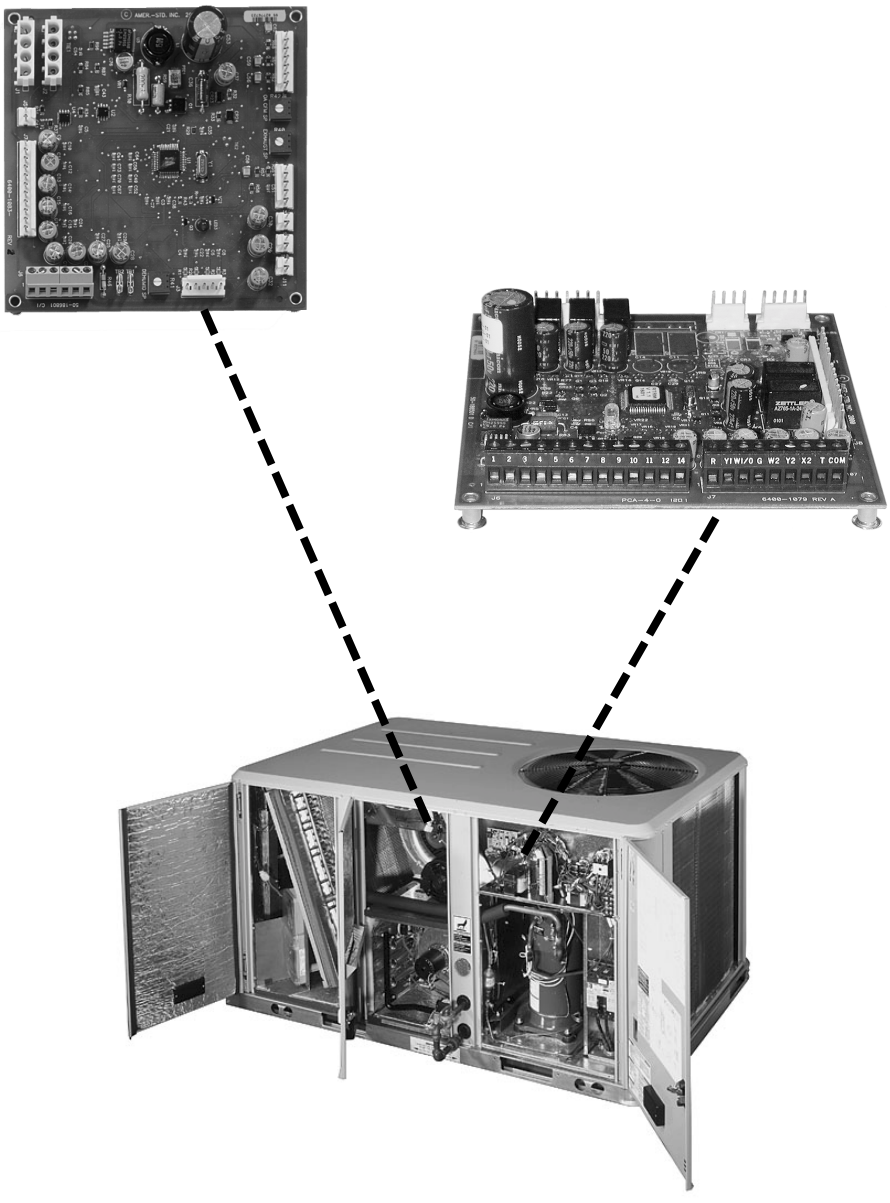
ReliaTel™ Microprocessor Controls



April 2003

RT-SVD03A-EN

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2-10 Ton Convertible Packaged Rooftops
Introduction

Two through ten ton cooling only and gas electric convertible packaged units can be built with electromechanical controls instead of ReliaTel™ controls. Heat pumps are built with ReliaTel controls only. This book will cover all styles, however most material relates to ReliaTel units due to more involved application and service opportunities.

This booklet does not cover all aspects of service. It assumes that the servicer is an experienced commercial service technician with a strong background in electrical controls as well as DC circuits. If you are not well experienced in HVAC service, do not attempt to use this manual to service equipment. Doing so could endanger yourself or others, as well as cause expensive equipment or property damage.

ReliaTel is not the name of a circuit board, but rather an overall communicating control system consisting of up to five communicating modules. The next section covers various aspects of ReliaTel and Electromechanical control.

ReliaTel Introduction

ReliaTel is the name given to the second generation microprocessor controls developed by Trane/American Standard.

The first usage of ReliaTel control is in the 2-10 ton convertible packaged cooling with electric heat, gas electric, and heat pump. Eventually, ReliaTel will be applied in other commercial products as well.

Why change?
The Micro has proven itself to our customers in thousands of applications around the world. A microprocessor based unit provides superior comfort, unmatched reliability and much greater flexibility than conventional systems. ReliaTel has even more flexibility, is more compact, has additional system reliability enhancements and more.

Much of what ReliaTel does will be very familiar to service technicians accustomed to The Micro. Testing and troubleshooting is similar, and in many cases the same as The Micro. There are, however, some significant differences, so it is important that the servicer use the correct material for the unit being serviced.

ReliaTel vs. Electromechanical

Two through ten ton convertible packaged gas/electric (YSC, YHC) and cooling only (TSC, THC) are available without microprocessor controls.[1] With electromechanical controls, zone sensors cannot control the units, nor can building automation systems communicate with it. Electromechanical units require the use of a thermostat or relay based control system to directly control relays, contactors, etc. The ignition control and economizer are different than the ones used with ReliaTel. Service information for these components are handled separately in this book.

Note:
1. ReliaTel Controls: 9th digit "R"
   Electromechanical Controls: 9th digit "E"

ReliaTel – Module Descriptions

Each ReliaTel Module is a communicating control.

ReliaTel Refrigeration Module (RTRM)

Every ReliaTel unit uses an RTRM. The RTRM provides primary unit control for heating and cooling. In addition, it has built-in logic that controls heating and cooling staging, minimum run times, diagnostics, heat pump defrost control, short cycle timing and more. It can be controlled directly by any of the following:

Zone Sensor Module (BAYSENS006-11B, AYSTAT661-664B)
Programmable Zone Sensor (BAYSENS019B, AYSTAT666B)
Conventional Thermostat (such as BAYSTAT036-038A, ASYSTAT701-703)

Note: Unlike the previous micro, a conventional thermostat does not require any sort of interface. It can be wired directly to the RTRM.

In addition, the unit can be controlled using Trane® ICS systems by applying the appropriate interface. The RTRM is configured through the unit wiring harness. The same module is used on gas/electric, cooling only with electric heat, and heat pumps. The following additional inputs are connected to the RTRM:

Outdoor Air Sensor (OAS)
Coil Temperature Sensor (CTS) heat pump only
Smoke detector (*unless it is factory installed*) or other shutdown device.

See outlines on pages 8-10

ReliaTel Options Module (RTOM)

The RTOM gets power from and communicates with the RTRM.

Any of these optional ReliaTel devices require the use of an RTOM:

- Frostat (FOS)
- Clogged Filter Switch (CFS)
- Fan Failure Switch (FFS)
- Discharge Air Sensor (DAS) used for supply air tempering and ICS input data
- Smoke Detector, Factory Installed

Note: A factory installed Smoke Detector provides instant shutdown and ICS alarm output.

See Outline on page 11

Economizer Actuator w/ Module (ECA)

The economizer can be used with or without the Options module. The actuator has a detachable communicating module, which can be replaced separately. The outdoor air sensor connected to the RTRM provides outdoor temperature information for the changeover decision.
The ECA accepts the following inputs:
Mixed Air Sensor (MAS)
Return Air Sensor (RAS) for comparative enthalpy or ICS input data
Outdoor Humidity Sensor (OHS) for reference or comparative enthalpy
Return Air Humidity Sensor (RHS) for comparative enthalpy
CO2 Sensor 0-10VDC input
Remote Minimum Potentiometer (RMP)
The Power Exhaust relay is connected to the ECA module as well.
See outline on page 12

COMM3/4 Communication Interface

Allows ICS communication between a ReliaTel unit and Trane ICS systems as follows:
Tracer 100 series
Tracer Summit
Tracker
ComforTrac
VariTrac 1 (Comfort Manager)
VariTrac 2 (Central Control Panel)

LonTalk (Comm5) Communication Interface

Allows ICS communication between a ReliaTel unit and future Tracker 2 and (LonTalk) COMM 5 communication applications. Not available for general distribution yet.

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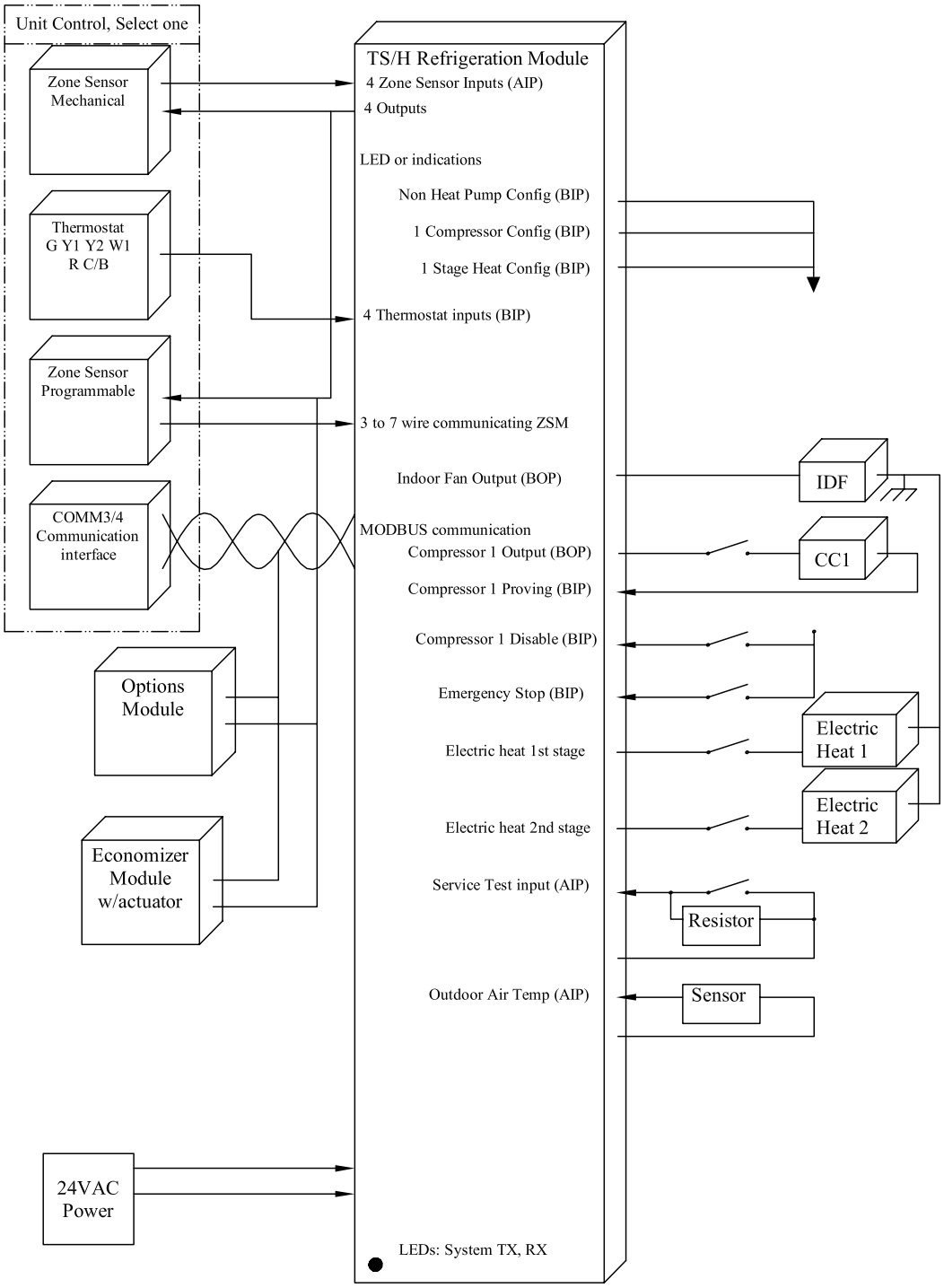
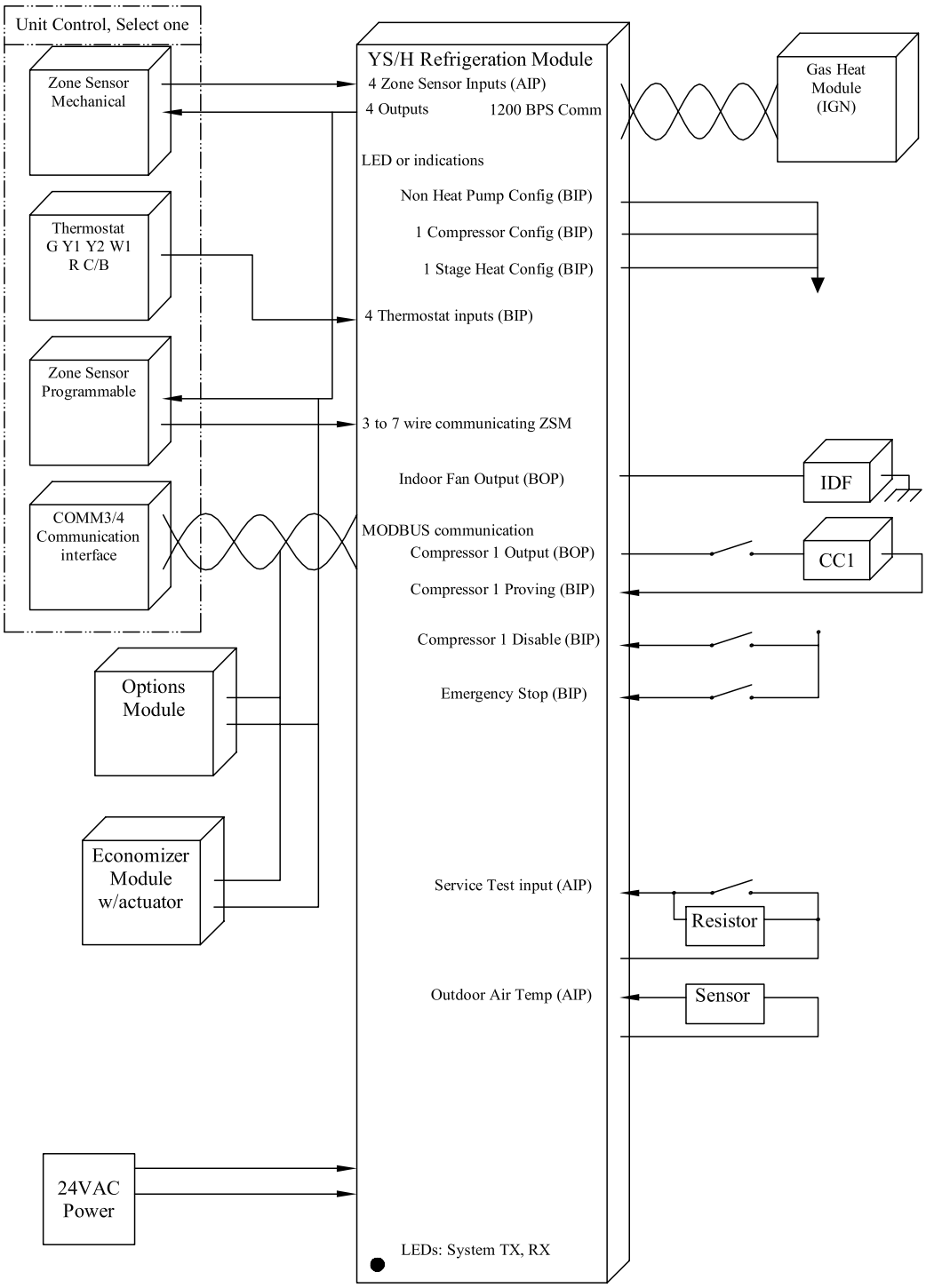
Tables

Technical Literature Printed in U.S.A.

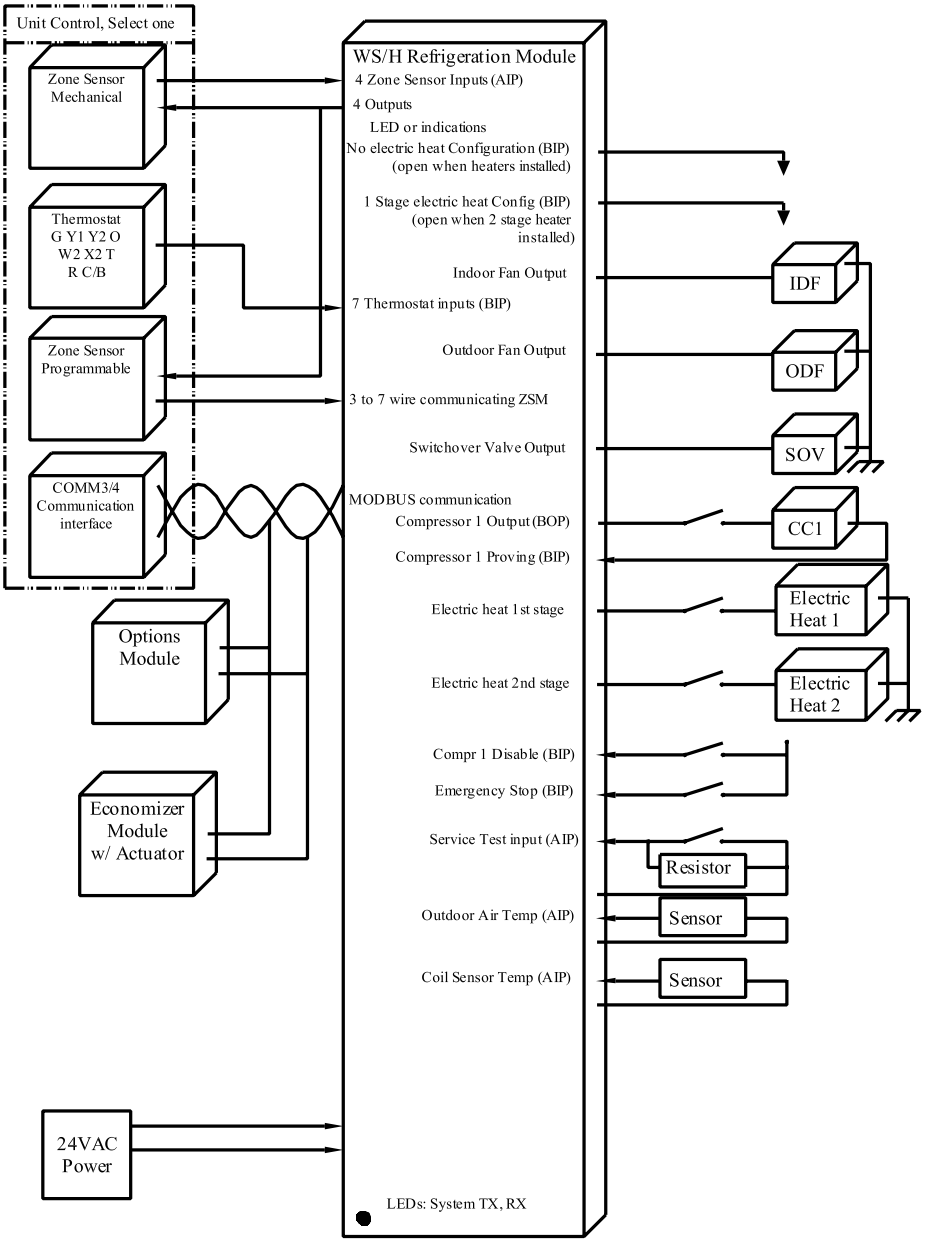
TS/H Refrigeration Module (RTRM) Electric Heat /No Heat



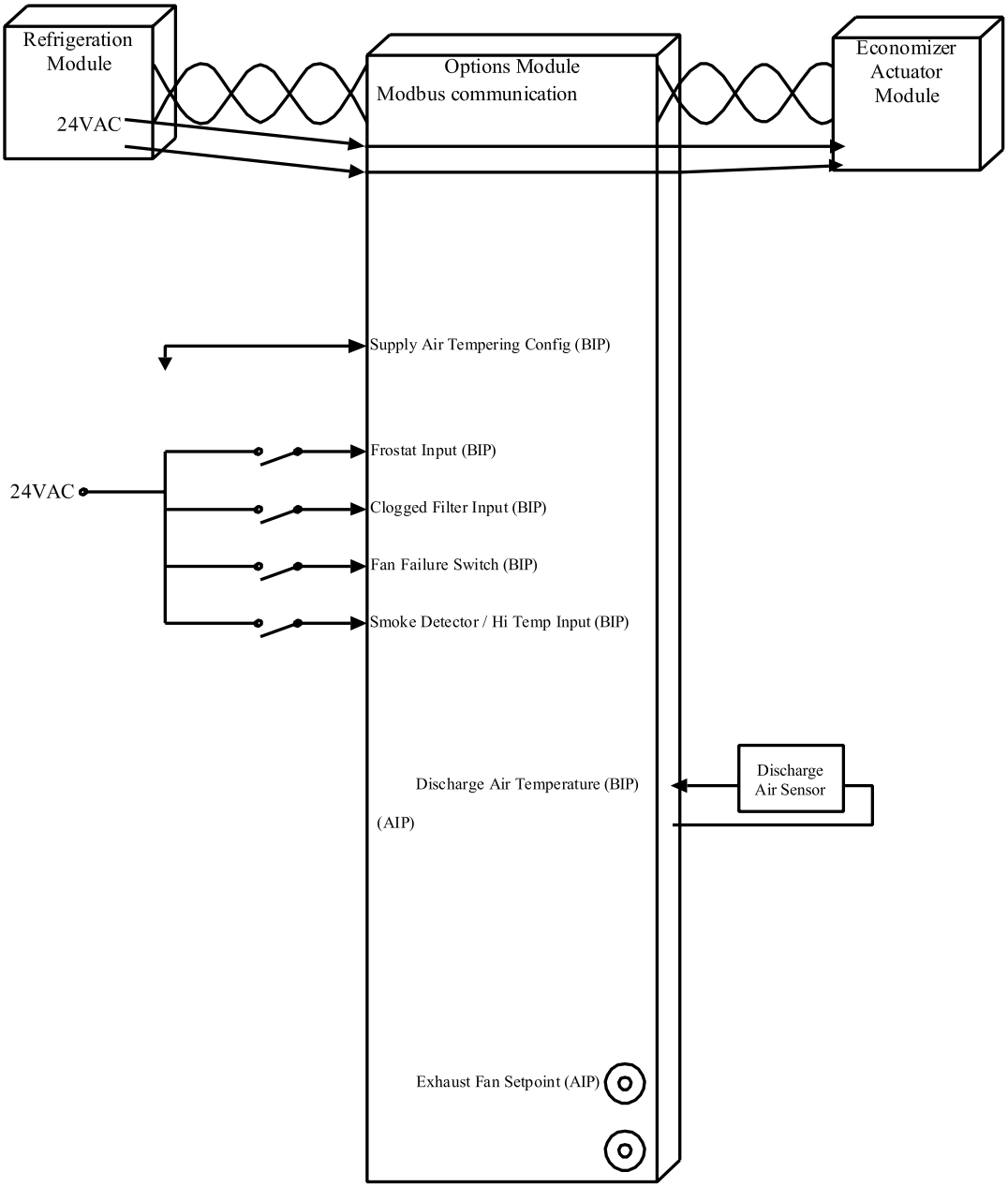
YS/H Refrigeration Module (RTRM) Gas Heating



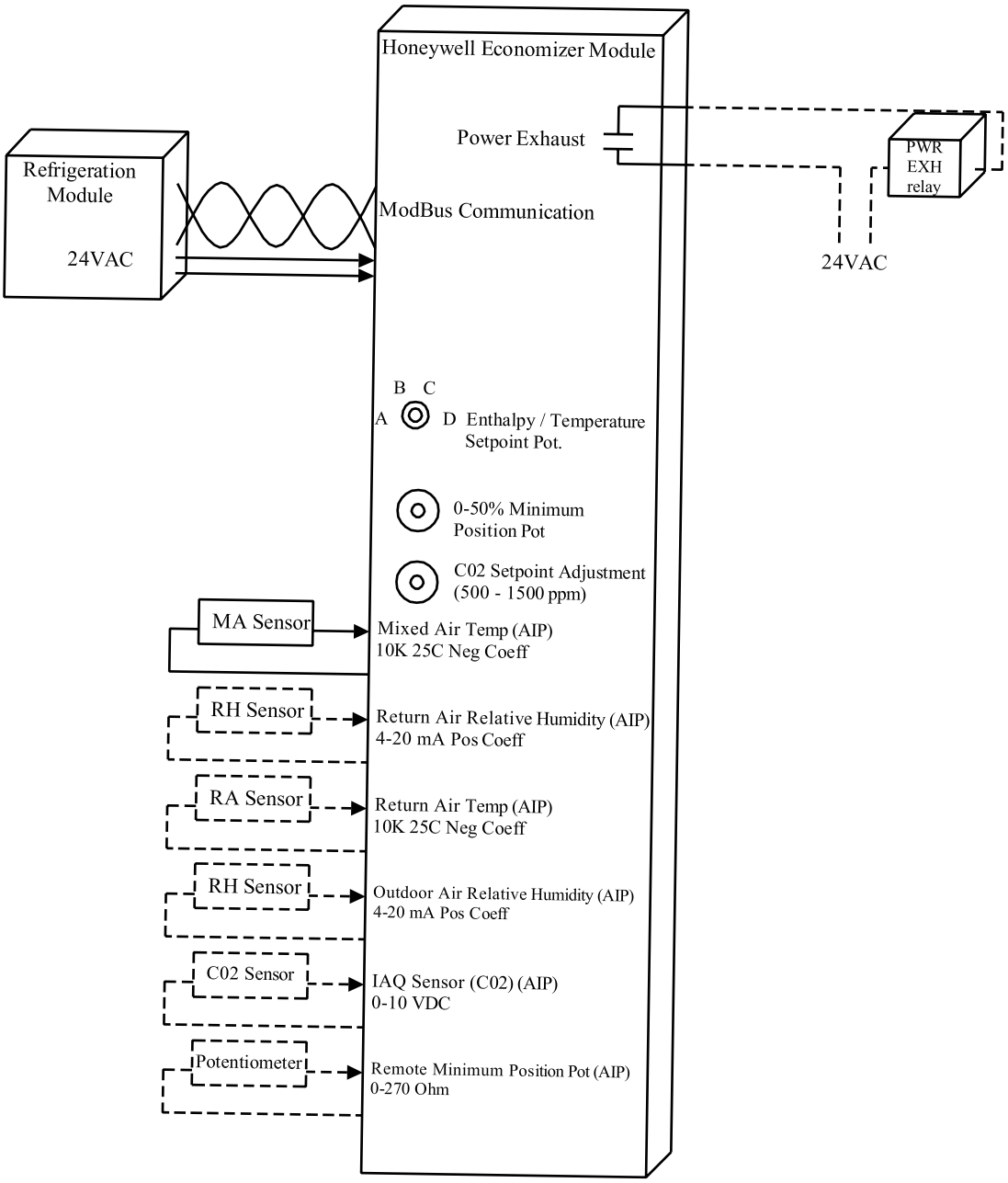
WS/H Refrigeration Module (RTRM) Heat Pump



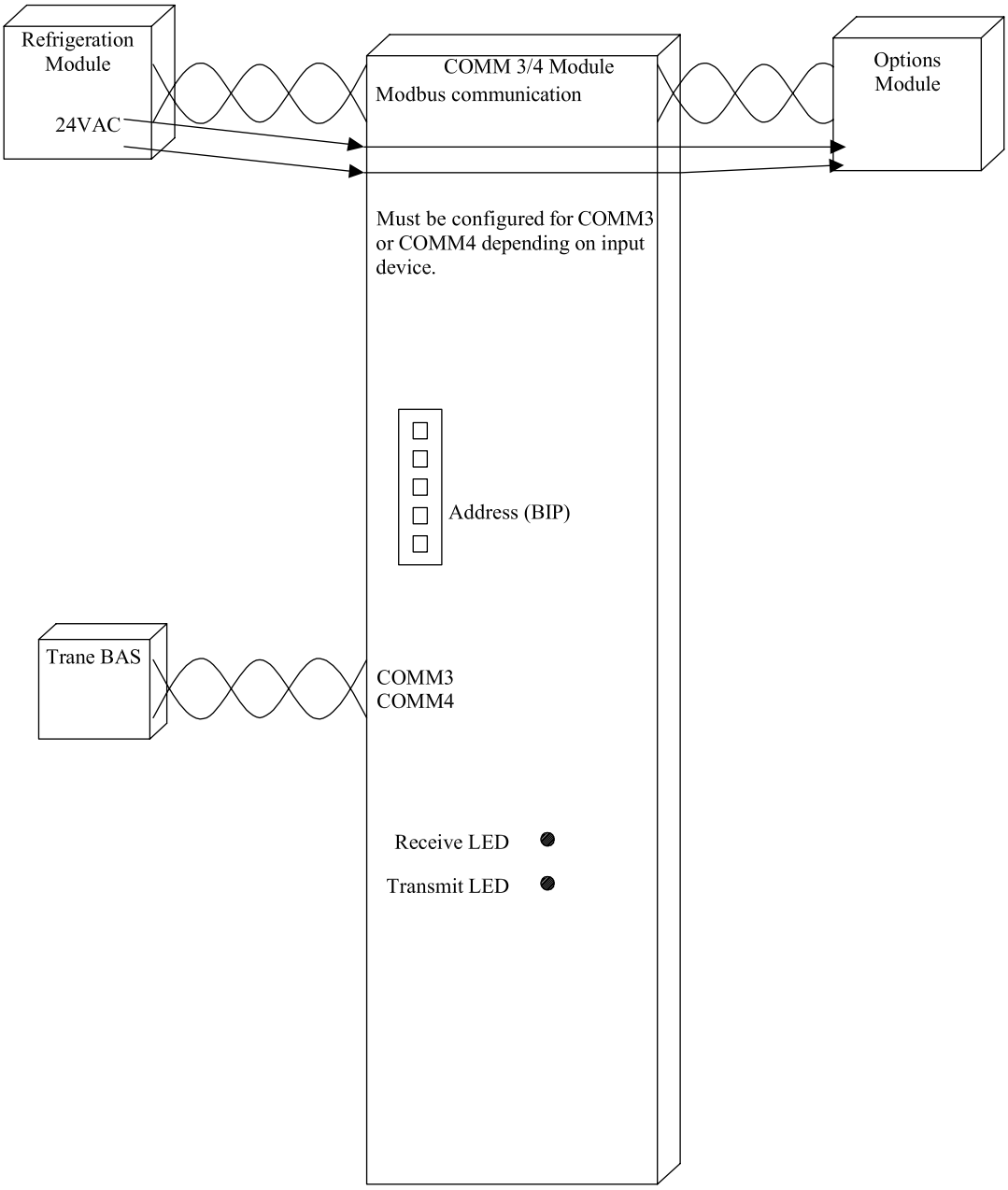
Options Module (RTOM)



Economizer Module (ECA)



COMM3/4 Module for ICS Communication



Low Voltage Terminal Strip

TEST terminals

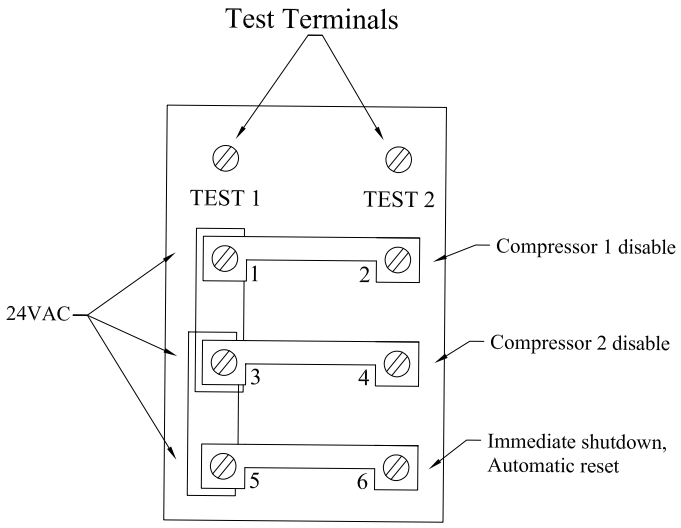
By jumpering from TEST1 to TEST2, the service technician can test the unit or start it with or without any controls attached. See TEST MODE section for details.

Compressor 1 disable

If the factory installed jumper from 1 to 2 is removed (Compressor 1 disable), compressor 1 will not run, even in the TEST MODE. This is where a load shedding device could be connected.

Compressor 2 disable

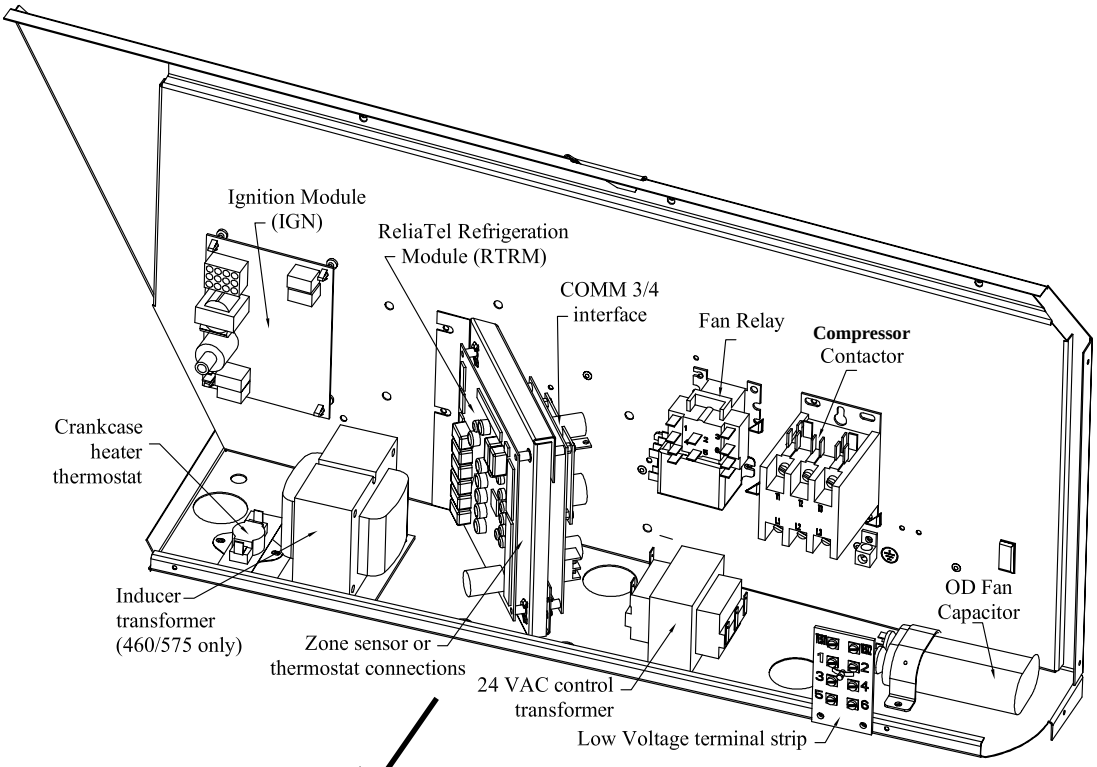
If the factory installed jumper from 3 to 4 is removed (Compressor 2 disable), compressor 2 will not run, even in the TEST MODE. This is where a load shedding device could be connected.



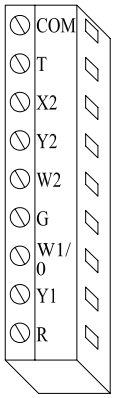
Emergency Stop

If the factory installed jumper from 5 to 6 is removed (Emergency Stop), the unit will not run. The RTRM system LED (Lite Port) will still be on, and no diagnostic will be seen. This is where an external smoke detector or other interlock device could be added.

Typical Control Box Layout 2-5 ton

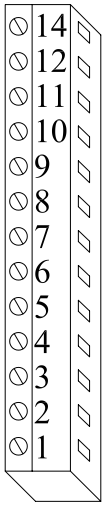


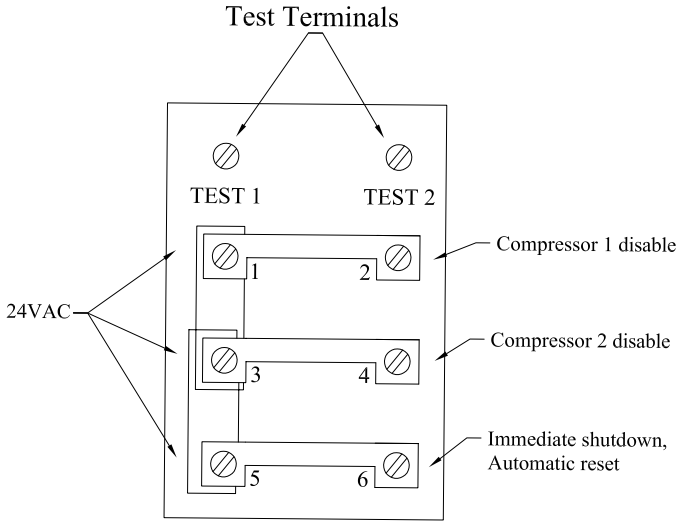
Thermostat



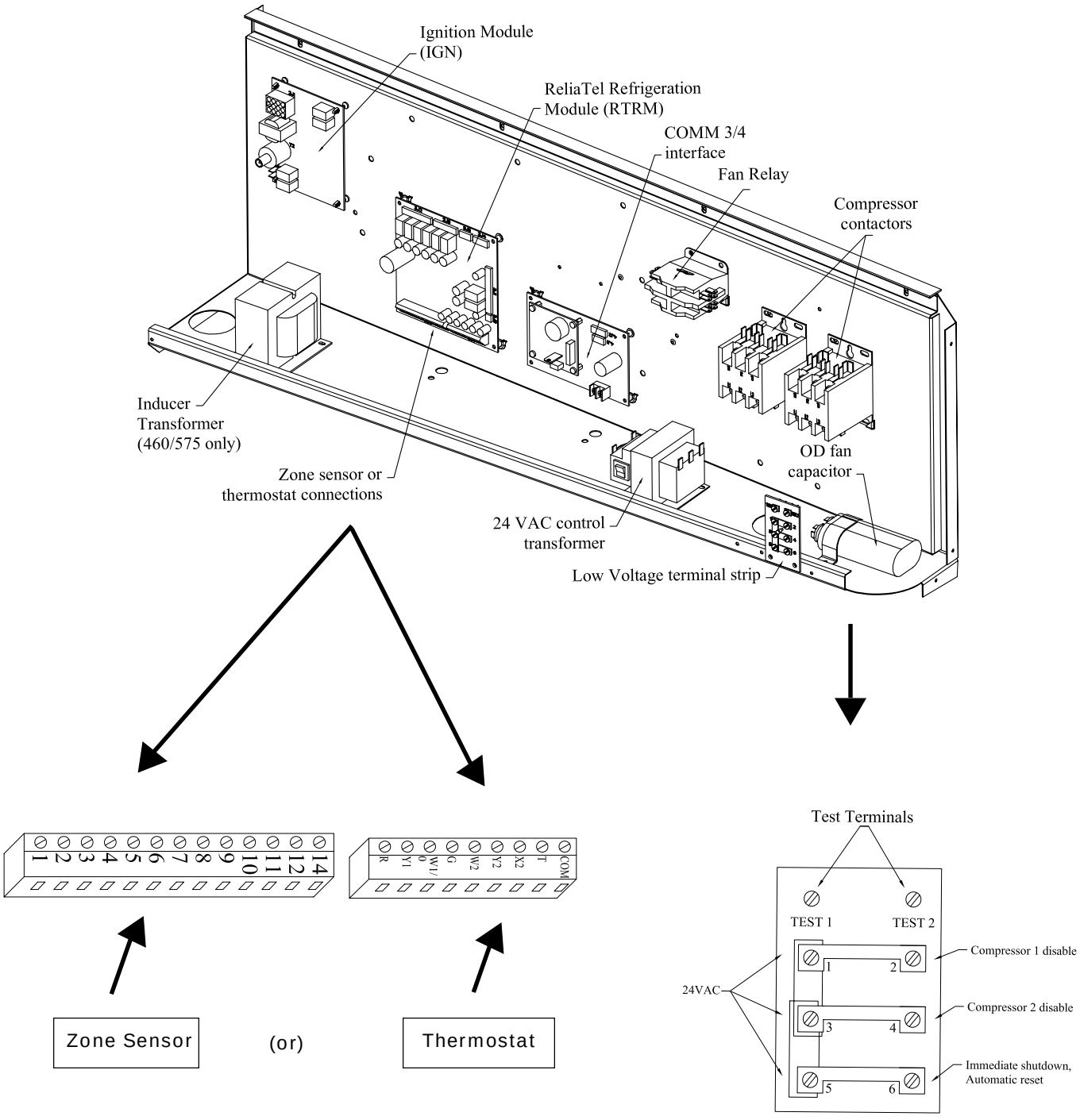
(or)

Zone Sensor

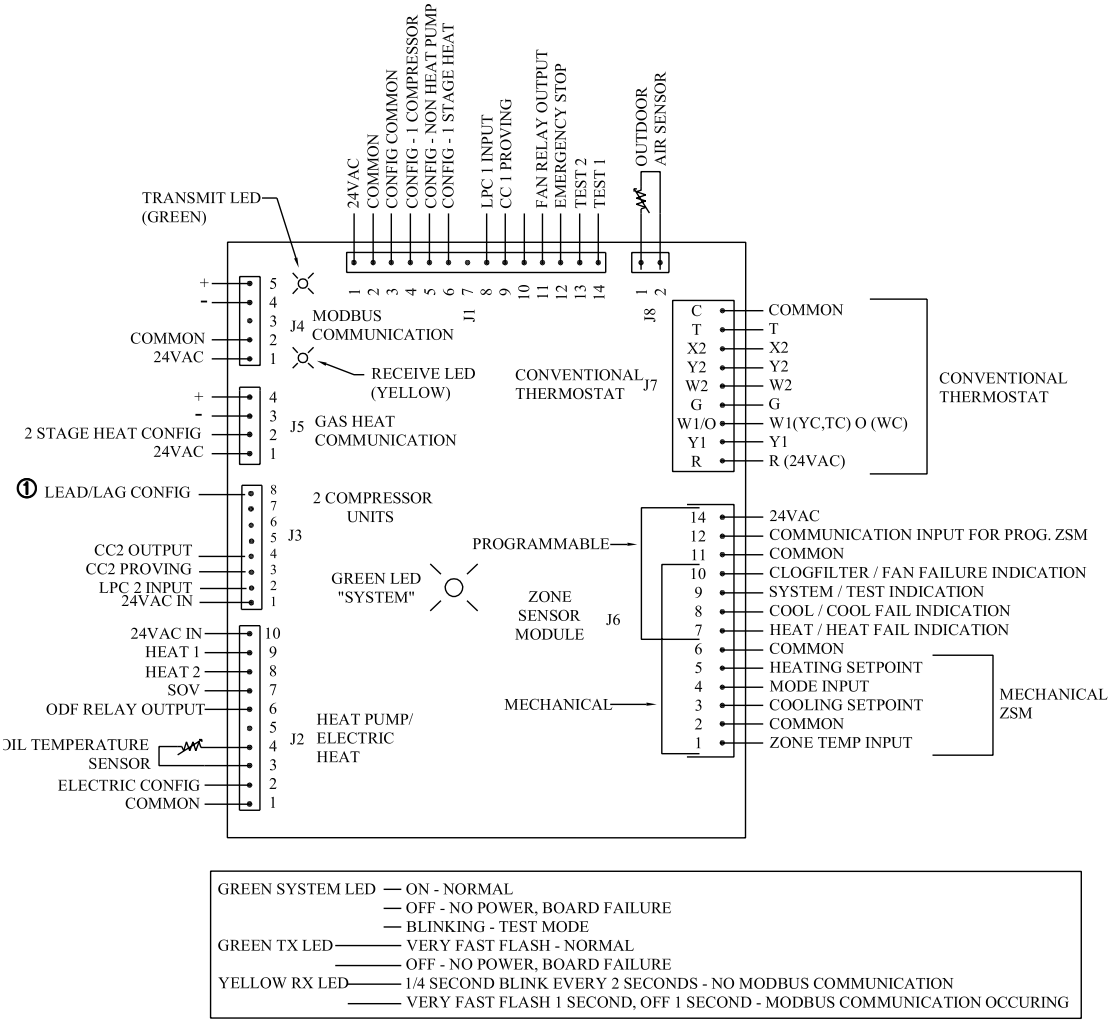




Typical Control Box Layout 6-10 Ton

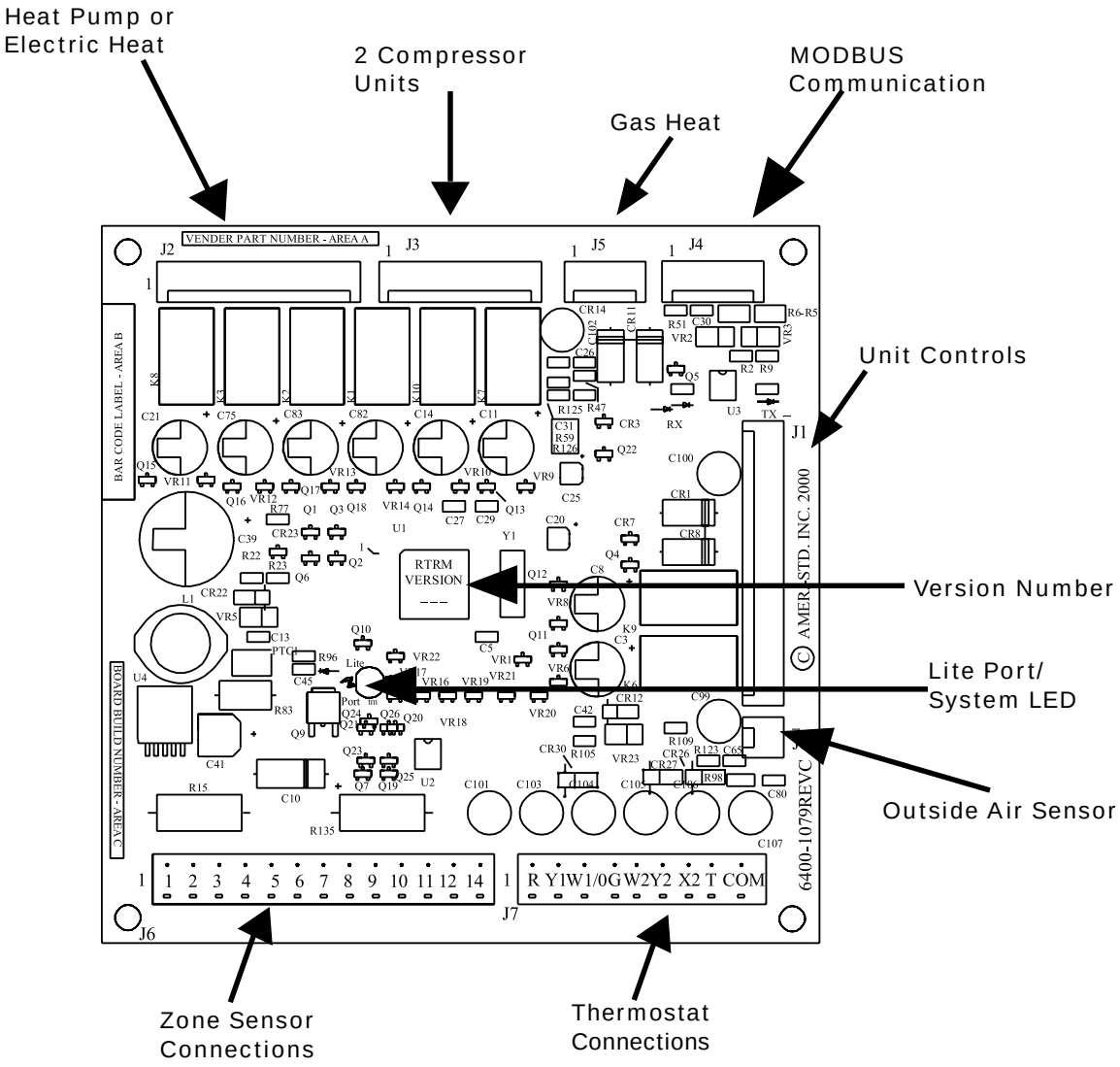


ReliaTel Refrigeration Module (RTRM) Layout



①To enable lead/lag on multiple compressor units, cut wire 101pp connected to J3-8.

ReliaTel Refrigeration Module (RTRM)
Board Connections

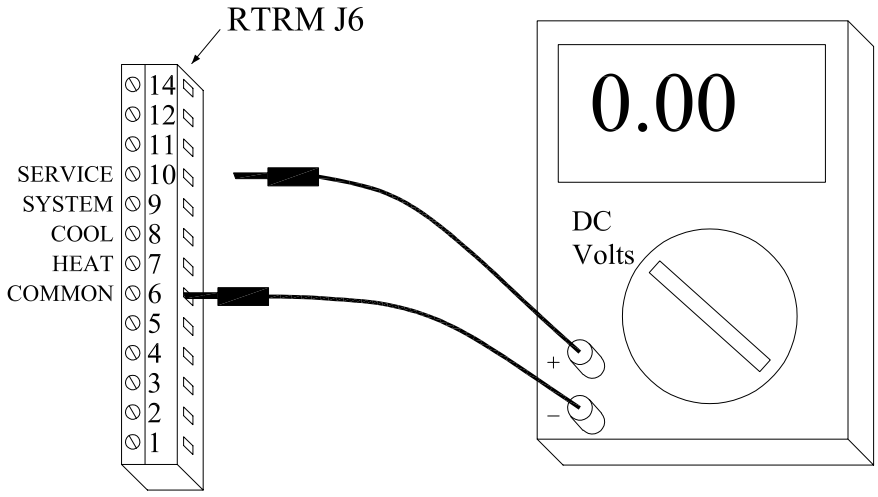


For production, several versions of the RTRM are used depending on unit functions. There will be one replacement module for all units (MOD01263).

RTRM Diagnostics

The RTRM provides certain diagnostic information to the end user or service technician depending on the type of controls used. Regardless of controls used however, a service technician with a DC voltmeter can read the diagnostics at the RTRM as shown below.

Note: when a voltmeter is first applied, allow 2-3 seconds for the reading to stabilize.



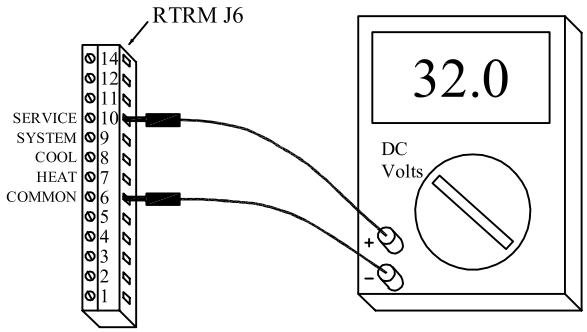
The actual readings obtained vary depending on the controls used. The following charts show what readings to expect, as well as what the readings mean.

	Approximate voltage readings (depending on control used)		
See "What The Readings Mean" on the follow-ing pages.	Thermostat or mechanical ZSM without indicators or with no controls attached at all	Programmable ZSM with indicators	Mechanical ZSM with indicators
ON	32 VDC ± 10%	26 VDC ± 10%	2.0 VDC ± 10%
OFF	0.75 VDC ± 10%	0.75 VDC ± 10%	0.75 VDC ± 10%
PULSING	20 TO 30VDC	1.5 TO 2.5VDC	14 TO 30VDC

What the readings mean

Service

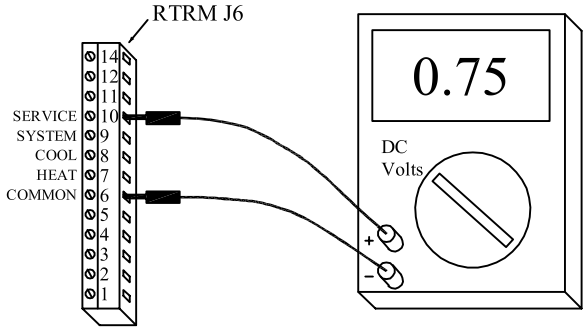
ON – Clogged filter switch has been closed for at least 2 minutes, indicating a clogged filter.



This example illustrates what would be seen if the unit did not have a zone sensor with indicator LEDs, such as would be the case with an ICS system. Page 19 lists voltages seen if a zone sensor is attached. Volt meter readings should be within 10%.

OFF –

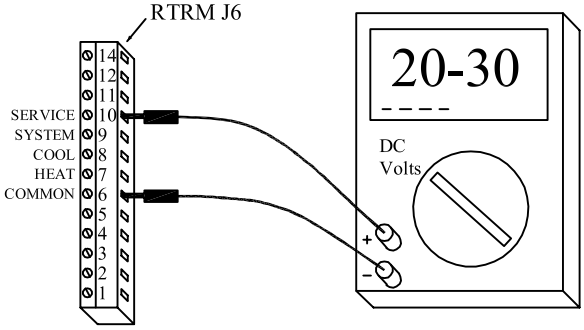
1) Clogged filter switch is in open position or no switch is installed.
2) Fan Fail switch (if installed) has opened within the first 40 seconds, proving that the fan has started.



PULSING – Fan Proving switch (also called Fan Fail Switch FFS) has failed to open after 40 seconds.

During this condition, the unit will run for 40 seconds and then stop. Only the fan will run during the TEST mode, except during the first 40 seconds.

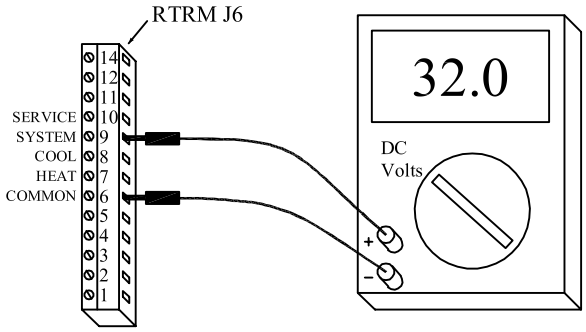
Note that at the bottom of the meter display, the “analog bar” will pulse back and forth. Some meters do not have this extra feature.



What the readings mean

System

ON – System is powered up. This output should be on whenever the RTRM System LED (Lite Port) is on. Incidentally, the Lite Port flickers as part of its normal function.

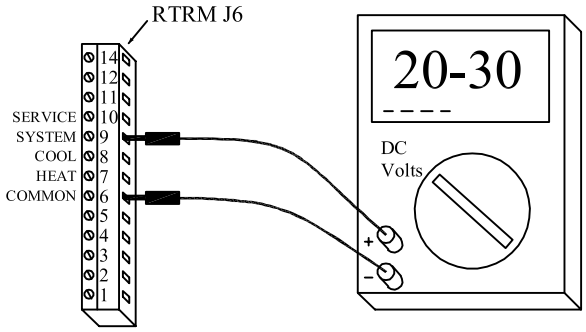


OFF – If 0VDC is seen, the RTRM does not have power, the output wiring is shorted, or there is an internal failure. Remove any wires connected to this terminal and check again.

PULSING – Unit is in the TEST mode.

Also during the TEST mode the System LED will pulse on and off.

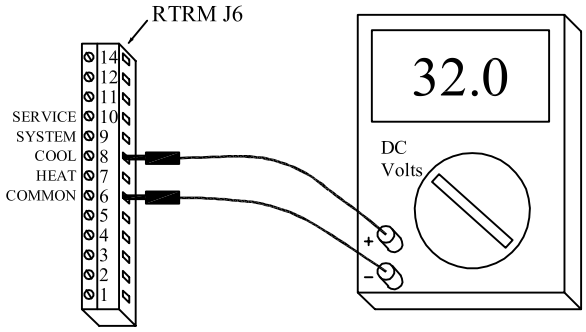
This output does not provide any diagnostic information, but is a good place to confirm that voltage readings taken are consistent with what should be seen on other outputs.



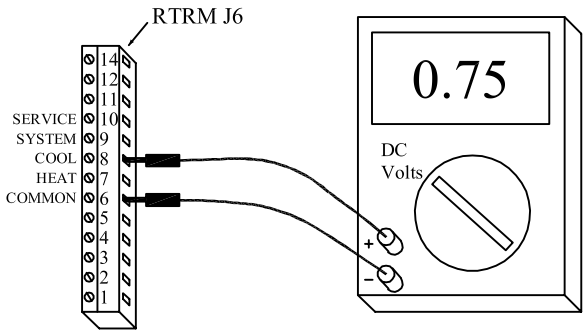
What the readings mean

Cooling

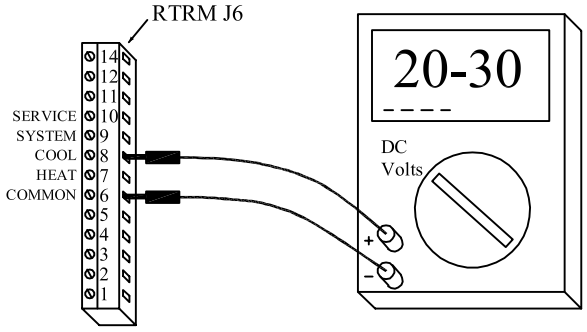
ON – System is in the cooling mode and actively cooling. The unit could be economizing or have one or both compressors on. If the unit is a heat pump, the reversing valve is energized as well.



OFF – System is not actively cooling.
It may or may not be in the cooling mode.



PULSING –This indicator can mean one or more of the following:



Any controls

1) CC1 or CC2 opens during cooling, or is open when a call for compressor occurs.The unaffected circuit will still run.

2) CPR1 Disable or CPR 2 Disable input has opened during a compressor cycle each time a compressor starts (within the first 3 minutes) for 3 consecutive cycles. It locks out on the fourth cycle. The unaffected circuit will still run.

Mechanical ZSM

1) Zone temperature input failure after a successful input.

2) Both heating and cooling setpoint inputs have failed or are not attached (such as when using a 2 - wire sensor on terminals 1 & 2).

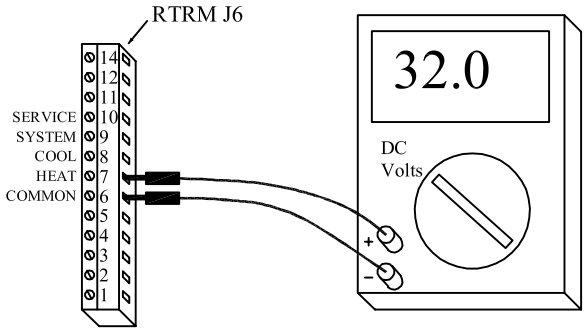
Programmable ZSM

The ZSM has failed to communicate for 15 consecutive minutes after successful communication has occurred.

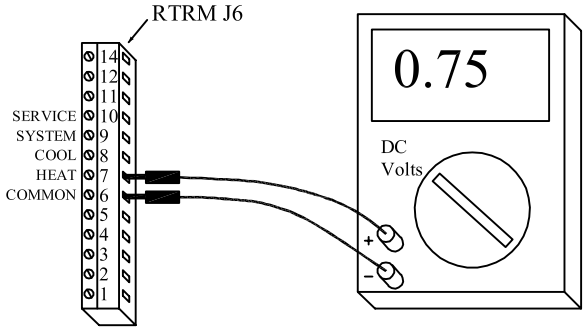
What the readings mean

Heating

ON – System is actively heating.



OFF – System is not actively heating.



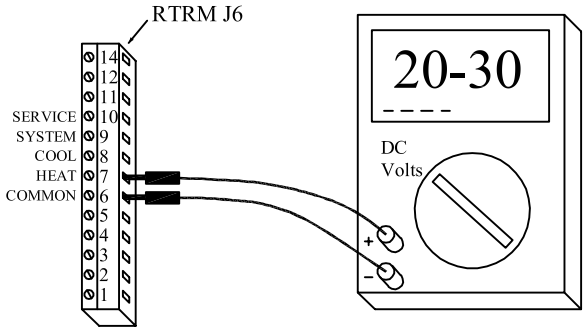
PULSING –

Gas Heat

If any failure occurs such as loss of flame, limit switch trip, flame rollout etc, this indication is present. Further diagnostics are available by examining the Ignition Module LED. See the gas heat section for details.

Electric heat

These units have safety limit switches in the electric heat control circuit. Should they trip however, no indication will occur. The HEAT indication will stay ON.



Heat Pump

1) Unit is in the EMERGENCY HEAT mode.

2) If the Compressor Disable circuit or CC1, CC2 circuits create a lockout during heating mode, a COOL FAIL (pulsing) indication will occur, not a HEAT FAIL (pulsing) indication. See COOL indications for details.

HEAT FAIL and COOL FAIL at the same time:

1) Coil temperature sensor is open or shorted.
2) Unit has failed to defrost properly. See Heat Pump section for further details.

ReliaTel Control – Default Operation

The ReliaTel Refrigeration Module (RTRM) can accept input from any of the following:
Mechanical Zone Sensor Module (ZSM) BAYSENS006-11B, AYSTAT661-664B
Programmable Zone Sensor BAYSENS019B, AYSTAT666B
Conventional thermostat BAYSTAT036-038A (or similar)
ICS systems –Tracer, Tracker, VariTrac
With each installed device, default modes of operation come into play, depending on that device's inputs. Following is a summary of functions and defaults:

Default operation for Mechanical ZSM:

J6 Input / connection	If no input / connection this happens:
J6-1 - Zone temperature	Unit stops
J6-2 – Common terminal for 1-5	Unit stops
J6-3 - Cooling Set Point (CSP)	HSP + 4F
J6-5* - Heating Set Point (HSP)	CSP – 4F
J6-3&5 - No CSP or HSP from unit	74F CSP, 71F HSP
J6-4 - Mode Input from ZSM	Auto Changeover with continuous fan
J6-6* – Common terminal for 7-10	LED's will not function any time
J6-7* – Heat indication	LED will not come on while heating
	LED will not flash during heat fail
J6-8* – Cool indication	LED will not come on while cooling
	LED will not flash during cool fail*
J6-9* – System indication	LED will not come on while unit has power
J6-10* – Service indication	LED will not come on when CFS or FFS trips

* these connections are only on certain model ZSM's.

Default operation for Programmable ZSM:

J6 Input / connection	If no input / connection this happens:
J6-7 – Heat indication	"HEAT" will not be displayed while heating
	"HEAT FAIL" will not be displayed during heat fail
J6-8 – Cool indication	"COOL" will not be displayed while cooling
	"COOL FAIL" will not be displayed during cool fail*
J6-9 – System indication	Colon (:) will not blink during normal operation
	"TEST" will not be displayed duringTEST mode
J6-10 – Service indication	"SERVICE" will not be displayed when clogged filter switch has tripped
	"SERVICE" will not flash when the FFS has tripped
J6-11 – Common	No display, no communication
J6-12 - Communication	No communication – "COOL FAIL" indication
J6-14 – 24VAC power	No display, no communication

*cool fail indication can occur for several reasons. See diagnostic section for more on this.
Note: Version 1.1 and 1.3 RTRM do not provide Heat, Cool, Service, Cool Fail, Heat Fail indications for Programmable ZSM. Later versions (with a higher number) do.

Default operation for ICS control:

COMM 3/4 and COMM 5 Communication Interface Modules use MODBUS communication directly with the RTRM. Tracker and Tracer require inputs as shown:

J6 Input / connection	If no input this happens:
J6-1 - Zone temperature	Unit stops (unless Tracer is providing this input)
J6-2 – Common terminal for 1-3	Unit stops
J6-3 - Cooling Set Point (CSP)	Tracer /Tracker set points are used.

Note: VariTrac does not require any input to J6

Conventional thermostat – default operation

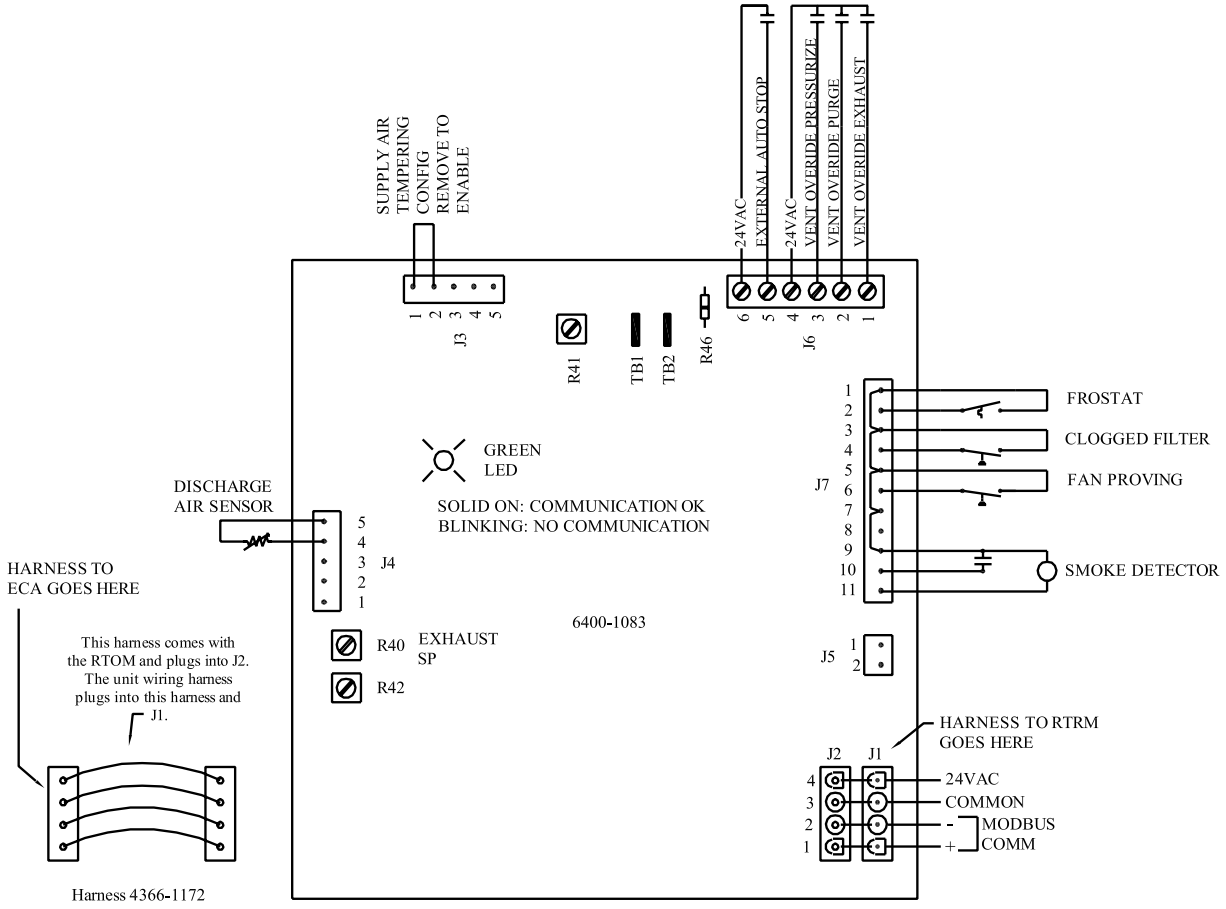
See section on Conventional Thermostat Operation for more on this.

Input / connection	If no input this happens:
G (Indoor fan)	A heat or cool call will also enable the fan.

The purpose of G is to provide a way to run the fan continuously.

RTOM (ReliaTel Options Module) Layout

The RTOM is installed in the indoor fan section. When field installed, it comes with a short harness which allows both ends of the unit control harness to be attached.



ReliaTel Options Module (RTOM) Inputs

J1, J2 Inputs:
J1 provides 24VAC power and MODBUS communication to and from the RTRM (via the COMM 3/4 if used). J2 sends power and communication to the ECA (if used).

J3 Inputs:
J3-1 to J3-2 – Allows supply air tempering when using a mechanical ZSM such as BAYSENS006-11/ AYSTAT664. Removed = supply air tempering enabled, installed = disabled. Supply air tempering can also be enabled or disabled by using the BAYSENS019B/AYSTAT666B or a Trane ICS system. The other inputs are not used on this unit.

J4 Inputs:
Discharge air sensor (10K @ 77F/25C) allows supply air tempering, also discharge air information for Building Automation systems (BAS) using COMM 5 such as Tracer Summit™ V13 and Tracker™ Version 10. Earlier versions of Tracker (V6.5 and below) and any Tracer system using COMM 3 or COMM 4 do not recognize this input.

The input seen by Tracer (using COMM 3 or COMM 4) and Tracker (prior to Version 10) is "Supply Air Temperature", which is actually the Mixed Air Temperature input from the ECA to the RTRM. The other inputs on J4 are not used.

J5 Input Is not used on this unit.

J6 Inputs:
Ventilation override inputs J6-1, 2, 3 are explained in the application section of this manual.
Remote Shutdown – when this input is open, the unit runs normally. When closed, the unit shuts down after minimum run times are met, up to 4 minutes. This is not the same as the emergency stop inputs on LTB 5&6.

J7 Inputs:
Frostat closes at 10°F+-2°. When closed, compressors will shut off after minimum run times are met. The Frostat opens at 60°F+-2°.
Clogged filter switch is factory set to close at 0.45", however is adjustable from 0.05" to 12.0". A 7/32" allen wrench is required for this adjustment. When the switch is closed for 2 minutes, the service indicator on the ZSM will be on (see diagnostics section for details). When the switch opens, the indicator is off (auto reset).
Fan proving switch is factory set to open at 0.07", and is adjustable from 0.05" to 12.0", though adjustment is not recommended. If the switch does not open within 40 seconds after the fan starts, the unit stops, requiring manual reset from the Zone Sensor or BAS system, or by resetting power to the unit. The service indicator on the ZSM will pulse during fan fail mode.
Smoke detector contacts are open during normal operation. When closed, the unit shuts down immediately. When the contacts are re-opened, the unit will automatically restart.
Exhaust setpoint potentiometer sets the point to which the exhaust fan will come on. It can be set from 0% (whenever supply fan is on exhaust is on) to 100% (exhaust fan comes on when economizer is 100% outside air). Turn clockwise to increase setpoint.

ReliaTel – LED Functions

ReliaTel Refrigeration Module (RTRM)

Green System LED	On: Normal operation (slight pulsing is normal) Blinking: Test mode Off: No power, board failure
Green Transmit LED	Very fast flash: Normal operation, information being sent to other modules. Off: System failure
Yellow Receive LED	Very fast flash 1 second, off 1 second: Normal communication 1/4 second wink every 2 seconds: Not communicating with any other module Off: Board failure

Note: The first boards produced, version 1.1 and 1.3, have a red SYSTEM LED as well as Lite Port. It operates the same as above.

ReliaTel Options Module (RTOM)

Green system LED	On: Normal communication with RTRM 1/4 second on, 2 seconds off: No communication Off: No power or board failure

Economizer Actuator Module (ECA)

Green system LED	On: OK to economize Slow flash: Not OK to economize Fast flash: Not communicating with RTRM OFF: No power or system failure *Error codes - 1/2 second on, 1/4 second off* 1 flash – Actuator fault 2 flash – CO2 sensor 3 flash – RA humidity sensor 4 flash – RA temp sensor 6 flash – OA humidity sensor 7 flash – OA temperature sensor (On power up: No communication with RTRM) 8 flash – MA temp sensor 9-11 flash – Internal fault

Ignition Control (IGN)

Green	On: Normal no call for heat Slow flash: Active call for heat Fast flash: Not communicating with RTRM *Error codes* 2 flash – system lockout – failure to sense flame 3 flash – pressure switch failure to close when CBM stops or open when CBM starts 4 flash – TCO circuit open 5 flash – Flame being sensed yet gas valve not energized 6 flash - Flame Rollout (FR) circuit open

COMM3/4 Interface

Yellow receive (RX) LED	Flashing intermittently: ICS line activity Off: Communication down or no power
Green transmit (TX) LED	Flashing intermittently: Unit is communicating OK with ICS system Off yet RX light flashes – address wrong, COMM3/4 board in wrong position

RTRM/RTOM Temperature Inputs

Terminals to read voltage:

Outdoor Air Sensor	RTRM J8-2, J8-1
Discharge Air Sensor	RTOM J4-5, J4-4
Coil Temp Sensor	RTRM J2-3, J2-4

Note: These are RTRM, RTOM inputs only. Economizer inputs (MAS, RAS, OHS, RHS, CO2) are in the ReliaTel Economizer inputs section.

Read DC voltage with the sensor attached. If voltage does not appear to be correct, read the resistance of the circuit, then the sensor itself, to see if a problem exists in the sensor or the wiring. With the sensor not attached there should be 5.00 VDC at the terminals listed above.

Service Tips:
The second sensor terminal listed above is common. All common terminals are grounded, therefore one volt meter lead can be attached to ground for voltage tests.
To check for induced voltage, read AC voltage to ground from each sensor wire. Should be less than 1 VAC.

Problems to look for:

- Miswire / short / open
- Excessive resistance in circuit (corroded or loose connection)
- Sensor inaccurate (should be +- 2F of chart)
- Moisture in sensor (becomes accurate when dry)
- Induced voltage (high voltage wires in same conduit)

Temperature °F	Resistance	DC Volts	Temperature	Resistance	DC Volts
	open circuit	5.000	-15	143192	4.670
-40	345684	4.856	-14	138435	4.660
-39	333237	4.851	-13	133856	4.649
-38	321274	4.845	-12	129449	4.638
-37	309777	4.840	-11	125199	4.627
-36	298724	4.834	-10	121100	4.615
-35	288097	4.828	-9	117146	4.603
-34	277879	4.823	-8	113331	4.591
-33	268053	4.816	-7	109652	4.579
-32	258603	4.810	-6	106102	4.566
-31	249523	4.804	-5	102676	4.553
-30	240810	4.797	-4	99377	4.540
-29	232425	4.790	-3	96197	4.526
-28	224355	4.783	-2	93127	4.512
-27	216590	4.776	-1	90163	4.498
-26	209114	4.768	0	87301	4.483
-25	201918	4.760	1	84537	4.468
-24	194991	4.752	2	81868	4.453
-23	188320	4.744	3	79291	4.437
-22	181904	4.736	4	76802	4.421
-21	175738	4.727	5	74403	4.404
-20	169798	4.718	6	72087	4.388
-19	164076	4.709	7	69849	4.371
-18	158562	4.700	8	67687	4.353
-17	153248	4.690	9	65597	4.336
-16	148127	4.680	10	63577	4.317

Temperature	Resistance	DC Volts	Temperature	Resistance	DC Volts
11	61624	4.299	64	13762	2.895
12	59737	4.280	65	13416	2.864
13	57913	4.261	66	13078	2.832
14	56153	4.241	67	12752	2.801
15	54452	4.221	68	12435	2.770
16	52807	4.201	69	12126	2.739
17	51216	4.180	70	11827	2.708
18	49677	4.159	71	11535	2.677
19	48188	4.138	72	11252	2.646
20	46748	4.116	73	10977	2.616
21	45354	4.094	74	10709	2.585
22	44007	4.072	75	10448	2.554
23	42705	4.049	76	10194	2.523
24	41446	4.026	77	9949	2.493
25	40226	4.002	78	9710	2.462
26	39046	3.978	79	9477	2.432
27	37904	3.954	80	9250	2.402
28	36797	3.929	81	9030	2.372
29	35726	3.904	82	8815	2.342
30	34689	3.879	83	8607	2.312
31	33686	3.853	84	8404	2.283
32	32720	3.827	85	8206	2.253
33	31797	3.801	86	8014	2.224
34	30903	3.775	87	7827	2.195
35	30037	3.749	88	7645	2.166
36	29198	3.722	89	7468	2.137
37	28386	3.695	90	7295	2.109
38	27599	3.668	91	7127	2.080
39	26836	3.641	92	6963	2.052
40	26097	3.613	93	6803	2.024
41	25383	3.585	94	6648	1.996
42	24690	3.557	95	6497	1.969
43	24018	3.528	96	6350	1.942
44	23367	3.500	97	6207	1.915
45	22736	3.471	98	6067	1.888
46	22123	3.442	99	5931	1.861
47	21530	3.412	100	5798	1.835
48	20953	3.383	101	5668	1.809
49	20396	3.353	102	5543	1.783
50	19854	3.324	103	5420	1.757
51	19330	3.294	104	5300	1.732
52	18821	3.264	105	5184	1.707
53	18327	3.233	106	5070	1.682
54	17847	3.203	107	4959	1.658
55	17382	3.173	108	4851	1.633
56	16930	3.142	109	4745	1.609
57	16491	3.111	110	4642	1.585
58	16066	3.080	111	4542	1.562
59	15654	3.050	112	4444	1.539
60	15253	3.019	113	4349	1.516
61	14864	2.988	114	4256	1.493
62	14486	2.957	115	4165	1.470
63	14119	2.926			

Temperature	Resistance	DC Volts
116	4076	1.448
117	3990	1.426
118	3906	1.405
119	3824	1.383
120	3743	1.362
121	3665	1.341
122	3589	1.321
123	3514	1.301
124	3442	1.281
125	3371	1.261
126	3302	1.241
127	3234	1.222
128	3169	1.204
129	3104	1.185
130	3041	1.166
131	2980	1.148
132	2919	1.130
133	2861	1.113
134	2804	1.095
135	2748	1.078
136	2693	1.061
137	2640	1.045
138	2587	1.028
139	2536	1.012
140	2486	0.996
141	2438	0.981
142	2390	0.965
143	2343	0.950
144	2298	0.935
145	2253	0.920
146	2210	0.906
147	2167	0.891
148	2125	0.877
149	2085	0.863
150	2044	0.849
151	2006	0.836
152	1967	0.823
153	1930	0.810
154	1894	0.797
155	1859	0.784
156	1823	0.772
157	1789	0.759
158	1756	0.747
159	1723	0.736
160	1691	0.724
161	1659	0.712
162	1629	0.701
163	1599	0.690
164	1570	0.679
165	1541	0.668
166	1512	0.658
167	1485	0.647
168	1458	0.637
169	1432	0.627
170	1406	0.617
171	1380	0.607
172	1356	0.598
173	1331	0.588
174	1308	0.579
175	1284	0.570
176	1261	0.561
177	1239	0.552
178	1217	0.543
179	1196	0.535
180	1174	0.526
181	1154	0.518
182	1133	0.510
183	1113	0.502
184	1094	0.494
185	1076	0.487
186	1057	0.479
187	1038	0.471
188	1020	0.464
189	1003	0.457
190	986	0.450
191	969	0.443
192	952	0.436
193	937	0.429
194	920	0.422
195	905	0.416
196	890	0.410
197	875	0.403
198	860	0.397
199	846	0.391
200	831	0.385
	Shorted or no power	0

ReliaTel Control – Protocol of Communication

It is possible, though not recommended, to connect multiple control devices to a ReliaTel system. The terminal strip is arranged such that simultaneous connection of ICS communication (Tracker, Tracer, Summit, VariTrac), Mechanical Zone Sensor Module (ZSM), Programmable Zone Sensor, and a conventional thermostat is possible. Of course, only one device can control the unit at a time. Following is a protocol of communication; if communication fails, the RTRM seeks the next lower priority level device. If no device is connected, the unit will not run except during the TEST MODE.

On power up, the RTRM looks for a mechanical zone sensor. If it doesn't see one, it then ignores zone sensor inputs and looks for thermostat (RGYW) inputs. A programmable zone sensor will take priority over either input when connected, and an ICS system takes the highest priority.

ICS (Tracker*, Tracer*, VariTrac, Summit*)	(highest priority)
*Using BAYSENS013, 014, 017 as needed	
Programmable Zone Sensor	
(BAYSENS019B, AYSTAT666B	(next priority)
Mechanical ZSM	
(BAYSENS006-11B, AYSTAT661-664)	(next priority)
Conventional Thermostat (R,G,Y,W,C)	(least priority)

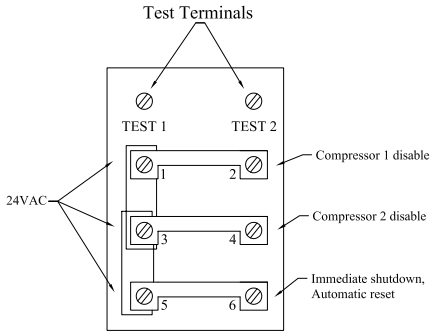
Although it's possible to connect multiple devices, doing so increases the chance for error in application and troubleshooting.

ReliaTel Test Mode

Service Test mode allows the qualified service technician or installer to activate all functions of the unit, regardless of thermostat, sensor, or ICS input. Test Mode is activated using either a fixed resistance or a jumper as explained below. In Service Test mode, the unit can be operated in any of several pre-defined operating modes that exercise all unit functions. The operating modes include Supply Fan On, Economizer open and close, Cool 1, Cool 2, Heat 1, Heat 2, Emergency Heat (heat pumps only), and Outdoor Coil Defrost (heat pump only). If a unit does not have a component, such as an economizer, that test stage is skipped.

There are 3 ways to use the Test Mode; in each case, the unit can be running in any mode or not running at all. Service Test Mode can be initiated any time the unit is powered and an open condition has been detected on the Service Test Terminal at some time since power-up.

1) Auto-Cycle Test –Place a jumper from TEST 1 to TEST 2. The unit will run in each mode for 30 seconds, scrolling through all modes, then exiting the Test mode automatically. To go through Test Mode again, remove then restore the jumper. If the jumper is removed at any time during the test mode, the unit will stay in the selected mode for 1 hour (except for the defrost mode on heat pumps), then revert to normal operation. Unused states, such as Heat 2 when no Heat 2 is present, shall be skipped.



2) Resistance Test -Specific operating states can be selected by applying an appropriate resistance from TEST 1 to TEST 2. Operating modes can be changed in any order by applying the correct resistance values. Operation in any one mode is limited to 60 minutes as with the jumper method.

Resistance Test Table:

1	Indoor fan on	2.2k ohms
2*	Economizer open	3.3k ohms
3	Cool 1	4.7k ohms
4*	Cool 2	6.8k ohms
5	Heat 1	10k ohms
6*	Heat 2	15k ohms
7*	Heat 3	22k ohms
8**	Defrost cycle	33k ohms
9*	Emergency heat	47k ohms

*optional components.

** defrost cycle in test mode runs for at least 1 minute, up to 10 minutes, depending on outdoor ambient and outdoor coil temperature.

3) Step Test - By placing a jumper from TEST 1 to TEST 2 for 2 continuous seconds nominal, allowing the unit to energize the mode for at least 2 seconds, then placing the jumper again, the unit can be scrolled through modes as in method 1 but more quickly. Unused states, such as Heat 2 when no Heat 2 is present, shall be skipped.

TEST MODE - Service Tips:

To insure appropriate unit restart after operating in Service Test mode, Service Test mode termination causes a system reset resulting in execution of the startup sequence identical to initial power-on startup.

To prevent undesired activation of Service Test mode at startup, Service Test mode can only be activated after an open condition has been detected on the Service Test terminals.

The Test Mode bypasses timing functions including minimum run times.

Test Mode does not bypass safety controls such as the high temperature limit switch, high pressure control or smoke detector circuits.

To help with troubleshooting, unplug J4 from the RTRM. This removes all optional components such as the COMM 3/4, ECA and RTOM.

Emergency Stop input, LTB 5&6 (3J1-12 on RTRM) – if this input is open, the *indoor fan, heat & cooling will not run* in the TEST MODE. There is no diagnostic output for this function.

Remote Shutdown input, J6-5, J6-6 on RTOM – if this input is closed, after minimum run times are met, all functions stop. *The indoor fan, heat & cooling will run* in the TEST MODE. There is no diagnostic output for this mode.

Fan Proving input, 5J2-6 on RTOM – if this input fails to open within 40 seconds, *only the indoor fan* will run in the TEST MODE. The diagnostic for this failure is SERVICE (pulsing 1.5 – 2.5VDC from J6-6 to J6-10).

Compressor disable inputs, 3J1-8, 3J3-2 (2 compressor units) on RTRM – if this input is open, ie. 24VAC not present, that compressor circuit will not run during TEST MODE. No diagnostic will be seen.

Compressor proving circuits, 3J1-9, 3J3-3 (2 compressor units) on RTRM – if this input is open when the contactor is energized by the RTRM, that circuit will not run during TEST MODE. The diagnostic for this failure is COOL FAIL (pulsing 1.5 – 2.5VDC from J6-6 to J6-8).

Gas heat failures, such as TCO, PS, FR (see wiring diagram) will not be bypassed during TEST MODE. Diagnostics can be picked up at the Ignition Control Module. Also, an additional diagnostic for this failure is HEAT FAIL (pulsing 1.5 – 2.5VDC from J6-6 to J6-7).

Electric/Electric Units

Step	Mode	IDM	Econ	CPR1	CPR2	HT1	HT2	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	**
5 *	Heat 1	On	Min	Off	Off	On	Off	Off	Off
6 *	Heat 2	On	Min	Off	Off	On	On	Off	Off

* With Optional Accessory
** "Off" If temperature falls below 60° (±2°)F, "On" if temperature rises above 65° (±2°)F.
Note: Steps for optional accessories and modes not present in unit will be skipped.

Heat Pump Units

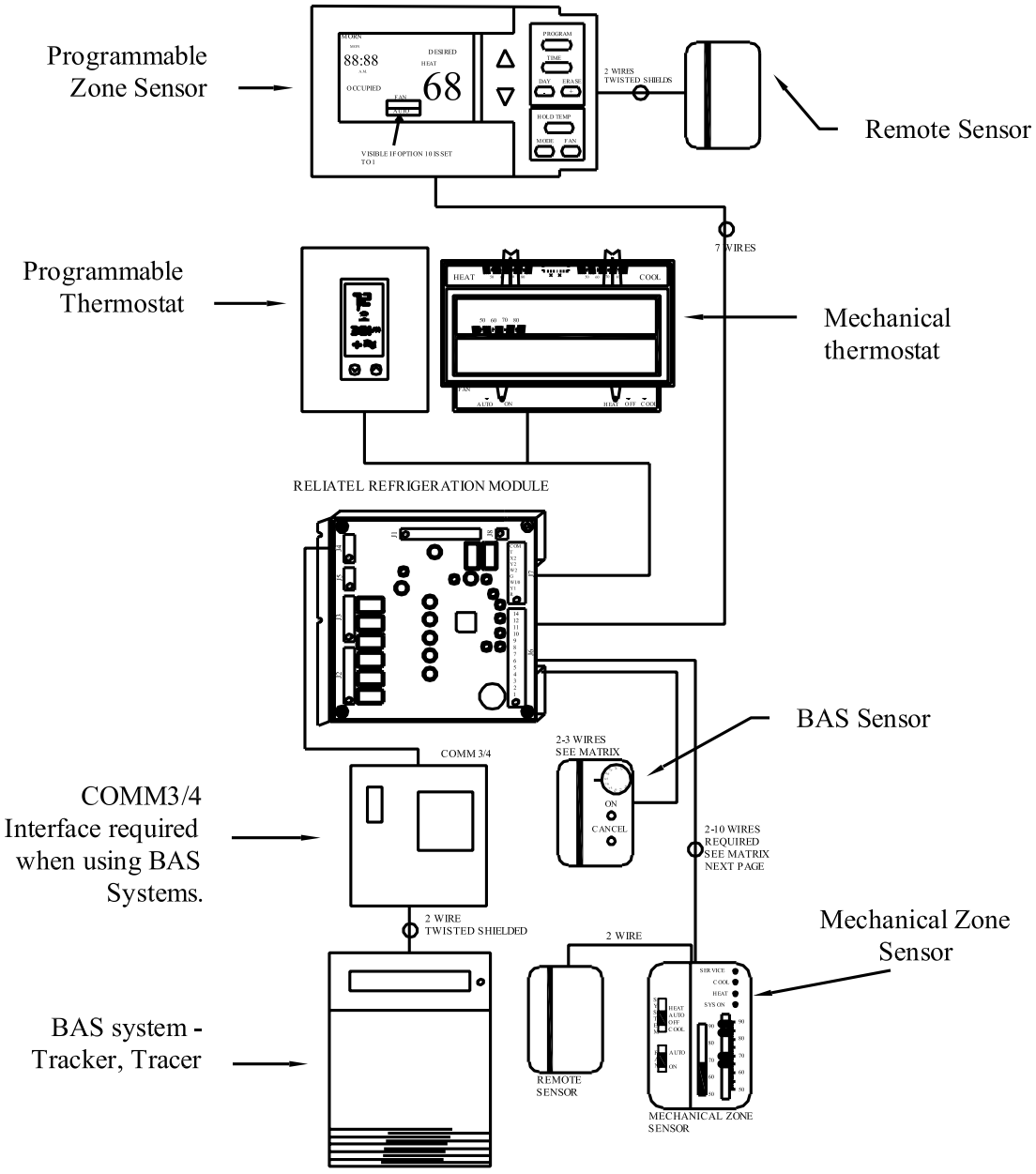
Step	Mode	IDM	Econ	CPR1	CPR2	AUX HT1	AUX HT2	SOV	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	On	**
5	Heat 1	On	Min	On	On	Off	Off	Off	On	On
6 *	Heat 2	On	Min	On	On	On	Off	Off	On	On
7 *	Heat 3	On	Min	On	On	On	On	Off	On	On
8***	Defrost	On	Min	On	On	On	On	On	Off	Off
9	Em Heat	On	Min	Off	Off	On	On	Off	Off	Off

* With Optional Accessory
** "Off" If temperature falls below 60° (±2°)F, "On" if temperature rises above 65° (±2°)F.
*** defrost cycle in test mode runs for at least 1 minute, up to 10 minutes, depending on outdoor ambient and outdoor coil temperature
Note: Steps for optional accessories and modes not present in unit will be skipped.

Gas/Electric Units

Step	Mode	IDM	Econ	CPR1	CPR2	HT1	HT2	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	**
5	Heat 1	On	Min	Off	Off	On	Off	Off	Off
6	Heat 2	On	Min	Off	Off	On	On	Off	Off

* With Optional Accessory
** "Off" If temperature falls below 60° (±2°)F, "On" if temperature rises above 65° (±2°)F.
Note: Steps for optional accessories and modes not present in unit will be skipped.

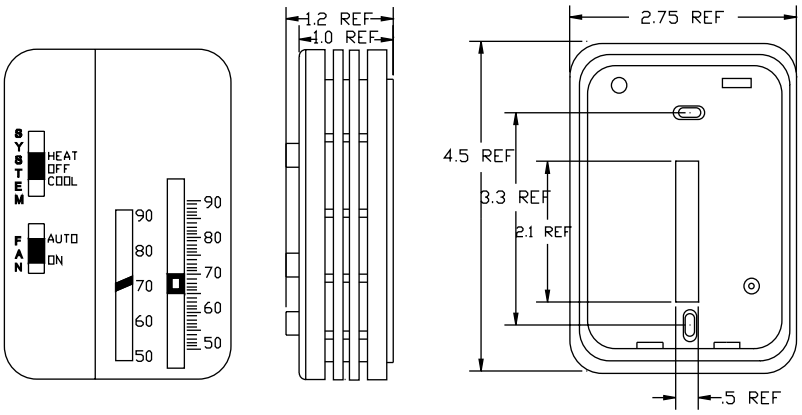

Programmable Zone Sensor
2 WIRES TWISTED SHIELDS
Remote Sensor
7 WIRES
Programmable Thermostat
Mechanical thermostat
RELIATEL REFRIGERATION MODULE
BAS Sensor
COMM 3/4
2-3 WIRES SEE MATRIX
COMM3/4 Interface required when using BAS Systems.
2-10 WIRES REQUIRED SEE MATRIX NEXT PAGE
2 WIRE TWISTED SHIELDED
2 WIRE
Mechanical Zone Sensor
BAS system - Tracker, Tracer
REMOTE SENSOR
MECHANICAL ZONE SENSOR

ReliaTel Zone Sensor Modules

Accessory Model #	Zone Sensor Module Description	Required # Conductors	Terminal Connections at J6
Heat/Cool			
BAYSENS006B ASYSTAT661B	Single Set Point Manual Change Over	4	1,2,3,4
BAYSENS008B ASYSTAT663B	Dual Set Point Manual / Auto Change Over	5	1,2,3,4,5
BAYSENS010B	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
BAYSENS019B ASYSTAT666B	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10, 11,12,14, (7-10 are optional)
BAYSENS017B	Remote sensor	2	1, 2
BAYSENS032	Averaging Remote sensor (2 required)	2	1, 2
Heat Pump			
BAYSENS007B ASYSTAT662B	Single Set Point Manual Change Over	6	1,2,3,4, 6,7
BAYSENS009B ASYSTAT664B	Dual Set Point Manual / Auto Change Over	7	1,2,3,4,5, 6,7
BAYSENS011B	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
BAYSENS019B ASYSTAT666B	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10, 11,12,14, (7-10 are optional)
BAYSENS017B	Remote sensor	2	1, 2
BAYSENS032	Averaging Remote sensor (2 required)	2	1, 2
Tracer / Tracker ICS			
BAYSENS013C	Override Sensor with Override / Cancel	2	1,2
BAYSENS014C	Override Sensor with Set Point and Override / Cancel	3	1,2,3

BAYSENS006B/ASYSTAT661B

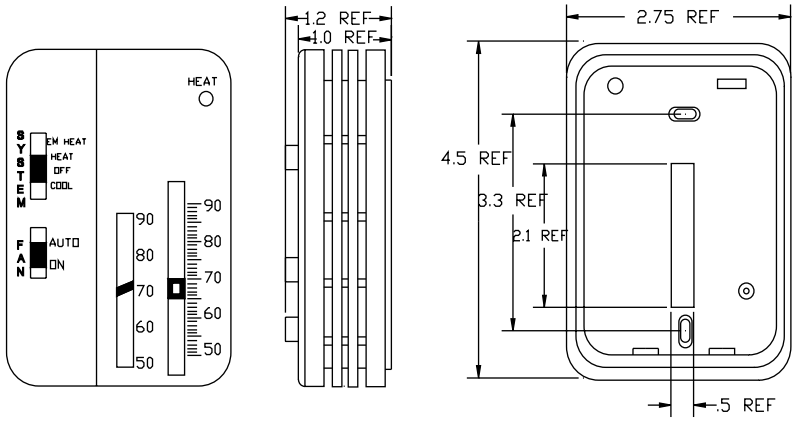
Accessory Heat / Cool Zone Sensor Module (ZSM), single set point, manual change over. Four conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS006B [Sunne part# 62822]	SEN-0410
ASYSTAT661B [Sunne part# 62830]	SEN-0417

BAYSENS007B / ASYSTAT662B

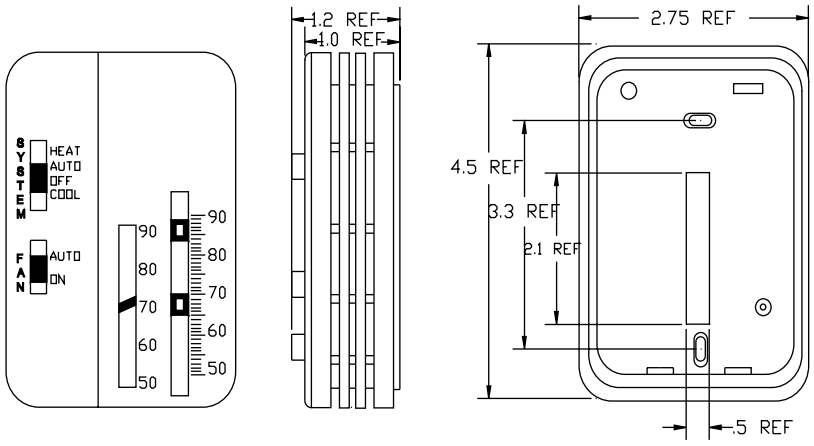
Accessory Heat Pump Zone Sensor Module (ZSM), single set point, manual change over. Six conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS007B [Sunne part# 62821]	SEN-0411
ASYSTAT662B [Sunne part# 62831]	SEN-0418

BAYSENS008B / ASYSTAT663B

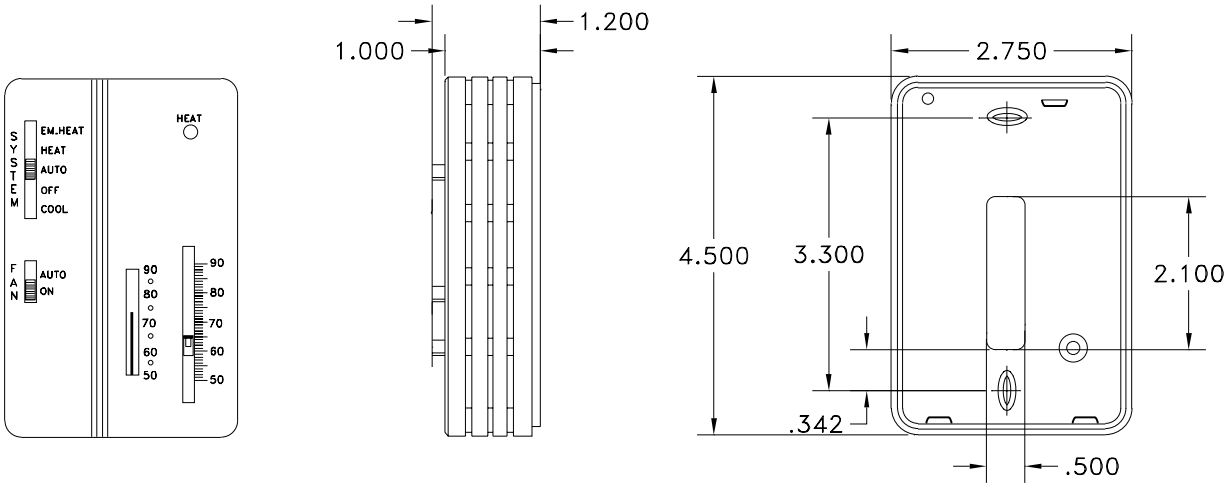
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point, manual / auto change over. Five conductors required. Manufactured by Sunne, introduced 12/93



Component Description	Part Number
BAYSENS008B [Sunne part# 62826]	SEN-0408
ASYSTAT663B [Sunne part# 62833]	SEN-0419

BAYSENS009B / ASYSTAT664B

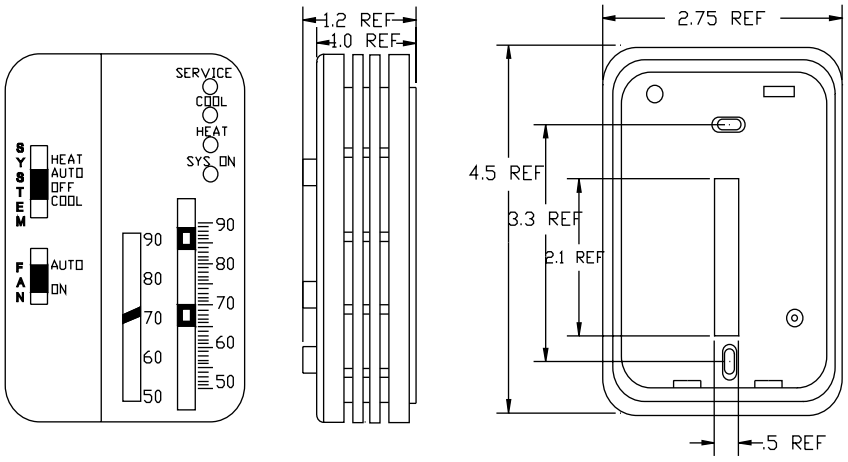
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point, manual / auto change over. Seven conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS009B [Sunne part# 62825]	SEN-0412
ASYSTAT664B [Sunne part# 62832]	SEN-0420

BAYSENS010B

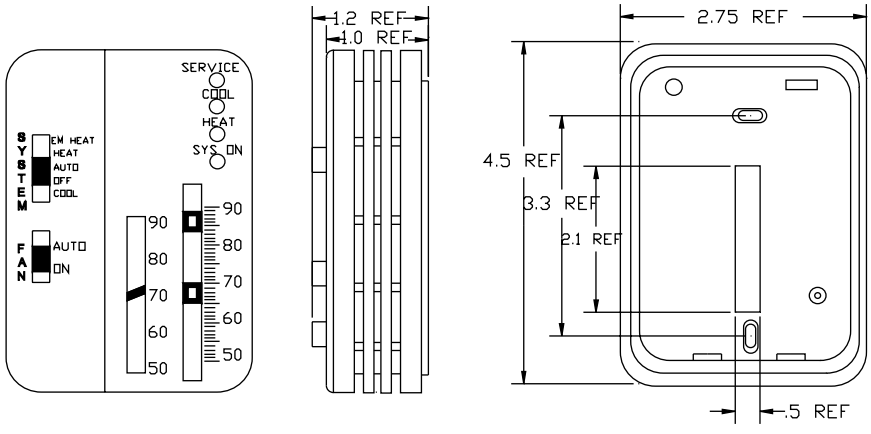
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto change over. Ten conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS010B [Sunne part# 62823]	SEN-0413

BAYSENS011B

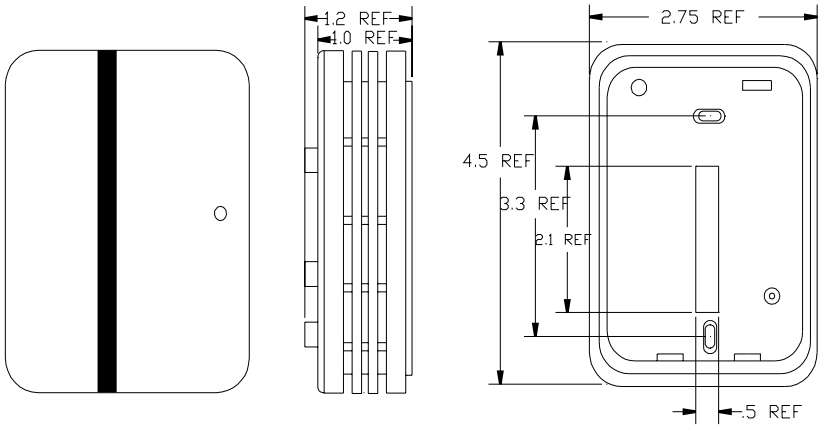
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto change over. Ten conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS011B [Sunne part# 62824]	SEN-0414

BAYSENS013C

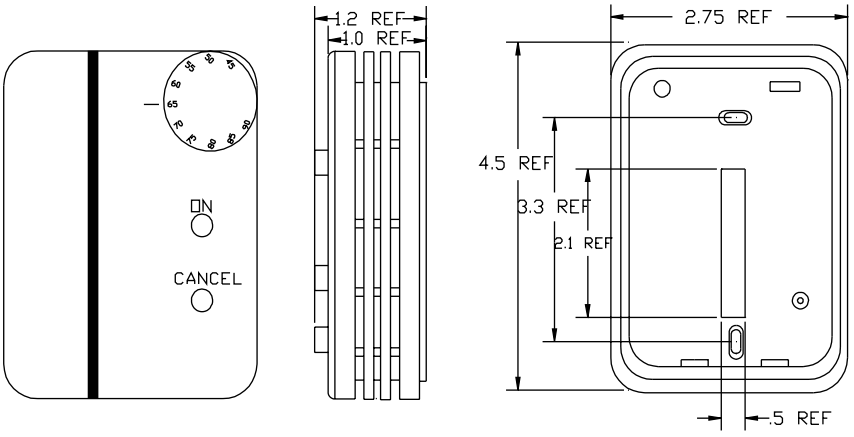
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button, and override cancel button. Two conductors required. Manufactured by Sunne, introduced 08/95.



Component Description	Part Number
BAYSENS013C [Sunne part# 65464]	SEN-0495

BAYSENS014C

Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button, set point, and override cancel button. Three conductors required. Manufactured by Sunne, introduced 08/95.



Component Description	Part Number
BAYSENS014C [Sunne part# 65465]	SEN-0496

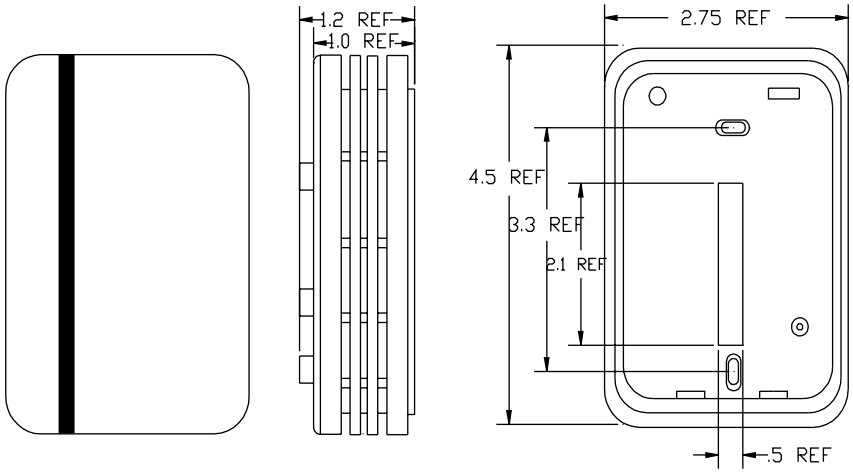
BAYSENS016A
Thermistor Sensor (OAS, SAS, RAS, CTS)

Outdoor Air Sensor: Located in the condenser section, lower left corner. The compressor access panel has a slotted opening to provide airflow across the sensor. Standard with all ReliaTel controlled units.
Return Air Sensor: Field or factory installed accessory. Located on the return air damper of the economizer, used with comparative enthalpy control only.
Coil Temperature Sensor: Located in a 3/8" copper tube well, which is brazed to the lowest circuit entering the outdoor coil (2-10 ton heat pumps only).
Mixed Air Sensor: Field or factory installed in the supply fan section, protruding through the fan housing.
Discharge Air Sensor: Field or factory installed in the supply fan section, using an averaging tube located downstream of the heat section.

Component Description	Part Number
Thermistor Sensor (OAS, SAS, RAS, MAS, CTS)	SEN-0339

BAYSENS017B / ASYSTAT669A

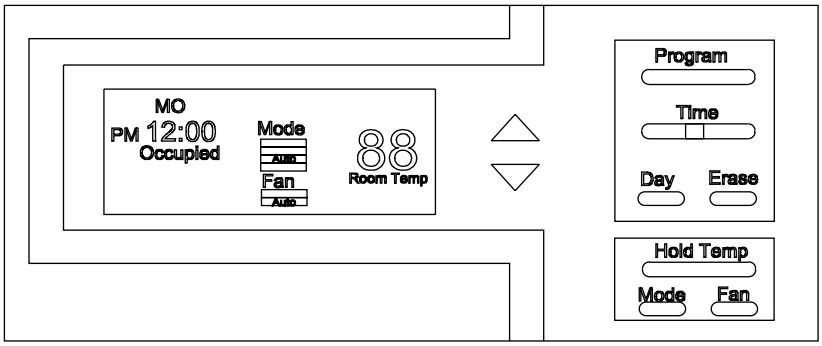
Accessory Zone Sensor Remote, used with all current zone sensors. Two conductors required.
Manufactured by Sunne, introduced 12/93



Component Description	Part Number
BAYSENS017B [Sunne part# 62828]	SEN-0435
ASYSTAT669A [Sunne part# 65541]	SEN-0493

BAYSENS019B / ASYSTAT666B
(CV 3-50 Ton)

Accessory Heat/Cool, programmable night set back Zone Sensor Module (ZSM), with LCD status / diagnostic indicators. Seven conductors: terminals 11, 12 & 14 required, 7 through 10 optional. Manufactured by Caradon, introduced 06/98.



Component Description	Part Number
BAYSENS019B [Caradon part# 91K91]	SEN-0874
ASYSTAT666B [Caradon part# 91K92]	SEN-0907

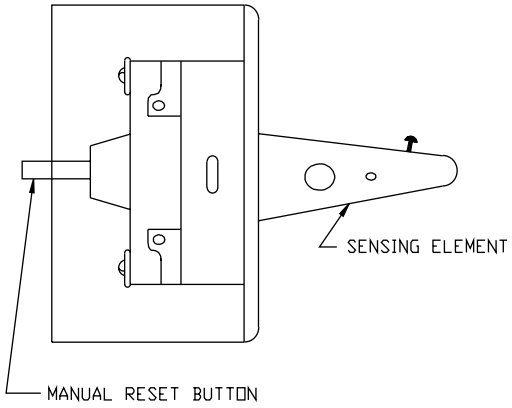
High Temperature Sensor

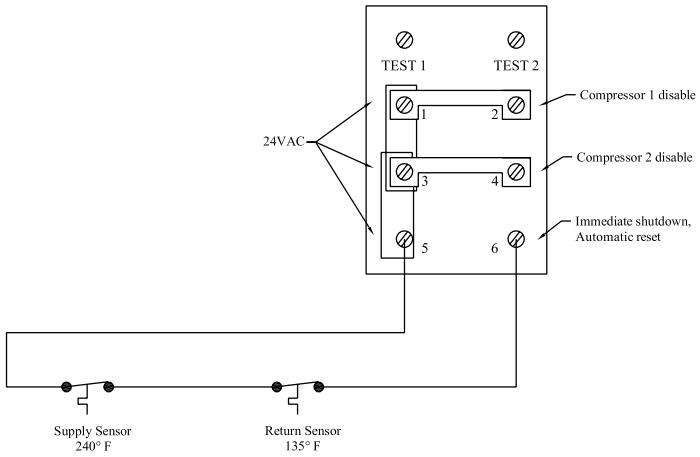
The high temperature sensor accessory (BAYFRST001A) provides high limit cutout with manual reset in ICS device Tracer / Tracker / ComforTrac / VariTrac systems. The sensors are wired to the LTB5 and LTB6 in the control panel. Jumper must be removed.

The sensors may be used to detect excessive heat in air conditioning or ventilation ducts and provide system shut down. Immediately after sensor opens, the associated unit will completely shut down. The sensors come with case and cover, and mount directly to the ductwork. There are two sensors that are included in the accessory. Both sensors are factory set; one opens at 135° F. and should be installed in the return air duct, the other opens at 240° F. and should be installed in the supply duct.

Note: This accessory can also be applied in Non-ICS applications. The wiring on the unit is the same. The unit will shut down immediately when the sensor opens.

To reset a sensor which has opened, push and release the button protruding through the cover. See reset button. The sensor temperature must drop 25° F. below the cut out point before it will reset.
There are no field adjustments that can be made to the sensor; if a problem exists, the sensor must be replaced.
Part Number "CNT-0637" = 135° F. sensor. Part Number "CNT-0638" = 240° F. sensor





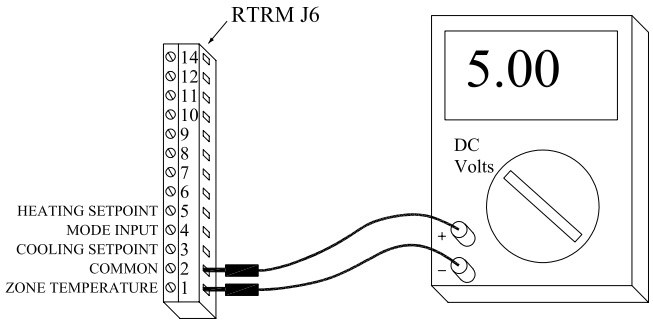
Component Description	Part Number
BAYFRST001A	CNT-0637 & CNT-0638

ReliaTel ZSM Testing: Zone Temperature Input

BAYSENS006–11, 14, 17/AYSTAT661–664

Terminals to read voltage:
RTRM J6-1, J6-2

Read DC voltage with the sensor attached. If voltage does not appear to be correct, read the resistance of the circuit, then the sensor itself, to see if a problem exists in the sensor or the wiring. With the sensor not attached there should be 5.00 VDC at the terminals as shown.



Temp	Resistance	DC Volts	Temp	Resistance	DC Volts
40	26097	3.613	68	12435	2.770
41	25383	3.585	69	12126	2.739
42	24690	3.557	70	11827	2.708
43	24018	3.528	71	11535	2.677
44	23367	3.500	72	11252	2.646
45	22736	3.471	73	10977	2.616
46	22123	3.442	74	10709	2.585
47	21530	3.412	75	10448	2.554
48	20953	3.383	76	10194	2.523
49	20396	3.353	77	9949	2.493
50	19854	3.324	78	9710	2.462
51	19330	3.294	79	9477	2.432
52	18821	3.264	80	9250	2.402
53	18327	3.233	81	9030	2.372
54	17847	3.203	82	8815	2.342
55	17382	3.173	83	8607	2.312
56	16930	3.142	84	8404	2.283
57	16491	3.111	85	8206	2.253
58	16066	3.080	86	8014	2.224
59	15654	3.050	87	7827	2.195
60	15253	3.019	88	7645	2.166
61	14864	2.988	89	7468	2.137
62	14486	2.957	90	7295	2.109
63	14119	2.926	91	7127	2.080
64	13762	2.895	92	6963	2.052
65	13416	2.864	93	6803	2.024
66	13078	2.832	94	6648	1.996
67	12752	2.801	95	6497	1.969

Problems to look for:

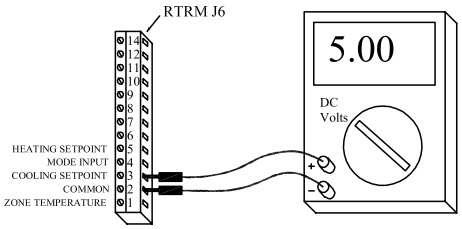
- Miswire/short/open
- Excessive resistance in circuit (corroded or loose connection)
- Sensor inaccurate (should be +- 2F of chart)
- Moisture in sensor (becomes accurate when dry)
- Induced voltage (high voltage wires in same conduit)

Service Tips:
To check for induced voltage, read AC voltage to ground from each sensor wire. Should be less than 1 VAC.

ReliaTel Setpoint\Mode Inputs –Mechanical Zone Sensor Module

BAYSENS006–11, 14, 17, AYSTAT661–664
Setpoint Inputs

	Read voltage here	or here
Cooling setpoint	RTRM J6-3	ZSM terminal 3
Heating setpoint	RTRM J6-5	ZSM terminal 5
Common	RTRM J6-2	ZSM terminal 2



Read DC voltage with Zone Sensor Module (ZSM) attached. If voltage read does not appear to be correct, read the resistance of the circuit, then the ZSM itself, to see if a problem exists in the ZSM or the wiring. With the ZSM not attached there should be 5.00 VDC at the terminals as shown. To check for induced voltage, read AC voltage to ground from each sensor wire. Should be less than 2VAC.

Temp °F	Resistance	DC Voltage
	Open	5.00 (open circuit)
40.0	1084.1	2.601
41.0	1065.6	2.579
42.0	1047.2	2.557
43.0	1028.7	2.535
44.0	1010.2	2.513
45.0	991.8	2.490
46.0	973.3	2.466
47.0	954.8	2.442
48.0	936.3	2.418
49.0	917.9	2.393
50.0	899.4	2.368
51.0	878.7	2.338
52.0	858.0	2.309
53.0	837.3	2.278
54.0	816.6	2.247
55.0	795.8	2.216
56.0	775.1	2.183
57.0	754.4	2.150
58.0	733.7	2.116
59.0	714.2	2.083
60.0	694.8	2.050
61.0	675.3	2.015
62.0	655.8	1.980
63.0	636.3	1.944
64.0	616.9	1.908
65.0	597.4	1.870
66.0	577.9	1.831
67.0	558.4	1.792
68.0	539.0	1.751
69.0	519.5	1.709
70.0	500.0	1.667
71.0	480.5	1.623
72.0	461.0	1.578
73.0	441.6	1.532
74.0	422.1	1.484
75.0	402.6	1.435
76.0	383.2	1.385
77.0	363.7	1.333
78.0	344.2	1.280
79.0	324.7	1.226
80.0	305.3	1.169
81.0	285.8	1.111
82.0	266.3	1.051
83.0	246.8	0.990
84.0	227.3	0.926
85.0	207.9	0.860
86.0	188.4	0.793
87.0	168.9	0.723
88.0	149.5	0.650
89.0	130.1	0.575
90.0	110.6	0.498
(shorted/ no power)		0.000

Problems to look for:

- Miswire/short / open
- Excessive resistance in circuit (corroded or loose connection)
- Setpoint lever inaccurate (should be +- 2F of chart)
- Induced voltage (high voltage wires in same conduit)

Mode Input:

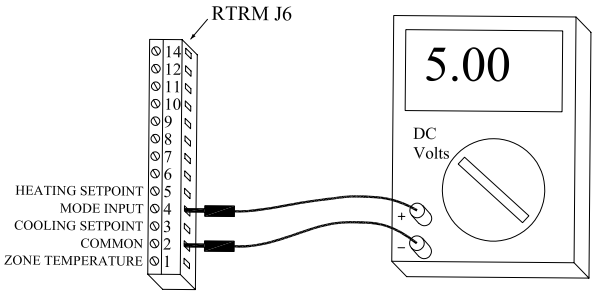
Mode Input	RTRM J6-4	ZSM terminal 4
Common	RTRM J6-2	ZSM terminal 2

Read DC voltage with Zone Sensor Module (ZSM) attached. If voltage read does not appear to be correct, read the resistance of the circuit, then the ZSM itself, to see if a problem exists in the ZSM or the wiring. With the ZSM not attached there should be 5.00 VDC at the terminals listed above. To check for induced voltage, read AC voltage to ground from each sensor wire. Should be less than 2VAC.

Problems to look for:

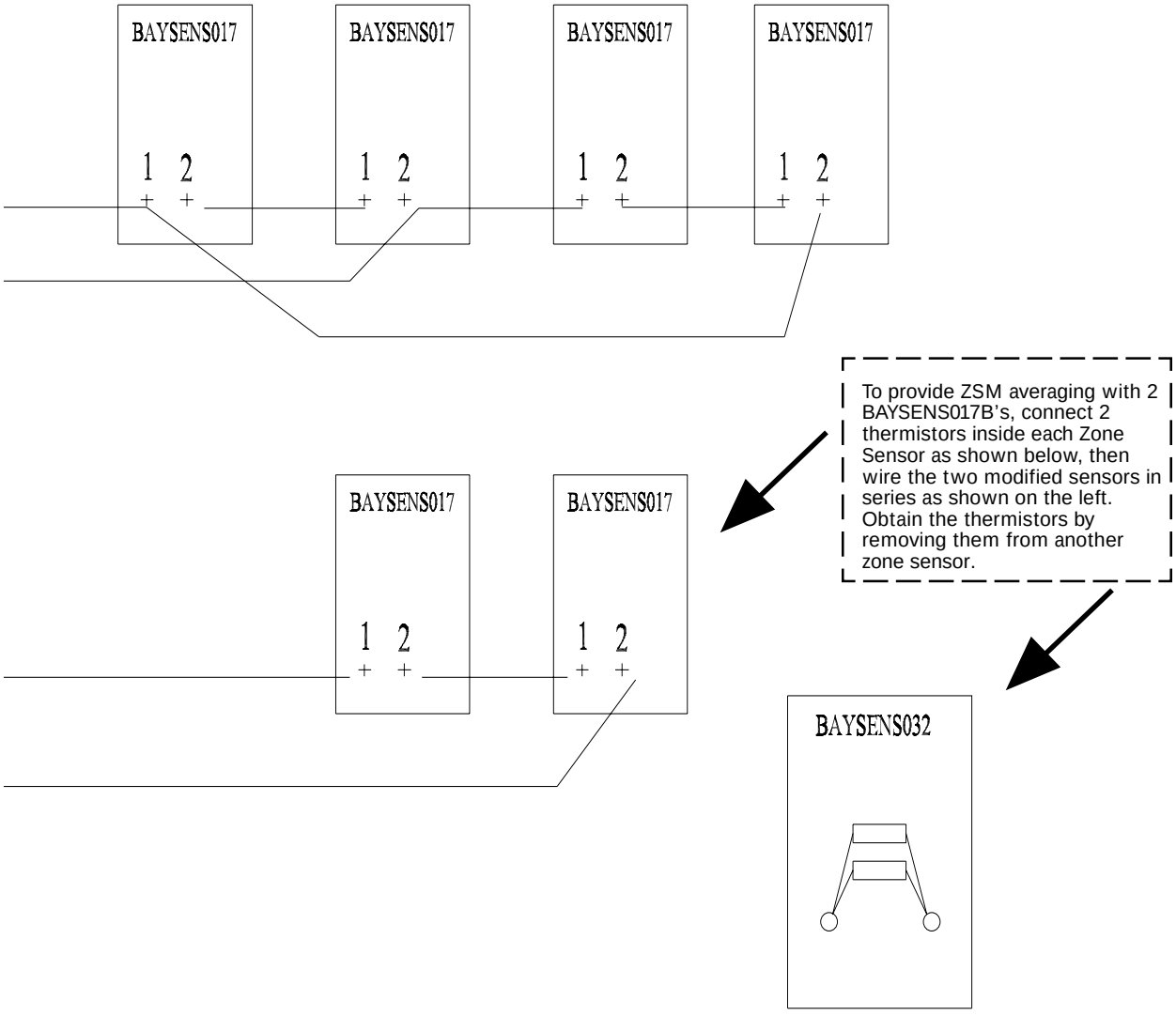
- Miswire/short/open
- Excessive resistance in circuit (corroded or loose connection)
- Induced voltage (high voltage wires in same conduit)

System Switch	**Fan** Switch	**Ohms** Rx1K	**Volts** DC+- 5%
Short to common		0	0.00
OFF	AUTO	2.32	0.94
COOL	AUTO	4.87	1.64
AUTO	AUTO	7.68	2.17
OFF	ON	10.77	2.59
COOL	ON	13.32	2.85
AUTO	ON	16.13	3.08
HEAT	AUTO	19.48	3.30
HEAT	ON	27.93	3.68
EM HEAT	AUTO	35.00	3.88
EM HEAT	ON	43.45	4.06
Open circuit			5.00



ReliaTel - Zone Sensor Averaging

In some applications, 1 zone sensor does not give a good representation of zone temperature. The internal thermistors, 10K ohm resistance @ 25C/77F, can be wired as shown below in order to provide an average input to the mechanical or programmable Zone Sensor Module (BAYSENS006-11/AYSTAT661-663, BAYSENS019B/AYSTAT666B). If using a Programmable ZSM, the remote sensor wiring must be twisted/ shielded. Connect the shield to terminal J6-11.



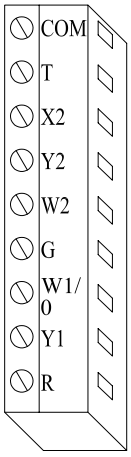
ReliaTel Operation with a Conventional Thermostat

The ReliaTel module has conventional thermostat connections as well as Zone Sensor Module connections. When a conventional thermostat is controlling the unit, operation differs as follows.

- Supply Air Tempering feature is not available. If outdoor air is being introduced through the equipment, discharge air temperature may be cold when not actively heating.
- Proportional Integral (PI) control is not available.
- Zone Sensor Diagnostics are only available on the RTRM module on the J6 terminals, instead of at the Zone Sensor in the space.
- Intelligent Fall-Back is not available. If a failure occurs in the device controlling the equipment, operation will cease.
- Heat Pump Smart Recovery and Smart Staging is not available. Heat Pump operation becomes more costly unless the generic control being applied can accomplish this.
- Remote Sensing Capabilities are not available on most mechanical thermostats.
- Space Temperature Averaging capabilities are not available on most mechanical thermostats.
- Built in Night Set Back and Unoccupied Functions function differently with a conventional mechanical thermostat.
- A built-in algorithm which allows for automatic reset of the discharge air temperature while economizing is not available.

The terminal strip for attaching the thermostat wires is located on the RTRM module in the control compartment.

The purpose of each terminal is discussed in the next section.



ReliaTel Control – Conventional Thermostat Operation

Customers occasionally require operation with a conventional thermostat rather than a zone sensor. In some cases there is a preference for a specific thermostat model, and in others there is reluctance to adopt newer technology that may not be as well understood as conventional thermostats. In addition, non-Trane Building Controllers typically provide an interface to HVAC equipment based on a conventional thermostat interface. Units applied with this type of controller need to accept conventional thermostat inputs.

Conventional thermostat signals represent direct calls for unit functions. In their simplest applications, thermostat contacts directly control contactors or other load switching devices. This function provides inputs for the thermostat signals and processing to enhance reliability and performance. Compressor protection and reliability enhancement functions (HPC, LPC, Minimum On/Off timers, etc.) all operate the same whether applied with zone sensors or a conventional thermostat. Logic is also provided to cause appropriate unit functions when inappropriate thermostat signals are provided. Simultaneous calls for heating and cooling will be ignored, and the fan will be turned on with a call for heating or cooling even if the fan request is not detected.

Thermostat signals are as follows:

R 24VAC power to thermostat
Y1 Call for compressor 1 or first stage cooling
Y2 Call for compressor 2 or 2nd stage cooling
G Call for supply fan
W1 Call for heat 1
W2 Call for heat 2

Heat pump only:

X2 Call for emergency heat
O Switchover valve On = cooling, Off = heating
T Bias for heat anticipation for those mechanical thermostats that use this function

Conventional thermostat – Gas/ Electric, Electric Heat:

Input/connection	Function when energized:
G (fan)	Fan runs continuously except during unoccupied mode (see next page)
Y1 (compressor 1 or economizer)	Compressor #1 runs or economizer operates
Y2 (compressor 2 or compressor 1 while economizing)	Compressor #2 also runs, or #1 compressor runs while economizing
W1 (gas / electric heat first stage)	1st stage heat
W2 (gas / electric heat 2nd stage)	2nd stage heat (if available)

Conventional thermostat – Heat Pump

Input/connection	Function when energized
Cooling mode:	
G (fan)	Fan runs continuously except during unoccupied mode (see next page)
O (reversing valve during cooling)	Reversing valve in cool mode
Y1 + O (first stage cooling)	Compressor #1 runs or economizer operates
Y1 + Y2 + O (2nd stage cool)	Compressor #2 also runs, or #1 compressor runs while economizing.

Heating mode:

G (fan)	Fan runs continuously except during unoccupied mode (see below)
Y1 (both compressors 1st stage heat)	Both compressors run
Y2 (during heating – nothing happens)	No change
W2 (electric heat 2nd stage)	2nd stage (electric) heat
X2 (electric heat only)	Electric heat only – no compressors

T (provides heat anticipation signal for those mechanical thermostats that use this feature. If the thermostat used does not have a "T" terminal, disregard this terminal.

Unoccupied mode: If the thermostat being used is programmable, it will have its own strategy for unoccupied mode and will control the unit directly. If a mechanical thermostat is being used, a field applied time clock with relay contacts connected to J6-11 and J6-12 can initiate an unoccupied mode as follows:

Contacts open: Normal occupied operation.
Contacts closed: Unoccupied operation as follows -
Fan in auto mode regardless of fan switch position.
Economizer closes except while economizing regardless of minimum position setting.

Cooling/Economizer Operation:

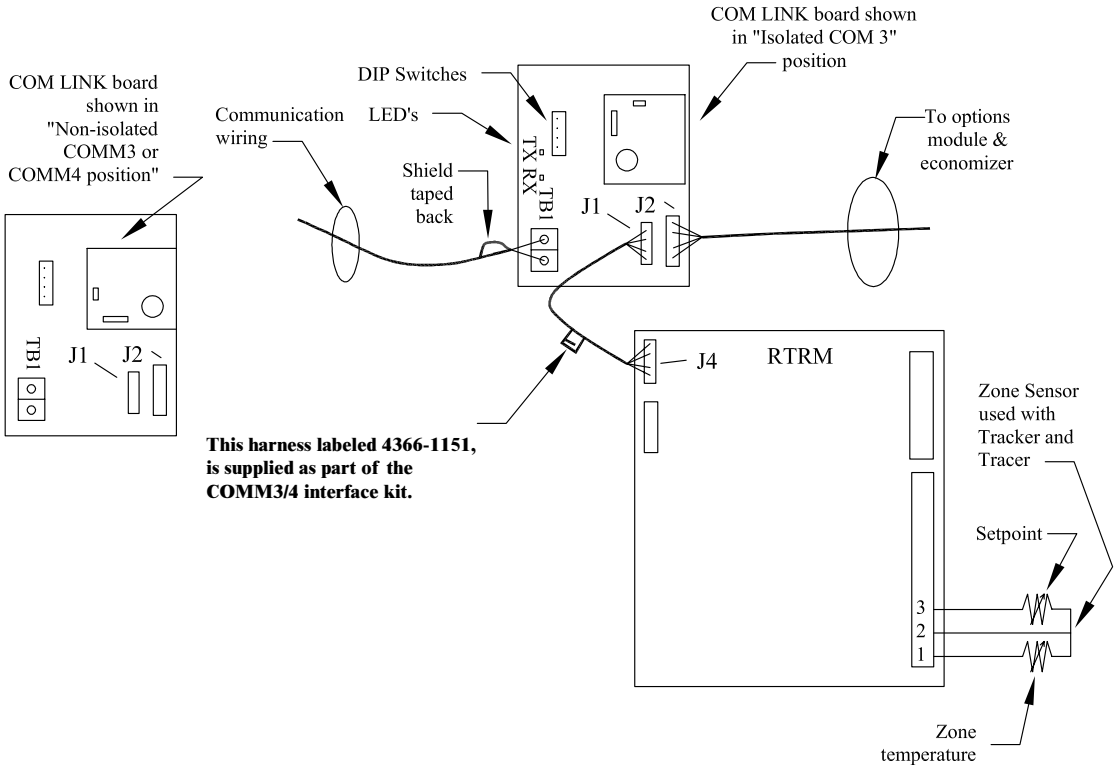
If an economizer is not available on the unit, the Cool/Econ Stage 1 and Stage 2 will call directly for mechanical cooling (compressor) stages. If an economizer is available, the Cool/Econ stages will function as follows.

Cooling/Economizer Operation with Thermostat

OK to Economize ?	Thermostat Y1	Thermostat Y2	Call for Economizer Cooling	Compressor Staging Request
No	On	Off	Inactive	Compressor Output 1
No	Off	On	Inactive	Compressor Output 2
No	On	On	Inactive	Compressor Outputs 1 & 2
Yes	On	Off	Active	Off
Yes	Off	On	Active	Compressor Off
Yes	On	On	Active	Compressor Output 1

COMM3/4 Interface Operation & Troubleshooting

Wiring:
The COMM3/4 board communicates with the RTRM via the MODBUS link using the harness, labeled 4366-1151. The connections to the board are shown below.
Communication wires must be twisted/shielded as specified by the BAS system being applied. Do not attach the shield to the COMM3/4 board. It must be taped back to prevent it from touching the unit.



LED's:
Amber receive (RX) LED: Blinks whenever communication is occurring with any device. This tells the service technician that the BAS system is communicating or trying to communicate with other devices as well as this one.

Green transmit (TX) LED: Blinks once every several seconds, sometimes up to 45 seconds between blinks, when the unit is sending data to the BAS system. This tells the service technician that this unit is communicating information to the BAS system. When the TX LED is blinking, the unit is communicating.

Communication problems:

Won't communicate with Tracker STAT4, STAT7, STAT16:

- Harness, labeled 4366-1151, must be plugged into RTRM correctly – see previous page.
- Com Link board must be in "ISOLATED COM 3" position. If it is in the wrong position or not installed, the unit will not communicate.
- Each unit must have a unique address by setting the DIP switches according to the IOM. If 2 units have the same address, neither will communicate. If the unit has a DIP switch setting other than the ones specified in the IOM, Tracker will not recognize it.
- Once the unit communicates with Tracker, the Tracker panel will automatically recognize th unit.

Won't communicate with Tracer SUMMIT:

- Harness, labeled 4366-1151, must be plugged into RTRM correctly – see previous page.
- Com Link board must be in "NON ISOLATED COM 3 or COM4" position. If it is in the wrong position or not installed, the unit will not communicate.
- Each unit must have a unique address by setting the DIP switches according to the IOM. If 2 units have the same address, neither will communicate. If the unit has a DIP switch setting other than the ones specified in the IOM, Tracer will not recognize it.
- Once the unit communicates with Tracer, the Tracer panel will automatically recognize the unit.

Won't communicate with VariTrac CCP zoning system:

- Harness, labeled 4366-1151, must be plugged into RTRM correctly – see above.
- Com Link board must be in "NON ISOLATED COM 3 or COM4" position. If it is in the wrong position or not installed, the unit will not communicate.
- The DIP switches must all be in the ON position. If not, The VariTrac CCP will not recognize it.
- The communication wires must be in the same daisy chain link as the dampers.
- New VariTrac - All dip switches are off.

Communicates but will not run, even in TEST mode:

- Emergency stop input is open (RTRM 3J1-12). There is no diagnostic when this occurs.

Communicates but will not run; fan (but not heating or cooling) runs in TEST mode:

- Fan proving circuit (RTOM 5J7-6) is closed; should open when fan is on. If not, only the fan will run in TEST mode.

Communicates but will not run compressor(s); fan and heating run in TEST mode:

- Compressor disable circuit(s) (RTRM 3J1-8, 3J3-2) open due to loss of charge or LTB jumper removal.

Communicates but will not run compressors, yet everything runs in TEST mode:

- FROSTAT circuit (RTOM 5J7-2) is closed; should open when indoor coil is frost free. There is no diagnostic output when this occurs.

ReliaTel Direct Spark Ignition Control – Texas Instruments

This microprocessor based, communicating solid state device provides gas valve control, proof of ignition, ignition retries, 1 hour reset, operation of the inducer and indoor fan, and diagnostics through an LED as well as communication to the refrigeration module. Inputs to the control include a pressure switch, rollout switch and limit switch as well as a flame proving circuit. This device takes control of the ignition, timings related to the ignition cycle, and supervision of the gas components.

The RTRM controls all functions via a MODBUS communication link.

The remote flame sensor is located on the top burner which ensures that all burners are lit. Field measured flame sensor voltage can vary significantly due to the construction of typical voltmeters used.

The control has a 20 second pre-purge cycle as well as a 60 second inter-purge between cycles should a flame not be established on the first try.

Voltage range	18-32 VAC, 50/60Hz
Power consumption	350mA @ 24vac
Spark Voltage	25,000 volts max @ 10-13 mJ
Flame sense voltage	Nominal 90Vrms
Flame sense signal	Nominal 4.5 micro amps, minimum 1.2 micro amps
Pre-purge	20 seconds
Post-purge	5 Seconds
Inter-purge	60 seconds
Flame establishment period	2 to 7 seconds
Flame failure response time	0.8 seconds
Loss of flame lockout	3 tries, locks out after 3rd try
Lockout reset	Interrupt signal for 3 seconds minimum
Auto reset	1 hour
Loss of communication (with RTRM) lockout	10 seconds

Ignition Module Diagnostics

The ignition module has a green LED for diagnostics:

—Steady light ..... Module is powered up, but no active call for heat.
—Blinking at continuous steady rate ..... Active call for heat.
—One blink ..... Loss of communication.
—Two blinks ..... System lockout (failure to ignite, no spark, low/no gas pressure, etc.
—Three blinks ..... Pressure switch (no vent air flow, bad CBM, closed at initial call for heat). Auto reset.
—Four blinks ..... High limit (excessive heat in combustion chamber, low airflow). Auto reset.
—Five blinks ..... Flame sensed and gas valve not energized or flame sensed and no call for heat.
—Six blinks ..... Flame rollout (CBM failure, incorrect gas pressure, incorrect primary air). *Requires manual reset of the switch.*
—ReliaTel module will communicate a heat fail diagnostic back to the RTRM.

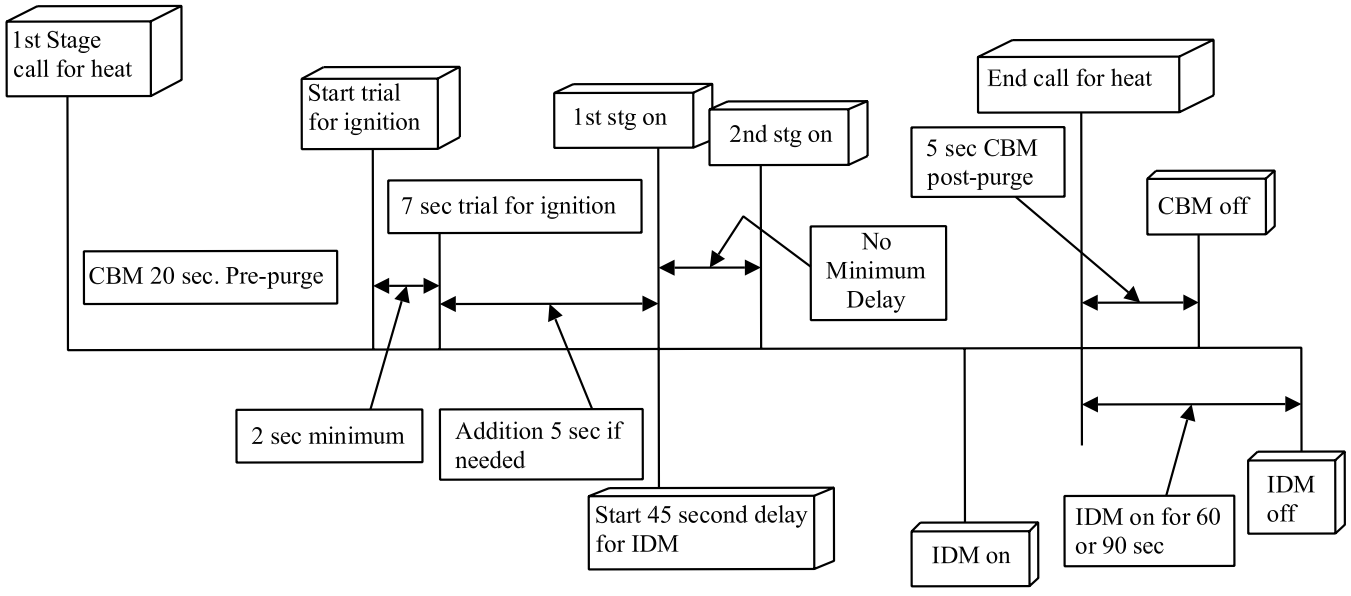
ReliaTel Direct Spark Ignition Control – Sequence of Operation

1-stage units

Ignition control (IGN) runs a self check (including verification that the gas valve is de-energized). IGN checks the high limit switch (TCO 1) for closed contacts, the pressure switch (PS) for open contacts, flame rollout (FR) for closed contacts.
IGN energizes inducer blower. When PS closes, 20 second pre-purge begins. After 20 seconds, the IGN energizes the spark and gas valve at the same time. The spark will stay energized for at least 2 seconds attempting to establish flame. If a flame is not established, the spark will continue up to 7 seconds. Once a flame is established, spark is de-energized and indoor blower motor (IBM) timing begins. 45 seconds later, the RTRM energizes the IBM. When the zone sensor or thermostat is satisfied, the gas valve is de-energized, the inducer runs for 5 seconds then stops (post-purge), and the IBM runs for 60 seconds then stops unless being requested to run continuously.

2-stage units

Ignition control (IGN) runs a self check (including verification that the gas valve is de-energized). IGN checks the high limit switches (TCO 1 &TCO 2) for closed contacts, the pressure switch (PS) for open contacts, flame rollout (FR) for closed contacts.
IGN energizes inducer blower on high speed. When PS closes, 20 second (15 seconds on high, 5 seconds on low) pre-purge begins. After 20 seconds, the IGN energizes the spark and gas valve at the same time. The spark will stay energized for at least 2 seconds attempting to establish flame. If a flame is not established, the spark will continue up to 7 seconds. Once a flame is established, spark is de-energized and indoor blower motor (IBM) timing begins. 45 seconds later, the RTRM energizes the IBM. If deviation from setpoint is great enough, there is no minimum delay before 2nd stage is energized. When the zone sensor or thermostat is satisfied, the gas valve is de-energized, the inducer runs for 5 seconds then stops (post-purge), and the IBM runs for 60 seconds then stops unless being requested to run continuously



3-5 Ton Gas Heat Specifications — Low Heat

Model Number Digit18 =(B,C) Denotes Through the Base Gas	Y#C036A#L	Y#C048A#L	YSC060A#L	YHC060A#L
Unit Size (Tonnage)	3	4	5	5
Cabinet Size	A	A	A	B
Input (BTUh)	60000	60000	60000	60000
Output (BTUh)	48000	48000	48000	48000
Minimum Input (BTUh)	60000	60000	60000	60000
High Altitude Maximum Input (BTUh)	54000	54000	54000	54000
High Altitude Minimum Input (BTUh)	43200	43200	43200	43200
Temperature Rise Range (F)	25-55	15-45	10-40	10-40
Maximum Outlet (F)	180	180	180	180
Maximum External Static (in. w.c.)	0.2	0.2	0.2	0.2
NG Orifice Drill (0-2000ft.)	38	38	38	38
Maximum Gas Supply Pressure (in. w.c.)	14	14	14	14
Minimum Gas Supply Pressure (in. w.c.)	4.5	4.5	4.5	4.5
Manifold Pressure (in. w.c.)	3.3	3.3	3.3	3.3
Maximum Input (BTUh)	60000	60000	60000	60000
LP Orifice Drill #	52	52	52	52
Burner Insert Inside Diameter (in.)	0.6	0.6	0.6	0.6
Air Orifice Diameter (in.)	1.281	1.281	1.281	1.281
TCO1 High Limit Value (F)	170	170	170	155
Rate Per PRI Tube (BTUh)	30000	30000	30000	30000
Number of Primary Tubes	2	2	2	2
Number of Secondary Tubes	2	2	2	2
Final Restrictor Height (in.) (If Used)				
Turbulator Length (in.) (If Used)	12			12
TCO2 High Limit Value (F)	120	120	120	120

Notes:

The primary tubes are constructed of .049" minimum T1 40 Aluminized Steel, 2.25" OD, 29.8" long.

All Y*036-060 units will use a FASCO 7021-11054 combustion blower as described in the report.

All Y*036-060 units will use a 240 F Flame Rollout device as described in the report.

All Y*036-060 units will use a 120 F Fan Limit as described in the report.

All Y*36-060 units will be factory set for high speed indoor fan.

3-5 Ton Gas Heat Specifications — Medium Heat

Model # Digit 18 =(B,C) Denotes Through the Base Gas	Y*C036A*M	Y*C048A*M	YSC060A*M	YHC060A*M
Unit Size (Tonnage)	3	4	5	5
Cabinet Size	A	A	A	B
Input (BTUh)	80000	80000	80000	80000
Output (BTUh)	64000	64000	64000	64000
Minimum Input (BTUh)	80000	80000	80000	80000
High Altitude Maximum Input (BTUh)	72000	72000	72000	72000
High Altitude Minimum Input (BTUh)	57600	57600	57600	57600
Temp Rise Range (F)	35-65	20-50	15-45	15-45
Maximum Outlet (F)	180	180	180	200
Maximum External Static (in. w.c.)	0.2	0.2	0.2	0.2
NG Orifice Drill (0-2000 ft)	#32	#32	#32	#32
Maximum Gas Supply Pressure (in.w.c.)	14	14	14	14
Minimum Gas Supply Pressure (in.w.c)	4.5	4.5	4.5	4.5
Manifold Pressure (in.w.c.)	3.3	3.3	3.3	3.3
Maximum Input (BTUh)	80000	80000	80000	80000
LP Orifice Drill #	50	50	50	50
Burner Insert inside Diameter (in.)	0.6	0.6	0.6	0.6
Air Orifice Diameter (in.)	1.593	1.593	1.593	1.593
TCO1 High Limit Value (F)	220	170	170	155DF / 170 HZ
Rate Per PRI Tube (BTUh)	40000	40000	40000	40000
Number of Primary Tubes	2	2	2	2
Number of Secondary Tubes	3	3	3	3
Final Restrictor Height (in.) (If Used)	0.375			
Turbulator Lenght (in.) (If Used)	12	12	12	12
TCO2 High Limit Value (F)	120	120	120	120

Notes:
The primary tubes are constructed of .049" minimum T1 40 Aluminized Steel, 2.25" OD, 29.8" long.
All Y*036-060 units will use a FASCO 7021-11054 combustion blower as described in the report.
All Y*036-060 units will use a 240 F Flame Rollout device as described in the report.
All Y*036-060 units will use a 120 F Fan Limit as described in the report.
All Y*36-060 units will be factory set for high speed indoor fan.

3-5 Ton Gas Heat Specifications — High Heat

Model Number Digit 18 =(B,C) Denotes Through the Base Gas	Y#C036A#H	Y#C048A#H	Y#C060A#H
Unit Size (Tons)	3	4	5
Cabinet Size	B	B	B
Input (BTUh)	120000	120000	130000
Output (BTUh)	96000	96000	108000
Minimum Input (BTUh)	120000	120000	130000
High Altitude Maximum Input (BTUh)	108000	108000	117000
High Altitude Minimum Input (BTUh)	86400	86400	97200
Temperature Rise Range (F)	55-85	40-70	35-65
Maximum Outlet (F)	200	200	200
Maximum External Static (in. w.c.)	0.2	0.2	0.2
NG Orifice Drill (0-2000FT)	#32	#32	31
Maximum Gas Supply Pressure (in.w.c.)	14	14	14
Minimum Gas Supply Pressure (in. w.c.)	4.5	4.5	4.5
Manifold Pressure (in. w.c.)	3.3	3.3	3.3
Maximum Input (BTUh)	120000	120000	130000
LP Orifice Drill #	50	50	49
Burner Insert Inside Diameter (in.)	0.6	0.6	0.7
Air Orifice Diameter (in.)	2.25	2.25	2.75
TCO1 High Limit Value (F) (Df/Hz)	190F/210F	180F/220F	170F/200F
Rate Per PRI Tube (BTUh)	40000	40000	43000
Number of Primary Tubes	3	3	3
Number of Secondary Tubes	4	4	4
Final Restrictor Height (in.) (If Used)	0.25	0.25	
Turbulator Length (in.) (If Used)	12	12	12
TCO2 High Limit Value (F)	120	120	120

Notes:

The primary tubes are constructed of .049" minimum T1 40 Aluminized Steel, 2.25" OD, 29.8" long.

All Y*036-060 units will use a FASCO 7021-11054 combustion blower as described in the report.

All Y*036-060 units will use a 240 F Flame Rollout device as described in the report.

All Y*036-060 units will use a 120 F Fan Limit as described in the report.

All Y*36-060 units will be factory set for high speed indoor fan.

6-10 Tons Gas Heat Specifications — Low Heat

Model Number	Y*C072-L	YSC(090,092)A-L	YHC092A-L	Y*C102A-L	Y*C120A-L
Unit Size (Tons)	6	7.5	7.5	8.5	10
Cabinet Size	C	C	D	D	D
Input (BTUh)	80000	120000	120000	120000	150000
Output (BTUh)	64000	96000	96000	96000	120000
Minimum Input (BTUh)	60000	90000	90000	90000	105000
Temperature Rise Range	15-45	20-50	20-50	15-45	20-50
Maximum Outlet	180	160	160	160	180
Maximum External Static	0.2	0.2	0.2	0.2	0.2
NG Orifice Drill (0-2000 ft)	#32	#32	#32	#32	3.3mm
Maximum Gas Supply Pressure (in. w.c.)	14	14	14	14	14
Minimum Gas Supply Pressure (in. w.c.)	4.5	4.5	4.5	4.5	4.5
Manifold Pressure (Low/ High) (in. w.c.)	3.3	3.3	3.3	3.3	1.8/ 3.5
Maximum Input	80000	120000	120000	120000	150000
LP Orifice Drill	49	49	49	49	46
Burner Insert Inside Diameter	0.6	0.6	0.6	0.6	0.7
Air Orifice Diameter	1.593	3.25	3.25	3.25	1.844
TCO1 High Limit Trip Temperature	200	200	225	225	200
FASCO Part Number	7021-11054	7021-11054	7021-11054	7021-11054	7062-5033
Combustion Blower Motor Number of Speeds	1	1	1	1	2
Combustion Blower Motor HP	1/35	1/35	1/35	1/35	1/15
Combustion Blower Motor FLA	0.7	0.7	0.7	0.7	0.42
Combustion Blower Motor (volts/ph/ hz)	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60
Combustion Blower Motor RPM	3000	3000	3000	3000	3250
Rate per Primary Tube	40	40	40	40	50
Number Primary Tubes	2	3	3	3	3
Number Secondary Tubes	2	3	3	3	4
Air Baffle Required	No	No	No	No	No
Turbulator	12	12	12	12	12
Inlet Pipe Size (in.)	1/2	1/2	1/2	1/2	3/4
TCO2 High Limit Value (F)	120	120	120	120	120

Notes:

Primary tubes are 35.8" long, T1 40 Aluminized Steel, 2.25" OD.

Secondary tubes are constructed of .042" minimum T1 40aluminized steel, 1.75" OD. They are 32.25" long.

All units will use a 240 flame rollout device as described in the report.

All units will use a 120 F fan limit as described in the report.

All units will use 12" long turbulators in the primary tubes.

6-10 Tons Gas Heat Specifications — Medium Heat

Model Number	Y*C072A-M	YSC(090,092)A-M	YHC092A-M	Y*C102A-M	Y*C120A-M
Unit Size (Tons)	6	7.5	7.5	8.5	10
Cabinet Size	C	C	D	D	D
Input (BTUh)	120000	150000	150000	150000	200000
Output (BTUh)	96000	120000	120000	120000	160000
Minimum Input (BTUh)	90000	105000	105000	105000	140000
Temperature Rise Range	20-50	25-55	25-55	20-50	25-55
Maximum Outlet	160	200	200	180	200
Maximum External Static	0.2	0.2	0.2	0.2	0.2
NG Orifice Drill (0-2000 ft)	#32	3.3mm	3.3mm	3.3mm	3.3mm
Maximum Gas Supply Pressure (in. w.c.)	14	14	14	14	14
Minimum Gas Supply Pressure (in. w.c.)	4.5	4.5	4.5	4.5	4.5
Manifold Pressure (Low/ High) (in. w.c.)	3.3	1.8/ 3.5	1.8/ 3.5	1.8/ 3.5	1.8/ 3.5
Maximum Input	120000	150000	150000	150000	200000
LP Orifice Drill	49	46	46	46	46
Burner Insert Inside Diameter	0.6	0.7	0.7	0.7	0.7
Air Orifice Diameter	3.25	1.844	1.844	1.844	2.25
TCO1 High Limit Trip Temperature (Df/Hz)	200/200	180/220	180/220	180/220	190/260
FASCO Part Number	7021-11054	7062-5033	7062-5033	7062-5033	7062-5033
Combustion Blower Motor Number of Speeds	1	2	2	2	2
Combustion Blower Motor HP	1/35	1/15	1/15	1/15	1/15
Combustion Blower Motor FLA	0.7	0.42	0.42	0.42	0.42
Combustion Blower Motor (volts/ph/ hz)	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60
Combustion Blower Motor RPM	3000	3250	3250	3250	3250
Rate per Primary Tube	40	50	50	50	50
Number Primary Tubes	3	3	3	3	4
Number Secondary Tubes	3	4	4	4	5
Air Baffle Required	No	No	No	No	No
Turbulator	12	12	12	12	12
Inlet Pipe Size (in.)	1/2	3/4	3/4	3/4	3/4
TCO2 High Limit Value (F)	120	120	120	120	120

Notes:

Primary tubes are 35.8" long, T1 40 Aluminized Steel, 2.25" OD.

Secondary tubes are constructed of .042" minimum T1 40aluminized steel, 1.75" OD. They are 32.25" long.

All units will use a 240 flame rollout device as described in the report.

All units will use a 120 F fan limit as described in the report.

All units will use 12" long turbulators in the primary tubes.

6-10 Tons Gas Heat Specifications — High Heat

Model Number	Y*C072A-H	YSC090A-H	YHC092A-H	Y*C102A-H	Y*C120A-H
Unit Size (Tons)	6	7.5	7.5	8.5	10
Cabinet Size	C	C	D	D	D
Input (BTUh)	150000	200000	200000	200000	250000
Output (BTUh)	120000	160000	160000	160000	200000
Minimum Input (BTUh)	105000	140000	140000	140000	175000
Temperature Rise Range	25-55	35-65	35-65	35-65	35-65
Maximum Outlet	200	180	200	200	200
Maximum External Static	0.2	0.2	0.2	0.2	0.25
NG Orifice Drill (0-2000 ft)	3.3mm	3.3mm	3.3mm	3.3mm	3.3mm
Maximum Gas Supply Pressure (in.w.c.)	14	14	14	14	14
Minimum Gas Supply Pressure (in. w.c.)	4.5	4.5	4.5	4.5	4.5
Manifold Pressure (Low/ High) (in. w.c.)	1.8/ 3.5	1.8/ 3.5	1.8/ 3.5	1.8/ 3.5	1.8/ 3.5
Maximum Input	150000	200000	200000	200000	250000
LP Orifice Drill	46	46	46	46	46
Burner Insert Inside Diameter	0.7	0.7	0.7	0.7	0.7
Air Orifice Diameter	1.844	2.25	2.25	2.25	3.25
TCO1 High Limit Trip Temperature (Df/Hz)	180/210	200/200	180/220	190/260	190/260
FASCO Part Number	7062-5033	7062-5033	7062-5033	7062-5033	7062-5033
Combustion Blower Motor Number of Speeds	2	2	2	2	2
Combustion Blower Motor HP	1/15	1/15	1/15	1/15	1/15
Combustion Blower Motor FLA	0.42	0.42	0.42	0.42	0.42
Combustion Blower Motor (volts/ph/ hz)	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60
Combustion Blower Motor RPM	3250	3250	3250	3250	3250
Rate per Primary Tube	50	50	50	50	50
Number Primary Tubes	3	4	4	4	5
Number Secondary Tubes	4	5	5	5	6
Air Baffle Required	No	YES	YES	YES	YES
Turbulator	12	12	12	12	12
Inlet Pipe Size (in.)	3/4	3/4	3/4	3/4	3/4
TCO2 High Limit Value (F)	120	120	120	120	120

Notes:

Primary tubes are 35.8" long, T1 40 Aluminized Steel, 2.25" OD.

Secondary tubes are constructed of .042" minimum T1 40aluminized steel, 1.75" OD. They are 32.25" long.

All units will use a 240 flame rollout device as described in the report.

All units will use a 120 F fan limit as described in the report.

All units will use 12" long turbulators in the primary tubes.

ReliaTel Control – Heat Pump Demand Defrost

There are two schemes in common usage for heat pump outdoor coil defrosting: demand defrost and time-temperature defrost. Demand Defrost is more efficient because defrost cycles are initiated only when necessary, compared with initiation based on operating time below the threshold temperature. All 2-10 ton convertible packaged heat pumps use Demand Defrost.

Outdoor coil defrosting occurs only when operating in heating mode with outdoor ambient temperature below 52F and the outdoor coil temperature below 35F. The first defrost cycle after power-up is initiated based on operating time at the required conditions. Shortly after completion of the defrost cycle, the temperature difference between the outdoor coil and outdoor air is calculated and is used as an indicator of unit performance at dry coil conditions. Over time, as moisture and frost accumulate on the coil, the coil temperature will drop, increasing the temperature difference. When the temperature difference reaches double the dry coil temperature differential (deltaT), a defrost cycle is initiated. While defrosting, the reversing valve is in the cooling position, outdoor fans are off, and the compressors continue to operate. The defrost cycle is terminated when the coil temperature rises high enough to indicate that the frost has been eliminated.

Termination of the defrost cycle includes a "soft start" delay. At the end of each defrost cycle, the outdoor fan comes on 5 seconds before the reversing valve is de-energized. This reduces stress on the compressor and makes for a quieter defrost.

Demand defrost operation
Heating mode
Outdoor ambient <52F
Outdoor coil <35

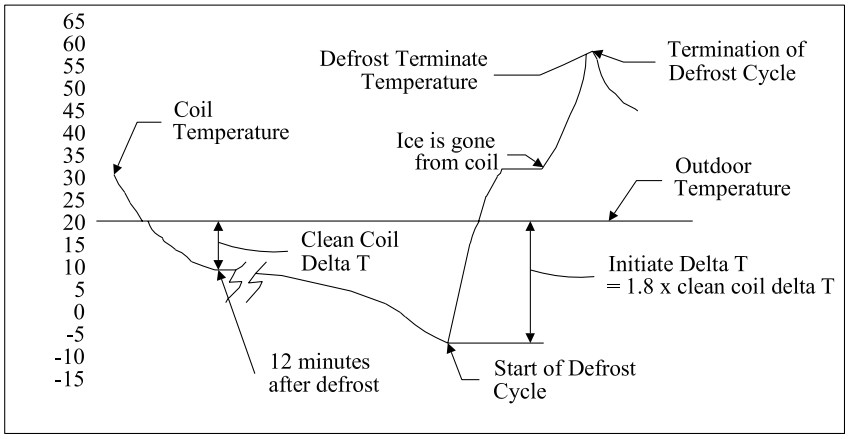
Defrost Service Test

When a Service Test Defrost Request is received, defrost mode is initiated immediately. The defrost cycle will remain active for a minimum of 1 minute, after which the normal termination will occur when the coil temperature exceeds the defrost termination temperature as defined below.

Defrost Mode Operation

Defrost Mode shall remain active until the Outdoor Coil Temperature (OCT) exceeds the Defrost Termination Temperature (DTT) or until ten (10) minutes have passed, whichever occurs first. If all Compressor Outputs turn Off during the defrost cycle, such as during a High Pressure Cutout or Low-Pressure Cutout event, Defrost Mode will terminate.
When Defrost Mode has terminated, the function will track twelve (12) minutes to assure that a dry coil condition has been achieved. At the twelve-minute point, D_T will be calculated using the current values of OAT and OCT (OAT is expected to be higher than OCT). This value is doubled to become the new Initiate Value. Figure 1 presents a graphical representation of a typical demand defrost cycle.

Figure 1-Typical Demand Defrost Cycle



Diagnostic Information

Demand Defrost also tracks failures and operating problems as follows.
When any Defrost Fault is active, or if any sensor has failed, a 5-minute defrost cycle will be initiated after each 30 minutes of compressor heating operation.

Table1 – Demand Defrost Fault Designation

Symptom	Diagnostic	Response
Δ_T is below Minimum Value 12 minutes after defrost is terminated	Low Δ_T	If> 2 hours, activate Defrost Fault Reset timer if Δ_T returns within bounds.
Defrost Terminated on time requirement	Time Termination	If defrost is terminated on time requirement (vs. differential temperature). After 10 consecutive Time Terminations, activate Defrost Fault.
Δ_T is above Maximum Value 12 minutes after defrost is terminated	High Δ_T	Initiate Defrost After 16 consecutive High Δ_T Initiations, activate Defrost Fault

Notes:

Defrost Termination Temperature (DTT) = Outdoor Air Temperature (OAT) + 47ºF

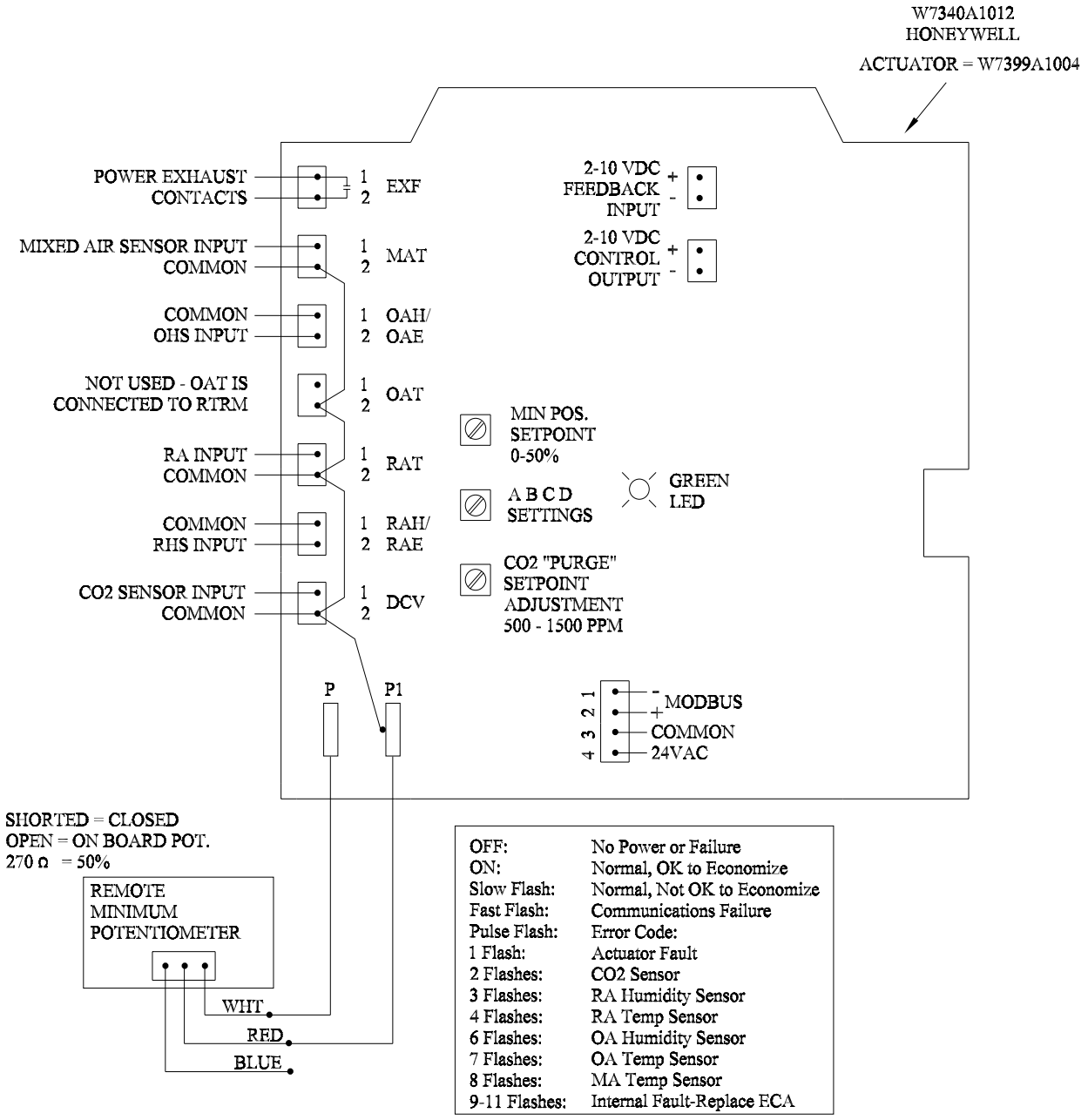
57ºF <= DDT <= 72ºF

Δ_T = Outdoor Air Temperature (OAT) – Outdoor Coil Temperature (OCT)
Defrost Initiate Temperature ≡1.8 * (Δ_T| 12 Minutes After Defrost Mode is terminated)

Economizer Module (ECA) layout

The economizer module plugs directly onto the actuator. It has a diagnostic LED, which under normal operation is either ON (OK to economize) or FLASHING (Not OK to economize). It communicates via MODBUS with the RTRM, and receives outside air temperature input from the RTRM.

Mixed air sensor (MAS), return air sensor (RAT), outdoor humidity sensor (OHS), and return humidity sensor (RHS) are all plugged directly into the ECA. The application section of this manual shows how to apply a CO2 sensor.



ReliaTel Economizer Operation

Customer Benefit

An economizer consists of a fresh air damper, a return air damper, linkage to maintain an inverse relationship between the two, and an actuator to control the damper position. An economizer is used to provide two unit functions: ventilation and economizer cooling. In either case, the inverse relationship between the return and outdoor air dampers allows the unit to maintain the same approximate total airflow regardless of economizer position. A linkage adjustment is typically required in the field to adjust for differences in pressure drops due to different duct designs.

Economizer cooling is provided to take advantage of cooler outdoor air to satisfy a cooling load in a conditioned space minimizing the need for mechanical cooling (with compressors). While economizer cooling, it is necessary to limit the damper position so that the mixed air temperature does not fall below 53°F (± 3°F) and cause excessively cool air from being discharged from the unit. When used with a zone sensor, an economizer setpoint that is below the cooling setpoint is used to allow sub-cooling essentially for free, further reducing the need for more expensive mechanical cooling. To maximize the use of an economizer, mechanical cooling is delayed from running until it has been determined that the economizer alone cannot satisfy the load.

Any time the supply fan is On and the building (unit) is occupied, the economizer damper will be maintained at or above minimum position. The economizer damper is held Closed when the supply fan is Off to prevent water from getting into the economizer section of the unit.

Economizer operation:

When economizing is enabled and the unit is operating in the cooling mode with a zone sensor, the economizer damper is modulated between its minimum position and 100% to maintain the zone temperature at the economizer setpoint. When the unit is applied with a zone sensor or ICS, the economizer setpoint (ESP) is derived from the Cooling and Heating setpoints (CSP and HSP) so that ESP is the higher of 1) CSP – 1.5°F or 2) HSP + 1.5°F. When operating with a thermostat, the economizer damper will be modulated between minimum position and 100% to maintain mixed air temperature at 53±3°F in response to a call for stage 1 of cooling (Y1 active), assuming economizing is enabled.

When operating with a zone sensor, compressors will be delayed for operating until the economizer has opened to 100% for 5 minutes and the zone temperature error is not being reduced quickly enough.

Barometric relief

Units with economizers bring in outside air for ventilation and/or economizer cooling. Because the economizer contains a return air damper that operates inversely to the outdoor air damper, the outdoor air will tend to pressurize the conditioned space. This can cause exterior doors to open or audible noise from air escaping through various building openings.

Units without exhaust fans rely on barometric dampers to vent the pressure that builds up in the space due to outdoor airflow.

Power exhaust

Exhaust fans offer improved performance since they can be sized to overcome the pressure drops associated with the return duct that would otherwise add to the space pressure. This function allows the exhaust fan to operate when appropriate to maintain space pressure.

Units without RTOM: The power exhaust is on whenever the economizer damper is at 25% outside air or greater. This is not adjustable.

Units with RTOM: The power exhaust set point (point at which the power exhaust is turned on) is adjustable from 0% to 100% at the RTOM “exhaust setpoint” potentiometer.

Three different methods can be used to determine if outdoor air contains more cooling capacity than the return air and are described below. The different methods are suited for different applications and environments.

- Comparative Enthalpy - Outdoor Air Enthalpy is compared with Return Air Enthalpy. This method is best suited for high humidity climates and applications in which humidity can affect the cooling capacity of the outdoor air or return air.
- Reference Enthalpy - Outdoor Air Enthalpy is compared with a reference enthalpy point. This method is best suited for high humidity climates in which humidity can affect the cooling capacity of the outdoor air, but not necessarily the return air.
- Reference Dry Bulb- Outdoor Air Temperature is compared with a user set reference temperature. This method is best suited for low humidity climates and applications in which humidity does not strongly affect cooling capacity of the outdoor air or return air.

Dry bulb temperature and relative humidity data are used to determine enthalpy.
Economizer-based cooling is enabled only when outdoor air is determined to have more cooling capacity than the return air. The method used is according to the available data. When temperature and humidity data are available for the outdoor air and return air, the Comparative Enthalpy method is used. One of the other methods are used if data is invalid or unavailable. Ultimately, when there is insufficient data to use any of the three methods, economizer-based cooling is disabled.

When the Active Unit Mode is Cool, one of the enthalpy or temperature methods are used to determine if economizer-based cooling should be enabled or disabled.

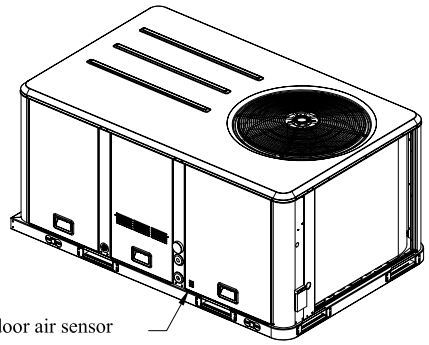
Thermostat note

If the unit is applied with a thermostat, the algorithms use a fixed mixed air temperature setpoint of 55°F when the Y1 input is closed. If the unit is applied with a zone sensor, the algorithms use a dynamically calculated mixed air temperature setpoint, which is calculated by other algorithms, when cooling is requested.

The damper can be in three different states.

Closed. The damper is held at 0%.
Minimum Position. The damper is held at the Minimum Position as determined by the Minimum Position Potentiometer on the ECA or by an edited input from ICS. This position is between 0% and 50%.
Modulating. Algorithms control the damper to meet cooling demand. When modulating, the damper's range of motion is between Active Minimum Position and 100%.

The following inputs are used:
Mixed Air Sensor (MAS) measures the dry bulb temperature of the air leaving the evaporator coil while economizing. Return air, outdoor air and cooling caused by any compressor cooling make up the Mixed Air input. The MAS is plugged into the Economizer Actuator Module (ECA).



Outdoor Air Sensor (OAS) measures the ambient air surrounding the unit. It is located in the compressor section on the left side. Ventilation holes in the access panel of the unit allow air movement across the sensor. The OAS is plugged into the RTRM module.
Outdoor Humidity Sensor (OHS) measures the relative humidity of the outside air. It is located inside the economizer hood. The OHS is plugged into the ECA.
Return Air Temperature Sensor (RAT) measures the return air temperature. It is located on the return air damper of the economizer.
The RAT is plugged into the ECA.
Return Humidity Sensor (RHS) measures the relative humidity of the return air. It is located on the return air damper of the economizer. The RHS is plugged into the ECA.

Figure 1- Economizer

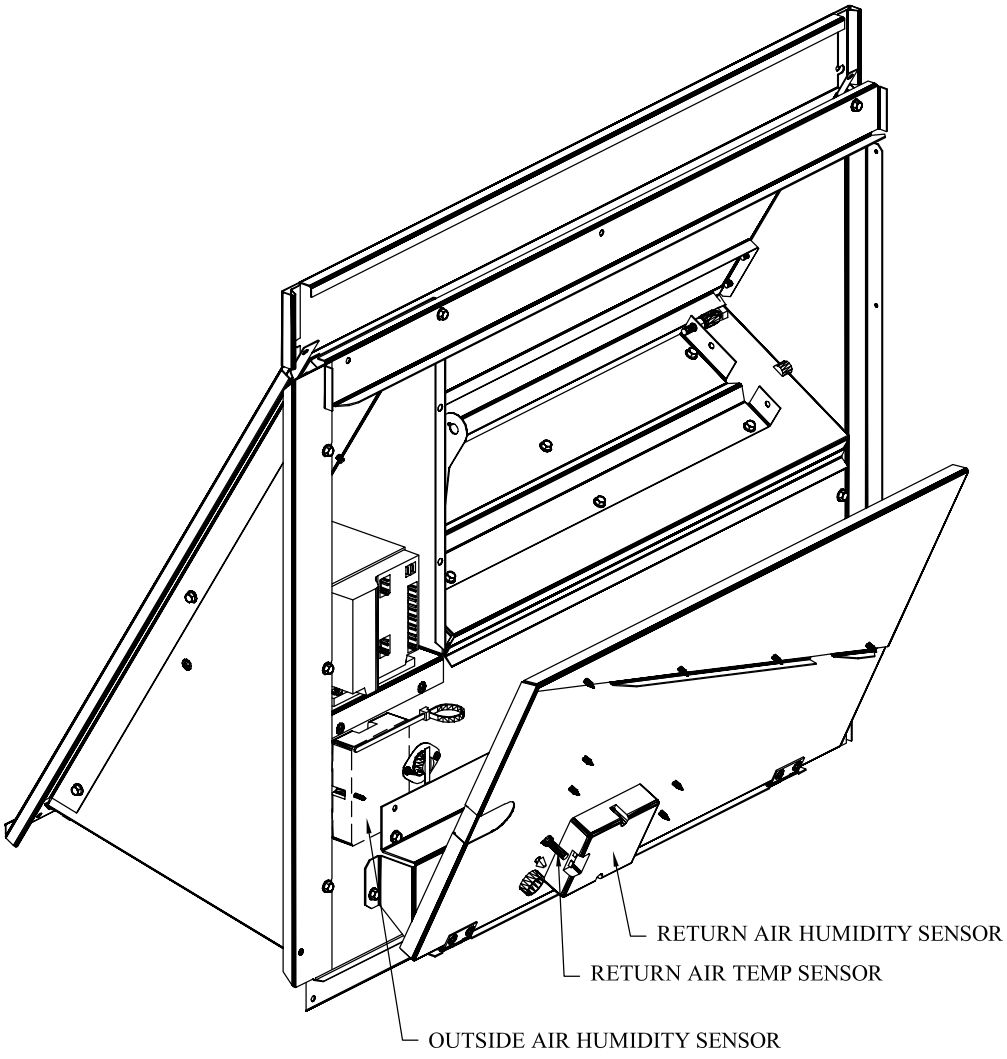


Table 1 - Choice of Enthalpy Method

Method used to determine economizer effectiveness	Required Data
Comparative Enthalpy	MAS, OAT, OAH, RAT, RAH
Reference Enthalpy	MAS, OAT, OAH
Reference Dry Bulb	MAS, OAT
Unit will not economize	MAS or OAT data is invalid or unavailable

Dry bulb/Reference Point Selections

The Dry Bulb or Reference Enthalpy Point is user-selectable, according to the choices below. This selection is made on the ECA.

Table 2 – Dry Bulb / Reference Enthalpy Point Choices

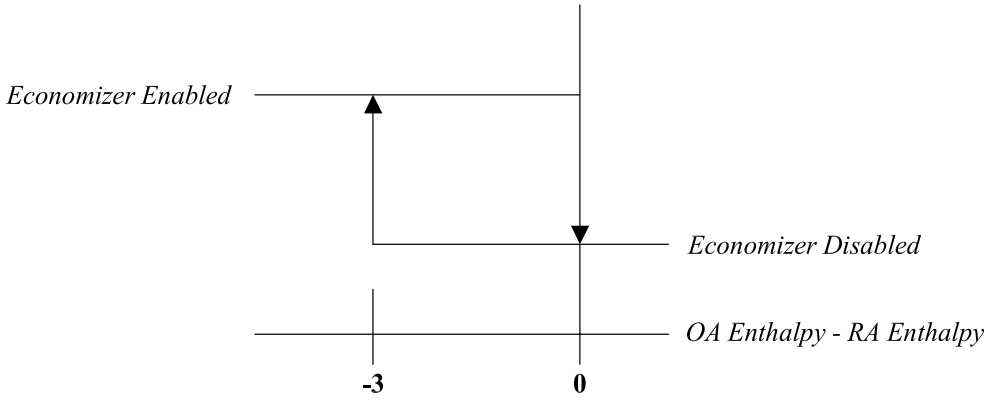
Potentiometer Setting Point	Dry bulb changeover Point	Reference Enthalpy
A	73°F	27 BTU/lb.
B	70°F	25 BTU/lb.
C	67°F	23 BTU/lb.
D	63°F	22 BTU/lb.

Comparative Enthalpy Method

OA Enthalpy is compared with RA Enthalpy.

- The Economizer is enabled when OA Enthalpy < [RA Enthalpy - 3.0 BTU/lb.].
- The Economizer is disabled when OA Enthalpy > RA Enthalpy.
- While [RA Enthalpy - 3.0 BTU/lb.] < OA Enthalpy < RA Enthalpy, the Economizer enable/disable status is not changed.

Figure 2 Comparative Enthalpy Enable



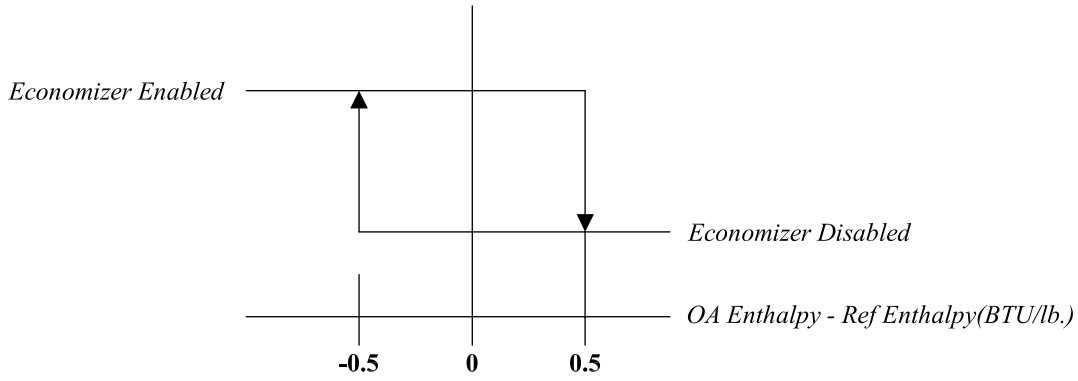
Comparative Enthalpy Hysteresis

Reference Enthalpy Method

OA Enthalpy is compared with a reference enthalpy point.

- The Economizer is enabled when OA Enthalpy < [reference enthalpy point - 0.5 BTU/lb.].
- The Economizer is disabled when OA Enthalpy > [reference enthalpy point + 0.5 BTU/lb.].
- While [reference enthalpy point - 0.5 BTU/lb.] < OA Enthalpy < [reference enthalpy point + 0.5 BTU/lb.], the Economizer enable/disable status is not changed.

Figure 3 — Reference Enthalpy Enable



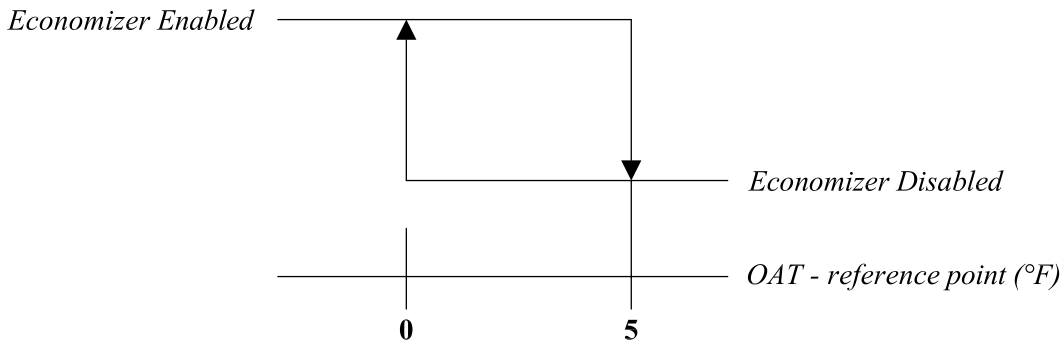
Reference Enthalpy Hysteresis

Reference Dry Bulb Method

OA Temperature is compared with a reference dry bulb point.

- The Economizer is enabled when OA Temp < reference dry bulb point.
- The Economizer is disabled when OA Temp > (reference dry bulb point + 5.0)°F.
- While reference dry bulb point < OA Temp < (reference dry bulb point + 5.0°F), the Economizer enable/disable status is not changed.

Figure 4 - Dry Bulb Enthalpy Enable



Dry Bulb Hysteresis

Internal Calculations

Air enthalpy is a value calculated from the air temperature and relative humidity using the relationship:

Enthalpy= 0.24 x O.A.Temp(deg. F) + h(R.H.,OAT)

Air enthalpy is calculated (Btu/Lb. dry air) using:

H = 0.24 * T + W * Hv

Where T= dry bulb temperature, deg. F
W= humidity ration, lb. water/lb. dry air
W = 0.622 * P/ (14.696 - P)
Hv= enthalpy of water at T, Btu/lb.
Hv= 1062.1 + 0.43 * T

Also,

P= partial pressure of water at T, psia
P= (0.421 - 0.01503 * T + 0.000202 * T**2) * RH

ReliaTel Economizer Inputs

Terminals to read voltage:

Mixed Air Sensor	ECA	J13 1&2
Return Air Sensor	ECA	J10 1&2

Note: These are Economizer inputs only. RTRM, RTOM inputs (Zone temp, Setpoints, OAS, DAS) are in the ReliaTel Temperature inputs section.

Read DC voltage with the sensor attached. If voltage does not appear to be correct, read the resistance of the circuit, then the sensor itself, to see if a problem exists in the sensor or the wiring. With the sensor not attached there should be approximately 2.50 VDC at the terminals listed above.

Service Tips:

Terminal 1 in each of these circuits is common. All common terminals are grounded, therefore one volt meter lead can be attached to ground for voltage measurements.

Temp (°F)	Resistance	DCV	Temp (°F)	Resistance	DCV
40.00	26,105	1.853	61.00	14,899	1.551
41.00	25,393	1.839	62.00	14,521	1.536
42.00	24,703	1.826	63.00	14,154	1.520
43.00	24,033	1.812	64.00	13,797	1.505
44.00	23,385	1.799	65.00	13,451	1.490
45.00	22,756	1.785	66.00	13,114	1.475
46.00	22,146	1.771	67.00	12,787	1.460
47.00	21,554	1.757	68.00	12,469	1.444
48.00	20,980	1.743	69.00	12,160	1.429
49.00	20,424	1.728	70.00	11,860	1.413
50.00	19,884	1.714	71.00	11,568	1.398
51.00	19,360	1.699	72.00	11,284	1.383
52.00	18,852	1.685	73.00	11,008	1.367
53.00	18,359	1.670	74.00	10,740	1.352
54.00	17,880	1.656	75.00	10,479	1.337
55.00	17,415	1.641	76.00	10,225	1.321
56.00	16,964	1.626	77.00	9,978	1.306
57.00	16,527	1.611	78.00	9,738	1.291
58.00	16,102	1.596	79.00	9,505	1.276
59.00	15,689	1.581	80.00	9,278	1.261
60.00	15,288	1.566			

To Test Humidity Sensors

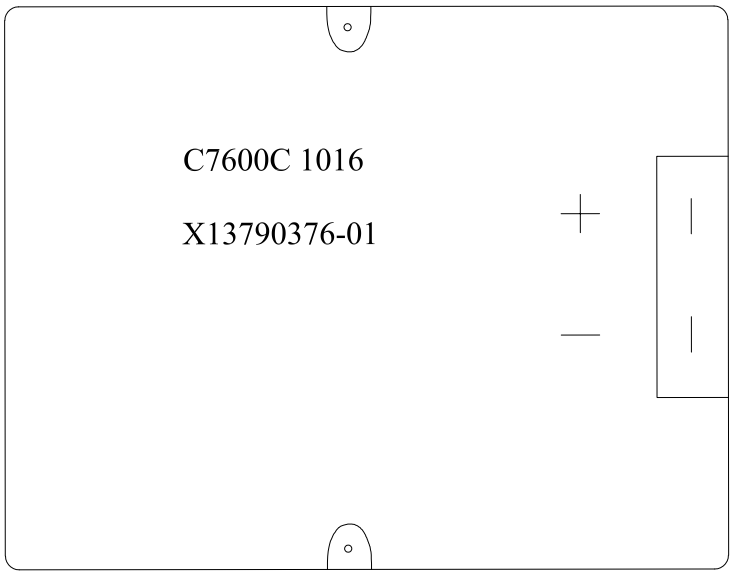
Return Air Humidity Sensor	ECA	J9 1 +, J9 2 -
Outdoor Humidity Sensor	ECA	J12 1 +, J9 2 -

To test this circuit, place a DC milliamp meter in series with either of the leads to the humidity sensor. If the reading is 0ma, polarity may be reversed. Reverse + & - and retest. If the reading does not correspond to the table below, check the output voltage from the ECA with the sensor disconnected. It should be approximately 20VDC. If so, and all connections are intact, replace the sensor. If 20VDC is not present, yet the ECA green LED is on, the ECA module has failed.

RH%	DCma	RH%	DCma	RH%	DCma
100%	20.000	52.6	12.414	31.2	9.000
97.7	19.636	51.7	12.273	30.8	8.926
95.5	19.286	50.8	12.135	30.3	8.852
93.4	18.947	50.0	12.000	29.9	8.780
91.4	18.621	49.2	11.868	29.4	8.710
89.4	18.305	48.4	11.739	29.0	8.640
87.5	18.000	47.6	11.613	28.6	8.571
85.7	17.705	46.8	11.489	28.1	8.504
83.9	17.419	46.1	11.368	27.7	8.438
82.1	17.143	45.3	11.250	27.3	8.372
80.5	16.875	44.6	11.134	26.9	8.308
78.8	16.615	43.9	11.020	26.5	8.244
77.3	16.364	43.2	10.909	26.1	8.182
75.7	16.119	42.5	10.800	25.8	8.120
74.3	15.882	41.8	10.693	25.4	8.060
72.8	15.652	41.2	10.588	25.0	8.000
71.4	15.429	40.5	10.485	24.6	7.941
70.1	15.211	39.9	10.385	24.3	7.883
68.8	15.000	39.3	10.286	23.9	7.826
67.5	14.795	38.7	10.189	23.6	7.770
66.2	14.595	38.1	10.093	23.2	7.714
65.0	14.400	37.5	10.000	22.9	7.660
63.8	14.211	36.9	9.908	22.5	7.606
62.7	14.026	36.4	9.818	22.2	7.552
61.5	13.846	35.8	9.730	21.9	7.500
60.4	13.671	35.3	9.643	21.6	7.448
59.4	13.500	34.7	9.558	21.2	7.397
58.3	13.333	34.2	9.474	20.9	7.347
57.3	13.171	33.7	9.391	20.6	7.297
56.3	13.012	33.2	9.310	20.3	7.248
55.4	12.857	32.7	9.231	20.0	7.200
54.4	12.706	32.2	9.153		
53.5	12.558	31.7	9.076		

Humidity Sensors

Outdoor Humidity Sensor: Field installed accessory, located below and to the left of economizer actuator motor. Used in reference (BAYENTH005A) and comparative (BAYENTH006A) enthalpy control. Operates from 10-90% RH, 32F – 90F.
Return Humidity Sensor: Field installed accessory, located inside economizer barometric relief hood. Used in comparative (BAYENTH006A) enthalpy control only. (Honeywell #C7600C).



Component Description	Part Number
SEN1036 Humidity Sensor (OHS, RHS)	SEN-0277

ReliaTel ECA LED Fault Code Information

Actuator fault: An actuator fault will occur when the economizer position signal to the actuator is 25% different than the feedback signal from the actuator. Example: if the economizer is not attached to the motor, you would get an actuator fault only after the economizer would tell the motor to drive to at least 25% open.

Sensor faults: Sensor faults will occur if the sensors are disconnected during normal operation. However, during the 3 minute boot-up period, the ECA will default to the sensors that are connected. During the 3 minute period, the economizer will look to see which sensors are hooked up and determine which state it will be in.
Example: if only the OAS and MAS is hooked up, it will be in Dry Bulb. If the OAS, OHS and MAS is hooked up, it will be in Reference.

If after the 3 minute "configuration" time has passed, if one of those sensors are disconnected, the economizer should fault. If you attach and disconnect sensors during the original 3 minutes, the economizer should not fault.

The mixed air sensor (MAS) and outdoor air sensor input from the RTRM are minimum required sensors.

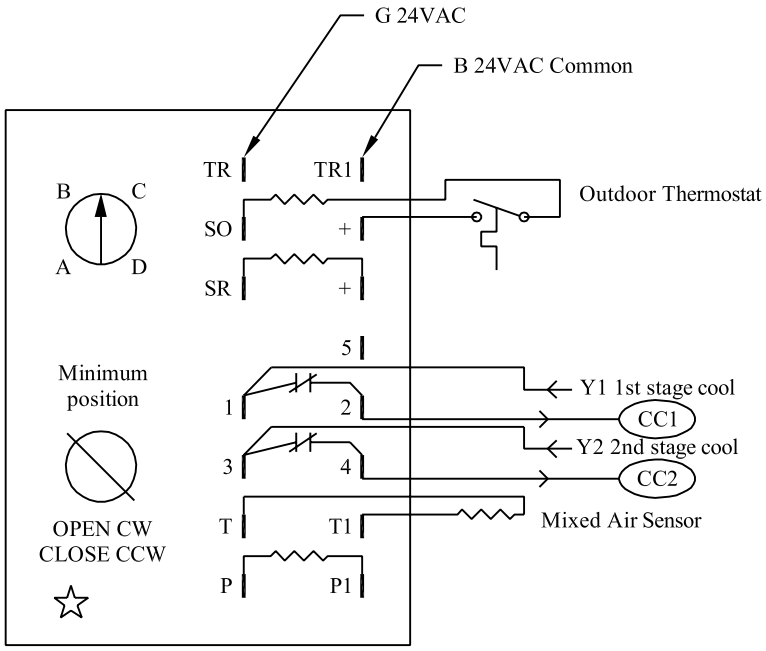
If the CO2 sensor is not hooked up, the economizer will not look for it and will not fault.

The flash codes are prioritized. The higher the flash count, the more priority the fault has. If there is more than one fault, only the higher priority fault will flash.

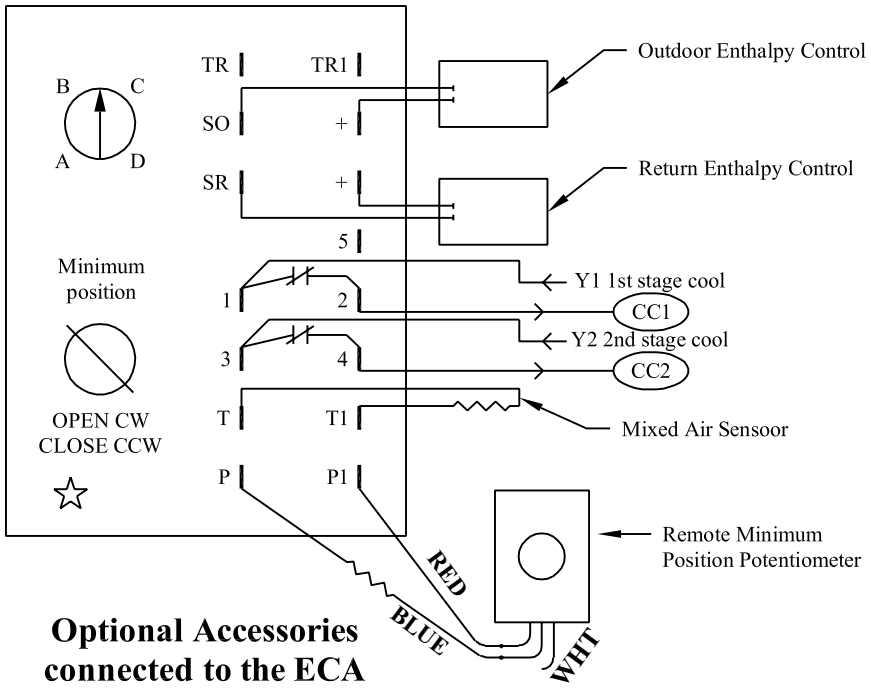
The green system LED is located near the center of the ECA Module.

On: OK to economize
Slow flash: Not OK to economize
Fast flash: Not communicating with RTRM
OFF: No power or system failure
Error codes — ½ second on, ¼ second off
1 flash — Actuator fault
2 flash — CO2 sensor
3 flash — RA humidity sensor
4 flash — RA temp sensor
6 flash — OA humidity sensor
7 flash — OA temperature sensor (On power up: No communication with RTRM)
8 flash — MA temp sensor
9-11 flash — Internal fault

Electromechanical Economizer Functions



Economizer Actuator (ECA)
connected to the unit



Optional Accessories
connected to the ECA

Electromechanical Economizer Testing

When the outdoor air thermostat is in the cold position (closed), the unit will attempt to economize if a fan (G) and cooling (Y1) call exists at the ECA module. This is readily apparent at the ECA, as the "OK to economize" LED will be on. During this time, the ECA is measuring the Mixed Air temperature via the Mixed Air Sensor (MAS).

Service tips:
The MAS sensor is not energized unless the LED is on (G signal present, OK to economize), *and* the Y1 signal is present.

If the MAS is open, approximately 4.3 VDC will be seen.

Read the voltage with the sensor connected, read the resistance with the sensor disconnected.

TEMP F	TEMP C	R(OHMS)	DC VOLTS
33.8	1	9576	3.910
35.6	2	9092	3.882
37.4	3	8636	3.894
39.2	4	8204	3.863
41.0	5	7796	3.829
42.8	6	7412	3.790
44.6	7	7048	3.749
46.4	8	6705	3.713
48.2	9	6380	3.674
50.0	10	6073	3.634
51.8	11	5782	3.590
53.6	12	5507	3.550
55.4	13	5247	3.507
57.2	14	5000	3.420
59.0	15	4767	3.373
60.8	16	4545	3.328
62.6	17	4335	3.283
64.4	18	4136	3.239
66.2	19	3948	3.180
68.0	20	3769	3.157
69.8	21	3599	3.118
71.6	22	3437	3.080
73.4	23	3284	3.034
75.2	24	3138	3.007
77.0	25	3000	2.971
78.8	26	2869	2.932
80.6	27	2744	2.896
82.4	28	2625	2.860
84.2	29	2512	2.824
86.0	30	2404	2.787
87.8	31	2301	2.750
89.6	32	2204	2.714
91.4	33	2111	2.676
93.2	34	2023	2.639
95.0	35	1938	2.600
96.8	36	1858	2.561
98.6	37	1781	2.526
100.4	38	1708	2.484

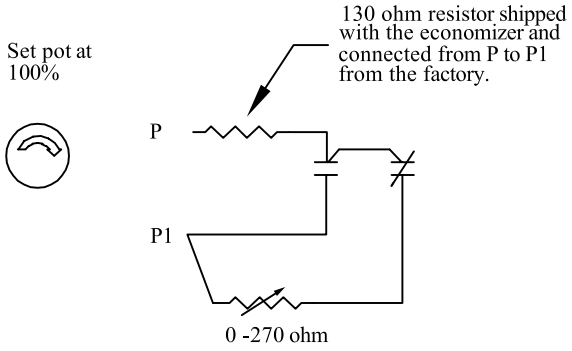
Electromechanical Economizer - 3 Position Damper

Full open (50%) economizer minimum position is accomplished by setting the ECA minimum position potentiometer to 100% and installing a set of contacts in series with the existing 130 ohm resistor to terminals P and P1 on the ECA.

Any intermediate (0 - 50%) economizer position is accomplished by installing a 0 - 270 ohm potentiometer in series with an additional set of contacts and the existing 130 ohm resistor to terminals P and P1 on the ECA. 0 ohms = 50% outside air and 270 ohms = 0% outside air.

Fully closed position is accomplished when the indoor fan is disabled.

Note: Actual outside airflow is also dependent on return air static pressure



ReliaTel Control – Temporary Operation

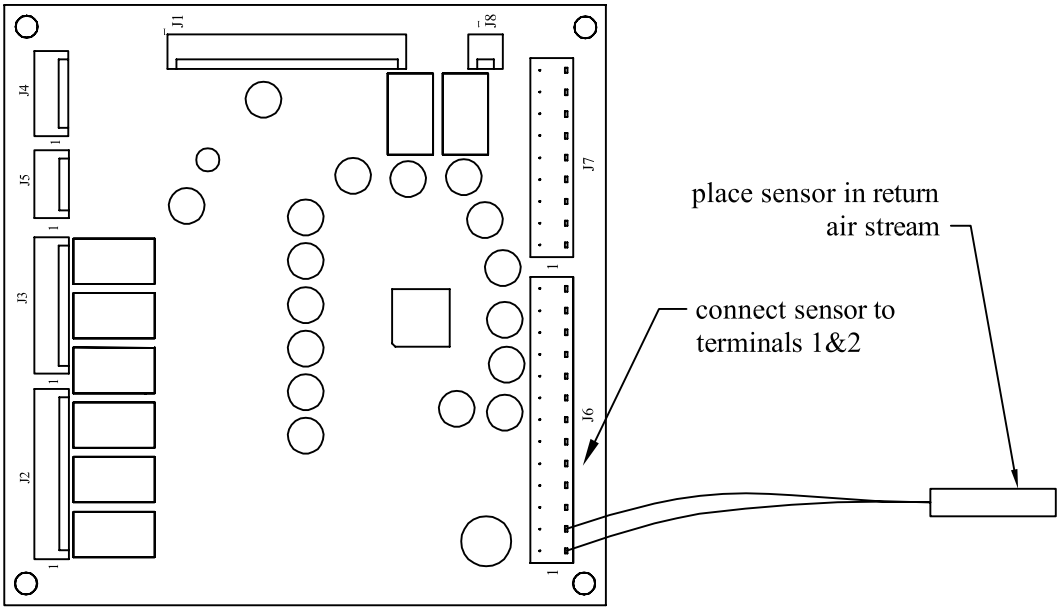
Temporary comfort can be provided without a Zone Sensor Module or thermostat in place by using the Outdoor Air Sensor or a spare Supply Air / Return Air Sensor. How to do it: remove the sensor from the unit, add enough thermostat wire to it so that it can be placed in the return air stream, then connect the sensor to J6-1 & J6-2.

After the permanent Zone Sensor or thermostat is in place, the sensor must be removed from J6-1 & J6-2.

If the RTRM does not have a space temperature input (J6-1, J6-2), or have a conventional thermostat input (G, Y, W), the unit will not run (except in the test mode).

Temporary Sensor (thermistor) attached to J6-1 and J6-2 only:
Continuous fan
Auto changeover
74F cooling, 71F heating

Reliatel Refrigeration Module



ReliaTel Supply Air Tempering Control

Supply air tempering maintains the supply air temperature above a lower limit during minimum ventilation periods when in heat mode. Supply air tempering is available when using a BAYSENS019B/ AYSTAT666B Programmable Zone Sensor, BAYSENS006-11/AYSTAT661-664 Mechanical Zone Sensor, or Trane ICS system. It is only active in the Heating mode.

The unit requires an RTOM (options module) and BAYTUBE discharge air sensing kit. Supply air tempering will not work with a conventional thermostat.

How to enable Supply Air Tempering:

Mechanical Zone Sensor BAYSENS006-11/AYSTAT661-664: remove the jumper from RTOM J3-1 and J3-2.

Programmable Zone Sensor BAYSENS019B/AYSTAT666B: change Option 4 in the options menu to 1=enabled. Or, remove the jumper from RTOM J3-1 and J3-2.

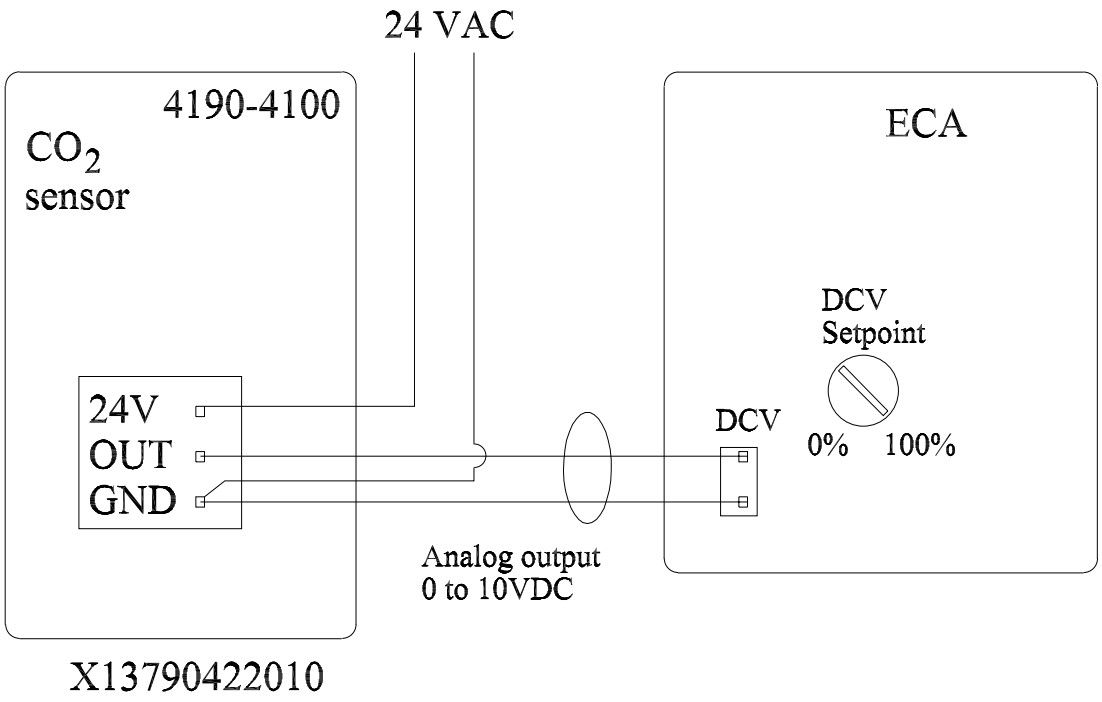
Trane ICS system: Enable through appropriate menu

Sequence of operation:

When Supply Air Tempering is enabled, the supply fan is on, active mode is Heat or Emergency Heat, and with the unit not actively heating, stage 1 of heat is turned ON when the supply air temperature is 10°F below the Active Heating Setpoint. Stage 1 of heat is turned OFF when the supply air temperature is 10°F above the Active Heating Setpoint or the Mode is no longer Heat or Emergency Heat. Should the zone temperature exceed the Active Heating Setpoint by 1-2F, Supply Air Tempering will cease until another normal heating cycle resumes.
For heat pump units, the auxiliary heat is used for tempering.

CO2 Sensor Connections For ReliaTel Units With Economizer

CO2 setpoint adjustment
DCV setpoint potentiometer on economizer module can be adjusted as follows:
0% = 500ppm
50% = 1000ppm
100% - 1500ppm



Operation

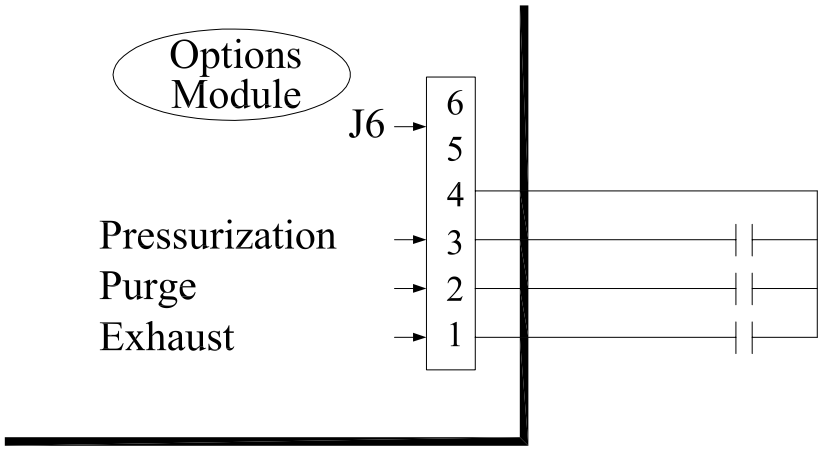
The outside air damper will modulate from minimum position setting up to 100% while attempting to maintain the CO2 setpoint.

ReliaTel – Ventilation Override

Three Ventilation modes are available with ReliaTel through use of an Options Module (RTOM) and economizer (ECA) with Power Exhaust. Following is a list of each mode and what happens during each.

	Fan forced:	Compressors may run?	OK to heat (gas/elect.)?	Economizer position?	Power Exhaust?
Pressurization	ON	No	No	100%	Off
Purge	ON	No	No	100%	On
Exhaust	OFF	No	No	0%	On

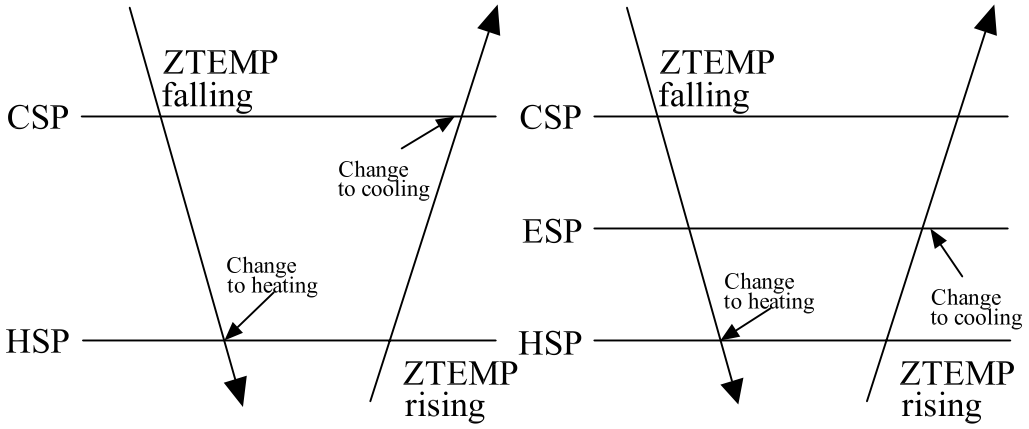
Connections to the unit to accomplish Ventilation Modes are shown below. All three inputs are shown for illustration; only one is typically used. The output from J6-4 is 24VAC.



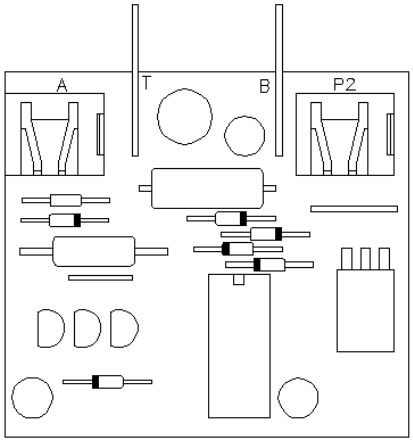
ReliaTel Heating/Cooling Change Over

The change over from heating to cooling is accomplished in two different ways. The first drawing below illustrates change over in a system without an economizer, and the second drawing illustrates change over in a system with an economizer. Change over from cooling to heating is accomplished in the same manner for both economizer and non-economizer systems.

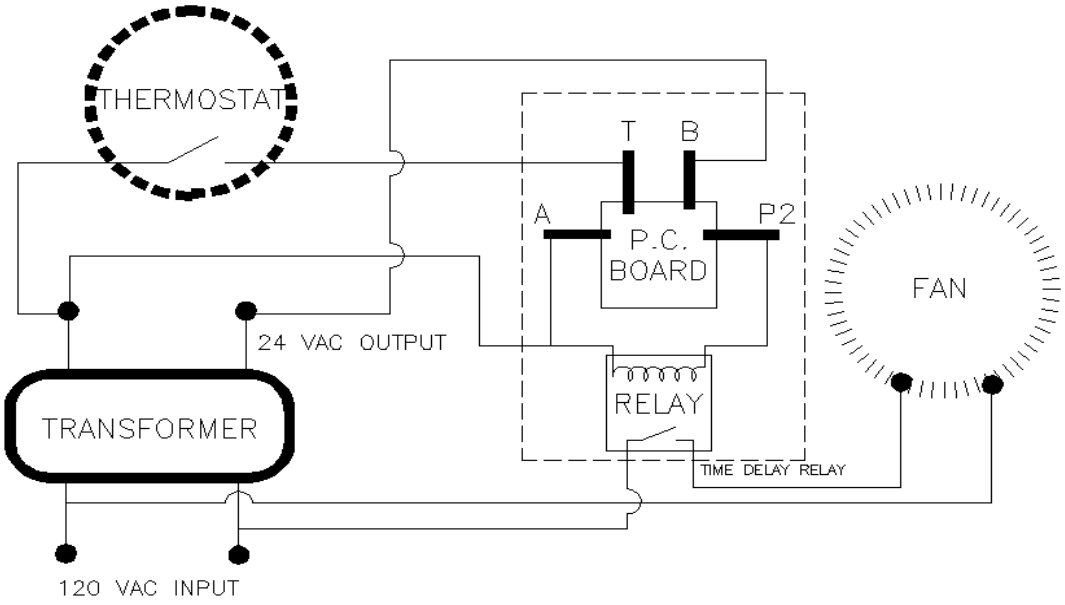
If the unit is in the cooling mode and the zone temperature is falling, the unit will change to the heating mode when the zone temperature is equal to or less than the heating set point. For systems without economizers, if the unit is in the heating mode, and the zone temperature is rising, the unit will change to the cooling mode when the zone temperature is equal to or greater than the cooling set point. For systems with economizers, if the unit is in the heating mode, and the zone temperature is rising, the unit will change to the cooling mode when the zone temperature is equal to or greater than the economizer set point.



Electromechanical Unit -Time Delay Relay
Sequence of Operation



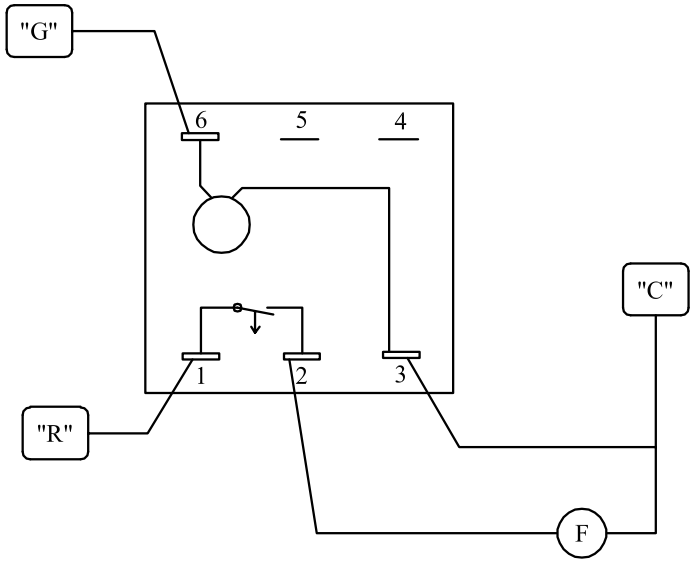
This time delay circuit board attaches to the side of the relay. When energized, the fan starts immediately and when de-energized shuts off 80 seconds later. This delay is not adjustable.



Electromechanical Unit – Fan “Off” Delay Solid State Timer Sequence of Operation

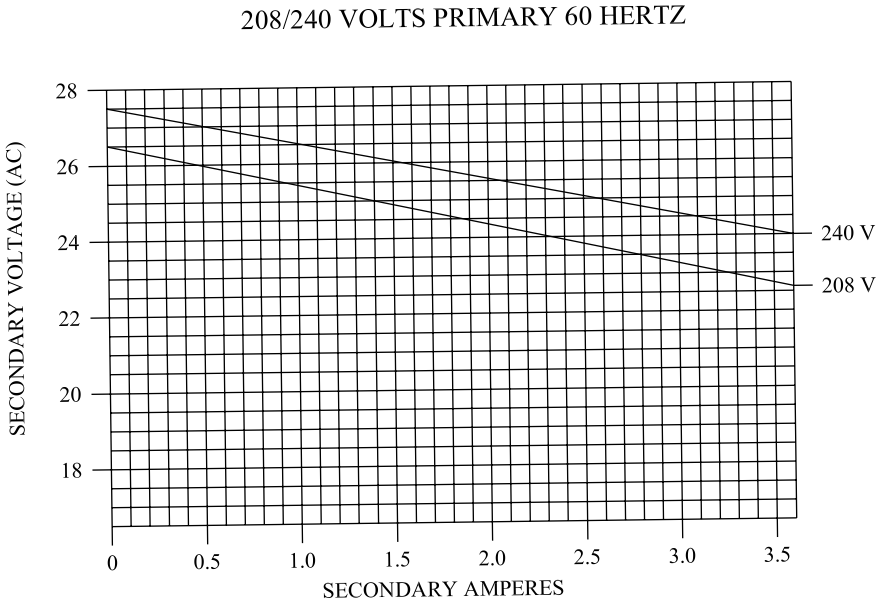
When “G” is energized, the N.O. contacts between 1 and 2 close immediately, energizing the fan relay (F), which in turn starts the indoor fan.

When “G” is de-energized, the contacts between 1 and 2 remain closed for 80 seconds, then open. This in turn de-energizes the F relay, which stops the indoor fan.



Transformer Troubleshooting

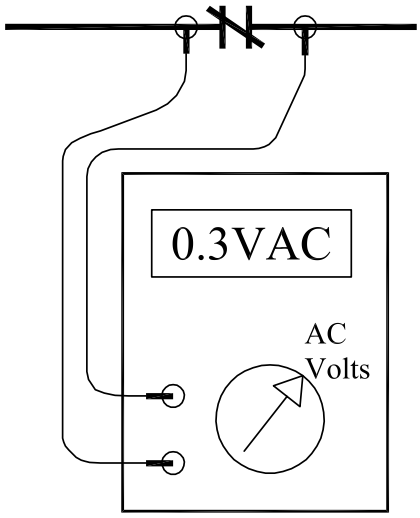
The graph below shows how as current caused by loads on the transformer increases, voltage decreases. Once the voltage drops below the level that the contactor can pull in, usually about 16-18 volts, the current raises up to the point where the transformer burns out. The chart below is for illustration only.



A transformer usually burns out due to a short circuit. When this occurs, the technician can usually find the source of the short. Sometime though, the cause of transformer failure is not so obvious. It can also fail when excessive voltage drops occur because of poor connections, thermostat wires too long, bad contacts on the smoke detector, etc. The excessive voltage drop results in low voltage to the load (contactor, relay) and then the transformer blows.

Here's what to look for:
Transformer on wrong voltage tap, ie. 208 volts at the unit, transformer on 230 volt tap.

Voltage drop across contacts (measure with a load on the circuit):



Voltage drop across contacts when load is applied should be less than 1/2 volt.