INSTALLATION & OPERATION

V SERIES LOAD CONTROLS AND POWER CELLS FOR VARIABLE FREQUENCY AND DIRECT CURRENT POWER

Power Cells Sense Motor Power From Variable Frequency And DC Drives — V Series Load Controls Use This Signal To:

- Adjust Machines and Processes
- Signal Beginning or End of Process
- Detect Trouble
- Protect Machines and Processes

LOAD CONTROLS INCORPORATED

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www.loadcontrols.com

POWER CELLS

Various models of the Power Cell are used to sense variable frequency and DC power. They utilize Hall effect sensors that are not affected by wave shape or frequency.

MODEL NUMBER	HOOKUP ON
PH-3 For Variable Frequency Power to 350 Amps	Page 5
PH-1000V For Variable Frequency Power to 1000 Amps	Page 6
PH-1 For DC Power to 350 Amps	Page 7
PH-1000DCV For DC Power to 1000 Amps	Page 8

These Power Cells are matched to the load with plug-in voltage and current networks. (See Page 14)

The output of the Power Cell goes to a V series load control.

FEATURES ON ALL V SERIES CONTROLS

ADJUSTABLE SET POINTS

When power reaches your selected SET POINT a built-in Relay Output is activated (tripped). Relay stays tripped (latched). You choose when to reset.

ANALOG OUTPUT

Hook to the Load Meter for monitoring load, easy setup and adjustment.

EASY SETUP WITH SET READ SWITCHES

Press the SET READ Switch and the SET POINT for that Channel is displayed on the LOAD METER.

- You **know** where the SET POINT is
- Easily verify proper operation

BUILT-IN STARTUP TIMER

Adjustable Timer eliminates false trips while the Motor is starting.

FILTER OUT NUISANCE TRIPS

Adjustable On-Delay Timer. Trip won't activate until the selected delay time is exceeded.

RESET

The Control can be Reset

- Automatically — when the overload is gone
- Remotely — with switch, relay or programmable controller
- Manually

TRIP INHIBIT

The Control can be remotely bypassed during any part of the cycle when not required.

Also Available

Remote Set Point Adjustment for All Models

STANDARD LOAD CONTROLS

The relays trip when a Set Point is reached. Set Points can be:
High Trip — Trips when the power goes above the Set Point
Low Trip — Trips when the power goes below the Set Point

STANDARD LOAD CONTROL MODEL NUMBERS

PFR-1500V Single Set Point
One Set Point — High Trip

PFR-1500VL
One Set Point — Low Trip

PFR-1700V Dual Set Points
Two Set Points — Both High Trip

PFR-1700VHL High-Low Set Points
Two Set Points — One High Trip, One Low Trip

COMPENSATOR™ LOAD CONTROLS

For machine tool applications the IDLE or BASELINE power of a machine tool drifts because of changes in:

- Temperature
- Lubricant Viscosity
- Mechanical Clearance
- Idle Speed

For accurate dull or broken tool detection, grinder gap elimination, this drift should be zeroed out.

- A limit switch or programmable controller signal tells the COMPENSATOR™ each time the machine is in the idle or "BASELINE" position.
- The COMPENSATOR™ samples this power level and retains it as a reference.
- The SET POINTS are related to this BASELINE.

In other words, the COMPENSATOR™ zeros out the BASELINE power for each cycle. The absolute trip point changes as conditions change but always remains a fixed amount away from the BASELINE. This means no constant fine tuning. It adjusts itself.

COMPENSATOR™ LOAD CONTROL MODEL NUMBERS

PCR-1800V COMPENSATOR™
Single Set Point Above the Compensating Baseline

PCR-1810V COMPENSATOR™
Two Set Points: One Compensating, One Standard

PCR-1820V COMPENSATOR™
Two Set Points, Both Compensating

INSTALLATION

MOUNTING

The Load Control should be mounted in a control cabinet or in a protected area. The four phillips head screws on the Control should be removed and used for attaching the mounting brackets to the Control.

The Power Cell should be mounted so that the motor supply leads can pass through the holes. Direction is important. The Load side (the Load Controls Label) must face the load.

INPUT CONNECTIONS TO THE LOAD CONTROL

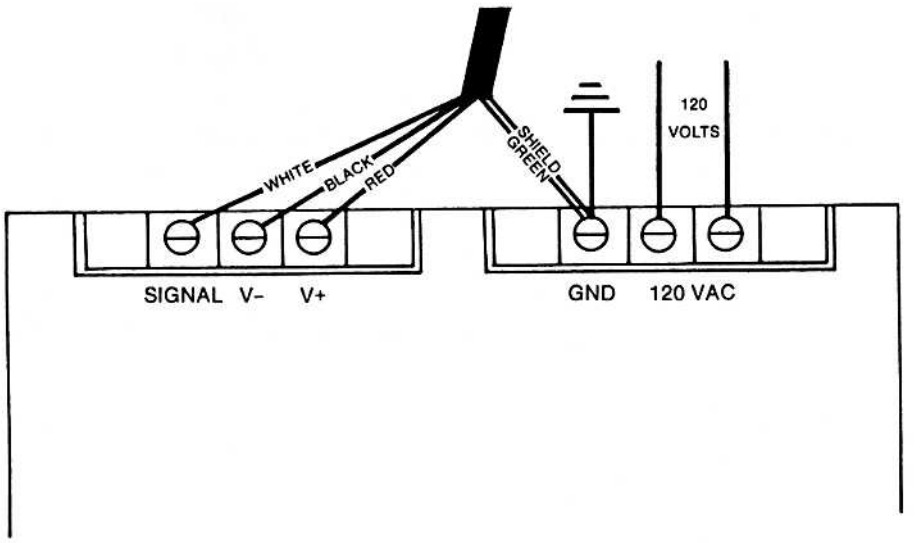
A 3 foot 4 wire shielded cable is provided to connect the Power Cell to the V Series Control. If more length is needed, use shielded cable.

White	SIG
Red	V+
Black	V-
Green	GND

Shield Wire - Connected to "Chassis GND" on Load Control NOT connected at Power Cell.

120 Volt Power

Connect to the 120VAC terminals on the Load Control. Ground the Load Control Chassis.



PH-3 POWER CELL

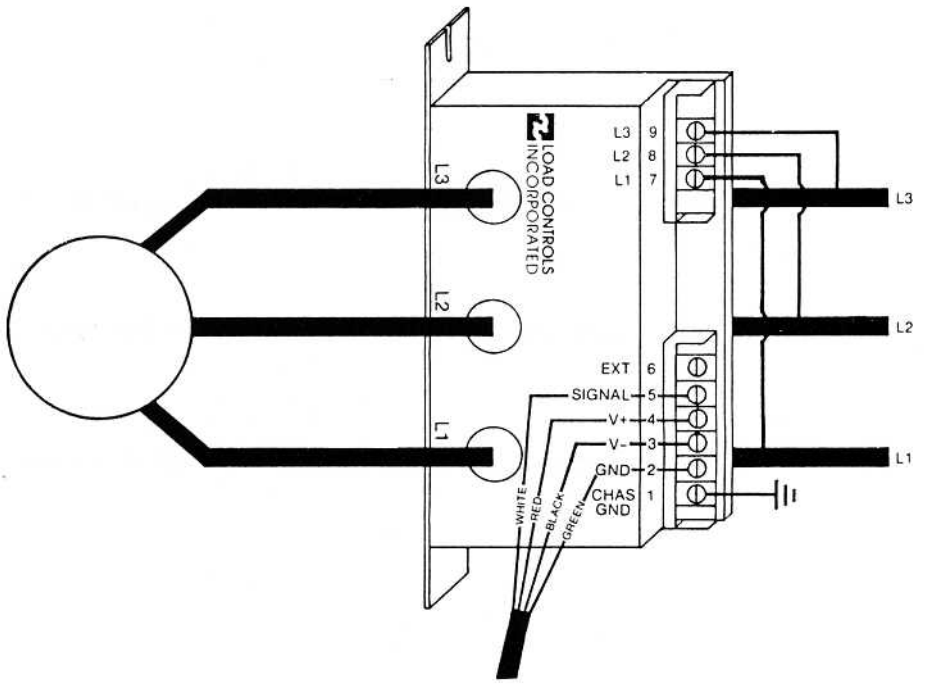
For Variable Frequency Power to 350 Amps

Pass each of the phases through the L1, L2, L3 holes in the Cell. Be certain that ***DIRECTION*** is correct. The LOAD side of the Cell should face the load. The Power Cell should be on the output side of the drive.

From a convenient location provide a voltage signal for each phase with 20 gauge or larger wire. The voltage signal should also come from the output side of the Drive.

L1 to Terminal 7
L2 to Terminal 8
L3 to Terminal 9

Make sure that the voltage samples don't get switched



PH-1000V POWER CELL

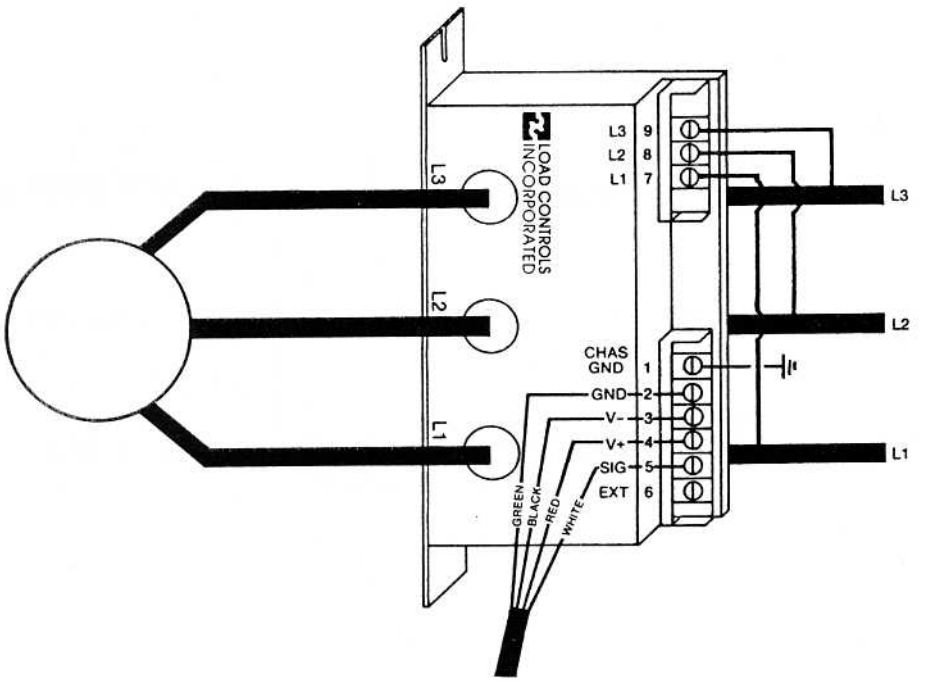
For Variable Frequency Power to 1000 Amps

Pass each of the phases through the L1, L2, L3 holes in the Cell. Be certain that ***DIRECTION*** is correct. The LOAD side of the Cell should face the load. The Power Cell should be on the output side of the drive.

From a convenient location provide a voltage signal for each phase with 20 gauge or larger wire. The voltage signal should also come from the output side of the Drive.

L1 to Terminal 7
L2 to Terminal 8
L3 to Terminal 9

Make sure that the voltage samples don't get switched



PH-1 POWER CELL

For DC Power or Current to 350 Amps

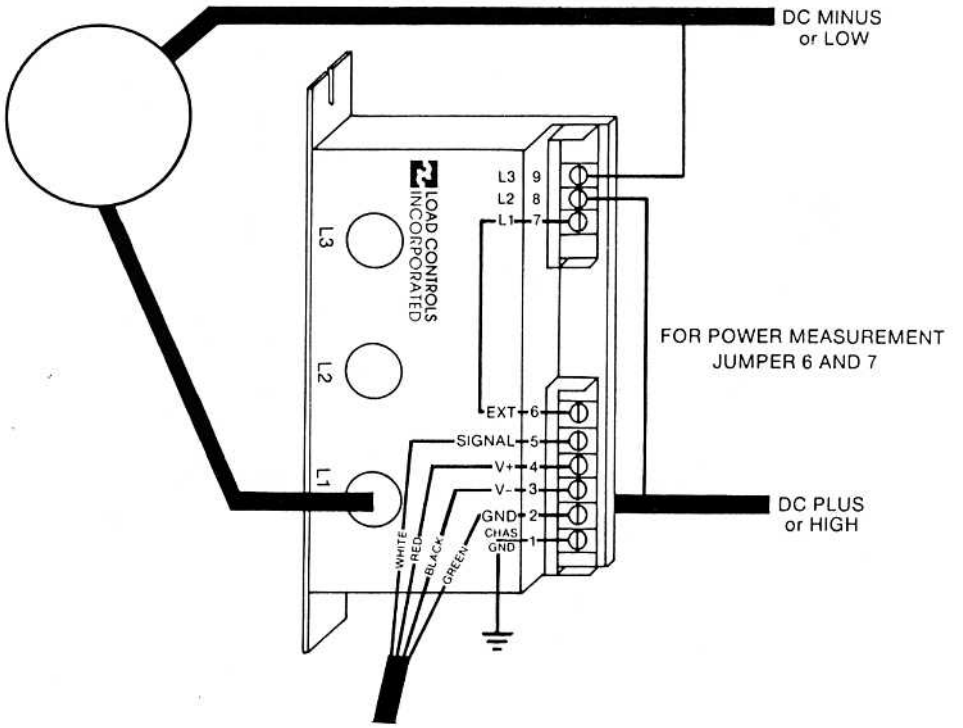
Pass the DC Plus or High through the L1 hole in the Cell. Be certain that ***DIRECTION*** is correct. The LOAD side of the Cell should face the load.

From a convenient location provide a voltage signal from each DC line with 20 gauge or larger wire.

DC Plus or High to Terminal 8
DC Minus or Low to Terminal 9

For DC Power Measurement, Jumper Terminal 6 and 7 on the Power Cell.

For DC Current Measurement, remove the Jumper and remove the voltage connections to Terminal 8 and 9.



PH-1000DCV POWER CELL

For DC Power or Current to 1000 Amps

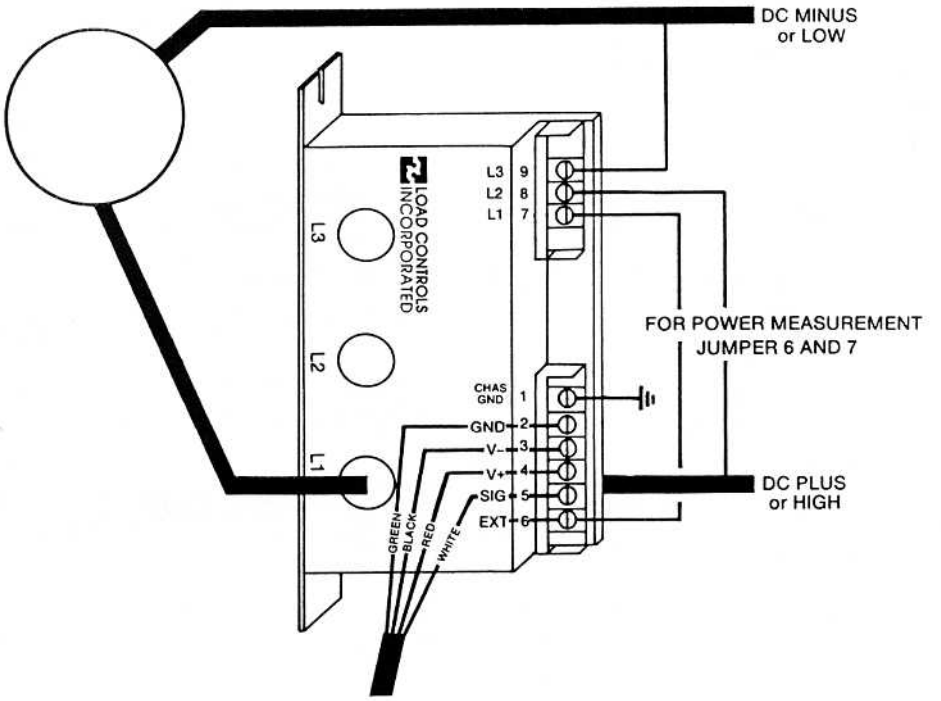
Pass the DC Plus or High through the L1 hole in the Cell. Be certain that ***DIRECTION*** is correct. The LOAD side of the Cell should face the load.

From a convenient location provide a voltage signal from each DC line with 20 gauge or larger wire.

DC Plus or High to Terminal 8
DC Minus or Low to Terminal 9

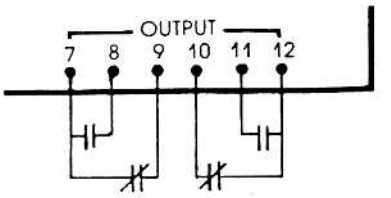
For DC Power Measurement, Jumper Terminal 6 and 7 on the Power Cell.

For DC Current Measurement, remove the Jumper and remove the voltage connections to Terminal 8 and 9.

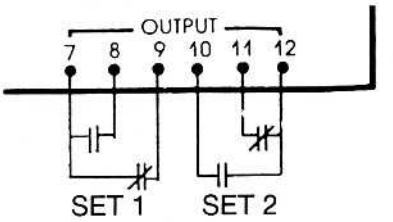


OUTPUT CONNECTIONS (Terminals 7-12)

RELAY OUTPUTS —
SINGLE SET POINT CONTROLS
PFR-1500V
PFR-1500VL
PCR-1800V



RELAY OUTPUTS —
TWO SET POINT CONTROLS
PFR-1700V
PFR-1700VHL
PCR-1810V
PCR-1820V



- ***Relays Shown Normal Operation***
- ***Power On***
- ***Not Tripped***
- Specifications: .01 Amps to 3 Amps at 120 Volts AC 1/20 HP at 120 Volts AC

(Set 1 is the low set point for model PFR-1700VHL)

CONTROL CONNECTIONS (Terminals 1-6)

ANALOG OUTPUT AND SET READ SWITCHES

Always use a Load Meter! It greatly simplifies setup, adjustment and trouble shooting.

The ANALOG OUTPUT (0-1 milliamp) proportional to motor power is on Terminal 6 (Positive) and Terminal 5 (Common). The Percent Load Meter is connected to this output.

- The Meter shows the Motor Load.
- When the Set Read switches are pressed, the Set Point is displayed.

The ANALOG OUTPUT can also be used to drive a chart recorder or as an input to a computer or controller.

The output can be factory modified for a 0-10V or 4-20 milliamp output. To convert the 0-1 milliamp output in the field to 0-10 volts, use a 10K ohm 1% resistor across Terminals 5 and 6.

HOOKUP

Terminal 6 Positive **Terminal 5 Common**

Use #20 AWG or larger. For lengths of 10-100 feet, use shielded cable with the shield grounded at the Control, but not at the Meter.

HOOKING UP RESET, INHIBIT AND BASELINE

The terminals for BASELINE, RESET and INHIBIT generate a small amount of current (8-12 milliamps). To activate one of these functions you just need to connect the terminal to the circuit common (Terminal 5).

The switches or relays that you use must be suitable for low current. (Gold flashed contacts, Reed Relays, Mercury Switches, Open Collectors).

Don't use 10 Amp switches. They won't be reliable.

A voltage signal from a programmable controller can also be used but it must be a sink or source/sink (30 Volt max., 12 Volt min). When in doubt, use a reed relay.

Don't put 120V on Terminals 1-6. It will destroy the control.

RESET

The Control can be reset 3 ways:

- Manually with the Reset button on the Control.
- Remotely with a remotely located Reset button.
- Automatically by jumpering the Reset Terminal. The Control will then automatically reset itself when the trip condition goes away.

HOOKUP

Remote Reset —

Momentarily Connect Terminal 2 to Terminal 5 for Set 1
Momentarily Connect Terminal 4 to Terminal 5 for Set 2

Automatic Reset —

Jumper Terminal 2 to Terminal 5 for Set 1
Jumper Terminal 4 to Terminal 5 for Set 2

INHIBIT

The Control can be inhibited or bypassed with the INHIBIT. This lets you ignore the Control during certain parts of the machine cycle, if you desire.

HOOKUP

Terminal 1 to Terminal 5

HOOKING UP RESET, INHIBIT AND BASELINE (Continued)

BASELINE
(For COMPENSATOR™ Models PCR-1800V, PCR-1810V, PCR-1820V)

A COMPENSATED Set Point needs a zero reference. This is done 2 ways: The first way is with a limit switch or programmable controller on the machine. Usually, an existing switch or controller is used as long as it is electrically compatible. The BASELINE signal should last at least 250 milliseconds but can be as long as you want. The COMPENSATOR™ remembers the last value before the BASELINE contact opens.

You need a BASELINE update for each machine cycle. The green Baseline LED is on DURING the update.

The Control also automatically establishes a Baseline when the Startup timer goes off. If each machine cycle includes starting the motor, an external BASELINE is not needed.

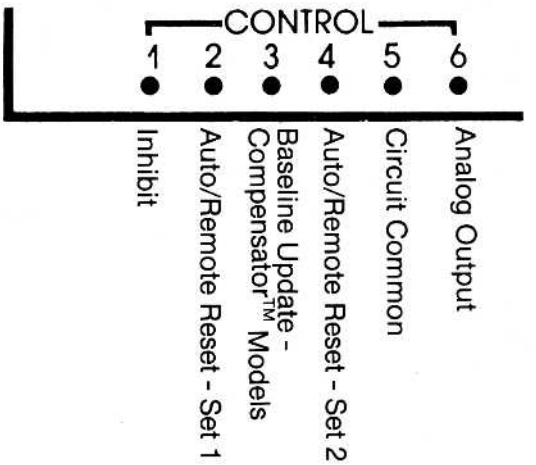
HOOKUP

Momentarily connect Terminal 3 to Terminal 5.

Check the Load Meter as the Baseline LED goes out. This is the value that the COMPENSATOR™ remembers. It should be the idle load of the machine.

MANUAL BASELINE UPDATE

During machine setup it is sometimes helpful to manually update the BASELINE. Do this by momentarily jumpering Terminal 3 to Terminal 5.



Don't put 120 volts on Terminals 1-6! It will destroy the control.

ADJUSTMENTS

TRIP SET AND SET READ SWITCHES

The TRIP SET knobs set the power level at which the Load Control will trip.

The SET READ switches show the trip point on the Percent Load Meter. Press the SET READ switch to read the set point. Holding the switch down while moving the TRIP SET knob makes set up easy.

For COMPENSATING Set Points, the set point is the level ***ABOVE THE BASELINE*** at which the Load Control will trip. With the power on but motor not running, the SET READ switch will show the ***INCREASE*** in load needed to trip. With the motor running, the SET READ switch shows the combined Baseline and Setting.

This means that the total Set Point for the COMPENSATING Controls will change as the Baseline or idle power changes during the day. But, the ***INCREASE*** always stays the same. This zeroes out the effect of machine drift.

STARTUP TIMER

The STARTUP TIMER bypasses the control during motor startup to avoid false trips because of current inrush. For convenience, ***THE TIMING BEGINS WHEN THE MOTOR STARTS.*** The STARTUP LED stays lit until the Startup period is over.

Adjust the STARTUP time with the locking pot on the Load Control. Clockwise for more time. The Startup time should be:

- Long enough so that the load has stabilized. The Percent Load Meter should stabilize before the STARTUP LED goes out.
- Short enough so that the machine does not start a work cycle before the LED goes out.

ON-DELAY TIMERS

To avoid nuisance trips from short overloads, ON-DELAY Timers bypass the Control for the selected time. The relays won't trip until the time is exceeded. If the trip condition goes away before the time is up, the timer resets to zero.

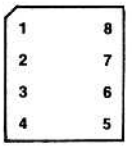
- Always start with minimum ON-DELAY (full counterclockwise). If you are getting trips where you don't want them (as the tool is entering the workpiece for example) increase the ON-DELAY time.

CHANGING CAPACITY

Capacity (sensitivity) of the Power Cells is set with plug-in voltage and current "networks" that are field changeable. Order from Load Controls, Inc. $10 each

For PH-3 & PH-1000V	1 Voltage Network 3 Current Networks
For PH-1 & PH-1000DCV	1 Voltage Network 1 Current Network

The Network pins are numbered

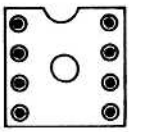


Insert Pin 1 into Socket 1

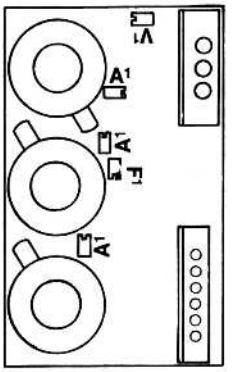
1 = Location of Pin 1

V = Voltage Network
A = Current Network
F = Function Network

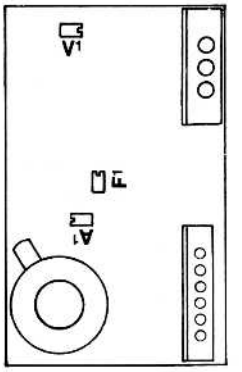
The Socket locations



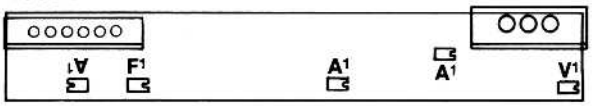
PH-3



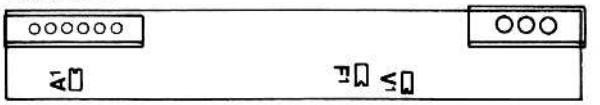
PH-1



PH-1000V



PH-1000DCV



ADDITIONAL TURNS

The capacity can also be reduced by taking additional "turns" of the Primary through each hole. Example:

A 40 Amp Power Cell is reduced to 20 Amps by taking 2 turns through each hole.

A 40 Amp Power Cell is reduced to 10 Amps by taking 4 turns through each hole.

OVERLOAD DAMAGE

The Power Cell is designed so that it is ***NOT DAMAGED*** by overloads. At about 20% above full capacity, the internal circuitry latches up. This prevents damage to attached meters, etc. It also means that the Power Cell can be sized to match the running load without worrying about inrush current.

CURRENT NETWORKS

PH-3, PH-1

4 Amp	10 Amp	15 Amp	20 Amp
30 Amp	40 Amp	50 Amp	60 Amp
70 Amp	80 Amp	90 Amp	100 Amp
140 Amp	175 Amp	210 Amp	245 Amp
280 Amp	315 Amp	350 Amp	

Above 175 Amps Check Conductor Size Max. Opening ¾"

Specify when ordering Power Cell

CURRENT NETWORKS

PH-1000V, PH-1000DCV

100 Amp	200 Amp	300 Amp	400 Amp
500 Amp	600 Amp	700 Amp	800 Amp
900 Amp	1000 Amp		

Specify when ordering Power Cell

VOLTAGE NETWORKS—AC

PH-3 & PH-1000V

115 Volt AC	180 Volt AC	230 Volt AC	255 Volt AC
350 Volt AC	380 Volt AC	415 Volt AC	460 Volt AC
580 Volt AC			

Specify when ordering Power Cell

VOLTAGE NETWORKS—DC

PH-1 & PH-1000DCV

12 Volt DC	90 Volt DC	230 Volt DC	300 Volt DC
440 Volt DC	500 Volt DC	575 Volt DC	

Specify when ordering Power Cell

ANALOG OUTPUT AND FULL SCALE

The Analog Output is proportional to the power that is being sensed. This output is usually 0-1 milliamp but can also be 0-10 Volts or 4-20 milliamps. The output is hooked to a Percent Load Meter and the value of this signal can be calculated:

The Full Scale is proportional to the Voltage and Current Networks that are plugged into the Power Cell.

For 3 Phase Power PH-3 & PH-1000V

To calculate Full Scale Watts equivalent to full scale analog output:

Watts = (1.73) (Voltage Network) (Current Network)

Example: 460 Volt Network
20 Amp Network
Watts = (1.73) (460) (20) = 15,916 Watts
Horsepower = Watts/746
= 21.3 Horsepower

For DC Power PH-1 & PH-1000DCV

To calculate Full Scale Watts equivalent to full scale analog output:

Watts = (Voltage Network) (Current Network)

Example: 460 Volt Network
20 Amp Network
Watts = (460) (20) = 9,200 Watts
Horsepower = Watts/746
= 12.3 Horsepower

CHECK LIST

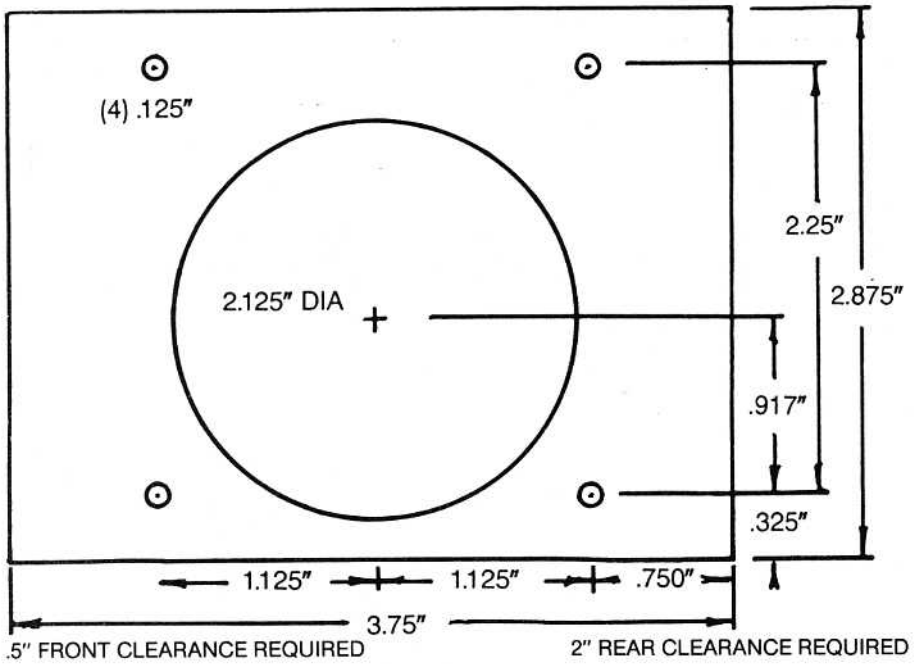
Power Cell Load Side Must Face Load (No Analog Output, Startup Light Doesn't Go Out)

Voltage samples must match phases. (No Sensitivity)

Voltage and Current Networks—Must be firmly inserted in CORRECT DIRECTION.

Remember—The Power Cell is sensing power rather than just current. Power is low for lightly loaded motors (because the power factor is low). The output signal increases linearly as the load increases.

PLM LOAD METER MOUNTING TEMPLATE

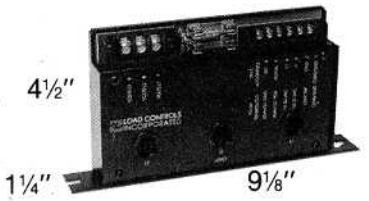


.5″ FRONT CLEARANCE REQUIRED

2″ REAR CLEARANCE REQUIRED

DIMENSIONS

PH-3, PH-1 POWER CELLS



Maximum Conductor:
¾″ with grommets removed

PH-1000V POWER CELLS

Maximum Conductor: 1¾″

LOAD CONTROL