S3

Intellisys Controller

Technician Guide

August 2008

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Contents

General Information

The Intellisys S3 Controller is designed as a global controller to be used on all 90 - 160kW (125 - 200Hp) units. This Controller has replaced all wording with symbols eliminating the need of multiple language programming. The below picture shows the basic layout of the S3 controller, this controller is designed for easy use by the end-user as well as the service technician.

This controller was developed to be used in both rapidly Developing Economies as well as Developed Markets around the world making this controller a common worldwide solution for the Rotary Screw compressor line.
The S3 controller controls all aspects of machine operation including; starting, stopping, loading and unloading, safety shutdowns, user interface,

and compressor remote connectivity to other devices.
This controller is offered in either a standard configuration or an enhanced configuration. The differences will be indicated in this manual by show the following guides after each input or output device or software function.

Std – Standard Controller
Enh – Enhanced Controller

The S3 controller has three (3) Analog Inputs, one (1) Analog Output, eight (8) Digital Inputs, and six (6) Digital Outputs. This controller also has capabilities of using both Multi-485 and Modbus communication protocols.

Component Review

Analog Inputs

4APT [Std] – This pressure transducer used to convert the package discharge pressure of the compressor into a 4-20ma analog signal to the controller. This sensor has a supply voltage of 24VDC, and wired into terminal block XO5 pins 1 & 2 on the backside of the controller. The output analog signal ranges from 4ma at 0 psi to 20ma at 232psi.The output signal is processed by the Intellisys and depending on the voltage the controller may cause a change in the pressure readout on the display, load or unload the compressor, or even shut the compressor down if conditions dictate.

There are no adjustments to this pressure transducer and if problems arise, the transducer will need to be replaced. Although the transducer is non-adjustable, it must be calibrated periodically. Calibrating the transducer allows the controller to read the transducers output at zero gauge pressure and make any corrections in deviation from the 4ma. This sensor has an accuracy of 0.5%. Sensor calibration will be discussed later in this handbook.

3APT [Enh]– This sensor is the same as 4APT and can be interchangeable however, 3APT measures the pressure from the wet side of the sump. Only available with the enhanced controller option, this transducer is connected to the controller at terminal XO5 pins 5 and 6.

2ATT [Std] – This 10K ohm NTC (negative temperature coefficient) thermistor is located at the airend discharge. This thermally sensitive resistor increases the resistant value as the temperature decreases. It is wired into the controller at terminal XO5 pins 3 and 4. The thermistor has a range of -34 to 124°C (-29 to 255°F) the following pages shows the relationship between resistance and temperature for this thermistor.

Ohms	Temperature	Ohms	Temperature
251311	-30	86914	1
243422	-29	84161	2
235533	-28	81503	3
227644	-27	78938	4
219756	-26	76463	5
211867	-25	74072	6
203978	-24	71765	7
196089	-23	69536	8
188200	-22	67384	9
182622	-21	65306	10
177044	-20	63298	11
171467	-19	61359	12
165888	-18	59485	13
160311	-17	57674	14
154733	-16	55924	15
149156	-15	54233	16
143578	-14	52598	17
138000	-13	51017	18
134004	-12	49490	19
130037	-11	48012	20
126070	-10	46584	21
122104	-9	45202	22
118137	-8	43865	23
114170	-7	42573	24
110204	-6	41322	25
106623	-5	40112	26
102300	-4	38941	27
99802	-3	37808	28
96650	-2	36712	29
93399	-1	35650	30
89768	0	34623	31

Ohms	Temperature	Ohms	Temperature
33631	32	14301	63
32668	33	13933	64
31736	34	13575	65
30834	35	13227	66
29960	36	12890	67
29114	37	12562	68
28295	38	12244	69
27501	39	11934	70
26733	40	11634	71
25988	41	11342	72
25267	42	11058	73
24568	43	10782	74
23891	44	10514	75
23235	45	10254	76
22599	46	10000	77
21983	47	9754	78
21385	48	9515	79
20806	49	9282	80
20244	50	9055	81
19699	51	8835	82
19171	52	8621	83
18658	53	8413	84
18161	54	8210	85
17679	55	8013	86
17211	56	7821	87
16757	57	7635	88
16317	58	7453	89
15889	59	7277	90
15475	60	7105	91
15072	61	6937	92
14681	62	6774	93

Ohms	Temperature	Ohms	Temperature
6616	94	3287	125
6461	95	3218	126
6311	96	3150	127
6165	97	3083	128
6022	98	3019	129
5883	99	2955	130
5748	100	2894	131
5616	101	2833	132
5488	102	2775	133
5363	103	2717	134
5241	104	2661	135
5123	105	2607	136
5007	106	2553	137
4894	107	2501	138
4784	108	2450	139
4677	109	2400	140
4573	110	2352	141
4472	111	2304	142
4372	112	2258	143
4276	113	2213	144
4182	114	2169	145
4090	115	2125	146
4000	116	2083	147
3913	117	2042	148
3828	118	2001	149
3745	119	1962	150
3663	120	1924	151
3584	121	1886	152
3507	122	1849	153
3432	123	1813	154
3359	124	1778	155

Ohms	Temperature	Ohms	Temperature
1744	156	978.8	187
1710	157	961.5	188
1677	158	944.6	189
1645	159	928.1	190
1614	160	911.9	191
1583	161	896	192
1553	162	880.5	193
1523	163	865.2	194
1495	164	850.3	195
1466	165	835.6	196
1439	166	821.3	197
1412	167	807.2	198
1386	168	793.4	199
1360	169	779.9	200
1335	170	766.7	201
1310	171	753.7	202
1286	172	741	203
1262	173	728.5	204
1239	174	716.3	205
1216	175	704.3	206
1194	176	692.5	207
1172	177	681	208
1151	178	669.7	209
1130	179	658.6	210
1110	180	647.7	211
1090	181	636.9	212
1071	182	626.5	213
1051	183	616.2	214
1033	184	606.1	215
1014	185	596.3	216
996.4	186	586.6	217

Ohms	Temperature	Ohms	Temperature
577.1	218	355.7	249
567.8	219	350.4	250
558.6	220	345.2	251
549.7	221	340.1	252
540.9	222	335.1	253
532.2	223	330.2	254
523.8	224	325.4	255
515.4	225		
507.3	226		
499.3	227		
491.4	228		
483.7	229		
476.1	230		
468.7	231		
461.4	232		
454.2	233		
447.2	234		
440.3	235		
433.5	236		
426.9	237		
420.3	238		
413.9	239		
407.6	240		
401.4	241		
395.3	242		
389.4	243		
383.5	244		
377.7	245		
372.1	246		
366.5	247		
361.1	248		

Digital Inputs

Emergency Stop Switch [Std] – Located on the front of the compressor next to the controller, it is intended to stop the compressor only in an emergency. This switch has two sets of normally closed contacts that open when the red button is pressed. One contact is wired into the 120-volt AC power circuit and the other is wired into the 24-volt DC logic circuit. These parallel contacts ensure that power is removed from the starter and solenoids as well as the Intellisys controller; this will stop the compressor immediately. Once the switch has been pressed in, it will lock open and must be manually reset by rotating the red button clockwise.

Coolant Filter Condition [Enh] – A differential pressure-sensing switch is installed to monitor the condition of the coolant filter. This switch is normally open and closes when the differential across the filter exceeds 20 psi. This switch is designated as 1DPS on the electrical schematic and is wired into the controller at terminal XO4 pins 1 and 3.

Inlet Filter Condition [Enh] – This sensor is installed to monitor the vacuum at the inlet valve. This switch is a normally opened switch and will close when the vacuum across the inlet, while unloaded, exceeds 15 psi and 1 psi when unit is running loaded. The inlet filter switch is labeled as 1VAC on all schematics and is wired into XO4 pins 1 and 4.

Motor Overloads – There are possibly three sets of overload contacts with this controller. On a standard controller there is an overload for the main motor and one for the fan motor, both of these overloads are normally closed. For an enhanced controller and the compressor has an integrated dryer installed there will also be a normally closed dryer overload. All three of these overloads will be wired in series at terminal XO4 pins 1 and 5. Electrical schematic labeling for these three overloads are as follows:

MOL – Main Motor Overload [Std]
FMS – Fan Motor Overload [Std]
DMS – Dryer Motor Overload [Enh]

Remote Start and Stop [Enh]– The customer can install this single contact onto the controller at terminal XO4 pins 1 and 6. This switch allows the customer to remotely start and stop his or her compressor. The remote contact must be sized for 24 volts DC and 200ma max. To use this feature you must enable the software in Parameter P03 RC.

Remote Load Enabled [Enh] – This normally closed contact can be installed by the customer or service technician to allow the enabling of a remote load/unload switch. If the remote enabled contact is opened, the controller will use its load and unload pressure settings as operating the compressor. If the contact is closed then the controller will use the remote load/unload input for loading or unloading the

compressor. The controller will still compare its discharge pressure to the discharge level high warning value. If the discharge pressure reaches this value, the controller will automatically unload and issue a high discharge pressure warning. This function can also be performed by the IEO using an ISCI-II module connected to terminal XO4 pins 1 and 7. The X4I and X8I controllers can also be used by the S3 controller by simply connecting to the X07 RS485-1 Network connector. To use this feature you must enable the software in Parameter P03 RC (See remote control).

Remote Load/Unload [Enh] – this single normally opened contact is wired into terminal XO4 pins 1 and 8 and allows the user to remotely load or unload his or her compressor. If the Remote Load Enabled contact is closed and the Remote Load/Unload contact is open the unit will run unloaded. If the Remote Load/Unload contact closes, the unit will load. An IEO can be installed with an ISCI-II module and wired into the above-mentioned terminal and pins. To use this feature you must enable the software in Parameter P03 RC (See remote control).

Motor PTC [Enh] – This is a positive temperature coefficient (PTC) switch that is embedded into the motor and it is used to detect the temperature of the motor windings. This PTC is wired into the controller at terminal XO4 pins 1 and 9. If the motor windings get to hot the

controller will shut the unit down on a (code 20) Main motor Over Temp alarm.

Digital Outputs

All digital outputs are connected to terminal XO3 on the back of the controller.

1M / 2M Starter Contacts [Std] – YΔ Logic uses two digital contacts on one common output. The S3 controllers start and run logic remains the same but the 2M output is not used for the starters. A normally closed electrical interlock (KMS-3) from 1S (KM3) contactors keeps the 2M (KM2) contactor from energizing anytime the 1S contactor is energized. Electrical interlocks are wired such that when the 1S (KM3) output is de-energized at Star Delta transition time causing the 1S (KM3) contactor to open, the 1S normally closed interlock (KM3-2) falls back to the closed position energizing the 2M (KM2) contactor. A second electrical interlock from 1S (KM3) contactor is wired in series with 1M (KM1) contactor to ensure the 1S (KM3) is pulled in before 1M (KM1) will be energize. An interlock from 1M (KM1) contactor is used to seal around the 1S (KM3-1) contact to allow the 1M (KM1) contact to remain energized when the 1S (KM3) contact is de-energized at the Star Delta transition.

1S Starter Contact [Std] – This contactor is only installed and used in the YΔ type of starter.

Load Valve (1SV) [Std] – Normally closed 3-way solenoid valve connected within the control system to direct pressurized air into, or allow it to vent out of, the airend inlet valve. The follow of the pressurized air into or out of the inlet valve causes the valve to open or close thereby load or unload the compressor. This solenoid valve is known schematically as 1SV, has a 120-volt AC coil.

Blowdown Valve (3SV) [Std] – 3SV is the schematic designation for the blowdown solenoid valve. This valve is a 2-way normally opened valve with a 120-volt AC coil. This valve is wired in parallel with 1SV and when de-energized allows the pressurized air in the sump to be released back to the inlet valve allowing the compressor to run in the unload mode. 3SV is piped directly into the top of the separator lid but prior to the minimum pressure check valve. The exhaust port of 3SV is piped back into the inlet filter housing to reduce noise as the pressurized air vents. When the compressor is stopped, 3SV automatically releases all internal pressure.

Important: Always ensure that internal pressure has been completely released prior to removing caps, plugs, filters, etc.

Modulation Valve (5SV & 6SV) [Enh] – If the modulation set point in the Intellisys controller is turned off the modulation output stays off. If the

modulation set point is turned on then the modulation output is used to turn on the modulation solenoid valves whenever the requirements for modulation have been met. When the compressor first starts and loads, the modulation set point is off. If the unit cycles (loads and unloads) 3 times in 3 minutes, the compressor will start modulating. If the unit is modulating, the modulation output will follow the load output. Modulation output will be on if the unit is loaded and off if the unit is unloaded. If the compressor unloads and stays unloaded for 3 minutes, the compressor will stop modulating. The compressor will have to repeat the 3 load cycles within 3 minutes to start modulation again. If the unit stops in auto start/stop while modulating, it will continue modulating if it restarts in less than 3 minutes after unloading. If it restarts more than 3 minutes after unloading it will have to load and unload 3 times in 3 minutes again to start modulating. If the operator or a fault stops the unit, the modulation output will be off when the unit is restarted. Again, it will have to cycle 3 times in 3 minutes for the modulation output to be turned on.

Condensate Drain Valve (9SV) [Std] – This 120-volt coiled normally closed solenoid valve is used to remove the condensate that has been collected at the moisture drain with is piped into the discharge of the aftercooler. This solenoid valve has an output timer that toggles on for a period defined by the Condensate Drain Time set point. The drain valve will remain off for a

period defined by the Condensate Drain Interval Time set point.

General Alarm Contact [Std] – This is provided for the customers use. A normally open contact will close when the compressor is in operation. If a shutdown or trip occurs this contact will return to its normally open state.

PORO Relay [Std] – The controller will energize the PORO relay (FR1) that is connected to terminal XO6 pins 1 and 2. This electronic relay is used to sound the horn mounted on the compressor package by closing the auxiliary contact FR1-1 which will supply 120 volts AC to the PORO Horn. This horn warns the surrounding area that the compressor is about to start after a power outage or before a scheduled start. For PORO this relay should be energized immediately when power is restored and remains energized until the PORO timer expires and the compressor actually starts. For scheduled starts, this relay will be energized for 10 seconds prior to the unit starting.

Serial Communication

Serial Port 1 (terminal XO7) [Enh] - Used for Integral Sequencing, Ingersoll Rand X4I, or Compressor room and energy management controllers.

Serial Port 2 (terminal XO8) [Enh]– Used for IEO, ASC, ModBus Remote Monitoring and Control of the compressor.

Integral Sequencing [Enh]–Through serial communication port #1, terminal XO7 pins 1 and 2, it is possible to sequence 3 Intellisys controlled compressors without a system controller. This is possible through a cable connection up to the 3 S3 controllers and using one of the controllers as a system controller. This feature can be used to create an air compressor system operating coherently to a single pressure target with automated timed sequence rotation. In this configuration, the air compressor designed as compressor “1” becomes the system Master. System pressure is detected by the Master’s delivery pressure sensor and pressure regulation is determined by the Master’s pressure set points. The Master also determines sequence rotation. Air compressors designated as “2” and “3” will respond to load/unload commands from the Master compressor.
The Master compressor (1) determines the sequence of regulation for each compressor in the system. Each compressor is assigned as “base load” (A), “stand-by (B), or “second stand-by” (C). The sequence assignment is rotated on a routine bases in accordance with the sequence rotation time interval setting of the Master controller. The sequence assignment is displayed in the status menu item of the Master controller. The status of each compressor is also

indicated by the sequence display: if the assignment letter (A, B, C) is on continuously, the compressor is running loaded. If the assignment letter is flashing, the compressor is unloaded. If the assignment letter is replaced by a dash “– “ the compressor is not available. For Integral, sequencing to work properly each compressor must be started locally, running or in standby state. The Master compressor cannot start the slave compressors that have been stopped. An unavailable compressor will always be assigned last in the sequence. System pressure is determined by the set points of the Master controller and values determined by the Master’s pressure sensor. The system “target” pressure is calculated to be the midpoint between the Master’s upper pressure set point and lower pressure set point. A slave compressor will ignore its own pressure set points when operating with a system Master controller however, all Slave safety functions continue in accordance with the local pressure detected by the Slave’s delivery pressure sensor. In the event that communications with the Master controller is disrupted, a Slave compressor will automatically switch to local regulation control. When the Master becomes available again, the Slave pressure regulation will automatically revert to the Master and the “Remote Pressure Control” symbol will remain.

Options

Low Ambient [Std] – The low ambient kit is designed to protect the compressor when starting in temperatures below 2°C (35°F). The temperature is measured at the airend discharge. The temperature is read using the standard airend temperature sensor. When the low ambient option is installed and selected if the airend discharge sensor measures a temperature below 2°C (35°F), the compressor will start when commanded however it will delay the load for a period defined by the Low Ambient Delay Time. This will allow the coolant temperature to rise above an allowable level before loading the compressor in cold environments. If the low ambient option is not installed the machine will not start if the airend temperature is below 2°C (35°F). The machine will trip on a low ambient fault. This trip will be logged in the fault table. The user can restart the compressor by holding the start button in for 10 seconds. Each time the compressor faults on low ambient the customer will have to restart the compressor manually and the trip will be recorded in the fault table.

Power Out Restart [Std] – At loss of power to the compressor a software flag is set indicating the operational status of the compressor. Once power is returned the flag is evaluated and the compressor is returned to its previous operational state. PORO when activated will work in all Local and Remote control modes. For

PORO to execute, the PORO option must be installed and the PORO enable must be set to ON in the factory set-up menu, the technician than has visibility to turn PORO on or off and set the time delay in the advanced menu. Once activated if power is lost while the compressor is running or stopped in auto start/stop, the controller will store in memory the current operating conditions. When power is restored to the unit, the controller will first verify the PORO option is installed, enabled, and turned ON. Next, the controller will check to see if the unit was running or stopped in auto start/stop when the power was lost. If it is determined, this was the case; it will start the PORO sequence. The controller will energize the PORO horn and start a count down on the display. The Red light will flash indicating a Warning condition and the horn will blow for the number of seconds the operator has set in the PORO time set point. At the end of the countdown, the horn will stop blowing and the compressor will start. The PORO timer can be stopped at anytime by pressing the stop button on the user interface. The controller will then power up normally in a ready to start mode. If unit is being operated using a remote control, the compressor will not automatically restart after power returns if PORO kit is not installed.

Scheduled Start/Stop [Enh] – This is an auto stop/start mode of operation based on the Real Time clock. A scheduled start time set point is used to automatically start the compressor when

the current time equals the Scheduled Start Time entered for the set point. A scheduled stop time set point is used to automatically stop the compressor when the current time equals the Scheduled Stop time entered for the set point. This mode of operation can be turned on or off by selecting the desired mode in the Scheduled Start Stop On/Off set point. When scheduled start/stop is turned on and the current time equals the scheduled start time set point, and the compressor is not running, the compressor will automatically activate the PORO horn for 10 seconds to warn anyone that the compressor is about to start. The User Interface should display a countdown from 10 to zero and flash the red warning light. After 10 seconds, the compressor will automatically start as long as the compressor is not in a Fault condition or manually stopped by pressing the stop button. When Schedule Start/Stop is turned on, the current time equals the scheduled stop time set point, and the compressor is currently running, the compressor will automatically stop. The compressor can be manually be restarted by any of the standard starting methods: Pressing the control panel start button, or if Remote Control is turned on, closing the Remote Start signal or sending a serial start command.

Soft Starter [Std] – Outputs XO3-2 and XO3-3 can be configured to operate an Allen Bradley SMC-3 soft starter. The operating sequence of XO3-2 and XO3-3, when the soft starter staring method is selected follows: Xo3-3 energizes

immediately at the start command. ½ seconds later XO3-2 energizes. Both outputs maintain an energized state while the motor is given a run signal. When the motor is given a stop signal the operating sequence of XO3-2 and XO3-3 are reversed from the starting sequence.

Auto Stop Timer

The auto stop timer has a range of 30 to 3600 seconds. Zero can be selected, which will prevent the motor from stopping during automatic load/unload cycles. For values other than zero, following pressure limit related unload events, the machine will run for a minimum amount of time before stopping. In addition, the timing logic to stop the machine should be optimized to reduce energy consumption based on the maximum starts per hour for the motor (Sh). This can be set for 6 or 10 starts per hour and the controller will use logic to determine the shortest stop interval whilst maintaining integrity on the auto stop timer and starts per hour. The starts per hour requirement, applies only to auto stat/stop operation. The logic that is used allows the compressor to automatically start and stop until it reaches the maximum starts per hour. If the maximum starts per hour is 6, for example, and the auto stop time is set the minimum value of 30 seconds, the compressor will be able to start, load, unload, run unloaded for 30 seconds, and then stop 5 times. On the sixth start, the compressor will start when the pressure falls to the load pressure (Ld). It will load and unload; however, it will not stop if it runs unloaded for 30 seconds unless it has been one hour since the

first start. The controller limits the starts per hour by not allowing the unit to stop after the last start until it has been an hour since the first start. This only applies to cases where the unit may exceed the maximum number of starts per hour.

Maintenance Intervals

Multiple level maintenance intervals [Std]

150 Hours run time - 150 hours after the initial start-up of the compressor. One time timer.

2000 Hours run timer – 2000 hours of compressor run time since the last maintenance timer reset.

8760 Hours real time clock time – (1Yr) after initial startup of the compressor or after the maintenance timers have been reset. This function requires a real time clock.
Maintenance Indicator [Std] – The maintenance timer will display the maintenance timer value in hours and in percentage, (2000 or 8760) whichever is closest to reaching its respective predetermined maintenance interval time. Once the timer value reaches 10 % or the preprogrammed time remaining (1800 hrs runtime or 7884 hours clock time) the Wrench Icon will appear and flash. Once the maintenance timer value reaches 0% of the preprogrammed time (2000 hrs runtime or 8760 hrs clock time) the Red LED will flash indicating a Warning and the Wrench Icon will be on

continuously and remain on until the maintenance is performed and the timers reset.

Reset Maintenance Timer [Std] – Once maintenance has been performed, the following steps should be taken to reset the maintenance timer:
With unit stopped and power still applied to controller, Press Menu button which will bring up the code screen. From Pass code screen enter 0101. [Press green (enter) button {middle of cluster} while on the first digit to enter 0, use arrows to change second digit to 1 and press green (enter) button to proceed to third digit, continue in this manner until 0101 has been entered].
Display should change to P00 flashing.
Using up and down arrows, select P03 and press enter.
Using up and down arrows, select Sd (Service due) and press enter, the Sd should stop blinking and now the counter numbers should be blinking, middle of the bottom display line.
Using up arrow, change the right side of the display from Mn to Rst and press enter.
The counter should change to default 2000 unless Maintenance timer has been adjusted to a lesser number and the Sd should now be blinking again.
Press the red C button until display returns to AE. You have now exited out of the programming menu. If the wrench icon is still displayed, please contact local service representative. If a value less than 2000 hours is

needed then you must go to PO4 (Factory Setup menu) and select the Maintenance Hour reset menu (Mn)

Warnings

An Intellisys S3 Warning will not shutdown the compressor however, it will remain on the display until acknowledged. It is cleared by pressing the “C” clear key. A log is retained in alarm history. The S3 display will show FC and the following code, as well as WA (Warning).

(05) **High Sump Pressure** [Enh] – This warning occurs when the pressure inside the sump reaches 1.5bar (22 psi) above the unload pressure set point.

(12) **High Package Disch Pressure** [Std] – If the system pressure increases to 0.5 bar (7 psi) above the unload pressure set point.

(13) **High A/E Disch Temp** [Std] – If the airend discharge temperature sensor registers a temperature of the pressurized air/coolant mixture that is exiting the airend greater than 105°C (221°F) this warning will appear on the display.

(14) **Maintenance Due Soon** [Std] - Once the maintenance timer value reaches 10 % or the preprogrammed time remaining (1800 hrs

runtime or 7884 hours clock time) the Wrench Icon will appear and flash.

(15) **Maintenance Due Immediately** [Std] - Once the maintenance timer value reaches 0% of the preprogrammed time (2000 hrs runtime or 8760 hrs clock time) the Red LED will flash indicating a Warning and the Wrench Icon will be on continuously and remain on until the maintenance is performed and the timers reset.

(16) **Change Coolant Filter** [Enh] – This warning will occur if the high side pressure is 1.3bar (20psi) greater than the low side pressure of 1DPS, and the airend discharge temperature is 49°C (120°F).

(17) **Change Air Filter** [Enh] – If the unit is equipped with a standard inlet filter this will occur if the inlet vacuum at 1VAC is greater than 0.05 bar (0.7 psi) and the compressor is fully loaded with the inlet valve in the fully open position.

(18) **Change Separator Element** [Enh] – this warning will occur when the sump pressure is 1.2 bar (18 psi) greater than the delivery pressure while the compressor is fully loaded and the inlet valve is in the full open position.

(19) **Integral Sequencing Communication Failure** [Enh] – This occurs when the Master compressor loses or is unable to communicate

with a slave compressor. All units must be in the integral sequencing mode.

Alarms (Trip)

An Intellisys S3 Trip will shut the compressor down and must be manually cleared by pressing the “C” clear key. A trip will take precedence over a warning and an entry will be made in the alarm history log. The S3 display will show FC and the following code, as well as TR (Trip).

(01) **Motor Reverse Rotation** [Enh] – Sump pressure has not indicated a positive pressure 2 seconds after the machine has started. This time is increased to 6 seconds if the soft start option is turned on. Once the correct motor rotation has been verified and alarm reset this will not be checked again until power is removed from the controller.

(02) **Emergency Stop** [Std] – the emergency stop contact has been opened.

(03) **Motor Overload** [Std] – This occurs if the main motor, fan motor, or dryer motor overload contacts open.

(04) **Low Ambient Temperature** [Std] – The airend temperature sensor is measuring a temperature less then 2°C (35°F). The compressor will not start if the temperature. This

alarm is only shown if Low Ambient (La) is activated.

(05) **High Sump Pressure** [Enh] – This alarm occurs when the pressurized air in the sump exceeds 2 bar (29 psi) above the controllers unloaded system pressure set point.

(06) **Low Sump Pressure** [Enh] – The sump pressure has either not increased 1bar (15psi) this is measured 15 seconds after starting and operational anytime the compressor is running in either a load or unload state.

(07) **P1 Sensor Failure** [Std] – The Discharge pressure sensor input reading to the controller is beyond the normal measurement range of either below 3.4ma or above 20.8ma. The alarm could be caused by a loose connection at XO5. Also, check for a damaged sensor and broken or damaged wire.

(08) **P2 Sensor Failure** [Enh] --The Sump pressure sensor input reading to the controller is beyond the normal measurement range of either below 3.4ma or above 20.8ma. The alarm could be caused by a loose connection at XO5. Also, check for a damaged sensor and broken or damaged wire.

(09) **Temperature Sensor Failure** [Std] - This alarm occurs if the airend Discharge temperature sensor is recognized as missing or

broken. The alarm could be caused by a loose connection at XO5. Also, check for a damaged sensor and broken or damaged wire.

(10) **P1 Sensor Calibration Failure** [Std] – A sensor calibration has been attempted with P1 the discharge pressure sensor and the measured value is outside of the +/- 10% full-scale value.

(11) **P2 Sensor Calibration Failure** [Enh] -- A sensor calibration has been attempted with P2 Sump pressure sensor and the measured value is outside of the +/- 10% full-scale value.

(12) **High Package Discharge Pressure** [Std] The pressure sensor at the package discharge (P1) is reading a pressure that is 1.5bar (22psi) above the controllers unloaded pressure set point.

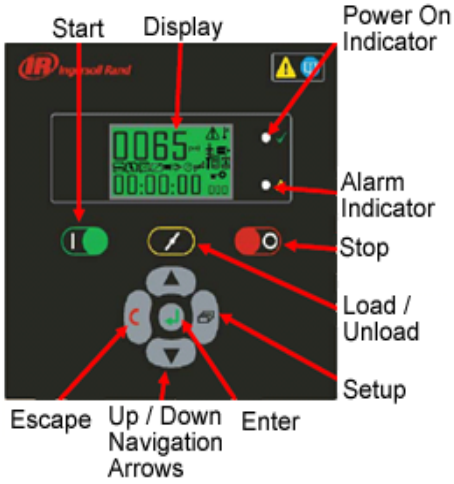
(13) **High A/E Discharge Temp.** [Std] – The airend discharge temperature sensor is reading an airend discharge temperature that exceeds 109°C (228°F). There can several reasons for this alarm and a partial list includes high ambient temperature, dirty coolers, cooling airflow restrictions, low coolant level, and faulty thermostat control valve.

(20) **Main Motor Over Temp**. [Enh] – This alarm indicates that the PTC sensor embedded in the motor has tripped. The main cause of this

is due to the motor being overheated. Some of the same causes for alarm 13 could be the cause for this alarm as well.

Fault History

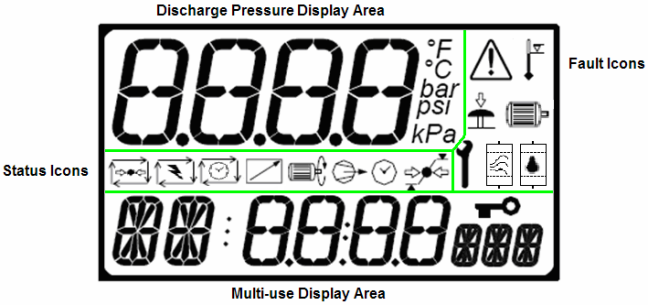
The last 15 warnings or alarms are logged into Fault History (PO2), along with the alarm or warning code the log allows the technician to view the compressors operating conditions at the point of the fault. Once a fault is selected, the controller will automatically scroll through all the status menu screens and display the values at the time of fault. This function is available in both standard and enhanced controllers.
Controller User Interface



Start Key – Used to start compressor.
Stop Key – Used to stop the compressor.
Load/Unload Key – When machine is running this button switches the machine between loaded and forced unload. During normal forced unloaded running the auto stop timer and the energy conservation logic for the motor will be ignored, the compressor will run indefinitely in this mode. Following a Stop or Reset command, the status of the manual load/unload is reset to loaded running. If the compressor has stopped in auto start/stop, pressing this button will have the same effect as pressing the stop key.
Enter Key – Used for entering set point values.

Up/Down Key – Used to changing set point values and navigate the display.
Clear Key – Used to clear trip and warning conditions and back out of menus.
Setup/Menu Pass Code Key – Used to enter the code number for menu selection.
Power On LED – When compressor is running with no fault conditions detected this LED is on. If the LED is on solid, the unit is running loaded. If it is flashing, the unit is running unloaded. Off the unit is in a shutdown – fault condition.
Alarm Indicator – Flashing Red indicates a warning condition. On solid indicates a shutdown alarm condition

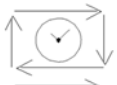
LCD Display



The displays backlight will always be on as long as the unit is powered up and running.
Display Symbols

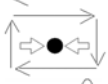
Change Oil Filter

Change Inlet Filter



Scheduled Start/Stop Active

PORO Active



Shutdown on Auto Restart

Compressor Running Unloaded

Compressor Running Loaded

Remote Control Active

Discharge Pressure below Load set point

Discharge Pressure is between Load and Unload set points

Discharge Pressure is above Unload set point

Running Hours

Loaded Hours

Maintenance Hours

Maintenance %

Pass Code


Unloaded Running Timer


Modulation


Current Time


Scheduled Start Time


PORO Timer


Warning or Alarm

Display Abbreviations

Ae	Airend
Ip	Sump Pressure
Rn	Running Hours
Ld	Loaded Hours
Mn	Maintenance Timer
Is	Integrated Sequencer
CD	Code
Un	Unloaded Pressure
Ld	Loaded Pressure (in setup menu)
As	Auto Stop Timer
Md	Modulation
Eu	Engineering Units
Dt	Date
Tm	Time
Fc	Fault Code
Pd	Discharge Pressure
YΔ	Star Delta Timer
Sf	Soft Start Timer
Cd	Condensate Drain Timer

Ci	Condensate Drain Interval
SD	Service Due Timer
Ss	Scheduled Start/Stop
St	Scheduled Start Time
Sp	Scheduled Stop Time
Po	Power Out Restart Option
Lt	Low Ambient Load Delay
Rc	Remote control
Cn	Multi 485 Communication
Ad	ModBus Address
Bd	Baud Rate
Sr	Starter Type
Rp	Rated Pressure
La	Low Ambient
De	Dryer Enabled
Sh	Starts per Hour
DΔ	Differential Pressure
Pt	PORO Timer

S3 Controller Parameters

Display Item	Range	Default STD	Default ENH
Rn	0-99999 hrs	-	-
Ld	0-99999 hrs	-	-
Mn	0-2000 hrs	2000	2000
Is	Off – On	-	Off
Maintenance Timer	0-100%	100	100
Un	Bar	Rp + 0.2	Rp + 0.2
Ld	Bar	Un – 0.6	Un – 0.6
As	30-360 sec.	360	360
Md	0-1 (Off/On)	0	0
Eu	0=°F & psi 1=°C & psi 2= °C & Bar 3=°C & KPa	2	0
Tm	0:00 – 24:00	-	1
Dt		-	1
YΔ	8-20 Sec	10	10
Sf	Sec	0.5	0.5
Cd	1-30 sec	5	5
Ci	90-300 sec	180	180
Sd	0-2000	2000	2000
Ss	0-1 (Off/On)	0	0
St	0-24 hrs	-	7:00
Sp	0-24 hrs	-	17:00
Po	0-1 (Off/On)	0	0

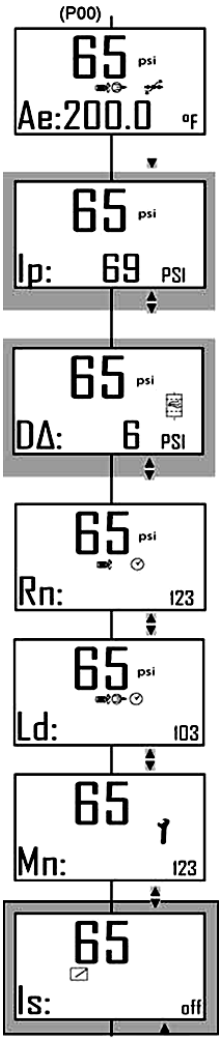
Pt	10-180 sec	10	10
Lt	30-300 sec	180	180
Rc	0=Local Control 1=Multi 485, ModBus read only 2=ModBus Control 3=Digital Input control, ModBus read only 4=Digital input, Load/Unload control, No remote Start/Stop control, Modbus read only	-	0
Bd	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200	-	9600
Sr	0=Full Voltage 1= Star Delta 2= Soft start/VFD	1	1

Sh	6 or 10	6	6
La	0-1 (Off/On)	0	0
Rp	0=100psi 1=125psi 2=140psi 3=210psi 4=7.5bar 5=8.5bar 6=10bar 7=14.5bar	0	0

Real Clock Function

With a standard configured controller, the real time clock will be used to count down the 8760 hours before maintenance. This time is reset when the maintenance hour indicator is reset. The customer will not be able to view the clock.

With an enhanced configured controller, the real time clock is accessible to the customer and technician and once set at compressors commissioning the display will show current time and date. The real time clock is capable of running when the power is removed from the controller and should be able to maintain the current date and time during power outages for up to 4 years. This real time clock does not recognize day light savings time and must be adjusted accordingly.



Menu Screens

In this portion of the manual, we will discuss the different menus that are available from this controller and show you examples of the screens.

Status Screens (P00)

Status screens are viewable by all and can be navigated through by just pressing the up/down buttons on the controller, no password is necessary. When navigating to any other screen, a nonadjustable timer will cause the controller to switch back to the default screen after 30 seconds of inactivity.
6 screens can be scrolled through to check status of compressor. These screens are read only and consist of the following:

Default Screen

This is the main Status screen, it will display the package pressure, airend discharge temperature, and

any symbols that show if the unit is running or not.

Sump Pressure

This screen is only viewable with an enhanced controller (enhanced controllers will be discussed later in this section). The Sump Pressure screen allows the user to view Sump Pressure and Package Discharge Pressure.

Running Hours

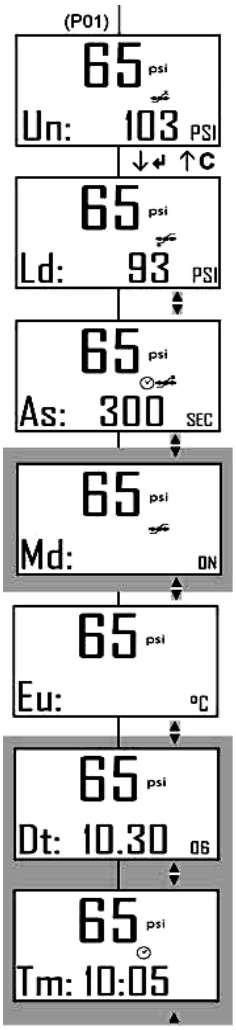
This screen shows the total hours that the machine has been running, either loaded or unloaded.

Loaded Hours

Display show the total hours that the compressor has been running loaded.
Maintenance Hours
This screen displays the hours left until the next service is due. The maintenance timer works off a 2000 running hour's timer and an 8760 real time timer.

Integrated Sequence Control

This screen will only be available on the enhanced controller. When the integrated sequence is enabled it will allow up to three machines to be controlled without the extra components needed to sequence compressors.



Setup Screen (P01)
This menu section allows both customer and service technicians' access to change normal running perimeters of the compressor.

Pass Code Screen
The Pass Code screen requires a password, "0000." Once this code is entered, the user will be allowed to make changes in the Setup menu.

Unload Pressure Screen
This screen is where the compressors unloaded pressure setting will be entered. Unloaded pressure is the pressure setting at which the compressor will close the inlet valve and unit will not supply air to the customers system. If unit runs unloaded for a preset time then it may go into Auto Stop / Restart.

Load Pressure

This screen is used to set the load pressure for the compressor. Typically, the load pressure setting is the minimum system pressure needed. Once the system pressure falls to the load pressure setting, the controller will energize 1SV sending an air signal to the inlet valve, causing it to open and the compressor to start making air. If the compressor is off on Auto Restart, once the load pressure has been reached the compressor will automatically startup, open the inlet valve, and start producing air.

Auto Stop Timer

This screen is used to set the auto stop timer. This timer determines how long the compressor will run unloaded before it shuts down on auto restart. This timer is adjustable from 30 to 360 seconds.

Modulation

This is where Modulation Control is turned on or off. This screen is only available in the enhanced version of the controller.

Engineering Units

The engineering units screen allows the operator to change the unit of measure displayed as follows: °F and PSI, °C and PSI, °C and Bar, and finally °C and KPa.

Date and Time

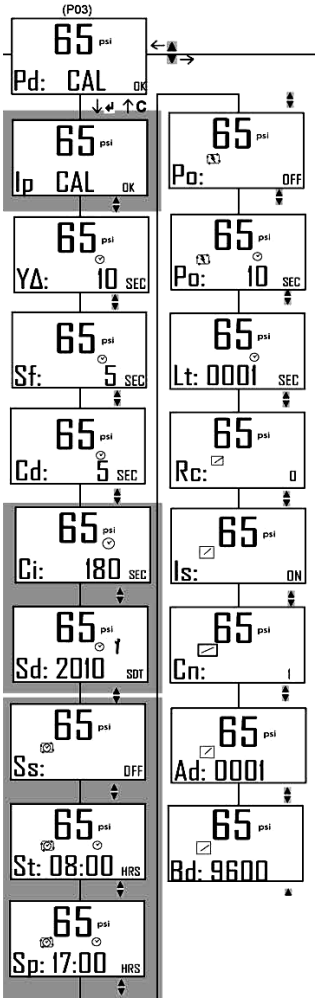
These next two screens are for the real time clock. These need to be accessed and setup to

current time at startup. Setting up the real time clock allows the controller in standard configuration to count down from 8760 hours for the maintenance timer. This will reset once the maintenance timer has been reset. In standard configuration, the customer will not be able to view the clock. However, the enhanced controller will allow the customer to see the date and time as well as have the date and time displayed for when an alarm occurred. The real time clock will be able to maintain current date and time during power outages for up to 4 years, however, the clock will not have daylight savings time automatic updates so the service technician will have to go into the controller from time to time and adjust the clock.

Fault History (P02)

The Intellisys S3 controller has the capability of saving the last 15 alarms. The most recent alarm will always be displayed first. The alarm will display a fault code. Not only will the controller display the fault code but it will also display up to seven different screens, depending on standard or enhanced version of controller. Along with the alarm code, the status icon will display the status the machine was in when the alarm occurred. Then it will automatically scroll through the following screens for each trip. Along with the alarm code, the status icon will display the status the machine was in when the alarm occurred. Then it will automatically scroll through the following screens for each trip. The last three screens, Sump Pressure, Date, and

Time, are only viewable with an Enhanced Controller.



Advanced Setup Menu (P03)

This menu function is only to be entered by the service technician to enter startup information and help setup the controller for the proper compressor it is installed on. To enter the Advanced Setup screen the technician must first enter a code in the pass code screen. The pass code is “0101.” Once this code is entered the technician will be allowed to make changes in the menu.

Pressure Calibration

Entering this screen will allow the technician to

calibrate the system pressure transducer. This pressure transducer is located at the top of the moisture separator as the discharge air leaves the compressor package.

Sump Pressure Calibration

With an enhanced controller, this screen will allow the technician to calibrate the sump pressure transducer.

Warning: Anytime a pressure transducer is to be calibrated, the unit needs to be isolated from the customers system, and care must be taken to ensure that there is no pressure present on the transducer.

Star Delta Timer

This screen allows the technician to adjust the transition timer for a start delta unit. This timer is adjustable from 8 to 20 seconds. The compressor must be setup with a star delta starter for this screen to be enabled.

Soft Start Timer

This screen allows the technician to adjust the soft start timer on the controller. For this screen to be enabled the starter type on the compressor must be a soft start option.

Condensate Drain Time

This screen allows the service technician to adjust the amount of time the electronic condensate drain will be open. This setting needs to be adjusted so that just as it shuts off there is a small amount of air coming out. If condensate is still purging from the drain when it

times out and shuts off then this timer needs to be adjusted to a longer time span. This timer is adjustable from 1 - 30 seconds.

Condensate Interval Timer

This timer is adjustable from 90 - 300 seconds and it is set to tell the controller when to energize the electronic drain valve.

Service Due Timer

This screen allows the service technician to adjust the service timer. The timer can be adjusted from 0 – 2000.

Scheduled Start and Stop

This screen allows the service technician to turn on or off the scheduled start and stop option. This screen will only be visible in the enhanced version of the controller.

Scheduled Start Time

If the scheduled start/ stop option has been turned on, then this screen will be available to allow the technician to set a time for the compressor to automatically turn itself on. This time can be set for any time between 0 – 24 hours. NOTE: This is a seven-day a week timer and will start the compressor everyday at the same time.

Scheduled Stop Time

This screen will be viewable if the scheduled start/stop option has been turned on. This

screen allows the technician to set a time that the compressor will automatically shut off. Like the scheduled start time this timer can be adjusted to anytime within a 24 hour period, it is a seven-day a week timer.

Power Out Restart Option Timer

With the PORO option installed and activated (covered later in this section), this screen will allow the technician to set the PORO timer. This timer can be set from 10 - 180 seconds. The PORO timer is used on power outages where the compressor had been on but due to power loss, the unit has shutdown. Once power has been restored, the controller will activate the PORO horn and display a countdown. Once the timer times out then the compressor will start automatically.

Low Ambient Load Delay

If the low ambient option is turned on then this screen will be visible and allows the technician the ability to set this timer from 30 – 360 seconds. If the timer is set and the ambient temperature is below the recommended Ingersoll Rand temperature of 2°C (35°F) the compressor will not allow the compressor to load until this timer is satisfied. This will allow the compressor to run unloaded and create some heat to warm up the compressor.

Remote Control Selection

This screen allows the technician the ability to setup a remote control to the starter.

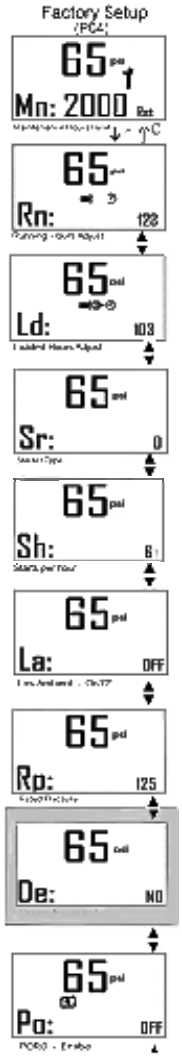
Integral Sequencing
This allows up to three compressors to be installed and work together to ensure customers air system is running optimally. (This is available on the Enhanced controller only).

Modbus Address

This screen allows the technician to assign a number to the compressor from 1-50; this will allow any remote control devise that is installed to identify which compressor it is communicating with. NOTE: This setting is only available on the enhanced controller.

Baud Rate

This screen allows the technician to change the rate of speed at which the controller will communicate with a remote control device.



Factory Setup Menu (P04)

To allow access into this section of the controller, the technician must enter the code 1954 into the pass code screen. *The screens within this menu option are designed for technician access only.*

Running Hours Adjust

With this screen, the technician is able to readjust the total running hours on the compressor. This screen is used when a new controller is being installed.

Loaded Hours Adjust

As the running hours adjust screen, this screen will allow the technician to change the loaded hours on the compressor. This function comes in very handy when a technician is replacing a controller.

Maintenance Hours Reset

This screen allows the technician to reset the maintenance timer back to

2000 hours. This screen needs to be reset every time maintenance is preformed on the compressor.

Starter Type

This screen gives the technician the ability to setup which type of starter the compressor has been installed with. Technician is able to choose between DOL (Direct On Line), Start Delta starter, or Soft Start starter. Technician will have the option to pick numbers from 0-2, (0=DOL, 1=Star Delta, 2=Soft start/VFD).

Rated Pressure

This allows the compressors rated pressure to be changed. (NOTE: never change the rated pressure of a unit due to safety hazard issues.)

Low Ambient

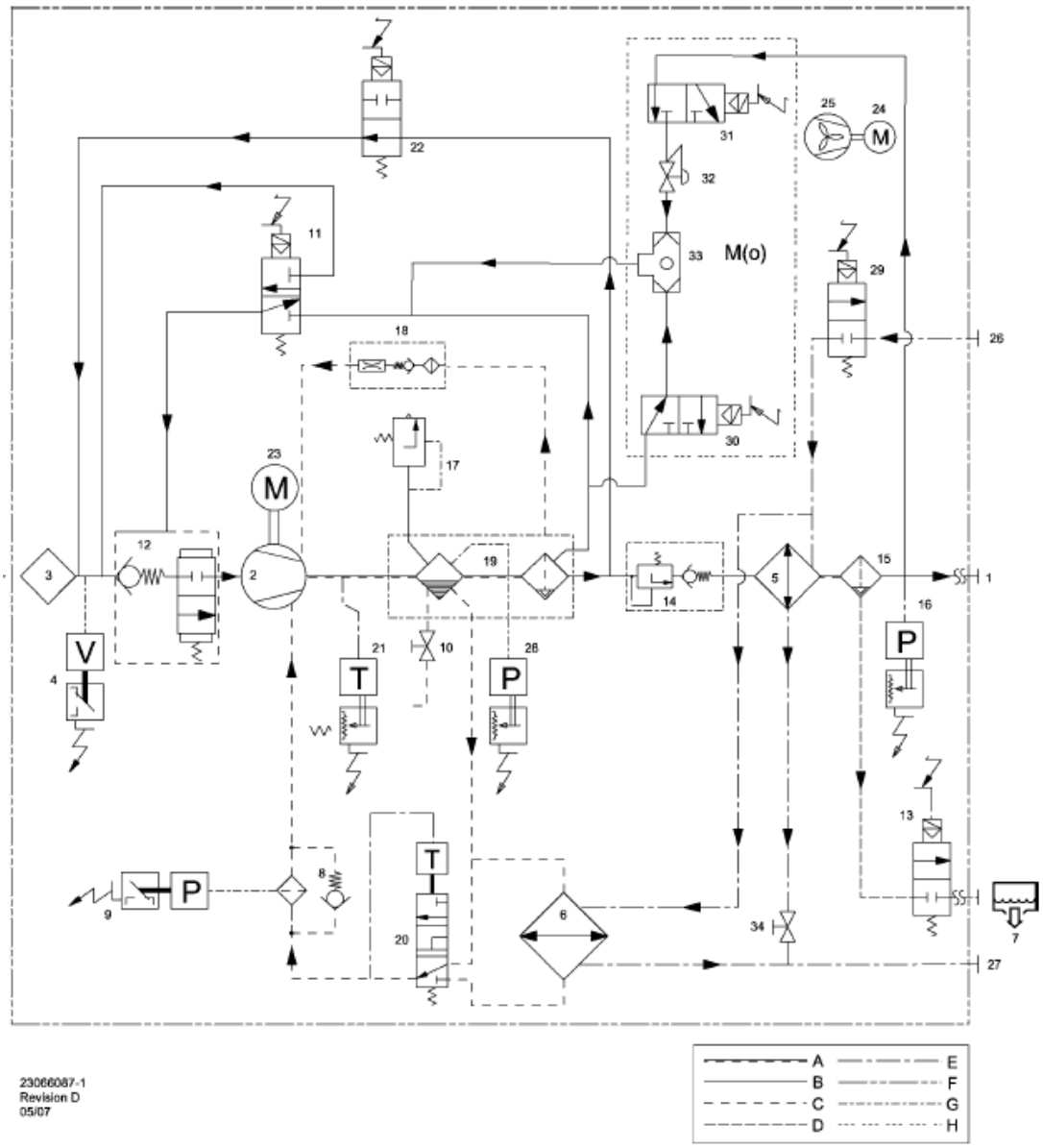
Low ambient is toggled on or off in this screen. If the low ambient is turned off the unit will not start if the temperature falls below 2°C (35°F). If the low ambient is turned on then the low ambient timer in the Advanced Menu to be adjusted.

Dryer Enabled

In this screen, the technician can enable or disable the dryer on any 45-75kW (60- 100Hp) units. This screen is only available with the enhanced mode controller.

PORO Enabled

Once the PORO option has been installed, the technician needs to enable the option in this screen. If PORO is turned off then the PORO timer in the Advanced Setup Menu will not be visible.



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Revision D
05/07

PROCESS AND INSTRUMENTATION DIAGRAM

KEY

1. Air discharge
2. Compressor
3. Air filter
4. Vacuum switch 1VAC
5. Cooler, air
6. Cooler, coolant
7. Condensate discharge
8. Coolant filter
9. Pressure switch, coolant filter 1DPS
10. Drain valve, coolant
11. Load valve 1SV
12. Air inlet check valve
13. Electronic drain trap
14. Minimum pressure check valve
15. Moisture separator
16. Pressure transducer 4APT
17. Pressure relief valve
18. Scavenge filter / orifice / check
19. Separator tank (primary/secondary)
20. Oil temperature control valve
21. Temperature thermistor 2ATT
22. 3SV blowdown solenoid valve
23. Drive motor
24. Fan motor
25. Cooling fan
26. Cooling water inlet (W.C. only)
27. Cooling water outlet (W.C. only)
28. Pressure transducer 3APT
29. Water stop valve 4SV
30. Modulation valve 6SV
31. Modulation valve 5SV
32. Regulator
33. Shuttle valve
34. Ball valve

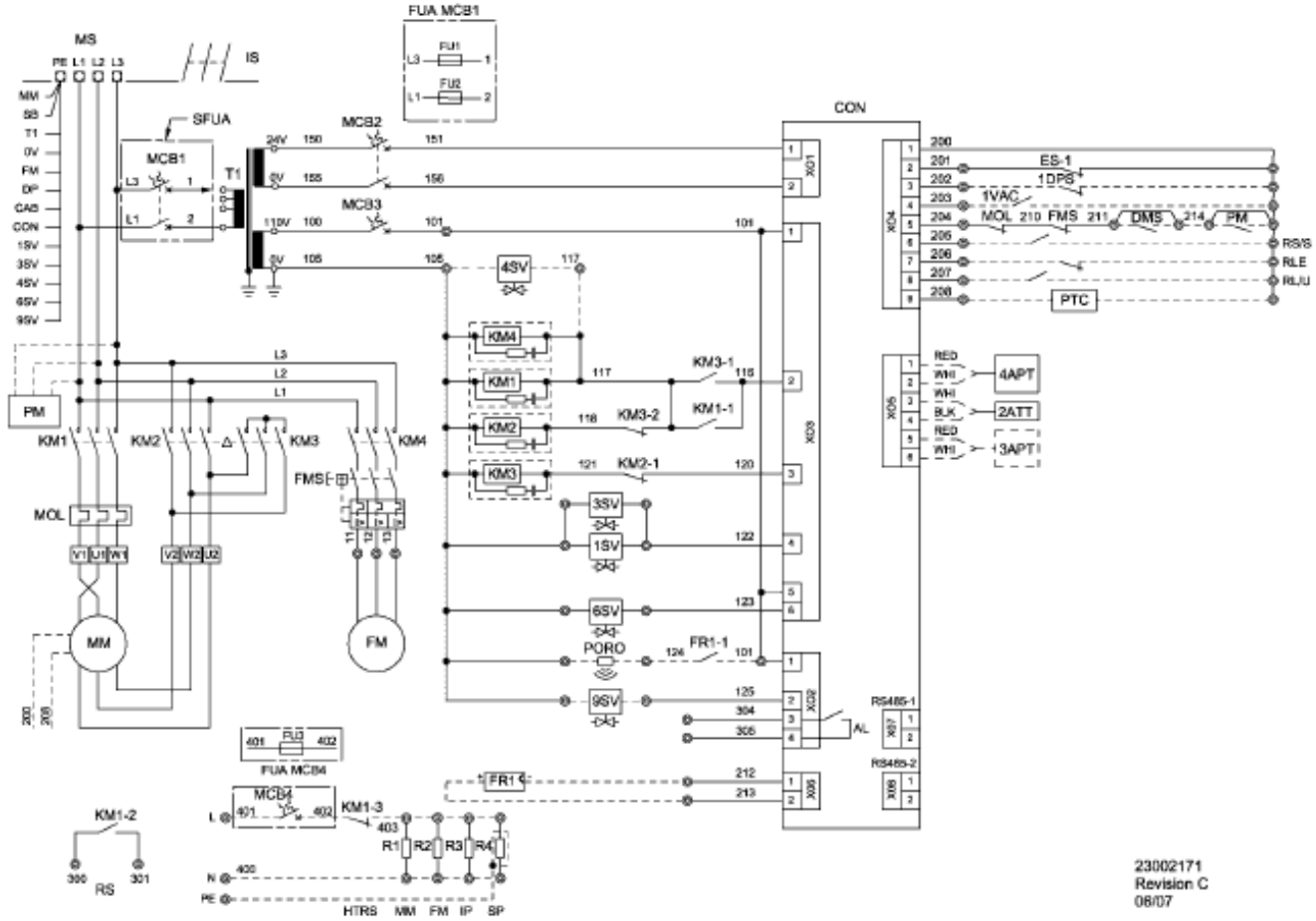
M(o) Modulation (optional)

PIPING LEGEND

A. Air/coolant
B. Air
C. Coolant
D. Condensate
E. Cooling water (W.C. only)
F. Compressor enclosure
G. Sensor connection
H. Modulation

NOTES

1. For customer connection sizes and locations see foundation plan of unit.
2. Post filter must be supplied by customer.



Colors

BLK	Black
BLU	Blue
BRO	Brown
GRE	Green
PIN	Pink
RED	Red
SCR	Screened
VIO	Violet
WHI	White
YEL	Yellow

Wires

Numbers	Function	Wire color
1–99	Power	Black
100–199	AC Control	Red
200–299	DC Control	Blue