

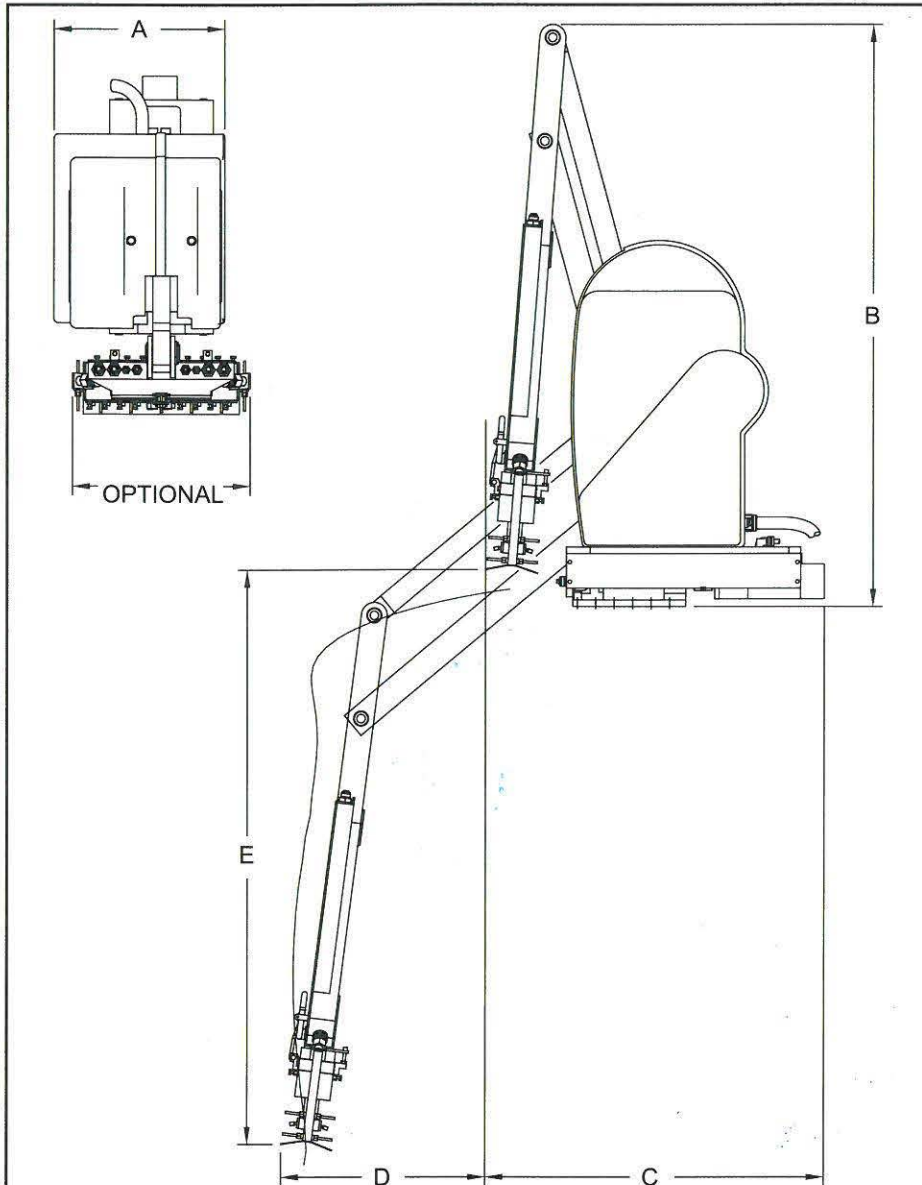
305/410 LEGEND

DIE CAST MACH

S242443

5/2/13

# 410 Servo Drive Reciprocator



	Variation "A"	Variation "B"	Variation "C"	Variation "D"	Variation "E"
43" Stroke	20	53 3/8	37 3/4	15 3/4	43
47" Stroke	20	56	37	17 3/8	47
60" Stroke	20	63 3/4	38	21 3/4	60
66" Stroke	20	57 1/8	39	23 5/8	66
72" Stroke	20	70 1/2	40 1/4	25 3/4	72
80" HD Stroke	23 1/2	82 1/2	52 3/4	29	80

## What Can Rimrock's 410 Reciprocator Do for Me?

### Creates a Safe Workplace

- Removes operator from between the dies

### Reduces Setup Time With

- Memory areas for program storage
- Auto teach
- Quick change manifolds
- Powered horizontal base drive

### Reduces Cycle Time

- Approach position
- Short cycle
- Multiple nozzle manifolds

### Spray complex dies consistently

- Custom manifolds
- Wait function
- Accepts multiple nozzles
- Two lube option
- Separate air blow off
- Multiple spray tips
- Separate pilot air circuits
- 20 programmable positions
- Exact & Accurate

### Provides Ease of Maintenance & Operation

- User-friendly graphical interface
- Nozzle purging
- Proximity switches
- Light fiberglass covers

### Sells Castings

- Consistency
- Better quality
- Lower scrap



MODEL 305 LADLE  
WITH LEGEND CONTROLS

## Rimrock Corporation

1700 Jetway Blvd. - Columbus, Ohio 43219  
(614) 471-5926 - FAX (614) 471-7388  
[www.rimrockcorp.com](http://www.rimrockcorp.com)

## **TABLE OF CONTENTS**

- 1 - Introduction**
- 2 - Definitions**
- 3 - Safety**
- 4 - Installation**
- 5 - Operation**
- 6 - Legend Control System**
- 7 - Programming**
- 8 - Maintenance**
- 9 - Appendix**
- 10 - Drawings**

# Section 1 – Introduction to the Rimrock Automation Equipment Manual

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## **Warning and Disclaimer**

Correct usage of the machine is important to assure the expected machine capabilities and functions as well as operator's safety. Please read this manual thoroughly.

The information in this manual is subject to change without notice and should not be construed as a commitment by RIMROCK CORPORATION. RIMROCK CORPORATION assumes no responsibility for any errors that may appear in this manual.

In no event shall RIMROCK CORPORATION be liable for incidental or consequential damages arising from use of this manual or of the software and hardware described in this manual.

For questions, comments, or concerns please contact Rimrock during normal business hours -- Monday through Friday 8:00 a.m. to 5:00 p.m. Eastern Standard Time.

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## Safety Alert Symbols

Throughout this manual there are safety alert symbols. Wherever they appear, in this manual or on safety signs on the machine, the user should be alert to potential for personal injury or accidents.

Always observe safety precautions and follow recommended procedures.

### SAFETY ALERT SYMBOL

The words “**CAUTION**”, “**WARNING**”, and “**DANGER**” are used throughout this manual and on labels on machines to indicate hazards or unsafe practices. Observe the precautions indicated whenever you see the Safety Alert Triangle, no matter which word appears next to the exclamation point symbol.

#### **CAUTION!**

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against a generally unsafe practice.

#### **WARNING!**

Indicates a hazardous situation that, if not avoided, could result in serious injury or death. It may also be used to alert against a highly unsafe practice.

#### **DANGER!**

Indicates a hazardous situation that, if not avoided, is very likely to cause death or extremely serious injury.

The word “**IMPORTANT**” is used throughout this manual to indicate actions that could result in damage to the equipment.

#### **IMPORTANT!**

Indicates an action that could result in damage to the equipment.

## Manual Construction

This manual is constructed of sections that address aspects of machine use and setup. The manual sections are written generically so that they apply to a wide variety of machines. Specific information about optional features or configurations can be found in any appendices or in the drawings.

## Replacement Parts

To order parts, contact Rimrock Sales Department at 614-471-5926. A list of recommended spare parts can be found in the Maintenance section. The drawings will have bills of materials with them.

## Serial Number Identification

Knowing the serial number or C# is helpful when ordering replacement parts. This number is located on the machine name plate attached to the machine.

**RIMROCK** CORP. MANUFACTURED AND ASSEMBLED IN THE U.S.A.

MODEL No. : [ ]

MFG. No. : [ ] - C- [ ]

MFG. DATE : [ ] - [ ]

RIMROCK CORPORATION • COLUMBUS, OHIO U.S.A.

## Training

Rimrock provides several opportunities for training:

- Classroom training at its facility in Columbus, Ohio
- Training at the customer's facility
- Training videos
- Tech Tips on the Website [www.rimrockcorp.com](http://www.rimrockcorp.com)

Contact Rimrock for more information on training at 614-471-5926.

## Section 2 - Definitions

The definitions in this section are particular to the Die Casting industry and Rimrock Corporation. Other terms are explained as they are used in this manual or can be found in the dictionary.

**DCM** – Acronym for Die Casting Machine.

**HMI** – Acronym for Human Machine Interface. The HMI is the device used to program the Rimrock machinery.

**Dipper** – This refers to vessel at the end of the ladle arm that is used to scoop, transport, and pour the molten metal.

**Arm** – Refers to the mechanical links that carry the dipper.

**Arm Axis**– Refers to the axis that moves dipper from the furnace to the DCM.

**Dipper Axis** – Refers to the axis that rotates the dipper from fill angle to through pour.

**Cup** – See Dipper.

**Metal Probes** – The metal rods that are at the end of the arm that sense the metal in the furnace by shorting together as they touch the metal.

**Probes** – See Metal Probes.



# Section 3 - Safety

## Introduction

Any machine, if not properly used, can be a hazard to people or other machines in the die cast plant.

Safety in the plant begins with training personnel to properly operate and maintain equipment. They must understand how the equipment functions in order to operate it safely. While the owner of the Rimrock equipment is responsible for all aspects of safety, Rimrock can help by providing equipment training. Contact Rimrock sales department for info on training in your plant or at Rimrock.

### **IMPORTANT!**

This manual is intended for use by persons having electrical and mechanical training and a level of knowledge of these subjects that is generally considered acceptable in the die casting industry. Rimrock cannot be responsible nor assume any liability for injury or damage of any kind arising from the use of information in this manual.

## Risk Assessment

Since Rimrock machines are installed in many plants for different applications occurring in different environments, each plant must perform its own risk assessment. Use the risk assessment to determine the safety precautions that must be applied in each individual plant and insist that all employees follow these precautions.

### **IMPORTANT!**

The risk assessment is an important part of machine safety. Document your task – hazard pairs and select the appropriate safeguarding.

## Safety Standards

Many codes and standards have been initiated to maintain safety while installing, operating, and maintaining automation equipment. Follow all applicable federal, state, and local regulations at all times. Listed below are some of the most commonly applied standards for automation equipment in die casting. This is not intended to be an all-inclusive list of machine standards information.

- ANSI B152.1 Safety requirements for the design, manufacture, maintenance, and operation of die casting machines
- ANSI B11.19 Safeguarding when referenced by the other B11 machine tool safety standards; performance criteria for the design, construction, care, and operation
- ANSI B11.20 Safety requirements for construction, care, and use of manufacturing systems/cells
- ANSI/RIA R15.06 Industrial robots and robot system safety requirements
- ANSI Z535 Series Safety color code; environmental facility safety symbols; product safety signs and labels; and accident prevention tags
- NFPA 70 National Electric Code

Contact Global Engineering at 1(800) 854-7179, or its website at [www.global.ihs.com](http://www.global.ihs.com), to obtain a copy of these industry standards.

For additional safety information specific to the die casting industry, see the NADCA Die Casting Safety Manual E-908.

## Safeguards

Safeguards are required to keep personnel from the moving parts of the ladle during operation. The type of safeguard required should be determined by your risk assessment. The safeguard can be electrically interlocked to the ladle to shut-down the ladle when opened. See the installation section for more on wiring the safeguard into the control system.

### **IMPORTANT!**

Your risk assessment will determine the safeguard needed. Rimrock can assist you in this crucial step and can supply safeguarding for your installation.

## General Safety Tips

Machine owners, operators, maintenance personnel, and service personnel must know that safety practices are a vital part of the job. A safety program should be implemented in the plant and should include, but not be limited to:

- Personal protective equipment
- Clean work areas
- Work areas that are free of potential hazards
- Warning labels, signs, and equipment covers
- Guards around equipment
- Proper training
- Equipment maintenance
- Lockout/tagout procedures

## Safety During Maintenance or Repair

Whenever maintenance or repair is performed on the machine, all equipment in the work cell must be in a zero energy state and proper lockout/tagout procedures must be performed.

### **DANGER!**

Tasks can involve working between the die halves of the die cast machine. This is extremely dangerous. The user must put the die cast machine in a zero energy state and follow lockout/tagout procedures on the die cast machine and other equipment in the work cell. Follow the instructions from the manufacturer of the die cast machine to put all areas of the die cast machine and other related or connected equipment in a zero energy state.

## Zero Energy State

When putting equipment in a zero energy state, you may encounter the following energy sources:

- Electrical power
- Pressurized air
- Hydraulics
- Hydraulic accumulators that store energy even when the electrical power is off
- Pressured fluids such as water and die lube
- Hot surfaces
- Components that can fall via gravity
- Other potential hazards not listed

### **CAUTION!**

When users put equipment in a zero energy state, they must remember that heat is a form of energy too. Dissipate any heat before working on hot surfaces.

## Where to Lockout the Ladle

The 305 Legend ladle must be electrically locked out at the disconnect switch or plug that supplies the electrical power to the 305 Legend control system. Be aware that some of the ladle surfaces may be hot and can also fall due to gravity. Also be aware that to work on the ladle other machines may require lockout and the furnace properly covered.

## Lockout/Tagout Procedures

Follow these steps before performing any maintenance or repair work on the equipment:

1. Shut down the equipment
2. Isolate the equipment from the energy source
3. Release residual energy
4. Apply a lockout/tagout device to the energy-isolating device
5. Verify the isolation of the equipment

There are two types of energy-isolating devices: those that can be locked and those that cannot be locked. If the energy-isolating device cannot be locked with a lockout device, apply a tagout device. In order for the tagout to be effective, the employees must be trained to follow these limitations of tags:

- Tags are warning devices only and do not supply physical restraint
- Tags are not to be removed except by the person who applied them
- Tags are never to be ignored or bypassed
- Tags must be legible
- Tags must be made of materials able to withstand the environmental conditions
- Tags must be attached securely to the energy-isolating device

Additional safety measures may be taken when tagout is used, including:

- Removing and isolating a circuit element
- Blocking a control switch
- Opening a disconnecting device
- Removing a valve handle

## Lockout/Tagout Steps

To lockout or tagout the energy-isolating device, disconnect the source of energy and follow the lockout/tagout procedures implemented by the plant. Typically, to lockout or tagout the equipment, the user must:

1. Disconnect the power
2. Put a lock with a lockout tag or a tagout tag through the door to the source of the power.
3. Record the name of the person working on the equipment on the tag

**Note:** The person working on the equipment should be the only person having a key to unlock the equipment. This procedure ensures that another person cannot restore energy to the equipment while someone is working on it.

## Lockout/Tagout Removal

To remove the lockout or tagout devices and restore energy to the equipment, follow these steps:

1. Inspect the equipment to verify that all components are intact and operable.
2. Inspect the work area to ensure all tools, non-essential parts, and other unnecessary items are removed.
3. Check that all personnel are safely removed from the work area.
4. Remove the lockout or tagout device from the energy-isolating device.

### CAUTION!

The lockout or tagout device must be removed only by the person who applied it.

5. Before starting the equipment, notify appropriate personnel that the lockout/tagout has ended.

## Special Considerations

Special circumstances may exist when lockout/tagout procedures are used while working on the equipment.

### Testing or Positioning

If testing or positioning of the equipment requires reenergization of the equipment, OSHA allows temporary removal of locks or tags. Follow these steps to reenergize the equipment:

1. Inspect the work area to ensure all tools, non-essential parts, and other unnecessary items are removed.
2. Check that all personnel are safely removed from the work area.
3. Remove the lockout or tagout device from the energy-isolating device.
4. Energize the equipment.
5. Test or position the equipment.
6. Deenergize the equipment and reapply the lockout/tagout devices.

### Outside Personnel

If outside personnel are working in the plant, both the inside and outside personnel must inform each other of their lockout/tagout procedures.

### Group Lockout or Tagout

Each plant must be responsible for determining the lockout/tagout procedures to be used when the equipment is worked on by a group of people.

### Changes in Shift

When shift changes occur during lockout/tagout, if the person who controls lockout/tagout cannot remain, the oncoming shift must verify the deenergization and lockout/tagout.

# Section 4 - Installation 305 Ladler

## Description

The Rimrock 305 Servo-Drive Ladler is an automatic metal ladling system for the die casting industry. It offers the user a safe, fast, and accurate way to ladle metal into the die cast machine or sand molds. The 305 Ladler improves the consistency and quality of castings, resulting in a product that is more saleable for the die cast manufacturer.

The 305 Ladler's closed loop servo system provides highly accurate and fast machine movement. Typically the ladler is mounted between the die cast machine shot end and the furnace. The ladler dipper is slowly moved into the furnace dip well and fills with metal. The ladle then moves forward to the die cast machine and pours the metal into the shot hole. The shot is then made and the part is removed after cooling and solidifying.

This basic cycle is repeated typically 24 hours a day, 7 days a week. The 305 ladler pours the same amount of metal every cycle insuring consistent castings.

## Features

The 305 Ladler was designed with the customer's needs in mind. Some of the features of the 305 are:

- **Increased safety**
- **Reduced set up time**
- **Reduced cycle time**
- **Reduced Shot Variation**
- **Easy maintenance and operation**
- **Quality castings**

## Safety Precautions During Install

Follow these precautions when installing the Ladle:

- Use all previously listed safety precautions
- Wear appropriate personal protective equipment such as safety glasses, ear plugs, safety harnesses, hard hat, gloves
- Follow lockout/tagout procedures
- Be sure the personnel involved in installations have read and understand this manual
- Consult the die cast machine manufacturer before making any changes to circuits
- Follow in-plant safety rules



### **CAUTION!**

Read this entire 305 Servo-Drive Ladle User Guide before installing the Rimrock 305 Servo-Drive Ladle. Pay special attention to "Safety" section in the user guide.

## Keeping the Arm from Falling

The arm of the Ladle can fall, causing personal injury and equipment damage. Secure the arm when performing installation, repairs, or maintenance on ladles. This can be accomplished by placing a chain or strap on the ladle arm to prevent movement.

## Path of the Ladle

Do not work in the path of the ladle. A barrier as specified by applicable federal and state codes must be installed to keep users out of the path of the ladle when the ladle is running. The risk assessment for the ladle should determine the type of barrier and interlocking method required.

## Gravity

Always be aware of the force of gravity. Always secure heavy parts properly during installation, repairs, or maintenance on ladles.



### **WARNING!**

Mechanical parts that can fall (such as the ladle arm) should be brought to a safe and secure position during maintenance and repair.

## **Specifications**

### **Machine Weight**

The 305 can weigh up to approximately 500 Lbs (227kg). Verify the lifting means can support the weight safely.

### **Utility Requirements**

Rimrock recommends that users have a machine tool transformers for their machines rather than general purpose transformers. A machine tool transformer is constructed to withstand periods of high inrush and has good power regulation on the output of the transformer. The 305 Ladle requires a power supply of:

120 Volts, 20 Amperes, 1 Phase

The incoming supply to the 305 Legend control system must have a lockable disconnect switch or a plug that can be used as the lockout for the ladle. Refer to the appropriate electrical code for qualifying devices. Rimrock can optionally supply the disconnect device.

### **Ambient Temperature**

The 305 Ladle mechanical unit is designed to work in the harsh environments of the Die Casting industry. The Legend controller is designed to work in ambient air temperatures up to 120F. Higher ambient temperatures require the use of cooling devices available from Rimrock.

## **Performing Preliminary Steps**

Perform these steps to prepare for the installation of the ladle:

1. Make sure there is an adequate supply electric power and if the present electrical system can handle the load.
2. Confirm with the die cast machine manufacturer that the proper interlock connections, logic changes, and wiring changes to work with the die cast machine have been determined.
3. Before scheduling Rimrock services for start-up assistance, please complete the tasks on the Pre-Installation Checklist For Ladles, fill out the check list, and fax it to Rimrock. The pre-installation checklist is attached to the side of the shipping crate (a copy is in this section). Use the to indicate the completeness of the installation. It is not a substitute for reading the manual.
4. Schedule startup assistance with Rimrock. To make the time the Rimrock representative spends on start up as effective as possible, be sure to complete all the tasks on the checklist before the representative arrives.
5. Use the drawings included with this manual for additional mounting, and installation information.



## Unpacking and Handling

To unpack the ladle:

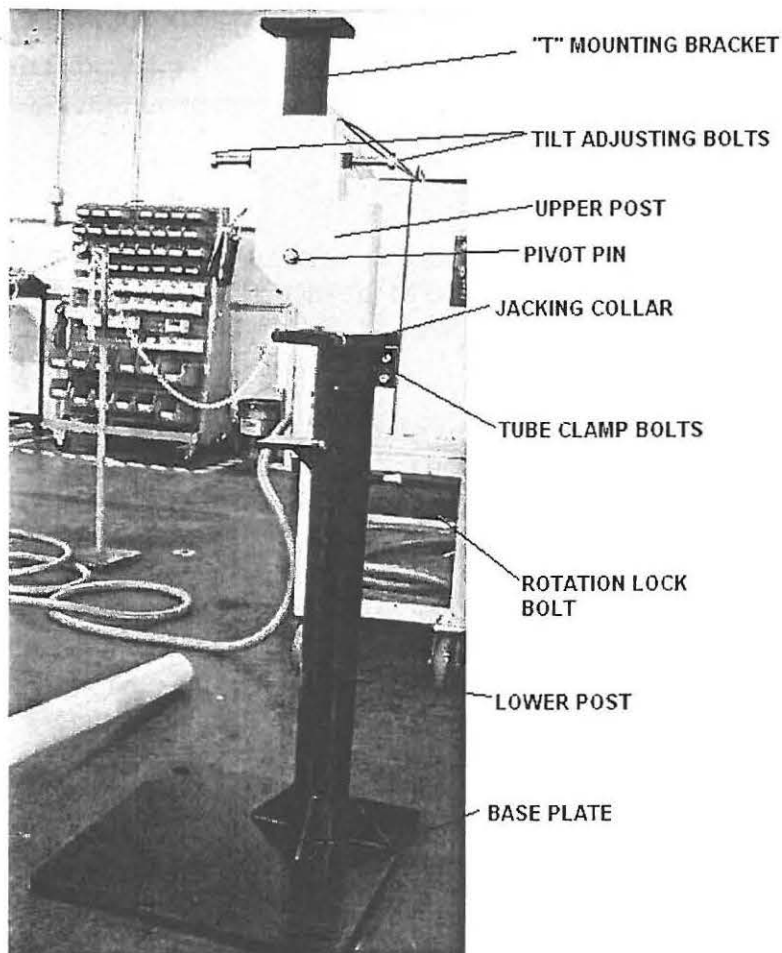
- 1) Remove top and sides of crate
- 2) Remove control panel
- 3) Remove and assemble the pedestal

Typical assembly:

Refer to the mechanical drawings for a pictorial of the pedestal and assembly of non-standard mounts

- a) Place the base plate on a flat, level floor
- b) Insert the upper post into the base plate
- c) Insert the "T" mount weldment into the top of the upper pedestal assembly. Secure the pivot pin supplied and lock in place with the snap rings
- d) Install the ladle tilt bolts into the upper pedestal assembly.

TYPICAL LADLE PEDESTAL ASSEMBLY



- 4) Do NOT remove the interconnecting cables
- 5) Remove the fiberglass side covers from the ladle
- 6) Place a nylon sling of appropriate capacity (500 lbs) under the three side plate spacers
- 7) Hook the sling to a crane
- 8) Remove the bolts that secure the steel plates to the crate
- 9) Lift the ladle out of the crate and mount to the top of the pedestal with the 4 bolts provided
- 10) Tighten and clamp the bolts that secure the post to the floor

### **CAUTION!**

When positioning the ladle body over the pedestal base, keep the largest portion of the body over the offset portion of the base. This will keep the center of gravity over the large area of the base plate. Improper positioning can cause machine damage or personal injury.

## **Considerations to Reduce Cycle Time**

To reduce cycle time address the following issues prior to placing, positioning, and adjusting the ladle.

- 1) Position the ladle closer to the DCM allows it to reach the cold chamber faster.
- 2) Changing the angle of the ladle path can affect the speed that the metal pours.
- 3) Larger pour holes will allow faster pours.

## **Mounting**

The ladle may be placed on the operator or helper side of the die cast machine (DCM). The unit is normally configured at the factory for the side specified by the customer. The unit can be changed to meet site requirements.

To change sides of the ladle:

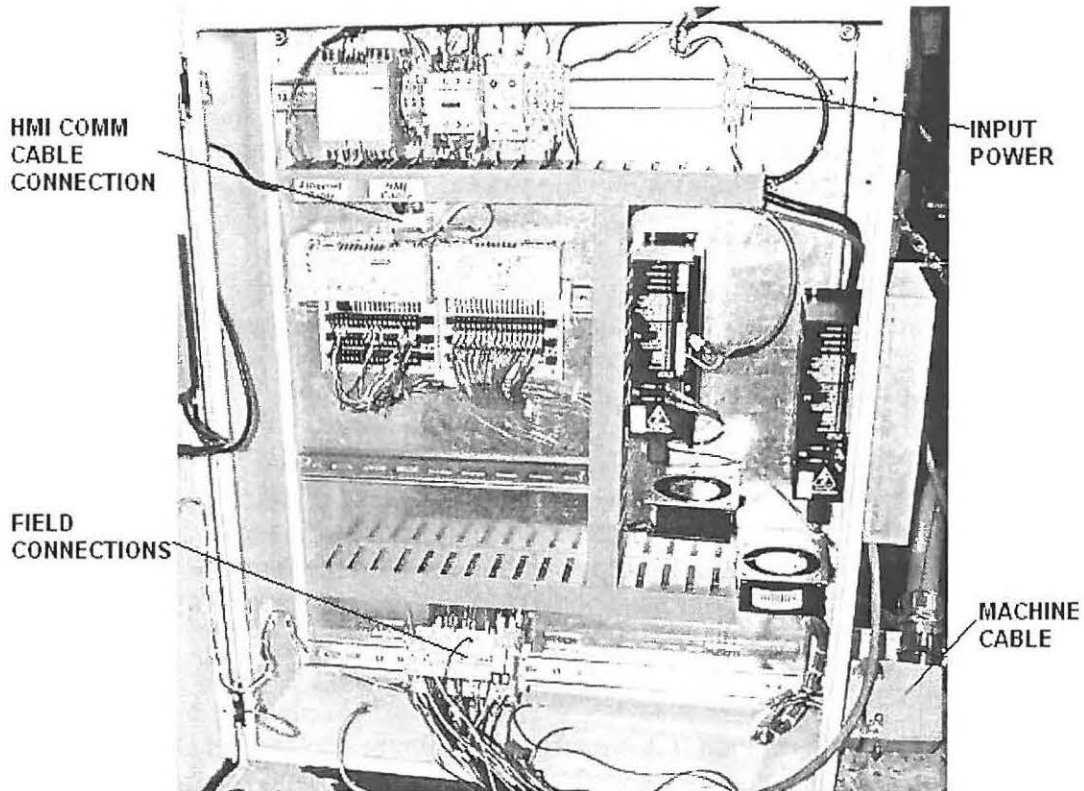
- 1) Interchange the dipper and its mount bracket on the lower arm
- 2) Reposition the mount adapter to the opposite side being sure to keep the support bolt pattern away from the ladle side plate
- 3) Reattach the support "T" to the mount.
- 4) Position the pedestal

## **Installing the Control Enclosure**

The Legend controller is usually mounted in a 30" x 24" enclosure mounting holes in each corner. The enclosure may or may not contain operator controls and can be mounted to a wall or stand. Rimrock can optionally supply a stand. Choose a mounting location away from heat sources and within sight of the mechanical unit, particularly if any operator controls are on this enclosure. Consider the applicable standards for placement, clearances, and worker safety when installing this enclosure. Power, interlock, and operator interface wiring will need to be brought into this enclosure. Minimize the amount of metal shavings

used to make holes for this wiring. Rimrock recommends the use of knock-out devices for making holes in the enclosure. Do not weld on this enclosure.

TYPICAL LEGEND 305 CONTROLLER



## Connecting Power to the Control Enclosure

The incoming supply to the 305 Legend control system must have a lockable disconnect switch or a plug that can be used as the lockout for the ladle. Refer to the appropriate electrical code for qualifying devices. Rimrock can optionally supply the disconnect device.

The Legend Controller must be connected to a power supply of 120VAC, 1 phase, 20A, with a good ground and a disconnect switch. An isolation transformer may be required to achieve this. The supply circuit should be dedicated to this controller and have its own breaker or fuse. The AC neutral of this power must be connected to ground at the source. All applicable wiring codes must be observed. The incoming power connects to the controller's input terminals (Line 2040, Neutral 2121) in the upper right corner of the enclosure. The incoming ground should be bolted directly to the enclosures' backpanel. A minimum of 12AWG wire must be used. Sheet 2 of the electrical schematic shows details of the power input.

## Interlock Wiring

The interlock wiring is the wiring between the Legend controller and the other controllers in the work cell. This consists of three types of signals: Safeties, Inputs, and Outputs.

### **SAFETIES:**

Safety signals are connected to the Legend controller via terminals located along the bottom of the enclosure internal backplane. Your risk assessment should determine how these are used within the work cell and the types devices that are to be connected to them. The safety signals are described below:

EXTERNAL EMERGENCY STOP: This is a mechanical contact that when open E-stops the ladle. Typically this contact comes from a cell safety relay that also senses the ladle safeguards. The contact is to be wired to terminals 2210 and 2570. This signal will carry 24VDC at 500ma.

EMERGENCY STOP CONTACT: This is a dry (potential free) contact directly off of the E-Stop switch on the Legend control panels. This contact is to be used to E-stop other controllers in the cell as required by your risk assessment. You may add additional contacts to the E-stop switches as needed. Rimrock can optionally provide those additional contacts. The contact can be found on terminals 2600, 2601, and is rated up to 240VAC at 2A.

### **INPUTS:**

Inputs to the Legend controller are used to coordinate sequences with the DCM. The interlock input signals are 24VDC and carry up to 500ma each. The inputs should be derived from dry (potential free) mechanical contacts in the DCM control. Terminal 2210 is the +24VDC source for all of these signals and must be wired to one side of each dry contact. The input signals are described below:

OK TO POUR 1: This signal permits the ladle to pour into the cold chamber. The ladle will not pour if this signal is not on. Typically this signal is derived from the plunger retracted status. Optionally, this signal can also be used to prevent the ladle from approaching the cold chamber (See Programming section). This signal is to be wired to terminal 3070.

OK TO POUR 2: This signal permits the ladle to pour into the cold chamber. The ladle will not pour if this signal is not on. Typically this signal is derived from the dies locked status. This signal is to be wired to terminal 3080.

LADLE START: This signal starts an automatic ladle cycle. This signal is derived from any convenient status, like die opening, that affords the ladle enough time to bring metal to the cold chamber before just as the DCM becomes ready. Timing can be tuned with a start delay based upon this signal if needed (See Programming section). This signal is to be wired to terminal 3090.

## **OUTPUTS:**

The outputs from the Legend controller are used to indicate its status to other cell equipment. Outputs from the F500 are used to coordinate sequences with the press, robot, and other machines. All F500 interlock outputs are dry mechanical relay contacts rated up to 250VAC @ 1A. Connections are made directly to the appropriate relay. The Legend Controller has one standard output. That output is:

POUR COMPLETE: The Legend controller closes this contact after the ladle has poured and timed any Pour Complete time that was programmed (See Programming section). This contact can be found on CR 321, terminals 11 and 14.

## **Mounting and Wiring the Remote Operator Interface**

Many Legend controllers have the operator interface devices mounted in a separate enclosure. Each remote enclosure has mounting holes on the 4 rear corners for mounting to a wall or stand. When choosing a site for mounting keep in mind the applicable standards for placement, clearances, and worker safety. Connections to the remote panels are made via a flexible conduit cable supplied by Rimrock. Consider the routing of this cable when choosing the mount.

The remote panels have 1 cable that must be connected between them and the controller. The Rimrock supplied cable is pre-marked. Connect the cable on the remote panel end to the terminals within the box according to the marked wires. Do the same on the controller end with the terminals there. Be aware of the cable routing between the boxes as connections are made. Holes for this cable will need to be punched. Take care when punching these holes to not leave metal shavings in the boxes. A communication cable is included in cables that go to remote panels that have HMIs. Do not alter the communication cable. If a different length is required contact Rimrock.

## Pre-Installation Check List For Ladles

### General

---

---

- |   |   |
|---|---|
| <input type="checkbox"/> Personnel have read and understand the equipment manual. Extra copies of the manual can be purchased from Rimrock.   | <input type="checkbox"/> Personnel skilled in electrical tasks, rigging/millwright/machine moving and plumbing/pipe-fitting (where required) are ready to assist with the start up. |
| <input type="checkbox"/> A safety barrier is set up with interlocking device(s) connected to the external safety inputs of the unit being installed. <i>Refer to the manual for more information.</i> | <input type="checkbox"/> Plan who should attend the training session and where and when it should take place.   |
| <input type="checkbox"/> The service visit has been scheduled three weeks in advance.   | <input type="checkbox"/> The die and the DCM are ready to run   |

### Controls

---

---

- |   |  |
|---|--|
| <input type="checkbox"/> The power has been connected to an <b>industrial control</b> or <b>machine tool transformer</b> with a disconnect that can be locked out. Refer to installation section of the manual. | <input type="checkbox"/> Connect the interlocking wires to interface relays or a dedicated I/O rack in the PLC. The programming and/or connections required for interlocking must be finalized with the die cast machine builder and completed before our arrival. |
| <input type="checkbox"/> Remote operator station (if used) is mounted.  |  |

### Mechanical Unit

---

---

- |  |  |
|--|--|
| <input type="checkbox"/> All parts are out of the crate and assembled.                             | <input type="checkbox"/> A properly coated ladle cup is installed.   |
| <input type="checkbox"/> The ladle is mounted and bolted to floor according to the layout drawing. | <input type="checkbox"/> If possible, the furnace should be empty. This allows the proper setting of the low metal limit and will help if moving the furnace if necessary. |
| <input type="checkbox"/> The correct shot sleeve and plunger tip is installed.                     |  |

**The items listed above are complete:**

Signature \_\_\_\_\_ Date \_\_\_\_\_

Print Name \_\_\_\_\_ Title \_\_\_\_\_

Fax completed form to Rimrock Corporation at (614) 471-7388

# Section 5 - Operation Ladle

This section covers adjustments and startup procedures for the Rimrock 305 Ladle normal to daily operation and when dies are changed. The user should be familiar with the controls (See the Controls section) in order to position the ladle for adjustments. Programming is addressed in the Programming section.

## Introduction

The Rimrock 305 Servo-Drive Ladle is an automatic ladling system for the die casting industry. It moves molten metal from a furnace to the die cast machine in a consistent, repeatable cycle. The sequence of operation is programmed in the ladle control system.

## Typical Ladle Sequence of Operation

A typical ladle sequence is described below:

- Cycle Start
- Fill
- Spill off
- Forward to Pour
- Pour
- Pour complete

**Cycle Start** In a typical cycle the ladle will be waiting at the Rest Position until a START signal is received or the AUTO CYCLE START pushbutton is pressed.

**Fill** The arm will move to the Clear Position, slow to Enter Metal speed, rotate the dipper to the Fill Angle, and stop when the probes touch the metal.

**Spill-off** The arm will then raise up to the Spill Off position

**Forward to Pour** The dipper rotates to level and the arm moves forward to the Pour position.

**Pour** When the ladle reaches the pour position and the OK TO POUR signals are on (typically shot plunger retracted and dies are locked) the ladle will start the pour.

**Pour Complete** When the pour is finished the POUR COMPLETE output is turned on and the ladle will return to the rest position until another start signal is received.

## **Powering Up and Homing the Ladle Procedure**

Prior to using the ladle it must be powered-up and homed. Perform this procedure each time the ladle is powered-up or requires homing:

- 1) Verify all personnel are out of the ladle's work space and electrical enclosures.
- 2) Verify all ladle safeguards are in-place.
- 3) Verify all E-stop devices are reset.
- 4) Turn on the disconnect switch that applies power to the Legend controller.
- 5) The HMI should come on with a communication error message
- 6) After approximately 1 minute the HMI error message should go away
- 7) Press the START pushbutton. It should light.
- 8) Press the MANUAL pushbutton. It should light indicating manual mode.
- 9) Press and hold the HOME pushbutton. While held down the ladle will perform the homing procedure. When completed the HOME pushbutton will light.

The ladle is now ready for manual or automatic operations. Before doing so verify the programming setups are correct, the ladle mechanical adjustments have been made, and the unit is prepared for production. The Programming section of the manual has details about the electronic settings. The mechanical adjustments and production preparations are listed below.

## **Start of Shift**

Perform this procedure at the start of each shift to verify ladle safeties.

- 1) Power up and home the ladle if needed. Leave in manual mode.
- 2) Operate all ladle E-Stop devices and electrically interlocked safeguards individually and verify these 3 conditions when operated:
  - The START pushbutton light shuts off.
  - The MANUAL pushbutton light shuts off.
  - The ladle cannot be moved with the manual pushbuttons switches.
  - Ladle cannot go into auto or manual mode.Reset the controls to manual mode after each verification.
- 3) Inspect the condition of the ladle, control enclosures, and cabling for damage. Do not use the ladle if damage is apparent.

## **Preparing for Production**

Each time the ladle is to be put into production perform the START OF SHIFT procedure to verify the integrity of the ladle. Once completed the ladle is then ready to respond to manual or automatic operations. Before doing so verify the programming setups are correct and that the ladle mechanical adjustments have been made. The Programming section of the manual has details about the electronic settings. The mechanical adjustments are detailed later in this section.



## Production (Auto Mode)

Prior to production verify the ladle is ready for production (see above). After the setups and mechanical adjustments are verified, the integrity of the safety systems checked, and the ladle has been powered on press the AUTO pushbutton. It should light indicating auto mode. If it does not light verify the ladle is above the CLEAR position setting and try again. Once in auto mode the ladle will now respond to the START signals received via the interlock wiring from the DCM or from the AUTO START pushbutton. Each cycle will repeat the sequence of operation, listed above, with any programmed options that may modify it's cycle (See Programming section). Changes to settings may be made during a cycle but will not take effect until the next cycle. Through this on-the-fly adjusting the ladle cycle can be tuned for optimum performance. Read the programming section of this manual to understand the settings, how they affect operation, and tips on optimizing performance.

## MECHANICAL SETUP ADJUSTMENTS

Mechanical adjustments may be necessary as jobs are changed, dippers replaced, or any other occurrence that requires the ladle path to be modified. When an adjustment is made all of the other adjustments should be checked and the ladle path tested slowly in manual mode.

### **DANGER!**

Never approach or make mechanical adjustments to the ladle until it is locked out. Be aware that the ladle may have hot surfaces and use appropriate protection. Cover the furnace adequately to prevent serious injury or death. Lockout all other equipment that may endanger personnel during the adjustments.

## Dipper Setup

Selecting and leveling the dipper is key to having a stable and repeatable process. Before adjusting the ladle position mount and level the dipper so the ladle path can be properly seen. After making ladle position adjustments recheck the dipper level.

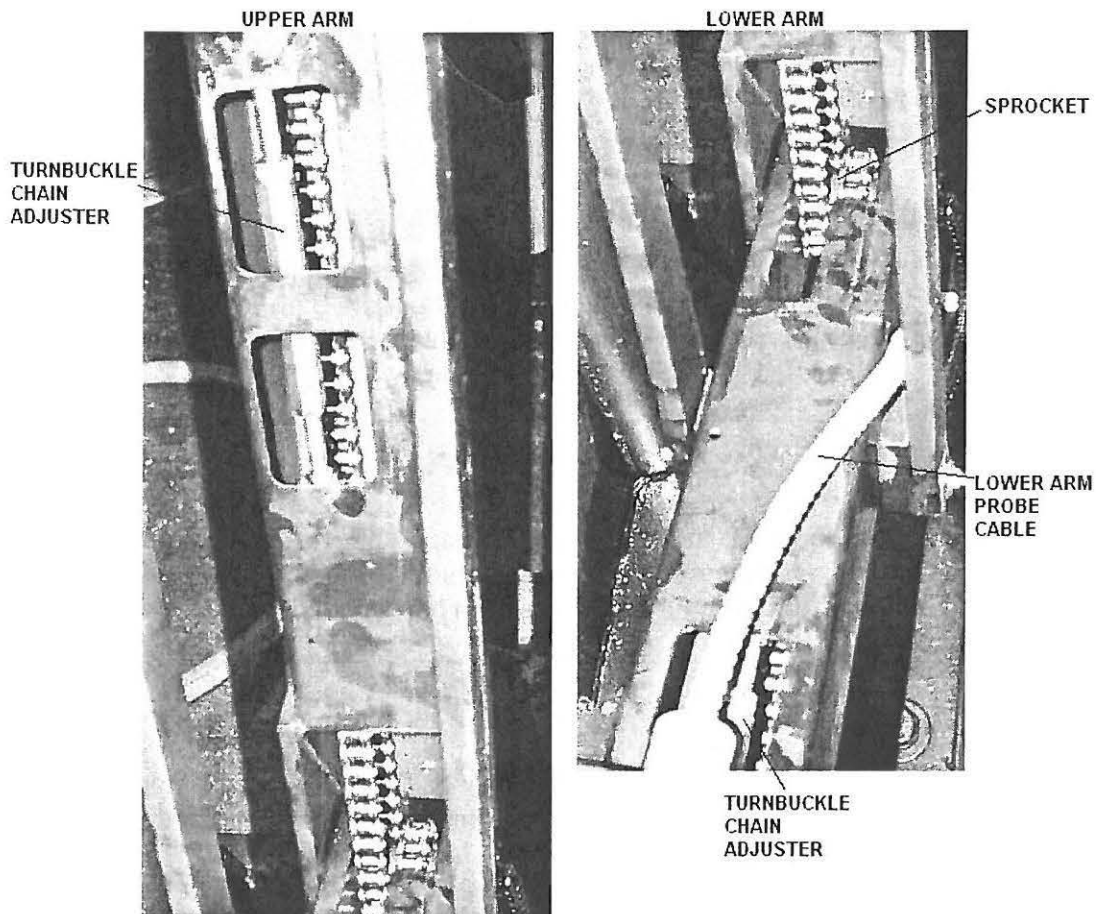
## Dipper Size

Verify that the dipper size is correct for the required shot weight. Use the following Fill Angle Chart to determine size requirements. Always use a properly coated dipper.

## Leveling the Dipper

Verify that the arm chains are correctly positioned before leveling the dipper. Incorrect arm chain positions can cause the chain to stretch or snap. To check the arm chain positions do the following:

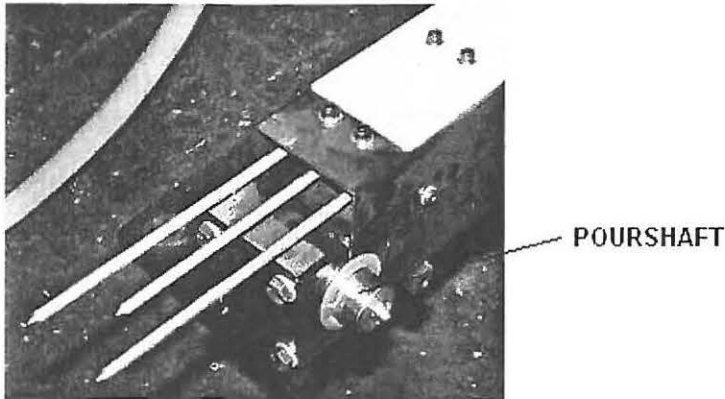
- 1) Power-up the ladle and home using the procedure above.
- 2) Power down and lockout the ladle.
- 3) Remove the arm cover plates and view the placement of the turnbuckles. They should be centered in the opening.



To align the dipper do the following:

- 1) Power-up the ladle and home using the procedure above.
- 2) Power down and lockout the ladle.
- 3) Mount the dipper on the pour shaft and tighten the locking collar just enough for friction to hold it in place.

- 4) Insert a straight edge through the fill window and across the front lip of the dipper.
- 5) Place a line level on the straight edge.
- 6) Rotate the locking collar on the pour shaft until the line level shows that the dipper is level.
- 7) Tighten the locking collar.



### **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.

## Dipper Size Chart

Fill Angle	Dipper Size											
	2 lb	4 lb	6 lb	8 lb	10 lb	12 lb	16 lb	20 lb	25 lb	30 lb	40 lb	50 lb
	Shot Weights (lb)											
165	*	*	*	*	*	*	*	*	*	*	*	*
164	*	*	*	*	*	*	*	*	*	*	*	*
163	*	*	*	*	*	*	*	*	*	*	*	*
162	*	*	*	*	*	*	*	*	*	*	*	*
161	*	*	*	*	*	*	*	*	*	*	*	*
160	*	*	*	*	*	*	*	*	*	*	*	*
159	*	*	*	*	*	*	*	*	*	*	*	51.5
158	*	*	*	*	*	*	*	*	*	*	41.4	50.6
157	*	*	*	*	*	*	14.3	20.0	*	29.0	40.6	49.8
156	*	*	5.5	*	9.8	*	14.0	19.6	22.5	28.5	39.9	48.9
155	*	*	5.4	7.1	9.6	*	13.7	19.2	22.1	27.9	39.2	48.1
154	*	*	5.3	6.9	9.4	11.2	13.4	18.8	21.7	27.4	38.4	47.2
153	*	3.8	5.2	6.8	9.3	10.9	13.1	18.4	21.3	26.8	37.7	46.4
152	*	3.7	5.1	6.7	9.1	10.7	12.8	18.0	20.9	26.3	37.0	45.6
151	2.9	3.6	5.0	6.5	8.9	10.4	12.5	17.6	20.4	25.7	36.3	44.8
150	2.9	3.6	4.8	6.4	8.8	10.2	12.2	17.3	20.0	25.2	35.6	44.0
149	2.8	3.5	4.7	6.3	8.6	9.9	12.0	16.9	19.6	24.7	34.9	43.2
148	2.7	3.4	4.6	6.2	8.4	9.7	11.7	16.5	19.2	24.1	34.2	42.4
147	2.7	3.3	4.5	6.0	8.3	9.4	11.4	16.1	18.8	23.6	33.5	41.6
146	2.6	3.2	4.4	5.9	8.1	9.2	11.1	15.8	18.5	23.1	32.8	40.8
145	2.5	3.2	4.3	5.8	7.9	8.9	10.9	15.4	18.1	22.6	32.1	40.0
144	2.4	3.1	4.2	5.6	7.8	8.7	10.6	15.0	17.7	22.1	31.4	39.3
143	2.4	3.0	4.1	5.5	7.6	8.5	10.3	14.7	17.3	21.6	30.8	38.6
142	2.3	2.9	4.0	5.4	7.4	8.2	10.1	14.3	16.9	21.1	30.1	37.8
141	2.2	2.9	3.8	5.3	7.2	8.0	9.8	14.0	16.5	20.6	29.4	37.1
140	2.2	2.8	3.7	5.1	7.1	7.8	9.5	13.6	16.1	20.1	28.8	36.3
139	2.1	2.7	3.6	5.0	6.9	7.5	9.3	13.2	15.7	19.6	28.1	35.6
138	2.0	2.6	3.5	4.9	6.7	7.3	9.0	12.9	15.4	19.1	27.4	34.8
137	2.0	2.5	3.4	4.7	6.5	7.1	8.7	12.5	15.0	18.5	26.8	34.1
136	2.0	2.5	3.3	4.6	6.4	6.8	8.4	12.1	14.6	18.0	26.1	33.3
135	2.0	2.4	3.2	4.5	6.2	6.6	8.2	11.8	14.2	17.5	25.4	32.5

## Ladle Positioning and Testing

Correct alignment of the ladle with the DCM and furnace should be checked and adjusted each time a new job is run. To do this follow the procedure below:

- 1) Setup and test the ladle when the metal is low in the dip well to make sure the dipper and sensor probes clear the well walls. A low metal level will allow identification of interference points for the entire draw-down stroke.
- 2) At any time adjustments are needed make them with the ladle locked out. Use the Power-up and Homing procedure above to continue after adjustments are made. The adjustments are detailed below.

### **DANGER!**

Never approach or make mechanical adjustments to the ladle until it is locked out. Be aware that the ladle may have hot surfaces and use appropriate protection. Cover the furnace adequately to prevent serious injury or death. Lockout all other equipment that may endanger personnel during the adjustments.

- 3) Align the ladle with the DCM and furnace. Initially do this by inspection using the ladle adjustments and moving the arm manually. Enter the furnace carefully but do not touch the metal. Make sure the shot hole is attainable. Keep making adjustments until comfortable with the path.
- 4) Retract the arm back to a point just above where the metal would be when the furnace is full and rotate the dipper to 135 degrees. Note the ladle arm position and set the Clear position to this value (See Programming section). Let the ladle stay there for a few minutes to preheat the dipper.
- 5) Retract the arm down until the probes touch the metal. If the dipper hits the dip well bottom before the sensors contact the metal stop and move the arm up a few inches. Record the position of the arm for programming the Low Metal Position. If the arm stops prior to the probes contacting metal then the Low metal position may need to be increased. Have the Low metal setting changes (See Programming section) and retest. If the metal level is not low you may need to make a judgement call on this setting.
- 6) Level the dipper and move the arm out of the furnace.
- 7) Extend the arm to the shot sleeve such that when the dipper pours it would pour into the shot hole. Record the arm position and set this value into the Ready To Pour position (See Programming section). If the ladle stops short of the pour hole without binding up then the Ready To Pour position will need adjusted to allow the ladle to reach. If the ladle binds-up or is off-center then make mechanical adjustments and re-test. Note that the greater you can make the Ready To Pour position the less stress the arm will have during operation.
- 8) The ladle should now be aligned with the shot sleeve and dip well. The dipper should rotate freely within the dip well.

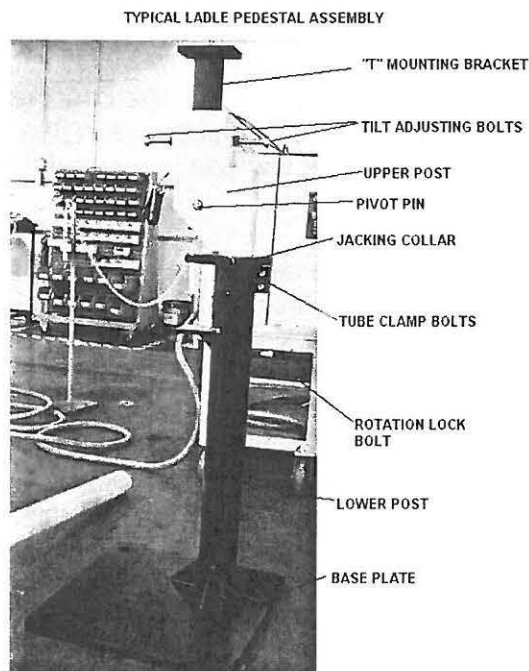
## Ladle Path and Positioning Adjustments

The ladle has mechanical positioning adjustments to meet a wide range of shot heights and furnace locations. Here is a summary of those adjustments.

### **DANGER!**

Never approach or make mechanical adjustments to the ladle until it is locked out. Be aware that the ladle may have hot surfaces and use appropriate protection. Cover the furnace adequately to prevent serious injury or death. Lockout all other equipment that may endanger personnel during adjustments.

- 1) Ladle height can be adjusted so that the dipper pours at the proper height in relation to the shot sleeve. The height is adjusted by loosening the tube clamp bolts on the mounting post and using the jack on the mounting post.
- 2) Tilt adjustments can be used to align the ladle with the shot sleeve and dip well height. The tilt adjustment screws are on the pedestal. Tilt the ladle backward to make the path into the furnace more vertical.
- 3) Ladle rotation can be adjusted to meet shot sleeve and furnace alignment. The rotation is adjusted by loosening the tube clamp bolts on the mounting post and rotating the body into position.
- 4) The ladle body can be moved backward or forward in two-inch increments by re-bolting the body to a different set of holes in the pedestal.



## Sensor Probe Settings

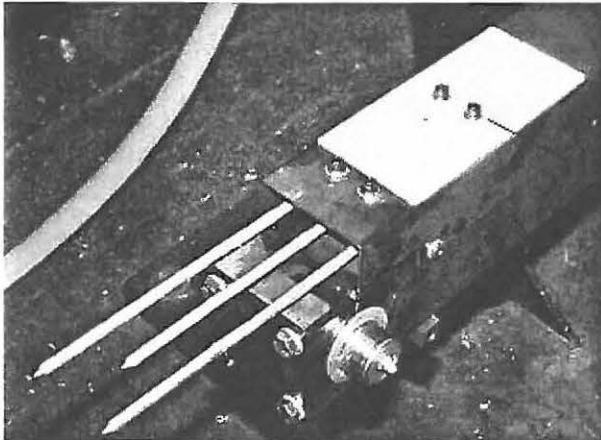
Improper Sensor Probe settings can cause excessive heating and premature failure of the arm, chains, and pour shaft. Adjust the probes so the arm does not touch the metal. To adjust the probes perform the following procedure:

- 1) Power down and lockout the ladle. Allow the probes to cool before handling.

### **DANGER!**

Never approach or make mechanical adjustments to the ladle until it is locked out. Be aware that the ladle may have hot surfaces and use appropriate protection. Cover the furnace adequately to prevent serious injury or death. Lockout all other equipment that may endanger personnel during the adjustments.

- 2) Loosen, but do not remove, the two probe adjustment screws on the lower arm. These screws are located on a moveable plate on top of the probe cover.
- 3) Slide the probes up or down as needed and retighten the adjustment screws.
- 4) Power up and home the ladle using the Power up procedure.
- 5) Carefully move the arm back to the furnace with the dipper at the fill angle. Observe the probes' clearance as they enter the dip well and touch metal. Also observe that the dipper fills with metal when the arm stops.

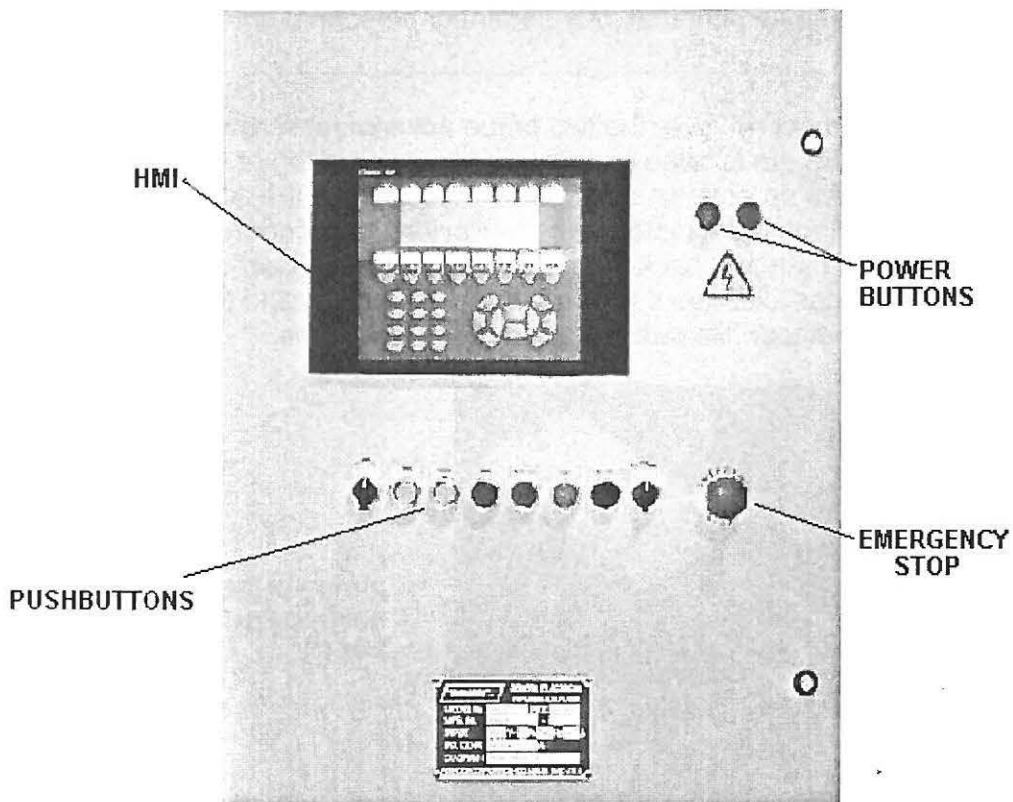


PROBE SLIDE  
ADJUSTMENT  
BOLTS

# Section 6 - Legend Control System

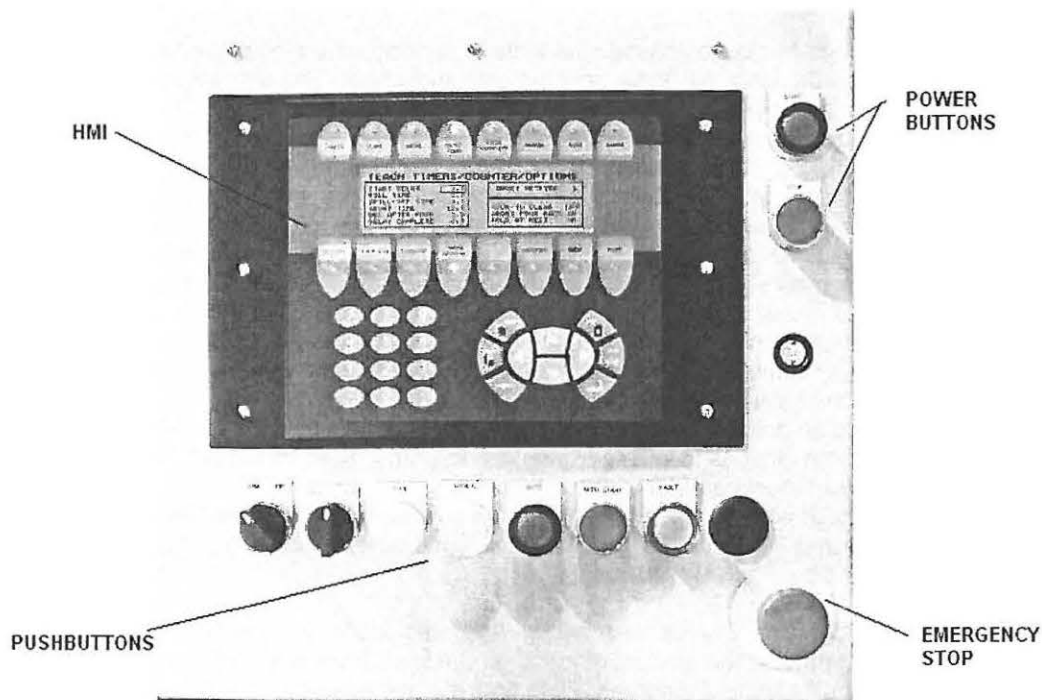
The Legend Control System is a powerful yet user friendly control platform for Rimrock Die Casting machinery. The Legend Controls feature a combination of easy to use pushbuttons and simplified HMI functions to perform precise control. The simplified feature set of the Legend Controllers makes them easy to program and a very cost effective solution.

Legend Control systems utilize most of the same control components as Rimrock's popular Epic Controllers. Like the Epic Controllers, Legend Controllers can be configured with the operator controls located at the main control enclosure or remoted to a more convenient site. Typical operator control stations are shown below:



Operator Controls in Main Enclosure





**Typical Remote Panel**

Other variations include pushbuttons mounted away from the HMI, an HMI being shared between two Legend Controllers, and dual Legend Controllers in a single enclosure. Simplicity, flexibility, and cost-effectiveness make Legend Controllers the choice for many installations.

## Operator Controls

Legend Controls feature both pushbuttons and an HMI for controlling machinery. The pushbutton controls are used to power up, change modes, manual operations, fault recovery, and status indications. The HMI has status indication but is primarily used for programming user setups. This section will familiarize the user with the HMI but the programming of parameters will be explained in detail in the Programming section.

### PUSHBUTTON CONTROLS

Each Legend 305 control system has the following pushbuttons:

- START** – Turns on the output power and power to the motor drives. All Emergency Stops must be reset before this button will function.
- STOP** – Turns off output power and power to the motor drives.
- EMERGENCY STOP** – Turns off output power and power to the motor drives. Has auxiliary contacts that can be used to stop other equipment.
- ARM/DIP** – Selects which axis of motion, arm or dipper, will be controlled by the REV/FWD selector switch.
- REV/FWD** – Moves the axis selected by the ARM/DIP selector switch when in manual mode. If used prior to homing the ladle will move slowly. After homing the ladle will move at the Manual speed settings. When in the furnace the arm will move at the Metal speed. Before moving the arm make sure the dipper is level or the command will be ignored. Do not attempt to move the dipper unless the arm is in the furnace or at the shot hole or the

command will be ignored. If unsure you can use the HOME button to put the ladle back to a safe position.

- HOME** – In manual mode this button causes the ladle to perform a homing procedure. Simultaneously the ladle will move both the arm and dipper. The arm will move reverse until off of the Stroke (home) prox switch and then change directions until just back onto that switch. The dipper will move to the Fill (reverse) overtravel prox switch then back to the Level prox switch. When homing is completed the pushbutton will light.
- MANUAL** – When pushed places the ladle in manual mode. The pushbutton indicates manual mode when lit. The ladle can be placed in manual mode only after output and drive power has been turned on via the START button and no faults exist. As an added feature this button can also serve as the HOME button. To do this simply press and hold.
- AUTO** – When pushed places the ladle in automatic mode. The pushbutton indicates auto mode when lit. The ladle can be placed in auto mode only after output and drive power has been turned on via the START button, no faults exist, the ladle has been homed, and the arm is above the furnace CLEAR setting.
- AUTO START** – Starts an automatic cycle when in auto mode and pushed. Electrically this button operates the same input as the START interlock from the DCM. When auto mode is entered the input must be off or it will be ignored.
- FAULT** – Indicates a fault when lit. Pressing this button acknowledges and resets the fault status. If the fault persists the light will stay on. To see what fault is occurring press the LIST key on the HMI and the Fault List will display.

**FILL ANGLE INC/DEC** – This is an optional button. It is used during auto mode to adjust the Fill Angle setting and thus the amount of metal for the shot. Each press increments or decrements the fill angle .5 degrees. Each time the adjustment is made the light in the switch will come on to indicate the change has been made. Changes cannot be made while the ladle is moving in the furnace and towards the metal. The button is ignored during that time.

### **USING THE PUSHBUTTONS**

Most pushbuttons only require a single press for their function to perform. Functions that cause motion (FWD, REV, HOME) must be held by the operator for the functions to perform. Lights indicate status (MANUAL, AUTO, HOME, FAULT, POWER ON). The E-stop switch has a special operator that maintains when pressed in and must be twisted to pull back out.

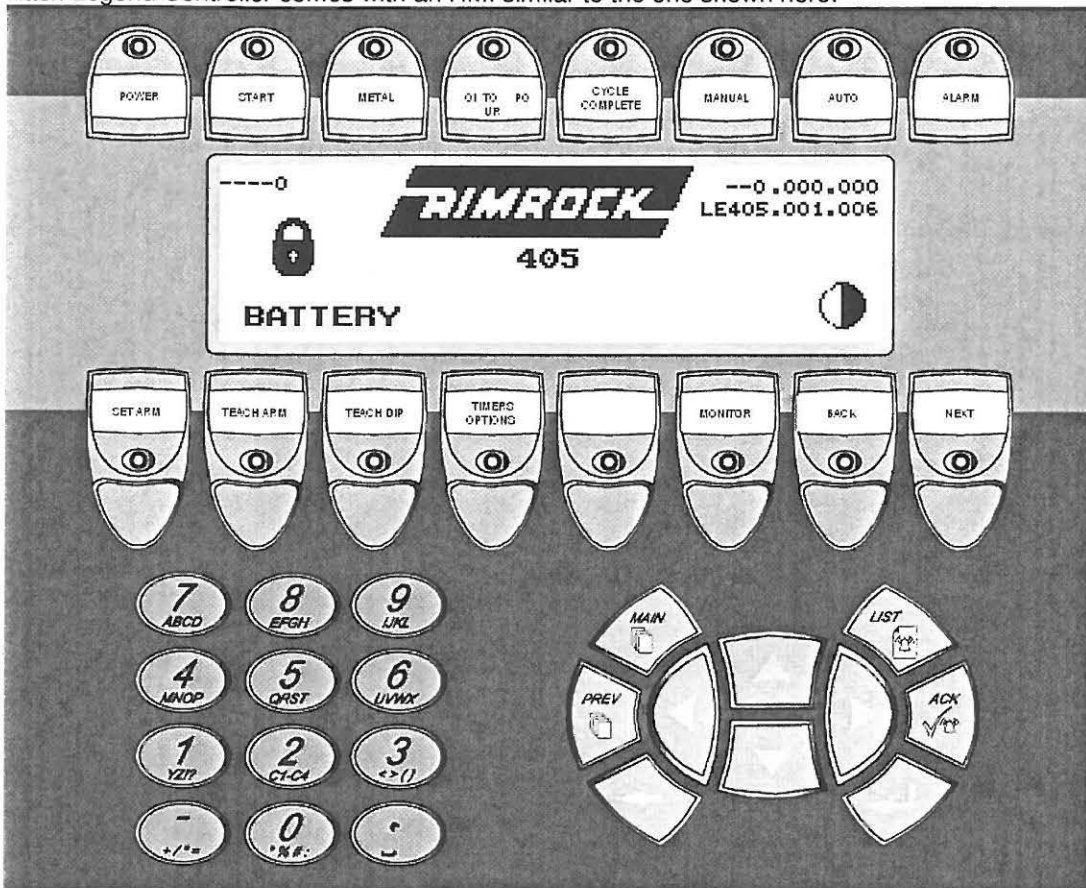
Before operations can begin the ladle must be powered up and homed. The Operation section has detailed procedures for starting up the ladle and preparing for operations. Manual operations can be performed while in manual mode with the appropriate switch function. To go to manual mode the power must be on, E-stops reset, the START light must be on, and there must be no faults. Pressing the MANUAL button then places the ladle in manual mode and manual functions are enabled. There are limitations on the use of the FWD/REV switch as outlined above in the switch description. The HOME switch has no limitations in manual mode and the operator can use it anytime the ladle needs to be positioned at home. For ease, holding the MANUAL switch down also performs homing.

To go to auto mode the power must be on, E-stops reset, the START light must be on, the ladle has been homed and is above the Clear position setting, and there must be no faults. Pressing the AUTO button places the ladle in auto mode and the ladle will then respond to interlock commands. The AUTO START button can be used to initiate an auto cycle. Note that if any start signal is on when auto is entered it will be ignored. During auto mode the optional FILL ANGLE INC/DEC switch can be used to adjust metal amounts without the use of the HMI. This switch has limitations outlined above.

Should a fault occur the FAULT pushbutton will light. Pressing the FAULT pushbutton acknowledges and resets the fault. To see what fault is occurring or has occurred press the List key on the HMI.

## HMI INTRODUCTION

Each Legend Controller comes with an HMI similar to the one shown here:



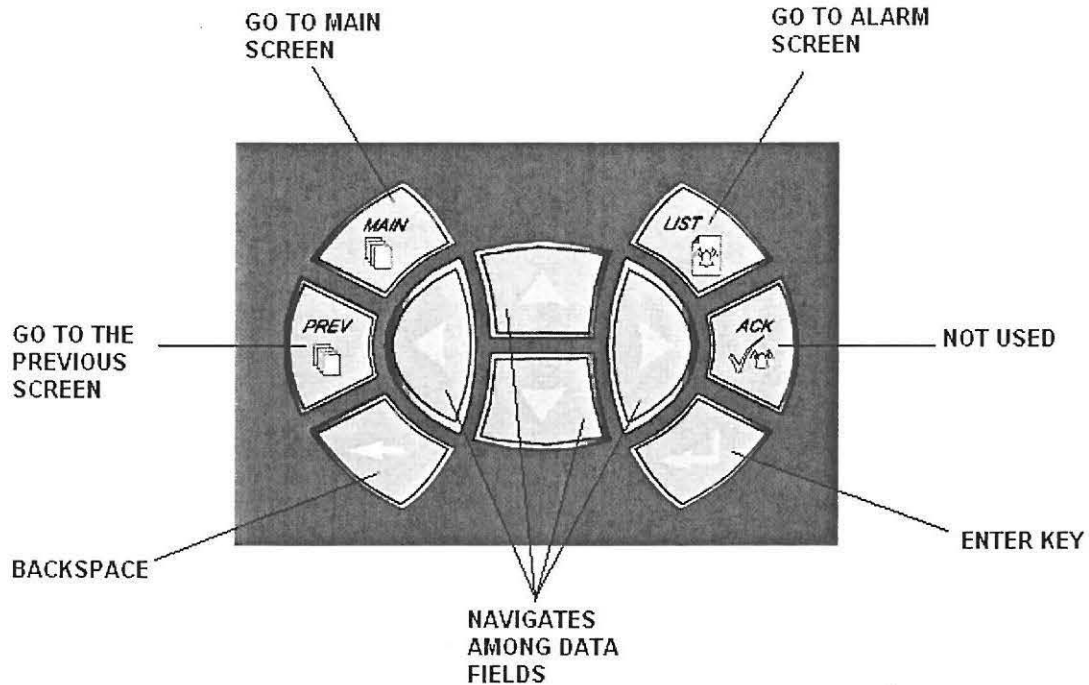
The HMI has no direct control over the starting, stopping, or mode changing. It is only used to show status and program user setups. Programming parameters is covered in detail in the Programming section.

Each HMI has a row of status indicating lights along the top of the screen. Each light has a description below it of the status it represents. Along the bottom of the screen is a row of function keys with indicating lights. Unless otherwise noted on the screen each function key has a description of what screen will be displayed or function performed when pressed. The indicating lights will be lit when a particular screen, or in some cases the screen series, is displayed. For example the Monitor screen has several sub screens. Whenever any of the Monitor screens are displayed the light under the Monitor key will be lit. When a key has text or a symbol on the screen immediately above it then that key has a different function designated by that text or symbol. For example, the Main screen shown above has the contrast symbol above the key marked BACK. Pressing that key will take the operator to the contrast setting screen.

Below the function keys are alphanumeric keys and navigation keys. The alphanumeric keys are used to type numbers and letters into data fields. The navigation keys allow the user to highlight a data field for entry and enter data after typed. Entering numbers is as simple as highlighting the field, typing the number, and pressing the enter key. If a mistake is made the backspace key can be used to erase it. To enter letters highlight the text field and press the enter key. Notice under each number key the letters and punctuation marks, similar to a cell phone. Pressing the number keys repeatedly while on a text field will cause the letters on that key to appear instead of the

number. Once the correct letter appears wait a few seconds and the cursor will move to the next character. When done press enter.

The navigation keys are detailed below:



### **IMPORTANT!**

Moving off of a data field before pressing the enter key will make the data field revert back to the original setting. Press the enter key before moving off of the data field

#### **Using the HMI**

The Legend controller's HMI is a very user friendly operator interface. The user can quickly and easily go directly from screen to screen by pressing the key associated with the desired screen. If in a special screen (Contrast setting or Alarms) the user will have to exit that screen first. Programming is accomplished by going to the appropriate teach screen and making setting changes. The system will automatically save the new settings in the current memory area and begin using the new values on the next auto cycle. The status lights along the top of screen indicate their status regardless of which screen is displayed. For more detailed status go to the Monitor screens. Should an Alarm occur a flashing "**ALARM**" indicator will appear on the screen. Pressing the List key will display the Alarm List. Should the screen be too light or dark the contrast can be adjusted by pressing the key under the contrast symbol on the Main screen.