Connect Touch Control for DynaCIAT LG/LGN chillers

MODBUS COMMUNICATION

User's guide

REVISIONS HISTORY

REV	DATE yyyy mm dd	DESCRIPTION	DONE BY
Original	2017-04-03	Original	**JA**
A	2019-11-12	. Update MODBUS point list . Add 2.3 Control MODBUS values update best practice §	**SyD**

TABLE OF CONTENT

1 INTRODUCTION

1.1 Purpose

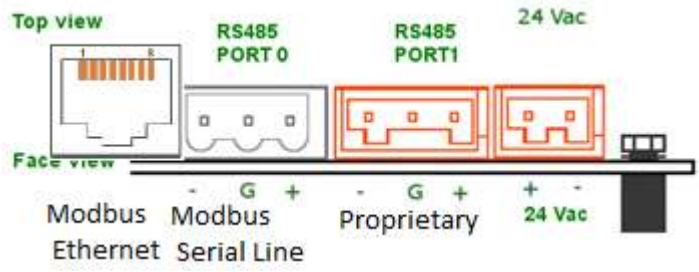
This guide is intended to be used by Building Management System (BMS) engineer inside or outside the CIAT Corporation.
It describes in details the Modbus communication with DynaCIAT LG/LGN units.
All information already provided in the product IOM are not available in this document.

1.2 Definitions, Abbreviations and acronyms

Acronym /Abbreviation	Definition
DI	Discrete Input
EXV	Expansion Valve
FC	Free Cooling
HR	Holding Register
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IR	Input Register
Net	Network
OAT	Outside Air Temperature
RTU	Remote Terminal United Technologies Corporation
SCT	Saturated Condensing Temperature
SST	Saturated Suction Temperature
TCP	Transmission Control Protocol
xxLS	..Low Speed
xxHS	..High Speed

2 CONNECTION CHANNELS

Here below sockets available for communication purposes with external devices.



sockets identification available for communication

NB: PORT 0 should be used only if it is not already used to connect a gateway integrated in the unit.

2.1 RS485 socket details

Bus "port0" is intended to Modbus serial line with RS485 (i.e. no control flow)

Transmission mode:

Used for Local area network communication type by external devices.

- With twisted shielded pair
- distance up to 1000m without amplifier
- Normally configurable at 9600, 19200 or 38400 baud in half duplex.
- Parity bit may be active or deactivated. If parity is disabled, additional stop bits are automatically set for frame timing considerations. Otherwise, parity may be odd or even according to the settings chosen.

  Exclusively RTU mode operates with configurable combination (No ASCII mode permission)

  1 start, 8 data, even parity, 1 stop bit

  1 start, 8 data, odd parity, 1 stop bit

  1 start, 8 data, even parity forced, 1 stop bit

  1 start, 8 data, odd parity forced, 1 stop bit

  1 start, 8 data, 2 stop bit

  ~~1 start, 8 data, no parity , 1 stop bit~~ (EXCLUDED)

- RTU protocol is compatible with both Little/ Big Endian for data field (i.e. either most significant byte is sent first or Least significant byte is sent first)
- Unit identifier must be declared from 1 to 247 as slave product number setup (i.e. station number)
- Cyclic Redundancy Check is made by the RTU protocol layer as defined in Appendix A of "Modbus over serial line" specification available at modbus.org

- Due to floating no native floating point representation for the Modbus communication protocol, IEEE754 representation has been integrated. As the opposite, float handled as integer is also available (i.e. float X 10) depending on setup.

Bus “port1” is proprietary and therefore reserved for internal purpose.

2.2 RJ45 socket details

Modbus Ethernet is intended to Modbus IP.

Used for wide area network communication type by external devices (building management system tool or maintenance tool and so on…)

- Cross pair wired cable shall be used for nominal configuration.
- distance up to 100m without amplifier
- Speed communication at 10 Mega baud not configurable
- IPv4 address configurable for class address with DHCP NOT active for

  Class A (0.xxx.xxx.xxx to 127.xxx.xxx.xxx)

  Class B (128.0.xxx.xxx to 191. 255.xxx.xxx)

  Class C (192.0.0.xxx to 223.255.255.xxx)

  (IP address declared on the control unit needed to set up connection with external device)
- All requests are sent via Transfer Control Protocol on registered port 502 by default but other port number may be set as calibrate value.
- TCP/IP Modbus protocol is compatible with both Little/ Big Endian for data field (i.e. either most significant byte is sent first or Least significant byte is sent first)
- Unit identifier must be declared from 1 to 247 as slave product number setup (i.e. station number)

2.3 Control MODBUS values update best practice

MODBUS points included in FACTORY, FACTORY2 tables should not be modified.
MODBUS points included in SERVICE1, MSL_SLV tables can be modified by Ciat After Sales People only.
MODBUS points included in configuration tables like PUMPCONF, HCCONFIG could be updated when unit is in OFF state.
MODBUS points included in setpoint tables SETPOINT RESETCFG could be updated when unit is in ON or OFF state.
Configuration and setpoint BACnet points should not be written too often (max update rate is one per hour) in order to limit control's file compress operation occurences.
BACnet points in GENUNIT or PROTOCOL table with write access can be modified once every 10 minutes (or longer time period).

3 MODBUS FUNCTIONS

The following standard functions are supported:

Code	Modbus function	Address register range	Application
01 with quantity 1	READ COIL STATUS	0 to 9999 (decimal)	None
01 with quantity N	READ MULTIPLE COIL STATUS (from 1 to 2000max. contiguous)		None
15 with quantity 1	WRITE COIL		None
15 with quantity N	WRITE MULTIPLE COILS (from 1 to 2000max. contiguous)		None
02 with quantity 1	READ DISCRETE INPUT		Alarms
02 with quantity N	READ MULTIPLE DISCRETE INPUTS (from 1 to 2000max. contiguous)		
04 with quantity 2	READ INPUT REGISTER		Useful user parameters
04 with quantity NX2	READ MULTIPLE INPUT REGISTERS (from 1 to 123 max. contiguous)		Useful user parameters
03 with quantity 2	READ HOLDING REGISTER		Configuration or service dataset
03 with quantity NX2	READ MULTIPLE HOLDING REGISTERS (from 1 to 123 max. contiguous)		Configuration or service dataset
16 with quantity 2	WRITE HOLDING REGISTER		Configuration or service dataset
16 with quantity NX2	WRITE MULTIPLE HOLDING REGISTERS (from 1 to 123 max. contiguous)		Configuration or service dataset

4 MAPPING INTERFACE

Table	Item	Description	Media Type	Address (hex)	Format
ALM	COOLER_FREEZE_F	Cooler Water Exchanger Freeze Protection	DI	1 (0001)h	Byte (8-bit)
ALM	LOW_SUCTION_A_F	Circuit A Low Saturated Suction Temperature	DI	5 (0005)h	Byte (8-bit)
ALM	LOW_SUCTION_B_F	Circuit B Low Saturated Suction Temperature	DI	6 (0006)h	Byte (8-bit)
ALM	HIGH_SH_A_F	Circuit A High Suction Superheat	DI	8 (0008)h	Byte (8-bit)
ALM	HIGH_SH_B_F	Circuit B High Suction Superheat	DI	9 (0009)h	Byte (8-bit)
ALM	LOW_SH_A_F	Circuit A Low Suction Superheat	DI	11 (000B)h	Byte (8-bit)
ALM	LOW_SH_B_F	Circuit B Low Suction Superheat	DI	12 (000C)h	Byte (8-bit)
ALM	LOCK_SW_F	Customer Interlock Failure	DI	14 (000E)h	Byte (8-bit)
ALM	CONDENSER_LOCK_F	Condenser Flow Switch Failure	DI	15 (000F)h	Byte (8-bit)
ALM	CPA1_REVERSE_ROT_F	Compressor A1 Not Started Or Pressure Increase not Established	DI	16 (0010)h	Byte (8-bit)
ALM	CPA2_REVERSE_ROT_F	Compressor A2 Not Started Or Pressure Increase not Established	DI	17 (0011)h	Byte (8-bit)
ALM	CPA3_REVERSE_ROT_F	Compressor A3 Not Started Or Pressure Increase not Established	DI	18 (0012)h	Byte (8-bit)
ALM	CPB1_REVERSE_ROT_F	Compressor B1 Not Started Or Pressure Increase not Established	DI	20 (0014)h	Byte (8-bit)
ALM	CPB2_REVERSE_ROT_F	Compressor B2 Not Started Or Pressure Increase not Established	DI	21 (0015)h	Byte (8-bit)
ALM	LOSS_COM_MS_F	Master/Slave communication Failure	DI	30 (001E)h	Byte (8-bit)
ALM	NETWORK_EMSTOP_F	Unit is in Network emergency stop	DI	31 (001F)h	Byte (8-bit)
ALM	COOL_PUMP1_F	Cooler pump 1 default	DI	32 (0020)h	Byte (8-bit)
ALM	COOL_PUMP2_F	Cooler pump 2 default	DI	33 (0021)h	Byte (8-bit)
ALM	COND_PUMP1_F	Condenser pump 1 default	DI	73 (0049)h	Byte (8-bit)
ALM	COND_PUMP2_F	Condenser pump 2 default	DI	74 (004A)h	Byte (8-bit)
ALM	REPEAT_HIGH_DGT_A_F	Circuit A Repeated High Discharge Gas Overrides	DI	37 (0025)h	Byte (8-bit)
ALM	REPEAT_HIGH_DGT_B_F	Circuit B Repeated High Discharge Gas Overrides	DI	38 (0026)h	Byte (8-bit)
ALM	REPEAT_LOW_SST_A_F	Circuit A Repeated low suction temperature overrides	DI	40 (0028)h	Byte (8-bit)
ALM	REPEAT_LOW_SST_B_F	Circuit B Repeated low suction temperature overrides	DI	41 (0029)h	Byte (8-bit)
ALM	HEAT_LOW_EWT_F	Low entering water temperature in heating	DI	43 (002B)h	Byte (8-bit)
ALM	COOLER_FLOW_F	Cooler flow switch failure	DI	51 (0033)h	Byte (8-bit)
ALM	HP_A_F	Circuit A High pressure switch Failure	DI	63 (003F)h	Byte (8-bit)
ALM	HP_B_F	Circuit B High pressure switch Failure	DI	64 (0040)h	Byte (8-bit)
ALM	SENSORS_SWAP_F	Cooler Water Exchanger Temperature Sensors Swapped	DI	97 (0061)h	Byte (8-bit)

Table	Item	Description	Media Type	Address (hex)	Format
ALM	COND_SENSORS_SWAP_F	Condenser Water Exchanger Temperature Sensors Swapped	DI	98 (0062)h	Byte (8-bit)
ALM	LOSS_COM_SM_F	Loss of communication with System Manager	DI	29 (001D)h	Byte (8-bit)
ALM	FLUIDE_FAIL	Possible Refrigerant Leakage Failure	DI	99 (0063)h	Byte (8-bit)
ALM	FC_PROCESS_F	Free Cooling Process Failure	DI	101 (0065)h	Byte (8-bit)
ALM	CL_WL_PRES_ZERO_ERR	Cooler water loop process failure - zero error	DI	1202 (04B2)h	Byte (8-bit)
ALM	CL_WL_PRES_TOO_LOW	Cooler water loop failure - water press too low	DI	1203 (04B3)h	Byte (8-bit)
ALM	CL_WL_PUMP_NO_START	Cooler water loop failure - pump not started	DI	1204 (04B4)h	Byte (8-bit)
ALM	CL_WL_SPECI_PUMP_RT	Cooler Water Loop : RT specific	DI	1205 (04B5)h	Byte (8-bit)
ALM	CL_WL_PUMP_OVERLOAD	Cooler water loop failure - pump overload	DI	1206 (04B6)h	Byte (8-bit)
ALM	CL_WL_FLOW_SWITCH_F	Cooler water loop failure - switch fail	DI	1207 (04B7)h	Byte (8-bit)
ALM	CL_WL_PRES_CROSS	Cooler water loop failure - press cross	DI	1208 (04B8)h	Byte (8-bit)
ALM	CD_WL_PRES_ZERO_ERR	Condenser water loop failure - zero error	DI	1102 (044E)h	Byte (8-bit)
ALM	CD_WL_PRES_TOO_LOW	Condenser water loop failure - water press too low	DI	1103 (044F)h	Byte (8-bit)
ALM	CD_WL_PUMP_NO_START	Condenser water loop failure - pump not started	DI	1104 (0450)h	Byte (8-bit)
ALM	CD_WL_SPECI_PUMP_RT	Condenserer Water Loop : RT specific	DI	1105 (0451)h	Byte (8-bit)
ALM	CD_WL_PUMP_OVERLOAD	Condenser water loop failure - pump overload	DI	1106 (0452)h	Byte (8-bit)
ALM	CD_WL_FLOW_SWITCH_F	Condenser water loop failure - switch fail	DI	1107 (0453)h	Byte (8-bit)
ALM	CD_WL_PRES_CROSS	Condenser water loop failure - press cross	DI	1108 (0454)h	Byte (8-bit)
ALM	CL_WL_PROCESS_F	Cooler Water loop process Failure	DI	1100 (044C)h	Byte (8-bit)
ALM	CD_WL_PROCESS_F	Condenser Water loop Failure	DI	1200 (04B0)h	Byte (8-bit)
ALM	DP_A_F	Circuit A Discharge Pressure Transducer Failure	DI	2001 (07D1)h	Byte (8-bit)
ALM	DP_B_F	Circuit B Discharge Pressure Transducer Failure	DI	2002 (07D2)h	Byte (8-bit)
ALM	SP_A_F	Circuit A Suction Pressure Transducer Failure	DI	2004 (07D4)h	Byte (8-bit)
ALM	SP_B_F	Circuit B Suction Pressure Transducer Failure	DI	2005 (07D5)h	Byte (8-bit)
ALM	CL_WP_IN_F	Water Exchanger Entering Fluid Transducer Failure	DI	2024 (07E8)h	Byte (8-bit)
ALM	CL_WP_OUT_F	Water Exchanger Leaving Fluid Transducer Failure	DI	2025 (07E9)h	Byte (8-bit)
ALM	CD_WP_IN_F	Water Condenser Entering Fluid Transducer Failure	DI	2026 (07EA)h	Byte (8-bit)
ALM	CD_WP_OUT_F	Water Condenser Leaving Fluid	DI	2027 (07EB)h	Byte (8-bit)

Table	Item	Description	Media Type	Address (hex)	Format
		Transducer Failure			
ALM	SERVICE_MAINTNANCE	Service maintenance alert	DI	3000 (0BB8)h	Byte (8-bit)
ALM	FGAS_NEEDED	Fgas check needed, call your maintenance company	DI	3005 (0BBD)h	Byte (8-bit)
ALM	SIOB_A_LOW_VOLT_F	SIOB 1 Low Voltage Failure	DI	4001 (0FA1)h	Byte (8-bit)
ALM	SIOB_B_LOW_VOLT_F	SIOB 2 Low Voltage Failure	DI	4002 (0FA2)h	Byte (8-bit)
ALM	EXV_A_F	Main EXV stepper motor failure - cir A	DI	4005 (0FA5)h	Byte (8-bit)
ALM	EXV_B_F	Main EXV stepper motor failure - cir B	DI	4020 (0FB4)h	Byte (8-bit)
ALM	SIOB_A_COM_F	Loss of communication with SIOB Board Number 1	DI	4901 (1325)h	Byte (8-bit)
ALM	SIOB_B_COM_F	Loss of communication with SIOB Board Number 2	DI	4902 (1326)h	Byte (8-bit)
ALM	AUX1_HEATER_COM_F	Loss of communication with AUX1 Heating Device Control board	DI	4601 (11F9)h	Byte (8-bit)
ALM	AUX1_DRYC_COM_F	Loss of communication with AUX1 Condenser board	DI	4602 (11FA)h	Byte (8-bit)
ALM	AUX1_FREECOOL_COM_F	Loss of communication with AUX1 FreeCooling board	DI	4603 (11FB)h	Byte (8-bit)
ALM	AUX1_OPTION_COM_F	Loss of communication with AUX1 Options board	DI	4604 (11FC)h	Byte (8-bit)
ALM	FC_AUX1_COM_F	Loss of communication with Free Cooling Board 1	DI	4602 (11FA)h	Byte (8-bit)
ALM	COOL_EWT_F	Water Exchanger Entering Fluid Thermistor Failure	DI	5001 (1389)h	Byte (8-bit)
ALM	COOL_LWT_F	Water Exchanger Leaving Fluid Thermistor Failure	DI	5002 (138A)h	Byte (8-bit)
ALM	COND_EWT_F	Condenser Entering Fluid Thermistor Failure	DI	5006 (138E)h	Byte (8-bit)
ALM	COND_LWT_F	Condenser Leaving Fluid Thermistor Failure	DI	5007 (138F)h	Byte (8-bit)
ALM	OAT_F	OAT Thermistor Failure	DI	5010 (1392)h	Byte (8-bit)
ALM	CHWSTEMP_F	Master/Slave Common Fluid Thermistor Failure	DI	5011 (1393)h	Byte (8-bit)
ALM	HTWSTEMP_F	Master/Slave Common Heating Fluid Thermistor Failure	DI	5032 (13A8)h	Byte (8-bit)
ALM	DRY_LWT_F	Dry Cooler LWT Thermistor Failure	DI	5036 (13AC)h	Byte (8-bit)
ALM	DGT_A_F	Circuit A Discharge Gas Thermistor Failure	DI	5044 (13B4)h	Byte (8-bit)
ALM	DGT_B_F	Circuit B Discharge Gas Thermistor Failure	DI	5045 (13B5)h	Byte (8-bit)
ALM	SUCTION_T_A_F	Circuit A Suction Gas Thermistor Failure	DI	5012 (1394)h	Byte (8-bit)
ALM	SUCTION_T_B_F	Circuit B Suction Gas Thermistor Failure	DI	5013 (1395)h	Byte (8-bit)
ALM	FC_WLOOP_F	Free Cooling Water Loop Thermistor Failure	DI	5046 (13B6)h	Byte (8-bit)
ALM	FC_LWT_F	Free Cooling Leaving Water	DI	5047 (13B7)h	Byte (8-bit)

Table	Item	Description	Media Type	Address (hex)	Format
		Thermistor Failure			
ALM	FC_OAT_F	Free Cooling OAT Sensor Failure	DI	5048 (13B8)h	Byte (8-bit)
ALM	CL_PUMP_DRIVE_F	Cooler Water pump Variable Speed Failure	DI	7003 (1B5B)h	Byte (8-bit)
ALM	CD_PUMP_DRIVE_F	Condenser Water pump Variable Speed Failure	DI	7004 (1B5C)h	Byte (8-bit)
ALM	ILL_FACT_CONF_F	Illegal configuration	DI	8001 (1F41)h	Byte (8-bit)
ALM	INI_FACT_CONF_F	Initial factory configuration required	DI	8000 (1F40)h	Byte (8-bit)
ALM	M_S_CONFIG_F	Master/Slave configuration error	DI	8101 (1FA5)h	Byte (8-bit)
PROTOCOL	SP_OCC	Occupied Setpoint	HR	0 (0000)h	Signed Integer (32-bit)
PROTOCOL	CHIL_S_S	Chiller Start/Stop order	HR	2 (0002)h	Signed Integer (32-bit)
PROTOCOL	CHIL_OCC	Chiller occupancy order	HR	4 (0004)h	Signed Integer (32-bit)
PROTOCOL	EMSTOP	Emergency Stop	HR	6 (0006)h	Signed Integer (32-bit)
PROTOCOL	HC_SEL	HeatCool Select	HR	8 (0008)h	Signed Integer (32-bit)
PROTOCOL	SP_SEL	Setpoint selection	HR	10 (000A)h	Signed Integer (32-bit)
PROTOCOL	DEM_LIM	Demand Limit	HR	12 (000C)h	Signed Integer (32-bit)
PROTOCOL	CTRL_PNT	Control Point	HR	14 (000E)h	IEEE Float (32-bit)
PROTOCOL	LAG_LIM	Slave demand Limit	HR	16 (0010)h	Signed Integer (32-bit)
HCCONFIG	cr_sel	Cooling Reset Select	HR	18 (0012)h	Signed Integer (32-bit)
HCCONFIG	hr_sel	Heating Reset Select	HR	20 (0014)h	Signed Integer (32-bit)
RESETCFG	oatcr_no	OAT No Reset Value	HR	22 (0016)h	IEEE Float (32-bit)
RESETCFG	oatcr_fu	OAT Full Reset Value	HR	24 (0018)h	IEEE Float (32-bit)
RESETCFG	dt_cr_no	Delta T No Reset Value	HR	26 (001A)h	IEEE Float (32-bit)
RESETCFG	dt_cr_fu	Delta T Full Reset Value	HR	28 (001C)h	IEEE Float (32-bit)
RESETCFG	cr_deg	Cooling Reset Deg. Value	HR	30 (001E)h	IEEE Float (32-bit)
RESETCFG	oathr_no	OAT No Reset Value	HR	32 (0020)h	IEEE Float (32-bit)
RESETCFG	oathr_fu	OAT Full Reset Value	HR	34 (0022)h	IEEE Float (32-bit)
RESETCFG	dt_hr_no	Delta T No Reset Value	HR	36 (0024)h	IEEE Float (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
RESETCFG	dt_hr_fu	Delta T Full Reset Value	HR	38 (0026)h	IEEE Float (32-bit)
RESETCFG	hr_deg	Heating Reset Deg. Value	HR	40 (0028)h	IEEE Float (32-bit)
RESETCFG	I_cr_no	Current No Reset Value	HR	42 (002A)h	IEEE Float (32-bit)
RESETCFG	I_cr_fu	Current Full Reset Value	HR	44 (002C)h	IEEE Float (32-bit)
RESETCFG	I_hr_no	Current No Reset Value	HR	50 (0032)h	IEEE Float (32-bit)
RESETCFG	I_hr_fu	Current Full Reset Value	HR	52 (0034)h	IEEE Float (32-bit)
CP_UNABL	un_cp_a1	Compressor A1 Disable	HR	60 (003C)h	Signed Integer (32-bit)
CP_UNABL	un_cp_a2	Compressor A2 Disable	HR	62 (003E)h	Signed Integer (32-bit)
CP_UNABL	un_cp_a3	Compressor A3 Disable	HR	64 (0040)h	Signed Integer (32-bit)
CP_UNABL	un_cp_b1	Compressor B1 Disable	HR	68 (0044)h	Signed Integer (32-bit)
CP_UNABL	un_cp_b2	Compressor B2 Disable	HR	70 (0046)h	Signed Integer (32-bit)
SETPOINT	csp1	Cooling Setpoint 1	HR	76 (004C)h	IEEE Float (32-bit)
SETPOINT	csp2	Cooling Setpoint 2	HR	78 (004E)h	IEEE Float (32-bit)
SETPOINT	hsp1	Heating Setpoint 1	HR	80 (0050)h	IEEE Float (32-bit)
SETPOINT	hsp2	Heating Setpoint 2	HR	82 (0052)h	IEEE Float (32-bit)
SETPOINT	ramp_sp	Ramp Loading Setpoint	HR	84 (0054)h	IEEE Float (32-bit)
SETPOINT	lim_sp1	Switch Limit Setpoint 1	HR	90 (005A)h	Signed Integer (32-bit)
SETPOINT	lim_sp2	Switch Limit Setpoint 2	HR	92 (005C)h	Signed Integer (32-bit)
SETPOINT	lim_sp3	Switch Limit Setpoint 3	HR	94 (005E)h	Signed Integer (32-bit)
MODBUSRS	metric	Metric Unit	HR	106 (006A)h	Signed Integer (32-bit)
MODBUSRS	swap_b	Swap Bytes	HR	108 (006C)h	Signed Integer (32-bit)
MODBUSRS	real_typ	Real type management	HR	110 (006E)h	Signed Integer (32-bit)
MODBUSIP	metric	Metric Unit	HR	112 (0070)h	Signed Integer (32-bit)
MODBUSIP	swap_b	Swap Bytes	HR	114 (0072)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
MODBUSIP	real_typ	Real type management	HR	116 (0074)h	Signed Integer (32-bit)
GENUNIT	SP_OCC	Setpoint Occupied?	IR	0 (0000)h	Signed Integer (32-bit)
GENUNIT	CHIL_S_S	Net.: Cmd Start/Stop	IR	2 (0002)h	Signed Integer (32-bit)
GENUNIT	CHIL_OCC	Net.: Cmd Occupied	IR	4 (0004)h	Signed Integer (32-bit)
GENUNIT	EMSTOP	Emergency Stop	IR	6 (0006)h	Signed Integer (32-bit)
GENUNIT	CTRL_TYP	Local=0 Net.=1 Remote=2	IR	8 (0008)h	Signed Integer (32-bit)
UNIT	STATUS	Running Status	IR	10 (000A)h	Signed Integer (32-bit)
GENUNIT	min_left	Minutes Left for Start	IR	12 (000C)h	IEEE Float (32-bit)
GENUNIT	HEATCOOL	Heat/Cool Status	IR	14 (000E)h	Signed Integer (32-bit)
GENUNIT	SP_SEL	Setpoint Select	IR	16 (0010)h	Signed Integer (32-bit)
GENUNIT	CAP_T	Percent Total Capacity	IR	18 (0012)h	Signed Integer (32-bit)
GENUNIT	CAPA_T	Circuit A Total Capacity	IR	20 (0014)h	Signed Integer (32-bit)
GENUNIT	CAPB_T	Circuit B Total Capacity	IR	22 (0016)h	Signed Integer (32-bit)
GENUNIT	DEM_LIM	Active Demand Limit Val	IR	24 (0018)h	Signed Integer (32-bit)
GENUNIT	SP	Current Setpoint	IR	26 (001A)h	IEEE Float (32-bit)
GENUNIT	CTRL_PNT	Control Point	IR	28 (001C)h	IEEE Float (32-bit)
GENUNIT	ALM	Alarm State	IR	30 (001E)h	Signed Integer (32-bit)
MODBUSRS	modrt_en	RTU Server Enable	IR	32 (0020)h	Signed Integer (32-bit)
MODBUSRS	ser_UID	Server UID	IR	34 (0022)h	Signed Integer (32-bit)
MODBUSRS	baudrate	Baudrate	IR	40 (0028)h	Signed Integer (32-bit)
MODBUSRS	parity	Parity	IR	42 (002A)h	Signed Integer (32-bit)
MODBUSRS	stop_bit	Stop bit	IR	44 (002C)h	Signed Integer (32-bit)
PROTOCOL	CTRL_WT	Control Water	IR	46 (002E)h	IEEE Float (32-bit)
TEMP	EWT	Entering Water Temp	IR	48 (0030)h	IEEE Float (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
TEMP	LWT	Leaving Water Temp	IR	50 (0032)h	IEEE Float (32-bit)
TEMP	OAT	Outside Air Temperature	IR	52 (0034)h	IEEE Float (32-bit)
TEMP	CHWSTEMP	Chilled Water Syst Temp	IR	54 (0036)h	IEEE Float (32-bit)
TEMP	SCT_A	Saturated Condens Tp A	IR	56 (0038)h	IEEE Float (32-bit)
TEMP	SST_A	Saturated Suction Tp A	IR	58 (003A)h	IEEE Float (32-bit)
TEMP	SCT_B	Saturated Condens Tp B	IR	60 (003C)h	IEEE Float (32-bit)
TEMP	SST_B	Saturated Suction Tp B	IR	62 (003E)h	IEEE Float (32-bit)
TEMP	SUCT_A	Gas Suction Temp A	IR	68 (0044)h	IEEE Float (32-bit)
TEMP	SUCT_B	Gas Suction Temp B	IR	70 (0046)h	IEEE Float (32-bit)
LOADFACT	SH_A	Suction Superheat A	IR	72 (0048)h	IEEE Float (32-bit)
LOADFACT	SH_B	Suction Superheat B	IR	74 (004A)h	IEEE Float (32-bit)
TEMP	COND_EWT	Cond Entering Water Temp	IR	80 (0050)h	IEEE Float (32-bit)
TEMP	COND_LWT	Cond Leaving Water Temp	IR	82 (0052)h	IEEE Float (32-bit)
TEMP	DGT_A	Discharge Gas Temp cir A	IR	84 (0054)h	IEEE Float (32-bit)
TEMP	DGT_B	Discharge Gas Temp cir B	IR	86 (0056)h	IEEE Float (32-bit)
TEMP	SPACETMP	Optional Space Temp	IR	92 (005C)h	IEEE Float (32-bit)
PRESSURE	DP_A	Discharge Pressure A	IR	94 (005E)h	IEEE Float (32-bit)
PRESSURE	SP_A	Suction Pressure A	IR	96 (0060)h	IEEE Float (32-bit)
PRESSURE	DP_B	Discharge Pressure B	IR	98 (0062)h	IEEE Float (32-bit)
PRESSURE	SP_B	Suction Pressure B	IR	100 (0064)h	IEEE Float (32-bit)
PUMPSTAT	CL_WPIN	Cool Inlet Water Press	IR	102 (0066)h	IEEE Float (32-bit)
PUMPSTAT	CL_WPOUT	Cool Outlet Water Press	IR	104 (0068)h	IEEE Float (32-bit)
INPUTS	ONOFF_SW	On/Off - Remote Switch	IR	106 (006A)h	Signed Integer (32-bit)
INPUTS	HC_SW	Remote heat/Cool Switch	IR	108 (006C)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
INPUTS	on_ctrl	Current Control	IR	110 (006E)h	Signed Integer (32-bit)
INPUTS	SETP_SW1	Remote Setpoint Switch1	IR	112 (0070)h	Signed Integer (32-bit)
INPUTS	LIM_SW1	Limit Switch 1 Status	IR	114 (0072)h	Signed Integer (32-bit)
INPUTS	LIM_SW2	Limit Switch 2 Status	IR	116 (0074)h	Signed Integer (32-bit)
INPUTS	FLOW_SW	Exchanger Flow Switch	IR	118 (0076)h	Signed Integer (32-bit)
INPUTS	HP_SW_A	High Pressure Switch A	IR	128 (0080)h	Signed Integer (32-bit)
INPUTS	HP_SW_B	High Pressure Switch B	IR	130 (0082)h	Signed Integer (32-bit)
INPUTS	LOCK_SW	Lock Input	IR	134 (0086)h	Signed Integer (32-bit)
AIR_COND	FanSp_A	Variable Speed Fan A	IR	156 (009C)h	IEEE Float (32-bit)
AIR_COND	FanSp_B	Variable Speed Fan B	IR	158 (009E)h	IEEE Float (32-bit)
OUTPUTS	EXVPosA	EXV Position Circuit A	IR	160 (00A0)h	IEEE Float (32-bit)
OUTPUTS	EXVPosB	EXV Position Circuit B	IR	162 (00A2)h	IEEE Float (32-bit)
OUTPUTS	boiler	Boiler Output	IR	176 (00B0)h	Signed Integer (32-bit)
OUTPUTS	EHS	Electrical Heat Stages	IR	178 (00B2)h	Signed Integer (32-bit)
OUTPUTS	CP_A1	Compressor A1 Output	IR	182 (00B6)h	Signed Integer (32-bit)
OUTPUTS	CP_A2	Compressor A2 Output	IR	184 (00B8)h	Signed Integer (32-bit)
OUTPUTS	CP_A3	Compressor A3 Output	IR	186 (00BA)h	Signed Integer (32-bit)
OUTPUTS	CP_B1	Compressor B1 Output	IR	190 (00BE)h	Signed Integer (32-bit)
OUTPUTS	CP_B2	Compressor B2 Output	IR	192 (00C0)h	Signed Integer (32-bit)
OUTPUTS	alarm	Alarm Relay Output	IR	222 (00DE)h	Signed Integer (32-bit)
OUTPUTS	RUNNING	Running Status	IR	224 (00E0)h	Signed Integer (32-bit)
OUTPUTS	alert	Alert status	IR	226 (00E2)h	Signed Integer (32-bit)
OUTPUTS	shutdown	Shutdown signal	IR	228 (00E4)h	Signed Integer (32-bit)
AIR_COND	FanSt_A	Circuit A Fan Stages	IR	232 (00E8)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
AIR_COND	FanSt_B	Circuit B Fan Stages	IR	234 (00EA)h	Signed Integer (32-bit)
PUMPSTAT	CL_PUMP1	Cooler Pump 1 Command	IR	240 (00F0)h	Signed Integer (32-bit)
PUMPSTAT	CL_PUMP2	Cooler Pump 2 Command	IR	242 (00F2)h	Signed Integer (32-bit)
PUMPSTAT	CD_PUMP1	Cond Pump 1 Command	IR	244 (00F4)h	Signed Integer (32-bit)
PUMPSTAT	CD_PUMP2	Cond Pump 2 Command	IR	246 (00F6)h	Signed Integer (32-bit)
PUMPSTAT	CL_WPIN	Cool Inlet Water Press	IR	250 (00FA)h	IEEE Float (32-bit)
PUMPSTAT	CL_WPOUT	Cool Outlet Water Press	IR	252 (00FC)h	IEEE Float (32-bit)
PUMPSTAT	CD_WPIN	Cond Inlet Water Press	IR	254 (00FE)h	IEEE Float (32-bit)
PUMPSTAT	CD_WPOUT	Cond Outlet Water Press	IR	256 (0100)h	IEEE Float (32-bit)
PUMPSTAT	CL_WFLOW	Cool Water flow	IR	268 (010C)h	IEEE Float (32-bit)
PUMPSTAT	CD_WFLOW	Cond Water flow	IR	272 (0110)h	IEEE Float (32-bit)
PUMPSTAT	CL_WdtSp	Cool Water DT Setpoint	IR	276 (0114)h	IEEE Float (32-bit)
PUMPSTAT	CL_WdpSp	Cool Water DP Setpoint	IR	278 (0116)h	IEEE Float (32-bit)
PUMPSTAT	CL_DvPos	Cool Pump drive position	IR	280 (0118)h	Signed Integer (32-bit)
PUMPSTAT	CD_DvPos	Cond Pump drive position	IR	282 (011A)h	Signed Integer (32-bit)
RUNTIME	hr_mach	Machine Operating Hours	IR	294 (0126)h	IEEE Float (32-bit)
RUNTIME	st_mach	Machine Starts	IR	296 (0128)h	IEEE Float (32-bit)
RUNTIME	hr_cp_a1	Compressor A1 Hours	IR	298 (012A)h	IEEE Float (32-bit)
RUNTIME	hr_cp_a2	Compressor A2 Hours	IR	300 (012C)h	IEEE Float (32-bit)
RUNTIME	hr_cp_a3	Compressor A3 Hours	IR	302 (012E)h	IEEE Float (32-bit)
RUNTIME	hr_cp_b1	Compressor B1 Hours	IR	306 (0132)h	IEEE Float (32-bit)
RUNTIME	hr_cp_b2	Compressor B2 Hours	IR	308 (0134)h	IEEE Float (32-bit)
RUNTIME	st_cp_a1	Compressor A1 Starts	IR	314 (013A)h	IEEE Float (32-bit)
RUNTIME	st_cp_a2	Compressor A2 Starts	IR	316 (013C)h	IEEE Float (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
RUNTIME	st_cp_a3	Compressor A3 Starts	IR	318 (013E)h	IEEE Float (32-bit)
RUNTIME	st_cp_b1	Compressor B1 Starts	IR	322 (0142)h	IEEE Float (32-bit)
RUNTIME	st_cp_b2	Compressor B2 Starts	IR	324 (0144)h	IEEE Float (32-bit)
RUNTIME	hr_clpm1	Cooler Pump 1 Hours	IR	330 (014A)h	IEEE Float (32-bit)
RUNTIME	hr_clpm2	Cooler Pump 2 Hours	IR	332 (014C)h	IEEE Float (32-bit)
RUNTIME	chr_mach	Cooling Operating Hours	IR	360 (0168)h	IEEE Float (32-bit)
RUNTIME	hhr_mach	Heating Operating Hours	IR	362 (016A)h	IEEE Float (32-bit)
MODES	m_delay	Delay Active	IR	364 (016C)h	Signed Integer (32-bit)
MODES	m_2ndspt	Second Setpoint Active	IR	366 (016E)h	Signed Integer (32-bit)
MODES	m_limit	Demand Limit Active	IR	370 (0172)h	Signed Integer (32-bit)
MODES	m_cooler	Cooler Heater Active	IR	374 (0176)h	Signed Integer (32-bit)
MODES	m_night	Night Low Noise Active	IR	380 (017C)h	Signed Integer (32-bit)
MODES	m_leadla	Master Slave Active	IR	384 (0180)h	Signed Integer (32-bit)
MODES	m_heater	Electric Heat Active	IR	388 (0184)h	Signed Integer (32-bit)
MODES	m_boiler	Boiler Active	IR	392 (0188)h	Signed Integer (32-bit)
MODES	m_ice	Ice Mode Active	IR	394 (018A)h	Signed Integer (32-bit)
GENCONF	lead_cir	Cir Priority Sequence	IR	428 (01AC)h	Signed Integer (32-bit)
GENCONF	off_on_d	Unit Off to On Delay	IR	434 (01B2)h	Signed Integer (32-bit)
GENCONF	nh_limit	Night Capacity Limit	IR	436 (01B4)h	Signed Integer (32-bit)
GENCONF	nh_start	Night Mode Start Hour	IR	438 (01B6)h	Signed Integer (32-bit)
GENCONF	nh_end	Night Mode End Hour	IR	440 (01B8)h	Signed Integer (32-bit)
HCCONFIG	both_sel	HSM Both Command Select	IR	448 (01C0)h	Signed Integer (32-bit)
HCCONFIG	boil_on	Boiler Manual Command	IR	454 (01C6)h	Signed Integer (32-bit)
PUMPCONF	clpmpseq	Cooler Pumps Sequence	IR	456 (01C8)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
PUMPCONF	cdpmpseq	Condenser Pumps Sequence	IR	458 (01CA)h	Signed Integer (32-bit)
PUMPCONF	clpmpdel	Pump Auto Rotation Delay	IR	460 (01CC)h	Signed Integer (32-bit)
HCCONFIG	boil_th	Boiler OAT Threshold	IR	472 (01D8)h	IEEE Float (32-bit)
HCCONFIG	ehs_th	Elec Stage OAT Threshold	IR	474 (01DA)h	IEEE Float (32-bit)
HCCONFIG	ehs_pull	Electrical pulldown time	IR	478 (01DE)h	Signed Integer (32-bit)
FACTORY	unit_typ	Unit Type	IR	484 (01E4)h	Signed Integer (32-bit)
FACTORY	unitsize	Unit Size	IR	486 (01E6)h	Signed Integer (32-bit)
FACTORY	ehs_sel	Electrical Heater Select	IR	492 (01EC)h	Signed Integer (32-bit)
FACTORY	boil_sel	Boiler Command Select	IR	494 (01EE)h	Signed Integer (32-bit)
FACTORY	cool_pmp	Cool Water Pump Type	IR	506 (01FA)h	Signed Integer (32-bit)
FACTORY	clp_dual	Dual Cool Water Pump	IR	508 (01FC)h	Signed Integer (32-bit)
FACTORY	coolvpmp	Cool Water Pump Drive	IR	510 (01FE)h	Signed Integer (32-bit)
FACTORY	condvpmp	Cond Water Pump Drive	IR	512 (0200)h	Signed Integer (32-bit)
FACTORY	leak_chk	Leakage Charge Detection	IR	514 (0202)h	Signed Integer (32-bit)
FACTORY2	ClExchTp	Exchanger Type	IR	534 (0216)h	Signed Integer (32-bit)
MAINTCFG	s_alert	Servicing Alert	IR	540 (021C)h	Signed Integer (32-bit)
MAINTCFG	charge_c	Refrigerant Charge Ctrl	IR	542 (021E)h	Signed Integer (32-bit)
MAINTCFG	w_loop_c	Water Loop Ctrl	IR	544 (0220)h	Signed Integer (32-bit)
MST_SLV	ms_sel	Master/Slave Select	IR	554 (022A)h	Signed Integer (32-bit)
MST_SLV	ms_ctrl	Master Control Type	IR	556 (022C)h	Signed Integer (32-bit)
MST_SLV	slv_addr	Slave Address	IR	558 (022E)h	Signed Integer (32-bit)
MST_SLV	lag_mini	Lag Minimum Running Time	IR	562 (0232)h	Signed Integer (32-bit)
MST_SLV	lstr_tim	Lead/Lag Start Timer	IR	564 (0234)h	Signed Integer (32-bit)
MST_SLV	lag_pump	Lag Unit Pump Control	IR	570 (023A)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
MST_SLV	ll_serie	Chiller In Series	IR	574 (023E)h	Signed Integer (32-bit)
M_MSTSLV	ms_activ	Master/Slave Ctrl Active	IR	578 (0242)h	Signed Integer (32-bit)
M_MSTSLV	lead_sel	Lead Unit is the:	IR	580 (0244)h	Signed Integer (32-bit)
M_MSTSLV	slv_stat	Slave Chiller State	IR	582 (0246)h	Signed Integer (32-bit)
M_MSTSLV	slv_capt	Slave Chiller Total Cap	IR	584 (0248)h	Signed Integer (32-bit)
M_MSTSLV	ms_error	Master/Slave Error	IR	594 (0252)h	Signed Integer (32-bit)
M_MSTSLV	cap_max	Max Available Capacity ?	IR	596 (0254)h	Signed Integer (32-bit)
M_MSTSLV	slav_hr	Slave Operating Hours	IR	600 (0258)h	IEEE Float (32-bit)
M_MSTSLV	slav_ewt	Slave Cooler Ent. Fluid	IR	602 (025A)h	IEEE Float (32-bit)
M_MSTSLV	slav_lwt	Slave Cooler Leav. Fluid	IR	604 (025C)h	IEEE Float (32-bit)
FACTORY	flui_typ	Fluid Type	IR	606 (025E)h	Signed Integer (32-bit)
SERVICE1	ewt_opt	Entering Fluid Control	IR	608 (0260)h	Signed Integer (32-bit)
SERVICE1	hd_pg	Prop PID Gain	IR	610 (0262)h	IEEE Float (32-bit)
SERVICE1	hd_ig	Int PID Gain	IR	612 (0264)h	IEEE Float (32-bit)
SERVICE1	hd_dg	Deri PID Gain	IR	614 (0266)h	IEEE Float (32-bit)
SERVICE1	sh_sp_a	EXV A Superheat Setpoint	IR	616 (0268)h	IEEE Float (32-bit)
SERVICE1	sh_sp_b	EXV B Superheat Setpoint	IR	618 (026A)h	IEEE Float (32-bit)
SERVICE1	hp_th	High Pressure Threshold	IR	622 (026E)h	IEEE Float (32-bit)
SERVICE1	heatersp	Cooler heater Delta Spt	IR	624 (0270)h	IEEE Float (32-bit)
SERVICE1	pump_cyc	Pump Cycling Freeze Prot	IR	626 (0272)h	Signed Integer (32-bit)
SERVICE1	freezesp	Brine Freeze Setpoint	IR	628 (0274)h	IEEE Float (32-bit)
SERVICE1	min_lwt	Brine Minimum LWT	IR	630 (0276)h	IEEE Float (32-bit)
SERVICE1	zm_spt	Auto Z Multiplier	IR	634 (027A)h	Signed Integer (32-bit)
LOADFACT	ctrl_avg	Average Ctrl Water Temp	IR	720 (02D0)h	IEEE Float (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
LOADFACT	diff_wt	Differential Water Temp	IR	722 (02D2)h	IEEE Float (32-bit)
LOADFACT	delta_t	Water Delta T	IR	724 (02D4)h	IEEE Float (32-bit)
LAST_POR	date_on1	Power On 1: day-mon-year	IR	892 (037C)h	IEEE Float (32-bit)
LAST_POR	time_on1	Power On 1: hour-minute	IR	894 (037E)h	IEEE Float (32-bit)
LAST_POR	date_of1	PowerDown 1:day-mon-year	IR	896 (0380)h	IEEE Float (32-bit)
LAST_POR	time_of1	PowerDown 1:hour-minute	IR	898 (0382)h	IEEE Float (32-bit)
LAST_POR	date_on2	Power On 2: day-mon-year	IR	900 (0384)h	IEEE Float (32-bit)
LAST_POR	time_on2	Power On 2: hour-minute	IR	902 (0386)h	IEEE Float (32-bit)
LAST_POR	date_of2	PowerDown 2:day-mon-year	IR	904 (0388)h	IEEE Float (32-bit)
LAST_POR	time_of2	PowerDown 2:hour-minute	IR	906 (038A)h	IEEE Float (32-bit)
LAST_POR	date_on3	Power On 3: day-mon-year	IR	908 (038C)h	IEEE Float (32-bit)
LAST_POR	time_on3	Power On 3: hour-minute	IR	910 (038E)h	IEEE Float (32-bit)
LAST_POR	date_of3	PowerDown 3:day-mon-year	IR	912 (0390)h	IEEE Float (32-bit)
LAST_POR	time_of3	PowerDown 3:hour-minute	IR	914 (0392)h	IEEE Float (32-bit)
LAST_POR	date_on4	Power On 4: day-mon-year	IR	916 (0394)h	IEEE Float (32-bit)
LAST_POR	time_on4	Power On 4: hour-minute	IR	918 (0396)h	IEEE Float (32-bit)
LAST_POR	date_of4	PowerDown 4:day-mon-year	IR	920 (0398)h	IEEE Float (32-bit)
LAST_POR	time_of4	PowerDown 4:hour-minute	IR	922 (039A)h	IEEE Float (32-bit)
LAST_POR	date_on5	Power On 5: day-mon-year	IR	924 (039C)h	IEEE Float (32-bit)
LAST_POR	time_on5	Power On 5: hour-minute	IR	926 (039E)h	IEEE Float (32-bit)
LAST_POR	date_of5	PowerDown 5:day-mon-year	IR	928 (03A0)h	IEEE Float (32-bit)
LAST_POR	time_of5	PowerDown 5:hour-minute	IR	930 (03A2)h	IEEE Float (32-bit)
SERMAINT	S_RESET	Reset Maintenance Alert	IR	952 (03B8)h	Signed Integer (32-bit)
SERMAINT	charge_m	2 - Refrigerant Charge	IR	954 (03BA)h	Signed Integer (32-bit)

Table	Item	Description	Media Type	Address (hex)	Format
SERMAINT	w_loop_m	3 - Water Loop Size	IR	956 (03BC)h	Signed Integer (32-bit)
SERMAINT	s_date1	Date numeric	IR	958 (03BE)h	IEEE Float (32-bit)
SERMAINT	s_hour1	Hour mntn numeric	IR	960 (03C0)h	Signed Integer (32-bit)
SERMAINT	s_days1	Days running numeric	IR	962 (03C2)h	Signed Integer (32-bit)
SERMAINT	f_date1	Fgas Date numeric	IR	964 (03C4)h	IEEE Float (32-bit)
ALARMRST	alarm_1c	Current Alarm 1	IR	968 (03C8)h	Signed Integer (32-bit)
ALARMRST	alarm_2c	Current Alarm 2	IR	970 (03CA)h	Signed Integer (32-bit)
ALARMRST	alarm_3c	Current Alarm 3	IR	972 (03CC)h	Signed Integer (32-bit)
ALARMRST	alarm_4c	Current Alarm 4	IR	974 (03CE)h	Signed Integer (32-bit)
ALARMRST	alarm_5c	Current Alarm 5	IR	976 (03D0)h	Signed Integer (32-bit)
MODBUSIP	modip_en	TCP/IP Server Enable	IR	1032 (0408)h	Signed Integer (32-bit)
MODBUSIP	ser_UID	Server UID	IR	1034 (040A)h	Signed Integer (32-bit)
MODBUSIP	port_nbr	Port Number	IR	1036 (040C)h	Signed Integer (32-bit)
PUMPSTAT	CD_WdtSp	Cond Water DT Setpoint	IR	1114 (045A)h	IEEE Float (32-bit)
PUMPSTAT	CD_WdpSp	Cond Water DP Setpoint	IR	1116 (045C)h	IEEE Float (32-bit)