GUARDIAN SCC-20

Screw Compressor Controller for coldstores and supermarkets

- **Suction pressure setpoint control of up to 2 compressors**
- **Discharge pressure setpoint control of up to 4 stages of condenser fans**
- **Compressor monitor with capacity, pressure & hours-run displays**
- **Alarm, trip & load monitoring**
- **Local panel operation & setup of timers, limits and configuration**
- **Remote RS485 monitoring and setup**

Operation and Setup Manual

The SCC-20 screw compressor controller provides suction pressure setpoint control and alarm monitoring for up to two compressors plus discharge pressure control for up to four stages of condenser fans.

Pushbuttons on the local control panel permit operator display of setpoints, pressures, temperatures, liquid level, alarm and trip settings, compressor load, run hours and status. Control strategy, setpoints, alarm and trip settings may be changed from the panel after entry of the appropriate passcode.

The SCC-20 communicates with a GUARDIAN Autograph Terminal which provides remote central alarm monitoring, data recording and graphs.

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Contents

Getting Started

Guardian Controllers provide refrigeration engineers with

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

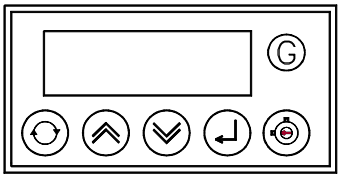
This manual provides refrigeration designers, installers, service mechanics and supermarket personnel with the necessary information to achieve the above objectives.

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 two position **keyswitch** may be used to toggle display case control status from OFF to FANS only and back to AUTO
The Keyswitch is not used on any compressor controllers.

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 =4.8

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

SCC20 Controllers operate at **230vac**

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'.**

Control Type

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

Enter Passcode PP05 as button sequence above

@:@ Unit ? C2LF @:@ SPd= ? Std=

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. SPd) and then press **'enter'** which causes the display to wink briefly and display the new unit model selection(e.g. SPd)

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 31

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 (SCC-20)

SCC-20 'STD'	2 Compressors with 2 steps loading each, plus 4 Fans
SCC-20 'SPD'	1 Variable Speed Compressor and I Compressor with 2 stages of loading, plus 4 Fans

GENERAL SPECIFICATION

Power	**SCC-20 + 16X extension unit**	230 Vac 50 Hz 10VA
Operation	0 to 55ºC	

Approx. dimensions,2 Enclosures each of: - Width 70 x length 100 x height off rail 110mm.

The SCC-20 controller is housed in two DIN rail mounting enclosures, each with 20 screw clamp connectors.

SCC20

CONTROLLER OPERATION

Std = Standard

2 Fixed Speed Compressors With Capacity Loading

Any Compressor may start first
Running Compressor will modulate capacity relative To Suction Pressure
Running Compressor at 100% Max. and stage up timer satisfied, then
Second Compressor starts
IF in **un01** then
Second Compressor will modulate capacity relative To Suction Pressure
Second Compressor at 50% Min. and stage down timer satisfied, then
Second Compressor stops
IF in **un02** then
Both Compressors will modulate capacity relative To Suction Pressure
Both Compressors to be at 50% Min. and stage down timer satisfied before any Compressor is allowed to stop.

****

SPd = Speed

1 Variable Speed Compressor + 1 Fixed Speed Compressor with Capacity Loading

Compressor 1 is first to start
Compressor 1 Modulates speed relative to Suction Pressure
Compressor 1 at 100% Max. and stage up timer satisfied, then
Compressor 2 at 50%
Compressor 1 Modulates speed relative to Suction Pressure
Compressor 1 at 100% Max. and stage up timer satisfied, then
Compressor 2 at 75%
Compressor 1 Modulates speed relative to Suction Pressure
Compressor 1 at 100% Max. and stage up timer satisfied, then
Compressor 2 at 100% Max.
Compressor 1 at 0% Min. and stage down timer satisfied, then sequence is reversed.

IF Compressor 2 starts first due to the unavailability of Compressor 1, the normal sequence is restored when Compressor 1 is next made available.

****

Note. Economiser Output **on** only when **both** items 1 & 2 are satisfied.
1, Suction Pressure Is Below **E** value (Economiser Setpoint)
2, Compressor Capacity is at or above 75% load.

Note. The **un** value has no effect in **SPd**

SCC-20 'STD' and 'SPD' Input/Output Signals

STD	SPD			
Analogue Inputs				**Terminals**
P1 LP	P1 LP	Suction Pressure	-1 to 24 bar	**Main unit 23/24**
P2 HP	P2 HP	Discharge Pressure	-1 to 24 bar	**Main unit 25/26**
T1 Temp	T1 Temp	Suction Temp 2.2kohms @25°C	-40 to +40°C	**Main unit 4/9**
T2 Temp	T2 Temp	Discharge Temp 22kohms @25°C	0 to +90°C	**Main unit 4/10**
Analogue Output				
	SPEED	Compressor 1	0 to10 vdc	**Main unit 21/22**
Digital Inputs		**230 vac**		
230v Mains	**230v Mains**	**230v Mains**		**Main unit 20**
230v Mains	**230v Mains**	**230v Mains**		**Extn. Unit 20**
Neutral ac	**Neutral ac**	**Neutral ac**		**Main unit 19**
Neutral ac	**Neutral ac**	**Neutral ac**		**Extn. Unit 1**
Neutral ac	**Neutral ac**	**Neutral ac**		**Extn. Unit 19**
Phase Fail	**Phase Fail**	230vac (Negative Trip)		**Main unit 18**
C1 Run	**C1 Run**	230vac (Positive input)		**Extn. Unit 2**
C2 Run	**C2 Run**	230vac (Positive input)		**Extn. Unit 3**
C1 Start available	C1 Start available	230vac (Positive input)		**Extn. Unit 4**
C2 Start available	C2 Start available	230vac (Positive input)		**Extn. Unit 5**
Oil level	Oil level	230vac (Positive input)	alarm/trip	**Extn. Unit 6**
Liquid Level	Liquid Level	230vac (Positive input)	alarm	**Extn. Unit 8**
C/Fan Overload	C/Fan Overload	230vac (Positive input)	alarm	**Extn. Unit 9**

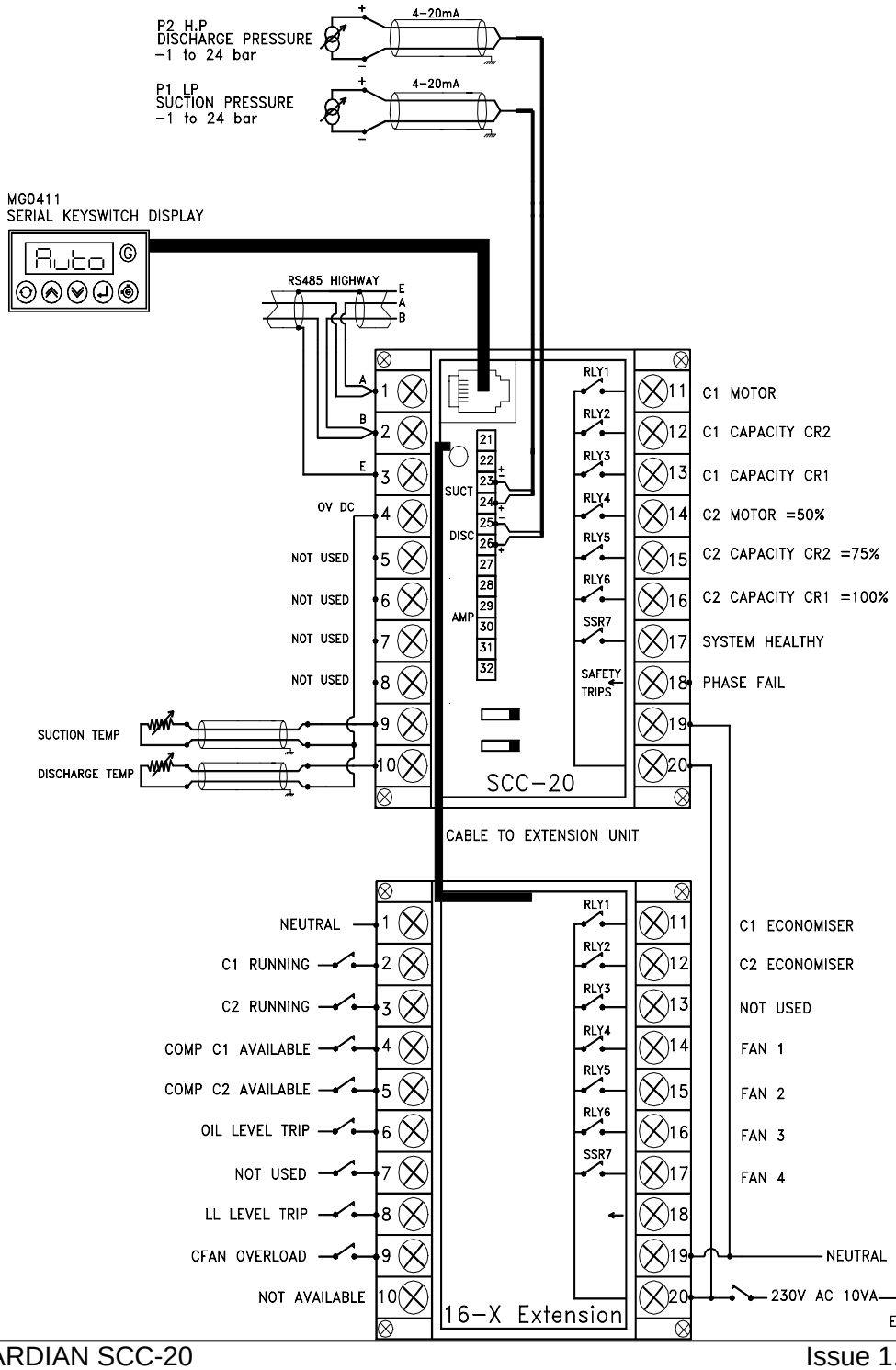
MAIN UNIT				
Relay Outputs		**230 AC 3 amp. Maximum Accumulative Current 10 amp.**		
RLY1	RLY1	Compressor Motor 1 (50% if **STD)**	C1 Start	**Main unit 11**
RLY2	RLY2	Loading Valve (75% if **STD)**		**Main unit 12**
RLY3	RLY3	Loading Valve (100% if **STD)**		**Main unit 13**
RLY4	RLY4	Compressor Motor 2 (50% if **STD)**	C2 Start	**Main unit 14**
RLY5	RLY5	Loading Valve (75% if **STD)**		**Main unit 15**
RLY6	RLY6	Loading Valve (100% if **STD)**		**Main unit 16**
SSR7	SSR7	System Healthy		**Main unit 17**

SCC-20 ‘STD’ and ‘SPD’ Input/Output Signals Continued

16X EXTENSION UNIT				
Relay Outputs		**230 AC 3 amp. Maximum Accumulative Current 10 amp.**		
STD	**SPD**			**Terminals**
RLY1	RLY1	C1 Economiser on		**Extn. unit 11**
RLY2	RLY2	C2 Economiser on		**Extn. unit 12**
RLY3	RLY3	NOT USED		**Extn. unit 13**
RLY4	RLY4	Condenser Fan-1		**Extn. unit 14**
RLY5	RLY5	Condenser Fan-2		**Extn. unit 15**
RLY6	RLY6	Condenser Fan-3		**Extn. unit 16**
SSR7	SSR7	Condensor Fan-4		**Extn. unit 17**

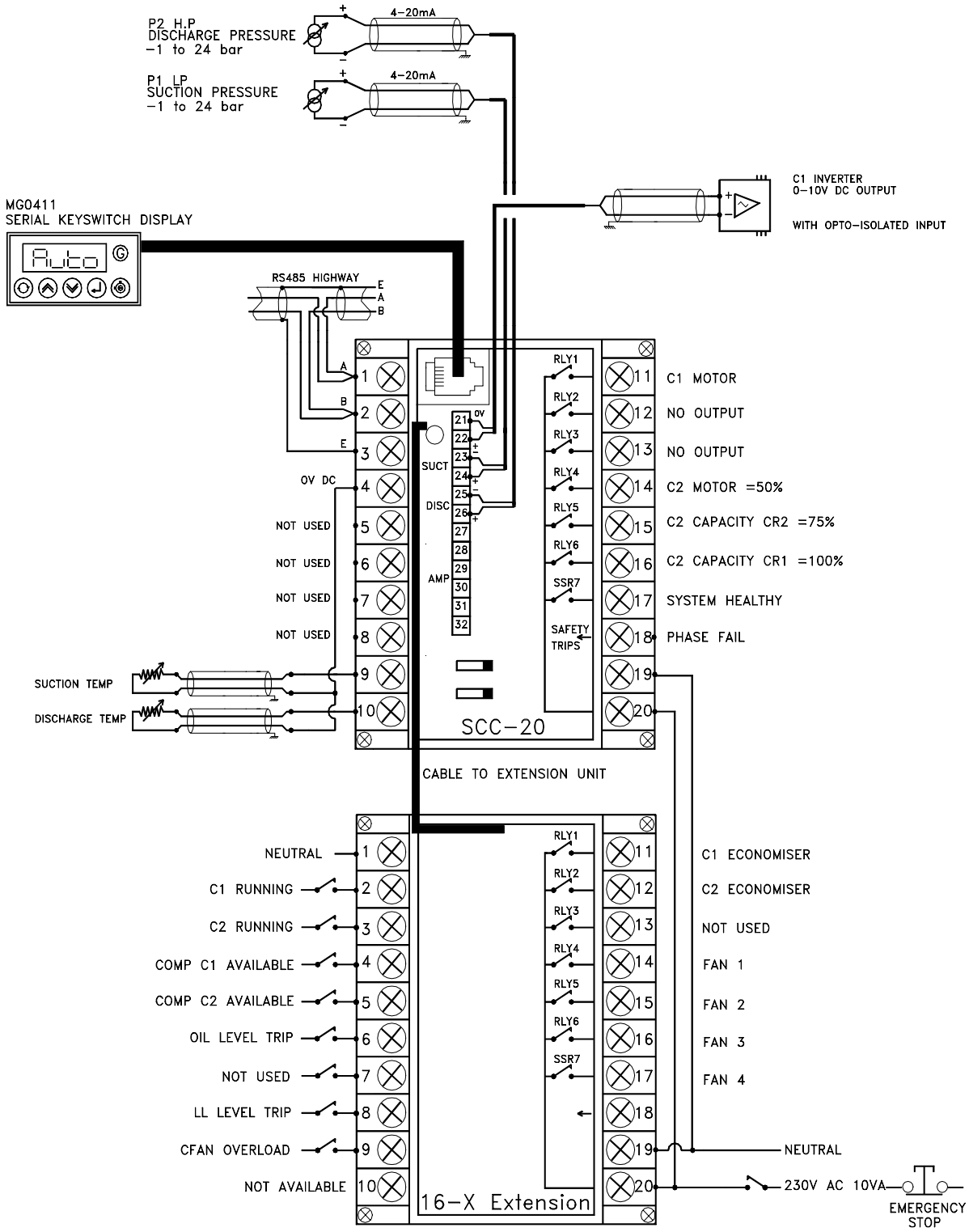
SCC-20 'STD'

SCC-20 Termination Wiring - 'STD' model selection



SCC-20 'SPD'

SCC-20 Termination Wiring - 'SPD' model selection

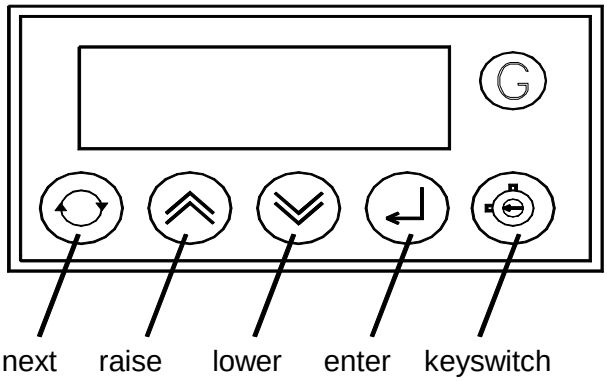


OPERATION

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

Compressor suction pressure
Condenser discharge pressure.

Display of other temperatures pressures etc by pressing'next' @ button,
the values displayed depend on the unit model selected.
The keyswitch. Is not used on the SCC20
Passcode protected setup of controller setpoints, timers and limits.
Alarms and trips are reset by pressing accept



DISPLAY INDICATIONS

Compressor Displays

The following displays are available by repeatedly pressing @ .Value displays are alternated with an identification Tag (ie 'Suct') which is displayed for a quarter time:-

Tag	Value	
Suct	==2.3	Suction pressure (-1 to 24barG)
CAP=	=100	Total Pack Capacity % (0 to 100 %) (capacity raise/lower operative in HAnd control mode)
S-uP	==3.5	Stage up timer count
S-dn	==0.3	Stage down timer count
	Auto	Pack Auto control mode (press 'accept')
	OFF=	Pack OFF control mode (press 'accept')
	hAnd	HANd control mode (press 'accept') (enables raise/lower buttons)
CPrS	1=11	Compressor motors running status
triP	==11	Motor trip status
=St=	=-36	Suction temperature
SPd=	=100	Variable Speed Output % of 0-10v
CSEt		Request compressor parameter change
FAnS	?	Press ? 'accept' to display discharge

CONDENSER FAN DISPLAYS MAY ALSO BE SELECTED BY PRESSING 'Lower' with 'Suct' on display

COMPRESSOR SETTINGS MAY ALSO BE SELECTED BY PRESSING 'Raise' with 'Suct' on display

Default Displays

The default suction pressure display

==2.3	Suction pressure (-1 to 24barG)

is during AUTO or restart sometimes replaced by

8888	During restart
C2LF	Unit model configuration selected
u1.OA	(Software version)
-OFF	If unit selected OFF
HAnd	If unit selected hand control
=PC= FAiL	if RS485 comms watchdog fail

TRIPS AND ALARMS

PACK AND COMPRESSOR SAFETY TRIPS

Pack trips always de-energise the system healthy output, stops all motors and de-energises the loading valve and fan relays.
Compressor Motor trips only stop the appropriate compressor.
ALL Trips are RESET locally by pressing the 'enter' button.
The last safety trip input detected is automatically displayed with a flashing alternative **'triP'** message.

The **'next'** button may always be used to view other displays.

Trip messages displayed depend on the unit model and the configuration selected.

Analogue Trips

Suct =oc= FAiL	Suction pressure open circuit
diSc =oc= FAiL	Discharge pressure open circuit
diSc 18.6 triP	Discharge pressure high trip

Action
All Analogue Trips require **MANUAL RESET**, a pack **SHUTDOWN** occurs and **RELAY SS7** output (Healthy Signal On Main Control Unit) is Turned **OFF.**

Digital Trips

Safety Trip Messages from digital inputs include:-

Oil= triP	Oil Level Low Trip (Only If Oil t Selected)
PhAS triP	Phase Failure Trip (Negative Input To Trip)

Action

All Digital Trips require **MANUAL RESET**, a pack **SHUTDOWN** occurs and **RELAY SS7** output (Healthy Signal On Main Control Unit) is Turned **OFF.**

System Healthy Output

IF a pack Safety trip occurs or suction pressure or discharge pressure signal inputs detect an open circuit FAIL or exceed trip limits then the System Healthy output is removed.

ALARMS

Analogue Alarms

If the suction pressure value goes outside the high or low alarm limits then the appropriate value is displayed with a flashing alternative '**Hi**' or **'Lo**' alarm message.

Suct -0.8 =Lo	Suction Pressure Low alarm, **ACTION = Alarm +ALL COMPRESSORS IMMEDIATE STOP + Auto Reset**
Suct 10.8 Hi=	Suction Pressure High alarm, **ACTION = Alarm + Auto Reset**

Digital Alarms

Digital alarm messages include: -

LEu= Lo-A	Liquid Level Low Alarm
FAn= ALr=	Condenser Fan Overload Alarm
Oil= ALr=	Oil Level Low Alarm (Only If OilA Selected)

PC-FAIL ALARM

If the SCC20 unit is in **'Auto'** mode and a valid status request has not been received for 60 seconds via the RS485 highway then a Watchdog timer **'PC/FAIL'** message is displayed.
This alarm is reset if 485 communications are restored or the AGT/SYS5/Locl/nonE is set to **'LocL'** or **'nonE'** in unit settings.

=PC= FAIL	if RS485 comms watchdog fail

MODE CHANGE Compressors

Pressing 'next' until the pack mode selections are on display and then pressing **'enter'** changes the pack mode to the new selection displayed.

Auto	AUTO pack control mode with compressor control on suction pressure
oFF=	-OFF = pack control stopped (standby operation)
hAnd	hAnd = pack control in local manual operation

Pack Capacity Manual

With the pack mode selected to HANd, the pack capacity can be increased or decreased by pressing **'raise'** or **'lower'** buttons when the pack capacity is on display.

@:@ HAnd ?
@:@ CAP= ==50 /:/ ==75 ?

GLOBAL RS485 COMMANDS

IF all compressors are tripped or the unit is in **'OFF'** mode and Trip Settings are **'CoFF'** then a GLOBAL RS485 **'OFF'**command is sent to all case controllers on the same section of RS485 Highway to prevent liquid floodback.

A GLOBAL RS485 **'AUTO'** command is sent on **restart**, when trip **'reset'** is pressed or when control mode is selected **'AUTO'**.
A GLOBAL RS485 **TIME** synchronisation command is sent to all case controllers twice per day if **Agt/SYS5/Locl/nonE** protocol selected is **'LocL'**

CONDENSER FAN DISPLAY

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

diSc	14.5	Discharge pressure
FAnS	===3	Number of fans running (No. of fans running changed by raise/lower buttons if HANd selected)
dELY	==13	Fan stage delay timer (secs)
Auto		Auto control mode (press 'accept')
oFF=		OFF control mode (press 'accept')
hAnd		Hand control mode (press 'accept') (enables raise/lower buttons)
triP	11==	Fan trip status
=dt=	==69	Discharge Temperature
FSEt		Request parameter change for FANS (press accept & raise to PP05)

Return to compressor display
COMPRESSOR DISPLAYS MAY ALSO BE SELECTED BY PRESSING 'Lower' with 'Disc' on display

CONDENSER SETTINGS MAY ALSO BE SELECTED BY PRESSING 'Raise' with 'Disc' on display

HIGH DISCHARGE PRESSURE

If the discharge pressure goes outside the high alarm limit then the pressure value is displayed with a flashing alternative 'Hi' alarm message.

diSc 10.8 ==Hi	Discharge Pressure High alarm

FAN OVERLOAD TRIPS

Any fan overload trip displays the message

FAn= ALr=	Condenser Fan Overload

MODE CHANGE CONDENSERS

Pressing 'next' until the condenser mode selections are on display and then pressing 'enter' changes the condenser mode to the new selection displayed.

Auto	Auto AUTO fan control mode with compressor control on discharge pressure
OFF=	Fan control stopped
hAnd	Fan control in local manual operation

FAN CAPACITY MANUAL

With the fan mode selected to 'HANd', the condenser capacity can be increased or decreased by pressing 'raise' or 'lower' buttons when the fan capacity is on display.

@:@ HAnd ?

@:@ CAP= ==50 / : / ==75 ?

A maximum of seven fan stages (fans or valves) are sequenced up or down.

USEFUL BUTTON SEQUENCES

The following button sequences should prove useful during normal service operation

Reset ALARM or TRIP

diFF triP ? =2.4

RESET

Change suction control setpoint and differential

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

@:@ cprs ?

@:@ c=2.0 /:/ c=2.5 ? c=2.5

@ cd01 /:/ cd02 ? cd02

@:@ End= ? =2.6

Check Unit Model

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

@:@ Unit ? SPd= This unit model is 'SPd'

@:@ End= ? =2.6

Select Stub, Case No and Address

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

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

@:@ unit ?

@:@ Sn01 /:/ Sn60 ? Sn60

@ Cn01 ? Cn01

@ A001 /:/ A180 ? A180

@:@ End= ? =2.6

SETUP OPERATION

Setup operation lasts for a maximum of 5 minutes after being activated by pressing ? with CSEt or FSEt on the display panel.
On entry to Setup passcode PP00 is displayed.

To change any settings passcode PP05, or PP11 must be first selected using / and ? pushbuttons.

If the correct passcode is not entered then setup values may be displayed but any attempted changes are ignored.

Compressors	**Condenser Fans**	**Settings Level 2**	
CSEt	FSEt	CSEt	Press ?
PP00	PP00	PP00	Set passcode PP05, or PP11 by using the < and / pushbuttons
PP05 ?	PP05 ?	PP11	Press ?

PP11 menu page 30

PP05 Condenser menu page 22

PP05 Compressor menu page 22

Setup Functions (Normal) passcode 05

PP05 Menu

Press @ to sequence through the following PP05 Menu selections:-
Press ? to select the displayed menu

Compressors

Unit	Unit	Unit model setup SCC-20 Page 23
CPRS	CPrS	Compressor setup Page 24
Loop	Loop	Variable Speed Compressor Control Page 25
Delay	dELY	Compressor delay timers Page 25
Suction	Suct	Suction pressure alarm levels Page 26
Trip	triP	Trip inputs and control Page 26
Size	SIZE	Compressor sizes Page 26
Test	tESt	Force relays on/off Page 26
End	End=	Return to suction pressure display

Condenser Fans

Cond	Cond	Condenser configuration Page 28
Fans	FAnS	Fan control settings Page 28
Delay	dELY	Fan control delays Page 27
Fanp	FAnP	Fan pressure Alarm Limits Page 29
End	End=	Return to condenser pressure display

Compressor Settings

Unit
Un i t

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Unit Model

YYYY

YYYY = C2LF 2 Compressor Control + 2 Loaders + 4 Fans

Control Type

YYYY

YYYY = SPd= 1 Variable Speed Compressor + 1 Compessor with 2 capacity steps

YYYY = Std= 2 Compessors each with 2 capacity steps

System number Snnn nn = 1 - 255

Monitor Address Annn nnn = 1 - 255
SCC20 units require 5 addresses in sequence

Comms protocol YYYY

YYYY = Agt= Autograph terminal PC

SYS5 Woodley System 5

LocL Local highway only

nonE If 'Locl' or 'nonE' is selected the 'PC FAIL' message is not displayed

CPrS
CP r s

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Pack suction control setpoint — c=2.1 — n.n = -0.6 to 5.0

Control deadband — dbn.n — nn = 0.1 to 1.0

Capacity Loading valve polarity — CYYY

YYYY = CpoS Positive
CnEg Negative

Starting Output for loading valve — SoYY

YYYY = SoFF Output Off
Son= Output On

Number of Compressors to be run unloaded before stopping a motor — unYy

YYYY = un01 1 Compressor
un02 2 Compressors

Fast response deadband — FbY.Y — yy = 0.1 to 2.0

stage up control algorithm — CAuy — u = 0 to 9

stage down control algorithm — CAdy — d = 0 to 9

u/d determines rate of response when outside fast deadband with relation to amount of error from setpoint.
Stage time = stage-delay - (stage-delay x error from setpoint) / Control Algorithm
FAu0 = not used.
FAu9 = fastest fan response
i.e. Greater u / d value then the shorter the stage up / down time will be for a given error.

Economiser — E=Y.Y — yy = -0.6 to 5.0 bar.

Economiser on when Suction Pressure is **below**

setpoint and Compressor Is **Loaded 75% or Greater.**

LooP
LooP

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Proportional Gain	Pyy.y	YYY = 0.0 to 23.0 Multiplier Gain Factor of Differential of actual Suction Pressure relative to Setpoint.
Integral Gain	Iyy.y	YYY = 0.0 to 23.0 Constant Gain relative to Suction Setpoint.

dELY
dELY

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Control delays

Starts per hour	SHnn	nn = 2 to 25 e.g. 4= 1 start every 15mins commencing from start output, if the compressor stops before this 15min period then it will not restart until the 15mins have elapsed. **NB Delay after stop timer has also to be satisfied.**
Stage up delay	Sun.n	n.n = 0.2 to 9.9 mins Compressor at Max Load before next compressor is started
Stage down delay	Sdn.n	n.n = 0.2 to 9.9 mins Compressor at Min Load before compressor is stopped
Delay after stop	dAn.n	n.n = 0.1 to 9.9 mins
Starting Period for receipt of run signal	SPnn	n.n = 15 to 60 secs If Signal not received after 3 attempted starts then TRIP.
Oil Alarm/Trip delay	odnn	n.n = 00 to 60 secs

Liquid Level delay	Ldnn	n.n = 00 to 60 mins
Available signal timer	Atnn	n.n = 00 to 60 mins Alarm after timeout with no run signal present.

Suct
Suct

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Suction pressure low alarm limit	L=n.n	n.n = -1.0 to 5.0
Suction pressure high alarm limit	Hnn.n	nn.n = 0 to 20.0

triP
triP

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

GLOBAL RS485 command action after all compressors tripped or OFF	CYYY	CoFF = Cases OFF on highway section CnoA = Cases no Action on trip

SIZE
SIZE

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Size 1st compressor	1Cnn	nn = 0 to 1
Size 2nd compressor	2Cnn	nn = 0 to 1

Number of sizes displayed depends on unit model
Size 0 means no compressor fitted

Test
tESt

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

Relay R1	1OFF 1=on	
Relay R2	2OFF 2=on	
Relay R3	3OFF 3=on	
	etc	
Relay R7	7OFF 7=on	
16-X Relay R1	AOFF A=on	C1 Economiser
16-X Relay R2	bOFF b=on	C2 Economiser
	etc	
16-X Relay R6	FOFF F=on	Fan 4
16-X Relay R7	GOFF G=on	Not Used

End

End= Exit settings change and return to default compressor display

Condenser Settings

Cond
Cond

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Fan control selection	=YYY	YYY = Lin - Linear Fan stage up stage down (last on first off) rot = Sequential rotation of fans, with first fan to start being first fan to stop.
Max. number of fans	Fn=n	n = (0 - 4)

FAnS
FAnS

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Control settings

Fan control setpoint	Fnn.n	nn.n = 0 to 23.0
Control deadband	dbn.n	nn = 0.1 to 5.0 (0.1 bar inc)
Fast response deadband	FbY.Y	yy = 0.1 to 5.0 (0.1 bar)
Stage up control algorithm	FAuy	u = (0-9)
Stage down control algorithm	FAdy	d = (0-9)

u/d determines rate of response when outside fast deadband with relation to amount of error from setpoint.
stage time = stage_delay - (stage_delay x error from setpoint) / Control Algorithm.

i.e. Greater ud value then the shorter the stage up time will be for a given error.
FAu0 = not used.
FAu9 = fastest fan response.

dELY
dELY

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Control delays

Fan stage delay — Fdnn — nn = 0.1 to 3.0 mins

FAnP
FAnP

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Fan pressure Alarm Limits

Discharge pressure Hi-alarm limit — Hnn.n — nn.n = 0 to 23.0

Discharge pressure Hi-trip limit — tnn.n — nn.n = 0 to 23.0

End
End=

Return to condenser pressure display

PP11 Menu - SETTINGS LEVEL 2

rtc
r t c=

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Real Time Clock

real time hours	r h n n	nn = 0 - 23 hours
real time minutes	r t n n	nn = 0 - 59 minutes

SCAL
SCAL

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Pressure transducer 1	=P1=	Press ?
	L-n.n	4ma value bar gauge
	Hnn.n	20ma value bar gauge
Pressure transducer 2	=P2=	Press ?
	L-n.n	4ma value bar gauge
	Hnn.n	20ma value bar gauge
Clear compressor runhours	CLrH	Press ?
	SurE	Are you sure? if so press accept to clear all run hours

End
End=

Exit settings change
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
and coldstore stub 45 has address 45/1

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

e) Receive Time and Date with new hours and minutes, day, month and year for real time clock

f) Remote Reset of alarm or trip

g) ON auto / unit OFF selection from PC

Setup / commissioning Parameters

PP05 Normal Menu Compressor Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Unit	Model for SCC-20		C2LF	C2LF	C2LF	C2LF
	Control selection		***S***	Std.	Std.	SPd
	System number		***Sn***	Sn01	Sn01	S255
	Monitor Address		***A***	A 01	A 01	A255
	Monitor Comms Protocol			Agt	Agt	nonE
	Oil Alarm or Oil Trip		***OiL***	OiLA	OiLA	OiLt
Cprs	Pack suction control setpoint	bar	***c***	c 0.0	c-0.6	c 5.0
	Control deadband	bar	***db***	db0.1	db0.1	db1.0
	Capacity Loading valve polarity		***C***	Cneg	Cneg	CPoS
	Starting Period Loading Valve Ouput		***So***	SoFF	SoFF	SoN
	Number Of Comps with unloaders		***un***	un01	un01	un02
	Fast response deadband	bar	***Fb***	Fb0.1	Fb0.1	Fb2.0
	Stage up control algorithm		***CAu***	CAu0	CAu0	CAu9
	Stage down control algorithm		***CAd***	CAd0	CAd0	CAd9
	Economiser on below, when>75%load	bar	***E***		E-0.6	E 5.0
Loop	Proportional Gain (Multiplier Factor of Differential Suction Pressure Relative to Setpoint)		***P***	P	P 0.0	P23.0
	Integral Gain (Constant Relative To Suction Setpoint)		***i***	i	i 0.0	i 23.0
dELY	Starts per hour		***SH***	SH12	SH02	SH25
	Stage up delay	mins	***Su***	Su0.2	Su0.2	Su9.9
	Stage down delay	mins	***Sd***	Sd0.2	Sd0.2	Sd9.9
	Delay After Stop	mins	***dA***	dA1.0	dA0.1	dA9.9
	Starting Period for run input signal	secs	***SP***	SP	SP15	SP60
	Oil Delay Alarm/Trip On Input	secs	***od***	od	od00	od60
	Liquid Level Delay On Input	mins	***Ld***	Ld	Ld00	Ld60
	Comp Available Signal Not Present	mins	***At***	At	At00	At60

PP05 Normal Menu Compressor Settings Continued

		unit	ACTUAL settings	**Default setting**	Min. setting	Max. setting
Suct	Suction pressure low alarm limit	bar	***L***	L-1.0	L-1.0	L 5.0
	Suction pressure high alarm limit	bar	***H***	15.0	0.0	20.0
trip	GLOBAL RS485 command action			CnoA	CoFF	CnoA
SIZE	Size 1st compressor	%	***1C***	01	00	01
	Size 2nd compressor	%	***2C***	01	00	01

PP05 Normal Menu Condenser Settings

Cond	Fan control selection			Lin	Lin	rot
	Number of fans		***Fn***	Fn00	Fn00	Fn04
FAnS	Fan control setpoint	bar	***F***	F0.5	F 0.0	F23.0
	Control deadband	bar	***db***	db0.1	db0.1	db5.0
	Fast response deadband	bar	***Fb***	Fb0.1	Fb0.1	Fb5.0
	Fast response Algorithm up	bar	***FAu***	FAu0	FAu0	FAu9
	Fast response Algorithm down	bar	***FAd***	FAd0	FAd0	Fad9
dELY	Fan stage delay	mins	***Fd***	Fd0.1	Fd0.1	Fd3.0
FAnP	Discharge pressure Hi-alarm limit	bar	***H***	H15.0	0.0	23.0
	Discharge pressure Hi-trip limit	bar	***t***	t22.0	0.0	23.0

PP11 Menu - Settings Level

		unit	ACTUAL settings	**Default setting**	Min. setting	Max. setting
r t c =	Real time hours	Hrs	***rh***	rh00	rh00	rh23
	Real time minutes	mins	***rt***	rt00	rt00	rt59
SCAL	Pressure Transducer 1 4ma bar gauge	bar	***L***	L-01	-13	242
	Pressure Transducer 1 20ma bar gauge	bar	***H***	H24	-13	242
	Pressure Transducer 2 4ma bar gauge	bar	***L***	L-01	-13	242
	Pressure Transducer 2 20ma bar gauge	bar	***H***	H24	-13	242
CL r H	Clear Compressor run hours to zero		***SurE***	if yes	enter	if not press next

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