INSTALLATION, OPERATION

AND MAINTENANCE MANUAL

FOR

W-TRAC

HEAT WHEEL CONTROLLER

RECOGNIZED COMPONENT
C ETL LISTED
Intertek

RECOGNIZED COMPONENT
ETL LISTED US
Intertek

UNIT MODEL NO. _____
UNIT SERIAL NO. _____
SERVICED BY: _____
TEL. NO: _____

CANADIAN HEAD OFFICE AND FACTORY

1401 HASTINGS CRES. SE
CALGARY, ALBERTA
T2G 4C8
Ph: (403) 287-4774
Fx: 888-364-2727

USA HEAD OFFICE AND FACTORY

32050 W. 83rd STREET
DESOTO, KANSAS
66018
Ph: (913) 583-3181
Fx: (913) 583-1406

CANADIAN EASTERN FACTORY

1175 TWINNEY DRIVE
NEWMARKET,
ONTARIO
L3Y 5V7
Ph: (905) 898-1114
Fx: (905) 898-7244

SALES OFFICES ACROSS CANADA AND USA

Retain instructions with unit and maintain in a legible condition.
Please give model number and serial number when contacting Engineered Air for information and/or parts.

www.engineeredair.com

Mar 99 R3

W-TRAC

If any errors or omissions are noted please contact the nearest Engineered Air Technical Service Department.

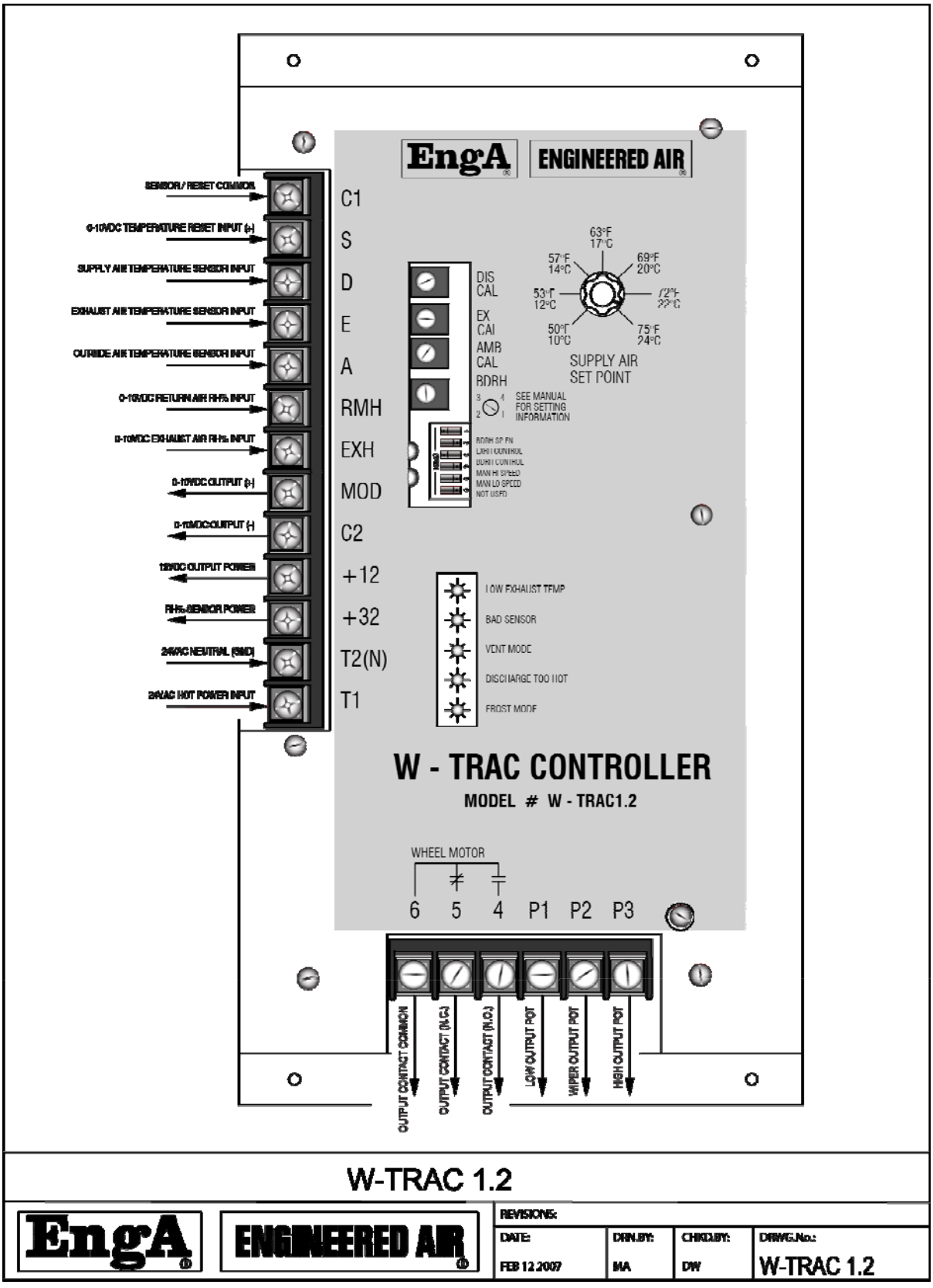
To ensure warranty is honored, only qualified personnel should be employed for service and troubleshooting. If further information is required please contact the nearest Engineered Air office.

There are two sets of electrical drawing and unit function sheets provided with the appliance. One set is in an envelope which also contains the Operation, Installation and Maintenance manual(s). This package is for copying, then should either be returned to the appliance or stored in a safe place. The other set is attached to the control panel door and should never be removed.

Please report any omissions to the national service manager.

Warning: ⚠	**Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.**

Warning: ⚠ ⚠	**This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.**



W-TRAC 1.2

EngA ENGINEERED AIR

REVISIONS:			
DATE:	DRN.BY:	CHKD.BY:	DRWG.No.:
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INTRODUCTION

The W-TRAC is a supervisory controller for Engineered Air HRW heat wheels, with built in discharge air temperature control and optional exhaust frost control.

The information used in this manual should be used in conjunction with the unit function sheet(s) and the HRW series Installation, Operation, and Maintenance manual.

The W-TRAC is designed to control only Engineered Air equipment. Various upgrades and improvements have been made over time. Always include any suffix letters and numbers for troubleshooting and/or replacement. All W-TRAC models are backwards compatible; however some additional wiring may be required.

Note: It is necessary that all of the remote wiring and controls be complete and operational before starting the appliance.

CONTROLLER RATINGS

Power requirements: 24 VAC, 40 VA.
Contact Rating: 120V 3A inductive
0-10 Vdc input impedance: 5 kΩ
Environment: -40 to 120°F (-40 to 50°C) non-condensing.

CONTROLLER DESCRIPTION

TERMINAL LIST

Terminal	Description
C1	Sensor common, and 0-10Vdc reset common (-).
S	0-10Vdc temperature reset input (+).
D	Supply air temperature sensor input.
E	Exhaust air temperature sensor input.
A	Outside air temperature sensor input.
RMH	0-10Vdc return air RH% input.
EXH	0-10Vdc exhaust air RH% input.
MOD	0-10Vdc heat wheel control output (+).
C2	0-10Vdc heat wheel control output (-).
+12	12Vdc output power
+32	32Vdc output power (RH% sensor hot)
T2(N)	24Vac Neutral power input.
T1	24Vac Hot power input.
6	Output contact common
5	Output contact normally closed (N.C.)
4	Output contact normally open (N.O.). Start contact.
P1	Low output potentiometer (legacy, for old style DC drive motors).
P2	Wiper output potentiometer (legacy, for old style DC drive motors).
P3	High output potentiometer (legacy, for old style DC drive motors).

DIP SWITCHES

W-TRAC configuration options are configured by DIP switch selection and/or wiring connections. These are factory set and should not normally need to be altered.

DIP SW	Description
BDRH SP EN	'ON' when RH% sensing of the return air is not used. W-TRAC will control based on pre-defined RH% values. Switch will be 'OFF' when sensing actual RH%.
EXRH CTRL	'ON' when using exhaust air RH% sensing.
BDRH CTRL	'ON' when RH% sensing of the return air is not used. Switch must be in the same position as BDRH SP EN (above).
MAN HI SPEED*	'ON' to drive the output to maximum wheel rotation speed.
MAN LO SPEED*	'ON' to drive the output to minimum wheel rotation speed.

* Do not enable both switches at the same time, or leave either switch 'on' in normal operation.

INDICATION AND DIAGNOSTIC LIGHTS

On the face of the W-TRAC are 5 red LED indication lights.

Light	Description
Low Exhaust Temp	Indicates the exhaust temperature is below the calculated minimum allowable temperature, which is based on the amount of moisture in the return air (measured or estimated) and the ambient temperature.
Bad Sensor	Shorted or open sensor indication.
Vent Mode	Wheel will be stopped. No call for heating or cooling.
Discharge Too Hot	Wheel is slowing down due to excessive recovery of heat.
Frost Mode	Heat wheel rotation speed is reducing to prevent frost accumulation.

ADJUSTMENT POTS

There are a number of setting and calibration potentiometers (POT's) located on the face of the W-TRAC. Modifications to these should only be done by experienced and qualified personnel.

POT	Description
DIS CAL	Discharge temperature sensor calibration.
EX CAL	Exhaust temperature sensor calibration.
AMB CAL	Ambient / outdoor temperature sensor calibration.
BDRH	Predicted design return air RH% scale (1-4).

TEMPERATURE CONTROL

The W-TRAC has 4 modes of operation; Heat, Defrost, Vent and Cool, that controls the wheel rotational speed to achieve the desired temperature setpoint of supply air leaving the wheel.

When the outside air is colder than the exhaust air, the heat wheel will rotate to capture heat from the exhaust air side and transfer it to the supply air stream. Increasing the rotation speed will increase the amount of heat transferred.

If too much heat is being removed from the exhaust air stream it is possible for frost to accumulate on the face of the heat wheel. The W-TRAC will automatically reduce the rotation speed to prevent frosting.

If no heating is required, the W-TRAC will stop the wheel rotation and enter 'vent mode'.

If the outside air temperature is warmer than the exhaust air the W-TRAC will enter 'cool mode' and rotate the heat wheel to transfer heat from the outside air to the exhaust.

BASE SETPOINT

The W-TRAC is designed to be a discharge air temperature controller. The base discharge air temperature is set from the setpoint control knob located on the face of the W-TRAC.

SETPOINT RESET

The base discharge air temperature is often modified from a remote signal to maintain the desired temperature of the supplied space. This is called *reset*. The W-TRAC discharge temperature can be reset from a variety of sources using a 0-10 VDC signal.

An offset to the BMS input range can be implemented by adding a 7.5k resistor in series with terminal S. The following table describes the change of discharge setpoint from the input voltage (to terminals S + and C1 -), with a setpoint fixed at 66°F. Refer to the equipment function page for the design reset range.

		Input Voltage					
		0.0	**2.0**	**4.0**	**6.0**	**8.0**	**10.0**
Discharge Setpoint (°F/°C)	**No Resistor**	30 / -1	40 / 4	45 / 7	52 / 11	60 / 15	66 / 19
	7.5k Resistor	48 / 9	53 / 12	56 / 13	59 / 15	63 / 17	66 / 19

FROST CONTROL

Frost should not be allowed to build up on the wheel. It is necessary to reduce the amount of heat recovered when the outside temperature is below the freezing point (0°C / 32°F) and the exhaust leaving temperature falls to a point that frost can begin to form. Frost may damage the wheel and reduce airflow.

Operating the heat wheel close to the frost threshold temperature will provide maximum energy recovery. There are 3 different methods of providing frost control, all of which reduce the heat wheel rotation speed.

EXHAUST AIR RH% SENSOR

This method of control requires a humidity sensor connected across terminals EXH and C2. DIP 1 and 3 must be OFF, DIP 2 must be ON. The sensor is installed in the exhaust air section, just after the heat wheel.

When the outdoor ambient temperature is below 15°F (-10°C) the speed of the heat wheel will be reduced to maintain the leaving exhaust air humidity between 80 – 90%. This application requires high accuracy humidity sensors.

RETURN AIR RH% SENSOR

This method of frost control requires a RH sensor installed in the equipment return air section, just before the heat wheel, wired into terminals RMH and C2. DIP 3 must be ON, DIP 1 and 2 must be OFF.

Using the values of the RH and ambient (outside air) sensor, the W-TRAC calculates the minimum allowable exhaust air temperature that will keep frost from forming on the wheel.

BDRH PREDICTED RETURN AIR RELATIVE HUMIDITY

RH% sensing is not used in this method of frost control. DIP 1 and 3 must be ON, while DIP 2 is OFF.

The W-TRAC may operate without the use of humidity sensing in situations where the RH% values are expected to be reasonably constant. In these cases, the W-TRAC operates by sensible temperature only.

When enabled, the BDRH pot (Building Design Relative Humidity) is set according to the expected design return air conditions. Refer to the table below to set the expected values based on temperature and RH%.

Table 1

BDRH setting	Return Air Conditions		
	70°F (21°C)	**75°F (24°C)**	**80°F (27°C)**
1	< 25%	< 21%	< 18%
2	26 – 32%	22 – 27%	19 – 23%
3	33 – 39%	28 – 33%	24 – 27%
4	40 – 49%	34 – 42%	28 – 35%

To use this table, first select the return air temperature, then select the RH% range in the column below, then select the BDRH setting to the left.

WIRING

The W-TRAC terminals H and N require a minimum 24 VAC, 40 VA class 2 power supply that does not need to be isolated from the rest of the systems components.

Terminal N should be wired to the common of the same source supplying power to terminals E, A, and K. All remote wiring should be installed in a clean (no electrical noise) environment. Wire size should be a minimum of 24ga. twisted pair to reduce electrical noise (shielded wire is recommended). For longer runs

(over 50 ft. eq. length), the use of a minimum 20 gauge-shielded wire is recommended. The shield should be grounded at the controller end only, with the other end taped.

It is important to ensure correct polarity when wiring into the system.

SERVICE NOTES

ROTATION

Most heat wheels have a purge section to purge exhaust air trapped in the wheel flutes before they rotate to the supply air side. The correct wheel rotation direction is noted on the face of the heat wheel. Drive motor rotation may be changed at the motor wire connections or on the inverter drive feeding the motor (if used).

MOTOR SPEED CONTROL

The modulating 0-10Vdc motor speed output may be connected to a variety of controllers and/or inverters. Refer to the equipment wiring diagram for connection details. The following setup parameters are typical. Always refer to the equipment function sheet for any changes. To ensure proper setup operation, do not have DIP 4 and DIP 5 on at the same time.

KBVF / SIVF(R)

The KBVF inverter drive and SIVF signal isolator are manufactured by KB Electronics Inc. The inverter and isolator installation and operation manuals are included in the information package, originally located in the main equipment electrical panel. The 0-10Vdc W-TRAC control output feeds into the SIVF signal isolator which, in turn, feeds an isolated 0-5Vdc signal to the KBVF inverter drive.

High Speed

Turn on W-TRAC DIP 4 to force the W-TRAC to maximum output (near 10Vdc). Note that if the W-TRAC is operating in frost mode DIP 4 will not allow the drive to go to full speed. Measure the motor amps and confirm the readings are less than the maximum motor ampacity. If possible, measure and confirm the output frequency is 60Hz.

The KBVF is factory set to 100% of rated frequency (60Hz) and should not be adjusted.

Low Speed

Turn on DIP 5 to drive the output to minimum (0Vdc). Adjust the minimum speed pot on the KBVF inverter drive until the heat wheel just begins to turn, usually between 0.5 and 2 rpm. Turn the power off,

and then restart the system to confirm the motor has enough starting torque to reliably start rotating the heat wheel.

Return all DIP switches to their original position.

WHEEL ROTATION SPEED

Maximum wheel rotation speed will be factory set in the range of 30-40 rpm, at 60 Hz, depending on the size of the heat wheel.

Minimum wheel speed is dependent on the starting torque of the motor and heat wheel, usually between 0.5 and 2 rpm.

SENSOR CALIBRATION

Discharge Temperature Calibration

Remove the supply air temperature sensor and measure both the sensor resistance and the temperature at the sensing element. Compare these readings to the sensor table values. If the resistance is out by more than 16 ohms, replace the sensor.

- Measuring a sensor temperature between 60 – 70°F, slowly rotate the temperature setpoint dial counter clockwise until the 'Discharge Too Hot' light just comes on.
- Slowly increase the temperature setpoint dial until the light goes off.
- The setpoint should match the sensed temperature measurement. If not, adjust the calibration pot and repeat test.

Exhaust Temperature Calibration

Remove the exhaust air temperature sensor and measure both the sensor resistance and the temperature at the sensing element. Compare these readings to the sensor table values. If the resistance is out by more than 16 ohms, replace the sensor. The 'bad sensor' LED may turn on and off during this procedure.

- Place a jumper wire across terminals A and C1.
- Remove the exhaust temperature sensor and replace with a 909 Ω resistor.
- Note the position of the BDRH pot, and then adjust to position 2.
- Slowly rotate pot #2 counter clockwise (EX CAL)) until the low exhaust temperature light comes on.
- Slowly rotate pot #2 clockwise until the low exhaust temperature light just turns off.
- Reconnect all sensors and set pot BDRH back to its original position.

Humidity sensors

Accurately measure the relative humidity at the sensor location and compare to the sensor Vdc output. The 0-10Vdc output is proportional to 0-100% RH.

SENSOR TABLE

Sensor Resistance Chart for TE6000EA3

Table 2

°C	°F	Resistance Ω	°C	°F	Resistance Ω	°C	°F	Resistance Ω
-40	-40	602	18.3	65	983	48.9	120	1234
-34.4	-30	633	20	68	996	54.4	130	1269
-28.9	-20	665	20.6	69	1000.7	60	140	1333
-23.3	-10	698	21.1	70	1005	65.5	150	1365
-17.8	0	732	23.9	75	1026.5	71.1	160	1437
-12.2	10	768	26.7	80	1048	76.7	170	1491
-8.7	20	804	29.4	85	1070	82.2	180	1546
-1.1	30	842	32.2	90	1092	87.7	190	1602
4.4	40	881	35.6	95	1116	93.3	200	1659
10	50	921	37.8	100	1139	98.8	210	1718
12.8	55	942	43.3	110	1186	100	212	1778

Reference resistance is 1035 ohms at 77°F. Resistance tolerances are ±0.05 to 0.15% at 77°F. Temperature range +32 to +104°F.