TECHNICAL REFERENCE

FOR

CAREL CRC CONTROLLERS

CONDENSER REHEAT CONTROL

CANADIAN HEAD OFFICE AND FACTORY

1401 HASTINGS CRES. SE
CALGARY, ALBERTA
T2G 4C8
Ph: (403) 287-2590
Fx: 888-364-2727

USA HEAD OFFICE AND FACTORY

32050 W. 83rd STREET
DESOTO, KANSAS
66018
Ph: (913) 583-3181
Fx: (913) 583-1406

CANADIAN EASTERN FACTORY

1175 TWINNEY DRIVE
NEWMARKET, ONTARIO
L3Y 5V7
Ph: (905) 898-1114
Fx: (905) 898-7244

SALES OFFICES ACROSS CANADA AND USA

Retain instructions with unit and maintain in a legible condition.
Please give model number and serial number when contacting factory for information and/or parts.

www.engineeredair.com

TABLE OF CONTENTS

YOU HAVE RESPONSIBILITIES TOO

This installation, operation and maintenance manual cannot cover every possibility, situation or eventuality. Regular service, cleaning and maintaining the equipment is necessary. If you are not capable of performing these tasks, hire a qualified service specialist. Failure to perform these duties can cause property damage and/or harm to the building occupants and will void the manufacturers' warranty. This technical manual is intended to be used as on operating guide, and shall be used with the Installation, Operation and Maintenance Manual(s) supplied with the equipment.

SAFETY PRECAUTIONS

Read, understand and follow the complete manual before beginning the installation, including all safety precautions and warnings.

Warning: 

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

Warning: 

This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.

INTRODUCTION

The Condenser Reheat Control (CRC) is a packaged controller using a Carel pCO5 module. The CRC controller is designed to be included in equipment with complicated piping, including condenser reheat and tandem systems. Typically the CRC uses the reheat signal from the CTRAC controller.

CONTROLLER PACKAGE

The following components are used with the CRC controller:

pCO5+ Compact (CRC Controller): PCOX002BA0
Pressure Transducer (Head Pressure Sensor): SPKT00B6R0
Pressure Transducer Cable: SPKC005310
NTC Temperature Sensor (optional D/A Temp Sensor, standalone only): NTC060WF00

CONTROLLER SPECIFICATIONS

The controller requires 24 VAC.
The controller may be installed in a control enclosure with operating ranges from -20°F to 150°F with non-condensing humidity levels. The control enclosure must be heated in colder than -20°F environments.

COMMON TERMINOLOGY

Electronic Expansion Valve (EEV): A stepper motor valve that controls the flow of refrigerant to the evaporator coil.
Expansion Valve Driver (EVD): Carel controller that modulates the EEV to maintain the required superheat.
PCO controller: Carel controller that controls the compressor and processes data from the EVD controller.
pLAN network: Carel proprietary communication protocol. Carel PCO and EVD boards communicate with each other via pLAN.
pGD user interface: Graphical display on the PCO controller that lets user scroll through information menus and change variables.
Mask: A graphical interface on the Carel display (PGD) that allows the user to select and change parameters. Masks are display pages and are arranged in sections called loops. There are several loops of masks that may be accessed. The up/down buttons are used to maneuver through different masks in a loop.
Loop: Menu structure that allows user to scroll through masks.
Inputs/Outputs (I/O): Pins on the controller where analog and digital I/Os are connected and allow controller to process data and control devices.

Features

Oil Return

Oil is circulated through the refrigerant system as a normal part of compressor operation. The system must return oil back to the compressor to avoid failure. Oil can become trapped in idle portions of complicated systems. This can be a function of refrigerant velocity, component sizing or extended operation. If enough oil accumulates in the idle portion of the system, compressor damage will occur. The CRC monitors operating conditions and triggers an oil return cycle every hour (adjustable). The oil return cycle will drive the reheat valve fully open, then the ambient condenser valve fully open to ensure full flow through both portions of the system and return oil to the compressor. The oil return cycle operates on four minute duration (adjustable).

Reheat Head Pressure Control

Some systems experience low head pressures during high reheat demands. This can be a result of low DX leaving temperatures, excessive airflow, low DX load, etc. The controller will measure head pressure and reset the reheat valve signal (limit the maximum opening) to maintain a minimum head pressure.

The head pressure set-point (typical 325psi R-410A) must be below the EVD ambient head pressure control set point (typical 350psi R-410A). The intention is for the ambient condenser head pressure controller to be the primary controller, while the CRC head pressure control only affects the reheat signal to maintain the minimum head pressure in full reheat mode.

Sample scenario:

With the reheat valve driven fully open, the operating head pressure may fall below optimum levels. If the head pressure drops, the EVD Head pressure control will close the ambient condenser stepper valve. If the head pressure continues to drop after the ambient stepper valve is completely shut, the auxiliary reheat head pressure limit will enforce a maximum opening limit on the reheat valve. This ensures stable operation and maximum heat output. If the pressure transducer on the PCO controller fails, the system will shut the compressor off and indicate a warning on the main page PRESSURE SENSOR FAIL.

Reheat Temperature Control

The reheat control can be selected as a slave controller (standard) or standalone control (with addition of optional sensor). The CRC 0-10VDC input no longer requires the NC/NO switching system previously used when paired with a DJM or GTRAC using CTRAC D/A control. The DJM draws 15 mA, and the CRC only draws 1.5 mA at 10VDC. The CTRAC is capable of producing 20+ mA, more than required to drive both simultaneously. Both controllers should be wired straight to the HD terminal of the CTRAC.

Slave (CTRAC D/A Control, Standard):

The input voltage is scaled from less than 0.5 VDC = 0% and greater than 9.5 VDC is 100%. The reduced scaling is designed to prevent signal noise from affecting proper valve operation.

Standalone (CRC D/A Control):

With addition of an optional temperature sensor (wired to B3, mounted downstream of the reheat coil) the controller can be setup to maintain a fixed discharge air temperature. The controller cannot stage compressors to maintain a DX leaving temperature. The set-point is selectable in SETPOINT mask, and PID loop parameters can be set in Manufacturing and Technician loops.

Max Reheat

Input from a dry contact can be used to drive the reheat valve to maximum reheat. The reheat head pressure limit feature will prevent the valve from opening to a point where the head pressure drops below programmed values.

Input Filter

Input values are often affected by electrical noise. This can cause unnecessary ‘jitter’ in the stepper valve operation. The input filter can be selected to stabilize the reheat valve operation, giving better temperature control. The filter can be selected as small (default, 5-7s), or large (10-15s).

Tandem Compressor Maintenance

Some tandem compressors can experience uneven oil levels between the compressors during run time, as the compressors share oil levels in the sumps by oil equalization lines. In certain rare conditions one compressor is favored with oil return and the other compressor can eventually run short of oil. When tandem compressors are selected, the controller will:

With one Compressor Running:

1. Randomize the starting compressor.
2. Rotate the operating compressor every time period (adjustable) to equalize run times, and allow compressors to share oil return.

With both Compressors Running:

1. Periodically cycle one compressor in the tandem off, allowing a compressor with low oil levels to recover oil from the favored compressor.

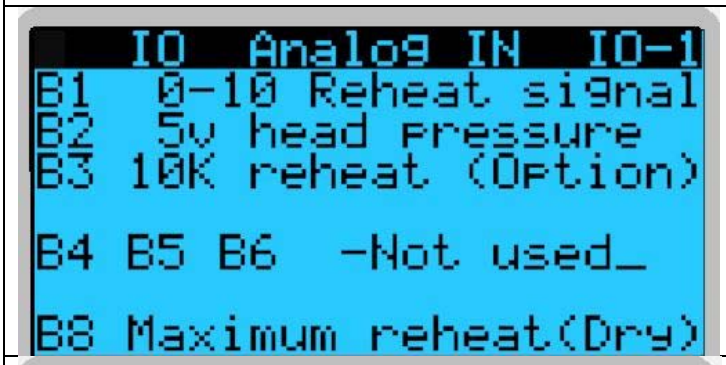
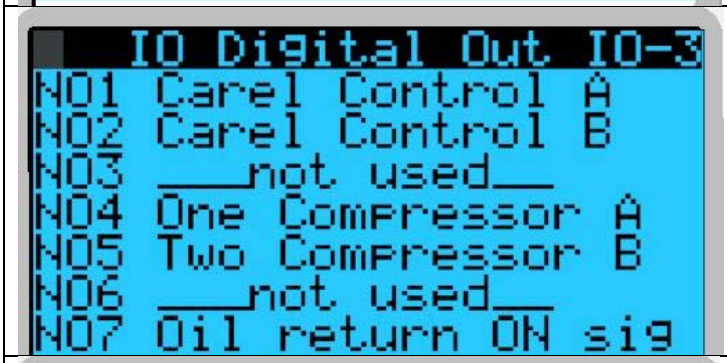
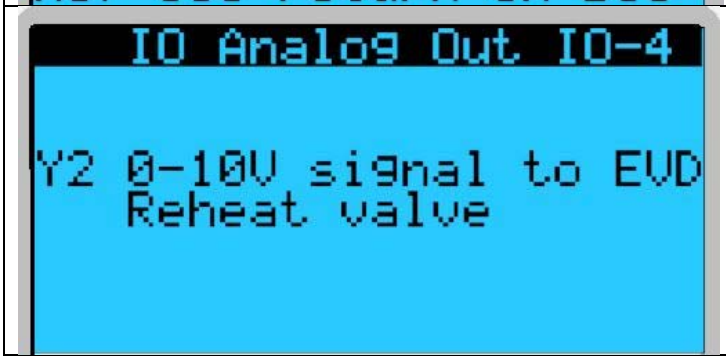
EVD Reset

Stepper valve drivers are open loop controls, and do not have feedback from the stepper valves. The driver can lose track of the valve position if ran continuously for long periods of time. The controller will shut off the EVD for resynchronization every 7 days (adjustable 1 to 30 days) of continuous compressor run time.

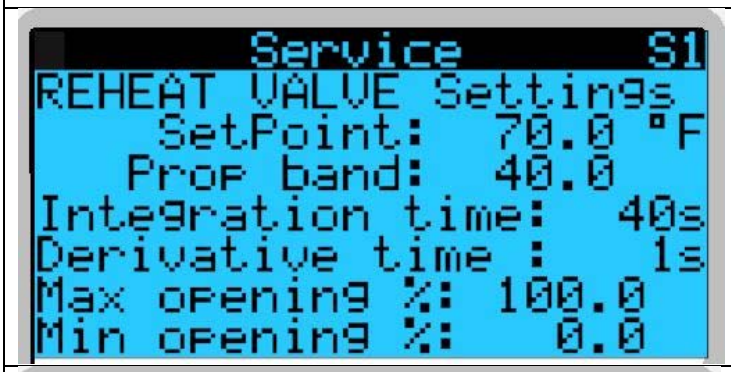
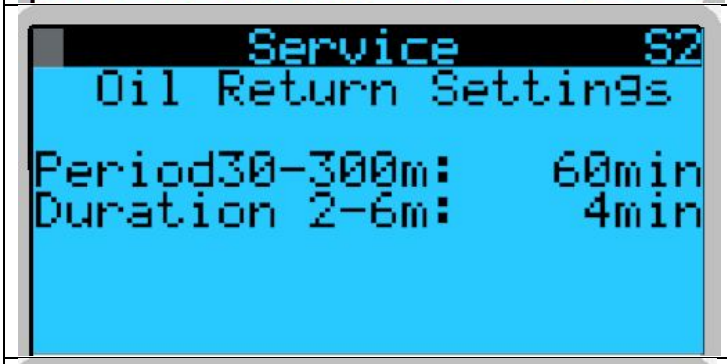
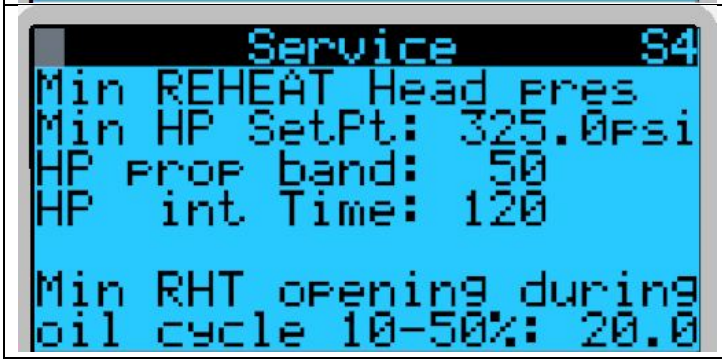
MASKS

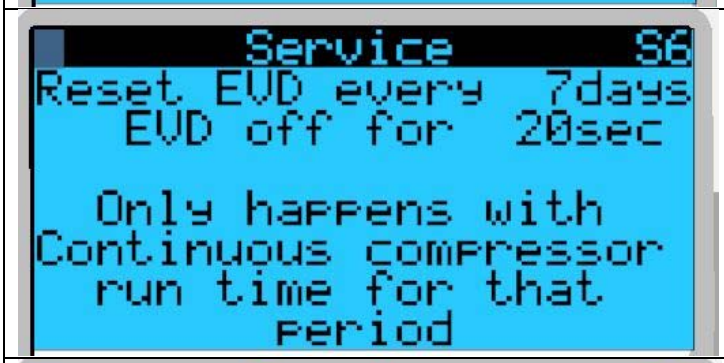
IO Masks

The following masks display wiring information only.

IO Masks	
	**IO-1** Input table, indicates input type and location.
	**IO-2** Input table, indicates digital input type and location.
	**IO-3** Digital output. Terminal numbers of Control output. Relays contacts are 1 amp rated. Output is pilot duty only.
	**IO-4** Analog out. 0-10 VDC

Service Masks

	**S1** 0 to 10 VDC external. Or Standalone control: Requires a 10K sensor to terminal B3 and control parameters to be set. Reheat valve can be configured to have a minimum and maximum opening steps as required
	**S2** Oil management function. Period: Time in minutes between cycles. Duration: How long the oil return cycle (min)
	**S3** Head pressure transducer. 5 VDC Ratiometric sensor (0.5V to 4.5V) Input sensor scaling min and max pressure. Input terminal B2.
	**S4** Reheat head pressure. Setpoint provides the minimum head pressure for reheat. The reheat valve max opening is controlled by this setting Min reheat setting ensures reheat valve opens to a minimum value during oil return.

	**S5** Tandem rotation will rotate compressors every hour to equalize oil return When both compressors are running. 1 is shut off for XXs to allow other compressor to equalize oil as required.
	**S6** If the system has run continuously for XX days, the EVD reset shuts off the EVD to allow synchronization between EVD and valve. Compressors shut off for anti-short cycle time.
	**S7** Input filter. Filters the input to reduce valve jitter due to signal noise. Small or large filter available, average of 100 or 200 last readings. If there is a large amount of noise Large filter is good, but will reduce reaction time.

Testing Control Functions

A Page to test the functions is provided in the Service/Technician menu. This allows the Technician to test the functions without having to wait for standard timers. Service Test Menu ST1 allows Technician to enable or terminate the selected function. The Rotate Tandems feature will reset in 30 seconds. If selected multiple times. Anti-short cycle timers may be enabled on the compressors.