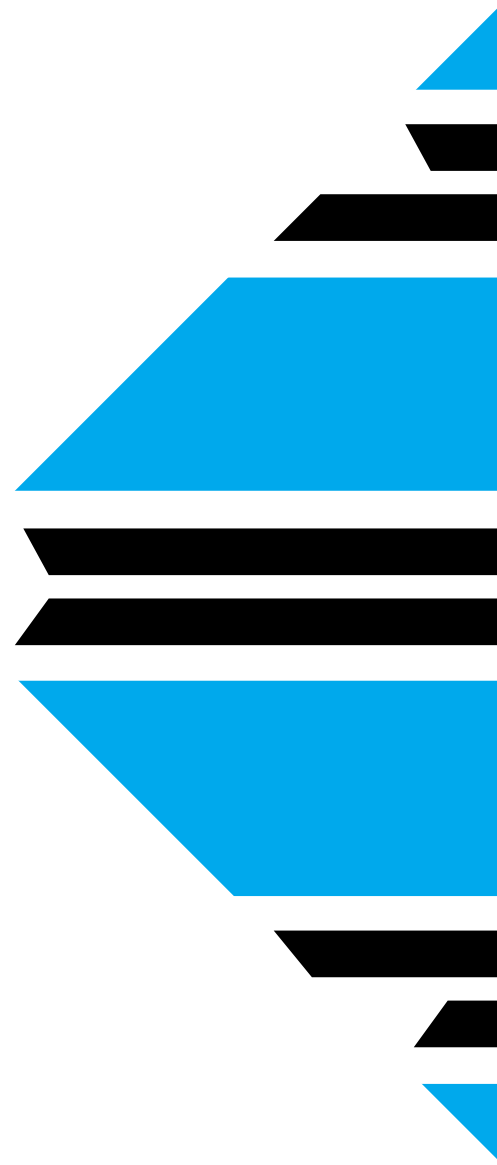


Issue V  
January 2002

# ISDN Premises Powering Guide



**System Engineering International, Inc.**

**“When POWER Is The Priority”**

***System Engineering International located in Frederick, MD, has been part of the Telecom power world since 1977.***

***SEI designed ISDN power systems have been installed since 1988, providing CPE powering to a wide variety of installations throughout the country.***

***SEI provides both standard and custom powering solutions with or without UPS capabilities.***

### **Support Telephone Assistance**

SEI provides ISDN powering information without charge. Please call (301) 694-9601 or 1-800-765-4-SEI and ask for ISDN support.

Our E Mail Address is [info@seipower.com](mailto:info@seipower.com)  
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To request additional copies of this guide please contact SEI. At time of printing, information in this guide was considered complete and accurate. However, information and product specifications are subject to change.

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## I INTRODUCTION

The purpose of this guide is to familiarize the reader with the SEI series of ISDN Powering and Distribution Systems. SEI provides a number of units that power ISDN terminals with -48 vdc that can include battery holdover in the event the normal premises powering should fail. This guide concentrates on powering methods, configuring and sizing power, reserve power options, and interfacing with NT1s, and punchdown blocks.

If the reader has questions or needs additional information not covered in this guide, please feel free to call, write, or email SEI at info@seipower.com.

## II POWER and ISDN

ISDN in North America requires that the power to telephones, adapters, and Network Terminators (NT1s) be supplied at the customer premises site. This is opposed to analog service where power is transmitted by the Central Office. With ISDN, data and signal without power is delivered to the demarcation point of the premises.

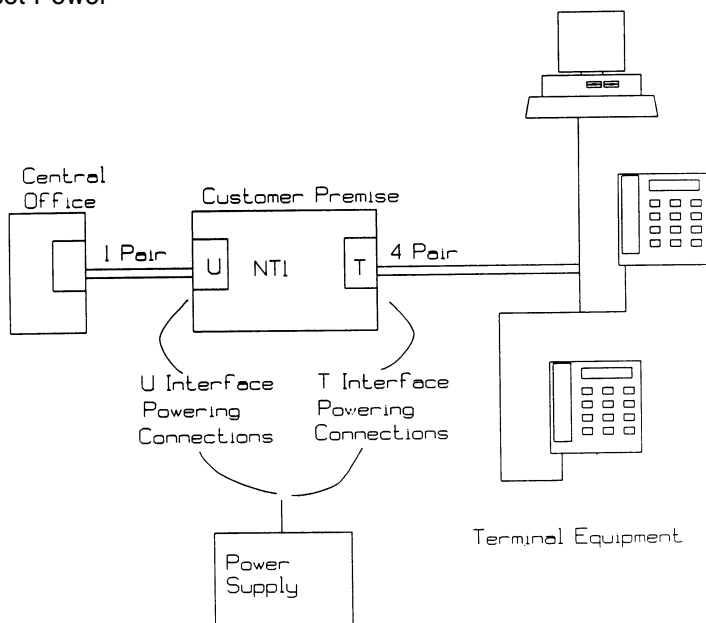
At a point, called the "U" interface, the input pair is connected to a NT1 (Network Terminator). Here it is converted to four pair and interfaced with an ISDN terminal. This four pair is designated the "S/T" interface, and is commonly called the "T" interface. Power must be supplied to both the NT1 and terminal. Power can be supplied at either the "U" or the "T" interface.

If the switch is on the premises site, then the customers' equipment may be connected directly at the "U" interface using a T card, and a NT1 is not required. In newer switch software releases however, a NT1 will be necessary. In either case, the customers' equipment must still be powered.

## III POWERING METHODS

Power at the premises for ISDN can be accomplished in one of three ways.

- a) Distributed or Closet Power
- b) Local Power
- c) Central Power

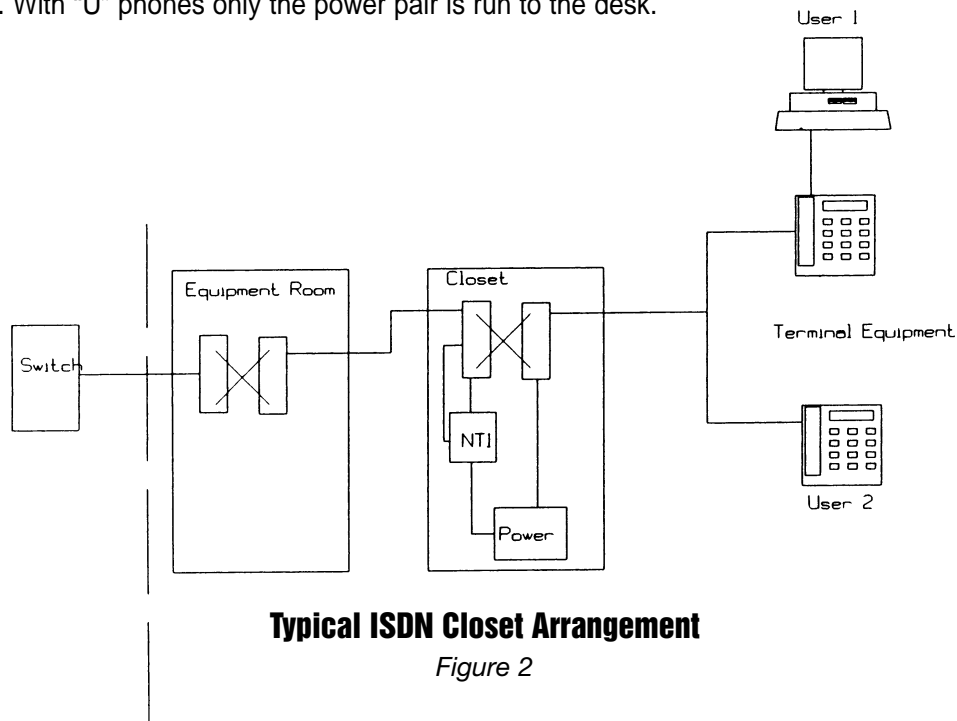


**Interface Powering Options**

Figure 1

## Distributed or Closet Power

With Closet Power, units are located in telephone or wiring closets throughout the building. Multiple power units may be required within each closet. NT1's are usually located in cages in the closet. In most cases, punchdown blocks are utilized to combine the Power and S/T signal of the NT1, and then the four pair cable is then run to the telephone. With "U" phones only the power pair is run to the desk.

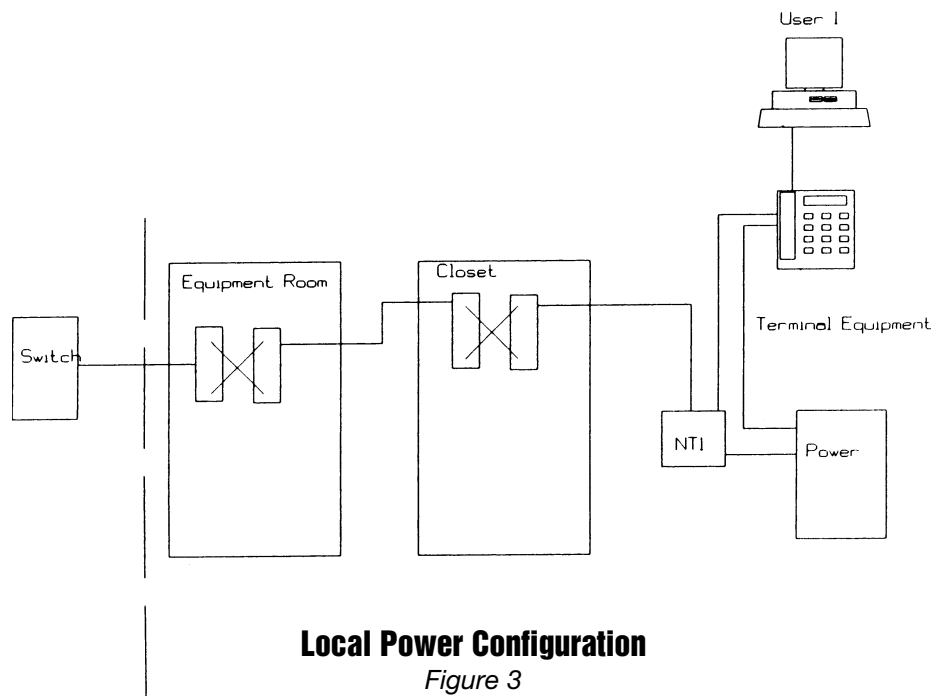


**Typical ISDN Closet Arrangement**

Figure 2

## Local Power

With local power each set or terminal is individually powered at its location. The NT1 is usually co-located at the set location. For this method of powering, SEI provides the DP-20B and DP-20B-E with battery holdover.



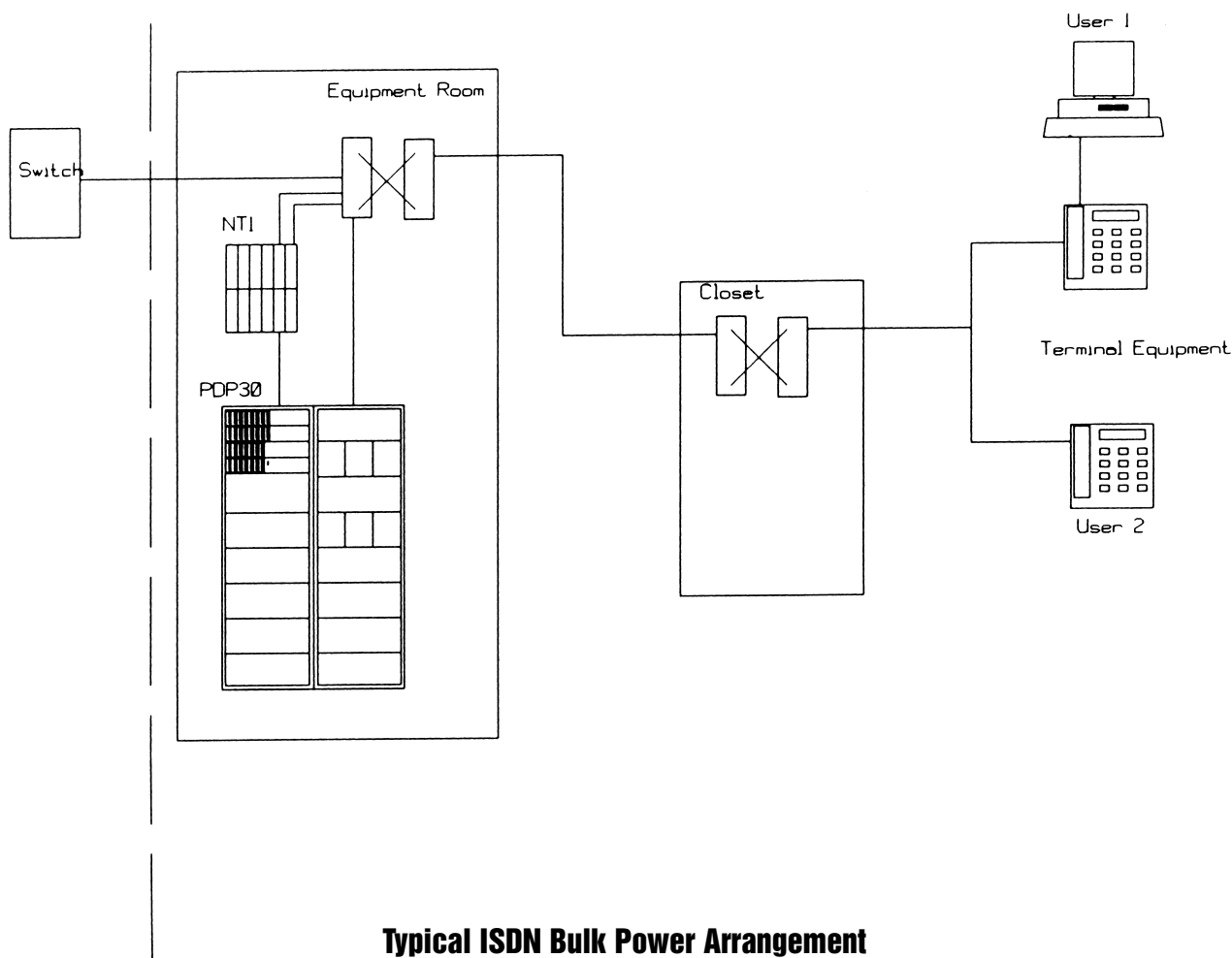
**Local Power Configuration**

Figure 3

### Central Power

In this method, the premises equipment is powered by a single power plant that rectifies ac to -48 vdc and provides some form of reserve or back up power in the form of batteries or generators. The -48 vdc power is then distributed through the riser and horizontal runs to the individual sets and NT1's.

To accomplish this power distribution, SEI provides the PDP30/DM500 Distribution System.



**Typical ISDN Bulk Power Arrangement**

*Figure 4*

## IV DISTRIBUTED or CLOSET POWER

With distributed power, units are located in telephone closets throughout the building. These powering units may have reserve battery holdover at the user's discretion. Depending on the number of sets being deployed, multiple powering units may be required within each closet. NT1's are usually positioned in cages located in the closet. SEI accomplishes this method of powering by the use of the DP Series, the PowerRack Series, or PowerBox Systems.

### The Distributed Power Series

With the Distributed Power (DP) Series, power is joined with the signal at the NT1's through the use of punch-down blocks. The NT1's are usually located in cages within the closet. The resulting four pair wire is then run to the terminal. (See figure 2). The DP series of distributed power uses a single unit to power up to 144 lines in 24 line increments, and up to 12 NT1 cages. This is accomplished with DM200 distribution boards. Each DM200 board supports one 25 pair connector or "Champ" connector and two RJ11 connectors. Even Though the Amphenol connector is capable of supplying power to 25 sets, to retain color and punchdown compatibility one pair of pins is held as a spare.

### SEI Distributed Power (DP) Unit

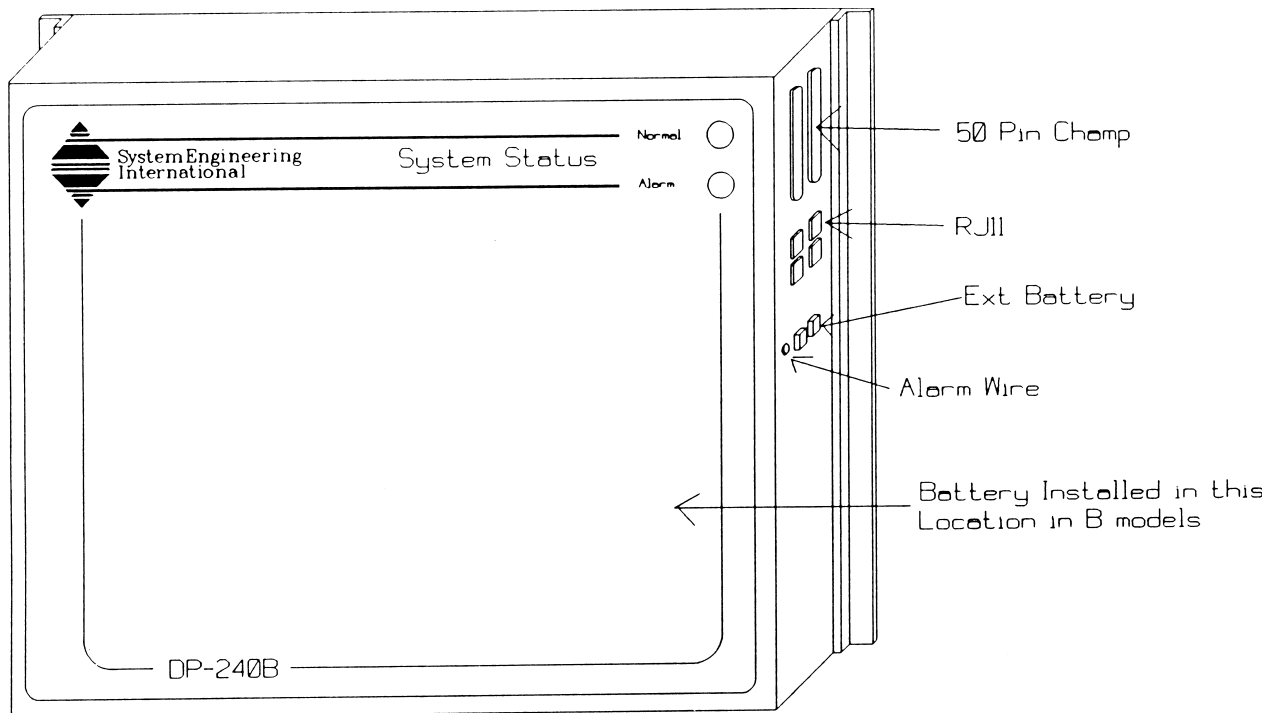


Figure 5

**DM-200 Distribution Board**

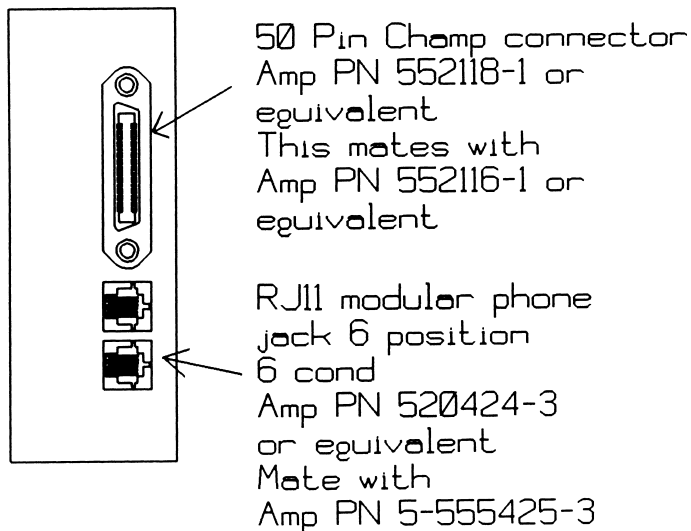


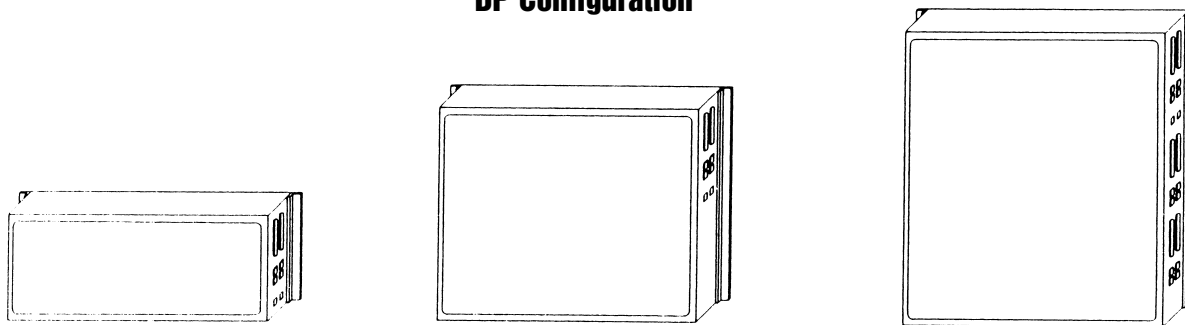
Figure 6

**Unit Selection**

To reduce the physical size requirements of the DP units a smaller chassis is used for 48 lines or less, when no batteries are specified.

The DP series of distributed power uses DM200 distribution boards to configure a DP unit in either 12 or 24 line increments with the ability to power either one or two NT1 cages per distribution board. Up to six distribution boards can be mounted on a single DP700 chassis, thereby providing expansion from 72 lines to 144 lines, 24 lines at a time in a point to point installation.

**DP Configuration**



DP Model	70/70B	140	240	140B	240B	700/700B			
No of Lines	12	24	48	24	48	72	96	120	144
No of NT1s	12	24	48	24	48	72	96	120	144

Figure 7

### Technical Specifications - DP Series

MODEL NUMBER	70/70B	140/140B	240/240B	700/700B
INPUT POWER	92-132/176-246 IEC RECEPTACLE			
OUTPUT POWER	70 WATTS	140 WATTS	250 WATTS	500 to 750 WATTS
OUTPUT CONFIG. POINT/POINT	12 NT1's 12 TERMINALS	24 NT1's 24 TERMINALS	48 NT1's 48 TERMINALS	Up To 144 NT1's Up To 144 TERMINALS
MULTIPOINT	12 NT1's 24 TERMINALS	24 NT1's 48 TERMINALS	48 NT1's 96 TERMINALS	Up To 144 NT1's Up To 288 TERMINALS
BATTERY HOLDOVER	70 - No 70B - Yes	140 - No 140B - Yes	240 - No 240B - Yes	700 - No 700B - Yes
BATTERY AMPHRS	2.5 - 8	8 - 16	8 - 35	UP TO 130 AMPHRS
BATTERY HOLDOVER	1 TO 8 HOURS			
BATTERY MAINTENANCE	LOW VOLTAGE DISCONNECT FLOAT CHARGED			
INDICATORS	GREEN LED-NORMAL          RED LED-ON BATTERY REMOTE ALARM FORM C RELAY			
OPERATING TEMP.	0 TO 50 C°			

### Chart 1

**Battery Enclosures** - Where extended battery holdover times are required, some models require external 12 volt batteries that are placed in a battery cabinet or tray dependent upon wall or rack mounting.

**Mechanical Specifications  
DP Configurations and Unit Dimensions**

<b>CONFIGURATION</b>	<b>MODEL #</b>	<b>DESCRIPTION</b>	<b>DIMENSIONS</b>
Configuration #1	DP70-12-0 DP140-24-0 DP240-48-0	Power Supply No Battery Backup	19"W X 5"D X 7"H
Configuration #2	DP70B-12-2 DP240B-48-8	Power Supply with Internal Battery	19"W x 5"D x 7"H
Configuration #3	DP70B-12-8 DP140B-24-8 DP240B-48-8	Power Supply with Internal Battery	19"W x 5"D x 14"H
Configuration #4	DP140A-24-8	Power Supply with Internal Battery No Internal Low Voltage Disconnect	19"W x 5"D x 14"H
Configuration #5	DP140B-24-16 DP240B-48-16	Power Supply with Internal Battery and External Battery Pack	19"W x 5"D x 14"H Battery Pack 19"W x 5"D x 7"H
Configuration #6	DP700-XX-0	Power Supply No Battery Backup	19"W x 5"D x 20"H
Configuration #7	DP700B-XX-8	Power Supply with Internal Battery	19"W x 5"D x 20"H
Configuration #8	DP700B-XX-25 To DP700B-XX-130	Power Supply with an External Battery Cabinet for Wall Mounting or a Battery Tray for Rack Mounting	19"W x 5"D x 20"H 25 to 65 AmpHrs Battery Cabinet 27.5"H x 15.25"Wx12"D
Configuration #9	DP700B-XX-16	Power Supply with Internal Battery and External Battery Pack	19"W x 5"D x 20"H
Configuration #10	DP240B-48-25/35	Power Supply with External Battery, Battery Tray, or Cabinet	19"W x 5"D x 20"H See Tray and Cabinet Dimensions

**Battery Cabinet** - used in wall mount versions. The cabinet is stored on the floor, or stand beneath the Power Supply. Fusing is contained in the locker and the locker opens from the top and front. **Battery Trays** are used in a rack mounted configuration with the battery tray positioned under the power supply. The tray fits in a 19 inch rack and the tray is shipped with the Power Supply. Fusing is mounted on the rack. Each rack holds four 12 volts batteries with associated harness wiring.

Dimensions - All DP Power Systems and external battery packs (BP8) are 19 inches wide and have depth of 5 inches. Height is only variable depending on the configuration.

**Chart 2**

## CONFIGURATING AND SIZING CLOSET POWER - DP SERIES

Sizing the type and number of DP units for installation consists of combining a number of factors to configure the optimum size. These factors are as:

- The number of telephone sets and terminal adapters to power. (This is the number of terminations).
- The load in watts per telephone set.
- The ability to locate units so they can power multi-floors based on riser location and space.
- The distance the power runs between the power supply and the terminal.

Since the NT1 cages are powered by the RJ11 connectors, their number and power loads do not have to be considered in selecting a particular DP unit. In a multi-point installation, the number of telephone sets determines the number of line terminations in the configuration matrix.

Unless the telephone set or terminal adapter draws more than 6 watts and the power runs over 1000 feet there is no need to be concerned with individual loads. If a single line termination has a requirement for greater than 6 watts, or if more than a 1000 foot power run is required, then two of the pin outs on the Amphenol connector would be utilized at the punchdown block. See chart 4 for Power Runs.

These factors are condensed into the following configuration charts.

### Using the DP configurator in Chart 3:

- Determine what the average load wattage is per line termination. If it is 3 watts or less, and it is a point to point installation, use Configurator I. If the installation is a multipoint or passive bus installation and the load wattage is 3 watts or less on an offhook status, use the Multipoint Configurator II to maximize the load capacity of the power unit. If the load wattage is greater than 3 watts, usually legacy sets, use Configurator III.
- Find the number of telephone sets needed to be powered on the product configurator matrix.
- Select the duration of battery holdover time required on the left side of the matrix.
- Where the line terminations and the reserve time intersect on the matrix, is the optimum DP unit selection with its model designation.

This model designation includes all necessary batteries and their cabling. The suffix "RM" or "WM" specifies if it is a wall or rack mount installation.

In an existing installation, where increased reserve time is required, up to a total of four BP-8s, depending on the DP model can be added.

#### Mounting Information:

For Wall Mounting Specify **WM** after Model Number

For 23" Rack Mount Specify **23RM** after Model Number

For 19" Rack Mount Specify **19RM** after Model Number

For 25" Rack Mount Specify **25RM** after Model Number

## The DP Series Product Configurator I

### For Termination Loads in a Point to Point Configuration

(off hook loads less than 3 watts)

Battery Holdover	Number of Terminations						
	1 -12 Phones	1-24 Phones	1-48 Phones	1-72 Phones	1-96 Phones	1-120 Phones	1-144 Phones
None	DP70-12-0	DP140-24-0	DP240-48-0	DP700-72-0	DP700-96-0	DP700-12-0	DP700-144-0
1 Hour	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-8	DP700B-96-8	DP700B-120-8	DP700B-144-8
2 Hours	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-8	DP700B-96-16	DP700B-120-16	DP700B-144-24
4 Hours	DP70B-12-8	DP140B-24-8	DP240B-48-16	DP700B-72-16	DP700B-96-24	DP700B-120-32	DP700B-144-32
8 Hours	DP70B-12-8	DP140B-24-16	DP240B-48-24	DP700B-72-32	DP700B-96-50	DP700B-120-65	DP700B-144-65
	<b>12 NT1's</b>	<b>24 NT1's</b>	<b>48 NT1's</b>	<b>72 NT1's</b>	<b>96 NT1's</b>	<b>120 NT1's</b>	<b>144 NT1's</b>
	<b>Number of NT1's to Power per Single Unit</b>						

## The DP Series Product Configurator II

### For Termination Loads in a Multipoint Configuration

(off hook loads less than 3 watts)

Battery Holdover	Number of Multipoint Phones to Power per Single Unit						
	1 -24 Phones	1-48 Phones	1-96 Phones	1-144 Phones	1-192 Phones	1-240 Phones	1-288 Phones
None	DP70-12-0	DP140-24-0	DP240-48-0	DP700-72-0	DP700-96-0	DP700-12-0	DP700-144-0
1 Hour	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-8	DP700B-96-16	DP700B-120-16	DP700B-144-16
2 Hours	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-16	DP700B-96-24	DP700B-120-24	DP700B-144-32
4 Hours	DP70B-12-8	DP140B-24-8	DP240B-48-16	DP700B-72-24	DP700B-96-32	DP700B-120-50	DP700B-144-65
8 Hours	DP70B-12-8	DP140B-24-16	DP240B-48-32	DP700B-72-65	DP700B-96-90	DP700B-120-100	DP700B-144-130
	<b>12 NT1's</b>	<b>24 NT1's</b>	<b>48 NT1's</b>	<b>72 NT1's</b>	<b>96 NT1's</b>	<b>120 NT1's</b>	<b>144 NT1's</b>
	<b>Number of NT1's to Power per Unit</b>						

## The DP Series Product Configurator III

### For Termination Loads in a Legacy Set Configuration

(off hook loads greater than 3 watts)

Battery Holdover	Number of Multipoint Phones to Power per Single Unit						
	1 -12 Phones	1-24 Phones	1-48 Phones	1-72 Phones	1-96 Phones	1-120 Phones	1-144 Phones
None	DP70-12-0	DP140-24-0	DP240-48-0	DP700-72-0	DP700-96-0	DP700-12-0	DP700-144-0
1 Hour	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-8	DP700B-96-16	DP700B-120-16	DP700B-144-16
2 Hours	DP70B-12-2	DP140B-24-8	DP240B-48-8	DP700B-72-16	DP700B-96-24	DP700B-120-32	DP700B-144-32
4 Hours	DP70B-12-8	DP140B-24-8	DP240B-48-16	DP700B-72-24	DP700B-96-32	DP700B-120-50	DP700B-144-65
8 Hours	DP70B-12-8	DP140B-24-16	DP240B-48-32	DP700B-72-65	DP700B-96-90	DP700B-120-100	DP700B-144-130
	<b>12 NT1's</b>	<b>24 NT1's</b>	<b>48 NT1's</b>	<b>72 NT1's</b>	<b>96 NT1's</b>	<b>120 NT1's</b>	<b>144 NT1's</b>
	<b>Number of NT1's to Power per Single Unit</b>						

**Chart 3**

## SEI's POWERACK CONFIGURATOR FOR MULTIPOINT INSTALLATIONS

All units equipped with battery backup, power supply and NT1 cages

No. NT1's and Phones Per Unit	NT1 Type			Battery Holdover Time
	B300	P230 Circuit Card	D300 Packs	
12 NT1's/24 Phones	PR300-24	PR230-24	PR180	2 Hours
24 NT1's/48 Phones	PR300-48	PR230-48	PR180	2 Hours
36 NT1's/72 Phones	PR300-72	PR96	PR180	1 Hour
48 NT1's/96 Phones	PR300-96	PR96	PR180	1 Hour
90 NT1's/180 Phones			PR180	1 Hour
<b>For Extra Battery Holdover time</b>				
External Battery Pack	BP-2 / BP-8	BP-8	BP180	1 Hour

Battery holdover time allows phones to be 40% off-hook at a minimum and still provide the specified battery holdover. Configurations are based on average load of 6 watts per BRI line, allowing two off-hook phones and a NT1 per BRI line.

### Chart 4

#### The PowerRack Series

The PowerRack Series are integrated units that not only provide power and battery holdover, but also have built in NT1 Cages and punchdown blocks where appropriate. PowerRacks are designed around specific NT1's such as the Lucent type P230 circuit card, the Lucent D300 circuit pack, and the Lucent type B300.

Because of their integration, the PowerRack Series significantly reduces installation times, minimizes the normal space requirements and lowers total cost by eliminating the need for stand alone components.

#### The PowerRack-96

The PowerRack 96 (PR96) combines distributed power with NT1 circuit card cages. Up to 48 Lucent Technologies NT1P230 circuit cards are arrayed in a four high by 12-card cage that is built into the chassis of the PowerRack.

Power is supplied to the NT1 cages and terminals by a 250-watt telecom rectifier. An 8-amp monoblock battery (maintenance free) can be contained within the power side of the unit to provide a source of uninterruptible DC power in the event of an AC failure.

In addition, the PowerRack functions as a distribution block for the NT1's and associated terminal adapters and telephones. The backplane of the unit both supplies the 'U' or incoming signal to the NT1's and distributes both the 'S/T' signal and power to eight 50-pin amphenol connectors on the left side or distribution side of the unit.

As a result each 50 pin connector provides six 4 pair that can be directly run to the terminal without the need for any intermediate use of the punchdown blocks that are normally used to combine power and signal. In a multi-point configuration, the 4 pair would be bridged at the appropriate junction point. Thereby servicing up to 96 terminals/telephones and 48 NT1's.

As with the other versions of the SEI product line, the PowerRack provides Form C relay for remote alarm capability, and a low voltage disconnect switch, (to preserve battery life), and the ability to add two additional strings of batteries, providing up to 65 amp hours or reserve time.

The PowerRack can be either rack (19 to 25 inches) or wall mounted.

**PowerRack-96 Wiring Diagram**

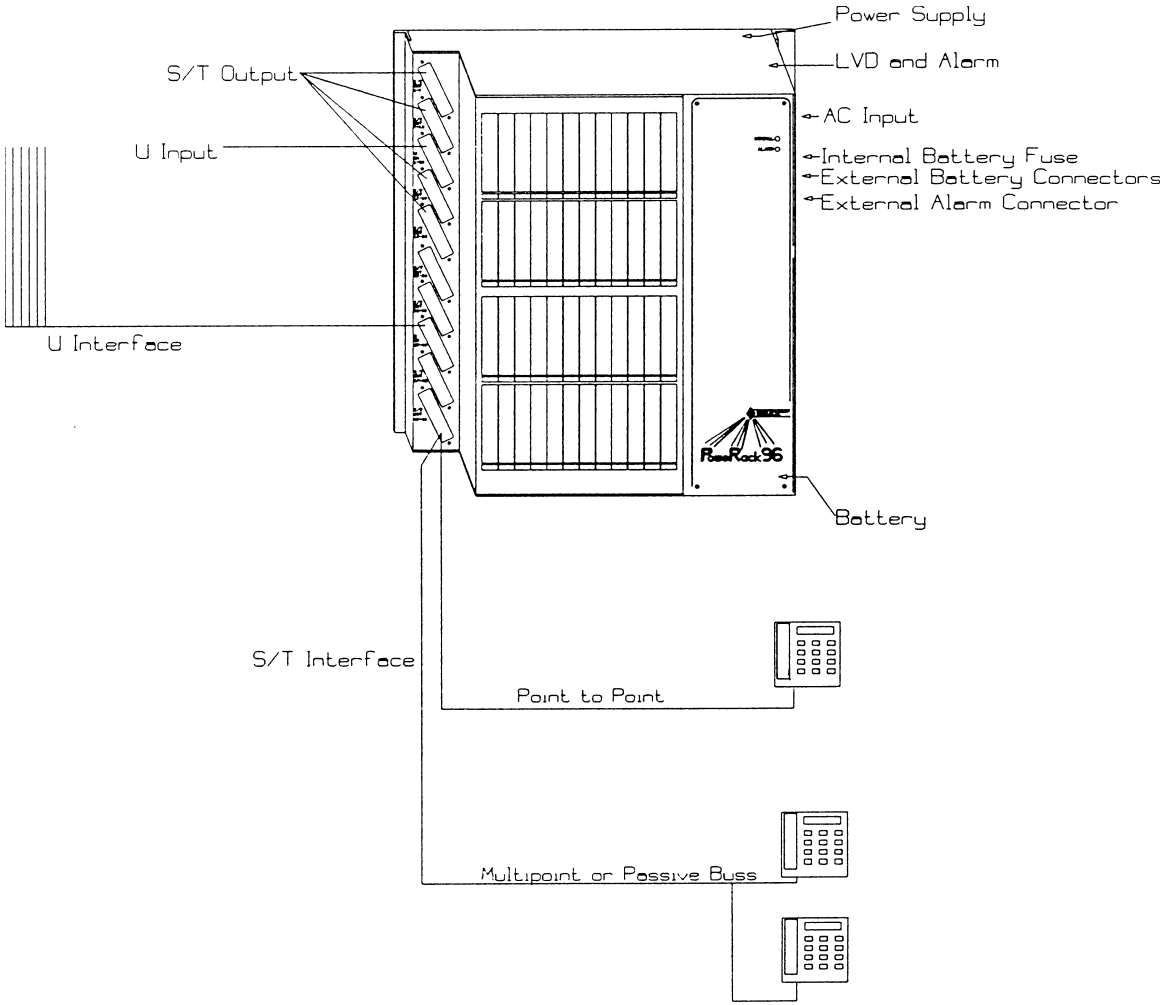


Figure 8

**The PowerRack 48**

The PowerRack 48 combined distributed power with NT1 circuit card cages. Up to 24 Lucent Type NT1P230 circuit cards were arrayed in a two high by 12 card cage that is part of the PowerRack chassis.

The PowerRack 48 was configured in the same way as the PowerRack 96 with the exception that only one 'U' interface 50 pin Amphenol connector and four 50 pin 'S/T' output connections were used.

## The PoweRack 180

The PoweRack180 (PR180) combines bulk or distributed power for seven Lucent NT1D 300 circuit packs and six P230 circuit cards with built in NT1 cages. The PR180 powers up to 180 multipoint telephones in a footprint of only 19 by 23 inches.

Power is supplied to the NT1's and terminals by two 250-watt telecom rectifiers that are part of the unit. Back up power is provided by a companion Battery Pack(s) (BP180). Each BP180 has maintenance free 8-amp monoblock batteries. Together, the PR180 and BP180 provide a source of uninterruptible DC power in the event of an AC failure.

In addition, the PoweRack functions as a distribution block for the NT1's and associated terminal adapters and telephones. The backplane of the unit both supplies the 'U' or incoming signal to the NT1's and distributes both the 'S/T' signal and power. For the six NT1P-230 NT1s the PR180 provides 12 Modular RJ45 jack provide the 'S/T' output. For the NT1D-300 the RJ45 jacks are built in. All 'U' connections are distributed from four 50-pin Amphenol connectors on the left side or distribution side of the unit.

Consequently, each RJ45 connector provides a 4 pair that can be directly run to the terminal without the need for any intermediate use of the punchdown blocks that are normally used to combine power and signal. In a multipoint configuration, a second RJ45 jack is provided on the PR180 or the NT1D-300, thereby servicing up to 180 terminals/telephones and 90 NT1's.

As with the other versions of the SEI product line, the PR180 provides a Form C relay for remote alarm capability, a low voltage disconnect switch to preserve battery life, and the ability to add two additional strings of batteries, providing up to 32-amp hours or reserve time.

An added feature of the PR180 is a built in battery test circuit, which is activated when a front panel push-button is depressed, indicating the current battery status of the unit. (A front panel display provides pass/fail indication for this feature).

The PR180 can be either rack (19 to 25 inches) or wall mounted.

### PowerRack 180 Wiring Diagram

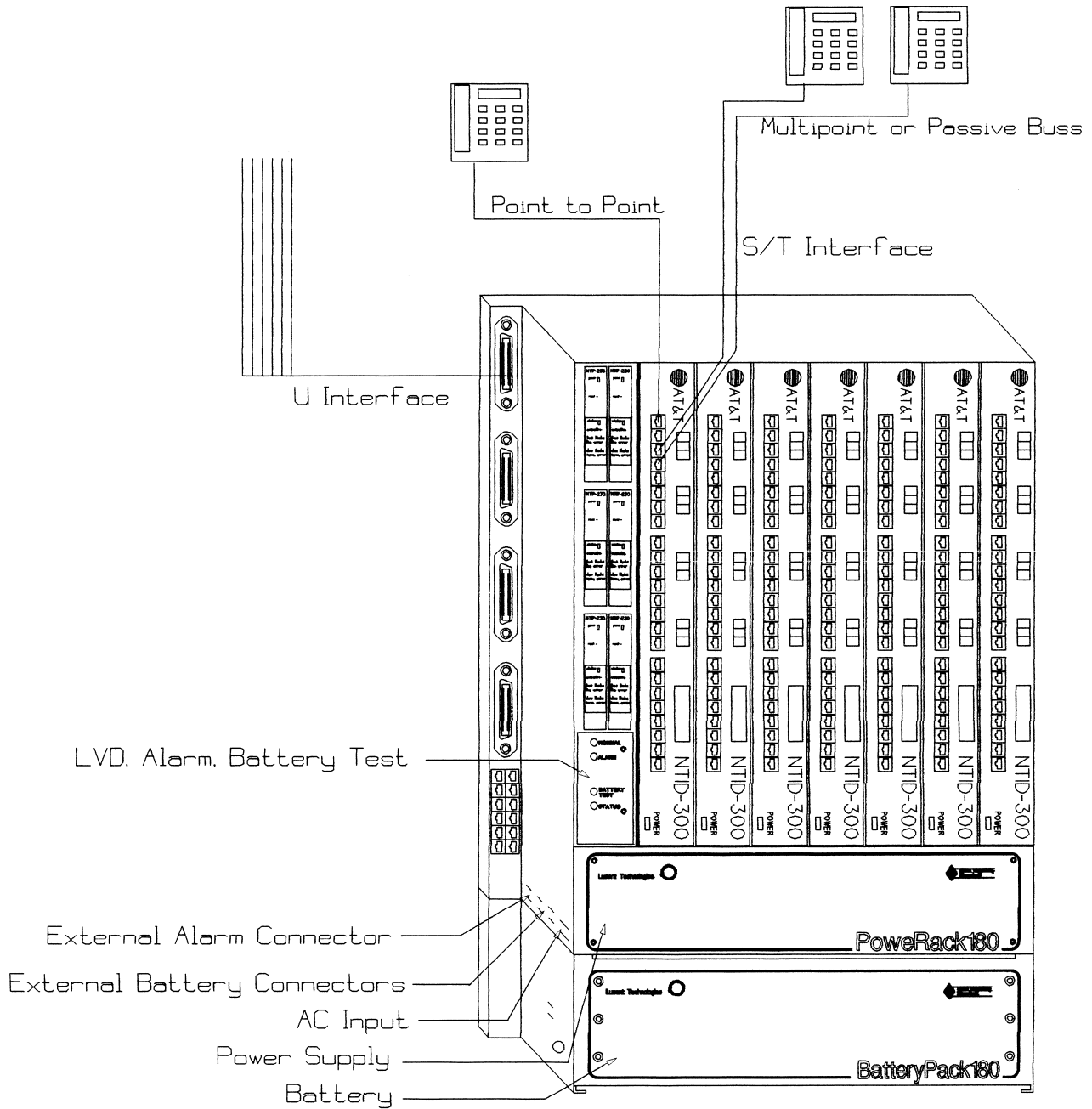


Figure 9

## THE POWERACK 230

The PowerRack 230 (PR230) combines power, distribution, battery holdover, and NT1 caging in a single unit. The PR230 powers Lucent type NT1 P230 cards along with their associated phones. The PR230 is available in two models. The PR230-24 is a 12 NT1/24 phone version or a 24 NT1/48 phone version; the PR230-48. The 12 NT1 model, PR230-24 is field upgradable by adding a 230R NT1 cage.

The "U" input and "S/T" output are located on the left side of the unit with cabling distribution using 50-pin amphenol connector. The PowerRack 230 comes equipped with a built-in 2.5 amp hour battery to provide up to two hours of battery holdover time in the event of a utility power failure. Battery holdover time can be increased by adding battery packs (BP2) to the configuration.

Installation simply requires mounting the PR230 on a wall or equipment rack right out of the box. Connect the "U" and "S/T" interfaces and the installation is completed.

A feature of the PR230-24 is the ability to power a Lucent NT1 M-210 card cage from its auxiliary DC output jack.

For larger P230 NT1 installations, consider using the PR96, which powers up to 96 phones and 48 NT1's.

## THE POWERACK 230

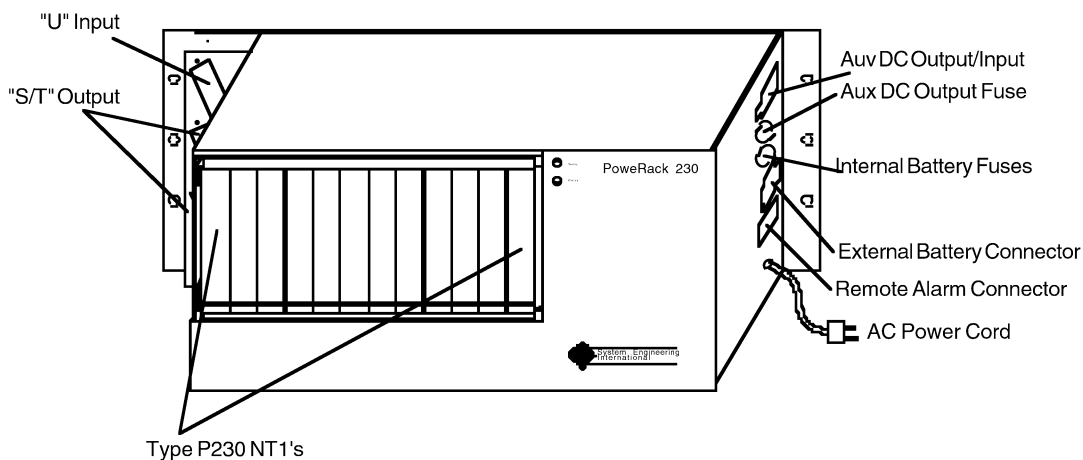


Figure 10

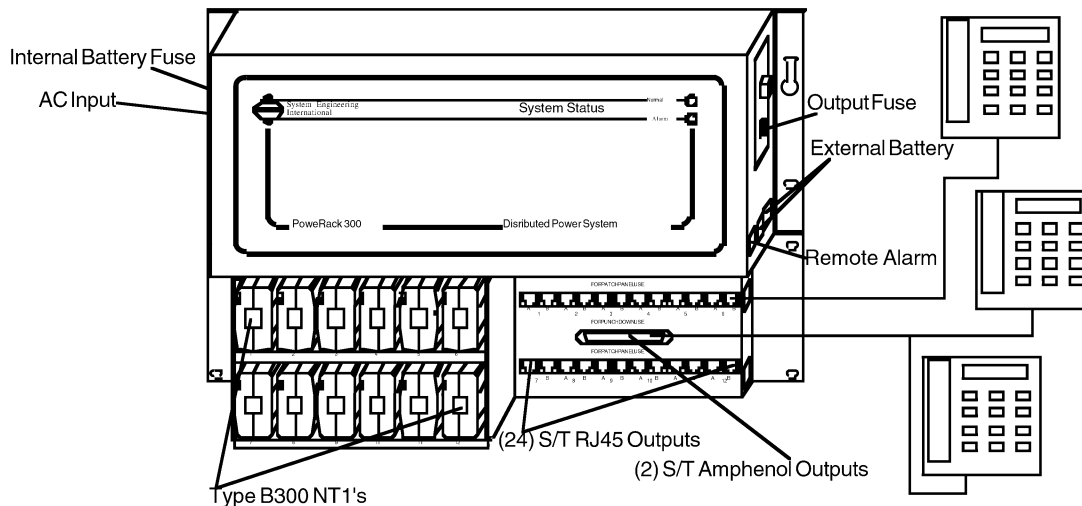
## The PowerRack 300

The PowerRack 300 (PR300) combines power, distribution, battery holdover, and NT1 caging in a single unit. The PR300 powers Lucent type NT1 B300's and similar NT1's along with their associated phones. The PR300 is available in four versions; from 12 NT1's and 24 phones to 48 NT1's and 96 phones in 24 phone increments. The 24 and 72 line versions of the PR300 are field upgradable by adding a 300R-U NT1 cage.

The 'U' and power inputs are located on the sides of the 300R cage and allow multiple cages and/or battery packs to be daisy chained. The "S/T" outputs are located on the front of the 300R-U NT1 cage, and allow the use of either RJ 45's or 50 Pin Amphenol Connectors.

All PowerRack 300's comes equipped with a built in battery to provide at a minimum of 1 hour of holdover time in the event of a utility failure.

As in other models of the PowerRack series the PR300 reduces space requirements and simplifies installation time and complexity.



**PowerRack 300**

Figure 11

### Technical Specifications - PR Series

Model Number	PR230	PR96	PR180	PR300
NT1 Type	NT1P230	NT1P230	NT1D300	NT1B300
Input Power	92-132/176 IEC RECEPTACLE			
Output Power	140 Watts	250 Watts	500 Watts	140-250 Watts
Output Config	12 to 24 Terminals	48 Terminals	90 Terminals	12 to 48 Terminals
Point to Point	12 to 24 NT1's	48 NT1's	90 NT1's	12 to 48 NT1's
Output Config	12 to 48 Terminals	96 Terminals	180 Terminals	18 to 96 Terminals
Multipoint	12 to 24 NT1's	48 NT1's	90 NT1's	12 to 48 NT1's
Battery Holdover	Yes	PR-96-0 No PR-96-x Yes	PR-180-0 No PR-180-x Yes	Yes
Battery AmpHrs	2.5-10	8-24	8-32	2.5-24
Battery Holdover	1 to 8 Hours			
Battery Maintenance	Low Voltage Disconnect Float Charge Battery Load test-PR180			
Indicators	Green LED-Normal Red LED -On Battery Remote Alarm Form C Relay			

(1) Battery reserve calculated at full load 100% off hook.

### Chart 5

#### Configuring The PowerRack Series

Configuring the PowerRack Series to optimize installation consists of these factors.

1. The ability to locate units so that they can power multiple floors based on riser location and space.
2. The distance of the horizontal and vertical run between the PR Series and the terminal(s). When installing multipoint, the terminals should not be more than 300 feet from the NT1.
3. The duration of battery holdover or reserve time required (if any) to back up the terminals and NT1s in the event of AC utility failure.
4. Off hook servicing.
5. Legacy terminals in use.

Consult the Power Runs and Reserve time charts for further information.

The PR Series is primarily designed to power newer series of telephones i.e., 2 watts or less load per phone. As such, there is no need to be concerned relative to off-hook servicing factors.

When using legacy or more watt intensive phones, their power loads must be computed to determine off-hook servicing levels in order to comply with the power output of the PowerRacks.

To determine this load level, do the following calculation for the PR96 and PR300-72/96. A similar calculation can be made for the PR180 with the wattage limit of 500-watts. For the PR230-24/48 and PR300-24/48 the limitation is 140 watts.

1. Add the off-hook load of the load intensive phone sets (4 watts each) to the newer phone sets (2 watts each). Along with the factor of .75 watts per NT1. This is the total off-hook load in watts.
2. Multiply this total load by the expected off-hook servicing percentage. The result is the off-hook draw.
3. Subtract this result from the total load.
4. The remainder of the total load is then multiplied by 50% to account for the idle power draw.
5. Combine the idle power draw (on-hook load) with the off-hook draw. If the result is above the unit's wattage, the off-hook service percentage must be reduced or sets must be removed to reduce overall power consumption.

#### Example For A 250 Watt Unit

60 - 7500 sets @ 4 watts	=	240 watts
30 - 8500 sets @ 2 watts	=	60 watts
45 - NT1's @ .75 watts	=	<u>34 watts</u>
Total off-hook load		334 watts

Multiply off-hook service percentage:  $30\% \times 334 \text{ watts} = 101 \text{ watts}$   
 Multiply remaining total load by 50%:  $334 - 101 = 233 \times 50\% = 116 \text{ watts}$   
 Total expected power consumption:  $101 + 116 = 217 \text{ watts}$   
 217 watts is within the 250 watts limit.

Note: In the event of a power outage, there is the possibility that power to the telephones and/or the NT1's would have to be reinitialized per the installation manual. This is due to the action of the sets once the power is restored.

#### Notes

1. Reserve time computed with newer generation phone sets, or like series phones at 40 to 100% off-hook condition and NT1's
2. When intermixing older series telephones, their larger power draw must be factored in the load to approximate reserve time.
3. If longer reserve times are required, please contact SEI for configuration information.

Options that can be ordered are:

- DC - Heat and dust cover that mounts above unit to protect the unit from falling dust/debris and dissipate heat.
- RA - A physical remote alarm that connects the internal alarm to alert via buzzer and flasher that the unit is on battery or has lost AC power.
- 23"X" Mounting brackets for mounting on a 23-inch wide racks.
- 25"X" Mounting brackets for mounting on a 25-inch wide racks.
- BP/BP2 - Additional external 8 and 2.5 amp hour battery packs that can be added after initial installation.
- BP180 - External 8 amp hour battery pack for the PR180.

### **Mechanical Specifications PR Series Configurations and Unit Dimensions**

<b>CONFIGURATION</b>	<b>MODEL #</b>	<b>DESCRIPTION</b>	<b>DIMENSIONS</b>
Configuration #1	PR96-0 PR96-8	PR96 with integrated NT1 caging for 48 NT1P-230s w/wo battery	19"W x 8"D x 19" H
Configuration #2A Configuration #2B	PR230-24 PR230-48	PR230 with integrated NT1 caging for 12 to 24 NT1P-230s with battery	19"W x 7.5"D x 7" H 19"W x 7.5"D x 14"H
Configuration #3	PR180-0	PR180 with integrated NT1 caging, no battery	19"W x 9"D x 22"H
Configuration #4	PR180-8	PR180 with integrated NT1 caging, external battery pack	19"W x 9"D x 28"H
Configuration #5	PR300-24	PR300 with one 300R card cage with battery	19"W x 6"D x 12"H
Configuration #6	PR300-48	PR300 with two 300R card cages and battery	19"W x 6"D x 25"H
Configuration #7	PR300-72	PR300 with three 300R card cages and battery	19"W x 6"D x 30"H
Configuration #8	PR300-96	PR300 with four 300R card cages with battery	19"W x 6"D x 35"H

**Chart 6**

### THE POWERBOX U

The PowerBox U (PBU) is the ISDN version of SEI's PowerBox VoIP telephony uninterruptible power system. The PowerBox provides industry standard S/T output in addition to providing a replacement/upgrade capability for installed legacy Lucent/AT&T 1145 power systems.

The two types of S/T power distribution available are;

Two 50-pin Amphenol connectors with RJ11 jacks for standard punchdown installations.

1146 punchdown blocks that preserves existing wiring without the need to re-cable. This is accomplished by simply moving the detachable 1146 block(s) from the replaced 1145 to the PowerBox U. No other action is required to maintain existing wiring protocol. The PowerBox fits within the existing footprint of an 1145 power supply making it an ideal candidate as a replacement for these aging units while presenting increased functionality.

The PowerBox U powers up to two NT1 cages (24 NT1's), and 48 phones with up to four hours of battery holdover with it's 8 amp hour battery. It can also accommodate up to two 1146 punchdown blocks through mounting points on the PowerBox's front cover. The 250 watt power supply can be augmented with a field installable 250 watt PowerPack for N+1 redundancy or increased load handling capability. Additional battery holdover is accomplished by adding field installable Battery Packs.

An added feature of the PowerBox is a built-in battery test that advises on current battery status of the unit.

The PowerBox U can be converted with the addition of a power distribution unit to a mid-span powering system for VoIP thereby preserving user investment. The PowerBox is wall or rack movable. The unit's dimensions are 19"W x 8"D x 7"H.

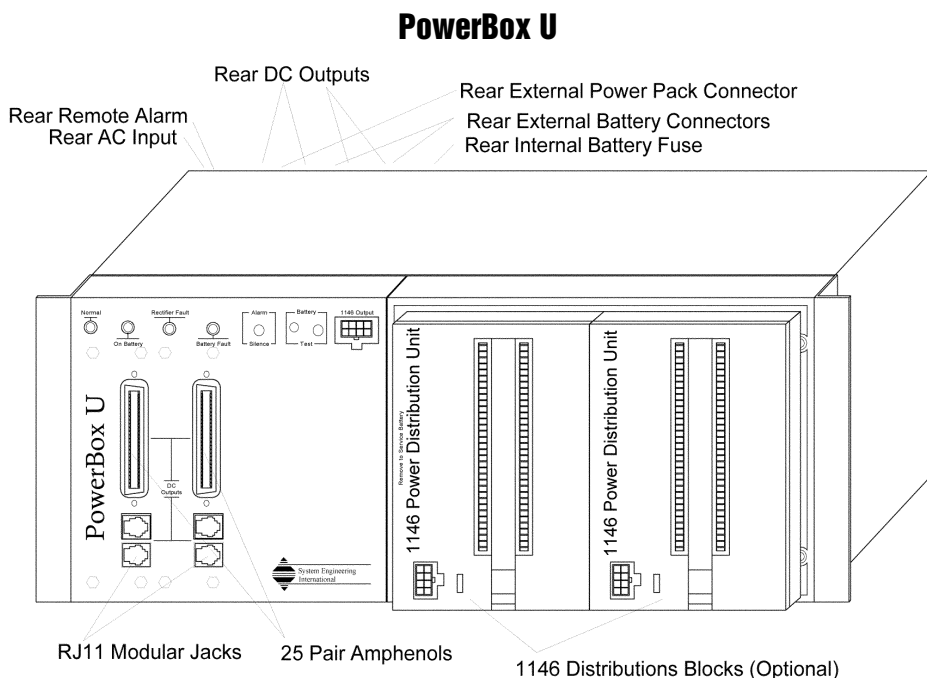
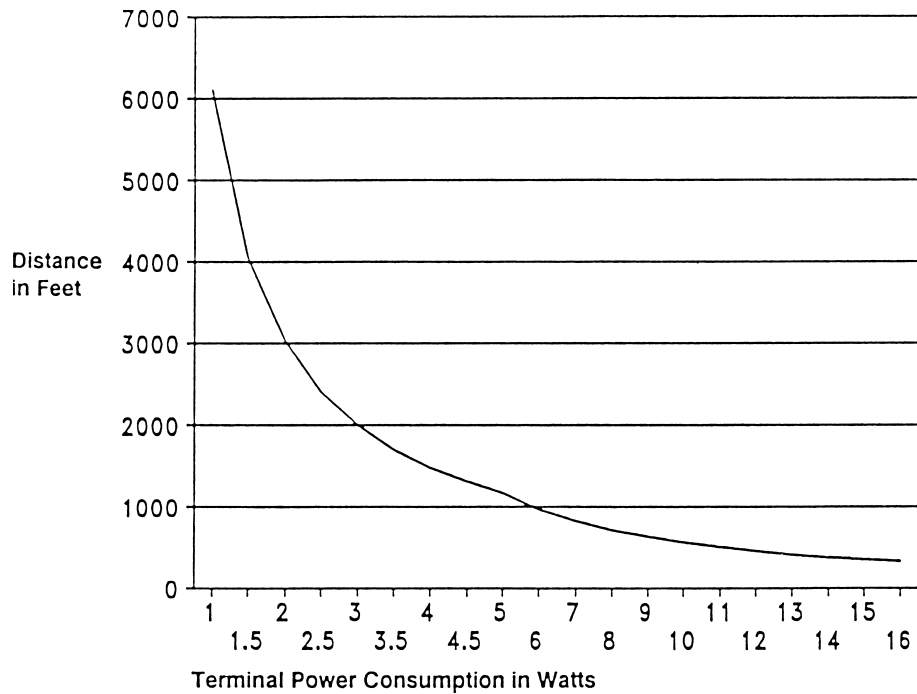


Figure 12

### Power Run Graph



Maximum Terminal  
Loop Lengths

Terminal Power Consumption

Chart 7

### BATTERY HOLDOVER

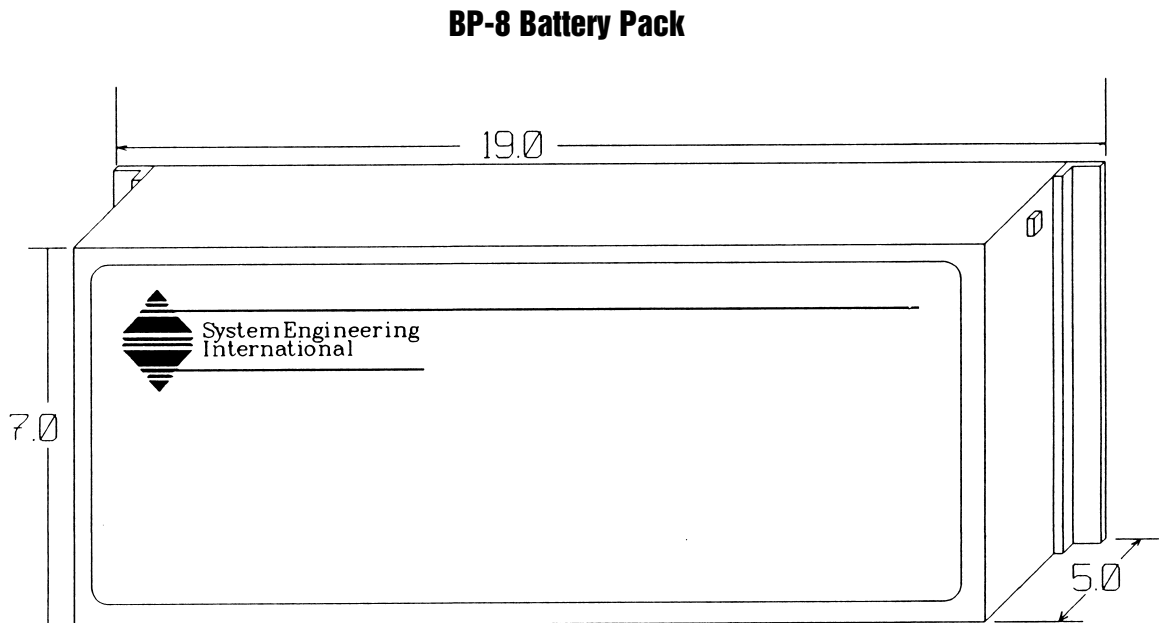
Holdover or reserve power on SEI Power units is provided in one of three ways depending on the power load and duration of reserve time needed; and internal battery pack, an external battery pack, or external 12 volt sealed batteries.

Due to the high quality switch rectifier used in the SEI DP series, units can operate without the need of a battery. Batteries are only required to provide a standby reserve capacity. Reserve capacity is provided in 1 to 8 hour increments.

When battery packs are used for holdover, they are 2.5 or 8 amp hour lead acid monoblocks. Battery packs are either contained within the unit or packaged in their own external chassis. These are designated as the BP2, BP8 or the BP180. Again, depending on reserve time required, a specific configuration could contain both an internal battery and an external pack or packs. BP2's and BP8's cannot be mixed within the same configuration.

**BP-8 BATTERY PACK**  
**BP-2 BATTERY PACK**

The battery packs contain monoblocks that are housed in a 7" high chassis. There can be multiple battery packs per unit and are attached to the unit by connectors located on the distribution side of the unit. Cables are supplied with the battery packs. Packs can be either wall or rack mounted and installed at any time after the unit is installed, to allow additional reserve capacity to be added to an existing installation.



*Figure 13*

Internal batteries and battery packs have an expected life of 4 - 6 years and are maintenance free. However to achieve full rated life the ambient temperature should be maintained at 25 degrees centigrade. Temperatures above this range as with all batteries will decrease their life.

## 12 VOLT BATTERIES

For some longer reserve times, backup power may be supplied by larger amperage batteries due to the greater loads carried. In these cases, 12-volt valve regulated batteries are used. The batteries are configured ranging from 25 to 130 amp hours. Four batteries are used in specific configurations and are packaged in either a battery cabinet for wall mounted units, or in a battery tray when the unit is rack mounted.

In a wall mount installation, the battery cabinet sits on the floor. Seven feet of connect cable is supplied with the cabinet to allow convenient placement near the unit. See chart 2 for physical sizing considerations in planning the installations. The cabinet is mounted on wheels so that it is easily moveable.

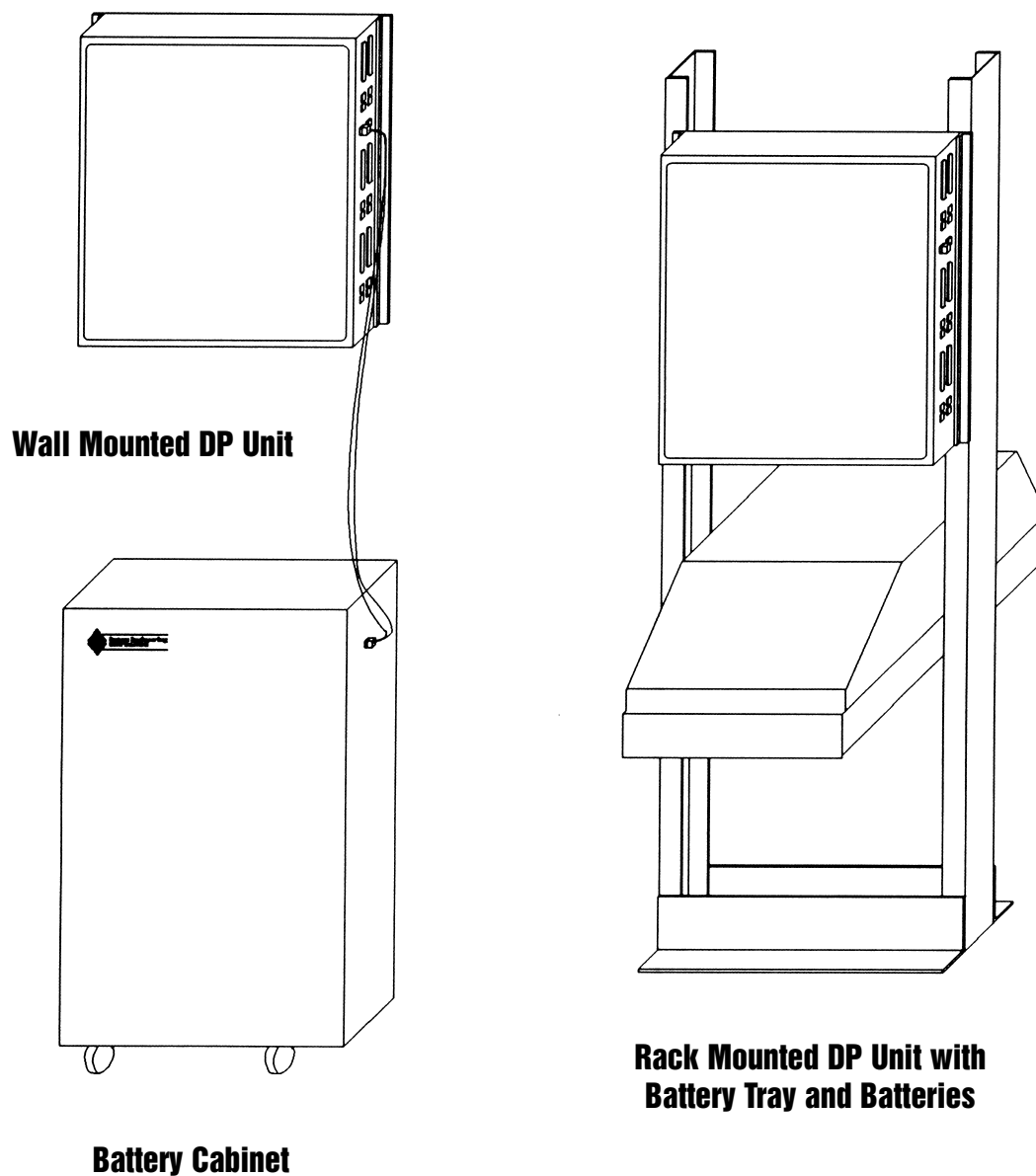


Figure 14

(All stated battery holdover times are based upon full rated duty cycle of 40 to 100%. Smaller load factors will increase holdover time.)

## THE POWERPACK

PowerPacks are field installable auxiliary power supplies that depending on the system configuration augment the PowerRack or PowerBox and/or provide N+1 power supply redundancy. A PowerPack provides 250 watts of circuit limited -48vdc power and thus can extend the capacity of the installed system. PowerPacks are wall or rack mountable and come in a 19"W x 5"H x 5"D chassis.

## 230R NT1 CAGE

The 230R NT1 cage holds 12 Lucent type NT1 circuit cards. The 230R can be used as an individual stand-alone cage or as a field upgrade to the PowerRack230-24 converting it to a PowerRack230-48. Because of power limitations only one 230R can be added to the PowerRack. The U and S/T amphenol connectors are located on the left side of the unit. The 230R can be connected to and powered by a legacy 1145 power system.

## 300R-U NT1 CAGE

The 300R-U NT1 cage holds 12 Lucent Type NT1B 300's. The 300R-U can be used as individual stand-alone cage or to field upgrade the PowerRack 300. The S/T outputs are located on the front of the cage and allows multipoint output for either RJ 45's or amphenols without the need for punchdown blocks. The units can also be daisy-chained to work off a single power source.

## LOW VOLTAGE DISCONNECT (LVD)

SEI's Power Systems provide a low voltage disconnect feature to prolong battery life. When the unit is on battery holdover, and the voltage output from the batteries drops below a preset point, the low voltage feature will disconnect the batteries and the unit will cease to supply power. The purpose of this automatic disconnect is to insure that the batteries are not drained to a point where they would be impaired from recharging or holding sufficient holdover times per specification.

Batteries are continuously charged, or "floated," to insure the batteries are at their full capacitance. This is achieved by the unit supplying power to the batteries, (up to 56 volts), providing sufficient power to both float the batteries and service the load. Should the batteries become completely discharged, they may require a period of 20 hours of continuous charging once AC is restored to insure that they have reached their full capacitance. Some versions of the DP-140 may not have this low voltage disconnect feature and are designated as a DP140"A".

## REMOTE ALARM

SEI Bulk Power Systems provide a form C contact relay via a RJ11 connector. When connected this relay can be used to signal an alarm when the unit loses AC power. The termination of this alarm could be at a maintenance or guard station. Entry point for the wire run is located on the distribution side of the power unit. The length of run can be up to 1,500 feet and will provide a voltage of 9 volts at the monitoring station over 24-gauge wire. Some versions of the DP-140 may not have this feature and are designated as a DP140"A".

A physical Remote Alarm can be ordered as an option. The Remote Alarm unit (RA) is a compact device measuring, 2.5" x 4" x 1". This unit combines both a flashing LED and an audible alarm. The Remote Alarm is powered either by AC or by Batteries. Both the visual and audible alarm can be silenced once an alarm has been given.

## DUST COVER

SEI closet or Distributed Power units can be provided with a combination dust cover/heat baffle (DC). The feature prevents debris, dust, liquid, etc. from entering the power unit. It also acts as a heat baffle to dissipate rising heat from the units more quickly.

## RACK MOUNTING BRACKETS

All DP and PR series units are mountable either on a wall or on 19-inch racks without any modifications or mounting accessories. Both 23 inch and 25 inch rack mounting brackets may be ordered as options.

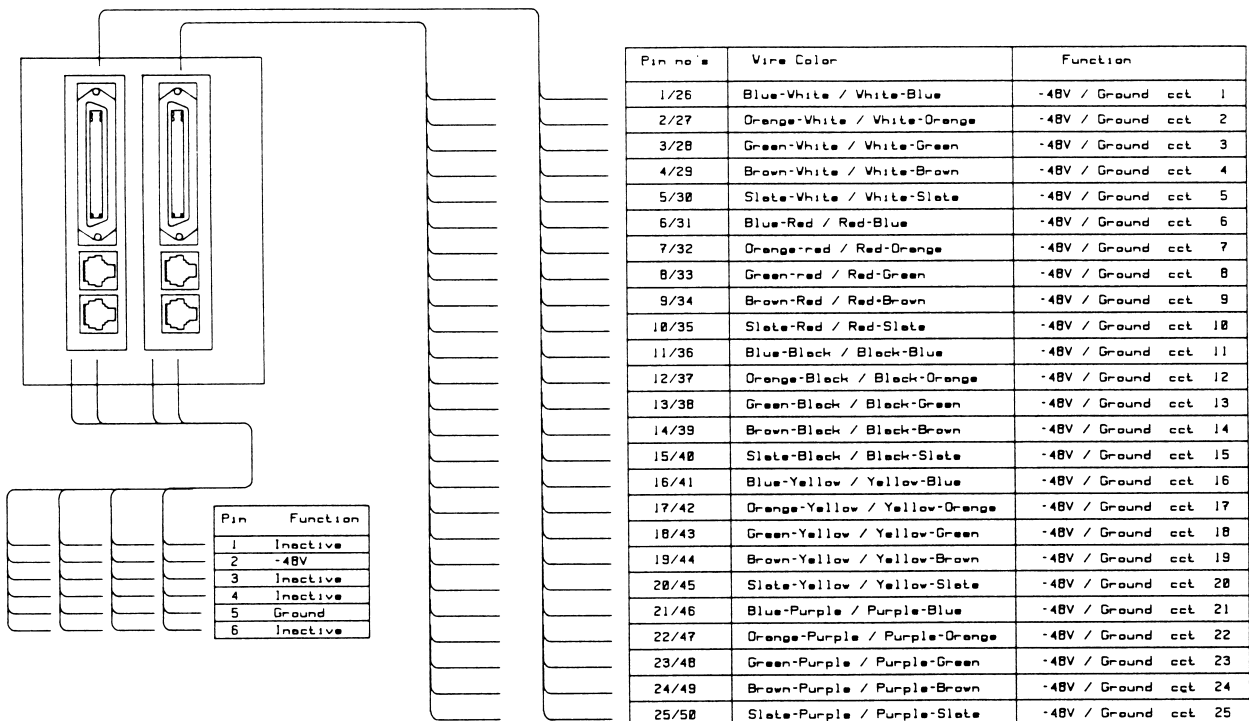
## BATTERY TEST

An added feature of the PR180 and the PowerBox is a "Battery Test." This test can be preformed at any time by pressing the 'Battery Test' button, located on the front panel of the unit. This test takes up to one minute. A green LED light confirms sufficient battery capacity, a red indication suggest the batteries may be in need of further testing. The status indicator will remain active for approximately one hour after which it will automatically shut off.

## POWER AND PUNCHDOWN WIRING FOR THE DP SERIES

Each pin out in the amphenol connector is rated to provide 20 watts of power. On the RJ11 connections, each jack provides 40 watts. Representative punchdown wiring is illustrated on charts 8 and 9.

**Lucent Punchdown Chart Example**



**Chart 8**

Nortel Punchdown Example

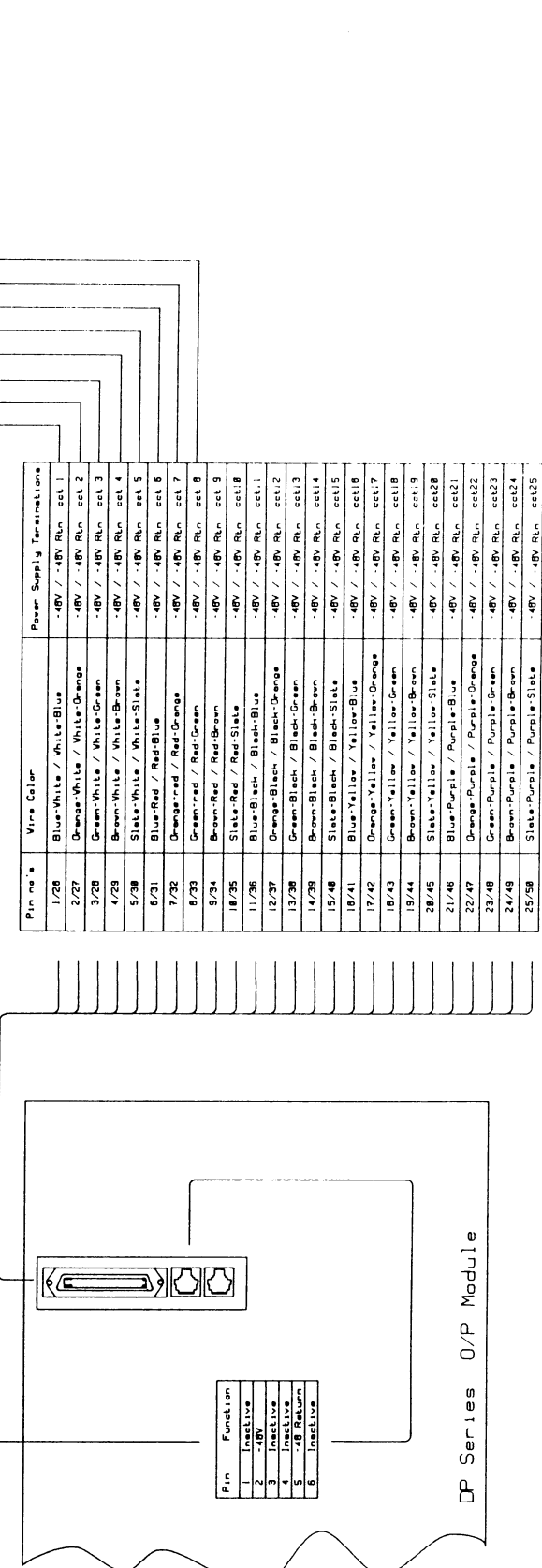
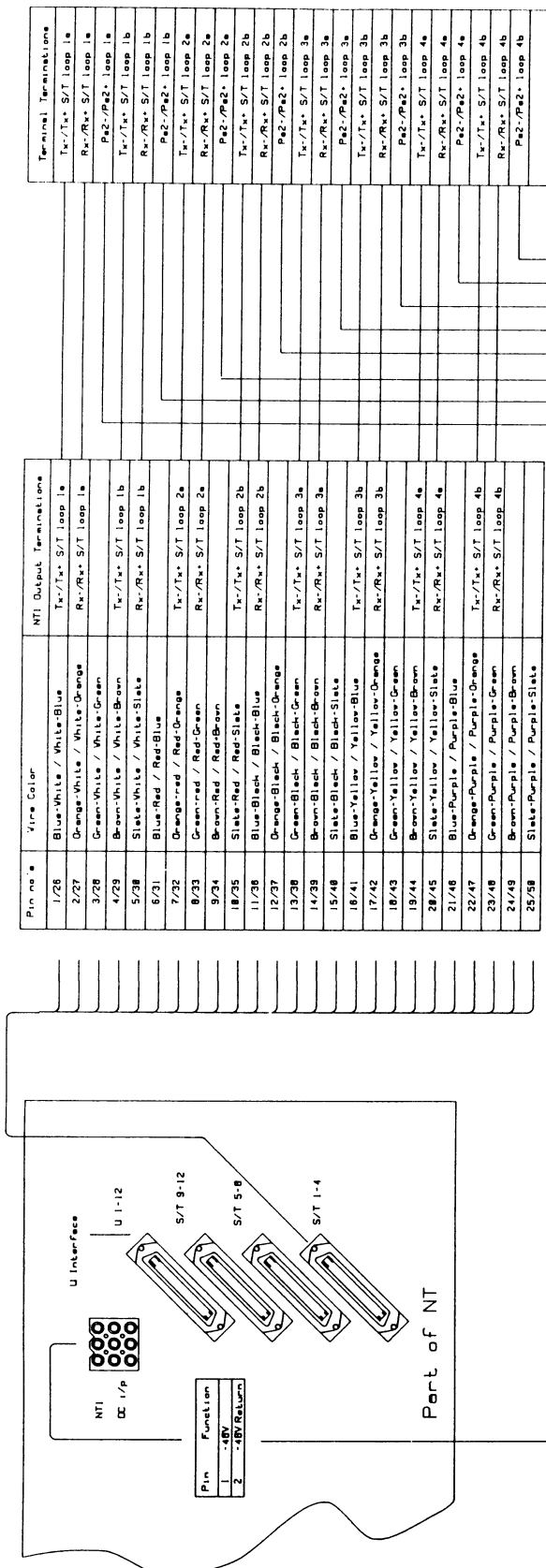


Chart 9

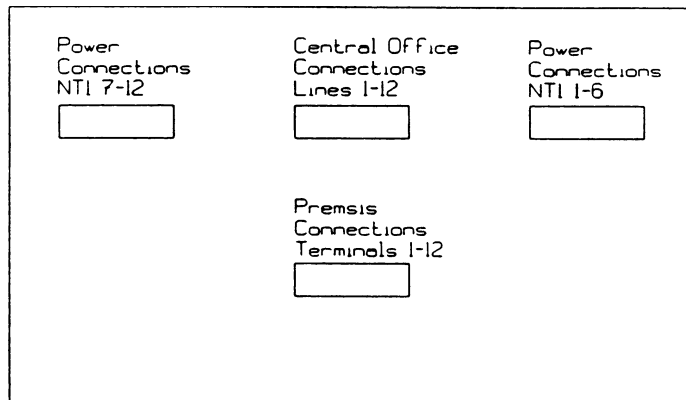
### NT1 CAGE WIRING CONNECTIONS FOR THE DP SERIES

Connection to NT1 cages are through the RJ11's on the DP or PowerBox distribution board. Each RJ11 output is rated at 40 watts and can power a rack of 12 NT1's where each NT1 draws 1.5 to 1.6 watts. Power on the 6-pin connector is taken from pins 5 (-48vdc) and 2 (ground). Refer to figure15.

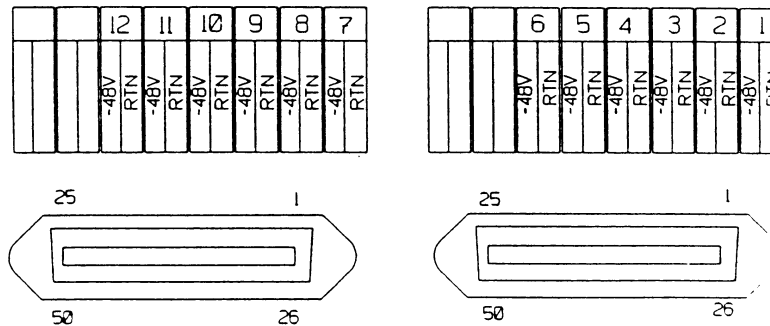
### CONNECTION TO LUCENT NT1 CAGES

Connection to the NT1 cage on Lucent models NT1M-200 and NT1M-210 is made by running a RJ11 cable to the two punchdown blocks on the rear of the cage. Each set of blocks power 6 NT1s and the second punch-down block is bridged from the first to power a full rack of 12 NT1s.

#### NT1M-200 Cage Wiring



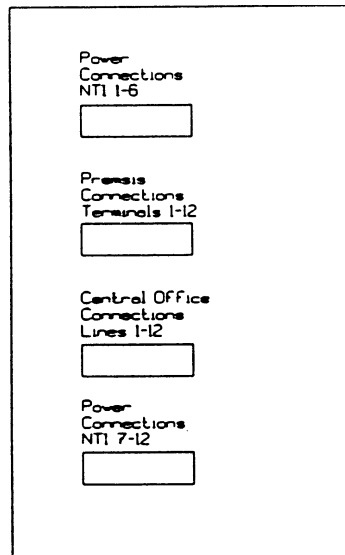
#### Rear View of NT1M-200



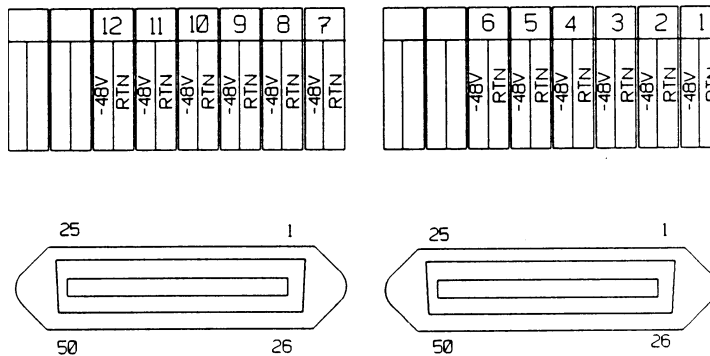
#### Connector Pin Locations

Figure 15

### NT1M-210 Cage Wiring



### Rear View of NT1M-210



### Connector Pin Locations

Figure 16

## CONNECTION TO NORTEL CAGES

Connection to the Nortel NT1 module (model NTB83AA) is made via a 9 pin connector. This connector is supplied with the DP series unit. The 9 pin power assignment is as follows:

### NORTEL NT1 WIRING POWER INTERFACE PIN ASSIGNMENT

Each Nortel NT1 draws 1.6 watts. Since each cage can hold up to 12 NT1's, power consumption per cage would be 19.2 watts.

PIN NUMBER	FUNCTION	DESCRIPTION
1	-48 V	Power
2	-48 V ret	Power return
3	No connection	
4	No connection	
5	Battery status	Open - battery fail Closed - battery good
6	Battery status ret	Toggle - no battery
7	PWR mode	Open - ac power
8	PWR mode ret	Closed - battery power
9	No connection	

**Chart 10**

**V LOCAL POWER**

DP20B for local or stand-alone power is utilized to power one to six telephones and one to three NT1's. With local power, the NT1 is usually situated at the set location. If no battery holdover is required, a simple AC to DC converter can be utilized.

The DP20B provides 20 watts of power sufficient to drive up to three NT1's and six sets or combinations thereof. It has a battery holdover capacity to power a full load up to 90 minutes. The DP20B with its battery reserve is contained in a 2" high case that is 5.5" wide and 7.5" deep.

**SEI DP-20B Stand Alone Power Unit**

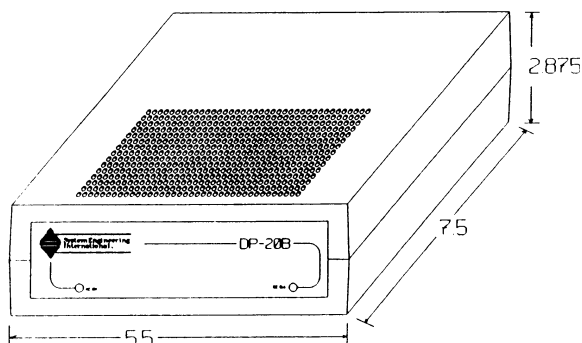


Figure 17

**DP-20B SPECIFICATIONS**

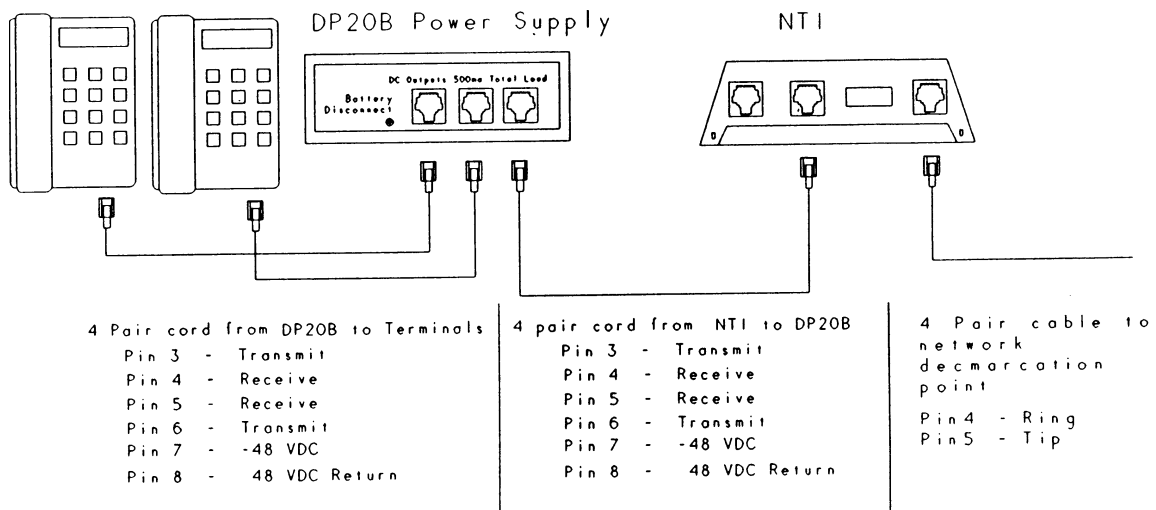
INPUT POWER	108-126 VAC
OUTPUT POWER	20 WATTS-45 VDC
OUTPUT JACKS	8 PIN JACKS
OUTPUT CONFIGURATION	ON U INTERFACE-UP TO 3 NT1s WITH ASSOCIATED TERMINALS ON S/T INTERFACE-UP TO 2 TERMINALS AND ONE NT1
BATTERY HOLDOVER TIME	1 TO 4 HOURS DEPENDENT ON LOAD AND METHOD OF OPERATION
INDICATORS	GREEN LED - AC ON AMBER LED - DC OUT
DIMENSIONS	5.5"W X 7.5" D X 2" H
WEIGHT	3 LBS
OPERATING TEMPERATURE	0 TO 50 C°

**Chart 11**

## WIRING CONFIGURATIONS

The DP20B can be interfaced either at the U or S/T side of the NT1s. The DP20B is provided with three 8 pin jacks at the rear panel. These jacks are configured in accordance with T1-601 to allow powering of both the NT1 and the terminal equipment.

### S/T Interface Diagram



#### NOTE

1. Pins 3, 4, 5 & 6 are all linked across the three jacks within the DP 20B
2. The NT1 is powered by back feeding power on pairs 7 & 8.

Figure 18

### U Interface Diagram

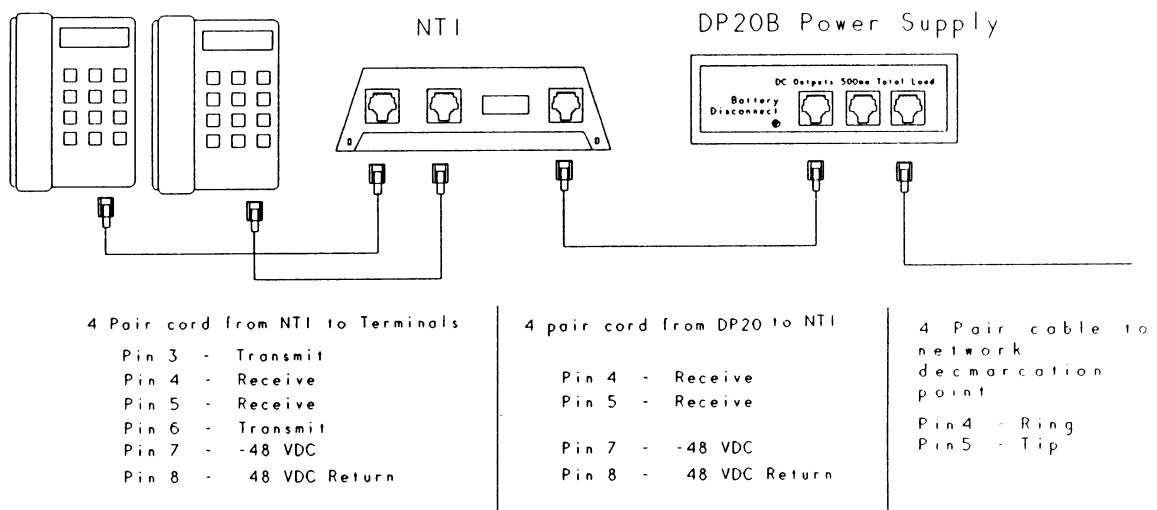


Figure 19

To power multiple NT1s with the DP20B, U Adapters must be utilized. These adapters (IA-U) provide a pathway that separates the signal from the power at the U interface of the DP20B. The 'IA-U' is required to power two NT1s and up to 4 telephones. Three IA-U's are required to power three NT1s and up to 6 telephones.

The use of DP20B Extender is the preferred alternative to the U Adapters.

**THE DP20B EXTENDER**

With the DP20B Extender, the DP20B is combined with a combination RJ punchdown block and mounting plate that is pre-wired for multiple NT1's. In addition, the Extender provides a splitter capability to allow a single four pair wire to be split into three separate U lines from the input distribution block. This feature can be used to provide fast frame video for three BRI lines. The Extender mounts on a wall or in a closet.

**Multi "U" Interface Diagram For The DP20B - EXTENDER**

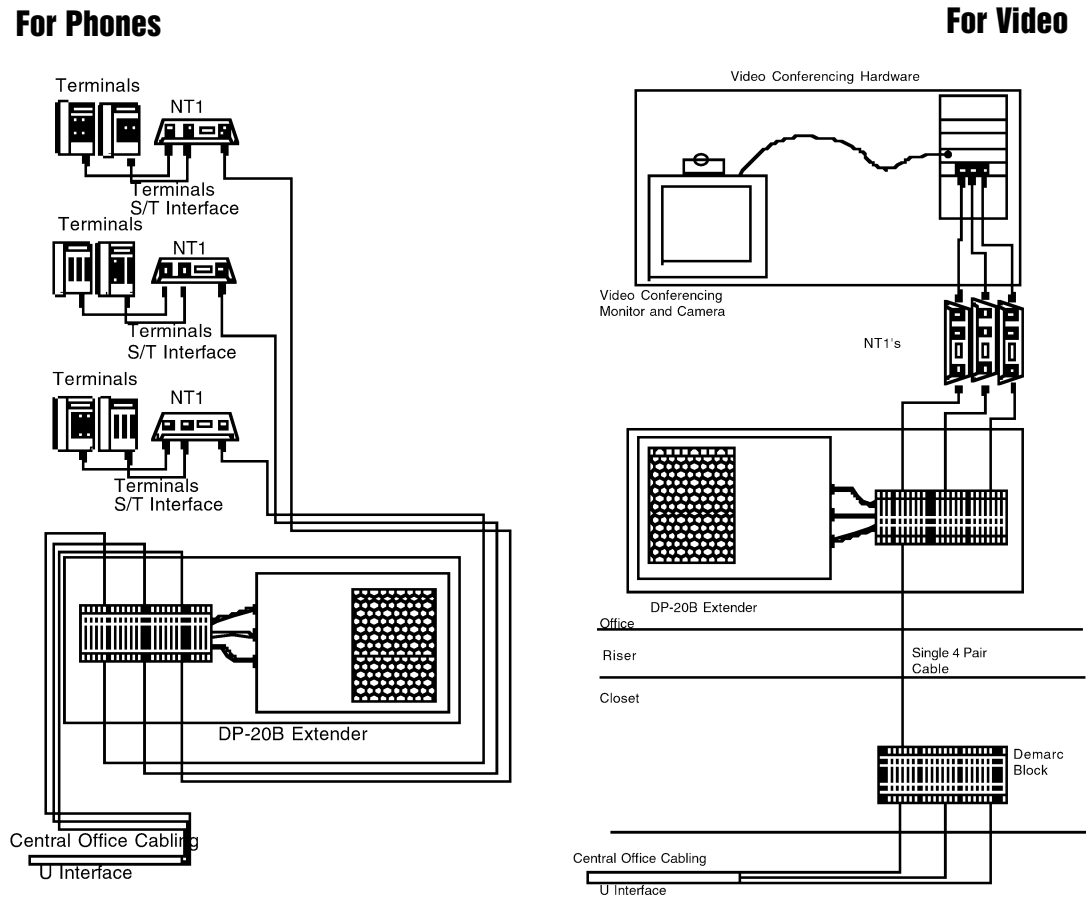


Figure 20

## VI CENTRALIZED POWER

In a centralized or bulk power installation, a DC power plant is used to power terminals and NT1s. These plants contain a number of rectifier/charger modules to convert the incoming ac to -48 vdc.

In addition, these DC plants normally includes a string of batteries that provide a battery holdover power capability, should there be a utility power outage. This reserve or holdover time is usually in the 4-8 hour range.

### Bulk DC Power Plant with Distribution Bay

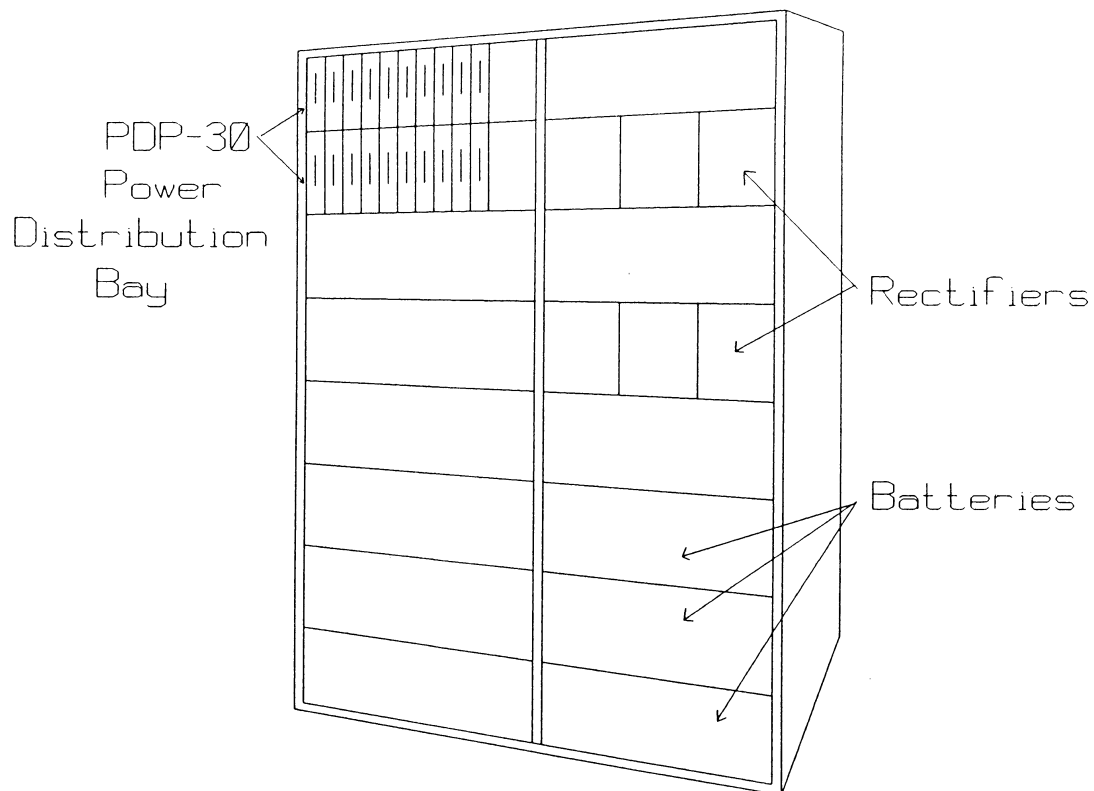


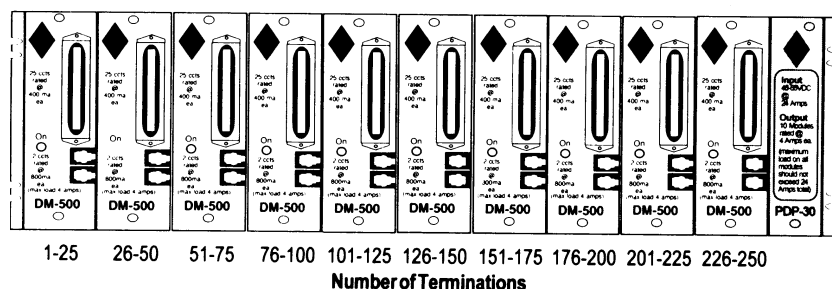
Figure 21

The -48 vdc output is supplied to the ISDN terminals via a distribution board or panel, the SEI PDP30. The actual distribution is accomplished through a distribution module, the SEI DM-500. The DM-500 contains PTC fusing (thermal fusing), and each module can distribute power for 25 telephones and 2 racks of associated NT1s. There can be up to 10 DM-500's distribution modules in one PDP30.

The PDP30 can be either wall or rack mounted, though in most instances a rack mount is used. There can be up to 14 PDP30s mounted back to back on a 7-foot rack, providing distribution for 3500 sets.

Distribution racks can either be located adjacent to the power plant or on various floors/locations within the premise site. Cabling is then run through the riser and horizontal run the sets in addition to the NT1 signal.

### The PDP-30 Product Configurator



#### Chassis

PDP30

One required for up to 10

DM-500's

#### Distribution Modules

DM-500

25 terminations per module

Figure 22

### WIRING CONSIDERATIONS FOR THE PDP-30

1. Cable connections from the powering system to the PDP30 can be up to an 8-gauge wire. This wire is connected to the unit screw connection block. No other connections from the power plant are required for this connection.
2. From the DM-500 distribution board a 25 pair Amphenol connector is used to connect the twisted pair wires to the cross connect blocks model 66 or model 110.
3. The wire from the RJ11 connectors are connected to blocks or NT1 cages.

### POWER CONSIDERATIONS FOR THE PDP-30

1. Power output from the PDP30 limited to 2200 watts.
2. Output power from the 25 pair Amphenol connector is 20 watts per pair. Ground is located on the even numbered pins. While -48 vdc is located on the odd number pins.
3. Power output from the RJ11 6 pin jack is limited to 40 watts per connector. Power is located on pins 2 and 5 of these connectors. Pin 5 is the ground terminal for the connector. Pin 2 is the -48vdc.
4. Power run lengths are shown in chart 4.

## DM-500 Wiring Diagram

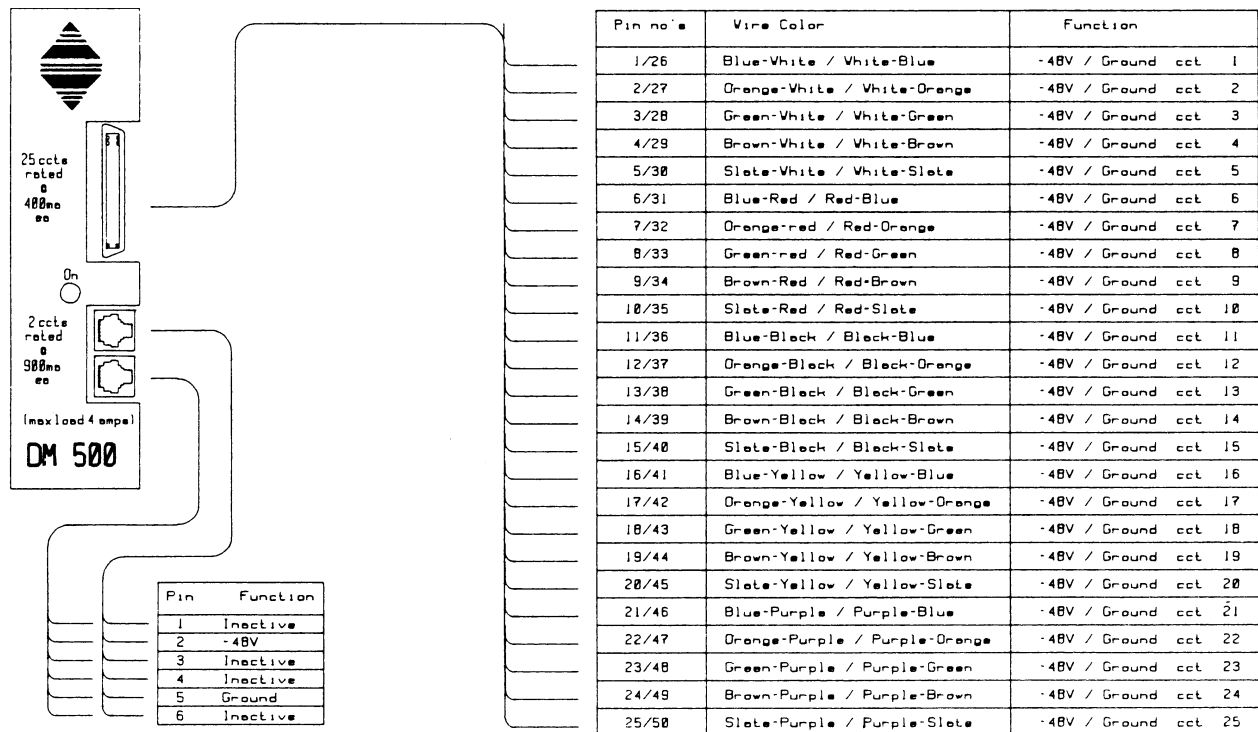


Chart 12

## VII CONCLUSION

The purpose of this ISDN Power Guide is to illustrate the methods of CPE powering and how to best configure the optimum solution. It does not purport to answer all questions that might arise in designing CPE powering.

For specific advice on configuring and engineering ISDN powering please call SEI at (301) 694-9601 or (800) 765-4SEI and ask for ISDN Support or fax your questions to (301) 694-9608.

Our E Mail address is [info@seipower.com](mailto:info@seipower.com) and our web page is <http://www.seipower.com>

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5115 Pegasus Ct., Suite Q  
Frederick, MD 21704  
(301) 694-9601 Voice • (301) 694-9608 Fax  
Email: [info@seipower.com](mailto:info@seipower.com)