



# BTU Training

## Site Training



# BTU Training Program For Celestica

2001/3/28 9:00am---5:00pm

BTU System Overview

Including:

- \*Oven Overall Description
- \*System Structure and Function
- \*Main Options Instruction
- \*Facilities Requirement
- \*Moving, Installation and Adjustment of Oven

BTU System Operation Procedure

- Safety Precaution
- BTU Control Software “WINCON” Study
- Recipe Edit
- Preparation Before Operation
- Starting Up Oven
- Performing Emergency Stop
- Clearing ALERT and ALARM
- Shutting Down the Oven

Trainee Test

Wincon Test (Edit a New Recipe, Edit the Profile)



# BTU Training Program For Celestica

2001/3/29 9:00am---5:00pm

System study

- \* Heating System
- \* Cooling System
- \* Flux Management
- \* Drive System
- \* Auto Center Support System

## **Afternoon**

1) System study

- \* Closed Loop Blower Speed Control System
- \* O2 Sampling System
- \* N2 System
- \* Alarm System

2) Preventive maintenance

3) Trainee Practice

- \* Conveyor speed calibration
- \* Rail Position Width Calibration

4) Test

- \* Paper Test



# SMT 380/220V 3 PHASE, 4-Wire, 50/60Hz



*Paragon 150*



# P150 Oven Data

Power 380/220VAC 3 Phase 4 wires 1 Ground 50/60 HZ

## Max. Load Data - Line Current

Line VAC	L1	L2	L3	Neutral	Total KVA
380/220	189A	179A	159A	189A	122

Average Heater Load at 30KVA

## Approx. Shipping Weight

Furnace	7400LBS
Furnace w/Pallet	7850LBS

Max. Operating Temperature 325 C



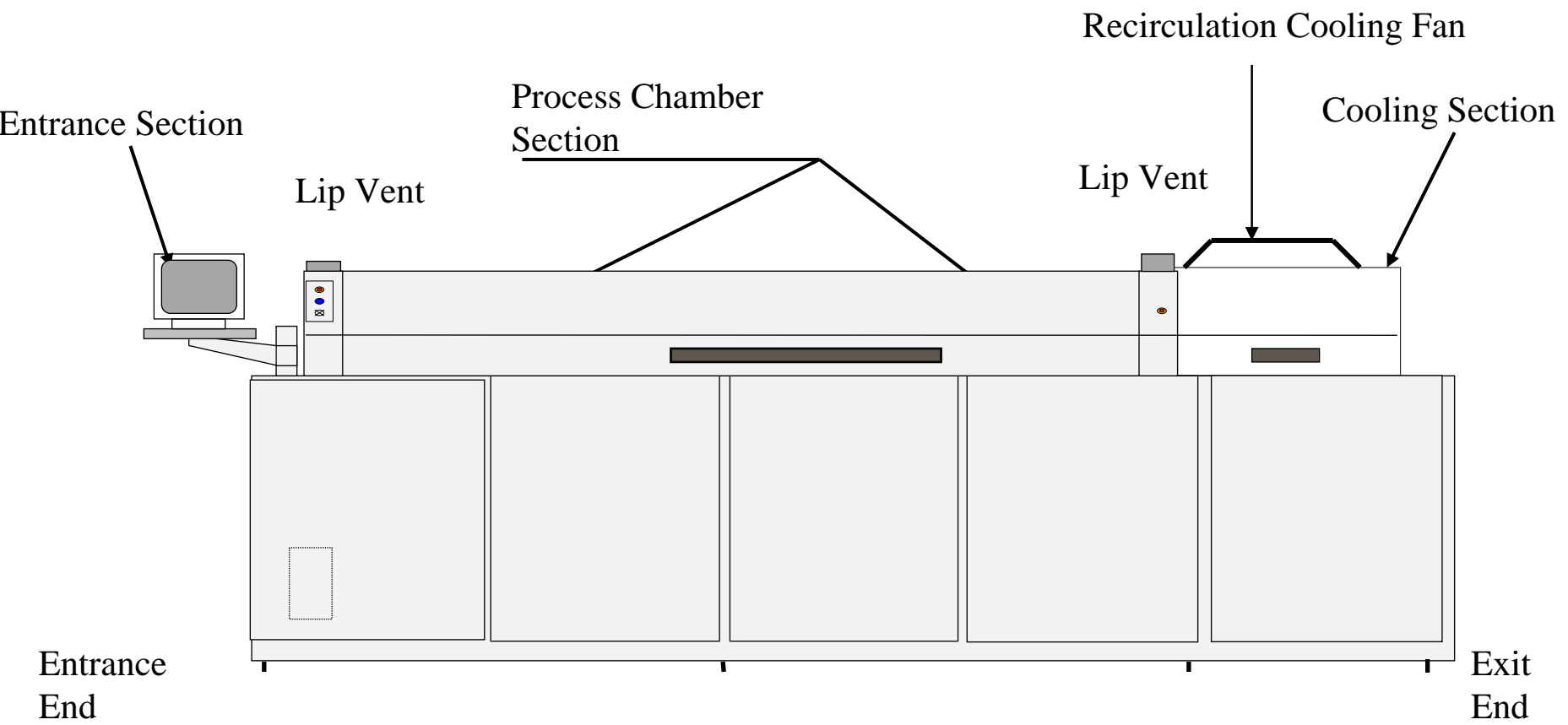
# P150 Oven

## Utility Connections

	Utility	Size	Pressure	Nominal Flow
A	N2	0.5NPT	55-80PSI	30SCFM
B	Air	0.5NPT	55-80PSI	18SCFM
C	H2O Drain	0.5NPT	Open	
D	H2O Inlet	0.5NPT	30-85PS!	3-12GPM
E	ENT Vent	D5.0"	0.1-0.05IWC	100-150SCFM
F	EXIT Vent	D5.0"	0.1-0.05IWC	150-200SCFM

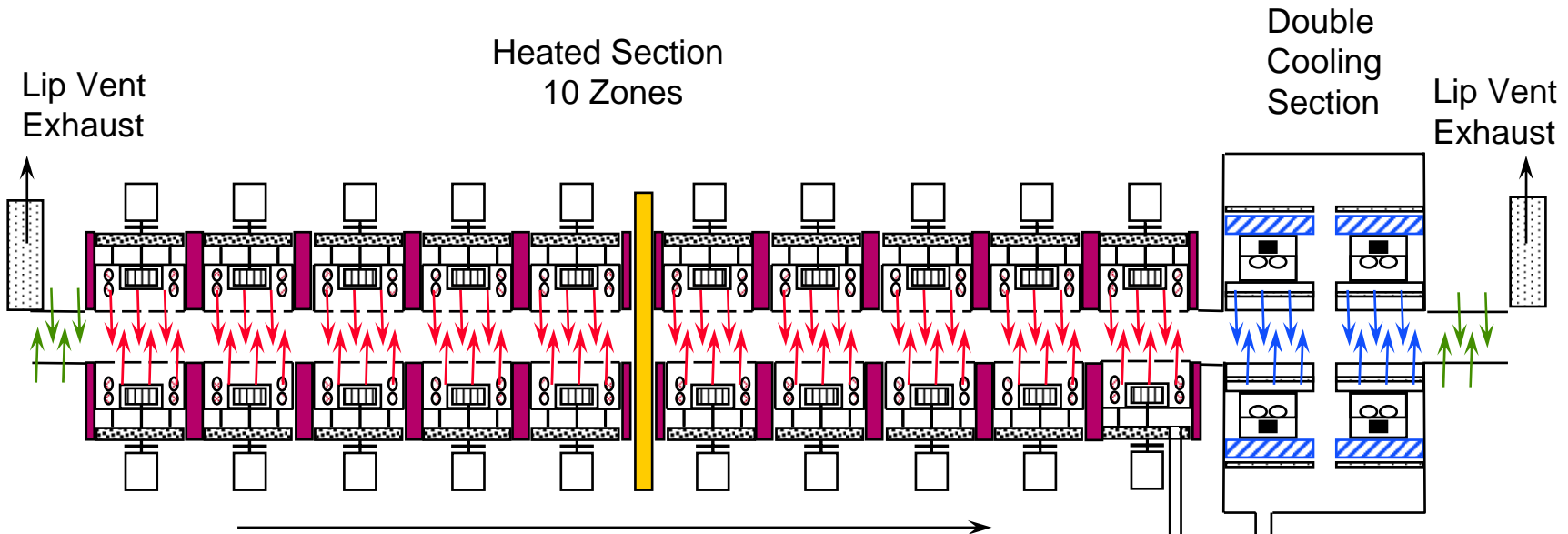


# P150





# Paragon 150 Layout



- 150 Inches of Heat
- 10 Zones Top/Bottom
- 2 Cooling Zones
- Flux Condenser

Flux  
Condenser

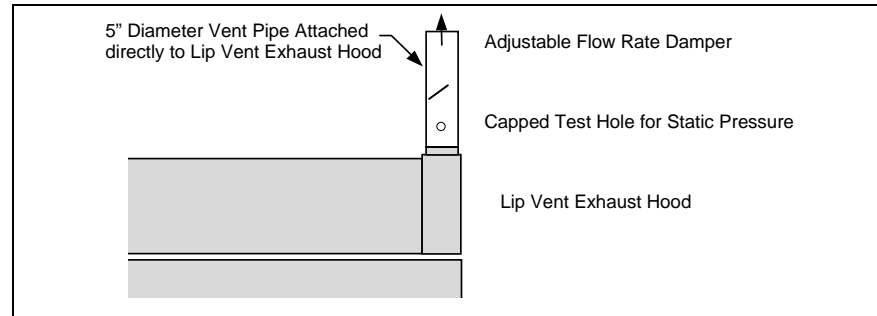




# Lip Vent Hoods



VIP-98-I Series Furnace



Exhaust Duct Damper Locations



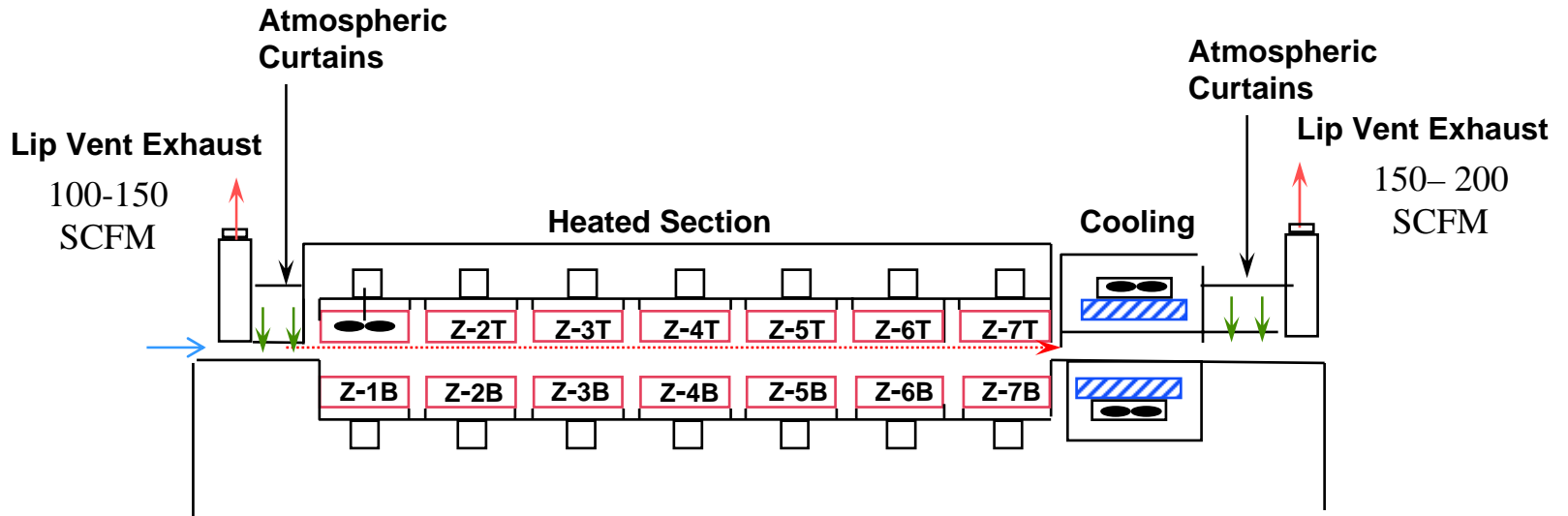
Acrobat Document

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Lip Vent Assy



# Lip Vent Hoods



Acrobat Document

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Entrance side

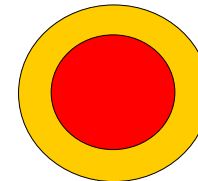
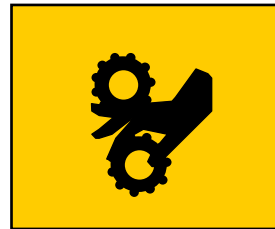
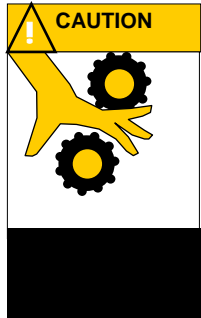


Acrobat Document

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Exit side

# Safety Labels

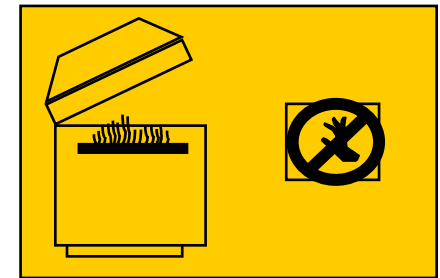
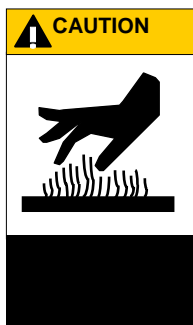


**EMERGENCY  
STOP BUTTON  
(Yellow and Black)**



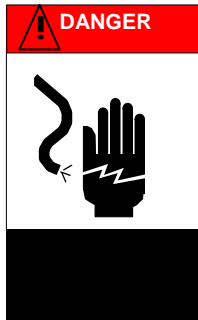
**EMERGENCY OFF OR  
EMERGENCY STOP  
BUTTON  
(Red and White)**

**MECHANICAL OR PINCH POINT HAZARD  
(Yellow and Black)**

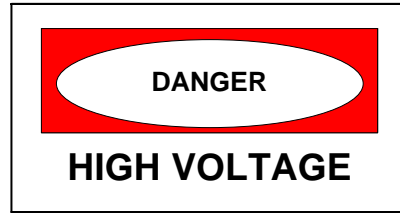


**TEMPERATURE HAZARD  
(Yellow and Black)**

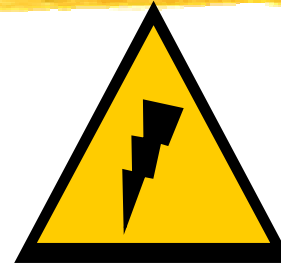
# Safety Labels



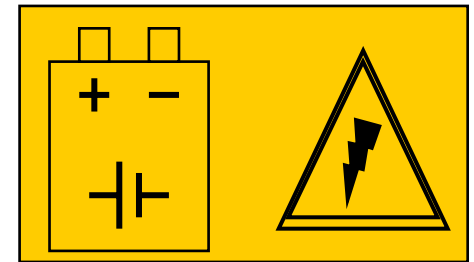
ELECTRICAL HAZARD  
(Red and Black)



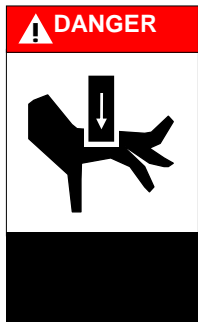
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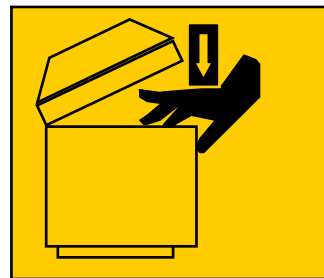
TEMPERATURE HAZARD  
(Yellow and Black)



TEMPERATURE HAZARD  
(Yellow and Black)



CRUSH HAZARD  
(Red and Black)



CRUSH HAZARD  
(Yellow and Black)



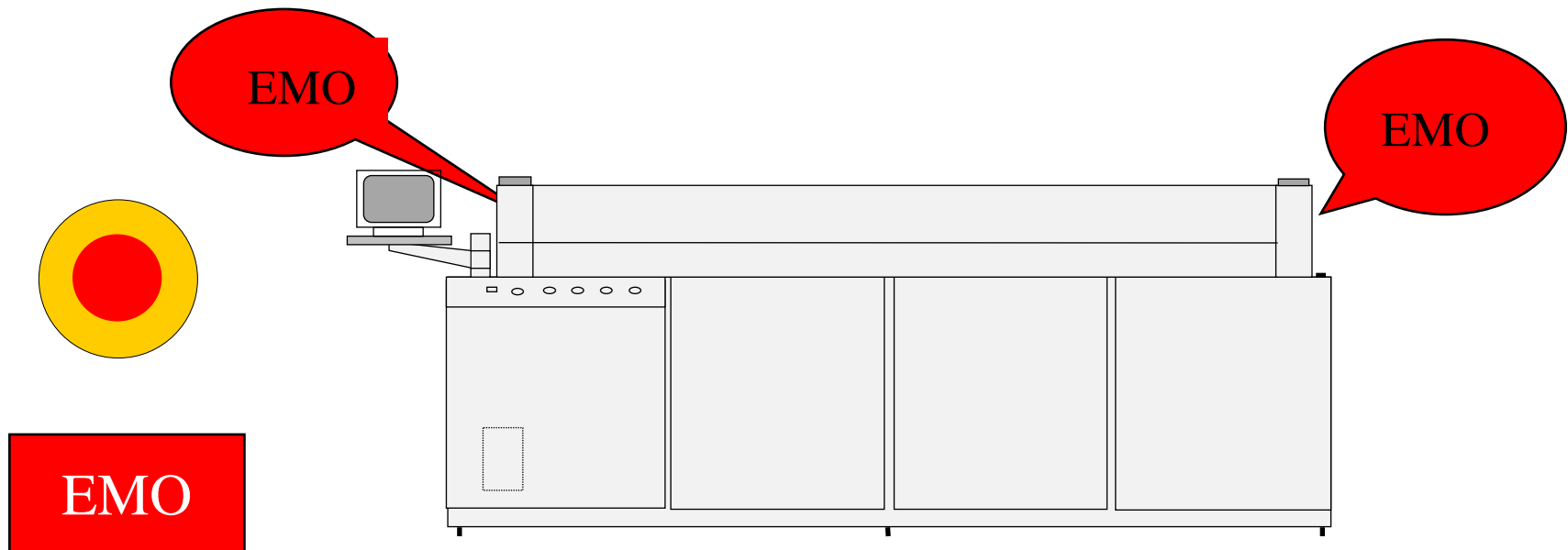
VAPOR HAZARD  
(Red and Black)

**⚠ WARNING**

This equipment contains Refractory Ceramic Fibers (RCF) that have been identified by the International Agency for Research on Cancer (IARC) as a possible human carcinogen (Group 2B). Exposure to RCF may be hazardous to your health. **Under normal operating conditions, exposure should not occur.** If maintenance is to be performed on this equipment, or if exposure to RCF otherwise occurs, then precautions should be taken for the handling of RCF. The necessary precautions and emergency procedures are described in the MSDS sheets included in the technical manual supplied with this equipment. Further information on RCF may also be obtained from: The Carborundum Company - Fibers Division. HOTLINE NUMBER (716) 278-2183.



# Emergency Stop Buttons (EMO's)



The heater power will be turned off, which will cause the zone temperature to slowly drop. This furnace configuration also turns off, the conveyor and rail systems, blower system, hood controls, flux system, gas controls, cooling system, recirculating water system and case cooling.



# Lockable Power Disconnect Switch



Tab may be pulled out  
when switch is in the  
OFF Position  
and Locked Out

# UPS Circuits

Drawing 5182368 - Schematic Diagram - Instrument Control

**Shows: Uninterruptible Power Supply which supplies the following circuits**

**Conveyor - C000**

**Instruments (PC) - E000**

**Lid Lift - (H000)**

**Note: The UPS Circuits provides power for approximately 15 minutes and is mounted internally. Time is reduced when the Hood Lift are operated.**





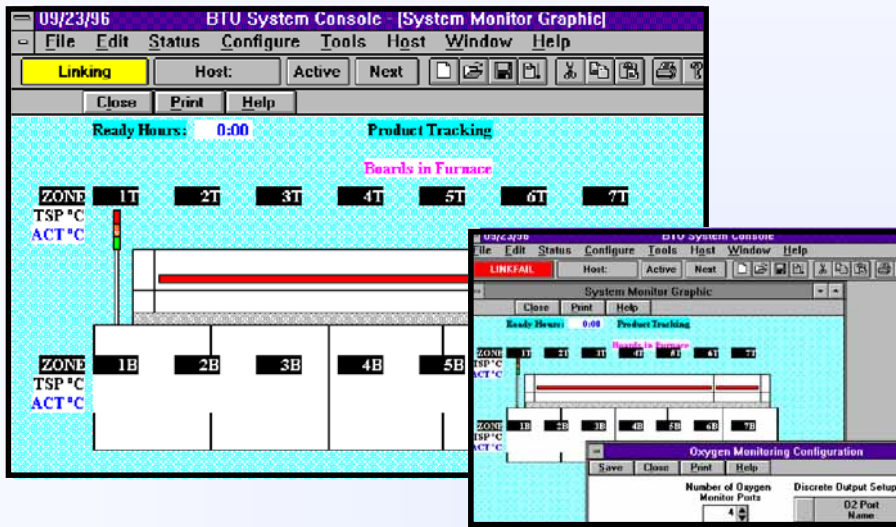
# Light Tower

Color	Condition	Description
<b>RED</b>	<b>ALARM</b>	Indicates that the furnace is in an ALARM STATE.
<b>YELLOW</b>	<b>ALERT</b>	Indicates that the furnace is in an ALERT STATE.
<b>GREEN</b>	<b>READY</b>	Indicates that the furnace has reached operating temperatures and is in the Ready state, as directed by your process recipe. (When recipe changes take place, this indicator light will temporarily go out.)
<b>Blue</b> (Optional)	<b>N<sup>2</sup> On</b>	Indicates that the FCU has energized F600-CR to turn on nitrogen



# WINCON Software

## Operating Software



- ⌘ Windows TM Platform
- ⌘ GEM Available
- ⌘ Extensive Security Features
- ⌘ Extensive data Collection Capability
- ⌘ Flexible Time and Sequence Scheduling



# **Furnace Safety Features**

The model P150 furnace contains the following safety features:

1. Emergency Stop Buttons
2. Over Temperature Protection
3. Conveyor Protection
4. Lockable Power Disconnect Switch
5. System Interlocks and Alarms



# Topic 3

## System Documentation & Drawings

Upon successfully complete of this topic you will be able to:

- 1 Demonstrate the ability to use the System Owner's Manual to determine but not limited to the following:
  - a Identification of system specifications.
  - b Performance of preventative maintenance.
  - c Removal and replacement of system components.



# *System Documentation & Drawings*

- 2 Demonstrate the ability to use the system drawings to determine, but not limited to the following:
  - a. Layout of the system, assemblies, wiring, and plumbing.
  - b. Reference connections to other diagrams.
  - c. Source voltage information.
  - d. Component identification.
  - e. Component specification.
  
- 3 Demonstrate an ability to use the electrical systems drawing to isolate and diagnose problems.



# *System Owner's Manual*



- Section 1 Before You Begin
- Section 2 System Overview
- Section 3 System Operations
- Section 4 System Troubleshooting
- Section 5 System Maintenance
- Section 6 Spare Parts
- Section 7 System Drawings
- Section 8 Appendices
  - Appendix A System Specifications
  - Appendix B Glossary of Terms
  - Appendix C Reference Manuals
- Index



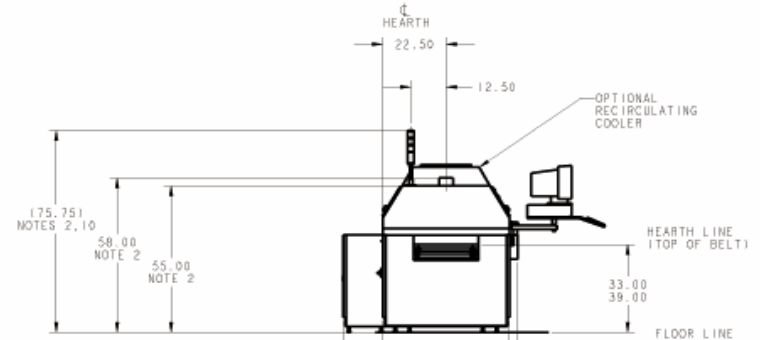
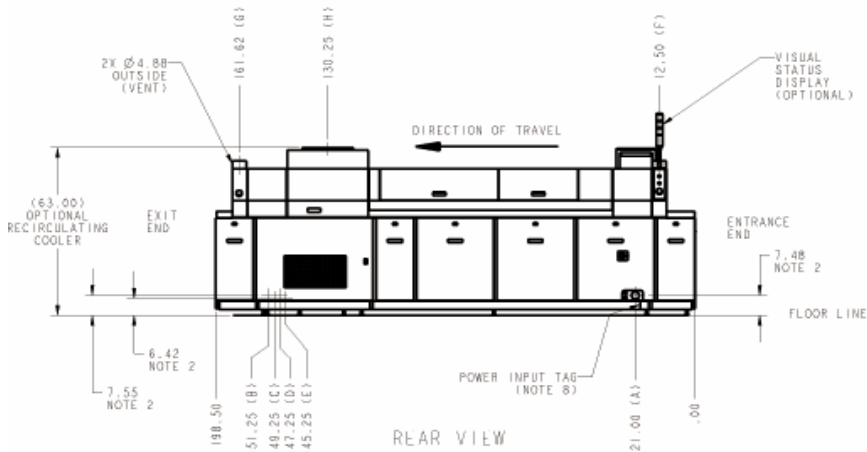
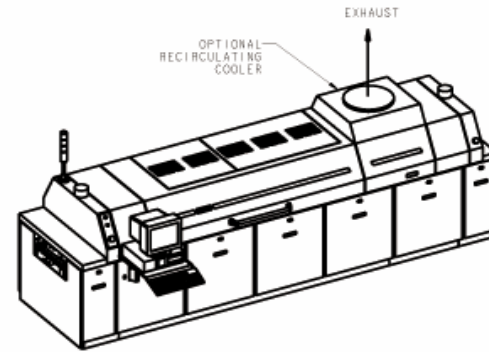
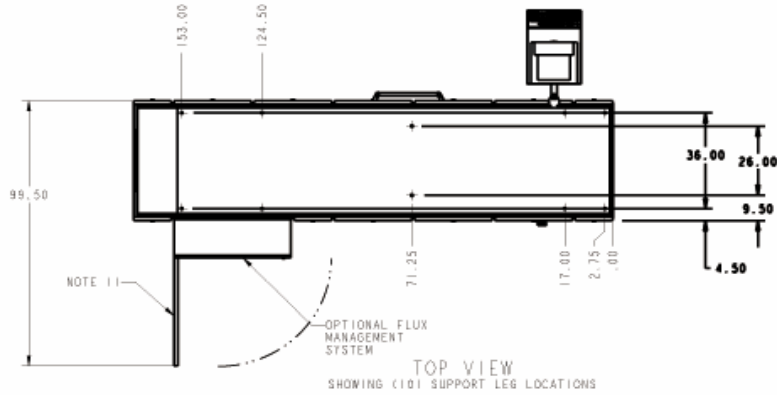
# *System Drawings*

- ✧ Installation Drawing
- ✧ Installation Data Drawing
- ✧ Heater Current Data Drawing
- ✧ W/D FCU 3615 Controller Drawing
- ✧ Electrical Components Layout Drawing
- ✧ Ground Layout Drawing
- ✧ Operator Panel Layout Drawing
- ✧ Calibration Procedure for Drive Controllers
- ✧ Plumbing Schematics



# Installation Drawing

REVISIONS			
REV	DESCRIPTION	DATE	APP





# Installation Data Drawing

PURCHASER TO SUPPLY CIRCUIT BREAKER OR FUSED DISCONNECT SWITCH FOR: 240 VOLTS 90 AMPERES 3 PHASE 3 WIRES 37 KILOVOLT-AMPERES 50/60 HZ FURNACE CASE MUST BE GROUNDED PER LOCAL CODES					
MAXIMUM LOAD DATA					
LINE CURRENT-AMPERES					
LINE VOLTAGES	L1	L2	L3	NEUTRAL	TOTAL KV-A
200	69	70	73		26
208	72	73	76		28
220	76	77	81		31
230	80	81	84		34
240	83	84	88		37
AVERAGE HEATER LOAD (33%) 13KW					
TYPICAL OPERATING POWER 18 KVA					
OVERHEAT THERMOSWITCH IN ZONES: 1/5 TOP & BOTTOM.					

PURCHASER TO SUPPLY CIRCUIT BREAKER OR FUSED DISCONNECT SWITCH FOR: 480 VOLTS 50 AMPERES 3 PHASE 3 WIRES 37 KILOVOLT-AMPERES 50/60 HZ FURNACE CASE MUST BE GROUNDED PER LOCAL CODES					
MAXIMUM LOAD DATA					
LINE CURRENT-AMPERES					
LINE VOLTAGES	L1	L2	L3	NEUTRAL	TOTAL KV-A
440	38	39	40		31
460	40	40	42		39
480	42	42	44		37
AVERAGE HEATER LOAD 13KW					
TYPICAL OPERATING POWER 18 KVA					
OVERHEAT THERMOSWITCH IN ZONES: 1/5 TOP & BOTTOM.					

PURCHASER TO SUPPLY CIRCUIT BREAKER OR FUSED DISCONNECT SWITCH FOR: 415 VOLTS 63 AMPERES 3 PHASE 4 WIRES 36 KILOVOLT-AMPERES 50/60 HZ FURNACE CASE MUST BE GROUNDED PER LOCAL CODES					
MAXIMUM LOAD DATA					
LINE CURRENT-AMPERES					
LINE VOLTAGES	L1	L2	L3	NEUTRAL	TOTAL KV-A
380/220	47	42	46	47	31
400/230	49	44	48	49	34
415/240	51	46	50	51	37
AVERAGE HEATER LOAD (33%) 13KW					
TYPICAL OPERATING POWER 18 KVA					
OVERHEAT THERMOSWITCH IN ZONES: 1/5 TOP & BOTTOM.					

SEE SHEET 2 FOR ELECTRICAL DATA IF OPTIONAL FLUX MANAGEMENT SYSTEM, AND/OR RECIRCULATING COOLER, WAS ORDERED.

	APPROX. SHIPPING WEIGHT	
	FURNACE	FURNACE W/ PALLET
SINGLE COOLER	2,900 LBS	3,100 LBS
DOUBLE COOLER	3,100 LBS	3,300 LBS
FURNACE WEIGHT WILL VARY WITH OPTIONS		

MAXIMUM OPERATING TEMPERATURE- 300° CELSIUS NOMINAL OPERATING TEMPERATURE- 150 TO 275° CELSIUS					
UTILITY CONNECTIONS					
	UTILITY	SIZE	PRESSURE	NOMINAL FLOW	COMMENTS
A	ELEC. PWR	N/A	N/A	N/A	
B	N <sub>2</sub> W/O AIR AMPS	* SMT	55-80 PSIG	20 SCFM	USE THESE VALUES IF AIR AMPLIFIER OPTION WAS NOT PURCHASED USE THESE VALUES IF AIR AMPLIFIER OPTION WAS PURCHASED
	W/ AIR AMPS		70-80 PSIG	30 SCFM	
C	AIR (OPTIONAL) W/O AIR AMPS	* SMT	55-80 PSIG	10 SCFM	AIR REQUIRED ONLY IF OPTIONAL DUAL INLET WAS PURCHASED USE THESE VALUES IF AIR AMPLIFIER OPTION WAS NOT PURCHASED USE THESE VALUES IF AIR AMPLIFIER OPTION WAS PURCHASED
	W/ AIR AMPS		70-80 PSIG	30 SCFM	
D	H <sub>2</sub> O DRAIN	* SMT	OPEN DRAIN		NOT REQUIRED IF OPTIONAL RECIRCULATING COOLER WAS PURCHASED
E	H <sub>2</sub> O INLET	* SMT	30-85 PSIG	3-12 GPM	NOT REQUIRED IF OPTIONAL RECIRCULATING COOLER WAS PURCHASED
F	LIP VENT EXHAUST	Ø 5.0"	1-05 IWC	75 SCFM	SEE NOTES 4, 5, 6 & 7
G	LIP VENT EXHAUST	Ø 5.0"	1-05 IWC	125 SCFM	SEE NOTES 4, 5, 6 & 7
H	RC COOLER FAN EXHAUST	Ø 10.0"		1000 SCFM/FAN	SEE NOTE 12.

- NOTES:
- SEE PURCHASE ORDER TO DETERMINE WHICH OPTIONS ARE PRESENT ON FURNACE.
  - THESE DIMENSIONS BASED ON 33.00" HEARTH LINE.
  - GAS SUPPLY MUST BE CLEAN, DRY, AND FREE OF OIL.
  - CONNECT ACTIVE EXHAUST DIRECTLY TO VENT.
  - EXHAUST GAS FLOWS ARE BASED ON A 3-1 ENTRAINMENT RATIO. (ADDITIONAL AIR IS DRAWN INTO EXHAUST TO ENSURE THAT ALL CONTAMINANTS ARE REMOVED. ENTRAINMENT RATIO IS THE RATIO OF THIS AIR FLOW TO THE EFFLUENT FLOW. UNDER SPECIAL CIRCUMSTANCES, DIFFERENT ENTRAINMENT RATIOS MAY BE REQUIRED. CONSULT YOUR LOCAL HVAC SPECIALIST IF NECESSARY.)
  - CUSTOMER TO SUPPLY EXHAUST DAMPER TO CONTROL FLOW.
  - BTU RECOMMENDS THE USE OF FILTRATION ON CUSTOMER'S EXHAUST SYSTEM TO PREVENT THE BUILDUP OF EFFLUENTS IN THE DUCTWORK.
  - REFER TO POWER INPUT TAG FOR REQUIRED VOLTAGE.
  - MINIMUM INSIDE DIAMETER OF .5"NPT SUPPLY PIPE MUST BE 0.52 INCHES (13.2MM).
  - COMPUTER AND OPTIONAL LIGHT POLE ARE SHOWN IN STANDARD LOCATION. ACTUAL LOCATION MAY DIFFER.
  - DOOR IS REMOVABLE BY LIFTING OFF HINGES, FULL OPENING IS NOT REQ'D.
  - RECIRCULATING COOLER FAN EXHAUST HOODS MUST BE SUSPENDED/HARD PLUMBED. FAN BOXES MUST BE ABLE TO SLIDE BACK AND FORTH WITHOUT INTERFERING W/HOOD.

\*-SEE NOTE 9





# Heater Current Data Drawing

			APPLIED VOLTAGES														
			200			208			220			230			240		
ZONE	ZONE LENGTH	HEATER POSITION	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW
1/4	14"	T	9.3 A	18.6 A	3.7 KW	9.7 A	19.4 A	4.0 KW	10.3 A	20.6 A	4.5 KW	10.8 A	21.6 A	4.9 KW	11.2 A	22.4 A	5.4 KW
		B	9.3 A			9.7 A			10.3 A			10.8 A			11.2 A		
5	14"	T	18.5 A	37.0 A	7.4 KW	19.2 A	38.4 A	8.0 KW	20.3 A	40.6 A	9.0 KW	21.3 A	42.6 A	9.8 KW	22.2 A	44.4 A	10.7 KW
		B	18.5 A			19.2 A			20.3 A			21.3 A			22.2 A		

			APPLIED VOLTAGES								
			440			460			480		
ZONE	ZONE LENGTH	HEATER POSITION	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW	AMPS	TOTAL AMPS	TOTAL KW
1/4	14"	T	5.2 A	10.4 A	4.5 KW	5.4 A	10.8 A	4.9 KW	5.6 A	11.2 A	5.4 KW
		B	5.2 A			5.4 A			5.6 A		
5	14"	T	10.2 A	20.4 A	9.0 KW	10.6 A	21.2 A	9.8 KW	11.1 A	22.2 A	10.7 KW
		B	10.2 A			10.6 A			11.1 A		

### NOTES for HEATER DATA SHEET TABLES

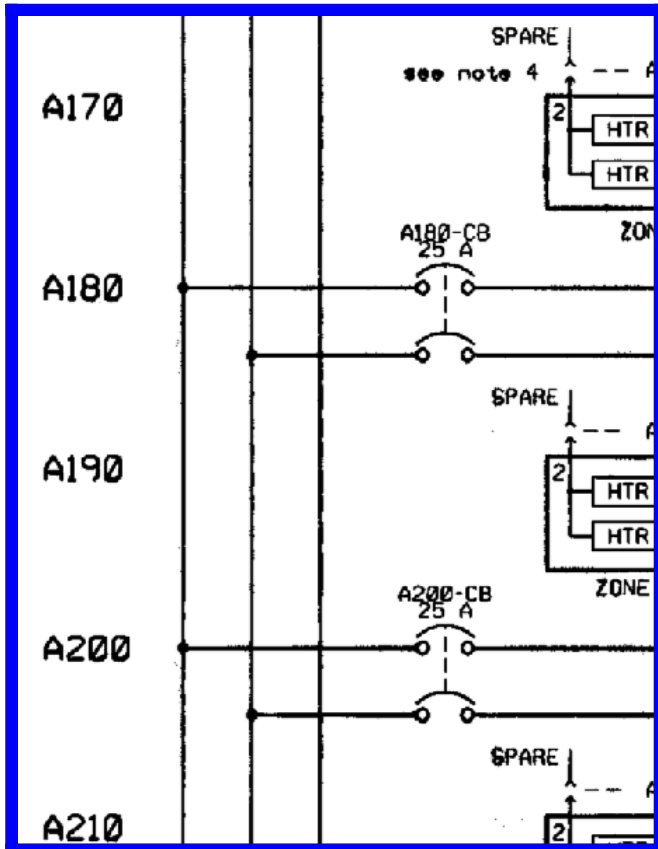
1. SELECT THE APPROPRIATE VOLTAGE COLUMN FOR HEATER AMPS AND KW RATINGS.
2. FOR 3 PHASE 4 WIRE SYSTEMS REFER TO THE PHASE VOLTAGE. FOR EXAMPLE;  
AT 380/220V USE THE 220V COLUMN  
AT 400/230V USE THE 230V COLUMN  
AT 415/240V USE THE 240V COLUMN
3. THE CALCULATIONS ARE BASED ON NOMINAL RESISTANCE AND VOLTAGE. THE TOLERANCE FOR THE HEATER RESISTANCE IS +- 5% AND FOR VOLTAGE +- 10%

### KEY

- T - TOP
- B - BOTTOM
- L - LEFT
- R - RIGHT
- S - SIDE
- C - CENTER



# Line Numbering



## **Line Numbering**

Electrical drawings have line numbers drawn along the left side. Each line number contains both a letter and a number.

- The letter designates a circuit group.
- The number locates a position on the drawing.

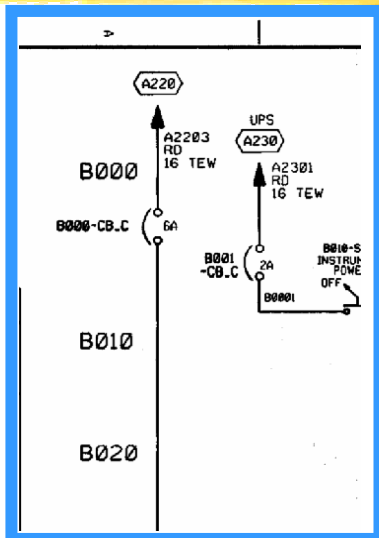
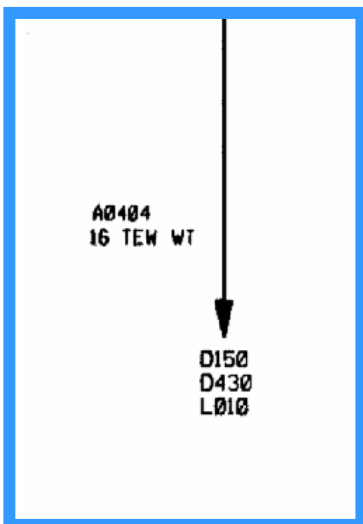
Circuit groups may be designated differently from one BTU product to another, depending on the types of circuits included.

This table shows an EXAMPLE of a circuit group set contained in a typical BTU oven or furnace

- A Input Power/ Heaters
- B Instrument Control
- C Drive Control
- D Gas Control
- E Controller
- F Alarms
- G – Z Optional Equipment

The Circuit Groups for your BTU product are listed next.

# Reference Connections

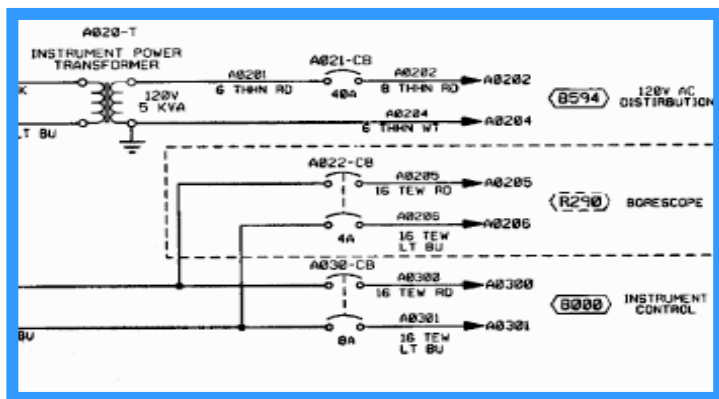


## Reference pointer with line numbers

Reference pointers direct you to the next drawing or to drawings for other circuits. The line number with each pointer identifies

- The circuit group of the next drawing (D or L in the example).
- The position of the connection on the next drawing (150, 430, 010).

Reference pointer line numbers may also be enclosed in a box as shown in the following example.



You match the drawings on the right has reference pointers.

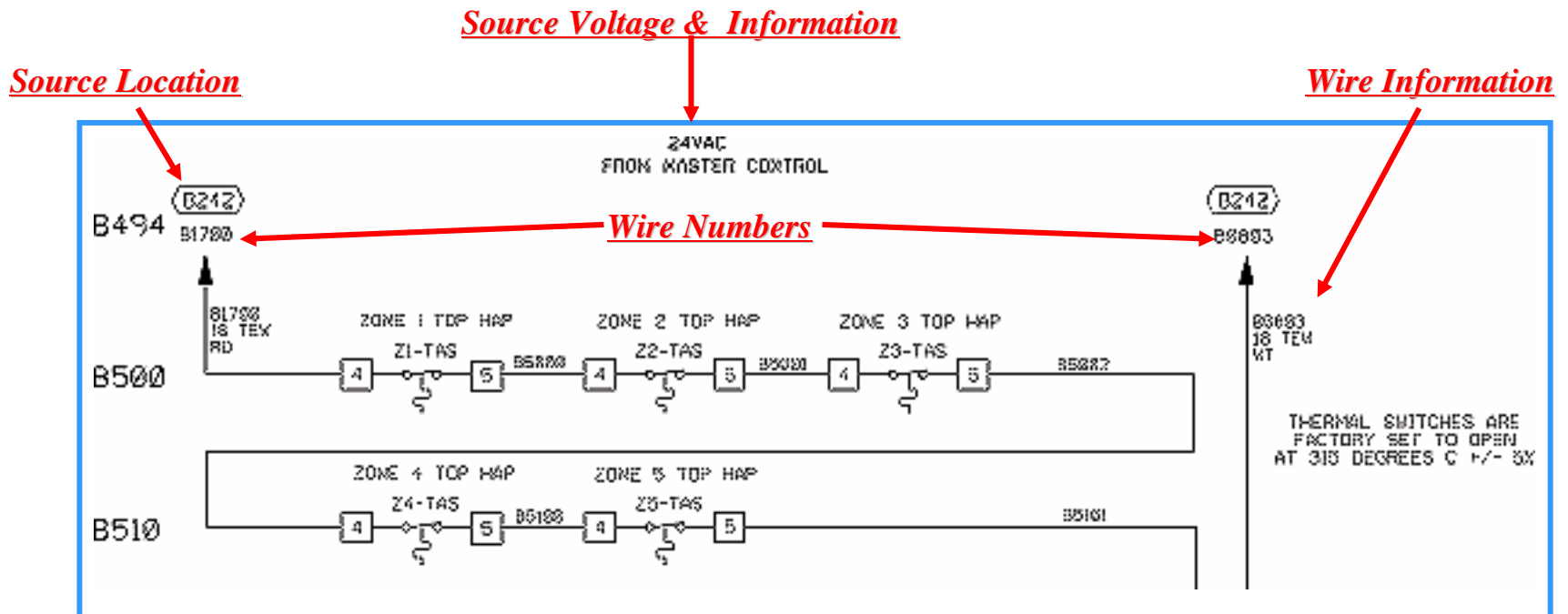
The example on the top left shows it's reference pointer exiting on the bottom of the drawing, as you would normally hold it, but the example on the bottom has it's reference pointer pointing to the right, both are outputs.

The top right drawing section has a reference pointer coming in from the top, this indicates an input and shows where the input is coming from.



# Source Voltage Information

Electrical diagrams which have voltages originating from other electrical diagrams are marked with the voltage level, voltage type (AC or DC) and the wire size and insulation type. A description may be included to describe the general origination of the source voltage (I.e. from input power circuits). This general description, if used, is immediately below the voltage level/type information.





# Wire Color Codes

<b>COLOR</b>	<b>CIRCUIT AND CONDUCTORS</b>
Black	Line, load, and control circuits at line voltage
Red	AC control circuits at less than line voltage
White	Grounded circuit conductor (neutral)
Blue	DC control circuits
Gray	Grounded circuit conductor for UPS control circuits
Yellow	Interlock control circuits supplied from an external power source
Green/Yellow	Equipment grounding conductor

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## Exceptions:

Multi-conductor cables present an exception to the above standard color codes.

Light Blue is used for the Neutral for equipment shipped to Europe (European Community).

Customer specified color codes are used as required.

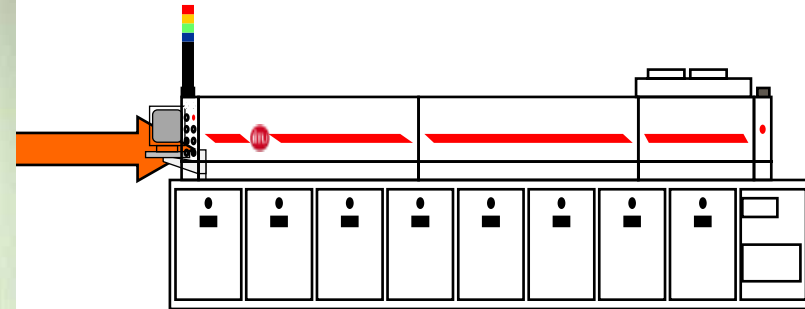
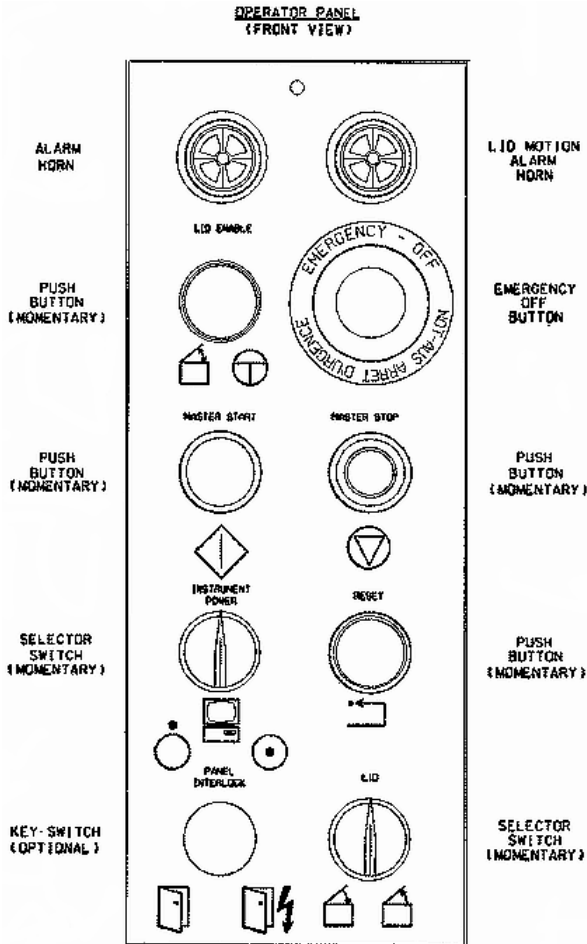


# Device Codes and Types

<b>CODE</b>	<b>TYPE OF DEVICE</b>	<b>CODE</b>	<b>TYPE OF DEVICE</b>
<b>AH</b>	Alarm Horn or Audible Alarm	<b>PB</b>	Push Button
<b>CB</b>	Circuit Breaker	<b>PL</b>	Plug
<b>CR</b>	Control Relay	<b>POT</b>	Potentiometer
<b>CON</b>	Contactors	<b>PS</b>	Pressure Switch
<b>CT</b>	Current Transformer	<b>PWRS</b>	Power Supply
<b>DISC</b>	Disconnect Switch	<b>PRX</b>	Proximity Switch
<b>ENCO</b>	Optical Encoder	<b>RES</b>	Resistor
<b>EPB</b>	Emergency Push Button	<b>RECP</b>	Receptacle
<b>FS</b>	Flow Switch	<b>SOL</b>	Solenoid
<b>FU</b>	Fuse	<b>SS</b>	Selector Switch
<b>GND</b>	Ground	<b>SSR</b>	Solid State Relay
<b>HTR</b>	Heater	<b>T</b>	Transformer
<b>INST</b>	Instrument	<b>TAS</b>	Temperature Actuated Switch
<b>LS</b>	Limit Switch	<b>TB</b>	Terminal Block
<b>LT</b>	Pilot Light	<b>T/C</b>	Thermocouple
<b>MTR</b>	Motor	<b>TR</b>	Timing Relay
<b>OL</b>	Overload	<b>UPS</b>	Uninterruptable Power Supply



# Paragon Operator Control Panel







## START UP THE OVEN

- .Turn on the facilities power switch.
- Turn on the Oven main power switch.
- Turn on UPS. Waiting 30 seconds.
- .Turn on the instrument switch.
- .Turn on PC.
- .Waiting the Wincon linking.
- .Open a Recipe.
- .Run the Recipe.
- Pushing the Master Start Buttom.
- .Waiting going to Ready.
- .Test profile.



## SHUTTING DOWN THE OVEN

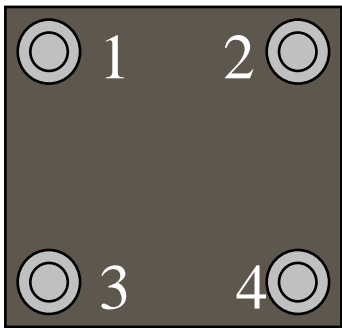
- .Run the Cooldown Recipe.
- .Waiting 45 minutes.
- .Run the Shutoff Recipe.
- .Exit the Wincon.
- .Exit the Windows.
- Pushing the Master Stop Button
- Turn off the Instrunment switch.
- .Turn off the UPS.
- .Turn off the main power switch.
- Turn the facilities power switch.



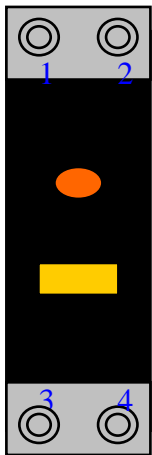
# *Electronic Controls & Components*

- ☺ Solid State Relays
- ☺ Fuses and Circuit Breakers
- ☺ Control Relays & Contactors
- ☺ Timing Relays

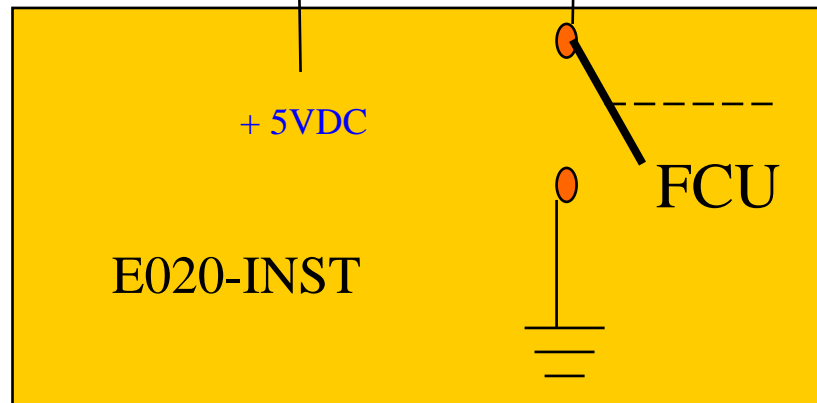
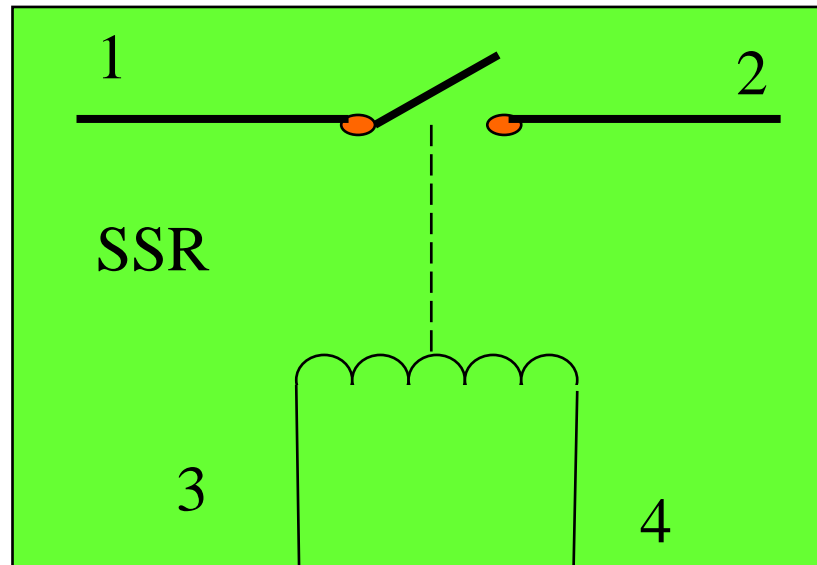
# Solid State Relays



**Heater SSR**

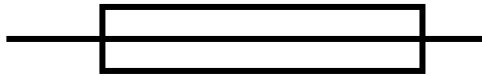


**Control SSR**



# Fuses & Circuit Breakers

**FU**

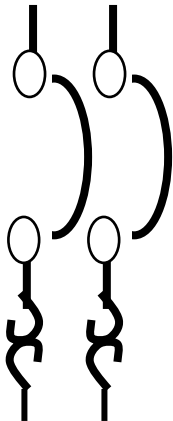


**Fuse Symbol**

**CB's**

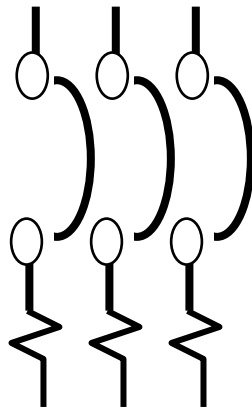


1-Pole



2-Pole w/Thermal

Overload device



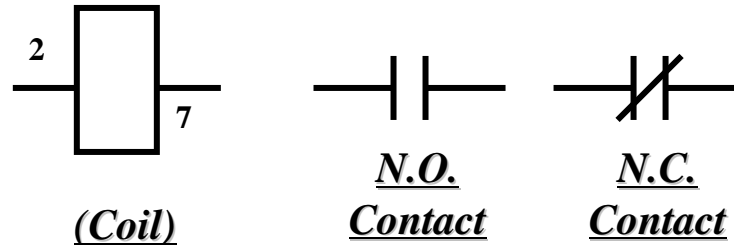
3-Pole w/Magnetic

Overload device

**Circuit Breaker Symbol**



# Control Relays & Contactors



## Control Relay Types



VOLTAGES - 24, 120, & 240 VAC  
24 VDC



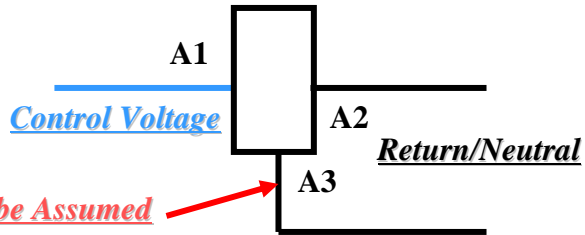
# OF Pins - 5 Pin - 1 Control Legs/Contacts  
8 Pin - 2 Control Legs/Contacts  
11 Pin - 3 Control Legs/Contacts



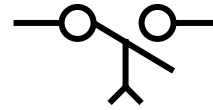
**Contactors - Used for High Voltage and High Current Needs usually at or above 120 VAC, dependent upon system needs. Additional contacts may be added.**

# Timing Relays

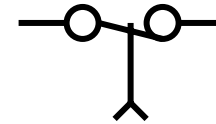
**TDM**



(Coil)

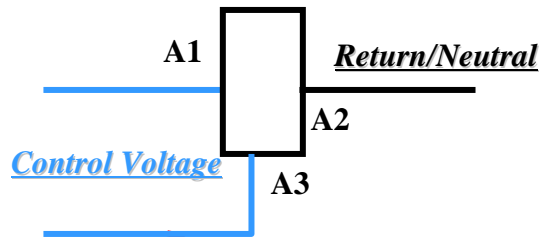


(N.O.)

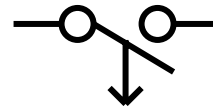


(N.C.)

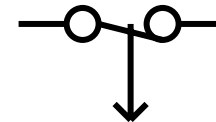
**TDB**



(Coil)



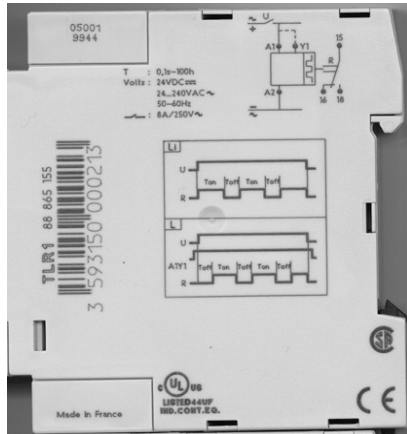
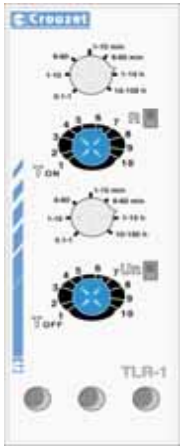
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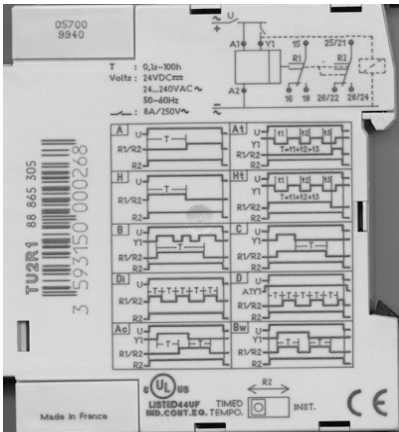
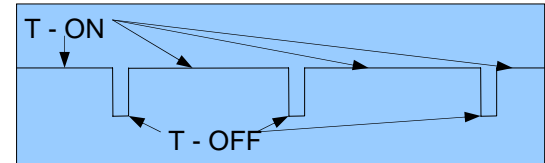
(N.C.)



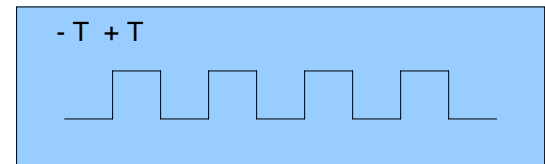
# Multi-Functional Timing Relays



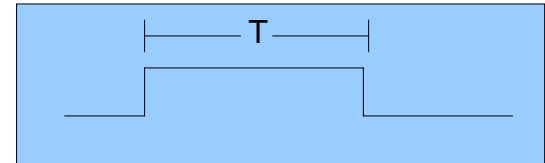
**T030-TR** -FLUX Cleaning Cycle  
ASYMETRICAL Recycler  
Mode L1 - Flip Flop  
Default Setting = 3 Hrs ON  
4 Min OFF



**D190-TR** - N2 Idle Indicator  
Repeat Cycle Timer  
Mode D - Flip Flop  
Default Setting = 2 Sec



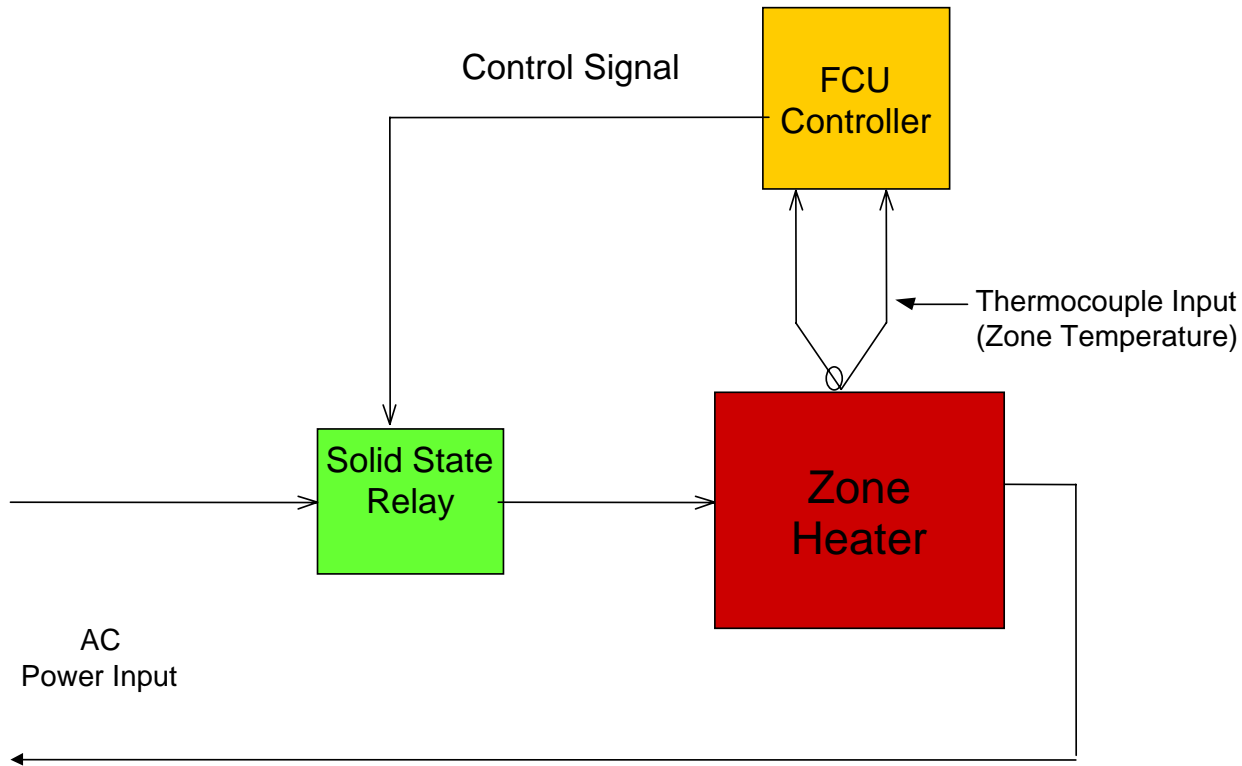
**G440-TR** - Water Flow Interlock  
Mode B - Single Shot  
Default Setting = 3 Sec







# Heater Controls & Components



Acrobat Document

5182398



# *PID Algorithm*

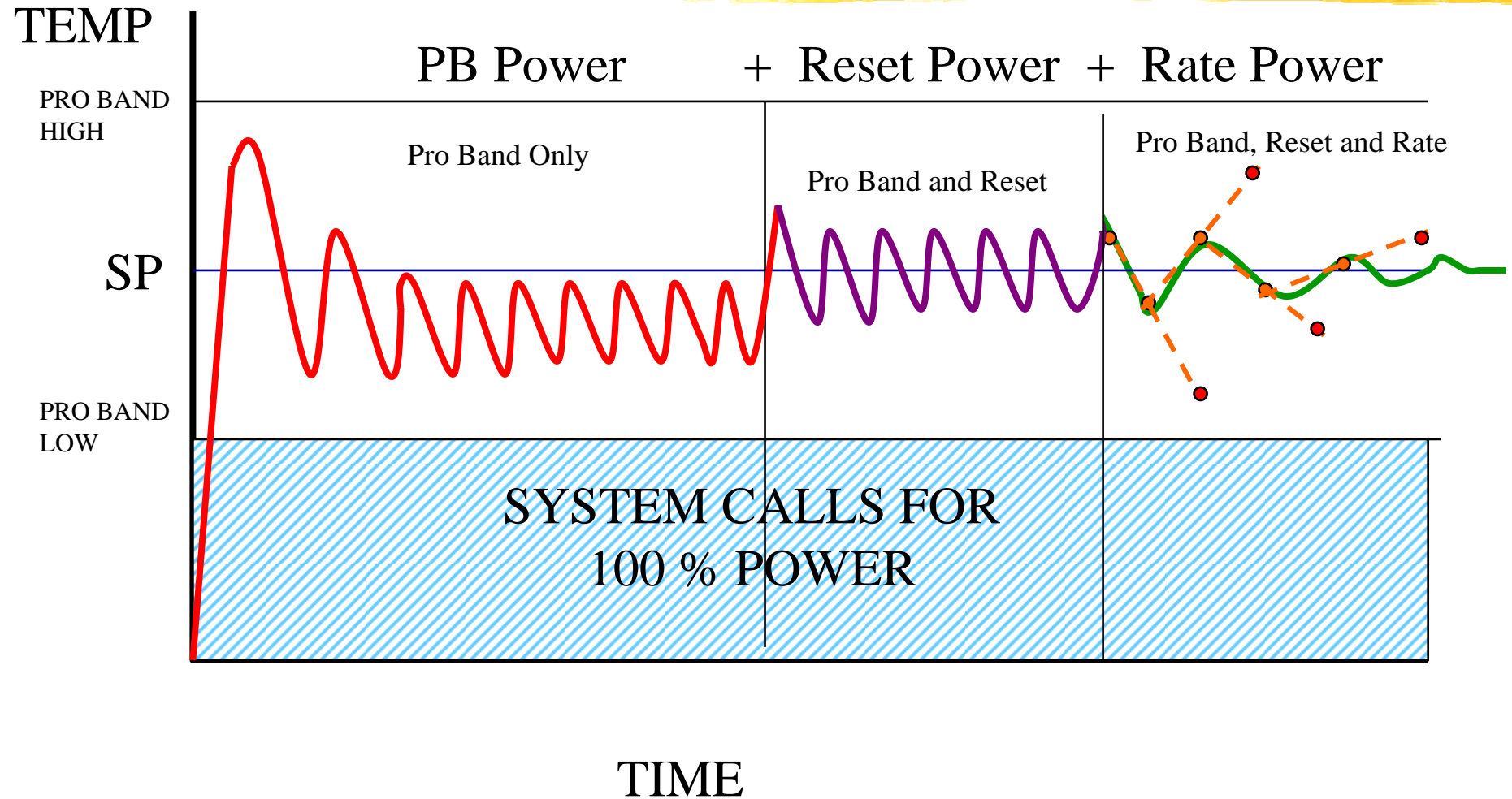
 P = Proportional Band (Pro-bands)

 I = Intergral (Reset)

 D = Derivative (Rate)

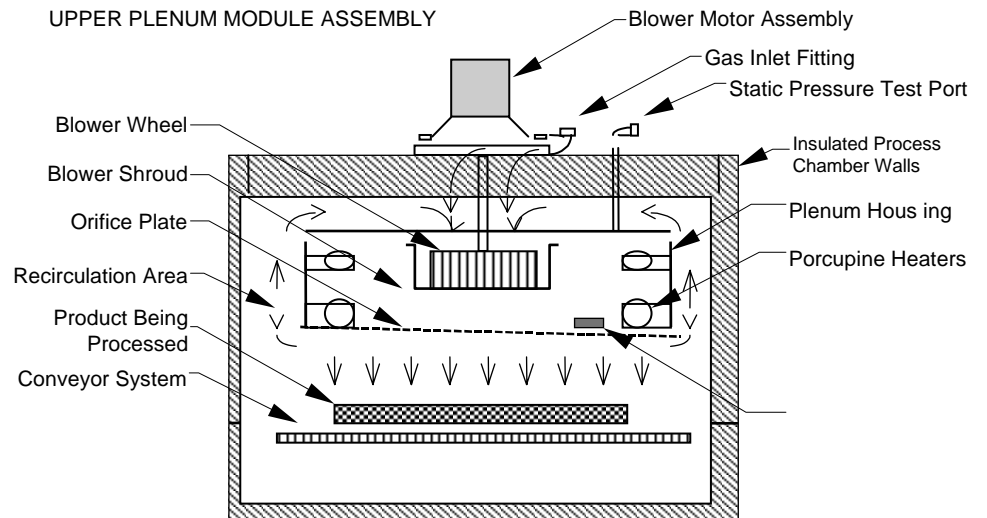


# PID Algorithm





# Gas Feed Plenum



Acrobat Document

Zones 1 thru 6

5113243



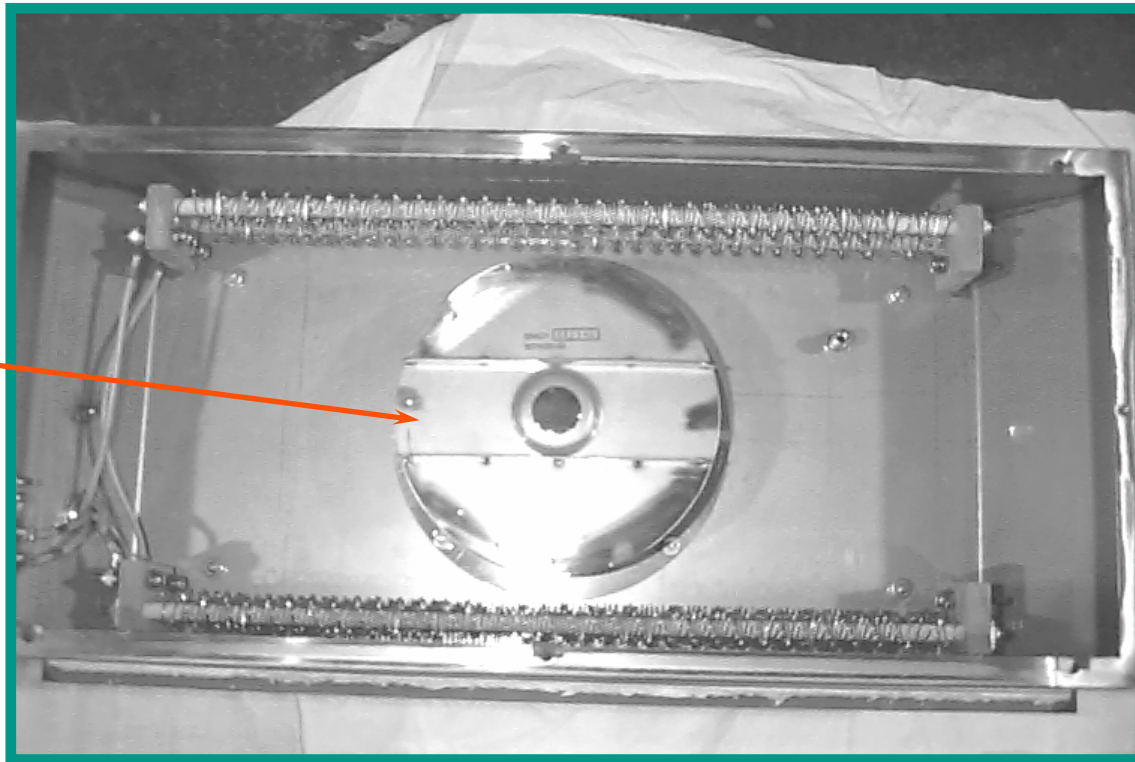
Acrobat Document

Zone 7

5113273

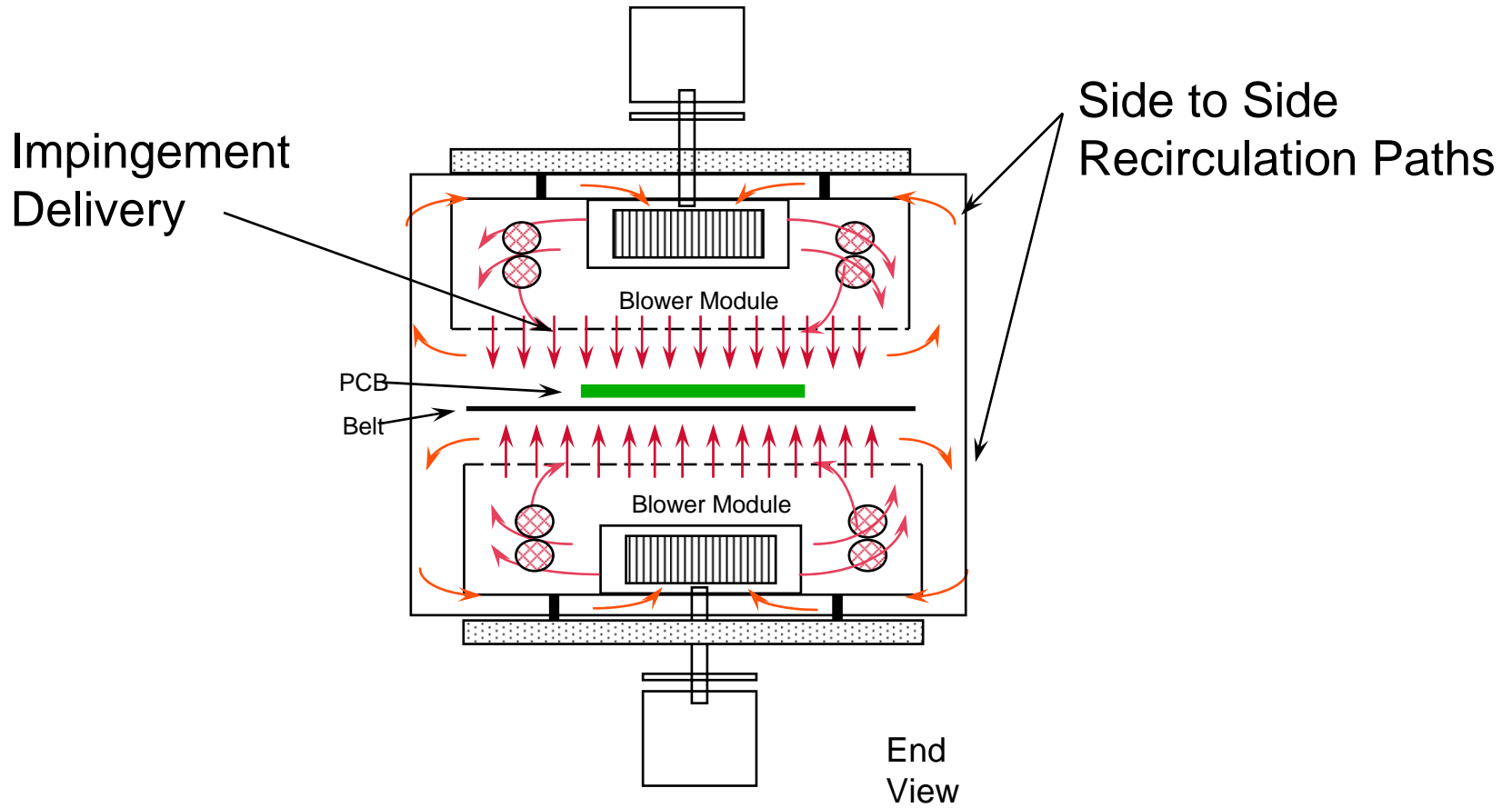


# Blower Plenum Module

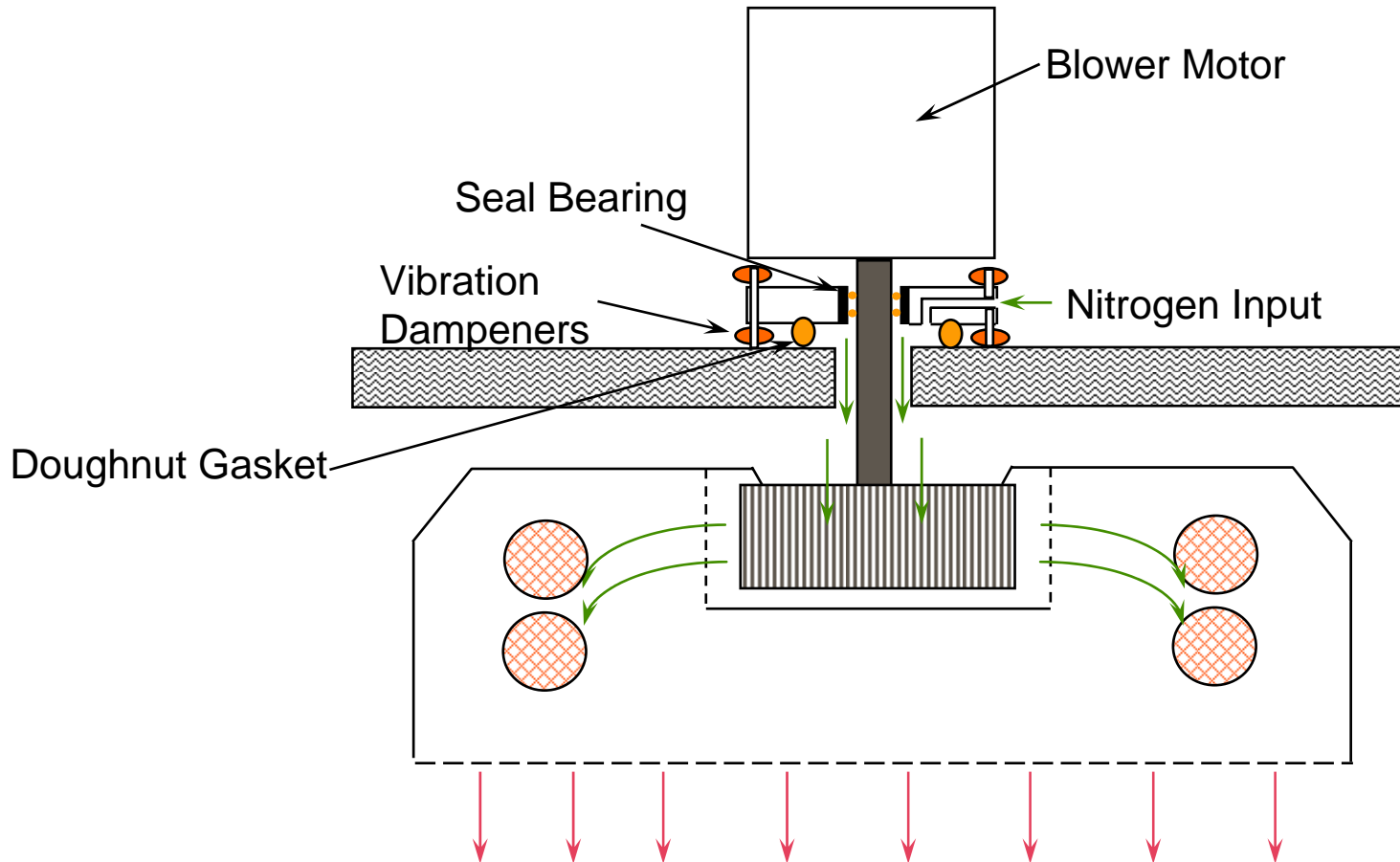


Blower Outlet  
Scroll

# Plenum Module Dynamics

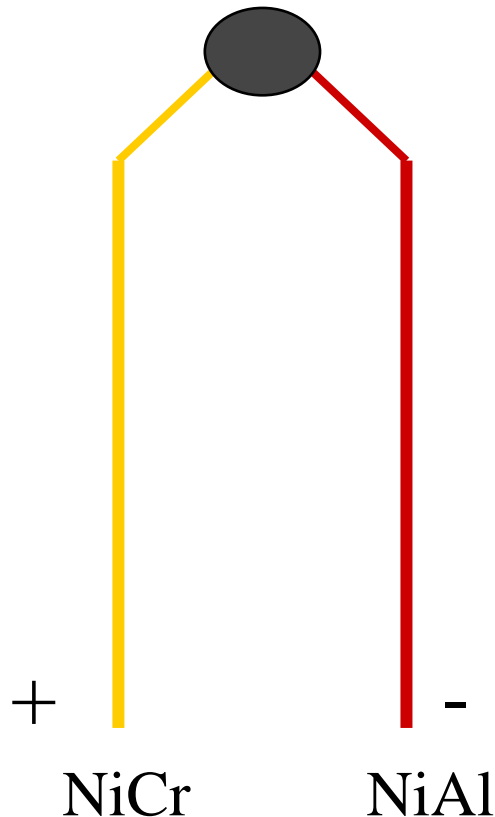


# Nitrogen Feed



# Heater Controls & Components

## T/C Troubleshooting



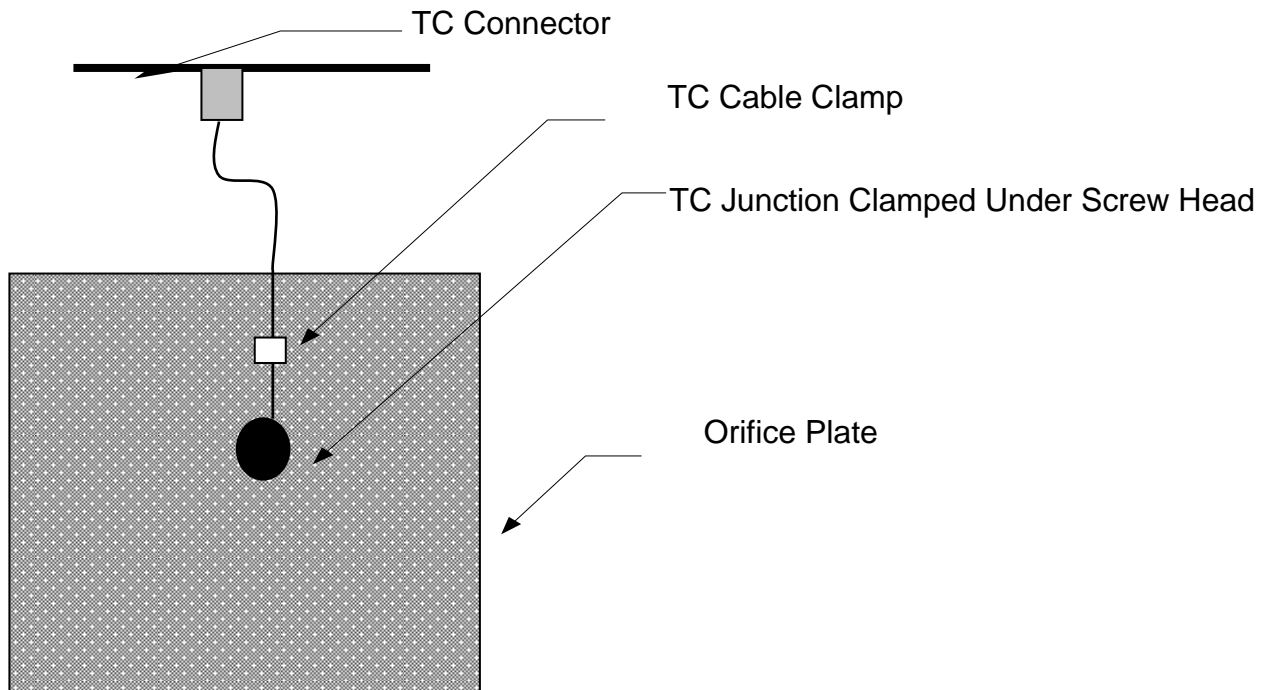
1. Open T/C
2. Shorted within the Zone
3. Shorted outside the Zone
4. Mis-Wired T/C





# Heater Controls & Components

## Thermocouple Position



Acrobat Document



# Over-Temperature Protection



## WINCON Temperature Deviation Alarm



Alarm Level

10 ° C

190 ° C



Alert Level

5 ° C

185 ° C

Setpoint

180 ° C

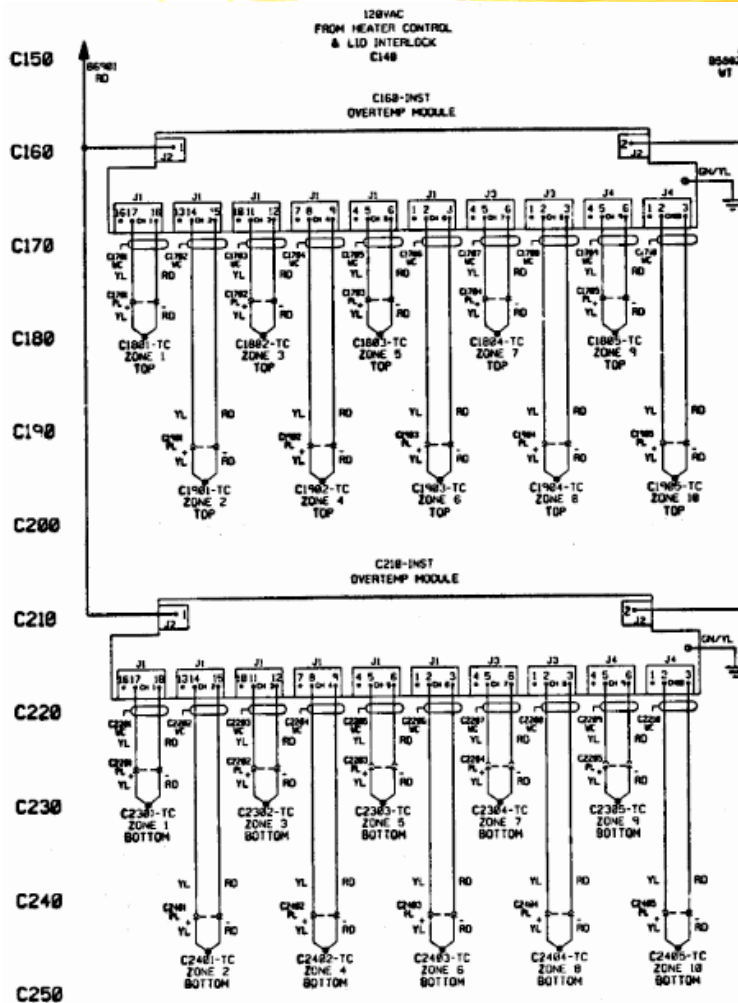
180 ° C

When the FCU senses 190 ° C it will generate a signal that will de-energizes the B450-CON (Heater Power Contactor).



# Paragon-TRS

## Over-Temperature Protection



TRS =  
275 ° C

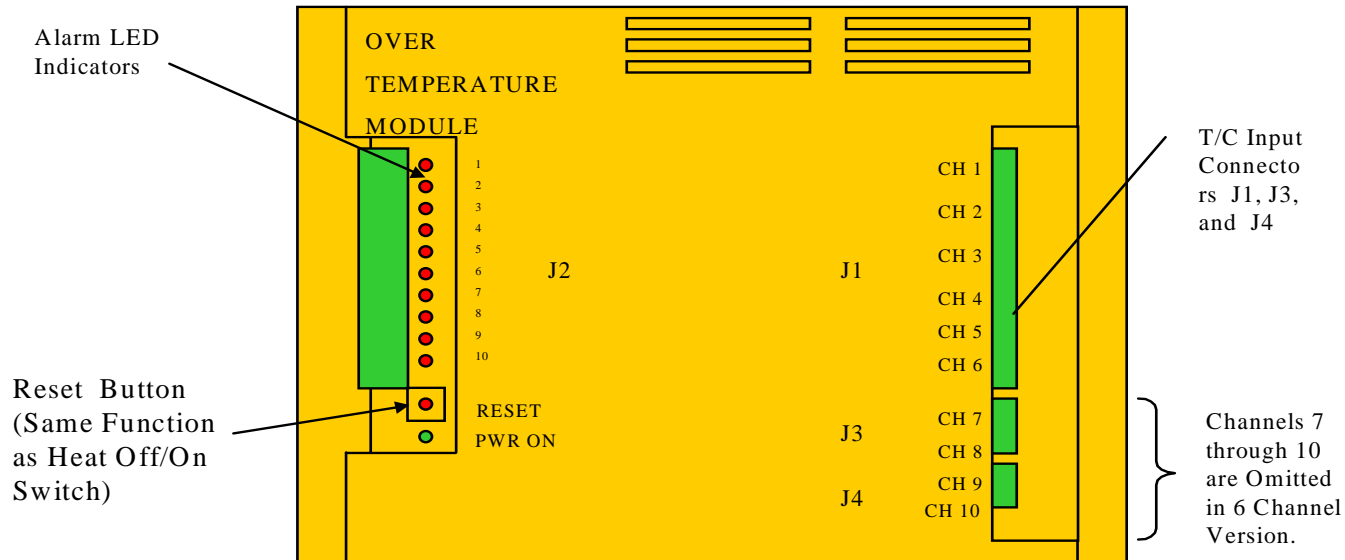
Paragon =  
315 ° C



Acrobat Document

Drawing 5169739

# Over-Temperature Protection

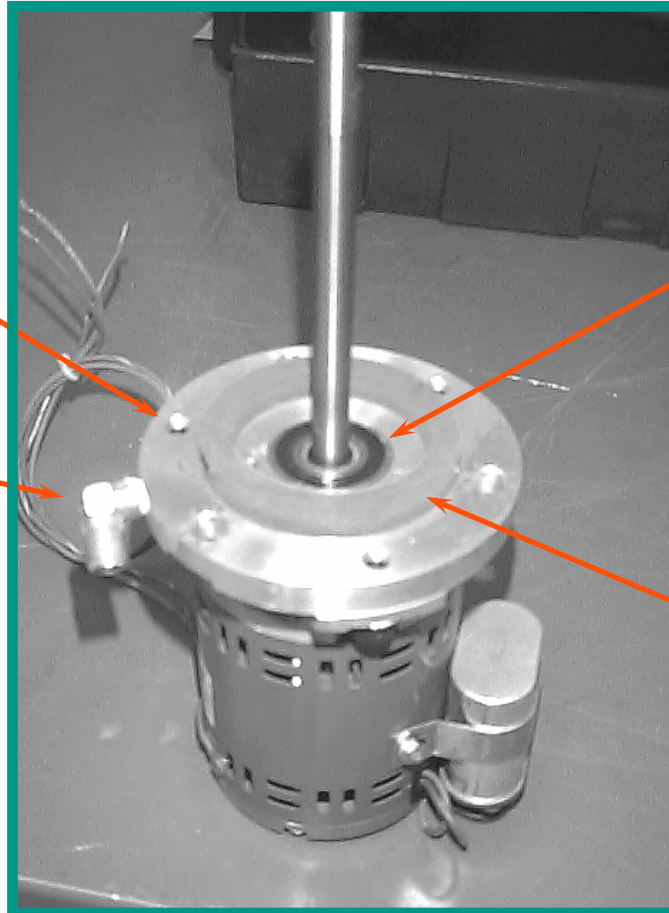


- The Overtemperature Module's setpoints are preset at the factory (to 275°C) and should not be changed.
- Each heated zone is monitored by an overtemperature T/C that is independent from the zone control circuitry. If any zone exceeds the preset safe maximum temperature, the overtemp condition causes the module to shut off all heater power (219-CON) and generates an alarm with the PCDIU software. Conveyor is maintained running.

# Blower Motor

Motor Mounting

N2 Inlet

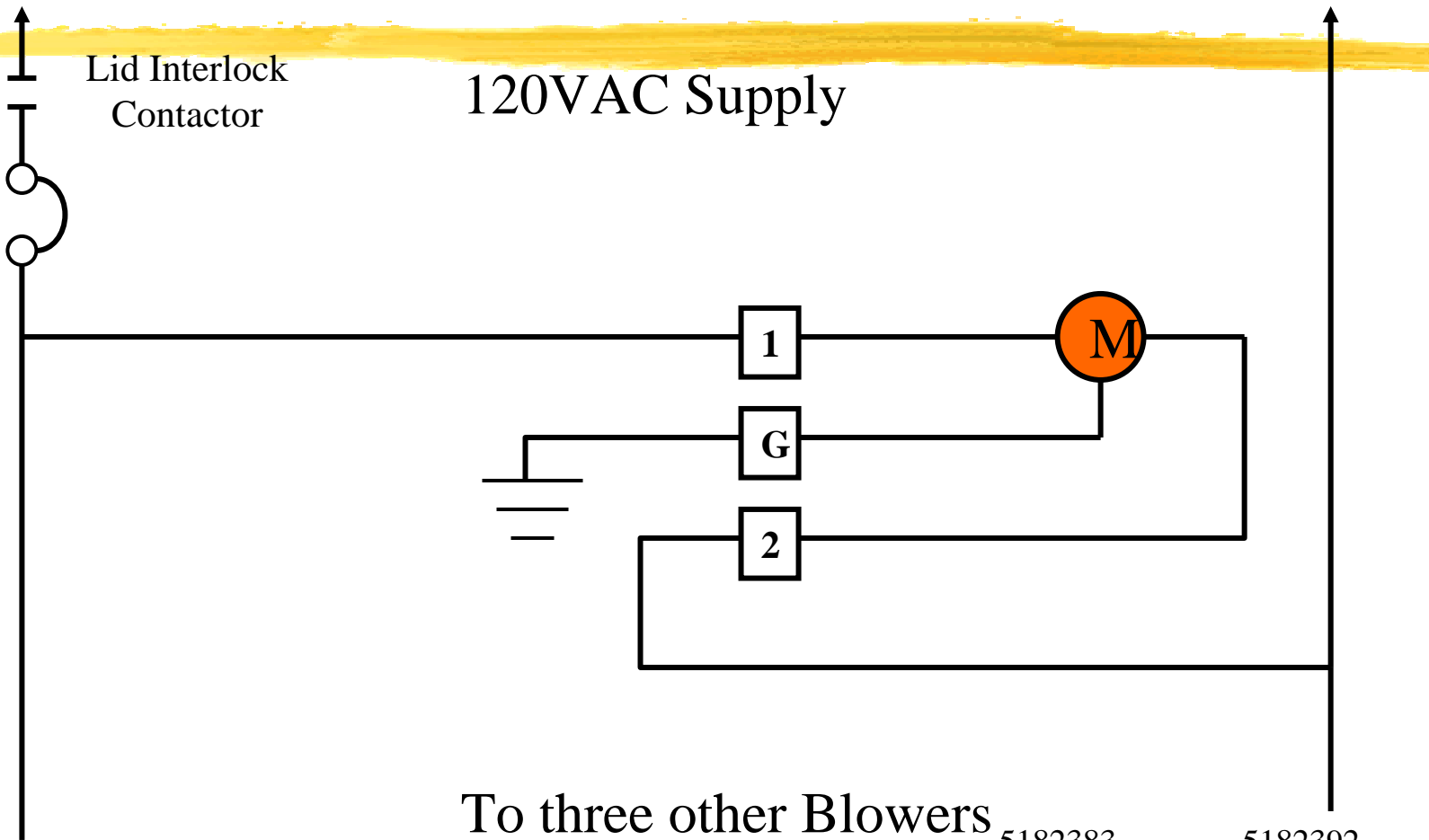


Shaft Seal

Doughnut Seal



# Blower Power (Standard)



To three other Blowers

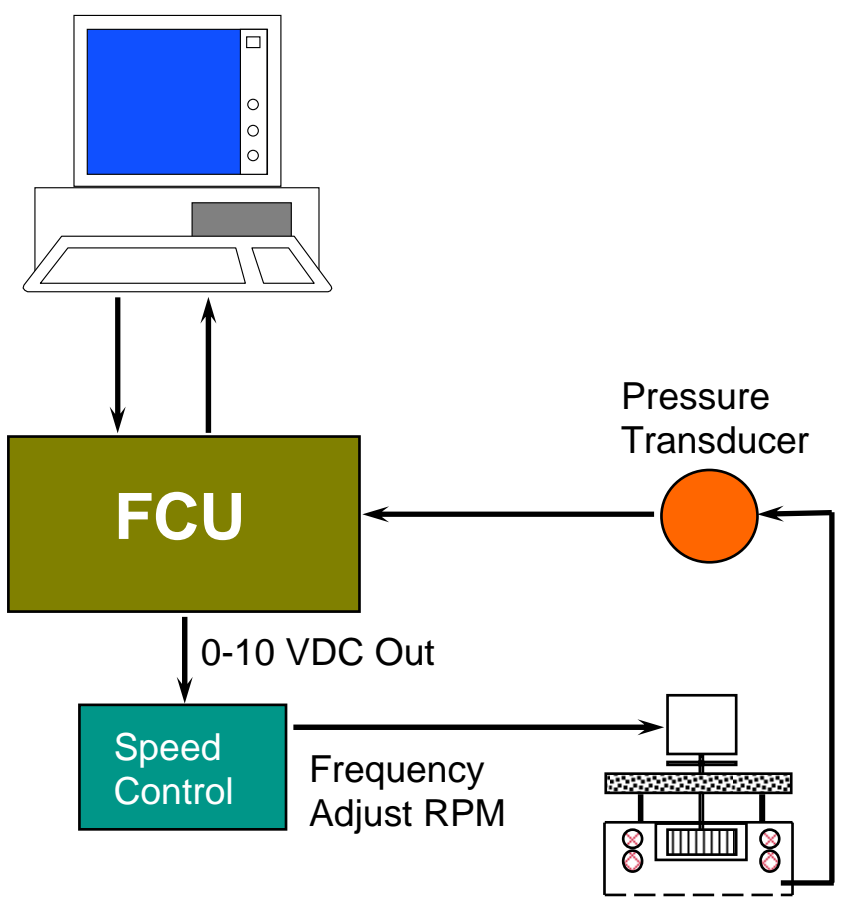
5182383  
Distribution

5182392  
Blower Circuits





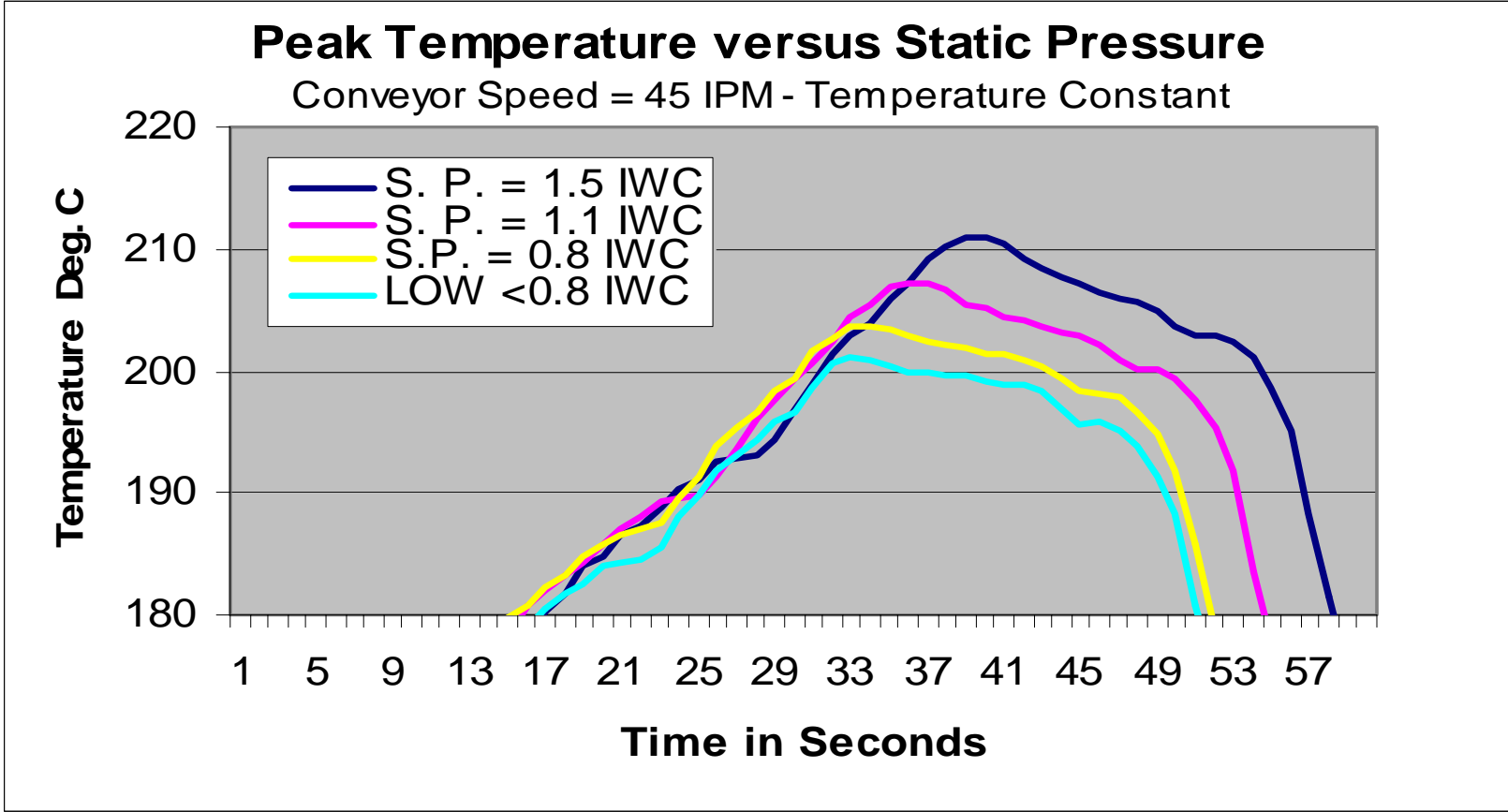
# Closed Loop Blower Speed Control



- ⌘ Developed for *0402, 0201, Flip Chip, CSP & now lead-free*
- ⌘ Insures Repeatable Process Control
- ⌘ Closed Loop Control of Convection via Static Pressure with a programmable range of 0.5" - 1.2" IWC
- ⌘ Recipe storage of all parameters



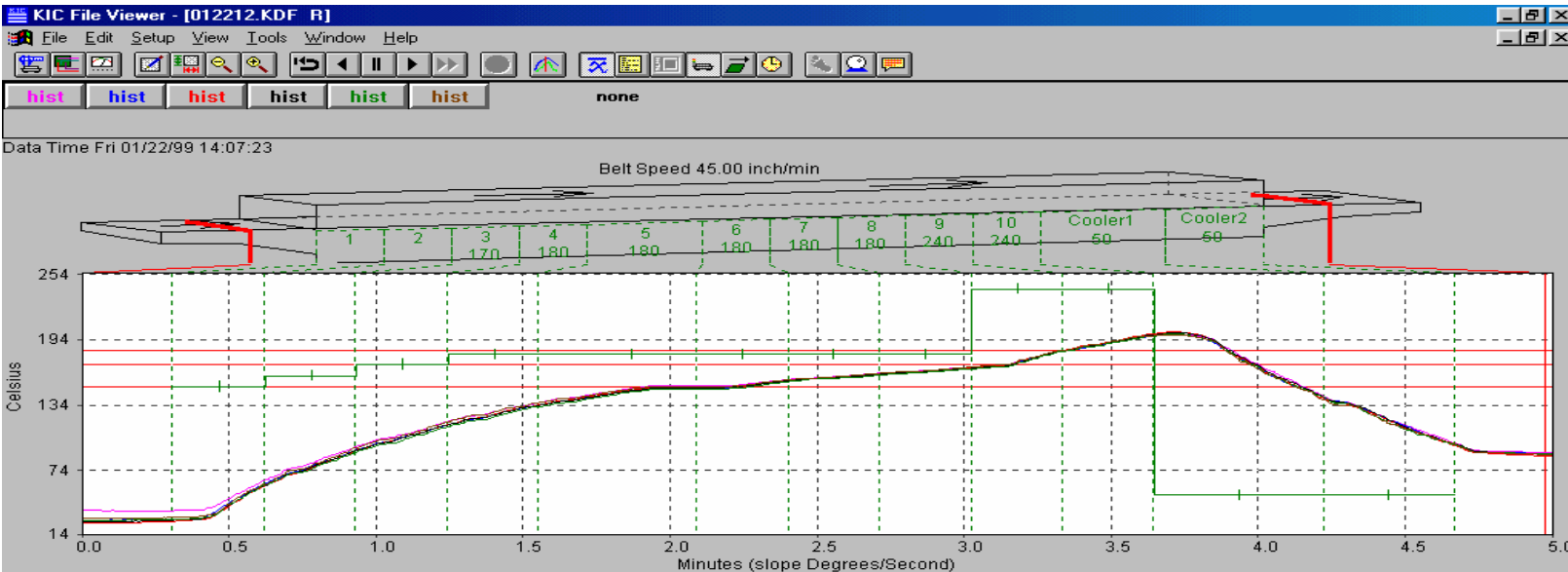
# Static Pressure Affects Peak Temperature







# Static Pressure 1.5 IWC



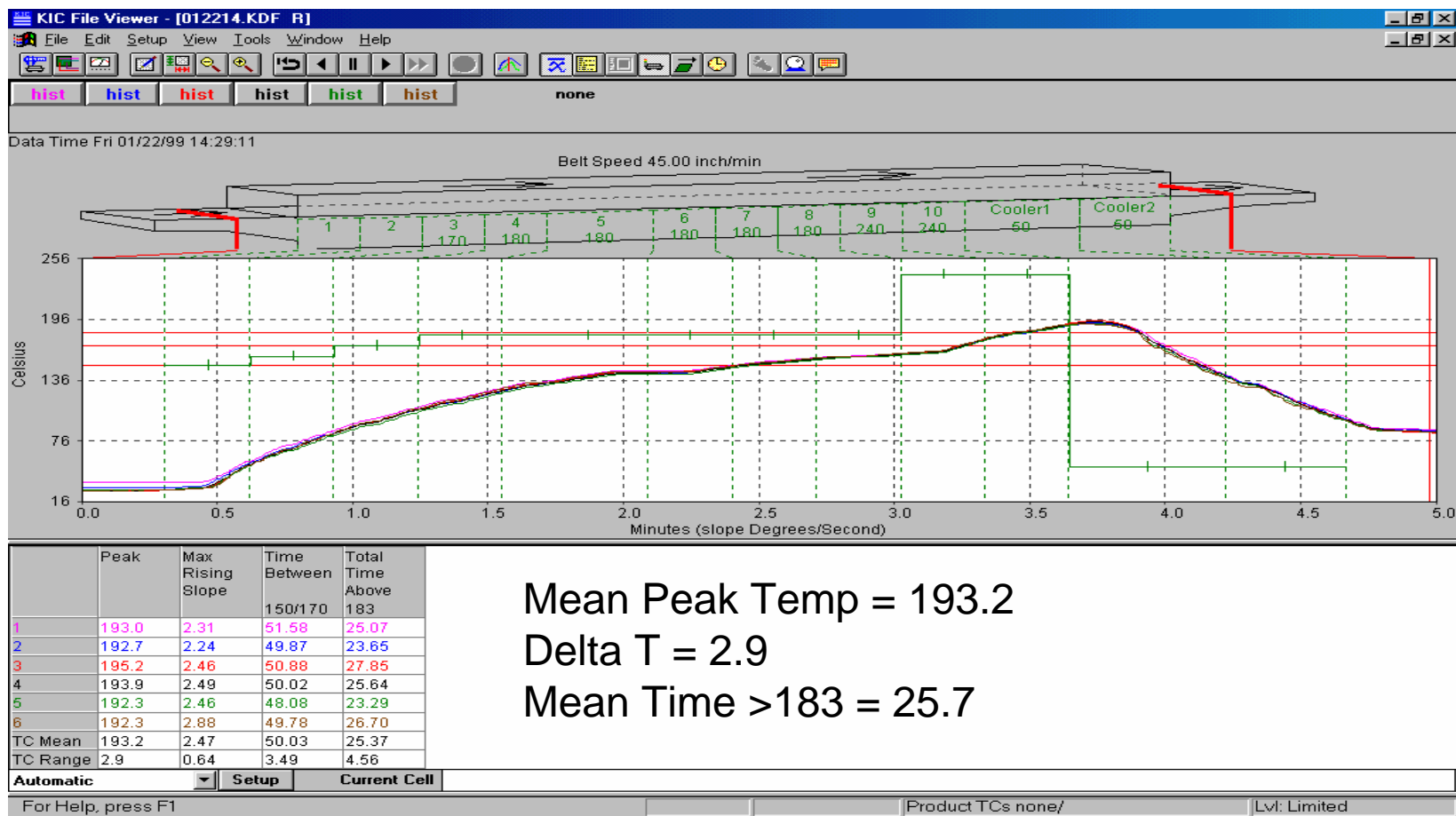
	Peak	Max Rising Slope	Time Between	Total Time Above
			150/170	183
1	198.5	2.47	73.34	33.53
2	197.8	2.66	54.71	32.35
3	200.2	2.78	56.54	33.80
4	199.7	2.80	55.12	33.50
5	198.3	2.85	53.78	31.96
6	197.7	3.15	63.50	32.64
TC Mean	198.7	2.78	59.50	32.96
TC Range	2.5	0.68	19.56	1.85

Mean Peak Temp = 198.7  
 Delta T = 2.5  
 Mean Time >183 = 32.96

Automatic Setup Current Cell  
 For Help, press F1 Product TCs none/ Lvl: Limited

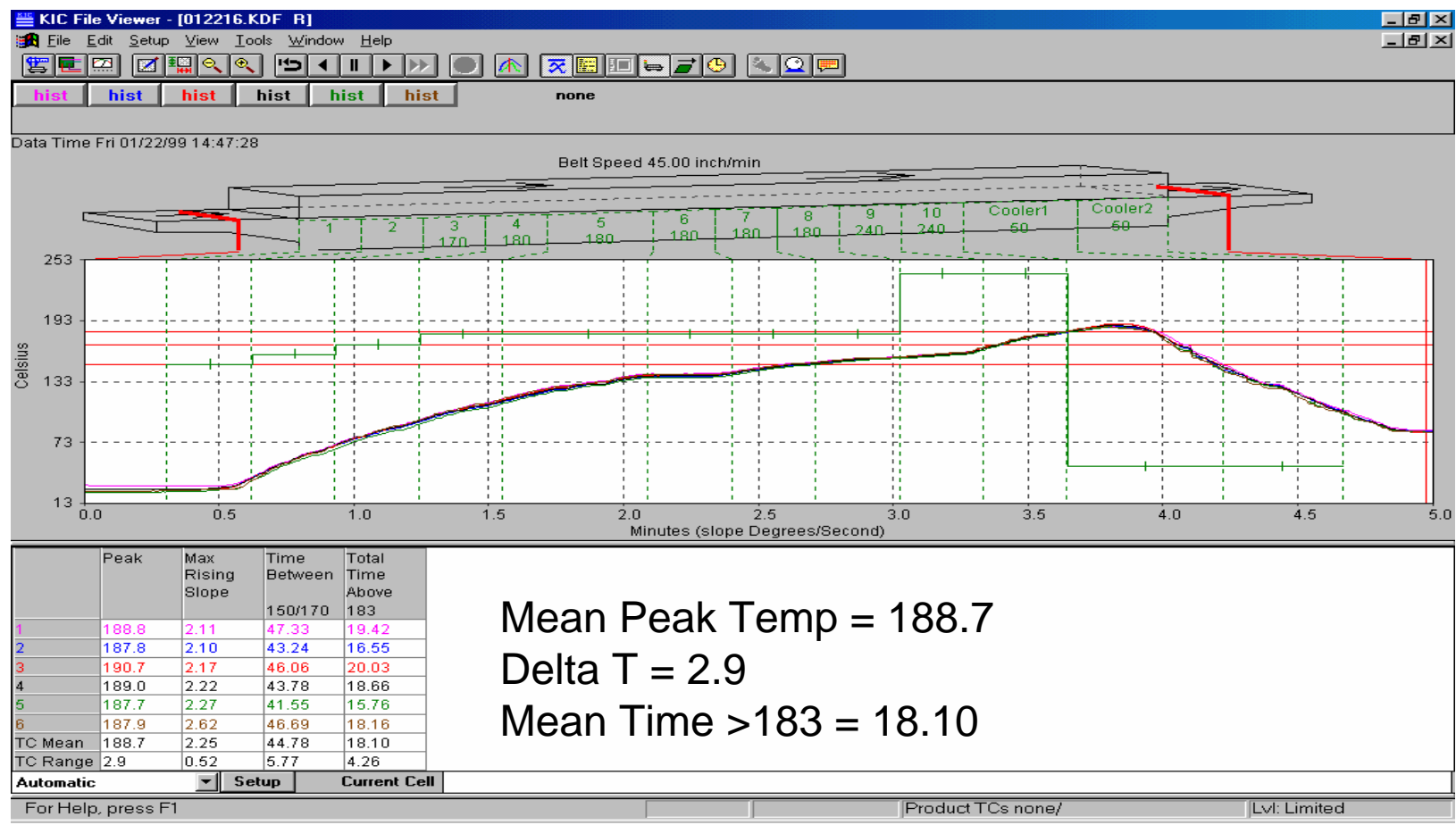


# Static Pressure 1.1 IWC





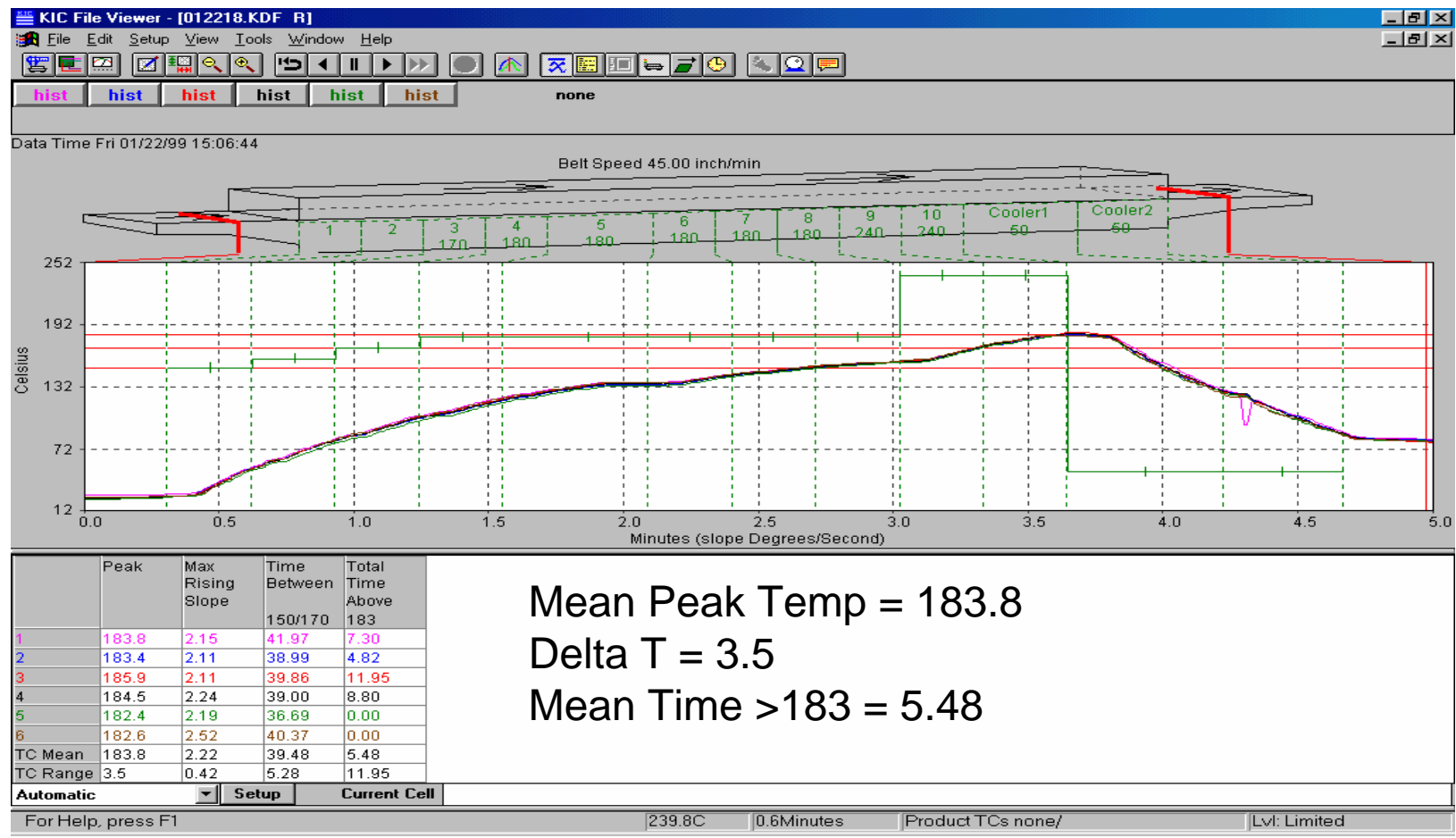
# Static Pressure 0.8 IWC



Mean Peak Temp = 188.7  
 Delta T = 2.9  
 Mean Time >183 = 18.10

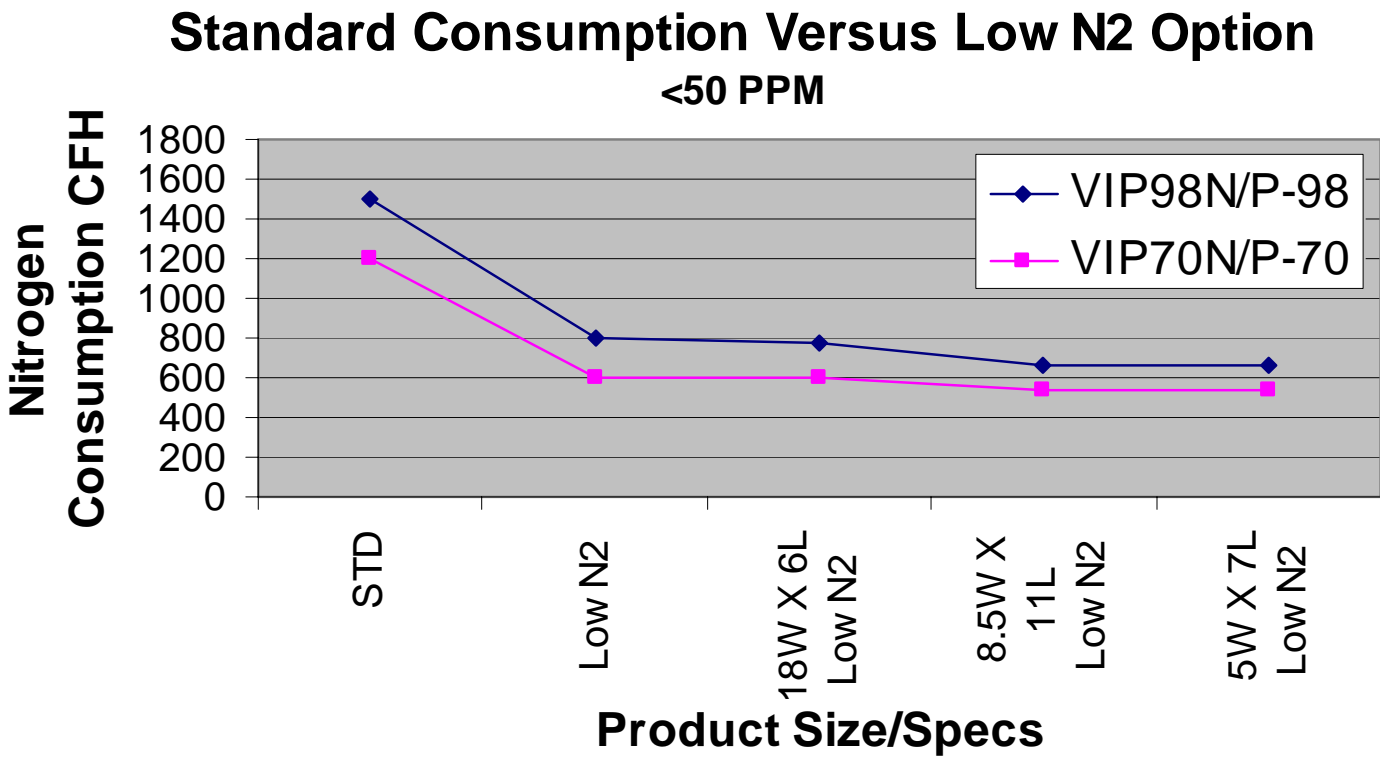


# Static Pressure <0.8 IWC



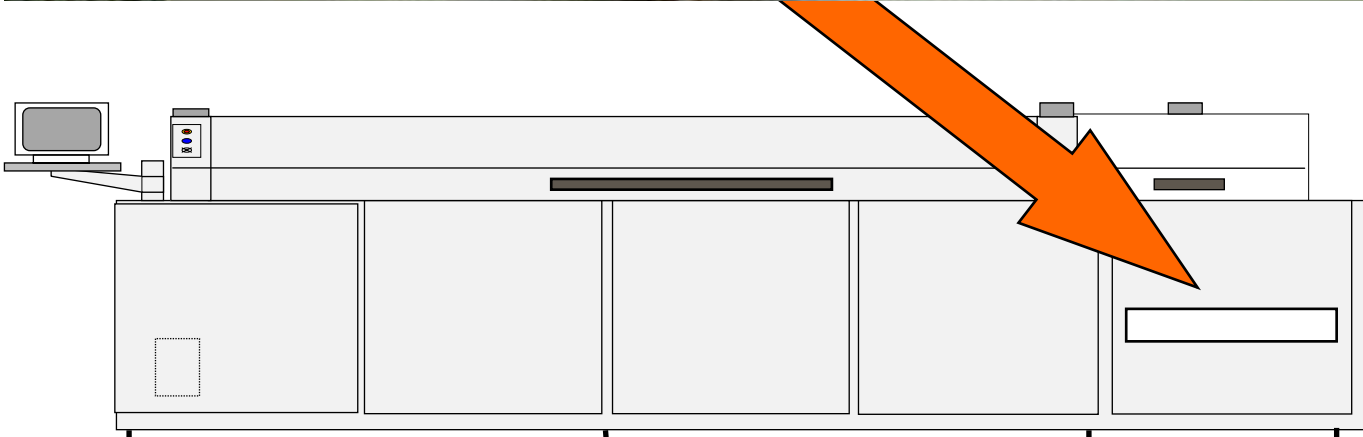


# N2 Consumption





# Plenum Gas Feed Flowmeters





## *P150 Plenum Gas Feed Flowmeters w/flux Management*

Entrance Curtain Top & Bottom	2 Flowmeters	75/75 LPM
Zone 1/2/3 Top	1 Flowmeter	70 LPM
Zone 1/2/3 Bottom	1 Flowmeter	70 LPM
Zone 4/5/6 Top	1 Flowmeter	40 LPM
Zone 4/5/6 Bottom	1 Flowmeter	40 LPM
Zone 8 Top & Bottom	1 Flowmeter	60 LPM
Zone 9/10 Top	1 Flowmeter	40 LPM
Zone 9/10 Bottom	1 Flowmeter	40 LPM
Cooler Jets	1 Flowmeter	0 LPM
Exit Curtain Top & Bottom	2 Flowmeters	10/10 LPM



## *Paragon/VIPN Regulator Settings*

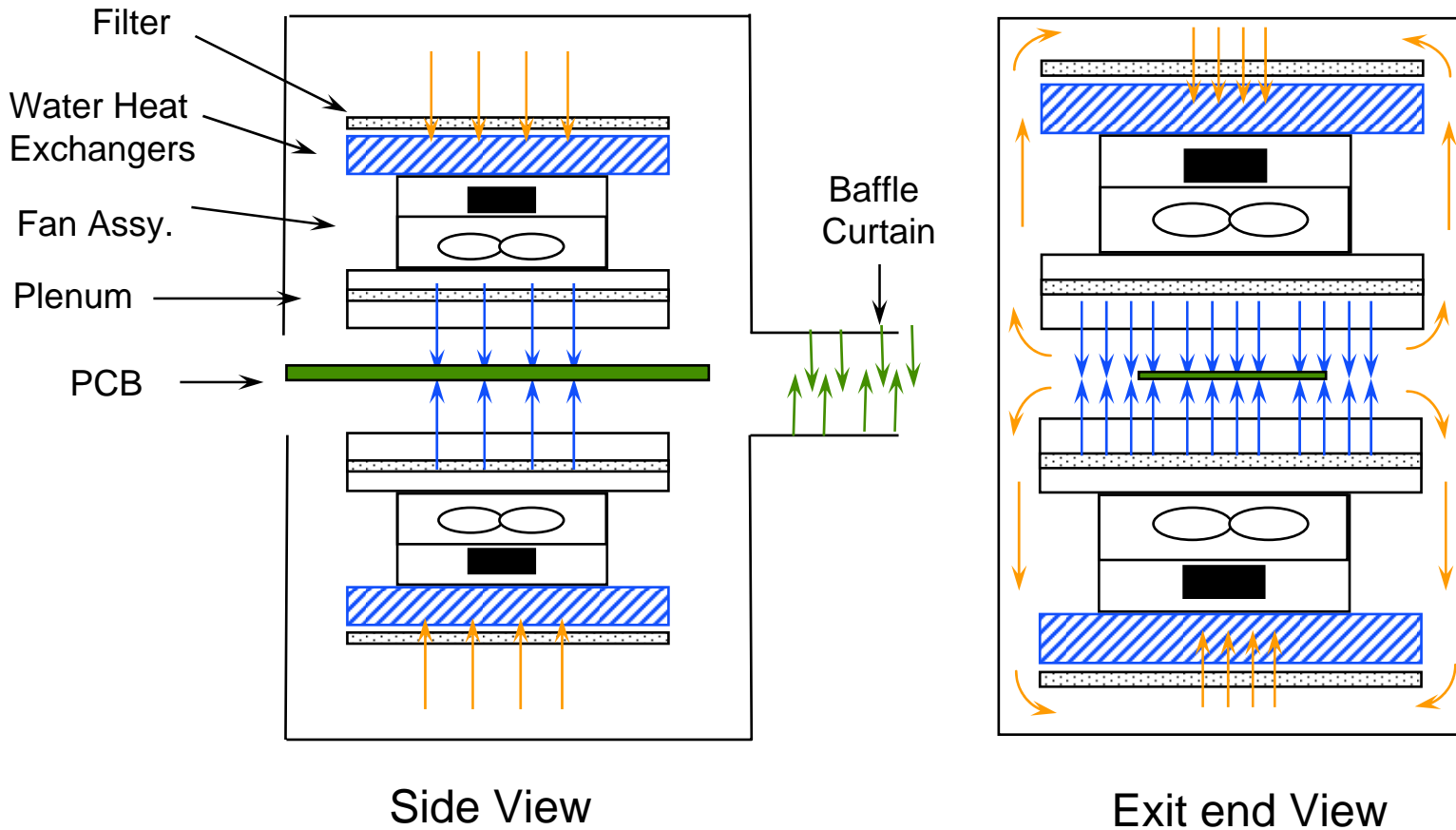
- Inlet N2 Pressure: 60 PSIG (4.14 Bar)
- Dynamic Idle Pressure: 35 PSIG (2.41 Bar)
- Fast Purge Pressure: 20 PSIG (1.38 Bar)

*Fast purge flows at 1600 SCFM for 30 min.*

*And consumes 800 Cubic Feet of Nitrogen*



# Single Cooler



Side View

Exit end View



Acrobat Document



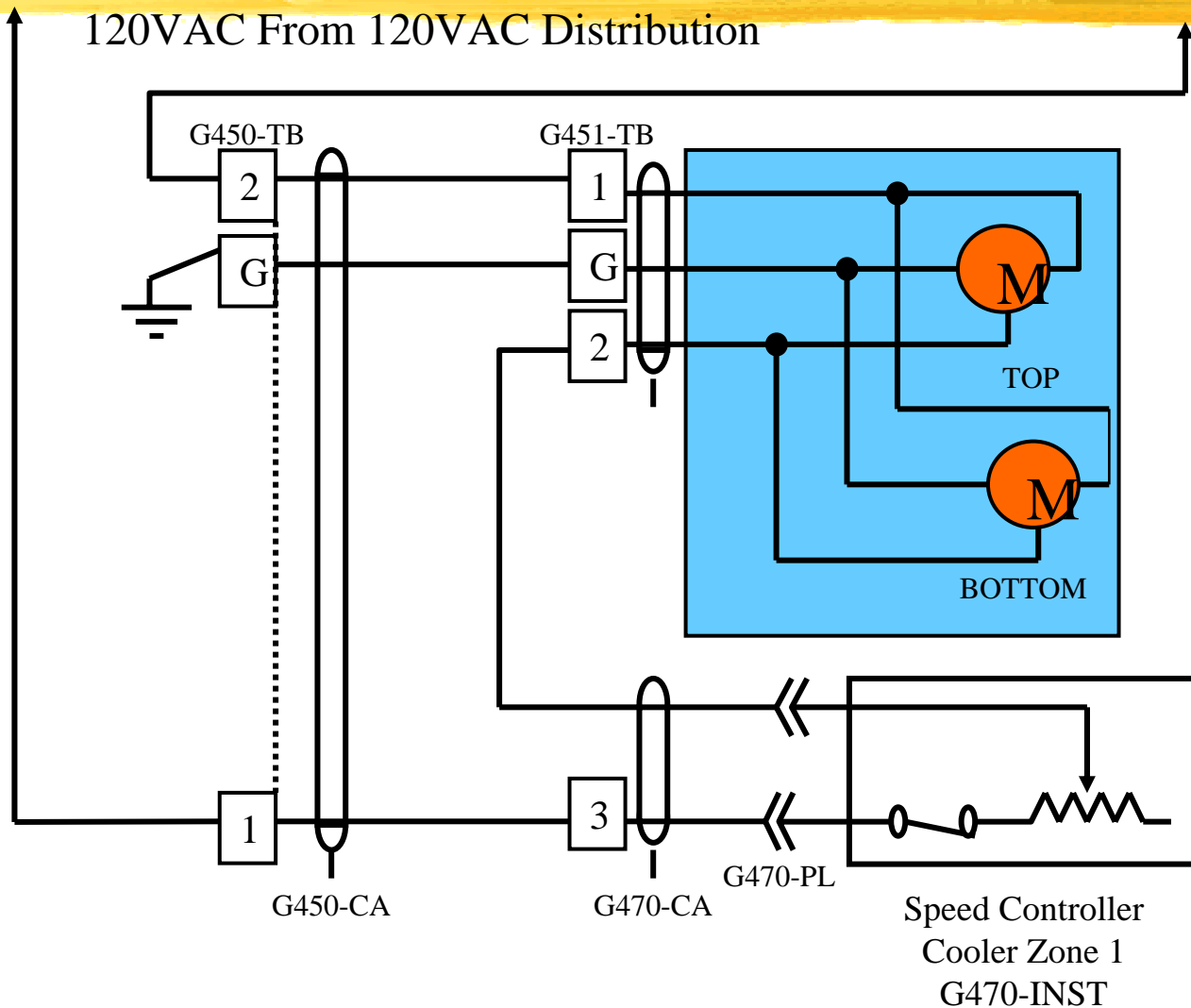
Acrobat Document



Acrobat Document

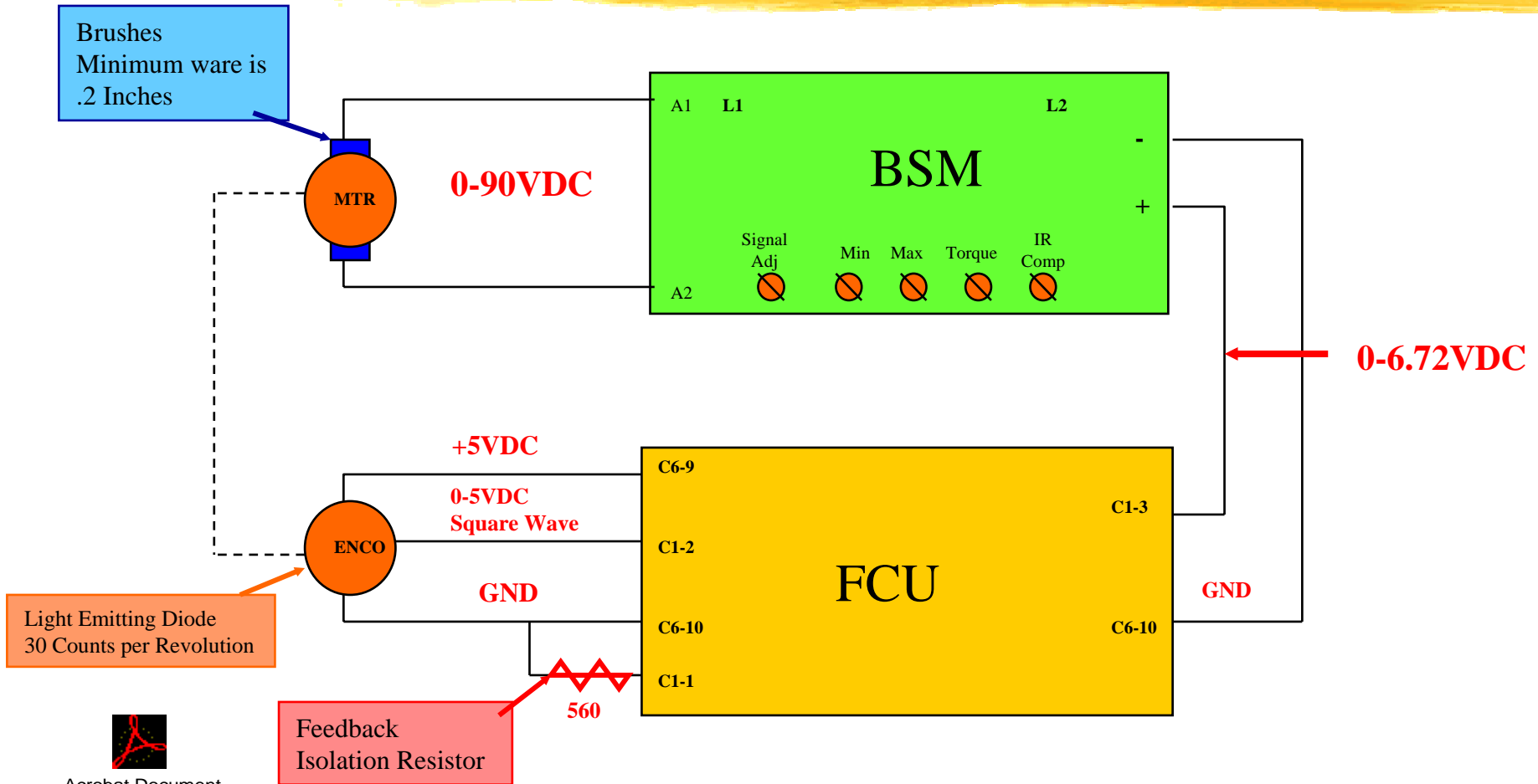


# Cooling Controls





# Conveyor Controls and Components

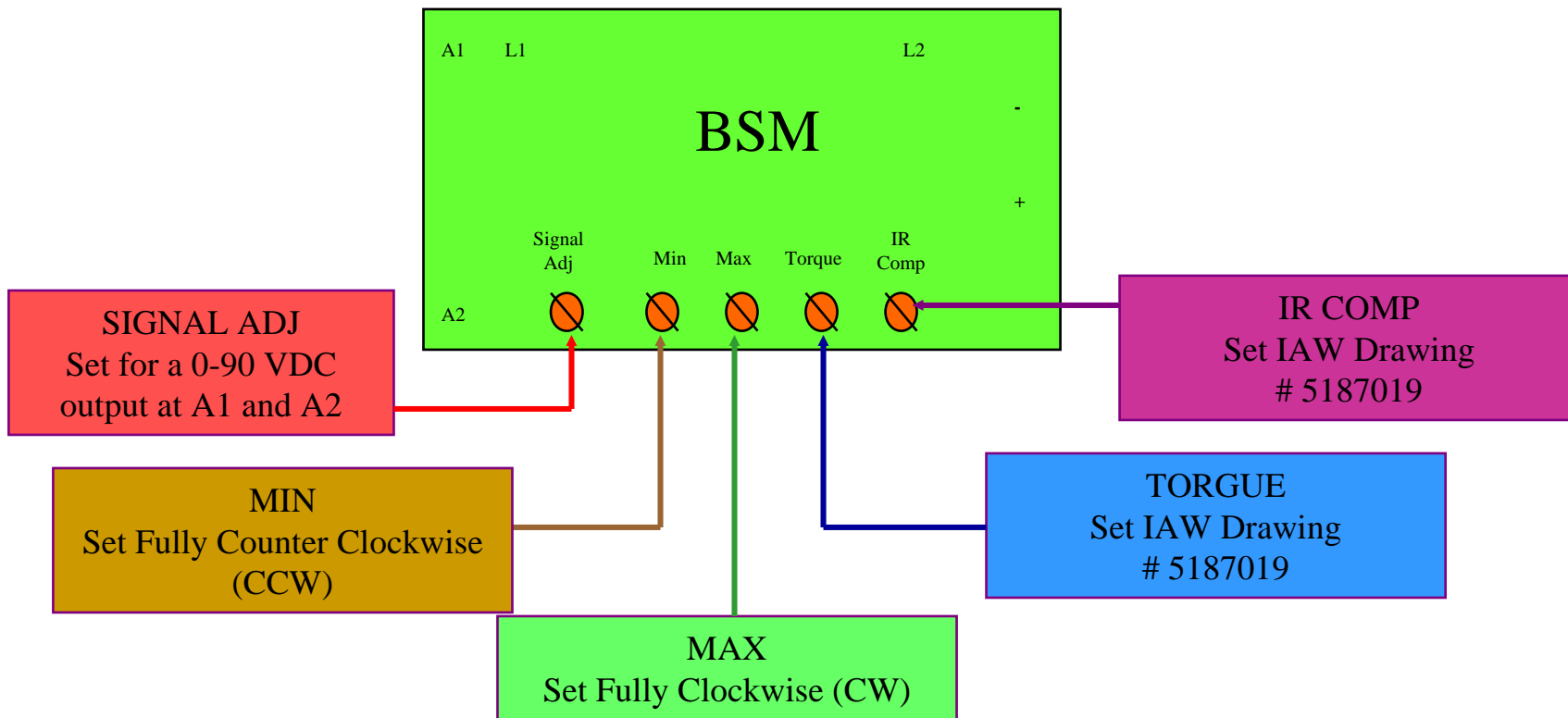


Acrobat Document

5182385



# BSM Potentiometers



Reference Drawing # 5187019





# Conveyor Belt

Belt Type, Material.....302 Stainless Steel Flat Flex  
Belt Type, Width.....22”  
Belt Speed, Nominal.....30 IPM  
Belt Speed, Range.....10-60 IPM





# Conveyor Belt and rail Specifications

- ⌘ Belt type material.....302 Stainless Steel Flat Flex
- ⌘ Belt Type Width.....22"
- ⌘ Speed, Nominal.....30 IPM
- ⌘ Speed, Range.....10-60 IPM
- ⌘ Speed Control Accuracy.....  $\pm 0.1$  IPM

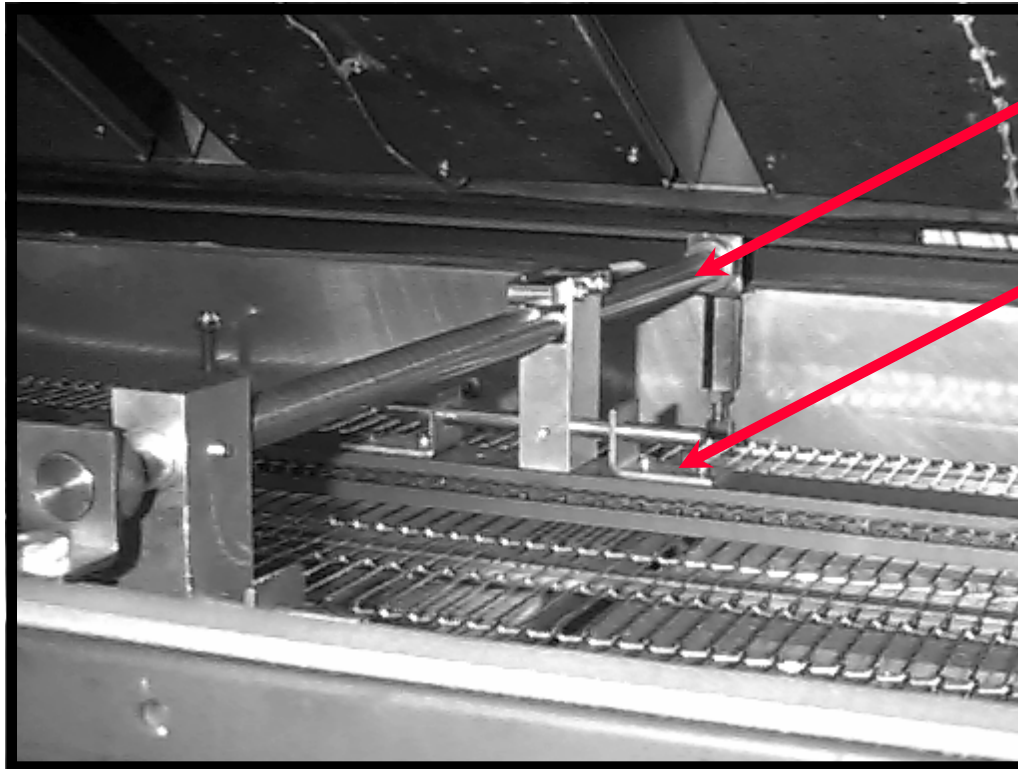


# Edge Conveyor Specifications

- Optional Edge Conveyor.....#35 Roller Chain in an Extrusion
- Edge Conveyor Width Adjustment.....2" to 18"
- Support Pin Length .....0.187 "
- Pin to Pin Distance.....0.375"
- Support Pin Height Clearance.....1.2" above top of pin  
0.8" below top of pin



# Edge Conveyor Features



Round Rail Support Shaft  
Less Friction (drag)

Simplified Sheetmetal  
Brackets



Acrobat Document

5113408

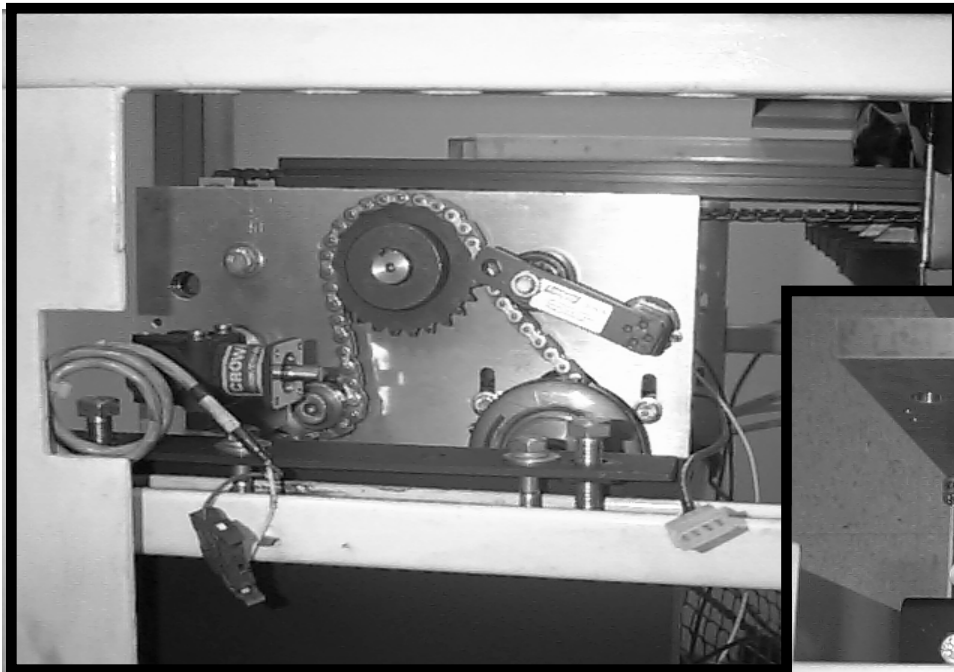


Acrobat Document

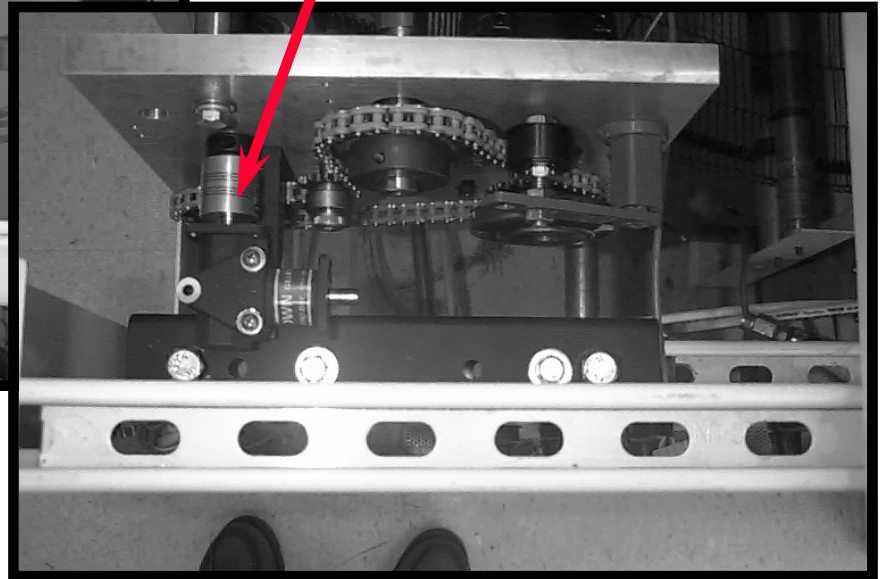
5113409



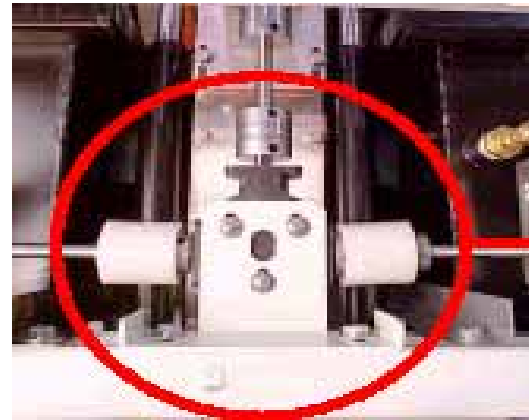
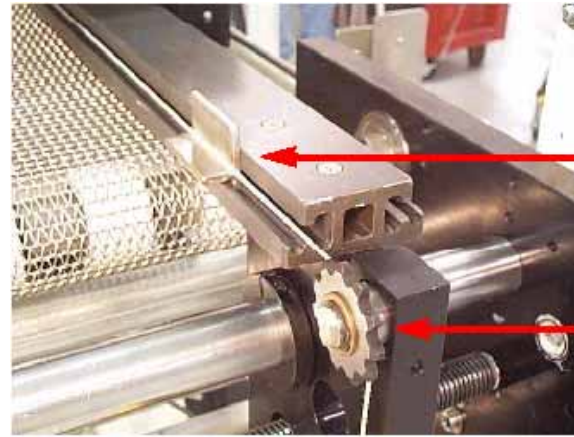
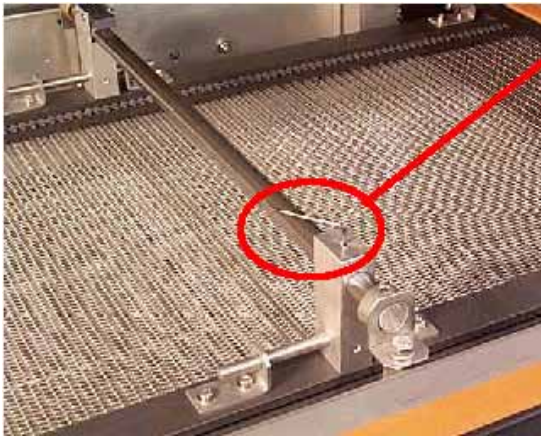
# Edge Conveyor Features



Flexible Coupling



# Edge Conveyor



Acrobat Document

5113187



Acrobat Document

5114028

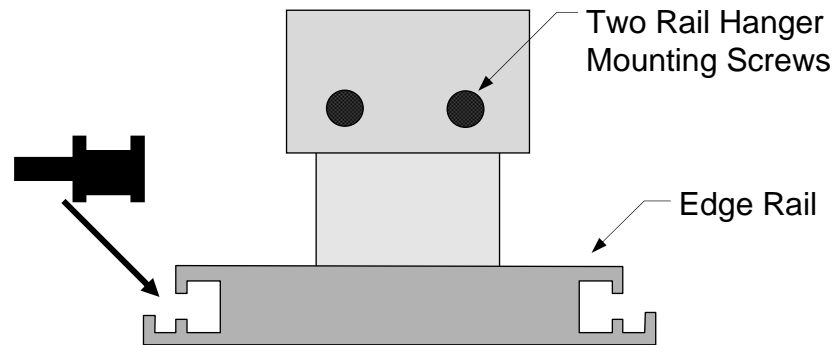


Acrobat Document

5114029

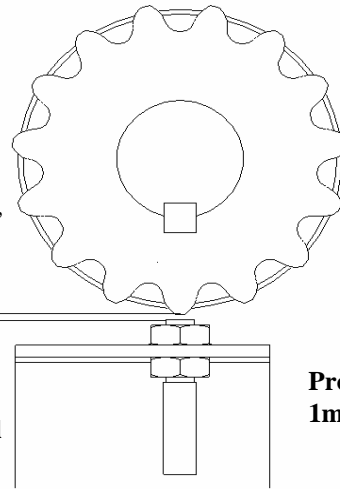


# Edge Conveyor Guide Rail System





# Conveyor Protection (New)



15 Tooth Gear

0.005" +/- 0.002"

The Proximity Switch has a small sensing range so the setting is very Important.

Proximity Switch Sensing Range:  
1mm (1/32") Maximum Distance

In this example with a 15 Tooth Gear the Proximity Switch sees 15 Pulses per revolution

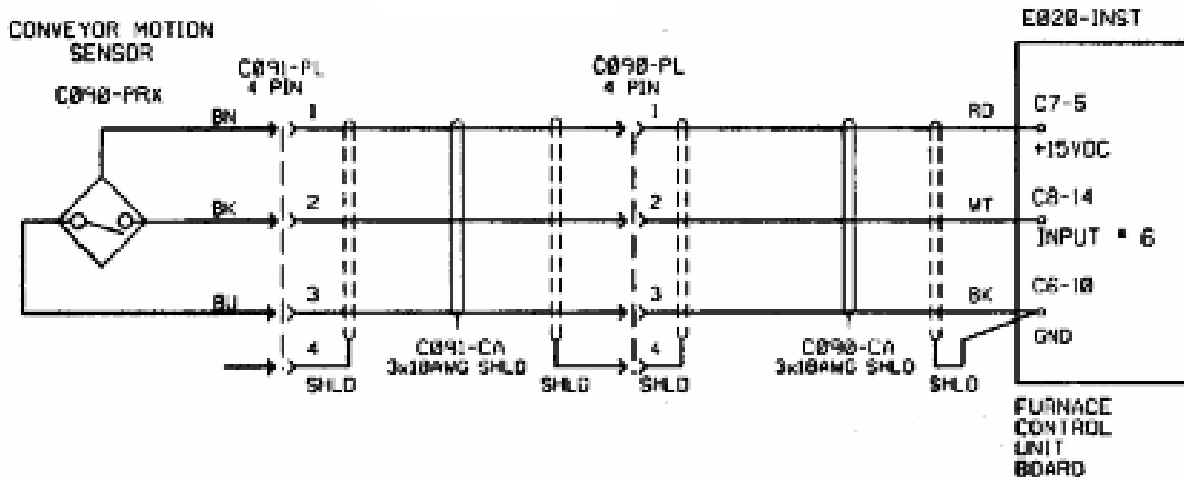
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C080 thru C100

C080

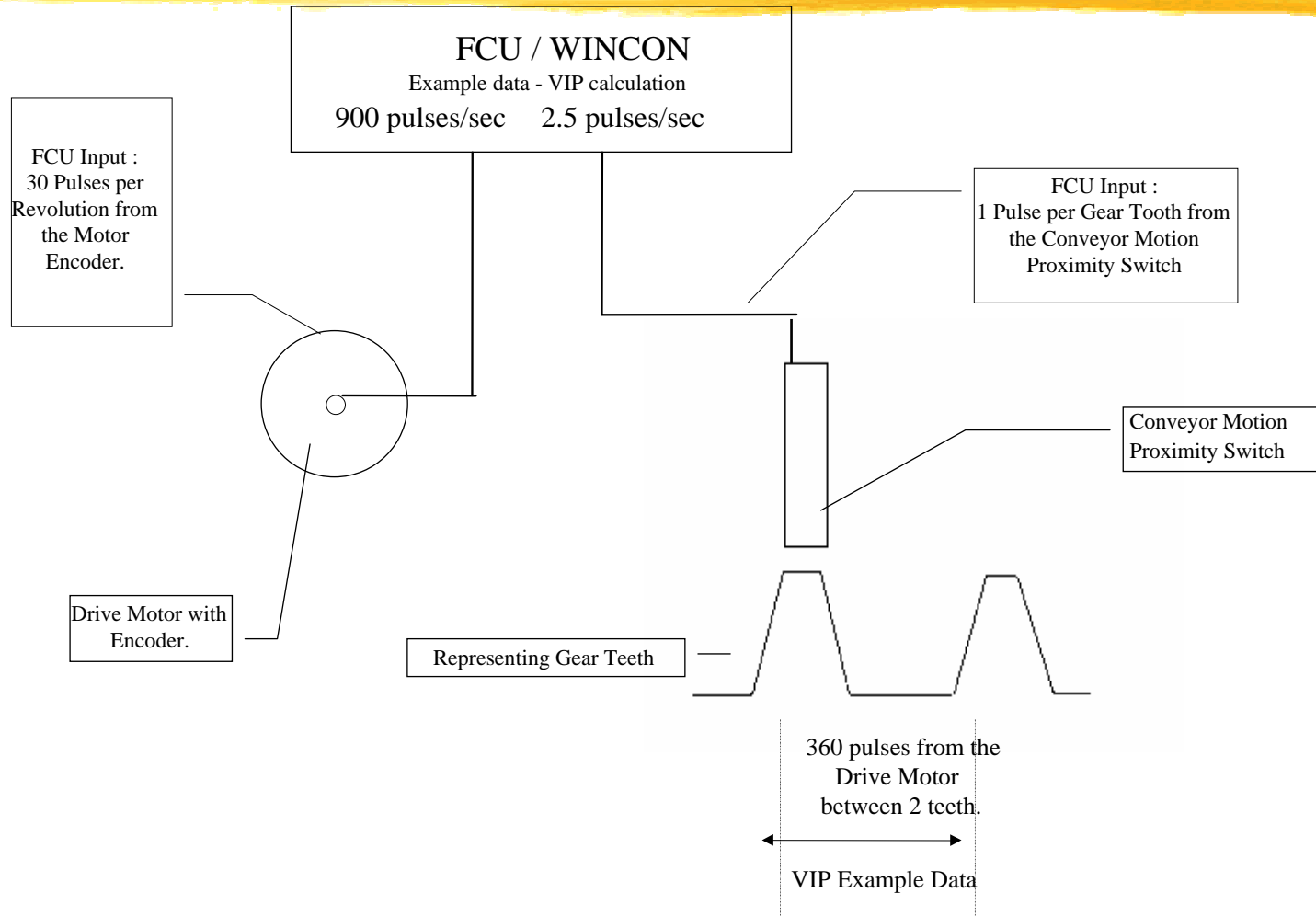
C090

C100



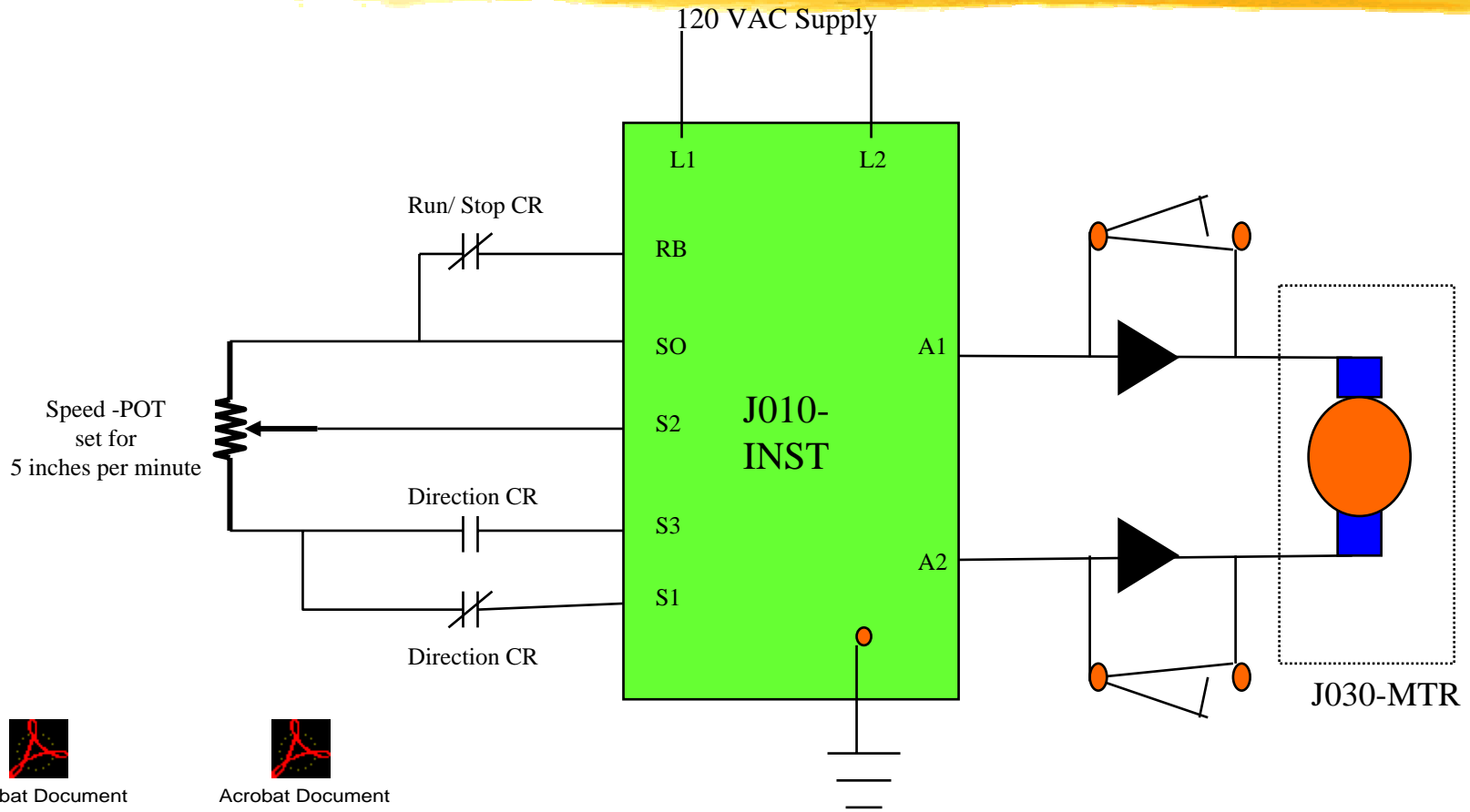


# Conveyor Protection





# Edge Rail Controls & Components



5114343  
Components

5182451  
Schematic Diagram

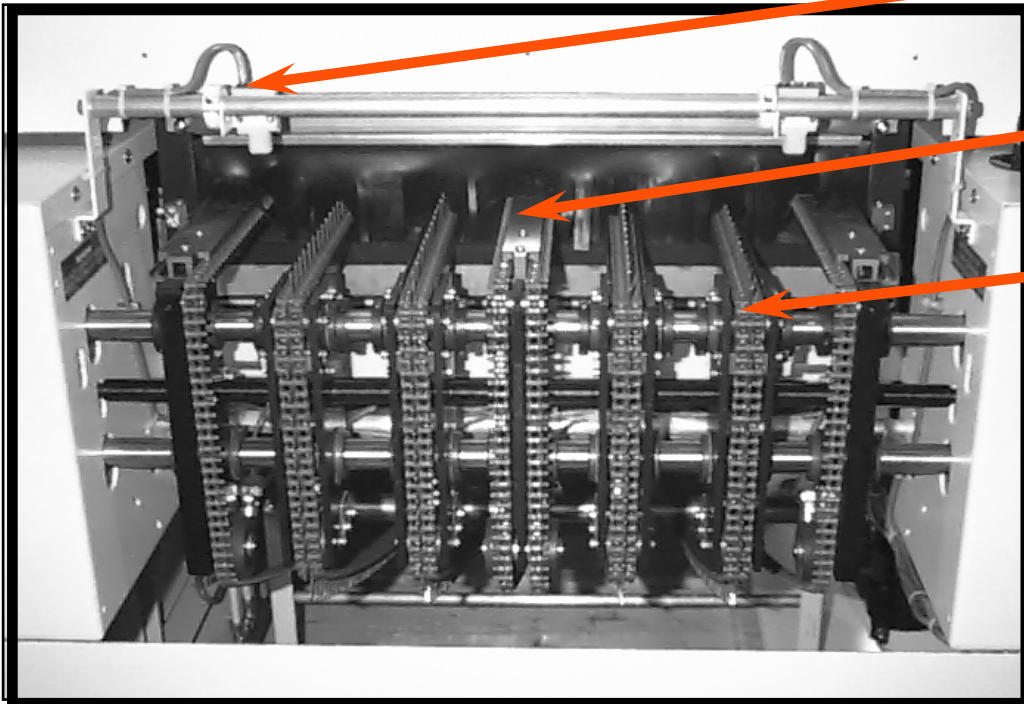


# Dual Track Precision Center Supports

Dual Product Tracking

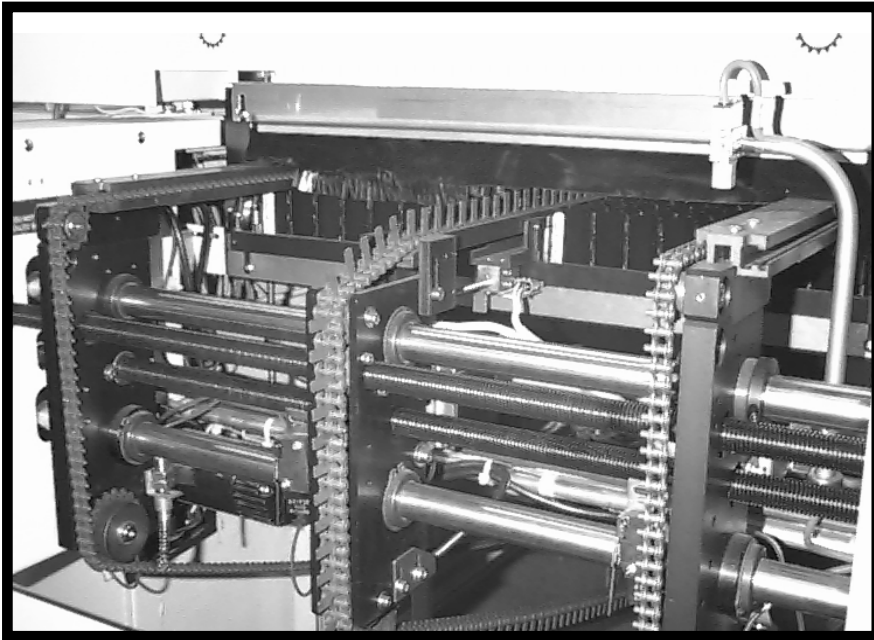
1.375" Wide Center Rail

Precision Extrusion Supports





# Retractable Center Support



- ⌘ Versatile
- ⌘ Robust Dual Extrusion Design
- ⌘ Computer Controlled Horizontal and Vertical Adjustment

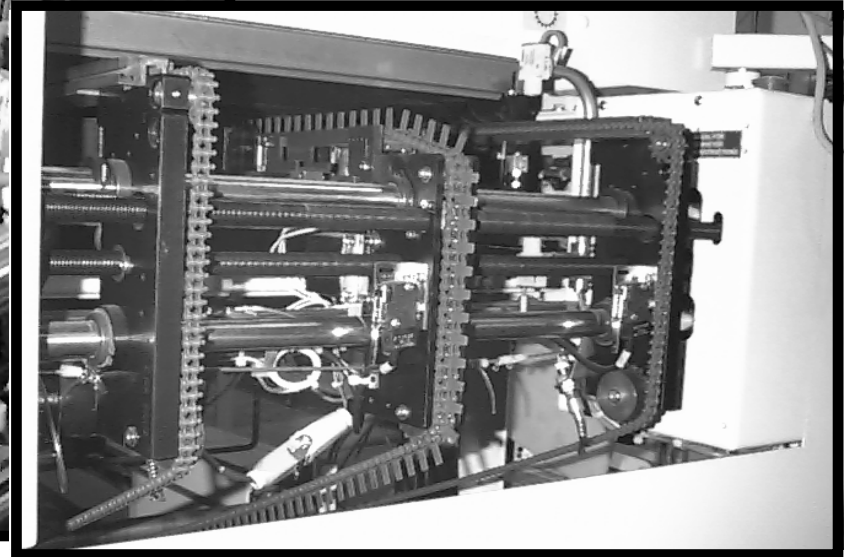
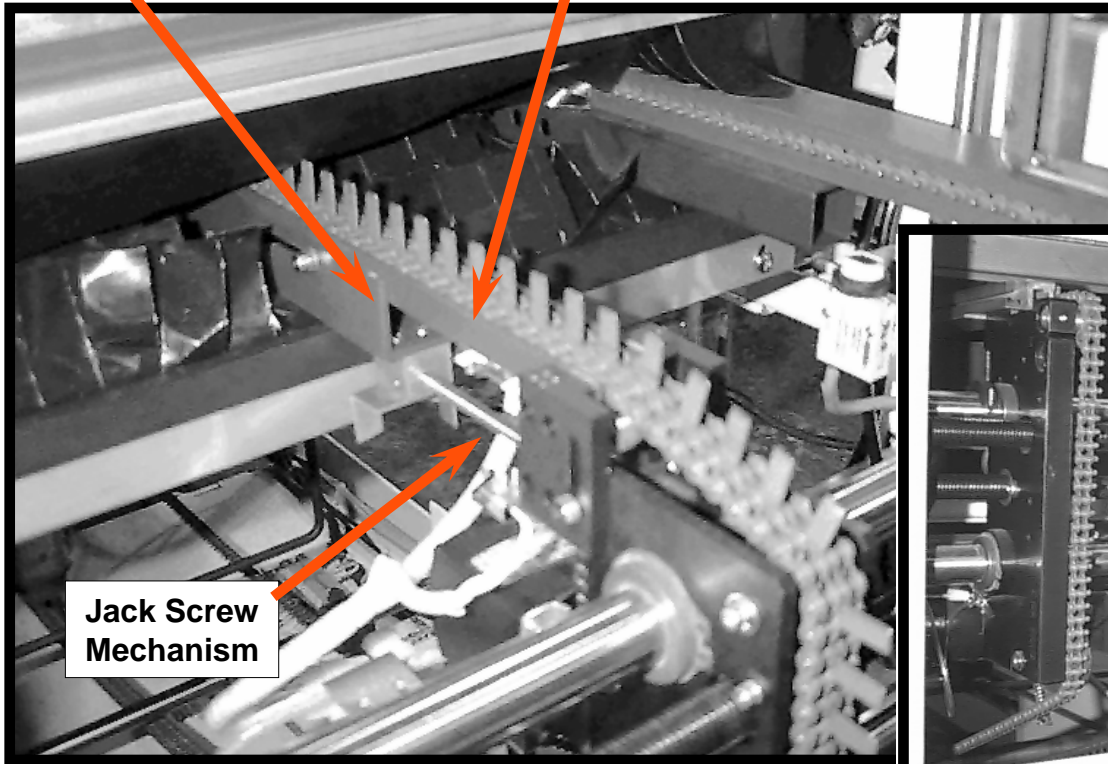




# Retractable Center Support

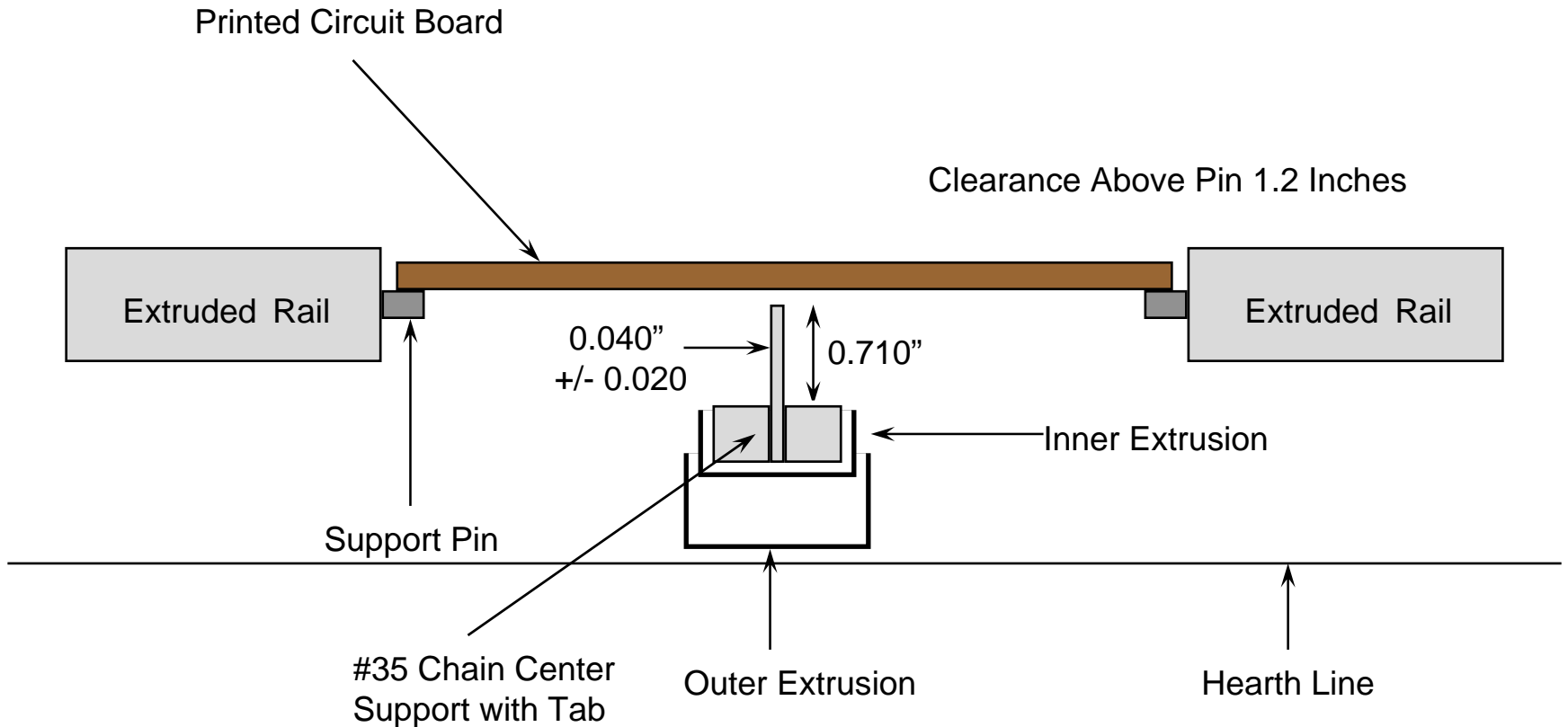
Outer Extrusion

Inner Chain  
Extrusion





# Retractable Center Support





# Flux System Operation

- ★ Flux Laden Gas is Extracted from the Bottom Reflow Zone
- 🕒 Routed Through Condensing System
  - ↓ Heat Exchangers and Filters
- 🕒 Returned To Cooling Section

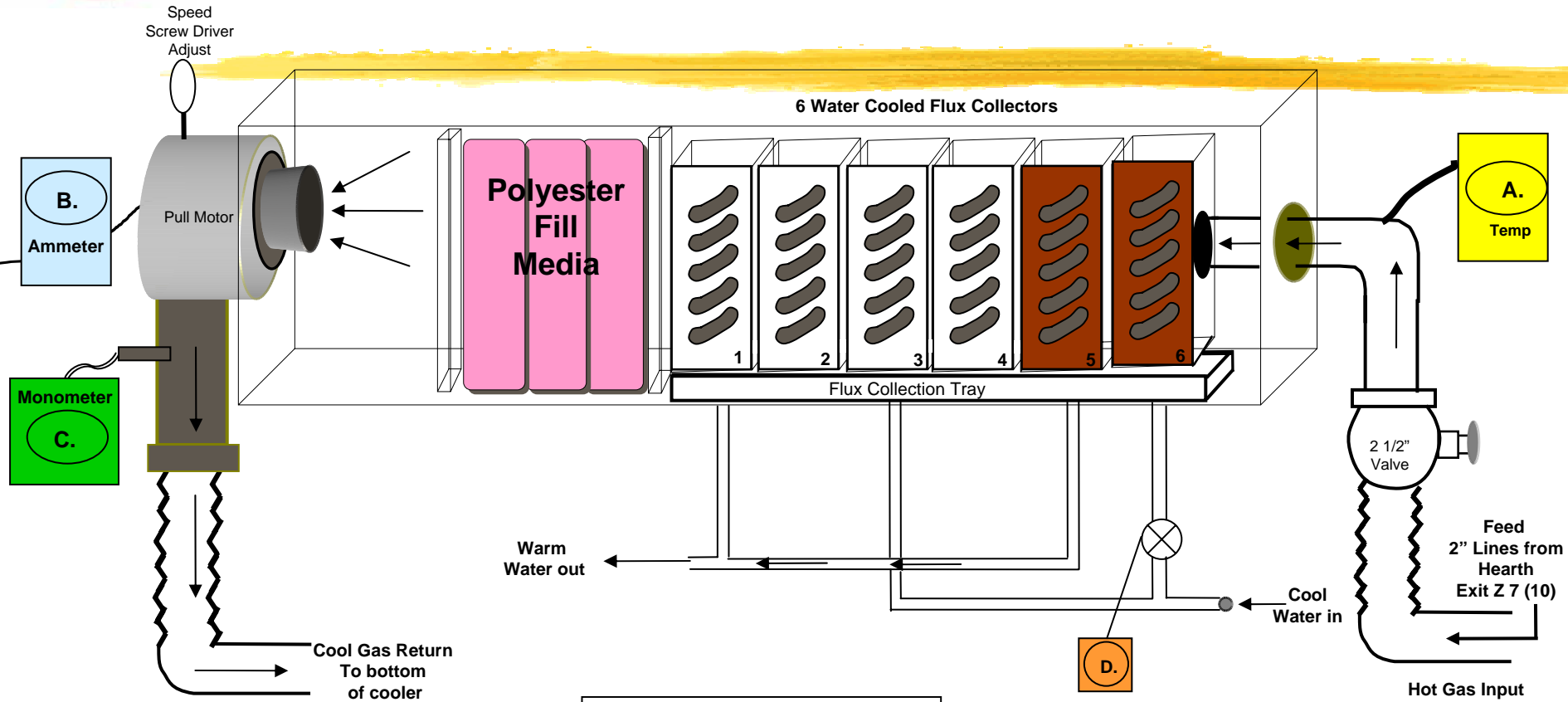


# Flux Mgt. Features

- ⌘ Self-Cleaning Cycle
- ⌘ "On-the-Fly" Maintenance
- ⌘ Condenser Maintenance Alarm
- ⌘ Flow Fail Alarm
- ⌘ Easy Access Drip Tray
- ⌘ Corrosion Resistant Coatings
- ⌘ Pressure Relief Valve



# Flux Box Diagram



### PULL MOTOR OPERATION

Clean 2 AMPS 3.6" - 4" WC  
 Dirty 5.5 AMPS 2.5" - 3.0" WC

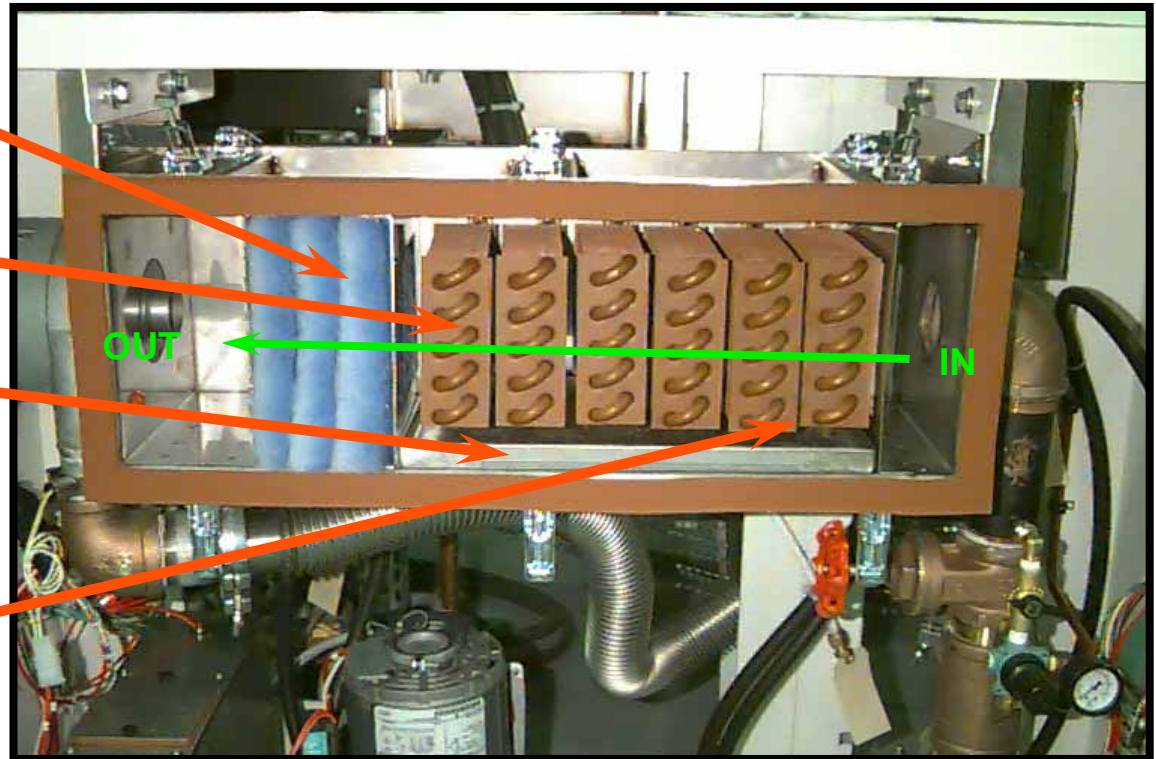
TYPICAL VALUES	
A. Temp Meter	100 ° C-150 ° C
B. Motor Current	2 - 5.5 Amps
C. Static Pressure	3.5" - 4" wcD
D. Flux Regen Cycle	3 hr / 4 min regen

D. Timer  
 1-12 Hrs ON  
 1-12 Min OFF  
 Controls 4, 5, & 6



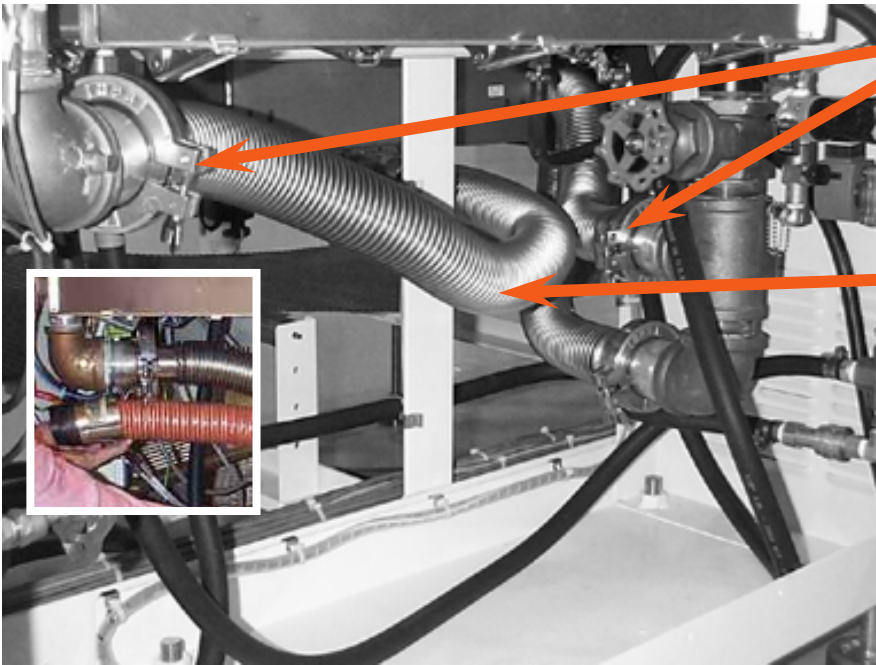
# Flux Management Packaging

- Polyester Filters
- Condensing Heat Exchangers
- Drip Tray
- Self-Cleaning Exchangers





# Stainless Steel Hoses



Hose Clamping  
Arrangement

Stainless Steel  
Vacuum Hoses

Replaces the Silicone Hose Arrangement



# Performance

- ⌘ Dependent on Paste Composition
- ⌘ Effectively removes *as much as 90%* of Rosin/Resin Flux Residues (Typical if maintained properly)
- ⌘ Changing Polyester Filters Weekly Improves the Removal of Solvents
- ⌘ Can be Serviced without Taking the Oven out of Production





# System Interlocks

- ⌘ HIC - Heater Interlock Contactor
  - ☑ Main Water Flow(Not on TRS)
  - ☑ Package Drop (not on TRS)
  - ☑ Cooler Over Temp
  - ☑ Conveyor On/Off (not on TRS)
  - ☑ Zone Over Temp

- ⌘ LIC - Lid Interlock Contactor
  - ☑ Lid Open
  - ☑ Exhaust Failure (Not on TRS)
  - ☑ Conveyor Failure

- ⌘ Nitrogen Interlock
  - ☑ Nitrogen Pressure Switch

- ⌘ Water Flow Interlock
  - ☑ Recirc. Cooler Flow Switch

- ⌘ *Flux Management isn't available on TRS*

- ⌘ Flux Water Flow Interlock
  - ☑ Recirc. Flux Cooler Flow Switch

- ⌘ Flux Panel Interlock
  - ☑ Flux Panel Interlock

- ⌘ Flux Interlock (T190-CR)
  - ☑ Flux Over Temp



# *System Alarms* *(External)*

- ⌘ Emergency Stop
- ⌘ Lid Open
- ⌘ Exhaust Fail Zone
- ⌘ Over Temperature
- ⌘ Conveyor Motion
- ⌘ Shutdown Event
  - ☒ Flux On/Off
  - ☒ LIC
- ⌘ Check Flux Blower
- ⌘ Flux Over Temperature
- ⌘ Flux Water Flow
- ⌘ Low Water Level Flux
- ⌘ Flux Panel Open Event
- ⌘ Low Water Level Cooler
- ⌘ Low N2 Pressure
- ⌘ Cooler Over Temperature
- ⌘ Main Water Flow



# *Furnace Controls*

→ WINCON / 3615 FCU Controller


⚙ System Software

→ OPERATOR Controls




# WINCON / 3615 FCU Controller


## *Minimum recommended computer requirements:*


 IBM compatible with MS-DOS and WINDOWS

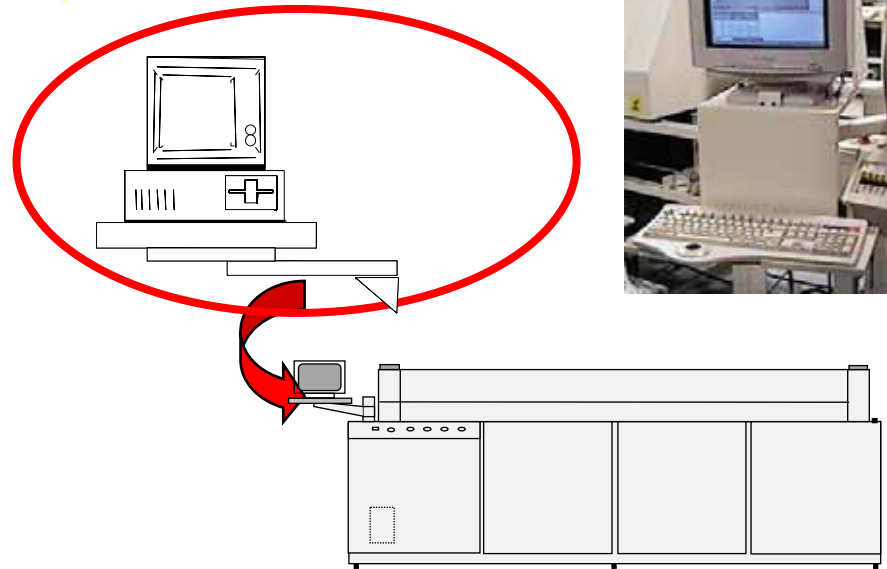
 8MB main memory and battery backup clock

 120MB hard drive and one 3-1/2" high density floppy drive

 One parallel printer port, and two RS-232 serial ports

 14" VGA color graphics monitor

 Keyboard (mouse or trackball optional)

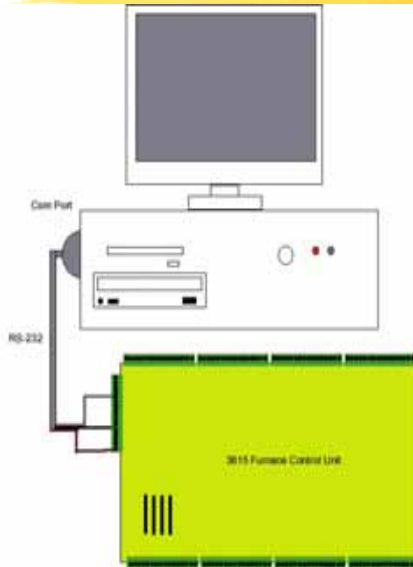


Acrobat Document

5057631 RS232-3615



# Link (RS-232) Communications



25 Pin D-sub connector  
(Com Port on PC)

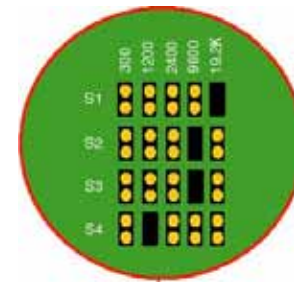


FCU	Pin	Personal Computer
N/A	1	Chassis Ground (only Terminated at one end of cable)
C9-18	2	Transmit Data
C9-15	3	Receive Data
C9-7	7	Signal Ground

9 Pin D-sub connector  
(Com Port on PC)

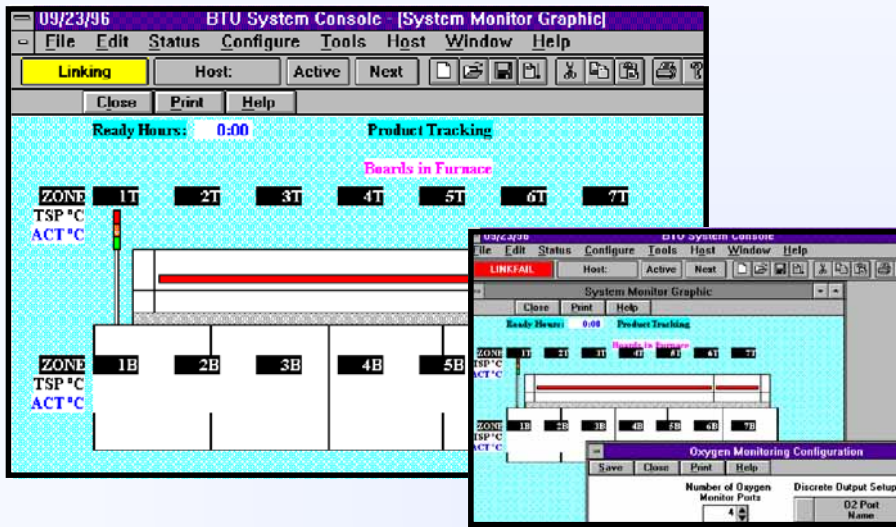


FCU	Pin	Personal Computer
C9-15	2	Receive Data
C9-18	3	Transmit Data
C9-7	7	Signal Ground



# WINCON Software

## Operating Software



- ⌘ Windows TM Platform
- ⌘ GEM Available
- ⌘ Extensive Security Features
- ⌘ Extensive data Collection Capability
- ⌘ Flexible Time and Sequence Scheduling



## **Furnace Control Unit (FCU) Board**

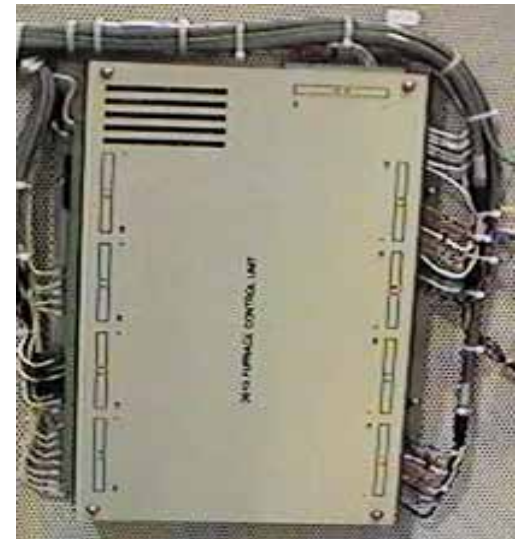
### **FCU description:**

The Furnace Control Unit (FCU) is an independent Z80 based Microprocessor controller board. The board will operate with only a 15 volt DC power supply. No other external connections and apparatus are need for it to operate. The FCU is normally connected to a IBM compatible PC, to simplify programming and for storage of information. A PC with WINCON® software operating an a RS-232 (COM) port interface with the FCU.

The FCU is equipped with 31 analog inputs and 36 analog output, they are generally used as closed looped controlled I/Os. These ports are used to control heated zones, static pressure in a close loop configurations. The analog inputs can be used without outputs to monitor activities like O<sub>2</sub> or dew point. The analog outputs can also used independent of inputs. Equipment with cooling fan control operate this way, to allow the FCU to control fan RPM.

We utilize 16 digital output to control external options like Gas flow. Sixteen digital inputs, monitor external events and alarm condition such as Low Pressure switches.

There is Lithium battery pack on every FCU board to maintain data time and configurations for a ten year period. This allows the FCU board to maintain information on how long it has been on or off and all calibration values.





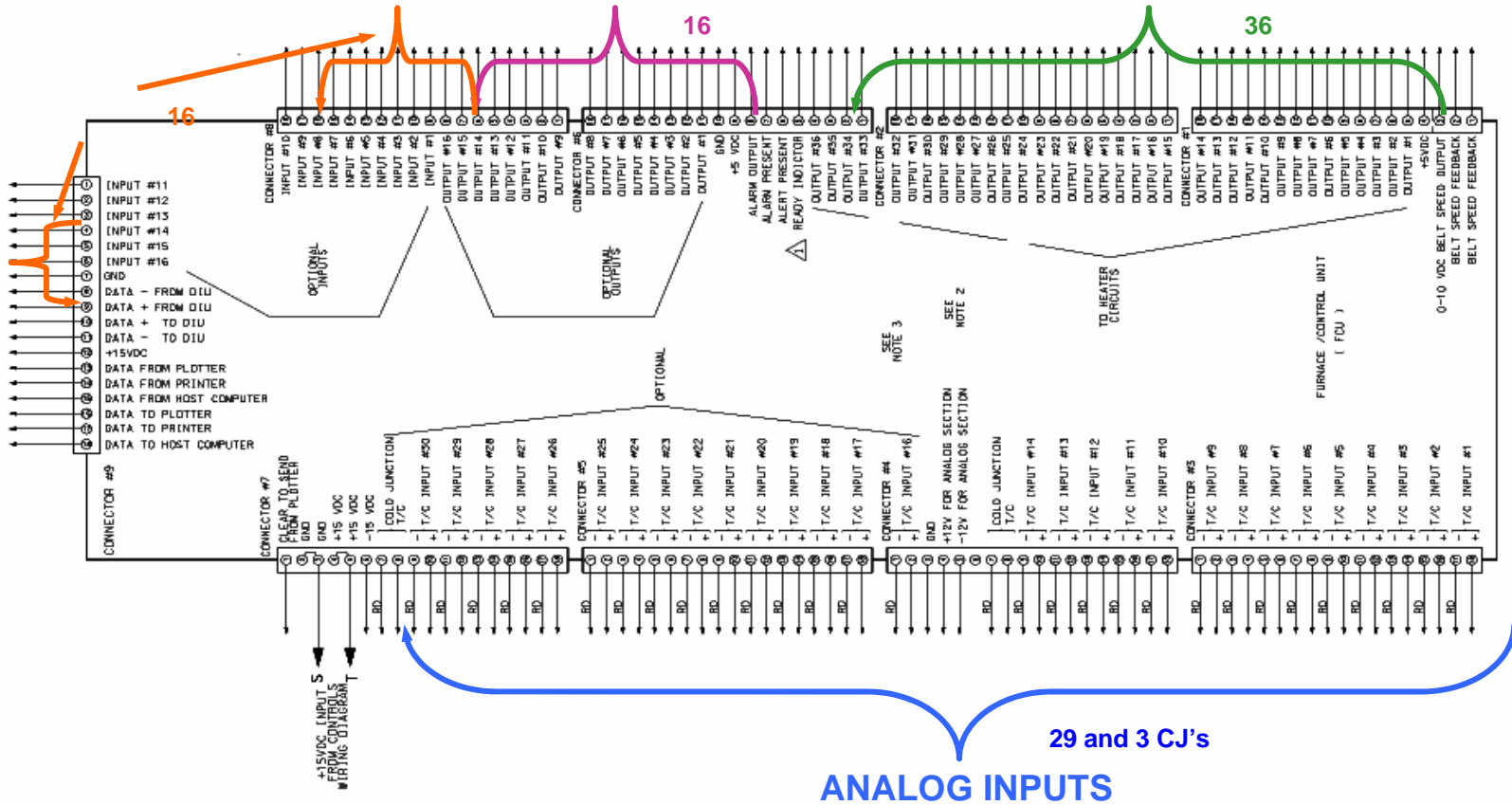
# FCU 3615 Controller W / D Drawing

#1 - E050-INST & # 2 E080-INST

DIGITAL OUTPUTS

ANALOG OUTPUTS

DI  
IN



16

16

36

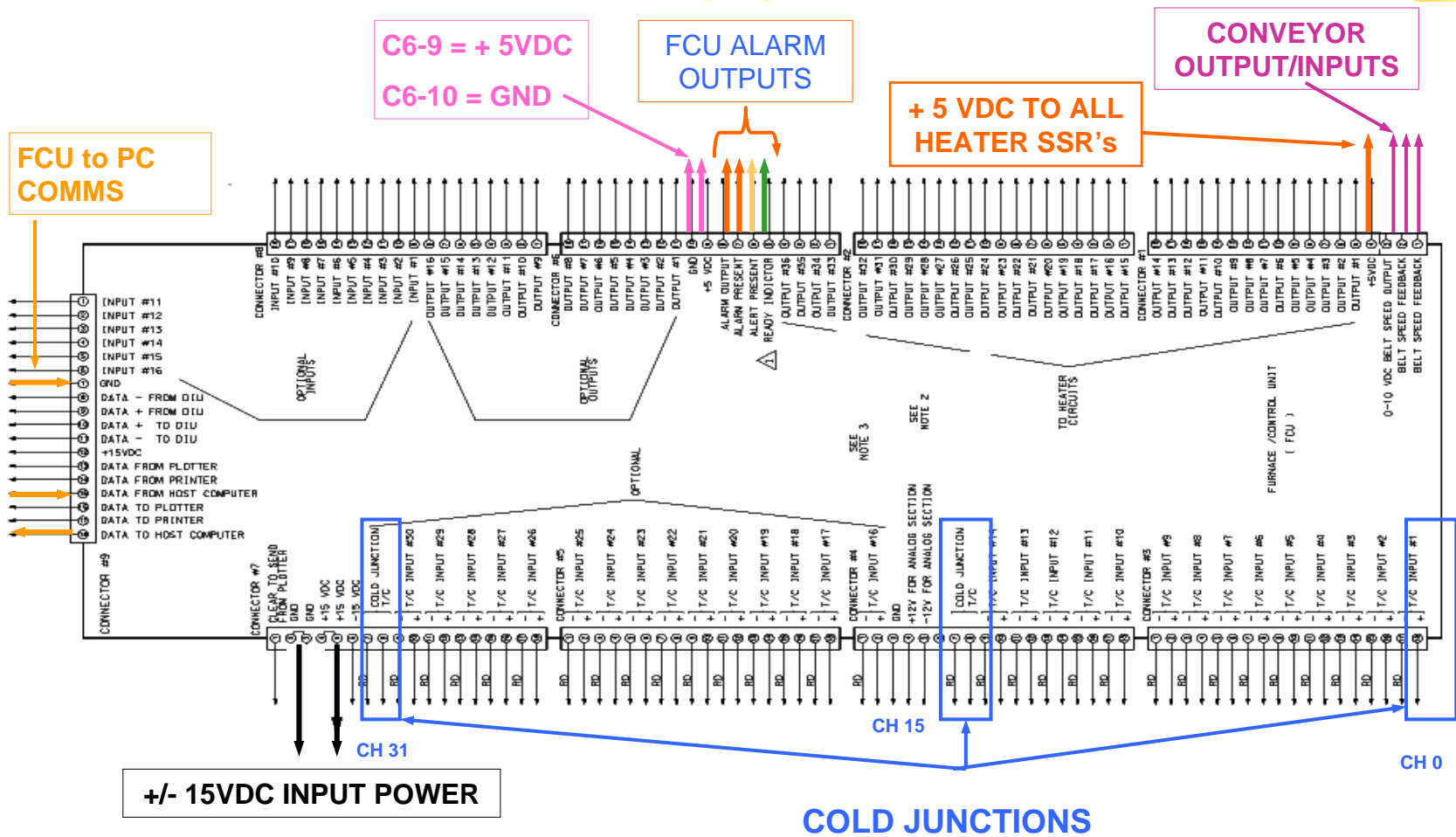
29 and 3 CJ's

ANALOG INPUTS



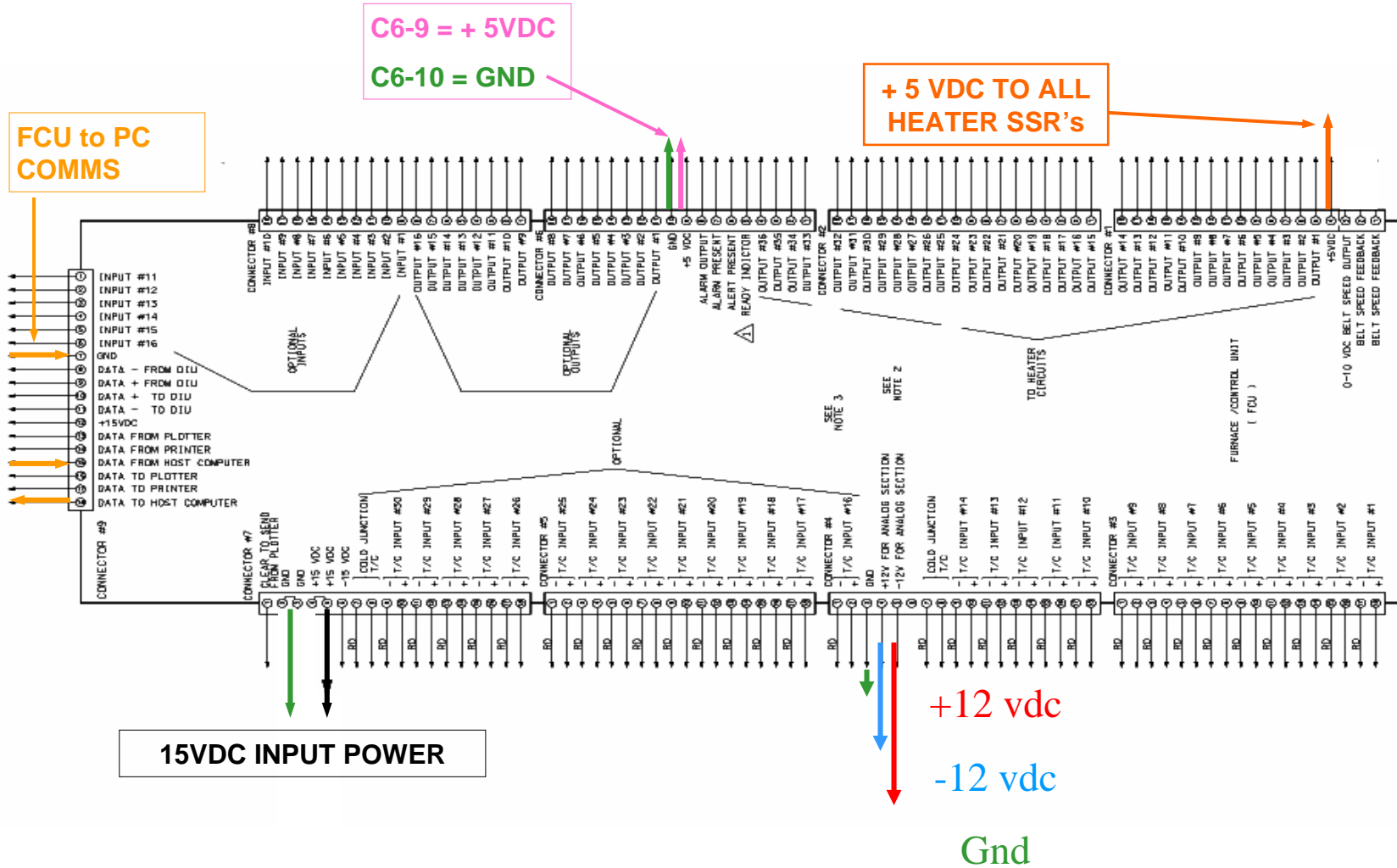


# FCU 3615 Controller W / D Drawing





# Link Failures and Electrical Faults





# Link Failures and Software Faults

1. **Exit WINCON® Software**
2. **Go to the C:\windows\temp directory and delete all the files there**
3. **Run Scandisk on thorough**
4. **Run Defrag twice, if it needs it or not**
5. **Exit Windows 95 (Shutdown)**
6. **Turn off the Furnace**
7. **Unplug the RS-232 ports**
8. **Turn on the Furnace and PC**
9. **When WINCON® says Link fail, plug in the RS-232 connectors**
10. **Do a set System**
11. **If the Link isn't established then try another PC or spare FCU, before completely replacing the FCU board**



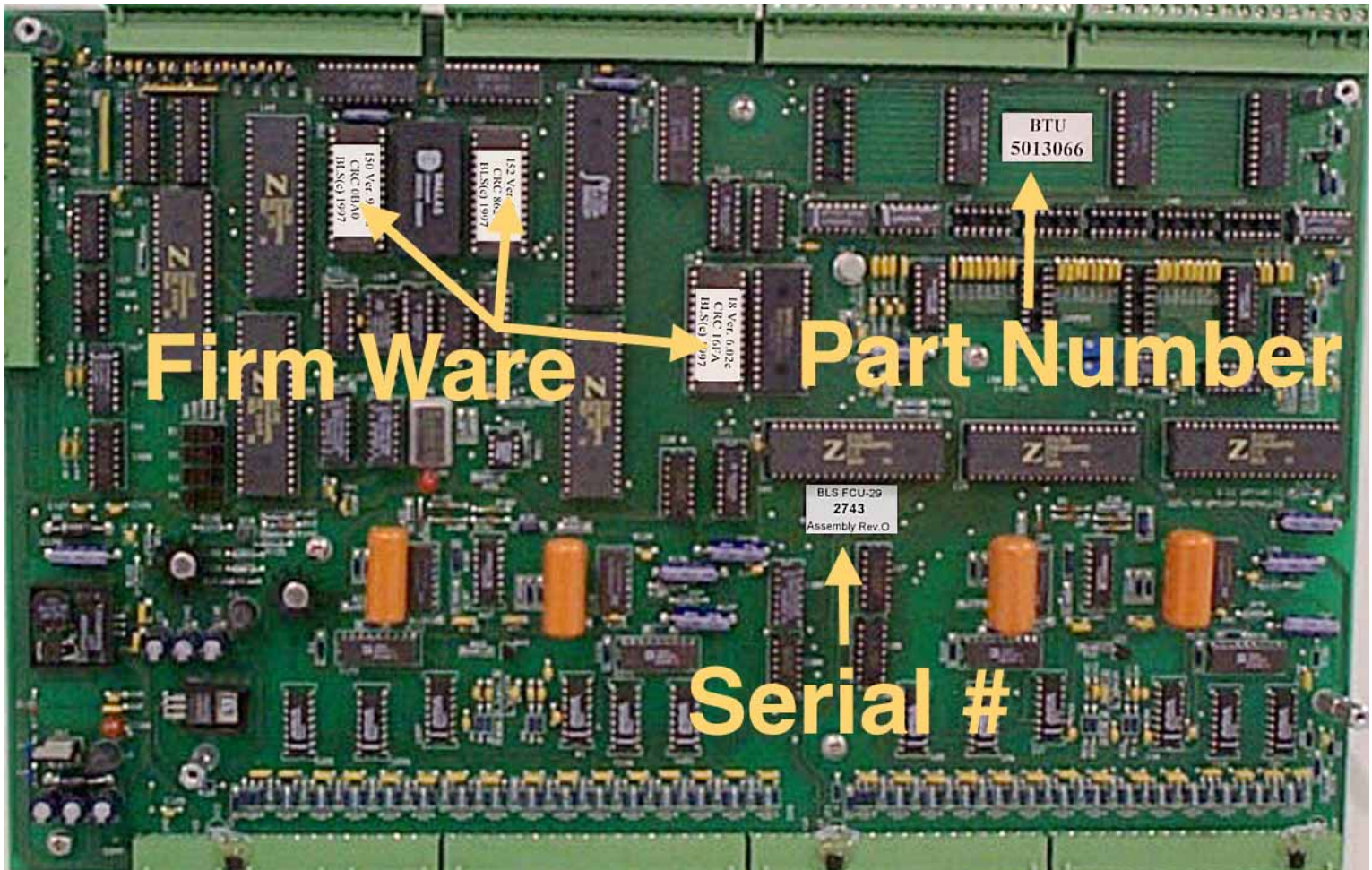
# WINCON® Troubleshooting with a good Link

## **PC Preventative maintenance**

1. Exit WINCON® Software
2. Go to the C:\windows\temp directory and delete all the files there
3. Run Scandisk on thorough
4. Run Defrag twice, if it needs it or not
5. Exit Windows 95 (Shutdown)
6. Turn off the Furnace for 10 seconds
7. Turn on the Furnace and PC
8. When WINCON® says Link fail, plug in the RS-232 connectors
9. Do a “Set System”
10. Go to the Embedded controller and “Save to Controller” all the Calibration values for each FCU



# Identifying the FCU Board





# *Yearly PM Procedures*

## **LABS**

### ➤ **Perform Calibrations**

- ✦ Calibrated FCU board's Analog inputs
- ✦ Calibrate FCU boards Cold Junction(s)
- ✦ Calibrate Over Temperature module (except VIP)
- ✦ Calibrate Cooling Fan Speed controllers

### ✦ **Inspect Mechanical Ware Items**

- ✦ Inspect and Replace glide plates on Rail Hangers
- ✦ Inspect and Replace Sprockets
- ✦ Shorten Belts