HOT RUNNER CATALOG

ATHENA®

LEGENDARY QUALITY
PERFORMANCE & VALUE

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Non-Modular Hot Runner Controllers

Modular Hot Runner Control System, Single Zone Controllers

Modular Hot Runner Control System, Dual Zone Controllers

How to Order Information

To request a quote or more information on Athena products in this catalog, please go to **www.athenacontrols.com**, click on the **Sales Office Locator** link on the left side of the Home Page under the **Contact Us** tab and take the following steps:

1. Please click on your region of the world map to find the authorized Athena sales representative or distributor in your area
2. Please enter your zip code in the box and press the "Find Reps/Distributors" button to find your local representative or distributor
3. Please use the phone, fax or e-mail link found on your local representative or distributors page to request a quote or get more information on any of the products in this catalog

To contact us directly, please call **800-782-6776** (in the USA) or **610-828-2490** or e-mail us at **sales@athenacontrols.com**.

BEDROS™ Hot Runner Controller

For Medium-Sized Multizone Applications

Athena's new Bedros Hot Runner control system offers 8 to 32 zones of microprocessor-based control. The system delivers more functionality with a full featured easy-to-use touch screen that simplifies single and multi-zone system setup with mold storage recipe capabilities.

- Compact package design
- 8 to 32 zones of control with 15 amps per zone
- A user-friendly color touch screen with intuitive HMI and built-in buttons for joy stick operation
- Accepts "J" or "K" thermocouple input
- Compustep® bake out feature prevents moisture at start-up
- Built-in loop break, short, open, and reverse thermocouple
- Slaving feature
- Adjustable set-point limits
- "Boost" mode for temporary % of power output increase
- USB or Ethernet communications
- Remote input standby function
- Remote alarm output contacts
- Mold storage recipe capabilities
- GFI protection

Ordering Information

B E D – C – □ – □ – □□ – □□

Communications
C = USB/Ethernet

Market
D = Domestic
X = Export
E = CE

Zone Count

08 = 8	28 = 28
12 = 12	30 = 30
16 = 16	32 = 32
18 = 18	
20 = 20	
22 = 22	
24 = 24	
26 = 26	

Future

Options
Consult Factory

Accessory

Floor Stand: Part Number BFS-000 (see page 31)

Technical Specifications

Operating Limits

Absolute Voltage Limits	85 to 265 Vac
Input Line Voltage	Nominal 100 to 240 Vac
Ambient Temperature	32 to 122°F (0 to 50°C)
Relative Humidity Tolerance	90%, non-condensing
Frequency	50-60 Hz

Performance

Auto Control Mode	CompuCycle® system (PWM, 200 msec)
Control Accuracy	± 0.1°F (± 0.1°C) dependent on the total thermal system
Temperature Stability	± 0.5% of full scale over the ambient range
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 400 ms
Process Sampling	100 ms
°F/°C	Field Configurable
CompuStep® System Control Mode	PWM
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Voltage	PWM % with Zero Cross
CompuStep® System Override Temperature	200°F (93°C)
Operation Mode Priority	a: T/C open, T/C reverse, Shutdown and open heater override CompuStep® b: Manual mode overrides T/C open, T/C reverse

Dimensions

Height	24-1/4″
Width	16-1/2″
Depth	20″ with connectors
Weight	62 lbs.

Dimensions (mounted on floor stand)

Height	48-1/2″
Width	23″
Depth	22-1/2″
Weight, floor stand	19 lbs.

Inputs

Thermocouple (T/C Sensor)	Type “J” or “K” grounded or ungrounded
External T/C Resistance	Max. 100 ohms for related accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.03°C/°C)
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100dB
Power Supply Rejection Ratio	Greater than 70dB

Outputs

Voltages	240 Vac nominal, single phase 100 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac per zone
Overload Protection	Type (ABC) Fuses
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts
Output Drive	Internal solid state triac

Human Interface (HMI)

Color Touch/screen (6″ x 4″)
Summary of all zones including process values and set points
Configure single or multiple zones
Zone Group Naming
Mold Storage Capabilities
Network Communications
Built-in Buttons for joy stick

See Appendix 1 (pages 46-57) for BEDROS connector plate layouts and wiring.
See page 33 for Standard TC and Power Cables

BEDROS™ XL Hot Runner Controller

For Medium-Sized Multizone Applications

Athena's new Bedros Hot Runner control system offers 34 to 64 zones of microprocessor-based control. The system delivers more functionality with a full featured easy-to-use touch screen that simplifies single and multizone system setup with mold storage recipe capabilities.

- Compact package design
- 34 to 64 zones of control with 15 amps per zone
- A user-friendly color touch screen with intuitive HMI and built-in buttons for joy stick operation
- Accepts "J" or "K" thermocouple input
- CompuStep® bake out feature prevents moisture at start-up
- Build-in loop break, short, open, and reverse thermocouple
- Slaving feature
- Adjustable set-point limits
- "Boost" mode for temporary % of power output increase
- USB or Ethernet communications
- Remote input standby function
- Remote alarm output contacts
- Mold storage recipe capabilities
- GFI protection

Ordering Information

B E D – [C] – [ ] – [ ] – [ ] – [ ] – [ ]

Communications
C = USB/Ethernet

Market
D = Domestic
X = Export
E = CE

Zone Count

34 = 34	50 = 50
36 = 36	52 = 52
38 = 38	54 = 54
40 = 40	56 = 56
42 = 42	58 = 58
44 = 44	60 = 60
46 = 46	62 = 62
48 = 48	64 = 64

Future

Options
Consult Factory

Accessory

Floor Stand Included

Technical Specifications

Operating Limits

Absolute Voltage Limits	85 to 265 Vac
Input Line Voltage	Nominal 100 to 240 Vac
Ambient Temperature	32 to 122°F (0 to 50°C)
Relative Humidity Tolerance	90%, non-condensing
Frequency	50-60 Hz

Performance

Auto Control Mode	CompuCycle® system (PWM, 200 msec)
Control Accuracy	± 0.1°F (± 0.1°C) dependent on the total thermal system
Temperature Stability	± 0.5% of full scale over the ambient range
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 400 ms
Process Sampling	100 ms
°F/°C	Field Configurable
CompuStep® System Control Mode	PWM
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Voltage	PWM % with Zero Cross
CompuStep® System Override Temperature	200°F (93°C)
Operation Mode Priority	a: T/C open, T/C reverse, Shutdown and open heater override CompuStep® b: Manual mode overrides T/C open, T/C reverse

Dimensions

Height	52-1/2˝ with floor stand
Width	16-1/2˝
Depth	20˝
Weight	130 lbs.

Inputs

Thermocouple (T/C Sensor)	Type “J” or “K” grounded or ungrounded
External T/C Resistance	Max. 100 ohms for related accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.03°C/°C)
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100dB
Power Supply Rejection Ratio	Greater than 70dB

Outputs

Voltages	240 Vac nominal, single phase 100 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac per zone
Overload Protection	Type (ABC) Fuses
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts
Output Drive	Internal solid state triac

Human Interface (HMI)

Color Touch/screen (6˝ x 4˝)
Summary of all zones including process values and set points
Configure single or multiple zones
Zone Group Naming
Mold Storage Capabilities
Network Communications
Built-in Buttons for joy stick

Consult Athena for connector plate layouts, wiring, and TC & power cables

RMB/6 Non-Modular Hot Runner Controller

Hot Runner Temperature Control for 6 Zones

Athena's new RMB/6 Non-Modular Hot Runner control system offers 6 zones of microprocessor-based control. The system delivers more functionality with a full featured easy-to-use Operator Keypad/LCD display and 6 discrete indicators of Heat, Boost, Closed Loop, Open Loop, Idle, and Alarm.

- Compact package design
- 6 zones of control with 15 amps per zone
- Accepts "J" or "K" thermocouple input, grounded or ungrounded
- CompuStep® bake out feature prevents moisture at start-up
- Built-in loop break, short, open, and reverse thermocouple
- Adjustable set point limits
- "Boost" mode for temporary % of power output increase
- Remote input standby function
- Remote alarm output contacts
- Fan cooled

Ordering Information

R	M	B	6	–	0	–		–			–			–		

Communications
0 = None

Market
D = Domestic
X = Export
E = CE

Zone Count
06 = 6

Future

Options
Consult Factory

Standard Cables

Market "D" & "X": Thermocouple Cable, 10 ft #TC08C10A
Power Cable, 10 ft #MPCL08C10A

Market "E": Thermocouple Cable, 10 ft #TC08C10E
Power Cable, 10 ft #MPCL08C10E

Technical Specifications

Technical Operating Limits

Absolute Voltage Limits	240 Vac +10/-20%
Input Line Voltage	Nominal 100 to 240 Vac
Ambient Temperature	32 to 122°F (0 to 50°C)
Relative Humidity Tolerance	90% non-condensing
Frequency	50-60 Hz

Performance Specifications

Auto Control Mode	CompuCycle® system (PWM, 200 msec)
Control Accuracy	± 0.1°F (± 0.1°C) dependent on the total thermal system
Temperature Stability	± 0.5% of full scale over the ambient range
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 400 ms
Process Sampling	100 ms
°F/°C	Field Configurable
CompuStep® System Control Mode	PWM
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Voltage	PWM % with zero cross
CompuStep® System Override Temperature	200°F (93°C)
Operation Mode Priority	a: T/C open, T/C reverse, Shutdown and open heater override CompuStep® b: Manual mode overrides T/C open, T/C reverse

Dimensions

Height	6″
Width	17-1/4″
Depth	13-1/2″
Weight	17 lbs.

Input Specifications

Thermocouple (T/C Sensor)	Type “J” or “K” grounded or ungrounded
External T/C Resistance	Max 100 ohms for rated accuracy
T/C Isolation	Channel to channel common mode voltage ± 1.5 Vdc
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.03°C/°C)
Input Impedance	10 megohms
Input Protection	Diode clamp RC filter
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 100 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac per zone
Overload Protection	Type (ABC) fuses
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts
Output Drive	Internal solid state triac

Human Interface (HMI)

Operator Keypad
8 Control Switches, 6 Status LED’s per zone
Degrees “F” and “C” Status indicators
LCD Display, 2 Line x 24 Characters

See Appendix 2 (pages 58 and 59) for RMB/6 connector plate layouts and wiring.

RMB/12 Non-Modular Hot Runner Controller

Hot Runner Temperature Control for 12 Zones

Athena's new RMB/12 Non-Modular Hot Runner control system offers 12 zones of microprocessor-based control. The system delivers more functionality with a full featured easy-to-use Operator Keypad/LCD display and 6 discrete indicators for Heat, Boost, Closed Loop, Open Loop, Idle, and Alarm.

- Compact package design
- 12 zones of control with 15 amps per zone
- Accepts "J" or "K" thermocouple input, grounded or ungrounded
- CompuStep® bake out feature prevents moisture at start-up
- Built-in loop break, short, open, and reverse thermocouple
- Adjustable set point limits
- "Boost" made for temporary % of power output increase
- Remote input standby function
- Remote alarm output contacts
- Fan cooled

Ordering Information

R	M	B	1	2	–	0	–	☐	–	☐☐	–	☐☐	–	☐☐	–	☐☐

Communications	Market	Zone Count	Future	Options
0 = None	D = Domestic X = Export E = CE	12 = 12		Consult Factory

Standard Cables

Market "D" & "X": Thermocouple Cable, 10 ft #TC12C10A
Power Cable, 10 ft #MPCL12C10A

Market "E": Thermocouple Cable, 10 ft #TC12C10E
Power Cable, 10 ft #MPCL12C10E

Technical Specifications

Technical Operating Limits

Absolute Voltage Limits	85 to 265 Vac
Input Line Voltage	Nominal 100 to 240 Vac
Ambient Temperature	32 to 122°F (0 to 50°C)
Relative Humidity Tolerance	90% non-condensing
Frequency	50-60 Hz

Performance Specifications

Auto Control Mode	CompuCycle® system (PWM, 200 msec)
Control Accuracy	± 0.1°F (± 0.1°C) dependant on the total thermal system
Temperature Stability	± 0.5% of full scale over the ambient range
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 400 ms
Process Sampling	100 ms
°F/°C	Field Configurable
CompStep® System Control Mode	PWM
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Voltage	PWM % with zero cross
CompuStep® System Override Temp	200°F (93°C)
Operation Mode Priority	a: T/C open, T/C reverse, Shutdown and open heater override CompuStep® b: Manual Mode overrides T/C open, T/C reverse

Dimensions

Height	6″
Width	22-1/4″
Depth	13-1/2″
Weight	20 lbs.

Input Specifications

Thermocouple (T/C Sensor)	Type “J” or “K” grounded or ungrounded
External T/C Resistance	Max. 100 ohms for rated accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.03°C/°C)
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 100 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac per zone
Overload Protection	Type (ABC) fuses
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts
Output Drive	Internal solid state triac

Human Interface (HMI)

(2) Operator keypads each with
8 control switches, 6 status LED’s per zone
Degrees “F” and “C” status indicators
LCD Display, 2 line x 24 characters

See Appendix 2 (pages 60 and 61) for RMB/12 connector plate layouts and wiring.

How to Order a Modular Hot Runner Control System

(Single Zone Controllers)

1. Specify type of controller required:

See page 13 for Hot Runner Controller Selection Guide

Controller Specifications and Ordering Codes:

RMA, pages 14, 15

RMB, pages 16, 17

RMC, pages 18, 19

IMP, pages 20, 21

2. Amperage required per zone: (heater wattage x voltage)

15 Amp Modules: IMP, RMA, RMB, RMC

30 Amp Modules: IMP, RMB

3. How many zones of control are required (48 zones maximum)

4. Specify the mainframe cabinet configuration

For 15A modules size of mainframe required is the number of control modules
Use MFL Style Mainframes
See pages 22, 23 for mainframe configurations and ordering codes

For 30A modules size of mainframe is 1 through 6 zones
Use MFH Style Mainframes
See pages 22, 23 for mainframe configurations and ordering codes

5. Specify Cables, Connectors and Terminal Mounting Boxes and Accessories

Reference Pages 31 through 37

Hot Runner Selection Guide

Feature	Controller Series				
	RMA	RMB	RMC	IMP	RMT
CE-Compliant	X	X	X	X	X
Fahrenheit/Centigrade	Dip Switch	Dip Switch	Dip Switch	Dip Switch	Dip Switch
Type J/K Thermocouple	Dip Switch	Dip Switch	Dip Switch	Dip Switch	Dip Switch
Process Display (LED)	X	X	X	X	X
CompuStep®	X	X	X	X	X
SafeChange™ "Hot-Swap" Feature	X	X	X	X	X
Setpoint Display	LED	LED	LED	Thumbwheel	LED
Setpoint Adjust	Pushbutton	Pushbutton	Pushbutton	Thumbwheel	Pushbutton
Control Algorithms	Fixed PI	PID (autotune)	PID (autotune)	Fixed PI	Fixed PI
Auto/Manual Control	X	X	X	X	X
Bumpless Auto/Manual Transfer	Dip Switch	Dip Switch	Dip Switch	Dip Switch	
Current Reading	X	X	X	X	
Temperature Alarms	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable
Reverse Thermocouple Alarm	X	X	X	X	X
Open Thermocouple Alarm	X	X	X	X	X
Open TC Switch to Manual	X	X	X	X	X
Selectable Open TC Action		X	X		
Alarm Output	X	X	X	X	
Ground Fault Alarm		X	X		
Loop Break (Open Heater Alarm)	X	X	X	X	X
% Output Reading	X	X	X	X	X
Shorted Triac Safety Relay		X	X		
Boost Mode		X	X		
Standby (Idle Setpoint/Setback)	X	X	X	X	
Selectable Power Up Mode	X	X	X	X	
Front Panel Lockout		X	X		
All Command			X		
Set Point Limits		X	X		
High Temp Memory		X	X		
Modbus Communication			X		
Warranty Years	2	2	2	2	2

Series RMA

Athena's Series RMA Modular Hot Runner controller is a microprocessor-based, single-zone temperature controller specifically designed for runnerless molding applications. The controller is fully self-tuning, with built-in diagnostics, and features an easy-to-use operator keypad with simultaneous process and set point displays and discrete indicators for heat output, alarm, degrees F/C, manual/closed loop mode, and CompuStep®.

- CompuStep® bake out feature removes moisture from the heater before full power is applied
- SafeChange™ "hot swap" feature allows safe removal and replacement of modules
- Compatible with all D-M-E Company's G Series and Smart Series, ITC, MCS, Yudo, and Incoe brand mainframes
- Accepts Type "J" or "K" thermocouple input (dip switch selectable)
- Current monitoring feature displays average output current to load
- Bumpless auto/manual transfer (dip switch selectable)
- Built-in loop break, open, and reverse thermocouple protection
- Preset alarms at 30°F (17°C)
- CE Compliant

CE COMPLIANT

Ordering Information

R M A – [ ] – 1 5 – [ ] [ ] [ ]

Market
D = Domestic
X = Export
E = CE

Current Rating
15 = 15 A

Special Options
000 = None
Consult Factory

Technical Specifications

Performance Specifications

Auto Control Mode	CompuCycle® System
Control Accuracy	±0.1°F (±0.1°C) dependent on the total thermal system
Ambient Temperature	32°F to 130°F (0°C to 55°C)
Temperature Stability	±0.5% of full scale over the ambient range of 32°F to 130°F (0°C to 55°C)
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 200 ms
Process Sampling	100 ms (nominal)
CompuStep® System Control Mode	Variable stepping voltage, phase angle fired
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Percent	Steps approximately 4% of input voltage
CompuStep® System Override Temperature	200°F (93°C)
Error Mode Response	a. T/C open, T/C reverse, T/C shorted and Loop Break overrides Auto mode/CompuStep® b. Manual mode overrides T/C open, T/C reverse

Input Specifications

Thermocouple (T/C) Sensor	Type “J” or “K” grounded or ungrounded (dip switch selectable)
External T/C Resistance	Maximum 100 ohms for accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.01°C/°C)
Input Type	Potentiometric
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Amplifier Stability	Better than 0.05°F/°F (0.03°C/°C)
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 120 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac
Overload Protection	Triac and load use fast-blow fuses. Both control legs are fused (ABC) Optional: High Speed Fuse (GBB)
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts.
Output Drive	Internal solid state triac, triggered by ac zero crossing pulses

Controls and Indicators

Set Point Control	Two buttons up or down
Range	0 to 999°F (535°C)
Resolution	1°F (1°C)
Display Top	3-digit filtered LED
Display Bottom	3-digit filtered LED
Status Indicators	Heat Output Alarm °F/°C SoftStart CompuStep® Mode Indication closed loop/manual
Power On/Off	Rocker Switch, UL, CSA, and VDE approved

Electrical Power Specifications

Input Voltage	95-265 Vac
Frequency	50 Hz ± 3 Hz, 60 Hz ± 3 Hz
DC Power Supplies	Internally generated, regulated, and temperature compensated
Module Power Usage	Less than 3 watts, excluding load

Series RMB

Athena's Series RMB Modular Hot Runner controller is a microprocessor-based, single-zone temperature controller specifically designed for runnerless molding applications. The controller is fully self-tuning, with built-in diagnostics, and features an easy-to-use operator keypad with simultaneous process and set point displays and discrete indicators for heat output, alarm, degrees F/C, manual/closed loop mode, and CompuStep®.

- CompuStep® bake out feature removes moisture from the heater before full power is applied
- CompuCycle® feature improves response time, reduces thermal fatigue and prolongs heater life by applying AC power smoothly and continuously
- SafeChange™ "hot swap" feature allows safe removal and replacement of modules
- Compatible with all D-M-E Company's G Series and Smart Series, ITC, MCS, Yudo, and Incoe brand mainframes
- Accepts Type "J" or "K" thermocouple input (dip switch selectable)
- Current monitoring feature displays average output current to load
- Bumpless auto/manual transfer (dip switch selectable)
- Built-in loop break, open, and reverse thermocouple protection
- Adjustable alarms at 30°F (17°C)
- Built-in triac safety protection
- Ground fault protection
- Auto-tuning with adjustable proportional band and rate
- CE Compliant

CE COMPLIANT

Ordering Information

R M B – [ ] – 1 5 – [ ] [ ] [ ]

Market
D = Domestic
X = Export
E = CE

Current Rating
15 = 15 A
30 = 30 A

Special Options
000 = None
Consult Factory

Technical Specifications

Performance Specifications

Auto Control Mode	CompuCycle® system
Control Accuracy	±0.1°F (±0.1°C) dependent on the total thermal system
Ambient Temperature	32°F to 130°F (0°C to 55°C)
Temperature Stability	±0.5% of full scale over the ambient range of 32°F to 130°F (0°C to 55°C)
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 200 ms
Process Sampling	100 ms (nominal)
CompuStep® System Control Mode	Variable stepping voltage, phase angle fired
CompuStep® System Duration	Approximately 5 min
CompuStep® System Output Percent	Steps approximately 4% of input voltage
CompuStep® System Override Temperature	200°F (93°C)
Error Mode Response	a. T/C open, T/C reverse, T/C shorted and Loop Break overrides Auto mode/CompuStep® b. Manual mode overrides T/C open, T/C reverse

Input Specifications

Thermocouple (T/C) Sensor	Type “J” or “K” grounded or ungrounded (dip switch selectable)
External T/C Resistance	Max. 100 ohms for rated accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.01°C/°C)
Input Type	Potentiometric
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Amplifier Stability	Better than 0.05 °F/°F (0.03°C/°C)
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 120 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac; 30 amperes, 7200 watts @ 240 Vac
Overload Protection	Triac and load use fasst-blow fuses. Both control legs are fused (ABC) Optional: High Speed Fuse (GBB)
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts.
Output Drive	Internal solid state triac, triggered by ac zero crossing pulses
Ground Fault Interupt (GFI)	Trips at 55 mA of leakage current

Controls and Indicators

Set Point Control	Two buttons up or down.
Range	0 to 999°F (535°C)
Resolution	1°F (1°C)
Display Top Display Bottom	3-digit filtered LED 3-digit filtered LED
Status Indicators	Heat Output Alarm °F/°C SoftStart CompuStep® Mode Indication Normal (closed loop) Manual and Standby Boost Function Indicator
Boost Control	Pushbutton
Power On/Off	Rocker Switch, UL, CSA, and VDE approved

Electrical Power Specifications

Input Voltage	95-265 Vac
Frequency	50 Hz ± 3 Hz, 60 Hz ± 3 Hz
DC Power Supplies	Internally generated, regulated and temperature compensated
Module Power Usage	Less than 3 watts, excluding load

Series RMC

Athena's Series RMC Modular Hot Runner controller is a microprocessor-based, single-zone temperature controller specifically designed for runnerless molding applications. The controller is fully self-tuning, with built-in diagnostics, and features an easy-to-use operator keypad with simultaneous process and set point displays and discrete indicators for heat output, alarm, degrees F/C, manual/closed loop mode, and CompuStep®.

- CompuStep® bake out feature removes moisture from the heater before full power is applied
- CompuCycle® feature improves response time, reduces thermal fatigue and prolongs heater life by applying AC power smoothly and continuously
- SafeChange™ "hot swap" feature allows safe removal and replacement of modules
- Compatible with all D-M-E Company's G Series and Smart Series, ITC, MCS, Yudo, and Incoe Brand mainframes
- Accepts Type "J" or "K" thermocouple input (dip switch selectable)
- Current monitoring feature displays average output current to load
- Bumpless auto/manual transfer (dip switch selectable)
- Built-in loop break, open, and reverse thermocouple protection
- Adjustable alarms at 30°F (17°C)
- Built-in triac safety protection
- Ground fault protection
- Auto-tuning with adjustable proportional band and rate
- Modbus communications
- CE Compliant

CE COMPLIANT

Ordering Information

R M C – [ ] – [ ][ ] – [ ][ ][ ]

Market
D = Domestic
X = Export
E = CE

Current Rating
15 = 15 A

Special Options
000 = None
Consult Factory

Technical Specifications

Performance Specifications

Auto Control Mode	CompuCycle® system
Control Accuracy	±0.1°F (±0.1°C) dependent on the total thermal system
Ambient Temperature	32°F to 130°F (0°C to 55°C)
Temperature Stability	±0.5% of full scale over the ambient range of 32°F to 130°F (0°C to 55°C)
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 200 ms
Process Sampling	100 ms (nominal)
CompuStep® System Control Mode	Variable stepping voltage, phase angle fired
CompuStep® System Duration	Approximately 5 min
CompuStep® System Output Percent	Steps approximately 4% of input voltage
CompuStep® System Override Temperature	200°F (93°C)
Error Mode Response	a. T/C open, T/C reverse, T/C shorted and Loop Break overrides Auto mode/CompuStep® b. Manual mode overrides T/C open, T/C reverse

Input Specifications

Thermocouple (T/C) Sensor	Type “J” or “K” grounded or ungrounded (dip switch selectable)
External T/C Resistance	Max. 100 ohms for accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.01°C/°C)
Input Type	Potentiometric
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Amplifier Stability	Better than 0.05 °F/°F (0.03°C/°C)
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 120 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac
Overload Protection	Triac and load use fast-blow fuses. Both control legs are fused (ABC) Optional: High Speed Fuse (GBB)
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts.
Output Drive	Internal solid state triac, triggered by ac zero crossing pulses
Ground Fault Interupt (GFI)	Trips at 55 mA of leakage current

Controls and Indicators

Set Point Control	Two buttons up or down
Range	0 to 999°F (535°C)
Resolution	1°F (1°C)
Display Top Display Bottom	3-digit filtered LED 3-digit filtered LED
Status Indicators	Heat Output Alarm °F/°C SoftStart CompuStep® Mode Indication Normal (closed loop) Manual and Standby Boost Function Indicator
Power On-Off	Rocker Switch, UL, CSA, and VDE approved

Electrical Power Specifications

Input Voltage	95-265 Vac
Frequency	50 Hz ± 3 Hz, 60 Hz ± 3 Hz
DC Power Supplies	Internally generated, regulated and temperature compensated
Module Power Usage	Less than 3 watts, excluding load

Series IMP
(A New Look)

Athena's Series IMP Modular Hot Runner controller is a microprocessor-based, single-zone temperature controller specifically designed for runnerless molding applications. The controller is fully self-tuning, with built-in diagnostics, and features an easy-to-use operator keypad with simultaneous process and set point displays and discrete indicators for heat output, alarm, degrees F/C, manual/closed loop mode, and CompuStep®.

- CompuStep® bake out feature removes moisture from the heater before full power is applied
- CompuCycle® feature improves response time, reduces thermal fatigue, and prolongs heater life by applying AC power smoothly and continuously
- SafeChange™ "hot swap" feature allows safe removal and replacement of modules
- Compatible with all D-M-E Company's G Series and Smart Series, ITC, MCS, Yudo, and Incoe brand mainframes
- Accepts Type "J" or "K" thermocouple input (dip switch selectable)
- Current monitoring feature displays average output current to load
- Bumpless auto/manual transfer (dip switch selectable)
- Built-in loop break, open, and reverse thermocouple protection
- Preset alarms at 30°F (17°C)
- CE Compliant
- Available in 30 amp modules
- Available 10 and 15 amp single zone portable units

CE COMPLIANT

Ordering Information

I M P – □ – □□ – □□□

Market
D = Domestic
X = Export
E = CE

Current Rating
15 = 15 A
30 = 30 A

Special Options
000 = None
Consult Factory

Note: The 30 amp Series IMP is twice as wide as the 15 amp model and has a circuit breaker instead of a power switch.

Technical Specifications

Performance Specifications

Auto Control Mode	CompuCycle® System
Control Accuracy	± 0.1°F (± 0.1°C) dependent on total thermal system
Ambient Temperature	32°F to 130°F (0°C to 55° C)
Temperature Stability	± 0.5% of full scale over the ambient range of 32°F to 130°F (0°C to 55°C)
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 200 ms
Process Sampling	100 ms (nominal)
CompuStep® System Control Mode	Variable stepping voltage, phase angle fired
CompuStep® System Duration	Approximately 5 min.
CompuStep® System Output Percent	Steps approximately 4% of input voltage
CompuStep® System Override Temperature	200°F (93°C)
Error Mode Response	a. T/C Open, TC reverse, TC shorted and Loop Break overrides Auto mode/CompuStep® b. Manual Mode overrides T/C Open and T/C Reverse

Input Specifications

Thermocouple (T/C Sensor)	Type “J” or “K” grounded or ungrounded (Dip Switch Selectable)
External T/C Resistance	Maximum 100 ohms for accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.01°C/°C)
Input Type	Potentiometric
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Amplifier Stability	Better than 0.05°F/°F (0.03°C/°C)
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 120 Vac available
Power Capability	15 amps, 3600 watts @ 240 Vac
Overload Protection	Triac and load use fast blow fuses Both control legs are fused (ABC) Optional: High Speed Fuses (GBB)
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts
Output Drive	Internal solid state triac, triggered by ac zero crossing pulses

Controls and Indicators

Set Point Control	Precision 3 digit pushbutton switch, direct reading
Range	0 to 999°F (535°C)
Resolution	1°F (1°C)
Accuracy	Better than 0.5°F (0.3°C)
Display Top	3-digit filtered LED
Status Indicators	Heat Output Alarm Degrees F/C Soft Start CompuStep® Mode Indication
Power On/Off	Rocker Switch, UL, CSA, and VDE approved

Electrical Power Specifications

Input Voltage	95-265 Vac
Frequency	50 Hz + 3 Hz, 60 Hz + 3 Hz
DC Power Supplies	Internally generated, regulated, and temperature compensated
Module Power Usage	Less than 3 watts, excluding load

MFL & MFH Mainframe Configurations

Mainframes for 15-Amp Control Modules*

For use with RMA, RMB, RMC & IMP control modules only

The configurations illustrated below provide a wide selection of zone capacities to suit almost any hot runner control application. The 5, 6, 8 and 12 zone frames use individual frame sections. The 16 thru 48 zone frames use 2, 3 or 4 frame sections rigidly fastened together into one prewired integral unit which requires only one main AC power input connection.

Dimensions*

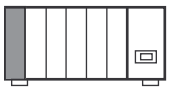
MFL Mainframe	Height	Depth	Width	MFH Mainframe
1- & 2-zone	9-1/4″	10″	7″	1-zone
3-zone	9-1/4″	12-3/4″	7″	
5-zone	8-7/8″	11-1/2″	16-1/8″	2-zone
6-zone	8-7/8″	11-1/2″	18-1/8″	3-zone
8-zone	8-7/8″	11-1/2″	22-1/8″	4-zone
12-zone	8-7/8″	11-1/2″	30-1/4″	5- & 6-zone

*For mainframes over 12 zones, add dimensions of stacked cabinets.

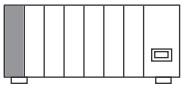
1-Zone

2-Zone

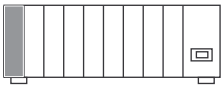
3-Zone



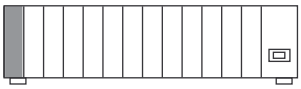
5-Zone



6-Zone

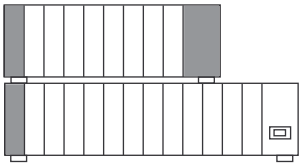


8-Zone

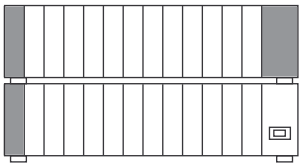


12-Zone

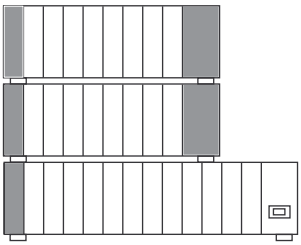
16-Zone



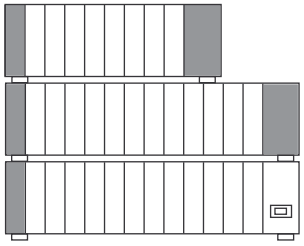
20-Zone



24-Zone

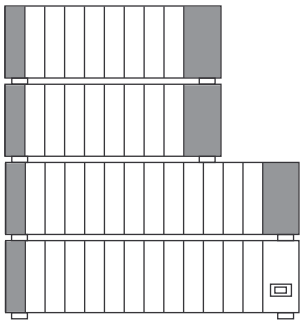


28-Zone

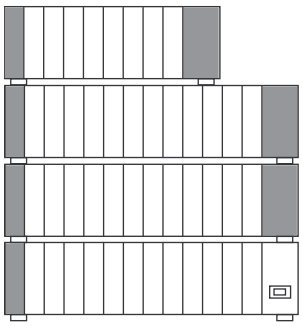


32-Zone

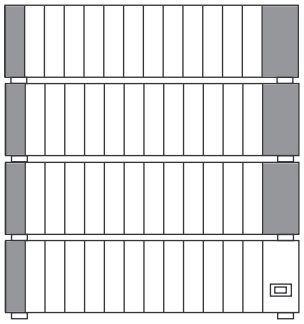
36-Zone



40-Zone



44-Zone



48-Zone

Notes on Mainframes

Mainframe cabinets may be stacked to form a permanent, integrated unit with a single ac power input and breaker. Up to 48 control modules (zones) may be accommodated.

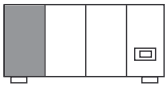
5, 6, 8, and 12 zone mainframes have a circuit breaker rating of 50 amps and a maximum total wattage of 20 kW (domestic models) and 36 kW (Export and CE Models). Mainframes for 16 zones and over have a circuit breaker rating of 70 amps and 29 kW (domestic models) and 50.4 kW (Export and CE Models).

Mainframes for 30-amp Modules**

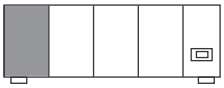
The 5 configurations illustrated provide 1, 2, 3, 5 or 6 zones of 30 amp control for higher wattage heater applications.

**NOTE: Blank panel(s) should be ordered to provide for heat dissipation and to cover unused zones in frames. Combination frames to accommodate both 15 and 30 amp modules are available on special order.

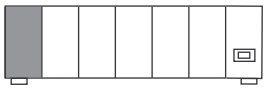
1-Zone



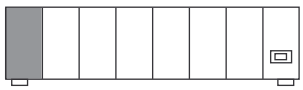
2-Zone



3-Zone



5-Zone



6-Zone

MFL, MFH and Portable Mainframes

Single-Zone

Dual-Zone

Tri-Zone

Standard Mainframes (15 amps)

Ordering Information

M F L – [ ] – [ ] – [ ][ ] – [ ][ ] – [ ][ ][ ]

Communications
O = No communications
C = Communications

Market*
D = Domestic
X = Export
E = CE

Zone Count
01 = 1] (see Note 1)
02 = 2]
03 = 3
05 = 5
06 = 6
08 = 8
12 = 12
16 = 16
20 = 20
24 = 24
28 = 28
32 = 32
36 = 36
40 = 40
44 = 44
48 = 48

Special Options
000 = Consult factory
006 = Single Phase
016 = Controllers Inserted

00 = Standard for 5, 8, and 12-Zone Mainframes
01 = COPO = Clamp In / 5 Pin Out
02 = NOPO = NEMA In / 5 Pin Out
03 = COPF = Clamp In / 5 Pin Out - Fan
04 = NOCO = NEMA In / Clamp Out
05 = NONO = NEMA In / NEMA Out
06 = COPS = Clamp In / 5 Pin Out - Fan w/Switch
07 = NOPS = NEMA In / 5 Pin Out - Fan w/Switch
08 = CONF = Clamp In / NEMA Out - Fan
09 = COPT = Clamp In / Combo MP/TC 10 Pin Female - Fan w/Switch
10 = NONF = NEMA In / NEMA Out - Fan
11 = NOPF = NEMA In / 5 Pin Out - Fan
12 = CODO = Clamp In / (2) 25 Pin Inserts
13 = COPE = Clamp In / Combo MP/TC 16 Pin Female - Fan w/Switch
14 = NOPT = NEMA In / Combo MP/TC 16 Pin Female

* Use "D" ordering suffix for 60 Hz & °F
Use "X" ordering suffix for 50 Hz & °C
Use "E" ordering suffix for 50 Hz & °C, CE Compliant

Note 1: CE Rating only available for 3 Zone and higher mainframe configurations

High-Power Mainframes (30 amps)

Ordering Information

M F H – [ ] – [ ] – [ ] – [ ][ ] – [ ][ ] – [ ][ ][ ]

Communications
O = No communications
C = Communications

Market*
D = Domestic
X = Export
E = CE (see Note 2)

Zone Count
01 = 1 (see Note 2)
02 = 2
03 = 3
05 = 5
06 = 6

Options
00 = None (see Note 1)
CO = Clamp for Both Input & Output Power
Zone Count 1 Only

Special Options
000 = Consult factory
006 = Single Phase
016 = Controllers Inserted

* Use "D" ordering suffix for 60 Hz & °F
Use "X" ordering suffix for 50 Hz & °C
Use "E" ordering suffix for 50 Hz & °C, CE Compliant

Note 1: Standard for Zone Counts 2 through 6

Note 2: Single (1) Zone unit not available for CE Market

MFL, MFH and Portable Hot Runner Controls, System Components

#Zones	Cables		Connectors		Mold Terminal Boxes**		
	Mold Power (C10=10 Ft) (C20=20 Ft)	Thermocouple (C10=10 Ft) (C20=20 Ft)	Mold Power Input*	Thermocouple	Power Input	Thermocouple	Combination
Standard Mainframe ("A" Suffix = Domestic or Export, "E" Suffix = CE Compliant)							
1, 2 & 3	Reference page 37 for cables and connectors						
5	1-MPCL05Cxxz	1-TC05Cxxz	1-PICL05z	1-MTC05z	1-PICL512TBz	1-MTC005TBz	1-PTCL005TBz
8	1-MPCL08Cxxz	1-TC08Cxxz	1-PICL08z	1-MTC08z	1-PICL512TBz	1-MTC008TBz	1-PTCL008TBz
12	1-MPCL12Cxxz	1-TC12Cxxz	1-PICL12z	1-MTC12z	1-PICL512TBz	1-MTC012TBz	1-PTCL012TBz
16	2-MPCL08Cxxz	2-TC08Cxxz	2-PICL08z	2-MTC08z	2-PICL512TBz	2-MTC008TBz	2-PTCL008TBz
20	1-MPCL08Cxxz	1-TC08Cxxz	1-PICL08z	1-MTC08z	2-PICL512TBz	1-MTC008TBz	1-PTCL008TBz
	1-MPCL12Cxxz	1-TC12Cxxz	1-PICL12z	1-MTC12z	1-MTC012TBz	1-PTCL012TBz	
24	2-MPCL12Cxxz	2-TC12Cxxz	2-PICL12z	2-MTC12z	2-PICL512TBz	2-MTC012TBz	2-PTCL012TBz
28	2-MPCL08Cxxz	2-TC08Cxxz	2-PICL08z	2-MTC08z	3-PICL512TBz	2-MTC008TBz	2-PTCL008TBz
	1-MPCL12Cxxz	1-TC12Cxxz	1-PICL12z	1-MTC12z		1-MTC012TBz	1-PTCL012TBz
32	1-MPCL08Cxx	1-TC08Cxxz	1-PICL08z	1-MTC08z	3-PICL512TBz	1-MTC008TBz	1-PTCL008TBz
	2-MPCL12Cxx	2-TC12Cxxz	2-PICL12z	2-MTC12z		2-MTC012TBz	2-PTCL012TBz
36	3-MPCL12Cxx	3-TC12Cxxz	3-PICL12z	3-MTC12z	3-PICL512TBz	3-MTC012TBz	3-PTCL012TBz
40	2-MPCL08Cxxz	2-TC08Cxxz	2-PICL08z	2-MTC08z	4-PICL512TBz	2-MTC008TBz	2-PTCL008TBz
	2-MPCL12Cxxz	2-TC12Cxxz	2-PICL12z	2-MTC12z		2-MTC012TBz	2-PTCL012TBz
44	1-MPCL08Cxxz	1-TC08Cxxz	1-PICL08z	1-MTC08z	4-PICL512TBz	1-MTC008TBz	1-PTCL008TBz
	3-MPCL12Cxxz	3-TC12Cxxz	3-PICL12z	3-MTC12z		3-MTC012TBz	3-PTCL012TBz
48	4-MPCL12Cxxz	4-TC12Cxxz	4-PICL12z	4-MTC12z	4-PICL512TBz	4-MTC012TBz	4-PTCL12TBz
High-Power Mainframe ("A" Suffix = Domestic or Export, "E" Suffix = CE Compliant)							
2	1-MPCH23Cxxz	1-TC05Cxxz	1-PICH23z	1-MTC05z	1-PICH023TBz	1-MTC005TBz	1-PTCH023TBz
3	1-MPCH23Cxxz	1-TC05Cxxz	1-PICH23z	1-MTC05z	1-PICH023TBz	1-MTC005TBz	1-PTCH023TBz
5	1-MPCH05Cxxz	1-TC05Cxxz	1-PICH05z	1-MTC05z	1-PICH005TBz	1-MTC005TBz	1-PTCH005TBz
6	1-MPCH06Cxxz	1-TC08Cxxz	1-PICH06z	1-MTC08z	1-PICH006TBz	1-MTC008TBz	1-PTCH006TBz

* Includes Crimp Connectors **Order Power Input and Thermocouple or Combination

Note: Replace xx with Cable Length (10 = 10 ft., 20 = 20 ft.)
Replace z with Wiring (A = Domestic/Export, E = CE Complaint)

How to Order a Modular Hot Runner Control System

(RMT Dual Zone Controllers)

1. Specify type of controller required:

See page 13 for RMT Control Module Features

See pages 26, 27 for RMT Controller specifications and ordering code

Note: The RMT Module is a dual zone controller

2. Amperage required per zone: (heater wattage x voltage)

15 AMP Modules RMT
The RMT amperage capability has 2 modes of operations
Mode 1: Total amperage of 15A per the 2 zones of control
Mode 2: Total amperage of 15A when only 1 channel is active and the 2nd channel is turned off

3. How many zones of control are required (48 zones maximum)

4. Specify the mainframe cabinet configuration

The size of the mainframe required (number of slots) is the number of RMT control modules required

Use MFT Style Mainframes
See pages 28, 29 for MFT mainframe configurations and ordering codes

5. Specify Cables, Connectors and Terminal Mounting Boxes and Accessories

Reference Pages 31 through 36

Series RMT (Dual Zone)

The Athena Series RMT is a microprocessor-based, dual-zone temperature controller specifically designed for runnerless molding applications effectively doubling the zone count per module without doubling the price.

It features two easy-to-use operator keypads, four LED displays, and discrete indicators for heat output, alarm, degree F/C indication, manual and closed loop mode.

- Accepts Type J thermocouple
- Bumpless auto/manual transfer
- CompuStep® bake out feature prevents moisture at startup
- Built-in loop break for open heater, shorted triac, reversed or shorted thermocouple
- Open thermocouple break protection with jumper-selectable shutdown or average power output based on operation
- Preset alarms at 30°F (17°C)
- SafeChange™ "hot swap" feature allows safe removal and replacement of module
- 15 amps per zone

Ordering Information

R M T – [ ] – [ ][ ] – [ ][ ][ ]

Market
D = Domestic
X = Export

Current Rating
15 = 15 A

Special Options
000 = None
Consult Factory

Technical Specifications

Performance Specifications

Auto Control Mode	CompuCycle® system
Control Accuracy	±0.1°F (±0.1°C) dependent on the total thermal system
Ambient Temperature	32°F to 130°F (0°C to 55°C)
Temperature Stability	±0.5% of full scale over the ambient range of 32°F to 130°F (0°C to 55°C)
Calibration Accuracy	Better than 0.2% of full scale
Power Response Time	Better than 200 ms
Process Sampling	100 ms (nominal)
CompuStep® System Control Mode	Variable stepping voltage, phase angle fired
CompuStep® System Duration	Approximately 5 min
CompuStep® System Output Percent	Steps approximately 4% of input voltage
CompuStep® System Override Temperature	200°F (93°C)
Error Mode Response	a. T/C open, T/C reverse, T/C shorted and Loop Break overrides Auto mode/CompuStep® b. Manual mode overrides T/C open, T/C reverse

Input Specifications

Thermocouple (T/C) Sensor	Type “J” or “K” grounded or ungrounded (dip switch selectable)
External T/C Resistance	Maximum 100 ohms for rated accuracy
T/C Isolation	Isolated from ground and supply voltages
Cold Junction Compensation	Automatic, better than 0.02°F/°F (0.01°C/°C)
Input Type	Potentiometric
Input Impedance	10 megohms
Input Protection	Diode clamp, RC filter
Input Amplifier Stability	Better than 0.05°F/°F (0.03°C/°C)
Input Dynamic Range	Greater than 999°F (537°C)
Common Mode Rejection Ratio	Greater than 100 dB
Power Supply Rejection Ratio	Greater than 70 dB

Output Specifications

Voltages	240 Vac nominal, single phase 120 Vac available
Power Capability	15 amperes, 3600 watts @ 240 Vac per two zones
Overload Protection	Triac and load use fast-blow fuses. Both control legs are fused (ABC) Optional: High Speed Fuse (GBB)
Power Line Isolation	Optically and transformer isolated from ac lines. Isolation voltage is greater than 2500 volts.
Output Drive	Internal solid state triac, triggered by ac zero crossing pulses

Controls and Indicators

Set Point Control	Precision 3 digit pushbutton switch, Direct Reading, Range: 0 to 999°F (535°C) Resolution: 1°F (1°C) Accuracy: better than 0.5°F (0.3°C)
Range	0 to 999°F (535°C)
Resolution	1°F (1°C)
Display Top	3-digit filtered LED
Display Bottom	3-digit filtered LED
Status Indicators	Heat Output Alarm °F/°C SoftStart CompuStep® Mode Indication
Power On-Off	Rocker Switch, UL, CSA, and VDE approved

Electrical Power Specifications

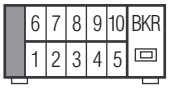
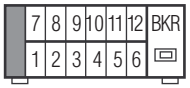
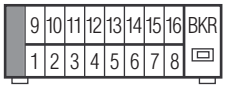
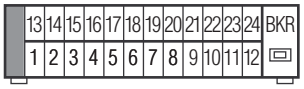
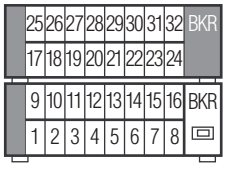
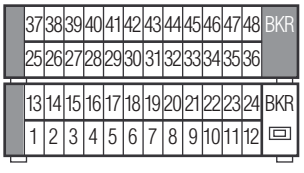
Input Voltage	95-265 Vac
Frequency	50 Hz ± 3 Hz, 60 Hz ± 3 Hz
DC Power Supplies	Internally generated, regulated, and temperature compensated
Module Power Usage	Less than 3 watts, excluding load

MFT Mainframe Configurations

Mainframes for 15-Amp Modules, 15 A Total per Slot* For use with RMT only

The configurations illustrated below provide a wide selection of space-saving zone capacities to suit almost any control application. The 5, 6, 8, and 12 slot frames use individual frame sections with a 50 A main circuit breaker. The 16 and 24 slot frames use two (2) frame sections rigidly fastened together with a 70 A main circuit breaker.

*Note: Blank panel(s) should be ordered to provide for heat dissipation and to cover unused slots in the frames.

MFT Mainframe Configuration with Standard Zone Numbering	Available MFT Mainframe Power and TC Connector Mounting Arrangements
1-Slot 	(2) Single Zone Combination Power and T/C Connector mounted on top of frame
2-Slot 	(1) 5 Zone T/C Connector mounted on rear of frame (1) 5 Zone Power Connector mounted on rear of frame
3-Slot 	(1) 8 Zone T/C Connector mounted on rear of frame (1) 8 Zone Power Connector mounted on rear of frame
5-Slot 	(1) 12 Zone T/C Connector mounted on side of frame (1) 12 Zone Power Connector mounted on side of frame
6-Slot 	(2) 8 Zone T/C Connector mounted on side of frame (1) mounted on rear cover of frame (2) 8 Zone Power Connectors (1) mounted on side of frame (1) mounted on rear cover of frame
8-Slot 	(2) 8 Zone T/C Connectors (1) mounted on side of frame (1) mounted on rear cover of frame (2) 8 Zone Power Connectors (1) mounted on side of frame (1) mounted on rear cover of frame
12-Slot 	(2) 12 Zone T/C Connectors (1) mounted on side of frame (1) mounted on rear cover of frame (2) 12 Zone Power Connectors (1) mounted on side of frame (1) mounted on rear cover of frame
16-Slot 	(4) 8 Zone T/C Connectors Mounting per frame, 2 frames stacked (1) mounted on side of frame (1) mounted on rear cover of frame (4) 8 Zone Power Connectors Mounting per frame, 2 frames stacked (1) mounted on side of frame (1) mounted on rear cover of frame
24-Slot 	(4) 12 Zone T/C Connectors Mounting per frame, 2 frames stacked (1) mounted on side of frame (1) mounted on rear cover of frame (4) 12 Zone Power Connectors Mounting per frame, 2 frames stacked (1) mounted on side of frame (1) mounted on rear cover of frame

MFT Mainframes

MFT Twin Zone Mainframes with all RMT Modules (15 amps max per slot)

Ordering Information

M F T – [ ] – [ ][ ] – [ ][ ] – 0 0 – [ ][ ][ ]

Market*
D = Domestic
X = Export
E = CE

Slot Count

Slots		Zones
01	=	2
02	=	4
03	=	6
05	=	8 to 10
06	=	10 to 12
08	=	12 to 16
12	=	16 to 24
16	=	16 to 32
24	=	26 to 48

"T" Slots
Specify # of RMT Modules

Special Options
000 = Consult factory
016 = Controllers Inserted

* Use "D" ordering suffix for 60 Hz & °F
Use "X" ordering suffix for 50 Hz & °C
Use "E" ordering suffix for 50 Hz & °C, CE Compliant

Combination MFT Twin Zone Mainframes with RMT and RMA Modules
(15 amps max per RMT slot and 15 amps max per RMA slot)

Ordering Information

M F T – [ ] – [ ][ ] – [ ][ ] – [ ][ ] – [ ][ ][ ]

Market*
D = Domestic
X = Export
E = CE

Slot Count

Slots		Zones
01	=	**
02	=	**
03	=	**
05	=	**
06	=	**
08	=	**
12	=	**
16	=	**
24	=	**

"T" Slots
Specify # of RMT Modules

"A" Slots
Specify # of RMA Modules

Special Options
000 = Consult factory
016 = Controllers Inserted

Note: With combination MFT mainframes RMT modules inserted first, followed by the RMA modules.

* Use "D" ordering suffix for 60 Hz & °F
Use "X" ordering suffix for 50 Hz & °C
Use "E" ordering suffix for 50 Hz & °C, CE Compliant

** Zone count depends on RMT and RMA module mixture

MFT (Twin Zone) Hot Runner Control System Components, Domestic and Export (A), CE Compliant (E)

Components

Slots	Cables		Connectors		Mold Terminal Boxes**		
	Mold Power	Thermocouple	Mold Power Input*	Thermocouple	Power Input	Thermocouple	Combination
1	2-MPTCxx	Combination Power and TC	2-CKPTIC1	Combination Power and TC			1-PTCL02TBz
2	1-MPCL05Cxxz	1-TC05Cxxz	1-PICL05z	1-MTC05z	1-PICL512TBz	1-MTC05TBz	1-PTCL05TBz
3	1-MPCL08Cxxz	1-TC08Cxxz	1-PICL08z	1-MTC08z	1-PICL512TBz	1-MTC08TBz	1-PTCL05TBz
5 & 6	1-MPCL12Cxxz	1-TC12Cxxz	1-PICL12z	1-MTC12z	1-PICL512TBz	1-MTC12TBz	1-PTCL12TBz
8	2-MPCL08Cxxz	2-TC08Cxxz	2-PICL08z	2-MTC08z	2-PICL512TBz	2-MTC08TBz	2-PTCL05TBz
12	2-MPCL12Cxxz	2-TC12Cxxz	2-PICL12z	2-MTC12z	2-PICL512TBz	2-MTC12TBz	2-PTCL12TBz
16	4-MPCL08Cxxz	4-TC08Cxxz	2-PICL12z	2-MTC12z	2-PICL512TBz	2-MTC12TBz	2-PTCL12TBz
24	4-MPCL12Cxxz	4-TC12Cxxz	4-PICL12z	4-MTC12z	4-PICL512TBz	4-MTC12TBz	4-PTCL12TBz

* Include Crimp Connectors
**Order power input and thermocouple or combination.

Note: Replace xx with Cable Length (10 = 10 ft., 20 = 20 ft.)
Replace z with Wiring (A = Domestic/Export, E = CE Complaint)

Hot Runner Control System Accessories

Closure (Blanking) Panels

Must be used to cover unused zones in main frames for correct air circulation (cooling). MFB10 for use on single unused zones. MFB20 for use on two unused zones. Supplied with push-pull panel fasteners.

Ordering Information

MFB – ☐☐ – ☐☐

Zones
10 = Single zone
20 = Dual Zone

Market
A = Domestic and Export
E = CE

Universal Floor Stand

Floorstand is adjustable for use with 5, 8 or 12 slot mainframes.

Ordering Information

MFS – 5812 – ☐☐

Special Options
00 = None
Consult Factory

BEDROS Floor Stand

Ordering Information

BFS – 000

Module Replacement Fuses

Catalog No.	Description	Amps	Qty.
ABC15	15 amp, 240 V	15	5
A25X30	30 amp, 240 V	30	1

Insulated Crimp Connectors

For easy splicing of mold power input connector leads to heater leads.

Catalog Number	Amps	Qty.
HWCC-1	15	36
HWCC-2	30	20

How to Size Circuit Breakers and Transformer Kits

To Size Circuit Breakers, Follow These Guidelines:

5, 8, 12 zones = 50 A breaker rating @ 20 kW max.
>12 zones = 70 A breaker rating @ 29 kW max.

To Size a Transformer Kit, Follow These Steps:

1. Calculate total heater wattage
2. Divide result by 1000 (equals kVA)
3. Select transformer from table below

Transformer Part No.	Load Rating in kVA	3-Phase Amperage (per Phase)
TK09	9	21.7 A
TK15	15	36.1 A
TK30	30	72.3 A
TK45	45	108.4 A

Transformer kits are fully wired and include enclosed transformer (480 Vac 3Ø in, 240 Vac 3Ø out) with adjustable voltage taps, power cable to main frame, disconnect switch, extra fuses, and floor stand with all hardware. Other transformers are available for your particular power requirements.

Ordering Information

TK – □□ – □ – □

Rating
06 = 6 KVA
09 = 9 KVA
15 = 15 KVA
30 = 30 KVA
45 = 45 KVA

Phases
1 = Single Phase
3 = Three Phase

Voltage
A = 480
B = 600

Mold Power and Thermocouple Cables Ordering Information

Mold Thermocouple Cable

Ordering Information

T C – □□ – □□□ – □ – □□□

 # Zones
05 = 5 Zones
08 = 8 Zones
12 = 12 Zones

Length*
C10 = 10′
C20 = 20′

Market
A = Domestic and Export
E = CE

Special Options
000 = Consult factory

Mold Power Cable (15 A)

Ordering Information

M P C L – □□ – □□□ – □ – □□□

 # Zones
05 = 5 Zones
08 = 8 Zones
12 = 12 Zones

Length*
C10 = 10′
C20 = 20′

Market
A = Domestic and Export
E = CE

Special Options
000 = Consult factory

Mold High-Power (30 A) Cable

Ordering Information

M P C H – □□ – □□□ – □ – □□□

 # Zones
23 = 2 or 3 Zones
05 = 5 Zones
06 = 6 Zones

Length*
C10 = 10′
C20 = 20′

Market
A = Domestic and Export
E = CE

Special Options
000 = Consult factory

Flexible Mold Thermocouple Cables

Ordering Information

F T C – □□ – □□□ – □ – □□□

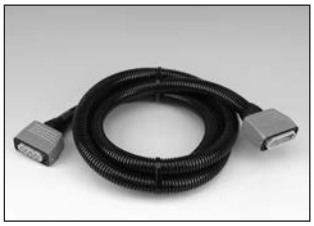
 # Zones
05 = 5 Zones
08 = 8 Zones
12 = 12 Zones

Length*
C10 = 10′
C20 = 20′

Market
A = Domestic and Export
E = CE

Special Options
000 = Consult factory

Mold Power Cable (15 A)



Ordering Information

F M P C L – □□ – □□□ – □ – □□□

 # Zones
05 = 5 Zones
08 = 8 Zones
12 = 12 Zones

Length*
C10 = 10′
C20 = 20′

Market
A = Domestic and Export
E = CE

Special Options
000 = Consult factory

Note: Consult factory for special lengths.

Thermocouple and Mold Power Connectors

Thermocouple Connectors

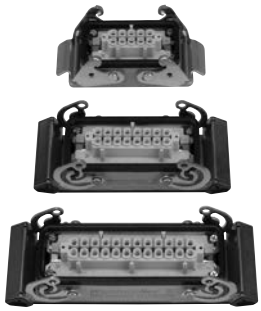
Domestic and Export Market

Ordering Information

MTC – ☐☐ – ☐

 # Zones
05= 5 Zones
08= 8 Zones
12 = 12 Zones

Market
A = Domestic and Export
E = CE



CE Market

Mold Power/Input Connectors

Domestic and Export Market

Ordering Information

Mold Power Connectors

PICL – ☐☐ – ☐

 # Zones
05 = 5 Zones
08 = 8 Zones
12 = 12 Zones

Market
A = Domestic and Export
E = CE

Mold High-Power (30 A) Connectors

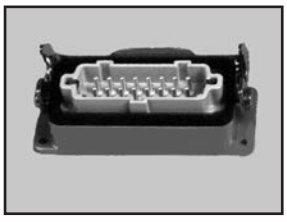
PICH – ☐☐ – ☐

 # Zones
23 = 2 or 3 Zones
05 = 5 Zones
06 = 6 Zones

Market
A = Domestic and Export
E = CE

CE Market

Combo Connectors for Tri-Zone™ System



Ordering Information

TPT03 – ☐

Market
A = Domestic and Export
E = CE

Mold Terminal Mounting Junction Boxes

Ordering Information

MTC Terminal Mounting Boxes for Thermocouple Connectors

Thermocouple Junction Boxes

M T C — [ ][ ][ ] — T B — [ ]

 # Zones
005 = 5 Zones
008 = 8 Zones
012 = 12 Zones

Market
A = Domestic or Export
E = CE

PICL and PICH Terminal Mounting Boxes for Mold Power Input Connectors (15 amps)

Mold Power Junction Box

P I C L — [ ][ ][ ] — T B — [ ]

 # Zones
512 = 5, 8 or 12 Zones
005 = 5 Zones (CE only)
008 = 8 Zones (CE only)
012 = 12 Zones (CE only)

Market
A = Domestic or Export
E = CE

Mold High Power (30 A) Junction Box

P I C H — [ ][ ][ ] — T B — [ ]

 # Zones
023 = 2 or 3 Zones
005 = 5 Zones
006 = 6 Zones

Market
A = Domestic or Export
E = CE

PTCH and PTCL Combination Terminal Mounting Boxes (30 amps)

Mold Thermocouple/High Power (30 A) Combination Junction Boxes

P T C H — [ ][ ][ ] — T B — [ ]

 # Zones
005 = 5 Zones
008 = 8 Zones
012 = 12 Zones

Market
A = Domestic or Export
E = CE

Mold Thermocouple/Power Combination Junction Boxes

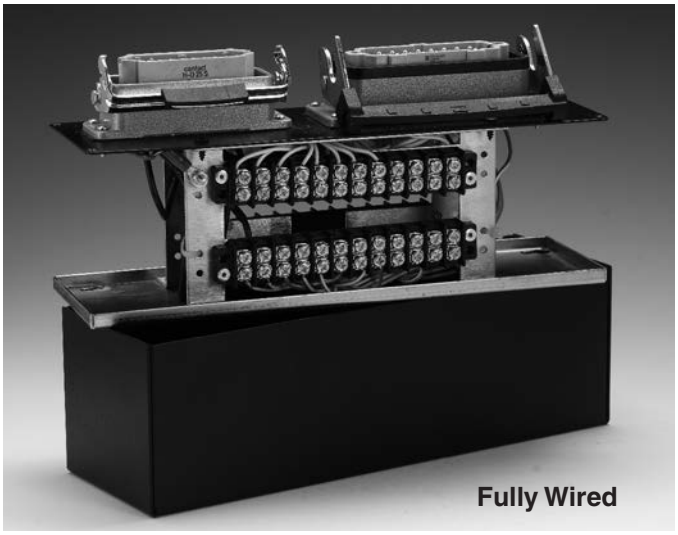
P T C L — [ ][ ][ ] — T B — [ ]

 # Zones
005 = 5 Zones
008 = 8 Zones
012 = 12 Zones

Market
A = Domestic or Export
E = CE

Mold Mounting Junction Boxes for Portable Hot Runner Systems	
Model No.	**Used With**
PTCL-001-TB-A	IMP/P, RMC/P and Single Zone MFL Mainframes with one 5-pin connector
PTCL-002-TB-A	Dual Zone MFL Mainframe with two 5-pin connectors
PTCH-001-TB-A	Single Zone MFH Mainframes with one 30-amp NEMA plug and one thermocouple plug

Prewired 5, 8, 12-Zone Mold Junction Box for Hot Runner Wiring

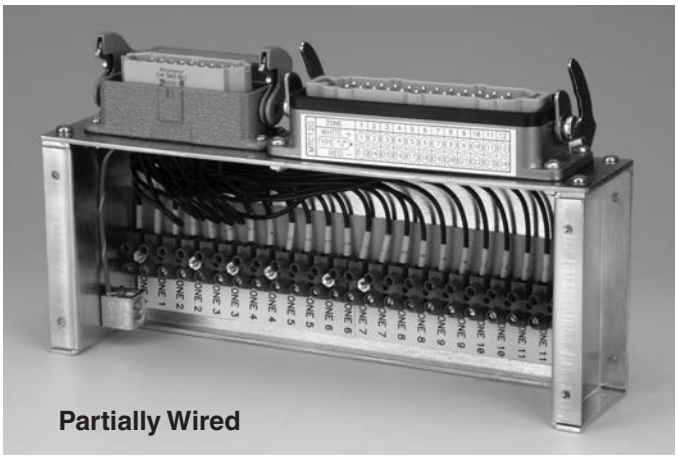

Fully Wired

Athena Prewired Mold Junction Boxes feature an innovative design that makes hot runner wiring fast, easy, and logical. Boxes contain a 25-pin power connector for 15 AMP/240 zones, and a 10, 16 or 24 pin thermocouple connector.

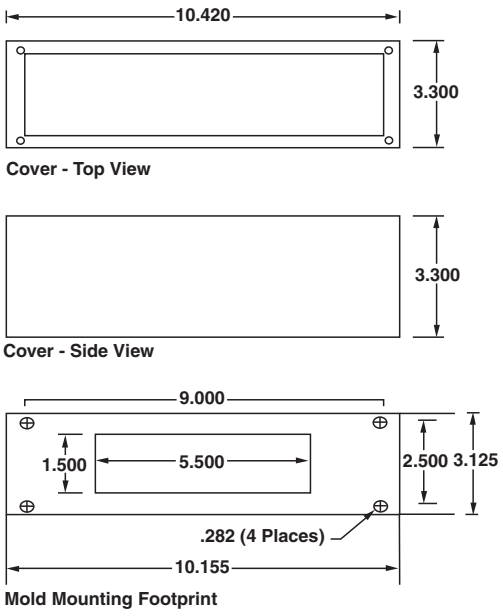
Each Box:

- Is completely assembled
- Prewired with marked zones
- Contains terminal strips for accurate wiring

Athena's Prewired Hot Runner Mold Wiring System has quickly developed recognition as the new industry standard. Changeovers are quick and logical, and troubleshooting can be done while the mold is still in the press.


Partially Wired

Dimensions



Ordering Information

P T B — ☐ — ☐☐☐ — ☐ — ☐☐☐

Description
C = Combination
T = Thermocouple
P = Power

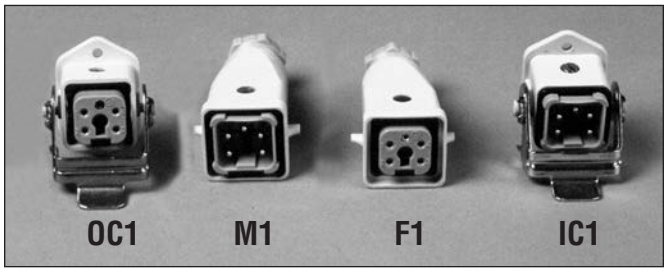
 # Zones
005 = 5 Zones
008 = 8 Zones
012 = 12 Zones

Market
A = Domestic or Export
E = CE

Options
Code
000
00P = Partially Wired

Connectors and Cables for Portable Controllers

5-Pin Combination Power and Thermocouple Connectors for Portable Controllers (one per zone required)



C K P T – ☐☐☐

Type
OC1 = Frame
M1 = Cable, Frame-End
F1 = Cable, Mold-End
IC1 = Mold

NEMA Connectors for Portable Controllers

215K005U01 (AC1512F)
Cord connector, female
15 A, 125 V
Power out

215K006U01 (AC1512M)
Cord connector, male
15 A, 125 V
Power in

215K004U01 (AC1524F)
Cord connector, female
15 A, 250 V
Power out

215K003U01 (AC1524M)
Cord connector, male
15 A, 250 V
Power in

215K002U01 (AC2024F)
Connector chassis, female
20 A, 250 V
Power out

215K001U01 (AC2024M)
Connector chassis, male
20 A, 250 V
Power in

TCS1
TC Socket, mold side

215P001U01 (M2MJ)
TC mini-plug

Individual 5-Pin Cable for Portable Controllers (one per zone required)

M P T C – ☐☐

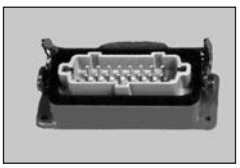
Length
10 = 10′
20 = 20′

Combo Cable for Tri-Zone System

T P T C – ☐☐

Length
10 = 10′
20 = 20′

Combo Connector for Tri-Zone System



T P T 0 3 – ☐

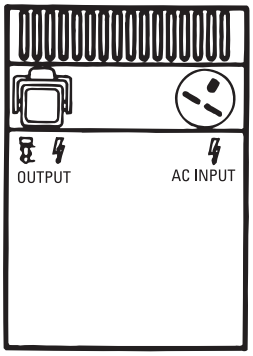
Market
A = Domestic and Export
E = CE

Series IMP/P and RMC/P Horizontal Portable Controllers

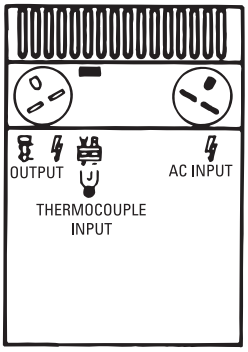
Series IMP/P Single-Zone Controller

For features and technical specifications of the Series IMP/P, refer to the Series IMP description on pages 20 & 21.

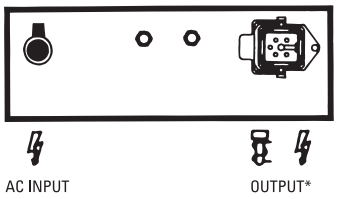
IMPP15BD
NEMA IN,
5 PIN OUT*



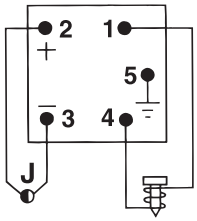
IMPP15AD
NEMA IN,
NEMA OUT*



IMPP10BD
POWER CORD IN,
5 PIN OUT (CE)

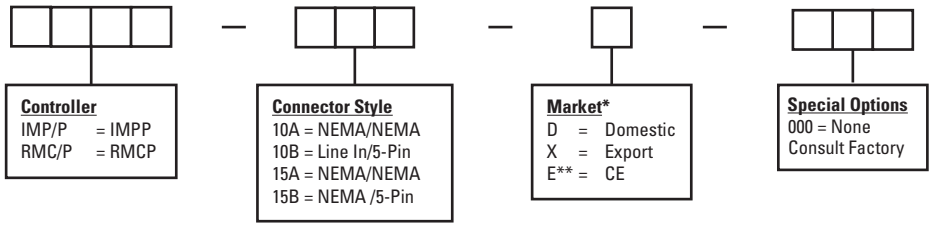


5 PIN CONNECTOR
WIRING



* Mating connector supplied.

Ordering Information

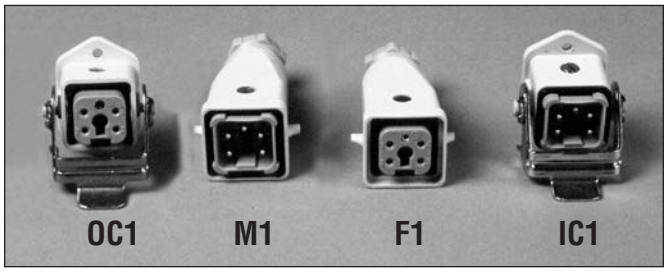


* Use "D" ordering suffix for 60 Hz & °F
Use "X" ordering suffix for 50 Hz & °C
Use "E" ordering suffix for 50 Hz & °C, CE Compliant

** 10 amp only

Connectors and Cable for Horizontal Portable Controllers

5-Pin Combination Power and Thermocouple Connectors for Portable Controllers (one per zone required)



C K P T – ☐☐☐

Type
OC1 = Frame
M1 = Cable, Frame-End
F1 = Cable, Mold-End
IC1 = Mold

NEMA Connectors for Portable Controllers

215K005U01 (AC1512F)
Cord connector, female
15 A, 125 V
Power out

215K006U01 (AC1512M)
Cord connector, male
15 A, 125 V
Power in

215K004U01 (AC1524F)
Cord connector, female
15 A, 250 V
Power out

215K003U01 (AC1524M)
Cord connector, male
15 A, 250 V
Power in

215K002U01 (AC2024F)
Connector chassis, female
20 A, 250 V
Power out

215K001U01 (AC2024M)
Connector chassis, male
20 A, 250 V
Power in

TCS1
TC Socket, mold side

215P001U01 (M2MJ)
TC mini-plug

Individual 5-Pin Cable for Portable Controllers (one per zone required)

M P T C – ☐☐

Length
10 = 10′
20 = 20′

I. The Control System

The automatic control system consists of a process as shown in Figure 1.

II. Sensors

Sensors commonly used in temperature control are:

1. **Thermistor:** A non-linear device whose resistance varies with temperature. Thermistors are used at temperatures under 500°F. Fragility limits their use in industrial applications.
2. **Resistance Temperature Detector (RTD)**: Changes in temperature vary the resistance of an element, normally a thin platinum wire. Platinum RTDs find application where high accuracy and low drift are required. 3-wire sensors are used where the distance between the process and the controller is more than several feet. The third wire is used for leadwire resistance compensation.
3. **Thermocouple:** A junction of two dissimilar metals produces a millivolt signal whose amplitude is dependent on (a) the junction metals; (b) the temperature under measurement. Thermocouples require cold-end compensation whereas connections between thermocouple wire and copper at the controller's terminal block produce voltages that are not related to the process temperature. Thermocouple voltage outputs are non-linear with respect to the range of temperatures being measured and, therefore, require linearization for accuracy. Thermocouple junctions are usually made by welding the dissimilar metals together to form a bead. Different thermocouple types are used for various temperature measurements as shown in Table 1. Thermocouples are the most commonly used industrial sensor because of low cost and durability.
4. Other temperature sensors include non-contact infrared pyrometers and thermopiles. These are used where the process is in motion or cannot be accessed with a fixed sensor.

III. Sensor Placement

Reduction of transfer lag is essential for accurate temperature control using simple temperature controllers. The sensor, heater and work load should be grouped as closely as possible. Sensors placed downstream in pipes, thermowells or loose-fitting platen holes will not yield optimum control. Gas and air flow processes must be sensed with an open element probe to minimize lag. Remember that the controller can only respond to the information it receives from its sensor.

Table 1.

Thermocouple Type	Wire Color	Useful Temperature Range °F
J	White	32 to 1300
K	Yellow	-328 to 2200
T	Blue	-328 to 650
R/S	Black	-32 to 2642

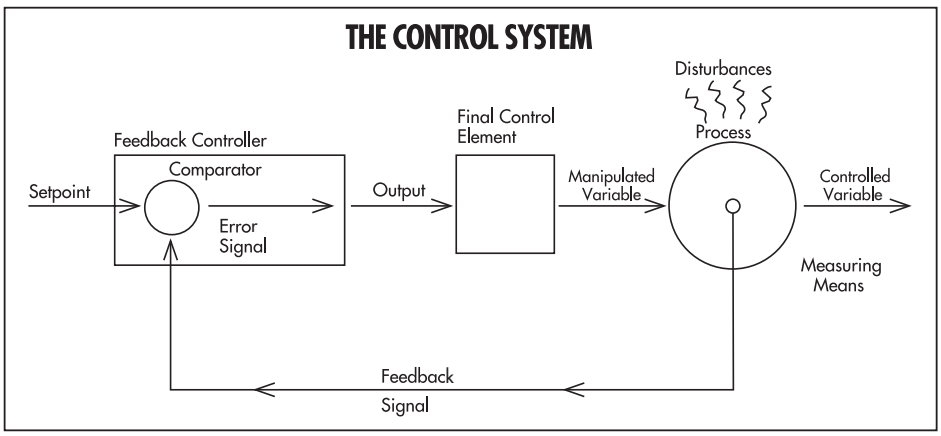


Figure 1.

IV. Process Load Characteristics

Thermal lag is the product of thermal resistance and thermal capacity. A single lag process has one resistance and one capacity. Thermal resistance is present at the heater/water interface. Capacity is the storage capacity of the water being heated.

Sometimes the sensor location is distant from the heated process and this introduces dead time. Figure 2a.

Introduction of additional capacities and thermal resistance changes the process to multi-lag. Figure 2b & 2c.

V. Control Modes

1. On-Off. Figure 3.
   On-Off control has two states, fully off and fully on. To prevent rapid cycling, some hysteresis is added to the switching function. In operation, the controller output is on from start-up until temperature set value is achieved. After overshoot, the temperature then falls to the hysteresis limit and power is reapplied.

   On-Off control can be used where:
   (a) The process is underpowered and the heater has very little storage capacity.
   (b) Where some temperature oscillation is permissible.
   (c) On electromechanical systems (compressors) where cycling must be minimized.
2. Proportional. Figure 4.
   Proportional controllers modulate power to the process by adjusting their output power within a proportional band. The proportional band is expressed as a percentage of the instrument span and is centered over the setpoint. At the lower proportional band edge and below, power output is 100%. As the temperature rises through the band, power is proportionately reduced so that at the upper band edge and above, power output is 0%.

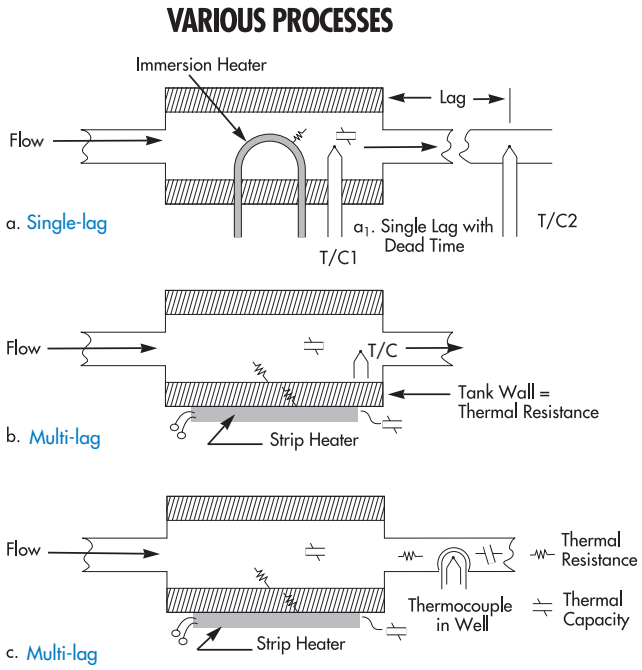


Figure 2.

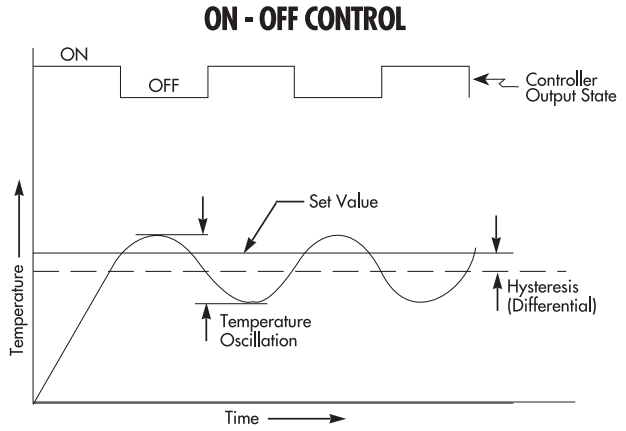


Figure 3.

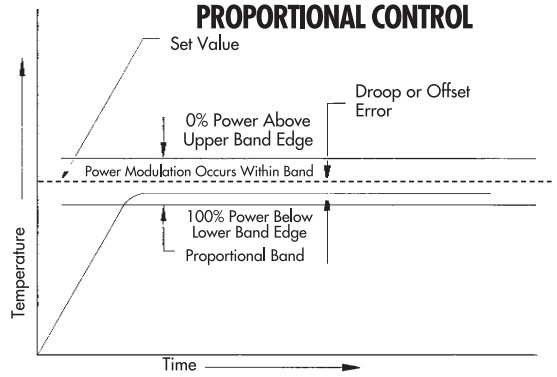


Figure 4.

Proportional controllers can have two adjustments:

a) Manual Reset. Figure 5. Allows positioning the band with respect to the setpoint so that more or less power is applied at setpoint to eliminate the offset error inherent in proportional control.

b) Bandwidth (Gain). Figure 6. Permits changing the modulating bandwidth to accommodate various process characteristics. High-gain, fast processes require a wide band for good control without oscillation. Low-gain, slow-moving processes can be managed well with narrow band to on-off control. The relationship between gain and bandwidth is expressed inversely:

$$\text{Gain} = \frac{100\%}{\text{Proportional Band in \%}}$$

Proportional-only controllers may be used where the process load is fairly constant and the setpoint is not frequently changed.

3. Proportional with Integral (PI), automatic reset. Figure 7. Integral action moves the proportional band to increase or decrease power in response to temperature deviation from setpoint. The integrator slowly changes power output until zero deviation is achieved. Integral action cannot be faster than process response time or oscillation will occur.

4. Proportional with Derivative (PD), rate action. Derivative moves the proportional band to provide more or less output power in response to rapidly changing temperature. Its effect is to add lead during temperature change. It also reduces overshoot on start-up.

5. Proportional Integral Derivative (PID). This type of control is useful on difficult processes. Its Integral action eliminates offset error, while Derivative action rapidly changes output in response to load changes.

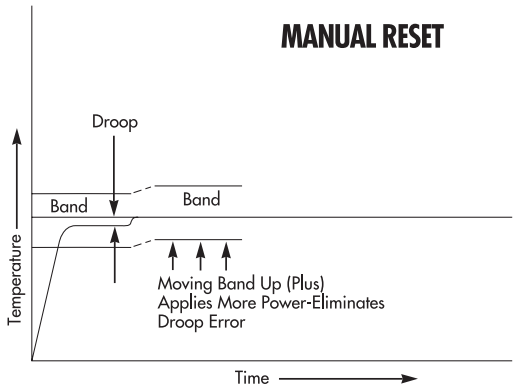


Figure 5.

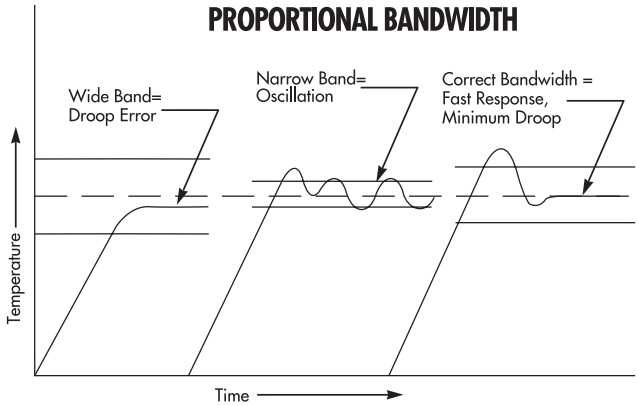


Figure 6.

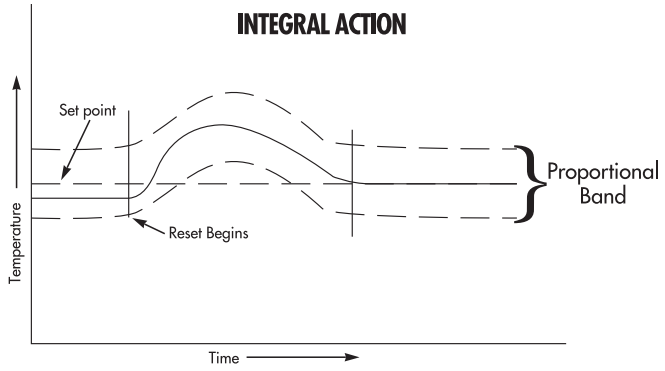


Figure 7.

VI. Proportional Outputs

Load power can be switched by three different proportioning means:

1. Current proportional: A 4-20 mA signal is generated in response to the heating % requirement. See Figure 9. This signal is used to drive SCR power controllers and motor-operated valve positioners.
2. Phase angle: This method of modulating permits applying a portion of an ac sine wave to the load. The effect is similar to light dimmer function. See Figure 10.
3. Time proportioning:
   A clock produces pulses with a variable duty cycle. See Figure 11. Outputs are either direct- or reverse-acting. Direct-acting is used for cooling; reverse-acting for heating.
4. Cycle Time:
   In time proportioning control the cycle time is normally adjustable to accommodate various load sizes. A low mass radiant or air heater requires a very fast cycle time to prevent temperature cycling. Larger heaters and heater load combinations can operate satisfactorily with longer cycle times. Use the longest cycle time consistent with ripple-free control.

VII. Power Handlers

Power is switched to an electric heating load through the final control element. Small, single-phase 120/240 V loads may be connected directly to the temperature controller. Larger, higher voltage heaters must be switched through an external power handler. Power handlers are either large relays (contactors), solid-state contactors or power controllers.

1. Mechanical contactors are probably the most widely used power handlers. They:
   - Are rugged. Fuses protect against burnout due to shorts.
   - Will wear out in time due to contact arcing.
   - Cannot be fast-cycled for low-mass loads.
   - Produce RF switching noise.
2. Solid-state contactors are often used on loads requiring fast switching times. They need heat sinking and I^2T fuse protection.
3. 3 - 32V S.S. contactors switch power at zero crossing of the ac sine wave.
4. SCR power controllers. These devices switch ac power by means of thyristors (SCRs). These are solid-state devices that are turned on by gate pulses. They have unlimited life and require no maintenance. SCR controllers are available for switching single- or three-phase loads in zero crossing/burst firing (Figure 12) or phase-angle modes (Figure 10)

Figure 9. Control Current vs. Power Output

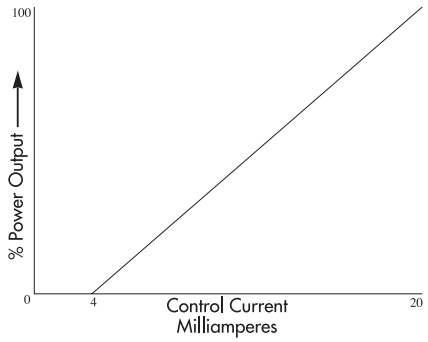


Figure 10. PHASE ANGLE

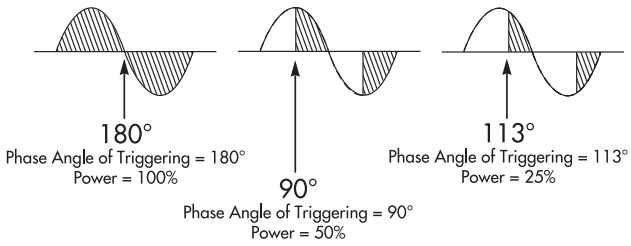
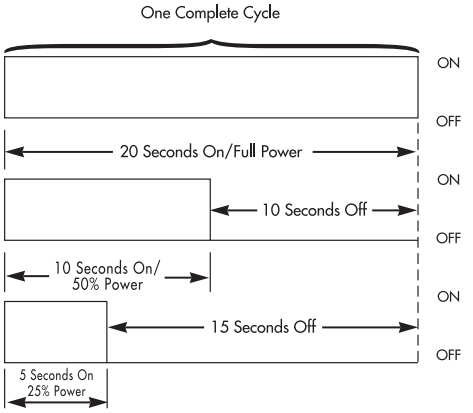


Figure 11. TIME PROPORTIONING



SCR power control selection by switching method can be simplified, as follows:

Use zero crossing for all standard heater applications.

Specify phase angle:

a) When soft start (ramp voltage to peak) is required on high inrush heater loads.

b) If voltage limit is needed to clamp the maximum output voltage to a level lower than the supply voltage.

VIII. HEATER AND POWER CONTROL CONNECTIONS

Power controls are connected to the control signal and load, per Figure 12.

The control signal to the power controller may originate from a manual potentiometer, PLC or temperature controller. This signal is normally 4-20 mA, but can be other currents or voltages. An increase in the signal level produces a corresponding increase in power controller output.

Calculation of SCR size for various voltages and heater sizes is as follows:

Loads

Single-phase $\frac{\text{watts}}{\text{volts}} = \text{amps}$

Three-phase $\frac{\text{watts}}{1.73 \times \text{volts}} = \text{amps}$

watts = total heater watts

volts = line voltage

amps = total line current

SCRs should not be sized at exactly the heater current requirement because heaters have resistance tolerances as do line supplies.

Example: A single-phase 240 volt heater is rated at 7.2 kW. 7,2004240 = 30 A

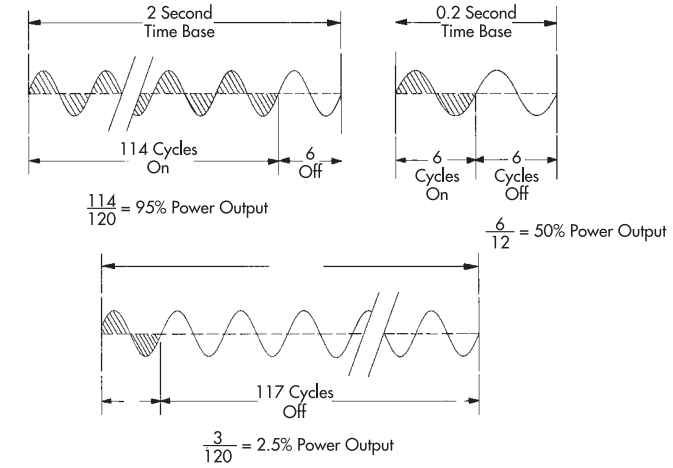
If the heater is 10% low on resistance, at 240 V, the heater will draw 33 amperes. Damage to fuses will result. Power controllers must be properly cooled and, therefore, the mounting location should be in a cool area. SCRs dissipate approximately 2 watts per ampere per phase.

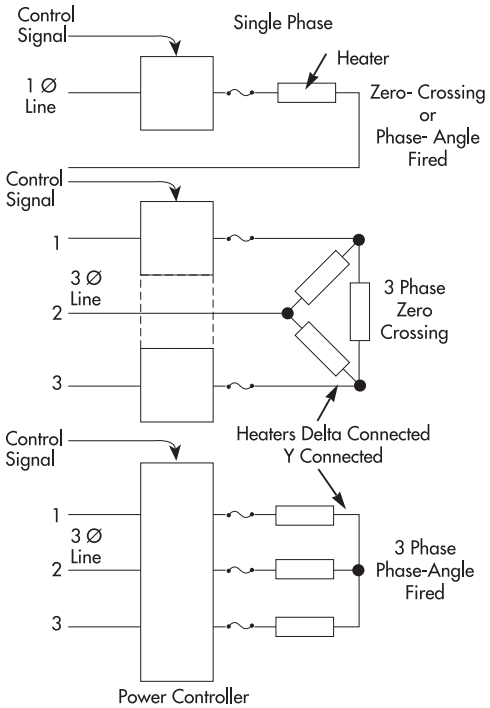
Proper fusing is essential to protect the SCR devices from damage due to load short circuits. The type of fuse is marked I^2T or semiconductor.

Only SCRs designed to drive transformers should be used for that purpose.

SCR power controllers must never be used as disconnects in high-limit applications.

Figure 12. ZERO VOLTAGE





Appendix 1

Quote Request Form for BEDROS™ Non-Modular Hot Runner Control System

1: Specify Incoming Voltage

❑ 240Vac, 3 Phase, 4 Wire
❑ 240Vac, 3 Phase, 5 Wire

2: Specify Market for System

❑ Domestic (D) (Continental USA)
❑ Export (X) (Outside Continental USA)
❑ Europe (E) (CE Compliant)

3: Specify Total Number of Zones _____

Number of Tips: _____ Heater Wattage of Tips: _____

Number of Manifolds: _____ Heater Wattage of Manifolds: _____

Number of Spures: _____ Heater Wattage of Spures: _____

4: Specify Thermocouple Type

❑ Type "J" Grounded
❑ Type "J" Un-Grounded
❑ Type "J" Grounded or Un-Grounded
❑ Unknown (assume Type "J" Grounded)
❑ Type "K" Grounded
❑ Type "K" Un-Grounded
❑ Type "K" Grounded or Un-Grounded

5: Specify Connector Plate Layout (Reference attached pages)

Domestic (D) or Export (X) Systems

❑ 8 Zone Connector Layout and Wiring (BED-C-DX-08-00-000-(LAY/WIR) _____
❑ 12 Zone Connector Layout and Wiring (BED-C-DX-12-00-000-(LAY/WIR) _____
❑ 16 Zone Connector Layout and Wiring (BED-C-DX-16-00-000-(LAY/WIR) _____
❑ 24 Zone Connector Layout and Wiring (BED-C-DX-24-00-000-(LAY/WIR) _____
❑ 32 Zone Connector Layout and Wiring (BED-C-DX-32-00-000-(LAY/WIR) _____

Europe (E) CE Compliant

❑ 8 Zone Connector Layout and Wiring (BED-C-E-08-00-000-(LAY/WIR) _____
❑ 12 Zone Connector Layout and Wiring (BED-C-E-12-00-000-(LAY/WIR) _____
❑ 16 Zone Connector Layout and Wiring (BED-C-E-16-00-000-(LAY/WIR) _____
❑ 24 Zone Connector Layout and Wiring (BED-C-E-24-00-000-(LAY/WIR) _____
❑ 32 Zone Connector Layout and Wiring (BED-C-E-32-00-000-(LAY/WIR) _____

Special Connector Layout and Wiring

Consult Sales at Athena

Bedros XL

Custom units for 32 to 64 zones, Consult Sales at Athena

Contact Information

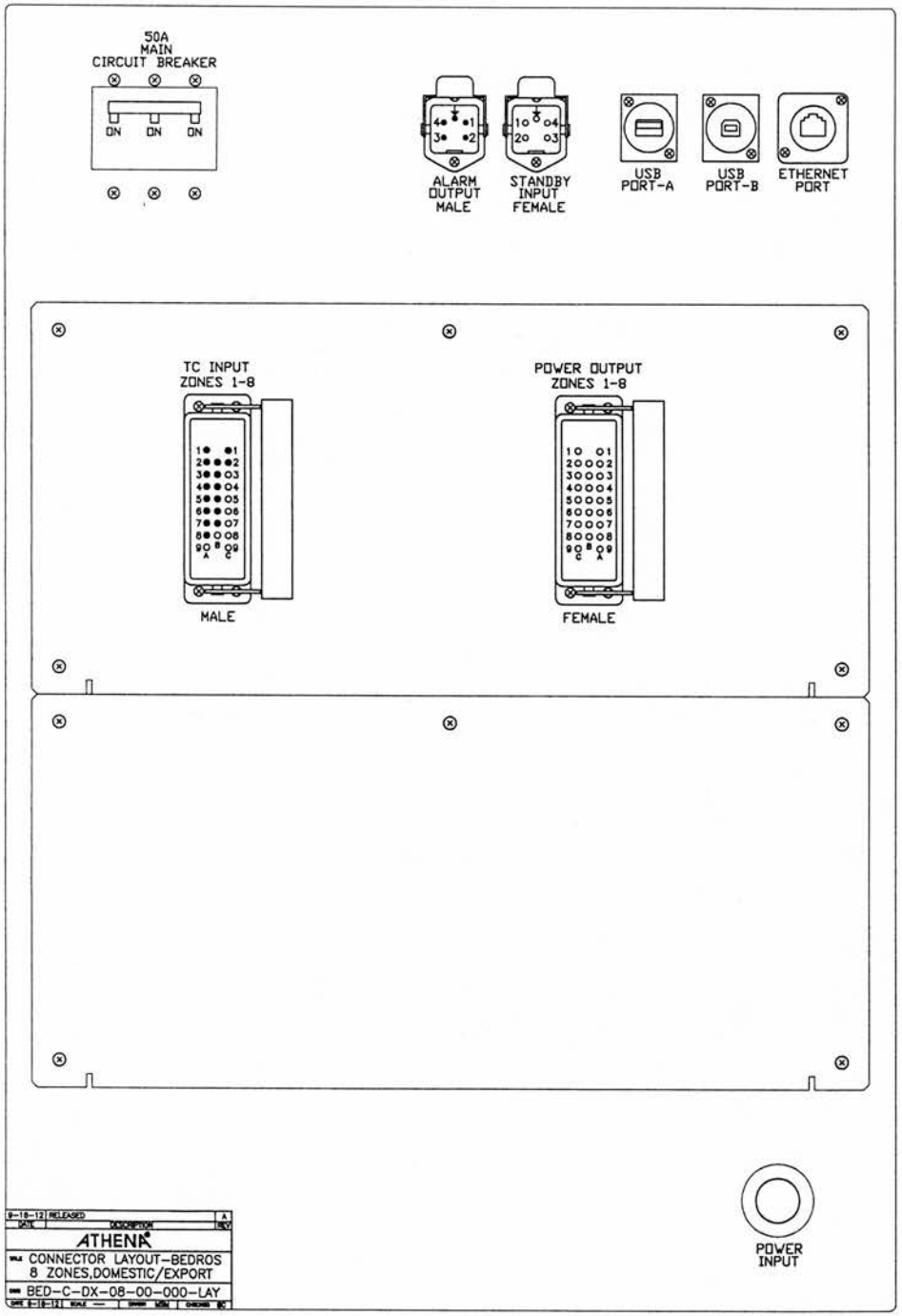
Company Name _____

Contact _____

Phone _____ Ext _____

E-mail _____

E-mail completed form to mktg@athenacontrols.com or fax to 610-729-1031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OUTPUT
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STANDBY
INPUT
FEMALE
USB
PORT-A
USB
PORT-B
ETHERNET
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TC INPUT
ZONES 1-8
MALE
POWER OUTPUT
ZONES 1-8
FEMALE
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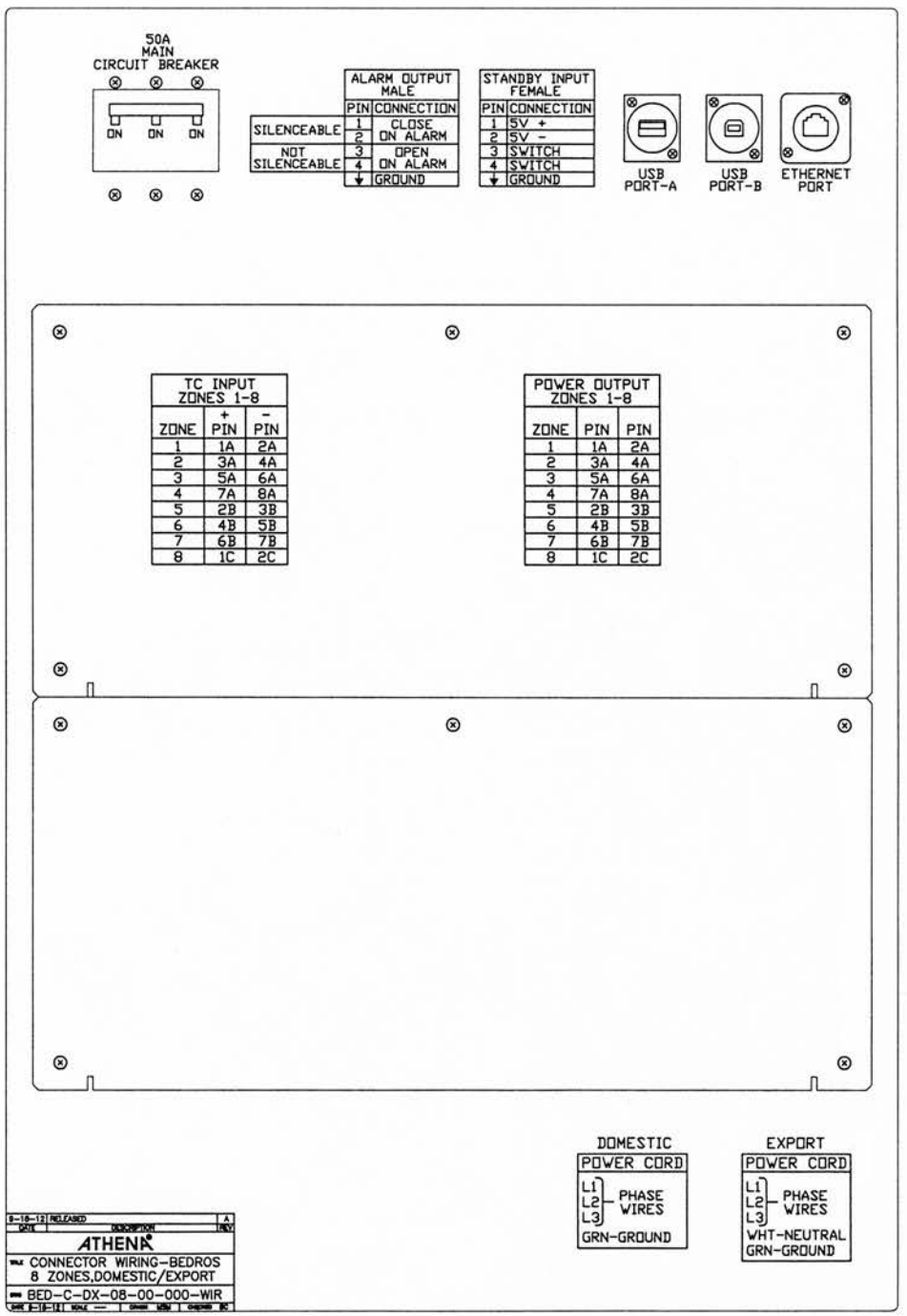
BED-C-DX-08-00-000-LAY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NOT
SILENCEABLE
3 OPEN
4 ON ALARM
GROUND
STANDBY INPUT
FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-8
ZONE + PIN - PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
POWER OUTPUT
ZONES 1-8
ZONE PIN PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
DOMESTIC
POWER CORD
L1
L2
L3
PHASE
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GRN-GROUND
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POWER CORD
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L3
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WHT-NEUTRAL
GRN-GROUND
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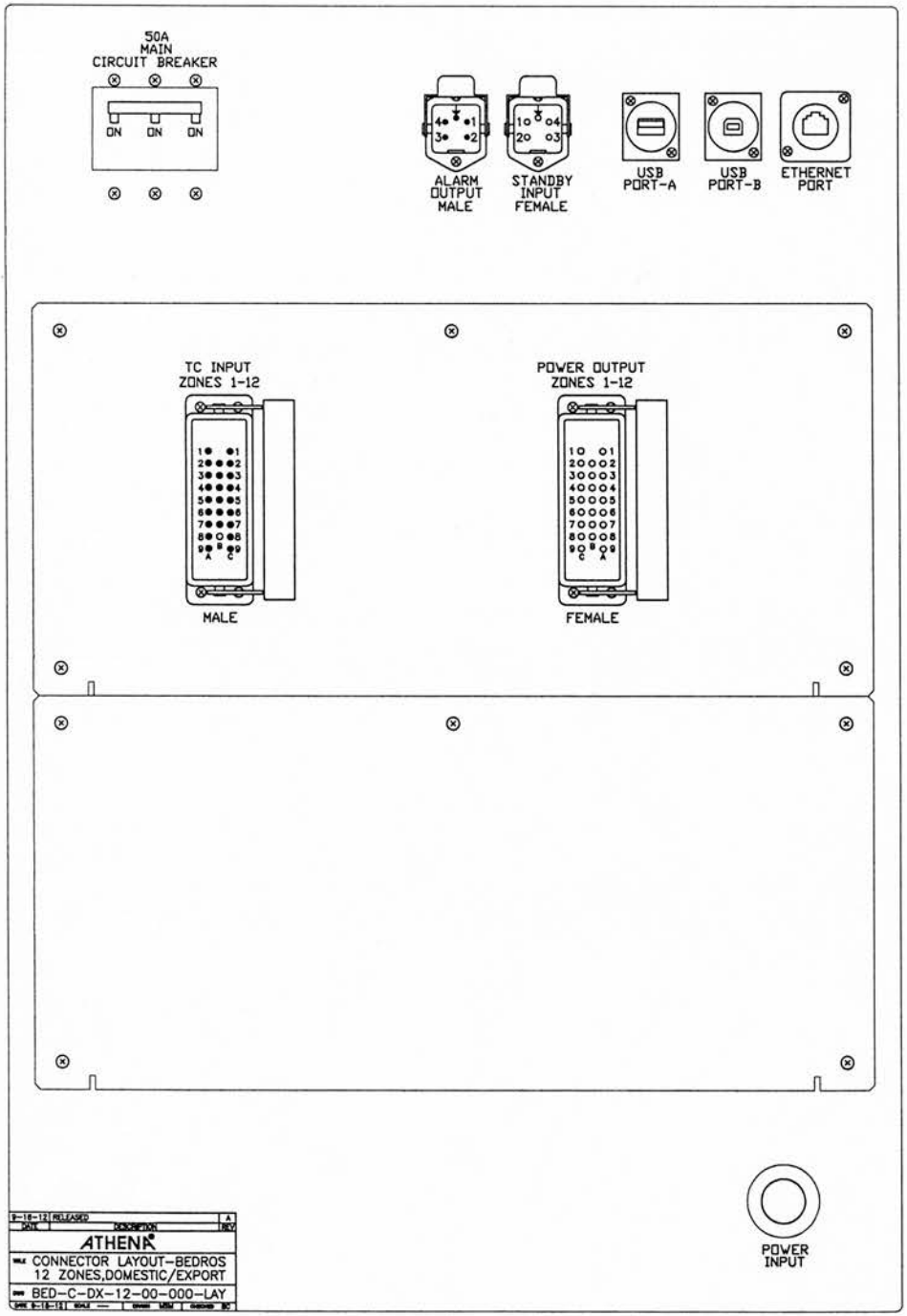
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TC INPUT
ZONES 1-12
MALE
POWER OUTPUT
ZONES 1-12
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12 ZONES,DOMESTIC/EXPORT
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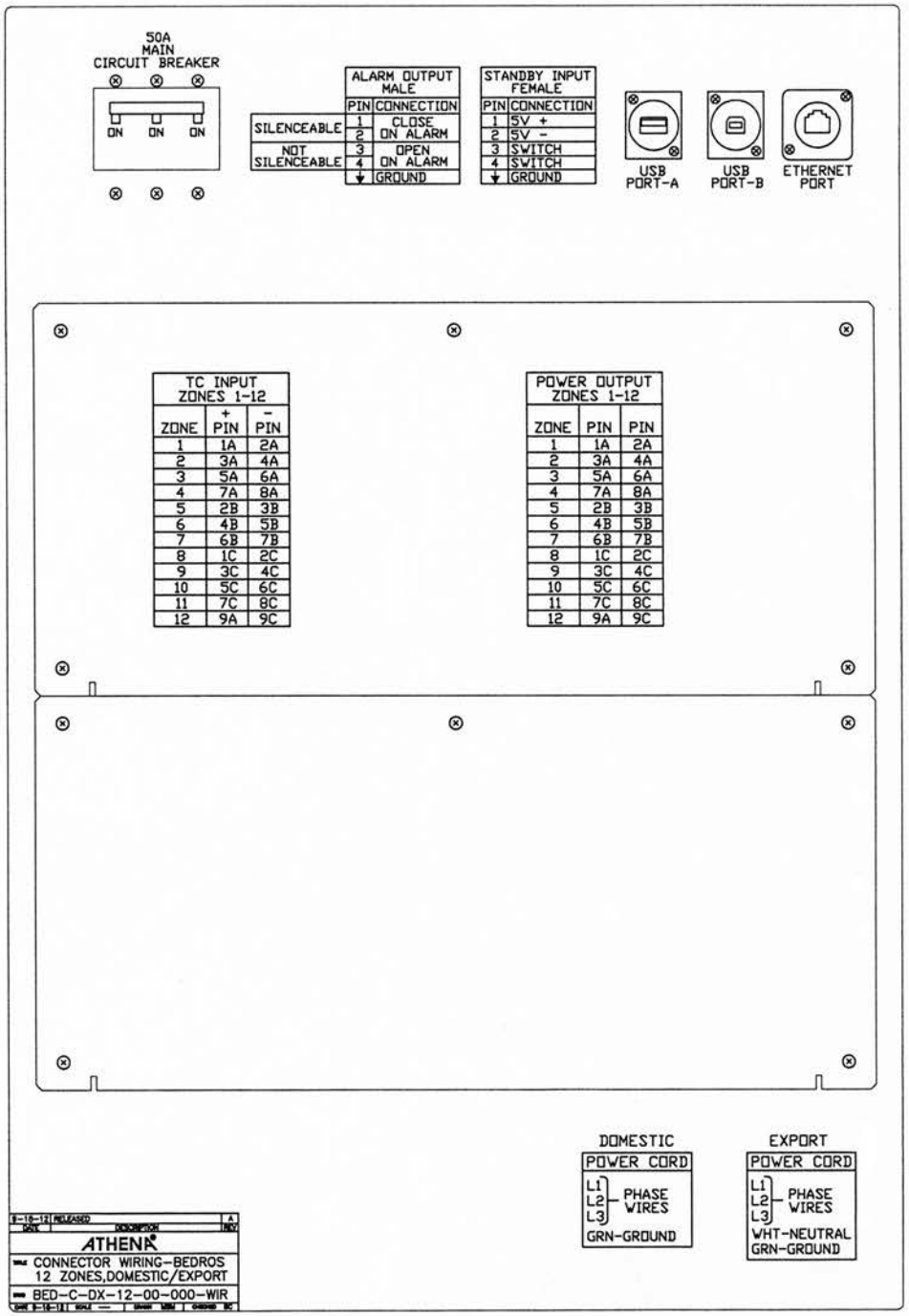
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ALARM OUTPUT
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2 ON ALARM
3 OPEN
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PIN CONNECTION
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2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-12
ZONE + PIN - PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
9 3C 4C
10 5C 6C
11 7C 8C
12 9A 9C
POWER OUTPUT
ZONES 1-12
ZONE PIN PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
9 3C 4C
10 5C 6C
11 7C 8C
12 9A 9C
DOMESTIC
POWER CORD
L1
L2
L3
PHASE WIRES
GRN-GROUND
EXPORT
POWER CORD
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L2
L3
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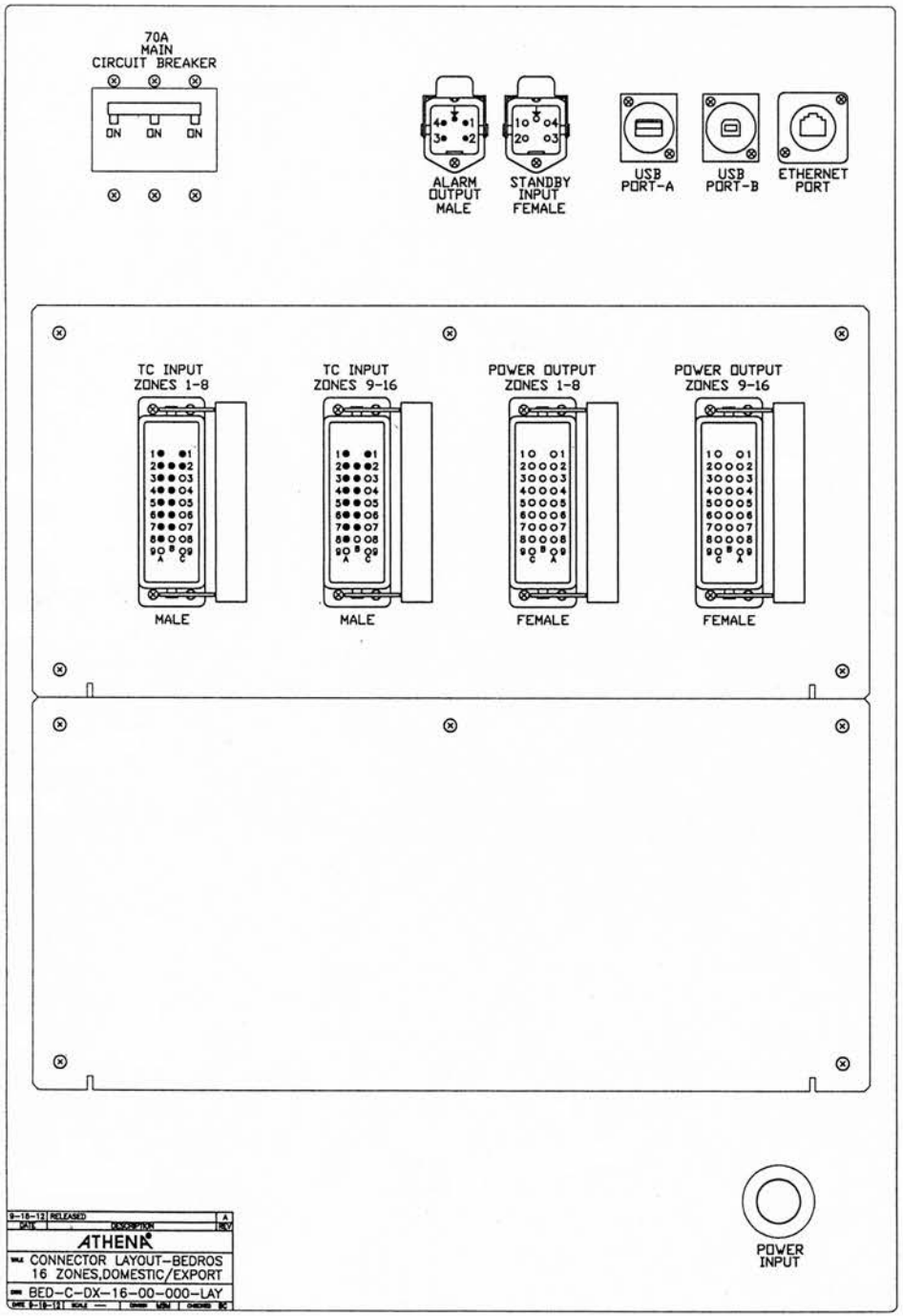
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USB
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PORT
TC INPUT
ZONES 1-8
TC INPUT
ZONES 9-16
POWER OUTPUT
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ZONES 9-16
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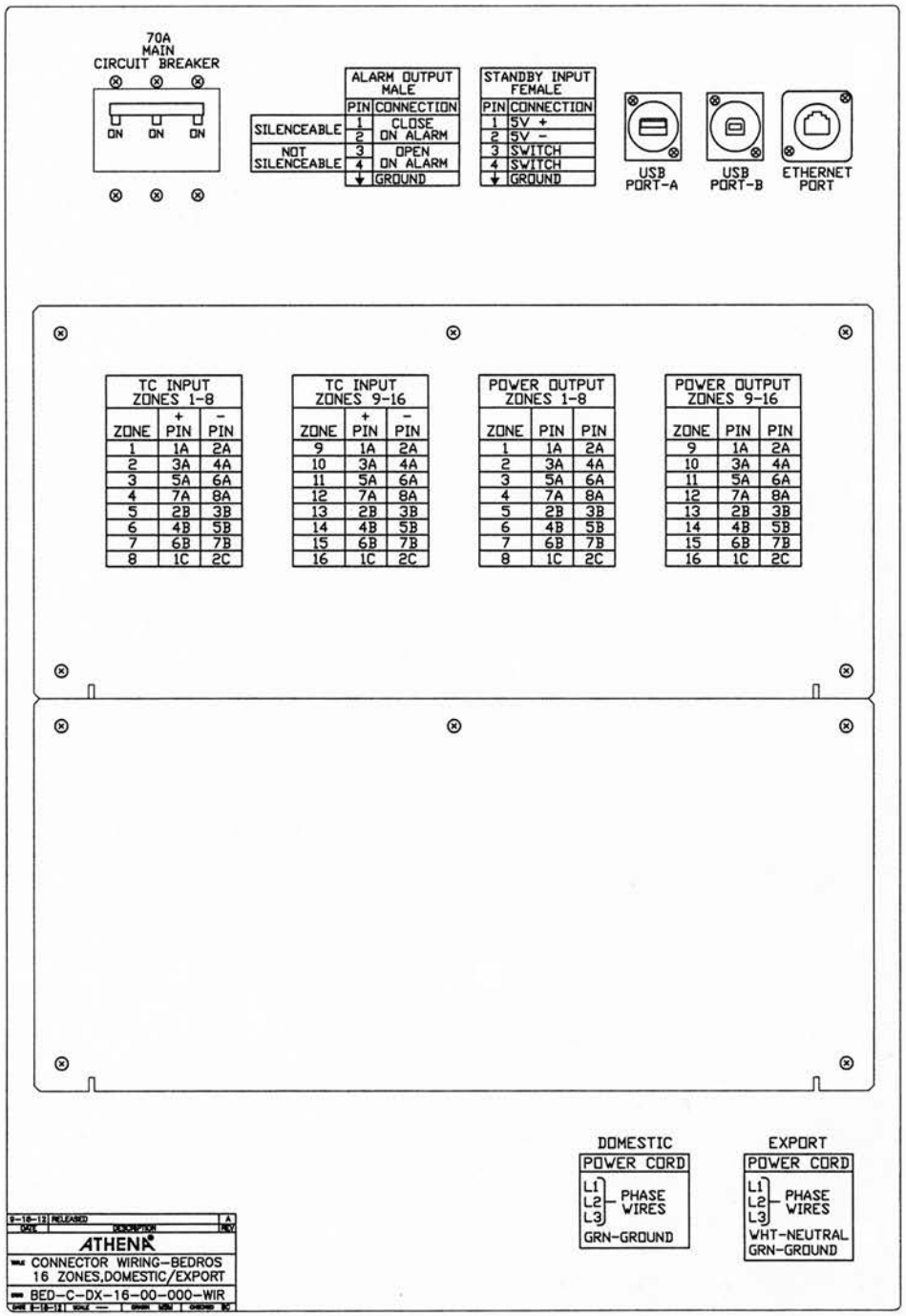
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2 ON ALARM
NOT
SILENCEABLE
3 OPEN
4 ON ALARM
GROUND
STANDBY INPUT
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PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT ZONES 1-8
ZONE + PIN - PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
TC INPUT ZONES 9-16
ZONE + PIN - PIN
9 1A 2A
10 3A 4A
11 5A 6A
12 7A 8A
13 2B 3B
14 4B 5B
15 6B 7B
16 1C 2C
POWER OUTPUT ZONES 1-8
ZONE PIN PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
POWER OUTPUT ZONES 9-16
ZONE PIN PIN
9 1A 2A
10 3A 4A
11 5A 6A
12 7A 8A
13 2B 3B
14 4B 5B
15 6B 7B
16 1C 2C
DOMESTIC
POWER CORD
L1
L2
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PHASE WIRES
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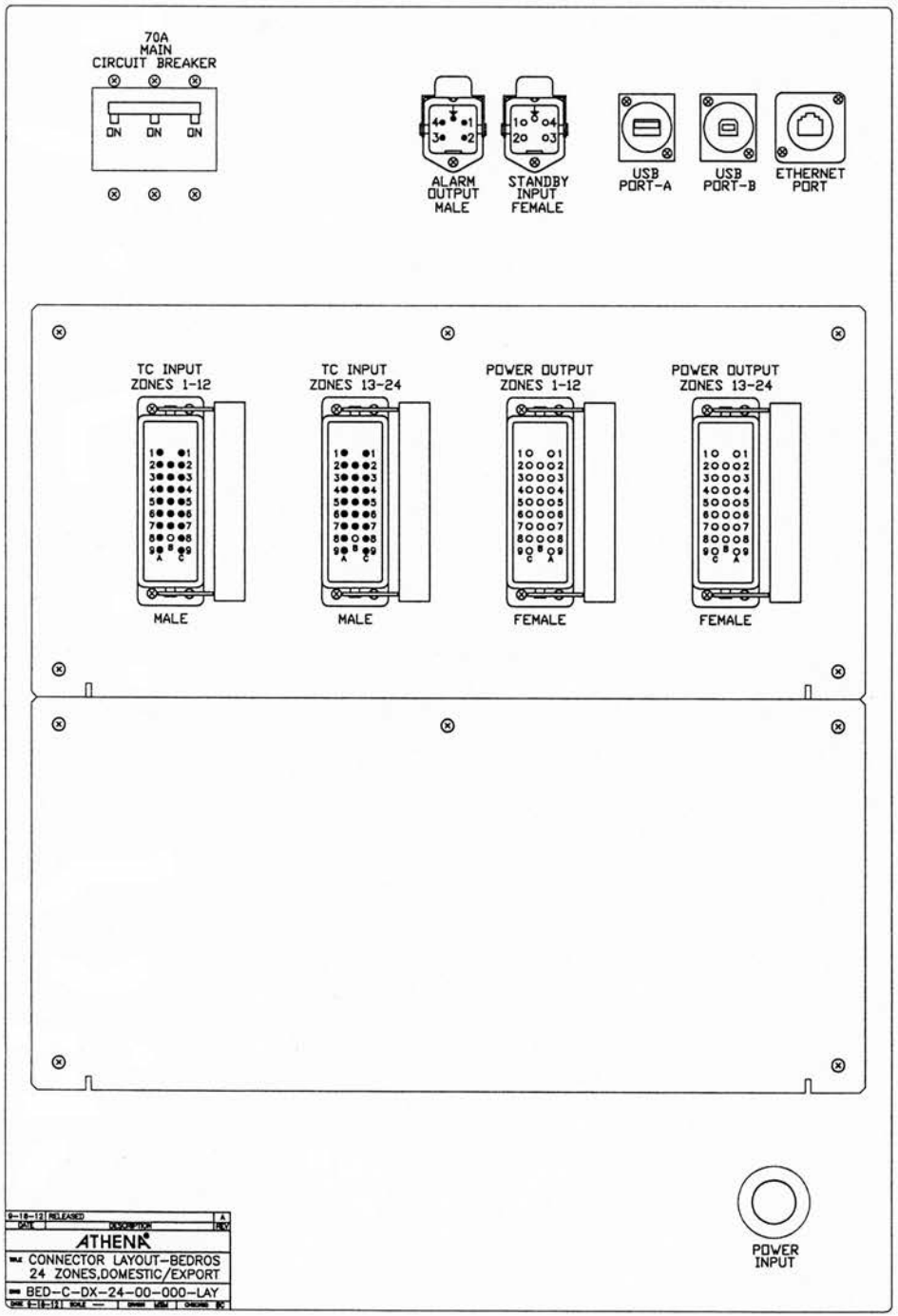

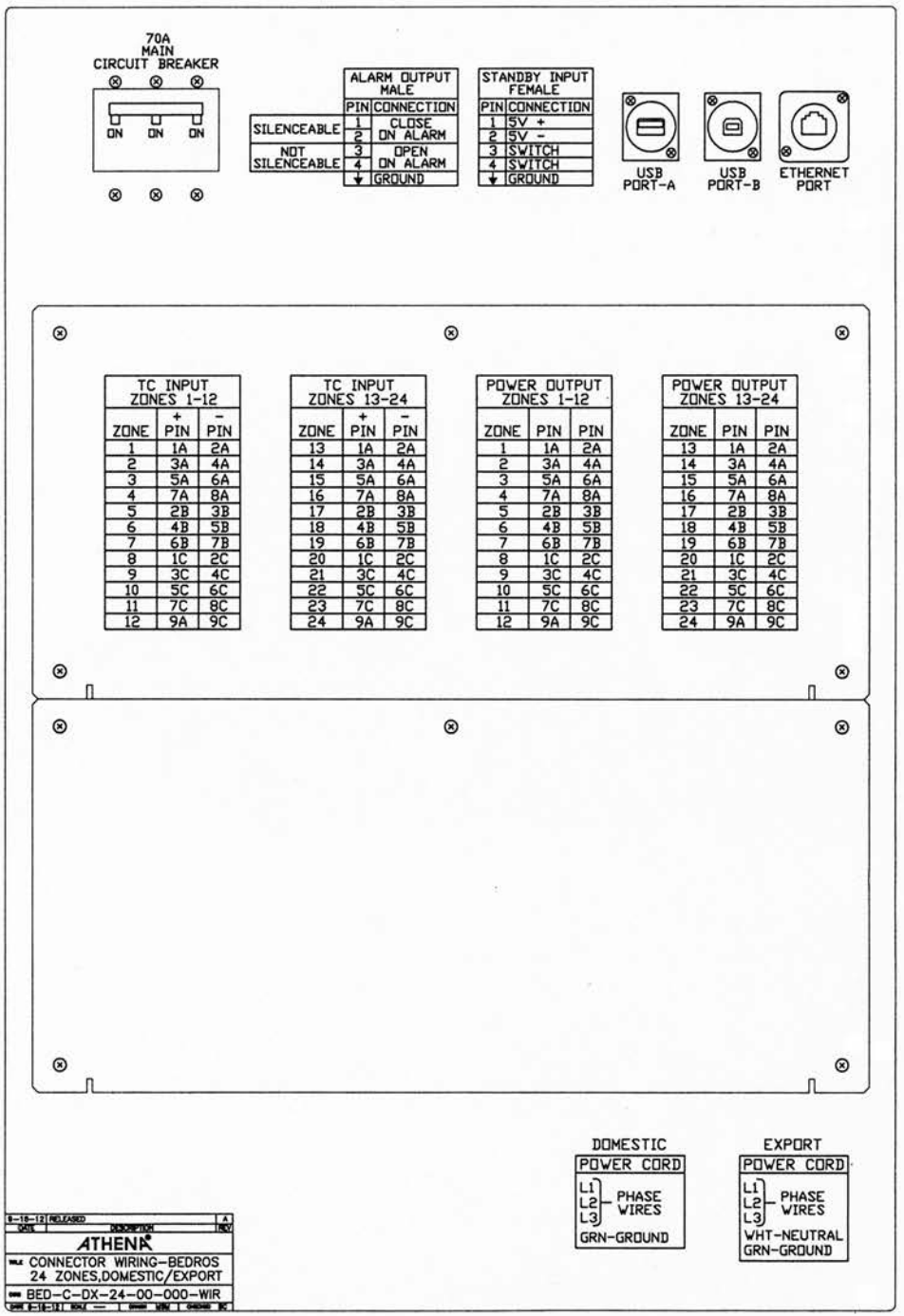

TC INPUT ZONES 1-12

ZONE	+ PIN	- PIN
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2	3A	4A
3	5A	6A
4	7A	8A
5	2B	3B
6	4B	5B
7	6B	7B
8	1C	2C
9	3C	4C
10	5C	6C
11	7C	8C
12	9A	9C

TC INPUT ZONES 13-24

ZONE	+ PIN	- PIN
13	1A	2A
14	3A	4A
15	5A	6A
16	7A	8A
17	2B	3B
18	4B	5B
19	6B	7B
20	1C	2C
21	3C	4C
22	5C	6C
23	7C	8C
24	9A	9C

POWER OUTPUT ZONES 1-12

ZONE	PIN	PIN
1	1A	2A
2	3A	4A
3	5A	6A
4	7A	8A
5	2B	3B
6	4B	5B
7	6B	7B
8	1C	2C
9	3C	4C
10	5C	6C
11	7C	8C
12	9A	9C

POWER OUTPUT ZONES 13-24

ZONE	PIN	PIN
13	1A	2A
14	3A	4A
15	5A	6A
16	7A	8A
17	2B	3B
18	4B	5B
19	6B	7B
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21	3C	4C
22	5C	6C
23	7C	8C
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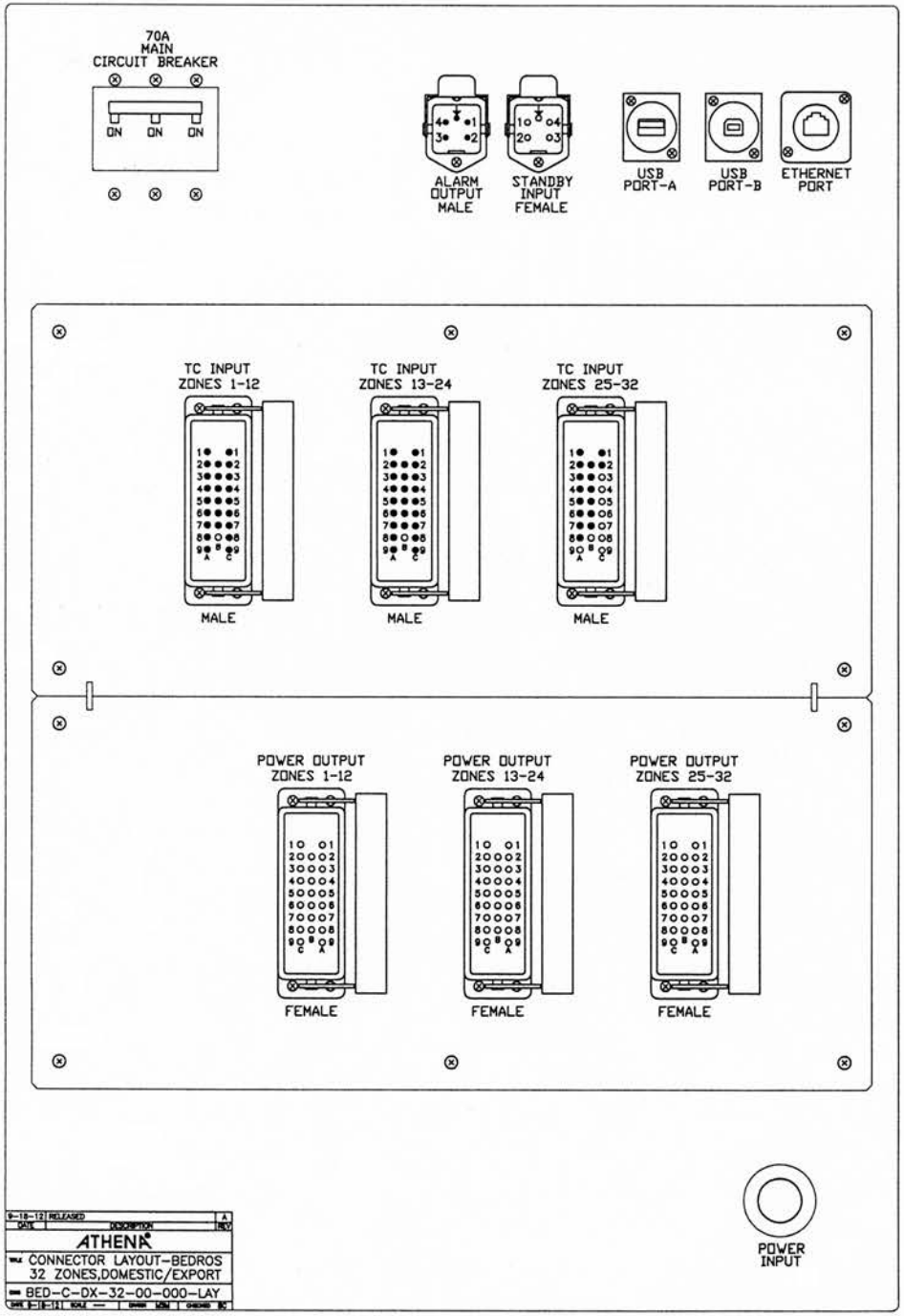
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MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
STANDBY INPUT FEMALE
USB PORT-A
USB PORT-B
ETHERNET PORT
TC INPUT ZONES 1-12
TC INPUT ZONES 13-24
TC INPUT ZONES 25-32
MALE
MALE
MALE
POWER OUTPUT ZONES 1-12
POWER OUTPUT ZONES 13-24
POWER OUTPUT ZONES 25-32
FEMALE
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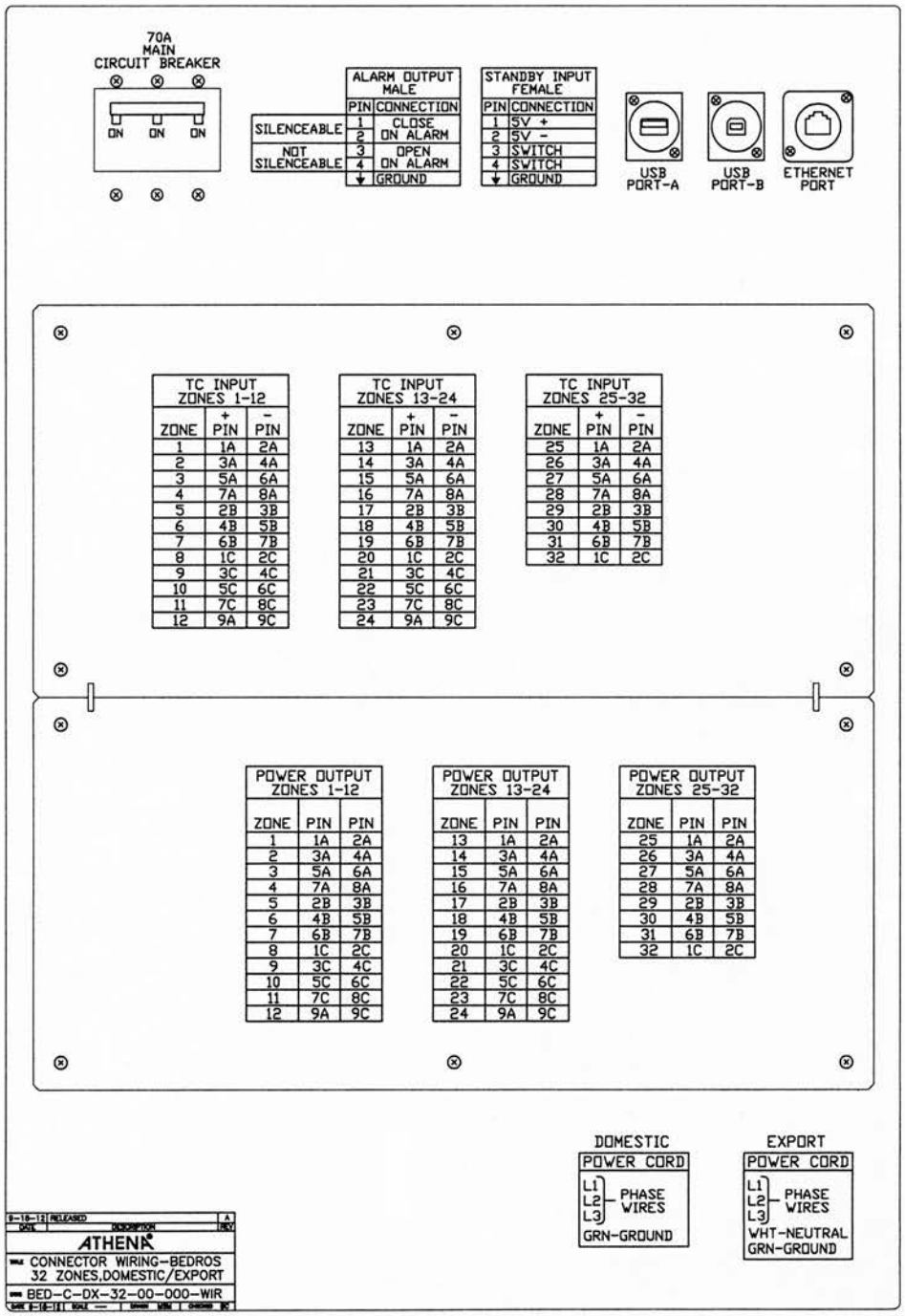
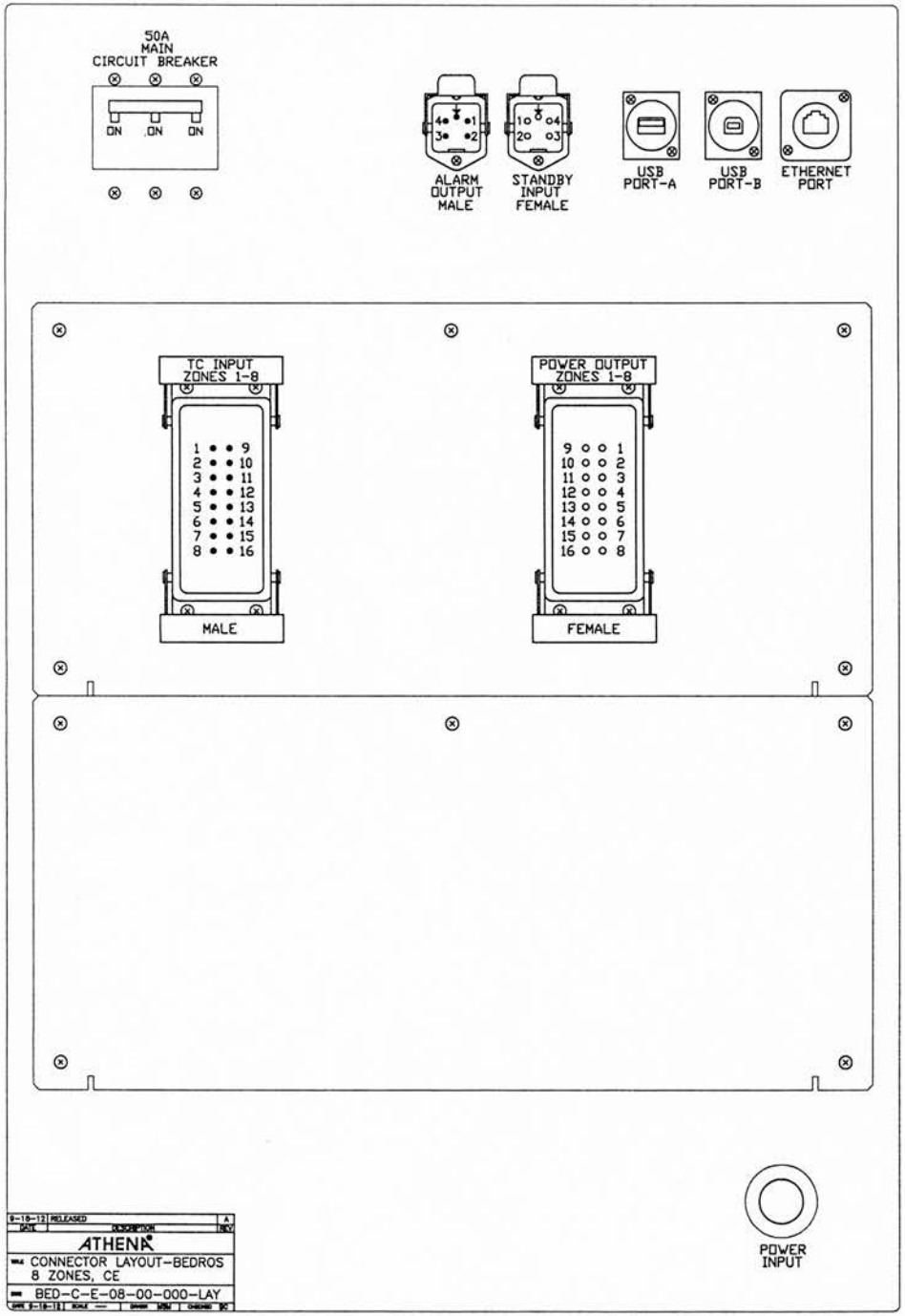
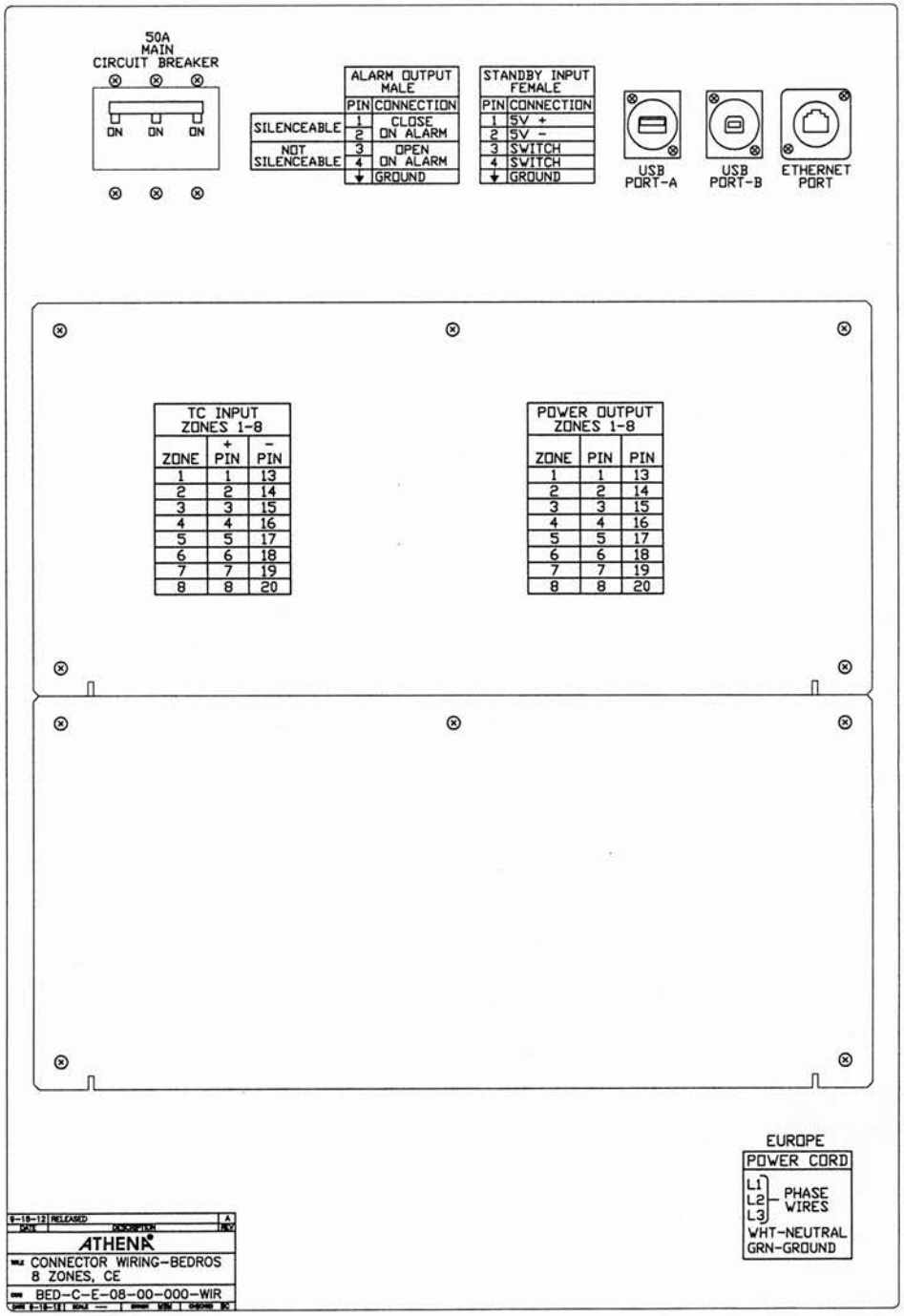
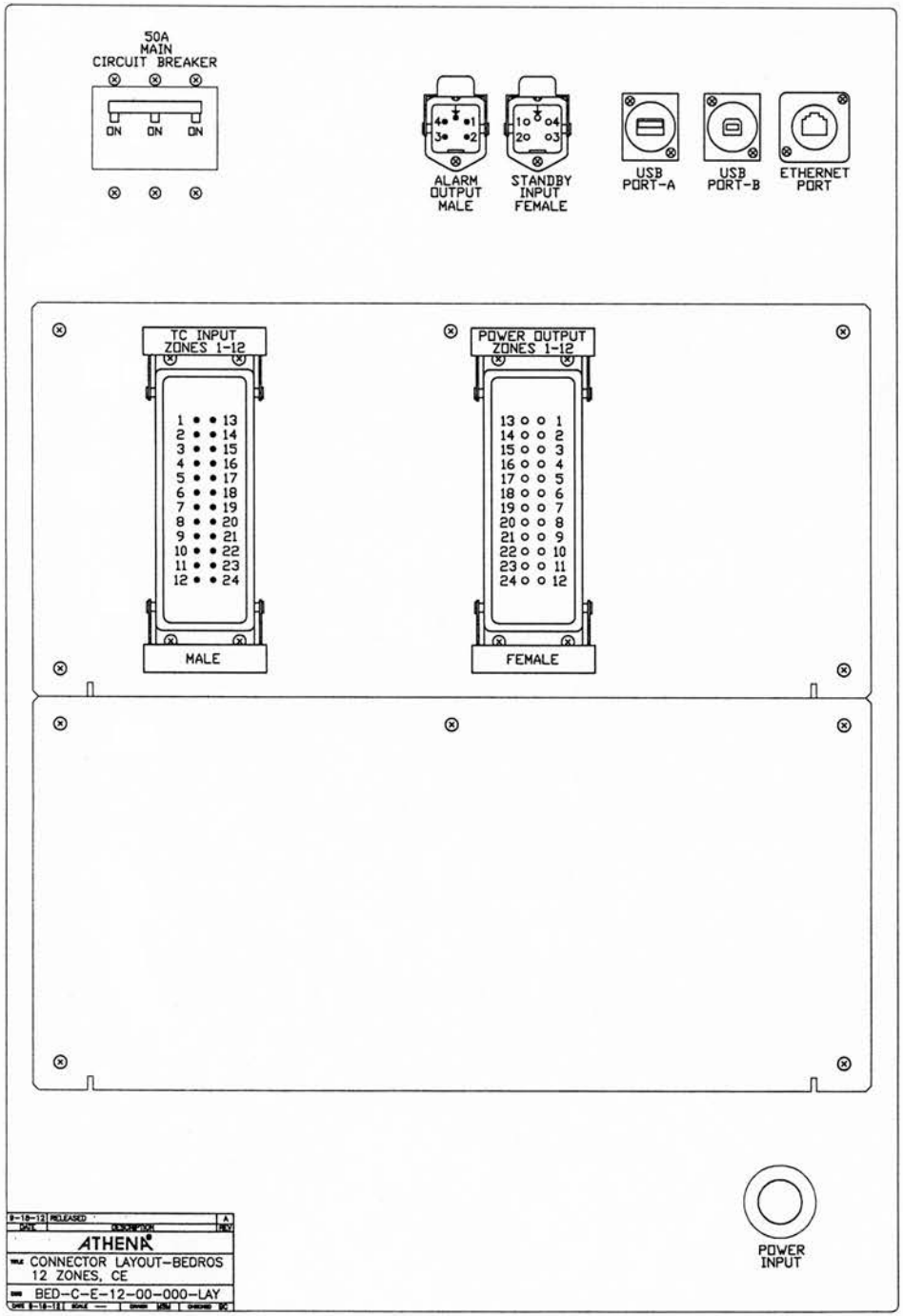
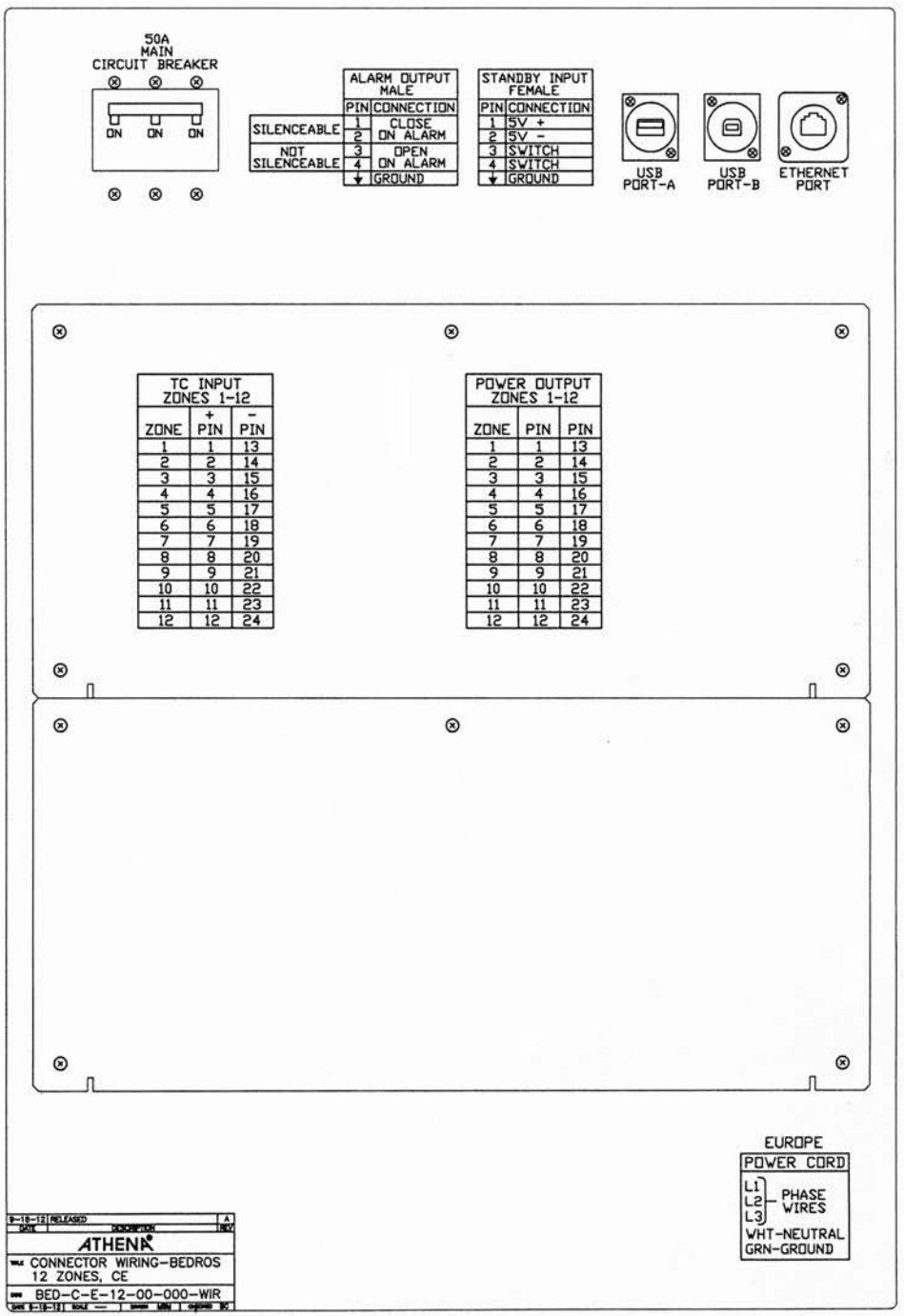
CONNECTOR LAYOUT-BEDROS 32 ZONES,DOMESTIC/EXPORT
BED-C-DX-32-00-000-LAY

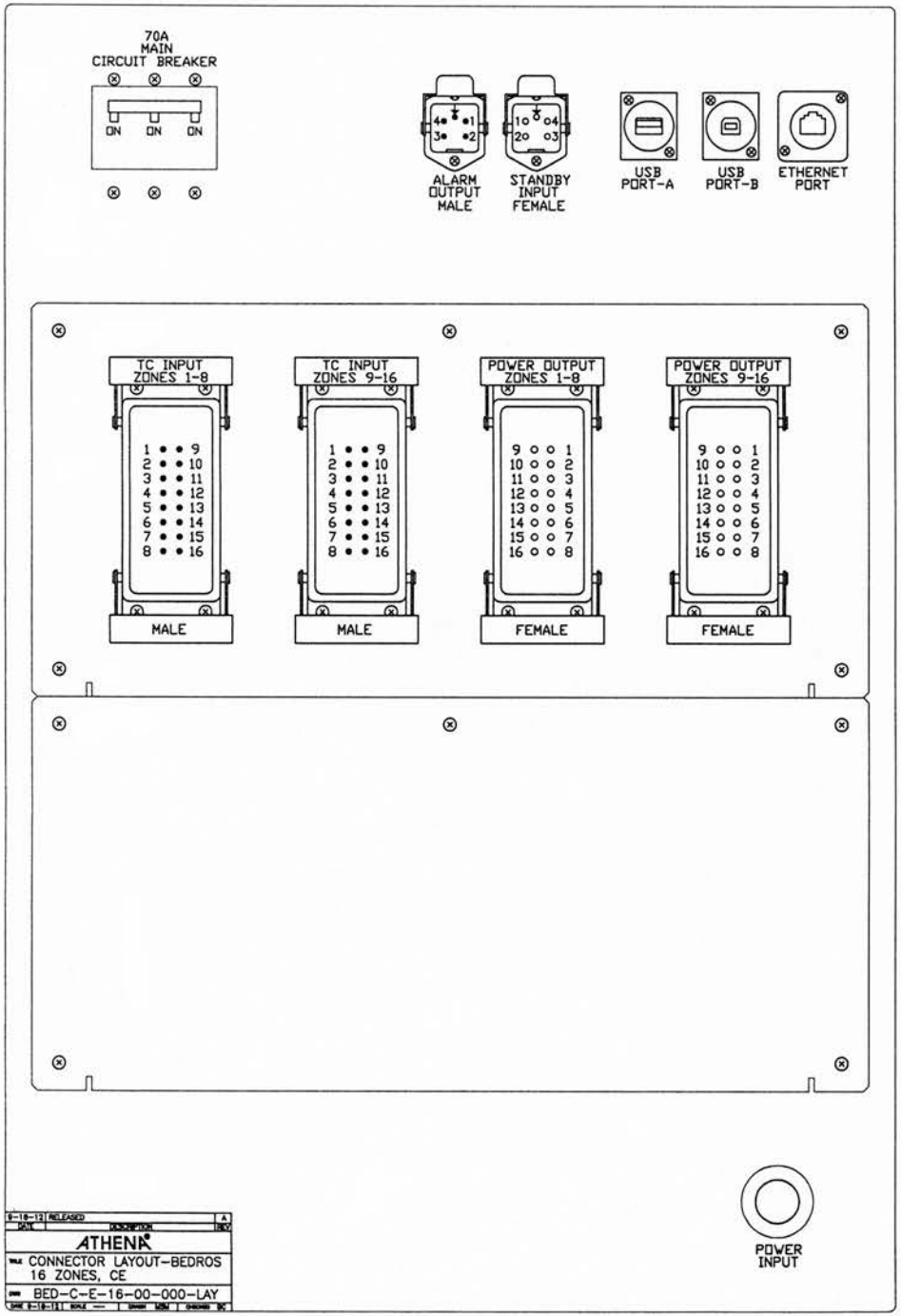

70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
NOT SILENCEABLE
2
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB PORT-A
USB PORT-B
ETHERNET PORT
TC INPUT ZONES 1-12
ZONE + PIN - PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
9 3C 4C
10 5C 6C
11 7C 8C
12 9A 9C
TC INPUT ZONES 13-24
ZONE + PIN - PIN
13 1A 2A
14 3A 4A
15 5A 6A
16 7A 8A
17 2B 3B
18 4B 5B
19 6B 7B
20 1C 2C
21 3C 4C
22 5C 6C
23 7C 8C
24 9A 9C
TC INPUT ZONES 25-32
ZONE + PIN - PIN
25 1A 2A
26 3A 4A
27 5A 6A
28 7A 8A
29 2B 3B
30 4B 5B
31 6B 7B
32 1C 2C
POWER OUTPUT ZONES 1-12
ZONE PIN PIN
1 1A 2A
2 3A 4A
3 5A 6A
4 7A 8A
5 2B 3B
6 4B 5B
7 6B 7B
8 1C 2C
9 3C 4C
10 5C 6C
11 7C 8C
12 9A 9C
POWER OUTPUT ZONES 13-24
ZONE PIN PIN
13 1A 2A
14 3A 4A
15 5A 6A
16 7A 8A
17 2B 3B
18 4B 5B
19 6B 7B
20 1C 2C
21 3C 4C
22 5C 6C
23 7C 8C
24 9A 9C
POWER OUTPUT ZONES 25-32
ZONE PIN PIN
25 1A 2A
26 3A 4A
27 5A 6A
28 7A 8A
29 2B 3B
30 4B 5B
31 6B 7B
32 1C 2C
DOMESTIC
POWER CORD
L1 L2 L3 PHASE WIRES
GRN-GROUND
EXPORT
POWER CORD
L1 L2 L3 PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
9-18-12 RELEASED A
ATHENA
CONNECTOR WIRING-BEDROS 32 ZONES,DOMESTIC/EXPORT
BED-C-DX-32-00-000-WIR

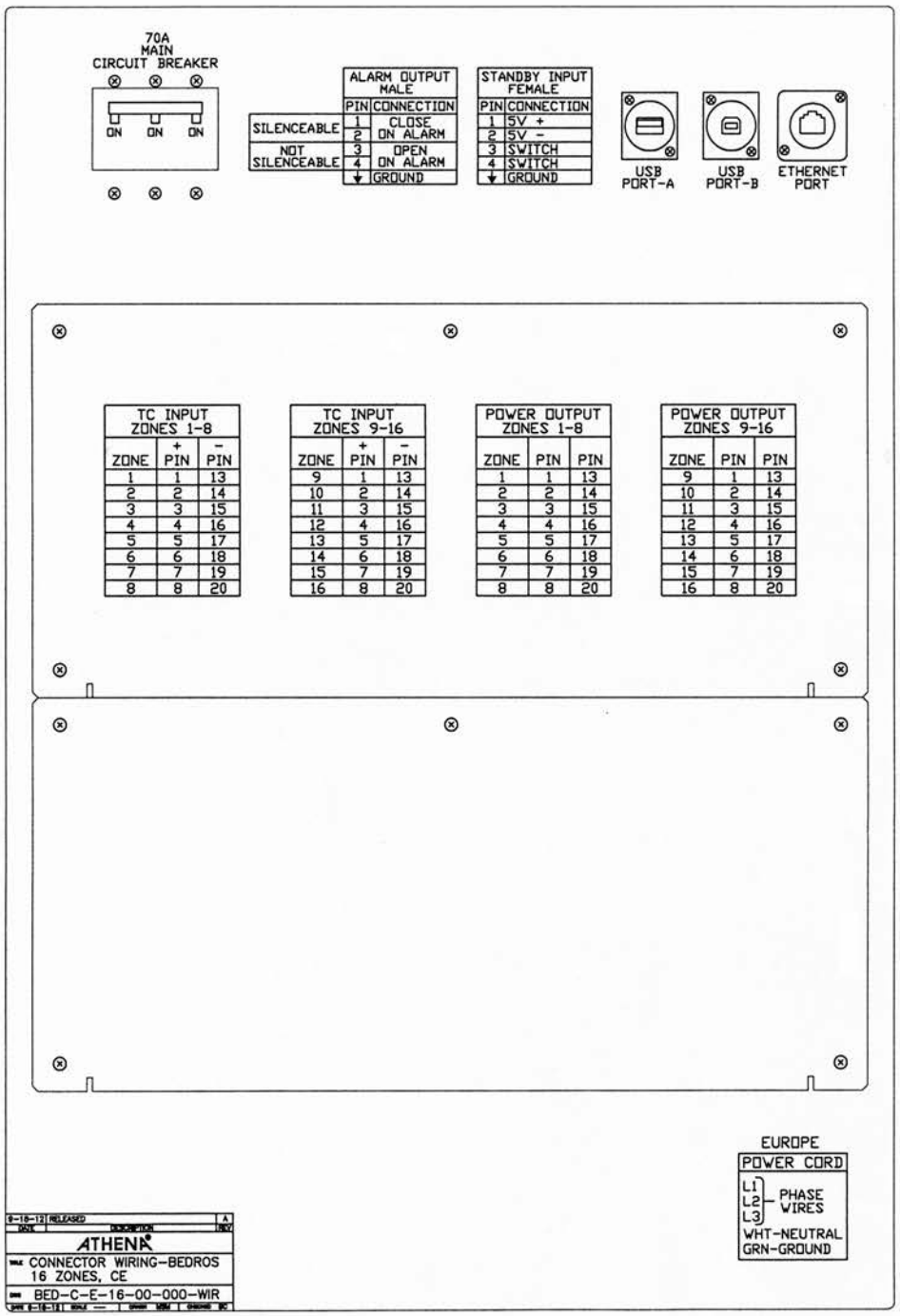

50A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM
OUTPUT
MALE
STANDBY
INPUT
FEMALE
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-8
1 9
2 10
3 11
4 12
5 13
6 14
7 15
8 16
MALE
POWER OUTPUT
ZONES 1-8
9 1
10 2
11 3
12 4
13 5
14 6
15 7
16 8
FEMALE
POWER
INPUT
6-18-12 RELEASED A
DATE DESCRIPTION REV
ATHENA
CONNECTOR LAYOUT-BEDROS
8 ZONES, CE
BED-C-E-08-00-000-LAY

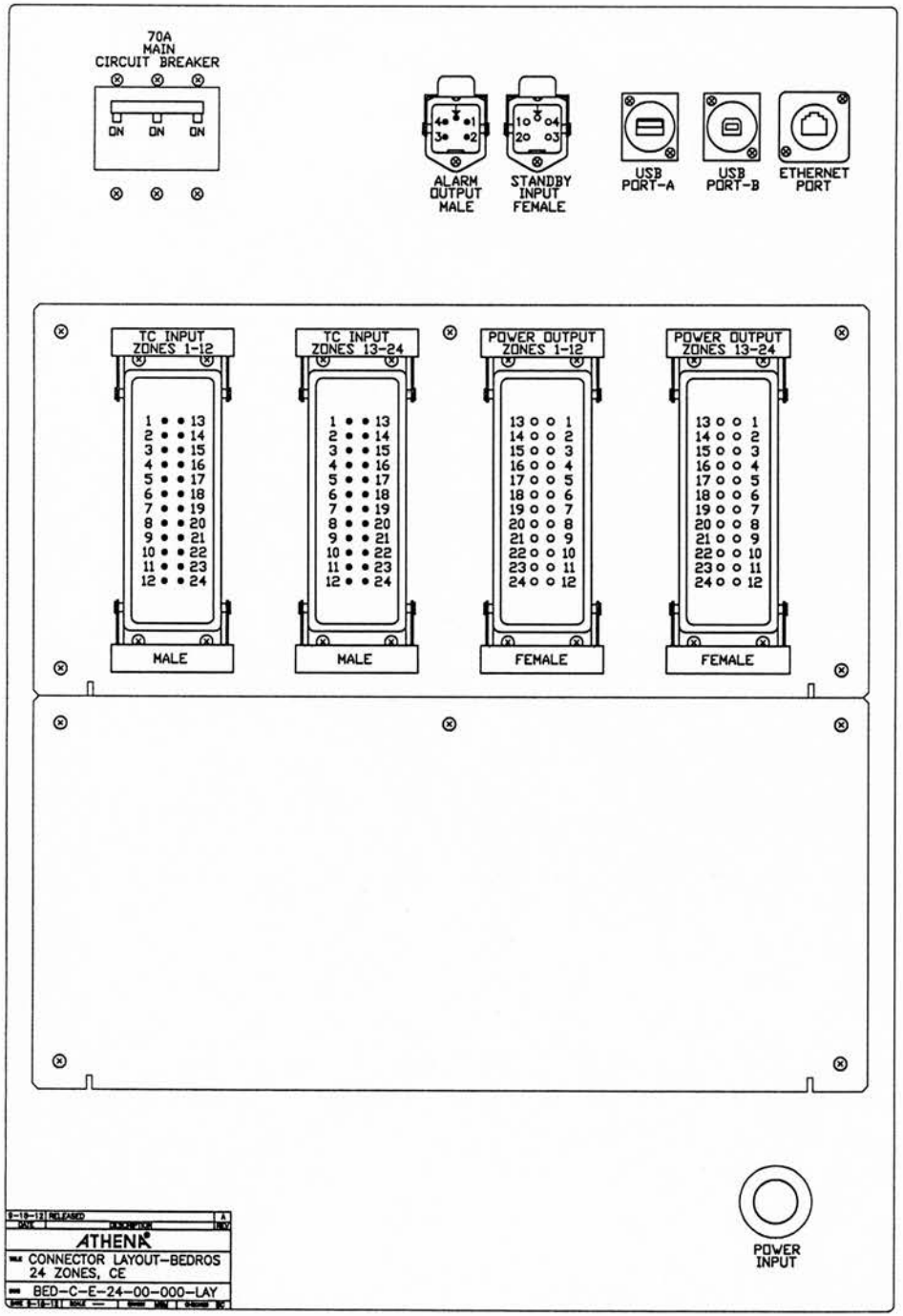

50A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
2
NOT SILENCEABLE
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-8
ZONE + PIN - PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
POWER OUTPUT
ZONES 1-8
ZONE PIN PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
EUROPE
POWER CORD
L1
L2
L3
PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
6-18-12 RELEASED A
DATE DESCRIPTION REV
ATHENA
CONNECTOR WIRING-BEDROS
8 ZONES, CE
BED-C-E-08-00-000-WIR

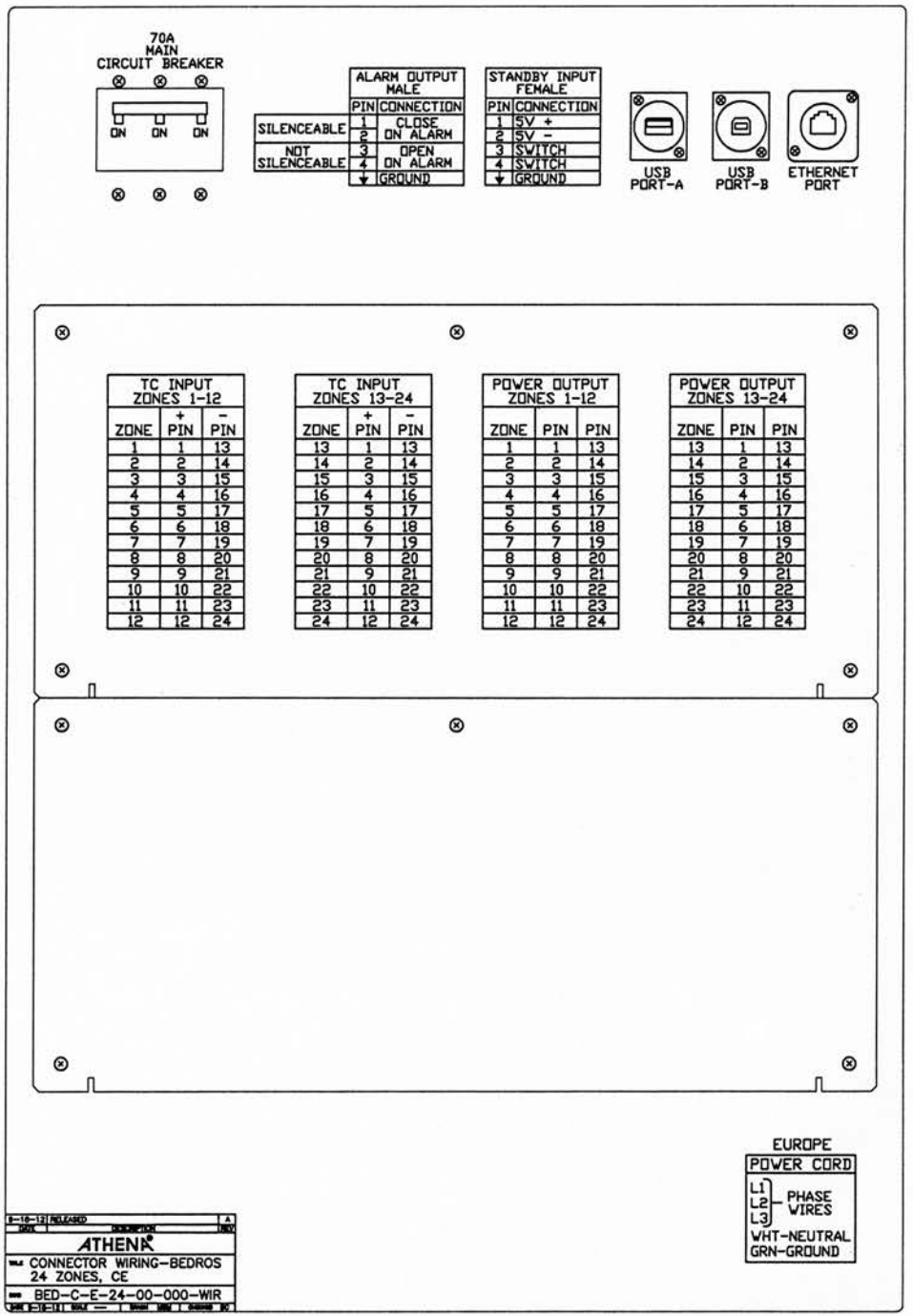

50A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM
OUTPUT
MALE
STANDBY
INPUT
FEMALE
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-12
1 • • 13
2 • • 14
3 • • 15
4 • • 16
5 • • 17
6 • • 18
7 • • 19
8 • • 20
9 • • 21
10 • • 22
11 • • 23
12 • • 24
MALE
POWER OUTPUT
ZONES 1-12
13 o o 1
14 o o 2
15 o o 3
16 o o 4
17 o o 5
18 o o 6
19 o o 7
20 o o 8
21 o o 9
22 o o 10
23 o o 11
24 o o 12
FEMALE
POWER
INPUT
9-18-12 RELEASED A
DATE DESCRIPTION REV
ATHENA
CONNECTOR LAYOUT-BEDROS
12 ZONES, CE
BED-C-E-12-00-000-LAY


50A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
2
NOT SILENCEABLE
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-12
ZONE + PIN - PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
POWER OUTPUT
ZONES 1-12
ZONE PIN PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
EUROPE
POWER CORD
L1
L2
L3
PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
9-18-12 RELEASED A
DATE DESCRIPTION REV
ATHENA
CONNECTOR WIRING-BEDROS
12 ZONES, CE
BED-C-E-12-00-000-WIR


70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM
OUTPUT
MALE
STANDBY
INPUT
FEMALE
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-8
TC INPUT
ZONES 9-16
POWER OUTPUT
ZONES 1-8
POWER OUTPUT
ZONES 9-16
1 • • 9
2 • • 10
3 • • 11
4 • • 12
5 • • 13
6 • • 14
7 • • 15
8 • • 16
9 ○ ○ 1
10 ○ ○ 2
11 ○ ○ 3
12 ○ ○ 4
13 ○ ○ 5
14 ○ ○ 6
15 ○ ○ 7
16 ○ ○ 8
MALE
MALE
FEMALE
FEMALE
POWER
INPUT
ATHENA
CONNECTOR LAYOUT-BEDROS
16 ZONES, CE
BED-C-E-16-00-000-LAY


70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
2
NOT SILENCEABLE
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT ZONES 1-8
ZONE + PIN - PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
TC INPUT ZONES 9-16
ZONE + PIN - PIN
9 1 13
10 2 14
11 3 15
12 4 16
13 5 17
14 6 18
15 7 19
16 8 20
POWER OUTPUT ZONES 1-8
ZONE PIN PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
POWER OUTPUT ZONES 9-16
ZONE PIN PIN
9 1 13
10 2 14
11 3 15
12 4 16
13 5 17
14 6 18
15 7 19
16 8 20
EUROPE
POWER CORD
L1
L2
L3
PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
ATHENA
CONNECTOR WIRING-BEDROS
16 ZONES, CE
BED-C-E-16-00-000-WIR





TC INPUT ZONES 1-12

ZONE	+ PIN	- PIN
1	1	13
2	2	14
3	3	15
4	4	16
5	5	17
6	6	18
7	7	19
8	8	20
9	9	21
10	10	22
11	11	23
12	12	24

TC INPUT ZONES 13-24

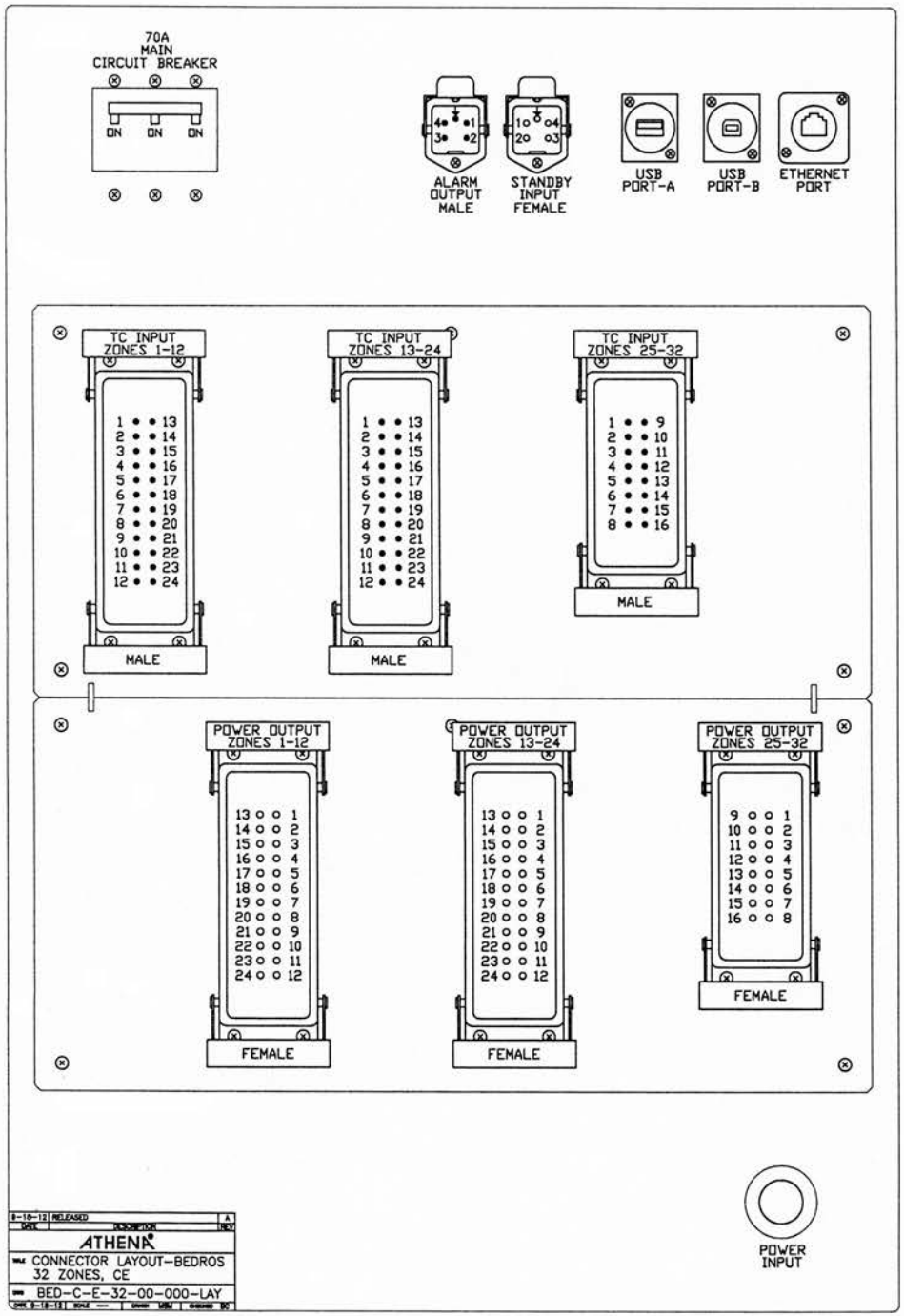
ZONE	+ PIN	- PIN
13	1	13
14	2	14
15	3	15
16	4	16
17	5	17
18	6	18
19	7	19
20	8	20
21	9	21
22	10	22
23	11	23
24	12	24

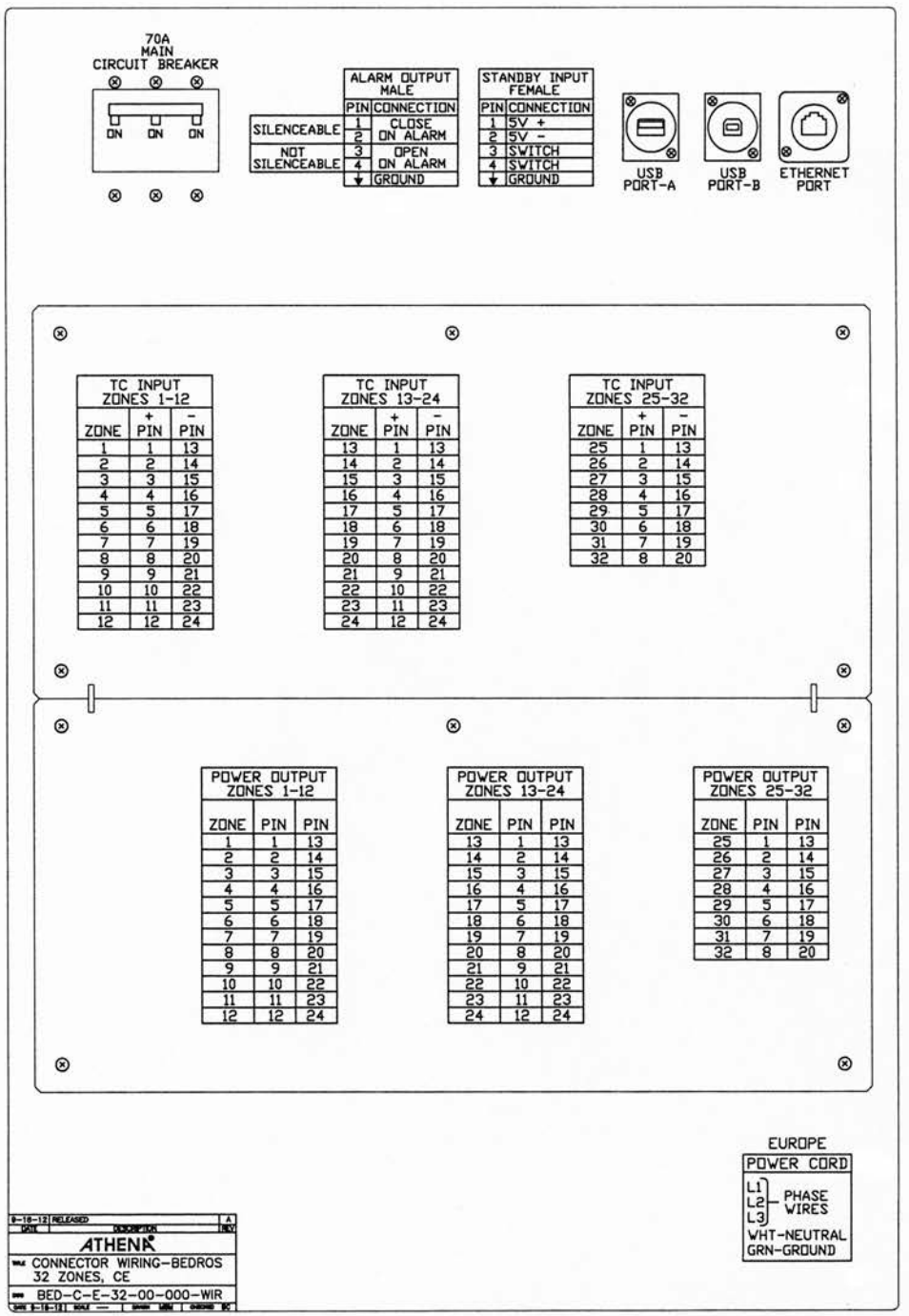
POWER OUTPUT ZONES 1-12

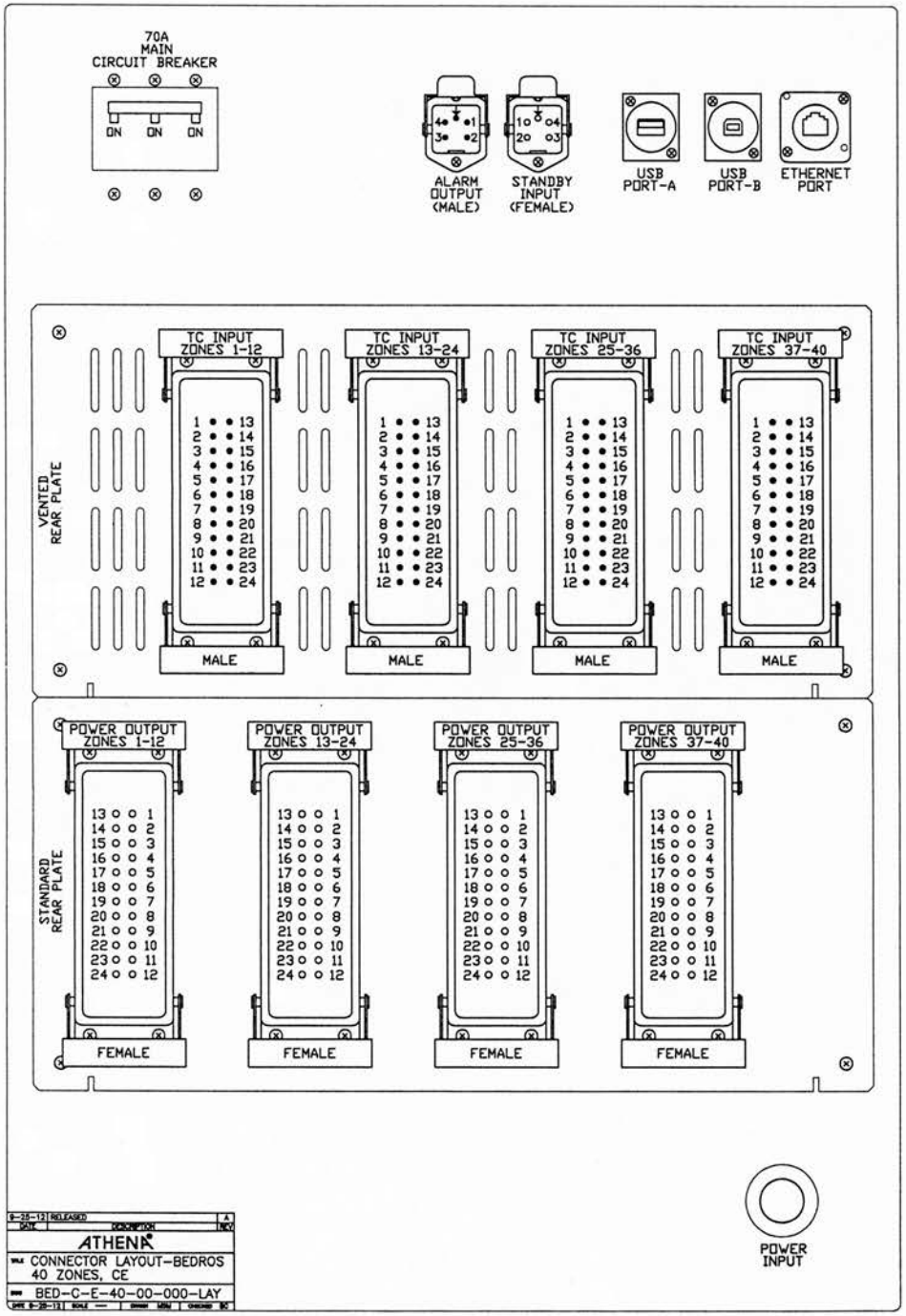
ZONE	PIN	PIN
1	1	13
2	2	14
3	3	15
4	4	16
5	5	17
6	6	18
7	7	19
8	8	20
9	9	21
10	10	22
11	11	23
12	12	24

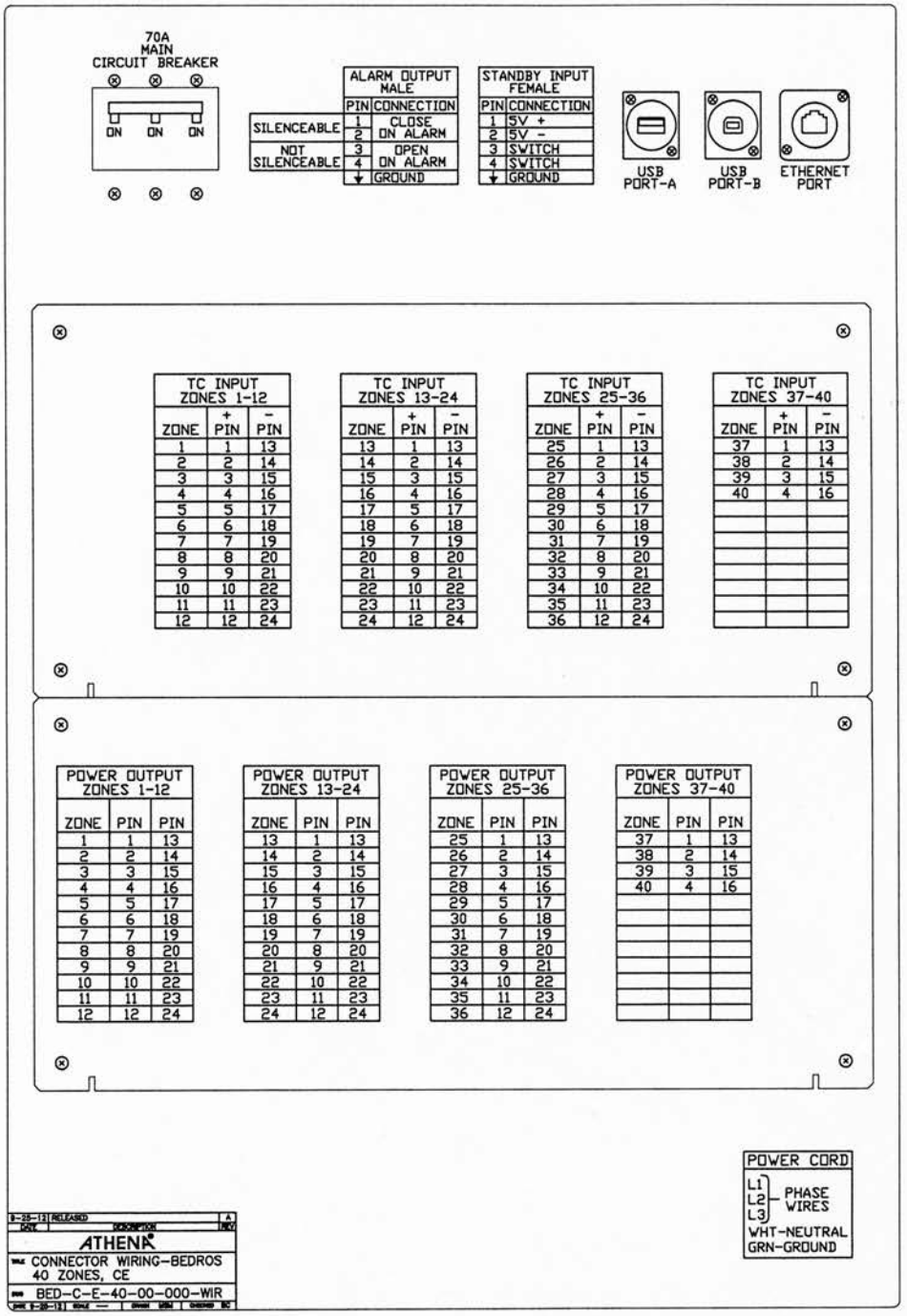
POWER OUTPUT ZONES 13-24

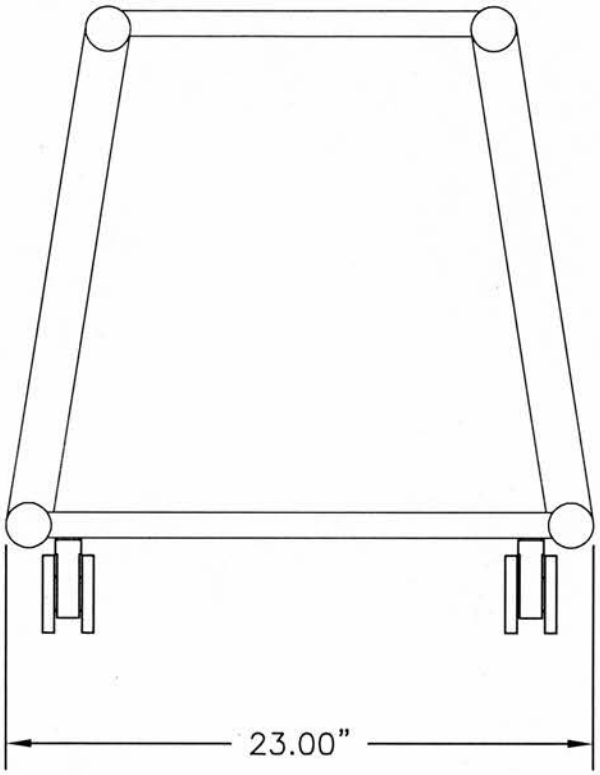
ZONE	PIN	PIN
13	1	13
14	2	14
15	3	15
16	4	16
17	5	17
18	6	18
19	7	19
20	8	20
21	9	21
22	10	22
23	11	23
24	12	24

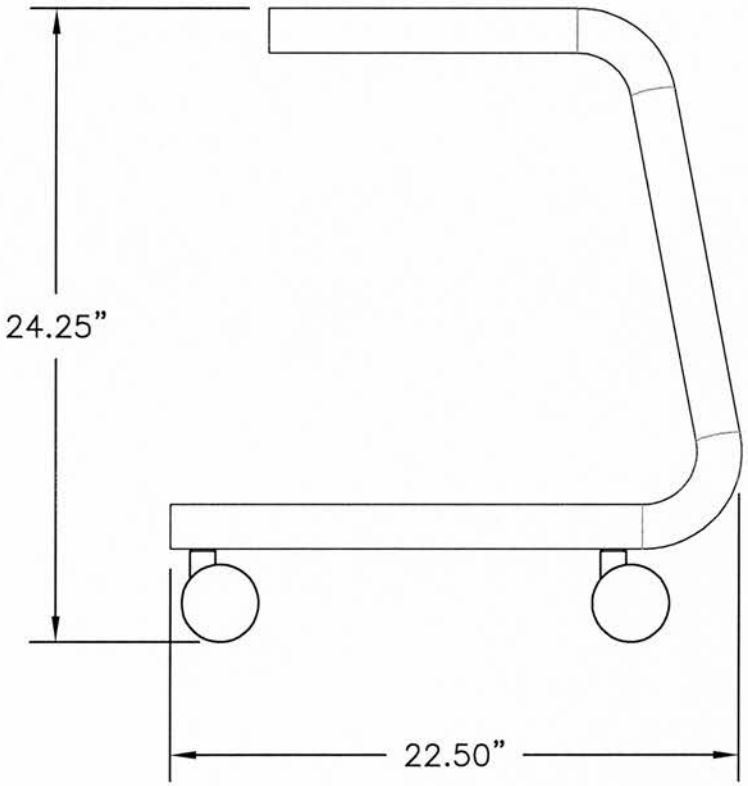

70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM
OUTPUT
MALE
STANDBY
INPUT
FEMALE
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT
ZONES 1-12
MALE
TC INPUT
ZONES 13-24
MALE
TC INPUT
ZONES 25-32
MALE
POWER OUTPUT
ZONES 1-12
FEMALE
POWER OUTPUT
ZONES 13-24
FEMALE
POWER OUTPUT
ZONES 25-32
FEMALE
POWER
INPUT
RELEASED
ATHENA
CONNECTOR LAYOUT-BEDROS
32 ZONES, CE
BED-C-E-32-00-000-LAY


70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
2
NOT SILENCEABLE
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB
PORT-A
USB
PORT-B
ETHERNET
PORT
TC INPUT ZONES 1-12
ZONE + PIN - PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
TC INPUT ZONES 13-24
ZONE + PIN - PIN
13 1 13
14 2 14
15 3 15
16 4 16
17 5 17
18 6 18
19 7 19
20 8 20
21 9 21
22 10 22
23 11 23
24 12 24
TC INPUT ZONES 25-32
ZONE + PIN - PIN
25 1 13
26 2 14
27 3 15
28 4 16
29 5 17
30 6 18
31 7 19
32 8 20
POWER OUTPUT ZONES 1-12
ZONE PIN PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
POWER OUTPUT ZONES 13-24
ZONE PIN PIN
13 1 13
14 2 14
15 3 15
16 4 16
17 5 17
18 6 18
19 7 19
20 8 20
21 9 21
22 10 22
23 11 23
24 12 24
POWER OUTPUT ZONES 25-32
ZONE PIN PIN
25 1 13
26 2 14
27 3 15
28 4 16
29 5 17
30 6 18
31 7 19
32 8 20
EUROPE
POWER CORD
L1
L2
L3
PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
RELEASED
ATHENA
CONNECTOR WIRING-BEDROS
32 ZONES, CE
BED-C-E-32-00-000-WIR


70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT (MALE)
STANDBY INPUT (FEMALE)
USB PORT-A
USB PORT-B
ETHERNET PORT
VENTED REAR PLATE
TC INPUT ZONES 1-12
TC INPUT ZONES 13-24
TC INPUT ZONES 25-36
TC INPUT ZONES 37-40
MALE
STANDARD REAR PLATE
POWER OUTPUT ZONES 1-12
POWER OUTPUT ZONES 13-24
POWER OUTPUT ZONES 25-36
POWER OUTPUT ZONES 37-40
FEMALE
POWER INPUT
ATHENA
CONNECTOR LAYOUT-BEDROS 40 ZONES, CE
BED-C-E-40-00-000-LAY


70A
MAIN
CIRCUIT BREAKER
ON ON ON
ALARM OUTPUT MALE
PIN CONNECTION
SILENCEABLE
1 CLOSE ON ALARM
2
NOT SILENCEABLE
3 OPEN ON ALARM
4
GROUND
STANDBY INPUT FEMALE
PIN CONNECTION
1 5V +
2 5V -
3 SWITCH
4 SWITCH
GROUND
USB PORT-A
USB PORT-B
ETHERNET PORT
TC INPUT ZONES 1-12
ZONE + PIN - PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
TC INPUT ZONES 13-24
ZONE + PIN - PIN
13 1 13
14 2 14
15 3 15
16 4 16
17 5 17
18 6 18
19 7 19
20 8 20
21 9 21
22 10 22
23 11 23
24 12 24
TC INPUT ZONES 25-36
ZONE + PIN - PIN
25 1 13
26 2 14
27 3 15
28 4 16
29 5 17
30 6 18
31 7 19
32 8 20
33 9 21
34 10 22
35 11 23
36 12 24
TC INPUT ZONES 37-40
ZONE + PIN - PIN
37 1 13
38 2 14
39 3 15
40 4 16
POWER OUTPUT ZONES 1-12
ZONE PIN PIN
1 1 13
2 2 14
3 3 15
4 4 16
5 5 17
6 6 18
7 7 19
8 8 20
9 9 21
10 10 22
11 11 23
12 12 24
POWER OUTPUT ZONES 13-24
ZONE PIN PIN
13 1 13
14 2 14
15 3 15
16 4 16
17 5 17
18 6 18
19 7 19
20 8 20
21 9 21
22 10 22
23 11 23
24 12 24
POWER OUTPUT ZONES 25-36
ZONE PIN PIN
25 1 13
26 2 14
27 3 15
28 4 16
29 5 17
30 6 18
31 7 19
32 8 20
33 9 21
34 10 22
35 11 23
36 12 24
POWER OUTPUT ZONES 37-40
ZONE PIN PIN
37 1 13
38 2 14
39 3 15
40 4 16
POWER CORD
L1
L2
L3
PHASE WIRES
WHT-NEUTRAL
GRN-GROUND
ATHENA
CONNECTOR WIRING-BEDROS 40 ZONES, CE
BED-C-E-40-00-000-WIR





10/15/12	RELEASED	A
DATE	DESCRIPTION	REV

ATHENA®

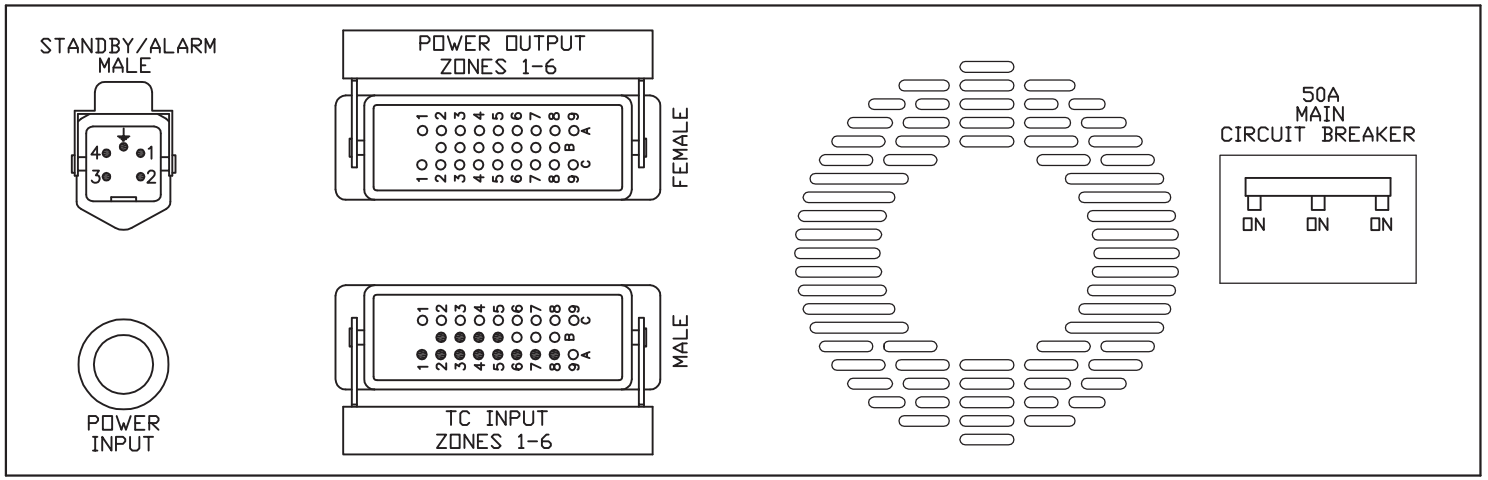
TITLE BEDROS STAND DIMENSIONS

DWG NO. BEDSTDIM–1

DATE 10–15–12	SCALE ——	DRAWN MSM	CHECKED BC

STANDBY/ALARM MALE	
PIN	CONNECTION
1	ALARM COMMON
2	ALARM N.O.
3	STANDBY SWITCH
4	STANDBY SWITCH
⏚	GROUND

	POWER OUTPUT ZONES 1-6					
ZONE	1	2	3	4	5	6
PIN	1A	3A	5A	7A	2B	4B
PIN	2A	4A	6A	8A	3B	5B



POWER CORD
L1, L2, L3 — PHASE WIRES
GRN-GROUND

DOMESTIC

POWER CORD
L1, L2, L3 — PHASE WIRES
WHT-NEUTRAL
GRN-GROUND

EXPORT

	TC INPUT ZONES 1-6					
ZONE	1	2	3	4	5	6
+PIN	1A	3A	5A	7A	2B	4B
-PIN	2A	4A	6A	8A	3B	5B

12/10/12	RELEASED	A
DATE	DESCRIPTION	REV

ATHENA®

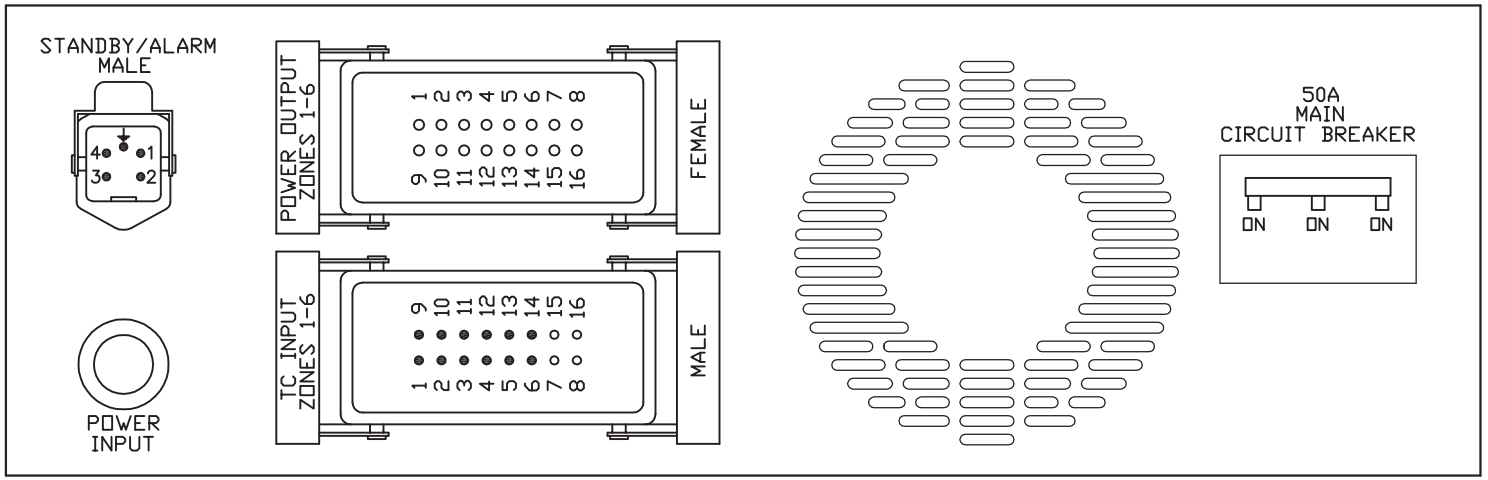
TITLE: RMB6 DOMESTIC/EXPORT
LAYOUT AND WIRING
STD CONNECTORS,NO OPTIONS

DWG: RMB6-0-DX-6-00-000

DATE	SCALE	DRAWN	CHECKED
12/10/12	—	MM	BC

STANDBY/ALARM MALE	
PIN	CONNECTION
1	ALARM COMMON
2	ALARM N.O.
3	STANDBY SWITCH
4	STANDBY SWITCH
⏚	GROUND

	POWER OUTPUT ZONES 1-6					
ZONE	1	2	3	4	5	6
PIN	1	2	3	4	5	6
PIN	9	10	11	12	13	14



POWER CORD
L1, L2, L3 — PHASE WIRES
WHT-NEUTRAL
GRN-GROUND

EUROPE

	TC INPUT ZONES 1-6					
ZONE	1	2	3	4	5	6
+PIN	1	2	3	4	5	6
-PIN	9	10	11	12	13	14

12/10/12	RELEASED	A
DATE	DESCRIPTION	REV

ATHENA®

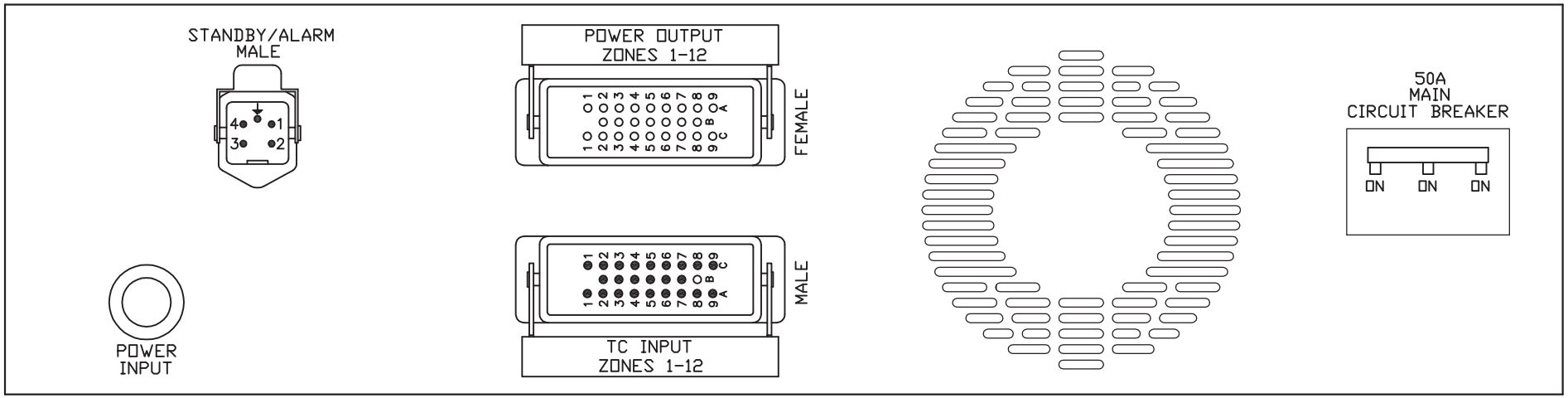
TITLE: RMB6 CE
LAYOUT AND WIRING
STD CONNECTORS,NO OPTIONS

DWG: RMB6-0-E-6-00-000

DATE	SCALE	DRAWN	CHECKED
12/10/12	—	MM	BC

STANDBY/ALARM MALE	
PIN	CONNECTION
1	ALARM COMMON
2	ALARM N.O.
3	STANDBY SWITCH
4	STANDBY SWITCH
⏚	GROUND

	POWER OUTPUT ZONES 1-12											
ZONE	1	2	3	4	5	6	7	8	9	10	11	12
PIN	1A	3A	5A	7A	2B	4B	6B	1C	3C	5C	7C	9A
PIN	2A	4A	6A	8A	3B	5B	7B	2C	4C	6C	8C	9C



POWER CORD
L1 L2 — PHASE WIRES L3
GRN-GROUND

DOMESTIC

POWER CORD
L1 L2 — PHASE WIRES L3
WHT-NEUTRAL
GRN-GROUND

EXPORT

	TC INPUT ZONES 1-12											
ZONE	1	2	3	4	5	6	7	8	9	10	11	12
+PIN	1A	3A	5A	7A	2B	4B	6B	1C	3C	5C	7C	9A
-PIN	2A	4A	6A	8A	3B	5B	7B	2C	4C	6C	8C	9C

DATE	DESCRIPTION	REV
12/10/12	RELEASED	A

ATHENA®

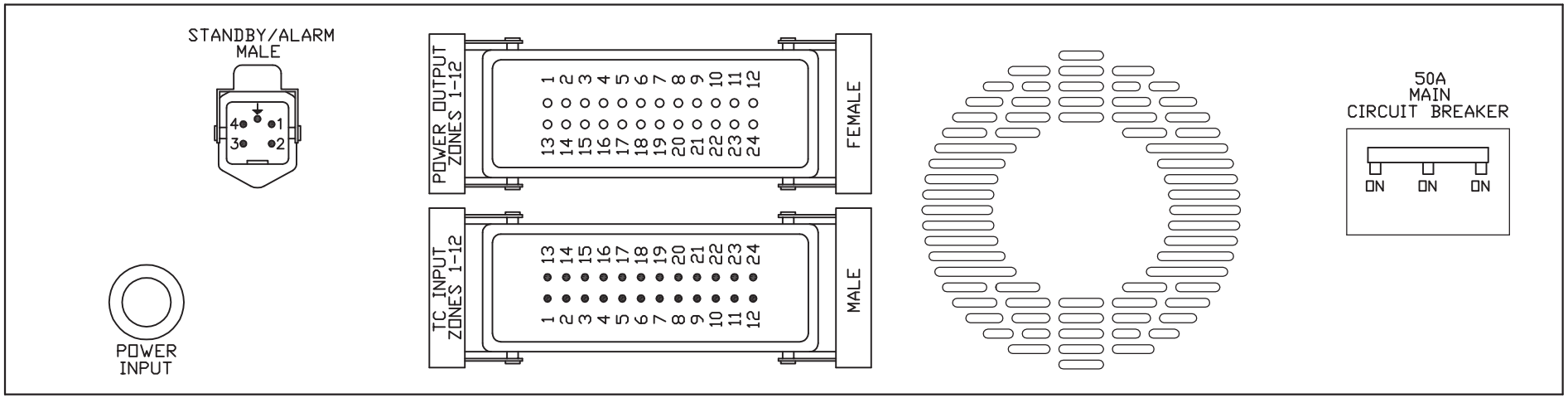
TITLE: RMB12 DOMESTIC/EXPORT
LAYOUT AND WIRING
STD CONNECTORS,NO OPTIONS

DWG: RMB12-0-DX-12-00-000

DATE	SCALE	DRAWN	CHECKED
12/10/12	—	MM	BC

STANDBY/ALARM MALE	
PIN	CONNECTION
1	ALARM COMMON
2	ALARM N.O.
3	STANDBY SWITCH
4	STANDBY SWITCH
⏚	GROUND

	POWER OUTPUT ZONES 1-12											
ZONE	1	2	3	4	5	6	7	8	9	10	11	12
PIN	1	2	3	4	5	6	7	8	9	10	11	12
PIN	13	14	15	16	17	18	19	20	21	22	23	24



POWER CORD
L1, L2, L3 — PHASE WIRES
WHT-NEUTRAL
GRN-GROUND

EUROPE

	TC INPUT ZONES 1-12											
ZONE	1	2	3	4	5	6	7	8	9	10	11	12
+PIN	1	2	3	4	5	6	7	8	9	10	11	12
-PIN	13	14	15	16	17	18	19	20	21	22	23	24

12/10/12	RELEASED	A
DATE	DESCRIPTION	REV

ATHENA®

TITLE: RMB12 CE
LAYOUT AND WIRING
STD CONNECTORS,NO OPTIONS

DWG: RMB12-0-E-12-00-000

DATE	SCALE	DRAWN	CHECKED
12/10/12	—	MM	BC

Glossary

ACCURACY: The difference between the reading of an instrument and the true value of what is being measured, expressed as a percent of full instrument scale.

ACTION: The function of a controller. Specifically, what is done to regulate the final control element to effect control. Types of action include ON-OFF, proportional, integral and derivative.

ACTIVE DEVICE: A device capable of producing gain; for example, transistors and ICs.

ALARM: A condition, generated by a controller, indicating that the process has exceeded or fallen below the limit point.

AMBIENT TEMPERATURE: The temperature of the immediate surroundings in which a controller must operate.

ANALOG SETPOINT INDICATION: A dial scale to indicate setpoint as opposed to digital setpoint indication. The traditional clock face is a good example of analog indication.

AUTOMATIC TUNING: Sometimes referred to as "self-tuning." The ability of a control to select and adjust the three control parameters (Proportional, Integral, and Derivative) automatically via a complex algorithm. Generally no operator input is required.

BANDWIDTH: See "Proportional Band"

BUMPLESS TRANSFER: When transferring from auto to manual operation, the control output(s) will not change ("bumpless"- a smooth transition).

CLOSED LOOP: A signal path which includes a forward path, a feedback path and a summing point, and forms a closed circuit.

COLD JUNCTION COMPENSATION: Measurement of temperature at thermocouple connections to controller and compensation for the "cold end" junction millivoltage generated here.

COMMON MODE: The noise signal that is common to all sensor wires.

COMMON-MODE REJECTION: The ability of an instrument to reject interference from a common voltage at its input terminals with relation to ground, usually expressed in dB.

COMPENSATION: See "Cold Junction Compensation"

CONTROL POINT: See "Setpoint"

COOL GAIN: In Athena microprocessor-based temperature controllers, a reference Gain value that is expressed in terms of the controller's Span, divided by the cooling proportional band, in degrees.

CURRENT PROPORTIONING: An output from a controller which provides current proportional to the amount of power required.

CYCLE TIME: The time necessary to complete a full ON-through-OFF period in a time proportioning control system.

CURRENT ALARM: Provides an alarm signal when a current level is detected below or above a preselected level.

DV/DT: Rate of change of voltage over time. A rapidly rising voltage waveform could induce false firing of an SCR. MOV's or R-C Snubber Circuits are used to prevent this false firing.

DEAD BAND: The range through which an input can be varied without initiating observable response.

DERIVATIVE: The process by which a controller senses the rate of temperature change and alters output.

DEVIATION ALARM: An alarm referenced at a fixed number of degrees, plus or minus, from setpoint.

DIN: Deutsche Industrial Norms, a widely-recognized German standard for engineering units.

DIFFERENTIAL: The temperature difference between the points at which the controller turns the heater on and off. Typically used when discussing an on/off controller.

DIRECT ACTING: Increase in value of output as the measured value increases.

DRIFT: A deviation of the system from setpoint that typically occurs over a long period of time. Drift may be caused by such factors as changes in ambient temperature or line voltage.

DROOP: Occurs when the actual system temperature stabilizes at some value below the desired setpoint. If system droop is unacceptable, a common solution is the use of a control incorporating an automatic or manual reset feature.

DUTY CYCLE: Percentage of load "ON" time relative to total cycle time.

FEEDBACK CONTROLLER: A mechanism that measures the value of the controlled variable, compares with the desired value and as a result of this comparison, manipulates the controlled system to minimize the size of the error.

FREQUENCY RESPONSE: The response of a component, instrument, or control system to input signals at varying frequencies.

GAIN: Amount of increase in a signal as it passes through any part of a control system. If a signal gets smaller, it is attenuated. If it gets larger, it is amplified.

GUARANTEED SOAK: On a ramp and soak controller, a feature that stops the clock if the temperature drops below a preset value, then continues the timing when the temperature recovers.

HEAT GAIN: In Athena microprocessor-based temperature controllers, a reference Gain value that is expressed in terms of the controller's Span, divided by the heating proportional band, in degrees.

HYSTERESIS: Temperature sensitivity between turn on and turn off points on on-off control. Prevents chattering.

I^2T: A measure of maximum one time overcurrent capability for a very short duration. Value used for fuse sizing to protect SCRs.

IMPEDANCE: The total opposition to electrical flow in an ac circuit.

INTEGRAL FUNCTION: This automatically adjusts the position of the proportional band to eliminate offset.

ISOLATION: Electrical separation of sensor from high voltage and output circuitry. Allows for application of grounded or ungrounded sensing element.

LAG: The time delay between the output of a signal and the response of the instrument to which the signal is sent.

LATCHING ALARM: Requires operator intervention to reset even though the alarm condition on the input may have disappeared.

MOV: Metal Oxide Varistor: A semiconductor device that acts as a safety valve to absorb high voltage transients harmlessly, thereby protecting the SCRs and preventing false firing.

NOISE: An unwanted electrical interference.

NORMAL-MODE REJECTION: The ability of an instrument to reject interference; usually of line frequency across the input terminals (common mode).

OFFSET: A sustained deviation of the controlled variable from setpoint (this characteristic is inherent in proportional controllers that do not incorporate reset action). Also referred to as Droop.

ON/OFF CONTROL: Control of temperature about a setpoint by turning the output full ON below setpoint and full OFF above setpoint in the heat mode.

OPEN LOOP: Control system with no sensory feedback.

OUTPUT: Action in response to difference between setpoint and process variable.

OVERSHOOT: Condition where temperature exceeds setpoint due to initial power up.

PARAMETER: A physical property whose value determines the response of an electronic control to given inputs.

PD Control: Proportioning control with rate action.

PHASE: The time-based relationship between two alternating waveforms.

PHASE-ANGLE FIRING: A form of power control where the power supplied to the process is controlled by limiting the phase angle of the line voltage as opposed to burst firing.

PI Control: Proportioning control with auto reset.

PID: Proportional, integral and derivative control action.

POSITIVE TEMPERATURE COEFFICIENT: A characteristic of sensors whose output increases with increasing temperature.

PROCESS VARIABLE: System element to be regulated, such as pressure, temperature, relative humidity, etc.

PROPORTIONAL ACTION: Continuously adjusts the manipulated variable to balance the demand.

PROPORTIONAL BAND: The amount of deviation of the controlled variable required to move through the full range (expressed in % of span or degrees of temperature). An expression of Gain of an instrument (the wider the band, the lower the gain).

PROPORTIONING CONTROL PLUS DERIVATIVE FUNCTION: A controller incorporating both proportional and derivative action senses the rate temperature change and adjusts controller output to minimize overshoot.

PROPORTIONING CONTROL PLUS INTEGRAL: A controller incorporating both proportional and integral action.

PROPORTIONAL, INTEGRAL AND DERIVATIVE CONTROL: A PID controller is a three-mode controller incorporating proportional, integral, and derivative actions.

RAMP: Automatic adjustment for the setpoint for the temperature increase or decrease from process temperature. The target value can be either above or below the current measured value. The ramp value is a combination of time and temperature.

RAMP TO SETPOINT: Allows the operator to enter a target time for the controller to reach setpoint.

RANGE: The difference between the maximum and the minimum values of output over which an instrument is designed to operate normally.

RATE (ACTION): Control function that produces a corrective signal proportional to the rate at which the controlled variable is changing. Rate action produces a faster corrective action than proportional action alone. Also referred to as Derivative Action. Useful in eliminating overshoot and undershoot.

R.C. SNUBBER CIRCUIT: Resistor - Capacitor Snubber Circuit: Controls the maximum rate of change of voltage and limits the peak voltage across the switching device. Used to prevent false firing of SCRs.

REFERENCE JUNCTION: See “Cold Junction Compensation”

REPRODUCIBILITY: The ability of an instrument to duplicate with exactness, measurements of a given value. Usually expressed as a % of span of the instrument.

RESET ACTION: Control function that produces a corrective signal proportional to the length of time and magnitude the controlled variable has been away from the setpoint. Accommodates load changes. Also called Integral Action.

REVERSE ACTING: Reduces the output as the measured value increases.

RFI: An acronym for radio frequency interference. RFI is commonly generated by devices that switch the output power at some voltage other than zero. Typically, phase-angle fired SCRs may generate RFI while zero-cross fired SCRs virtually eliminate RFI.

RTD: An acronym for a resistance temperature detector. Typically a wire wound device that displays a linear change in resistance for a corresponding temperature change. An RTD has a positive temperature coefficient.

SCR: This term has two separate and distinct meanings: 1) A solid-state semiconductor component that conducts or resists current flow depending upon whether a trigger voltage is present at the gate terminal. 2) A complete power controller that utilizes SCRs or TRIACs as the switching devices to control current flow.

SEGMENT: In a ramp and soak controller, one part of a profile.

SOAK: One segment with no setpoint change.

SSR: An acronym for solid-state relay. Semiconductor device that switches electrical current on and off in response to an electrical signal at the control terminals.

SENSITIVITY: The minimum change in input signal required to produce an output change in the controller.

SERIES MODE: A condition in which a noise signal appears in series with a sensor signal.

SETPOINT: The position to which the control point setting mechanism is set, which is the same as the desired value of the controlled variable.

SPAN: The difference between the top and bottom scale values of an instrument. On instruments starting at zero, the span is equal to the range.

STANDBY: Method of putting controller into the idle mode.

SURGE CURRENT: A high current of short duration that generally occurs when the power is first applied to inductive loads. The surge generally lasts no more than several ac cycles.

THERMISTOR: A bead-like temperature sensing device consisting of metallic oxides encapsulated in epoxy or glass. The resistance of a thermistor typically falls off sharply with increasing temperature, making it a particularly good sensing device. A thermistor has a negative temperature coefficient.

THERMOCOUPLE: The junction of two dissimilar metals. A small voltage is generated at this junction, increasing as its temperature rises.

THERMOCOUPLE BREAK PROTECTION: Fail-safe operation that ensures output shutdown upon an open thermocouple condition.

THREE-MODE CONTROL: Proportioning control with reset and rate.

THYRISTOR: Any of a group of solid-state controlling devices. These devices are referred to as TRIACs, SCRs and DIACs.

TIME PROPORTIONING CONTROL MODE: In this mode, the amount of controller "on" time depends upon the system temperature. At the beginning of each time base interval, the signal from the sensor is analyzed and the controller is kept "ON" for a percentage of the time base.

TRIAC: A device, similar to a controlled rectifier, in which both the forward and reverse characteristics can be triggered from blocking to conducting (Also see Thyristor).

ZERO SWITCHING: Action that provides output switching only at the zero voltage crossing point of the ac sine wave.

Athena Controls, Inc.
5145 Campus Drive • Plymouth Meeting, PA 19462-1129 USA
Toll free: 1.800.782.6776 • Tel: 1.610.828.2490
Fax: 1.610.828.7084 • E-mail: sales@athenacontrols.com
www.athenacontrols.com