. To view the Log page, click the Log button in the bottom banner of any AUI screen.

**Figure 2.5: Log page**

The main screen displays a chronological listing of events. Depending on the selections made in the Log Manager screen (see “Managing the log” on page 2-12), the events displayed may be filtered by the originating device (Controller, Exciter or All), and the time of occurrence.

Refer to the VS2.5 Troubleshooting Manual to cross-reference the alarm name to possible causes and troubleshooting tips.
The number of log matches displayed is shown below the Log Manager button (e.g., 104 Matches Sorted by “Time of Event”). You can scroll through the list using the scroll bar or the up and down arrow buttons to the right of the scroll bar. When there are more than 100 matches in the list, a Page #/# tab will appear to allow viewing of further listings. In this case, click on Page #/#, select the desired page from the Select Page window, then click OK to view that page or Cancel to return to the Transmitter Log page. The columns in the display indicate specific information about the event:

- **Device** indicates the origin device of the event (Controller, Exciter or All).
- **Event** indicates the event name.
- **State** indicates whether the event is active (red bell) or cleared (green checkmark) and in some cases, indicates whether the RF was turned on or off (see Legend under Log Manager, Figure 2.11 on page 2-23).
- **Severity** indicates how the event affects transmitter operation [a single orange ! indicates low severity (RF output not affected); a single red ! indicates medium severity (RF output is reduced); three red ! indicates high severity (RF output is inhibited)].
- **Time of Event** indicates the time and date that the event that occurred.

With an event highlighted, click the i button on the right-hand side of the display to view that specific event’s details (see “Event Information page” on page 2-17). This page is similar to the Transmitter Status page (see “Transmitter Status page” on page 2-58), except that it is a snapshot taken at the exact time at which the event occurred. The Alarms tab lists all events that were active at the time of the selected event, by name and severity [1 = low (RF output not affected), 5 = medium (RF output is reduced), 10 = high (RF output is inhibited)]. The Meters tab allows selection of various metered parameters to view for troubleshooting purposes. You can also select a time span (between 1 second and 24 hours) when viewing Meters. The time of the event is always the centre point of the time span (e.g., if you select a timespan of 10 Minutes, then the meter indications will span from 5 minutes before the event to 5 minutes after the event).

**Managing the log**

You can manage the VS2.5 AUI’s events log by clicking on the Log Manager button (see Figure 2.6). This screen provides options to perform various event monitoring operations such as filtering, copying, deletion and statistical analysis. Click X to close this window.

**Figure 2.6: Log Manager options**
Filter
You can filter transmitter events based on their origin or date by clicking the Filter button in the log manager (see Filter - Select Logs - see Figure 2.7).

Click the Device Type drop-down arrow, and select the desired device type to filter events based on the type selected. Click the OK button or the Cancel button when done.

- All - displays all transmitter events
- Controller - displays controller events only
- Exciter - displays exciter events only

Click the Filter by Date Range checkbox to filter events based on a specific date and time range, and the device type selected. Click the OK button or the Cancel button when done.

Click the Cancel button or X to close this window and discard changes.

Figure 2.7: Filter - Select Logs
Copy
You can create a copy of all the logs in the selected list (copied to the remote user’s computer clipboard) by clicking on the Copy button in the log manager (see Copy Logs – see Figure 2.8). You can paste the tab-delimited text copy of the logs into a text editing program such as Word, Excel, Notepad, etc. Click X to close this window.

Figure 2.8: Copy Logs

Delete
You can delete all events or a selection of events by clicking on the Delete button in the log manager (see Delete Logs – see Figure 2.9).

Click the Delete All Events checkbox and click OK to delete all events.

Click the Delete Old Events checkbox to allow deletion of events that occurred prior to (Older than) a specified date and time. Use the up and down arrows to select the date and time and click OK to delete the specified events.

Click the Cancel button or X to close this window and discard changes.

Figure 2.9: Delete Logs
Statistics

You can view statistical information on the events being displayed by clicking on the Statistics button in the log manager (see Log Statistics - see Figure 2.10).

![Note: Only the events subject to the user-defined filtering parameters will be displayed on the Log Statistics screen.]

The Log Statistics screen indicates the Total Events (number of occurrences) and the time and date of the Earliest Event and the Latest Event. You can scroll through the list using the scroll bar (if applicable) or the up and down arrow buttons to the right of the scroll bar. The columns in the display indicate specific information about the events:

- **Device** indicates the origin device of the event (Controller, Exciter or All).
- **Event** indicates the event name.
- **Severity** indicates how the event affects transmitter operation [a single orange ! indicates low severity (RF output not affected); a single red ! indicates medium severity (RF output is reduced); three red ! indicates high severity (RF output is inhibited)].
- **# Events** indicates the number of occurrences of that event during the filtered period.
- **Earliest** indicates the time and date of the first event, within the filtered period.
- **Latest** indicates the time and date of the latest event, within the filtered period.

Click X to close this window.

**Figure 2.10: Log Statistics**
Click on the **Legend** button in the log manager (see Figure 2.11) to display a legend that describes the meaning of the symbols shown in the **State** and **Severity** columns of the **Log** page.

Click X to close this window.

**Figure 2.11: Log Manager - Legend**

Use the **Reset** button at the bottom of any AUI screen to attempt to clear any latching alarms that are holding the transmitter in an “off-air” state. If the offending alarm has cleared, the transmitter should resume operation. See “**Reset:**” on page 2-14.
USING THE FRONT PANEL

When you select View Status -> Alarms or View Status -> View Log from the Main Menu (see Figure 2.12), you can view various active or logged events, respectively, of the VS2.5. These parameters are displayed on multiple pages of Meters screens.

Note:
This screen is for viewing purposes only and does not offer the same level of analytical features as the AUI's Log page (see Figure 2.5 on page 2-18).

Figure 2.12: View Alarms and View Logs Screens

The View Alarms screen displays only alarms that are currently active. Older alarms that have cleared may still be present in the View Events screen.

Use the up and down buttons to scroll through the list of alarms or events.

Refer to the VS2.5 Troubleshooting Manual to cross-reference the alarm name to possible causes and troubleshooting tips.

When you select Clear Log from the View Status menu, you will delete all logged events.

Use the Reset Alarms command in the front panel UI's Main Menu -> Reset Alarms screen to attempt to clear any latching alarms that are holding the transmitter in an “off-air” state. If the offending alarm has cleared, the transmitter should resume operation. See “Resetting alarms” on page 2-57.
Viewing Tool Menu Panels

The VS2.5 AUI provides five tool menu panels that you can choose to display on the AUI home page (see Figure 2.13). Up to four tool menu panels can be displayed at one time, including a spectrum analyzer. To view all the tool menu options (see Figure 2.14), close one of the existing tool menu panels on the Home page by clicking X in the top, right corner of the tool menu panel, and then click anywhere in the blank space (see Figure 2.13).

Figure 2.13: Tool Menus on Home page

Figure 2.14: Tool Menu Options

Click on the desired tool menu panel to display it. See Table 2.3 on page 2-26 for a description of each tool menu panel.
Table 2.3: Tool Menu Panels

<table>
<thead>
<tr>
<th>Tool Menu</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectrum Analyzer</td>
<td>Displays a spectrum analyzer, capable of monitoring various RF sections of the transmitter, including the RF output.</td>
<td>See page 2-27</td>
</tr>
<tr>
<td>EQ Frequency</td>
<td>Displays the frequency response of the modulator’s EQ filter.</td>
<td>See page 2-28</td>
</tr>
<tr>
<td>EQ Impulse</td>
<td>Displays the impulse response of the modulator’s EQ filter.</td>
<td>See page 2-29</td>
</tr>
<tr>
<td>EQ Filter Delay</td>
<td>Displays the delay of the modulator’s EQ filter across its bandwidth</td>
<td>See page 2-30</td>
</tr>
<tr>
<td>Lissajous Plot</td>
<td>Displays a Lissajous figure that represents the relationship between the two applicable channels (either L and R or I and Q).</td>
<td>See page 2-31</td>
</tr>
</tbody>
</table>
**Spectrum Analyzer**

See Figure 2.15. The carrier level is normalized to its unmodulated carrier level at 0 dB. Graph center is always at the carrier frequency.

Click on the panel to display a cursor in the approximate area. The cursor position (frequency and amplitude) is noted in the upper, right-hand corner of the panel. Click in other areas of the panel to provide a coarse adjustment of the cursor position.

Use the left and right buttons to make fine adjustments to the cursor position.

Use the up or down button to maximize (if minimized) or minimize (if maximized) the panel size.

Use the “peak” button to place the cursor on the next successive peak in the spectrum.

Use the “cog” button to gain access to spectrum settings (see Figure 2.15) such as resolution bandwidth, span, averaging rate and the actual measurement source (FM or MPX) that is being displayed. Click **OK** to save changes or **X** to discard changes and close the window.

**Note:**
The FM spectrum analyzer displays the ideal spectrum generated by the DSP. It is not necessarily the same as the spectrum seen at the RF output.
**EQUALIZER SCREENS**

The VS2.5's exciter includes a fixed equalizer to optimize audio performance. There are three menus available in the tool panel - **EQ Frequency**, **EQ Impulse Response** and **EQ Filter Delay**. Coefficients are selected based on your channel frequency. All frequencies shown are relative to the channel frequency.

**Figure 2.16: EQ Frequency**

**EQ_FREQUENCY**

See Figure 2.16. This panel displays the frequency response of the modulator's EQ filter.

Click on the panel to display a cursor in the approximate area. The cursor position (magnitude and amplitude) is noted in the upper, right-hand corner of the panel. Click in other areas of the panel to provide a coarse adjustment of the cursor position.

Use the left and right buttons to make fine adjustments to the cursor position.

Use the up or down button to maximize (if it was minimized) or minimize (if it was maximized) the panel size.
Figure 2.17: EQ Impulse

EQ IMPULSE RESPONSE
See Figure 2.17. This panel displays the impulse response of the modulator’s EQ filter.

Click on the panel to display a cursor in the approximate area. The cursor position (magnitude and time) is noted in the upper, right-hand corner of the panel. Click in other areas of the panel to provide a coarse adjustment of the cursor position.

Use the left and right buttons to make fine adjustments to the cursor position.

Use the up or down button to maximize (if it was minimized) or minimize (if it was maximized) the panel size.
**Figure 2.18: EQ Filter Delay**

See Figure 2.18. This panel displays the delay of the modulator’s EQ filter across its bandwidth.

Click on the panel to display a cursor in the approximate area. The cursor position (delay and frequency) is noted in the upper, right-hand corner of the panel. Click in other areas of the panel to provide a coarse adjustment of the cursor position.

Use the left and right buttons to make fine adjustments to the cursor position.

Use the up or down button to maximize (if it was minimized) or minimize (if it was maximized) the panel size.
**LISSAJOUS PLOT**

See Figure 2.19. This panel displays a Lissajous plot that represents either left and right audio content or a representation of the FM modulated signal (I and Q). I and Q will be automatically selected when using MPX as the main audio source. Left and right audio content is displayed for all other audio sources.

The plot consists of a group of sequential samples to allow signal analysis. In L and R mode, the L+R portion of the signal tends to dominate the plot, resulting in the majority of samples appearing in the lower, left and upper, right quadrants. In I and Q mode, signals that are of equal frequency and 90 degrees out-of-phase result in a circular display.

Use the up or down button to maximize (if it was minimized) or minimize (if it was maximized) the panel size.
**Viewing real-time meters**

You can view meters using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-34).

**Using the AUI**

The VS2.5’s AUI can display many metered parameters on the right hand side of its home page. To view all the meter options, click the **Meters** button on the right-hand side of the AUI. This opens the System Review page (see Figure 2.20).

**Figure 2.20: System Review page (Meter Options)**

Click the appropriate transmitter sub-system from the Transmitter Layout list to view the Relevant Meters for that sub-system. The Transmitter Layout list contains **Controller** and **Exciter** sub-systems.

Click on the check-box next to the desired parameter in the Relevant Meters list to select it for display in the Meters section of the AUI home page. If necessary, use the scroll bar on the right side of the page to find the desired meter.
Each meter is a colour-coded bar with minimum and maximum values. The meter’s current value is indicated by an arrow on the colour-coded bar, as well as a displayed value below the meter. A parameter value in the green section of a meter bar indicates the parameter is within the range for normal operation. A parameter value in the yellow section (as applicable) of a meter bar indicates the parameter is still within an operational range, but is approaching design limitations. A parameter value in the red section of a meter bar indicates the parameter is outside normal operating conditions.

To delete a meter from the home page, click the X in the upper, left corner of the meter’s box in the Meters section or de-select the check-box in the Relevant Meters list.

To view detailed info on a specific transmitter sub-system (e.g., Controller), select the desired sub-system and then click on the i (information) button to the right of the sub-system name (see Figure 2.21).

**Figure 2.21: Detailed Sub-System Information (Controller shown)**

![Controller](image)

This screen displays the status of the selected sub-system, as well as real-time meter values. The Alarms section shows all active alarms pertaining to the sub-system.
**USING THE FRONT PANEL**

When you select **View Status -> View Meters** from the **Main Menu** (see Figure 2.22) you can view various metered parameters of the VS2.5. These parameters are displayed as a list on the **View Meters** screen.

---

**Note:**

This screen is for viewing purposes only and does not offer the same level of analytical features as the AUI's **System Review** page (see Figure 2.20 on page 2-32).

---

**Figure 2.22: View Meters Screen**

![View Meters Screen](image.png)

Use the up and down buttons to scroll through the following list of metered parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward (forward power)</td>
<td>1-3/33 0W</td>
</tr>
<tr>
<td>Reflected (reflected power)</td>
<td>0.00W</td>
</tr>
<tr>
<td>Avg. PA Volts</td>
<td>0.00W</td>
</tr>
<tr>
<td>Preamp Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>IPA Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>PA1 Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>PA2 Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>PA3 Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>PA4 Curr</td>
<td>0.00W</td>
</tr>
<tr>
<td>Heatsink Temp 1</td>
<td>0.00W</td>
</tr>
<tr>
<td>Heatsink Temp 2</td>
<td>0.00W</td>
</tr>
<tr>
<td>+48V</td>
<td>0.00W</td>
</tr>
<tr>
<td>+15V</td>
<td>0.00W</td>
</tr>
<tr>
<td>-15V</td>
<td>0.00W</td>
</tr>
<tr>
<td>+5V</td>
<td>0.00W</td>
</tr>
<tr>
<td>+3.3 V</td>
<td>0.00W</td>
</tr>
<tr>
<td>+1.8 V</td>
<td>0.00W</td>
</tr>
<tr>
<td>+1.2 V</td>
<td>0.00W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 1</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 2</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 3</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 4</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 5</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 6</td>
<td>0.00W</td>
</tr>
<tr>
<td>Fan 7</td>
<td>0.00W</td>
</tr>
<tr>
<td>TCXO</td>
<td>0.00W</td>
</tr>
<tr>
<td>Ext 10 MHz</td>
<td>0.00W</td>
</tr>
<tr>
<td>Bal L</td>
<td>0.00W</td>
</tr>
<tr>
<td>Bal R</td>
<td>0.00W</td>
</tr>
<tr>
<td>MPX</td>
<td>0.00W</td>
</tr>
<tr>
<td>Int SCA1</td>
<td>0.00W</td>
</tr>
<tr>
<td>Int SCA2</td>
<td>0.00W</td>
</tr>
<tr>
<td>Dig L</td>
<td>0.00W</td>
</tr>
<tr>
<td>Dig R</td>
<td>0.00W</td>
</tr>
<tr>
<td>MPX SCA</td>
<td>0.00W</td>
</tr>
</tbody>
</table>

**Peak Mod**  
**MPX RMS**  
**VSWR**  
**delta 10 MHz**  
**IPA Fwd**  
**Total PA Curr**  
**DC Power In**  
**DC-RF Eff**  
**Avg PA Diss**  
**PA1 Bias**  
**PA2 Bias**  
**PA3 Bias**  
**PA4 Bias**  
**IPA Bias**  
**Preamp Bias**  
**Fwd Atten**  
**DAC Gain**
SETTING TIME AND DATE

The VS2.5’s internal clock uses a backup battery, and therefore maintains an accurate time and date, even during power outages. The time and date needs to be set when the transmitter is first installed, or after a power outage if the backup battery has failed.

You can set the time and date using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-36).

USING THE AUI

You can remotely set the VS2.5’s time and date from the AUI’s Set Time & Date page - see Figure 2.23. To view the Set Time & Date page, click on the time or date in the upper, left corner of any AUI page.

Figure 2.23: Set Time & Date page

The Set Time & Date page contains editable fields for the date (month, day and year) and time (hours, minutes and seconds). The clock is displayed in 24-hour format.

Use the up and down buttons to increase or decrease the desired value in the specific field. Click the OK button to accept changes or click the Cancel button or X to discard changes and close the window.
**Using the front panel**

When you select **User Settings -> Set Clock** from the **Main Menu** menu (see Figure 2.24) you can set the current time and date. The time appears on the top line of the top level screen (see Figure 2.4 on page 2-7).

**Figure 2.24: Set Clock screen**

![Set Clock screen]

To change the time or date, use the right and left arrow buttons to move the cursor to the desired field (hours, minutes, seconds, year, month, day), and use the up and down arrow buttons to increase or decrease the value of the selected field as desired. When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.
MANAGING PRESETS

Presets contain operational data (power level, frequency, mode, program input characteristics) for the transmitter. You can create presets and manage their various settings.

You can manage presets using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-40).

USING THE AUI

The Presets page (see Figure 2.25) allows you to create up to 63 operating presets or edit existing presets. To view the Presets page, select Presets from the Menu options or double-click in the Power section of the top banner.

Figure 2.25: Presets page (General tab shown)
**Loading Presets.** When you first enter the *Presets* page, the current preset is displayed. If the current preset is not the preset you want to work with, use the *Load* button on the left side of the *Presets* page to call up a window containing a list of alternate presets.

Select the desired preset and click the *Load* button to view or enable editing of the preset. Click the *Delete* button to delete the selected preset. Click the *Cancel* button or *X* to close this window.

**Applying Presets.** Click the *Apply* button to enable the preset as the transmitter’s active preset.

**Reloading Presets.** Click the *Reload* button to load the saved values in the selected preset, overwriting any temporarily edited values.

**Editing or Creating Presets.** To change the settings for a selected preset, or to establish settings for a new preset, change the value in the desired tab(s) and field(s) by entering new values or selecting from the drop-down menus, as appropriate. When you edit a field in an existing preset, note that an asterisk appears at the beginning of the preset name in the top, left corner. When changes are complete, click the *Save* button and then click the Save Preset window’s *Save* button. If you are creating a new preset, you can also enter a new name (e.g., Preset 4 - MPX) in the preset window before clicking the *Save* button. Click the *X* button to discard changes and return to the home page. Parameters that can be edited are:

**General** tab:
- Output Power (enter value in W)
- Frequency (enter value in MHz)
- Mode [temporarily disabled; defaulted to FM (analog) mode]

**Main Audio** tab:
- Audio Source (select Left/Right/Mono, MPX, Primary Digital or Secondary Digital)
  - For Left/Right/Mono:
    - Analog Level (enter value in dBu)
    - Audio Mode (select Mono L, Mono R or Stereo)
    - 15kHz Lowpass (select On or Off)
    - Preemphasis (select 0 us, 25 us, 50 us or 75 us)
  - For MPX:
    - MPX Level (enter value in Vpp)
  - For Primary Digital or Secondary Digital:
    - Secondary Source (select Playlist); displayed for Secondary Digital only
    - Digital Level (enter value in dBFS)
    - Audio Mode (select Mono L, Mono R or Stereo)
    - 15kHz Lowpass (select On or Off)
    - Preemphasis (select 0 us, 25 us, 50 us or 75 us)
SCA tab:

- MPX SCA (select Enabled or Disabled). If Enabled, enter:
  - Input Level (enter value in Vpp)
- SCA Reduction (enter percentage)
- Internal SCA1 or SCA2 (select Enabled or Disabled). If Enabled, enter:
  - Injection Level (enter percentage)
  - Frequency (enter value in kHz)
  - Input Level (enter value in dBu)
  - 7.5kHz Lowpass Filter (select Yes or No)
  - Preemphasis (select 0 us, 50 us, 75 us or 150 us)
  - Mode (select FM or DSB-SC)

RDS tab:

- RDS (select Enabled or Disabled). If Enabled, enter:
  - Data Source (select Internal, Ext. ASCII, Ext. UECP, ASCII Over IP, or UECP Over IP)
  - RDS Local Echo (select Enabled or Disabled); displayed for Ext. ASCII source only
  - Injection Level (enter percentage)
  - Phase (enter value in degrees)
  - Baud Rate (select 75, 150, 300, 60, 1200, 2400, 4800, 9600, 19200, 38400 or 57600 bps); displayed for Ext. UECP and Ext. ASCII sources only
  - PI Code (hex) (enter value)
  - PS Code (enter value)
  - PTY (select from various program choices)
  - PTYN (enter value)
  - Music/Speech (select Music or Speech)
  - Traffic Info (select None, TA, TP or TA+TP)
  - Artificial Head (select Yes or No)
  - Compression Flag (select Yes or No)
  - Dynamic (select Yes or No)
  - Stereo (select Yes or No)
  - Alt. Frequencies (select None or 1 through 6)
  - Alt. Freq. 1 through 6 (enter frequency in MHz)

Other Audio tab:

- Pilot Level (enter percentage)
- Pilot 1 PPS Sync (select On or Off). If On, enter:
  - Pilot Sync Phase (enter value in degrees)
- Audio Delay (select Yes or No). If Yes, enter:
  - Audio Delay (enter value in ms)
- Audio Loss Timeout (select Yes or No). If Yes, enter:
  - Action (None, Inhibit or Change Preset)
  - Timeout Minutes (enter value in minutes)
  - Timeout Seconds (enter value in seconds)
  - Threshold (enter percentage)
- Hard Limiter (select Yes or No). If Yes, enter:
  - Hard Limit (enter percentage)
• AGC Limiter (select Enabled or Disabled). If Enabled, enter:
  – AGC Limit (enter percentage)
  – Time Constant (enter value in ms)
• Two Slope Limiter (select Enabled or Disabled). If Enabled, enter:
  – Threshold (enter percentage)
  – Gain (enter percentage)

**SAVING PRESETS.** Click the **Save** button to save preset information.

**USING THE FRONT PANEL**

**SELECTING THE ACTIVE PRESET**

When you choose **Select Preset** from the **Main Menu** (see **Figure 2.26**) you can select the active preset for transmitter operation.

**Figure 2.26: Select Preset screen**

Use the up and down buttons to scroll through the existing presets. Press the accept (checkmark) button to enable the preset as the transmitter’s active preset. Press the cancel (X) button to return to the previous menu.

**EDITING OR CREATING PRESETS**

When you select **User Settings -> Edit Presets** from the **Main Menu** (see **Figure 2.27**) you can create up to 63 operating presets or edit existing presets.

**Figure 2.27: Edit Preset screen**
Use the up and down buttons to scroll through the existing presets, or scroll to the bottom of the list to **Create New Preset** (see Figure 2.28). Press the accept (checkmark) button to enter the editing menu for that preset (see Figure 2.29 on page 2-41). Press the cancel (X) button to return to the previous menu. When you create a new preset, the next available preset number is assigned (e.g., Preset 5).

**Figure 2.28: Create New Preset screen**

![Create New Preset screen]

Within the Preset Editing menu, use the up and down buttons to scroll through the options and press the accept (checkmark) button to enter the selected editing menu/screen. Press the cancel (X) button to return to the previous menu. Parameters that can be edited are:

**OUTPUT POWER.** See Figure 2.30. Use the up and down buttons to edit the output power (in 1 W increments, up to a maximum of 2800 W), then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.
**Figure 2.30: Output Power screen**

![Output Power screen](image)

**Frequency.** See Figure 2.31. Use the up and down buttons to edit the output power (in 0.01 MHz increments, then press the accept (checkmark) button to save the change. Press the cancel (X) button to return to the previous menu.

**Figure 2.31: Frequency screen**

![Frequency screen](image)

**Main Audio.** When you select Main Audio from the Preset editing options screen, you can edit various main audio parameters (see Figure 2.32).

**Figure 2.32: Main Audio menu**

![Main Audio menu](image)

Use the up and down buttons to scroll through the main audio menu options, then press the accept (checkmark) or right arrow button to enter the selected editing screen. Figure 2.33 shows the editing screens for the Main Audio menu. Press the cancel (X) button to discard changes and return to the previous menu.
Figure 2.33: Main Audio editing screens

- **Source**: Use the up and down buttons to locate the desired audio source - AES, MPX, Analog L/R or Audio Player, then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

- **Stereo Mode**: Use the up and down buttons to locate the desired stereo mode - Stereo, Right Mono, Left Mono or L+R Mono then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

- **Preemphasis**: Use the up and down buttons to locate the desired preemphasis characteristic - 0 us, 25 us, 50 us or 75 us, then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

- **Low Pass Filter**: Use the up and down buttons to toggle between ON or OFF, then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

- **Input Levels**: Use the up and down buttons to move the cursor to the desired audio input and then press the right button to enable editing of the parameter. Figure 2.34 on page 2-44 shows all the editing screens for the Input Levels sub-menu. Within any of the editing screens, use the up and down buttons to edit a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display. When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.
- **Audio Player**: Use the up and down buttons to select File Playlist or Stream 1 through Stream 255, then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

**Figure 2.34: Input Levels editing screens**

- **Bal L/R Level**: Select a level between -12 and 12 dBu.
- **MPX Level**: Select a level between 1 and 5 V peak-to-peak.
- **AES Level**: Select a level between -255 and 0 dBFS.
**Pilot Settings.** When you select **Pilot Settings** from the **Preset** editing options screen, you can edit the settings of the pilot signal (see Figure 2.35).

**Figure 2.35: Pilot Settings menu**

Use the up and down buttons to move the cursor to the desired pilot setting and then press the right button to enable editing of the parameter. **Figure 2.36** shows all the editing screens for the **Pilot Settings** menu. Within any of the editing screens, use the up and down buttons to edit or toggle a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display. When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

**Figure 2.36: Pilot Settings editing screens**

- **Level**: Select a level between 6 and 12%.
- **Phase**: Select a phase angle between 0 and 360 degrees.
- **1 PPS Sync**: Select ON or OFF.
**SCA Settings.** When you select SCA Settings from the Preset editing options screen, you can edit various SCA parameters (see Figure 2.37).

**Figure 2.37: SCA Settings menu**

![SCA Settings menu](image)

Use the up and down buttons to move the cursor to the desired SCA setting and then press the right button to enable editing of the parameter. Figure 2.38 shows all the editing screens for the SCA Settings menu. Within any of the editing screens, use the up and down buttons to edit or toggle a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display. When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu. If you select Internal SCA1 or Internal SCA2, there is a sub-menu that contains additional SCA settings (see Figure 2.39 on page 2-47).

**Figure 2.38: SCA Settings editing screens**

![SCA Settings editing screens](image)

- **SCA Reduction:** Select a value between 0 and 20%.
- **MPX SCAs:** Select ON or OFF.
- **MPX SCA Input:** Select a level between 1 and 5 V peak-to-peak (of MPX SCAs is ON).
- **Int. SCA1 or Int. SCA2** (see Figure 2.39 on page 2-47).
Figure 2.39: Internal SCA1 and SCA2 editing screens

- **SCA Enable**: Select ON or OFF.
- **SCA Level**: Select a level between 0 and 20%.
- **SCA Freq**: Select a frequency between 20 and 100 kHz.
- **SCA Input**: Select a level between -12 and 12 dBu.
- **SCA Low Pass**: Select ON or OFF.
- **SCA Preemp**: Select the desired pre-emphasis characteristic - 0 us, 50 us, 75 us or 150 us.
- **SCA Mode**: Select FM or DSB-SC.
**RDS Settings.** When you select **RDS Settings** from the **Preset** editing options screen, you can edit various RDS parameters (see **Figure 2.40**).

**Figure 2.40: RDS Settings menu**

![RDS Settings menu](image)

Use the up and down buttons to move the cursor to the desired RDS setting and then press the right button to enable editing of the parameter. **Figure 2.41 on page 2-49** shows all the editing screens for the **RDS Settings** menu. Within any of the editing screens, use the arrow buttons to edit or toggle a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display (as applicable). When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu. If you select DI Code (see **Figure 2.42 on page 2-50**) or AF Data (see **Figure 2.43 on page 2-51**), there are associated sub-menus that contain additional setting options.
• **Enable**: Select ON or OFF.

• **Data Source**: Select Internal, Ext. ASCII, Ext. UECP, ASCII Over IP, or UECP Over IP.

• **Baud Rate**: Select 150 bps, 300 bps, 600 bps, 1.2 kbps, 2.4 kbps, 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps or 115.2 kbps.
• **RDS Level**: Select a value between 0 and 10%.

• **RDS Phase**: Select a value between 0 and 360 degrees.

• **PS Name**: Enter an 8-character name. Use the right and left arrows to move the cursor to the desired character. Use the up and down arrows to edit the character.

• **PI Code**: Enter a hex value between 0x0000 and 0xFFFF.

• **Program Type**: Select the program type from various choices.

• **Traffic Flags**: Select None, TA/TP, TP or TA.

• **Music/Speech**: Select Music or Speech.

• **DI Code**: See Figure 2.42.

• **AF Data**: See Figure 2.43 on page 2-51.

• **Local Echo**: Select ON or OFF.

**Figure 2.42: DI Code editing screens**

- **Art. (Artificial) Head**: Select ON or OFF.

- **Compression**: Select ON or OFF.

- **Dynamic**: Select Dynamic or Static.

- **Stereo**: Select Stereo or Mono.
Figure 2.43: AF Data editing screen

- **AF Number**: Select the number of alternate frequencies (between 0 and 6).
**Limiter Settings.** When you select **Limiter Settings** from the **Preset** editing options screen, you can edit various limiter parameters (see **Figure 2.44**).

**Figure 2.44: Limiter Settings menu**

Use the up and down buttons to move the cursor to the desired limiter and then press the right button to enter the associated sub-menu for:

- **Hard Limiter** (see **Figure 2.45**)
- **AGC Limiter** (see **Figure 2.41** on page 2-49)
- **2-Slope Limiter** (see **Figure 2.41** on page 2-49).

Within a sub-menu, use the up and down buttons to move the cursor to the desired limiter setting and then press the right button to enter the associated editing screen. Within any of the editing screens, use the arrow buttons to edit or toggle a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display (as applicable). When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

**Figure 2.45: Hard Limiter sub-menu and editing screens**
The AGC Limiter sub-menu and editing screens allow the following configurations:

- **Enable**: Select ON or OFF.
- **Limit**: Select a value between 0 and 160%.
- **Time Constant**: Select a value between 0 and 100 ms.

The Figure 2.46 illustrates these configurations with graphical representations.
Figure 2.47: 2-Slope Limiter sub-menu and editing screens

- **Enable**: Select ON or OFF.
- **Limit**: Select a value between 0 and 160%.
- **Gain**: Select a value between 0 and 100%.

**Audio Loss**. When you select **Audio Loss** from the Preset editing options screen, you can edit the parameters related to an audio loss (see Figure 2.48).

Figure 2.48: Audio Loss menu
Use the up and down buttons to move the cursor to the desired audio loss menu item and then press the right button to enable editing of the item. **Figure 2.49** shows all the editing screens for the Audio Loss menu. Within any of the editing screens, use the up and down buttons to edit a parameter value, noting the minimum and maximum limitations indicated at the bottom of the display (as applicable). When complete, press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

**Figure 2.49: Audio Loss editing screens**

- **Enable**: Determines whether the audio loss feature is used. Select ON or OFF.
- **Threshold**: Sets the audio threshold below which the transmitter will take action. Select a value between 0 and 100%.
- **Timeout**: Sets the time period of low audio (based on the threshold setting) after which the transmitter will take action. Select a value between 0 and 15360 seconds (256 minutes).
- **Action**: Determines the action taken by the transmitter when the audio has been below the threshold for the timeout period. Select Alarm Only, Switch Preset or RF Inhibit.
- **Preset**: Determines the preset that becomes active after an audio loss if the audio loss action action is set to Switch Preset.
**Audio Delay.** When you select **Audio Delay** from the **Preset** editing options screen, you can edit or disable the audio delay period (see **Figure 2.50**).

**Figure 2.50: Audio Delay menu**

![Audio Delay menu](image)

Use the up and down buttons to change the audio delay setting between disabled and any time period between 0 and 13 seconds, then press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

**Copy Another Preset.** When you select **Copy Another Preset** from the **Preset** editing options screen, you can copy the settings from another preset into the preset that is being edited (see **Figure 2.51**). Note the preset being edited is displayed in parentheses [e.g., (P3)].

**Figure 2.51: Copy Another Preset Screen**

![Copy Another Preset Screen](image)

Use the up and down buttons to select the preset (see available presets in parentheses on the bottom line of the display) that you wish to copy to the selected preset for editing. Press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.
Setting Local/Remote Control

You can set the transmitter’s local/remote control using the remote AUI’s Local/Remote button (see “Local/Remote” on page 2-14) or using the local front panel display (see “Using the front panel”).

Using the Front Panel

When you select Local/Remote from the Main Menu, you can set the local/remote operating control for the VS2.5 (see Figure 2.52 on page 2-57).

Figure 2.52: Local/Remote Selection Screen

Use the up and down buttons to toggle between Local and Remote. Press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

Resetting Alarms

You can attempt to reset any latching transmitter alarms that are holding the transmitter in an “off-air” state using the remote AUI’s Reset button (see “Reset” on page 2-14) or using the local front panel display (see “Using the front panel”).

Using the Front Panel

When you select Reset Alarms from the Main Menu, you can attempt to reset latched protection circuits in the VS2.5 (see Figure 2.53). If the alarm condition has been cleared, the alarm indication on the View Alarms screen should disappear.

Figure 2.53: Reset Alarms Screen

Use the up and down buttons to toggle between Reset Alarms and Cancel. Press the accept (checkmark) button to save the change. Press the cancel (X) button to return to the previous menu.
VIEWING TRANSMITTER STATUS

You can view the VS2.5’s operational status using the AUI’s Transmitter Status page - see Figure 2.54. This page shows current active alarms and status to aid in fault diagnosis. To view the Transmitter Status page, select Transmitter Status from the Menu options.

Figure 2.54: Transmitter Status page

Click the X to close this page and return to the home page.

The left-hand section of the Transmitter Status displays tabs that list all transmitter alarms and meters (as selected). Alarms are listed by their host device (Controller or Exciter), alarm name and severity level [1 = low (RF output not affected), 5 = medium (RF output is reduced), 10 = high (RF output is inhibited)].

Click an item in the Alarms or Meters tab to display its details on the right-hand section. For the Alarms tab, details include a description of the alarm and help text (e.g., troubleshooting tips). For the Meters tab, click Show Meter List to display a list of selectable meters. Select the desired real-time meters to display on the left-hand side of the screen to assist in troubleshooting. Meter colour coding is identical to that described in “Viewing real-time meters” on page 2-32.

Click the Reset button at the bottom of any AUI screen to attempt to clear any latching alarms that are holding the transmitter in an “off-air” state (see “Reset:” on page 2-14). If the offending alarm has cleared, the transmitter should resume operation.
Setting user accounts

Depending on user permission rights, you can set up accounts to allow certain users to access and control features of the AUI using the User Accounts page - see Figure 2.55. To view the User Accounts page, select User Accounts from the Menu options. Click X in the upper, right corner to close this page, discard changes and return to the home page.

The VS2.5 contains a default user account when it leaves the factory. This account appears as Nautel (Auto) in the List of Users and has Super User permission level. The default Username is “Nautel”. The default Password is blank. It is recommended that this account be deleted once the desired user account(s) is (are) created (see “First-time login” on page 2-61).

Figure 2.55: User Accounts page

Note: This function is only available via remote connection to the AUI.

Note: Depending on the permission level assigned to a given user, some features shown in Figure 2.55 may not be displayed or available.
SETTING USER ROLE

There are three levels of role that can be assigned to users, each with their own specific functionality. All users have permission to change their own username and password, but are otherwise limited to the following functions:

- **Read Only**: Can monitor equipment data only. No administrative or control functions.
- **Read/Write**: Can monitor and control equipment. No administrative functions.
- **Super User**: Can perform all functions. Super User is the only permission level that allows addition, removal or modification of users.

EDITING ACCOUNT INFORMATION

If you have Super User permission level, you can edit any user account.

**EDITING AN EXISTING ACCOUNT.** To edit an existing user account, click on the desired user in the List of Users on the left side of the User Accounts panel. The Settings for that user will be displayed on the right-hand side of the User Accounts panel. You can edit the Username, Password, User Role (see “Setting user role”) and Permissions.

**CHANGING THE PASSWORD.** To change your password, click Change Password. A menu appears that prompts you to enter the old password, new password and confirmation of the new password. Click the OK button to accept changes or the Cancel button to discard changes and exit this menu.

**CHANGING PERMISSIONS.** To change permissions to specific functions, click Change Permissions. A menu appears that contains five selectable items - Presets, Hardware Configuration, Software Configuration, Remote I/O and Clear Log. Check the items for which you are allowing edit permission. Click the OK button to accept changes or the Cancel button to discard changes and exit this menu.

**ADDING AN ACCOUNT.** To add a new user account, click Add New User. Enter the username, click the OK button to accept, then set the account information in the Settings section. Click the Cancel button or X to discard changes and exit this menu.

**REMOVING AN ACCOUNT.** To remove a user account, select the desired user from the List of Users and click the Remove User button. A verification prompt will appear. Click the OK button to accept changes or the Cancel button to discard changes and exit this menu.

To save your changes, click Apply.
FIRST-TIME LOGIN

When you enter the User Accounts page for the first time, it is recommended you create an account and then delete the default Nautel account, as follows:

1. Login to the AUI using the default Username ("Nautel") and Password (blank).
2. Set up your own Super User account, with your desired Username and Password.
3. Logout of the AUI, then login to your new Super User account.
4. Delete the Nautel (Auto) account.
Software Configuration

Note:
Unless otherwise noted, the following functions are only available via remote connection to the AUI.

You can perform software upgrades to the AUI or transmitter, or perform various restarts or resets using the Software Configuration page - see Figure 2.56. To view the Software Configuration page, select Software Configuration from the Menu options. Click X in the upper, right corner to close this page and return to the home page. The following options are available:

Figure 2.56: Software Configuration page

- **Network Setup**: The AUI allows viewing of network parameters. Configuration of these parameters is done locally, using the front panel UI (see “Network setup” on page 2-64).

- **Upgrade Software**: Allows for uploading software upgrade files for various transmitter sub-systems (e.g., Controller, Exciter, etc.) (see “Upgrading software” on page 2-68).
• **Email Configuration**: Allows configuration of email parameters (e.g., server name, port number, etc.) (see “Email configuration” on page 2-69).

• **Notifications**: Allows configuration of email notifications to be sent for user-selected alarm occurrences (see “Notifications” on page 2-70).

• **Upload Files**: Allows uploading of audio files and software upgrade files (see “Upload files” on page 2-72).

• **Audio Player**: Allows configuration of an audio player to play audio files, Shoutcast audio streams or Livewire audio streams (see “Audio player” on page 2-73).
Network Setup

Network settings are configured using the local front panel display (see “Using the front panel”). Once you have established an IP address, you can login remotely and view (but not change) these settings using the remote AUI (see “Using the AUI”).

Determining DHCP setting

One of the main decisions in configuring the network connection on your VS2.5 transmitter is whether you set DHCP to ON or OFF. If you are connecting to a network, consult with a network administrator before connecting the transmitter to your network to determine whether to enable (turn ON) or disable (turn OFF) the DHCP setting.

When DHCP is set to ON (default from factory), IP addresses are assigned automatically. In order for this feature to function properly, you must have a network-viewable DHCP server on your network.

If a DHCP server is not present, you (or your network administrator) must provide static addresses for IP, netmask, gateway and nameservers (gateway and nameservers are optional). You must enter them manually using the front panel. In this case, DHCP should be set to OFF.

Using the front panel

From the front panel, in local mode, you can set or change network settings. To view the Network Settings screen, select User Settings -> Network Settings from the Main Menu. See Figure 2.57 on page 2-65. Configure the network as follows:

Use the up and down buttons to move the cursor to the desired parameter and then press the right button to enable editing of the setting. Within any of the editing screens, use the left and right buttons to select a character for editing and then use the up and down buttons to edit a setting. Press the accept (checkmark) button to save the change. Press the cancel (X) button to discard changes and return to the previous menu.

- **MAC Address**: Set during factory testing; cannot be modified.
- Set DHCP to ON or OFF (see “Determining DHCP setting”).
- If DHCP was set to OFF enter the IP Address, Netmask, Gateway, Nameserver 1 and Nameserver 2 (gateway and nameservers are optional). A nameserver (also called a DNS) translates a host name (e.g., mail.nautel.com) to an IP address such as in configuring email (see “Email configuration” on page 2-69).

If you are using a laptop to connect to the VS2.5, see “Connecting a laptop directly to the transmitter” on page 2-66.
Figure 2.57: 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.
Connecting a laptop directly to the transmitter

If connecting to the VS2.5 directly with a laptop, you must set a static IP address on the VS2.5 and your laptop.

1. From the front panel UI’s Main Menu, go to User Settings/Network Settings and set the IP address as follows:
   - DHCP: OFF
   - IP Address: 10.10.10.2
   - Netmask: 255.255.255.0

2. Set the transmitter for Remote control.

Note: The following steps assume the operating system is Windows XP. Adapt as required for computers with different operating systems.

3. On the laptop, go to Start Menu/Control Panel/Network Connections/Local Area Network.


5. In the Internet Protocol (TCP/IP) Properties window, select Use the following IP address.

6. Enter the following settings:
   - IP Address: 10.10.10.1
   - Subnet Mask: 255.255.255.0
   - Default Gateway: 192.168.1.2

7. In the Internet Protocol (TCP/IP) Properties window, select OK.

8. In the Local Area Connection Properties window, select OK.

9. In the Local Area Connection Status window, select Close.

10. Close the Network Connections window.
Using the AUI
By entering the VS2.5’s established IP address into an Internet browser’s address bar, and then logging into the AUI, you can view the network parameters configured through the front panel UI using the Network Setup page - see Figure 2.58. You cannot modify parameters from this page.

Figure 2.58: Network Setup page

All addresses shown are for reference purposes only
UPGRADING SOFTWARE

See Figure 2.59.

Figure 2.59: Upgrade Software page

To upgrade a transmitter subsystem’s software, see “Upgrading software” in Section 4, “Non-standard maintenance” on page 4-1 of this manual.

CAUTION:
If you are upgrading from a software version prior to V1.2, the ARM Watchdog feature must be DISABLED during the software upgrade process. Failure to observe this may result in a non-operational transmitter that will require a full operating system recovery. Refer to “Configuring ARM watchdog” on page 2-78 for details on disabling the ARM watchdog feature.
Email configuration

Email configuration (see Figure 2.60) is required if the notification feature is used (see “Notifications” on page 2-70).

Figure 2.60: Email Configuration page

To configure the email feature, perform the following steps:

1. Enter the four fields, noting the following:
   - **Server Name**: In order to enter a server name (e.g., mail.nautel.com), at least one nameserver IP address must be entered (see “Network setup” on page 2-64).
   - **Port Number**: Enter the addressing information used to identify the senders and receivers of messages. Typically set to 25 for SMTP systems.
   - **Client Name**: Set to a name that associates to the transmitter such as station identification (e.g., NV40_WXYZ). This name will be included in notification emails.
   - **Sender Name**: Enter as a standard email address (e.g., xxxxxxx@yyyyy.zzz).

2. When complete click **Apply** or click **Undo** to restore the previous setting. Use the **Test** button to enter an email address to test your settings. Click the **OK** button to run the test or the **Cancel** button to return to the **Email Configuration** page.
NOTIFICATIONS

The notifications feature (see Figure 2.61) provides a means for the transmitter to issue emails triggered by user defined alarm events.

Figure 2.61: Notifications page

To configure the notifications feature, perform the following steps:

1. Pre-existing notifications are displayed in the Notifications list. Click Add to create a new item for notification, click Update (after highlighting an existing item) to edit an existing item or click Delete to erase an item.

2. When you click Add or Update, the screen in Figure 2.62 will appear. This screen allows you to add or edit a Notification Name, Recipient Email, and define the alarm list by device type (Exciter or Controller). Add or remove alarms by moving them (using the >> and << arrow buttons) from the Available Alarms list to the Selected Alarms list. An email is issued when any alarm in the Selected Alarms list is active.

3. When complete click the OK button to accept changes or the Cancel button to discard changes and return to the Notifications page.
Figure 2.62: Notifications adding/updating page

[Diagram of Notifications interface]

- **Notification Name**: Power Supply Fault
- **Recipient Email**: vs@nautel.com
- **Device Type**: Controller

**Available Alarms**
- All Power Amplifiers Inactive
- ARM Network Down
- Cutback Active
- Discharging PA Volts
- External Interlock Open
- Fan 1 Fail
- Fan 2 Fail
- Fan 3 Fail

**Selected Alarms**
- +1.2V Supply Fail
- +1.8V Supply Fail
- +15V Supply Fail
- +3.3V Supply Fail
- +48V Supply Fail
- +5V Supply Fail
- -15V Supply Fail

Buttons: OK, Cancel
**UPLOAD FILES**

See Figure 2.63.

Figure 2.63: Upload Files page

Using the **Audio Files** tab, you can upload audio files with either .mp3 or .wav extensions.

Audio files are stored on a USB drive plugged into the USB-A (A1J8B) or USB-B (A1J8C) connector on the rear of the transmitter. The USB drive must be formatted with a FAT32 file system.

Use the **Browse** button to locate a file and then click **Upload** to upload the file. To remove a file from the USB drive, select a file from the list and click **Delete**. Before removing a USB drive from the rear of the transmitter, click the **Unmount** button.

**CAUTION:**
Failure to click the Unmount button before removing a mounted USB drive may result in lost or corrupt files.

Using the **Upgrade Files** tab, you can upload Nautel supplied software upgrade files that contain a .tgz extension. Use the **Browse** button to locate a file and then click **Upload** to upload the file. To remove a file, select a file from the list and click **Delete**.
The built-in audio player (see Figure 2.64) can use a file playlist, Livewire or Shoutcast as an audio source. These sources must be configured before they can be used. This section describes how to configure audio player sources. The Audio Player page has three selectable tabs:

- Playlist
- Files - see page 2-74
- Streams - see page 2-75

**Figure 2.64: Audio Player page - Playlist tab**

**Playlist**
The Playlist tab (see Figure 2.64) displays the audio files and sequence that currently make up the playlist. Only audio files that are supported (e.g., .wav or .mp3 files) will be played. Also, you must activate a preset that has Playlist selected in the Main Audio -> Secondary Digital -> Secondary Source in the Presets menu.

Use the Move Up and Move Down buttons on the right-hand side of the display to change the playlist sequence.
Use the **Remove** button to delete audio files from the playlist.

Use the **Save** button to save the new configuration whenever a change is made to the file playlist. If the playlist is currently playing, changes will not take effect until the playlist is started again.

**Figure 2.65: Audio Player page - Files tab**

**FILES**

The **Files** tab (see Figure 2.65) is used for adding audio files to the playlist. Audio files must be stored on a USB device plugged into the USB-A (A1J8B) or USB-B (A1J8C) connector on the rear of the transmitter; they are not stored in the transmitter. Only the audio files stored in the root directory of the most recently connected USB device appear on the playlist. The list will be empty if no USB device is connected.

Click the **Refresh** button to force an update of the playlist.

The audio player supports only one USB device at a time. If multiple USB devices are connected, only the most recently connected USB is recognized as the active USB drive. If multiple USB devices are connected and one is removed, both devices are unmounted.

To add an audio file to the playlist, select the file(s) from the list and click the **Add to Playlist** button.
STREAMS

The VS2.5 is capable of playing audio streams in either Shoutcast or Livewire format.

The audio player supports Shoutcast playlists and IP addresses for audio streams. For a Shoutcast playlist enter the URL for the station. For an audio stream, enter the IP address followed by a colon, then the port for that stream (e.g., 10.10.10.1:8080).

For Livewire, enter the channel that contains the desired audio.
**Adding an Audio Stream.** Add a new audio stream as follows:

1. From the **Streams** tab (see Figure 2.66 on page 2-75), click the **Add...** button.

2. Use the drop-down menu to select the desired **Type** of audio stream - **Shoutcast** or **Livewire** (see Figure 2.67).

3. Enter the appropriate information for the audio server (Name and URL for Shoutcast; Name and Channel for Livewire). Make sure the VS2.5 can access the location.

4. Click **OK** to add the audio stream or click **Cancel** to discard changes.
You can establish calibration values and fault thresholds for critical parameters of the VS2.5 using the remote AUI or using the local front panel display. The following options are available:

- Configuring ARM watchdog - see page 2-78
- Calibrating exciter TCXO - see page 2-79
- Calibrating audio inputs - see page 2-81
- Configuring RF drive source - see page 2-83
- ARM reset - see page 2-83
- OS recovery - see page 2-84

**Note:** Changing threshold values in the System Settings -> Thresholds menu and changing the console selection in the System Settings -> Console Select menu is not normally required, and should only be performed by trained personnel. Information on these sub-menus is not included in the manual. Contact Nautel for assistance.
**Configuring ARM watchdog**

*Note:* ARM watchdog configuration is only available using the front panel display.

From the front panel UI, you can enable or disable the ARM watchdog feature. This feature, when enabled, monitors communication between the ARM processor and the DSP processor on the exciter/control PWB. If communication is lost for more than 30 seconds, the transmitter will initiate an alarm and reboot the ARM. To view the ARM Watchdog screen, select System Settings -> ARM Watchdog from the Main Menu (see Figure 2.68).

**Figure 2.68: ARM Watchdog Screen**

Use the up and down buttons to toggle between Enabled and Disabled. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.
**CALIBRATING exciter TCXO**

You can calibrate the internal clock reference to an external 10 MHz clock using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-80).

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**Note:**

*During calibration, the external 10 MHz clock should be connected to the EXT 10 MHz IN (A1J4B) BNC connector on the rear of the VS2.5.*

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**USING THE AUI**

To view the AUI’s Exciter TCXO screen (see Figure 2.69), select Hardware Configuration from the Menu options.

**Figure 2.69: AUI - Exciter TCXO calibration page**

To automatically calibrate the internal reference, click the **Start** button. The progress bar at the bottom of the page will indicate that the calibration is in progress or complete. The **TCXO Calibration Value** will appear when calibration is complete. Alternatively, if the required calibration value is known, you can enter it in the **TCXO Calibration Value** field and click the **Set** button.
Using the Front Panel

To view the front panel's TCXO calibration screens (see Figure 2.70), select System Settings -> Calibration from the Main Menu.

Figure 2.70: Front Panel - TCXO calibration screens

Use the up or down arrow to place the cursor next to TCXO Offset, then press the accept (checkmark) button to enter the TCXO Offset screen. Use the up and down arrows to set the TCXO offset value (in ppm) for the external 10 MHz source. When complete, press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.

From the calibration menu, press the down arrow to place the cursor next to Run TCXO Cal, then press the accept (checkmark) button to enter the Run TCXO Cal screen. The calibration routine will begin when the external 10 MHz source is connected.
CALIBRATING AUDIO INPUTS

You can calibrate analog and MPX (composite) audio inputs using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-82).

USING THE AUI

To view the AUI’s Audio Input Calibration screen (see Figure 2.71), select Hardware Configuration from the Menu options. The peak meter value of each applied audio input (analog left, analog right, MPX or MPX SCA) will be displayed. Enter the calibration value and click Set to save changes.

Figure 2.71: Audio Input Calibration screen
**Using the front panel**

To view the front panel’s audio input calibration screens (see Figure 2.72), select **System Settings -> Calibration** from the **Main Menu**.

**Figure 2.72: Front Panel - Audio Input calibration screens**

Use the up or down arrow to place the cursor next to the desired audio input calibration item (Bal L Cal, Bal R Cal, MPX Cal or MPX SCA Cal), then press the accept (checkmark) button to enter the selected audio input. Use the up and down arrows to set the new calibration value for the selected audio input. When complete, press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.

**Note:**

Forward power (Run Fwd Cal) and reflected power (Run Refld Cal) calibrations are performed at the factory and should not require user adjustment. Contact Nautel for assistance, if necessary.
### Configuring RF Drive Source

**Note:**

> Configuration of the RF drive source is only available using the front panel display.

From the front panel UI, you can configure the source of the transmitter’s RF drive (internal or external). To view the **RF Drive Source** screen, select **System Settings -> RF Drive Source** from the **Main Menu** (see Figure 2.73).

**Figure 2.73: RF Drive Source Menu**

Use the up and down buttons to toggle between **Internal VS Exciter** and **External Exciter**. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.

### ARM Reset

**Note:**

> An ARM reset is only available using the front panel display.

From the front panel UI, you can reset the ARM on the exciter/control PWB. To view the **ARM Reset** screen, select **System Settings -> ARM Reset** from the **Main Menu** (see Figure 2.74).

**Figure 2.74: ARM Reset Screen**
Use the up and down buttons to toggle between **Force ARM Reset** and **Cancel**. Press the accept (checkmark) button to save the change. If a reset is selected, it will occur immediately. Select **Cancel** or press **X** to abort the reset and return to the previous menu.

**OS RECOVERY**

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**Note:**

An OS recovery reset can restore the transmitter’s operating system. It should only be required if a problem occurs during a software upgrade.

This feature is only available using the front panel display.

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From the front panel UI, you can perform a recovery reset of the operating system (OS). You will also need to install a flash drive, provided by Nautel, in one of the USB ports on the rear of the VS2.5. To view the **OS Recovery** screen, select **System Settings -> OS Recovery** from the **Main Menu** (see **Figure 2.75**).

**Figure 2.75: OS Recovery Screen**

Use the up and down buttons to toggle between **Force OS Recovery** and **Cancel**. Press the accept (checkmark) button to save the change. Select **Cancel** or press **X** to abort the recovery and return to the previous menu.
**CONFIGURING REMOTE INPUTS AND OUTPUTS**

*Note: This function is only available via remote connection to the AUI. However, you can view the status of remote inputs and outputs on the front panel display.*

You can define and configure your remote input/output interface for the transmitter using the Remote I/O Page (Inputs tab selected) - see Figure 2.76. To view the Remote I/O page, select Remote I/O from the Menu options. Click X in the upper, right corner to close this page and return to the home page.

Refer also to the VS2.5 Pre-installation Manual for information on remote inputs and outputs and their factory default settings.

**Figure 2.76: Remote I/O Page (Inputs tab selected)**

Click the Inputs (see “Digital inputs” on page 2-86) or Outputs (see “Digital outputs” on page 2-88) tab to view or edit detail on the digital inputs or outputs.
Digital Inputs

Using the Inputs tab (see Figure 2.76 on page 2-85), you can configure up to 10 digital inputs that allow you to remotely control various operational characteristics of the transmitter. Unless otherwise noted, these inputs are only accepted by the transmitter if the remote/local status is set to remote. That setting can only be made by a local user using the front panel UI.

Nautel presets the digital inputs prior to shipping. See the VS2.5 Pre-installation Manual for details.

Select the desired digital input (1 through 10) from the list. The Channel and Control settings for the selected input, as well as the current logic level (1 or 0), are displayed on the right-hand side of the page. You can define the Channel and Control settings as follows:

Select Channel

You can configure digital inputs 1 through 10 for one of a variety of control inputs. Click the existing Channel bar to display the Select a remote window. From this window select one of the following options by clicking Load:

- **Not Assigned.** No effect on transmitter operation, regardless of logic level.
- **RF On/Off.** Same as clicking RF On (telling the system to provide RF power, if possible) or RF Off on the AUI.
- **Controller Reset.** Causes a system reset.
- **Inc/Dec RF Power.** Same as clicking Increase or Decrease on the AUI.
- **Preset: NAME.** Selects the associated preset (from a list of all pre-defined presets) as active.

Configure Control Logic

You can configure the active/inactive control logic for each of the 10 digital inputs. Click the existing Logic bar to display the applicable drop-down menu options, which may include:

- **Rising Edge Turn On/Reset.** Logic ‘1’ (high or rising edge) activates the input (or causes a reset, as appropriate).
- **Falling Edge Turn On/Reset.** Logic ‘0’ (low or trailing edge) activates the input (or causes a reset, as appropriate).
- **Rising Edge Turn Off.** Logic ‘1’ (high or rising edge) de-activates the input.
- **Falling Edge Turn Off.** Logic ‘0’ (low or trailing edge) de-activates the input.
- **Falling Edge Toggle.** Logic ‘0’ (low or trailing edge) de-activates the input; next logic ‘0’ (low or trailing edge) activates the input.

- **Rising Edge Toggle.** Logic ‘1’ (high or rising edge) activates the input; next logic ‘1’ (high or rising edge) de-activates the input.

- **Rising Edge, Turn On. Falling Edge Turn Off.** Logic ‘1’ (high or rising edge) activates the input; logic ‘0’ (low or trailing edge) de-activates the input.

- **Falling Edge, Turn On. Rising Edge Turn Off.** Logic ‘0’ (low or trailing edge) activates the input; logic ‘1’ (high or rising edge) de-activates the input.

- **Active High, Increase.** Logic ‘1’ (high) causes a power increase.

- **Active Low, Increase.** Logic ‘0’ (low) causes a power increase.

- **Active High, Decrease.** Logic ‘1’ (high) causes a power decrease.

- **Active Low, Decrease.** Logic ‘0’ (low) causes a power decrease.

Click **Apply** to activate changes. Click **Undo** to cancel changes.

**View digital inputs on the front panel display**

To view the status of digital inputs 1 through 10 on the front panel display, select **User Settings -> Remote I/O -> Remote Inputs** from the **Main Menu** (see Figure 2.77).

**Figure 2.77: Remote Inputs Screen (Input 1 shown)**

Use the up and down buttons to scroll through the remote inputs. These inputs correspond to the remote inputs set through the remote AUI. The screen is for viewing purposes only. It contains the input number (1 through 10) and name, as well as the current logic state of the associated input pin. Press cancel (X) to return to the previous menu.
**Digital Outputs**

Using the Digital Outputs Page - see Figure 2.78, you can configure up to 16 digital outputs that indicate either the presence of various alarms or the status of operator controlled circuits.

Nautel presets the digital outputs prior to shipping. See the VS2.5 Pre-installation Manual for details.

**Figure 2.78: Digital Outputs Page**

Select the desired digital output (1 through 16) from the list. The **Channel** and **Logic** settings for the selected output, as well as the current logic level (1 or 0), are displayed on the right-hand side of the page. You can define the **Channel** and **Logic** settings as follows:
**Select channel**

You can configure digital outputs 1 through 16 to monitor a variety of alarm and status outputs. Click the existing Channel bar to display the Select a remote window. From this window, select one of the channels, then click Load to accept:

- **Not Assigned.** No alarm or status parameter is monitored.
- **Local/Remote.** The active logic level indicates the transmitter is in local control. The inactive logic level indicates the transmitter is in remote control.
- **RF On/Off.** The active logic level indicates the transmitter’s RF power stage is on (enabled). The inactive logic level indicates the transmitter’s RF power stage is off.
- **Preset Status** (1-4 default). The active preset’s output will be indicated by a logic low. The remaining, non-active preset outputs will be open collector.
- **Various Alarms.** The active logic level indicates that the selected alarm is occurring. Any transmitter alarm can be selected as a digital output. Refer to the VS2.5 Troubleshooting Manual for a description of each alarm.

**Configure logic**

You can configure the active/inactive logic for each of the 16 digital outputs. Click the existing Logic bar to display the applicable drop-down menu options. For example, if the selected channel is RF On/Off, the drop-down options are:

- **Output Low When Off.** Logic ‘0’ (low) indicates the output is true (RF is off); Logic ‘1’ (high) indicates the output is false (RF is on).
- **Output Low When On.** Logic ‘0’ (low) indicates the output is true (RF is on); Logic ‘1’ (high) indicates the output is false (RF is off).

Click Apply to activate changes. Click Undo to cancel changes.
View Digital Outputs on the Front Panel Display

To view the status of digital outputs 1 through 16 on the front panel display, select User Settings -> Remote I/O -> Remote Outputs from the Main Menu (see Figure 2.73).

Figure 2.79: Remote Outputs Screen (Output 1 shown)

Use the up and down buttons to scroll through the remote outputs. These outputs correspond to the remote outputs set through the remote AUI. The screen is for viewing purposes only. It contains the output number (1 through 16) and name, a logic description of the output’s active state (e.g., “RF On = Low” or “Active High”) as well as the current logic state of the associated output pin. Press cancel (X) to return to the previous menu.

Analog Outputs

There are four analog outputs that can be remotely monitored. These outputs are factory defined and are not user configurable. Refer to the VS2.5 Pre-Installation Manual for a list of these analog outputs.
Setting Pilot Sample Level

Note:
Setting the pilot sample is only available using the front panel display.

From the front panel, you can set the level of the pilot sample that is applied to the PILOT SAMPLE OUT (A1J4A) BNC connector on the rear of the VS2.5. To view the Pilot Sample screen, select User Settings -> Pilot Sample from the Main Menu (see Figure 2.80).

Figure 2.80: Pilot Sample Screen

Use the up and down buttons to edit the pilot sample level. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.
FRONT PANEL DISPLAY SETTINGS

Note:
Front panel display settings are only available using the front panel display.

From the front panel, you can configure the LCD display’s contrast, brightness and backlight settings. To view the LCD Settings screen, select User Settings -> LCD Settings from the Main Menu (see Figure 2.81).

**Figure 2.81: LCD Settings Menu**

This menu has four sub-menu options:

- **LCD Contrast** - sets the display contrast.
- **LCD Backlight** - sets the brightness of the display’s backlight during normal use.
- **LED Timeout** - sets a time delay, after a period of non-use, that the brightness of the display’s backlight will dim. Can also be disabled.
- **Menu Timeout** - sets a time delay, after a period of non-use, that the front panel screen will revert back to the main menu.

Use the up and down buttons to move the cursor to the desired display setting and then press the right button to enable editing of the setting. **Figure 2.82 on page 2-93** shows the editing screens for the LCD Settings menu. Within any of the editing screens, use the up and down buttons to edit a setting. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.
Figure 2.82: LCD Settings Editing Screens

- **LCD Contrast**: Select a value between 50 (lighter contrast) and 200 (darker contrast).
- **LCD Backlight**: Select a value between 0 and 100%.
- **LED Timeout**: Select disabled (i.e., no timeout) or select a time period between 0 and 1800 seconds (30 minutes).
- **Menu Timeout**: Select a time period between 1 and 60 minutes.
CONFIGURE TEST SIGNAL GENERATOR

Note:
The test signal generator function is only available using the front panel display.

From the front panel UI, you can configure the test signal generator output of the VS2.5. Note that a different menu will appear depending on the currently configured test signal type. To view the Signal Gen screen, select User Settings -> Signal Gen from the Main Menu (see Figure 2.83).

Figure 2.83: Signal Generator Menus

Use the up and down buttons to move the cursor to the desired line item and then press the right button to enable editing.

Figure 2.84 on page 2-95 shows all possible editing screens for the Signal Gen menu. Within any of the editing screens, use the up and down buttons to edit the setting. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.
Figure 2.84: Signal Generator Editing Screens

- **Enable**: Select ON or OFF.
- **Type**: Select None, Sine Wave, Sine Sweep or Bandlimited Noise.
- **Level**: Select a value between 0 and 100 %.
- **Start Freq**: When **Type** is set to Sine Sweep, select a start frequency between 0 and 20 kHz.
- **Stop Freq**: When **Type** is set to Sine Sweep, select a stop frequency between 1 and 20 kHz.
- **Sweep Time**: When **Type** is set to Sine Sweep, select a time between 0 and 60 seconds.
Setting station ID parameters

In certain applications, the VS2.5 may be used as a translator to re-broadcast primary information as a secondary station on an alternate frequency. To allow the secondary station to be identified, you can set station ID parameters such as call sign, FSK deviation and repeat interval. To view the Station ID screen, select User Settings -> Station ID from the Main Menu (see Figure 2.85).

Figure 2.85: Station ID Menu

This menu has four sub-menu options:

- **Call Sign** - sets the station’s call sign letters.
- **FSK ID Enable** - enables (ON) or disables (OFF) the station ID feature.
- **FSK Deviation** - sets the amount of carrier shift from the original carrier frequency. Select a value between -25 kHz and 25 kHz.
- **Repeat Interval** - determines how often the call sign is broadcast using FSK (recommended at least once per hour). Select a value between 1 and 60 minutes.

Use the up and down buttons to move the cursor to the desired display setting and then press the right button to enable editing of the setting. Figure 2.86 on page 2-97 shows the editing screens for the Station ID menu. Within any of the editing screens, use the up and down buttons to edit a setting. In the Call Sign editing screen, use the left and right buttons to select a character for editing. Press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.

Note:
Station ID settings are only available using the front panel display.
Figure 2.86: Station ID Editing Screens

- **Call Sign**: ABCDEFGH
- **FSK ID Enable**: OFF
- **FSK Deviation**: 7.5 kHz (-25 to 25 kHz)
- **Repeat Interval**: 60 minutes (1 to 60 minutes)
Using an external 10 MHz input

You can configure the VS2.5 to accept an external 10 MHz input using the remote AUI (see “Using the AUI”) or using the local front panel display (see “Using the front panel” on page 2-99).

Using the AUI

You can view the selection buttons for the external 10 MHz input on the AUI’s Miscellaneous screen (see Figure 2.87) by selecting Hardware Configuration from the Menu options. True and False buttons for Use External 10 MHz will be displayed. Click True if you are using an external 10 MHz signal. Click False if not. Click X in the upper, right corner to close this page and return to the home page.

Figure 2.87: Miscellaneous screen
Using the Front Panel

To view the enable/disable screen for the external 10 MHz input (see Figure 2.88), select User Settings -> Ext. 10 MHz Inp from the Main Menu.

Figure 2.88: Front Panel - External 10 MHz Input screen

Use the up or down arrow to toggle between ON (using external 10 MHz input) and OFF (not using external 10 MHz input), then press the accept (checkmark) button to save the change. Press cancel (X) to discard changes and return to the previous menu.
Section 3: Routine Maintenance

This section provides instructions for performing routine maintenance on the VS2.5 transmitter. This section includes the following topics:

- Scheduled maintenance
  - Cleaning fan filters
  - Checking hardware - see page 3-2
  - Battery replacement - see page 3-2
- Performing on-air checks - see page 3-4
- Replacing the exciter/control PWB battery - see page 3-7
- Inspecting lightning protection systems - see page 3-8

Scheduled Maintenance

Scheduled maintenance consists of performing a visual inspection of the VS2.5 at scheduled intervals. The recommended minimum time between scheduled maintenance visits is three months. Local operating and environmental conditions may dictate more frequent visits, while in remote sites, less frequent visits may be acceptable. Experience and system reliability will determine the most practical schedule for a specific installation.

Cleaning Fan Filters

Remove the air filter (see Figure 3.1 on page 3-3) by removing the front panel grill section that is secured with four M4 hex screws. Use the HY93 hex tool provided in the ancillary kit to loosen the screws just enough to allow removal of the front panel grill. Remove the PVC retaining plate and then the filter media from the grill section, rinse it with water, then re-install the air filter. If an air filter becomes damaged, replace it as soon as possible. See “Replacing a damaged air filter” on page 3-2.

Note:
A site located in a dirty area using open-air cooling requires more extensive cleaning than a site located in a clean area using closed-air cooling.
CHECKING HARDWARE

All hardware must be checked at least once a year. Nautel recommends more frequent checking if the VS2.5 is subjected to above average thermal cycling, caused by turning the VS2.5 on and off.

- To prevent damaging the hardware, ensure that the proper size tools are used. In most cases, hardware is metric.

- A mounting surface or terminal that has changed colour indicates a loose hardware connection.

BATTERY REPLACEMENT

The VS2.5's exciter/control PWB contains a battery backup circuit that allows the time and date to update during ac power failure. The battery should be replaced every 12 months. See “Replacing the exciter/control PWB battery” on page 3-7.

REPLACING A DAMAGED AIR FILTER

If an air filter becomes damaged, replace it as follows:

PARTS AND TOOLS

- Replacement air filter
- Hex tool, 3 mm (Nautel Part # HY93, provided in ancillary kit)

PROCEDURE

Take the following steps to replace the air filter in the front panel of the transmitter (see Figure 3.1 on page 3-3):

1. Order a new filter, as necessary, from Nautel (part # HAM77).

2. Gain access to the old filter by removing the front panel grill section secured with four captive M4 hex screws. Use the HY93 hex tool from the ancillary kit and loosen the screws just enough to allow removal of the front panel grill.

3. Temporarily remove the PVC retaining plate from the grill section and remove the old filter.

4. Insert the new air filter, re-insert the PVC retaining plate into the grill section and then re-install the front panel grill.

5. Dispose of the damaged air filter.
Figure 3.1: Air Filter Cleaning or Replacement
Performing on-air checks

You should check the on-air quality of the transmitter’s signal periodically. This check can be done locally at the transmitter site, or remotely from another location in the transmitter’s coverage area.

Interval

Every 12 months, or as required by law.

Parts and tools

• High-quality receiver, compatible with the modulation scheme used on the transmitter.

Procedure

1. Monitor the transmitter signal to identify any problems:
   
   – Use a high quality receiver to monitor audio quality.
   – Take a portable receiver to different locations in your coverage areas to identify any problems with the antenna pattern or areas of localized interference.

2. Obtain the **Proof of Performance** document that was completed during factory testing and provided with the transmitter. Use the front panel UI or the remote AUI to compare current transmitter meter readings with those in the **Proof of Performance** document and in Table 3.1 on page 3-5, which shows expected meter readings at 88 MHz, 98 MHz and 108 MHz. When comparing data, use the frequency column closest to your operating frequency.

**Note:**

Nautel completes the Proof of Performance document with the transmitter operating at 98 MHz, terminated into a precision 50 ohm load. Measurements made at other operating frequencies may not yield the same readings. The data in Table 3.1 on page 3-5 is an example of measured meter values and is provided as a troubleshooting aid. Your front panel meter readings may not be exactly the same as shown, but if an out-of-tolerance condition exists, an alarm will be displayed.
### Table 3.1: Expected Transmitter Meter Readings

<table>
<thead>
<tr>
<th>Meter Parameter (displayed on front panel UI or remote AUI)</th>
<th>Meter Value at ...</th>
<th>88 MHz</th>
<th>98 MHz</th>
<th>108 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward (forward power)</td>
<td></td>
<td>2783 W</td>
<td>2793 W</td>
<td>2789 W</td>
</tr>
<tr>
<td>Reflected (reflected power)</td>
<td></td>
<td>5.71 W</td>
<td>3.25 W</td>
<td>2.10 W</td>
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<tr>
<td>Final Reject Power</td>
<td></td>
<td>0.00 W</td>
<td>0.00 W</td>
<td>0.00 W</td>
</tr>
<tr>
<td>Preamp Current</td>
<td></td>
<td>0.06 A</td>
<td>0.07 A</td>
<td>0.07 A</td>
</tr>
<tr>
<td>IPA Curr</td>
<td></td>
<td>1.96 A</td>
<td>2.25 A</td>
<td>2.39 A</td>
</tr>
<tr>
<td>PA1 Curr</td>
<td></td>
<td>20.9 A</td>
<td>20.9 A</td>
<td>18.9 A</td>
</tr>
<tr>
<td>PA2 Curr</td>
<td></td>
<td>21.0 A</td>
<td>21.0 A</td>
<td>19.0 A</td>
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<tr>
<td>PA3 Curr</td>
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<td>21.3 A</td>
<td>19.9 A</td>
<td>21.6 A</td>
</tr>
<tr>
<td>PA4 Curr</td>
<td></td>
<td>20.5 A</td>
<td>19.3 A</td>
<td>21.8 A</td>
</tr>
<tr>
<td>Heatsink Temperature 1</td>
<td></td>
<td>35.2°C</td>
<td>34.9°C</td>
<td>35.2°C</td>
</tr>
<tr>
<td>Heatsink Temperature 2</td>
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<td>31.3°C</td>
<td>31.0°C</td>
<td>31.0°C</td>
</tr>
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<td>+48V</td>
<td></td>
<td>48.1 V</td>
<td>48.1 V</td>
<td>48.1 V</td>
</tr>
<tr>
<td>+15V</td>
<td></td>
<td>14.9 V</td>
<td>14.9 V</td>
<td>14.9 V</td>
</tr>
<tr>
<td>-15V</td>
<td></td>
<td>-15.5 V</td>
<td>-15.5 V</td>
<td>-15.5 V</td>
</tr>
<tr>
<td>+3.3V</td>
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<td>3.27 V</td>
<td>3.28 V</td>
</tr>
<tr>
<td>+1.8V</td>
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<td>1.81 V</td>
<td>1.81 V</td>
<td>1.81 V</td>
</tr>
<tr>
<td>+1.2V</td>
<td></td>
<td>1.20 V</td>
<td>1.19 V</td>
<td>1.20 V</td>
</tr>
<tr>
<td>Battery</td>
<td></td>
<td>3.01 V</td>
<td>3.01 V</td>
<td>3.01 V</td>
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<tr>
<td>Fan 1</td>
<td></td>
<td>6244 RPM</td>
<td>6308 RPM</td>
<td>6250 RPM</td>
</tr>
<tr>
<td>Fan 2</td>
<td></td>
<td>6074 RPM</td>
<td>6074 RPM</td>
<td>6134 RPM</td>
</tr>
<tr>
<td>Fan 3</td>
<td></td>
<td>6539 RPM</td>
<td>6544 RPM</td>
<td>6498 RPM</td>
</tr>
<tr>
<td>Fan 4</td>
<td></td>
<td>6147 RPM</td>
<td>6042 RPM</td>
<td>6047 RPM</td>
</tr>
<tr>
<td>Fan 5</td>
<td></td>
<td>6221 RPM</td>
<td>6226 RPM</td>
<td>6236 RPM</td>
</tr>
<tr>
<td>Meter Parameter (displayed on front panel UI or remote AUI)</td>
<td>Meter Value at ...</td>
<td></td>
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<td>----------------------------------------------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
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<td></td>
<td>88 MHz</td>
<td>98 MHz</td>
<td>108 MHz</td>
<td></td>
</tr>
<tr>
<td>Fan 6</td>
<td>6072 RPM</td>
<td>6147 RPM</td>
<td>6102 RPM</td>
<td></td>
</tr>
<tr>
<td>Fan 7</td>
<td>6331 RPM</td>
<td>6219 RPM</td>
<td>6290 RPM</td>
<td></td>
</tr>
<tr>
<td>VSWR</td>
<td>1.09</td>
<td>1.07</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Delta 10 MHz</td>
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<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>IPA Fwd</td>
<td>18.1 W</td>
<td>18.1 W</td>
<td>18.2 W</td>
<td></td>
</tr>
<tr>
<td>Total PA Curr</td>
<td>83.6 A</td>
<td>81.2 A</td>
<td>81.3 A</td>
<td></td>
</tr>
<tr>
<td>DC Power In</td>
<td>3497 W</td>
<td>3584 W</td>
<td>3700 W</td>
<td></td>
</tr>
<tr>
<td>DC-RF Eff</td>
<td>79.4 %</td>
<td>77.8 %</td>
<td>75.3 %</td>
<td></td>
</tr>
<tr>
<td>Avg Active PA Pwr</td>
<td>756 W</td>
<td>759 W</td>
<td>758 W</td>
<td></td>
</tr>
<tr>
<td>Avg PA Voltage</td>
<td>41.8 V</td>
<td>44.2 V</td>
<td>45.5 V</td>
<td></td>
</tr>
<tr>
<td>Reject Star 1 Power</td>
<td>0.00 W</td>
<td>0.00 W</td>
<td>0.00 W</td>
<td></td>
</tr>
<tr>
<td>Reject Star 2 Power</td>
<td>0.00 W</td>
<td>0.00 W</td>
<td>0.00 W</td>
<td></td>
</tr>
<tr>
<td>Avg PA Diss</td>
<td>119 W</td>
<td>137 W</td>
<td>168 W</td>
<td></td>
</tr>
<tr>
<td>PA1 Bias</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td></td>
</tr>
<tr>
<td>PA2 Bias</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td></td>
</tr>
<tr>
<td>PA3 Bias</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td></td>
</tr>
<tr>
<td>PA4 Bias</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td>2.74 V</td>
<td></td>
</tr>
<tr>
<td>IPA Bias</td>
<td>2.79 V</td>
<td>2.79 V</td>
<td>2.79 V</td>
<td></td>
</tr>
<tr>
<td>Preamp Bias</td>
<td>2.86 V</td>
<td>2.86 V</td>
<td>2.86 V</td>
<td></td>
</tr>
<tr>
<td>Fwd Atten</td>
<td>14.5 dB</td>
<td>14.5 dB</td>
<td>14.5 dB</td>
<td></td>
</tr>
<tr>
<td>DAC Gain</td>
<td>69.9 %</td>
<td>70.5 %</td>
<td>83.2 %</td>
<td></td>
</tr>
</tbody>
</table>
Replacing the exciter/control PWB battery

Replace the battery on the exciter/control PWB (A1) once a year, or whenever the Controller - Low Battery alarm appears (on the front panel UI or via remote AUI). Chemical leakage from an old battery can cause damage. Also, the exciter/control PWB’s microcontroller may not retain its settings if ac power is turned off while the backup battery power is low. The battery should be replaced while ac power is applied to the transmitter.

Interval

Every 12 months.

Parts and tools

Replacement battery: 3 V lithium coin cell, 20 mm (Nautel Part # BBLT01, Panasonic # CR2032).

Procedure

Perform the following steps to replace the battery:

1. Ensure ac power is being applied to the transmitter.

2. Gain access to the exciter/control PWB (A1) by removing the transmitter’s top cover.

3. Replace battery BT1 on the exciter/control PWB. See Figures MD-1 and MD-2 in the mechanical drawings section at the end of the VS2.5 Troubleshooting Manual to locate the exciter/control PWB (A1) and its battery (BT1).

4. Re-install the transmitter’s top cover.

5. Check for any alarms on the front panel UI or remote AUI. Battery related alarms should clear. (See “Viewing transmitter status” on page 2-58.)
INPECTING LIGHTNING PROTECTION SYSTEMS

You should inspect the lightning protection systems that are connected to your VS2.5 transmitter, ac power, RF feedline, antenna and tower periodically to ensure that your site, equipment and personnel are fully protected.

INTERVAL

Every 6 months.

PARTS AND TOOLS

Depends on your site, but may include a digital multimeter, ladder, binoculars, and continuity tester.

PROCEDURE

Perform the following steps to test the lightning protection systems:

1. Test the continuity between ground available at your lightning arrester and ground available on various pieces of equipment connected to the transmitter. Ensure that there is no resistance (near 0 ohms, accounting for multimeter test lead resistance).

2. Physically inspect the lightning arrester to ensure that all connections are tight. Also look for any sign of scoring or burning (indications of possible damage from earlier lightning strikes).

3. Using binoculars, visually inspect the hardware on the tower. Look for charred, broken or frayed connections and corrosion.
Section 4: Non-standard maintenance

This section provides instructions for performing non-standard maintenance on the VS2.5 transmitter. This section includes the following topics:

- Upgrading software

Upgrading software

Periodically, enhancements or improvements to the operating system are identified and made available. Perform a software upgrade, as required, as follows:

CAUTION:
If you are upgrading from a software version prior to V1.2, the ARM Watchdog feature must be DISABLED during the software upgrade process. Failure to observe this may result in a non-operational transmitter that will require a full operating system recovery. Refer to “Configuring ARM watchdog” on page 2-78 for details on disabling the ARM watchdog feature.

Parts and tools

- Laptop (i.e., local computer for direct connection) or network computer with Windows and Internet Explorer Web browser
- CAT5 Ethernet cable
- Upgrade software (*.tgz file), provided via email or web download

Preliminary checks

1. Determine the current software revision installed. Via the advanced user interface (AUI) screen, go to Menu/Software/Upgrade Software. Select the *.tgz file in the Select Upload File list (should highlight in blue) and click Versions. Note the current software revision for Audio Player, AUI, Server, SNMP Agent, Axia Livewire Module, Watchdog and Controller.

2. Contact Nautel for the most recent software revision and download *.tgz file to a laptop or network location.
**TRANSFERRING UPGRADE FILE**

The following steps assume either the laptop will be used to connect directly to the transmitter OR the transmitter and network computer are currently connected to the same network.

**Transmitter IP configuration**

1. From the transmitter AUI, go to **Menu/Software/Network Setup**.

2. Record your current network settings (IP Address, Subnet Mask, Default Gateway).

3. If connecting to the transmitter directly with a laptop, you must set a static IP address. This can only be done via the front panel interface. From the front panel UI’s **Main Menu**, go to **User Settings/Network Settings** and set the IP address as follows:
   - DHCP: OFF
   - IP Address: 10.10.10.2
   - Netmask: 255.255.255.0

4. Set the transmitter for **Remote** control.

**Laptop IP setup**

The following steps assume the operating system is Windows XP. Adapt as required for computers with different operating systems.

1. On the laptop go to **Start Menu/Control Panel/Network Connections/Local Area Network**.

2. In the Local Area Network Status, open the **General** tab and choose **Properties**. Scroll down and highlight **Internet Protocol (TCP/IP)**. Choose **Properties**.

3. In the **Internet Protocol (TCP/IP) Properties** window, select **Use the following IP address**.

4. Enter the following settings:
   - IP Address: 10.10.10.1
   - Subnet Mask: 255.255.255.0
   - Default Gateway: 192.168.1.2

5. In the **Internet Protocol (TCP/IP) Properties** window, select **OK**.

6. In the **Local Area Connection Properties** window, select **OK**.
7. In the Local Area Connection Status window, select Close.

8. Close the Network Connections window.

**TRANSFER SOFTWARE UPGRADE FILE TO TRANSmitter**

1. If using a laptop, connect the laptop network interface card to the transmitter LAN (A1J8A) connector on the rear panel using a CAT5 Ethernet cable. Open Internet Explorer and search for 10.10.10.2. The transmitter login screen should appear.

2. If using a network computer, open Internet Explorer and search for the IP address recorded in Step 2 of “Transmitter IP configuration” on page 4-2. The transmitter login screen should appear.

3. At the transmitter login screen enter:
   - User: “Nautel” or “*****”, where ***** is the user assigned user name
   - Password: leave blank (default) or “*****”, where ***** is the user assigned password

4. Navigate through the AUI to Menu/Software/Upload Files, select the upgrade files tab and press Browse. Locate the software update *.tgz file stored on the laptop or network computer, and press Upload to load the file into the transmitter upload file list. Allow this operation to complete.

**INSTALLING NEW SOFTWARE**

![CAUTION:]
If you are upgrading from a software version prior to V1.2, the ARM Watchdog feature must be DISABLED during the software upgrade process. Failure to observe this may result in a non-operational transmitter that will require a full operating system recovery. Refer to “Configuring ARM watchdog” on page 2-78 for details on disabling the ARM watchdog feature.

1. Using the front panel UI, set the transmitter to RF Off and for Remote control. Perform the following steps remotely using the AUI on the laptop.

2. Go to the AUI Menu/Software/Upgrade Software screen and select the update *.tgz file from the Select Upload Files list (should highlight in blue) and press Start.

![CAUTION:]
Do not leave this page until the flash process is complete.
3. After a successful load (status is 100% complete and a message indicates a successful load), cycle the ac power (turn off, then on) on the VS2.5.

4. This completes the software upgrade. Restore the former network settings on the transmitter and laptop as required (see Step 2 of “Transmitter IP configuration” on page 4-2).

5. Login and repeat Step 1 of “Preliminary checks” on page 4-1 to determine if the current version is the same as the upgrade version - this confirms the upgrade was successful.

6. If the upgrade was not successful, repeat Step 1 through Step 5. If still unsuccessful, contact Nautel.
SECTION 5: 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.

HD Radio. HD Radio is another term for In-Band-On-Channel (IBOC) technology. HD Radio is a
trademark of iBiquity Digital Corporation.

IBOC. Nautel In-Band-On-Channel technology provides high quality digital audio over existing FM
radio channels.

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 VS2.5 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.
VS2.5

OPERATIONS AND MAINTENANCE MANUAL

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