

GUARDIAN SCC

40/35/30/25

Screw Compressor Controllers

- Compressor status monitor with pressure, temperature, slide and load displays
- Control by suction pressure setpoint or remote 5th pressure
- Control by suction equivalent temperature setpoint or remote 5th temperature
- Alarm and trip monitoring
- Compressor, pump, slide and speed control
- Economiser, heater and liquid injection control
- Optional Automatic volumetric slide control
- Multiple compressor system control
- Local panel operation and set-up
- Communications for remote monitoring and set-up
- Auto VI Control

Operation and Set-up Manual

GUARDIAN SCC-40/35/30/25 Screw Compressor Controllers provide suction pressure setpoint control and alarm monitoring for one screw compressor. Alternatively the unit may be set-up to control on water chiller, glycol chiller or equivalent temperature.

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Contents

GUARDIAN	1
SCC	1
40/35/30/25.....	1
GETTING STARTED.....	4
BUTTON OPERATION SHORTHAND.....	5
HARDWARE CONFIGURATION CHECKS	5
CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS.....	6
Enter Passcode	6
Select Unit Model.....	6
Select System No and Address	7
RS485 Communications	7
UNIT MODELS.....	8
OVERVIEW.....	8
Functions.....	8
Displays.....	9
Pushbuttons.....	9
GENERAL SPECIFICATION	11
Consultant Format	12
AVAILABLE UNIT MODELS	13
SCC-40 Input/Output Signals.....	14
SCC-40 Termination Wiring -.....	15
SCC-35 Input/Output Signals.....	16
SCC-35 Termination Wiring -.....	17
SCC-30 Input/Output Signals.....	18
SCC-30 Termination Wiring -.....	19
SCC-25 Input/Output Signals.....	20
SCC-25 Termination Wiring	21
OPERATION	22
SCC40 PANEL LAYOUT	22
LED LAMPS.....	23
SYSTEM STATUS DISPLAYS.....	24
SAFETY TRIP INDICATIONS.....	27
DISPLAY PUSHBUTTON OPERATION	28
'view'.....	28
'type'.....	28
CONTROL PUSHBUTTON OPERATION.....	31
"mode".....	31
"Mode-MANUAL"	31
"Mode-AUTOMATIC"	31
"RESET"	31
"Call Frig Engineer".....	32
"stop"	32
"start"	32
"Lower"	32
"Raise"	32
SETTINGS CHANGE PUSHBUTTON OPERATION.....	33
"next"	33
"Accept"	33
"raise"	33

“Lower”	33
“RESET”	33
ALARM ACCEPT AND RESET PUSHBUTTON OPERATION.....	34
SETPOINTS.....	36
CONTROL MODES	38
CONTROL	39
COMPRESSOR CONTROL OPERATION	39
POWER UP	39
READY/WAITING	39
STARTING	40
RUNNING	41
STOPPING	42
MODES CHANGES	43
TWO SPEED MOTOR CONTROL.....	44
MANUAL MODE 2-SPEED	44
VARIABLE SPEED MOTOR CONTROL	44
TWO COMPRESSOR-SINGLE MOTOR OPERATION.....	47
AUTOMATIC STANDBY COMPRESSOR CHANGEOVER AFTER TRIP	50
NOTES ON SET-UP OF AUTO VI FOR HOWDEN COMPRESSOR	51
Auto VI Operation:.....	51
Procedure	52
Auto VI Commissioning Parameters.....	53
Auto VI Drawing.....	55
Auto VI Wallbox Wiring	56
TIMER SETPOINTS.....	57
SETUP	59
Compressor Settings	59
Unit Settings:	59
System Settings.....	60
Port Settings	61
Analog	61
Test	62
Done.....	62
TWO SPEED MOTOR CONTROL SELECTION.....	63
TRANSDUCER SETUP & CALIBRATION	64
COMMUNICATIONS.....	67
MAIN SET-UP/ COMMISSIONING PARAMETERS	68
Setup / Commissioning Parameters	71
PRESSURES	71
TEMPERATURES	72
EQUIVALENTS	72
DIFFERENTIALS.....	73
TIMERS	74
Settings display and change facilities.	75
SCC-40 Enclosure wiring: for trips negative	77
SCC-40 Enclosure wiring: for trips positive.	78
Local Communications	79
Standard Wallbox Internal wiring	80
Standard SCC 40 Drawing.....	81
FITTING NEW EPROM.....	82
Index.....	83

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.
- b) The shorthand used in the following chapters for concisely expressing button pressing and selection sequences to do all this set-up 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.

BUTTON OPERATION SHORTHAND

To assist in easy set-up 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, followed by text means press that button. “@_{accept}”
- iii) A double button, followed by text means press that button repeatedly. “@: @_{raise}”
- iv) A display box with the window above it shows the result of the last button press on the display.

DISCHARGE	FILTER	
====	2. 0b	“@: @ _{raise} ”
DISCHARGE	FILTER	
====	2. 5b	

- v)

DISCHARGE	FILTER	DISCHARGE	FILTER
H. P.	====	trip	====

Means the display alternately flashes between identifier and 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.

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 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

Before any permanent change of controller settings are made then the correct entry of the appropriate passcode is necessary.

The settings available for change on each passcode are as follows; Passcode

Passcode level 1	setpoints, low & high alarm settings	07
Passcode level 2	low & high trip settings and all level 1	09
Passcode level 3	system settings and levels 1 & 2	15

Enter passcode 15

DISCHARGE	FILTER	“@view” = “SETPOINT”	“@next”	“@next”
pASS	code			
DISCHARGE	FILTER	“@: @raise”	DISCHARGE	FILTER
== - =	== 12		== - =	== 15
				“@accept”

Press “**view**” to select “**SETPOINT**”, then press the “**next**” button twice to enter the passcode settings.

Press “**raise**” repeatedly until passcode **15** is selected and then press “**accept**”

Select Unit Model

Enter Passcode as button sequence above.

SUCTION	OIL	“@: @view” = “SYSTEM”
==SE	tUP=	“@: @type” = “SAFETY TRIPS”
DISCHARGE	FILTER	
====	=yEs	“@accept”
DISCHARGE	FILTER	DISCHARGE
====	Uni t	====
DISCHARGE	FILTER	FILTER
====	SC40	SC30
		“@: @raise”
		“@accept”

Press ‘**view**’ repeatedly until ‘**SYSTEM**’ is selected.

Press ‘**type**’ repeatedly until ‘**SAFETY TRIPS**’ is selected. Press ‘**accept**’

‘**Unit**’ is displayed press ‘**accept**’

Display shows unit model currently selected which may be wrong.

Press ‘**raise**’ repeatedly until correct model is displayed (e.g.SC30) and then press ‘**accept**’ which causes the display to wink briefly and display the new unit model selection (e.g SC40)

Select System No and Address

e.g. setup unit for system 65 compressor number 1 at address 195

Enter setup as button sequence as above

SUCTION	OIL		
==SE	tUP=		
DISCHARGE	FILTER		
====	=yEs	“@accept”	
DISCHARGE	FILTER		DISCHARGE FILTER
====	Uni t	“@accept”	==== sC40 “@next”
DISCHARGE	FILTER		DISCHARGE FILTER
====	Sn01	“@: @raise”	==== Sn65 “@accept”
DISCHARGE	FILTER	“@next”	
====	Cn01	“@accept”	
DISCHARGE	FILTER	“@next”	
====	A=01	“@: @raise”	
DISCHARGE	FILTER		
====	A195	“@accept”	“@: @next”
DISCHARGE	FILTER		
====	donE	“@accept”	

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 Consultant 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. For further details see page 63

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.

OVERVIEW

Functions

The GUARDIAN SCC-40 controller provides facilities for:-

MONITORING

Measurement of pressures, temperatures, load and slide inputs for control, alarm and trip display

Calculation of differential pressures and superheat temperatures for control, alarm and trip display.

Detection of digital input states or safety trip inputs.

ALARMS

Detection after a preset guardtime of pressure and temperature High/Low alarms when the compressor is in operation. Alarms are indicated by alternating a =Hi = or =LO= message on the appropriate temperature or pressure display.

TRIPS

Detection of pressure and temperature High/Low trips which stop the compressor. Trips are indicated by the flashing red TRIPPED lamp and an alternating 'TRIP' message on the appropriate temperature/pressure display.

All measurement values are frozen after detection of a trip condition. This facility provides information on the compressor state, pressures and temperatures when the trip occurred until after the RESET pushbutton has been pressed.

Detection of safety trips which stop the compressor.

Trips are indicated by the flashing red TRIPPED lamp and an appropriate message.

Trips vary dependent on pack model configuration.

ie :- L. P. ,H. P. ,LEU=, fLO= alternating with a t r I P message on the appropriate display.

CONTROLS

Oil pump, motor and economiser startup and run sequences using preset timers and limits
Compressor status is indicated by LED lamps on the control panel.

Compressor capacity slide valve raise / lower control dependent on suction pressure or slide control setpoint. The slide valve is automatically lowered when over-current limit or high discharge pressure are detected or the compressor is stopped.

Suction pressure or slide control initiation of other compressors in the system via a RS485 link when in REMOTE mode.

Oil heater and liquid injection control on oil sump and discharge temperatures.

Various vi type control outputs including VI control, condenser FAN control, extra injection and standby compressor.

Displays

i). SUCTION, DISCHARGE, OIL & FILTER.

SUCTION	OIL	4-digit 7-segment LED displays for display of measurements setpoints/limits for temperatures and pressures The contents change dependent on ' view ' and ' type ' selections
2. 1b	11. 7b	
DISCHARGE	FILTER	
10. 2b	11. 5b	

ii). CAPACITY%.

CAPACITY%
100

3-digit 7-segment LED displays for display of loading timers and capacity.

iii). MOTOR LOADING%.

MOTOR LOAD%
105

3-digit 7-segment LED displays for display of timers and motor load.

iv). COMPRESSOR No.

No
1

1-digit 7-segment LED display

Pushbuttons.

All pushbuttons are embossed, tactile membrane switches.

start, stop, raise & lower	used to control compressors when in manual mode.
RESET	used after a trip to reset the compressor.
Mode, view & type	used in conjunction with appropriate LED displays to select control, display or settings change facilities.
accept, next	used in conjunction with raise, lower and appropriate LED displays during setpoint and limit settings changes.

Unaccepted alarms and trips are acknowledged by pressing accept.

Pushbuttons on the local control panel permit operator display of setpoints, pressures, temperatures, alarm and trip settings and compressor runhours and status. Setpoints, alarm and trip settings may be changed from the panel after entry of the appropriate passcode.

The compressor may be selected to operate in one of three control modes:-

MANUAL, LOCAL or REMOTE MODES.

Safety interlocks, alarm, trip, startup and shutdown sequence controls are automatic in all three modes.

In **MANUAL** mode, the each compressor may be individually started and stopped and the pack capacity raised and lowered by operator pushbutton control from the local panel.

In **LOCAL** automatic mode, the compressor is started and stopped under control of the suction pressure setpoint.

REMOTE automatic mode allows up to six RCC-40 units to be connected via a two-wire communication link (RS485) to provide 6-unit system control.

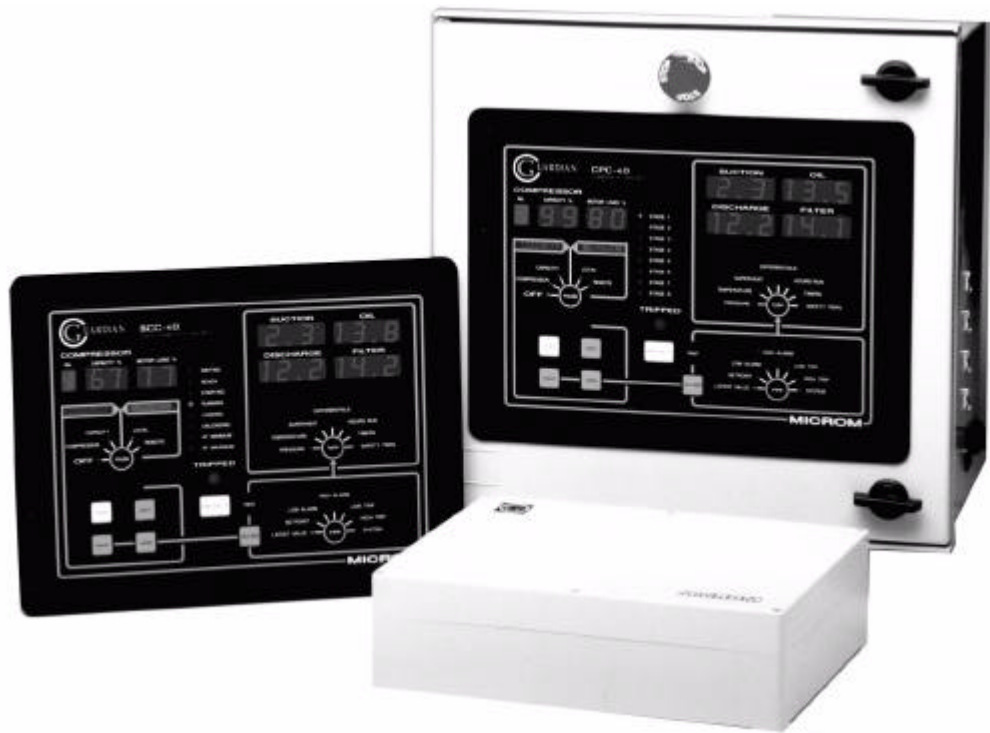
GENERAL SPECIFICATION

Power	110 or 230 Vac 50 Hz 30VA (dependent on model type)
Operation	0 to 50°C
Approx. Dimensions:	
Control panel:	300 x 220mm
Control unit:	300 x 230 x 90mm

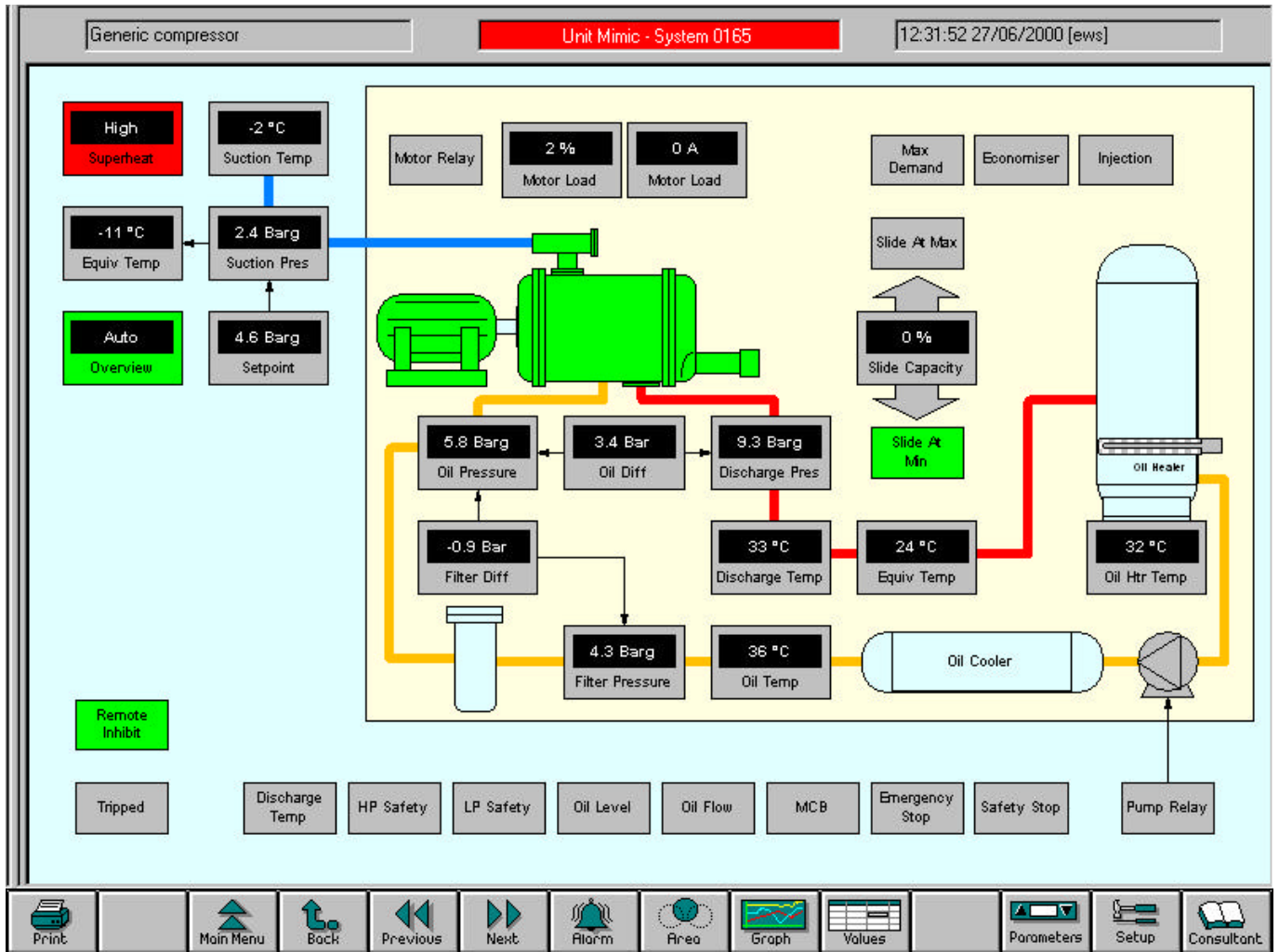
The GUARDIAN SCC40/35/30/25 control unit comprises a printed circuit board in an IP65 ABS enclosure for mounting at the rear of the compressor pack control panel with the display unit mounted on the door and has overall dimensions:- 300 x 230 x 90mm. The unit is fitted with two-part screw-clamp terminals for the connection of the appropriate input/output signals. (See input/output section)

The GUARDIAN SCC40 control panel comprises a membrane, pushbutton and display panel mounted on the front of the control unit.

The membrane front panel has a Black background with white lettering and green buttons with dimensions 300x220mm.



Consultant Format SCC40 Std.



AVAILABLE UNIT MODELS

The Guardian SCC-40 controllers are available in four models, which vary in facilities and cost:

SCC-40 4 pressures
 4 temperatures
 Additional 5th Pressure or 5th Temperature
 9 output relays
 4 12V dc inputs
 5 Mains inputs
 8 Trips
 2 Analogue outputs
 1 Real time clock

SCC-35 3 pressures
 3 temperatures
 7 output relays
 4 12V dc inputs
 5 Mains inputs
 8 Trips
 2 Analogue outputs
 1 Real time clock

SCC-30 3 pressures
 2 temperatures
 7 output relays
 4 12V dc inputs
 8 Trips

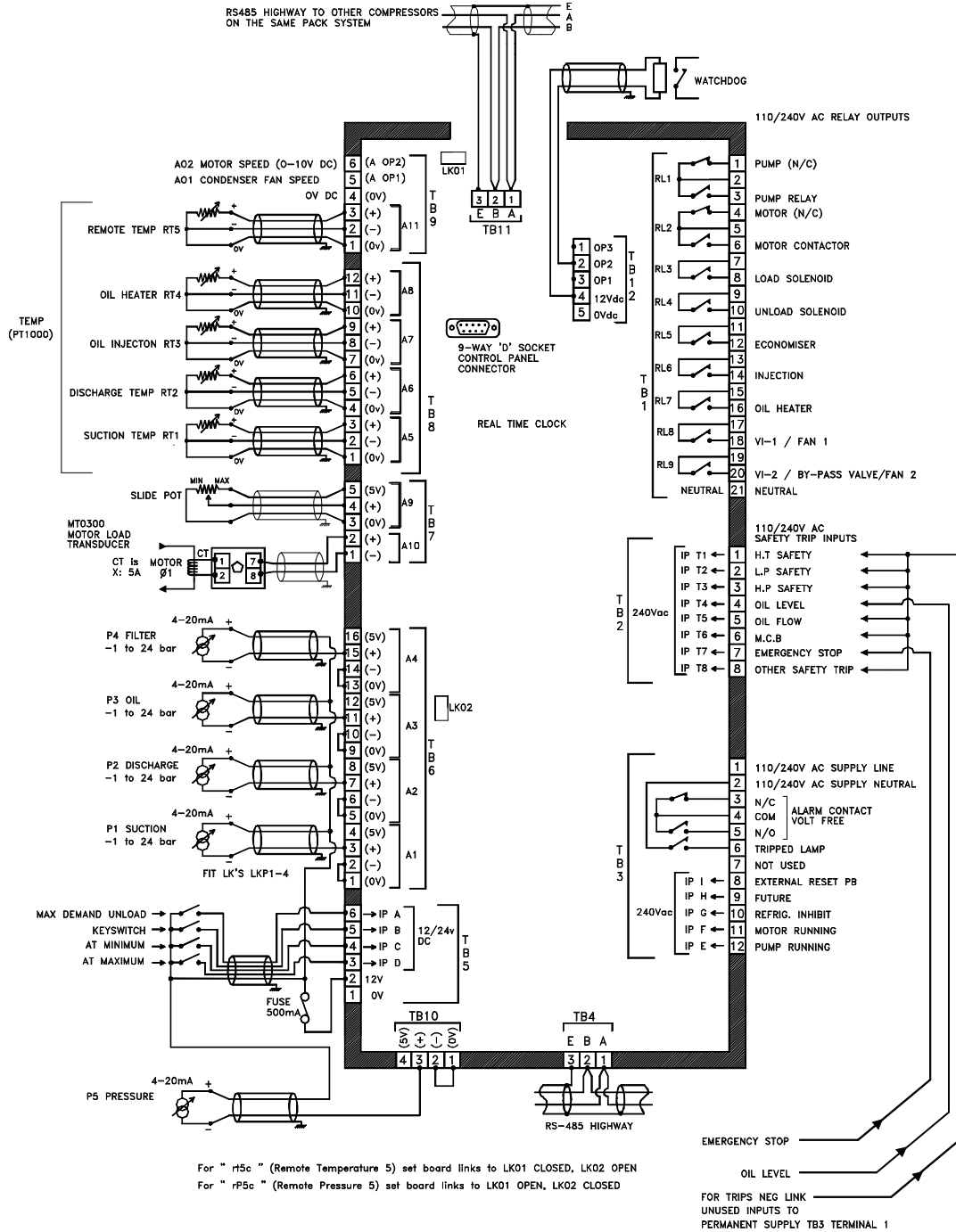
SCC-25 2 pressures
 2 temperatures
 7 output relays
 8 Trips

SCC controllers powered at 110V ac are available on request but require to be set up prior to delivery.

SCC-40 Input/Output Signals

Analogue inputs				
A1	Suction pressure		4 to 20mA	-1 to 24 bar g
A2	Discharge pressure		4 to 20mA	-1 to 24 bar g
A3	Oil pressure		4 to 20mA	-1 to 24 bar g
A4	Filter pressure		4 to 20mA	-1 to 24 bar g
A5	Suction temperature		PT1000	-50 to 125°C
A6	Discharge temperature		PT1000	-50 to 125°C
A7	Oil separator temperature		PT1000	-50 to 125°C
A8	Oil heater temperature		PT1000	-50 to 125°C
A9	Slide position		0 to 10Vdc	0 to 125%
A10	Load current		0 to 10Vdc	0 to 125%
A11	Chiller	temperature (5 th Temp probe)	PT1000	-50 to 125°C
TB10	Chiller	pressure or	4-20mA	-1 to 24 bar g
		vibration (5 th Pressure Transducer)	4-20mA	0 to 100%
Calculated inputs				
A17	Suction equivalent temperature		A1(R22/NH3)	-50 to 100°C
A18	Discharge equivalent temperature		A2(R22/NH3)	-50 to 100°C
A19	Suction superheat		A17-A5	
A20	Discharge diff pressure		A2-A1	-1 to 24 bar g
A21	Oil diff pressure		A3-A2	-1 to 24 bar g
	P_st/no_P/Filt syphen system		A3-A1	
A22	Filter differential pressure, Filter After Pump		A4-A3	-1 to 24 bar g
	Filter differential pressure, Filter Before Pump		A2-A4	
A23	Compressor hours run			0 to 65000 hrs
Digital inputs				
Trip 1	Discharge temperature high		dt-H	
Trip 2	L.P. cutout		L.P.	
Trip 3	H.P. cutout		H.P.	
Trip 4	Oil level		LEuL	
Trip 5	Oil diff/ flow switch		FLO	
Trip 6	motor circuit breaker		nncb	
Trip 7	Emergency stop		StoP	
Trip 8	Safety (motor thermistor)		SfTY	
12/24V dc inputs				
Input A	Slide at 50%/ max demand unload			
Input B	Optional keyswitch			
Input C	Slide at minimum 0%			
Input D	Slide at maximum 100%			
Mains inputs				
Input E	Oil pump running			
Input F	Compressor running			
Input G	Refrigeration (inhibit if Rneg)			
Input H	High setpoint/start			
Input I	External RESET pushbutton			
Relay outputs				
R1	Pump motor running		3 Amp inductive 110/240V ac with suppressors	
R2	Compressor motor			
R3	Slide valve load			
R4	Slide valve unload			
R5	Economiser			
R6	Liquid injection			
R7	Oil heater			
R8	VI control A orMotor speed LOW or Standby O/P orInjection 2 of Fans-1			
R9	VI control B orMotor speed HIGH or bypass valve or Fans-2			
Analog outputs				
AOP1	Capacity control by variable speed motor		0 to 5V dc	
AOP2	Motor control speed			
Extension outputs				
OP1	Not used			
OP2	Watchdog			
OP3	Not used			

SCC-40 Termination Wiring - SCC-40 Screw compressor controller.

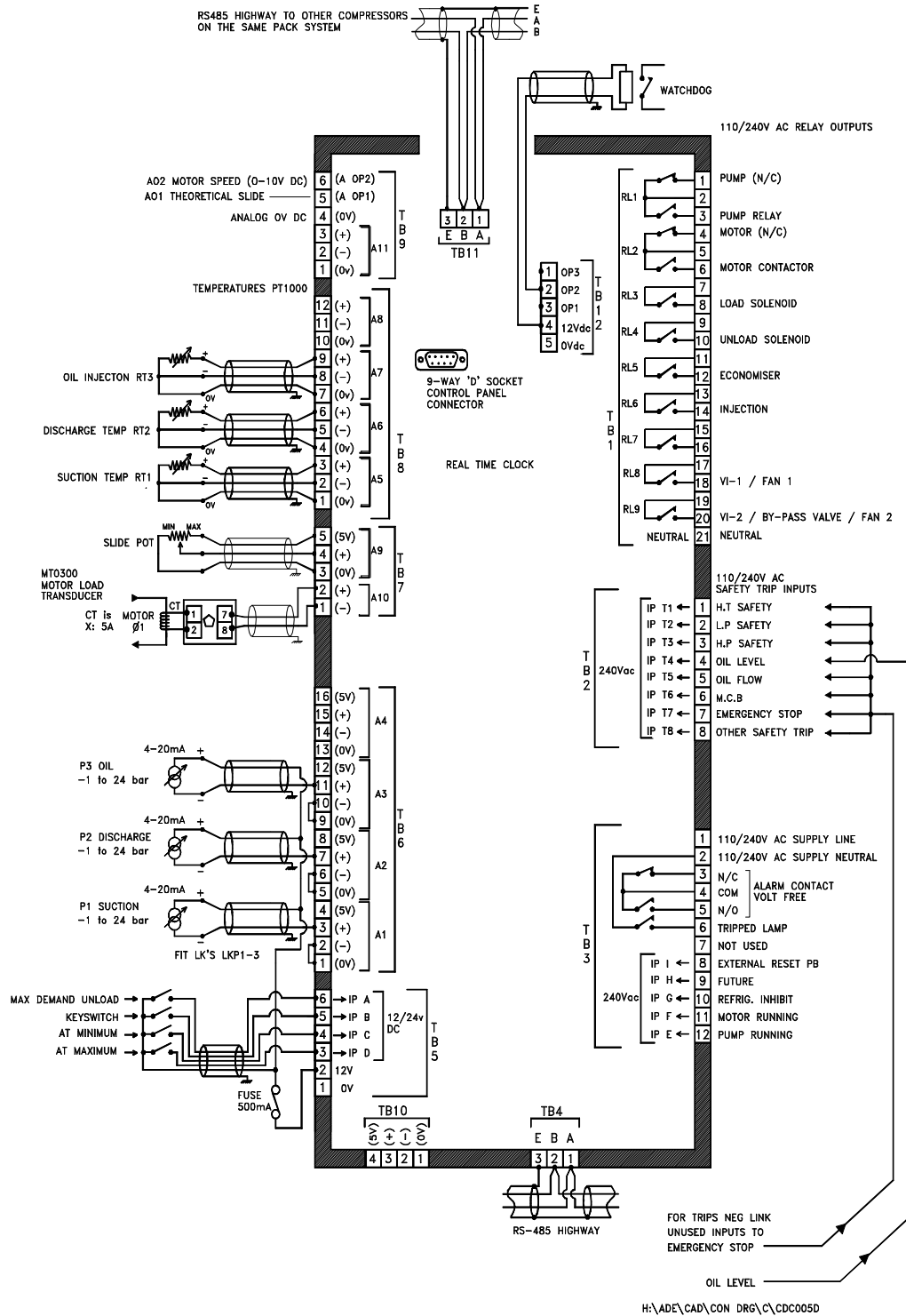


N.B. The Compressor Run Signal (TB3 Terminal 11) must be supplied to the Controller from the Delta Contactor of a Star-Delta System, or the Top of Ramp of a Soft Start System.

SCC-35 Input/Output Signals

SCC35			
Analogue inputs			
A1	Suction pressure	4 to 20mA	-1 to 24 bar g
A2	Discharge pressure	4 to 20mA	-1 to 24 bar g
A3	Oil pressure	4 to 20mA	-1 to 24 bar g
A4	Not used		
A5	Suction temperature	PT1000	-50 to 125°C
A6	Discharge temperature	PT1000	-50 to 125°C
A7	Oil separator temperature	PT1000	-50 to 125°C
A8	Not used		
A9	Slide position	0 to 10Vdc	0 to 125%
A10	Load current	0 to 10Vdc	0 to 125%
A11	Not used		
Calculated inputs			
A17	Suction equivalent temperature	A1(R22/NH3)	-50 to 100°C
A18	Discharge equivalent temperature	A2(R22/NH3)	-50 to 100°C
A19	Suction superheat	A17-A5	
A20	Discharge diff pressure	A2-A1	-1 to 24 bar g
A21	P_st/no_P/Filt syphen system	A3-A1	
A22	Filter Diff (Discharge Pressure To Oil Pressure)	A2-A3	
A23	Compressor hours run		0 to 65000 hrs
Digital inputs			
Trip 1	Discharge temperature high	dt-H	
Trip 2	L.P. cutout	L.P.	
Trip 3	H.P. cutout	H.P.	
Trip 4	Oil level	LEuL	
Trip 5	Oil diff/ flow switch	FLO	
Trip 6	motor circuit breaker	nncb	
Trip 7	Emergency stop	StoP	
Trip 8	Safety (motor thermistor)	SFTY	
12/24V dc inputs			
Input A	Slide at 50%/ max demand unload		
Input B	Optional keyswitch		
Input C	Slide at minimum 0%		
Input D	Slide at maximum 100%		
Mains inputs			
Input E	Oil pump running		
Input F	Compressor running		
Input G	Refrigeration (inhibit if Rneg)		
Input H	High setpoint/start		
Input I	External RESET pushbutton		
Relay outputs			
R1	Pump motor running	3 Amp inductive 110/240V ac with suppressors	
R2	Compressor motor		
R3	Slide valve load		
R4	Slide valve unload		
R5	Economiser		
R6	Liquid injection		
R7	Oil heater		
R8	VI control A or Motor speed LOW or Standby O/P or Injection 2 of Fans-1		
R9	VI control B or Motor speed HIGH or bypass valve or Fans-2		
Analog outputs			
AOP1	Capacity control by variable speed motor	0 to 5V dc	
AOP2	Motor control speed		
Extension outputs			
OP1	Not used		
OP2	Watchdog		
OP3	Not used		

SCC-35 Termination Wiring - SCC-35 Screw compressor controller

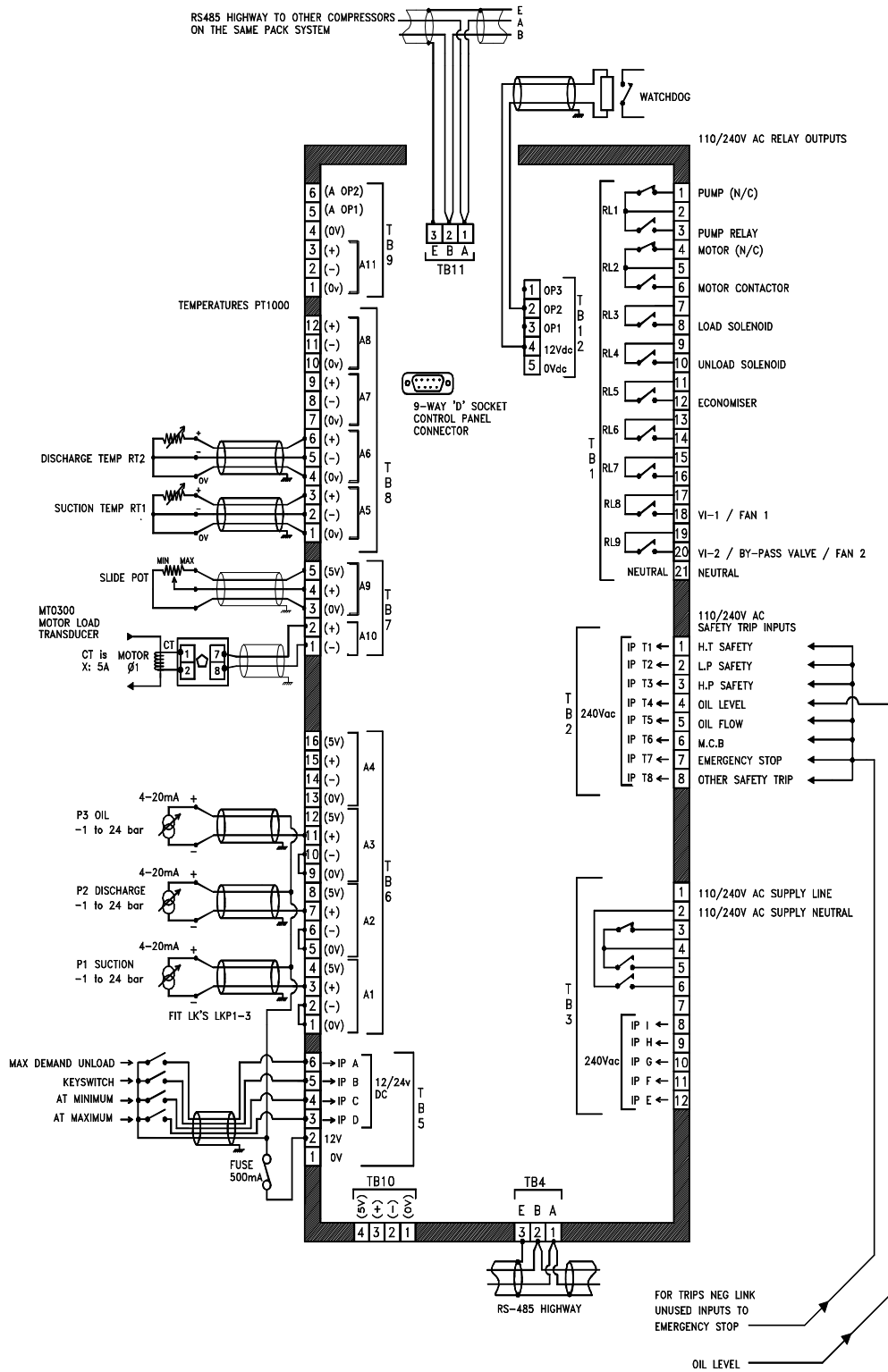


N.B. The Compressor Run Signal (TB3 Terminal 11) must be supplied to the Controller from the Delta Contactor of a Star-Delta System, or the Top of Ramp of a Soft Start System.

SCC-30 Input/Output Signals

SCC30			
Analogue inputs			
A1	Suction pressure	4 to 20mA	-1 to 24 bar g
A2	Discharge pressure	4 to 20mA	-1 to 24 bar g
A3	Oil pressure	4 to 20mA	-1 to 24 bar g
A4	Not used		
A5	Suction temperature	PT1000	-50 to 125°C
A6	Discharge temperature	PT1000	-50 to 125°C
A7	Not used		
A8	Not used		
A9	Slide position	0 to 10Vdc	0 to 125%
A10	Load current	0 to 10Vdc	0 to 125%
A11	Not used		
Calculated inputs			
A17	Suction equivalent temperature	A1(R22/NH3)	-50 to 100°C
A18	Discharge equivalent temperature	A2(R22/NH3)	-50 to 100°C
A19	Suction superheat	A17-A5	
A20	Discharge diff pressure	A2-A1	-1 to 24 bar g
A21	P_st/no_P/Filt syphen system	A3-A1	
A22	Filter Diff (Discharge Pressure To Oil Pressure)	A2-A3	
A23	Compressor hours run		0 to 65000 hrs
Digital inputs			
Trip 1	Discharge temperature high	dt-H	
Trip 2	L.P. cutout	L.P.	
Trip 3	H.P. cutout	H.P.	
Trip 4	Oil level	LEuL	
Trip 5	Oil diff/ flow switch	FLO	
Trip 6	motor circuit breaker	nncb	
Trip 7	Emergency stop	StoP	
Trip 8	Safety (motor thermistor)	SFTY	
12/24V dc inputs			
Input A	Slide at 50%/ max demand unload		
Input B	Optional keyswitch		
Input C	Slide at minimum 0%		
Input D	Slide at maximum 100%		
Mains inputs			
Input E	Not used		
Input F	Not used		
Input G	Not used		
Input H	Not used		
Input I	Not used		
Relay outputs			
R1	Pump motor running	3 Amp inductive 110/240V ac with suppressors	
R2	Compressor motor		
R3	Slide valve load		
R4	Slide valve unload		
R5	Economiser		
R6	Liquid injection		
R7	Oil heater		
R8	Not used		
R9	Not used		
Analog outputs			
AOP1	Not used		
AOP2	Not used		
Extension outputs			
OP1	Not used		
OP2	Watchdog		
OP3	Not used		

SCC-30 Termination Wiring -
SCC30 Screw compressor controller

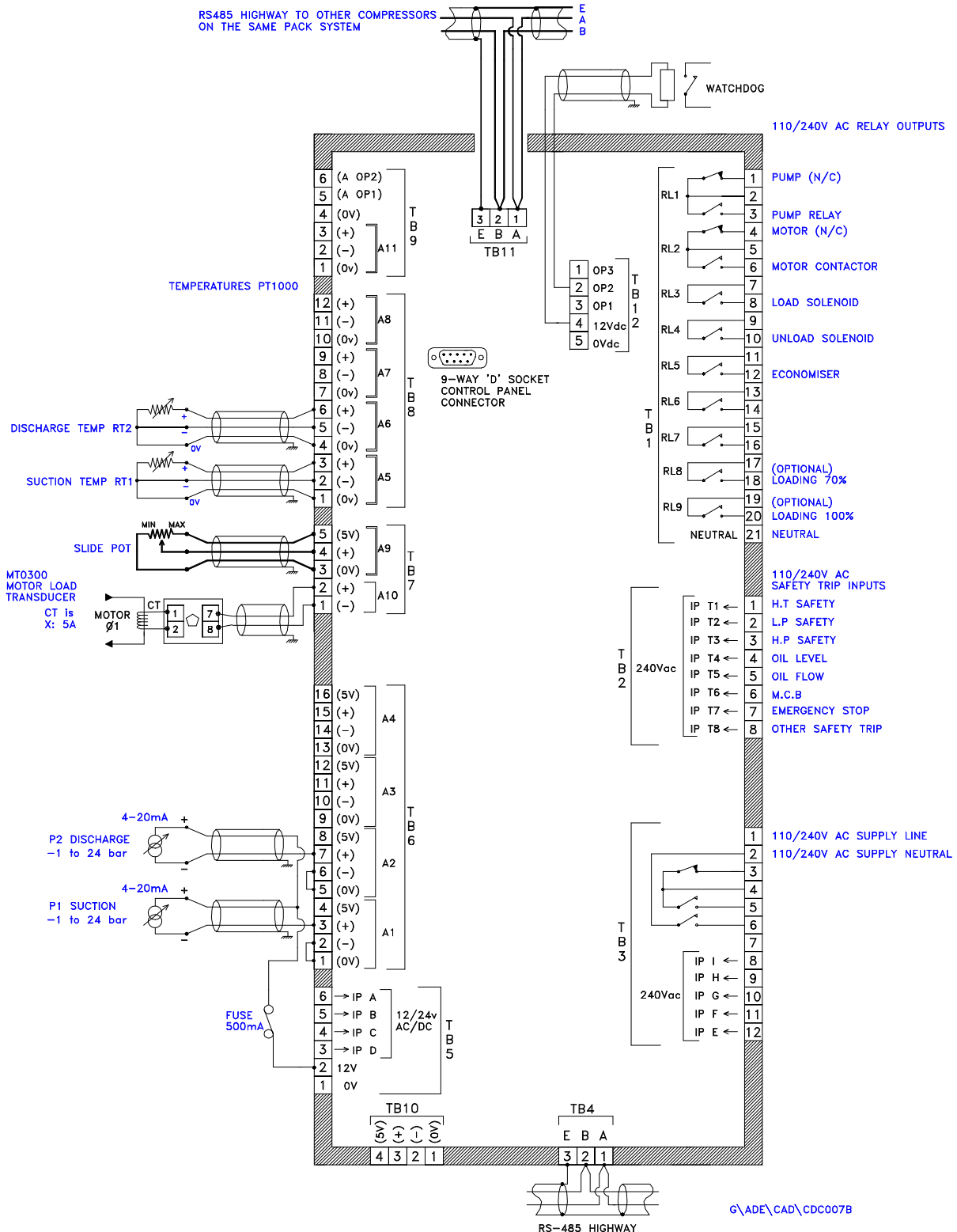


SCC-25 Input/Output Signals

SCC25			
Analogue inputs			
A1	Suction pressure	4 to 20mA	-1 to 24 bar g
A2	Discharge pressure	4 to 20mA	-1 to 24 bar g
A3	Not used		
A4	Not used		
A5	Suction temperature	PT1000	-50 to 125°C
A6	Discharge temperature	PT1000	-50 to 125°C
A7	Not used		
A8	Not used		
A9	Slide position	0 to 10Vdc	0 to 125%
A10	Load current	0 to 10Vdc	0 to 125%
A11	Not used		
Calculated inputs			
A17	Suction equivalent temperature	A1(R22/NH3)	-50 to 100°C
A18	Discharge equivalent temperature	A2(R22/NH3)	-50 to 100°C
A19	Suction superheat	A17-A5	
A20	Discharge diff pressure	A2-A1	-1 to 24 bar g
A21	Not used		
A22	Not used		
A23	Compressor hours run		0 to 65000 hrs
Digital inputs			
Trip 1	Discharge temperature high	dt-H	
Trip 2	L.P. cutout	L.P.	
Trip 3	H.P. cutout	H.P.	
Trip 4	Oil level	LEuL	
Trip 5	Oil diff/ flow switch	FLO	
Trip 6	motor circuit breaker	nncb	
Trip 7	Emergency stop	StoP	
Trip 8	Safety (motor thermistor)	SfTY	
12/24V dc inputs			
Input A	Not used		
Input B	Not used		
Input C	Not used		
Input D	Not used		
Mains inputs			
Input E	Not used		
Input F	Not used		
Input G	Not used		
Input H	Not used		
Input I	Not used		
Relay outputs			
R1	Pump motor running	3 Amp inductive 110/240V ac with suppressors	
R2	Compressor motor		
R3	Slide valve load		
R4	Slide valve unload		
R5	Economiser		
R6	Liquid injection		
R7	Oil heater		
R8	Not used		
R9	Not used		
Analog outputs			
AOP1	Not used		
AOP2	Not used		
Extension outputs			
OP1	Not used		
OP2	Watchdog		
OP3	Not used		

SCC-25 Termination Wiring

SCC25 Screw compressor controller

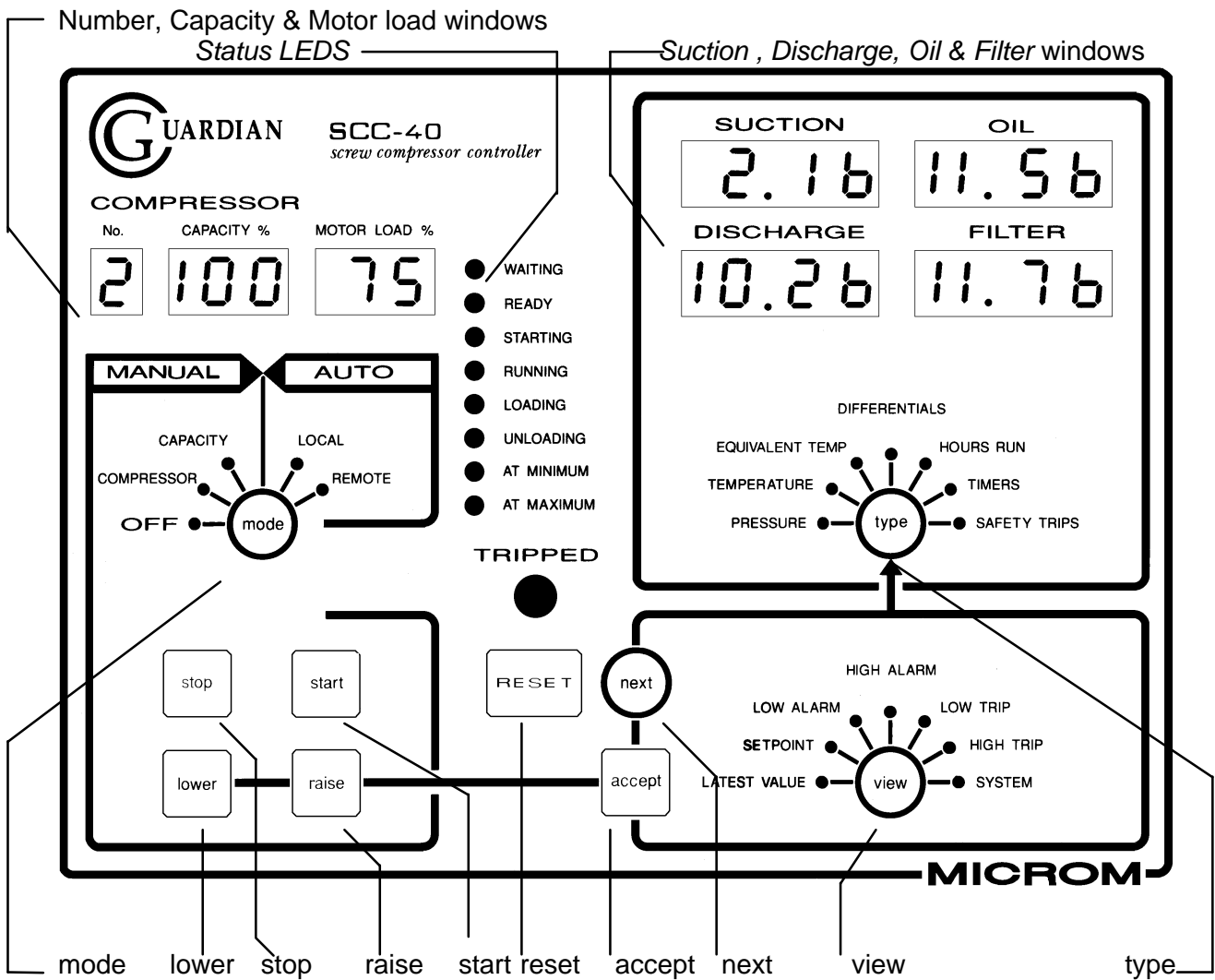


OPERATION

SCC40 PANEL LAYOUT

GUARDIAN SCC40 control panel comprises a membrane pushbutton and display panel mounted on the front of the control unit.

The membrane front panel (shown below) has a black background with white lettering and green buttons with dimensions 300 x 200mm and houses:-



CONTROL STATUS LED LAMPS

WAITING

The compressor is stopped and is waiting timeout of time-between-starts delay or time-after-stop delay or the oil sump temperature is LOW or the discharge temperature is HIGH or the external refrigeration inhibit signal is present in 'AUTOMATIC' mode.

READY

The compressor is stopped and ready to start and has not been tripped. This state is displayed after the compressor has stopped after reaching low-trip suction limit which is considered as a stop and resets automatically.

STARTING

The compressor is running and has received oil pump and compressor running signals but may have other alarms which require action.

RUNNING

The compressor is running and has received oil pump and compressor running signals but may have other alarms which require action.

LOADING

The solenoid loading valve is being pulsed opened to increase the slide capacity.

UNLOADING

The solenoid unloading valve is being pulsed opened to decrease the slide capacity.

AT MINIMUM

The slide is below minimum value (25%) or the external minimum setting limit switch is closed.

AT MAXIMUM

The slide is above maximum value (95%) or the external maximum setting limit switch is closed.

This lamp is lit when 'back-off' unloading is in progress due to over-current, discharge pressure or capacity .

LED LAMPS.

Compressor control status	Used to display compressor control status
TRIPPED	Flashing RED compressor tripped indicator
MANUAL	Mode selections: OFF, COMPRESSOR, CAPACITY
AUTOMATIC	Mode selections: LOCAL, REMOTE
'type'	7 led lamps. Selection for 4-digit LED displays PRESSURE, TEMPERATURE, EQUIVALENT TEMPERATURE DIFFERENTIALS, HOURS RUN, TIMERS & SAFETY TRIPS
'view'	7 led lamps. Selection for 4-digit LED displays LATEST VALUE, SETPOINT, LOW ALARM, HIGH ALARM, LOW TRIP, HIGH TRIP & SYSTEM

SYSTEM STATUS DISPLAYS

System status and set-up data may be displayed by selecting the following;

Press “@type” until “SAFETY TRIPS” is selected.

Press “@view” until “SYSTEM” is selected.

The data is displayed in the in the *SUCTION*, *DISCHARGE*, *OIL* and *FILTER* windows by pressing “@next.” Only displayed if keyswitch ON, or passcode = 3

Enter System Setup Mode

SUCTION OIL
 ==SE tUp=
 DISCHARGE FILTER
 ===== =YES Press “@accept” to enter system set-up mode

Terminate passcode operation.

SUCTION OIL
 pASS code
 DISCHARGE FILTER
 ===== End= Press “@accept” to remove passcode

Control status displays.

SUCTION	OIL			
Cont	roL=			
DISCHARGE	FILTER			
YYYY	YYYY	DISCHARGE	FILTER	
	YYYY=	suct	i on=	Remote master suction control.
		DISCHARGE	FILTER	
		fuLL	LoAd	Remote but at maximum load.
		DISCHARGE	FILTER	
		=sLI	dE==	Remote slave in load sharing.
		DISCHARGE	FILTER	
		stAn	dbY=	Remote mode stopped but ready.
		DISCHARGE	FILTER	
		=LOC	AL==	Compressor in local mode
		DISCHARGE	FILTER	
		I nhi	bi t=	Local mode but inhibited.
		DISCHARGE	FILTER	
		nnAN	UAL=	Compressor in manual.
		DISCHARGE	FILTER	
		====	OFF=	Compressor OFF.

Relay output status.

SUCTION	OIL			
=Out	pUtS			
DISCHARGE	FILTER			
PCEL	HrLt	-		Is displayed if relay is OFF
		p		Pump motor ON
		C		Compressor motor ON
		E		Economiser ON
		L		Liquid injection
		H		Oil heater ON
		r		Slide valve LOAD
		L		Slide valve UNLOAD
		t		Tripped relay ON

Inputs

SUCTION	OIL		
=InP	UtS=		
DISCHARGE	FILTER		
Abcd	Efgh	A	Maximum demand input (SCC25 Slide at 50%)
		b	Optional keyswitch (access code override)
		c	Slide at minimum 0%
		d	Slide at maximum 100%
		E	Oil pump running
		F	Compressor running
		g	Refrigeration inhibit
		H	Spare
		I	External reset pushbutton

Trip inputs.

SUCTION	OIL		
=tri	pS==		
DISCHARGE	FILTER		
1234	5678	-	Is displayed if trip input is OFF
		1	Discharge temperature high
		2	L.P. cutout
		3	H.P. cutout
		4	Oil level
		5	Oil flow switch
		6	Motor circuit breaker
		7	Emergency stop
		8	Safety (motor thermistor)

Analog output voltages..

SUCTION	OIL	
=A01	=A02	
DISCHARGE	FILTER	
10. 00	00. 00	Output in volts

SAFETY TRIP INDICATIONS

When detected, the following safety trips alternate the trip messages below with 'TRIP' in the windows specified and flash the 'type' = SAFETY TRIPS LED lamp. Accept and reset procedures are the same as for other trips. The messages depend on the model configuration

Trip	Model C1LF	message	flash	window
T1	Discharge temp hi trip	dt - H	Trip	FILTER
T2	L.P. cutout	L. P.	Trip	SUCTION
T3	H.P. cutout	H. P.	Trip	DISCHARGE
T4	oil flow switch	FLO.	Trip	FILTER
T5	oil level	LEu.	Trip	OIL
T6	motor circuit breaker	nncb	Trip	SUCTION
T7	emergency stop	stop	Trip	DISCHARGE
T8	safety trip (other)	sfty	Trip	OIL

STARTING and RUNNING Timeout Trips

When detected, the following timeout trips alternate the trip messages below with 'TRIP' in the windows specified and flash the 'type' = TIMERS LED lamp.

Compressor motor running signal off.	nnot	Trip	SUCTION
slide not at minimum	s - UP	Trip	DISCHARGE
pump running signal off	punP	Trip	OIL

Accept and reset procedures are the same as for other trips.

DISPLAY PUSHBUTTON OPERATION

Display of all compressor measured values, setpoints, alarm and trip limit settings is performed by repeated pressing of either the **'view'** and / or **'type'** pushbuttons.

At each button press the associated selection LED lamp advances by one in a clockwise direction indicating the type or setting of the value displayed in the; **SUCTION, DISCHARGE, OIL, FILTER, CAPACITY%** and **LOAD%** windows.

'view'

To display the latest temperature values, the **'view'** pushbutton is pressed repeatedly until the **LATEST VALUE** LED lamp is lit.

'type'

The **'type'** pushbutton is then pressed repeatedly until the **TEMPERATURE** LED lamp is lit.

The **SUCTION, DISCHARGE, and OIL** windows now display the latest measured values of suction, discharge and oil temperatures respectively.

“@: @_{view}” = “LATEST VALUE”

“@: @_{type}” = “TEMPERATURE”

SUCTION	OIL
= - 10	=====
DISCHARGE	FILTER
= = 70	=====

To display the high alarm settings for pressures, the **'view'** pushbutton is pressed repeatedly until the **HIGH ALARM** LED lamp is lit, and then the **'type'** pushbutton is pressed repeatedly until the **PRESSURE LED** lamp is lit.

The **SUCTION, DISCHARGE, OIL** and **FILTER** windows now display the high alarm limit settings, if applicable, for suction, discharge, oil and filter pressures respectively.

“@: @_{view}” = “HIGH ALARM”

“@: @_{type}” = “PRESSURE”

SUCTION	OIL
= = - 5	=====
DISCHARGE	FILTER
= = 85	=====

All pressures are displayed in the range: -1.0b to 24.0b where b= bar gauge

All temperatures are displayed in the range -50C to 125C where C= degrees centigrade

LOAD% and CAPACITY% are displayed in the range 0% to 125% where % is of maximum scale.

Compressor **HOURS RUN** is displayed using the SUCTION and OIL windows from 0 to 65000 in the form

SUCTION	OIL	
==65	000H	
DISCHARGE	FILTER	
====	====	
DISCHARGE	FILTER	
LAST	2359	Last trip time alternates with trip after any trip fail.

TIMERS setpoints for stage-up and stage-down, oil diff are displayed in minutes

		“@: @view” = “SETPOINT”
		“@: @type” = “TIMERS”
SUCTION	OIL	
3.5u	2.3P	u = stage-up = 3.5 mins
DISCHARGE	FILTER	P = prelube delay = 2.3 mins
2.0d	0.0o	d = stage-down = 2.0 mins
		o = pump off delay = 1.5 mins

If no buttons have been pressed for 5 minutes, the SUCTION, DISCHARGE, OIL and FILTER windows revert to the default display of latest pressure values with;

'view' = LATEST VALUE,
'type' = PRESSURE

CONTROL PUSHBUTTON OPERATION

“mode”

mode may be pressed at any time to change the operating mode of the compressor from **'MANUAL'** to **'AUTOMATIC'** control and visa versa. At each button press the associated 'mode' selection LED lamp advances by one in a clockwise direction indicating the required new mode selection.

Note: Compressor Mode changes only take place when the mode selection has been unchanged for 5 seconds.

“Mode-MANUAL”

With the **'OFF'** LED lamp selected in **MANUAL** mode, the compressor is automatically stopped if running lamp is lit and subsequently ignores any further manual or automatic control requests.

With the **'COMPRESSOR'** LED selected in **MANUAL** mode, the compressor may be started and stopped by operator pushbutton control using **'start'** and **'stop'**.

With the **'CAPACITY'** LED selected in **MANUAL** mode, the compressor capacity may be changed by operator pushbutton control using **'raise'** and **'lower'** buttons, provided the compressor is running.

“Mode-AUTOMATIC”

In **LOCAL** automatic mode, the compressor is started and stopped under control of the suction pressure setpoint and an optional external refrigeration allow/inhibit signal.

Operation in this mode is independent of any other compressors in the system.

REMOTE automatic mode allows up to six SCC-40 units to be connected via a two-wire communication link to provide 6-compressor system control. Any change to REMOTE mode whilst the compressor is running causes the compressor to automatically load up to 100% or assume suction pressure control if it is the only one in remote mode.

“RESET”

RESET is used to reset all control sequences prior to restarting the compressor after a **'TRIPPED'** condition has occurred and subsequently been corrected. When pressed with the **'TRIPPED'** LED lamp either flashing or steady the TRIPPED lamp is switched off, any flashing **'type'** alarm selection LED lamp goes steady, all display measurement values are unfrozen from the pre-trip conditions and revert to latest values and either **'WAITING'** or **'READY'** compressor control status LED lamps are lit.

“Call Frig Engineer”

The RESET pushbutton is inhibited if more than 6 trips occur within a 24 hour period and the following message is displayed.

SUCTION OIL
CALL Frig
DISCHARGE FILTER
Engi nEer

RESET is enabled and message is removed by keyswitch operation or entry of passcode level 3.

“stop”

'stop' may be pressed at any time in either 'MANUAL' or 'AUTOMATIC' mode and, if the compressor is running, causes the compressor to shutdown and stop in an orderly manner.

The stop sequence lowers the slide to minimum, selects minimum VI setting, stops the compressor, extinguishes the 'RUNNING' LED lamp, starts the delay_after_stop timer, lights the 'WAITING' LED lamp, continues to lower the slide until 'at_minimum' and then stops the oil pump after the pump_stop time.

“start”

start only operates in 'MANUAL' mode with the 'COMPRESSOR' LED lamp selected, the compressor 'READY' LED lamp on. The starting sequence lights the 'STARTING' LED lamp, starts and checks the oil pump, lowers the slide to minimum, selects minimum VI setting, starts and checks the compressor, starts the time_between_starts timer and then automatically raises the slide to 25% capacity.

When the compressor is running at above 25% capacity the 'STARTING' LED lamp is replaced by the 'RUNNING' LED lamp.

“Lower”

lower may be used in 'MANUAL' mode with the 'CAPACITY' LED lamp selected, the compressor 'RUNNING' LED lamp on. Whilst 'lower' is being pressed, the slide unloading solenoid valve and the 'UNLOADING' LED lamp are pulsed for the preset lower_pulse_time every five seconds to decrease the compressor capacity as required

The 'lower' pushbutton is also used after 'next' has been pressed to decrease the displayed values of setpoints, high, low, alarm and trip settings prior to changing them using 'accept'.

“Raise”

raise may be used in 'MANUAL' mode with the 'CAPACITY' LED lamp selected, the compressor 'RUNNING' LED lamp on and the 'TRIPPED' LED lamp off. Whilst 'raise' is being pressed, the slide loading solenoid valve and the 'LOADING' LED lamp are pulsed for the preset raise_pulse_time every five seconds to increase the compressor capacity as required.

The 'raise' pushbutton is also used after 'next' has been pressed to increase the displayed values of setpoints, high, low, alarm and trip settings prior to changing them using 'accept'.

SETTINGS CHANGE PUSHBUTTON OPERATION

“next”

'next' is used to initiate **'settings change'** operation provided an external security key or ink is activated or the appropriate passcode has been entered.
(See configure unit model section)
Passcode entries remain valid for 30 minutes.

Subsequent pressing of the **'next'** pushbutton cycles through the seven display windows flashing the last digit of each in turn to indicate which window is selected for changes. Unused windows are skipped.
Different settings may be displayed using **'view'** and **'type'** selections.
Changes are made by using the **'raise'** and **'lower'** pushbuttons to alter the displayed setting which then must be followed by pressing the 'accept' pushbutton.

“Accept”

'accept' pushbutton enters new values of setpoints, timers, alarm or trip settings.

“raise”

If the 'raise' pushbutton is held on for more than 2 seconds then the value increases automatically at a higher rate.

“Lower”

If the 'lower' pushbutton is held on for more than 2 seconds then the value decreases automatically at a higher rate.
If an attempt is made to change a setting using the incorrect passcode then the display defaults to:-
'view' = LATEST VALUE
'type' = PRESSURE

“RESET”

Exits setup mode without clearing passcode pressing 'next' again will flash value to be changed.

ALARM ACCEPT AND RESET PUSHBUTTON OPERATION

The “**accept**” pushbutton is used to acknowledge a high, low, alarm or trip condition. It stops the flashing of the '**type**' LED selection and the '**TRIPPED**' LED lamp thus allowing other '**view**' or '**type**' selections to be made in order to investigate the fault.

The '**TRIPPED**' LED lamp remains on until '**RESET**' is pressed. After an alarm, '**view**' and '**type**' selections are inhibited until 'accept' is pressed.

ALARM and TRIP INDICATIONS

The high and low alarm and trip conditions listed below are detected and displayed in all control modes.

New alarms or trips automatically select '**view**' = LATEST VALUE and flash the appropriate '**type**' LED lamp for the alarm or trip point ie (PRESSURE, TEMPERATURE, DIFFERENTIAL)

The window displaying the alarm point alternates the latest value with a '**trip**' , '**Hi**' or '**Lo**' fail message.

The **TRIPPED** LED flashes for all trips and the latest values are frozen at the time of the trip for subsequent fault diagnosis.

When '**accept**' is pressed the '**type**' LED stops flashing and other display selections may be viewed if required.

The alarm value continues to alternate with '**Hi**' or '**Lo**' whilst an alarm is present.

The tripped value continues to alternate with '**trip**' until 'RESET' is pressed.

Value	Description	Window	'type'	'view' selection			
				Lo-alarm	hi-alarm	low trip	high trip
1	suction press	SUCTION	PRESS	stop		yes	
2	discharge press	DISCHARGE	PRESS		start-unload		yes
3	oil pressure	OIL	PRESS				
4	filter pressure	FILTER	PRESS				
5	suction temp	SUCTION	TEMP		yes		yes
6	discharge temp	DISCHARGE	TEMP		yes		yes
7	oil temp	OIL	TEMP		yes		yes
8	oil temp (sump)	OIL	TEMP	heater			
9	slide %	CAPACITY	PRESS	yes	stop-load		
10	motor load %	LOAD%	PRESS		start-unload		
Calc							
17	equiv-suct-temp	SUCTION	superheat				
18	equiv-disc-temp	DISCHARGE	superheat				
19	suct-superheat	SUCTION	DIFF	yes	yes	yes	yes
21	diff-disc-pressure	DISCHARGE	DIFF				
22	diff-oil-pressure	OIL	DIFF	yes		yes	
23	diff-filter-pressure	FILTER	DIFF		yes		yes

SETPOINTS

SUCTION PRESSURE SETPOINT CONTROL.

-0.5 to 5.0bar

the suction pressure control setpoint for the compressor in increments of 0.1 bar. If 'CHIL' is selected then loading is inhibited until the suction is above this setpoint.

EQUIVALENT TEMPERATURE SETPOINT (tcon)

-50 to 50°C

the equivalent temperature control setpoint of the compressor in increments of 1°C. This setpoint can be switched between two values using input H (high setpoint if on).

WATER CHILLER TEMPERATURE SETPOINT (CHIL)

-1 to 24°C

the water chiller temperature RT5 control setpoint of the compressor in increments of 0.1°C.

SETPOINT CONTROL

Capacity loading takes place when the control temperature or suction pressure is greater than the setpoint.

Capacity unloading takes place when the temperature or suction pressure is less than the setpoint.

When the suction pressure is (0.3 bar, 0.3°C, 3°C) above or below the setpoint then the width of the load and unload pulses is automatically doubled and pulses are sent every five seconds to achieve suction setpoint more rapidly.

When the setpoint is within 0.3 of the setpoint then the loading valves are pulsed at the variable CAPACITY LOAD DELAY period to give time for plant to respond before sending the next pulse which prevents 'hunting'.

When the slide capacity is below 75%, loading pulses are doubled to counteract the effect of a non linear slide travel.

DISCHARGE TEMPERATURE SETPOINT

Liquid Injection ON. setpoint is the discharge temperature above which the liquid injection valve is opened. The liquid injection valve is shut when the temperature falls 5 degrees C below this setpoint.

Filter differential high alarms are inhibited until this setpoint is reached in order to ensure reasonable oil flow.

LIQUID INJECTION 2 IF 'Bypass' valve is selected then a second injection valve connected to VI-1 output is switched on 5°C above the discharge temperature setpoint and switched off at the setpoint

DISCHARGE DIFFERENTIAL SETPOINT STOP PUMP

When '**P-St**' is selected, this is the differential discharge to suction pressure above which the pump is stopped if it is only required during compressor startup.

**LOAD% PRESSURE SETPOINT
STOP-LOAD**

The % load current above which no further loading pulses are allowed

CAPACITY % PRESSURE HIGH ALARM

The maximum slide capacity % above which the compressor inhibits loading pulses.

**LOAD % PRESSURE HIGH ALARM
START-UNLOAD**

The % load current High Alarm Limit above which capacity unloading pulses are automatically started.

**DISCHARGE PRESSURE HIGH ALARM
START-UNLOAD**

The discharge pressure High Alarm Limit above which capacity unloading pulses are automatically started.

**CAPACITY % PRESSURE SETPOINT
ECONOMISER ON.**

The slide position above which the economiser is switched on when the motor is running and 'back-off' is not in progress.

The economiser is switched OFF when the slide is 5% below this setpoint.

The economiser is also switched off if 'Back-off' unloading occurs due to over-current or high discharge pressure. After back-off, the economiser time delay 'ETxx' minutes must elapse before the economiser can be switched on again.

**FILTER TEMPERATURE SETPOINT
OIL HEATER OFF**

Oil heater off setpoint is the oil sump temperature above which the oil heater is switched OFF. The oil heater is switched ON when the temperature falls below this setpoint provided the compressor is not 'running'.

**FILTER TEMPERATURE LOW ALARM
OIL HEATER ON = PUMP INHIBIT**

The oil sump temperature below which the oil heater is switched on and the pump is not allowed to start. The oil heater is switched off when the oil sump temperature is 5°C above this limit if this is higher than the control setpoint above.

**DISCHARGE TEMPERATURE HIGH ALARM
=MOTOR-START-INHIBIT**

The discharge temperature above which the pump is not allowed to start.

**CAPACITY PRESSURE LOW ALARM
=MIN LOAD %**

The minimum slide % at which a Load sharing compressor is allowed before it automatically stops after the stage-down time.

**CAPACITY PRESSURE LOW TRIP
=COMPRESSOR AUTO STOP**

The % Slide position at which below setpoint the stagedown timer autostops the compressor, restart is automatic after starts per hour **SH** timed out.
No Action If Set to Zero

**SUCTION PRESSURE LOW ALARM/LOW TRIP
=STOP-COMPRESSOR**

The minimum suction pressure for the compressor in increments of 0.1 bar.
This setpoint merely stops the compressor which automatically restarts again when the suction pressure rises again without needing RESET to be pressed.

**DISCHARGE PRESSURE SETPOINT
CONDENSER FANS 1 & 2**

With VI relays selected for 'FANS' FAN-1 (VI-1) is switched on when the discharge pressure is above this setpoint. FAN-2 (VI-2) is switched on '**Ft0.x**' bar above this setpoint. Both fans are switched off 0.5 bar below their respective setpoints.

CONTROL MODES

GENERAL

The controller is a general purpose screw compressor controller. It may be used as a stand-alone unit or may be integrated into an overall pack control strategy via the communications link with upto 5 other units.

The control and monitoring operations are based on the inputs and outputs described previously.

The controller has three modes of operation:-

i) MANUAL

Operator required to start/stop and control capacity.

ii) LOCAL AUTOMATIC

Compressor start/stops and controls capacity on suction pressure, equivalent temperature or chiller temperature setpoint control provided refrigeration input signal is enabled.

iii) REMOTE AUTOMATIC

Uses communications link to establish the most efficient loading of up to six compressors on the same suction line.

Multi-compressor loading can be selected to give priority in different ways:-

- a) runH uses Hours run on each compressor to determine which is best compressor to start or stop. The compressor with the least run hours is best to start, the compressor with the most runhours is best to stop.
- b) LEAD Always start this compressor first and stop it last
- c) LAG start this after LEAD compressor at maximum, OFF or tripped.
- d) StBy Only start this compressor if another compressor is tripped.

CONTROL

COMPRESSOR CONTROL OPERATION

POWER UP

After a power up the controller checks the integrity of the parameters it maintains in EEROM memory. If this check fails the controller will go to the OFF MANUAL mode. Otherwise these parameters are used and the controller reverts to its previous mode.

All timers are reset so that the compressor cannot restart until the time after stop timer has elapsed (2 mins). This will give the operator sufficient time to change modes etc. The controller checks for any fault conditions and if any are present it displays the tripped status, otherwise '**WAITING**' status is displayed

READY/WAITING

After a power reset the waiting status is displayed until the time after stop timer has elapsed, and the temperature of the oil is greater than the inhibit start setpoint as set in **Filter Temp Low Alarm**, after which the ready status is displayed.

If an external start/stop refrigeration signal is used then the waiting status is displayed whilst the stop signal is present.

The controller will allow up to 20 starts per hour. It achieves this by maintaining a time between starts timer. This timer is reset each time the compressor is started. If this timer has not elapsed, after the compressor has stopped, then the waiting state will be displayed for the remaining time.

Once the Ready state is indicated the controllers next actions are dependant on the mode selected:-

i) MANUAL mode - Provided COMPRESSOR is selected the controller will respond to START being pressed.

ii) LOCAL AUTOMATIC - The controller looks for the suction pressure to be above the control band or the external refrigeration signal to go to start.

iii) REMOTE AUTOMATIC - In a pack system of upto six compressors the compressor with the least runtime hours and which is also in the ready state is considered to be the Master. Once the control temperature/suction pressure goes above the control setpoint then the Master compressor will start.

STARTING

After a start request has been made the Oil pump is started. Provided a pump running signal has been received, the oil differential limit is satisfied,(within the oil differential delay time 'dt'), and the slide is at minimum the motor will then start.

If the slide is not at minimum when the pump is started then the following procedure is completed:-

1. The un-load solenoid is energised.
2. If the slide returns to minimum within the differential delay time,'dt', then motor start will proceed as above.
3. When the slide does not return to minimum within 'dt' the pump continues to run until the slide is at minimum or the pump pre-lube delay is exceeded.
4. If the slide is at minimum then the pump is stopped and a motor re-start delay time is enforced before a normal starting procedure is attempted. This allows excess oil in the compressor to drain away.
5. If the slide has not made minimum after the pre-lube delay the compressor will go to the tripped state '**S-uP**'/'trip'.
6. If the pump run signal is not present within 'dt' the compressor goes to the tripped state '**PunP**'/'trip'

If the motor running signal,(motor in delta), is not received within thirty seconds the compressor will go to the tripped state '**nnot**'/'trip'.

RUNNING

For all modes of operation status inputs and cutout trip limits are continuously checked for fault conditions. If any are found then the compressor is immediately stopped and the appropriate trip mode indicated. Over current and high discharge temperature capacity unloading operate in all in all modes.

MANUAL MODE.

In MANUAL mode, provided CAPACITY is selected, the capacity may be adjusted by operation of the RAISE/LOWER buttons. A raise/lower request is actioned at one pulse every five seconds, the pulse duration dependant on the RAISE/LOWER pulse width settings.

LOCAL AUTOMATIC.

In LOCAL AUTOMATIC mode the capacity is adjusted dependant on the suction pressure being above or below the control band selected. In REMOTE AUTOMATIC mode up to six compressors are available to run. One compressor always assumes overall control and is referred to as the Master. The Master compressor is selected on least runtime hours and Ready status. If runtime hours are equal then priority is based on the compressors' unit number, compressor 1 having the highest priority. When a compressor has established its' self as Master it uses the communications link to request status information from the other compressors. The action of transmitting by the Master will prevent any other REMOTE mode compressors from starting, regardless of suction pressure. The status request command also contains the status information of all other compressors. This status information consists of:-

- i) Runtime hours
- ii) Slide position
- iii) Compressor mode requires REMOTE automatic for control.
- iv) Compressor State - Ready, Waiting, At minimum, At maximum, Master, Load sharing, Over current, High Discharge.

When the suction pressure is above the control setpoint then the Master compressor will start. It will then attempt to maintain control by automatic adjustment of its capacity. If the suction pressure remains above the control band (+0.1 bar) such that the slide has reached 100% or the compressor has had an over current or high discharge back-off, then the stage up timer will be started. The timer will be reset if the capacity falls below 100% or the suction pressure goes into or below the control band after a back-off.

Once the stage up timer elapses the Master compressor will stop transmitting, releasing control to the compressor with the next highest priority. As all compressors have runtime hours etc., each compressor waits for its priority time out period before becoming Master.

The next compressor to establish its self as Master goes through the starting procedure. Whilst the suction pressure is above the control band the Master continues to raise its slide. When the Master brings the suction pressure into or below the control band; then, provided it slide is less than Capacity Low Limit, it will optimise capacity to improve efficiency. The Master will select a compressor

to balance its slide capacity with. To do this it selects the compressor with the greatest runtime hours, from the compressors that are at Maximum capacity.

The Master then sets the Load sharing status flag of the required compressor. This compressor then goes into slide position regulation mode, selecting a slide capacity setpoint that divides the available capacity between the Master and itself. The load sharing compressor moves to its calculated slide position, from 100%, by pulsing its lower valve. The Master compressor remains in suction pressure regulation mode, so as the pressure goes above the control band it will increase its capacity. The load sharing compressor continues to adjust its slide position setpoint as required.

The following situations may now occur:-

i) The refrigeration demand increases:-

Both compressors reach Maximum capacity and maintain this for the stage up period of the Master. The Master then removes the load sharing status, updates this status change to all other controllers and then stops transmitting so that the compressor with the next highest priority will take over.

ii) The refrigeration demand decreases:-

In this situation the load sharing compressor will not allow its slide to go below 50%. The Master compressor will compensate by continuing to reduce its capacity. When the total load of the 2 compressors is <100% for the stage down period then the load-sharing compressor will remove its load sharing status, ramp its slide down to minimum and then stop.

The master compressor will maintain suction pressure regulation.

iii) Master compressor trips.

If the load sharing compressor is not fully loaded it will be given highest priority, revert to suction pressure regulation mode and become Master.

iv) Load sharing compressor trips.

The Master compressor maintains suction pressure regulation and if the previously stated conditions occur it will look for another compressor to load share with.

Any mode changes made to the Master or load sharing compressor then the response is the same as for a trip condition.

STOPPING

The compressor may be stopped at any time by pressing the stop button. This will cause the compressor to unload to minimum and then stop. The controller will then display the MANUAL OFF mode.

MODES CHANGES

Once the compressor is running mode changes are allowed but they will have the following effects:-

- i) **Automatic (Remote/Local) to Manual** -The slide will remain at the last selected automatic position. The operator may then select capacity and use the raise/lower buttons as required.
- ii) **Manual to Automatic LOCAL** - The controller will use suction pressure regulation to automatically adjust the slide to match demand. If a start/stop refrigeration input is used then if stop is present the compressor will unload to minimum and then stop.
- iii) **Manual to Automatic REMOTE** - If this is the only compressor running in REMOTE mode then it will go into suction pressure regulation mode, begin requesting status information and become the master. If another compressor is already master, it will ramp its slide up to 100%.

TWO SPEED MOTOR CONTROL

Relay outputs VI-1, VI-2 can be configured as LOWSPEED, HIGHSPEED selections for two-speed motors thus allowing compressors to be run more efficiently at low capacity.

TWO SPEED OPERATION ('2-SP' selected)

In all control modes the LOWSPEED/HIGHSPEED control relays are selected when the pump is started. Whenever VI-1 (LOWSPEED) relay is energised the slide capacity is always halved (ie maximum capacity is 50%).

If the slide reaches the 'at maximum' limit switch in LOWSPEED mode (normally 50%) then after the stage-up delay the slide is automatically lowered, the motor is stopped, waits for appropriate delays, restarts the pump, selects HIGHSPEED mode and, provided the slide is 'at-minimum', the compressor is restarted in HIGHSPEED mode.

In HIGHSPEED mode, provided the slide has reached 55% capacity, when the capacity goes below the CAPACITY LOW ALARM limit the slide is automatically lowered, the motor stopped and, after the appropriate delays, reverts back to LOWSPEED selection when the pump is re-started.

The motor is subsequently started in LOWSPEED mode provided the slide is 'at-minimum'.

In both HIGH Speed and LOW speed modes a continuous loading pulse is given during the loading delay until the slide has moved from At-Minimum.

Loading/unloading pulses are automatically doubled in width if the suction pressure is more than 0.5 bar from the control setpoint. This improves response after changing speeds.

MANUAL MODE 2-SPEED

In manual mode the compressor stops automatically when 'at maximum' is reached in low speed and below Capacity LOW ALARM limit in high speed.

The compressor must be started again manually in both cases. The motor speed can be forced to be permanently LOWSPEED or HIGHSPEED by selecting 'vi-1' or 'vi-2' respectively instead of '2-SP'.

VARIABLE SPEED MOTOR CONTROL

With variable capacity slide.

The motor speed is controlled by analog output AO-2 which provides a signal of 0 to 10V dc for 0 to 100% motor speed.

The slide capacity is controlled by pulsing the LOAD and UNLOAD relays with a pulse duration equivalent to a 10% capacity increase or decrease.

A theoretical slide position capacity display may be obtained by connecting A01 to the slide input(0-10vdc).

STARTING

With the slide 'at-minimum' (capacity approx 25%) the compressor motor is started at start-stop-speed (SYST noSP, St50, St40, St30, St20, St10, demo).

After the capacity load-delay (approx 3minutes), the capacity solenoid is loaded until at-minimum limit switch is removed. IF SYST 'noSP' is selected then the motor runs at maximum speed and no speed control takes place (standard slide control).

RUNNING

Whilst above start-stop-speed and below 100%-speed, in order to achieve the required suction pressure setpoint the motor speed is varied up and down every five seconds by the speed-increment (SYST Si = approx 2 %).

If the suction pressure goes more than 0.5 bar outside setpoint then the speed increment is automatically doubled.

SLIDE CAPACITY INCREASE

When 100%-speed is reached the load-delay-timer is started. If the suction pressure is outside 0.5bar of setpoint then the load-delay timer is overridden. Each time 100%-speed has been present for greater than the load-delay (3 minutes) then the slide capacity is loaded by a further 10% increment until slide 'at-maximum' is present.

SLIDE CAPACITY DECREASE

When start-stop-speed is reached the load-delay-timer is started and the motor speed is not decreased any further. If the suction pressure is outside 0.5bar of setpoint then the load-delay-timer is overridden. Each time start-stop-speed (50%) has been present for greater than the load delay (3 minutes) then the slide capacity is unloaded by a further 10% decrement until slide 'at-minimum' is present.

STOPPING

If the compressor is at start-stop-speed with slide 'at-minimum' for longer than the stage-down-time (d) then the motor is switched off and motor speed is run down to zero.

REMOTE MODE- NEXT COMPRESSOR

If the compressor is at 100%-speed with slide 'at-maximum' for longer than the stage-up-time then another compressor in the same pack is allowed to start.

MANUAL MODE OPERATION

In manual mode the compressor speed may be increased/decreased using the raise and lower pushbuttons with mode selection = 'Compressor'.

In manual mode the slide capacity may be increased/decreased using the raise and lower pushbuttons with mode selection = 'Capacity'.

Local or remote operation may then be selected if required

TWO COMPRESSOR-SINGLE MOTOR OPERATION

Two SCC-40 controllers may be connected together in a Master-Slave configuration for applications where two stage compressors share a single motor. The low stage compressor (LS-U) is always the master. The high stage compressor (HS-U) is always the slave. The Std. (standard) or LS-U or HS-U selection may be made by pressing 'next' after SC40 is displayed in Setup Unit .

HARD WIRED INTERLOCKS

The common motor contactor requires both low stage and high stage controllers to have their individual motor relays energised before the common motor contactor is energised and the motor started. If any hard-wired safety interlocks are present for either high stage or low stage then the motor contactor is not energised. Both compressor pump systems must be running before the controllers energise their motor relay output to start the motor.

HIGH STAGE SLAVE MODES

The high stage compressor (HS-U) controller may only be selected to operate in REMOTE or MANUAL CAPACITY modes. The HS-U controller acts as a slave to the low stage (LS-U) controller. The low stage controller starts and stops under LOCAL or REMOTE suction pressure or MANUAL control and issues Start-slave and Stop-slave signals to the high stage whenever the low stage compressor starts or stops.

LOW STAGE START HIGH STAGE SLAVE

The low stage controller removes its Stop-slave output whenever the low stage pump is started. The RESET TRIP RELAY (1 second pulse) is issued by the low stage immediately after pump running signal is detected. This signal is connected to high stage start-slave input which initiates a startup sequence as though the high stage compressor had been started in local suction pressure control. Only when both controllers have completed their pre-lubrication time and energised their motor output relay is the motor contactor energised.

If the high stage fails to start its pump, or is in OFF mode, or fails to move its slide to At_minimum then the motor contactor is not energised and the failure mode of the low stage is displayed as 'nnot' (motor run fail) whilst the high stage controller displays the appropriate fail message 'PunP' or 'S-UP'.

LOW STAGE STOP HIGH STAGE SLAVE

When the low stage suction setpoint is satisfied and the low stage has been at minimum for longer than the 'stage down time' or a low stage Manual Stop request is given, then the low stage compressor goes into its stopping sequence and issues a Stop-slave signal to the high stage prior to removing the low stage motor relay signal which de-energises the motor contactor. The high stage goes into its stopping sequence, lowers its slide to At_Minimum and then removes the high_stage motor relay signal (the motor contactor is probably already de-energised). Both high stage and low stage compressors run their oil pumps until the appropriate slides are At_minimum and both controllers display 'Waiting' followed by 'Ready'.

LOW STAGE OR HIGH STAGE DETECTS SAFETY TRIPS

Any safety trip immediately de-energises the motor contactor by hard wiring which removes the motor running signal from both controllers.

If the safety trip is on the low stage then the low stage controller indicates the trip condition and flashes the 'Tripped' lamp, whilst the high stage controller flashes its 'Tripped' lamp and indicates 'nnot' (motor running fail) since it cannot detect any other trip.

If the safety trip is on the high stage then the high stage controller indicates the trip condition and flashes the 'Tripped' lamp, whilst the low stage controller flashes its 'Tripped' lamp and indicates 'nnot' (motor running fail) since it cannot detect any other trip.

LOW STAGE DETECTS TRIPS

If the low stage detects a high or low trip limit condition then the Stop-slave signal is given to the high stage and the low stage motor relay output is immediately removed which de-energises the motor contactor. The high stage shuts down in a normal stopping sequence even though the motor contactor has already been de-energised.

The low stage indicates the trip condition and lights its 'Tripped' lamp.

HIGH STAGE DETECTS TRIPS

If the high stage detects a trip condition then the STOP_MASTER signal is given to the low stage and the high stage motor relay output is immediately removed which de-energises the motor contactor.

The low stage shuts down in a normal stopping sequence.

The high stage indicates the trip condition and lights its 'Tripped' lamp.

HIGH STAGE STOP REQUEST

When a high stage Manual Stop request is given, then the high stage compressor goes into its stopping sequence and issues a Stop-slave signal to the low stage master prior to removing the high stage motor relay signal which de-energises the motor contactor. The low stage goes into its stopping sequence, lowers its slide to At_Minimum and then removes the low stage motor relay signal (the motor contactor is probably already de-energised).

Both high stage and low stage compressors run their oil pumps until the appropriate slides are At_minimum and both controllers display 'Waiting' followed by 'Ready'.

REMOTE OPERATION

When all three low stages are selected to REMOTE mode then one low stage controller takes over as best compressor and does suction pressure control and communications to all other low stage controllers as described in the section :- CONTROL OPERATION

High stage controllers are started and stopped as required by their associated low stage. Guardian SCC-40 Remote mode communications currently supports a maximum of 4 controllers.

ECONOMISER VALVES

On HS-U and LS-U controllers the economiser valve is open whilst the motor relay output is present.

INJECTION VALVES

On HS-U and LS-U controllers the injection valve is energised (valve closed) when the pump starts and de-energised (valve open) when the motor is running.

OIL HEATERS

Oil heaters are switched on when the motor is stopped and the appropriate oil sump temperature is below the low alarm limit (25°C) provided neither a low oil level or any other safety trip is present.

The oil heaters are switched off when the motor is running.

EVAPORATOR VALVE

The Low-stage LS-U controller provides an analogue output signal (0 to 10vdc) which is proportional to the Low-stage slide position (0 to 100%).

This signal is used to control the evaporator valve position.

AUTOMATIC STANDBY COMPRESSOR CHANGEOVER AFTER TRIP

IF auxiliary VI relay selection is Setup SySt = 'Stby' then VI-1 relay may be used to switch a multi-pole relay which routes all microswitch and safety trip inputs and control relay outputs to provide automatic compressor control changeover after any trip.

The changeover sequence is as follows:-

Suction pressure higher than setpoint
VI-1 relay de-energised
compressor 1 input/outputs connected to SCC controller
compressor 1 automatically starts and runs
... some time later
compressor 1 trips - flashing trip lamp
delay after stop timer started
- trip data still displayed
when delay complete - automatically reset trip lamp
VI-1 relay energised
compressor 2 input/outputs connected to SCC controller
compressor 2 automatically starts and runs
... some time later
compressor 2 trips - flashing trip lamp
delay after stop timer started
when delay complete - automatically reset trip
VI-1 relay de-energised
compressor 1 input/outputs connected to SCC controller
compressor 1 automatically starts and runs
etc.

If more than 6 trips occur in a 24 hour period with security keyswitch not present then the message 'CALL FRIG ENGINEER' is displayed and the system will not reset until the security key is selected or the passcode entered.

MANUAL SELECTION

The VI-1 relay (Stby) can be forced to a particular compressor by using 'raise' or 'lower' pushbuttons on VI selection in SetuP SySt as follows:-.

Use SetuP SySt noVI to de-energise the relay for compressor 1
or SetuP SySt Vi-1 to energise the relay for compressor 2

The automatic standby changeover feature is restored SetuP SySt Stby.

Notes on Set-up of AUTO VI for Howden Compressor

Auto VI Operation:

Howden supply Auto VI Compressors with a stepper motor built into the Volumetric slide. Guardian SCC40 Panels contain the drive PCB for the stepper motor as shown in attached drawing SCC40 Auto VI Wall box panel Wiring CDC0016

With the Howden VI slide mechanical arrangement there are two modes of operation:

1. **Part Load.** Capacity Slide is not in contact with VI slide.
2. **Full Load.** Capacity Slide is in contact with VI slide.

While the Slide capacity is less than the Initial VI setting the VI slide is set to VI minimum.

Above the Initial VI setting the VI slide is adjusted for the corresponding pressure ratio.(Part Load operation)

When the Capacity slide meets the VI slide the compressor is in Full Load mode and the At Maximum indication is set.

In Full Load mode and the suction pressure is at or above the setpoint, if the VI is decreasing the Capacity slide is moved first as this is able to push the VI slide back. If the VI is increasing the VI stepper is moved first and then the Capacity slide is moved, this ensures that the Capacity slide and VI slide remain in contact during full load mode.

In Full Load mode and the suction pressure is below the setpoint, the VI slide is moved to the calculated position for the pressure ratio and then the At Maximum indication is removed and Part Load operation is resumed.

Procedure

- 1 Check Wiring Connections as drawing SCC40 Auto VI Wall box panel Wiring CDC0016.
- 2 Switch Scc40 Controller to 'OFF' mode.
- 3 Select **Setup, System, 'noVI'** as SCC40 Manual page 56.
- 4 Calibrate Capacity Slide for maximum and minimum as described on SCC40 Manual pages 60 and 61
Note: For Auto VI to work successfully the capacity slide must have been calibrated at the lowest VI setting.
- 5 Select **Setup, System, 'Vi-A'** VI Auto as SCC40 Manual page 56. This allows display and setup of **AUi** settings listed below.
- 6 Setup type for Compressor Model and check Period is 0.5 and Fi=00 (automatic Vi control with recalculation every 30 seconds).
- 7 Enter **test mode** as on as SCC40 Manual page 58 and check pulse outputs are working by :-
 - a) Select ' SsuP' Select Slide up – pulses VI slide to maximum in about 2 minutes.
 - b) Select ' Ssdn' Select Slide down – pulses VI slide to minimum in about 2 minutes.
8. Start compressor. When the slide capacity is above Initial VI setting '**inxx**' the auto VI slide is controlled dependent on the difference between suction and discharge pressure.
The greater the difference the higher the VI ratio. (2.6 to 5.0).
9. The VI ratio currently in force is displayed in the '**Oil**' window by selecting **Equivalent Temperatures, Latest Values**.
10. The value displayed is recalculated and updated every VI Period Px.x minutes.
11. If the capacity slide is at maximum with value > 100% then the slide is automatically unloaded.
12. The compressor may be forced to a fixed VI ratio by selecting Fi (see next page) between 2.6 and 5.0.
To resume Automatic VI, the Fixed VI parameter Fi Must be set to zero Fi=00.
13. On SCC40 Restart Power-up, Compressor Stop or Compressor Trip then the VI slide is pulsed back to zero which takes about 2 minutes.

Auto VI Commissioning Parameters

Aui only displayed if 'VI-A' is selected

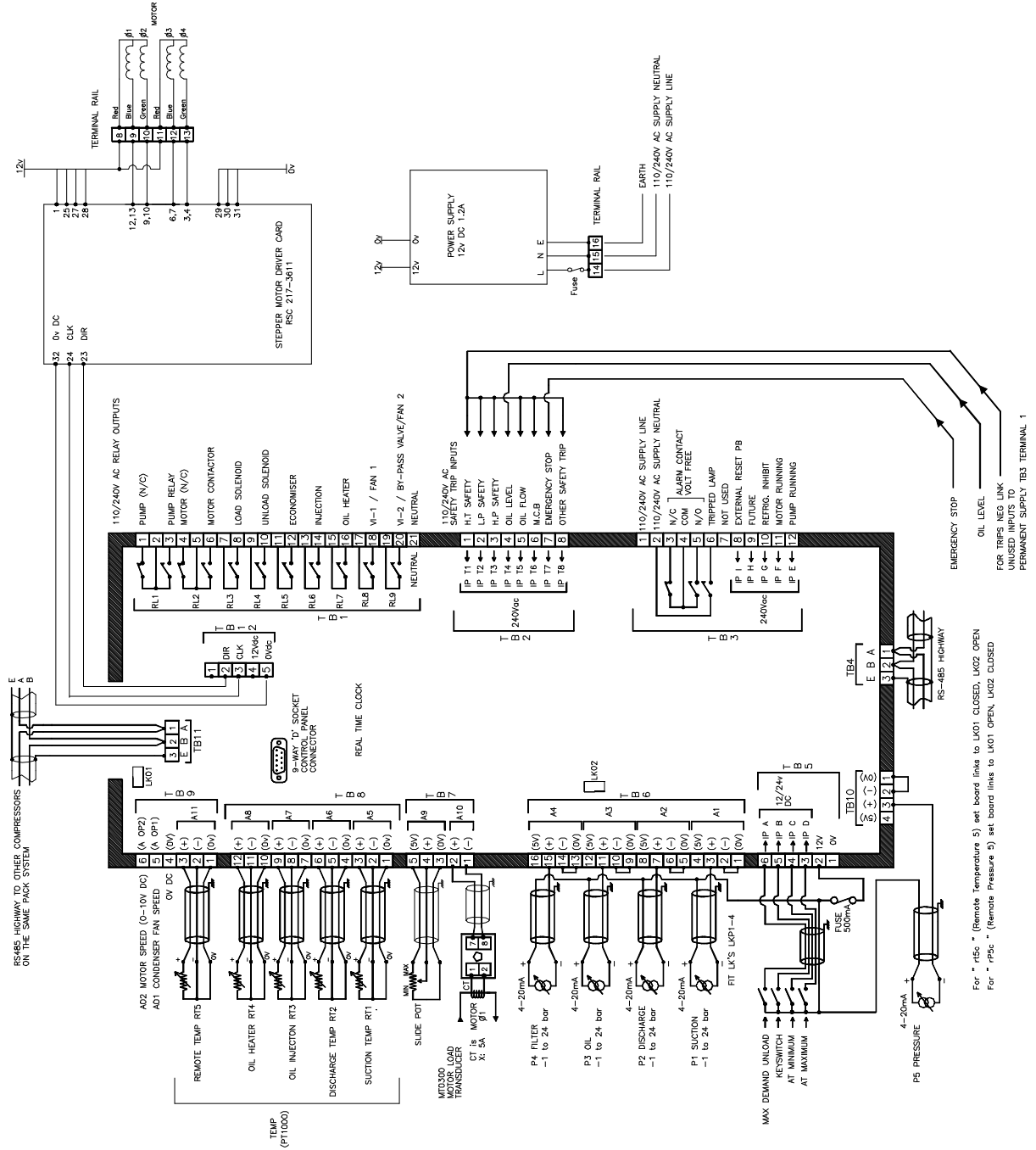
	units	Actual setting	Default setting	Min	Max
<p>Compressor Type Specifies the Howden compressor type:</p> <p style="text-align: center;">1 = XRV163/165 4 = XRV204/145</p> <p>NB. Only types 1 and 4 are currently supported. (See attached data sheet for Guardian defaults)</p>		Ct		Ct00	Ct06
<p>Maximum Capacity Travel. This is normally defaulted for the Compressor type selected. However, this may vary depending on Howden configuration, so check with manufacturers data sheets. (See attached data sheet for Guardian defaults)</p>	mm	C		C000	C255
<p>Maximum Slide Stop This is normally defaulted for the Compressor type selected. However, this may vary depending on Howden configuration, so check with manufacturers data sheets. (See attached data sheet for Guardian defaults)</p>	mm	U		U000	U255
<p>Initial VI Setting. Capacity slide percentage at which auto variable VI is applied. (See attached data sheet for Guardian defaults)</p>	%	in		in45	in99
<p>Period Auto VI is applied (Adjustable in 0.1 minute steps, ie 6 seconds) Dependant on application. Recommend starting at 0.5 (30 seconds) and observe system response. If too erratic increase time.</p>	Mins	P		P0.0	P25.5
<p>Fixed VI Setting If a fixed VI condition is required then this may be adjusted to give the required slide stop. When set to 0.0 then Auto variable VI is in action.</p>		Fi		Fi0.0	Fi5.0

Note: For Auto VI to work successfully the capacity slide must have been calibrated at the lowest VI setting.

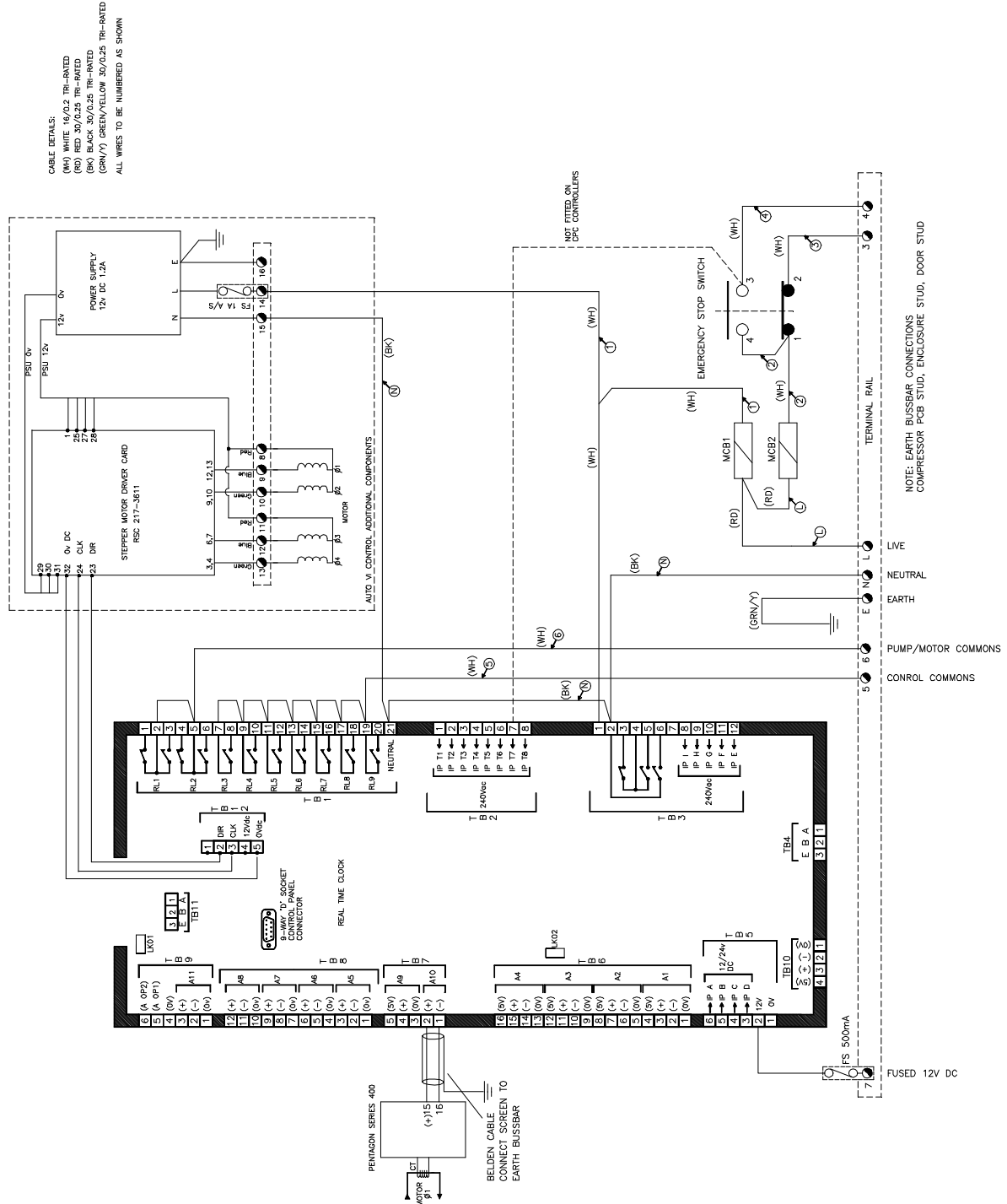
Guardian Default Data for Howden Compressors.

Compressor Model	Compressor Type	Capacity travel (mm)	Slide Stop (mm)	Initial VI Setting(%)	VI minimum	VI maximum	Parked position (mm)
XRV163/165	Ct 01	C150	U47	In 70	2.6	5.0	52
XRV204/145	Ct 04	C152	U54	In 64	2.6	5.0	59

Auto VI Drawing



Auto VI Wallbox Wiring



TIMER SETPOINTS

Timer delays are displayed in the windows detailed below with selections 'type'= 'TIMERS and 'view'= 'LATEST VALUE'.

All timer delays count down to zero in tenths of a minute :-

Timers are adjusted using 'raise', 'lower', 'next', 'accept' when 'view'= setpoints

Adjustable timers are available for:-

Timer	Window	Range and description
Stage-Up (u)	SUCTION	0.5 to 12min Time Compressor at 100% before allowing next compressor to start.
Stage-Down (d)	DISCHARGE	0.5 to 10min Time compressor at minimum load or time at 50% if in slide balance mode before stopping. Set at 10.0 min = none, NO STOP AT MINIMUM, MANUAL STOP ONLY N.B. To exit none setting = Discharge, Timer, Setpoint, Lower, Accept.
Pre-Lubrication (p)	OIL	0.0 to 5.0min Oil pump run before compressor starts. At-minimum signal must be present at the end of this timer or a 'S-UP' trip is displayed before the motor is started. On a siphon system this timer is restarted with the motor and inhibits LOW oil differential pressure alarms and trips whilst it is still active.
Pump-off-after Stop (o)	FILTER	0.0 to 5.0min Oil pump run delay after compressor stops until at-minimum received.
Capacity load delay	CAPACITY%	0.5 to 5.0min This timer determines the interval between loading/unload pulses when the control is close to (<0.3 bar) the control setpoint. This delay is also used after starting motor before loading pulses are started.
After-Stop	LOAD %	1.0 to 5.0min the minimum time required after stop before allowing another restart.

The following timers may be adjusted in SETUP SYST

Timer		Range and description	
Starts per hour	SH	0.5 to 12min	The controller restricts the compressor to 20 starts per hour.
Differential alarm delay	dt	0 to 9.9mins	This timer determines the delay before allowing oil differential alarms and trips. It is also used as a delay for oil level or flow safety trips.
Bypass delay	bt	0 to 99 secs	This timer is displayed if 'by-P' is selected and provides a discharge bypass valve pulse of duration bt seconds on output VI-2. The valve is opened 4 seconds before the motor is started. the bypass is also opened for bt seconds when the compressor is stopped or tripped.
Economiser Back-off delay	Et	0 to 99 mins	This timer determines the delay before allowing the Economiser to switch on again after a load reduction 'back-off'.
Loading pulse Width	LP	0 to 50%	0 to 50% of the 5 second raise-lower period. The value is change using System Setup mode This width is automatically doubled if the suction pressure is more then 0.5 bar above setpoint.
Loading pulse At maximum	LPSt LPPu		Loading pulses stopped, No further Pulses. Loading pulses pulsed, Continued Pulses.
Unloading pulse width	UP	0 to 50%	0 to 50% of the 5 second raise-lower period. The value is changed using system setup mode This width is automatically doubled if the suction pressure is more then 0.5 bar below setpoint.
Raise -Lower period		fixed 5 secs	interval between start of successive raise or lower pulses when 0.3bar outside setpoint.

LOAD% WINDOW; This window displays three timers.

- i) 10.0 - 0.0min Time between starts
- ii) 5.0 - 1.0min Time after stop
- iii) Motor pre-load delay after
When waiting the larger of i) and ii) is displayed.

SETUP

Compressor Settings

Unit Settings:

SUCTION OIL
 ==SE tUp= Press “@next” to sequence through Setup selections
 DISCHARGE FILTER Press “@raise” or “@lower” to change settings
 ==== Uni t Press “@accept” to accept settings

Unit Model YYYYY
 YYYYY = SC40
 SC35
 SC30
 SC25

Unit type YYYYY (definition of T5/P5 channel operation)
 YYYYY = Std Standard SCC-40 operation
 HS-U High side unit dual compressor, 1 motor
 LS-U Low side unit dual compressor, 1 motor
 Vibr P5 is 4-20mA vibration 0-100% with trips
 tcon Control on equivalent temperature
 CHIL Control on water chiller temperature T5
 rt5c Control on glycol chiller temperature T5
 rP5c Control on Remote Pressure P5

Multi-compressor control priority YYYYY
 YYYYY = runH Priority run on hours
 LEAD Priority always highest
 LAg Priority always lowest
 StbY Only run if another has tripped

System number Snnn nn = 1 - 80

Compressor number Cnnn nn = 01 - 06

Monitor Address Annn nnn = 1 - 255

if model type SCC-40 or SCC-35
 Real time clock rhnn Real time hours nn = 0 to 23
 Cnnn Real time mins nn = 0 to 59

System Settings

SUCTION	OIL		
==SE	tUp=	Press “@next”	to sequence through Setup selections
DISCHARGE	FILTER	Press “@raise”	or “@lower” to change settings
====	sySt	Press “@accept”	to accept settings
Starts per hour		sHnn	nn = 02 to 19
Loading pulse width		Lpnn	nn = 2 to 50 % (% of 6 Second Pulse)
Starting Pulse		Spnn	nn = 0 to 100 % (% of 6 Second Pulse) Initial Starting Pulse, Until at Minimum Removed.
Loading pulses when Slide at Maximum.		LpSt	= Load Pulses stopped @ max
		or	
Unloading pulse width		LpPu	= Load Pulses continued @ max
		Upnn	nn = 2 to 50 % (% of 6 Second Pulse)
Pump Selection		yyyy	
		YYYY=PunP	PunP , Pump Run Compressor
		P-St	P-ST , Pump Start Compressor
		no-P	no-P , No Pump Compressor
		FiLt	FiLt , Special, Contact Guardian.
Oil Differential alarm trip delay.		dt nn	nn = 0 to 9.9 minutes
Bypass delay if ‘bY_P’		bt nn	nn = 0 to 99 seconds
If 2Fan,.		bFnn	nn = 0.5 to 9.9 Bar Additional cut-in above setpoint of Fan1 in Discharge, Pressure, Setpoint
NOT USED		Lbnn	
Economiser back-off retry time		Et nn	nn = 0 to 99 minutes
Motor start speed if Inverter %		St nn	nn = 0 to 99 %
Inverter speed increment %		Si nn	nn = 1 to 20 %
Auxiliary relay VI-1 and VI-2 operation mode		yyyy	
		YYYY=noUi	no VI or auxiliary relay control
		ui-1	Switch on VI-1 output
		ui-2	Switch on VI-2 output
		both	Switch on VI-1 & VI-2 outputs
		auto	do Auto VI (special Eprom)
		2-SP	two speed motor control (see later section)
		StbY	Standby compressor switch over
		bY-P	Discharge bypass valve operation
		FANS	2-stage condenser fans control

frigeration input state for refrigeration ON	yyyy YYYY=rPos rnEg	
Trip input signal state to trip	yyyy YYYY=tPos tnEg	
Refrigeration gas type	yyyy YYYY=r22 nH3 404A	Refrigeration gas type for superheat calculations
Filter Differential	yyyy YYYY=FStd FdiS	Filter Position Relative To Pump Filter Standard (Filter After pump) Filter Discharge (Filter Before Pump)

Port Settings

Note Port is only used on early software versions, all later versions are fixed at a 9600 Baud rate and 'Port Settings' is not used

SUCTION	OIL	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	FILTER	Press "@raise" or "@lower" to change settings
====	Port	Press "@accept" to accept settings
Baud rate	YYYY	
	YYYY = 9600	Baud rate settings for RS485 highway
	4800	communications
	2400	
	1200	

Analog

SUCTION	OIL	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	FILTER	Press "@raise" or "@lower" to change settings
====	AnAL	Press "@accept" to accept settings
Pressure transducer type	P=nn	nn = 0 to 255
Slide voltage range	C=nn	nn = 0 to 100
Current transformer rating	tnnn	nnn = 10 to 990 Amps
Maximum rated motor load	rnnn	nnn = 10 to 990 Amps
		P=00 0-100mV P=04 4-20mA C=00 0-10Vdc C=05 is normal setting

Test

SUCTION	OIL	
==SE	tUp=	Press "@next" to sequence through relays
DISCHARGE	FILTER	
====	tEst	Press "@accept" to toggle relay states
Relay R1	1OFF	1=on
Relay R2	2OFF	2=on
Relay R3	3OFF	3=on
		etc
Relay R9	9OFF	9=on
Alarm relay	AOFF	A=on
LED 1	OFF	ON
		etc
LED 8	OFF	ON
Tripped relay	tOFF	t=on
Analog output calibration	Ao=0	
	Ao10	
	Ao05	

Done

SUCTION	OIL	
==SE	tUp=	
DISCHARGE	FILTER	
====	done	Exit settings change and return to default compressor display press "@accept" .

TWO SPEED MOTOR CONTROL SELECTION

Selection

Two-speed motor operation may be selected after entering passcode 15 and then selecting '**type**'= SAFETY TRIPS and '**view**'= SYSTEM

SUCTION	OIL	“@: @view” = “SYSTEM”		
==SE	tUP=	“@: @type” = “SAFETY TRIPS”		
DISCHARGE	FILTER			
====	=yEs	“@accept”		
DISCHARGE	FILTER			
====	Unit	“@: @next”		
DISCHARGE	FILTER		DISCHARGE	FILTER
====	SYSt	“@accept”	====	Lpnn “@next”
DISCHARGE	FILTER		DISCHARGE	FILTER
====	UPnn	“@next”	====	noSP “@next”
DISCHARGE	FILTER			
====	r22=	“@next”		
DISCHARGE	FILTER			
====	noUi	“@: @raise” or “@: @lower”		
DISCHARGE	FILTER			
====	2-sp	“@accept” “@RESET”		

Two speed motor operation has been selected.

Two speed operation may be removed by selecting ‘none’ instead of ‘2-SP’

TRANSDUCER SETUP & CALIBRATION

TRANSDUCER SETUP

Transducer zero, scale and voltage ranges must be selected prior to calibration and is done as follows:-

Enter set-up as described in earlier section:

		“@: @view” = “SYSTEM”
		“@: @type” = “SAFETY TRIPS”
SUCTION	OIL	
==sE	tUP=	
DISCHARGE	FILTER	
====	=yEs	“@accept” “@: @next”
DISCHARGE	FILTER	
====	AnAL	“@accept”
DISCHARGE	FILTER	
====	P=nn	nn = P000 = 0-100mV transducer (P -zero) “@next” nn = P004 = 4-20mA transducer
DISCHARGE	FILTER	
====	C=nn	nn = is slide voltage range 0-10V dc (C -scale) “@next” C 05 = 0-5V dc C 41 is a slide giving only 4.1 volts due to line losses instead of 5.0 volts C100 is 4-20mA slide input selection (Also for 4-20mA Fit Link LKV2 adjacent TB7)
DISCHARGE	FILTER	
====	tnnn	nnn = is the current transformer rating (T - size) “@next” eg for a CT of 300:5 then nnn = 300
DISCHARGE	FILTER	
====	rnnn	nnn = is the maximum rated motor (R - size) “@next” load in Amps eg For a 250Amp compressor nnn = 250

To change any ‘Anal’ (Analog) setting use the following procedure;

		“@raise” or “@lower” until correct value is displayed
		“@accept” . “@next”
SUCTION	OIL	
==sE	tUP=	
DISCHARGE	FILTER	
====	donE	“@accept” “@RESET”

PRESSURE TRANSDUCER SETUP

GUARDIAN Pressure transducers require the Setup-AnaL-P-xxx = P000.

SUCTION	OIL	
==SE	tUP=	
DISCHARGE	FILTER	
====	P=00	nn = P 00 = 0-100mV transducer

4-20mA pressure transducers require a link LKP1-P5 which connects an **internal** 500 ohm resistor across the “+” and “-“ terminals, and the selection Setup-AnaL P-xxx = P004.

(The Pressure transducer links are located immediately adjacent each pressure transducers' connector block on the extreme edge of the main board)

SUCTION	OIL	
==SE	tUP=	
DISCHARGE	FILTER	
====	P=04	nn = P 04 = 4-20mA transducer

CALIBRATION

4-20mA transducers are calibrated at the factory and should not need to be calibrated at site.

Before attempting Pressure Calibration, please contact Guardian Electronics Ltd.,

Pressure transducers are set for a range of -1 to 24 Barg. (0-25 Bara)

4mA = -1 Barg, 17.44mA = 20 Barg,

CAUTION, Do not press the accept button if during calibration the display reads -1.3Barg, as this is an out of range setting and will result in a permanent loss of calibration.

Select

'view' = SYSTEM,

'type' = PRESSURE

With the compressor stopped and slide at 0%.

The CAPACITY% display in the appropriate window is the slide error for 0%.

No	CAPACITY%	LOAD%
=	- - -	===

Using 'next' to select the CAPACITY window, press '**raise**' or '**lower**' to make the displayed value zero and press 'enter'.

The zero offset of the transducer is corrected provided the displayed value is below 15%. With the slide at full load setting (100%) use 'raise ' and 'lower' to adjust the value to 100% and press 'enter'.

The scale offset of the transducer is corrected.

CAPACITY % SETUP

Slide voltage range must be selected prior to slide calibration. Normal settings for a 1000ohm slide potentiometer using the on-board precision 5vdc connection is:-

SEtuP-AnAL-C_term = C005

Note if the full range of the 1000ohm pot is not used then adjust C005 to C004 or lower until a 0 to 100% scale can be viewed, respective to at minimum and at maximum.

IF a 10vdc slide position transmitter is used then:- SEtuP-AnAL-C_term = C010

IF no slide input is fitted then:- SEtuP-AnAL-C_term = C000

```

SUCTION      OIL
==SE  tUP=
DISCHARGE    FILTER
==== C000
  
```

The Capacity % is then deduced from the state of the slide position microswitches for 0%,50%,100%.

IF a 4-20mA slide transmitter is used then the slide input should have Link LKV2 (adjacent TB7) fitted with the shorting links supplied. setup selection is:-

SEtuP-AnAL-C_term = C100 for 4-20mA

MOTOR LOAD % SETUP

IF a 300:5 current transformer is used then SEtuP-AnAL-tnnn = t300

press 'raise' or 'lower' until current transformer size is displayed then press 'accept'.
press 'next'

```

SUCTION      OIL
==SE  tUP=
DISCHARGE    FILTER
==== t300
  
```

IF a 250 amp maximum rated motor is used then

SEtuP-AnAL-rnnn = r250

press 'raise' or 'lower' until the required motor rating is displayed then press 'accept'.

```

SUCTION      OIL
==SE  tUP=
DISCHARGE    FILTER
==== r250
  
```

The load % zero and 100% settings can be marginally adjusted using

'view' = **SYTEM** , 'type' = **PRESSURE** as for the capacity % above.
GUARDIAN SCC-40 Issue (Auto VI) & V3.6t 07/12/00

COMMUNICATIONS

The MASTER unit is always the one associated with the compressors with the least hours run which is also available for operation in REMOTE suction pressure control mode.

Remote monitoring, modification and control of the compressor system via a second two-wire serial link (RS485) may be provided using the GUARDIAN Autograph Monitor Terminal. This IBM compatible PC terminal provides displays of latest values, control and alarm settings, timers and compressor status together with daily printouts of pressure and temperature graphs, alarm and trip messages.

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 system no. 1-80

u is compressor number 1-6.

i.e. compressor 3 system 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
- e) Receive Time and Date with new hours and minutes, day, month and year for real time clock

Main Set-up/ Commissioning Parameters

Enter Passcode

“@ _{view} ” = “SETPOINT”		“@ _{next} ” “@ _{next} ”	
SUCTION	OIL		
pASS	codE		
DISCHARGE	FILTER	“@: @ _{raise} ”	“@ _{accept} ”
== - =	== 12		

“@: @ _{view} ” = “SYSTEM”		
“@: @ _{type} ” = “SAFETY TRIPS”		
SUCTION	OIL	“@ _{accept} ”
==SE	tUP=	
DISCHARGE	FILTER	
====	=yES	

Unit

	units	Actual setting	Default setting	Min	Max
Model type SC40/SC35/SC30/SC25		SC		SC	SC
Remote control mode runH/LEAd/LAg/StbY				runH	StbY
Control type Std/HS-U/LS-U/Uibr/tcon/CHIL/rt5c/rP5c				Std.	rP5c
System pack number		Sn		Sn01	Sn80
Compressor number		Cn		Cn01	Cn06
Monitor Address		A		A 01	A255

rtc.

	Hrs	rh		rh00	rh24
Real Time Clock					
Real Time Clock	mins	rt		rt00	rt59

Main Set-up/ Commissioning Parameters Cont'd

Syst

	units	Actual setting	Default setting	Min	Max
Motor starts per hour		SH		SH02	SH19
Loading Valve Polarity LPoS = Loading Valve is normally OPEN Lneg = Loading Valve is normally CLOSED		L	LPoS	LPoS	Lneg
Unloading Valve Polarity UPoS = Loading Valve is normally OPEN Uneg = Loading Valve is normally CLOSED		U	UPoS	UPoS	Uneg
Load pulse width, as a % of 6 seconds Load Pulse Interval Controlled by Capacity Timer Setpoint	%	LP		LP02	LP99
Starting Pulse Initial Loading pulse sent on receipt of compressor run signal, until at minimum signal removed. Output is % of 6 seconds No Initial pulse if set to 0%	%	SP		SP00	SP99
LPSt = pulse stop @ Max, LPPU = cont'd pulse @ Max		LP		LPSt	LPPU
Unload pulse width, as a % of 6 seconds Load Pulse Interval Controlled by Capacity Timer Setpoint	%	UP		UP02	UP99
Pump Type Selection PunP , Pump Run Compressor (Oil Differential, Oil P3 to Discharge P2) P-ST , Pump Start Compressor (Oil Differential, Oil P3 to Suction P1) no-P , No Pump Compressor (Oil Differential, Oil P3 to Suction P1) FiLt , Special, Contact Guardian.				PunP	FiLt
Oil differential trip delay	secs	dt		dt00	dt99
(IF bY- P) Bypass delay time, On 4secs before comp starts & On at compressor STOP. (output=VI-2, RL9)	secs	bt		bt05	bt99
(IF 2Fan), Fan 2 additional cut in above setpoint	bar	bF		bF0.5	bF9.9
NOT USED		Lb		Lb1.0	Lb9.9
Economiser retry after back off	mins	Et		Et00	Et99
Motor Inverter Minimum Start Speed [Analogue Output (A OP2)] Set To St00 if Not Used	%	St		St00	St99
(If Speed Inverter), Speed Increment	%	Si		Si01	Si20
Auxiliary relay operation mode noUi/Ui-1/Ui-2/both/VI-A/2-SP/Stby/by-P/2FAn					
Refrigeration input positive/negative for ON		r		rPoS	rnEg
Send OFF command on compressor trip (via comms) CnoA = no action, CoFF = Send Off Signal		C		CnoA	CoFF
Trip inputs positive tPoS / negative tneg to trip		t		tPoS	tneg
Gas type (R22, Ammonia NH3 or 404A)				r22	404A
Analogue input 5 selection None/Pres4-20/Ptr1000ohm			none	none	Ptr
Filter Differential Calculation Fstd , Filter Standard , Diff. Calc. = P4- P3 Filter Located after Pump P4 and before Oil Manifold P3 Fdis , Filter Discharge , Diff. Calc. = P2- P4 Filter Located after Discharge P2 and before Pump P4		F	Fstd	Fstd	Fdis

Hrun

Hours run adjustment		H		H -99	H127
----------------------	--	----------	--	--------------	-------------

AnAL Analogue Set-up

Pressure transducer type P=00 0-100mV P=04 4-20mA		P		P 00	P255
Slide scale (0 = none, 5 = standard) C100 is 4-20mA slide input selection (Also for 4-20mA Fit Link LKV2 adjacent TB7)		C		C 00	C100
Load transformer current rating ratio (txxx:5)	Amp	t		t000	t990
Motor maximum current rating (rxxx)	Amp	r		t000	t990

Setup / Commissioning Parameters

PRESSURES								
Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
SUCTION	PRESSURE	SETPOINT	Suction Pressure setpoint (Fixed Control Diff +/- 0.1bar) NB When in 'rP5c' Display is a duplicate of Filter/Equivalent/Setpoint.	bar			-0.6b	24.0b
DISCHARGE	PRESSURE	SETPOINT	ONLY If 'FANS' selected, condenser fan1 on @ setpoint, off @ 0.5b below setpoint	bar			5.0	20.0
CAPACITY	PRESSURE	SETPOINT	Economiser on at slide greater than	%			0	100
LOAD	PRESSURE	SETPOINT	% load current above which capacity unload pulses are started	%			50	99
SUCTION	PRESSURE	LOW ALARM	Stops compressor on low suction pressure (Automatic Restart)	bar			-1.0b	5.0b
CAPACITY	PRESSURE	LOW ALARM	Load Sharing Compressors Minimum slide % at which a load-sharing compressor is allowed before it auto-stops after stage-down time. Load Sharing OFF When set to 0%	%			0	80
SUCTION	PRESSURE	HIGH ALARM	hi-alarm suction pressure	bar			0.0b	20.0b
DISCHARGE	PRESSURE	HIGH ALARM	hi-alarm disc pressure (unload)	bar			0.0b	23.0b
CAPACITY	PRESSURE	HIGH ALARM	Maximum slide capacity above which the compressor inhibits loading pulses.	%			50	110
LOAD	PRESSURE	HIGH ALARM	% load current above which alarm generated	%			75	100
SUCTION	PRESSURE	LOW TRIP	Low-trip suction pressure (Comp Stop Manual Reset Required.)	bar			-1.0b	5.0b
CAPACITY	PRESSURE	LOW TRIP	Compressor Auto-stops when slide below Capacity, Pressure, Low-trip % , for stage down time period. No Action When Set to Zero 0% Restart after Starts/Hour timer SH	%			0	100
LOAD	PRESSURE	LOW TRIP	low-trip motor current	%			-11	50
SUCTION	PRESSURE	HIGH TRIP	high-trip suction pressure	bar			0.0b	20.0b
DISCHARGE	PRESSURE	HIGH TRIP	high-trip discharge pressure	bar			0.0b	23.0b

TEMPERATURES

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
DISCHARGE	TEMP	SETPOINT	Liquid injection / Oil cooler output, RL6, On at setpoint Discharge temp T2, Off at 5C below setpoint.	°C			40c	85c
FILTER	TEMP	SETPOINT	Switch off oil heater if greater than T4	°C			0c	50c
FILTER	TEMP	LOW ALARM	Inhibit start/heater-on if less than T4	°C			-6c	35c
SUCTION	TEMP	HIGH ALARM	hi-alarm suction temperature	°C			-40c	90c
DISCHARGE	TEMP	HIGH ALARM	hi-alarm discharge temperature	°C			40c	127c
OIL	TEMP	HIGH ALARM	hi-alarm Oil temperature (T3 Injection Manifold)	°C			40c	127c
SUCTION	TEMP	HIGH TRIP	hi-trip suction temperature	°C			-46c	100c
DISCHARGE	TEMP	HIGH TRIP	hi-trip discharge temperature	°C			40c	127c
OIL	TEMP	HIGH TRIP	hi-trip oil temperature (T3 injection manifold)	°C			40c	127c

EQUIVALENTS

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
SUCTION	EQUIV	SETPOINT	IF 'tcon', Suction equivalent temp setpoint	°C			-50	50
FILTER	EQUIV	SETPOINT	IF 'CHIL', Water chiller temp setpoint	°C			-1.0	24.0

rt5c Remote Temperature 5 Control

FILTER	EQUIV	SETPOINT	IF 'rt5c', Glycol Temperature Control Setpoint	°C			-37	30
FILTER	EQUIV	LOW ALARM	IF 'rt5c' Glycol temperature Low Alarm	°C			-47	50
FILTER	EQUIV	HIGH ALARM	IF 'rt5c' Glycol temperature High Alarm	°C			-28	127
FILTER	EQUIV	LOW TRIP	IF 'rt5c' Glycol temperature Low Trip	°C			-47	50

For rt5c set board links to LK01 CLOSED, LK02 OPEN

rP5c Remote Pressure 5 Control

FILTER	EQUIV	SETPOINT	IF 'rP5c', Remote Pressure Control Setpoint NB When in rP5c Display Setting is duplicated at Suction/Pressure/Setpoint	bar			-1.0	24.0
FILTER	EQUIV	LOW ALARM	IF 'rP5c' Remote Pressure Low Alarm	bar			-1.0	20.0
FILTER	EQUIV	HIGH ALARM	IF 'rP5c' Remote Pressure High Alarm	bar			-1.0	24.0
FILTER	EQUIV	LOW TRIP	IF 'rP5c' Remote Pressure Low Trip	bar			-1.0	20.0
FILTER	EQUIV	HIGH TRIP	IF 'rP5c' Remote Pressure High Trip	bar			-1.0	24.0

For rP5c set board links to LK01 OPEN, LK02 CLOSED
Note rP5c Alarms and Trips have a delay of 60 seconds

DIFFERENTIALS

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
OIL	DIFF	SETPOINT	If ' P-St ' ERROR MESSAGE , Actually Repeat of OIL DIFF LOW TRIP, DO NOT ADJUST	bar			-1.0b	5.0b
DISCHARGE	DIFF	SETPOINT	If ' P-St ', Differential discharge to suction above which pump is stopped if only required during start-up.	bar			5.0	20.0
SUCTION	DIFF	LOW ALARM	low-alarm suction superheat (Suction actual temp T1 – suction equivalent temp P1)	°C			-46c	20c
DISCHARGE	DIFF	LOW ALARM	If ' By-P ', lo-alarm differential, Discharge P2 to Suction P1, After FIXED 2min timer	bar			0.0	10.0
OIL	DIFF	LOW ALARM	Low-alarm oil pressure differential (After dt Oil diff trip delay) If ' No-Pump ' oil P3 – Suction P1 diff If PUMP oil P3 – Discharge P2 diff	bar			-1.0b	5.0b
SUCTION	DIFF	HIGH ALARM	high-alarm suction superheat (Suction actual temp T1 – suction equivalent temp P1)	°C			05c	100c
FILTER	DIFF	HIGH ALARM	High Alarm Filter Differential IF 'PUMP' & 'FStd' Selected (Filter Inlet Press4 – Manifold oil pressure Press3) IF 'PUMP' & 'Fdis' Selected (Filter inlet Press2 Discharge—Oil Pump inlet Press4) If 'No-P', 'FStd', 'SCC30/35' (Filter inlet Press P2—Oil Press P3) After FIXED 2min timer	bar			0	20.0
SUCTION	DIFF	LOW TRIP	Low-trip suction superheat (Suction actual temp T1- Suction equivalent temp P1) After FIXED 10min timer.	°C			-46c	30c
DISCHARGE	DIFF	LOW TRIP	If ' By-P ', lo-trip differential, Discharge P2 to Suction P1, After FIXED 2min timer	bar			0.0b	10.0b
OIL	DIFF	LOW TRIP	Low-Trip oil pressure differential (After ' dt ' oil trip delay) No-Pump or P-ST = oil P3 to Suction P1 diff PUMP = oil P3 to Discharge P2 diff 1 Compressor STARTS when at MIN and differential satisfied or TRIPS (on pre lube time-out, OIL TIMER SETPOINT) 2 'dt' time commences only when OIL DIFF LOW TRIP is satisfied 3 IF Slide not returned to MIN Within dt time then Oil Drain Delay Commences for ' SH ' Starts per Hour Timeout.	bar			-1.0b	5.0b

DIFFERENTIALS Cont'd

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
SUCTION	DIFF	HIGH TRIP	high-trip suction superheat (Suction actual temp T1--Suction equivalent temp P1) After FIXED 10min timer.	°C			-40c	100c
FILTER	DIFF	HIGH TRIP	High Trip Filter Differential IF PUMP & FStd Selected (Filter Inlet Press P4 – Manifold oil pressure Press P3) IF PUMP & Fdis Selected (Filter inlet Press P2 Discharge—Oil Pump inlet Press P4) If No-P,FStd,SCC30/35 (Filter inlet Press P4—Oil Press P3) After FIXED 2min timer	bar			0.0	20.0

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min	Max
TIMERS								
SUCTION	TIMERS	SETPOINT	stage up delay (time @ 100% before allowing next compressor to start)	(u)	mins		0.1u	12.5u
DISCHARGE	TIMERS	SETPOINT	stage down delay (time @ minimum load or 50% if in slide balance mode before stopping) Set at 10.0 = none, NO STOP AT MINIMUM, MANUAL STOP ONLY. N.B. To exit none setting = Discharge, Timer, Setpoint, Lower, Accept.	(d)	mins		0.1d	10.0d none
OIL	TIMERS	SETPOINT	pump pre-lube delay (pump run time before compressor starts)	(p)	mins		0.2P	5.0P
FILTER	TIMERS	SETPOINT	pump delay after compressor stops until at-minimum received	(o)	mins		0.0o	5.0o
CAPACITY	TIMERS	SETPOINT	slide load delay (interval between pulses when control within 0.3b)		mins		0.1	5.0
LOAD	TIMERS	SETPOINT	minimum delay after stop before allowing restart		mins		0.3	12.5

CALIBRATION

4-20mA transducers are calibrated at the factory and should not need to be calibrated at site.

Before attempting Pressure Calibration, please contact Guardian Electronics Ltd.,

Pressure transducers are set for a range of –1 to 24 Barg. (0-25 Bara)

4mA = -1 Barg, 17.44mA = 20 Barg,

CAUTION, Do not press the accept button if during calibration the display reads –1.3Barg, as this is an out of range setting and will result in a permanent loss of calibration.

Settings display and change facilities.

'view' LATEST VALUE						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	A1 bar	A2 bar	A3 bar	A4 bar	A9	A10
TEMPERATURE	A5 °C	A6 °C	A7 °C	A8 °C	A9	A10
EQUIV TEMP	A17 °C	A18 °C		A11 °C	A9	A10
DIFFERENTIAL	A17 - A5°C	A2 - A1 b	A3 - A2 b	A4 - A3 b	A9	A10
HOURS RUN	/1000		000Hrs		A9	A10
TIMERS (mins)	stage-up	stage-down	pre-lub	pump-off	preload	after-stop
SAFETY TRIPS	L.P.	H.P.	Leu.	Flo.	Econ.on	Stop-load

'view' SETPOINTS						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	Control	Fans				
TEMPERATURE		LIQ.INJ.	on			
EQUIV TEMP	Control			Chiller		
DIFFERENTIAL		stop-pump				
HOURS RUN						
TIMERS (mins)	stage-up	stage-down	pre-lub	pump-off	pre-load	after-stop
SAFETY TRIPS						

'view' LOW ALARM						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	stop		yes			
TEMPERATURE			pump-inh		min-load	
EQUIV TEMP				yes		
DIFFERENTIAL	yes		yes	yes		
HOURS RUN						
TIMERS (mins)						
SAFETY TRIPS						

'view' HIGH ALARM						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	yes	yes	yes		stop-load	start-unload
TEMPERATURE	yes	mot.inh	yes			
EQUIV TEMP				yes		
DIFFERENTIAL	yes			yes		
HOURS RUN						
TIMERS (mins)						
SAFETY TRIPS						

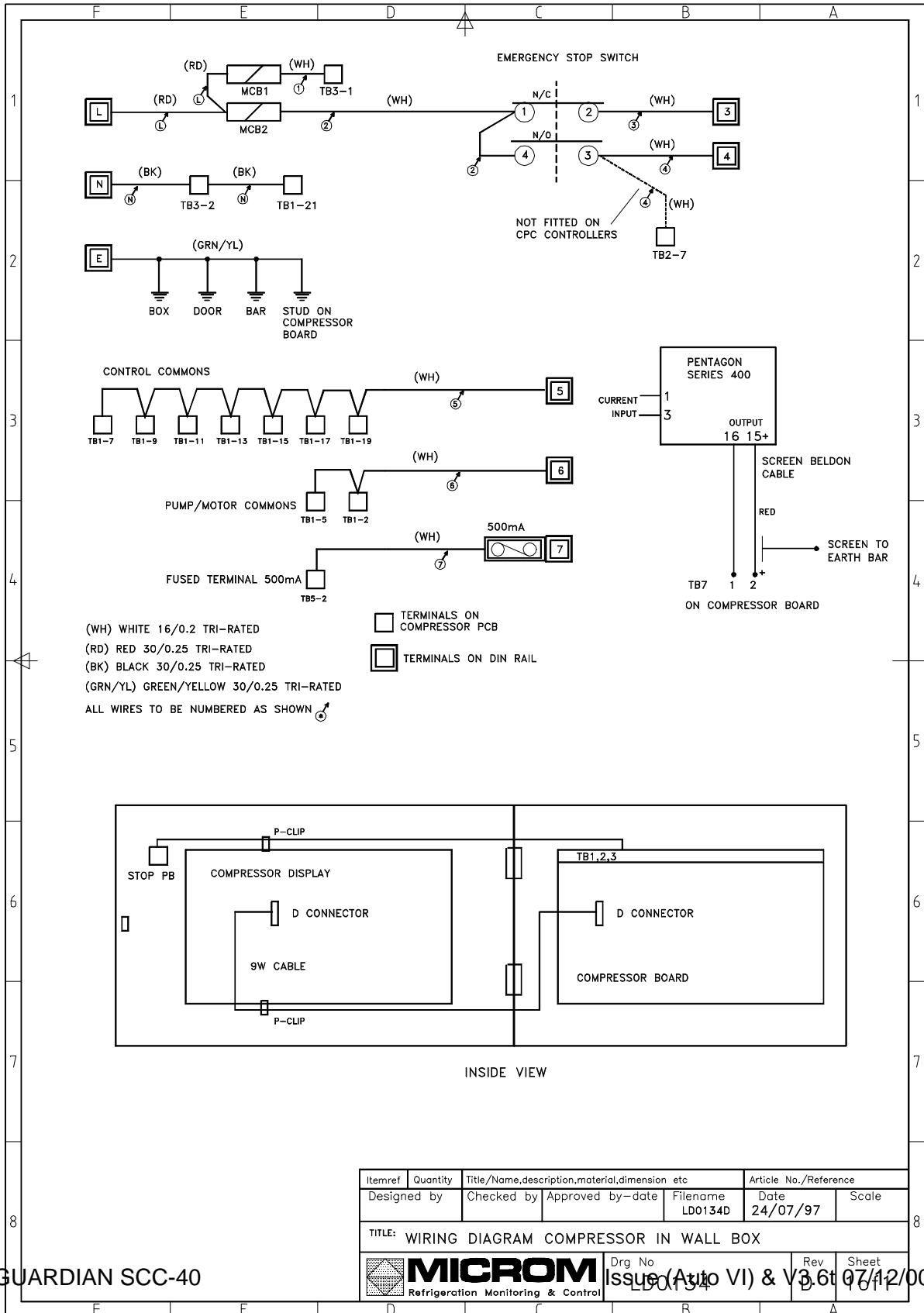
Settings display and change facilities cont'd.

'view' LOW TRIP						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	yes					
TEMPERATURE						
EQUIV TEMP				yes		
DIFFERENTIAL	yes		yes	yes		
HOURS RUN						
TIMERS (mins)						
SAFETY TRIPS						

'view' HIGH TRIP						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	yes	yes				
TEMPERATURE		yes	yes			
EQUIV TEMP				yes		
DIFFERENTIAL	yes			yes		
HOURS RUN						
TIMERS (mins)						
SAFETY TRIPS						

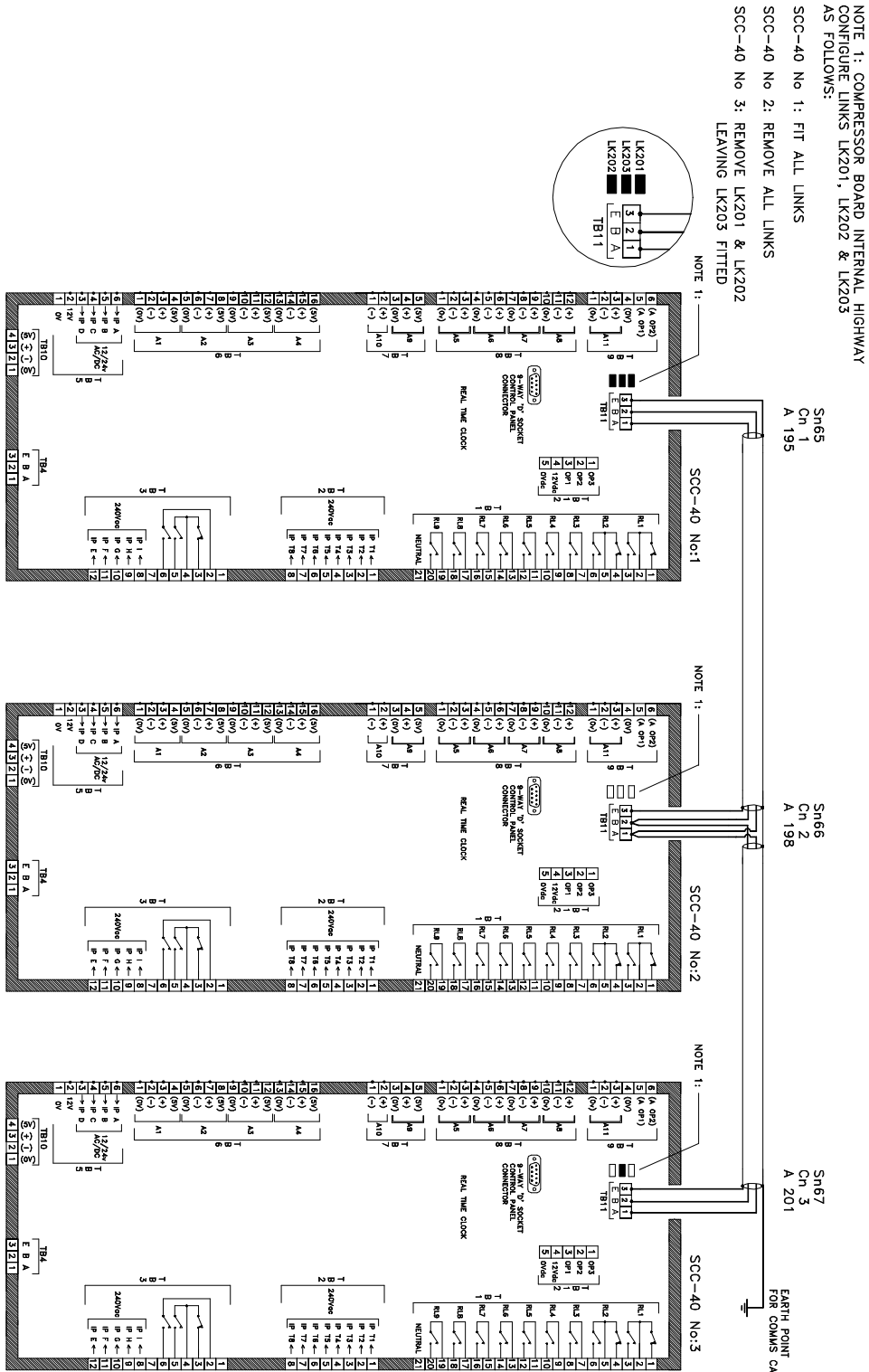
'view' SYSTEM						
'type'	SUCTION	DISCHARGE	OIL	FILTER	CAPACITY%	LOAD%
PRESSURE	cal - A1	cal - A2	cal - A3	cal - A4	cal - A9	cal - A10
TEMPERATURE						
EQUIV TEMP						
DIFFERENTIAL						
HOURS RUN						
TIMERS (mins)						
SAFETY TRIPS	SYSTEM STATUS & SETUP MODE					

SCC-40 Enclosure wiring: for trips positive.

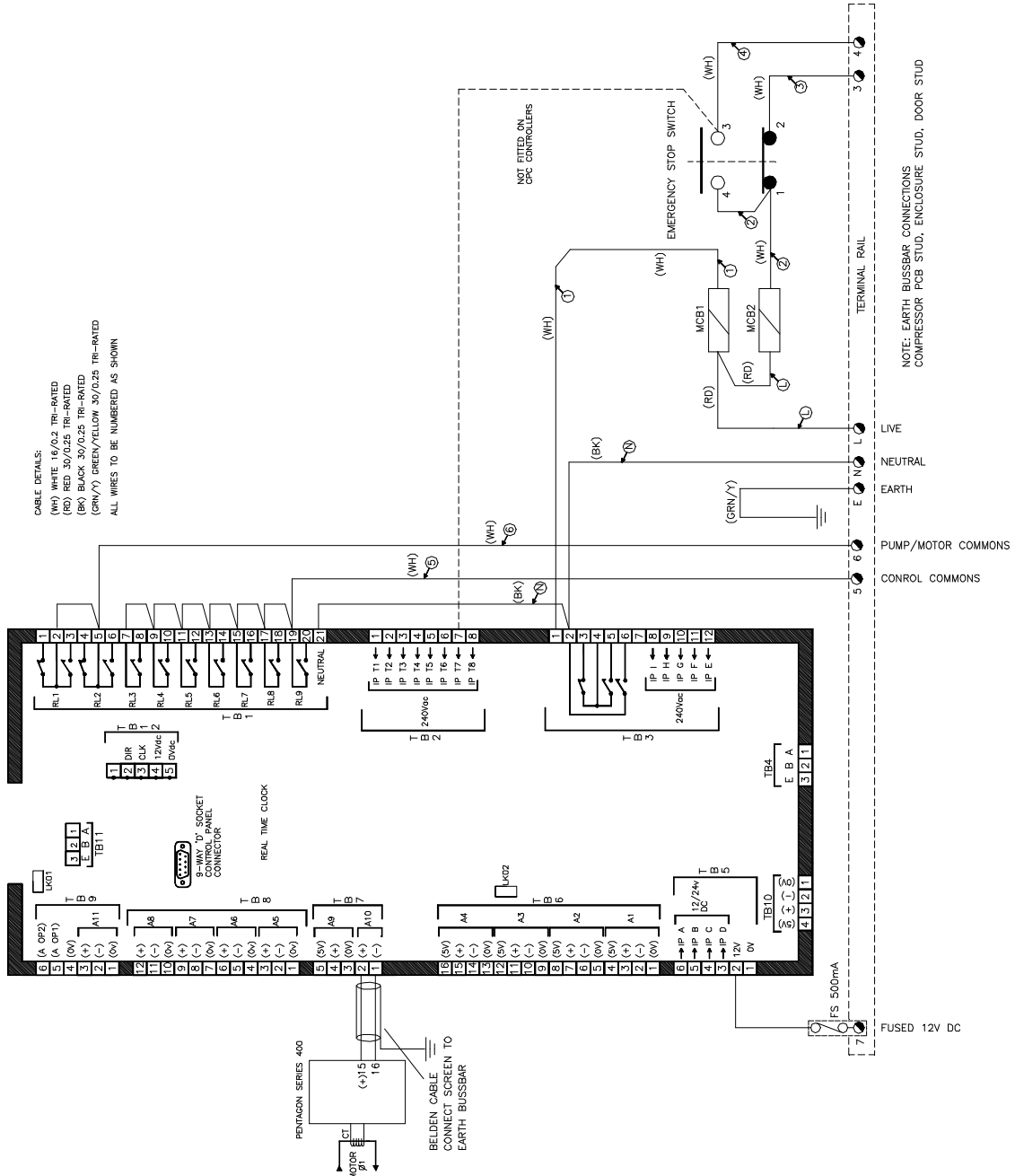


Local Communications

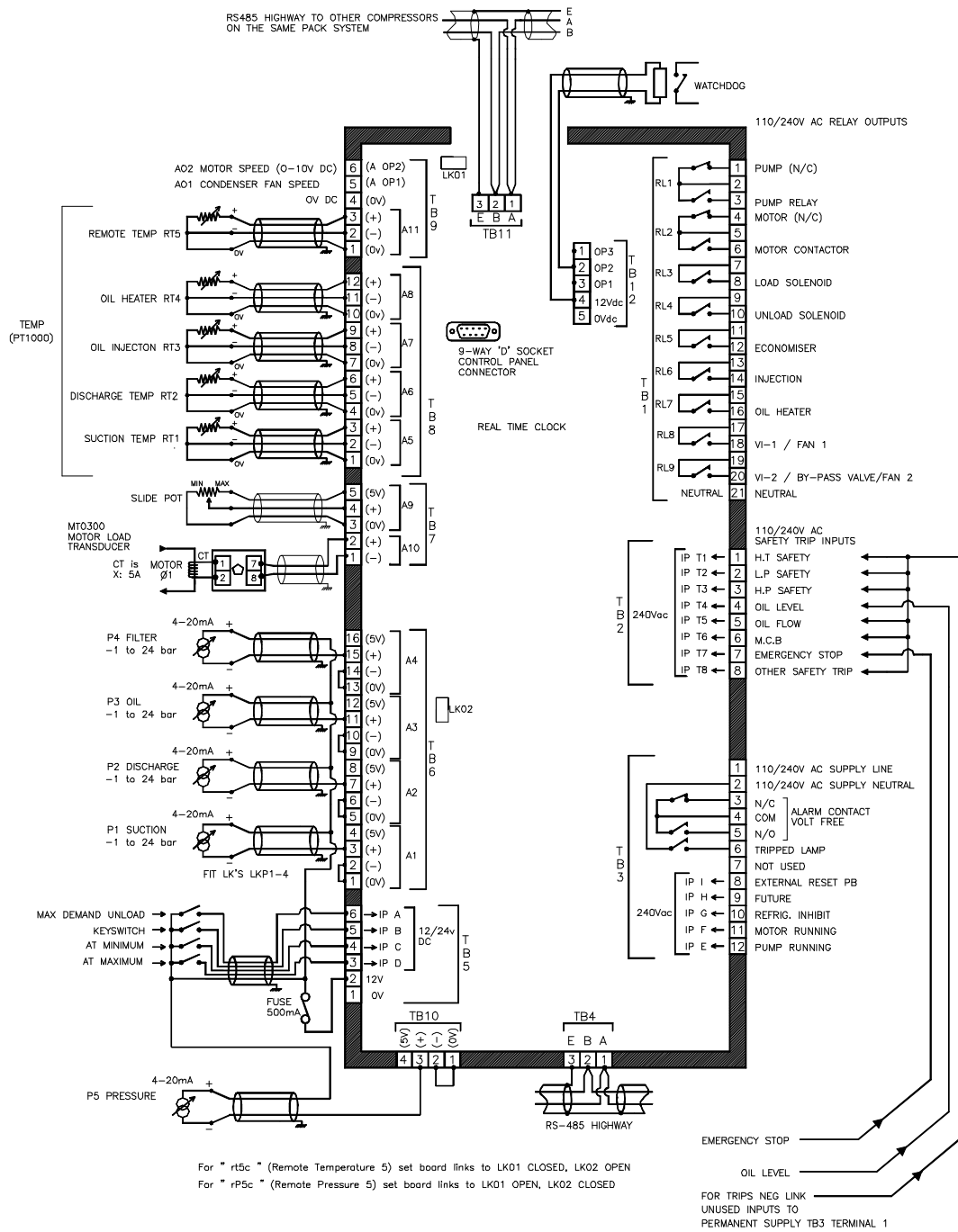
Internal Communications between Compressors



Standard Wallbox Internal wiring

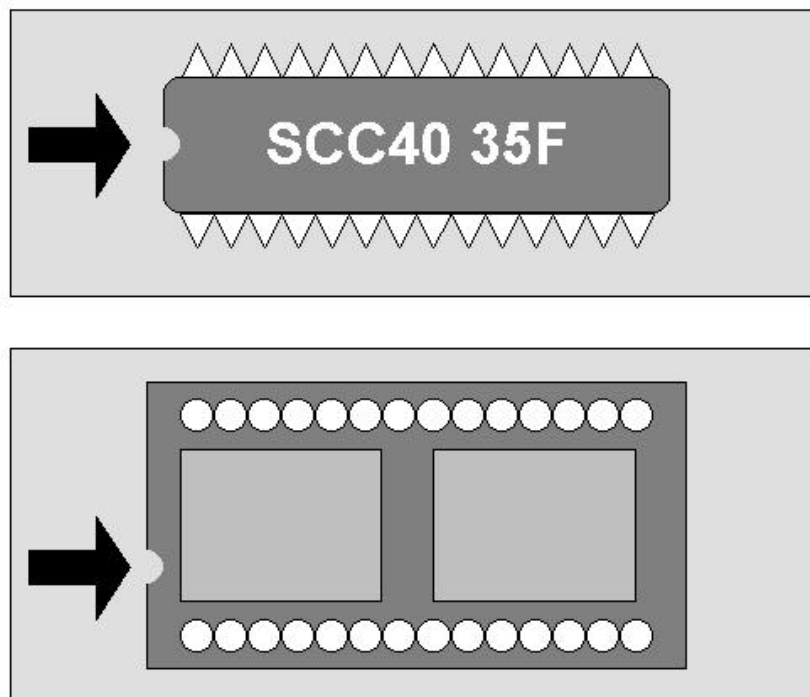


Standard SCC 40 Drawing



FITTING NEW EPROM

**NOTE POSITION BEFORE REMOVAL.
ACTUAL LOCATION MAY BE REVERSED**



**CORRECT POSITIONING OF EPROM
ALIGN INDICATED INDENTS**

Index

- Accept, 32
- ALARM ACCEPT AND RESET, 33
- Analog, 57
- Auto VI Commissioning Parameters, 50
- Auto VI Drawing, 51
- Auto VI Operation:, 48
- Auto VI Wallbox Wiring, 52
- AVAILABLE UNIT MODELS, 13
- BUTTON OPERATION SHORTHAND, 5
- CAPACITY % SETUP, 62
- COMMUNICATIONS, 63
- COMPRESSOR CONTROL OPERATION, 37
- Compressor Settings, 55
- CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS, 6
- CONTROL, 37
- CONTROL MODES, 36
- CONTROL PUSHBUTTON OPERATION, 30
- Control status displays., 25
- DISPLAY INDICATIONS, 23
- DISPLAY PUSHBUTTON OPERATION, 28
- Displays, 9
- Done, 58
- Enter Passcode, 6
- FITTING NEW EPROM, 78
- Functions, 8
- GENERAL**, 36
- GENERAL SPECIFICATION, 11
- GETTING STARTED, 4
- HARDWARE CHECKS, 5
- Inputs, 26
- LED LAMPS., 23
- LOCAL AUTOMATIC**, 36
- Local Communications, 75
- Lower, 31, 32
- Main Set-up/ Commissioning Parameters, 64
- MANUAL**, 36
- mode, 30
- Mode-AUTOMATIC, 30
- Mode-MANUAL, 30
- MODES CHANGES, 41, 42, 44
- MOTOR LOAD % SETUP, 62
- next, 32
- OPERATION, 22
- OVERVIEW, 8
- Port Settings**, 57
- POWER UP, 37
- PRESSURE TRANSDUCER SETUP, 61
- Pushbuttons., 9
- raise, 32
- Raise, 31
- RCC40 PANEL LAYOUT, 22
- Relay output status., 25
- REMOTE AUTOMATIC**, 36
- RESET, 30
- RS485 Communications, 7
- RUNNING, 37, 38
- SAFETY TRIP INDICATIONS, 27
- SCC-25 Input/Output Signals, 20
- SCC-25 Termination Wiring, 21
- SCC-30 Input/Output Signals, 18
- SCC-30 Termination Wiring -, 19
- SCC-35 Input/Output Signals, 16
- SCC-35 Termination Wiring -, 17
- SCC-40 Input/Output Signals, 14
- SCC-40 Enclosure wiring: for trips negative, 73
- SCC-40 Enclosure wiring: for trips positive., 74
- SCC-40 Termination Wiring -, 15
- Select System No and Address, 7
- Select Unit Model, 6
- SETPOINTS, 34
- SETTINGS CHANGE PUSHBUTTON OPERATION, 32
- SETUP, 55
- Standard SCC 40 Drawing, 77
- Standard Wallbox Internal wiring, 76
- start, 31
- stop, 31
- STOPPING, 39, 40
- System Settings, 56
- SYSTEM STATUS DISPLAYS, 24
- Test, 58
- TIMER SETPOINTS, 53
- TRANSDUCER SETUP & CALIBRATION, 60
- TRANSDUCER SETUP, 60
- Trip inputs., 26
- type, 28
- UNIT MODELS, 8
- Unit Settings:, 55
- view, 28