

SECTION 7 - LEGEND CONTROL 305 PROGRAMMING

INTRODUCTION

The Legend 305 controller can be programmed to meet a wide range of installation configurations and jobs. The controller does this with a minimum amount of settings. The programmer should be familiar with the Controls section of this manual prior to attempting programming. The Controls section has valuable information about how to operate the pushbuttons and HMI which will be assumed in this Programming section.

The programmer should also be familiar with typical ladle automatic cycles and automatic abort cycles. These operations are detailed below:

TYPICAL AUTOMATIC LADLE CYCLE

In a typical cycle the ladle will be waiting at the Home (also called Rest) Position until a Start signal (usually die-start-open from the DCM) is received. The arm will move to the Clear Position, slow to the In Metal speed, rotate the dipper to the Fill Angle, and stop when the probes touch the metal. The arm will then rise up after the Fill time expires and go to the Spill Off position, wait the Spill Off time, level the dipper and move forward toward the Ready To Pour position. Upon receiving the OK To Pour signals (Plunger Retracted/Dies Locked) the ladle will then start the pour. The pour consists of 3 programmable positions where speeds can be changed and the final pour angle determined. When the pour is complete an After Pour time delays the leveling of the dipper to get the last drips out. The ladle will level and begin timing the Pour Complete delay. The ladle will return to the Rest (Home) position and the Pour Complete Contact will pulse when the delay timer expires. The ladle will await another Start signal at the Rest position.

TYPICAL AUTOMATIC ABORT CYCLES

Should the ladle have to wait with metal at the shot hole the Abort Time will begin counting down. If it expires the ladle will perform an abort sequence. The abort sequence carries the metal back to the furnace and pours it back. This feature can be turned off if it is undesirable. The ladle can automatically re-attempt to supply the DCM with metal after this abort. Should the ladle continue to abort and exhaust the Retries setting the ladle will empty the dipper and stop at Rest. The operator can restart the ladle by pressing the AUTO START button and need not acknowledge the fault. Should the metal in the furnace drop below the Low Metal position setting the ladle will perform a Low Metal Abort sequence. In this sequence the metal, if any, is poured back into the furnace and the arm is raised up to the Rest position. A fault is then signaled. Should the High Metal probe contact metal, either by failure of the metal probe or by the furnace being filled while the ladle is in the furnace, a high metal abort sequence is run. This sequence simply raises the ladle arm up until the high metalprobe is no longer in contact with metal. The normal sequence is then rejoined

HMI SCREENS

MAIN SCREEN

This screen displays when first powered up. It also displays when the Main key is pressed or when other screens are backed out of.



This screen has these features:

PROGRAM VERSIONS – The top right of the screen shows the program version in the controller (top) and the HMI (bottom)

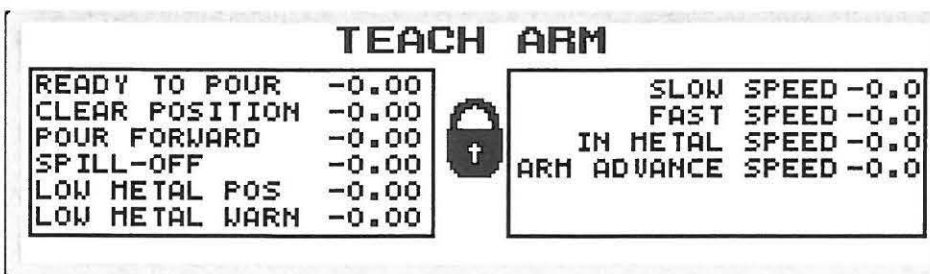
BATTERY WARNING – If the battery is low this warning will appear.

LOCK STATUS – If the lock symbol appears the Security system has been turned on. If a correct PIN is entered the symbol will unlock.

PASSWORD ENTRY – Entry for the user PIN is made in the top left of the screen. See the Programming section for more information on security functions.

CONTRAST – Note the contrast symbol in the lower right above the key marked BACK. This means that the BACK key will now take the user to the CONTRAST SETTING screen when pressed

TEACH ARM SCREEN



The Teach Arm Screen is where program parameters for the arm axis are entered. These settings are the current arm settings and are stored in the currently designated memory area. The arm travel ranges from 0.00 to 99.99 (% of travel). At 0 the ladle is as far forward (towards DCM) as the ladle can travel. 99.99 is as far backwards (towards furnace) as the ladle can travel. Some settings, such as Spill-Off, are offsets. For example, Spill-Off is an offset distance from where the ladle found metal. The speed settings are in percent of maximum speed. If the lock symbol appears none of the settings can be changed. To unlock go back to the Main screen and login with the correct PIN number.

The Teach Arm screen has these parameters:

READY TO POUR – This setting is where the arm will stop at to begin pouring into the shot hole. In manual mode the ladle will not move past this setting. The higher the value is set for this parameter the less stress there will be on the arm. The setting has a range of 0.00 to 44.25.

CLEAR POSITION – This setting is where the arm will slow to the In Metal speed for entry into the furnace. This setting must be set above the highest level that the furnace will ever be filled to. Failure to properly set this position can result in the arm submerging into the metal at high speed. The range of this setting is 44.25 to 99.99.

POUR FORWARD – This setting is optional. This setting is an offset from the Ready To Pour Position that the arm will travel during the pour into the DCM. This aids in eliminating drips outside the shot hole as the ladle spout rotates. The setting has a range of 0.00 to 9.99.

SPILL-OFF – This setting is an offset from where the ladle filled the dipper. After filling the dipper the arm will rise up this distance and allow the dipper to spill-off there. The range of this setting is 0.00 to 9.99.

LOW METAL POSITION – This setting is the lowest position the arm is allowed to travel in the furnace. In manual the ladle will not move lower than this position even if it has not yet found metal. In auto mode if the arm reaches this position when trying to get metal a Low Metal Abort will be triggered. The furnace will have to be filled before production can resume. The range of this setting is 44.25 to 99.99.

LOW METAL WARN – This setting is optional. This setting is an offset from the Low Metal Position. It will trigger an optional output (Low Metal Warning) to come on when the arm travels within this distance from the Low Metal Position. The output resets automatically when the furnace is filled and metal is found above the warning distance. The setting range is 0.00 to 9.99.

SLOW SPEED – This setting is the speed the arm will travel, in auto mode, when it has metal in the dipper. The range of this setting is 0.0 to 99.9.

FAST SPEED – This setting is the speed the arm will travel, in auto mode, when it does not have metal in the dipper. The range of this setting is 0.0 to 99.9.

IN METAL SPEED– This setting is the speed the arm will travel when below the CLEAR position. This speed is used in manual and auto modes. The range of this setting is 0.0 to 9.9.

ARM ADVANCE SPEED – This setting is the speed the arm will travel when it performs the Pour Forward optional move. The range of this setting is 0.0 to 9.9.


LOW METAL WARN – This setting is optional. This setting is an offset from the Low Metal Position. It will trigger an optional output (Low Metal Warning) to come on when the arm travels within this distance from the Low Metal Position. The output resets automatically when the furnace is filled and metal is found above the warning distance. The setting range is 0.00 to 9.99.

TEACH BY EXAMPLE

If the machine is in the MANUAL mode and the Teach Arm screen is displayed, The Teach by Example function is enabled. The operator moves the machine with manual Reverse/Forward buttons until it reaches the desired position. Once the position is reached, the operator can press the Set Arm key and the current Arm position will either be stored in the Ready To Pour (if ahead of Rest) or the Clear position (behind Rest).

TEACH DIPPER SCREEN

TEACH DIPPER	
FILL ANGLE	--0.0
POUR POSITION 1	--0.0
POUR POSITION 2	--0.0
POUR POSITION 3	--0.0



POUR SPEED 1	-0.0
POUR SPEED 2	-0.0
POUR SPEED 3	-0.0
FAST SPEED	-0.0
SLOW SPEED	-0.0

The Teach Dipper Screen is where program parameters for the dipper axis are entered. These settings are the current dipper settings and are stored in the currently designated memory area. The dipper travel ranges from 0.0 to 360.0 degrees. At 180 the dipper is level. Less than 180 is towards fill and more than 180 is towards pour. For example, 135 degrees corresponds to the dipper being tilted 45 degrees towards pour. 270 degrees is the dipper fully vertical when pouring. The speed settings are in percent of maximum speed. If the lock symbol appears none of the settings can be changed. To unlock go back to the Main screen and login with the correct PIN number.

The Teach Dipper screen has these parameters:

FILL ANGLE – This is the setting that the dipper will enter the metal, fill, and spill-off at. This setting controls the amount of metal in the shot. Lowering this setting lowers the amount of metal. The optional FILL ANGLE INC/DEC buttons can also be used to adjust this setting. The setting has a range of 180.0 to 135.0.


POUR POSITION 1,2,3 – These settings set the positions where the pouring speed changes. The pour starts at Pour Speed 1 until Pour Position 1 is met. The dipper then changes velocity to the Pour Speed 2 setting until Pour Position 2 is met. The dipper then changes velocity to the Pour Speed 3 setting until Pour Position 3 is met where it will stop. The pour positions can be set within the range of 180.0 to 270.0 but also must cascade ($1 < 2 < 3$).

POUR SPEED 1,2,3 – These settings set the velocities traveled during the pour profile. The pour starts at Pour Speed 1 until Pour Position 1 is met. The dipper then changes velocity to the Pour Speed 2 setting until Pour Position 2 is met. The dipper then changes velocity to the Pour Speed 3 setting until Pour Position 3 is met where it will stop. The pour speeds can be set within the range of 0.0 to 99.9

FAST SPEED – This setting is the speed the dipper will travel, in auto mode, when it does not have metal. The range of this setting is 0.0 to 99.9.

SLOW SPEED – This setting is the speed the dipper will travel, in auto mode, when it has metal. The range of this setting is 0.0 to 99.9.

TEACH TIMERS/COUNTERS/OPTIONS SCREEN

TEACH TIMERS/COUNTER/OPTIONS				
START DELAY	--0.0	ABORT RETRIES	-0	
FILL TIME	--0.0		POUR TO CLEAR	OFF
SPILL-OFF TIME	--0.0		ABORT POUR BACK	OFF
ABORT TIME	--0.0		HOLD AT REST	OFF
DEL AFTER POUR	--0.0			
DELAY COMPLETE	--0.0			

The Teach Timers/Counters/Options Screen is where program delays and cycle modifications are entered. These settings are all current parameters and are stored in the currently designated memory area. The timers are programmed in seconds, the counters in number of cycles, and the options are simply turned on or off. If the lock symbol appears none of the settings can be changed. To unlock go back to the Main screen and login with the correct PIN number.

The Teach Timers/Counters/Options screen has these parameters:

START DELAY – This is the amount of time the ladle will delay starting an automatic cycle after receiving the START signal. This parameter helps minimize the amount of time the ladle spends waiting to pour while the DCM is not ready. The setting has a range of 0.0 to 99.9.

FILL TIME – This is the amount of time the ladle stays in the metal filling the dipper during automatic cycling. The setting has a range of 0.0 to 99.9.

SPILL-OFF TIME – This is the amount of time the ladle will stay at the Spill-Off position before leveling the dipper and going to the DCM. This gives the dipper time to stabilize the amount of metal in the dipper and ensuring a consistent process. The setting has a range of 0.0 to 99.9.

ABORT TIME – During auto mode this is the maximum time the ladle will wait with metal in the dipper for the DCM to get ready. If this time expires an abort sequence is triggered where the metal is optionally poured back into the furnace. The setting has a range of 0.0 to 99.9.

DEL AFTER POUR– This is the amount of time the dipper stays at Pour Position 3 after an automatic pour before leveling. This delay helps get the last of the metal into the shot hole. The setting has a range of 0.0 to 99.9.

DELAY COMPLETE – This time is used to delay the POUR COMPLETE signal after the dipper has completed an automatic pour. The setting has a range of 0.0 to 99.9.

ABORT RETRIES - This count value is the number of consecutive abort sequences that the ladle may run. The DCM can stop and need operator attention for many reasons. This counter allows the ladle to keep presenting fresh metal to the DCM so that as soon as it becomes ready production can begin. The setting has a range of 0 to 99.

POUR TO CLEAR– This is an option that allows the ladle to return to the Clear position instead of the Rest (Home) position between cycles. This could be useful if faster ladle cycle times are needed. It does cause more heating of the dipper and pour shaft which may shorten their lives. The option can be set on or off.

ABORT POURBACK– This is an option that allows the ladle to pourback into the furnace after an abort sequence. This prevents the metal from freezing in the cup during extended downtime and allows the ladle to be quickly returned to production. Some furnaces have interference issues with the ladle pouring back while in the dip well. Test and make sure each dipper used can pourback within the furnace or turn off this option. The option can be set on or off.

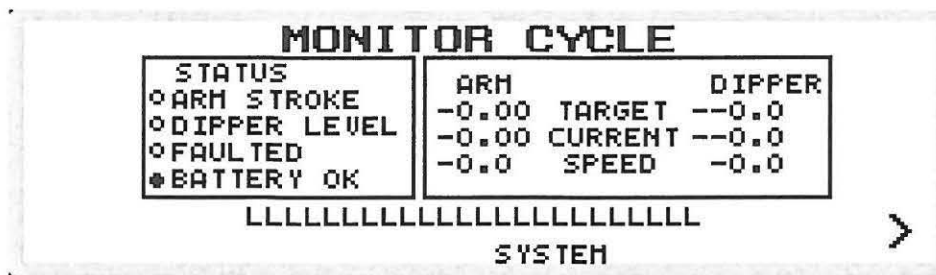
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HOLD AT REST– This is an option that allows the ladle to wait at the Rest position for the DCM to get ready instead of waiting at the shot hole. Some shot rods interfere with the ladle and this option allows the ladle to safely wait until the interference is gone. Specifically, the ladle waits until the OK TO POUR 1 interlock comes on before advancing to the shot hole when this option is turned on. The option can be set on or off.

MONITOR SCREENS

The Monitor screens are a series of status displays for the user to observe and troubleshoot the process and the ladle. The Monitor screens also allow the user to set some observational parameters like cycle counts and time of day. To page through the screens the operator can continue to press the Monitor key or use the Next and Back keys. The <> arrows indicate whether the operator can go to a next (>) screen or a back (<) screen in the series.

MONITOR CYCLE



The Monitor Cycle screen shows cycle, position, and battery status. This screen also can lead to the System Setup functions if properly logged in. The features of this screen are:

- ARM STROKE** – A status indicator that shows the condition of the Arm Stroke proximity switch.
- DIPPER LEVEL** – A status indicator that shows the condition of the Dipper level proximity switch.
- FAULTED** – A status indicator that shows whether a fault has been recognized.
- BATTERY OK** – A status indicator of the health of the battery. On is good.
- ARM TARGET** – The current position target of the arm axis.
- ARM CURRENT** – The current position of the arm axis.
- ARM SPEED** – The speed target of the arm axis.
- DIPPER TARGET** – The current position target of the dipper axis.
- DIPPER CURRENT** – The current position of the dipper axis.
- DIPPER SPEED** – The speed target of the dipper axis.
- TEXT DISPLAY** – The text display shows a description of what step of the sequence the ladle is performing.
- SYSTEM** – The user will see this if logged in under the Master password. This designates that the key below it will take the user to the System Setup screens when pressed.

MONITOR SYSTEM

MONITOR SYSTEM		
COUNT RESET	EDIT RUN	AUTO MODE ---0 TIMEOUT
CYCLES 00000000	CLOCK/CALENDAR TIME -0:00:00 DATE -0/00/00	SERVO CONTROL FIRMWARE --0.00
< >		

The Monitor System is the second screen in the Monitor series. This screen shows or sets cycle count, date/time, auto timeout, and servo firmware version.

COUNT RESET – Resets the cycle counter to 0. To activate use the arrow keys to highlight this text and press Enter.

CYCLES – A display of howmany auto cycles have run since the last reset.

EDIT, RUN, CLOCK CALENDAR – These functions are used to set the PLC clock. Follow this procedure to set:

- 1) Use the arrow keys to highlight the EDIT text and press Enter
- 2) Move the highlight down to the time and/or date field to be changed.
- 3) Type the change and press Enter.
- 4) Move the highlight and make other changes as necessary.
- 5) Move the highlight to the RUN text and press Enter.

AUTO MODE TIMEOUT – Sets the maximum amount of time the ladle will wait in auto mode between cycles. If this time expires the ladle will be placed in manual mode. Range is 0 to 9999 minutes.

SERVO CONTROL FIRMWARE – A display of the revision of firmware in the servo controller.

MONITOR INPUTS

MONITOR INPUTS	
OFF HIGH METAL PROBE	OFF MANUAL PB
OFF METAL PROBE	OFF LADLE START
OFF REVERSE SS	OFF OK TO POUR 2
OFF FORWARD SS	OFF OK TO POUR 1
OFF SELECT ARM SS	OFF DIPPER OT
OFF AUTO PB	OFF DIPPER LEVEL
OFF FAULT RESET PB	OFF ARM HOME
OFF HOME PB	OFF POWER SENSE < >

The Monitor Inputs is the third screen in the Monitor series. This screen shows the current status of the controller inputs. Refer to the electrical drawings for initiating devices.

MONITOR OUTPUTS

MONITOR OUTPUTS			
OFF	HCR PWR	OFF	BRAKE
OFF	PROBE POWER	OFF	000010
OFF	100003	OFF	000011
OFF	000004	OFF	000012
OFF	IN AUTO	OFF	000013
OFF	IN MANUAL	OFF	000014
OFF	HOMED	OFF	COMPLETE
OFF	FAULTED	OFF	000016

The Monitor Outputs is the fourth screen in the Monitor series. This screen shows the current status of the controller outputs. Refer to the electrical drawings for activated devices.

SYSTEM SCREENS

Access to the System screens is password protected. Only a user logged in with the Master PIN can access these screens. Once logged in the user can access these screens via the Monitor Cycle screen. The System screens are a series of special setup screens for high level parameters. To page through the screens the operator can continue to press the System key or use the Next and Back keys. The <> arrows indicate whether the operator can go to a next (>) screen or a back (<) screen in the series.

SYSTEM SETUP 1

SYSTEM SETUP 1			
ARM HOME SPEED	--0.0	FILL CHANGE	-0.00
ARM MAN SPEED	--0.0	ARM CHECK TOL	-0.00
DIP HOME SPEED	--0.0	DIP CHECK TOL	--0.0
DIP MAN SPEED	--0.0	HI METAL OFFSET	-0.00
MACHINE TYPE	-0		

SYSTEM >

The System Setup 1 screen is used to display or change the following parameters:

ARM HOME SPEED – The speed that the arm will move during homing. The slower the speed the more accurate the homing will be between from start-up to start-up. This is also the speed that the arm will move at before the ladle is homed. The range of this setting is 0% to 20%.

ARM MAN SPEED – The speed that the arm will move during manual operations after homing. The range of this setting is 0% to 99.9%.

DIP HOME SPEED – The speed that the dipper will move during homing. The slower the speed the more accurate the homing will be between from start-up to start-up. This is also the speed that the dipper will move at before the ladle is homed. The range of this setting is 0% to 20%.

DIP MAN SPEED – The speed that the dipper will move during manual operations after homing. The range of this setting is 0% to 99.9%.

MACHINE TYPE – This is factory set for your machine. This parameter changes the motion control settings. For a 305 ladle this parameter must be set to 1.

FILL CHANGE – This setting is the maximum allowed change in metal level from cycle to cycle. Each cycle the metal level is noted by the controller. Should the ladle exceed this setting relative

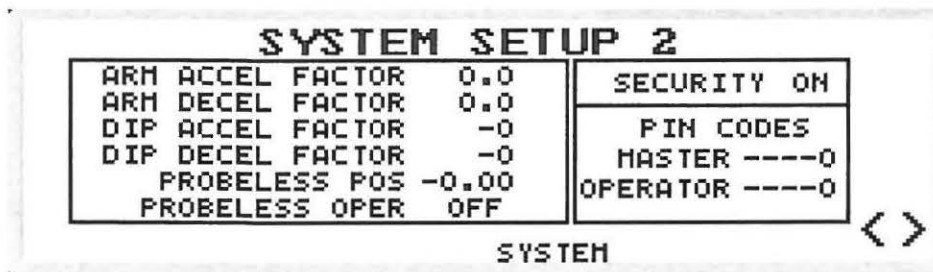
to the last cycle a fault will be generated. This is designed to help protect the arm from going into the metal because of any metal probe failure. The range of this setting is 0 to 9.9.

ARM CHECK TOL – The Arm Check Tolerance is a setting that establishes a tolerance around where the arm stroke prox switch just comes on. If the prox switch comes on too early or too late a warning message is displayed. This could happen as a result of a faulty encoder or switch. The range of this setting is 0 to 9.9.

DIP CHECK TOL – The Dip Check Tolerance is a setting that establishes a tolerance around where the dipper level prox switch just comes on. If the prox switch comes on too early or too late a warning message is displayed. This could happen as a result of a faulty encoder or switch. The range of this setting is 0 to 9.9.

HI METAL OFFSET – This setting is how high up the ladle will travel when in a High Metal Abort. High Metal Abort occurs when the High Metal probe contacts the metal and is usually the result of the furnace being filled while the dipper is filling. Set this high enough so the ladle can move out of the way to compensate for the rate that the furnace will be filled at. The range of this setting is 0 to 9.9.

SYSTEM SETUP 2



The System Setup 2 screen is the second screen in the System series.

ACCEL/DECEL FACTORS – These settings are multipliers for the amount of time the arm and dipper will accelerate and decelerate. The lower the setting the faster yet jerkier the motion will be. These should only be changed from the factory setting by instruction from Rimrock. The range of this setting is 0 to 9.

PROBELESS POSITION – A feature of the Legend controls is the optional ability to run without using the metal probes. To do this the metal level is assumed to always be at stable position such as what a launder system may provide. That position is programmed in this setting. When running probeless the ladle will assume metal is filling the dipper when the arm reaches this position. Probes can be used as backup with this feature. The range of this setting is 44.25 to 99.99.

PROBELESS POSITION – Turns on the Probeless Operation feature. See Probeless Position above for details. The option can be turned on or off.

SECURITY ON/OFF – Turns Teach security on or off. When on the user must log in to make any change to any Teach screen parameter. A "locked" symbol will also appear on the Teach screens until the user logs in. The parameters cannot be edited while locked.

MASTER – Establishes the MASTER PIN. The number can be from 1 to 32767.

OPERATOR – Establishes the OPERATOR PIN. The OPERATOR PIN may only grant access to Teach screen parameters, not System Setups.

For more on security see Security at the end of this section.

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MEMORY AREA TRANSFER

MEMORY AREA TRANSFER			
-0	AAAAAAAAAAAAAAAA	RUNNING PROGRAM	
-0	AAAAAAAAAAAAAAAA	LOAD A MEMORY AREA	SAVE TO MEMORY AREA
			< >

This is the third screen of the System series. This screen is used to store and retrieve memory areas. The screen has these functions:

RUNNING PROGRAM - Displays the name and the number of the current memory area being used for production. This information field cannot be edited.

LOADING OR SAVING MEMORY AREAS – These functions use the lower row of fields to store, retrieve, and name memory areas. The leftmost field is used to enter the number of the memory area to save to or retrieve from. The next field is used to display or change the name of a memory area. The text boxes to the right select which function, load or save, to perform. Follow these procedures to load and save memory areas:

Loading a Memory Area:

- 1) Using the arrow keys move to the leftmost field and enter the number of the memory area to load.
- 2) Move to the text box marked LOAD A MEMORY AREA and press enter. All of the settings for the arm, dipper, timers, and options will be loaded with the values stored in the selected memory area number. If this is done in auto mode (NOT RECOMMENDED) then load will occur between cycles.

Saving a Memory Area:

Note: The controller automatically saves changes in the current memory area as they are entered. Use this procedure when saving the current settings to a different memory area.

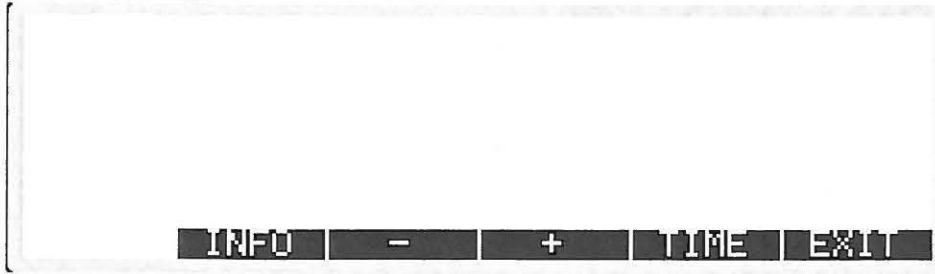
- 1) Using the arrow keys move to the leftmost field and enter the number of the memory area to save to.
- 2) Move to the text entry box and enter a name for the memory area.
- 3) Move to the text box marked SAVE A MEMORY AREA and press enter. All of the current settings for the arm, dipper, timers, and options will be loaded into the selected memory area number.

MEMORY AREA INDEX

MEMORY AREA INDEX	
1 AAAAAAAAAAAAAAAAAA	6 AAAAAAAAAAAAAAAAAA
2 AAAAAAAAAAAAAAAAAA	7 AAAAAAAAAAAAAAAAAA
3 AAAAAAAAAAAAAAAAAA	8 AAAAAAAAAAAAAAAAAA
4 AAAAAAAAAAAAAAAAAA	9 AAAAAAAAAAAAAAAAAA
5 AAAAAAAAAAAAAAAAAA	10 AAAAAAAAAAAAAAAAAA
< >	

This is the fourth screen of the System series. It is used to see what memory areas are named.

ALARM SCREEN



This screen is accessed by pressing the List key. The current and past alarms will be shown. The past alarms can be paged through and the display can be changed to show time and date. Press the key under the EXIT text to leave. See the Maintenance section for alarm meanings and recovery.

SECURITY SYSTEM

Introduction

The security feature is built into every Rimrock LEGEND Control system. The security system allows you to limit which personnel can access and operate its various features. There are 2 security levels, MASTER and OPERATOR, which can be assigned personal identification numbers (PINs).

Security Safeguard

System Setups are permanently restricted only to users who have the MASTER PIN. A user who wants to access System Setups must first log in with the MASTER PIN whether or not security for the Teach functions is being used.

Legend controllers are shipped with all Teach functions accessible to any person who can navigate the screens. In some facilities Teach security may not be necessary while in others it may be essential. If security is enabled for the Teach functions then a lock symbol appears on the teach screens and the parameters cannot be changed. Either the MASTER or OPERATOR PINs can be used to temporarily unlock the ability to change the parameters.

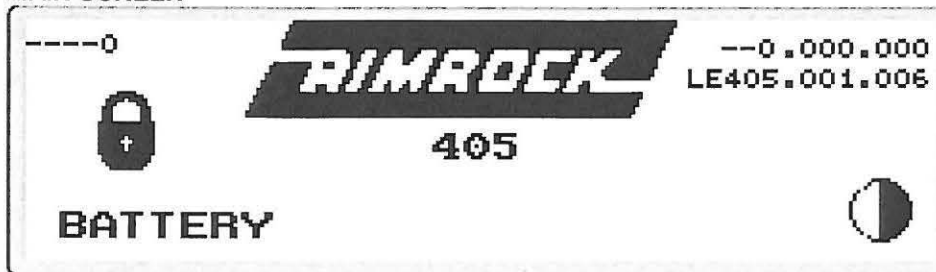
CAUTION

Only authorized personnel should be allowed to access the MASTER PIN. The factory pre-programmed MASTER PIN in every system is 5926. It is recommended that this be changed and the new number stored in a safe place. If this PIN is forgotten the memory must be cleared by removing the battery to restore factory defaults. This will also clear all memory area settings and system settings.

Log On

A PIN must be entered on the Machine's Main Screen to gain access to any restricted parameter. The factory pre-programmed MASTER PIN in every system is 5926. It is recommended that this be changed and the new number stored in a safe place. If this PIN is forgotten the memory must be cleared by removing the battery to restore factory defaults and all memory area settings and system settings will be lost.

MAIN SCREEN



In order to log on:

1. Go to the Main Screen. The upper left portion of the screen will display an entry box.
2. Use the alpha/numeric keys to type in the PIN and press the ENTER (↵) built-in function key.
3. If the PIN is correctly matched, either MASTER or OPERATOR, the entry box will clear and the "unlocked" symbol will appear.
4. If the PIN is not correctly matched, the screen will remain the same.

Once logged in you will notice that the entry box appears around the “unlocked” symbol. Pressing ENTER while the entry box is around this symbol will log you out.

Security Set-up

You can access the security settings only if logged in with the MASTER PIN. Once logged in the Monitor screen will display SYSTEM above a key. Pressing that key allows you to go to the System Setup screens. Go to the System Setup 2 screen by repeatedly pressing this SYSTEM key. On this screen are the 3 security settings which are explained below. It is strongly urged to keep the PIN numbers recorded in a safe place.

SYSTEM SETUP 2

SYSTEM SETUP 2	
ARM ACCEL FACTOR 0.0	SECURITY ON
ARM DECEL FACTOR 0.0	PIN CODES
DIP ACCEL FACTOR -0	MASTER ----0
DIP DECEL FACTOR -0	OPERATOR ----0
PROBELESS POS -0.00	
PROBELESS OPER OFF	

SYSTEM <>

Security ON/OFF – Turns Teach security on or off. When on the user must log in to make any change to any Teach screen parameter. A “locked” symbol will also appear on the Teach screens until the user logs in. The parameters cannot be edited while locked.

MASTER – Establishes the MASTER PIN. The number can be from 1 to 32767.

OPERATOR – Establishes the OPERATOR PIN. The OPERATOR PIN may only grant access to Teach screen parameters, not System Setups.

Security Time Out

Security time out is the amount of time that the controls can be left idle before automatically logging off the user. The timer is permanently set to 60 seconds which starts upon log in. When a security time out occurs, the information last entered is retained and the screen being viewed when the time out occurred remains. The Teach screens immediately lock however the System Setup screens will remain unlocked until they are left.

Security Settings Back-up

All settings, including security, are saved in battery-backed memory in the Legend controller processor. Normal power failures will not reset these settings. However, if the batteries fail, the settings will be lost and the system will revert back to the original factory settings.

Section 8 - Maintenance 305

This section covers routine maintenance, adjustments, troubleshooting, component locations, and spare parts for the Rimrock 305 Ladle with Legend controls. Only qualified maintenance personnel familiar with the Operation and Controls sections should perform the procedures in this section. Troubleshooting personnel should additionally be familiar with the Programming section.

ROUTINE MAINTENANCE

Routine maintenance assures proper operation and increases the life of the machine and its components. Routine maintenance must be performed while the machine and the area around the machine is safe and locked out.

CAUTION!

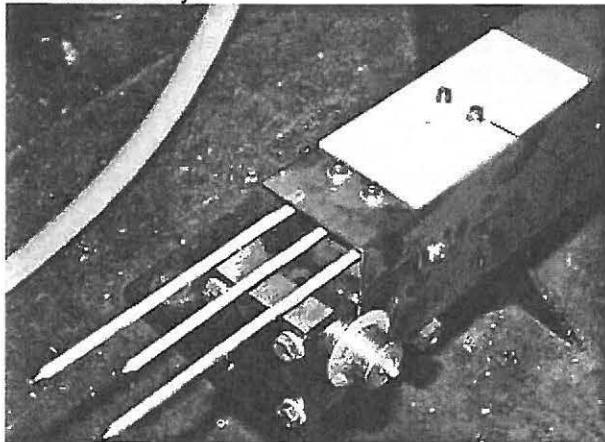
Do not attempt to perform any maintenance on equipment until all safety instructions have been reviewed and all power sources are locked out as described in Safety section of the users manual.

PLANNING AND DOCUMENTATION

The procedures in this section give guidelines as to how often maintenance should be done. Plan and document what is done during maintenance to aid in determining the effectiveness of the overall program and to help tailor the plan to meet the specific needs of the facility.

Sensor Probe Settings

The temperature of the arm can go up as much as 500 degrees and damage can occur if the probes are not set up properly and the arm becomes immersed in metal. Adjust the probes so the arm does not touch the metal. This will increase the life of the pour shaft, chains, and other components associated with the lower arm assembly.



PROBE SLIDE
ADJUSTMENT
BOLTS

Mechanical Interference

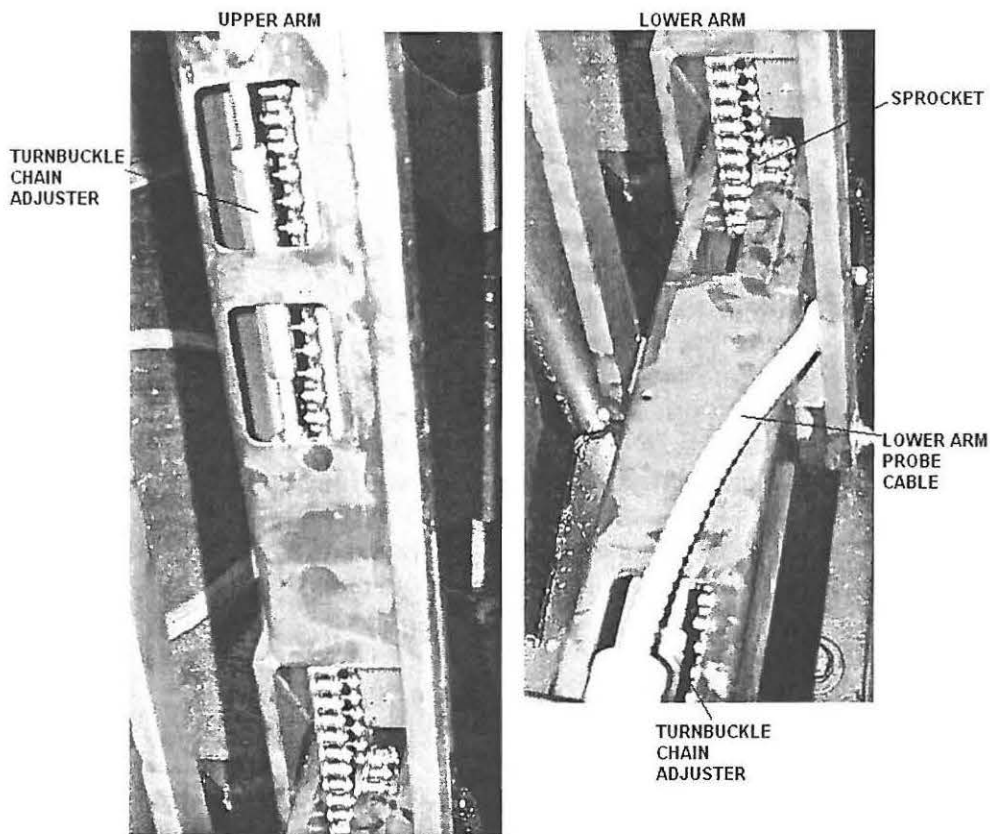
The dipper cup should come in contact only with the molten metal. If there is interference with the furnace walls (due to dross build up) or the die cast machine, the equipment may be damaged or require re-calibration.

Lubrication of the Bearings

The bearings in the arm should be lubricated every 200 hours of operation. Use only high-temperature grease to prevent build-up. The fittings are located in the shaft ends in the lower arm and in the bearing housings in the upper arm.

Chain Maintenance

Over time, chains used to operate the ladle arm and dipper will stretch. Checking and correcting the chain tension on a regular basis will prevent downtime that can be caused when a chain becomes too loose. If chains need to be replaced, be sure the timing of the chain's turnbuckle is correct; otherwise a simple PM activity will cause downtime if the turnbuckle rides onto to a sprocket and breaks a chain.



Chain Inspection

Inspect the dipper chains 10 hours after initial maintenance, then every 200 hours of operation. Chain inspection should include the following:

- 1) Check the sprocket teeth. Replace the chain if the sprocket teeth show signs of wear. If excessively worn replace the sprockets as well.
- 2) Check the Chain tension and adjust.
- 3) Every six months remove, clean, and inspect the dipper pour shaft. Lubrication is necessary unless graphite is used. Replace the pour shaft if worn excessively.

Chain Lubrication

During each inspection lubricate the chains with high temperature grease. The grease can be purchased from Rimrock as PN 03046. The following are types of grease that may be used:

Dubois HTG-3048
Mobile Temp 2
Shell Darina 2

Lubricate the chains as follows:

- 1) Remove arm covers.
- 2) Remove all old grease and foreign matter. Use solvent and rag
- 3) Re-Lubricate chains and sprockets
- 4) Replace arm covers

Chain Tensioning

If chain tensioning is needed do the following:

- 1) Move the ladle to the rest position.
- 2) Remove the upper and lower arm covers.
- 3) Loosen the locking nut on the turnbuckle assembly
- 4) Rotate the turnbuckle in the direction needed to either tighten or loosen the chain. The chain is properly adjusted when 15pounds of force applied to the chain causes it to just touch the inside of the arm.
- 5) Re-tighten the locking nuts and replace the covers. Do not use screws longer than 3/16" as they will interfere with the chain.

Chain Replacement

If chain replacement is needed do the following:

- 1) Move the ladle to the Ready to Pour position with the dipper level cam pointing directly at the dipper level switch.
- 2) Remove the arm cover.
- 3) Loosen the locking nut and turnbuckle assembly until the chain is free.
- 4) To remove the lower chain the end cap must be removed first.

- 5) Place the new chain in the arm with the turnbuckles positioned at the center of the arm opening. Failure to do so can result in the turnbuckles contacting the sprockets.
- 6) Rotate the turnbuckle in the direction needed to either tighten or loosen the chain. The chain is properly adjusted when 15 pounds of force applied to the chain causes it to just touch the inside of the arm.
- 7) Re-tighten the locking nuts and replace the covers. Do not use screws longer than 3/16" as they will interfere with the chain.

Gear Box Lubrication

After the first 50 hours of operation, drain the gear box, flush it out, and fill with new oil to the oil plug level. Change the oil every six months, every 2,500 operating hours. The oil in the gear boxes should be changed more often if operating conditions cause condensation of moisture and/or sludge forms inside the housing. For extremely severe service conditions contact Rimrock for recommended lubricants. For best results use Mobil 600W super or equivalent SAE 90 weight oil.

Proper Coating of Dippers

Rimrock recommends keeping two dippers on hand for each ladle. One properly coated dipper runs on the ladle, while a second dipper is ready for use. Changing the dipper each shift, and properly coating the old dipper will dramatically increase the life of the dipper. Follow the instructions on the container of the dipper coating. Make sure the coating has completely dried before submerging the dipper in the metal. Do not allow the dipper coating to contact the ladle probes. The dipper coating acts as an electrical insulator and will prevent the ladle probes from sensing the metal. This can cause the ladle's arm to become submerged in the metal.

Electrical Checks

The electrical system for any type of automation equipment must be properly maintained in order to maintain production and protect equipment. The electrical checks can be done on a monthly basis. Areas to routinely check are:

Loose Connections

The control systems are routinely exposed to heat and vibration. Over time the electrical connections can loosen. Hand tightening the terminations can ensure proper connection and prevent failures.

Power Supply

Carefully measure the power supply with power on to the cabinet. The supply should read between 23.5 and 24.5 volts. There is an adjustment for the supply. If it cannot be adjusted to the range it should be replaced.

Control Enclosure Upkeep

The control enclosure should be kept clean and neat. Typical upkeep includes:

- Vacuum the top and sides of the enclosure.
- Keep the enclosure clear of debris, tools, gloves, etc.
- Keep the enclosure closed when not being serviced.
- Make sure all cooling fans and other cooling apparatus are working.
- Keep the wiring coming into the cabinet neat and labeled.
- Make sure the heat sinks on the side are clean and unblocked from air movement.

Conduits

Inspect the electrical conduits for damage. Repair or replace damaged conduits immediately. Rimrock recommends that the conduit between the control enclosure and the mechanical unit not be repaired but rather replaced if damaged.

Battery

Power-up and check the Main screen for the word BATTERY. If it is displayed then the battery must be replaced.

Replacing the Batteries

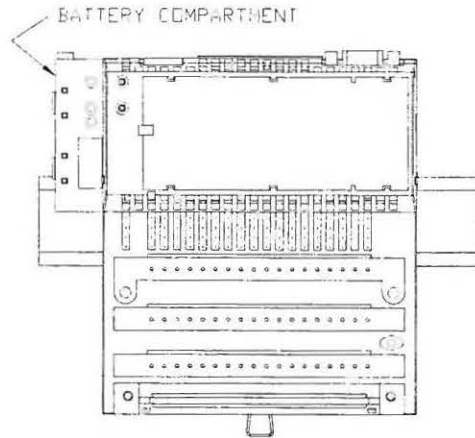
The Programmable Control CPU module is supplied with a lithium battery available from Rimrock. These batteries have an operating life of several years. When the battery loses charge the CPU will still function but will lose the user setups when power is lost

Leave Power On When Changing Batteries

Once your CPU has been commissioned and is running, maintain power to the module whenever you change the battery. Change the battery by carefully pressing down on the battery compartment door tabs on the end of the CPU battery adapter module, remove and replace the battery, then snap the battery compartment door shut. If too much force is used when opening the battery compartment door hinge pins may break. If the pin breaks, the battery may come loose causing CPU malfunctions.

Installing Batteries

When installing the battery observe correct polarity, as indicated on the compartment door.



CAUTION - ELECTRONIC CIRCUITRY EXPOSED



When the battery door is open, electronic circuitry is exposed. Follow proper ESD measures while handling the equipment during battery maintenance.
Failure to observe this precaution can result in injury or equipment damage.



CAUTION

Dispose of used batteries according to the manufacturer's instructions.
Ultimate disposal of this product should be handled according to all national laws and regulations.

DO NOT EXPOSE TO HIGH TEMPERATURES, INCINERATE, PUNCTURE, CRUSH, RECHARGE, OR SHORT CIRCUIT.

TROUBLESHOOTING

FAULTS

This section deals with some situations that may arise during the operation of the ladle. Keep in mind that all situations are not alike and use good troubleshooting techniques when diagnosing problems. Many times a mechanical issue may cause an electronic fault condition and vice-versa

4.01 – AXIS 1 (ARM) SERVO FAULT - This can be caused by an overloaded or bad motor, a bad encoder signal, loose motor wiring connection, aggressive accel and decel settings, faulty amp/motor/controller. Check the wiring and connections. Replace components one at a time. The machine must be re-homed after this fault.

4.02 – AXIS 2 (DIPPER) SERVO FAULT - This can be caused by an overloaded or bad motor, a bad encoder signal, loose motor wiring connection, aggressive accel and decel settings, faulty amp/motor/controller. Check the wiring and connections. Replace components one at a time. The machine must be re-homed after this fault.

4.04 - HIGH METAL PROBE FAILED - One of the High Metal probe wires may be broken or disconnected, or the resistor may have failed. Check the Input module to verify. The input should be on when the probe is not touching metal.

4.04/4.05 - PROBES SHORTED - The probes may be shorted by flash or the power to the probe resistors may have been lost. Check the Input module to verify.

4.05 - METAL PROBE FAILED - One of the Metal probe wires may be broken or disconnected, or the resistor may have failed. Check the Input module to verify. The input should be on when the probe is not touching metal.

4.07 - LOW METAL ABORT - The amount of metal in the furnace is below the reach of the Ladle. Refill the furnace and check the Low Metal setting.

4.09 - DIPPER OVERTRAVEL - The dipper has rotated to and triggered the Fill overtravel limit switch. Make sure that the program settings are not beyond the maximum settings that the limit switch will allow and that the limit switch is clear of flash and debris.

4.12 - ALLOWABLE FILL CHANGE EXCEEDED - This fault indicates a drastic difference between where metal was found on this cycle and where it was found on the previous cycle. A large change in metal level may indicate furnace problems or a probe problem.

4.15 - DIPPER CHECK POSITION ERROR - This may occur if there is mechanical slippage on the machine, a bad encoder, loose electrical connections to the motor, or a loose or failing limit switch.

4.16 – ARM CHECK POSITION ERROR - This may occur if there is mechanical slippage on the machine, a bad encoder, loose electrical connections to the motor, or a loose or failing limit switch

4.17- ABORT CYCLE RETRIES EXCEEDED - The ladle has attempted to pour and did not receive both OK to Pour signals. This fault will automatically reset if a new Start signal is received.

OPERATIONAL PROBLEMS

In some situations the ladle may not respond to operator commands and not give a fault. These situations are a result of procedural errors or failed components. To find the cause refer to the symptom below.

START Pushbutton will not light.

Verify incoming power is on.

Verify all E-stops and guards made after making sure all personnel are safe.

The processor has not had time to boot-up. This takes approximately 45 seconds.

Check to see if any fuses are blown or breakers are tripped.

Check the DC Power supply for proper operation.

Check the START pushbutton for proper operation.

Check MCR for proper operation.

Check to see if the processor RUN light is on

Will not go into Manual Mode

Make sure START pushbutton is lit.

Reset any faults.

Verify switch operation.

Make sure the controller RUN light is on

Will not go into Auto Mode

Make sure START pushbutton is lit.

Reset any faults.

Make sure the ladle has been homed

Make sure the arm is above the Clear position

Verify switch operation.

Make sure the controller RUN light is on

Cannot start an auto cycle

Make sure you are in auto mode.

Verify the user program positions and speeds are set

Make sure all start signals are off before entering auto mode. The Controller has anti-tie-down logic to prevent sudden starts when entering auto mode.

Make sure a start signal is generated after the system is in auto mode.

The auto cycle stalls

Make sure the unit is not faulting. Check the HMI screen for any alarm message..

Make sure the unit is still in Auto mode.

Verify the user program, particularly the speeds.

The system will not respond to any manual commands

Make sure power is on and the START lamp is on.

Make sure no fault exists.

Check to make sure the machine connector on the side of the enclosure is securely fastened.

Verify all fuses and breakers.

Make sure the controller RUN light is lit.

Make sure that Module 2 and 3 BA, RC, and RD lights are on steady and not flashing. If they are flashing check the cables that connect all of the modules together.

Make sure the 18 position connectors that go to the modules are securely fastened.

There is no data in any memory area and/or current settings

Make sure the controller RUN light is on.

Make sure the controller's COM/ACT light is on steady while on the Teach screen.

Make sure no one downloaded blank programs to the controller.

Check the battery status on the Main screen. If "BATTERY" appears then change the battery

The HMI has a COM ERR message

This is normal while the controller boots-up.

Make sure the RUN light is lit on the controller

Make sure the cable from the HMI to the middle deck of Module 1 is intact and plugged in.

The controller will not keep the edits being made

Make sure you are pressing ENTER (the L shaped arrow key) after typing in your change.

When in auto the controller saves data at the start of auto cycles. Abort cycles do not count.

If you are using the Memory Area Transfer screen make sure you are using the functions correctly. Refer to the Programming section of the manual.

Check the battery status on the Main screen. If "BATTERY" appears then change the battery

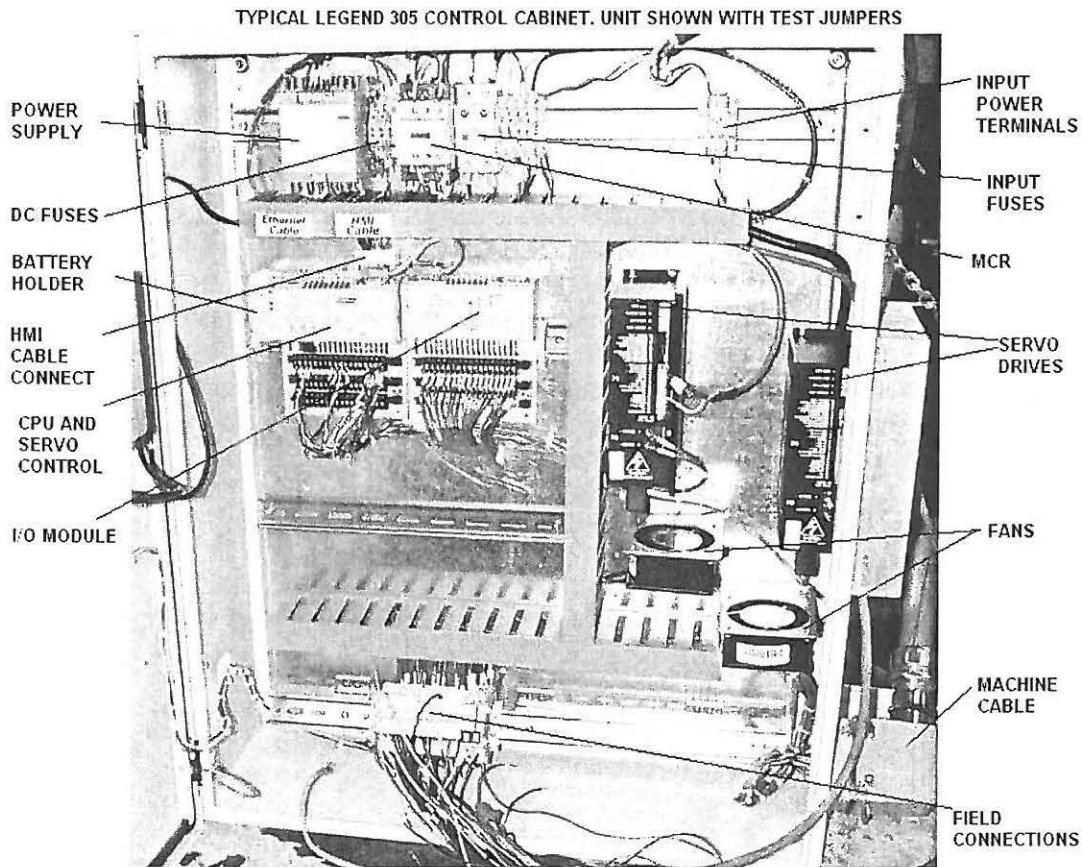
The START pushbutton light goes off without any faults.

Check for any loss of E-stop or guard inputs. Even a momentary loss of one will cause the system to shut down. You can see the inputs on the Monitor Inputs screen.

Check to see if the DC power is momentarily going off. If so, the processor will reset without any faults but will take about 45 seconds to complete booting-up. During that time the HMI will display a "Com err". If so you may have a short circuit on the DC wiring in the cabinet or on the machine. The power supply has protection built into it that shuts down the power until the short goes away.

Make sure the 18 position connectors that go to the modules are securely fastened.

ELECTRICAL COMPONENT IDENTIFICATION AND SPARE PARTS LISTS



Inside the Legend controller is a powerful CPU processor that houses the machine program and user setups. The CPU communicates to a servo controller module mounted underneath the it and an I/O module mounted adjacent to it. Power distribution and fusing components are mounted along the top rail while field connection terminals and relays are along the bottom. On the left side of the enclosure are the motor drives.

The CPU, I/O, and servo controller all have status light indicators. The user setups are stored in battery-backed memory on the CPU. A BATTERY warning will be given on the main screen of the HMI should the battery run low. Contact Rimrock for replacement batteries.

Incoming power to the Legend Controller is distributed through fuses mounted along the top rail. The input fuses are current limiting CC class fuses and should

RIMROCK

only be replaced by the same. Glass 5x20mm fuses are used for supplemental DC fusing. All fuses have blown fuse indicating lights. The 24VDC power supply is located on the top rail and has a status indicating light. The negative of this supply is grounded making live voltage measurements easy (simply reference the nearest grounded metal). The MCR contactor can also be found along the top rail.

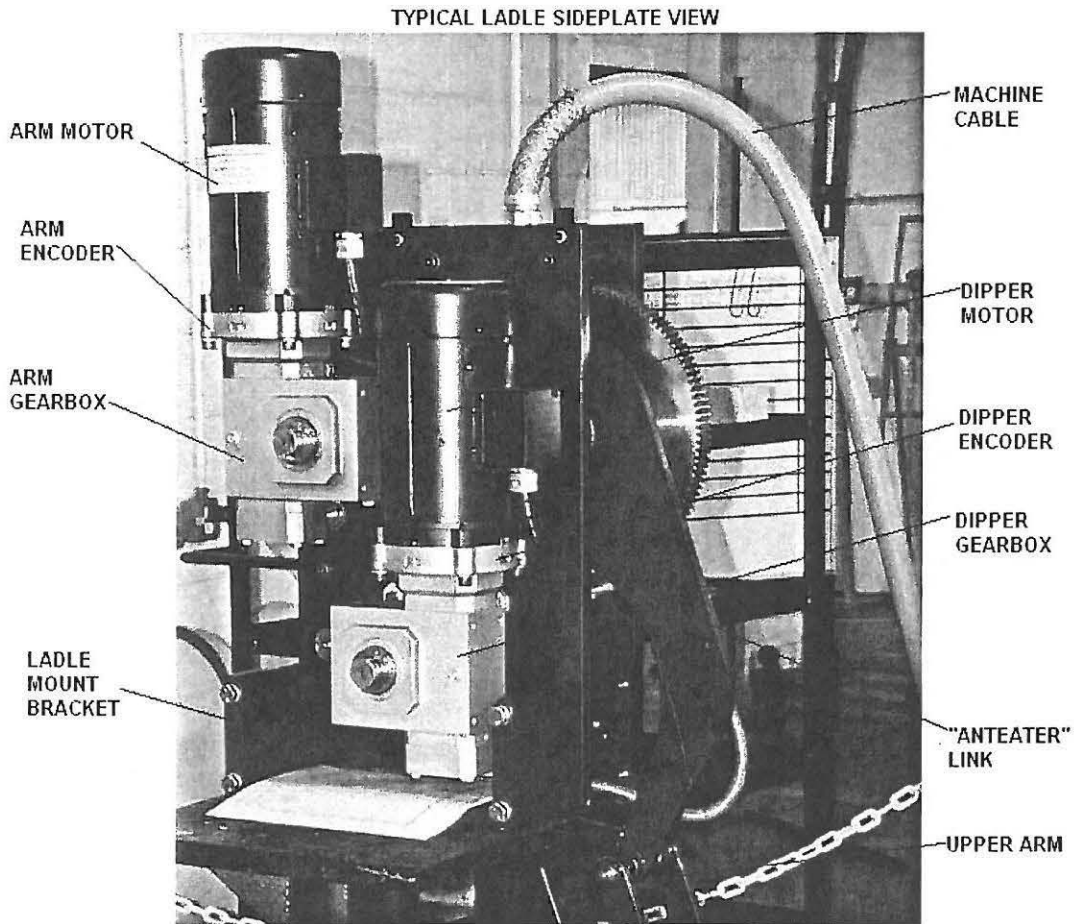
The field connections along the bottom rail are marked with tags. Each relay has an indicating status light. The motor drives along the left side of the controls also have indicating two-color status lights. Green means enabled and red means disabled **OR** faulted.

305 Electrical Recommended Spare Parts List

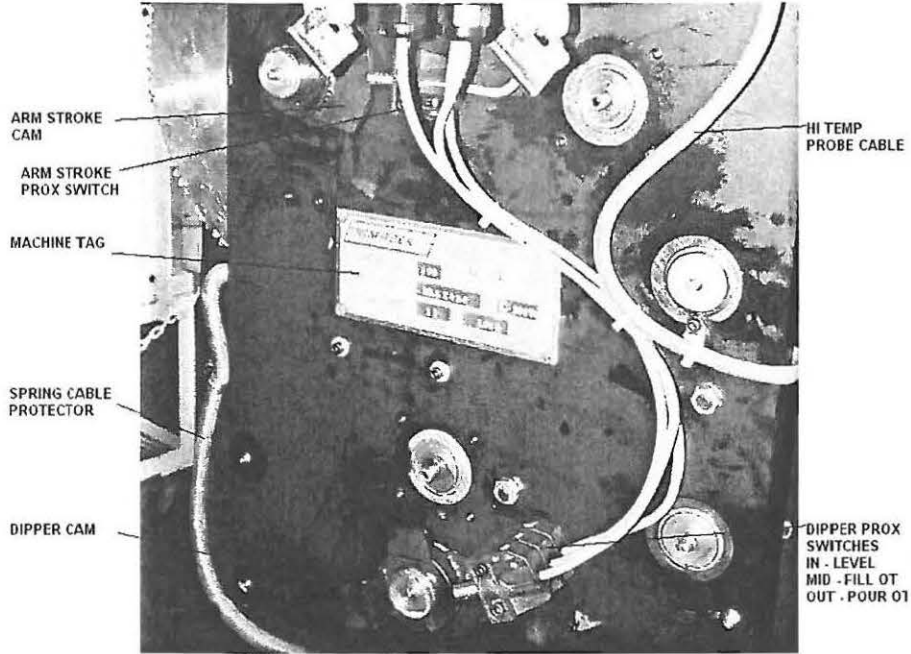
Reference the Electrical drawings for exact location.

Fuse Holder CC Fuse	1	02364-48
Fuse Holder 5x20mm	1	08729-125
Fuse 5A CC Class	5	06873-20
Fuse 15A CC Class	5	07631-17
Fuse 315ma 5X20mm	5	07632-100
Fuse 1.6A 5X20mm	5	07632-101
Fuse 4A 5X20mm	5	07632-102
Power Supply	1	02274-153
CPU Module	1	17460-081
I/O Module	1	17460-002
Motor Amplifier	1	06664-81
24VDC SPDT Relay	1	17500-060
24VDC DPDT Relay	1	17500-061
120VAC SPDT Relay	1	17500-062
MCR Contactor	1	02846-39
Motor (std 305)	1	06664-5E
Prox Switch	2	02863-49
HMI, Preprogrammed	1	17461-110
ROSCO Package	1	17490-000
Green IPB Switch	2	16824-101
Red PB Switch	1	16824-102
ESTOP Switch	1	16824-103
White IPB Switch	1	16824-104
Green PB Switch	1	16824-105
Yellow IPB Switch	1	16824-106
2 Pos Selector Sw	1	16824-107
3 Pos Selector Sw	1	16824-108
Spare Bulbs	5	16824-05
Encoder Assembly	1	11303-6

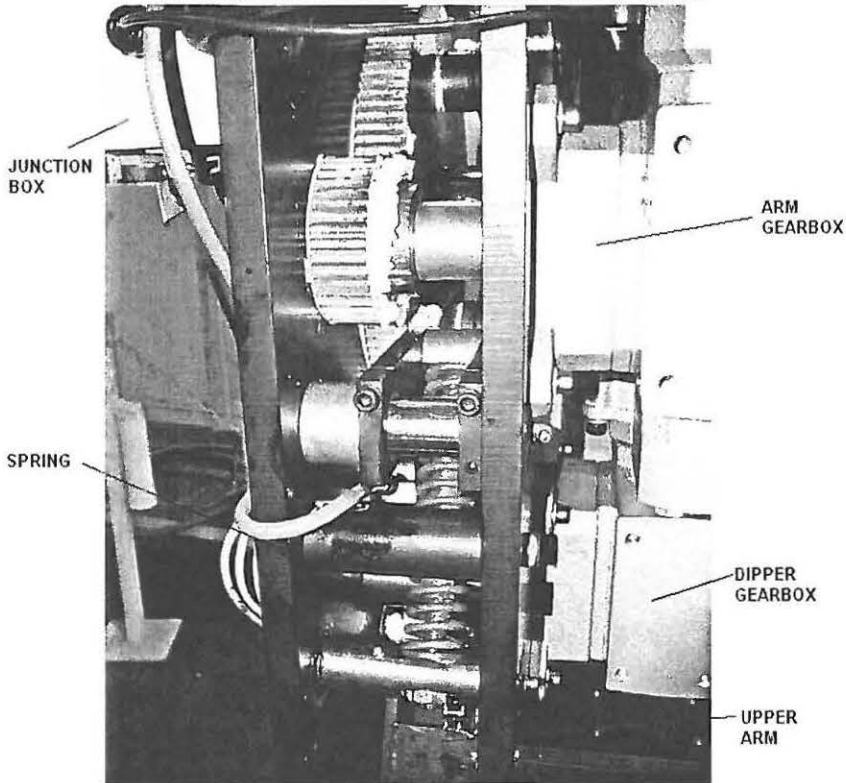
MECHANICAL COMPONENT IDENTIFICATION AND SPARE PARTS LISTS

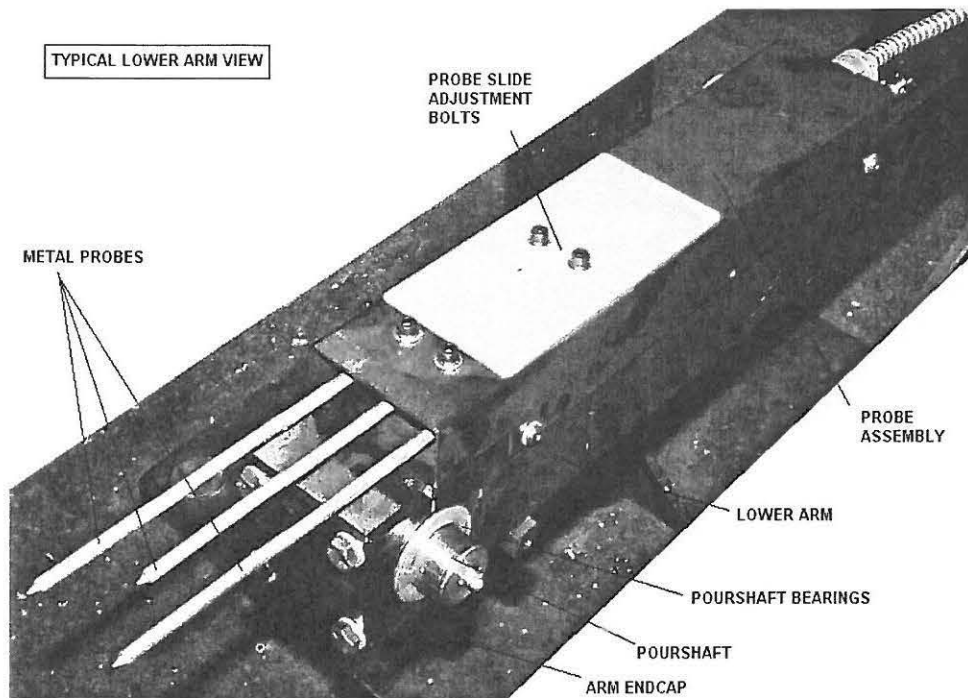
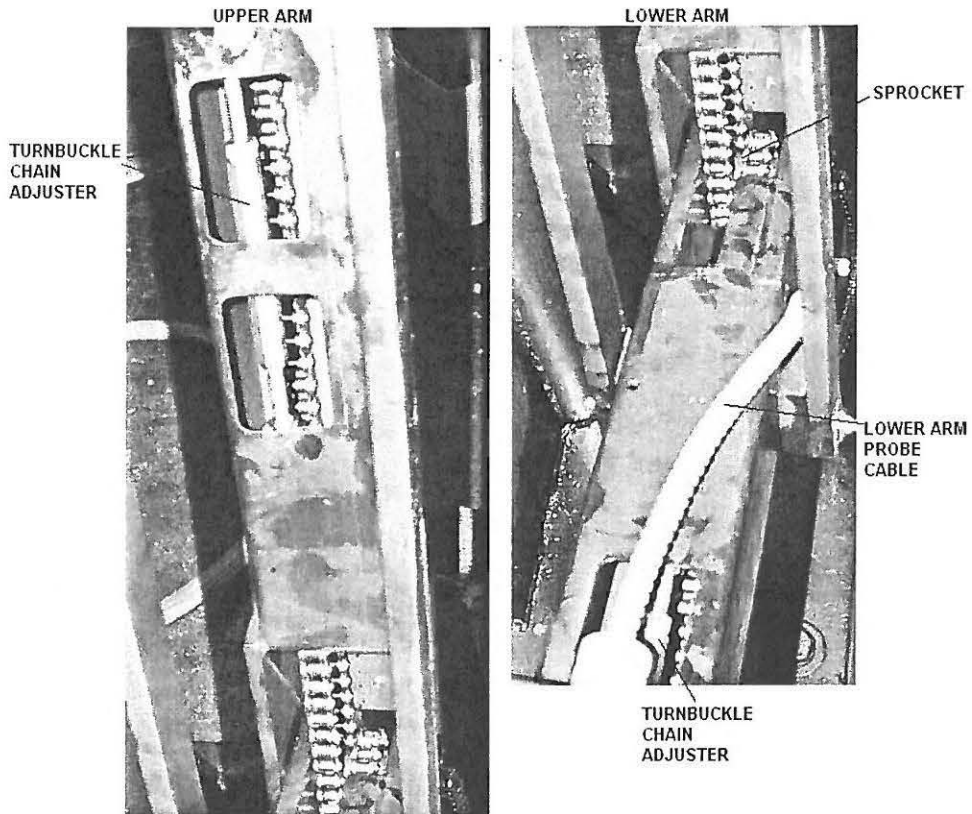


TYPICAL MACHINE SIDEPLATE VIEW



TYPICAL GEAR AND LINKAGE ASSEMBLY
SEE MECHANICAL DRAWINGS FOR ASSEMBLY AND PART DETAILS





305 Mechanical Recommended Spare Parts List

Reference the Mechanical drawings for exact location.

Lower Chain Kit	2	10535-01
Upper Chain Kit	1	10535-02
Pour Shaft/Bearing Kit	2	10534
Sensor Wire	16'	17500-041
Sensor Isolator	4	10864
Sensor Probe 4"	2	05527-7
Sensor Probe 5"	4	05527-8
Spring 12#-30#	1	08909-09
Spring 2#-10#	1	08909-18
Ball Bearing 1621	1	02150-2
Sleeve Bearing CB-0608	1	04938-9
Spring Extension	1	05532
Speed Reducer 23MF-01	1	10888-01
Speed Reducer 23MF-02	1	10888-02
Pour Shaft Bearing	4	10763-1
Snap Ring	4	02212-75
Shaft-Lower Arm	1	10785-2
Thrust Washer TRA-1220	14	02184-1
Needle Bearing B-128	10	02158-6
Elbow Shaft	1	10784-2
Thrust Washer TT-1701	2	02184-3
Bearing B-1210	2	02164-5
Thrust Washer TT-1205	2	02184-4
Arm Shaft	1	10926
Needle Bearing B-1612	2	02156-2
Needle Bearing B-2012	12	02156-7
Needle Bearing B-1610	2	02156-9
Needle Bearing B-1212	2	02154-1
Thrust Washer TRA 2031	20	02180-35
Thrust Washer TRA 1625	8	02408-2
Thrust Bearing NTA 1625	4	02409-2
Thrust Bearing NTA 2031	8	02409-4
Sleeve Bearing 12DU16	1	09156-11
Sensor Assembly	1	10972-13

305 Dipper Selection 5/21/03

1/2# Dipper	11023-050
1# Dipper	11023-101
2# Dipper	11023-102
4# Dipper	11023-104
6# Dipper	11023-106
8# Dipper	11023-108
10# Dipper	11023-110
12# Dipper	11023-12
16# Dipper	11023-16
20# Dipper	11023-20
25# Dipper	11023-25
30# Dipper	11023-30
40# Dipper	11023-40
50# Dipper	11023-50s
Mount 2#-10#	11024-15
Mount 12#-20#	11024-13
Mount 25#-40#	11024-14
Mount 50#	11024-16

SECTION 9 APPENDIX

MACHINE _____ DIE NAME _____ DATE ____ / ____ / ____

FUNC.	PARAMETER	DEFAULT	MIN	MAX	ACTUAL SETTING
		VALUE			
Arm pos	LOW METAL POSITION	99.99	REST	99.99	
Arm pos	CLEAR POSITION	82.00	REST	LOW METAL	
Arm pos	READY TO POUR POSITION	2.00	0.00	REST	
Arm pos	LOW METALWARNING OFFSET	0.00	0.00	20.00	
Arm pos	SPILL-OFF OFFSET	1.00	0.25	9.90	
Arm pos	POUR FORWARD OFFSET	0.00	0.00	3.00	
Dipper pos	FILL ANGLE	141.0	0.0	360.0	
Dipper pos	POUR POSITION 1	180.0	180.0	360.0	
Dipper pos	POUR POSITION 2	180.0	180.0	360.0	
Dipper pos	POUR POSITION 3	180.0	180.0	360.0	
Arm Speed	FAST	5.0	5.0	99.9	
Arm Speed	SLOW	20.0	0.0	99.9	
Arm Speed	IN METAL	2.0	0.0	10.0	
Arm Speed	POUR FORWARD	0.0	0.0	9.9	
Dipper Speed	POUR SPEED 1	0.0	0.0	99.9	
Dipper Speed	POUR SPEED 2	0.0	0.0	99.9	
Dipper Speed	POUR SPEED 3	0.0	0.0	99.9	
Dipper Speed	FAST	20.0	5.0	99.9	
Dipper Speed	SLOW	5.0	0.0	99.9	
Timer	START DELAY	1.0	0.0	99.9	
Timer	FILL TIMER	1.0	0.0	20.0	
Timer	SPILL-OFF TIMER	1.0	0.0	99.9	
Timer	ABORT CYCLE TIMER	5.0	0.0	99.9	
Timer	DELAY AFTER POUR	1.0	0.0	99.9	
Timer	DELAY POUR COMPLETE	1.0	0.0	20.0	
Counter	ABORT CYCLE RETRIES	5.0	1.0	99.0	
Option	POUR TO CLEAR	OFF			
Option	HOLD AT REST	OFF			
Option	POURBACK AFTER ABORT	OFF			
Option	RETRACT AND DIPPER LEVEL	OFF			

SYSTEM DEFAULTS

MACHINE _____ DIE NAME _____ DATE ____ / ____ / ____

FUNC.	PARAMETER	DEFAULT			ACTUAL SETTING
		VALUE	MIN	MAX	
Arm Speed	ARM HOME SPEED	5.0	0.0	15.0	
Arm Speed	ARM MANUAL SPEED	30.0	0.0	99.9	
Dipper Speed	DIPPER HOME SPEED	5.0	0.0	15.0	
Dipper Speed	DIPPER MANUAL SPEED	15.0	0.0	99.9	
Arm pos	ARM CHECK POS TOL.	2.50	0.00	99.99	
Dipper pos	DIPPER CHECK POS TOL.	3.5	0.0	99.9	
Arm pos	ALLOWABLE FILL CHANGE	2.00	2.00	2.00	
Arm pos	HIGH METAL REVERSE OFFSET	3.00	3.00	3.00	
Arm pos	ACCEL FACTOR -ARM	2.0	1.0	9.0	
Arm pos	DECEL FACTOR -ARM	3.0	1.0	9.0	
Dipper pos	ACCEL FACTOR -DIPPER	1	1	9	
Dipper pos	DECEL FACTOR -DIPPER	1	1	9	
Arm pos	PROBELESS METAL POSITION	HOME	HOME	99.99	
System	MACHINE TYPE	0	0	5	
PROBELESS METAL POSITION		OFF			

SECTION 10 DRAWINGS

Mechanical Section

Drawing	OPT	Description
305D10687-09		EPIC 305 ASSEMBLY
306C11303-6		ENCODER ASSY
305D11700-123		EPIC 305 SENSOR ASSEMBLY
305B11700-28		PROBE WIRE ASSEMBLY EPIC 305
305D10878		PEDESTAL ASSEMBLY 305 MLL
305D10878-10	OPT	FURNACE PEDESTAL ASSEMBLY 305
307DDIP_02_10	OPT	RIMROCK DIPPER 2 - 10 LB
307DDIP_12_20	OPT	RIMROCK DIPPER 12 - 20 LB
307DDIP_25_40	OPT	RIMROCK DIPPER 25 - 40 LB
307DDIP_50	OPT	RIMROCK DIPPER 50 LB
305D11234	OPT	BARRIER SAFETY ASSEMBLY

Electrical Section

Drawing		Description
306D17455-130		305 LEGEND CONTROLS
306D17595-003		305 2 AXIS CONTROL CABLE
140D17450-410	OPT	LADLE STANDARD REMOTE ASSEMBLY
306C17535-000		305 EPIC MACHINE CABLE
140D17522-200	OPT	STANDARD LEGEND REMOTE HMI CABLE

OPT = OPTIONAL EQUIPMENT. YOUR MACHINE MAY NOT HAVE THIS OPTION

ANY SPECIAL DRAWINGS WILL BE LISTED BELOW: