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BRAINAC™
REFINER CONTROLLER SYSTEM

Rev. 2.0

TABLE OF CONTENTS

Installation Section

I. LOCATION

The Refiner Controller is supplied with an enclosure designed for indoor mounting. The installation site should be dry, well lighted, and vibration free.

II. MOUNTING

The Refiner Controller is designed to be flush panel mounted. Appropriate mounting hardware is supplied by TECO. Outline dimensions and panel cutout requirements for case mounting are shown in Figure 1

III. MOUNTING PROCEDURE:

1. Prepare panel cutout per Figure 1.

2. From the front of panel, slide controller through cutout.

3. Using the two brackets supplied, secure controller in panel. Note that one bracket goes on top and one goes on bottom.

IV. INTERCONNECTIONS

The Refiner Controller is available in three levels of control. Prior to electrical interconnection, the particular level you are installing should be established and all inputs and outputs identified and assigned to assure proper interconnection. The three levels available are:

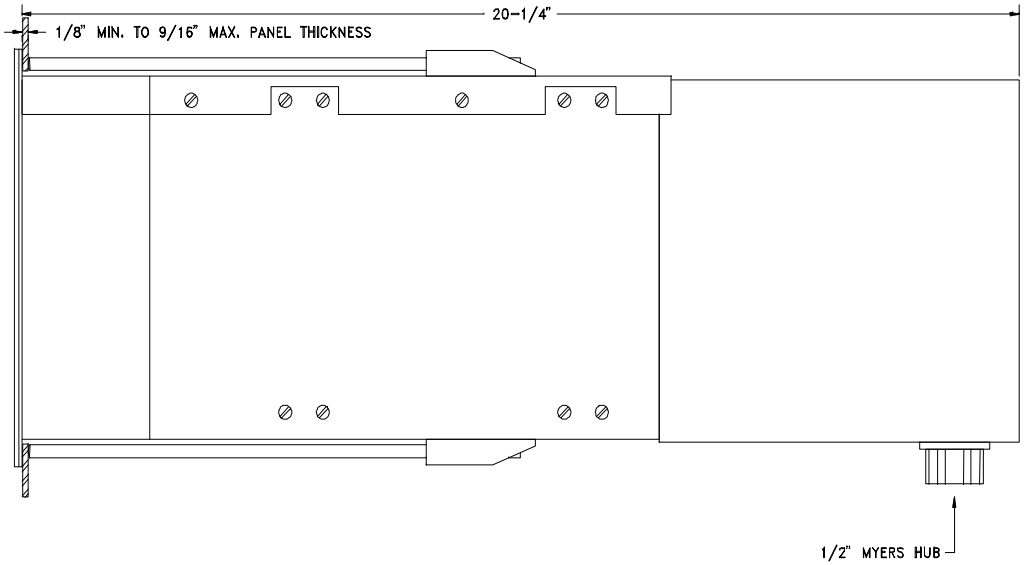
Level 1. This is a motor load controller only. It requires a wattage input from refiner drive motor and switched outputs to drive plate position.

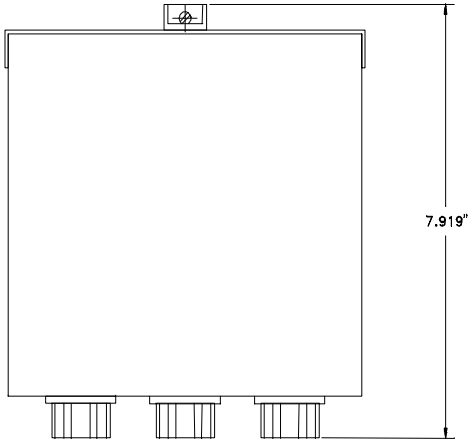
Level 2. This is a motor load controller whose setpoint is adjusted by a Horsepower Day per Ton controller. It requires the same inputs and outputs of Level 1 plus flow and consistency inputs.

Level 3. This is the same as Level 2 controller with the addition of a freeness controller that modifies the Horsepower Day per Ton setpoint. It requires the same inputs and outputs of Level 2 plus the addition of a freeness signal.

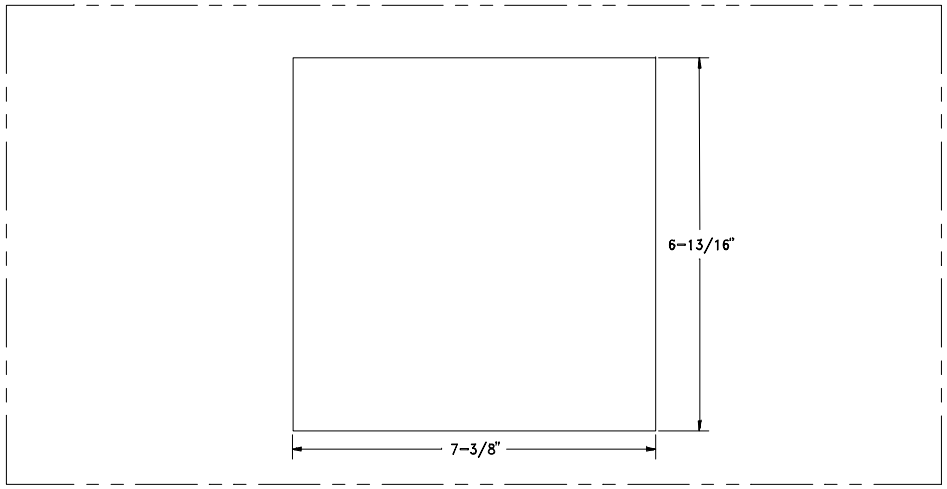
In addition to the inputs mentioned above all three levels, The Refiner Controller has some optional inputs and outputs that the user may elect to use. These are covered in the wiring procedure below.

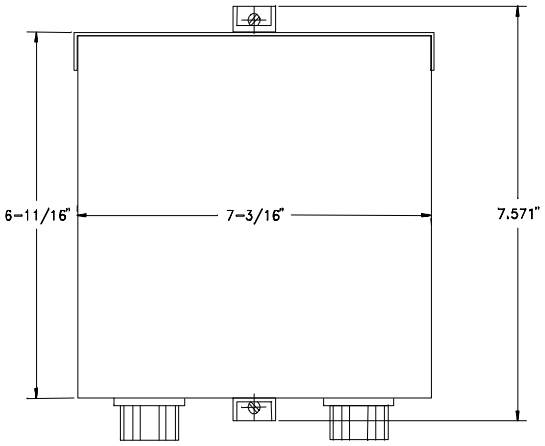
Once the control level to be installed is established, proceed with the wiring.





PANEL CUTOUT





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PANEL CUT-OUT REQUIREMENTS
AND OUTLINE DIMENSIONS

Figure 1 Panel cutout and outline dimensions

I. WIRING DIAGRAMS

Figure 2 shows the field terminal and jumper layout found on the rear of the BRAINAC™ chassis. Note the jumper required between TB1-22 and TB2-22.

Figure 3 Shows interconnections between the BRAINAC™ field terminals and the BRAINAC™ relay box for the refiner plate drive signals.

Figure 4 illustrates the internal interconnections of the BRAINAC™ relay box. This internal wiring is made and tested during manufacturing at TECO, but this drawing may be useful for later field service and troubleshooting. It also identifies the terminals, which are interconnected with the BRAINAC™ as per and the terminals for interconnecting the relay box with the refiner gear motor starter relays.

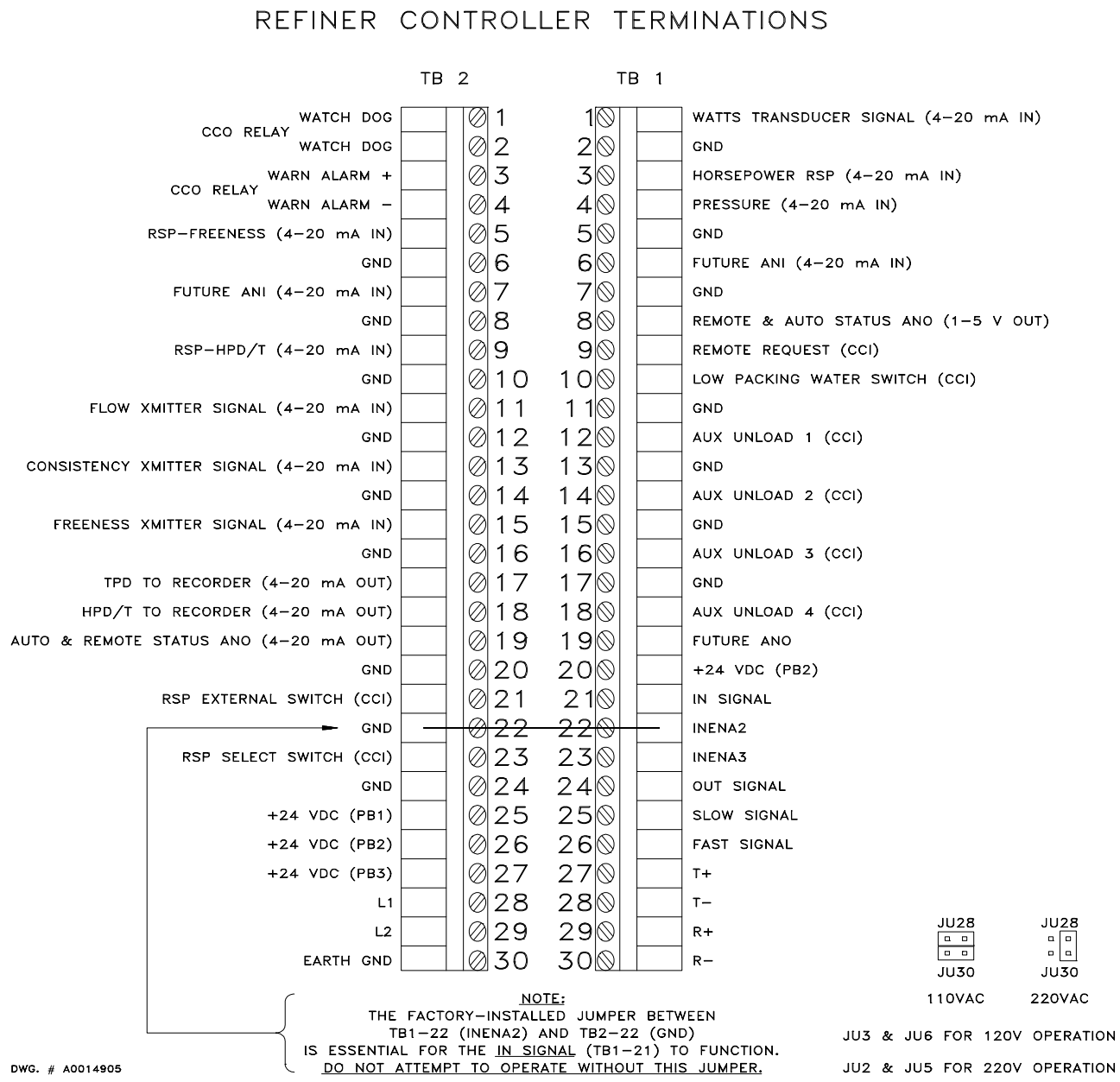

Figure 2 Refiner controller terminations

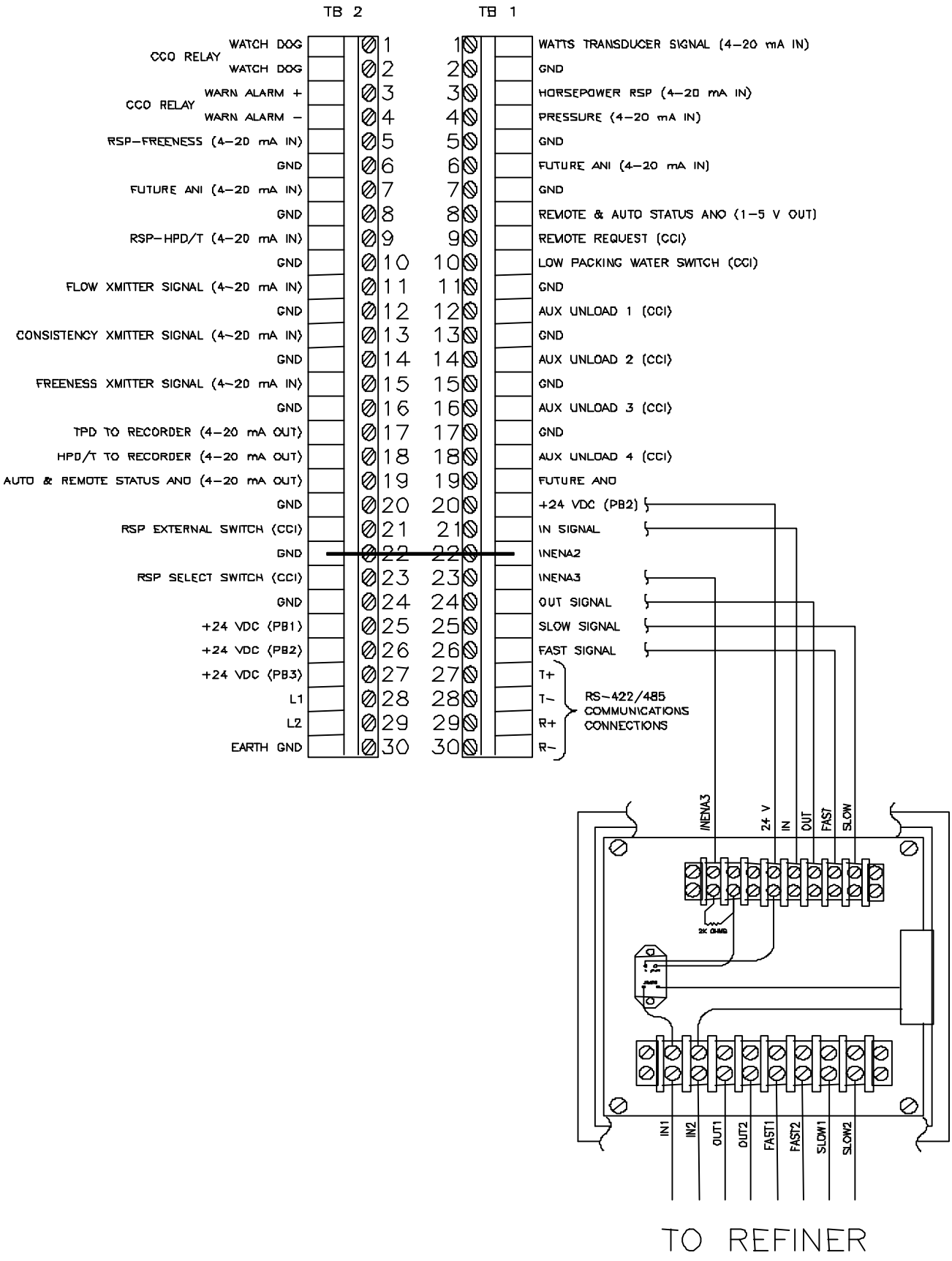
TB 2
TB 1
CCO RELAY
WATCH DOG
WATCH DOG
CCO RELAY
WARN ALARM +
WARN ALARM –
RSP–FREENESS (4–20 mA IN)
GND
FUTURE ANI (4–20 mA IN)
GND
RSP–HPD/T (4–20 mA IN)
GND
FLOW XMITTER SIGNAL (4–20 mA IN)
GND
CONSISTENCY XMITTER SIGNAL (4–20 mA IN)
GND
FREENESS XMITTER SIGNAL (4–20 mA IN)
GND
TPD TO RECORDER (4–20 mA OUT)
HPD/T TO RECORDER (4–20 mA OUT)
AUTO & REMOTE STATUS ANO (4–20 mA OUT)
GND
RSP EXTERNAL SWITCH (CCI)
GND
RSP SELECT SWITCH (CCI)
GND
+24 VDC (PB1)
+24 VDC (PB2)
+24 VDC (PB3)
L1
L2
EARTH GND
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
WATTS TRANSDUCER SIGNAL (4–20 mA IN)
GND
HORSEPOWER RSP (4–20 mA IN)
PRESSURE (4–20 mA IN)
GND
FUTURE ANI (4–20 mA IN)
GND
REMOTE & AUTO STATUS ANO (1–5 V OUT)
REMOTE REQUEST (CCI)
LOW PACKING WATER SWITCH (CCI)
GND
AUX UNLOAD 1 (CCI)
GND
AUX UNLOAD 2 (CCI)
GND
AUX UNLOAD 3 (CCI)
GND
AUX UNLOAD 4 (CCI)
FUTURE ANO
+24 VDC (PB2)
IN SIGNAL
INENA2
INENA3
OUT SIGNAL
SLOW SIGNAL
FAST SIGNAL
T+
T–
R+
R–
RS–422/485 COMMUNICATIONS CONNECTIONS
INENA3
24 V
IN
OUT
FAST
SLOW
2K OHMS
IN1
IN2
OUT1
OUT2
FAST1
FAST2
SLOW1
SLOW2
TO REFINER

Figure 3 Termination detail

II. PLATE IN/OUT CONTROL WIRING

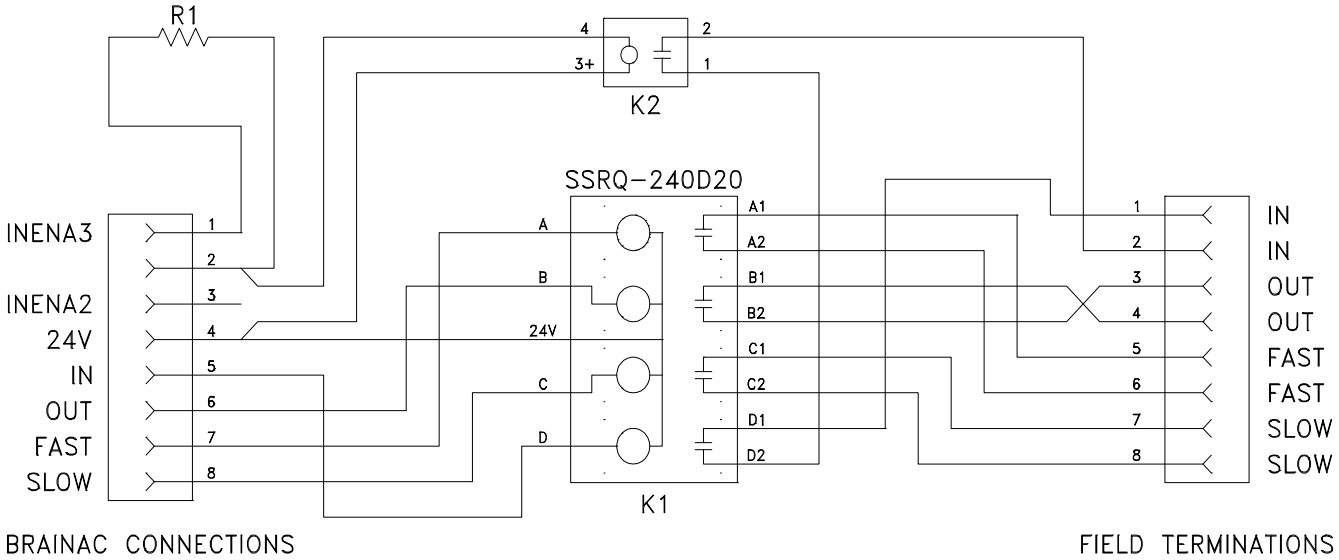

Figure 4 Relay Box Detail

Supplied with the TECO BRAINAC™ Refiner Controller is a relay box consisting of two terminal strips and two solid-state relays, used to control the IN/OUT motion of the plates in the refiner. Figure 4. The Refiner Controller outputs to this box are common to all levels of control.

The following terminations are used between the Refiner Controller and the plate-control relay junction box:

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
POWER	24V	TB1-20	+ Power	Plate Control "POWER" (TB1-20) supplies relay power for both solid state relays
PLATE IN	IN	TB1-21	C.C. Out	Plate Control "IN" signal (TB1-21) switches ground to activate the solid-state relay, moving the plates "in" or closer together.
INENA2	INENA2 (NO CONNECTION)	TB1-22	C.C. Out	Plate Control (interlock)"INENA2" (TB1-22) is jumpered to GND (TB2-22) at the factory. THIS JUMPER IS NECESSARY AND MUST NOT BE REMOVED.
INENA3	INENA3	TB1-23	C.C. Out	Plate Control (interlock) "INENA3" (TB1-23) is a closed-contact output. It provides safety against plate contacting. It completes the circuit from + 24V through solid state relay K2 to the current limiting resistor R1 and down to GND through "INENA2".
PLATE OUT	OUT	TB1-24	C.C. Out	Plate Control "OUT SIGNAL" (TB1-24) switches ground to activate the solid-state relay, moving the plates "out" or further apart.

OPTIONAL CONNECTIONS For refiners that have dual speed gear motors, wire as follows.

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
PLATE SLOW	SLOW	TB1-25	C.C. Out	"SLOW SIGNAL" switches ground to activate the solid-state relay, controlling the rate at which the plates are moved
PLATE FAST	FAST	TB1-26	C.C. Out	Plate Control "FAST SIGNAL" (TB1-26) switches ground to activate the solid-state relay, controlling the rate at which the plates are moved.

NOTE 1:

Listed below is a description of the various inputs and outputs of the refiner controller. Please note that the 4-20 mA inputs, 4-20 mA outputs, and contact closure inputs are all referenced to circuit ground. In many cases, a ground connection is provided at an adjoining connection for convenience. However, any ground connection can be used with any 4-20 mA input, output or any contact input. Some 4-20 mA inputs (remote setpoints), 4-20 mA outputs (TPD, HPD/T and REMOTE & AUTO STATUS INDICATORS), and contact inputs, do not have an adjoining GND terminal. You can use any GND terminal with these.

III. REFINER CONTROLLER POWER WIRING

The Refiner Controller can be supplied in either 120 volt AC (standard) or 240 volt AC (optional). The unit is configured for one of these voltages at time of order.

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
L1		TB2-28	Power In	Self-explanatory
L2		TB2-29	Power In	Self-explanatory
Earth GND		TB2-30	Power In	Self-explanatory

IV. WIRING FOR LEVEL I MOTOR LOAD CONTROL

The following terminations are mandatory for Level I operation:

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
WATTS TRANSDUCER +		TB1-1	+ I In*	Motor Load Input
WATTS TRANSDUCER -		TB1-2	- I In*	

This current loop is scaled to represent the range of 0 HP to maximum HP of the refiner motor. It is received from a watt transducer monitoring the power factor of the refiner. * This may be specified by the customer to be 4-20 mA, 0-1 mA, or other current range, when ordering.

The following terminations are available for safety and information purposes but not mandatory for Level I operation:

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
LOW PACKING WATER SWITCH		TB1-10	Contact Closure In to GND	This switch input can be used to monitor the loss of packing water. A contact closure will cause a refiner unload. Terminal TB1-11 is provided as a convenient GND
AUX UNLOAD 1		TB1-12	Contact Closure In to GND	A contact-closure on this input will cause a refiner unload. Terminal TB1-13 is provided as a convenient GND.
AUX UNLOAD 2		TB1-14	Contact Closure In to GND	A contact-closure on this input will cause a refiner unload. Terminal TB1-15 is provided as a convenient GND.
AUX UNLOAD 3		TB1-16	Contact Closure In to GND	A contact-closure on this input will cause a refiner unload. Terminal TB1-17 is provided as a convenient GND
AUX UNLOAD 4		TB1-18	Contact Closure In to GND	A contact-closure on this input will cause a refiner unload. Terminal TB1-19 is provided as a convenient GND
WATCH DOG		TB2-1	Contact Closure Out	This dry closed-contact output (mechanical relay) could be used to sound an alarm when the WATCH DOG indicates a failure in the microprocessor. This contact is rated for 10 amps resistive load @ 120 VAC/30 VDC, 7.5 amps general use @ 120 VAC/30 VDC, 7 amps general use @ 240 VAC, 1/6 HP @ 120 VAC, 1/3 HP @ 240 VAC.
WATCH DOG		TB2-2	Contact Closure Out	
WARN ALARM		TB2-3	Contact Closure Out	This dry closed-contact output (mechanical relay) can be used to sound an alarm (or any use desired) when an out-of-tolerance condition is occurring that may lead to an Unload. This contact is rated the same as the WATCHDOG contact above
WARN ALARM		TB2-4	Contact Closure Out	
HORSEPOWER RSP +		TB1-3	+ 4-20 In	Horsepower Remote Setpoint This current loop allows the operator to remotely set the horsepower setpoint from a computer. THIS OPTION REQUIRES A HARDWARE MODIFICATION AT THE FACTORY AND IS AVAILABLE IN LEVEL I ONLY. Use any convenient GND for current loop return
REMOTE & AUTO STATUS ANO		TB1-8	+ 4-20	This current output signal is used to tell a computer when the Horsepower controller is in Automatic Control and Remote Setpoint. When this is true, the output will be 20 mA. Otherwise, the output is 4 mA. Use any convenient GND for current loop return.
REMOTE REQUEST		TB1-9	Contact Closure In to GND	Activation requires a contact closure between TB1-9 and any convenient GND.

V. LEVEL II MOTOR LOAD CONTROL WITH HPD/T

Level II includes the Motor Load Control of Level I and adds the ability to modify control based on Horsepower Day per Ton (HPD/T). It requires the additional inputs of flow rate and consistency. Level II retains all of the mandatory inputs and outputs from Level I, and retains all optional inputs from Level I except for remote setpoint of horsepower. Level II provides outputs to record Horsepower Day per Ton and Tons per Day. The following terminations are mandatory for Level II operation:

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
FLOW TRANSMITTER +		TB2-11	+ 4-20 In	This 4-20 mA current signal provides stock velocity information to the Refiner Controller.
FLOW TRANSMITTER -		TB2-12	GND	
CONSISTENCY TRANSMITTER +		TB2-13	+ 4-20 In	This 4-20 mA current signal provides stock consistency information to the Refiner Controller.
CONSISTENCY TRANSMITTER -		TB2-14	GND	
TONS PER DAY		TB2-17	+ 4-20 Out	This 4-20 mA current signal can provide Ton per Day information to a recorder or other device. Use any convenient GND for current loop return.
HORSEPOWER DAY PER TON		TB2-18	+ 4-20 Out	This 4-20 mA current signal can provide Horsepower Day per Ton information to a recorder or other device. Use any convenient GND for current loop return.
RSP-HPD/T		TB2-9	+ 4-20 Out	This 4-20 mA current signal can provide Horsepower Day per Ton Remote Setpoint control based on the status of three other inputs (AUTO & REMOTE STATUS ANO, TB2-19; RSP EXTERNAL SWITCH, TB2-21; and RSP SELECT SWITCH, TB2-23)
AUTO & REMOTE STATUS ANO		TB2-19	+ 4-20 Out	This 4-20 mA current signal is 4 mA when the system is NOT using a remote setpoint. It is 20 mA when the system is sending remote setpoint information.
RSP EXTERNAL SWITCH		TB2-21	Contact Closure In to GND	A contact-closure on this input will allow the HPD/T remote setpoint to be transmitted IF the RSP SELECT SWITCH is closed
RSP SELECT SWITCH		TB2-23	Contact Closure In to GND	A contact-closure on this input will select Horsepower Day per Ton remote setpoint information for transmission out on the RSP-HPD/T line.

VI. LEVEL III MOTOR LOAD CONTROL WITH HPD/T AND FREENESS

Level III includes the Motor Load Control of Level I, the Horsepower Day per Ton of Level II, and adds the ability to modify refiner control based on freeness measurements. Level III retains all of the mandatory inputs and outputs from Levels I and II, and requires an input for freeness. The following additional terminations are mandatory for Level III operation:

Signal/ Function	Relay Box Terminal	Refiner Controller Terminal	Type	Description
FREENESS TRANSMITTER +		TB2-15	+ 4-20 In	This 4-20 mA current signal provides freeness information
FREENESS TRANSMITTER -		TB2-16	GND	
RSP-FREENESS		TB2-5	+ 4-20 Out	This 4-20 mA current signal can provide Freeness Remote Setpoint control based on the status of three other inputs (AUTO & REMOTE STATUS ANO, TB2-19; RSP EXTERNAL SWITCH, TB2-21; and RSP SELECT SWITCH, TB2-23)
AUTO & REMOTE STATUS ANO		TB2-19	+ 4-20 Out	This 4-20 mA current signal is 4 mA when the system is NOT using a remote setpoint. It is 20 mA when the system is sending remote setpoint information.
RSP EXTERNAL SWITCH		TB2-21	Contact Closure In to GND	A contact-closure on this input will allow the Freeness remote setpoint to be transmitted if the RSP SELECT SWITCH is open and Horsepower Tons per Day remote setpoint to be transmitted if the RSP SELECT SWITCH is closed.
RSP SELECT SWITCH		TB2-23	Contact Closure In to GND	An open switch on this input will select Freeness remote setpoint information for transmission out on the RSP-FREENESS line. As in Level II, a closed switch on this input will again select Horsepower Tons per Day remote setpoint information for transmission out on the RSP-HPD/T line.

Configuration Section

CONFIGURATION

HARDWARE CONFIGURATION

The TECO BRAINAC™ Refiner Controller hardware must first be configured by means of jumper settings on the backplane.
Figure 5 illustrates the overall layout of the backplane with the locations of the jumpers relative to major components on the backplane.

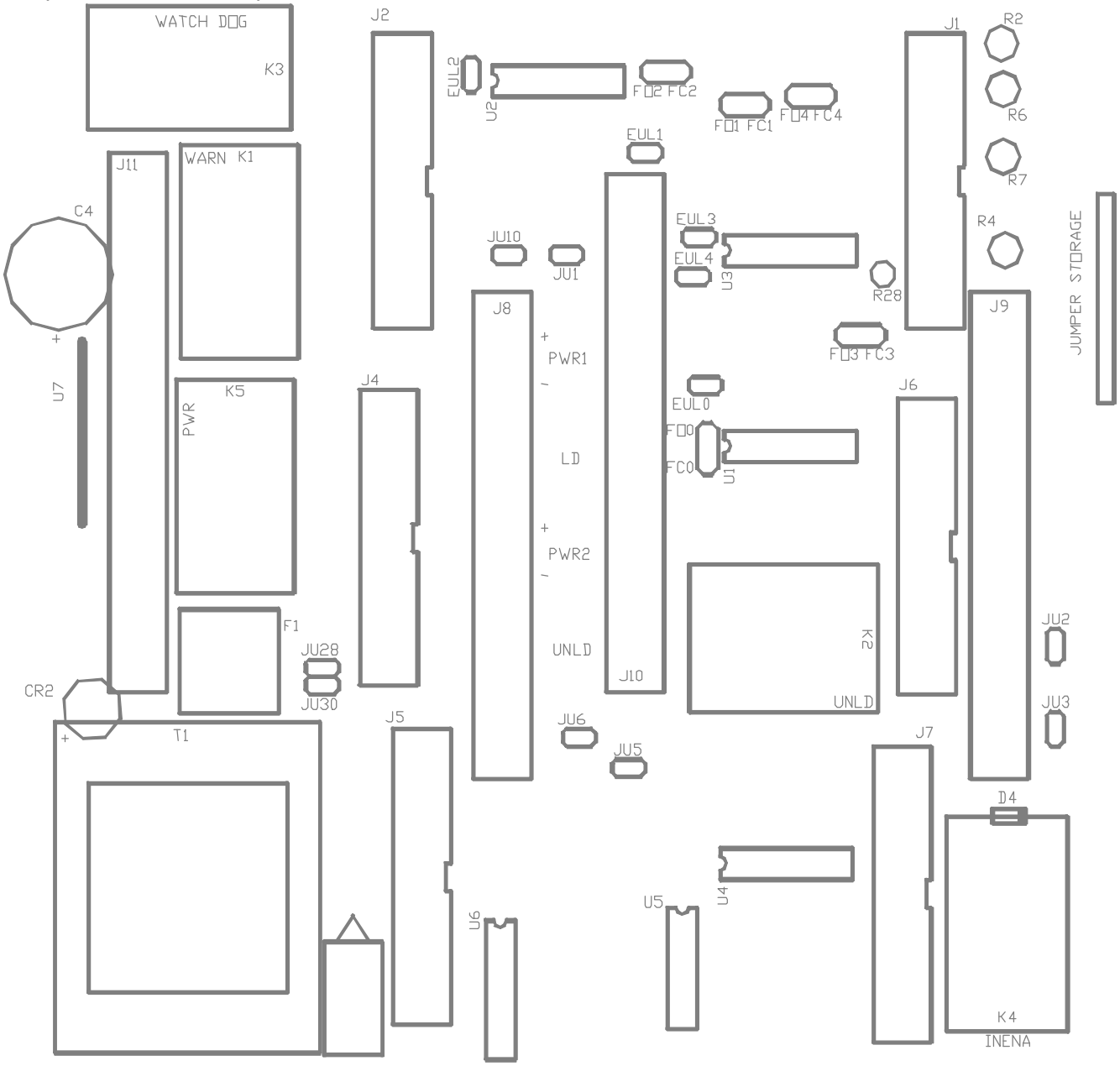

Figure 5 Jumper Locations

Operating Voltage Jumpers

The Operating Voltage of the refiner controller should be preset by the factory based on the customer's ordering specifications, but this information is provided in the event that available operating voltage changes.

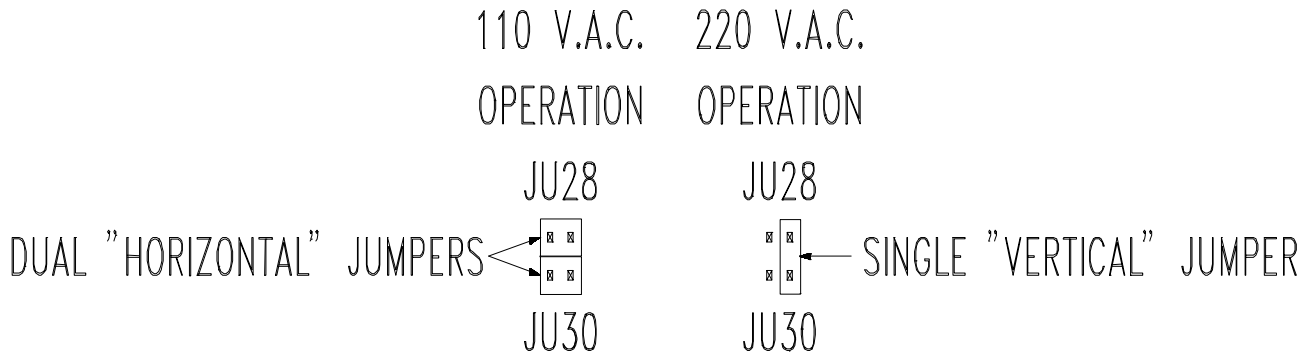

Figure 6 Operating Voltage Jumpers

For 110 V.A.C. operation, JU28 and JU30 should be connected as shown above left.

For 220 V.A.C. operation, they should be connected as shown above right. The spare jumper should be retained on the "JUMPER STORAGE" strip on the upper right hand of the backplane.

Unload Jumpers

The Fail Opened/Fail Closed jumpers (FO0/FC0 - FO4/FC4) are five groups of three position jumpers. They control the "sense" of the input conditions required to activate the Unload and cause an alarm condition. When the jumper is placed across the "FO" side, the unload is activated by opening normally closed external contacts. When the jumper is placed across the "FC" side, the unload is activated by closing normally open external contacts. Redundant hardware unloading is activated only if the corresponding Enable Unload jumper is installed.

The Enable UnLoad jumpers (EUL0 - EUL4) are five pairs of jumpers used to configure the circuits for the redundant interlocking unload circuit. They control enabling and disabling of their respective unload functions. When the jumper is placed across the contacts, the unload is enabled. When the contacts are disconnected, the unload function is disabled. If Unload is not enabled, the hardware logic will not unload the refiner. An alarm condition is still generated, and the software logic can still unload the refiner. If a particular Unload function is not going to be used, the associated jumper should be retained on the "JUMPER STORAGE" strip on the upper right hand of the backplane.

Redundant Interlocking Unload Logic (Digital Alarms)

The digital unload logic is processed using a redundant control scheme. Unloading of the refiner is controlled by the unload circuit on the backplane, by the program in the controller, or by a combination of both. This design was used so that the unload circuit would be able to unload the refiner if the controller could not due to a malfunction or vice-versa. Whichever system "votes" to unload the refiner overrides the other.

Each contact input can be individually configured to allow the hardware unload circuit to process it. This is accomplished by installing the appropriate Enable Unload jumper. If any of the "Enabled" contact inputs is activated the unload circuit will cause a FAST OUT of the refiner, and an alarm condition will be processed by the controller program.

Each contact input can also be configured in the controller program to allow unloading. If activated, the contact input will first cause an alarm condition to occur, regardless of the state of the Enable Unload jumper. The controller program will then process the specific alarm condition. Additional jumper definitions

are as follows:

EUL0	This jumper, if installed, enables the LO PACK WATER Unload
FO0/FC0	This jumper selects "Fail Opened" or "Fail Closed" sensing for the LO PACK WATER Unload
EUL1	This jumper, if installed, enables the AUX UNLD 1 Unload
FO1/FC1	This jumper selects "Fail Opened" or "Fail Closed" sensing for the AUX UNLD 1 Unload
EUL2	This jumper, if installed, enables the AUX UNLD 2 Unload
FO2/FC2	This jumper selects "Fail Opened" or "Fail Closed" sensing for the AUX UNLD 2 Unload
EUL3	This jumper, if installed, enables the AUX UNLD 3 Unload.
FO3/FC3	This jumper selects "Fail Opened" or "Fail Closed" sensing for the AUX UNLD 3 Unload.
EUL4	This jumper, if installed, enables the AUX UNLD 4 Unload
FO4/FC4	This jumper selects "Fail Opened" or "Fail Closed" sensing for the AUX UNLD 4 Unload
JU1	Connects the "Horsepower Remote setpoint" signal from the Freeness HPD/T Controller ANO1 to the Motor Load Controller ANI1.
JU10	This jumper connects the "R/A STATUS" signal from the Motor Load Controller ANO0 to the Freeness/HPD/T controller ANI4

Jumpers JU4, JU7, JU8, and JU9 are used for factory testing ONLY. They should be left open at all times. Connecting these contacts with jumpers will cause faulty operation and possible damage to the circuitry.

Software configuration:

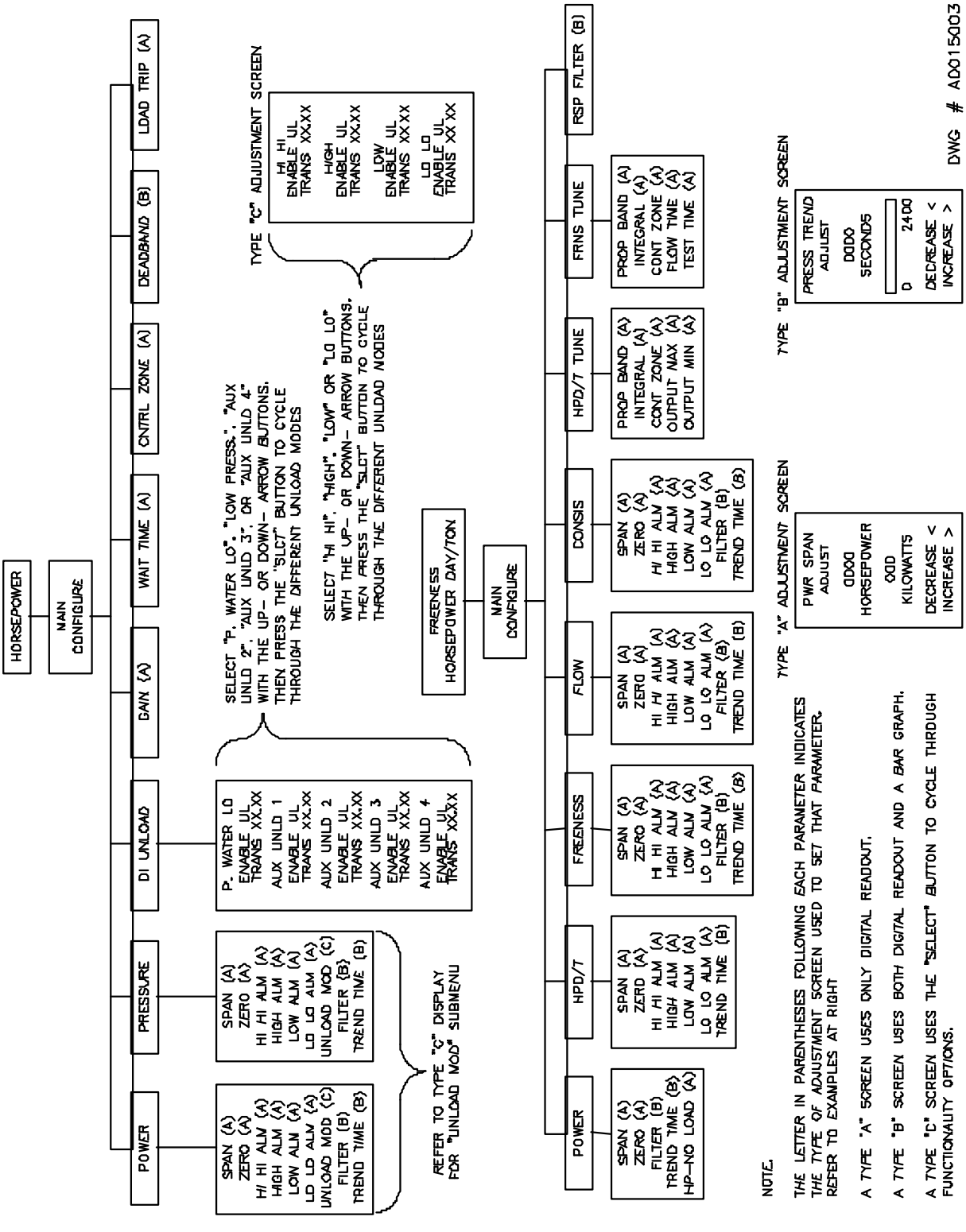

Figure 7 Configuration Menus

Depending on the level of implementation, the TECO BRAINAC™ Refiner Controller consists of one or two separate electronic modules. The HORSEPOWER module monitors and controls the refiner and receives setpoint information on other conditions from the FREENESS HORSEPOWER DAY/TON module. Each module is configured in a similar manner through a series of configuration menus. Figure 7 illustrates the hierarchy of configuration menus.

The button assignments are identical on each module. Figure 8 shows the position of the various buttons used in configuration.

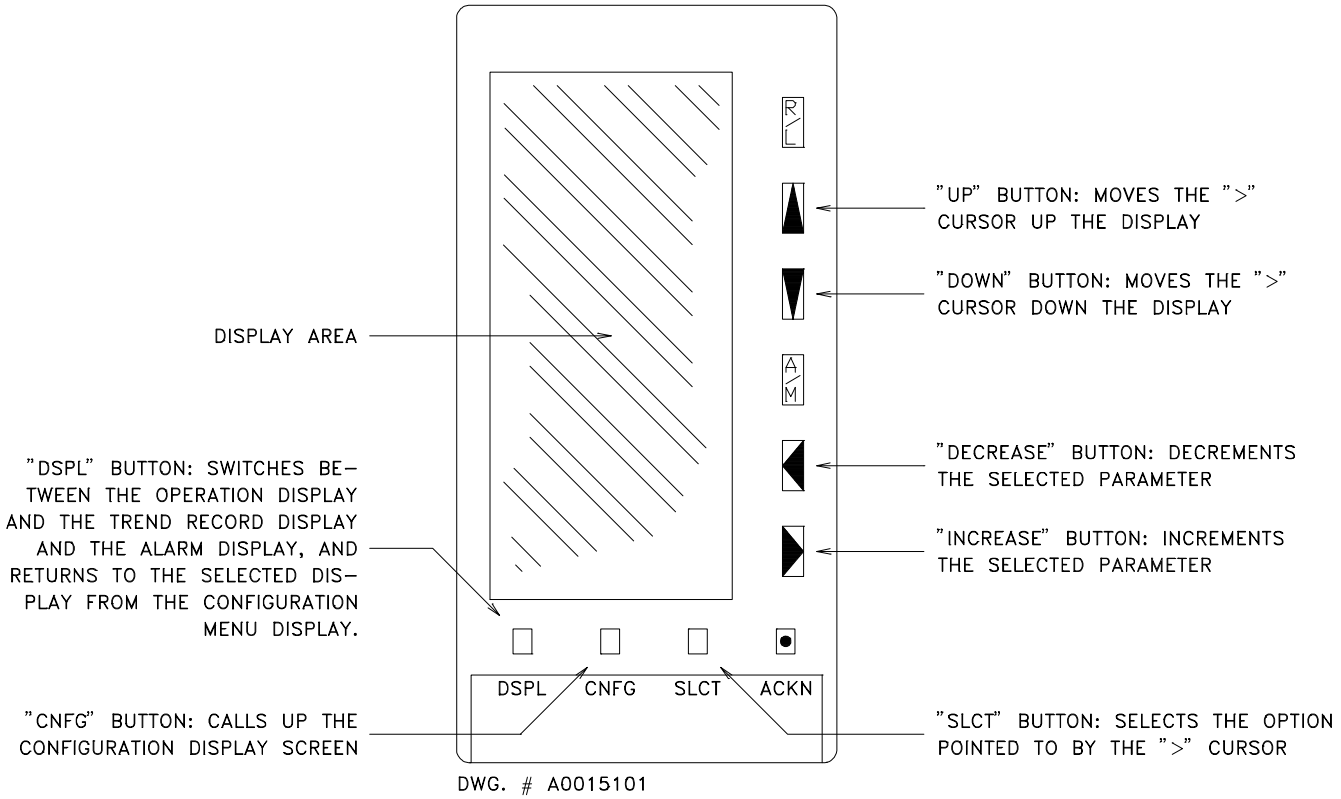

Figure 8 Button Identification

HORSEPOWER

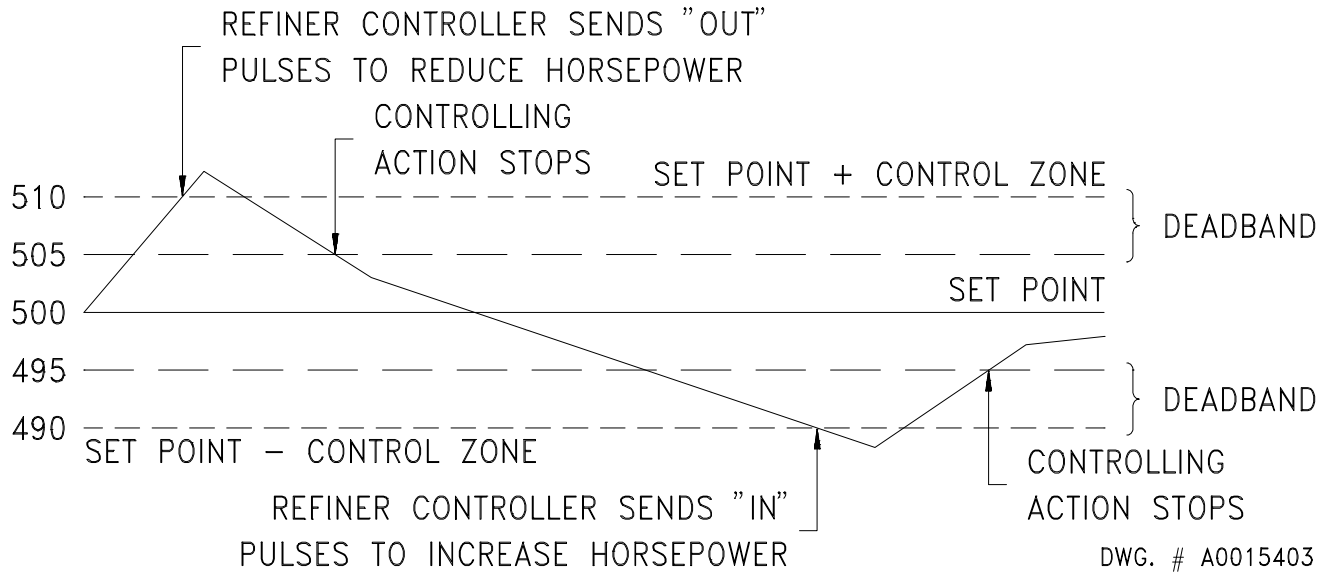

Figure 9 Control Zone, Deadband And Controller Action

The HORSEPOWER module configuration consists of setting parameters for:

POWER
PRESSURE
GAIN
WAIT TIME
CNTRL ZONE
DEADBAND
LOAD TRIP

Each set of parameters is accessed from a MAIN CONFIGURE menu screen, and may have sub-menu screens.

A. POWER

To configure the POWER parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. The CNFG button is the second button from the left just below the display screen. Use the UP and DOWN buttons to move the pointer until it is pointing to "POWER". The UP and DOWN buttons are the second and third buttons (respectively) down from the top along the right side of the display screen. Once the cursor points to "POWER", press the "SLCT" button. The screen will display the "POWER CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM

LO LO ALM
UNLOAD MOD
FILTER
TREND TIME

At this point, select the desired parameter by using the "UP" or "DOWN" buttons to move the pointer and pressing the "SLCT" button.

1. SPAN

When SPAN is selected, press the "SLCT" button to select the PWR SPAN ADJUST screen. This screen displays the current POWER SPAN setting in horsepower. These values are adjustable up or down by using the "INCREASE" or "DECREASE" buttons. The PWR SPAN is adjustable between 0-9999 HP and is set to match the range of the horsepower signal transmitter.

2. ZERO

To select the ZERO ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to "ZERO" and press the "SLCT" button. The screen will display the PWR ZERO ADJUST screen. The PWR ZERO may be adjusted by using the "INCREASE" or "DECREASE" buttons. The PWR ZERO is set to match the range of the horsepower signal transmitter.

3. HI HI ALM

To select the PWR HI HI ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to HI HI ALM and press the "SLCT" button. The screen will display the PWR HI HI ADJUST screen. The HI HI ALM may be adjusted by using the "INCREASE" or "DECREASE" buttons. The HI HI ALM can be set to the maximum horsepower of the refiner operation without causing damage. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the POWER CONFIGURE menu.

NOTE: The HI HI ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

4. HIGH ALM

To select the PWR HI ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to HIGH ALM and press the "SLCT" button. The screen will display the PWR HI ADJUST screen. The HIGH ALM may be adjusted by using the "INCREASE" or "DECREASE" button. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the POWER CONFIGURE menu.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

To select the PWR LOW ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to LOW ALM and press the "SLCT" button. The screen will display the PWR LOW ADJUST screen. The LOW ALM may be adjusted by using the "INCREASE" or "DECREASE" button. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the POWER CONFIGURE menu.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

6. LO LO ALM

To select the PWR LO LO ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to LO LO ALM and press the "SLCT" button. The screen will display the PWR LO LO ADJUST screen. The LO LO ALM may be adjusted by using the "INCREASE" or "DECREASE" button. The LO LO ALM can be adjusted to a value that helps to prevent damage to a refiner when a horsepower transmitter or some other hardware fails. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the POWER CONFIGURE menu.

NOTE: The LO LO ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

7. UNLOAD MOD

When UNLOAD MOD is selected, the next screen is the POWER UNLOAD MOD screen. This screen is made up of 4 individually configurable alarms. Use the UP- or DOWN- arrow to select each item in turn. Pressing the "SLCT" button changes the alarm unload mode for the selected POWER alarm. Displayed beneath the alarm name is the current unload mode for that alarm. The time settings for Transient and Timed Unload are adjusted using the "INCREASE" and "DECREASE" buttons.

1. HI HI
2. HIGH
3. LOW
4. LO LO
5. UNUSED

Each of the alarms can be configured to one of three alarm unload modes "DISABLE UL", "LATCHED UL", and "TIMED UL". A transient detection feature can also be used in conjunction with the LATCHED and TIMED unload modes described below. The transient function determines if the alarm condition is caused by a temporary surge in the process variable or if it is a valid alarm.

"TRANSIENT" - Warning alarm and Transient Unload. The alarm condition is monitored for a configured time period. While the alarm is being processed, the unload condition is latched and the controller is put in manual control mode. If the alarm condition clears before time has expired, the alarm is automatically acknowledged and the controller is automatically restored to its previous control mode. If the alarm condition does not clear within the allotted time, the specified unload mode is activated and takes control. The transient time range is 0-10 seconds adjustable in increments of 0.05 seconds.

Note: If any Latched Unload or Timed Unload occurs while a transient is being processed, the controller will be kept in manual control mode.

The alarm unload modes operate as follows:

"DISABLE UL" - Warning alarm only. Unload is disabled.

"LATCHED UL" - Warning alarm and Latched Unload. Latches unload condition and puts the controller in manual mode. The unload condition is released only after the alarm condition has cleared and the alarm has been acknowledged.

"TIMED" - Warning alarm and Timed Unload. Unload condition is latched for a configured time period, and

the controller is put in manual control mode. The unload condition is released after
time has expired. The latch time range is 0-999.5 seconds adjustable in increments of 0.5 seconds.

8. FILTER

To select the PWR FILTER ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to FILTER and press the "SLCT" button. The screen will display the PWR FILTER ADJUST screen. The PWR FILTER may be adjusted by using the "INCREASE" or "DECREASE" button. The PWR FILTER (damping) is set to a value between 0-3.099 seconds, which assists in improving control action of the horsepower without causing the controller to be insensitive to horsepower changes.

9. TREND TIME

To select the PWR TREND ADJUST screen, press the "CNFG" button to return to the MAIN CONFIGURE menu. Press the "SLCT" button to select the POWER CONFIGURE menu. Use the "UP" or "DOWN" button to move the cursor to TREND TIME and press the "SLCT" button. The screen will display the PWR TREND ADJUST screen. The TREND TIME may be adjusted by using the "INCREASE" or "DECREASE" button. The TREND TIME can be set to a value between 0-2400 seconds and is adjusted to aid in start-up and operation.

B. PRESSURE (Stockline Pressure)

To configure the PRESSURE parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "PRESSURE". Once the cursor points to "PRESSURE", press the "SLCT" button. The screen will display the "PRESSURE CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM
LO LO ALM
UNLOAD MOD
FILTER
TREND TIME

At this point, select the desired parameter by using the "UP" or "DOWN" buttons to move the pointer and pressing the "SLCT" button. The various configuration and adjustment menus are selected and adjusted using the same method used for the POWER parameters.

1. SPAN

When SPAN is selected, the next screen is the PRESS SPAN ADJUST screen. This screen displays the current PRESSURE SPAN setting in PSI. Set this parameter to match the range of the pressure transmitter. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

2. ZERO

When ZERO is selected, the next screen is the PRESS ZERO ADJUST screen. This screen displays the current PRESSURE ZERO setting in PSI. Set this parameter to match the range of the pressure transmitter. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

3. HI HI ALM

When HI HI ALM is selected, the next screen is PRESS HI HI ADJUST screen. This screen displays the current HI HI ALARM POINT setting in PSI. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the PRESSURE CONFIGURE menu.

NOTE: The HI HI ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

4. HIGH ALM

When HIGH ALM is selected, the next screen is the PRESS HI ADJUST screen. This screen displays the current HIGH ALARM POINT setting in PSI. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the PRESSURE CONFIGURE menu.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

When LOW ALM is selected, the next screen is the PRESS LOW ADJUST screen. This screen displays the current LOW ALARM POINT setting in PSI. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the PRESSURE CONFIGURE menu.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

6. LO LO ALM

When LO LO ALM is selected, the next screen is the PRESS LO LO ADJUST screen. This screen displays the current LO LO ALARM POINT setting in PSI. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. The unload mode for this alarm can be configured in the UNLOAD MOD screen of the PRESSURE CONFIGURE menu.

NOTE: The LO LO ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

7. UNLOAD MOD

When UNLOAD MOD is selected, the next screen is the PRESSURE UNLOAD MOD screen. This screen is made up of 4 individually configurable alarms. Use the UP or DOWN arrow to select each item in turn. Pressing the "SLCT" button changes the alarm unload mode for the selected PRESSURE alarm. Displayed beneath the alarm name is the current unload mode for that alarm. The time settings for Transient and Timed Unload are adjusted using the "INCREASE" and "DECREASE" buttons.

1. HI HI
2. HIGH
3. LOW
4. LO LO
5. UNUSED

Each of the alarms can be configured to one of three alarm unload modes "DISABLE UL", "LATCHED UL", and "TIMED UL". A transient detection feature can also be used in conjunction with the LATCHED and TIMED unload modes described below. The transient function determines if the alarm condition is caused by

a temporary surge in the process variable or if it is a valid alarm.

"TRANSIENT" - Warning alarm and Transient Unload. The alarm condition is monitored for a configured time period. While the alarm is being processed, the unload condition is latched and the controller is put in manual control mode. If the alarm condition clears before time has expired, the alarm is automatically acknowledged and the controller is automatically restored to its previous control mode. If the alarm condition does not clear within the allotted time, the specified unload mode is activated and takes control. The transient time range is 0-10 seconds adjustable in increments of 0.05 seconds.

Note: If any Latched Unload or Timed Unload occurs while a transient is being processed, the controller will be kept in manual control mode.

The alarm unload modes operate as follows:

"DISABLE UL" - Warning alarm only. Unload is disabled.

"LATCHED UL" - Warning alarm and Latched Unload. Latches unload condition and puts the controller in manual mode. The unload condition is released only after the alarm condition has cleared and the alarm has been acknowledged.

"TIMED" - Warning alarm and Timed Unload. Unload condition is latched for a configured time period, and the controller is put in manual control mode. The unload condition is released after time has expired. The latch time range is 0-999.5 seconds adjustable in increments of 0.5 seconds.

8. FILTER

When FILTER is selected, the next screen is the PRESS FILTER ADJUST screen. This screen displays the current PRESSURE FILTER setting in seconds. The range is from 0 to 1638 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

9. TREND TIME

When TREND TIME is selected, the next screen is the PRESS TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

C. DI UNLOAD (Digital Input UNLOAD)

1. CONFIGURATION

To configure the Digital Input UNLOAD parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "DI UNLOAD" and press the "SLCT" button. The screen will display the "DIGITAL IN UNLOAD ENA" menu. This parameter is made up of 5 individually-enabled digital inputs. Use the UP- or DOWN- arrow to select each input in turn. Pressing the "SLCT" button changes the alarm unload mode for the selected input. Displayed beneath the alarm name is the current unload mode for that alarm. The time settings for Transient and Timed Unload are adjusted using the "INCREASE" and "DECREASE" buttons.

1. P. WATER LOW
2. AUX UNLOAD 1
3. AUX UNLOAD 2
4. AUX UNLOAD 3
5. AUX UNLOAD 4

Each of the alarms can be configured to one of three alarm unload modes "DISABLE UL", "LATCHED UL", and "TIMED UL". A transient detection feature can also be used in conjunction with the LATCHED and TIMED unload modes described below. The transient function determines if the alarm condition is caused by a temporary surge in the process variable or if it is a valid alarm.

"TRANSIENT" - Warning alarm and Transient Unload. The alarm condition is monitored for a configured time period. While the alarm is being processed, the unload condition is latched and the controller is put in manual control mode. If the alarm condition clears before time has expired, the alarm is automatically acknowledged and the controller is automatically restored to its previous control mode. If the alarm condition does not clear within the allotted time, the specified unload mode is activated and takes control. The transient time range is 0-10 seconds adjustable in increments of 0.05 seconds.

Note: If any Latched Unload or Timed Unload occurs while a transient is being processed, the controller will be kept in manual control mode.

The alarm unload modes operate as follows:

A "TRUE" input may be represented by either opening or closing a set of contacts external of the Refiner Controller. The actual condition representing "TRUE" is determined by the setting of jumpers on the backplane P.C. board.

"DISABLE UL" - A "TRUE" input will cause a warning alarm only. Unload is disabled.

"LATCHED UL" - A "TRUE" input will cause a warning alarm and Latched Unload. Latches unload condition and puts the controller in manual mode. The unload condition is released only after the alarm condition has cleared and the alarm has been acknowledged.

"TIMED" - A "TRUE" input will cause a warning alarm and Timed Unload. Unload condition is latched for a configured time period, and the controller is put in manual control mode. The unload condition is released after time has expired. The latch time range is 0-999.5 seconds adjustable in increments of 0.5 seconds.

NOTE: The redundant digital UNLOAD logic on the backplane P.C. board overrides the controller UNLOAD program. Therefore, this mode will only operate properly if all Enable Unload jumpers (EUL0 - EUL4) are removed from the backplane.

2. REDUNDANT UNLOAD LOGIC

The digital unload logic is processed using a redundant control scheme. Unloading of the refiner is controlled by the unload circuit on the backplane, by the program in the controller, or by a combination of both. This design was used so that the unload circuit would be able to unload the refiner if the controller could not due to a malfunction or vice-versa. Whichever system "votes" to unload the refiner overrides the other.

Each contact input can be individually configured to allow the hardware unload circuit to process it. This is accomplished by installing the appropriate Enable Unload jumper. If any of the "Enabled" contact inputs is activated the unload circuit will cause a FAST OUT of the refiner, and an alarm condition will be processed by the controller program.

Each contact input can also be configured in the controller program to allow unloading. If activated, the contact input will first cause an alarm condition to occur, regardless of the state of the Enable Unload jumper. The controller program will then process the specific alarm condition. The unloading action is determined by the unload mode.

Conditions which may occur:

a) Unload Mode is set to "Disable" in the program, and "Enable Unload" jumper is installed. - This will cause the unload circuit to take control. In this situation a FAST OUT unloading of the refiner will occur. The controller will highlight the alarm condition but will not indicate the correct status of "FAST", "OUT", and "UNLOAD" parameters. The unload circuit will maintain the controller in FAST OUT until the alarm condition has cleared.

b) Unload Mode is set to "TIMED" in the program, and Enable Unload jumper is installed. - This will

cause the unload circuit to take control. A FAST OUT unloading of the refiner will occur. The alarm condition will be highlighted. The "FAST", "OUT", and "UNLOAD" parameters will show the correct status until the latch time has expired. Although these parameters will have cleared, the unload circuit will maintain the controller in FAST OUT until the alarm condition has cleared.

D. GAIN

To configure the GAIN parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "GAIN" and press the "SLCT" button. The screen will display the "GAIN ADJUST" menu. This parameter is adjustable between 0 and 20 seconds per horsepower, using the "INCREASE" and "DECREASE" buttons. The duration of the drive pulse is calculated by multiplying the GAIN times the Power deviation.

E. WAIT TIME

WAIT TIME is the minimum time allowed between the end of one drive pulse and the start of the next drive pulse. It is also the minimum time between motor IN & OUT. To configure the WAIT TIME parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "WAIT TIME" and press the "SLCT" button. The screen will display the "WAIT TIME ADJUST" menu. This parameter is adjustable using the "INCREASE" and "DECREASE" buttons. It should be set slightly longer than the inertial spindown time of the refiner gearmotor.

F. CNTRL ZONE

The CONTROL ZONE is the range above or below the setpoint at which the controller starts making corrections. To configure the CNTRL ZONE parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "CNTRL ZONE" and press the "SLCT" button. The screen will display the "CNTRL ZONE ADJUST" menu. Adjustment is made by pressing the "INCREASE" or "DECREASE" buttons to raise or lower respectively the control zone in horsepower. Refer to Figure 9 for an illustration of CONTROL ZONE application.

G. DEADBAND

The DEADBAND is the range above or below the control zone value at which the controller stops making corrections. To configure the DEADBAND parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "DEADBAND" and press the "SLCT" button. The screen will display the "DEADBAND ADJUST" menu. This parameter is adjustable between 0 and the value entered for CNTRL ZONE above, using the "INCREASE" and "DECREASE" buttons. Refer to Figure 9 for an example of DEADBAND application in which the set point is 500, the control zone is 10, and the deadband is 5.

H. LOAD TRIP

LOAD TRIP is the point at which the refiner switches from FAST to SLOW loading. To configure the LOAD TRIP parameter, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "LOAD TRIP" and press the "SLCT" button. The screen will display the "LOAD TRIP ADJUST" menu. Adjustment is made by pressing the "INCREASE" or "DECREASE" buttons to raise or lower respectively the control zone in horsepower and kilowatts.

II. FREENESS - HORSEPOWER DAY/TON

The FREENESS - HORSEPOWER DAY/TON module configuration consists of setting parameters for:

POWER

HPD/T
FREENESS
FLOW
CONSIS
HPD/T TUNE
FRNS TUNE
RSP FILTER

Each set of parameters is accessed from a MAIN CONFIGURE menu screen, and may have sub-menu screens.

A. POWER

To configure the POWER parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "POWER". Once the cursor points to "POWER", press the "SLCT" button. The screen will display the "POWER CONFIGURE" menu. The available options are:

SPAN
ZERO
FILTER
TREND TIME
HP-NO LOAD

At this point, select the desired parameter by using the "UP" or "DOWN" buttons to move the pointer and pressing the "SLCT" button.

1. SPAN

When SPAN is selected, the next screen is the PWR SPAN ADJUST screen. This screen displays the current POWER SPAN setting in horsepower. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. It should be set to the same value used for SPAN in the Power controller.

2. ZERO

When ZERO is selected, the next screen is the PWR ZERO ADJUST screen. This screen displays the current POWER ZERO setting in horsepower. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. It should be set to the same value used for ZERO in the Power controller.

3. FILTER

When FILTER is selected, the next screen is the PWR FILTER ADJUST screen. This screen displays the current POWER FILTER setting in seconds. The range is from 0 to 12.7 seconds, adjustable up or down using the "INCREASE" or "DECREASE" buttons. It should be set to the same value used for FILTER in the Power controller.

4. TREND TIME

When TREND TIME is selected, the next screen is the PWR TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

5. HP-NO LOAD--NO LOAD ADJUST (HORSEPOWER)

HP-NO LOAD is the horsepower used by the refiner with the plates in a position such that no actual stock

refining is done, but stock is flowing in the refiner.

B. HPD/T

To configure the HPD/T parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "HPD/T" and press the "SLCT" button. The screen will display the "HPD/T CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM
LO LO ALM
TREND TIME

1. SPAN

When SPAN is selected, the next screen is the HPDT SPAN ADJUST screen. This screen displays the current HPDT SPAN setting in HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

2. ZERO

When ZERO is selected, the next screen is the HPDT ZERO ADJUST screen. This screen displays the current HPDT ZERO setting in HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

3. HI HI ALM

When HI HI ALM is selected, the next screen is the HPDT HI HI ADJUST screen. This screen displays the current HI HI ALARM POINT setting in HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: When the HI HI ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

4. HIGH ALM

When HIGH ALM is selected, the next screen is the HPDT HI ADJUST screen. This screen displays the current HIGH ALARM POINT setting in HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

When LOW ALM is selected, the next screen is the HPDT LOW ADJUST screen. This screen displays the current LOW ALARM POINT setting in HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn

alarm.

6. LO LO ALM

When LO LO ALM is selected, the next screen is the HPDT LO LO ADJUST screen. This screen displays the current LO LO ALARM POINT setting in the HPD/T. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: When the LO LO ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

7. TREND TIME

When TREND TIME is selected, the next screen is the HPDT TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

C. FREENESS

To configure the FREENESS parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "FREENESS" and press the "SLCT" button. The screen will display the "FREENESS CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM
LO LO ALM
FILTER
TREND TIME

1. SPAN

When SPAN is selected, the next screen is the FRE SPAN ADJUST screen. This screen displays the current HPDT SPAN setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

2. ZERO

When ZERO is selected, the next screen is the FRE ZERO ADJUST screen. This screen displays the current FRE ZERO setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

3. HI HI ALM

When HI HI ALM is selected, the next screen is the FRE HI HI ADJUST screen. This screen displays the current HI HI ALARM POINT setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: When the HI HI ALM is tripped, the HPD/Ton controller will switch to local Set Point.

4. HIGH ALM

When HIGH ALM is selected, the next screen is the FRE HI ADJUST screen. This screen displays the current HIGH ALARM POINT setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

When LOW ALM is selected, the next screen is the FRE LOW ADJUST screen. This screen displays the current LOW ALARM POINT setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

6. LO LO ALM

When LO LO ALM is selected, the next screen is the FRE LO LO ADJUST screen. This screen displays the current LO LO ALARM POINT setting in CSF. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: When the LO LO ALM is tripped, the HPD/Ton controller will switch to local Set Point.

7. FILTER

When FILTER is selected, the next screen is the FRE FILTER ADJUST screen. This screen displays the current FRE FILTER setting in seconds. The range is from 0 to 1638 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

8. TREND TIME

When TREND TIME is selected, the next screen is the FRE TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

D. FLOW

To configure the FLOW parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "FLOW" and press the "SLCT" button. The screen will display the "FLOW CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM
LO LO ALM
FILTER
TREND TIME

1. SPAN

When SPAN is selected, the next screen is the FLOW SPAN ADJUST screen. This screen displays the current FLOW SPAN setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

2. ZERO

When ZERO is selected, the next screen is the FLOW ZERO ADJUST screen. This screen displays the current FLOW ZERO setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

3. HI HI ALM

When HI HI ALM is selected, the next screen is the FLOW HI HI ADJUST screen. This screen displays the current HI HI ALARM POINT setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: When the HI HI ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

4. HIGH ALM

When HIGH ALM is selected, the next screen is the FLOW HI ADJUST screen. This screen displays the current HIGH ALARM POINT setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

When LOW ALM is selected, the next screen is the FLOW LOW ADJUST screen. This screen displays the current LOW ALARM POINT setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

6. LO LO ALM

When LO LO ALM is selected, the next screen is the FLOW LO LO ADJUST screen. This screen displays the current LO LO ALARM POINT setting in GPM. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: When the LO LO ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

7. FILTER

When FILTER is selected, the next screen is the FLOW FILTER ADJUST screen. This screen displays the current FLOW FILTER setting in seconds. The range is from 0 to 1638 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

8. TREND TIME

When TREND TIME is selected, the next screen is the FLOW TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

E. CONSIS

To configure the CONSIS parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons t move the pointer until it is pointing to "CONSIS" and press the "SLCT" button. The screen will display the "CONSIS CONFIGURE" menu. The available options are:

SPAN
ZERO
HI HI ALM
HIGH ALM
LOW ALM
LO LO ALM
FILTER
TREND TIME

1. SPAN

When SPAN is selected, the next screen is the CONS SPAN ADJUST screen. This screen displays the current CONSISTENCY SPAN setting in % CONSistency. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

2. ZERO

When ZERO is selected, the next screen is the CONS ZERO ADJUST screen. This screen displays the current CONSISTENCY ZERO setting in % CONSistency. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

3. HI HI ALM

When HI HI ALM is selected, the next screen is the CONS HI HI ADJUST screen. This screen displays the current HI HI ALARM POINT setting in % CONSistency. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: When the HI HI ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

4. HIGH ALM

When HI ALM is selected, the next screen is the CONS HI ADJUST screen. This screen displays the current HIGH ALARM POINT setting in % CONSistency. This value is adjustable up or down by using the "INCREASE" OR "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value above the full-scale value.

NOTE: The HIGH ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

5. LOW ALM

When LOW ALM is selected, the next screen is the CONS LOW ADJUST screen. This screen displays the current LOW ALARM POINT setting in % CONSistency. This value is adjustable up or down by using the

"INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: The LOW ALM has an internal contact used by all High and Low alarms to activate an external Warn alarm.

6. LO LO ALM

When LO LO ALM is selected, the next screen is the CONS LO LO ADJUST screen. This screen displays the current LO LO ALARM POINT setting in % CONS. This value is adjustable up or down by using the "INCREASE" or "DECREASE" buttons. If it is desired to disable this alarm, it can be configured to some value below the minimum-scale value.

NOTE: When the LO LO ALM is tripped, the HORSEPOWER controller will switch to local Set Point.

7. FILTER

When FILTER is selected, the next screen is the CONS FILTER ADJUST screen. This screen displays the current CONS FILTER setting in seconds. The range is from 0 to 1638 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

8. TREND TIME

When TREND TIME is selected, the next screen is the CONS TREND ADJUST screen. This screen displays the current TREND TIME setting in seconds. The range is from 0 to 2400 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons.

F. HPD/T TUNE

To configure the HPD/T TUNE parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "HPD/T TUNE" and press the "SLCT" button. The screen will display the "HPD/T TUNE CONFIGURE" menu. See Figure 9 The available options are:

PROP BAND
INTEGRAL
CONT ZONE

1. PROP BAND--HPD/T PB ADJUST (% PROP BND)
2. INTEGRAL--HPD/T INT ADJUST (MIN/REP)
3. CONT ZONE--CONT ZONE ADJUST (HPD/T)- (Deadband + and - of setpoint)

G. FRNS TUNE

To configure the FRNS TUNE parameters, enter the MAIN CONFIGURE menu by pressing the CNFG button. Use the UP and DOWN buttons to move the pointer until it is pointing to "FRNS TUNE" and press the "SLCT" button. The screen will display the "FRNS TUNE CONFIGURE" menu. The available options are:

PROP BAND
INTEGRAL
CONT ZONE
FLOW TIME
TEST TIME

1. PROP BAND--FREE PB ADJUST (% PROP BND)

2. INTEGRAL--FREE INT ADJUST (MIN/REP)

3. CONT ZONE--CONT ZONE ADJUST (FREENESS)- (Deadband + and - of setpoint)

4. FLOW TIME-FLOW TIME ADJUST (SECONDS)- Set to time it takes stock to travel from the refiner to the freeness tester at maximum flow.

5. TEST TIME--TEST TIME ADJUST (SECONDS)- Set to complete cycle time of the freeness tester.

NOTE: If FLOW TIME and TEST TIME are negligible with respect to the freeness response time, it may be wise to use values of zero for FLOW TIME and TEST TIME, and adjust integral time to compensate.

H. RSP FILTER

When RSP FILTER is selected, the next screen is the RSPFILT ADJUST screen. This screen displays the current RSP FILTER setting in seconds. The range is from 0 to 1638 seconds, adjustable up or down by using the "INCREASE" or "DECREASE" buttons. This adjustment provides damping on an external remote setpoint.

Operators Section

SCOPE

This section is intended to familiarize the stock refiner operator on the functions and features available in the TECO Refiner Controller.

OVERVIEW

The TECO Refiner Controller offers a variety of refiner control schemes with controller displays, trend displays, and alarm displays. The control schemes available are managed by two instruments. The First instrument manages the Motor Load controller, while the second manages the Horsepower Day/Ton controller and the Freeness controller. The controllers are integrated so that information from each controller is passed on to the other controllers permitting a bump-less balance-less transfer from control level to control level. The TECO Refiner Controller is based on a triple cascade control scheme. The inner most loop controls the refining process through power only (Horsepower or Kilowatts). The second level of control combines power, consistency and flow. This method controls the specific energy delivered to the stock and is measured in HORSEPOWER*DAY/TON (HPD/T). The outer most loop controls the refining process based on the condition of the stock after refining by adjusting the specific energy delivered to the stock. The middle loop controls this requested specific energy by adjusting the power delivered to the refiner. The inner most loop controls this power level requested by adjusting the plate position.

MOTOR LOAD CONTROLLER

I. PRINCIPLE OF OPERATION

Motor Load control is the most fundamental method of control available in the TECO Refiner Controller. The principle of operation is based on a single loop feedback scheme. The input to the controller is the refiner motor load (Horsepower or Kilowatts). The most significant factor affecting motor load is refiner plate separation. The closer together the refiner plates are the greater the motor load, while the greater the separation the less the motor load. Plate positioning by the TECO Refiner Controller is implemented through contact closure outputs.

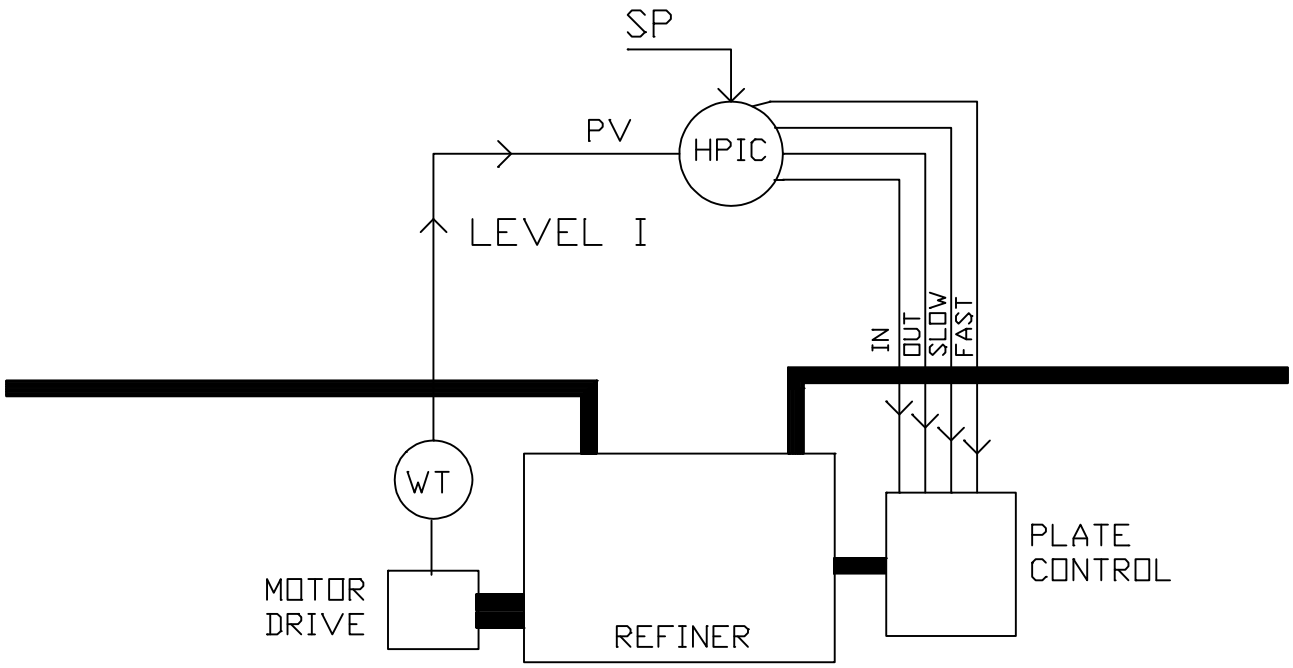

Figure 10 Level 1 Control Diagram

II. OPERATOR INTERFACE

The Motor Load controller is operated through the left display. Process information and alarm status are conveyed by way of selectable displays. Manual adjustments are made directly through pushbuttons on the display panel.

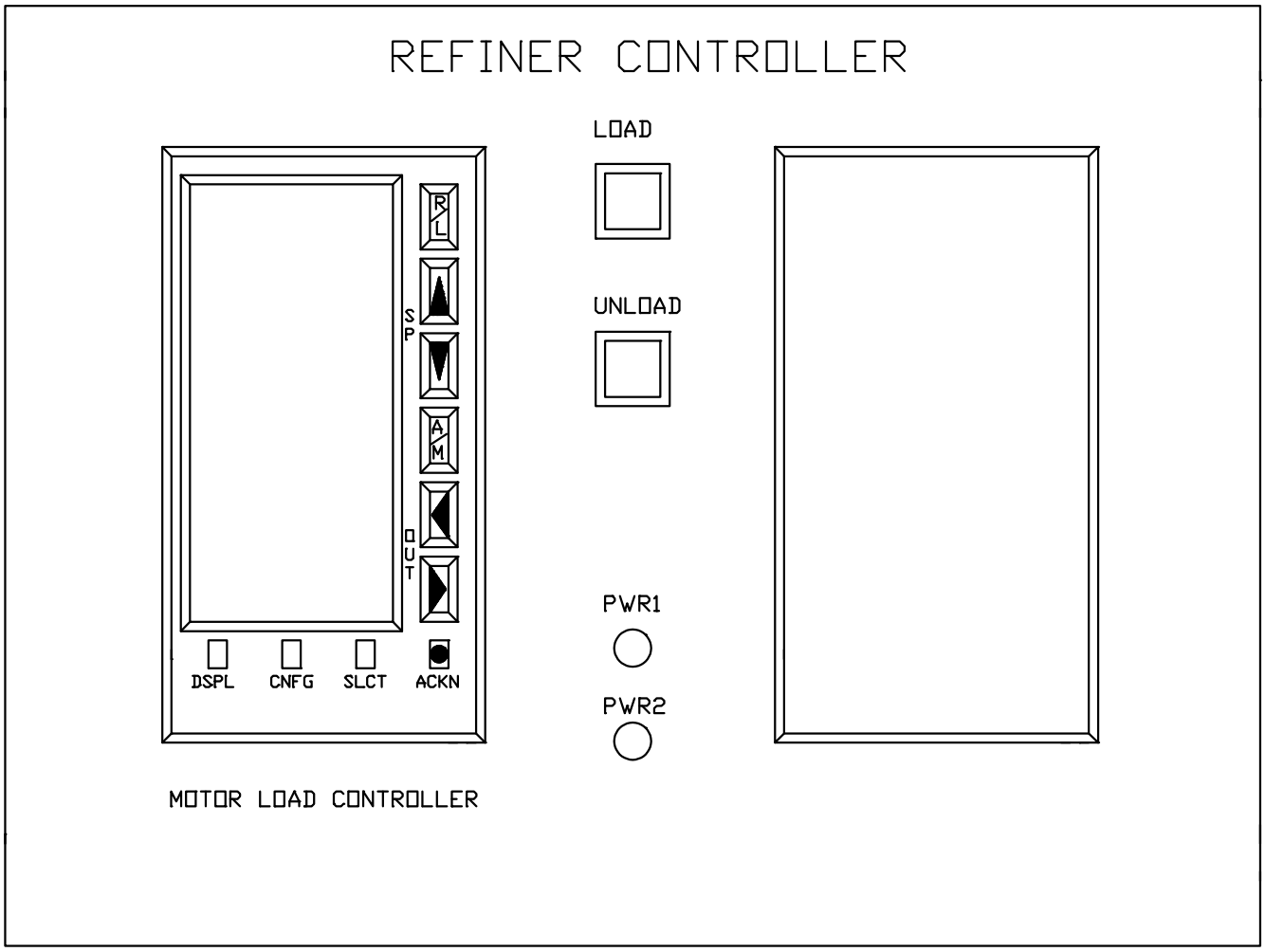

Figure 11 Level 1 Faceplate

III. CONTROLLER FACE PLATE AND OPERATOR KEYS

The display has ten function key pushbuttons as seen in the figure below.

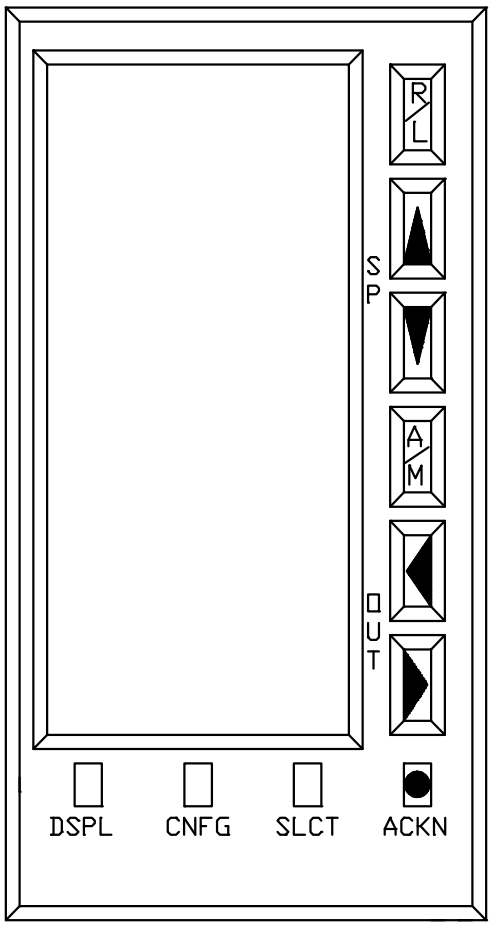

Figure 12 Operator Keys

A. DSPL
This key allows the operator to page through the display screens and alarm status screens.

B. CNFG
Not used at the operator level.

C. SLCT
Not used at the operator level.

D. ACKN
This key is used to acknowledge ALARMS.

E. R/L
This key allows the operator to place the controller in either remote "R" or local "L" setpoint mode.

F. SP Arrows
These pushbuttons are used to move the setpoint of the controller up or down when the controller is in local mode.

G. A/M

This push button is used to select between automatic "A" and manual "M" control mode.

H. IN/OUT Arrows

These pushbuttons are used to directly adjust the plate position of the refiner when the controller is in manual "M" mode

I. POWER SUPPLY INDICATORS

The TECO Refiner Controller is equipped with redundant power supplies for the relay and logic circuitry. The power supply indicators are located in the lower center of the refiner controller. If the indicator light is on, the power supply corresponding to that light is functioning. Both lights should always be illuminated when power is supplied. If either light is out, Maintenance personnel should be called.

J. LOAD AND UNLOAD KEYS

The UNLOAD button overrides all other functions of the controller and executes a fast unloading of the refiner, it should only be used under extreme conditions. The LOAD button executes a rapid loading of the refiner to a certain motor load.

MOTOR LOAD CONTROLLER DISPLAYS

The Motor Load controller has five selectable displays. The displays consist of Horsepower Controller, Power Trend, Pressure Trend, Analog Alarms, and Digital Alarms.

I. HORSEPOWER CONTROLLER

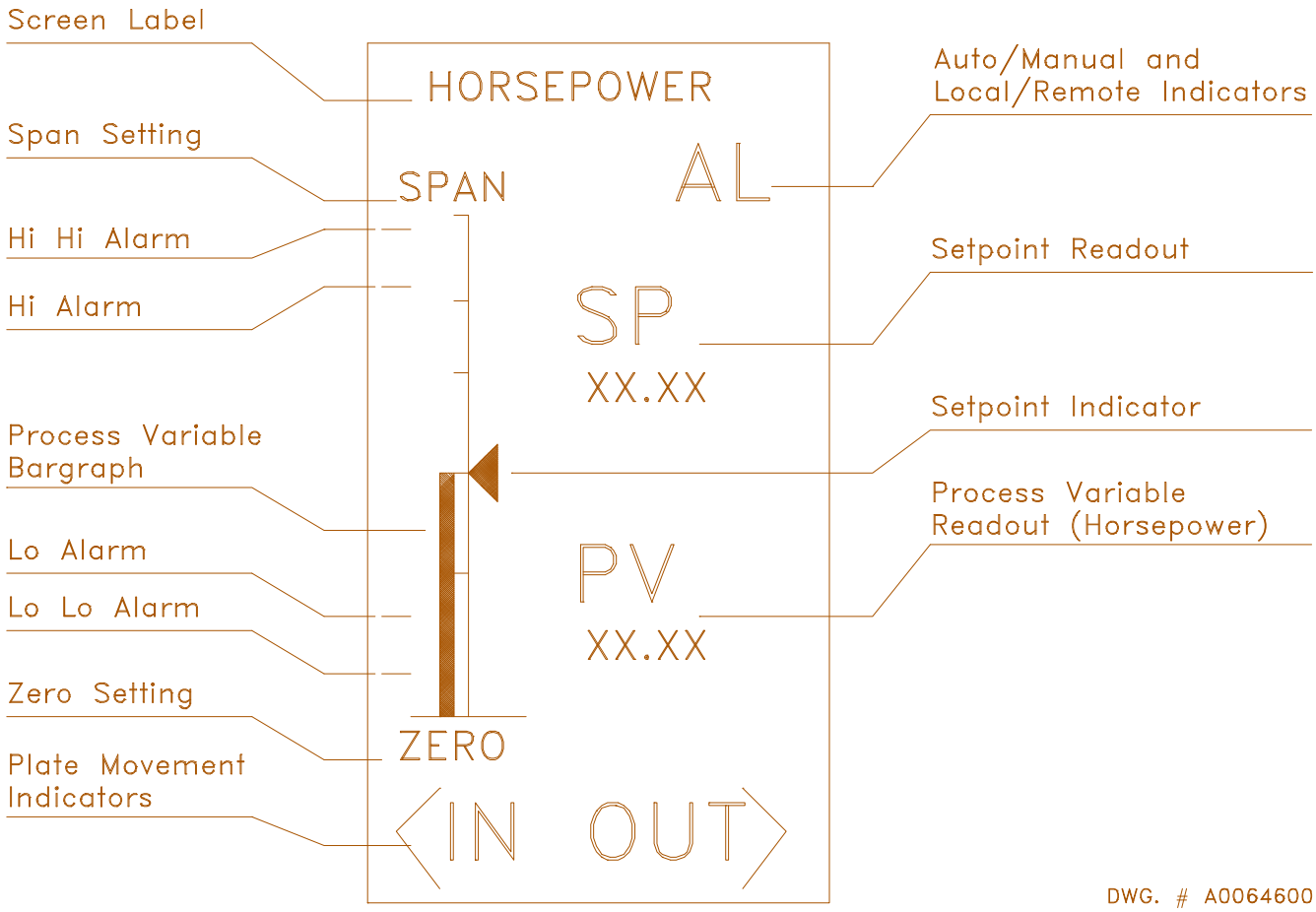

Figure 13 Horsepower Controller Display

II. POWER TREND

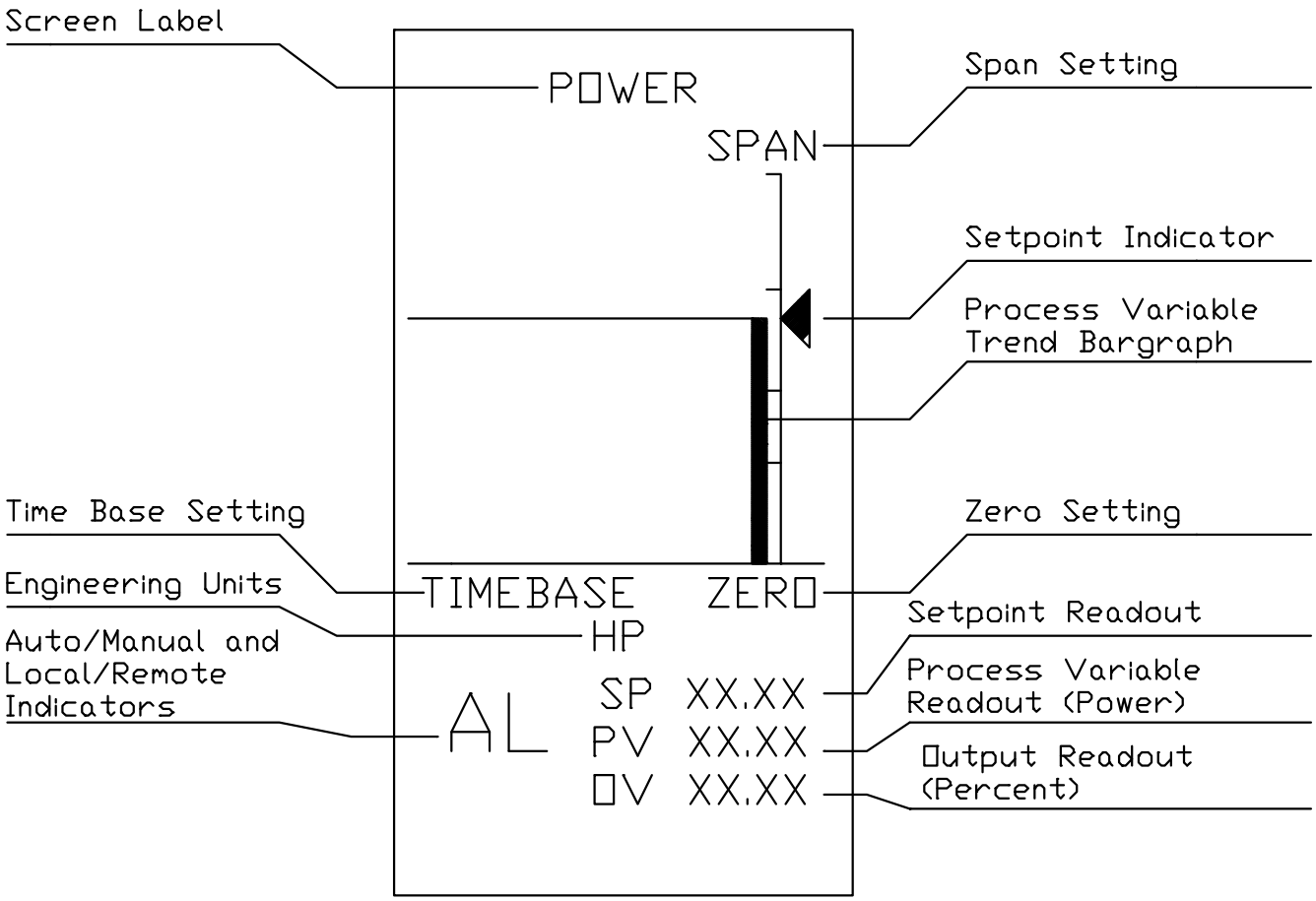

Figure 14 Power Trend

III. PRESSURE TREND

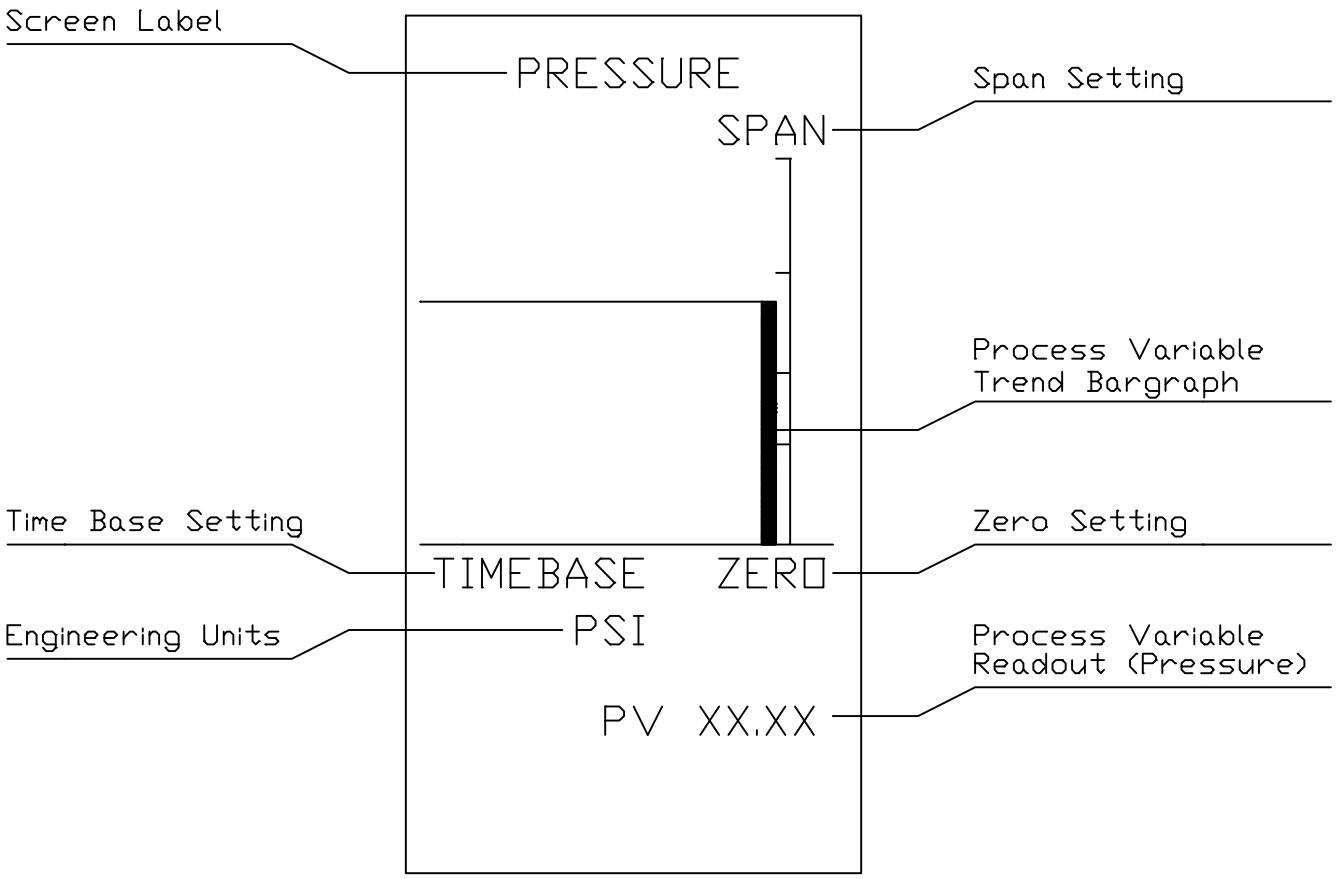

Figure 15 Pressure Trend

IV. ANALOG ALARMS

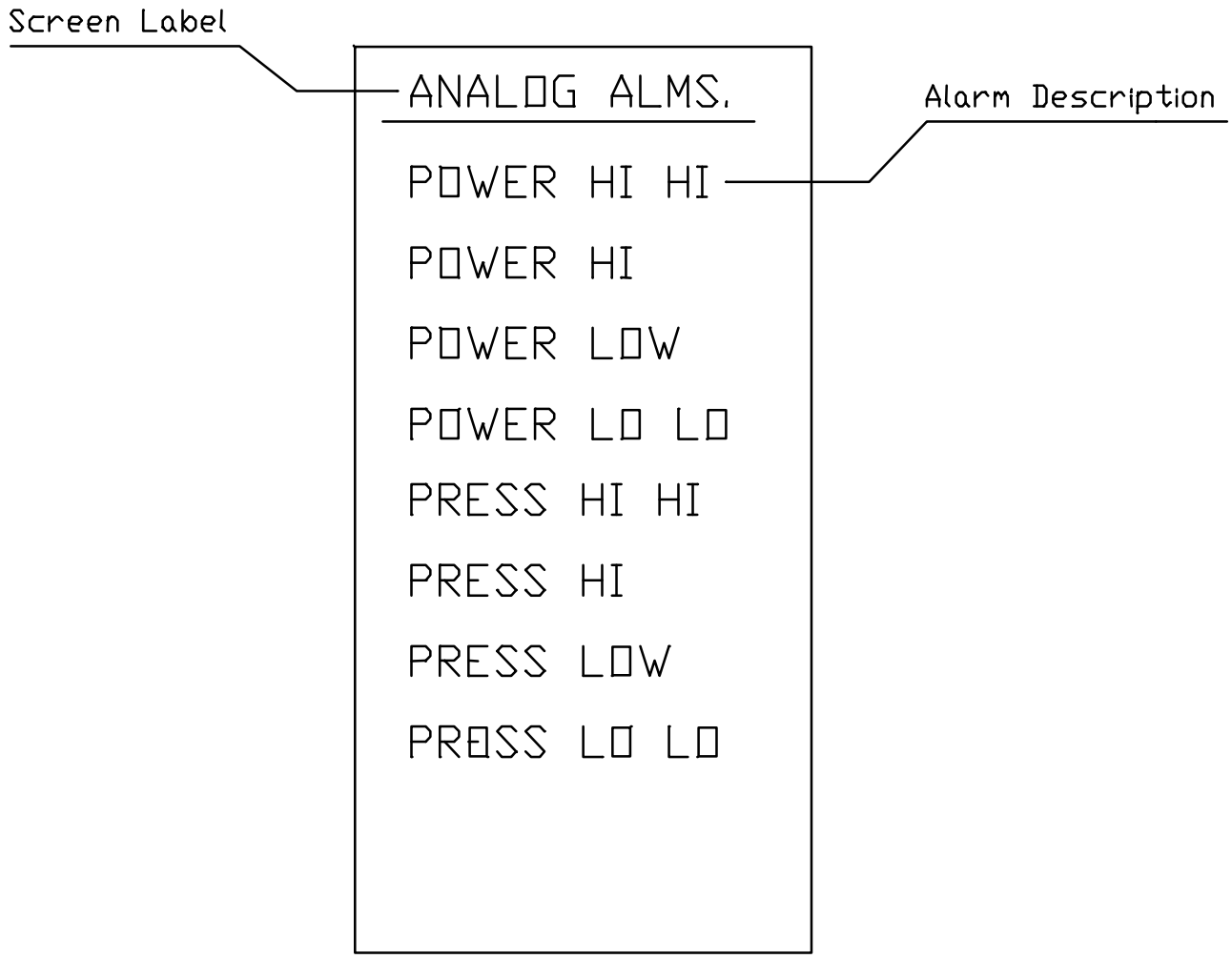

Figure 16 Analog Alarms

V. DIGITAL ALARMS

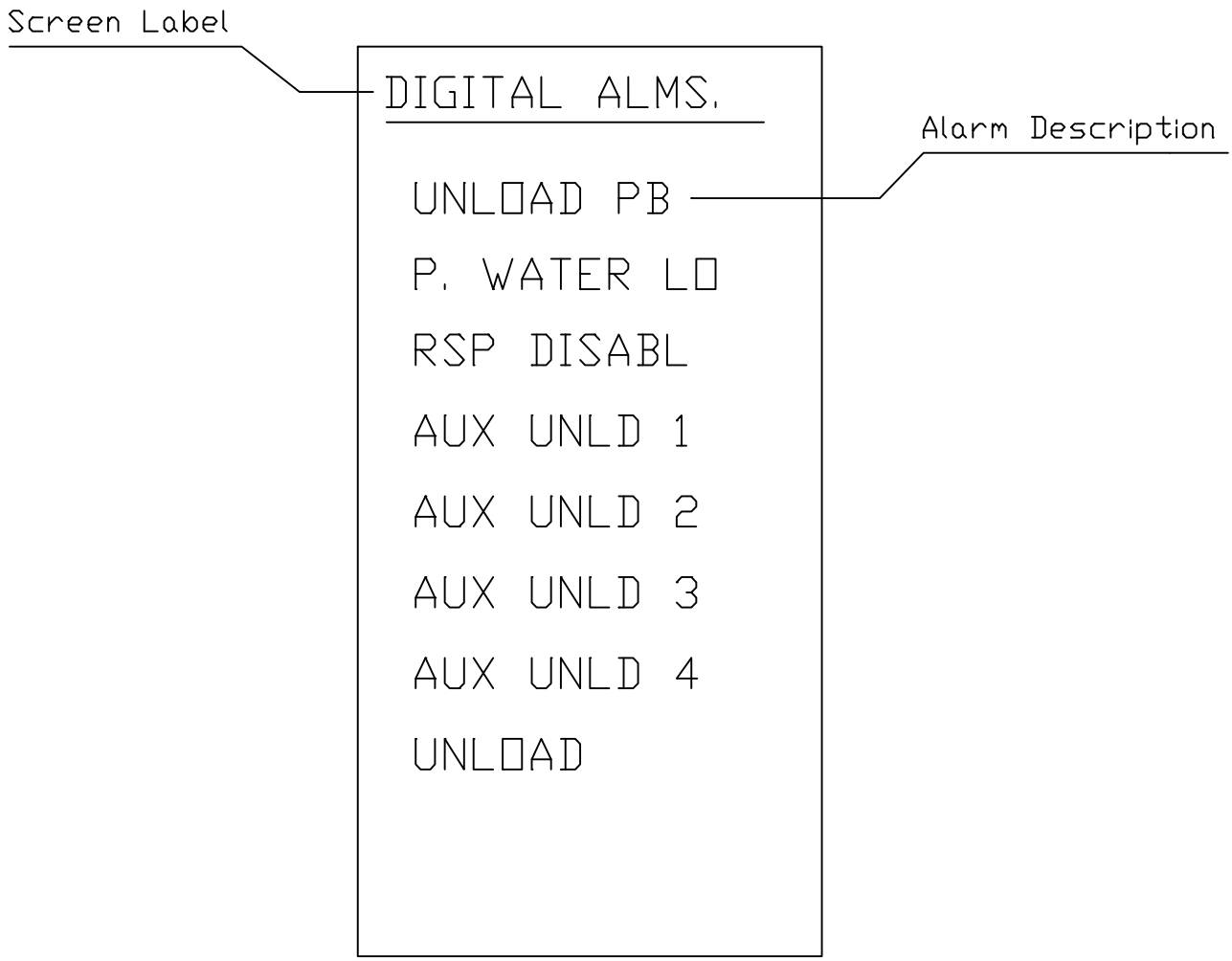

Figure 17 Digital Alarms

ALARMS

The Motor Load controller is equipped with an extensive alarming system. The alarms are classified as analog and digital. The analog alarms are software controlled, while the digital alarms are configured through hardware and software redundant interlocking logic.

All of the alarms can be configured to cause unloading of the refiner using the "LATCHED UNLOAD" or "TIMED UNLOAD" mode. Both of these unload modes can be used with transient detection enabled. The transient detection feature allows the controller to automatically acknowledge the alarm and resume control if the alarm condition is caused by a temporary surge of the process variable.

When any of the alarms are triggered, 3 conditions occur. First an alarm is triggered, second the alarm condition is highlighted, and finally the "UNLOAD" condition is highlighted. The "UNLOAD" condition is de-activated according to the specified unload mode. See sections I.A.7, I.B.7, and I.C.1 of the configuration manual for more details.

I. ANALOG ALARMS

Each analog alarm has four alarm conditions HI HI, HI, LO, and LO LO. The alarms deal with motor load "POWER" and refiner pressure "PRESS". See alarm table in Appendix A for more information.

II. DIGITAL ALARMS/STATUS

Except for the "RSP DISABL" the digital alarms are all designed to unload the refiner when triggered. The "RSP DISABL" is a status indicator only and will not unload the refiner. The only configured digital alarms are the "P. WATER LO" (low packing water) and "UNLOAD PB" (unload pushbutton). Four auxiliary alarms are provided to the user to configure as desired. The labels can be customized for each user. The explanation of these alarms depends on the user. The display also contains "UNLOAD PB" and "UNLOAD" indicators. The "UNLOAD PB" status is only activated when the unload pushbutton is used to unload the refiner.

MOTOR LOAD AUTOMATIC PROCEDURE

Upon power up, the refiner controller will have a display in the Motor Load controller. The PWR1 and PWR2 indicators should be illuminated. If the indicators are not illuminated refer to the Installation and Maintenance Manual and check power connections.

a. Using the DSPL pushbutton page to the "HORSEPOWER" display of the Motor Load controller (left display).

b. Using the A/M and R/L pushbuttons. Place the Motor Load controller in local "L" mode and manual "M" mode.

c. Using the output keys, adjust the plate position and check for power response. The "IN" and "OUT" labels will be highlighted when activated. The power signal should respond smoothly with reasonable values.

d. Using the setpoint keys adjust the setpoint, the setpoint arrow and digital readout should increase or decrease based on the adjustments. With the Motor Load controller in manual "M" select a setpoint with a deviation from the actual power output.

Note: The Motor Load controller must be tuned and alarm points set before initiating automatic operation.

e. Using the A/M pushbutton. Place the controller in automatic "A" mode and check to see that the process variable "PV" (power) approaches the setpoint "SP" selected.

HORSEPOWER DAY PER TON CONTROLLER

I. PRINCIPLE OF OPERATION

Horsepower Day per Ton control (HPD/T) is the second level of control available in the TECO Refiner Controller. The strategy behind this level of control is to measure the specific energy delivered to the stock. The inputs to the controller are motor load, consistency, and flow. The output of the controller is plate position. The plates are adjusted based on the desired specific energy. This level of control produces a more uniformly refined stock as compared to motor load control. The HPD/T controller is a two-loop cascade controller. The upper level of control is HPD/T and the lower level of control is motor load. Both levels of control are available to the operator.

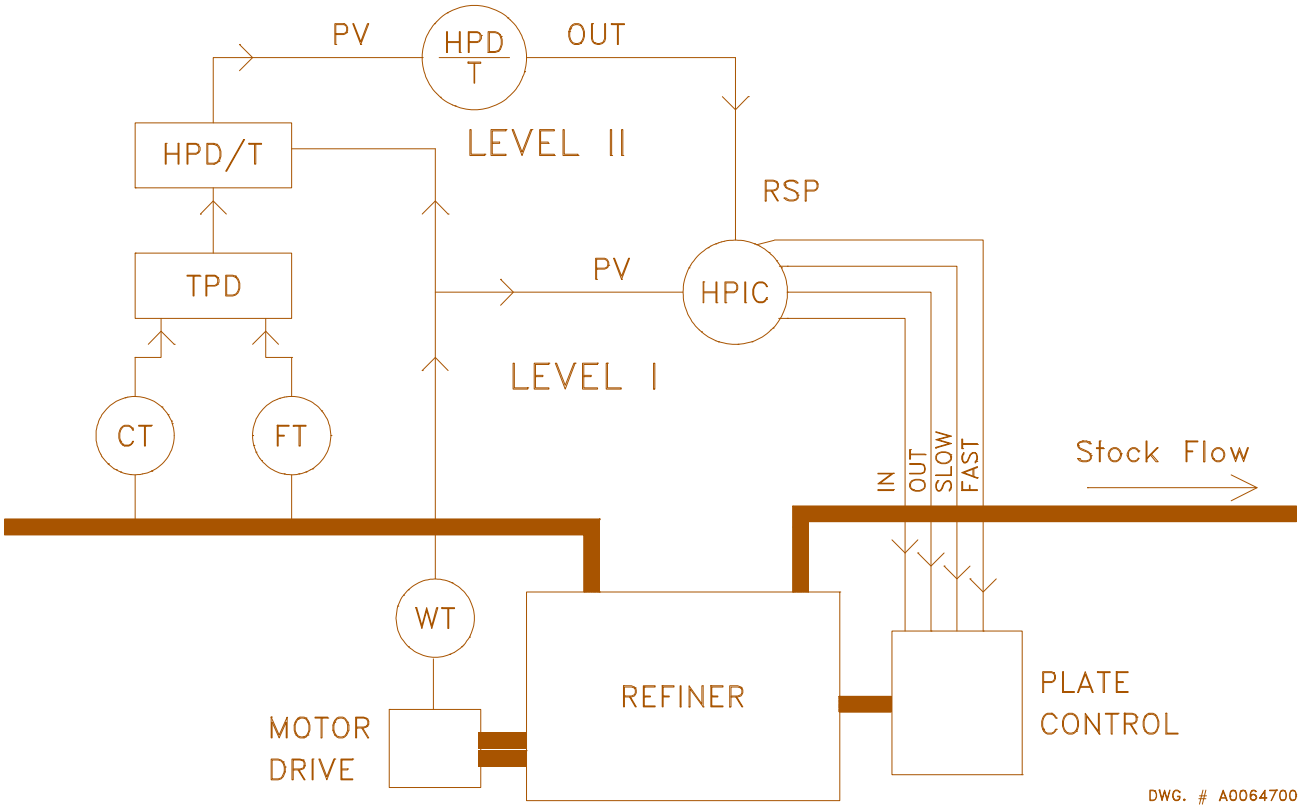

Figure 18 Level 2 Control Diagram

II. OPERATOR INTERFACE

The HPD/T controller is operated through the right display. Process information and alarm status are conveyed by way of selectable displays. Manual adjustments are made directly through the pushbuttons on the display.

A. FACE PLATE KEY AND INDICATORS

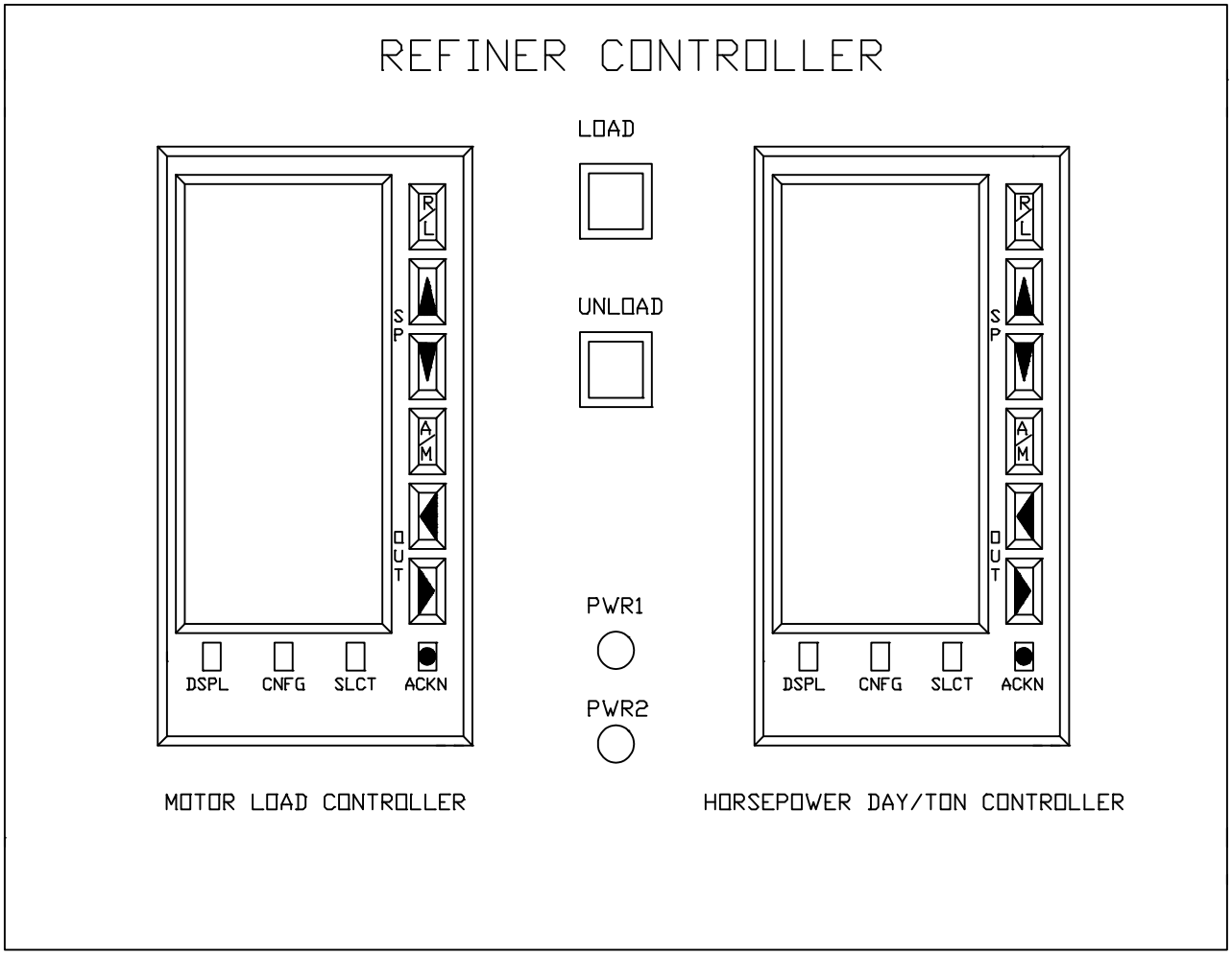

Figure 19 Level 2 Faceplate

B. CONTROLLER FACE PLATE OPERATOR KEYS

The display has ten function key pushbuttons as seen in the figure below.

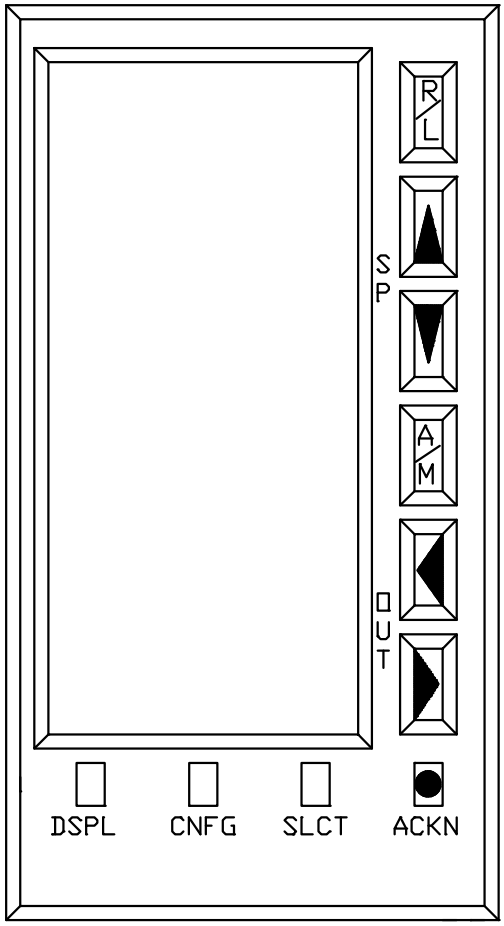

Figure 20 Operator Keys

1. DSPL

This key allows the operator to page through the display screens and alarm status screens.

2. CNFG

Not used at the operator level.

3. SLCT

Not used at the operator level.

4. ACKN

This key is used to acknowledge ALARMS.

5. R/L

This key allows the operator to place the controller in either REMOTE "R" or LOCAL "L" setpoint mode. Under certain conditions only the LOCAL mode may be selected.

6. SP Arrows

These pushbuttons are used to move the setpoint of the controller up or down when the controller is in LOCAL mode.

7. A/M

This push button is used to select between automatic "A" and manual "M" control mode. Under certain conditions a controller will be place in TRACK "T" mode, this mode is automatically selected and forces the controller to track a master controller.

8. IN/OUT Arrows

These pushbuttons are used to adjust the output of the controller when the controller is in manual "M" mode.

9. POWER SUPPLY INDICATORS

The power supply indicators are located in the lower center of the refiner controller. If the indicator light is on, the power supply corresponding to that light is functioning.

10. LOAD AND UNLOAD KEYS

The UNLOAD button overrides all other functions of the controller and executes a fast unloading of the refiner, its should only be used under extreme conditions. The LOAD button executes a rapid loading of the refiner to a certain motor load.

HORSEPOWER DAY/TON DISPLAYS

The HPD/T has five selectable displays. The displays consist of Horsepower Day per Ton, Horsepower Day per Ton Trend, Tons per Day Trend with Horsepower Trend, Gallons per Minute Trend, and Alarms.

I. HORSEPOWER DAY/TON

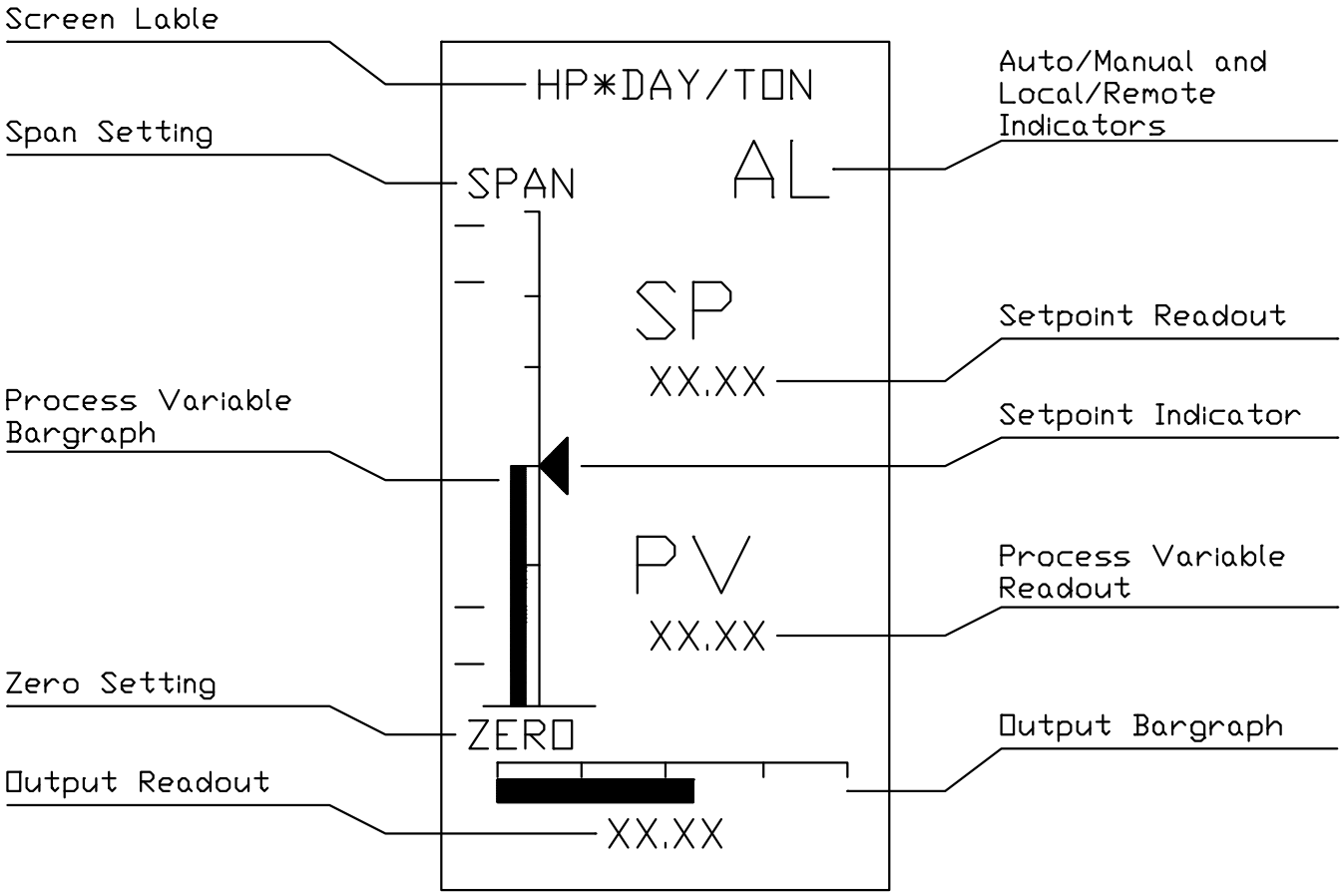

Figure 21 HPD/T Display

II. HORSEPOWER DAY/TON TREND

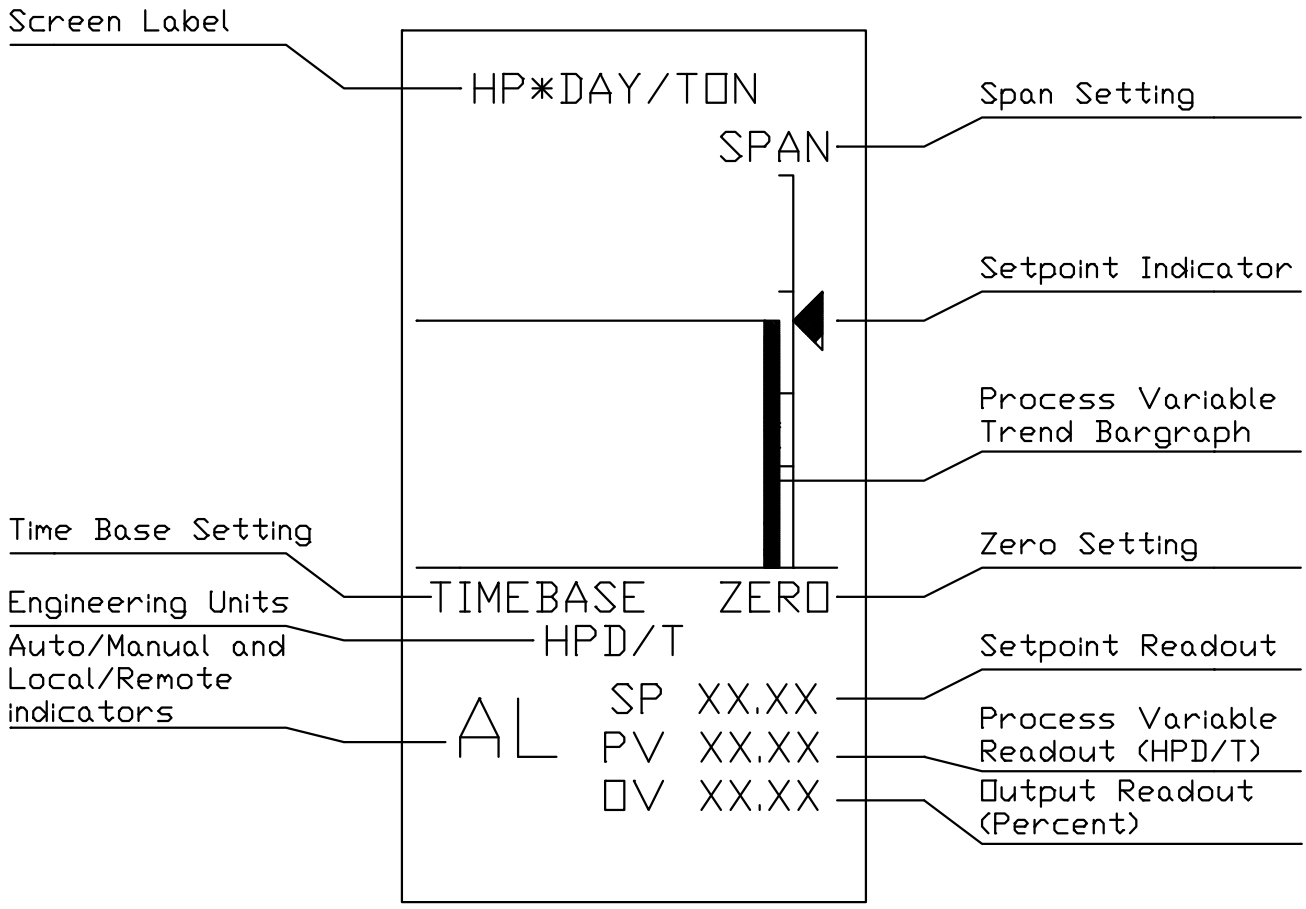

Figure 22 HPD/T Trend

III. TONS PER DAY "TPD" and HORSEPOWER "HP" TREND

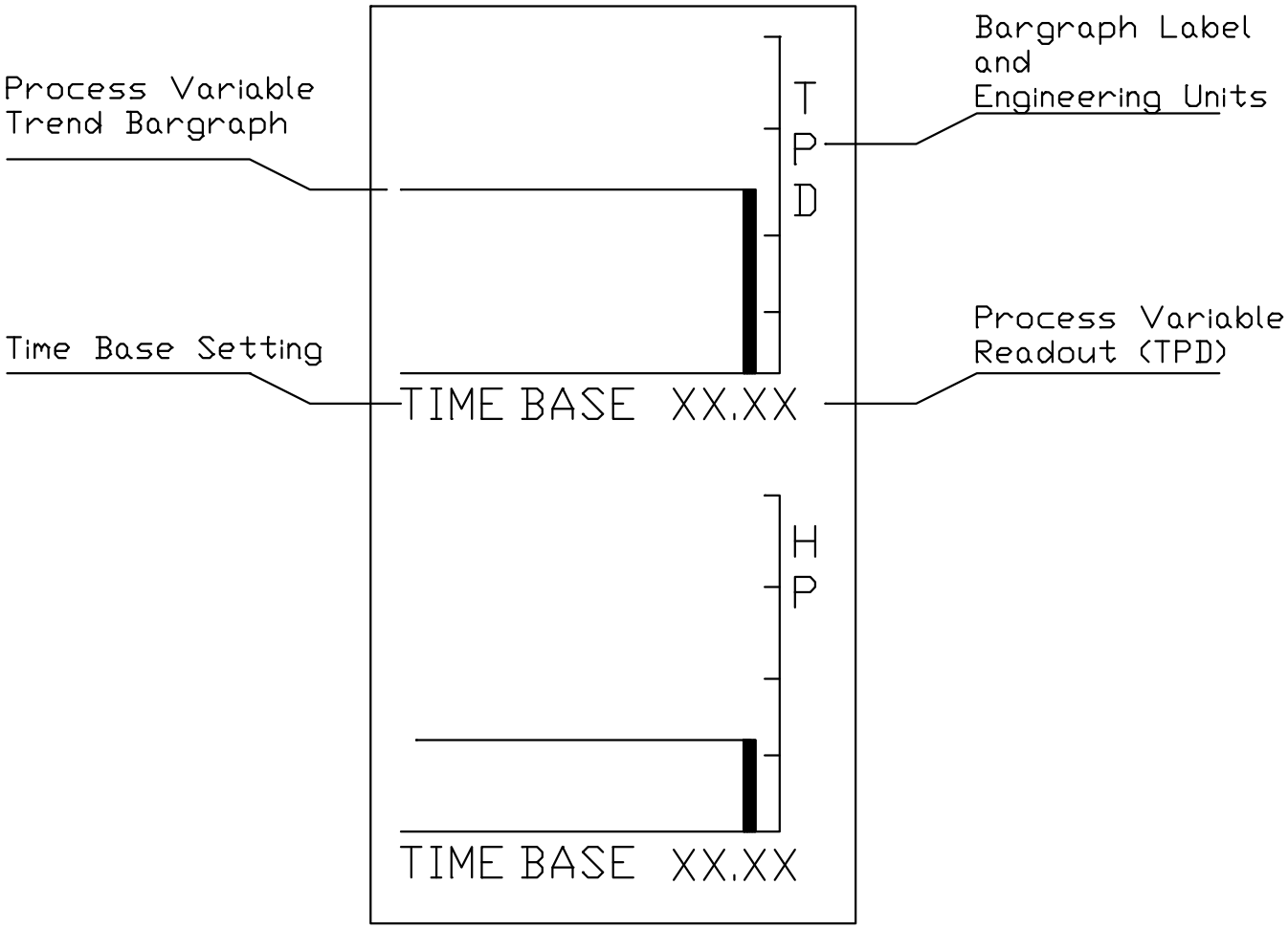

Figure 23 TPD and HP Trend

IV. GALLONS PER MINUTE "GPM" TREND

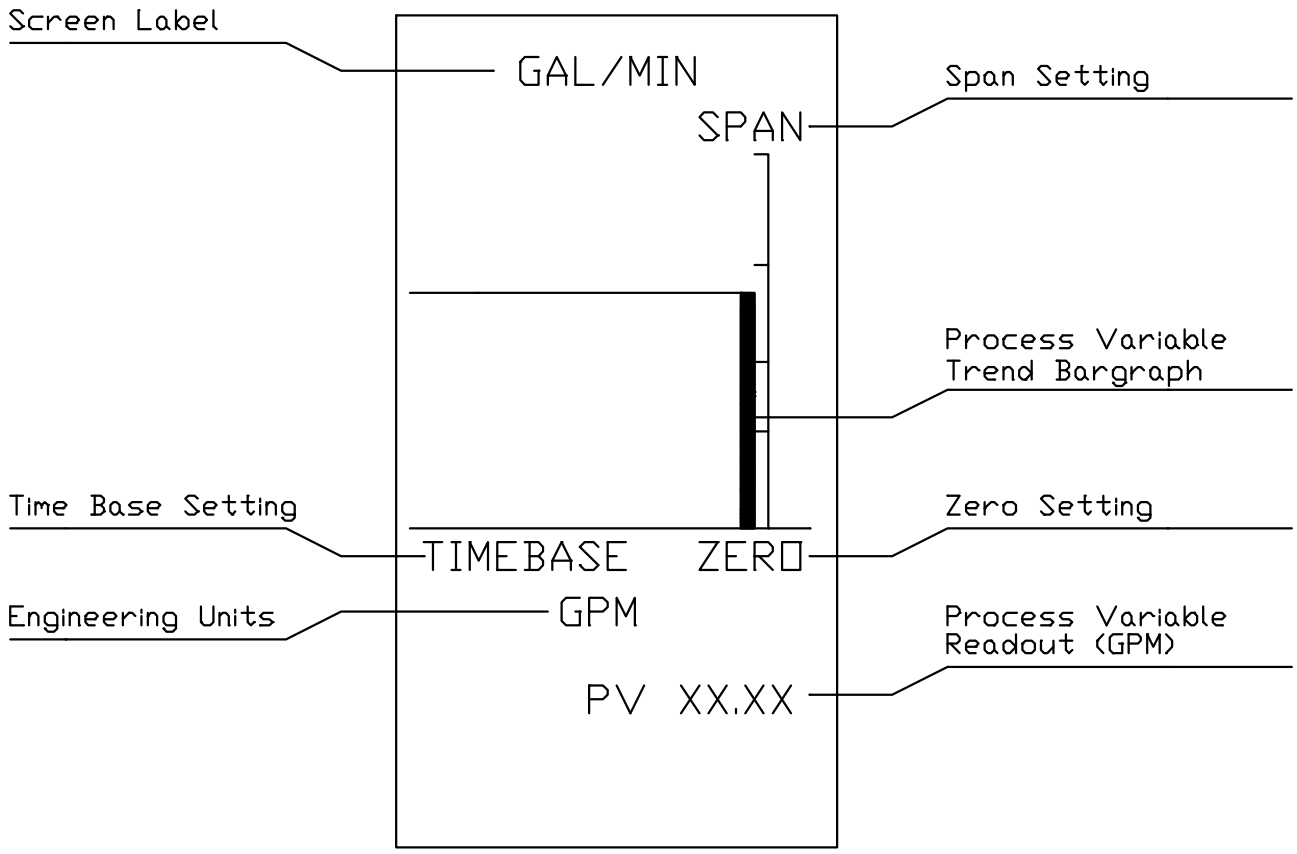

Figure 24 GPM Trend

V. ALARMS

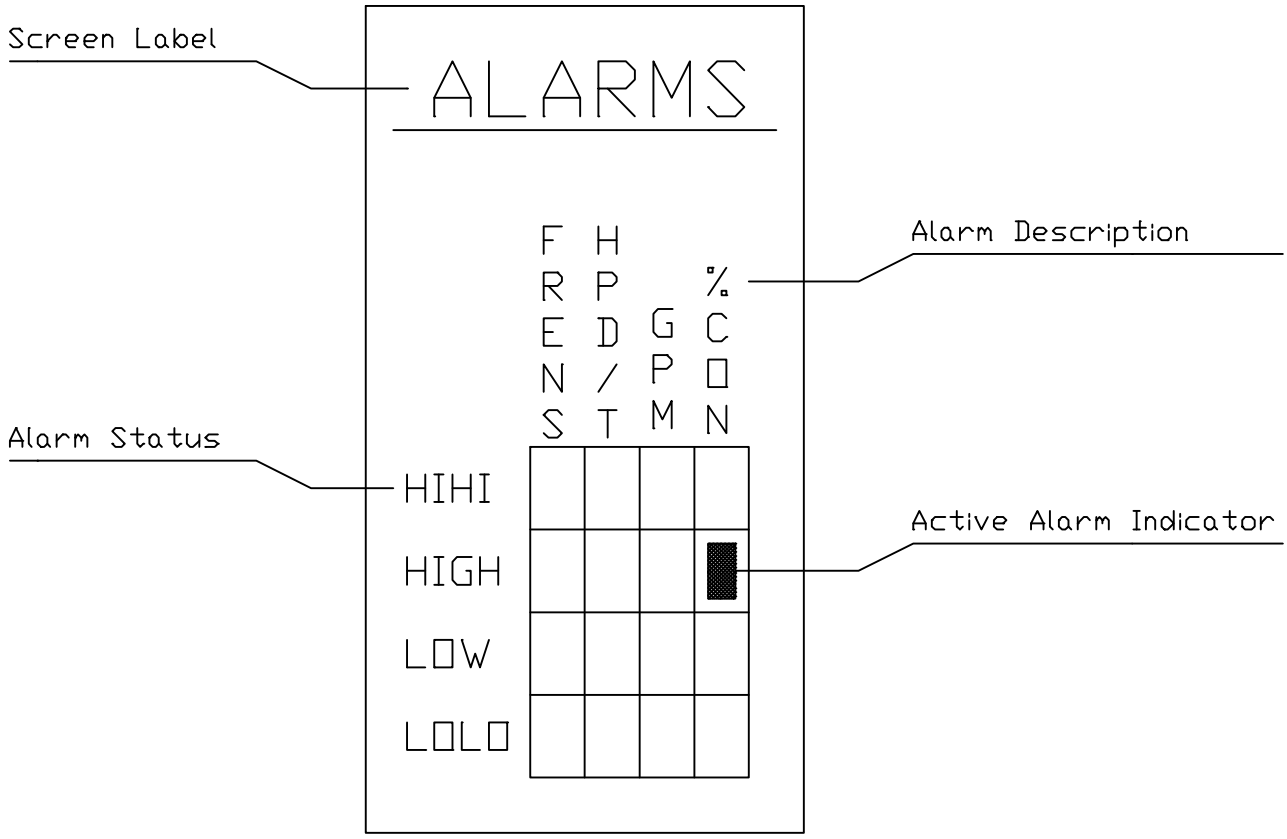

Figure 25 Alarm Screen

ALARMS:

The HPD/T controller is equipped with 3 alarms HPD/T, GPM, and %CON. Each alarm has 4 alarm conditions HI HI, HI, LO, and LO LO. The LO and HI alarm conditions only alert the operator to a potential problem. The LO LO and HI HI alarm conditions will cause changes in the level of control only. If either the flow or consistency transmitters fails it will cause a LO LO alarm which in turn will cause the HPD/T controller to switch to motor load control.

HPD/T AUTOMATIC OPERATION

It is assumed that the controller has been tuned and all of the alarm points have been set.

Upon power up, the Refiner controller will have a display in both the motor load display (left display) and horsepower day per ton display (right display). The PWR1 and PWR2 indicators should be illuminated. If the indicators are not illuminated refer to the Installation and Maintenance Manual and check power connections.

Note: The HPD/T controller must be tuned and alarm points set before initiating automatic operation.

a. Complete the checkout procedure for the Motor Load controller in the Motor Load Automatic Procedure

Section of this manual.

b. Using the DSPL pushbutton page to the "HP*DAY/TON" display of the HPD/T controller (right display), if it is not already displayed.

c. With the Motor Load controller controlling in automatic and stabilized. Place the Motor Load controller in remote "R" and set the desired specific energy (HPD/T) setpoint with a deviation from the actual specific energy output.

Note: The Motor Load controller must be tuned properly before using automatic HPD/T control.

If the Motor Load controller will not go into remote check, the status of the flow and consistency alarms by pushing the DSPL pushbutton on the right display until the "ALARMS" page comes up. If the flow or consistency HI HI or LO LO alarms are active, the Motor Load controller is forced to local.

d. Once the Motor Load controller is in automatic and remote, the HPD/T controller will read manual "M" instead of track "T". Place it in local and automatic. You should then see HPD/T controller move the setpoint "SP" of the Motor Load controller to bring the specific energy (HPD/T) to the setpoint.

CONTROL LEVEL SELECTION

The HPD/T controller has 2 possible levels of control, motor load control and HPD/T control. The controller can be placed into either level of control based on operating conditions or operator selection. The Refiner Controller is designed to automatically switch its control level downward based on input changes. For example, if the controller were operating in the HPD/T mode and the flow input was removed the controller would automatically switch to motor load control. The operator can select the control level from the front panel keys as follows:

I. MOTOR LOAD CONTROL

In order to activate this level of control the Motor Load controller (left display) must be placed in local "L" mode. The HPD/T controller will be placed in track "T" mode. The HPD/T controller's output will track the setpoint "SP" of the Motor Load controller, and the setpoint "SP" of the HDP/T controller will track its own process variable "PV". At this point the Motor Load controller can be placed in either automatic or manual mode.

II. HORSEPOWER DAY PER TON CONTROL

The second level of control is achieved by placing the Motor Load controller in automatic "A" mode and remote "R" mode. The HPD/T controller will be in manual mode "M". At this point, the HPD/T controller can be placed in either automatic or manual mode.

FREENESS CONTROLLER

I. PRINCIPLE OF OPERATION

Freeness control is the highest level of control available in the TECO Refiner Controller. The advantage of this control approach is that it is controlling based on the effect of the refining process on the stock. The parameter used to measure the effect of the refiner is freeness, which is a measure of the rate at which water drains from the stock. The inputs to the controller are motor load, flow, consistency, and freeness. The output is plate position based on a desired freeness. Freeness control is achieved by using a triple cascade method, which builds up from motor load control to HPD/T control to Freeness control. All levels of control are available to the operator.

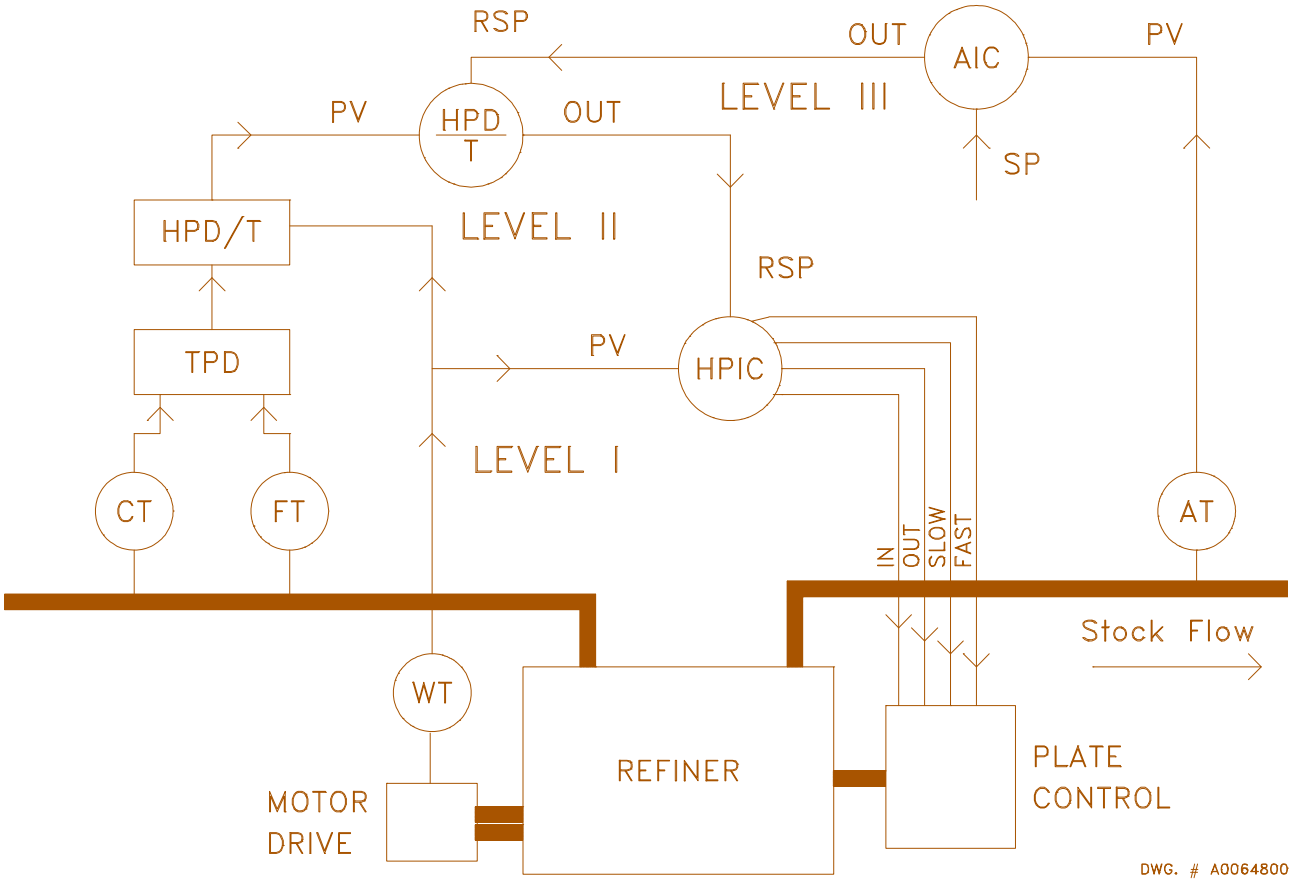

Figure 26 Level 3 Control Diagram

II. OPERATOR INTERFACE

The Freeness controller is operated through the right display. Process information and alarm status are conveyed by way of selectable displays. Manual adjustments are made directly through the pushbuttons on the display.

A. FACE PLATE KEY AND INDICATORS

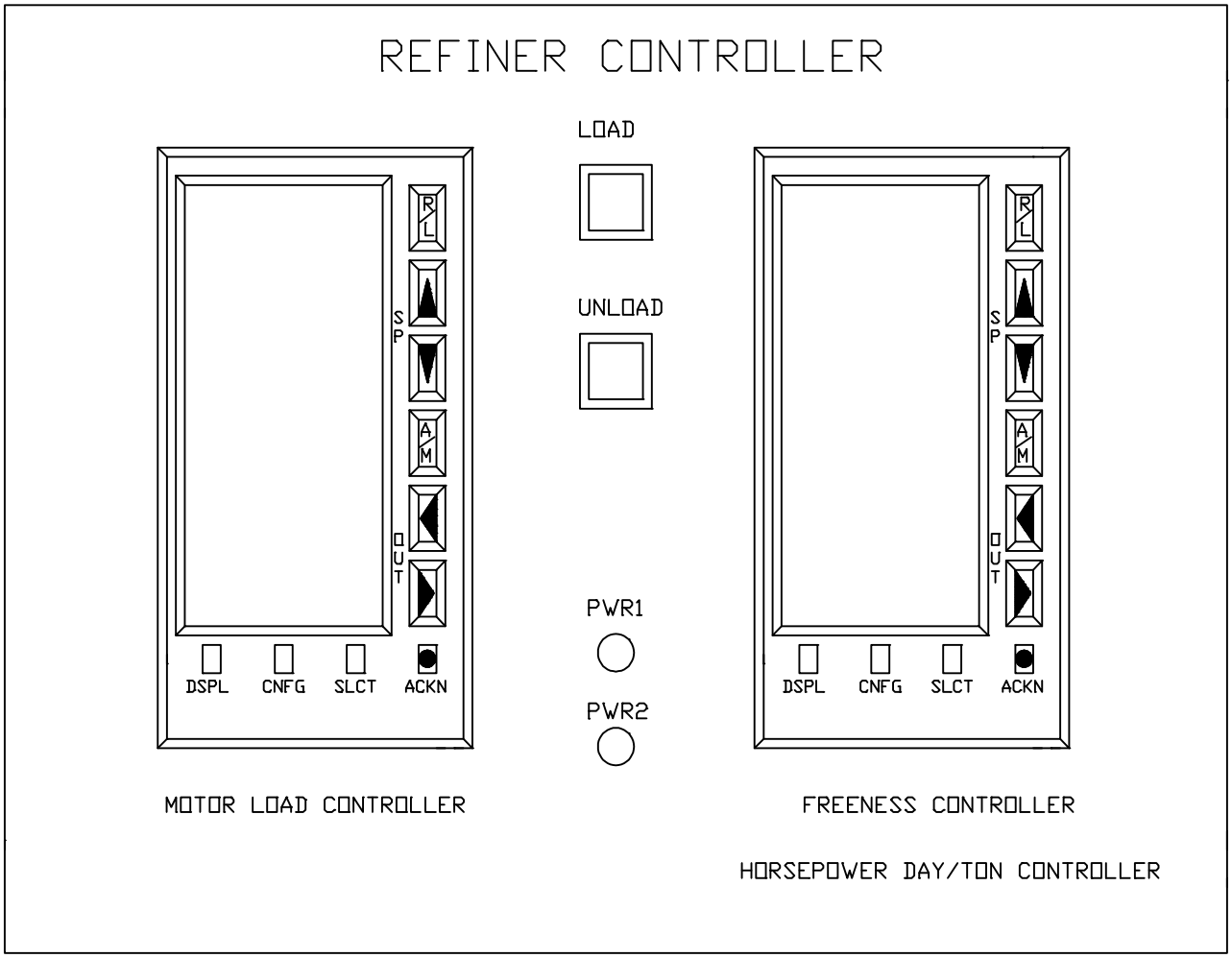

Figure 27 Level 3 Faceplate

B. CONTROLLER FACE PLATE OPERATOR KEYS

The display has ten function key pushbuttons as seen in the figure below.

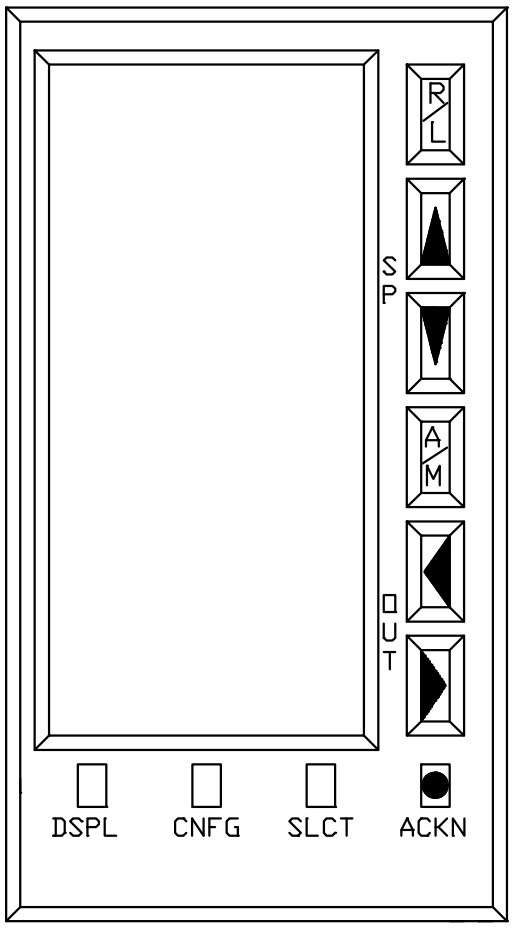

Figure 28 Operator Keys

1. DSPL

This key allows the operator to page through the display screens and alarm status screens.

2. CNFG

Not used at the operator level.

3. SLCT

This key is used to switch between controllers when a dual controller screen is displayed (Freeness and Horsepower Day per Ton).

4. ACKN

This key is used to acknowledge ALARMS.

5. R/L

This key allows the operator to place the controller in either REMOTE "R" or LOCAL "L" setpoint mode. Under certain conditions only the LOCAL mode may be selected.

6. SP Arrows

These pushbuttons normally are used to move the set point of the selected controller up or down when the controller is in LOCAL mode.

7. A/M

This push button is used to select between automatic "A" and manual "M" control mode. Under certain conditions a controller will be placed in TRACK "T" mode; this mode is automatically selected and forces the controller to track a master controller.

8. IN/OUT Arrows

These pushbuttons normally are used to adjust the output of the controller when the controller is in manual "M" mode.

9. POWER SUPPLY INDICATORS

The power supply indicators are located in the lower center of the refiner controller. If the indicator light is on, the power supply corresponding to that light is functioning.

10. LOAD AND UNLOAD KEYS

The UNLOAD button overrides all other functions of the controller and executes a fast unloading of the refiner. It should only be used under extreme conditions. The LOAD button executes a rapid loading of the refiner to a certain motor load.

FREENESS DISPLAYS

The selectable displays consist of Freeness and Horsepower Day/Ton, Freeness Trend, Gallons per Minute with Percent Consistency, and Alarms. Note: The Freeness controller display is combined with the Horsepower Day per Ton controller display.

I. FREENESS CONTROLLER and HORSEPOWER DAY/TON CONTROLLER

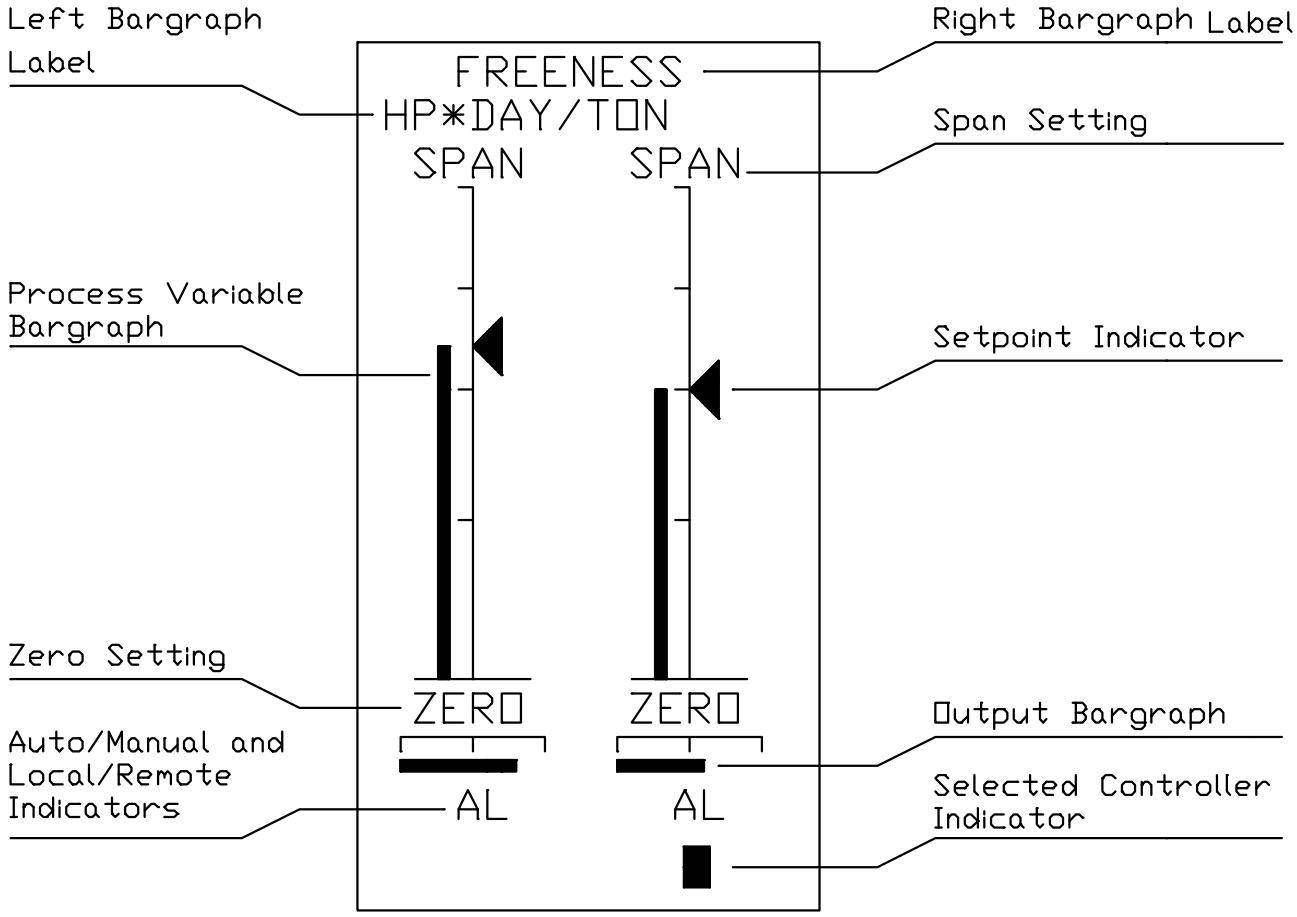

Figure 29 Freeness Controller

II. FREENESS TREND

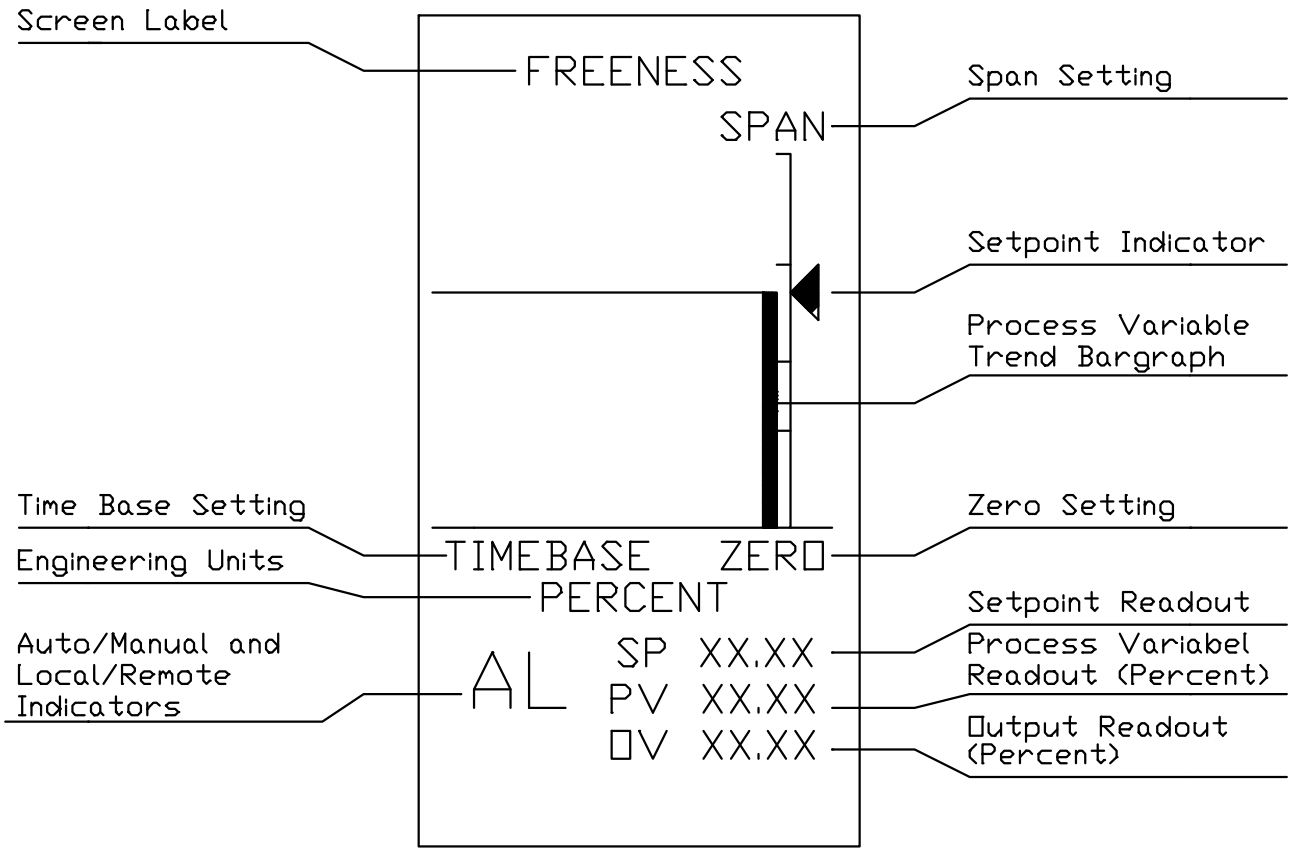

Figure 30 Freeness Trend

III. GALLONS PER MINUTE "GPM" and PERCENT CONSISTENCY "%CON

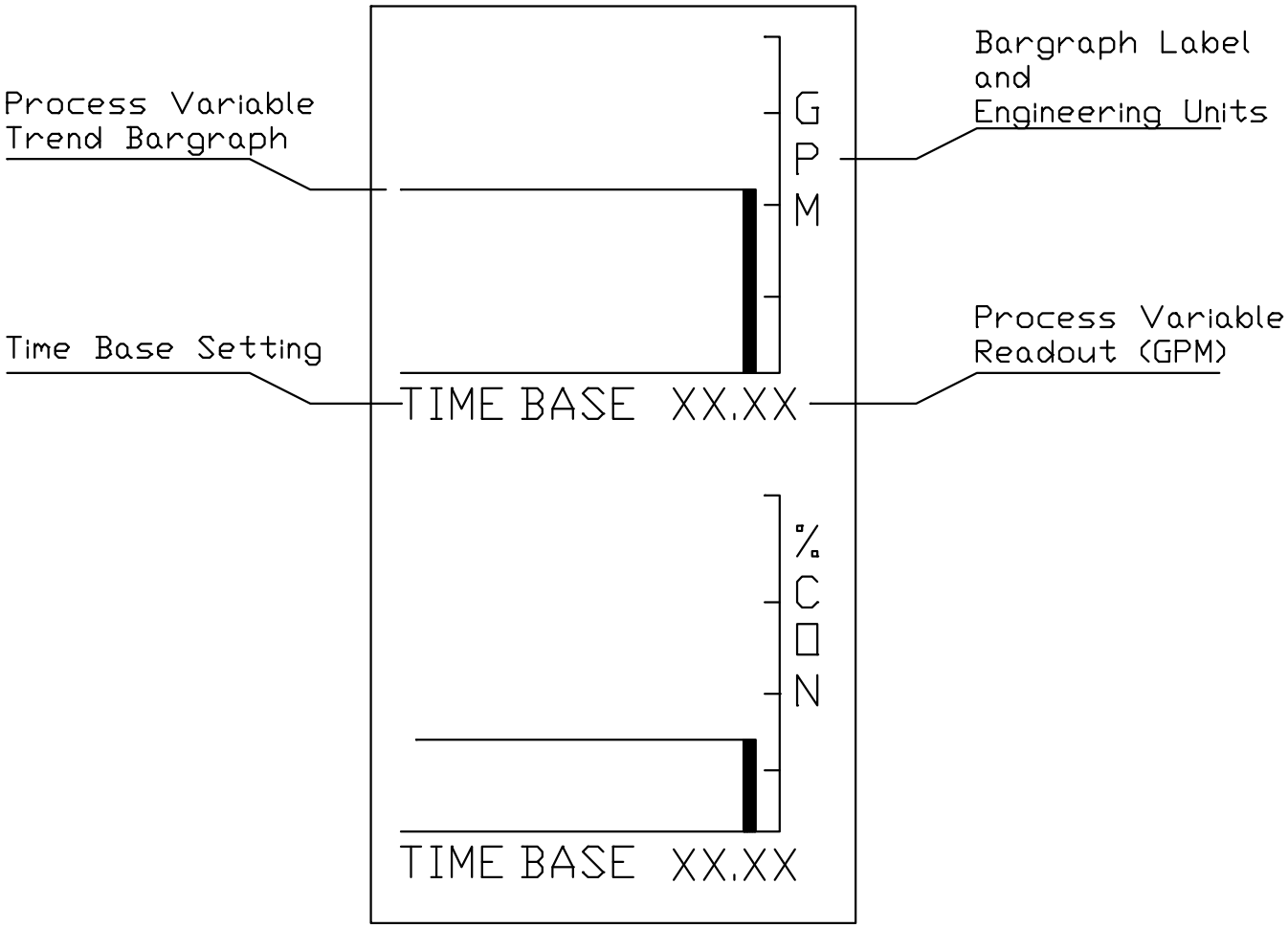

Figure 31 GPM and %CON Trend

IV. ALARMS

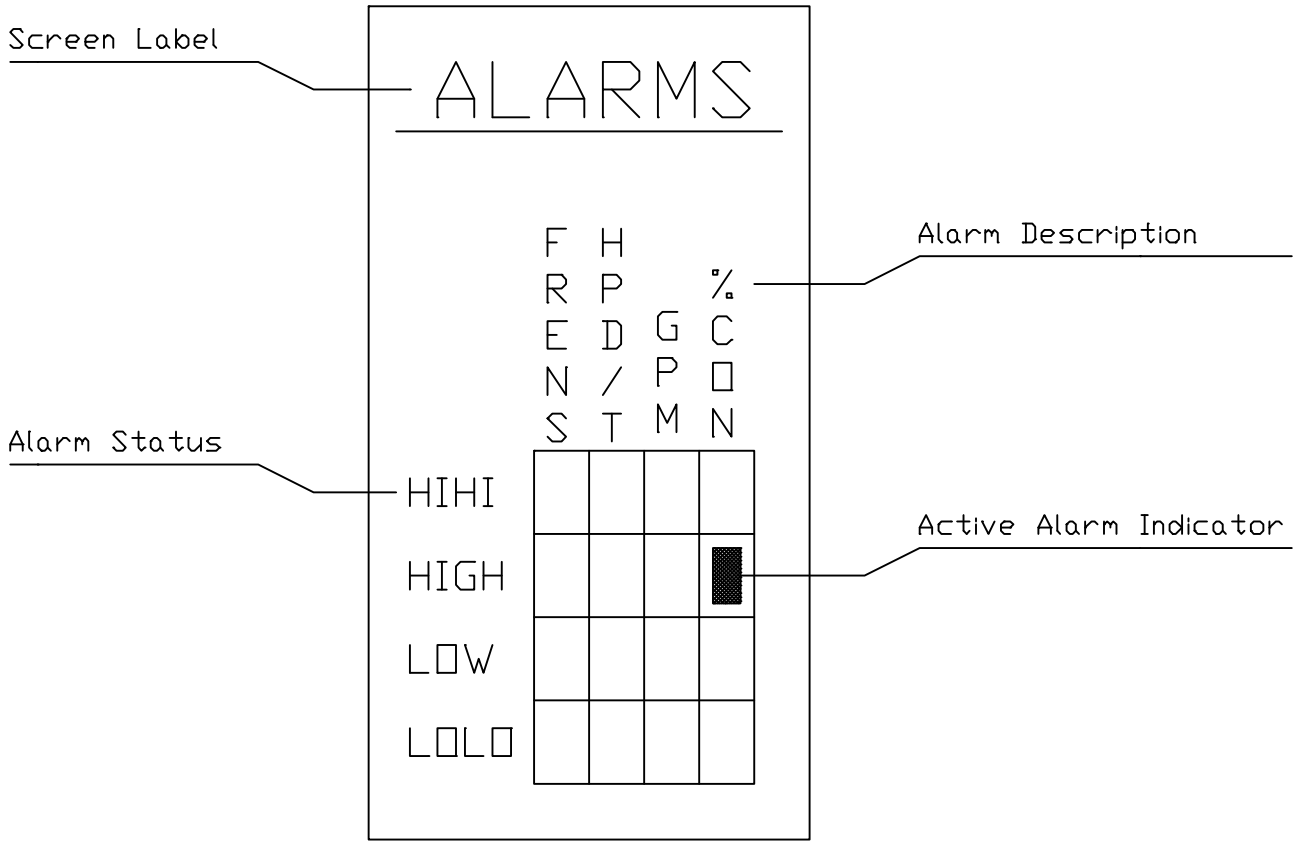

Figure 32 Alarms

ALARMS

The Freeness controller has 1 alarm. It monitors the freeness transmitter for HI HI, HI, LO, and LO LO conditions. The LO and HI alarm conditions only alert the operator to a potential problem. The LO LO and HI HI alarm conditions will cause changes in the level of control only. For example if the freeness transmitter goes into HI HI alarm the controller will switch to HPD/T control.

FREENESS AUTOMATIC OPERATION

Upon power up, the refiner controller will have a display in both the Motor Load display (left-hand side) and Freeness and Horsepower Day per Ton display (right hand side). The PWR1 and PWR2 indicators should be illuminated.

Note: The Freeness controller must be tuned and alarm points set before initiating automatic operation.

a. Complete the checkout procedure for the Motor Load and HPD/T controllers in the Motor Load Automatic Procedure and HPD/T Automatic Operation sections of this manual.

b. Using the DSPL pushbutton page to the "FREENESS HP*DAY/TON" display of the Freeness controller (right display) and with the SLC pushbutton, select the "HP*DAY/TON" controller.

Note: The HPD/T controller must be tuned properly before using automatic Freeness control.

c. With the HPD/T controller controlling in automatic "A" and stabilized, switch its setpoint from local "L" to remote "R". If the HPD/T controller will not go into remote "R" check the status of freeness by pushing the DSPL pushbutton of the right display and page to the "ALARMS" display. Select the "FREENESS" controller and set a desired freeness setpoint "SP" with a deviation from the actual freeness reading. If the freeness HI HI or LO LO alarms are active, the HPD/T controller is forced to local.

d. Once the HPD/T controller is in automatic and remote, the Freeness controller will read manual "M" instead of track "T". At this point, place the controller in automatic "A". The controller should then adjust the specific energy (HPD/T) setpoint "SP" to bring the freeness to the setpoint.

CONTROL SCHEME SELECTION

The controller can be placed into any available level of control at any time based on operating conditions or operator selection. The refiner controller is designed to automatically switch its control level downward based on input changes. For example, if the controller were operating in Freeness control and the freeness input was removed the controller would automatically switch to HPD/T control. The operator can select the control scheme from the front panel keys as is described in the following sections.

I. MOTOR LOAD CONTROL

In order to activate this level of control the Motor Load controller must be placed in local "L" mode. The HPD/T controller and the Freeness controller will automatically be forced into track "T" mode. The HPD/T controller's output will track the setpoint "SP" of the Motor Load controller and the freeness controller output will track the setpoint "SP" of the HPD/T controller. Also the setpoint "SP" of the HPD/T controller will track its own process variable "PV", and the setpoint "SP" of the Freeness controller will track its own process variable "PV". At this point, the controller can be placed in either automatic or manual mode.

II. HORSEPOWER DAY PER TON CONTROL (HPD/T)

HPD/T control is achieved by placing the Motor Load controller in automatic "A" and remote "R". The HPD/T controller will be in manual mode "M" and the Freeness controller will be in track mode "T", with its output tracking the setpoint "SP" of the HPD/T controller, and its setpoint "SP" tracking its own process variable "PV". At this point the HPD/T controller can be placed in either automatic or manual mode.

III. FREENESS CONTROL

Freeness control is reached by placing the Motor Load controller in automatic "A" and remote "R". The HPD/T controller should also be in automatic "A" and remote "R". At this point the Freeness controller will be in manual "M" mode and local "L" mode with the option of being placed in automatic "A" mode.

APPENDIX A

I. MOTOR LOAD CONTROLLER ALARM TABLE

ALARM	POSSIBLE CAUSES	EFFECT
POWER HI	Increase in stock consistency, change to a harder furnish, increase in stock flow	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
POWER LOW	Decrease in stock consistency, change to softer furnish, watt meter failure, decrease in stock flow	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
POWER HI HI	Plates binding, debris caught in plates	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
POWER LO LO	Blockage of stock line, watt meter failure	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode
PRESSURE HI	Stock flow rate increased, minor obstruction of refiner output	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
PRESSURE LOW	Stock flow rate decreased, minor obstruction of refiner input	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
PRESSURE HI HI	Major blockage of refiner output	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
PRESSURE LO LO	Major blockage of refiner input	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
UNLOAD PB	Unload pushbutton was pressed	Alarm is triggered and the refiner is unloaded
P. WATER LO	Refiner packing water is low, pressure switch failure	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
RSP DISABLE	Failure of consistency meter, or freeness meter	The controller is placed in local mode
AUXILIARY UNLOAD 1 THROUGH 4	Contact closure detected for associated user-defined input	Alarm is triggered to warn operator, and the refiner is unloaded according to the alarm unload mode.
UNLOAD	Occurs when any digital or analog alarm unload is triggered.	Informs operator status of refiner

II. HORSEPOWER DAY PER TON and FREENESS ALARMS

ALARM	POSSIBLE CAUSES	EFFECT
GPM HI HI	Flow meter failure	Alarm is triggered and control level is switched to Motor Load control
GPM HI	Increase in line flow	Alarm is triggered to warn operator only
GPM LO	Decrease in line flow	Alarm is triggered to warn operator only
GPM LO LO	Flow meter failure, line blockage	Alarm is triggered and control level is switched to Motor Load control
% CON HI HI	Failure of consistency meter	Alarm is triggered and control level is switched to Motor Load control
% CON HI	Decrease in water or increase in stock density	Alarm is triggered to warn operator only
% CON LO	Increase in water or decrease in stock density	Alarm is triggered to warn operator only
% CON LO LO	Failure of consistency meter	Alarm is triggered and control level is switched to Motor Load control
HPD/T HI HI	Failure of watt, consistency, or flow meters, Plates binding, Debris caught in plates	Alarm is triggered and control level is switched to Motor Load control
HPD/T HI	Decrease in flow or consistency, Increase in furnish hardness or pressure	Alarm is triggered to warn operator only
HPD/T LO	Increase in flow or consistency, Decrease in furnish hardness or pressure	Alarm is triggered to warn operator only
HPD/T LO LO	Failure of watt, consistency, or flow meters, Blockage of stock line	Alarm is triggered and control level is switched to Motor Load control
FRENS HI HI	Failure of freeness meter, improper screen	Alarm is triggered and control level is switched to HPD/T control
FRENS HI	Change in furnish	Alarm is triggered to warn operator only
FRENS LO	Change in furnish	Alarm is triggered to warn operator only
FRENS LO LO	Failure of freeness meter, clogged screen	Alarm is triggered and control level is switched to HPD/T control