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## SECTION ONE GENERAL INFORMATION

### 1.1 Introduction

Thank you for using an IPC Automation Elevator Control. At IPC, we are committed to designing and manufacturing quality elevator controls to meet our customers' needs.

This manual familiarizes the user with the **Model D2120 Three Phase Hoist Motor Field Control with Integral Brake** . It provides a general overview of the operation of the control, along with detailed descriptions of the diagnostic indicators, status indicators, adjustments and connections. Also included is a step by step start-up procedure, troubleshooting information, and applications.

Please read this manual before installation or start-up. If there are any questions concerning the application, hook-up, or adjustment of this control please call us and ask for Technical Support.

**For Technical Help  
Call:  
(815) 759-3934  
(7 AM to 5 PM CST)  
Please Ask For Technical Support**

## 1.2 Safety

There are certain fundamental warnings, which must be kept in mind at all times. These include:

**WARNING:**

**THE MODEL D2120 MOTOR FIELD CONTROL SHOULD BE INSTALLED, ADJUSTED AND SERVICED BY QUALIFIED ELECTRICAL MAINTENANCE PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL EQUIPMENT IN THE ELEVATOR SYSTEM; PERSONAL INJURY AND/OR EQUIPMENT DAMAGE MAY OCCUR IF INDIVIDUALS ARE NOT FAMILIAR WITH THE HAZARDS RESULTING FROM IMPROPER OPERATION.**

**WARNING:**

**THE USER IS RESPONSIBLE FOR CONFORMING TO THE NATIONAL ELECTRICAL CODE WITH RESPECT TO MOTOR, CONTROLLER AND OPERATOR DEVICE INSTALLATION, WIRING AND START-UP. THE USER IS ALSO RESPONSIBLE FOR UNDERSTANDING AND APPLYING ALL OTHER APPLICABLE LOCAL CODES, WHICH GOVERN SUCH PRACTICES AS WIRING PROTECTION, GROUNDING, DISCONNECTS AND OVER CURRENT PROTECTION.**

**WARNING:**

**DO NOT GROUND THE MOUNTING PANEL.**

**NOTE:**

**ALL ADJUSTMENT POTENTIOMETERS ARE APPROXIMATELY TWENTY (20) TURNS TO ALLOW ACCURATE ADJUSTMENT, WITH A CLUTCH AT THE END OF THE RANGE.**

## 1.3 Warranty

Standard conditions of sale for the company include a Statement of Warranty, which covers the control equipment. This Statement of warranty covers all new equipment.

**The Model D2120 Three Phase Hoist Motor Field Control has been designed as a standard product to meet the general criteria for controlling a hoist motor field in conjunction with an elevator. IPC does not warrant that the control will meet all application requirements, codes and safety standards.**

## **1.4 Q.C. Testing**

Each unit is carefully tested at the factory prior to shipment. The control must pass both Static and Dynamic performance checks as well as Final Inspection for quality of workmanship. A unit is allowed to ship only after acceptance of all aspects of Q.C. Testing and Inspection.

## **1.5 Storage**

If it should become necessary to store the control for any length of time, the following precautions should be taken:

- Store the control in a clean, dry (non-corrosive) location that is protected from sudden temperature changes, high levels of moisture, shock and vibration.
- Ambient temperature should be maintained between 0° degrees C and 65° degrees C.
- The control should be covered to protect from dust and dirt contamination.

## SECTION TWO GENERAL DESCRIPTION

### 2.1 Introduction

The model D2120 is a 20 Amp continuous rated hoist motor field control that provides a full wave rectified output for a hoist motor with field control. The output is varied by six potentiometers that control; four independent setpoints, one ramp-up rate and one ramp-down rate. The control operates from a 208/220 VAC Three Phase input line. The third phase should be applied at all times and should not be interrupted. The D2120 can be configured to operate as either a voltage or a current regulator.

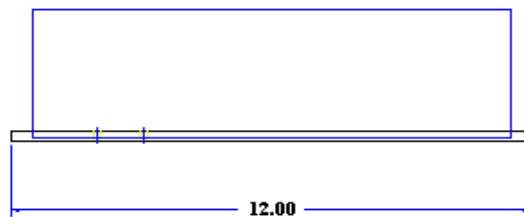
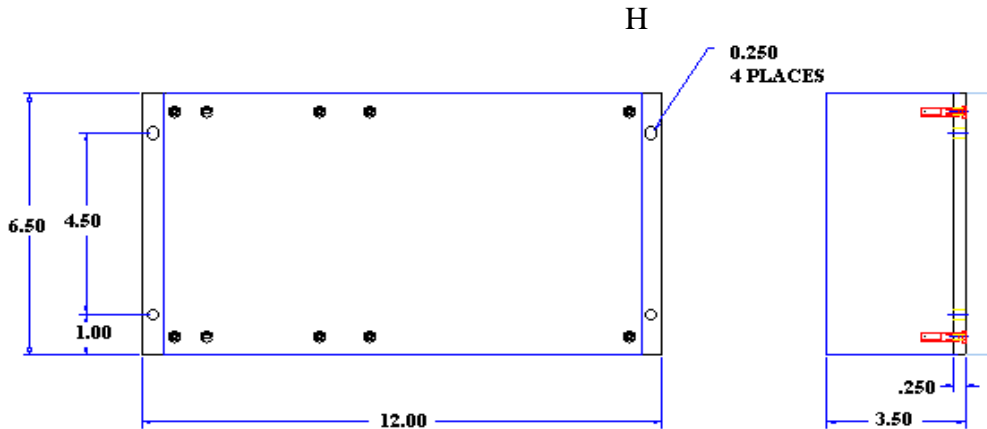
**WARNING:**

**THIS CONTROL IS NOT RECOMMENDED FOR USE ON HOIST MOTORS WITH FIELD IMPEDANCES OF LESS THAN FIFTEEN (15) OHMS.**

### 2.2 Mounting Dimensions

Length            12.00 inches  
Width             6.50 inches

Use four (4) 1/4-20 bolts for



-  
s (with cover)  
mounting



## **2.3 Control Features**

### **2.3.1 Field Weakening**

Top speed of the motor is increased while the torque is decreased in a constant horsepower range. This may be accomplished by adjusting one of the four setpoints for a low output voltage.

### **2.3.2 Field Forcing**

High torque is provided at low speed and the top motor speed is limited. This may be accomplished by adjusting one of the four setpoints for a high output voltage. Field forcing is typically used during leveling and re-leveling.

### **2.3.3 Input Command Fault Protection**

During normal operations it is critical that hoist motor field voltage is present at all times. To ensure that there is always voltage across the field, the D2120 cannot output a voltage less than 40 VDC. The D2120 will default to setpoint one, **SET 1**, if no other setpoint is selected.

### **2.3.4 Phase Loss Protection/Inhibit**

If a loss of phase occurs during operation, the D2120 will go into inhibit mode which shuts off the

output of the control and drops the field loss relay **CR1**. When the control is in inhibit mode, the red **INHIBIT** indicator will be lit. If the loss of phase clears, the control will automatically reset, the output voltage will ramp up to the selected setpoint voltage and relay **CR1** will energize.

## 2.4 Setpoints SET 1- SET 4

There are four (4) output settings available, labeled **SET 1** through **SET 4**. Each setpoint is independently adjustable from 40 VDC to full output. Three of the four available setpoints are independently selectable (**SET 2** through **SET 4**). These setpoints are selected by applying 80 to 110 VAC to the appropriate input. The fourth setpoint, **SET 1** is the default setpoint. This setpoint is selected when no inputs are present. When two or more inputs are present at one time, the highest input will be selected. For example, if **SET 2** and **SET 4** were selected at the same time (80 - 110 VAC), **SET 4** would be the selected setpoint.

### NOTE:

**ALL SETPOINT INPUTS ACCEPT 110 VAC AS A SELECTION SIGNAL WITH GREEN LED INDICATORS DENOTING THE SELECTED SETPOINT.**

## 2.5 Field Loss Relay/Field Current Setpoint FLD I

The field loss relay provides one set of normally open contacts and one set of normally closed contacts for customer use. These contacts are rated for 3 Amps. The relay is designed to pull in when the field current is equal to the field current setpoint which is set with the **FLD I** potentiometer. This potentiometer can adjust the pull-in point from 2% to 90% of the unit rating (approx. 0.3A to 18A). Whenever the field loss relay **CR1** is de-energized, the red **FLD I** indicator will light.

### WARNING:

**DO NOT EXCEED THE FIELD LOSS RELAY CONTACT RATING OF 3 AMPS, OR DAMAGE TO THE CONTROL WILL OCCUR**

## 2.6 Ramp UP/DN Settings

### 2.6.1 Ramp UP1

There is one ramp-up rate labeled **RAMP UP1**. This potentiometer controls the length of time for the output to go from minimum to the selected setpoint. The range of adjustment is approximately 0.5 seconds to 4 seconds. **RAMP UP1** is automatically selected and requires no selection signal.

### 2.6.2 Ramp DN1

There is one ramp-down rate **RAMP DN1**. This potentiometer controls the length of time for the output to go from the selected setpoint to minimum. The range of adjustment is approximately 0.5 seconds to 4 seconds. **RAMP DN1** is automatically selected and requires no selection signal.

As an option, an additional ramp-up and ramp-down rate may be added to the D2120 for customers requiring even more control over the motor field.

### **2.6.3 Ramp UP2 (optional)**

**RAMP UP2** provides the same level of adjustability as the first ramp-up potentiometer (0.5 sec to 4 sec). As with the setpoints, the highest ramp input selected will be the controlling rate. For example, if **RAMP UP2** is selected, **RAMP UP2** is the controlling ramp-up rate. Whenever **RAMP UP2** is selected, the yellow **RAMP UP2** indicator will be lit.

### **2.6.4 Ramp DN2 (optional)**

**RAMP DN2** provides the same level of adjustability as the first ramp-down potentiometer (0.5 sec to 4 sec). As with the setpoints, the highest ramp input selected will be the controlling rate. For example, if **RAMP DN2** is selected, **RAMP DN2** is the controlling ramp-down rate. Whenever **RAMP DN2** is selected, the yellow **RAMP DN2** indicator will be lit.

## **2.7 Limit (optional)**

The limit pot adjusts the maximum range of the **SET 1 - SET 4** settings. When the **LIMIT** potentiometer is turned full clockwise, the output voltage range of all the setpoint potentiometers will be 100% (40 to 280 VDC). Turning the **LIMIT** potentiometer counterclockwise will reduce the voltage range of all the setpoint potentiometers. For example, one turn counterclockwise will reduce the setpoint voltage range to approximately 75% (40 to 210 VDC). The **LIMIT** potentiometer can also be considered a *scaling* potentiometer.

## 2.8 Mode Selector Jumper J2

The D2120 has two available modes of operation.

**Voltage Regulation Mode** The control will operate as a voltage regulator when the **J2** selector jumper is in the **VOL** position. In this mode, the output voltage is regulated, but the current to the load may vary.

**Current Regulation Mode** The control will operate as a current regulator when the **J2** selector jumper is in the **CUR** position. In this mode, the output current is regulated, but the voltage to the load may vary.

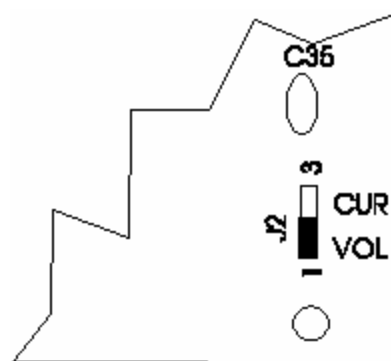
Current regulation mode is recommended for applications where there are large differences in loads and temperature.

### NOTE:

**THE J2 OPERATING MODE SELECTOR MUST BE SET BEFORE APPLYING POWER TO THE CONTROL.**

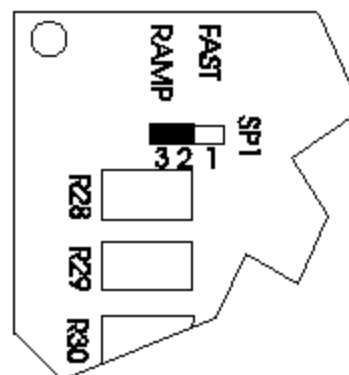
### NOTE:

**IN THE CURRENT REGULATING MODE, THE CURRENT WILL FOLLOW THE RAMP UP/DOWN TIME RATES. THE OUTPUT VOLTAGE COULD CHANGE RAPIDLY AND MAY OVERSHOOT THE SETPOINT FOR A SHORT PERIOD OF TIME BEFORE RETURNING TO THE SETPOINT. THIS IS NORMAL BEHAVIOR SINCE THE CONTROL IS REGULATING THE RAMP TIMES OF THE CURRENT AND NOT THE RAMP TIMES OF THE VOLTAGE.**



## 2.9 Fast/Ramp Jumper SP1

The **SP1** jumper controls the behavior of the control whenever a setpoint is de-selected. If **SP1** is in the **RAMP** position (2 - 3), the output will ramp down to the minimum field voltage (approximately 40VDC), or the next lowest setpoint selected. If **SP1** is in the **FAST** position (1 - 2), the output will immediately drop to zero volts. With **SP1** in the **FAST** position the D2120 will operate as a 20 Amp brake control.



## **SECTION THREE INSTALLATION AND SET-UP**

### **3.1 Power Connections**

#### **3.1.1 Input Voltage (L1, L2, L3)**

Connect a balanced three phase 208 to 220 volt AC line to the terminals marked **L1**, **L2** and **L3**. The control is not phase sensitive, so the input lines may be connected in any order.

#### **3.1.2 Output Power (F+, F-)**

Connect the hoist motor field to the terminals marked **F+** and **F-**. The output voltage is adjustable from 40 to 280 volts DC and is rated for a maximum of 20 Amps DC continuous output current.

**WARNING:**

**THIS CONTROL IS NOT RECOMMENDED FOR USE ON HOIST MOTORS WITH FIELD IMPEDANCES OF LESS THAN FIFTEEN (15) OHMS.**

### **3.2 Input Command Selection**

Input commands are selected by applying 110 VAC between **NEUT** (TB1-1) and the desired input. Input selections are available for **SET 2**, **SET 3** or **SET 4** (**SET 1** is selected with no input). Two optional selections are available for added ramp control. The optional **RAMP UP2** and **RAMP DN2** settings are selected in the same manner as the setpoints (**RAMP UP1** and **RAMP DN1** are selected with no inputs).

**NOTE:**

**ALL INPUTS ACCEPT 110 VAC AS AN INPUT WITH LED INDICATORS DENOTING SELECTION. AN INPUT VOLTAGE OF 80 TO 110 VAC IS CONSIDERED AN "ON" SELECTION. A VOLTAGE OF 0 TO 30 VAC IS CONSIDERED AN "OFF" OR DE-SELECTION.**

### **3.2.1 Potentiometers**

Set all potentiometers to the full counterclockwise position. This will set all setpoints at their minimum values and the ramp times at the longest ramp time. The minimum output voltage is now set at approximately 40 Volts DC. The ramp-up and ramp-down times are set at their slowest rate which is approximately four (4) seconds.

### **3.3 Operating Mode**

Determine whether the control will be operated in voltage or current mode. Set the J2 jumper in the appropriate position for the mode selected.

### **3.4 Setpoint Configuration**

#### **3.4.1 Maximum Output Voltage/Current (Field Forcing)**

Connect the hoist motor's field wires to the **F+** and **F-** terminals of the D2120. Connect a Voltmeter set to read DC Volts across the terminals marked **F+** and **F-** with the negative meter lead on the **F+** terminal. Select the **SET 4** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 4 (TB1-4)**. Adjust the **SET 4** potentiometer until the voltmeter reads the voltage/current level required for field forcing or the maximum output voltage/current required.

#### **3.4.2 Running Voltage/Current**

Leave the voltmeter attached to the **F+** and **F-** terminals. Select the **SET 3** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 3 (TB1-3)**. Adjust the **SET 3** potentiometer for the normal running voltage or current level required.

#### **3.4.3 Field Weakening Voltage/Current**

With The voltmeter still attached to the **F+** and **F-** terminals; Select the **SET 2** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 2 (TB1-2)**. Adjust the **SET 2** potentiometer for the field weakening voltage or current required.

#### **3.4.4 Default Voltage/Current**

**SET 1** is the setpoint that is selected when there are no inputs to TB1. **SET 1** is therefore selected by default (no input command), this makes **SET 1** ideal for use as a safety setpoint in case of input command failure. Adjust the **SET 1** potentiometer to the desired voltage or current level as in the preceding steps.

### 3.5 Ramp-Up and Ramp-Down Rates

Adjust the **RAMP UP** and **RAMP DN** potentiometers as desired. The adjustable range of the potentiometers is from 0.5 seconds to 4 seconds. For the fastest rate, set the potentiometer(s) full clockwise.

### 3.6 Field Loss Relay

The field loss relay is designed to pull-in when the field current is equal to the field current setpoint. This setpoint is adjustable from 10% to 90% of the unit rating (2 Amps to 18 Amps). To set the field loss relay pull-in point, attach a DC Ammeter in series with one leg of the Field (between **F+** and motor field). Turn the **FLDI** potentiometer fully clockwise and the **SET 1** potentiometer fully counterclockwise. Remove all input calls for field setpoints. Slowly turn the **SET 1** potentiometer clockwise until the Ammeter reads the desired field current trip point.

Monitor either of the relay contacts at terminal block TB1 (C to NO, or C to NC) with an Ohmmeter. Slowly turn the **FLDI** potentiometer counterclockwise until the relay pulls in and the state of the Ohmmeter changes.

#### **IF A DC AMMETER IS UNAVAILABLE:**

- 1) Measure the impedance of the hoist motor field with an Ohmmeter.
- 2) Multiply the impedance measured in step #1 by the desired pull-in current point. This will give you the output voltage that corresponds to the pull-in current.

Example:	Field Impedance	= 20 Ohms
	Desired Current	= 4 Amps
	Output Voltage	= 20 Ohms * 4 Amps = 80 Volts

- 3) Monitor the output voltage across the **F+** and **F-** terminals. Slowly turn the **SET 1** potentiometer clockwise until the voltage across the **F+** and **F-** terminals equals the voltage calculated in step #2.
- 4) Monitor either of the relay contacts at terminal block TB1 (C to NO, or C to NC) with an Ohmmeter. Slowly turn the **FLDI** potentiometer counterclockwise until the relay pulls in and the state of the Ohmmeter changes.

### 3.7 Fast/Ramp Jumper (SP1)

Set the **SP1** jumper to select the ramp mode desired. The **SP1** jumper is factory set to the **RAMP**



position. If the **SP1** jumper is set to the **FAST** position, the **RAMP DN** setting(s) will have no effect.

## **MODEL D2120**

### **10A INTEGRAL BRAKE OPTION**



## SECTION ONE DESCRIPTION 10 AMP INTEGRAL BRAKE OPTION

### 1.1 Introduction

The model D2120 is available with an integral 10 Amp continuous rated brake control that provides a full wave rectified output for controlling a brake. The output is varied by five potentiometers that control; three independent setpoints, one ramp-up rate and one ramp-down rate. The D2120 brake option can be configured to operate as either a voltage or a current regulator.

#### WARNING:

**THIS CONTROL IS NOT RECOMMENDED FOR USE ON BRAKES WITH COIL IMPEDANCES OF LESS THAN TWENTY (20) OHMS.**

### 1.2 Setpoints SET 1- SET 3

There are three (3) output settings available, labeled **SET 1** through **SET 3**. Each setpoint is independently adjustable from zero to full output. These setpoints are selected by applying 80 to 100 VAC to the appropriate input. When two or more inputs are present at one time, the highest input will be selected. For example, if **SET 1** and **SET 3** were selected (80 - 100 VAC), **SET 3** would be the selected setpoint.

#### NOTE:

**ALL SETPOINT INPUTS ACCEPT 110 VAC AS A SELECTION SIGNAL WITH LED INDICATORS DENOTING THE SELECTED SETPOINT.**

### 1.3 Ramp UP/DN Settings

#### 1.3.1 Ramp UP

There is one ramp-up rate labeled **RAMP UP**. This potentiometer controls the length of time for the output to go from zero to full output. The range of adjustment is approximately 0.5 seconds to 4 seconds.

#### 1.3.2 Ramp DN

There is one ramp-down rate labeled **RAMP DN**. This potentiometer controls the length of time for the output to go from full output to zero. The range of adjustment is approximately 0.5 seconds to 4 seconds.

## 1.4 Mode Selector Jumper

The D2120 brake option has two available modes of operation.

**Voltage Regulation Mode** The control will operate as a voltage regulator when the selector jumper is in the **VOL** position. In this mode, the output voltage is regulated, but the current to the load may vary.

**Current Regulation Mode** The control will operate as a current regulator when the selector jumper is in the **CUR** position. In this mode, the output current is regulated, but the voltage to the load may vary.

Current regulation mode is recommended for applications where there are large differences in loads and temperature.

**NOTE:**

**THE OPERATING MODE MUST BE SET BEFORE APPLYING POWER TO THE CONTROL.**

**NOTE:**

**IN THE CURRENT REGULATING MODE, THE CURRENT WILL FOLLOW THE RAMP UP/DOWN TIME RATES. THE OUTPUT VOLTAGE COULD CHANGE RAPIDLY AND MAY OVERSHOOT THE SETPOINT FOR A SHORT PERIOD OF TIME BEFORE RETURNING TO THE SETPOINT. THIS IS NORMAL BEHAVIOR SINCE THE CONTROL IS REGULATING THE RAMP TIMES OF THE CURRENT AND NOT THE RAMP TIMES OF THE VOLTAGE.**

## 1.5 Fast Off Jumper

This jumper controls the behavior of the control whenever a setpoint is de-selected. If the jumper is in the **RAMP** position, the output will ramp down to zero. If this jumper is in the **FASTOFF** position, the output will immediately drop to zero volts.

**SECTION TWO**  
**INSTALLATION INSTRUCTIONS**  
**10 AMP INTEGRAL BRAKE OPTION**

**2.1 Output Power (BRK+, BRK-):**

Connect the brake coil to the terminals marked **BRK+** and **BRK-**. The output voltage is adjustable from zero to 280 volts DC and is rated for up to 10 Amps DC continuous output current.

**WARNING:**

**THIS CONTROL IS NOT RECOMMENDED FOR USE ON BRAKES WITH COIL IMPEDANCES OF LESS THAN TWENTY (20) OHMS.**

**2.2 Input Commands:**

Input commands are selected by applying 110 VAC between **NEUT** (neutral) and the desired input. Input selections are available for **SET 1**, **SET 2** or **SET 2**.

**NOTE:**

**ALL INPUTS ACCEPT 110 VAC AS AN INPUT WITH LED INDICATORS DENOTING SELECTION. AN INPUT VOLTAGE OF 80 TO 110 VAC IS CONSIDERED AN "ON" SELECTION. A VOLTAGE OF 0 TO 30 VAC IS CONSIDERED AN "OFF" OR DE-SELECTION.**

**2.3 Mode Selector:**

Set the J2 jumper to the position that represents the desired mode of operation. The operating mode choices are **VOLTage** or **CURrent**.

**Voltage Regulation Mode**    Output voltage level is regulated, current to the load may vary.

**Current Regulation Mode**    Output current is regulated, voltage at the load may vary.

Current regulation mode is recommended for applications where there are large differences in loads and temperature.

**NOTE:**

**THE OPERATING MODE MUST BE SET BEFORE APPLYING POWER TO THE CONTROL.**

**NOTE:**

**IN CURRENT REGULATING MODE, THE CURRENT WILL FOLLOW THE RAMP UP/DOWN RATES. THE OUTPUT VOLTAGE COULD CHANGE RAPIDLY AND MAY OVERSHOOT THE SETPOINT FOR A SHORT PERIOD OF TIME BEFORE RETURNING TO THE SETPOINT. THIS IS NORMAL BEHAVIOR SINCE THE CONTROL IS REGULATING THE RAMP TIMES OF THE CURRENT AND NOT THE RAMP TIMES OF THE VOLTAGE.**

**SECTION THREE**  
**SET-UP PROCEDURE**  
**10 AMP INTEGRAL BRAKE OPTION**

**3.1 Potentiometers:**

Set all potentiometers to the full counterclockwise position. This will set all setpoints at their minimum values and the ramp times at the longest ramp time. The minimum output voltage is now set at zero volts. The ramp-up and ramp-down times are set at their slowest rate which is approximately four (4) seconds.

**3.2 Maximum Output Voltage (Pick Voltage):**

Connect a Voltmeter set to read DC Volts across the terminals marked **BRK+** and **BRK-** with the negative meter lead on the **BRK-** terminal. Select the **SET 1** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 1 (TB1-2)**. Adjust The **SET 1** potentiometer until the voltmeter reads the voltage level required for picking the brake or the maximum output voltage required.

**3.3 Holding Voltage:**

Leave the voltmeter attached to the **BRK+** and **BRK-** terminals. Select the **SET 2** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 2 (TB1-3)**. Adjust the **SET 2** potentiometer for the normal holding voltage level required.

**3.4 Auxiliary Voltage:**

With the voltmeter still attached to the **BRK+** and **BRK-** terminals; Select the **SET 3** setpoint by applying 110 VAC between **NEUT (TB1-1)** and **SET 3 (TB1-4)**. Adjust the **SET 3** potentiometer for the auxiliary voltage required.

**3.5 Ramp-Up and Ramp-Down Rates:**

Adjust the **RAMP UP** and **RAMP DN** potentiometers as desired. The adjustable range of the potentiometers is from 0.5 seconds to 4 seconds. For the fastest rate, set the potentiometer(s) full clockwise.

**MANUAL REVISION LIST**

<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>
1	May, 1995	First release of Manual
2	May, 1996	Pg 7: Added “(optional)” to LIMIT pot title. Pg.11: Added field loss relay adjustment range and percentage information.
3	July 2002	Address updates -cleanup