

Application Data

Product Integrated Controls (PIC) on 50BJP/BKP Indoor Packaged Cooling Units

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DESCRIPTION

Introduction — Carrier's indoor packaged cooling units with Product Integrated Controls (PIC) provide comfort cooling for variable air volume (VAV) units. Refer to unit product data digest for applicable performance data.

Carrier PIC controls are microprocessor-based VAV controls suitable for a single unit on a stand-alone basis or as part of the Carrier Comfort Network (CCN) for remote monitoring and control.

All electronic components and all wires are internal to the unit. The self-diagnostic Quick Test program permits quick, worry-free start-up.

The control system consists of a local interface device (HSIO), processor module (PSIO) and a relay module (DSIO). The local interface device and processor module are equipped with a 5 year lithium battery to prevent loss of memory in the event of a power failure.

Physical Characteristics — The control box includes electronic modules, transformers, fuses, and terminal blocks. Control box component locations are shown in Fig. 1 - 3. See Fig. 4 and 5 for field control wiring.

Control environmental limitations are as follows:

Operating temperature	— -40 to 158 F
Operating humidity	— 10 to 95%
Storage temperature	— -40 to 185 F
Storage humidity	— 10 to 100%

CONTROL SYSTEM DESIGN

General — The control utilizes analog inputs for measuring temperature, discrete inputs for indicating status, analog outputs for proportional control, and discrete outputs for start/stop or enable/disable control. See Table 1.

Control Functions:

- Cooling capacity control of up to 6 stages, using 2 compressors and one or 2 unloaders on the lead compressor
- Seven-day electronic time clock that allows up to 8 occupied periods with full battery backup
- Provides fully integrated hydronic economizer control that operates based on the status of a changeover switch
- Unoccupied cooling option using a space thermistor for initiating cooling during unoccupied periods
- Provides remote or keyboard timed override
- Provides demand limiting
- Provides space temperature reset
- Provides a factory/field test that allows individual outputs to be exercised during the standby mode

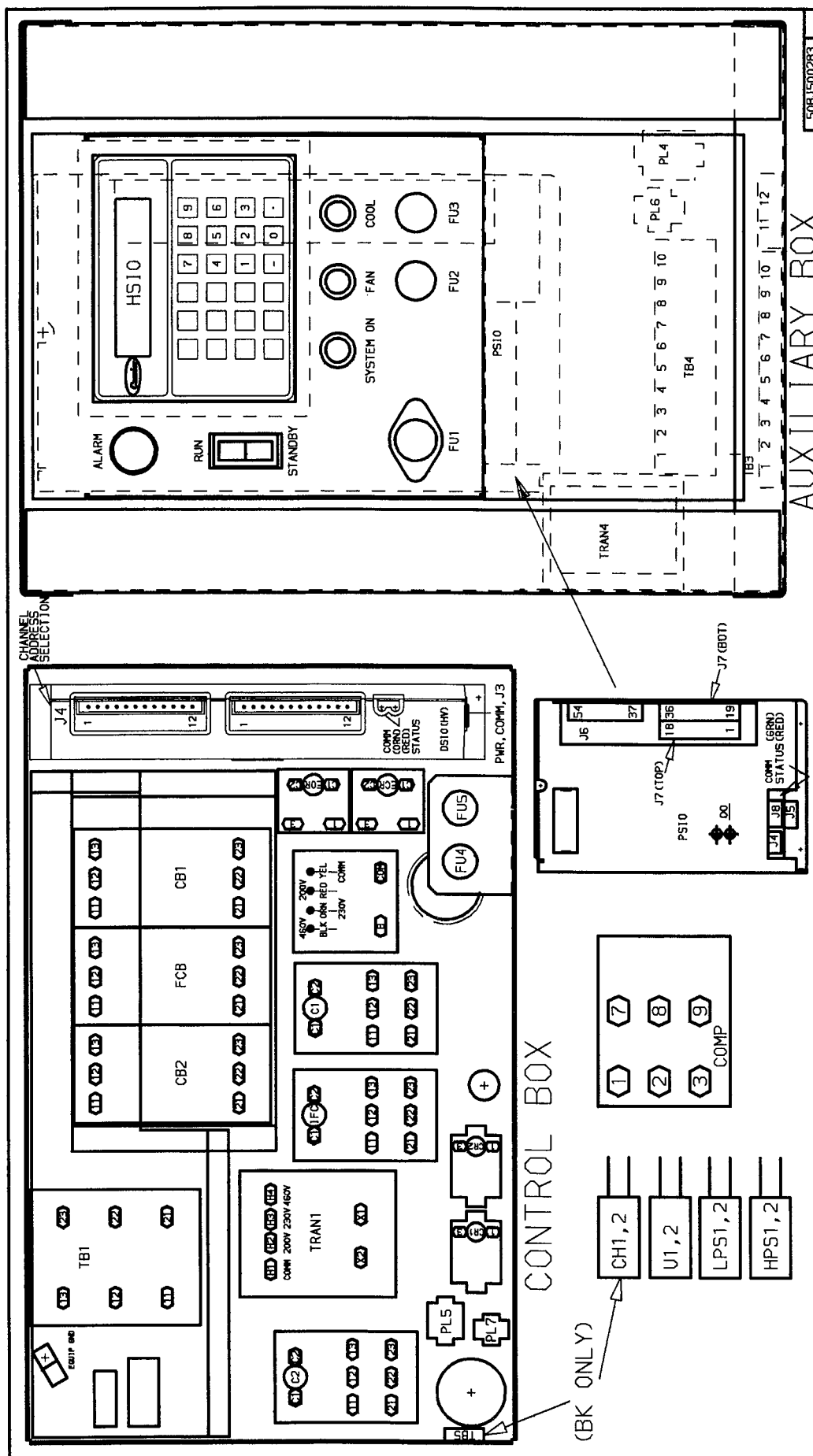


Fig. 1 — Control Box Component Arrangement; 50BJP,BKP024

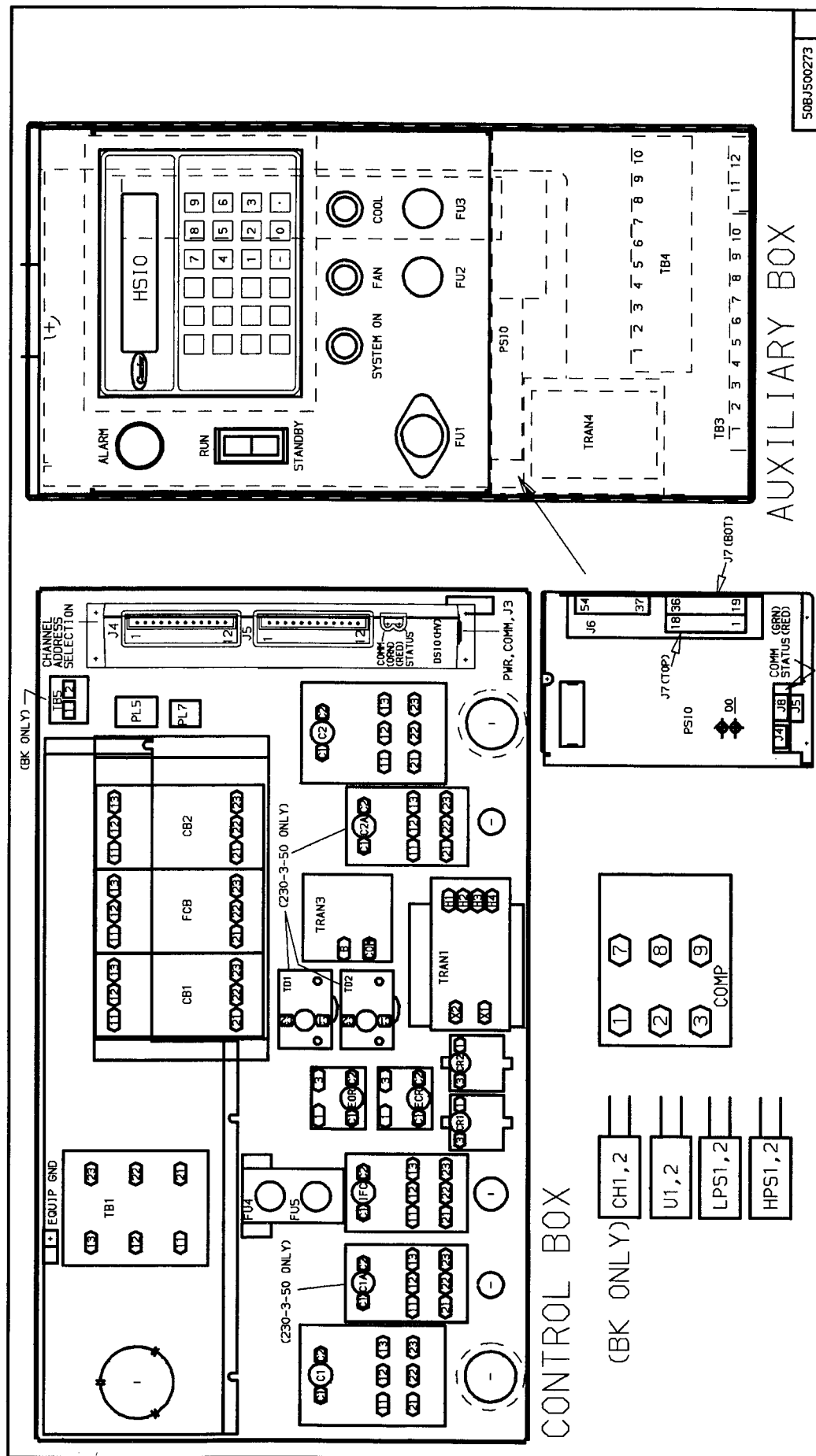


Fig. 2 – Control Box Component Arrangement; 50BJP,BKP028 and 034

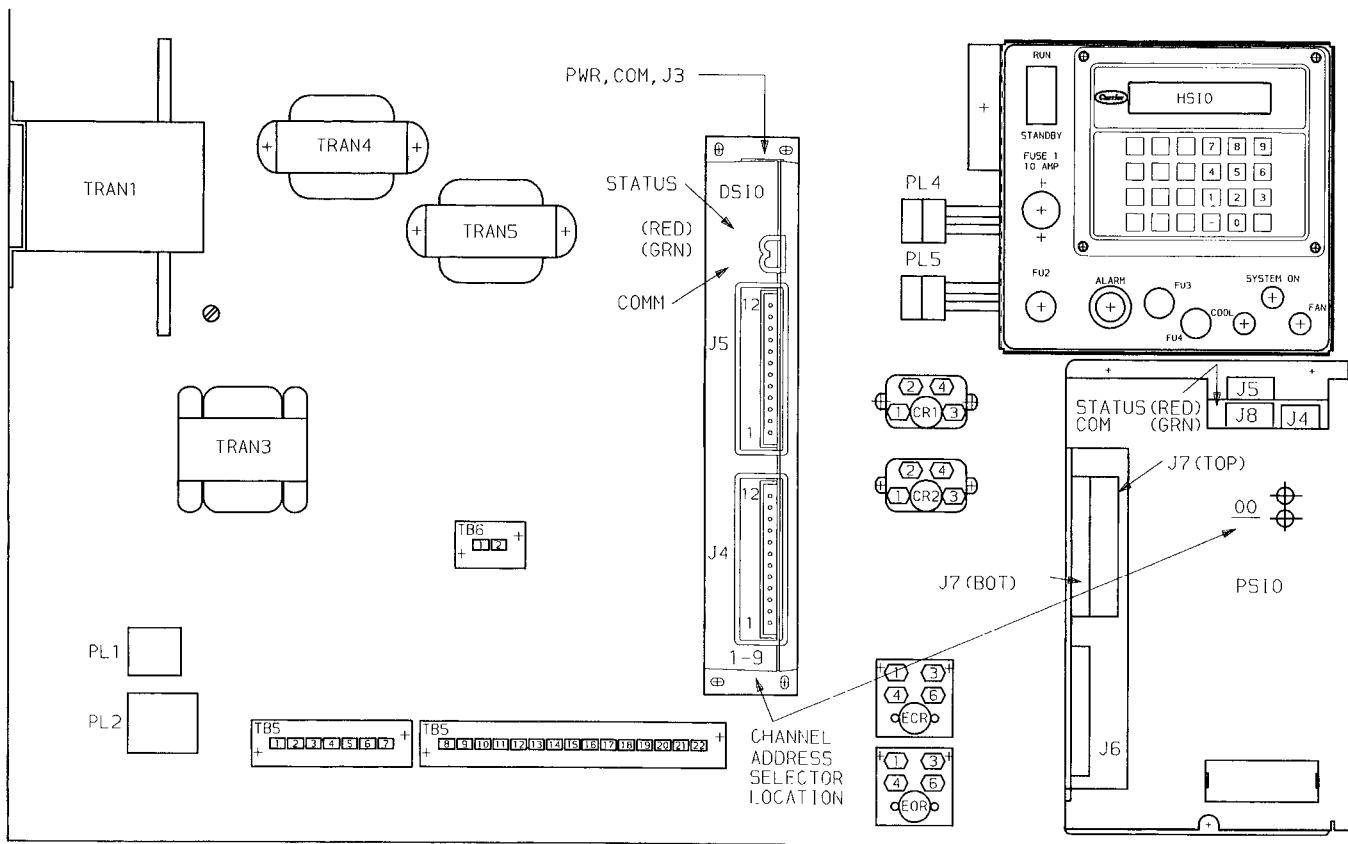


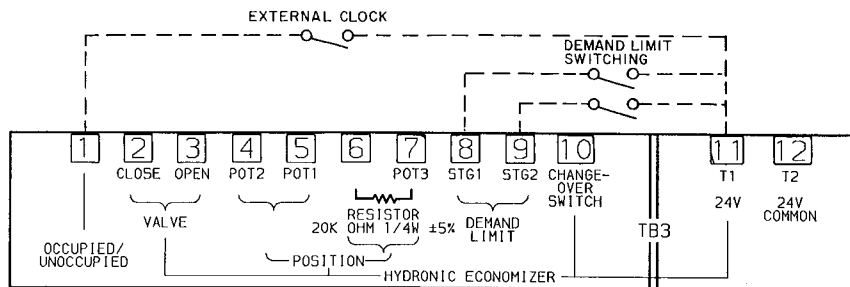
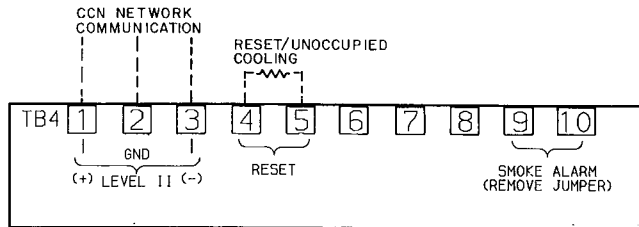
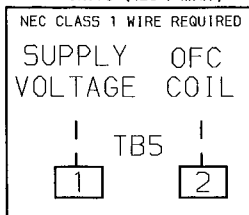
Fig. 3 – Control Box Component Arrangement; 50BJP,BKP044-064

LEGEND FOR FIG. 1 - 3

C	— Contactor	FU	— Fuse
CB	— Circuit Breaker	GND	— Ground
CH	— Crankcase Heater	HPS	— High-Pressure Switch
COMP	— Compressor	HSIO	— Local Interface Device
COMM	— Communication	IFC	— Indoor Fan Contactor
CR	— Compressor Relay	LPS	— Low-Pressure Switch
DSIO	— Relay Module	PL	— Plug
ECR	— Economizer Close Relay	PSIO	— Processor Module
EOR	— Economizer Open Relay	TB	— Terminal Block
EQUIP	— Equipment	TRAN	— Transformer
FCB	— Fan Circuit Breaker	U	— Unloader

50BK UNITS (120 v max)

50BK UNITS (120 V MAX)



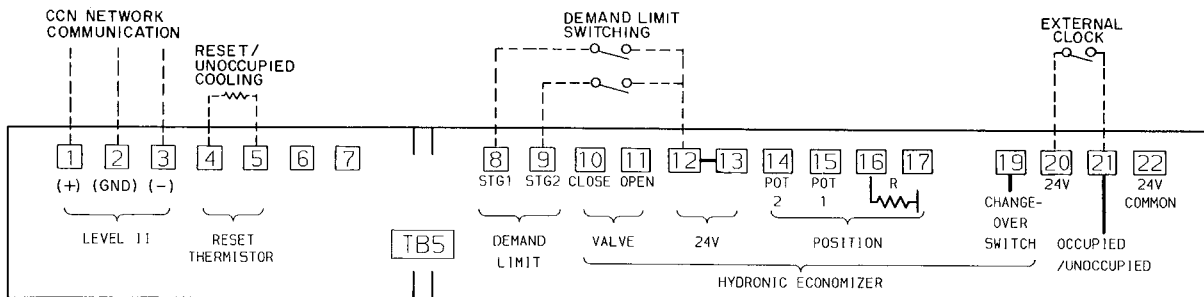
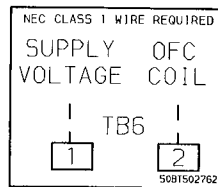
LEGEND

GND - Ground
OFC - Outdoor Fan Contactor
POT - Potentiometer
STG - Stage
TB - Terminal Block

Fig. 4 - Field Control Wiring, Models 50BJP,BKP024-034

50BK UNITS (120 v max)

50BK UNITS (120 V MAX)



LEGEND

GND - Ground
OFC - Outdoor Fan Contactor
POT - Potentiometer
STG - Stage
TB - Terminal Block

Fig. 5 - Field Control Wiring, Models 50BJP,BKP044-064

Table 1 — Input and Output Points

MODULE	INPUT	INPUT TYPE	CHANNEL NUMBER	OUTPUT	OUTPUT TYPE	CHANNEL NUMBER
Processor	LAT	AI	1	ALARM	DO.	13
	EAT.	AI	2	—	—	—
	DL1_SWT	DI	5	—	—	—
	DL2_SWT	DI	6	—	—	—
	OCC_OVRD	DI	8	—	—	—
	CST	AI	9	—	—	—
	VLV_POS	AI	10	—	—	—
	ECON	DI	11	—	—	—
	RUN_SWT	DI	12	—	—	—
Relay Module	RF1_SWT	DI	19	ECON_CLS	DO.	23
	RF2_SWT	DI	20	ECO_OPEN	DO	24
	CMP2_FLT	DI	21	ULD2	DO.	25
	CMP1_FLT	DI	22	ULD1	DO	26
	—	—	—	OFC	DO	27
	—	—	—	IFC	DO.	28
	—	—	—	CMP2	DO.	29
	—	—	—	CMP1	DO.	30
	—	—	—	—	—	—

LEGEND FOR TABLE 1

AI	— Analog input	ECO_CLS	— Economizer close
CST	— Cooling space temperature	ECO_OPEN	— Economizer open
CMP	— Compressor	IFC	— Indoor fan contactor
CMP1_FLT	— Compressor 1 fault	LAT	— Leaving air temperature
CMP2_FLT	— Compressor 2 fault	OCC_OVRD	— Occupancy override switch
DI	— Discrete input	OFC	— Outdoor fan contactor
DO.	— Discrete output	RF1_SWT	— Circuit 1 low-pressure switch
DL1_SWT	— Demand limit input 1	RF2_SWT	— Circuit 2 low-pressure switch
DL2_SWT	— Demand limit input 2	RUN_SWT	— Run/Standby switch
EAT.	— Entering air temperature	ULD	— Unloader
ECON	— Economizer	VLV_POS	— Valve position

Control Features

SPACE TEMPERATURE RESET — Space temperature reset prevents overcooling at light load conditions while keeping comfortable air circulation. The control adjusts the leaving air set point upward as the conditioned space temperature falls below a predetermined set point. The space temperature at which reset begins and the maximum allowable leaving air reset are both programmed by the user.

INTERNAL TIME CLOCK — An electronic time clock allows scheduling of unit operation for up to 8 occupied/unoccupied periods per schedule with 7 different schedule days. The time clock allows a timed override of up to 4 hours of occupancy.

UNOCCUPIED COOLING — Unoccupied cooling provides a means for cooling a space before the space temperature exceeds a predetermined temperature during the unoccupied mode.

DEMAND LIMIT — Two-step demand limit is available to limit the total power draw of the unit by controlling the number of steps of capacity operating during the demand limiting period.

QUICK TEST — The Quick Test feature allows the operator to determine the status (ON/OFF) of various control components (fans, compressors, unloaders, economizer actuator motor). When the unit is in the standby mode, these steps will energize the components and provide an indication as to whether they are operational.

DIAGNOSTICS — The PIC control system features extensive self-diagnostics. The display will show a 2-digit diagnostic code and will scroll an explanation of the code for failures that cause the unit to shut down, terminate a reset option, or use a default value as set point.

CONTROL HARDWARE

Processor Module — This module contains the operating software and controls the operation of the unit. It continuously monitors information received from the inputs listed in Table 1 and controls alarm output.

Local Interface Device (Fig. 6) — This device consists of a keyboard with 6 function keys, 5 operative keys, 10 numeric keys (0 to 9) and an alphanumeric 8 character Liquid Crystal Display (LCD). It is used to view data, input set points, time schedules, force points, and modify configurations. Key usage is explained in Table 2. Each function has one or more subfunctions as shown in Table 3.

The local interface device may be remote mounted if required.

Relay Module — This module closes contacts to energize compressors and control economizer operation. It also monitors compressor safety circuit input and low-pressure inputs.



Fig. 6 – Local Interface Device

Sensors — The entering air thermistor (EAT.) and leaving air thermistor (LAT) are factory supplied for field installation. They have a nominal resistance of 5,000 ohms at 25 C.

An accessory space temperature sensor is available for field installation. It consists of a thermistor with a nominal resistance of 10,000 ohms at 25 C. The space temperature sensor may be mounted directly to the wall or to a standard American electrical box.

Table 2 – Local Interface Device Key Usage

FUNCTION KEYS	USE
	Status — Displaying diagnostic codes and current operating information about the unit
	Quick Test — Checking inputs and outputs for proper operation
	History — Checking most recent alarms
	Service — Entering specific unit configuration information
	Set Point — Entering operating set points and day/time information
	Schedule — Entering Occupied/Unoccupied schedules for unit operation
OPERATIVE KEYS	USE
	Expand Display — Displaying a non-abbreviated expansion of the display
	Clear — Clearing the screen of all displays
	Up Arrow — Returning to previous display position
	Down Arrow — Advancing to next display position
	Entering data

Table 3 – Functions and Subfunctions

SUBFUNCTION NUMBER	FUNCTIONS					
	Status	History	Test	Service	Set Point	Schedule
1	Alarm Displays	Alarm History	Quick Test of Inputs	Log On and Log Off	System	Occupied Mode Override
2	Operating Mode Displays	—	Quick Test of Outputs	Software Version	Reset	Period 1
3	Capacity Stages	—	Quick Test of Compressors	Factory Configurations	Demand Limit	Period 2
4	Current Operating Set Points	—	Terminate Quick Test	Field Configurations	Time	Period 3
5	System Temperatures	—	—	Service Configurations	Unoccupied Cooling	Period 4
6	System Pressures	—	—	Service Variables	—	Period 5
7	System Position	—	—	Network Address	—	Period 6
8	Override	—	—	—	—	Period 7
9	—	—	—	—	—	Period 8

CONTROL FUNCTIONS

Status — The Status function shows the current status of all measured system temperatures, output values, pressure switch positions, alarm (diagnostic) codes, operating modes, and set points. Table 4 lists available operating modes and alarms.

History — The History function displays the 5 latest alarms generated by the unit in order of their occurrence.

Schedule — The Schedule function provides a means to automatically switch the unit from an unoccupied mode to an occupied mode.

Each schedule consists of from one to 8 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 the week or holiday period. The day begins at 00.00 and ends at 24.00

The time schedule can be overridden to keep the unit or optional discrete output in the occupied mode for between one and 4 hours, programmable in one-hour increments.

The unit may be configured for an applicable holiday schedule. Each period is defined by a starting date and a duration from one to 99 days. The broadcast function may be enabled to provide a single point for holiday configuration if several units are connected through the CCN communication bus

Service — The Service function allows the operator to log on to the controller (with proper password entry) and verify or change factory or field configurations. With the service function, the operator can display the software version that is used in the processor module.

By accessing subfunctions, the operator can enable or disable demand limit, space temperature reset, ventilation (economizer), morning warm-up, unoccupied cooling, unoccupied heating, and electronic time clock.

Refer to Table 5 for Service configuration ranges and defaults.

Set Point — The Set Point function allows the operator to access, display and change system set points. Refer to Table 6 for set point ranges and defaults.

Test — The Quick Test function allows the operator to test fans, unloaders, compressors and economizer actuator motor. When the unit is operating Quick Test, all controlling algorithms are stopped and all outputs go to a zero state. After Quick Test is properly exited all controlling algorithms are reactivated and prior forces are reinstated. See Control Sequence, Quick Test section for more details.

Table 4 — Display Codes

OPERATING MODES	
Display	Description
20	Initialization
21	Temperature reset in effect
22	Demand limit in effect
24	Unoccupied Cooling
25	Standby
27	Unoccupied mode
28	Run mode

ALARMS				
Display	Description	Action Taken By Control	Reset Method	Probable Cause
51	Compressor 2 failure	Lag Circuit shut OFF	Manual	High pressure switch or high discharge gas temperature switch trip ON
55	Compressor 1 failure	Lead Circuit shut OFF	Manual	
59	Loss of charge — lead circuit	Circuit 1 shut OFF	Manual	Low refrigerant charge or low pressure switch failure
60	Loss of charge — lag circuit	Circuit 2 shut OFF	Manual	
71	Leaving air thermistor	Unit shut OFF	Auto.	Thermistor failure, or wiring error, or thermistor not connected to processor board
72	Entering air thermistor	Use default	Auto.	
81	Reset thermistor failure	Stop reset	Auto.	
83	Economizer potentiometer failure	Economizer dampers close	Manual	Potentiometer failure, wiring error, or potentiometer not connected to input terminals

NOTES:

1. All auto. reset failures that cause unit to stop will restart the unit when the error has been corrected
2. All manual reset errors must be reset by moving the control switch to STANDBY and then to RUN

Table 5 — Service Configuration Ranges and Defaults

SUBFUNCTION NUMBER	CONFIGURATION VALUE	RANGE	FACTORY DEFAULT
3	Number of compressors	2	2
	Number of unloaders:		
	Sizes 024-034, 054 and 064	1 to 2	2
4	Size 044	1	1
	Space temperature reset	Enable/Disable	Disable
	Demand limit	Enable/Disable	Disable
	Economizer	Enable/Disable	Disable
7	Unoccupied cooling	Enable/Disable	Disable
	Electronic time clock	Enable/Disable	Enable
7	Element address	0 to 239	0
	Bus number	0 to 239	0

Table 6 — Set Point Ranges and Defaults

SET POINT	RANGE	FACTORY DEFAULT
Leaving Air Temperature Set Point (F)	45 to 70	55
Demand Limit Set Point No. 1 (%)	50 to 100	100
Demand Limit Set Point No. 2 (%)	0 to 49	49
Reset Temperature Set Point (F)	40 to 80	70
Reset Limit Set Point (F)	0 to 20	10
Unoccupied Cooling Set Point (F)	70 to 100	85

CONTROL OPERATING SEQUENCE

Cooling — When the unit enters the occupied mode, the indoor fan will activate, and the control will compare the leaving air temperature to the leaving air set point. If leaving air is above set point, the control will turn on capacity steps one at a time until unit capacity (depending on unit size) meets the load. The rate at which capacity stages are turned on and off depends on the differential between leaving air actual temperature and set point, the rate of change of leaving air and return air temperatures, recent load history.

On units with hydronic economizer, the unit will go through a 3-minute initialization period when it enters the occupied mode. During initialization, the economizer 3-way valve will open and close the economizer circuit before the unit goes into the cooling mode. This allows the processor to program the position of the valve at both extremes, so that it can properly modulate the economizer function during cooling. The indoor fan will not be activated until completion of the initialization process.

An aquastat is utilized with the hydronic economizer to determine if the condenser water is cool enough to provide free cooling. The aquastat set point is adjustable and must be set at installation. When the unit goes into the cooling mode, if the condenser water temperature is below the aquastat set point, controls will attempt to satisfy the cooling load with the economizer before bringing on any stages of mechanical cooling. Once mechanical cooling is energized, the economizer is held at 100% open.

When the first stage of compression is turned on, the relay module will close a set of contacts between terminals 1 and 2 on TB5 (024 - 034 units) or TB6 (044 - 064 units) to activate the remote condenser fans for 50BK applications. The low-pressure switches are bypassed during the first 2.5 minutes of operation of each compressor, to assist low-ambient starting situations.

Units Equipped With Temperature Reset —

Temperature reset is a means for preventing overcooling at light loads, while keeping air circulation at reasonable levels. The effect is to reset the leaving air set point upward, as the conditioned space temperature drops below a predetermined temperature level. The leaving air set point is raised 0.33°F for every degree the space temperature drops below the reset set point. The reset set point is equal to the space temperature at which temperature reset is to begin. The maximum reset set point is adjusted by setting the reset limit to the maximum amount of reset desired.

Units Equipped With External Time Clock —

When a 24-volt signal is sent to terminal 1 of TB3 (024 - 034 units) or terminal 21 of TB5 (044 - 064 units), the unit enters the occupied mode. When signal is removed, the unit enters the unoccupied mode. This signal will override any unoccupied schedule programmed into the internal clock. However, it cannot override an occupied schedule. If the external clock is intended to be the permanent control, then the internal clock must be disabled

(4 ☐ SWC).

Unoccupied Cooling — The purpose of unoccupied cooling is to provide a means for cooling a space during the unoccupied mode before the space temperature exceeds some predetermined temperature. The unit will enter the occupied mode at 2 degrees above the space temperature set point and will reenter the unoccupied mode at 1 degree below the space temperature set point.

Demand Limit — Two-step Demand Limit is available for the purpose of limiting the number of stages of cooling allowed at a particular time. This is typically used to reduce electrical utility demand charges at peak power consumption periods of the day.

When connected to the Carrier Comfort Network (CCN), demand limiting may be accomplished through the loadshed option of the CCN instead of the demand limiter. When the Loadshed option issues a redline alert to the controller, first-stage Demand Limit will be used. When the Loadshed option issues a shed command to the controller, second-stage Demand Limit will be used.

CARRIER COMFORT NETWORK

General — The Carrier Comfort Network (CCN) is a system of communicating microprocessor-based controls. Communication between system devices enables the system to coordinate its activities for greater efficiency and to simplify the identification of problems that may arise.

NOTE: When more than one unit is connected to the CCN, the element address must be changed on all but one unit. The element address system default is 1, and element address numbers cannot be repeated. Element address can be changed through the local interface device or network service tool.

When the PIC unit is interfaced with the CCN several additional options and system enhancements are available. These include: Loadshed, data collection, broadcast, alarms, and building supervisor.

Loadshed — When the Demand Limit option is enabled through the local interface device or building supervisor, the control receives and accepts a redline alert from the network Loadshed option.

See Control Operating Sequence, Demand Limit section for a more detailed explanation.

Data Collection — The data collection software enables the user to acquire historical data on the unit and store that data for access by the building supervisor.

The unit collects run time and consumable data.

Run time data is a record of how many minutes each hour a discrete point (i.e. supply fan) has been ON. There are 10 variables which are applicable for runtime.

Consumable data is a record, taken at fifteen minute intervals, of resource usage and rate of usage as measured by monitoring an input point.

Broadcast Option — Each unit has the ability to become a broadcast master. The master will maintain the correct time in all other PIC units equipped with clocks by broadcasting the time on the CCN twice daily.

Building Supervisor — When connected to the CCN, the building supervisor allows the operator to access all data within the PIC, including status, configuration, service, set points, time schedules, and maintenance. The only function that cannot be accessed through the building supervisor is Quick Test, which must be accessed using a local interface device.

Alarms (Diagnostic Features) — Alarms are monitored on each unit through the local interface device or building supervisor.

The following points are monitored for alarms: Leaving air temperature, entering air temperature, cooling space temperature, low pressure switch, compressor faults, and valve position.

Analog input channels are compared against their user configured alarm limits. If any channel remains outside its limits for a fixed preset period of time, an alarm is generated.

At the local interface device, the operator can use the ☐ key to display current alarms. At the building supervisor, the alarm message reads as follows: BJ (ADDRESS) alarm at (TIME) (DATE), (NAME) (VALUE), outside limit (LIMIT)

Where:

ADDRESS = System address of unit
TIME = Time alarm occurred
DATE = Date alarm occurred
NAME = Channel name in alarm
VALUE = Channel value at time when alarm condition occurred
LIMIT = Configured alarm limit

When the channel returns within its limits, the following message is generated. BJ (ADDRESS) return to normal at (TIME) (DATE), (NAME)

Carrier Comfort Network Interface — Communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to negative pins; the signal ground pins must be wired to signal ground pins.

NOTE: Conductors and drain wire must be 20 AWG minimum stranded, tinned copper. Individual conductors must be insulated with suitable material for the specified application. Specific codes may require the use of plenum type cables or larger gage wire. Check specific codes before installing cable. See table below for cables that meet the minimum requirements.

MANUFACTURER	CABLE NUMBER
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

GUIDE SPECIFICATIONS

Indoor Packaged Cooling Unit with Product Integrated Controls

HVAC Guide Specifications

Size Range. **20 to 60 Nominal Tons**

Carrier Model Number: **50BJP,BKP024-064**

NOTE: The following guide specification is provided to assist in specifying indoor packaged cooling units with product integrated controls. There are several options that may be applied, depending on application requirements. These specifications have been written such that the indoor packaged cooling unit equipment supplier is also the temperature control vendor.

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Indoor vertical water-cooled or condenserless packaged unit with Product Integrated Controls (PIC) utilizing semi-hermetic reciprocating type compressors. Units shall discharge supply air through the ductwork as shown on contract drawings
- B. The PIC shall be factory installed and wired as specified as an integral part of the unit.

1.02 MICROPROCESSOR CONTROLLER

The product integrated control shall include a factory-installed solid-state microprocessor controller using direct digital control with software designed to perform control functions as specified. The microprocessor controller shall be factory installed and wired within the packaged cooling unit. All application software actually performing the required control functions shall be factory supplied, pre-tested and preconfigured.

1.03 BUILDING CONTROL SYSTEM NETWORK INTERFACE

The PIC shall have the ability to interface and communicate directly to the building control system without the use of additional field-installed hardware or software. The building control system, packaged cooling unit equipment and factory-installed PIC must be supplied by same manufacturer.

Part 2 — Products

2.01 STANDARD CONTROL HARDWARE

The PIC shall include the following control hardware standard with each packaged cooling unit.

- A. Local Interface Device
 - 1. The PIC shall be provided with an optional factory-mounted local interface device that shall allow the user to: configure the unit time schedule(s) and set points, operate a field test of all inputs and controlled devices, and dynamically view the status of the system. The local interface device shall consist of an 8 character liquid crystal display and a keyboard containing 24 keys. It shall be shipped installed in each unit as specified and may be removed and remote mounted if required.
 - 2. The local interface device may be mounted up to 1000 ft from the unit and shall be wired and installed per temperature control vendor instructions. The power and communication signals shall be sourced from the PIC unit.
- B. Entering Air Thermistor.

The entering air thermistor shall be factory supplied for field mounting and wiring. It shall have a nominal resistance of 5,000 ohms at 25 C.

C. Leaving Air Thermistor:

Leaving air thermistor sensor shall be factory supplied for field mounting and wiring. It shall have a nominal resistance of 5,000 ohms at 25 C.

2.02 OPTIONAL CONTROL HARDWARE

The PIC shall include the following optional hardware as required with each packaged cooling unit.

Hydronic Economizer Control:

Unit shall be supplied with a factory-mounted hydronic economizer with aquastat.

2.03 LOCAL INTERFACE DEVICE OPERATION

The local interface device shall have a minimum of 6 special function keys that shall provide the following 6 functions.

A. Status

The Status function allows display of information related to unit operation. Typical information a user may display locally: Current alarms, current operating modes, current operating set points, system inputs, system outputs.

B. History

Alarm history of the 5 most recent alarm messages is stored and available for display locally.

C. Schedule

The Schedule function shall allow a user to define the occupied and unoccupied schedule using the electronic time clock within the PIC. Scheduling shall provide the user with the following functions:

- 1. Define schedule period times (unoccupied/occupied).
- 2. Define days of week and period times apply (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, and Holidays).

D. Service

The Service function shall provide the user with the following features.

- 1. Verification of software version (ID number).
- 2. Editing or setting building management network address.
- 3. Entering unit configuration for operation, including space temperature reset, demand limiting, ventilation/economizer position, unoccupied cooling, and electronic time clock.

E. Set Point

- 1. Configuration and display of system set points, including: leaving air temperature, reset temperature, demand limit, and unoccupied cooling.
- 2. Configuration and display of electronic clock current time (day of week, time, hour and minute, A.M./P M).

F. Test

The test function permits the user to run a PIC resident diagnostic test to exercise and test any of the input/outputs connected to the PIC.

Part 3 — Indoor Packaged Cooling Unit Product Integrated Control (PIC) Software

3.01 GENERAL REQUIREMENTS

- A. The PIC shall provide stand-alone operation. It shall accept analog and digital signals from sensors, switches, relays, etc. and shall multiplex the various signals into digital format. All closed loop direct digital control shall utilize PIC based software algorithms that shall be resident in the PIC. All standard control

GUIDE SPECIFICATIONS (cont)

PIC based algorithms shall operate independently of an on-line host computer.

- B. All set points shall be factory supplied and reside within the PIC with factory-provided defaults. The set points shall be configurable by the user through the local interface device or building supervisor

3.02 DIRECT DIGITAL CONTROL ALGORITHMS

The PIC digital controller shall contain resident algorithms for processing analog and digital outputs. The algorithms shall be as follows:

- A. Control of economizer valve position.
- B. Unoccupied cooling control to maintain space temperature set point.
- C. Keyboard override of unit using a local interface device. The duration of override shall be in one hour increments with a maximum of 4 hours. Once override time has expired, keyboard override cannot be repeated unless it is reprogrammed at the local interface device.
- D. Manual override of unit by enabling the occupied override input on the processor module. Unit shall remain in the occupied mode as long as the input remains enabled.
- E. The space temperature reset algorithm shall reset the leaving air temperature set point upwards as the space temperature falls below the reset temperature set point.
- F. Capacity control for up to 6 stages of cooling. The software shall maintain leaving air temperature set point by cycling compressors and unloaders.
 - 1. Slow change override prevents the addition or subtraction of another stage when the leaving air tem-

perature is close to the set point and moving towards the set point.

- 2. Low-temperature override protects against rapid load decreases.
- 3. High-temperature override protects against rapid load increases.
- 4. Time delay prevents compressors from rapid cycling and allows oil return on short ON periods.
- G. Two-step demand limit shall limit the maximum stage number using one of 2 Demand Limit set points.
- H. Compressor output control shall control the staging of compressors and unloaders based on the number of stages requested. Software shall prevent economizer dampers from moving after the desired economizer position is reached.
- I. Quick Test software shall be supplied with each PIC. The program shall be initiated and controlled by the local interface device. The software shall allow a service technician or user to test all inputs and outputs controlled by the PIC. When initiated, the software shall display all current values of input channels and allow the user to exercise all output channels.
- J. Diagnostic software shall permit the control to check all inputs every 3 seconds (if option is currently enabled) and to display codes on the local interface device.
 - 1. Thermistor failure
 - 2. Compressor faults
 - 3. Loss of charge failure
 - 4. Economizer valve position