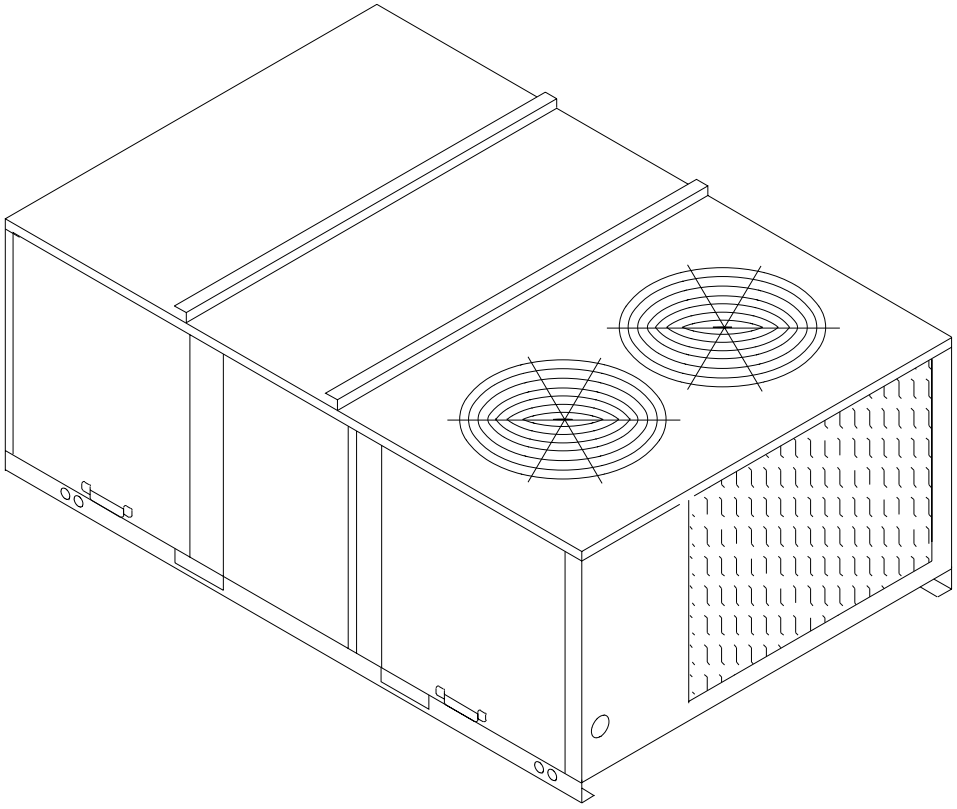
INSTALLATION OPERATION MAINTENANCE

<u>Customer Property</u> — Contains wiring, service, and operation information. Please retain.

Library	Service Literature
Product Section	Unitary
Product	Rooftop Lt. Comm.
Model	WK
Literature Type	Installation/ Oper/ Maint
Sequence	2
Date	November 2000
File No.	SV-UN-RT-WK-IOM-2 11/00
Supersedes	New

Models: (50 Hz)
WK*100-125
WK*155-200

Packaged Heat Pump
100 - 200 Models



IMPORTANT NOTE: All phases of this installation must comply with the **NATIONAL, STATE & LOCAL CODES.** These units are equipped with an electronic unit control processor, (UCP) that provides service functions which are significantly different from conventional units. Refer to the TEST MODES and START-UP PROCEDURES before attempting to operate or perform maintenance on this unit.

Since the manufacturer has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

Table of Contents

Inspection 2
Module Names 3
Unit Features 3
ZSM Mode 3
Auto Test Mode 4
Resistance Test Mode 4
Unit Dimensions 5
Curb Dimensions 6
Installation 7
Unit Support 7
Location and Clearances 7
Placing and Rigging 7
Attaching Downflow Ductwork to Roof Curb 9
Filter Installation 9
Evaporator Fan Adjustment 9
Interconnecting Diagram 12
Wire Connection Guide 14
Pre-Start Quick Check List 14
Power-up Initialization 15
Unitary Control Processor (UCP) 15
Switch Settings for Cycle Timing 15
Defrost Module Test & Operation 16
Final Installation Checklist 16

Read this manual carefully before attempting to install, operate or perform maintenance on this unit. Installation and maintenance must be performed by qualified service technicians except where noted.

⚠ WARNING: ***Bodily injury can result from high voltage electrical components and fast moving fan drives. For protection from these inherent hazards during installation and servicing, the electrical supply must be turned off. If operating checks must be performed with the unit operating, it is the technician's responsibility to recognize these hazards and proceed safely.***

⚠ WARNING: **All power legs to the electrical components may not be broken by contactors. See the wiring diagram on the unit control box cover.**

Before starting the compressor, the crankcase heaters should be energized for eight hours.

Note: "Warnings" and "Cautions" appear at appropriate places in this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The manufacturer assumes no liability for installations or servicing performed by unqualified personnel.

Inspection

1. Check for damage after unit is unloaded. Report promptly, to the carrier, any damage found to unit. Do not drop unit.

2. Check unit nameplate to determine if unit is correct for application intended. Power supply must be adequate for the unit and all accessories.

3. Check to be sure the refrigerant charge has been retained during shipment. Access to 1/4" flare pressure taps may be gained by removing compressor compartment access panel.

MODULE NAMES

UCP -Unitary Control Processor (standard component) This is the heart of the system. The computer program resides in this module. The minimum configuration will include the **UCP** and one of the zone sensor modules

ZSM -Zone Sensor Module (accessory component) Replaces thermostat, provides operator controls and the zone temperature sensor for the **UCP**. A complete line of **ZSMs** is available with various combinations of features. A zone sensor module, or a CTI and generic control is required for each system.

UEM - Unitary Economizer Module (standard component on economizer accessory). This module provides the hardware necessary to connect the economizer accessory to the **UCP**.

TCI - Communication Interface. This interface is required to connect the system to an ICS BUILDING MANAGEMENT, i.e. - Tracker or Tracer. system.

CTI - Conventional Thermostat Interface (accessory component.) This module can be used in special applications that require the installation of select electro-mechanical thermostats to interface with the **UCP**, instead of using a zone sensor module (**ZSM**)

UNIT FEATURES

Self-test/Auto-configuration
At power-up, the system will perform a series of tests to verify correct operation and configure itself automatically, based on the unit wiring harness.

Cooling Minimum ON/OFF times
To enhance compressor reliability, a minimum of 3 minutes ON/OFF time has been implemented in the software. Any time power is applied or re-applied (e.g. after a power failure), the 3 minutes minimum OFF time is enforced to prevent short cycling a compressor.

Lead-Lag (Cooling Mode Only)
A selectable configuration within the UCP which alternates the starting of the compressors between the two refrigeration circuits. To enable the Lead/Lag function, cut wire 52F (PR) which is connected to terminal J1-7 at the UCP. Refer to the unit wiring diagram. Each time the request for cooling is satisfied, the designated lead compressor switches. Upon Power-up Initialization, the control will default to the number one compressor. When a Conventional Thermostat Interface (CTI) is used, Lead/Lag is functional except during the test mode.

Zone Temperature Sensor
The zone temperature sensor provides the zone temperature sensing function to the **UCP**.

ZSM MODE

HEAT - Heat functions only enabled.

AUTO - Auto-changeover between Cooling mode and Heating mode as required by zone load (on some models).

OFF - No heating or cooling functions

COOL - Cooling functions only, including economizer function enabled.

FAN SETTINGS

FAN AUTO - Fan is enabled only when heating or cooling functions are required.

FAN ON - Fan is enabled at all times. This setting is used when air circulation is required.

Option Remote Panel Zone Sensors
Indicator Lights

SYS-ON
Indicates that power is applied to the unit and the UCP is functioning correctly. This indicator will flash at a 1 second rate to indicate operation of one of the test modes.

HEAT
Indicates that at least one stage of heat is ON. This indicator will flash at a 1 second rate to indicate a heat failure .

COOL
Indicates that cooling is active. This could be economizing and/or compressor cooling. This indicator will flash at a 1 second rate to indicate a cool failure. Sources of cool failure include high pressure controls if present and zone sensor failures.

SERVICE
Indicates that a problem exists in the supply air stream. Could be dirty filters, broken drive belt or other functions depending on what sensors or switches are installed on the fan/filter status input.

TEST MODE PROCEDURE

Operating the unit from the roof using the test mode.

⚠WARNING: ***When operating the unit in the test mode, the evaporator access panel and the control box cover, must be closed. Failure to ensure that the evaporator access panel and control box cover is in place could result in severe personal injury or death***

The Unitary Control Processor **(UCP)** has a red indicator light in the lower left corner. When power is applied to the unit the light will glow if the **UCP** is functioning correctly. If the system is placed in the test mode the light will blink continuously.

Note: The control box cover has a small peep hole, located in the lower left hand corner. The red indicator light on the UCP can be seen through this peep hole. Do not remove the control box cover while the unit power is connected.

Step Test Mode

The step test mode is initiated by shorting across the "TEST" terminals, marked test 1 and test 2 on the unit's low voltage terminal strip **(LTB)**, for two (2) to three (3) seconds and then removing the short.

When the test mode is initiated, the light on the **UCP** will blink and the system will begin the first test step, and turn on the indoor fan. (See test mode table)

To continue to the next step, reapply the short across the test terminals for 2 to 3 seconds.

The unit may be left in any test step for up to one hour. If allowed to remain in any test step for more than one hour, the test mode will terminate and control will revert to the zone sensor. As you continue to apply and remove the short across the test terminals, the unit will move through the steps according to the table below.

To terminate the test mode, cycle the unit power at the unit disconnect or continue stepping through the modes until the **UCP's** indicator light glows constantly.

Auto Test Mode

—The auto test mode is initiated by installing a jumper between terminals marked TEST 1 and TEST 2 on the LTB. The unit will start in step 1 and cycle through the test steps one time, changing every 30 seconds.

—When the test mode is initiated, the light on the UCP will blink and the system will begin the first test step, and turn on the indoor fan. (See test mode table)

—At the end of the auto test mode, the indicator light will glow constantly and control will revert to the zone sensor.

—The unit can be left in any one of the test steps, by removing the jumper. It will remain in this step for up to one hour. If allowed to remain in any test step for more than one hour, the test mode will terminate and control will revert to the zone sensor.

— To terminate the test mode, cycle the unit power at the unit disconnect.

Resistance Test Mode

The resistance test mode is Initiated by applying the appropriate resistance value across the "Test" terminals marked TEST 1 and TEST 2 on the **LTB**.

—When the test mode is initiated, the light on the **UCP** will blink and the system will begin the test step selected by the resistance being applied across the test terminals. (See test mode table)

—The resistance values are indicated in the Resistance Value Chart below.

—After selecting the desired test step, and applying the appropriate resistance across the test terminals, the unit will start.

—The unit can be left in this step for up to one hour. If allowed to remain in any test step for more than one hour, the test mode will terminate and control will revert to the zone sensor.

—To terminate the test mode, remove the resistance, and cycle the unit power at the unit disconnect.

Test Mode Table

Step	Mode	Fan	Econ	C1	C2	Heat 1	Heat 2	Heat 3	Defrost	Em Heat
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	Off	Off	Off
4	Cool 2	On	Min	On	On	Off	Off	Off	Off	Off
5	Heat1	On	Min	On	On	On	Off	Off	Off	Off
6*	Heat 2	On	Min	On	On	On	On	Off	Off	Off
7*	Heat 3	On	Min	On	On	On	On	On	Off	Off
8**	Defrost	On	Min	On	On	Off	On	On	On	Off
9**	Em Heat	On	Min	Off	Off	Off	On	On	Off	On

* With Optional Accessory ** With Heat Pump

Note: Steps for optional accessories and modes not present in unit, will be skipped.

Resistance Valves Chart

STEP	MODE	Ohms
1	FAN ON	2.2K
2*	ECONOMIZER	3.3K
3	COOL 1	4.7K
4	COOL 2	6.8K
5	HEAT 1	10K
6*	HEAT 2	15K
7*	HEAT 3	22K
8**	DEFROST	33K
9**	EM HEAT	47K

* With Optional Accessory

** With Heat Pumps

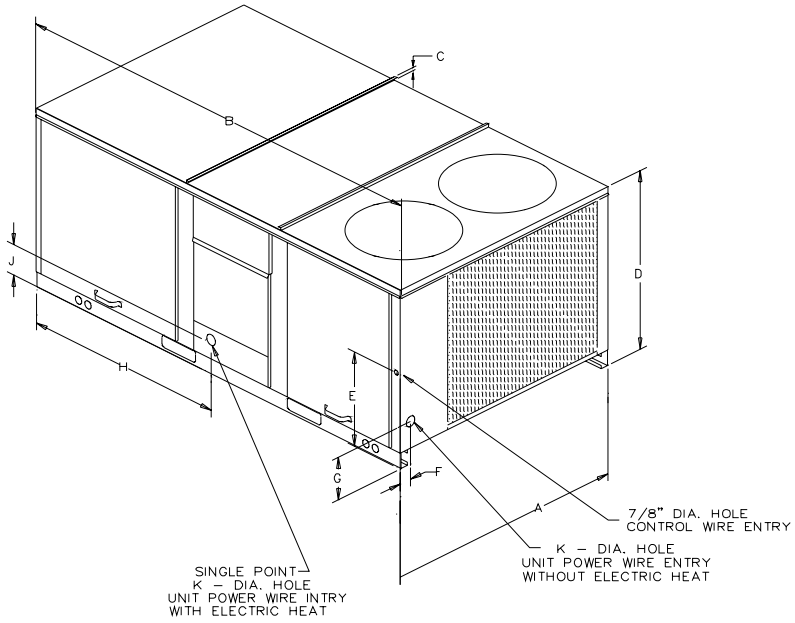
Note: Steps 7,8 & 9 are not applicable on Electric/Electric or Gas Units

Dimensional Data

Unit Dimensions - mm

Units	A	B	C	D	E	F	G	H	J	K
WK* 100	1608	2380	20	1245	726	56	213	1000	173	51
WK* 125, 155	1798	2710	20	1273	744	68	213	1229	168	51
WK* 200	2154	3107	20	1372	843	69	226	1422	173	76

* Downflow or Horizontal

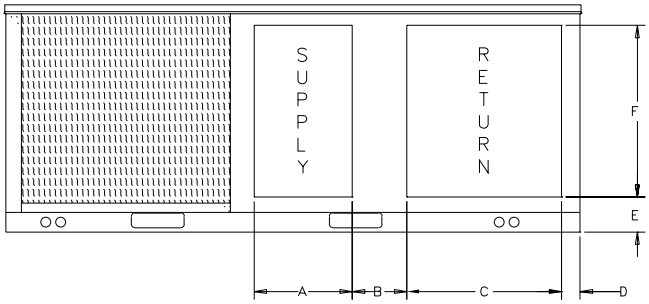


HORIZONTAL UNIT

REAR VIEW SHOWING DUCT OPENINGS

FOR HORIZONTAL AIR FLOW - mm

UNITS	A	B	C	D	E	F
WKH100	571	457	437	51	100	1053
WKH125, 155	673	497	624	51	100	1080
WKH200	673	611	700	51	100	1180



DOWNFLOW UNIT

TOP VIEW SHOWING DUCT OPENINGS IN THE BASE - mm

UNITS	A	B	C	D	E
WKD100	570	368	449	1312	1199
WKD125, 155	672	572	475	1586	1389
WKD200	672	730	506	1938	1745

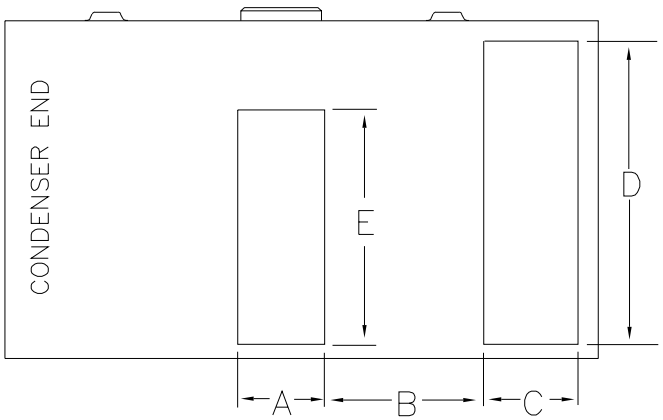
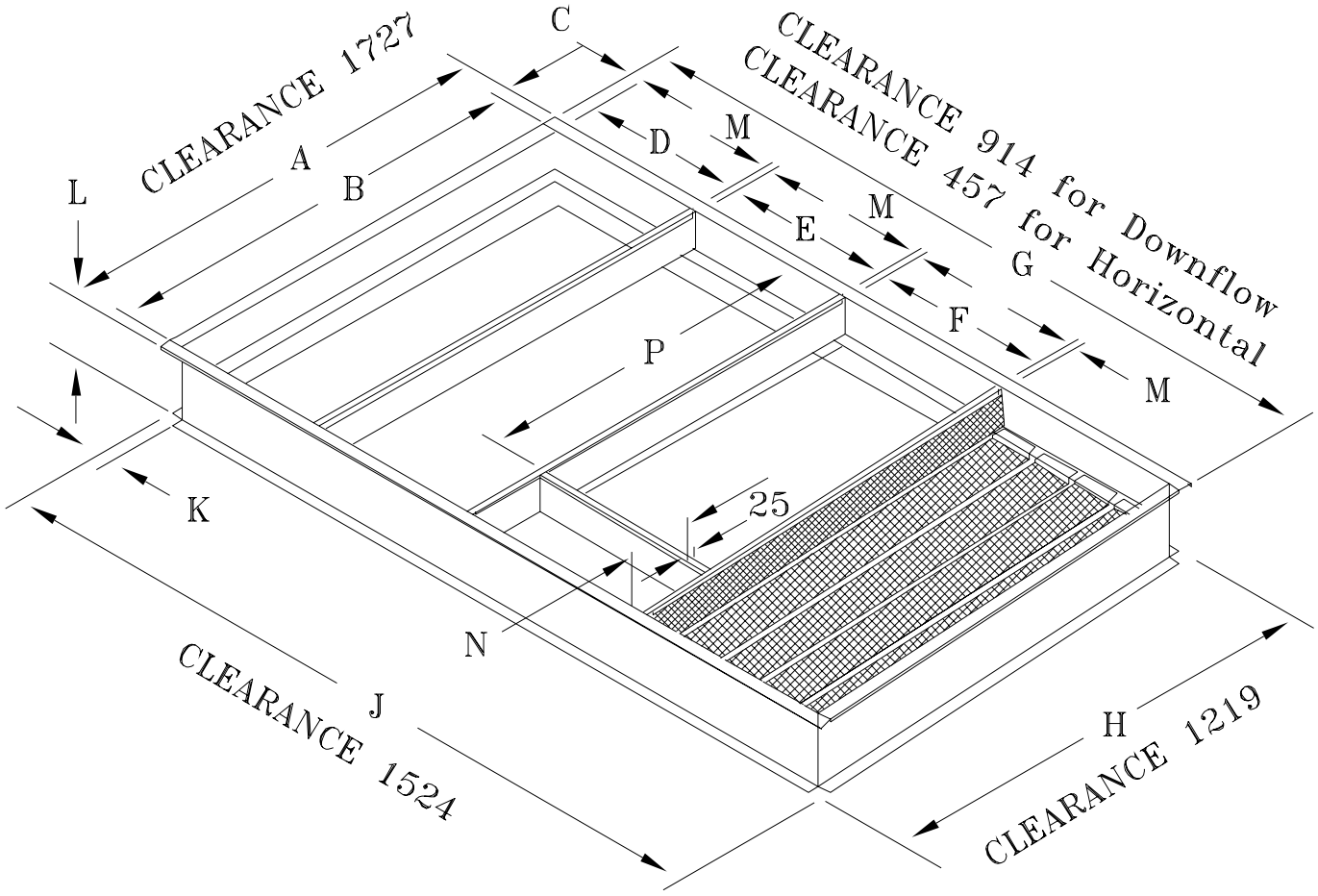


Figure 1 - Curb Dimensions - mm

UNITS	A	B	C	D	E	F	G	H	J	K	L	M	N	P
WKD100	1502	1408	46	486	251	622	2259	1509	2267	51	357	25	205	1205
WKD125, 155	1692	1600	46	530	435	724	2588	1702	2597	51	357	25	191	1410
WKD200	2048	1956	46	565	591	725	2969	2057	2977	51	357	25	191	1765



INSTALLATION
Location and Recommendations

Unit Support

If unit is to be roof mounted check building codes for weight distribution requirements. Refer to accessory roof curb mounting instructions. Check unit nameplate for supply voltage required. Determine if adequate electrical power is available. Refer to specification sheet.

Location and Clearances

Installation of unit should conform to local and national building codes.

Select a location that will permit unobstructed airflow into the condenser coil and away from the fan discharge. Suggested airflow clearances and service clearances are given in Figure 1.

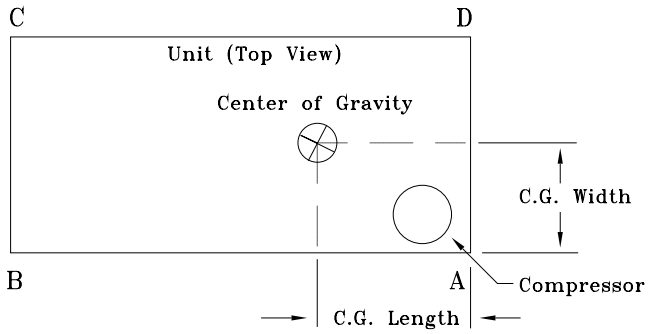
Placing and Rigging

***Note*: Before attempting to rig the unit, remove the fork lift pockets located on the condenser end of the unit.**

Rig the unit using either belt or cable slings. The sling eyelet must be placed through the lifting holes in the base rail of the unit. The point where the slings meet the lifting eyelet should be at least 6 feet above the unit. Use spreader bars to prevent excessive pressure on the top of the unit during lifting. Figure 2 shows the unit center of gravity.

IMPORTANT: The use of "spreader bars" is required when hoisting the unit (prevents damage to sides and top). Top crating can be used as spreader bars.

Figure 2



Mounting Unit on Roof

Downflow units should be mounted on a roof curb when possible. When installing the unit on the roof curb, follow the installation instructions accompanying the roof curb kit. On new roofs, the curb should be welded directly to the roof deck. For existing construction, nailers must be installed under the curb if welding is not possible. Be sure to attach the downflow ductwork to the curb before setting unit in place. See Figure 3A or 3B. Refer to the curb installation instructions to insure the unit will be level.

When installing the unit, it must be level to insure proper condensate flow from the unit drain pan. The maximum pitch of the unit down from the condensate drain of the unit is 0.5 mm per meter **(1/16 inch per foot)**.

Slab Mount

For ground level installation, the unit base should be adequately supported and hold the unit near level. The installation must meet the guidelines set forth in local codes.

Table 1
Corner weights & Center of Gravity

Unit Dimensions	Net Weight	Corner Weights (kg) (See Note 1)				Center of Gravity (mm)	
		A	B	C	D	Length	Width
WK*100B	536	183	140	92	120	1041	635
WK*125B	625	218	159	105	144	1143	711
WK*155B	642	228	162	105	147	1143	711
WK*200B	871	291	226	155	199	1346	889

* Downflow or Horizontal

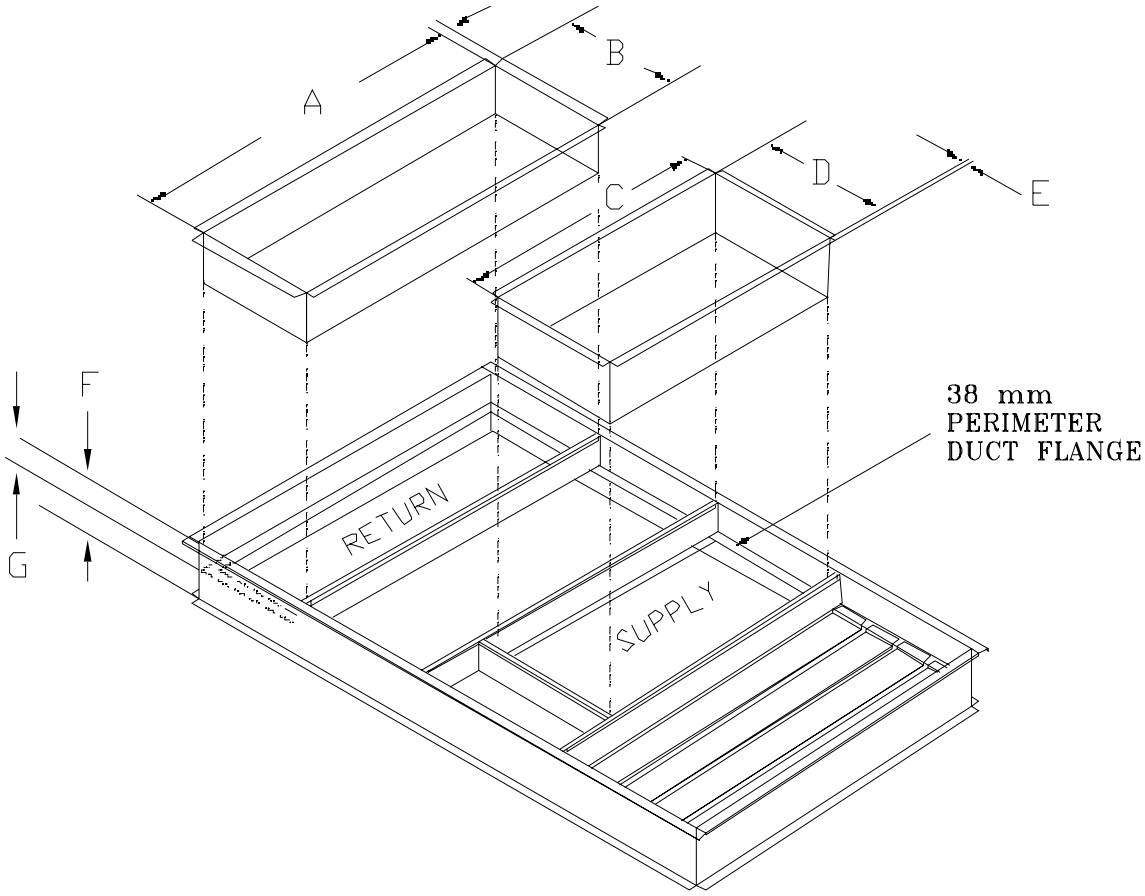
Note: Corner weights are given for information only. Unit is to be supported continuously by curb or equivalent frame support.

Duct Dimensions - mm

UNITS	A	B	C	D	E	F	G
WK*100	1318	411	1130	567	25	357	189
WK*125, 155	1510	454	1334	643	25	357	189
WK*200	1865	491	1689	668	25	357	189

* G Dimension represents the distance from the top fo the curb to the duct flange.

Figure 3



Ductwork

Attaching Downflow Ductwork to Roof Curb

Supply and return openings have curb flanges provided for easy duct installation.

Note: Ductwork sleeves must be attached to the curb flanges before the unit is set into place. See Figure 3A and 3B for duct connections and dimensions.

Guidelines for ductwork construction:

— Connections to the unit should be made with three-inch canvas connectors to minimize noise and vibration transmission.

— Elbows with turning vanes or splitters are recommended to minimize air noise and resistance.

— The first elbow in the ductwork leaving the unit should be no closer than 610 mm (two feet) from the unit, to minimize noise and resistance.

Attaching Horizontal Ductwork to Unit

— All conditioned air ductwork should be insulated to minimize heating and cooling duct losses. Use minimum of 50 mm (2") of insulation with a vapor barrier. The outside ductwork must be weather proofed between the unit and the building.

— When attaching ductwork to a horizontal unit, provide a flexible water tight connection to prevent noise transmission from the unit to the ducts.

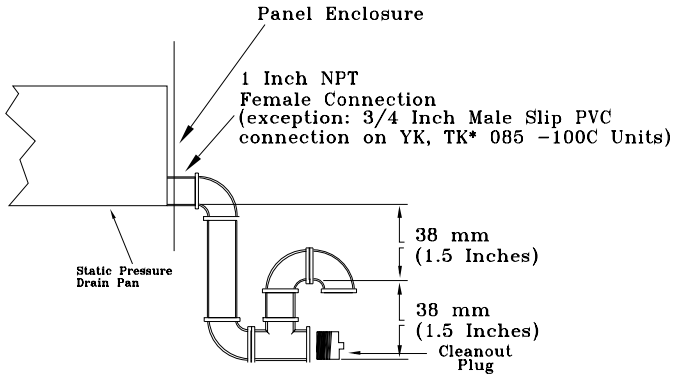
Note: **Do not draw the canvas connectors taut between the unit and ducts. See dimensional data for duct connections.**

Condensate Drain Piping

A 1 inch NPT female condensate drain connection is provided on all units.

Follow local codes and standard piping practices when running the drain line. Install a trap and be sure to fill with water before starting the unit. Pitch the line downward, away from the unit; avoid long, level, horizontal runs. Refer to Figure 4.

Figure 4



Filter Installation

To gain access to filters, remove the evaporator fan access panel. Each unit ships with 2 inch filters. Number and size of filters is determined by size and configuration of the unit. Refer to the unit “Service Facts” for filter requirements.

Note: On WKD100 and WKH200 units, there is an installation instruction label on the end of the filter rack which provides instructions on how to replace the top filters.

Evaporator Fan Adjustment

Use the following procedure to determine the proper adjustment of the evaporator fan sheaves for a specific application.

1. Determine total system external static pressure (in inches water column) with accessories installed. To accomplish this:

   a. Obtain the design airflow rate and the design external static pressure drop through the distribution system. Your sales representative or the design engineer can provide you with these values.

   b. Using the table from unit Service Facts, add static pressure drop of the accessories installed on the unit.

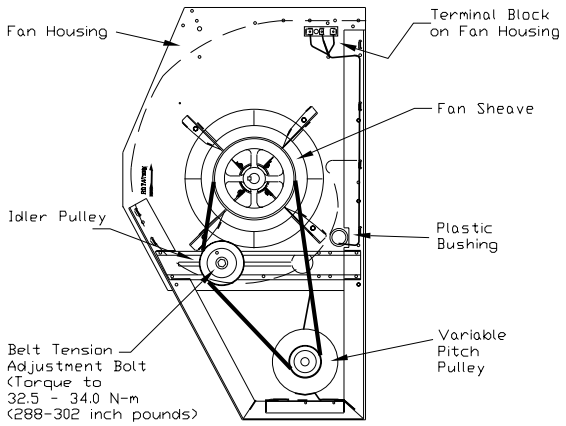
   c. Add the total accessory static pressure drop (from step 1b) to the design external static pressure. The sum of these two values is the total system external static pressure.

2 . Use the table(s) in the Service Facts to find the external static pressure (in inches water column) that most closely approximates total system external static pressure. Then locate the appropriate airflow rate (in m^3/n (cfm) for your unit. The value obtained represents the Kw brake horsepower for the evaporator fan motor and the fan RPM.

Important: Fan Kw Break Horsepower (BHP) listed in the Table is the percentage range of nameplate amperage the motors will safely work within before and oversized motor is required.

3. Adjust the variable pitch pulley to increase or decrease the fan RPM as required. See Figure 5.

Figure 5
Typical fan, motor, and sheave assembly



TO INCREASE M^3/h CFM
Loosen the pulley adjustment set screw and turn sheave clockwise

TO DECREASE M^3/hCFM
Loosen the pulley adjustment set screw and turn sheave counter-clockwise

TO INCREASE BELT TENSION
Loosen the nut (next to the idler sheave) that secures the sheave in place. With a wrench, apply pressure clockwise on the outside nut (round headed one), until tension desired is reached. While holding pressure with the tension nut, retighten the nut next to the idler sheave.

Electrical Connections

Electrical wiring and grounding must be installed in accordance with local and national codes.

Electrical Power

It is important that proper electrical power is available for the unit. Voltage variation should remain within the limits stamped on the nameplate.

Power Entry

Holes are provided for low-voltage and high-voltage wiring. It is not necessary to punch any new holes in either the interior or exterior unit panels. If new holes are punched, performance will be adversely affected unless they are resealed to be both air- and watertight.

Disconnect Switch

Provide an approved weather-proof disconnect either on the side of unit or within close proximity.

Over Current Protection

The branch circuit feeding the unit must be protected as shown on the unit rating plate.

Power Wiring

The power supply lines must be run in weather-tight conduit to the disconnect, and into the bottom of the unit control box. Provide strain relief for all conduit with suitable connectors.

Provide flexible conduit supports whenever vibration transmission may cause a noise problem within the building structure.

Insure all connections are made tight. (See Figure 6)

Note: For branch circuit wiring (main power supply to unit disconnect), Wire size for the length of run should be determined using the circuit ampacity found on the unit nameplate and the N.E.C..

For more than 3 current carrying conductors in a raceway or cable, for de-rating the ampacity of each conductor.

GROUNDING: THE UNIT MUST BE ELECTRICALLY GROUNDED IN ACCORDANCE WITH LOCAL AND NATIONAL CODES.

Control Wiring (Class II)

Note about 24 Volt Transformers:
Units have intergal circuit breakers in their low voltage transformers. If the breaker trips, be sure to open the unit disconnect before attempting to reset the breaker.

Some earlier model units have a replaceable fuse mounted in the transformer. An extra fuse is taped down near the transformer. To use this replacement fuse, remove the old one by pushing in and turning counter-clockwise 1/4 turn, then pull it out. To insert the new fuse, push in and turn clockwise until it stops.

CAUTION: Do not replace with a fuse of greater ampacity than 3.5 amps.

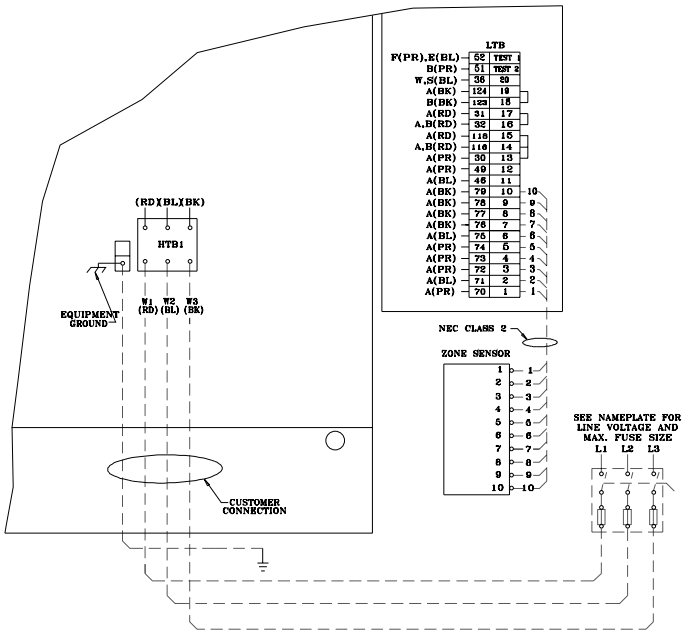
⚠ WARNING: ***Open and lock unit disconnect. Failure to do so could result in severe personal injury or death due to electrical shock.***

Remove compressor access panel and control box panel to access transformer. Reset by pressing in on the black reset button located on the left side of the transformer.

Replace all panels before restoring power to the unit.

Important Note: The unit 24 volt transformer must not be used to power Field Installed Accessories (FIA), except for the ones that are factory supported.

Figure 6
Typical Field Wiring Diagram



Low voltage control wiring **must not** be run in conduit with power wiring. Route low voltage (class II) colored wire from zone sensor terminals through 7/8 inch bushing in the unit. See dimensional data for control wire entry location. Make connections as shown by the appropriate low voltage wiring diagrams in Figure 7.

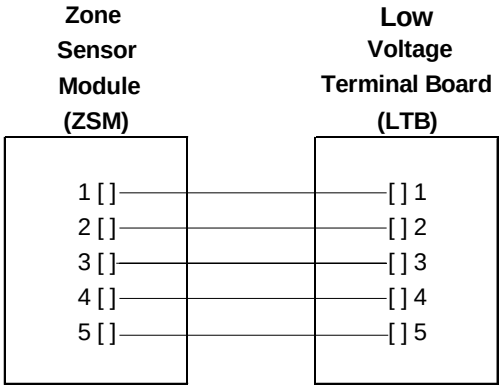
Zone Temperature Sensor conductors are standard thermostat wire 22 to 14 ga. The only exceptions are Tracer/Tracker installations which utilize a serial communications link and require a shielded twisted pair of conductors between the Tracer/Tracker and the (TCI) Communications Interface.

Recommended wire sizes and lengths for installing the Zone Temperature Sensor are provided in Table 4. Ensure that the wiring between the controls and the unit's termination point does not exceed two and a half (5) ohms/conductor for the length of the run. Resistance in excess of 5 ohms per conductor can cause deviation in the accuracy of the control.

Table 4 - DC Conductors

Diameter (mm^2)	Maximum Length (m)
0.33	45
0.50	76
0.75	115
1.30	185
2.00	300

NOTE: Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.

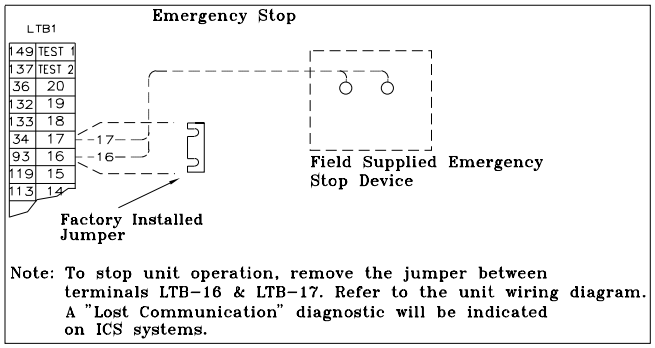


Zone Temperature Sensor and low voltage terminal designations are no longer R-W-Y-G-B etc, they are now 1-2-3 etc. Connections should be made using 1 to 1, 2 to 2, 3 to 3, and so on. See example below.

Zone Temperature Sensor Terminal Strip

Terminal #	Terminal I.D.
1	ZTEMP
2	SIGNAL COMMON
3	CSP
4	MODE
5	HSP
6	LED COMMON
7	HEAT LED
8	COOL LED
9	SYS ON LED
10	SERVICE LED

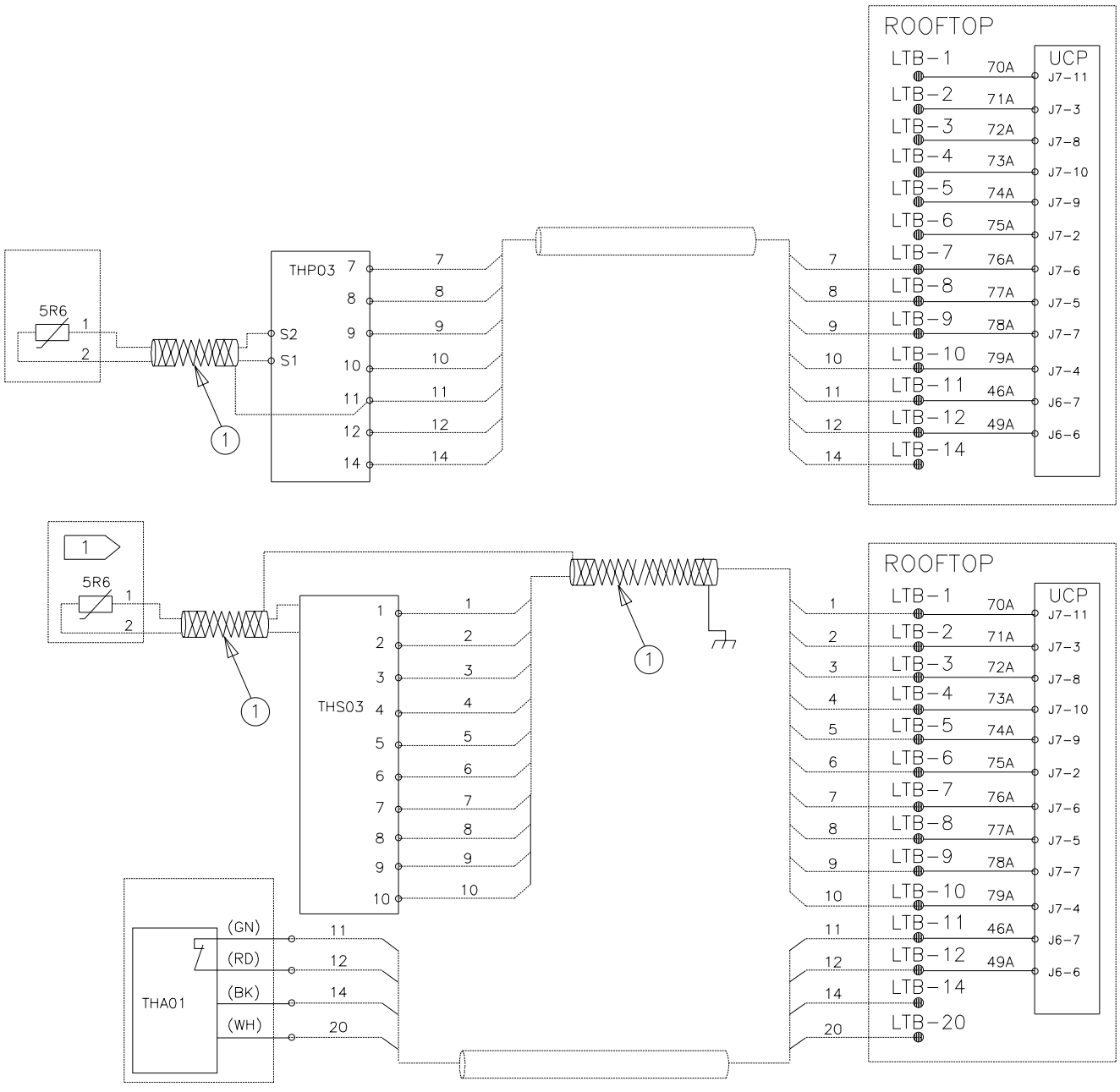
Emergency Shut Down
For Emergency Shut down, remove the jumper between LTB-16 and LTB-17 and install normally closed contacts (Open at Fault Condition). Immediate shut down will occur and the UCP will be diabled.



Compressor Disable
To disable Compressor #1, remove the jumper between LTB-13 and LTB-14 and install normally closed contacts (open to disable).

To disable Compressor #2, (if applicable), remove the jumper between LTB-14 and LTB-15 and install normally closed contacts (open to disable).

Figure 7A
Zone Sensor Interconnecting Diagram



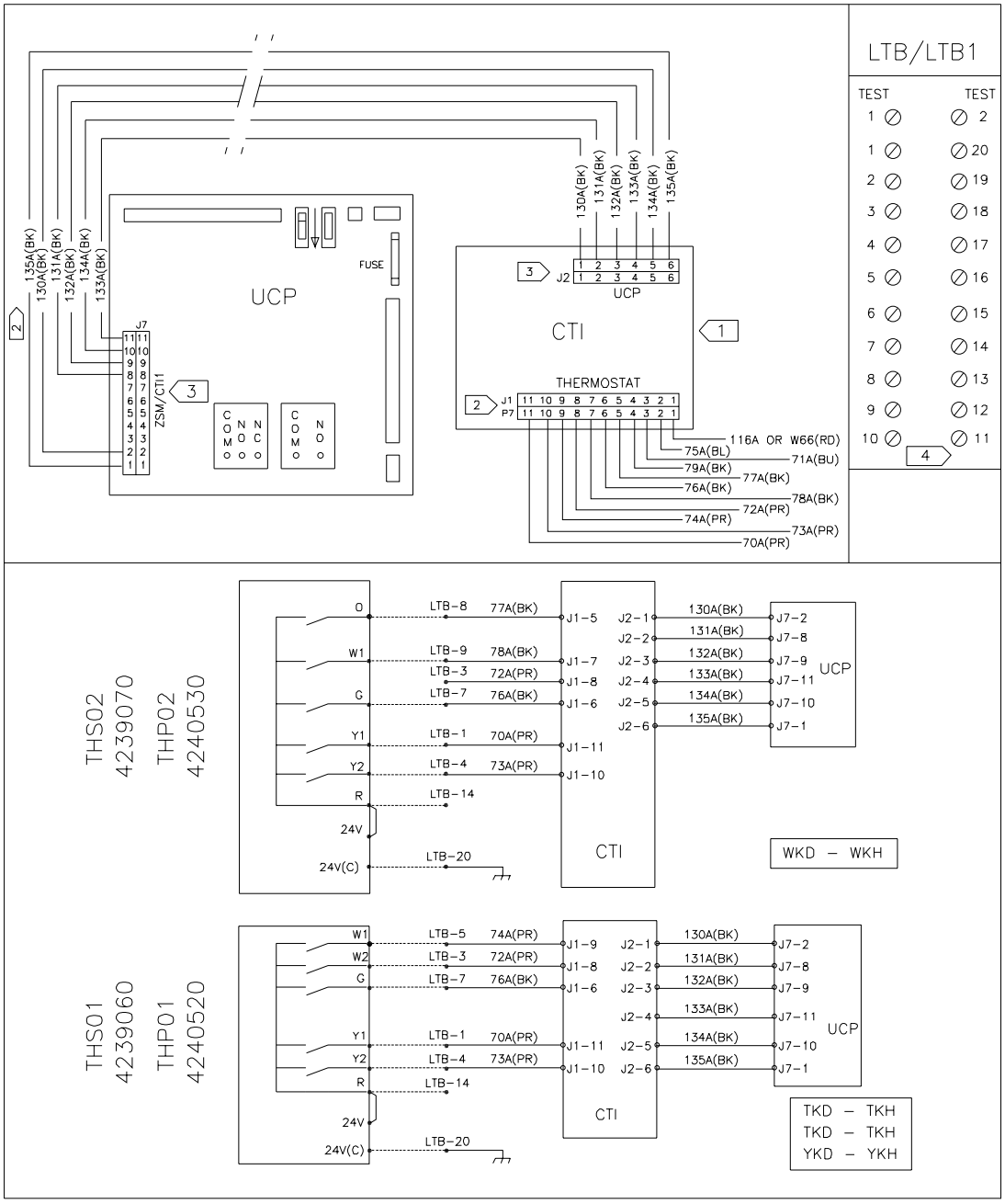
———	TRANE WIRING
.....	CUSTOMER WIRING

ITEM	DESCRIPTION
LTB-...	CONTROL TERMINAL BLOCK
THS03	STANDARD THERMOSTAT
THP03	PROGRAMMABLE THERMOSTAT
5R6	REMOTE SENSOR
GTC	BUILDING MANAGEMENT SYSTEM
TCI-3	TRANE COMMUNICATION INTERFACE
THA01	OCCUPANCY SENSOR
UCP	UNIT CONTROL MODULE

1 DISCONNECT THE THERMOSTAT'S THERMISTOR RTI WHEN REMOTE SENSOR OPTION IS USED.

(1) SHIELDED, TWISTED PAIR WIRE.

Figure 7B
Conventional Thermostat Interconnects



1. MOUNT CTI IN CONTROL BOX IN THE HOLES PROVIDED WITH 4 SCREWS INCLUDED.
2. REMOVE CONNECTOR P7 FROM J7 OF THE UCP AND INSTALL CONNECTOR ON J1 OF THE CTI.
3. UTILIZE CABLE INCLUDED WITH CTI TO CONNECT J2 OF THE CTI TO J7 OF THE UCP.
4. CONNECT ROOM THERMOSTAT TO TERMINAL BLOKC (X...LTB..) AS SHOWN FOR THE TYPE UNIT. PLACE WIRING DIAGRAM LABEL ON INSIDE OF ACCESS PANEL.

————	TRANE WIRING
- - - - - - - - - - - - - -	CUSTOMER WIRING

ITEM	DESCRIPTION
CTI	CONVENTIONAL THERMOSTAT INTERFACE
LTB	TERMINAL BLOCK
UCP	UNITARY CONTROL MODULE
24V(C)	0 VOLT STRIP
R – 24V	THERMOSTAT SUPPLY 24V
Y1 – Y2	COMPRESSOR CONTROL
G	SUPPLY FAN CONTROL
O	SWITCH OVER VALVE
W1	ELECTRIC HEATER CONTROL
THS	STANDARD CONTROL THERMOSTAT
THP	PROGRAMMABLE CONTROL THERMOSTAT
HTR	HEATING COIL

Wire Connection Guide

Holes are provided for low voltage and high voltage wiring. It is not necessary to punch any new holes in either the interior or exterior unit panels. If new holes are punched, performance will be adversely affected unless they are resealed to be both air tight and water tight. Refer to the Unit Dimensional Data and unit view on page 5 for hole locations of units with or with electric heat.

Correcting Improper Electrical Phase Sequence

Proper compressor motor electrical phasing can be quickly determined and corrected before starting the unit. Use a quality instrument such as an Associated Research Model 45 Phase Sequence Indicator and follow this procedure.

1. Open the electrical disconnect or circuit protection switch that provides line power to the High Voltage Terminal Block (HTB1) in the control panel.

2. Connect the phase sequence indicator leads to the HTB1 as follows:

Phase Seq. Lead	HTB1 Terminal
Black (Phase A)	L1
Red (Phase B)	L2
Yellow (Phase C)	L3

⚠ WARNING: ***Bodily injury can result from high voltage electrical components. If operating checks must be performed with the unit operating, it is the technician's responsibility to recognize these hazards and proceed safely. Failure to do so could result in severe personal injury or death due to electrical shock or contact with moving parts.***

3 . Read the phase sequence on the indicator after turning power on by closing the unit disconnect switch. The "ABC" indicator on the face of the phase indicator will glow if phase is ABC.

4. If the "CBA" indicator glows instead, open the unit main disconnect and interchange any two main line leads on HTB1. reclose the unit main disconnect and recheck phasing.

5. Open units main disconnect before continuing with installation.

⚠ WARNING: ***Open and lock unit disconnect switch before continuing installation. Failure to do so could result in severe personal injury or death due to electrical shock or contact with moving parts.***

6. Disconnect the phase indicator.

Note: If a phase indicator is not available, follow the electrical phasing sequence in the cooling start-up section.

IMPORTANT: After completion of wiring, check all electrical connections, including factory wiring within the unit, and ensure all connections are tight. Replace and secure all electrical box covers and access doors before leaving unit or connecting power to circuit supplying unit.

After all electrical wiring is complete, SET THE ZONE SENSOR SWITCH TO THE **OFF** POSITION AND THE FAN SWITCH TO **AUTO** SO COMPRESSOR AND FAN WILL NOT RUN, and apply power by closing the system main disconnect switch. This will activate the compressor crankcase heaters. Do not change the zone sensor setting until power has been applied long enough to evaporate any liquid R-22 in the compressor. It is recommended the crankcase heaters be energized for 8 hours prior to starting.

Start-Up
Pre-Start Quick Check List

[ ] Is unit properly located and level with proper clearances? See Figure 1A and 1B.

[ ] Is the duct work correctly sized, run, taped, insulated and weather proofed with proper unit arrangement? (see duct work installation)

[ ] Is condensate line properly sized, run, trapped and pitched?

[ ] Is the filter of the correct size and number, clean and in place?

[ ] Is the wiring properly sized and run in according to the unit wiring diagram?

[ ] Are all wiring connections tight including those in unit and compressor electrical boxes?

[ ] Has the unit been properly grounded and fused with the recommended fuse size? (see wiring data)

[ ] Is the zone temperature sensor correctly wired and in a good location?

[ ] Have the air conditioning systems been checked at the service ports for charge and leak tested if necessary?

[ ] Does the condenser fan and indoor blower turn freely without rubbing and are they tight on the shafts?

[ ] Has the indoor blower speed been determined and the proper speed been set? (see air flow performance data)

[ ] Has all work been done in accordance with applicable local and national codes?

[ ] Are all covers and access panels in place to prevent air loss and safety hazards?

⚠ WARNING: ***Bodily injury can result from high voltage electrical components. If operating checks must be performed with the unit operating, it is the technician's responsibility to recognize these hazards and proceed safely. Failure to do so could result in severe personal injury or death due to electrical shock or contact with moving parts.***

Power-up Initialization

The "initialization" by the Unitary Control Processor **(UCP)** occurs each time the system is powered-up. The **UCP** performs internal self-diagnostics checks, which include identifying the equipment components of its system, and the configuring of itself to that system. It also checks itself to be sure it is functioning correctly. On units with the optional economizer, the damper is driven open for 15 to 20 seconds and then fully closed for 90 seconds to calibrate itself. The **UCP** system indicator **LED** is turned to **"ON"** within one second of start-up if operation is correct.

The Unitary Control Processor **(UCP)** switches are factory set to provide comfort for most applications. Control cycles may be adjusted as indicated in the table below. These switches function similar to the heat anticipator adjustment in conventional thermostats.

Unitary Control Processor (UCP)
Switch Settings for Cycle Timing

Switch 1	Switch 2	Cycle Time
OFF	OFF	NORMAL (Factory Setting)
OFF	ON	LONGER
ON	OFF	SHORTER
ON	ON	*SPECIAL

* Special applications, where very short cycles are necessary to prevent excessive temperature swings.

Starting the Unit in the Heating Mode

Check to ensure all grilles and registers are open and all unit access doors are closed before start-up.

Place the zone system switch in the heat position.

Postition the heating setpoint approximately 10 degrees above room temperature and place the fan switch in "Auto" or "On" position.

Turn on main power supply.

Note: To bypass time delays, and verfiy the operation of this unit from the roof, use the Test mode procedure on page 3 and 4 of this manual.

Heating Shut-down

To exit the test mode, disconnect unit power for 3-5 seconds and reapply. When running the unit using the zone sensor as the control, position the selector switch at "Off". There will be a delay of 60 seconds before the unit shuts down in this setting.

Starting The Unit In The Cooling Mode

IIMPORTANT NOTE: **Before starting the system in the cooling cycle, turn the zone sensor switch to "off" and close the unit disconnect switch. This procedure energizes the compressor crankcase heaters, vaporizing any liquid refrigerant in the crankcase. This is a precaution against foaming at start-up, which could damage the compressor bearings. Allow the heater to operate for a minimum of eight hours.**

Verify that the unit airflow rate is adjusted according to information provided in "Determining Evaporator Fan Adjustment" section of this manual.

Note: See "Sequence of operation" in the unit Service Facts for a complete description of cooling operating sequence.

To start the unit in the cooling mode, close unit disconnect switch and set the zone sensor system switch to COOL and move the cooling setpoint approximately 10 degrees below room temperature. There will be a delay of up to 5 minutes before the unit will start automatically.

To bypass time delays, and verify the operation of this unit from the roof, use the "Test mode procedure" on page 3 and 4 of this manual.

Operating Pressures

After the unit has operated in the cooling mode for a short period of time, install pressure gauges on the gauge ports of the discharge and suction line valves.

Note: Always route refrigerant hoses through the port hole provided and have compressor access panel in place.

Check the suction and discharge pressures and compare them to the normal operating pressures provided in the unit's Service Facts.

Note: Do not use pressures from Service Facts to determine the unit refrigerant charge. The correct charge is shown on the unit nameplate. To charge the system accurately, weigh the charge.

Voltage

With the compressor operating, check the line voltage at the unit. The voltage should be within the range shown on the unit nameplate. If low voltage is encountered, check the size and length of the supply line from the main disconnect to the unit. The line may be undersized for the length of the run.

Cooling Shut Down

To exit the test mode, disconnect unit power for 3-5 seconds and reapply. When running the unit using the zone sensor as the control, position the selector switch at **"Off"**. There may be a delay of up to 3 minutes before compressors shut down and an additional 1 minute before the fan shuts down in this setting.

Do not de-energize main power disconnect except when unit is to be serviced. Power is required to keep air conditioning compressor crankcase warm and boil off refrigerant in the oil.

(EDC) Evaporator Defrost Control

During low ambient operation (below 55 degree F for single condenser fan units, and below 40 degree F for dual condenser fan units) compressor run time is accumulated by the UCP. When compressor run time reaches approximately 10 minutes, an evaporator defrost cycle is initiated. The defrost cycle lasts approximately 3 minutes.

During a defrost cycle, the compressor(s) are turned off and the indoor motor continues to run. After completing the defrost cycle the unit returns to normal operation, and the compressor run time counter is reset to zero.

Economizer operation is not affected by a defrost cycle.

Defrost Module Test and operation

The defrost function is a time/temperature type operation very similar to the time temperature defrost of the current Ft. Smith products.

The only difference is that the timing function is provided by the **UCP**, and the temperature information is provided by the defrost module (located in the unit control box.)

Four (4) defrost time intervals can be selected by changing the switch positions of switch 1, and switch 2 on the defrost module. A defrost cycle is initated when the mechanical heating is operating. The defrost termination switch is in the closed position, and the accumulated compressor run time exceeds the selected defrost time interval.

When defrost is initiated, the reversing valves are energized, the compressors turned on, and the condenser fans are turned off. The electric heaters are turned on to maintain zone temperature. (If installed)

Once a defrost cycle has started, it will continue until it is completed even if the zone sensor module has stopped calling for heat.

The defrost cycle is terminated when one of three events occur:

1. The defrost termination switch opens.

2. The defrost cycle has been operating for 10 minutes.

3. The high pressure control opens in either compressor circuit.

Upon termination of a defrost cycle, the condenser fan(s) are turned on for approximately 5 seconds before de-energizing the reversing valves.

Defrost Time	Switch 1	Switch 2	Resistance between pins J2-3 & J2-4 on (DFM)
70 Min.	OFF	OFF	Approximately 42.1 K
90 Min.	ON	OFF	Approximately 30.3 K
60 Min.	OFF	ON	Approximately 21.2 K
45 Min.	ON	ON	Approximately 4.5 K

If the **UCP** reads an out of range temperature resistance from the defrost module, due to an open or shorted circuit, a 10 minute defrost cycle will be initiated by the **UCP** after each 70 minutes of accumulated compressor run time. Any failure of this type will indicate a heat and a cool failure at the low voltage terminal block. The defrost module can be virtually destroy, and as long as the on board relay remains intact to energize the reversing valves defrost will still occur.

Final Installation Checklist

[ ] Does the unit run and operate as described in the “Sequence of Operation” in the unit Service Facts?

[ ] Is the condenser fan and indoor blower operating correctly, with proper rotation and without undue noise?

[ ] Is the compressor operating correctly and has the system been checked with a charging chart?

[ ] Have voltage and running currents been checked to determine if it is with limits?

[ ] Have the air discharge grilles been adjusted to balance the system?

[ ] Has the ductwork been checked for air leaks and condensation?

[ ] Has the heating air temperature rise been checked?

[ ] Has the indoor airflow been checked and adjusted if necessary?

[ ] Has the unit been checked for tubing and sheet metal rattles and are there unusual noises to be checked?

[ ] Are all covers and panels in place and properly fastened?

[ ] Has the owner or maintenance personnel been given this manual, warranty, and been instructed on proper operation and maintenance?

Routine Maintenance by Owner

You can do some of the periodic maintenance functions for your unit yourself; this includes replacing (disposable) or cleaning (permanent) air filters, cleaning unit cabinet, cleaning the condenser coil, and conducting a general unit inspection on a regular basis.

Season Maintenance - Cooling

To keep the unit operating safely and efficiently, the manufacturer recommends that a qualified serviceman check the entire system at least once each year, or more frequently if conditions warrant.

Examine these areas of unit:

1. Filters (for cleaning or replacement)

2. Motors and drive system components

3. Economizer gaskets (for possible replacement)

4. Condenser coils (for cleaning)

5. Safety Controls (for mechanical cleaning)

6. Electrical components and wiring (for possible replacement or connection tightness)

7. Condensate drain (for cleaning)

8. Inspect the unit duct connections to ensure they are physically sound and sealed to the unit casing.

9. Inspect the unit mounting support to see that it is sound.

10. Inspect the unit to ensure there is no obvious deterioration.

Season Maintenance - Heating

Complete the unit inspections and service routines described below at the beginning of each heating season.

⚠ WARNING: ***To prevent injury or death due to electrical shock of contact with moving parts, lock unit disconnect switch in open position before servicing unit.***

⚠ WARNING: ***To prevent an explosion and possible injury, death and equipment damage, do not store combustible materials, gasoline or other flammable vapors and liquids near the unit.***

[ ] Visually inspect the unit to ensure that the airflow required for the condenser coil is not obstructed from the unit.

[ ] Inspect the control panel wiring to verfiy that all electrical connections are tight, and that wire insulation is intact.