GUARDIAN

CMC-12

Compressor Motor Controller

- **Flexible compressor motor controller & trip monitor selectable for remote, local or standby operation**
- **2 relays at 13 A for motor and or unloading control**
- **2 outputs at 5 / 1 A for unloading / alarm control**
- **1 motor current input from C.T. with 1 amp secondary**
- **1 pressure input at 4-20ma for -1 to 24bar**
- **8 safety-trip / remote control inputs at 230Vac or 24Vac**
- **DIN- rail mounting enclosure with terminals**
- **Options available for 230Vac or 24Vac operation**
- **Local panel display & setup**
- **Remote RS485 communications**

Operation and Setup Manual

The GUARDIAN CMC-12 Compressor Motor Controller is a rail-mounted, unit which operates at either 230Vac or 24Vac and can be configured as :-

a) Independent compressor motor controller using suction pressure to start/stop and load/unload the compressor.

b) Slave and/or standby motor controller for external master pack controller which sends remote motor start/stop and loading signals to the CMC-12 slave unit.

c) Input/output compressor extension unit (CXU-10 or HrEC) for the GUARDIAN CPC-25 or RCC-20 compressor pack controllers using a RS485 communications link.

Local displays and modification of control settings is available when a GUARDIAN SKD-9 Serial Keyswitch Display is connected.

The CMC-12 may communicate with a MICROM Consultant Terminal PC or a Woodley System 5 which provide central display, graphs and trip monitoring via a RS485 multi-drop serial link.

Contents

GETTING STARTED

Guardian Controllers provide refrigeration engineers with

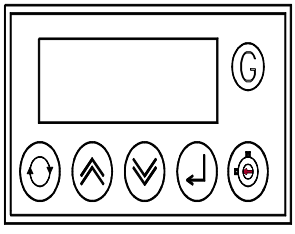
- **ULTIMATE FLEXIBILITY**
- **ASSURED MONITORING**
- **RELIABLE ALARMS**

This manual provides refrigeration designers, installers, service mechanics and supermarket personnel with the necessary information to achieve the above objectives.
All users require to know a few basic facts about this controller before successfully starting to perform their design, commissioning, maintenance or operating functions.

a) All GUARDIAN controllers need to be set up with a unit model selection and other basic settings for setpoints, timers and addresses. All these settings need to be done using the SKD.9 Keyswitch Display, so the understanding of the button operation of this unit is essential.
b) The shorthand used in the following chapters for concisely expressing button pressing and selection sequences to do all this setup needs to be understood.
c) Mains power input voltage and hardware switch and link option selections (if any are required) must correspond to the selected unit model configuration.
d) Since each controller can be configured in a number of different ways to perform flexible refrigeration control then an understanding of how to find out what unit model is currently selected, what it does and how it is connected, is also necessary.

SKD.9 KEYSWITCH DISPLAY OPERATION

GUARDIAN controllers require a SKD.9 Keyswitch Display unit to be plugged into the telephone jack socket in the controller before any settings can be changed.
The SKD.9 is connected to the GUARDIAN controller via a 6-core telephone cable.
The SKD.9 Keyswitch/Display comprises a plastic enclosure housing a PCB with four membrane pushbuttons, four LED displays and a 2-position Keyswitch.



SKD.9 buttons have the following functions when pressed:

@	**'next' button**	displays next value or menu selection in sequence.
/	**'raise' button**	raises a menu settings value or menu item selection.
<	**'lower' button**	decreases a menu settings value or item selection.
?	**'accept' or 'enter' button**	accepts any alarm and is used for entering a menu selection or settings value data entry

The Keyswitch is not used on a CMC-12 controller.

BUTTON OPERATION SHORTHAND

To assist in easy setup of control setpoints, delays, timers and other configuration settings, the sequence of button presses and subsequent displays will be shown in this handbook as below:
ii) A button symbol means press that button
iii) A display box shows the result of the last button press on the SKD.9 display.
EXAMPLES

@ Auto ? OFF= ? -OFF is shorthand for

Press **'next'** button which then displays AUTO
Press **'next'** button which then displays OFF
Then press **'enter'** button which changes the control mode to OFF and displays -OFF

@:@ Auto ?

Press **'next'** repeatedly until **Auto** is displayed then press **'enter'.**

Suct 4.8b

means the display alternates between the value identifier tag and the latest value.

DiSc =oC= FAIL

means the display alternately flashes between the value identifier tag (discharge temperature), the measured value (open circuit) and the alarm or trip message.

HARDWARE CONFIGURATION CHECKS

Prior to switching on the GUARDIAN controller check that the hardware unit is the correct type for the incoming mains voltage

Models with **BLUE** labels and suffix '**L' (LOW VOLTAGE)** operate at **24Vac**
Models with **BLACK** labels and no suffix **(LINE VOLTAGE)** operate at **230Vac**

230Vac MAINS SUPPLY WILL DAMAGE A BLUE LABEL CONTROLLER !!!
A BLACK label controller will not work with a 24Vac supply

When satisfied that the correct type of controller is available then the following checks should be made prior to controller installation or replacement.
a) Ensure mains supply is wired correctly to the appropriate TERMINAL WIRING drawing for the model selected.
b) Ensure that any transducer selector switches specified on the TERMINAL WIRING diagram are in the correct state.
c) Ensure any shorting link selector pins specified on the TERMINAL WIRING diagram are correctly fitted.
d) Ensure that probes are wired to the terminal WIRING DIAGRAM and the correct type of thermistor or pressure transducer probes are fitted.
e) The SKD.9 Keypad/display unit is fitted correctly in its 6-way telephone socket.
f) The RS485 highway connections (if required) are wired to the correct terminals and the screen drain wire is continuous to earth.

CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS

Enter Passcode PP05 for normal changes

Before any permanent change of controller settings are made then the correct entry of the appropriate passcode is necessary.
Most normal system settings require entry of passcode PP05

@:@ SEt= ? PP00 /:/ PP05 ?

Press **'next'** repeatedly until **SEt** is displayed then press **'enter'**. **PP00** is displayed.
Press **'raise'** repeatedly until **PP05** is displayed and then press **'enter'.**

Select Unit Model

@:@ SEt= ? PP00 /:/ PP05 ?

Enter Passcode PP05 as button sequence above

@:@ Unit ? cu10 /:/ CLLA ? CLLA

Press **'next'** repeatedly until **Unit** is displayed and then press **'enter'**
Display shows unit model currently selected which may be wrong.
Press **'raise'** repeatedly until correct model is displayed (e.g.cu10) and then press **'enter'** which causes the display to wink briefly and display the new unit model selection
(e.g. CLLA)

Select System No and Address

e.g. setup unit for system 60 case 1 at address 180

Enter Passcode as button sequence as above

@:@ Unit ?
@:@ Sn01 /:/ Sn60 ? Sn60
@ Cn01 ? Cn01
@ A001 /:/ A180 ? A180
@:@ End= ? =-26

RS485 Communications

When the correct system number, case/compressor number and highway address have been entered as above then the controller can communicate with the GUARDIAN AutoGraph Terminal PC for central alarm monitoring and temperature display. Control setpoints, defrost times and alarm limits may then be sent to the controller from the PC rather than using the SKD9 Keyswitch display. For further details see page 43

UNIT MODELS

Guardian controllers may be configured in a number of different ways dependent on unit model selection. Each unit model fulfils a different refrigeration temperature monitoring and control requirement. In order to perform the required refrigeration control then each model has different uses for the controller's input output signals. This section gives details of all the model variations available for the controller and the way to connect the wiring to the plant devices and measuring transducers.

Available Unit Models (CMC-12)

Each CMC-12 is associated with a single compressor and provides 4 outputs which may be selected for control of motor starter, unloading/loading valves or alarm indication.

The unit measures suction pressure using a 4-20 mA transducer and motor current via a current transformer with a 1 Amp secondary winding.
Each unit monitors up to 8 safety trips/control inputs for the compressor and stops the motor if any trips are active.
There are three main control modes

a) Independent compressor motor controller using suction pressure to start/stop and load/unload the compressor. **(LOCL o r Stby**)
b) Slave and/or standby motor controller for external master pack controller which sends remote motor start/stop and loading signals to the CMC-12 slave unit**.(rCL)**
c) Input/output compressor extension unit (CXU-10 or HrEC) for the GUARDIAN CPC-25 or RCC-20 compressor pack controllers using a RS485 communications link.**(cu10)**

Each of these control modes can be used with the following unit model input/output configurations

CMC-12 'CLLA'	Motor output two loading valves and alarm relay
CMC-12 'CCLA'	Part wound motor, one loading valve and alarm relay
CMC-12 'CCLL'	Part wound motor, two loading valves
CMC-12 'CLLL'	Motor output, three loading valves
CMC-12 'CCA'	Part wound motor, alarm relay
CMC-12 'cu10'	CXU10 controller emulation
CMC-12 'HrEC'	CXU10 heat reclaim controller emulation

GENERAL SPECIFICATION

Power	24 / 230 Vac 50 hz 10VA (Dependant on model)
Operation	0 to 55ºC
Approx. dimensions	Width 70 x length 100 x height off rail 110mm.

The pressure transducer and AMPS C.T. are connected via a 4-way 2-part screw terminal connector.
The controller is housed in a DIN rail mounting enclosure with 20 screw clamp connectors.

The SKD.9 display connects via a RJ12 6-way connector.

CONTROL MODES

'rCL' remote compressor motor and loading inputs

Compressor motor start/stop relay and capacity unloading solenoid valve relays are switched on and off as requested by a remote external pack controller dependent on suction pressure, control setpoint and differential as measured by this external controller.

Control commands are sent to the CMC-12 via two control signal inputs:-

MOTOR input - Start compressor motor provided ISO RETURN (OK to run) input is present, no safety trips are active and the controller is not waiting for starts per hour or time after stop timers. The motor may be selected to start with the loading valve energised or de-energised.

CAPACITY input - increase/decrease compressor capacity to 100%/50% by activating/deactivating the loading/ unloading valve provided that minimum motor AMPS has been established.

If a suction transducer is fitted and the pre-set suction pressure limits are exceeded for greater than the specified guard-times then the controller goes into 'Standby mode'.

StBy STANDBY MODE

When selected as 'Stby' control mode or if a suction transducer is fitted and the pre-set suction pressure limits are exceeded for greater than the specified guard-times or a r485 communication watchdog failure is detected then the controller goes into 'Standby mode'.
In standby mode the controller starts/stops the motor and loads/unloads the compressor as if in LOCAL mode but alternately displays a 'stby' message with the suction pressure display.
I.e. 2.5b Stby

Standby mode can be setup with a transducer per CMC12 or by using the RS485 highway and only connecting one transducer.
For the single transducer method to work the following steps must be completed:-

1 . The unit with the transducer connected must have its Woodley address and Suction address set the same.
2. All other CMC12's on the highway must have their suction address set to the same address as the unit with the transducer attached.

The suction address is a parameter found under the 'Unit' menu, after the Woodley address and is designated 'u' .Its value may be 0 to 255.

Each controller calculates its stage delay by taking into account its compressor number and the number of stages of loading to give the total number of stages that must precede it. This is then multiplied by the stage-up/stage-down delay to give the time it must wait before starting/stopping. So, compressor 1 is always the first to start or unload and the highest numbered compressor is always the last to start or unload.

If the pressure transducer fails or the comms link fails then, provided the LP auto reset function has been selected, the compressors will run on their LP trips.
All safety trips are still active and stop the compressor in standby mode.

The controller reverts to its previous control mode when ? is pressed on the keypad display.

LOCL' LOCAL control mode

When selected as 'LoCL' control mode with a suction transducer fitted and the ISO RETURN input present then the controller starts/stops the motor and loads/unloads the compressor dependent on suction pressure, suction setpoint and deadband.

All safety trips are still active and stop the compressor in Local mode.

Starts and stops observe delay timer settings restrictions of maximum starts per hour, delay after stop, stage up and stage down times.

cu10/r485 mode (CXU-10 replacement)

Compressor motor start/stop relay and capacity loading solenoid valve relays are switched on and off as requested by CPC-25/RCC-20 Controller dependent on suction pressure, control setpoint and differential as measured by CPC-25/RCC-20.

Control commands are sent via the RS485 highway interconnecting the CMC-12 units with the CPC-25.

RAISE Increase compressor capacity by starting motor or activating next loading valve.

LOWER Decrease compressor capacity by deactivating next loading valve or stopping motor.

OFF Force to OFF mode - switches all relays off instantly.
Alarms & trips are inhibited.

AUTO Force CXU-12 unit to AUTO mode -allows RAISE/LOWER commands via communication highway to operate.
Alarms & trips are reset.

If a suction transducer is fitted and the pre-set suction pressure limits are exceeded for greater than the specified guard-times or a communication watchdog failure is detected then the controller goes into 'Standby mode'.

LOADING VALVE SELECTIONS.

To cater for the various permutations of compressor loading/unloading valves and master controller output possibilities the following facilities are available.

START CONFIGURATION:-

Spos Compressor start with valves energised.

Sneg Compressor start with valves de-energised.

In local control the first valve will energise after the Su stage up delay time.

In remote control the first valve will energise at the load command from the main controller.

VALVE CONFIGURATION:-

LpoS Energise to load compressor.

Lneg Energise to unload compressor.

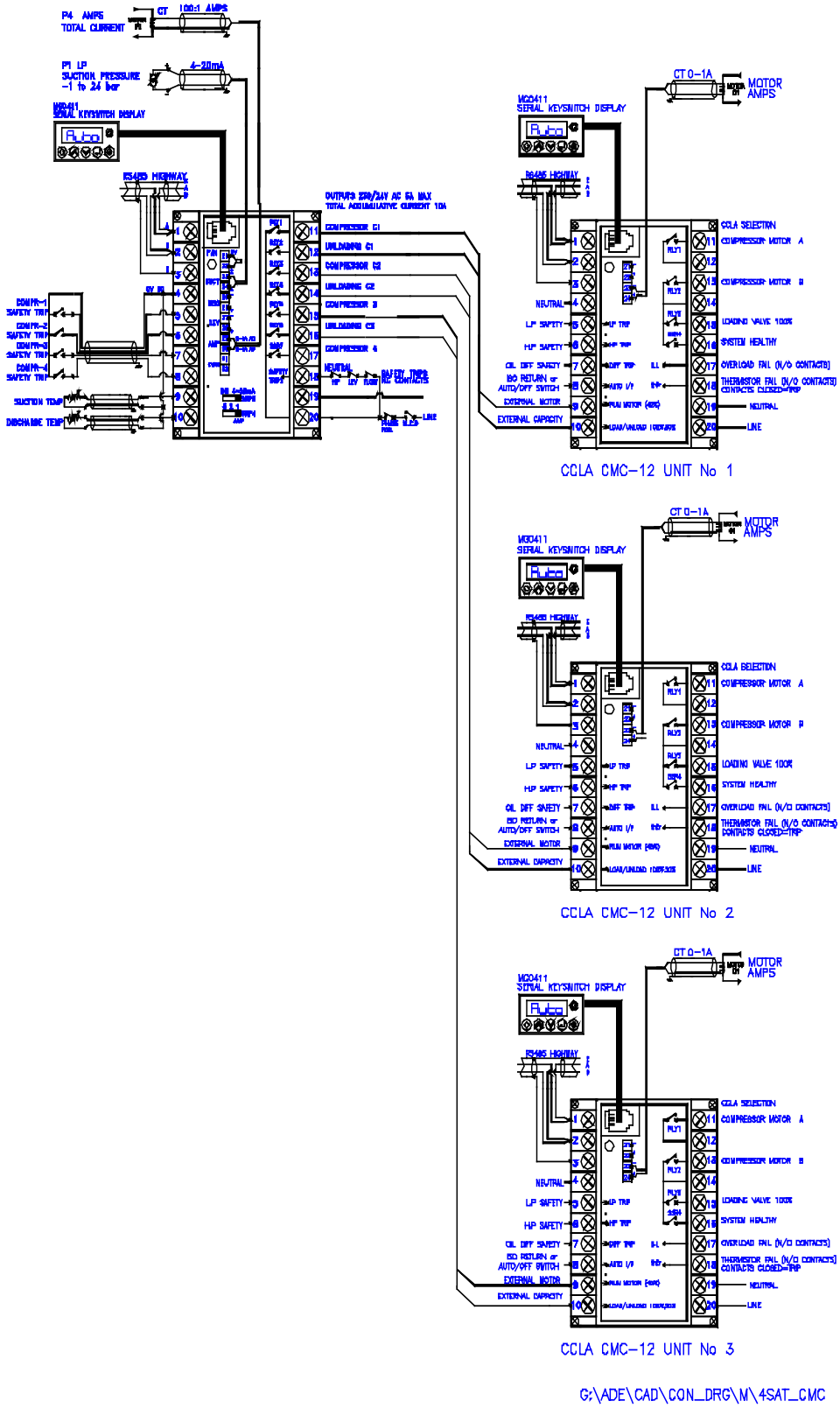
INPUT CONFIGURATION:-

The output relays of a main controller may be either normally open or closed and therefore on remote control applications the load command input/external capacity signal (terminal 10) can be set as:-

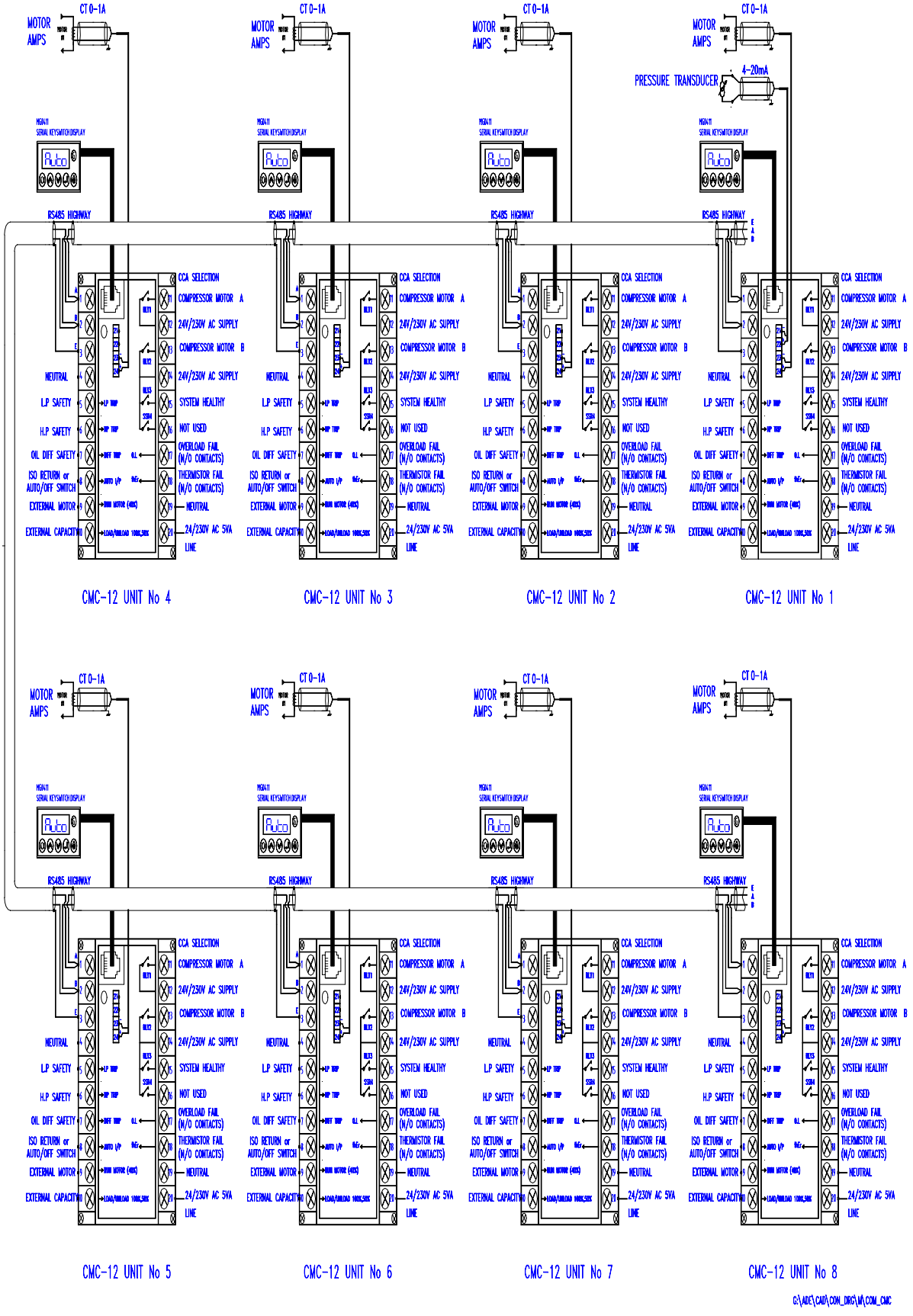
Cpos Apply voltage to load.

Cneg Remove voltage to load.

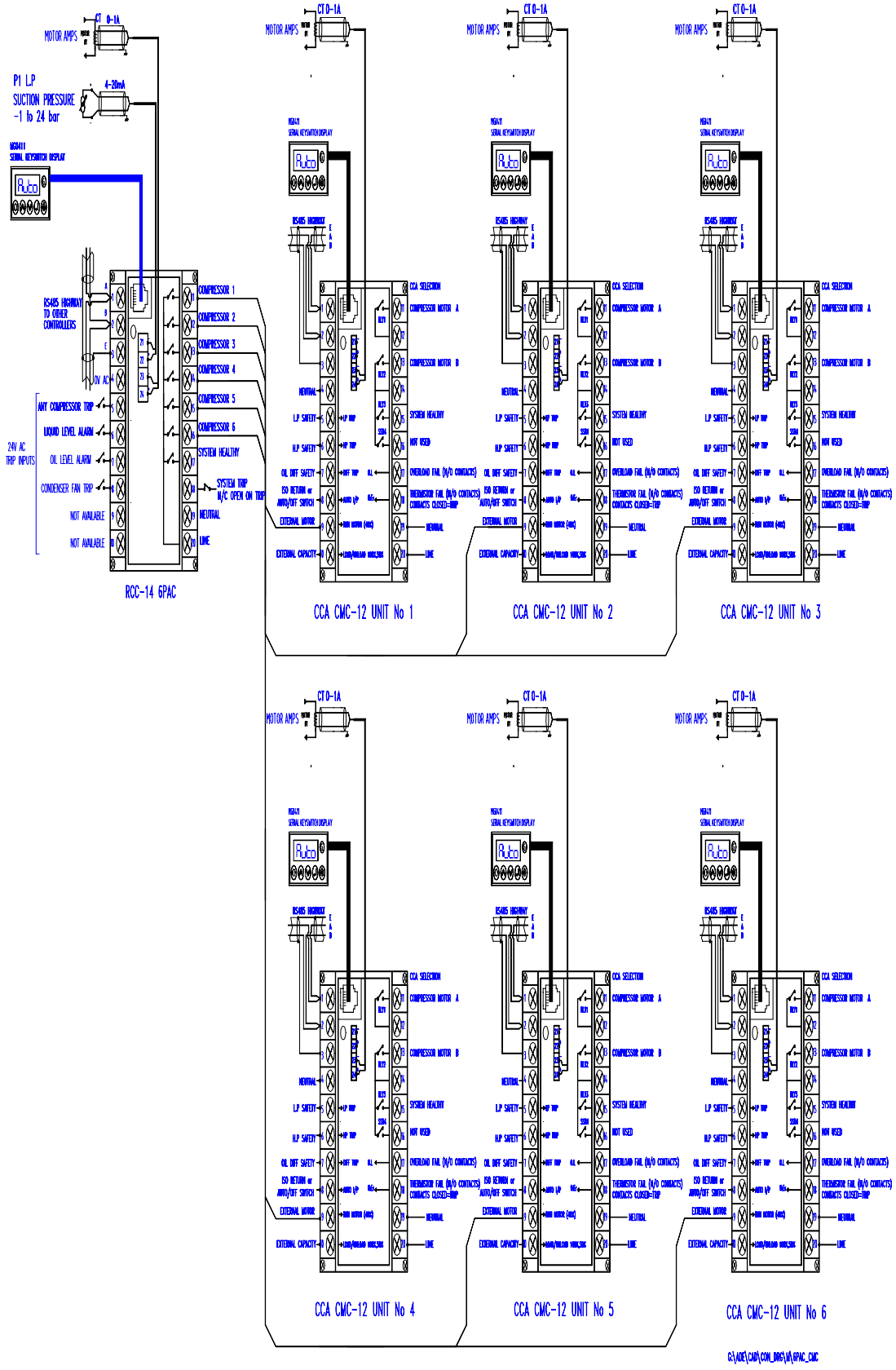
RCC.14 ‘6PAC controlling 3 motors with loading using CMC12 in ‘rCL’


CCLA CMC-12 UNIT No 1
CCLA CMC-12 UNIT No 2
CCLA CMC-12 UNIT No 3
G:\ADE\CAD\CON_DRG\M\4SAT_CMC

8 CMC12 units sharing a common suction transducer in ‘Stby’


CT 0-1A
MOTOR AMPS
4-20mA
PRESSURE TRANSDUCER
MGA11 SERIAL KEYSWITCH DISPLAY
RS485 HIGHWAY
CCA SELECTION
COMPRESSOR MOTOR A
24V/230V AC SUPPLY
COMPRESSOR MOTOR B
24V/230V AC SUPPLY
SYSTEM HEALTHY
NOT USED
OVERLOAD FAIL (N/O CONTACTS)
THERMISTOR FAIL (N/O CONTACTS)
NEUTRAL
24/230V AC 5VA LINE
NEUTRAL
L.P SAFETY
H.P SAFETY
OIL DIFF SAFETY
ISO RETURN or AUTO/OFF SWITCH
EXTERNAL MOTOR
EXTERNAL CAPACITY
CMC-12 UNIT No 4
CMC-12 UNIT No 3
CMC-12 UNIT No 2
CMC-12 UNIT No 1
CMC-12 UNIT No 5
CMC-12 UNIT No 6
CMC-12 UNIT No 7
CMC-12 UNIT No 8

RCC.14 ‘6PAC controlling 6 motors (no loading) with CMC12 in ‘rCL’


CT 0-1A
MOTOR AMPS
P1 LP
SUCTION PRESSURE
-1 to 24 bar
4-20mA
MG0411
SERIAL KEYSWITCH DISPLAY
RS485 HIGHWAY
TO OTHER
CONTROLLERS
24V AC
ANY COMPRESSOR TRIP
LIQUID LEVEL ALARM
OIL LEVEL ALARM
CONDENSER FAN TRIP
NOT AVAILABLE
NOT AVAILABLE
24V AC
TRIP INPUTS
COMPRESSOR 1
COMPRESSOR 2
COMPRESSOR 3
COMPRESSOR 4
COMPRESSOR 5
COMPRESSOR 6
SYSTEM HEALTHY
SYSTEM TRIP
N/C OPEN ON TRIP
NEUTRAL
LINE
RCC-14 GPAC
CCA SELECTION
COMPRESSOR MOTOR A
COMPRESSOR MOTOR B
SYSTEM HEALTHY
NOT USED
OVERLOAD FAIL (N/O CONTACTS)
THERMISTOR FAIL (N/O CONTACTS)
CONTACTS CLOSED=TRIP
NEUTRAL
LINE
CCA CMC-12 UNIT No 1
CCA CMC-12 UNIT No 2
CCA CMC-12 UNIT No 3
CCA CMC-12 UNIT No 4
CCA CMC-12 UNIT No 5
CCA CMC-12 UNIT No 6

CONTROL INPUTS

CXU-10 AUTO/OFF switch input

When selected as unit model CU-10, the controller is forced into OFF mode when the supply voltage is removed from the AUTO/ OFF input.
When in OFF mode, all motors and valves are switched off and safety trips are inhibited.
A message '-OFF' is displayed on the keypad display.
When voltage is restored to the AUTO/OFF input normal automatic operation is resumed and any safety trips actioned.

ISO RETURN (OK to RUN) input

When selected for ***'rCL'*** remote compressor/Loading control mode, the controller is forced into the OFF mode when the voltage is removed from the ISO RETURN (OK to RUN) input provided no safety trips are present.
A message '-OFF' is displayed on the keypad display.
If any safety trips are present when the voltage is removed from this input then the appropriate trip message is displayed instead of the OFF message.
When in OFF mode, all motors and valves are switched off and further safety trips are inhibited.
When voltage is restored to the ISO RETURN input, normal automatic operation can be resumed.

MOTOR input

When the supply voltage is applied to the external Motor input signal, the compressor motor is started provided ISO RETURN (OK to run) input is present, no safety trips are active and the controller is not waiting for starts per hour or time after stop timers. The motor may be selected ***'Spos'*** or ***'Sneg***' to start the motor with the loading valve energised or de-energised.
If CCLA is selected then the MOTOR START B output is energised ***btnn*** seconds after MOTOR START A output.
When the supply voltage is removed from the external Motor input then the motor is stopped.
If CCLA is selected then both MOTOR START A and MOTOR START B outputs are deenergised together.

CAPACITY input

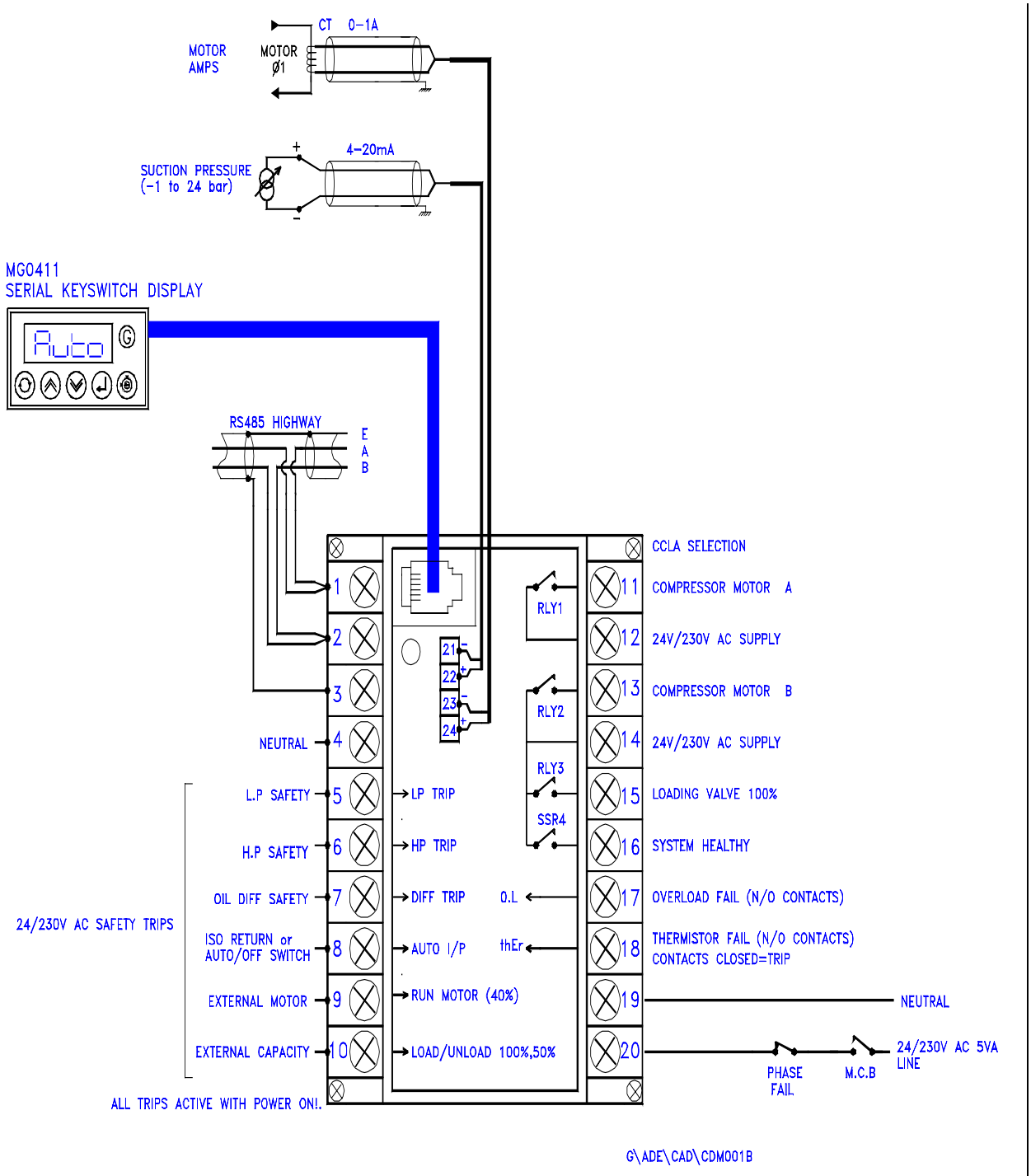
('Cneg' and 'Lneg' selected)
When the supply voltage is applied to the external CAPACITY input with ***'Cneg'*** and ***'Lneg'*** selected then the compressor capacity is decreased to 50% by activating the unloading valve provided that minimum motor AMPS ***'LAaa'*** has been established.
When the supply voltage is removed from the external CAPACITY input then the compressor goes to its fully loaded capacity (100%).
('Cpos' and 'Lpos' selected)
When the supply voltage is applied to the external CAPACITY input with ***'Cpos'*** and ***'Lpos'*** selected then the compressor capacity is increased to 100% by activating the loading valve provided that minimum motor AMPS ***'LAaa***' has been established.
When the supply voltage is removed from the external CAPACITY input then the compressor goes to its unloaded capacity (50%).

Remote Compressor and Loading Inputs rCL Input/Output Signals

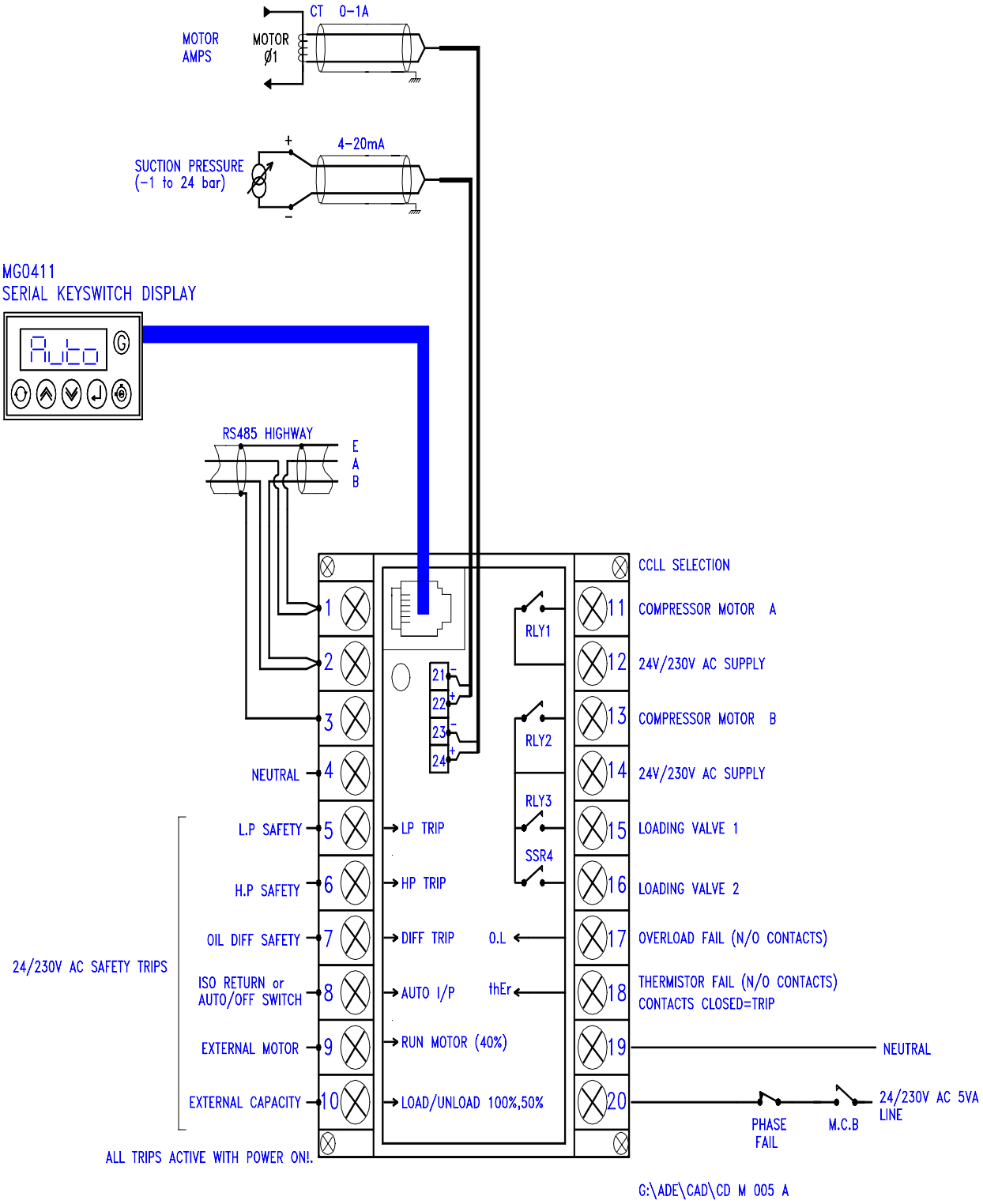
rCL			
Analogue Inputs			
MOTOR AMPS	Motor	0-1 AMP	
P1	Suction Pressure	4 to 20mA	-1 to 24 bar g
Digital Inputs			
Trip 1	L.P safety trip	n/o	closed=trip
Trip 2	H.P safety trip	n/o	closed=trip
Trip 3	Oil diff safety	n/o	closed=trip
Trip 4	Iso return or Auto/Off switch	n/o	closed=trip
Trip 5	External motor (40%)	n/o	closed=trip
Trip 6	External capacity (Load/Unload 100/50%)	n/o	closed=trip
Mains input 1	Overload fail	n/o	closed=trip
Mains input 2	Thermistor fail	n/o	closed=trip
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.			
R1	Compressor motor A		
R2	Compressor motor B		
R3	Loading valve 100%		
SSR4	System healthy		

Termination Wiring rCL

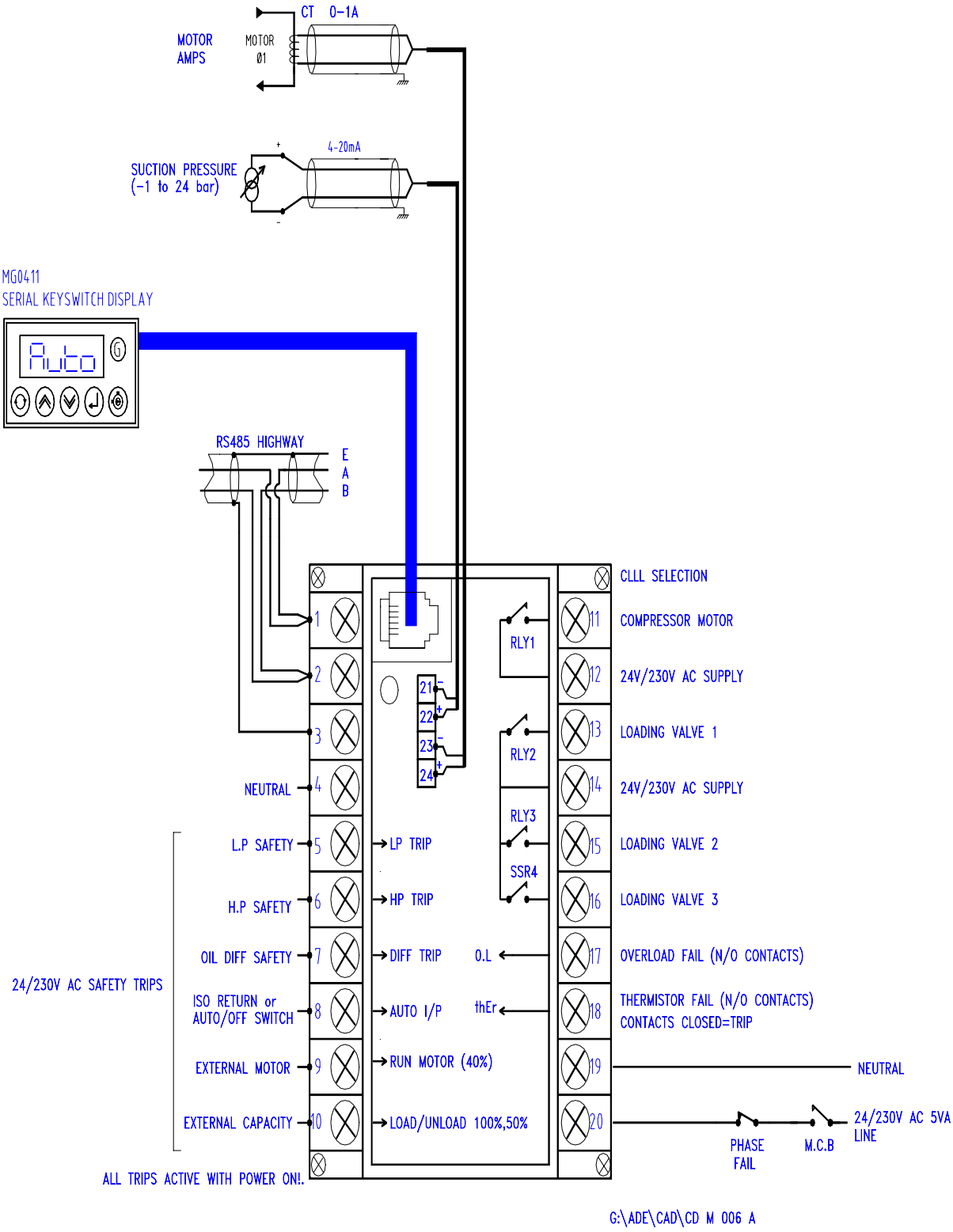
'CCLA' output relay selection(Control Mode 'rCL' remote compressor & loading inputs)



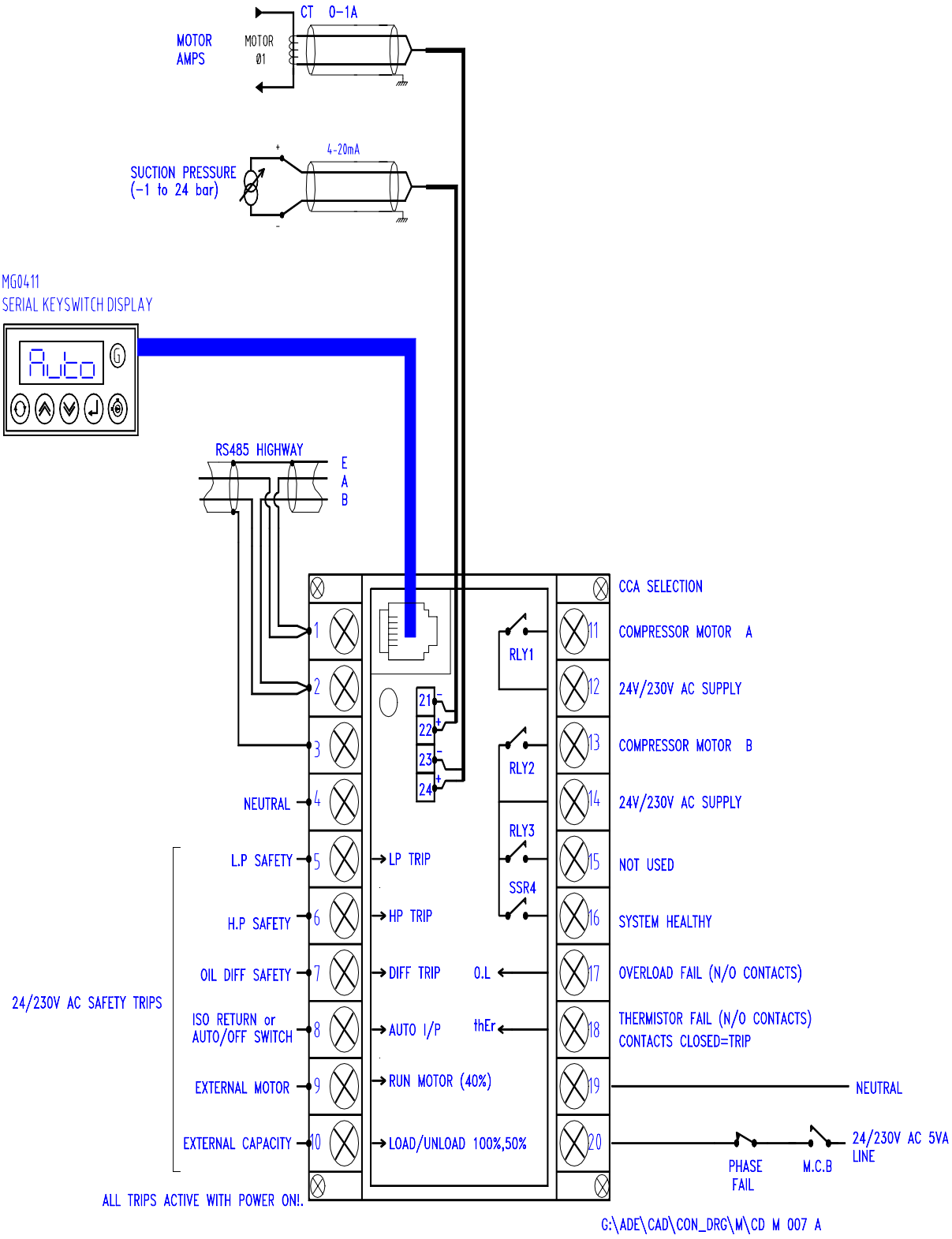
'CCLL' output relay selection(Control Mode 'rCL' remote compressor & loading inputs)



'CLLL' output relay selection(Control Mode 'rCL' remote compressor & loading inputs)



'CLA' output relay selection(Control Mode 'rCL' remote compressor & loading inputs

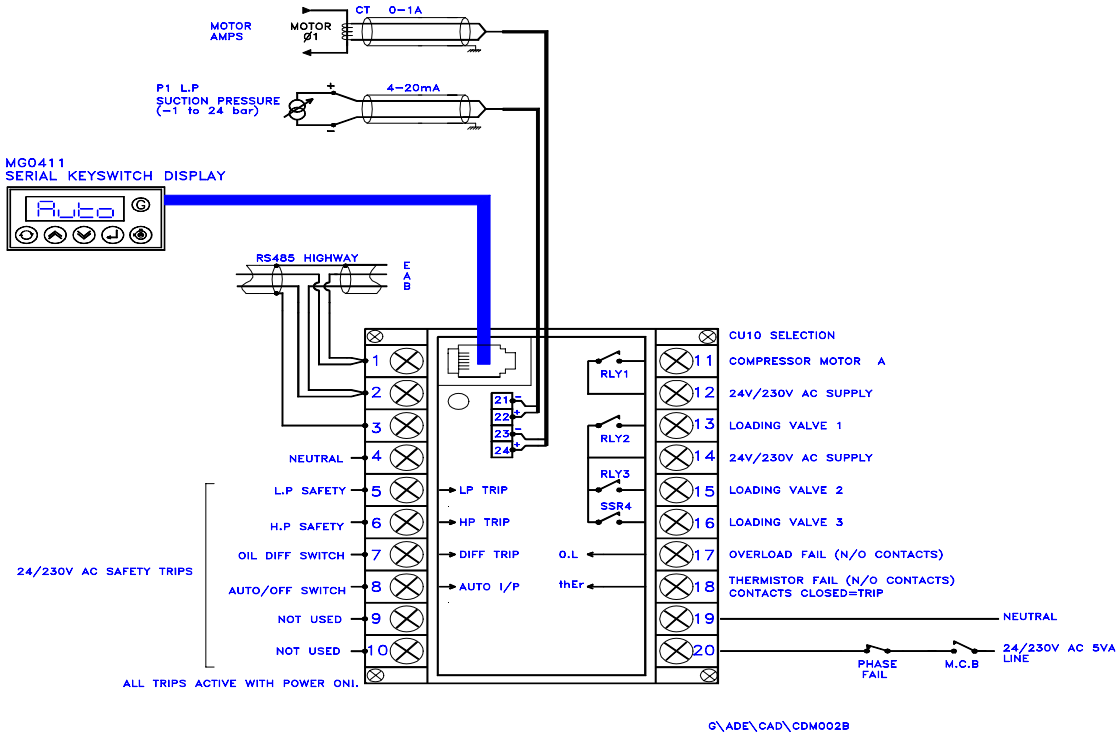


Compressor Extension Unit CXU 10 Input/Output Signals

CU10		
Analogue Inputs		
MOTOR AMPS	Motor	0-1 AMP
P1	Suction Pressure	4 to 20mA -1 to 24 bar g
Digital Inputs		
Trip 1	L.P Safety Trip	n/o closed=trip
Trip 2	H.P Safety Trip	n/o closed=trip
Trip 3	Oil Diff Switch	n/o closed=trip
Trip 4	Auto/Off Switch	n/o closed=trip
Trip 5	Not used	n/o closed=trip
Trip 6	Not used	n/o closed=trip
Mains input 1	Overload fail	n/o closed=trip
Mains input 2	Thermistor fail	n/o closed=trip
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
R1	Compressor Motor A	
R2	Loading valve 1	
R3	Loading valve 2	
SSR4	Loading valve 3	

Termination Wiring CXU10

(Compressor Extension unit cu10/r485 selection)



CAUTION WHEN REPLACING A *CXU 10* WITH A *CMC12 (SET AS CXU 10)* IT IS IMPORTANT TO NOTE THAT THE MOTOR CURRENT TRANSFORMER CONNECTIONS TERMINALS 9 & 10 ON THE *CXU 10* MUST BE MOVED TO THE CENTRAL CONNECTIONS 23 & 24 ON THE *CMC12*

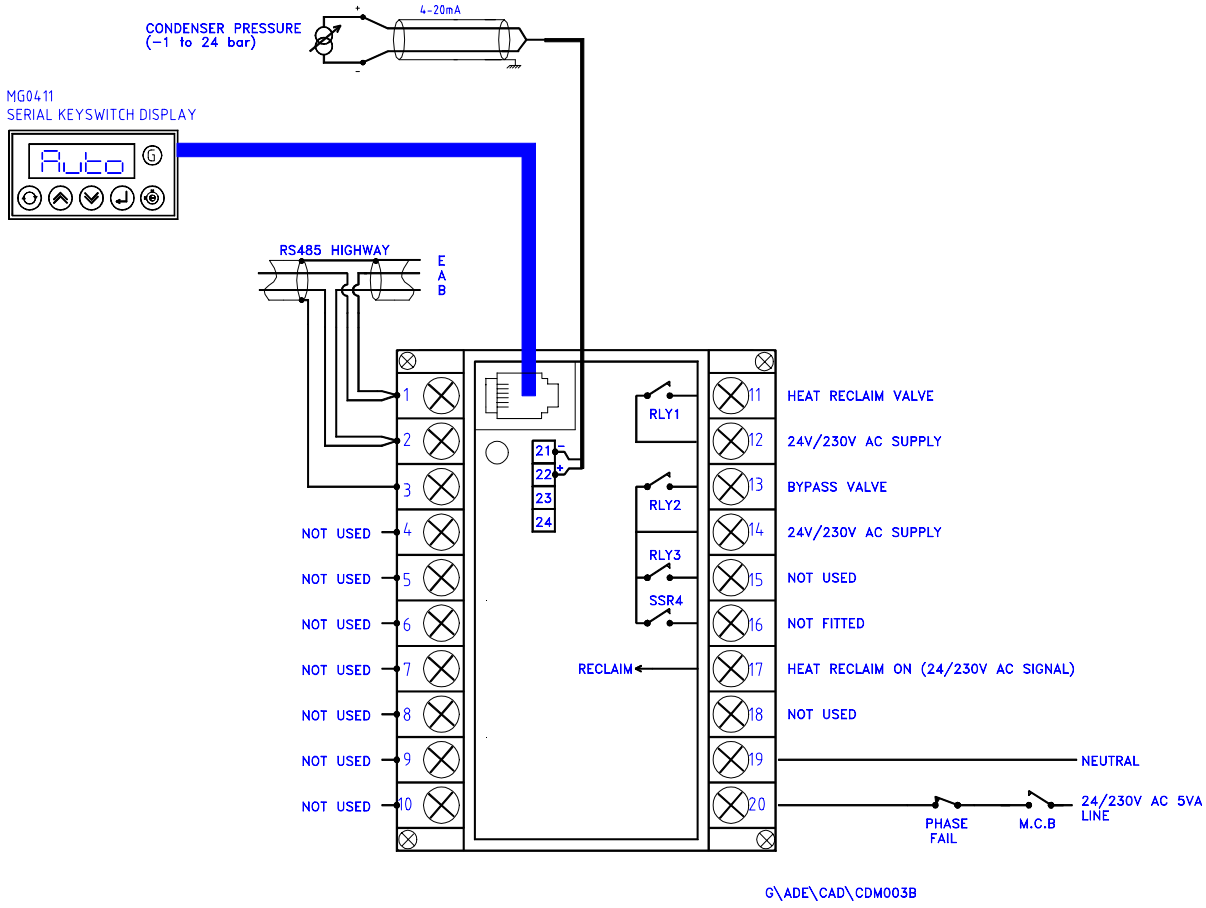
FAILURE TO OBSERVE THIS INSTRUCTION WILL RESULT IN SERIOUS DAMAGE TO MULTIPLE COMPONENTS INCLUDING THE *CPC25*

Heat Reclaim Unit HrEC Input/Output Signals

HreC		
Analogue Inputs		
P1	Condenser Pressure	4 to 20mA -1 to 24 bar g
Digital Inputs		
Trip 1 to 6	Not used	
Mains input 1	Heat Reclaim on	
Mains input 2	Not used	
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
R1	Heat reclaim valve	
R2	Bypass valve	
R3	Not used	
SSR4	Not used	

Termination Wiring HrEC

(Heat Reclaim Unit HrEC)


CONDENSER PRESSURE
(-1 to 24 bar)
4-20mA
MG0411
SERIAL KEYSWITCH DISPLAY
Auto
RS485 HIGHWAY
E
A
B
1
2
3
NOT USED 4
NOT USED 5
NOT USED 6
NOT USED 7
NOT USED 8
NOT USED 9
NOT USED 10
21
22
23
24
RLY1
RLY2
RLY3
SSR4
RECLAIM
11 HEAT RECLAIM VALVE
12 24V/230V AC SUPPLY
13 BYPASS VALVE
14 24V/230V AC SUPPLY
15 NOT USED
16 NOT FITTED
17 HEAT RECLAIM ON (24/230V AC SIGNAL)
18 NOT USED
19 NEUTRAL
20 24/230V AC 5VA LINE
PHASE FAIL
M.C.B
G\ADE\CAD\CDM003B

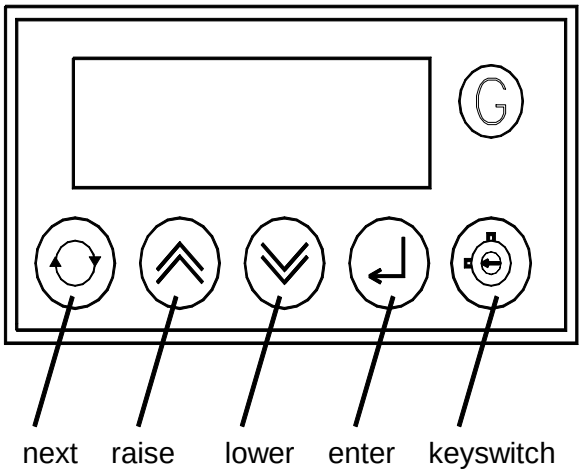
OPERATION

The SKD.9 Keyswitch display provides a display at the control panel of:

Compressor suction pressure

Display of other pressures etc by pressing 'next' @ button,

the values displayed depend on the unit model selected.
The keyswitch. Is not used on the CMC12
Passcode protected setup of controller setpoints, timers and limits.



Alarms and trips are reset by pressing accept ?

DISPLAYS - rCL

Default Display

	8888	After power on restart
	YYYY	Unit model selection
	YYYY=	CCLA CCLL CLLA CLLL
	u1.1A	Software version displayed after power on or after OFF
	-OFF	If unit selectd OFF
	HAnd	If unit selected hand (manual) control
YYYY	triP	If any compress or safety trip YYYY active Where YYYY = H.P., L.P., dIFF, O.L., ther
CP25	FAIL	If RS485 watchdog fail with CPC-25 comms.
=PC=	FAIL	If RS485 watchdog fail in local mode
	n.nb	n.n = Suction pressure in bar gauge
Suct	FAIL	If open circuit suction transducer

The following displays are available by repeatedly pressing the 'next' button:-

nnnA	Motor current if Auto nnn = 0 - 125 amps	
n.nd	n.n d=stage down delay active n.n u=stage up delay active	
nnnL		
nnn =	0/33/66/100 % Capacity (2 valves) 0/50/100 % Capacity (1 valve) 0/100 % Capacity (0 valves)	
Capacity changed by / and < buttons if HANd selected		
n.nt	n.n = wait time if motor starts/hour exceeded when in any control mode	
nn.nn	1000 Hours run (65.55 max)	
C=nn	n= Compressor number	
Auto	Auto control mode	press ?
oFF=	OFF control mode	press ?
hAnd	Hand control mode (enables / and < buttons)	press ?
Set=	Request parameter change	press ?

DISPLAYS - CU10

Default Display

	8888	After power on restart
	cu10	Unit model selection
	u1.1A	Software version displayed after power on or after OFF
	-OFF	If unit selectd OFF
	HAnd	If unit selected hand (manual) control
YYYY	triP	If any compress or safety trip YYYY active Where YYYY = H.P., L.P., dIFF, O.L., ther
CP25	FAIL	If watchdog fail with CPC-25 comms.
	nnnA	Motor current if Auto nnn = 0 - 125 amps

The following displays are available by repeatedly pressing the 'next' button:-

nnnL

nnn = 0/25/50/75/100 % Capacity (3 valves)
0/33/66/100 % Capacity (2 valves)
0/50/100 % Capacity (1 valve)
0/100 % Capacity (0 valves)

Capacity changed by / and < buttons if HANd selected

n.nt	n.n = wait time if motor starts/hour exceeded when in any control mode	
nn.nn	1000 Hours run (65.55 max)	
C=nn	n= Compressor number	
Auto	Auto control mode	press ?
oFF=	OFF control mode	press ?
hAnd	Hand control mode (enables / and < buttons)	press ?
Set=	Request parameter change	press ?

DISPLAYS - CMC-12 (HEAT RECLAIM)

CMC-12 Heat Reclaim Units do not normally have a display fitted.
The unit must be setup using a SKD-9 display with unit model = 'HrEC' which forces address 8= Heat Reclaim Unit.
If a display is connected then the following facilities are available.

Default Display

	8888	After power on restart
	u1.1A	Software version displayed after power on or after OFF
	-OFF	If unit selectd OFF
	HAnd	If unit selected hand (manual) control
CP25	FAIL	If RS485 watchdog fail with CPC-30 comms.
=PC=	FAIL	If RS485 watchdog fail in local mode
	nn.nb	nn.n = Condenser pressure (-1 to 24barG)

The following displays are available by repeatedly pressing the 'next' button:-

YYYY		
YYYY =	nil/rECL/ByPS none/R1/R2 selected for reclaim or Bypass valves (State changed by / and < buttons if HANd selected)	
HrEC	CXU-12 address (always 8)	
Auto	Auto control mode	press ?
oFF=	OFF control mode	press ?
hAnd	Hand control mode (enables / and < buttons)	press ?
SEt	Request parameter change	press ?

HEAT RECLAIM CONTROL

When the CPC-25 detects that the discharge pressure is above a pre-set limit then it sends a control command (raise) which requests the CXU-12 unit, provided it is in auto, to open the reclaim valve and close the bypass valve provided the reclaim input switch is energised.
The Bypass valve is opened and the reclaim valve is closed if the reclaim input switch is open.
When the discharge pressure falls below the preset limit then the CPC-25 sends a control command (lower) which closes both valves.

RECLAIM INPUT SWITCH

When CXU-12 unit is in 'AUTO' and the reclaim input switch is closed then the Reclaim valve is opened and the Bypass valve is closed provided the discharge pressure is above a control limit.

Alarm Indications

SAFETY TRIPS

Digital safety trip conditions detected are

r485/standby/LOCAL mode/ rCL mode

L.P. triP	L.P. safety trip active
H.P. triP	H.P. safety trip active
diFF triP	Oil pressure safety trip active
=OFF Auto	Local auto/ off switch
O.L. triP	Motor overload
thEr triP	Thermistor

Remote motor request input
Remote unloading request i/p
Any active trip condition stops the appropriate motor relays and deenergises the loading valve relays

ALL Trips are RESET by pressing 'enter' ? on the keypad on the default display

Trip inputs conditions may be transmitted via the RS485 highway interconnecting the CMC10 units to print alarm messages on the GUARDIAN AUTOGRAPH terminal PC or Woodley System 5.

The first safety trip input detected is automatically displayed with a flashing alternative 'triP' message.
trip messages are 'L.P.', 'H.P.', 'diFF', 'O.L.', 'thEr'.

The 'next' button may always be used to view other displays.
Oil differential safety trips are delayed by the oil diff trip guardtime 'otxx' seconds.
All other trips require two sucessive readings before being actioned.

WATCHDOG FAIL TRIP

If the unit is in 'r485' mode with baud rate set at 300 baud and a valid status request from the CPC-25/RCC20 has not been received for 60 seconds via the RS485 highway then a Watchdog timer 'CP25'/triP message is displayed.

CP25 triP	Watchdog timer

A 'CP25' trip forces 'STBY' mode if a pressure transducer is present or stops the motor and de-energises the loading valves if not.

PC FAIL MESSAGE

If the unit has a baud rate set to 9600 baud and a valid status request from the Autograph PC or Woodley System 5 has not been received for 60 seconds via the RS485 highway then a Watchdog timer ' PC '/FAIL message is displayed.

=PC= FAIL	If RS485 comms watchdog fail

If the baud rate is set to 'nonE' (see LEVEL 2 settings) then it is assumed that no PC monitoring is required and the PC FAIL message not displayed.

Note for CCLA, in RCL with multiple compressors sharing a pressure transducer, set the controller with transducer to ***none,*** and all other compressors to 9600 baud.

SUCTION PRESSURE TRANSDUCER FAIL

On failure of the suction pressure transducer the open circuit message 'Suct'/FAIL is given on the local display and the compressor stopped. When the transducer has been replaced the 'Accept' button is used to reset the controller.

Suct FAIL	Suction pressure

USEFUL BUTTON SEQUENCES

The following button sequences should prove useful during normal service operation

Reset an alarm or trip

diFF trIP ? =2.4b

Change suction control setpoint and differential

@:@	SEt=	?	PP00	/:/	PP05	
@:@	cprs	?				
@:@	c2.0b	/:/	c2.5b	?	c2.5b	
@	cd01	/:/	cd02	?	cd02	
@:@	End=	?	=2.6b	?		

Check Unit Model & Control Mode

@:@	SEt=	?	PP00	/:/	PP05	?
@:@	Unit	?	CLLA	This unit model is 'CLLA'		
@	rCL=			Control Mode is 'rCL'		
@:@	End=	?	=-26			

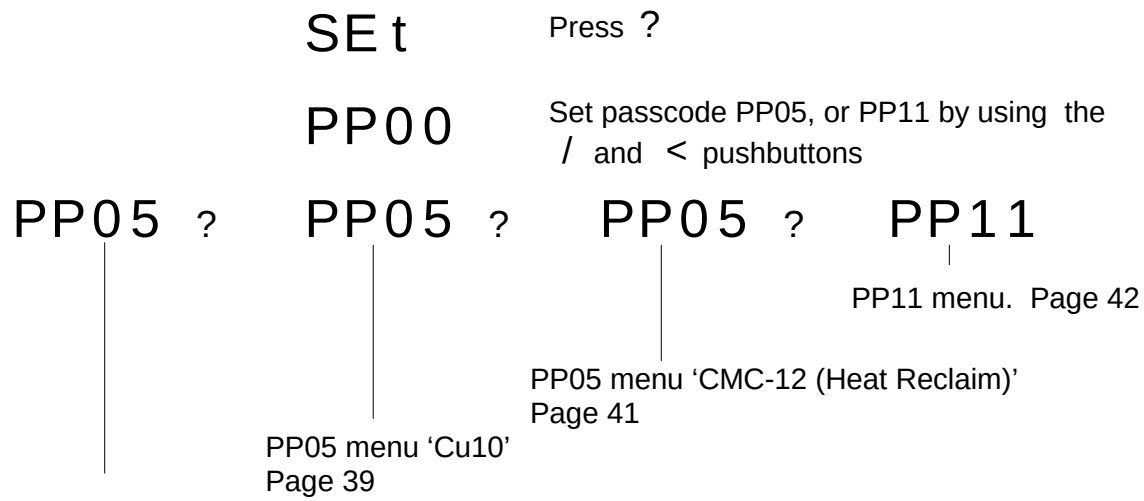
Select Stub, Case No and Address

e.g. setup unit for system 60, case 1, at address 180

@:@	SEt=	?	PP00	/:/	PP05	?
@:@	Sn01	/:/	Sn60	?	Sn60	
@	Cn01	?	Cn01			
@	A001	/:/	A180	?	A180	
@:@	End=	?	=-26			

SETUP OPERATION

Setup operation lasts for a maximum of 5 minutes after being activated by pressing ?
with SEt on the display panel.
During setup operation, alarms, temperature and defrost controls are inhibited.
If the correct passcode is not entered then setup values may be displayed but any attempted changes are ignored.



Setup Functions (Normal) passcode 05

P05 Menu 'rCL'

Press @ to sequence through the Setup selections

Press ? to accept the settings

Unit	Unit	Unit Model Identity Page 35
CPrS	CPrS	Compressor settings Page 36
Suct	Suct	Skipped if 'LoCL' selected Suction pressure standby limit settings Page 36
dELy	dELy	Delay timers Page 36
LoAd	LoAd	Page 36
Adj	Hnnn	Hours Run Adjustment Page 37
Test	tESt	Toggle output relays Faulty valve check. Page 37

End	End=	Return to normal operation

PP05 Menu Settings ‘rCL’

Unit

Unit

Press @ to sequence through the Setup selections

Press / or < to change the settings Press ? to accept

Model type selection	YYYY	Unit model for CMC-12 where relay outputs selections are:-
	YYYY = CLLA	Compressor, Loading 1, 2 , alarm
	CCLA	Compressor motor start A, compressor motor start B, Loading 1, alarm
	CCLL	Compressor A, compressor B, Loading 1, 2
	CLLL	Compressor, Loading 1, 2, 3
	Cu10	Compressor extension unit
	Hrec	Heat reclaim unit
TRIP mode selection	YYYY	
	YYYY = ALL	Alarm output on all alarms
	trip	Alarm output on trips only
Control mode selection	YYYY	
	YYYY = rCL	Remote control from external compressor motor/loading input signals
	Stby	Only operates as standby unit
	LOCL	Independent suction pressure control
	r485	Remote control from CPC25/RCC20 via RS485 link
System number	SNnn	nn = 1 - 80
Compressor number	Cn=n	n = compressor number 1-6 (n always = 8 for HrEC units)
Unit address	Annn	nnn = SNnn x 3 = 1 - 255
Suction address	unnn	nnn = 0 if not used, nnn=Annn if pressure transducer is fitted and the RS485 highway is to be used. nnn= address of unit with pressure transducer fitted for all other CMC12s on the same highway

CPrS

CPrS

Press @ to sequence through the Setup selections

Press / or < to change the settings Press ? to accept

Suction control setpoint	cn.n	n.n = (bar guage)
Suction control deadband	dbn.n	n.n = (bar guage)
Loading valve polarity	YYYY	YYYY = Lpos/Lneg unloader = negative)
Capacity input polarity	YYYY	YYYY = Cpos/Cneg (unload = negative)
Motor Start Loading valve polarity	YYYY	YYYY = Spos/Sneg
Trip input polarity positive or negative	YYYY	tneg/tpos

Suct

Suct

Standby compressor operation commences if the suction pressure is outside the high or low limits for longer than the appropriate guardtime

Low level	L=n.n
Low level guardtime	gLn.n
High level	H=n.n
High level guardtime	gHn.n

dELy

dELy

Press @ to sequence through the Setup selections

Press / or < to change the settings Press ? to accept

Starts per hour allowed for compressor	SHnn	nn =
Stage up time	SUn.n	n.n = mins
Stage down time	Sdn.n	n.n = mins

After stop delay time	A t n n	If CCLL or CCLA selected, skipped if not nn = secs
Delay time between motor start A and motor start B outputs	b t n . n	n.n = 0.1 secs
Oil differential trip guardtime	o t n n	nn = secs

LoAd

L o A d

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Minimum amps level before allowing compressor loading	L A n n	nn = amps
Current transformer rating	t n n n	nnn = (10-250 amp) AMPS = value x tnnn / 1000

Adj

A d J

Press / or < to change the settings

Press ? to accept the settings

Adjust compressor thousand hours run	n n . n n	nn.nn = (to nearest 10 hours)

tESt

t E S t

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

Motor a	1 0 F F	1 = o n	Relay R1
Motor b / loading valve 1	2 0 F F	2 = o n	Relay R2
Alarm/loading valve 2	3 0 F F	3 = o n	Relay R3

All outputs return to automatic control when SETUP is ended

End

End	Exit settings change and return to default display

PP05 Menu ‘CU10’

Press @ to sequence through the Setup selections

Press ? to accept the settings

Unit	Unit	Unit Model Identity Page 39
Adj	Hnnn	Hours Run Adjustment Page 40
Test	tESt	Toggle output relays Faulty valve check. Page 40
End	End=	Return to normal operation

PP05 Menu Settings ‘CU10’

Unit

Unit

Press @ to sequence through the Setup selections

Press / or < to change the settings.

Press ? to accept

Model type selection	YYYY	Unit model for CMC-12 where relay outputs selections are:-
	YYYY = CLLA	Compressor, Loading 1, 2 , alarm
	CCLA	Compressor motor start A, compressor motor start B, Loading 1, alarm
	CCLL	Compressor A, compressor B, Loading 1, 2
	CLLL	Compressor, Loading 1, 2, 3
	Cu10	Compressor extension unit
	Hrec	Heat reclaim unit
Compressor number	Cn=n	n = compressor number 1-6 (n always = 8 for HrEC units)
Loading valve capacity	L=nn	nn = 0 / 50 / 33 / 25
Trip input polarity	YYYY	YYYY = LPOS / LnEg
Reset for LP trip	YYYY	YYYY = LP-A / LP-r A = automatic, r = keypad reset
Current transformer rating	tnnn	nnn = 10 - 125 amp AMPS = value x tnnn / 1000 **(If Set to Zero controller assumes ct is 100:1, and No FAIL action on NO LOAD)**
Starts per hour	SHnn	nn = 2 - 12

Adj

AdJ — Press / or < to change the settings

Press ? to accept the settings

Hours run adjustment — Hnnn — nnn =

tESt

tESt — Press @ to sequence through the relay selections

Repeatedly press **?** to switch the relays on and off

Motor	10FF 1=on	Relay R1
Loading valve 1	20FF 2=on	Relay R2
Loading valve 2	30FF 3=on	Relay R3
Loading valve 3	40FF 4=on	Relay SSR4

All outputs return to automatic control when SETUP is ended

End

End — Exit settings change and return to default display

PP05 Menu ‘CMC-12 (Heat Reclaim)’

Press @ to sequence through the Setup selections

Press ? to accept the settings

Unit	Unit	Unit Model Identity Page 41
Test	tESt	Toggle output relays Faulty valve check. Page 41
End	End=	Return to normal operation

Unit

Unit

Press @ to sequence through the Setup selections

Press / or < to change the settings. Press ? to accept th

Model type selection	YYYY	Unit model for CMC-12 where relay outputs selections are:-
	YYYY = CLA	Compressor, Loading, alarm
	CCA	Compressor motor start A, compressor motor start B, alarm
	CCL	Compressor A, compressor B, Loading 1
	CLL	Compressor, Loading 1, Loading 2
	Cu10	Compressor extension unit
	Hrec	Heat reclaim unit
Compressor number	Cn=8	Address is always = 8 for HrEC units

tESt

tESt

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

Heat Reclaim valve	10FF	1=on	Relay R1
Bypass Valve	20FF	2=on	Relay R2
Not used	30FF	3=on	Relay R3
Not used	40FF	4=on	Relay SSR4

All outputs return to automatic control when SETUP is ended

End

End	Exit settings change and return to default display

Setup Functions (level 2) passcode 11

PP11 Menu

Press @ to sequence through the following PP11 menu selections:-

Press ? to select the displayed menu

Port	Port	RS485 communication port baud rate Page 42
SCAL	SCAL	Pressure transducer scaling Page 42
End	End=	Return to normal operation

Port

Port

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

RS485 communication port baudrate

YYYY

YYYY = 9600	Baud rate
300	Baud rate **SET TO 300 Baud when used as CU10 with CPC25**
None	'None' removes PC FAIL if no PC present

SCAL

SCAL

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

L-n.n	4ma value bar gauge **Set to ZERO when no Transducer Fitted**
Hnn.n	20ma value bar gauge **Set to ZERO when no Transducer Fitted**

End

End — Exit settings change and return to suction pressure display

COMMUNICATIONS

Communication facilities are available for interrogation of temperatures, status and modification / display of setpoints, limits and timeclock settings. All communication is via a daisy chain RS485 link which connects all GUARDIAN controllers units in series.
Communication commands and replies are checked for parity and block length and automatically re-transmit if errors are detected.
Each GUARDIAN controller has a unique unit number address UU/u which is used to select the appropriate unit for interrogation or modification.

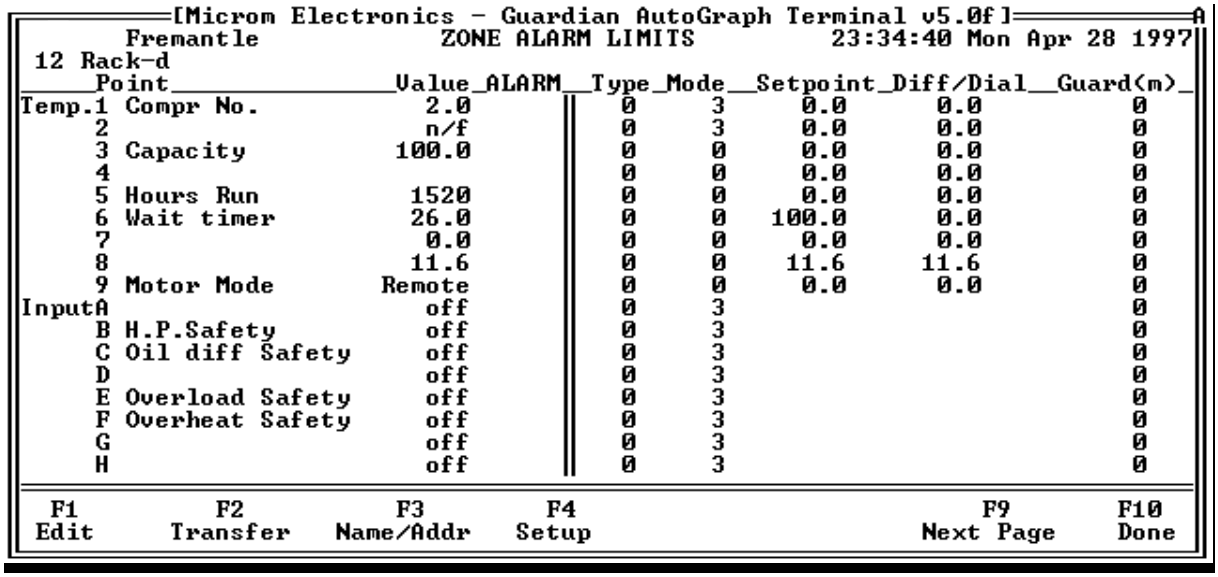
UU is stub no. 1-80
u is case / coldstore number 1-3.
i.e. case 3 stub 56 has address 56/3

Some communication commands may use 'wildcard' stub number 99 and 'wildcard' case number 9 to access all stubs on the highway or all cases in a stub.
GUARDIAN controllers are inactive until they are addressed.
When the organisation of commands on the RS485 highway is under the control of a Woodley Mk V then GUARDIAN units only accept status requests which transmit case, discharge and return air temperatures and defrost status.

GUARDIAN Autograph or RM-256 Refrigeration Monitor Communication commands available are:-

a) Transmit Unit Status which replies with command plus stub status & case temperature
b) Transmit Values which replies with stub address plus latest signed temperature values, time, trip states, relay states and internal status
c) Transmit Setpoints which replies with setpoints and limits.
System Sn and unit Addresses Axxx may not be changed via the RS485 serial link
d) Receive setpoints with new setpoint values
g) ON auto / / case OFF selection for case cleaning

CMC12 Autograph Zone display



Setup / commissioning Parameters

PP05 Normal Settings 'CU10'

		Unit	ACTUAL setting	Default setting	Min. setting	Max. setting
Unit	Unit Model for CMC-12		***cu10***	CCLA	CLLA	HrEC
	Compressor number		***Cn***	Cn01	Cn01	Cn08
	Loading valve capacity		***L***	L50	L00	L50
	Loading valve polarity			LPoS	LPoS	LnEg
	Capacity input polarity			CnEg	CnEg	CPoS
	Motor Start Loading valve polarity			Spos	SnEg	SPoS
	Trip input polarity			tPoS	tPoS	tnEg
	Reset for LP trip (manual/automatic)		***LP***	LP-A	LP-A	LP-r
	Current Transformer rating **(If Set to Zero controller assumes ct is 100:1, and No FAIL action on NO LOAD)**		***t***	t100	t 00	t255
	Starts per hour		***SH***	SH12	SH02	SH12
	Oil differential trip guardtime	secs	***ot***	ot30	ot00	ot99
Adj=	Hours run adjustment			0.00	0.00	65.52
PP11 level 2 Settings 'CU10'						
rtc=	Real Time (hours)		***rh***	rh99	rh00	rh23
	Real Time (minutes)		***rt***	rt99	rt00	rt59
Port	RS485 communication port baud rate **SET TO 300 Baud when used with CPC25**			300	9600	none
SCAL	Pressure transducer scaling					
	4mA value bar gauge **Set to ZERO when no Transducer Fitted**	barg	***L***	L-10	L-99	L 99
	20mA value bar gauge **Set to ZERO when no Transducer**	barg	***H***	H 24	H-99	H 99

		Unit	ACTUAL setting	Default setting	Min. setting	Max. setting
	Fitted					

PP05 Normal Settings 'rCL'						
Unit	Unit model for CMC-12			CCLA	CLLA	HrEC
	Control mode selection		***rCL***	rCL	rCL	r485
	Alarm output ALL alarms or Trips only		***ALL***	ALL	trip	
	System number		***Sn***	Sn01	Sn01	Sn80
	Compressor number		***Cn***	Cn 1	Cn 1	Cn 8
	Unit Address		***A***	A 01	A 00	A255
	Suction pressure transducer address		***u***	u 00	u 00	u255
	Central system type			Agt	Agt	SYS5
CPrS	Suction control setpoint	bar.g	***c***	c 2.0	c -1.0	c 5.0
	Suction control deadband	bar	***db***	db0.1	db0.1	db1.0
	Loading valve polarity			LpoS	LPoS	LnEg
	Capacity input polarity			CnEg	CnEg	CpoS
	Motor Start Loading valve polarity			SpoS	SnEg	SPoS
	Trip input polarity positive or negative			tPoS	tPoS	tnEg
Suct	Low level	bar.g	***L***	L 0.5	L-1.0	L 5.0
	Low level guardtime	mins	***gL***	gL 0.1	gL0.1	gL9.9
	High level	bar.g	***H***	H 3.5	H-1.0	H 9.9
	High level guardtime	mins	***gH***	gH4.0	gH0.1	gH9.9
	Stand-by Delay	mins	***Sd***	Sd0.0	Sd0.1	Sd9.9
	LP reset manual/automatic		***LP***	LP-A	LP-A	LP-r
dELy	Starts per hour allowed for compressor		***SH***	SH12	SH02	SH15
	Stage up time	mins	***Su***	Su0.2	Su0.2	Su9.9
	Stage down time	mins	***Sd***	Sd0.2	Sd0.2	Sd9.9
	After stop delay time	secs	***At***	At30	At99	At 0
	Delay time between motor start A and motor start B outputs	secs	***bt***	bt1.0	bt0.1	bt9.9
	Oil differential trip guardtime	secs	***ot***	ot30	ot00	ot99
LoAd	Minimum amps level before allowing compressor loading		***LA***	LA30	LA00	LA99
	Current Transformer rating		***t***	t100	t 00	t255
Adj=	Adjust compressor thousand hours run		***Adj***	0.00	0.00	65.52

PP11 level 2 Settings 'rCL'						
r t c=	Real Time (hours)		***rh***	rh99	rh00	rh23
	Real Time (minutes)		***rt***	rt99	rt00	rt59
Port	RS485 communication port baud rate			300	9600	none
SCAL	Pressure transducer scaling					
	4mA value bar gauge		***L***	L-10	L-99	L 99
	20mA value bar gauge		***H***	H 24	H-99	H 99
PP05 Normal Settings 'CMC-12 (Heat Reclaim)'						
Unit	Unit model for CMC-12		***HrEC***	CCLA	CLLA	HrEC
	Address is always = 8 for HrEC units		***Cn***	Cn08	Cn01	Cn08
PP11 level 2 Settings 'CMC-12 (Heat Reclaim)'						
r t c=	Real Time (hours)		***rh***	rh99	rh00	rh23
	Real Time (minutes)		***rt***	rt99	rt00	rt59
Port	RS485 communication port baud rate			300	9600	none
SCAL	Pressure transducer scaling					
	4mA value bar gauge		***L***	L-10	L-99	L 99
	20mA value bar gauge		***H***	H 24	H-99	H 99

Index

M I C R O M
Tel. +44 (0) 1270 760599
Fax. +44 (0) 1270 766804
Email: sales@microm-electronics.com
www.microm-electronics.com