Field Modification FM20003A

NV Series Transmitters: Replacing UG69* with NAS70* Power Supply Adapter

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FM20003A: NV Series Transmitters: Replacing UG69* With NAS70* Power Supply Adapter

FIELD MODIFICATION

1 INTRODUCTION

This document provides instructions for Nautel customers or their appointed agents to modify the subject equipment in the field.

NOTE

There are several variations of the UG69 power supply (e.g., UG69*, UG69*A, etc.) that may be in your transmitter, all of which are subject to this modification. For clarity, the document refers to the power supply as 'UG69*' from this point forward.*

1.1 Reason for Modification

The UG69* power supply is no longer available. This modification allows the customer to use an NAS70* Power Supply Adapter with integrated UG132 Power Supply module, in place of a UG69* power supply. This way, future power supply related failures can be addressed by replacing the readily available UG132 power supply.

1.2 Equipment Affected

This modification affects all NV Series transmitters that require a UG69* power supply replacement. The power supplies affected are the RF, IPA and Fan Power supplies. Depending on the model and release version of the transmitter, some power supply positions cannot use the NAS70* power supply adapter. These include:

NV3.5-NV10 with Field Mod FM10002A
NV15-NV40 with Field Mod FM10006
NV3.5-NV10 with DWA 10-006
NV7.5-NV10 with DWA 10-050
NV3.5-NV5 with DWA 10-127
NV15-NV40 – all IPA positions

Refer to Appendix A for more details. In the event a power supply module must be replaced in a restricted position, move an available UG69* power supply from another functional position into the failed position, and install the NAS70* Power Supply Adapter in the open acceptable position.

It is also worth noting that once the modification is complete, the transmitter's minimum achievable output power level will increase from the default value, based on the number of power supply adapters in use. See Appendix B for more details on how minimum power is affected for your transmitter model, based on the number of power supply adapters in use and their location.

NOTE

The transmitter set-point minimum limit remains unchanged, however, the transmitter will not be able to lower the power level to achieve that set-point.

To safely perform antenna tower maintenance within the United States (as per FCC RFR) and Canada (as per Health Canada's Safety Code 6), the RF output power of high-power RF transmitters must be reduced below the normal minimum set-point. To achieve this, inhibit (disable) RF power modules until the output power is at a safe operating level. Nautel recommends disabling either even or odd numbered modules only, to prevent a shutdown due to a combiner imbalance.

1.3 Responsibility for Implementation of Procedure

This procedure should be carried out by qualified station maintenance personnel who are familiar with NV Series transmitters.

1.4 Scheduling & Manpower Requirements

Implement this procedure at the earliest convenience of station maintenance personnel when in need of a UG69* replacement.

NOTE

The power supply can be replaced while on-air, however, will result in reduced output power while the power supply is removed.

1.5 Special Tools/Test Equipment

Standard slot screwdriver.
Isopropyl Alcohol

1.6 Materials

The only part required for this procedure is the NAS70* Power Supply Adapter. Nautel ships the appropriate number of replacement assemblies for your transmitter model as requested.

1.7 Identifying Modified Assemblies/Parts

Identifying modified assemblies informs future maintainers of the current configuration. Use indelible ink to mark "**FM20003A**" on the transmitter top rear chassis near the model label. This indicates the adapter has been installed using this upgrade procedure.

1.8 Publications Affected

NV3.5/NV5/NV7.5/NV10/NV15/NV20/NV30/NV40 GENERAL INFORMATION
(affects various areas of the Installation and Operation Manual and Troubleshooting Manual)

The power supply module has changed from UG69* to an NAS70* Power Supply Adapter with integrated UG132 power supply module. The front panel interface for each power supply module differs as shown in Table 1. Note these changes for any upgraded power supply modules.

Table 1: Power Supply Interface

FRONT PANEL ITEM	UG69* (OLD PS MODULE)	UG132 (NEW PS MODULE)
AC OK LED ~	LED is green when the supply's ac input is greater than 175 V ac. LED is off when the supply's ac input is less than 175 V ac.	LED is green when the supply's ac input is greater than 175 V ac. LED is off when the supply's ac input is less than 90 V ac.
DC OK LED ⎓	LED is green when the supply's dc output is within operational limits. LED is off when the supply's output is outside operational limits or inhibited.	Same operation as UG69*.
SERVICE LED	Not applicable	Power Supply is experiencing a thermal alarm (5 ºC before shutdown) or thermal shutdown condition.
FAULT LED !	Not applicable	Power Supply is experiencing an internal/communication fault such as: thermal shutdown or defective fan, blown Ac fuse or over-voltage shutdown.

NV SERIES TROUBLESHOOTING MANUAL:

Section 3: Parts Information: In the Family Tree (Figure 3-2), note that one or more power supply modules (e.g., U7, U8, U9, etc., Nautel Part # UG69*) has been replaced by the NAS70* Power Supply Adapter. A Reference Designation list has been provided in this document. Print and add this information to the Troubleshooting Manual.

Section 4: Wiring Information: Table 2 of this document show the Connector Mating information for the NAS70* Power Supply Adapter. Print and add this information to the Troubleshooting Manual.

Section 5: Electrical Schematics: The existing Electrical Schematic SD-2 shows power supply module blocks (e.g., for NV3.5/NV5, U9 for power supply module IPA A or U12 for power supply module A) that interface with an associated PS Interface PWB (e.g., A10 or A19) via the power supply module's blind-mate connector J1. After the UG69* power supply is replaced by the NAS70* Power Supply Adapter, note that this connector changes to A1J2 (from J1), for each power supply affected. Electrical Schematics SD-2A to SD-2C are provided with this document to show the detail of the Power Supply Adapter (NAS70*) and its internal Power Supply Interface PWB's (NAPI177 and NAPI178). Print and add these schematics after Figure SD-2 in the Troubleshooting Manual.

Section 6: Mechanical Drawings: Mechanical drawings MD-A, MD-B and MD-C are provided with this document to show the assembly detail of the Power Supply Adapter module (NAS70*) and its internal Power Supply Interface PWBs (NAPI177 and NAPI178). Print and add these mechanical drawings to the end of the existing mechanical drawings of the Troubleshooting Manual.

2 REPLACING UG69* WITH NAS70* POWER SUPPLY ADAPTER

Replace a UG69* power supply module with an NAS70* Power Supply Adapter module as follows:

(a) Remove the UG69* power supply. If necessary, use a slotted screwdriver to turn the LATCH knob at the front of the power supply counterclockwise to unlatch the module from its support bracket.

(b) Obtain the NAS70* Power Supply Adapter and temporarily remove the UG132 Power Supply Module from the adapter. See instructions in Figure 1.

(c) Ensure the surface of the transmitter shelf where the NAS70* Power Supply Adapter mates is cleaned with isopropyl alcohol prior to installing the adapter.

NOTE

Nautel recommends you secure it with tape, however, it is optional, unless concern for seismic activity.

(d) Remove a small corner of the backing strip from the double-sided tape that is attached to the NAS70* Power Supply Adapter. See Mechanical Drawing MD-C.

(e) Install the NAS70* Power Supply Adapter in place of the power supply module that was removed. Elevate the adapter until the adapter is fully engaged in the blind-mate connector in the power supply module slot in order to avoid the tape from sticking. Once engaged firmly, press down and hold in place for 30 seconds for the tape to fully adhere.

NOTE

For future troubleshooting or power supply replacement, typically only the power supply *module (Nautel Part # UG132) needs to be removed. Refer to Section 3 – UG132 Power Supply Module Replacement in this document for details. If the entire adapter must be replaced, remove the UG132 Power Supply Module first, then disengage the adapter by lifting against the tape, once loose, remove power supply adapter and replace using these instructions.*

(f) Reinstall the UG132 power supply in the adapter. See Figure 1.

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.

Figure 1: Removing/Installing UG132 Power Supply Modules

(g) The power supply should begin to operate at the desired output and its DC OK LED will be green. Confirm this by comparing the power supply voltages of the new power supply adapter to that of the other modules by using the AUI RF Modules Meter screen – PA Voltage 1 and PA Voltage 2 Meters. Refer to the Operations and Maintenance manual, if required. The power supply voltage levels of all UG69* power supplies should be within ± 2.0 V dc of each other. The same differential applies to all UG132 power supplies. The differential between the nominal power supply voltage of the UG69* and UG132 supplies should be within 3 V dc when the power supplies are operating above 18 V dc.

NOTE

*For mixed configurations (transmitters having UG69*s and UG132s) with the transmitter operating at the minimum RF Power Set Point, the voltage will be nominal 6 V for UG69* power supplies and nominal 18 V for UG132 power supplies.*

With the transmitter operating above 18 V, the difference between the minimum and maximum voltages will be less than 7 V.

The modification is complete.

3 UG132 POWER SUPPLY REPLACEMENT

To replace the power supply (U1) in the NAS70* adapter, perform the following steps (see Figure MD-C for reference):

(a) Open the transmitter's front door.

(b) Use the front handle to pull out the power supply. See Figure 1.

NOTE

The UG132 Power Supply can be removed from the transmitter without disabling the Power Module first.

(c) Obtain a new UG132 Power Supply Module and install it in the adapter module, ensuring it is fully seated in the blind-mate connector in the adapter. See Figure 1.

PARTS INFORMATION FOR NAS70* PS ADAPTER

StockCode: NAS70
Description: PS Adapter Assy, UG132 to UG69,

Component Lvl.	StockCode	Description	Reference Designation
01	**206-7002**	**Cable Set Assy, NAS70**	
02	HAM69	Conn,Quick-Dis,F,1/4 Tab 14-16 Shrink	P01, P02
01	**NAPI177**	**Power Supply Interface PWB Assy (UG69-UG132)**	A01
02	CCFS04	Cap,SMT,Ceramic,0.01uF,10%,50V,X7R,0603	C10, C14, C16, C19, C21, C22
02	CCFS23	Cap,SMT,Ceramic,18pF,2%,50V, C0G,0603	C11, C12
02	CCFS52	Cap, SMT, Ceramic, 0.1uF, 10%, 25V X7R, 0603	C01, C03, C04, C05, C06, C07, C08, C09, C13, C15, C20, C23, C24, C25, C26
02	CCFS53	Cap, SMT, Ceramic,47uF,20%, 6.3V, 1210	C18
02	CCFS57	Cap,SMT,Ceramic,10uF,20%,6.3V, X5R,0805	C02, C17
02	HAC130	1 Pin Screw Terminal, Power Tap M4 Surface Mount.	E03
02	HAJ66	Terminal, SMT, Test Point, PWB	TP01, TP04
02	HR26	Connector, Quick-Dis, M, 1/4 Tab, PWB	E01, E02
02	JA94	Conn, 47 Contact, M, 90deg, PWB Mt	J01
02	JF47	Conn, Header,Square Post,Gold, Dual,40-pin	J03
02	JP99	Conn, Recept, Dual Row, 10-pin , 0.1", PWB	J02
02	LCFS01	Inductor, SMT, Choke, 600ohms, 2A, 0805	L02, L09
02	LCFS02	Inductor, SMT, Choke, 2000 ohm s, 80mA, 0805	L01, L03, L04, L05, L06, L07
02	LS22	Choke,SMT,Common Mode,2200 ohm ,200mA,1206	L08
02	QDLS07	Diode, SMT, LED, Amber, (592nm), 0603	DS01
02	RAD10	Resistor, SMT, MF, 56.2 Ohms, 1% 1/4W	R23, R25
02	RFFS01	Resistor,SMT,MF,0.0ohms,Jumper ,0603	R07, R08, R09, R10, R16, R19, R21, R22
02	RFFS26	Resistor, SMT, MF, 100ohms, 1%, 1/10W, 0603	R31
02	RFFS28	Resistor, SMT, MF, 150ohms, 1%, 1/10W, 0603	R02
02	RFFS34	Resistor,SMT,MF,475ohms,1%, 1/10W,0603	R24, R26
02	RFFS42	Resistor,SMT,MF,2210ohms,1%, 1/10W,0603	R17
02	RFFS50	Resistor,SMT,MF,10.0Kohms,1%, 1/10W,0603	R01, R03, R04, R11, R14, R18, R20, R29, R30
02	RFFS52	Resistor,SMT,MF,15.0Kohms,1%, 1/10W,0603	R15
02	RFFS56	Resistor, SMT, MF, 33.2Kohms, 1%, 1/10W, 0603	R27
02	RFFS68	Resistor, SMT, MF, 332Kohms, 1%, 1/10W, 0603	R28
02	UDTS04	IC,SMT,RS-485 Transceiver,3.3V ,SO-8	U07
02	ULAS02	IC,SMT,Opamp,Quad,Rail-To-Rail ,SOIC-14	U02
02	US31	IC, SMT, CMOS, Quad Tri-State Buff, SOIC-14	U04, U05
02	UT110	IC, Voltage Regulator, 1.5A, ADJ, Low Drop	U06
02	UX169	IC, SMT, Micro, 32k, 3.3V, TQFP-44	U01
02	UX83	IC,SMT,2.5V Reference,0.1%,SOT -23-6	U03
02	XFPS10	Crystal,SMT,Fund,ParRes,32.768 kHz, 20ppm, 12.5pF,	Y01
01	**NAPI178**	**Power Supply Interface PWB Assy - (UG132-UG69)**	A02
02	HAC130	1 Pin Screw Terminal, Power Tap M4 Surface Mount.	E01, E02, E03
02	HR26	Connector, Quick-Dis, M, 1/4 Tab, PWB	E04
02	JA119	Conn, PwrBlade, 3ACP+4P+24S, Vertical Solder Recep	J01
02	JP100	Conn, Header, Right Angle, 10 pin, 0.1", Dual Row	J02
01	**UG132**	**Power Supply, 18-53Vdc, 47A, 2250W/1200W, 90-265Va**	U01

CONNECTOR MATING INFORMATION FOR NAS70* PS ADAPTER

Table 2: Connector Mating Information – NAS70* Power Supply Adapter Module

CONNECTOR	MATE	COMMENTS
P1	A1E1	L1 (red)
P2	A1E2	L2/N (grey)

Appendix A

The following graphics indicate the power supply locations inside the NV series transmitter where the NAS70* Power Supply Adapter with integrated UG132 power supply module cannot be installed because of the AUI/Cooling modification installed on the inside of the front door that mounts the 17” AUI touchscreen. See Figures A-1 and A-2 and Tables A-1 and A-2.

NV3.5-NV10
Conflict A in Table A-1

NV15-NV40
Conflict B in Table A-1

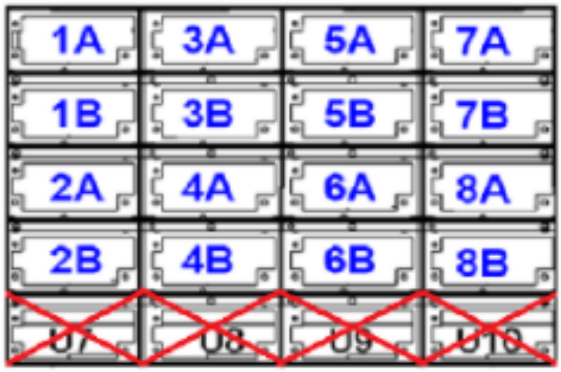

Figure A-1: Locations where the NAS70* cannot be installed

NOTE

In the NV30/40 transmitters, the NAS70 Power Supply Adapter **cannot** be used in IPA C (U11) position (not shown in Figure A-1, Conflict B).*

To interpret Tables A-1 and A-2, the letter (A or B) specified, references the Conflict Figures (see Figure A-1) that the related transmitter Nomenclature/Model number will have physical and/or air flow restriction conflicts with when attempting to install NAS70 adapters in locations indicated by an X. The "-" in the tables indicate that the Field Modification or factory installed Deviation (DWA) does not apply to that model transmitter.*

Table A-1: Release 1 NV Series Cooling Mod Conflict Matrix

Nomenclature	Model	FM10002A (FM Kit: 206-5920-01)	FM10006 (FM Kit: 206-5925)	DWA 10-006	DWA 10-050	DWA 10-127
NARF50	NV5 RLS1	A	-	A	-	A
NARF51	NV10 RLS1	A	-	A	A	-
■ NARF53	NV20 RLS1	-	B	-	-	-
■ NARF55	NV40 RLS1	-	B	-	-	-
NARF56	NV3.5 RLS1	A	-	A	-	A
NARF57	NV7.5 RLS1	A	-	A	A	-
■ NARF58	NV15(S) RLS1	-	B	-	-	-
■ NARF59	NV30(S) RLS1	-	B	-	-	-

Release 1 NV transmitters have a solid door with no front grill/air filter. If one of the Field Modifications or factory applied Deviations (DWA) specified in the Table A-1 are applied to the transmitter, the Conflict Figure letter shown against the Nomenclature/Model number transmitter applies.

Field Modifications and/or Deviations are determined by locating a label on the rear of the transmitter.

NOTE

■ indicates that NAS70* must not be installed in the NV15 thru NV40 IPA Power Supply positions, as NAS70* adapters do not share effectively with UG69* power supply modules and will yield undesirable behavior. Nautel recommends using available UG69* power supplies, however, ensure all are the same vintage; i.e. all 1509 non-platinum (UG69* thru UG69*D) or all 1578 platinum (UG69*E thru UG69*J), but do not mix. Consult with Nautel if unsure.

Table A-2: Release 2 NV Series Cooling Mod Conflict Matrix

Nomenclature	Model	Factory Configured
NARF50A	NV5/NV3.5 RLS2	A
NARF51A	NV10/NV7.5 RLS2	A

Release 2 NV transmitters were factory configured with a front door having integral blowers installed to cool the AUI touchscreen and SBC. An intake duct that restricts air flow into NAS70 adapters is installed in conflicting regions specified in the Conflict Figure referenced. See Figure A-2.*

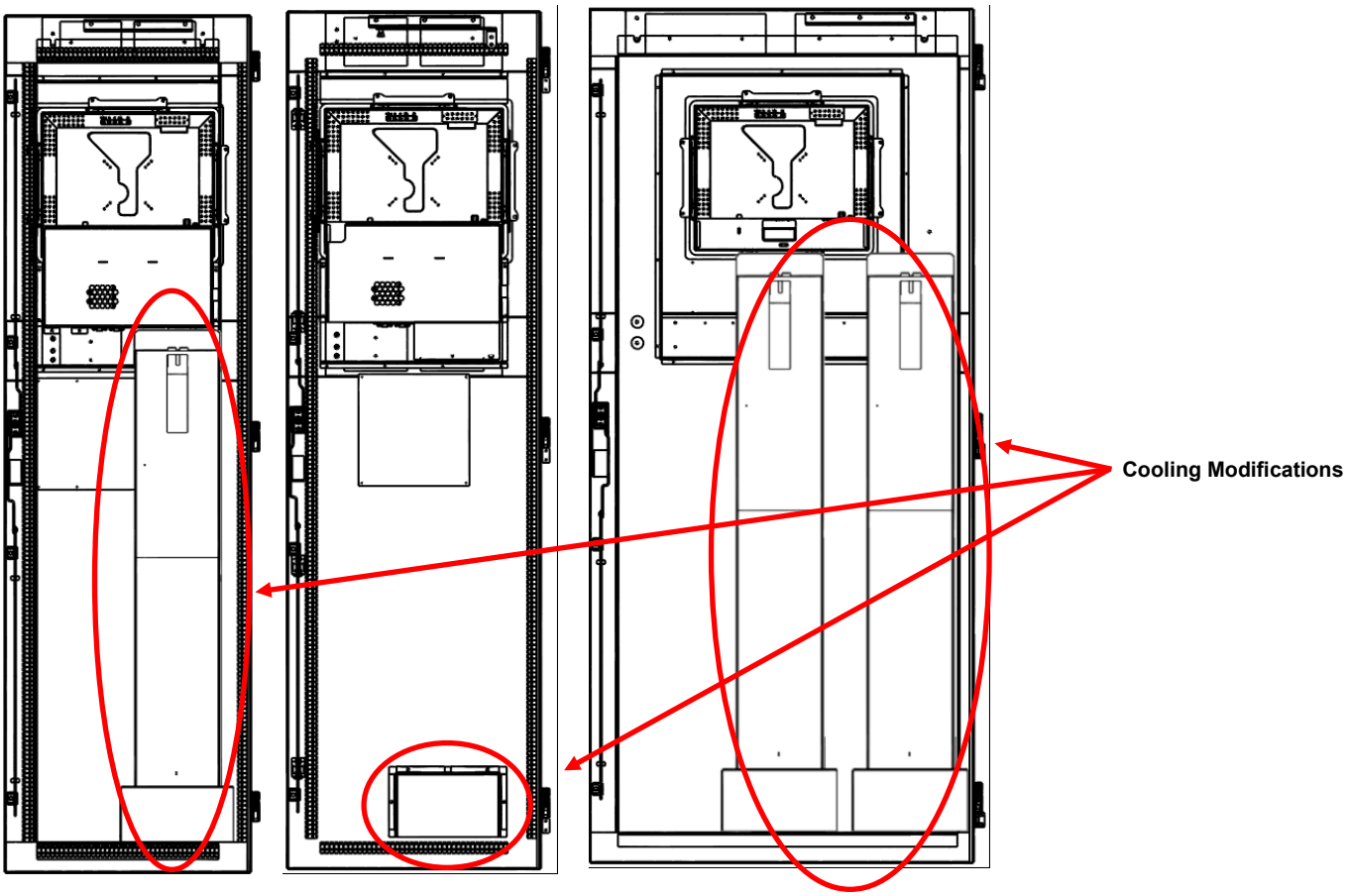

Figure A-2: Release 2 NV Series Transmitter Cooling Modifications

Table A-3: No Conflict Configuration Matrix

Nomenclature	Model	Factory Configured
NARF50	NV5 RLS1	Standard
NARF51	NV10 RLS1	Standard
■ NARF53	NV20 RLS1	Standard or DWA 09-190 or DWA 09-191
■ NARF55	NV40 RLS1	Standard or DWA 09-179 or DWA 09-184
NARF56	NV3.5 RLS1	Standard
NARF57	NV7.5 RLS1	Standard
■ NARF58	NV15(S) RLS1	Standard or DWA 09-190 or DWA 09-191
■ NARF59	NV30(S) RLS1	Standard or DWA 09-179 or DWA 09-184
NARF51A	NV10/NV7.5 RLS2	DWA 11-090
■ NARF53A	NV20/NV15 RLS2	Standard or DWA 11-091
■ NARF55A	NV40/NV30 RLS2	Standard or DWA 11-092
NARF50B	NV5/NV3.5 RLS3	Standard
NARF51B	NV10/NV7.5 RLS3	Standard
■ NARF53B	NV20/NV15 RLS3	Standard
■ NARF55B	NV40/NV30 RLS3	Standard

The Nomenclatures/Models specified are factory configured to prevent physical or air flow restriction conflicts with NAS70 adapters in any position as long as they are "Standard", indicating that no Deviation (DWA) referenced in either Table A-1 or A-2 have been applied, or one of the DWAs referenced in Table A-3 (if applicable) was applied. Unless specified otherwise (see **Note** below), NAS70* adapters can be installed in any position within the transmitter.*

NOTE

■ indicates that NAS70* must not be installed in the NV15 thru NV40 IPA Power Supply positions, as NAS70* adapters do not share effectively with UG69* power supply modules and will yield undesirable behavior. Nautel recommends using available UG69* power supplies, however, ensure all are the same vintage; i.e. all 1509 non-platinum (UG69* thru UG69*D) or all 1578 platinum (UG69*E thru UG69*J), but do not mix. Consult with Nautel if unsure.

Appendix B

Minimum Power vs # of NAS70*'s vs Transmitter Model

Tables B-1 through B-4 show the transmitter's minimum power with a specific number of UG69* power supplies that have been replaced with the NAS70* Power Supply Adapter with integrated UG132 power supply module.

NOTE

NAS70 Power Supply Adapters installed in the IPA and Fan power supply positions have no impact on minimum power. Only RF power module positions apply, and are equivalent, regardless of position.*

NOTE

The NAS70 Power Supply Adapter's integrated UG132 power supply module has a higher minimum output voltage of 18 V when compared to the UG69* minimum output voltage of 6 V, and therefore, results in incrementally higher minimum output power of the transmitter as the number of adapters increases. Tables B-1 through B-4 provide a typical minimum power value and represent a guideline only, as various conditions can cause variation from the values shown.*

Table B-1: NV3.5/NV5

Number of NAS70* Installed	Typical Minimum Power (W)
0	150
1	338
2	600
3	938
4	1350

Table B-2: NV7.5/NV10

Number of NAS70* Installed	Typical Minimum Power (W)
0	300
1	469
2	675
3	919
4	1200
5	1519
6	1875
7	2269
8	2700

Appendix B
(continued)

Table B-3: NV15/NV20

Number of NAS70* Installed	Typical Minimum Power (W)
0	600
1	759
2	938
3	1134
4	1350
5	1584
6	1838
7	2109
8	2400
9	2709
10	3038
11	3384
12	3750
13	4134
14	4538
15	4959
16	5400

Appendix B
(continued)

Table B-4: NV30/NV40

Number of NAS70* Installed	Typical Minimum Power (W)
0	1200
1	1355
2	1519
3	1692
4	1875
5	2067
6	2269
7	2480
8	2700
9	2930
10	3169
11	3417
12	3675
13	3942
14	4219
15	4505
16	4800
17	5105
18	5419
19	5742
20	6075
21	6417
22	6769
23	7130
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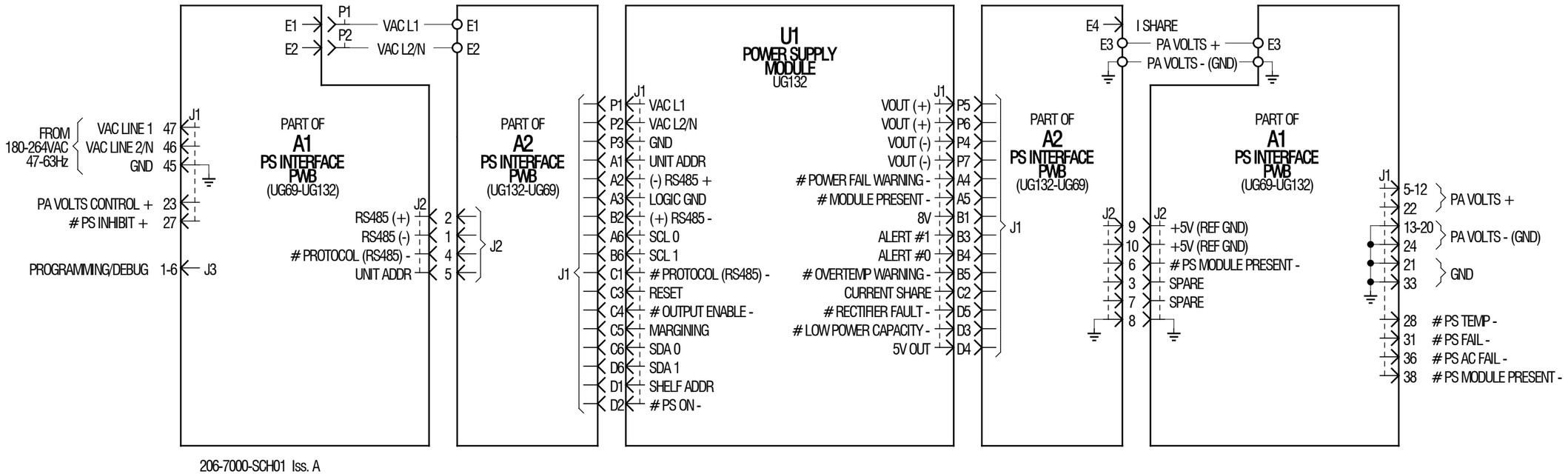
28	9075
29	9462
30	9919
31	10355
32	10800



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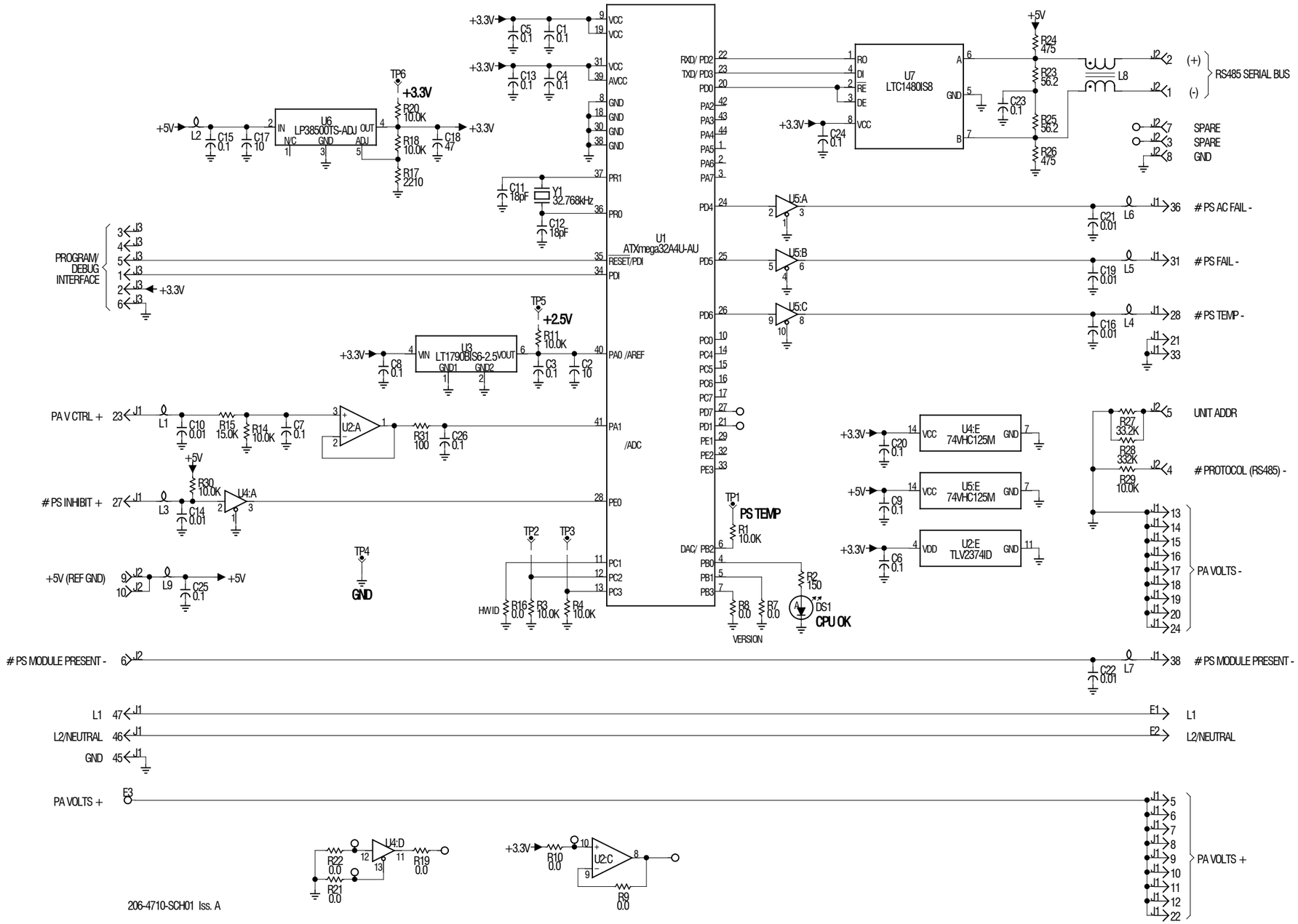
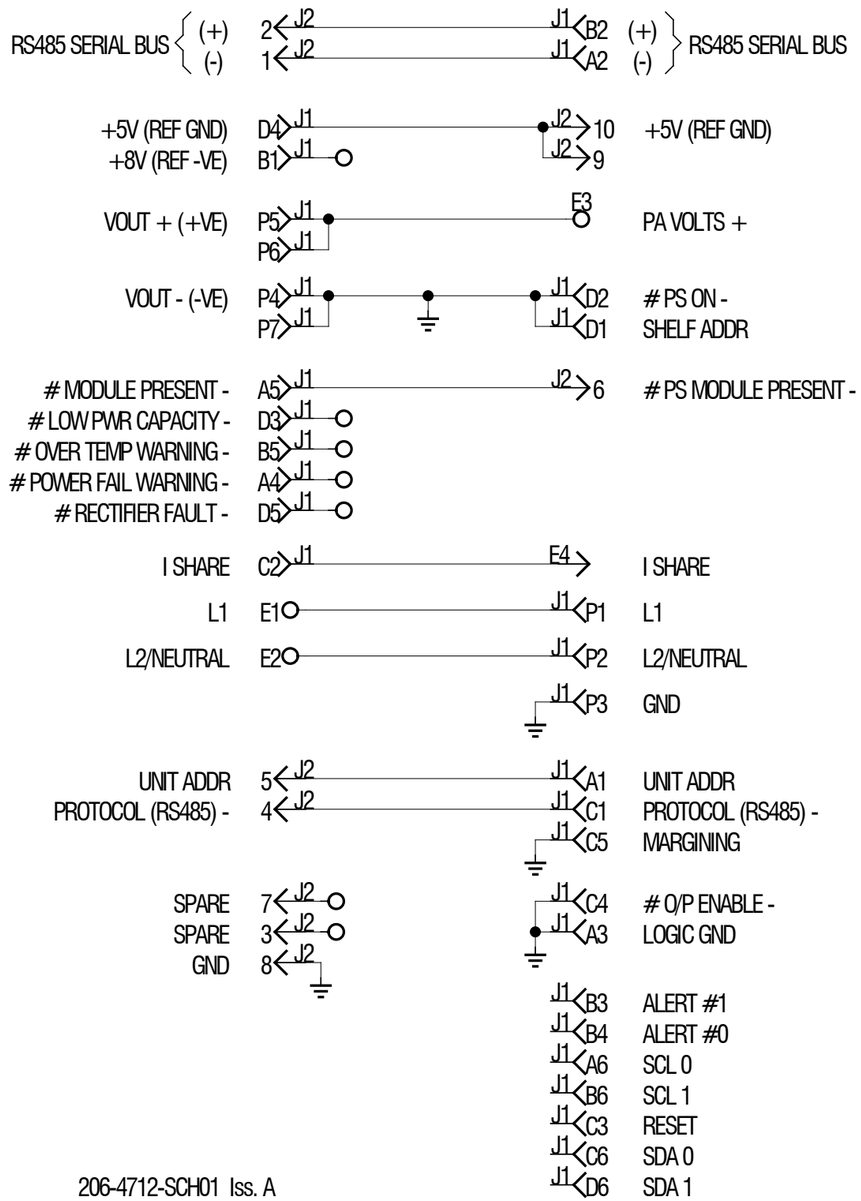
Electrical Schematic – Power Supply Adapter Module (NAS70*)			
FM20003A – Manual Replacement Page	Not to Scale	Figure SD-2A	Page 1 of 1



Electrical Schematic – NAPI177 Power Supply Interface PWB (UG69*-UG132)			
FM20003A – Manual Replacement Page	Not to Scale	Figure SD-2B	Page 1 of 1



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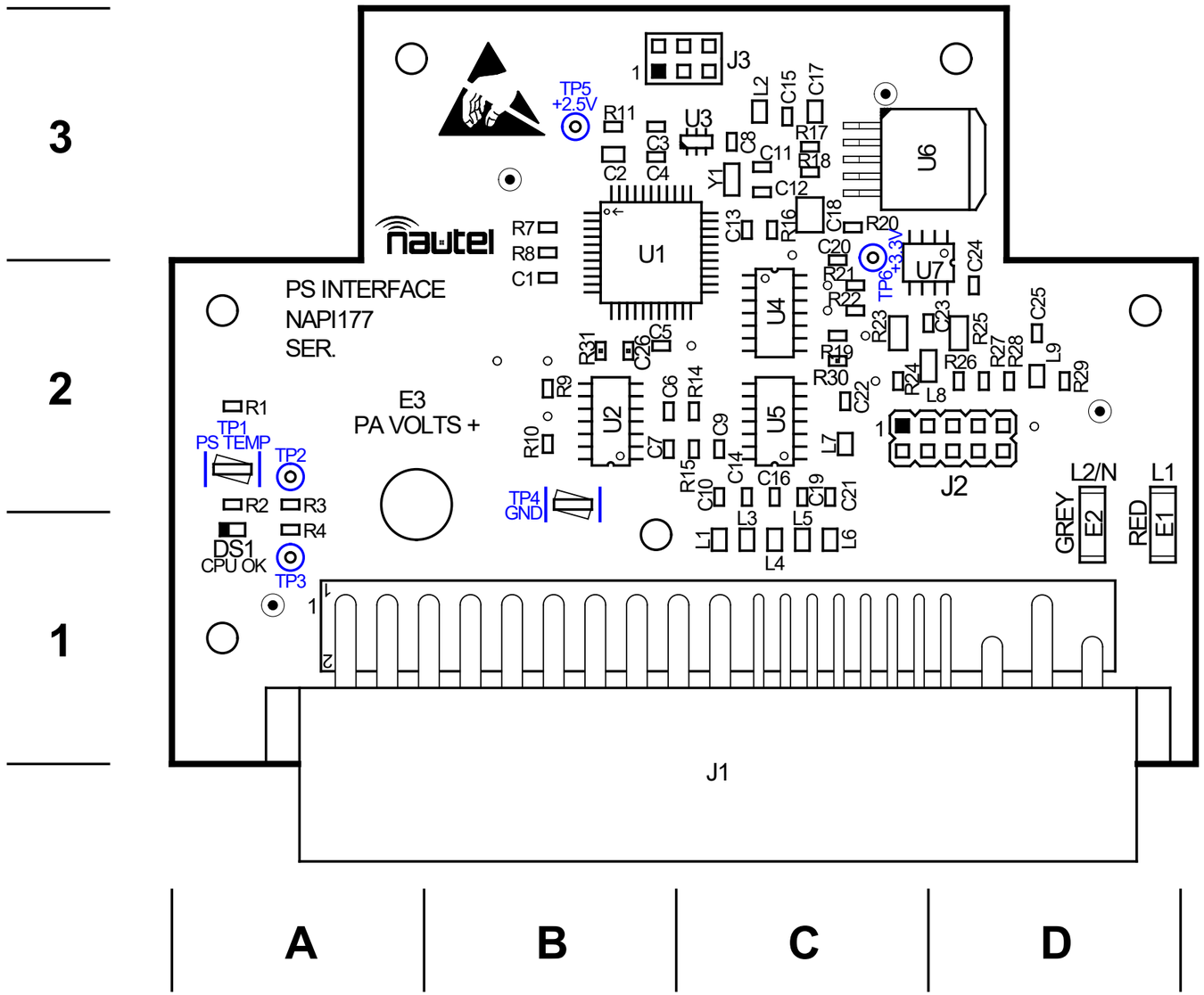
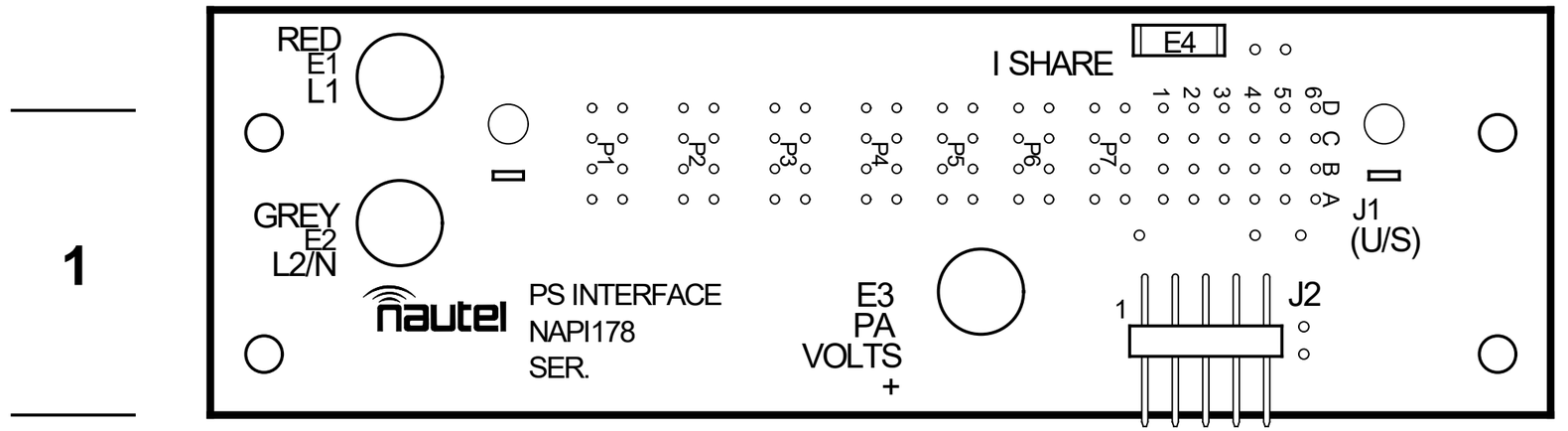
Electrical Schematic – NAPI178 Power Supply Interface PWB (UG132-UG69*)			
FM20003A – Manual Replacement Page	Not to Scale	Figure SD-2C	Page 1 of 1

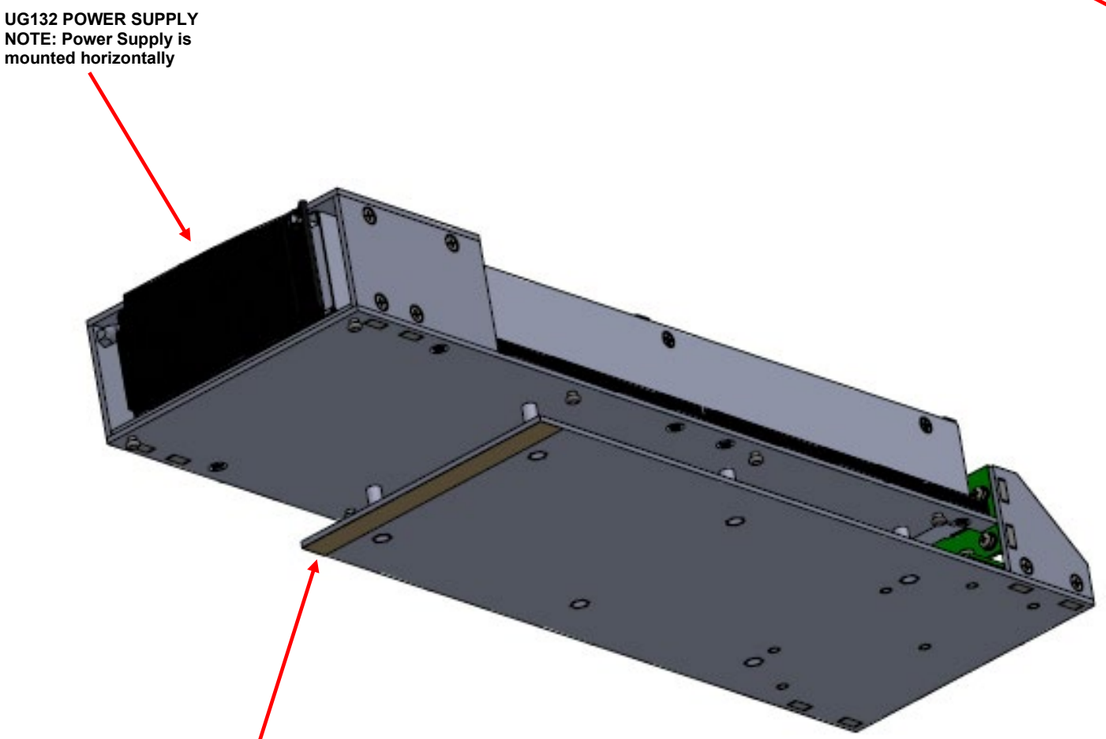


206-4710-MCH01 Iss. A

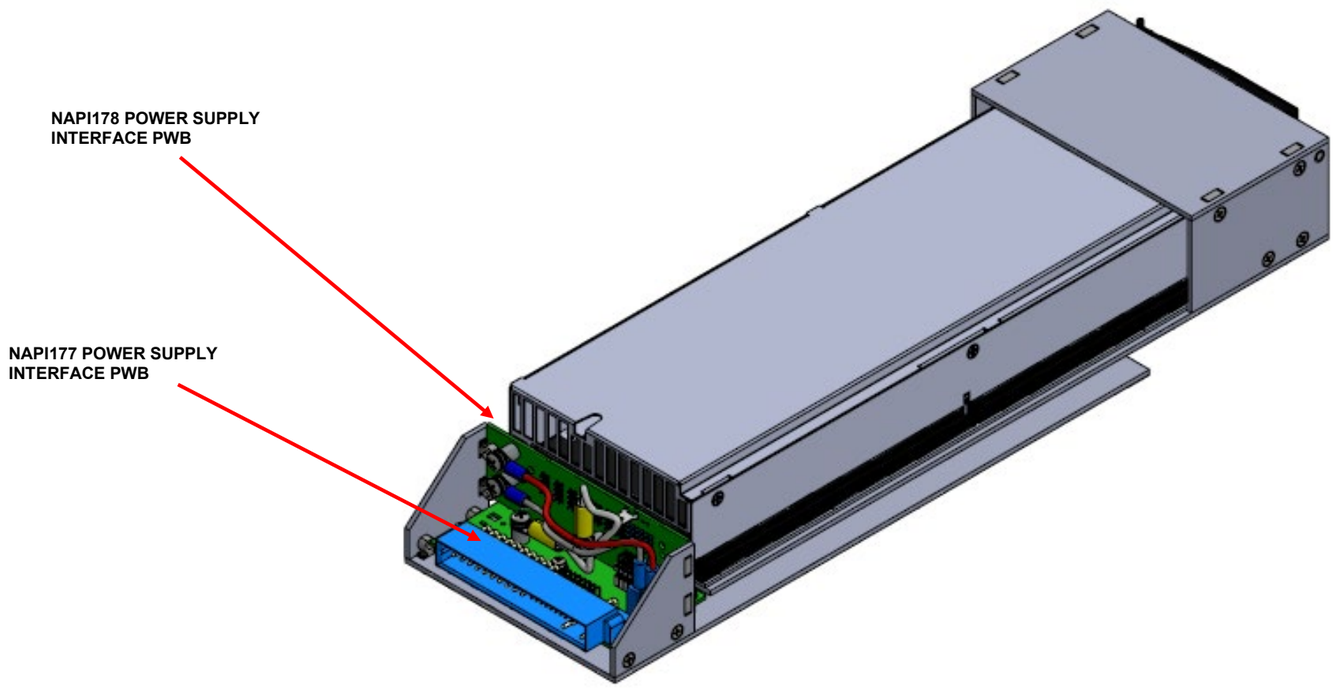
Assembly Detail – NAPI177 Power Supply Interface PWB (UG69*-UG132)			
FM20003A – Manual Replacement Page	Not to Scale	Figure MD-A	Page 1 of 1



206-4712-MCH01 Iss. A



BOTTOM VIEW



REAR VIEW

207-7000_MCH01

Assembly Detail – NAS70* Power Supply Adapter Module			
FM20003A – Manual Replacement Page	Not to Scale	Figure MD-C	Page 1 of 1