GUARDIAN

RCC-40

Reciprocating Compressor Controller

- **Multiple compressor monitor with % load, pressure & temperature displays**
- **Suction pressure setpoint control of up to 4 compressors**
- **Discharge pressure setpoint control of up to 8 condenser fans**
- **Capacity loading valve control**
- **Alarm and trip monitoring**
- **Multiple pack/compressor system control**
- **Local panel operation and set-up of pack configuration & control modes**
- **Communications for remote monitoring and set-up**

Operation and Setup Manual

The GUARDIAN RCC-40 Compressor Pack Controller provides suction pressure setpoint control and alarm monitoring for either a single large industrial compressor with up to 4 loading valves or a pack of up to 4 multi-stage compressors, plus discharge pressure control for up to 8 condenser fans.
ALL compressors can be even or uneven sizes.

GUARDIAN
Tel. +44 (0) 1270 760599
Fax. +44 (0) 1270 766804
Email: sales@Guardian-controls.com
www.Guardian-controls.com

Contents

GETTING STARTED

Guardian Controllers provide refrigeration engineers with

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

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

All users require to know a few basic facts about this controller before successfully starting to perform their design, commissioning, maintenance or operating functions.

a) All GUARDIAN controllers need to be set up with a unit model selection and other basic
b) settings for setpoints, timers and addresses.

c) 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.

d) Mains power input voltage and hardware switch and link option selections
(if any are required) must correspond to the selected unit model configuration.

e) 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 OIL2
==== 2.0b "@ : @raise"

DISCHARGE OIL2
==== 2.5b

v) DISCHARGE OIL2 DISCHARGE OIL2
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 OIL2 “@view” = “SETPOINT” “@next” “@next”

pASS codE

DISCHARGE OIL2 DISCHARGE OIL2

==-= ==12 “@ : @raise” ==-= ==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.

“@ : @view” = “SYSTEM”

“@ : @type” = “SAFETY TRIPS”

SUCTION OIL1

==sE tUP=

DISCHARGE OIL2

==== =yEs “@accept”

DISCHARGE OIL2 DISCHARGE OIL2

==== Unit “@accept” ==== C2Lf “@ : @raise”

DISCHARGE OIL2

==== C1Lf “@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.C1LF) and then press **‘accept’** which causes the display to wink briefly and display the new unit model selection (e.g C1LF)

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	OIL1				
==sE	tUP=				
DISCHARGE	OIL2				
====	=yEs	“@accept”			
DISCHARGE	OIL2		DISCHARGE	OIL2	
====	Unit	“@accept”	====	C2Lf	“@next”
DISCHARGE	OIL2		DISCHARGE	OIL2	
====	Sn01	“@ : @raise”	====	Sn65	“@accept”
DISCHARGE	OIL2	“@next”			
====	Cn01	“@accept”			
DISCHARGE	OIL2	“@next”			
====	A=01	“@ : @raise”			
DISCHARGE	OIL2				
====	A195	“@accept”	“@ : @next”		
DISCHARGE	OIL2				
====	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 AutoGraph Terminal PC for central alarm monitoring and temperature display. Control setpoints, defrost times and alarm limits may then be sent to the controller from the PC.
For further details see page 50

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 RCC-40 controller provides facilities for:-

MONITORING

Measurement of 5 pressures and 4 temperatures and optional liquid level KVAR and pack load for control, alarm and trip display.
Calculation of differential pressures and superheat temperatures for control, alarm and trip display.
Detection of digital input states on upto 8 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.
Automatic trips include:-

low suction pressure
high discharge pressure
high discharge temperature
high/low suction superheat
low oil if differential (if fitted)

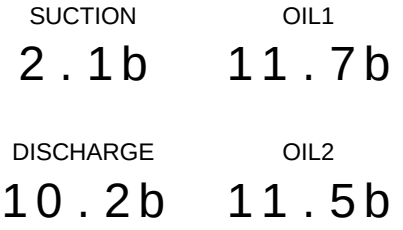
Detection of safety trips which stop the compressor.
Trips are indicated by the flashing red TRIPPED lamp and an appropriate message.
Trips vary dependent on pack model configuration.
ie :- nncb ,H.P. ,diff, syst alternating with a trIP message on the appropriate display.

CONTROLS

Control of compressor motors, and different combinations of loading valves dependent on suction pressure setpoint. Startup and run sequences use preset timers and limits plus compressor runhours to determine control sequence actions.
Compressor stage is indicated by LED lamps on the control panel.
Discharge pressure control of up to 8 condenser fans with control mode'last-on_first-off' .
Suction pressure initiation of other compressors in the system via a RS485 link when in REMOTE mode.

Displays

i). SUCTION, DISCHARGE, OIL1 & OIL 2 .

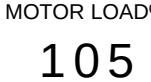


4-digit 7-segment LED displays for display of measurements setpoints/limits for temperatures and pressures
The contents change dependent on **'view'** and **'type'** selections

ii). CAPACITY%.

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

iii). MOTOR LOADING%.



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

iv). COMPRESSOR No.

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 50ºC
Approx. Dimensions:	
Control panel:	300 x 220mm
Control unit:	300 x 230 x 90mm

The GUARDIAN RCC40 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 RCC40 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.

AVAILABLE UNIT MODELS (RCC-40)

C2LF 2 compressors each with 1x50% loading selection
5 condenser fans(8 with extra relays)
4 trips/motor MCB circuit breaker/thermistor
H.P. high discharge safety
diff oil diff pressure safety
syst other system safety trip
2 alarms Low Liquid Level
Condenser Fan Fail
1 input External Max demand unload i/p

C1LF 1 compressors with 4x25% loading selection
4 condenser fans
8 trips
2 alarms Low Liquid Level
Condenser Fan Fail
1 input External Max demand unload i/p

C1L4 1 two-stage compressor with 0,30,60,80,100%
loading selection with intermediate pressure
4 condenser fans
8 trips
3 start signals
2 alarms Low Liquid Level
Condenser Fan Fail
1 input External Max demand unload i/p

C4L1 4 compressors each with 1x50% loading selection
The last compressor may be a satellite.
2 trips/compressor
2 alarms Low Liquid Level
Condenser Fan Fail
1 input External Max demand unload i/p

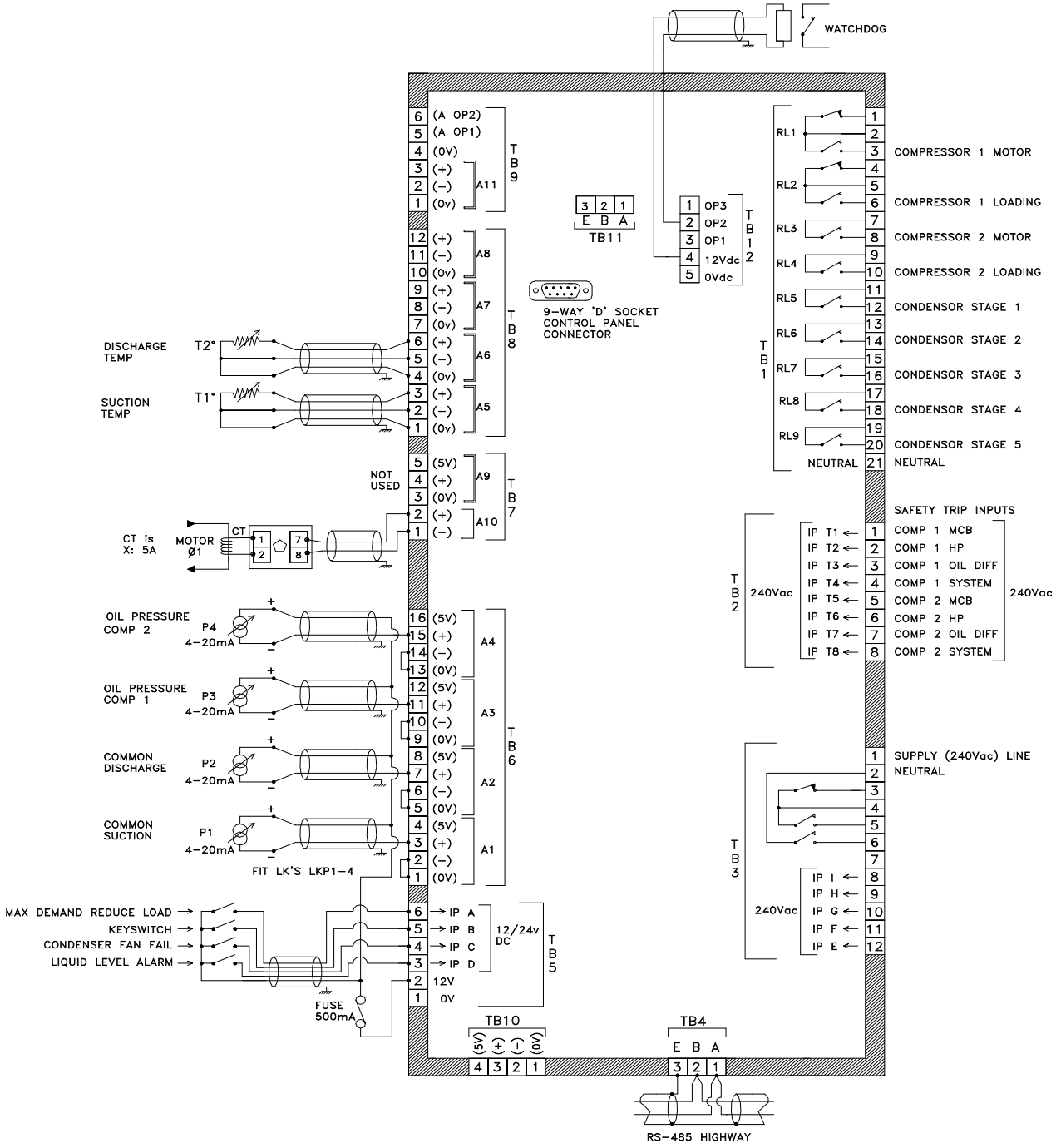
C4F5 4 even or uneven size compressors with up to
5 condenser fans (8 with extra relays)
2 trips/compressor
2 alarms Low Liquid Level
Condenser Fan Fail
1 input External Max demand unload i/p

RCC-30 'C2LF' Input/Output Signals

C2LF			
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	C1 oil pressure	4 to 20mA	-1 to 24 bar g
A4	C2 oil pressure	4 to 20mA	-1 to 24 bar g
A5	Suction temperature	PT1000	-50 to 180°C
A6	Discharge temperature	PT1000	-50 to 180°C
A7	Not used		
A8	Not used		
A9	(Optional liquid level)	0 to 5V dc	0 to 100%
A10	(Optional pack load %)	0 to 10V dc	0 to 127%
A11	Not used		
Calculated inputs			
	Number of fans running		
	Total pack capacity		
	Equivalent Suction temperature		
	Equivalent Discharge temperature		
	Suction superheat		
	Diff discharge pressure		
	C1 oil diff. Pressure		
	C2 oil/intermediate diff. Pressure		
	Motor Hours run		
Digital inputs			
Trip 1	Compressor 1 M.C.B trip		
Trip 2	Compressor 1 H.P trip		
Trip 3	Compressor 1 Oil Diff trip		
Trip 4	Compressor 1 System trip		
Trip 5	Compressor 2 M.C.B trip		
Trip 6	Compressor 2 H.P trip		
Trip 7	Compressor 2 Oil Diff trip		
Trip 8	Compressor 2 System trip		
12/24V dc inputs			
Input A	Max demand unload		
Input B	keyswitch		
Input C	Condenser fan fail		
Input D	Liquid Level Alarm		
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	Compressor 1 motor		
R2	Compressor 1 loading		
R3	Compressor 2 motor		
R4	Compressor 2 loading		
R5	Condenser stage 1		
R6	Condenser stage 2		
R7	Condenser stage 3		
R8	Condenser stage 4		
R9	Condenser stage 5		
Extension outputs			
OP1	Not used		
OP2	Watchdog		
OP3	Not used		

RCC-30 Termination Wiring - 'C2LF' model selection

Two Compressors with 50% Loading & Condenser Control

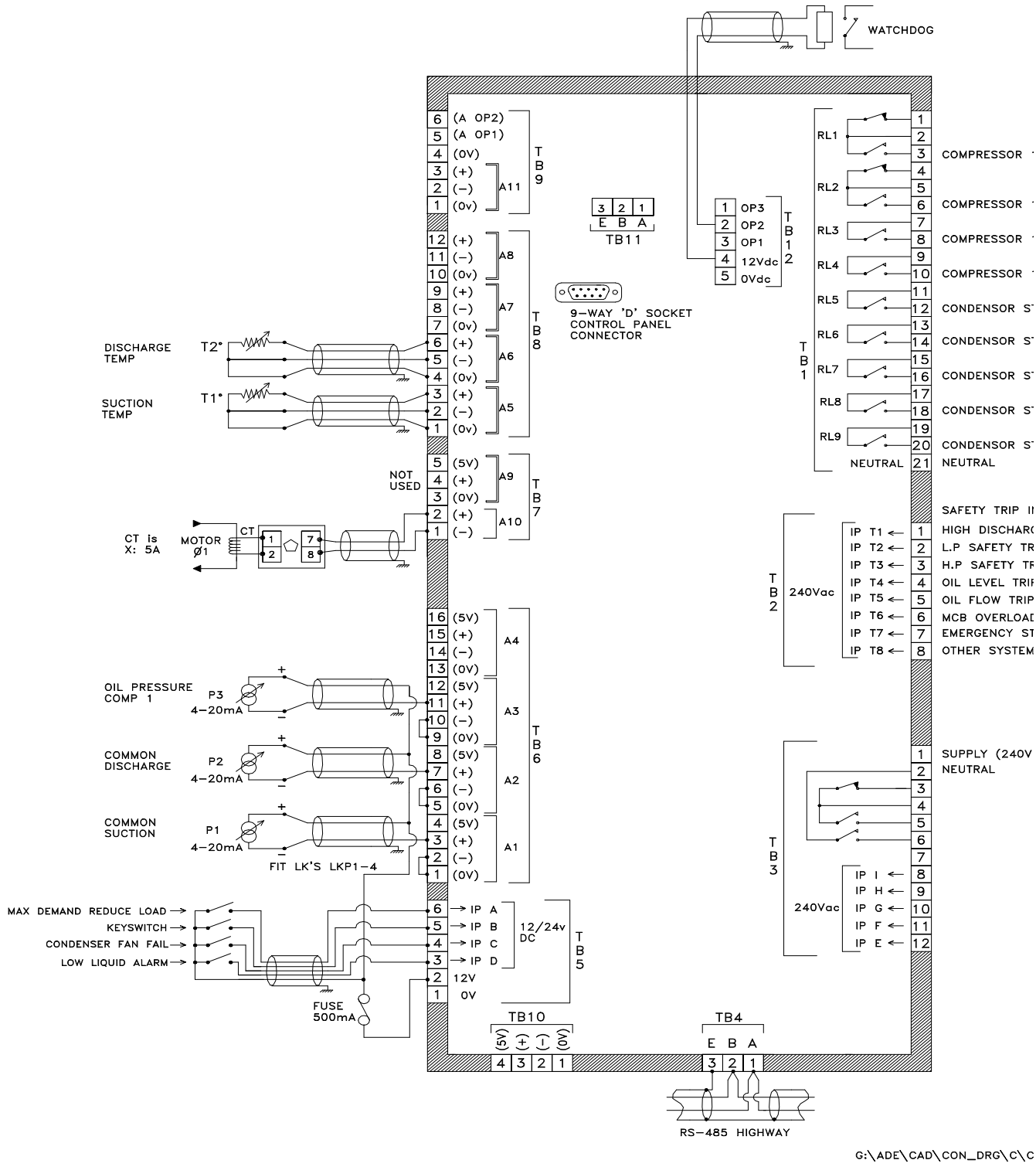


RCC-30 'C1LF' Input/Output Signals

C1LF			
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	C1 oil pressure	4 to 20mA	-1 to 24 bar g
A4	Not used		
A5	Suction temperature	PT1000	-50 to 180°C
A6	Discharge temperature	PT1000	-50 to 180°C
A7	Not used		
A8	Not used		
A9	(Optional liquid level)	0 to 5V dc	0 to 100%
A10	(Optional pack load %)	0 to 10V dc	0 to 127%
A11	Not used		
Calculated inputs			
	Number of fans running		
	Total pack capacity		
	Equivalent Suction temperature		
	Equivalent Discharge pressure		
	Suction superheat		
	Diff discharge pressure		
	C1 diff oil pressure		
	Motor Hours run		
Digital inputs			
Trip 1	High discharge temp trip		
Trip 2	L.P Safety trip		
Trip 3	H.P Safety trip		
Trip 4	Oil level trip		
Trip 5	Oil flow trip		
Trip 6	M.C.B overload trip		
Trip 7	Emergency stop		
Trip 8	Other system trip		
12/24V dc inputs			
Input A	Max demand reduce load		
Input B	Keyswitch		
Input C	Condenser fan fail		
Input D	Liquid Level Alarm		
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	Compressor 1 motor		
R2	Compressor 1 loading 50%		
R3	Compressor 1 loading 75%		
R4	Compressor 1 loading 100%		
R5	Condenser stage 1		
R6	Condenser stage 2		
R7	Condenser stage 3		
R8	Condenser stage 4		
R9	Condenser stage 5		
Extension outputs			
OP1	Not used		
OP2	Watchdog		
OP3	Not used		

RCC-30 Termination Wiring - 'C1LF' model selection

One Compressor with 3 stages of Loading Control

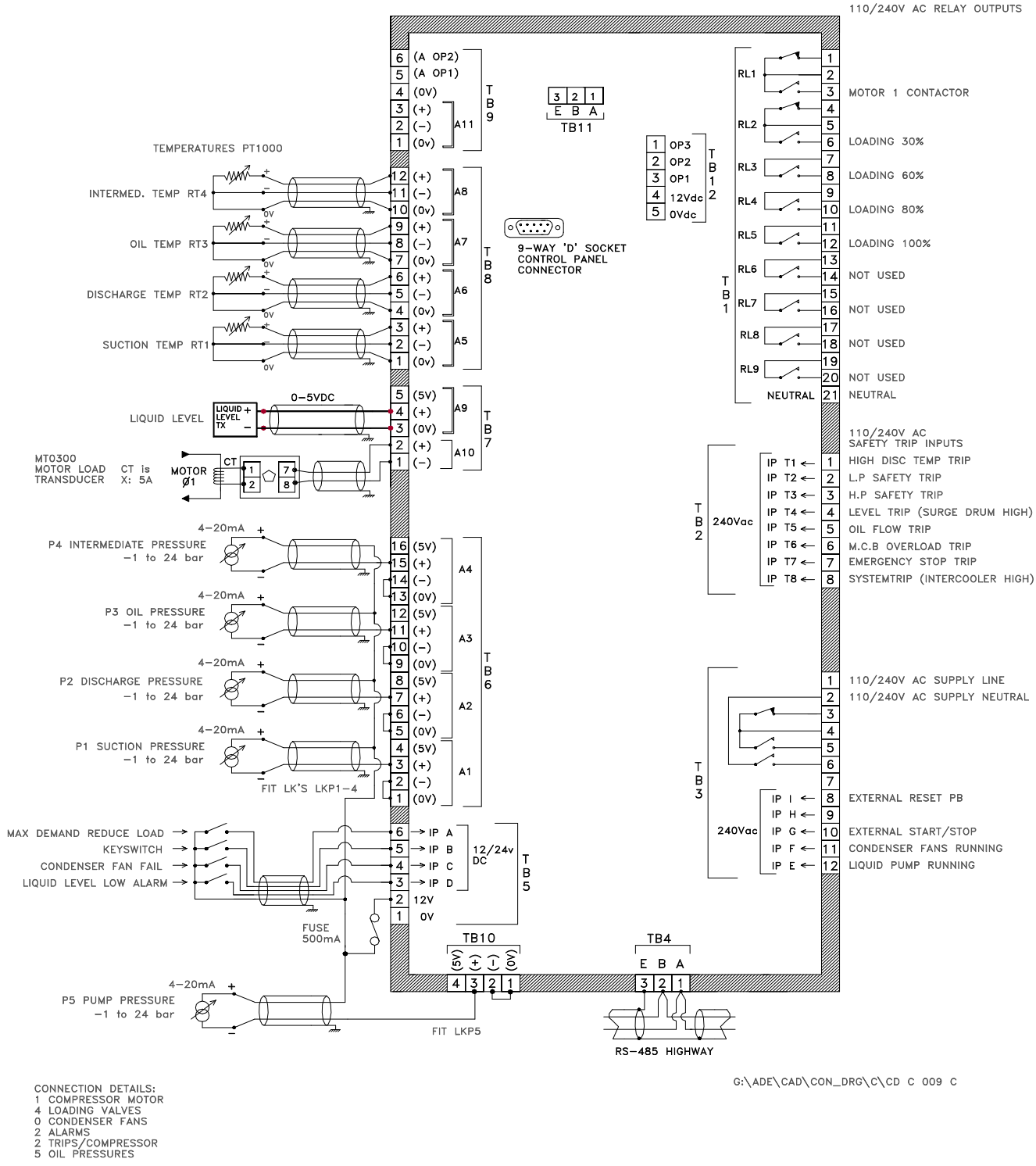


RCC-40 'C1L4' Input/Output Signals

C1L4			
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	C1 oil pressure	4 to 20mA	-1 to 24 bar g
A4	Intermediate pressure	4 to 20mA	-1 to 24 bar g
A5	Suction temperature	PT1000	-50 to 180°C
A6	Discharge temperature	PT1000	-50 to 180°C
A7	Oil temperature	PT1000	-50 to 180°C
A8	Intermediate temperature	PT1000	-50 to 180°C
A9	(Optional liquid level)	0 to 5V dc	0 to 100%
A10	(Optional pack load %)	0 to 10V dc	0 to 127%
A11	Not used		
Calculated inputs			
	Total pack capacity		
	Equivalent Suction temperature		
	Equivalent Discharge temperature		
	Equivalent intermediate temperature		
	Diff discharge pressure		
	Diff oil pressure		
	Diff pump pressure		
	Hours run		
Digital inputs			
Trip 1	High discharge temperature trip		
Trip 2	L.P Safety trip		
Trip 3	H.P safety trip		
Trip 4	Oil Level trip (surge drum high)		
Trip 5	Oil flow trip		
Trip 6	M.C.B overload trip		
Trip 7	Emergency stop		
Trip 8	System trip (intercooler high)		
12/24V dc inputs			
Input A	Max demand reduce load		
Input B	Keyswitch		
Input C	Condenser fan fail		
Input D	Liquid Level Alarm		
Mains inputs			
Input E	Liquid pump running		
Input F	Condenser fans running		
Input G	External start/stop		
Input H	Not used		
input I	External reset pushbutton		
Relay outputs			
R1	Motor 1 contactor		
R2	Loading 30%		
R3	Loading 60%		
R4	Loading 80%		
R5	Loading 100%		
R6	Not used		
R7	Not used		
R8	Not used		
R9	Not used		
Extension outputs			
OP1	Not used		
OP2	Not used		
OP3	Not used		

RCC-40 Termination Wiring - 'C1L4' model selection

One Compressor with Four Stages of Loading Control

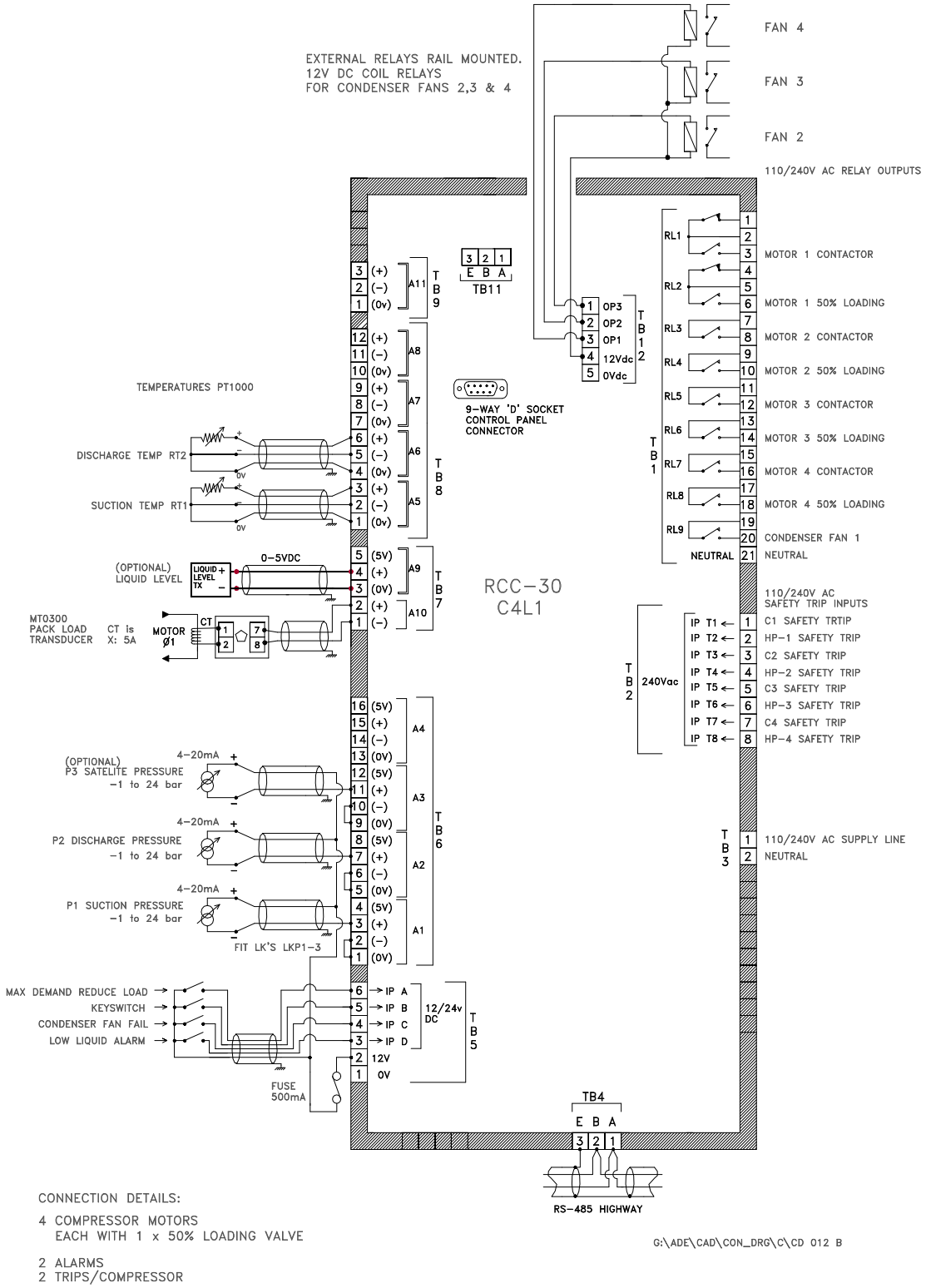


RCC-30 'C4L1 Input/Output Signals

C4L1			
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	(Optional satellite pressure)	4 to 20mA	-1 to 24 bar g
A4	Not used		
A5	Suction temperature	PT1000	-50 to 180°C
A6	Discharge temperature	PT1000	-50 to 180°C
A7	Not used		
A8	Not used		
A9	(Optional liquid level)	0 to 5V dc	0 to 100%
A10	(Optional pack load %)	0 to 10V dc	0 to 127%
A11	Not used		
Calculated inputs			
	Total pack capacity		
	Equivalent Suction temperature		
	Equivalent Discharge temperature		
	Suction superheat		
	Diff discharge pressure		
	Hours run		
Digital inputs			
Trip 1	Compressor 1 Safety trip		
Trip 2	Compressor 1 H.P Safety trip		
Trip 3	Compressor 2 Safety trip		
Trip 4	Compressor 2 H.P Safety trip		
Trip 5	Compressor 3 Safety trip		
Trip 6	Compressor 3 H.P Safety trip		
Trip 7	Compressor 4 Safety trip		
Trip 8	Compressor 4 H.P Safety trip		
12/24V dc inputs			
Input A	Max demand reduce load		
Input B	Keyswitch		
Input C	Condenser fan fail		
Input D	Liquid Level Alarm		
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	Motor 1 contactor		
R2	Motor 1 loading 50%		
R3	Motor 2 contactor		
R4	Motor 2 loading 50%		
R5	Motor 3 contactor		
R6	Motor 3 loading 50%		
R7	Motor 4 contactor		
R8	Motor 4 loading 50%		
R9	Condenser fan 1		
Extension outputs			
OP1	Condenser fan 4		
OP2	Condenser fan 3		
OP3	Condenser fan 2		

RCC-30 Termination Wiring - 'C4L1' model selection

Four Compressors , 3 with 50% Loading plus one Satellite

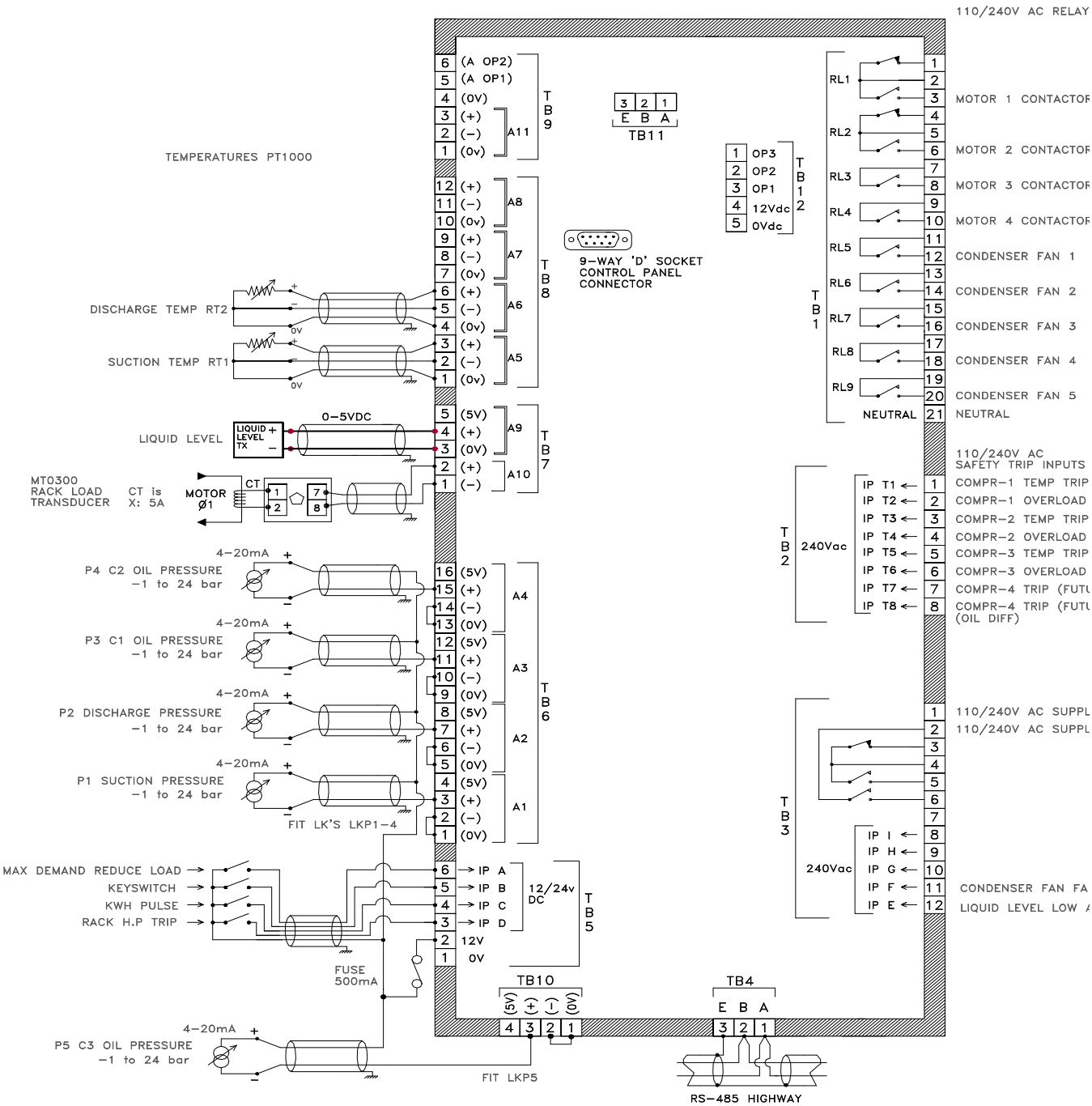


RCC-30 'C4F5' Input/Output Signals

C4F5			
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	C1 oil pressure	4 to 20mA	-1 to 24 bar g
A4	C2 oil pressure	4 to 20mA	-1 to 24 bar g
A5	Suction temperature	PT1000	-50 to 180°C
A6	Discharge temperature	PT1000	-50 to 180°C
A7	Not used		
A8	Not used		
A9	(Optional liquid level)	0 to 5V dc	0 to 100%
A10	(Optional pack load %)	0 to 10V dc	0 to 127%
	C3 oil pressure	4 to 20mA	
Calculated inputs			
	Number of fans running		
	Total pack capacity		
	Equivalent Suction temperature		
	Equivalent Discharge temperature		
	Suction superheat		
	C1 oil diff pressure		
	C2 oil diff pressure		
	C3 oil diff pressure		
	Motor Hours run		
Digital inputs			
Trip 1	Compressor 1 temperature trip		
Trip 2	Compressor 1 overload trip		
Trip 3	Compressor 2 temperature trip		
Trip 4	Compressor 2 overload trip		
Trip 5	Compressor 3 temperature trip		
Trip 6	Compressor 3 overload trip		
Trip 7	Compressor 4 temperature trip (Future)		
Trip 8	Compressor 4 overload trip (Future)		
12/24V dc inputs			
Input A	Max demand reduce load		
Input B	Keyswitch		
Input C	KWH pulse		
Input D	Rack H.P trip		
Mains inputs			
Input E	Liquid Level Alarm		
Input F	Condenser fan fail		
Input G	Not used		
Input H	Not used		
input I	Not used		
Relay outputs			
R1	Motor 1 contactor		
R2	Motor 2 contactor		
R3	Motor 3 contactor		
R4	Motor 4 contactor		
R5	Condenser fan 1		
R6	Condenser fan 2		
R7	Condenser fan 3		
R8	Condenser fan 4		
R9	Condenser fan 5		
Extension outputs			
OP1	Not used		
OP2	Not used		
OP3	Not used		

RCC-30 Termination Wiring - 'C4F5' model selection

Four Compressors with Fan Control



CONNECTION DETAILS:
4 COMPRESSOR MOTORS
0 LOADING VALVES
5 CONDENSER FANS
2 ALARMS
2 TRIPS/COMPRESSOR
3 OIL PRESSURES (NOT 4)

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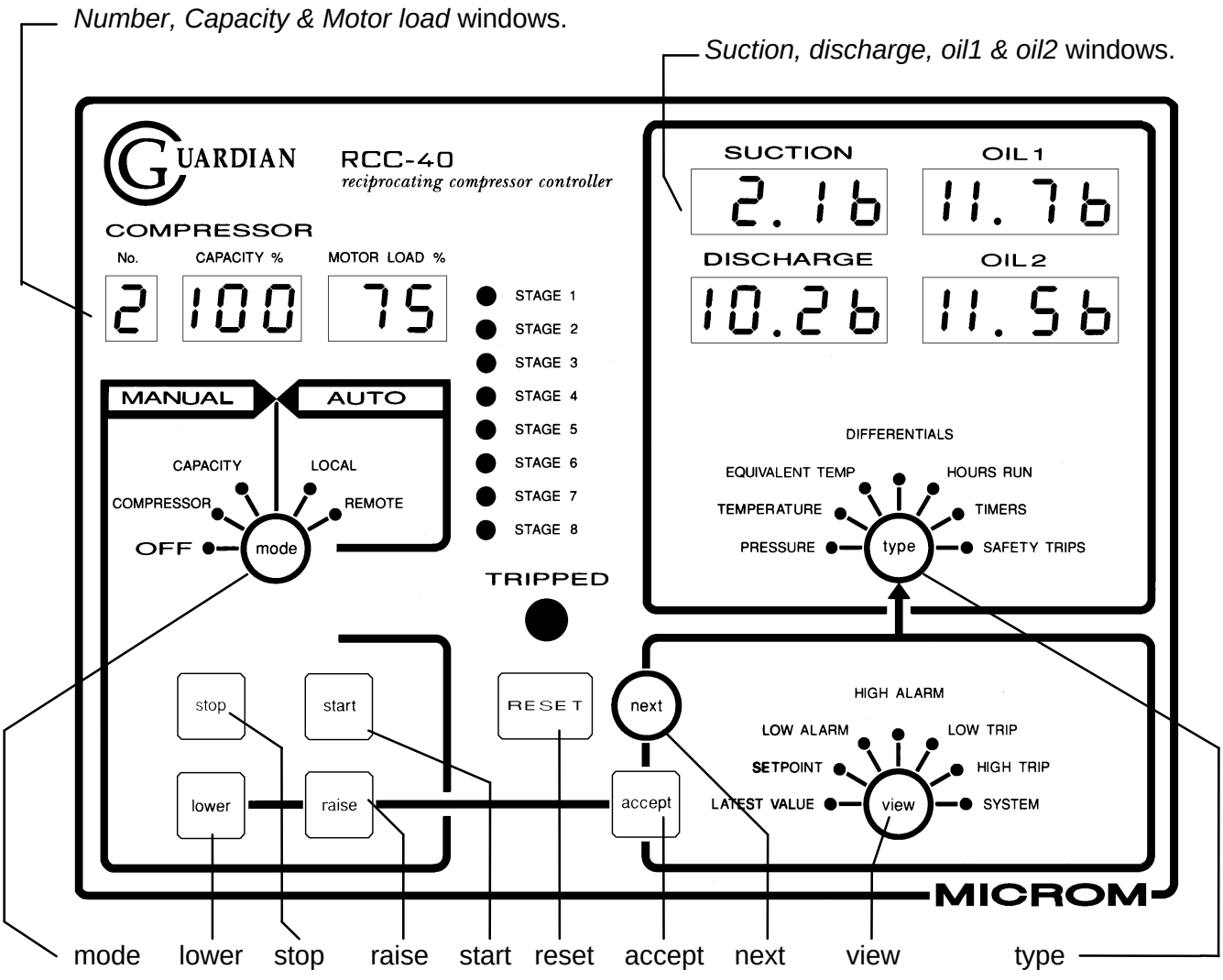
OPERATION

RCC40 PANEL LAYOUT

GUARDIAN RCC40 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

STAGE 1 to Stage 8 Status LED lamps indicate the current pack stage of loading.
The actual display depends on the unit configuration C2LF C1LF,C4L1 etc, but the motor and subsequent lamps are as many loading valves as specified by the configuration.

LED LAMPS.

Stage 1 to 8	Used to display compressor control stage 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

ALARM INPUTS

When detected, the following digital alarm inputs alternate the alarm messages below with 'TRIP' in the windows specified and flash the 'type' = TIMERS LED lamp.

Fans overload	FAnS	TriP	SUCTION
Liquid level alarm	LEvL	TriP	DISCHARGE

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

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, OIL1* and *OIL2* windows by pressing "@next." Only displayed if keyswitch ON, or passcode = 3

Enter System Setup Mode

SUCTION OIL1
==SE tUp=
DISCHARGE OIL2
==== =YES Press "@accept" to enter system set-up mode

Terminate passcode operation.

SUCTION OIL1
pASS code
DISCHARGE OIL2
==== End= Press "@accept" to remove passcode

Control status displays.

SUCTION	OIL1		
Cont	roL=		
DISCHARGE	OIL2		
YYYY	YYYY		
	YYYY=		
DISCHARGE	OIL2		
suct	ion=		Remote master suction control.
DISCHARGE	OIL2		
fuLL	LoAd		Remote but at maximum load.
DISCHARGE	OIL2		
=sLl	dE==		Remote slave in load sharing.
DISCHARGE	OIL2		
stAn	dbY=		Remote mode, stopped but ready.
DISCHARGE	OIL2		
=LOC	AL==		Compressor in local mode
DISCHARGE	OIL2		
Inhi	bit=		Local mode but inhibited.
DISCHARGE	OIL2		
nnAN	UAL=		Compressor in manual.
DISCHARGE	OIL2		
====	OFF=		Compressor OFF.

Relay ouput status.

SUCTION	OIL1
=Out	pUtS
DISCHARGE	OIL2
1234	5678

- Is displayed if relay is OFF

1 to 8 Is displayed if relay is ON.

Relay output is dependent on model configuration.

Inputs

SUCTION	OIL1
=InP	UtS=
DISCHARGE	OIL2
Abcd	EfgH

A	Max demand unload input
b	Optional keyswitch input
c	Low liquid level alarm.
d	Condenser fan fail
E - H	Not fitted.

Trip inputs.

SUCTION OIL1
=tri pS==
DISCHARGE OIL2
1234 5678

\- Is displayed if trip input is OFF

1 to 8 Is displayed if trip input is ON.

Trip input message depends on model configuration.
Trip inputs can be selected (**tPoS** or **tneg**) to act if active trip signal is positive or negative. .

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 C2LF	message	flash	window
T1	C1 MCB Overload	nncb	Trip	SUCTION
T2	C1 H.P. trip	H.P.	Trip	DISCHARGE
T3	C1 Oil Diff. trip	diFF	Trip	OIL1
T4	C1 System trip (other)	syst	Trip	OIL2
T5	C2 MCB Overload	nncb	Trip	SUCTION
T6	C2 H.P. trip	H.p.	Trip	DISCHARGE
T7	C2 Oil Diff. trip	diff	Trip	OIL1
T8	C2 System trip (other)	syst	Trip	OIL2

Trip	Model C1LF	message	flash	window
T1	Discharge temp hi trip	dt-H	Trip	OIL2
T2	L.P. cutout	L.P.	Trip	SUCTION
T3	H.P. cutout	H.P.	Trip	DISCHARGE
T4	oil flow switch	FLO.	Trip	OIL2
T5	oil level	LEu.	Trip	OIL1
T6	motor circuit breaker	nncb	Trip	SUCTION
T7	emergency stop	stoP	Trip	DISCHARGE
T8	safety trip (other)	sfty	Trip	OIL

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, OIL1, OIL 2, 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	OIL1
= - 10	====
DISCHARGE	OIL2
==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 **OIL 2** windows now display the high alarm limit settings, if applicable, for suction, discharge, oil and oil 2 pressures respectively.

"@ : @$_{view}$" = "HIGH ALARM"

"@ : @$_{type}$" = "PRESSURE"

SUCTION	OIL1
== - 5	====
DISCHARGE	OIL2
==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	OIL1
==65	000H
DISCHARGE	OIL2
====	====

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

"@ : @view" = "SETPOINT"
"@ : @type" = "TIMERS"

SUCTION	OIL1
3.2u	2.5P
DISCHARGE	OIL2
2.3d	1.5o

u = stage-up = 3.2 mins
P = C1 oil diff = 2.5 mins

d = stage-down = 2.3 mins
o = C2 oil diff = 1.5 mins

If no buttons have been pressed for 5 minutes, the SUCTION, DISCHARGE, OIL1and OIL2 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, all compressors are automatically stopped if any stage 1-8 LED lamp is lit and subsequently ignores any further manual or automatic control requests.

With the **'COMPRESSOR'** LED selected in **MANUAL** mode, a particular compressor may be started and stopped by operator pushbutton control using **'start'** and **'stop**' after using 'next' to select the required compressor number.

With the **'CAPACITY'** LED selected in **MANUAL** mode, the selected 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 Operation in this mode is independent of any other compressors in the system.

REMOTE automatic mode allows up to four SCC-40/RCC-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 .

“stop”

stop may be pressed at any time in either **'MANUAL'** or **'AUTOMATIC'** mode and, if the selected compressor is running, causes the compressor to shutdown and stop in an orderly manner.
The stop sequence unloads valves, stops the compressor, extinguishes the **'STAGE 1-8'** LED lamps, starts the **delay after stop** timer,

“start”

start only operates in **'MANUAL'** mode with the **'COMPRESSOR'** LED lamp selected. The selected compressor is started and the appropriate STAGE1-8 LED lamp illuminated, resets the **time between starts** timer.

“Lower”

lower may be used in **'MANUAL'** mode with the **'CAPACITY'** LED lamp selected. Whilst 'lower' is being pressed, the slide unloading solenoid valves are changed and the **'STAGE 1-8'** LED lamps are extinguished.

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 and the **'TRIPPED**' LED lamp off. Whilst **'raise'** is being pressed, the slide loading solenoid valves are increased and the 'STAGE 1-8' LED lamps are lit.

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

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.

				‘view’ selection			
Value	**Description**	**Window**	**‘type’**	**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	oil2 pressure	OIL2	PRESS				
5	suction temp	SUCTION	TEMP		yes		yes
6	discharge temp	DISCHARGE	TEMP		yes		yes
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-oil2-pressure	OIL2	DIFF		yes		yes

SETPOINTS

SUCTION PRESSURE SETPOINT CONTROL.

the suction pressure control setpoint for the compressor in increments of 0.1 bar. Capacity loading takes place when the suction pressure is greater than the setpoint.
Capacity unloading takes place when the suction pressure is less than the deadband below the setpoint.
When the suction pressure is 0.5 bar above or below the setpoint then the width of the load and unload pulses is automatically doubled to achieve suction setpoint more rapidly.

CONDENSER CONTROL.

the discharge pressure control setpoint for the compressor in increments of 0.1 bar. The deadband works both sides of the setpoint.
The Fast band also works both sides of the setpoint.

STOP-LOAD.

The % load current above which no further loading pulses are allowed.
Loading pulses are also inhibited when the HIGH capacity limit is reached.

START-UNLOAD.

The % load current or the discharge pressure High Alarm Limits above which capacity unloading pulses are automatically started.

SLIDE HIGH ALARM.

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

DISCHARGE TEMPERATURE HIGH ALARM= MOTOR-START-INHIBIT.

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

SUCTION PRESSURE LOW ALARM. = 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.

INTERMEDIATE PRESSURE.

On C1L4 units the intermediate pressure and saturated temperature are displayed under OIL2 and OIL1 windows after selecting type = Equivalent Temp.

CONTROL MODES

GENERAL

The controller is a general purpose compressor pack and fan 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 up to 6 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
- Provided COMPRESSOR is selected the controller will respond to START being pressed.

ii) LOCAL AUTOMATIC

Compressor start/stops and controls capacity on suction pressure setpoint control

iii) REMOTE AUTOMATIC

Uses communications link to establish the most efficient loading of up to four compressors.
In a pack system of up to 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 suction pressure goes above the control setpoint then the Master compressor will start.

All modes support alarm and cut-out trip monitoring and automatic over-current and high discharge pressure capacity unloading.

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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.

RUNNING

For all modes of operation status inputs and cut-out 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 pressure capacity unloading operate 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 period dependant on the Loading delay value.

LOCAL AUTOMATIC MODE.

In LOCAL AUTOMATIC mode the capacity is adjusted dependant on the suction pressure being above or below the control band selected.

REMOTE AUTOMATIC MODE.

This mode of operation is only available for multiple controllers set to operate single compressors e.g C1L4 and C1LF. Controllers set for pack operation e.g C2LF only operate LOCAL AUTOMATIC MODE.

In remote automatic mode up to six individual 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 itself 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) Capacity/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 capacity. When the Master brings the suction pressure into or below the control band; then, provided it capacity is less than 100%, it will optimise capacity to improve efficiency. The Master will select a compressor to balance its capacity. 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 capacity position regulation mode, selecting a capacity setpoint that divides the available capacity between the Master and itself. The load sharing compressor moves to its calculated capacity 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 capacity 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 capacity to go below 50%. The Master compressor will compensate by continuing to reduce its capacity. If the load sharing compressor maintains the 50% capacity for greater than its stage down delay it will remove its load sharing status, ramp its capacity 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 capacity 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 capacity 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 capacity up to 100%.

SATELLITE COMPRESSOR OPERATION

A satellite compressor may be set-up on the RCC-30 using the C4L1 configuration. The Satellite compressor is always the last compressor in the pack i.e. C2,C3,or C4.
The motor capacity sizes for all compressors in the pack are set-up in the normal way, including the satellite, and the selection 'noSC' is selected to 'SAtC' which designates the last compressor as a satellite

The Suction pressure and setpoint for the satellite are displayed in the **'OIL1'** window with **‘view’** = **LATEST VALUE** or **‘view’** = **SETPOINT** respectively.

CONDENSER CONTROL

Up to 5 Condenser fans may be controlled on the discharge pressure.
Fans stages are increased in the order Fan-1 to Fan-5 and reduced in the order Fan-5 to Fan-1. (Last on -First off).

Inside deadband
If the discharge pressure is inside the setpoint plus or minus the deadband (db) then no fan stage change takes place.

Outside Deadband
If the discharge pressure is outside the setpoint plus or minus the deadband (db) then, after the Fan stage delay (Fd), addition fans are run or stopped up to the maximum fitted (Fn).

Outside Fastband
If the discharge pressure is outside the setpoint plus or minus the Fans Fastband (Fb) then, in order to speed up response, the stage delay is reduced dependent on the discharge pressure error from setpoint and Fans Algorithm UP(FAu)/Fans Algorithm Down (FAd).
If FAu=0 and FAd=0 then Fastband control is ignored.
With FAu=1 then response is slower than with FAu=9
The algorithm for reducing the fan stage delay is given by :-

stage_time to start/stop next fan = Stage delay subtract
(FAN Control Algorithm/10)
multiplied by (stage_delay x 60 x error from setpoint)
divided by (maximum error allowed [2.0bar]) seconds

eg with FAu=3
error=1.4 bar
normal stage delay =0.6 minutes (36 secs)
then stage time=stage delay- [(3/10) x (0.6x60 x 1.4)] /2.0]
= 36-7.5 secs
= 29 secs

eg with FAu=5
error=1.4 bar
normal stage delay =0.6 minutes (36 secs)
then stage time=stage delay- [(5/10) x (0.6x60 x 1.4)] /2.0]
= 36-12.6 secs
= 24 secs

eg with FAu=5
error=0.7 bar
normal stage delay =0.6 minutes (36 secs)
then stage time=stage delay- [(5/10) x (0.6x60 x 0.7)] /2.0]
= 36-6.3 secs
= 30 secs

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	
Restart	OIL2	2 to 9	starts per hour The controller restricts the compressor to the selected number of starts per hour.
After-stop	LOAD%	1 to 5mins	A minimum of one minutes is required after stop
C1 oil diff trip delay	OIL1	0.1 to 5mins	Delay before stopping compressor 1 on oil diff trip
C2 oil diff trip delay	OIL2	0.1 to 5mins	Delay before stopping compressor 2 on oil diff trip (or pump differential)
Stage up	SUCTION	1 to 12mins	Time compressor at 100% before allowing next compressor to start.
Stage down	DISCHARGE	1 to 10mins	Time compressor at minimum load before stopping
Loading delay	CAPACITY	0.1 to 5mins	Time between increasing/decreasing compressor loading solenoids
Fan stage delay	(no display)	0.1 to 5mins	Time between increasing/decreasing condenser fan stages.

SETUP

Compressor Settings

Unit Settings:

SUCTION OIL1

==SE tUp= Press "@next" to sequence through Setup selections

DISCHARGE OIL2 Press "@raise" or "@lower" to change settings

==== Unit Press "@accept" to accept settings

Unit Model	YYYY	
	YYYY = C2LF	2 compressors with loading selection and condenser fans
	C1LF	1 compressor with loading selection and condenser fans
	C1L4	2 stage compressor with loading and condenser fans
	C4L1	4 compressors each with loading selection
	C4F5	4 compressors with 5 loading fans
System number	Snnn	nn = 1 - 80
Compressor number	Cnnn	nn = 01 - 06
Monitor Address	Annn	nnn = 1 - 255

System Settings

SUCTION OIL1

==SE tUp=

DISCHARGE OIL2

==== syst

Press "@next" to sequence through Setup selections

Press "@raise" or "@lower" to change settings

Press "@accept" to accept settings

Starts per hour	sHnn	nn = 02 to 19
deadband	dbnn	nn = 00 to 10
Size 1st compressor	1Cnn	nn = 1 to 99
Size 2nd compressor	2Cnn	nn = 1 to 99
	|	
	etc	
Size 6th compressor	6Cnn	nn = 1 to 99
Satellite compressor selection	YYYY	
	YYYY = SAtC	Satellite compressor required for last compressor
	noSC	in C4L1 pack
Loading valve polarity	YYYY	
	YYYY = LPoS	Positive
	LnEg	Negative
Oil diff input	yyyy	
	YYYY = diFA	Oil diff input Analog transducer or
	diFb	Digital oil diff safety trip
Alarm limit checking	YYYY	
	YYYY= AlrA	Alarm limit checking ALL or
	Alrb	Basic suction & discharge checks
GLOBAL RS485 command action after all compressors tripped or OFF	CYYY	CoFF = Cases OFF on highway section CnoA = Cases no Action on trip
Trip input state	YYYY	
	YYYY =TpoS	Trip input state Positive
	tnEg	Trip input state Negative
Refrigerant gas type	YYYY	
	YYYY =r22	
	nH3	
	r404A	

Port Settings

SUCTION	OIL1	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	OIL2	Press "@raise" or "@lower" to change settings
====	Port	Press "@accept" to accept settings

Baud rate YYYY

YYYY = 9600, 4800, 2400, 1200 — Baud rate settings for RS485 highway communications

Hours run

SUCTION	OIL1	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	OIL2	Press "@raise" or "@lower" to change settings
====	Hrun	Press "@accept" to accept settings

Hours run adjustment Hnnn — nnn = -99 to 100

Fans

SUCTION	OIL1	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	OIL2	Press "@raise" or "@lower" to change settings
====	FANs	Press "@accept" to accept settings

Max number of fans	fn=n	n = 0 to 5
Control deadband	dbn.n	n.n = 0.1 to 5.0 (0.1 bar increments)
Fast response deadband	Fbn.n	n.n = 0.1 to 5.0 (0.1 bar increments)
Stage up control algorithm	FAun	n = 0 to 9
Stage down control algorithm	FAdn	n = 0 to 9
Fan stage delay	Fdn.n	n.n = 0.1 to 3.0 mins

u/d determines rate of response when outside fast deadband with relation to amount of error from setpoint.
stage time = stage_delay - (stage_delay x error from setpoint) / Control Algorithm.
If u=0 and d=0 then Fast band control is inhibited.

Analog

SUCTION	OIL1	
==SE	tUp=	Press "@next" to sequence through Setup selections
DISCHARGE	OIL2	Press "@raise" or "@lower" to change settings
====	AnAL	Press "@accept" to accept settings

Pressure transducer type	P=nn	nn = 0 to 255	P=00 0-100mV P=04 4-20mA
Slide voltage range	C=nn	nn = 0 to 100	C=00 0-10Vdc C=05 is normal setting
Current transformer rating	tnnn	nnn = 10 to 990 Amps	
Maximum rated motor load	rnnn	nnn = 10 to 990 Amps	

Test

SUCTION	OIL1	
==SE	tUp=	Press "@next" to sequence through relays
DISCHARGE	OIL2	
====	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

Done

SUCTION	OIL1	
==SE	tUp=	
DISCHARGE	OIL2	
====	done	Exit settings change and return to default compressor display

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	OIL1		
==sE	tUP=		
DISCHARGE	OIL2		
====	=yEs	"@accept"	"@ : @next"
DISCHARGE	OIL2		
====	AnAL	"@accept"	
DISCHARGE	OIL2		
====	P=nn	nn = P000 = 0-100mV transducer (P -zero) nn = P004 = 4-20mA transducer	"@next"
DISCHARGE	OIL2		
====	C=nn	nn = is slide voltage range 0-10V dc (C -scale) C 05 = 0-5V dc	"@next"
DISCHARGE	OIL2		
====	tnnn	nnn = is the current transformer rating (T - size) eg for a CT of 300:5 then nnn = 300	"@next"
DISCHARGE	OIL2		
====	rnnn	nnn = is the maximum rated motor load in Amps (R - size) eg For a 250Amp compressor nnn = 250	"@next"

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

"@raise" or "@lower" until correct value is displayed
"@accept" . "@next"

SUCTION	OIL1		
==sE	tUP=		
DISCHARGE	OIL2		
====	donE	"@accept"	"@RESET"

PRESSURE TRANSDUCER SETUP

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

SUCTION	OIL1
==sE	tUP=
DISCHARGE	OIL2
====	P=00

nn = P 00 = 0-100mV transducer

4-20mA pressure transducers require a link LKP1-P5 to connect a 500 ohm resistor across the **"+"** and **"-"** terminals, and the selection Setup-AnaL P-xxx = P004.

SUCTION	OIL1
==sE	tUP=
DISCHARGE	OIL2
====	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.

0-100mV transducers always require to be calibrated as follows;-
Select **'view'** = SYSTEM, **'type'** = PRESSURE with appropriate **SUCTION, DISCHARGE**, **OIL1, OIL2** pressure transducer vented to atmosphere (0 bar).

SUCTION	OIL1
====	====
DISCHARGE	OIL2
====	====

The pressure display in the appropriate window is the current error for each transducer at 0.0 bar.

Using **'next'** to select the required transducer, press **'raise'** or **'lower'** to make the displayed value zero and press **'accept'**.
The zero offset of the transducer is corrected if the displayed value is less than 1.5 bar.

With pressure at a normal operating value for the transducer ie 2.0 bar suction, 12-15 bar for discharge and oil, use **'raise'** and **'lower'** to adjust the value to match a calibrating gauge and press **'accept'**.

The scale offset of the transducer is corrected provided the displayed value is above 1.5 bar.

CAPACITY % SETUP

Slide voltage range must be selected prior to slide calibration.
On RCC systems slide calibration is not required so select :-

SEtuP-AnAL-C_term = C000

SUCTION OIL1
==SE tUP=
DISCHARGE OIL2
==== C000

The Capacity % is then deduced from the state of the motor relays and loading/unloading valves active.

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 OIL1
==SE tUP=
DISCHARGE OIL2
==== 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 OIL1
==SE tUP=
DISCHARGE OIL2
==== r250

The load % zero and 100% settings can be marginally adjusted using 'view'=SYTEM , 'type'=PRESSURE as for the capacity % above.

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

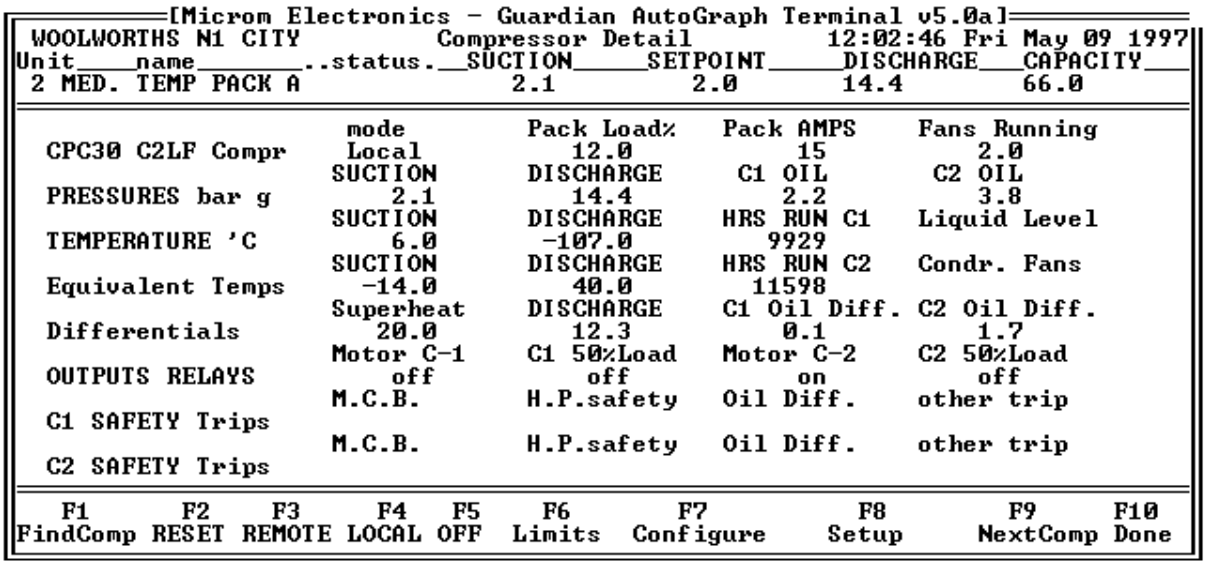
d) Receive setpoints with new setpoint values

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

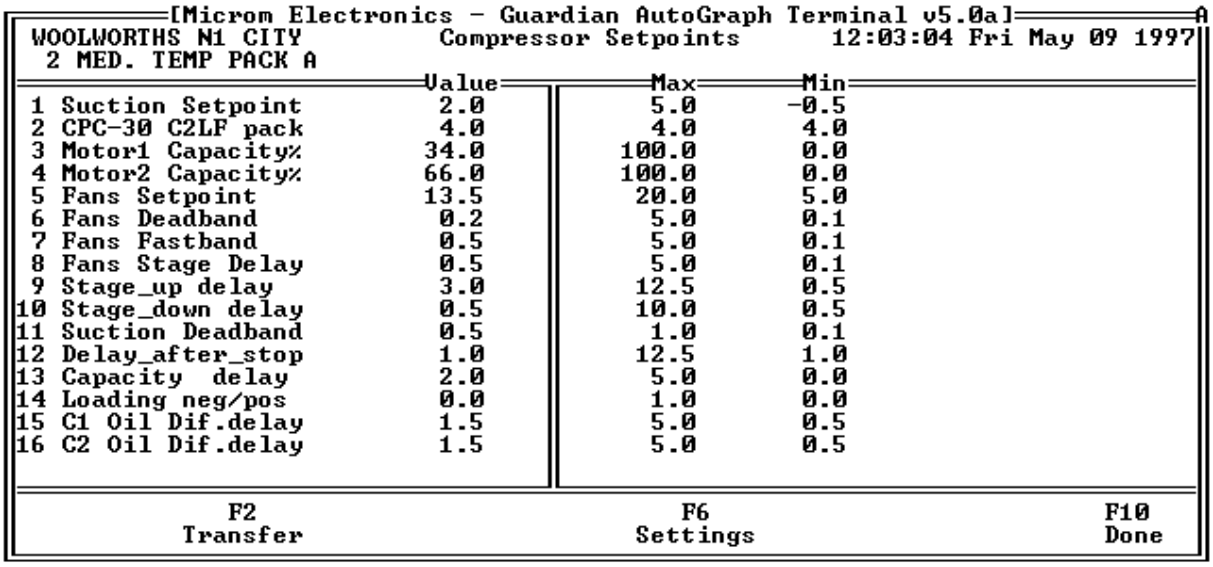
AUTOGRAPH FORMATS

Typical C2LF Formats

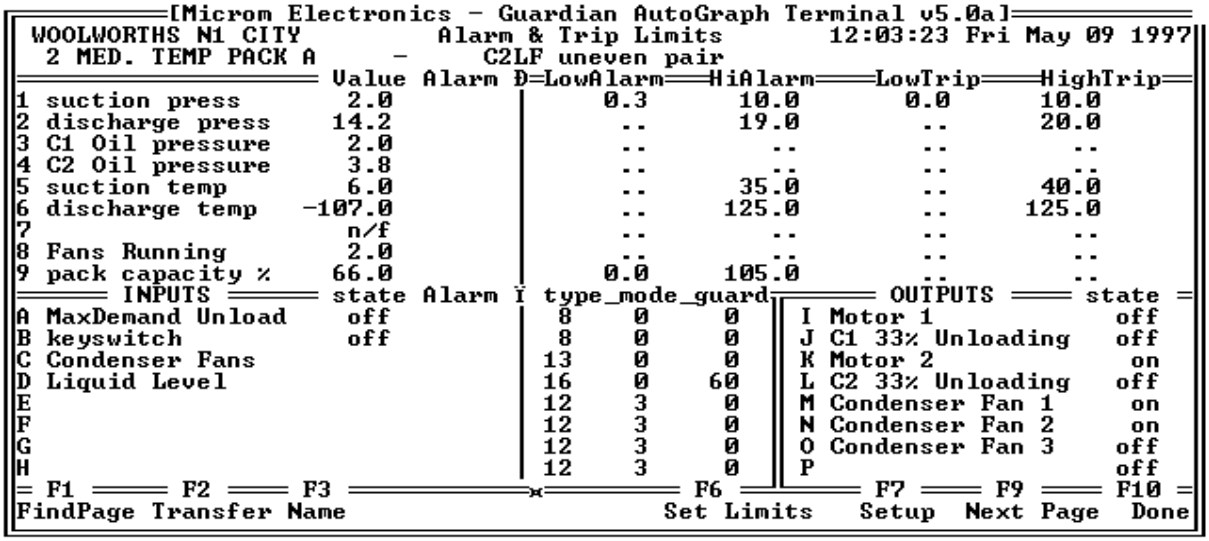
F2 Compressor Detail C2LF



F4 Compressor Setpointsl C2LF

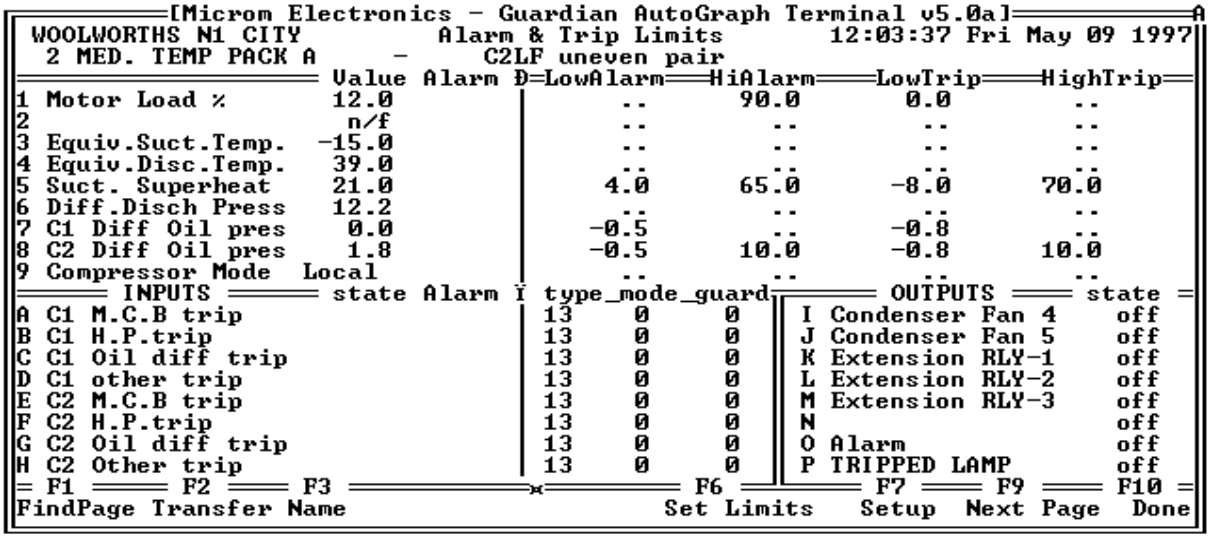


F6 Compressor Limits C2LF page 1



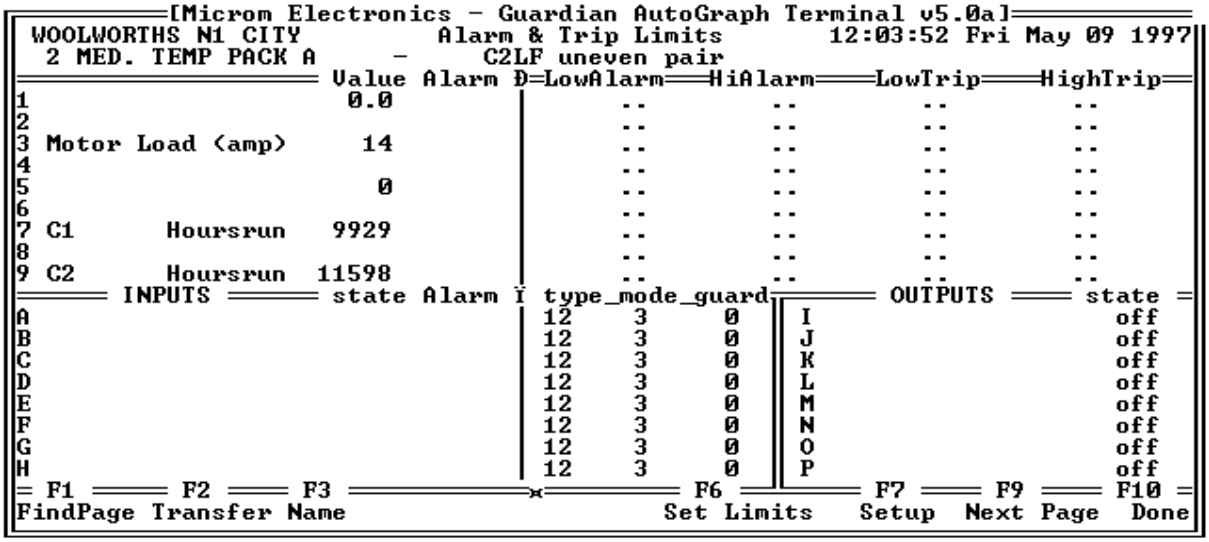
```
[Microm Electronics - Guardian AutoGraph Terminal v5.0a]
 WOOLWORTHS N1 CITY          Alarm & Trip Limits        12:03:23 Fri May 09 1997
  2 MED. TEMP PACK A      -      C2LF uneven pair
                      Value Alarm |LowAlarm  HiAlarm  LowTrip  HighTrip
1 suction press         2.0       |   0.3     10.0      0.0     10.0
2 discharge press      14.2       |    ..     19.0       ..     20.0
3 C1 Oil pressure       2.0       |    ..       ..       ..       ..
4 C2 Oil pressure       3.8       |    ..       ..       ..       ..
5 suction temp          6.0       |    ..     35.0       ..     40.0
6 discharge temp     -107.0       |    ..    125.0       ..    125.0
7                       n/f       |    ..       ..       ..       ..
8 Fans Running          2.0       |    ..       ..       ..       ..
9 pack capacity %      66.0       |   0.0    105.0       ..       ..
 INPUTS  state Alarm | type_mode_guard  OUTPUTS  state
A MaxDemand Unload     off          |  8    0     0 |  I Motor 1              off
B keyswitch            off          |  8    0     0 |  J C1 33% Unloading     off
C Condenser Fans                    | 13    0     0 |  K Motor 2               on
D Liquid Level                      | 16    0    60 |  L C2 33% Unloading     off
E                                   | 12    3     0 |  M Condenser Fan 1       on
F                                   | 12    3     0 |  N Condenser Fan 2       on
G                                   | 12    3     0 |  O Condenser Fan 3      off
H                                   | 12    3     0 |  P                      off
= F1 ==== F2 ==== F3 ==========x========= F6 ========== F7 ==== F9 ==== F10 =
FindPage Transfer Name                  Set Limits   Setup  Next Page  Done
```

F6 Compressor Limits C2LF page 2



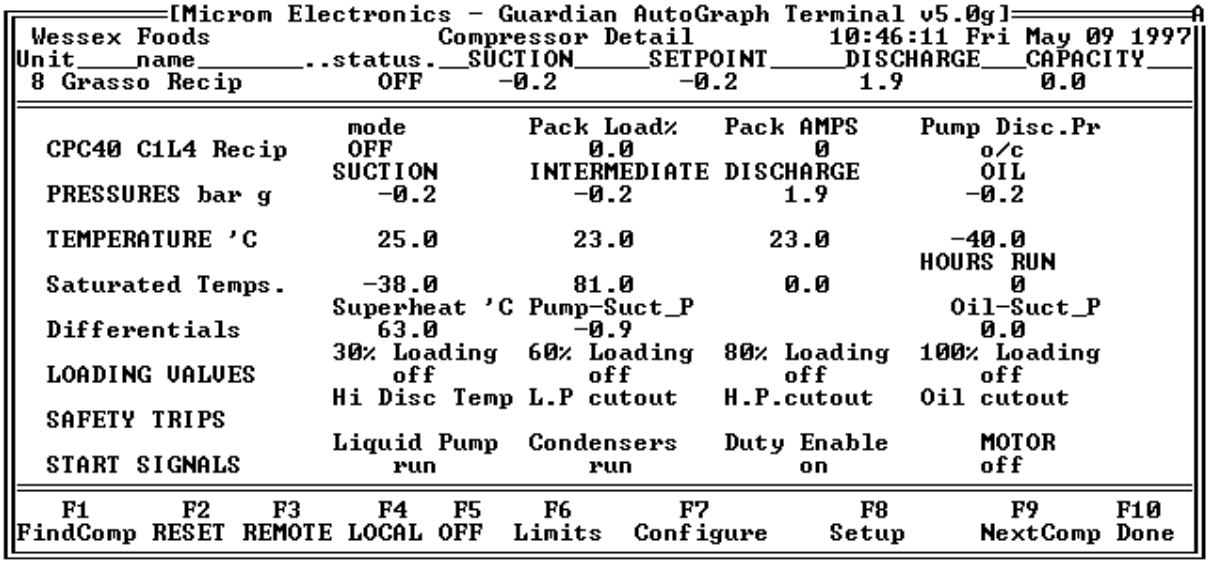
```
[Microm Electronics - Guardian AutoGraph Terminal v5.0a]A
 WOOLWORTHS N1 CITY          Alarm & Trip Limits        12:03:37 Fri May 09 1997
  2 MED. TEMP PACK A      -      C2LF uneven pair
                      Value Alarm |LowAlarm  HiAlarm  LowTrip  HighTrip
1 Motor Load %         12.0       |    ..     90.0      0.0       ..
2                       n/f       |    ..       ..       ..       ..
3 Equiv.Suct.Temp.   -15.0        |    ..       ..       ..       ..
4 Equiv.Disc.Temp.     39.0       |    ..       ..       ..       ..
5 Suct. Superheat      21.0       |   4.0     65.0     -8.0     70.0
6 Diff.Disch Press     12.2       |    ..       ..       ..       ..
7 C1 Diff Oil pres      0.0       |  -0.5       ..     -0.8       ..
8 C2 Diff Oil pres      1.8       |  -0.5     10.0     -0.8     10.0
9 Compressor Mode  Local          |    ..       ..       ..       ..
 INPUTS  state Alarm | type_mode_guard  OUTPUTS  state
A C1 M.C.B trip                     | 13    0     0 |  I Condenser Fan 4      off
B C1 H.P.trip                       | 13    0     0 |  J Condenser Fan 5      off
C C1 Oil diff trip                  | 13    0     0 |  K Extension RLY-1      off
D C1 other trip                     | 13    0     0 |  L Extension RLY-2      off
E C2 M.C.B trip                     | 13    0     0 |  M Extension RLY-3      off
F C2 H.P.trip                       | 13    0     0 |  N                      off
G C2 Oil diff trip                  | 13    0     0 |  O Alarm                off
H C2 Other trip                     | 13    0     0 |  P TRIPPED LAMP         off
= F1 ==== F2 ==== F3 ==========x========= F6 ========== F7 ==== F9 ==== F10 =
FindPage Transfer Name                  Set Limits   Setup  Next Page  Done
```

F6 Compressor Limits C2LF page 3

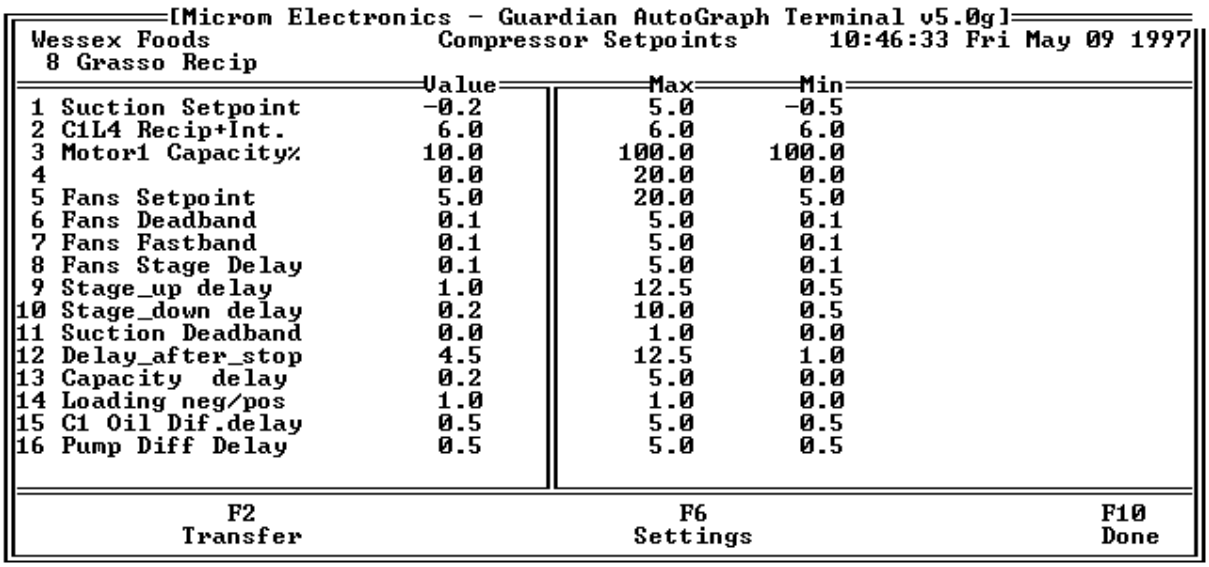


Typical C1L4 Formats

F2 Compressor Detail C1L4

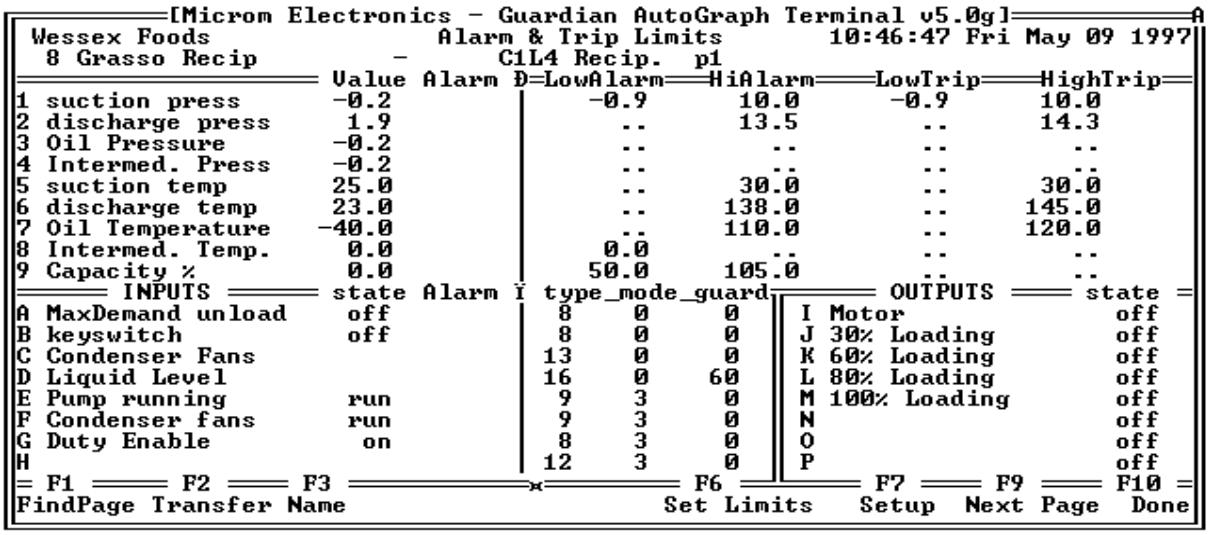


F4 Compressor Setpointsl C1L4



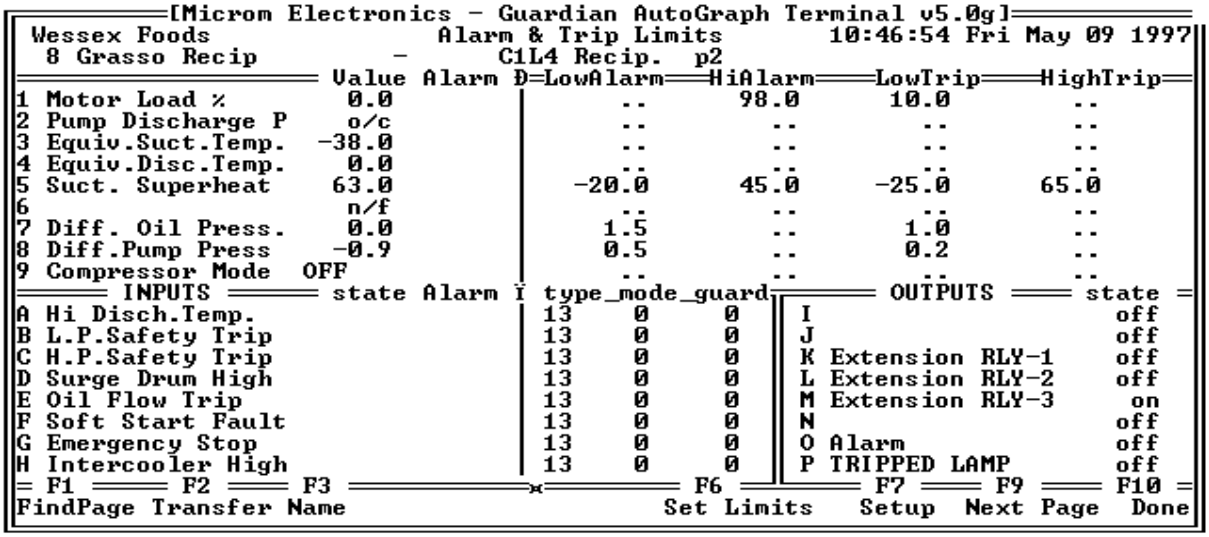
```
[Microm Electronics - Guardian AutoGraph Terminal v5.0g]
 Wessex Foods                Compressor Setpoints      10:46:33 Fri May 09 1997
  8 Grasso Recip
                            Value          Max          Min
 1 Suction Setpoint          -0.2          5.0         -0.5
 2 C1L4 Recip+Int.            6.0          6.0          6.0
 3 Motor1 Capacity%          10.0        100.0        100.0
 4                            0.0         20.0          0.0
 5 Fans Setpoint              5.0         20.0          5.0
 6 Fans Deadband              0.1          5.0          0.1
 7 Fans Fastband              0.1          5.0          0.1
 8 Fans Stage Delay           0.1          5.0          0.1
 9 Stage_up delay             1.0         12.5          0.5
10 Stage_down delay           0.2         10.0          0.5
11 Suction Deadband           0.0          1.0          0.0
12 Delay_after_stop           4.5         12.5          1.0
13 Capacity  delay            0.2          5.0          0.0
14 Loading neg/pos            1.0          1.0          0.0
15 C1 Oil Dif.delay           0.5          5.0          0.5
16 Pump Diff Delay            0.5          5.0          0.5

          F2                            F6                          F10
       Transfer                      Settings                      Done
```

F6 Compressor Limits C1L4 page 1



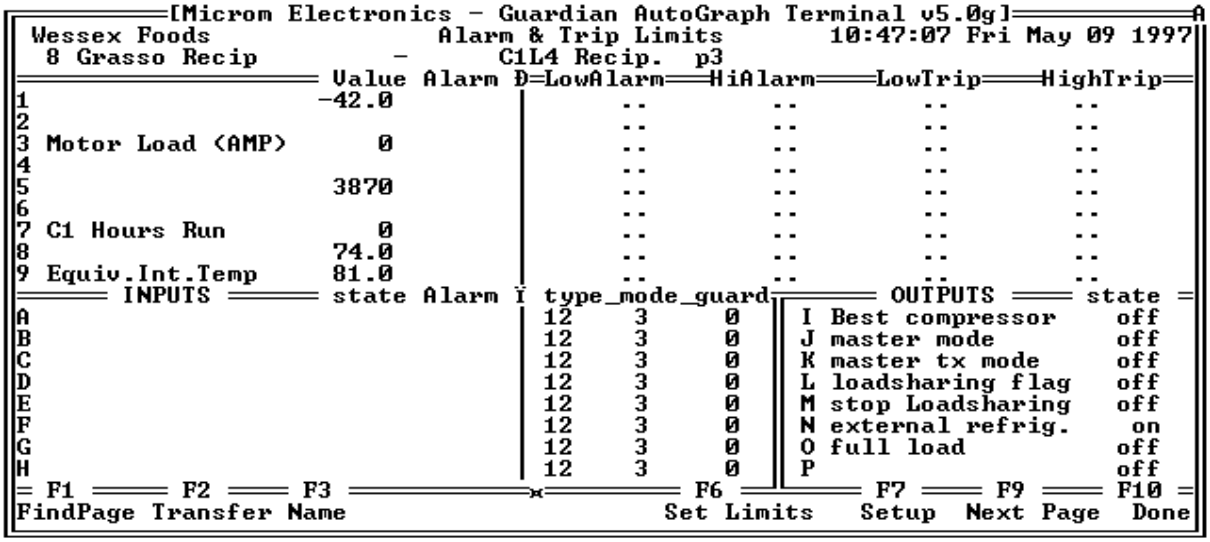
```
[Microm Electronics - Guardian AutoGraph Terminal v5.0g]
 Wessex Foods                Alarm & Trip Limits       10:46:47 Fri May 09 1997
  8 Grasso Recip        -       C1L4 Recip.  p1
                    Value Alarm Ð=LowAlarm==HiAlarm====LowTrip====HighTrip==
1 suction press      -0.2          -0.9       10.0       -0.9       10.0
2 discharge press     1.9            ..       13.5         ..       14.3
3 Oil Pressure       -0.2            ..         ..         ..         ..
4 Intermed. Press    -0.2            ..         ..         ..         ..
5 suction temp       25.0            ..       30.0         ..       30.0
6 discharge temp     23.0            ..      138.0         ..      145.0
7 Oil Temperature   -40.0            ..      110.0         ..      120.0
8 Intermed. Temp.     0.0           0.0         ..         ..         ..
9 Capacity %          0.0          50.0      105.0         ..         ..
====== INPUTS ====== state Alarm Ï type_mode_guard ====== OUTPUTS ==== state =
A MaxDemand unload    off          8    0     0    I Motor                off
B keyswitch           off          8    0     0    J 30% Loading          off
C Condenser Fans                  13    0     0    K 60% Loading          off
D Liquid Level                    16    0    60    L 80% Loading          off
E Pump running        run          9    3     0    M 100% Loading         off
F Condenser fans      run          9    3     0    N                      off
G Duty Enable          on          8    3     0    O                      off
H                                 12    3     0    P                      off
= F1 ===== F2 ==== F3 ==========x========= F6 ========== F7 ==== F9 ==== F10 =
FindPage Transfer Name                    Set Limits   Setup  Next Page  Done
```

F6 Compressor Limits C1L4 page 2



```
[Microm Electronics - Guardian AutoGraph Terminal v5.0g]
 Wessex Foods              Alarm & Trip Limits       10:46:54 Fri May 09 1997
  8 Grasso Recip        -       C1L4 Recip.  p2
                    Value Alarm Ð=LowAlarm==HiAlarm====LowTrip====HighTrip==
1 Motor Load %        0.0           ..        98.0       10.0         ..
2 Pump Discharge P    o/c           ..          ..         ..         ..
3 Equiv.Suct.Temp.  -38.0           ..          ..         ..         ..
4 Equiv.Disc.Temp.    0.0           ..          ..         ..         ..
5 Suct. Superheat    63.0        -20.0        45.0      -25.0       65.0
6                     n/f          ..          ..         ..         ..
7 Diff. Oil Press.    0.0         1.5          ..        1.0         ..
8 Diff.Pump Press    -0.9         0.5          ..        0.2         ..
9 Compressor Mode   OFF           ..          ..         ..         ..
====== INPUTS ====== state Alarm Ï type_mode_guard======= OUTPUTS ==== state =
A Hi Disch.Temp.              13    0     0   I                       off
B L.P.Safety Trip             13    0     0   J                       off
C H.P.Safety Trip             13    0     0   K Extension RLY-1       off
D Surge Drum High             13    0     0   L Extension RLY-2       off
E Oil Flow Trip               13    0     0   M Extension RLY-3        on
F Soft Start Fault            13    0     0   N                       off
G Emergency Stop              13    0     0   O Alarm                 off
H Intercooler High            13    0     0   P TRIPPED LAMP          off
= F1 ===== F2 ==== F3 ==========»========= F6 ========= F7 ==== F9 ==== F10 =
FindPage Transfer Name                    Set Limits   Setup  Next Page  Done
```

F6 Compressor Limits C1L4 page 3



```
[Microm Electronics - Guardian AutoGraph Terminal v5.0g]
 Wessex Foods              Alarm & Trip Limits       10:47:07 Fri May 09 1997
  8 Grasso Recip        -       C1L4 Recip.  p3
                    Value Alarm Ð=LowAlarm==HiAlarm====LowTrip====HighTrip==
1                   -42.0           ..          ..         ..         ..
2                                   ..          ..         ..         ..
3 Motor Load (AMP)      0           ..          ..         ..         ..
4                                   ..          ..         ..         ..
5                    3870           ..          ..         ..         ..
6                                   ..          ..         ..         ..
7 C1 Hours Run          0           ..          ..         ..         ..
8                    74.0           ..          ..         ..         ..
9 Equiv.Int.Temp     81.0           ..          ..         ..         ..
====== INPUTS ====== state Alarm Ï type_mode_guard======= OUTPUTS ==== state =
A                             12    3     0   I Best compressor       off
B                             12    3     0   J master mode           off
C                             12    3     0   K master tx mode        off
D                             12    3     0   L loadsharing flag      off
E                             12    3     0   M stop Loadsharing      off
F                             12    3     0   N external refrig.       on
G                             12    3     0   O full load             off
H                             12    3     0   P                       off
= F1 ===== F2 ==== F3 ==========»========= F6 ========= F7 ==== F9 ==== F10 =
FindPage Transfer Name                    Set Limits   Setup  Next Page  Done
```

Setup / Commissioning Parameters

Unit	units	Actual setting	default	Min setting	Max setting
Model type C2LF,C1LF,C1L4,C4L1,C4F5		*C*		C2LF	C4F5
Remote control mode runH/LEAd/LAg/StbY (C1LF,C1L4)				runH	StbY
System pack number		*Sn*		Sn01	Sn80
Compressor number		*Cn*		Cn01	Cn06
Monitor Address		*A*		A 01	A255
syst					
Motor starts per hour		*SH*		SH02	SH19
Suction deadband	bar	*db*		db00	db10
Suction Fast response band	bar	*Fb*		Fb0.1	Fb5.0
Suction Control Fast Algorithm stage up		*CAu*		FAu0	FAu9
Suction Control Fast Algorithm stage down		*CAd*		FAd0	FAd9
Compressor No 1 size	%	*1C*		1C00	1C99
Compressor No 2 size	%	*2C*		2C00	2C99
Compressor No 3 size (C4L1,C4F5)	%	*3C*		3C00	3C99
Compressor No 4 size (C4L1,C4F5)	%	*4C*		4C00	4C00
SatC/noSC satelite compressor required (C4L1)				noSC	SAtC
LpoS/Lneg loading valve polarity		*L*		Lneg	LPoS
Oil diff input (difA/difd) Analog or Digital (C4F5)		*dif*		difA	difd
Alarm limit checking (AlrA/Alrb) All or Basic (C4F5)		*Alr*		AlrA	Alrb
Trip inputs positive/negative to trip		*t*		tPoS	tneg
Gas type (R22, Ammonia NH3 or 404A)				r22	404A
Action on trip: CnoA no action on trip Coff on highway section		*C*		CnoA	CoFF
Port					
Communications baud rate (9600,4800,2400,1200)				9600	1200
Hrun					
Hours run adjustment (compressor No 1)		*H*		H -99	H100
Hours run adjustment (compressor No 2)		*H*		H -99	H100
FAnS (C2LF,C1LF,C4F5)					
Maximum number of condenser fans		*Fn*		Fn00	Fn05
Fan control deadband	bar	*db*		db0.1	db5.0
Fast response band	bar	*Fb*		Fb0.1	Fb5.0
Fans Algorithm stage up		*FAu*		FAu0	FAu9
Fans Algorithm stage down		*FAd*		FAd0	FAd9
Fans stage delay	mins	*Fd*		Fb0.1	Fb3.0
AnAL					
Pressure transducer type P=00 0-100mV P=04 4-20mA		*P*		P 00	P255
Slide scale (0 = none, 5 = standard)		*C*		C 00	C100
Load transformer rating	Amp	*t*		t000	t990
Motor maximum rating	Amp	*r*		t000	t990

Display Window	'type' selection	'view' selection	Settings	unit	Actual Setting	Default Setting	Min Setting	Max Setting
PRESSURES								
SUCTION	PRESSURE	SETPOINT	Suction Pressure setpoint	bar			-0.6b	5.0b
DISCHARGE	PRESSURE	SETPOINT	Condenser fans setpoint	bar			5.0b	20.0b
OIL2	PRESSURE	SETPOINT	CIL4 Intermediate Setpoint	bar			0.0o	5.0o
LOAD	PRESSURE	SETPOINT	Stop loading at > load	%			50	99
SUCTION	PRESSURE	LOW ALARM	Stop compressor on low suction	bar			-1.0b	5.0b
CAPACITY	PRESSURE	LOW ALARM		%				
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		%				
LOAD	PRESSURE	HIGH ALARM	Start unloading at >load	%			75	100
SUCTION	PRESSURE	LOW TRIP	lo-trip suction pressure	bar			-1.0b	5.0b
LOAD	PRESSURE	LOW TRIP	lo-trip motor current	%				
SUCTION	PRESSURE	HIGH TRIP	hi-trip suction pressure	bar			0.0b	20.0b
DISCHARGE	PRESSURE	HIGH TRIP	hi-trip discharge pressure	bar			0.0b	23.0b
TEMPERATURES								
OIL2	TEMP	SETPOINT	CIL4 Intermediate Setpoint	°C			0.0o	5.0o
OIL2	TEMP	LOW ALARM	CIL4 Intermediate Setpoint	°C			0.0o	5.0o
SUCTION	TEMP	HIGH ALARM	hi-alarm suction temperature	°C			-40c	90c
DISCHARGE	TEMP	HIGH ALARM	hi-alarm discharge temperature	°C			40c	170c
OIL1	TEMP	HIGH ALARM	hi-alarm oil temperature	°C				
SUCTION	TEMP	HIGH TRIP	hi-trip suction temperature	°C			-46c	100c
DISCHARGE	TEMP	HIGH TRIP	hi-trip discharge temperature	°C			40c	170c
OIL1	TEMP	HIGH TRIP	hi-trip C1 oil temperature	°C				
DIFFERENTIALS								
SUCTION	DIFF	LOW ALARM	lo-alarm suction superheat	°C			-46c	20c
OIL1	DIFF	LOW ALARM	lo-alarm C1 oil-suction diff	bar			-1.0b	5.0b
OIL2	DIFF	LOW ALARM	lo-alarm C2 oil-suction diff	bar			-1.0b	5.0b
SUCTION	DIFF	HIGH ALARM	hi-alarm suction superheat	°C			05c	100c
SUCTION	DIFF	LOW TRIP	lo-trip suction superheat	°C			-46c	30c
OIL1	DIFF	LOW TRIP	lo-trip oil diff pressure	bar			-1.0b	5.0b
OIL2	DIFF	LOW TRIP	lo-trip oil 2 diff	bar			-1.0b	5.0b
SUCTION	DIFF	HIGH TRIP	hi-trip suction diff temperature	°C			-40c	100c
TIMERS								
SUCTION	TIMERS	SETPOINT	stage up delay (u)	mins			0.1u	12.5u
DISCHARGE	TIMERS	SETPOINT	stage down delay (d)	mins			0.1d	10.0d
OIL1	TIMERS	SETPOINT	C1 oil diff delay (p)	mins			0.2P	5.0P
OIL2	TIMERS	SETPOINT	C2 oil diff delay (o)	mins			0.0o	5.0o
CAPACITY	TIMERS	SETPOINT	Loading valve delay	mins			0.1	5.0
LOAD	TIMERS	SETPOINT	delay after stop	mins			0.3	12.5

Settings display and change facilities.

'view' LATEST VALUE							
'type'	**SUCTION**	**DISCHARGE**	**OIL1**	**OIL2**	**COMP No**	**CAPACITY%**	**LOAD%**
PRESSURE	A1 bar	A2 bar	A3 bar	A4 bar	Cn	A9 %	A10 %
TEMPERATURE	A5 °C	A6 °C			Cn	A9 %	A10 %
EQUIV TEMP	A11 °C	A12 °C			Cn	A9 %	A10 %
DIFFERENTIAL	A11-A5 bar	A2-A1 bar	A3-A1 bar	A4-A1 bar	Cn	A9 %	A10 %
HOURS RUN	64		000Hrs		Cn	A9 %	A10 %
TIMERS (mins)	stage-up	stage-down	C1 diff	C2 diff	Cn	A9 %	A10 %
SAFETY TRIPS	.....dependent on model.....				Cn	A9 %	A10 %

'view' SETPOINTS							
'type'	**SUCTION**	**DISCHARGE**	**OIL1**	**OIL2**	**COMP No**	**CAPACITY%**	**LOAD%**
PRESSURE	Comprs	Fans					stop-raise
TEMPERATURE							stop-raise
EQUIV TEMP							stop-raise
DIFFERENTIAL							stop-raise
HOURS RUN							stop-raise
TIMERS (mins)	stage-up	stage-down	C1 diff	C2 diff		min run %	stop-raise
SAFETY TRIPS							stop-raise

'view' LOW ALARM							
'type'	**SUCTION**	**DISCHARGE**	**OIL1**	**OIL2**	**COMP No**	**CAPACITY%**	**LOAD%**
PRESSURE	yes						
TEMPERATURE				yes			
EQUIV TEMP							
DIFFERENTIAL			<1.5 bar				
HOURS RUN							
TIMERS (mins)							
SAFETY TRIPS							

'view' HIGH ALARM							
'type'	**SUCTION**	**DISCHARGE**	**OIL1**	**OIL2**	**COMP No**	**CAPACITY%**	**LOAD%**
PRESSURE	yes	yes	yes	1.5			start-lower
TEMPERATURE	yes	motor-inhibit	yes				start-lower
EQUIV TEMP	yes						start-lower
DIFFERENTIAL	yes						start-lower
HOURS RUN							start-lower
TIMERS (mins)							start-lower
SAFETY TRIPS							start-lower

'view' LOW TRIP							
'type'	**SUCTION**	**DISCHARGE**	**OIL1**	**OIL2**	**COMP No**	**CAPACITY%**	**LOAD%**
PRESSURE	stop-compr						
TEMPERATURE				yes			
EQUIV TEMP							
DIFFERENTIAL			<1.0 bar				
HOURS RUN							
TIMERS (mins)							
SAFETY TRIPS	SP min						

'view' HIGH TRIP							
'type'	SUCTION	DISCHARGE	OIL1	OIL2	COMP No	CAPACITY%	LOAD%
PRESSURE	yes			>2.3 bar			
TEMPERATURE	yes	start-lower	yes				
EQUIV TEMP							
DIFFERENTIAL							
HOURS RUN							
TIMERS (mins)							
SAFETY TRIPS	SP max						

'view' SYSTEM							
'type'	SUCTION	DISCHARGE	OIL1	OIL2	COMP No	CAPACITY%	LOAD%
PRESSURE	cal - A1	cal - A2	cal - A3	cal - A4	Cn 1 to 4	cal A10	max load
TEMPERATURE							
EQUIV TEMP							
DIFFERENTIAL							
HOURS RUN	adjust	adjust					
TIMERS (mins)	raise_w	raise_w					
SAFETY TRIPS							

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