REDUNDANT SYSTEM CONTROLLER

BRL-1000 REDUNDANT REFRIGERATION CONTROLLER

SEQUENCE OF OPERATION MANUAL

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INTRODUCTION

PURPOSE

The Redundant System Control is a hard wired, permanently mounted electronic control panel that is designed for improving operation of the refrigeration system and maintaining a stable cooling temperature inside the cooling room. The system has two evaporators in the same cooling room. One evaporator oper-ates as the primary system while the other system is idle as the secondary system. The Control will maintain the room temperature utilizing the cooling capacity of the primary system. The Control will automatically switch the master system to the slave system and maintain the equal run time on both systems. The Control can also be set to have both evaporators operating as primary systems, utilizing the cooling capacities of both systems. This Control has the simplicity of its front panel, which offers minimum yet versatile keys and functions.

CONTROL SYSTEM

CONTROL

Microprocessor based

Program logic stored within non-volatile EPROM memory. Set points and system configuration stored within EEPROM with at least 10 years storage life. Logged Data stored on the memory chip with backup power.

Menu driven controls with all operating sequences and control algorithms included. The control has non-volatile program memory and a capacitor backed clock in the event of power outage. All programmable options are installed via a "Yes" or "No" question.

Keypad

Front panel accessible with 5 tactile key switches.

Key assignments -- UP, DOWN, SELECT/ENTER, EXIT, ALARM CLEAR.

Display

2 x 16 character LCD Back Lit Display. Six control status lights and two alarm lights.

Power

Input -- 100-250 VAC, 50/60 HZ, 0.8 Amp.

Housing

Metal Cabinet, NEMA 1, Enclosure

INPUTS

Entrapment Push Button Input

Door Open Alarm Input

Temperature Sensors -- 2-wire thermistor, -40 to

150 Refrigerant Sensor -- 3-wire input

Defrost Termination Click-on input or thermistor input All inputs use un-pluggable screw terminals

INTRODUCTION

OUTPUTS
Control and Alarm Relays
These Relay Outputs are 1 Form C SPDT rated for 250 VAC and 3.15 Amp per circuit. Each relay circuit is fused with a 3.15 Amp slow blow fuse on the common leg. Outputs are screw terminal type.

Fan and Defrost Relays
These Relay Outputs are 1 Form A DPST rated for 250 VAC and 30 Amp resistive load per circuit. Single and Three Phase available.

Outputs are Screw Terminal Type

OPERATING CAPACITY
Single temperature probe input.

One entrapment alarm push button input

One door switch input

One refrigerant Leak Sensor input

Two defrost relay outputs.

Two fan control relay outputs

Two liquid solenoid relay outputs

Two levels of refrigerant leak alarm relay outputs

LEAD-LAG OPERATING MODE
The Lead-Lag system has two evaporators in the same cooling room. One system is operated as the primary system while the other system is idle as the secondary system. The Control will maintain it room tempera-ture utilizing the cooling capacity of the master system. The Control will automatically switch the master system to slave system and to maintain the equal run time on both systems. The method of switching is user selectable, either strictly on time (2 to 240 Hrs) or Operational (switches on tempera-ture satisfied, programmed defrost). The Fans on the evaporators can be energized on both systems while in cooling mode or the backup system can be off also user selectable. Lastly, it will alternate systems where after two hours of continuous operation without the room temperature being satisfied, the Control will switch operating modes and activate system alarm.

(ROUND-ROBIN) OPERATING MODE
The Controller runs two evaporators based on first-in, first-out mode (FIFO). The Controller monitors the room temperature and maintains the room temperature by utilizing the cooling capacity of both evaporators. The evaporator liquid line which was turned on first will be the one to be turned off when cooling capacity requirement is reduced. This rotation scheme equalizes the run time on both evaporators. This mode is acti-vated by menu selection or by shorting the inputs at the MAX. COOLING FIFO input terminals.
CAUTION – NO SYSTEM ALARM IN THIS MODE IF ONE SYSTEM DOES NOT FUCTION.

INTRODUCTION CONT'D

DEFROST OPERATION

The two evaporators will go into defrost mode either at the same time or on a time offset schedule whereas the second system will defrost at a user selectable time after the initiation time of the first system. This would be either 1,2, or 3 hours offset. There are four cycles within a full defrost: pump down cycle, main defrost cycle, drip cycle, and fan on delay cycle. All the cycle times can be adjusted. The defrost cycle can be terminated by the closure of the temperature termi-nation input contacts (thermostat closed) or by termination temperature probe reaching a preset temperature.

ENTRAPMENT ALARM

User selectable option. When Entrapment input is opened (Input is connected to a N.C. Entrapment Push Button inside the cooling room), the Control will enter into entrapment alarm mode immediately; the system alarm relays are turned on, the front panel alarm light are flashing and the buzzer is turned on. Entrapment Alarm can only be reset manually by pressing the ALARM RESET key.

DOOR OPEN ALARM (Optional Switch Required)

User selectable option. When door to the room is opened (Door Alarm Input is closed), the Control will start counting down the door alarm delay time. After the delay time expired and the door is still opened, the Control will enter into door alarm mode; the system alarm relays are turned on, the front panel alarm light are flashing and the buzzer is turned on. By choice, the alarm can be reset when door is closed or the alarm has to be reset manually.

REFRIGERANT LEAK ALARM (Optional Sensor Required)

User selectable option. The Control can be used to monitoring refrigerant leak with the installation of the Refrigerant Leak Sensor. There are two alarm levels. Each alarm level has two alarm relay outputs. One of the alarm outputs is silence-able. This relay output is connected to Audiovisual devices for local alarming. The non-silence-able relay output is connected to EMS, BAS or local ALARM CENTER for remote and service alarming. Alarm levels and alarm delays are adjustable.

INSTALLATION

CONTROL MOUNTING

Basic model has three mounting holes at the back panel. Secure the box to a frame structure with four #8 screws. The type of screw used depends on the attached surface.

GENERAL WIRING GUIDELINES

All cabling utilized in the Lead-Lag Control applications must have the following minimum rating: 105°C, 300V Insulation Rating.

Shielded Cables - Certain I/O connections require shielded cables to help reduce the effects of electrical noise coupling. Ground each shield at one end only. A shield grounded at both ends forms a ground loop which can cause a processor to fail. Ground each shield at the Lead-Lag Control Panel. Never connect a shield to the common side of a logic (dry contact) circuit (this would introduce noise into the logic circuit). Connect each shield directly to a chassis ground. Avoid breaking shields at junction boxes. If you do break a shield at a junction box, do the following:

- Connect only category-2 conductors in the junction box.
- Do not strip the shield back any further than necessary to make a connection.
- Connect the shields of the two cable segments to ensure continuity along the entire length of the cable.

Splices -- For all splices of sensor wiring use the 3M Scotchlok DR Connectors.

TEMPERATURE SENSOR WIRING

The Temperature Sensors are High Precision Thermistor devices that have no required polarity, but we recommend the following connection procedure: for consistency, connect the black wire to GND, the red or white wire to numbered terminal and the drain wire to a chassis ground. (I.e. Match the same color wire with the same input/output identity). **Do not run the sensor wire near power lines or** high **voltage wiring. otherwise control may act erratically!!**

INSTALLATION CONT'D

SENSOR WIRE TECHNICAL SPECIFICATIONS

For Wiring Runs of 0 to 99 ft

Twisted pair (2-wire), Shielded

22AWG

Belden part number 8451 (For Plenum installations - 83552)

For Runs 100 ft and higher

Shielded, Twisted Pair (2-wire)

18 AWG

Belden part number 8760 (For Plenum installations - 83652)

REFRIGERANT SENSOR WIRING

For Runs 0-250 ft

Twisted pari (3-wire), Shielded 18 AWG

Belden part number 8770.

POWER TERMINAL

The Power Screw Terminal is a three-screw terminal strip:

Each terminal is rated to handle wire ranging from 14 to 18 AWG, copper only.

L	LINE VOLTAGE	100 to 250 VAC
		0.8 Amps 50/60 Hz
N	NEUTRAL	Grounded Neutral
G	EARTH GROUND CONNECTION	

Connections must utilize wire with a minimum insulation value rating of300 VAC, 105°C.

GROUNDING REQUIREMENTS

The Earth Grounding Terminal on the Input Power Terminal must be grounded in accordance to NEC and UL requirements.

Connect the grounding to the G Earth Grounding Connection.

INSTALLATION CONT'D

The universal power supply on the Control is fused for over-current protection.

NOTE: The Lead-Lag Control is a hard wired, permanently mounted electronic control panel. Ensure that the control power source is wired though an external electrical cut-off switch or through a circuit breaker. Locate the cut-off switch or circuit breaker near the control unit. The disconnect should be marked as the disconnecting device for the unit.

DEFROST RELAY AND FAN RELAY WIRING

Defrost relay and Fan relay contacts are rated at 30 Amp, 250 VAC resistive load. No external contactors are needed for applications whose current requirements are within this contact rating limits, The screw terminals are heavy duty type that can handle up to 30 Amp current. There are two normally open contacts on each relay. Use 10 AWG copper insulation wire for these load connections.

SOLENOID RELAY AND OTHER HIGH VOLTAGE RELAY WIRING

Each relay has a 3.15 Amp time-lagged fuse connected in series at the common leg. For high voltage wirings, use minimum rating: 105 *DC,* 300V Insulation wires.
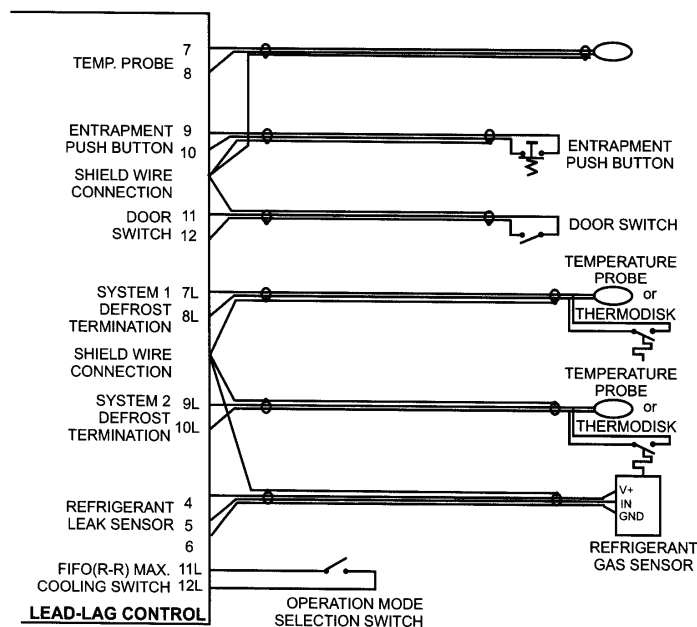

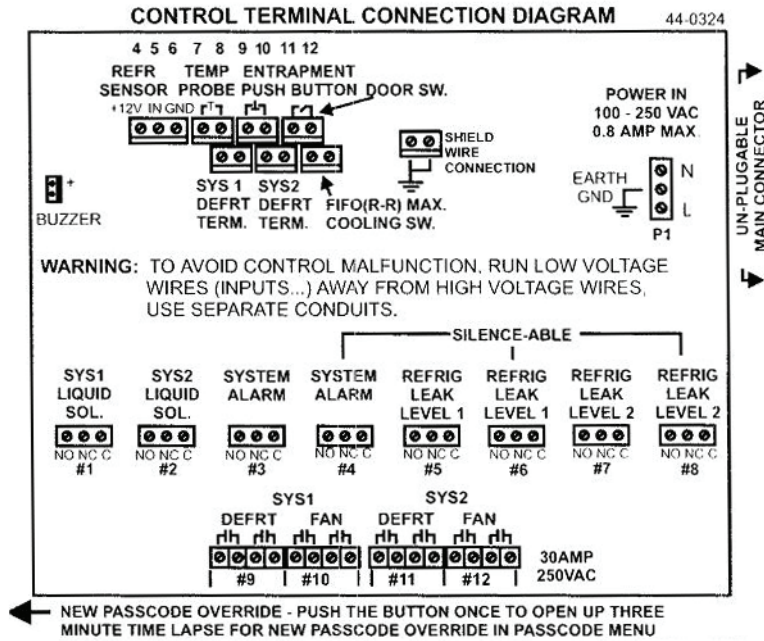Fig. 1-1 Typical Input Wiring Diagram With All The Options Installed

INSTALLATION CONT'D

CONTROL TERMINAL CONNECTION DIAGRAM 44-0324
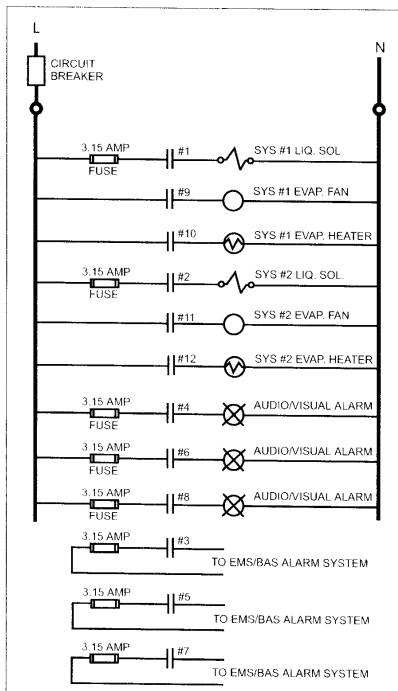
4 5 6 7 8 9 10 11 12

REFR   TEMP ENTRAPMENT
SENSOR PROBE PUSH BUTTON DOOR SW.

+12V IN GND

POWER IN
100 - 250 VAC
0.8 AMP MAX

SHIELD WIRE CONNECTION

EARTH GND   N

BUZZER

SYS 1 SYS2
DEFRT DEFRT FIFO(R-R) MAX.
TERM. TERM. COOLING SW.

L

P1

UN-PLUGABLE MAIN CONNECTOR

WARNING: TO AVOID CONTROL MALFUNCTION, RUN LOW VOLTAGE WIRES (INPUTS...) AWAY FROM HIGH VOLTAGE WIRES, USE SEPARATE CONDUITS.

SILENCE-ABLE

SYS1 LIQUID SOL.	SYS2 LIQUID SOL.	SYSTEM ALARM	SYSTEM ALARM	REFRIG LEAK LEVEL 1	REFRIG LEAK LEVEL 1	REFRIG LEAK LEVEL 2	REFRIG LEAK LEVEL 2
NO NC C #1	NO NC C #2	NO NC C #3	NO NC C #4	NO NC C #5	NO NC C #6	NO NC C #7	NO NC C #8

SYS1   SYS2
DEFRT FAN   DEFRT FAN

#9   #10   #11   #12   30AMP 250VAC

NEW PASSCODE OVERRIDE - PUSH THE BUTTON ONCE TO OPEN UP THREE MINUTE TIME LAPSE FOR NEW PASSCODE OVERRIDE IN PASSCODE MENU

FIGURE 1-2 CONTROL TERMINAL DIAGRAM

L   CIRCUIT BREAKER   N

3.15 AMP FUSE #1 SYS #1 LIQ. SOL.
#9 SYS #1 EVAP. FAN
#10 SYS #1 EVAP. HEATER
3.15 AMP FUSE #2 SYS #2 LIQ. SOL.
#11 SYS #2 EVAP. FAN
#12 SYS #2 EVAP. HEATER
3.15 AMP FUSE #4 AUDIO/VISUAL ALARM
3.15 AMP FUSE #6 AUDIO/VISUAL ALARM
3.15 AMP FUSE #8 AUDIO/VISUAL ALARM
3.15 AMP #3 TO EMS/BAS ALARM SYSTEM
3.15 AMP #5 TO EMS/BAS ALARM SYSTEM
3.15 AMP #7 TO EMS/BAS ALARM SYSTEM

Fig. 1-3 Typical Output Relay Wiring Diagram

(1) (2) (3) (4)

L1

N

(1) INPUT POWER CAN BE 120VAC OR 208/240VAC, 3 AMP

(2) 100 TO 240 VAC, 0.8 AMPS 50/60 HZ

(3) GROUNDED NEUTRAL

(4) THE LEAD-LAG CONTROL SYSTEM IS A PERMANENTLY CONNECTED DEVICE. ENSURE THAT THE CONTROL POWER SOURCE IS WIRED THROUGH AN EXTERNAL ELECTRICAL CUT-OFF SWITCH OR THROUGH A 15AMP CIRCUIT BREAKER. LOCATE THE CUT-OFF SWITCH OR CIRCUIT BREAKER NEAR THE CONTROL UNIT AND MARK AS THE DISCONNECTING DEVICE FOR THE UNIT.
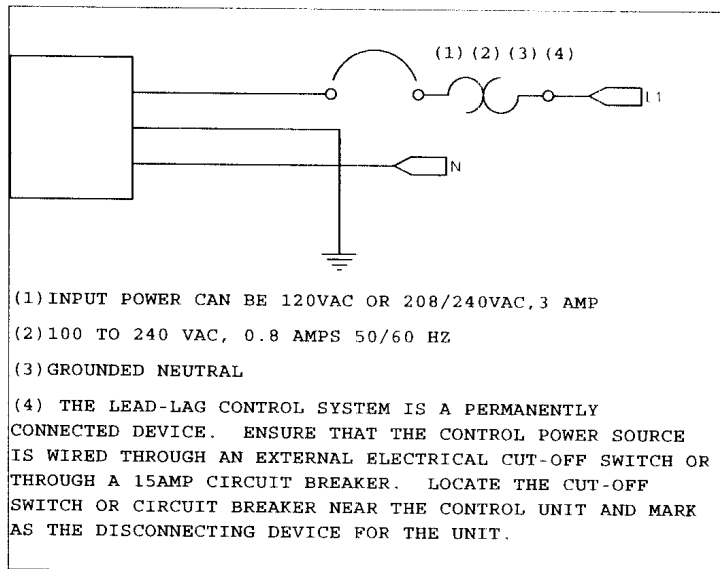
Fig. 1-4 Power Terminal Wiring Diagram

OPERATION

KEYPAD FUNCTION DESCRIPTION
Operation of the Lead-Lag Control is simple; yet, the system is powerful enough to display current information, log prior history, log alarms, set control options and set control limits.

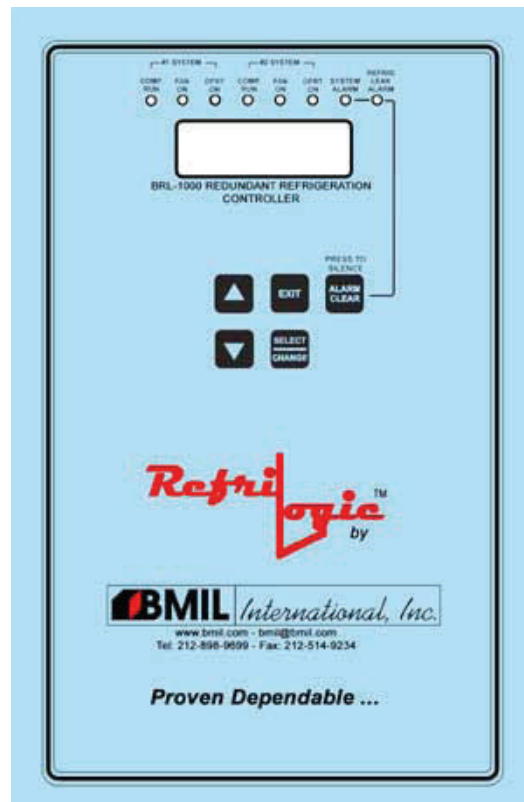The Control has five keys: "UP", "DOWN", "EXIT", "SELECT" and "ALARM CLEAR".

Figure 2. Front Panel Keypads and Displays

"UP/DOWN" Keys
The scroll up and down arrow keys allow the user to move to the next screen (scroll down) or to the previ-ous screen (screen up). These keys are also used to change values and to return to menus from submenus (exit would take the user back to the main display)

NOTE: When the last screen of a menu is reached, the processor will revolve back to the top of that menu. So if a screen is near the bottom of a menu, Scroll up will reach it faster than Scroll down.

"EXIT" key
This key allows the user to return to the main display from a menu or a submenu.

OPERATION

"SELECT" Key

The select key has numerous functions depending on where the user is within the menu selections. Select allows the user to:

    1. Enter a menu.

    2. Enter a submenu.

    3. Return to a menu from a submenu (exit would take the user back to the main display).

    4. Enter change value mode

"ALARM CLEAR" Key

This key is used to silence or reset the alarm. When in alarm, the reason of alarming is shown on the display.

DEFAULT DISPLAY

When the system is first powered up the display will read: BMIL INTL INC. LEAD-LAG CONTROL

Following the power up display the Control will show the time of the day. The room temperature reading and the refrigerant leak reading if refrigerant monitoring is enabled.
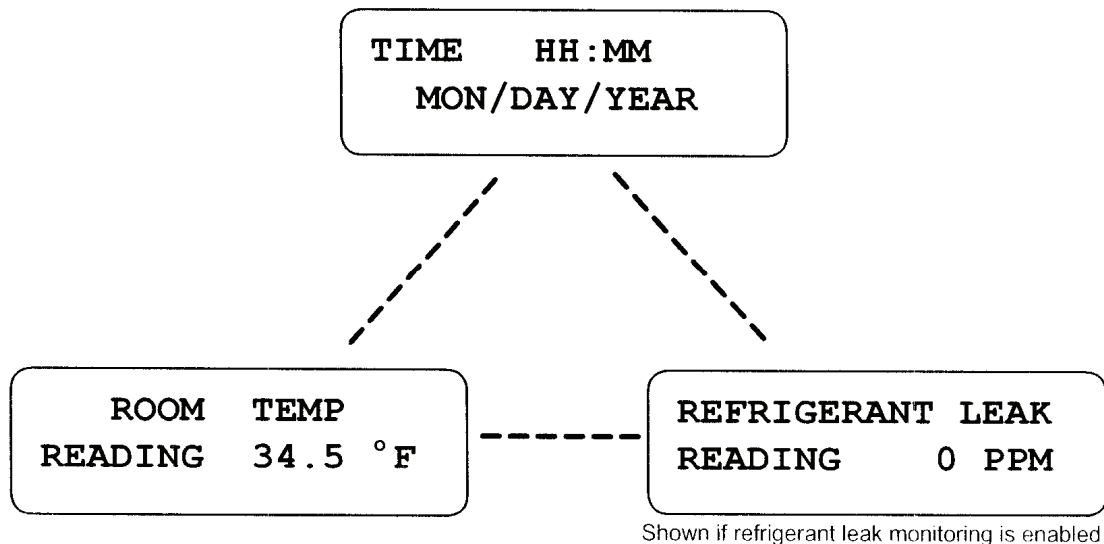
```
  TIME    HH:MM
    MON/DAY/YEAR
```

```
    ROOM   TEMP
READING   34.5 °F
```

```
REFRIGERANT  LEAK
READING      0 PPM
```

Shown if refrigerant leak monitoring is enabled

Figure 3. Default Display

OPERATION

ALARM DISPLAY AND RESET

When Control detects operation out of normal for a preset duration, such as temperature reaches its high limit setpoint for more than preset time delay, it will enter into alarm state, it will turn on the alarm light, turn on the buzzer and turn on the alarm relays. The display will show "*** IN ALARM***" message along with the cause of alarming in the second line of the display. If more than one alarm is activated at the same time, alarm messages will be shown in alternating format. The alarm relays can be linked to the external alarm device such as a bell, strobe light or horn/strobe. Pressing the ALARM CLEAR key once will silent the buzzer, the silence-able alarm relays will return to their non-alarm states while the non-silenceable alarm relays will remain in their alarm states. The "* ALARM SILENCED* PRESS "EXIT" KEY OR "ALARM CLEAR" "message will appear on the display for three seconds. To clear the alarm, press ALARM CLEAR key one more time. Alarm clear action can also be secured by passcode. To turn on this mode, in CONFIGURATION menu, set the control to use passcode to clear alarm. When in alarm, the message "ENTR PASSCODE TO CLEAR ALARM: " will be shown when ALARM CLEAR key is pressed twice (First key strobe will silent the alarm). Correct user passcode must be entered before alarm can be cleared and and return to normal operation. If the cause of alarming is not corrected, the Control will go into alarm again after the preset time delay. Entrapment Alarm has no time delay, it can only be silenced if input to the terminal is closed, i.e. entrapment button is no longer being pushed, and no longer creates a break signal. Refer to ALARM menu for all the alarm messages and review the alarm log. Alarm limits are set in the SETTING menu.
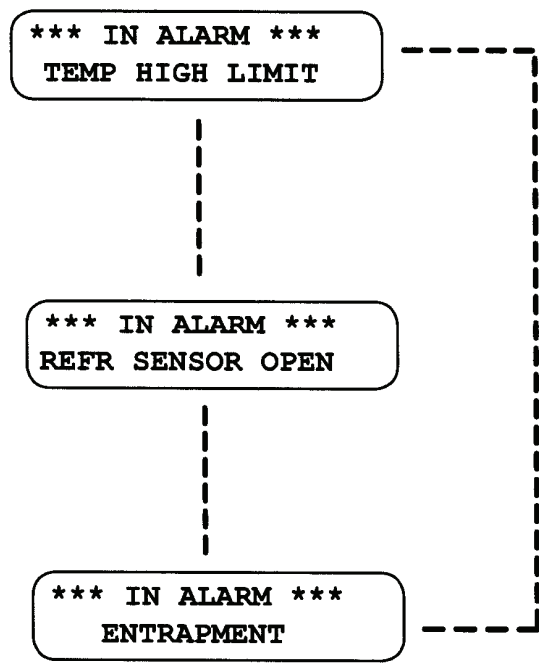

Figure 4. Alarm Message

OPERATION

MENU FUNCTIONS

There are nine menus. Each menu has sub-menus. Operating parameters can be reviewed and set within the menus and sub-menus. These menus and their descriptions are shown below. At default display screen, press UP/DOWN keys to scroll through these menus. The Control must be UNLOCK mode to make changes. When inside the menu, the first few abbreviated letters enclosed in arrow

'SELECT" KEY TO
<ALARM LOG M>

This menu allows user to view all recent alarm events with time

'SELECT" KEY TO
<STATUS MENU>

This menu allows user to view the control settings and current operating conditions.

'SELECT" KEY TO
<DEFROST MENU>

This menu sets the defrost cycle length, the defrost schedule and forces defrost on/off.

'SELECT" KEY TO
<TEST MENU>

This menu allows user to test the output relay on/off. and to re-start the Control.

'SELECT" KEY TO
<SETTING MENU>

This menu allows user to setup the operating param-eters for those installed options.

'SELECT" KEY TO
<CONFIGURATION >

This menu allows user to setup the Control for dif-ferent operat-ing options, clear alarm logs, and clear memory.

'SELECT" KEY TO
<CALIBRATION M >

This menu allows user to calibrate those sensors that are active.

'SELECT" KEY TO
<CLOCK MENU>

Sets the real time clock.

'SELECT" KEY TO
<PASSCODE MENU>

Enter user passcode to put the Control into view only mode and change mode.

OPERATION CONT'D

STATUS MENU

This menu is view only. The actual readings, status and control parameters can be viewed here. This menu allows user to view the control settings and current operating conditions. Sub-menus related to a particular option will not be shown if this option is not enabled in the CONFIGURATION menu.

▼	'SELECT" KEY TO <STATUS MENU>	Press SELECT key to enter <STATUS MENU>. Press UP/DOWN key to scroll to next display.
SELECT CHANGE	<STS> 23:57 11/26/2005	Time of Day
▼	<STS> DOOR IS CLOSED	Door condition (opened or closed), When door is opened, it shows the duration of the door opening.
▼	<STS> DOOR OPEN ALARM DELAY 10M	Door alarm delay
▼	<STS> SYSTEM #1 IS MASTER	In Lead/Lag mode will display current lead unit number.
▼	<STS> ROOM TEMP READING 63.0	Room temperature actual reading
▼	<STS> ROOM TEMP SETPOINT -10.0	Room temperature setpoint for control liquid valve open/ close
▼	<STS> ROOM TEMP DIFFERENTIAL 1.0	Room temperature control differential
▼	<STS> ROOM TEMP HIGH ALARM 1.0	Room temperature high alarm limit setpoint
▼	<STS> TEMP HIGH ALARM DELAY 1.0	Room temperature high alarm limit delay
▼	<STS> ROOM TEMP LOW ALARM -20.0	Room temperature low alarm limit setpoint

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OPERATION CONT'D

▼ <STS> TEMP LOW
   ALARM DELAY 30   Room temperature low alarm limit
                                  delay

▼ <STS> REFRIG LEAK
   SENSOR WARM UP   Control is in refrigerant sensor warm up stage, the first
                                  10 minutes whenever power is applied to the control,

▼ <STS> REFRIG LEAK
   ALARM 1   250 PPM   Refrigerant leak level I alarm setpoint

▼ <STS> REFRIG LEAK
   ALM 1 DELAY 10M   Refrigerant leak level 1 alarm delay

▼ <STS> REFRIG LEAK
   ALARM 2   250 PPM   Refrigerant leak level 2 alarm setpoint

▼ <STS> REFRIG LEAK
   ALM 2 DELAY 10M   Refrigerant leak level 2 alarm delay

▼ <STS> SYSTEM #1
   NOT IN DEFROST   Defrost Input Status on SYSTEM #1

▼ <STS> SYSTEM #2
   NOT IN DEFROST   Defrost Input Status on SYSTEM #2

▼ <STS> ALARM RLYS
   OPERATE IN: N.O.   Alarm Relay Operating Mode. Either Normally Open
                                  or Normally Closed

▼ <STS> TEMPERATURE
   MEASUREMENT : F   Temperature Measurement Units. Either F or C

▼ <STS> SYSTEM
   VERSION 1.50   System control firmware version no.

▼   Pressing DOWN key again will take you back to the top
                                  of the menu. You may leave the menu at any time by
                                  pressing EXIT key.

EXIT   (End of STATUS MENU)

ALARM LOG MENU

This menu allows the user to view the controllers alarm log. When in alarm, the ALARM CLEAR key in the front of the Control can be used to silent and/or to clear the alarm.

▲

"SELECT" KEY TO
<ALARM LOG M>

Press SELECT key to enter the <ALARM LOG MENU>.

SELECT
CHANGE

<ALM> LOW TEMP
-50.0 MN/DAY HR:MM

There are IO alarm logs. Alarm log 1 to 8 records the most recent alarm event with time stamp. ALM9 & ALM10 are for entrapment alarm log. The alarm log can be cleared at <CONFIGURATION MENU>

▼

<ALM2>R SNR OPEN
AT DAY/MN HR:MM

▼

<ALM3> POWER UP
-50.0 MN/DAY HR:MM

▼

<ALM4> NO ALARM
AT DAY/MN HR:MM

▼

<ALM5> NO ALARM
AT DAY/MN HR:MM

▼

<ALM6> NO ALARM
AT DAY/MN HR:MM

▼

<ALM7> NO ALARM
AT DAY/MN HR:MM

▼

<ALM8> NO ALARM
AT DAY/MN HR:MM

▼

<ALM9> NO ALARM
AT DAY/MN HR:MM

▼

<ALM10> NO ALARM
AT DAY/MN HR:MM

▼

Pressing DOWN key again will take you back to the top of the menu. You may leave the menu at any time by pressing EXIT key.

EXIT

(End of STATUS MENU)

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OPERATION CONT'D

ALARM MESSAGE	DESCRIPTION
NO ALARM	There is no alarm condition for this entry in the alarm log. The Alarm Log has probably been cleared recently.
ENTRAPMENT	Entrapment push button has been pushed.
DOOR OPENED	Door has been opened for more that the door open delay time.
SYS 1 FAIL	System #1 could not provide enough cooling capacity to maintain the setpoint temperature for the last two hours.
SYS 2 FAIL	System #2 could not provide enough cooling capacity to maintain the setpoint temperature for the last two hours.
HIGH TEMP	The room temperature has reached or exceeded the temperature high limit setpoint for more than the alarm delay duration.
LOW TEMP	The room temperature has reached or is below the temperature low limit setpoint for more than the alarm delay duration.
TERM 1 HI	Defrost termination #1 input has been closed (or #1 defrost termination temperature probe has reached or exceeded its high limit setpoint) for more than one hour.
TERM 2 HI	Defrost termination #2 input has been closed (or #2 defrost termination temperature probe has reached or exceeded its high limit setpoint) for more than one hour.
R SNR OPEN	The refrigerant sensor input had no signal and was opened.
REFR LEAK1	The refrigerant sensor detected gas leak and was at level one alarm
REFR LEAK2	The refrigerant sensor detected gas leak and was at level two alarm

OPERATION CONT'D

PASSCODE MENU

Enter user passcode to put the control into UNLOCK mode or LOCK mode. Supervisor can also change the user passcode.

▲ ▼	"SELECT" KEY TO <PASSCODE MENU>

Press SELECT key to enter the <PASSCODE MENU>.

SELECT CHANGE	<PSC>LOCKED MODE ENTER PASSCODE

The control has two security modes, LOCK mode and UNLOCK mode. To make changes to any menus and sub-menus, the control must be in UNLOCK mode. The "DENY" message will be shown if a change is attempted to an entry in LOCK mode. If correct passcode is entered here, the control will be in UNLOCK mode. The control will remain in this mode for the next 120 minutes. To lock the control manually, enter a incorrect passcode here. The control will go back to LOCK mode immediately.

SELECT CHANGE	<PSC>LOCKED MODE ENTER CODE: 0

▲ ▼	SELECT CHANGE
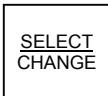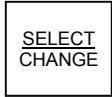
If correct passcode is entered the control will enter into UNLOCK mode and exit this menu.

Enter User Passcode: Passcode range is 0 to 9999. factory default user passcode is 5. After pressing SELECT/CHANGE "0" will flash. Press UP/DOWN arrow to correct passcode. Press SELECT/CHANGE again. The control will return to LOCK mode after 120 minutes. If after three tries without success, the control will enter into PASSCODE LOCKOUT mode, no new passcode is accepted for the next two hours. This prevents un-authorized personnel gaining access to the control by guessing the passcode.

	<PSC>LOCKED MODE INCORRECT CODE

After three tries without success, the control will enter into PASSCODE LOCKOUT mode, no new passcode is accepted for the next tow hours

	<PSC>LOCKED MODE PASSCODE LOCKOUT
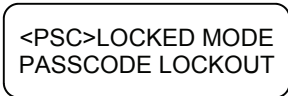
Change User Passcode: Supervisor passcode is needed to change to a new user passcode, factory default supervisor passcode is 10.

▲ ▼	<PSC>LOCKED MODE CHANGE NEW CODE

Supervisor and user passcodes can be overridden by pushing the passcode overriding button once which is located inside the control at the main P>C> board.

SELECT CHANGE	<PSC>LOCKED MODE SUPERVISOR: 0

▲ ▼	SELECT CHANGE	<PSC>LOCKED MODE NEW PASSCODE: 0

▲ ▼	SELECT CHANGE
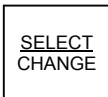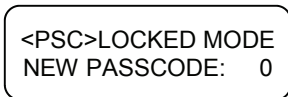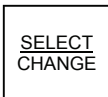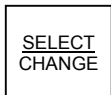
EXIT	(End of PASSCODE MENU)

OPERATION CONT'D

DEFROST MENU

This menu allows user to set the defrost length on each defrost cycle, and to setup the defrost schedule or force defrost on/off manually.

▲ ▼ "SELECT" KEY TO <DEFROST MENU>	Press SELECT key to enter the <DEFROST MENU>.
SELECT CHANGE <DEFROST LENGTH> SEL KEY TO ENTER	Press SELECT key to enter <DEFROST LENGTH> sub-menu.
SELECT CHANGE <DFT-CTL>DEFROST PUMPDOWN, M 1	Defrost pumpdown cycle in minutes (0-240) in this cycle, liquid solenoid is off, fan is on, and heater is off.

SELECT CHANGE   ▲ ▼   SELECT CHANGE
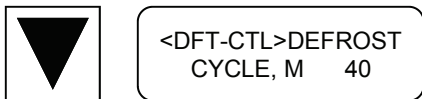
▼ <DFT-CTL>DEFROST CYCLE, M 40	Defrost heater on cycle in minutes (0-240) in this cycle, liquid solenoid is off, fan is off, and heater is on. This cycle can be shortened by defrost termination input signal. If a thermo-disc close on rise device is used, a closed contact at the termination input will terminate this cycle and continue onto the next refrigeration cycle. If a temperature probe is used, a rise in temperature beyond the termination temperature setpoint will terminate this cycle and continue on.

SELECT CHANGE   ▲ ▼   SELECT CHANGE

▼ <DFT-CTL>DEFROST DRIP CYC, M 2	Defrost drip cycle in minutes (0-240) in this cycle liquid solenoid is off, fan is off, and heater is off.

SELECT CHANGE   ▲ ▼   SELECT CHANGE

▼ <DFT-CTL>DEFROST FAN ON DLY, M 2	Defrost fan delay cycle in minutes (0-240) in this cycle liquid solenoid is on, fan is off, and heater is off.

SELECT CHANGE   ▲ ▼   SELECT CHANGE

▼	Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

EXIT

OPERATION CONT'D

DEFROST MENU

▲ ▼	\<DEFROST SCHED\> SEL KEY TO ENTER	Press SELECT key to enter the \<DEFROST SCHEDULE\> sub-menu.
SELECT CHANGE	\<DEFROST SCHED\> DEFROST/DAY: 2	Select number of defrosts per day (0 to 6)
SELECT CHANGE ▲ ▼ SELECT CHANGE		
SELECT CHANGE	\<DEFROST SCHED\> DFT TIME 1 00:00	Defrost start time in hours and minutes. In 15 minute increments.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▼	\<DEFROST SCHED\> DFT TIME X 20:00	Manually force the defrost on or off. You will be asked to confirm the action.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
EXIT		Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.
▲ ▼	\<FORCE DEFROST\> FORCE DEFROST NO	Force defrost on/off. "FORCE DEFROST" message will be shown if the control is not in defrost, else "STOP DE-FROST" message will be shown. Confirmation is needed for the action.
	\<FORCE DEFROST\> STOP DEFROST NO	
SELECT CHANGE ▲ ▼ SELECT CHANGE		
	\<FORCE DEFROST\> CONFIRM: NO	
SELECT CHANGE ▲ ▼ SELECT CHANGE		Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.
EXIT		(End of DEFROST MENU)

OPERATION CONT'D

TEST MENU
This menu allows user to test the output relay on/off and restart the control

| ▲ ▼ | "SELECT" KEY TO <TEST MENU> | Press SELECT key to enter the <TEST MENU>. |

| SELECT CHANGE | <TESTING>TOGGLE RELAY K1 : |
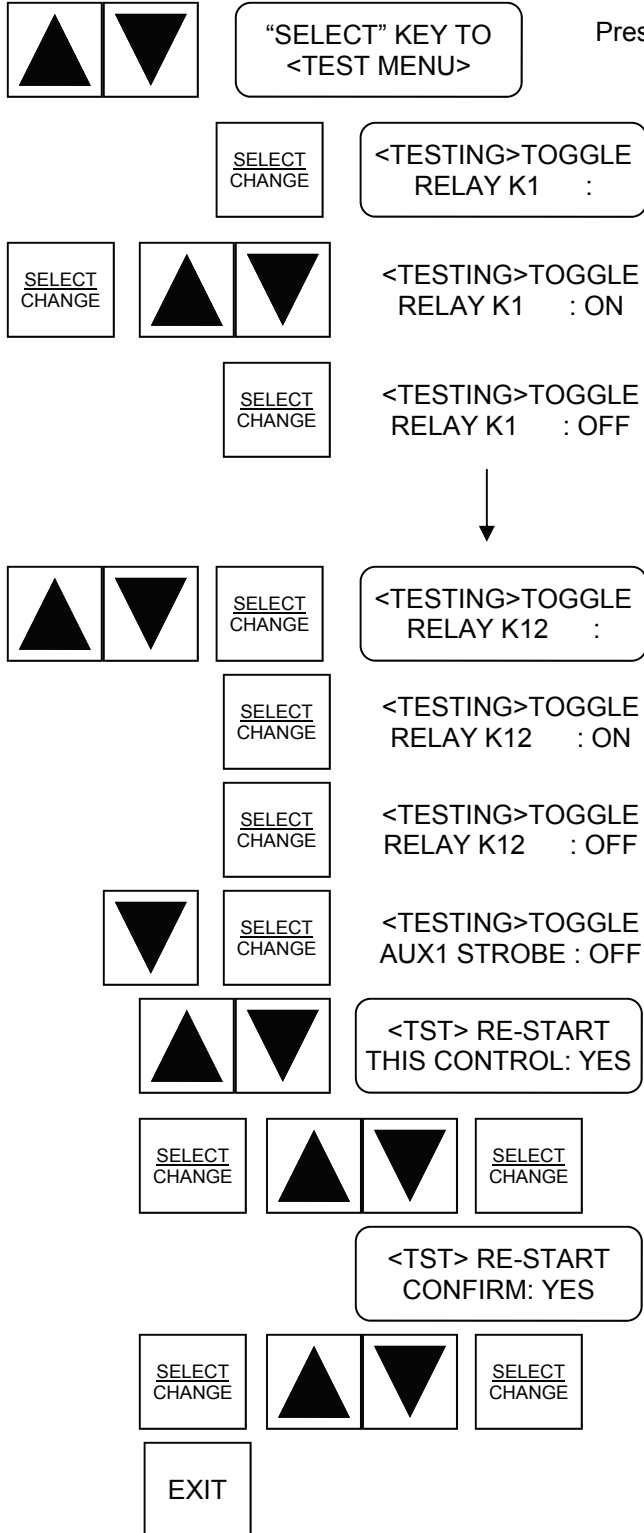
Relay testing. Turn on or off each relay manually. This test is performed directly on each relay and bypasses the control logic. Make sure the test sequence will not damage any system components. All forced relays will be cancelled and returned to their operationg states when this menu is exited. When entered, the relay is in its operating state. Press SELECT key once to force on the relay (relay energized). Press SELECT key again to force off the relay (relay de-energized). Press DOWN key advance test to next relay.

| SELECT CHANGE | ▲ ▼ | <TESTING>TOGGLE RELAY K1 : ON |

| SELECT CHANGE | <TESTING>TOGGLE RELAY K1 : OFF |

| ▲ ▼ | SELECT CHANGE | <TESTING>TOGGLE RELAY K12 : |

| SELECT CHANGE | <TESTING>TOGGLE RELAY K12 : ON |

| SELECT CHANGE | <TESTING>TOGGLE RELAY K12 : OFF |

Repeat testing for all the relays in the system.

| ▼ | SELECT CHANGE | <TESTING>TOGGLE AUX1 STROBE : OFF |

Repeat testing for all the relays in the system.

| ▲ ▼ | <TST> RE-START THIS CONTROL: YES |

Restart this control as if power is first applied. Confirmation is needed. If any alarm is pending, the control will not re-start and will ask the user to clear the alarm condition first and try again.

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

| <TST> RE-START CONFIRM: YES |

Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

| EXIT |

(End of TEST MENU)

OPERATION CONT'D

SETTING MENU
This menu allows user to setup the operating parameters of those installed options.

▲ ▼	"SELECT" KEY TO <SETTING MENU>	Press SELECT key to enter the <SETTING MENU>.
SELECT CHANGE	<SET> DOOR OPEN ALRM DELAY, M: 10	Set Door Open Alarm Delay. The range is 2 to 240 minutes.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▲ ▼	<SET> ROOM TEMP SETPOINT: -10.0	Set Temperature Setpoint. The range is –45 deg. F. to +110 deg. F.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▲ ▼	<SET> ROOM TEMP DIFFERENTIAL: 2.0	Set Temperature Differential. The range is 0.5 deg. to 5.0 deg. Cut-in temperature is the temperature setpoint plus the differential. Cut-out temperature is the temperature setpoint minus the temperature differential.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▲ ▼	<SET> ROOM TEMP HIGH ALARM: 5.0	Set Room High Alarm Limit Temperature. The range is –45 deg. To +110 deg.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▲ ▼	<SET> ROOM HIGH ALRM DELAY, M:	Set Room High Alarm Limit Delay. The range is 2 to 120 minutes.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
▲ ▼	<SET> ROOM TEMP LOW ALARM: -20.0	Set Room Low Alarm Limit Temperature. The range is –45 deg. To +110 deg.
SELECT CHANGE ▲ ▼ SELECT CHANGE		
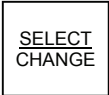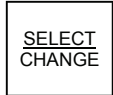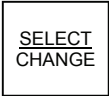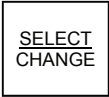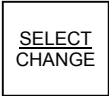
OPERATION CONT'D

▲ ▼	<SET> ROOM LOW ALRM DELAY, M: 30
SELECT CHANGE ▲ ▼ SELECT CHANGE	

Set Room Low Alarm Limit Delay. The range is 2 to 120 minutes.

▼	<S> R-R OPT CYCLE SPEED SEC: 100
SELECT CHANGE ▲ ▼ SELECT CHANGE	

Speed in Seconds that the control will look at room status to determine if second system is needed. Round-Robin mode only.

▼	<S> SSW-OVER AFTER LEAD FAIL HR: 2
SELECT CHANGE ▲ ▼ SELECT CHANGE	
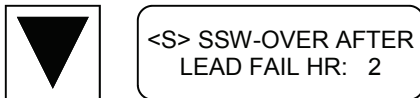
Set time for lag system switch over after primary system failure. 1 to 240 hours.

▼	<SET> REFRIG LEAK ALARM1, PPM: 250
SELECT CHANGE ▲ ▼ SELECT CHANGE	

Set Refrigerant Leak Level 1 Alarm Setpoint. The range is 20 to 999 ppm.

▼	<SET> REFRIG ALRM 1 DELAY, MIN: 10
SELECT CHANGE ▲ ▼ SELECT CHANGE	

Set Refrigerant Leak Level 1 Alarm Delay. The range is 20 to 999 ppm.

▼	<SET> REFRIG LEAK ALARM2, PPM: 320
SELECT CHANGE ▲ ▼ SELECT CHANGE	

Set Refrigerant Leak Level 2 Alarm Setpoint. The range is 20 to 999 ppm.

OPERATION CONT'D
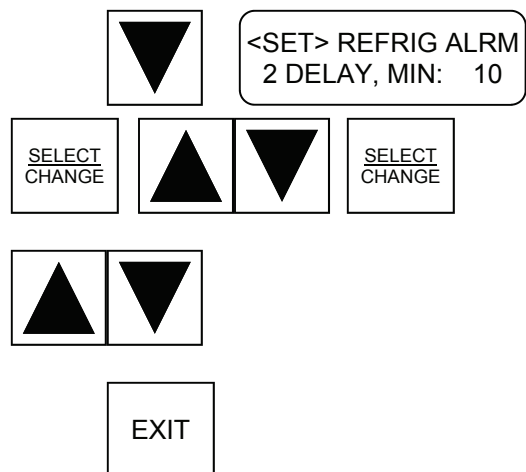
▼ | <SET> REFRIG ALRM 2 DELAY, MIN: 10 | Set Refrigerant Leak Level 2 Alarm Delay. The range is 20 to 999 ppm.

SELECT CHANGE   ▲ ▼   SELECT CHANGE

▲ ▼   Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

EXIT   (End of SETTING MENU)

OPERATION CONT'D

CONFIGURATION MENU
This menu allows user to setup the control for different operating options, clear alarm logs, and clear memory.

▲ ▼	"SELECT" KEY TO <CONFIGURATION>

Press SELECT key to enter the <CONFIGURATION MENU>

SELECT CHANGE	<CFG> ENABLE DOOR OPEN ALARM: YES

ENABLE/DISABLE: Door Open Alarm Function

SELECT CHANGE	▲ ▼	SELECT CHANGE

▼	<CFG>ENB FAN OFF DOOR OPEN: NO

SELECT CHANGE	▲ ▼	SELECT CHANGE
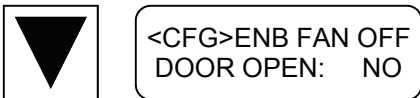
ENABLE/DISABLE: Turn fan off when door is opened. If enabled, when door is opened, both the liquid valve and the fan will be shut off for **(CHECK TIME).** If disabled, fan and liquid valve operation is not affected by the door switch. This entry will be shown only when Door Alarm is enabled.

▼	<CFG>ENABLE TEMP CONTROL: YES

SELECT CHANGE	▲ ▼	SELECT CHANGE
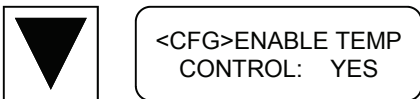
ENABLE/DISABLE: Room Temperature Control function

▼	<CFG>ZONE CYCLE METHOD: LEAD-LAG

SELECT CHANGE	▲ ▼	SELECT CHANGE
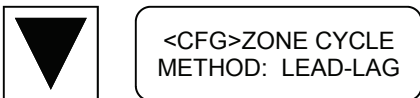
Select mode of operation. LEAD/LAG, R-ROBIN, SY1 ONLY, SY2 ONLY

▼	<CFG>LEAD-LAG METHOD BY: TEMP

SELECT CHANGE	▲ ▼	SELECT CHANGE
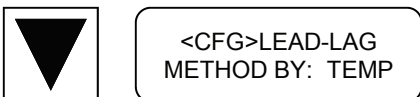
Select LEAD/LAG method of control <TEMP> where primary system will switch after room temp is satisfied, system defrost or 2 hours continuous operation. <TIME> control will switch after pro-grammed time period.

▼	<CFG>LAG SYSTEM FANS ALWAYS: OFF

SELECT CHANGE	▲ ▼	SELECT CHANGE

Select Lag System Fans Always OFF or ON

OPERATION CONT'D

▼ | <CFG>DEFROST METHOD: ELEC
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

Select Defrost Method. ELECtric or AIR

▼ | <CFG>SYS1 & SYS2 DEFROST: TOGETHER
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

Select for systems to defrost either at the same time or offset. In OFFSET lag system #2 will defrost after system #1 by the offset period. 1,2 or 3 hours

▼ | <CFG>ENABLE TEMP TERMINATION1:   NO
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

ENABLE/DISABLE: System #1 defrost heating cycle termination by temperature probe. If disabled, snap-on thermo-disc can be connected to the termination input to terminate the heating cycle defrost.

▼ | <CFG>ENABLE TEMP TERMINATION2:   NO
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

ENABLE/DISABLE: System #2 defrost heating cycle termination by temperature probe. If disabled, snap-on thermo-disc can be connected to the termination input to terminate the heating cycle defrost.

▼ | <CFG>ENABLE REFR LEAK MONITOR: NO
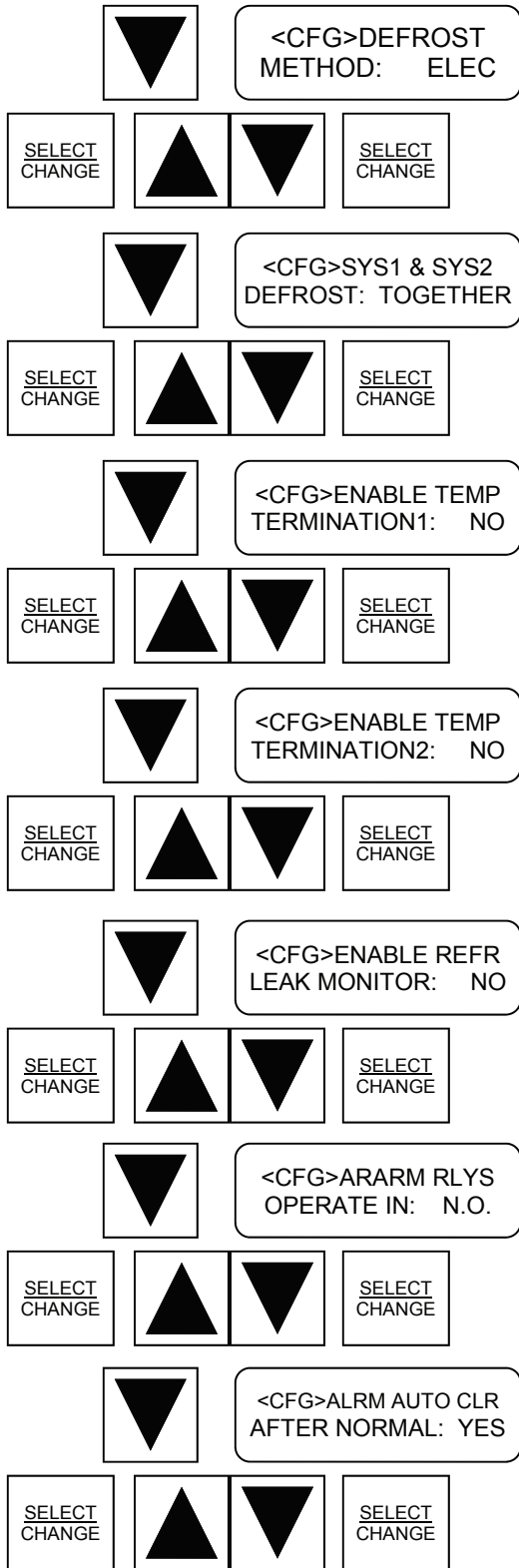SELECT CHANGE | ▲ ▼ | SELECT CHANGE

ENABLE/DISABLE: Refrigerant leak monitor detection

▼ | <CFG>ARARM RLYS OPERATE IN: N.O.
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

Select either Normally Open or Normally Closed operation for alarm relays. This is the state you want them to be in when conditions are normal.

▼ | <CFG>ALRM AUTO CLR AFTER NORMAL: YES
SELECT CHANGE | ▲ ▼ | SELECT CHANGE

ENABLE/DISABLE: Alarm Auto Clear after the alarm condition is returned to normal (Latched alarm or Un-latched alarm). If auto alarm clear is not enabled, alarm can only be cleared manually

OPERATION CONT'D

<C>NEED PASSCODE
TO CLEAR ALM: NO

SELECT
CHANGE

SELECT
CHANGE
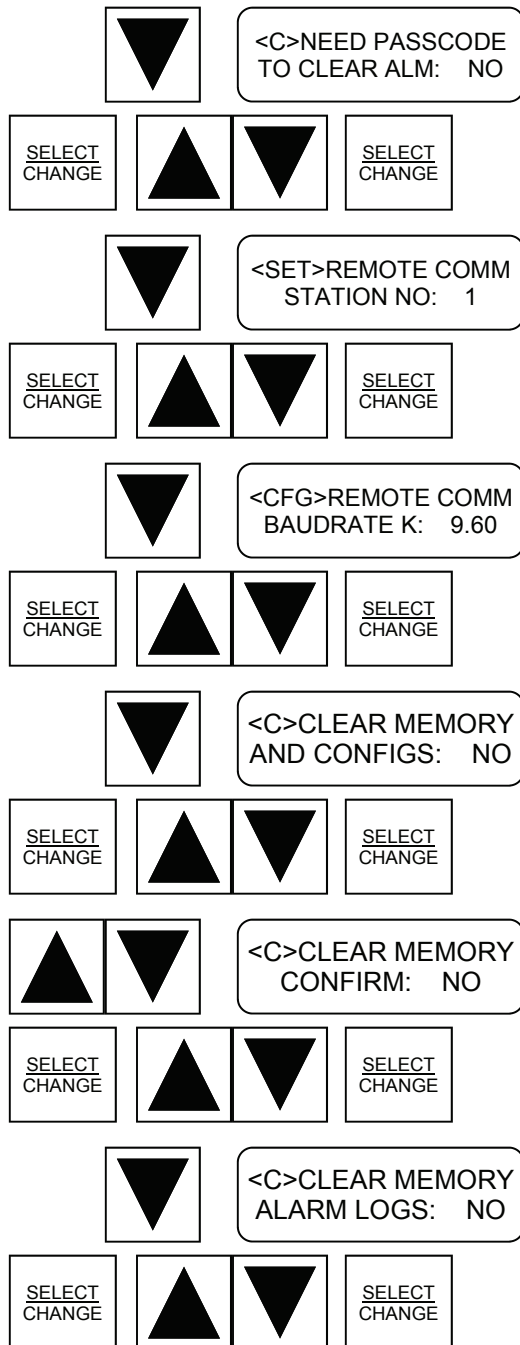
ENABLE/DISABLE: Need Passcode to Clear Alarm. If enabled, alarm can only be cleared after correct user password is entered

<SET>REMOTE COMM
STATION NO: 1

SELECT
CHANGE

SELECT
CHANGE

Set the station number for GenCom Communications software. If more than one control is monitored they must have different numbers. Only required if Communications Options were purchased

<CFG>REMOTE COMM
BAUDRATE K: 9.60

SELECT
CHANGE

SELECT
CHANGE

Set Modem Baud rate. 9600, 14400, 19200, 38400

<C>CLEAR MEMORY
AND CONFIGS: NO

SELECT
CHANGE

SELECT
CHANGE

Clear All Memory Configurations. Clar all the setting and reload the factory default values to the control. Memory clear is confirmed before clearing. The control must be re-configured after the memory is cleared

<C>CLEAR MEMORY
CONFIRM: NO

SELECT
CHANGE

SELECT
CHANGE

<C>CLEAR MEMORY
ALARM LOGS: NO

SELECT
CHANGE

SELECT
CHANGE

Clear All Alarm Logs

OPERATION CONT'D
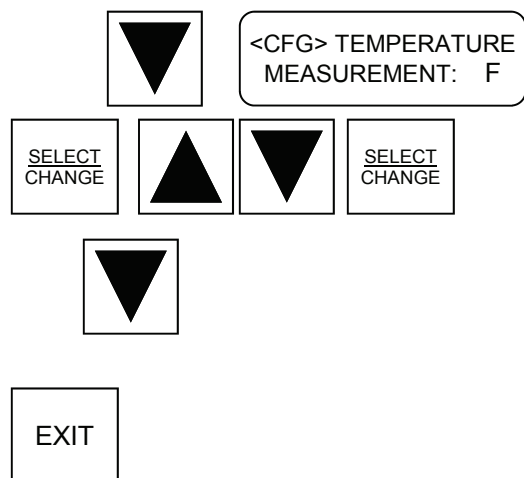
▼ | <CFG> TEMPERATURE MEASUREMENT: F | Clear All Alarm Logs

SELECT CHANGE ▲ ▼ SELECT CHANGE   Select temperature measuring unit Fahrenheit or Celsius

▼   Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

EXIT   (End of CONFIGURATION MENU)

OPERATION CONT'D

CALIBRATION MENU

This menu allows user to calibrate the temperature and refrigerant sensors. Only those active sensors can be calibrated.

▲ ▼	"SELECT" KEY TO <CALIBRATION M>

Press SELECT key to enter the <CALIBRATION MENU>

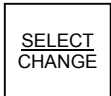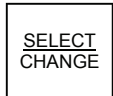|	
SELECT CHANGE	<CAL> CALIBRATE TEMP SNR: 30.0

Temperature Probe Calibration. The raw temperature is shown. Calibration range is 0.1 to 10 Deg. F. **(CHECK RANGE)**

SELECT CHANGE	▲ ▼ SELECT CHANGE

▲ ▼	<CAL> CALIBRATE TEMP TERM1: 0.0

Calibrate Temperature Termination Probe on System #1 (if used)

SELECT CHANGE	▲ ▼ SELECT CHANGE
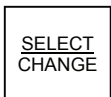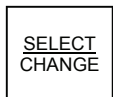
▲ ▼	<CAL> CALIBRATE TEMP TERM2: 0.0

Calibrate Temperature Termination Probe on System #2 (if used)

SELECT CHANGE	▲ ▼ SELECT CHANGE
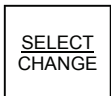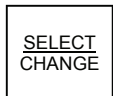
▲ ▼	<CAL> CALIBRATE REFRIG MONITOR
SELECT CHANGE	<CAL> CALIBRATE CALIBRATE DONE

Leak Monitor Sensor Calibration at the control. Absolute reading on the sensor must be less than 80 for successful calibration. Before calibration, the sensor leak reading shows the raw reading. After calibration, actual leak reading is shown which is at zero level for no refrigerant leak. The refrigerant sensor itself does need calibration periodically. Please refer to the Refrigerant Sensor Manual.

▲ ▼	<CAL> REFR SENSOR ABSOLUTE RD: 0

Shows Absolute Leak Monitor Sensor Raw Reading. For calibrated sensor, the reading is between 10 and 25.

OPERATION CONT'D

▲ ▼	<CAL> UNDO REFRG SNR CALIBRATION	Undo Leak Monitor Sensor Calibration. User is asked to confirm the undo.

SELECT CHANGE

<CAL> UNDO REFRG CONFIRM:

▼

Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

EXIT

(End of CALIBRATION MENU)

OPERATION CONT'D

CLOCK MENU
This menu allows user to set the real time clock.

| ▲ ▼ | "SELECT" KEY TO <CLOCK MENU> | Press SELECT key to enter the <CLOCL MENU> |

| SELECT CHANGE | <CLK> HOUR:MIN TIME IS: HR:MM | Current Time Setting |

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

| ▲ ▼ | <CLK> MON/DAY TODAY IS: MON/DAY | Current Date Setting |

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

| ▲ ▼ | <CLK> THIS YEAR: 2005 | Current Year Setting |

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

| ▲ ▼ | <CLK> ENABLE DAY LIGHT SAVING: YES | **Enable/Disable:** Daylight Savings Time auto adjust function |

| SELECT CHANGE | ▲ ▼ | SELECT CHANGE |

▼   Pressing DOWN key again will take you back to the top of the sub-menu. You may leave the sub-menu at any time by pressing EXIT key.

EXIT   (End of CLOCK MENU)

SERVICE

CHECKOUT AND TROUBLESHOOTING PROCEDURE
This section is designed to assist in troubleshooting the control. A step-by-step checkout procedure is included to isolate the cause of the malfunction.

Apparent Malfunctions
If there are indications of recurring problems, proceed with this instruction and verify the complete processor operation or identify the component failure.

Check the Alarm Log for a history of alarms to determine the most likely cause. Proceed in order through the checkout procedures list for each observation until the fault is isolated.
NOTE: When performing continuity and resistance checks in this procedure, make sure the circuit being tested is disconnected from any other circuits or disconnected from the control.

Power Supply Test
Check the power source going to the power supply board with an AC voltage meter. Input voltage is acceptable between 100 and 250 VAC. Check the power output voltage from the power supply board with a DC voltage meter. If should be 12 VDC +/- 0.3VDC. If no output, check the over current protection fuse on the power supply board.

Temperature Sensor Checkout
The same type of temperature sensors are used for all temperature inputs. Testing and verification of all sensors will be identical except for the location of the sensor connection on the terminal strip.

General Check
The most fundamental checkout of the temperature sensor is to place an accurately calibrated thermometer in the air stream near the sensor bulb and make a direct comparison between the reading of the thermometer and the reading on the control.

If the readings are within three degrees F or 1.5 deg. C. the sensors and other components are operating correctly. If the readings are unacceptable the following items need to be checked to determine the problem.

Sensor Mounting– Check to insure that the entire sensor is in the air stream to be measured. Clamping the sensor to a metal wall or duct can allow the wall temperature to adversely effect the temperature reading.

Resistance Check– Remove the temperature sensor cable from the input terminal. Using an accurate Ohmmeter measure the resistance of the sensor with the cable leads removed from the input terminal strip. Polarity of the ohmmeter leads will not change the measurement. See Temperature Sensor Resistance Chart.

If the ohm reading on the chart does not correspond to the known temperature of the sensor within 3 degrees F. then replace the sensor and cable.

SERVICE

Relay Output Check
Medium power relay output have a 3.15 amp fuse in series with the common leg of the contact. Pull out the fuse and perform a resistance test on it. The resistance should read less than one ohm. If resistance is zero, replace fuse. There is a spare on the right end of the medium power relay board.

Each relay has a LED light to indicate relay is energized. If the control calls for the relay to energize and the relay light is not on, the relay driver may be damaged. Use the TEST MENU to energize the output relay. Faulty relay should be identified with ease. The power relay has two Normally Open contacts carrying a maximum of 30 amp resistive load each. Perform a resistance test on the contact (with load removed) will isolate the problem area easily. If relay contact has low ohm resistance (less than 50 ohm) when the relay is not energized, the noise suppression capacitor in parallel with the contact may be damaged and cause the contact shorted circuit. If the relay driver or the relay itself is found to be faulty contact BMIL International, Inc. for a replacement.

TEMPERATURE SENSOR RESISTANCE CHART

DEG C.	DEG F.	KOHM		DEG C.	DEG F.	KOHM		DEG C.	DEG F.	KOHM
-45.56	-50	255.00		-16.11	3	56.20		13.33	56	15.60
-45	-49	247.00		-15.56	4	54.70		13.89	57	15.30
-44.44	-48	239.00		-15.00	5	53.40		14.44	58	15.00
-43.89	-47	232.00		-14.44	6	52.20		15.00	59	14.60
-43.33	-46	225.00		-13.89	7	50.60		15.56	60	14.30
-42.78	-45	218.00		-13.33	8	49.40		16.11	61	14.00
-42.22	-44	212.00		-12.78	9	48.10		16.67	62	13.70
-41.67	-43	205.00		-12.22	10	46.90		17.22	63	13.40
-41.11	-42	200.00		-11.67	11	45.70		17.78	64	13.10
-40.56	-41	194.00		-11.11	12	44.60		18.33	65	12.80
-40	-40	188.00		-10.56	13	43.50		18.89	66	12.60
-39.44	-39	182.00		-10.00	14	42.40		19.44	67	12.30
-38.89	-38	176.00		-09.44	15	41.30		20.00	68	12.00
-38.33	-37	173.00		-08.89	16	40.20		20.56	69	11.80
-37.78	-36	166.00		-08.33	17	39.30		21.11	70	11.50
-37.22	-35	162.00		-07.78	18	38.30		21.67	71	11.30
-36.67	-34	157.00		-07.22	19	37.40		22.22	72	11.10
-36.11	-33	152.00		-06.67	20	36.40		22.78	73	10.80
-35.56	-32	148.00		-06.11	21	35.60		23.33	74	10.60
-35	-31	144.00		-05.56	22	34.70		23.89	75	10.40
-34.44	-30	139.00		-05.00	23	33.90		24.44	76	10.20
-33.89	-29	135.00		-04.44	24	33.00		25.00	77	10.00
-33.33	-28	131.00		-03.89	25	32.20		25.56	78	9.79
-32.78	-27	128.00		-03.33	26	31.40		26.11	79	9.59
-32.22	-26	124.00		-02.78	27	30.70		26.67	80	9.39
-31.67	-25	120.00		-02.22	28	30.00		27.22	81	9.20
-31.11	-24	117.00		-01.67	29	29.20		27.78	82	9.01
-30.56	-23	114.00		-01.11	30	28.60		28.33	83	8.83
-30	-22	111.00		-00.56	31	27.90		28.89	84	8.65
-29.44	-21	108.00		0.00	32	27.20		29.44	85	8.48
-28.89	-20	104.00		0.56	33	26.60		30.00	86	8.31
-28.33	-19	102.00		1.11	34	26.00		30.56	87	8.15
-27.78	-18	99.10		1.67	35	25.30		31.11	88	7.98
-27.22	-17	96.50		2.22	36	24.70		31.67	89	7.82
-26.67	-16	93.70		2.78	37	24.20		32.22	90	7.66
-26.11	-15	91.30		3.33	38	23.60		32.78	91	7.51
-25.56	-14	88.70		3.89	39	23.10		33.33	92	7.36
-25	-13	86.40		4.44	40	22.50		33.89	93	7.22
-24.44	-12	84.00		5.00	41	22.00		34.44	94	7.08
-23.89	-11	81.60		5.56	42	21.50		35.00	95	6.94
-23.33	-10	79.50		6.11	43	21.00		35.56	96	6.80
-22.78	-9	77.30		6.67	44	20.50		36.11	97	6.67
-22.22	-8	75.30		7.22	45	20.10		36.67	98	6.54
-21.67	-7	73.30		7.78	46	19.60		37.22	99	6.41
-21.11	-6	71.40		8.33	47	19.20		37.78	100	6.29
-20.56	-5	69.50		8.89	48	18.70		38.33	101	6.17
-20	-4	67.70		9.44	49	18.30		38.89	102	6.05
-19.44	-3	65.90		10.00	50	17.90		39.44	103	5.94
-1889	-2	64.00		10.56	51	17.50		40.00	104	5.82
-18.33	-1	62.40		11.11	52	17.10		40.56	105	5.71
-17.79	0	60.70		11.67	53	16.70		41.11	106	5.60
-17.22	1	59.20		12.22	54	16.40		41.67	107	5.50

ONE YEAR LIMITED WARRANTY

 BMIL INTERNATIONAL INC. (BMIL) warrants each new Electronic Control System and component part thereof to be free from defects in material and workmanship at the time of purchase. BMIL'S obligation under this warranty shall be limited to repairing or exchanging any part or component parts thereof, without charge, F.O.B. factory or nearest authorized parts depot, which may prove defective within one (1) year from date of original instal-lation (not to exceed fifteen (15) months from the date of shipment from the BMIL factory) and which is proven to the satisfaction of BMIL to be defective. BMIL may at its option ship a replacement part prior to receipt of the customer's defective part and proof of the date of original installation upon receipt of a purchase order from the customer. Upon receipt by BMIL of a defective part proven to BMIL'S satisfaction to be defective, the customer will be credited the exchange price of the part. If not within the coverage of this limited warranty, the part or parts will be returned to the customer C.O.D. and a charge may be imposed for a repair cost estimate. The warranties to repair or replace above recited are the only warranties, express, implied or statutory, made by BMIL with respect to the Electronic Control System or component parts thereof, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, and GENESIS neither assumes nor authorizes any person to assume for it, any other obligation or liability in connection with any product which utilizes a BMIL Electronic Control System. Shipping charges for warranted items may also apply.

Within 30 days of the date of shipping BMIL will take back any unused equipment and refund the customer in full minus a 15% restocking fee and any damage charges or testing charges. If the unit is returned within 90 days an in house credit will be given minus a 15% restocking fee. Returns for credit will not be given after 90 days from the ship date.

 THIS WARRANTY SHALL NOT APPLY TO LOSS OF FOOD OR REFRIGERANT GAS, OR IN-CREASED POWER CONSUMPTION OR INCREASED UTILITY CHARGES DUE TO FAILURE FOR ANY REASON.

 GENESIS SHALL NOT BE LIABLE for any loss, claim, injury or damage to any person or property, or lost profits or other similar loss, or damage, which may arise, directly or indirectly, result or be claimed to have resulted from a defect in the workmanship or materials of any product which utilizes the BMIL Electronic Control System or any component part thereof.

GENESIS SHALL NOT BE LIABLE for any losses or damages 1) resulting from any repairs or replacements made by the customer to the BMIL Electronic Control System or any component part thereof without the written consent of BMIL, or 2) when the Electronic System is installed or operated in a manner contrary to the printed instructions covering installation and service which accompanied the System. Furthermore, BMIL shall not be liable for pay-ment of any removal or installation charges of warranted parts.

 Within 30 days of the date of shipping BMIL will take back any unused equipment and refund the customer in full minus a 15% restocking fee and any damage charges or testing charges. If the unit is returned within 90 days an in house credit will be given minus a 15% restocking fee. Returns for credit will not be given after 90 days from the ship date.

 Within 30 days of the date of shipping BMIL will take back any unused equipment and refund the customer in full minus a 15% restocking fee and any damage charges or testing charges. If the unit is returned within 90 days an in house credit will be given minus a 15% restocking fee. Returns for credit will not be given after 90 days from the ship date.

The warranty of items resold by BMIL INTERNATIONAL and warranted by the original manufacturer shall be transferred to the original owner and will be the only warranty recognized by BMIL INTERNATIONAL.

FOR SERVICE AND REPLACEMENT PARTS:

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