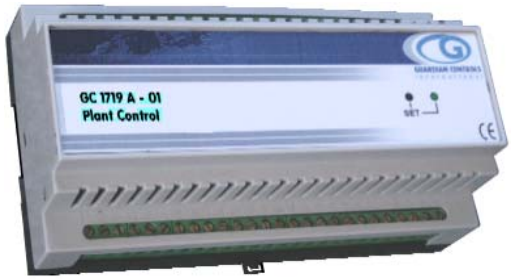
REFRIGERATION CONTROL & MONITORING

GUARDIAN CONTROLS international

GC 1719 3AKV

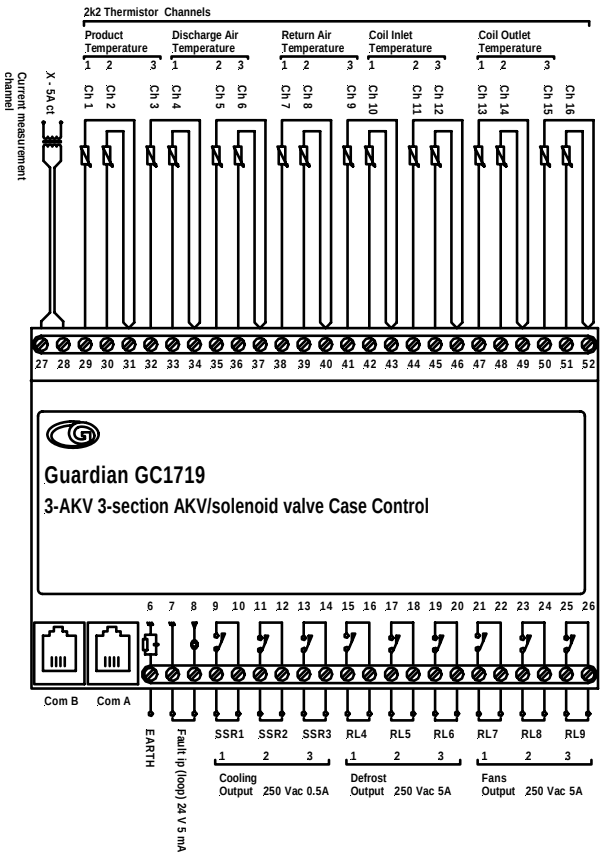
3-Section Modulating Valve Case Control

- **3-section AKV or Solenoid valve case control**
- **Superheat control** modulating AKV10 valve
- **Improved energy** saving superheat algorithms
- **Time scheduled defrosts** with temperature termination
- **Cooling, Fans and defrost** outputs for each section
- **Five Temperatures per section** are available:-
  Product, Discharge Air, Return Air, Coil-In and Coil-Out.
- **Fault input alarm detects** Fans or Compressor faults
- **Total Load Amps** measurement for 3 sections
- **LCD-8 panel** for display, alarms & setup of **8** units
- **Alarm monitoring and data logging** is available via RS485 *MODBUS* communication links to a '*Consultant*' or other Supervisory PC system.
- **Optional IPM-3 Internet Protocol communications**



H 86 x L 156 x D 59 mm

GC1719 Plant Control



3-AKV Superheat Case Control

Options

LCD-8 Alarm Monitor panel provides LCD display and pushbutton selections for alarm indication, parameter setup and value display.

IPM-3 Internet Protocol (IP) module is available to provide Modbus over TCP /IP when local area network communications are required.

Communications

Two independent serial links communicate all values and settings to a Guardian *'Consultant'* SCADA system and an optional *LCD-8* local setup and alarm monitor display panel.
Both links use RS485 MODBUS RTU protocol at 19200 baud. A **'SET'** lamp and button on the top of each unit allows setup of the Modbus Address.

SPECIFICATION		GC1719
General		
Power		**24Vdc/ac 0.2A**
Operation		**0 to 50 °C**
Dimensions Height Length Depth		**86 mm** **156 mm** **59 mm**
Mounting		**DIN rail**
Connectors		
Terminals size type	47	5.08mm 2-part Screw clamp
Power and RS485	2	4-way sockets
Input/Output signals		
temperatures	16	2K2 thermistor (-40 to 40 C)
current input	1	XXX:5 Amp CT
fault input	1	contact (loop) 24vdc 5ma
control relays (n/o)	6	230Vac 3 A
SSR solid state relays	3	230Vac 0.5 A
Communications		
communication links	2	RS485 19200 baud
protocol	1	Modbus RTU
Approvals		**CE**

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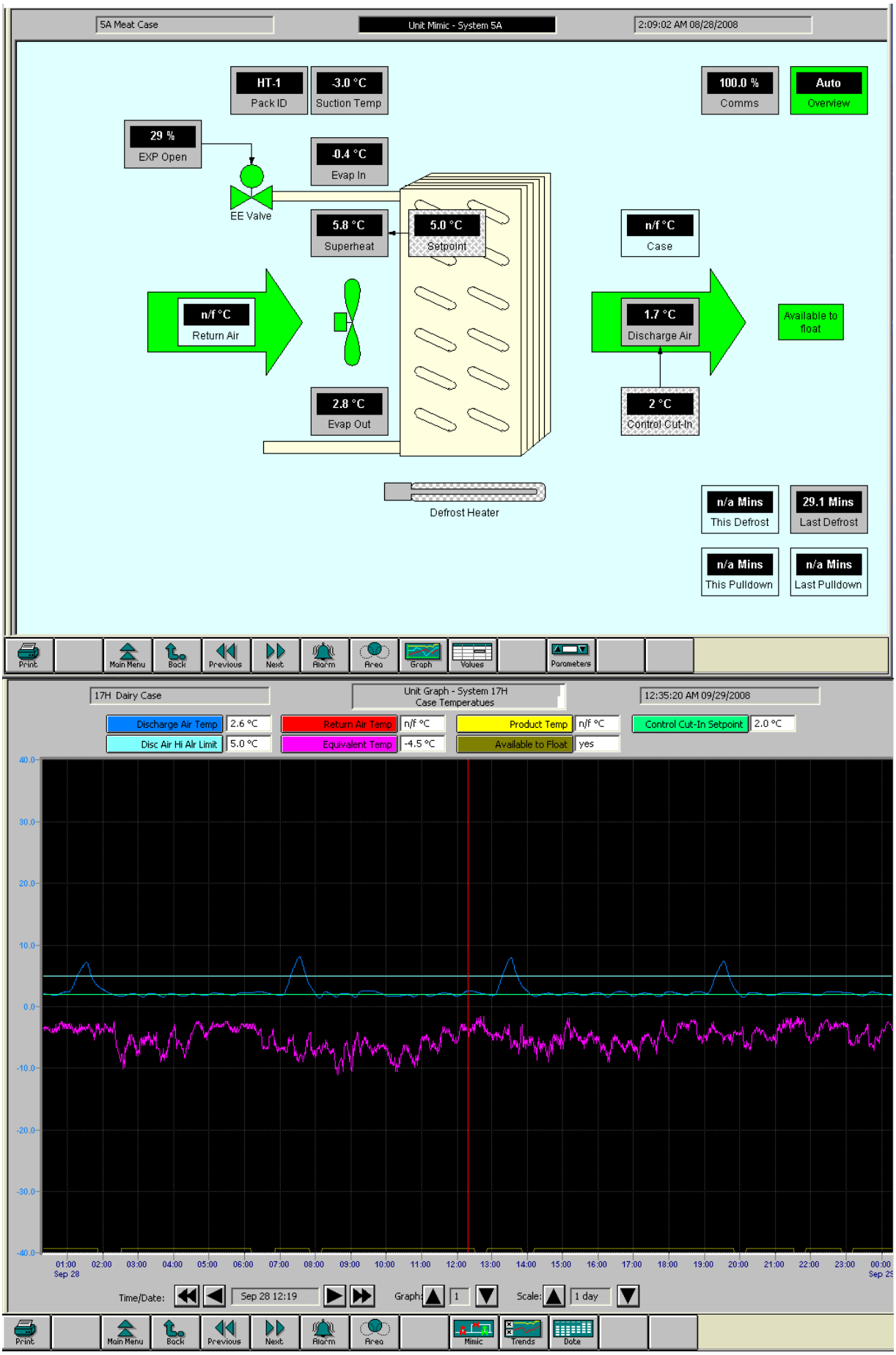

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GC1719 - 3AKV issue 1.b

MODBUS Specification

Two independant comms links "Com A" "Com B" each able to send / receive all measured values, digital states, parameters and overrides.
Each Channel provides two wire half-duplex communications using MODBUS RTU protocol, at 19200, 8 data bits with odd, even or no parity.

Input Registers FUNCTION CODE 04.

REGISTER ADDRESS	DESCRIPTION	RANGE
(Decimal)	**Unit**	
001	Alarm relay state	1=energised
002	Fault Input State (high, low)	Fault Input State
003	Fault Input Alarm	1=alarm
004	Current	0-999 Amps
005	Fault input Timer (time remaining)	0- 10.0 seconds

	Case Section ZONE 1	
01001	Case Status	See case states
01002	Defrost State	1=defrosting
01003	T1 PODUCT Temperature	-40C to +50C
01004	T2 DELIVERY Temperature	-40C to +50C
01005	T3 RETURN Temperature	-40C to +50C
01006	T4 COIL IN Temperature	-40C to +50C
01007	T5 COIL OUT Temperature	-40C to +50C
01008	CALCULATED PRODUCT Temperature CPT	-40C to +50C
01009	Cooling Relay mask	1=energised
01010	Defrost Relay mask	1=energised
01011	Fans Relay mask	1=energised
01012	PWM Relay mask	1=energised
01013	Alarm State CASE Temperature T1	See alarm states
01014	Alarm Timer CASE Temperature T1	0-255 minutes
01015	Alarm State DELIVERY Temperature T2	See alarm states
01016	Alarm Timer DELIVERY Temperature T2	0-255 minutes
01017	Alarm State RETURN Temperature T2	See alarm states
01018	Alarm Timer RETURN Temperature T2	0-255 minutes
01019	Alarm State COIL IN Y Temperature T2	See alarm states
01020	Alarm Timer COIL IN Temperature T2	0-255 minutes
01021	Alarm State COIL OUT Temperature T2	See alarm states
01022	Alarm Timer COIL OUT Temperature T2	0-255 minutes
01501	AKV Valve State	
01502	AKV Duty Cycle output	
01503	AKV Duty Cycle Timer	
01504	AKV Superheat *10	
01505	AKV Superheat Alarm State	
01506	AKV Superheat Loop Count	
01507	AKV Superheat Loop State	
01508	AKV Superheat Loop Setpoint*10	
01509	AKV Superheat Loop Output	
01510	AKV Superheat Loop Previous Output	
01511	AKV Superheat Loop Recovery Position	

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	Case Section ZONE 2	
02001	Case Status	
02002	Defrost State	See alarm states
02003	CASE Temperature T1	-40 to +50C
	ETC.	
02511	AKV Superheat Loop Recovery Position	
	Case Section ZONE 3	
03001	Case Status	See case states
03002	Defrost State	1=defrosting
03003	T1 CASE Temperature	-40 to +50C
	ETC.	
03511	AKV Superheat Loop Recovery Position	

Format Type	Description	Value(Decimal)
Fault Input State	Never Alarm	0
	Alarm if input low	1
	Alarm If Input High	2
Alarm State	Clear	0
	Alarm High	1
	Alarm Low	2
	Probe Fault	128

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Read/Write Contoller Settings

Modbus Addressed parameters are read using function code 03, Read Holding registers, and are written to by using function code 16, Pre-set Multiple registers**.**

READ HOLDING REGISTERS FUNCTION CODE 03.
PRESET MULTIPLE REGISTERS FUNCTION CODE 16.

Modbus Addresses		**System Settings**			Default	Min.	Max.
65518		Controller type	Read only				
65534		Software version	Read only				
65501 to 65508		Serial number					
64998		Baud rate 19200			19200	19200	19200
64999		Parity none, odd, even.			none	none	even
65301		Real Time Clock Seconds					
65302		Real Time Clock Minutes					
65303		Real Time Clock Hours					
65304		Real Time Clock Weekday					

Modbus Addresses			**Unit Settings**			Default	Min.	Max.
00001	**L2**		Area No.			99	1	99
00002	**L3**		Panel No.			99	1	99
00003	**L4**		TM-16 Unit No.			8	1	8
00004	**L5**		Modbus Slave Address			255	01	255
00005	**L9**		Fault input in use (None, Ok Open, Ok Closed)			Ok Open	None	Closed
00006	**L10**		Fault input Guardtime	Minutes		01	0	25
00007	**L11**		Current transformer size	Amps		0	0	250
00008	**L12**		Sensor Type 0=PT100 3-wire, 1=PT1000 3-wire, 2=PT1000 2-wire, 3=Thermistor (2k2) 2-wire			PT100	PT100	Thermistor

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			SETTINGS ZONE			Default	Min.	Max.
			ZONE 1 Zone & Defrost					
01001	**L1**		Zone in Use (1=yes, 0=No)				0	1
01002	**L2**		Zone Control Mode (0=Auto, 1= Fans ,2=OFF)				0	1
01003	**cool L1**		Control Input Probe (0=Product, 1=Delivery,2=Return			1	0	2
01004	**L2**		Cooling Cut-in setpoint for Liquid valve	°C	***c***	-01.0	-40.0	40.0
01005	**L3**		Cooling deadband for Liquid valve (cutout=cutin-db)	°C	***db***	0.1	0.1	2..0
01006	**L17**		Defrost termination probe 0-4	°C	***d***		0	4
01008	**L1**		Number of defrosts per day		***dn***	4	00	12
01009	**L2**		Defrost Schedule Automatic (1=Yes , 0=No)			1	0	1
01010	**L3**		First defrost time T1	hrs	***1h***	0000	0000	2300
01011	**L4**		First defrost time T2	hrs	***1h***	0000	0000	2300
01012	**L5**		First defrost time T3	hrs	***1h***	0000	0000	2300
01013	**L6**		First defrost time T4	hrs	***1h***	0000	0000	2300
01014	**L7**		First defrost time T5	hrs	***1h***	0000	0000	2300
01015	**L8**		First defrost time T6	hrs	***1h***	0000	0000	2300
01016	**L9**		First defrost time T7	hrs	***1h***	0000	0000	2300
01017	**L10**		Defrost time T8	hrs	***1h***	0000	0000	2300
01018	**L11**		Defrost time T9	hrs	***1h***	0000	0000	2300
01019	**L12**		Defrost time T10	hrs	***1h***	0000	0000	2300
01020	**L13**		Defrost time T11	hrs	***1h***	0000	0000	2300
01021	**L14**		Defrost time T12	hrs	***1h***	0000	0000	2300
01022	**L19**		Defrost period	mins	***dP***	dP 15	dP 02	dP 60
01023	**L20**		Defrost termination Temperature	°C		d 01	dd 00	dd 40
01024	**L21**		Pumpdown delay time At Defrost Start,	mins	***Pt***	Pt 2.5	Pt 0.0	Pt 9.9
01025	**L22**		Draindown period At the end of Defrost Period, Liquid Valve delay time for Draindown (All Valves Closed)	mins	***Lt***	Lt 1.0	Lt 0.0	Lt 9.9
01026	**L23**		Fan delay time after Suction and Liquid Valves Open	mins	***Ft***	Ft 1.0	Ft 0.0	Ft 9.9
01027	**L3**		Alarms Active (1=yes, 0=no)					
01028	**L24**		Control Type 0=3LSOL,1=3EET, 2=3EEP,3=3DEF,4=8OC, 5=Staamalo,6=3ACR	mins		LSOL	0	6
	Z2		**Zone 2 Zone & Defrost**					
02001	**L1**		Pack Maximum Evaporating temperature	°C	***E***	E -01	E -40	E 40
			ETC….					
02028	**L24**		Control Type 0=3LSOL,1=3EET, 2=3EEP,3=3DEF,4=8OC, 5=Staamalo,6=3ACR	mins		LSOL	0	6
02513	**L13**		Superheat Control Bleed Position	%	***bl***	bL 00	bL 00	bL 99
	Z3		**Zone 3 Zone & Defrost**					
03501	**L1**		Pack Maximum Evaporating temperature	°C	***E***	E -01	E -40	E 40
			ETC….					
03028	**L24**		Control Type 0=3LSOL,1=3EET, 2=3EEP,3=3DEF,4=8OC, 5=Staamalo,6=3ACR	mins		LSOL	0	5
03513	**L13**		Superheat Control Bleed Position	%	***bl***	bL 00	bL 00	bL 99

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Modbus Address			**SETTINGS Temperatures T1 to T5**			Default	Min.	Max.
T1	Z 1		**ZONE 1 Product Temperature**					
01301	L1		Product Temperature in Use (1=Yes 0= No)			Yes	No	
01302	L2		Temperature Alarm State(0=None, 1=High=1, 2=Low, 3= High/Low			High/ Low	None	High/Low
01303	L3		High temperature alarm limit	C		40	-40	40
01304	L4		High temperature alarm guardtime	minutes		30	0	254
01305	L5		Low temperature alarm limit	C		-40	-40	50
01306	L6		Low temperature alarm guardtime	minutes		30	0	254
	T2		**ZONE 1 Discharge Temperature**					
01307	L1		Air Off Temperature in Use (1=Yes 0= No)			Yes	No	
01308	L2		Temperature Alarm State(0=None, 1=High=1, 2=Low, 3= High/Low			High/ Low	None	High/Low
01309	L3		High temperature alarm limit	C		40	-40	40
01310	L4		High temperature alarm guardtime	minutes		30	0	254
01311	L5		Low temperature alarm limit	C		-40	-40	50
01312	L6		Low temperature alarm guardtime	minutes		30	0	254
	T3		**ZONE 1 Return Temperature**					
01313	L1		Air On Temperature in Use (1=Yes 0= No)			Yes	No	
01314	L2		Temperature Alarm State(0=None, 1=High=1, 2=Low, 3= High/Low			High/ Low	None	High/Low
01315	L3		High temperature alarm limit	C		40	-40	40
01316	L4		High temperature alarm guardtime	minutes		30	0	254
01317	L5		Low temperature alarm limit	C		-40	-40	50
01318	L6		Low temperature alarm guardtime	minutes		30	0	254
	T4		**ZONE 1 Coil in Temperature**					
01319	L1		Coil In Temperature in Use (1=Yes 0= No)			Yes	No	
01320	L2		Temperature Alarm State(0=None, 1= High=1, 2=Low, 3=High/Low			High/ Low	None	High/Low
01321	L3		High temperature alarm limit	C		40	-40	40
01322	L4		High temperature alarm guardtime	minutes		30	0	254
01323	L5		Low temperature alarm limit	C		-40	-40	50
01324	L6		Low temperature alarm guardtime	minutes		30	0	254
	T5		**ZONE 1 Coil Out Temperature**					
01325	L1		Cooil Out Temperature in Use (1=Yes 0= No)			Yes	No	
01326	L2		Temperature Alarm State(0=None, 1=High, 2=Low, 3= High/Low			High/ Low	None	High/Low
01327	L3		High temperature alarm limit	C		40	-40	40
01328	L4		High temperature alarm guardtime	minutes		30	0	254
01329	L5		Low temperature alarm limit	C		-40	-40	50
01330	L6		Low temperature alarm guardtime	minutes		30	0	254
T1	**Z 2**		**ZONE 2Product Temperature**					
02301	L1		Product Temperature in Use (1=Yes 0= No)			Yes	No	
			ETC….					
02330	L6		Low temperature alarm guardtime	minutes		30	0	254
T1	Z3		**ZONE 3 Product Temperature**					
03301	L1		Product Temperature in Use (1=Yes 0= No)			Yes	No	
			ETC….					
03330	L6		Low temperature alarm guardtime	minutes		30	0	254

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Modbus Address			SETTINGS SUPERHEAT			Default	Min.	Max.
			ZONE 1 Superheat					
01501	**L1**		Pack Maximum Evaporating temperature	°C	***E***	E -01	E -40	E 40
01502	**L2**		Superheat High. Maximum	°C	***SH***	SH 08	SH00	SH40
01503	**L3**		Superheat Low. Minimum	°C	***SL***	SL 00	SL 00	SL 99
01504	**L4**		Superheat Alarm Level at which superheat recovery is actioned.	°C	***SA***	SA 01	SA00	SA40
01505	**L5**		Starting Recovery Valve Position	%	***So***	So 50	So 00	So 99
01506	**L6**		Defrost Recovery Valve position	%	***dr***	dr 50	dr 00	dr 99
01507	**L7**		Superheat Recovery Time ON	mins	***tn***	tn 01	tn 00	tn 15
01508	**L8**		Superheat Recovery Time OFF	mins	***tF***	tF 01	tF 00	tF 15
01509	**L9**		Superheat Proportional Gain		***P***	P 255	P 00	P 255
01510	**L10**		Superheat Integral Gain		***I***	i 255	i 00	i 255
01511	**L11**		Superheat Differential Gain		***d***	d 255	d 255	d 255
01512	**L12**		Superheat Control Loop Period	secs	***Pd***	Pd 02	Pd 00	Pd 99
01513	**L13**		Superheat Control Bleed Position	%	***bl***	bL 00	bL 00	bL 99
			ZONE 2 Superheat					
02501	**L1**		Pack Maximum Evaporating temperature	°C	***E***	E -01	E -40	E 40
			ETC….					
02513	**L13**		Superheat Control Bleed Position	%	***bl***	bL 00	bL 00	bL 99
			ZONE 3 Superheat					
03501	**L1**		Pack Maximum Evaporating temperature	°C	***E***	E -01	E -40	E 40
			ETC….					
03513	**L13**		Superheat Control Bleed Position	%	***bl***	bL 00	bL 00	bL 99

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