



3: TROUBLESHOOTING MANUAL

VX150 to VX2 FM BROADCAST TRANSMITTER

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The comparisons and other information provided in this document have been prepared in good faith based on publicly available information. For verification of materials, the reader is encouraged to consult the respective manufacturer's most recent publication on the official website or through contact with Customer Service.

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RELEASE CONTROL RECORD

ISSUE	DATE	REASON
0.1	2020-12-01	Preliminary release for VX150 to VX2. Supports hardware versions: VX150, VX300, VX600 (NARF81) VX1 (NARF79) VX1.5. VX2 (NARF80) Supports software version VX SW 1.0 and later.

SECTION 3.1: RESPONDING TO ALARMS

This section provides instructions you need when performing troubleshooting on the VX150 to VX2 transmitter. This section includes the following topics:

- [Corrective Maintenance](#)
- [Electrostatic Protection - see page 3.1.3](#)
- [Identifying and Troubleshooting an Alarm - see page 3.1.4](#)
- [Replacement Procedures - see page 3.1.17](#)

If none of the procedures and alarms described in this section address your problem, contact Nautel for assistance. See “Technical Support” in the Installation Manual.

Corrective Maintenance

Corrective maintenance procedures consist of identifying and correcting defects or deficiencies that arise during transmitter operation. Local and/or remote alarm signals are generated when a malfunction occurs. If an alarm condition is caused by a malfunction in the RF power stage, the transmitter may maintain operation at a reduced RF output level. The nature of the fault – and station policy – will dictate whether an immediate maintenance response is necessary. Fault analysis and rectification may be conducted from three different levels, with a different technical competence level required for each: on-air troubleshooting, remote or local, and off-air troubleshooting.

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

On-Air Troubleshooting

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

Remote Troubleshooting

Remote on-air troubleshooting consists of monitoring the transmitter's radiated signal using an on-air monitor or via a LAN connection, and observing the status of each remote fault alarm indicator. Information obtained from these sources should enable an operator to decide whether an alarm response may be deferred to a more convenient time, an immediate corrective action must be taken, or

if a standby transmitter must be enabled (if one is available). It is recommended that the significance of remote indications, and the appropriate responses, be incorporated into a station's standard operating procedures. Refer to ["Identifying and Troubleshooting an Alarm" on page 3.1.4](#) to determine the remedial action required for a given fault.

Local Troubleshooting

Local on-air troubleshooting consists of monitoring the transmitter's integral meters and fault alarm indicators. Analysis of this data will normally identify the type of fault, and in most cases will determine what corrective action must be taken. Refer to ["Identifying and Troubleshooting an Alarm" on page 3.1.4](#) to determine the remedial action required for a given fault.

Off-Air Troubleshooting

Off-air troubleshooting must be performed when routine on-air calibration adjustments will not restore operation.

It is recommended that the transmitter's output be connected to a precision 50 Ω resistive dummy load (rated for at least the maximum transmitter power rating) before starting off-air troubleshooting procedures. If an appropriate dummy load is not available, troubleshooting for a majority of faults can be performed with RF power turned off. The transmitter may remain connected to its antenna system for these procedures.

NOTE: *Reduce the RF output level to a minimal value when troubleshooting faults in the power amplifier stage while the transmitter's RF output is connected to the antenna system.*

Electrostatic Protection

The transmitter's assemblies contain semiconductor devices that are susceptible to damage from electrostatic discharge. The following precautions must be observed when handling an assembly which contains these devices.

CAUTION! Electrostatic energy is produced when two insulating materials are rubbed together. A person wearing rubber-soled shoes, walking across a nylon carpet or a waxed floor, can generate an extremely large electrostatic charge. This effect is magnified during periods of low humidity. Semiconductor devices such as integrated circuits, field-effect transistors, thyristors and Schottky diodes may be damaged by this high voltage unless adequate precautions are taken.

Electrical Discharging of Personnel

Personnel should be electrically discharged by a suitable grounding system (e.g., anti-static mats, grounding straps) when removing an assembly from the transmitter, and while handling the assembly for maintenance procedures.

Handling/Storage

An assembly should be placed in an anti-static bag when it is not installed in a host transmitter, or when it is not undergoing maintenance. Electronic components should be stored in anti-static materials.

Tools/Test Equipment

Testing and maintenance equipment – including soldering and unsoldering tools – should be suitable (i.e., grounded tip) for contact with static sensitive semiconductor devices.

Stress Current Protection

Every precaution should be taken to ensure the static sensitive semiconductor devices are protected from unnecessary stress current. This is achieved by ensuring that current is not flowing when an electrical connection is broken, and that voltages are not present on external control/monitoring circuits when they are connected.

Identifying and Troubleshooting an Alarm

You can identify an alarm locally by viewing the front panel user interface (UI) (see [“Front Panel Alarm Checks”](#)) or remotely by viewing the remote AUI’s Alarms page (see [“Remote AUI Alarms Page Checks”](#) on page 3.1.7).

Front Panel Alarm Checks

There two ways to check for alarms on the front panel:

- [Fault LED](#)
- [Alarms Screen](#)

Fault LED

See [Figure 3.1.1](#). The FAULT LED on the right-hand side of the display indicates that a fault is present. The FAULT LED will be either off or red. When illuminated, the transmitter has encountered a summary fault. Use the remote AUI or local UI to view the status of the transmitter.

Figure 3.1.1: Transmitter Front Panel (VX1 shown for reference)

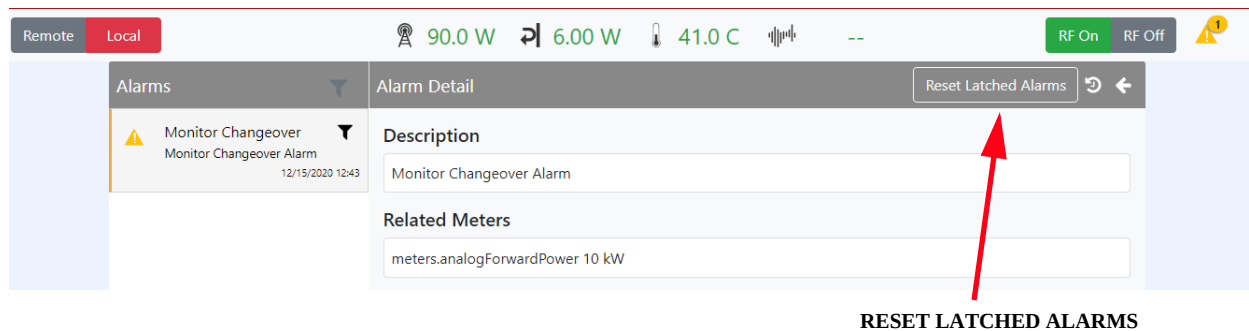


When a fault is present, the transmitter may still produce an RF output. In this case, or if the transmitter has shut down, you should schedule and commence more in-depth fault diagnosis. See [“Alarms Screen”](#) on page 3.1.5.

Alarms Screen

If an alarm exists and is currently being recognized by the transmitter system, it is displayed in the Alarms screen (Dashboard -> Alarms) of the front panel display (see [Figure 3.1.2](#)).

Figure 3.1.2: Alarms Screen



RESET LATCHED ALARMS

[Table 3.1.1 on page 3.1.9](#) contains a column for most alarms that can occur, sorted alpha-numerically. The Description and Troubleshooting Action column provides a brief description of the alarm, troubleshooting tips and a cross-reference to more troubleshooting, if applicable.

1. Scroll through the Alarms screen to view the active faults.
2. Attempt to clear any latching alarms by pressing the Reset Latched Alarms button in the Main Dashboard -> Alarms screen. If the alarm persists, it will not clear from the display.
3. Locate the alarm name in [Table 3.1.1 on page 3.1.9](#) to determine the cause of the alarm and perform any recommended procedures in the Description and Troubleshooting Action column. This may also lead to replacing a suspect PWB, power supply or fan, as detailed in "[Replacement Procedures](#)" on page 3.1.17.

NOTE: Before undertaking any troubleshooting, record all meter readings and note if any other alarms are displayed on the Alarms screen. record all alarms.

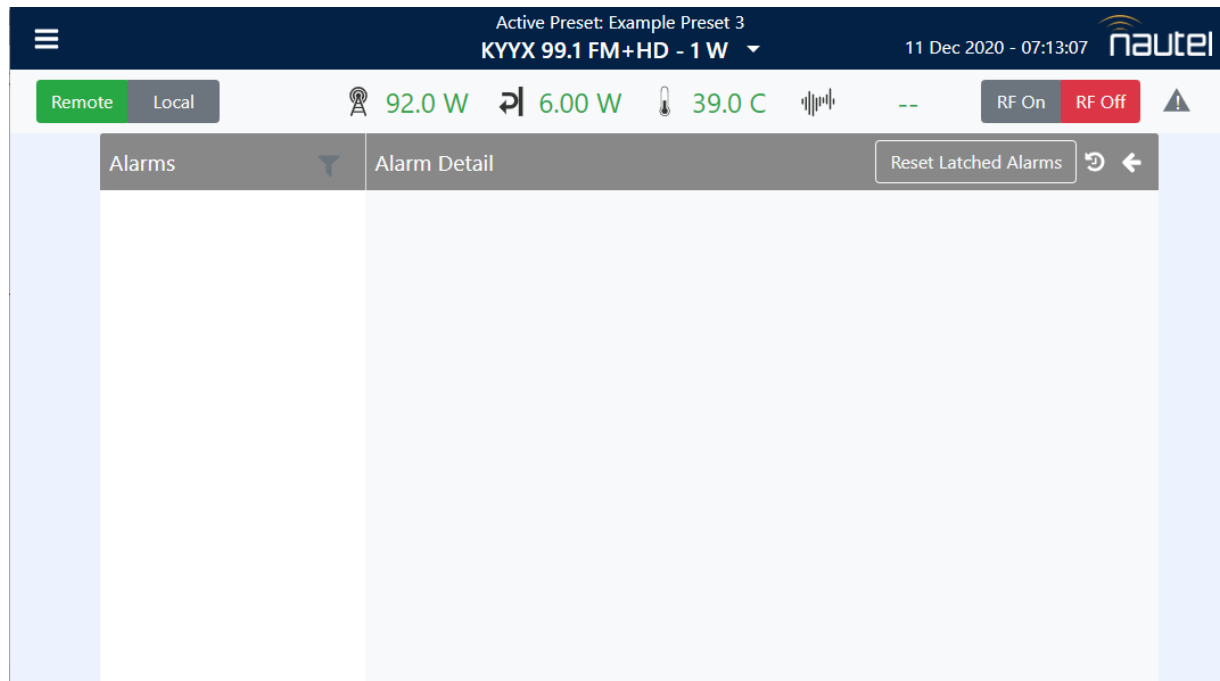
NOTE: [Table 3.1.1 on page 3.1.9](#) contains a column for most alarms that can occur, sorted alpha-numerically, including both the names displayed on the front panel and, if different, the remote AUI. The Description and Troubleshooting Action column provides a description of the alarm, troubleshooting tips, and a link to detailed troubleshooting, as applicable.

4. If troubleshooting and subsequent replacement of a suspect PWB or module causes the alarm to disappear from the Alarms screen, the alarm has been successfully cleared. If the fault condition does not clear, contact Nautel.

Remote AUI Alarms Page Checks

If an alarm exists and is being recognized by the transmitter, it is displayed on the Alarms page (see [Figure 3.1.3](#)). The warning symbol in the upper, right section of the remote AUI dashboard (any page) will be amber or red when an alarm is present.

Figure 3.1.3: AUI Alarms Page



1. Click the warning symbol (or select Menu -> Alarms) to go to the Alarms page (see [Figure 3.1.3](#)). View the list of active faults. Alarms are listed by their name (Alarm column), and then by severity (Alarm Detail column) [single orange ! indicates low severity (RF output not affected); single red ! indicates medium severity (RF output is reduced); two red ! indicates high severity (RF output is inhibited)].
2. Attempt to clear any latching alarms by pressing the Reset Latched Alarms button on the bottom banner of the page. If the alarm persists, it will not be cleared from the display.
3. Locate the alarm name in [Table 3.1.1 on page 3.1.9](#) to determine the cause of the alarm and perform any recommended procedures in the Description and Troubleshooting Action column. This may also lead to replacing a suspect PWB, power supply or fan, as detailed in ["Replacement Procedures" on page 3.1.17](#).

NOTE: [Table 3.1.1 on page 3.1.9](#) contains a column for most alarms that can occur, sorted alphanumerically for each sub-system, including both the names displayed on the remote AUI and, if different, the front panel display. The **Description and Troubleshooting Action** column provides a brief description of the alarm, troubleshooting tips and a cross-reference to more detailed troubleshooting, as applicable.

4. If troubleshooting and subsequent replacement of a suspect PWB or module causes the alarm to disappear from the Alarms page, the alarm has been successfully cleared. If the fault condition does not clear, contact Nautel.

NOTE: Before undertaking any troubleshooting, record all remote AUI meter readings and note if any other alarms are displayed on the Alarms page. Record all alarms. The most convenient way to do this is by using the remote AUI's Menu -> Reports page to download a report of the Alarm History (see "Alarm History" in the Operations & Maintenance Manual). Another method is to use a web browser over a LAN connection to save screen shots of critical status, meter and alarm pages. Go to the Dashboard -> Meters page to view (and save) detailed information (see "Viewing Meters" in the Operations & Maintenance Manual).

Table 3.1.1: Troubleshooting Alarms

Alarm Name	Description and Troubleshooting Action
Analog Audio PWB +12V Fail	This alarm occurs if the +12 V supply in the analog audio PWB is 10% lower or 10% higher than the desired value. Check the output voltage of the 12 V power supply module (U2). If necessary, replace the 12 V power supply module (see ???). There may also be a problem with the controller's power supply PWB.
Analog Audio PWB DC Voltage Fail	
Analog Audio PWB Fail/Missing	
Analog Left Audio Low	This alarm indicates the analog left audio input level is too low or is not applied. The transmitter takes no action on this alarm.
Analog Right Audio Low	This alarm indicates the analog right audio input level is too low or is not applied. The transmitter takes no action on this alarm.
Audio Changeover	This alarm occurs if the main audio source has been lost, and the exciter has switched to the backup source as configured by the user.
Audio Player Digital Low	This alarm occurs if the audio player is in use on the SBC , but no digital audio is detected by the controller .
Audio Processor Offline	This alarm occurs if the transmitter is configured to include an Orban Inside audio processor, but it is not communicating with the processor on the internal serial bus. Check all connections to the Orban Inside audio processor card
Audio Processor Output Fail	This alarm occurs if the transmitter is configured to include an Orban Inside audio processor, but it is not detecting audio from the processor. Check all connections to the Orban Inside audio processor card.
Composite 1 Low	This alarm indicates the composite 1 audio input level is too low. The transmitter takes no action on this alarm.
Composite 2 Low	This alarm indicates the composite 2 audio input level is too low. The transmitter takes no action on this alarm.
Configuration File Not Found	This alarm occurs when the controller does not find a valid configuration file to load at power-up. This alarm is unlikely and may clear when the correct settings are entered.
Delaying Turn On	This alarm occurs, if the turn-on delay function is enabled, and transmitter is not permitted turn-on until the delay period elapses. The turn-on delay function is enabled upon an ac power failure and is typically used to add delay for use with an external generator.
Digital AES 1 Audio Low	This alarm indicates the digital AES 1 audio input level is too low. Suspect a problem with the external audio processor or studio feed. The transmitter takes no action on this alarm.
Digital AES 2 Audio Low	This alarm indicates the digital AES 1 audio input level is too low. Suspect a problem with the external audio processor or studio feed. The transmitter takes no action on this alarm.

Alarm Name	Description and Troubleshooting Action
Entered Firmware Upgrade	This alarm occurs when the exciter is in "firmware upgrade" mode. It should only be displayed during a transmitter software upgrade.
Exciter +12V Fail	This alarm occurs if the +12 V supply in the exciter PWB is 10% lower or 10% higher than the desired value. Check the output voltage of the 12 V power supply module (U2). If necessary, replace the 12 V power supply module (see ???). There may also be a problem with the controller's power supply PWB.
Exciter Audio Reset	
Exciter DC Voltage Fail	
Exciter Failure	
External Interlock	This alarm occurs when the external interlock input wired to the EXT INTLK terminal is open. The transmitter will not be able to enable its RF output. Check the interlock connection on the rear of the transmitter. If the interlock connection is intact, check that all external interlock switches are closed. If no problem is found with the connection at the transmitter or any of the external interlock switches, suspect a problem with the interlock circuitry on the exciter/control PWB (A1).
Fan1/2 Fail	This alarm occurs if the speed of cooling fan 1 is below 3000 RPM (half of its nominal value of 6000 RPM). If either fan 1 or 2 fail, the transmitter takes no action (no effect on the RF output). If the alarm occurs for fans 1 or 2, check the connection between the indicated fan and the PS Distribution PWB (A2). If these connections look OK, replace the indicated fan (see "Cooling fan replacement" on page 1-42). If the alarm still occurs after the fan has been replaced, suspect the PS distribution PWB.
FPGA Version Mismatch	
Forward Power Shutdown	This alarm occurs if the transmitter tries to reduce the forward power below minimum (?? W) due to repeated Forward Power Limiting alarms. The transmitter latches off. See Forward Power Limiting for troubleshooting tips
Front Panel User Interface Failure	This alarm occurs if there is a fault with the front panel user interface (UI), preventing it from being used to control the transmitter. The transmitter will automatically switch to remote control mode to allow use of the AUI or digital I/O.
High Ambient Temperature	This alarm is indication only and occurs if the transmitter's ambient temperature exceeds 60°C (140°F). Check the intake air filter or cooling fans.
High PA Temperature	This alarm occurs if the power amplifier's heatsink temperature exceeds 85°C (185°F). This alarm is most likely caused by excessive ambient temperature, a fan failure or blockage, or excessive power amplifier dissipation. This alarm will clear when the power amplifier's heatsink temperature decreases to 75°C (167°F).

Alarm Name	Description and Troubleshooting Action
High SWR	This alarm occurs if the transmitter's average reflected power exceeds the high SWR threshold (?? W). The transmitter takes no action on this alarm. Inspect the antenna and transmission line system for damage or de-tuning. If there are no major issues with the antenna network that would cause an impedance change (icing for example), suspect the Combiner Interface PWB (see "Combiner Interface PWB Replacement" on page 1-50) output power probe PWB (A7) (see "Output power probe PWB replacement" on page 1-45).
High SWR Shutdown	This alarm occurs if the transmitter tries to reduce the forward power below a level that is equivalent to a 3:1 VSWR (forward power of ?? W) at the SWR Foldback threshold (reflected power of ?? W) due to a gradually degrading load match. This alarm causes the transmitter to latch off. Inspect the antenna and transmission line system for damage or de-tuning. If there are no major issues with the antenna network that would cause an impedance change (icing for example), suspect the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50).
Host Not Booted	This alarm indicates that the controller's host has not finished booting. The remote AUI will not yet be available. Occurrence of this alarm is normal for approximately one to five minutes while the host is booting, immediately after ac power has been applied/restored or after a software upgrade. If this alarm continues to occur more than 30 minutes after ac power has been applied to the transmitter, cycle (turn off, then on) the ac power. If the alarm persists after 30 minutes, replace the Exciter/Control PWB (A1) (see "Exciter/Control PWB Replacement" on page 1-46).
Host Not Responding	This alarm indicates that the microcontroller (host) that runs the remote interfacing applications is not communicating with the transmitter's primary microcontroller (DSP). If the watchdog function is enabled, the DSP will automatically reset the host. If this alarm persists for more than 10 minutes, try cycling power (off, then on) to the transmitter. If the alarm persists, replace the Exciter/Control PWB (A1) if necessary (see "Exciter/Control PWB Replacement" on page 1-46).
IPA Failure	This alarm occurs if the IPA Output Low alarm is present and the measured IPA current is below 225 mA. The transmitter takes no action on this alarm. See IPA Output Low for troubleshooting tips.
IPA Output High	This alarm occurs if the pre-amp/IPA PWB's forward power is greater than the IPA Output High threshold (130%/36 W). If this condition persists, replace the pre-amp/IPA PWB (A5) (see "Pre-amp/IPA PWB replacement" on page 1-42). The transmitter takes no action on this alarm. If this alarm persists after replacing the pre-amp/IPA PWB, suspect the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50) or the Exciter/Control PWB (A1) (see "Exciter/Control PWB Replacement" on page 1-46).

Alarm Name	Description and Troubleshooting Action
IPA Output Low	This alarm occurs if the pre-amp/IPA PWB's forward power is less than the IPA Output Low threshold (70%/14.4 W). This alarm causes the controller to limit the PA voltage to 30 V. Check for a +48V Supply Fail alarm and follow the associated troubleshooting procedure if present. IPA Fail and Pre-amp Fail alarms may also be present. If no associated alarms are present, turn RF off and run the bias routine in the front panel's Main Menu -> System Settings -> Calibration menu. If the alarm persists, enable RF and use a digital multimeter to measure the voltage between pad B on Pre-amp/IPA PWB (pre-amp bias) and chassis (ground) and also between pad C on Pre-amp/IPA PWB (IPA bias) and chassis (ground). If the voltage is less than 1 V at either of these points, suspect the Exciter/Control PWB (A1). If the voltage is greater than 1 V at both of these points, use a digital multimeter to measure between pad E (IPA volts) on the Pre-amp IPA PWB and chassis (ground). If the measured voltage is not within an acceptable range (between +43 V and +48 V), with ac power off, perform a continuity check across F1 of the PS Distribution PWB (A2). If the measurement is greater than 1 W, replace the fuse (Nautel Part # FA57 in the ancillary kit). If the measurement is less than 1 W, or replacing the fuse does not clear the alarm, replace the Pre-amp/IPA PWB (A5) (see "Pre-amp/IPA PWB replacement" on page 1-42). If the voltage on pad E is acceptable, use a digital multimeter to measure between pad D (pre-amp volts) on the Pre-amp IPA PWB and chassis (ground). If the measured voltage is not within an acceptable range (between +43 V and +48 V), replace the Pre-amp/IPA PWB (A5) (see "Pre-amp/IPA PWB replacement" on page 1-42). If the voltage is acceptable, or replacing the pre-amp/IPA PWB does not clear the alarm condition, suspect the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50) or the Exciter/Control PWB (A1) (see "Exciter/Control PWB Replacement" on page 1-46).
Low Forward Power	This alarm occurs if the transmitter's average forward power falls below the low forward power threshold (defaulted to 50% of the preset power level and is user adjustable) due to PA failures, fan failures, SWR foldback or a pre-amp/IPA failure. The transmitter takes no action on this alarm. Check for associated alarms, and follow the associated troubleshooting procedure if present. If no other alarms are being indicated, with RF turned on, use a digital multimeter to measure the voltage between pad V and pad W on any PA. If the voltage does not fall within an acceptable range (between 2.3 V and 3 V), suspect the Exciter/Control PWB (A1). If the voltage is within this range, perform the "PA resistance checks" on page 1-37, else suspect the Output Power Probe PWB (A7) (see "Output power probe PWB replacement" on page 1-45).
Missing Preset	This alarm indicates that there are no presets programmed into the transmitter. The user will not be able to enable RF without first programming a preset.
Modulation Loss	This alarm, enabled by the user, indicates that the exciter's audio modulation level is below the level specified in the audio loss settings of the active preset (see "Mod Loss" on page 3.2.110 of the Operations & Maintenance Manual to enable/disable this alarm and to configure the resulting action). Depending on the setting, this alarm could trigger a preset change, inhibit the RF or have no effect (alarm only). Check the appropriate program input(s) and the mod loss setting for the preset.
Muted Transmitter Output	For internal control only; no troubleshooting action required

Alarm Name	Description and Troubleshooting Action
No External 10 MHz	This alarm occurs if frequency locking to an external 10 MHz source is enabled and no external 10 MHz is detected. The exciter will automatically switch over to the internal 10 MHz reference, and will continue to run. Check the 10 MHz input. If there are no problems with the 10 MHz signal and connection, suspect the Exciter/Control PWB (A1) .
No LAN Connection	This alarm occurs if the transmitter is not detecting communication over the LAN connection. This alarm is typically only visible in the Events Log, since it will not be transmitted when communication is interrupted.
No One Pulse per Second	This alarm occurs if the pilot phase locking to 1 PPS is enabled and the 1 PPS signal is not present. Check the 1 PPS input. If there are no problems with the 1 PPS signal and connection, suspect the Exciter/Control PWB (A1) . The transmitter takes no action on this alarm
Overall Summary	Not displayed in AUI or UI status. Configurable as a remote output. This alarm occurs if there are any alarms present. Check for associated alarms, and follow the associated troubleshooting procedure, if present.
PA Fail Foldback	This alarm occurs if the control system determines that the calculated dissipation in any FET on a PA is above the high dissipation threshold (?? W), or the forward power being asked for out of an individual PA [calculated as (output power - combiner losses) / number of active PAs in the system] is above the PA output high threshold (400 W)(850 W for VS2.5 or 900 W for VS3). The forward power of the transmitter will be limited to a level such that neither of these thresholds are exceeded. Check for associated alarms. Typically, the assertion of this alarm is the result of a PA failure or removal, or a high SWR condition. If no other alarms are being indicated, contact Nautek for further support
PA Fail/PA1 Fail	This alarm occurs if the dc input current for the PA (A7), also PA1 for VX1.5/VX2 transmitters) has fallen below a predetermined threshold (typically less than 50% of the average PA current of the operational PAs, or below 500 mA, whichever is lower). This may be caused by a cabling fault on the PA, loss of PA voltage or bias, or a defective FET. The transmitter's output power will be reduced (see Table 1.3 on page 1-31) and this condition could cause Per PA Foldback and Reject Foldback alarms. Perform the "PA resistance checks" on page 1-37. If there is no problem found with the PA, or the alarm still persists after replacing the PA, suspect the PS Distribution PWB (A2) .
PA2 Fail	For VX1.5/VX2 transmitters only. This alarm occurs if the dc input current for PA2 (A8) has fallen below a predetermined threshold (typically less than 50% of the average PA current of the operational PAs, or below 500 mA, whichever is lower). This may be caused by a cabling fault on the PA, loss of PA voltage or bias, or a defective FET. The transmitter's output power will be reduced (see Table 1.3 on page 1-31) and this condition could cause Per PA Foldback and Reject Foldback alarms. Perform the "PA resistance checks" on page 1-37. If there is no problem found with the PA, or the alarm still persists after replacing the PA, suspect the PS Distribution PWB (A2) .

Alarm Name	Description and Troubleshooting Action
PA Power Supply AC Fail	This alarm occurs if the power supply module (U3) is reporting an ac failure, indicating its ac input voltage is less than 175 V ac . The transmitter will inhibit its RF output until the alarm is cleared. Check the ac voltage applied to the power supply module. If the ac voltage is acceptable, try replacing the indicated power supply module with a new module (see "Power Supply Module Replacement" on page 3.1.23). If replacing the power supply module does not clear the fault, suspect the PS Distribution PWB (A2) .
PA Power Supply Current Limit Foldback	
PA Power Supply Fail	This alarm occurs if the power supply module (U3) is reporting a PS failure, indicating its output voltage is outside of its acceptable range. The transmitter will inhibit its RF output until the alarm is cleared. Try replacing the indicated power supply module with a new module (see "Power Supply Module Replacement" on page 3.1.23). If replacing the power supply module does not clear the fault, suspect the PS Distribution PWB (A2) or the Exciter/Control PWB (A1) .
PA Power Supply Not Compatible	
PA Power Supply Not Detected	This alarm occurs if the power supply module (U3) is not being detected or has been removed. The transmitter will inhibit its RF output until the alarm is cleared. If there is a power supply module in the transmitter, try re-seating it or replacing it with a new module (see "Power Supply Module Replacement" on page 3.1.23). If replacing the power supply module does not clear the fault, suspect the PS Distribution PWB (A2) .
PA Power Supply Over Temperature	This alarm occurs if the power supply module (U3) is reporting a high temperature alarm, indicating its operating temperature has exceeded its internal threshold. The transmitter will inhibit its RF output until the alarm is cleared. This alarm is most likely caused by a module fan failure or blockage. Allow the module to cool and attempt to reset the alarm. Verify the module turns on and its fan is operational. If the fan is not operational, inspect it for possible blockage. If a problem is found, replace the power supply module (see "Power Supply Module Replacement" on page 3.1.23). If there is no problem found, inspect the transmitter's front air filter and clean or replace as required (see Section 3, "Routine maintenance of the Operations and Maintenance Manual"). If the alarm persists, replace the power supply module (see "Power Supply Module Replacement" on page 3.1.23). If replacing the power supply module does not clear the fault, suspect the PS Distribution PWB (A2) .
PA PS Current Limit Foldback	This alarm occurs if the transmitter is limiting its output power to avoid drawing excessive current (?? A) from the power supply module. This may occur when there are PA failures and the transmitter is attempting to compensate to attain the setpoint level. Check for associated alarms, and follow the associated troubleshooting procedure if present.
PA Volts Failure	This alarm indicates the PA voltage from the power supply module does not match the requested setpoint. This is likely caused by a power supply module failure. Check the power supply module (U3) and replace if necessary (see "Power Supply Module Replacement" on page 3.1.23).

Alarm Name	Description and Troubleshooting Action
Pilot Unsync	This alarm occurs if there is no synchronization between the 10 MHz and 1PPS signals. It may indicate that the GPS receiver is not detecting a signal. Check the GPS receiver and antenna. The transmitter takes no action on this alarm.
PLL Unlocked	This alarm indicates that the exciter's master clock is not locked. Possible causes are an out-of-range 10 MHz input or a hardware failure on the Exciter/Control PWB (A1) . The transmitter's RF output is inhibited.
Rebooted Exciter	This is an informational alarm only that is displayed when the watchdog timer reboots the transmitter's main microcontroller (DSP). Typically, this alarm will show up after an ac power interruption.
Reboot Required	This alarm indicates that exciter setup changes have been made, typically via the Hardware Configuration page of the AUI . Typically, the DSP will reboot itself automatically; however, if this alarm persists for more than five minutes, cycle the transmitter's ac power (off, then on) to store the changes.
Running Bias Routine	This is an informational alarm only that is displayed when the bias routine has been initiated.
SWR Cutback	This alarm occurs whenever the transmitter experiences a cutback. A cutback (reduction in power) occurs when repeated shutback alarms occur within a prescribed time period. Shutbacks occur when the transmitter's peak reflected power exceeds 2:1 due to a transient SWR condition (arc or lightning) within the output transmission line or antenna system. The transmitter shuts back and recovers to a series of cutback levels (depending on the severity of the alarm), with each level being a 1/8th reduction in power from the previous cutback level, starting from the preset setpoint. Inspect the output transmission line for punctures or damage. After repairing damage, or if no damage is found, attempt to reset the latched condition by clicking the remote AUI's Reset Latched Alarms button in the Alarms page or using the local front panel display (see "Resetting Alarms" on page 2-96 of the Operations and Maintenance Manual). If no damage can be found, suspect a fault with the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50) or the Output Power Probe PWB (A7) (see "Output power probe PWB replacement" on page 1-45).
SWR Foldback	This alarm occurs if the transmitter's average reflected power exceeds the SWR foldback threshold (?? W) due to a gradually degrading load match. The forward power of the transmitter will be limited to a level such that this threshold is not exceeded. If the load match improves while the transmitter is producing RF output, the forward power will increase. If the transmitter folds back to a forward power that is equivalent to a 3:1 VSWR at the SWR Foldback threshold (forward power of ?? W), an SWR Shutback alarm occurs. Inspect the antenna and transmission line system for damage or de-tuning. If there are no major issues with the antenna network that would cause an impedance change (icing for example), suspect the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50) or the Output Power Probe PWB (A7) (see "Output power probe PWB replacement" on page 1-45).

Alarm Name	Description and Troubleshooting Action
SWR Shutback	This alarm occurs if the transmitter's reflected power suddenly exceeds the SWR shutback threshold, which is the reflected power that is equivalent to a 2:1 VSWR at max power (?? W) due to a transient SWR condition (arc or lightning) within the output transmission line or antenna system. Attempt to reset the latched condition by clicking the remote AUI's Reset Latched Alarms button in the Alarms page or using the local front panel display (see "Resetting Alarms" on page 2-96 of the Operations and Maintenance Manual)]. Inspect the output transmission line for punctures or damage. If no damage can be found, suspect the Combiner Interface PWB (A12) (see "Combiner Interface PWB Replacement" on page 1-50) or the Output Power Probe PWB (A7) (see "Output power probe PWB replacement" on page 1-45). See also SWR Cutback alarm
Thermal Shutdown	
Unsigned DSP Image	This alarm indicates that the exciter is operating with 'unsigned code', but is otherwise operational. This alarm may only be displayed if the transmitter is operating with a 'beta' version of factory software.
Unsigned FPGA Image	This alarm indicates that the exciter is operating with 'unsigned code', but is otherwise operational. This alarm may only be displayed if the transmitter is operating with a 'beta' version of factory software.
Unsupported Audio Mode	This alarm indicates that the user has selected a preset configuration for the audio processing in the exciter that cannot be implemented. This may be due to attempting to use the same physical input for multiple purposes, or because two incompatible modes have been selected.
Very Low Forward Power	This alarm occurs if the transmitter's average forward power falls below the very low forward power threshold (defaulted to 12.5% of the preset power level and is user adjustable) due to PA failures, fan failures, or SWR foldback. The transmitter takes no action on this alarm. See Low Forward Power for troubleshooting tips.

Replacement Procedures

Table 3.1.2 lists the procedures available in this manual for replacing PWBs and modules that have been designated as line replaceable units (LRUs).

Table 3.1.2: Replacement Procedures

Module	Replacement Procedure
Pre-Amplifier/IPA PWB	See page 3.1.18
Power Amplifier PWB	See page 3.1.20
Power Supply Modules	See page 3.1.23

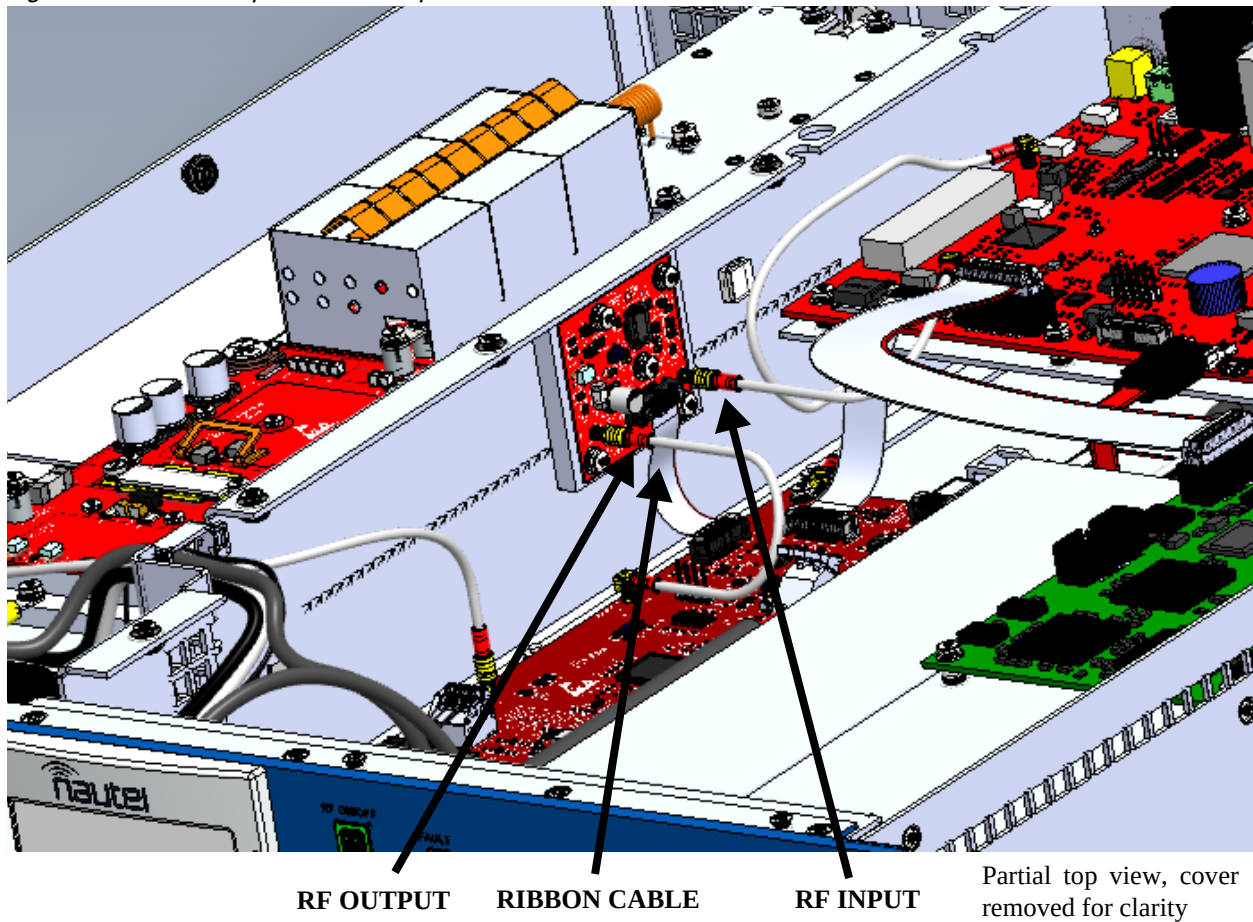
Pre-Amplifier/IPA PWB Replacement

See [Figure 3.1.4 on page 3.1.19](#) of this section, and MD-1 and MD-8 in the Mechanical Drawings section of this manual.

1. Turn RF off and disconnect ac power from the transmitter.
2. Disconnect the RF Input cable from J1 on the IPA PWB.
3. Disconnect the RF Output cable from J2 on the IPA PWB.
4. Disconnect the ribbon cable from J3 that connects between the IPA PWB and the System Interface PWB.
5. Remove and retain the four M3 screws securing the IPA PWB and remove.
6. Obtain the replacement NAPA41 IPA PWB and thermal compound (Nautel part # HAG80) from Nautel.
7. Spread a small amount of thermal compound thinly and evenly, on the underside of the IPA PWB.

CAUTION! The thermal compound is electrically conductive, so care must be taken to ensure it is only on the IPA PWB.

8. Install the Power Amplifier PWB by reversing [Step 2](#) to [Step 5](#).
9. Return the transmitter to operation.

Figure 3.1.4: Pre-Amp/IPA PWB Replacement

Power Amplifier PWB Replacement

See [Figure 3.1.5 on page 3.1.21](#) of this section, and MD-1 and MD-9 in the Mechanical Drawings section of this manual.

1. Turn RF off and disconnect the ac power from the transmitter.
2. Before replacing a suspect Power Amplifier PWB, verify the fault is with the suspect Power Amplifier PWB by performing the continuity and resistance checks detailed in [“PA Resistance Checks” on page 3.1.22](#). If you are prompted to replace a Power Amplifier PWB, return to [Step 3](#) of this procedure.
3. Remove the MCX RF drive connector from J1 on the Power Amplifier PWB.
4. Remove and retain the M3 screw securing the PA volts at E1.
5. Remove and retain the M3 screw securing the jumper connecting the Power Amplifier PWB to the Low Pass Filter at E2.
6. Remove and retain the two M3 screws securing the FET on Power Amplifier PWB.
7. Remove and retain the four M3 screws securing the Low Pass Filter cover. Remove the cover to access the jumper described in [Step 5](#). Loosen the M3 screw and move the jumper off to the side to allow the Power Amplifier to be removed.
8. Remove and retain the eleven M2.5 screws securing the Power Amplifier PWB to the heat sink.
9. Remove the Power Amplifier PWB.
10. Obtain the replacement PA Replacement kit (Nautel part # 235-5046) from the Station Spare kit (Nautel part # 235-5043).
11. Obtain the new NAPA40 PA, thermal pad (Nautel part # HAK77C) and thermal compound (Nautel part # HAG80) that is supplied with the PA Replacement kit. Spread a small amount of thermal compound thinly and evenly on the pad.

CAUTION! The thermal compound is electrically conductive, so care must be taken to ensure it is only on the thermal pad.

NOTE: FETs are static sensitive and must be handled in a static protected manner.

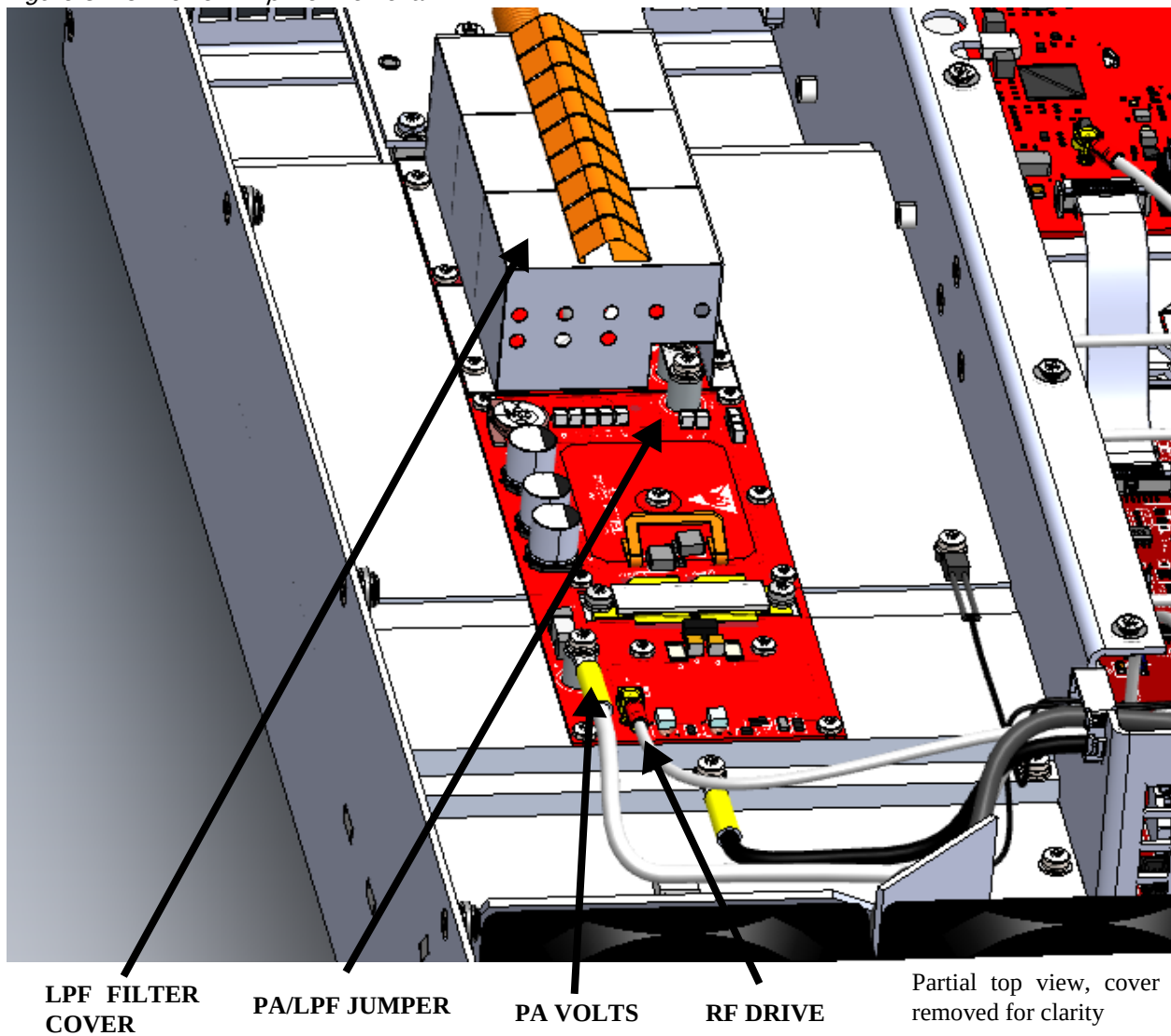
CAUTION! When installing FET securing hardware, you can damage the FET case if you fully tighten one screw while the other is loose. Avoid this by alternately tightening the two screws.

NOTE: Using a torque screwdriver, alternate tightening the left and right screws on each FET, a quarter turn at a time, until 6 inch-pounds (0.67 Newton-meters) of torque has been applied.

12. Install the Power Amplifier PWB by reversing [Step 3](#) to [Step 8](#).

13. Return the transmitter to operation.

Figure 3.1.5: Power Amplifier Removal



PA Resistance Checks

1. Using a digital multimeter, check the continuity across fuse F1 on the suspect PA PWB.
 - ❖ If the measurement is an open circuit, replace the PA PWB (see ["Power Amplifier PWB Replacement" on page 3.1.20](#)).
 - ❖ If the measurement is short circuit (near 0 Ω), proceed to [Step 2](#).
2. Using a digital multimeter, measure the resistance between each gate lead of the FET and the metal flange of the FET.
 - ❖ If the measurement is less than 8 k Ω , replace the PA PWB (see ["Power Amplifier PWB Replacement" on page 3.1.20](#)).
 - ❖ If the measurement is between 8 k Ω and 17.5 k Ω , check the other PA PWBs for a failure. If none of the other PA PWBs have failed, replace the original suspect PA PWB.
 - ❖ If the measurement is greater than 17.5 k Ω , proceed to [Step 3](#).
3. Using a digital multimeter, check the continuity between each drain lead of the FET (positive meter probe) and the metal flange of the FET (negative meter probe).
 - ❖ If the measurement is open circuit, the PA PWB is OK and does not require replacement. Continue troubleshooting and suspect a problem with an associated PWB.
 - ❖ If the measurement is not open circuit, replace the PA PWB (see ["Power Amplifier PWB Replacement" on page 3.1.20](#)).

Power Supply Module Replacement

WARNING! Lethal voltages exist inside the transmitter when the power is turned on. Follow replacement instructions carefully to ensure safety for maintenance personnel during power supply replacement.

Figure 3.1.6: Location of Power Supply Module



NOTE: The power supply module is hot-swappable, meaning there is no need to turn RF off or disconnect ac power from the transmitter.

1. From the front of the transmitter, locate the power supply module. See [Figure 3.1.6 on page 3.1.23](#).
2. Using [Figure 3.1.7 on page 3.1.24](#) as a guide, remove the power supply module from the front of the transmitter.
3. Locate or obtain a replacement power supply module (Nautel Part # UG132 for VX150/VX300/VX600 or UG136 for VX1/VX1.5/VX2).
4. Using [Figure 3.1.7 on page 3.1.24](#) as a guide, reinstall the new power supply module.
5. Verify that the AC OK and DC OK LEDs, on the front of the LVPS / Power Supply module, are solid green.

NOTE: The FAULT LED (red) may blink temporarily until communication is established between the power supply and the transmitter.

6. The transmitter should resume normal operation and the alarm should clear.
7. Close the transmitter's front door.

Figure 3.1.7: Removal of Power Supply Module

NOTE:
Power Supply is mounted horizontally in the adapter

REMOVAL

- Push Panel Latch in and lift handle outwards (swing to the left)
- Remove Power Supply

INSTALLATION

- Push Panel Latch in and lift handle outwards (swing the left)
- Insert Power Supply until it seats in the adapter
- Push handle inwards until it latches (swing the right)

AC & DC OK LEDs should be green (on) after successful power supply installation.

If the associated RF power module is disabled, the DC OK LED will not turn on until the module is enabled.

SECTION 3.2: PARTS INFORMATION

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

Topics in this section include:

- [Family Tree](#)
- [How to Locate Information About a Specific Part](#)
- [Column Content on page 3.2.2](#)

Family Tree

A family tree is included in this section for each of the three low power VX model classes:

- VX150/VX300/VX600 - see [Figure 3.2.1 on page 3.2.4](#)
- VX1 - see [Figure 3.2.2 on page 3.2.5](#)
- VX1.5/VX2 - see [Figure 3.2.3 on page 3.2.6](#)

The family tree is based on the descending order of the reference designation hierarchy and identifies all assemblies that have an assigned Nautel configuration control number.

How to Locate Information About a Specific Part

To locate the information for a specific part, the assigned reference designation for the part must be known. In addition, the Nautel nomenclature (e.g., NAPA40) assigned to the assembly containing the part or the full reference designation, including the reference designation of all higher assemblies, must be known.

When the Nautel Nomenclature is Known:

- Refer to the appropriate family tree ([Figure 3.2.1 on page 3.2.4](#), [Figure 3.2.2 on page 3.2.5](#), or [Figure 3.2.3 on page 3.2.6](#)) and identify the block(s) associated with the Nautel nomenclature. Locate the part's reference designation in the identified reference designation list in this section, noting they are sorted alphanumerically.

When the Reference Designation is Known:

- Refer to the appropriate family tree depicted in [Figure 3.2.1 on page 3.2.4](#), [Figure 3.2.2 on page 3.2.5](#), or [Figure 3.2.3 on page 3.2.6](#) with the full reference designation.
- Follow the family tree branches to the block that represents the lowest level assembly assigned a Nautel configuration control number, then locate the reference designation information for that Nautel configuration control number.
- Locate the part's reference designation and associated Nautel Part # in the list provided at the end of this section. In a PDF manual, use Ctrl-F (find) to quickly locate the reference designation.

Reference Designation Lists

Reference designation lists are provided for assemblies that are assigned an alpha-prefixed Nautel nomenclature (e.g., NAPA40) or a numbered Nautel part (e.g., 235-8050).

To obtain the full reference designation for a specific part the Nautel configuration control number must be located in the appropriate family tree ([Figure 3.2.1 on page 3.2.4](#), [Figure 3.2.2 on page 3.2.5](#), or [Figure 3.2.3 on page 3.2.6](#)) to include the reference designation of all higher level assemblies. The reference designation lists are presented in alphanumeric order - for each component level of the transmitter - are divided into columns to aid in locating specific information.

Column Content

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

Component Level, Stock Code Column

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

Component Level

This number represents the level of a component in relation to the highest level parts list. In this case the highest level parts list is the VX transmitter's overall parts list, or the top block in the family tree shown in [Figure 3.2.1 on page 3.2.4](#), [Figure 3.2.2 on page 3.2.5](#), or [Figure 3.2.3 on page 3.2.6](#).

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

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

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

Stock Code

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

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

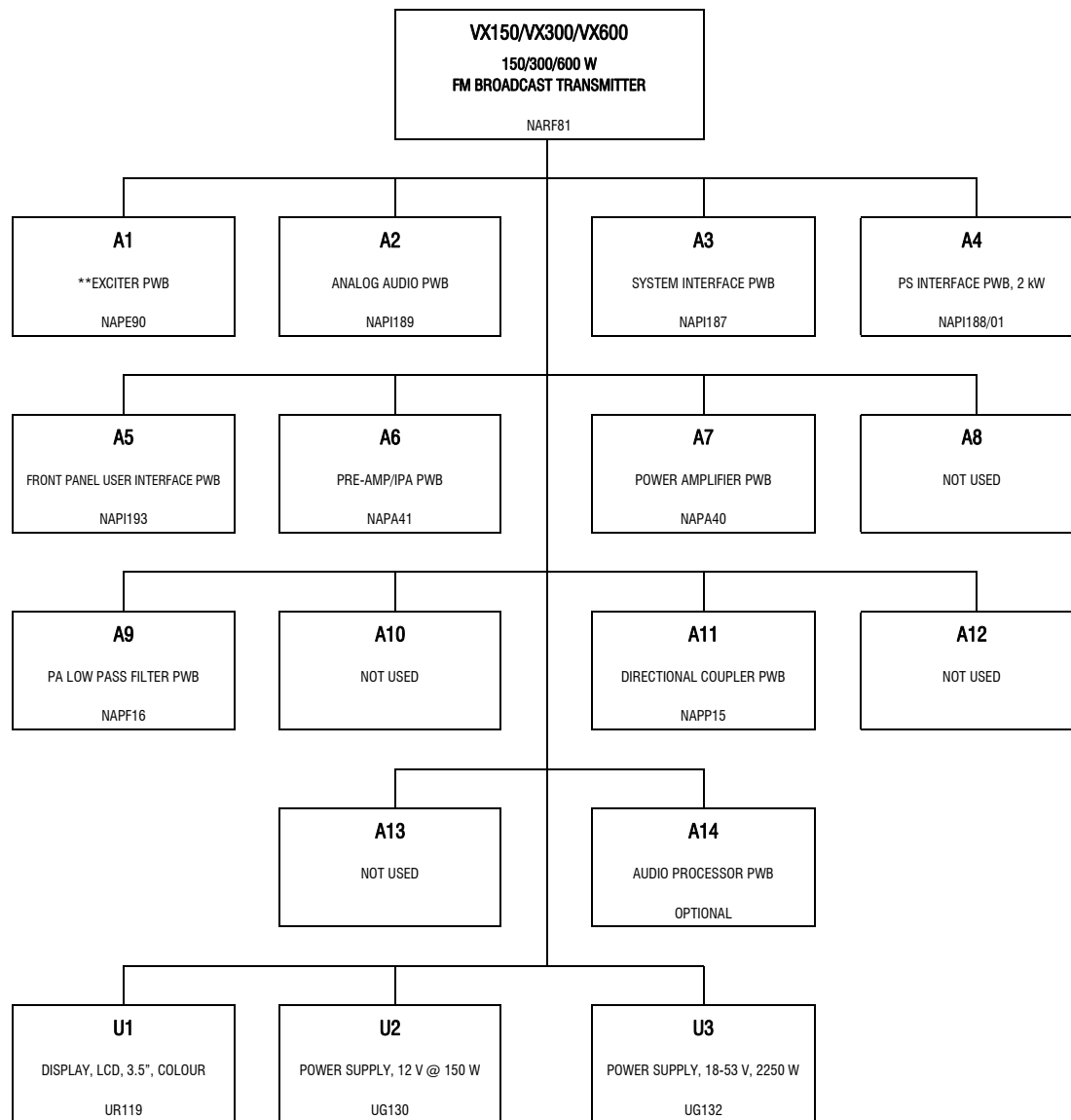
Description Column

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

Reference Designation Column

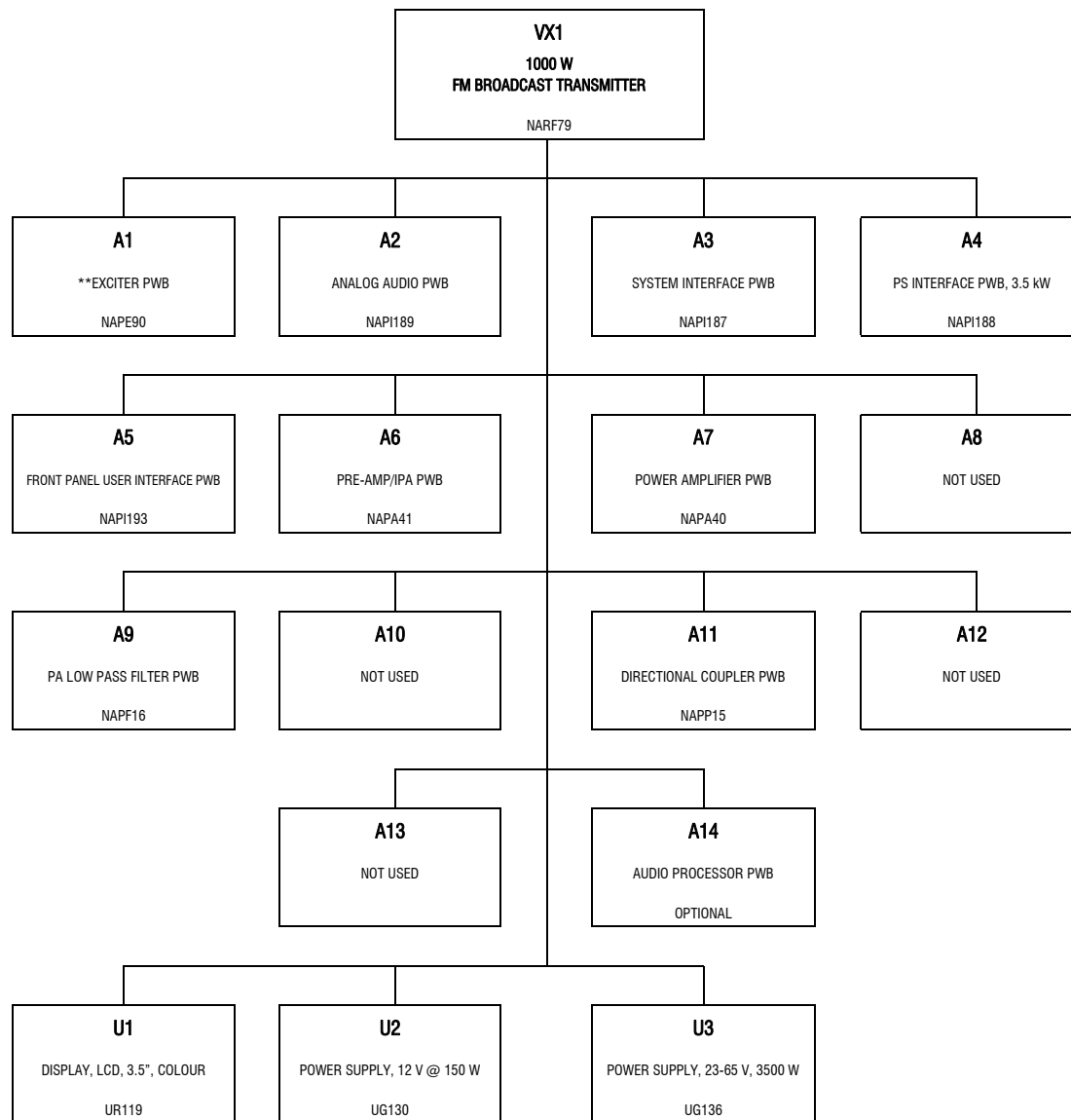
The *Reference Designation* column contains the reference designation(s) for a specific part. When multiple reference designations apply to a part, they are sorted alphanumerically. These designations are assigned in accordance with the requirements of American Society of Mechanical Engineers ASME Y14.44-2008.

Figure 3.2.1: VX150/VX300/VX600 Family Tree (NARF81)



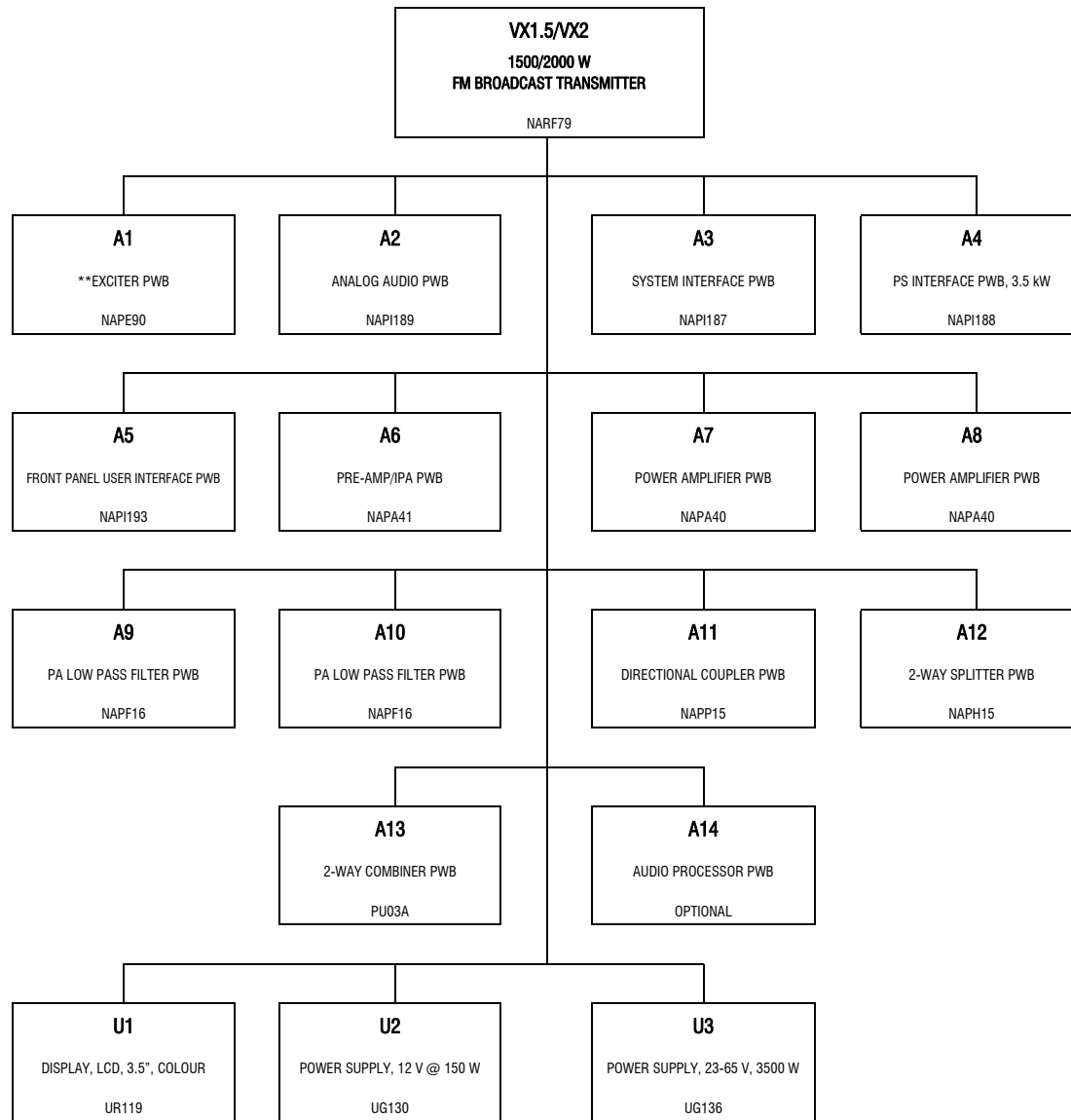
** - Denotes the NAPE90 Exciter PWB is considered proprietary by Nautek. Component details are not provided in this manual.

Figure 3.2.2: VX1 Family Tree (NARF79)



** - Denotes the NAPE90 Exciter PWB is considered proprietary by Nautel. Component details are not provided in this manual.

Figure 3.2.3: VX1.5/VX2 Family Tree (NARF80)



** - Denotes the NAPE90 Exciter PWB is considered proprietary by Nautel. Component details are not provided in this manual.

StockCode: NARF81
Description: Final Assy, VX150/300/600,

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
01	235-5910	SD card mod, Programmed (UB114)	A01U63
01	235-8010	Ancillary kit for VX (150W-2kW)	
01	235-8900	2RU Front Panel Detail Assembly	
01	JDP21	Conn, Coax, N, Recept, Panel, 50ohm	J01
01	LA82C	Inductor, Air Core, 16 AWG magnet, 17 Turn, 0.27"	L01
01	NAPA40	PA PWB Assy	A07
02	CB48	Capacitor, SMT, Clad Mica, 100pF, 300V, +/-5%	C07
02	CT102	Capacitor,SMT, Porcelain, 12pF 1500V,+/-2%	C15, C22
02	CT104	Capacitor,SMT,Porcelain,1000pF ,300V,+/-5%	C16, C17, C18
02	CT105	Capacitor,SMT,Porcelain,470pF, 300V,+/-5%	C14, C19, C20, C21
02	CT110	Cap, SMT, Elect, Alum Polymer, 56uF, +/-20%, 63V	C06, C10, C11
02	CT113	Capacitor, SMT, Porcelain, 680pF, 300V, +/-5%	C09, C23
02	CT115	Capacitor,SMT,12pF,+/-1%,250V, NP0,0805	C03
02	CT124	Capacitor,SMT,22pF,+/-1%,250V, NP0,0805	C02
02	CT66	Capacitor, SMT, Ceramic, 0.1uF 10%, 100V	C01, C12
02	FA79	Fuse, SMT, 40A, 72VDC, Very Fast	F1
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E1, E2
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1
02	LA80C	Inductor, 1 turn, rectangular + angled, 0.032" cop	L1
02	LS33	Inductor, SMT, 17.5nH, 5%, 4A 3.15mm H x 6.86mm L	L2
02	LS59	Inductor, SMT, 22nH, 20%, 40A	L3
02	LS69	Inductor, SMT, 150nH, 2%, 1.2A, 4.2mm H x 4.95mm L	L4, L5
02	QAP73	Transistor, FET, LDMOS, 65V, Dual, Ruggedized	Q1
02	RAD01	Resistor, SMT, MF, 10 Ohms, 1% 1/4W	R1
02	RAD45	Resistor, SMT, MF, 47.5K Ohms, 1% 1/4W	R5
02	RFFS94	Resistor, SMT, 10 ohms, 1%, 1W, 2512	R4, R6
01	NAPA41	Pre-Amp/IPA Pwb Assy	A06
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C08
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06
02	CT116	Capacitor,SMT,6.8pF,+/-0.25pF, 250V,NP0,0805	C12
02	CT117	Capacitor, SMT,33pF,+/-1%,250V, NP0,0805	C03
02	CT118	Capacitor,SMT,51pF,+/-1%,250V,NP0,0805 NP0,0805	C16
02	CT119	Capacitor,SMT,82pF,+/-2%,250V, NP0,0805	C17

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Description: Final Assy, VX150/300/600,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	CT120	Capacitor, SMT,150pF,+/-1%,250V, NP0,0805	C02, C04, C07
02	CT121	Capacitor,SMT,180pF,+/-1%,250V, NP0,0805	C05, C09, C15
02	CT122	Capacitor,SMT, 1000pF, +/-5%, 50V,NP0	C11, C13
02	CT123	Capacitor, SMT, 0.01uF, +/-10%, 50V,BX	C10, C14
02	FA76	Fuse, 125 VAC, VDC, 5A, Very fast acting	F1
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1, J2
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J3
02	LS68	Inductor, SMT, 56nH, 2%, 3A, 4.2mm H x 4.95mm L	L1
02	LS70	Inductor,SMT,51nH,+/-2%,1A, Ceramic,0805	L7
02	LS71	Inductor,SMT,33nH,+/-2%,0.5A, Ceramic,0805	L6
02	LS72	Inductor,SMT,68nH,+/-2%,0.5A, Ceramic,0805	L5
02	LS73	Inductor,SMT,5nH,+/-2%, 4A,Air	L4
02	LS74	Inductor,SMT,33nH,+/-2%, 4.8A,Air	L2, L3
02	QAP74	Transistor,SMT,MOSFET,LDMOS, Single,40V,TO-270-2	Q1
02	RAD33	Resistor, SMT, MF, 4750 Ohms, 1%, 1/4W	R2
02	RAD95	Resistor,SMT,1 Ohm,1%, 1/4W,1206	R1
02	RAD96	Resistor,SMT,39.2 Ohms,1%,1/4W,1206 1/4W,1206	R4
02	RFFS58	Resistor, SMT, MF, 47.5Kohms, 1%, 1/10W, 0603	R3

01	NAPF16	PA LPF PWB Assy	A09
02	CT106	Capacitor,SMT,Porcelain,1.5pF, 1500V,+/-0.1pF	C06
02	CT107	Capacitor,SMT,Porcelain,1.8pF, 1500V,+/-0.1pF	C10
02	CT108	Capacitor,SMT,Porcelain,3.3pF, 1500V,+/-0.1pF	C08
02	CT109	Capacitor,SMT,Porcelain,5.6pF, 1500V,+/-0.1pF	C07, C09
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01
02	LA77F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L01
02	LA78F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L02
02	LA79F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.4	L03
01	NAPI187	System Interface PWB Assy	A03

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Description: Final Assy, VX150/300/600,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	CCJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C02, C04, C11, C12, C14, C15, C53, C81, C82, C86
02	CCJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C19, C22, C47, C65, C83, C84
02	CCJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C01, C03, C05, C13, C16, C17, C18, C20, C21, C24, C25, C26, C27, C28, C29, C30,, C31, C32, C37, C38, C40, C41, C42, C43 C44, C45, C46, C48, C50, C51, C54, C55, C56, C57, C58, C59, C61, C63, C64, C66, C68, C69, C71, C72, C74, C77, C78, C79, C80
02	CCJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C08, C09, C23, C39, C73, C85
02	CCJ06	Cap,SMT,Ceramic,4.7uF,10%, 25V,X7R,0805	C52, C60, C62, C75
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C67
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C70, C76
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C33, C35
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06, C07, C10
02	CT65	Cap, SMT, Ceramic, 6.8pF, 50V, +/-0.25pF, 1206	C49
02	H AJ66	Terminal, SMT, Test Point, PWB	TP03, TP14
02	JF47	Conn, Header,Square Post,Gold, Dual,40-pin	J12
02	JQ16	Conn, Header, SIP, 12 Pin Breakaway, 10 Ctr	J11
02	JR77	Terminal Block, 2 Pos, 300V, 13A, 28-14AWG, Spring	TB02
02	JR89	Terminal Block, 4 Pos, 300V, 26 - 20AWG, Spring C	TB01
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J05, J06, J09
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J07
02	JU91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J04, J10
02	JU95	Conn, Header, Shrouded, 3mm, 4 pos, Vertical, Gold	J01, J02
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J03, J08
02	LCFS01	Inductor, SMT, Choke, 600ohms, 2A, 0805	L05, L06, L10, L11
02	LCFS02	Inductor, SMT, Choke, 2000 ohm s, 80mA, 0805	L08, L15, L16
02	LS18	Inductor,SMT.2.2uH,600ma,1210	L12
02	LS34	Inductor, SMT, 28nH, 2%, 4A 3.15mm H x 6.86mm L	L09
02	LS45	Inductor, SMT, Shielded, 33uH, 3.3A RMS	L03, L04
02	LS60	Inductor, SMT, 22uH, 4A RMS, Shielded, Pwr	L13
02	LS61	Inductor, SMT, 9.5nH, 5%, 480mA RMS, 0402	L17
02	QDLS02	Diode, SMT, LED, Yellow/Green, (570nm), 0603	DS01
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR01, CR04, CR05
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	QR82	Diode, SMT, TVS, Vw 5V, Vb 6V Vc 10.8V, SOT-143	CR02, CR03
02	RAD15	Resistor, SMT, MF, 150 Ohms, 1% 1/4W	R39, R40

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Description: Final Assy, VX150/300/600,

<u>Component Lvl. StockCode</u>		<u>Description</u>	<u>Reference Designation</u>
02	RAD38	Resistor, SMT, MF, 12.1K Ohms, 1% 1/4W	R34
02	RAD93	Resistor, SMT, 0.01 ohms, 1%, 1/4W, 1206	R80
02	RAF24	Resistor SMT MF 68.1 Ohm 1% 1/16W 0402	R98
02	RAF27	Resistor SMT MF 121 Ohm 1% 1/16W 0402	R01, R03, R09, R12, R17, R20, R23, R26, R35, R38, R41, R53, R54, R61, R62, R63, R71, R72, R74,, R75, R76, R78, R84, R85 R86, R87, R91, R92, R93, R94
02	RAF34	Resistor SMT MF 475 Ohm 1% 1/16W 0402	R83, R88, R90, R95
02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R33
02	RAF42	Resistor SMT MF 2210 Ohm 1% 1/16W 0402	R02, R04, R43, R44, R46, R56, R57, R64, R68
02	RAF44	Resistor SMT MF 3320 Ohm 1% 1/16W 0402	R06, R08, R10, R11, R36, R52
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R05, R07, R13, R14, R15, R16, R29, R30, R31, R32, R37, R42, R47, R50, R51, R55, R65, R69, R79,, R81, R82, R89, R96
02	RAF54	Resistor SMT MF 22.1K Ohm 1% 1/16W 0402	R21, R22, R27, R28, R45, R48, R49, R58, R59, R60, R67, R70, R73
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R18, R24
02	RAF62	Resistor SMT MF 100K Ohm 1% 1/16W 0402	R19, R25, R66, R77
02	RAF83	Resistor SMT MF 499 Ohm 1% 1/16W 0402	R97
02	RFFS04	Resistor, SMT, MF, 1.50ohms, 1%, 1/10W, 0603	R99
02	RT50	Resistor,SMT,MF,0.0 ohms, Jumper,0805	L01, L02, L07, L14
02	UDTS04	IC,SMT,RS-485 Transceiver,3.3V ,SO-8	U07, U08
02	UDTS05	IC, SMT, RS-232 Transceiver, 3.3V, SO-16	U04
02	ULAS01	IC,SMT,Opamp,Quad,Single Suppl y,SOIC-14	U01
02	UT157	IC, SMT, DC-DC Conv, Buck, Adj, 2A, 4.5-28Vin, SOT	U06
02	UT158	IC, SMT, Amp, Current Sense, Precision, 50V/V, SOT	U05
02	UW207	Attenuator, SMT, 20dB, 50 ohm, 0.5W, DC to 8 GHz	U09
02	UX161	IC, SMT, Micro, 128K, 8K SRAM, 3.3V, TQFP-100	U02
02	UX191	IC, SMT, RMS RF Power detector , 3.3V, 40MHz-10GHz	U10
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
02	XFPS14	Crystal,SMT,Fund,32.768kHz, 10ppm,12.5pF,50kOhm,-4	Y01
01	NAPI188/01	Power Supply Interface PWB Assy - 2kW	A04
02	CCFS09	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	C02
02	CCFS52	Cap, SMT, Ceramic, 0.1uF, 10%, 25V X7R, 0603	C01, C03, C07, C09, C10, C11, C13, C15, C16, C17, C18, C20, C21, C23, C24
02	CCFS73	Cap, SMT, Ceramic, 1uF, 10%, 16V, X5R, 0603	C05, C14
02	CX33	Cap,SMT,Ceramic,4.7uF,20%,10V, X5R,1206	C06
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01, E03

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Description: Final Assy, VX150/300/600,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	H AJ66	Terminal, SMT, Test Point, PWB	TP2
02	J A121	Conn, PwrBlade, 3ACP+4P+24S, R/A,Solder Recp, 4mm	J01
02	J R78	Terminal Block, 3 Pos, 300V, 13A, 28-14AWG, Spring	TB1
02	J T202	Conn, Recept, AC, 250VAC, 20A, PWB Mount	J03
02	J U91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J02
02	L S23	Choke, SMT, Common Mode, 7000 ohm, 700mA	L01
02	R FCS04	Resistor, SMT, 0.002 ohms, 1%, 5W	R28
02	R FFS01	Resistor,SMT,MF,0.0ohms,Jumper ,0603	R21, R31, R33, R35, R38
02	R FFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R09, R14
02	R FFS27	Resistor, SMT, MF, 121ohms, 1%, 1/10W, 0603	R04, R05, R06, R07
02	R FFS34	Resistor,SMT,MF,475ohms,1%, 1/10W,0603	R03, R10
02	R FFS38	Resistor,SMT,MF,1000ohms,1%, 1/10W,0603	R30
02	R FFS40	Resistor,SMT,MF,1500ohms,1%, 1/10W,0603	R25, R26
02	R FFS42	Resistor,SMT,MF,2210ohms,1%, 1/10W,0603	R08, R16, R17, R19
02	R FFS43	Resistor, SMT, MF, 2740ohms, 1%, 1/10W, 0603	R11
02	R FFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R01, R02, R12, R13, R23, R24, R27
02	R FFS59	Resistor,SMT,MF,56.2Kohms,1%, 1/10W,0603	R18
02	U LAS02	IC,SMT,Opamp,Quad,Rail-To-Rail ,SOIC-14	U05
02	U P156	IC, SMT, Linear Voltage Regula tor, 3.3V, SOT-223	U01
02	U S49	IC, SMT, ADC, 12 bit, 8 Ch, 3.3V, I2C	U02
02	U T74	IC, Amplifier, Instrumentation	U06
02	U X83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
01	NAPI189	Analog Audio PWB Assy	A02
02	C CFS54	Cap,SMT,Ceramic,1500pF,10%,50V ,X7R,0603	C058, C074, C117, C118
02	C CJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C001, C005, C006, C022, C023, C028, C029, C045
02	C CJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C036, C044, C061
02	C CJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C003, C007, C008, C010, C015, C016, C017, C018, C019, C020, C026, C031, C032, C034, C038, C039,, C051, C053, C056, C062, C065, C067, C082, C083, C085, C087, C088, C091, C095, C098, C100,, C104, C108, C111, C113, C115, C121, C124, C127, C131
02	C CJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C004, C009, C012, C014, C021, C024, C025, C027, C037, C041, C046, C050, C055, C063, C068, C069,, C073, C078, C081, C086, C092, C094, C101, C102, C103, C107, C112, C116, C119, C120
02	C CJ05	Cap,SMT,Ceramic,10uF,10%, 25V,X5R,0805	C033, C040, C054, C059, C070, C071, C072, C079, C090, C132

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Description: Final Assy, VX150/300/600,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	CCJ07	Cap,SMT,Ceramic,100pF,1%, 50V,C0G,0402	C048, C049, C057, C080, C089, C110, C128
02	CCJ08	Cap,SMT,Ceramic,2.2uF,10%, 25V,X5R,0402	C011, C035, C043, C060, C097
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C093, C105, C114, C125
02	CCJ13	Cap,SMT,Ceramic,3300pF,10%, 50V,X7R,0402	C077
02	CCJ19	Cap,SMT,Ceramic,470pF,1%, 50V,C0G,0402	C042, C076, C122
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C099
02	CCJ26	Cap,SMT,Ceramic,220pF,1%,50V, COG/NPO,0402	C052, C109
02	CCJ28	Cap,SMT,Ceramic,39pF,1%,50V, NPO/COG,0402	C075, C123
02	H AJ66	Terminal, SMT, Test Point, PWB	TP01, TP14
02	JT204	Conn, BNC, Dual Stacked, Isolated	J01
02	JT61	Conn, BNC, Recept, 50ohm,Insul , Rt Angle	J02
02	JT87	Conn,3-pin,PWB Mount, Fem, XLR	J03, J04
02	JU85	Conn, Header, Shrouded, 0.050" 30pos, Dual Row, Go	J05
02	LA72	Bead, Ferrite, SMT, 120 Ohm at 100MHz, 1.3A, 0402	L02
02	LS56	Inductor, SMT, 3.3uH, 5.6A,RMS	L01, L03
02	QDDS02	Diode, SMT, Schottky, 40V, 1A, SMA	CR04
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR03
02	QDZS11	Diode, SMT, Zener, 5.6V, 1.5W, SMA, 403D	CR01, CR02, CR05, CR06
02	RAD23	Resistor, SMT, MF, 681 Ohms, 1% 1/4W	R011, R052
02	RAF01	Resistor SMT MF 0.0 Ohm Jumper 0402	R034, R095, R099, R100, R123, R154
02	RAF18	Resistor SMT MF 22.1 Ohm 1% 1/16W 0402	R090, R103, R144, R145
02	RAF26	Resistor SMT MF 100 Ohm 1% 1/16W 0402	R003, R018, R037, R038, R048, R069, R082, R097, R113, R131, R153
02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R007, R008, R009, R014, R015, R016, R031, R032, R044, R045, R046, R060, R061, R062, R109, R110,, R117, R125, R127, R128, R129, R136, R137, R149, R150
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R004, R005, R012, R019, R023, R025, R026, R027, R033, R035, R039, R041, R042, R050, R051, R053,, R056, R057, R058, R066, R070, R073, R074, R075, R080, R085, R086, R089, R093, R096, R098, R101,, R102, R104, R105, R106, R107, R108, R114, R119, R126, R134, R135, R146, R147, R148
02	RAF52	Resistor SMT MF 15.0K Ohm 1% 1/16W 0402	R021, R029, R079, R118
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R055
02	RAF57	Resistor SMT MF 39.2K Ohm 1% 1/16W 0402	R006, R013, R020, R043, R059, R072, R088, R111, R116, R141, R151
02	RAF59	Resistor SMT MF 56.2K Ohm 1% 1/16W 0402	R024, R028, R049, R054, R094

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Description: Final Assy, VX150/300/600,

<u>Component Lvl. StockCode</u>		<u>Description</u>	<u>Reference Designation</u>
02	RAF63	Resistor SMT MF 121K Ohm 1% 1/16W 0402	R071
02	RAF66	Resistor SMT MF 221K Ohm 1% 1/16W 0402	R087, R120
02	RAF74	Resistor SMT MF 1.00M Ohm 1% 1/16W 0402	R001, R030
02	RAF87	Resistor SMT MF 3740 Ohm 1% 1/16W 0402	R010, R017, R047, R063
02	RAF93	Resistor SMT MF 7.15K Ohm 1% 1/16W 0402	R077, R083, R132, R139
02	RAF94	Resistor SMT MF 3.57K Ohm 1% 1/16W 0402	R078, R133
02	RAF95	Resistor SMT MF 4.12K Ohm 1% 1/16W 0402	R084, R091, R140, R142
02	RAF96	Resistor SMT MF 2.10K Ohm 1% 1/16W 0402	R092, R143
02	US12	IC, SMT, Rectifier, Bridge, 400V, 0.5A, SOIC-4	U02, U08, U21, U26
02	US58	IC, SMT, 24Bit Audio Codec, SPI, I2C, TSSOP28	U06
02	US59	IC, SMT, 10-Bit A/D Converter, 4Ch, 200KSPS, 10-VS	U03
02	US60	IC, SMT, ADC 16 Bit, 2Ch, 750KSPS, 16-WQFN	U17
02	UT170	IC, SMT, Adj. DC to DC Inverting Reg, 2.4A, 16-LFC	U20
02	UT171	IC, SMT, Op AMP, Dual, Low Noise, Bipol Supply, 8-	U01, U04, U09, U13, U15, U18, U19, U23
02	UT172	IC, SMT, Precision Diff Amp, 8-MSOP	U05, U10, U16, U25
02	UT178	IC, SMT, Rail to Rail Dual Op-amp, Wide BW, SOIC8	U14, U24
02	UX66	IC,SMT,Linear Regulator,150mA Adj.,MSOP-8	U07, U11, U12
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U22
01	NAPI193	Front Panel User Interface Pwb Assy	A05
02	CCFS04	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	C02, C03
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C04
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C06
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C05
02	JA140	Conn, USB, Vertical Mount, Type A, PWB	J04
02	JQ55	Conn, Header, Ribbon Cbl, 20 Pin	J03
02	JQ97	Conn, Header, SATA, Vert, PWB	J01
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J02
02	LS18	Inductor,SMT,2.2uH,600ma,1210	L01
02	QM77	Diode, LED, RED, Rectangular, TH, 5mm x 2mm	DS1
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	RFFS18	Resistor, SMT, MF, 22.1ohms, 1%, 1/10W, 0603	R20, R21
02	RFFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R12, R16
02	RFFS28	Resistor, SMT, MF, 150ohms, 1%, 1/10W, 0603	R03, R05, R06, R14, R18
02	RFFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R02, R04, R07, R08, R09, R10, R11, R13, R15, R17, R19, R22, R23

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Description: Final Assy, VX150/300/600,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	SD94	Switch, Push-Button, Green/Red, MOM, SPST-NO, PWB	S01, S02
02	SD95	Switch, Push-Button, Tactile, SPST-NO, PWB	S03
02	UC107	Rotary Encoder, 20PPR, Quadrature, w / MOM Push Bu	U01
01	NAPP15	Directional Coupler Bottom PWB Assy	A11
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J01, J02, J03
02	RT73	Resistor, Termination, 50 Ohm, +/- 5%, 60W, Tuned	R01
01	RX49	Thermistor,-30/105°C,10Kohms@ 25°C,Neg,Bvalue 3435	RT01, RT02
01	UA296	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 16 con	W02
01	UA297	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W03
01	UA298	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W04
01	UA300	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 10 con	W05
01	UA301	Cable Assembly, Flat IDC, 0.100" pitch, 20 cond, 2	W06
01	UA307	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W07, W08
01	UA309	Cable, Coax, SRC 316, MCX(M) RA to BNC(F) Bulkhead	W10
01	UA310	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 12.0	W11
01	UA311	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 16.0	W12
01	UA313	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W13
01	UA316	Cable, SATA, 0.5m, Straight F to Straight F, Shiel	W15
01	UA318	Cable Assembly, Flat IDC, 0.050" Tiger Eye,30 cond	W16
01	UG130	Power Supply, LED, 12V@150W, 90-305Vac, PFC, IP67	U02
01	UG132	Power Supply, 18-53Vdc, 47A, 2250W/1200W, 90-265Va	U03
01	UR119	Display, TFT LCD, 320x240 Graphic, 3.5", Color, SP	U01
01	ZAP68	Fan, 80mm, 12Vdc, PWM Ctrl, Tach, w/Conn+HS Tube+M	B01, B02

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Description: Final Assy, VX1,

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
01	235-5910	SD card mod, Programmed (UB114)	A01U63
01	235-8010	Ancillary kit for VX (150W-2kW)	
01	235-8900	2RU Front Panel Detail Assembly	
01	JA44	Conn, Coax, Recept, 7/16 DIN, Panel,50ohm	J01
01	LA82C	Inductor, Air Core, 16 AWG magnet, 17 Turn, 0.27"	L01
01	NAPA40	PA PWB Assy	A07
02	CB48	Capacitor, SMT, Clad Mica, 100pF, 300V, +/-5%	C07
02	CT102	Capacitor,SMT, Porcelain, 12pF 1500V,+/-2%	C15, C22
02	CT104	Capacitor,SMT,Porcelain,1000pF ,300V,+/-5%	C16, C17, C18
02	CT105	Capacitor,SMT,Porcelain,470pF, 300V,+/-5%	C14, C19, C20, C21
02	CT110	Cap, SMT, Elect, Alum Polymer, 56uF, +/-20%, 63V	C06, C10, C11
02	CT113	Capacitor, SMT, Porcelain, 680pF, 300V, +/-5%	C09, C23
02	CT115	Capacitor,SMT,12pF,+/-1%,250V, NP0,0805	C03
02	CT124	Capacitor,SMT,22pF,+/-1%,250V, NP0,0805	C02
02	CT66	Capacitor, SMT, Ceramic, 0.1uF 10%, 100V	C01, C12
02	FA79	Fuse, SMT, 40A, 72VDC, Very Fast	F1
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E1, E2
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1
02	LA80C	Inductor, 1 turn, rectangular + angled, 0.032" cop	L1
02	LS33	Inductor, SMT, 17.5nH, 5%, 4A 3.15mm H x 6.86mm L	L2
02	LS59	Inductor, SMT, 22nH, 20%, 40A	L3
02	LS69	Inductor, SMT, 150nH, 2%, 1.2A, 4.2mm H x 4.95mm L	L4, L5
02	QAP73	Transistor, FET, LDMOS, 65V, Dual, Ruggedized	Q1
02	RAD01	Resistor, SMT, MF, 10 Ohms, 1% 1/4W	R1
02	RAD45	Resistor, SMT, MF, 47.5K Ohms, 1% 1/4W	R5
02	RFFS94	Resistor, SMT, 10 ohms, 1%, 1W, 2512	R4, R6
01	NAPA41	Pre-Amp/IPA Pwb Assy	A06
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C08
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06
02	CT116	Capacitor,SMT,6.8pF,+/-0.25pF, 250V,NP0,0805	C12
02	CT117	Capacitor, SMT,33pF,+/-1%,250V, NP0,0805	C03
02	CT118	Capacitor,SMT,51pF,+/-1%,250V,NP0,0805 NP0,0805	C16
02	CT119	Capacitor,SMT,82pF,+/-2%,250V, NP0,0805	C17

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Description: Final Assy, VX1,

<u>Component Lvl. StockCode</u>		<u>Description</u>	<u>Reference Designation</u>
02	CT120	Capacitor, SMT,150pF,+/-1%,250V, NP0,0805	C02, C04, C07
02	CT121	Capacitor,SMT,180pF,+/-1%,250V, NP0,0805	C05, C09, C15
02	CT122	Capacitor,SMT, 1000pF, +/-5%, 50V,NP0	C11, C13
02	CT123	Capacitor, SMT, 0.01uF, +/-10%, 50V,BX	C10, C14
02	FA76	Fuse, 125 VAC, VDC, 5A, Very fast acting	F1
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1, J2
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J3
02	LS68	Inductor, SMT, 56nH, 2%, 3A, 4.2mm H x 4.95mm L	L1
02	LS70	Inductor,SMT,51nH,+/-2%,1A, Ceramic,0805	L7
02	LS71	Inductor,SMT,33nH,+/-2%,0.5A, Ceramic,0805	L6
02	LS72	Inductor,SMT,68nH,+/-2%,0.5A, Ceramic,0805	L5
02	LS73	Inductor,SMT,5nH,+/-2%, 4A,Air	L4
02	LS74	Inductor,SMT,33nH,+/-2%, 4.8A,Air	L2, L3
02	QAP74	Transistor,SMT,MOSFET,LDMOS, Single,40V,TO-270-2	Q1
02	RAD33	Resistor, SMT, MF, 4750 Ohms, 1%, 1/4W	R2
02	RAD95	Resistor,SMT,1 Ohm,1%, 1/4W,1206	R1
02	RAD96	Resistor,SMT,39.2 Ohms,1%,1/4W,1206 1/4W,1206	R4
02	RFFS58	Resistor, SMT, MF, 47.5Kohms, 1%, 1/10W, 0603	R3
01	NAPF16	PA LPF PWB Assy	A09
02	CT106	Capacitor,SMT,Porcelain,1.5pF, 1500V,+/-0.1pF	C06
02	CT107	Capacitor,SMT,Porcelain,1.8pF, 1500V,+/-0.1pF	C10
02	CT108	Capacitor,SMT,Porcelain,3.3pF, 1500V,+/-0.1pF	C08
02	CT109	Capacitor,SMT,Porcelain,5.6pF, 1500V,+/-0.1pF	C07, C09
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01
02	LA77F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L01
02	LA78F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L02
02	LA79F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.4	L03
01	NAPI187	System Interface PWB Assy	A03

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<u>Component Lvl. StockCode</u>		<u>Description</u>	<u>Reference Designation</u>
02	CCJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C02, C04, C11, C12, C14, C15, C53, C81, C82, C86
02	CCJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C19, C22, C47, C65, C83, C84
02	CCJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C01, C03, C05, C13, C16, C17, C18, C20, C21, C24, C25, C26, C27, C28, C29, C30,, C31, C32, C37, C38, C40, C41, C42, C43 C44, C45, C46, C48, C50, C51, C54, C55, C56, C57, C58, C59, C61, C63, C64, C66, C68, C69, C71, C72, C74, C77, C78, C79, C80
02	CCJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C08, C09, C23, C39, C73, C85
02	CCJ06	Cap,SMT,Ceramic,4.7uF,10%, 25V,X7R,0805	C52, C60, C62, C75
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C67
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C70, C76
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C33, C35
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06, C07, C10
02	CT65	Cap, SMT, Ceramic, 6.8pF, 50V, +/-0.25pF, 1206	C49
02	H AJ66	Terminal, SMT, Test Point, PWB	TP03, TP14
02	JF47	Conn, Header,Square Post,Gold, Dual,40-pin	J12
02	JQ16	Conn, Header, SIP, 12 Pin Breakaway, 10 Ctr	J11
02	JR77	Terminal Block, 2 Pos, 300V, 13A, 28-14AWG, Spring	TB02
02	JR89	Terminal Block, 4 Pos, 300V, 26 - 20AWG, Spring C	TB01
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J05, J06, J09
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J07
02	JU91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J04, J10
02	JU95	Conn, Header, Shrouded, 3mm, 4 pos, Vertical, Gold	J01, J02
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J03, J08
02	LCFS01	Inductor, SMT, Choke, 600ohms, 2A, 0805	L05, L06, L10, L11
02	LCFS02	Inductor, SMT, Choke, 2000 ohm s, 80mA, 0805	L08, L15, L16
02	LS18	Inductor,SMT.2.2uH,600ma,1210	L12
02	LS34	Inductor, SMT, 28nH, 2%, 4A 3.15mm H x 6.86mm L	L09
02	LS45	Inductor, SMT, Shielded, 33uH, 3.3A RMS	L03, L04
02	LS60	Inductor, SMT, 22uH, 4A RMS, Shielded, Pwr	L13
02	LS61	Inductor, SMT, 9.5nH, 5%, 480mA RMS, 0402	L17
02	QDLS02	Diode, SMT, LED, Yellow/Green, (570nm), 0603	DS01
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR01, CR04, CR05
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	QR82	Diode, SMT, TVS, Vw 5V, Vb 6V Vc 10.8V, SOT-143	CR02, CR03
02	RAD15	Resistor, SMT, MF, 150 Ohms, 1% 1/4W	R39, R40

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<u>Component Lvl. StockCode</u>		<u>Description</u>	<u>Reference Designation</u>
02	RAD38	Resistor, SMT, MF, 12.1K Ohms, 1% 1/4W	R34
02	RAD93	Resistor, SMT, 0.01 ohms, 1%, 1/4W, 1206	R80
02	RAF24	Resistor SMT MF 68.1 Ohm 1% 1/16W 0402	R98
02	RAF27	Resistor SMT MF 121 Ohm 1% 1/16W 0402	R01, R03, R09, R12, R17, R20, R23, R26, R35, R38, R41, R53, R54, R61, R62, R63, R71, R72, R74,, R75, R76, R78, R84, R85 R86, R87, R91, R92, R93, R94
02	RAF34	Resistor SMT MF 475 Ohm 1% 1/16W 0402	R83, R88, R90, R95
02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R33
02	RAF42	Resistor SMT MF 2210 Ohm 1% 1/16W 0402	R02, R04, R43, R44, R46, R56, R57, R64, R68
02	RAF44	Resistor SMT MF 3320 Ohm 1% 1/16W 0402	R06, R08, R10, R11, R36, R52
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R05, R07, R13, R14, R15, R16, R29, R30, R31, R32, R37, R42, R47, R50, R51, R55, R65, R69, R79,, R81, R82, R89, R96
02	RAF54	Resistor SMT MF 22.1K Ohm 1% 1/16W 0402	R21, R22, R27, R28, R45, R48, R49, R58, R59, R60, R67, R70, R73
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R18, R24
02	RAF62	Resistor SMT MF 100K Ohm 1% 1/16W 0402	R19, R25, R66, R77
02	RAF83	Resistor SMT MF 499 Ohm 1% 1/16W 0402	R97
02	RFFS04	Resistor, SMT, MF, 1.50ohms, 1%, 1/10W, 0603	R99
02	RT50	Resistor,SMT,MF,0.0 ohms, Jumper,0805	L01, L02, L07, L14
02	UDTS04	IC,SMT,RS-485 Transceiver,3.3V ,SO-8	U07, U08
02	UDTS05	IC, SMT, RS-232 Transceiver, 3.3V, SO-16	U04
02	ULAS01	IC,SMT,Opamp,Quad,Single Suppl y,SOIC-14	U01
02	UT157	IC, SMT, DC-DC Conv, Buck, Adj, 2A, 4.5-28Vin, SOT	U06
02	UT158	IC, SMT, Amp, Current Sense, Precision, 50V/V, SOT	U05
02	UW207	Attenuator, SMT, 20dB, 50 ohm, 0.5W, DC to 8 GHz	U09
02	UX161	IC, SMT, Micro, 128K, 8K SRAM, 3.3V, TQFP-100	U02
02	UX191	IC, SMT, RMS RF Power detector , 3.3V, 40MHz-10GHz	U10
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
02	XFPS14	Crystal,SMT,Fund,32.768kHz, 10ppm,12.5pF,50kOhm,-4	Y01
01	NAPI188	Power Supply Interface PWB Assy - 3.5kW	A04
02	CCFS09	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	C02
02	CCFS52	Cap, SMT, Ceramic, 0.1uF, 10%, 25V X7R, 0603	C01, C03, C07, C09, C10, C11, C12, C13, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24
02	CCFS73	Cap, SMT, Ceramic, 1uF, 10%, 16V, X5R, 0603	C05, C14
02	CX33	Cap,SMT,Ceramic,4.7uF,20%,10V, X5R,1206	C06
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01, E02, E03, E04

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02	H AJ66	Terminal, SMT, Test Point, PWB	TP2
02	J A137	Conn, PwrBlade, 3ACP+4P+24S, RA PCB, CP3500 Mate	J01
02	J R78	Terminal Block, 3 Pos, 300V, 13A, 28-14AWG, Spring	TB1
02	J T202	Conn, Recept, AC, 250VAC, 20A, PWB Mount	J03
02	J U91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J02
02	L S23	Choke, SMT, Common Mode, 7000 ohm, 700mA	L01
02	R FCS04	Resistor, SMT, 0.002 ohms, 1%, 5W	R22, R28
02	R FFS01	Resistor,SMT,MF,0.0ohms,Jumper ,0603	R32, R34, R36, R37
02	R FFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R09, R14
02	R FFS27	Resistor, SMT, MF, 121ohms, 1%, 1/10W, 0603	R04, R05, R06, R07
02	R FFS34	Resistor,SMT,MF,475ohms,1%, 1/10W,0603	R03, R10
02	R FFS38	Resistor,SMT,MF,1000ohms,1%, 1/10W,0603	R29, R30
02	R FFS40	Resistor,SMT,MF,1500ohms,1%, 1/10W,0603	R25, R26
02	R FFS42	Resistor,SMT,MF,2210ohms,1%, 1/10W,0603	R08, R16, R17, R19
02	R FFS43	Resistor, SMT, MF, 2740ohms, 1%, 1/10W, 0603	R11
02	R FFS46	Resistor, SMT, MF, 4750ohms, 1%, 1/10W, 0603	R13
02	R FFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R01, R02, R12, R20, R23, R24, R27
02	R FFS59	Resistor,SMT,MF,56.2Kohms,1%, 1/10W,0603	R15, R18
02	U LAS02	IC,SMT,Opamp,Quad,Rail-To-Rail ,SOIC-14	U05
02	U P156	IC, SMT, Linear Voltage Regula tor, 3.3V, SOT-223	U01
02	U S49	IC, SMT, ADC, 12 bit, 8 Ch, 3.3V, I2C	U02
02	U T74	IC, Amplifier, Instrumentation	U04, U06
02	U X83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
01	NAP189	Analog Audio PWB Assy	A02
02	C CFS54	Cap,SMT,Ceramic,1500pF,10%,50V ,X7R,0603	C058, C074, C117, C118
02	C CJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C001, C005, C006, C022, C023, C028, C029, C045
02	C CJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C036, C044, C061
02	C CJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C003, C007, C008, C010, C015, C016, C017, C018, C019, C020, C026, C031, C032, C034, C038, C039,, C051, C053, C056, C062, C065, C067, C082, C083, C085, C087, C088, C091, C095, C098, C100,, C104, C108, C111, C113, C115, C121, C124, C127, C131
02	C CJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C004, C009, C012, C014, C021, C024, C025, C027, C037, C041, C046, C050, C055, C063, C068, C069,, C073, C078, C081, C086, C092, C094, C101, C102, C103, C107, C112, C116, C119, C120

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	CCJ05	Cap,SMT,Ceramic,10uF,10%, 25V,X5R,0805	C033, C040, C054, C059, C070, C071, C072, C079, C090, C132
02	CCJ07	Cap,SMT,Ceramic,100pF,1%, 50V,C0G,0402	C048, C049, C057, C080, C089, C110, C128
02	CCJ08	Cap,SMT,Ceramic,2.2uF,10%, 25V,X5R,0402	C011, C035, C043, C060, C097
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C093, C105, C114, C125
02	CCJ13	Cap,SMT,Ceramic,3300pF,10%, 50V,X7R,0402	C077
02	CCJ19	Cap,SMT,Ceramic,470pF,1%, 50V,C0G,0402	C042, C076, C122
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C099
02	CCJ26	Cap,SMT,Ceramic,220pF,1%,50V, COG/NPO,0402	C052, C109
02	CCJ28	Cap,SMT,Ceramic,39pF,1%,50V, NPO/COG,0402	C075, C123
02	HAJ66	Terminal, SMT, Test Point, PWB	TP01, TP14
02	JT204	Conn, BNC, Dual Stacked, Isolated	J01
02	JT61	Conn, BNC, Recept, 50ohm,Insul , Rt Angle	J02
02	JT87	Conn,3-pin,PWB Mount, Fem, XLR	J03, J04
02	JU85	Conn, Header, Shrouded, 0.050" 30pos, Dual Row, Go	J05
02	LA72	Bead, Ferrite, SMT, 120 Ohm at 100MHz, 1.3A, 0402	L02
02	LS56	Inductor, SMT, 3.3uH, 5.6A,RMS	L01, L03
02	QDDS02	Diode, SMT, Schottky, 40V, 1A, SMA	CR04
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR03
02	QDZS11	Diode, SMT, Zener, 5.6V, 1.5W, SMA, 403D	CR01, CR02, CR05, CR06
02	RAD23	Resistor, SMT, MF, 681 Ohms, 1% 1/4W	R011, R052
02	RAF01	Resistor SMT MF 0.0 Ohm Jumper 0402	R034, R095, R099, R100, R123, R154
02	RAF18	Resistor SMT MF 22.1 Ohm 1% 1/16W 0402	R090, R103, R144, R145
02	RAF26	Resistor SMT MF 100 Ohm 1% 1/16W 0402	R003, R018, R037, R038, R048, R069, R082, R097, R113, R131, R153
02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R007, R008, R009, R014, R015, R016, R031, R032, R044, R045, R046, R060, R061, R062, R109, R110,, R117, R125, R127, R128, R129, R136, R137, R149, R150
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R004, R005, R012, R019, R023, R025, R026, R027, R033, R035, R039, R041, R042, R050, R051, R053,, R056, R057, R058, R066, R070, R073, R074, R075, R080, R085, R086, R089, R093, R096, R098, R101,, R102, R104, R105, R106, R107, R108, R114, R119, R126, R134, R135, R146, R147, R148
02	RAF52	Resistor SMT MF 15.0K Ohm 1% 1/16W 0402	R021, R029, R079, R118
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R055
02	RAF57	Resistor SMT MF 39.2K Ohm 1% 1/16W 0402	R006, R013, R020, R043, R059, R072, R088, R111, R116, R141, R151

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	RAF59	Resistor SMT MF 56.2K Ohm 1% 1/16W 0402	R024, R028, R049, R054, R094
02	RAF63	Resistor SMT MF 121K Ohm 1% 1/16W 0402	R071
02	RAF66	Resistor SMT MF 221K Ohm 1% 1/16W 0402	R087, R120
02	RAF74	Resistor SMT MF 1.00M Ohm 1% 1/16W 0402	R001, R030
02	RAF87	Resistor SMT MF 3740 Ohm 1% 1/16W 0402	R010, R017, R047, R063
02	RAF93	Resistor SMT MF 7.15K Ohm 1% 1/16W 0402	R077, R083, R132, R139
02	RAF94	Resistor SMT MF 3.57K Ohm 1% 1/16W 0402	R078, R133
02	RAF95	Resistor SMT MF 4.12K Ohm 1% 1/16W 0402	R084, R091, R140, R142
02	RAF96	Resistor SMT MF 2.10K Ohm 1% 1/16W 0402	R092, R143
02	US12	IC, SMT, Rectifier, Bridge, 400V, 0.5A, SOIC-4	U02, U08, U21, U26
02	US58	IC, SMT, 24Bit Audio Codec, SPI, I2C, TSSOP28	U06
02	US59	IC, SMT, 10-Bit A/D Converter, 4Ch, 200KSPS, 10-VS	U03
02	US60	IC, SMT, ADC 16 Bit, 2Ch, 750KSPS, 16-WQFN	U17
02	UT170	IC, SMT, Adj. DC to DC Inverting Reg, 2.4A, 16-LFC	U20
02	UT171	IC, SMT, Op AMP, Dual, Low Noise, Bipol Supply, 8-	U01, U04, U09, U13, U15, U18, U19, U23
02	UT172	IC, SMT, Precision Diff Amp, 8-MSOP	U05, U10, U16, U25
02	UT178	IC, SMT, Rail to Rail Dual Op-amp, Wide BW, SOIC8	U14, U24
02	UX66	IC,SMT,Linear Regulator,150mA Adj.,MSOP-8	U07, U11, U12
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U22
01	NAPI193	Front Panel User Interface Pwb Assy	A05
02	CCFS04	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	C02, C03
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C04
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C06
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C05
02	JA140	Conn, USB, Vertical Mount, Type A, PWB	J04
02	JQ55	Conn, Header, Ribbon Cbl, 20 Pin	J03
02	JQ97	Conn, Header, SATA, Vert, PWB	J01
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J02
02	LS18	Inductor,SMT,2.2uH,600ma,1210	L01
02	QM77	Diode, LED, RED, Rectangular, TH, 5mm x 2mm	DS1
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	RFFS18	Resistor, SMT, MF, 22.1ohms, 1%, 1/10W, 0603	R20, R21
02	RFFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R12, R16
02	RFFS28	Resistor, SMT, MF, 150ohms, 1%, 1/10W, 0603	R03, R05, R06, R14, R18

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	RFFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R02, R04, R07, R08, R09, R10, R11, R13, R15, R17, R19, R22, R23
02	SD94	Switch, Push-Button, Green/Red, MOM, SPST-NO, PWB	S01, S02
02	SD95	Switch, Push-Button, Tactile, SPST-NO, PWB	S03
02	UC107	Rotary Encoder, 20PPR, Quadrature, w / MOM Push Bu	U01
01	NAPP15	Directional Coupler Bottom PWB Assy	A11
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J01, J02, J03
02	RT73	Resistor, Termination, 50 Ohm, +/- 5%, 60W, Tuned	R01
01	RX49	Thermistor,-30/105°C,10Kohms@ 25°C,Neg,Bvalue 3435	RT01, RT02
01	UA296	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 16 con	W02
01	UA297	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W03
01	UA298	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W04
01	UA300	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 10 con	W05
01	UA301	Cable Assembly, Flat IDC, 0.100" pitch, 20 cond, 2	W06
01	UA307	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W07, W08
01	UA309	Cable, Coax, SRC 316, MCX(M) RA to BNC(F) Bulkhead	W10
01	UA310	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 12.0	W11
01	UA311	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 16.0	W12
01	UA313	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W13
01	UA316	Cable, SATA, 0.5m, Straight F to Straight F, Shiel	W15
01	UA318	Cable Assembly, Flat IDC, 0.050" Tiger Eye,30 cond	W16
01	UG130	Power Supply, LED, 12V@150W, 90-305Vac, PFC, IP67	U02
01	UG136	Power Supply, 23-65Vdc, 3500W/1500W, 90-265Vac, Co	U03
01	UR119	Display, TFT LCD, 320x240 Graphic, 3.5", Color, SP	U01
01	ZAP68	Fan, 80mm, 12Vdc, PWM Ctrl, Tach, w/Conn+HS Tube+M	B01, B02

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
01	235-5910	SD card mod, Programmed (UB114)	A01U63
01	235-8010	Ancillary kit for VX (150W-2kW)	
01	235-8900	2RU Front Panel Detail Assembly	
01	JA44	Conn, Coax, Recept, 7/16 DIN, Panel,50ohm	J01
01	LA82C	Inductor, Air Core, 16 AWG magnet, 17 Turn, 0.27"	L01, L02
01	NAPA40	PA PWB Assy	A07, A08
02	CB48	Capacitor, SMT, Clad Mica, 100pF, 300V, +/-5%	C07
02	CT102	Capacitor,SMT, Porcelain, 12pF 1500V,+/-2%	C15, C22
02	CT104	Capacitor,SMT,Porcelain,1000pF ,300V,+/-5%	C16, C17, C18
02	CT105	Capacitor,SMT,Porcelain,470pF, 300V,+/-5%	C14, C19, C20, C21
02	CT110	Cap, SMT, Elect, Alum Polymer, 56uF, +/-20%, 63V	C06, C10, C11
02	CT113	Capacitor, SMT, Porcelain, 680pF, 300V, +/-5%	C09, C23
02	CT115	Capacitor,SMT,12pF,+/-1%,250V, NP0,0805	C03
02	CT124	Capacitor,SMT,22pF,+/-1%,250V, NP0,0805	C02
02	CT66	Capacitor, SMT, Ceramic, 0.1uF 10%, 100V	C01, C12
02	FA79	Fuse, SMT, 40A, 72VDC, Very Fast	F1
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E1, E2
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1
02	LA80C	Inductor, 1 turn, rectangular + angled, 0.032" cop	L1
02	LS33	Inductor, SMT, 17.5nH, 5%, 4A 3.15mm H x 6.86mm L	L2
02	LS59	Inductor, SMT, 22nH, 20%, 40A	L3
02	LS69	Inductor, SMT, 150nH, 2%, 1.2A, 4.2mm H x 4.95mm L	L4, L5
02	QAP73	Transistor, FET, LDMOS, 65V, Dual, Ruggedized	Q1
02	RAD01	Resistor, SMT, MF, 10 Ohms, 1% 1/4W	R1
02	RAD45	Resistor, SMT, MF, 47.5K Ohms, 1% 1/4W	R5
02	RFFS94	Resistor, SMT, 10 ohms, 1%, 1W, 2512	R4, R6
01	NAPA41	Pre-Amp/IPA Pwb Assy	A06
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C08
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06
02	CT116	Capacitor,SMT,6.8pF,+/-0.25pF, 250V,NP0,0805	C12
02	CT117	Capacitor, SMT,33pF,+/-1%,250V, NP0,0805	C03
02	CT118	Capacitor,SMT,51pF,+/-1%,250V,NP0,0805 NP0,0805	C16
02	CT119	Capacitor,SMT,82pF,+/-2%,250V, NP0,0805	C17

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<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
02	CT120	Capacitor, SMT,150pF,+/-1%,250V, NP0,0805	C02, C04, C07
02	CT121	Capacitor,SMT,180pF,+/-1%,250V, NP0,0805	C05, C09, C15
02	CT122	Capacitor,SMT, 1000pF, +/-5%, 50V,NP0	C11, C13
02	CT123	Capacitor, SMT, 0.01uF, +/-10%, 50V,BX	C10, C14
02	FA76	Fuse, 125 VAC, VDC, 5A, Very fast acting	F1
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J1, J2
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J3
02	LS68	Inductor, SMT, 56nH, 2%, 3A, 4.2mm H x 4.95mm L	L1
02	LS70	Inductor,SMT,51nH,+/-2%,1A, Ceramic,0805	L7
02	LS71	Inductor,SMT,33nH,+/-2%,0.5A, Ceramic,0805	L6
02	LS72	Inductor,SMT,68nH,+/-2%,0.5A, Ceramic,0805	L5
02	LS73	Inductor,SMT,5nH,+/-2%, 4A,Air	L4
02	LS74	Inductor,SMT,33nH,+/-2%, 4.8A,Air	L2, L3
02	QAP74	Transistor,SMT,MOSFET,LDMOS, Single,40V,TO-270-2	Q1
02	RAD33	Resistor, SMT, MF, 4750 Ohms, 1%, 1/4W	R2
02	RAD95	Resistor,SMT,1 Ohm,1%, 1/4W,1206	R1
02	RAD96	Resistor,SMT,39.2 Ohms,1%,1/4W,1206 1/4W,1206	R4
02	RFFS58	Resistor, SMT, MF, 47.5Kohms, 1%, 1/10W, 0603	R3

01	NAPF16	PA LPF PWB Assy	A09, A10
02	CT106	Capacitor,SMT,Porcelain,1.5pF, 1500V,+/-0.1pF	C06
02	CT107	Capacitor,SMT,Porcelain,1.8pF, 1500V,+/-0.1pF	C10
02	CT108	Capacitor,SMT,Porcelain,3.3pF, 1500V,+/-0.1pF	C08
02	CT109	Capacitor,SMT,Porcelain,5.6pF, 1500V,+/-0.1pF	C07, C09
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01
02	LA77F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L01
02	LA78F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.5	L02
02	LA79F	Inductor, SMT, Air Core, 2.5 turn, 10 AWG TCW, 0.4	L03
01	NAPH15	2-Way Splitter Pwb Assy	A12

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02	CCFS04	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	C01, C02
02	CS81	Capacitor, SMT, Porcelain,24pF 500V, 2%	C05
02	CS89	Capacitor, SMT, Porcelain,27pF 500V, 2%	C07
02	CT53	Capacitor,SMT,Ceramic,0.001uF, 50V,10%	C03, C04
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J01, J02, J03
02	JU91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J04
02	LS68	Inductor, SMT, 56nH, 2%, 3A, 4.2mm H x 4.95mm L	L01
02	RAD38	Resistor, SMT, MF, 12.1K Ohms, 1% 1/4W	R01, R02
02	RFFS38	Resistor,SMT,MF,1000ohms,1%, 1/10W,0603	R03, R04
02	RT57	Resistor, SMT, AIN, 100 ohms, 2%, 30W, 3725	R05
01	NAPI187	System Interface PWB Assy	A03
02	CCJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C02, C04, C11, C12, C14, C15, C53, C81, C82, C86
02	CCJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C19, C22, C47, C65, C83, C84
02	CCJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C01, C03, C05, C13, C16, C17, C18, C20, C21, C24, C25, C26, C27, C28, C29, C30,, C31, C32, C37, C38, C40, C41, C42, C43 C44, C45, C46, C48, C50, C51, C54, C55, C56, C57, C58, C59, C61, C63, C64, C66, C68, C69, C71, C72, C74, C77, C78, C79, C80
02	CCJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C08, C09, C23, C39, C73, C85
02	CCJ06	Cap,SMT,Ceramic,4.7uF,10%, 25V,X7R,0805	C52, C60, C62, C75
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C67
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C70, C76
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C33, C35
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C06, C07, C10
02	CT65	Cap, SMT, Ceramic, 6.8pF, 50V, +/-0.25pF, 1206	C49
02	HAI66	Terminal, SMT, Test Point, PWB	TP03, TP14
02	JF47	Conn, Header,Square Post,Gold, Dual,40-pin	J12
02	JQ16	Conn, Header, SIP, 12 Pin Breakaway, 10 Ctr	J11
02	JR77	Terminal Block, 2 Pos, 300V, 13A, 28-14AWG, Spring	TB02
02	JR89	Terminal Block, 4 Pos, 300V, 26 - 20AWG, Spring C	TB01
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J05, J06, J09
02	JU84	Conn, Header, Shrouded, 0.050" 16pos, Dual Row, Go	J07
02	JU91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J04, J10
02	JU95	Conn, Header, Shrouded, 3mm, 4 pos, Vertical, Gold	J01, J02
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J03, J08
02	LCFS01	Inductor, SMT, Choke, 600ohms, 2A, 0805	L05, L06, L10, L11

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02	LCFS02	Inductor, SMT, Choke, 2000 ohm s, 80mA, 0805	L08, L15, L16
02	LS18	Inductor,SMT,2.2uH,600ma,1210	L12
02	LS34	Inductor, SMT, 28nH, 2%, 4A 3.15mm H x 6.86mm L	L09
02	LS45	Inductor, SMT, Shielded, 33uH, 3.3A RMS	L03, L04
02	LS60	Inductor, SMT, 22uH, 4A RMS, Shielded, Pwr	L13
02	LS61	Inductor, SMT, 9.5nH, 5%, 480mA RMS, 0402	L17
02	QDLS02	Diode, SMT, LED, Yellow/Green, (570nm), 0603	DS01
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR01, CR04, CR05
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	QR82	Diode, SMT, TVS, Vw 5V, Vb 6V Vc 10.8V, SOT-143	CR02, CR03
02	RAD15	Resistor, SMT, MF, 150 Ohms, 1% 1/4W	R39, R40
02	RAD38	Resistor, SMT, MF, 12.1K Ohms, 1% 1/4W	R34
02	RAD93	Resistor, SMT, 0.01 ohms, 1%, 1/4W, 1206	R80
02	RAF24	Resistor SMT MF 68.1 Ohm 1% 1/16W 0402	R98
02	RAF27	Resistor SMT MF 121 Ohm 1% 1/16W 0402	R01, R03, R09, R12, R17, R20, R23, R26, R35, R38, R41, R53, R54, R61, R62, R63, R71, R72, R74., R75, R76, R78, R84, R85 R86, R87, R91, R92, R93, R94
02	RAF34	Resistor SMT MF 475 Ohm 1% 1/16W 0402	R83, R88, R90, R95
02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R33
02	RAF42	Resistor SMT MF 2210 Ohm 1% 1/16W 0402	R02, R04, R43, R44, R46, R56, R57, R64, R68
02	RAF44	Resistor SMT MF 3320 Ohm 1% 1/16W 0402	R06, R08, R10, R11, R36, R52
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R05, R07, R13, R14, R15, R16, R29, R30, R31, R32, R37, R42, R47, R50, R51, R55, R65, R69, R79., R81, R82, R89, R96
02	RAF54	Resistor SMT MF 22.1K Ohm 1% 1/16W 0402	R21, R22, R27, R28, R45, R48, R49, R58, R59, R60, R67, R70, R73
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R18, R24
02	RAF62	Resistor SMT MF 100K Ohm 1% 1/16W 0402	R19, R25, R66, R77
02	RAF83	Resistor SMT MF 499 Ohm 1% 1/16W 0402	R97
02	RFFS04	Resistor, SMT, MF, 1.50ohms, 1%, 1/10W, 0603	R99
02	RT50	Resistor,SMT,MF,0.0 ohms, Jumper,0805	L01, L02, L07, L14
02	UDTS04	IC,SMT,RS-485 Transceiver,3.3V ,SO-8	U07, U08
02	UDTS05	IC, SMT, RS-232 Transceiver, 3.3V, SO-16	U04
02	ULAS01	IC,SMT,Opamp,Quad,Single Suppl y,SOIC-14	U01
02	UT157	IC, SMT, DC-DC Conv, Buck, Adj, 2A, 4.5-28V _{in} , SOT	U06
02	UT158	IC, SMT, Amp, Current Sense, Precision, 50V/V, SOT	U05
02	UW207	Attenuator, SMT, 20dB, 50 ohm, 0.5W, DC to 8 GHz	U09

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02	UX161	IC, SMT, Micro, 128K, 8K SRAM, 3.3V, TQFP-100	U02
02	UX191	IC, SMT, RMS RF Power detector , 3.3V, 40MHz-10GHz	U10
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
02	XFPS14	Crystal,SMT,Fund,32.768kHz, 10ppm,12.5pF,50kOhm,-4	Y01
01	NAPI188	Power Supply Interface PWB Assy - 3.5kW	A04
02	CCFS09	Cap,SMT,Ceramic,0.47uF,10%,25V,X7R,0805	C02
02	CCFS52	Cap, SMT, Ceramic, 0.1uF, 10%, 25V X7R, 0603	C01, C03, C07, C09, C10, C11, C12, C13, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24
02	CCFS73	Cap, SMT, Ceramic, 1uF, 10%, 16V, X5R, 0603	C05, C14
02	CX33	Cap,SMT,Ceramic,4.7uF,20%,10V, X5R,1206	C06
02	HAC122	1 Pin Screw Terminal, Power Tap M3 Surface Mount	E01, E02, E03, E04
02	HAI66	Terminal, SMT, Test Point, PWB	TP2
02	JA137	Conn, PwrBlade, 3ACP+4P+24S, RA PCB, CP3500 Mate	J01
02	JR78	Terminal Block, 3 Pos, 300V, 13A, 28-14AWG, Spring	TB1
02	JT202	Conn, Recept, AC, 250VAC, 20A, PWB Mount	J03
02	JU91	Conn, Header, Shrouded, 0.050" 10pos, Dual Row, Go	J02
02	LS23	Choke, SMT, Common Mode, 7000 ohm, 700mA	L01
02	RFC504	Resistor, SMT, 0.002 ohms, 1%, 5W	R22, R28
02	RFFS01	Resistor,SMT,MF,0.0ohms,Jumper ,0603	R32, R34, R36, R37
02	RFFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R09, R14
02	RFFS27	Resistor, SMT, MF, 121ohms, 1%, 1/10W, 0603	R04, R05, R06, R07
02	RFFS34	Resistor,SMT,MF,475ohms,1%, 1/10W,0603	R03, R10
02	RFFS38	Resistor,SMT,MF,1000ohms,1%, 1/10W,0603	R29, R30
02	RFFS40	Resistor,SMT,MF,1500ohms,1%, 1/10W,0603	R25, R26
02	RFFS42	Resistor,SMT,MF,2210ohms,1%, 1/10W,0603	R08, R16, R17, R19
02	RFFS43	Resistor, SMT, MF, 2740ohms, 1%, 1/10W, 0603	R11
02	RFFS46	Resistor, SMT, MF, 4750ohms, 1%, 1/10W, 0603	R13
02	RFFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R01, R02, R12, R20, R23, R24, R27
02	RFFS59	Resistor,SMT,MF,56.2Kohms,1%, 1/10W,0603	R15, R18
02	ULAS02	IC,SMT,Opamp,Quad,Rail-To-Rail ,SOIC-14	U05
02	UP156	IC, SMT, Linear Voltage Regula tor, 3.3V, SOT-223	U01
02	US49	IC, SMT, ADC, 12 bit, 8 Ch, 3.3V, I2C	U02
02	UT74	IC, Amplifier, Instrumentation	U04, U06
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
01	NAPI189	Analog Audio PWB Assy	A02

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02	CCFS54	Cap,SMT,Ceramic,1500pF,10%,50V ,X7R,0603	C058, C074, C117, C118
02	CCJ01	Cap,SMT,Ceramic,1000pF,10%, 50V,X7R,0402	C001, C005, C006, C022, C023, C028, C029, C045
02	CCJ02	Cap,SMT,Ceramic,0.01uF,10%, 50V,X7R,0402	C036, C044, C061
02	CCJ03	Cap,SMT,Ceramic,0.1uF,10%, 50V,X7R,0402	C003, C007, C008, C010, C015, C016, C017, C018, C019, C020, C026, C031, C032, C034, C038, C039,, C051, C053, C056, C062, C065, C067, C082, C083, C085, C087, C088, C091, C095, C098, C100,, C104, C108, C111, C113, C115, C121, C124, C127, C131
02	CCJ04	Cap,SMT,Ceramic,1uF,10%, 25V,X5R,0402	C004, C009, C012, C014, C021, C024, C025, C027, C037, C041, C046, C050, C055, C063, C068, C069,, C073, C078, C081, C086, C092, C094, C101, C102, C103, C107, C112, C116, C119, C120
02	CCJ05	Cap,SMT,Ceramic,10uF,10%, 25V,X5R,0805	C033, C040, C054, C059, C070, C071, C072, C079, C090, C132
02	CCJ07	Cap,SMT,Ceramic,100pF,1%, 50V,C0G,0402	C048, C049, C057, C080, C089, C110, C128
02	CCJ08	Cap,SMT,Ceramic,2.2uF,10%, 25V,X5R,0402	C011, C035, C043, C060, C097
02	CCJ10	Cap,SMT,Ceramic,18pF,1%, 50V,C0G,0402	C093, C105, C114, C125
02	CCJ13	Cap,SMT,Ceramic,3300pF,10%, 50V,X7R,0402	C077
02	CCJ19	Cap,SMT,Ceramic,470pF,1%, 50V,C0G,0402	C042, C076, C122
02	CCJ20	Cap,SMT,Ceramic,15pF,1%, 50V,C0G,0402	C099
02	CCJ26	Cap,SMT,Ceramic,220pF,1%,50V, COG/NPO,0402	C052, C109
02	CCJ28	Cap,SMT,Ceramic,39pF,1%,50V, NPO/COG,0402	C075, C123
02	H AJ66	Terminal, SMT, Test Point, PWB	TP01, TP14
02	JT204	Conn, BNC, Dual Stacked, Isolated	J01
02	JT61	Conn, BNC, Recept, 50ohm,Insul , Rt Angle	J02
02	JT87	Conn,3-pin,PWB Mount, Fem, XLR	J03, J04
02	JU85	Conn, Header, Shrouded, 0.050" 30pos, Dual Row, Go	J05
02	LA72	Bead, Ferrite, SMT, 120 Ohm at 100MHz, 1.3A, 0402	L02
02	LS56	Inductor, SMT, 3.3uH, 5.6A,RMS	L01, L03
02	QDDS02	Diode, SMT, Schottky, 40V, 1A, SMA	CR04
02	QDSS01	Diode, SMT, Schottky, 30V, 0.2A, SOD-323	CR03
02	QDZS11	Diode, SMT, Zener, 5.6V, 1.5W, SMA, 403D	CR01, CR02, CR05, CR06
02	RAD23	Resistor, SMT, MF, 681 Ohms, 1% 1/4W	R011, R052
02	RAF01	Resistor SMT MF 0.0 Ohm Jumper 0402	R034, R095, R099, R100, R123, R154
02	RAF18	Resistor SMT MF 22.1 Ohm 1% 1/16W 0402	R090, R103, R144, R145
02	RAF26	Resistor SMT MF 100 Ohm 1% 1/16W 0402	R003, R018, R037, R038, R048, R069, R082, R097, R113, R131, R153

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02	RAF38	Resistor SMT MF 1000 Ohm 1% 1/16W 0402	R007, R008, R009, R014, R015, R016, R031, R032, R044, R045, R046, R060, R061, R062, R109, R110,, R117, R125, R127, R128, R129, R136, R137, R149, R150
02	RAF50	Resistor SMT MF 10.0K Ohm 1% 1/16W 0402	R004, R005, R012, R019, R023, R025, R026, R027, R033, R035, R039, R041, R042, R050, R051, R053,, R056, R057, R058, R066, R070, R073, R074, R075, R080, R085, R086, R089, R093, R096, R098, R101,, R102, R104, R105, R106, R107, R108, R114, R119, R126, R134, R135, R146, R147, R148
02	RAF52	Resistor SMT MF 15.0K Ohm 1% 1/16W 0402	R021, R029, R079, R118
02	RAF56	Resistor SMT MF 33.2K Ohm 1% 1/16W 0402	R055
02	RAF57	Resistor SMT MF 39.2K Ohm 1% 1/16W 0402	R006, R013, R020, R043, R059, R072, R088, R111, R116, R141, R151
02	RAF59	Resistor SMT MF 56.2K Ohm 1% 1/16W 0402	R024, R028, R049, R054, R094
02	RAF63	Resistor SMT MF 121K Ohm 1% 1/16W 0402	R071
02	RAF66	Resistor SMT MF 221K Ohm 1% 1/16W 0402	R087, R120
02	RAF74	Resistor SMT MF 1.00M Ohm 1% 1/16W 0402	R001, R030
02	RAF87	Resistor SMT MF 3740 Ohm 1% 1/16W 0402	R010, R017, R047, R063
02	RAF93	Resistor SMT MF 7.15K Ohm 1% 1/16W 0402	R077, R083, R132, R139
02	RAF94	Resistor SMT MF 3.57K Ohm 1% 1/16W 0402	R078, R133
02	RAF95	Resistor SMT MF 4.12K Ohm 1% 1/16W 0402	R084, R091, R140, R142
02	RAF96	Resistor SMT MF 2.10K Ohm 1% 1/16W 0402	R092, R143
02	US12	IC, SMT, Rectifier, Bridge, 400V, 0.5A, SOIC-4	U02, U08, U21, U26
02	US58	IC, SMT, 24Bit Audio Codec, SPI, I2C, TSSOP28	U06
02	US59	IC, SMT, 10-Bit A/D Converter, 4Ch, 200KSPS, 10-VS	U03
02	US60	IC, SMT, ADC 16 Bit, 2Ch, 750KSPS, 16-WQFN	U17
02	UT170	IC, SMT, Adj. DC to DC Inverting Reg, 2.4A, 16-LFC	U20
02	UT171	IC, SMT, Op AMP, Dual, Low Noise, Bipol Supply, 8-	U01, U04, U09, U13, U15, U18, U19, U23
02	UT172	IC, SMT, Precision Diff Amp, 8-MSOP	U05, U10, U16, U25
02	UT178	IC, SMT, Rail to Rail Dual Op-amp, Wide BW, SOIC8	U14, U24
02	UX66	IC,SMT,Linear Regulator,150mA Adj.,MSOP-8	U07, U11, U12
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U22
01	NAPI193	Front Panel User Interface Pwb Assy	A05
02	CCFS04	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	C02, C03
02	CCFS07	Cap,SMT,Ceramic,0.1uF,10%,50V,X7R,0805	C04
02	CCJ18	Cap,SMT,Ceramic,22uF,20%, 25V,X5R,0805	C06
02	CT112	Cap, SMT, Elect, Alum Polymer, 100uF, +/- 20%, 25V	C05

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02	JA140	Conn, USB, Vertical Mount, Type A, PWB	J04
02	JQ55	Conn, Header, Ribbon Cbl, 20 Pin	J03
02	JQ97	Conn, Header, SATA, Vert, PWB	J01
02	JU96	Conn, Header, Shrouded, 0.050" 20pos, Dual Row, Go	J02
02	LS18	Inductor,SMT,2.2uH,600ma,1210	L01
02	QM77	Diode, LED, RED, Rectangular, TH, 5mm x 2mm	DS1
02	QN53	Transistor,SMT,MOSFET,N-Channe l,60V,115mA,SOT-23	Q01, Q02, Q03, Q04, Q05
02	RFFS18	Resistor, SMT, MF, 22.1ohms, 1%, 1/10W, 0603	R20, R21
02	RFFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R12, R16
02	RFFS28	Resistor, SMT, MF, 150ohms, 1%, 1/10W, 0603	R03, R05, R06, R14, R18
02	RFFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R02, R04, R07, R08, R09, R10, R11, R13, R15, R17, R19, R22, R23
02	SD94	Switch, Push-Button, Green/Red, MOM, SPST-NO, PWB	S01, S02
02	SD95	Switch, Push-Button, Tactile, SPST-NO, PWB	S03
02	UC107	Rotary Encoder, 20PPR, Quadrature, w / MOM Push Bu	U01
01	NAPP15	Directional Coupler Bottom PWB Assy	A11
02	JT188	Conn, Jack, MCX, 50Ohm, Gold, Vert, SMT	J01, J02, J03
02	RT73	Resistor, Termination, 50 Ohm, +/- 5%, 60W, Tuned	R01
01	PU03A	PWB DETAIL, 2-WAY COMBINER, RF-35TC-0600- C1/C1,2L	A13
01	RT69	Res, (BeO), 50 ohms, 5%, 250W, Flng Mt w/stress re	A13R1, A13R2
01	RX49	Thermistor,-30/105°C,10Kohms@ 25°C,Neg,Bvalue 3435	RT01, RT02
01	UA295	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 10 con	W01
01	UA296	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 16 con	W02
01	UA297	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W03
01	UA298	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 20 con	W04
01	UA300	Cable Assembly, Flat IDC, 0.050" Tiger Eye, 10 con	W05
01	UA301	Cable Assembly, Flat IDC, 0.100" pitch, 20 cond, 2	W06
01	UA307	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W07, W08, W09
01	UA309	Cable, Coax, SRC 316, MCX(M) RA to BNC(F) Bulkhead	W10
01	UA310	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 12.0	W11
01	UA311	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) RA, 16.0	W12

StockCode: NARF80
Description: Final Assy, VX1.5/2,

Page 9 of 9

<u>Component Lvl.</u>	<u>StockCode</u>	<u>Description</u>	<u>Reference Designation</u>
01	UA313	Cable, Coax, SRC 316, MCX(M) RA to MCX(M) Straight	W13, W14
01	UA316	Cable, SATA, 0.5m, Straight F to Straight F, Shiel	W15
01	UA318	Cable Assembly, Flat IDC, 0.050" Tiger Eye,30 cond	W16
01	UG130	Power Supply, LED, 12V@150W, 90-305Vac, PFC, IP67	U02
01	UG136	Power Supply, 23-65Vdc, 3500W/1500W, 90-265Vac, Co	U03
01	UR119	Display, TFT LCD, 320x240 Graphic, 3.5", Color, SP	U01
01	ZAP68	Fan, 80mm, 12Vdc, PWM Ctrl, Tach, w/Conn+HS Tube+M	B01, B02

SECTION 3.3: READING ELECTRICAL SCHEMATICS

This section contains electrical schematics and logic diagrams for the transmitter. Block diagrams, simplified electrical schematics, and logic diagrams may be included. Refer to [Table 3.3.1 on page 3.3.5](#) for an itemized listing.

Component Values

Unless otherwise specified on the logic or schematic diagram, the following defaults apply:

-  5 Capacitor values are shown in microfarads (uF) (e.g. 5 uF)
-  10 Resistor values are shown in ohms (e.g. 10 ohms; K = 1,000 and M = 1,000,000)
Resistor power ratings are not shown when less than 0.5 W
-  Unidentified diodes are part number BAS21HT1 (Nautel Part # QDRS01)
-  24V Unidentified transient suppressors are part number 0603E SDA-TR1 (Nautel Part # QR70)

Graphic and Logic Symbols

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

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

Reference Designations

Referenced designations were assigned in accordance with American Society of Mechanical Engineers ASME Y14.44-2008 - Reference Designations for Electrical and Electronic Parts and Equipment.

Each electrical symbol is identified with its basic reference designation. To obtain the full reference designation for a specific part, prefix this basic identifier with the reference designation assigned to all higher assemblies. For example, the complete designation for a resistor (R1) on a printed wiring board (A1), that is part of a larger board (A2), would be A2A1R1.

Unique Symbols

Nautel uses unique symbols on electrical schematics to describe logic (two-state) signals. These signals differ from single-state signals or analog signals that may have multiple values.

Type of Inputs and Outputs

On electrical schematics, names used to describe logic (two-state) input and output signals are prefixed with a # symbol.

Logic Level Convention

The # prefix identifies an input or output signal that has two distinct states: high and low.

The suffix on an input or output signal name identifies the active (true) state of the signal. The high suffix (+) indicates the more positive of the two levels used to represent the logic states. The low suffix (-) indicates the less positive of the two levels.

Two types of logic, positive and negative, may be represented on a particular schematic. In positive logic, high represents the active (true) state, and low represents the inactive (false) state. In negative logic, low represents the active (true) state, and high represents the inactive (false) state.

Identifying Schematic Diagrams

Each electrical schematic in this section is identified by a number that is both the figure number and the page number. The numbers are assigned sequentially and are prefixed by the letters SD. The electrical schematics and logic diagrams included in this section are listed in [Table 3.3.1 on page 3.3.5](#).

Structure of Schematics

The electrical schematics are structured in a hierarchical format that is based on function and signal flow. Wherever practical, the signal flow is from left to right. Normally, inputs originate on the left-hand side and outputs extend to the right-hand side. Exceptions are shown by an arrow indicating the direction of signal flow.

NOTE: The physical location of a part or assembly was not necessarily a factor during creation of the schematic. The full reference designation assigned to a part or assembly, in conjunction with the family tree (see [Section 3.2, “Parts Information” on page 3.2.1](#)) and the assembly detail drawings (see [Section 3.4, “Mechanical Drawings” on page 3.4.1](#)), will identify its location.

Figures SD-1 through SD-4 identify each major stage and its detailed interconnection. Each stage contains cross-references that identify which blocks are the signal sources for inputs, or the destinations for outputs.

When a sub-function is treated as a block in figures SD-1 through SD-4, its detailed circuit information is included in its own schematic drawing(s), which is also included in this section.

Locating Schematic Diagram(s) for a Functional Block

The text inside a functional block provides the key to locating its schematic diagram(s).

1. When a functional block is assigned a reference designation (e.g., A2), refer to the family trees in [Section 3.2, “Parts Information” on page 3.2.1](#). Follow the family tree branches to the block that contains the desired reference designation, and associated Nautel nomenclature (e.g., NAPI187 System Interface PWB).
2. Refer to [Table 3.3.1 on page 3.3.5](#) and use the reference designation and Nautel nomenclature to identify the appropriate schematic diagram(s).
Example: NAPI187 System Interface PWB is shown on schematics SD-7 and SD-8.
3. If necessary, refer to the referenced figure in the schematics at the end of this section and locate the next, lower-level assembly. Then, repeat this procedure until the desired schematic diagram is found.

Locating a Part or Assembly on a Schematic

The full reference designation assigned to a part or assembly is the key to physically locating that part or assembly.

NOTE: Full reference designations contain the assembly hierarchical coding. When the end item is divided into units (cabinets), the first coding is a unit number (1, 2, 3, etc.). When the end item is divided into assemblies, the first coding is an assembly number (A1, A2, A3, etc.). If a unit or an assembly is divided into sub-assemblies, assembly coding that identifies assembly relationship (1A1, A2A1, A2A1A1, etc.) is added.

1. Refer to the family trees in [Section 3.2, "Parts Information" on page 3.2.1](#).
2. Follow the family tree branches to the block that contains the desired reference designation, while noting the Nautel nomenclatures and names of all higher assemblies in the path. Example: A2 NAPI187 System Interface PWB.

NOTE: The drawings in the Mechanical Drawings section depict the assembly detail of the transmitter and its modules and assemblies

3. Refer to [Table 3.4.1 in Section 3.4, "Mechanical Drawings" on page 3.4.1](#). Use the Nautel nomenclature and name of each family tree block in the path, starting at the highest assembly – this is normally Figure MD-1 – to determine the figure number(s) for that assembly. Example: NAPI187 System Interface PWB is shown on MD-4.
4. Refer to the referenced figure (e.g., MD-4) in [Section 3.4, "Mechanical Drawings" on page 3.4.1](#) to locate the desired part or assembly.

Table 3.3.1: List of Electrical Schematics

Figure #	Title
SD-1	VX150/VX300/VX600 and VX1 Transmitter - Control/Monitor Stage
SD-2	VX150/VX300/VX600 and VX1 Transmitter - Ac and RF Power Stages
SD-3	VX1.5/VX2 Transmitter - Control/Monitor Stage
SD-4	VX1.5/VX2 Transmitter - Ac and RF Power Stages
SD-5	NAPI189 Analog Audio PWB (Sheet 1 of 2)
SD-6	NAPI189 Analog Audio PWB (Sheet 2 of 2)
SD-7	NAPI187 System Interface PWB (Sheet 1 of 2)
SD-8	NAPI187 System Interface PWB (Sheet 2 of 2)
SD-9	NAPI188/01 Power Supply Interface PWB, 2 kW (VX150/VX300/VX600)
SD-10	NAPI188 Power Supply Interface PWB, 3.5 kW (VX1/VX1.5/VX2)
SD-11	NAPI193 Front Panel User Interface PWB
SD-12	NAPA41 Pre-Amp/IPA PWB
SD-13	NAPA40 Power Amplifier PWB
SD-14	NAPF16 Low Pass Filter PWB
SD-15	NAPP15 Directional Coupler Bottom PWB
SD-16	NAPH15 2-Way Splitter PWB (VX1.5/VX2)

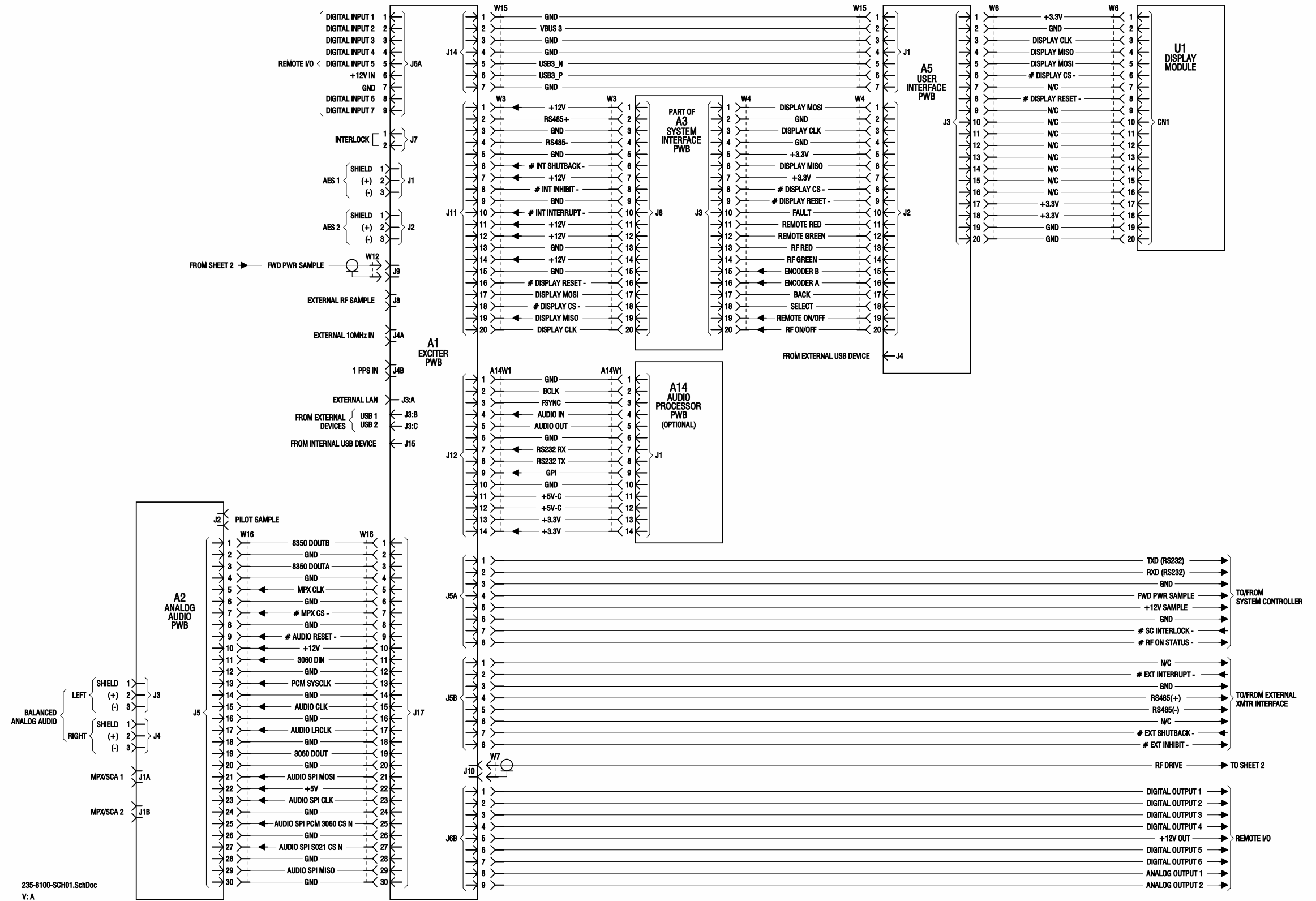
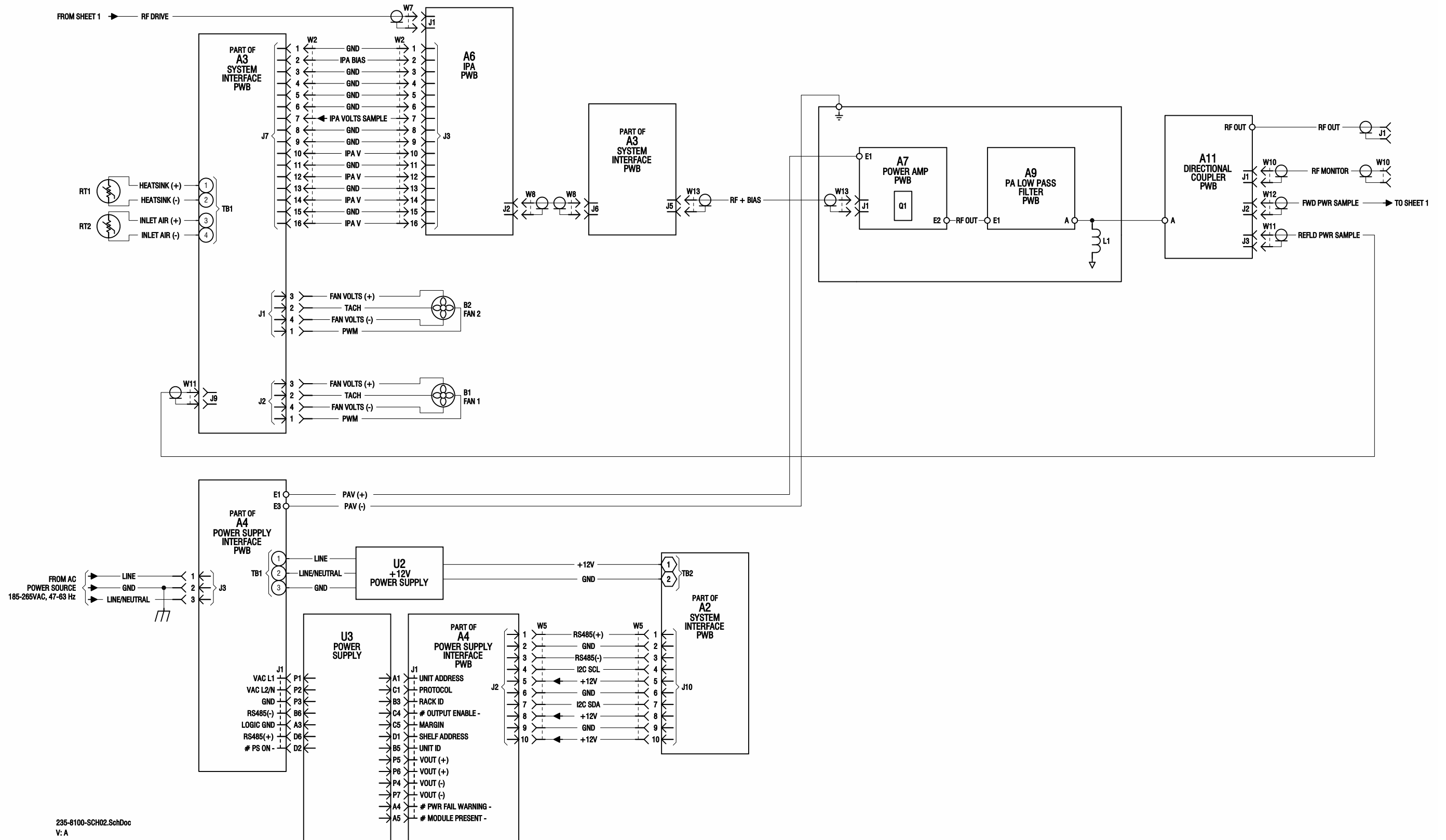


Figure SD-1: VX150/VX300/VX600 and VX1 Transmitter - Control/Monitor Stage



235-8100-SCH02.SchDoc
V: A

Figure SD-2: VX150/VX300/VX600 and VX1 Transmitter - Ac and RF Power Stages

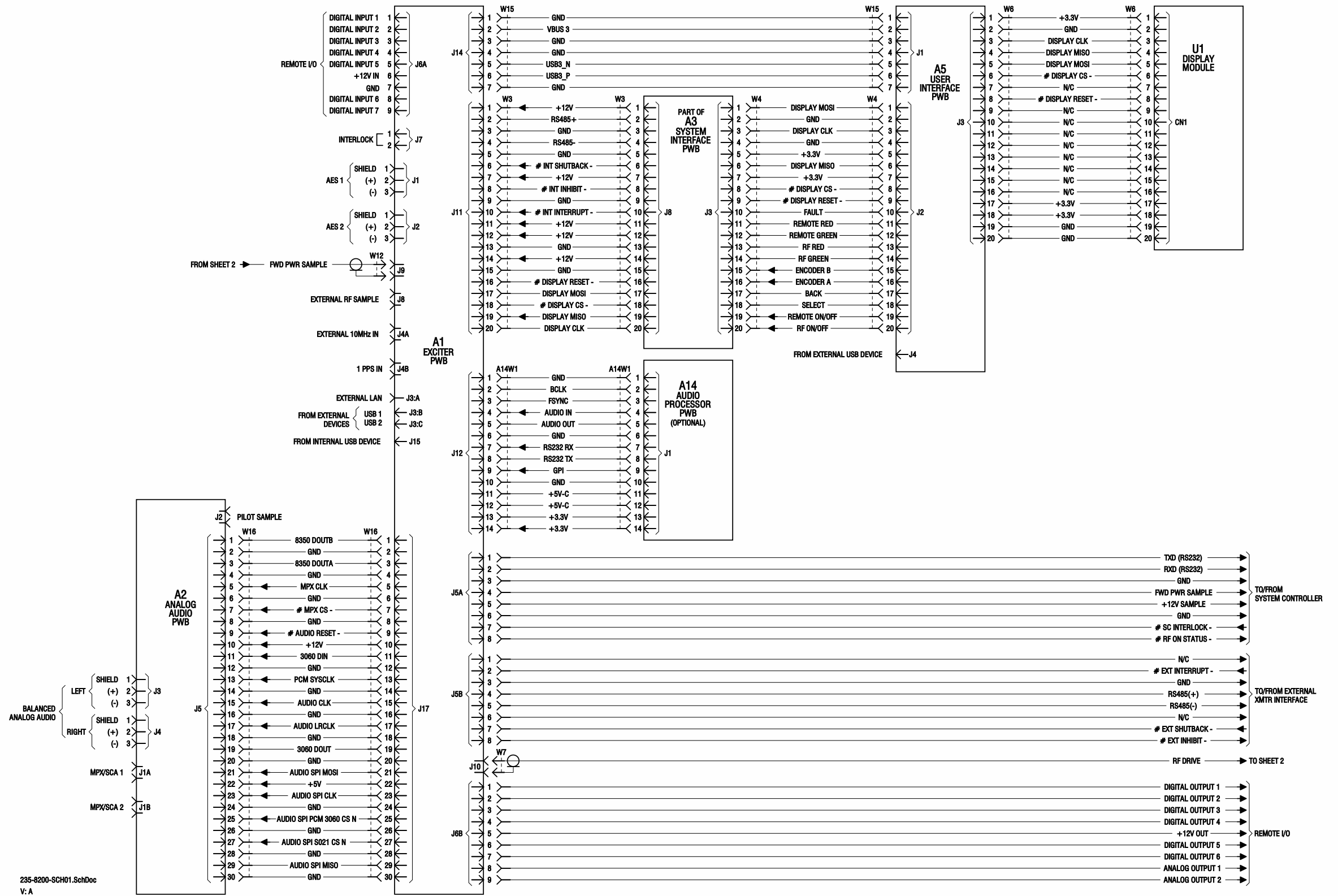


Figure SD-3: VX1.5/VX2 Transmitter - Control/Monitor Stage

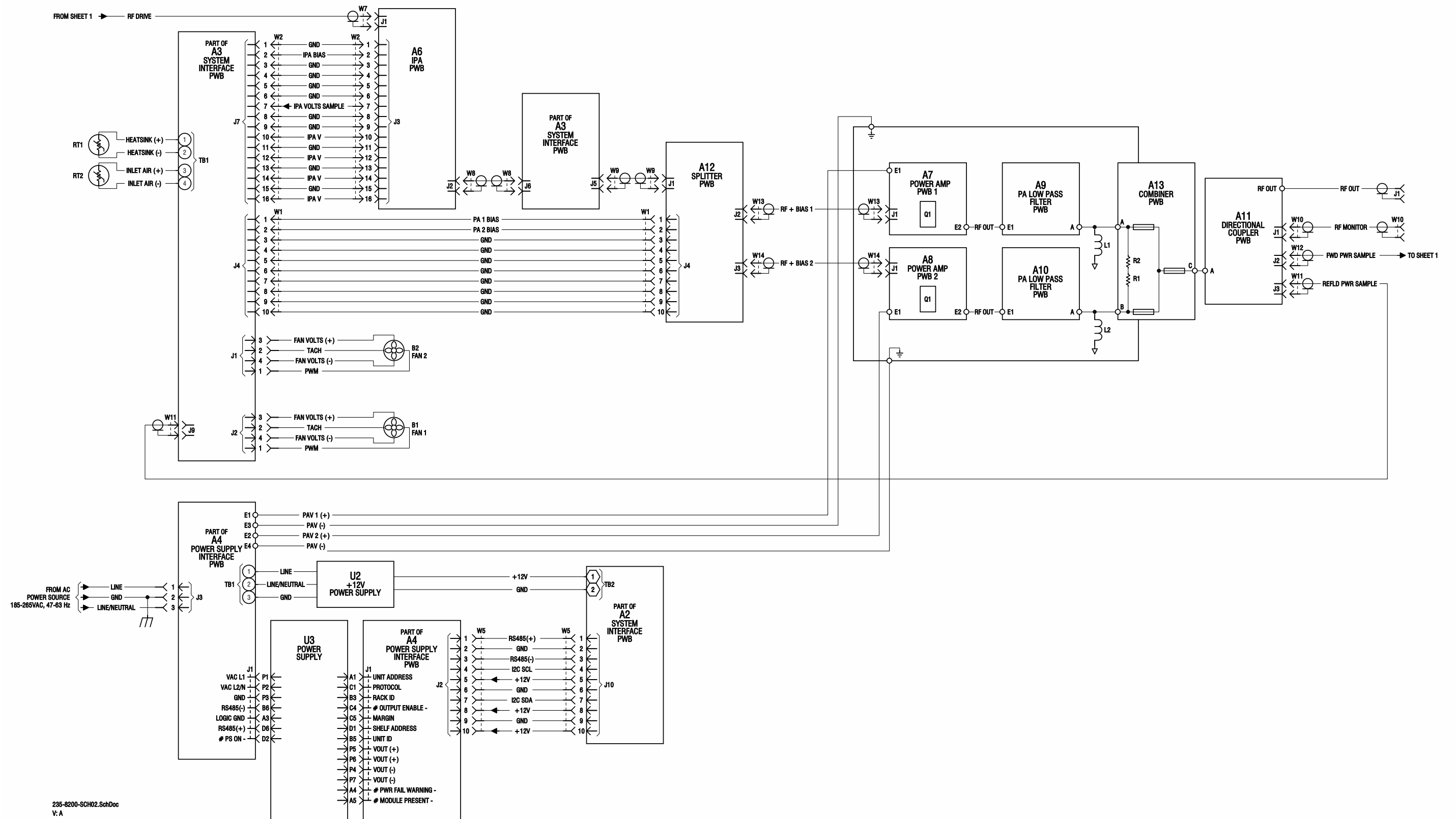


Figure SD-4: VX1.5 Transmitter - Ac and RF Power Stages

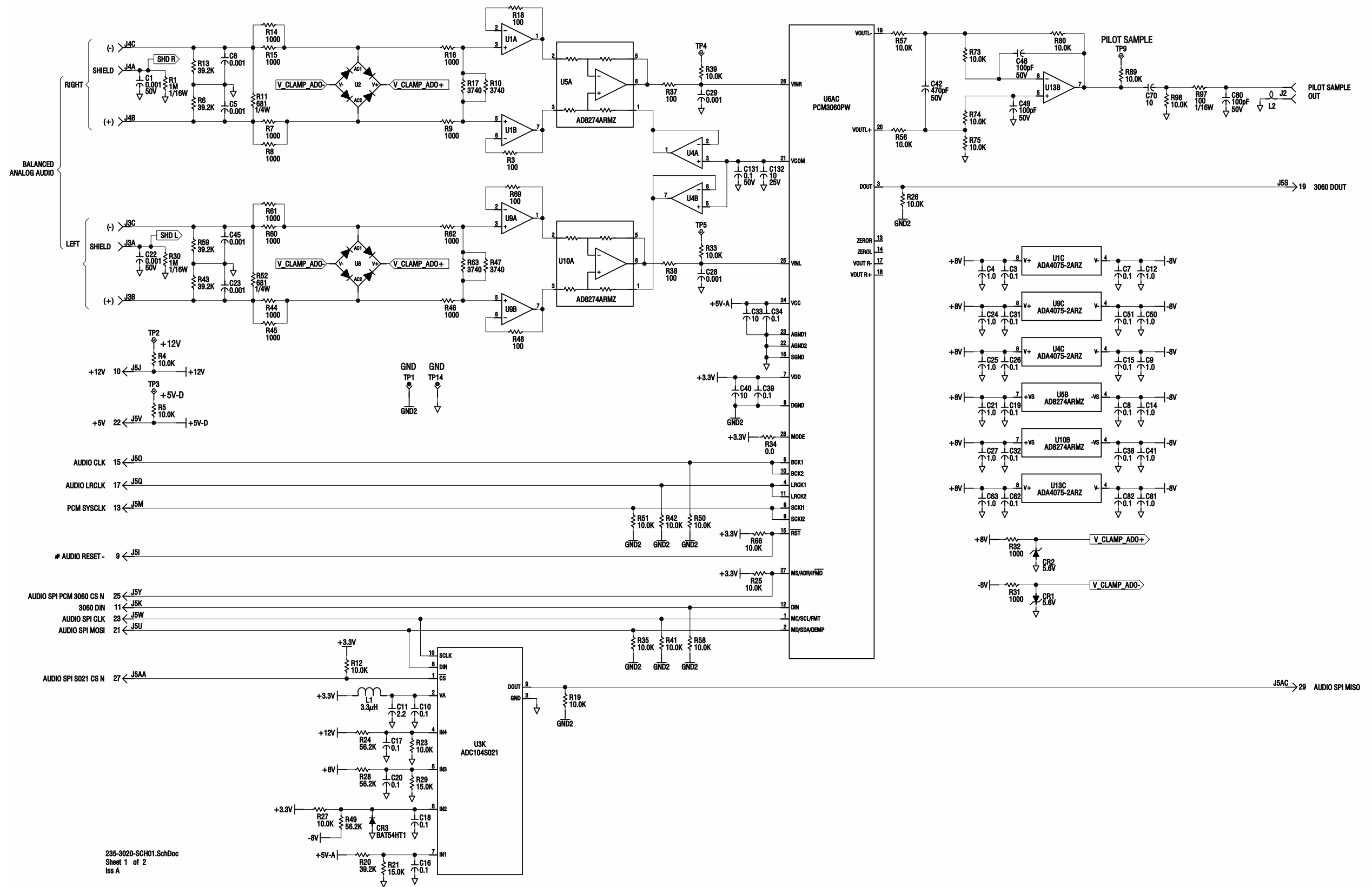
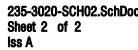


Figure SD-5: NAPI189 Analog Audio PWB (Sheet 1 of 2)



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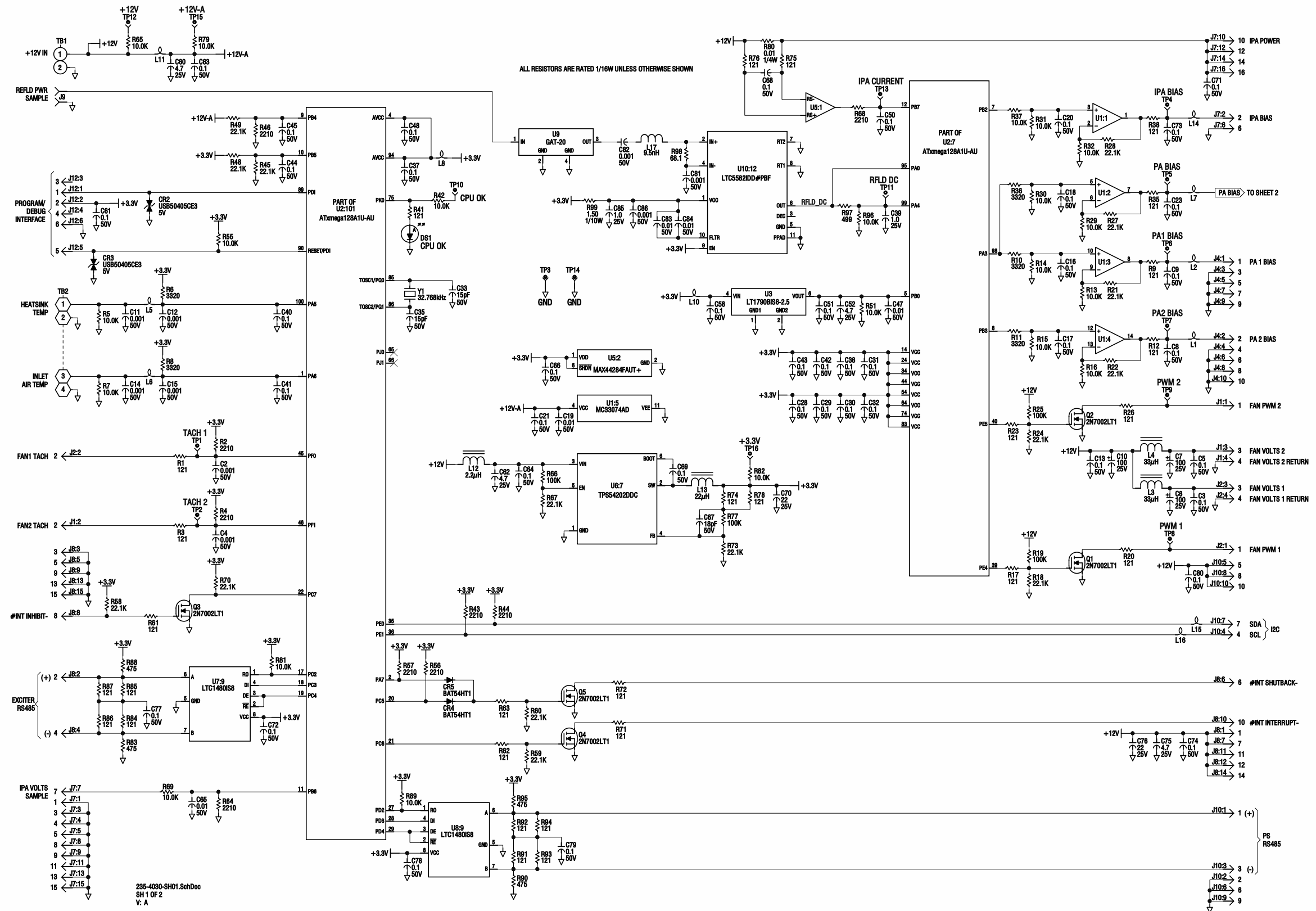


Figure SD-7: NAPI187 System Interface PWB (Sheet 1 of 2)

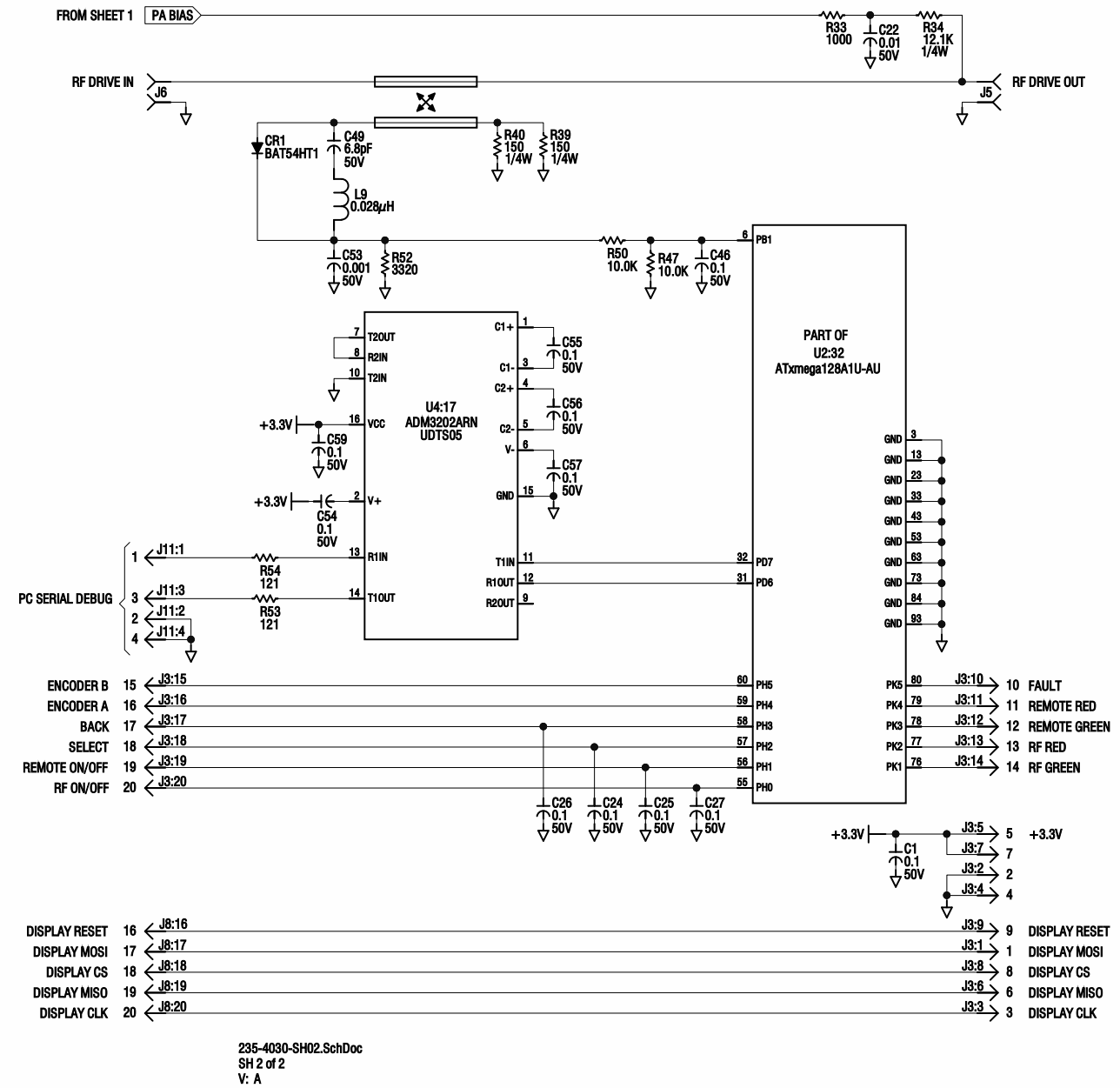
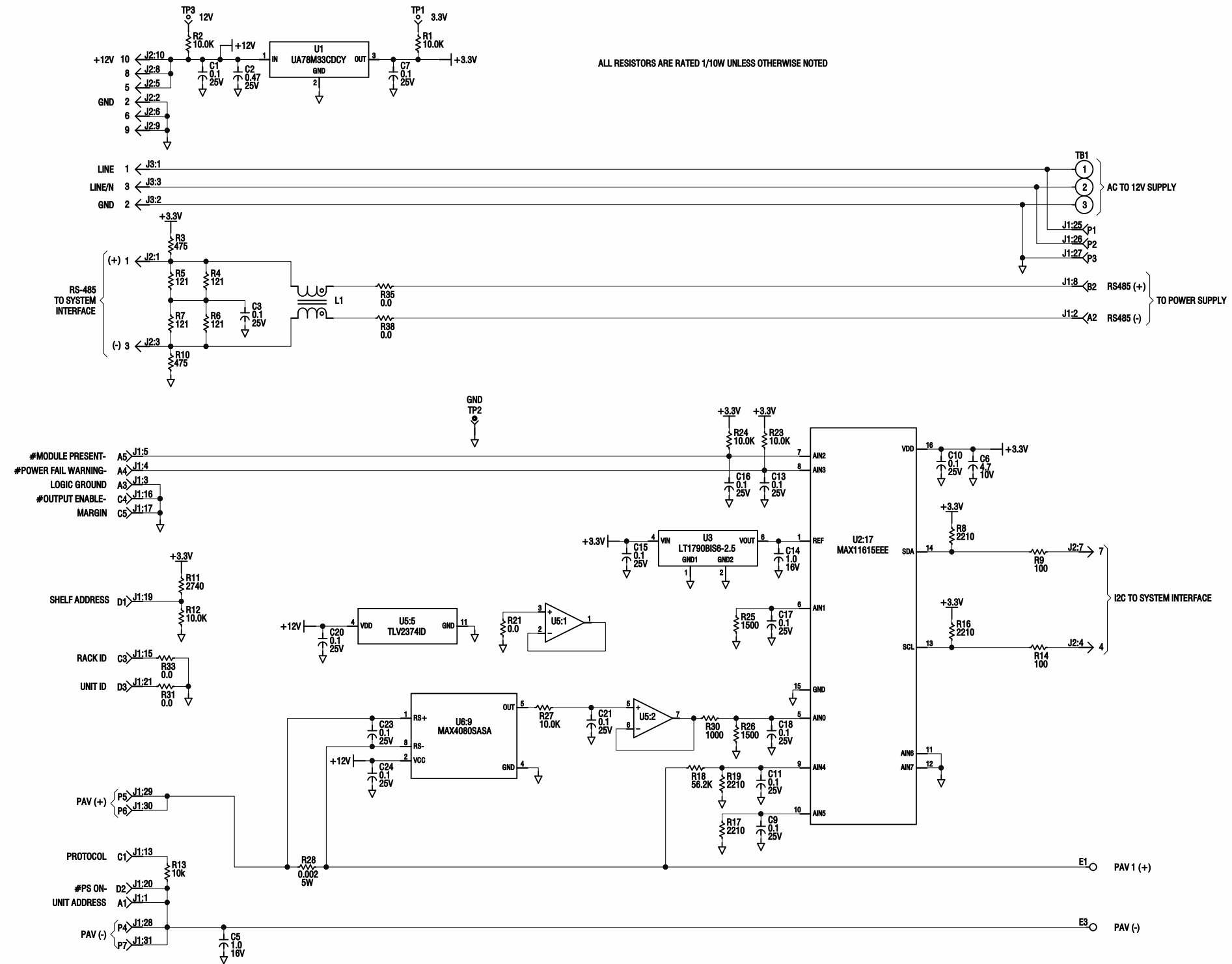
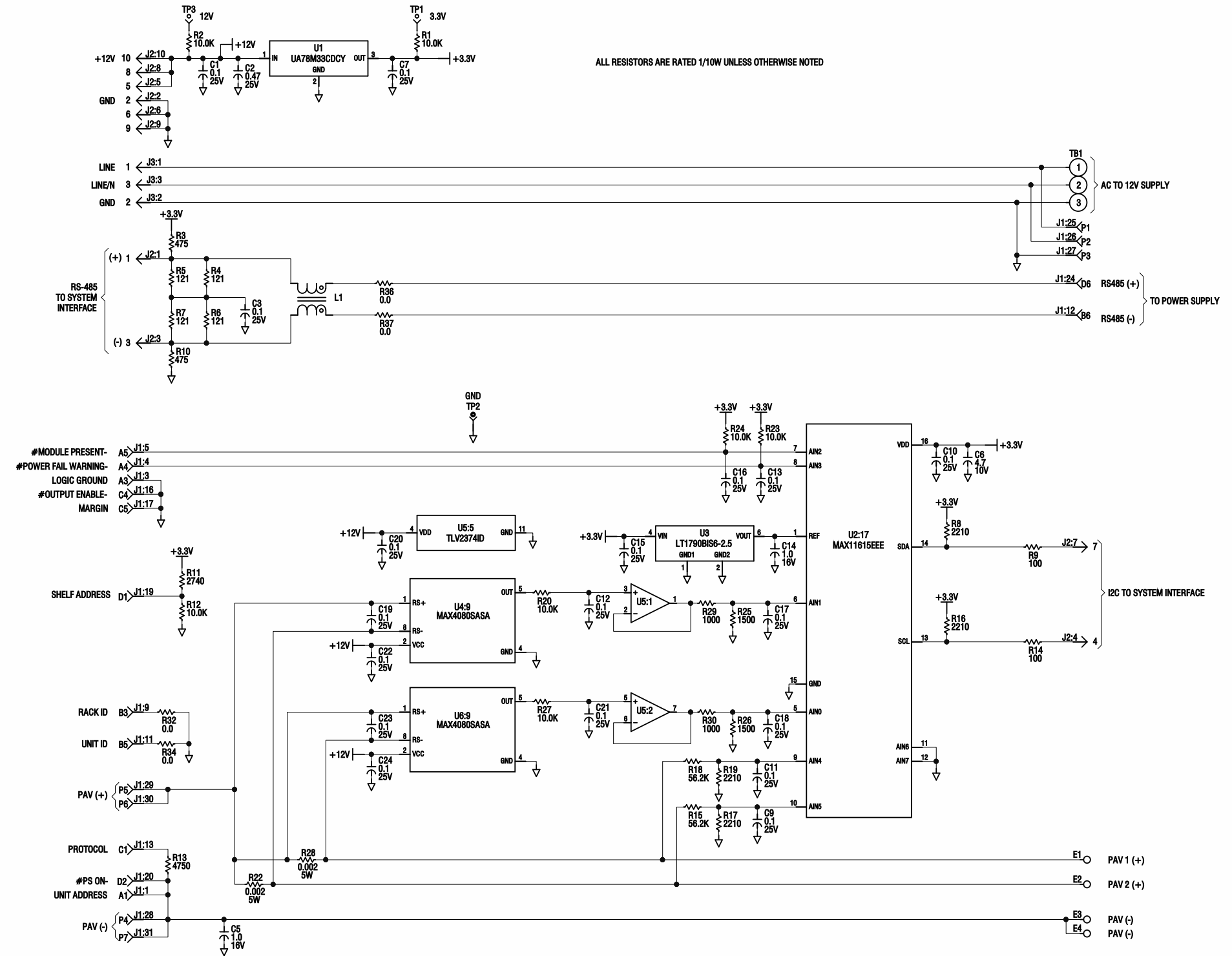


Figure SD-8: NAPI187 System Interface PWB (Sheet 2 of 2)



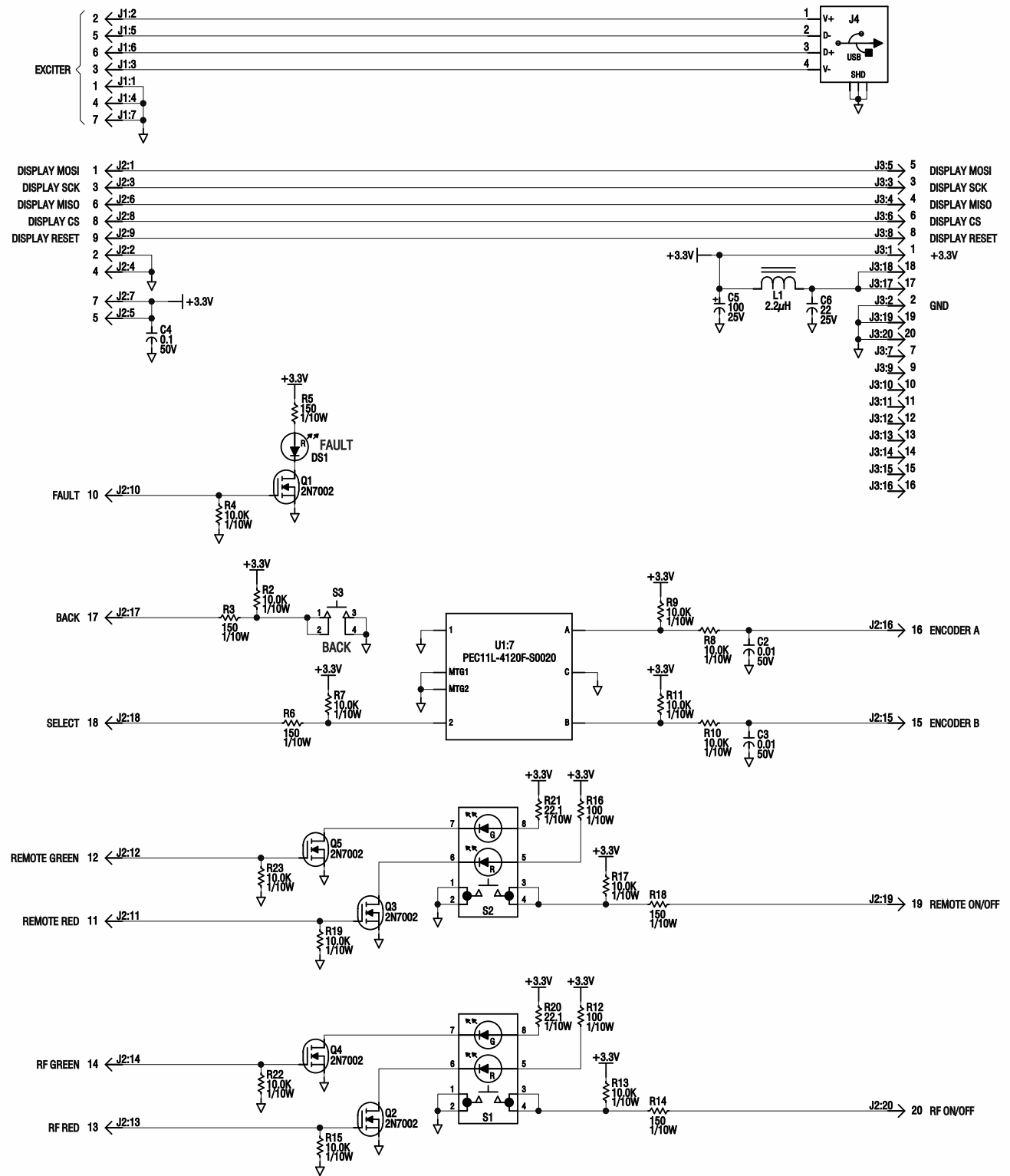
235-4050-01-SCH01.SchDoc
V: B

Figure SD-9: NAPI188/01 Power Supply Interface PWB, 2 kW (VX150/VX300/VX600)



235-4050-SCH01.SchDoc
V: B

Figure SD-10: NAPI188 Power Supply Interface PWB, 3.5 kW (VX1/VX1.5/VX2)



235-4032-SCH01.schdoc
V: A

Figure SD-11: NAPI193 Front Panel User Interface PWB

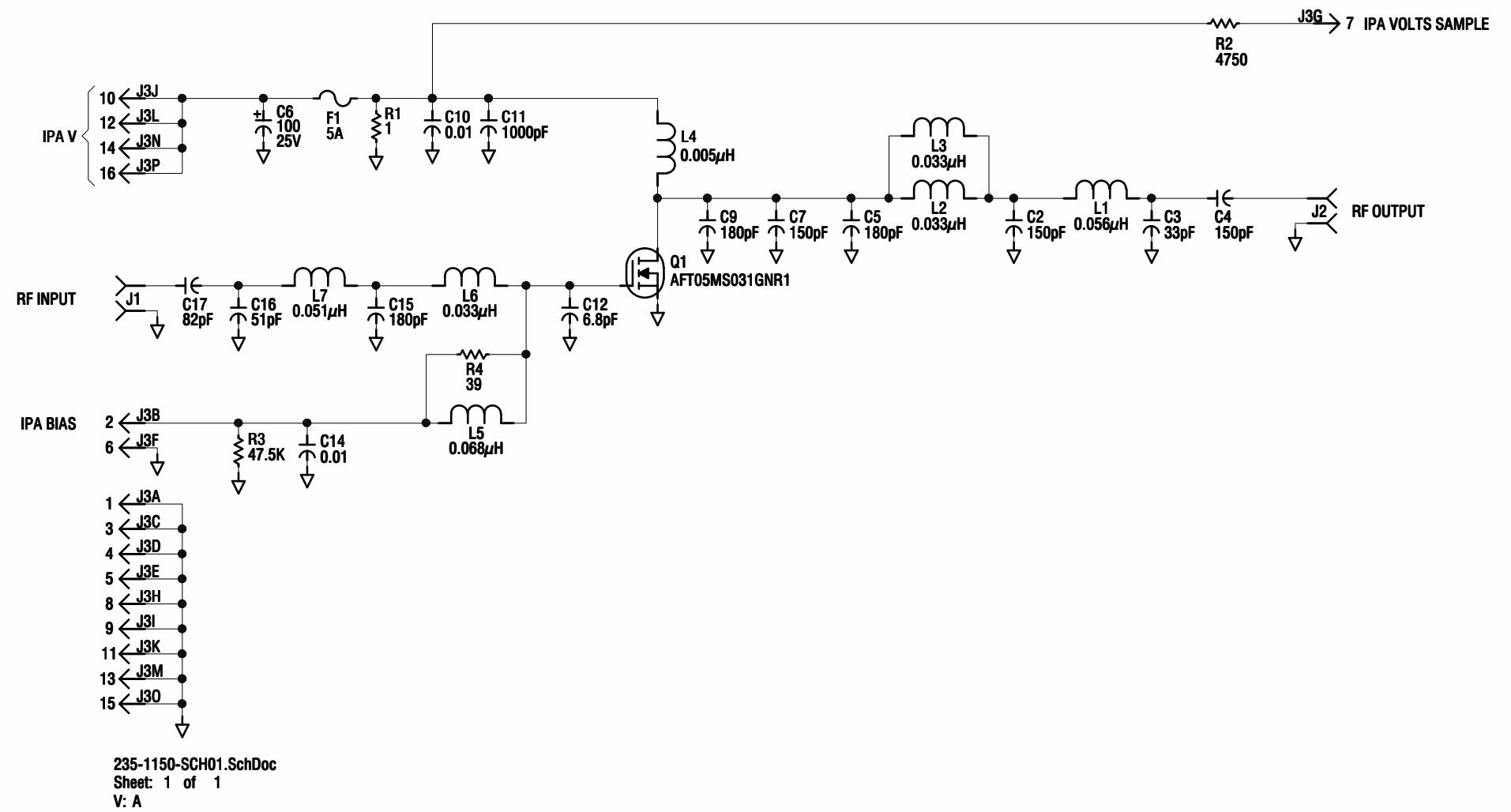


Figure SD-12: NAPA41 Pre-Amp/IPA PWB

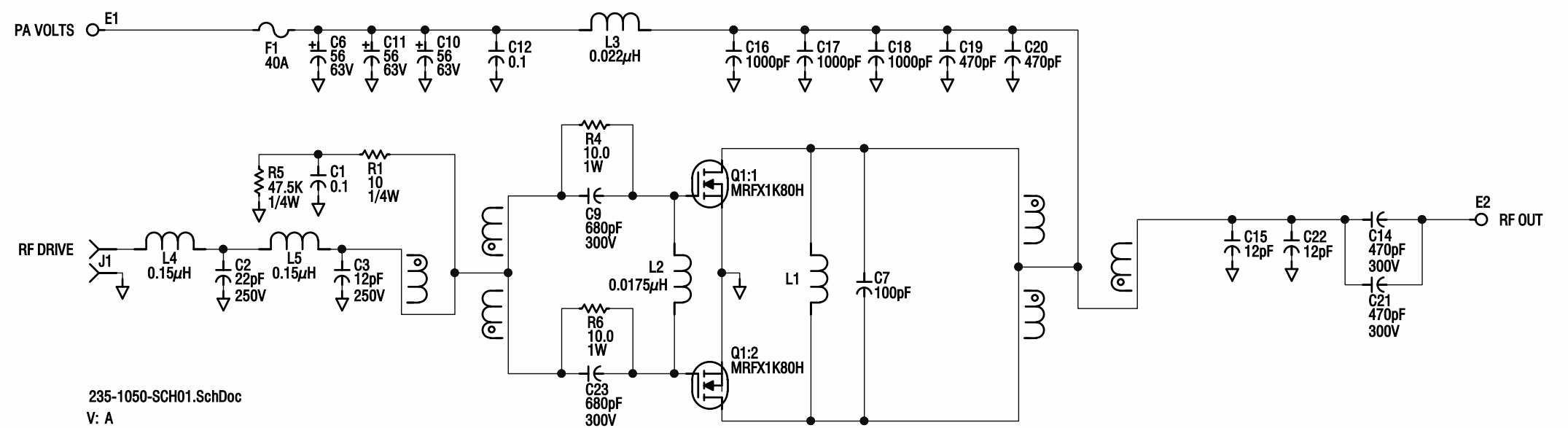


Figure SD-13: NAPA40 Power Amplifier PWB

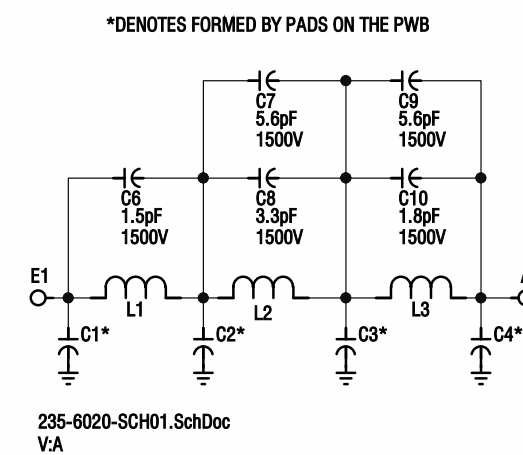


Figure SD-14: NAPF16 Low Pass Filter PWB

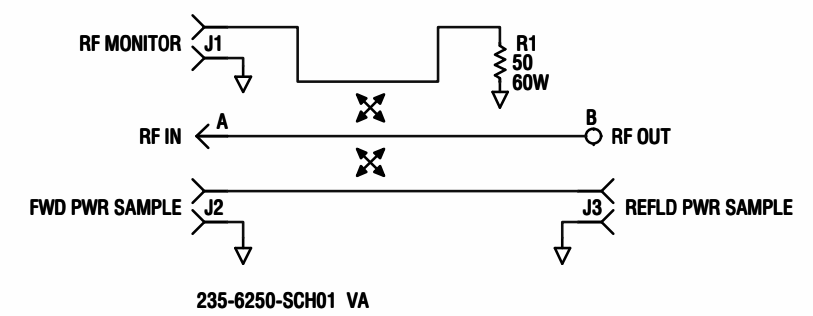


Figure SD-15: NAPP15 Directional Coupler Bottom PWB

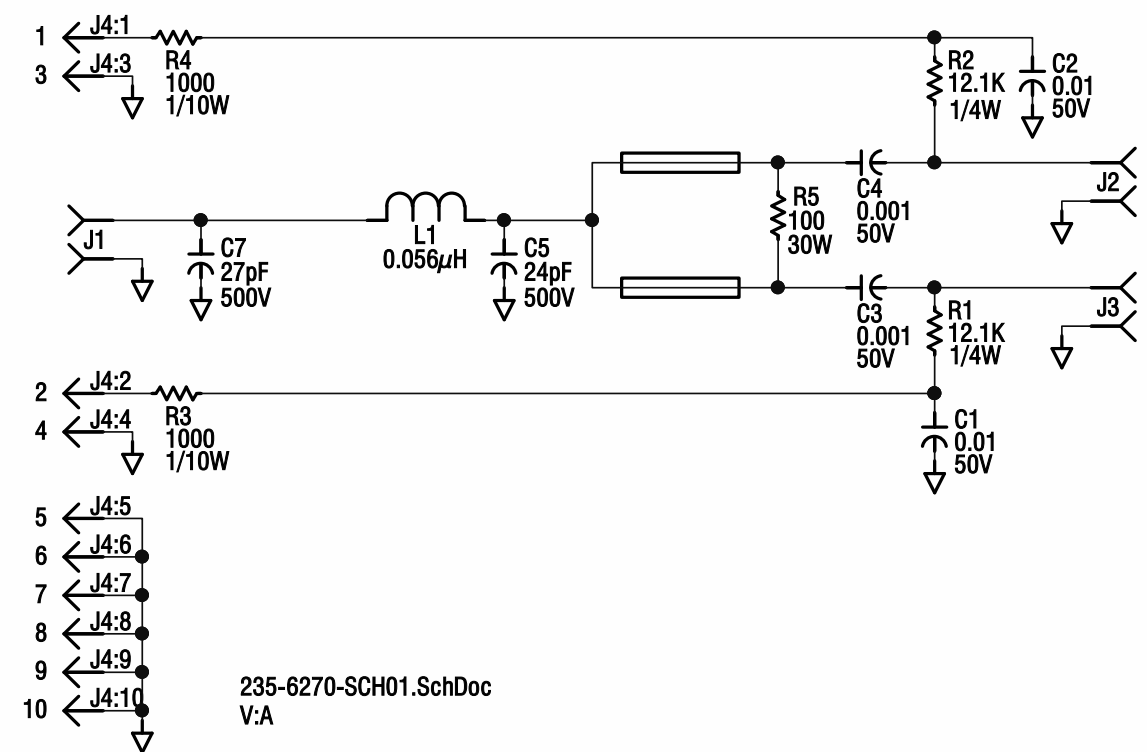


Figure SD-16: NAPH15 2-Way Splitter PWB (VX1.5/VX2)

SECTION 3.4: MECHANICAL DRAWINGS

This section contains mechanical drawings for assemblies of the transmitter. Dimensional drawings may be included. Refer to [Table 3.4.1 on page 3.4.2](#) for an itemized list.

Assembly detail drawings for assemblies and modules that have separate manuals are not included. Refer to the appropriate maintenance manual for the assembly detail of these assemblies.

Identifying Mechanical Drawings

Each mechanical drawing in this section is identified by a number that is both the figure number and the page number. The numbers are assigned sequentially and are prefixed by the letters MD. Drawings in this section are listed in [Table 3.4.1 on page 3.4.2](#).

Content of Mechanical Drawings

Mechanical drawings are illustrations that depict the location of electrical components and show assembly outline detail. Dimensional information is included, where appropriate.

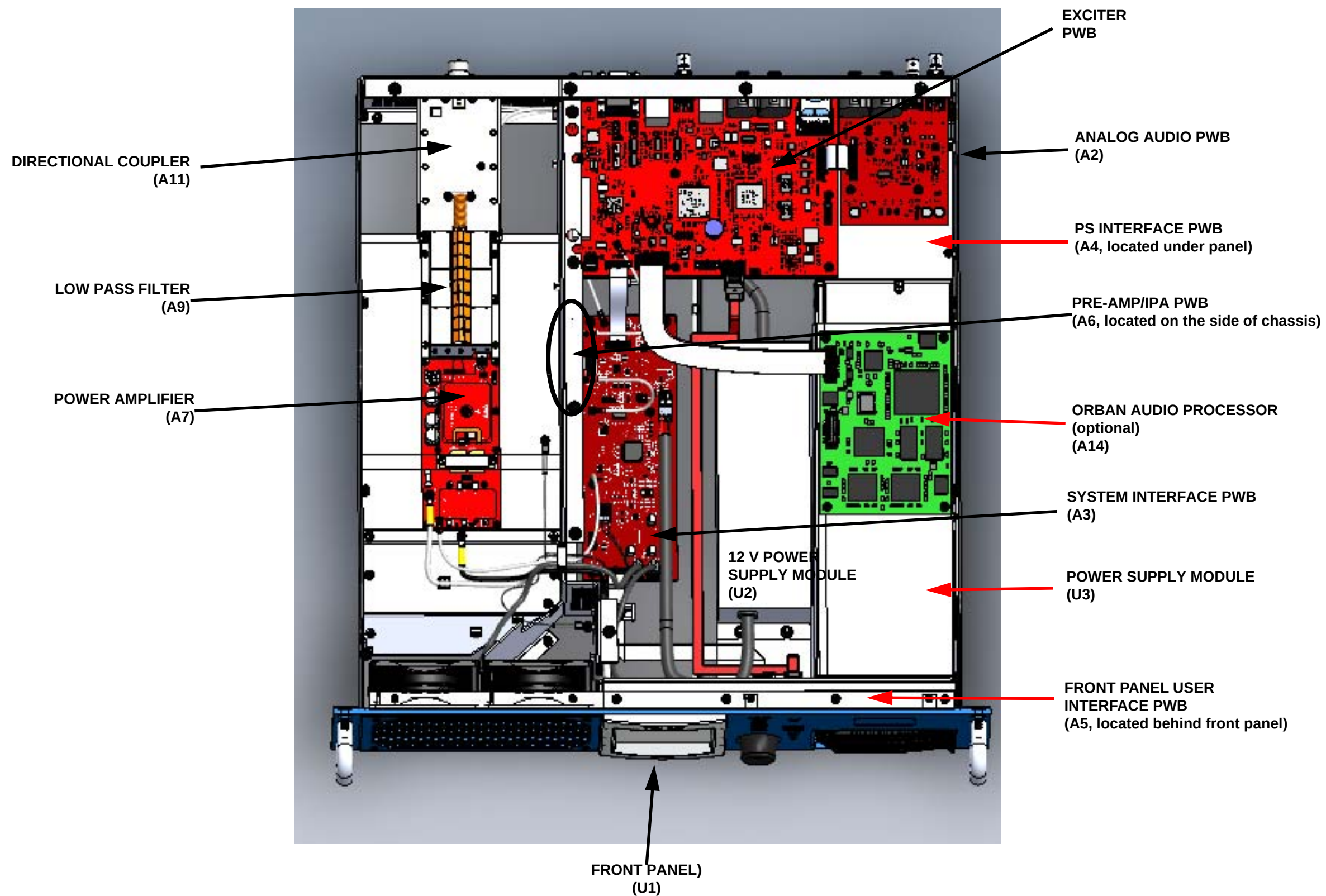
When a module or assembly is the subject of its own assembly detail drawing, and it is also shown in a higher level assembly, the detail depicted in the higher level assembly may have minor differences from the module or assembly actually installed. In this case, always refer to the assembly detail drawing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

Locating a Part or Assembly on a Mechanical Drawing

1. When a part or assembly is assigned a reference designation (e.g., A1 or A1R1), refer to the family trees in [Section 3.2, "Parts Information" on page 3.2.1](#). Follow the family tree branches to the block that contains the desired reference designation and Nautel nomenclature (e.g., NAPA4o Power Amplifier PWB). Note the reference designations and Nautel nomenclatures of all higher assemblies in the path.
Example: A7 NAPA4o Power Amplifier PWB.
2. Refer to [Table 3.4.1 on page 3.4.2](#). Use the reference designation and Nautel nomenclature to identify the appropriate mechanical drawing.
Example: NAPA4o Power Amplifier PWB is shown on schematics MD-9.
3. If necessary, refer to the referenced figure (e.g., MD-9) in the mechanical drawings at the end of this section and locate the next, lower-level assembly. Then, repeat this procedure until the desired part or assembly is found.

Table 3.4.1: List of Mechanical Drawings

Figure #	Title
MD-1	VX150/VX300/VX600/VX1 Transmitter
MD-2	VX1.5/VX2 Transmitter
MD-3	NAPI189 Analog Audio PWB
MD-4	NAPI187 System Interface PWB
MD-5	NAPI188/01 Power Supply Interface PWB (VX150/VX300/VX600)
MD-6	NAPI188 Power Supply Interface PWB (VX1/VX1.5/VX2)
MD-7	NAPI193 Front Panel User Interface PWB
MD-8	NAPA41 Pre-Amp/IPA PWB
MD-9	NAPA40 Power Amplifier PWB
MD-10	NAPF16 Low Pass Filter PWB
MD-11	NAPP15 Directional Coupler PWB
MD-12	NAPH15 2-Way Splitter PWB (VX1.5/VX2)
MD-13	2-Way Combiner PWB (Nautel Part # PU03A) (VX1.5/VX2)

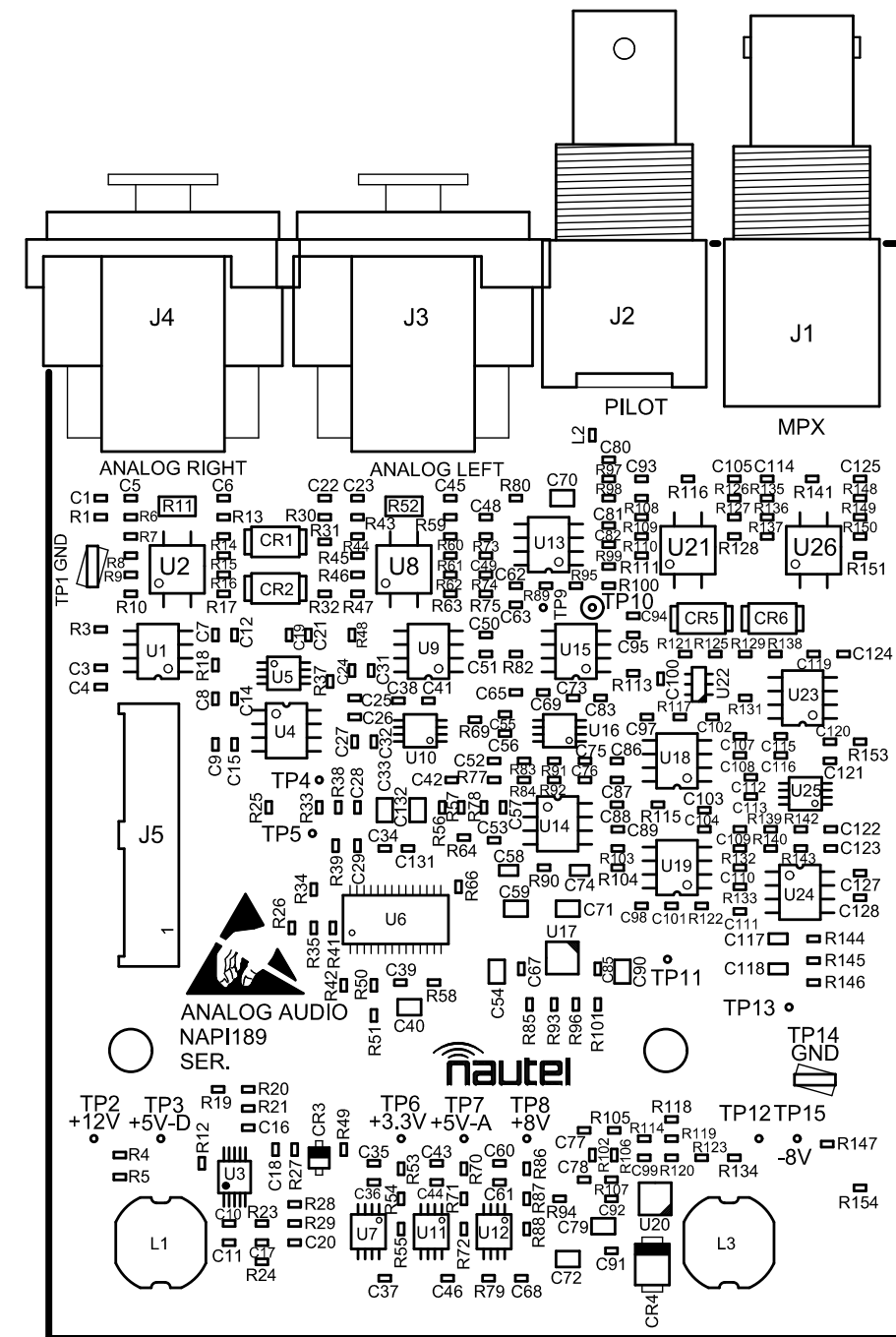


TOP COVER REMOVED FOR CLARITY

Figure MD-1: VX150/VX300/VX600/VX1 Transmitters

NOT AVAILABLE AT TIME OF PRINT

Figure MD-2: VX1.5/VX2 Transmitter



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Figure MD-3: NAPI189 Analog Audio PWB

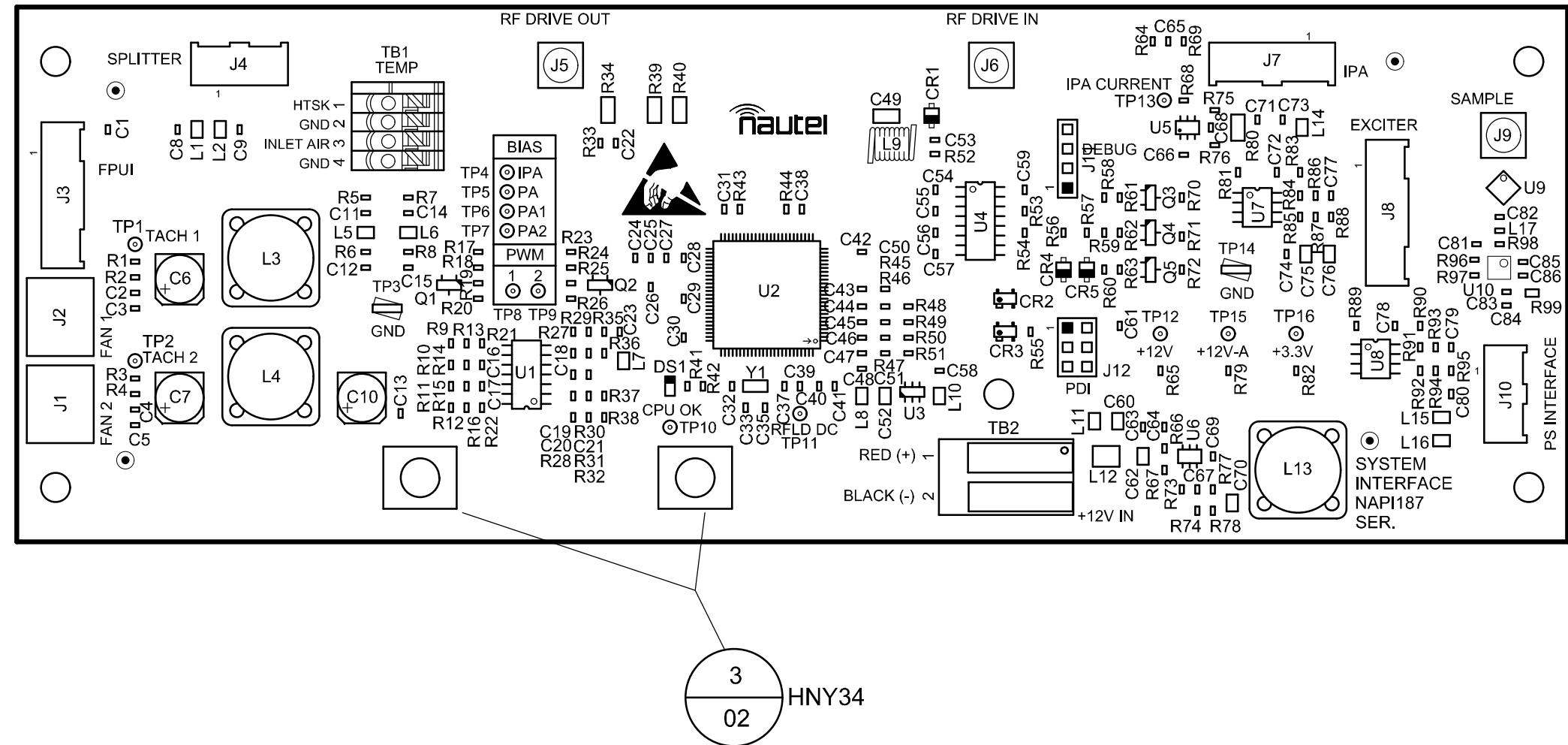


Figure MD-4: NAPI187 System Interface PWB

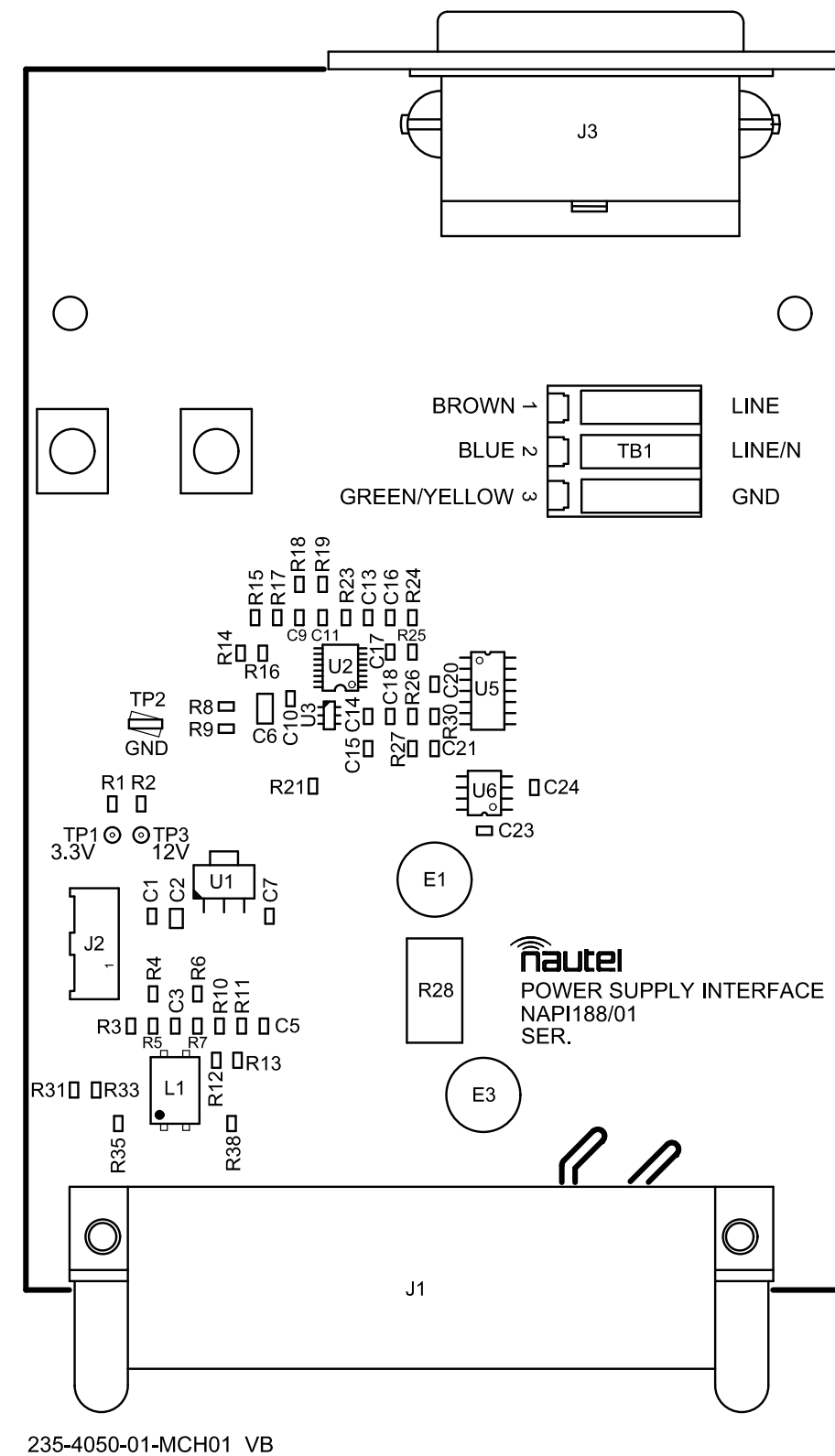


Figure MD-5: NAPI188/01 Power Supply Interface PWB (VX150/VX300/VX600)

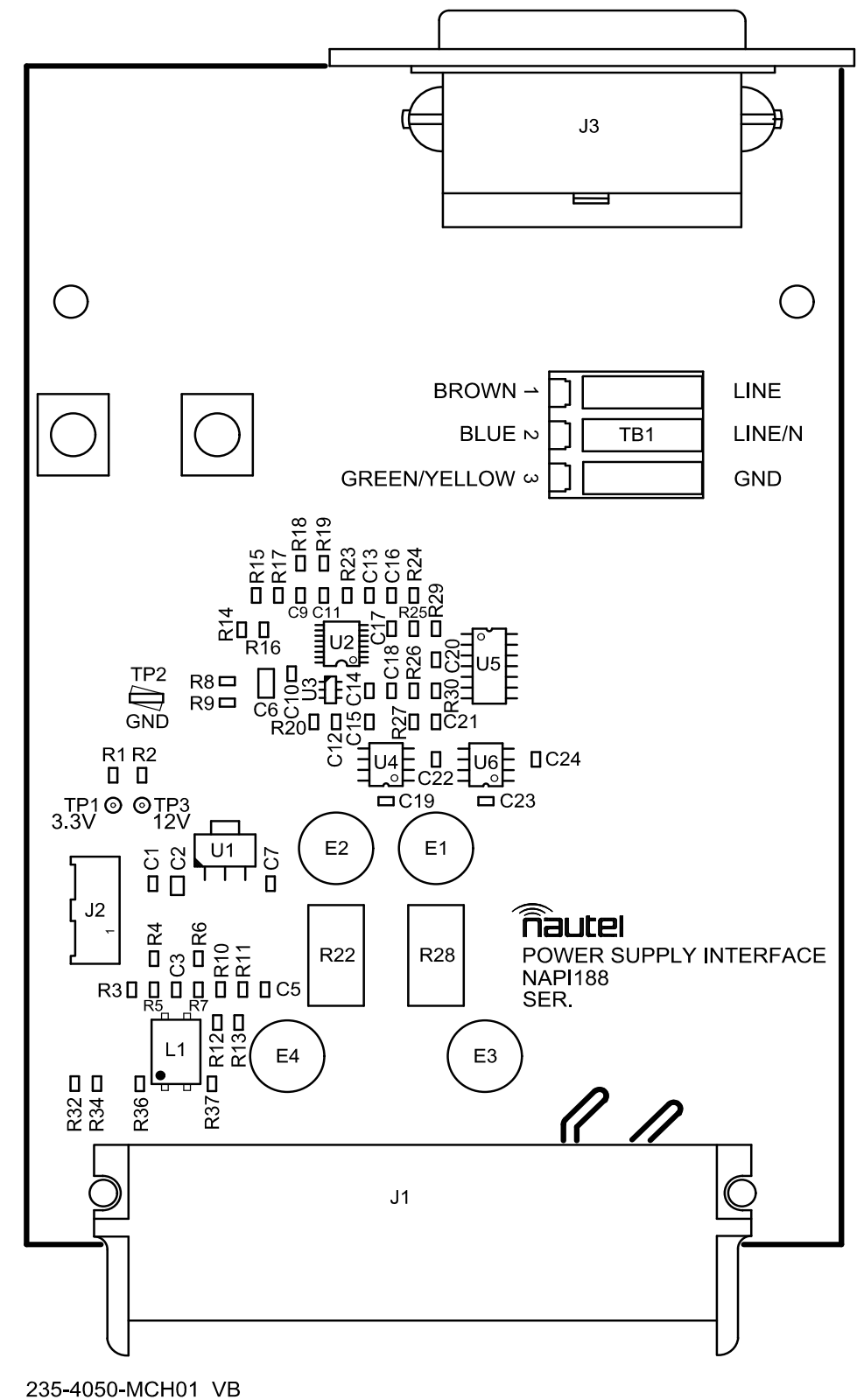
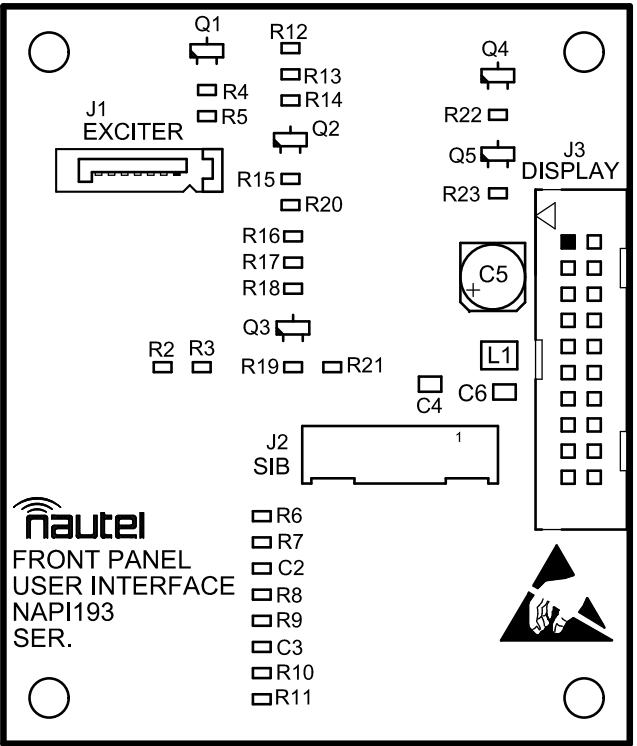
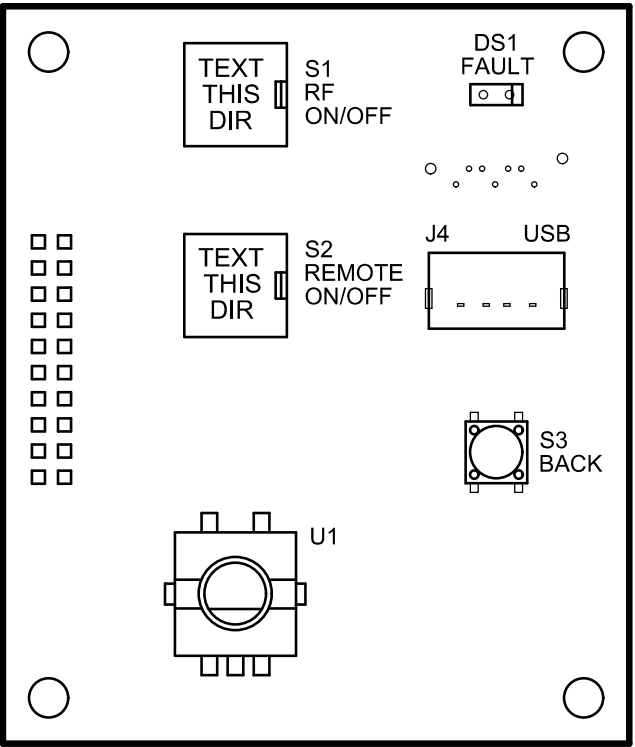


Figure MD-6: NAPI188 Power Supply Interface PWB (VX1/VX1.5/VX2)



TOP SIDE



UNDERSIDE

235-4032-MCH01 VA

Figure MD-7: NAPI193 Front Panel User Interface PWB

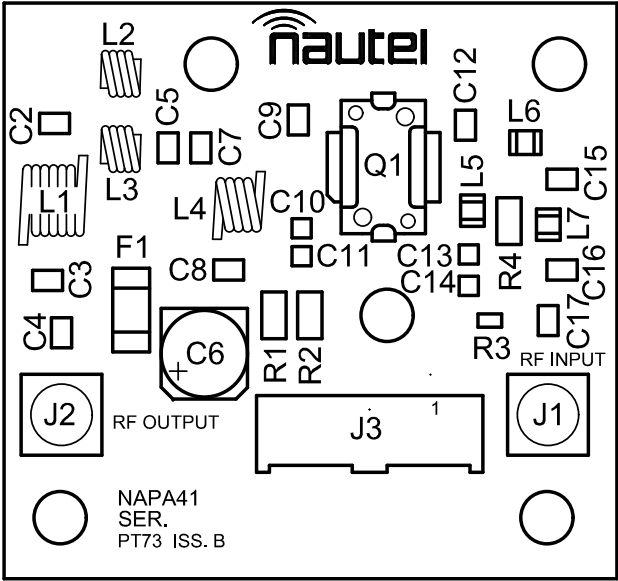
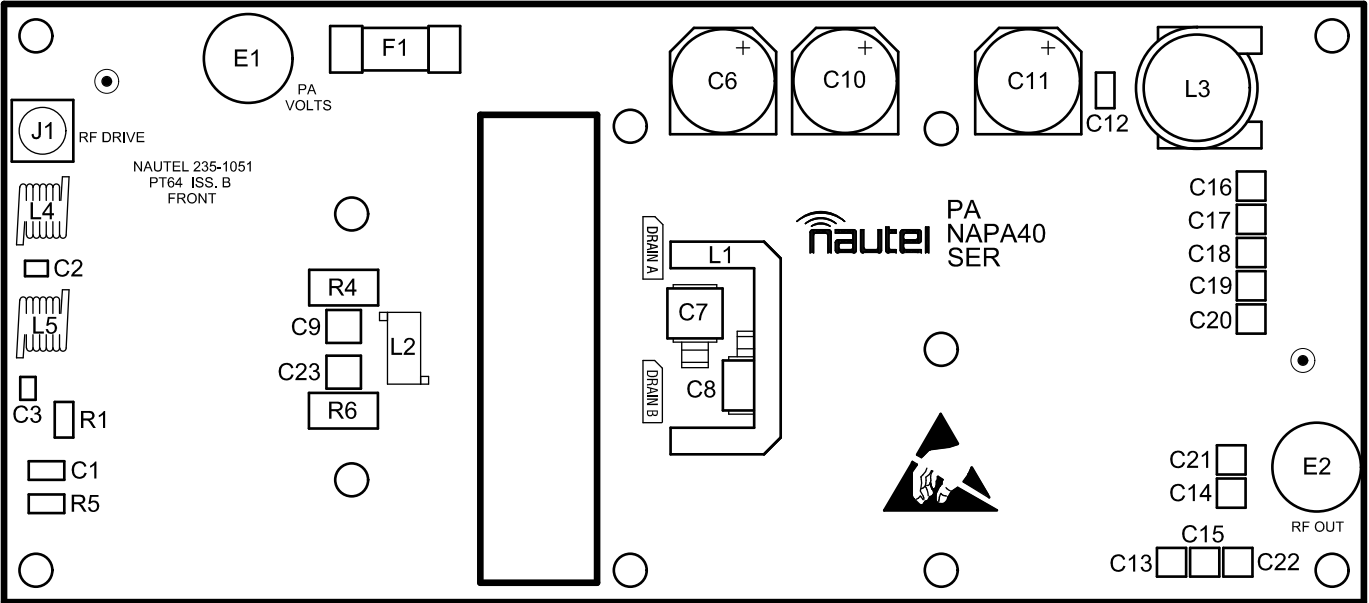
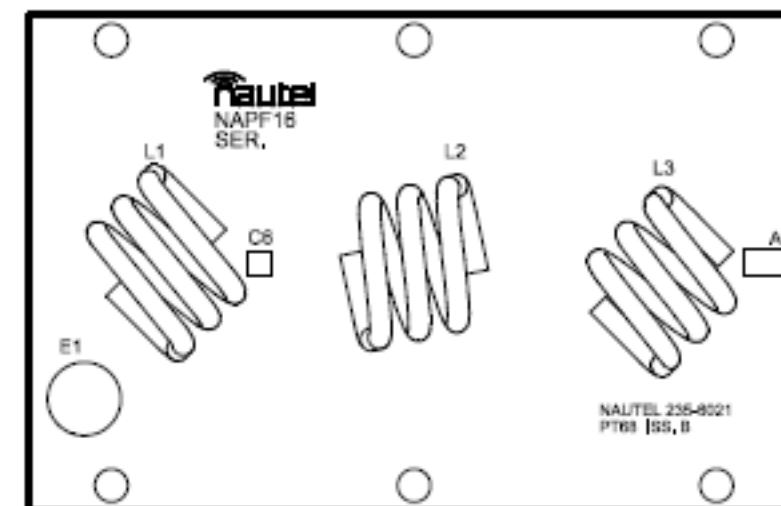


Figure MD-8: NAPA41 Pre-Amp/PA PWB



235-1050-MCH01 VA

Figure MD-9: NAPA40 Power Amplifier PWB

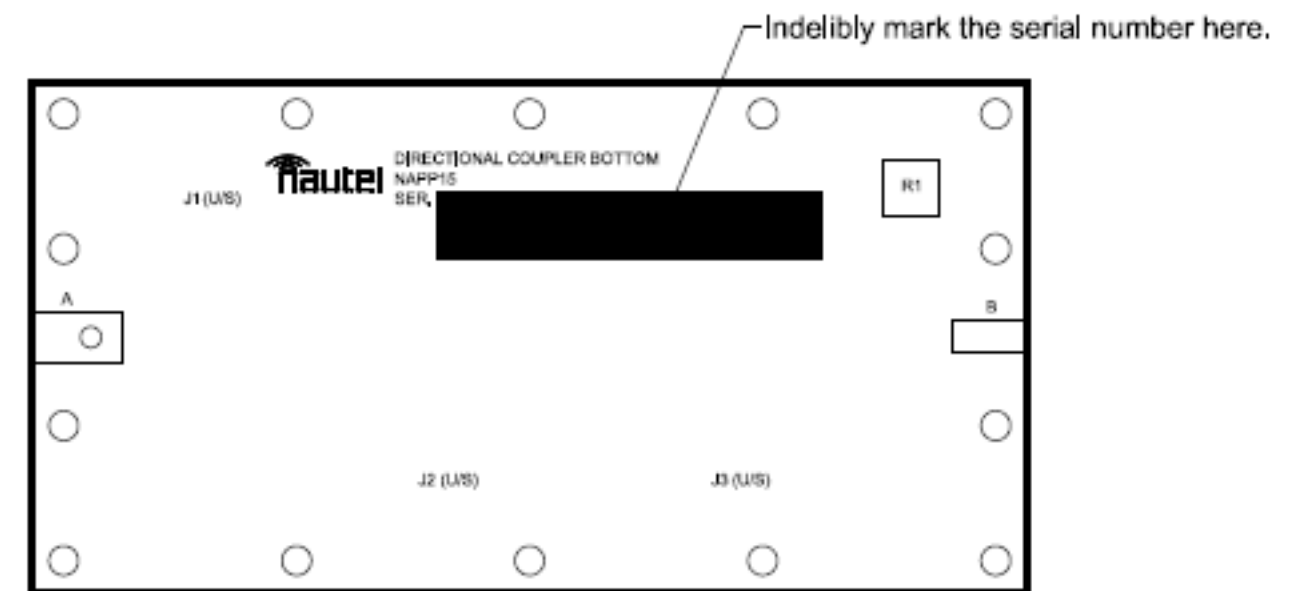


Notes:

Capacitors C7 & C8 are located under L2.

Capacitors C9 & C10 are located under L3.

Figure MD-10: NAPF16 Low Pass Filter PWB



Notes:

- 1) Do not place any labels on this board.
- 2) J1, J2 & J3 are located on the u/side of the PWB.

Figure MD-11: NAPP15 Directional Coupler PWB

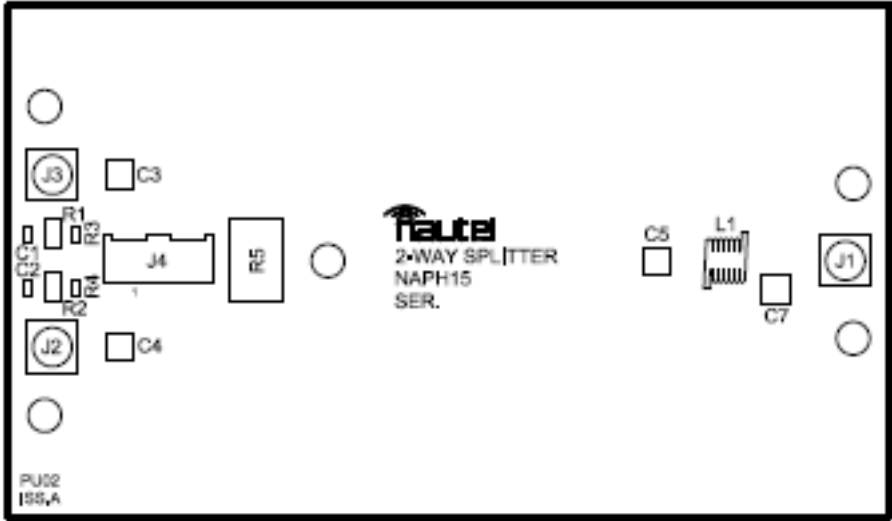


Figure MD-12: NAPH15 2-Way Splitter PWB (VX1.5/VX2)

SECTION 3.5: 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 micros). One cable carries both left-channel and right-channel audio data to the receiving device.

AUI. The Advanced User Interface is the local touch screen on the front door and the advanced remote control/monitoring feature that allows for extensive remote 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.

DHCP. Dynamic Host Carrier Protocol.

DSP. Digital 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.

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

LVPS. Low Voltage Power Supply. A module or modules used in the ac-dc power stage that generates the low level dc supply voltage for the transmitter.

PRESET. A setting that controls power level, frequency and audio parameters. The VX150 to VX2 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.

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.

UI. The User Interface is the controller module's front panel LCD screen that allows for extensive local control and monitoring of the transmitter.

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

VX150 TO VX2 TROUBLESHOOTING MANUAL

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