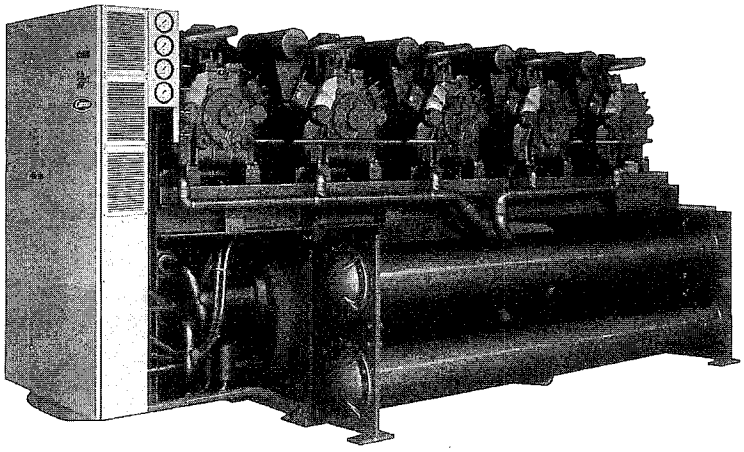
Carrier

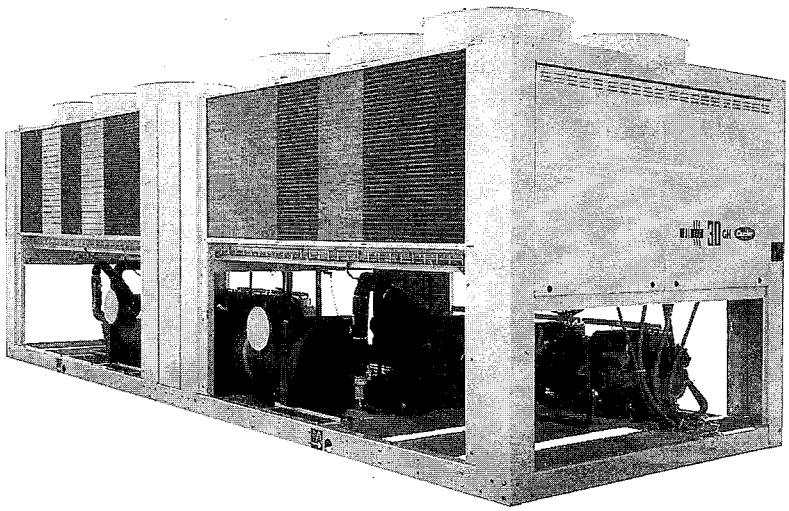
30G and 30H Series

Flotronic II control for reciprocating liquid chillers

50 Hz

Operation, maintenance and troubleshooting instructions





QUALITY ASSURANCE

APPROVALS
BS 5750 Part 1
NF EN 29001
ISO 9001

Contents

IMPORTANT

This equipment generates, uses and can radiate radio frequency and if not installed and used in accordance with these instructions may cause radio interference. It has been tested and found to comply with the limits of a Class A computing device as defined by FCC regulations, Subpart J of Part 15, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Safety considerations

Only authorized personnel whose qualification conform to the the recommendation of International Electric Commission can have access to the electrical equipment of 30G units.

It is strongly recommended to disconnect all electrical power supply before servicing this equipment.

Disconnect main power supply with the help of main power disconnect switch.

IMPORTANT

A sticker indicates location and number of the unit main disconnect switch. This sticker is located on the unit electrical box and it should be completely filled out with ineffaceable ink. Tag all disconnect switch locations to alert others not to restore power until work is completed.

CAUTION

Electrical shock

This main disconnect switch in its OFF position does not cut necessarily all power supply to the unit. For example compressor crankcase heaters which have individual power supply will remain energized.

Burning

Electrical current has a heating effect on some of the unit components. Consequently special precaution should be taken during manipulation of the following unit components: electrical cables, covers of derivation box or electrical motor enclosure.

I. Major Flotronic II system components

The Flotronic II control system cycles compressors and compressors unloaders to maintain the selected leaving water temperature set point. It automatically positions the EXV to maintain the specified refrigerant superheat entering the compressor cylinders. It also cycles condenser fans on and off to maintain suitable head pressure for each circuit. Safeties are continuously monitored to prevent the unit from operating under unsafe conditions. A scheduling function, programmed by the user, controls the unit occupied/unoccupied schedule. The control also operates a Test program that allows the operator to check output signals and ensure components are operable.

The control system consists of a processor module (PSIO), a low-voltage relay module (DSIO - LV), 2 electronic expansion valves (EXV), an EXV driver module (DSIO - EXV), a keyboard and display module (HSIO), transducers plus thermistors, to provide inputs to the microprocessor. An options module (SIO) is used to provide additional functions.

1. Processor module (PSIO)

This module contains the operating software, and controls the operation of the machine. It continuously monitors information received from the various transducers and thermistors and communicates with the low voltage relay module (DSIO-LV) and 6 interface relays to increase or decrease the active stages of capacity. The processor module also controls the EXV driver module, commanding it to open or close each EXV in order to maintain the proper superheat entering the cylinders of each lead compressor. Information is transmitted between the processor module and the relay module. The EXV driver module and the keyboard and display module through a 3-wire communications bus. When used, the options module is also connected to the communication bus.

For the 30G chillers, the processor monitors system pressure by mean of six transducers, 3 in each lead compressor. Compressor suction pressure, discharge pressure, and oil pressure are sensed. If the processor senses high discharge pressure, or low suction pressure, it immediately shuts down all compressors in the affected circuit. During operation, if low oil pressure is sensed for longer than one minute, all compressors in the affected circuit are shut down. At start-up, the oil pressure signal is ignored for two minutes. If shutdown occurs due to any of these pressure faults, the circuit is locked out and the appropriate fault code is displayed.

2. Low voltage relay module (DSIO-LV)

This module closes contacts to energize compressor unloaders and/or compressors. It also senses the status of the safeties for compressors A1, A2, B1, B2 and transmits this information to the processor.

3. Electronic expansion valve module (DSIO-EXV)

This module receives signals from the processor and operate the electronic expansion valves. It also monitors the status of safeties for compressors A3, A4, B3, B4 and transmits this information to the processor.

4. Keyboard and display module (HSIO)

See Fig. 1. This device consists of a keyboard with 6 functions keys, 5 operative keys, 12 numeric keys and an alphanumeric 8-characters LCD. Key usage is explained in keyboard and display module section (functions and subfunctions).

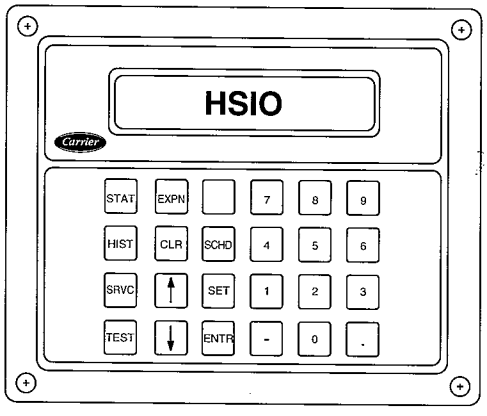


Fig. 1 Keyboard and display module

Function keys	Use
STAT	***Status*** — Displaying diagnostic codes and current operating information about the machine
TEST	***Quick test*** — Checking inputs and outputs for proper operation
HIST	***Historic*** — Checking for run time, starts alarms
SRVC	***Service*** — Entering specific unit configuration information
SET	***Set Point*** — Entering operating set points and day/time information
SCHD	***Schedule*** — Entering occupied / unoccupied schedules for unit operation
	Use
EXPN	***Expand Display*** - Displaying a non-abbreviated expansion of the display
CLR	***Clear*** - Clearing the screen of all displays
↑	***Up Arrow*** - Returning to previous display position
↓	***Down arrow*** - Advancing to next display position
ENTR	***Entering data***

Table 1 Keyboard and display module key usage

Each function has one or more subfunctions as shown in chart 1. These functions are defined in greater detail in the Controls Operation section of this book.

5. Options module

This module allows the use of Flotronic II features such as dual set point, remote reset, demand limit and accessory unloaders. The options module also allows for reset and demand limit to be activated from a remote 4-20 mA signal.

The options module is installed at factory on the 30G chillers. For more details on installation and configuration of each feature offered, see separate Accessory Options Module Installation Instructions.

6. Control Switch

Control of the chiller is defined by the position of the Local/Stop/Network switch. This is a 3-position manual switch that allows the chiller to be (1) put under the control of its own Flotronic II controls, (2) manually stopped, or (3) put under the control of a Carrier Comfort Network. Switch allows unit operation as shown in Table 2.

Switch position	Unit operation	Configuration and set point control	
		Keypad control	**Network control**
STOP	Unit cannot run	Read/Write	Read only
LOCAL	Unit can run	Read/Limited write	Read only
NETWORK Stop -	Unit cannot run	Read only	Read/Write
NETWORK Run -	Unit can run	Read only	Read/Limited write

Table 2 LOCAL/STOP/NETWORK Switch Positions and Operation

In the Local position, the chiller is under local control and responds to the scheduling configuration and set point data input at its own local interface device (keyboard and display module).

In the Network position, the chiller is under remote control and responds only to Network commands. The occupied/unoccupied conditions are defined by the Network. All keyboard and display functions can be read at the chiller regardless of position of the switch.

Network run or stop condition is established by a command from the Network. It is not possible to force outputs by the Network, except that an emergency stop command shuts down the chiller immediately and causes "ALARM 52" to be displayed.

7. Electronic expansion valve (EXV)

EXV's are actuated by an EXV driver module connected to the Main Processor Module.

To control flow of refrigerant for different operating conditions, EXV piston moves up and down over slot orifices through which refrigerant flows to modulate size of opening. Piston is moved by a stepper motor through 750 or 1500 discrete steps and its position is permanently stored in the microprocessor memory.

The EXV is used to control superheat in compressor. One pressure transducer and one thermistor, located in the lead compressor of each circuit are used to directly determine superheat. The EXV is controlled to maintain superheat entering pistons at approximately 8.3°C (15°F) to 11.1°C (20°F), which results in slightly superheated refrigerant leaving cooler.

The electronic control provides for a prepurge and pumpout cycle each time the lead compressor in a circuit is started or stopped. These pumpout cycles minimize amount of excess refrigerant that can go to compressor on start-up and cause oil dilution which would result in eventual bearing wear.

The microprocessor software is programmed so that EXV functions as a MOP (maximum operating pressure) valve, limiting the suction temperatures to 12.8°C (55°F). This makes it possible to start unit at high water temperatures, up to 35°C (95°F), without overloading compressor. If necessary the MOP value can be readjusted.

The electronic expansion valve is not fitted on 30GH 040, because cooling capacity is too low.

8. Sensors

The Flotronic II chiller system control gathers information from sensors to control the operation of the chiller. The 30G uses 6 pressures transducers and 4 thermistors to monitor sytem pressures and temperatures at various points within the chiller. Sensors are listed on page 5, see paragraph "Thermistors and pressure transducers" for details, locations are shown in fig. 18.

II. Flotronic II controls

1. Components function

a. Microprocessor

Microprocessor controls overall unit operation. Its central executive routine controls a number of processes simultaneously. These include internal timers, reading inputs, Analog to Digital conversions, display control, diagnostic control, output relay control, demand limit, capacity control, head pressure control and temperature reset. Some processes are updated almost continuously, others every 2 to 3 seconds, and some every 30 seconds.

The machine is allowed to start by switching the LOCAL/OFF/NETWORK switch to LOCAL. This switch is also used to reset the control should any safety requiring manual reset trip.

Microprocessor controls capacity of chiller by cycling compressors on and off at a rate to satisfy actual dynamic load conditions. Control will maintain leaving water temperature set within values of setpoint entered on the keyboard on display board through intelligent cycling of compressors. Accuracy will depend on loop volume, loop flow rate, load, number of stages, and particular stage being cycled off. No adjustment for cooling range or cooler flow rate is required, because the control automatically compensates for cooling range by measuring both return water temperature and leaving water temperature. This is referred to as leaving water temperature control with return water temperature compensation.

The basic logic for determining when to add or remove a stage is a time band integration of deviation from set point plus rate of change of leaving water temperature. When leaving water temperature is close to set point and slowly moving closer, logic prevents addition of another stage. If leaving water temperature is less than 1.7°C (35°F) for water, or 3.3°C (6°F) below the set point for brine units, the unit is shut off until the water temperature goes to 3.3°C (6°F) above the set point, to protect against freezing.

If adjustable rate ramp loading control has been selected the microprocessor maintains the rate of change in leaving water temperature below the desired value (adjustable from 0.1 to 1.0°C/min).

Where available (requires optional unloaders on some units), two sequences are used to obtain circuit lead-lag operation, which evens out compressor operating hours. First, as unit turns on, microprocessor determines which circuit will start first. Also, when decreasing from maximum stage, control will again select which circuit to run longest.

Also available are the following loading sequences:

- starting circuit A (or B) first
- loading completely circuit A (or B) first

This feature allows more flexibility for different applications such as :

- low loads
- one circuit used as a back-up

Control will also vary loading sequence of lag compressor in each circuit to equalize run time.

The control also performs other special functions when turning on or off. When a circuit is to be turned off, EXV is closed first and lead compressor is run to pump out refrigerant that was in the cooler.

Again at start-up, EXV is held closed if necessary to pump out any refrigerant that has migrated to the cooler. Pump down operations, as well as low refrigerant pressures, high refrigerant pressures and differential oil pressures are monitored by pressure transducers.

b. Thermistors and pressure transducers

Four thermistors are used for temperature sensing inputs to microprocessor. (A fifth may be used as a remote temperature sensor for optional LCWT reset).

As an option, additional thermistors can be used to display condenser (and reclaim condenser) water leaving and entering temperature. This requires the use of an additional input/output module.

R1 Cooler leaving chilled water temperature
R2 Cooler entering water (return temperature)
R3 Suction gas temperature - Circuit A
R4 Suction gas temperature - Circuit B
R10 Remote temperature sensor (accessory)

Six pressure transducers are used for control and safeties :

BP1 Discharge pressure Comp 1 Circuit A
BP2 Discharge pressure Comp 1 Circuit B
BP3 Suction pressure Comp 1 Circuit A
BP4 Suction pressure Comp 1 Circuit B
BP5 Oil pressure Comp 1 Circuit A
BP6 Oil pressure Comp 1 Circuit B

The microprocessor uses these pressures and temperatures to control capacity and electronic expansion valve (EXV) operation.

c. Control options No. 138

- Electrical power demand can be limited by utilizing demand limit control option. This interface with microprocessor allows to set maximum percentages of total capacity at which the machine can operate. These numbers are preprogrammed with the keyboard. Actual demand limit is controlled either by closure of two external switches or by analog signal input to the option Module.
- Also the microprocessor can be programmed for different leaving water temperature reset modes based on return water temperature, outdoor or space temperature or analog 4-20 mA signal. An accessory set (including thermistor and option Module) is required if outdoor temperature or space temperature or analog signal are selected.

d. Interface relays (20 VDC)

Six interface relays are connected to the main processor module (PSIO), they drive fan stages (4). General alarm (1) and cooler pump (1), this last one is available as an accessory.

e. Control Panel

Eight digit alphanumeric panel displays information on status, operating modes, alarms, plus set points, time of day and actual temperatures, pressures and superheats. This information is displayed in English or in anyone of the 6 following languages : Dutch, French, German, Italian, Spanish or Swedish (depending the order, one only). Set points, time schedules, reset limits, ramp loading rates and other operating parameters are entered through the keyboard function and digit keys with password protection. During normal operation, time of day, operating mode and number of alarms will alternate on the display.

2. Control sequence

a. Off cycle

During unit off cycle, crankcase heaters are energized. Electronic expansion valves are closed.

b. Start-up

After the Local/Off/Network selector is switched to "Local", prestart process takes place. First circuit to start may be A or B (automatic or manual lead/lag selected). The controlled ramp loading feature limits compressor loading on start-up to reduce demand on start-up and unnecessary compressor usage. If ramp loading is selected, the microprocessor limits supply water temperature decrease to the selected rate (from 0.1 to 1.0°C/min).

c. Operating sequence

The unit is started by putting the LOCAL/STOP/NETWORK switch in LOCAL or NETWORK position. When the unit receives a call for cooling (either from the internal control or NETWORK command) the unit stages up in capacity to maintain the cooler fluid set point. The first compressor starts 1 1/2 to 3 minutes after the call for cooling.

The lead circuit can be specifically designated or randomly selected by the controls, depending on how the unit is field configured. A field configuration is also available to determine these lead/lag sequence.

When the lead compressor of each circuit starts, the circuit goes through a pumpout cycle to purge the cooler and suction line of any liquid refrigerant. The EXV remains closed until the saturated suction temperature is 11.1°C (20°F) below the saturated suction temperature at start-up, or is 5.5°C (10°F) below the cooler leaving fluid temperature. At this point, the EXV gradually opens to provide a controlled start-up and prevent liquid flood-back to the compressor. The control also limits the saturated suction temperature to 12.8°C (55°F) to prevent compressor overload.

The head pressure is controlled by fan cycling. The desired head pressure set point is entered, and is controlled by EXV position or saturated discharge temperature measurement. The usual head pressure control method (also field configured) is EXV control, which maintains the lowest head pressure that provides enough pressure drop across the valve.

If temperature reset is being used, the unit controls to a higher leaving water temperature as the building load reduces. If demand limit is being used, the unit may temporarily be unable to maintain the desired leaving water temperature because of imposed power limitations.

When the occupied period ends, or when the building load drops low enough, the lead compressor in each circuit shuts down. The pumpout cycle repeats prior to compressor shutdown to purge the cooler and suction lines of refrigerant. In the event of fault conditions requiring immediate shutdown, this pumpout cycle is omitted.

Low-temperature override feature prevents LCWT from overshooting the set point and possibly causing a nuisance trip-out by freeze protection.

High-temperature override feature allows chiller to add capacity quickly during rapid load variations.

d. Dual set point

The unit can be set for dual set point operation, changeover can be programmed on the unit time clock (STD unit) or performed through an external switch connected to the optional Module (option 138).

e. Demand limit

If applied, two discrete steps or analog signal are used for limiting total power draw of unit by controlling number of operational compressors during periods of peak electrical demand (option 138).

f. Set point reset

If applied, microprocessor compares either return water, space or outdoor temperature and adjusts leaving chilled water temperature appropriately. Set point can also be reset through an external 4-20 mA analog signal (option 138).

g. Abnormal conditions (alarm on display board)

All control safeties in chiller operate through compressor protection board and microprocessor. High-pressure switch and compressor protection board directly shut down compressor(s) by de-energizing compressor contactor coil(s).

For other safeties, microprocessor makes appropriate decision to shut down a compressor due to a safety trip or bad sensor reading. In both cases microprocessor energizes an alarm relay (an alarm message is displayed). Chiller holds safety mode until reset. It then reverts to normal control when unit is reset. Reset can be automatic or manual depending on the type of alarm. Previous defect remain stored in memory.

Safeties include :

- low water flow (without the need of a flow switch)
- too high or too low refrigerant pressures
- too high or too low suction superheat
- insufficient oil pressure (lead compressor of each circuit)
- prevent freeze of the evaporator
- ground fault current protection
- high pressure switch
- discharge gas temperature too high
- internal motor temperature
- 5 V power supply failure (pressure transducers)
- pump down failure
- communication failure (between modules)
- thermistor failures

h. Diagnostics

Microprocessor may be put through Quick Test without additional equipment or tools. Quick Test confirms microprocessor is functional, informs operator through LCD, displays the condition of each sensor and switch in chiller and allows to check for proper operation of system components such as compressors, EXV'S etc. Also, each control module (Main Processor, Relay Module, EXV driver, Optional Input-Output Module, has flashing self diagnostic light Emitting Diodes (LED) for easy commissioning and troubleshooting).

III. Troubleshooting

The Flotronic II control has many features to help the technicians in troubleshooting a Flotronic II chiller. By using keyboard and display module and Status function, actual operating conditions of the chiller are displayed while unit is running. Test function allows proper operation of compressors, compressors unloaders, fans, EXV's and other components to be checked while chiller is stopped. Service function display how configurable items are configured.

If an operating fault is detected, and alarm is generated and an alarm code(s) is displayed under the subfunction [2] [STAT], along with an explanation of the fault. Up to 5 current alarm codes are stored. For checking specific items, see keyboard directory.

1. Check display codes

To determine how machine has been programmed to operate, check diagnostic information, [2] [STAT] and operating mode displays [3] [STAT]. If no display appears, follow procedures in Troubleshooting section. Control modules. If display is working, continue as follow :

1. Note all alarm codes displayed, [2] [STAT]
2. Note all operating mode codes displayed, [3] [STAT]
3. Note leaving chilled water temperature set point in effect and current leaving water temperature, [5] [STAT].

If machine is running, compare "in effect" leaving water temperature set point with current water temperature. Remember, if reset is in effect, the values may be different because machine is operating to the modified chilled water set point. If current temperature is equal to set point but set point is not the one desired, remember that if dual set point has been selected in the Schedule function, there are 2 set points to which the machine can be operating. Check the programming of schedule function to see if Occupied or Unoccupied set point should be in effect.

2. Unit shutoff

To shut unit off, move LOCAL/STOP/NETWORK switch to STOP position. Any refrigeration circuit operating at this time continues to complete the pumpout cycle. Lag compressors stop immediately, lead compressors run to complete pumpout.

a. Complete unit stoppage

Complete unit stoppage can be caused by any of the following conditions :

1. Cooling load satisfied
2. Remote ON/OFF contacts open
3. Programmed schedule
4. Emergency stop command from NETWORK
5. General power failure
6. Trip out of control circuit breaker
7. Open control circuit fuse
8. LOCAL/STOP/NETWORK switch moved to STOP
9. Freeze protection trip
10. Low flow protection trip
11. Open contacts in any auxiliary interlock. Interlocks that are field wired between terminals 34 and 35. Opening the circuit between these terminals places unit in STOP mode, similar to moving the control switch to STOP. Unit cannot start if these contacts are open. If they open while unit is running, unit pumps down and stops.
12. Cooler entering or leaving fluid thermistor failure
13. Low transducer supply voltage
14. Loss of communication between processor module and other control modules
15. Low refrigerant pressure

b. Single circuit stoppage

Single circuit stoppage can be caused by the following :

1. Compressor discharge gas temperature too high in the lead compressor
2. Compressor motor temperature too high in the lead compressor
3. Low oil pressure in the lead compressor
4. Ground fault in the lead compressor
5. Open contacts in lead compressor high pressure switch
6. Low refrigerant pressure
7. Thermistor failure
8. Transducer failure
9. High suction superheat
10. Low suction superheat
11. Blown fuse in lead compressor power supply for circuit breaker.

Stoppage of one circuit by a safety device action does not affect other circuit. When a safety device trips on a lead compressor, circuit is shut down immediately and EXV closes.

c. Lag compressor stoppage

Lag compressor stoppage can be caused by the following :

1. Compressor discharge gas temperature too high
2. Compressor motor temperature too high
3. Compressor ground fault
4. Open contact in high pressure switch
5. Blown fuse in compressor power supply
6. Not required to run to meet cooling load requirement.

IMPORTANT

If stoppage occurs more than once as a result of any of the above safety devices, determine and correct the cause before attempting another restart.

3. Restart procedure

After cause for stoppage has been corrected, restart is either automatic or manual, depending on fault. Manual reset requires that LOCAL/STOP/NETWORK switch be moved to STOP, then back to original operating position. For a complete list of fault conditions, codes, and reset type, see table 3.

Power failure external to the unit — Unit restarts automatically when power is restored.

4. Alarm codes

Following is a detailed description of each alarm code error and possible cause. Manual reset of an alarm is accomplished by moving Local/Stop/Network switch to Stop, then back to Local or Network. See table 3. for listing of each alarm code.

a. Alarm codes description

Code 0 No alarm exist

Codes 1-8 Compressor failure

If DSIO relay module relay or control relay feedback switch opens during operation of a compressor, microprocessor detects this and stops compressor, energizes alarm light, and displays a code of 1 to 8 depending on the compressor. Compressor locks off ; to reset, use manual reset method.

If lead compressor in a circuit shuts down, the other compressors in the circuit stop and lock off. Only the alarm mode for lead compressor is displayed.
The microprocessor is also programmed to indicate compressor failure if feedback terminal on DSIO J3 terminal strip receives voltage when compressor is not supposed to be on.

Following are possible causes of failure :

High-Pressure Switch Open — High-pressure switch for each compressor is wired in series with 24-V power that energizes compressor control relay. If high-pressure switch opens during operation compressor stops. This is detected by microprocessor through the feedback terminals.

Sensor module contact — Compressor motor internal protection and discharge gas sensor are detected by the sensor module located in the power terminal box of each compressor. The contact is also wired in series with 24 V power that energizes control relay. If switch opens during operation of compressor. The compressor stops and failure is detected through feedback terminals.

DSIO Module Failure — If a DSIO relay module relay fails open or closed, microprocessor detects this, locks compressor off and indicates an error.

Wiring Errors — If a wiring error exists causing control relay or feedback switch not to function properly, microprocessor indicates an error.

Processor (PSIO) Failure — If hardware that monitors feedback switch fails, or processor fails to energize relay module relay to ON, an error may be indicated.

Ground Fault Module — Ground fault module contact is wired in series with 24 V power that energizes compressor control relay. If ground current protection module contact opens during operation, compressor stops. This is detected by microprocessor through the feedback terminals.

Checkout Procedure (Codes 1 - 8) — Shut off main power to unit. Turn on control power, then step through subfunction [2] [TEST] to proper compressor number (i.e. failure code 5 is compressor B1). Next, energize the step. If step works correctly, then failure code is caused by :

- HPS open
- Sensor module contact open
- Misplaced feedback wire from J4 and J5 terminals
- Ground wire and 24-V feeds reversed on one or more points on J3
- Ground current protection module safety contact open.

Compressor A1 Alarm Circuit — Processor closes contacts between J4 terminals 2 and 3 to start compressor. Safeties must be closed in order for power to reach compressor control relay, and the feedback input terminals on J3.
Failure of power to terminal 1 on J3, when contacts J5 2 and 3 should be closed, causes a code 1 alarm.
Terminal 2 on J3 is the other leg of the compressor A1 feedback channel. It is connected to the 24 V ground.

Code 9 Leaving water thermistor failure
Code 10 Entering water thermistor failure

If temperature measured by these thermistors is outside range of - 40 to 116°C (- 40 to 240°F), unit shuts down after going through a normal pumpout. Reset is automatic if temperature returns within range, and unit start-up follows normal sequence. Cause of fault is usually a bad thermistor, wiring error or loose connection.

Code 15 Not used
Code 16 Not used

Code 19 Compressor A1 suction thermistor failure
Code 20 Compressor B1 suction thermistor failure

If temperature measured by these thermistors is outside the range of - 40 to 116°C (- 40 to 240°F), affected circuit shuts down after going through a normal pumpout. Other circuit continues to run. Reset is automatic if temperature returns within range, and circuit start-up follows normal sequence. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 21 Reset thermistor failure applies only to installations having external temperature reset.

If temperature measured by this thermistor is outside range of - 40 to 116°C (- 40 to 240°F), reset function is disabled and unit controls to normal set point. If temperature returns within range, reset function is automatically enabled. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 22 Compressor A1 discharge pressure transducer failure
Code 23 Compressor B1 discharge pressure transducer failure
Code 24 Compressor A1 suction pressure transducer failure
Code 25 Compressor B1 suction pressure transducer failure
Code 26 Compressor A1 oil pressure transducer failure
Code 27 Compressor B1 oil pressure transducer failure

If output voltage of any of these transducers is greater than 5 Volts, affected circuit shuts down without going through pumpout process. Other circuit continues to run. Reset is automatic if output voltage returns within range, and circuit start-up follows normal sequence. Cause of fault is usually a bad transducer or a wiring error.

Code 28 Low transducer 5 V supply voltage failure

If transducer supply voltage is less than 4.5 Volts or greater than 5.5 Volts, unit shuts down without going through pumpout process. Reset is automatic if supply voltage returns within range, and circuit start-up follows normal sequence. Cause of fault is usually a faulty transformer, or primary voltage is out of range.

Code 29 Chilled water pump interlock switch open. Code can occur under these conditions :

1. Interlock switch fails to close within one minute after chilled water pump starts
2. Interlock switch opens during unit operation
3. Interlock voltage is detected, but unit is not configured for interlock
4. Interlock voltage is outside its valid range
5. Safety thermostat controlling electrical box inside temperature trips out. Available only on air cooled chillers size above 260 tons.

If any of these conditions occur, all compressors are disabled and, if running, shutdown occurs without pumpout. Chilled water pump also shuts down. Reset is manual, with LOCAL/STOP/NETWORK Switch. Most probable cause of this fault is shutdown or failure of chilled water pump to start. Other possibilities are improper configuration or wiring errors.

Code 30 Reset input failure (4 to 20 mA)
Code 31 Demand limit input failure (4 to 20 mA)

These codes apply only if unit is configured for these functions. If a 4-20 mA signal is less than 2 or more than 22 mA, reset or Demand Limit function is disabled and unit functions normally. If mA signal returns within range, function is automatically enabled.

Code 32 Loss of communication with compressor relay module (DSIO-LV)
Code 33 Loss of communication with EXV relay module (DSIO-EXV)

If communication is lost with either of these modules, unit shuts down without going through pumpout process. Reset is automatic when communication is restored and start-up follows normal sequence. Probable cause of fault is a loose plug, wiring error, or bad module.

Code 34 Loss of communication with options board

This applies only if one or more of the following options are used :

- External temperature reset
- 4-20 mA temperature reset
- External switch controlled dual set point
- Switch controlled demand limit
- 4-20 mA demand limit
- Compressor unloaders

If communication is lost with options board, unit shuts down after going through normal pumpout. Reset is automatic when communication is restored, and start-up follows normal sequence. Probable cause of fault is a loose plug, wiring error, or defective options board.

Code 36 Low refrigerant pressure, Circuit A
Code 37 Low refrigerant pressure, Circuit B

If suction pressure transducer senses a pressure below set point for more than 5 minutes at start-up or more than 2 minutes during normal operation, affected circuit shuts down without going through the pumpout process. Reset is automatic when pressure reaches 10 psig or 67 kPa above set point, if there have been no previous occurrences of this fault on the same day. If this is a repeat occurrence on same day, then reset is manual, with LOCAL/STOP/NETWORK Switch. Factory configured set point is 27 psig or 180 kPa for standard chillers and 12 psig or 80 kPa for brine chillers.
Possible causes of fault are low refrigerant charge, faulty EXV, plugged filter drier, or faulty transducer.

Code 38 Failure to pump out, Circuit A
Code 39 Failure to pump out, Circuit B

The pumpout process is terminated when saturated suction temperature is 11°C (20°F) below temperature at beginning of pumpout, or 5.5°C (10°F) below leaving water temperature. If neither is met within 3 minutes, circuit shuts down without pumpout. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence.

Code 40 Low oil pressure, Circuit A
Code 41 Low oil pressure, Circuit B

If oil pressure differential is less than set point for more than 2 minutes at start-up, or more than 1 minute during normal operation, affected circuit shuts down without going through pumpout process. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence. Factory configured differential oil pressure is 70 kPa or 117 kPa depending on compressor size.

Possible causes of fault are faulty compressor, EXV, crankcase heater, or transducer; or refrigerant overcharge, or insufficient oil charge.

Code 42 Cooler freeze protection

If cooler entering or leaving water temperature is below 1.1°C (34°F) for water or more than 4.4°C (8°F) below set point for brine, unit shuts down without pumpout. Chilled water pump continues to run if controlled by chiller controls. Reset is automatic when leaving water temperature reaches 3°C (6°F) above set point, providing there has been no prior occurence of this fault the same day. If fault has occured previously the same day, reset is manual with LOCAL/STOP/NETWORK Switch.

Possible causes of fault are low water flow or faulty thermistor.

Code 43 Low water flow

If any compressors are operating and entering water temperature is 1.7°C (3°F) or more below leaving water temperature for more than 1 minute, unit shuts down without pumpout. Chilled water pump also shuts down. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence.

This is a suitable method for sensing low water flow because entering water thermistor is in the cooler shell and responds quicker to compressor operation than the leaving water thermistor which is in the leaving water nozzle. Possible causes of fault are faulty chilled water pump, control or thermistor.

Code 44 Low cooler suction temperature, Circuit A
Code 45 Low cooler suction temperature, Circuit B

If saturated suction temperature is less than 0°C (32°F) and is 11 degrees C (20°F) or more below leaving water temperature, mode 14 is displayed, unit continues to run, but additional compressors are not allowed to start. If condition persists for more than 10 minutes, fault code is displayed, and unit shuts down without pumpout. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence.

Possible causes of fault are low refrigerant charge, plugged filter drier, faulty EXV or thermistor.

Code 46 High suction superheat, Circuit A
Code 47 High suction superheat, Circuit B

If EXV is full open, suction superheat is greater than 42°C (75°F) and saturated evaporator temperature is less than MOP (maximum operating pressure) for more than 5 minutes, unit shuts down after normal pumpout process. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence.

Possible causes of fault are low refrigerant charge, plugged filter drier, faulty EXV or faulty thermistor.

Code 48 Low suction superheat, Circuit A
Code 49 Low suction superheat, Circuit B

If EXV is at minimum position, suction superheat is more than 5.5°C (10°F) below set point, and saturated evaporator temperature is greater than MOP (maximum operating pressure) for more than 5 minutes, affected circuit shuts down after going through pumpout process. Reset is manual with LOCAL/STOP/NETWORK Switch, and start-up follows normal sequence.

Possible causes of fault are faulty EXV or thermistor.

Code 50 Illegal configuration

This fault indicates a configuration error. Unit is not allowed to start. Check all configuration data and set points and correct any errors.

Code 51 Initial configuration required

This fault indicates factory configuration has not been done, and unit is not allowed to start. Refer to unit wiring labels for factory configuration codes. There are 8 groups of 8-digit numbers that must be entered. The first 6 groups must be entered under [3] [SRVC] subfunction. Groups 7 and 8 must be entered under [5] [SRVC] subfunction.

Simply enter each group, then press the [ENTR] key. Use the down arrow [↓] after each group to bring up the next empty screen. Unit should start after factory and field configurations are correctly entered.

The usual cause of this fault is replacement of the processor module. Refer to instructions accompanying the replacement module.

Code 52 Emergency stop by NETWORK command. Unit goes through normal shutdown when this command is received, and goes through normal start-up when command is cancelled.

5. Alarm display codes

Display	Description	Action taken by control	CKT pumpdown	Reset method	Probable cause
0	No Alarms Exist	—	—	—	—
1	Compressor A1 Failure	Circuit A shut down	No	Manual	• High pressure switch trip • Compressor motor internal protection or discharge gas temperature too high detected by sensor module • Ground fault module contact open
2, 3, 4	Compressor A2, A3 or A4 Failure	Compressor shut down	No	Manual	
5	Compressor B1 Failure	Circuit B shut down	No	Manual	
6,7,8	Compressor B2, B3 or B4 Failure	Compressor shut down	No	Manual	
9	Leaving Water Thermistor Failure	Unit shut down	Yes	Auto.	Thermistor failure or wiring error.
10	Entering Water Thermistor Failure	Unit shut down	Yes	Auto.	
19	Compressor A1 Thermistor Failure	Circuit A shut down	Yes	Auto.	
20	Compressor B1 Thermistor Failure	Circuit B shut down	Yes	Auto.	
21	Reset Thermistor Failure	Normal set point used	No	Auto.	
22	Discharge Pressure Transducer Failure Circuit A	Circuit A shut down	Yes	Auto.	Transducer failure or wiring error.
23	Discharge Pressure Transducer Failure Circuit B	Circuit B shut down	Yes	Auto.	
24	Suction Pressure Transducer Failure Circuit A	Circuit A shut down	No	Auto.	
25	Suction Pressure Transducer Failure Circuit B	Circuit B shut down	No	Auto.	
26	Oil Pressure Transducer Failure Circuit A	Circuit A shut down	No	Auto.	
27	Oil Pressure Transducer Failure Circuit B	Circuit B shut down	No	Auto.	
28	Transducer 5 V supply voltage low	Unit shut down	No	Auto.	Unit voltage low or electronic control circ. transformer faulty
29	Interlock switch open	Unit shut down	No	Manual	Chilled water pump inoperative or internal electrical power box too high
30	4-20 mA Reset Input Failure	Normal set point used	No	Auto.	Wiring error or faulty module or improper address code.
31	4-20 mA Demand Limit Failure	Demand limit ignored	No	Auto.	
32	Loss of communication with DSIO-LV	Unit shut down	No	Auto.	
33	Loss of communication with DSIO-EXV	Unit shut down	No	Auto	
34	Loss of communication with Options Board	Unit shut down	Yes	Auto.	
36	Low pressure Circuit A,	Circuit A shut down	No	*	Low refrigerant charge. Plugged filter drier. Faulty EXV
37	Low Pressure Circuit B	Circuit B shut down	No	*	Low refrigerant charge. Plugged filter drier. Faulty EXV
38	Failure to pump down Circuit A	Circuit A shut down	No	Manual	Faulty EXV or transducer.
39	Failure to pump down Circuit B	Circuit B shut down	No	Manual	Faulty EXV or transducer.
40	Low oil pressure Circuit A	Circuit A shut down	No	Manual	Low oil level, faulty EXV, crankcase heater or pressure transducer failure.
41	Low oil pressure Circuit B	Circuit B shut down	No	Manual	Low oil level, faulty EXV, crankcase heater or pressure transducer failure.
42	Cooler Freeze Protection	Unit shut down	No	*	Low water flow or faulty thermistor.
43	Low cooler water flow	Unit shut down	No	Manual	Chiller water pump failure or faulty thermistor.
44	Low suction temperature Circuit A	Circuit A shut down after 10 min.	No	Manual	Faulty EXV or thermistor.
45	Low suction temperature Circuit B	Circuit B shut down after 10 min.	No	Manual	Faulty EXV or thermistor.
46	High suction superheat Circuit A	Circuit A shut down	Yes	Manual	Low charge, faulty EXV or thermistor, or plugged filter drier.
47	High suction superheat Circuit B	Circuit B shut down	Yes	Manual	Low charge, faulty EXV or thermistor, or plugged filter drier.
48	Low suction superheat Circuit A	Circuit A shut down	Yes	Manual	Faulty EXV or thermistor.
49	Low suction superheat Circuit B	Circuit B shut down	Yes	Manual	Faulty EXV or thermistor.
50	Illegal configuration	Unit cannot start	-	Manual	Configuration error.
51	Initial configuration required	Unit cannot start	-	Manual	Configuration omitted.
52	Emergency stop by Network command	Unit shut down	Yes	Network	Network command.

Note :

** Reset automatic first time, manual if repeated same day.*

Table 3 Alarm display codes

IV. Flotronic II controls operation

1. Accessing functions and subfunctions

Table 4. Refer also to chart 1, which shows the functions (indentified by name) and the subfunctions (identified by number). Table shows the sequence of all the elements in a subfunction.

2 Display functions

a. Summary display

Whenever the keyboard has not been used for 10 minutes, the display will automatically switch to an alterning summary display. This display has 4 parts, shown below, which alternate in continuous rotating sequence.

Display	**Expansion (EXPN)**
Date/hour	Date (ex. TUE)/HOUR (ex. 12:50)
"n" mode	Operating modes
"n" stages	Number of stages
"n" alarms	"n" alarms detected

Operation	Keyboard entry	Display	Description
To access a function, press the subfunction number and the function name key. The display will show the subfunction group.	1 SET	SET POINT	Unit set point
To move to the other elements, scroll up or down using the arrow keys.	↓	CSP1	Cold set point 1
	↓	CSP2	Cold set point 2
	↓	HSPA	Head pressure set point circuit A
When the last element in a subfunction has been displayed, the first element will be repeated.	↓	CSP1	Cold set point 1
To move to the next subfunction, it is not necessary to use the subfunction number ; pressing the function name key will advance the display through all subfunctions within a function and then back to the first.	SET	RESET	Reset set points
	SET	DEMAND	Demand limit set points
	SET	TIME	Day of week and time of day Date
	SET	SET POINT	Unit set points
To move to another function, either depress the function name key for the desired function (display will show the first subfunction) or access a particular subfunction by using the subfunction number and the function name key.	STAT	AUTO INFO	Summary display
	4 STAT	STAGES	Capacity stages

Table 4 Accessing functions and subfunctions

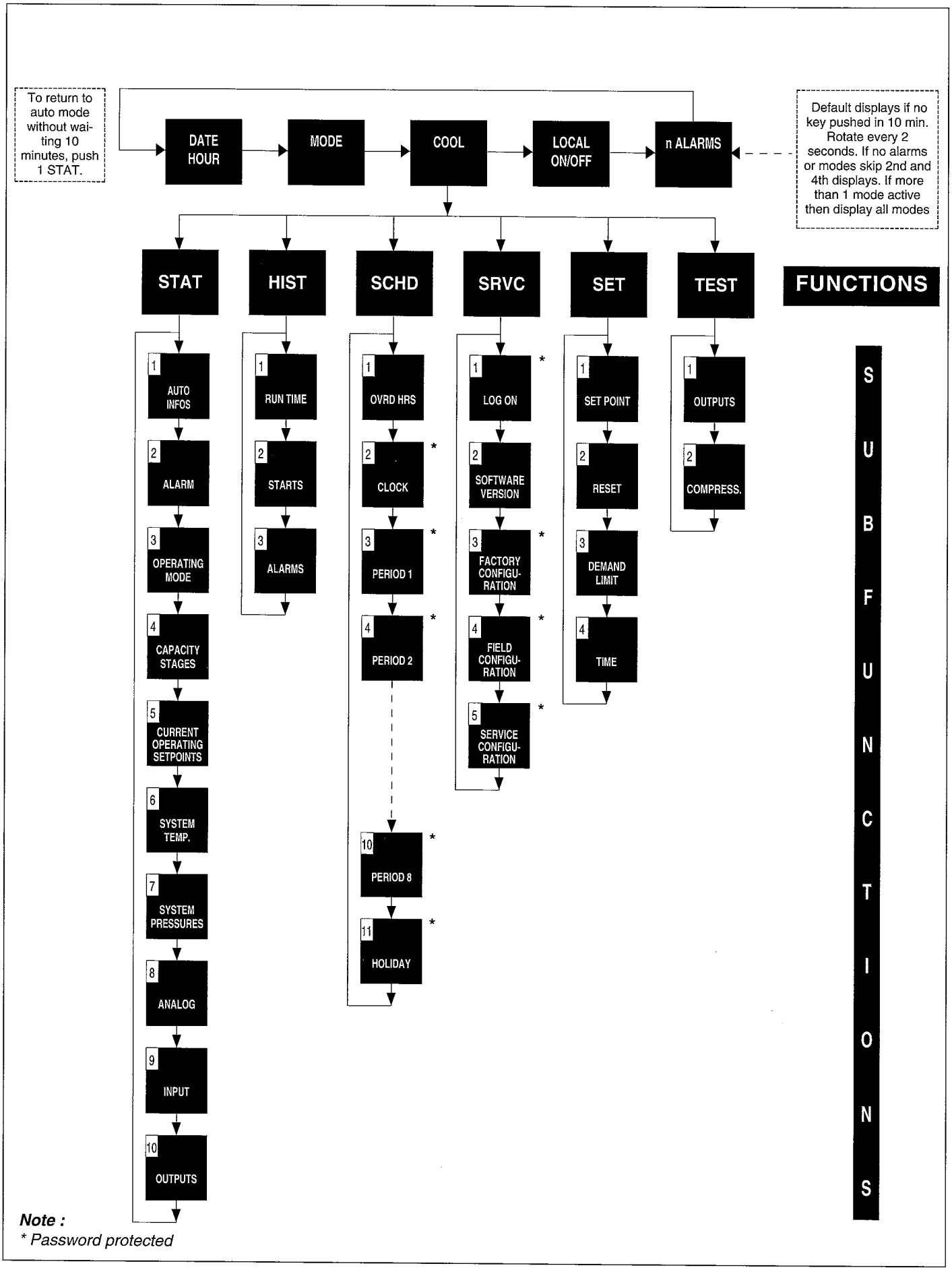


Chart 1 Flotronic II. HSIO tree structure - Functions and subfunctions

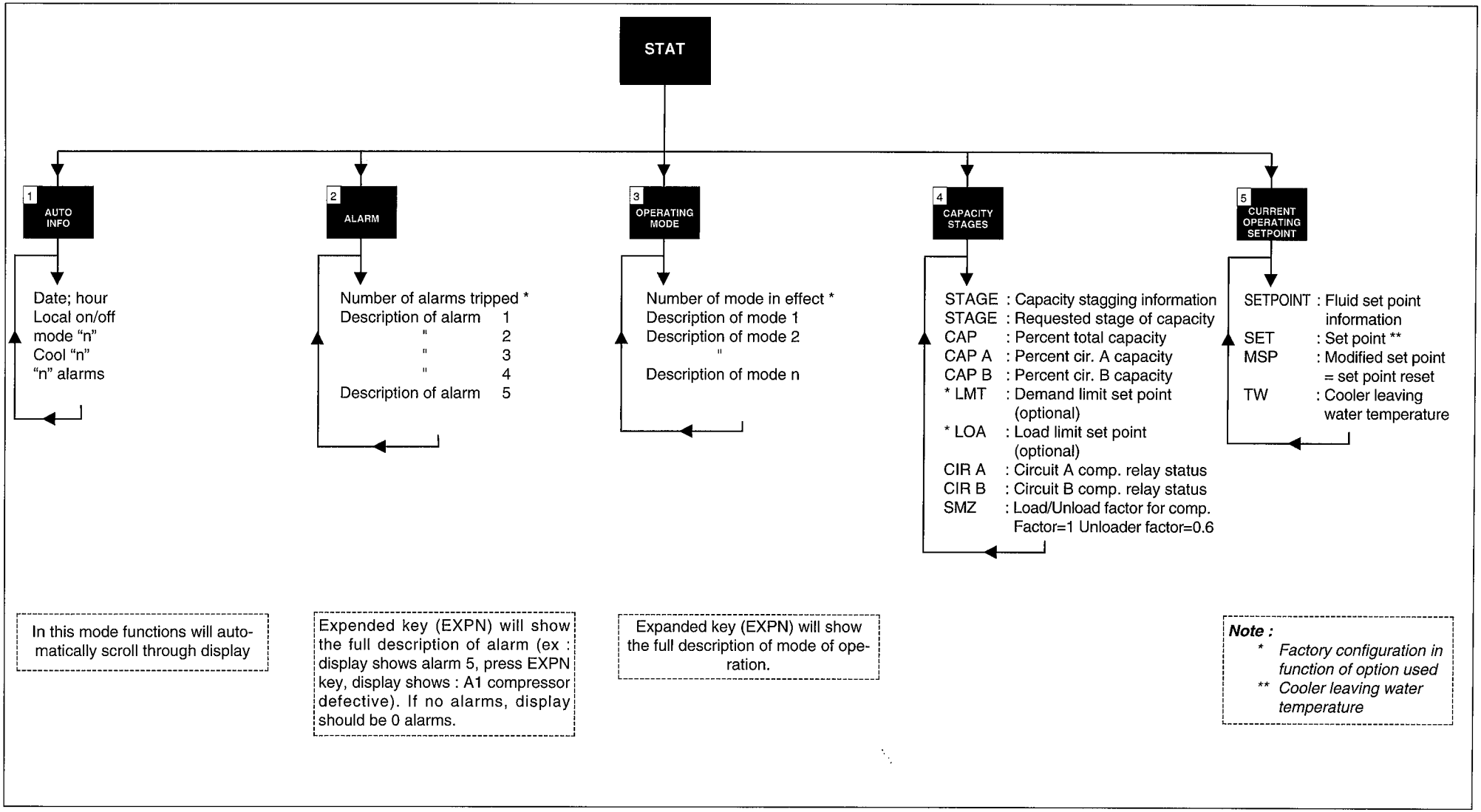


Chart 2a. STATUS subfunctions

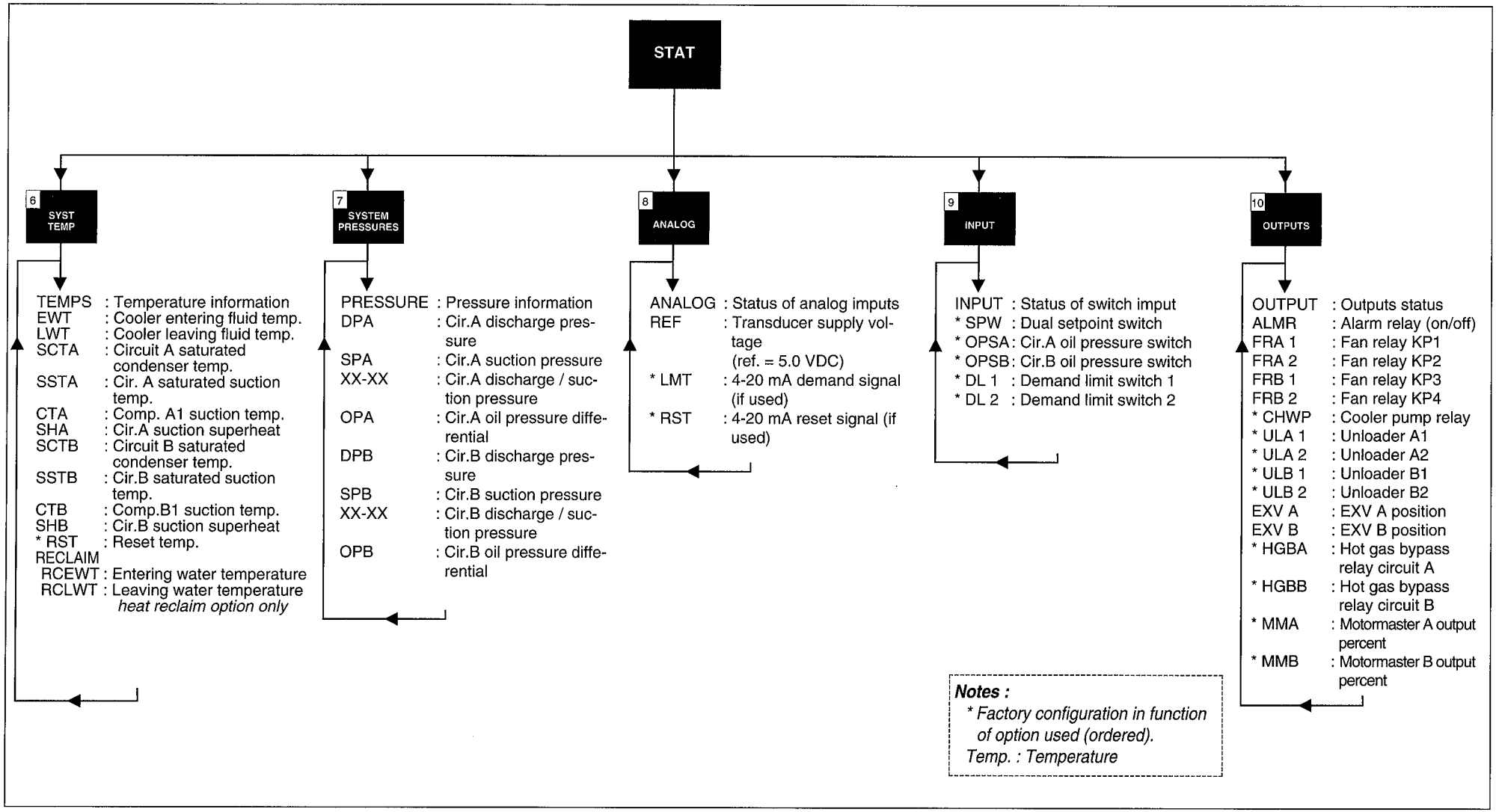


Chart 2b. STATUS subfunctions

3. Status function

The status function shows the current status of alarm (diagnostic) codes, capacity stages, operating modes, chilled water set point, all measured system temperatures, superheat values, pressure switch positions and expansion valves positions. These subfunctions are defined below. Refer to charts 2a and 2b for additional information.

[1] [STAT] AUTO INFO (information). The display will automatically switch to an alternating summary display. This display has 5 parts, shown below, which alternate in continous rotating sequence.

Display	Expansion (EXPN)
Date/hour	Date (Ex. TUE/12:50)
Local on/off	Status of mode switch
"n" mode	Number of operating modes
"n" stages	Number of stages
"n" alarms	"n" alarms detected

[2] [STAT] ALARMS. Alarms are messages that one or more faults have been detected. Each fault is assigned a code number which is reported with the alarm. (See table 3 for code definitions). The code indicate failures that cause the unit to shut down, terminate an option (such as reset) or result in the use of a default value as setpoint.

Up to 5 alarm codes can be stored at once. To view them in sequence, press [1] [STAT] to enter the alarm displays and then press [↓] to move to the individual alarm displays.

Press [EXPN] after a code has been displayed and the meaning of the code will scroll across the screen.

When a diagnostic (alarm) code is stored in the display and the machine automatically resets, the code will be deleted. Codes for safeties which do not automatically reset will not be deleted until the problem is corrected and the machine is switched to Stop, then back to Local or Network.

When switching to STOP position, the alarms stay in memory up to switching to LOCAL.

Example 1 Reading alarm codes

Keyboard Entry	Display Response	Comment
	TUE 12:45 Mode 6 0 STAGES 2 ALARMS	Keyboard has not been used for at least 10 min. Alternating summary display appears on screen
[2] [STAT]	2 ALARMS	2 alarms detected
[↓]	ALARM 9	First alarm code
[EXPN]	COOLER LEAVING FLUID THERMISTOR FAILURE	Explanation of alarm code
[↓]	ALARM 42	Second alarm code. Cooler freeze protection
[EXPN]	COOLER FREEZE PROTECTION	Explanation of alarm code

OPERATING MODE. The operating modes are displayed by name or code number, to indicate the operating status of the unit at given time. The modes are :

	Code	Description
1	LOCAL # OFF	Unit is off. LOCAL/STOP/NETWORK switch is in OFF position, or LOCAL/STOP/NETWORK switch may be in LOCAL position with external ON/OFF switch in OFF position.
2	NETWORK OFF (CCN)	Unit is off due to NETWORK command. LOCAL/STOP/NETWORK switch is in NETWORK position.
3	CLOCK # OFF	Unit is off due to internal clock schedule. LOCAL/STOP/NETWORK switch is in LOCAL position.
4	LOCAL ON	Unit is on. LOCAL/STOP/NETWORK switch is in LOCAL position. If external ON/OFF switch is used, it will be in ON position.
5	NETWORK ON	Unit is on due to NETWORK command. LOCAL/STOP/NETWORK switch is in NETWORK position.
6	CLOCK ON	Unit is on due to internal clock schedule or Occupied override function. LOCAL/STOP/ NETWORK switch is in LOCAL position.
7	MODE 7 DUAL SET POINT	Dual set point is in effect. In this mode, unit continues to run in Unoccupied condition, but leaving water set point is automatically increased to a higher level (CSP2 set point is in SET function).
8	MODE 8 TEMPERATURE RESET	Temperature reset is in effect. In this mode, unit is using temperature reset to adjust leaving water set point upward, and unit is currently controlling to the modified set point. The set point can be modified based on return water, outside air temperature or space temperature.
9	MODE 9 DEMAND LIMIT ACTIVE	Demand Limit is in effect. This indicates that capacity of unit is being limited by Demand Limit control option. Because of this limitation, unit may not be able to produce the desired leaving water temperature.
10	MODE 10 LOAD LIMIT ACTIVE	Load Limit is in effect. This indicates that capacity of a system of units is being limited by a NETWORK Loadshed command. Due to this limitation, unit may not be able to produce the desired leaving water temperature.
11	MODE 11	Not applicable
12	MODE 12 RAMP LOAD LIMITED	Ramp load (pulldown) limiting is in effect. In this mode, the rate at which leaving water temperature is dropped is limited to a predetermined value to prevent compressor overloading. See CRAMP set point in the SET function. The pulldown limit can be modified, if desired, to any rate from .1 to 1°C (.2 to 2°F)/minute.
13	MODE 13 TIMED OVERRIDE (HOURS)	Time override is in effect. This is a 1 to 4 hour temporary override of the programmed schedule, forcing unit to Occupied mode. Override can be implemented with unit under LOCAL or NETWORK control. Override expires after each use.
14	MODE 14 LOW COOLER SUCTION	Low cooler suction protection is in effect. In this mode, unit capacity is reduced if cooler saturated suction temperature is 11°C (20°F) degrees or more below leaving water temperature, and leaving water temperature is less than 0°C (32°F). If these conditions persist beyond ten minutes, circuit is shut down and fault code 44 or 45 is displayed.

To enter the MODES subfunction, depress [3] [STAT] and use the [↓] key to determine if more than one mode applies. See example 2 to read current mode with expansion.

Example 2 Reading current operating modes

Keyboard Entry	Display Response	Comment
	TUE 15:45 LOCAL ON COOL 1 0 ALARMS	Keyboard has not been used at least for 10 min. Rotating summary display appears on screen
[3] [STAT]	2 MODES	There are 2 modes currently in effect
[↓]	LOCAL ON	Units is on by remote on/off switch
[↓]	MODE 8	Temperature reset is in effect

[4] [STAT] STAGES. This subfunction displays the capacity stage number, from 1 to 17. See "Compressor loading sequence".

To enter the STAGES subfunction, depress [4] [STAT] and use the [↓] to display the stage number. Additional [↓] provides the following information :

- Percent of total unit capacity being utilized.
- Percent of each circuit capacity being utilized.
- Demand limit set point in effect (can be any value between 0% and 100%)
- Load limit set point in effect. This is a NETWORK function for controlling operation of multiple units between 0% and 100% of total capacity of all units combined.
- Status of each compressor relay. When a compressor is on, the number of that compressor is displayed. If a compressor is off, a 0 is displayed. Example : In a given circuit, if compressors 1 and 3 are running, and 2 and 4 are not running, 1030 is displayed for that circuit.
- Load/Unload factor for compressors. This factor is an indication of when a step of capacity is added or subtracted. Its value can range from slightly less than - 1.0 to slightly more than + 1.0. When load/unload factor reaches + 1.0 a compressor is added. When load/unload factor reaches - 1.0 a compressor is substracted. If compressor unloaders are used, at - 0.6 a compressor is unloaded and at + .6, a compressor is loaded up.

[5] [STAT] CURRENT OPERATING SET POINT. This subfunction displays the leaving water temperature and the leaving chilled water set point. If the unit is programmed for dual set point, the chilled water set point currently in effect (either occupied or unoccupied) will be displayed. If reset is in effect, the unit will be operating to the modified chilled water set point. This means that the leaving water temperature may not equal the chilled water set point. The modified chilled water set point can also be displayed in the status function.

To enter the set point subfunction, depress [5] [STAT] and use the [↓] to display modified leaving chilled water set point followed by leaving water set point and actual cooler leaving fluid temperature.

Subfunction
5 Set point

Keyboard Entry	Display Response	Comment
[5] [STAT]	SET POINT	Fluid set point information
[↓]	SET X	Set point
[↓]	MSP X	Modified set point = set point + reset
[↓]	TW X	Cooler leaving fluid temperature

[6] [STAT] SYSTEM TEMPERATURE. The temperature subfunction displays the readings at temperature sensing thermistors.

To read a temperature, enter [6] [STAT], then scroll to the desired temperature using the [↓] key. Chart 2b shows the order of the readouts.

[7] [STAT] SYSTEM PRESSURE. In this mode, the pressure transducer inputs is displayed in actual units. Note that all pressures are displayed in gauge units. A special mode is used to display high and low pressures on the same display. The display will show the high pressure in the 3 left display digits followed by a space and then 3 digits for the low side pressure.

[8] [STAT] ANALOG INPUTS. This subfunction displays analog inputs. Enter [8] [STAT], then use the [↓]
The transducer supply voltage, 4-20 mA reset signal can be displayed. This is useful for problem diagnosis as preliminary to the Test function

[9] [STAT] SWITCH INPUT. This subfunction displays status (ON/OFF) of input switch where applicable. Status of dual set point switch, and demand limit switch 1 and 2 can be displayed. This is useful for problem diagnosis as preliminary to the Test function.

[10] [STAT] OUTPUTS. This function displays ON/OFF status of alarm relay, all fan relays and chilled water pump relay. It also displays ON/OFF status of compressor unloaders (if used). The position of each EXV (in percent open) can be displayed.

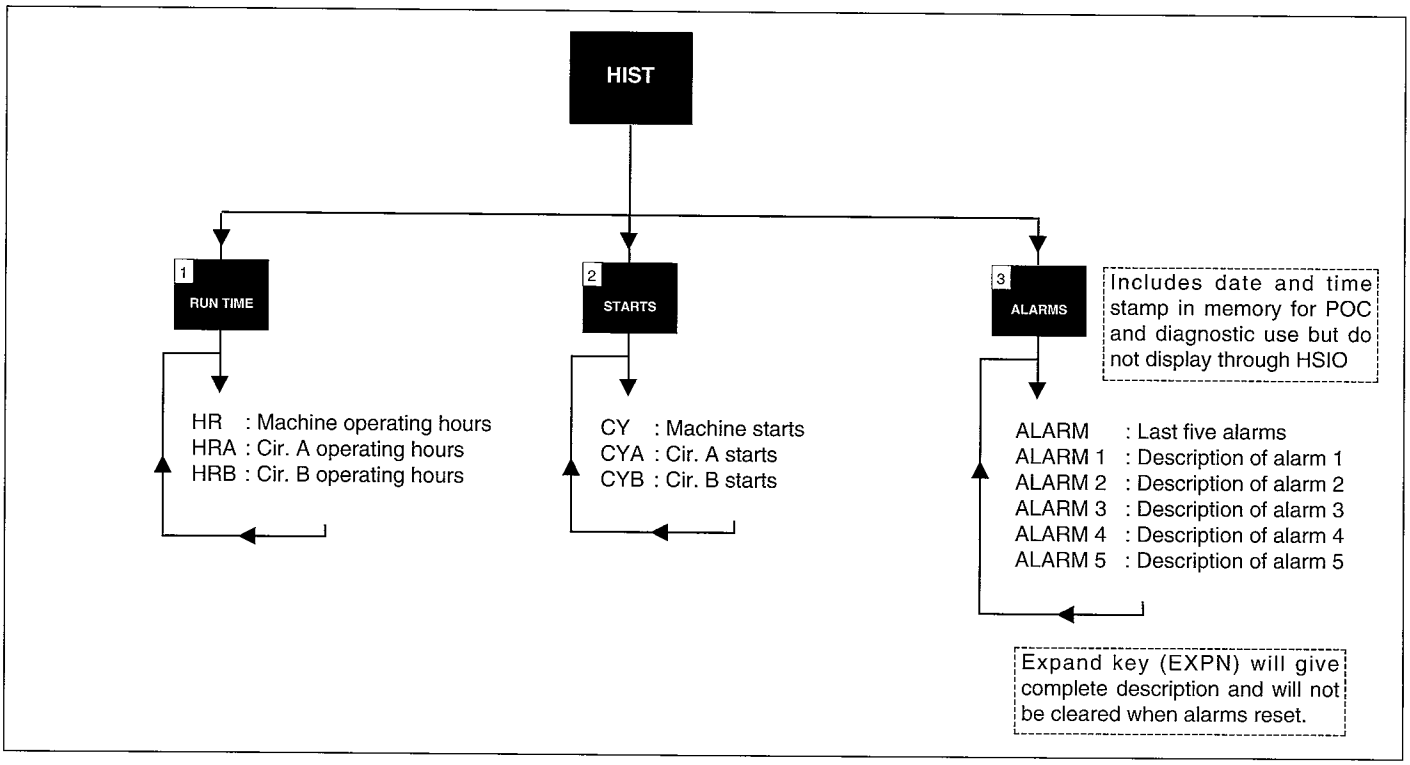


Chart 3. HISTORIC subfunctions

4. Historic function

This HIST function is used to display historical data such as machine or circuit run time, machine cycles and circuit cycles. Individual compressor runtime and cycles are stored in memory, but they will not be displayed through the HSIO. This information is available through the Service Tool, except for the lead compressor of each circuit.

1 HIST RUN TIME. In this mode the machine operating hours are displayed. The operating hours is the number of hours that compressor was running. Operating hours of each compressor is stored but they can only be displayed through the Service Analyzer. The lead compressors operating hours are available through HSIO.

2 HIST STARTS. In this mode the number of machine starts is displayed. The number of machine starts is the number of times the unit goes from stage 0 to stage 1. Also the number of starts of each circuit is displayed. Starts for each compressor are stored in memory but they can only be displayed through Service Analyzer. The lead compressors starts are available through HSIO.

3 HIST ALARMS. In this mode the last five alarms trips are displayed. When the EXPN key is pushed the display will show an expanded explanation plus the time at which safety tripped. Alarms are sent to History whenever an error is reset through the LOCAL/STOP/NETWORK switch (see table 3 for details).

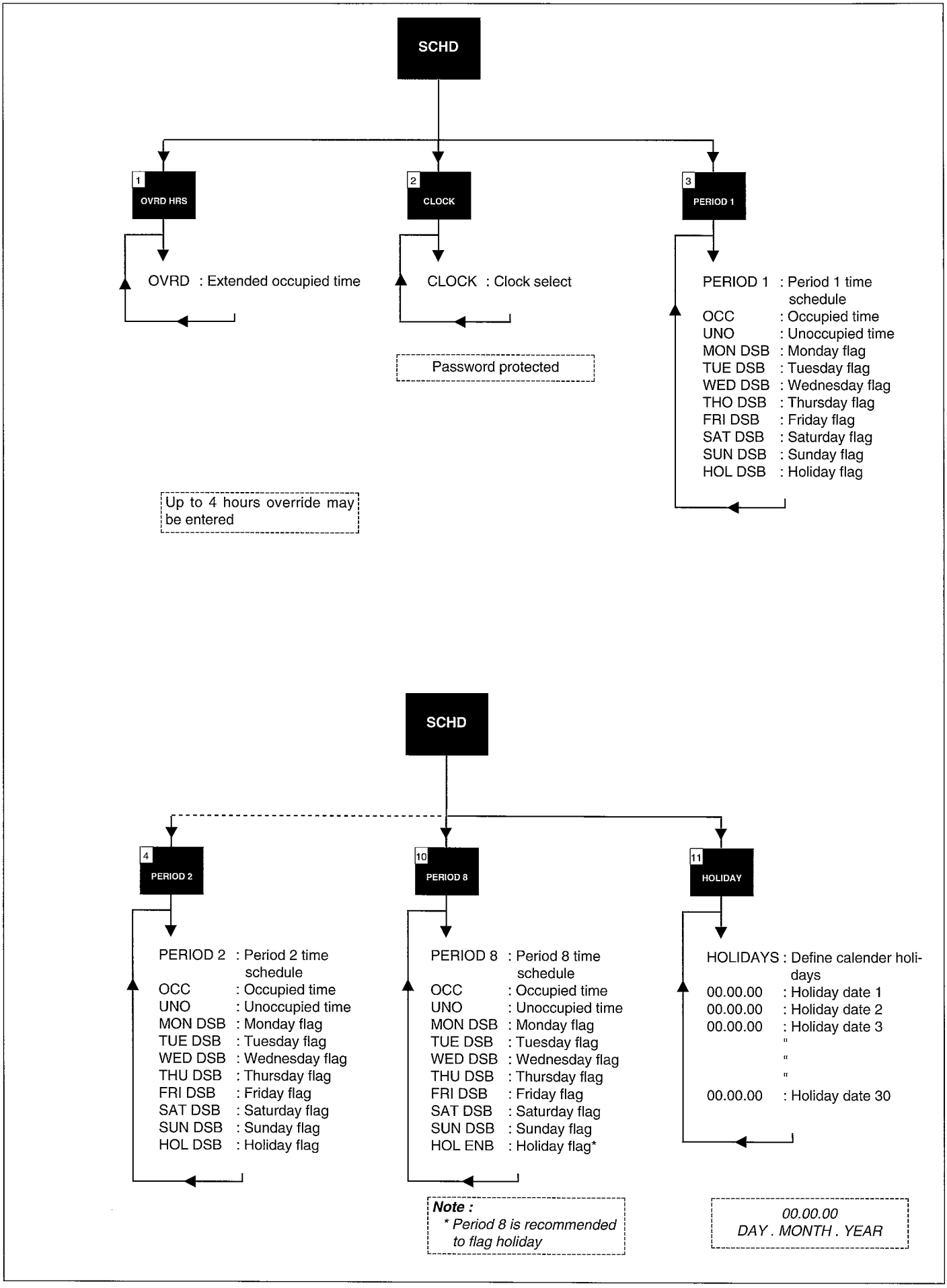


Chart 4. SCHEDULE subfunctions

5. Schedule function

This function provides a means to automatically switch chiller from an Occupied mode to Unoccupied mode. When using Schedule function, chilled water pump relay must be used to switch chilled water pump on and off. Connections for chilled water pump relay are shown at the end of the document.

The chilled water pump relay starts chilled water pump but compressors do not run until remote chilled water pump interlock contacts are closed and leaving chilled water temperature is above set point. If a remote chilled water pump interlock is not used, the first compressor starts (upon a call for cooling) approximately one minute after chilled water pump is turned on.

The Schedule function can be programmed for inactive, single set point, or dual set point operation.

When schedule is configured for inactive, chilled water pump relay remains energized continuously but is not used since chiller is usually controlled by remote chilled water pump interlock contacts.

When unit is configured for single set point operation, chilled water pump relay is energized whenever chiller is in Occupied mode regardless of whether chiller is running. When chiller is in Unoccupied mode, chiller water pump relay is not energized.

When unit is configured for dual set point, chilled water pump realy is energized continuously, in both Occupied and Unoccupied modes. Occupied mode places Occupied chilled water set point into effect. Unoccupied mode places Unoccupied chilled water set point into effect.

It can also be used to configure the machine for use of one of the 2-99 Network clocks, but time schedule configuration of these clocks routines can only be done through the Network CPOC or other devices.

The schedule function is used for clock 1 which is the internal clock. This clock can be used in either the Local or Network control modes. The clock function can be used for unoccupied shutdown or unoccupied setback depending on the configuration selected as part of the reset subroutine. The SCHD will allow configuration of a timed override, up to 8 occupied/unoccupied periods, up to 30 holidays and configuration as to the type of scheduling.

[1] [SCHD] OVRD nHRS. This subfunction when selected will display the number of override hours with the display "OVRD OHRS". Up to 4 hours may be entered by pressing [4] [ENTR] Only integer numbers (0, 1, 2, 3 or 4 may be entered). See example 3a.

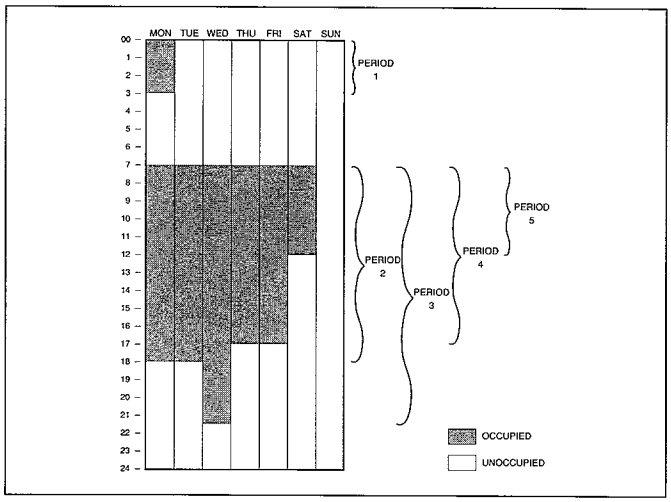


Fig. 2 Sample time schedule

[2] [SCHD] CLOCK. This subfunction will allow for the selection of the type of clock control. The three types are available :

0. No clock control (always on)
1. Local clock control (clock 1)
2-99 NETWORK clock control (where 2-99 is clock number)*.

Note that this display is password protected and therefore the HSIO password has not been entered then the display will show "0".

[3] [SCHD] - [10] [SCHD] PERIOD 1 to PERIOD 8. This function provides a means to automatically switch the chiller from an occupied mode to an unoccupied mode. The schedule key is used to configure the occupancy schedules.

The schedule consists of from one to eight occupied time periods, set by the operator. These time periods can be flagged to be in effect or not in effect on each day of week. The day begins at 00.00 and ends at 24.00. The machine will not be in unoccupied mode unless a scheduled time period is in effect. If an occupied period is to extend pass midnight, it must be programmed in the following manner : Occupied period must end at 24.00 hours (midnight) ; a new occupied period must be programmed to begin at 00.00 hours.

The time schedule can be overriden to to keep the unit in the occupied mode for one, two, three or four hours.

Figure 7 shows a schedule for an office building with the chiller operating on a single set point schedule. The schedule is based on building occupancy with 3-hour off-peak cool down period from midnight to 3 am following the weekend shutdown. To learn how this sample schedule should be programmed, see example 3.

Note :
This schedule was designed to illustrate the programming of the schedule function and is not intended as a recommended schedule for chiller operation.

Ex. 3a Using the schedule function

Keyboard Entry	Display Response	Comment
Programming Override		
For this example, unit will run 3 hours after unoccupied time.		
[1] [SCHD]	OVRD 0	Override is set for 0 ; enter the number of hours of override desired.
[3] [ENTR]	OVRD 3	Unit will now remain in occupied mode for an additional hours.
To extend an occupied mode beyond its normal termination for a one-time schedule override, program as shown above.		

Ex. 3b Using the schedule function

Keyboard Entry	Display Response	Comment
Clock selection		
[1] [SRVC]	PASSWORD	Password protection
PASSWORD [ENTR]	LOGED ON	
[2] [SCHD]	CLOCK 0	No clock selected
[1] [ENTR]	CLOCK 1	Internal clock selected

Example 3b Using the schedule function (cont)

Keyboard Entry	Display Response	Comment
Programming period 1:		
3 SCHD	PERIOD 1	Define schedule period 1.
↓	OCC 00.00	Start of occupied time. For this example, first period should start here (at midnight) so no entry is needed.
↓	UNO 00.00	Start of unoccupied time (end of period). For this example, period 1 should end at 3:00 am.
3 . 0 0 ENTR	UNO 3.00	Period 1 ends at 3:00 am.
↓	MON NO	Monday is not flagged for period 1. To put period 1 into effect on Monday, Monday must be flagged yes.
1 ENTR	MON YES	Monday is now flagged for period 1 to be in effect.
↓	TUE YES	For this example, period 1 is to be in effect on Monday only. All other days must be checked to be sure that they are flagged no. If any day is flagged yes, change to no.
. ENTR	TUE NO	Tuesday is now flagged no for period 1. Define schedule period 2.

Example 4 Using holiday function

Keyboard Entry	Display Response	Comment
Programming holidays :		
For this example, holiday periods 1 and 2		
11 SCHD	HOLIDAYS	Define calender holidays
↓	NEW	Holiday date 1
0 1 . 1 2 . 9 1		
ENTR	JAN.12.91	
↓	NEW	Holiday date 2
0 3 . 2 3 . 9 1		
ENTR	MAR.23.91	

Example 3b Using the schedule function (cont)

Keyboard Entry	Display Response	Comment
Programming period 2:		
For this example, period 2 is used on Monday and Tuesday		
4 SCHD	PERIOD 2	Start of occupied time.
↓	OCC 00.00	
7 . 0 0 ENTR	OCC 7.00	Occupied time will start at 7:00 am.
↓	UNO 00.00	Start of unoccupied time (end of period) for this example, period 2 should end at 18:00 (6:00 pm).
1 8 . 0 0 ENTR	UNO 18.00	Period 2 ends at 18:00 (6:00 pm)
↓	MON NO	Monday is not flagged for period 2. To put period 2 into effect on Monday, Monday must be flagged yes.
1 ENTR	MON YES	Monday is now flagged for period 2 to be in effect.
↓	TUE NO	Tuesday is not flagged for period 2. To put period 2 into effect on Tuesday, Tuesday must be flagged yes.
1 ENTR	TUE YES	Tuesday is now flagged for period 2 to be in effect.
↓	WED YES	For this example, period 2 is to be in effect only on Monday and Tuesday. All other days must be checked to be sure that they are flagged no. If any day is flagged yes, change to no.
. ENTR	WED NO	Wednesday is now flagged no for period 2.

Periods 3, 4 and 5 can be programmed in the same manner, flagging Wednesday for period 3, Thursday and Friday yes for period 4, and saturday yes for period 5. For this example, periods 6, 7 and 8 are not used ; they should be programmed OCC 00.00, UNO 00.00.

Note :

When a day is flagged yes for 2 overlapping periods, occupied time will take precedence over unoccupied time. Occupied times can overlap in the schedule with no consequence.

To extend an occupied mode beyond its normal termination for a one-time schedule override, program as shown below :

11 SCHD HOLIDAY. Up to 30 holidays may be set as the last option of the schedule key. Holidays are entered as MM. DD. where MM is the month of the year and DD is the day of the month. If the current day is a holiday then the holiday schedule will be used. If any of the 30 holiday periods are used, the display shows NEW. The example 4 explains how this sample schedule should be programmed.

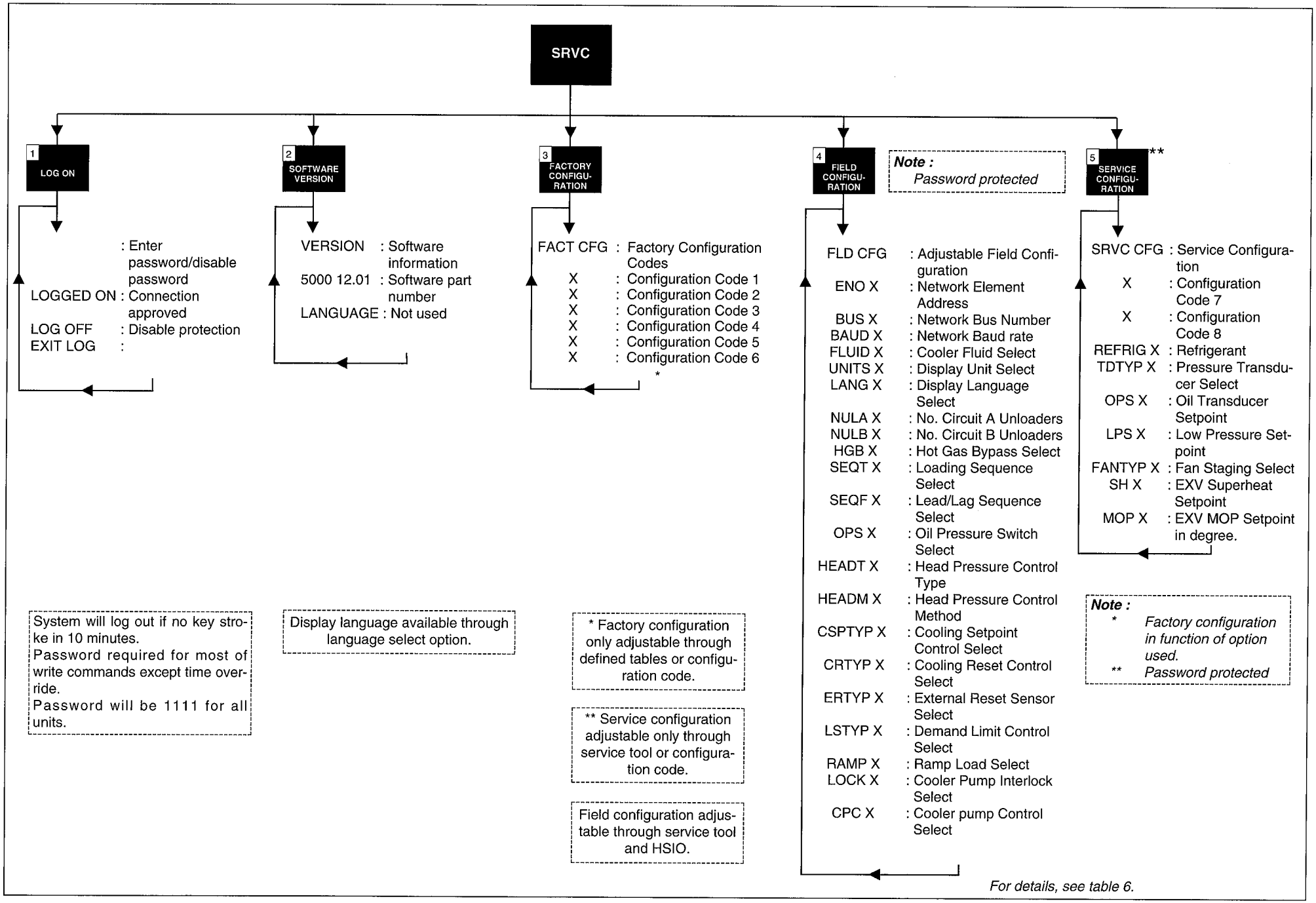


Chart 5. SERVICE subfunctions

6. Service Function

The service function allows the operator to verify factory configurations and read or change field configurations. The service subfunctions are listed below.

[1] [SRVC] LOG ON. The operator must use this subfunction to log on before performing any other subfunctions, and to log off after completing service subfunctions. System will log out if no key stroke in 30 minutes. Password is required for all write commands exept time override. Password is 1111 for all units. To logg off, push [SRVC] to obtain logged on, push [↓] , to obtain log off and push [ENTR] to valid this and [↓] to exit log. After using SRVC function, it is recommended to log off. (See example 5)

[2] [SRVC] SOFTWARE VERSION. Used to verify software version and language option (see example 6).

[3] [SRVC] FACTORY CONFIGURATION CODES allows entry into the factory configuration subfunction. Under this subfunction, there are six groups of configuration codes that are downloaded at factory. Each group is made up of eight digits. If processor module is replaced in the field, these six groups of configuration codes must be entered through the keyboard and display module. Factory configuration codes (groups 1 through 6) that apply to the particular Flotronic II chiller being serviced are found on a label located inside the control box cover. See table 6 for a summary of factory configuration subfunction keystrokes.

To change a configuration enter the new configuration and press [ENTR] while on the correct configuration.

Table 5. Factory configuration keystrokes

Sub-function	Keyboard entry	Display	Comments
3 Factory CFG	[3] [SRVC]	**Fact CFG**	**Factory configuration codes**
	[↓]	XXXXXXXX	Configuration Code 1
	[↓]	XXXXXXXX	Configuration Code 2
	[↓]	XXXXXXXX	Configuration Code 3
	[↓]	XXXXXXXX	Configuration Code 4
	[↓]	XXXXXXXX	Configuration Code 5
	[↓]	XXXXXXXX	Configuration Code 6
5 SERVICE CFG	[5] [SRVC]	**SRV CFG**	**Service configuration codes**
	[↓]	XXXXXXXX	Configuration Code 7
	[↓]	XXXXXXXX	Configuration Code 8

[4] [SRVC] ADJUSTABLE FIELD CONFIGURATIONS

After logging on, keystrokes allow entry into this subfunction. The subfunction allows operation of the chiller to be customized to meet the particular needs of the application. The chiller comes from the factory preconfigured to meet needs of most applications. Each item should be checked to determine which configuration alternative best meets the needs of a particular application. See table 12, for factory loaded configuration codes and alternative configurations.

If processor module is replaced, service replacement module is preloaded with the software. Each configuration code must be checked and, if necessary, reconfigured to meet needs of the application. See table 6 for pre-loaded service replacement configuration codes.

To learn how field configuration should be used, see example 7-8.

[5] [SRVC] SERVICE CONFIGURATION CODES

Allows entry into the service configuration subfunction. The first two items under this subfunction are two groups of eight digits each of configuration codes that are downloaded at the factory. If processor module is replaced in the field, the two groups of configuration codes must be entered through the keyboard and display module. The two groups of configuration codes (groups 7 and 8) that apply to the unit being serviced can be found on a label inside the control box cover. See table 11 for keystroke information to enter configuration codes 7 and 8.

Example 5 Logging on and logging off- service function

Keyboard Entry	Display Response	Comment
[1] [SRVC]	PASSWORD*	Enter password
[↓]	LOGGED ON	Connection approved
[↓]	LOG OFF	Disable protection
[↓]	EXIT LOG	Exit from logging

Note :

** Display "password". If password was not entered (password is 1111 for all units).*

Table 6 Authorized field adjustment values

Display	Field configuration item and codes	Factory configuration code	Service replacement code
ENO	Network element address (entered by Network Technician)	001	001
BUS	Network bus number (entered by Network Technician)	000	000
BAUD	Network baud rate (entered by Network Technician)	9600	9600
FLUID	Cooler fluid select 1 = Water 3.3 to 21°C (38 to 70°F) setpoint 2 = Medium brine -10 to 21°C (15 to 70°F) setpoint 3 = Low brine - 28 to	1 = Standard models 2 = Brine models	1
UNITS	Display unit select 0 = English 1 = Metric SI	0	0
LANG	Display language select 1 = English	1	1
NULA	No. circuit A unloaders 0 = No unloaders 1 = One unloader 2 = Two unloaders		0
NULB	No. circuit B unloaders 0 = No unloaders 1 = One unloader 2 = Two unloaders	0	0
HGB	Hot gas bypass select 0 = No valve	0	0
SEQT	Loading sequence select 1 = Equal circuit loading 2 = Staged circuit loading	1	1
SEQF	Lead/lag sequence select 1 = Automatic 2 = Cir A lead 3 = Cir B lead	1	1
OPS	Oil pressure switch select 0 = Not used 1 = Used	0	0
HEADT	Head pressure control type 0 = Not used 1 = Air cooled 2 = Water cooled	1	0
HEADM	Head pressure control method 1 = EXV controlled 2 = Setpoint control	1	1
CSPTYP	Cooling setpoint control select 0 = Single setpoint control 1 = Dual setpoint, switch controlled 2 = Dual setpoint, clock controlled	0	0
CRTYP	Cooling reset control select 0 = No reset 1 = Return fluid reset 2 = External temperature reset 3 = 4-20 mA controlled reset	0	0
ERTYP	External reset sensor select 0 = Thermistor connected to options module 1 = Obtained through Network	0	0
LSTYP	Demand limit control select 0 = No demand limiting 1 = Two external switch inputs 2 = External 4-20 mA input 3 = Network load limiting (multi-unit) 4 = Network loadshed interface	0	0
RAMP	Ramp load select (pulldown control) 0 = Disabled 1 = Enabled	1	0
LOCK	Cooler pump interlock select 0 = No interlock 1 = With interlock	0/1*	0
CPC	Cooler pump control select 0 = No controlled 1 = On/Off controlled	0/1*	0

Example 6 Reading software version

Keyboard Entry	Display Response	Comment
2 SRVC	VERSION	Software information
↓	xxxxxxx	Software part number
↓	Language	English

Example 7 Changing reset type

Keyboard Entry	Display Response	Comment
4 SRVC	FLD CFG	Field configuration subfunction of service function
↓	CSPTYP 0	Scroll past single cooling set point
↓	CRTYP 0	No reset has been selected
1 ENTR	CRTYP 1	Return water temperature reset is selected and actived
2 ENTR	CRTYP 2	Reset type is changed to space or outside air temperature reset and activated
3 ENTR	CRTYP 3	Reset type is changed to 4-20 mA signal reset and activated
. ENTR	CRTYP 0	Reset is desactivated

Example 8 Changing unloader count

Keyboard Entry	Display Response	Comment
4 SRVC	FLD CFG	Adjust. field configuration
↓	ENO1	NETWORK element address
⋮		
↓	NULA	No. cir A unloaders
1	1	
ENTR	NULA1	1 unloaders, cir A

** GF/GH*

7. Lead-lag circuit sequence logic

This function will control the sequence of the two circuits. Each machine will always have two independent refrigerant circuits with one being labeled "A" and the other being labeled "B". The Lead-Lag sequence control should determine the order or sequence in which these two circuits should be used. Lead Circuit means the circuit (A or B) that will be used first for capacity changes when all other conditions have been met. For exemple when a machine is starting and the first stage of compression is being added then the circuit that will be started first will be the Lead Circuit.

Selection of the Lead-Lag control method will depend on the field selected configuration option Lead-Lag Sequence Control (seq-flg). There are three configurable modes which can be field configured. These options are :

SEQF	Meaning
1	automatic mode
2	manual, circuit A lead
3	manual, circuit B lead

a. Automatic mode

When the Automatic Mode has been selected the Lead-Lag Sequence determination uses the internal logic to optimize the Lead-Lag sequence (circuit A or circuit B).

b. Manual ; circuit A lead

When this configuration option has been selected the lead circuit shall always be circuit A and will not change.

c. Manual ; circuit B lead

When this configuration option has been selected the lead circuit shall always be circuit B and will not change.

d. Sequence type function

The order in which circuit capacity is changed is determined by this function. The field configuration option Loading Sequence Type (SEQT) will allow the following two options :

1. Equal Circuit Loading
2. Staged Circuit Loading

e. Equal circuit loading

If this sequence option has been selected the control logic will attempt to maintain equal capacity for circuit A and circuit B as the machine loads and unloads.

f. Staged circuit loading

If this option has been selected or the Equal Circuit Loading has been overridden then the logic will load the lead circuit completely before the lag circuit is started. When the load is decreasing the lag circuit will be unloaded first.

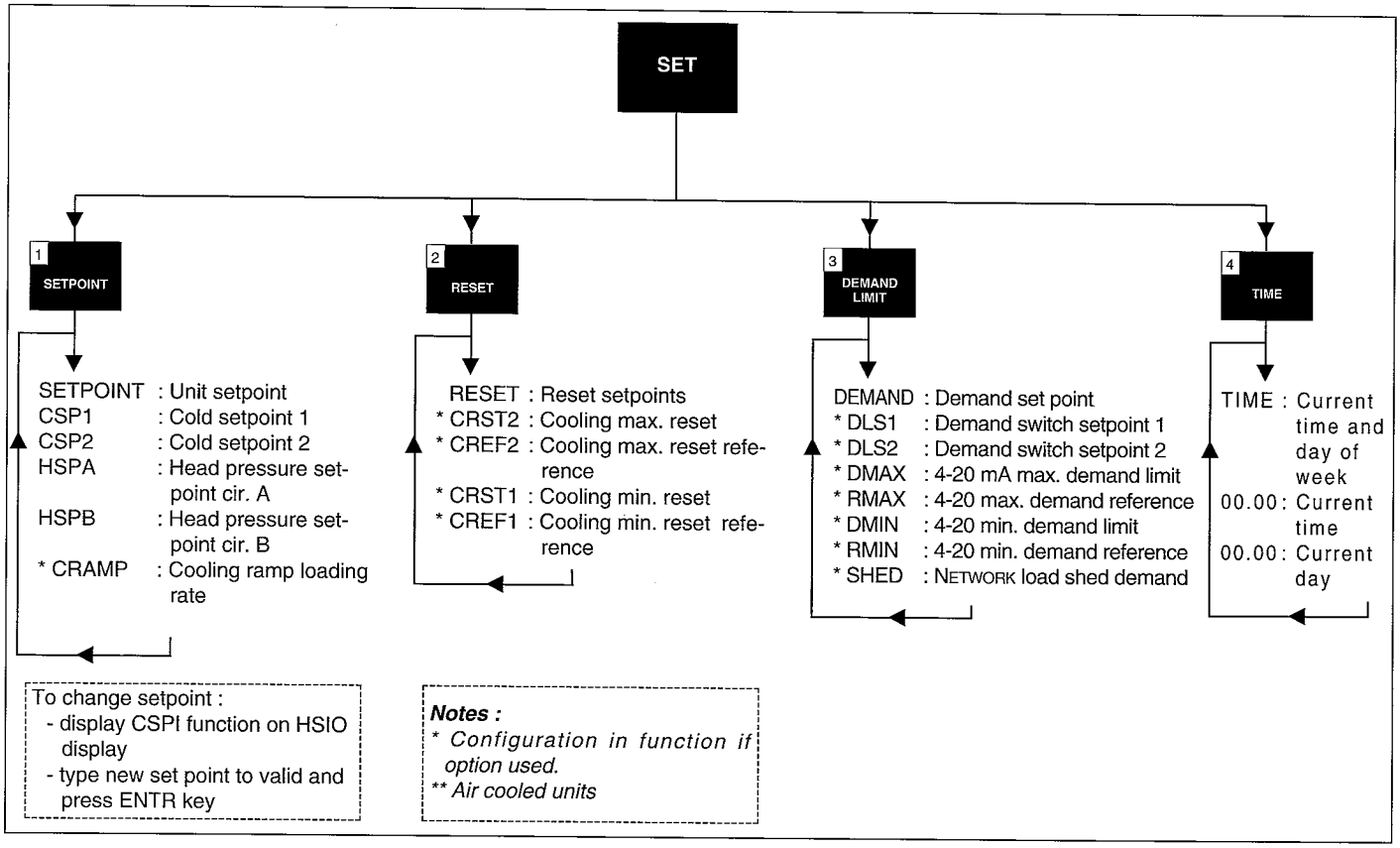


Chart 6. SET subfunctions

8. Set function

a. Description

Set points are entered through the keyboard. Set points can be changed within the upper and lower limits, which are fixed. The ranges are listed below.

Chilled water set point
Water : 3.3 to 21°C (38 to 70°F)
Brine : -10 to 21°C (15 to 70°F)

Pulldown set point : .11 to 1.1°C (.2 to 2.0°F)/min.

Reset set points
Max. reset range : 0 to 11°C (0 to 20°F)
Maximum reset reference range :
Return fluid reset 0 to 11°C (0 to 20°F)
Ext. temp. reset -6.6 to 51.6°C (20 to 125°F)
Ext. signal reset 4 to 20 mA
Minimum reset reference range :
Return fluid reset 0 to 11°C (0 to 20°F)
Ext. temp. reset -6.6 to 51.6°C (20 to 125°F)
External signal reset 4 to 20 mA

Demand limit set points
Switch input : Step 1 - 0 to 100% capacity reduction
Step 2 - 0 to 100% capacity reduction
External signal : Maximum demand limit 4 to 20 mA
Minimum demand limit 4 to 20 mA

Set points are grouped in subfunctions as follows :

[1] [SET] SET POINT. Displays chilled water set points.

a. The first value shown is the occupied chilled water set point.

b. The next value to be displayed depends on how the schedule function has been programmed (see page 30).

If dual set point has been selected, the next set point after [↓] has been pressed will be the unoccupied chilled water set point ; this will be followed by the modified chilled water set point.

If single set point or inactive schedule has been selected in the schedule function, then when [↓] is depressed, the display will show the modified chilled water set point.

c. The modified chilled water set point is determined by the microprocessor as a result of the reset function, and is displayed for reference only ; it can not be set or changed by the operator. If reset is not in effect, the modified set point will be the same as either the occupied or unoccupied chilled water set point, according to how the schedule function has been programmed.

d. The final value displayed when the [↓] is depressed is the cooling ramp loading rate. This is the maximum reach at which the leaving chilled water is allowed to drop, and can be field set from 0.2 to 1.1°C (0.2 to 2.0°F)/minute. This value is not displayed unless the function is enable (see adjustable field configurations).

[2] [SET] RESET. Displays the reset, reset limit and reset ratio set points. These set points are not accessible when reset type has been configured for none in the service function.

[3] [SET] DEMAND LIMIT. Displays the demand limit set points.

[4] [SET] TIME. Displays time of day and day of week.

Reading and changing set points

Example 9 shows how to read and change the chilled water set point. Other set points (except for modified set point, determined by the microprocessor), can be changed by following the same procedure. Refer to chart 6 for the sequence of display of set points in each subfunction.

Reading and changing time display

Time is entered and displayed in 24-hour time. The day of the week is entered as a number : 1 = MON, 2 = TUE, ...,7 = SUN.

The [.] key is used as the column when entering time.
See example 10.

Start-up checklist for Flotronic II chiller systems

A. Preliminary information

Job name _____
Location _____
Installing contractor _____
Distributor _____
Start-up performed by _____
Equipment : **Chiller :** Model # Serial #

Compressors :

Circuit A
1) M# _____
S# _____
MTR# _____
2) M# _____
S# _____
MTR# _____
3) M# _____
S# _____
MTR# _____
4) M# _____
S# _____
MTR# _____

Circuit B
1) M# _____
S# _____
MTR# _____
2) M# _____
S# _____
MTR# _____
3) M# _____
S# _____
MTR# _____
4) M# _____
S# _____
MTR# _____

Cooler :

Model # _____ Manufactured by _____
Serial # _____ Date _____
Type of expansion valves *(check one)* : EXV _____ TXV _____

Air handling equipment :

Manufacturer _____
Model # _____ Serial # _____
Additional air-handling units accessories _____

B. Preliminary equipment check *(yes or no)*

Is there any shipping damage ? _____ If so, where ? _____

Will this damage prevent unit start-up ? _____
Assure compressor base rail isolators have all been properly adjusted. _____
Check power supply, does it agree with unit ? _____
Has the circuit protection been sized and installed properly ? (refer to installation intructions) _____
Are the power wires to the unit sized and installed properly ? (refer to installation intructions) _____
Has the ground wire been connected ? _____
Are the terminals tight ? _____
Inspect all thermistors and EXV cables for possible crossed wires. _____
Inspect plug connectors on all modules for tightness. _____

B. Preliminary equipment check *(cont)*

Does this chiller require Carrier certification ? _____
If so, has the chiller been properly interlocked with the auxiliary contacts of the chilled water pump starter ? _____
If not, do not certify until interlock has been properly connected (refer to wiring diagram).
Are there any reasons why this job should not be certified ? ____ If so, explain : _____
_____

Check air systems *(YES or NO)*
Are all air handlers operating ? *(refer to air-handling equipment installation and start-up instructions)* _____
Are all chilled water valves open ? _____
Is the water piping connected properly ? _____
Has all air been vented from the cooler loop ? _____
Is the chilled water pump operating ? _____
Is the CWP rotation correct ? _____
CWP motor amperage : Rated _____ Actual _____

C. Unit start-up *(insert check mark as each item is completed)*

Assure that unit is supplied with correct NETWORK power voltage.
_____ 400 Volts-3 phases-50 Hertz _____
Assure crankcase heaters have been energized for a minimum of 24 hours prior to start-up. _____
Assure compressor oil level is correct. _____
Assure both liquid line service valves are backseated. _____
Assure **all** compressor discharge service valves are backseated. _____
Assure **all** compressor suction service valves are backseated. _____
Leak check **thoroughly** : all compressors, condenser manifolds and headers, EXV's, solenoïd valves,filter driers, fusible plugs, thermistors, transducers and cooler heads, with G.E H-10-B electronic leak detector. _____
_____

Locate, repair, and report any R-22 leaks. _____
_____

Check voltage imbalance : _____ AB _____ AC _____ BC _____
AB + AC + BC (divided by 3) = average voltage = _____ Volts _____
Maximum deviation from average voltage = _____ Volts

$$\text{Voltage imbalance} = \frac{\text{max. deviation}}{\text{average voltage}} \times 100 = \text{_____ \% voltage imbalance}$$

If over 2% voltage imbalance, do not attempt to start chiller !
Call local power company for assistance.

Assure that incoming power voltage to chiller is within rated unit voltage range.

System water volume in loop : Type system :
Air conditioning - minimum 6.5 litres per nominal kW = _____ litres
Process cooling - minimum 13.0 litres per nominal kW = _____ litres

C. Unit Start-Up (cont)

Check pressure drop accross cooler.

Water entering cooler: _____ kPa Water leaving cooling: _____ kPa

Plot cooler pressure drop on performance data chart (located in product data literature) to determine total water flow rate (l/s).

Total water flow (l/s) = _____ Unit's rated minimum flow rate (l/s) = _____

L /HR per KW = _____ Unit's rated min. press. drop (kPa) = _____
(Refer to product data literature)

Job's specified (l/s) (if available)

If unit has low water flow, find source of problem: check water piping, in line water strainer, shut-off valves, CWP rotation, etc.

Cooler loop protection if required :

Liters of brine added. _____

Piping includes electric tape heaters. _____

Perform quick test :

Follow the controls and troubleshouting test fonction instructions. Be sure to check for proper fan rotation on quick test fan relay steps. Be sure compressor service valves and liquid line valves are open.

Quik test components—indicate results below:

1 <TEST>: Component	Result	2 <TEST>: Component	Result
Test display		Compr A1	
Alarm relay		Compr A2	
Fan relay A1		Compr A3	
Fan relay A2		Compr A4	
Fan relay B1		Compr B1	
Fan relay B2		Compr B2	
Cooler water pump relay		Compr B3	
EXV A		Compr B4	
EXV B			

Check for blinking red and green LED's on all modules. _____

Enter chilled water set point. _____

Set the current date and time. _____

Review and record unit factory, field and service configurations. _____

Factory configuration: Enter 3 <SVC> on keyboard and display module.

Configuration Code 1 _____ Configuration Code 4 _____
Configuration Code 2 _____ Configuration Code 5 _____
Configuration Code 3 _____ Configurabon Code 6 _____

Field configuration: Enter 4 <SVC> on keyboard display module.

Network element address _____ Oil pressure switch select _____
Network bus number _____ Head pressure control type _____
Network band rate _____ Head pressure control method _____
Cooler fluid select _____ Motormaster select _____
Display unit select _____ Cooling set point control select _____
Display language select _____ Cooling reset control select _____
No. of circuit A unloaders _____ Extemal reset sensor select _____
No. of circuit B unloaders _____ Demand limit control select _____
Hot Gas bypass select _____ Ramp load select _____
Loading sequence select _____ Cooler pump interlock select _____
Lead/Lag sequence select _____ Cooler pump control select. _____

C. Unit Start-Up (cont)

Service configuration: enter 5 <SVC> on keyboard and display module.

Configuration code 7 _____
Configuration code 8 _____
Refrigerant type _____
Pressure transducer select _____
Oil transducer set point _____

Low pressure set point _____
Fan staging select _____
EXV superheat set point _____
EXV MOP set point _____

To start the chiller:

Turn the LOCAL/STOP/NETWORK switch to "LOCAL".

Measure the following : measure while the machine is in stable operating condition.

	Circuit A			Circuit B	
Oil pressure (OPA)	_____	kPa	(OPB)	_____	kPa
Suction pressure (SPA)	_____	kPa	(SPB)	_____	kPa
Saturated suction line temp (SSTA)	_____	°C	(SSTB)	_____	°C
Compressor suction temp (CTA)	_____	°C	(CTB)	_____	°C
Discharge pressure (DPA)	_____	kPa	(DPB)	_____	kPa
Discharge line temp	_____	°C		_____	°C

Notes :

Example 9 Reading and changing chilled water set point

Keyboard Entry	Display Response	Comment
1 SET	SET POINT	System set points
↓	CSP1 6.7	Present occupied chilled water set point is 6.7°C
7 . 5 ENTR	CSP1 7.5	Key in 7.5 and press the ENTR key. Display shows new occupied chilled water set point is 7.5°C
↓	CSP2 6.7	Present unoccupied chilled water set point is 6.7°C
1 0 ENTR	CSP2 10	Key in 10 and press the ENTR key. Display shows new unoccupied chilled water set point is 10°C
2 SET	RESET	Displays the maximum reset and minimum reset set points. The minimum and maximum reference reset set points can also be displayed These set points are not accessible when reset type has been configured for NONE in the service function

Readind and changing set points

Example 9 shows how to read and change the chilled water set point. Other set points can be changed by following the same procedure. Refer to keyboard directory for the sequence of display of set points in each subfunction.

Example 10 Setting time of day and day of week

Keyboard Entry	Display Response	Comment
4 SET	TIME	Present time and day of week
↓	TUE 11.25	Present day and time
3 . 9 . 4 5	3.9.45	Type new day and time (day of week, hour, minutes)
ENTR	WED 9.45	New day and time
↓	JAN.30.90	Present date
2 . 1 . 9 0	2.1.90	Type new date (month, day, year)
ENTR	FEB.1.90	New current date

Legend

Code	*Month*	*Code*	*Day*
1	*January*	*1*	*Monday*
2	*February*	*2*	*Tuesday*
3	*March*	*3*	*Wednesday*
4	*April*	*4*	*Thursday*
5	*May*	*5*	*Friday*
6	*June*	*6*	*Saturday*
7	*July*	*7*	*Sunday*
8	*August*		
9	*September*		
10	*October*		
11	*November*		
12	*December*		

b. Using control temperature reset

This routine will adjust the controlled leaving water temperature based on type of temperature reset selected. The type of temperature resets are :

Reset Number	Reset Type
0	No reset
1	Return Water Reset
2	External Temperature Reset
3	4-20 mA reset

Temperature Reset is only intended for local machine control. In addition to temperature reset, dual set point control can also be used. It can be used with temperature reset or independently from temperature reset. Control can be accomplished in one of two methods:

1. Switch controlled dual set point
2. Internal clock controlled dual set point

When external temperature reset is selected the leaving chilled water temperature should be controlled from a sensor connected to the optional board.

Return Temperature Reset

The control system is capable of handling leaving water temperature reset based on return cooler water temperature, because the change in temperature through the cooler is a measure of the building load.

The return water temperature reset is essentially an average building load reset method.

This option will automatically reset the leaving water temperature set point of the cooler. Set point of the amount of reset is accomplished by entering data pairs. A data pairs consists of a reset value and a reference temperature difference between the entering and leaving water temperature. One pair represents the maximum reset and the other pair represents the minimum reset. If the cooler temperature difference is greater than minimum reset temperature difference then the reset is equal to 0°C. When the temperature difference is between the minimum reset and maximum reset temperature difference then the reset is to be determined by a linear interpolation between the maximum and minimum reset values. Below the maximum reset temperature difference the reset is fixed at the maximum reset value.

Input data pairs for the set function

1. **Maximum reset amount (CRST2)** - allowable range 0 to 11°C (0 to 20°F). This is maximum amount leaving chilled water set point is to be increased.
2. **Maximum reset reference (CREF2)** - allowable range 0 to 11°C (0 to 20°F). This is the cooler temperature drop at which reset reaches its maximum value.

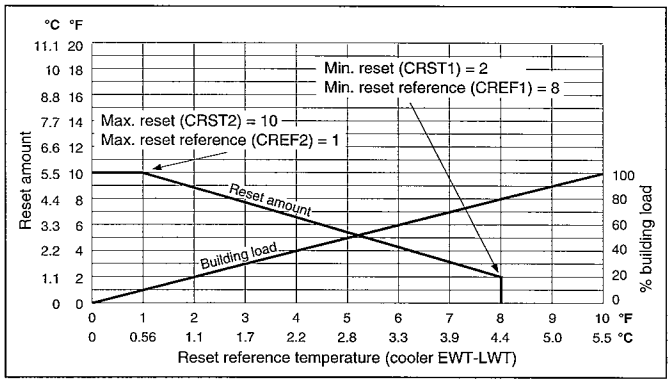


Fig. 3 Cooling Return Water Reset.

3. **Minimum reset amount (CRST1)** - allowable range 0 to 11°C (0 to 20°F). This is minimum amount leaving chilled water set point is to be increased when reset is initiated.
4. **Minimum reset reference (CREF1)** - allowable range 0 to 11°C (0 to 20°F). This is the cooler temperature drop at which reset reaches its minimum value (reset begins here).

Note

Reset set points are not accessible unless the reset function is enable first. This is done as a field configuration. Select one of the three choices for type of reset :
Return fluid reset, external temperature reset or 4-20 mA external signal reset.

If dual set point control is enabled, the amount of reset is applied to whichever set point is in effect at the time.

Example demonstrates how to activate reset. Assume that reset is to be based on return water temperature, the desired reset range is to be 1 to 5.5°C (2 to 10°F) and full load is a 5.5°C (10°F) drop across the cooler. See figure 3.

Example 11 Using return water temperature reset

Keyboard Entry	Display Response	Comments
4 SRVC	FLD CFG	Field configuration subfunction of service function
↓	CSPTYP X	Scroll past single/dual
↓	CRTYP 0	Display shows no reset type has been selected
1 ENTR	CRTYP 1	Return water temperature is selected and activated
1 SET	SET POINT	System set points
↓	CPS1 44.0	Present occupied chilled water set point (44°F)
4 5 . 8 ENTR	CPS1 45.6	Enter new chilled water set point (45.6°F)
2 SET	RESET	Reset set points
↓	CRST2 0.0	Cooling maximum reset is 0°F
1 0 ENTR	CRST2 10.0	Cooling maximum reset is 10°F
↓	CREF2 0.0	Cooling maximum reset reference is 0°F
1 ENTR	CREF2 1.0	Cooling maximum reset reference is 1°F
↓	CRST1 0.0	Cooling minimum reset is 0°F
2 ENTR	CRST1 2.0	Cooling minimum reset is 2°F
↓	CREF1 0.0	Cooling minimum reset reference is 0°F
8 ENTR	CREF1 8.0	Cooling minimum reset reference is 8°F

c. External temperature reset

Outside or space temperature reset allow for the reset of the leaving water temperature based on an external temperature. Under normal operation, the chiller will maintain a constant leaving water temperature approximately equal to the chilled water temperature set point. This temperature is usually selected based on full-load conditions. At part-load conditions, it may be desirable to reset the leaving water set point higher to improve the efficiency of the chiller. The control is capable of resetting automatically the chilled water setpoint higher in response to an external temperature. This external temperature can be outside air or an internal building temperature (space temperature).

The external temperature, either outdoor air or space temperature, is obtained through a thermistor connected to the accessory options module. Leaving chilled water reset can range from 0 to 11°C (0 to 20°F). The external temperature reset set points can range from -6.6 to 51.6°C (20 to 125°F).

The same basic logic is used for external temperature reset as return reset except the external temperature is substituted for the entering and leaving temperature difference.

For external temperature reset control, data pairs (2 numbers) are used to configure the unit. The data pairs consist of :

1. Leaving chilled water reset value
2. A reference external temperature

One pair is used to set the maximum reset and the other pair is used to set the minimum reset. When the external temperature is above the minimum reference external temperature (CREF1), the chilled water temperature does not reset. When the external temperature is below the maximum reference external temperature (CREF2), the reset value is the maximum reset value. A linear relationship between the reset reference temperature and reset amount occurs between CREF2 and CREF1. See Fig. 6 for a typical example.

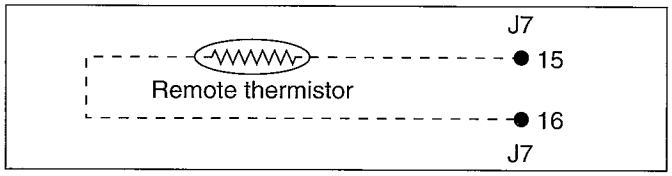


Fig. 4 External temperature reset control (from space or outside air temperature)

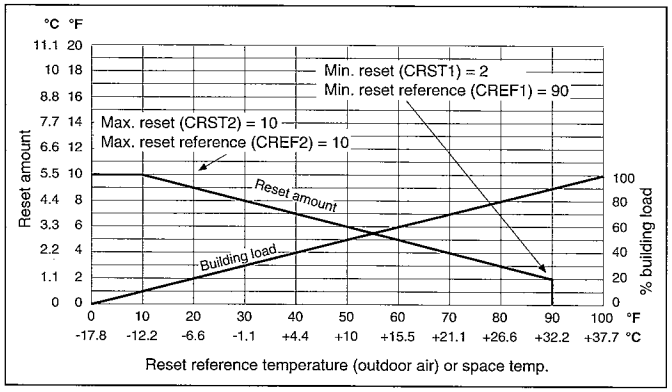


Fig. 5 Cooling external temperature reset control

Example 12 Using external temperature reset

Keyboard Entry	Display Response	Comment
First, log on to the keyboard and display module		
1 SRVC	PASSWORD	Enter password/disable protection
1 1 1 1 ENTR	LOGGED ON	Logged on
Now, enter field configurations on the keyboard and display module		
4 SRVC	FLD CFG	Adjustable field config.
Scroll to cooling reset control selection, "CRTYP" and external reset sensor select "ERTYP" and enter appropriate configurations.		
↓	CRTYP 0	Cooling reset control selection currently set for no temperature reset 0 = No reset 1 = Return fluid reset 2 = External temperature reset 3 = 4-20 mA controlled reset
2 ENTR	CRTYP 2	Cooling reset control selection reset for external temperature reset
↓	ERTYP 0	External reset sensor selection for a thermistor connected to options module.
Enter temperature reset set points.		
2 SET	RESET	Temperature reset set points
Scroll to maximum reset value "CRST 2" and maximum reference external temperature "CREF 2".		
↓	CRST2 0	Maximum reset value currently set for 0°F
1 0 ENTR	CRST2 10	Maximum reset value reset for 10°F as an example
	CREF2 0	Maximum reference external temperature currently set for 0°F
1 0 ENTR	CREF2 10	Maximum reference external temperature reset for 10°F as example
Scroll to minimum reset value "CRST 1" and minimum reference external temperature "CREF 1".		
↓	CRST1 0	Minimum reset value currently set for 0°F
2 ENTR	CRST1 2	Minimum reset value reset for 2°F as an example
↓	CREF1 0	Minimum reference external temperature currently set for 0°F
9 0 ENTR	CREF1 90	Minimum reference external temperature reset for 90°F as example
Finally, log off		
1 SRVC	LOGGED ON	Logged on
↓	LOG OFF	Disable password protection
ENTR	EXIT LOG	Logged off/enable password protection

d. Temperature reset

4-20 mA signal control

This type of reset is controlled by an external 4-20 mA input. Again the same basic logic with data pairs is used for the 4-20 mA reset option except the reference reset signal points are based on the 4-20 mA input settings. Examples of this settings are shown in fig. 6.

For the 4-20 mA signal control, data pairs also are used to configure the unit for temperature reset. The first data pair represents the maximum reset and the 4-20 mA input signal at which this reset should be obtained. Any signal above the maximum reset reference (CREF2) results in the maximum reset of the chilled water temperature. The second data pair represents the minimum reset and the 4-20 mA signal at which the minimum reset is obtained. Any signal below the minimum reset reference (CREF1) results in no reset of the chilled water temperature. Signals that are read between CREF1 and CREF2 result in a linear relationship between the reset reference signal and the reset amount. See fig. 6 for a typical example.

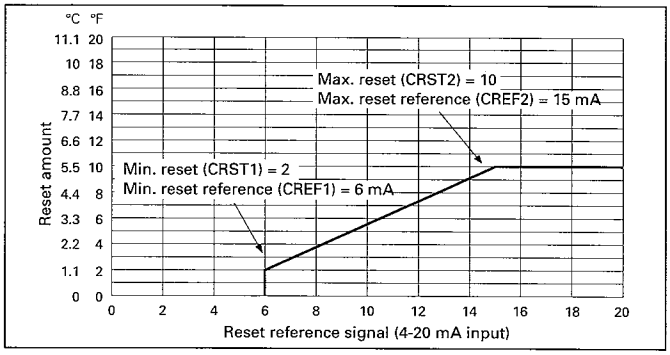


Fig. 6 Temperature reset 4-20 mA signal control

Wiring

The 4-20 mA signal control device can be either externally or internally powered. Wire as shown below on J7 connector of the option module depending on whether the 4-20 mA signal generator is internally or externally powered.

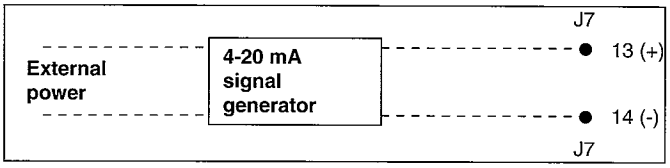


Fig. 7a Temperature reset 4-20 mA signal control externally powered

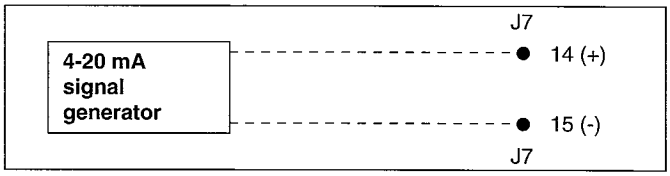


Fig. 7b Temperature reset 4-20 mA signal control internally powered

Example 13 Using temperature reset 4-20 mA signal control

Keyboard Entry	Display Response	Comment
First, log on to the keyboard and display module		
1 SRVC	PASSWORD	Enter password/disable password protection
1 1 1 1 ENTR	LOGGED ON	Logged on
Now, enter field configurations on the keyboard and display module		
4 SRVC	FLD CFG	Adjustable field config.
Scroll to cooling reset control selection, "CRTYP" and enter appropriate configurations.		
↓	CRTYP 0	Cooling reset control selection currently set for no temperature reset 0 = No reset 1 = Return fluid reset 2 = External temperature reset 3 = 4-20 mA controlled reset
3 ENTR	CRTYP 3	Cooling reset control selection reset for 4-20 mA controlled reset
Enter temperature reset set points.		
2 SET	RESET	Temperature reset set points
Scroll to maximum reset value "CRST 2" and maximum reset reference "CREF 2".		
↓	CRST2 0	Maximum reset value currently set for 0°F
1 0 ENTR	CRST2 10	Maximum reset value reset for 10°F as an example
↓	CREF2 0	Maximum reference currently set for 0 mA
1 5 ENTR	CREF2 15	Maximum reset reference reset for 15 mA as an example
Scroll to minimum reset value "CRST 1" and minimum reference external temperature "CREF 1".		
↓	CRST1 0	Minimum reset value currently set for 0°F
2 ENTR	CRST1 2	Minimum reset value reset for 2°F as an example
↓	CREF1 0	Minimum reset reference currently set for 0 mA
6 ENTR	CREF1 6	Minimum reset reference reset for 6 mA as an example
Finally, log off		
1 SRVC	LOGGED ON	Logged on
↓	LOG OFF	Disable password protection
ENTR	EXIT LOG	Logged off/enable password protection

e. Demand limit control feature

General

Demand limit control refers to the restriction of the unit capacity to control the amount of power the units draws. The accessory options module has been designed to accept demand limit signals from a building-load shedding control. The demand limit function provides for 2 levels of load limiting. The keyboard and display module (HSIO) is used to set the demand limit set points which can range from 0 to 100% of capacity. The capacity steps can be controlled by 2 field supplied switches/relay contacts, or by a 4-20 mA signal, either externally or internally powered. The switches/relay contacts-should be rated for 24V, 24 mA, and normal pilot duty.

To use the demand limit control :

① enable the demand limit control desired, either for 2-stage switch control or 4-20 mA signal control.

② enter the demand limit set points, and maximum and minimum demand limit reference points (in mA) for the 4-20 mA signal control.

For 2 -stage switch control, closing the first stage demand limit contact puts the unit on the first demand limit level. Therefore, the unit does not exceed the percentage of capacity entered as the demand limit stage 1 (demand limit switch 1 set point). Closing the contacts on the second stage demand limit relay prevents the unit from exceeding the capacity entered as demand limit stage 2 (demand limit switch 2 set point). The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed.

For the 4-20 mA signal control, when the maximum demand limit reference point (RMAX) is read by the options module, the unit runs at maximum demand limit set point (DMAX) or the maximum allowable machine load in percent. The unit runs at 100% capacity when reading any signal above RMAX. When the minimum demand reference point (RMIN) is read by the options module, the unit runs at the minimum demand limit set point (DMIN) or the minimum allowable machine load in percent. The unit continues to run at DMIN when reading any signal below that of RMIN. Signals that are read between the minimum and maximum demand limit reference points result in a linear relationship between the demand limit signal and the allowable machine load. For a specific example see fig. 8.

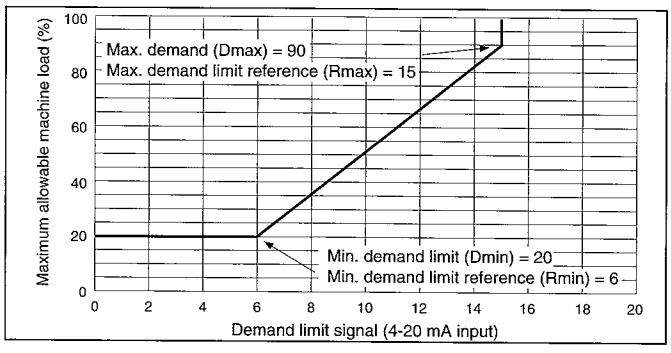


Fig. 8 4-20 mA demand limiting curve

Note :

The demand limit function must be enabled in order to function and may be turned off when its operation is not desired. The demand limit relays can, in off condition, remain connected without affecting machine operation.

Installation

Wiring

For a 2 -stage switch control arrangement, wire according to fig. 10 schematic to terminals of J7 connector (option module).

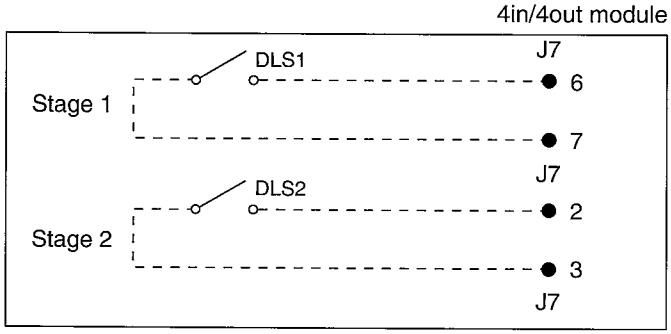


Fig. 9 Demand limit 2-stage switch control

For a 4-20 mA signal control arrangement, wire according to figures below, depending on whether the 4-20 mA signal generator is internally or externally powered, to terminals of J7 connector (options module).

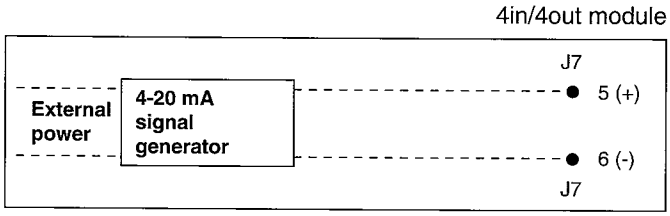


Fig. 10 Demand limit 4-20 mA signal control externally powered

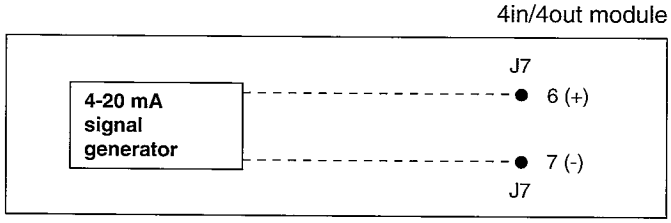


Fig. 11 Demand limit 4-20 mA signal control internally powered

Example 14 Using demand limit 2 -stage switch control

Keyboard Entry	Display Response	Comment
First, log on to the keyboard and display module		
1 SRVC	PASSWORD	Enter password/disable password protection
1 1 1 1 ENTR	LOGGED ON	Logged on
Now, enter field configurations on the keyboard and display module		
4 SRVC	FLD CFG	Adjustable field config.
Scroll to "LSTYP" by using up arrow, and enter appropriate configuration type		
↓	LSTYP 0	Demand limit control selection currently set for no demand limit control 0 = No demand limit 1 = 2 -stage switch control 2 = 4-20 mA signal control
1 ENTR	LSTYP 1	Demand limit control configured for 2 -stage switch control
Enter demand limit switch set points		
3 SET	DEMAND	Demand set points
Scroll to demand limit switch 1 set point "DLS1" by using down arrow		
↓	DLS1 100	Demand limit switch 1 set point is currently 100%
Enter step 1 capacity reduction in percent ranging from 0 to 100		
6 0 ENTR	DLS1 60	Demand limit switch 1 reset to 60% as an example
Scroll to demand limit switch 2 set point "DLS2" by using down arrow		
↓	DLS2 100	Demand limit switch 2 set point is currently 100%
Enter step 2 capacity reduction in percent ranging from 0 to 100		
4 0 ENTR	DLS2 40	Demand limit switch 2 reset to 40% as an example
Finally, log off		
1 SRVC	LOGGED ON	Logged on
↓	LOG OFF	Disable password protection
ENTR	EXIT LOG	Logged off/enable password protection

Example 15 Using demand limit 4-20 mA signal control

Keyboard Entry	Display Response	Comment
First, log on to the keyboard and display module		
1 SRVC	PASSWORD	Enter password/disable password protection
1 1 1 1 ENTR	LOGGED ON	Logged on
Now, enter field configurations on the keyboard and display module		
4 SRVC	FLD CFG	Adjustable field config.
Scroll to "LSTYP" by using up arrow, and enter appropriate configuration type		
↓	LSTYP 0	Demand limit control selection currently set for no demand limit control 0 = No demand limit 1 = 2 -stage switch control 2 = 4-20 mA signal control
2 ENTR	LSTYP 2	Demand limit control configured for 4-20 mA signal control
Enter demand limit switch set points		
3 SET	DEMAND	Demand set points
Scroll to maximum demand limit set point "DMAX" by using down arrow		
↓	DMAX 100	Maximum demand limit is currently 100%
Enter prefered max. demand limit set point in percent ranging from 0 to 100		
9 0 ENTR	DMAX 90	Maximum demand limit is reset to 90%
Scroll to maximum demand limit reference point "RMAX" and enter preferred value (in mA) ranging from 4-20 by using down arrow		
↓	RMAX 20	Maximum demand limit reference is currently 20 mA
1 5 ENTR	RMAX 15	Maximum demand limit reference is reset to 15 mA
Scroll to minimum demand limit set point "DMIN" and minimum demand limit reference point "RMIN" and enter preferred values. Ranges are the same as above		
↓	DMIN 0	Minimum demand limit is currently 0%
2 0 ENTR	DMIN 20	Minimum demand limit is reset to 20%
↓	RMIN 4	Minimum demand limit reference is currently 4 mA
6 ENTR	RMIN 6	Minimum demand limit reference is reset to 6 mA
Finally, log off		
1 SRVC	LOGGED ON	Logged on
↓	LOG OFF	Disable password protection
ENTR	EXIT LOG	Logged off/enable password protection

Dual cooling set point

Control feature

This reset is used to allow for dual setpoint control for occupied/unoccupied setpoint control based on the Time Clock status, or through external Dual Setpoint Switch if configured for its use.

If the unit is configured for switch control then the occupied set point is used if the switch is open and the unoccupied setting is used if the switch is closed. If the unit is also configured for clock operation the unit will operate in the occupied mode and will shutdown in the unoccupied mode. Setpoint is independent of clock control. If the unit is configured for clock control setpoint then the occupied setpoint is used during the occupied mode and the unoccupied set point is used during the unoccupied mode.

Dual setpoint and reset can be used at the same time.

Example 16 Using Dual Setpoint

Keyboard Entry	Display Response	Comment
First, log on to the keyboard and display module		
1 SRVC	PASSWORD	Enter password/disable password protection
1 1 1 1 ENTR	LOGGED ON	Logged on
Now, enter field configurations on the keyboard and display module		
4 SRVC	FLD CFG	Adjustable field config.
Scroll to cooling set point control selection "CSPTYP" and enter appropriate configuration		
↓	CSPTYP 0	Cooling set point control selection is currently set for single set point control
1 ENTR	CSPTYP 1	Cooling set point control selection is reset for external switch controlled set point
Now, set the desired cooling set points. Note, when switch is open, cooling set point 1 (CSP1) is in effect, and when switch is closed, cooling set point 2 (CSP2) is in effect		
1 SET	SET POINT	Unit set point
↓	CSP1 44	Leaving chilled water temperature set point n° 1 currently 44°F
4 2 ENTR	CSP1 42	Leaving chilled water temperature set point n° 1 reset to 42°F as an example
↓	CSP2 44	Leaving chilled water temperature set point n° 2 currently 44°F
5 0 ENTR	CSP2 50	Leaving chilled water temperature set point n° 2 reset to 50°F as an example
Finally, log off		
1 SRVC	LOGGED ON	Logged on
↓	LOG OFF	Disable password protection
ENTR	EXIT LOG	Logged off/enable password protection

Wiring

The field supplied switch used must be a 24 V, 24 mA, normal pilot duty switch. Wire the switch to terminals of J7 connector on the option module as shown.

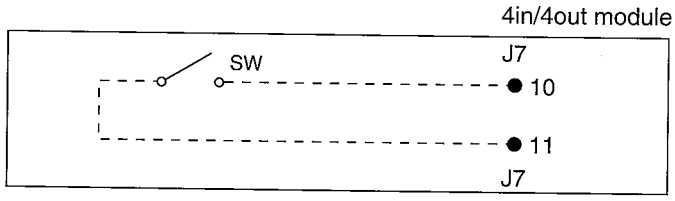


Fig. 12 Remote dual set point control wiring

9. Test Function

To use the test function, Local/Stop/Network *switch must be in stop position.*

The test function operates the Quick Test diagnostic program. When the unit is in Stop position, the test subfunctions will energize fan relays, cooler water pump, the electronic expansion valves, unloaders and compressors. The expansion valve will travel to fully open in one test and to fully closed in the next test. The compressors will energize from 8 to 10 seconds. The subfunctions are explained below and chart 7 shows all the elements in the subfunctions.

1 TEST OUTPUTS. Tests all the outputs from the processor except for compressors. If the unit is in the off mode then the step will be allowed to cause the output to change status if required. The steps can be scrolled through using the keys until the correct step is reached.

The status of the display will be shown if you desire to execute the test then the ENTR key can be pushed. To stop the test use the ENTR key or the ↓ keys.

1. ***Test display.*** Display will show 8.8.8.8.8.8.8.8.
2. ***Alarm output.*** This step will turn the alarm relay on and off.
3. ***Fan relay A1 (KP1)***
4. ***Fan relay A2 (KP2)***
5. ***Fan relay B1 (KP3)***
6. ***Fan relay B2 (KP4)***

   These steps will turn on the fan stages of circuit A and B.
7. ***Cooler pump.*** This step will turn on the cooler pump relay.
8. ***EXV valve A test.*** This step will energize the EXV valve in circuit A. The valve should open in steps of 1% until the position 100% set through keyboard is reached or the test is terminated. The position will be indicated through display. When the Output subfunction ends the valves will be closed to 0.
9. ***EXV valve B test.*** This step will energize the EXV valve in circuit B. The valve should open in steps of 1% until the position 100% set through keyboard is reached or the test is terminated. The position will be indicated through display. When the Output subfunction ends the valves will be closed to 0.

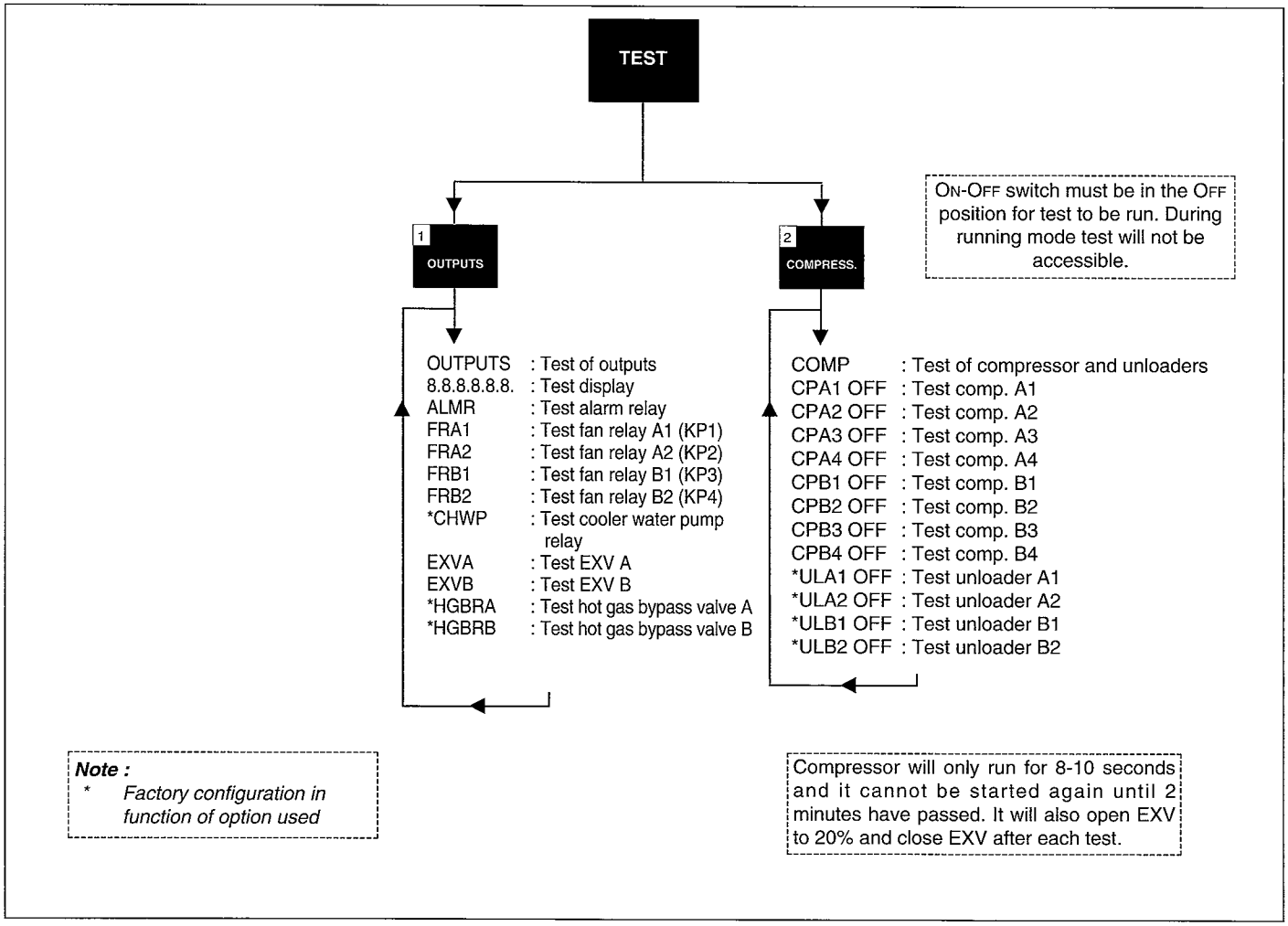


Chart 7. TEST subfunctions

[2] [TEST] COMPRESSORS TEST. This function is used to turn on the compressors and unloaders. Compressors will be energized for 8 to 10 seconds only. At the same time the EXV's will be opened to 20%. The control will check the status of the compressor voltage input and output and output the status to the display. After the test the EXV will be closed. Unloaders (if used) will be energized continously until the last step is left. For units with less than 8 compressors or without unloaders the unused output will not be displayed.

To reach the particular test, enter its subfunction number and scroll to desired test with the [↓] key.

A test can be determined by pressing [↓] key.

Pressing the [↓] key after a test has started will advance the system to the next test, whether current test is operating or has timed out.

Once in next step you may start test by pressing [ENTR] or advance past it by pressing [↓].

While the unit is in Quick Test, you may access another display or function by depressing the appropriate keys. If the keyboard is not used for 10 minutes, the unit will automatically leave the Quick Test function.

To learn how QUICK TEST should be used, see example 17.1 and 17.2.

WARNING

During compressor test, compressors start and run for 10 seconds. Compressor service valves and liquid line valves must be open.

Energize crankcase heaters 24 hours prior to performing compressor tests.

Example 17.1 Testing EXV

Keyboard Entry	Display Response	Comment
1 TEST	OUTPUTS	Test of outputs
↓	8.8.8.8.8.8.8.8.	Test of display
⋮		
↓	EXVA 0	Test EXVA
2 3	23	Position 23% called
ENTR	EXVA 23	Valve open 23%
↓	EXV0	End of the test
↓	EXVB0	Test EXVB

Note :
- *When leaving EXV, position is in 0% (close)*
- *Pressing ENTR or ↓ keys will stop the test.*

Example 17.2 Testing CPA3

Keyboard Entry	Display Response	Comment
2 TEST	COMP	
↓	CPA1 OFF	Test cir. A, compressor 1
⋮		
↓	CPA3 OFF	Test circuit A, compressor 3
ENTR	CPA3 ON	Pressing ENTR starts the test, when the compressor should be running, the display shows CPA3 ON*
	CPA3 OFF	If the test is allowed to time out, the display will show CPA3 OFF
↓	CPA4 OFF	Pressing the down arrow key advances the system
⋮		
↓	ULB2 OFF	Test unloader B2

Note :
** Compressor will only turn for 8-10 seconds and it can not be restarted until 2 minutes have passed.*

10. Operation data

a. Capacity Control

The control system cycles compressor to give capacity control steps as shown in Table 5. The unit controls leaving chilled water temperature. Entering water temperature is used by the microprocessor in determining the optimum time to add or substract steps of capacity, but is not a control set point.

The chilled water temperature set point can be automatically reset by the return temperature reset or space and outside air temperature reset features. It can also be reset from an external 4 - 20 mA signal or from a network signal.

b. Pumpout

When the lead compressor in each circuit is started or stopped, that circuit goes through a pumpout cycle to purge the cooler and refrigerant suction lines of refrigerant.

The pumpout cycle starts immediately upon starting the lead compressor and continues until the saturated suction temperature is 11.1°C (20°F) below the saturated suction temperature at start-up or is 5.5°C (10°F) below the cooler leaving fluid temperature. At this point, the EXV starts to open and continues to open gradually to provide a controlled start-up to prevent liquid flood-back to the compressor.

At shut down, the pumpout cycle continues until the saturated suction temperature for that circuit is 11.1°C (20°F) below the saturated suction temperature when pumpout is initiated. At that point, the compressor shuts down and the EXV continues to move until fully closed.

c. Head pressure control

The microprocessor controls the condenser fan in order to maintain the lowest condensing temperature possible, thus the highest unit efficiency. Instead of using the conventional head pressure control methods, the fans are controlled by the position of the electronic expansion valves and suction superheat.

As the condensing temperature drops, the electronic expansion valve opens to maintain the proper suction superheat. Once the electronic expansion valve is fully open, if the condensing temperature continues to drop, the suction superheat begins to rise.

Once the suction superheat is greater than 22.2°C (40°F), a fan stage is removed after 2 minutes. As the condensing temperature rises, the electronic expansion valve closes to maintain the proper suction superheat. Once the electronic expansion valve has closed to 39.5% open (590 steps open), a fan stage is added after 2 minutes.

During start-up, all the condenser fan are started when the condensing temperature reaches 35°C (95°F) to prevent excessive discharge pressure during pulldown.
See "Condenser fan sequence".

11. Pre-start-up

a. Initial Check

IMPORTANT

Before begining pre-start-up or start-up review start-up check list for Flotronic II chiller systems at center of this publication. The check list assures proper start-up of a unit, and provides a record of unit condition, application requirement system information and operation at initial start-up. Do not attempt to start chiller, even momentarily, until the following steps have been completed.

The pre-start up should be done in conjunction with the Installation, Operation manual that concerns these units.

The unit can only be set up properly when loaded to at least 50 % of maximum capacity.
Pending installation, units which are shipped wrapped (30H) must stay wrapped until commissioning by Carrier Service.
On no account may any unit be used as a footway, stepping stone, gantry or work platform.
While the Building Management System (BMS) is being commissioned take graeat care to ensure that the unit operates always within the prescribed operating limits.

1. Electrical power source must agree with unit nameplate rating.
2. Check all auxiliary components such as chilled water circulating pump, air handling equipment, or other equipment to which chiller supplies liquid. Consult manufacturer's instructions. Auxiliary contacts for chilled water starter must be properly interlock in control circuit (see field wiring).
3. Backseat (open) compressor suction (if used) and discharge shutoff valves. Close valves one turn to allow some pressure to reach test gauge (if installed).
4. Open liquid line valves.
5. Fill chilled liquid circuit with clean water (with recommended inhibitor added) or other noncorrosive fluid to be cooled. Bleed all air out of high points of system (see chilled water piping). If outdoor temperatures below 0°C are anticipated, sufficient ethylene glycol must be added to chilled liquid circuit to prevent freezing under those ambient conditions.

Keyboard Entry	Display Response	Comment
1 SET	SET POINT	Unit set point
↓	CSP1 5.0	Present occupied cold set point 1 is 5.0°C
↓	CSP2 6.0	Present unoccupied cold set point 2 is 6.0°C
7 . 0	7.0	Type new set point 2
ENTR	CSP2 7.0	New unoccupied cold set point 2 is 7.0°C
↓	HSPA	Head pressure setpoint, cir. A
↓	CRAMP	Cooling ramp loading rate

6. Check all field configuration data and set points. Units are shipped with pre-programmed values as follow :

Cooling set point control select (CSPTYP)	0
Chiller fluid set point 1 (CSP1)	44°F or 6°C
Ramp load select (RAMP)	1
Pulldown limit (CRAMP)	1°F
Cooler pump interlock select (LOCK)	0
Cooler pump control select (CPC)	0
Cooling reset control select (CRTYP)	0
Demand limit control select (LSTYP)	0
Clock control select (CLOCK)	0
Number of circuit A unloaders (NULA)	0
Number of circuit B unloaders (NULB)	0

Enter desired set points, field configurations, and the current date and time.

Refer to "Controls operation" and "Programming functions".

7. Proceed according to "Electrical precautions before initial unit start-up" indicated in Installation, Operation manual.
8. Be sure there are no refrigerant leaks (see Leak Test and Dehydration).
9. Be sure compressor oil is visible in bull's-eye (see Oil Charge).
10. Crankcase heater must be firmly locked into compressor crankcase and energized for 24 hours.
11. Check compressor suspension. The compressor mounting rail bolts and transportation spacers must be removed.

    Compressor rails must float freely on spring.
12. Fan motors are 3 phases. Check rotation during quick test. Rotation is clockwise as viewed from top of unit. Reverse two power 2 wires to correct rotation-if necessary.
13. Check tightness of compressors and mufflers collars.
14. Perform Quick Test to make sure controls are operating properly. Refer to Controls Operation, Display Functions section, beginning on page 12.
15. Now, it is possible to restore main power (see "Electrical precaution before initial star-up" for details).
16. If the unit is controlled by a BMS (with remote Stop/Start), the stop/start frequency must not exceed 6 per hour i.e there must be at least 10 minutes between successive signals.
    Furthermore this method must not be used as the means for controlling the temperature of the water loop. Doing so renders the warranty invalid.
17. It is equally important to confirm that the electrical supply circuit is correct for the unit (power, rating, voltage, power factor, cable sizes, sum of the harmonics less than 5 %). These factors are especially important when the unit is to be driven by a motor generator set.

V. Flotronic II, controls components

Each circuit has all necessary refrigerant controls.

1. Electronic expansion valves

The EXV is used to control superheat in compressor. One pressure transducer and one thermistor, located in the lead compressor of each circuit are used to directly determine superheat. The EXV is controlled to maintain superheat entering pistons at approximately 8.3°C (15°F) to 13.9°C (20°F), which results in slightly superheated refrigerant leaving cooler.

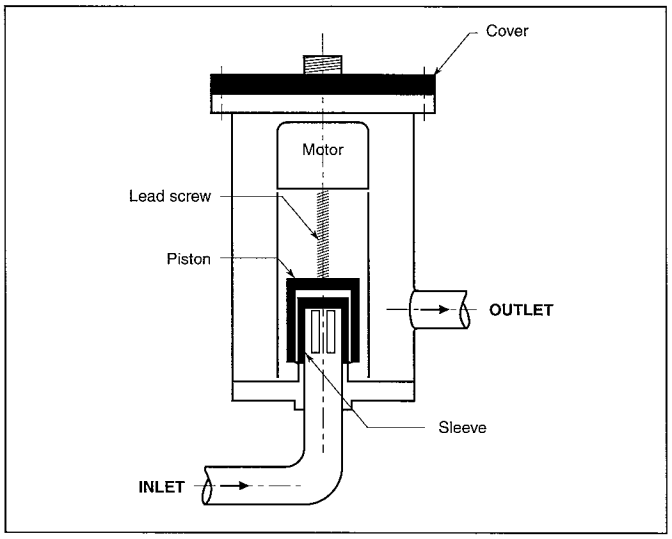


Fig. 13 Electronic expansion valve

A series of calibrated slots have been machined inside of orifice assembly. As refrigerant passes through orifice, pressure drops and refrigerant changes to a 2-phase condition (liquid and vapor). To control refrigerant flow for different operating conditions, piston moves up and down over orifice and modulates orifice size. Piston is moved by a linear stepper motor. Stepper motor moves in increments and is controlled directly by EXV module. As stepper motor rotates, motion is transferred into linear movement by lead screw. Through stepper motor and lead screw, discrete steps of motion are obtained. The large number of steps and long stroke results in very accurate control of refrigerant flow.

Control of valve is by microprocessor. One thermistor and one pressure transducer is used to determine superheat. Both are located in the lead compressor of each circuit. The difference between saturated temperature (based on suction line pressure) and actual temperature controls superheat. On a normal TXV system, superheat leaving evaporator is normally 5.6°C and motor then adds approximately 8 to 11°C resulting in approximately 16.7°C superheat entering cylinders. The EXV controls superheat entering cylinders to approximately 13.8°C. Thus superheat leaving cooler is approximately 2°C to 3°C, or less.

Because the EXVs are controlled by the processor module, it is possible to track valve position. During initial start-up, EXV is fully closed and performs pump down. After start-up, valve position is tracked by processor by constantly observing amount of valve movement.

The EXV is also used to limit cooler suction temperature to 13°C (R22). This makes it possible for the chiller to start at higher cooler water temperatures without overloading compressor. This is commonly referred to as MOP (Maximum Operating Pressure).

If it appears that the electronic expansion valve is not properly controlling operating suction pressure or superheat, there are a number of checks that can be made using Quick Test features built into the microprocessor control.

The external connector should be properly greased with CARRIER silicone grease (reference 397 EE) to avoid water condensation and corrosion.

Follow steps below to diagnose and correct EXV problems.

2. EXV Driver Module

• Step 1. Check EXV Driver Outputs

Check EXV output signals at appropriate terminals on the EXV driver module (fig. 21) as follows :

Connect positive test lead to terminal 1 on EXV driver. Set meter for approximately 20 V DC. Enter outputs subfunction of test function by pressing [1] [TEST], then advance to EXVA Open Quick Test by pressing [↓] 8 times.
Press [1] [0] [0] [ENTR]

The driver should drive the circuit A EXV fully open. During the next several seconds connect the negative test lead to pins 2, 3, 4 and 5 in succession. Voltage should rise and fall at each pin. If it remains constant at a voltage or at zero volts, remove the connector to the valve and recheck.

Press [.] [ENTR] key to close the circuit A EXV. If a problem still exists, replace the EXV driver module.

If the voltage reading is correct, the expansion valve should be checked. Next, test EXVB. Connect the positive test lead to pin 7 and the negative to pin 8, 9, 10, 11 in succession during the EXVB Test.

• Step 2. Check EXV Wiring

Check wiring to electronic expansion valves from terminal strip on EXV driver (fig. 13).

1. Check color coding and wire connections. Make sure they are connected to correct terminals at driver and EXV plug connections.
2. Check for continuity and tight connection at all pin terminals.
3. Check plug connections at driver and at EXVs. Be sure EXV connections are not crossed.

• Step 3. Check Resistance of EXV Motor Windings

Remove plug at J4 terminal strip and check resistance between common lead (red wire, terminal D) and remaining leads A, B, C and E (see fig. 14). Resistance should be 25 ohms ± 2 ohms.

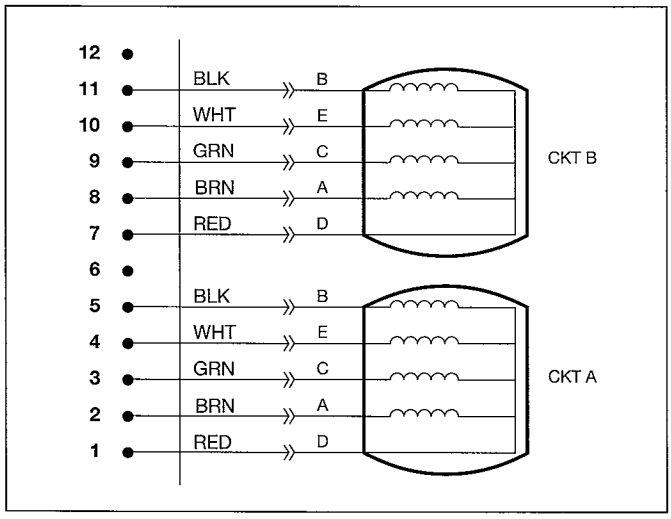


Fig. 14 EXV cable connections to EXV driver module, DSIO (EXV)

• ***Step 4. Check pressure transducer and thermistor that control EXV***

Check thermistors that control processor output voltage pulses to EXVs. Circuit A : thermistor is R3 and pressure transducer is BP3. Circuit B : thermistors is R4 and pressure transducer is BP4. Refer to fig. 18 for location.

1. Use the temperature subfunction of the status function ([6] [STAT]) to determine if thermistors are reading correctly.

2. Check thermistor calibration at known temperature by measuring actual resistance and comparing value measured with values listed in Table 7.

3. Make sure that thermistor leads are connected to proper pin terminals at J7 terminal strip on processor module and that thermistor probes are located in proper position in refrigerant circuit.

4. Troubleshooting - If transducer is suspected of being faulty, first check supply voltage to transducer. Supply voltage should be 5 VDC ± 0.2V. If supply voltage is correct, compare pressure reading displayed on keyboard and display module against pressure shown on a calibrated pressure gauge. If the two pressure readings are not reasonably close, replace pressure transducer (± 20 kPa or ± 3 PSI).

When above checks have been completed, actual operation of EXV can be checked by using procedures outlined in step 5.

• ***Step 5. Check operation of the EXV***

Use following procedure to check actual operation of electronic expansion valves.

1. Close liquid line service valve for circuit to be checked and run through the Quick Test step (in subfunction 2 of test function) for the lead compressor in that circuit to pump down the low side of the system. Repeat test step 3 times to ensure that all refrigerant has been pumped from low side.

Note :

Do not use control circuit breaker to achieve this operation. Be sure to allow compressors to run full 10 seconds at each step.

2. Turn OFF compressor. Make sure that electrical power is shut-off. Disconnect compressor fuses or compressor optional circuit breakers. Close compressor discharge valves.

At this step, glasses and gloves must be worn.

3. Remove screws holding top cover of EXV. Carefully remove top cover, using caution to avoid damage to the O-ring seal and motor leads. If EXV plug was disconnected during this process, reconnect it after the cover is removed.

4. Enter appropriate EXV Quick Test step for EXVA or EXVB in the outputs subfunction of the test function [1] [TEST].

Press [1] [0] [0] [ENTR] to initiate test. With cover lifted off the EXV valve body, observe operation of valve motor and lead screw. The motor should turn in the clockwise direction and the lead screw should move down into the motor hub until the valve is fully closed or fully open depending on whether you initiated the open or close test step for that valve. Lead screw movements should be smooth and uniform from fully open to fully closed position, or from fully closed to fully open.

If valve is properly connected to processor and receiving correct signals, yet does not operate as described above, the valve should be replaced.

The EXV test can be repeated as required by entering any percentage from 0 ([.]) to 100 to initialize movement.

If operating problems persist after reassembly, they may be due to out-of calibration thermistor(s), or intermittent connections between processor board terminals and EXV plub. Recheck all wiring connections and voltage signals.

Other possible causes of improper refrigerant flow control could be restrictions in liquid line. Check for plugged filter drier(s), or restricted metering slots in the EXV.

Formation of ice or frost on lower body of electronic expansion valve is one symptom of restricted metering slots. Clean or replace valve if necessary.

Note :

Frosting of valve is normal during compressor Quick Test steps and at initial start-up. Frost should dissipate after 5 to 10 minutes operation of a system that is operating properly. If valve is to be replaced, wrap valve with a wet cloth to prevent excessive heat from damaging internal components.

3. Transducers

Pressure transducers are used to measure the following pressures in each circuit :

- discharge pressure
- suction pressure
- oil pressure

These sensors are smart sensors with on-board electronics that linearize the signal and output a 0 to 5 DC signal to the PSIO module. These transducers give gauge reading in kPa or psig units. Two versions are used. One version is calibrated for the high pressure and one version is calibrated for the low pressure and oil pressure.

The fig. 15 and fig. 16 show these transducers curves for voltage output (VDC) versus measured pressure (psig). Faulty transducers are detected by checking if the transducers output signal is greater than 99% or less than 1%. Values outside this range should be treated as an error and faulty transducer(s) should be replaced.

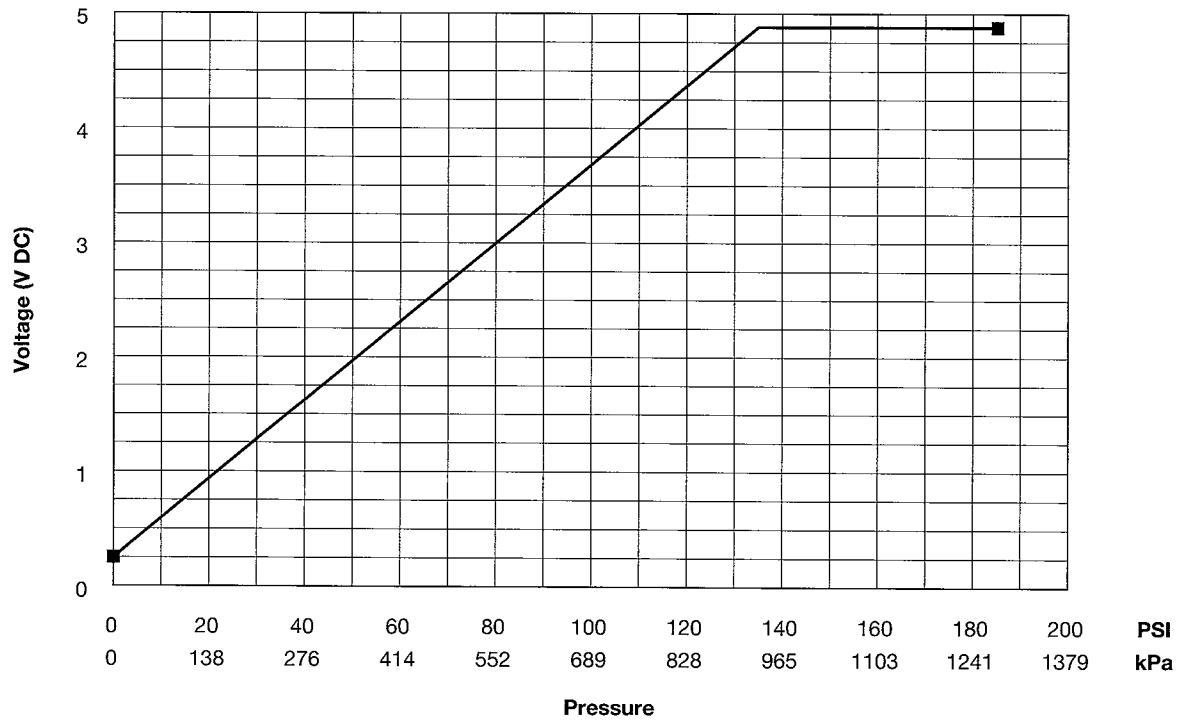


Fig. 15 Low pressure transducer, voltage vs pressure 5 VDC supply

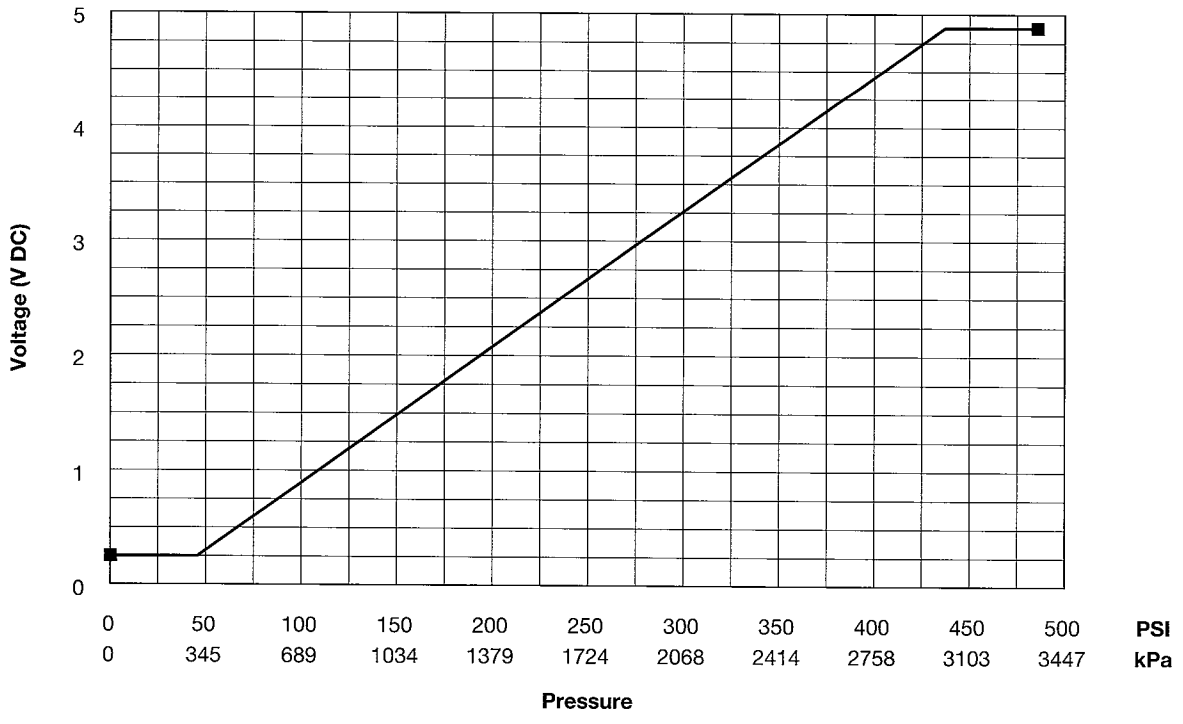


Fig. 16 High pressure transducer, voltage vs pressure 5 VDC supply

a. Discharge pressure transducers (BP1, BP2)

These transducers are located in the high side of each circuit at each lead compressor. They replace the discharge pressure gauges and they are used to control the head pressure.

b. Suction pressure transducers (BP3, BP4)

These transducers are used to measure the pressure on the low side of the unit. They are connected to the lead compressor of each refrigeration circuit in the oil cranckase port. The reading of suction pressure transducers is used to control the electronic expansion valves (EXV). They replace the low pressure switch or the superheat and the oil switch.

c. Oil pressure transducers (BP5,BP6)

These transducers are used to measure the oil pressure of the lead compressor of each refrigeration circuit. The suction pressure is substracted for this reading to determine the oil pressure differential.

IMPORTANT

Sensors are installed directly in lead compressors of refrigerant circuits A and B. Pumpdown the cooler as described in § "Compressor replacement" and relieve all refrigerant pressure from the lead compressors A or B before removing transducers.

4. Transducer replacement (compressor)

Proceed as follows (see fig. 17) :

1. Disconnect electrical and control wires from transducers
2. Remove and discard original transducer
3. Apply pipe sealant to 1/4-in. NPT threads on replacement transducer coupling and install in place of original.

   Do not use packing nut to tighten coupling; this would damage ferrules (see fig. 15).
4. Hand tighten transducers, then finish tightening 1-1/4 turns with a suitable tool.
5. Connect the electrical and control wires.
6. Open shut-off and discharge valves of lead compressor.
7. Start up the unit.

5. Transducers testing

To test the transducers; the pressure and voltage reading must be taken. Then voltage output reading should be compared with voltage value taken from the curve at the pressure value indentical to the test pressure from fig. 16 or fig. 17 depends if high or low pressure transducer was tested. Use tee connector completed with manometer to take the pressure reading. Shut off the suction and discharge valves before installing tee and manometer in the refrigerant line.

Accuracy (± 3 PSI or 20 kPa).

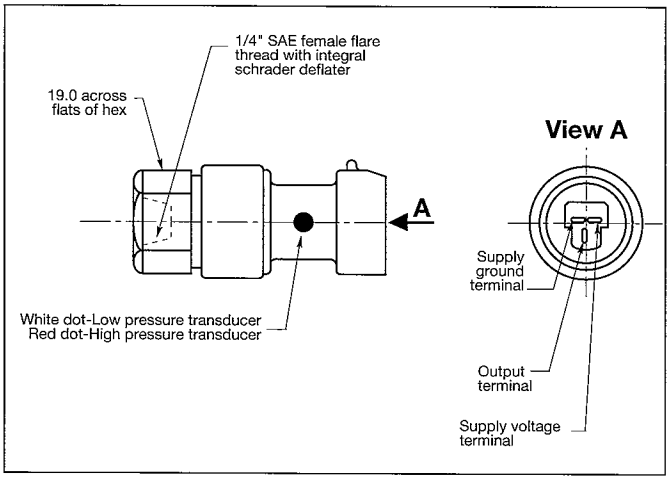


Fig. 17 Compressor transducer

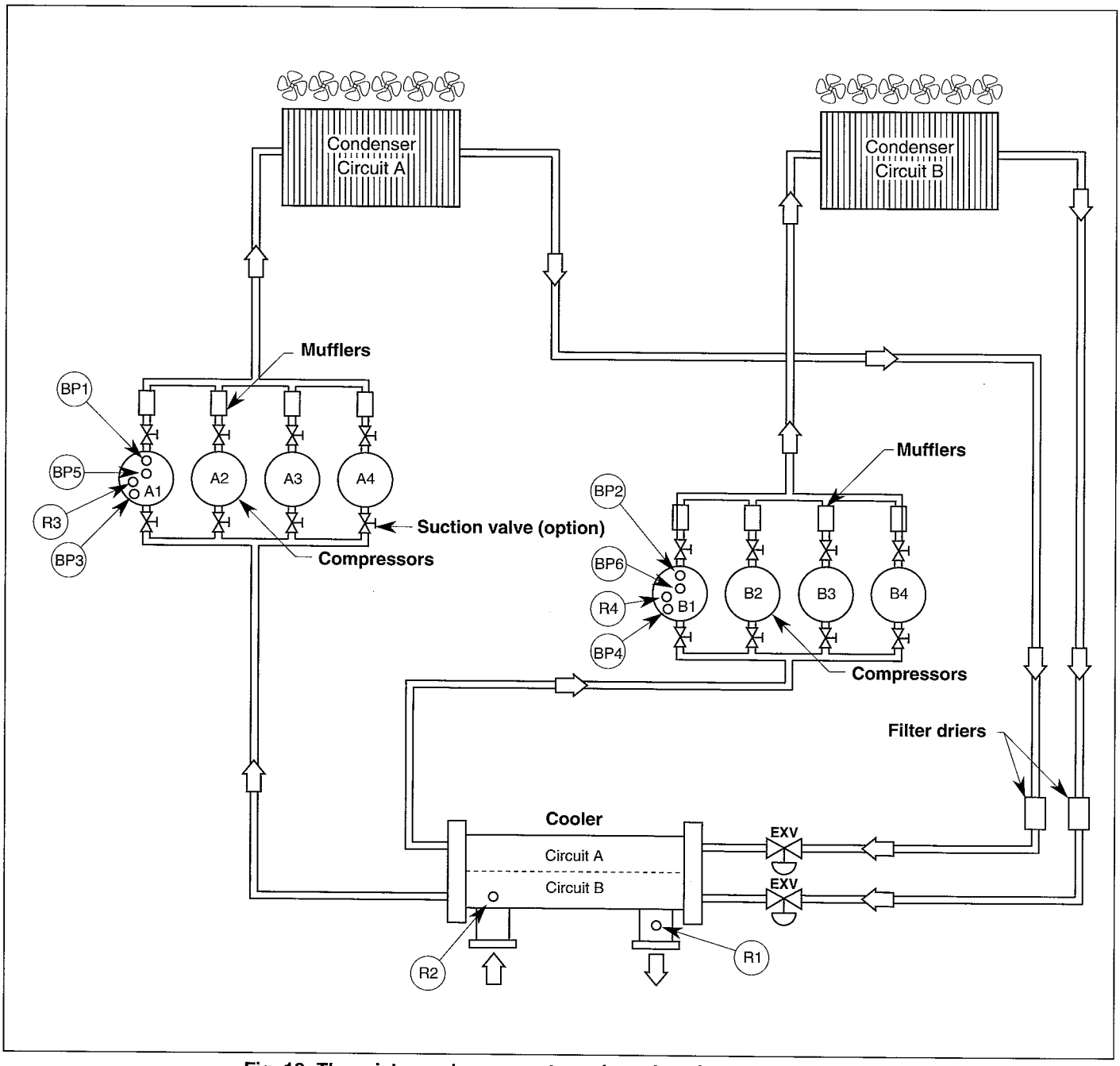


Fig. 18 Thermistor and pressure transducer locations - ex : 30GF 220

Legend :

R1	*Cooler leaving chilled water temperature*
R2	*Cooler entering water (return temperature)*
R3	*Suction gas temperature - Circuit A*
R4	*Suction gas temperature - Circuit B*
R10	*Remote temperature sensor (accessory)*
BP1	*Discharge pressure Comp 1 Circuit A*
BP2	*Discharge pressure Comp 1 Circuit B*
BP3	*Suction pressure Comp 1 Circuit A*
BP4	*Suction pressure Comp 1 Circuit B*
BP5	*Oil pressure Comp 1 Circuit A*
BP6	*Oil pressure Comp 1 Circuit B*

Note :
Schematic wiring diagram is only for information. It is not intended to be used as an installation guide.

Temp. (°C)	Resistance (Ohms)	Voltage Drop (V)	Temp. (°C)	Resistance (Ohms)	Voltage Drop (V)	Temp. (°C)	Resistance (Ohms)	Voltage Drop (V)	Temp. (°C)	Resistance (Ohms)	Voltage Drop (V)	Temp. (°C)	Resistance (Ohms)	Voltage Drop (V)
-32.0	100049.0	4.690	-4.0	20075.9	3.756	24.0	5203.2	2.201	52.0	1694.0	1.003	80.0	602.4	0.431
-31.5	97006.4	4.680	-3.5	19560.8	3.732	24.5	5088.1	2.174	52.5	1663.5	0.988	80.5	592.4	0.425
-31.0	94060.8	4.671	-3.0	19060.6	3.707	25.0	4976.0	2.147	53.0	1633.5	0.974	81.0	582.8	0.418
-30.5	91209.3	4.661	-2.5	18574.8	3.682	25.5	4866.8	2.120	53.5	1604.1	0.959	81.5	573.4	0.412
-30.0	88449.0	4.651	-2.0	18102.9	3.656	26.0	4760.2	2.094	54.0	1575.2	0.945	82.0	564.4	0.406
-29.5	85777.0	4.641	-1.5	17644.5	3.631	26.5	4656.4	2.067	54.5	1546.9	0.931	82.5	555.7	0.400
-29.0	83190.7	4.630	-1.0	17199.1	3.605	27.0	4555.2	2.041	55.0	1519.0	0.917	83.0	547.2	0.394
-28.5	80687.1	4.620	-0.5	16766.3	3.579	27.5	4456.6	2.015	55.5	1491.6	0.903	83.5	539.1	0.388
-28.0	78263.9	4.609	0.0	16345.7	3.553	28.0	4360.4	1.989	56.0	1464.7	0.890	84.0	531.2	0.383
-27.5	75918.3	4.597	0.5	15936.9	3.526	28.5	4266.7	1.963	56.5	1438.3	0.876	84.5	523.6	0.377
-27.0	73648.0	4.586	1.0	15539.5	3.500	29.0	4175.4	1.938	57.0	1412.3	0.863	85.0	516.2	0.371
-26.5	71450.6	4.574	1.5	15153.1	3.473	29.5	4086.3	1.912	57.5	1386.8	0.850	85.5	509.2	0.366
-26.0	69323.7	4.562	2.0	14777.5	3.446	30.0	3999.6	1.887	58.0	1361.6	0.837	86.0	502.3	0.361
-25.5	67265.0	4.550	2.5	14412.2	3.419	30.5	3915.0	1.862	58.5	1336.9	0.825	86.5	495.7	0.355
-25.0	65272.4	4.537	3.0	14056.9	3.392	31.0	3832.5	1.837	59.0	1312.6	0.812	87.0	489.4	0.350
-24.5	63343.7	4.525	3.5	13711.4	3.364	31.5	3752.1	1.813	59.5	1288.7	0.800	87.5	483.2	0.345
-24.0	61476.9	4.512	4.0	13375.3	3.337	32.0	3673.7	1.789	60.0	1265.2	0.788	88.0	477.4	0.340
-23.5	59670.0	4.499	4.5	13048.3	3.309	32.5	3597.3	1.764	60.5	1242.1	0.776	88.5	471.6	0.335
-23.0	57920.9	4.485	5.0	12730.1	3.281	33.0	3522.9	1.741	61.0	1219.3	0.765	89.0	466.1	0.331
-22.5	56227.9	4.471	5.5	12420.5	3.253	33.5	3450.2	1.717	61.5	1196.9	0.753	89.5	460.8	0.326
-22.0	54589.1	4.457	6.0	12119.2	3.225	34.0	3379.4	1.693	62.0	1174.8	0.742	90.0	455.6	0.321
-21.5	53002.7	4.443	6.5	11826.0	3.197	34.5	3310.4	1.670	62.5	1153.2	0.731	90.5	450.6	0.317
-21.0	51467.0	4.428	7.0	11540.5	3.169	35.0	3243.1	1.647	63.0	1131.8	0.720	91.0	445.7	0.312
-20.5	49980.4	4.413	7.5	11262.7	3.140	35.5	3177.5	1.624	63.5	1110.9	0.709	91.5	440.9	0.308
-20.0	48541.1	4.398	8.0	10992.1	3.112	36.0	3113.4	1.602	64.0	1090.2	0.698	92.0	436.3	0.303
-19.5	47147.7	4.383	8.5	10728.8	3.083	36.5	3051.0	1.579	64.5	1069.9	0.688	92.5	431.8	0.299
-19.0	45798.6	4.367	9.0	10472.3	3.054	37.0	2990.1	1.557	65.0	1050.0	0.678	93.0	427.4	0.295
-18.5	44492.4	4.351	9.5	10222.6	3.026	37.5	2930.7	1.536	65.5	1030.3	0.667	93.5	423.0	0.291
-18.0	43227.6	4.334	10.0	9979.3	2.997	38.0	2872.8	1.514	66.0	1011.0	0.657	94.0	418.8	0.287
-17.5	42002.9	4.318	10.5	9742.5	2.968	38.5	2816.2	1.492	66.5	992.1	0.648	94.5	414.5	0.283
-17.0	40816.9	4.301	11.0	9511.7	2.939	39.0	2761.1	1.471	67.0	973.4	0.638	95.0	410.3	0.279
-16.5	39668.3	4.283	11.5	9287.0	2.911	39.5	2707.2	1.450	67.5	955.1	0.628	95.5	406.0	0.275
-16.0	38555.9	4.266	12.0	9068.0	2.882	40.0	2654.7	1.430	68.0	937.1	0.619	96.0	401.8	0.271
-15.5	37478.4	4.248	12.5	8854.7	2.853	40.5	2603.4	1.409	68.5	919.4	0.609	96.5	397.6	0.267
-15.0	36434.7	4.230	13.0	8646.9	2.824	41.0	2553.3	1.389	69.0	902.1	0.600	97.0	393.3	0.264
-14.5	35423.7	4.211	13.5	8444.5	2.795	41.5	2504.4	1.369	69.5	885.1	0.591	97.5	389.0	0.260
-14.0	34444.2	4.193	14.0	8247.2	2.766	42.0	2456.6	1.349	70.0	868.4	0.582	98.0	384.7	0.257
-13.5	33495.2	4.174	14.5	8055.0	2.737	42.5	2410.0	1.330	70.5	852.0	0.574	98.5	380.3	0.253
-13.0	32575.6	4.154	15.0	7867.7	2.708	43.0	2364.4	1.311	71.0	836.0	0.565	99.0	375.8	0.250
-12.5	31684.6	4.135	15.5	7685.1	2.680	43.5	2319.9	1.292	71.5	820.2	0.557	99.5	371.1	0.246
-12.0	30821.0	4.115	16.0	7507.2	2.651	44.0	2276.3	1.273	72.0	804.8	0.548	100.0	366.5	0.243
-11.5	29984.0	4.094	16.5	7333.9	2.622	44.5	2233.8	1.254	72.5	789.8	0.540	100.5	361.6	0.240
-11.0	29172.7	4.074	17.0	7164.9	2.593	45.0	2192.2	1.236	73.0	775.0	0.532	101.0	356.7	0.236
-10.5	28386.3	4.053	17.5	7000.3	2.565	45.5	2151.5	1.218	73.5	760.6	0.524	101.5	351.5	0.233
-10.0	27623.8	4.032	18.0	6839.8	2.536	46.0	2111.7	1.200	74.0	746.5	0.516	102.0	346.3	0.230
-9.5	26884.4	4.010	18.5	6683.4	2.508	46.5	2072.8	1.182	74.5	732.6	0.508	102.5	341.1	0.227
-9.0	26167.5	3.989	19.0	6530.9	2.479	47.0	2034.7	1.165	75.0	719.2	0.501	103.0	335.3	0.224
-8.5	25472.2	3.967	19.5	6382.3	2.451	47.5	1997.4	1.148	75.5	706.1	0.493	103.5	329.7	0.221
-8.0	24797.8	3.944	20.0	6237.5	2.423	48.0	1960.9	1.131	76.0	693.3	0.486	104.0	323.8	0.218
-7.5	24143.6	3.922	20.5	6096.3	2.395	48.5	1925.1	1.114	76.5	680.8	0.479	104.5	317.9	0.215
-7.0	23509.0	3.899	21.0	5958.7	2.367	49.0	1890.1	1.098	77.0	668.6	0.472	105.0	311.6	0.212
-6.5	22893.2	3.876	21.5	5824.6	2.339	49.5	1855.7	1.081	77.5	656.8	0.465	105.5	305.3	0.209
-6.0	22295.6	3.852	22.0	5693.9	2.311	50.0	1822.1	1.065	78.0	645.2	0.458	106.0	298.6	0.206
-5.5	21715.7	3.829	22.5	5566.4	2.283	50.5	1789.1	1.049	78.5	634.0	0.451	106.5	292.1	0.204
-5.0	21152.8	3.805	23.0	5442.2	2.256	51.0	1756.8	1.034	79.0	623.2	0.444	107.0	285.2	0.201
-4.5	20606.4	3.781	23.5	5321.2	2.228	51.5	1725.1	1.019	79.5	612.6	0.437			
-4.0	20075.9	3.756	24.0	5203.2	2.201	52.0	1694.0	1.003	80.0	602.4	0.431			

Table 7 Thermistor resistance and voltage drop characteristics (°C)

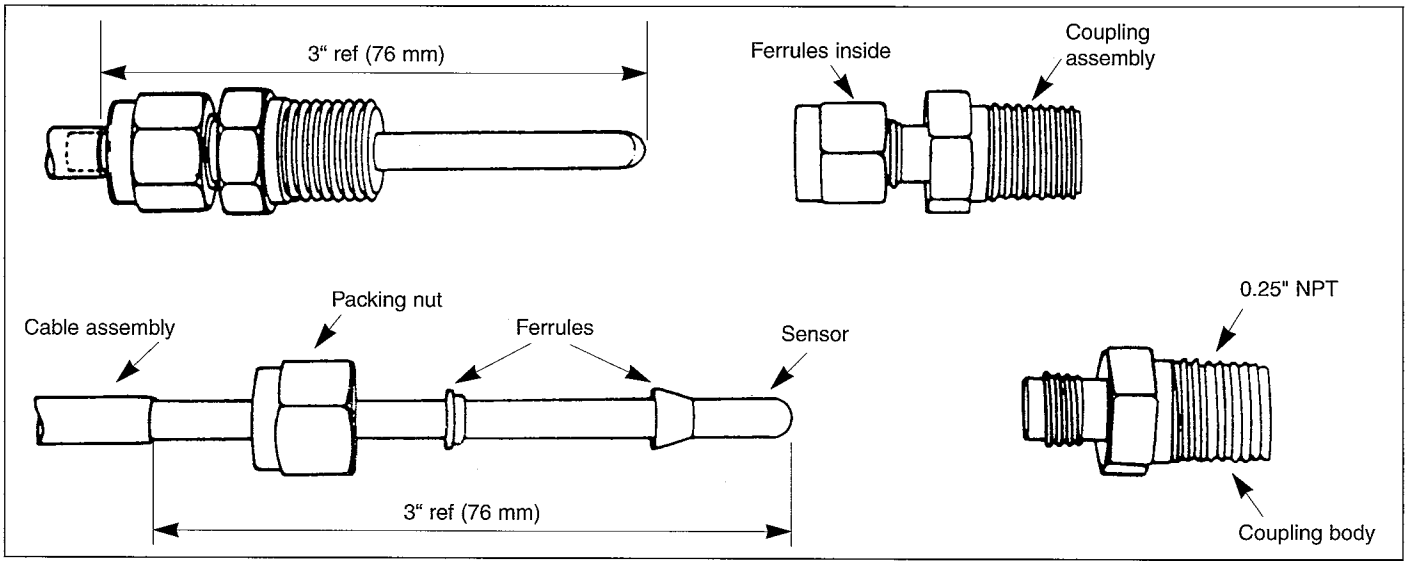


Fig. 19 Thermistor (compressor and cooler)

6. Thermistors

All thermistors are identical in their temperature vs resistance performance. Resistances at various temperatures are listed in table 6.

a. Location

General location of thermistor sensors are shown in fig. 18. Cooler leaving water sensor R1, is located in the leaving water nozzle. The probe is immersed directly in the water. Connection is made through a 1/4-in. coupling (fig. 19).

Compressor Suction Gas Temperature Sensors, R3 and R4, are located in lead compressor in each circuit in a suction passage between motor and cylinders, above oil pump. The 1/4-in. coupling is used (fig. 19).

Reset Sensor, R10, is an accessory sensor and is mounted remotely from unit. It is used for outside air or space temperature reset. Carrier Part No. HH79NZO14 should be used for this purpose (see fig. 30); it is included in Service Parts package no. 30GB660002. The thermistor should be connected to the 4x4 module as shown in fig. 20.

To avoid electrical interference, **do not** run the thermistor wire near line voltage wiring, electrical machinery, large contactors or other devices. Wire lengths up to 300 m may be used with 22-gauge wire.

The accessory thermistor is equipped with 9.1 m 22-gauge twisted-pair cable. If additional length is required, use twisted-pair wire with a minimum of one twist per inch. The additional wire should be spliced onto the end of the 9.1 m wire. All connections should be soldered.

When outside air is used, the thermistor should be mounted in a location that is shielded from the sun.

When using space reset, the thermistor should be mounted in an area within the space where it will sense freely circulating air.

b. Sensor replacement

(compressor and cooler)

IMPORTANT

Sensors are installed directly in refrigerant or water circuit. Relieve all refrigerant pressure or drain water before removing.

Gloves and glasses should be worn to perform this operation.

Proceed as follows (refer to fig. 10) :

1. Remove and discard original sensor and coupling.

Important :

Do not disassemble new coupling ; install as received.

2. Apply pipe sealant to 1/4-in. NPT threads on replacement coupling and install in place of original. Do not use packing nut to tighten coupling ; this would damage ferrules (see fig. 19).

3. Insert new sensor in coupling body to its full depth. Hand tighten packing nut to position ferrules, then finish tightening 1-1/4 turns with a suitable tool. Ferrules are now attached to sensor, which can be withdrawn from coupling for unit servicing.

7. Operation of Processor Module (PSIO), Low-Voltage Relay Module (DSIO) and EXV Driver Module (DSIO)

The PSIO and DSIO modules all perform continuous diagnostic evaluations of the condition of the hardware. Proper operation of these modules is indicated by LEDs (light emitting diodes) on the front surface of the DSIOs and on the top horizontal surface of the PSIO.

a. Red LED

Blinking continuously at second rate indicates proper operation.

Lit Continuously indicates a problem requiring replacement of the module.

Off Continuously indicates the power should be checked. If there is no input power, check fuses. If fuse is bad, check for shorted secondary of transformer, or for bad module.

b. Green LED

(On a PSIO, this is the green LED closest to the COMM connectors. The other green LED on the module could be used with external communications).

The green LED should always be blinking when power is on; it indicates that the modules are communicating properly. If a green LED is not blinking, check the red LED. If the red LED is normal, check the module address switches. See fig. 30.

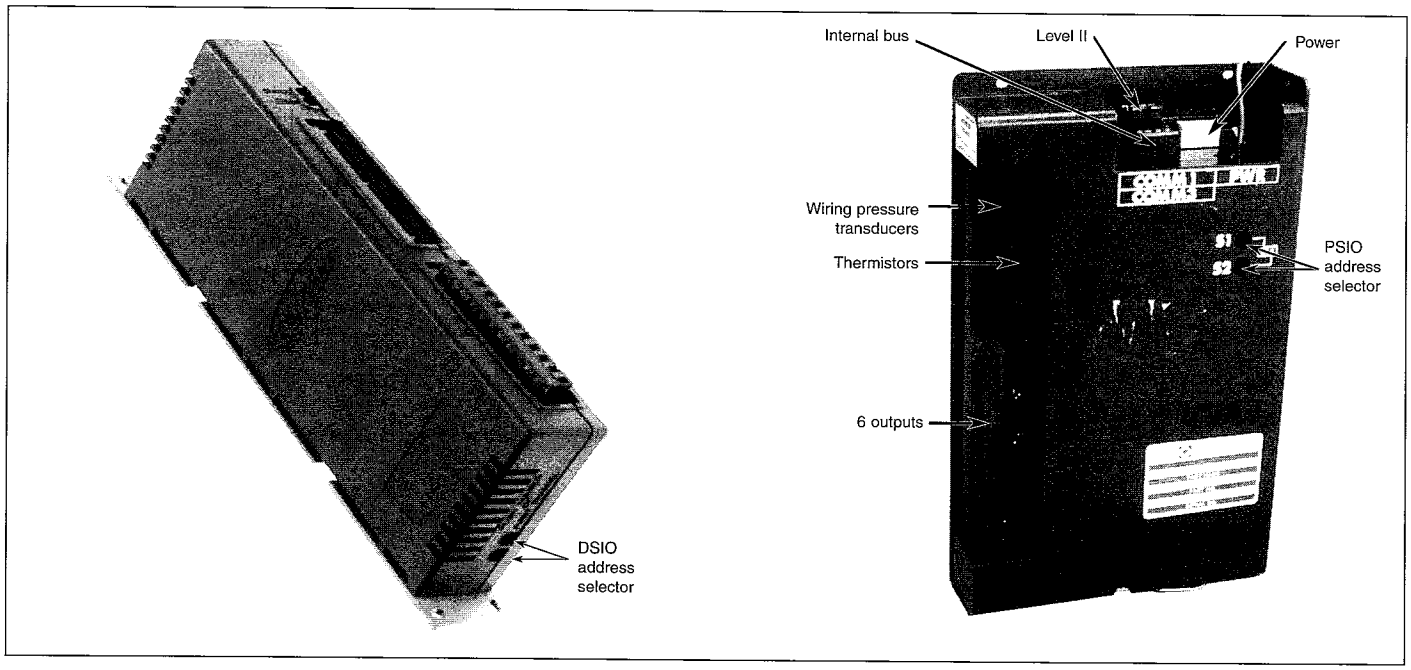


Fig. 20 Module address selector Switch locations

The proper addresses are :

PSIO	(Processor Module)	: 01
DSIO	(Relay Module)	: 19
DSIO	(EXV Driver Module)	: 31
4x4	(Optional Module)	: 59
Data Port	(Communication module)	: 6E

Module designation	Module type	Wiring label
Master module Relay module EXV Driver module	PSIO DSIO (LV) DSIO (EXV)	A1 A3 A4
Display module	HSIO	A2
Option 138 module	4INx4OUT module	A6
Communication module	Data Port	NA

If all modules indicate a communication failure, check the COMM plug on the PSIO module for proper seating. If a good connection is assured and the condition persists, replace the PSIO module.

If only a DSIO module indicates a communication failure, check the COMM plug on that module for proper seating and the proper address. If a good connection is assured and the condition persists, replace the DSIO module.

All system operating intelligence rests in the PSIO module (processor module), the module that controls the unit. This module monitors conditions through input and output ports and through the DSIO modules (low voltage relay module and EXV driver module).

The machine operator communicates with the microprocessor through the HSIO module (keyboard/display module). Communication between the PSIO and the other modules is accomplished by a 3-wire sensor bus.

These 3 wires run in parallel from module to module. Each module in a panel is numbered (1,2,3...). Each terminal strip on a module is labeled (J2,J3, J4...). The terminal strip number on the machine schematic combines the module and strip numbers. For example, 2J3 is terminal strip J3 on module 2. The module numbers can be found on the component arrangement label.

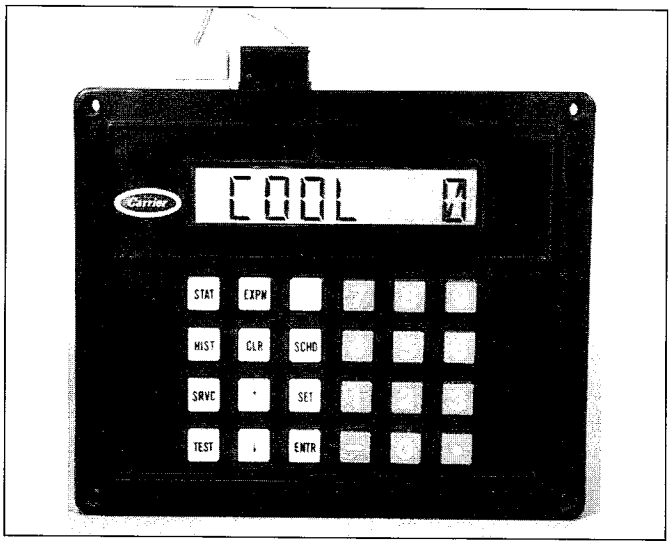


Fig. 21 HSIO module A2

On the sensor bus terminal strips, terminal 1 of the PSIO module is connected to terminal 1 of each of the other modules ; terminal 2 and 3 are connected in the same manner. (see fig. 34) If a terminal 2 wire is connected to terminal 1, the system will not work.

In the units, the processor module, low-voltage relay module, and keyboard/display module are all powered from a common 21 VAC power source which connects to terminal 1 and 2 on the power input strip of each module.

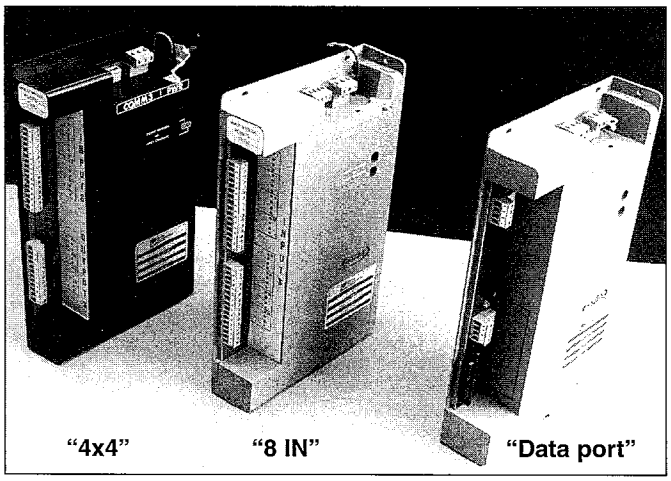


Fig. 22 4x4, 8 IN & Data port modules

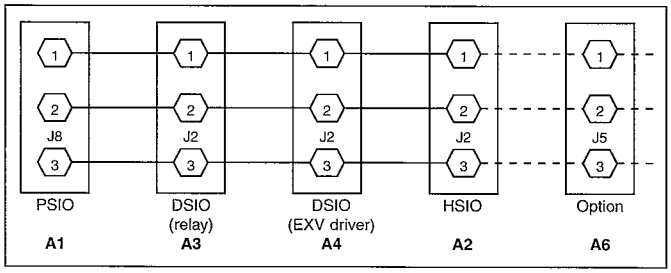


Fig. 23 Sensor bus wiring

A separate source of 12.5 VAC power is used to power the EXV driver module through terminals 1 and 2 on the power input strip.

c. Processor module (PSIO) (see fig. 24)

Inputs

Each input channel has 3 terminals; only 2 of the 3 terminals are used. The application of the machine determines which terminals are used. Always refer to the individual unit wiring for terminal numbers.

Outputs

Output is 24 vdc. Again, there are 3 terminals, only 2 of which are used; which 2 depends on the application. Refer to unit wiring diagram.

Note :
Address switches must be set at 01.

d. Low-voltage relay module (DSIO) (see fig. 25)

Inputs

Inputs on strip J3 are discrete inputs (ON-OFF). When 24 vac are applied across the 2 terminals in a channel it is read as an ON signal. Zero volts is read as an OFF signal.

Outputs

Terminal strips J4 and J5 are internal relays whose coils are powered-up and powered-off by a signal from the microprocessor. The relays switch the circuit to which they are connected. No power is supplied to these connections by the DSIO module.

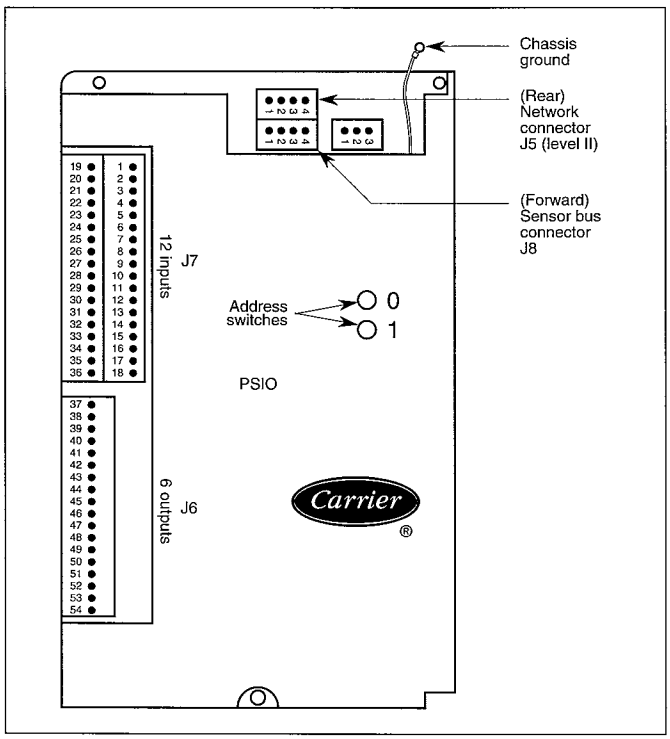


Fig. 24 Processor module (PSIO) A1

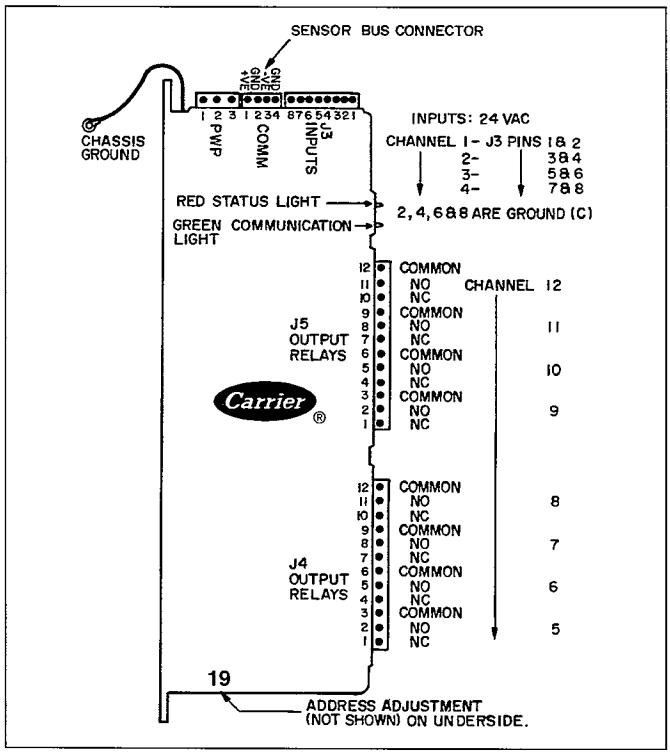


Fig. 25 Low-voltage relay module (DSIO) A3

e. Keyboard/display module (HSIO) (see fig. 21)

The only function of the HSIO is to allow the operator to communicate with the processor. It is used to enter configurations and set points and to read data, perform tests and set schedules.

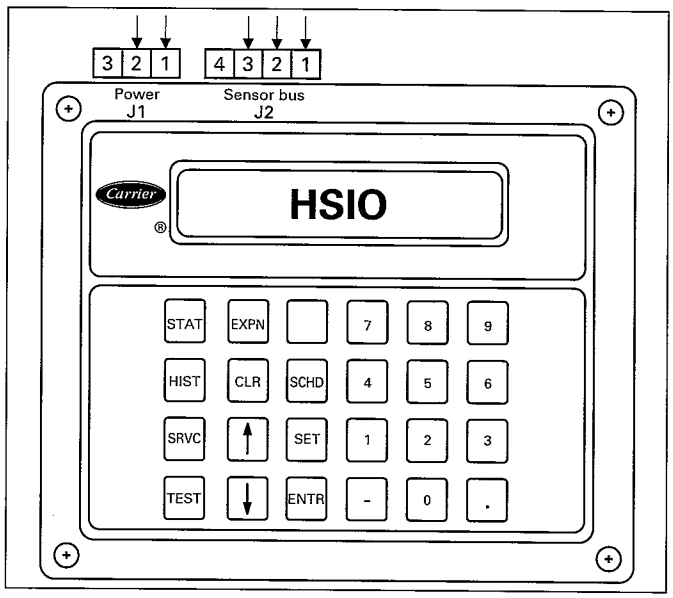


Fig. 26 Keyboard/display module (HSIO) A2

EXV driver module (see fig. 27)

Inputs

Input on strip J3 are discrete inputs (ON-OFF). When 24 vac are applied across the 2 terminals in a channel it is read as an ON signal. Zero volts is read as an OFF signal.

Outputs

Two stepper motor driver outputs are used to drive the electronic expansion valves. Terminals 1 and 7 supply voltage to the valves. Terminals 2 through 5 and 8 through 11 connect the individual coils (4 per valve) to neutral in a repeating sequence to drive the valves in incremental steps.

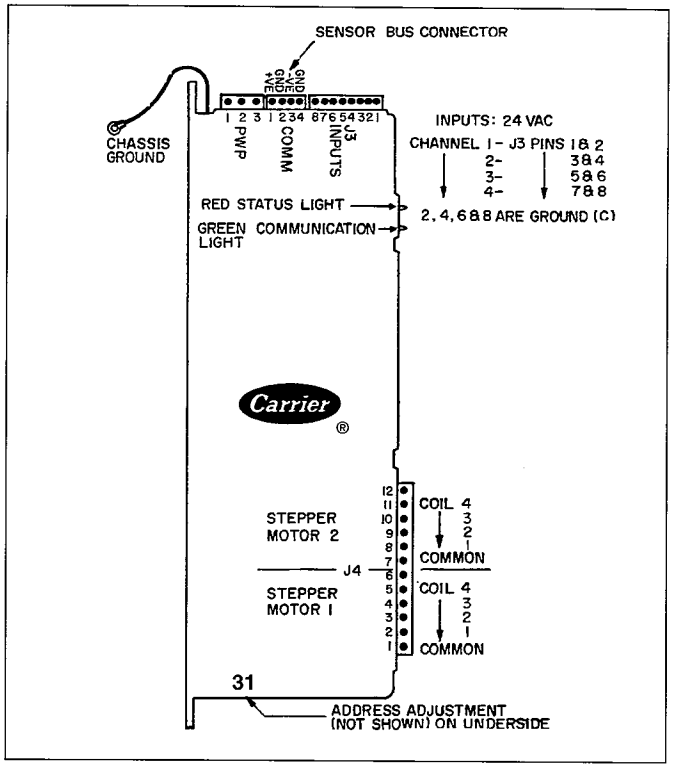


Fig. 27 EXV driver module (DSIO) A4

f. Options module (4 IN x 4 OUT)

Options modules allows the following features to be utilized :

1. Temperature reset by outdoor air or space temperature. A remote thermistor (Part No 30GB660002) is also required.

Note :

This accessory is not required for return water temperature reset

2. Temperature reset by remote 4-20 mA signal.
3. Demand limit reset by remote 2-stage switch.
4. Demand limit reset by remote 4-20 mA signal.
5. Dual set point by remote switch

Remember to configure the chiller for each feature selected (see "Adjustable field configurations". For temperature reset, demand limit and dual set point, desired set points must be entered through keyboard and display module (see "Set point function").

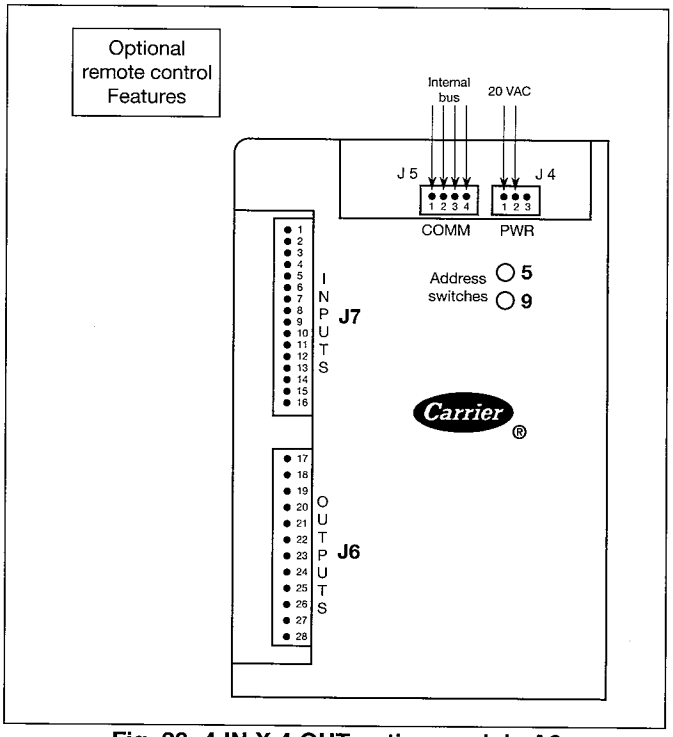


Fig. 28 4 IN X 4 OUT option module A6

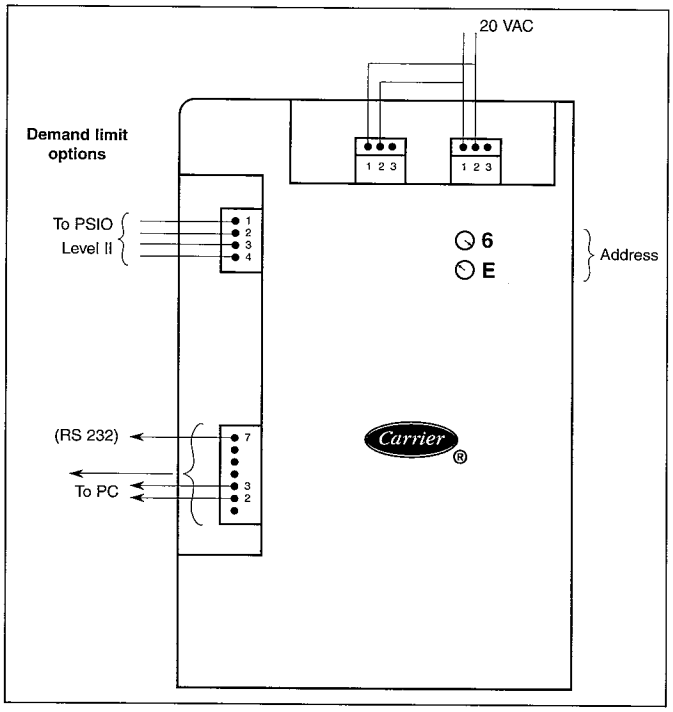


Fig. 29 Data Port module

8. Field wiring on 4IN/4OUT accessory option module (A6) for the remote control features

a. Remote demand limit control feature, A6 module

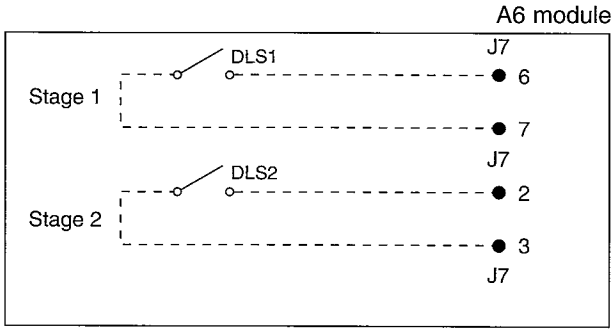


Fig. 30 Demand limit 2-stage switch control

Note : Contacts must be rated for dry circuit application, capable of reliably switching a 5 VDC, 1 mA to 20 mA load

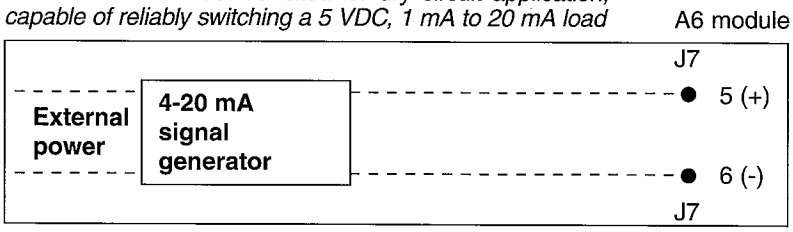


Fig. 31 Demand limit 4-20 mA signal control externally powered

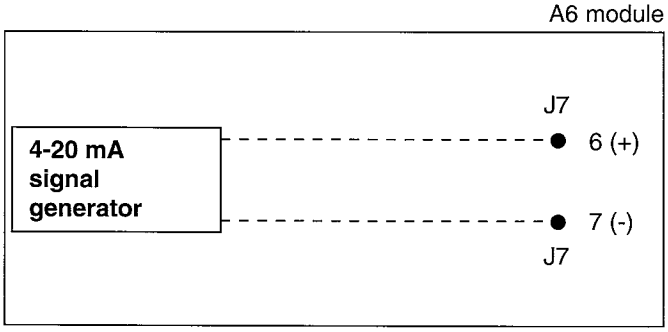


Fig. 32 Demand limit 4-20 mA signal control internally powered

b. Remote chilled water temperature reset feature (field wiring), A6 module

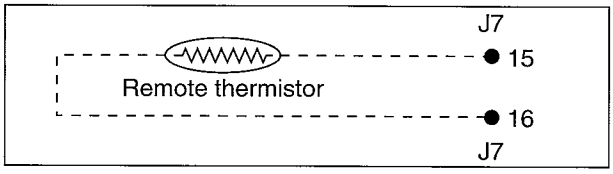


Fig. 33 External temperature reset control (for space or outside air temperature)

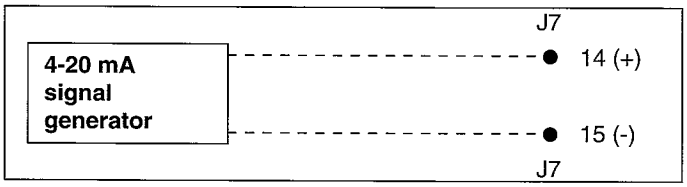


Fig. 34 Temperature reset 4-20 mA signal control internally powered

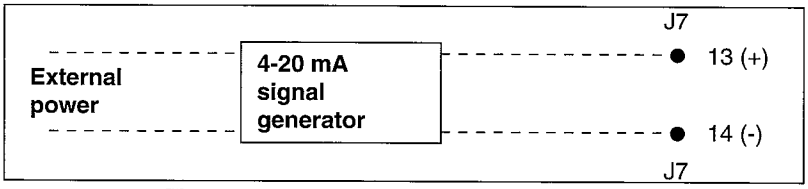


Fig. 35 Temperature reset 4-20 mA signal control externally powered

b. Remote dual cooling set point control feature

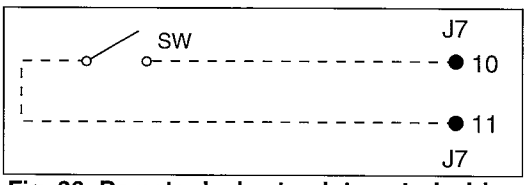
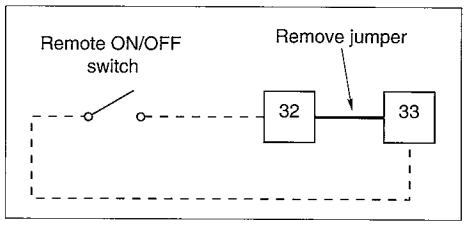


Fig. 36 Remote dual set point control wiring

Note : Contacts must be rated for dry circuit application, capable of reliably switching a 5 VDC, 1 mA to 20 mA load

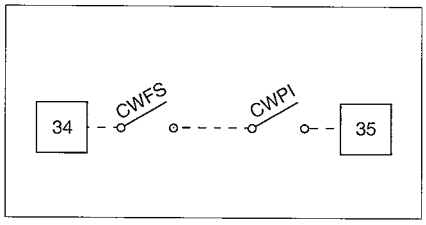
Field wiring for
- Remote ON/OFF
- Chilled water pump interlocks
- Chilled water pump relay (KP6)
- Remote alarm relay (KP5)

Remote ON/OFF



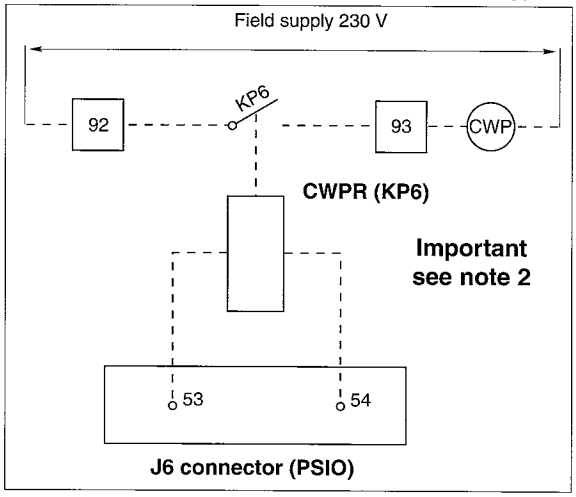
Important see note 1

Interlocks

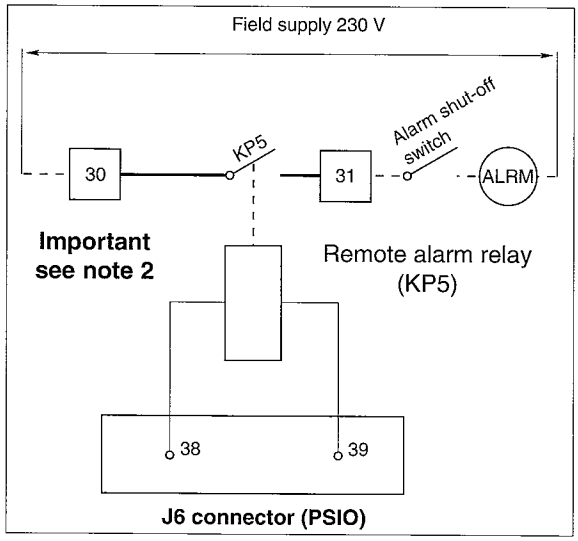


Important see note 1

Chilled water pump relay KP6 (accessory)



General remote alarm relay KP5



CWPR : Chilled water pump relay (kP6)

CWFS : Chilled water flow switch (not required, low flow protection is provided by Flotronic II control)

CWPI : Chilled water pump interlock

_ _ _ _ _ _ _ Field control wiring

_____ Factory wiring

Note 1 : Important

Terminals 32 33 34 35 are for field external interlock connection for remote ON/OFF or chilled water pump interlock. The contacts must be rated for dry circuit application, capable of reliability switching a 5 VDC, 1 mA to 20 mA load.

Note 2 : Important

Terminals 92 93 30 31 are for chilled water pump and remote alarm control functions.

The maximum load allowed for the alarm circuit and chilled water pump circuit is 125 VA sealed, 1250 VA inrush at 230 Volts.

9. Replacing defective processor module

The replacement part number is printed on a small label on front of the PSIO module (see spare parts catalogue). The model and serial numbers are printed on the unit nameplate located on an exterior corner post. The proper software and unit configuration data is factory installed by Carrier in the replacement module. Therefore, when ordering a replacement processor module (PSIO), specify complete replacement part number, *full* unit model number, and serial number. If these numbers are not provided, the replacement module order is configured instead as a generic Flotronic II replacement module. This requires reconfiguration of the order by Service.

CAUTION

Electrical shock can cause personnal injury. Disconnect all electrical power before servicing.

a. Installation

1. Verify the existing PSIO module is defective, by using the procedure described in troubleshooting section, Control Modules.
2. Refer to Start-Up checklist for Flotronic II Chiller Systems (completed at time of original start-up) found in job folder. This information is needed later in this procedure.

   If checklist does not exist, fill out the [4] [SRVC] and [5] [SRVC] configuration code sections on a new check-list.
   Tailor the various options and configurations as needed for this particular installation.
3. Check that all power to unit is off. Carefully disconnect all wires from defective module by unplugging the six connectors. It is not necessary to remove any of the individual wires from the connectors. Remove the green ground wire.
4. Remove defective PSIO by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws for later use.
5. Use a small screwdriver to set address switches S1 and S2 on the new PSIO module to exactly match the settings on the defective module.
6. Package the defective module in the carton of the new module for return to CARRIER, warranty dept.
7. Mount the new module in the unit control box using a Phillips screwdriver and the screws saved in step 4 above.
8. Reinstall all 6 wire connectors and the green ground wire.
9. Carefully check all wiring connections before restoring power.
10. Verify the LOCAL/STOP/NETWORK switch is in STOP position.
11. Restore control power. Verify the red and green lights on top of PSIO and front of each DSIO module respond as described in Troubleshooting section, Control Modules. The keyboard and display module (HSIO or LID) should also begin its rotating display.
12. Using the keyboard and display module in [2] [SRVC] verify the software version number matches the ER number shown on the PSIO label.
13. In [3] [SRVC] verify that the 6 Factory configuration codes (CODE 1 through CODE 6) exactly match the codes listed for this unit model on the component arrangement label on the control box door. If they are different or are all zeros, reenter the 6 codes.

    If any changes are required, the PSIO display becomes blank and re-configures itself after pressing the [SRVC] key while displaying CODE 6. The display returns in approximately 15 seconds.
14. In [4] [SRVC] ,verify each item is configured as needed for this particular installation.

It is strongly suggested that the Start-Up Checklist for Flotronic II Chiller Systems (completed at time of original start-up) be used at this time to verify and/or reprogram the various options and configurations required for this job.

15. After completing the configuration steps outlined above, restore main power and perform a unit test as described in [1] [TEST] and [2] [TEST] section of this book.
16. Complete this procedure and restore chiller to normal operation by returning the Local/Stop/Network switch to desired position.

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