CARRIER
REDISTART™ MICRO
INSTRUCTION MANUAL

SOLID STATE MOTOR CONTROL

INSIDE DELTA
with
PIC II CONTROLS
&
MX POWER SECTION

****CAUTION****

Motor is not mechanically isolated from main power. Motor disconnect must be locked open before it is safe to service or inspect motor or machine parts.

BENSHAW
ADVANCED CONTROLS & DRIVES

Pub. #890003-05-00

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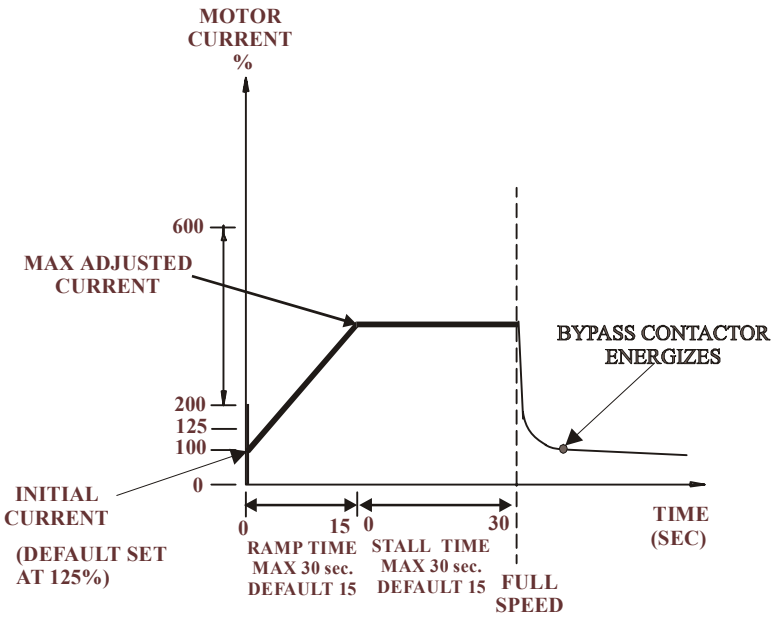
REDISTART MICRO SERIES SOLID STATE STARTER

1.0 DESCRIPTION

The ***Carrier RediStart Micro*** is a microprocessor controlled solid state reduced voltage starter for three phase induction motors which incorporates Benshaw's patented integral bypass contactors. The starter is connected "Inside the Delta" on Carrier's 6 lead, wye delta, chiller motor. The ***RediStart Micro*** operates on a user programmed current ramp for optimal motor control and protection. This type of operation is referred to as closed loop current control. The motor is accelerated from the initial current setting to the maximum current setting during the defined ramp time. When the motor is up to full speed, the SCRs are then bypassed utilizing Benshaw's integral bypass contactors. Figure 1 depicts the standard operation mode of the ***RediStart Micro***.



CURRENT RAMP MODE
FIGURE 1

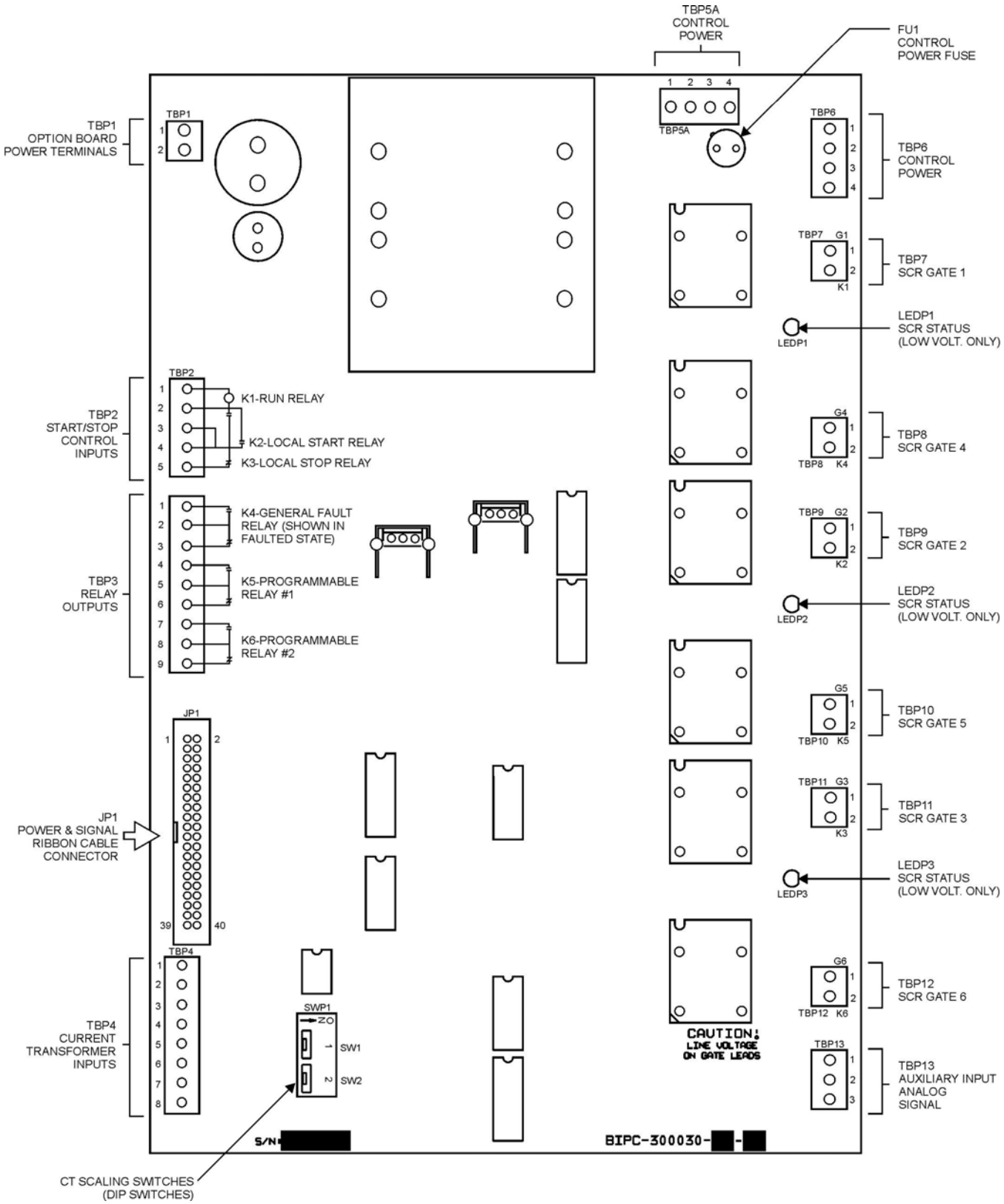
Current Ramp mode is recommended for high inertia and heavy load applications where full motor torque is required to accelerate the load. For this mode, the maximum current setting is limited to 85% of locked rotor torque. As the current ramps toward the maximum setting, increasing starting torque is developed to accelerate the motor to full speed. **NOTE:** Even though the maximum current is set at 85%, this maximum will only be reached if the load requires 85% to achieve full speed. Ramp time is also a factor in determining whether or not max current is reached.

Constant Current mode is recommended for light loads, or when the power supply is limited. The motor must not require full torque to accelerate the load under this constant current mode. For this mode, the maximum current setting may be reduced to deliver the required starting torque to the motor. Setup should be done under worst case load conditions to ensure acceleration to full speed under all load conditions.

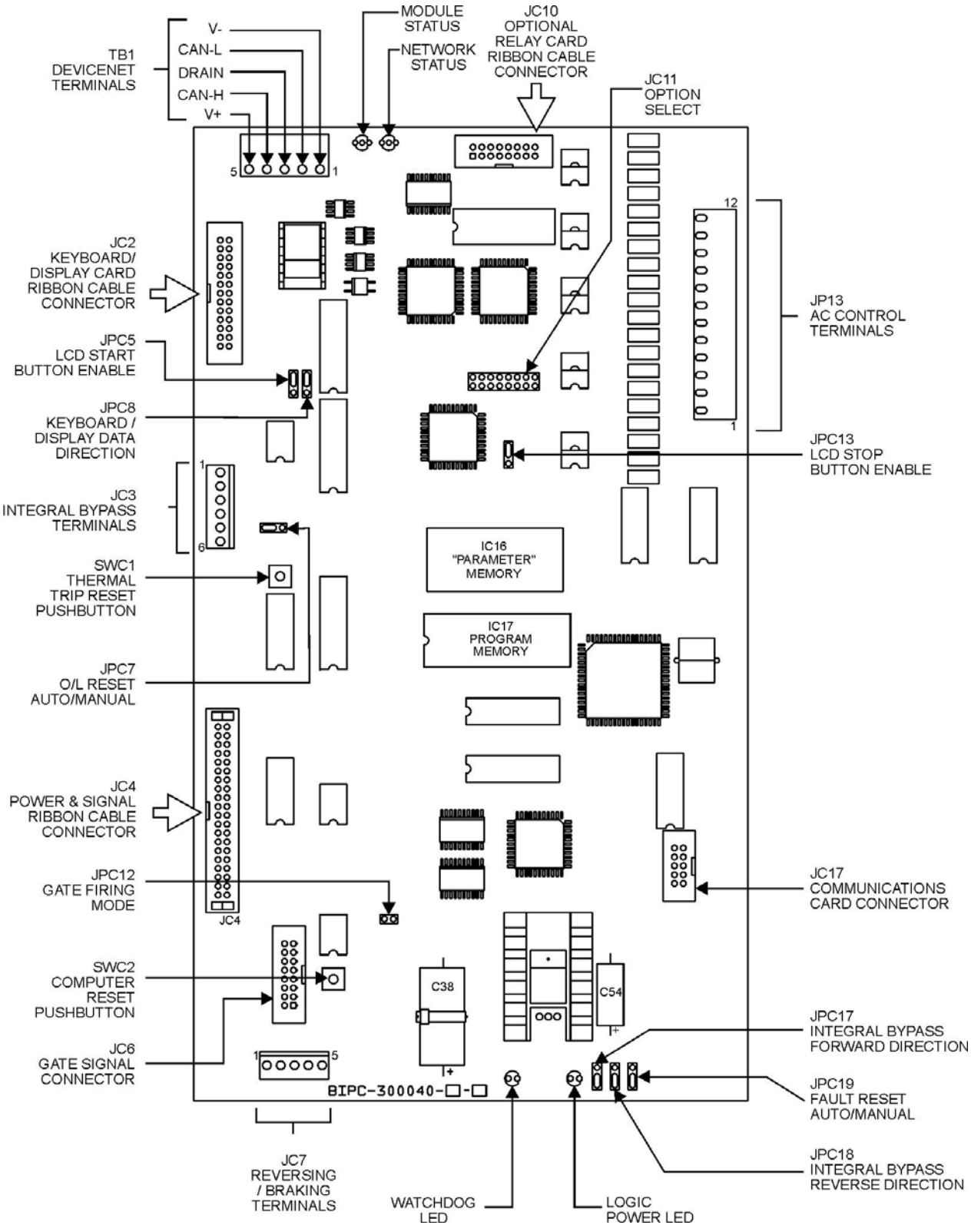
1.1 STANDARD FEATURES

- Integral bypass contactors
- LCD and LED status and diagnostics
- Solid State Motor Overload
- Instantaneous electronic over-current trip
- Open/Shorted SCR Detection
- Single Phase Protection
- Phase rotation is ABC (Fault detected if otherwise)
- Current regulated, closed loop control
- Full fault annunciation
- Accumulated event recorder (99 events)
- Programmable metering display (amps, volts, Freq., overload content, P.F.)
- Plain English operation via LCD display interface
- Adjustable ramp time
- Initial/Max current adjust

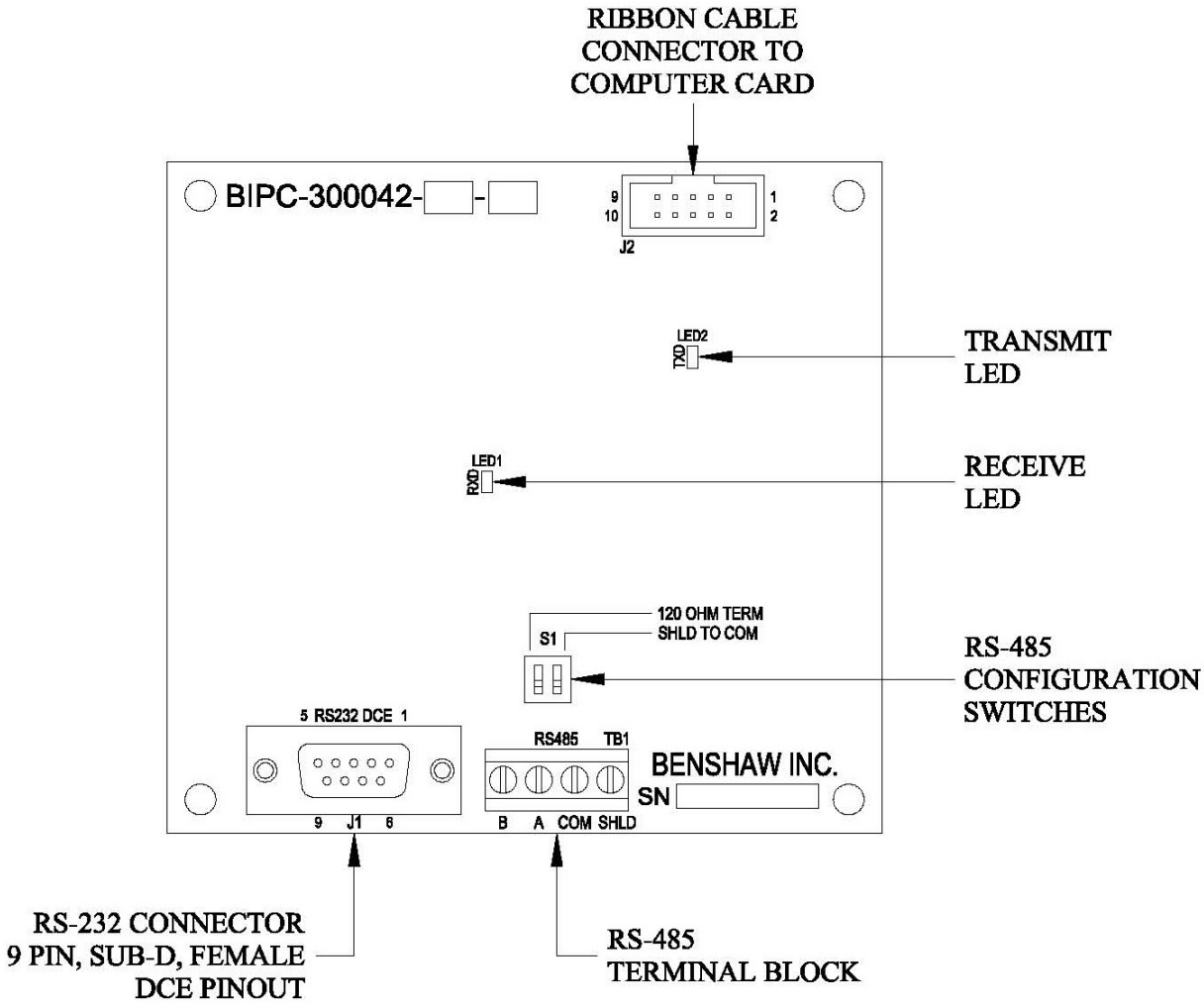
1.2 REDISTART MICRO POWER CARD LAYOUT



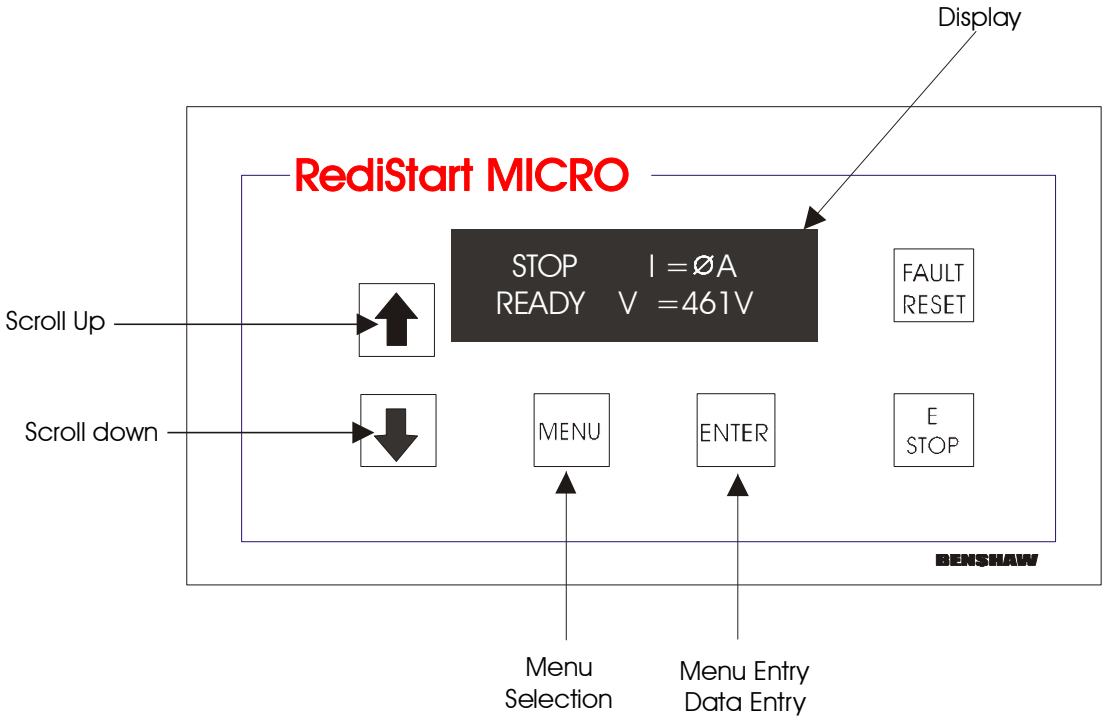
1.3 REDISTART MICRO COMPUTER CARD LAYOUT



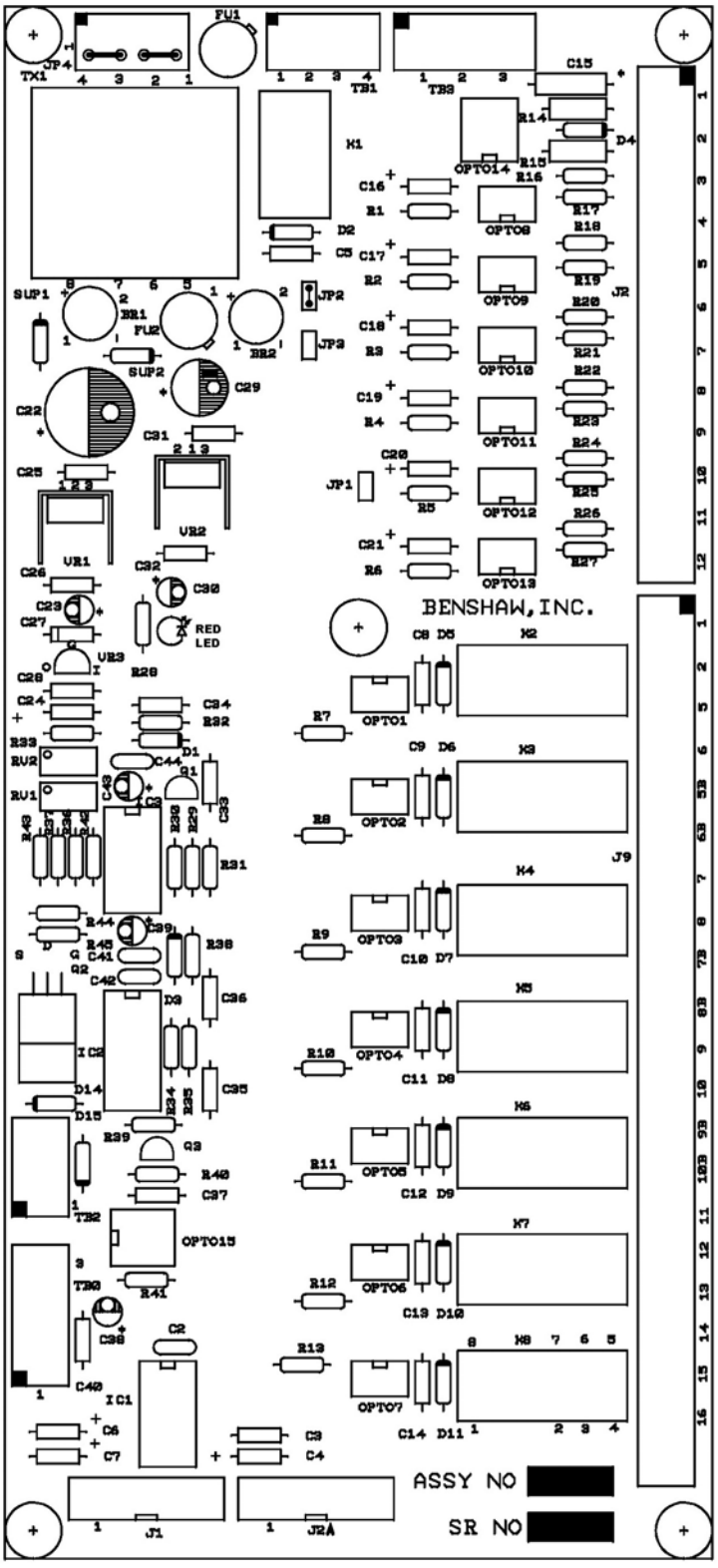
1.4 RS-485 CARD LAYOUT



1.5 DISPLAY / KEYPAD LAYOUT



1.6 I/O BOARD


BENSHAW, INC.
ASSY NO
SR NO
RED LED
OPTO1
OPTO2
OPTO3
OPTO4
OPTO5
OPTO6
OPTO7
OPTO8
OPTO9
OPTO10
OPTO11
OPTO12
OPTO13
OPTO14
OPTO15

2.0 CONTROL

2.1 *RediStart Micro*

The ***RediStart Micro*** solid state control is a two PC card system. The power card (refer to power card layout diagram on page 4) generates the gating signals for the SCRs and is also the analog data acquisition point. The computer card (refer to computer card layout on page 5) provides digital control for the system. Together, these two cards control the operating characteristics of the entire solid state starter system. The following sections explain the adjustments and configurations necessary for proper operation of the starter.

2.2 JUMPER SETTINGS & FAULT RESETTING

All jumpers are factory set and do not need to be field adjusted.

Motor Thermal Overload:
The overload is reset through the CVC. Reset can only be accomplished after sufficient motor cooling has occurred. When the motor reaches 90% of its thermal content the message ***O/L WARN*** will appear on the ***RediStart Micro*** LCD display. Upon motor overload, the ***RediStart Micro*** locks an overload condition until the motor has cooled to less than 60% thermal content. This is indicated by ***OL lock*** appearing on the LCD display. This message will change to ***OL trip*** when sufficient cooling has occurred. When the overload has been reset, the display will return to the ***Ready*** state.

2.3 CT RATIO & BURDEN SELECT

Two small DIP switches located on the power card (see power card layout on page 4, DIP) permits current transformer ratio scaling according to motor full load current. This switch will be factory set but can be adjusted as per the table below if needed. The switches are "ON" when moved to the right and "OFF" when moved to the left.

CURRENT TRANSFORMER CT1 - CT3				
Starter Frame Size (Amps)	**Motor RLA Range (Amps)**	**CT Ratio**	**Micro Power Card (BIPCMIPWR-C1) Overload Switch Settings SW1-1**	**SW1-2**
200 Amps	95-135 Amps	3900:1	OFF	OFF
200 Amps	136-200 Amps	5760:1	OFF	OFF
300 Amps	201-231 Amps	2640:1	ON	OFF
300 Amps	232-300 Amps	3900:1	ON	OFF
480 Amps	301-340 Amps	3900:1	ON	OFF
480 Amps	341-480 Amps	5760:1	ON	OFF
600 Amps	481-580 Amps	2640:1	ON	ON
600 Amps	581-600 Amps	3900:1	ON	ON
740 Amps	601-740 Amps	3900:1	ON	ON
1250 Amps	741-855 Amps	3900:1	ON	ON
1250 Amps	856-1250 Amps	5760:1	ON	ON

****CAUTION****
Do not adjust dip switches when the motor is running. The switch may be damaged.

2.4 LED INDICATION

There are several diagnostic LEDs located on the computer and power card. These indicators are primarily used for troubleshooting situations. The table below lists these LEDs by name and function. Refer to power and computer card layouts for LED locations.

CARD	LED#	NAME	INDICATOR
COMPUTER	**LEDC2**	**POWER**	**On when control voltage is present**
COMPUTER	**LEDC1**	**WATCH DOG/ POWER FAIL/RST**	**On if computer has failed, if control reference voltage has failed, or CPU is resetting**
POWER	**LED 1 - 3**	**GATE STATUS**	**Indicates SCR Condition.. Stop - Lights must be on, otherwise SCR is shorted. Start Mode - Lights will become dimmer as motor accelerates. Run Mode - Lights must be fully off, otherwise SCR is open or misfiring.**

3.0 TECHNICAL DATA

3.1 SUPPLY VOLTAGE

LINE POWER: Three Phase, 200 thru 600V, 25Hz thru 70Hz
CONTROL VOLTAGE: Single Phase, 115V, 50-60Hz : -25% +15%
(See nameplate for design)

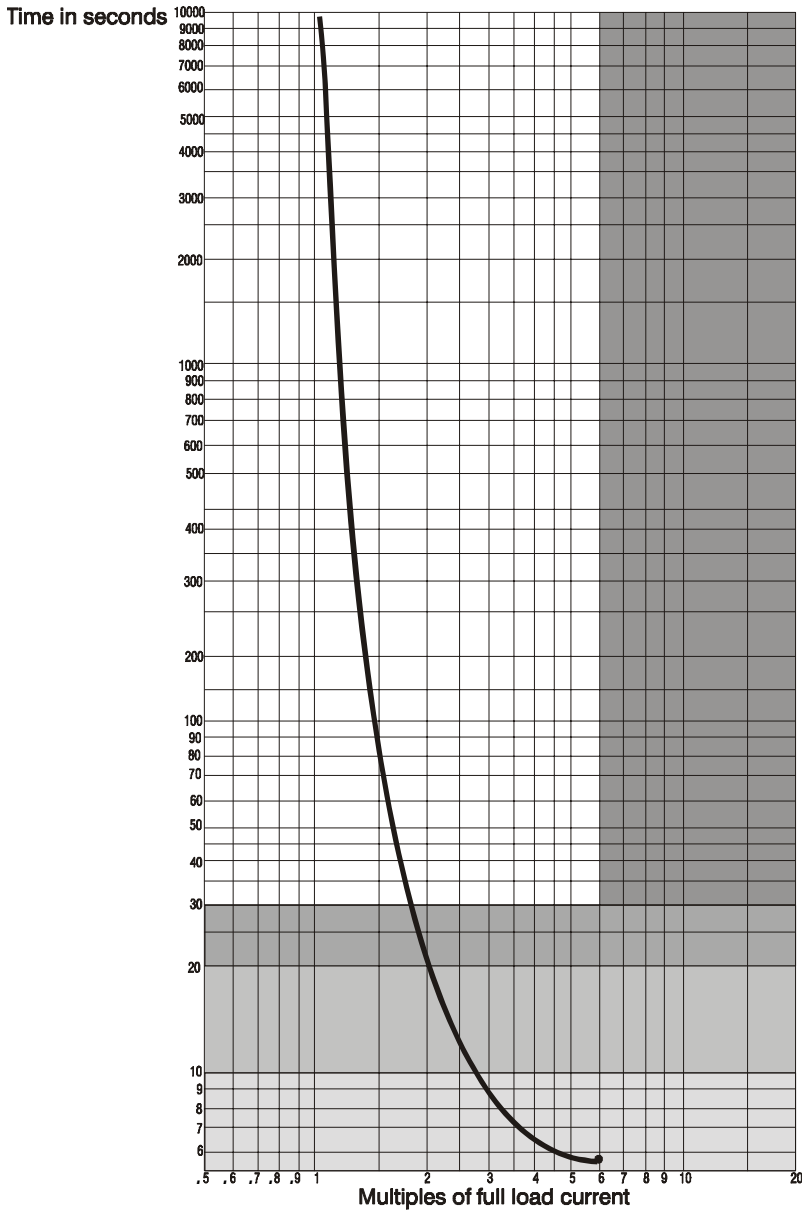
3.2 CONTROL TERMINALS (Located on the power card)

TBP6-1,3 Control Voltage 115VAC –25% + 15%
TBP3-2 Fault Contact Common
TBP3-1 N.O. Start Enable Contact
TBP3-3 N.C. Start Enable Contact
TBP3-5 Aux #1 Common
TBP3-4 Aux #1 N.O.
TBP3-6 Aux #1 N.C.
TBP3-8 Aux #2 Common
TBP3-7 Aux #2 N.O.
TBP3-9 Aux #2 N.C.

Output Contact Ratings: 5A, 250VAC Resistive
(Power card and I/O card) 2A, 250VAC Inductive
3A, 30VDC

3.3 OVERLOAD CURVE

The following curve serves to define current versus trip times that can be expected from the electronic motor overload.



4.0 RECEIVING & INSTALLATION

The Carrier ***RediStart Micro*** has been packaged to protect it from damage caused by normal handling during shipment, however mishandling may cause damage to the system. Unpack and inspect the unit as soon as it is received and check for any shipping damage. If damage is suspected, notify the carrier immediately. Any damage reports must be filed by the customer since all shipments are F.O.B. shipping point unless otherwise specified.

4.1 INSTALLATION GUIDELINES

Standard NEMA 1 starters must be installed indoors in an area that is not exposed to direct water spray. Do not install in areas where the ambient temperature falls below 0°C or exceeds 40°C unless this was noted at the time of order placement and special precautions were taken to protect against these abnormal temperatures.

Heatsink temperatures can run as high as 70°C during normal operation. Do not mount the starter in contact with any material which cannot accept this heat.

****CAUTION****

Equipment is at line voltage when AC power is connected. All phases must be disconnected before it is safe to work on machinery, or touch motor terminals or control equipment parts.

****CAUTION****

Do not close CB1 when motor is in vacuum. Damage to breaker and motor will result.

****CAUTION****

Do not attempt to megger the RediStart Micro Solid State Starter as damage will result.

****CAUTION****

Motor is not mechanically isolated from main power. Motor disconnect must be locked open before it is safe to service or inspect motor or machine parts.

4.2 SAFETY PRECAUTIONS

The electrical code requires that all equipment, (starter, motor, operator station, etc.) be properly grounded. An incoming disconnect must be locked open before wiring or servicing this starter, motor, or other related equipment. This equipment must only be serviced by qualified personnel fully familiar with the equipment.

Short circuit protection is provided by a circuit breaker sized properly for the particular motor starting application. Standard interrupting capacity is 30K amps. Optional 65K Amps interrupting capacity is available upon request.

4.3 WIRING GUIDELINES

The National Electrical Code requires that an approved circuit disconnecting device be installed in series with the incoming AC supply and mounted in a location readily accessible to personnel installing or servicing this equipment. A circuit breaker is supplied with the Carrier ***RediStart Micro*** starter to isolate power from the motor terminals. A separate disconnect must be provided by others in order to isolate power from the starter.

Power factor correction capacitors (PFC) MUST NOT be connected between the *RediStart Micro* and the motor. If used, they must be connected ahead of the starter. The up-to-speed output contact, which is available with each ***RediStart Micro,*** should be used to properly sequence the capacitors after full motor speed has been reached. If ordered from the factory with PFCs, the PFCs will be prewired and sequenced as indicated above.

5.0 BEFORE POWER-UP

The ***RediStart Micro*** has been fully tested before leaving the factory, to ensure a rapid and problem free start-up. Before applying power to the starter, consult the start-up check list below.

- ⇒ **Open the main circuit breaker (CB1) on the starter.**
- ⇒ **Inspect Starter and remove any foreign matter.**
- ⇒ **Ensure that all electrical connections are as per the schematic supplied with the starter.**
- ⇒ **Ensure that all connections are properly torqued.**
- ⇒ **Apply incoming three phase power to the starter .**
- ⇒ **Turn on auxiliary circuit breakers CB2 and CB3, then wait 30 seconds.**
- ⇒ **Turn on main circuit breaker (CB1).**
- ⇒ **Check that LED 2 (PWR) on the computer card is lit.**
- ⇒ **Enter system parameters from the CVC and on the LCD display board if required. The starter is normally factory set allowing the starter to be operated immediately. (Refer to the following sections 5.1 and 5.2).**

5.1 PROGRAMMING THE REDISTART MICRO

The ***RediStart Micro*** may require programming before it can properly control your application. Programming is a simple procedure achieved by setting operational parameters on the LCD Display. When control power is applied to the ***RediStart Micro*** and line power is present, the main display should be similar to the following.

Stop	**I = OA**
Ready	**V = 461V**

RediStart Micro programming is done in 2 programming menus. There is also an event recorder viewing menu. The Programming menu structure is presented below in tree format.

MAIN DISPLAY

MENU 1 Starter Set-up	MENU 2 Meter Set-up	MENU 3 Event Recorder
Initial Current as % RLA	Meter #1 Display	Events 1-99
Max. Curr As % LRA	Meter #2 Display	
Ramp Time (sec.)		
CT Ratio:1		

5.2 CHANGING PARAMETERS (Reference keypad layout in section 1.5)

To select a specific menu and change parameter values:

1. Press the **MENU** button repeatedly until the desired menu is reached on the LCD display.
2. Press the **ENTER** button to access the displayed menu items.
3. Use the ↑ or ↓ arrow keys to scroll between menu items until the desired parameter is reached on the display.
4. Press the **ENTER** button to allow changing of the selected parameter value from the displayed value.
5. Use the ↑ or ↓ arrow keys to adjust the new listed value. The ↑ key increases the value while the ↓ key decreases the value. Holding the arrow key will progressively increase the rate of change. The display will stop changing the value when either the factory set minimum or maximum value is approached. For this reason the key must be released and re-pressed to make fine adjustments to the value.
6. When the correct value has been selected, press the **ENTER** key to store the new parameter value. If this is not done and step 7 is performed, the value will remain unchanged.
7. At this point, there are two options, the **MENU** key will return the display to the main display. The ↑ or ↓ arrow keys will move the display to the next menu parameter.
8. Step 1-7 may be repeated to enter into other menus.

NOTES:

- MENU 3 can only be viewed.
- Values may be changed when the motor is stopped or when the motor is running.

5.3 DESCRIPTION OF MENUS AND PARAMETERS

MENU 1: **STARTER SET-UP**

INITIAL CURRENT

This parameter is adjustable from 50%-300%. It sets the starting point for the closed loop current ramp. The parameter is set in percentage of full load current. Ideally this parameter should be set so that the motor develops just enough torque at start to rotate the load. Typical settings are from 100 - 300%. Default is 100%.

MAX. CURR
As % LRA

This parameter is adjustable from 30%-75%. It sets the endpoint for the current ramp. Under normal conditions, this parameter should be set to 55%. **NOTE:** This does not mean that the current during startup will reach this maximum setting, only if it is required to start the load will it be reached. For constant current applications, on the other hand, this value may be reduced to limit the motor's peak inrush current. This kind of setup is typically used where weak power systems, marginally sized transformers, etc., dictate some lower inrush current value than would be achieved by the first scenario. It must be noted at this time that the maximum current, in all cases, must be set high enough to allow motor acceleration to full speed under all load conditions. Monitor motor speed during startup to ensure that full speed is achieved with the maximum current that you have set under this parameter. Default is 55%.

RAMP TIME

This parameter is adjustable from 5-30 seconds. It sets the time in seconds taken to smoothly ramp from the initial current to the maximum current value. Typical setting are in the range of 10-20 seconds. During startup the motor may achieve full speed before the controller has ramped up to the maximum set current value. This is normal for many applications. It simply means that the motor and driven load did not require the set level of current nor max ramp time to achieve full speed. In this situation, if motor acceleration was acceptable during startup, no further adjustments will need to be made. Setting a ramp time of 0 seconds and the maximum current to 85% will cause the controller to act as a solid state contactor with an across-the-line start. Actual maximum currents achieved during motor starting are a function of both the selected ramp time and the inertia of the load on the motor during startup. Except on some high inertia motor loads, extending the ramp time typically serves to reduce the actual peak inrush currents experienced during motor starting. Default is 20 seconds.

CT RATIO

This parameter calibrates the controller to the current transformer ratio. The ratio will be factory set and need only be adjusted if the CTs are changed. The parameter can be confirmed by reading the ratio printed on the current transformers. Refer to section 2.3 on page 8 for standard CT ratios.

MENU 2: **I/O & DISPLAY**

METER #1 DISPLAY
METER #2 DISPLAY

Display Meters may be set to measure either Amps (A), Volts (V), Frequency (Hz), Motor thermal content (OL), or power factor (PF). When measuring current or voltage, AVG. Indicates an average of all three lines, SCL indicates scroll of all three lines and 1, 2, or 3 indicates a specific line measurement. (I.E. selecting V AVG will display the average voltage of all three lines. Selecting A2 will display the amperage through Line 2, while selecting ASCL will display the amperage through lines 1-3 alternately.

MENU 3: **EVENT RECORDER**

EVENT RECORDER

Displays 1-99 most recent events. See section 7.3 and section 8 for description and listing of codes and conditions.

6.0 APPLYING POWER

6.1 FINE TUNING

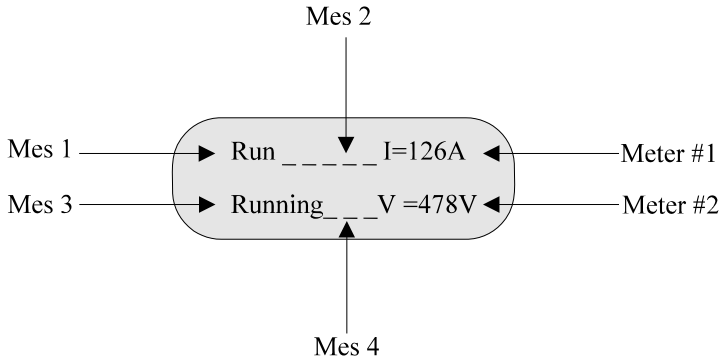
Once the start has been commanded, the motor should begin to rotate immediately. It should not stall. Increase the initial current setting in Menu 1 if necessary to correct an initial stall condition. Decrease the initial current if the motor begins rotating too quickly.

The ramp time can also be readjusted to extend or decrease the acceleration time. To speed up the acceleration, decrease the ramp time in Menu 1. To extend the acceleration, increase the ramp time. A ramp time setting of 5 seconds and a maximum current of 85% will cause the starter to act more like an across the line contactor.

7.0 DISPLAY

7.1 METER DISPLAY

The ***RediStart Micro*** has two user programmable display meters. These meters can be set to display either current, voltage, frequency, motor thermal content, or power factor. Meter #1 is displayed with units in the top right quadrant of the display (refer to diagram below). Meter #2 is displayed in the bottom right quadrant. Only the values displayed on meter #1 will be retained in history along with the description of the fault condition.



7.2 OTHER OPERATING MESSAGES

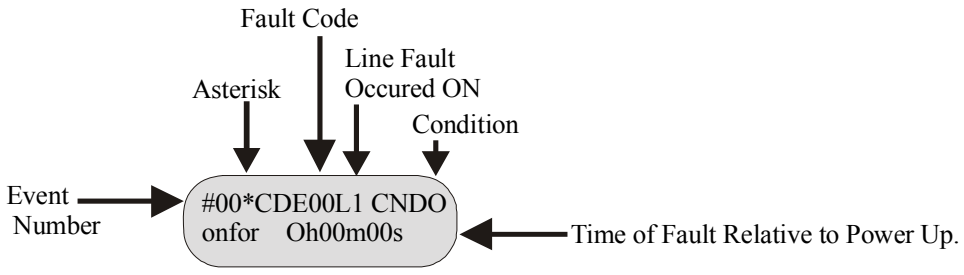
The ***RediStart Micro*** will display the following messages on the main display. (Refer to Meter display 7.1 on page 15).

MESSAGE	LOCATION	DESCRIPTION
Stop	Mes 1	Motor is not running, start command has not been given.
RUN	Mes 1	Motor is accelerating, start command has been given.
UTS	Mes 2	Motor is running at full speed and UTS contact is closed if enabled
Ready	Mes 3	All conditions OK to run, line voltage is present.
Accel	Mes 3	Motor is on current ramp, start command has been given.
Running	Mes 3	Motor is at full voltage, ramp is complete, bypass contactor is closed.
No Line	Mes 3	Line voltage is not present.
Fault	Mes 1	A fault has occurred, fault code and description will also be displayed see section 8.0 for fault codes.
O/L Warn	Mes 3	Motor is at 90% thermal content. Motor is about to overload. Fault 89 recorded.
O/L Lock	Mes 3	Thermal overload reset is locked out until motor has cooled to 60% thermal content. Fault 90 recorded.
O/L Trip	Mes 3	Motor thermal overload is ready to be reset.
ShutDWN	Mes 3	Loss of communications with Chiller Control (CVC). Starter is in shutdown mode. Fault 31 recorded.
PH Error	Mes 3	Phasing error (displayed only if in non-running state).
TIMEOUT	Mes 3	30 second wait after a starter reset.

7.3 FAULTS & EVENT RECORDER

If a fault occurs, the fault code, relative time of fault with respect to power up, and fault conditions will be recorded in the revolving event recorder. At the same time, the motor is shut down, the fault contact changes state, and the fault code and description is displayed. Section 8 provides a list of fault codes, condition codes, descriptions and possible causes.

The event recorder may be viewed by following the steps necessary to enter MENU 3 (refer to section 5). Once within this menu, sequential fault codes may be viewed by scrolling with the arrow keys. The event recorder stores the fault code, time the fault occurred relative to power-up, a condition code, and an asterisk to indicate the most recent fault. Fault code and condition code descriptions are provided in section 8.



GENERAL TROUBLESHOOTING

If problems are experienced on a new equipment start up, the following should be verified:

- Ensure all metallic particles and foreign matter has been removed from the starters introduced by cutting holes, wiring, etc. If necessary use a low pressure, high volume air hose to clean printed circuit cards and system components. Use a vacuum to remove debris from the enclosure.
- Inspect all components for damage caused by shipping, installation or environmental factors.
- Thoroughly inspect every connection point in the system. Gently tighten and confirm all control and power wire connections. Check all the bolts and screws on the solid state starter to verify tightness.
- If the unit is shutting down due to current imbalance pay careful attention to the current transformers supplying the reference signals to the power card TB4 terminals 1, 3, 5, 7, 8 to verify they have a good mechanical and electrical connection to the Power Card circuit.
- Note that a current imbalance trip in the starter could be caused by a variety of problems. If tripping persists verify the AC power feeding the unit has properly balanced voltages prior to start and during the starting sequence while the chiller is accelerating. Disconnect the motor and check with a megger to verify the motor is not breaking down under full voltage conditions.
- Verify power meets nameplate requirements. (Refer to equipment nameplate for voltage/amperage/frequency ratings).

Typically if a problem occurs with the motor starter, a fault or event message will be displayed by the LCD on the chiller control panel and motor starter. Refer to chiller display and “Diagnostic and Troubleshooting Guide” first, then refer to starter troubleshooting guide. The event recorder will log all stops/starts and fault or trips. There is additional information on fault codes in the pages following.

The starter is designed to always have power applied to the control printed circuit boards and micro processor for troubleshooting purposes. Caution is necessary therefore, as power will be present in the starter even though CB1 the main circuit breaker is disconnected.

8.0 TROUBLESHOOTING

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
PWR (LED 1) on computer card not lit & no display	X	1 120VAC not present Blown fuse (FU 1) located on Micro Power Card on rear of control panel	1 Check 120VAC source Inspect and replace fuse if necessary
		2 No main power applied	2 Check primary of CB1 for line power
		3 Fuses FU1, 2 or 3 open or CB2 tripped	3 Inspect and correct (fuses may be accessed by removing the right side of the enclosure)
PWR LED on computer card is lit, no display	X	1 Loose or defective ribbon cable	1 Check ribbon cable connection between display and computer card
		2 Defective display or computer card	2 Replace display, then computer card
WD/PF/RST (LED 2) on computer card lit	X	1 CPU Fault	1 Reset CPU card (Consult Factory)
		2 Low power supply	2 Inspect 120VAC and correct problem
Motor does not start	X	1 Incorrect control wiring	1 Inspect and correct
		2 Power On pilot light not lit, CB1 is tripped or turned off	2 Check for any fault codes through LCD, reset breaker
		3 Motor is not connected properly	3 Inspect and correct
		4 Defective control boards	4 Check LED's and input commands to determine fault
		5 Incorrect control setting	5 Check and correct
Main disconnect trips	X	1 Shunt trip activated by micro control of starter	1 Check for fault/event message in LCD display. Reset micro and breaker.
		2 CVC activated the shunt trip	2 Check for fault. Reset CVC and breaker.
		3 Magnetic trip activated breaker (if happens at startup)	3 Raise magnetic trip.

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 0	X	1 No fault occurred. Used to store conditional information.	
FAULT CODE 2	X	1 Phase sequence not ABC	1 Swap any two incoming lines
FAULT CODE 3	X	1 Very distorted or noisy line	1 Check line quality, consider installing a line reactor (on 120V supply)
FAULT CODE 4	X	1. Line frequency is less than 23Hz 2 Failing CPU card	1 Check line frequency 2 Contact factory possible hardware failure on CPU card.
FAULT CODE 5	X	1 Line frequency is greater than 72Hz	1 Check line frequency
FAULT CODE 11, 12 & 15	X	1 Line phasing error, phase sequence has changed since last start command	1 Press Fault Reset
FAULT CODE 16	Shunt Trip CB1	1 Extreme noise on line 2 Control or power wiring too close to the ribbon cable. 3 Failing CPU card	1 Add suppressers to control power wiring 2 Move ribbon cable or wiring to increase separation. 3 Replace CPU card
FAULT CODE 17	X	1. Line voltage high Greater than 150%	1 Inspect line and correct Check line to neutral voltages at power distribution
FAULT CODE 18	X	1. Line voltage high Greater than 115%	1 Inspect line and correct Check line to neutral voltages at power distribution
FAULT CODE 19	X	1. Line voltage high Greater than programmable level in CVC	1 Inspect line and correct Check line to neutral voltages at Power Distribution
FAULT CODE 20	X	1. Line voltage high Less than 75%	1 Verify line voltages
FAULT CODE 21	X	1. Low line voltage Less than80%	1 Verify line voltages
FAULT CODE 22	X	1. Low line voltage Less than 85%	1 Verify line voltages
FAULT CODE 23	X	1. Low line voltage Less than programmable level in CVC	1 Inspect line or increase PGM voltage level in CVC

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 24	X	1 Line 1 current is out of balance	1 Inspect and correct or increase current imbalance level in CVC
		2 Line 2 current is out of balance	2 Inspect and correct or increase current imbalance level in CVC
		3 Line 3 current is out of balance	3 Inspect and correct or increase current imbalance level in CVC
		4 Failed SCR's	4 If defective SCR is found replace the complete phase assembly (1,2, or 3) if possible. If this is not possible refer to service note SN12873 for replacing individual SCR's Refer to Service Note SN8833 "Testing SCR Condition in Solid State Starters"
		5 Poor connections or improper wiring between power card and SCR's	5 Refer to wiring diagram. Inspect and correct, verify all red and white gate connections are tight
		6 Defective Power card failing to turn on SCR gate	6 Replace power card. Should have .5 to 1.5VDC on output terminal power card to gates of SCR's
		7 Poor or improper connection in motor or motor failure	7 Inspect connections, test the motor for shorts or open windings. (Disconnect completely all motor leads from the starter prior to any testing with a megger as damage could occur to starter or components contained in the starter)
		8 Improper current transformers installed or defective	8 Test for continuity and refer to Section 2.3 for proper size current transformers
		9 Improper current transformer burden switch selection on power card	9 Refer to Section 2.3.

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 25	X	1 True voltage imbalance continuous 2 Temporary voltage disturbance	1 Increase voltage imbalance level 2 No action
FAULT CODE 29	Shunt Trip CB1	1 RAM battery is new or has lost data 2 Battery has failed or has poor connection 3 Extreme noise spikes may cause overwrite of data (welding, arcing, lightning)	1 While holding the ↓ key, press fault reset. **NOTE:** All menu parameters must be re-entered 2 Remove and re-install battery or replace with new battery and re-enter parameters. (See Appendix A, 10.0) 3 Reset and re-enter parameters, protect from power disturbances
FAULT CODE 30	Shunt Trip CB1	1 Default parameters have been loaded from the RAM chip	1 Reset computer
FAULT CODE 31	Event log only	1 Loss of communications with CVC	1 Inspect wiring Verify CVC has power and is operational
FAULT CODE 32	Event log only	1 Communications re-established with CVC	1 None required
FAULT CODE 40	X	1 Voltage phase loss	1 Check voltage inputs on the power card
FAULT CODE 41	X	1 Current phase loss	1 Check CT''s and CT wiring to power card
FAULT CODE 51	Shunt Trip CB1	1 Motor locked rotor current exceeded	1 Verify motor locked rotor setting is corrected 2 Verify that motor shaft is free
FAULT CODE 52	Shunt Trip CB1	1 Starter locked current exceeded	1 Verify starter locked rotor setting is correct 2 Verify that motor shaft is free
FAULT CODE 54	X	1 No connections, CT's disconnected	1 Verify all connections
FAULT CODE 55	X	1 Current exceeded 110% of RLA at run	1 Verify correct RLA 2 Verify loading of chiller

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 56	Shunt Trip CB1	1 Current while stopped	1 Inspect unit for shorts
FAULT CODE 64	X	1 High condenser pressure cut-out	1 Verify condenser pressure
FAULT CODE 65	X	1 One or more SCR's have failed open	1 If defective SCR is found replace the complete phase assembly (1,2, or 3) if possible. If this is not possible refer to service note SN12873 for replacing individual SCR's Refer to Service Note SN8833 "Testing SCR Condition in Solid State Starters
FAULT CODE 66	X	1 Failing power card 2 Wiring problem in the run current	1 Replace power card 2 Check run circuit wiring
FAULT CODE 67	Shunt Trip CB1	1 Emergency stop pushbutton pressed on LCD	1 Inspect and correct
FAULT CODE 69	X	1 Shunt trip fuse blown	1 Replace fuse FU4
FAULT CODE 70	X	1 Low control voltage 2 Loss of incoming power 3 Fuses FU1, 2, 3 or CB2 open	1 Inspect control voltage and correct 2 Inspect and correct 3 Inspect and correct
FAULT CODE 71	Shunt Trip CB1	1 Ground Fault	1 Inspect motor and wiring to motor Check with ohmmeter and megger if necessary. When using a megger disconnect all motor leads from the starter, damage could result to starter or starter components.

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 73	X	1 Bypass fault, all bypasses did not close when commanded 2 Bypass contactor not pulling in, fuses and wiring appear good	1 Inspect bypass contactor coil and auxiliary contact wiring - correct or replace if required. 2 Verify system line voltage. If less than 330VAC make sure JP1 is installed on bypass card. Check with an ohmmeter the bypass contactor coils refer to schematic on door.
FAULT CODE 74	X	1 Up to speed fault, motor never achieved full speed 2 Weak incoming voltage, line drop, brown-out etc. 3 Motor stalled or overloaded	1 Increase max current setting verify that motor FLA and LRA is set correctly in the CVC. 2 Inspect and correct. 3 Inspect and correct.
FAULT CODE 76	X	1 POR (Power on Reset) at run	1 Check 120VAC control power.
FAULT CODE 89	X	1 An overload warning has occurred	1 Unload the motor or shut down to allow motor cooling time.
FAULT CODE 90	X	1 A motor overload has occurred	1 Once the motor has cooled restart and monitor for overload conditions. Reset overload by pushing Reset button SW1 on CPU card on right side control panel. Verify CVC and starter settings.
FAULT CODE 91	X	1 Failing power card 2 Wiring problem in the run circuit	1 Replace power card. 2 Check run circuit wiring.

TROUBLESHOOTING - CONTINUED

FAULT	NON-CRITICAL	POSSIBLE CAUSE	CORRECTION
FAULT CODE 92 **93** **94** **95** **96** **97**	Shunt Trip CB1	1 Shorted SCR on line 1 2 Shorted SCR on Line2 3 Shorted SCR on Line 3 4 Shorted SCR on Line 2 and 3 5 Shorted SCR on Line 1 and 3 6 Shorted SCR on Line 1 and 2	1-6 Refer to Service Notes SN8833 "Testing SCR Condition" and SN12873 "Replacing Individual SCR's". Additionally shorted SCR's may be visually indicated by one or more of the LED's on the power card located on the inside of the right side control panel. The LED's are located next to the pulse transformers, yellow indicates a healthy phase; red, green, or out completely indicates one or more SCR's shorted or an open motor winding.
FAULT CODE 98	X	1 Line power was not present when start command was given	1 Inspect line, inspect line contactor if present
FAULT CODE 99	X	1 The output of the starter is shorted	1 Inspect and correct

TROUBLESHOOTING - CONTINUED

CONDITION CODE	DESCRIPTION OF CONDITION
CONDITION CODE 0	Starter was in a stop condition (Decel complete and no power output to motor).
CONDITION CODE 1	Start command was given, starter ramp time had not expired and motor was not at full speed.
CONDITION CODE 3	Start command was given, starter ramp time had expired and motor was not at full speed.
CONDITION CODE 5	Start command was given, starter ramp time had not expired and motor was at full speed.
CONDITION CODE 7	Start command was given, starter ramp time had expired and motor was at full speed.
CONDITION CODE 8	Stop command was given and starter went to decel mode.

9.0 SPARE PARTS

Refer to spare parts booklet located in print pocket.

10.0 APPENDIX A

RediStart Micro
Ram/Battery Replacement Instructions

The following procedure should be used to replace the RAM/Battery integrated circuit chip on the RediStart micro. The chip will need to be replaced if the starter displays a Fault Code 29 "Bad Ram Battery" after an attempt to load the default parameters has been unsuccessful. This means that the battery backed-up ram (random access memory) has failed. The chip has a usable life of between 5 and 10 years depending on how often the control voltage is off.

1. Remove all power to the starter.

2. Cut the nylon tie-wrap, which secures IC-16 to the socket. Carefully remove the cut tie-wrap and discard.

3. Using a small flat blade screwdriver, carefully lift and remove IC-16 from the socket.

4. Observing correct orientation insert the new "DALLAS" or "Timekeeper" IC into IC socket 16. Care should be taken to ensure that all pins line up with the socket holes.

5. Re-apply power to the starter unit.

6. The starter will display the Fault code 29 "Bad RAM Battery". This is normal and simply indicates that the chip is new and has not yet been initialized.

7. Press and hold the down arrow key while at the same time pressing and releasing the computer reset button. Make sure that the down arrow key is held until the starter displays Fault Code 30 "Default Parameters Loaded".

8. Once again reset the starter. At this time the system parameters must be re-entered into the RediStart Micro. The procedure for this is clearly outlined in the instruction manual supplied with the unit.

NOTES:

Publication History:

Revision	Date	ECO #
00		Initial Release
01	Sept. 23, 2005	E1072

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- RDB/RMB6 – SSRV Integral Bypass
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- RSM10 – SSRV + Reversing
- RSM11 – SSRV + DC Injection Braking + Reversing
- RSM10/12TS – SSRV Two Speed
- WRSM6 – SSRV Wound Rotor
- SMRSM6 – SSRV Synchronous
- DCB3 – Solid State DC Injection Braking

Medium Voltage Solid State Reduced Voltage Starters

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