1. Abbreviations and Acronyms

Abbreviation / Acronym	Definition
	{ = Two definitions, { same abbreviation/acronym
ACLR	Adjacent Channel Leakage Power Ratio
ACP	Adjacent Channel Power
A/D	Analog-to-Digital Conversion
ADC	{Analog-to-Digital Converter {Automatic Data Collection
AM	Amplitude Modulation
AMPS	Advanced Mobile Phone System
ANSI	American National Standards Institute
APC	Automatic Power Control
APTT	Analog Push To Talk
ASG	Applications Support Group
ASIC	Application Specific Integrated Circuit
ATE	Automatic (Automated) Test Equipment
ATP	Acceptance Test Procedure
ATTEN	Attenuator
BER	Beyond Economical Repair
BOM	Bill Of Materials
BPF	Band Pass Filter
BS	Base Station
BTS	Base Transceiver Station (System)
BW	BandWidth
°C	Degrees Celsius
CAD	Computer Aided Design
CCA	{Circuit Card Assembly
CCW	Counter ClockWise
CDMA	Code Division Multiple Access
CDPD	Cellular Digital Packet Data
CTRL	Control
CW	{ClockWise {Continuous Wave
dB	deciBels
dBc	Referenced to a carrier level
dBm	Reference to a specific power level (one milliwatt)
dBw	Reference to a specific power level (one watt)
DIN	Deutsches Insitut für Normung eV
DLNA	Duplexer Low Noise Amplifier
DPTT	Digital Push To Talk
DQPSK	Differential Quadrature Phase Shift Keyed
DSP	Digital Signal Processing
DUT	Device Under Test
ECD	Estimated Completion Date
ECM	Electronic Counter Measure
EDGE	Enhanced Data for GSM Evolution
EEPROM	Electrically-Erasable Programmable Read-Only Memory
EIA	Electronic Industries Association
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EPROM	{Electrically Programmable Read-Only Memory

	{Erasable Programmable Read-Only Memory
ESD	ElectroStatic Discharge
ESG	Electronic Signal Generator
ETDMA	Extended Time Division Multiple Access
ETSI	European Telecommunications Standard Institute
EUT	Equipment Under Test
FAR	Failure Analysis Report
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access
FET	Field Effect Transistor
FHMA	Frequency Hopping Multiple Access
FM	Frequency Modulation
FRU	Field Replaceable Unit
FSK	Frequency Shift Key modulation
GHz	GigaHertz
GMSK	Gaussian Minimum Shift Keying
GOLAY	See GSC
GSC	Golay Sequential Code
GSM	Global System for Mobile Communications
HPF	High Pass Filter
HW	Hardware
Hz	Hertz
IAW	In Accordance With
IC	Integrated Circuit
IMD	InterModulation Distortion
IRL	Input Return Loss
IS-54	Interim Standard 54 for TDMA
IS-95	Interim Standard 95 for CDMA
ISDN	Integrated Services Digital Network
ISM	Industrial, Scientific and Medical unlicensed frequency bands
ISO	{International Organization for Standardization
	{ISOlator
kHz	KiloHertz
LDA	Linear Discrete Amplifier (Class A or AB)
LGL	Lower Guardband Limit
LMR	Land Mobile Radio
LMS	Land Mobile Systems
LNA	Low Noise Amplifier
LO	Local Oscillator
LPA	Linear Power Amplifier
LPF	Low Pass Filter
LSL	Lower Specification Limit
LVD	Low Voltage Disconnect
MC	MultiChannel
MCA	MultiChannel Amplifier
MCPA	{MultiCarrier Power Amplifier
	{MultiChannel Power Amplifier
MCR	MultiChannel Rack
MFRM	{Multiple Frequency Radio Mobile
	{Multifunction Frequency Radio Modulation
MHz	MegaHertz
MSO	Master Switch Office
MTBF	Mean Time Between Failures
MTSO	Master Telephone Switch Office

MU ..... Measurement Uncertainty
M&TE ..... Measuring and Test Equipment

NAMPS ..... Narrow Analog Mobile Phone System
NIOSH ..... National Institute for Occupational Safety and Health
NIST ..... National Institute for Standards and Technology
NMT ..... Nordic Mobile Telephone
NVM ..... NonVolatile Memory

OEM ..... Original Equipment Manufacturer
OFDM ..... Orthogonal Frequency Division Multiplexing
OMS ..... Operational Method Sheet
OOB ..... Out Of Box
O/P ..... Output
OSHA ..... Occupational Safety and Health Administration

PA ..... Power Amplifier
PAF ..... Powerwave Amplifier Frame
PAR ..... Peak to Average Ration
PCB ..... Printed Circuit Board
PCMCIA ..... Personal Computer Memory Card International Association
PCN ..... Personal Communications Network
PCS ..... {Personal Communications Services
{Personal Communication System(s)
PDA ..... Personal Digital Assistant
PEP ..... Peak Envelope Power
PF ..... PicoFarads
PHS ..... Personal Handyphone System – Japan
PLC ..... Product Life Cycle
PLL ..... Phase Locked Loop
PM ..... {Phase Modulation
{Preventive Maintenance
PMR ..... Peak to Minimum Ratio
PO ..... Purchase Order
PPM ..... Parts Per Million
PSC ..... {PCS Single Channel
..... {Product Serialization Code
PSTN ..... Public Switched Telephone Network
PTI ..... Powerwave Technologies, Inc.
PTT ..... Push To Talk
PWAV ..... PowerWAVe

QA ..... Quality Assurance
QAM ..... Quadrature Amplitude Modulation

RBW ..... Resolution BandWidth
RF ..... Radio Frequency
RFI ..... Radio Frequency Interference
RFQ ..... Request For Quotation
RFS ..... RF Solutions
RFSU ..... RF Switching Unit
RGO ..... Return Goods Order
RH ..... Relative Humidity
RL ..... Return Loss
RMA ..... {Rack-Mounted Amplifier
{Return Material Authorization
RMP ..... Reliability Monitoring Plan (Procedure)
RMS ..... Root Mean Square
RSS ..... Root Sum Square

Rx ..... Receive, Receiver

SCHPA ..... Single-Channel High Power Amplifier
SCPA ..... Single Channel Power Amplifier
SIM ..... System Interface Module
SMA ..... SubMiniature Type A (coaxial connector)
SMT ..... Surface Mount Technology
SN ..... Serial Number
SO ..... System Outage
SOE ..... Sequence of Events
SW ..... SoftWare

TBC ..... To Be Confirmed
TBD ..... To Be Determined (To Be Defined)
TCXO ..... Temperature Controlled crystal Oscillator
TD ..... {Temperature Drift
..... {Temporary Deviation
TDMA ..... Time Division Multiple Access
TRU ..... Transmit Receive Unit
TRX ..... Transceiver (Transmit / Receiver) Unit
Tx ..... Transmit, Transmitter

UAI ..... Use As Is
UART ..... Universal Asynchronous Receiver Transmitter
UCL ..... Upper Control Limit
UCLR ..... Upper Control Limit for Range
UGL ..... Upper Guardband Limit
UL ..... Underwriters Laboratories
UMTS ..... Universal Mobile Telecommunications System
UNL ..... Unit Nominal Level
URG ..... Unit Reference Gain
USL ..... Upper Specification Limit
UUT ..... Unit Under Test

VADJ ..... Voltage ADJust (signal name frequently found on schematic or block diagrams)
VBW ..... Video BandWidth
VCO ..... Voltage Controlled Oscillator
VFWD ..... Voltage ForWarD (signal name frequently found on schematic or block diagrams)
VREFL ..... Voltage REFLected (signal name frequently found on schematic or block diagrams)
VSWR ..... Voltage Standing Wave Ratio
VVA ..... Voltage Variable Attenuator

WCDMA ..... Wideband Code Division Multiple Access

XMT ..... Transmit
XMTR ..... Transmitter

2. Revision History

Release Date	Revision Level	Comments
May 9, 2004	Rev. A.01	Initial Draft
September 10, 2004	Rev. B	Added Pilot Tone Procedure Updated Electrical Service Block Diagram Updated Torque Specs Added Fuse warning to beginning of installation procedures. Added DLNA VSWR setting procedure. Updated all drawings Added all specifications

Release Date	Revision Level	Comments
		Updated tables to new cabinet configuration Reorganized commissioning procedure Added wiring diagrams and lists Added General Site Survey Incorporated Nortel feedback

3. Introduction

3.1 Equipment Changes

Powerwave Technologies, Inc. reserves the right to make changes to the subject equipment, including but not necessarily limited to component substitution and circuits. Changes that impact this manual may subsequently be incorporated in later revisions.

3.2 System Components and Documents

The table below lists the model numbers and descriptions of the major components that comprise the S-New system and the document number of the manual related to each component.

Major S-New Components

Model	Manual	Description	Quantity per system
S-New	044-05156	Reference Manual	1
	044-05162	Maintenance & Troubleshooting Manual	
	044-05163	Site Preparation & Installation Manual	
	044-05164	Field Replaceable Units Manual	
G3S-1900-125-25	044-05122	MCPA	6
MCR21925-1-2	044-05121	Subrack	3
800-08826-001		Duplexer Low Noise Amplifier	6
1000075		Handle, Module Extractor	1
800-08824-001		System Interface Module	1
800-08829-201		Subrack Interface Module	3
930-00018-005*		148-Amp Rectifier	3
1000233*		Low Voltage Disconnect	1
920-00337-003		Back-Up Battery	4

* Manufactured by Cherokee International

4. Safety Concerns

4.1 Symbols - Warnings, Cautions, and Notes

Warnings, Cautions, and Notes are found throughout this manual where applicable. The associated icons are used to quickly identify a potential condition that could result in the consequences described below if precautions are not taken. Notes clarify and provide additional information to assist the user.

Warning This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.

Caution This caution symbol means *reader be careful*. In this situation, the user might do something that could result in equipment damage or loss of data.

Note This note symbol means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document. Procedures are not contained in notes.

4.2 Lifting Standards

The handling of the power amplifier cabinet and its subassemblies involves heavy lifting. Various methods of lifting must be employed to safely and properly install this equipment. The following web site addresses are provided as references to OSHA personnel lifting guidelines:

http://www.osha.gov/SLTC/etools/electricalcontractors/materials/heavy.html

http://www.cdc.gov/niosh/pdfs/94-110.pdf

Table xx describes the weight of major cabinet components, and other related factors.

Item	Weight		Lift Method	Vertical Distance (Min)		Vertical Distance (Max)		Horizontal Distance	
	lbs	kg		inches	mm	inches	mm	inches	mm
Cabinet	400	181.4	Mechanical	6	152				
Batteries	90	40.8	2 people	6	152	12	305	18	457
MCPA	52	23.6	1 person	15	381	60	1524	13	330
MCPA Subrack	38	17.2	1 person	15	381	60	1524	13	330
LVD	15	6.8	1 person	6	152	12	305	13	330
Rectifier	13.5	6.1	1 person	14	356	72	1829	13	330
DLNA	10	4.5	1 person	12	305	72	1829	13	330
SIM	3	1.4	1 person	72	1829	72	1829	13	330

Lifting of heavier modules may require two people in awkward work environments, whereas only one person might otherwise be able to safely lift the module. Be aware of the environmental impact on lifting and twisting while moving heavier materials.

4.2.1 Transporting Heavy Loads

Loads that are manually relocated via equipment carts or pallet jacks should be pushed rather than pulled, to reduce the strain and likelihood of injury to the body. Be aware of the obstacles along the planned transportation path, as well as inclines/declines along the planned path. Do not attempt to handle a load that cannot be easily managed; seek assistance from others in this circumstance.

The lifting bosses at the cabinet top are designed to support the full weight of the cabinet and all internal components when the weight is distributed equally to the lifting device.

4.3 General Safety

4.3.1 Cabinet

Wear gloves and other protective equipment during cabinet movement, lifting, and positioning. Be aware that the cabinet has many potential pinch points as a result of moving parts (such as doors), or the installation of additional equipment on-site (such as rectifiers and amplifiers). In addition, many of the support braces and access holes may have sharp or rough edges. Handle the equipment with care, to avoid personal injury.

Follow the procedures in this manual for site preparation and installation to ensure proper handling and securing of the cabinet. Failure to follow safe practices may result in equipment damage, personal injury or death.

4.3.2 Batteries

Wear protective clothing and non-absorbent / non-conductive gloves when handling the batteries. Do not touch both battery terminals simultaneously with any metal object/tool or body part, as this will cause bodily injury and damage the battery. The batteries are very heavy, and should be lifted by two people.

4.3.3 Power Plant

Only qualified electricians, certified to work on high voltages (176 to 264 VAC; 150 amp), should perform installation and maintenance to the cabinet and rectifier inputs. Failure to follow safe practices may result in equipment damage, personal injury or death.

Never remove bare DC power wires from equipment or allow bare DC voltage wires to dangle freely in the cabinet. Prior to removal of equipment that necessitates dangling of DC wires, disconnect DC power at the LVD and turn rectifiers off. Verify, with a voltmeter, that DC power is removed prior to disconnecting equipment.

4.3.4 Electronic Modules

Electronic modules should be turned off before removal, when an on/off switch is provided. For example, the amplifier module draws up to 26 amps of current with no RF energy applied. Failure to turn the amplifier module off before removal will cause arching between the amplifier module and the amplifier subrack, resulting in damage to both pieces of equipment.

RF energy should be turned off before removal or installation of RF cables. Failure to RF energy may result in equipment damage or personal injury.

Electronic modules should be turned off before removal or installation of electronic interconnecting cables.

5. Site Preparation

5.1 Site Survey

Powerwave Technologies recommends that site surveys be performed by qualified individuals or firms prior to equipment ordering or installation. Performing a detailed site survey will reduce or eliminate installation and turn-up delays caused by oversights. A general site survey form is provided in section 10. This form is commonly used by Powerwave field engineers and may be used as a guide. Pay particular attention to power plant capacity, air conditioning needs, floor space, and RF/DC cabling/breaker requirements.

5.2 Site Preparation

A civil / structural engineer must evaluate each planned installation site for:

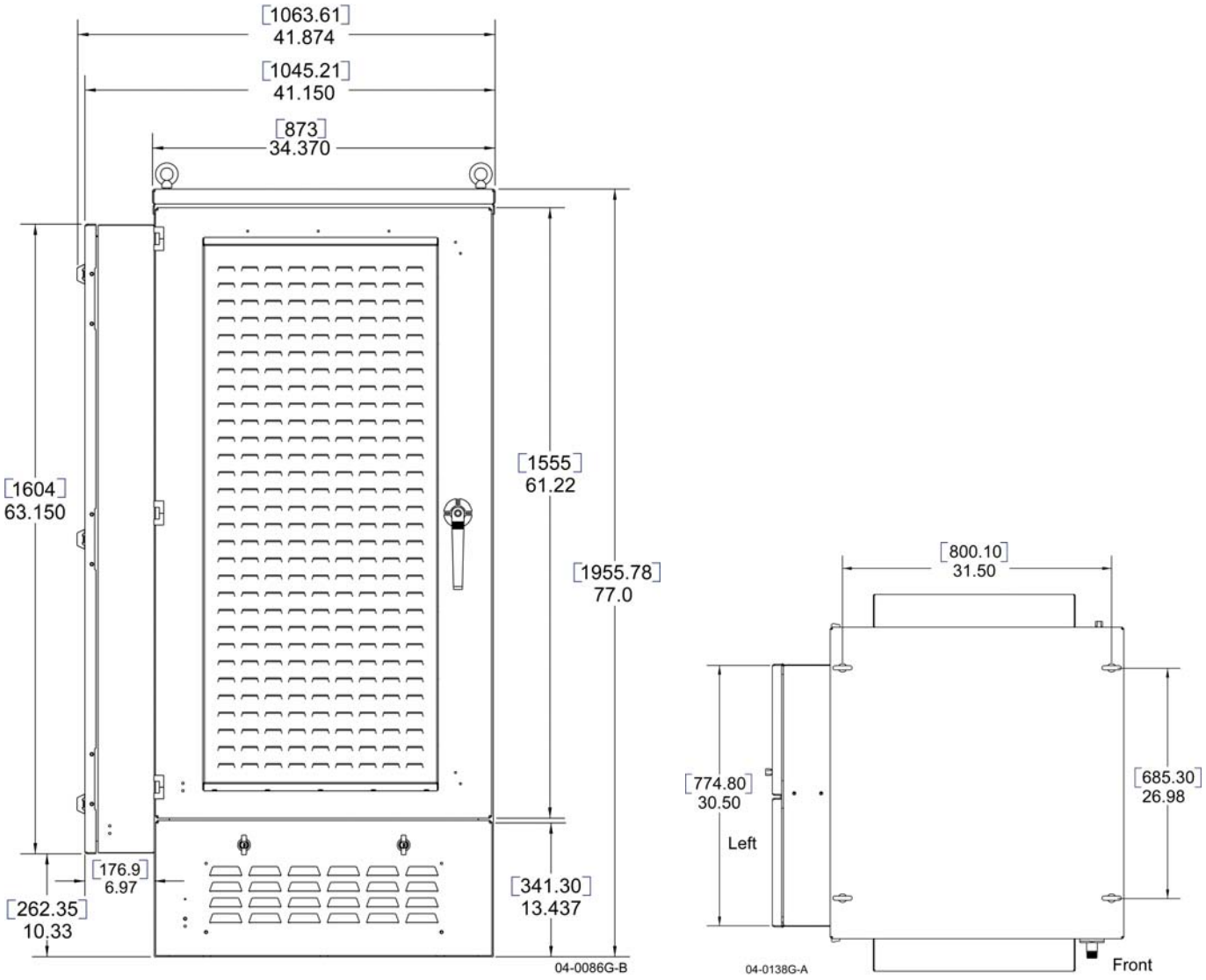
- Access
  - Installation procedures
  - Cable entrance
- Maintenance
- Load bearing ability
- Availability of AC power
- Earth grounding

Specific site preparation details are contained in the sections that follow.

5.2.1 Site Access

The installation site must provide reasonable access for the equipment cabinet from the delivery truck to final installation site. Access must be accounted for the mechanical lifting device needed to position the equipment at the site. The two tables that follow describe the installed and shipping dimensions and weights involved.

Direction	**Cabinet Dimensions, Doors closed**		**Cabinet Dimensions including minimum clearance for all doors fully opened once installed**		**Cabinet Dimensions including minimum clearance for pallet / site access**		**Secondary Equipment Dimensions including minimum clearance for pallet / site access (MCPAs, Batteries, etc.)**	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
Width:	42.5	1079.5	59	1498.6	51	1295.4	51	1295.4
Height:	79.5	2019.3	79.5	2019.3	88	2235.2	34.5	876.3
Depth:	44.2	1122.7	105	2667.0	51	1295.4	51	1295.4
Front			34.2	868.7				
Rear			34.2	868.7				
Left			24.75	628.7				



Front and Top Views

System Weights

	Individual Weight		System Shipping			System Installed	
Item	**lbs**	**kg**	**Qty**	**lbs**	**kg**	**lbs**	**kg**
Cabinet	400	181.439	1	400	181.439	400	181.439
MCPA shelf, Paragon	50	22.680	3	150	68.040	150	68.040
Rectifier Shelf	6.5	2.948	3	19.5	8.845	19.5	8.845
Alarm Assy	10	4.536	1	10	4.536	10	4.536
LVD	15	6.804	1	15	6.804	15	6.804
Cabling	20	9.072	1	20	9.072	20	9.072
Subtotal				614.5	278.735	**614.5**	**278.735**
Pallet	75	34.020	1	75	34.020		
Subtotal				**689.5**	**312.755**		
Batteries	90	40.824	4	360	163.295	360	163.295
MCPA, Paragon	55	24.948	6	330	149.687	330	149.687
Rectifiers	13.5	6.124	4	40.5	18.371	40.5	18.371
Subtotal				730.5	331.353	**730.5**	**331.353**
Pallet	50	22.680	1	50	22.680		
Subtotal				**780.5**	**354.032**		
Total				1470	666.788	**1345**	**610.088**

Note Civil engineering of the planned installation is required to establish load tolerances of rooftops that might be traversed, as well as the planned installation site. Extra precautions and/or materials may be necessary to transport the equipment to the installation site. Verify all doorways and elevators provide sufficient clearance.

5.2.2 Wind Loading

Wind resistance calculations are in accordance with the guidelines contained in Telecordia Technologies, Inc., Electronic Equipment Cabinets, Detailed Requirements Document GR-487-CORE, Issue 1, June 1996, and can be calculated using the following formula:

P = 0.05 WH
Where: P = force applied to cabinet, pounds
W = cabinet width, inches
H = cabinet height, inches

The calculated wind loading on the power amplifier cabinet is the following:

Form Factor	No	No	Yes	Yes	No	No	Yes	Yes
Parameter	In^2	m^2	In^2	m^2	In^2	m^2	In^2	m^2
Frontal Area	3378.75	2.17984	3378.75	2.17984	4488	2.89549	4488	2.89549
Side Area	3132.3	2.02084	3132.3	2.02084	4488	2.89549	4488	2.89549
	MPH		MPH		MPH		MPH	
Wind Velocity	150		150		100		100	
	lbs	N	lbs	N	lbs	N	lbs	N
Frontal Force	1340.2	5961.7	2683.1	11934.9	595.7	2649.6	1192.5	5304.4
Side Force	1242.5	5526.8	2487.4	11064.3	552.2	2456.4	1105.5	4917.5

When a form factor is accounted for, the worst case loading effectively doubles the loadings. The form factor depends on mounting location, topography and drag coefficient of the equipment. According to the UBC (Uniform Building Code), the form factor must be accounted for.

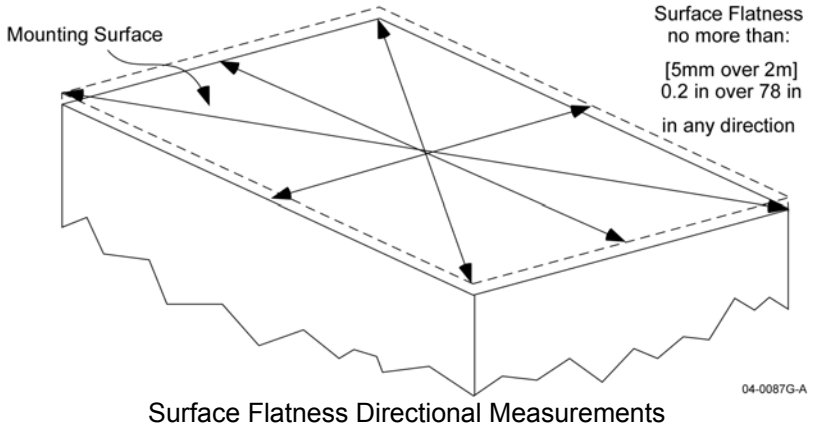
5.2.3 Mounting Surface Characteristics

5.2.3.1 Surface Resistance

Outdoor BTS cabinet In accordance with the cabinet weight, the minimum floor resistance must therefore be: 818.1 kg/m^2, 144.6 $lb./ft^2$. A load-spreading structure must be studied in compliance with the maximum floor resistance allowed by the supporting surface, and the type of mounting interface chosen to install the cabinets (I-Beams, customer frame, concrete pad, etc.).

5.2.3.2 Surface Flatness

The power amplifier cabinet must be installed on a level floor surface. The maximum tolerance is 5mm over 2m (~ 0.2'' over 78''). In other words, the vertical tolerance shall not exceed 5mm over a 2m horizontal length.



Surface Flatness Directional Measurements

If the installation surface does not respect this maximum tolerance, the cabinet (once installed) may be 'twisted' and cabinet water-tightness along the doors is not guaranteed.

Levelness of the floor is determined with a magnetic level including a protractor vial or wedge. All three axis must be verified; depth, width and diagonal.

5.2.3.3 Seismic Rating

The cabinet is designed to withstand Zone 4 seismic activity, with appropriate mounting hardware and proper installation.

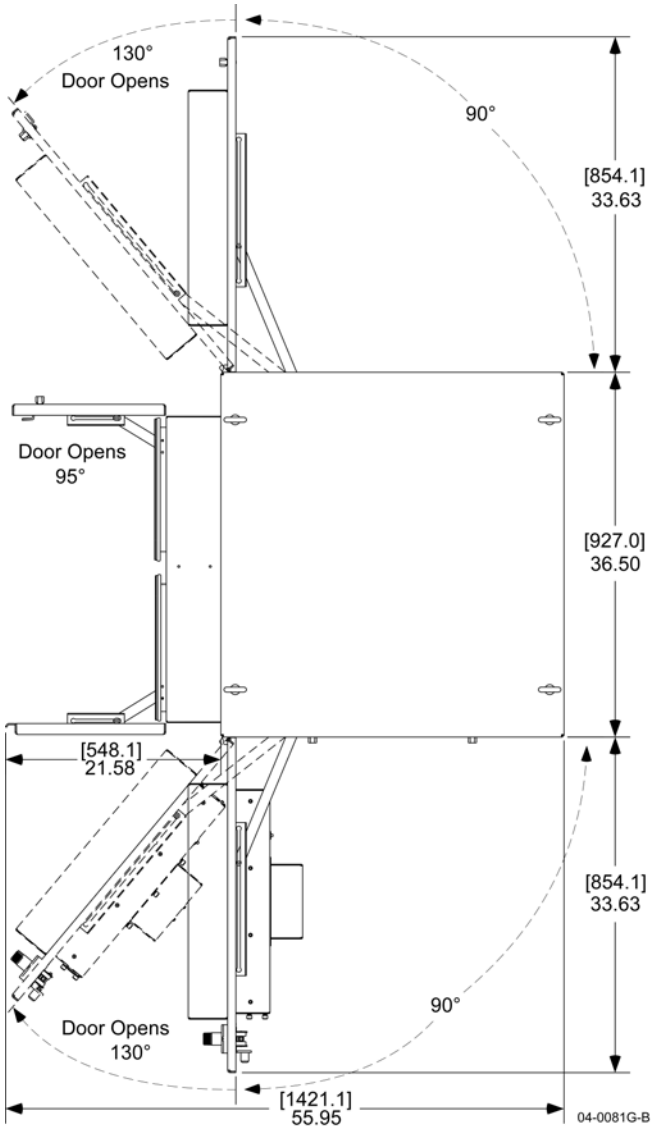
5.2.4 Site Dimensioning

Each site may be constituted from 1 up to 2 BTS cabinets (with CBCF), plus one optional outdoor battery cabinet for each BTS cabinet with 1 power amplifier cabinet.

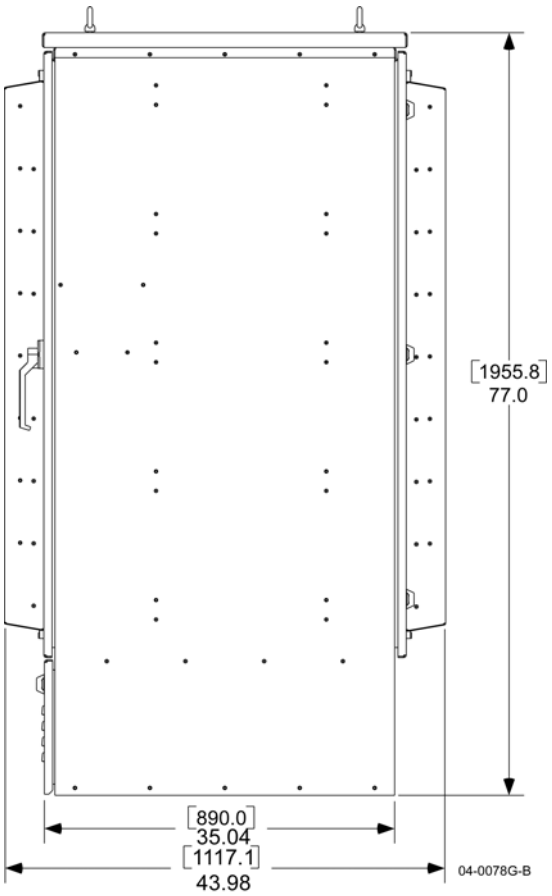
The criteria governing the size of the site are:

- The cabinet dimension and the distance constraint,
- Relative positions of cabinets,
- Input constraint of coaxial cables in the cabinet,
- Cabinets orientation in exterior site, with respect to exposure to winds / sun and possible nuisance caused to the neighborhood (noise).

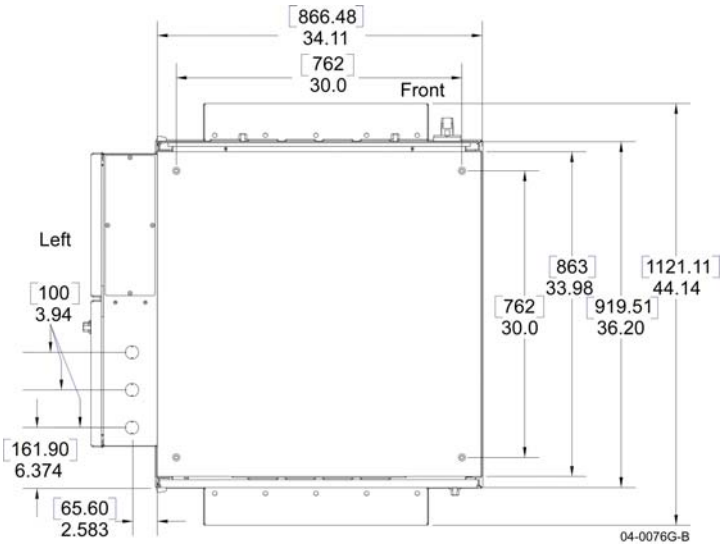
Direction	**Cabinet Dimensions, Doors closed**		**Cabinet Dimensions including minimum clearance for all doors fully opened once installed**	
	Inches	mm	Inches	mm
Width:	42.5	1079.5	59	1498.6
Height:	79.5	2019.3	79.5	2019.3
Depth:	44.2	1122.7	105	2667.0
Front			34.2	868.7
Rear			34.2	868.7
Left			24.75	628.7



Top View of Cabinet

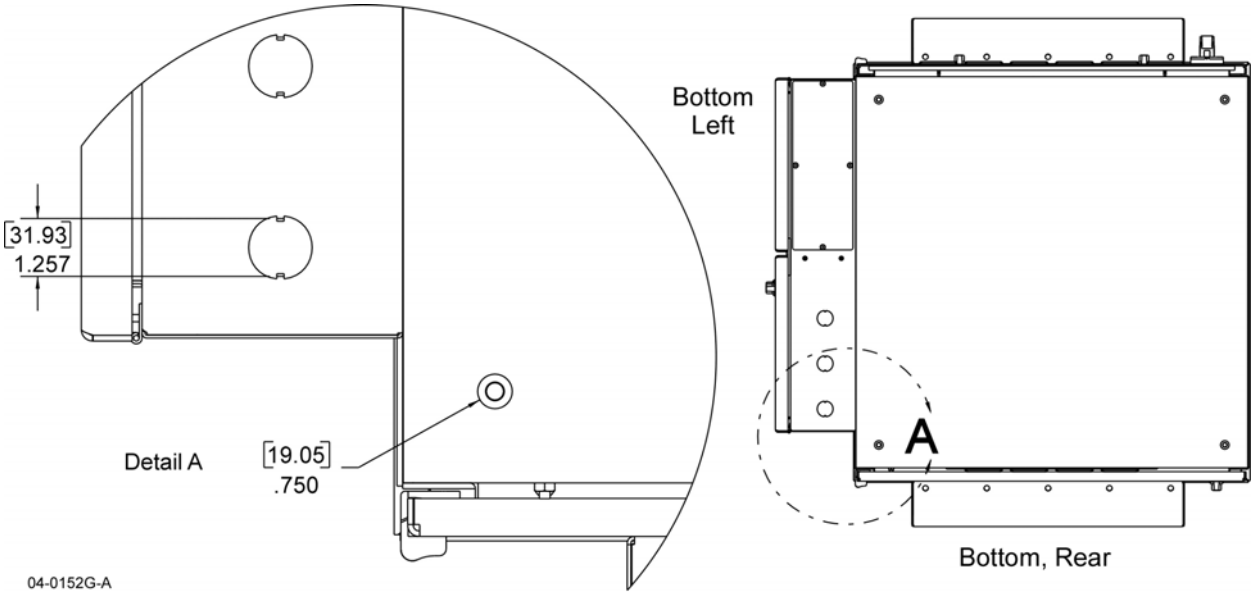


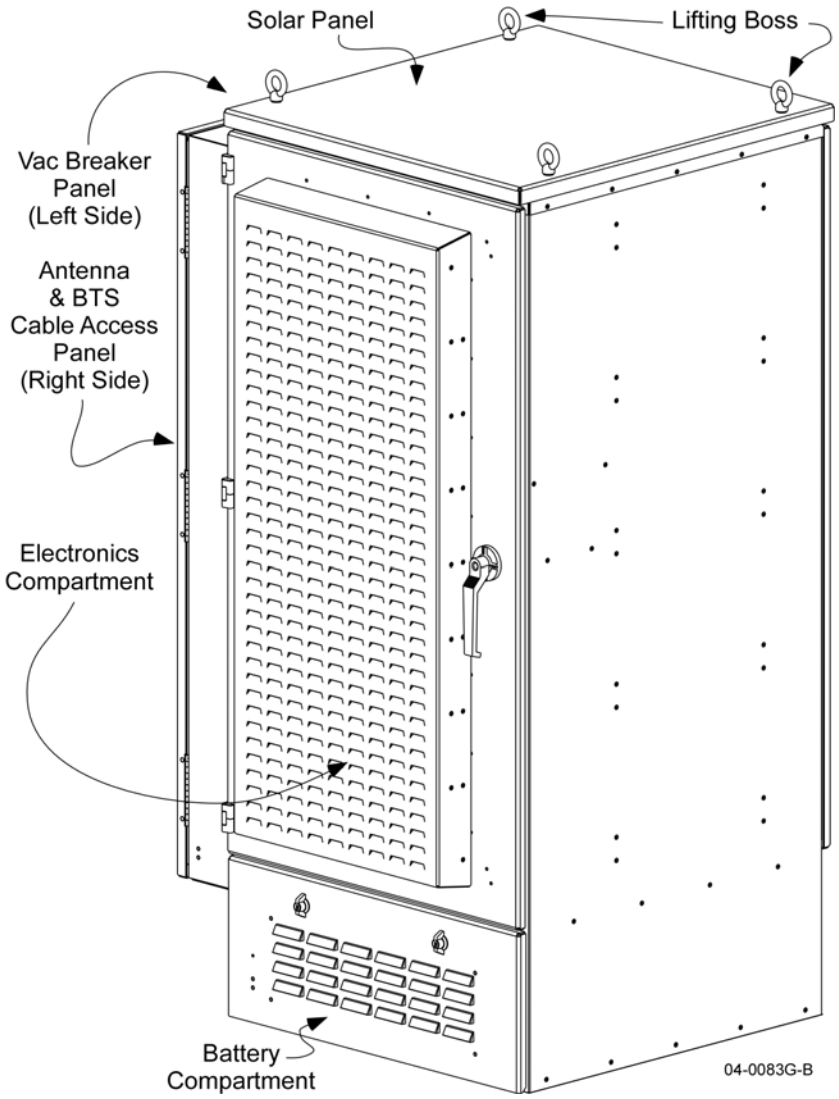
Right Side



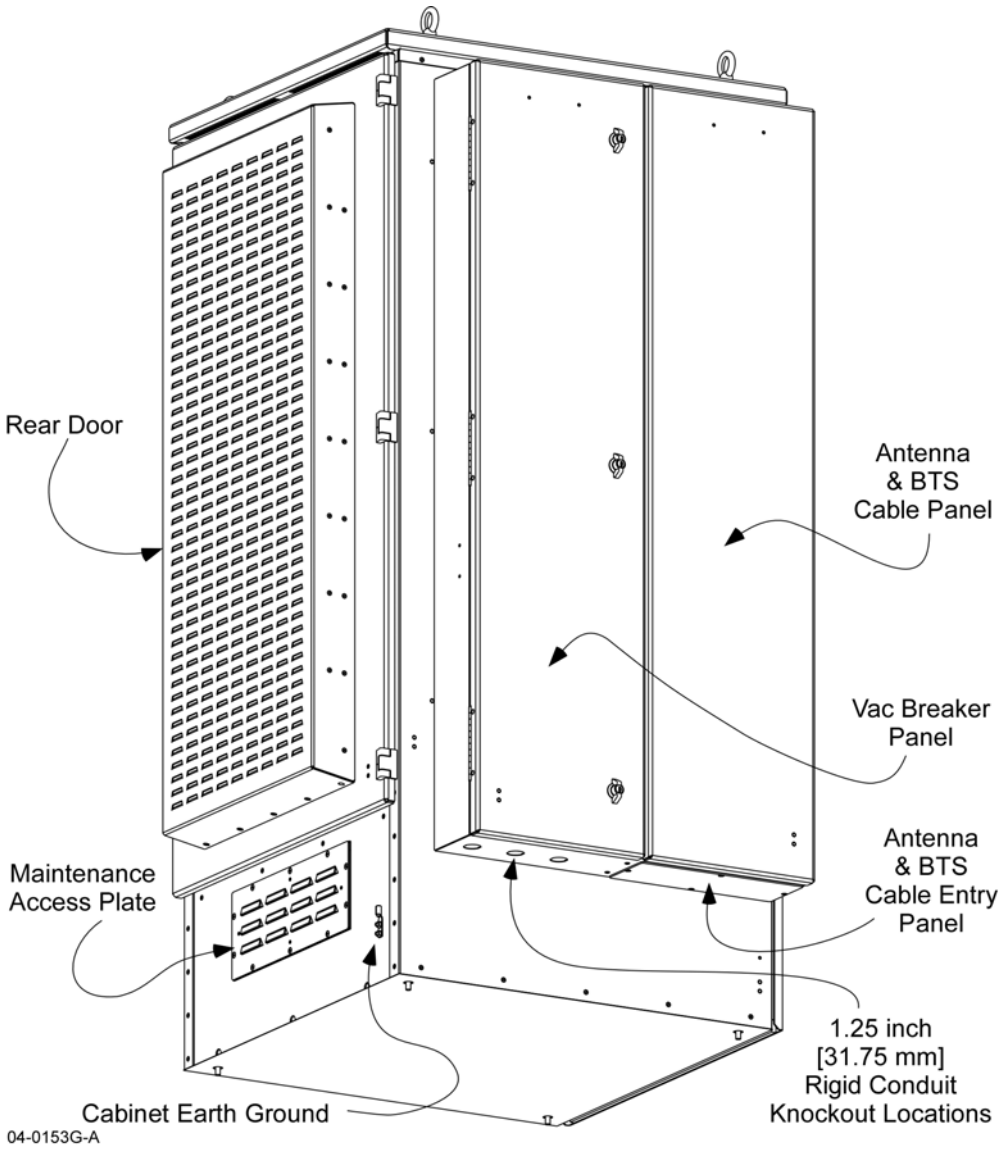
Cabinet Bottom

Full access to the cabinet's front, rear and left sides is required for routine maintenance. Cabling access panels are available on the Left, Right, and Rear sides of the cabinet. Position the cabinet for appropriate equipment access (primarily front and left) and the desired cable access.





Front and Right Side View



Back and Left Side View

5.3 Electrical Service

The power amplifier cabinet provides AC line conditioning and surge suppression on the primary AC input to the +27 Vdc power source. All electrical service should be installed in accordance with established electrical guidelines (i.e. the National Electric Code), any applicable state or local codes, and good engineering practice. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter sites to lightning. Lightning arrestors are provided in the service entrance. Straight, short ground runs are recommended. The electrical service and cabinet frame must be well grounded.

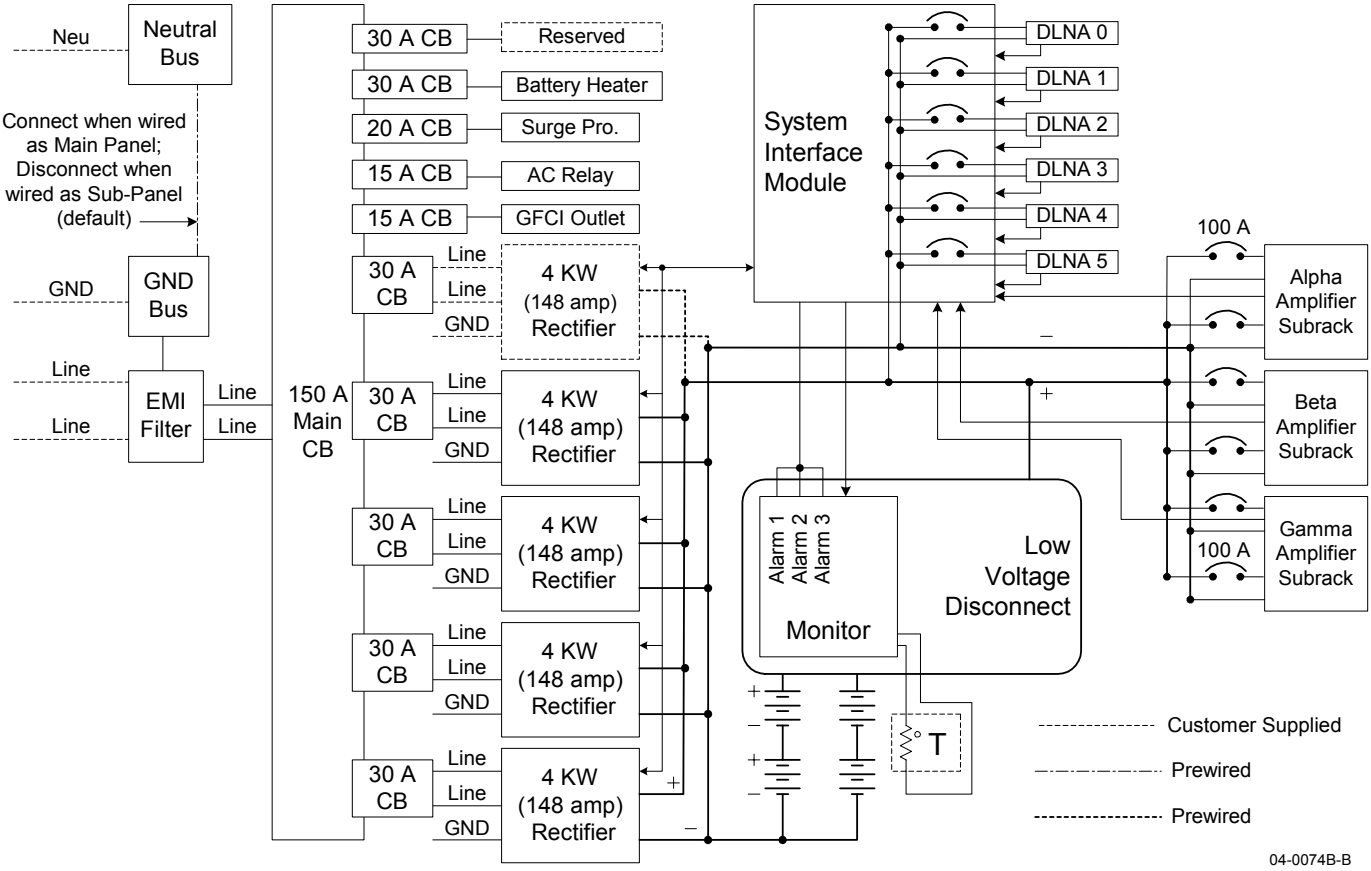
The cabinet must be provided with 150 amps of AC service. The rectifiers operate at 220 VAC (180 to 264 VAC), single phase, 47 to 63 Hz; all other AC modules operate at 110 VAC. The load center is equipped with a master switch. Individual circuit breakers are installed for each major AC circuit. Powerwave recommends the AC panel be connected with 2/0 [68 mm^2] cable from the service provider. The input EMI filter clamp connectors will accept 6 AWG [14 mm^2] to 4/0 [107 mm^2] cable.

Sample of Cable Ratings (0 to 2000V)

AWG or MCM	Copper						Aluminum					
	3 Cond. In Raceway		Single Conductor In Free Air				3 Cond. In Raceway		Single Conductor In Free Air			
	90 °C	110 °C	90 °C	110 °C	125 °C	200 °C	90 °C	110 °C	90 °C	110 °C	125 °C	200 °C
6	70	80	100	120	125	135	55	60	80	95	100	105
4	95	105	135	160	170	180	75	80	105	125	135	140
2	125	135	185	210	225	240	100	105	140	165	175	185
1	145	160	215	245	265	280	110	125	165	190	205	220
0	165	190	250	285	305	325	130	150	190	220	240	255
2/0	190	215	290	330	355	370	145	170	220	255	275	290
3/0	215	245	335	385	410	430	170	195	255	300	320	335
4/0	250	275	390	445	475	510	195	215	300	345	370	400
250	275	315	440	495	530	--	220	250	330	385	415	--

Based on ambient temperature of 30 °C (86 °F) 100% Load Factor

Source: Industrial Electric Wire & Cable Inc., Technical Guide Vol. 4M 11/99, Table III Suggested Ampacities - All Types of Insulations; Based on National Electric Code



The cabinet is equipped with four 148 amp 220 VAC to +27 VDC rectifiers, producing a combined output of up to 592 DC amps. The amplifiers and batteries represent the major current consumers of the power plant. The power amplifier cabinet will consume 12,000 AC watts under full load.

Each amplifier has its own circuit breaker, so a failure in one does not shut off the whole installation. The circuit breakers are capable of handling the anticipated inrush current and are sized at 100 amps. Each amplifier is wired with 4AWG DC cable rated for a minimum of 90º C. A separate 100 amp breaker per amplifier is also installed in the Subrack Interface Module to prevent accidental DC shorts when an amplifier subrack module requires replacement.

A typical 3-sector site utilizes three MCR21925-1-2 amplifier subracks, each housing up to two G3S-1900 amplifiers. The power plant is able to support the current required by this equipment, plus the remaining cabinet equipment.

According to the laws of probability used to formulate Erlang tables, rarely are all channels transmitting at the same time. We can use Erlang tables to predict typical maximum current usage. The table below describes the amplifier current load for a 3-sector (70%), 2-sector (80%), omni (90%), and typical (100%) site.

A battery backup system is installed to aid in protecting sites that experience brownout conditions or generator switchovers. Adding this equipment should eliminate the need for site visits by technicians after brownouts or power outages. Battery backup systems also provide excellent DC filtering as a side benefit. Each battery is rated for 105 Ah of backup power.

Note This equipment has been tested and found to be in compliance with regulatory requirements when operated at rated power levels provided the input voltage to the equipment does not fall below 26 volts. Operation below 26 volts may cause certain emissions to exceed regulatory requirements for which the operator of the equipment is solely responsible.

Averaged DC Current Load (Amperes; 125 Watt)
(typical, based on % of output power @ 26 Vdc)

Amplifier Power	No. Of Amplifiers	3-Sector (70%) Averaged Current	2-Sector (80%) Averaged Current	1-Sector (90%) Averaged Current	100% Typical
125	6	283			311
125	4	189	197		207
125	2	94	99	102	104
125	1	47	49	51	52

5.3.1 Earth Ground

The cabinet frame must be connected to Earth ground with 6 AWG [16mm^2] or larger cable. The cable must be kept as short as possible.

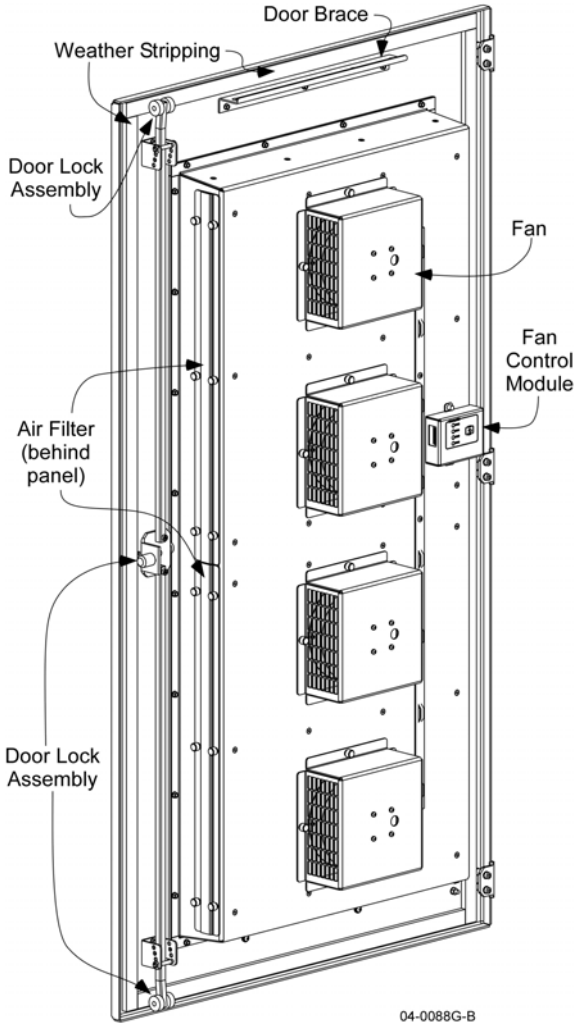
The electrician determines VAC panel Earth Ground using established electrical guidelines (i.e. the National Electric Code), any applicable state or local codes, and good engineering practice. Care must be taken in identifying whether the interface is for a primary or secondary panel.

5.4 Cooling Requirements

The cabinet provides for forced outside air-cooling. Air is drawn in from the front of the cabinet through a front panel filters and four temperature regulated fan assemblies. The outside air is then drawn through each of the amplifier and rectifier assemblies via module-installed fans. The modular heated air is force vented out via the cabinet rear door.

The System Interface Module (SIM) determines the number of door fans operating (and their speed). The SIM monitors the operating temperature of the various components in the system. A door mounted fan control module display cabinet fan alarms and provides a maintenance test switch. Fan control deactivates fan(s), as appropriate, during cold weather.

Note Blank panels must be installed in the space where modules are not field installed. Failure to install blank panels for vacant modules will result in improper airflow and ventilation of cabinet heat, which may cause the equipment to shut-down prematurely.



Each G3S-1900-125-25 amplifier generates up to 4,364 BTUs typical of heat at full power. This Powerwave equipment cabinet is designed to operate at temperatures below -30° C to + 50° C (-22° F to + 122° F) Ambient.

In keeping with paragraph 5.3, the table below describes the amplifier heat load for a 3-sector (70%), 2-sector (80%), omni (90%), and typical (100%) site. Perform a site survey to determine actual air conditioning needs.

Averaged Heat Loading (British Thermal Units/hr; 125 Watt)
(typical, based on % of output power @ 26 Vdc)

Amplifier Power	No. Of Amplifiers	3-Sector (70%) Averaged BTU's	2-Sector (80%) Averaged BTU's	1-Sector (90%) Averaged BTU's	100% Typical
125	6	24,253			26,182
125	4	16,169	16,806		17,455
125	2	8,084	8,403	8,648	8,727
125	1	4,042	4,202	4,324	4,364

Caution If the cabinet must be installed in a space limited environment, 12 inches (305 mm) of unobstructed space must remain behind the cabinet for proper heat dissipation.

If the cabinet must be installed in a space limited environment, 12 inches (305 mm) of unobstructed space must remain behind the cabinet for proper heat dissipation.

5.5 Unpacking and Inspection

This equipment has been operated, tested, and calibrated at the factory. Only in the event of severe shocks or other mistreatment should any substantial readjustment be required. Carefully unpack each piece of equipment after it has reached the installation site and is approximately in place. Carefully open the several amplifier system containers and remove the contents. Inventory all items to ensure all needed materials are delivered. Retain all packing material that can be reassembled in the event that the equipment must be returned to the factory.

Caution Exercise care in handling equipment during inspection to prevent damage caused by rough or careless handling. Some components are heavy. Follow the guidelines set fourth in section 4.2 when lifting heavy components.

Visually inspect the cabinet and all modules for damage that may have occurred during shipment. Check for evidence of water damage, bent or warped chassis, loose screws or nuts, or extraneous packing material in the connectors or fans. Inspect male connectors on modules and harnesses for bent connector pins. If the equipment is damaged, a claim should be filed with the carrier once the extent of any damage is assessed. We cannot stress too strongly the importance of IMMEDIATE careful inspection of the equipment and the subsequent IMMEDIATE filing of the necessary claims against the carrier if necessary. If possible, inspect the equipment in the presence of the delivery person. If the equipment is damaged, the carrier is your first area of recourse. If the equipment is damaged and must be returned to the factory, write or phone for a return authorization. Powerwave may not accept returns without a return authorization. Claims for loss or damage may not be withheld from any payment to Powerwave, nor may any payment due be withheld pending the outcome thereof. WE CANNOT GUARANTEE THE FREIGHT CARRIER'S PERFORMANCE.

5.6 Materials

The following is a list of materials required, but not supplied. The list is not limited to these items, as each installation is inherently unique, additional materials may be required.

Materials	Where Used	Approximate Length (each)	Quantity per Cabinet
*2/0 AWG (90º C min.) Power Cable	From cabinet AC input to host distribution box	As needed	3
6 AWG Green Ground Cable	Exterior Cabinet Earth Gnd	8 feet	1
Tie wraps (8 inch) or wax cord	Cable dressing		As needed
¾ in [20 mm] diameter bolt hardware for appropriate mounting surface	Securing cabinet to pad or platform (length and type determined by installation substrate)		4
¾ [20 mm]Flat Washer	Securing cabinet		4
¾ [20 mm] Lock Washer	Securing cabinet		4

Materials	Where Used	Approximate Length (each)	Quantity per Cabinet
3 in [76 mm] Fender Washer for ¾ hardware	Securing cabinet		4
3 in [76 mm] Conduit	Inter-cabinet cabling	As needed	3
1.25 in [38 mm] Conduit	AC panel cabling	As needed	1
0.5 in. foam semi-rigid coax (7/16 DIN Male to that used at the hatch plate)	Cabinet output to antenna foam jumper	As needed	6
LMR-240 coax or equivalent (N-Type Male to that used at the base station output)	Base station primary and diversity receive input from the power amplifier cabinet output	Supplied by Nortel	6 (8x8x8) 12 (16x16)
LMR-240 coax or equivalent (N-Type Male to that used at the base station output)	Base station transmit output to the power amplifier cabinet input	Supplied by Nortel	3 (8x8x8) 6 (16x16x16)
Nolox	Battery terminals to prevent corrosion		1 tube
Electrical Tape (3 colors)	Cable marking	As needed	

*Refer to section 5.3 for additional guidelines

The following is a list of tools required, but not supplied. The list is not limited to these items, as each installation is inherently unique, additional tools may be required.

Tools Needed	Where Used
7/16 Thin Wall Nut Driver	Various hardware points (one supplied with cabinet)
T-27 Torx Driver	Access Panel Doors (one supplied with cabinet)
TBD Allen Wrench	Securing AC mains cables
#6 Terminal crimp tool	Earth ground Power cables
Electricians knife	Earth ground
Cable cutters	Power cables
Roto-hammer	Mounting equipment cabinet
¾ inch concrete drill bit	Mounting equipment cabinet
Softjaw pliers	Tightening and loosening N connectors
5/16 open end wrench	Tightening and loosening SMA connectors
7/16 socket wrench	Tightening and loosening ground terminals
3/8 slotted screwdriver	Securing power cables
3/16 slotted screwdriver	Securing alarm cables
#2 Phillips 6 inches long	Mounting subracks in equipment rack
#3 Phillips 6 inches long	Mounting subracks in equipment rack
Wire cutters	Cut tie wraps
Tuning wand or jewelers' screwdriver	Setting gain on variable attenuator
Digital power meter (up to 500 watts, 800 to 2000 MHz)	Setting output power levels (Agilent E4418B or equivalent)
Spectrum analyzer (800 to 2000 MHz)	System performance checks
Dummy load (minimum 500 watts, 800 to 2000 MHz)	Setting output power levels
10, 20, 30 dB 20 watt (min.) attenuators	Spectrum analysis
Digital volt-ohm meter	Verify power
Digital clamp ammeter	Verify power
Level	Mounting equipment rack

The following is a list of supplied materials. Powerwave reserves the right to make changes to this list without notice.

Item Number	Item Description	Qty
800-08823-101	FA, S-NEW,S16-16-16 HP (PARAGON)	Ref
100-08417-001	Blank Panel 1.75 X 19.00	2
100-08417-002	Blank Panel 3.5 X 19.00	1
800-09499-001	Cabinet, Outdoor, w/Fans, 34x34x77	1
MCR21925-1-2	2-Way, 19" Pseudo Front Arsenal 1900	3
800-08829-201	SA, Cable Module, Front Access, 2U, Arsenal, Common	3
800-08824-001	SA, System Interface Module, SNEW	1
800-09500-001	Shelf, Cherokee Rectifier, 1-Way, 4KW	4
800-08826-001	SA, DLNA, 2U, S-NEW	6
100-09063-001	Cover, Single Bussbar	2
100-09064-001	Cover, Dual Bussbar	1
100-09093-001	Panel, 3U, Blank	2
100-09487-001	Panel, 1U, Blank	1
700-09345-001	Cable Assy, 2/0 AWG, ¼ Lug to ¼ Lug	2
700-09115-001	Cable Assy, Wire, Dsub15P To Dsub15S, Fan Sense-SIM	1
700-09116-001	Cable Assy, Wire, 2X2 To DC Lug, Fan Power	1
700-09121-002	Cable Assy, Wire, 2X9 To 4 2X2, Fan Extension Interface	1
800-09088-001	Assembly, Fan Interface, SNEW	1
920-00940-007	Lightning Surge Protector, 1850-1990MHz, 300W, 7/16 DIN-F To N-F, 1/4 Wave Type	6
1000233	Battery Back Up Connection Unit, 20VDC-30VDC, 600A Max, 2 Connections (LVD)	1
920-00337-003	Battery, Valve Regulated Lead Acid 12V, 105AH, 6 Cells	4
G3S-1900-125-25	MCPA, 1930 to 1990 MHz, 125W Paragon	6

5.7 Torque Specifications

Powerwave Torque Specifications

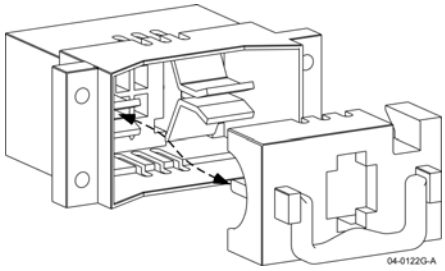
Size	**Tightening Torque (in Inch-pounds)**
Battery Terminals	120
Metal machine screws	
2-56	2.5 to 3.5
2-56 (W / Loctite)	3.0 to 4.0
3-48	4 to 6
4-40	5.5 to 8
4-40 (transistor mounting screws)	5 to 6
6-32	8 to 13
8-32	20 to 24
10-32	32 to 40
1/4-20	70 to 80
5/16-18	140 to 160
Coaxial connectors	
SMA	5 to 6
Type “N”	12 to 15
7/16 DIN	220 to 230

Note Accurate torque of screws is attained from proper use of torque drivers. Torque drivers must NOT be double clicked. Double clicking of torque drivers will increase the torque on screws.

6. Installation Instructions

The Powerwave equipment is designed for installation in a ventilated location. Section 5.6 sets forth the various materials and tools that the installer will need, but are not supplied by Powerwave. Additional materials may be necessary on a case-by-case basis.

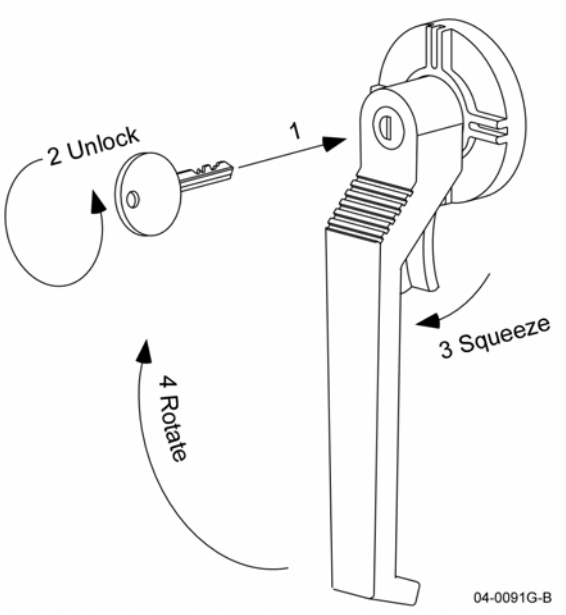
Warning Before making any electrical connections, remove the two 600 amp fuses from the LVD front panel. When the cabinet is shipped without the batteries installed, the battery leads may short against the cabinet if the fuses are not removed when the electrical service is connected. As a result, the equipment may be damaged or personal injury is possible.



To open the cabinet, use the key provided to unlock the appropriate lock. Refer to the diagram following the instruction.

Caution The cabinet cannot be opened without a 7/16 inch thin walled nut driver. Do not close the cabinet door while the nut driver is inside the cabinet.

1. Insert the key in the door handle.
2. Use the right hand to turn the key counter-clockwise until the end-stop is reached.
3. Use the left hand to squeeze the door handle trigger.
4. Use the left hand to rotate the door handle clockwise, 90 degrees.
5. Release the key and pull the door open.



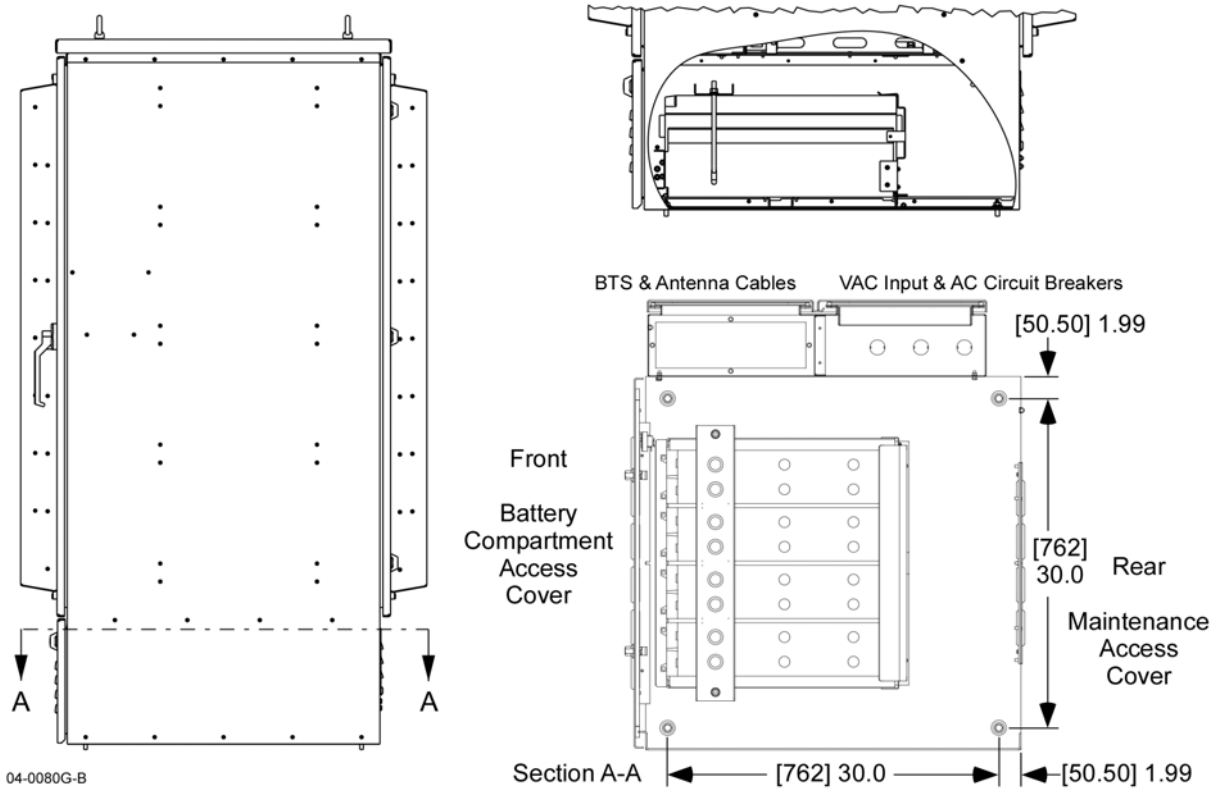
6.1 Cabinet Installation

To install the Powerwave equipment, proceed as follows:

Caution The cabinet, as shipped from the factory, weighs approximately 730 lbs [331 kg] without batteries and amplifiers installed (1090 lbs [495 kg] with batteries installed). Fully loaded, the cabinet weighs approximately 1470 lbs [667 kg].

1. Verify rear panel clearance, particularly, and remaining side clearances are sufficient for installation and service of the equipment.

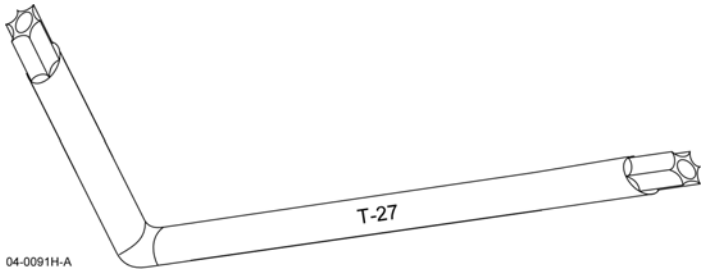
2. Use the rubber template shipped with the cabinet. Mark the four drill holes on the floor where the mounting bolts will be installed.
3. Remove the whole template and drill the four holes. Refer to the bolt manufacturers' instructions for hole depth and diameter.



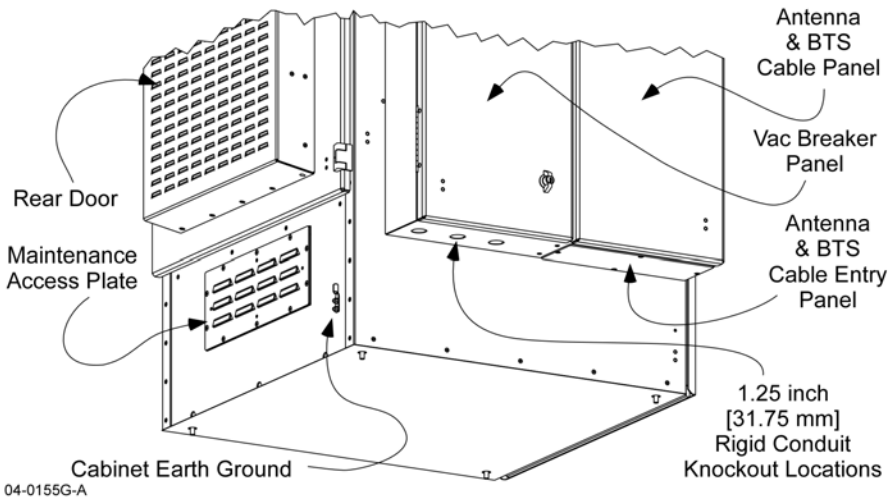
Bottom Panel View

4. Clean the mounting surface area. Ensure it is free dust and debris.
5. Place the floor anchor in the hole.
6. Set the mounting template on the mounting surface. Align the drill hole pattern with the drilled holes.

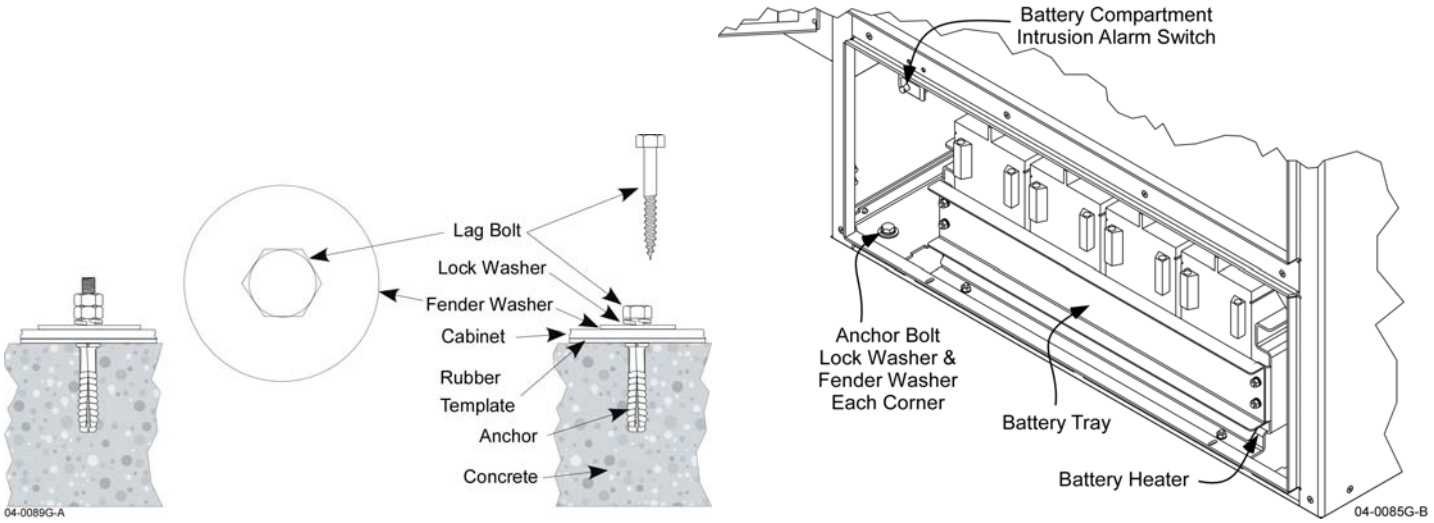
Note The special T-27 Torx driver (supplied) is used to remove the cable maintenance access panel.



7. Use the T-27 Torx driver (supplied) to remove the Torx screws on the rear maintenance access panel. Place the loose screws in a safe place, as they will be re-installed later. Removing this plate will aide in aligning the cabinet and provide access to the mounting bolt locations.



8. Use the 7/16 nut driver (supplied) to unlock the battery door on the front of the cabinet. Remove the battery door by tilting the top down then pull the door away from the cabinet. Set the door aside, it will be re-installed later. Removing this door will aide in aligning the cabinet and provide access to the mounting bolt locations.
9. Using a proper lifting device, set the cabinet in the planned location.



Frame Mounting

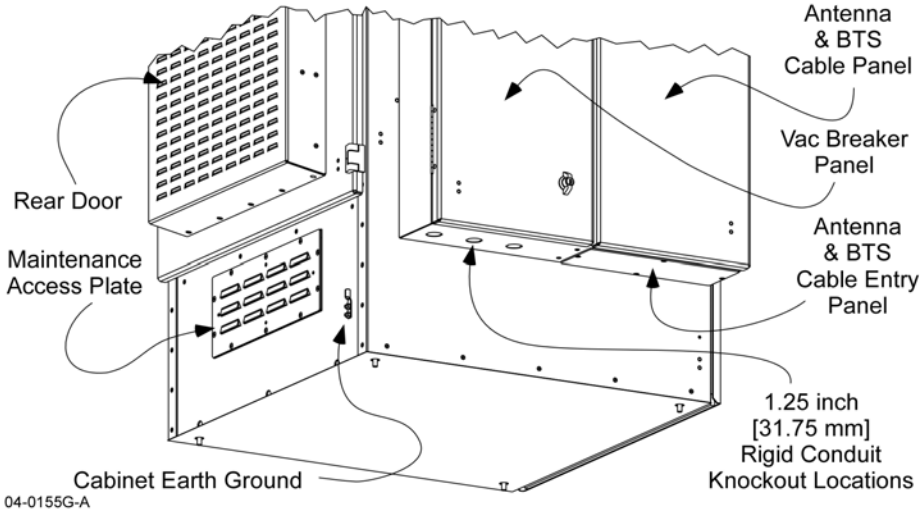
10. Secure the frame in place with four bolts, four fender washers, and four lock washers.

    If the anchor bolt presents a threaded shaft through the cabinet base, use two nuts on each bolt. In this scenario, enough bolt thread should protrude past the second nut to accommodate a third nut (do not install three nuts).

6.2 Inter-cabinet and AC Panel Mechanical Interface

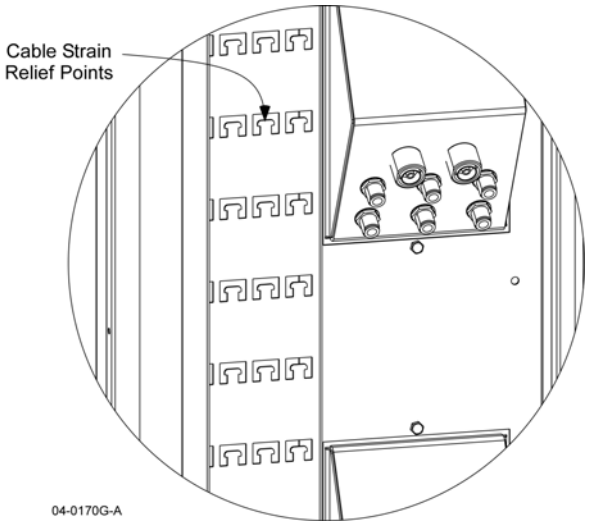
6.2.1 Inter-cabinet Mechanical Interface

1. Install conduit, with appropriate weather seals, between the BTS cabinet and the power amplifier cabinet.

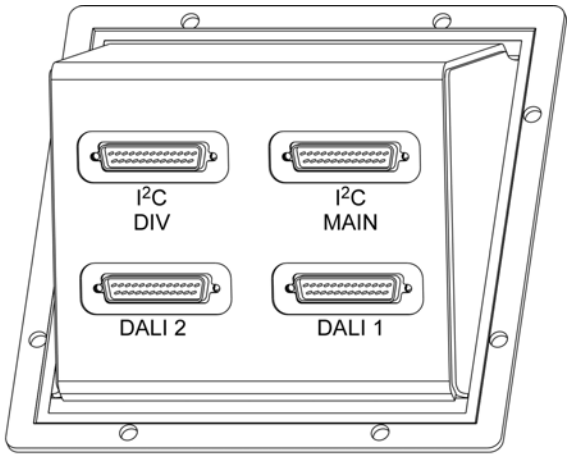


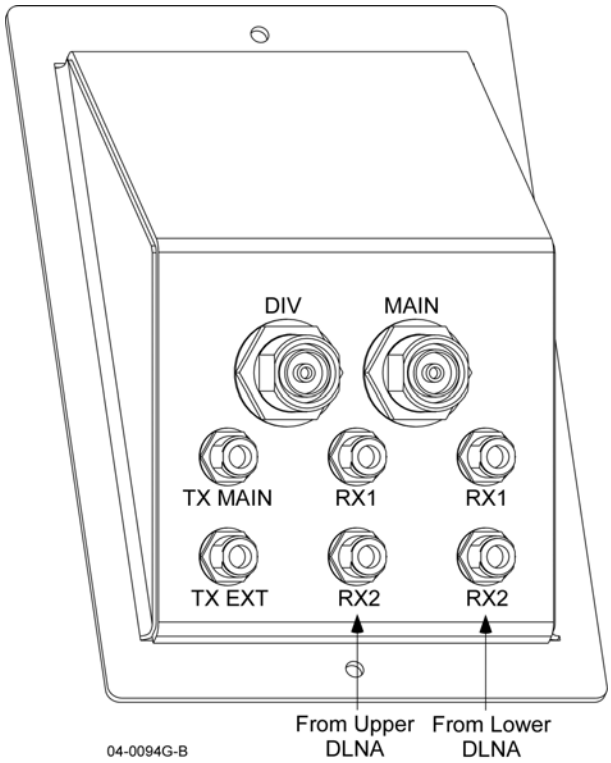
Conduit provides the best protection against insect, rodent, water, and dirt intrusion to the cabinet.

2. Label the inter-cabinet RF and data cables with colored electricians tape for sector ID, TX, RX primary, RX diversity, DALI1, DALI2, I^2C Main, and I^2C Diversity.
3. Route the BTS cables through the conduit, into the antenna / BTS panel of on the left side of the cabinet. The BTS and antenna cables can be dressed along the left side of the panel with tie wraps or wax cord on the service points provided.



a. The data cable interface is along the Left side of the cabinet at the top.

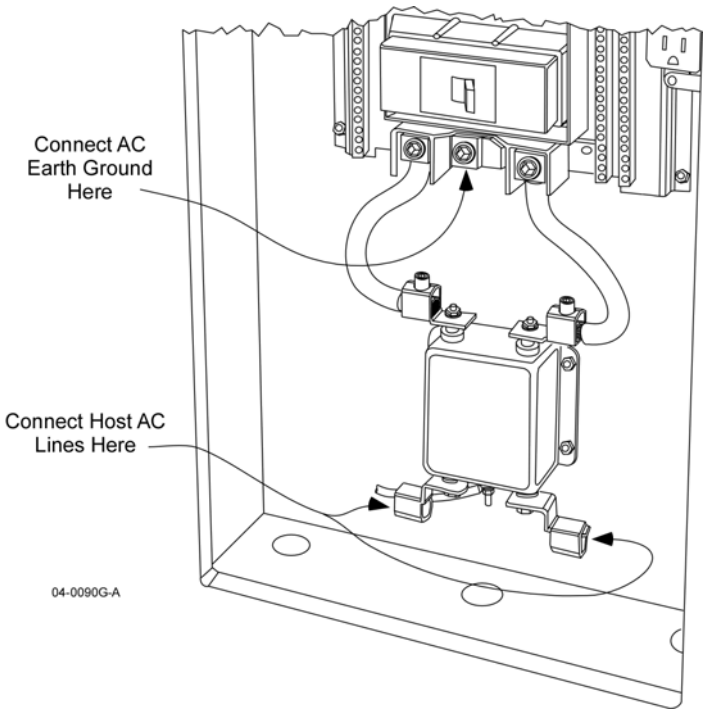




b. The BTS RF and antenna RF connections are along the Left side of the cabinet.

6.2.2 AC Power Connections

1. Unlock the circuit breaker panel door on the left side of the cabinet using the key (provided). Open the door.
2. With a #2 Philips screwdriver, remove the four Philips head machine screws and accompanying washers from the corners of the AC panel faceplate. Place the loose screws in a safe place, as they will be re-installed later.
3. Remove the AC panel faceplate. This provides access to install the host AC mains cables.
4. Determine the best conduit input at the bottom of the AC panel. Punch the appropriate knock-out.
5. Attach conduit with a weatherproof fitting to the bottom of the AC input panel on the left side of the cabinet.
6. Turn the 150 amp input circuit breaker to Off.



Warning A licensed electrician must install AC main cables.

Refer to the diagram in section 5.3.

When the cabinet is installed as the main electrical panel coming from the service provider, the Ground Bus and the Neutral Bus should be grounded together.

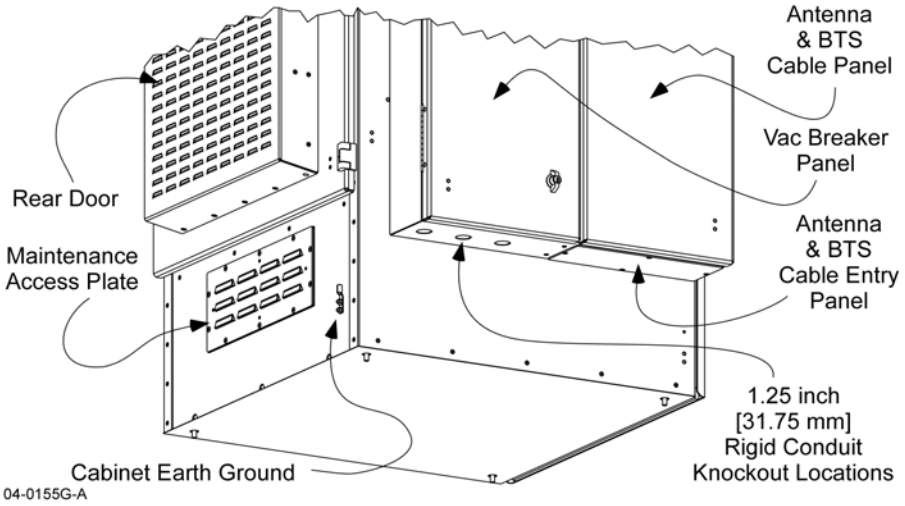
When the cabinet is installed as a sub-electrical panel coming from the main electrical panel, the Ground Bus and the Neutral Bus should be disconnected from each other (default).

7. Connect the 2/0 [68 mm^2] AC Line power cables to the EMI filter Line inputs as depicted in the illustration above.
8. Connect the 2/0 [68 mm^2] AC ground cable as depicted in the illustration above.
9. Connect the 2/0 [68 mm2] AC neutral cable to the neutral bus.
10. Connect the AC power cables to the power source.
11. With a multimeter, verify the input voltage is correct.
12. Install the AC panel faceplate.
13. With a #2 Philips screwdriver, install the four Philips head machine screws and accompanying washers into the corners of the AC panel faceplate.

6.2.3 Earth Grounding

The power amplifier cabinet must be well grounded. Both the AC Earth ground and the external cabinet Earth ground must be connected to the site's Earth ground. The AC Earth ground is connected in section 6.2.2.

1. Remove two nuts securing the 6 AWG terminal lug from the back of the cabinet with 7/16 inch socket wrench.



2. Strip sufficient insulation from the 6 AWG ground wire for insertion into the terminal lug and spread Nolox on the bare wires.
3. Insert the 6 AWG wire into the ground terminal and crimp the wire to the terminal with a 6 AWG crimp tool.
4. Spread Nolox on the back of the ground terminal.
5. Install the 6 AWG terminal ground lug on the back of the cabinet with two nuts and tighten using the 7/16 inch socket wrench.

6.2.4 RF Connections

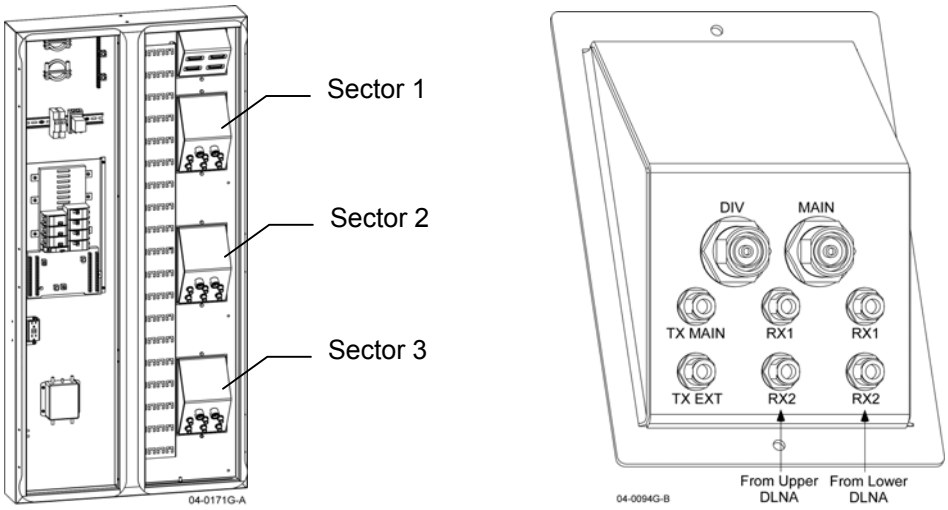
Connect the power amplifier cabinet RF cables as described in the steps that follow.

1. The inter-cabinet RF cables between the BTS and the power amplifier cabinet connect via N-Type male connectors through an equipment cabinet base plate series of bulkhead connectors. These connectors are accessible through the cabinet's left side maintenance access panel, and are arranged as depicted below.

   The connections labeled as TX MAIN, and middle RX1 and RX2 connect to the 8x8x8 base station configuration.

   The connections labeled as TX EXT, and right side RX1 and RX2 connect to the 16x16x16 base station configuration, for the extended 8 radios in this configuration.

   The even numbered DLNA's connect to the primary duplexed antenna. The odd numbered DLNA's connect to the simplexed diversity antenna in the 8x8x8 configuration or the duplexed diversity antenna in the 16x16x16 configuration.



2. Before installing each cable, verify the center pin is straight and at the proper depth. Connect the six (8x8x8 configuration) RX cables to the base station receive input. Maintain the proper sector orientation with the base station and install primary and diversity receive cables in the power amplifier cabinet. Tighten the cables to the proper torque (12 to 15 inch lbs). The new RF cables need N-Type male connectors on the Powerwave end.
3. Before installing each cable, verify the center pin is straight and at the proper depth. Connect the three TX Main cables to the base station composite transmit output. Maintain the proper sector orientation with the base station and install the transmit cables in the power amplifier cabinet. Tighten the cables to the proper torque (12 to 15 inch lbs). The new RF cables need N-Type male connectors on the Powerwave end.
4. The antenna RF cables from the power amplifier cabinet connect via 7/16 DIN male connectors on the same plate as the BTS input connectors. These connectors are arranged as depicted above.

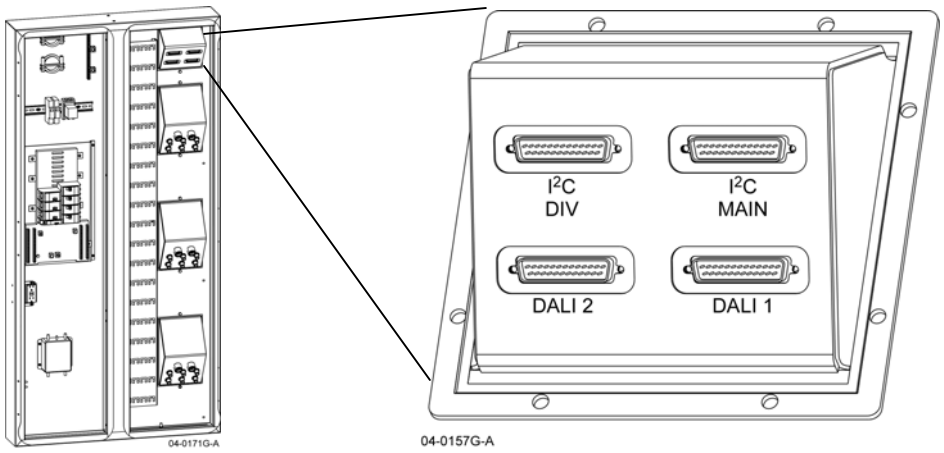
   The connections labeled as MAIN, and DIV are duplexed and simplexed respectively in the 8x8x8 base station configuration.

   The connections labeled as MAIN, and DIV are duplexed and duplexed respectively in the 16x16x16 base station configuration.
5. Connect the six antenna cables to the power amplifier cabinet input/output. Maintain the proper sector orientation with the base station. Do not tighten the cables, as they will be temporarily removed when commissioning the base station. The new RF cables need 7/16DIN male connectors on the Powerwave end.

6.2.4 Data Cable Connections

Connect the power amplifier cabinet data cables as described in the steps that follow.

1. The inter-cabinet data and alarm cables between the BTS and the power amplifier cabinet connect via 25-pin male D-sub connectors through an equipment cabinet plate above the BTS RF connectors in the left side panel.



The connections labeled as I^2C MAIN, I^2C DIV, DALI 1, and DALI 2 connects to the 8x8 base station configuration.

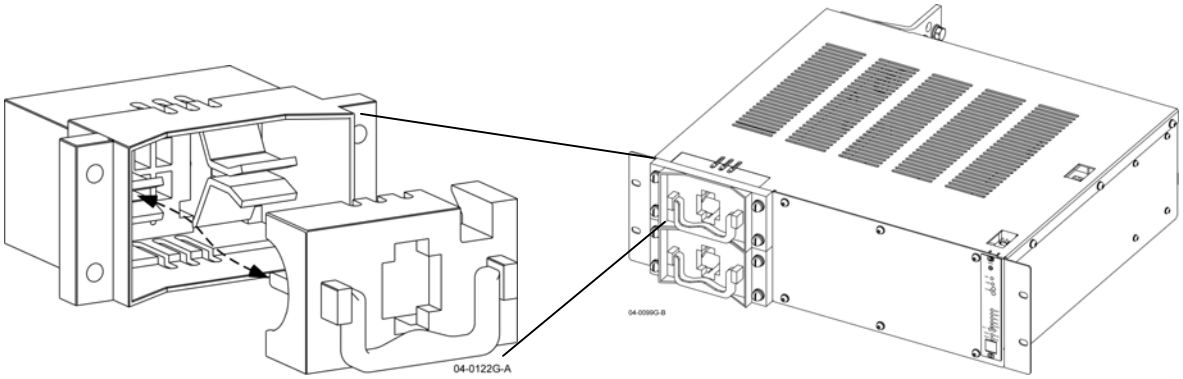
6.2.5 Battery Installation

Warning The batteries each weigh 90 lbs [40.8 kg] without packing material. Two people should lift the batteries. When a battery is in front of the power amplifier cabinet, one person may position and lift one end of the battery onto the internal tray.

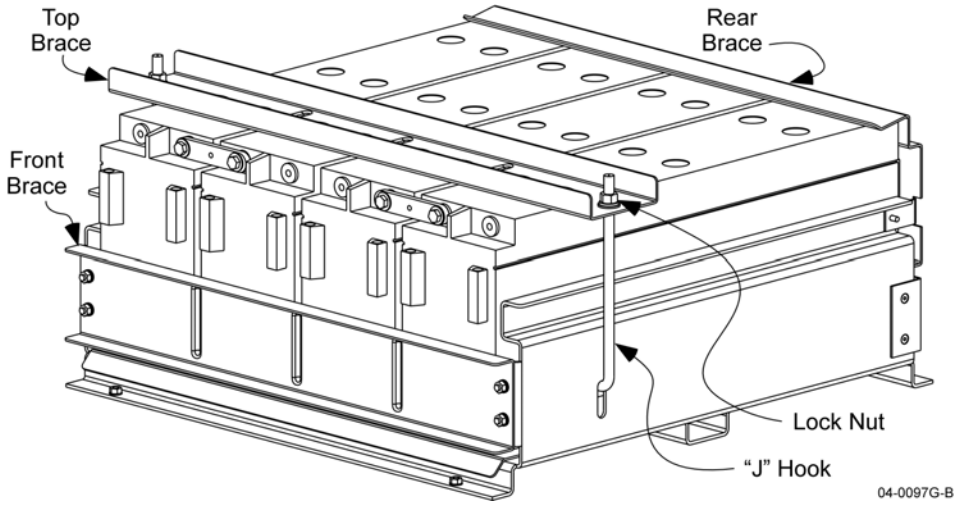
The batteries must be handled with non-conductive, non-absorbent gloves to prevent personal injury.

The batteries must always be installed with DC power from the LVD disabled. Failure to remove DC power from the battery cables prior to installation may cause equipment damage, bodily injury or death.

1. Remove the two 600 amp fuses from the LVD. Set the fuses aside in a safe place, they will be reinstalled later.



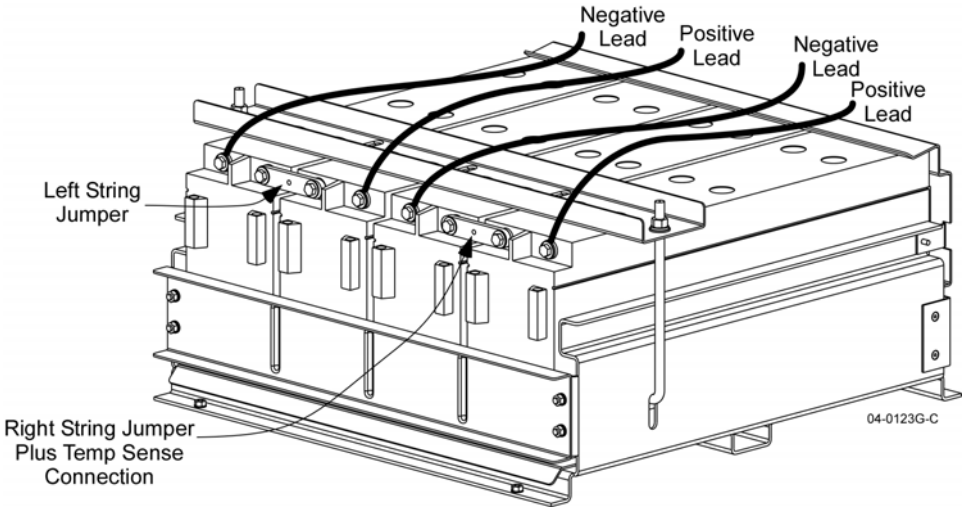
2. If the batteries are not shipped installed in the cabinet, arrange the batteries so that the power terminals face the cabinet door.
3. Slide the batteries, one at a time, into the battery compartment of the power amplifier cabinet. Ensure the batteries are pushed all the way to the rear of the battery tray.
4. Install the top battery brace by positioning the brace bar over the batteries. Position the brace with the battery clamps facing down.



5. Hook the J end of the J-hook into the vertical elongated hole in the battery tray on each side. Thread the rod through the top brace and cap the rod with the supplied lock nut. Do the same for the other side. Do not tighten the lock nuts.
6. Install the front battery brace with the supplied bolts, lock washers and flat washers. Use a 9/16 or 14mm socket to tighten the bolts and lock nuts on the front brace, then the top brace.

6.2.6 Battery Connection

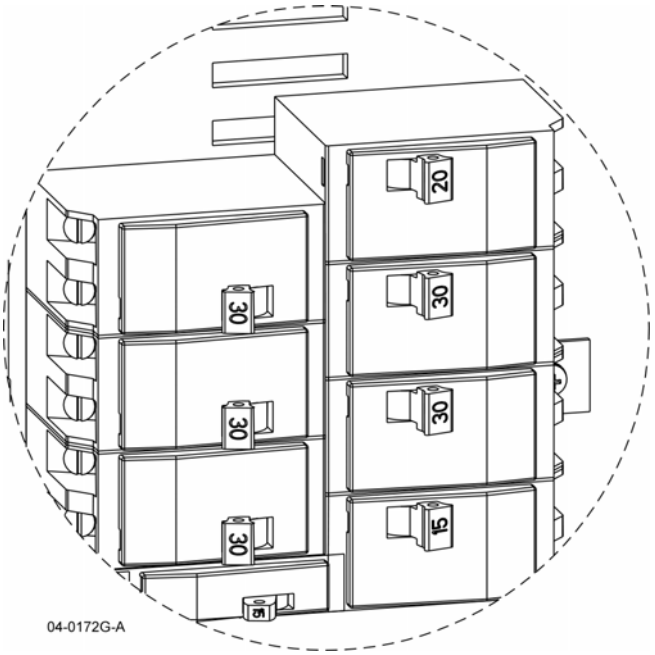
1. Place a layer of Nolox on each battery cable prior to installation.

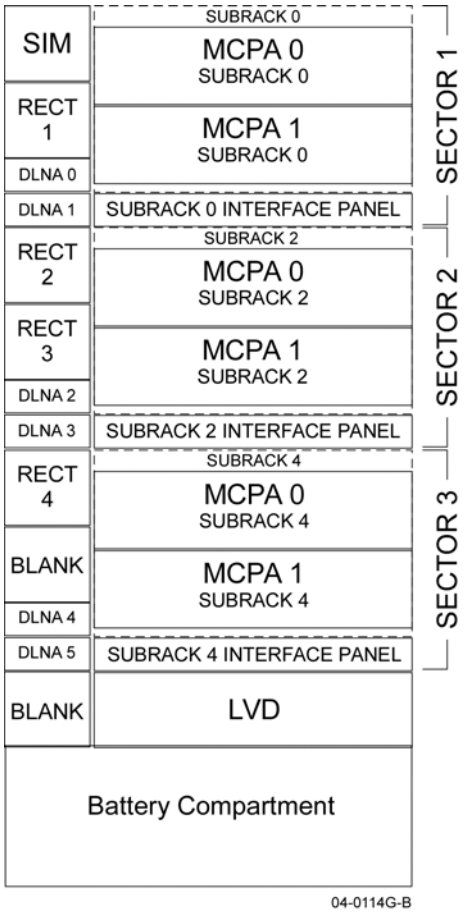


2. Connect the positive supplied battery jumper cable between on the Left battery string.
3. Connect the Left battery jumper between the outside battery's positive terminal and the adjacent battery's negative terminal.
4. Connect the negative supplied battery jumper cable between on the Left battery string.
5. Connect the positive supplied battery jumper cable between on the Right battery string.
6. Connect the Right battery jumper between the outside battery's negative terminal and the adjacent battery's positive terminal.
7. Connect the negative supplied battery jumper cable between on the Right battery string.
8. DO NOT INSTALL THE LVD FUSES UNTIL AFTER THE SYSTEM HAS BEEN TURNED ON AND DC VOLTAGES HAVE BEEN VERIFIED.

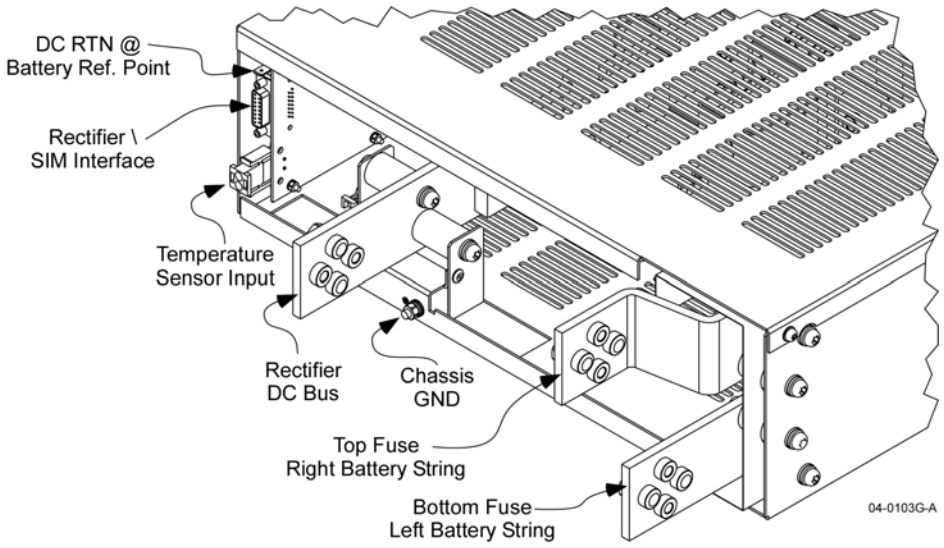
6.2.7 Verify DC Voltage

1. In the AC panel, turn off all equipment circuit breakers.
2. From the front of the equipment cabinet, turn off all MCPA subrack power circuit breakers on the Subrack x Interface Panel and turn off all of the SIM circuit breakers on the SIM front panel.





3. Check your work before applying AC voltage to the system. Make certain all connections are tight and correct and that the cabinet is free of debris.
4. Turn the 150 amp circuit breaker to On.
5. Turn the following circuit breakers to On:
    a. Surge Suppressor
    b. AC Relay
    c. Battery Heater
    d. GFCI – The cabinet lights will illuminate if the lamp light switch is turned on and the courtesy outlets will have 110 VAC power.
6. Turn on the Rectifier 1 circuit breaker.
7. Measure primary DC input voltage on the rectifier's output power terminals. DC output voltage should be +27 Vdc ±1.0 Vdc. If the DC output voltage is above or below the limits, call and consult Powerwave before you turn on your amplifier system.



8. Repeat steps 6 and 7 for Rectifiers 2, 3, and 4.
9. Reinstall the LVD 600 amp fuses. If the battery float voltage or current is low, the batteries will begin charging.

Warning The G3S-1900-125-25 MCPAs each weigh 52 lbs [23.6 kg] without packing material. One person may lift the MCPA in most situations; however, two people may be needed in certain environments to lift the MCPAs.

10. Inspect the 21-pin D-Sub male combo connector on the rear of each amplifier before installing it in the amplifier subrack. Verify that all pins are straight, no pins are recessed, and that the alignment shield is not bent.

Caution Do not slam amplifiers into the subracks. Forcing the amplifier into the subrack at too fast a rate may cause the pins on the 21-pin D-sub connector of the amplifier to become recessed or broken.

11. Verify that the amplifier front panel power ON / OFF switch is in the OFF position, and gently install the plug-in amplifier modules in the subrack. Tighten front panel thumbscrews until they are finger-tight. Use a slotted screwdriver to tighten the thumbscrews 1/8th turn past finger-tight.
12. Set the all of the SIM circuit breakers to On. The DLNAs and the SIM will power up.

6.2.8 Verify MCPA Operation

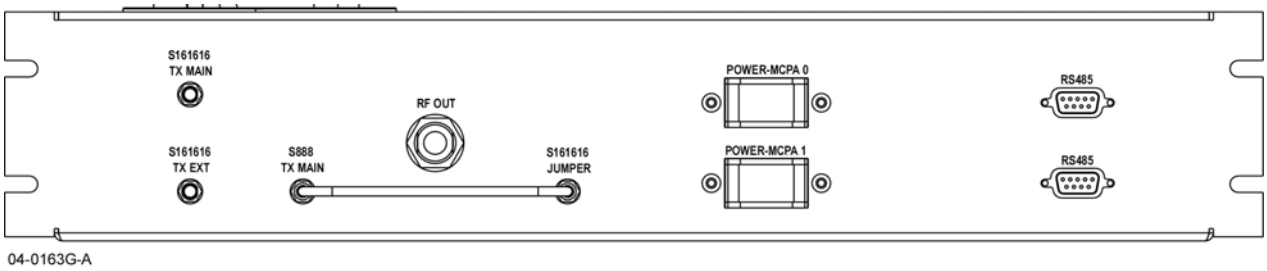
The amplifier module has two operating controls, both located on the front face of the module, the power ON/OFF circuit breaker and the RF OFF/ON/RESET switch. Perform the initial start-up as follows:

1. Verify that all input and output cables are properly connected.

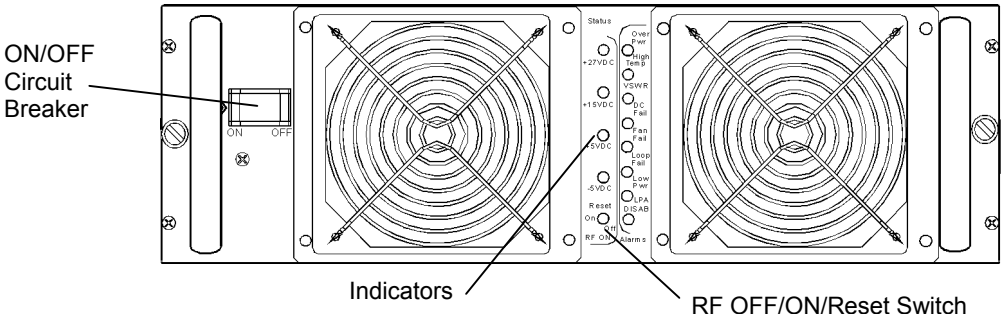
Caution Before applying power, make sure that the input and output of the system is properly terminated at 50 ohms. Do not operate the system without a load attached. Refer to section 9 for input power requirements. Excessive input power may damage the amplifier.

Warning Never remove or install coaxial cables on either the subrack input or output port when the power amplifier is turned on. Operating the power amplifier while disconnecting and connecting RF cables may damage the equipment and/or cause personal injury.

2. Verify that the amplifier front panel ON/OFF circuit breaker is in the OFF position and the RF OFF/ON/Reset switch is in the OFF (down) position. See the figure below.
3. Verify that no RF power is being applied to the system.
4. Turn on the circuit breakers at the Subrack Interface Panels.



5. Place the amplifier ON/OFF circuit breaker in the ON position. Visually check the indicators on the amplifier module, and verify that the following indicators are on:
    a. The LPA DISAB indicator (red) should be on.
    b. The +27VDC, +15VDC, +5VDC and -5VDC indicators (green) on the amplifier module should be on.
6. Set the RF OFF/ON/Reset switch to the ON (center) position. All red LEDs should turn off after five seconds.
7. Set the input RF power level in accordance with the procedure set forth in section 7.



G3S Series Amplifier Front Panel

7. Site Commissioning

7.1 Pilot Tone Setting Procedure

Each individual market selects the Pilot tone. The Pilot tone must be moved to the closest neighboring frequency band to provide optimum system performance. See the Reference Manual for more details. Pilot tone frequency selection is based on the intended operational band of the amplifiers as listed in the table below.

Pilot Frequency Setting Based on PCS Frequency Block of Operation

Block Designator	Transmit Frequency Band (MHz)		
	Base Station	Bandwidth	Pilot (MHz)
A	1930-1945	15	1945.5 (A)
D	1945-1950	5	1950.5 (D)
B	1950-1965	15	1965.5 (B)
E	1965-1970	5	1964.5 (E) *
5	1965-1970	5	1970.5 (5)
F	1970-1975	5	1969.5 (F)
C	1975-1990	15	1974.5 (C)
Block Pairs			
A-D	1930-1950	20	1950.5 (D)
D-B	1945-1965	20	1965.5 (B)
B-E	1950-1970	20	1970.5 (5)
E-F	1965-1975	10	1964.5 (E) *
F-C	1970-1990	20	1969.5 (F)
E-C Excluding F	1965-1990 Excluding: 1970-1975	25	1974.5 (C)

(1) If the Block Designator has not been previously selected through serial communication on connector J10M of the amplifier, pilot defaults to 1964.5 on the G3S-1900-125-25 amplifier

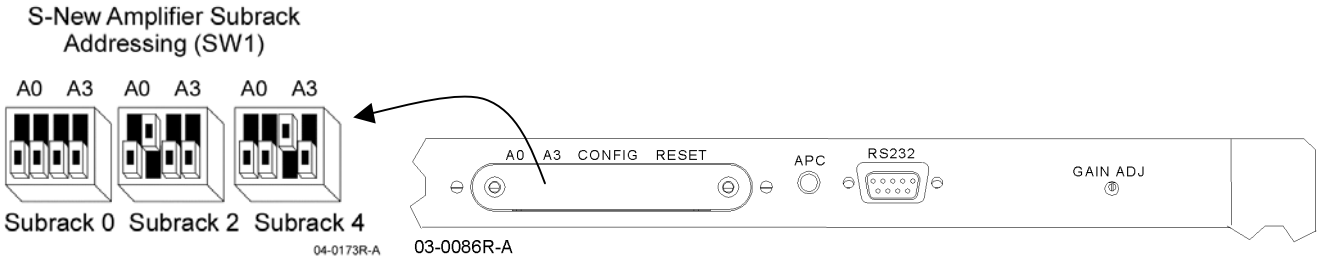
(2) If the Block Designator is selected through serial interface on connector J10M of the amplifier or via the subrack RS-232 port, pilot frequency is moved to the appropriate spot and is stored permanently into the microprocessor until another band is changed.

If the pilot tone is not moved from the default setting and signals are transmitted in B-band, some traffic channels may transmit directly on the pilot tone. The pilot tone requires a guard band of 270 KHz for UMTS, and 400 KHz for GSM. Transmitting on the pilot tone will cause the amplifier to go into Loop Fail. This will not damage the MCPA. However, UMTS customers will experience a Loop Fail in every sector where the amplifiers are installed. GSM customers will experience intermittent Loop Fails in the sectors that use these frequencies.

On the other hand, if the pilot tone is not moved and signals are transmitted in A-band (1930-1945) or C-band (1975-1990), the instantaneous bandwidth of the amplifier will be exceeded. This will cause equipment operated in the outer bands of the PCS band to experience higher intermodulation distortion, which may in turn cause them to exceed FCC emission limits. The lower end of the PCS band presents the farthest frequency span from the pilot tone, which begins at 1930 MHz; 30.5 MHz away from the pilot tone of the G3S-1900-80 amplifier; 34.5 MHz away from the pilot tone of the G3S-1900-125-25 amplifier.

7.1.1 Amplifier Subrack Addressing

The SIM requires the following amplifier subrack addresses: 0, 2, and 4. If the subrack is set to another address, the SIM will not acknowledge that subrack. In addition, if 2 subracks are at the same address, SIM communication with the subracks will be unreliable. If there is a problem with communication to the subrack, the SIM will send Minor, Major, and Critical Alarms at the same time.



1. Loosen the right hand cover screw on the subrack faceplate.
2. Remove the left hand cover screw on the subrack faceplate.
3. Swing the faceplate down from the left side.
4. Set the subrack address on the left-most dip switch pack.
5. Reinstall the faceplate.
6. Turn both Subrack Interface breakers to Off. This causes the entire subrack to loose power.
7. Turn both Subrack Interface breakers to On. This causes the subrack microprocessor to read the new address setting.

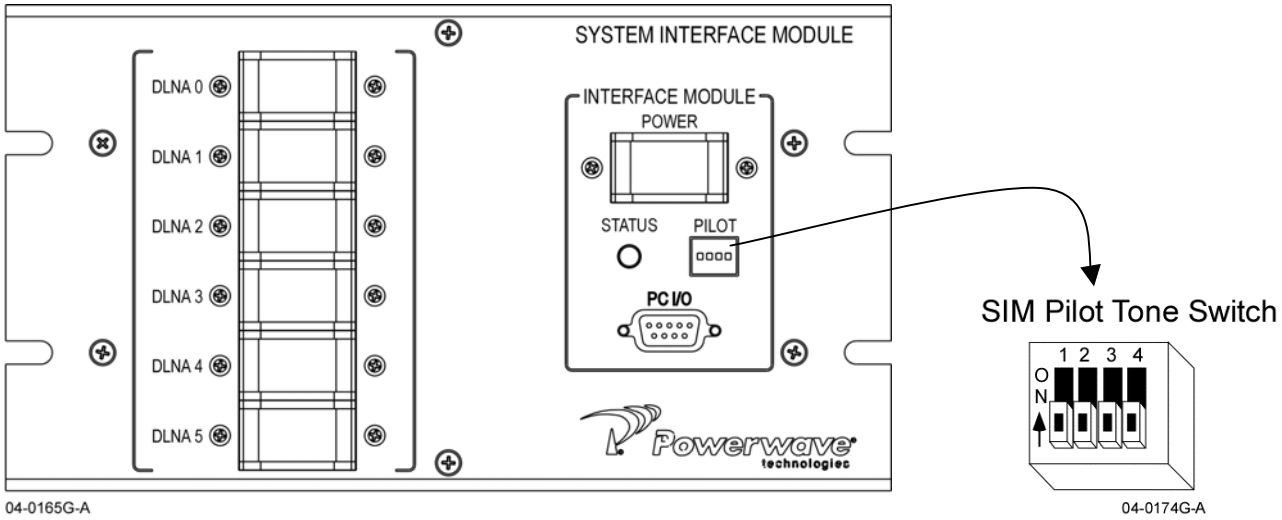
7.1.2 SIM Pilot Switch Settings

1. Verify that the subrack address is set correctly per 7.1.1 above.
2. Set the SIM Power circuit breaker to Off.
3. Set the SIM Pilot switch as follows:

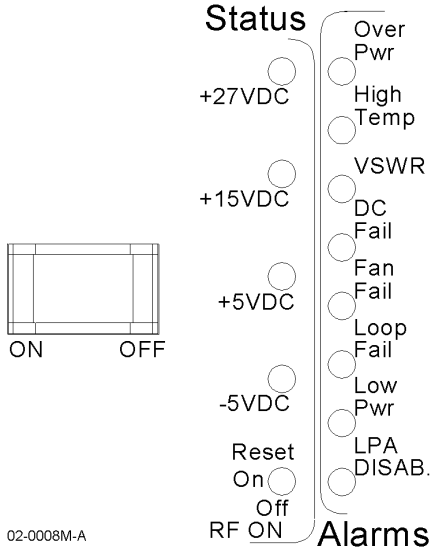
SIM Pilot Dip Switch Assignments

Pilot Band	Frequency (MHz)	SW4	SW3	SW2	SW1
A	1945.5	0	0	0	0
B	1965.5	0	0	0	1
C	1974.5	0	0	1	0
D	1950.5	0	0	1	1
E	1964.5	0	1	0	0
F	1969.5	0	1	0	1
5	1970.5	0	1	1	0

0= Off
1= On



4. Set the SIM power and Subrack Interface module MCPA breakers to On. Once the Switches are set, it will take about 1 minute to set the amplifier subracks. After that, all PA's will need to be reset in order for the pilot change to take effect.
5. Set the amplifier ON / OFF / RESET switch to Reset for 1 second to cause the microprocessor to recycle.



6. Set the amplifier ON / OFF / RESET switch to ON.

7.2 Transmit Path Gain Setting Procedure

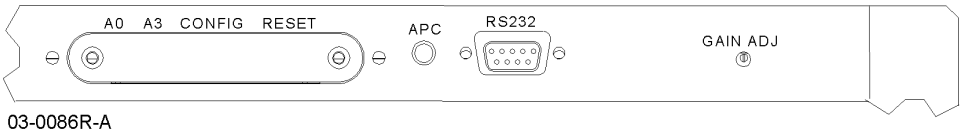
There are two aspects to setting gain on the MCPA, 1) power and 2) gain. The amplifier provides a “pool of power” that can be consumed by any number of radios. With two amplifiers per sector, this system provides up to 220 watts of available power. The base station can consume as little or as much of this available power as is needed at any given time. The gain of the MCPA system is fixed, based on an initial adjustment that is made by the cell technician. Once the gain for the system is set, the technician makes no further adjustment to the MCPA system. Following this adjustment, the input drive level of each individual radio determines the final output power per carrier. Radio carrier output power may be individually adjusted to achieve balanced radio-to-radio carrier power on the sector.

The power and gain needed for each carrier is designed into this system, with a 10 dB adjustable range within the MCPA portion of the system. Each radio card also has an adjustable range, to ensure the sector is properly balanced to account for variances in cable lengths and other passive device characteristics unique to each transmit path. The procedure that follows, describes the technique for setting the system gain by keying one carrier to achieve the desired output power for that carrier. By doing so, the gain for the system is also set. Input drive levels to the MCPA system need only be verified when performing troubleshooting procedures, should the desired output power level be unachievable.

1. Set the amplifiers to OFF.

Warning Ensure the amplifiers are turned off while disconnecting and reconnecting cables between the antenna interface and power measurement equipment. Failure to do so may cause damage to the equipment or personal injury.

2. Block all transmit carriers in the sector.
3. Connect the power meter to the 7/16 DIN connector for the sector under test and place appropriate attenuators in-line to protect the power meter. For most power meters, a 50 dB, 250 watt fixed attenuator will work.
4. Set the Gain Adjust on the front of amplifier subrack to –10 dB (fully counter-clockwise).



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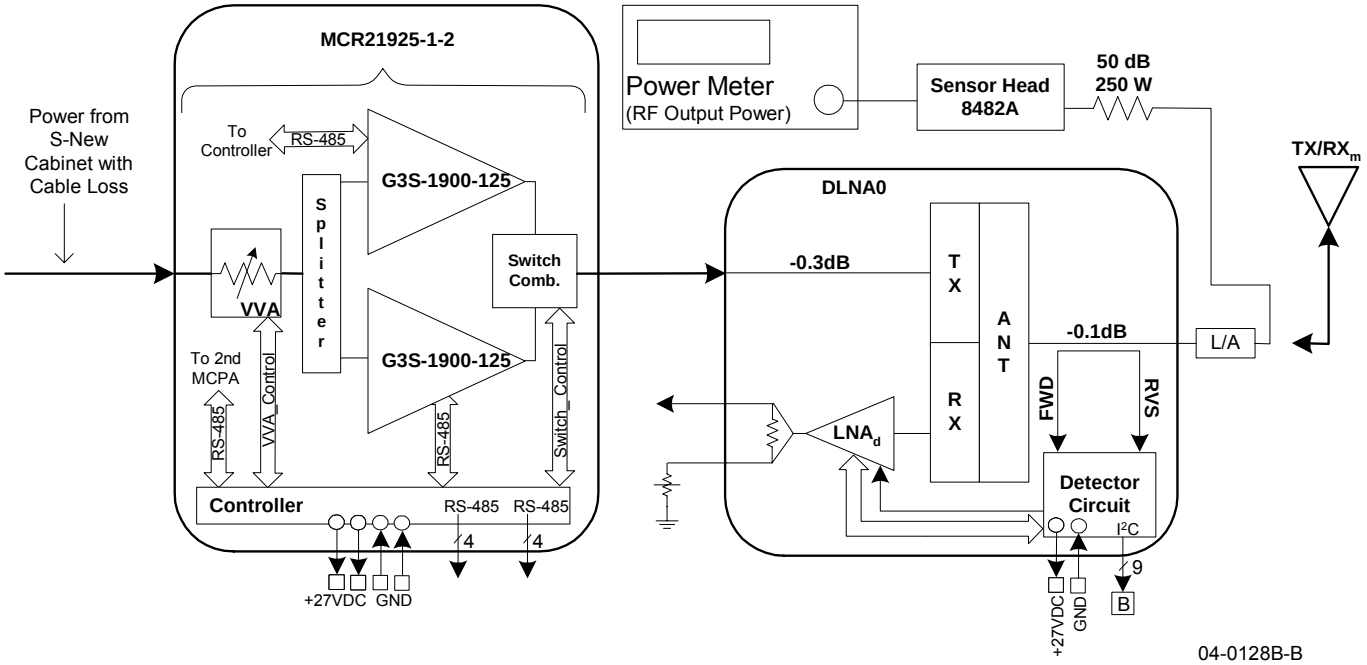
5. Turn the amplifiers to ON and allow them to warm up for 20 minutes. Failure to warm the amplifiers up could result in an inappropriate power setting, which may fall as much as 8% of the rated amplifier power after the amplifiers are finally warm.

Note The action in the next step sets the gain for the system. Once the system gain is correct for one radio, no further adjustment is made on the power amplifier equipment. Refer to the Reference Manual for more information on this topic.

6. Set the system gain and output power per channel at the antenna jumper on the radios by keying up the BCCH at the proper BTS output power level (i.e. –3.0 dBm). Adjust the Gain Adjust on the amplifier subrack clockwise to achieve the desired antenna feed power level (i.e. 20 watts or 43 dBm).



7. Using the power meter, verify that each carrier sets to the output power level commanded (i.e. 43dBm or 20W). Ensure only one radio is active at any given time. If the carrier power level is high or low, adjust the appropriate transceiver card. Do not adjust the amplifier subrack.
8. Turn the amplifiers off.
9. Remove the power meter and restore system cabling to normal.
10. Unblock all devices.

7.3 DLNA VSWR Selection

1. Set the front panel four-position rotary switch for the appropriate VSWR alarm threshold based on the length of cable from DLNA output (typically FSJ4 or LDF4) to the antenna foam jumper (typically 1 5/8 Heliax). The switch position is set with a jeweler's screwdriver. As a general guide, set the switch as follows:

DLNA Number	Switch Position	Design Tolerance (dB)	Internal Cabinet Cable Loss	External Cabinet Cable Loss	Alarm Thresholds (in dB; Return Loss)		
					Alarm State 1 Minor	Alarm State 2 Major	Alarm State 3 Critical
0	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-
1	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-
2	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-
3	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-

4	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-
5	1	1	0.16	<0.84	6 ±2	9.5 ±2.5	12 ±3
	2	2	0.16	>0.84, <1.84	8 ±2.25	11.5 ±3	14 ±3.5
	3	3	0.16	>1.84, <2.84	10 ±2.5	13.5 ±3	16 ±4
	4	Test	-	-	-	-	-

7.4 Receive Path Gain Setting Procedure

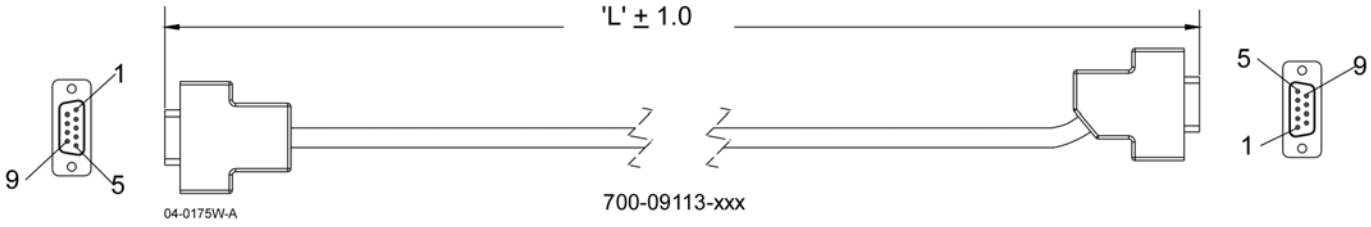
The DLNA (system) receive path gain is factory set to 43.6 dB. No gain adjust of the DLNA is required. Do not adjust the DLNA gain! Field adjustment of the DLNA gain may introduce up to 2 dB of error in the receive path gain and changes the receive noise figure for the base station.

8. Wiring Diagrams

Wire List

Part Number	Item Description	Qty
700-09533-001	Cable Assy, RF, .141 SR, SMA-M to SMA-M	3
700-09304-003	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M-RA, 21.50-in	3
700-09304-002	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M-RA, 18.65-in	3
700-09305-001	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M, 14.25-in	3
700-09305-002	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M, 14.25-in	3
700-09305-003	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M, 12.75-in	3
700-09305-004	Cable Assy, RF, 1/4 SF, N-F-BH to SMA-M, 12.75-in	3
700-09306-002	Cable Assy, RF, LMR 600, N-M-RA to N-M-RA, 10.50-in	3
700-09307-001	Cable Assy, RF, LMR 600, N-M to N-M, xx-in	3
700-09307-002	Cable Assy, RF, LMR 600, N-M to N-M, xx-in	3
700-09117-101	Cable Assy, wire, Dsub25p to dsub25s, dali interface	1
700-09117-201	Cable Assy, wire, Dsub25p to dsub25s, dali interface	1
700-09118-101	Cable Assy, wire, Dsub25p to dsub25s, dlna host	1
700-09118-201	Cable Assy, wire, Dsub25p to dsub25s, dlna host	1
700-09113-001	Cable Assy, wire, Dsub9p to dsub9p, rs485, 84.00-in	1
700-09113-002	Cable Assy, wire, Dsub9p to dsub9p, rs485, 102.00-in	1
700-09113-003	Cable Assy, wire, Dsub9p to dsub9p, rs485, 119.00-in	1
700-09489-001	Cable Assy, wire, Dsub15S, alarm mask	1
700-09120-001	Cable Assy, wire, SIM power system interface	1
700-09158-001	Cable Assy, wire, 2x2 to dc lug, SIM power	1
700-09114-001	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 63 in.	1
700-09114-002	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 63 in.	1
700-09114-003	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 78 in.	1
700-09114-004	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 78 in.	1
700-09114-005	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 94 in.	1
700-09114-006	Cable Assy, wire, Dsub15P to Dsub15S, DLNA-SIM, 94 in.	1
700-09115-001	Cable Assy, wire, Dsub15P to Dsub15S, fan sense-sim	1
700-09116-001	Cable Assy, wire, 2x2 to DC lug, fan power	1
700-09121-002	Cable Assy, wire, 2x9 to 4 2x2, fan extension interface	1
700-09090-001	Cable Assy, 4 AWG, Blk, 1/4 lug to #10 lug, DC return	4
700-09345-001	Cable Assy, 2/0 AWG, 1/4 lug to 1/4 lug, xx-in	2

700-09113-xxx MCPA RS-485 Alarm Cable

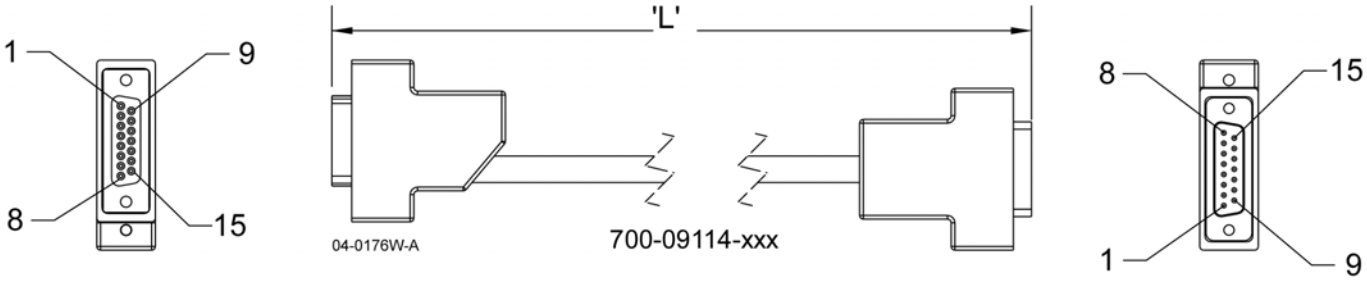


700-09113-xxx Wire List				
Twisted Pair Number	Color	From	To	Signal
1	White/Blue	P1-1	P2-1	PA_RS485_TX+
	Blue/White	P1-2	P2-2	PA_RS485_TX-
2	White/Orange	P1-3	P2-3	PA_RS485_RX+
	Orange/White	P1-4	P2-4	PA_RS485_RX-

700-09113-xxx Nomenclature		
Dash Number	Conn	Nomenclature
-001	P1	SIM-MCPA 0
	P2	RS485-MCPA 0
-002	P1	SIM-MCPA 2
	P2	RS485-MCPA 2
-003	P1	SIM-MCPA 4
	P2	RS485-MCPA 4

700-09113-xxx Cable Length 'L'	
Dash Number	LengthL'
-001	84"
-002	102"
-003	119"

700-09114-xxx DLNA / SIM Interface Cable

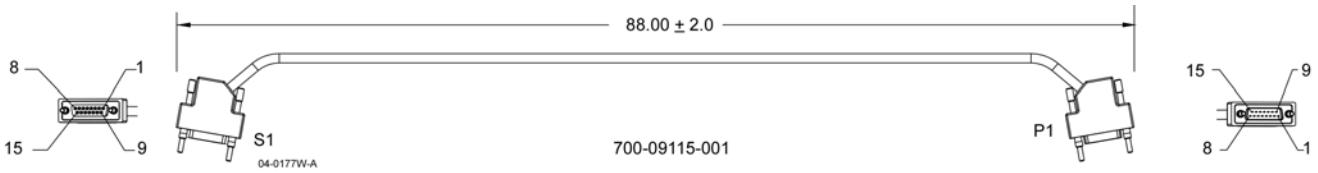


700-09114-xxx Wire List				
Twisted Pair Number	Color	From	To	Signal
1	Black/Red	P1-1	S1-1	DLNA_DC+
	Red/Black	P1-2	S1-2	DLNA_DC+
2	Black/White	P1-3	S1-3	DLNA_DC-
	White/Black	P1-4	S1-4	DLNA_DC-
3	Black/Green	P1-6	S1-6	SCL+
	Green/Black	P1-13	S1-13	SCL-
4	Black/Blue	P1-7	S1-7	SDA_TX+
	Blue/Black	P1-14	S1-14	SDA_TX-
5	Black/Yellow	P1-8	S1-8	SDA_RX+
	Yellow/Black	P1-15	S1-15	SDA_RX-
6	Black/Brown	P1-9	S1-9	DETECT
	Brown/Black	P1-10	S1-10	DLNA_TEMP
7	Black/Orange	P1-5	S1-5	No Signal
	Orange/Black	P1-11	S1-11	No Signal

700-09114-xxx Nomenclature		
Dash Number	Conn	Nomenclature
-001	P1	SIM-DLNA0
	S1	DLNA0
-002	P1	SIM-DLNA1
	S1	DLNA1
-003	P1	SIM-DLNA2
	S1	DLNA2
-004	P1	SIM-DLNA3
	S1	DLNA3
-005	P1	SIM-DLNA4
	S1	DLNA4
-006	P1	SIM-DLNA5
	S1	DLNA5

700-09114-xxx Cable Length 'L'	
Dash Number	Dimension 'L' +/- 2.0
-001	63.0
-002	63.0
-003	78.0
-004	78.0
-005	94.0
-006	94.0

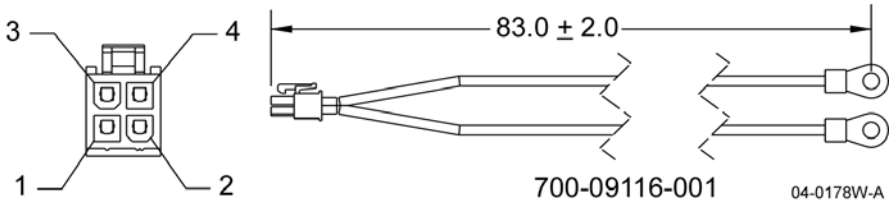
700-09115-xxx Fan Sense SIM Interface Cable



700-09115-xxx WIRE LIST			
Twisted Pair Number	Color	From	To
1	Black/Red	P1-1	S1-1
	Red/Black	P1-9	S1-9
2	Black/White	P1-2	S1-2
	White/Black	P1-3	S1-3
3	Black/Green	P1-10	S1-10
	Green/Black	P1-12	S1-12
4	Black/Blue	P1-4	S1-4
	Blue/Black	P1-11	S1-11
5	Black/Yellow	P1-5	S1-5
	Yellow/Black	P1-13	S1-13
6	Black/Brown	P1-7	S1-7
	Brown/Black	P1-14	S1-14
7	Black/Orange	P1-8	S1-8
	Orange/Black	P1-15	S1-15

700-09115-xxx Nomenclature	
Conn	Nomenclature
P1	Sim-Cabinet Fans
S1	Fan Dist-Control

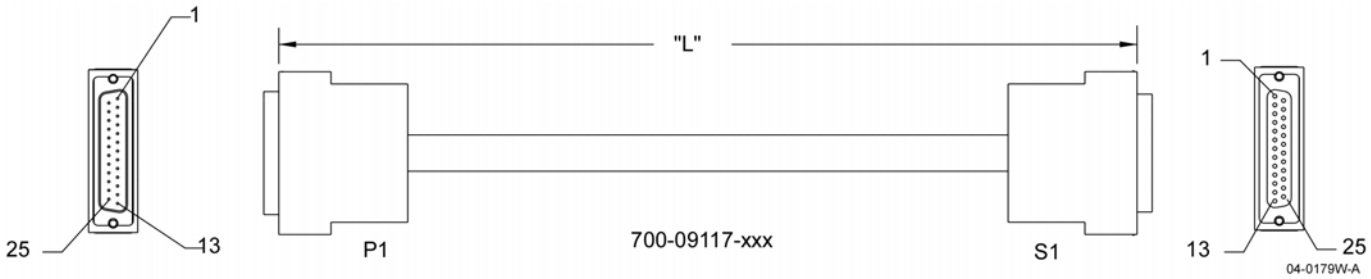
700-09116-xxx 2x2 DC Fan Power Cable



700-09116-xxx Wire List			
Wire Number	From	To	Color
1	P1-1	E1	Black
2	P1-2	E1	Black
3	P1-3	E2	Red
4	P1-4	E2	Red

700-09116-xxx Nomenclature	
Conn	Nomenclature
P1	Fan Dist-Power
E1	Return
E2	+DC

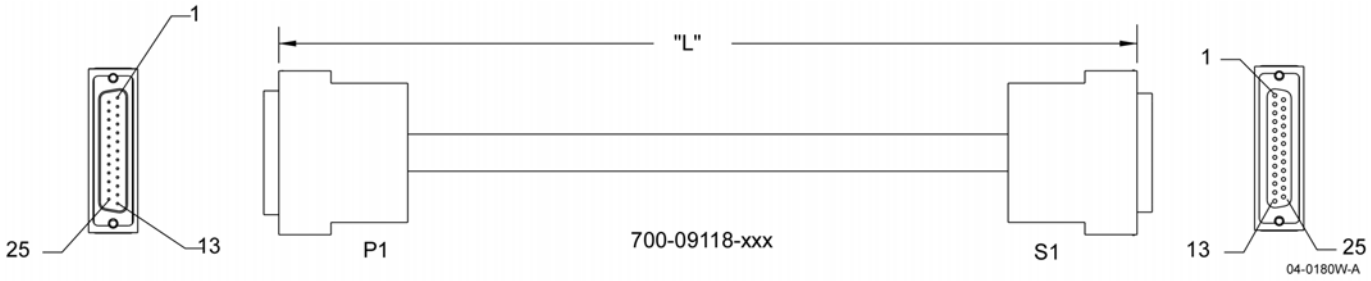
700-09117-xxx DALI Interface Cable



700-09117-xxx Wire List				
Twisted Pair Number	Color	From	To	Signal
1	White/Blue	P1-1	S1-1	DALI0
	Blue/White	P1-2	S1-2	DALI1
2	White/Orange	P1-3	S1-3	DALI2
	Orange/White	P1-4	S1-4	DALI3
3	White/Green	P1-5	S1-5	Common
	Green/White	P1-6	S1-6	DALI4
4	White/Brown	P1-7	S1-7	DALI5
	Brown/White	P1-9	S1-9	DALI7
5	White/Grey	P1-10	S1-10	Common
	Grey/White	P1-11	S1-11	DALI8
6	Red/Blue	P1-12	S1-12	DALI9
	Blue/Red	P1-13	S1-13	DALI10
7	Red/Orange	P1-14	S1-14	DALI11
	Orange/Red	P1-15	S1-15	Common
8	Red/Green	P1-16	S1-16	DALI12
	Green/Red	P1-18	S1-18	DALI14
9	Red/Brown	P1-19	S1-19	DALI15
	Brown/Red	P1-20	S1-20	Common
10	Red/Gray	P1-21	S1-21	DALI16
	Gray/Red	P1-22	S1-22	DALI17
11	Black/Blue	P1-23	S1-23	DALI18
	Blue/Black	P1-24	S1-24	DALI19
12	Black/Orange	P1-8	S1-8	DALI6
	Orange/Black	P1-17	S1-17	DALI13
Single	Gray	P1-25	S1-25	Common
Single	Gnd Conductor	NC	NC	Drain

700-09117-xxx DALI Nomenclature and Length			
Dash Number	Conn	Label Text	"L"
-101	S1	BH-DALI 1	36.5
	P1	SIM-DALI 1	
-201	S1	BH-DALI 2	33.5
	P1	SIM-DALI 2	

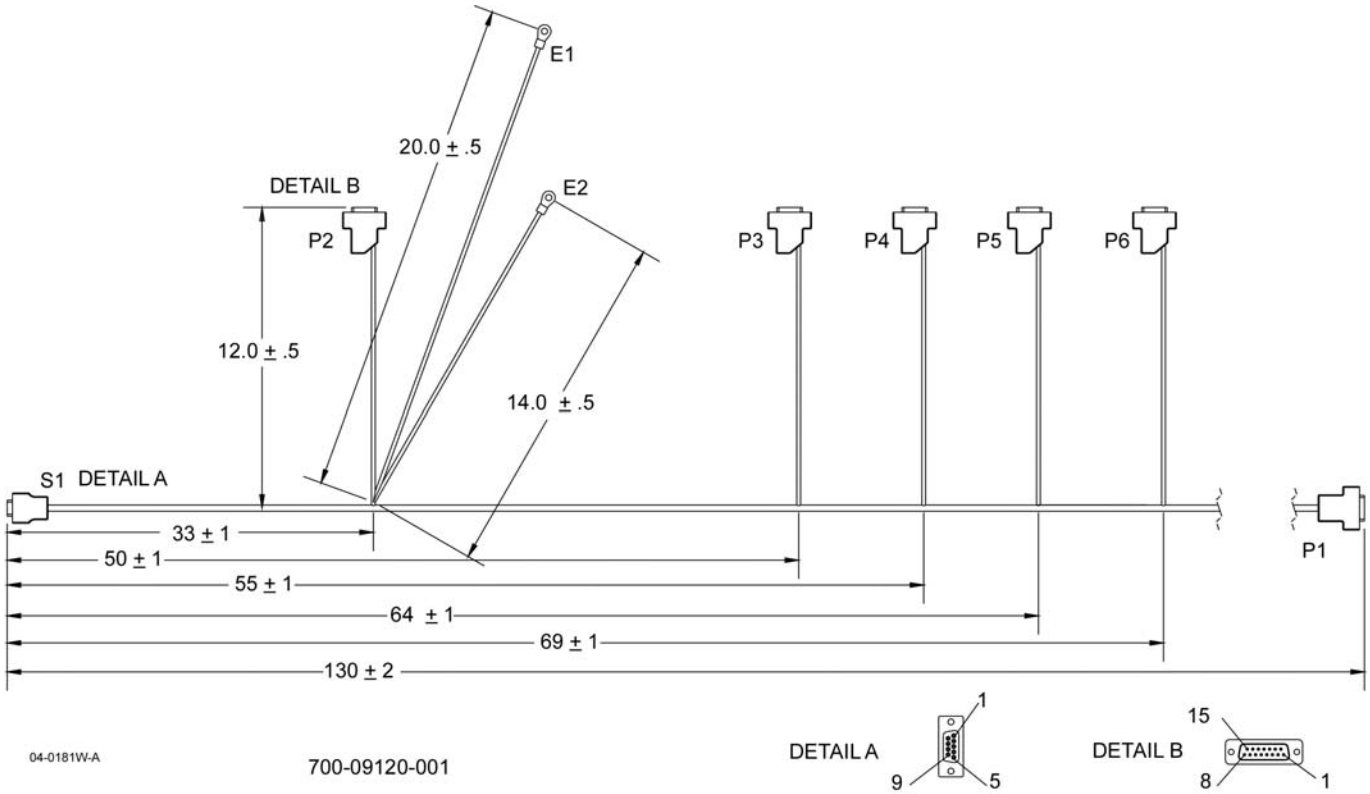
700-09118-xxx DLNA Host Interface Cable



700-09118-xxx Wire List				
Twisted Pair Number	Color	From	To	Signal
1	White/Blue	P1-23	S1-23	SCL_P_4
	Blue/White	P1-24	S1-24	SCL_N_4
2	White/Orange	P1-5	S1-5	SCL_P_0
	Orange/White	P1-6	S1-6	SCL_N_0
3	White/Green	P1-12	S1-12	SDA_TX_P_2
	Green/White	P1-13	S1-13	SDA_TX_N_2
4	White/Brown	P1-10	S1-10	SDA_RX_P_2
	Brown/White	P1-11	S1-11	SDA_RX_N_2
5	White/Grey	P1-14	S1-14	SCL_P_2
	Grey/White	P1-15	S1-15	SCL_N_2
6	Red/Blue	P1-16	S1-16	DETECT_2
	Blue/Red	P1-18	S1-18	GND
7	Red/Orange	P1-19	S1-19	SDA_RX_P_4
	Orange/Red	P1-20	S1-20	SDA_RX_N_4
8	Red/Green	P1-21	S1-21	SDA_TX_P_4
	Green/Red	P1-22	S1-22	SDA_TX_N_4
9	Red/Brown	P1-8	S1-8	NC
	Brown/Red	P1-17	S1-17	NC
10	Red/Gray	P1-1	S1-1	SDA_RX_P_0
	Gray/Red	P1-2	S1-2	SDA_RX_N_0
11	Black/Blue	P1-3	S1-3	SDA_TX_P_0
	Blue/Black	P1-4	S1-4	SDA_TX_N_0
12	Black/Orange	P1-7	S1-7	DETECT_0
	Orange/Black	P1-9	S1-9	GND
Single	Gray	P1-25	S1-25	DETECT_4
Single	GND Conductor	NC	NC	Drain

700-09118-xxx DLNA Nomenclature and Length			
Dash Number	Conn	Label Text	"L"
-101	S1	BH-I2C MAIN	35
	P1	SIM-I2C MAIN	
-201	S1	BH-I2C DIV	32
	P1	SIM-I2C DIV	

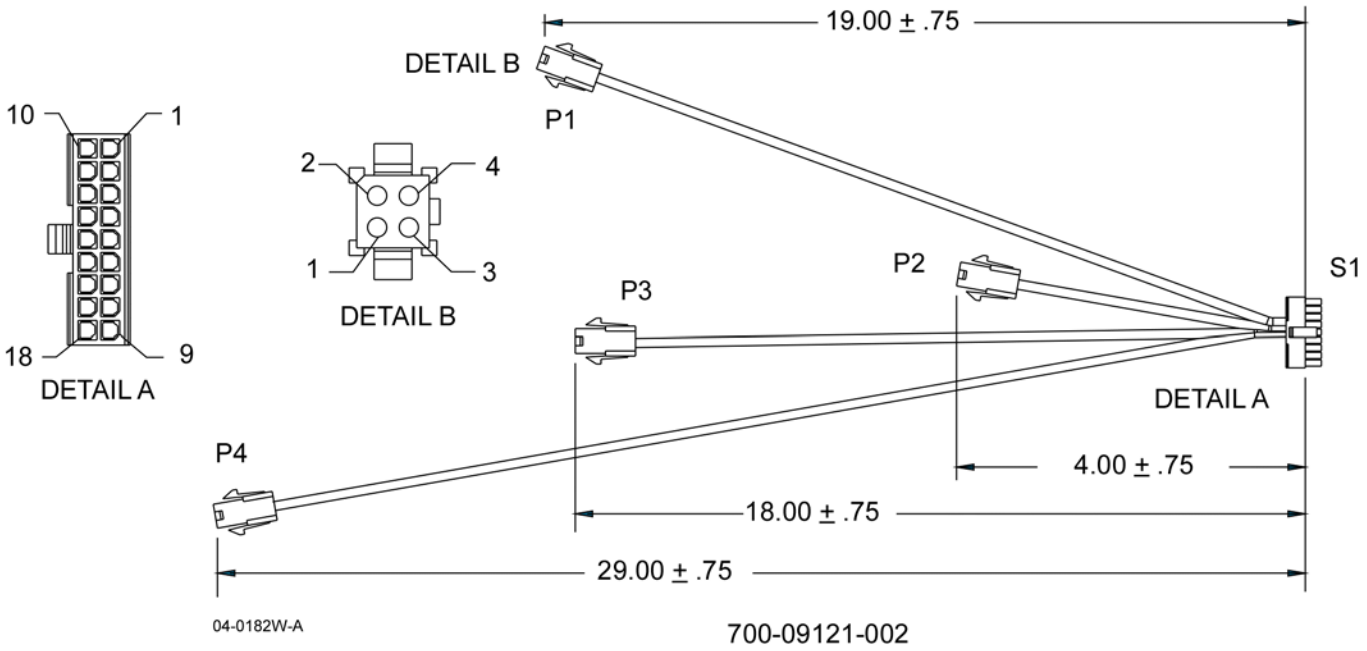
700-09120-xxx SIM Power System Interface Cable



700-09120-xxx Wire List				
Wire Number	From	To	Color	Signal
1	P2-7	S1-2	BRN/RED	RECT1
2	P2-9	P3-9	GRN	I_SHARE
3	P2-11	E1	RED	V SENSE+
4	P2-12	E2	BLK	V SENSE-
5	P2-10	P3-10	VIO	V PROG
6	P3-7	S1-3	BRN/ORG	RECT2
7	P3-9	P4-9	GRN	I_SHARE
8	P3-11	E1	RED	V SENSE+
9	P3-12	E2	BLK	V SENSE-
10	P3-10	P4-10	VIO	V PROG
11	P4-7	S1-4	BRN/YEL	RECT3
12	P4-9	P5-9	GRN	I_SHARE
13	P4-11	E1	RED	V SENSE+
14	P4-12	E2	BLK	V SENSE-
15	P4-10	P5-10	VIO	V PROG
16	P5-7	S1-5	BRN/GRN	RECT4
17	P5-9	P6-9	GRN	I_SHARE
18	P5-11	E1	RED	V SENSE+
19	P5-12	E2	BLK	V SENSE-
20	P5-10	P6-10	VIO	V PROG
21	P6-7	S1-6	BRN/BLU	RECT5
22	P6-11	E1	RED	V SENSE+
23	P6-12	E2	BLK	V SENSE-
24	P6-10	P1-8	VIO	V PROG
25	P1-1	S1-7	BRN/VIO	RECT6
26	P1-3	P1-9	WHT	-
27	P1-5	E2	BLK	V SENSE-
28	P1-10	P1-11	WHT	-
29	P1-14	E2	BLK	V SENSE-

700-09120-xxx Nomenclature	
Conn. Design.	Nomenclature
S1	RECT ALARM
P1	X2 LVD
P2	RECT1
P3	RECT2
P4	RECT3
P5	RECT4
P6	RECT5
E1	+27V
E2	RETURN

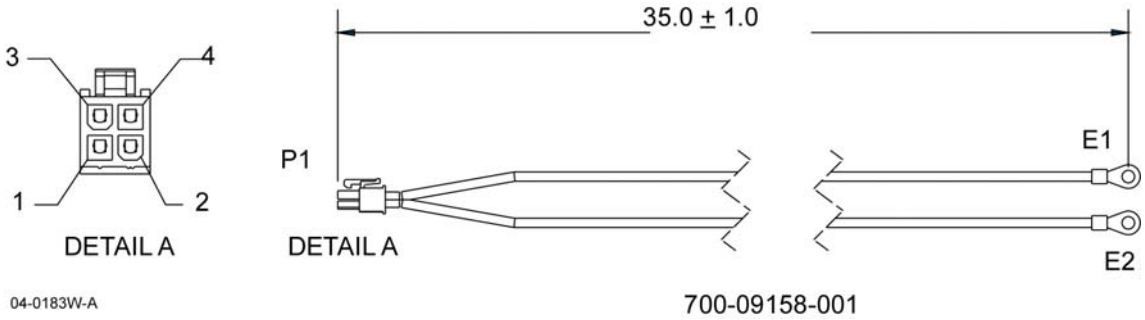
700-09121-xxx Fan Extension Interface Cable



700-09121-xxx Wire List				
Wire Number (4 Cond)	Color	From	To	Signal
1	Black	P1-1	S1-1	GROUND
	Red	P1-2	S1-11	DC0
	Brown	P1-3	S1-10	FAN_SENSE0
	Orange	P1-4	S1-2	FAN_DRVR0
2	Black	P2-1	S1-3	GROUND
	Red	P2-2	S1-13	DC1
	Brown	P2-3	S1-12	FAN_SENSE1
	Orange	P2-4	S1-4	FAN_DRVR1
3	Black	P3-1	S1-6	GROUND
	Red	P3-2	S1-16	DC2
	Brown	P3-3	S1-15	FAN_SENSE2
	Orange	P3-4	S1-7	FAN_DRVR2
4	Black	P4-1	S1-8	GROUND
	Red	P4-2	S1-18	DC3
	Brown	P4-3	S1-17	FAN_SENSE3
	Orange	P4-4	S1-9	FAN_DRVR3

700-09121-xxx Nomenclature	
Conn	Nomenclature
S1	FAN DIST
P1	FAN0
P2	FAN1
P3	FAN2
P4	FAN3

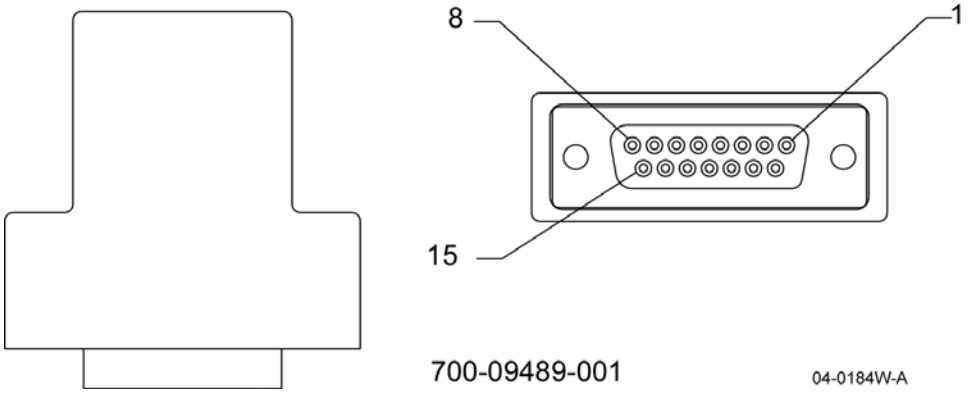
700-09158-xxx 2x2 SIM Power Cable



700-09158-xxx Wire List			
Wire Number	From	To	Color
1	P1-1	E2	Black
2	P2-1	E2	Black
3	P3-1	E1	Red
4	P4-1	E1	Red

700-09158-xxx Nomenclature	
Conn	Nomenclature
P1	SIM-POWER
E1	+DC
E2	RETURN

700-09489-xxx SIM Rectifier Alarm Mask Connector



700-09489-xxx Pin Assignments		
From	To	Function
J1-7	J1-12	Jumper

9. Specifications

G3S-1900-125-25 Multicarrier PCS Amplifier Functional Specifications

Frequency Range	1930-1990 MHz
*Instantaneous Bandwidth	20 MHz
Total Maximum Input Power	-4 dBm
Total Output Power	125 W typical (1 Module)
Intermodulation Distortion and In-Band Spurious:	-63 dBc (Min) @ +26 to +28 Vdc @ 125 Watts
RF Gain at 1930 MHz	60 dB
Gain Flatness:	±0.5 dB @ 27 Vdc ±1 Vdc
Gain Variation Over Temperature:	±0.5 dB from 24 to 30 Vdc
Output Protection:	Mismatch Protected
Input Port Return Loss:	-16 dB (Min)
Out of Band Spurious:	Better than -60 dBc, +24 Vdc to +28 Vdc
Duty Cycle:	Continuous
DC Input Power:	+27 Vdc ± 1 Vdc, 52 amps Typical, 60 Amps Max @ 125 Watts; Operational +21.0 Vdc to 30 Vdc
Operating Temperature:	0 ºC. to +50 ºC.
Storage Temperature:	-40 ºC. to +85 ºC.
Operating Humidity:	5 % - 95 % Relative Humidity (Noncondensing)
Storage Humidity:	5 % - 95 % Relative Humidity (Noncondensing)
RF Input / Output Connector	Radial BMA Female Blind Mate Connector
Status / Alarm / Control / DC Input Connectors:	21-Pin D-Subminiature Combo Connector
Weight	52 lbs (47.2 kg)
Dimensions:	5.22” High, 16.97” Wide, 20.44” Deep (Including handles, rear fans)

*Amplifier specifications are valid for any signals within a 20 MHz band and the closest Pilot Frequency to this band.

Pilot Frequency Setting Based on PCS Frequency Block of Operation

Block Designator	Transmit Frequency Band (MHz)		
	Base Station	Bandwidth	Pilot (MHz)
A	1930-1945	15	1945.5 (A)
D	1945-1950	5	1950.5 (D)
B	1950-1965	15	1965.5 (B)
E	1965-1970	5	1964.5 (E)
5	1965-1970	5	1970.5 (5)
F	1970-1975	5	1969.5 (F)
C	1975-1990	15	1974.5 (C)
Block Pairs			
A-D	1930-1950	20	1950.5 (D)
D-B	1945-1965	20	1965.5 (B)
B-E	1950-1970	20	1970.5 (5)
E-F	1965-1975	10	1964.5 (E)
F-C	1970-1990	20	1969.5 (F)
E-C Excluding F	1965-1990 Excluding: 1970-1975	25	1974.5 (C)

(3) If the Block Designator has not been previously selected through serial communication on connector J10M, pilot defaults to 1964.5 on the G3S-1900-125-25 amplifier.

(4) If the Block Designator is selected through serial interface on connector J10M, pilot frequency is moved to the appropriate spot and is stored permanently into the microprocessor until another band is changed.

MCR21925-1-2 Specifications

Frequency Range	1930-1990 MHz (see section 4, paragraph 4-9 – Pilot Tone Control)
Power Output / Max Input w/125W modules	109 W (50.37 dBm) / 1.87 dBm (1 Module) 218 W (53.38 dBm) / 1.88 dBm (2 Modules)
Duty Cycle	Continuous
RF Gain – Standard (±0.50 dB)	48.5 dB 1 Module 51.5 dB 2 Modules
RF Gain – Constant (±0.50 dB)	48.0 dB
RF Gain Adjust	0 to 10 dB Standard operating mode 0 to 3 dB Constant Gain operation mode 0 dB when preamps are employed
Gain Variation with Voltage / Freq.	± 0.5 dB @ 26 to 28 VDC
Gain Variation over Temperature	±0.5 dB
Input Port Return Loss	13 dB (min)
Subrack Noise Figure	34.0 dB 1 Module 31.0 dB 2 Modules + Gain Adjust Attenuation value (0-10 dB)
DC Input Voltage Range	21 to 30 VDC (26 to 28 VDC for rated operation)
RF Power Derating for DC Input Voltage	28V ≤ V < 30V 0.5 dB 26V ≤ V < 28V 0.0 dB Normal operating voltage 24V ≤ V < 26V 0.5 dB 22V ≤ V < 24V 1.0 dB 21V ≤ V < 22V 1.5 dB
DC Input Current per Subrack	104 Amps Typical, 120 Amps Max (2 Modules) @ 27 ±1 VDC
Alarms (Subrack)	Minor – Fan Fail Major – One or more MCPAs Failed Critical – All MCPAs Failed
Alarm Indication	Form C Contacts, LEDs & RS-485
Operating Temperature Range	0 °C to + 50 °C, Ambient
Storage Temperature	-40 °C to + 85 °C
Operating Humidity, Normal	0% - 80% RH (Noncondensing)
Storage Humidity	0% - 100% RH (Noncondensing)
Connectors DC RF Input RF Output Alarm Outputs (Form-C) RS-485 (2), Preamp (1), and RS-232 (1)	 Strip-n-Poke (2 to 10 AWG) SMA Female 7/16 DIN Female 15-Pin D-Subminiature Female 9-Pin D-Subminiature Female
Controls	Subrack Address Subrack Operating Mode
Indicators	APC (RED)
Dimensions: MCR21925-1-2	 19” W x 12.17” H x 25” D
Weight: MCR21925-1-2	 38 lbs. Empty; 142 lbs. Fully Loaded

148-Amp Rectifier Model 930-00018-005 Specifications

Input Voltage	180 / 264 Vac, 47 / 63 Hz, Single phase
Input Current	25.5 Amps @ full load @180 Vac
Power Factor	0.99 typical
Inrush Current	50 Amps maximum
Harmonic Distortion	<5% total @ full load; <3% @ each harmonic
Efficiency	89% typical @ 230 Vac
Hold-Up Time	>20 ms @ low line
Output Voltage Range	+20.0 to +29.0 Vdc (set to +27.0 for Powerwave)
Line Regulation	0.5% using remote sense (5% on standby voltage)
Load Regulation	0.5% using remote sense (5% on standby voltage)
Output Ripple & Noise	< 1% P-P
Transient Response	3 % max deviation. 0.50 ms recovery time for a 25% load change
Start-Up Time	2 Seconds
Hold-Up time	>20 ms @ low line
Overshoot/Undershoot	1% at turn on/off
Temperature Coefficient	0.02% per ºC
Remote On/Off	Logic 1(TTL high) or open enables unit (on), Logic 0 (TTL low) or short shuts unit down (Off)
Power Fail Signal	Signal goes low (TTL low) 2 ms before loss of output regulation
Current Limit Protection	110-140% V1, 5VSB <2.5 amps automatic recovery
Over Voltage Protection	29.5 to 30.5 V. Reset by cycling input power
Over Temperature Protection	Automatic shutdown with auto recovery. Thermal shutdown point @ 95 ºC
MTBF	300,000 hours per Belcore standard
Output Power Good	TTL high = power good, TTL low = output out of limits
LED Indicators	DC good = green LED; temperature OK = green LED; AC good = amber LED
Operating Temperature	0 to 50 ºC @ rated output power. Supply derates linearly from 50 ºC to 65 ºC @ 2.2% per ºC
Cooling	Self contained ball bearing fan
Shock and Vibration	Per MIL STD-810F, NEBS compliant to GR 63 Core
EMI/EMC	Meets EN61000-3-2, -3 CISPR22 and FCC Part 15 Class A, Bellcore GR1089-Core
Safety Approvals	Meets UL1950, CSA 22.2 #650, TUV EN60950 and CE Mark
Weight	13.5 pounds

Specifications as provided by Cherokee International, Document Number 97MS2101M, Revision A, Aug 1, 2003

DLNA Specifications

Electrical Characteristics			
Parameter	Limit	Unit	Remarks
Transmit (TX) Path specific			
Frequency Range	1930-1990	MHz	
Insertion Loss	1.2	dB	Max Over entire Pass band
Loss variation over temperature	0.4	dB	Any given frequency
In-Band Ripple (J1: TX to J2: Antenna Port)	0.7	dB	Max Over Temp
Input Power, Average (J1: TX)	250	W	Continuous
Peak Instantaneous Power Handling	5	kW	PIP @ an altitude of 4000 m
Rejection (J1: TX to J2: Antenna Port)	85	dB	Min over DC – 1850 MHz
Rejection (J1: TX to J2: Antenna Port)	105	dB	Min over 1850-1900 MHz
Rejection (J1: TX to J2: Antenna Port)	97	dB	Min over 1900-1910 MHz
Rejection (J1: TX to J2: Antenna Port)	45	dB	Min over 2015 – 4000 MHz
Rejection (J1: TX to J2: Antenna Port)	35	dB	Min over 4000 – 12750 MHz
Inter modulation Distortion (IMD3) in TX Band (J1: TX to J2: Antenna Port)	-80	dBc	2 tones @100W (+50dBm) / Tone at (J1: TX)
Isolation (J1: TX to J3:RX_01) or (J1:TX to J4: RX_02)	-59	dB	DC – 1910 MHz
	-34	dB	1930 – 12750 MHz
Receive (RX) Path Specific (Antenna port to LNA output port)			
Frequency Range	1850-1910	MHz	
Gain (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	45.0+/- 0.5	dB	at Fc=1880 MHz & Room temp)
Dynamic power range:	-121 to –23	dBm	Max GMSK average power
	-121 to –26	dBm	Max EDGE average power
Input IP3	-8.0	dBm	Min. (Added filter loss)
Input P1dB	-16.0	dBm	Min. (Added filter loss)
Variable attenuation, voltage controlled	+0.0 /- 2.0	dB	via front panel potentiometer
Gain variation, over temperature	± 1.0	dB	Full Band
Gain flatness, over specified frequency range	1.7	dB	Filter ripple, Filter + LNA
Noise Figure	2.0	dB	Max at Room Temp.
	2.5	dB	Max Over Temp.
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	90	dBc	Min. over DC to 1720 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	40	dBc	Min. over 1720 to 1820 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	25	dBc	Min. over 1820 to 1830 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	0	dBc	1830 to 1850 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	0	dBc	Reference = 1850 to 1910 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	0	dBc	1910 to 1930 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	90	dBc	Min. over 1930 to 2050 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	70	dBc	Min. over 2050 to 4000 MHz
Rejection (J2: Antenna to J3: RX_01) or (J2: Antenna to J4: RX_02)	30	dBc	Min. over 4000 to 12750 MHz
Isolation (J3: RX_01) to (J4: RX_02)	15	dB	Over the specified frequency range
Gain balance	0.5	dB	Between (J3: RX_01) & (J4: RX_02)

Electrical Characteristics			
Parameter	Limit	Unit	Remarks
Inter modulation Distortion (IMD7) RX Band (J3: RX_01) to (J4: RX_02)	-110	dBc	Measured @ 1870 MHz., 2 tones @100W (+50dBm)/Tone at J2: Antenna
General Specification			
Max Input RF	-10.0	dBm	RMS power with no damage to DLNA
Input Return Loss	-18	dB	(J1: TX) 50 ohm matched.
	-18	dB	(J2: Antenna) 50 ohm matched
Supply Voltage Range	+20 to +30	Vdc	
Supply Voltage Range	27± 0.5	Vdc	Nominal
DC Current	2	A	Max.
VSWR	1.5:1		Max; Source and Load
Sample Port J5			
Frequency Range	1930~1990	MHz	
Loss (J1: TX port to J5: Sample Port)	-55±2.5	dB	Nominal
Flatness (J1: TX port to J5: Sample Port)	2.0	dB	Max
Output Return Loss (J5: Sample)	-18	dB	Max (50 ohm matched)
Mechanical			
Connector - TX port	N-type F	1	
Connector - RX Ports	SMA F	2	
Connector - Antenna Port	N-type F	1	
Connector - Sample Port	SMA F	1	
Connector - DC power & I/O	DB15	1	
Switch	Rotary 4 position	1	
LED		2	
Dimensions	16.12 L x 9.50 W x 1.75 H inches (409.12 L x 241.3 W x 44.45 H mm)		
Weight	9 KG (19.8 lbs)		

Common Environmental characteristics				
Characteristic	Test Conditions	Value		Unit
		Min	Max	
Transportation Shock	IEC 68-2-27			
Transportation Bounce	IEC 68-2-55			
Operating Altitude(Note 2)		- 152	4000	Meter AMSL
Operating Temperature Range		- 20	+85	ºC
Storage Temperature Range		- 40	+85	ºC
Operating Humidity	Non-condensing	0	95	%RH

Notes:

1. Maximum ratings represent the limits beyond which damage to the device may result. Continuous operation of the device at the maximum rating limit is prohibited.
2. Max op temp may be derated by 2 degrees C/1000 ft above 2154 meters.

SIM Specifications

Operating Voltage	+27 ±0.5 VDC nominal; 20 min to 30 VDC max
Current	5 amps typical; 7.2 amps max
Operating Temperature	-40 to +80 °C
Storage Temperature	-40 to +80 °C
Humidity	5 to 95% RH, non-condensing @ 50 °C
Interface Signals	Form-B Open-Collector TTL, 5 V pull-up, 5 mA max Open-Collector Fan Sense, 5 V pull-up, 1 mA max Fan Control, 0 to 10 VDC typical, 12 VDC max RS-232 RS-485
Output Voltage	DLNA use, 21 to 27 VDC, 5 amp circuit breaker protection, 6 outputs
Dimensions	9.5 W x 5.4 D x 5.22 H inches (241.3 W x 136.91 D x 132.56 H mm)
Weight	3 lbs (1.4 Kg)

Electrical Specifications		
DC bus connection	Specification	Comments
Nominal voltage User adjustable values Factory set	 26.5V, 26.75V, 27V, 27.25V 27V	At 25°C adjustable by dip switches located on the controller board when programming signal is connected rectifier programming pins
Voltage range	20Vdc to 30Vdc	
Bus voltage monitoring Pre alarm user value range Pre alarm Factory set Battery disconnect range Factory set	 23Vdc or 25Vdc 25Vdc 21V or 22V 21Vdc	Set by dip switches on the controller
Rated bus current	600A Nominal	
Battery connections		
Number of connections	2	
Battery type (AH)	40; 60; 100; 200; 300	VRLA; Capacity set by dip switches
Temperature compensation Temperature range Slope user adjustable values Factory set	-10°C to 60°C /(14°F to 140°F) 0; -36; -48; -60 mV/K -36mV/K	Based on temperature probe when enabled Set by dip switches on the controller
Battery protection Fuse rating ranges Factory set	 70A to 600A 600A	Single blade fuse on each battery branch with auxiliary contacts
Battery Disconnect User settable voltage values Factory set Reconnect	 21V or 22V 21Vdc 24V	Set by dip switches on the controller
Battery charge current limitation; Factory set	C/10	
Environmental		
Operating temperature range	-25°C to 70°C (-13°F to 158°F)	
Max. humidity	80% non condensing	
Safety	Meets EN 60950; All components are UL approved	when mounted in an enclosed 19 inch frame
Mechanical		
Dimensions: Width x Depth x Height	19 W x 14.2 L x 5.25 H inches (482.6 W x 360 L x 133 H mm)	
Weight	15 lbs (6.8 Kg)	

Front panel	Fuse, Controller	Maintenance access
Connections		
DC Bus	Screw connection	Back of the module
Battery connection	Screw connection	Back of the module
Signals connection	Sub-D 15p female	Back of the module
Grounding	M6 stud	Back of the module

Battery Heater Specification

Operating Voltage	240 VAC
Power	400 W
Thermostat Set Points	Close at 0 ºC (32 ºF); Open at 10 ºC (50 ºF); tolerance ± 3.3 ºC (+ 6 ºF)
Maximum Surface Temperature	200 ºC (392 ºF)
Dimensions	20.5 L x 20.5 W x 0.030 H inches (521 L x 521 W x 0.76 H mm)

12 VDC 105 AH Battery Model 920-00337-003 Specifications

Cells / Volts	6 Cells / 12 Volts (DC)
Terminal Type	Threaded Copper Insert, ¼ inch
Capacity @ 77 ºF (25 ºC)	105 AH (8 hrs) to 1.75 Volts (DC) per cell
Operating Temperature	-40 ºC to +60 ºC (-40 ºF to +140 ºF)
Charging Voltage / Current	2.27 to 2.30 Volts (DC) per cell, constant voltage at a maximum current of C/4 amps
Temperature Compensation	nSubtract 3mV/ °C/cell above +25 °C or 1.7 mV/°F/cell above 77 °F nAdd 3mV/ °C below +25 °C or 1.7 mV/°F/cell below 77 °F
Storage time from a fully charged condition	6 months at 25 °C / 77 °F; for each 9 °C / 15 °F rise, reduce storage time by half
Self discharge rate	< 2% per month at 25 °C / 77 °F
AC ripple from charging source	1.5% peak to peak of float
Overall dimensions	Inches: 21.96 L x 4.86 W x 8.93 H; mm: 558 L x123 W x 227 H
Weight	90 lbs / 41 kgs

Specifications as provided by Power Battery Company, Inc., Document Number 1606-1-0310

I^2R SA120-40 AC Lightning Arrestor Specifications

Item	UOM	Specification
Tested to		IEC 61643-1
Arrester class acc. to IEC 61643-1		II
Nominal voltage (50/60 Hz)	U_N	120V
Max. continuous operating voltage	U_C	170V
Max. discharge current at wave shape I_{max} (8/20)	I_{max}	40kA
Nominal discharge current at wave shape I_n(8/20)	U_P	20kA
Voltage protection level at I_n	I_n	<850V
Response Time	t_a	<25ns
Recommended back-up fuse		160AgL/gG
Short-circuit withstand capability	I_P	$60kA_{ef}$
Recommended cross-section of connecting conductors	θ	$25mm^2$ (solid) $16mm^2$ (flexible)
Operation temperature range	-40 to +80 ºC	
Protection type acc. to CSN EN 60529	IP 20	
Mounting on	DIN rail 35mm	
Housing's material	FRNC-UL94VO Flame Rating	
Weight	3.2 oz (90g)	
Potential free signal contact	electrical strength against surrounding circuits 3750Vef electrical strength against network circuit 3750Vef insulation resistance 2x107W max. switching current ~0,5A max. switching voltage ~250V	

Specifications as provided by Transtector, Inc., Document Number 1458-009_Rev0 (R8-11/04/02)

10. General Site Survey Form

Name of Operator: _____ **Brand Name:** _____

Date: _____ Info Source: _____ Tel: _____

Your Name:_____ Tel: _____ Email: _____

BTS

Type / Supplier: _____ Sectors(S) To Be Equipped: _____

Downlink Frequencies in use _____ MHz to_____ MHz.

Uplink Frequencies in use _____ MHz to_____ MHz.

Ant 0 Signals

BCCH present? _____ TRXn _____

Ant 1 Signals

BCCH sometimes present? ____ TRXn _____

Existing Sites

Plans to add additional TRX during trial? _____

Feedline

Size: _____, Length _____, dB loss estimate: _____

For existing sites: BTS jumper from BTS top to feedline on tower: _____

Shelter exit on up tower: _____

Jumper to antenna: _____

Overall feedline loss estimate from BTS to Antenna _____

Jumpers

From BTS to power amplifier cabinet required:

Length _____, Connector Type _____, and Gender _____,

From power amplifier cabinet to feedline for tower required:

Length _____, Connector Type _____, and Gender _____,

Location

On Roof Near Antenna? _____ On Ground? _____ Type of raised platform? _____

Adequate space including ½ meter min jumper bend radius at power amplifier left side? _____

Is a structural analysis needed? _____

Network Link Budget

RF carrier power (each TRX) at BTS top connector (in dBm)? _____

Desired RF carrier power (each TRX) at power amplifier cabinet output connector (in dBm)? _____

Current system uplink and downlink balance or difference? _____

Is discontinuous transmit (DTX) feature used? _____

Power

AC Voltage available for power amplifier at site: _____ Vac; _____ Amps

Singe Phase or Three Phase? (circle one)

Main Panel or Sub Panel? (circle one)

Required RF Jumpers (8x8x8 configuration)

9 pieces Type N male to Type N male, ½" Heliax jumper - BTS top to power amplifier cabinet input

Length: _____

6 pieces 7/16 DIN male to 7/16 DIN male, ½" Heliax jumper - power amplifier cabinet output to antenna feedline

Length: _____

Other? (Type & Length _____)

Required Cables (non-RF)

AC wiring from panel to power amplifier cabinet. Length: _____

Interconnecting alarm wire and connection. Length: _____

Ground bus wiring and attachment. Length: _____

Host is Responsible for

- Installing power mains panel
- Contractor management of cabinet mounting, installation and coax seal weatherproofing.
- Location preparation: structural analysis, platform installation, building code conformance, site security

Photos Required

- BTS top connection
- BTS front inside showing TRX unit and number of TRX
- Wide view of BTS and proposed power amplifier cabinet location in same photo
- Proposed power amplifier cabinet location shown with a 1 meter long ruler in view nearby
- Existing feedline cable to antenna (where power amplifier cabinet output will connect to)
- Power mains circuit breaker panel (shows adequate capacity for breakers)
- Misc. pictures showing tower and site access.