Valley TouchPro
Control Panel
Owner's Manual

0999006_B

Software Versions:
TouchPro Module v9.02
FlexBox v1.02 P1.9
**Table of Contents**

Quick Reference Guide ...........................................................................................................5
EC Declaration of Conformity..................................................................................................7
Electrical Safety Statement ....................................................................................................8
About This Manual ..................................................................................................................8
Ancillary Equipment Warranty .................................................................................................8

**Safety** ..................................................................................................................................9
Recognize Safety Information .................................................................................................9
Safety Messages .......................................................................................................................9
Information Messages .............................................................................................................9
Use of Personal Protective Equipment ..................................................................................10
Conductive Materials and Equipment .....................................................................................10
Fall Protection ..........................................................................................................................10
Minimum Working Clearance .................................................................................................11
Qualified Person .....................................................................................................................11
Overhead Power Lines ...........................................................................................................12
Minimal Lockout / Tagout Procedure ......................................................................................13
Sequence of Lockout .............................................................................................................13
Restoring Equipment to Service ............................................................................................13
Operate Safely .........................................................................................................................14
Safety Decals ..........................................................................................................................18

**Overview** ..........................................................................................................................23
Control Panel ..........................................................................................................................23
Main Disconnect .....................................................................................................................23
Safety Override Switch ..........................................................................................................23
3-Second Delay Timer ...........................................................................................................23
Pump Restart Delay ...............................................................................................................23

**Main Screen** .......................................................................................................................24
Control Buttons .....................................................................................................................24
Current Machine Settings .......................................................................................................27
Status Section .........................................................................................................................28
Menu Buttons .........................................................................................................................29
Numeric Keypad ......................................................................................................................30
Pivot Circle Colors and Shapes .............................................................................................31

**Control Panel Setup** ..........................................................................................................33
Main Screen Setup ..................................................................................................................35
Minimum Control Panel Setup ...............................................................................................37
Set GPS Position and Fallback Run Time Manual Method (Machines With GPS) ....................39
Set Up GPS Position Loss .......................................................................................................41
Test GPS Position ..................................................................................................................42
Voltage .....................................................................................................................................43
Low Voltage ...........................................................................................................................43
Estimated Drive Unit Speed Table ..........................................................................................43
GPS Angular Conversion Table .............................................................................................44
Angular Degree Examples .....................................................................................................44
System Constants Record ......................................................................................................45
## Table of Contents

### Operation
- Before Running the Machine ................................................................. 49
- Run the Machine Wet (With Water) .......................................................... 49
- Run the Machine Dry (Without Water) ..................................................... 49
- Stopping The Machine ........................................................................... 50
  - Emergency Stopping ........................................................................... 50
  - Stopping Under Normal Conditions .................................................... 50

### Diagnostics
- Diagnostics Screen ................................................................................ 51
- System Faults ......................................................................................... 51
  - Viewing System Faults ....................................................................... 52
- Error Codes ............................................................................................ 52
  - Viewing and Clearing an Error Code .................................................... 52
  - Error Codes ........................................................................................ 53
- Error Logs ............................................................................................... 54
  - Viewing an Error Log .......................................................................... 54
  - Resetting an Error Log to Zero ......................................................... 54
- Review History ....................................................................................... 55
  - Viewing a History Record ................................................................... 55
  - Event Codes ....................................................................................... 56

### Troubleshooting
- System Faults ....................................................................................... 58
- Error Codes ............................................................................................ 60
- Troubleshooting List .............................................................................. 63
- Hard Reset ............................................................................................. 65
  - Executing a Hard Reset ...................................................................... 65

### Button Flowcharts
- System Button ...................................................................................... 67
- Setup Button ......................................................................................... 68
- Program Button .................................................................................... 69
- Options Button ..................................................................................... 70
- Diagnostics Button ............................................................................... 71
- Home Button ......................................................................................... 72
- Start Button .......................................................................................... 72
To Run The Machine: (Refer to the Overview and Operation sections of the Owner’s Manual, and to the Advanced Features Manual.)

1. ALWAYS make sure that vehicles, other equipment, livestock, and people are clear of the machine before operating.
2. Turn the control panel main disconnect switch to the ON position. If the power is supplied by an engine driven generator, adjust the RPM of the generator until the voltmeter reads 460 – 505 volts. DO NOT EXCEED 505 VOLTS.

Run The Machine Wet (With Water)

3. Push the button on the Main screen to turn the water ON.
4. Select the direction of travel by pushing the Forward or Reverse button.
5. Set the water application by pushing or .
   - Use to set water application by inches (mm) of water.
   - Use to set water application by percent timer setting.
6. Use the numeric keypad to enter the depth of water in inches (mm), or the percent timer setting.
   - Push (Enter) to retain the value.
7. Push to start the machine.
8. Push to stop the machine.

Controlling Auxiliary Relays:

1. Push System (A), Control. Set AUX 1 or AUX 2 to turn it on.
2. Push the button again to turn it OFF.

Selecting Stop-In-Slot On/Off:

1. Push the Stop-In-Slot button to toggle between ON and OFF.
   - Stop-In-Slot OFF to bypass the stop-in-slot location.
   - Stop-In-Slot ON to stop at the stop-in-slot location.

To Set The Stop-In-Slot Position:

1. Push the Stop-In-Slot Setting button.
2. Enter the desired stop-in-slot position in degrees and push .

Turning Power and Pressure Restart On:

1. Push System (A), Control. Set Auto Restart OFF to toggle between ON and OFF.
   - Auto Restart OFF
   - Auto Restart ON

NOTE: Refer to the section in the Advanced Features Manual entitled “Automatic Restart Option” for more information.

Selecting Auto Reverse or Auto Stop:

1. Push System (A), Control. Set Auto Reverse/Auto Stop (AR/AS) to toggle between OFF, Auto Stop On and Auto Reverse ON.
   - Auto Reverse/Auto Stop OFF
   - Auto Stop ON
   - Auto Reverse ON

NOTE: Only applicable with the drive-unit-mounted, end-of-field stop/auto reverse hardware. AR/AS must be ON.

Run The Machine Dry (Without Water)

3. Press the button on the Main screen to turn the water OFF.
4. Select the direction of travel by pushing the Forward or Reverse button.
5. Set the speed of travel by pushing .
6. Use the numeric keypad to enter the percent timer setting in inches (mm).
   - Push (Enter) to retain the value.
7. Push to start the machine.
8. Push to stop the machine.

Setting The End Gun:

Refer to Figure 1.

1. Push Options (H), End Gun (F).
2. Push the End Gun or Wide Boundary tab.
3. Push the Start Angle field (end gun ON) for a sequence, and enter degrees on the numeric keypad. Push .
4. Push the End Angle field (end gun OFF) for that same sequence, and enter degrees on the numeric keypad. Push .
5. Repeat steps 2-4 for other sequences as needed.

Figure 1.
## System Faults & Descriptions

<table>
<thead>
<tr>
<th>FAULT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM POWER FAULT</td>
<td>Voltage has fallen below the low voltage limit for more than 15 seconds, or power was lost while the machine was running.</td>
</tr>
<tr>
<td>SYSTEM SAFETY FAULT</td>
<td>Caused by a break in the safety return circuit that lasted longer than three seconds.</td>
</tr>
<tr>
<td>LOW PRESSURE FAULT</td>
<td>The pressure fell below the low pressure limit, or the Pressure Delay is not a sufficient amount of time to build pressure in the machine after it is started.</td>
</tr>
<tr>
<td>HIGH PRESSURE FAULT</td>
<td>With VRI-Z on, the pressure went above the high pressure limit for more than three seconds.</td>
</tr>
<tr>
<td>WATER TIMER FAULT</td>
<td>The machine shut down because it was moving too slowly, thereby applying too much water.</td>
</tr>
</tbody>
</table>
| COMMAND FAULT             | The machine was commanded to stop by one of the following:  
1) The STOP button was pressed.  
2) An autostop condition occurred at the end-of-field stop.  
3) A programmed STOP command was executed. |
| STOP-IN-SLOT (SIS) FAULT  | The machine was shut down by the Stop-In-Slot.                               |
| PROGRAM FAULT             | The machine was shut down because a Step program stopped the system.         |
| AUTOSTOP FAULT            | An autostop condition occurred at the end-of-field stop.                    |
| BBRAM FAULT               | An attempt was made to start the machine when error E01 was displayed on the status screen. |
| FLOW FAULT                | With VRI-Z on, the flow rate has fallen below the amount set in the FLOWMETER GAL/PULSE field. |
| FOR/REV FAULT             | Both the forward and reverse sensor relays were on for more than 15 seconds while the system was running or waiting. |
| TIRE PRESSURE             | While the system was running or waiting, two consecutive error messages from a particular tire were received. |
| WIND FAULT                | The machine shut down because the wind speed reached the high wind limit. The wind speed indicator is an option. WIND is only displayed on the system faults screen when wind is turned ON. |
| TEMPERATURE FAULT         | The machine shut down because the temperature fell below the low temperature limit. |
| RAIN FAULT                | The machine shut down because the rain limit was exceeded in the rain window time period. |
| DAILY OPS FAULT           | The daily operations program shut the machine down because it is not allowed to run between a certain time period, DAILY OPS is only displayed on the system faults screen when Daily Ops is turned ON. |
| NO ACK                    | No Acknowledge is enabled and the BaseStation did not acknowledge the message. |
| RELAY COM FAULT           | There is a hardware or software communication problem between the TouchPro module and the electrical relay board within the control panel. |
| GPS COM FAULT             | When GPS is selected as a protocol and the system shuts down due to no communication with GPS for a user-specified amount of time, when shut down of GPS signal loss is ON, or while the system was running or waiting. |
| GPS LOCK FAULT            | When GPS is selected as a protocol and the System shuts down due to GPS signal loss for a user-specified amount of time, or when shut down of GPS signal loss is ON, or while the system is running or waiting. |
| BOUNDARY FAULT            | The machine shut down because it traveled beyond the forward or reverse Position angles. |

## Error Codes & Descriptions

<table>
<thead>
<tr>
<th>ERROR</th>
<th>DESCRIPTION</th>
<th>ERROR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E01</td>
<td>BBRAM - Checksum failed at power up.</td>
<td>E15</td>
<td>UNDERWATER ERROR - Check for induced voltages and % timer connections.</td>
</tr>
<tr>
<td>E02</td>
<td>EEPROM - Checksum failed at power up.</td>
<td>E16</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>E03</td>
<td>UNIT RESETS - This is logged when the software resets.</td>
<td>E17</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>E04</td>
<td>POWER DROP - Power dropped below low voltage limit.</td>
<td>E18</td>
<td>GPS COMMUNICATIONS ERROR - Check GPS connection and power.</td>
</tr>
<tr>
<td>E05</td>
<td>SYSTEM SAFETY - Possible tower misalignment, drive unit may be stuck.</td>
<td>E19</td>
<td>GPS SIGNAL LOSS - Check for clear path above antenna.</td>
</tr>
<tr>
<td>E06</td>
<td>PUMP SAFETY - Pressure too low after pressure delay.</td>
<td>E20</td>
<td>DGPS SIGNAL LOSS - Check for clear path above antenna.</td>
</tr>
<tr>
<td>E07</td>
<td>PRESSURE SENSOR - Out of range high. Check connection.</td>
<td>E21</td>
<td>LOW FLOW -</td>
</tr>
<tr>
<td>E08</td>
<td>PRESSURE SENSOR - Out of range low. Check connection.</td>
<td>E22</td>
<td>HIGH PRESSURE -</td>
</tr>
<tr>
<td>E09</td>
<td>PRESSURE SENSOR - Pressure high with pump off. Check connection.</td>
<td>E23</td>
<td>PLC COMMUNICATIONS ERROR. (GPS V2 Only)</td>
</tr>
<tr>
<td>E10</td>
<td>PRESSURE SENSOR - Mechanical switch could be stuck.</td>
<td>E24</td>
<td>RESYNC VALVE DUTY CYCLE DUE TO PRESSURE</td>
</tr>
<tr>
<td>E11</td>
<td>RESOLVER - Angle jumping around. Lube J pipe.</td>
<td>E25</td>
<td>GPS COORDINATES OUT OF RANGE. Check distance to GPS or for crosstalk.</td>
</tr>
<tr>
<td>E12</td>
<td>E12 RESOLVER - Out of range high. Check for loose or shorted wires.</td>
<td>E26</td>
<td>LOW TIRE PRESSURE</td>
</tr>
<tr>
<td>E13</td>
<td>KEYPAD - Possible key stuck. Check keypad connection.</td>
<td>E27</td>
<td>TPMS COMMUNICATIONS ERROR</td>
</tr>
<tr>
<td>E14</td>
<td>FWD/REV SENSE - Possible short FWD/REV. Check ARAS box.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EC Declaration of Conformity

We: Valmont Industries, Inc.
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+1 402.359.6143 (Facsimile)

declare under our sole responsibility that the product,

Crop Irrigation System

to which this documentation relates, is in conformity with the following documents:

Machinery Directive 2006/42/EC
Low Voltage Directive 2006/95/EC

The above-referenced equipment is in conformity with all safety-related clauses (Not all clauses reflecting commercial preference are met) of the following documents:

EN 60204-1:2006 Safety of Machinery – Electrical Equipment of Machines
EN 12100:2010 Safety of Machinery
EN 909:1998+A1 Irrigation Machines

Statement regarding Pressure Equipment Directive 97/23/EC:

The Crop Irrigation System is excluded from the scope of the Pressure Equipment Directive, by the language of Article 1, Sections 3.2, 3.6 & 3.10. This equipment is classified less than Category 1.

Statement regarding RoHS Directive 2011/65/EC:

The Crop Irrigation System is excluded from the scope of the RoHS Directive, by the language of Article 2, Section 4(e), being a “Large Scale Fixed Installation.”

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Place of Issue: Valley, NE 68064
Electrical Safety Statement

Installation Of The Valley Electric Irrigation Machine - European Union Only

Valmont Industries Inc. does not install a differential (ground fault) circuit breaker in the control panel of the Valley electric irrigation machine because the standards of protection vary according to country of destination. The distributor must provide and install a differential (ground fault) circuit breaker that meets the standards of the country where the Valley irrigation machine is installed.

In the European Union, differential circuit breaker protection is fixed at a maximum of 24 volts.

Good grounding of the Valley irrigation machine is required.

• If resistance to ground is lower than 80 ohms, a differential (ground fault) circuit breaker of 300 mA will meet requirements.
• If resistance to ground is between 80 and 800 ohms, a differential (ground fault) circuit breaker of 30 mA will meet requirements.

The power supply installation and inspection of equipment protection components or machines are the responsibility of the installer. Valmont Industries Inc. is not responsible for the failure of equipment protection components or machines not of their manufacture.

Valley pivot irrigation machines receiving power from a generator must have a cable connected from the irrigation machine structure to a ground rod and another cable from the irrigation machine structure to the ground terminal on generator in order for the differential (ground fault) circuit breaker to work.

• The resistance between the irrigation machine and the generator must be substantially below 80 ohms.

About This Manual

Information contained in this manual applies to Valley TouchPro Control Panels with Software Versions - Touch-Pro Module v9.02 and FlexBox v1.02 P1.9. Sections related to safety, pivot hardware, maintenance, towing, troubleshooting and winterization are covered in the appropriate Valley Pivot Owners Manual.

You, as the owner/operator, should familiarize yourself with the capabilities of the system in order to obtain optimum system performance. It should be remembered that the sprinkler will perform according to your knowledge of the equipment, soil and water relationships and equipment application concepts.

Specifications, descriptions and illustrative material contained herein were as accurate as known at the time this publication was approved for printing. Valmont Industries Inc. reserves the right to change specification or design without incurring obligation. Specifications are applicable to machines sold in the United States and may vary outside the United States.

Ancillary Equipment Warranty

The owner is responsible for warranty registration of all ancillary equipment such as engines, pumps and generators with its respective manufacturer.
Recognize Safety Information

This irrigation equipment can be powered by high voltage, which can be extremely dangerous if used improperly. For maximum safety and optimum performance of the machine, all owner/operators and maintenance personnel must read and understand the owner/operator manual(s), all safety messages in this manual and safety signs/decals on the machine before operating this equipment.

Anyone assembling, operating, servicing or maintaining this machine must read and understand all operation, maintenance, troubleshooting, testing, installation, assembly instructions and all safety messages in this manual before operating the machine or beginning any maintenance, troubleshooting, testing, installation or assembly of components.

These instructions alert you to certain things you should do carefully; if you don’t, you could hurt yourself or others, hurt the next person who operates the equipment, or damage the equipment.

Safety Messages

Safety messages in this manual are preceded by the hazard symbol and one of three words: DANGER, WARNING or CAUTION. These messages alert you to potential hazards that could hurt you or others and or cause property damage.

⚠️ This HAZARD SYMBOL is used to alert you to information about unsafe actions or situations, and may be followed by the word DANGER, WARNING or CAUTION.

⚠️ DANGER

The HAZARD SYMBOL used with the word DANGER describes immediate hazards that can result in severe personal injury or death.

⚠️ WARNING

The HAZARD SYMBOL used with the word WARNING describes unsafe actions or situations that can result in severe injury, death and/or major equipment or property damage.

⚠️ CAUTION

The HAZARD SYMBOL used with the word CAUTION describes unsafe actions or situations that can result in injury, and/or minor equipment or property damage.

Information Messages

Important information messages in this manual are preceded by the word NOTE.

NOTE

The word NOTE is used to alert you to information that describes procedures or tips to help you install, operate or maintain your equipment properly.
Safety

Use of Personal Protective Equipment

- People working in areas where there are potential electrical hazards must use, personal protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Safeguards for personnel protection. - 1910.335, or applicable national, state or local regulations, for additional information.
- Personal protective equipment must be maintained in a safe, reliable condition and periodically inspected or tested.
- Protective shields, protective barriers, or insulating materials must be used to protect each person from shock, burns, or other electrically-related injuries while that person is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance or repair, they must be guarded to protect unqualified persons from contact with the live parts.
- Safety signs and tags. Safety signs, safety symbols, or accident prevention tags must be used where necessary to warn people about electrical hazards which may endanger them.

Conductive Materials and Equipment

Materials and equipment that can conduct electricity must be handled in a way that will prevent them from contacting energized power lines, exposed conductors or circuit parts.
- When handling long conductive objects (such as but not limited to truss rods, pipes, angles and ladders) in areas with energized power lines, exposed conductors or circuit parts, work practices (such as the use of insulation, guarding, and material handling techniques) must be used to minimize the hazard.
- Portable ladders must have non-conductive side rails.
- Do not wear conductive articles of jewelry and clothing (such as but not limited to watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) that could come in contact with energized power lines, exposed conductors or circuit parts.

Fall Protection

Identify potential fall hazards and determine if fall protection equipment is appropriate for the task, before beginning the work. Pay attention to hazards associated with routine and non-routine tasks. Inspect fall protection equipment (harnesses, lanyards) and devices (guardrails, tie-off points) before each use. Use fall protection equipment if required for the job. Be sure the fall protection equipment is right for the task, fits properly, and is in good condition. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations Standards - 29 CFR 1926.500, 1926.501 and 1926.502, or applicable national, state or local regulations for more information.
- When using scaffolds, make sure there is proper access, full planking, stable footing, and guard railing.
- When using a boom lift, keep feet firmly on the platform of a boom lift, use fall protection equipment tied-off at all times to the guardrail or tie-off point.
- When using a ladder, make sure the ladder is non-conductive and the correct size for the task. Read the ladder user instructions and be sure the ladder is in good condition. Make sure ladder is set on stable footing and at the correct angle.
### Minimum Working Clearance

To reduce the risk of injury, all persons require adequate working clearance around the electrical panel or other electrical equipment. The table below identifies the minimum working clearance needed. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Safeguards for personnel protection. -1910.303(g)(1)(i), or any other applicable national, state or local regulations, for additional information.

<table>
<thead>
<tr>
<th>MINIMUM WORKING CLEARANCE 0-600 VOLTS</th>
<th>★MINIMUM WORKING CLEARANCE IN FRONT OF ELECTRICAL PANEL/EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDTH OF WORKING CLEARANCE AREA</td>
<td>HEIGHT OF WORKING CLEARANCE AREA</td>
</tr>
<tr>
<td>30in.(760mm) MINIMUM OR WIDTH OF ENCLOSURE, WHICH EVER IS GREATER</td>
<td>78in.(1980mm) MINIMUM OR HEIGHT OF ENCLOSURE, WHICH EVER IS GREATER</td>
</tr>
</tbody>
</table>

★Concrete, brick or tile walls shall be considered as grounded.

### Qualified Person

A Qualified Person is one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Only qualified persons may work on electric circuit parts or equipment that have not been de-energized.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations Standards - 29 CFR 1926.32(m) and 1910.333, or applicable national, state or local regulations for additional information.
Safety

Overhead Power Lines

Assembling, towing or transporting irrigation machine components such as but not limited to the pivot point, linear cart, span/drive unit assemblies, overhangs and/or corner assemblies underneath or near power lines is extremely dangerous because of the risk of electrocution.

Operating equipment that elevates irrigation machine components, such as but not limited to an aerial lift or crane, near power lines is extremely dangerous because of the risk of electrocution. Only qualified personnel should operate this type of equipment. Before operating the equipment, qualified personnel must read the equipment manufacturers’ operating and safety instructions.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Cranes and derricks. - 1926.550, or any other applicable national, state or local regulations for additional information.

- Always presume that any overhead power line is an energized line unless and until the person(s) owning the line and/or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

- Before operating any equipment near any power line make sure the line has been de-energized and visibly grounded at the point of work.

- Electrocution can occur without touching an electrical power line. Electricity, depending on the magnitude, can jump or become induced into equipment or conductive materials that come in close proximity to, but do not touch a power line. High wind, lightning, wet ground and other environmental conditions will increase the possibility of electrocution and require additional consideration.

- Transmitter towers can induce the equipment or materials being handled with an electrical charge. Before working or operating equipment near transmitter towers, make sure the transmitter is de-energized.

- Select the location where the span/drive unit will be assembled to ensure that neither the irrigation machine, or the equipment used during the assembly process, will violate the minimum clearance guidelines.

- Never operate equipment or allow the load, ropes or tag lines within 10 ft (3.05 m) of any power line rated 50 kV or lower whether it is energized or not. For lines rated over 50 kV, the minimum clearance shall be 10 ft (3.05 m) plus 0.4 inch (1.1 cm) for each kV over 50 kVs.

- Never assemble, tow, transport or allow irrigation machine components underneath or within 10 ft (3.05 m) of any power line rated 50 kV or lower whether it is energized or not. For lines rated over 50 kV, the minimum clearance shall be 10 ft (3.05 m) plus 0.4 inch (1.1 cm) for each kV over 50 kVs. Overhang support angles, cables and spinner drive components regularly extend 10 ft to 12 ft (3.1 m to 3.7 m) above the irrigation pipeline (span).

- Use barricades to identify areas where interference with overhead power lines could occur. Keep the assembly, towing or transporting of irrigation machine components and the operation of equipment including load, ropes or tag lines away from any power line, in the distances described above, whether the line is energized or not.

- Always designate a person to observe clearance between the power line and all equipment being operated or moved in order to give timely warning for all operations to STOP if the minimum clearance is violated.
Minimal Lockout / Tagout Procedure

The following procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It is used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before personnel perform any servicing or maintenance where the unexpectedly energized or start-up of the machine or equipment or release of stored energy could cause injury. All personnel, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

When the energy isolating devices are not lockable, tagout should be used and affected personnel must wear full personal protection.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Typical minimal lockout procedures - 1910.147 App A, or applicable national, state or local regulations, for additional information.

Sequence of Lockout

1. Notify all affected personnel that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.
2. The authorized personnel shall identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.
3. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
4. De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
5. Lock out the energy isolating device(s) with assigned individual lock(s).
6. Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. CAUTION: Return operating control(s) to neutral or “off” position after verifying the isolation of the equipment.
8. The machine or equipment is now locked out.

⚠️ DANGER

• WHEN PERSONNEL WILL BE EXPOSED TO CIRCUIT ELEMENTS AND ELECTRICAL PARTS, A QUALIFIED PERSON MUST USE TEST EQUIPMENT TO VERIFY THAT THE CIRCUIT ELEMENTS AND EQUIPMENT PARTS OF THE EQUIPMENT ARE DE-ENERGIZED.

Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:

1. Check the machine or equipment and the immediate area around the machine to ensure that non-essential items are removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all personnel are safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and re-energize the machine or equipment.
5. Notify affected personnel that the servicing or maintenance is completed and the machine or equipment is ready to be used.
Operate Safely

Valley Irrigation machines are designed with safety in mind. However, if this machine is operated incorrectly, it may pose a safety threat to the operator. A good safety program is much like a chain, it is only as strong as its weakest link. The manufacturer, dealer, and operator must maintain and improve all safety programs. Following is a list of safety operating tips which you and all other persons servicing or operating the machine must read and understand:

⚠️ CAUTION

- **DO NOT OPERATE THIS MACHINE WITHOUT FIRST READING THE OWNER’S MANUALS FOR THE MACHINE.**
- **READ ALL SAFETY MESSAGES IN THIS MANUAL AND SAFETY SIGNS ON THE MACHINE.**
- **DO NOT LET ANYONE OPERATE THIS MACHINE WITHOUT PROPER INSTRUCTIONS.**
- **UNAUTHORIZED MODIFICATIONS MAY IMPAIR THE FUNCTION AND/OR SAFETY OF THE MACHINE.**
- **IF YOU DO NOT UNDERSTAND ANY PART OF THIS MANUAL, CONTACT YOUR VALLEY DEALER.**

**EMPLOYEE INSTRUCTION ON SAFETY**

It is very important to instruct your employees on the safe use of this equipment at the time of their initial assignment to operate it. **DO NOT let anyone operate this equipment without proper instructions.**

Safety training should be presented annually and the service manager should ensure employees fully understand the safety messages and what to do in case of emergencies.

**EMERGENCY STOPPING**

The machine can be stopped at any time at any tower by turning the disconnect switch, located underneath the tower box, to the OFF position. See Figure 14-1.

⚠️ WARNING

**PROPER GROUNDING**

**DO NOT** attempt to start the machine until the electrical service is properly installed and grounded by a qualified electrician as per the electrical standards. See Figure 14-2.

If the power supplied to the machine is not grounded properly, severe injury, or death can result should an electrical malfunction occur.

It is your responsibility to ensure that your power supplier and/or electrical contractor has grounded the irrigation machine as required by the National Electrical Code and by applicable local electrical codes. If a machine is properly grounded and fuse sizing is correct, there is extremely low probability of an individual being injured by electrical shock.

**NOTE**

- **All 480 VAC, 60 Hz. (380 VAC, 50 Hz.) power supply services MUST be a 4 conductor service.** Three 480 VAC (380 VAC) power lines and one ground conductor which is as large as the power carrying conductors for that service.
- **Each time a towable machine is moved, the ground wire MUST be reattached to the ground rod and checked for electrical integrity before restarting the machine.**
Operate Safely (Continued)

⚠️ DANGER

DISCONNECT POWER WHEN SERVICING
ALWAYS disconnect electrical power before servicing or performing maintenance to the machine.

If you are going to perform maintenance on the machine, YOU MUST shut off and lock the main power disconnect as shown below. See Figure 15-1.

The blue (OSHA safety color code) tag shown below should also be filled out and attached to the disconnect after locking. See Figure 15-2.

The tag should reveal the name of a person to contact before restoring power to the machine.

⚠️ CAUTION

QUALIFIED SERVICE PERSONNEL
If you do not understand electricity or other parts of the machine, have qualified service personnel perform any hazardous repairs or maintenance.

⚠️ CAUTION

GUARD ALL POWER TAKE-OFF DRIVES
This includes all belt and power line drives.
Replace any guards and shields removed for maintenance.

⚠️ WARNING

MARK AND GUARD ALL POWER LINES
Do NOT deep rip or chisel near the buried power service wires.

Do NOT deep rip in a circle at the drive unit. The deep chisel track will cause severe stresses on the structure.

If you do deep rip your field, run the machine with the percent timer at 100% for the first revolution.

⚠️ WARNING

SUSPECTED SHORT CIRCUITS
DO NOT touch the machine if you suspect a short-circuit situation. Call a qualified electrician or an authorized Valley dealer immediately.

Circumstances which may cause you to suspect hazardous voltage situations may include:

• Physical damage to the machine or span cable
• Recent electrical storms (lightning)
• Unusual operating characteristics of the machine

If you suspect a short circuit due to feeling a rippling tingle when touching the machine, DO NOT touch the machine again. Call a qualified electrician or an authorized Valley dealer immediately.
Safety

Operate Safely (Continued)

⚠️ WARNING

LIGHTNING AND THE MACHINE
Stay away from the machine during an electrical storm. An irrigation machine makes a good path to earth. It is also probably the tallest object in the field, which makes it a good lightning receptor!

⚠️ CAUTION

DO NOT OVERSIZE FUSES
Fuses are sized for the protection of a specific machine. Be certain you have the proper fuse sizes in place before initial start-up and when replacing fuses.

⚠️ CAUTION

PLUG - IN CONNECTORS
Disconnect power before connecting or disconnecting any plug-in connectors.

⚠️ CAUTION

DO NOT OPERATE AT FREEZING TEMPERATURES
Spraying water has a cooling effect and water will freeze even though the air temperature is slightly above freezing.

Shut the machine down at 40 degrees Fahrenheit (4.5 degrees Celsius). Do not operate machine when temperature is below 40° F (4.5° C).

• DAMAGE TO EQUIPMENT RESULTING FROM FREEZE-UP IS NOT COVERED UNDER WARRANTY.
• IT IS IMPORTANT TO MAKE SURE ALL PIPE DRAINS FUNCTION PROPERLY TO PREVENT PIPELINE FREEZE-UP DURING COLD WEATHER.

⚠️ CAUTION

AVOID HIGH PRESSURE WATER STREAMS
Avoid body contact with high pressure water streams.

⚠️ WARNING

AVOID CHEMICALS
Avoid exposure to sprinkler spray while chemicals are being injected into the water. Read EPA Label Improvement Program (PR Notice 87-1) and all instructions for chemical applications.

If you plan on chemigating, make certain you have complied with state or local regulations in regard to safety equipment, certification, operation and calibration of the injector pump. Make certain you have first aid and fresh water available in case of an accident. You must also be familiar with the correct cleanup procedures in case of a spill.

• USE OF PROTECTIVE CLOTHING IS RECOMMENDED WHEN HANDLING CHEMICALS. SAFETY GLASSES, GLOVES, AND PROTECTIVE OUTERWEAR SHOULD BE WORN WHEN HANDLING CHEMICALS.
• CONTAMINATION OF THE WATER SUPPLY MAY OCCUR IF EFFECTIVE SAFETY DEVICES ARE NOT INSTALLED/USED IN CONNECTION WITH INJECTION EQUIPMENT FOR CHEMIGATION.

⚠️ DANGER

DRIVE SHAFTS START WITHOUT WARNING
An electric motor on each tower of the center pivot powers two or more drive shafts connected to wheel gear drives. These drive shafts start and stop without warning.

• DO NOT TOUCH ROTATING DRIVE SHAFT OR SHIELD, CLOTHING OR LIMBS MAY BECOME ENTANGLED, RESULTING IN SEVERE INJURY.
• DO NOT SERVICE THE MACHINE UNTIL THE MAIN DISCONNECT IS LOCKED IN THE OFF POSITION.
• ALWAYS REPLACE DRIVE SHAFT SHIELDS AFTER SERVICING.
• DRIVE SHAFT SHIELDS MUST ALWAYS BE IN PLACE WHEN OPERATING THE MACHINE.
Operate Safely (Continued)

⚠️ CAUTION

CHECK WHEEL TRACKS BEFORE STARTING
Make sure all objects, livestock or persons are clear of the machine before starting. Drive trains are powerful and can climb over vehicles, equipment, etc.

⚠️ CAUTION

KEEP CHILDREN AWAY
Pivots are NOT playground equipment.
Prevent children from playing or climbing around on the machine. This can be extremely dangerous, especially if the machine is operating.

⚠️ CAUTION

CHECK MACHINE DIRECTION
DO NOT operate the machine if it moves in the direction opposite to that which was chosen.
Forward should be clockwise and reverse counterclockwise.

⚠️ CAUTION

KEEP WATER OFF ROADWAYS
It is against the law in most states to allow water to spray on state and county roadways. This is a serious hazard to passing motorists.
If end guns are used, make sure you read and understand the correct procedures for setting the on and off positions to avoid watering the roadways.
If an end gun is watering a roadway, immediately discontinue use and adjust the shutoff setting or call your Valley dealer to repair the end gun shut off mechanism.

⚠️ CAUTION

PART CIRCLE OPERATION SAFETY
If the machine reverses direction at a roadway or a physical object such as a building, tree line, power pole, etc., then you MUST provide a backup device to stop the machine if the reversing mechanism were to fail. See Figure 17-1.
Contact your Valley dealer for more information concerning physical barricades for machines under these circumstances.

⚠️ CAUTION

PROPER USE OF THE SAFETY OVERRIDE
Caution MUST be taken by the operator when using the safety override function as it will bypass or disable all of the machine’s automatic safety shutdown circuits.

- NEVER DEPRESS AND HOLD THE START/STOP SAFETY OVERRIDE SWITCH IN THE START POSITION FOR MORE THAN 3 TO 5 SECONDS.

If the machine is not in full view by the operator, do not use the Safety Override function.
The operator MUST inspect the entire machine between each safety override start attempt.
Repeated safety override start attempts can cause severe structural damage.
Call your Valley dealer if the machine fails to start.
Safety Decals
These Danger, Warning, and Caution decals appear in various locations on a Valley irrigation machine. You MUST familiarize yourself and other operators with these safety decals. For replacement of any decal, contact your local Valley dealer.

- **CAUTION**
  Do not operate system when temperature is below 40°F (4.5°C). Read and understand the VALLEY operator manual before operating this equipment.
  Location: Control Panel

- **CAUTION**
  Structural damage can occur when the Safety Override Switch is depressed.
  Location: Control Panel

- **DANGER**
  HIGH VOLTAGE CAN KILL! DO NOT OPEN UNTIL MACHINE DISCONNECTED AND LOCKED.
  Location: Control Panel

- **WARNING**
  ARC FLASH HAZARD, APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY CAN RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.
  Location: Control Panel
Safety

Safety Decals (Continued)

DANGER PELIGRO

Main Power Supply Connection
Use 60°C Minimum Insulation COPPER WIRE
L1
L2
L3

Branchez de l'alimentation électrique principale
Utiliser du fil ECHEVREUIL ISOLE 60 °C MINIMUM

Conexión del suministro de energía eléctrica
Principal utilice cables de cobre con aislamiento
para 60 °C mínimo

This panel is for irrigation machines only. Improper installation of wiring may cause injuries or equipment failure. Machine must be connected to a four wire, grounded electrical service. Machine must be grounded as required by "National Electrical Codes and Applicable Local Codes. Refer to Valley Service Manual for Irrigation Electrical Standards."

Ce panneau est destiné exclusivement aux machines d'irrigation. Une installation électrique inadéquate peut provoquer des blessures ou une panne. La machine doit être raccordée à une installation électrique mise à la terre à quatre fils. La machine doit être mise à la terre conformément aux "Codes électricités nationaux" et aux normes locales en vigueur. Se reporter au manuel d'entretenir de Valley pour les normes électriques d'irrigation.

Este panel es únicamente para equipos de riego. La instalación incorrecta de los cables puede causar lesiones o la falla del equipo. Este equipo de riego debe conectarse a un suministro eléctrico tetraflam con puesta a tierra. Este equipo debe estar conectado a tierra siguiendo los estándares del "National Electrical Code" (Código eléctrico nacional) y los códigos locales aplicables. Consulte el manual de servicio de Valley para las normas eléctricas de riego.
Safety

Safety Decals (Continued)

DANGER
HIGH VOLTAGE
DO NOT OPEN UNLESS PIVOT DISCONNECT SWITCH IS IN THE "OFF" POSITION

WARNING
HIGH VOLTAGE CAN KILL. DO NOT OPEN UNLESS MACHINE DISCONNECT SWITCH IS IN "OFF" POSITION.

DANGER
PELIGRO
ALTO VOLTAJE PUEDE SER FATAL. NO ABRA HASTA QUE EL DISCONNECT ABRIR SE EN EL "OFF".

WARNING
HAUTE TENSION PEUT TUE LA HORA. NE PAS OUVRIR AUCUN ALIMENTATION HIGH POUR COUPEJET.

WARNING
VALENT BLOOD
HIGH PRESSURE AND DAMAGE CAN OCCUR IF THE TIRE IS NOT PROPERLY INFLATED.

WARNING
AIRLESS INFLATION
ADJUST PRESSURE BEFORE USE. SEE OWNERS MANUAL FOR RECOMMENDED PRESSURE.

WARNING
TIRE AND RIM FOR IRRIGATION USE ONLY.
ADJUST PRESSURE BEFORE USE.
SEE OWNERS MANUAL.
FOR RECOMMENDED PRESSURE.
18 PSI (1.2 BAR) MAXIMUM

WARNING
TIRE AND RIM FOR IRRIGATION USE ONLY.
ADJUST PRESSURE BEFORE USE.
SEE OWNERS MANUAL.
FOR RECOMMENDED PRESSURE.
23 PSI (1.6 BAR) MAXIMUM

WARNING
TIRE AND RIM FOR IRRIGATION USE ONLY.
ADJUST PRESSURE BEFORE USE.
SEE OWNERS MANUAL.
FOR RECOMMENDED PRESSURE.
30 PSI (2.1 BAR) MAXIMUM

WARNING
TIRE AND RIM FOR IRRIGATION USE ONLY.
ADJUST PRESSURE BEFORE USE.
SEE OWNERS MANUAL.
FOR RECOMMENDED PRESSURE.
34 PSI (2.3 BAR) MAXIMUM

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Do not touch rotating drive shaft or shield. Clothing or limbs may become entangled, resulting in severe injury. Do not service until machine is locked in the off position. Always replace drive shaft shield after servicing.

**WARNING**

Improper installation of this motor may result in fire, explosion, electrical shock or other personal injuries. Read operating instructions.

- Disconnect power before maintenance. Open all circuits before removing conduit box cover. Be sure motor is properly grounded per local and national codes.
- Do not place fingers or objects near openings.
- Do not use eye bolts or lifting hooks to lift anything except the product.

**DANGER**

Drive Shaft Starts Without Warning!

- Do not touch rotating drive shaft or shield. Clothing or limbs may become entangled, resulting in severe injury.
- Do not service until machine is locked in the off position.
- Always replace drive shaft shield after servicing.
The pages in this section provide a brief description of the Valley TouchPro control panel components and controls.

**Control Panel**
This Valley control panel uses a TouchPro module for executing operator commands. See Figure 23-1.

**Main Disconnect**
This switch disconnects all power to the machine except at the incoming (upper) terminals on the Main Disconnect Switch inside the control panel. The function of the disconnect is to turn the power ON or OFF. See Figure 23-1.

**Safety Override Switch**
The machine’s safety circuit can be overridden by depressing this switch in conjunction with the start button. See Figure 23-1.

![WARNING]

- NEVER DEPRESS THE SAFETY OVERRIDE SWITCH FOR LONGER THAN THREE SECONDS AT ANY TIME. USING THE SAFETY OVERRIDE CAN CAUSE SERIOUS STRUCTURAL DAMAGE. CALL YOUR LOCAL VALLEY DEALER, SHOULD YOUR MACHINE FAIL TO START.

**3-Second Delay Timer**
A three-second delay timer is standard equipment built into the circuitry of the control panel.

In the event of a momentary power loss or voltage drop, the machine will remain running if power returns within three seconds.

**Pump Restart Delay**
When the control panel also controls an irrigation pump that is set to automatically start, the irrigation pump must be protected from damage with a pump restart delay. The pump restart delay must be in the pump circuit between the irrigation machine control panel and the pump.

![CAUTION]

- TO REDUCE THE POSSIBILITY OF DAMAGE TO AN AUTOMATICALLY CONTROLLED ELECTRIC PUMP DUE TO A MOMENTARY POWER LOSS OF 3 SECONDS OR LESS, A PUMP RESTART DELAY IS REQUIRED IN THE PUMP CIRCUIT BETWEEN THE IRRIGATION MACHINE CONTROL PANEL AND THE PUMP.
Overview

Main Screen
The Main Screen is where you begin operating your irrigation machine, and where you learn its current status. Control buttons are located on the left side of the screen, and menu buttons are on the right. The center contains information about the machine's current status and other selected details. See Figure 24-1, which presents the default main screen.

The following pages describe the elements that can appear on the Main Screen.

Control Buttons
Up to eight control buttons can appear on the left side of the screen for programming and operating the machine. This section can also display the status of end guns, auxiliary inputs and the machine's hours per revolution. Below are descriptions of each available control button.

It is very important to understand that, except for the Start/Stop button, the control button indicates what the machine is currently doing. In Figure 24-1, the Forward button is displayed, indicating the machine's direction when it is moving. When you push that button to change direction, the Forward button becomes the Reverse button.

The Controls and Status fields can be customized and may look different than what is shown in Figure 24-1.

START / STOP Button - Item 1

START
Push to start the machine, assuming safety circuits are operating correctly.

STOP
Push to halt machine movement, shut pump off, and close water valve.

The machine has a time delay that prevents it from restarting when you press the Start button within five seconds after stopping it.

Forward / Reverse Button - Item 2

Forward
Machine movement is currently in the forward (clockwise) direction. Push to command movement in the reverse (counter-clockwise) direction.

Reverse
Machine movement is currently in the reverse (counter-clockwise) direction. Push to command movement in the forward (clockwise) direction.
Main Screen (Continued)
Control Buttons

Water ON/OFF Button - Item 3

Water ON
The pump and/or close water valve are currently on. Push to turn them off.

Water OFF
The pump and/or close water valve are currently off. Push to command pump to turn on, valve to open, or both, when machine starts.
A pre-programmed pressure switch delay is automatically recalled to allow sufficient time for pressure to build up in the machine.

Percent Timer Button - Item 4
Push to set the percent timer by entering the value on the numeric keypad.

Depth Button - Item 5
Push to set the desired water application depths in inches or millimeters, depending on the selected unit of measure, by entering the value on the numeric keypad.

Cruise Control Button - Item 6
Cruise Control Off
Cruise control is off. Push to turn on.

Cruise Control On
Cruise control is on. Push to turn off.

Hours per Pass
Push to set the number of hours to complete one pass.

Stop-In-Slot ON/OFF Button - Item 7
Stop-In-Slot ON
The stop-in-slot is ON and will stop the machine at a preset location in the field that is user selected. Push to turn stop-in-slot OFF.

End Gun/Wide Boundary #1 Buttons - Item 8

End Gun Enabled Not running
The end gun is currently enabled, but not running. If the end gun is disabled, the icon is not displayed. Push to open the end gun screen.

End Gun Running
The end gun is running between the user set start and stop angles.

Wide Boundary #1 Enabled Not running
Wide boundary #1 is currently enabled, but not running. If wide boundary #1 is disabled, the icon is not displayed. Push to open the wide boundary #1 screen.

Wide Boundary #1 Running
Wide boundary #1 is running between the user set start and stop angles.

Wide Boundary #2 and #3 Buttons

Wide Boundary #2 Enabled Not running
Wide boundary #2 is currently enabled, but not running. If wide boundary #2 is disabled, the icon is not displayed. Push to open the wide boundary #2 screen.

Wide Boundary #2 Running
Wide boundary #2 is running between the user set start and stop angles.

Wide Boundary #3 Not Running
Wide boundary #3 is currently enabled, but not running. If wide boundary #3 is disabled, the icon is not displayed. Push to open the wide boundary #3 screen.

Wide Boundary #3 Running
Wide boundary #3 is running between the user set start and stop angles.

Auto Restart ON/OFF Button
Auto Restart ON Button
The automatic restart feature is currently ON. Push to turn OFF.

Auto Restart OFF Button
The automatic restart feature is currently OFF. Push to turn ON.
### Main Screen ( Continued )

#### Control Buttons

<table>
<thead>
<tr>
<th>Button Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| **AR/AS ON/OFF Button**         | AR/AS is OFF  
The Auto Reverse/Auto Stop feature is currently OFF. Push to turn the Auto Stop feature ON. |
| **Auto Stop Button**            | Push to turn the Auto Reverse/Auto Stop feature OFF.                        |
| **Auto Reverse ON**             | The Auto Reverse feature is currently ON.  
Push to turn the Auto Reverse/Auto Stop feature OFF. |

#### Auxiliary Buttons

<table>
<thead>
<tr>
<th>Button Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auxiliary 1 Toggle Button</strong></td>
<td>Push to turn the Auxiliary ON or OFF.</td>
</tr>
<tr>
<td><strong>Auxiliary 2 Toggle Button</strong></td>
<td>Push to turn the Auxiliary ON or OFF.</td>
</tr>
<tr>
<td><strong>Digital Out 1 Toggle Button</strong></td>
<td>Push to turn the Digital Out ON or OFF.</td>
</tr>
<tr>
<td><strong>Digital Out 2 Toggle Button</strong></td>
<td>Push to turn the Digital Out ON or OFF.</td>
</tr>
<tr>
<td><strong>Relay Driver 1 Toggle Button</strong></td>
<td>Push to turn the Relay Driver ON or OFF.</td>
</tr>
<tr>
<td><strong>Relay Driver 2 Toggle Button</strong></td>
<td>Push to turn the Relay Driver ON or OFF.</td>
</tr>
</tbody>
</table>
Main Screen (Continued)

Current Machine Settings

Next to each control button is the machine's current setting for that feature. The setting changes automatically every time you push the corresponding button. A description of each setting in Figure 27-1 appears below.

Machine Status - Item 1
Indicates the current status of the irrigation machine, either Running, Stopped, or Waiting for water pressure.

Direction Setting - Item 2
Indicates the direction, either Forward (clockwise) or Reverse (counter-clockwise), in which the machine is set to move, or is moving.

Water Setting - Item 3
Indicates the current setting for applying water, either Water ON or Water OFF.

Percent Timer Setting - Item 4
Indicates the current pivot or linear percent timer setting.

Depth Setting - Item 5
Indicates the current depth setting in inches or millimeters, depending on the selected unit of measure.

Hours per Pass Setting - Item 6
Indicates the number of hours to complete one pass of the field, based on the percent timer setting.

Stop-In-Slot Setting - Item 7
Indicates the current Stop-In-Slot (SIS) setting.
- If the Stop-In-Slot is on, SIS ON and the position where the machine will stop (in degrees) appears.
- If the Stop-In-Slot is off, SIS OFF appears.

Auto Restart Setting - Item 8
Indicates the current setting for restarting the machine automatically, either Auto Restart ON or Auto Restart OFF.

End Gun/Wide Boundary #1 Setting - Item 9
Indicates the current End Gun and Wide Boundary #1 settings, either ON or OFF.

AR/AS Disable, Auto Stop, Auto Reverse Setting
Indicates the current setting for ARAS, either Disabled, Auto Stop ON or Auto Reverse ON.

AUX 1 and 2 Setting
Indicates the current Aux 1 and 2 settings, either ON or OFF.

Wide Boundary #2 and #3 Setting
Indicates the current Wide Boundary #2 and #3 settings, either ON or OFF.
Overview

Main Screen (Continued)

Status Section

Up to six statuses can appear below the machine’s name in the center portion of the screen. Below the statuses is a graph depicting the machine’s current position. A description of each field and all the statuses appear below.

NOTE: This Status section illustrates the operating conditions of a typical irrigation machine example. The Status section of your machine will show different conditions.

Figure 28-3

Machine Name - Item 1
Displays the name associated with the machine.

Restart Notice - Item 2
Indicates whether the machine will restart.

Program Notice - Item 3
Indicates whether any program is running.

Alarms Notice - Item 4
Indicates whether any errors or system faults are present.

Error Notice - Item 5
Indicates whether any errors occurred. You can access the Error Codes screen by pushing the icon.

Voltage - Item 6
Indicates current operating voltage. The machine shuts down when voltage drops below the Low Voltage Limit.

Pressure - Item 7
Indicates the current water pressure at the pressure transducer, in pounds per square inch (psi).

Position - Item 8
Indicates the machine location in the field. The location of the machine is expressed in degrees.

Wind - Item 9
Indicates the speed of the wind expressed in miles per hour. Requires optional hardware.

Field Position - Item 10
Graphic yellow line indicates the machine location in the field.

Pivot Circle Status - Item 11
Displays a color and shape to represent the current known status of the machine.

Fault Notice - Item 12
Indicates whether any system faults have occurred. You can access the System Faults screen by pushing the icon.

Other Statuses

The following statuses can also appear in the Main Screen. Below is a description of each status.

Temp
Indicates the current outdoor temperature. Requires optional hardware.

Wet Hours
Indicates the number of hours that the machine was irrigating while in motion.

Flow Meter
Indicates the amount of water, in gallons per minute, that the machine uses to irrigate. Requires optional hardware.

Total Hours
Indicates the total number of hours that the machine was in motion.
Main Screen (Continued)

Menu Buttons

The menu buttons are located on the right side of the screen. These buttons are used to program the panel, view data and select options not frequently used. Below are descriptions of each button.

System (A) - Item 1

Used to input the constant values of the irrigation machine, reset other values and view machine operating data.

Setup (F) - Item 2

Used to input the constant values of the irrigation machine, reset other values and view machine operating data.

Program (G) - Item 3

Use to either write or run programs that execute commands in the future, based upon conditions such as date/time and position in the field.

Options (H) - Item 4

Use to control options not frequently used by the operator.

Diagnostics (I) - Item 5

Used to assist the operator in determining the cause of an unplanned machine shutdown or potential problem situation.

Notes (E) - Item 6

Used to view and enter notes. Push the Notes field to display a keyboard.

Main Screen (J) - Item 7

Push this button at any time to return to the Main Screen.

Time - Item 8

Displays the current time. This is not a button.

Home - Item 9

Used to input the values of the Display. Push this button again to return to the previous screen.

Start - Item 10

Used to reprogram the device or input the values of the Display. Push this button again to return to the previous screen.
Main Screen (Continued)

Numeric Keypad

The numeric keypad is used to input values such as percentage timer setting, water application depth, SIS setting, etc. and is also used for programming the panel. The functions of these buttons are explained below:

Keypad Number Buttons - Item 1
Used to input numerical values and select programming options.

Backspace - Item 2
Use to back space and delete the previous number or symbol.

Decimal Point - Item 3
Used when inputting numerical values in decimal form. Example: 1.75 in (44.45 mm).

Plus/Minus Sign - Item 4
Use to input positive or negative values (generally not used, except for entering GPS position values).

Escape - Item 5
Use to step backward from the current screen to a previous screen without performing any changes.

Enter - Item 6
Use at the end of a numerical value entry or programming sequence.
### Main Screen (Continued)

#### Pivot Circle Colors and Shapes

The table below shows a list of all the colors and shapes the Main Screen uses to represent the current known status of the machine.

<table>
<thead>
<tr>
<th>STATUS</th>
<th>COLOR AND SHAPE</th>
<th>GRAPHIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pivot is stopped.</td>
<td>Gray circle.</td>
<td><img src="image" alt="Gray Circle" /></td>
</tr>
<tr>
<td>Pivot is waiting</td>
<td>Dark Cyan circle.</td>
<td><img src="image" alt="Dark Cyan Circle" /></td>
</tr>
<tr>
<td>Pivot is running dry.</td>
<td>Green circle.</td>
<td><img src="image" alt="Green Circle" /></td>
</tr>
<tr>
<td>Pivot is running dry, with Auxiliary 1 ON.</td>
<td>Gold circle.</td>
<td><img src="image" alt="Gold Circle" /></td>
</tr>
<tr>
<td>Pivot is running wet.</td>
<td>Blue circle.</td>
<td><img src="image" alt="Blue Circle" /></td>
</tr>
<tr>
<td>Pivot is running wet, with Auxiliary 1 ON.</td>
<td>Cyan circle.</td>
<td><img src="image" alt="Cyan Circle" /></td>
</tr>
<tr>
<td>Stop In Slot is ON.</td>
<td>A red line appears in the stop in slot location.</td>
<td><img src="image" alt="Red Line" /></td>
</tr>
<tr>
<td>Pivot representation and position in the field.</td>
<td>A yellow line represents the pivot and it's position in the field.</td>
<td><img src="image" alt="Yellow Line" /></td>
</tr>
<tr>
<td>Pivot is running in forward.</td>
<td>A black arrow is displayed pointing in the forward direction.</td>
<td><img src="image" alt="Black Arrow Forward" /></td>
</tr>
<tr>
<td>Pivot is running in reverse.</td>
<td>A black arrow is displayed pointing in the reverse direction.</td>
<td><img src="image" alt="Black Arrow Reverse" /></td>
</tr>
<tr>
<td>System Fault</td>
<td>Red circle centered on pivot.</td>
<td><img src="image" alt="Red Circle" /></td>
</tr>
</tbody>
</table>
Control Panel Setup

Set up the control panel for use by completing the Minimum Control Panel Setup.

Reference tables are included in this section for Voltage, Low Voltage, Estimated Drive Speed and GPS Angular Conversion of minutes and seconds into decimal degrees.

Listed below are the setup and reference table locations.

**Control Panel Setup**

- Main Screen Setup ........................................................................................................................................... 35
- Minimum Control Panel Setup .......................................................................................................................... 37
  - Set GPS Position and Fallback Run Time Manual Method (Machines With GPS)........................................... 39
  - Set Up GPS Position Loss.......................................................................................................................... 41
  - Test GPS Position........................................................................................................................................ 42
- Voltage.............................................................................................................................................................. 43
- Low Voltage ...................................................................................................................................................... 43
- Estimated Drive Unit Speed Table .................................................................................................................... 43
- GPS Angular Conversion Table ........................................................................................................................ 44
- Angular Degree Examples................................................................................................................................ 44
- System Constants Record................................................................................................................................ 45

If desired, control panel settings can be recorded on the System Constants Record at the end of this section.
Control Panel Setup
Main Screen Setup

Use the Main Screen Setup screen to do the following:

• Configure the pivot and enable it for part circle, and add the pivot road.

• Select the control buttons and statuses that you want to display, in the order you want.

The steps below explain how to set up the Main Screen:

1. Go to the Main Screen Setup screen:
   
   (a) Push the **Main** button (J).
   
   (b) Push the **Setup** button (F) on the Main Screen.
   
   (c) Push the **Main Screen Setup** button (F) on the Setup Screen.

2. On the Field screen, name the field, add the pivot road, and enable or disable the part circle. See Figure 35-1.
   
   (a) Select the **Pivot Name** field and enter the name using the keyboard. See Figure 35-2.
   
   (b) If desired, check the **Pivot Road** checkbox, and enter its position, in degrees, on the field using the numeric keypad. See Figure 35-3.
   
   (c) If this is a part circle field, check the **Part Circle** checkbox to enable it. Enter the angles in the **Start Angle** and **End Angle** fields using the numeric keypad. See Figure 35-3.

   An empty **Part Circle** checkbox indicates a full circle pivot field.

**NOTE**

• When Part Circle is enabled, you are creating a graphical representation of the pivot field. The control panel does NOT prevent the system from running outside the designated zone. It also does NOT stop the system at the start angle or end angle.
Control Panel Setup

Main Screen Setup (Continued)

3. Push the Status tab to select up to six statuses on the Main screen.
   
   (a) Select a Line field and choose a status from the drop-down menu. Choose Empty if you want to leave the field blank. See Figure 36-1.

4. Push the Control tab to select up to eight buttons or three statuses:
   
   (a) Select a button field and choose a button or status from the drop-down list. Choose Empty if you want to leave the field blank. See Figure 36-2.
Minimum Control Panel Setup
To set up the control panel for use with standard positioning or GPS positioning, do the following.

1. Push the Home button.

2. On the Display - Main screen, push the Global (G) button to display the Display - Settings screen.

3. Push the Regional tab to set the Language and Unit of Measure. See Figure 37-1.
   (a) Select the Language field and choose the language from the drop-down menu.
   (b) Select the Units field and choose Imperial/US or Metric as the unit of measure.

4. Push the Time/Date tab to set the Current Date and Time. See Figure 37-2.
   (a) Select the Date fields and choose the month, day, and year from their respective drop-down lists.
   (b) Select the Date Format field and choose from the drop-down list how to display the date.
   (c) Select the Time fields and enter the hour and minutes on the numeric keypad. Push to select AM or PM.
   (d) Optional, check the 24 Hour Clock checkbox to display time in the 24-hour format.
   (e) Optional, check the Daylight Savings Time checkbox to display the Daylight Savings Time for the selected region.

5. Go to the Constants screen to set the pivot minimum application, time per revolution, and voltage. See Figure 37-3.
   (a) Push the Home button to return to the Main screen.
   (b) Push the Setup (F) button.
   (c) Push the Constants (G) button.
   (d) Select the Minimum Application field and enter the rate on the numeric keypad. Refer to the VChart Report for this machine.
   (e) Select the Hours Per Revolution field and enter the number on the keypad. Refer to the VChart Report for this machine.
   (f) Select the Low Voltage field and enter the limit number on the keypad, if it’s lower than 440 volts. Refer to the Low Voltage section for more information.
   (g) Push the Calibrate button and enter the voltage number on the keypad. Refer to the Voltage section for more information.
Control Panel Setup

Minimum Control Panel Setup (Continued)

6. Go to the Pump screen to calibrate the pressure sensor.
   (a) Select the Pressure Sensor field and choose the type of
       pressure sensor from the drop-down list. See Figure 38-1.
   (b) With the pump OFF and the machine dry, push the Cali-
       brate button on the Pump screen to set the water pres-
       sure sensor to the current water pressure of zero. See
       Figure 38-1.

7. Program the position-related control panel settings based on
   how the machine is equipped:
   • If the machine is NOT equipped with GPS Position, go to
     the Position screen. Push the Calibrate button and enter the
     position on the numeric keypad. See Figure 38-2.
     » Minimum control panel setup is now complete.
   • If the machine is equipped with GPS Position, use SET
     GPS POSITION AND FALLBACK RUN TIME MANUAL
     METHOD on the next page and set the pivot point posi-
     tion and fallback run time to complete the minimum control
     panel setup for a machine with GPS Position.
Minimum Control Panel Setup (Continued)
Set GPS Position and Fallback Run Time Manual Method (Machines With GPS)

To setup the GPS position type, do the following:

- Obtain the last tower speed and pivot length information from the VChart report for this machine or measure the span length from pivot to last regular drive unit, excluding the overhang, and use the Estimated Drive Unit Speed chart in this section.
- Use a handheld GPS receiver to obtain the GPS coordinates for the Pivot Point position.
- If necessary, use the GPS Angular Conversion chart in this section to convert the GPS coordinate values into decimals of degree.

1. Set the Y-DB9 Communications Port protocol:
   (a) From the Main screen, push **Setup (F)** and then **Comm Port (H)**.
   (b) Select the **Y-DB9** field and choose **PLC** from the drop-down list. See Figure 39-1.
   (c) Select the **Baud Rate** field and choose **4800 bps** from the drop-down list.
   (d) Select the **PLC** tab.
   (e) Check the **GPSV2** checkbox. See Figure 39-2.
   (f) Enter the **PLC ID** for the GPS tower box.

2. Go to the Position screen. See Figure 37-3.
   (a) From the Main screen push **Setup (F)** and then **Constants (G)**.
   (b) Select the **Position** tab on the Constants screen.

3. Set the Pivot Point GPS position:
   NOTE:
   - Latitude and Longitude positions displayed on a handheld GPS receiver are usually displayed as North, South, East or West.
   - The direction displayed affects how the position is entered into the control panel.
   - If the position is shown as West or South the position MUST be entered as a Negative Degree.
   - In North America, latitude positions are always positive, and longitude positions are always negative.
   (a) Select the **Lat** field and enter the latitude on the numeric keypad.
   (b) Select the **Lon** field and enter the longitude on the numeric keypad.
Control Panel Setup

Minimum Control Panel Setup (Continued)

Set the Distance to GPS (The distance from pivot point to GPS tower box).

Referring to Figure 40-1, in the Length to GPS fields (Item 1):

1. Select the **Length to GPS (ft)** field and enter the length from the pivot point to the GPS receiver. (Item 1) Do not enter the pivot length. The default is 1320 ft (402.3 m), and the range is 10 to 6554 ft (3.0 to 1997.6 m).

2. Select the **Plus Tolerance** field and enter the Plus Tolerance for the length from pivot point to GPS receiver (Item 3). The Default is 50 ft (15.2 m) and the range is 10 to 6554 ft (3.0 to 1997.6 m). A setting of 50 ft (15.2 m) or more is recommended to allow for variation in the GPS signal if Wide Area Application Services (WAAS) is unavailable. Refer to Figure 40-7.

3. Select the **Minus Tolerance** field and enter the Minus tolerance for the length from pivot point to GPS receiver (Item 4). The Default is 50 ft (15.2 m) and the range is 10 to 6554 ft (3.0 to 1997.6 m). A setting of 50 ft (15.2 m) or more is recommended to allow for variation in the GPS signal if WAAS is unavailable.

Minimum Control Panel Setup (Continued)

Set Up GPS Position Loss

In the event of GPS Position Loss, three different position loss functions can be used independently, or with each other, to control the machine operation. Listed below are the functions and their default settings.

- **Shutdown System**: When checked, shuts the system down if the GPS position is lost for a specified period of time. The default setting is unchecked with a 20-minute delay.
- **Disable Endguns**: When checked, disables the endguns if the GPS position is lost for a specified period of time. The default setting is unchecked with a 10-minute delay.
- **Fallback Position**: When checked, if the GPS position is lost, the position is calculated using Runtime or Resolver until the GPS position is re-acquired. The default setting is unchecked with Runtime.

To access these functions, follow the steps below.

1. Push the **Setup** button (F) on the Main screen.
2. Push the **Constants** button (G) on the Setup screen.
3. Push the **Position** tab on the Constants screen.

**Shutdown System**

To set up a shutdown of the system, do the following:

1. On the Position tab, check the **Shutdown System** checkbox. See Figure 41-1.
2. Select the **Shutdown System Delay Time** field and enter the number of minutes (1 to 255) on the numeric keypad. The default is 20 minutes.

**Disable Endguns**

To set up the disabling of endguns, do the following.

1. On the Position tab, check the **Disable Endgun** checkbox. See Figure 41-1.
2. Select the **Disable Endguns Delay Time** field and enter the number of minutes (1 to 255) on the numeric keypad. The default is 10 minutes.

**Fallback Position**

To set up the fallback position, do the following.

1. On the Position tab, check the **Fallback Position** checkbox. See Figure 41-1.
2. Select either Runtime or Resolver from the **Position Calculation Mode** drop-down menu. The default is Runtime. Resolver is not recommended.

When Runtime is selected, do the following:

(a) Select the **Pivot Speed** field and enter the speed on the numeric keypad. The default is 15.56 ft/min.

(b) Select the **Pivot Length** field and enter the length on the numeric keypad. The default is 1320 ft.
Minimun Control Panel Setup (Continued)

Test GPS Position

If the machine is equipped with GPS Position, do the following to verify that GPS Position is working.

1. Go to the Position screen.
   (a) Push the Setup button (F) on the Main screen.
   (b) Push the Constants button (G) on the Setup screen.
   (c) Push the Position tab on the Constants screen.

2. When GPS Position is working, the Position screen displays the fields listed below. See Figure 42-1.
   - Current GPS Position:
     » Count – the number of satellites in view
     » Sat Lock – the satellite signal (None, Standard, DGPS, and No GPS) onto which the GPS receiver is locked
       » Lat – the current latitude
       » Lon – the current longitude
   - Pivot Point GPS Position – the current position (latitude and longitude) of the machine’s pivot point
   - In Event of GPS Signal Loss:
     » Shutdown System – a position loss function that shuts the system down
     » Disable Endguns – a position loss function that disables the endguns
     » Fallback Position – a position loss function that calculates the position until the GPS position is re-acquired
       » Pivot Speed – the pivot's current speed (ft/min)
       » Pivot Length – the pivot's current length (ft)

When the GPS Position is lost No GPS is displayed in the Sat Lock field.

3. Run the machine in either direction to verify that the position displayed on the Status screen changes periodically as the machine moves.
   - If GPS position is not working, refer to the Troubleshooting section of this manual or call your local Valley Dealer.
   - If GPS position is working, the installation is complete.
Voltage

The Voltage constant calibrates the volt meter with the actual voltage coming into the control panel so that the voltage fluctuations can be monitored correctly.

The incoming voltage to the control panel must be measured with a meter by a qualified electrician or service person. This value is entered as the voltage constant.

The supply voltage should never exceed the limits shown in the Maximum Supply Voltage chart. Refer to Figure 43-1.

Low Voltage

The Low Voltage constant is used to set the low voltage limit. The low voltage limit factory default setting is 440 volts for use with a supply voltage of 480 VAC @ 60Hz. Recommended low voltage limits for other supply voltages are shown in the Recommended Low Voltage chart. Refer to Figure 43-2.

If the control panel voltmeter senses voltage below the low voltage limit, a built-in timer keeps the machine running for up to 15 seconds to prevent nuisance shutdowns due to voltage fluctuations.

If the low voltage condition still exists after 15 seconds, the machine will be shut down and the diagnostics screen will display a fault for machine power.

CAUTION

• DO NOT SET LOW VOLTAGE LOWER THAN THE RECOMMENDED LOW VOLTAGE LIMIT.
• LOW VOLTAGE WILL DAMAGE THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS. CORRECT THE PROBLEM BEFORE RESUMING OPERATION

Estimated Drive Unit Speed Table

Use this table to estimate the Intermediate Drive Unit and End Drive Unit speed based on the drive unit motor output RPM, tire size, and machine voltage. Refer to Figure 43-3.
GPS Angular Conversion Table

Use the GPS Angular Conversion table to convert the GPS angular degrees from minutes and seconds to decimal degrees when manually setting up the GPS coordinates in the Pro2 control panel. Refer to Figure 44-1.

<table>
<thead>
<tr>
<th>Minutes into Decimals of a Degree</th>
<th>Seconds into Decimals of a Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0167</td>
</tr>
<tr>
<td>2</td>
<td>0.0333</td>
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<tr>
<td>3</td>
<td>0.0500</td>
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<td>4</td>
<td>0.0667</td>
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<td>5</td>
<td>0.0833</td>
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<tr>
<td>6</td>
<td>0.1000</td>
</tr>
<tr>
<td>7</td>
<td>0.1167</td>
</tr>
<tr>
<td>8</td>
<td>0.1333</td>
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<tr>
<td>9</td>
<td>0.1500</td>
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<tr>
<td>10</td>
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<td>16</td>
<td>0.2667</td>
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<td>18</td>
<td>0.3000</td>
</tr>
<tr>
<td>19</td>
<td>0.3167</td>
</tr>
<tr>
<td>20</td>
<td>0.3333</td>
</tr>
</tbody>
</table>

Figure 44-1 GPS Angular Conversion Table

Angular Degree Examples

An angular degree in degrees, minutes, seconds will look like the following examples:

- **10° 11´ 37”, reads as 10 degrees, 11 minutes, 37 seconds.**
  - (a) Convert minutes and seconds to a decimal degree value using the table in Figure 44-1.
    - 11 minutes = 0.1833 degrees
    - 37 seconds = 0.0103 degrees.
  - (b) Add all decimal degree values together.
    - 10 degrees = 10.0000 degrees
    - 11 minutes = 0.1833 degrees
    - 37 seconds = 0.0103 degrees
    - 10° 11´ 37” = 10.1936 degrees

- **12° 5.245´, read as 12 degrees, 5.245 minutes.**
  - (a) Convert decimals of a minute to decimal degrees using the table in 44-1 and multiply the decimal of a minute by 0.0167.
    - 5 minutes = 0.0833 degrees
    - 0.245 minutes = 0.0833 × 0.0167 = 0.0014 degrees
  - (b) Add all decimal degree values together.
    - 12 degrees = 12.0000 degrees
    - 5 minutes = 0.0833 degrees
    - 0.245 minutes = 0.0014 degrees
    - 12° 5.245´ = 12.0841 degrees
### System Constants Record

Enter system constants as needed. If desired, fill in the form below with the applicable constants for this machine.

<table>
<thead>
<tr>
<th>Constants</th>
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</thead>
<tbody>
<tr>
<td><strong>SIS</strong></td>
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<tr>
<td>Stop-In-Slot Position</td>
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<td><strong>End Gun</strong></td>
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<tr>
<td>Sequence</td>
<td>Left Angle</td>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
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<td>Pivot Point</td>
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<td>Latitude</td>
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<td>Longitude</td>
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<tr>
<td>Position Loss</td>
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<td>Distance to GPS</td>
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<tr>
<td>Plus</td>
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<td>Minus</td>
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<td>Startup Pressure Delay in Seconds</td>
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<td>Operating Pressure Delay in Seconds</td>
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<td>Flowmeter Pulse Rate</td>
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<td>Daily On/Off</td>
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<tr>
<td>On or Off</td>
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<td>Mode</td>
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<td>Stop Time</td>
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<td>Cycle Start Time</td>
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## Control Panel Setup

### Constants

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<td>Percent Timer</td>
<td>Cycle in Seconds</td>
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<td>COM Port</td>
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<td>Control</td>
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<td>Callout Tries</td>
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<td>Radio Hop On or Off</td>
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<td>Intermediate Unit ID</td>
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<td>Cruise Control</td>
<td>Max % Change of Speed</td>
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<td>Field Size in Degrees</td>
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<td>VRI Zone</td>
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</tr>
<tr>
<td></td>
<td>Minimum Flow Rate</td>
</tr>
<tr>
<td></td>
<td>Maximum Pressure</td>
</tr>
<tr>
<td></td>
<td># of Sprinkler Banks</td>
</tr>
<tr>
<td>Tire Pres</td>
<td>Warning Pressure Drop</td>
</tr>
<tr>
<td></td>
<td>Shutdown Pressure Drop</td>
</tr>
<tr>
<td>End Pres</td>
<td>TPMS ID</td>
</tr>
<tr>
<td></td>
<td>Sensor ID</td>
</tr>
</tbody>
</table>
## Constants

<table>
<thead>
<tr>
<th>Watering Timer</th>
<th>Watering Timer</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Overwater</td>
<td>% Overwater</td>
</tr>
<tr>
<td>Shutdown</td>
<td>Shutdown</td>
</tr>
<tr>
<td>% Underwater</td>
<td>% Underwater</td>
</tr>
<tr>
<td>Error</td>
<td>Error</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Temperature</td>
</tr>
<tr>
<td>Shutdown</td>
<td>Shutdown</td>
</tr>
<tr>
<td>Low Temp</td>
<td>Low Temp</td>
</tr>
<tr>
<td>Limit</td>
<td>Limit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rain</th>
<th>Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Shutdown</td>
<td>Rain Shutdown</td>
</tr>
<tr>
<td>Rain Limit</td>
<td>Rain Limit</td>
</tr>
<tr>
<td>Rain Window</td>
<td>Rain Window</td>
</tr>
</tbody>
</table>
Control Panel Setup
Before Running the Machine
Before running the machine (either with or without water) do the following.

1. ALWAYS make sure vehicles, other equipment, livestock, and persons are clear of the machine before operating.
2. Turn the control panel main disconnect switch to the ON position. If the power is supplied by an engine driven generator, adjust the RPM of the generator until the voltmeter reads 460 – 505 volts. DO NOT EXCEED 505 VOLTS.

Run the Machine Wet (With Water)
3. Press the button on the Main screen to turn the water ON. See Figure 49-1.
4. Select the direction of travel by pressing the Forward or Reverse button.
5. Set the water application by pressing or .
   - Use to set water application by inches (mm) of water.
   - Use to set water application by percent timer setting.
6. Use the numeric keypad to enter the depth of water in inches (mm), or the percent timer setting.
   - Press (Enter) to retain the value.
7. Press to Start the machine.
8. Press to Stop the machine.

Run the Machine Dry (Without Water)
3. Press the button on the Main screen to turn the water OFF. See Figure 49-1.
4. Select the direction of travel by pressing the Forward or Reverse button.
5. Set the speed of travel by pressing .
6. Use the numeric keypad to enter the percent timer setting.
   - Press (Enter) to retain the value.
7. Press to start the machine.
8. Press to stop the machine.
Stopping The Machine
Emergency Stopping
To stop the machine in an emergency situation, shut off any one of the following. See Figure 50-1.

- Main Service Disconnect Switch from public power to the control panel. (Item 1)
- Control Panel Main Disconnect Switch. (Item 2)
- Any Tower Box Disconnect Switch. (Item 3)

Stopping Under Normal Conditions
1. Push the Stop button. See Figure 50-2.
2. Turn the main disconnect switch to the OFF position. See Figure 50-3.
3. Turn the pumping unit OFF (if not automatic).
4. If an engine generator set is used, move the Engine Run/Start switch to the Start position for the next start-up sequence.

⚠️ WARNING
• DO NOT SHUT THE MACHINE OFF BY SLOWLY IDLING DOWN THE ENGINE GENERATOR SET. THIS PRACTICE CAUSES LOW VOLTAGE AND WILL DAMAGE MACHINE COMPONENTS.
• ALWAYS STOP THE IRRIGATION MACHINE PRIOR TO SHUTTING DOWN THE ENGINE-GENERATOR SET.
Diagnostics

The Diagnostics section provides an overview of using the diagnostic features incorporated into the control panel. Diagnostics aid in identifying machine failures, troubleshooting and correcting problems. Push the Diagnostics button (I) to view the screen. See Figure 51-1.

System Faults

System Faults are failures that shut the machine down. Any item showing FAULT on the System Faults screen has caused the machine to shut down. The faults that can be indicated on the System Fault screen are shown in Figure 51-2. Refer to the Troubleshooting section for possible causes and corrective actions.

Faults and Definitions

<table>
<thead>
<tr>
<th>Fault</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM POWER FAULT</td>
<td>Voltage has fallen below the low voltage limit for more than 15 seconds, or power was lost while the machine was running.</td>
</tr>
<tr>
<td>SYSTEM SAFETY FAULT</td>
<td>Caused by a break in the safety return circuit that lasted longer than three seconds.</td>
</tr>
<tr>
<td>LOW PRESSURE FAULT</td>
<td>The pressure fell below the low pressure limit, or the pressure delay is not a sufficient amount of time to build pressure in the machine after it is started.</td>
</tr>
<tr>
<td>HIGH PRESSURE FAULT</td>
<td>With VRI-Zon on, the pressure went above the high pressure limit for more than three seconds.</td>
</tr>
<tr>
<td>WATER TIMER FAULT</td>
<td>The machine shut down because it was moving too slowly, thereby applying too much water.</td>
</tr>
</tbody>
</table>
| COMMAND FAULT          | The machine was commanded to stop by one of the following:
                          1) The STOP button was pressed.
                          2) An Autostop condition occurred at the end-of-field stop.
                          3) A programmed STOP command was executed. |
| STOP-IN-SLOT (SIS) FAULT| The machine was shut down by Stop-In-Slot.                                  |
| PROGRAM FAULT          | The machine was shut down because a Step program stopped the system.        |
| AUTOSTOP FAULT         | An auto stop condition occurred at the end-of-field stop.                   |
| BBRAM FAULT            | An attempt was made to start the machine when error E01 was displayed on the status screen. |
| FLOW FAULT             | With VRI-Z on, the flow rate has fallen below the amount set in the FLOWMETER GAL/PULSE field. |
| FOR/REV FAULT          | Both the forward and reverse sensor relays were on for more than 15 seconds while the system was running or waiting. |
| TIRE PRES FAULT        | While the system was running or waiting, two consecutive error messages from a particular tire were received. |
| WIND FAULT             | The machine shut down because the wind speed reached the high wind limit. The wind speed indicator is an option. WIND is only displayed on the System Faults screen when WIND is turned ON. |
| TEMPERATURE FAULT      | The machine shut down because the temperature fell below the low temperature limit. |
| RAIN FAULT             | The machine shut down because the rain limit was exceeded in the rain window time period. |
| DAILY OPS FAULT        | The Daily Operations program shut the machine down because it is not allowed to run between a certain time period. DAILY OPS is only displayed on the System Faults screen when Daily Ops is turned ON. |
| NO ACK FAULT           | No acknowledgement was received from a communication device while the machine was running. Notice must be ON with No Ack set to SHUT DOWN. |
| RELAY COM FAULT        | There is a hardware or software communication problem between the TouchPro module and the electrical relay board within the control panel. |
| GPS COM FAULT          | When GPS is selected as a protocol, and the system shut down due to no communication with GPS for a user-specified time when shutdown of GPS signal loss is ON while system was running or waiting. |
| GPS LOCK FAULT         | When GPS is selected as a protocol, and the system shut down due to GPS signal loss for a user-specified time when shutdown of GPS signal loss is ON while the system is running or waiting. |
| BOUNDARY FAULT         | The machine shut down because it traveled beyond the forward or reverse position limits. |
Diagnostics

Viewing System Faults

Push the Fault Notice icon or the Diag, Faults button, then the System Faults tab to display the System Faults screen. See Figures 52-1 and 52-2.

When a recognized fault causes the machine to shut down, the Fault Notice icon is displayed on the pivot and “Fault” is displayed on the System Faults screen next to the item responsible for the shut down.

The fault and fault notice icon are automatically cleared the next time the machine runs successfully.

Error Codes

Error Codes are failures that may or may not shut the machine down. If one or more failures occur, the Error Notice icon appears on the Main screen. See Figure 52-2.

Refer to the Troubleshooting section for possible causes and corrective actions.

NOTE

• Viewing the Error Codes screen clears the Error Notice icon from the Main screen.

Viewing and Clearing an Error Code

Push the Error Notice icon or the Diag, Faults button, then the Error codes tab to display the Error Codes screen. See Figures 52-3 and 52-4.

Do the following to view and clear error codes:

1. Push the Error Notice icon to display the Error Codes screen. See Figure 52-3.
2. Push the Prev and Next buttons to view all of the error codes. Viewing an error code clears the Error Notice icon from the Main screen. See Figure 52-4.
**Error Codes**

A list of possible error codes is shown in the table below. Refer to the Troubleshooting section for possible causes and corrective action.

<table>
<thead>
<tr>
<th>ERROR CODES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E01</td>
<td>BBRAM - CHECKSUM FAILED AT POWER UP</td>
</tr>
<tr>
<td>E02</td>
<td>EEPROM - CHECKSUM FAILED AT POWER UP</td>
</tr>
<tr>
<td>E03</td>
<td>UNIT RESETS - THIS IS LOGGED WHEN THE SOFTWARE RESETS</td>
</tr>
<tr>
<td>E04</td>
<td>POWER DROP - POWER DROPPED BELOW LOW THE VOLTAGE LIMIT</td>
</tr>
<tr>
<td>E05</td>
<td>SYSTEM SAFETY - POSSIBLE TOWER MISALIGNMENT... OR DRIVE UNIT MAY BE STUCK</td>
</tr>
<tr>
<td>E06</td>
<td>PUMP SAFETY - PRESSURE TOO LOW AFTER PRESSURE DELAY</td>
</tr>
<tr>
<td>E07</td>
<td>PRESSURE SENSOR - OUT OF RANGE HIGH... CHECK CONNECTION</td>
</tr>
<tr>
<td>E08</td>
<td>PRESSURE SENSOR - OUT OF RANGE LOW... CHECK CONNECTION</td>
</tr>
<tr>
<td>E09</td>
<td>PRESSURE SENSOR - PRESSURE HIGH WITH PUMP OFF... CHECK CONNECTION</td>
</tr>
<tr>
<td>E10</td>
<td>PRESSURE SENSOR - MECHANICAL SWITCH COULD BE STUCK</td>
</tr>
<tr>
<td>E11</td>
<td>RESOLVER - ANGLE JUMPING AROUND... LUBE SWIVEL, ADJUST J-PIPE PACKING</td>
</tr>
<tr>
<td>E12</td>
<td>RESOLVER - OUT OF RANGE HIGH... CHECK FOR LOOSE OR SHORTED WIRES</td>
</tr>
<tr>
<td>E13</td>
<td>KEYPAD - POSSIBLE KEY STUCK... CHECK KEYPAD CONNECTION</td>
</tr>
<tr>
<td>E14</td>
<td>FWD/REV SENSE - POSSIBLE SHORT... CHECK WIRING</td>
</tr>
<tr>
<td>E15</td>
<td>UNDERWATER ERROR - CHECK FOR INDUCED VOLTAGES AND % TIMER CONNECTIONS</td>
</tr>
<tr>
<td>E16</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>E17</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>E18</td>
<td>GPS COMMUNICATION ERROR... CHECK GPS COMMUNICATION AND POWER</td>
</tr>
<tr>
<td>E19</td>
<td>GPS SIGNAL LOSS... CHECK FOR CLEAR PATH ABOVE ANTENNA</td>
</tr>
<tr>
<td>E20</td>
<td>DGPS SIGNAL LOSS... CHECK FOR CLEAR PATH ABOVE ANTENNA</td>
</tr>
<tr>
<td>E21</td>
<td>LOW FLOW</td>
</tr>
<tr>
<td>E22</td>
<td>HIGH PRESSURE</td>
</tr>
<tr>
<td>E23</td>
<td>PLC COMMUNICATIONS ERROR, (GPS V2 and VRI Zone Only)</td>
</tr>
<tr>
<td>E24</td>
<td>RESYNC VALVE DUTY CYCLE DUE TO PRESSURE</td>
</tr>
<tr>
<td>E25</td>
<td>GPS COORDINATES OUT OF RANGE... CHECK DISTANCE TO GPS OR FOR CROSSTALK</td>
</tr>
<tr>
<td>E26</td>
<td>LOW TIRE PRESSURE</td>
</tr>
<tr>
<td>E27</td>
<td>TPMS COMMUNICATIONS ERROR</td>
</tr>
</tbody>
</table>
Diagnostics

Error Logs
For each error code there is an error log. When an error occurs, information about the error, including the first time and date that the error occurred, last time and date that the error occurred, and total count of all times that the error occurred, is recorded in the error log. See Figure 54-1.

Viewing an Error Log
To view an Error Log, push the Error Codes tab on the Diagnostics screen. See Figure 54-1.

There are several ways to access the desired error log.

• Push the Previous button to search backward through the Error Logs.

NOTE
• Viewing the Error Codes screen clears the Error Notice icon from the Main Screen.

• Push the Next button to search forward through the Error Logs.

• Push the Error Code field and select the error from the drop-down list.

Push the Main button (J) to return to the Main Screen.

Resetting an Error Log to Zero
To reset an Error Log to zero, on the Error Codes tab select the Error Code field, choose the error code and push the Reset button. The count is reset to zero, and the first and last error occurrences are set to the current time and date. See Figure 54-1.
Review History

Review History screens provide a record of the 99 most recent machine operation status changes via the Review History Standard and Review History Advanced screens. Refer to Figures 55-1 and 55-2.

The history record number is in the upper left hand corner. Number 01 is the newest status change and number 99 is the oldest status change.

When the maximum number of 99 records exist in the control panel memory, any new status change is added as record number 01 and the oldest record is discarded. Refer to Figure 55-1.

Viewing a History Record

1. To view a History Record, push the Review History Standard button on the Diagnostics screen. See Figure 55-1.

2. There are several ways to access the desired history record:
   - Push the Previous button to search backward through the History Records.
   - Push the Next button to search forward through the History Records.
   - Select the Review History field and choose the History Record from the drop-down list.

3. Push the Review History Advanced button to view additional information and the Event Code that triggered the history record. Refer to Figure 55-2.

A list of event codes is shown on the next page. The Review History Advanced screen displays a record of all error codes related to the history record being displayed.

Each error code is represented by a 0 placeholder. Reading from right to left, the left most placeholder represents error code E01 (refer to Error Codes appearing earlier in this section). If an error occurred, the placeholder representing the error code is changed from 0 to 1. Refer to Figure 55-2.
### Review History Screen Event Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Event</th>
<th>Code</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Date Change/Midnight event log</td>
<td>82</td>
<td>Paused (Reserved use)</td>
</tr>
<tr>
<td>01</td>
<td>Percent Timer or Water Depth change</td>
<td>83</td>
<td>Stopped - Power Fault</td>
</tr>
<tr>
<td>02</td>
<td>One or more step programs are running or no programs are running</td>
<td>84</td>
<td>Stopped - Safety Fault</td>
</tr>
<tr>
<td>03</td>
<td>Program command triggers an event log</td>
<td>85</td>
<td>Stopped - Low Pressure Fault</td>
</tr>
<tr>
<td>04</td>
<td>Auto restart feature active/inactive change</td>
<td>86</td>
<td>Stopped - High Pressure Fault</td>
</tr>
<tr>
<td>05</td>
<td>System direction change</td>
<td>87</td>
<td>Stopped - Water Timer Fault</td>
</tr>
<tr>
<td>06</td>
<td>Water on/off change</td>
<td>88</td>
<td>Stopped - Command Fault</td>
</tr>
<tr>
<td>07</td>
<td>SIS on/off change</td>
<td>89</td>
<td>Stopped - SIS Fault</td>
</tr>
<tr>
<td>08</td>
<td>SIS position change</td>
<td>8A</td>
<td>Stopped - Program Fault</td>
</tr>
<tr>
<td>09</td>
<td>Cruise on/off change</td>
<td>8B</td>
<td>Stopped - AutoStop Fault</td>
</tr>
<tr>
<td>0A</td>
<td>VRI-Z on/off change</td>
<td>8C</td>
<td>Stopped - BBRAM Fault</td>
</tr>
<tr>
<td>0B</td>
<td>VRI-S on/off change</td>
<td>8D</td>
<td>Stopped - Flow Fault</td>
</tr>
<tr>
<td>0C</td>
<td>Auxiliary In 1 change</td>
<td>8E</td>
<td>Stopped - For/Rev Fault</td>
</tr>
<tr>
<td>0D</td>
<td>Auxiliary In 2 change</td>
<td>8F</td>
<td>Stopped - Tire Pressure Fault</td>
</tr>
<tr>
<td>0E</td>
<td>Auxiliary Out 1 change</td>
<td>90</td>
<td>Stopped - Wind Fault</td>
</tr>
<tr>
<td>0F</td>
<td>Auxiliary Out 2 change</td>
<td>91</td>
<td>Stopped - Temperature Fault</td>
</tr>
<tr>
<td>10</td>
<td>End Gun on/off change</td>
<td>92</td>
<td>Stopped - Daily Ops Fault</td>
</tr>
<tr>
<td>11</td>
<td>Wide Boundary on/off change</td>
<td>93</td>
<td>Stopped - No Acknowledge Fault</td>
</tr>
<tr>
<td>12</td>
<td>PLC Wide Boundary 2 on/off change</td>
<td>94</td>
<td>Stopped - GPS Com Fault</td>
</tr>
<tr>
<td>13</td>
<td>PLC Wide Boundary 3 on/off change</td>
<td>95</td>
<td>Stopped - GPS Lock Fault</td>
</tr>
<tr>
<td>14</td>
<td>AD10 high/low change</td>
<td>96</td>
<td>Stopped - Transition Fault (Reserved use)</td>
</tr>
<tr>
<td>15</td>
<td>System crossed SIS position (Doesn't have to be on)</td>
<td>97</td>
<td>Stopped - Rain Fault</td>
</tr>
<tr>
<td>16-7F</td>
<td></td>
<td>98</td>
<td>Stopped - Relay Com Fault</td>
</tr>
<tr>
<td>80</td>
<td>Running</td>
<td>99</td>
<td>Stopped - Boundary Fault</td>
</tr>
<tr>
<td>81</td>
<td>Waiting</td>
<td>9A-FF</td>
<td></td>
</tr>
</tbody>
</table>

The following is a list of codes for events that trigger that create history records. The event code appears on the history record when viewed on the Review History Advanced screen.
Use this Troubleshooting section with the machine owner's manual to diagnose and troubleshoot problems with the machine and/or control panel.

Always perform service or maintenance safely, use personal protection equipment when required, maintain a minimum working clearance around the control panel and other equipment, use fall protection when required, and always use at least the minimal lockout/tagout procedure when maintaining or servicing the machine. For more information refer to the Safety section.

⚠️ WARNING

TO REDUCE THE POSSIBILITY OF SEVERE INJURY OR DEATH:

• TROUBLESHOOTING OR REPAIRING ELECTRICAL PROBLEMS SHOULD ONLY BE PERFORMED BY A QUALIFIED VALLEY DEALER.
• ALWAYS CONTACT YOUR LOCAL VALLEY DEALER TO TROUBLESHOOT OR CORRECT ANY ELECTRICAL PROBLEMS ON OR ASSOCIATED WITH THE CONTROL PANEL OR MACHINE. NEVER ATTEMPT TO TROUBLESHOOT OR CORRECT ELECTRICAL PROBLEMS ON YOUR OWN.
• USE PERSONAL PROTECTION EQUIPMENT WHEN REQUIRED.
• MAINTAIN A MINIMUM WORKING DISTANCE AROUND THE CONTROL PANEL AND OTHER EQUIPMENT.
• USE FALL PROTECTION WHEN REQUIRED.
• BEFORE SERVICING OR PERFORMING MAINTENANCE ON THE MACHINE, ALWAYS SHUT OFF ALL ELECTRICAL POWER TO THE CONTROL PANEL AND MACHINE, THEN USE THE MINIMAL LOCKOUT/TAGOUT PROCEDURE ON THE SERVICE DISCONNECT AND CONTROL PANEL.
## Troubleshooting

### System Faults

Listed in the following table are the possible system faults with the description, possible causes, whether the machine will shutdown if the error occurs, and corrective action to take.

<table>
<thead>
<tr>
<th>SYSTEM FAULT</th>
<th>DESCRIPTION WITH POSSIBLE CAUSES</th>
<th>SHUT DOWN</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM POWER FAULT</td>
<td>Voltage has fallen below the low voltage limit for more than 15 seconds, or power was lost while the machine was running.</td>
<td>YES</td>
<td>Check Low Voltage Limit for correct value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>SYSTEM SAFETY FAULT</td>
<td>Caused by a break in the safety return circuit for more than three seconds.</td>
<td>YES - if more than 3 seconds</td>
<td>Make sure a tower is NOT stuck.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check for flat tire on a tower.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check for wheel gearbox failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check End-Of-Field Stop for proper operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>LOW PRESSURE FAULT</td>
<td>The pressure fell below the low pressure limit for more than thirty seconds, or the pressure delay is not a sufficient amount of time to build pressure in the machine after it is started.</td>
<td>YES - if more than 3 seconds</td>
<td>Make sure pump is on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set Low Pressure Limit higher.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set Pressure Delay for longer period of time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>HIGH PRESSURE FAULT</td>
<td>With VRI-Z one, the pressure went above the high pressure limit for more than three seconds.</td>
<td>YES - if more than 3 seconds</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>WATER TIMER FAULT</td>
<td>The machine shut down because it was moving too slowly, thereby applying too much water.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>COMMAND FAULT</td>
<td>The machine was intentionally commanded to stop by one of the following: 1) The stop button was pressed. 2) An autostop condition occurred at the end-of-field stop. 3) A programmed stop command was executed.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>STOP-IN-SLOT (SIS) FAULT</td>
<td>The machine was shut down by the Stop-In-Slot.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If desired, program a different Stop-In-Slot location.</td>
</tr>
<tr>
<td>PROGRAM FAULT</td>
<td>The machine was shut down because a Step program stopped the system.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>AUTOSTOP FAULT</td>
<td>An autostop condition occurred at the end-of-field stop.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>BBRAM FAULT</td>
<td>Indicates that an attempt was made to start the machine when Error E01 was displayed on the status screen.</td>
<td>YES</td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clear by viewing Diagnostics/System Fault when BBRAM is present.</td>
</tr>
<tr>
<td>FLOW FAULT</td>
<td>With VRI-Z on, the flow rate has fallen below the amount set in the FLOWMETER GAL/PULSE field.</td>
<td>YES</td>
<td>Examine the VRI-Z prescription to determine why so many sprinklers are turned off. Revise prescription.</td>
</tr>
<tr>
<td>FOR/REV FAULT</td>
<td>Both the forward and reverse sense relays were on for more than 15 seconds while the system was running or waiting.</td>
<td>YES</td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fault cleared when the system attempts to run.</td>
</tr>
<tr>
<td>TIRE PRES FAULT</td>
<td>While the system was running or waiting, two consecutive error messages from a particular tire were received.</td>
<td>YES</td>
<td>Tire pressure is at or lower than the tire pressure shutdown value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>View error E26 to determine which tower has a tire with low pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check the tires on the tower for low pressure, and repair as needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
</tbody>
</table>
## System Faults (continued)

<table>
<thead>
<tr>
<th>SYSTEM FAULT</th>
<th>DESCRIPTION WITH POSSIBLE CAUSES</th>
<th>SHUT DOWN</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIND FAULT</td>
<td>The machine shut down because the wind speed reached the high wind limit. The wind speed indicator is an option. WIND is only displayed on the system faults screen when wind is turned ON.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td>TEMPERATURE FAULT</td>
<td>The machine shut down because the temperature fell below the low temperature limit.</td>
<td>YES</td>
<td>Restart the machine when the temperature rises above the limit.</td>
</tr>
<tr>
<td>RAIN FAULT</td>
<td>The machine shut down because the rain limit was exceeded in the Rain Window field time period.</td>
<td>YES</td>
<td>Turn Rain Shutdown Off, or restart the machine when the Rain Total is below the Rain Limit.</td>
</tr>
<tr>
<td>DAILY OPS FAULT</td>
<td>The daily operations program shut the machine down because it is not allowed to run between a certain time period, DAILY OPS is only displayed on the system faults screen when Daily Ops is turned ON.</td>
<td>YES</td>
<td>Normal operation - No corrective action needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If desired, reprogram Daily OPS to run at a different time or turn Daily OPS OFF.</td>
</tr>
<tr>
<td>NO ACK FAULT</td>
<td>No Acknowledgement was received from communication device while machine was running. Notice must be ON with No Ack set to Shut Down.</td>
<td>YES</td>
<td>Check communication devices for proper operation.</td>
</tr>
<tr>
<td>RELAY COM FAULT</td>
<td>There is a hardware or software communication problem between the Pro2 module and the electrical relay board within the control panel.</td>
<td>YES</td>
<td>Contact your Valley dealer.</td>
</tr>
</tbody>
</table>
| GPS COM FAULT  | While system was running or waiting, all of the following must have occurred:  
1. GPS is selected as a protocol.  
2. GPS signal loss is set to shut down the machine.  
3. The machine shut down due to no communication with the GPS for a user specified time.                                                                 | YES        | Check the GPS connection and the power. Contact your Valley dealer.              |
| GPS LOCK FAULT | While system was running or waiting, all of the following must have occurred:  
1. GPS is selected as a protocol.  
2. GPS signal loss is set to shut down the machine.  
3. The machine shut down due to GPS signal loss for a user specified time.                                                                                     | YES        | Check for a clear path above the antenna. Contact your Valley dealer.          |
| BOUNDARY FAULT | The machine shut down because it traveled beyond the forward or reverse Position angles.                                                                                                                                              | YES        | Walk the machine back. Check the For/Rev Position angles. Contact your Valley dealer. |
## Troubleshooting

### Error Codes

Listed in the table below are the possible error codes with the description, threshold for the error to occur, whether the machine will shutdown if the error occurs and possible causes or corrective action to take. See figures 60-1 and 61-1.

<table>
<thead>
<tr>
<th>ERROR</th>
<th>DESCRIPTION</th>
<th>THRESHOLD</th>
<th>SYSTEM FAULT SHUT DOWN</th>
<th>POSSIBLE CAUSES or CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E01</td>
<td>BBRAM - BATTERY BACKED RAM CHECKSUM FAILED AT POWER UP.</td>
<td>YES</td>
<td>Contact your Valley dealer.</td>
<td>YES</td>
</tr>
<tr>
<td>E02</td>
<td>EEPROM - CHECKSUM FAILED AT POWER UP.</td>
<td>One of the blocks failed.</td>
<td>YES</td>
<td>This error can occur when power is lost while entering constants. Data being entered may be lost. Try to hard reset module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>E03</td>
<td>UNIT RESETS - THIS IS LOGGED WHEN THE SOFTWARE RESETS.</td>
<td>Every time the software is power cycled.</td>
<td>NO</td>
<td>Records every time the module is power cycled. Normal operation. No corrective action.</td>
</tr>
<tr>
<td>E04</td>
<td>POWER DROP - POWER DROPPED BELOW LOW VOLTAGE LIMIT.</td>
<td>If running/waiting, and voltage drops below low voltage.</td>
<td>YES</td>
<td>This error occurs when the voltage drops below the low voltage limit. Nuisance shutdowns can be caused by setting the Low Voltage Limit too high.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>E05</td>
<td>SYSTEM SAFETY - POSSIBLE TOWER MISALIGNMENT, DRIVE UNIT MAY BE STUCK.</td>
<td>Safety lost while running.</td>
<td>YES</td>
<td>This error occurs when the safety circuit is open due to misaligned towers, guidance problems, over-watering timer timed out, or any other component in the safety circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact Your Valley Dealer.</td>
</tr>
<tr>
<td>E06</td>
<td>PUMP SAFETY - PRESSURE TOO LOW AFTER PRESSURE DELAY.</td>
<td>Pressure with pump off.</td>
<td>YES</td>
<td>This error may occur when the pressure delay time or the low pressure setting are not correct. The pump, pressure transducer, or pressure switch may have failed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low pressure set point too close to operating pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact Your Valley dealer.</td>
</tr>
<tr>
<td>E07</td>
<td>PRESSURE SENSOR - OUT OF RANGE HIGH, CHECK CONNECTION.</td>
<td>&gt; 4.5 volts.</td>
<td>NO</td>
<td>This error occurs when the pressure transducer has failed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>E08</td>
<td>PRESSURE SENSOR - OUT OF RANGE LOW, CHECK CONNECTION.</td>
<td>&lt; 0.5 volts.</td>
<td>NO</td>
<td>This error may occur when the pressure transducer has failed or is not installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contact your Valley dealer.</td>
</tr>
<tr>
<td>E09</td>
<td>PRESSURE SENSOR - PRESSURE HIGH WITH PUMP OFF, CHECK CONNECTION.</td>
<td>Pump off for 5 min., and more then 7 PSI (0.5 bar)</td>
<td>NO</td>
<td>This error may occur when the pressure transducer has failed or water is still in riser pipe because a machine drain may be plugged.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Re-calibrate pressure transducer.</td>
</tr>
<tr>
<td>ERROR</td>
<td>DESCRIPTION</td>
<td>THRESHOLD</td>
<td>SYSTEM FAULT SHUT DOWN</td>
<td>POSSIBLE CAUSES or CORRECTIVE ACTION</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-----------</td>
<td>------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>E10</td>
<td>PRESSURE SENSOR - MECHANICAL SWITCH COULD BE STUCK.</td>
<td>Pump off for 5 min, and switch still on.</td>
<td>NO</td>
<td>This error may occur if the pressure transducer or switch has failed or is stuck. Contact your Valley dealer.</td>
</tr>
<tr>
<td>E11</td>
<td>RESOLVER - ANGLE JUMPING AROUND, LUBE J PIPE.</td>
<td>5° jump in 1 second (twice).</td>
<td>NO</td>
<td>This error may occur if the pivot swivel is binding or sticking, and requires lubrication. J-tube overtightened or seized. Pipe not secured to H-bracket. Collector ring loose.</td>
</tr>
<tr>
<td>E12</td>
<td>RESOLVER - OUT OF RANGE HIGH, CHECK FOR LOOSE OR SHORTED WIRES.</td>
<td>X AND Y = 2.5 volts.</td>
<td>NO</td>
<td>This error may occur if the resolver wires are loose or shorted. Contact your Valley dealer.</td>
</tr>
<tr>
<td>E13</td>
<td>KEYPAD - POSSIBLE KEY STUCK CHECK KEYPAD CONNECTION.</td>
<td>10 seconds.</td>
<td>NO</td>
<td>This error may occur if the key pad has failed or a key is stuck. Contact your Valley dealer.</td>
</tr>
<tr>
<td>E14</td>
<td>FWD/REV SENSE - POSSIBLE SHORT, CHECK WIRING.</td>
<td>2 seconds.</td>
<td>YES - after 15 seconds.</td>
<td>When this error is detected, both the forward and reverse run lines are powered. The machine status will show running when AR/AS is OFF even though the motor contactor is disabled. The machine will stop if AR/AS is ON and Auto Stop is selected. If AR/AS is ON and Auto Reverse is selected, the machine will alternate between forward and reverse direction control. Since motor power is disabled until the direction has locked in, the machine will not move. Contact your Valley dealer.</td>
</tr>
<tr>
<td>E15</td>
<td>UNDERWATER ERROR - MACHINE MAY BE MOVING TOO FAST.</td>
<td>Number of minutes as set in the UNDERWATER ERROR field.</td>
<td>NO</td>
<td>Check for induced voltages and Percent Timer connections.</td>
</tr>
<tr>
<td>E16</td>
<td>NOT ASSIGNED</td>
<td></td>
<td></td>
<td>This error code is not assigned.</td>
</tr>
<tr>
<td>E17</td>
<td>NOT ASSIGNED</td>
<td></td>
<td></td>
<td>This error code is not assigned.</td>
</tr>
<tr>
<td>E18</td>
<td>GPS COMMUNICATION ERROR, CHECK GPS CONNECTION AND POWER.</td>
<td>10 seconds.</td>
<td>YES, if Shut Down System is selected.</td>
<td>This error occurs when GPS is selected as a protocol, and a transition occurs from communications to no communications for 10 seconds. Check GPS connection. When GPS option is powered by safety circuit, a loss of power will cause this error.</td>
</tr>
</tbody>
</table>
## Error Codes (continued)

<table>
<thead>
<tr>
<th>ERROR</th>
<th>DESCRIPTION</th>
<th>THRESHOLD</th>
<th>SYSTEM FAULT SHUT DOWN</th>
<th>POSSIBLE CAUSES or CORRECTIVE ACTION</th>
<th>SHOWN ON SCREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>E19</td>
<td>GPS SIGNAL LOSS, CHECK FOR CLEAR PATH ABOVE ANTENNA. Position of machine will flash when error occurs.</td>
<td>10 seconds.</td>
<td>YES, if Shut Down System is selected.</td>
<td>This error occurs when the signal from the GPS transitions from GPS Lock to GPS Unlock. Check for clear path above the antenna.</td>
<td>NO, position will flash.</td>
</tr>
<tr>
<td>E20</td>
<td>DGPS SIGNAL LOSS, CHECK FOR CLEAR PATH ABOVE ANTENNA.</td>
<td>10 seconds.</td>
<td>NO</td>
<td>This error occurs when the signal from the DGPS transitions from DGPS to Standard. Check for clear path above the antenna.</td>
<td>NO</td>
</tr>
<tr>
<td>E21</td>
<td>LOW FLOW Minimum flow rate is enabled, and the machine water pressure is above the low pressure setting</td>
<td>YES</td>
<td>A Low Flow error can only occur if the constant's Minimum Flow Rate is enabled, and the machine water pressure is above the low pressure setting.</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>E22</td>
<td>HIGH PRESSURE</td>
<td>3 Seconds</td>
<td>YES</td>
<td>A High Pressure error occurs if the machine water pressure reaches the constant's Maximum Pressure setting for 3 seconds.</td>
<td>YES</td>
</tr>
<tr>
<td>E23</td>
<td>PLC COMMUNICATIONS ERROR. (GPS V2 Only) 3 Times in a Row.</td>
<td>NO</td>
<td>YES</td>
<td>This error occurs when a PLC with GPS V2 does not reply to control panel messages three times in a row. Verify Correct PLC Channel and ID Settings.</td>
<td>YES</td>
</tr>
<tr>
<td>E24</td>
<td>RESYNC VALVE DUTY CYCLE DUE TO PRESSURE</td>
<td>Pressure reaches the constant's valve resync water pressure setting</td>
<td>A Resync Valve Duty Cycle error is recorded if the machine water pressure reaches the constant's Valve Resync Water Pressure setting.</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>E25</td>
<td>GPS COORDINATES OUT OF RANGE, CHECK DISTANCE TO GPS OR FOR CROSSTALK.</td>
<td>When GPS coordinates go out of range</td>
<td>YES, if Shut Down System is selected.</td>
<td>This error occurs when: The distance from the pivot to the GPS receiver is outside of the set length ± Set correct distance to GPS. The pivot point coordinates are incorrect - Set pivot point to correct coordinates. There is crosstalk from another GPS device on the same channel - Change GPS PLC to different channel to avoid crosstalk.</td>
<td>YES</td>
</tr>
<tr>
<td>E26</td>
<td>LOW TIRE PRESSURE Records every occurrence on one tower</td>
<td>NO</td>
<td>YES</td>
<td>A tire with pressure at or below the tire pressure warning value is on the indicated tower. The error and the number of occurrences are logged for only one tower at a time. If the error is already logged on a tower, errors on a different tower will not be logged. Correct the problem and clear the error to log other occurrences.</td>
<td>YES</td>
</tr>
<tr>
<td>E27</td>
<td>TPMS COMMUNICATIONS ERROR</td>
<td>3 Failed Attempts in a Row</td>
<td>NO</td>
<td>A particular TPMS ID did not reply to control panel messages 3 times in a row.</td>
<td>YES</td>
</tr>
</tbody>
</table>
## Troubleshooting List

Listed in the following tables are various problems, with the descriptions and possible causes or corrective action to take.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE OR CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESOLVER POSITION IS NOT ACCURATE.</td>
<td>PIVOT POINT BINDING</td>
</tr>
<tr>
<td></td>
<td>J-TUBE OVERTIGHTENED OR SEIZED</td>
</tr>
<tr>
<td></td>
<td>PIPE NOT SECURED TO H-BRACKET</td>
</tr>
<tr>
<td></td>
<td>COLLECTOR RING LOOSE</td>
</tr>
<tr>
<td></td>
<td>DIRECTION OFFSET INCORRECT.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>PIVOT AUTO REVERSES RANDOMLY.</td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>PIVOT AUTO STOPS RANDOMLY.</td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>PIVOT BREAKS SAFETY AT BARRICADE.</td>
<td>BARRICADE TOO HIGH ON ACTUATOR ARM</td>
</tr>
<tr>
<td></td>
<td>AUTO-REVERSE/AUTO-STOP DISABLED</td>
</tr>
<tr>
<td></td>
<td>AUTO-REVERSE/AUTO-STOP BOX NOT ADJUSTED CORRECTLY.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>PRESSURE TRANSDUCER READING INCORRECT.</td>
<td>CALIBRATE WITHOUT WATER.</td>
</tr>
<tr>
<td></td>
<td>CHECK VALVE HOLDING WATER IN RISER.</td>
</tr>
<tr>
<td></td>
<td>TRANSUDCER HAS ICE AGAINST SENSOR.</td>
</tr>
<tr>
<td></td>
<td>TRANSUDCER PLUGGED</td>
</tr>
<tr>
<td></td>
<td>PRESSURE TUBE PLUGGED OR DAMAGED</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>NO DISPLAY</td>
<td>CONTRAST ADJUSTED TOO LIGHT OR DARK</td>
</tr>
<tr>
<td></td>
<td>DISCONNECT SWITCH OFF</td>
</tr>
<tr>
<td></td>
<td>NO POWER TO PIVOT</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>ENDGUN DOES NOT SHUT OFF.</td>
<td>INCORRECT ENDGUN ENTRY</td>
</tr>
<tr>
<td></td>
<td>FILTER PLUGGED</td>
</tr>
<tr>
<td></td>
<td>DEFECTIVE ENDGUN HARDWARE</td>
</tr>
<tr>
<td></td>
<td>DIRECTION OFFSET INCORRECT; ARC TOO SMALL.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>ENDGUN DOES NOT TURN ON.</td>
<td>ENDGUN CONSTANTS NOT PROGRAMMED CORRECTLY.</td>
</tr>
<tr>
<td></td>
<td>ENDGUN OPTIONS SET TO DISABLE</td>
</tr>
<tr>
<td></td>
<td>DEFECTIVE ENDGUN HARDWARE</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>SCREEN CYCLES ON AND OFF.</td>
<td>ERRATIC INCOMING POWER</td>
</tr>
<tr>
<td></td>
<td>LOW VOLTAGE</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td></td>
<td>LOOSE CONNECTION</td>
</tr>
</tbody>
</table>
## Troubleshooting List (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE OR CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOES NOT STOP AT SIS.</td>
<td>SIS NOT TURNED ON.</td>
</tr>
<tr>
<td></td>
<td>SIS POSITION HAS BEEN CHANGED.</td>
</tr>
<tr>
<td></td>
<td>MACHINE MUST MOVE AT LEAST 2° AWAY FROM THE SIS POSITION BEFORE IT CAN BE STOPPED AGAIN BY SIS.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>BACKLIGHT DOES NOT TURN ON.</td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>BACKLIGHTING DOES NOT TURN OFF.</td>
<td>INCORRECT CONSTANT ENTERED.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>SCREEN DARK.</td>
<td>CONTRAST SET TOO HIGH OR LOW.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td></td>
<td>PUSH ON THE CENTER OF THE SCREEN TO TURN ON BACKLIGHTING.</td>
</tr>
<tr>
<td>PIVOT WON'T AUTO RESTART.</td>
<td>STARTS PROGRAM WRITTEN INCORRECTLY OR MISSING.</td>
</tr>
<tr>
<td></td>
<td>RESTART CRITERIA HAS NOT BEEN MET.</td>
</tr>
<tr>
<td></td>
<td>OFF DAY IN DAILY OPS</td>
</tr>
<tr>
<td></td>
<td>SYSTEM FAULT OTHER THAN POWER OR PRESSURE.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>PIVOT WON'T STOP WITH DAILY OPS.</td>
<td>START/STOP TIMES REVERSED.</td>
</tr>
<tr>
<td></td>
<td>DAILY OPS NOT ACTIVE.</td>
</tr>
<tr>
<td></td>
<td>A PROGRAM OTHER THAN DAILY OPS STARTS MACHINE.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
<tr>
<td>AUTO RESTART DOES NOT WORK</td>
<td>MAKE SURE A STARTS IS ENTERED.</td>
</tr>
<tr>
<td></td>
<td>SYSTEM FAULT MUST BE EITHER POWER OR PRESSURE FOR RESTART TO WORK.</td>
</tr>
<tr>
<td></td>
<td>VERIFY THAT AUTO RESTART IS TURNED ON.</td>
</tr>
<tr>
<td></td>
<td>CONTACT YOUR VALLEY DEALER.</td>
</tr>
</tbody>
</table>
Hard Reset
A hard reset resets the Electrically Erasable Programmable Read-Only Memory (EEPROM).
- Resets current status to factory settings.
- Restores all constants to factory settings.
- Restores all options to factory settings.
- Erases all current and stored programs.
- Clears Review History.
- Clears Error Log history.

Executing a Hard Reset
To execute a hard reset, follow the steps below.
1. Record all options settings, constants settings, and programs that will need to be re-entered after the hard reset.
2. From the Main screen, push the Diagnostics (I) button.
3. Push the Advanced tab.
4. Push one of the following buttons.
   - **Pro2 Default** (Figure 65-1) - Used to reset and clear the battery-backed memory. If a reset is executed, all values within the Pro2 are set back to their default values. Examples:
     » All System Constants
     » Direction = Forward
     » Water = Water Off
     » SIS = SIS Off
     » End Gun and wide boundary angles are set to 0.0
     » All counter readings are reset to zero.
     » Flow/Wind/Temp screen values are reset to zero.
     » AUX 1 and 2 are reset to Off.
     » Programs are deleted.
   - **Pro2 EMC Reset** (Figure 65-1) - Used to reboot the TouchPro module. Memory is not affected.
   - **Flexbox Default** (Figure 65-1) - Used to reset and clear the flex box memory. If a reset is executed, appearance of the Main screen is affected as the settings on the following tabs are reset back to their default values:
     » **Field** Tab: Pivot Name - TouchPro, Pivot Road - Disabled, Full Circle Pivot
     » **Status** Tab: Line 1 - Programs, Line 2 - Alarms, Line 3 - Voltage, Line 4 - Percentage, Line 5 - Empty, Line 6 - Empty
     » **Controls** Tab: Position 1 - Direction, Position 2 - Water, Position 3 - Percentage, Position 4 - Depth, Position 5 - Hrs/Pass, Position 6 - Stop In Slot, Position 7 - Empty, Position 8 - Endgun

![Figure 65-1](image)

1. Reset Pro2 Memory to Default
2. Reset Pro2 EMC
3. Reset Flexbox to Default
Troubleshooting

Executing a Hard Reset (continued)

If you choose Pro2 Default or Flexbox Default, a dialog box appears warning you that the system will reset to its default values. See Figures 66-2 and 66-3.

5. Push the (Escape) button to cancel out of the reset:

6. Push the (Enter) button to complete the reset.

If no selection is made within 60 seconds, the reset is canceled.

Figure 66-2 1. Pro2 Memory Reset Warning

Figure 66-3 1. Flexbox Reset Warning
The following flowcharts are provided to help you access the features associated with the System, Setup, Program, Options, Diagnostics, Home and Start menu buttons.

**System Button**
Button Flowcharts

Setup Button

Main Screen Setup
- Field
- Status
- Control

Field Settings
- Pivot Name
- Pivot Road
  - Enable/Disable
- Road Location
- Part Circle
  - Enable/Disable
- Part Circle
  - Start/End Angles

Main Screen Status
- Choose up to 6 different functions to monitor. The status of each selection will display on the main screen.

Main Screen Control
- Choose up to 8 different functions to control from the main screen. A button for each selection will display on the main screen.

Constants Settings
- Min/App
- Hours/Rev
- % Cycle Time
- ARAS Delay
- Cruise Settings
  - Max % Change of Speed
  - Field Size
  - Resolution
- Low Voltage
- Voltage
- Calibrate Voltage

GPS Loss
- Shutdown System
  - On/Off
- Shutdown Limit
- Fallback Position
  - On/Off
- Fallback Type
- Disable Endgus
  - On/Off
- Disable Limit
- Pivot Speed
- Pivot Length

GPS V2
- Tx Test
- RTU ID
- DB9
- Y-DB9

GPS V2 PLC ID

Tire Pressure

VRI Zone

Water Pressure

PLC Wide boundary

PLC Wide boundary

Comm Port Settings
- Comm Port
- PLC

DB9 Settings
- Protocol
- Baud Rate
- Hardware Flow Control
- High Speed
- Key Wait

Y-DB9 Settings
- Protocol
- Baud Rate
- Hardware Flow Control
- High Speed
- Key Wait

Setup
- Constants (G)
- Comm. Port (H)

Watering Timer
- Watering Timer On/Off
- % Overwater
  -Shutdown
- % Underwater
  - Error
- % Overwater
  - Status
- % Underwater
  - Status

Positon Settings
- Current Point
  - Deg
- Calibrate Position
- Resolver Direction
  - Offset

Current Position
- Latitude
- Longitude

Satellite Lock

Satellite Count

Length To GPS
+ Distance
- Distance

GPS Loss Settings

PLC Settings
- GPS V2
- GPS V2 PLC ID
- Tire Pressure
- VRI Zone
- Water Pressure
- PLC Wide boundary
- PLC Wide boundary

Comm Port Settings
- PLC

PLC ID

68 Valley TouchPro Control Panel Owner's Manual
Diagnostics Button

Review History
Advanced (C)
Faults (F)
Data (G)
Review History
Standard (H)

Data
Flow/Wind/Temp
Pulse
A/D
Modules

Faults
System Faults
Error Codes
Firmware Info
Advanced

Advanced
Pro2 Default
Pro2 EMC Reset
Flex Box Default

Flow/Wind/Temp
Total Flow
Flow Meter
Flow Multiplier
Wind Speed
Wind Shutdown
On/Off
Temperature
Reading
Temp Shutdown
On/Off

Pulse
Counter Readings
Pulse Per/Min
Button Flowcharts

Home Button

Display-Main
- Display-Main ( )
- Display-Settings (G)
- Display-Diagnostics (N)

Display-Main
- Backlight
- Volume
- Highlight Color

Backlight
- Display Backlight Off
- Day Setting
- Night Setting

Display-Settings
- Regional
- Time/Date
- Units of Measure

Regional
- Country
- Language
- Numeric
- Units

Display-Diagnostics
- Readings
- Tests
- About

Tests
- Color Test
- Touch Screen Test
- Touch Screen Calibration
- Reset Touch Screen Calibration

Time/Date
- Date
- Date Format
- Time
- 24 Hour clock On/Off
- Daylight Savings Time On/Off

Units of Measure
- Distance
- Volume
- Temperature
- Pressure

Start Button

Valley (H)
Reprogram Device (I)
Display (J)

Units of Measure

Distance
Volume
Temperature
Pressure