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SECTION 1 - GENERAL INFORMATION

1.1 Introduction

This manual provides the necessary information to install, adjust and troubleshoot a Series-90 Version 2 elevator controller. It should be read and understood completely before trying to work with the controller. Please feel free to call O.Thompson Engineering with any questions you may have BEFORE performing installation or start-up.

We are constantly improving our controller design and documentation. If there are suggestions you would like to make concerning design or documentation, send comments to:

O.Thompson Company
84-00 73rd Avenue
Unit F
Glendale, NY 11385
FAX (718) 417-5363
ATT: CUSTOMER SUPPORT

1.2 Year 2000 Compliance

Any equipment manufactured or furnished by O. Thompson Company that contains computer software is fully Year 2000 compliant, as it does not operate using a calendar year designation.
1.3 About The Documentation

SECTION 1 - GENERAL INFORMATION highlights many areas of concern when installing a controller.

SECTION 2 - THEORY OF OPERATION acquaints the reader with the function of the major components of a user entry system.

SECTION 3 - SEQUENCE OF OPERATION describes the normal input and output sequence.

SECTION 4 - INSTALLATION details the mechanical and electrical requirements in a installation.

SECTION 5 - START UP PROCEDURES outlines a normal sequence to start up a controller on hand operation.

SECTION 6 - TUNE UP PROCEDURES explains the keypad terminal, parameter entry, and final adjustments to a Series-90 controller.

SECTION 7 - DISPATCHER DESCRIPTION EXPLAINS THE OPERATION OF THE BUILT in duplex and Microflite Plus dispatchers.

SECTION 8 - TROUBLE SHOOTING PROCEDURES outlines trouble shooting.

SECTION 9 - PARAMETER LIST
There are certain fundamental warnings which must be kept in mind at all times. If these fundamental warnings are not kept in mind, **personal injury and or death may occur**. These Warnings include:

- Series 90 Controllers should only be **installed by qualified, licensed elevator personnel** familiar with the operation of microprocessor based elevator controls.

- Verify that all safety devices (limits, governor, hoistway locks, car gate, broken tape switch, etc) are **fully functional** prior to attempting to run the elevator. Never operate the Series 90 controls with any safety device rendered inoperative in any way.

- The User is responsible for **compliance with the National Electrical Code** with respect to the overall installation of the equipment, and proper sizing of electrical conductors connected to the controls.

- The User is responsible for understanding and applying all Local, State, Provincial, and Federal Codes which govern such practices such as controller placement, applicability, wiring protection, disconnects, over current protection, and grounding procedures.

- Controller equipment is at line voltage when AC power is connected. Never operate **Series 90 controls with covers removed** from Motor Field controls, Generator Field controls, or Brake controls.

- After AC power has been removed, internal capacitors can remain charged for up to 5 minutes after power has been removed. Therefore, **wait at least 5 minutes after power down before touching any internal components** of the controls.

- To prevent the risk of personal shock, **all equipment should be securely grounded to earth ground**, with a minimum of #8 AWG wire as outlined in the National Electrical Code. Failure to obtain an actual earth ground source may result in electrical shock to personnel.

- When using test equipment (oscilloscopes, etc.) with a power cord that electrically ties probe common to earth ground, **an isolation transformer should be used to isolate the instrument common from earth ground**.

- Care should be taken to remain clear of all rotating equipment while working on the controls.
1.5 Equipment Safety

There are certain fundamental precautions that should be taken when working on any Series 90 or Microflite Products. If these precautions are not taken, equipment damage, and possibly personal injury could occur. These cautions include:

< All equipment should be securely grounded to earth ground, with a minimum of #8 AWG wire as outlined in the National Electrical Code. Failure to obtain an actual earth ground source may result in electrical shock to personnel. Improper grounding is the most common cause of electrical component failure and electrically noised induced problems.

< All component replacement must be done with the main line power off. Additionally, internal capacitors remain charged for up to five minutes after power down. Therefore, component replacement should not take place until this five minute waiting period. Damage to equipment or unexpected operation of the elevator may occur if this caution is not adhered to.

< Substitution of parts or unauthorized modifications to circuits or components should not be attempted before first contacting O. Thompson Engineering to insure all safety features are maintained.

< Circuit boards that are determined to be defective should be sent to O. Thompson for repair and subsequent testing. Field repairs may leave the board with undetected problems that may affect other parts of the control.

< Care should be taken when using test leads and jumpers to avoid applying high voltage or ground to low voltage circuits.

1.6 Quality Control Testing

Each controller 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.

All units go through a High Pot test procedure where all incoming lines are checked with 1000 volts plus twice the line voltage for any breakdowns or grounds during a one minute period.
1.7 Environment

Series 90 controls should be installed in environments that meet the following considerations:

1. AMBIENT TEMPERATURES - 0 degrees C to 40 degrees C (104 F)
2. RELATIVE HUMIDITIES - up to 90%

Although the control will perform over a wide temperature range, thermal shock can reduce the extended life of solid state components. Ideal operating temperatures are between 68F and 87F.

The installer should minimize exposure to the following:

1. Dust, carbon, or metallic particles should not accumulate on any part of the control.
2. Vibration and shock.
3. Rapid temperature change, high humidities, high ambient temperatures.
4. Caustic fumes.
5. Electromagnetic interference, this may be caused by radio frequency transmitters, high frequency noise from unsuppressed relay coils, improper grounding, improper wiring practice. The following should be noted:

< The outer door will protect against interference, only if it is closed. When the door is open, do not run high wattage radios next to the microprocessor.

< Noise from door operator reactors can cause a problem, if mounted on the controller.

< If the car microprocessor keeps re-setting, check for electromagnetic interference (noise) by checking the following:

1. Check for proper (water pipe) grounding,
2. Check that high voltage wiring is not running near the computer boards.
3. If the noise is seen when the door motor is operating, add suppression around the door operator circuitry.
4. Try to pinpoint when the noise occurs (I.E. when the noise occurs, what relay is picking or dropping.) Once the problem relay is pinpointed, add arc suppression around the coil.

Note: Standard arc suppressors (resistor/capacitor networks) are used on AC relays, and diode/resistor combinations work well for DC relays. Consult O. Thompson engineering for proper component sizing.
1.8 Piping and Wiring Considerations

Proper routing of the signal and power wires for the car and dispatcher is essential to a trouble free installation with any microprocessor based equipment. This part of the installation is where most people turn their heads and say "oh, I didn't see that section." As much as it sounds like an "engineering thing", low voltage and high voltage wiring cannot be run in the same conduit or duct.

1.9 How Electrical Noise Occurs

Electrical noise occurs in most cases when two wires run along side one another, one of them a high power conductor, and the other of relatively low signal level conductor. As current flows through the high power wire, magnetic lines of flux (voltage) expand outwards around the outside of the wire. With a low signal level wire along side the high voltage wire, a voltage from the magnetic lines of flux is induced in the low level conductor.

The low level conductor, in the case of Series 90, may be a 24 volt input that really only needs to see 12 volts to turn on. If the voltage induced from the high power conductor is large enough to induce a 12 volt spike, the input can falsely turn on.

1.10 How to Avoid Electrical Noise Problems

Noise problems can be avoided in a variety of ways. The easiest way to avoid noise problems is in the proper routing of high and low level signal wiring. Keep low level wiring in separate conduit from high power wiring. The separate conduit provides a shield from electrical noise. If high and low power wiring must be run in the same duct, try to keep them a minimum of three to four inches apart. Also, if the two must cross each other, they should cross at a ninety degree angle to each other. Sometimes this is not practical.

A second way of protecting from electrical noise problems is to run low level wiring in shielded cable. It is very expensive to run all wiring in this manner, so only certain signals are run in this manner. The shield provides a conductor external to the actual signal wiring to collect any induced voltage from surrounding high power wiring.

The shield or "drain", as it is often referred to, is then connected to ground on one end. With the induced voltage connected directly to ground, the induced spike is suppressed immediately before affecting the actual signal being shielded. The shield or "drain" should never be connected to ground at both ends.

Arc suppressor failure, such as diodes, quench arcs and capacitors could create electrical noise. Physically check all arc suppressors for connection and damage.

Note: For maintenance purposes - periodically check all arc suppressors.
1.11 Tach Generator Wiring

The tach generator signal is the heart of any type of regulator used. This signal must be as clean as possible or extreme instabilities may occur in the motor drive system. Instabilities caused by a noisy tach signal can take days of adjustment to filter out of the regulator circuits. It only takes a couple of hours to run a separate pipe for the tach.

The tach signal should also be wired using a shielded twisted cable with the shield terminated to the controller ground terminal on the controller. DO NOT ground the shield on both ends of the cable. If the shield is grounded at both ends, an "antenna" is created, and more noise can be induced into the tach signal than if the shield were left completely ungrounded.

1.12 Low Voltage Signal Wiring

Low voltage signal wiring includes all the 24 volt inputs. These include the car calls, door limits, electric eyes, etc. All inputs only need to see 12 volts or more to turn on. If the signal wires are run along side the 240 VDC door operator wiring, a 12 volt spike is very likely to occur. Keep low level signal wiring run at least 4 inches away from high power wiring to avoid false signal firing. Wherever this is not possible and the low level wiring must cross the high power wiring, the two should cross at ninety degree angles to each other.

1.13 Dispatcher Communication Wiring

Serial communication cables between the car and dispatcher or between two cars in a duplex should be run in a separate pipe from all other signal wiring. Serial communication cables between lobby displays and building management systems should be done in shielded pair wiring. Ground the controller prior to hooking up dispatcher communication wires when hooking the car up to a Microflite Dispatcher. Failure to do so may cause the serial communication board at the dispatcher to fail.

1.14 High Power Wiring

High power wiring that should be piped separately from all other signal wiring include the following:

- Power wires for the AC end of the Generator
- Main line connections to the cabinet.
- Generator Field and Armature Wiring.
- Motor armature and motor field wiring.
- Brake coil wiring.

In most cases it is practical to run the motor armature, motor field, and brake wiring in one pipe. The other wiring should all be run in separate pipes, and NOT run in the common duct with all the signal wiring.
1.15 Proper Grounding Procedures

A proper ground is essential to the trouble free operation. GROUND is defined as a direct connection to EARTH GROUND. This type of ground is not always available from the electrical supply panel. Electrical codes vary in some areas, and some electrical codes consider the conduit used to carry the conductors the ground for the system.

We do not consider the electrical conduit to be a sufficient ground for our system. Electrical ground should be obtained and certified from the electrical contractor. If this is not available, keep the following in mind when seeking an adequate connection to EARTH GROUND:

1. The building steel is not always earth ground. In most cases, building beams rest on concrete beam pockets, and the earth connection is inadequate.

2. A sprinkler system water pipe is not adequate because the sprinkler system is in most cases isolated from a free flowing earth water source.

If either of the two methods above are chosen for ground, and a true electrical ground is later introduced to the system, a difference in potential can occur between the assumed ground and the earth actual earth ground. This may lead to unsafe operating conditions, and the possibility of electrical shock to passengers or personnel.

3. A water pipe is an adequate ground only if the water in the pipe is connected to a continuous city water source.

1.16 Wiring Connections for Properly Grounded Systems

1. An uninterrupted ground wire of at least #8 AWG wire should be run from each car controller cabinet to earth ground. The connection at the car controller must be scraped free of paint so the ground connection can be made to the bare metal of the enclosure.

2. Ground straps, or short loops of ground wire should be run from the controller ground connection to the primary duct connections.

3. An uninterrupted #8 AWG ground wire should be run from the hoist motor frame to the controller ground. Wherever the ground connection is made on the hoist motor should be free of paint.

4. An uninterrupted #8 AWG ground wire should be run from the frame of the AC end of the Generator to the controller ground to ensure proper ground protection for people working on the equipment.
5. An uninterrupted #8 AWG ground wire should be run from the frame of the DC end of the generator to the controller ground.

6. A continuously looped ground wire should be run from each hall lantern and position fixture box to controller ground. The ground connection at each fixture should make an electrical connection to the bare metal of the fixture box and its cover. This connection should be free of paint.

7. An uninterrupted ground wire of a minimum of #14 AWG should be run from a termination point on the cab to the controller ground.

8. An uninterrupted ground wire should be run from the cab enclosure to the ground terminal on the cab to provide passengers and personnel protection from electrical shock.

9. An uninterrupted ground wire should be run from each car operating panel to the ground terminal on the cab to provide passengers and personnel protection from electrical shock.

10. An uninterrupted ground wire should be run from the dispatch cabinet to earth ground. The connection at the dispatch cabinet must be scraped free of paint so the ground connection can be made to the bare metal of the enclosure.

11. A continuously looped ground wire should be run from each hall push button station to the dispatch or controller ground.

1.17 Proper Tach Mounting Procedures

The most often overlooked item in a DC drive application is the proper mounting of the tach generator. Poor or improper mounting of the tach generator leads to an unstable tach feedback signal to the regulator. Unstable feedback signals become amplified within the regulator circuits and lead to oscillations and vibration in the ride.

The most common misunderstanding is that the tach signal should exactly reflect the actions of the car. This is incorrect in that mechanical resonances and instabilities can exist in a system that should not be incorporated into the motor control. An example of a mechanical instability would be improper gear lash in a geared application.

The tach signal should exactly reflect the actions or speed of the motor in all cases. Tach signal is also looked at in terms of resolution. The higher the tach voltage at contract speed, the better the resolution of the signal. We recommend a tach signal with an amplitude of at least 60 volts DC at contract speed on all applications.
1.17.1 Tach Mounting for Geared Applications

WE RECOMMEND the tach generator for geared applications be coupled directly to the motor shaft using an isolated flexible coupling supplied by the tach manufacturer. The tach shaft should not be hard fixed to the motor shaft due to imperfections in the motor shaft alignment. If the tach shaft is hard coupled to the motor shaft without a flexible coupling, premature tach generator failure will occur.

WE DO NOT RECOMMEND driving the tach generator from the drive sheave on geared applications. This is primarily due to the lower resolution tach feedback signal that would be sent to the drive. Another reason we do not recommend this method is that the mechanical instabilities of the gear box will be introduced into the motor control circuits and the electrical stability of the system will be sacrificed. Ideally, the tach should be mounted on geared applications to yield between 70 - 120 volts at contract speed.

1.17.2 Tach Mounting for Gearless Applications

WE RECOMMEND the tach generator for gearless applications be driven from the drive sheave using a standard 3 ½" tach wheel. The tach wheel should ride on a smooth machined surface to the side of the rope grooves or directly on the brake pulley. This surface should be free of paint and excessive grooving. The tach should be mounted to allow the tach generator to pivot with and closely follow the imperfections of the driving surface.

WE DO NOT RECOMMEND the tach generator for gearless applications be coupled directly to the motor shaft. This is primarily due to the lower resolution tach feedback signal that would be sent to the drive. Ideally the tach wheel should be sized and situated on gearless applications to yield between 70 - 120 volts at contract speed.

1.17.3 Tach Mounting for AC Vector

WE RECOMMEND the tach generator for AC vector applications be mounted on the sheave using a base mounted tach.

Note:
Tach voltage will not affect ride quality, the tach is used for voltage reference.
1.18 Routine Controller Inspection

The controller goes through the following steps prior to being shipped to your jobsite:

- **Phase 1:** The controller is assembled per job drawings.
- **Phase 2:** The logic section of the controller is tested.
- **Phase 3:** All wiring connections are checked for tightness.
- **Phase 4:** Metal filings and wire stripplings are vacuumed out.
- **Phase 5:** The controller is wrapped and put on a pallet.
- **Phase 6:** The controller is shipped.

After phase 3 of the process, the controller is sometimes subjected to vibration and jarring that occurs during shipping. This vibration often causes wire connections to loosen and in extreme cases boards can become dislodged from their sockets.

The following items should be checked prior to applying power to the controller. This procedure should take approximately one hour, and is an hour well spent in comparison to the intermittent problems that may occur if it is not done.

1. Gently push in on every circuit board to make sure they are seated properly into the Motherboard and the latches lock the boards in place. Also check that all phoenix connectors are seated properly on the Motherboard and on all Car Call and Expansion I/O boards if applicable.

2. Check the 12, 24, & 5 volt power supply connections on the left side of the Motherboard.

   **Note:**

   12 volts to Mother Board connections supplied only if a Building Management System is supplied.

3. Check and re-tighten every contact and coil screw to all ice cube relays.

4. Check the wire connections on the power relays (typically the "C, O, BK, & P" relays).

5. Check the connections at the phoenix connectors at the top of the brake and motor field regulators. Also check the power connections at the bottom of the brake and motor field regulators.

6. Check all connections to the generator shunt field regulator.

7. Check all connections to the Limit Board if applicable.
8. Check the connections to all power transformers mounted at the bottom of the controller.

9. Check all power connection lugs on the bottom of the controller.

10. Check the connections to all terminal blocks by gently pulling on each wire at the terminal blocks.

11. Check the connections to all termination cards and verify that all power phoenix connectors are inserted properly.

12. Gently press in on all ice cube relays to make sure they are seated properly in their sockets.

13. Verify that all heat resistant wire insulation is in tact where they pass through into the main controller cabinet.

14. Verify that no resistor tubes have been cracked during shipping.

15. Gently pull on each wire leading to the end or tap of each resistor tube to make sure the connections are tight.

16. Attempt to slide each resistor tube tap by hand. If the tap moves by hand, tighten the tap ½ turn at a time until the tap can no longer be moved by hand.
SECTION 2 - THEORY OF OPERATION

2.1 General Description

The Series 90 is a micro processor based system. The M.P.U board is built around a powerful 80188 16 bit CPU operating at 8 MHZ. The program is stored on a non volatile 64K byte EPROM. Parameters and diagnostic data is stored on an 8K byte non volatile SRAM and a 2K EEPROM. The board also provides a wide range of I/O and peripherals, including dual DMA channels, three counter/timers, two serial ports, a parallel port with DMA, and a multi-source interrupt controller.

The M.P.U. board interfaces to the outside world through the I/O Mother board. This board contains all of the address decoding for the inputs, outputs, the built in LED display and keyboard.

2.2 Series-90 Features

Series-90 software and hardware supports a wide array of standard and optional features. Listed below are many of the features currently supported. The entire field programmable parameter list is explained in Sections 6.3, 6.4. Series-90 features are continually updated, if a feature not listed is desired contact O. Thompson engineering or the sales department for availability.

2.2.1 Features

* Two to twenty-four landings
* Programmable Selective doors
* Simplex operation
* Self contained E.T.A. duplex operation, with programmable zoning
* Group operation from Microflite E.T.A. dispatcher
* Mono chrome or color lobby display with Microflite dispatcher
* Motor control - V.V. open and closed loop, S.C.R. drive, Single speed & Two speed A.C., AC Inverter drive & AC Vector Drive.
* L.E.D. Display provides - Diagnostics, Set-up Parameter Entry,
* Adaptive door timing
* Anti-nuisance
* Automatic MG shutdown
* Car call canceling on direction reversal
* Continuity of service (loss of dispatcher backup)
* Door nudging
2.3 Relay Interface

The relay circuits are required to:

1. Select between inspection and automatic operation. Car is fully operational on inspection mode without the car microprocessor and without the electronic generator field regulator.
2. Interface the microprocessor's outputs to the motion control circuitry.
3. Interface high voltage wiring to the microprocessor's inputs.
4. Meet code requirements (ANSI 17.2, CSA/CAN B44.1/M91).

2.4 Controller Switch Functions

**MPU Switch**

This switch shuts off the 24, 12, & 5 volt power supply for the microprocessor and the inputs. This switch should be left off until the processor is absolutely needed. Placing this switch in the up position turns the processor on.

**IND Switch**

This switch places the car on independent service for testing and running the car from the machine room. Placing this switch in the up position places the car on independent service.

**INSP Switch**

This switch places the car on inspection. Placing this switch in the up position places the car on automatic service.

**DOOR Switch**

This switch disables the door relay circuits. Note there is no input to the micro that this has occurred, so the micro will still attempt to open the doors by turning on the door open output. Placing this switch in the up position enables the doors to cycle normally.
IP Switch
This switch allows the power to be disconnected from the car top encoder unit to service it. Placing this switch in the up position supplies power to the Set 9000 unit.

MG Jobs Only

EMGI Switch
This switch disconnects the electronic generator field regulator from the generator shunt field and connects the generator shunt field to a simple rectifier/resistor power supply. This is a desirable feature during start up because the car can be run without adjusting the generator field regulator initially.

MG Switch
This switch shuts off the generator set.

CAUTION: The MPU, MG, and the IP switch should never be switched down while the car is running on automatic. This will cause the car to make a high speed stop.

2.5 Motherboard

2.5.1 Built In Keyboard and Display
The built in keyboard and display provides the user with monitor, parameter entry and diagnostic information. Refer to Section 6.1 for key pad and display operating instructions. The main menu and parameter enter flow charts provide a graphic illustration of the key pad and display usage (See Section 8).

2.5.2 Car Inputs
Inputs accept either 24 or 125 VDC signals. Inputs are considered “on” when the input is brought above 12 VDC with respect to 24M- (ground), at the input terminal. As an input is brought to a voltage above ground, the input L.E.D. will glow. Using a digital meter, an input can be tested. Measure from 24M- to the input terminal, when the input is “on”, the meter must read more than 12 VDC. All inputs and outputs can be tested using the I/O display functions. Refer to Section 6.1.5 for information regarding this operation.

IMPORTANT NOTE:

If high voltage is connected to a low voltage input, the channel will be damaged on the motherboard. If this occurs, the motherboard must be replaced or repaired.
# S90 Bottom Board Mapping

## Inputs (Top LED’s Read Right to Left)

<table>
<thead>
<tr>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J7/1</td>
<td>L1</td>
<td>Door Lock and Gate Switch</td>
</tr>
<tr>
<td>J7/2</td>
<td>L2</td>
<td>Door Close Limit Front</td>
</tr>
<tr>
<td>J7/3</td>
<td>L3</td>
<td>Door Open Limit Front</td>
</tr>
<tr>
<td>J7/4</td>
<td>L4</td>
<td>Safety Circuit Front</td>
</tr>
<tr>
<td>J7/5</td>
<td>L5</td>
<td>Safety Edge Front</td>
</tr>
<tr>
<td>J7/6</td>
<td>L6</td>
<td>Electric Eye Front</td>
</tr>
<tr>
<td>J7/7</td>
<td>L7</td>
<td>Door Open Button Front</td>
</tr>
<tr>
<td>J7/8</td>
<td>L8</td>
<td>Door Close Button Front</td>
</tr>
<tr>
<td>J8/1</td>
<td>L9</td>
<td>3 Inch Door Zone</td>
</tr>
<tr>
<td>J8/2</td>
<td>L10</td>
<td>Up Step/Level Up</td>
</tr>
<tr>
<td>J8/3</td>
<td>L11</td>
<td>Dn Step/Level Dn</td>
</tr>
<tr>
<td>J8/4</td>
<td>L12</td>
<td>Bottom Reset</td>
</tr>
<tr>
<td>J8/5</td>
<td>L13</td>
<td>Top Reset</td>
</tr>
<tr>
<td>J8/6</td>
<td>L14</td>
<td>Inspection</td>
</tr>
<tr>
<td>J8/7</td>
<td>L15</td>
<td>Independent Service</td>
</tr>
<tr>
<td>J8/8</td>
<td>L16</td>
<td>Handicap Chime Enable</td>
</tr>
<tr>
<td>J9/1</td>
<td>L17</td>
<td>Fire Phase 1</td>
</tr>
<tr>
<td>J9/2</td>
<td>L18</td>
<td>Primary Smoke Detector</td>
</tr>
<tr>
<td>J9/3</td>
<td>L19</td>
<td>Alternate Smoke Detector</td>
</tr>
<tr>
<td>J9/4</td>
<td>L20</td>
<td>2nd Alt. Smoke Detector</td>
</tr>
<tr>
<td>J9/5</td>
<td>L21</td>
<td>Fire Phase 2 On</td>
</tr>
<tr>
<td>J9/6</td>
<td>L22</td>
<td>Fire Phase 2 Hold</td>
</tr>
<tr>
<td>J9/7</td>
<td>L23</td>
<td>Fire Call Cancel</td>
</tr>
<tr>
<td>J9/8</td>
<td>L24</td>
<td>Fire Smoke Bypass</td>
</tr>
<tr>
<td>J10/1</td>
<td>L25</td>
<td>Motor Generator On</td>
</tr>
<tr>
<td>J10/2</td>
<td>L26</td>
<td>Weight Switch Dispatch</td>
</tr>
<tr>
<td>J10/3</td>
<td>L27</td>
<td>Weight Switch Bypass</td>
</tr>
<tr>
<td>J10/4</td>
<td>L28</td>
<td>Independent Riser</td>
</tr>
<tr>
<td>J10/5</td>
<td>L29</td>
<td>Earthquake Counterweight</td>
</tr>
<tr>
<td>J10/6</td>
<td>L30</td>
<td>Earthquake Seismic Sensor</td>
</tr>
<tr>
<td>J10/7</td>
<td>L31</td>
<td>Spare</td>
</tr>
<tr>
<td>J10/8</td>
<td>L32</td>
<td>Brake Switch</td>
</tr>
</tbody>
</table>

## Outputs (Bottom LED’s Read Left to Right)

<table>
<thead>
<tr>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J11/1-2</td>
<td>L01</td>
<td>P.I. Bit 1</td>
</tr>
<tr>
<td>J11/3-4</td>
<td>L02</td>
<td>P.I. Bit 2</td>
</tr>
<tr>
<td>J11/5-6</td>
<td>L03</td>
<td>P.I. Bit 3</td>
</tr>
<tr>
<td>J11/7-8</td>
<td>L04</td>
<td>P.I. Bit 4</td>
</tr>
<tr>
<td>J12/1-2</td>
<td>L05</td>
<td>P.I. Bit 5</td>
</tr>
<tr>
<td>J12/3-4</td>
<td>L06</td>
<td>Fire Light</td>
</tr>
<tr>
<td>J12/5-6</td>
<td>L07</td>
<td>Buzzer</td>
</tr>
<tr>
<td>J12/7-8</td>
<td>L08</td>
<td>Floor Passing Chime</td>
</tr>
<tr>
<td>J13/1-2</td>
<td>L09</td>
<td>Door Open Relay Front</td>
</tr>
<tr>
<td>J13/3-4</td>
<td>L10</td>
<td>Door Close Relay Front</td>
</tr>
<tr>
<td>J13/5-6</td>
<td>L11</td>
<td>Up Direction Arrow</td>
</tr>
<tr>
<td>J13/7-8</td>
<td>L12</td>
<td>Down Direction Arrow</td>
</tr>
<tr>
<td>J14/1-2</td>
<td>L13</td>
<td>Up Car Lantern</td>
</tr>
<tr>
<td>J14/3-4</td>
<td>L14</td>
<td>Dn Car Lantern</td>
</tr>
<tr>
<td>J14/5-6</td>
<td>L15</td>
<td>Up Hall Lantern</td>
</tr>
<tr>
<td>J14/7-8</td>
<td>L16</td>
<td>Dn Hall Lantern</td>
</tr>
<tr>
<td>J15/1-2</td>
<td>L17</td>
<td>Fire Stop Switch Bypass</td>
</tr>
<tr>
<td>J15/3-4</td>
<td>L18</td>
<td>Nudging</td>
</tr>
<tr>
<td>J15/5-6</td>
<td>L19</td>
<td>Generator Run</td>
</tr>
<tr>
<td>J15/7-8</td>
<td>L20</td>
<td>Up Direction</td>
</tr>
<tr>
<td>J16/1-2</td>
<td>L21</td>
<td>Dn Direction</td>
</tr>
<tr>
<td>J16/3-4</td>
<td>L22</td>
<td>High Speed</td>
</tr>
<tr>
<td>J16/5-6</td>
<td>L23</td>
<td>Medium Speed</td>
</tr>
<tr>
<td>J16/7-8</td>
<td>L24</td>
<td>Medical Emergency</td>
</tr>
</tbody>
</table>
### S90 I/O Expansion Board Mapping

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1/1</td>
<td>L1</td>
<td>Door Close Limit Rear / 22U</td>
<td></td>
</tr>
<tr>
<td>J1/2</td>
<td>L2</td>
<td>Door Open Limit Rear / 23C</td>
<td></td>
</tr>
<tr>
<td>J1/3</td>
<td>L3</td>
<td>Safety Edge Rear / 23D</td>
<td></td>
</tr>
<tr>
<td>J1/4</td>
<td>L4</td>
<td>Electric Eye Rear / 23U</td>
<td></td>
</tr>
<tr>
<td>J1/5</td>
<td>L5</td>
<td>Door Open Button Rear / 24C</td>
<td></td>
</tr>
<tr>
<td>J1/6</td>
<td>L6</td>
<td>Door Close Button Rear / 24D</td>
<td></td>
</tr>
<tr>
<td>J1/7</td>
<td>L7</td>
<td>Attendant Up Button</td>
<td></td>
</tr>
<tr>
<td>J1/8</td>
<td>L8</td>
<td>Attendant Dn Button</td>
<td></td>
</tr>
<tr>
<td>J2/1</td>
<td>L9</td>
<td>Attendant</td>
<td></td>
</tr>
<tr>
<td>J2/2</td>
<td>L10</td>
<td>Attendant Bypass</td>
<td></td>
</tr>
<tr>
<td>J2/3</td>
<td>L11</td>
<td>Medical Emerg/Emerg Power</td>
<td></td>
</tr>
<tr>
<td>J2/4</td>
<td>L12</td>
<td>Return To Lobby / NPWR</td>
<td></td>
</tr>
<tr>
<td>J2/5</td>
<td>L13</td>
<td>Lobby Door Hold / EP2</td>
<td></td>
</tr>
<tr>
<td>J2/6</td>
<td>L14</td>
<td>Freight Door Timing / EP1</td>
<td></td>
</tr>
<tr>
<td>J2/7</td>
<td>L15</td>
<td>Anti Nuisance Disable</td>
<td></td>
</tr>
<tr>
<td>J2/8</td>
<td>L16</td>
<td>Spare / PTS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3/1-2</td>
<td></td>
<td></td>
<td>Door Open Rear / 22U</td>
</tr>
<tr>
<td>J3/3-4</td>
<td></td>
<td></td>
<td>Door Close Rear / 23C</td>
</tr>
<tr>
<td>J3/5-6</td>
<td></td>
<td></td>
<td>Up Car Lantern Rear / 23D</td>
</tr>
<tr>
<td>J3/7-8</td>
<td></td>
<td></td>
<td>Dn Car Lantern Rear / 23U</td>
</tr>
<tr>
<td>J6/1-2</td>
<td></td>
<td></td>
<td>Up Hall Lantern Rear / 24C</td>
</tr>
<tr>
<td>J6/3-4</td>
<td></td>
<td></td>
<td>Dn Hall Lantern Rear / 24D</td>
</tr>
<tr>
<td>J6/5-6</td>
<td></td>
<td></td>
<td>Up Attendant Light</td>
</tr>
<tr>
<td>J6/7-8</td>
<td></td>
<td></td>
<td>Dn Attendant Light</td>
</tr>
</tbody>
</table>

#### 2.5.3 Car Outputs

Outputs are rated at 1.5 amperes at 120 VDC, resistive load. Each output is wired to a terminal block on the perimeter of the I/O board. Each output is a dry, normally open contact. The contact is brought to two field wiring terminals. This allows each output to be wired to any supply voltage or controller circuit. The terminals for each output can be found on the I/O mapping and board layout drawings point to point schematics. All of the outputs have LED indicators to display that the output is received from the M.P.U. card to close the contacts.

#### 2.6 Car Control M.P.U. (Microprocessor Unit)

The car control microprocessor is responsible for all car operations. The M.P.U reads field inputs such as: car call registration; safety switches; door and gate switches; door operator limits; safety edge; electric eyes; service switches; attendant; independent and fire service.

The car position is read from the level zone, door zone, and step sensors in the hoist way. This provides the M.P.U. with the information to determine the car position. The M.P.U.
writes outputs to Relay outputs. The outputs controlled are door control functions, speed control selection, direction, car output signals. These signal output include position indicators, car travel lanterns, and buzzers.

The M.P.U provides communication (RS 232) to the optional Microflite dispatcher or Lobby Display through the serial communication port on the M.P.U board.

2.7 Call Boards

Four (4) slots are provided on the I/O mother board for car and hall calls. When fully populated, the four Call Boards provide the capability to serve 22 landings (Front Openings), 12 landings (Front and Rear Selective) or any combination of front and rear up to 22 openings. The board can also handle up to 24 openings with front door service only.

The call boards have the ability to connect the acknowledgment light output for the call to one of two commons (J5/1 & J5/2). The headers labeled JMP1 through JMP8 select the output commons for outputs 1 to 8 on each call board respectively.

The standard jumper arrangement is as follows (viewed from the component side of the Call Board, with the motherboard connector to your right):

```
X
X
-
```

This selects the top (J5/1) common for the acknowledgment lights.

To select the bottom (J5/2) common place jumper as shown below:

```
-
X
X
```

The call boards are addressed using the headers located on the call boards. Each of the four (4) expansion slots has its own unique address. Each call board must be addressed properly for the car or hall calls to be recognized. The proper addressing for each of the four Call Boards is shown below.

**NOTE:** Jumper assignments are shown as viewed with the Call Board laying flat with the edge (motherboard) connector to the right of the addressing headers.
2.7.1 Car Call Board Addressing Jumpers

<table>
<thead>
<tr>
<th>SLOT 1</th>
<th>SLOT 2</th>
<th>SLOT 3</th>
<th>SLOT 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>M3</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>M3</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>M3</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>M1</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>M1</td>
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<td>X</td>
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</tr>
<tr>
<td>M1</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M4</td>
<td>-</td>
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<tr>
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<td>M2</td>
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</tr>
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<td>M2</td>
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<td>-</td>
</tr>
<tr>
<td>M2</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

2.8 I/O Expansion (Front/Rear Door & Attendant) Board

This board adds the capability for selective rear doors, simplex medical emergency, and Attendant Service. See point to point schematics for an illustration of the I/O Expansion Board and a layout of the location of the inputs and outputs.

2.9 Brake Control Regulator

This regulator controls the brake lifting and holding voltages. The control consist of two P.C. boards in a single package. The drive will provide 20-270 VDC. The drive will be 7.5, 10 or 20 amp card, depending on the particular application requirements. The drive provides four voltage adjustments and two ramp up and two ramp down rates.

NOTE: On AC drive and hydro applications the Brake Control Regulator is not used. On these applications, adjustable resistors will be provided to adjust voltages.
2.10 Hoist Motor Field Regulator

This regulator controls the voltage to the hoist motor field. The control consists of two P.C. boards in a single package. The drive will provide 20-270 VDC. The drive will be 7.5, 10, 20, or 30 amp card, depending on the particular application requirements. The drive provides four voltage adjustments and two ramp up and two ramp down rates.

2.11 IPC Speed Board (MG and SCR jobs only)

The speed board interfaces basic relay steps in deceleration into an integrated pattern that can be fed into any type of drive system used. The board has 5 different speed adjustments, two accel ramps, two decel ramps, and 4 rollover rounding adjustments.

The five speed adjustments are not used on all jobs. On lower speed jobs, only 3 or 4 speeds will be up. The first set of accel and decel ramps will be used on two speed operation for all runs, and for one floor runs on three speed operation.

The second set of accel and decel ramps will only be used for three speed operation. These ramps allows the user to adjust different acceleration and deceleration rates for multi-floor runs.

The set up of the speed board is not as critical as consistent settings of the floor magnets. The speed board can compensate for most situations where the magnets are set an incorrect distance from the floor as long as the magnets for all floors are consistently off by the same distance.
2.12 Amicon Generator Field Regulator

The Amicon generator regulator is an SCR field current regulator. The regulator is easily adaptable between a 5,10, or 15 amp unit. It will regulate speed to within ½ % of contract speed. Other features are its ability to sense tach loss, reverse tach feedback, overspeed, over current, and power loss.

Additionally, the regulator can be run in “Test” mode to allow the user to set up feedbacks without the regulator tripping during initial setup.

No special transformers are required for the regulator. The incoming control power must be between 208 - 230 VAC. The regulator has many adjustments to allow for individual speed loop, current loop, and armature feedback compensation gain adjustment.

2.13 IPC Generator Field Regulator

The IPC generator regulator is a pulse width modulated field regulator. The output of the regulator is limited to 7.5 amps. It will regulate speed to within ½ % of contract speed. Other features are its ability to sense tach loss, reverse tach feedback, overspeed, overcurrent, and power failure.

Additionally, the regulator can be run in “Set Up” mode to allow the user to set up feedbacks without the regulator tripping during initial setup. The regulator also has an automatic reset built in to prevent shut downs during nuisance trips.

A special transformer is supplied with the IPC regulator to allow adjustment in the output voltage levels. The outputs from the secondary of this transformer are 110, 130,150, &165 VAC. The gain from the regulator will give approximately 1.33 times the incoming AC power. In other words, if the transformer is tapped at the 165 volt tap, we should be able to get approximately 220 VDC to the generator shunt field.

The regulator uses tach feedback as its primary feedback, however, field current and armature voltage feedback are also used for stability. Separate speed loop gain adjustment is provided in addition to armature voltage feedback compensation.

2.14 Baldor Sweo Drive

The Sweo drive is the SCR drive used on O. Thompson geared applications unless the Customer requests differently. It is necessary for O.Thompson to supply a DC contactor on this drive as one is not supplied by Sweo. The Sweo drive is basically comprised of four main components: The Control Board, The Firing Board, the Feedback Board, and the Power Converter.
O. Thompson does not use the motor field power supply on the Baldor Sweo drive, so a separate motor field voltage regulator will be supplied.

The Control board interfaces with the Series 90 relay circuitry and accepts inputs through plug-in terminal strips located on the bottom of the board. This board plugs into the Firing board and contains all of the analog speed and current regulator circuitry. All potentiometer adjustments are made on this board.

The Firing board contains all the firing logic to convert an analog DC firing signal from the control board to properly phased firing pulses for the 12 SCRs.

The Feedback board provides a step of isolation between the armature and the Control board. A hall effect sensor isolates the armature current to provide armature current feedback to the Control board while power resistors isolate the armature voltage feedback from the Control board.

The Power converter contains the SCRs, snubbers, reactors, and MOVs for firing the SCRs. The pulse transformers for the 12 SCRs are contained on the SCR Interface board that is considered part of the power converter.

The drive is equipped with circuitry to sense phase loss, improper phase sequence, tach loss, overspeed, and instantaneous overcurrent.

The Control board has all the pots for adjustment and their functions are as follows:

- **R101 MAX SPEED**: Is pattern scaling. This pot is used to bring the car up to contract speed when 7 volts is applied for a contract speed pattern.

- **R57 ZERO TRIM**: Is offset adjustment. This pot is used to adjust for any offsets that may appear in the Sweo analog circuitry. When the MicroFlite control asks for zero speed, this pot will adjust the drive to output exactly zero speed.

- **R56 RATE GAIN**: Is the speed loop gain adjustment. Turning this pot clockwise increases the response of the drive and provides better tracking of actual vs demand.

- **R161 CURRENT LIMIT**: Is the current limit pot. This allows you to limit the amount of current the drive will supply. If this is set too low, poor tracking will result during acceleration and deceleration. Fully clockwise equates to a setting of approximately 150% of the current limit setting. This is normally too high. This pot is usually left as set from the factory.
R45 IOC Is the instantaneous overcurrent trip point. This pot sets the level at which the drive will trip on instantaneous overcurrent.

R46 OVERSPEED Is the overspeed trip threshold. This sets the point at which the drive will trip on an overspeed fault. If the pot is turned fully clockwise, the trip point is set to 125% of the max speed setting.

R178 NULL FORCING Is a deadband adjustment. This will change the gain of the current regulator at very low current levels (balance load). This pot should only be touched if vibrations or oscillations occur at low current levels.

Two indicators, in addition to the fault indicators will be very useful at times. The READY indicator indicates that the drive ± 15 volt power supplies are in tact and the drive is not faulted.

The ON indicator indicates when a run enable signal has been initiated from the MicroFlite controls.

2.15 MagneTek Digital DC Drive

Instructions for installing the MagneTek Drive can be found in the separate manufacturers manual - MagneTek Technical Manual CS 0274 - enclosed with the project shipment.

The drive has been modified to meet O. Thompson’s specifications. The MagneTek Technical Manual CS 0274 that is shipped with the elevator control panel(s) can be used, with the exceptions listed below. The exceptions listed below supersede those in the standard manual.

2.15.1 Hardware Modifications

Typically, the only hardware modification is the occasional use of a motor field transformer. The guidelines when to use the transformer is in the Motor Field section below.

2.15.1a Motor Field

The only hardware modification that may be required is the addition of a motor field transformer. This transformer is required under two conditions:

1. A step-up transformer is required if -
   - The nominal 3 phase AC input voltage is less than 1.25 X Full Motor Field voltage.
2. A step-down transformer is required if -
  The Full Motor Field voltage is less than 1/3 the nominal 3 phase AC input voltage.

The motor fields should be reconnected or a step-up/step-down transformer used if the following relationship is false,

\[
3.0 > \frac{V_{AC}}{V_{DC}} > 1.25
\]

\( V_{AC} \) is the nominal 3 phase input voltage to the drive.

\( V_{DC} \) is the Full Motor Field voltage.

**2.15.1b Encoder Wiring**

The encoder used on the MagneTek DSD 412 drive is a 4 channel quadrature encoder. The four 4 channels are:

\[\bar{A}, A, \bar{B}, B\]

Sometimes referred to as: \( \bar{A}, A^- B, B^- \)

\( \bar{A} \) is pronounced A not \( A \)

\( \bar{B} \) is pronounced B not \( B \)

Three twisted pairs, each with an overall shield is used to wire the encoder.

- \( \bar{A} \) and \( A \) are wired with a single twisted pair with an overall shield (drain) wire.
- \( \bar{B} \) and \( B \) are wired with a single twisted pair with an overall shield (drain) wire.
- The +5 volts and Com to the encoder is wired with a single pair with an overall shield (drain) wire.

All the shield wires are connected together and terminated at TB1-6 on the drive. There should be no connection of the shield (drain) wire at the encoder end. Tape off/insulate the drain wires at the encoder end.
Reversing the Encoder
If it is determined the encoder is wired for the wrong direction, the following procedure should be used to reverse the direction electrically.

1. Switch A and B wires - Drive terminals TB1-2 and TB1-4
2. Switch A- and B- wires - Drive terminals TB1-3 and TB1-5

**CAUTION:** Run the car on inspection in both directions after rewiring the encoder. The car may take off at high speed, or the wrong speed, if encoder is wired incorrectly.

2.15.2 Software Modifications

The following software modifications to the standard Microtrac DSD 412 Digital System Drive are unique to the Thompson Series 90 system.

The major change in the software is the nominal speed reference and speed feedback, input and output signals. This has been changed to ±7 volts, from the drive standard of ±10V. The ±7 volt speed reference is a Thompson standard on Series 90 system.

A second modification to the software is the addition of a Speed Error. This error condition is a speed reference (Pattern) vs. car speed (Tach) error condition that results in a new #410 error.

2.15.2a New Functions / Parameters

**Function # 16 Gearless Ratio**
This is the ratio of the encoder RPM to the motor RPM.

If the encoder is coupled to the end of the motor (typical geared application) and turns at the same RPM as the motor, Function #16 is set to a **1.000**.

If the encoder is run with a rubber type wheel on the brake sheave or rope sheave then this is a ratio of the two diameters.

*Example:* The encoder wheel diameter is 3.82 inches and the sheave diameter is 26 inches. Function #16 Gearless Ratio is 26/3.82 = 6.806

**Function # 21 Acceleration Rate (ft/sec²)**
This is a maximum clamp for the job acceleration rate. Set to **1.25** times the standard acceleration rate for the job.

*Example:* A job has an acceleration rate of 3.0 ft/sec². Function #21 is (1.25 X 3) = 3.75.
Function # 56  Field Strength Speed  
The default setting is 130%. (i.e., no field weaken/strengthen)

If field weaken/strengthen is required, this value should be less than 100%. Initially set to 90% and motor field will strengthen at 90% of motor speed. Adjust both Functions #56 & #57 if field strengthen is required.

Function # 57  Field Weaken Speed  
The default setting is 130%. (i.e., no field weaken/strengthen)

If field weaken/strengthen is required, this value should be less than 100%. Initially set to 70% and monitor the armature voltage and car speed. A lower Function # 57 will increase car speed with a lower armature voltage. Adjust both Functions # 57 & #56 if field weakening is required.

Function # 82  Reference Multiplier  
The range has been expanded to Max 2.0 Min 0.9 Default 1.0.  
Set for 1.428 for ±7 volt scaling of the speed reference.

Function # 87  Pretorque Multiplier  
The range has been expanded to Max 2.0 Min 0.9 Default 1.0.  
Set for 1.42 for ±7 volt scaling of the Pretorque input.

Function # 95  Analog Output 0 (TB1-45) (TP41)  
Set to 0.  TB1-45 (TP41) is a ±7 volt speed reference output signal.

Function # 96  Analog Output 1 (TB1-46) (TP44)  
Set to 0.  TB1-46 (TP44) is a ±7 volt speed feedback output signal.  
TB1-46 is wired to the tach input of the limit board.

Function # 97  Test Point 0 Multiplier. (Analog Output 0).  
Set to 0.7.  Specific multiplier value for Analog Output 0.  
This sets the Analog Output 0 to ±7 volts.

Function # 98  Test Point 1 Multiplier. (Analog Output 1).  
Set to 0.7.  Specific multiplier value for Analog Output 1.  
Sets Analog Output 1 to ±7 volts.

Function # 99  Speed Error Hysteresis.  
Set to 0.8.  Min 0.0  Max 0.8  Default 0.8  
Time in seconds for Function #100 to be outside the limit before generating a Speed Error Fault (#410) and shutting down the drive.
Function #100  Speed Error Limit.
   Set to 20. Min 0.0 Max 30.0 Default 30.0

   The percentage the Speed Reference signal (Pattern) can be different from the Speed
   Feedback signal (Tach). If the percentage is greater than this limit for the time period
   of Function # 99, a Speed Error Fault (#410) will occur and shut the car down.

Function #104    I_Serial_Gain_Sw.
   Set to OFF.

Function #105    Gain Switch Speed
   Set to 1.0.

Function #107    Tach Rate Gain
   Set to 0.0.

Function #108    Gain Reduce
   Set to 1.00.

Function #110    One Equals Multi Step.
   Set to OFF. Setting to ON, enables the internal “S” curve in the drive.
   This is NOT used with the Thompson controls.

Function #150 to #164  Preset Speed
   Set to 0.0. This is the default setting. This is for the internal “S” curve in the drive.
   Thompson controls do not use the internal “S” curve in the drive.

Function #170 - #173  Accel/Decel rates for the internal “S” curve in the drive.
   Set to 5.0. This is the default setting. This is for the internal “S” curve in the drive.
   Thompson controls do not use the internal “S” curve in the drive.

Function #174 - #177  Accel/Decel jerk rates for the internal “S” curve in the drive.
   Set to 30.0. This is the default setting. This is for the internal “S” curve in the drive.
   Thompson controls do not use the internal “S” curve in the drive.

2.15.2b Deleted Faults/Errors

Function #210  Fault Disable
   This function disabled ‘400’ type faults and had no elevator applications.
   This Function has been eliminated with a software revision HH834660 rev 3.0.
Fault # 402  2nd Auxiliary Contactor Fault.
This was used to monitor the main contractor’s second auxiliary contact at TB1-50. This second auxiliary contact has been eliminated with software HH834660 rev 3.0. The first auxiliary contact at TB1-7 is still used and will generate a Fault #900, if it fails to operate. The Fault #402 has been eliminated with a software revision HH834660 rev 3.0.

Fault # 406   Slew Rate Limit.
This fault is not relevant with the Speed Error Fault. The Fault #406 has been eliminated with a software revision HH834660 rev 3.0.

2.15.2c   Added Faults/Errors

Fault # 916   Forcing Fault
This is not a new fault or error. However, it is not in the MagneTek Technical Manual - CS 0601 dated 3/27/97. This indicates the prohibit rotation bit was removed with the loop picked up. This error has only occurred during the testing of the drive at MagneTek.

2.15.2d   2:1 Roping

The RPM stated on the nameplate of some gearless motors is the RPM the motor will run if the car is roped 1:1. If the same motor is used for 2:1 roped cars, the actual motor RPM may be twice that of the nameplate. Do not rely on the nameplate RPM of gearless motors roped 2:1 for the entry of Parameter #11. Parameter #11 (Motor RPM) must be set for actual motor RPM at full speed.

Measure full speed motor RPM with hand tach on cars roped 2:1 and enter this value for Parameter #11. Failure to do this will result in car speed to be ½ desired speed.

2.15.3   Self Tune

The MagneTek DSD 412 digital DC drive has a self tuning feature that dynamically calculates the armature resistance and inductance. This includes the choke and filter if used in series with the armature. It also measures the motor field resistance and inductance.

After the self tune is successful, the calculated values are stored in the following parameters:

#613 Measured Motor Resistance
#614 Measured Motor Inductance
#615 Measured Field L/R time constant
These values should then be transferred and stored to the proper locations.

#613 value transferred to Function #4 Arm Ohms
#614 value transferred to Function #5 Arm L
#615 value transferred to Function #51 Field L/R

Use Function #997 for self tuning and Function #994 with switch S3 (NV RAM protect switch) [Switch S3 is to the right of the display on drive. Access is on side of drive cover.] to store to NV RAM.

**Note:** Motor fields must be at full field current during self tune. Parameter #612 must be the same as parameter #50. Check by running on inspection. Motor field fault will result if parameter #612 is less than parameter #50 during self tune.

### 2.15.3a Self Tune Setup


The self tune feature requires two temporary jumpers.
One jumper shorts out the “PT” contact in series with the main contactor “M” coil.
The other jumper enables the drive. (i.e., apply +24VDC to terminal TB1-8)
The car should be on Inspection with the doors closed.
The drive will automatically pick and drop the LPR relay. Therefore, the main contactor “MA” may drop two or three times while the self tuning is in process.

First, put the drive in the Self Tune mode by following the steps below:

A. Put the car on inspection, with the Inspection Switch on the controller.
B. Remove the wires to the brake. (BK1, BK2)
C. Use the up arrow [ • ] to display parameter #997.
D. Set switch S3 (NV RAM protect switch)
   [Switch S3 is to the right of the display on drive. Access is on side of drive cover.] in the up position.
   The NV RAM unprotected LED comes on to the left of the S3 switch.
E. Press the DATA/FCTN key once.
   The display should indicate “Entr”.
   If it displays “Prot”, the S3 switch is not in the up position. Repeat from A.
F. Jump fuse 2A to PT-2.
   This shorts out the “PT” contact in series with the “M” coil.
G. Jump TB1-48 to SR-1.
   This enables the drive by applying +24 VDC to TB1-8 (Drive Enable).
H. Relays SR, LPR and contactor M will pick.
I. Press “Enter” on the keypad.
J. The display will indicate “tESt” while self tuning.
    Relays LPR and contactor M will pick and drop 2 or 3 times during the test.
K. The display will indicate “PASS” after a successful Self tune.
L. Set S3 switch in the down position.
    The NV RAM unprotected LED will go out, at the left of the S3 switch.
M. The values in parameters #613, 614 & 615 should then be entered and stored into Functions #4, 5, & 51 respectively.
N. Save the values. (See - Saving Data Permanently)
O. Remove jumpers on fuse 2A - To PT-2T.
P. Remove jumpers on TB1-48 To SR-1.
Q. Reconnect the brake wires.

2.15.3b Attempt To Run The Car

1. Inspection pot (SP3) from Speed Board is preset for .7 volts. This is 10% of contract speed.

2. Momentarily press the Inspection Up button on the controller. The following relays should energize in this order: U, UV, PA, PB, PT, LPR, M contactor & BK.

3. If the car does not run up at a controlled speed when pressing the Up button take the actions provided in this chart.

<table>
<thead>
<tr>
<th>IF THIS HAPPENS</th>
<th>DO THIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car runs up very fast until drive trips.</td>
<td>Swap wires TB1-2 (A) and TB1-4 (B)</td>
</tr>
<tr>
<td></td>
<td>Swap wires TB1-3 (A-) and TB1-5 (B-)</td>
</tr>
<tr>
<td>Car runs down very fast until drive trips.</td>
<td>Turn off the main line power and wait 60 seconds.</td>
</tr>
<tr>
<td></td>
<td>Swap the motor field connections.</td>
</tr>
<tr>
<td>Car runs down at a controlled speed.</td>
<td>Turn off the main line power and wait 60 seconds.</td>
</tr>
<tr>
<td></td>
<td>Swap the motor field connections.</td>
</tr>
<tr>
<td></td>
<td>Swap wires TB1-2 (A) and TB1-4 (B)</td>
</tr>
<tr>
<td></td>
<td>Swap wires TB1-3 (A-) and TB1-5 (B-)</td>
</tr>
</tbody>
</table>

4. While running the car on inspection, vary the inspection pot (SP3 - Speed Board) and observe the car to make sure the car speed varies.

5. Connect your red meter lead to the TB1-68 terminal of the drive, and your black meter lead to the TB1-63 terminal on the drive. As the car runs, adjust the inspection pot until .7 volts appears on the meter. If the car is running down, the polarity will be negative, and, if the car is running up the polarity will be positive.
6. Hand tach the car and compare the actual car speed to the speed displayed on the car monitor. Parameter - 600 on the drive will display car speed.

2.15.4 Editing & Saving Values

See pages 3-1, 3-2, 3-3 & 3-4 of the MagneTek Technical Manual CS 0274 manual dated 3/27/97.

The Functions #1 - #177 can be viewed and changed with the four pushbuttons directly below the display.

The #400 - #407 Faults/Errors and #900 - #926 Faults/Errors are view only.

The #600 - #621 Display Parameters are view only.

The special auxiliary functions #993 - #999 can be viewed and modified.

The keys directly below the display are,

[DATA/FCTN] [ ] [ • ] [ ] [ Ent ]

To view a Function, Parameter or Fault/Error, use the [ ] [•] keys to scroll to the location. The locations will wrap around after 999, back to 0. Also if the [ ] [•] keys are held down for about 4 seconds the display will scan at a rapid rate. Once the location is displayed, pressing the [DATA/FCNT] key will allow the contents of that location to be displayed.

To change the location contents, press the [ ] [•] keys to increment the contents of that location. Press the [Enter] key to save the contents at that location. Press the [DATA/FCNT] key once, to return to the Function mode.

CAUTION:

This is only temporary. The contents will be lost if the drive is turned off. To permanently save the contents to NV Ram, Parameter #994 & the NV ram protect switch must be used. See Saving Data Permanently.

2.15.5 Saving Data Permanently

Once data has been changed, it is only temporary and will be lost if the drive is turned off or the drive is reset (by depressing the reset button on the drive). The values from the last time the NV Ram was saved will then be loaded into the memory. It is not necessary to do a permanent save after each location change, saving once at the end of many changes will save all the locations at once. All locations can be saved permanently any number of times.
Procedure to save to NV Ram (save and restored after power loss):

A. Make sure the DATA and DATA PENDING LED’s are off, under the display. Press the [DATA/FCNT] key to turn off the LED’s.

B. Use the [ ¶ ] [ · ] keys to scroll to location #994.

C. Press the [DATA/FCNT] key once. The display indicates “rEst” and the green DATA PENDING LED is on.

D. Press the [¶] key once. The display indicates “SAVE” and the red DATA LED is on. Green LED is off.

E. Slide S3 switch up. (NV Ram Unprotected) [Switch S3 is to the right of the display on drive. Access is on side of drive cover.] The NV Ram not protected LED will come on.

F. Press [ Ent ] and the display will indicate “994”, if successful. The display will indicate “Prot”, if the S3 switch is in the down position when [ Ent ] is pressed and nothing will be saved.

G. Slide the S3 switch down. The NV Ram not protected LED will go out.

H. The data is now saved.

2.15.6 Drive Faults

Drive faults will be indicated on the display as an “F” followed by a 2 or 3 digit number.

Example: “F 910”: This is an indication of a blown fuse.

There are two (2) error logs within the drive.

Parameter #800 contains a list of the last 16 faults that occurred. This list is constantly updated, with the newest error overwriting the oldest in the list. The list is stored on NVRAM and is never cleared. Errors on this list could be from the first time the drive was powered up, it is a continuous list, constantly updated.

Parameter #0 also contains a list of the last 16 faults that occurred. This list is also constantly updated, with the newest error overwriting the oldest in the list. However, this list can be cleared.
To view or clear this error list, do the following;

A. Use the arrow keys to scroll to Parameter #0.
B. Press DATA/FCTN key.
C. The first entry is “ALL”.
D. Press ENT to clear all the errors in the list.
E. Use arrow keys to scroll past the “ALL” entry to view the error list.
F. The first error after “ALL”, is the latest error.
G. Press the ENT key to clear that particular error.
H. The end of the list will be indicated by “END”.

For a more complete description of the Parameters #800 & #0, refer to pages 3-6 through 3-8 of the MagneTek Technical Manual CS 0274.

2.15.7 Drive Overspeed

To overspeed the drive, three (3) parameters must be temporarily changed during the test. The three (3) parameters and their default settings are listed below:

Parameter #12 Overspeed%  Normal operation - 110
Parameter #80 Overspeed Test (logic)  Normal operation - OFF
Parameter #81 Overspeed Multiplier  Normal operation - 1

To overspeed the drive, Change:

Parameter #12 Overspeed%  125% of rated speed
(125% of parameter #17)

Parameter #80 Overspeed Test (logic)  Switch to ON
(Enables the speed multiplier - overspeed test only)

Parameter #81 Overspeed Multiplier  Adjust to 1.2
(This multiples the speed reference value)

DO NOT STORE the #12, #80 or #81 test parameters to NVRAM.

CAUTION: Set #12, #80 and #81 parameters back to their default settings before returning the car to normal operation.

NOTE: Default Parameters are:

Parameter #12 Overspeed%  110
Parameter #80 Overspeed Test (logic)  OFF
Parameter #81 Overspeed Multiplier  1
### 2.15.8 Parameters

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Factory Default</th>
<th>Original Job Values</th>
<th>Final Job Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Reset Errors</td>
<td>ALL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Current Limit (%)</td>
<td>250</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Use Self Tune (Logic)</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rated Arm. Current (Amps)</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Armature Resistance (Ohms.)</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Armature Induct. (mHenry)</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rated Arm Volts (Volts)</td>
<td>240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I Reg Crossover (Rads)</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Nominal AC voltage (Volts)</td>
<td>230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Encoder Pulses/Rev (P/R)</td>
<td>4096</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Motor RPM (RPM)</td>
<td>1150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* See Section 2.15.2d before entering RPM on cars roped 2:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Over speed (%)</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Voltage Sense (%)</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Tach Sense (%)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Gearless Ratio (No units)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Rated Ft/Min (Ft/Min)</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Accel. Rate (Ft/Sec^2)</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Full Field Sensing (%)</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Response (Rads)</td>
<td>6.0</td>
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<td></td>
</tr>
<tr>
<td>41</td>
<td>System Inertia (Sec)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Stability (No units)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Weak Field Current (Amps)</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Full Field Current (Amps)</td>
<td>6.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Description</td>
<td>Factory Default</td>
<td>Original Job Values</td>
<td>Final Job Values</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>51</td>
<td>Field L/R (Sec)</td>
<td>0.8</td>
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<tr>
<td>52</td>
<td>Rated Field Voltage (Volts)</td>
<td>240</td>
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<td></td>
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<tr>
<td>53</td>
<td>Standing Field (Amps)</td>
<td>2.0</td>
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<td></td>
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<tr>
<td>54</td>
<td>Field Response (Rads)</td>
<td>5</td>
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<td></td>
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<tr>
<td>56</td>
<td>Field Strength Speed (%)</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Field Weaken Speed (%)</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Field Strength Rate (Sec)</td>
<td>2.0</td>
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<td></td>
</tr>
<tr>
<td>59</td>
<td>Field Weaken Rate (Sec)</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Up/Down Pick Up (%)</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Over speed Test (Logic)</td>
<td>OFF</td>
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<td></td>
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<tr>
<td>81</td>
<td>Over speed Mult. (No units)</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>82</td>
<td>Reference Mult. (No units)</td>
<td>1.000 1.428</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Motor Overload Time Out (Sec)</td>
<td>90</td>
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<tr>
<td>84</td>
<td>Motor Overload Level (No units)</td>
<td>1</td>
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<tr>
<td>85</td>
<td>Current Decay Ramp (Sec)</td>
<td>0.2</td>
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</tr>
<tr>
<td>86</td>
<td>LPR Delay Time (Sec)</td>
<td>0.3</td>
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<tr>
<td>87</td>
<td>Pretorque Mult. (No units)</td>
<td>1.00 1.42</td>
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</tr>
<tr>
<td>95</td>
<td>Analog Output 0 (Logic)</td>
<td>0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Analog Output 1 (Logic)</td>
<td>0 0</td>
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<td></td>
</tr>
<tr>
<td>97</td>
<td>Test Point 0 Mult. (No units)</td>
<td>1.0 0.7</td>
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<td></td>
</tr>
<tr>
<td>98</td>
<td>Test Point 1 Mult. (No units)</td>
<td>1.0 0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Speed_Error_Hysteresis (Sec)</td>
<td>0.8 0.8</td>
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<td></td>
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<tr>
<td>100</td>
<td>Speed_Error_Limit (%)</td>
<td>20.0 20.0</td>
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<td></td>
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<tr>
<td>104</td>
<td>I_Serial_Gain_Switch (Logic)</td>
<td>OFF OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Gain Switch Speed (No units)</td>
<td>1.0</td>
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<td></td>
</tr>
<tr>
<td>107</td>
<td>Tach Rate Gain (No units)</td>
<td>0.0</td>
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<td></td>
</tr>
<tr>
<td>108</td>
<td>Gain Reduce (No units)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Factory Default</td>
<td>Original Job Values</td>
<td>Final Job Values</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>110</td>
<td>Multistep-enable (Logic)</td>
<td>OFF</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>150 - 164</td>
<td>Preset Speed for “S” curve (Ft/Min)</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>170 - 173</td>
<td>Accel/Decel rates for “S” curve. (Ft/Sec^3)</td>
<td>5.0</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>174 - 177</td>
<td>Accel/Decel Jerk rates for “S” curve. (Ft/Sec^3)</td>
<td>30.0</td>
<td>30.0</td>
<td></td>
</tr>
</tbody>
</table>

Saving to NVRAM

1. Select #994, Press the DATA/FCNT key, display “rESt”
2. Press the Up Arrow key, display “SAVE”
3. Push the S3 switch up, NV unprot LED on, press the ENT key

Switch S3 is to the right of display on Drive
Access on side of Drive cover
### 2.15.9 Faults / Errors

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Illegal Instruction</td>
</tr>
<tr>
<td>14</td>
<td>Line 1010 Emulator</td>
</tr>
<tr>
<td>15</td>
<td>Line 1111 Emulator</td>
</tr>
<tr>
<td>16</td>
<td>Privilege Violation</td>
</tr>
<tr>
<td>17</td>
<td>Divide by Zero</td>
</tr>
<tr>
<td>21</td>
<td>Watchdog Timeout</td>
</tr>
<tr>
<td>22</td>
<td>Reserved Interrupt</td>
</tr>
<tr>
<td>23</td>
<td>Uninitialized Interrupt</td>
</tr>
<tr>
<td>24</td>
<td>Trace Exception</td>
</tr>
<tr>
<td>26</td>
<td>Spurious Exception</td>
</tr>
<tr>
<td>97</td>
<td>Over speed trip</td>
</tr>
<tr>
<td>98</td>
<td>Tach Loss</td>
</tr>
<tr>
<td>99</td>
<td>Tach Reverse Connection</td>
</tr>
<tr>
<td>100</td>
<td>Not a Number</td>
</tr>
<tr>
<td>101</td>
<td>Math Overflow</td>
</tr>
<tr>
<td>102</td>
<td>Math Underflow</td>
</tr>
<tr>
<td>103</td>
<td>Floating Point Divide by 0</td>
</tr>
<tr>
<td>104</td>
<td>Sign Error in Speed Reg.</td>
</tr>
<tr>
<td>110</td>
<td>Bad Thumb wheel Digit</td>
</tr>
<tr>
<td>111</td>
<td>Missing Thumb wheel</td>
</tr>
<tr>
<td>112</td>
<td>Bad PCDU pointer</td>
</tr>
<tr>
<td>113</td>
<td>Missing PCU</td>
</tr>
<tr>
<td>114</td>
<td>Locked Up Queues</td>
</tr>
<tr>
<td>115</td>
<td>Multiplexer Config. Error</td>
</tr>
<tr>
<td>210</td>
<td>Deleted by 6/23/97</td>
</tr>
</tbody>
</table>

The faults listed above are errors that can occur during the operation of the O. Thompson Series 90 system. Each fault number corresponds to a specific description of the error. This table provides a comprehensive list of faults and their descriptions, which can be useful for troubleshooting and understanding the operational status of the system.
<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>DCU ROM BUS error</td>
</tr>
<tr>
<td>221</td>
<td>DCU RAM BUS error</td>
</tr>
<tr>
<td>222</td>
<td>DCU NVRAM BUS error</td>
</tr>
<tr>
<td>223</td>
<td>DCU DPRAM BUS error</td>
</tr>
<tr>
<td>232</td>
<td>Unknown BUS error</td>
</tr>
<tr>
<td>240</td>
<td>DCU ROM BUS error</td>
</tr>
<tr>
<td>241</td>
<td>DCU RAM BUS error</td>
</tr>
<tr>
<td>242</td>
<td>DCU NVRAM add. error</td>
</tr>
<tr>
<td>243</td>
<td>DCU DPRAM add. error</td>
</tr>
<tr>
<td>252</td>
<td>Unknown address error</td>
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<tr>
<td>400</td>
<td>Motor Overload</td>
</tr>
<tr>
<td>401</td>
<td>Excess Field Current</td>
</tr>
<tr>
<td>402</td>
<td>Deleted 6/23/97</td>
</tr>
<tr>
<td>403</td>
<td>5 minute Full Field</td>
</tr>
<tr>
<td>404</td>
<td>Open Arm. circuit fault</td>
</tr>
<tr>
<td>405</td>
<td>Drive safety circuit fault</td>
</tr>
<tr>
<td>406</td>
<td>Deleted by 6/23/97</td>
</tr>
<tr>
<td>407</td>
<td>DCU CEMF fault</td>
</tr>
<tr>
<td>408</td>
<td>PCU CEMF fault</td>
</tr>
<tr>
<td>409</td>
<td>PCU reset</td>
</tr>
<tr>
<td>410</td>
<td>Speed Error fault</td>
</tr>
<tr>
<td>800</td>
<td>Error list (16 errors max)</td>
</tr>
<tr>
<td>801</td>
<td>Activation list</td>
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<tr>
<td>900</td>
<td>PCU loop fault</td>
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</table>

# Description
<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
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<tbody>
<tr>
<td>901</td>
<td>PCU IST fault</td>
</tr>
<tr>
<td>902</td>
<td>Power supply fault</td>
</tr>
<tr>
<td>903</td>
<td>Line sync failure</td>
</tr>
<tr>
<td>904</td>
<td>Low line fault</td>
</tr>
<tr>
<td>905</td>
<td>Field loss</td>
</tr>
<tr>
<td>906</td>
<td>DCU failure (Bad EPROMS)</td>
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<tr>
<td>907</td>
<td>Thermistor fault</td>
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<tr>
<td>908</td>
<td>Over temperature</td>
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<tr>
<td>909</td>
<td>Excessive ripple</td>
</tr>
<tr>
<td>910</td>
<td>Blown fuse</td>
</tr>
<tr>
<td>911</td>
<td>Shorted doubler</td>
</tr>
<tr>
<td>912</td>
<td>Open SCR</td>
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<tr>
<td>915</td>
<td>Parameter setup fault</td>
</tr>
<tr>
<td>916</td>
<td>Forcing fault</td>
</tr>
<tr>
<td>917</td>
<td>Reverse ARM. V. feedback</td>
</tr>
<tr>
<td>918</td>
<td>IST setting error</td>
</tr>
<tr>
<td>919</td>
<td>Rated line volt. Setting error</td>
</tr>
<tr>
<td>920</td>
<td>Rated arm. volt. Setting error</td>
</tr>
<tr>
<td>921</td>
<td>Bridge type fault</td>
</tr>
<tr>
<td>922</td>
<td>Rated source freq. error</td>
</tr>
<tr>
<td>923</td>
<td>Rated Arm. I. Setting error</td>
</tr>
<tr>
<td>924</td>
<td>Rated Field I. Setting error</td>
</tr>
<tr>
<td>925</td>
<td>Field type fault</td>
</tr>
<tr>
<td>926</td>
<td>PCU watchdog timeout fault</td>
</tr>
<tr>
<td>980</td>
<td>Trace monitor</td>
</tr>
<tr>
<td>993</td>
<td>Clear NV RAM</td>
</tr>
<tr>
<td>994</td>
<td>NV RAM save/recall</td>
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</tbody>
</table>
995  NV RAM load defaults
997  Do Self Tune
998  Do PCU Diagnostics

2.15.10 Display Parameters

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
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<tr>
<td>600</td>
<td>Car Speed</td>
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<tr>
<td>601</td>
<td>Motor RPM</td>
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<tr>
<td>602</td>
<td>Speed Reference</td>
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<tr>
<td>603</td>
<td>Pretorque input</td>
</tr>
<tr>
<td>609</td>
<td>CEMF, Counter EMF of armature</td>
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<tr>
<td>610</td>
<td>Motor Armature Voltage</td>
</tr>
<tr>
<td>611</td>
<td>Motor Armature Current</td>
</tr>
<tr>
<td>612</td>
<td>Motor Field Current</td>
</tr>
<tr>
<td>613</td>
<td>Measured Motor Resistance</td>
</tr>
<tr>
<td>614</td>
<td>Measured Motor Inductance</td>
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<tr>
<td>615</td>
<td>Measured Field L/R time constant</td>
</tr>
<tr>
<td>616</td>
<td>Speed Error</td>
</tr>
<tr>
<td>617</td>
<td>Line Frequency in HZ</td>
</tr>
<tr>
<td>618</td>
<td>Heatsink temperature in Deg. C</td>
</tr>
<tr>
<td>619</td>
<td>AC Line Voltage</td>
</tr>
<tr>
<td>620</td>
<td>Software Revision</td>
</tr>
<tr>
<td>621</td>
<td>RS422 Communication Enabled</td>
</tr>
</tbody>
</table>
2.16 GE DC300E Drive

The GE DC300E drive is used by O. Thompson on request only.

2.16.1 Theory of Operation

The GE DC300 was a digital DC drive used by most industries, and used a digital tach feedback signal. In most cases, a digital tach signal does not yield high enough resolution to give stable low leveling speeds for elevator applications. So GE provided the elevator industry with a DC300E drive that used an analog speed regulator board attached to its digital drive circuitry.

The tach vs pattern signal is compared and amplified in analog circuitry (op amps and resistors). This is referred to as the "speed loop". The "error" or difference between the tach and pattern signal is then fed to a digital armature current regulator. The analog error signal from the speed loop is first converted to a digital number.

The armature current feedback received from a DC shunt is converted to a digital number and then compared mathematically to the digital number that represents the speed loop error. This area is referred to as the "current loop". The error from the current loop is fed to a microprocessor that generates the SCR firing pulses.

2.16.2 Breakdown of Drive Components

The DC300E is a fully regenerative DC drive (fully regenerative means it has twelve SCRs and can pump current back into the main line when there is an overhauling load). We will give a break down of each board, but for now let's look at the whole picture.

You will notice 3 AC fuses where the secondary side of the isolation transformer is connected. A DC shunt is provided next to the AC fuses and is used as a transducer to provide the drive with armature current feedback. A DC fuse is also supplied to protect the armature in case of overcurrent in the regenerative mode. A main contactor, referred to as "MA" by GE is provided to disconnect the AC supply to the SCRs.
Main Control Card

The main control board has three microprocessors on board that handle the digital regulation of the current loop. Programmable parameters are stored on an EEROM (Electrically Erasable Read Only Memory) chip.

A JP13 jumper located directly above the EEROM allows parameters to be changed through the use of a hand held tool, providing the jumper is in the write enable position. **It is important to note that the JP13 jumper should never be left in the write enable or 2-3 position when cycling the power to the drive.** If the jumper is left in this position, irreparable damage to the EEROM can occur. Always move the JP13 jumper to the 1-2 position prior to turning on or off the main power feed to the drive.

An onboard drive reset button (SW2) is provided in case the drive faults. The reset button should never be pushed while the armature is active or damage to the drive or motor may occur. All microprocessors on the drive are switched to the halt mode while this button is pressed.

You will also notice 6 diagnostic LEDs located under the U6 microprocessor chip on the top left hand corner of the board. The diagnostic LEDs will move in a ring and counter (one on then off, then the next one on, then off) from right to left one at a time if the armature is not active. When the armature is active, the LEDs will ring and counter two at a time from right to left. The diagnostic LEDs can also annunciate up to 80 different fault messages.

The scaled pattern reference voltage can be measured with the black meter lead on the PCOM terminal located on the right hand side of the board, and the red meter lead on the SRS test point located below the SW2 reset button. The scaled pattern reference will be $\pm 4$ volts at top speed.

The hand held programmer also plugs into the main control board on the 18PL connector of the Main Control board. The hand held programmer allows parameters to be modified in the field. It is very important to note that when the hand held programmer is plugged into this port, the blue or red strip on the edge of the cable should face to the left. If the plug is inserted backwards, no damage will be done if the cable is removed immediately.
MFC/POWER SUPPLY CARD

OPTIONAL APPLICATION CARD

DC-300 E CONTROLLER WITH FRONT CARD CARRIER LOWERED
Power Supply Card

The power supply board contains the +5, +15, and +24 volt power supplies used throughout the drive.

The K3 fault relay can also be found on this board. Contacts of the K3 relay are cross connected to our relay circuits to drop the "SCR" relay on the controller. When SCR drops, the safety circuit is opened.

The K2 relay is the run pilot relay we energize with our external relay circuits. When the K2 relay is energized, contacts of K2 complete the circuit to energize the drive's MA relay. The MA relay, if you recall, connects the three phase power to the SCRs.

The JP1 and JP2 jumpers allow various current ranges to be used for the motor field current regulator, depending on the application. A table is provided in the start up manual for proper scaling of the motor field current regulator.

Two different versions of the power supply board are available. The G1 version of the power supply contains all the fuses, MOVs, line reactors, etc required to supply motor field currents up to 10 amps.

The G2 version of the power supply board will have none of the supply elements for the motor field control as the G1 version does. The G2 version of the power supply is required when the motor field current exceeds 10 amps. The G2 requires the use of an externally mounted field power supply as seen to the right of the G2 power supply board. The G2 motor field and power supply board will supply motor field currents up to 24 amps. The firing pulses for the motor field SCRs is sent to the separately mounted power supply through a twisted pair of wires from the G2 power supply board.

The JP3 and JP4 jumpers along with the P2 and P3 potentiometers are used to scale the armature current feedback. The set up procedure for these potentiometers can be found in the start up manual for the DC300E.

Power Connection Card

The power connection card contains the gate pulse transformers for the forward and reverse SCRs. The armature voltage feedback scaling jumpers are also on this board to make the board universal for high voltage and low voltage armatures.
ANALOG PROCESS INTERFACE CARD
Analog Process Interface Card

This is the analog speed regulator. A line diagram can be seen to the left. The raw tach feedback signal comes into this board on the 1TB-1 and 1TB-3 terminals on this board. From there, the raw tach feedback signal is scaled with the Rfb resistor mounted between the CTBA-1 to CTBA-2 terminals. If the tach mounting is not calculated properly when the drive is ordered, this resistor will need to be changed.

The course scaled feedback is then scaled to 4 volts through the P8 (SFB) potentiometer. Remember that the DC300E uses 4 volts as a maximum speed signal. The 4 volt signal from the tach is then compared to the 4 volt top speed pattern signal, which is scaled using the P4 (PF Gain) potentiometer.

The difference between tach vs pattern is amplified through the use of some variable gain adjustments. The following is a brief explanation of these adjustments:

P10 (Response)- This pot is used to adjust the proportional gain of the speed regulator. Turning this pot clockwise increases the gain of the system for better performance.

P11 (Dampening)- This pot is used to increase the effect of armature feedback compensation when a jumper is in place between the SFB pin on the process interface board and the VFBB pin on the main control board. When hooked up in this arrangement, turning this pot clockwise will add stability to an otherwise unstable system.

Rrg & Crg - This is a resistor capacitor network provided to adjust the integral rate of the speed regulator. These component values should only be changed by the DC300E Gods.

2.16.3 G.E. Hand Held Programmer Usage

The hand held programmer allows you to modify values used in the calculation of the control of the motor. In other words, it allows you to modify parameters. There are three basic modes of use with the hand held tool.

Operate Mode

In the operate mode, the percentage speed and percentage load will be displayed on the screen as long as the hand held is plugged in. If the hand held is left in parameter or diagnostic mode for too long, the hand held will revert back to the operate mode. The hand held is normally in the operate mode when it is first plugged into the Main Control Card.
Parameter Mode

In this mode any parameter can be modified. To modify parameters, the JP13 jumper on the Main Control board must be in the 2-3 position. Also the first parameter that must be modified in order to modify any others is address 003 (DGNJP). This is a software protection jumper. The value of address 003 must be changed from 512 to 513 using the black function keys on the programmer.

Diagnostic Mode

In this mode the hand held tool can be used to monitor armature current, armature voltage, field current, and a variety of other items. The hand held tool can also be used as a DVM. Refer to the GE manual for more information on this feature.

To get to the various modes, follow these next few steps:

1. Plug the hand held terminal into the 18PL plug on the main control board with the colored edge of the ribbon cable facing to the left.
2. After plugging in the hand held tool, the word "Operate" should appear. Don't be alarmed if this message goes away after a while and turns into something that looks like Chinese. This is normal. You can now go to one of three modes.

Accessing Parameter Mode

A. Press [SET] [DRV] [7] [7] [ENTER]. (If you make a mistake while typing this, press the [CLEAR] button three times in a row as long as the armature is not active.

B. The word "Parameter" should now appear, and you are able to modify up to 254 parameters.

C. To access a parameter, you would type in the number of the parameter you wish to modify by typing its three digit address number. (The list of parameters you will need to modify and an explanation of their function is listed in the end of this section).

Accessing Diagnostic Mode

A: Press [CLEAR] once if the word "Parameter" is on the screen.

B: Press [CLEAR] a second time if you were in the middle of monitoring or modifying a variable.

C: The blue function keys can now be used and the hand held can be used as a DVM in an emergency.
### 2.16.4 Glossary of Most Commonly Used Parameters

<table>
<thead>
<tr>
<th>Address</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>REGJP</td>
<td>Tracking fault enable. When set to a &quot;1&quot;, speed loop tracking is enabled.</td>
</tr>
<tr>
<td>003</td>
<td>DGNJP</td>
<td>Software lock. When set to &quot;513&quot; all other parameters can be modified. When set to &quot;512&quot; no other parameters can be modified.</td>
</tr>
<tr>
<td>031</td>
<td>BFLPG</td>
<td>Field Current regulator proportional gain. Increasing this parameter increases the proportional gain of the field regulator and allows quicker response to stepped changes to field desired pattern.</td>
</tr>
<tr>
<td>032</td>
<td>BFLIP</td>
<td>Field Current Regulator integral gain. Increasing this parameter value increase the integral gain of the field regulator. This parameter should be adjusted in conjunction with parameter 031.</td>
</tr>
<tr>
<td>041</td>
<td>ILMMX</td>
<td>Sets the point where firing angle of the SCRs will be limited (current limit), rated in % current.</td>
</tr>
<tr>
<td>043</td>
<td>IOCTR</td>
<td>Sets the trip point for instantaneous overcurrent, rated in % current.</td>
</tr>
<tr>
<td>044</td>
<td>TOCTH</td>
<td>Sets the point at which the timed overcurrent integrator begins to sense time armature overcurrent rated in % current.</td>
</tr>
<tr>
<td>045</td>
<td>TOCGN</td>
<td>Sets the amount of time the armature current can remain above the value set in address 044 without tripping on timed overcurrent.</td>
</tr>
<tr>
<td>050</td>
<td>FLDEC</td>
<td>Standing field current level. should always be set at 128 unless standing field current of more than 50% of full field is desired.</td>
</tr>
<tr>
<td>076</td>
<td>FLDMX</td>
<td>Sets the full field or forcing field current level.</td>
</tr>
<tr>
<td>077</td>
<td>FLDMN</td>
<td>Sets the minimum guaranteed field current level above base speed as set by parameter 079.</td>
</tr>
</tbody>
</table>
### 0. Thompson Series 90 Installation & Adjustment Manual

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>078 FLDLS</td>
<td>Sets the field loss trip threshold.</td>
</tr>
<tr>
<td>079 CROSS</td>
<td>Sets the counter EMF level at which the field regulator begins to go into field weakening.</td>
</tr>
<tr>
<td>254 CHKSM</td>
<td>This is mathematical summation of all parameter values put together. This parameter cannot be modified manually, but is changed automatically any time a parameter is modified. Very useful for monitoring if parameters have been modified from the original settings.</td>
</tr>
</tbody>
</table>

#### 2.17 Baldor Sweo Flux Vector AC Drive (18H Series)

The Baldor flux vector drive is a pulse width modulated variable frequency drive used with Series 90 on cars up to 350 fpm. Since the drive is a pulse width modulated drive, as opposed to a variable voltage variable frequency (VVVF) drive, the amount of torque the motor is able to deliver remains constant throughout all speed ranges up to the base speed of the motor. This provides for smooth acceleration and deceleration rates and 100% torque at low leveling speeds.

The drive is fully processor controlled, and there are no potentiometers to adjust on the drive. The Control Board contains the processor, the EPROM, and an EEPROM chip to save the parameter values.

A Keypad plugs into the Control board and mounts on the front cover of the drive. The keypad allows you to program, display status, and diagnose drive malfunctions. The software is divided into 2 programming blocks. The Level 1 block concerns the interface to the drive (i.e. preset speeds, encoder directions, operating modes, etc). The Level 2 block concerns the actual calculation of the output of the drive (i.e. frequency, motor data, braking torque, etc).

Insulated Gate Bipolar Transistors (IGBT) are used to drive the motor. The transistors are connected to a DC buss with buss capacitors used to maintain a constant DC buss voltage. The full buss voltage is switched on and off to give a pulse width modulated DC voltage that appears to the motor as an AC sign wave.

The gates for the IGBTs are driven through the use of Gate Driver Boards. The Gate Driver Boards provide an isolated interface between the high voltage IGBTs and the processor on the Control Board. The firing signals for the gates are generated by the processor and switch at a frequency between 1 to 8 kilohertz.
As the car moves from a motoring mode to a regenerative mode, a means must be supplied to absorb the regenerated energy from the motor. This is done through the use of a braking transistor. The braking transistor is connected between the DC buss of the drive and a set of job specific regenerative resistors mounted on the side of the controller. When the DC buss voltage gets too high, the braking transistor is turned on by the drive processor to run the excess buss voltage through the braking resistors. The excess voltage is then dissipated as heat through the resistors.

The Baldor Sweo Flux Vector drive is a closed loop system. By closed loop we mean that an encoder is provided to give speed feedback to the drive. This is necessary for the calculation of the flux and torque in the motor. The encoder is typically coupled directly to the shaft of the motor. The encoder is then wired to the J1 terminal block on the drive as follows:

<table>
<thead>
<tr>
<th>On Drive</th>
<th>Reference Signal Encoder</th>
<th>Dynapar</th>
<th>Baldor</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1/23</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>J1/24</td>
<td>A-</td>
<td>C</td>
<td>H</td>
</tr>
<tr>
<td>J1/25</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>J1/26</td>
<td>B-</td>
<td>E</td>
<td>J</td>
</tr>
<tr>
<td>J1/29</td>
<td>+5V</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>J1/30</td>
<td>COM</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>J1/30</td>
<td>Drain wire from shielded cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Motor Connections**

If a two speed motor is being used, the low speed windings are normally taped off inside the motor and only the high speed windings are used.

A line reactor is placed in series between the motor and the drive. The T1, T2, and T3 terminals on the drive are connected to the A1, B1, and C1 terminals on the line reactor. The output of the line reactor (A2, B2, & C2) goes to an AC overload, and is then connected to the T1, T2, and T3 terminals of the motor.
2.18 Mitsubishi Variable Frequency AC Drive / Encoderless Vector

The Mitsubishi A200 is open loop variable voltage, variable frequency AC drive used on cars of less than 150 fpm. This drive varies the output voltage as well as the output frequency. The reduction of voltage at the motor causes a loss of torque at low leveling speed. To maintain adequate torque at low leveling speeds, DC injection boost is applied.

This drive also has the capability to be used as a vector as long as the RPM’s are at least 1200. To convert to vector, follow instructions under start up. The auto-tune section must be completed.

Power is applied to the drive at the R, S, and T terminals. The output of the drive comes out on terminals U, V, and W. On certain drives, an external braking package and resistors are supplied to absorb regenerative energy from the motor.

A separately purchased keypad is used for programming the drive. The typical configuration will have one keypad unit per job site. This removable keypad will work for any Mitsubishi “A” model drive.

The Series 90 controller will use the internal S curve of the drive. One internal S curve is supplied. The acceleration, deceleration, and blending pattern adjustments are made through the use of parameters.

Manual adjustment to the torque boost parameters is disabled on vector mode.
2.19 SET 9000 - Introduction

The SET 9000 landing system consists of:

- A stationary 2 inch wide solid steel tape that runs from the top of the hatch to the bottom.
- A sensor head assembly that rides on a stationary tape.
- A Sensor Head interface box with power supply. The interface box interfaces the sensor circuitry to the controller circuitry.
- 1 - 14" North pole magnet per floor for leveling and door zone.
- 2 or 4 - 8" North pole magnets per floor for slowdown targets. 2 per floor for 2 speed operation (I up slowdown target & 1 down slowdown target) and 4 per floor for 3 speed operation (1-1 flr run slowdown target for up, 1 high speed slowdown target for up, 1-1flr run slowdown target for down, 1 high speed slowdown for up).
- 1 - Row Guide for use in placing the leveling and slowdown magnets in proper horizontal alignment on the steel tape.
- 1 - Level Guide for aid in setting the leveling magnets per floor accurately.

The SET-9000 Hoistway Tape Reader rides on the steel tape and uses three lanes of sensors to sense the leveling and step magnets on the tape.

The center lane uses a fourteen inch north pole leveling magnet. The sensors in the SET 9000 assembly that senses this magnet are the LU, LD, and 3L sensors. The 3L sensor is used to sense the 3" door zone. The LU and LD sensors sense when the car is level with the floor. **The car is considered LEVEL when the LU and LD sensors are spanning the 14" magnet.** In other words, the car is considered level when LU and LD are off but 3L is on.

The two outer lanes use a eight inch north pole magnet. The sensors in these lanes are labeled HU and HD. The HU sensor is on the left side and the HD is on the right looking at the SET-9000 on the tape.
2.20 O. Thompson Limit Board

The Limit board is provided on any jobs of 150 fpm or above where code requires. The limit board provides up to four up and four down terminal limit trip points and two door zone overspeed trip points. Trip levels for each input are independently adjustable. The board also provides an up and a down over speed trip level. The overspeeds are labeled UOS and DOS, respectively. The limit board compares the tachometer feedback with field adjustable trip levels. If the tachometer voltage is higher than the preset trip level, the limit board trips to open the safety circuit. The board will reset up to 3 times. If the problem persists after 3 tries, the car will shut down and the board must to be manually reset.
SECTION 3 - SEQUENCE OF OPERATION

3.1 Inspection Operation

The system will run on inspection without the microprocessor circuitry or any associated electronic devices being active. It is suggested that the MPU switch be left in the "off" position during construction.

On inspection, the car can be run from the controller up/dn switch. Prior to starting the car on inspection, sections 1, 2, 4, & 5 should be read thoroughly.

For inspection operation the following relays will be up on power up:

- **R & RX**: If the generator starts up on power up.
- **SB**: Says the generator has transferred to Delta run.
- **BKA**: Brake cooling relay. De-energized 1 second after the car starts.
- **PFR**: Says Generator Regulator/Drive is not faulted.
- **DGX**: If locks and car gate are closed.
- **TC**: Says the car is not on car top inspection.
- **EMGI**: Says the electronic generator field regulator is in use (MG jobs only).

When an UP run is initiated on inspection, the following sequence will occur:

- The IU & IUX relays will pick when the button is pushed.
- The U, PA, PT, and BK relays will pick.
- When the PT relay is picked, contacts of it close to put a field forcing signal into the motor field regulator.
- Also when the PT relay picks, the brake regulator is given a signal to ramp up the voltage to pick the brake.
- Contacts of the PT and PA relays pick the P relay to complete the brake circuit to lift the brake.
3 SPEED

UP STEP LANE

LEVEL TARGET LANE

TOP LANDING

UP ONE FL. S/D

UP MULTI. FLOOR S/D

MAIN FLOOR

DN MULTI FL. S/D

DN. ONE FL. S/D

BOTTOM LANDING

2 SPEED

UP STEP LANE

LEVEL TARGET LANE

TOP LANDING

UP ONE FL. S/D

BOTTOM LANDING

1 SPEED

LEVEL TARGET LANE

TOP LANDING

MAIN FLOOR

BOTTOM LANDING
At the same time, contacts of the P relay apply power and a run signal to the generator field regulator.

With the car on inspection, the SP3 speed is chosen on the speed board, and a pattern for approximately 50 fpm is ramped into the regulator.

1 second later, the BKA relay de-energizes to drop the brake holding voltage.

When the up button is released, the U, PA, & BK relays are dropped immediately.

The contacts of the BK relay open the brake circuit to drop the brake.

Contacts of the PA relay open to cause the speed board pattern to drop and call for zero speed.

The PT relay is a timed drop out to hold power on the generator field regulator while the brake sets.

After the PT relay drops, the P relay drops to remove power from the generator field regulator.

3.2 Speed Operation, Stepping, & Leveling

The Series-90 provides three types of speed operation. Selection of the proper speed operation is set in the SPEED_OPER parameter. This allows the Series-90 to be used with many types of motor control over a variety of speed ranges up to 400 fpm.

If the medium and high speed outputs are wired on the mother board the SPEED_OPER parameter should be set to 3. If only the medium speed output is wired the SPEED_OPER parameter should be set to a 2. If neither the medium nor high speed outputs are wired the SPEED_OPER parameter should be set to a 1. Refer to the controller schematic to determine the setting of this parameter. Also, Refer to Table 4.3.2 for Minimum Floor Heights.

3.2.1 Single Speed Operation

Single speed operation is used with a motor control which requires no slowdown. The direction output is used to control the direction and motion of the car. This operation requires one 14" leveling magnet at each floor and no step target between floors. To use single speed operation set the SPEED_OPER parameter to a 1.
3.2.2 Two Speed Operation

Two speed operation is used with a motor control that will be able to accelerate to high speed on a one floor run. This is typically an elevator with a contract speed of 200 F.P.M. or less. The direction and the medium speed outputs are used for this operation. This operation requires one 14" leveling magnet at the floor and one 8" up and one 8" down slowdown magnet between floors. When the car comes onto the step target (slowdown magnet), the position of the car is incremented or decremented depending on the direction of travel. When the car moves off the step target the micro will turn off the medium speed output if a stop is required. The car will continue with the direction output until the car levels at the floor with the leveling target. To use two speed operation set the SPEED_OPER parameter to a 2.

3.2.3 Three Speed Operation

Three speed operation is used with a motor control which requires a one floor run speed and a multi floor run speed. A one floor and a multi floor slowdown distance is provided. This is typically used for elevators greater than 250 F.P.M.. The direction, medium speed, and high speed outputs are used for this operation. This operation requires a 14" leveling magnet at the floor and two 8 inch up and two 8 inch down step magnets between each floor. Two targets are required in the up and down lanes at the terminal landings. To use three speed operation set the SPEED_OPER parameter to a 3.

3.2.3a Three Speed Operation - One Floor Run

When the car is making a one floor run, only the direction and medium speed outputs are turned on. The first step target the car will see is the high speed step, this is ignored by the micro on a one floor run. As the car comes onto the second step target the position of the car is incremented or decremented depending on the direction of travel. When the car moves off the step target the micro will turn off the medium speed output. The car will continue with the direction output until the car levels at the floor with the leveling target.

3.2.3b Three Speed Operation - Multi Floor Run

When the car is making a multi floor run, the direction, medium speed, high speed outputs are turned on. As the car comes onto the first step target the position of the car is incremented or decremented depending on the direction of travel. The car position is incremented off the high speed step magnet at every floor during a multi-floor run.

When the car moves off the high speed step magnet for the target floor, the micro will turn off the high speed output. The car will continue with the direction and medium speed outputs turned on. As the car comes off the one floor run magnet for the target floor, the medium speed output will be turned off. The car will continue to decelerate with the direction output until the car levels at the floor with the leveling target.
3.2.4 Terminal Slowdown Redundant Slowdown

Terminal landing slowdown limits must be set equal to the normal SET-9000 sensor slowdown distance. The slowdown target is a eight inch magnet, set at the slowdown distance from the target floor. As the car approaches the terminal landing the position will change as the car comes onto the slowdown target. The control will drop the speed output when the car comes off the SET-9000 slowdown target. This is the slowdown distance. The terminal slowdown limit contacts should be set to open as the step sensor is coming off the slowdown target.

In the case of three speed operation, two terminal landing slowdown limits are used. Each of the terminal slowdown limits must be set equal to the slowdown distance from the SET-9000 target for the high speed and one floor run SET-9000 target.

3.2.5 Position Initialization on Power Up

A Series-90 V-2 control system will remember its last correct position when powered down. If it is level at a floor, and not on Inspection when powered down, it will remember its correct position when power is applied. If the car is placed on Inspection prior to removing power or it is moved off floor level, then the car will move to a terminal landing to reestablish its correct position. The POS_SAVE_RUNNING parameter can be enabled otherwise so the car will re-establish position without going to the terminal landing.

3.3 Automatic Operation

To run the car on automatic, the MPU must be enabled. Therefore, the MPU switch must be turned on, and the EMGI switch must be turned on to allow the car to go on auto (MG jobs only).

When the car is on automatic and independent, the following relays will be energized while the car is at the floor:

- **SB (MG)**: If the generator starts up on power up.
- **R & RX (MG)**: Says the generator has transferred to a delta run.
- **BKA**: Brake cooling relay. De-energized 1 second after the car starts.
- **PFR (MG)**: Says Generator Regulator is not faulted.
- **TC**: Says the car is not on car top inspection.
I & IA Says car is on automatic

EMGI (MG) Says the electronic generator field regulator is in use.

3L & 3LA Says car is in door zone.

For purposes of example, we will assume the car is at the bottom floor with the doors closed. We will also assume the car is set up to run for 3 speed operation. The bottom board mapping can be found along with a complete set of standard prints in the rear of the manual if you wish to follow along with the flow. The following inputs will be on with the car at the bottom floor on automatic:

J7/2 Doors are not fully closed.
J7/4 Safety string is complete.
J8/1 Car is in the door zone.
J8/5 Car is not at the top landing.
J8/6 Car is on automatic.
J10/1 MG set is running.

The following outputs will be on by the microprocessor:

J15/5-6 Generator start output.

The following sequence occurs when a call is registered for the 3rd floor.

< An input is received on J1/6 on the first call board.
< The micro turns on the J12/3-4 (Door Close Front) output to begin closing the doors.
< When the locks make, the DGX relay picks, and the J7/1 input is turned on.
< The micro turns on the J15/7-8 (Up Direction) output, J16/5-6 (Medium Speed) output, and the J16/3-4 (High Speed) output simultaneously.
< The motion/brake sequence occurs normally as on inspection with the only difference being that the Up Direction output is now holding the direction, P and BK relays energized.
When the medium and high speed outputs are turned on, the 1A and 2A relays are energized. Contacts of these relays are used at the speed board to cause the speed board to ramp up to a high speed pattern.

Also when the 1A relay energizes, contacts of it are used to energize the acceleration timer ACC. After the ACC timer expires, the 2AR relay is latched to latch a multi floor run. Contacts of the 2AR relay are input at the speed board to select the second deceleration rate setting when decel occurs. (DCC2)

Also when the 1A relay picked, the 3L, 3LA, and 1L relays are prevented from picking until the medium speed output is dropped.

As the car leaves the floor, the J8/3 (HD/LD) input turns on while the LD sensor rides off the bottom floor level magnet. Then the J8/1 (3L) input turns off as car leaves the door zone.

When the car comes onto the high speed slowdown target for the second floor, the J8/2(HU/LU) input comes on. The micro increments car position. As the car continues off this 8" magnet, the input goes off.

The car then comes onto the 1 floor run slowdown magnet for the second floor and the HU/LU input comes on again. The micro knows the car is doing a multi floor run, so this input is ignored internally during this run.

Then comes onto the leveling magnet for the second floor at the HU/LU input comes on again. The micro knows this is not the target floor, so this input and the 3L & HD/LD input that will follow is ignored as the car passes the second floor.

When the car comes onto the high speed slowdown target for the third floor, the position is incremented. Internally, the target floor matches the actual floor so the micro knows that when the HU/LU input turns off, the high speed output must be turned off. When the high speed output is turned off, the 2A relay is de-energized.

Contacts of the 2A relay open and the high speed pattern begins to decelerate the car.

When the car comes off the 1 floor run slowdown target, the medium speed output is dropped. When the medium speed output is dropped, the 1A relay is de-energized. Contacts of the 1A relay open and the car beings its next step of deceleration.

Also when the 1A relay is de-energized, normally closed contacts close to enable the 1L, 3L, and 3LA relays as soon as the car comes onto the 14" leveling magnet for the third floor.
As the car comes onto the leveling magnet, the HU/LU input goes on and the 1L relay is energized to move to the next step of deceleration.

When the car comes 3 inches from the floor, the 3L relay is energized and the J8/1 input turns on.

If the “PRE_OPEN” parameter is set to yes, the micro will turn on the J13/1-2 (Door Open Front) output to begin opening the doors.

As the doors begin opening, through relay circuitry, the locks and gate are bypassed to allow the car to continue leveling. The J7/1 input turns off, and the J7/2 input turns on to indicate the doors are partially open.

As the car continues to level, when the HU/LU sensor comes off the leveling magnet, the J8/2 input is turned off. When this happens, the micro knows the car is level and drops the J14/5-6 direction output.

When the direction output is dropped, the U, PA, & BK relays are dropped and the brake sets.

The doors continue to open until the J7/3 (Door Open Limit Front) goes off.

3.4 Automatic in Group - Lantern & Direction Preference

When landing at a floor, the hall lantern and gong will be turned on after the point of the PI change.

The car travel lantern and gong will be turned on at the start of door opening with a delay programmed in the "car_lant_time". It is adjustable from 0-5 seconds in 0.1 second increments.

Hall and car lanterns will remain on until the door is fully closed.

At a terminal landing, the lanterns will be turned on in the opposite direction.

If the door is opened with no direction preference (reopened with the door open button ) or on the last car call, the lanterns will not be lit. The floor passing chime will sound once in this case to signal the car arrival. If a direction preference is established at this time the lanterns will be turned on to signal the direction preference.

The direction preference at the floor will always be the same as the lantern which is lit, as described above. The direction preference will be maintained until the door is closed.
3.5 Attendant Service

Attendant operation is supported with the optional EXPANSION add on board. See the input/output mapping for attendant I/O's.

When the system is on attendant operation, independent will override attendant.

When the car lands at a floor, the lanterns and direction arrows will be similar to normal service. When the car is stopped at a floor, the doors will stay open. If the door is open for 30 seconds, the car direction and lanterns will be turned off.

Anytime there are hall calls above/below the car or for the opposite door at a 2-door landing, the attendant up/dn light output will be turned on. If the door is fully open, the attendant buzzer output will be turned on for 2 sec. and turned off at a user adjustable time. “ATT_BUZZER_TIME” adjustable up to 30 seconds.

Pressing the attendant up/dn will establish or reverse direction. If one of these buttons or the door close button is pressed, and there is a call in the service direction, the door will close. If the button is released before the is closed, the door will reopen.

Anytime the door open and the door close buttons are pressed at the same time, or the fire call cancel button is pushed, the car calls will be canceled. If the car is running and the attendant bypass button is pressed and held the car will ignore hall calls. If the car is running and there are no calls the car will stop at the next landing and open its doors.

3.6 Door Operation

The door will be powered closed under all circumstances when the car is out of the three inch door zone and not on inspection.

The door will be powered closed when the car is in motion.

If the car is stopped in the door zone due to a stop switch/safety input, the door will open, but the opening will not cancel calls if the car was not landing at that floor. The door will not open if the car is on Phase 1 away from the return floor or on Phase 2 fire service.

Whenever the door is closed in the door zone, it will be closed an additional 1.5 seconds after the door close limit opens. This is done to prevent bouncing on the door limit and to insure the door locks and gate switches are made.

If the parameter "pre-open" is set, the door will be opened when the car is landing and reaches the door zone. If the parameter "pre-open" is not set, the door will not open until the car is stopped in the door zone.
If the time from the start of door opening until the open limit is reached exceeds 10 seconds, the door will be treated as fully open (except on Phase 2). If the time from the start of door closing until the close limit is reached exceeds 20 seconds, the door will be recycled. If the door had closed to the close limit, and the car has a service demand, the door and gate input must be on within three seconds or the door will be recycled. There will be no dwell or beam_remake_time on recycling, but reopening devices will be active.

The door dwell time is measured from the time the door gets fully opened. It has the following values depending on the type of call or if the car is at the lobby.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CALL</th>
<th>IF NO BEAM BREAK</th>
<th>IF BEAM BREAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>car(only)</td>
<td>&quot;carcall_time&quot;</td>
<td>0 seconds</td>
<td>&quot;reopen_time&quot;</td>
</tr>
<tr>
<td>hall</td>
<td>&quot;hallcall_time&quot;</td>
<td>&quot;lobby_time&quot;</td>
<td>&quot;lobby_time&quot;</td>
</tr>
<tr>
<td>lobby</td>
<td>&quot;lobby_time&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the door is reversed by a door reopening device while closing, the dwell time is the "reopen_time". The door close button changes the dwell time to 0.

The "beam_remake_time" is measured from the last time the beam was reestablished after being broken.

The door will start to close after the dwell time and the beam_remake_time have expired, and all the door reopening devices are inactive.

The "nudging_time" is measured from when the dwell time expires. If the close limit is not reached before this time, the nudging output will be turned on as well as the nudging chime. With nudging active the door will close at a reduced speed with reopening devices active as set in the parameter "nudg_devices".

### 3.7 Fire Service

The system provides for NY City, National, Canada, California, Chicago, 1992 NY City and Houston fire codes. Setting the parameter "fire_code" to a 0, 1, 2, 3, 4, 5 or 6 respectively, will provide the required fire operation. Please contact O. Thompson Engineering for the proper setting to select other fire codes.

Most fire codes require car and hall key switches with multiple positions. The fire service requires only one input to be on from a single key switch. For example national code requires a three position key switch in the car, on, off, and fire door hold. When the switch is turned to on, the car will be put on fire phase two operation if all of the requirements of phase two are meet. To change the operation to fire door hold, the fire phase two input must be off and the fire door hold must be on.
3.7.1 Fire Service - National and NY City Code

There will be inputs for smoke detector recall to an alternate and to a second alternate recall floor, as well as the primary recall floor. Which ever input comes in first will determine the recall floor until leaving fire service operation.

The car fire light will be active throughout Phase 1 and 2 operation. It will be off on Phase 1 Bypass operation (National Code only). The car fire buzzer will be on when the fire light is on, and will be turned off when the car opens its door at the recall floor and during Phase 2 operation.

On Phase 1, the door open button will not be disabled until the car goes into motion. The hall button will be disabled immediately as a reopening device.

Hall and car lanterns will be disabled on fire service.

On Phase 2, if the door is being opened, and the stall time expires before the open limit is reached, the door will be considered open. When closing the door, there will be no door recycling for the close limit or the door gate inputs.

All Phase 2 switch mode changes will only be effective when the car door is fully open.

3.7.2 Fire Service - National Code

Smoke detector bypass is accomplished by moving the Phase 1 switch to the "Bypass" position while the car is at the recall floor. If the Phase 1 is deactivated while on Phase 2, and then reactivated with a new recall floor, the new floor will override the original recall floor.

When the Phase 2 switch is changed to "Off" from the "On" or "Hold" position, there will be a 2 second delay before the change is effective (due to undefined action when the switch is between positions). Changes To "On" "or "Hold" will be effective immediately.

The parameter "hospital_car" determines the operation when the independent service switch is on. It is on hospital service if the parameter is 1, and on independent service if it is 0. When the car is on hospital service operation, if the Phase 1 input is activated, the car will not be recalled, but the fire light and buzzer will be activated. If on independent service operation, it will be recalled only after a 30 second delay or if the door gets closed.

If the car is on Phase 2 away from the recall floor with the door open and the Phase 2 switch is turned "Off" with the Phase 1 still active, the door will close automatically and the car will go to the Phase 1 recall. If the Phase 2 is turned back to "On" or "Hold" before the door closes, the car will stay on Phase 2 and the door will reopen. If Phase 1 is not active when the above occurs, the door will stay open and the door close button will be ineffective. If Phase 1 becomes active again, the car will recall as above.
SECTION 4 - INSTALLATION

NOTE: In regards to controller installation, Section 1 should be thoroughly read and followed with regards to piping & wiring considerations, tach mounting, grounding, etc.

4.1 Tape Installation

Prior to the installation of the stationary tape, insure the location you choose will have adequate clearance from shaft way beams, walls, counterweights, cab, and terminal limit cams. Also make sure the SET9000 is not placed too close to the governor lift arm such that when the car safeties are activated, the stick assembly is damaged or the car safeties can not apply.

1. The tape should be hung high enough in the hoistway such that, when the counterweight is on fully compressed buffer, the stick can continue to ride up high enough that it will not be damaged by overhead obstructions. A bracket is provided to attach to an existing rail bracket.

2. The tape should be attached in the pit low enough so that when the car is on fully compressed buffer, the stick and any car devices does not come in contact with the tape hold down assembly.

3. The tape spring tension should be adjusted to give adequate tensioning of the tape in the hoistway such that the tape should not make noise as the car travels up the hoistway. Use double nuts to insure bolts do not become loose.

4. During installation, the edges of the tape become gouged. After the tape installation is complete, the edges of the tape should be gone over with a fine file to remove any burrs or gouges in the tape. This will lead to much quieter operation of the SET 9000 system as the car travels at contract speed.

5. After the tape edges are smooth, wipe off all excess oil and dirt from the face of the tape prior to installing magnets. Do not use rags that will leave lint on the tape during cleaning.
4.2 **SET - 9000 - Sensor Head Assembly Installation**

1. Mount the Sensor Interface box on the car top within 30 inches of where the sensor head will be attached to the crosshead.

2. Clip the crosshead bracket to the crosshead and make sure the bracket is square with the crosshead.

3. Attach the adapter bracket to the crosshead bracket and make sure it is square with the crosshead bracket. Tighten the tow brackets together.

4. Slide the sensor head mounting bracket onto the adapter bracket.

5. Remove the screws from the tape guides, and separate the tape guides in half. Position the sensor head on the steel tape and re-assemble the tape guides.

6. Bolt the sensor head assembly to the sensor head bracket and plug the sensor head into the Sensor Interface box.

7. Adjust the crosshead bracket so the sensor assembly is not pushing or pulling the tape out of its natural line of hanging in the shaft.

8. Adjust the adapter brackets so the sensor head rides in the middle of its spool guides as the car travels through the hoistway.

9. Tighten all brackets.

10. Connect the wiring for the HU/LU, HD/LD, and 3L sensors and the 110 VAC power as per the prints.

11. When the unit is powered up, the green light in the sensor head interface should be lit.

4.3 **Leveling & Slowdown Magnet Installation**

When installing the magnets on the tape, keep the following things in mind:

- Leveling targets are 14".
- Step targets are 8".
- Single speed operation requires no step targets between floors.
- Two speed operation requires one up and one down step target between floors.
GUIDE RAIL

HIGH SPEED DOWN MAGNETIC STRIP

One Floor Run Down Magnetic Strip

FLOOR LEVEL MAGNETIC STRIP

One Floor Run Up Magnetic Strip

HIGH SPEED UP MAGNETIC TAPE

DISTANCE DETERMINED BY TABLE 1
Three speed operation requires two up and two down step targets between floors, including the up and the down lanes at the terminal landing.

Consistent measurement is the key to a good installation. It is recommended that a stick be cut to the slowdown distance required for the magnets, and all magnets installed using this stick as a measurement. This will insure consistent slowdown targets for the installation. Even if the targets are installed at an incorrect distance (by up to 2 inches), the speed board, in most cases can be adjusted to mask over the incorrect slowdown distance.

Floor leveling magnets are placed in the center of the tape.

Up slowdown magnets are placed on the left side of the tape.

Down slowdown magnets are placed on the right side of the tape.

**There can be NO LESS THAN 8" between leveling magnets and stepping magnets.**

**On three speed operation, there must be NO LESS THAN 10" between coming off a high speed step target and coming onto a 1 floor run step target.**

### 4.3.1 Leveling Magnet Installation

1. With the car at floor level, place a mark across the tape in line with the top of the sensor head unit.
2. Run the car down and place the top to the level guide in line with the mark on the tape and in the middle of the tape - level guide is 5" long.
3. Peel the white adhesive from the back of the leveling magnet. Begin attaching the leveling magnet bottom of the level guide. Use the row guide to keep the leveling magnet centered on the steel tape.
4. Move the car to the next floor and repeat steps 1-3.

### 4.3.2 Slowdown(Target) Magnet Installation

Slowdown distances are typical one foot of slowdown for every 50 FPM. The table below uses this distance / speed ratio. This distance may need to be adjusted depending on your rotating equipment.
One floor run speeds are typically 200 to 250 FPM with 10’ floors.

For two speed operation, the magnets should be set as follows:

<table>
<thead>
<tr>
<th>Speed</th>
<th>Slowdown Magnet Distance</th>
<th>Minimum Floor Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 FPM</td>
<td>2'0&quot;</td>
<td>3'6&quot;</td>
</tr>
<tr>
<td>125 FPM</td>
<td>2'6&quot;</td>
<td>4'</td>
</tr>
<tr>
<td>150 FPM</td>
<td>3'0&quot;</td>
<td>6'</td>
</tr>
<tr>
<td>175 FPM</td>
<td>3'6&quot;</td>
<td>5'</td>
</tr>
<tr>
<td>200 FPM</td>
<td>4'0&quot;</td>
<td>5'6&quot;</td>
</tr>
<tr>
<td>225 FPM</td>
<td>4'6&quot;</td>
<td>6'</td>
</tr>
</tbody>
</table>

The slowdown distances are based on the magnets being placed as follows:

For Up Slowdowns - Measurement is from the center of the leveling magnet to the bottom edge of the slowdown magnet.

For Down Slowdowns - Measurement is from the center of the leveling magnet to the top edge of the slowdown magnet.

For three speed operation, the magnets should be set as follows:

<table>
<thead>
<tr>
<th>Speed</th>
<th>1 Floor Run Slowdown Magnet</th>
<th>High Speed Run Slowdown Magnet</th>
<th>Minimum Floor Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 FPM</td>
<td>3'6&quot;</td>
<td>5'0&quot;</td>
<td>6'6&quot;</td>
</tr>
<tr>
<td>275 FPM</td>
<td>4'0&quot;</td>
<td>5'6&quot;</td>
<td>7'</td>
</tr>
<tr>
<td>300 FPM</td>
<td>4'0&quot;</td>
<td>6'0&quot;</td>
<td>7'6&quot;</td>
</tr>
<tr>
<td>325 FPM</td>
<td>4'0&quot;</td>
<td>6'6&quot;</td>
<td>8'</td>
</tr>
<tr>
<td>350 FPM</td>
<td>4'0&quot;</td>
<td>7'0&quot;</td>
<td>8'6&quot;</td>
</tr>
<tr>
<td>375 FPM</td>
<td>4'6&quot;</td>
<td>7'6&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>400 FPM</td>
<td>5'0&quot;</td>
<td>8'0&quot;</td>
<td>9'6&quot;</td>
</tr>
</tbody>
</table>
The slowdown distances are based on the magnets being placed as follows:

For Up Slowdowns - Measurement is from the center of the leveling magnet to the bottom edge of the slowdown magnet.

For Down Slowdowns - Measurement is from the center of the leveling magnet to the top edge of the slowdown magnet.

### 4.4 Terminal Limit Switch Settings

The normal or directional limits should be set open when the car is 1" before floor level at the terminal floors.

The final limits should be set to open no sooner than 6" beyond the floor.

The terminal slowdowns should be set as follows:

#### 4.4.1 For Two Speed Operation

**Top:** Switch should be set to open immediately AFTER the HU sensor comes off the top floor slowdown magnet (This can be seen by monitoring the HU relay on the SET9000 sensor interface board).

**Bottom:**

Switch should be set to open immediately AFTER the HD sensor comes off the bottom floor slowdown magnet (This can be seen by monitoring the HD relay on the SET9000 sensor interface board).
4.4.2 For Three Speed Operation

Top Switch 1: The terminal slowdown switch that is furthest from the floor should be set to open immediately AFTER the HU sensor comes off the top floor high speed slowdown magnet (This can be seen by monitoring the HU relay on the SET9000 sensor interface board).

Top Switch 2: The terminal slowdown switch that is closest to the floor should be set to open immediately AFTER the HU sensor comes off the top floor one floor run slowdown magnet (This can be seen by monitoring the HU relay on the SET9000 sensor interface board).

Bottom Switch 1: The terminal slowdown switch that is furthest from the floor should be set to open immediately AFTER the HD sensor comes off the bottom floor high speed slowdown magnet (This can be seen by monitoring the HD relay on the SET9000 sensor interface board).

Bottom Switch 2: The terminal slowdown switch that is closest to the floor should be set to open immediately AFTER the HD sensor comes off the bottom floor one floor run slowdown magnet (This can be seen by monitoring the HD relay on the SET9000 sensor interface board).
SECTION 5 - START UP PROCEDURES

5.1 Controller Inspection

WARNING:

< Read Section 1 on Personal and Equipment Safety and Piping & Wiring Considerations and Practices completely before starting this procedure.

< Read this section completely before starting this procedure.

< Have someone stand by the main line disconnect during the following phases of the start up procedure for added safety:

- First time power on of the controller.
- First time the MG set is turned on.
- First time an attempt is made to move the car.

< Insure all safety circuits are functional.

< Insure all hoistway door interlocks are electrically and mechanically functional.

< Insure car gate circuitry is electrically functional.

5.1.1 Prior to Applying Power

< Verify all circuits are wired to the controller properly.

< (MG only) Verify the motor generator connections are correct as per the controller diagrams.

< Verify that the main line power supply voltage is the same as the controller order as seen on the prints shipped with the controller.

5.2 Power Up With MPU OFF

1. Place the MPU switch down
   IND switch up
   INSP switch down
   DOOR switch down
   IP switch down
   MG switch down (MG only)
   EMGI switch up (MG only)
2. Apply power to the controller and verify that the reverse phase detection monitor is on. The reverse phase monitor is O.K. if the red light is on. If the red light is not on, shut the main line power off, and swap 2 of the 3 phase connections to the reverse phase monitor.

3. Verify all transformer and power supply voltage levels are correct as per the prints.

4. If any fuses blow, with main line power off, find and remedy the short circuit.

5. Verify the safety circuit is complete. J7/4 input should be on LED - LI4.

The next few steps apply to generator jobs only, skip to the next section at this time if your application is not a generator job.

6. Momentary close the controller MG switch. Open the MG switch, as soon as the generator begins to rotate. Note the direction of rotation of the generator. If the generator rotated in the proper direction, move on to step 7. If the direction is incorrect, shut off the main line power and reverse any two main line wires.

Note: This will cause the reverse phase monitor to be incorrect. Reverse two of the three phase lines leading to the reverse phase monitor.

7. Connect a DC volt meter across the generator armature.

8. Start the generator and insure that the generator transfers from wye to delta properly if using a wye delta system. If using a resistance start, make sure there is adequate time before transfer. If the transfer time is not adequate, adjust the TA timer as needed.

9. With the generator running, note the meter reading of the armature. If there is any voltage on the meter above 10 VDC shut off the generator immediately. This may indicate the suicide circuit connections may be reversed.

Note: A build up of loop current will move the car in one direction or the other with out direction relays energized. Another cause of a build up of loop current may be caused by excessive series field turns. Verify that the series field is disconnected.

Note: If a build up of loop current was seen, shut the main line power off and wait at least 5 minutes. Then reverse the generator shunt field connections at the controller (GF1-GF4). Repeat the step 7 to make sure no build up of loop voltage.
5.3 Brake / Hoist Motor Field Regulator

The regulators which control the brake and motor field are identical. The control for each is a single unit with adjustment pots for four voltage outputs and two ramp up and two ramp down rates.

The driver card will provide 20-270 VDC. The driver card will be 7.5, 10, 20, or 30 amp drive, depending on the current requirements of the brake circuit. This is current rating is marked on the label on the side of the brake regulator.

At the bottom of the drive you will find five terminals on the TB1 terminal marked, F-, F+, L3, L2, L1. The L1 - L3 is the 208 VAC supply power. F- and F+ is the 20 - 270 VDC output power. The supply lines to the drive are fused on the drive card, except on the 30 amp card - external fuses are provided.

The drive has six inputs on the J1 terminal. The inputs are wired to the J1-1 through J1-5 terminals using J1-6 as the common for these inputs. The J1-6 terminal will be tied to the C-terminal on the controller, and the inputs will come in by switching the C+ feed to the J1-1 through J1-5 inputs. The DC output of the drive is based on which input is on and how the related pot is adjusted. The drive has individual adjustment pots and LEDs which correspond with each input and adjustment pot.

The V/I inputs, to the drive, allow multiple inputs to be on at the same time. The lowest input, in numeric order, will be the selected input if more than one input is on at a time. The LED, below the active adjustment pot will be on to indicate which voltage setting is in use at that time. The V/I-4 voltage setting is selected when no other input is on.

The ACC1 and DEC1 pots are always the selected ramp rates used for Series 90 unless the ACC2/DCC2 lights are on.

On the top rear left hand corner of the drive, you will find a three terminals labeled J3. This is the field loss fault relay contact output. This is used when the drive is used as a motor field drive and not used when the drive is used as a brake drive. It is normally wired from the common to the normally open terminals. The contact should be closed, when the field is at the standing voltage, and the FL pot is adjusted properly. The minimum field level required is lowered by turning the FL pot CCW.
5.3.1 Hoist Motor Field Adjustment (MG and Sweo SCR drives only)

**Note:** Controllers are factory preset to the motor field standing, running and full field voltages supplied with the order. Prior to making adjustments read Section 5.2.

**Note:** We will refer to **Standing Field** as the field voltage when the car is sitting at the floor with the doors fully open or when it is parked.

We will refer to **Full Field** as the field voltage when the car is accelerating or leveling into the floor.

We will refer to **Run Field** as the field voltage required to allow the car to reach contract speed without exceeding the rated armature voltage by more than 10%.

1. Insure the motor fields have been connected properly to the controller.

2. Connect a meter across the F- and F+ terminals of the drive. Set the meter range high enough to measure the field forcing voltage level for the job.

3. With no inputs on at the J1 terminal of the drive, the V/I-4 pot will be selected. Adjust the V/I-4 pot until standing field voltage is obtained.

4. To set the Field Loss Trip Point.

**Note:** The field loss trip point is pre-adjusted at O. Thompson according to the information supplied by the customer on the job specifications. This adjustment should not need to be made, but should be checked as a precaution to see if what was set up is actually on the job.

**Note:** The field loss trip point is typically set at 80% of standing field voltage. (I.E. If standing field voltage is 100 VDC, field loss should be set to trip at 80 volts).

A. Calculate the field loss trip point for the job.

B. Slowly begin turning the V/I - 4 pot until the calculated field loss trip voltage is obtained.

C. Turn the FL pot clockwise until the PFR relay de-energizes.

D. Turn the V/I - 4 pot clockwise until the standing field voltage is obtained. The PFR relay should energized while turning this pot clockwise.
HOIST MOTOR
FIELD & BRAKE CONTROL
MODEL FBC8100

FUSE
TYPE 3AB
20A
5. **Turn the main line power OFF.** Temporarily jump from C+ on the controller to J1-2 on the drive.

6. **Turn the main line power on.** Adjust the V/I-2 pot until full field voltage is obtained.

7. **Turn the main line power OFF.** Move the end of the jumper connected to J1-2 to J1-3 on the drive.

8. **Turn the main line power on.** Adjust the V/I-3 pot until run field voltage is obtained on the drive.

**Note:** On most GEARED applications, field weakening is not needed in order to lift full load at contract speed. In this case, adjust the V/I-3 pot to obtain the same voltage as full field voltage.

**Note:** On most GEARLESS applications, field weakening will be necessary in order to lift full load at contract speed. If run field data is not provided for the motor, typically the run field voltage is approximately 20 volts lower than forcing field voltage as a good starting point. The actual run field voltage should be adjusted by monitoring the armature nameplate voltage while lifting full load at contract speed. If the armature voltage exceeds nameplate voltage by more than 10%, turn the V/I-3 pot counterclockwise until the correct nameplate voltage is obtained.

9. Turn the ACC2 pot 10 turns clockwise.

10. Watch the meter and connect the jumper on the V/I-2 input and adjust the ACC1 pot so it takes approximately 3 seconds for the motor field voltage to go from standing field to full field. To make the voltage increase at a faster rate, turn the ACC1 pot clockwise.

11. Watch the meter and remove the jumper on the V/I-2 input and adjust the DCC1 pot so it takes approximately 3 seconds for the motor field voltage to go from full field to standing field. To make the voltage decrease at a faster rate, turn the DCC1 pot clockwise.

12. **Turn the main line power OFF.** Remove the jumper from C+ of the controller to J1-3.

13. Attempt to run the car up. If the car runs down. Shut the main line power off and **wait at least 5 minutes.** Swap the MF1 and MF2 connections to the controller.
5.3.2 Brake Adjustment (Except AC Drive Jobs)

Note: Potentiometers on the brake drive are factory preset to the brake lifting, running and re-level voltages supplied with the order. Prior to making adjustments read Section 5.2.

IMPORTANT NOTE:

_The brake assembly and all pins should be cleaned thoroughly and all spring tensions set properly to hold 125% of car capacity prior to adjusting the brake drive. If spring tensions are changed after this adjustment, the brake drive will need to be completely re-adjusted._

1. Insure the brake coil has been connected properly to the controller.
2. Connect a meter across the F- and F+ terminals of the drive. Set the meter range high enough to measure the brake lifting voltage level for the job.
3. With no inputs on at the J1 terminal of the drive, the V/I-4 pot will be selected. Adjust the V/I-4 pot 10 turns counterclockwise. The meter should read somewhere between 0 to 20 VDC.
4. **Turn the main line power** OFF. TEMPORARILY jump from C+ on the controller to J1-2 on the drive.
5. **Turn the main line power on.** Run the car on inspection and adjust the V/I-2 pot until brake pick voltage required for the job is obtained.
6. **Turn the main line power OFF.** Remove the jumper from J1-2 on the drive.
7. **Turn the main line power on.** Run the car on inspection and wait until the LED over the V/I-3 pot lights. Adjust the V/I-3 pot until approximately 60% of brake lifting voltage is obtained. If the brake drops at this level, stop the car, turn the pot clockwise 1 full turn, and attempt to run again until the brake arms do not relax when the brake drive drops to holding voltage.
8. Turn the ACC1 pot 15 turns clockwise or until the clutch inside the pot begins clicking. This will allow for a rapid response of the brake regulator from a lower voltage level to a higher voltage level. If rollback or hard starts occur, turn the ACC1 pot counterclockwise 1 turn at a time to allow the brake to pick in a slow linear fashion.
Note: Do not drag out the pick of the brake too much with the ACC1 pot. The timing of the BKA relay only allows a maximum of 1 second before the brake drive switches to the brake holding voltage.

9. Turn the DEC1 pot 15 turns clockwise or until the clutch inside the pot begins clicking. This will allow for a rapid response of the brake regulator from a higher voltage level to a lower voltage level.

5.4 Amicon Regulator Start Up

Up until now, you have been running the car on “EMGI” mode or emergency mode. Now it is time to set up the electronic regulator to run the car at the proper speed.

1. Temporarily place a jumper from the XY3 pin to the XY9 pin on the regulator. Switch the S3 switch to the TEST position.

2. Switch the EMGI switch OFF if it is not already off. The EMGI relay should energize.

3. Generator fields should be wired on series parallel.

4. Connect your meter to check the polarity of the tach feedback. Place the red lead of the meter on the XY5 test point (tach feedback) on the regulator, and the black meter lead on the XY3 test point on the regulator board.

5. Turn the main line power on. Run the car up. If the car runs down, shut the main line power off and swap the C and D connections on the regulator power board.

6. As the car runs up, the polarity on the meter should be positive for up running, and negative for down running. If it is reversed, stop the car and swap the tach connections at terminals 1 & 2 on the regulator board.

7. Move the red meter lead to the XY6 test point (armature voltage feedback). Run the car up. The polarity on the meter should be negative in the up direction and positive in the down direction. If it is reversed, stop the car and swap the A+ and A- connection on the regulator power board.

8. With the car stopped, switch the S3 switch to the RUN position.

9. Move the red meter lead to the XY4 test point (reference in).
10. While running the car on inspection, turn the SP3 pot on the speed board CCW until .7 volts is seen on the meter (should be positive for up and negative for down).

NOTE: *Make note of how many turns are taken on the SP3 pot. The pot will need to be returned to its original position after this procedure.*

11. Calculate the raw tach voltage at contract speed using the following formulas:

**Gearless**

Tach RPM @ contract Speed =

\[
\frac{\text{Circumference of Drive Sheave}}{\text{Circumference of Tach Wheel}} \times \text{Nameplate RPM of Motor}
\]

Where: Circumference = 3.1416 X the diameter

Tach RPM @ contract speed X .10 = Tach Volts @ Contract Speed

(1000 RPM’s = 100 volts)

**Geared**

Nameplate RPM of Motor X .10 = Tach Volts @ Contract Speed

Where: Tach Generator is directly coupled to the hoist motor shaft.

12. Perform rough tach scaling by switching the SW1 switches on the regulator board using the following table:

<table>
<thead>
<tr>
<th>Tach Volts @ Contract Speed</th>
<th>SW1 Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 10 volts</td>
<td>SW1 - SW8 = ON</td>
</tr>
<tr>
<td>10 - 18 volts</td>
<td>SW1 - SW7 = ON</td>
</tr>
<tr>
<td>18 - 35 volts</td>
<td>SW1 - SW6 = ON</td>
</tr>
<tr>
<td>35 - 65 volts</td>
<td>SW1 - SW5 = ON</td>
</tr>
<tr>
<td>65 - 110 volts</td>
<td>SW1 - SW4 = ON</td>
</tr>
<tr>
<td>110 - 180 volts</td>
<td>SW1 &amp; SW2 = ON</td>
</tr>
<tr>
<td>180 - 300 volts</td>
<td>SW1 - SW8 = OFF</td>
</tr>
</tbody>
</table>
13. While running the car with .7 volts of pattern, hand tach the car to see if it is running at 1/10 of contract speed. If the car is running too slow, turn the NMAX pot clockwise until the car runs 1/10 of contract speed and adjust resistance in series with generator fields (R12) shorten resistance. If the car is running too fast, turn the pot counterclockwise to slow the car down.

**Note:** If 1/10 of contract speed cannot be obtained in the direction of the load, the Idn pot may need to be turned clockwise slightly at this time to allow the regulator to put out more current. Usually this is not the case.

14. Move the red meter lead to the XY6 test point on the regulator. While the car runs at 1/10 of contract speed, adjust the ACAL pot until you see .75 volts on the meter.

15. If instability exists, turn the PN pot clockwise 1/4 turn at a time and make note of how many turns are made. If this seems to make the instability worse, go back to the original setting of PN and begin to turn the ACMP pot clockwise 1/4 turn at a time.

16. Move the red meter lead to the XY5 test point. While the car is running at 1/10 of contract speed, adjust the TFB pot until .7 volts is seen on the meter.

17. Move the red meter lead to the XY7 test point. With the car stopped, adjust the OVS pot for approximately 7.8 volts.

18. **Remove the temporary jumper from XY3 to the XY9 of the regulator board.**

**Note:** Adjustments will need to be touched up during the high speed adjustment period, but this is close enough to get you into high speed.

### 5.4.1 Amicon Regulator Reference Information

#### Status/ Fault Indicators

**RUN (Run Input)** - Indicates that the control has a run input and is currently enabled.

**LL (Re-Level Limit)** - Indicates that the re-leveling overspeed circuit is enabled and re-level overspeed trip limit is reduced to approximately 10% of contract speed.

**TE (Tracking Error)** - Indicates that there is currently a difference between commanded speed and actual speed of greater that 10% of full scale.

**SPD (Overspeed Fault)** - The overspeed trip is adjustable from 110% to 125% of the contract speed setting or at approximately 10% of the contract speed when the “LL” contact is pulled in during re-leveling. The overspeed fault circuit will latch if the scaled tachometer feedback should exceed 7.0 volts by more than overspeed trip percentage (110-125%).
SCR (SCR Power Fault) - When a run command is given to the control, the main SCR power is applied at the same time. If the control does not sense at least 250VAC with 2 seconds after a run command, the SCR power fault will latch. Similarly, when the run command is removed from the control, the main SCR power is disconnected at the same time. If the control does not sense that the SCR voltage has dropped to less than 50VAC within 2 seconds after the run command has been removed, the SCR power fault will latch.

TACH (Tach Loss Fault) - If at any time the motor armature voltage and tach feedback are more than 20% different as is the case when the tach wires becomes disconnected or are reversed, the tach loss fault will latch.

DIR (Direction Fault) - Indicates and disables the control when the tachometer’s direction is different from the command speed. If the speed reference direction is up and the tach moves more than 10% in the down direction or if the speed reference direction is down and the tach moves more than 10% in the up direction, the direction fault will latch.

MP (Positive Bridge Enabled) - Indicates the positive SCR bridge (motoring) is enabled.

MN (Negative Bridge Enabled) - Indicates the negative SCR bridge (regenerating) is enabled.

+/- 15 (Power Supplies OK) - Indicates the controls low voltage power supplies are present.

Adjustments

PN (Speed Loop Gain) - Sets the gain of the speed feedback loop. The gain should be adjusted for good regulation and stability of the system.

NMAX (Contract Speed) - Fine adjustment for setting contract speed with the maximum speed reference input to the control. This adjustment should be made after selecting the appropriate tach feedback scaling switch setting of S1.

ACAL (Armature Feedback Calibration) - The armature feedback calibration adjustment is used to achieve good stability and response of the machine. It is manually adjusted by monitoring the armature feedback test point (XY6) and adjusting the armature feedback potentiometer clockwise for 7.0V at contract speed. This adjustment may be fine tuned for maximum stability of the system. The response may be too slow if the armature feedback is too high. This adjustment, as well as stability gain, sets the armature voltage reference for the tach loss circuit. Setting will vary depending on the load. To adjust, run one car at contract speed in both directions to determine the voltage difference by subtracting one reading from the other. One-half of this difference should be subtracted from the baseline of 7.0V. Example - If difference is .20 volts. Subtract .1 (½ of .20) from 7.0V. Therefore, pot should be adjusted to 6.9 up.
ACMP (Armature Feedback Compensation) - The armature feedback compensation increases the effect of the armature feedback. The response of the machine may be too slow if the ACMP is too high. The ACMP potentiometer should be adjusted to achieve good, smooth operation. Too much ACMP may also affect running regulation.

IDN (Current Limit Setpoint) - It should be set for the amount of field current the control can regulate. The IDN pot is preset and sealed at the factory. It should not be readjusted. This pot sets the maximum amount of current output. It is preset for 15 amps. Instability in the system could result if the current is adjusted too high.

OFFSET - Provide and offset adjustment to prevent the elevator from “creeping” when zero speed is commanded to the control.

Settings

PI (Current Loop Gain) - Normally left about mid range. Provides a means to increase or decrease the gain of the control loop if the generator field current is unstable.

TFB (Tach Feedback Calibration) - The tach feedback adjustment is used to calibrate the tach feedback at contract speed for 7.0V. (ATXY5) This signal is used in the tach loss, direction fault and overspeed circuits as well as for monitoring the actual vs. set speed.

OVS (Overspeed Setpoint) - The overspeed setpoint is used to set the overspeed trip point of the control from 110% (fully CCW) to 125% (fully CW). The re-level limit will also be affected by this adjustment from 10% (fully CCW) to 12.5% (fully CW).

5.5 IPC Regulator Start Up

Up until now, you have been running the car on “EMGI” mode or emergency mode. Now it is time to set up the electronic regulator to run the car at the proper speed

1. Switch the SW1 switch to the SETUP position.

2. Switch the EMGI switch ON. The EMGI relay should energize.

3. Turn the Main line power OFF. Connect on ohmmeter across the generator shunt fields and manually press in the P relay. Measure the resistance of the generator shunt field.
4. Calculate the correct secondary tap for transformer #4 using the resistance reading in step 3 and the table below.

<table>
<thead>
<tr>
<th>Field Resistance</th>
<th>110 VAC</th>
<th>130 VAC</th>
<th>150 VAC</th>
<th>165 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Resistance</td>
<td>20</td>
<td>25</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>Maximum Resistance</td>
<td>150</td>
<td>162</td>
<td>210</td>
<td>250</td>
</tr>
</tbody>
</table>

5. Move the taps on transformer #4 to the correct taps as calculated in step 4.

6. The maximum DC output voltage to the fields can be calculated by multiplying the AC voltage selected by 1.33. The main focus is that the regulator is not capable of putting out more than 7.5 amps, so proper selection of the taps is sometimes critical.

7. Connect your meter to check the polarity of the tach feedback. Place the red lead of the meter on the TACH test point on the regulator, and the black meter lead on the common test point.

8. **Turn the main line power on.** Run the car up. If the car runs down, shut the main line power off and swap the F+ and F- connections on the regulator.

9. As the car runs up, the polarity on the meter should be positive for up running, and negative for down running. If it is reversed, stop the car and swap the tach connections at the regulator.

10. Move the red meter lead to the "ARM FEEDBACK" test point. Run the car up. The polarity on the meter should be positive in the up direction and negative in the down direction. If it is reversed, stop the car and swap the A+ and A- connections on the TB1 terminal block of the regulator (TB1-1 & 2).

11. With the car stopped, switch the SW1 switch to the AUTO position. **Remove the temporary jumper from the TRIP DISABLE pin to the COMMON pin of the regulator.**

12. Connect the meter with the red meter lead on the REF Signal UP+ terminal on the TB3 terminal block of the regulator, and the black lead on the REF Signal UP-.

13. While running the car on inspection, turn the inspection speed pot on the controller until .7 volts is seen on the meter (should be positive for up and negative for down).

14. Move the meter so the red meter lead is connected to the REF OUT test point on the regulator and the black meter lead is on the COMMON test point on the regulator.
15. While running the car with .7 volts of pattern coming in, adjust the SIGNAL IN GAIN pot to obtain .95 volts on the meter.

16. While running the car with .7 volts of pattern, hand tach the car to see if it is running at 1/10 of contract speed. If the car is running too slow, turn the CONTRACT SPEED pot clockwise until the car runs 1/10 of contract speed. If the car is running too fast, turn the pot counterclockwise to slow the car down.

**Note:** If 1/10 of contract speed cannot be obtained in the direction of the load, the CURRENT pot may need to be turned clockwise slightly at this time to allow the regulator to put out more current. Usually this is not the case.

17. Move the red meter lead to the ARM FEEDBACK test point on the regulator. While the car runs at 1/10 of contract speed, adjust the ARM FEEDBACK pot until you see .75 volts on the meter.

18. If instability exists, turn the LOOP GAIN pot clockwise 1/4 turn at a time and make note of how many turns are made. If this seems to make the instability worse, go back to the original setting of loop gain and begin to turn the STABILITY pot clockwise 1/4 turn at a time.

**Note:** The LOOP GAIN pot is factory preset by turning it fully counterclockwise, then turning it ½ turn clockwise. The STABILITY pot is factory preset by turning it fully clockwise, then ½ turn counterclockwise. Adjustments will need to be touched up during the high speed adjustment period, but this is close enough to get you into high speed.

**Note:** Adjustments will need to be touched up during the high speed adjustment period, but this is close enough to get you into high speed.

### 5.6 Baldor Sweo Start Up

1. With the car in the middle of the hoistway, attempt to run the car up. If the car does not run at a controller speed in the proper direction, with the MAIN LINE OFF swap connections using the chart on the next page.
**IF THIS HAPPENS** | **DO THIS**
---|---
Tach Loss Fault occurs | It is possible that the tach loss circuitry on the Control board is too sensitive for the job. The tach loss circuitry can be modified on the Control board by changing the R144 resistor as follows: Replace with 280 kohm resistor = allows 12% error Replace with 187 kohm resistor = allows 18% error
Car runs up very fast until drive trips. | Swap the tach connections on J1/1 and J1/2 of the drive
Car runs down very fast until drive trips. | Turn off the main line power and wait 60 seconds. Swap the motor field connections on the motor field drive unit.
Car runs down at a controlled speed. | Turn off the main line power and wait 60 seconds. Swap the motor field connections & swap the tach connections.
Car unstable, in one direction at 150 f.p.m. or more. | Check resistor in series with speed board output (100 ohms).

2. Connect your meter with the red lead on J1/5 and the black lead on J1/6 of the Sweo drive.

3. While running the car on inspection, adjust the inspection pot on the controller until .7 volts is seen on the meter.

4. Hand tach the car and turn the **MAX SPEED** pot until 1/10 of contract speed is attained.

5. If, while running the car in the direction lifting the load, the current limit pot comes on, turn the **CURRENT LIMIT** pot (R161) clockwise until the light goes off.

6. If instability exists, turn the **RATE GAIN** pot CW or CCW until the instability goes away.

### 5.7 GE DC300E Start Up

This step by step procedure will allow you to safely start up the Series 90 SCR controller using a GE DC300E drive. Prior to applying power to the controller, we strongly recommend you read and follow the instructions and recommendations in the "Installation Considerations" section of this manual.
If you are not familiar with the GE DC300E drive, we recommend you read the "GE DC300 Introduction" section of the manual. By reading the GE DC300E Introduction section, you will learn how to use the GE hand held programming tool. Instructions on how to use the tool will not be covered in depth in this procedure. The introduction section also gives a brief explanation of key parameter adjustments.

Each step in this procedure will be followed by an extremely brief commentary explaining what you did in the previous step, unless the step involves something real simple. The steps are also broken up into major sections for easier reference. If you don't understand the step or why to do it, read the explanation first. If you have done this before, and just want to follow the steps, skip the commentary notes in italics after each step. Good Luck!

**LOCK THE MAIN LINE POWER OFF**

1. Check the following items:
   - MPU switch down
   - IND switch up
   - INSP switch down
   - DOOR switch down
   - IP switch down

   *This ensures the controller is on inspection in more ways than one, and also removes power from the processor and I/O section in case of any wiring mistakes. Power is also removed from the SET 9000 unit.*

2. Verify, with an ohmmeter, that the governor overspeed switch and any other devices that are wired in at this time will open the safety string.

3. Physically verify that all hoistway doors are closed and locked.

4. Verify that the tach generator armature leads are wired to terminals 1TB-1 and 1TB-3 on the Analog Process Interface Card on the DC300E. (These leads may terminate at the A13 and A14 terminals at the logic cabinet first, but verify that the A13 and A14 cross connections have been made in this case).

5. If a DC choke is used, verify that the choke is wired in series with the armature, and the filtering capacitors are wired in parallel with the armature circuit.

6. Verify that the motor fields are connected to either the MF1 & MF2 studs on the controller or to the 2TB1 & 2TB2 terminals on the DC300E.
Motor Field Calculation & Calibration

**NOTE:** If a buck/boost transformer arrangement has been supplied for the motor field power supply, steps 7 & 8 can be skipped and you can move directly to step 9. The buck/boost transformer arrangement can be identified by looking for transformers mounted externally from the drive, with their connections made at the 2TB-5, 6, & 7 terminals on the top of the drive.

**NOTE:** It is also very important that the wiring of buck/boost transformer be done exactly as the diagrams that have been shipped from GE. If the transformers are wired incorrectly, the power supplied by the transformers will be out of phase with the phase angle reference used by the firing circuit for the motor field SCRs. Improper field regulation will occur, and you will experience field loss, or hot running fields.

7. Calculate the available motor field voltage using the following formula:

   \[ \text{Available Field Volts} = \text{Incoming AC voltage stamped on the nameplate of the drive} \times 0.67 \]

The DC300E is a 2/3 wave rectifier, so only 2/3 (67%) of incoming voltage is available.

8. Compare the voltage calculated in step 7 to the nameplate motor field voltage. If there is no nameplate, measure another car's forcing (leveling) field voltage, and use that as a full field value. If the actual forcing field voltage is higher than the voltage you calculated in step 7, the motor fields must be re-wired in series parallel.

   By re-wiring the fields, the total required field voltage will be cut in half, but the total circuit current will be doubled to maintain the same "current per pole piece" as in the old system.

Example:

   A drive has no buck boost transformer arrangement, and the incoming line voltage to the drive is 230 VAC. The motor field forcing voltage, as measured from a good running car next to this car, is 240 VDC. Using Step 2 from above:

   \[ \text{Available Field Volts} = 230 \text{ VAC} \times 0.67 = 150 \text{ volts} \]

   150 volts will not be enough voltage at forcing, so the fields must be wired in series parallel.

   It is a 6 pole motor, with a total cold field resistance of 60 ohms.
If the force field voltage was 240 VDC and the cold resistance was 60 ohms, the force field current can be calculated using Ohm's Law.

\[ \frac{240 \text{ volts}}{60 \text{ ohms}} = 4 \text{ amps} \]

By comparing the current field configuration to the diagram on the previous page, we can see that the fields on this motor are wired in a series configuration so the 4 amps will be the "current per pole piece."

We re-wire the field poles in a series parallel configuration to give 2 -30 ohm branches connected together to give a new total field resistance of 15 ohms.

The same "current per pole piece" must be maintained to maintain the same amount of flux in the motor as with the old system. So we use ohms law to calculate how much field voltage will be required of the DC300E now to produce the same current per pole piece as the old system did.

\[ \text{Voltage required} = 15 \text{ ohms (new total field resistance)} \times 4 \text{ amps (required current/pole piece)} = 60 \text{ volts} \]

9. Remove one of the motor field wires from the drive and measure the total resistance of the fields.

   This measurement will be used in calculating the field current required and the jumper arrangements before power is applied to the drive.

10. Calculate the force field current requirements using the following formula:

   \[ \text{Total Field Current} = \frac{\text{Nameplate field voltage}}{\text{Total field resistance measured in step 9}} \]

**NOTE:** If the fields had to be re-wired in series parallel, the nameplate voltage that should be used in this formula will be ½ of the actual nameplate voltage due to the re-configuration of the fields.

   If this calculation yields more than 10 amps, make sure a G2 version of the motor field power supply card was provided.

(This can be identified by pulling down the Main Control Card to expose the Power Supply Card on the drive. If the Power Supply Card has a large line reactor mounted on the top left hand corner of the board, the board is a G1 or 10 amp version. If the line reactor is missing, and an empty space is evident on the top left hand corner of the board, the board is a G2 or 24 amp version and will have a separately mounted DC power supply with heat sink).
This step is done to make sure the proper hardware was shipped for the job. If the power supply is not the correct size, please contact O. Thompson Engineering for further assistance.

11. Now that the actual field forcing current is known, configure the JP1 & JP2 jumpers on the Power Supply Card for the proper current range using the following table. The table you use will depend on the type of power supply (G1 or G2) used. Also make a note of the gain factor associated with the setting you will be using. The "Gain Factor" will be used in the calculation of the Field current parameters.

**For 10 amp (G1) Power Supply**

<table>
<thead>
<tr>
<th>Field Amps</th>
<th>Gain Factor</th>
<th>JP1 Setting</th>
<th>JP2 Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.64 - 1.6 amps</td>
<td>0.4</td>
<td>2-3</td>
<td>2-3</td>
</tr>
<tr>
<td>1.6 - 4.0 amps</td>
<td>1.0</td>
<td>1-2</td>
<td>2-3</td>
</tr>
<tr>
<td>4.0 - 10.0 amps</td>
<td>2.5</td>
<td>1-2</td>
<td>1-2</td>
</tr>
</tbody>
</table>

**For 24 amp (G2) Power Supply**

<table>
<thead>
<tr>
<th>Field Amps</th>
<th>Gain Factor</th>
<th>JP1 Setting</th>
<th>JP2 Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 - 6.0 amps</td>
<td>1.5</td>
<td>2-3</td>
<td>2-3</td>
</tr>
<tr>
<td>6.0 - 12.0 amps</td>
<td>3.0</td>
<td>1-2</td>
<td>2-3</td>
</tr>
<tr>
<td>12.0 - 24.0 amps</td>
<td>6.0</td>
<td>1-2</td>
<td>1-2</td>
</tr>
</tbody>
</table>

The following calculations should require no explanation as they are simply parameters in the drive that will control how much current is driven through the motor fields. Each parameter would be like setting a potentiometer if this were an analog field current regulator.

The following values for each parameter should be written down as you will need to enter them when the power is turned on to the drive. These parameters are calculated ahead of time to prevent motor field damage in case the parameters were miscalculated in the factory.

12. Calculate the field forcing current parameter (FLDMX) using the following formula:

\[(\text{Field Forcing Current} \times 2048) / (\text{Gain Factor} \times 5) = \text{FLDMX (Parameter address 076)}\]
13. Calculate the running field current level parameter (FLDMN) using the following formula:

\[
(\text{Field Forcing Current} \times 0.8 \times 2048) / (\text{Gain Factor} \times 5) = \text{FLDMN (Parameter address 077)}
\]

14. The value of the standing field current parameter (FLDEC) can be calculated using the following formula, however in most cases a standing field of 50% of run field is sufficient. If a standing field of 50% is sufficient, this parameter should always be set to "128".

\[
256 \times (\text{Standing Field Current} / \text{Forcing field Current}) = \text{FLDEC (Parameter address 050)}
\]

15. Calculate the field loss trip set point parameter (FLDLS) using the following formula and assuming a standing field current of exactly ½ of the field forcing current:

\[
(\text{Standing Field Current} \times 0.35 \times 2048) / (\text{Gain Factor} \times 5) = \text{FLDLS (Parameter address 078)}
\]

16. Calculate the field weakening crossover point parameter (CROSS) using the following formula:

\[
\% \text{ of Desired Armature Volts to start weakening} \times 1638 = \text{CROSS (Parameter address 079)}
\]

For example, if you wanted to start field weakening at 90% of full armature nameplate voltage, it would be calculated by 90% \( \times 1638 = 1474 \). Parameter 079 (CROSS) would be set at 1474.

**Pre-Power Checks**

17. Check each main line power connection to make sure there are no grounds present in the main feeder connections.

*This is a precautionary measure to make sure the connections have been made properly, and no wires have been scrun in the pipes or duct work.*

18. If the isolation transformer for the drive is being used as a step up transformer, make sure the main line connections are made on the "X" terminals and the connections leading to the drive are made on the "H" terminals on the isolation transformer.
If the isolation transformer for the drive is being used as a step down transformer, make sure the main line connections are made on the "H" terminals and the connections leading to the drive are made on the "X" terminals on the isolation transformer.

Make sure the jumper straps on the isolation transformer are configured properly to give the approximate incoming line voltage stamped on the nameplate of the drive ± 10%.

At the top of the drive, temporarily unbolt the three main AC fuses and remove them.

If a G2 motor field power supply is being used, remove the three fuses from the front of the heat sink assembly.

These steps are necessary to insure the proper line voltage is applied to the drive for the first time. If the isolation transformers are marked or wired incorrectly, the drive can be exposed to extremely high line voltage and damage to the drive will occur.

**GE DC300E ADJUSTMENTS**

19. Preset the pots on the each circuit board of the drive as follows:

**Main Control Card**
- P4 - Midway
- P1,P2,P6,P7, - Fully Counterclockwise
- P5 - As shipped
- P3 - As shipped
- P8 - Midway

**Analog Process Interface Card**
- P2 - Fully Counterclockwise
- P3 - As shipped
- P4 - Fully Counterclockwise
- P5 - 11 O'clock
- P8 - Fully Counterclockwise
- P9 - Fully Counterclockwise
- P10 - 9 O'clock
- P11 - 11 O'clock

**Power Supply Card**
- P1 - As shipped
- P2 - As shipped
- P3 - As shipped
20. A four page list of the drive parameters, jumper settings for each board, and job specific components is shipped and located on the inside drive door pocket. Locate and check each individual jumper on each board according to this sheet to make sure the jumpers are set properly for your job.

**APPLY MAIN LINE POWER**

21. Check the incoming line voltage at the top of the drive phase to phase. It should measure within 10% of the nameplate value stamped on the front door of the drive. If it is not, shut the power off, and check the jumper straps on the isolation transformer. If the voltage is extremely high or low, but balanced between phases, check "X" & "H" connections on the isolation transformer as in step 13.

**LOCK OFF THE MAIN LINE POWER**

22. Re-install the three main AC fuses on the top of the drive and tighten them securely to the posts. If the G2 power supply is supplied, re-install the 3 fuses on the front of the heat sink assembly.

**TURN ON THE MAIN LINE POWER**
23. Check the following voltages (All readings should be within 10% of expected):

<table>
<thead>
<tr>
<th>Meter Setting &amp; Minimum Range</th>
<th>Controller Location</th>
<th>Expected Reading</th>
<th>Possible Blown Fuse #</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 VAC</td>
<td>Bottom of Fuse F1 - Bottom Fuse F2</td>
<td>208 VAC</td>
<td>F1,F2</td>
</tr>
<tr>
<td>300 VAC</td>
<td>Bottom of Fuse F2 - Bottom Fuse F3</td>
<td>208 VAC</td>
<td>F2,F3</td>
</tr>
<tr>
<td>300 VAC</td>
<td>Bottom of Fuse F1 - Bottom Fuse F3</td>
<td>208 VAC</td>
<td>F1,F3</td>
</tr>
<tr>
<td>300 VAC</td>
<td>Terminal H1 - H2</td>
<td>110 VAC</td>
<td>F20,F22</td>
</tr>
<tr>
<td>300 VAC</td>
<td>Bottom Transformer T1 X1-X2</td>
<td>100 VAC</td>
<td>F21</td>
</tr>
<tr>
<td>300 VDC</td>
<td>Terminal C- &amp;C+</td>
<td>115 VDC</td>
<td>F21, F8</td>
</tr>
<tr>
<td>300 VAC</td>
<td>Bottom of F4 fuse - Bottom of F5 fuse</td>
<td>208 VDC</td>
<td>F1,F2,F3,F4, F5</td>
</tr>
<tr>
<td>30 VDC</td>
<td>(On DC300E) &quot;-15V&quot; pin on Main Control Card to &quot;PCOM&quot; pin on Main Control Card</td>
<td>-15 VDC</td>
<td>CFU6, CFU7, CFU8 (On Power Supply Card)</td>
</tr>
<tr>
<td>30 VDC</td>
<td>(On DC300E) &quot;+15V&quot; pin on Main Control Card to &quot;PCOM&quot; pin on Main Control Card</td>
<td>+15 VDC</td>
<td>CFU6, CFU7, CFU8 (On Power Supply Card)</td>
</tr>
<tr>
<td>30 VDC</td>
<td>(On DC300E) &quot;+24V&quot; pin on Main Control Card to &quot;PCOM&quot; pin on Main Control Card</td>
<td>+24 VDC</td>
<td>KPH, CFU7, CFU8 (On Power Supply Card)</td>
</tr>
<tr>
<td>30 VDC</td>
<td>(On DC300E) &quot;-24V&quot; pin on Main Control Card to &quot;PCOM&quot; pin on Main Control Card</td>
<td>-24 VDC</td>
<td>KPH, CFU7, CFU8 (On Power Supply Card)</td>
</tr>
<tr>
<td>30 VDC</td>
<td>(On DC300E) &quot;+5V&quot; pin on Main Control Card to &quot;PCOM&quot; pin on Main Control Card</td>
<td>+5 VDC</td>
<td>KPH, CFU7, CFU8 (On Power Supply Card)</td>
</tr>
</tbody>
</table>
DO NOT CONTINUE ANY FURTHER UNTIL ALL VOLTAGES ON THE DRIVE PER THE ABOVE TABLE ARE CORRECT. EQUIPMENT DAMAGE MAY OCCUR IF VOLTAGE LEVELS ARE INCORRECT.

24. Check the following:

**I, IA, & IB relays should be de-energized.** If they are energized, quickly switch the inspection switch on the controller to the opposite position.

If a phase sequence failure appears on the drive, check the phase to phase voltage to see if one of the drive fuses has blown. If all fuses are in tact, shut the main line power off and swap two of the three incoming feeds at the top of the drive.

**DG & DGX relays should be energized.** If not, find the open door lock or car gate switch.

**LIM (VFD) SCR (SCR’s) PFR (MG’s) relays should be energized.** Temporarily jump the SF1 and SF2 contacts on the limit board until the board can be set up properly.

**BKA relay should be energized.**

**GE PARAMETER ADJUSTMENT**

25. The LEDs should be flashing across the screen from right to left one at a time to indicate the drive is in standby mode. If the LEDs are not flashing in this fashion and are locked onto a specific fault, troubleshoot the fault using the GE handbook mounted on the inside cover of the drive door.

26. Plug the ribbon cable from the hand held programmer into the 18PL socket on the main control board of the drive. Make sure the colored edge of the ribbon cable faces to the left when plugging this cable in.

27. The word "Operate" should appear on the display of the tool. When using the hand held tool, if you mis-type something, press the [Clear] button on the hand held 3 times to perform a soft reset and start over from the beginning. Press the following keys, and in this sequence:

```
[SET] [DRV] [7] [7] [ENTER]
```

28. The word "Parameter" should appear on the screen. Move the JP13 jumper on the main control board to the 2-3 or write enable position. The JP13 jumper is located on the bottom left hand edge of the board. It is the only jumper on the board that has a rubber boot on the end of it.
By placing the jumper in the write enable position, you are now able to modify the parameters of the drive after a software parameter that will be covered in the next step is unlocked.

**CAUTION** - **THE MAIN LINE POWER SHOULD NEVER BE CYCLED ON OR OFF WITH THE JP13 JUMPER IN THE WRITE ENABLE OR 2-3 POSITION. IRREPARABLE DAMAGE TO THE EEROM ON THE DRIVE CAN OCCUR DUE TO TRANSIENT VOLTAGE SPIKES THAT MAY OCCUR WHEN THE MAIN LINE IS TURNED ON OR SHUT OFF.**

29. The software protection jumper must now be disabled, so press the following:

   \[003\] [ENTER]

30. "DGNJP 512" should appear on the screen. This variable must be changed to "513" to enable other parameters to be modified. To modify this parameter press:

   \[513\] [ENTER]

"DGNJP 513" should now appear on the screen. The software lock is now disabled, and all other variables can be modified at this time.

**MOTOR FIELD PARAMETER ADJUSTMENTS**

31. To get to the next parameter, press [CLEAR] once. The word "Parameter" should now appear on the screen. The first motor field parameter that should be modified is the forcing field current or the FLDMX parameter (address 076). Here you will enter the value you calculated in step 12. Press:

   \[0\] \[7\] \[6\] - "FLDMX" should appear and its current value should appear to the left.

Enter the value you calculated in step 12, then press [ENTER].

The value you now see on screen should be the value you just entered.

*After typing in the new value of the parameter and pressing enter a "FL39 - EFAIL" message comes up, the JP13 jumper on the main control board is in the wrong position.*

*After typing in the new value of the parameter and pressing enter a "FL38 - ELOCK" message comes up, the value of parameter 003 (DGNJP) must be changed to 513.*
32. Press [CLEAR] once, and the word "Parameter" should appear. The next motor field parameter to be modified should be the run field current level or the FLDMN parameter (address 077). Press:

[0] [7] [7] - "FLDMN" should appear and its current value should appear to the left.

Enter the value you calculated in step 13, then press [ENTER].

33. Press [CLEAR] once, and the word "Parameter" should again appear (this is getting repetitious). The next motor field parameter to be modified will be the standing field or the FLDEC parameter (address 050). Press:

[0] [5] [0] - "FLDEC" should appear and its current value to the left.

Enter the value you calculated in step 14, then press [ENTER].

34. Press [CLEAR] once. The next motor field parameter to be modified will be the field loss trip threshold or the FLDLS parameter (address 078). Press:

[0] [7] [8] - "FLDLS" should appear and its current value to the left.

Enter the value you calculated in step 15, then press [ENTER].

35. Press [CLEAR] once. The next motor field parameter to be modified will be the field weakening crossover point or the CROSS parameter (address 079). Press:

[0] [7] [9] - "CROSS" should appear and its current value to the left.

Enter the value you calculated in step 16, then press [ENTER].

36. Now test your changes by connecting your meter across the motor fields in the voltage mode, and set to a high enough range to read the field forcing voltage. The field should be at standing field voltage (roughly 50% of field forcing voltage).

Leave the meter connected, and touch a jumper from terminals 3TB56 to 3TB55 on the drive. The field voltage should rise to field forcing level. By removing the jumper, the fields should return back to standing field voltage level.

**NOTE:** It is important to remember that the DC300E field regulator is a CURRENT regulator. Normally, motor field resistance increases as fields get hot. As the resistance increases in the fields, the DC300E will increase the terminal voltage to the fields to keep the field current constant. Therefore, the field voltage at the beginning of the day will be substantially lower than at the end of the day due to the changing resistance of the motor fields.
37. As a final check, connect your red meter lead to the "FC" test point on the middle right hand side of the Main Control board, and your black meter lead to the "PCOM" test point on the bottom right hand side of the Main Control Card. Set the meter to read up to a 10 VDC scale.

Hold a jumper between 3TB55 and 3TB56 on the drive. The voltage on the meter should rise to somewhere between 3.0 - 4.0 volts. If the reading is above 4 volts, the JP1 & JP2 jumpers on the Power Supply Card are improperly scaled and should be reset. If the jumpers are changed, all motor field parameters must also be re-calculated and re-entered before this measurement can be taken again.

If the voltage read at the "FC" test point is between 3.0 - 4.0 volts at forcing field level, continue to the next step.

38. On the hand held programmer, press:

[CLEAR] [CLEAR] [CLEAR] - *The hand held should now be in the operate mode.*

Press: [SET] [DRV] [7] [7] [ENTER] - *The hand held should now be in the parameter mode.*

Press: [0] [0] [3] - "DGNJP  513" should appear on the screen

Press: [5] [1] [2] [ENTER] - *This locks the software variable so no more parameters can be changed.*

39. As mentioned earlier, the "CHKSM" parameter (address 254) is a mathematical summation of all parameter values. Check the number in the check sum parameter and write it down. Press:


Write this value down. It can later be compared to verify if parameter changes or EEROM damage has occurred.

40. Move the JP13 jumper from the 2-3 (write enable) position, to the 1-2 (write protect) position.

41. Shut the main line power off for 10-15 seconds, then turn it back on. If the drive faults on field loss during power up, decrease the value of the field loss parameter (FLDLS - address 078) by 25 counts, and try cycling the power again. If the drive comes up with no problems, continue to the next step.
This step is done because sometimes the proportional gain of the field control is too low to bring the fields up above trip level in the allotted time during the initial diagnostics. This fault can also be corrected by increasing the gain of the field current regulator by increasing parameters 031 and 032 - 1 increment at a time. This normally is not necessary during the start up phase of the drive.

**ARMATURE CURRENT FEEDBACK CALIBRATION**

42. Clip the red meter lead to the "CFB" test point on the right side of the Main Control Card, and the black meter lead on the "PCOM" test point on the Main Control Card.

43. Fold down the main control card and adjust the P2 pot on the Power Supply Card until exactly zero volts is obtained.

**TURN OFF THE MAIN LINE POWER**

44. Temporarily unplug the red and white twisted pair wires from the DRPL connection on the power supply card.

45. Move the JP3 and JP4 jumpers on the Power Supply Card from the 1-2 position to the 2-3 position.

**APPLY THE MAIN LINE POWER**

46. Locate the calibration voltage sticker on the inside right hand side of the drive frame next to the front of the power supply card. Adjust the P3 pot on the power supply card until the calibrated current voltage shown on the sticker appears on the meter.

*This calibrates the armature current feedback to the exact power tolerances of the job as set up in the factory.*

**TURN OFF THE MAIN LINE POWER**

47. Re-connect the armature current feedback wires on the DRPL connector on the power supply.


**APPLY THE MAIN LINE POWER**

49. Check that the voltage on the meter does not change any more than 5 millivolts. If it does, repeat from step 37 again.
ATTEMPT TO RUN THE CAR

50. Turn the inspection speed pot, counter clockwise 10 turns or until the pot begins to click. Then turn the pot 4 turns clockwise.

51. Momentarily press the Inspection Up button on the controller. The following relays should energize in this order: IU, UU, P, PA, PT, BK, MA on the DC300E, DB contactor.

52. If the car does not run up at a controlled speed when pressing the Up button take the actions provided in this chart.

<table>
<thead>
<tr>
<th>IF THIS HAPPENS</th>
<th>DO THIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car runs up very fast until drive trips.</td>
<td>Swap the tach connections on 1TB-1 to 1TB-3 on the Process Interface Card of the DC300E</td>
</tr>
<tr>
<td>Car runs down very fast until drive trips.</td>
<td>Turn off the main line power and wait 60 seconds. Swap the motor field connections.</td>
</tr>
<tr>
<td>Car runs down at a controlled speed.</td>
<td>Turn off the main line power and wait 60 seconds. Swap the motor field connections. Swap the tach connections on the Process Interface Card of the DC300E.</td>
</tr>
</tbody>
</table>

53. Vary the inspection pot and observe the car to make sure the car speed varies.

54. Connect your red meter lead to the 3TB-10 terminal of the drive, and your black meter lead to the 3TB-73 terminal on the drive. As the car runs, adjust the inspection pot until .7 volts appears on the meter. If the car is running down, the polarity will be negative, and if the car is running up the polarity will be positive.

55. With the hand tachometer, measure the car speed from the governor rope. The car should be running at approximately 1/10 of contract speed (give or take 5 FPM). If it is running faster than this, the resistor mounted between the CTBA1 to CTBA2 terminals on the Process Interface Card of the DC300E is too large. If the car is running slower than 1/10 of contract speed, this resistor is too small. **If the car is running at approximately 1/10 of contract speed, skip the next step.**

You will need to purchase a 500k ohm potentiometer from your local electronics store (Radio Shack) to perform the next step if it is necessary.
56. Remove the resistor mounted between the CTBA1-2 terminals on the Process Interface Card of the DC300E. Measure the value of the resistor you just removed, and adjust the 500k pot to approximately the same value as this resistor.
   a. Insert the pre-adjusted pot between the CTBA1-2 terminals.
   b. Run the car and trim the pot until the car runs at 1/10 of contract speed.
   c. Stop the car and remove the pot.
   d. Measure the resistance of the pot and replace it with a fixed resistor purchased at your local electronics store, or order the correct resistor from GE.

57. Adjust the inspection speed pot for a safe working speed of approximately 40 to 50 fpm. If a speed of much more than that is called for, a tach loss error will occur occasionally during start on inspection only.

*The tach loss error is nothing to be alarmed about. This is because the motor cannot possibly follow a large step in pattern (one that calls for 0 - 75 fpm instantly), and the drive fault circuitry annunciates a tach loss fault because the tach feedback is not sensed quickly enough.*

58. If vibration occurs while running on inspection, turn the P10 (Response) pot on the Process Interface Card clockwise or counterclockwise until the vibration stops.

5.8 Baldor Flux Vector Drive (18H Series) Start Up

When you first attempt to start the drive, the specific information about the motor must be entered into the drive. In addition, the current loop of the drive will be auto tuned with a Current Loop Compensation test. The following will outline this start up.

**NOTE:** *If more detailed information about the drive is needed, consult the Baldor Sweo Vector Drive book shipped with the controller.*

You will need to write down the following information from the nameplate of the motor:

1. Motor Nameplate Voltage.
3. Motor Rated Speed (RPM).
4. Motor Rated Frequency (Typically 60 hz)
5. Motor Magnetizing Amps (Excitation Current) If this is not know, this is typically around 40% of the rated nameplate current.
6. Motor Slip Frequency (If supplied)
Apply power to the controller. If no display appears on the drive perform the following steps:

1. Press the [DISP] key on the drive keypad.

2. Press the [SHIFT] key on the drive keypad.

3. Press the UP arrow key and hold it until the display intensity appeals to you. Press the DOWN arrow key to decrease the intensity of the display.

4. Press the [ENTER] key to save this contrast level for the next time you power up.

The standard display should now be present on the screen. Using the following steps, now check and enter the information required to run the drive.

**Note:** A job folder provided with each job contains a hard copy of all parameters adjusted by the factory.

1. Press the [PROG] key. The display should be set in the Level 1 Programming Block.

   The Level 1 Programming Block has menu of 7 items. You will see these menu items by pressing the Up or Down arrow key until you get to the item you wish to work with. (Again, most of the parameters are already adjusted for job - see hard copy in job folder.)

2. Press the UP arrow key until the INPUT heading comes onto the screen, then press the [ENTER] key.

3. Operating Mode will appear, then press [ENTER] to be able to change settings.

4. Press the UP arrow key until “15 SPD” appears on the screen, then press the [ENTER] key, to save setting.

   This tells the drive that the internal S-Curve of the drive will be used with 15 programmable speeds set using the drive software.

5. Press the RESET button to get back out to the main menu item list for the Level 1 programming block.

6. Press the UP arrow key until the OUTPUT heading appears, then press [ENTER]. Press the UP arrow key until “ANALOG OUT #1” appears, then press [ENTER].

7. Press the UP arrow key until “SPEED COMMAND” appears, then press [ENTER].

   This sets an analog output of the commanded pattern of up to 5 volts at the J1/6 terminal block of the drive to attach a scope probe if desired.
8. Press the UP arrow key until "ANALOG OUT #2" appears, then press [ENTER]. Press the UP arrow key until "ABS SPEED" appears, then press [ENTER].

This sets an analog output of the actual speed of the car of up to 5 volts at the J1/7 terminal block of the drive to attach a scope probe if desired.

9. Press the [RESET] button, and then press the UP arrow key until LEVEL 2 BLOCKS appears, then press [ENTER].

10. Press the UP arrow button until the MOTOR DATA heading appears, then press [ENTER].

11. Press [Enter] again to adjust setting.

12. Enter the motor voltage by using the up arrow key for the first digit, then press the [SHIFT] key to move the cursor to the next digit. Enter the next digit, then press the [SHIFT] key again to move the cursor to the next digit. When the correct motor nameplate voltage is entered, press [ENTER].

13. Press the UP arrow key and enter the appropriate data for each of the motor data parameters. Use step #12 as your guide to adjust parameters. After the MOTOR MAG AMPS is entered, press [RESET].

14. Press the UP arrow key until BRAKE ADJUST appears on the screen. Look on the print and find the regenerative braking resistance value for Ohms and Watts and enter the resistance value in the RESISTOR OHMS parameter.

15. Press the [ENTER] button, then press the UP arrow key until RESISTOR WATTS appears on the screen. Enter the braking resistor wattage and then press [ENTER]. Press the [RESET] button.

**Note:** Before proceeding to Auto-tune steps insure drive is on LOCAL Mode (Press LOCAL button on keypad once.) The following adjustments should be done at job site with motor hook up.

16. Press the UP arrow key until the AUTO-TUNING heading appears on the screen, then press [ENTER].

17. CALC PRESETS -> Press [Enter]. Press the UP key, YES will appear on the screen. Then, press [Enter]. The drive will calculate and the Yes on the screen will change to NO.

18. Press the UP arrow key until CUR LOOP COMP appears on the screen.
19. Temporarily place a jumper on the controller so the “P” relay is energized.

*The next step will cause approximately ½ rated motor current to flow in the motor. This is done to tune the current loop of the drive. All gain parameters for the drive will be automatically calculated.*

20. Press [ENTER], and wait approximately 20 seconds for the auto tuning to complete. When the autotune is complete, “PASS” should appear on the screen.

The drive is now tuned for the motor. Attempt to run the car up. If the car runs down, check the wiring between the Vector Drive Encoder on the motor shaft and the J1 terminal block on the drive. If wiring is correct, the “A” and “A-” wires on the encoder must be swapped.

If the drive runs in the proper direction, but a high pitched noise is coming from the motor and/or it appears unstable, go to the “ENCODER ALIGNMENT” parameter and change it from either a 0 to a 1 or from a 1 to a 0.

### 5.9 Mitsubishi Variable Frequency AC/Encoderless Vector Start Up

1. The Mitsubishi drive is not equipped with a reverse phase monitor, therefore, a separate reverse phase monitor is supplied. After powering up the controller, verify that the phase sequence to the controller is correct. If the phase sequence is correct, the red light on the reverse phase monitor will be on. If the phasing is incorrect, **SHUT THE MAIN LINE POWER OFF**, and swap two of the three main line feeds to the controller.

2. Check the incoming line voltage at the R, S, and T terminals on the drive. The line voltage should be within 10% of the nameplate voltage stamped on the side of the drive.

3. Check the value of the parameters shipped with the drive using the keypad. A list of applicable parameters is shipped with each controller. To check the parameters:

   a) Press [SET]
   b) Press the parameter or Function # you wish to check.
   c) Press [SET]
   d) Press the parameter or Function # you wish to check.
   e) Follow this procedure to check all parameters on the sheet that is shipped with the controller.

4. Momentarily push the up inspection button on the controller. The brake should lift and the car should begin to move in the up direction. If the car moves in the down direction, **SHUT THE MAIN LINE POWER OFF**, and swap two of the three motor leads connected to the AC overload on the controller.
5. Once proper rotation is established, check that the car is moving at an adequate inspection speed. If the car is moving too slow, modify parameter 24 as follows:

**Note:** The car must be stopped in order to change parameters. If the drive is enabled while in the program mode, the drive will not output and the car will drift out of control.

a) Press [PU/OP] button (green button).
b) Press the [SET] button.
c) Press [2] [4].
d) Press the [READ] button.
e) The second line tells the current value of this parameter. Press the desired Hz you wish to run the car on inspection. Keep in mind that 60 Hz is the synchronous speed of the motor (contract speed).
f) Press the [WRITE] button. If the new value has been accepted, the new value will flash in reverse video and the word “completed” will appear at the bottom of the screen.

Due to the open loop nature of this drive, speed variations will be noticed if any mechanical binds or extreme imbalance conditions exist in the system. This is normal.

### 5.9.1 Encoderless Vector Mode Auto-tune (Open Loop)

Encoderless Vector Mode will provide increased torque, performance, and tracking while lowering motor and drive currents.

1. Motor RPM must be 1200 or 1800 RPM range to perform Vector Auto-tune. (900 PRM motors will not Auto-tune)

2. Set Parameter 71 = 3 (setting for standard motor)

3. Set Parameter 80 = motor KW (=.746 x Motor HP) (Should be less than or equal to drive rating, i.e. 7.5KW for a -UL-7.5K drive)

4. Set Parameter 81= 6 for 1200 RPM motors or 4 for 1800 RPM motors

5. Verify Parameter 83 = motor voltage

6. Verify Parameter 84 = motor frequency

7. Disconnect Brake wire.
Auto-tune

8. Set Parameter 96 = 1 and leave this parameter displayed.

9. Hold the “P” Contactor in Manually and press the FWD button on the drive.

10. The procedure will last approximately 10 seconds and the display will go from 1 to 2 to 3. When a 3 appears, the auto-tune is complete. Release the “P” Contactor.

11. Exit from Parameter 96.

12. Reconnect the Brake wire.

13. Cycle the Mainline Power (Disconnect).

14. Auto-tune is complete.

**Note:** Setting Parameter 80 or 81 back to 9999 will disable Vector operation and revert back Volts/Hz operation.

5.9.1a Increased Over-Current Capacity

1. Set Parameter 22 = 175 (default = 150%)

2. If even more over-current capability is required then follow the procedure as described on Note 2 on the bottom of page 134 in the Mitsubishi A2000E-UL Instruction Manual. This will reduce the Fast-Response Current Limit.

   a) Record the value in Parameter 77 (typically 0) Parameter 77 = _____
   b) Set Parameter 77 = 701
   c) Set Parameter 156 = 1
   d) Set Parameter 77 back to the original value as recorded in step a.
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SECTION 6 - HIGH SPEED ADJUSTING

6.1 Built In Keyboard and Display (Parameter Entry)

The built in keyboard and display allows the user to program parameter values, view the status of the car while in service, view the status of inputs and outputs, and view a diagnostic log of past events. The main menu and parameter entry flow charts provide a graphic illustration of the keypad and display usage (See Section 9).

All keys will enter the alpha numeric data shown on the key. Some of the keys functions change depending on the mode of operation. Refer to the main menu flow chart, the parameter entry flow chart and the function key descriptions for the proper operation of the keypad.

6.1.1 Monitor Mode

When the controller is powered up or the M.P.U. is reset, the system will come up in the Monitor Mode. It will also go into the Monitor Mode if the keypad is inactive for 10 minutes. Information displayed in the Monitor Mode is shown below:

<table>
<thead>
<tr>
<th>DIRECTION</th>
<th>FLOOR STATUS</th>
<th>DOOR STATUS</th>
<th>RUN STATUS</th>
<th>SYSTEM STATUS</th>
</tr>
</thead>
</table>
| \
| U          | 1            | ()          | SFLR       | NORM          |

The Direction Preference is the first item displayed.

The Floor Status will display the current floor position (1-24).

The Door Status will show doors open, closed, opening, and closing.

The Run Status will display the following information.

- SFLR--Stopped at floor
- RMOT--Run motion only
- RMED--Run medium speed
- RHIG--Run high speed
- FFLR--Find floor
- FTER--Find terminal floor
- SBET--Stopped between floors
The System Status will display the following information:

- INIT--Initialization
- NORM--Normal service
- INDT--Independent service
- FPH1--Fire phase 1
- FPH2--Fire phase 2
- INSP--Inspection
- OOSV--Out of service
- PARK--Parking
- ATTD--Attendant
- L_OIL--Low oil hydro operation
- PWRF--Power Failure (hydro)
- MED1--Medical Emergency Phase 1
- MED2--Medical Emergency Phase 2
- EMPW--Emergency Power
- ERQK--Earthquake, seismic activity or cwt displacement
- RETN--Return to lobby
- ABYP--Attendant Bypass
- WBYP--Weight bypass
6.1.2 Function Keys

The asterisk [*] key is pressed twice to change the display from the Main Monitor to the Main Menu and the Main Menu level back to the Monitor Mode. When the asterisk [*] key is pressed once from the Parameter levels, the display will return to Parameter Entry.

2, 6, 8, 4: These keys are used as arrow keys. The 2 key moves you "up"; the 6 key moves you to the "right"; the 8 key moves you "down"; and the 4 key moves you to the "left".

0: The 0 key will move you immediately to the first parameter when in the parameter mode. This key is pressed once to return to the Main Menu from the parameter entry mode.

5: The 5 key will move you immediately to the center parameter label in the parameter entry mode. When in the main menu level pressing the 0 key will move to the first command (monitor). The 5 key will move you to the center command (parameter entry) in the main menu level.

# Key: The # key is used as the enter key. This is used to enter new data in the parameter entry mode. This key is pressed once to return to the Monitor Mode from the Main Menu.

Regardless of what area you are using of the keypad, by pressing the [*], [0], and then the [#] key you will be returned back to the main diagnostic monitor.
Series 90 Parameter Entry Flowchart

- **Parameter Entry**
  - Press 8
  - Next Parameter
    - Press 8
    - Press 5 Middle of Param. List
    - Press 0 First Param. In List
    - Press 6 Next Param. To The Right
    - Press 4 Next Param. To The Left
- Limits of Parameter
  - Press 8
- Current Value
  - Press 8
  - New Data
  - Enter New Value Of Parameter
    - Press # to Store Data
      - New Value Displayed
        - Press 2
  - Press *
6.1.3 Parameter Entry Mode

The standard software for the Series-90 is constantly being enhanced with new features. These new features typically require the addition of new parameters. The parameter list can be found Section 10. The date in the upper right hand corner of the parameter document should be compared to the software being used on the job. Call O.Thompson Engineering for a updated list if required. A separate Parameter Entry flowchart can be seen on the opposite page.

6.1.4 Diagnostic Parameter Mode

The diagnostic parameters are located at the end of parameter map. The number of faults for each parameter are stored and can be viewed. The number of faults stored will be retained with the power removed from the controller. Viewing of these parameters and adjusting data is done the same as the parameter entry. These parameters can be reset to 0 to capture a problem over a period of time.

NOTE: The diagnostic parameters are reset to 0 when a value of 200 on the preset parameters is entered. They are not reset to 0 when the car power is removed.

6.1.5 Input / Output Display Mode

The I/O display allows the user to view on the liquid crystal display the status of all inputs and outputs. I/O display can be used while the car is running and will provide I/O information updated every 250 milli seconds. As explained in Section 2.5, an input L.E.D. may be on but the micro may not be able to read the input. I/O display will allow you to determine if this is the case. View the I/O Display flow chart to see the key pad entry needed to access the I/O display.

All of the input and output terminals are labeled on the I/O mother board. For example look at the first input connector. This eight terminal connector is labeled J7.

The display will show the status of the first two inputs or outputs on a connector. Move left or right to view the status of any two inputs or outputs at a time. Some of the terminals that are inputs terminals are outputs as well, this is the case for car and hall calls. Outputs can be looked at to see if the micro has the output turned "on".

6.1.6 L.C.D. Test Mode

L.C.D. test allows the user to test the liquid crystal display. View the L.C.D. test flow chart to see the key pad entry needed to access the L.C.D. test. L.C.D. test can be used while the car is running. When L.C.D. test is run all of the characters capable of being displayed on the L.C.D. are displayed in each of the sixteen locations.

6.1.7 Set Access Code Mode
Set Access Code allows the user to set an access code between 0 -9999. View the Set Access Code flow chart to see the key pad entry needed to access the Set Access Code. Set Access Code can be used while the car is running. If the access code is set to 0, no access code will be needed. When the controller is powered up the display will come up in the monitor mode. To enter the main menu push the * key twice. If a access code has been programmed you will be asked to enter the number.

6.1.8 Set Blind Landings Mode

Set Blind Landings allows the user to set a blind landing floor, or multiple blind landing floors. If the “Preset Parameters” parameter is set, no blind landings are set. Set Blind Landings must be used for floors above the lobby not serviced by a car in a group. Leveling and step targets must be provided for all of the blind floors. When a car steps to a floor that has been programmed as a blind floor, the position indicator will be incremented or decremented. If there are multiple consecutive blind floors, the position is incremented or decremented one time. This is done to output a x from the position indicator. The car button inputs for the blind floors should not be wired.

6.1.9 Set Landings Mode

Set Landings allows the user to set front, rear, or both doors at any landing. Preset parameters sets all landings to be front openings. A 1 = front opening, a 2 = rear opening and a 3 = both (front and rear doors at the same landing). If all floors have selective doors, the maximum total landings supported would be eleven. As floors are set to have selective doors, from the bottom up, car and hall call inputs from the top down are used for the rear calls, starting with the lowest selective floor. See the input / output mapping for attendant and selective doors.

6.2 Preset Parameters

Enter and adjust all parameters as needed for your job using the on board keypad/display. The following sections will explain how to use the keypad/display, and the function of each area of the software. To set all parameters to the original default parameters, get into the Parameter Entry mode, and move to the PRESET_PARAMS parameter. Then perform the following steps:

1. After you are at the PRESET_PARAMS parameter, press the [8] key until the display reads “New Data”.

2. Using the numeric keys, enter a value of 100, then press the [ENTER] key.

3. Press the [8] key until the display reads “New Data”.

4. Using the numeric keys, enter a value of 125, then press the [ENTER] key.

5. Press the [8] key until the display reads “New Data”.
6. Using the numeric keys, enter a value of 200, then press the [ENTER] key.

7. Using the numeric keys, enter a value of 250, then press the [ENTER] key.

**Note:** *Wait at the main monitor prompt for approximately 5 seconds for the changes to take affect.*

8. Exit to the main monitor mode by pressing the [2] [*] [0] [#].

After this is done, the parameters that should be set exactly for the job are:

<table>
<thead>
<tr>
<th>Group_Car</th>
<th>Hydro_Car</th>
<th>Speed_Oper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top_Floor</td>
<td>Lobby_Floor</td>
<td></td>
</tr>
</tbody>
</table>

**For Self Contained Duplex Cars**  
(All parameters must be the same zoning in both cars.)

<table>
<thead>
<tr>
<th>Bldg_Top_Floor</th>
<th>Bldg_Lobby_Floor</th>
<th>Sec_Zone</th>
<th>Floor_Stop_Time</th>
<th>Floor_Travel_Time</th>
<th>Group_Car</th>
</tr>
</thead>
</table>

**Note:** *Sec_Zone should be lower value than building top floor.*
6.3 IPC Speed Board Set Up - Initial Settings (MG & SCR jobs only)

The speed board is used to integrate the relay steps of deceleration into a smooth S-Curve for smoother ride. The board should be set up as follows:

1. Put the car on inspection.
2. Temporarily remove the wires from terminal 9 of the speed board, and connect a digital meter across terminals 3 & 9 on the speed board.
3. Connect a temporary jumper from terminals 35 to 36 of the speed board.
4. Connect a temporary jumper from terminal 21 on the speed board to the terminals on the speed board in the following chart and adjust the related pots to the correct voltage for your job.

For Three Speed Operation (with 1A & 2A relay but no FS relay)

<table>
<thead>
<tr>
<th>Contract Speed</th>
<th>SP1 (22)</th>
<th>SP2 (23)</th>
<th>SP3 (24)</th>
<th>SP4 (25)</th>
<th>SP5 (26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>.11v</td>
<td>.28v</td>
<td>.56v</td>
<td>5.6v</td>
<td>7.0v</td>
</tr>
<tr>
<td>300</td>
<td>.09v</td>
<td>.23v</td>
<td>.47v</td>
<td>4.7v</td>
<td>7.0v</td>
</tr>
<tr>
<td>350</td>
<td>.08v</td>
<td>.20v</td>
<td>.40v</td>
<td>4.0v</td>
<td>7.0v</td>
</tr>
<tr>
<td>400</td>
<td>.07v</td>
<td>.18v</td>
<td>.35v</td>
<td>3.4v</td>
<td>7.0v</td>
</tr>
</tbody>
</table>

For Two Speed Operation (with FS relay but no 1A & 2A relay)

<table>
<thead>
<tr>
<th>Contract Speed</th>
<th>SP1 (22)</th>
<th>SP2 (23)</th>
<th>SP3 (24)</th>
<th>SP4 (25)</th>
<th>SP5 (26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>.19v</td>
<td>.49v</td>
<td>2.8v</td>
<td>.97v</td>
<td>7.0v</td>
</tr>
<tr>
<td>150</td>
<td>.16v</td>
<td>.41v</td>
<td>1.9v</td>
<td>.81v</td>
<td>7.0v</td>
</tr>
<tr>
<td>200</td>
<td>.13v</td>
<td>.34v</td>
<td>1.4v</td>
<td>.67v</td>
<td>7.0v</td>
</tr>
<tr>
<td>250</td>
<td>.11v</td>
<td>.28v</td>
<td>1.1v</td>
<td>.56v</td>
<td>7.0v</td>
</tr>
</tbody>
</table>
5. Turn the DCC1 and DCC2 pots clockwise 4 turns or until the clutch inside the pot clicks.

6. Turn the ACC1 pot counterclockwise 4 turns or until the clutch inside the pot clicks.

7. Turn the P1 fully counterclockwise. Turn the P2, P3, & P4 pots 1 ½ turns clockwise.

8. Remove the temporary jumper from terminal 21 of the speed board.

6.4 High Speed Electrical Adjustment - Amicon Regulator

1. Place your red meter lead on the XY4 test point and the black meter lead on the XY3 test point. While the car is running up at full speed, monitor the voltage on the meter. Touch up the SP5 pot on the speed board until exactly 7 volts appears on the meter.

2. If the car is not running at exactly contract speed, touch up the NMAX pot to increase or decrease the car speed as needed.

3. Move your red meter lead to the XY5 test point. Touch up the TFB pot until 7 volts appears on the meter while traveling at contract speed.

   **Note:** If not able to get up to speed, make sure generator fields are wired in parallel and lower R12 resistance (raise adjustable band).

4. Connect your red meter lead on the XY6 test point on the regulator and the black lead on the XY3 test point.

5. While the car is lifting full load at contract speed, touch up the ACAL pot until 7.5 volts appears on the meter.

6. Using a scope or chart recorder, attach one probe on the XY5 test point on the regulator and the other probe on the XY4 test point. This will plot actual vs demand at the regulator. Place the common to the probes to the XY3 test point on the regulator.

7. If the car is not tracking the demand to your satisfaction, turn the PN pot slowly clockwise 1/8 of a turn at a time to increase the response of the system. It is best to make this adjustment with the car at a standstill.

8. If tracking is acceptable but ride quality is not, turn the ACMP pot slowly clockwise 1/8 of a turn at a time to add armature voltage feedback compensation. It is best to make this adjustment while the car is at a standstill.
9. Make long high speed runs, up and down, while monitoring for speed instability. If instability is observed, turn the PN pot gradually CCW, until the instability is eliminated. If the PN pot is fully CCW and instability still exists, turn the ACMP pot gradually CW, until the instability is eliminated. Then turn the PN pot gradually CW, until the instability is once again observed. Finally, back off slightly (turn CCW) the PN pot.

Adjustments to speed board are also necessary at this time.

10. **Turn the Main line power OFF.** Connect on ohmmeter across the GF1 and GF4 terminals on the controller. Manually push in the “P” relay and measure the resistance on the meter.

11. Note from the prints the voltage coming in on the “U” and “V” terminals on the power board of the regulator. Calculate the amount of field current that will be required by using the formula below:

   \[
   \text{Maximum Current Out} = 0.67 \times \left( \frac{\text{AC Voltage} @ \text{“U”} - \text{“V”}}{\text{Total Generator Field Resistance}} \right)
   \]

12. Based on the Field Current calculated in step 11, check the power and regulator boards to make sure the following board modifications have been made to your job. **If the modifications have not been made, contact O.Thompson Engineering prior to making any board revisions.**

   **On the Power Board** (R2 & R3 resistors are located on the top left corner of the board)

   - For Field Current up to 5 amps  \( \text{R2 & R3 should be clipped out} \)
   - For Field Current up to 10 amps  \( \text{R3 only clipped out} \)
   - For Field Current up to 15 amps  \( \text{Both resistors in circuit} \)

   **On the Regulator Board** (CV Jumper and R168 resistor are located towards the top right corner of the board)

   - For Field Current up to 5 amps  \( \text{CV jumper & R168 resistor in circuit} \)
   - For Field Current up to 10 amps  \( \text{Cut off CV jumper} \)
   - For Field Current up to 15 amps  \( \text{Cut off CV jumper & R168 resistor} \)

13. **Offset Pot Settings** -
   To check proper adjustment, place the car in the middle of the hatch on Inspection. Temporarily remove Speed Reference (Amicon #5). Try to run the car on Inspection UP and DOWN - car should remain still. If the car does not remain still, turn the OFFSET pot until it is.
6.5 High Speed Electrical Adjustment - IPC Regulator

The "out of regulation" lamp (LED) on the field control regulator will light if the regulator is delivering its maximum output. It is acceptable if this light blinks briefly during acceleration or deceleration. If it is on while the car is at top speed, a higher voltage tap must be used on the regulator supply transformer; or the hoist motor field running voltage must be reduced.

1. Adjust the CURRENT pot counterclockwise slowly while the car is lifting full load at contract speed until you just see the car speed begin to decrease. Then turn the pot back ½ turn clockwise. (This sets the current limit point of the regulator and will tend to stabilize the regulator overall).

2. If the car cannot maintain contract speed while lifting full load, turn the CURRENT pot clockwise until it can just maintain contract speed and then turn the pot an additional ½ turn clockwise.

**Important Note:**

*The next few adjustments should be made by turning the pots in very small increments as they will affect the actual speed of the car.*

3. Connect the red meter lead to the REF OUT test point and the black meter lead to COMMON test point. With exactly 7 volts of pattern coming into the regulator, very slowly adjust the SIGNAL IN GAIN pot until 9.5 volts is obtained. (This signal will be positive in the up and negative in the down).

4. If the car is not running at exactly contract speed, touch up the CONTRACT SPEED pot to increase or decrease the car speed as needed.

5. Connect you digital meter with the red lead on the ARM FEEDBACK test point on the regulator and the black lead on the COMMON test point.

6. While the car is lifting full load at contract speed, touch up the ARM FEEDBACK pot until 7.5 volts appears on the meter.

7. Using a scope or chart recorder, attach one probe on the TACH test point on the regulator and the other probe on the REF OUT test point. This will plot actual vs demand at the regulator. Place the common to the probes to the COMMON test point on the regulator.

8. If the car is not tracking the demand to your satisfaction, turn the LOOP GAIN pot slowly clockwise 1/8 of a turn at a time to increase the response of the system. It is best to make this adjustment with the car at a standstill.

9. If tracking is acceptable but ride quality is not, turn the STABILITY pot slowly clockwise 1/8 of a turn at a time to add armature voltage feedback compensation. It is best to make this adjustment while the car is at a standstill.
10. Make long high speed runs, up and down, while monitoring for speed instability. If instability is observed, turn the LOOP GAIN pot gradually CCW, until the instability is eliminated. If the LOOP GAIN pot is fully CCW and instability still exists, turn the STABILITY pot gradually CW, until the instability is eliminated. Then turn the LOOP GAIN pot gradually CW, until the instability is once again observed. Finally, back off slightly (turn CCW) the LOOP GAIN pot.

6.6 High Speed Electrical Adjustment - Baldor Sweo Drive

1. With 7 volts of pattern coming in at high speed, trim the MAX SPEED pot to attain contract speed while watching the demanded speed on the screen. Only turn this pot while the micro is demanding top speed.

2. If acceleration or deceleration rates seem sluggish or the car cannot attain contract speed in one direction, verify that the current limit light is not on during high speed. If the current limit light comes on. With the car standing still turn the CURRENT LIMIT pot in small increments clockwise until the light no longer comes on.

3. If a difference in up leveling vs down leveling speed exists, adjust the ZERO TRIM pot to even out up vs down leveling speeds.

IMPORTANT NOTE: After the following adjustments are made to the drive, we highly recommend you make a 1 floor run up and down first before attempting high speed runs. Also, all of the following adjustments should be made with the car standing still. Pots should be turned no more than 1/10 of a turn at a time.

4. While lifting full load, observe the current limit light on the Control board. If the light comes on, with the car standing still, turn the CURRENT LIMIT pot clockwise in small increments until the LED does not light while lifting full load.

5. If vibration occurs, while the car is standing still, turn the RATE GAIN pot counterclockwise in small increments until the vibration is gone.

6. If oscillation or “hunting” occurs at loads other than near balance load, while the car is standing still, turn the RATE GAIN pot clockwise in small increments until the oscillation is gone.

7. If vibration occurs at low current levels (balanced load), while the car is standing still, turn the NULL FORCING pot in small increments counterclockwise.

8. If oscillation or hunting occurs at low current levels, while the car is standing still, turn the NULL FORCING pot in small increments clockwise.

9. If Instantaneous Overcurrent faults occur while accelerating with full load, while the car is standing still, turn the IOC pot clockwise in small increments until this fault no longer occurs.
10. If Overspeed faults occur at top speed, turn the OVERSPEED pot clockwise in small increments until this fault no longer occurs.

6.7 High Speed Electrical Adjustment - GE DC300E Drive

1. With the hand held tool, set parameter 002 (REGJP) from a 1 to 0. This disables the tracking fault on the drive while it is being set up.

2. Connect the black lead of the meter to the PCOM test point on the main control board. Connect the red lead of the meter to the SRS test point on the main control board.

3. With 7 volts coming in on 3TB71 (contract speed demand), adjust the P1 pot on the Main Control Board until 4 volts (± 5 millivolts) appears on the meter.

Note: Only adjust this pot while the controller is calling for contract speed. If the pot is turned while the pattern from the Speed Board is decreasing for deceleration, overspeed will occur the next time the car attempts to run at full speed.

4. Manually tach the speed of the car, turn the PF Gain pot (P4) on the Analog Process Interface card clockwise. Bring the car up to contract speed.

5. Move your red meter lead to the SFB test point on the Analog Process Interface card. Adjust the SFB pot (P8) until exactly 4 volts appears on the meter while the car is running at contract speed.

Note: On this adjustment, it is better to be slightly on the low side if exactly 4 volts cannot be obtained (IE 3.97 volts).

6. Set Parameter 002 (REGJP) back to a 1. This should enable the tracking fault internal to the drive. Make 1 floor, 2 floor, 3 floor, runs and make sure the drive does not trip on tracking fault.

7. Connect a dual channel storage scope with one lead on the SRS test point internal speed demand signal) and the other probe on the SFB test point (internal speed feedback signal). Connect the common of the probes to the ACOM test point on the Main Control Board.
8. If the drive is not tracking the demand to your satisfaction, turn the P10 pot on the Analog Process Interface card in small increments clockwise. Only turn this pot with the car at a standstill. **It is also highly recommended that the first run you do after moving the P10 pot is a 1 floor run. The drive can become very unstable very fast when this pot is turned too far.**

9. If vibration occurs, try to turn the P10 pot in small increments counter clockwise until the vibration goes away.

Additionally, a berge jumper is supplied between the DM5 test point on the Analog Process Interface card and the SFB test point. The jumper can be moved from the SFB end to the VFBB test point located on the right hand edge of the main control card. This will add armature voltage compensation to the speed regulator. When this is done, insure the VMET pot on the Main Control board is centered, and the VDAMP pot on the Analog Process Interface board is fully counter clockwise.

The VDAMP pot can then be turned clockwise in small increments to add stability to the drive. **Only adjust this pot with the car stopped. This pot can also make the drive highly unstable if the pot is turned too far.**

10. A packet is shipped with the DC300 with additional suggestions for reducing vibration problems with the drive. If vibration is a problem, look very closely at the tach signal with a scope and do everything possible to make the tach signal as “clean” as possible. Noisy tach signals account for 60 percent of vibration problems on SCR drives.

### 6.8 High Speed Adjustment - Sweo Vector Drive

To observe tracking, channel 1 of an oscilloscope can be connected to the J1/6 terminal on the drive to observe the pattern command, and channel 2 of the oscilloscope can be connected to the J1/7 terminal of the drive to observe the actual car response. The common of the scope probes should be attached to the J1/1 terminal on the drive.

If the drive is not tracking adequately enough, perform the following steps:

1. Increase the SPEED PROP GAIN parameter until adequate tracking is obtained.

2. Increase the SPEED INT GAIN parameter until the ride becomes slightly unstable. Then reduce this parameter value until the instability goes away.

3. If the car is overshooting the floor on one floor runs, decrease the “DECEL #1” parameter time. If the car is leveling for too long a period of time on one floor runs, increase this time.
4. If the car takes too long to accelerate from the floor on a one floor run only, decrease the “ACCEL #1” parameter time. If the car is overshooting the floor on one floor runs and the overshoot cannot be adjusted out properly with the DECEL #1 parameter, increase the value of ACCEL #1. A typical acceleration time is 2 seconds.

5. If the transitions in acceleration and deceleration are too abrupt, increase the “S-CURVE #1” parameter percentage.

Three Speed Operation Only

6. If the car is overshooting the floor on multi-floor runs only, decrease the “DECEL #2” parameter time. If the car is leveling for too long a period of time on multi-floor runs, increase this time.

7. If the car is taking too long to accelerate on multi-floor runs only, decrease the “ACCEL #2” parameter time. A typical acceleration time is 2 seconds.

8. If the transitions in acceleration and deceleration are too abrupt on multi-floor runs only, increase the S-CURVE #2 parameter percentage.

6.9 Hoist Motor Field Drive Adjustment (MG & Sweo only)

1. Measure the armature voltage as the car travels with either empty car down, or full load up. If the armature voltage in either of these two conditions is above nameplate by more than 10%, the run field voltage must be reduced.

2. To reduce the run field voltage, verify that the V/I-3 pot is lit while the car is traveling at contract speed.

3. Adjust the V/I-3 pot, counterclockwise until the armature voltage is at or below nameplate voltage while lifting full load. Be careful not to go below 50% of field forcing level.

6.10 Final Adjustments - Mitsubishi Variable Frequency AC/Encoderless Vector Drive

Important Note:
Proper counterweight is extremely important on this system due to its open loop nature. The counterweight must be balanced to no less than 40% and no more than 50% of the capacity of the car.

1. If the car takes too long accelerating away from the floor, adjust the ACCEL TIME parameter (parameter 7) for a shorter amount of time. A typical acceleration time is 2.4 seconds.
2. If the car overshoots the floor or drags into the floor, adjust the DECEL TIME parameter (parameter 8). Shorter times will cause the car to decelerate quicker over a shorter distance while longer times will cause the car to decelerate slower over a longer distance.

**Important Note:**

*If the ACCEL TIME and DECEL TIME parameters are adjusted for too short a time, the drive may trip intermittently on overcurrent faults. (EOC1 = Acceleration Overcurrent EOC3 = Deceleration Overcurrent).*

3. If the car stalls in leveling, increase the TORQUE BOOST MANUAL (parameter 0) without affecting the overall current in the motor. If this parameter is set too high, it will increase the overall current in the motor.

4. If more torque boost is needed, adjust the TORQUE BOOST AUTOMATIC (parameter 38) until an acceptable ride is felt while leaving the floor and arriving at the floor.

**Note:** Torque boost (Manual and Automatic) is disabled on encoderless vector.

5. If the car drifts when arriving at the floor, increase the DYNAMIC BRAKE FREQUENCY (parameter 10) until the car will hold zero speed until the brake has set.

### 6.11 Final Adjustments - IPC Speed Board

1. Run the car on one floor runs, and adjust the ACC1 pot on the speed board clockwise for quicker acceleration as needed.

2. Run the car on one floor runs and adjust the DCC1 pot on the speed board counterclockwise to make the car come into the floor faster. If the pot is fully clockwise, and the car is still overshooting the floor, reduce the SP3 and SP4 speed settings by ½ volt each and try again.

3. **For three speed operation only.** Run the car on multi-floor runs and adjust the DEC2 pot on the speed board until the car has the same amount of stabilized leveling as a 1 floor run.

4. **For three speed operation only.** Run the car on the shortest 2 floor run in the building, and set the ACC timer until it just latches on the shortest 2 floor run in the building. The ACC timer is an Artisan timer with dip switches.

5. **For three speed operation only.** After determining the value of the ACC timer, verify that the LOCKOUT_TIME parameter is set for 1 second less than the value of the ACC timer (IE If ACC = 3 seconds, LOCKOUT_TIME should equal 2 seconds).

6. If the transition from start to acceleration rate is too sharp, turn the P1 pot counterclockwise until this smoothes out.
7. If the transition from acceleration to top speed is too abrupt, or excessive overshoot above top speed is seen, turn the P2 pot counterclockwise.

8. If the transition from top speed to initial deceleration is too abrupt or tracking is lost at this rollover point, turn the P3 pot counterclockwise.

9. If the transition from deceleration to final leveling approach is too abrupt, turn the P4 pot counterclockwise to smooth this out.

10. **For three speed operation only.** If a bump is felt in the ride approximately 1 second after the car leaves the floor, turn the DEC1 pot counterclockwise 1 turn at a time until the bump becomes transparent.

11. **For three speed operation only.** If a bump is felt in the ride as the car begins to decelerate, turn the ACC1 pot counterclockwise 1 turn at a time until the bump becomes transparent.

12. If car overshoots on a one floor run, turn DEC1 pot clockwise 1/4 of a turn at the time until comfortable stop is reached.

13. If car overshoots on a multi floor run, turn DEC 2 pot clockwise 1/4 of a turn at a time until comfortable stop is reached.
Clockwise rotation of potentiometers increases voltages. Set tach voltage equal to 7 volts at full speed. Set UOS and DOS overspeeds to 7.7 volts.

Reference voltages can be adjusted between the values listed below:

- P1U = 0 Volts to +8.94 Volts (Highest Up Speed Limit)
- P2U = 0 Volts to +6.34 Volts
- P3U = 0 Volts to +6.34 Volts
- P4U = 0 Volts to +6.53 Volts (Lowest Up Speed Limit)

P1D = 0 Volts to -8.94 Volts (Highest Down Speed Limit)
6.12 Limit Board Adjustment (When required)

**IMPORTANT NOTE:**

The limit board should only be adjusted after all S-Curve adjustments and motor field and generator field adjustments are complete. If changes are made to the S-Curve or motor field or generator regulator, the limit board MUST be completely re-adjusted for reliable operation.

1. Measure the raw tach voltage while the car runs at contract speed. Adjust the course tach scaling DIP switches per the table below. The fine tach scaling will be done after the dip switches are set.

<table>
<thead>
<tr>
<th>Raw Tach Voltage</th>
<th>Switches ON</th>
<th>Switches OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 volts</td>
<td>SW1-SW8 = ON</td>
<td>--------------</td>
</tr>
<tr>
<td>10-20 volts</td>
<td>SW1-SW7 = ON</td>
<td>SW8 = OFF</td>
</tr>
<tr>
<td>20-35 volts</td>
<td>SW1-SW6 = ON</td>
<td>SW7 &amp; SW8 = OFF</td>
</tr>
<tr>
<td>35-65 volts</td>
<td>SW1-SW5 = ON</td>
<td>SW6-SW8 = OFF</td>
</tr>
<tr>
<td>65-110 volts</td>
<td>SW1-SW4 = ON</td>
<td>SW5-SW8 = OFF</td>
</tr>
<tr>
<td>110-180 volts</td>
<td>SW1-SW2 = ON</td>
<td>SW3-SW8 = OFF</td>
</tr>
<tr>
<td>180-300 volts</td>
<td>-------------</td>
<td>SW1-SW8 = OFF</td>
</tr>
</tbody>
</table>

2. Determine how many slowdowns will be used for each direction. Refer to the table provided below for the amount and the distance each of the slowdowns opens before the terminal landing. Up to three of the up and three of the down slowdowns can be bypassed. The bypass / enable jumper is to the right of the slowdown pot to be bypassed. Each of the headers will need a jumper installed. To bypass a pot, jump the center pin to the bottom (bypass pin).

If a slowdown is not bypassed, it must be enabled. This is done by jumping the center to the top (on). If a slowdown is not used, it must be bypassed with the bypass jumper provided. Do not wire the input for any slowdown that will be bypassed.
Approximate Slowdown Distances For Terminal Limits

### Two Speed Operation

<table>
<thead>
<tr>
<th>Speed</th>
<th>Terminal Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 fpm</td>
<td>1'9&quot;</td>
</tr>
<tr>
<td>125 fpm</td>
<td>2'3&quot;</td>
</tr>
<tr>
<td>150 fpm</td>
<td>2'9&quot;</td>
</tr>
<tr>
<td>175 fpm</td>
<td>3'3&quot;</td>
</tr>
<tr>
<td>200 fpm</td>
<td>3'9&quot;</td>
</tr>
<tr>
<td>225 fpm</td>
<td>4'3&quot;</td>
</tr>
</tbody>
</table>

### Three Speed Operation

<table>
<thead>
<tr>
<th>Speed</th>
<th>Terminal Limit</th>
<th>Terminal Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 fpm</td>
<td>3'3&quot;</td>
<td>4'9&quot;</td>
</tr>
<tr>
<td>275 fpm</td>
<td>3'9&quot;</td>
<td>5'3&quot;</td>
</tr>
<tr>
<td>300 fpm</td>
<td>3'9&quot;</td>
<td>5'9&quot;</td>
</tr>
<tr>
<td>325 fpm</td>
<td>3'9&quot;</td>
<td>6'3&quot;</td>
</tr>
<tr>
<td>350 fpm</td>
<td>3'9&quot;</td>
<td>6'9&quot;</td>
</tr>
<tr>
<td>375 fpm</td>
<td>4'3&quot;</td>
<td>7'3&quot;</td>
</tr>
<tr>
<td>400 fpm</td>
<td>4'9&quot;</td>
<td>7'9&quot;</td>
</tr>
</tbody>
</table>

3. Connect a digital meter with the red lead on the TACH test point on the limit board, and the black lead on the COM test point.

4. Run the car up. The polarity on the meter should be positive. If it is negative in the up direction, place the car on inspection and swap the tach connections at the limit board only.

5. Run the car at contract speed and adjust the R9 pot until 7 volts appears on the meter while the car is running at contract speed in both directions.

6. Put the car in the middle of the hoistway and move the red meter lead to the UL test point on the limit board.
7. Adjust the UOS pot until 7.75 volts appears on the meter.

8. Move the red meter lead to the DL test point on the limit board.

9. Adjust the DOS pot until -7.75 volts appears on the meter.

10. Connect a dual trace storage scope with one channel on the UL test point and the second channel on the TACH test point. Attach the commons of the scop probes to the COM test point.

**Note:** Adjusting the limit board without a scope requires finding the trip point for each slowdown limit approaching the terminal landings and increasing the voltage of each slowdown by about ½ a volt.

11. The pots associated with each slowdown switch are as follows:

<table>
<thead>
<tr>
<th>Pot On Limit Board</th>
<th>Switch in Hatch</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1U</td>
<td>1SU Switch</td>
</tr>
<tr>
<td>P2U</td>
<td>2SU Switch</td>
</tr>
<tr>
<td>P3U</td>
<td>3SU Switch</td>
</tr>
<tr>
<td>P4U</td>
<td>4SU Switch</td>
</tr>
<tr>
<td>PDZU</td>
<td>Open Door Gate in Up Direction</td>
</tr>
<tr>
<td>PDZD</td>
<td>Open Door Gate in Down Direction</td>
</tr>
<tr>
<td>P1D</td>
<td>1SD Switch</td>
</tr>
<tr>
<td>P2D</td>
<td>2SD Switch</td>
</tr>
<tr>
<td>P3D</td>
<td>3SD Switch</td>
</tr>
<tr>
<td>P4D</td>
<td>4SD Switch</td>
</tr>
</tbody>
</table>

12. The board will trip any time the voltage at the TACH test point exceeds the voltage at either the UL or DL test points. Make one floor, two floor, three floor, runs into the top terminal floor with no load in the car. Observe on the scope to see if the voltage at TACH ever meets or exceeds the voltage at UL. If the voltage does meet or exceed, adjust the appropriate pot for that slowdown clockwise to raise the limit trip voltage.

13. Move the scope probe that is on the UL test point to the DL test point, and repeat step 12 for the bottom terminal **with full load in the car.**
14. With car stopped, remove the door zone input wire to the limit board. The down door zone trip level can now be adjusted. Adjust the PDZD pot until .7 volts appears on the meter. This will allow up to 10% speed with the doors open before a limit board trip. On slower cars, 250 fpm and under adjust this to 1.0 VDC, which will allow up to 15% speed with the doors open.

15. Move the red meter lead from the DL test point to the UL test point. Adjust PDZU pot until .7 volts appears on the meter. This will allow up to 10% speed with the doors open before a limit board trip. On slower cars, 250 FPM and under adjust this to 1.0 VDC, which will allow up to 15% speed with the doors open.

16. Replace the wire on the door open input to the limit board.

17. Remove the temporary jumper from the SF1 and SF2 terminals on the limit board. Run the car into the terminal floors on one floor, two floor, three floor runs, etc to make sure the limit board does not trip.

6.13 Inspection Testing

6.13.1 Terminal Slowdown Test - Top

1. Place the car 3 - 5 floors below the top landing.

2. Temporarily remove the wire from the J8/4 input, then put it back in. The car position should reset to the bottom floor.

3. Put a call in for the top floor. The car should decelerate into the top floor normally.

6.13.2 Terminal Slowdown Test - Bottom

1. Place the car 3 - 5 floors above the bottom landing.

2. Temporarily remove the wire from the J8/5 input on the motherboard and then put it back in again. The car position should reset to the top floor.

3. Put a call in for the bottom floor. The car should decelerate into the bottom floor normally.

Note: If the car does not decelerate normally, check terminal slowdown for enough slowdown distance.
6.13.3 Counterweight Buffer Test

1. Place the car 3 - 5 floors below the top landing.

2. Temporarily remove the wire from the J8/4 input, then put it back in. The car position should reset to the bottom floor.

3. Place a temporary jumper across each of the top terminal slowdown limits.

4. Put a call in for the top floor. The car should run into the overhead and the counterweight buffer should compress completely.

5. Immediately place the car on inspection and check the car and counterweight for physical damage.

6. Remove the jumpers from the top terminal slowdown limits.

7. Temporarily jump out the top final limit and run the car down out of the overhead. **Remove all temporary jumpers placed on for this test.**

6.13.4 Car Buffer Test

1. Place the car 3 - 5 floors above the bottom landing.

2. Temporarily remove the wire from the J8/5 input, then put it back in. The car position should reset to the top floor.

3. Place a temporary jumper across each of the bottom terminal slowdown limits.

4. Put a call in for the bottom floor. The car should run into the pit until the car buffer compresses completely.

5. Immediately place the car on inspection and check the car and counterweight for physical damage.

6. Remove the jumpers from the bottom terminal slowdown limits.

7. Temporarily jump out the bottom final limit and run the car up out of the pit. **Remove all temporary jumpers placed on for this test.**
6.13.5 Car Governor Overspeed Test (For Tach Feedback Jobs)

1. With an ohmmeter, set a 100k potentiometer so that zero ohms appears on the meter.

2. **With the main line power off**, wire the 100k pot in series with the tach feedback on the generator shunt field regulator (terminal 1 on Amicon regulator).

3. Place a **TEMPORARY** jumper across the SF1 & SF2 contacts of the limit board.

4. Put the main line power on. Place a call such that the car will reach top speed. Do not place a call any closer than three floors from the bottom.

5. When the car reaches top speed, turn the 100k pot until the car overspeeds.

6. Immediately place the car on inspection.

7. Check that the comp sheave has not come out of its rails if applicable.

8. Check the car and cab for damage.

9. Place a **temporary jumper** across the Safety Operated Switch.

10. Reset the car governor overspeed switch.

11. Inch the car up off safeties.

12. Reset the car governor jaw.

13. Remove the temporary jumper placed across the Safety Operated Switch.

14. Remove the temporary jumper placed across the SF1 & SF2 contacts of the limit board.

15. Remove the 100k pot from the tach circuit and reconnect the tach feedback wire to the generator regulator.

6.13.6 Car Governor Overspeed Test for Vector Drives

1. With the main line power **off**. Place a **temporary** jumper across SF1 & SF2 contact of the limit board.
2. Put main line power on. Increase drive parameter MAX_OUTPUT_SPEED at least 200 rpm’s. Increase drive parameter CTRL_BASE_SPEED to the same value of MAX_OUTPUT_SPEED. Increase drive parameter PRESET_SPEED_(High Speed) to the same value of MAX_OUTPUT_SPEED. Increase drive parameter MOTOR_RATED_SPD to the same value of MAX_OUTPUT_SPEED.

3. Place a call such that the car will reach top speed. Do not place a call any closer than three floors from the bottom or top floor.

4. Car will overspeed - immediately place the car on inspection.

5. Check that the comp sheave has not come out of its rails if applicable.

6. Check the car and cab for damage.

7. Place a temporary jumper across the Safety Operated Switch.

8. Reset the car governor overspeed switch.

9. Inch the car up off safeties.

10. Reset the car governor jaw.

11. Remove the temporary jumper placed across the Safety Operated Switch.

12. Remove the temporary jumper placed across the SF1 & SF2 contacts of the limit board.

13. Change back all drive parameters back to their original value.

6.13.7 Counterweight Governor Overspeed Test (If Applicable)

1. With an ohmmeter, set a 100k potentiometer so that zero ohms appears on the meter.

2. With the main line power off, wire the 100k pot in series with the tach feedback on the generator shunt field regulator.

3. Tie the Car governor jaw up to prevent it from dropping.

4. Place a TEMPORARY jumper across the SF1 & SF1 contacts of the limit board.

5. Place a temporary jumper across the car governor overspeed switch.

6. Put the main line power on. Run the car to the bottom floor. Place a call such that the car will reach top speed for a long period of time. Do not place a call any closer than three floors from the top.

7. When the car reaches top speed, turn the 100k pot until the car overspeeds.
8. Immediately place the car on inspection.

9. Check that the comp sheave has not come out of its rails if applicable.

10. Check the car, cab, and counterweight for damage.

11. Reset the car and counterweight governor overspeed switches.

12. Inch the car down until the counterweight governor jaw can be reset.

13. Untie the car governor jaw and reset the latch.

14. Remove the temporary jumper placed across the car governor overspeed switch.

15. Remove the temporary jumper placed across the SF1 & SF2 contacts of the limit board.

16. Remove the 100k pot from the tach circuit and reconnect the tach feedback wire to the generator regulator.
SECTION 7 - DISPATCHER DESCRIPTION

7.1 Self Contained Duplex Dispatcher

The Series-90 can be supplied with a built in ETA (Estimated Time of Arrival) dispatching system for 2 car groups (Duplex). In the ETA system, the car with the lowest ETA is assigned the call. Penalties are assigned to cars that are stopped, doors are open, too many floors away, etc. Advantages are given to cars that are traveling in the same direction as the call, have a car call in at the same floor, etc.

The hall calls are wired to both cars, with the cars acting in a master / slave arrangement. The “Master” car is the first car in automatic service and will act as the dispatcher.

For example, if Car 1 is the Master car, and it is put on independent service, Car 2 will now be the master car - even after Car 1 is put back in service.

Only the master car will latch the hall calls. For that reason, the hall calls must be wired into both cars when the internal duplex dispatcher is used. Blocking diodes for the hall button power supplies are provided to insure hall button power is always available, but when a car is shut off, the call boards can still be serviced.

A serial communication link between the cars allows the two cars to communicate position and preference information.

7.1.1 Expected Time of Arrival Calculations

Note: LED 59A on both motor boards will rapidly blink once communication between 2 cars is established.

7.1.1a Penalties

1. The Floor_Travel_Time parameter is set for the amount of time it takes the car to travel from one floor to the next while at top speed. This is used in the ETA calculation and is multiplied by the number of floors between the car’s current position and the anticipated hall call. Basically this calculates how long it will take for the car to get to the call if it doesn’t have to stop. This time is counted as a penalty because the other car may be closer.

2. The Floor_Stop_Time parameter is set for the amount of time the car will be at the floor if it is currently stopped. This is set equal to the total amount of door open dwell time, physical time to open the doors, and physical time to close the doors. This is again used as a penalty because the other car may already be in motion.

3. A fixed penalty time is added to a car that is not in motion, a car with its doors open, a car stopped with no direction, or a car in the lobby.
7.1.1b Advantages

1. An advantage is given to a car that has a car call latched for the same floor as a hall call entered.

7.2 Microflite Plus Group Dispatcher

The Series-90 can also be supplied with a Microflite Plus Dispatching System. The hall calls are wired to the dispatcher and left off the car controllers. A serial communication link between the dispatcher and each car allows the dispatcher to assign calls and zoning to the cars in a coordinated manner.

When a Microflite Dispatcher is used, the dispatching parameters that are in the car software are not used. The dispatching parameters are adjusted at the Microflite dispatcher.

7.2.1 Microflite Plus Dispatcher Diagnostic Screen

```
Job Address

<table>
<thead>
<tr>
<th>BU</th>
<th>LU</th>
<th>2U</th>
<th>3U</th>
<th>4U</th>
<th>5U</th>
<th>6U</th>
<th>7U</th>
</tr>
</thead>
<tbody>
<tr>
<td>8U</td>
<td>9U</td>
<td>10U</td>
<td>11U</td>
<td>12U</td>
<td>14U</td>
<td>--</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>LD</td>
<td>2D</td>
<td>3D</td>
<td>4D</td>
<td>5D</td>
<td>6D</td>
<td>7D</td>
</tr>
<tr>
<td>---</td>
<td>CARDS</td>
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<td></td>
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</tr>
<tr>
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<td>9D</td>
<td>10D</td>
<td>11D</td>
<td>12D</td>
<td>14D</td>
<td>15D</td>
<td>---</td>
</tr>
<tr>
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<td>BREC</td>
<td>FBYP</td>
<td>REC</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>HBF</td>
</tr>
</tbody>
</table>

DSP 3U 6D
STATUS NOR INS NOR IND
FLOOR ON 1U B 12D 8D

C1,...C4 Car #1, ... Car #4 Status Information
DSP Hall Call Assignment (Car#1-Lobby Up Call)
Status Car Status
```

7.2.2 Dispatcher I/O Cards

The first four lines shown on the sample screen above display the input signals. Every two lines on the screen correspond to an input (I/O) card.

Input cards are easily identified by the gray ribbon cable which feeds the input signals from the field terminals to the front of the I/O cards.

The dispatcher I/O cards are typically located above the car card cage of Car #1. The dispatcher I/O cards will be in their own cabinet if a separate dispatcher is ordered.
In our example calls 3U, 4D and 6D are registered, we would see the third, eleventh, and thirteenth, LED (counting down from the top of the card) of I/O card #1 lit. The display also show these inputs as "ON" using reverse video.

7.2.3 Car Delayed (FLT)

When a car is delayed for more than 10 seconds at a floor (door being held, bad gate contact) it is placed on fault (FLT) by the dispatcher. If no car calls are registered a dummy hall demand will be sent to the car, in an effort to move it. Once the car has moved from the floor it is placed back on normal status (NOR) by the dispatcher. This feature is disabled if only one car is in group operation, to prevent "dumping hall calls".

7.2.4 Car-Dispatcher Communication Failure

If the communication link fails, between the car and dispatcher, the car's status becomes malfunction (MLF). The car will then enter its highest unlocked car call. After arriving at the top floor, it will enter all odd (even on next run) car calls to maintain service to hall calls.

When the communication link is restored the car will be place back on normal (NOR) status.

It is sometimes necessary to reset either the car or dispatcher to restore the communication link. Note that resetting the dispatcher will cancel all registered hall calls. If there is a problem with the communication link see General Troubleshooting - Section 8.3 for more information.

If a hall call cannot be answered by any car in the group that is currently in group service (and not on Car Delayed (FLT)), the call will be canceled. This is done to alert passengers that their hall call request will not be answered in a timely fashion.

**Note:** The inputs to the dispatcher function the same as the inputs to the car input/output cards, refer to the description in section 8.1.1 Car Input/Output Cards.

- **CR1,...CR4** Car #1, ..., Car #4 status information
- **HL STS** Hall status demand (Car #1- LU, lobby up)
- **STATUS** Car status: NOR(Normal); ATT(Attendant); IND(Independent); MLF(Malfunction); Fire Recall(REC); Fire Operation(FIR); Inspection(INS)
- **FLR ON** Floor on (Car #1 on 4th floor)
- **COMM.** Flashing signal indicates car communication signals are being received by the dispatcher
- **PROGRAM** Up peak, down peak, off peak
7.2.5 Input to the Dispatcher

- AREC or ARC1: Alternate hall fire recall smoke detector
- AUTO: Automatic emergency power
- BREC or ARC2: Alternate hall fire recall smoke detector
- CREC or ARC3: Alternate hall fire recall smoke detector
- nD or nDF: Front down hall calls
- nDR: Rear down hall calls
- EC: Energy conservation
- EMG: Emergency power generator run input
- EPn: Emergency power manual car selects
- FBY: Fireman bypass switch
- HBF: Hall button failure
- HLK or IFS: Inter floor service
- HP: High performance
- nIDF: Alternate riser front down hall call
- nIDR: Alternate riser rear down hall call
- IRn: Inconspicuous riser car Series '90 only
- nIUF: Alternate riser front up hall call
- nUR: Alternate riser rear up hall call
- nLF nLK nHL: Front up and down hall call lock
- LKOF: Lock all non-lobby car calls on all cars
- LKON: Unlock all car calls on all cars
- LDP: Monochrome lobby display input
- nM or nMF: Front medical emergency hall calls
- nMR: Rear medical emergency hall calls
- NPWR: Emergency Power Phase III - Return to Normal Power
- OFFL: Canadian hall fire recall switch lobby off
- OFFR: Canadian hall fire recall switch remote off
- REC: Hall fire recall switch
- RECL: Canadian hall fire recall switch lobby on
- RECR: Canadian hall fire recall switch remote on
- SASW: Seismic activity switch
- SEC: Security
- nU or nUF: Font up hall calls
- nUR: Rear up hall calls
7.2.6 Outputs from the Dispatcher

OP Off peak light
UPP Up peak light
DNP Down peak light
nUC...nUC Up cross cancellation front outputs
nDC...nDC Down cross cancellation front outputs
nUX...nUX Up cross cancellation rear outputs
nDX...nDX Down cross cancellation rear outputs
nUA...nUA Up annunciator light front outputs
nDA...nDA Down annunciator light front outputs
nUY...nUY Up annunciator light rear outputs
nDX...nDX Down annunciator light rear outputs
DF Dispatcher failure light
HF Hall button failure light
GDn Generator disable on car n (used for emergency power with S90)

7.2.7 Main Screen Display

1. Up and down hall calls (by floor)
2. System hardware locks (by floor)
3. Annunciator and cross cancellation outputs (by floor)
4. Fire bypass, recall and alternate recalls, emergency power and emergency power car selection
5. Hall call and hall direction assignment (by car)
6. Car status (by car)
7. System status
8. Car position and direction
9. Time, date and day of the week
7.2.8 Entering and Saving Parameters

Before entering dispatcher parameters, be sure that the write jumper on the MPU is enabled. If you try to enter parameters and get a message "ERROR IN STORING PARAMETERS", the write jumper is not enabled. The dispatcher should remain write enabled, since fire and seismic information is stored to EEPROM while the system is running (The car's write jumper is not write enabled, unless entering parameters).

Use the three buttons on the dispatcher MPU to change parameters. To move the cursor use the top, MOVE BUTTON. The middle button or ENTER BUTTON is used to change values and the lower button to reset the MPU. After setting all of the parameters to the values you select, use the middle button to get to the first parameter screen and move to the line "WRITE VALUES TO NON VOL MEM". Press the middle button to save the parameters. DO NOT RESET THE MPU, BEFORE SAVING YOUR PARAMETERS, or they will be lost!

The Microflite Ultra and Microflite Plus Systems designed after 3/1/94, allow for on screen hall call entry. Looking at the main screen or the diagram on the first page, you will ordinarily find the cursor under the position marked by the letter Y, between the program counter and the system status. To change parameters (call up the following screens), press the ENTER BUTTON with the cursor in this position.

To change the time, press the move button to bring the cursor to the position under the letter X, and press the ENTER BUTTON. Pressing the enter button, until the value is correct and then press the MOVE BUTTON to continue to the next entry. The time and date parameters need not be saved in the same manner as the operating parameters.

To place calls, press the move button to bring the cursor to the position under the letter X, and press the MOVE BUTTON. This will bring you to the input lines. Press the MOVE BUTTON until you reach the input representing the call you wish to enter and press the ENTER BUTTON to place the call. The call will then be highlighted and entered into the system.

7.2.9 Screen One Description

Screen one is used to save parameters and to set system peak and priority parking parameters. Emergency Power Service and Fire Recall are configured here, as are various timers.

Long Wait Priority: This should be set to a value that is at least twice as large as the average wait time. When a call has been in longer than the long wait time, it will be given priority by the dispatcher. Any long wait calls will be assigned before regular hall calls. This may cause the system to bypass a call in order to give the long wait call priority. If hall calls are being bypassed continually or you would rather not use this feature, adjust your Long Wait Priority Time to a higher number. Valid entries range from 45 to 999 seconds, with 120 seconds being the default.
PEAK DURATION TIME: There is a built in delay of approximately one minute before dropping a peak to avoid volatility in the system. This can be adjusted using the peak duration setting. The peak duration time can be set from 1 to 999 seconds, with a 30 second default.

UP and DOWN PEAK: Two up and two down peak intervals can be set. Military time should be used to enter the times (0 - 23 hour, 0 - 59 minutes).

IMBALANCE TO CAUSE UP PEAK - the difference in the amount of up calls and down calls which will trigger an up peak. This should be set from "0" to "30" and has a default value of "8".

IMBALANCE TO CAUSE DOWN PEAK - the difference in the amount of down calls and up calls which will trigger an down peak. This should be set from "0" to "30" and has a default value of "8".

If an up and down peak are set to occur at the same time, the down peak will have precedence. If an imbalance of calls occurs, which would cause a system peak, it will have precedence over a time generated peak. When the imbalance ceases the system will return to the time generated peak.

RETURN CARS ON ID/ATT ON EMERGENCY POWER RECALL: This only applies to a car on attendant or independent, sitting at a floor, with it's door open, when the Emergency Power signal comes in. If the door is closed, the car will do a phase I recall to the recall floor.

If you wish to bring cars on attendant or independent down for an emergency power phase I recall, set this to a yes. If you set this to a yes, the door will close, and the car will be brought to the recall floor. If set to a no, the car will not return (its recall floor will be considered the floor at which it is on). If it is selected to run, on phase II, it will return to service from this floor.

AMOUNT OF CARS TO RETURN TO SERVICE ON EMERGENCY POWER: This represents the maximum amount of cars allowed to return to service on the emergency generator. Up to this amount of cars can return to service, after the Phase I recall is completed. If set to a zero, no cars will return to service.

EMERGENCY POWER RETURN TIME-OUT: The amount of time, in seconds, that the system will wait for a car to start it's generator and begin its return to the recall floor. If it does not begin the recall within this time, it will be shut down and the next car will begin it's return sequence. This can be set from 10 to 65 seconds, with 20 seconds being the default.
MAXIMUM STALL TIME: The amount of time that is allowed to pass before a car, which is assigned a hall call, is faulted (loses it's assignment). This prevents a malfunctioning car (stuck in leveling or not opening it's door at the floor) from maintaining an assignment, which it can not handle. The timer begins, when the car reaches the floor on which it has been assigned a call and is reset, when it opens the door and cancels the assignment. This can be set from 10 to 99 seconds, with 15 seconds being the default.

RECALL FLOORS: The main and alternate recall floors should be entered here. The lowest floor is floor one.

ZONING RETARDATION is used to delay a car from accepting a zoning assignment. This prevents wasted movement in a fairly active building. The higher the number the longer the delay; zero gives no delay. The retardation can be set from 0 to 60 seconds, with 30 seconds being the default.

PRIORITY PARKING FLOORS can be set up so that at a prescribed time, a car will park at the floor selected. Military time should be used to set the start and end times. If 0 is set for the floor, no priority parking will occur (lobby service and zoning will be unaffected). If the car is set to 0, any car will park at the floor. If a specific car number is used, only that car will park (if and when it becomes available). There are four priority parking floor slots available. Priority parking has priority over lobby parking and zoning.

7.2.10 Screen Two Description

This screen allows the user to customize dispatching for their system.

GENERATOR OFF PENALTY: a disadvantage given to a car which is parked, when assigning calls. This should be set to "0" for SCR drive systems. In general, the more cars that are available to dispatch the higher this penalty should be set (less need to move a car with its generator off). For generator systems, multiply the number of cars by two for a good starting point value. Valid entries range from 0 to 10, with a default value of 5.

THIS CAR UP PENALTY: a disadvantage given to the lobby car, when calculating the best car to assign to a call. High values will cause the lobby car to remain in the lobby and another car in the shaft way to be assigned all calls. Valid entries range from 0 to 5, with a default value of 1.

NEXT CAR PENALTY: a disadvantage given to the next car up, when calculating the best car to assign to a call. Valid entries range from 0 to 5, with a default value of 1.

HALTED TIME PENALTY: amount of time taken for a car to halt (decelerate), open and close its doors. Valid entries range from 5 to 30, with a default value of 10. A system with slow door operators should be set to 20, or more.

IN LINE CALL ADVANTAGE: an advantage given to a car which must pass a hall call due to a car call. Valid entries range from 0 to 10, with a default value of 5.
CALL COINCIDENCE ADVANTAGE: An advantage given to a car which has a car call at the floor for which a hall call is registered. Valid entries range from 0 to 10, with a default value of 5.

DOORS OPEN TIME LOBBY UP - This can be set from 1 second to 98 seconds and is used to shorten the lobby door time, after a call is entered. The default is 5 seconds.

DOOR OPEN TIME LOBBY UP - This can be set from 1 second to 98 seconds. A value of 99 seconds will cause the door to remain open constantly, for the THIS CAR UP ONLY. The default is 10 seconds.

DOOR OPEN TIME IN LOBBY AFTER A CAR CALL - this can be set from 1 seconds to 98 seconds and is used to shorten the lobby door time, after a car call is entered. The default is 5 seconds.

RET AT/IN CARS ON MEDICAL RECALL - If this is set to a NO, cars on attendant or independent will not be assigned medical recall (code blue) calls.

DOOR OPEN TIME MEDICAL EMERGENCY RECALL - this is used to keep the door open before going on Phase II of Medical Emergency. When it expires the car will close its door, go off Medical Phase I and rejoin the group (the Phase II key switch was not turned on before the time expired).

AUTO CAR CALL LOCKS BY TIME: Car calls (except for the lobby call) will lock and unlock automatically at the set times. Three time options can be set (Monday to Friday, Saturday Only and Sunday Only).

GROUPS FOR LOBBY COVERAGE: This is used to split the group into two groups, for lobby service. If the group is split, you can have two THUS. This is useful if you wish a specific car to be the lobby car or if the group has two types of service (high and low rise) and you want one car from each service to park in the lobby. Enter a Yes or No for each car for group one and the same for group two. If you wish normal lobby service, enter NO for all cars in group two. If you select a car in both groups, it will fulfill the number of cars in lobby for both groups, when it is the lobby car.

NUMBER OF LOBBY CARS UP PEAK GROUP 1 and 2:
NUMBER OF LOBBY CARS DOWN PEAK GROUP 1 and 2:
NUMBER OF LOBBY CARS OFF PEAK GROUP 1 and 2:

These can be set from 0 to 10 and have a default value of 0 for DOWN PEAK and 1 for UP and OFF PEAK.

7.2.11 Screen Three Description

ENERGY CONSERVATION STATUS BASED ON TIME AND DAY: 0 - HIGH PERFORMANCE AND 1 - ENERGY CONSERVATION
To use this feature enter a time for the system to go on energy conservation mode and a time for it to return to high performance mode. The status should be set to 0, for high performance and 1, for energy conservation. The day of the week should be set to a yes or no. The default is 0, or high performance.

**TIME:**

<table>
<thead>
<tr>
<th>ON</th>
<th>OFF</th>
<th>STATUS</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
<th>S</th>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
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<tr>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

**HALL CALL LONG WAIT TIME BEFORE SWITCHING TO HIGH PERFORMANCE:** 000

This should be set to the number of seconds a hall call can be in, before switching a car off of 'Energy Conservation' and back to 'High Performance' mode. The default is 120 seconds, and the range is 0 to 999 seconds.

**REOPEN DOOR ON THE FLOOR** - If set to YES, the hall button will act similarly to the door open button, in that a closing door will reopen and can be held open, by pressing the hall button. The hall button will not hold the door beyond a preset time 'Bypass hall call time', unless it has no car calls registered and no hall assignment. This is to prevent a stuck button from holding the car at a floor, indefinitely. If set to NO, the car will not reopen its doors, if it has another hall assignment or a car call registered. The default is NO.

**BYPASS HALL CALL TIME** - The number of seconds that at hall call button can be used to keep a car’s door open at a floor, with the car having either car calls registered or a hall assignment, before considering that the hall button is stuck and releasing the car. The timing starts when the car first stops to answer the hall call. The timer increments only if the car has a hall assignment or car call, at another floor. The range is 0 to 999 seconds, with a default of 30 seconds.

### 7.2.12 Lock Screens

Additional screen to allow hall calls to be locked and unlocked for each car, by floor and direction. Car calls can be locked and unlocked, through the dispatcher, for each car.

*These locks will not unlock floors which have been locked with hardware locks.* When setting up the dispatcher, enter "Y" next to the floor to lock the floor in the Up or Down direction. If the car does not have an opening at a floor, enter "Y". If you wish to lock the car call, enter a "Y" under that column. There is a screen for each car and opening (front/rear). **After entering your selections, save them to EEPROM, on entry screen one.**

If you are using the remote locking system, you will **NOT** be able to unlock screen entered locks with the remote system. You should consider this before entering temporary locks with this screen.

**S90 BOTTOM BOARD MAPPING**
### Inputs (Top LED's Read Right to Left)

<table>
<thead>
<tr>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J7/1</td>
<td>L1</td>
<td>Door Lock and Gate Switch</td>
</tr>
<tr>
<td>J7/2</td>
<td>L2</td>
<td>Door Close Limit Front</td>
</tr>
<tr>
<td>J7/3</td>
<td>L3</td>
<td>Door Open Limit Front</td>
</tr>
<tr>
<td>J7/4</td>
<td>L4</td>
<td>Safety Circuit Front</td>
</tr>
<tr>
<td>J7/5</td>
<td>L5</td>
<td>Safety Edge Front</td>
</tr>
<tr>
<td>J7/6</td>
<td>L6</td>
<td>Electric Eye Front</td>
</tr>
<tr>
<td>J7/7</td>
<td>L7</td>
<td>Door Open Button Front</td>
</tr>
<tr>
<td>J7/8</td>
<td>L8</td>
<td>Door Close Button Front</td>
</tr>
<tr>
<td>J8/1</td>
<td>L9</td>
<td>3 Inch Door Zone</td>
</tr>
<tr>
<td>J8/2</td>
<td>L10</td>
<td>Up Step/Level Up</td>
</tr>
<tr>
<td>J8/3</td>
<td>L11</td>
<td>Dn Step/Level Dn</td>
</tr>
<tr>
<td>J8/4</td>
<td>L12</td>
<td>Bottom Reset</td>
</tr>
<tr>
<td>J8/5</td>
<td>L13</td>
<td>Top Reset</td>
</tr>
<tr>
<td>J8/6</td>
<td>L14</td>
<td>Inspection</td>
</tr>
<tr>
<td>J8/7</td>
<td>L15</td>
<td>Independent Service</td>
</tr>
<tr>
<td>J8/8</td>
<td>L16</td>
<td>Handicap Chime Enable</td>
</tr>
<tr>
<td>J9/1</td>
<td>L17</td>
<td>Fire Phase 1</td>
</tr>
<tr>
<td>J9/2</td>
<td>L18</td>
<td>Primary Smoke Detector</td>
</tr>
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<td>J9/3</td>
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<td>Alternate Smoke Detector</td>
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<td>J9/4</td>
<td>L20</td>
<td>2nd Alt. Smoke Detector</td>
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<td>J9/5</td>
<td>L21</td>
<td>Fire Phase 2 On</td>
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<tr>
<td>J9/6</td>
<td>L22</td>
<td>Fire Phase 2 Hold</td>
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<td>J9/7</td>
<td>L23</td>
<td>Fire Call Cancel</td>
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<td>J9/8</td>
<td>L24</td>
<td>Fire Smoke Bypass</td>
</tr>
<tr>
<td>J10/1</td>
<td>L25</td>
<td>Motor Generator On</td>
</tr>
<tr>
<td>J10/2</td>
<td>L26</td>
<td>Weight Switch Dispatch</td>
</tr>
<tr>
<td>J10/3</td>
<td>L27</td>
<td>Weight Switch Bypass</td>
</tr>
<tr>
<td>J10/4</td>
<td>L28</td>
<td>Independent Riser</td>
</tr>
<tr>
<td>J10/5</td>
<td>L29</td>
<td>Earthquake Counterweight</td>
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<tr>
<td>J10/6</td>
<td>L30</td>
<td>Earthquake Seismic Sensor</td>
</tr>
<tr>
<td>J10/7</td>
<td>L31</td>
<td>Spare</td>
</tr>
<tr>
<td>J10/8</td>
<td>L32</td>
<td>Brake Switch</td>
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### Outputs (Bottom LED's Read Left to Right)

<table>
<thead>
<tr>
<th>Term#</th>
<th>LED#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J11/1-2</td>
<td>L01</td>
<td>P.I. Bit 1</td>
</tr>
<tr>
<td>J11/3-4</td>
<td>L02</td>
<td>P.I. Bit 2</td>
</tr>
<tr>
<td>J11/5-6</td>
<td>L03</td>
<td>P.I. Bit 3</td>
</tr>
<tr>
<td>J11/7-8</td>
<td>L04</td>
<td>P.I. Bit 4</td>
</tr>
<tr>
<td>J12/1-2</td>
<td>L05</td>
<td>P.I. Bit 5</td>
</tr>
<tr>
<td>J12/3-4</td>
<td>L06</td>
<td>Fire Light</td>
</tr>
<tr>
<td>J12/5-6</td>
<td>L07</td>
<td>Buzzer</td>
</tr>
<tr>
<td>J12/7-8</td>
<td>L08</td>
<td>Floor Passing Chime</td>
</tr>
<tr>
<td>J13/1-2</td>
<td>L09</td>
<td>Door Open Relay Front</td>
</tr>
<tr>
<td>J13/3-4</td>
<td>L10</td>
<td>Door Close Relay Front</td>
</tr>
<tr>
<td>J13/5-6</td>
<td>L11</td>
<td>Up Direction Arrow</td>
</tr>
<tr>
<td>J13/7-8</td>
<td>L12</td>
<td>Down Direction Arrow</td>
</tr>
<tr>
<td>J14/1-2</td>
<td>L13</td>
<td>Up Car Lantern</td>
</tr>
<tr>
<td>J14/3-4</td>
<td>L14</td>
<td>Dn Car Lantern</td>
</tr>
<tr>
<td>J14/5-6</td>
<td>L15</td>
<td>Up Hall Lantern</td>
</tr>
<tr>
<td>J14/7-8</td>
<td>L16</td>
<td>Dn Hall Lantern</td>
</tr>
<tr>
<td>J15/1-2</td>
<td>L17</td>
<td>Fire Stop Switch Bypass</td>
</tr>
<tr>
<td>J15/3-4</td>
<td>L18</td>
<td>Nudging</td>
</tr>
<tr>
<td>J15/5-6</td>
<td>L19</td>
<td>Generator Run</td>
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<tr>
<td>J15/7-8</td>
<td>L20</td>
<td>Up Direction</td>
</tr>
<tr>
<td>J16/1-2</td>
<td>L21</td>
<td>Dn Direction</td>
</tr>
<tr>
<td>J16/3-4</td>
<td>L22</td>
<td>High Speed</td>
</tr>
<tr>
<td>J16/5-6</td>
<td>L23</td>
<td>Medium Speed</td>
</tr>
<tr>
<td>J16/7-8</td>
<td>L24</td>
<td>Medical Emergency</td>
</tr>
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</table>
### S90 I/O Expansion Board Mapping

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>LED#</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1/1</td>
<td>L1</td>
<td>Door Close Limit Rear / 22U</td>
</tr>
<tr>
<td>J1/2</td>
<td>L2</td>
<td>Door Open Limit Rear / 23C</td>
</tr>
<tr>
<td>J1/3</td>
<td>L3</td>
<td>Safety Edge Rear / 23D</td>
</tr>
<tr>
<td>J1/4</td>
<td>L4</td>
<td>Electric Eye Rear / 23U</td>
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<tr>
<td>J1/5</td>
<td>L5</td>
<td>Door Open Button Rear / 24C</td>
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<td>J1/6</td>
<td>L6</td>
<td>Door Close Button Rear / 24D</td>
</tr>
<tr>
<td>J1/7</td>
<td>L7</td>
<td>Attendant Up Button</td>
</tr>
<tr>
<td>J1/8</td>
<td>L8</td>
<td>Attendant Dn Button</td>
</tr>
<tr>
<td>J2/1</td>
<td>L9</td>
<td>Attendant</td>
</tr>
<tr>
<td>J2/2</td>
<td>L10</td>
<td>Attendant Bypass</td>
</tr>
<tr>
<td>J2/3</td>
<td>L11</td>
<td>Medical Emerg/Emerg Power</td>
</tr>
<tr>
<td>J2/4</td>
<td>L12</td>
<td>Return To Lobby / NPWR</td>
</tr>
<tr>
<td>J2/5</td>
<td>L13</td>
<td>Lobby Door Hold / EP2</td>
</tr>
<tr>
<td>J2/6</td>
<td>L14</td>
<td>Freight Door Timing / EP1</td>
</tr>
<tr>
<td>J2/7</td>
<td>L15</td>
<td>Anti Nuisance Disable</td>
</tr>
<tr>
<td>J2/8</td>
<td>L16</td>
<td>Spare / PTS</td>
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<table>
<thead>
<tr>
<th>OUTPUTS</th>
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<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3/1-2</td>
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<td>Door Open Rear / 22U</td>
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<tr>
<td>J3/3-4</td>
<td></td>
<td>Door Close Rear / 23C</td>
</tr>
<tr>
<td>J3/5-6</td>
<td></td>
<td>Up Car Lantern Rear / 23D</td>
</tr>
<tr>
<td>J3/7-8</td>
<td></td>
<td>Down Car Lantern Rear / 23U</td>
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<tr>
<td>J6/1-2</td>
<td></td>
<td>Up Hall Lantern Rear / 24C</td>
</tr>
<tr>
<td>J6/3-4</td>
<td></td>
<td>Down Hall Lantern Rear / 24D</td>
</tr>
<tr>
<td>J6/5-6</td>
<td></td>
<td>Up Attendant Light</td>
</tr>
<tr>
<td>J6/7-8</td>
<td></td>
<td>Down Attendant Light</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acknowledgment Lights</td>
</tr>
</tbody>
</table>
SECTION 8 - GENERAL TROUBLESHOOTING PROCEDURES

8.1 General Information

This troubleshooting guide is only meant to give assistance in finding the location of the malfunction; so that a minor repair can be made or so the defective printed circuit board can be identified for replacement. Defective PCB's should be forwarded to O.Thompson Engineering for repair.

CAUTION - Solid state equipment, while very reliable, can be damaged if high voltage is applied or if high voltage transients are introduced into the system (For example by pulling out a card while power is still connected or due to static electricity). Ground wrist straps should be used when handling any printed circuit boards. All printed circuit boards should be transported in anti static bags. Therefore, please exercise caution.

The first step in troubleshooting is to check the car M.P.U.. The M.P.U. LED indicator should be blinking at four times per second rate. After power up or a reset the LCD display should be in the monitor mode, check the status of the car. In normal operation the status for the car should be NOR (normal). Refer to Section 6.1 for information regarding the monitor mode information displayed.

The program is stored on two "EPROMs". This will rarely be a problem unless it is plugged in backwards. The "EPROM" should have the notch at the end of the chip away from the edge connector of the MPU board. If the EPROMs are bad or the jumpers are incorrectly set on the MPU board, the system status on the LCD display will show “OOSV” and the car will not run.

The parameter data is stored on a battery backed ram. This data can be destroyed or reprogrammed by someone entering data in the parameter entry menu. Any wrong parameter values will generate unusual operation. The parameters should be checked to insure the data stored is proper for the installation, number of floors, speed operation, etc. Observe the car you wish to troubleshoot. In order for the car to run, SAF, DG input must be "ON" and DCL must be "OFF". When calling for assistance it is extremely helpful to note the status of all inputs, outputs, and the status of the LCD display at the time the problem occurs.

If SAF is de-energized, check the safety string for open circuits.

WARNING - Manual reset must only be done if the car is not in motion!!
8.2 Power Supply Voltages Trouble Shooting

Check the MPU power supply voltages. The voltage at the MPU terminals J5-1 and J5-2 must be +5.0 VDC. The allowable voltage range for the 5 volt supply is critical. This must be between 5.2 VDC and 4.8 VDC, tested at the two pole 5 volt connector on the left side of the mother board.

Check MPU 24 VDC voltage at terminals J3-1 and J3-4. If meter shows 0 volts, power down MPU switch, temporarily remove the fuse in series with 24 VDC power supply output. Power up and check voltage again. If 24 VDC appears on meter, power down controller and check for possible short on any 24 VDC circuits.

8.3 Slow Down And Position Trouble Shooting

The M.P.U. reads five critical inputs to maintain a correct position, slow down, and leveling. The five inputs are up step/level up, dn step/level down, level zone, bottom reset, top reset. False leveling, door zone, or step information will cause the car to have a position problem. This problem may be caused by a defective Hoistway Tape Reader sensor, relay or misplaced magnet. Normally these conditions will be detected by the system. Corrective action will be taken by the system to correct the position. The diagnostic error counters will be incremented every time a position or step error occurs. These counter can be checked to see the frequency of a particular type of problem.

The position of the terminal slowdown limits are critical, and will cause a position problem if they are not set to open after the sensor comes off the slowdown magnet for the terminal landing. The slowdown limits must not be set to open to late as they are used to generate a slowdown when the car is sent to the terminal landing to correct the position. Refer to Sections 4.4 and 4.5 for more information regarding slowdown position.

8.4 Self Contained Duplex Dispatching Problems

If one of the cars does not latch, answer, or cancel hall calls:

1. Verify that the "problem" car will answer its own car calls.

2. Check that both cars' LED 59A are blinking at the same rate. Normally, LED59A should blink at 4 times per second. Reset the car that is answering hall calls. If the problem transfers to the other car, move to step 3.

3. Verify with O. Thompson that the jumpers on each car's MPU board are correct.
4. Verify that the following parameters are set correctly on both cars:

- Top_Floor set properly for the individual car.
- Lobby_Floor set properly for the individual car.
- Group_Car set to a 2 for both cars
- Block_Operation (one car set at 0, one set at 1 if block operation is desired in the event of a dispatcher problem)
- Bldg_Top_Floor set the same for both cars.
- Bldg_Lobby_Floor set the same for both cars.
- Floor_Travel_Time is set for a valid number.
- Floor_Stop_Time is set for a valid number.
- Sec_Zone_Floor is set for a valid floor number.

### 8.5 MicroFlite Dispatcher Problems

In one car does not answer or cancel hall calls:

1. Check the MicroFlite Dispatcher's diagnostic screen to verify the cars operational status (IE, NORMAL, INDEPENDENT, FAULT, etc.) and that the communication link is operation properly (Blinking Cursor under car number).

2. Check that each car's MPU has the jumper configuration.

3. Check that the communication cable connections to the MicroFlite dispatcher are correct.
O. Thompson Series 90 Installation & Adjustment Manual

Series 90 Software Flowchart for Keypad Parameter Entry

1. Power Up
2. Enter 4 Digit Entry Code
3. Monitor Mode
4. Press * 6
5. Press Main Monitor
6. Press Parameter Entry
7. Press 6
8. Press 5
9. Press 8
10. Current Value
11. Set Access Codes
12. Press 6
13. Press 4
14. Current Value
15. Set Blind Landings
16. Press 6
17. Press 4
18. Current Value
19. Set Dial Out
20. Press 6
21. Press 4
22. Current Value
23. Set Job ID
24. Press 5
25. Press 4
26. Current Value
27. Set Landings
28. Press 6
29. Press 4
30. Current Value
31. LCD Test
32. Press 6
33. Press 4
34. Current Value

O. Thompson Doc #101       Revision: E       Revision Date: 10/5/98
SECTION 9 - PARAMETER LIST

9.1 Parameters

The standard software for the series 90 version 2 is constantly being enhanced with new features. These new features typically require the addition of new parameters. For this reason we have removed the parameter list from the main manual. This parameter list is updated with every software change. The date in the upper right hand corner of this document should be compared to the date of the software being used on the job. Call Thompson Series 90 for an updated list if required.

The parameters listed below will allow the user to customize the system to suit the needs of the building. Based on the controller order, the parameters have been set by the test dept. View the parameter entry flow chart to see the key pad entry needed to access the parameter labels.

The parameters listed below are described with the following format. Using the first parameter as an example. The CAR_CALL_TIME is the label for the parameter. The value, 0-16 seconds is the allowable value which can be entered for the parameter. The preset value is the value set in each parameter when the preset parameters routine is run. Refer to the parameter PRESET_PARAMS for more information.

At the end of this manual you will find a list of the parameters listed below. Make a copy of this page and fill in the parameters as they set for your job. This should be left on the job for reference.

Note: On software versions 10/17/95 and later, PRESET_PARAMS will be the first parameter in the list. On earlier versions, it will be the last parameter in the list.

PRESET_PARAMS - Value, 0-250. A value 100, enter (#) then 125, enter then 200, enter programmed in this parameter will write preset parameters to all of the programmable parameters. 200 will reset the diagnostic parameters. The values written to each parameter are written in this manual as preset values after the parameter limits, for each parameter. Check these values as you will have to reset some of the parameters for your particular job. Some but not all to look at are top floor, lobby floor, speed operation, fire code, fire recall floors, group car, etc..

On software dates of 10/17/95 or later, it is necessary after Presetting the Parameters to enter a value of 250 and wait 2 seconds to permanently save changes.

CAR_CALL_TIME - Value, 0-16 seconds. Preset value 4 seconds. Car call door open time after the door open limit input off.
**HALL_CALL_TIME** - Value, 0-16 seconds. Preset value 5 seconds. Hall call door open time after the door open limit input is off.

**LOBBY_TIME** - Value, 0-16 seconds. Preset value 6 seconds. Lobby door open time after the door open limit is off at the floor programmed in the lobby floor parameter.

**REOPEN_TIME** - Value, 0-16 seconds. Preset value 1 seconds. Door time after a reopening has reopened the door.

**BEAM_REMAKE_TIME** - Value, 0-16 seconds. Preset value 1 seconds. Minimum door time after the remake of the electric eyes.

**FREIGHT_DR_TIME** - Value, 0-60 seconds. Preset value 30 seconds. This parameter will change the car door time to a extended door time when the freight door time input (expansion board J2/6) is on momentary as the door is opening or closing. The input must be turned on at each stop when extended door time is desired. This time can be canceled with the door close button.

**NUDGING_TIME** - Value, 0-60 seconds, disable value, 99. Preset value 30 seconds. Door forced closing time.

**PRE-OPEN** - Value, 0-2 Preset value 1. 0=N0 1= Door pre opening selection, the pre opening is initiated from the 3L sensor (3 inches). 2= Used with manual doors with a retiring cam.(Car can land correctly even if the door gate input opens before the car is level at the floor, as long as the car is in door zone. Door close limit will still be monitored as before.

**NUDG_DEVICES** - Value, 0=safety edge, door open button, electric eye 1=safety edge, door open button 2=none. Preset value 1. The parameter defines the devices active for door reopening when nudging time parameter time has expired.

**POS_SAVE_RUNNING** - Value, 0=yes 1=fire 2=no. Preset value 0. The value programmed in this parameter will control the saved position with a loss of power in flight between floors. With the parameter set to 1 (yes) the car will retain its position and move down to the floor below with a loss of power between floors. If the parameter is set to 1 (fire) the car will retain its position on fire service only. If the parameter is set to 2 (no) the car will loose its position and will be sent to the terminal landing to correct the position.

**SIM_DOOR** - Value, 0-2. Preset value 2. The value programmed in this parameter will determine the type of door operation. The parameter is for simultaneous door operation or not when you have selective front and rear doors. A value of 0 will allow no simultaneous door operation except on fire service. A value of 1 will allow simultaneous operation on all services except automatic. A value of 2 will allow simultaneous door operation on all services. If a Series 90 dispatcher is being used make sure the parameter on the dispatcher is set the same as the car with regard to the type of door operation.
DOOR_POLARITY - Value, 0-15. This parameter allows the polarity of certain door inputs to be reversed. The value can be 0 to 15, and setting the four lowest bits reverses the polarity of the front and rear door inputs as follows: Bit 0 = close limit, Bit 1 = open limit, Bit 2 = electric eye, Bit 3 = safety edge.

RECALL_DOOR - Value, 0-7. Used to set which door opens on Phase 1, Security Return, and Emergency Power recall modes, when the recall is to a floor with simultaneous doors it is set as follows:

<table>
<thead>
<tr>
<th>PHASE 1</th>
<th>SEC. RETN.</th>
<th>EMP RECALL</th>
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<tbody>
<tr>
<td>0=</td>
<td>FRONT</td>
<td>FRONT</td>
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<tr>
<td>1=</td>
<td>REAR</td>
<td>FRONT</td>
</tr>
<tr>
<td>2=</td>
<td>FRONT</td>
<td>REAR</td>
</tr>
<tr>
<td>3=</td>
<td>REAR</td>
<td>FRONT</td>
</tr>
<tr>
<td>4=</td>
<td>FRONT</td>
<td>FRONT</td>
</tr>
<tr>
<td>5=</td>
<td>REAR</td>
<td>FRONT</td>
</tr>
<tr>
<td>6=</td>
<td>FRONT</td>
<td>REAR</td>
</tr>
<tr>
<td>7=</td>
<td>REAR</td>
<td>REAR</td>
</tr>
</tbody>
</table>

INDEP_MODE - Value, 0-2. Preset value 0. The value programmed in this parameter will determine the type of door closing operation when the car is on independent service operation. 0 = CP, constant pressure of the car call required to close the door. 1= DCB, car call will latch, and constant pressure of the of the door close button is required to close the door. 2=MP, car call will latch, and momentary pressure of the of the car call will close the door.

INDEP_LOCKS - Value, 0 = No, 1 = Yes. Preset value 0. The value selected in this parameter will enable or disable car call locks on Fire Phase 2 and Independent Service.

PARK_DELAY_TIME - Value, 0-30 seconds, disable value, 99. Preset value 10. A delay time before parking. A number of 99 will disable parking. This must be set to 99 when the car is not used as a simplex.

PARKED_OPEN - Value, 0 to 3. Preset value 0. Selection off 0 or 1 will make the door stay open when the car is parked. This can be used with simplex operation only. A value of 2 will make the door stay open after all calls have been answered. This should be used if the control is being used on a swing door job. A value of 3 will make the door stay open after all calls have been answered except reverse polarity on DCL.

CLEAR_CALLS - Value, 0=no 1=yes. Preset value 0. Car calls registered will be canceled with the direction reversal.

NUIS_CC_STOPS - Value, 0-10 stops, disable value 99. Preset value 99. The number of car call stops with out the electric eye input coming on. The car calls registered will be dropped when this number is reached. Setting this parameter to 99 will disable anti nuisance.
**HCP_MODE** - Value, 0=no 1=all 2=but. Preset value 1. The value programmed in this parameter will adjust the output to the floor passing chime. A value of 0 disables the chime, 1 enables one chime output for every floor passed, and 2 enables the floor passing chime when the HCP button is pressed until the direction changes.

**RESET_FLT_TIME** - Value, 0-250 seconds, disable value 999. Preset value 180. The flight timer is started at the start of the run. If the destination floor is not reached (door zone) before the time expires the system will be reset. When the HYDRO_CAR parameter is set to a 1 the reset flit timer will function as the low oil timer in the up direction. Refer to the HYDRO_CAR parameter for more information. A number of 999 will disable this timer.

**STALL_TIME** - Value, 0-60 seconds, disable value 99. Preset value 15. The stall timer is used turn off the direction output in leveling and releveling. The stall timer is started when the car is on level up or down. The stall timer is reset only after the car has landed at the floor with level up and down off for two seconds. This will allow the leveling stall timer to time out a car that is releveling.

**LOCKOUT_TIME** - Value, 1-5 seconds. Preset value 2. The lock out time is used in three speed operation only. It is the period of time at the start of a run that the run is able to change from a multi floor run to a one floor run, or from a one floor run to a multi floor run.

**MED_DOOR_TIME** - Value, 0-30 seconds, D = 99. Preset value 99. The medical service door time will be the door open time after the car has been put on phase two medical service and a car call is registered. This door time can be bypassed on phase two medical service with the door close button.

**ATT_BUZZER_TIME** - Value, 3-60 seconds Preset value 7 seconds. The value in this parameter will determines the time off between buzzer output signal when a hall call is registered and the car is on attendant.

**GEN_CAR_MODE** - Value, 0-2. 0 = No, 1 = Out, 2 = In. Preset value 0. The value in this parameter will determine if a generator run output, and the generator on input are being used. Also the parameter will control the door operation when the MG switch is used to control the MG on input. 0 should be used in this parameter if the generator run output is not wired or the car does not have a generator. Generator jobs prior to this software change control the starting of the generator with the direction arrow outputs. The generator starting can be left controlled by the arrow outputs if you are changing software, and set the parameter to 0. Use a value of 1 if the MG switch is outside the car. If the MG switch is turned of the generator will shutdown, the doors will parked closed, and the car will be taken out of service. Use a value of 2 if the MG switch is inside the car. If the MG switch is turned of the generator will shutdown, the doors will stall, and the car will be taken out of service.

**GEN_SHTD_TIME** - Value, 0-300 seconds Preset value 180 seconds. The value in this parameter will determines the time the generator run output will be on after the car has answered all of the calls. Disable = 999.
EMP_DOOR_OPEN - Value, 0=no 1=yes. Preset value 1. Set this parameter for the door to remain open at the phase one emergency power recall floor.

CAR_NUMBER - Value, 1-2. 3 = EMP INTLK. Preset value 1. When group parameter is set to 2 use this parameter to designate which car is 1 or 2 for emergency power.

MAX_EMP_CARS - Value, 0-2 Preset value 1. When group parameter is set to 2 use this parameter to set total number of cars on emergency power.

EMP_PRE_XFER - Value 0 - 1. Preset value 0.

ALT_EMERG_INPUT - Value, 0 -4. Preset value 0. When Emergency Power is used with a simplex or self-contained dispatcher, there are three inputs which cannot be used. Now one of these can be made available on the expansion board J2/pin-8 by setting one of the following values: 0 = Disable, 1 = Security Return, 2 = Lobby Door Hold, 3 = Freight Door Timing.

BRAKE_PICKED - Value, 0-2. 0 = Dis, 1 = No, 2 = NC. Preset value 0. Used to control how the system monitors whether the brake is picked after the start of a run. 0=Brake monitor disabled. 1=Brake monitor active, normally open brake contact. 2=Brake monitor active, normally closed brake contact.

RELEVELING - Value, 0=no 1=yes. Preset value 1. Releveling after the initial stop at the landing.

TOP_FLOOR - Value, 2-24. Preset value 24. Set this to the total number of landings. The bottom floor will be 1. When set to 23 or 24 Expansion Board is needed to support additional hall and car calls.

LOBBY_FLOOR - Value, 1-24. Preset value 2. The value programmed in the lobby floor will adjust the parking floor and the floor used for lobby door time.

SPEED_OPER - Value 1,2,3. Preset value 1. The value programmed in this parameter will determine the type of speed control the micro processor control will be used on. A value of 1 will output the direction output to move the car. A value of 2 will output the direction and medium speed. A value of 3 will output the direction medium and high speeds. In all cases the controller hardware must be configured accept the outputs. A different arrangement of step targets is required for each of the speed operations. Refer to section 3.4 for a more detailed description.

CAR_LANT_TIME - Value, 0-50 * 1/10 = 0-5 seconds. Preset value 10. The value programmed in this parameter will reflect the time between the start of door opening and the output of the car travel lantern and gong. The preset value of 10 equals one second.

CAR_LANT_TYPE - Value, 0=2dn 1=1dn. Preset value 0. Adjusting this parameter generates a single or double stroke output for the down car travel lantern and gong.
HALL_LANT_TYPE - Value, 0=2dn 1=1dn. Preset value 0. Adjusting this parameter generates a single or double stroke output for the down hall lantern and gong.

PI_TYPE - Value, 0-2. Preset value 0. "1"- Three or five outputs are used for the position indicator. They can be used as a binary output or a single output per floor. Most jobs will need this parameter set to binary output "0". Check the controller diagrams to see if a decoding board was provided. "2"- Will set binary code to bottom floor of car using internal disp with unlike shafts.

HOSPITAL_CAR - Value, 0= independent 1= hospital. Preset value 0. Setting this parameter to 0 will allow the car to be recalled on independent service with the door open after a 30 second delay. Set to 1 the car will not be recalled. This setting is effective only when national fire service has been selected.

HYDRO_CAR - Value, 0-1. 0 = Traction, 1 = Hydro. Preset value 0. This parameter should be set to a value of 1 when the system is used for hydro application. When this parameter is set to a 1 the value set in the RESET_FLT_TIME will be the low oil timer. When this timer runs out in the up direction, the micro will turn off the up motion and medium speed. The monitor will display _oil and the car will return to the bottom terminal landing, cycle the doors once and remain in the out of service mode. Door reopen devices and any car call will reopen the doors.

A low oil condition in leveling will be handled by the STALL_TIME parameter. When the leveling stall timer runs out the direction output will be turned off and the car will continue to run to the next call. This will allow the car to remain in service with a low oil condition until the car can no longer transfer to the leveling stall timer at the top landing.

FIRE_CODE - Value 0 - 6, Preset value = 5. 0=Pre 1992 NYC 1= NATIONAL 2=Canada 3=California 4=Chicago 5=1992 NYC 6=Houston. This parameter allows the user to select between fire service operations.

PRIM_RECALL_FLR - Value, 1-24. Preset value 2. This parameter selects the phase one key switch and primary smoke detector recall floor.

ALT_RECALL_FLR - Value, 1-24. Preset value 3. This parameter selects the alternate smoke detector floor.

ALT2_RECALL_FLR - Value, 1-24. Preset value 4. This parameter selects the second alternate smoke detector floor.

PH1_NUDGING - Value, 0-1. 0 = Disable, 1 = Enable. Preset value 0. This parameter selects the type of door closing on phase one fire service. 0 will close the doors on phase one fire service without the door nudging output on. 1 will close the doors on phase one fire service with the door nudging output on.

EQK_CTRWT_FLR - Value, 1-24, Disable value 99. Preset value 99. The value programmed in this parameter should reflect the closest floor that the counter weight is equal to the car in
the shaftway. This should only be used when earthquake inputs are provided. If this is not used, enter a 99 in this parameter.

SEC_RETN_FLR - Value, 1-24. Preset value 99. This parameter sets the security return floor. When the return to lobby recall input is turned on the car calls will be dropped and hall call assignments removed. If the car is in motion the car will stop at the next available floor and will not open its door and return to the floor programmed in this parameter. The doors will open, and the car will be removed from service. The LCD will display RETN in the system status.

DIAL_PAUSE - Value, 1-11. disable=0 Preset value 0. This parameter will adjust how many numbers of the dial out number will be dialed before a six second delay. The delay is used for phone systems which require a number dialed, wait for a dial tone, then dial the rest of the number. The dial out number is programmed from a menu item in the main menu. This is used when a modem for event dial out and central station equipment has been provided.

GROUP_CAR - Value, Preset value 0. 0= simplex 1= Series 90 group dispatcher new data stream protocol 2= self contained E.T.A. series 90 V2 dispatcher 3= Micro Flite group dispatcher old data stream protocol 4=simplex communication with a building management system 5=communication with a dial out modem.

If the car is a simplex car set this parameter to a 0.

The Series 90 dispatcher new data stream includes individual hall and car call lock outs for each car on the dispatcher. The cars communicate to the separate dispatcher via the serial RS 232 port or the optical port on the M.P.U. board. This dispatcher software is being provided on jobs built after 2/1/92. Set the group parameter to 1 if this dispatcher has been provided.

The self contained duplex dispatcher allows for the operation of two Series 90 cars to operate as a E.T.A. duplex system without the use of a separate dispatcher. When used in this configuration one of the two cars will be the dispatcher. The cars communicate to each other via the serial RS 232 port or the optical port on the M.P.U. board. Set the group parameter to 2 if this dispatcher has been provided.

The Series 90 dispatcher old data stream was provided on group jobs prior to 2/1/92. The cars communicate to the separate dispatcher via the serial RS 232 port or the optical port on the M.P.U. board. Set the group parameter to 3 if this dispatcher has been provided.

Set this parameter for proper operation required for your particular job.

BLOCK_OPERATION - Value, 0-2. Preset value 2. This parameter should be set for the proper operation when a loss of dispatcher occurs. This parameter is used by the system when the group parameter is set to 1, 2 or 3.

When the group parameter is set to 2 (series 90 self contained E.T.A. dispatcher) the operation of block operation is as follows. Setting a 0 will allow odd up and even down hall
calls to latch. Setting a 1 will allow even up and odd down hall calls to latch. Setting a 2 will disable the block operation.

When the group parameter is set to 1 or 3 (Micro Flits dispatcher) the operation of block operation is as follows. Setting a 0 will disable the block operation. Setting a 1 or 2 will return the car to the top terminal landing. The first trip down the car will put in even car calls. The next trip down the odd car calls will be latched. All of the car calls will continue to function properly.

**BLDG_TOP_FLOOR** - Value, 2-24. Preset value 24. Set this to the total number of building landings. The value must be the same on the two cars. This parameter is used by the system when the group parameter is set to two.

**BLDG_LOBBY_FLOOR** - Value, 1-24. Preset value 2. The value programmed in the lobby floor will adjust the parking floor and the floor used for lobby door time. The value must be the same on the two cars. This parameter is used by the system when the group parameter is set to two.

**FLOOR_TRAVL_TIME** - Value, 0-16 seconds. Preset value 5. The value programmed in the floor travel time should reflect the high speed flits time for one floor. This parameter is used by the system when the group parameter is set to two.

**FLOOR_STOP_TIME** - Value, 0-30 seconds. Preset value 7. The value programmed in the floor stop time should reflect the average halted time at one floor. This parameter is used by the system when the group parameter is set to two.

**ZONING** - Value, 0-2. 0 = No, 1 = LOB, 2 = ALL. Preset value 2. 0 = no zoning. 1 = the first free car will zone to the lobby. 2 = the first free car will zone to the lobby and the second free car will zone to the floor value programmed in SEC_ZONE_FLOOR. This parameter is used by the system when the group parameter is set to two.

**SEC_ZONE_FLOOR** - Value, 1-24 Preset value 13. The floor value programmed in this parameter will be the second zoning floor if the zoning parameter is set to two. This parameter is used by the system when the group parameter is set to two.
ETA_ADJUSTMENT - Value, 0-10. Preset value 5. This parameter is used to adjust the weight given to the factors which modify the ETA's. These factors put an ETA penalty on a car which: is stopped or landing, has an open door, is idle, is at the lobby, and when the other car has a call already assigned or has a car call for the same floor. 0 = No weight given. 10 = max weight given.

SPECIAL_LED - Value, 0-1 Preset value 0. 0= with IC#10 1=with M1 jumper. This parameter is used with Mf884 software and S90 version 2 systems.

MPU_TYPE - Value, 0-2. Preset value 0. The value programmed in mpu type should match the version of mpu card being used.
0= 2  1= 1.1  2= 1.0  (Version printed on mpu card.)

EMUlator - Value, Preset value 0. 0= no emulator 1= emulator present. This is used by the test department and is not to be used by elevator field personal. This parameter must be set to a 0.

TEST_MODE - Value, 0-9999. A value programmed in this parameter will allow the micro to be run in a simulation mode. When in this mode the up/dn leveling, step, door zone, top/bot position, door open/close limit inputs are ignored. The operation of these inputs are simulated. All of the other inputs and outputs will function normally. The travel time between landings will be the time set in the parameter FLOOR_TRAVL_TIME. This is used by the test department, and is not to be used by elevator field personal.

9.2 Diagnostic Parameters

The diagnostic parameters are located at the end of parameter entry. The number of faults for each for each parameter are stored and can be viewed. The number of faults stored will be retained with the power removed from the controller. Viewing of these parameters and adjusting data is done the same as the parameter entry. These parameters can be set to 0 to capture a problem over a period of time.

NOTE: The diagnostic parameters are not reset to 0 when power is removed.

Listed below are the diagnostic parameters.
RESET_CTR - Value, 0-65535. This number reflects the number of times the system has been reset by reset button, and the number of times the power has been removed from the system.

FLT_RESET_CTR - Value, 0-65535. This number reflects the number of times the system is reset by the reset flight timer.

FLOOR_ERROR - Value, 0-65535. The number of times the car reaches a landing out of step.

LEV_ZONE_ERROR - Value, 0-65535. The number of times the car reaches a terminal landing with its position counter incorrect.
STEP_ERROR - Value, 0-65535. This counter reflects the number of position stepping errors.

DOOR_SAFETY_CTR - Value, 0-65535. This counter reflects the number of door lock or safety circuit failures when the car was in motion.

RESET_STOP_CTR - Value, 0-65535. This counter reflects the number of stops from internal resets.

RESET_MISS_CTR - Value, 0-65535. This counter reflects the number of stops from miscellaneous internal resets.

PASS_TARG_ERROR - Value, 0-65535. This counter reflects the number of stops from a passed target floor.

NO_MOTION_ERROR - Value, 0-65535. This value will reflect a internal motion error when motion is called for.

NO_DIRECTION_ERROR - Value, 0-65535. This value will reflect a internal direction error when direction is called for.

CKSUM_ERROR - Value, 0-65535. This value will reflect the number or times the parameters have been reset by the backup parameters.

B_MESSG_ERROR - Value, 0-65535. This value reflects a data communication error. It is used in group operation.

B_SPCOND_CTR - Value, 0-65535. This value reflects a data communication error. It is used in group operation.

B_PARITY_ERROR - Value, 0-65535. This value reflects a data communication error. It is used in group operation.

B_OVERRUN_ERROR - Value, 0-65535. This value reflects a data communication error. It is used in group operation.

B_FRAMING_ERROR - Value, 0-65535. This value reflects a data communication error. It is used in group operation.
9.3 Series 90 Re-Programming Procedure

If you have determined that parameters have been altered through electrical noise interference or the parameter values have been totally lost, it will be necessary to re-program the system memory to the factory preset values.

Note: Make sure all field connections to limits, leveling unit, and controller are correct before assuming program problems.

If the parameters become damaged or lost, the system will sometimes get an access code programmed into its memory. When this occurs, call O. Thompson for the access over ride code and then perform Step 1. If, by pressing the [ * ] key twice, an access code is not asked for, skip to Step 2.

Step 1.
A) Press the [ * ] key twice.
B) Enter the bypass code given by O. Thompson to over ride the false code that is in the system and press the [ # ] key.
E) Enter a value of “00000” and then press the [ # ] key.
F) Press [ * ], then press [ 4 ] and “PARAMETER ENTRY” should appear on the screen.

The access code is now set such that no access code is needed to enter the system.

Step 2.
A) If “MAIN MONITOR” is currently displayed on the screen, press [ 6 ] until “PARAMETER ENTRY” appears on the screen.
B) Press [ 8 ] to see the first parameter in the list.
C) Check the value of all suspect parameters and modify them as necessary.
D) After the values have been reset, run the car to see if the problem is remedied. If not, continue to step 3.

Step 3. If the value of any of the parameters causes the display to read “OUT OF RANGE”, or if the problem still exists after performing the above steps, the parameter values must be reset to the original factory values.

A) “PARAMETER ENTRY” should appear on the screen to begin.
B) Press [8] to see the first parameter in the list.

Note: On versions of software dated 10/17/95 or later, PRESET PARAMS will be the first parameter in the list. It will not be necessary to perform step C of this procedure.

C) Press [ 5 ] once to gain access to the middle of the parameter list.
F) Enter a value of 100, then press [ # ], then press [ 8 ].
G) Enter a value of 125, then press [ # ], then press [ 8 ].
H) Enter a value of 200, then press [ # ], then press [ 2 ].

The memory is now re-programmed to the factory preset values. The following parameters must be reset for job site conditions:

Group_Car  Hydro_Car  Speed_Oper
Top_Floor    Lobby_Floor

For Self Contained Duplex:

Bldg_Top_Floor
Bldg_Lobby_Floor

You must also return to SET BLIND LANDINGS, and SET LANDINGS to rest any special landing conditions such as front and rear openings, and landings serviced by one car and not another.

9.4 Storing Parameters to Non Volatile Memory

On versions of software prior to 6/28/95, parameters would normally be saved any time a new value is entered. We found this to leave the parameter section of the memory open to electrical noise spikes that would change parameters and “crash” the system memory. For that reason, changes have been made to the manner in which parameters are allowed to be written to memory.

Software Versions 6/28/95 - 10/17/95

When changing parameters with software versions between 6/28/95 and 10/16/95, it is necessary to go back to the main monitor (status diagnostic display on screen) for at least 5 seconds in order for the parameter changes to take effect.

Software Versions 10/17/95 - Later

When changing parameters with software versions of 10/17/95 and later, it is necessary to go to the PRESET_PARAMS parameter, and enter a value of “250”. You must then wait at least 2 seconds. During this time period, LED59A on the motherboard will stop blinking. When the parameters have been successfully stored, LED59a will begin to blink again at four times per second.

9.5 Car Controller Parameters S 90 V2
CAR_CALL_TIME______
HALL_CALL_TIME______
LOBBY_TIME______
REOPEN_TIME______
BEAM_REMAKE_TIME______
FREIGHT_DR_TIME______
NUDGING_TIME______
PRE-OPEN______
NUDG_DEVICES______
POS_SAVE_RUNNING______
SIM_DOOR______
DOOR_POLARITY______
DOOR_RECALL______
INDEP_MODE______
INDEP_LOCKS______
PARK_DELAY_TIME______
PARKED_OPEN______
CLEAR_CALLS______
NUIS_CC_STOPS______
HCP_MODE______
RESETFLT_TIME______
STALL_TIME______
LOCKOUT_TIME______
MED_DOOR_TIME______
ATT_BUZZER_TIME______
GEN_CAR_MODE______
GEN_SHTD_TIME______
EMP_DOOR_OPEN______
CAR_NUMBER______
MAX_EMP_CARS______
EMP_PER_XFER______
ALT_EMERG_INPUT______
BRAKE_PICKED______
RELEVELING______
TOP_FLOOR______
LOBBY_FLOOR______
SPEED_OPER______
CAR_LANT_TIME______
CAR_LANT_TYPE______
HALL_LANT_TYPE______
PL_TYPE______
HOSPITAL_CAR______
HYDRO_CAR______
FIRE_CODE______
PRIM_RECALL_FLR______
ALT_RECALL_FLR______
ALT2_RECALL_FLR______
PH1_NUDGING______
EQK_CTRWT_FLR______
SEC_RETN_FLR______
DIAL_PAUSE______
GROUP_CAR______
BLOCK_OPERATION______
BLDG_TOP_FLOOR______
BLDG_LOBBY_FLOOR______
FLOOR.TRAVL_TIME______
FLOOR_STOP_TIME______
ZONING______
SEC_ZONE_FLOOR______
ETA_ADJUSTMENT______
SPECIAL_LED______
MPU_TYPE______
EMULATOR______
TEST_MODE______