August 1995

OMEGA PLUS

Designed to centralize control of multiple constant volume and VAV systems

Manufactured by California Economizer

OMEGA PLUS

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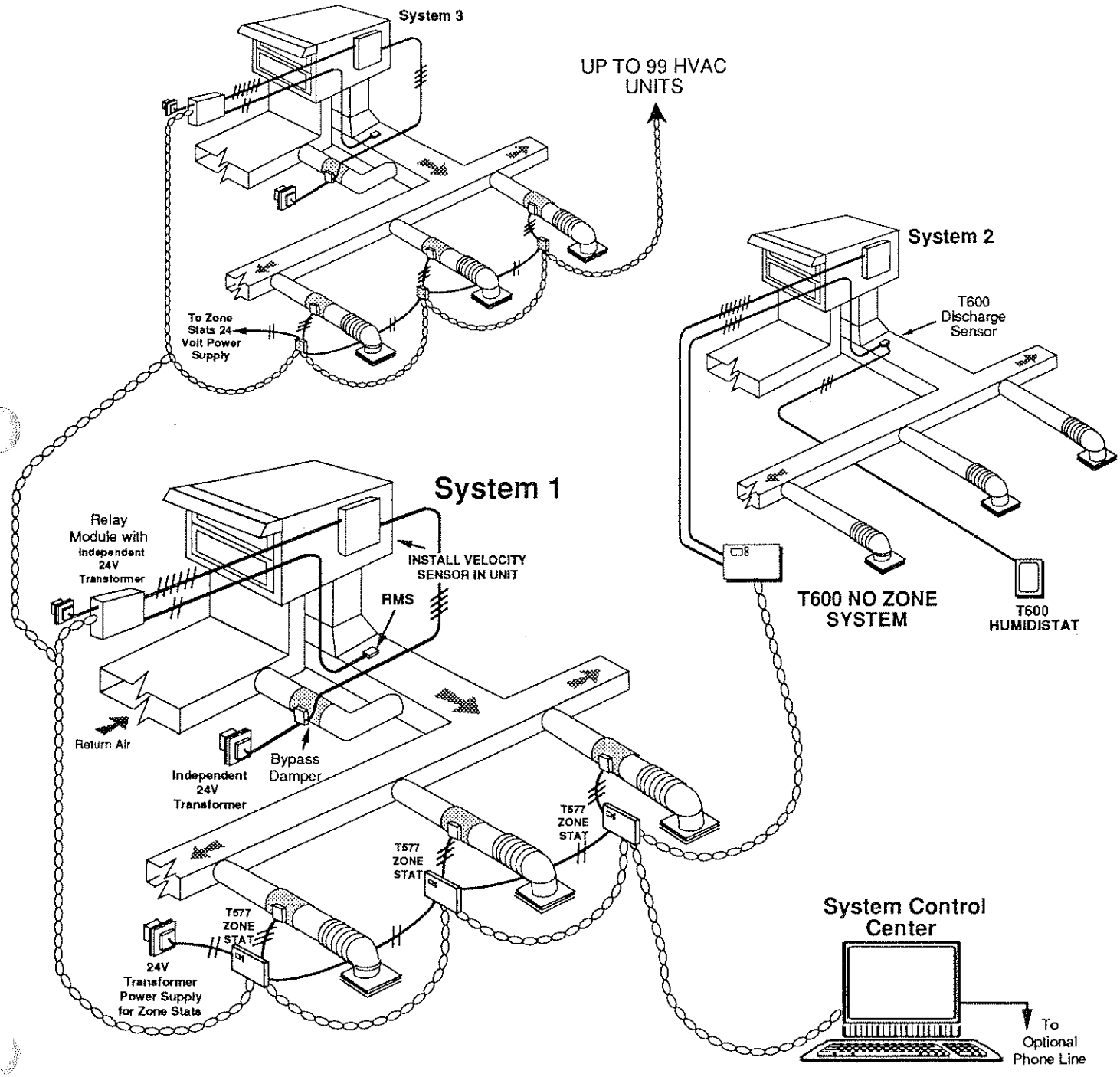
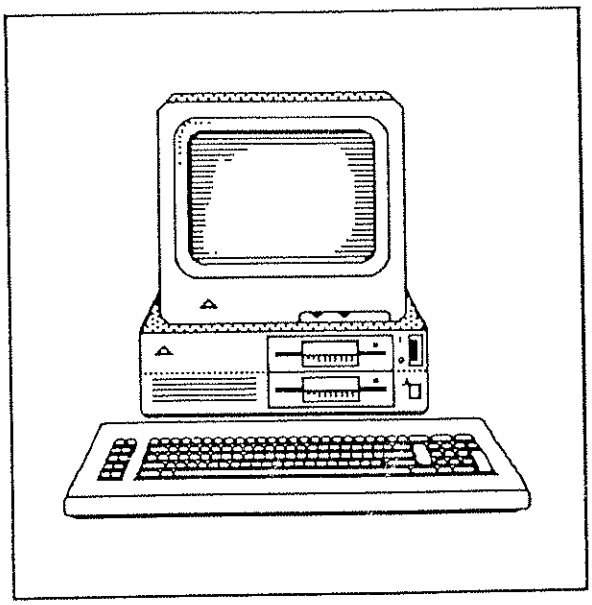
OMEGA PLUS is a fully modulating, auto changeover, bypass VAV system. *OMEGA PLUS* is designed to control multiple HVAC units and zone damper systems. This application of one Control Center for all of the HVAC units and zone dampers simplifies the control of the building by providing a central location where all clock/calendar, zone and schedule information is stored. The *OMEGA PLUS* Computerized Control Center basic system supports up to 99 HVAC units and 99 zones and can handle up to 198 zones in an expanded format. This system provides the Design Engineer or Installing Contractor with a unique alternative to complex systems. The Control Center allows the user to interface with the system in English rather than complicated codes, rotary switches or buttons.



THE CONTROL CENTER:

Computer Control Center	Part # OPCC
Computer Control Center W/Internal Modem	Part #OPCM
Computer Control Center W/FAX	Part #OPCF



The Control Center includes 1 Meg of RAM, 486 Microprocessor, Hard disk drive and one 1.44 meg 3.5" floppy disk drive, Keyboard, Monochrome monitor (color is optional), two RS 485 ports, modem expansion slot, 365 day calendar/clock with 10 year battery back-up and an *OMEGA PLUS* Control Center interface board.

THE SOFTWARE:

The software includes Initialization, Operating and Check, Test, and Start programs. The Initialization program is used to assign zone numbers, individual labels, maximum and minimum damper settings and set independent operating schedules for all HVAC units. The Operating software controls up to a total of 198 zone dampers and 99 HVAC units and displays operating information. The Check, Test and Start software contains diagnostic information and routines.

OMEGA PLUS software is "Menu guided". All entries and displays are in plain English. All programs, operating schedules and system data are non volatile and their retention does not depend on the continuity of the power supply or batteries Additional programs are available at extra cost to provide fax notification of system problems such as dirty filters and zone temperature deviation from set points, "after-hours" tenant billing, remote communication and trend logging.

THE CONTROL CENTER MONITOR CONTINUOUSLY DISPLAYS:

MAIN OPERATING SCREEN:

System status (Cool 1 / Cool 2/ Heat 1 / Heat 2 / Fan / Off), time, date, holiday schedule operation and identifies malfunctioning systems and zones, (if any).

By pressing any key on the keyboard, a Menu is displayed which will access the following information:

SYSTEM SCREEN:

System heating and cooling setpoints, requested operation mode, current operating mode, fan status, overrid mode, discharge air temperature, room temperature, lock out status and a malfunction fault warning.

ZONE SCREEN:

Identification number, a malfunction fault warning, alpha-numeric location, zone temperature, individual offset fron system setpoint, damper in percent open and minimum and maximum damper position limits.

GROUP OF SYSTEM ZONES:

Displays the following information for one system and the zones controlled by that system.

T600 heating and cooling setpoints, requested operation mode, current operating mode, fan status, overrid mode, discharge air temperature, room temperature, lock out status and faulting communication warning. Optional humidistat may also be displayed.

System heating and cooling setpoints, requested operation mode, current operating mode, fan status, overrid mode, discharge air temperature, room temperature, lock out status and faulting communication warning.

Zone Identification number, communication failure warning, alpha-numeric location, individual zone setpoints zone temperature, damper position in percent open and time clock bypass request indicator.

DAMPER MODIFICATION:

Modify damper maximum and minimum setting or turn zone off.

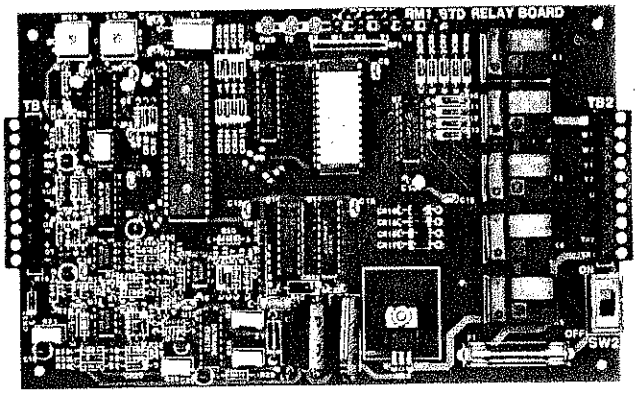
The Menu also contains a "Help" program, individual zone monitoring, time and temperature adjustment features.

RELAY MODULE

Relay Module	Part #OMRM
Relay Module Discharge air Sensor	Part #ORMS
Relay Module Return air Sensor	Part #ORMA
Relay Module Out Door air Sensor	Part #ORMO

OMEGA PLUS Relay Modules provide an interface between the Control Center and each HVAC unit or Heat Pump. Operating instructions for each unit travel from the Control Center to the Relay Module on the twisted pair data lines.

The Relay Module is supplied with two switches, each numbered 0-9. These switches can be set to a specific identification number (ID#), from 1 to 99. In this way, each HVAC unit controlled by a Relay Module is assigned its own unique identity. Any combination of 99 HVAC units or split systems and 99 zone dampers can be connected to each standard *OMEGA PLUS* Control Center. An additional Data line must be added to control more than 99 zones.



DIMENSIONS 7.5" x 11" x 2"

The type of Relay Module must be specified for each unit. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B" The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

The Control Center gathers zone temperature information from all of the *OMEGA* zone stats. Based on this information, the Control Center decides on fan, compressor and heater requirements. These decisions are then sent over the data lines to the Relay Module with the proper ID#. The Relay Module turns on the fan, compressors or chilled water valves and heaters of it's HVAC system.

Time clock functions are also sent to the Relay Module by the Control Center. In response to the computer's instructions, the Relay Module will operate the HVAC unit. The preprogrammed instructions will provide seven day clock and 365 day calendar operation for each HVAC unit.

CAPACITY CONTROL (RMS)

The Relay Module uses a Relay Module Sensor (RMS) as a discharge air sensor to monitor the cooling or heating capacity of the HVAC unit as building load decreases. If the supply air temperature drops below 52 degrees F, the Relay Module will break the Y2 wire controlling the second stage of cooling. If supply air temperature drops below 48 degrees F, the Relay Module will break the Y1 wire controlling the first stage of cooling. If the temperature goes above 125 degrees F, (106 degrees for heat pumps) the Relay Module will break the W2 wire controlling the second stage of heating. If the supply air temperature goes above 130 degrees F, (110 degrees for heat pumps) the Relay Module will break the W1 wire controlling the first stage of heating. In both cases there shall be a 5 minute delay to prevent short cycling of the compressor or heater. For Heat Pump operations place the RMS downstream of the coil where it will not be affected by the electric heat.

OUTDOOR SENSOR Allows the Control Center to display outdoor air temperature.

YEAR-ROUND FAIL-SAFE OPERATION:

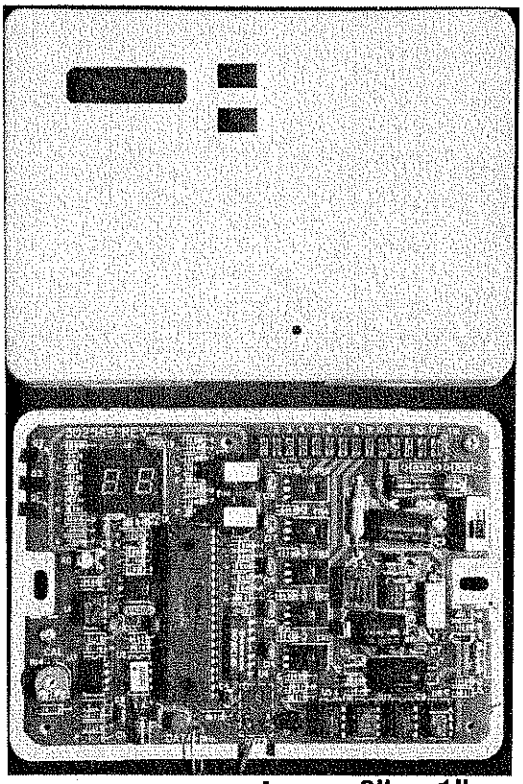
If the HVAC unit Relay Module does not receive instructions from the Control Center for 7 minutes, it will automatically turn on the unit fan to continuous operation. Each zone damper will go to fifty percent. The RMS in the return air duct connected to the Relay Module enables the Relay Module to take control of the HVAC unit and maintain system temperatures at a 74 degree cooling setpoint or a 70 degree heating setpoint.

T600 THERMOSTAT

T600 Fahrenheit	Part #OT600
T600 Celsius	Part #OT600C
T600 Fahrenheit for Remote Sensor	Part #OT600R
T600 Celsius for Remote Sensor	Part #OT600RC
T600 Remote Sensor	Part #ORST

The *OMEGA PLUS* T600 DDC thermostat can be used as a simple stand alone on / off two stage thermostat. One thermostat will directly control two compressors two heaters and the unit fan.

This DDC (direct digital control) thermostat may be applied as a stand alone thermostat or networked with up to 99 other T600 thermostats and *OMEGA PLUS* Relay Modules using a computer. The T600 thermostat contains all of the components needed to operate a two stage HVAC unit. The thermostat is directly wired to the package unit without the need for additional relay packs. The thermostat is designed to be plugged onto the T600 subbase. This allows the wiring connected to the subbase to be tested before the thermostat is mounted and powered up. Once the system is running, service and troubleshooting is simplified by the interchangeability of the T600 thermostats between subbases.



DIMENSIONS 4.5" x 6" x 1"

T600 STAND ALONE OPERATION

As a stand alone thermostat, the T600 functions like a basic auto changeover thermostat. Based on the setpoints selected by the occupant, the T600 will operate the package unit cooling or heating the space. Each T600 is provided with a power ON/OFF switch, two setpoint buttons, fan ON/AUTO switch and an LCD that will display either the current temperature or the heat or cool setpoint. At start up, the T600 has a default heating setpoint of 69 and a cooling setpoint of 72. After start up, the occupant may vary these setpoints within a range of 55 to 91 degrees. The T600 will always maintain a minimum 2 degree dead band between heating and cooling when they are brought together. Any time a change is made to the setpoints it is maintained in thermostats memory in the event of a power failure. Since the T600 is not a zone thermostat it does not base the decision to cool or heat on any other input other than it's temperature sensor. Fan operation may be controlled by the fan switch located on the side of the thermostat. The fan may be set to On or Auto mode. The On mode allows for continuous fan operation. The Auto mode will allow the fan to turn on only if the heating or cooling is on. Time clock operations may be added by a field supplied time clock. To review the T600 control strategy refer to the T600 control strategy below.

T600 CONTROL STRATEGY

The T600 will initiate the first stage of cooling one degree above cooling setpoint and second stage (if applicable) two degrees above the cooling setpoint. Second stage will be shut off at setpoint and first stage will be shut off one degree below setpoint. Heat works in reverse of cooling with stage one initiating at one degree below the heat setpoint and second stage (if applicable) two degrees below the heat setpoint. Second stage heat will be shut off at setpoint and first stage will be shut off one degree above setpoint.

NOTE: The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valv in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

T600 APPLICATION WITH *OMEGA PLUS*

365 day time clock with unlimited set ups and set backs	Holiday scheduling	Locally modifiable setpoints
Common weekly or individual day scheduling	Dirty filter warning	Bright LED temperature display
Remote programming and monitoring	Data logging	Local Heat/Cool setpoint readout
Time clock override capability	Optimum startup	Humidistat input
Diagnostic information	Load shedding	Discharge air input

When connected with a *OMEGA PLUS* computer control system, the T600 thermostats may be networked together to control up to 99 package units and Relay Modules using only a simple two wire twisted pair. Applying standard RS 485 protocol, this twisted pair network can also interface the T600 thermostats with other microprocessor devices.

The *OMEGA PLUS* computer not only adds network capability to the T600 but also provides advanced programmable thermostat type operations. The computer provides daily time clock operations, holiday scheduling and remote communication capability without the use of external devices to complicate the system. Multiple set up and set back operations with individual heating /cooling setpoints may be programmed for each T600. Using the computer, Fax capability may also be added to notify both a Service Contractor and/or the Building Owner of system problems, such as dirty filters, communication problems or extreme temperature variations. The *OMEGA PLUS* computer also gives the installation and service technicians minute by minute information updates on each T600 thermostat. Each minute the system "Polls" or talks to each T600. During polling, each T600 is sent an inquiry which it then responds to. This information is gathered and categorized by the *OMEGA PLUS* computer. Current setpoints, mode of operation, fan settings and current discharge air temperature readings are all available to the technician at the computer. A touch of a key will display all the information he needs to retrieve.

An individual temperature range between 55 thru 91 degrees may be programmed for any T600 thermostat. The offset range is set using the Control Center which will give each T600 individual offsets for each programmed schedule. The offsets may be set in a maximum range from 55 to 91 degrees. For instance, if the offset range is set to 65 and 78 the zone occupant would only have the ability to change the setpoints in that range. If the offset range setpoints were left at 55 and 91 then the occupant could change the setpoints up or down any where in that range. This offset will limit the zone tenants ability to change setpoints between the offset limits. This type of offset allows the Building Owner or Building Manager to control the temperature deviations from the desired building setpoints at each T600 thermostat.

Time clock overrides are provided by the override switch at each T600. If the building is unoccupied, a tenant may override the unoccupied setting by using the momentary contact switch that is accessible at the bottom of the T600 thermostat. The override switch will allow up to two hours of override. The override may be discontinued at any time during the two hour period.

If communication is lost between the T600 and the Control Center, the T600 will go into a fail-safe mode. The T600 will use the last information received from the Control Center.

By applying the *OMEGA PLUS* computer to the T600 system all external devices such as independent monitor control stats, multiplexing stats, relay packs and modems are eliminated. The *OMEGA PLUS* computer is the system controller and not just a monitoring device.

T600 CONTROL STRATEGY

The T600 will initiate the first stage of cooling one degree above cooling setpoint and second stage (if applicable) two degrees above the cooling setpoint. Second stage will be shut off at setpoint and first stage will be shut off one degree below setpoint. Heat works in reverse of cooling with stage one initiating at one degree below the heat setpoint and second stage (if applicable) two degrees below the heat setpoint. Second stage heat will be shut off at setpoint and first stage will be shut off one degree above setpoint.

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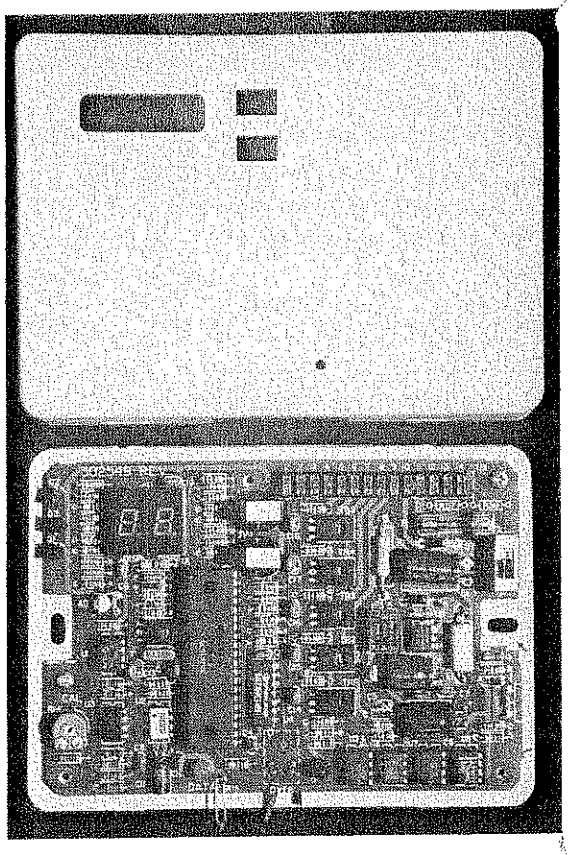
OMEGA T577 ZONE THERMOSTAT

Thermostat Fahrenheit	Part # OMSF
Thermostat Celsius	Part # OMSC
Thermostat Fahrenheit Remote Sensor	Part # ORSF
Thermostat Celsius Remote Sensor	Part # ORSC
Remote Sensor	Part # ORST

The *OMEGA T577* zone thermostat contains all the serviceable electronics needed to control a zone. The stat contains a thermistor based digital temperature sensing system which allows the stat to report zone conditions to the Control Center. Zone temperature is displayed in either Fahrenheit or Celsius through the stat cover. The stat receives information from the Control Center and modulates the damper according to the zone needs. A simple two-wire twisted pair gives the stat the ability to send information and receive instructions from the Control Center. The only setup required for a zone, after it is wired, is the setting of the zone ID#. This give each stat its own identity. No programming is necessary at the stat.

The *OMEGA* zone stat also has an auxiliary heat terminal which will activate a device, such as a radiant panel, baseboard or duct mounted strip heater. These auxiliary heat devices allow heat to be delivered to those zones which may need heat, even though the system majority requires cooling. The auxiliary heat terminal on the stat will activate the auxiliary heat device at setpoint.



DIMENSIONS 4.5" x 6" x 1"

The *OMEGA* zone stat also has a momentary contact "override" switch which can bypass a scheduled setback and operate the HVAC unit. This switch will automatically shut off after 2 hours. It can also be turned off manually by simply pressing the switch again.

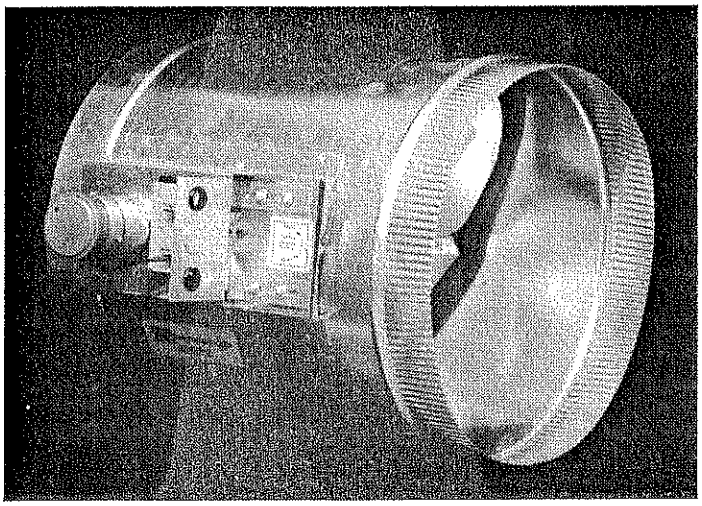
OMEGA Temperature Control

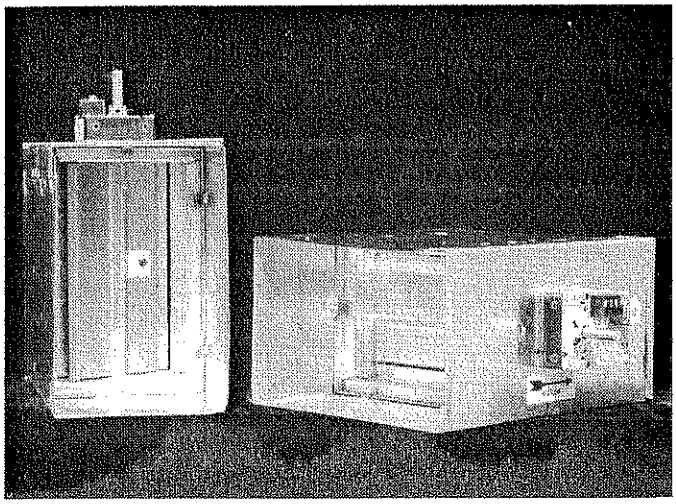
Heating and cooling setpoints for the HVAC unit are scheduled at the Control Center during startup. If no setpoint is entered, the Control Center will default to 69 degree heating and 74 degree cooling setpoints. The *OMEGA* Zone Stat can be adjusted + or - 3 degrees from the system setpoint by the zone occupant. This provides each zone with an individual setpoint within a six degree temperature range from the system setpoint. This deviation is referred to as an Offset.

The *OMEGA* temperature control strategy includes information input from all of the *OMEGA* zone stats. As each *OMEGA* stat is polled, the Control Center compares each zone temperature with the system setpoints. This also takes into account the zone requested Offset. Any zone with a temperature above the cooling setpoint is stored as a "cool call." Any zone with a temperature below the heating setpoint is stored as a "heat call." If there are more cool calls than heat calls, cooling is initiated. Next, the Control Center checks to see if any cool call is more than 1 degree above the cooling setpoint. If so, the Control Center will initiate first-stage compressor operation. If any cool call is more than 2 degrees above setpoint, both stages of cooling will be turned on. The reverse happens for the heat mode when heat calls predominate.

On system changeover, there is a five minute time delay between heating and cooling modes to protect the HVAC unit. During the changeover delay, the *OMEGA* zone stat will reposition its damper for the new mode. This avoids sending the wrong temperature air to a zone. The damper travels from full open to full close in 90 seconds. If the system stays satisfied for an eight minute period and the discharge air temperature is between heat and cool setpoints, all dampers will open to 50 percent to allow the system to ventilate.

Damper maximum and minimum air flow settings are set electronically by the *OMEGA* Control Center. A simple percentage such as 20 percent minimum and 90 percent maximum may be entered into the Control Center for each zone. If required, mechanical set stops located on the damper can also be set.





OMEGA ROUND DAMPERS For part numbers see "Selecting a Round Damper"

Each unit is made up of 20-22 gauge galvanized steel duct and an elliptical damper edged with a foam gasket. The damper travels through 45 degrees between the full open and full closed positions in ninety seconds. A pair of run stall, drive open/drive closed motors control the damper position. The limited travel, elliptical shape and modulating capability give the damper the ability to closely track the zone airflow requirements.

OMEGA RECTANGULAR DAMPERS For part numbers see "Selecting a Rectangular Damper"

Each unit is made of 20 gauge "snap-lock" steel frame with S & Drive duct connections. A 16 gauge formed steel blade closes on a 45 degree angle, in an opposed fashion, for improved control. Formed steel blade stops incorporate a gasket for quiet operation and improved structural rigidity. The damper is an opposed blade design. A drive open/drive closed motor controls the damper position. Sizes from 8 X 8 to 48 x 48.

DAMPER OPERATION

The solid state *OMEGA* zone thermostat, which operates the *OMEGA* damper, contains all of the electronic parts needed to control a zone. This makes servicing the electronic parts of the zone damper as simple as changing one printed circuit board. All wires from the damper are connected to the thermostat subbase. If a stat needs to be replaced, just unplug one thermostat from the subbase and plug in another. This will completely replace all the electronic components for that zone. On start up, the *OMEGA* zone thermostat resets the damper to the full open position. From this point the thermostat modulates the damper position to supply exactly the amount of air required to match the zone load. Once every 12 hours the thermostat recalibrates the damper position by running it full open.

OMEGA ROUND DAMPER FEATURES:

AUTOMATIC HEAT/COOL
built-in changeover

MAX. - MIN. CFM STOPS
software or mechanically adjustable

ELECTRONIC THERMOSTAT
no serviceable electronic parts on damper

LOW PRESSURE
up to 2200 CFM @.1"S.P.

MEDIUM PRESSURE OPERATION
damper will open against 1.75" S.P.

24 VOLT SYSTEM
requires 6 VA per damper
Add VA as required for Auxiliary Heat applications

ELLIPTICAL DAMPER
true modulation

FAST ACTING DAMPER
90 second full open-full close

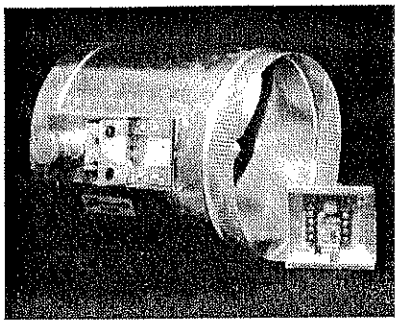
THERMOSTAT CONTROLLED
single-stage supplemental heat actuator

THE *OMEGA* BYPASS DAMPER

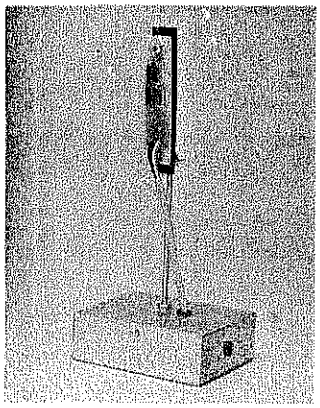
For part numbers see "Selecting the Bypass Damper

Velocity Sensor	Part #OMVS
Static Pressure Sensor	Part #101ASPC

The Bypass Damper is used to provide constant air delivery through an HVAC unit in a system with *OMEGA* modulating zone dampers. As building load is satisfied, the zone dampers in the system start to modulate closed. This reduces building air requirements. A Velocity Sensor or Static Pressure Sensor drives the Bypass Damper partially open to allow the excess air to flow from the supply to the return side of the HVAC unit. In this way, excessive static pressure does not build up in the duct system and a constant CFM can be maintained through the HVAC unit. This also prevents the generation of noise at the diffusers and erratic control in the zones.



ELECTRONIC BYPASS DAMPER



VELOCITY SENSOR

ROUND BYPASS DAMPERS

Each unit is made up of 20-22 gauge galvanized steel. The damper is made in the form of an ellipse, edged with a foam gasket and only travels through 45 degrees from the full open to full closed position. This limited travel and special shape give the damper the ability to closely control the amount of air bypassed from the supply to the return side of the HVAC unit. Each unit includes two 24V damper motors, solid state Bypass Controller and is operated by a field supplied velocity sensor, or static pressure controller.

RECTANGULAR BYPASS DAMPERS

The rectangular damper is made from 16 gauge roll formed extra rigid steel blades. Approximately 6" on center with 1/2" overlap. Each unit includes a 24V damper motor, solid state Bypass Controller and is operated by a field supplied velocity sensor, or static pressure controller. Rectangular damper sizes range from 8 X 8 to 48 X 48.

OPERATION

The solid state Bypass Controller which controls the damper is modulated by a Velocity Sensor. The Velocity Sensor bases its control decision on CFM through the unit. The Bypass is balanced in the closed position with all zone dampers open. As zone dampers close the air velocity through the unit slows down. The Velocity sensor recognizes this and modulates the Bypass damper open to bring the air velocity through the unit back to the balance point. The Static Pressure Sensor uses static pressure to make control decisions and works in a similar manner to the velocity sensor. Either sensor will provide adequate control when properly placed in the unit.

ROUND BYPASS DAMPER FEATURES:

ELECTRONIC VELOCITY SENSOR
will operate up to 4 slaved dampers

LOW PRESSURE DROP
up to 3000 CFM @ .2"S.P.

SOLID STATE CONTROL
accurate CFM based modulation

ELLIPTICAL DAMPER
tracks air linearly providing accurate control

2 LED SETPOINT INDICATORS
for easy installation and adjustment

24 VOLT SYSTEM
requires only 12 VA per Bypass Damper

DATA LINES

The Data Line consists of two wires which operate like a party line telephone exchange. They can carry as much information as 436 separate wires. This type of Data Line eliminates any confusing "home runs" and possible wiring mistakes. This feature greatly reduces the amount of time and confusion it takes to install and start up the system.

The advantage of the twisted pair is that it is self shielding. A negative and positive pulse are sent across the two wires simultaneously. These pulses loop around each other because of the twist in the wire. Due to this looping action, the antenna capability of the Data Line is lost and the wires are protected from outside interference. The two wire twisted pair **must be wired with minimum 22 ga. twisted pair control cable.** (The twisted pair should be equal to Belden 8740 solid, PVC coated, or 88442 stranded plenum-rated Teflon covered wire.)

OPTIONAL MODEM

The modem is a separate item internal to the Control Center. When it is added, it will allow remote modification or monitoring of the Control Center and all zones in the system via remote computer. A dedicated telephone line will allow the servicing contractor to make inquires, check and modify system operations and trouble shoot system components. Modem installation is as easy as plugging in a phone jack.

FAX CAPABILITY

Adding fax capability to the *OMEGA PLUS* system allows the Control Center to send fax notification of system problems such as dirty filters and zone temperature deviation from set points. This information may be faxed to a maximum of two fax machines. A dedicated telephone line is required for this option. Remote communication may also be included when using the fax option.

OMEGA PLUS can notify a Service Contractor Building Owner or any other location, that has a fax machine or computer with fax capability, with important information on the system status at any time a problem may occur. The fax capability does not depend on a national network, or a dedicated off sight computer waiting for information. For example, if a problem occurs in the Presidents office and the temperature is 5 degrees over or under the zone set point, a message similar to the one below will be sent after 5 minutes.

Tues Nov 12 10:22

PROBLEM WITH BUILDING:
WEST COAST CENTER
2733 Oak Park Dr. Los Angeles, CA 90027

PLEASE CONTACT THE BUILDING BY MODEM OR SEND SERVICE PERSONNEL.

Zone 3 "PRESIDENT'S OFFICE" is not within specified limits.
Current temperature at the stat is 78.4
Zone 3, System 2, Current cool set point is 72. Heat set point 68.

HVAC System #6 "Needs the filter changed"

This valuable information allows the service contractor to respond before there are complaints. Up to two different fax machines can be notified when the system is not performing as designed.

SELECTING AN *OMEGA* ROUND ZONE DAMPER

Determine CFM from calculations of heat gain and loss. Then, select the damper based on CFM and velocity, or selec damper to fit duct size required for the zone.

Flexible sound attenuating ducts are recommended where the *OMEGA* dampers, at velocities above 1000 FPM, installed within 10 feet of an outlet.

For *OMEGA* dampers within three feet of diffuser, grille or register, velocities above 700 FPM are not recommended.

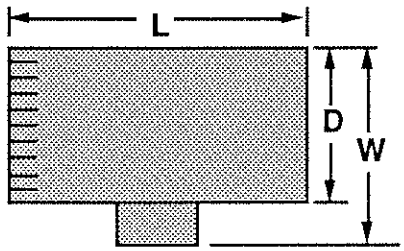
TYPICAL DAMPER & DUCT SIZES*

Duct Diameter	Nominal CFM	Duct Velocity FPM	Damper ΔP " WC
6"	110	540	.014
8"	250	700	.015
10"	410	750	.015
12"	660	850	.022
14"	1000	925	.035
16"	1450	1070	.036
18"	2000	1100	.036

* These air quantities were derived from a duct sizing chart .1" friction loss per 100' of duct. All CFMs listed above are approximate. For accurate selection use duct sizing table or device.

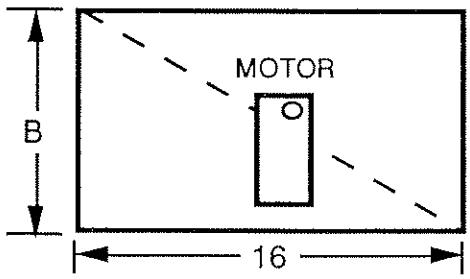
ROUND DIMENSIONAL DATA

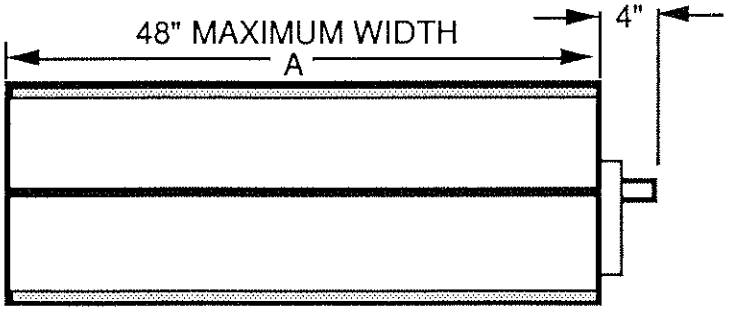
PART #	SIZE	D	L	W
OM06	6	6"	10"	9"
OM08	8	8"	10"	11"
OM10	10	10"	12"	13"
OM12	12	12"	14"	15"
OM14	14	14"	16"	17"
OM16	16	16"	18"	18 1/2'
OM18	18	18"	20"	20 1/2'



RECTANGULAR DAMPER

SELECT FROM 8 X 8 THRU 48 X 48





WIDTH	HEIGHT	DEPTH
A	B	16

Rectangular dampers should not operate above 1500 FPM

Part Number OMCD W X H

SELECTING THE BYPASS DAMPER

The round bypass is selected at 2500 FPM for 70% of air conditioning unit fan capacity. Many people ask the question what if only one damper is calling. Since we are dealing with a compressible fluid all the excess air can go through the bypass damper to the return, even though the velocity exceeds 2500 FPM.

Example: Select a bypass for a 7 1/2 ton air conditioning unit. 3000 CFM is the nominal rating for 7 1/2 ton units. Select a Bypass Damper which will handle 2100 CFM at velocities of 2500 FPM. The bypass velocity should be as close to 2500 FPM as possible, but not exceed 2500 FPM. This is done because regulation is better at higher pressure drops across the bypass. In this case we would refer to the capacity table and select a 14" Bypass Damper. The 12" was not chosen because at 2100 CFM its velocity would be over 2500 FPM. The 16" could be used but the velocity at 2100 CFM would be too low. Therefore, we recommend the 14" Bypass Damper for the 7 1/2 ton unit.

Velocity Sensor	Part #OMVS
Static Pressure Sensor	Part #101ASPC

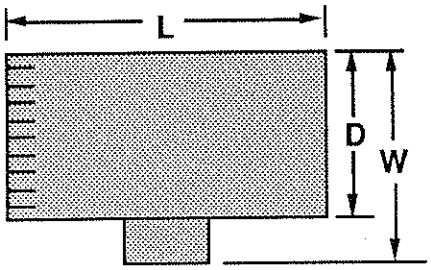
ROUND BYPASS CAPACITIES

PRESSURE DROP ▶	.07"	.1"	RECOMMENDED .2"
VELOCITY FPM ▶	1500 FPM*	1800 FPM*	2500 FPM*
DIA. ▼	CFM	CFM	CFM
6"	250	315	437
8"	470	567	787
10"	820	990	1375
12"	1060	1260	1750
14"	1590	1890	2675
16"	1850	2250	3125

* FPM = Feet Per Minute

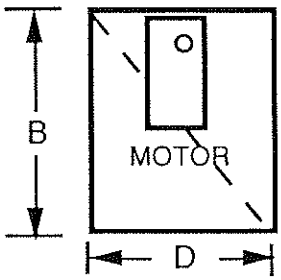
ROUND DIMENSIONAL DATA

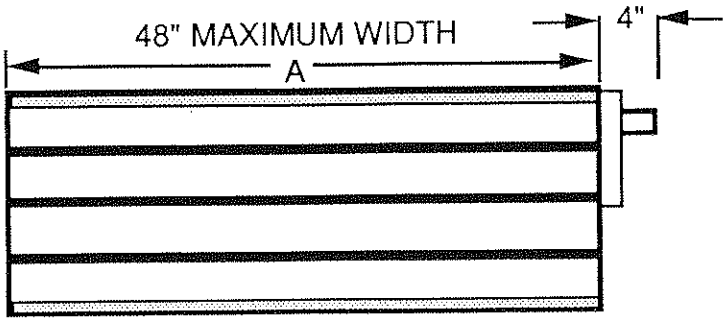
PART #	SIZE	D	L	W
OBP06	6	6"	18"	9"
OPB08	8	8"	18"	11"
OBP10	10	10"	18"	13"
OBP12	12	12"	24"	15"
OBP14	14	14"	24"	17"
OBP16	16	16"	24"	18 1/2"



RECTANGULAR BYPASS DAMPERS

SELECT FROM 8 X 8 THRU 48 X 48





WIDTH	HEIGHT	DEPTH
A	B	16

Rectangular bypass dampers should operate at 1500 FPM.
E.G. A 24" x 12" damper = 2 square feet.
2 square feet X 1500FPM = 3000 CFM.

Part Number OBP W X H

1. The *OMEGA PLUS* computer uses a 486 microprocessor and is furnished with 1 Meg of RAM, hard disk drive and one 1.44 meg 3.5" floppy disk drive. An *OMEGA PLUS* data interface board is factory installed in the computer. This board is set up to provide I/O for two RS 485 data line pairs. The computer package includes software, keyboard and monochrome TTL monitor. (An optional color monitor is available.) An optional fax modem or modem may be added to the computer for external communication to provide remote system operation, programming and monitoring.

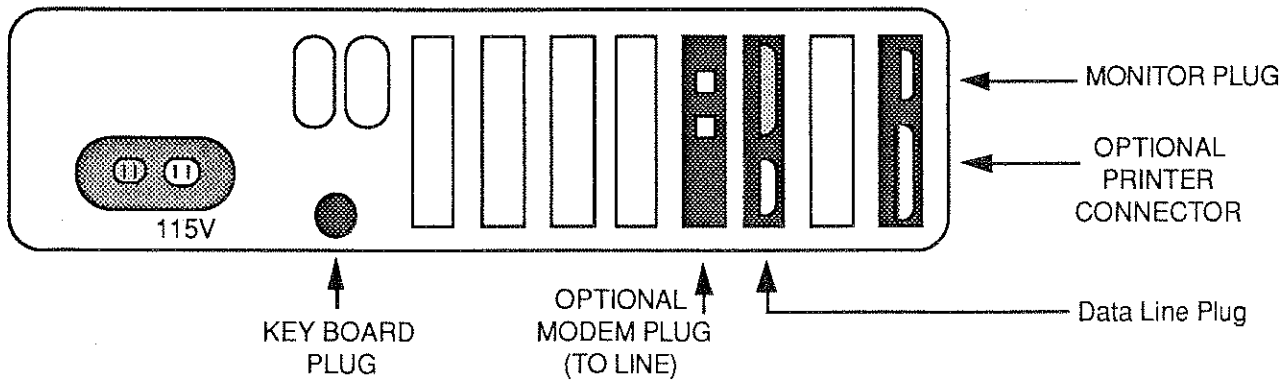
2. Locate the computer in the building's conditioned space. The computer will function best at normal room temperature.

3. The computer is furnished with a 115 volt UL approved plug and cord. When possible, provide an independent 115 volt power circuit for the computer. It is also advisable to power the computer through a surge suppressor.

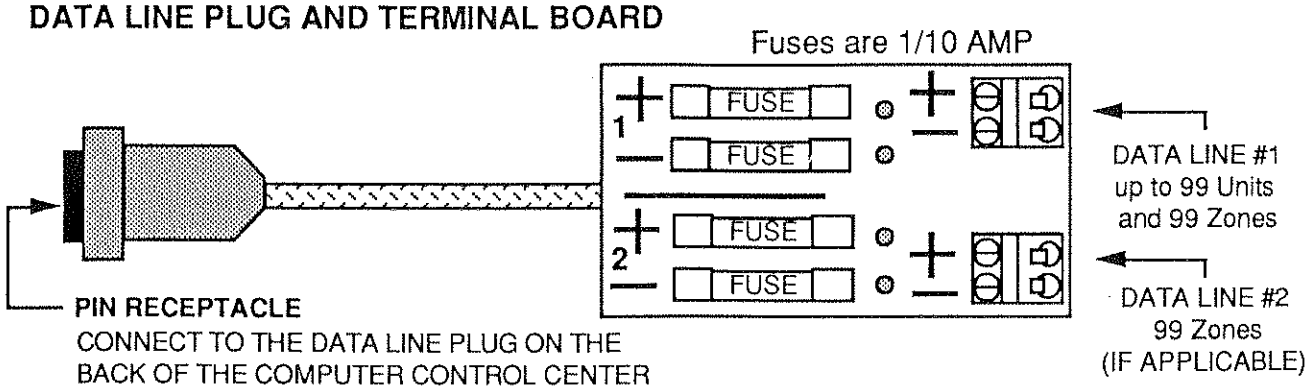
4. The drawing below shows the data line and the back of the computer. Connect the data line terminal board to the computer using the pin receptacle. The data line can then be connected to the terminal board. (CHECK THE POLARITY OF THE WIRES WHEN CONNECTING THE DATA LINE).

IMPORTANT: Read "Check, Test and Start" information before connecting the data lines to the computer.

LOCATED ON THE BACK OF THE COMPUTER CONTROL CENTER



DATA LINE PLUG AND TERMINAL BOARD



1. The *OMEGA PLUS* Relay Module has eight status lights. Three lights indicate power and communication status. Five lights indicate on/off operation of cooling, heating and fan relays. The status lights are helpful when the HVAC unit requires service. Install the Relay Module where a serviceman can easily get access to it, preferably in the HVAC unit's control vestibule.
2. Do not install the Relay Module out-of-doors. It is not water resistant and will not withstand extremely hot or cold temperatures. If the Relay Module is installed in the HVAC unit, it should be inside the control vestibule. Do not install the module where it can be affected by large starters or contactors.
3. The Relay Module is equipped with two rotary switches marked MSD and LSD. Each switch has ten positions, 0-9. These switches must be set to an ID number before the HVAC unit is started up. The ID number should be selected from the mechanical plans. If there is only one HVAC unit, the ID# switch should be set on number "0" "1." Additional HVAC units should be numbered in sequence: 2, 3, etc. Up to 99 Relay Modules and 99 zone dampers can be connected to <u>one</u> data line.
4. The computer is normally set up for one data line. Additional data lines are available if required and must be specified when ordered.

IMPORTANT: Each Relay Module in the system must have its own independent 40 VA, 24 Volt transformer. The transformer is used for electrical isolation. <u>Do not connect this transformer to any other device</u>; it will ground the data lines. If the data lines are grounded, the system components cannot communicate. Grounding may also cause damage to the computer, other system thermostats and Relay Module.

CAUTION: Do not run A.C., D.C. or twisted pair wires in the same bundle or conduit.

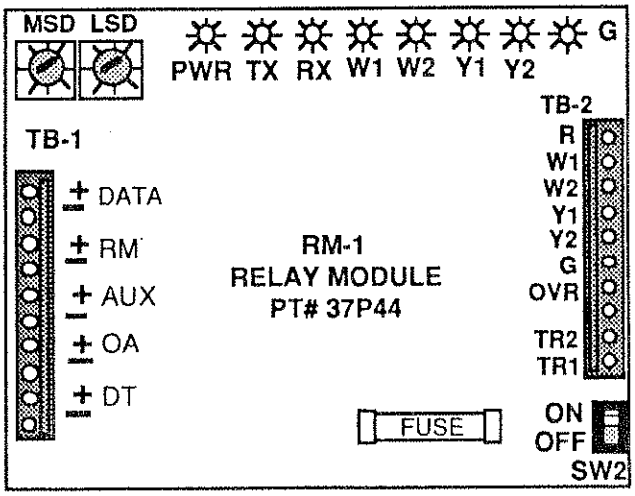
RELAY MODULE WIRING DIAGRAM

STATUS LIGHTS

All Boards		G/E or HP With Heating/Cooling Stat		Heat Pump Thermostat	
PWR	POWER ON	W1	1st Stage Heat	W1	Reversing Valve
TX	TRANSMITTING	W2	2nd Stage Heat	W2	Electric Heat
RX	RECEIVING	Y1	1st Stage Cool	Y1	1st Stage Compressor
G	FAN	Y2	2nd Stage Cool	Y2	2nd Stage Compressor

TERMINAL TB-1 WIRE TO SPECIFIED PARTS

DATA ±	2 WIRE, TWISTED PAIR DATA LINE
RM ±	(RMS) RETURN SENSOR PT# 51P46 IN RETURN AIR
AUX ±	FILTER SWITCH
OA ±	OUTDOOR SENSOR PT# 62P51
DT ±	(RMS) DISCHARGE SENSOR PT# 51P46 IN DISCHARGE AIR



TERMINAL TB-2 WIRE TERMINALS TO HVAC UNIT

R	CONTROL POWER
W1	1st STAGE HEATING
W2	2nd STAGE HEATING
Y1	1st STAGE COOLING
Y2	2nd STAGE COOLING
G	FAN CIRCUIT
OVR	TO "OVR" ON T-440
TR	INDEPENDENT 24V-40VA TRANSFORMER

RMS = Relay Module Sensor.

NOTE: Relay Module must be specified. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

OMEGA PLUS RELAY MODULE INSTALLATION AND WIRING

The Relay Module should only be used for zoned systems. Mount the Relay Module in a location near the HVAC unit or in the control vestibule. An independent 24V 40 VA transformer is required to power the Relay Module. No other device should be connected to this transformer. Connect the transformer to the terminals labeled TR1 and TR2. Run the normal wires required for the HVAC unit to the Relay Module as if it were a regular cooling and heating thermostat. (See Relay Module wiring). Connect these wires to the terminal strip labeled Y1, Y2, W1, W2, R, and G. Connect Data Lines into the terminals marked "Data +" and "Data -." Make sure the polarity of the Data Line wires are correct!!! Connect the Discharge Air RMS to the inputs labeled "DT + and -." Connect the Return air RMS to the inputs labeled "RM + and -." Place a jumper between "OA + and -" terminals and "AUX + and -" terminals. These jumpers are necessary for proper operation.

RELAY MODULE IDENTIFICATION NUMBER

There are two rotary ID# Switches on each Relay Module printed circuit board. The switches are marked MSD (most significant digit) and LSD (least significant digit). See Relay Module drawing. These switches should be set to the individual ID# shown for each HVAC unit on the mechanical plan. For example, if the plans show that the unit is labeled unit number 9 then set MSD (rotary) switch to "0" and set LSD (rotary switch) to "9".

DISCHARGE AIR TEMPERATURE CAPACITY CONTROL FOR ZONED SYSTEMS

All capacity control functions are handled by the Control Center with information provided by each units Relay Module. The Relay Module uses the Discharge Air RMS to monitor the cooling or heating capacity of the HVAC unit as building load decreases. If the supply air temperature drops below 52 degrees F, the Relay Module will break the Y2 wire controlling the second stage of cooling. If supply air temperature drops below 48 degrees F, the Relay Module will break the Y1 wire controlling the first stage of cooling. If the temperature goes above 125 degrees F, (106 degrees for heat pumps) the Relay Module will break the W2 wire controlling the second stage of heating. If the supply air temperature goes above 130 degrees F, (110 degrees for heat pumps) the Relay Module will break the W1 wire controlling the first stage of heating. In both cases there will be a 5 minute delay to prevent short cycling of the compressor or heater. For Heat Pump operations place the RMS downstream of the coil where it will not be affected by the electric heat. Overheat and/or low air protection for the strip heater shall be recommended by the strip heater manufacturer.

T600 THERMOSTAT

The T600 Thermostat may be applied as a stand alone thermostat or tied into the *OMEGA PLUS* control system. Mount the T600 in a location where it will sense normal load. Do not locate it near a window or any source of heat such as copy machines, coffee pots or any type of machine heat exhaust fan. 24V power for the T600 is supplied by the HVAC Unit which the T600 is controlling. Connect the terminals labeled TR1 and TR2 to the "R" and "C" terminals or the HVAC Unit transformer. Confirm that you are tapping into a 24 volt power supply. Polarity is not important for these wires.

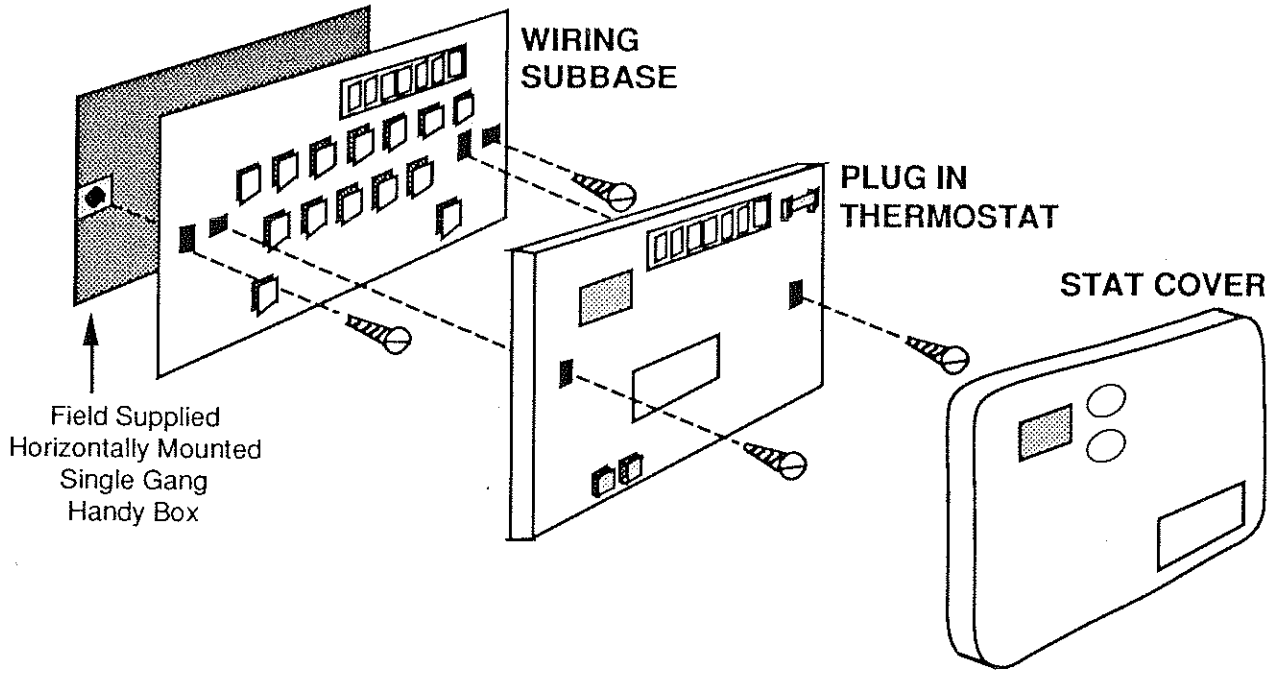
Run the normal wires required for the HVAC unit to the T600 as if it were a regular cooling and heating thermostat. (See T600 wiring). Connect these wires to the terminals labeled Y1, Y2, W1, W2, R, C and G.

Place the T600 Discharge Air Sensor down stream of the unit in the discharge duct. For Heat Pump operations place the RMS downstream of the coil where it will not be affected by the electric heat. Overheat and/or low air protection for the strip heater shall be recommended by the strip heater manufacturer. Connect the Discharge Air Sensor to the C, AN + and AN- terminals. (See T600 wiring.)

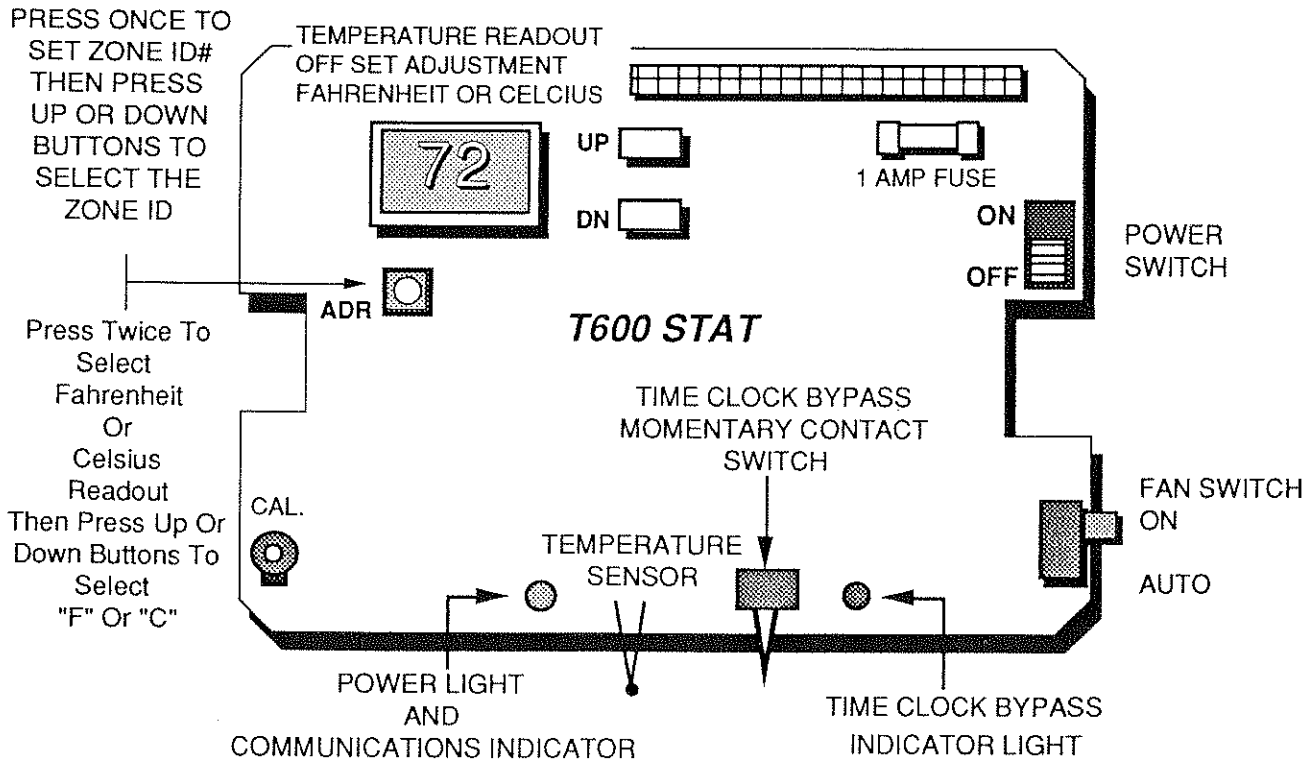
Connect the Data Lines into the terminals marked "Data +" and "Data -." Make sure the polarity of the Data Line wires are correct!!! Polarity is very important for these wires.

All T600 thermostat wiring should be done in 18 gauge or heavier solid thermostat wire except for the Data Lines. The Data Lines must be wired with 22 gauge twisted pair control cable. (The twisted pair should be equal to Belden 8740 solid, PVC Coated or 88442 stranded plenum-rated Teflon covered wire.)

T600 THERMOSTAT ASSEMBLY



T600 STAT FUNCTIONS THIS BOARD PLUGS ONTO THE SUBBASE



T600 SUBBASE CHECKOUT PROCEDURE This procedure requires that all T600 and Zone thermostats be removed from their subbases and the Data Line be disconnected from the Control Center.

NOTE: The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

Data Line Checkout

Using a voltmeter set at 2K on the ohms scale, check between terminals 1 and 2 on the subbase to see if continuity exists. If there is continuity, the Data Line is crossed and lines 1 and 2 are connected together. This needs to be corrected before proceeding or damage will occur to all stats. Also check each terminal to ground to see if continuity exists. If there is continuity then the data line is grounded. Find the ground and fix it before moving on or all parts on the data line will be damaged.

Transformer Wiring Checkout

For this test the unit transformer must have power. Set the voltmeter for A.C. volts at 200. Check between terminals R and C for nominal 24 volts. If this reading is incorrect, check at the HVAC Unit transformer for the same voltage. If the reading is correct at the transformer, check the wiring to the stat subbase. Next change the meter to check for continuity.

T600 THERMOSTAT INSTALLATION

Setting The Identification Number

Before the HVAC Unit power is turned on confirm that the power switch on the T600 is in the off position. Once the power is turned at the unit the T600 will have power available. Turn on the power switch and the temperature readout will display the current temperature at the stat. Press the Address button located below the display and labeled as "ADR." (See T600 Stat functions diagram). Once the button is pressed, the current address will be displayed on the readout. The default address is "99". To modify the address press the up and down buttons to the right of the display until the desired address is displayed. Each T600 needs to have an individual ID number. NO T600 or Relay Module may have the same ID number. Once entered the address is stored in a nonvolatile memory. The readout will return to displaying temperature after a short time out.

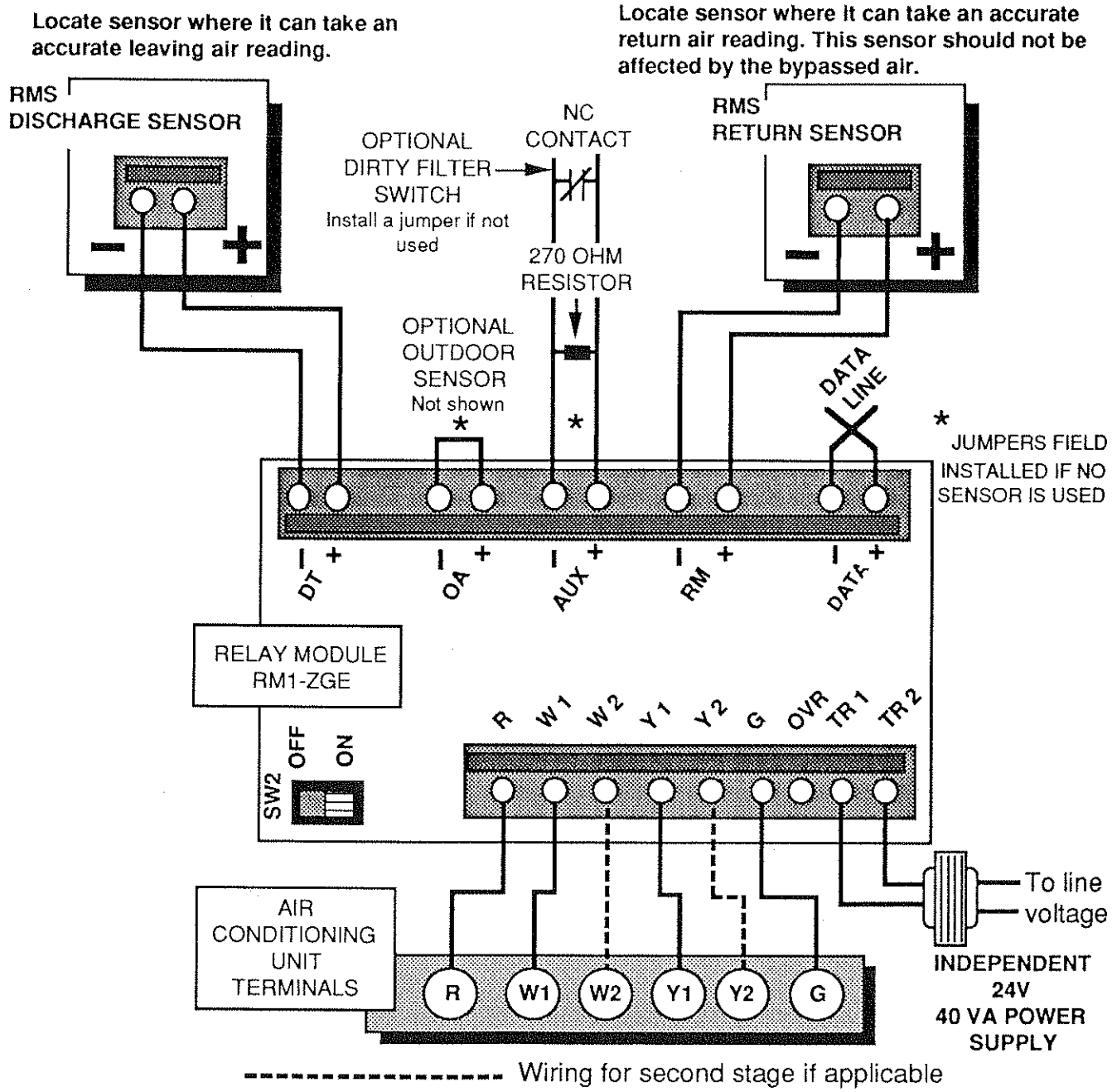
Local Modification of Setpoints

To modify the Heat and Cool setpoints at the T600 tap the button labeled UP once to display the current heat setpoint. A dot will appear to the left of the numbers on the display. This dot indicates that the heat setpoint is now displayed and may be changed. While the heat setpoint is displayed press either the UP or DN (down) button to adjust the heat setpoint. Wait for the display to change back to displaying the room temperature then tap the button labeled DN (down) once to display the current cool setpoint. A dot will appear between the numbers on the display. This indicates that the cool setpoint is now displayed and may be changed. While the cool setpoint is displayed press either the UP or DN (down) button to adjust the heat setpoint. Wait for the display to change back to displaying the room temperature before pressing any other button. When the T600 is connected to the *OMEGA PLUS* system the Offset allowed from the heat and cool setpoints is limited by the Control Center. The defaults limits for the Offset are 55 for heat and 91 for cooling. These limits are set for each event when programming the time and temperature schedules in the initialization program. They may be kept at the default of 55 and 91 which would then allow the occupant to modify the setpoints at the T600 in the range from 55 to 91 or set as close as the cooling and the heating setpoints which would limit the control at the T600.

The Fan Switch

The fan switch located on the right side of the T600 is inactive when the T600 is operated with the *OMEGA PLUS* system.

RELAY MODULE WIRING FOR GAS/ELECTRIC UNITS



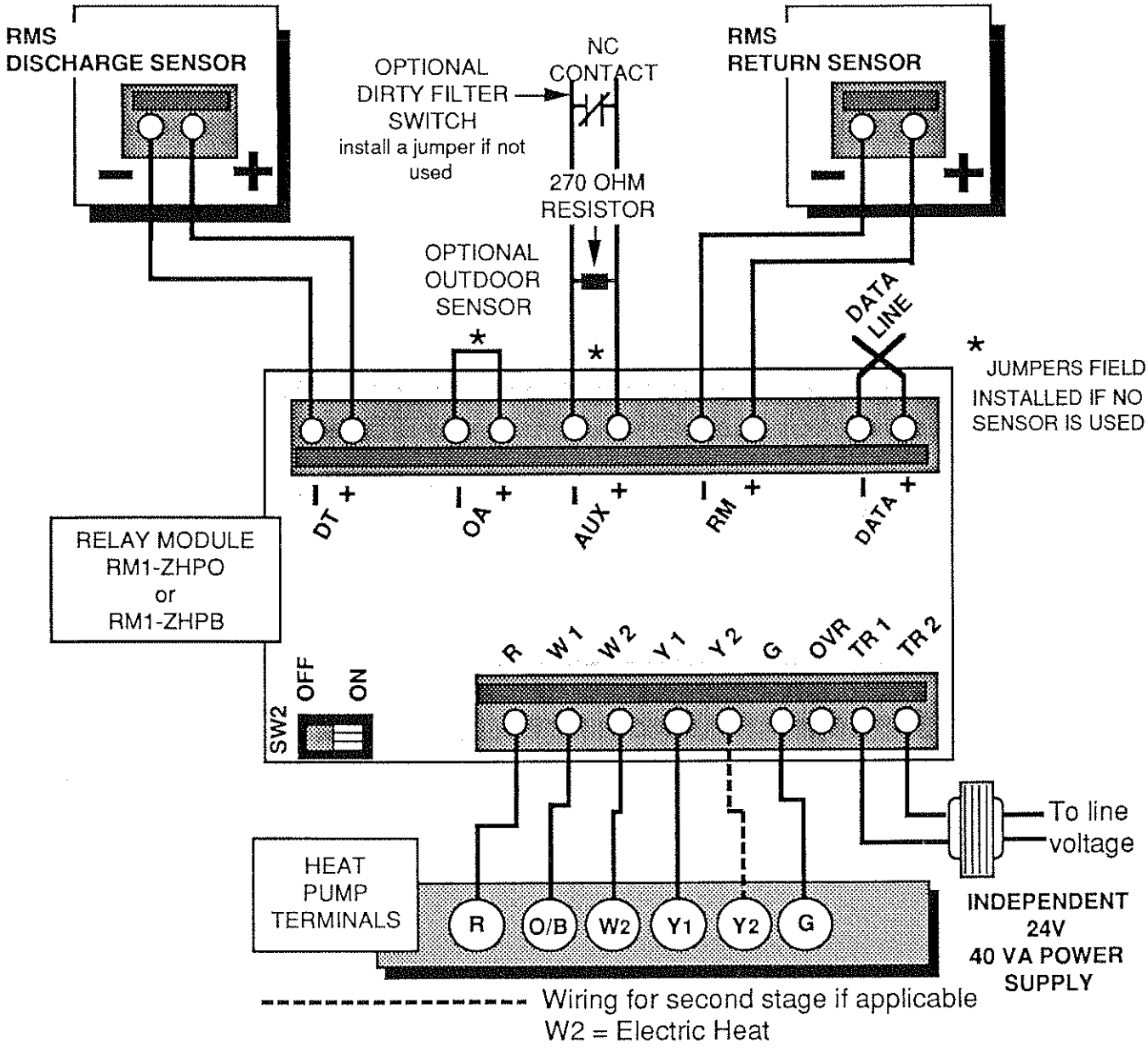
All wiring should be 18 ga. solid thermostat wire except the two wire twisted pair data lines. The two wire twisted pair **must be wired with 22 ga. twisted pair control cable.** (The twisted pair should be equal to Belden 8740 solid, PVC coated, or 88442 stranded plenum-rated Teflon covered wire.)

NOTE: Relay Module must be specified. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B". The Gas/Electric version will operate all, one and two stage Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

RELAY MODULE WIRING FOR HEAT PUMPS UNITS

Locate sensor where it can take an accurate leaving air reading. On a Heat Pump it should not see the electric heat

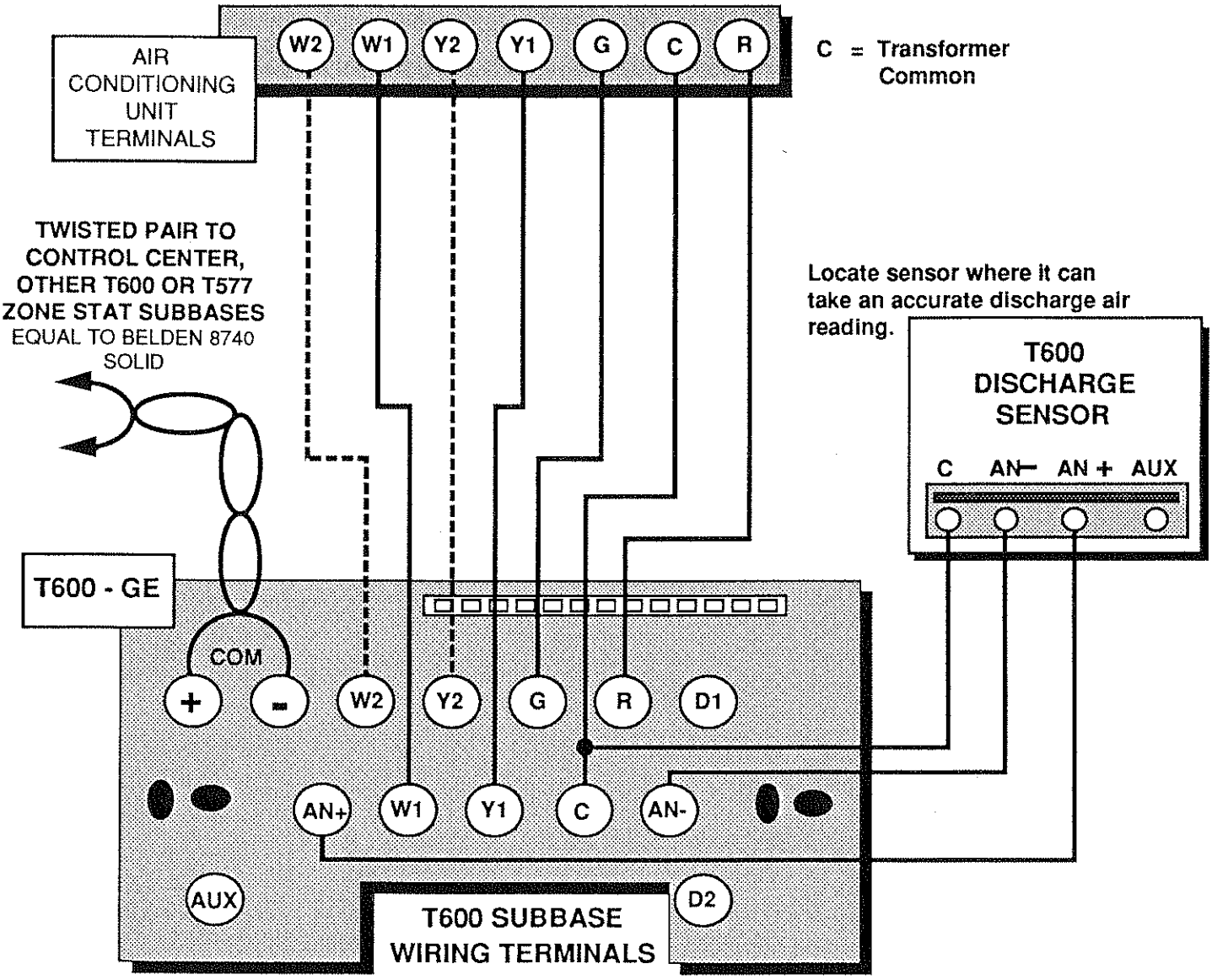
Locate sensor where it can take an accurate return air reading. This sensor should not be affected by the bypassed air.



All wiring should be 18 ga. solid thermostat wire except the two wire twisted pair data lines. The two wire twisted pair **must be wired with 22 ga. twisted pair control cable.** (The twisted pair should be equal to Belden 8740 solid, PVC coated, or 88442 stranded plenum-rated Teflon covered wire.)

NOTE: Relay Module must be specified. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B". The Gas/Electric version will operate all, one and two stage Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

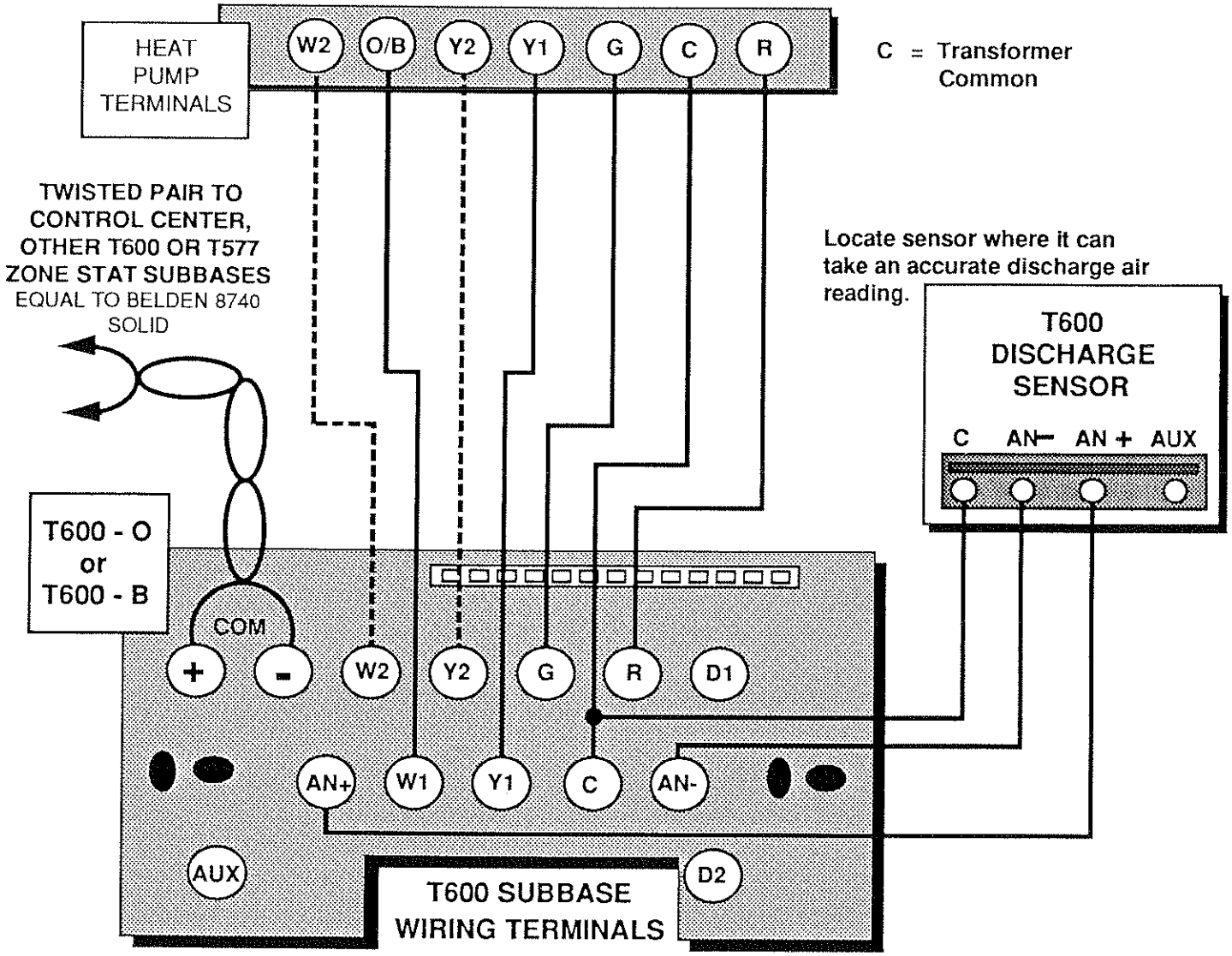
T600 THERMOSTAT WIRING FOR GAS/ELECTRIC UNITS



All wiring should be 18 ga. solid thermostat wire except the two wire twisted pair data lines. The two wire twisted pair **must be wired with 22 ga. twisted pair control cable.** (The twisted pair should be equal to Belden 8740 solid, PVC coated, or 88442 stranded plenum-rated Teflon covered wire.).

NOTE: The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

T600 THERMOSTAT WIRING FOR HEAT PUMP UNITS



All wiring should be 18 ga. solid thermostat wire except the two wire twisted pair data lines. The two wire twisted pair **must be wired with 22 ga. twisted pair control cable.** (The twisted pair should be equal to Belden 8740 solid, PVC coated, or 88442 stranded plenum-rated Teflon covered wire.)

NOTE: The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

T577 OMEGA ZONE STAT SUBBASE INSTALLATION AND CHECKOUT

The back of the Stat Subbase is designed to mount directly onto a horizontally mounted handy box. The Subbase should not press against any metal surface. Locate the Zone Stat where it can sense normal zone load. Do not locate it on an outside wall or near a source of heat or cold. Air from register, microwaves, coffee makers, copy machines, ETC. must not blow on the sensor. The subbase should be wired and checked according to the Subbase Wiring Checkout, below. This should be done before the *OMEGA* stat is mounted to the subbase.

Wiring

All zone thermostat wiring should be done in 18 gauge or heavier solid thermostat wire except for the Data Lines. The Data Lines must be wired with 22 gauge twisted pair control cable. (The twisted pair should be equal to Belden 8740 solid, PVC Coated or 88442 stranded plenum-rated Teflon covered wire.) Set the *OMEGA* zone stat ON/OFF switch to OFF position prior to startup. See "Typical Zone Stat and Subbase Wiring" for a complete zone wiring diagram. NOTE: The 24V wires may need to be larger than 18 gauge when line loss is taken into account.

Transformer

One 24V transformer can be used to supply power to all *T577 OMEGA* Zone Thermostats. Each thermostat requires 6VA. When calculating VA make sure to take line loss into account. Excessive voltage drops will affect the operation of the system. No thermostat should be operated with less than 22 volts.

Auxiliary Heat Connections

Use terminal 6 and terminal 10 to wire to an auxiliary heat application. Follow the manufacturers wiring recommendations for the auxiliary heat unit. When using Auxiliary heat increase the VA supplied to each Zone thermostat to include enough power for each Auxiliary heat unit.

SUBBASE CHECKOUT PROCEDURE

This procedure requires that all thermostats be removed from their subbases and the Data Line be disconnected from the Control Center.

Data Line Checkout

Using a voltmeter set at 2K on the ohms scale, check between terminals 1 and 2 on the subbase to see if continuity exists. If there is continuity, the Data Line is crossed and lines 1 and 2 are connected together. This needs to be corrected before proceeding or damage will occur to all stats. Also check each terminal to ground to see if continuity exists. If there is continuity then the data line is grounded. Find the ground and fix it before moving on, or all parts on the data line will be damaged.

Damper Motor Checkout

Using a voltmeter set at 200 on the ohms scale, connect one probe to terminal 7 and the other to terminal 9. Check for 25 ohms plus or minus 2 ohms. (If there are two dampers slaved together, this reading will be about 13 ohms, for three dampers 8 ohms and for 4 dampers 7 ohms). Next check between terminals 8 and 9 for this same reading. If it is incorrect, check the wiring between the subbase and the zone damper board on terminals 7, 8 and 9. Also check each terminal to ground to see if continuity exists. There should be no continuity to ground.

Transformer Wiring Checkout

Next, set the voltmeter for 200 volts AC. Check between terminals 10 and 11 for nominal 24 volts. If this reading is incorrect, check at the transformer for the same voltage. If the reading is correct at the transformer, check the wiring to the stat subbase. Next change the meter to check for continuity. Check between 10 and ground and 11 and ground to make sure there is no continuity.

Damper Motor Movement Checkout

Short together terminals 7 and 11. Make a visual check to see that the red pointer on the damper moves towards closed on the indicator sticker of the damper. Next disconnect the short to terminal 7 and short together terminals 8 and 11. The damper should move open. Check the red pointer on the damper to verify that damper is moving open. If the damper does not respond this way, check the wiring between the subbase and the zone damper board on terminals 7, 8 and 9.

T577 OMEGA ZONE STAT INSTALLATION

Plug the stat onto the subbase confirming that all of the subbase sockets are properly aligned with the pins on the back of the stat board. Secure stat to subbase with the screws provided.

Setting The Identification Number

Turn on the power switch and the temperature readout will display the current temperature at the stat. Press the Address button located below the display and labeled "ADR." (See T577 Zone Stat functions diagram). The current address will then be displayed on the readout. The default address is "99". To modify the address press the up or down buttons to the right of the display until the desired address is displayed. Each zone thermostat must have an individual ID number. This ID number may be the same as a T600 or Relay Module ID#. Once entered the address is stored in nonvolatile memory. The display will show room temperature after a short time out.

Zone Thermostat Auxiliary Heat

The auxiliary heat will activate at the heat setpoint. For example, if the heat setpoint is 70 degrees and the stat programmed offset is set to "0" when the temperature read out on the stat is at 70 or below, the stat will send a call for heat to the Controller and bring on its' auxiliary heat. To check to see if Auxiliary Heat is activated, force the Controller to a heat setpoint at least 10 degrees above the zone stats local temperature. Wait for the Control Center to poll twice and then check between pins 6 and 9 on the Zone Stat circuit board face for 24 volts AC.

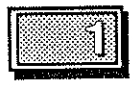
Offset Settings

This option is available for the zone occupant or can be disabled. (see Quick Set Up below) Tap either button and the offset will be displayed. Once displayed, press the up or down button to change the offset. If pressing both buttons and the display does not change, the offset feature has been disabled. To enable it, press the "ADR" button twice. Then use the Up or Down buttons to Enable or Disable the Offset feature.

QUICK SET UP

SET ZONE ID #:

Press the "ADR" button once to display the current zone ID number. Quickly press the up or down buttons to select the new zone ID number.



MODIFY OFFSET:

Tap either the up or down button. The current zone setpoint will appear with a dot at the top of the display. A dot to left of the numbers indicates that the system mode is heating. A dot between the numbers indicates the system mode is cooling. Press the up or down button to raise or lower the zone setpoint in a 6 degree range. If pressing the buttons has no effect, the offset feature has been disabled.

ENABLE OR DISABLE OFFSET:

To Disable or Enable the stats offset capability, press the "ADR" button twice. To toggle between Enabled or Disabled press the up button.

Enabled

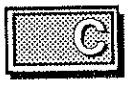
Disabled

SWITCH DISPLAY MODES:

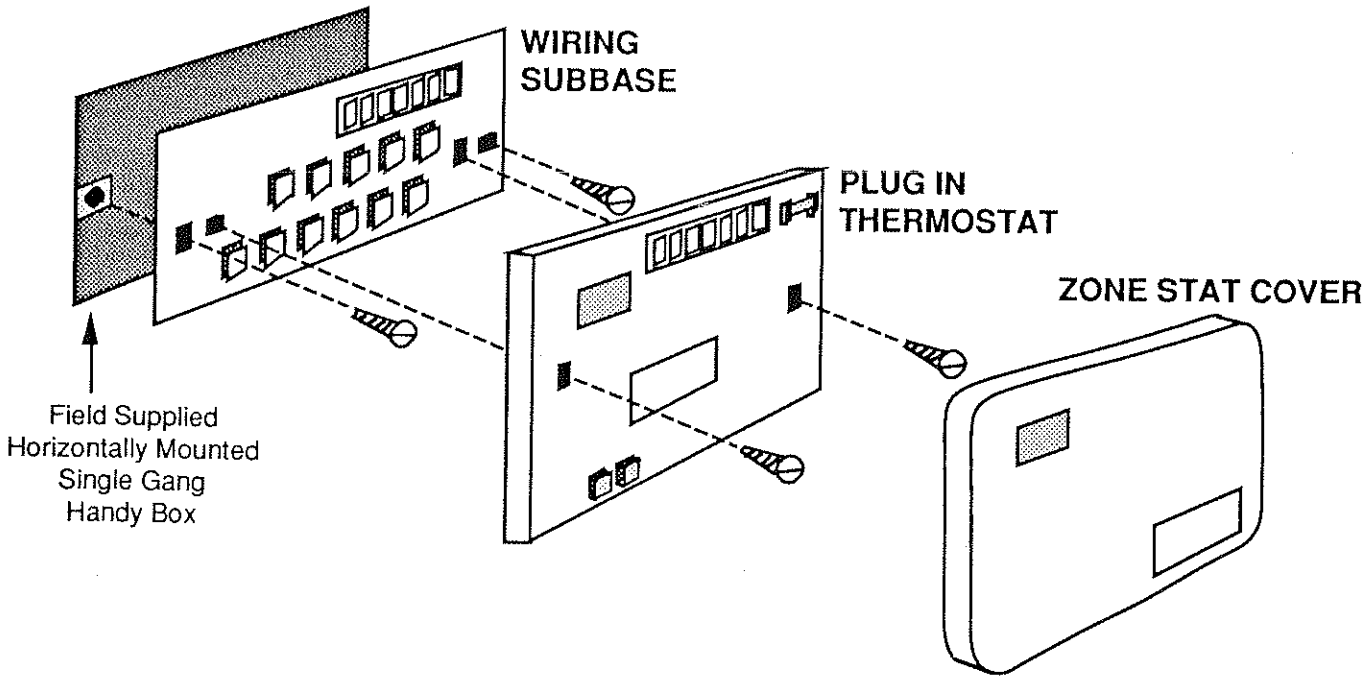
To switch between Fahrenheit or Celsius, press the "ADR" button 3 times. To toggle between Fahrenheit and Celsius press the up button.

Fahrenheit

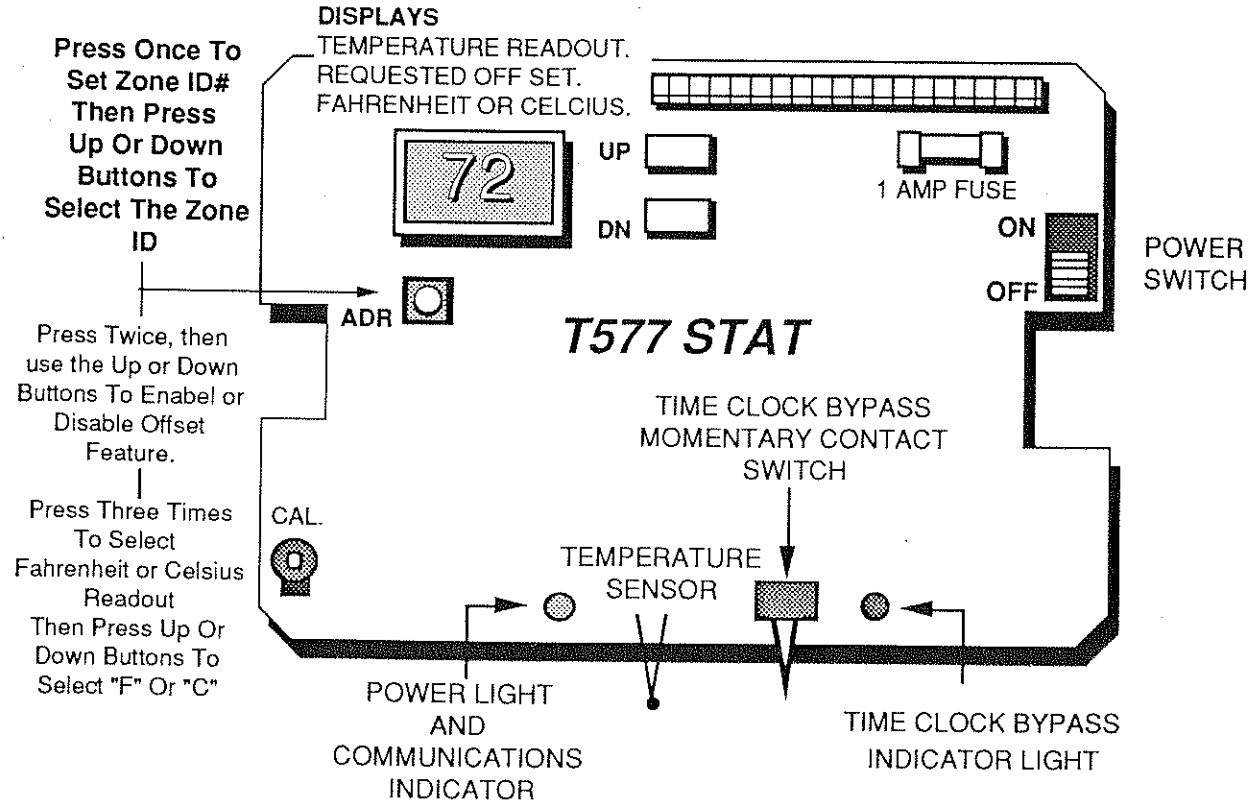
Celsius



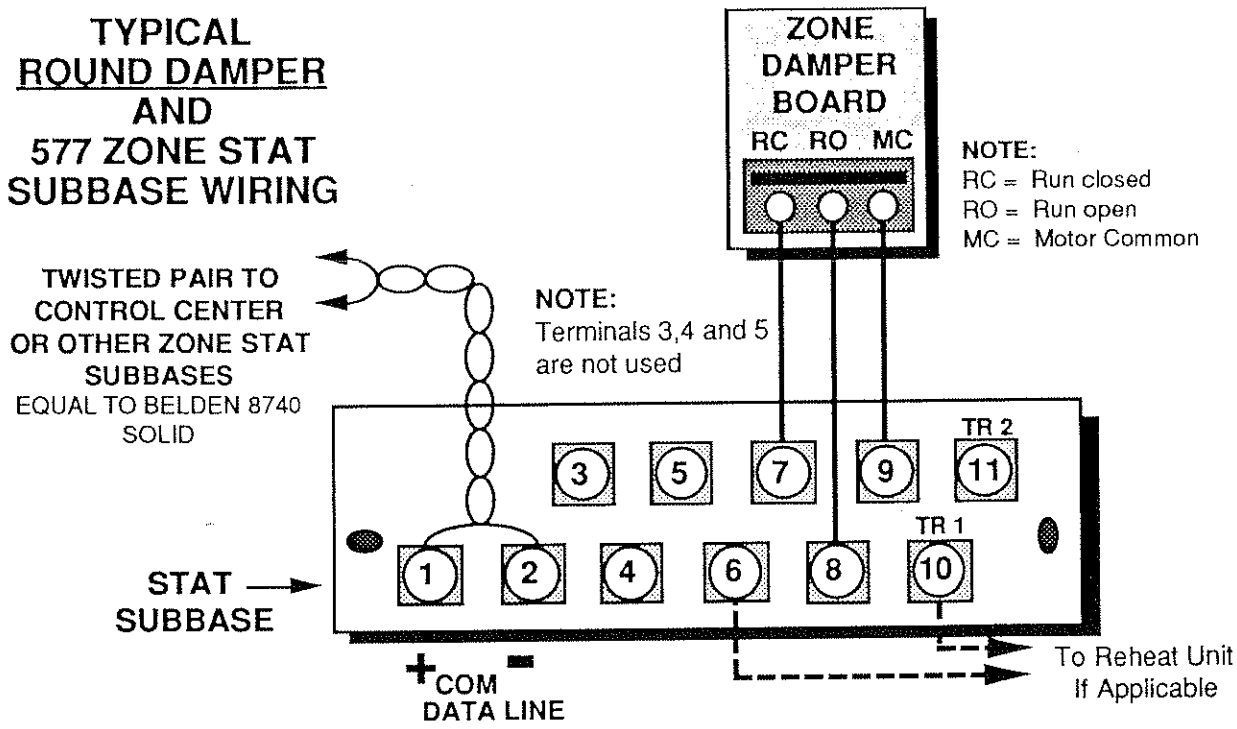
T577 THERMOSTAT ASSEMBLY



T577 STAT FUNCTIONS THIS BOARD PLUGS ONTO THE SUBBASE

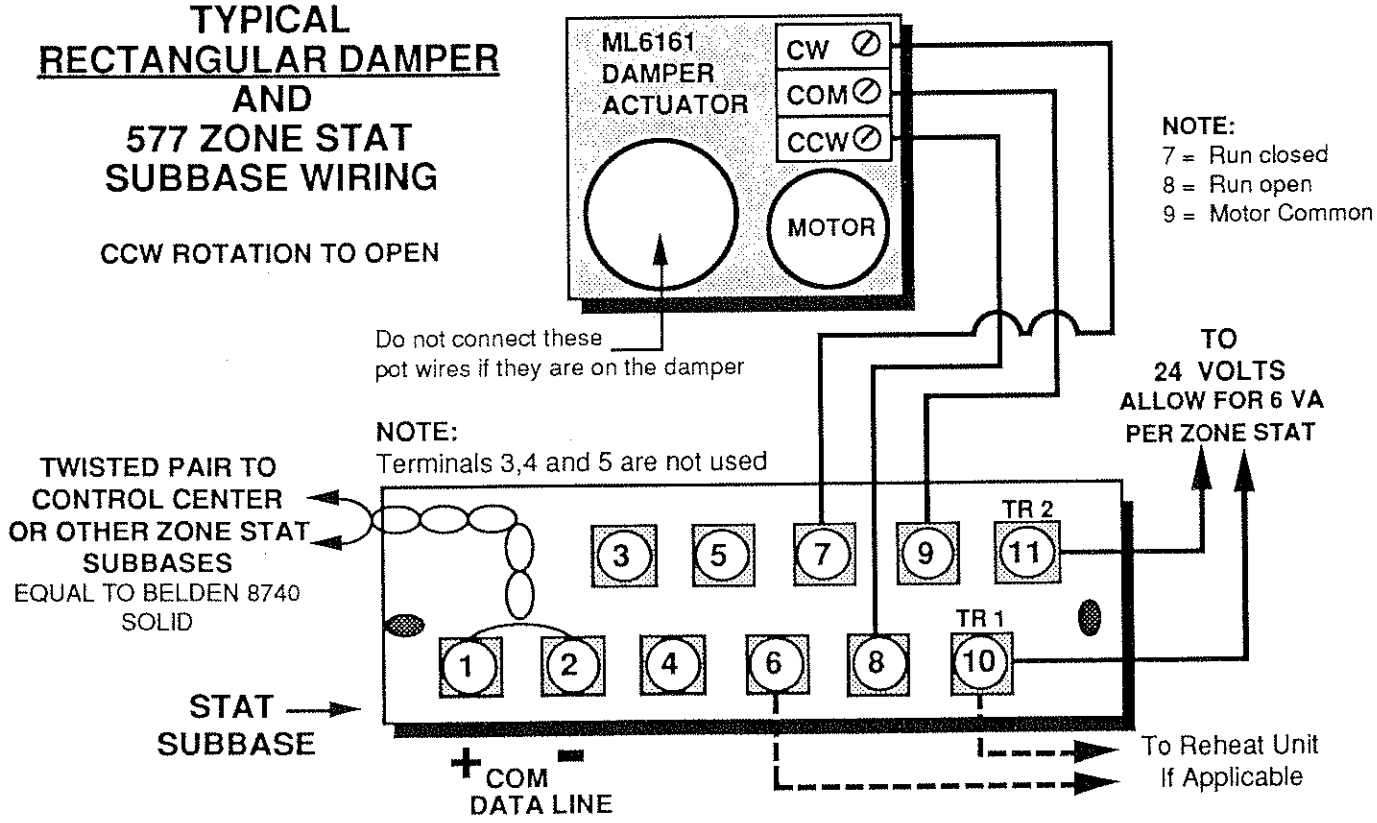


TYPICAL ROUND DAMPER AND 577 ZONE STAT SUBBASE WIRING



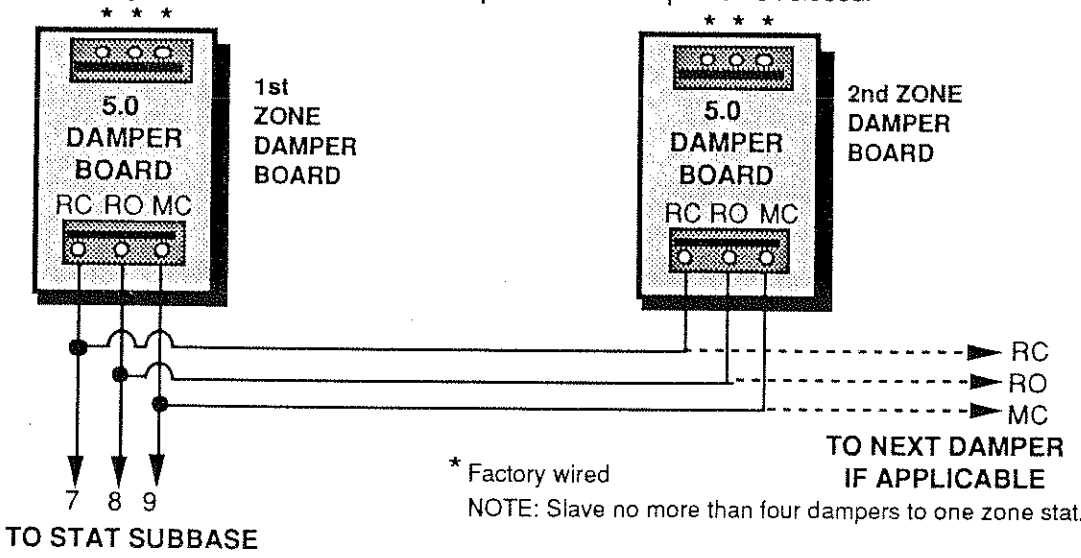
TYPICAL RECTANGULAR DAMPER AND 577 ZONE STAT SUBBASE WIRING

CCW ROTATION TO OPEN



SLAVING UP TO FOUR ZONE DAMPERS

Choose one of the dampers to be slaved as the primary damper. Any of the dampers will do. Connect the Zone Stat to the primary damper. Terminals 7, 8, and 9 of the second damper should then be connected to terminals 7, 8, and 9 of the first damper. The third damper should be paralleled in the same way from the second damper and then to the fourth damper. The slave dampers will self synchronize each time the dampers reach full open or full closed.

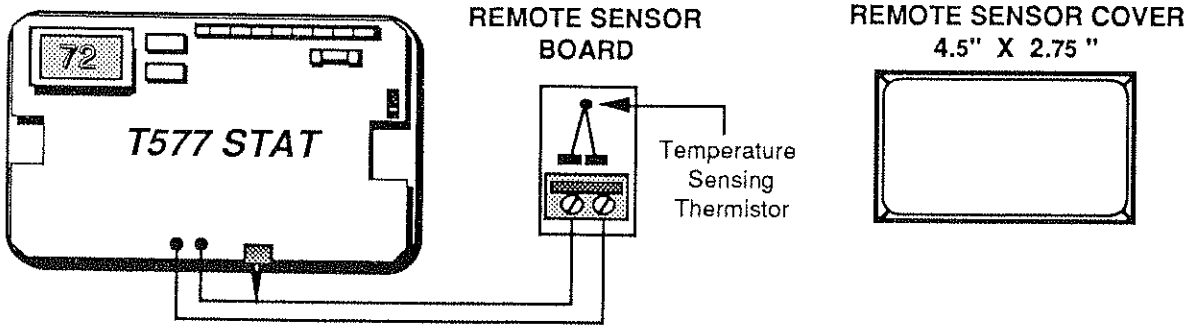


REMOTE SENSOR CAPABILITY

When it is necessary to remotely locate the temperature sensor for the *OMEGA* zone thermostat, a thermostat set up for a remote sensor must be specified for the Zone. This application requires that a small box be mounted in the zone, or in the return air duct which will contain a thermistor temperature sensor.

If this option is chosen, the zone occupant will lose the ability to vary zone temperature "+" or "-" 3 degrees. The zones' time clock override capability will be accessible only from the actual thermostat location.

The remote sensor should be connected by two shielded 18ga. wires. Ground the shield on one side only to a conduit ground. These wires will be supplied by the installing contractor. The wires should not exceed two hundred feet in length. The two wires are connected to the remote sensor with screw terminals and have no polarity. At the thermostat, field supplied wire nuts will be used to connect the sensor wires to the stat board.

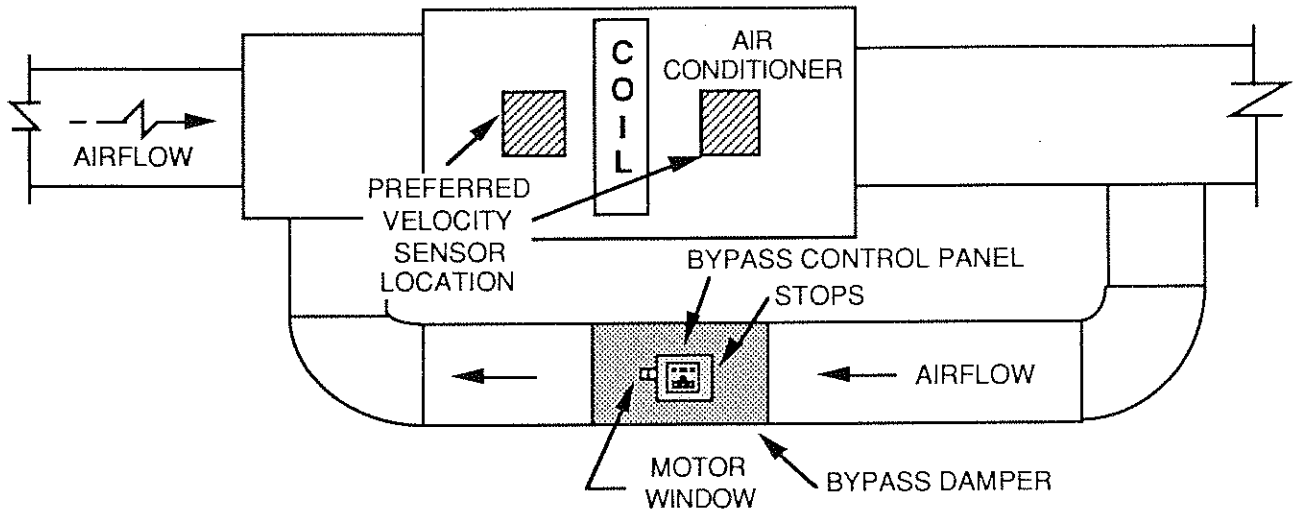


Round and Rectangular Bypass Damper Installation

Install the Bypass Damper between the supply and return duct as shown. Branch takeoffs must not be made *upstream* of the Bypass Damper takeoff. The Bypass Damper can dump into a plenum ceiling, but it is advisable to have the outlets as near as possible to the HVAC unit return inlet. If an economizer is used, be certain the return air damper does not close off the Bypass air. A 15% minimum return air position is usually sufficient.

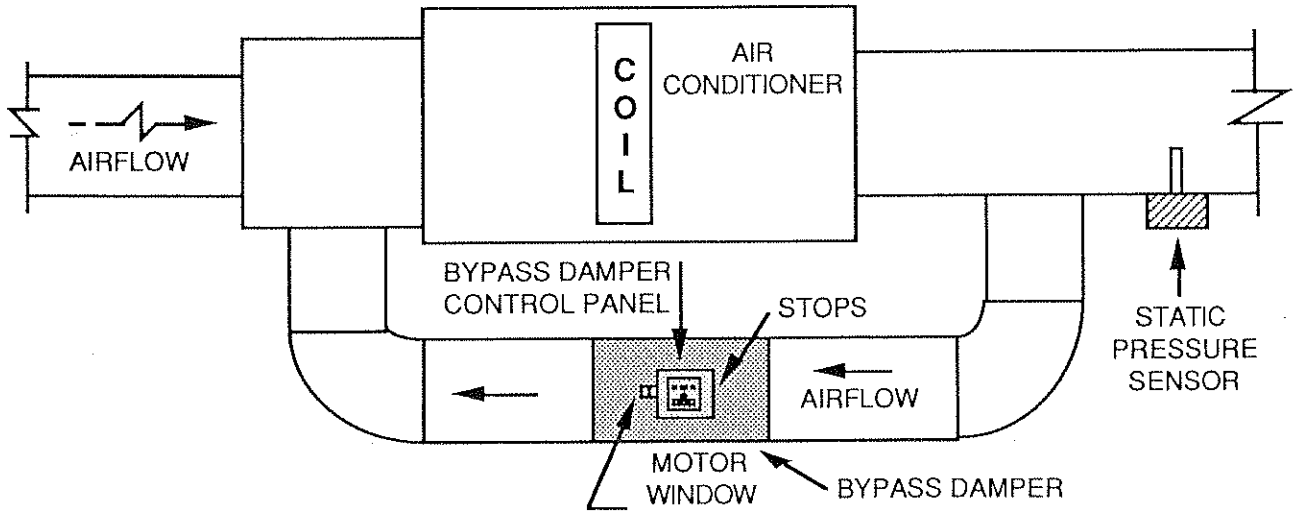
Velocity Sensor Placement

The Velocity Sensor is installed in the air conditioning unit upstream or downstream of the cooling coil and near the center of the coil. To avoid turbulence, the Velocity Sensor should be on the opposite side of the coil from the blower. The Velocity Sensor should not be installed in the corner or an elbow or dead spot where it will not sense air movement. For example, the Velocity Sensor can be suspended on a wire inside the unit or filter rack. The sensor should also be aligned as close to the center of the coil as possible. Installing the sensor in this manner uses the coil as an air straightener and averaging device. The bypass takeoff must be the first takeoff in the ductwork. An arrow on the Velocity Sensor indicates the direction the air should flow over it.

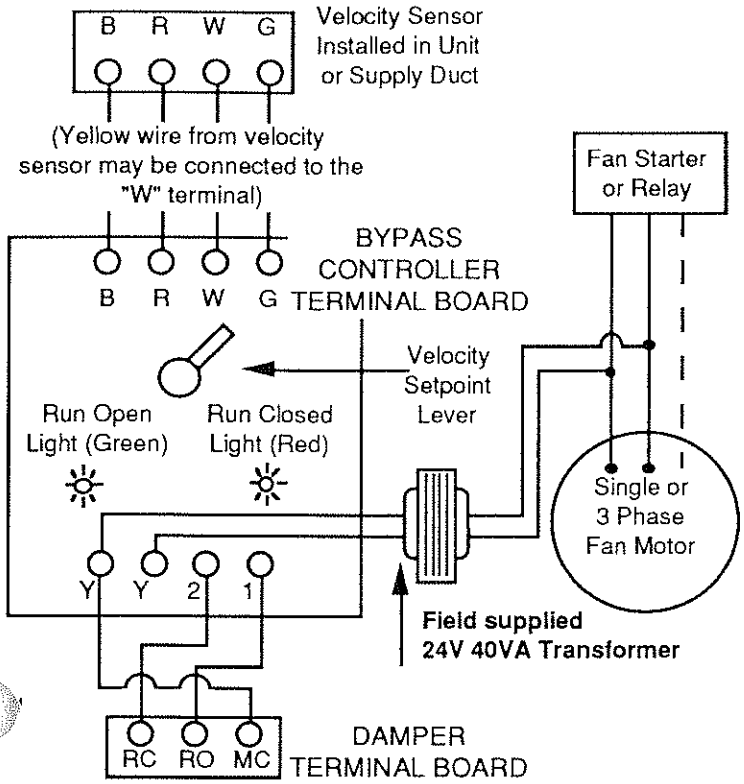


Static Pressure Sensor Location

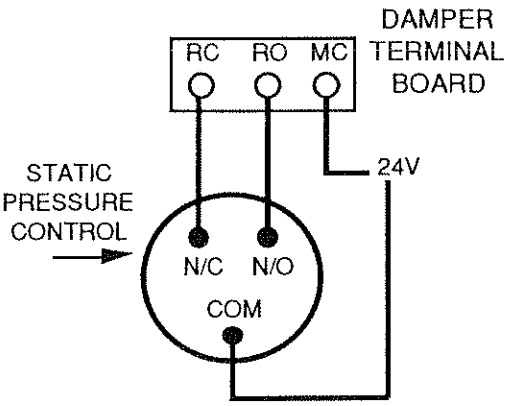
The Static Pressure Sensor should be installed after the bypass takeoff and before any zone takeoff.
See manufacturers recommendations for installation and start up.



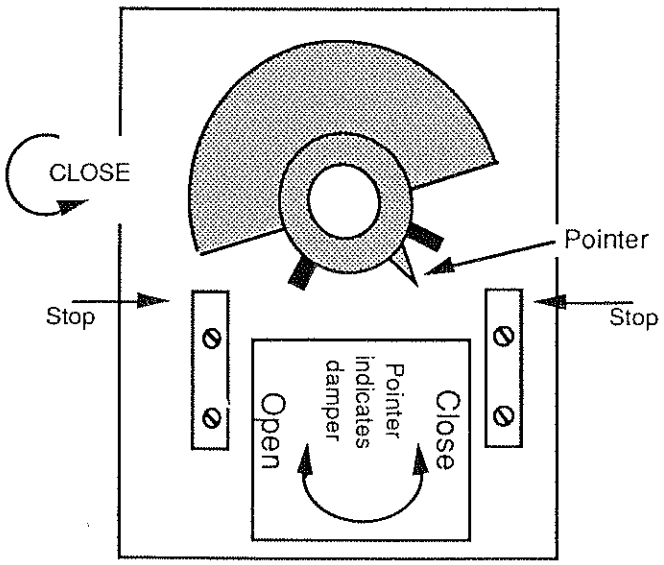
ELECTRONIC BYPASS USING A BYPASS CONTROLLER AND VELOCITY SENSOR



ELECTRONIC BYPASS USING A STATIC PRESSURE SENSOR

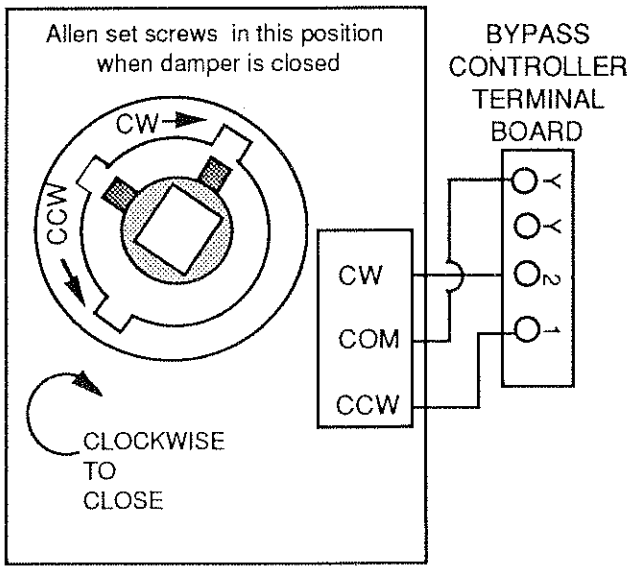


ROUND DAMPER SIDE VIEW OF MODULE



RECTANGULAR DAMPER MOTOR

Use the lock down screws on the motor to read damper position



NOTE: For buildings that are under construction or not fully leased, the following modification should be applied: A relief damper should be installed to prevent static pressure from exceeding 1" S.P. This is mandatory when less than 50% of the air is being delivered to zones in the building.

BYPASS DAMPER INSTALLATION Continued

Start-up

Velocity Sensor Application

Connect Velocity Sensor and Bypass Damper to the Bypass Damper Controller, color to color, as shown in the Bypass Damper wiring diagram on the previous page. Install and wire an independent 24 volt transformer in the blower circuit so that it will only operate when the fan is on. When breaking the power to the Bypass Damper Controller, *both* wires must be broken. Do not connect any other dampers to the Bypass Damper transformer.

Static Pressure Sensor Application

Connect the static pressure sensor to the motor wires as shown in the diagram labeled "Electronic Bypass Damper using a Static Pressure Sensor" shown on the previous page.

Continue on for both the Velocity Sensor and Static Pressure Sensor

1. It is necessary to get all of the dampers in the system full open. To do this, select number 4 on the Control Center, "Manual Operation." Press the "**Escape**" key then press the "**Menu**" key four times. Press "**Enter**" twice and the Controller will display "MODE?". Press the "**Mode**" key until "AUTO" appears on the display, Press "**Enter**". Now "FAN?" will appear on the display. Press the "**Fan**" key until "CONT" for continuous fan, appears on the display, Press "**Enter.**" Next, the Controller will display "HEAT SET?". Press "**55**" and then press "**Enter.**" Now, the Controller will display "COOL SET?". Press "**57**" then press "**Enter.**" Allow the system to run for 5 minutes before starting set up.

2. Close the bypass damper fully.

   A). To set up a **round** bypass damper, check the position of the pointer on the Bypass Damper module. See the diagram on the previous page. The damper should be in the fully closed position. There are two indicator lights on the Bypass Controller printed circuit board. Turning the setpoint lever counter-clockwise will open the damper and turn on the green light. Turning it clockwise will close the damper and turn on the red light. There are no indicator lights for the static pressure sensor. Use the motor window and actuator position shown on the previous page for damper operation and position.

   B) To set up a **rectangular** bypass damper check the position of the Allen set screws on the Bypass Damper actuator. See the diagram on the previous page. The damper should be in the fully closed position indicated by the Allen set screws. They should be be lined up with the CW indicator on the actuator. There are two indicator lights on the Bypass Controller printed circuit board. Turning the setpoint lever counter-clockwise will open the damper and turn on the green light. Turning it clockwise will close the damper and turn on the red light. There are no indicator lights for the static pressure sensor. Use the motor window and actuator position shown on the previous page for damper operation and position.

3. Set up:

   A. For the Velocity Sensor

      a) Turn the lever clockwise and allow the damper to close for at least 90 seconds. Only the red "closed" light should be lit.

      b) Move the lever slowly counter-clockwise until the red light turns off and the green "open" light just comes on.

      c) Move the lever very slowly clockwise and stop when both lights are off.

      d) Observe the motor operation through the window on the end of the motor. If the motor is running, stop it by slightly adjusting the lever. If the motor is not running, adjust the lever to barely start it, then bring it to a stop. Be sure the damper remains closed. The Bypass Damper is now ready to operate.

BYPASS DAMPER CONTINUED

B. For the Static Pressure Sensor

a) Turn the adjustment lever to fully close the bypass damper. Allow the damper to close for at least 90 seconds.

b) Turn the adjustment screw in the opposite direction until the damper indicator starts to open. See drawing on the previous page.

c) Back off the lever very slowly to stop the damper from opening.

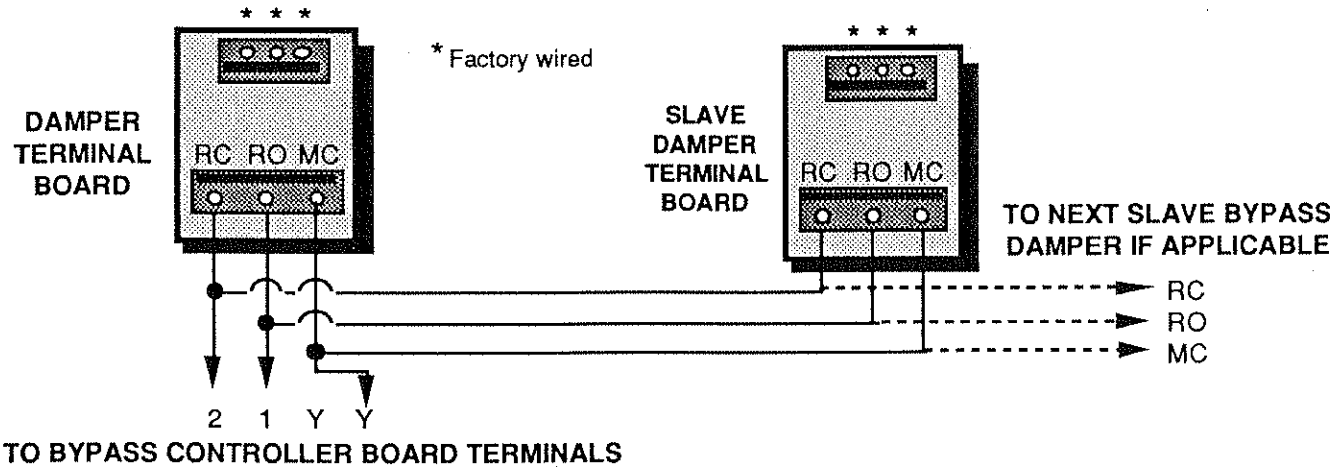
d) Observe the motor operation through the window on the end of the motor. If the motor is running, stop it by slightly adjusting the lever. If the motor is not running, adjust the lever to barely start it, then bring it to a stop. Be sure the damper remains closed. The Bypass Damper is now ready to operate.

4. Measurably reducing the air velocity, with the zone damper, will cause the Bypass Damper to partially open. The Bypass Damper will only open enough to compensate for the change in air velocity in the air handling unit.

5. If it is necessary to verify Velocity Sensor operation, with fan running, remove the Velocity Sensor from the air stream. If damper does not open, replace sensor and/or circuit board.

Slaving Two or more Bypass Dampers

Use one Velocity Sensor when slaving two or more Bypass Dampers together. Connect the Velocity Sensor wires to the B. R. W. G. terminals of the Bypass Controller Board. Connect the motor terminals RC, RO and MC of the first Bypass Damper to the Bypass Controller terminals Y,2,1. The motor terminals of the second Bypass Damper should then be connected to the first damper's terminal board as shown below. The third and fourth damper can be paralleled from the second damper. The slaved dampers will self synchronize each time the dampers reach full open or full closed.



If more than 4 slaves are required, a relay should be used to power terminals #1 and #2 of the slave boards.

INITIALIZATION PROGRAM

The Initialization program is used to identify all of the dampers and HVAC units in the system for the computer. Weekly time clock functions and holiday schedules are also set up using the Initialization program.

1. Type "Menu" to start the shell program or press the reset button on the computer and wait for the Auto boot to install the program in its memory. If you reset the computer you will see boot up information go by on the screen. Finally "Files found successfully" will be displayed and then the operating program system status will appear. To stop the program at any time press the "Ctrl" key and the "Q" key simultaneously. The program will abort.

2. Once the Shell programs Main Menu appears on the screen, select number "2" on the menu to begin initialization. A screen will give a brief explanation about the program. Press "ENTER" to continue.

3. The Initialization program will load press "ENTER" and an Initialization Menu will appear as follows:

<1> **ZONE CONFIGURATION**
<2> **HVAC system time/temperature schedule**
<3> **Holiday HVAC time/temperature schedule**
<4> **Relay Modules & T600 configuration**
<ESC> **EXIT** this program

Enter a number 1-4 and press the "Enter" key:

1. ZONE CONFIGURATION:

Press #1 then press "ENTER" and the Zone Configuration Menu will appear. Do not use this function to program T600 thermostats. They should be treated as Relay Modules not zone thermostats.

<1> **INITIALIZE** zone configuration for first time
<2> **REVIEW** current zone configuration
<3> **MODIFY** a zone configuration
<4> **DELETE** an existing zone configuration
<5> **ADD** to existing zone configuration
<ESC> **EXIT** to MAIN MENU

1. Press #1 then press "ENTER" to configure all zones in the system. If a warning appears it is telling you that this file already exists and if you continue on you will erase it. If this is the first time you are initializing the program answer "Y" for yes and continue on. Answer "N" for no to return to the menu.

INITIALIZATION PROGRAM CONTINUED

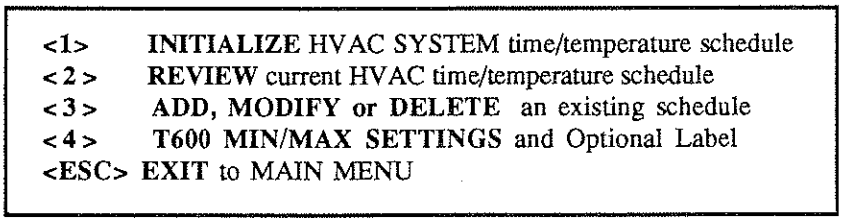
2. Follow the instructions on the screen and enter the total number of zone stats that the computer will be controlling. Then answer how many HVAC units there are. Press "ENTER" after each entry.
3. A screen will appear assigned to zone #1. Use the Arrow keys to move up and down between boxes. Use the Page Up or Page Down keys to modify each item. Use the alphanumeric keys to enter in a zone name. Press the "F10" key to move to the next zone entry. The zone number will automatically be incremented to the next higher number. You may modify it to any number you want. WARNING: It is possible to enter more than one zone with the same zone number; the operating program won't like this, so keep track of the zone numbers you have entered.
4. When all zones have been entered, the program will return to the Zone Initialization menu.

   NOTE: Zones can be entered in any order, however, we recommend ascending numbers from 1 to 99 so they can be displayed in sequence. The program will not accept information outside normal parameters. If a zone is left out, it can be added with the "ADD" option #5 of the menu.
5. Press #2 and "ENTER" to review the zone configuration. Use the <S> option to read the data on the screen, or, if a printer is connected to the computer, use the <P> option to print it out.

Press "ESC" key to return to the Initialization Main Menu.

2. HVAC SYSTEM TIME / TEMPERATURE SCHEDULE:

Use this option to schedule the time and temperature schedules for Relay Modules and T600 Thermostats. Press #2 then press "ENTER" and the Time and Temperature Menu will appear.



1. To set up the weekly time clock schedule, press #1 of the menu and then press "ENTER." A warning will appear telling you that this file already exists and if you continue on you will erase it. If this is the first time you are initializing the program answer "Y" for yes and continue on. Answer "N" for no to return to the menu.
2. Instructions will appear on the screen. After reading the instructions which tell you what keys to use, press the "C" key to continue on or press the "E" key to return to the menu, then press "ENTER." Remember, use the Arrow keys to move around the screen. Use the Page up and Page down keys to modify a selection. Use the Delete and Insert keys to add or remove a line. Use "F1" for help and press"F10" key to move to the next page. A box will fill the screen containing a default schedule of three events for unit #1. A Monday through Friday Set Up, a Monday through Friday Set Back and a Weekend Set Back. This schedule may be modified , added to or deleted from depending on your systems needs. Individual days of the week may be programmed to have their own events. If you want a particular day of the year to have its' own events use the Holiday Schedule. If you need more than 7 events press the "F10" key to add a new page, but notice that the unit number has been incremented to the next number so it needs to be modified back to the number of the unit you are programming. Press the "ESC" key to quit when given the option or the current screen will not be saved. You may enter in as many events as needed for each unit. **Each HVAC unit must have its' own schedule of events.**

INITIALIZATION PROGRAM CONTINUED

The last information that needs to be entered into the computer is the type of thermostat each unit would normally be controlled by, either Gas/Electric or Heat Pump. If it is a Heat Pump that does not use a Gas/Electric type thermostat, you must specify whether to energize the reversing valve in the cool or heat mode.

You may review your schedule by selecting #2 on the Time and Temperature menu. You may display the information on the screen or send it to a printer. The information may be displayed for one units schedule or for all units.

You may modify your schedules by using #3 "Add, Modify or Delete an existing HVAC schedule" on the Time and Temperature menu. You will be asked which unit you would like to modify, select a unit number then press "ENTER." You must now press "F1" if you would like to modify this schedule or press "F10" to move to the next page. Remember use the Arrow keys to move around the screen. Use the Page up and Page down keys to modify a selection. Use the Delete and Insert keys to add or remove a line. Use "F1" for help and press"F10" key to move to the next page.

T600 MIN/MAX SETTINGS AND OPTIONAL LABEL:
To add an optional location label and set up the minimum and maximum temperature range for a T600 select #4. The Min/Max settings will restrict the temperature offset range allowed at the T600. Enter the T600 ID number and press ENTER. A default minimum of 55 and a maximum of 91 will appear with each of the scheduled events. If the 55 and 91 were not changed they would allow the occupant a 41 degree range to move the heat and cool setpoints in. This range may be set as small as 2 degrees. Use the Page up and Page down keys to modify a selection

Press "ESC" key to return to the Initialization Main Menu.

3. HOLIDAY HVAC TIME / TEMPERATURE SCHEDULE: (Special events may also be entered here.)

Press #3 then press "ENTER" and the Holiday Time and Temperature Menu will appear.

<1> **INITIALIZE** holiday HVAC time/temperature schedule
<2> **REVIEW** current HVAC holiday time/temperature schedule
<3> **ADD** to the current HVAC holiday time/temperature schedule
<4> **DELETE** an existing HVAC holiday time/temperature schedule
<5> **COPY** an existing HVAC holiday time/temperature schedule
<ESC> **EXIT** to MAIN MENU

1. To set up the weekly time clock schedule, press #1 of the menu and then press "ENTER." A warning will appear telling you that this file already exists and if you continue on you will erase it. If this is the first time you are initializing the program answer "Y" for yes and continue on. Answer "N" for no to return to the menu.

This selection enables the creation of a special holiday schedule or special events which can automatically override the normal operation of the system for the days which you specify. It requires that you know the total number of AC unit systems in operation and the calendar for the current year. Note that any date you wish may be specified as a holiday. If a holiday falls on a weekend (Saturday or Sunday) and your holiday parameters are the same as a normal weekend, you do not need to redefine this date as a holiday. For example, suppose July 4th falls on a Friday and the building has a 3 day holiday for Friday, Saturday, Sunday. If Saturday and Sunday are the same as a non-holiday weekend, you only need to define July 4th as a holiday. Conversely, if July 4th falls on a Thursday and this is a 4 day holiday, you will define July 4th and July 5th both as holidays to override the normal Thursday and Friday schedules.

INITIALIZATION PROGRAM CONTINUED

2. Press "ENTER" to continue. These entries can be holiday settings or special event settings. For instance if this schedule was for a system that controlled a gymnasium all of the sporting events that may take place during the year after normal operating hours, such as a basket ball game, may be programmed as a holiday. Just enter a set up time and then a set back time and the unit will respond on the appropriate day.
3. Enter the month of the year and press "ENTER." Then enter the day of the month and press "ENTER." The schedule box will appear for unit #1 with one set back event. Remember, use the Arrow keys to move around the screen. Use the Page up and Page down keys to modify a selection. Use the Delete and Insert keys to add or remove a line. Use "F1" for help and press"F10" key to move on and schedule the next system. Use the Delete and Insert keys to add or remove a line. Use "ESC" key to add a different holiday date or to exit back to the "Holiday Time and Temperature Menu."
4. Use the other options on the "Holiday Time and Temperature Menu" to modify, delete, add to or copy from a Holiday schedule.

Press "ESC" key to return to the Initialization Main Menu.

4. RELAY MODULE AND T600 CONFIGURATION:

Press #4 then press "ENTER" and the Relay Module/T600 Configuration Menu will appear.

This configuration is created automatically. You may modify a unit type, Gas/Electric or Heat Pump, by selecting the first menu selection, "Modify a unit type." Remember, that the unit type depends on the type of thermostat that would normally operate the unit. There are only two types, all units that operate off a Gas/Electric type thermostat or those that operate of a Heat Pump type thermostat. A Heat Pump unit does not always operate off a Heat Pump thermostat. Check the unit manufactures recommendations for the thermostat type.

You may review the configuration by choosing the second menu selection, "Review current Relay Module/T600 configuration."

If you choose review:
The computer will ask if you want to display the configuration on the screen or send to a printer. If a printer is not available do not select "P" select "S" for screen.

Each unit should appear on the screen with data line information, type of zone application and unit type. The data line number should be 1 in all cases, unless you have a double data line system which is rare. Zone Control can be listed in three different ways.

1. "ZONED" for a system with more than one zone thermostat connected to an HVAC unit.
2. "SINGLE ZONE" for a system which has only one zone thermostat connected to an HVAC unit.
3. "T600" for a unit which is controlled by a T600 thermostat.

Unit type will be listed as Gas/Electric or Heat Pump.

After system is initialized, press the ESC key then the number 1 key to exit the initialization program and move back into the Shell program. Proceed to option #1, "Check, Test and Start," on the Main Menu of the Shell program.

SYSTEM WIRING CHECK:

1. Check wiring at all *OMEGA* zone and T600 thermostats. Be sure that all terminals are properly connected.

2. Turn off the power switches on all *OMEGA* zone thermostats, T600 thermostats and HVAC unit Relay Modules. Disconnect the data line from the Control Center.

3. Check for grounds shorts on both the data lines.

4. Put a voltmeter across data + and data - terminals. Both AC and DC voltage should read zero.

5. Check for opens. If the reading across the data line is zero ohms, the data lines are shorted. If the reading is infinity (one on a digital meter), the data lines are broken.

   All *OMEGA* zone stats, T600s and Relay Module power switches should still be in the off position.

6. Set the identification numbers on all Relay Modules, T600s and *OMEGA* zone stats. Each Relay Module is provided with two rotary ID switches. These switches are marked MSD (most significant digit) and LSD (least significant digit). Each Relay Module and T600 must have its own unique ID# which can be between 1 to 99. A relay Module and T600 can not have the same ID#. ID numbers for the T600 and zone stats are set electronically. See the installation instructions for more information. Each *OMEGA* zone stat must have its own unique zone ID# which can be between 1 to 99. The zone ID#s may be the same as a Relay Module or T600. A second data line can contain duplicate numbers. Relay Module and T600 must be numbered in order starting with 1, 2, Etc.

CHECK, TEST AND START

Insert program diskette into computer disk drive. Turn on the computer and allow the program to start running. When the program is not "polling " the system, press the "Ctrl" and the "Q" keys simultaneously. The program will stop running and a MENU will be displayed. Select number 1 and press the "ENTER" key. The following menu will appear:

CHECK, TEST AND START PROGRAM
M E N U

<1> Select Data Line
<2> Zone Stat Communication
Damper Operation Test
<3> Open or Close all Dampers
<4> Relay Module Communication Test
<5> T600 Communications Test
<6> Bypass Setup Procedure
<ESC> EXIT the program

What is your choice (1-6) ?

CHECK, TEST AND START CONTINUED

<1> Select Data Line:

This option is used only if there are more than 99 Relay Modules and T600s or more than 99 zone stats in the system. If there are, test all equipment connected to data line "1" first, then select this option and enter "2" to access the second data line. The Check, Test and Start program will always startup on data line one.

<2> Zone Stat Communication, Damper Operation Test:

1. The Stat Subbase Checkout should have been completed before starting this test. Set the power switch on the *OMEGA* stats to the "on" position.
2. Select "2" and then press "ENTER."
3. Enter the ID# of the damper to be tested.

   The computer will now try and communicate with this zone. If it successfully reaches the zone, it will display zone ID, the name given to the zone, zone temperature, damper position in percent open. The program will continue to communicate with the stat until the ESC key is pressed. When pressed a menu of option will be displayed. Using option number one a different zone stat may be selected.

DAMPER MOVEMENT TEST Use option number 5 to check damper movement.

The damper can now be told to open or close. Select <C> to close the damper or <O> to open the damper and then press "ENTER." This test is useful to check for damper movement problems. Select F1 to continue testing the zone. The information will be updated continuously. If all information is satisfactory, press ESC twice to return to the Main Menu.

NON COMMUNICATION If the computer cannot reach the zone, an error message will be displayed. If an error message is displayed, check the following:

-Check for correct setting of ID# at the zone stat.

-Check for opens, shorts or loose connections of the Data Line.

-Check at the computer for reversed "+" or " - " connections of the Data Line.

-Check the terminals at the zone stat for reversed "+" or " - " connections by placing a meter's positive probe on the "+" connector and the negative probe on the "-" connector. Set the meter on 20 MV DC and watch for a positive reading. If a negative reading appears, the wires are reversed somewhere between the computer and this checkpoint.

4. Press ESC twice to return to the Menu.

<3> Open or Close all dampers: Forces all dampers in the system to open or close.

<4> Relay Module Test:

1. Turn off the HVAC unit disconnect switch of the unit to be tested. This will prevent the Relay Module from short cycling the HVAC unit during testing. Turn on the Relay Module switch marked SW2. The three green lights should turn on. If either of the two green lights marked RX or TX do not turn on, the relay module may not be properly connected to the data lines. Check for opens, grounds, shorts or reversed "+" or "-" data connections. If the lights do turn on properly, then press "4" on the keyboard and press "ENTER." This will start the RM relay test. You will be asked to enter the Relay Module ID#. Enter the number that the Relay Module ID switches are set for and press "ENTER." The computer will display four temperature sensor inputs each time the Relay Module is contacted. The four temperatures are discharge air, return air, outside air temperature if applicable and one unassigned input that can be used to sense a dirty filter.
2. If "Test Failed" is displayed, the computer cannot contact the Relay Module. Something is wrong in the data line connections.

CHECK, TEST AND START CONTINUED

-Check to be sure that the correct Relay ID# has been entered and no other Relay Module has been assigned the same number.
-Be sure that there is 24 volt power to the Relay Module. (Don't rely only on the power lights. They may illuminate without sufficient power to the board).
-Check for opens, shorts or loose connections of the Data Line.
-Check at the computer for reversed "+" or " - " connections on the Data Line.
-Check at the Relay Module terminals for reversed "+" or " - " connections by placing a meters positive probe on the "+" connector and the negative probe on the "-" connector. Set the meter on 20 MV DC and watch for a positive reading. If a negative reading appears, it means somewhere between the computer and this checkpoint the wires are reversed.

3. To stop the test press any key to return to the Menu. If the test was successful leave the Relay Module turned on and test any additional Relay Modules in the system. Turn off the Relay Modules and turn on HVAC disconnect switches. Then turn the Relay Modules back on.

<5> T600 Communications Test

1. Turn on the HVAC unit disconnect switch of the unit to be tested. This will supply power to the T600. Turn on the T600 power switch marked SW1. One green light should turn on. If the light does not turn on, the T600 may not be properly connected to the data lines. Check for opens, grounds, shorts or reversed "+" or "-" data connections. If the light does turn on properly, then press "5" on the keyboard and press "ENTER." This will start the test. You will be asked to enter the T600 ID#. Enter the number and press "ENTER." The computer will display information received form the T600 such as the discharge air temperature.
2. If "Test Failed" is displayed, the computer cannot contact the T600. Something is wrong in the data line or power connections.

<6> Bypass Damper Setup:

1. Use this procedure to setup the Bypass Damper for each zoned HVAC unit. The Initialization program must be complete before using this procedure. Press "6" and "ENTER."
2. Enter the ID# of the Relay Module for the HVAC unit Bypass Damper to be setup. The procedure will start immediately and will automatically select only those zones which are tied to the selected HVAC unit. When these zones reach full open, a message will appear on the screen stating that all dampers are full open and the fan on the HVAC unit has been turned on. Proceed with Bypass Damper set-up instructions at the Bypass Damper to properly setup the Bypass. When set-up is complete, press any key to return to the Menu. Select "5" again to setup the next HVAC unit's Bypass Damper.

<ESC> EXIT the Program: Press "ESC" to exit to the Shell Program.

If all setup was successful, select "Return to building computer control" by pressing "3" on the Main Menu. This will start the operating program. If initialization has been done properly, the operating program will begin to control the system. Check the Relay Module T600s and their HVAC unit to be sure that this system is operating properly. The computer will beep and display "fault" for any Relay Modules or T600s that are not yet turned on or not communicating. Before the first poll, the computer will not display the actual status of any piece of equipment. The computer must contact them first by polling. (Polling is the process the computer uses to communicate with each piece of equipment and occurs once a minute.)

As the zoned HVAC unit run and the zones begin to satisfy, the dampers will modulate to maintain room temperature. Current status on each system (COOL-1, HEAT-2 ,ETC.) will be displayed after each poll.

OPERATING PROGRAM:

1. The *OMEGA PLUS* system uses a hard drive to hold all of the system programs. A backup floppy is provided and should be stored in a safe place after all set up information has been transferred to it.

2. Turn on the power to the computer and monitor. After the computer takes a few seconds to check its memory, the Operation program will automatically start.

3. These messages will appear on the monitor screen:

```
"OMEGA PLUS CPU Software Vers._
 Initializing serial port...
 Reading configuration files, please wait..."
```

4. Within a few seconds this message should appear:

```
"Files successfully found..."
```

5. If the files are not found, the program will issue a warning. If it does, these files have not yet been initialized. See Initialization instructions.

6. If the files are successfully found, the program will begin to operate. The proper time and date should appear on the first line of the screen. If the date and time are not correct, see Date and Time instructions on next page. Before the first poll, the next few lines will display default information about each HVAC system. If any HVAC unit identification number is missing, check the Initialization program under Relay Module Configuration to see if it appears there. If it does not add a schedule for the unit in the time and temperature schedules.

7. Once a minute the word "Polling" will appear at the bottom of the screen. During this time the Control Center takes control and the keyboard is inactive. The polling operation is repeated for each HVAC unit once a minute for buildings with 1-14 HVAC units and once every two minutes for buildings with 15-28 HVAC units. For any building with more than 28 HVAC units, the polling process will be customized for that application.

8. During the polling operation the dampers are given their instructions. They are told desired zone temperature, minimum/ maximum damper position in percent open and requested temperature offset from the programmed setpoints, if any.

9. After the first poll, the computer will make all of the decisions for cooling/heating/fan and send instructions to all Relay Modules T600s and *OMEGA* zone stats.

OPTIONS:

There are operating options that may be controlled from the computer keyboard.
They are: HELP, MONITOR, CHANGE , VIEW and DAMPER PARAMETERS.

10. Pressing the "ENTER" key (except when polling) will bring up the following message:

```
<H>Help     Definitions and Trouble Shooting?
<M>onitor   Enable or Disable the monitoring of a given zone?
<C>hange    the current Setpoints (Heat/Cool), Mode or Fan settings
            or the HVAC system temporarily or permanently?
View...<T>600s, <S>ystems, <Z>ones, <G>roups of System zones.
<D> to adjust damper parameters.
<B> to disable or enable warning bell.
```

OPERATING PROGRAM CONTINUED

11. If <M> (monitor) is entered, you will be asked for the HVAC unit ID# of the zone to be monitored. Then you will be asked to enter the zone ID#. Be sure to press the "ENTER" key after each selection. When this information has been entered, the screen will return to the status display mode. After 5 seconds, a small rectangle will show up in the lower right quadrant of the screen. It will display the zone temperature, damper position in percent open and if an override has been requested by that zone.

12. If <C> (change) is entered, you will be asked for the HVAC unit ID# of the HVAC unit to be changed. You will then be asked to enter the temperatures to be maintained. A temperature range between 55-85 degrees is what the computer will accept. No tenths of a degree are allowed. The computer will then ask for the operating mode <A>uto <C>ool or <H>eat. Enter the desired mode, "A", "C" or "H." Next, enter if the fan is to be continuous or intermittent.

    The changes you have entered can be <T>emporary or <P>ermanent. The computer will want to know how long a temporary change is desired (in hours). Temporary changes are used to override the Time and Temperature program the user has previously entered in the Initialization Schedule for setup or setback. If a permanent change is requested, you will be asked if the permanent change is desired for each day of the week? (Sun, Mon, Tues etc.) The permanent change will be recorded into the Initialization program as a permanent change.

13. To VIEW <T>(600s), <S>(Systems), <Z>(Zones), <G>(Group of systems zones).
    If <T> or <S> is entered, the monitor will display the following for each HVAC unit: System heating and cooling setpoints, requested operation mode, current operating mode, fan status, time clock bypass information, discharge air temperature, room temperature, lock out status and faulting communication warning.

    If <Z> is entered, the monitor will display the following for each zone: Identification number, faulting communication warning, alpha-numeric location, zone temperature, individual offset from system setpoint, damper in percent open and minimum and maximum damper position limits.

    If <G> is entered, the following information will be displayed for one HVAC unit and it's zones:
    System heating and cooling setpoints, requested operation mode, current operating mode, fan status, time clock bypass information, discharge air temperature, room temperature, lock out status and faulting communication warning.
    Zone Identification number, faulting communication warning, alpha-numeric location for each zone, individual zone setpoints, zone temperature, damper position in percent open and time clock bypass request indicator.

14. If the computer is turned off and restarted or the operating program is interrupted, all temporary changes that were made using the above options will be lost. The computer will return to the initialized temperatures and mode scheduled in the Initialization program. Any permanent changes that were made will have been saved to the hard drive.

INSTRUCTIONS TO RESET TIME CLOCK:

Press the "Ctrl" and "Q" keys simultaneously this will stop the operating program. Menu 1 will appear select number 4 "More Options, Menu 2" and press "ENTER." Select number 5 "Set System Time Clock" and press "ENTER." Then simply follow the instructions on the screen. After setting the time you will return to Menu 2. Press the "ESC key to move back to Menu 1 and restart the operating program by choosing number 3. "Building Computer Control" Check at the top of the screen for the correct time.

CALL OUT COMMUNICATIONS SOFTWARE

Part #OCOS

HARDWARE INSTALLATION AT THE *OMEGA PLUS* COMPUTER:

Use the supplied 4 pin connector cable to plug into the phone jack on the wall. Locate the internal modem on the back of the computer. It is in the fourth slot from the right when looking at the back of the computer. There are two phone jacks, plug the other end of the cable into the jack marked **"to line."** Do not use the jack marked "to phone." You should not have to make any modifications to the on site communications software.

REMOTE HARDWARE REQUIREMENTS:

An IBM PC or AT compatible computer with an internal or external modem. Com channel is software selectable.

SOFTWARE INSTALLATION:

The software is provided on a 1.44 meg 3.5" diskette. It can be used on any IBM PC or AT compatible system. Please make a working copy of the disk using the copy function listed on the menu. Store the original diskette as a master. Warning: The copy function is a "diskcopy" program and will reformat the diskette being copied to. Any files on the diskette will be destroyed. A new diskette should be used for this purpose. Warning: Do not use this copy function to copy the diskette to a hard drive. To copy the files to a hard drive or to a pre-formatted diskette, use the Dos command "copy *.* " function.

TO START THE PROGRAM:

Type "menu" and press "Enter" or place the diskette in the A: drive of the computer and turn the computer on. The program will boot up to a menu.

Press 1 then "Enter" to place a call.

Press 2 then "Enter" to make a copy of this diskette. (Diskcopy)

Press 1 then press "Enter." The call out program will load into the computer. A screen will appear which is the phone book. Press the "Alt" key and the "N" key to enter a new number into the phone book. The set up information for each phone number must be entered as it is listed below before a call can be made. Use the arrow keys to move up and down on the screen to answer these questions. Use the left and right arrows to increment the parameter you are setting. For example, for "Speed," if you press the right arrow key the baud rate will advance from 300 to 1200.

Name:	**Use a short name here no more than 8 letters**
Description:	Optional
Phone number:	**1-555-555-1234** (enter 1 and area code only for long distance)
Speed (baud rate):	use right arrow key to set to **1200**
User ID:	Enter in **MANAGER**
Password:	Enter in **OMEGA**
Error correction:	use right arrow key to set to **"on"**
Automatic logon:	use right arrow key to set to **"on"**
Keyboard emulation:	use right arrow key to set to **"standard"**

Press the "Ctrl" key and the "Enter" key to accept the entries.

CALL OUT
COMMUNICATIONS SOFTWARE CONTINUED

TO PLACE A CALL:

The name and phone number that were entered in the set up list should now be displayed on the phone book screen. Use the up and down arrow keys to move the highlighted bar to the number you want to call. Once there, press the "Enter" key. The software will now call out. The screen should change and the phone number should appear. When contact is made with the on-site modem, "Log in attempt #1" should appear on the screen. At this point the screen should change to the operating screen of the on-site computer. Now you have full control of the on-site computer by pressing any key on your keyboard. Caution: Press keys in slow succession. Remember you are sending key commands over a phone line which takes time. The screen will also be affected by the phone line and will react slowly.

You may exit the on-site operating program by pressing the "Ctrl" and "Q" keys. This will allow you to use the "Check, Test and Start" program to check damper movement or use the "Initialization" program to change existing zone set up or make a schedule change. You can also change the time. The only things you can not do are use any printer options or reboot the on-site computer.

TO STOP COMMUNICATION:

The proper way to hang up is to bring up the on-line menu. To do this, press the "Ctrl" and "ESC" keys simultaneously. A menu will pop up. Using the down arrow key, move the highlighted bar to the last selection, "Hang up." Once there, press the "Enter" key. The modem will now disconnect and the Phone Book screen will appear. It is important to "Hang up" properly so that the on-site computer does not lock up. To exit the call out software, press the "Alt" and "Q" keys simultaneously only when the Phone Book is displayed. The "Alt" and "Q" keys will not work while you are on line to another computer.

TROUBLE SHOOTING:

If the software tries to dial out and there is no dial tone.

Make sure that your modem is set to "Com 1."

Make sure the phone jack is in the "To Line" socket not the "To Phone" socket.

Exit the program and turn off the computer; it is possible the modem needs to be reset.

If the on-site modem picks up and the software does not respond.

Most likely the modem at the on-site computer needs to be reset or all of the program needed for communications are not properly loaded. Someone at the on-site computer needs to reboot it by turning off the power. The modem will reset and the proper programs will be automatically put into memory.

If the on-site software responds with a box asking for a "User ID" and "Pass word".

The User ID and or Pass word are different than the ones you have entered in the phone book. The on-site software is now giving you a chance to enter in the proper ones. If you know them, type them in carefully so you do not make a mistake. If it still does not let you in, then it is necessary for someone to check the software at the on-site computer.

If the computer seems to lock up.

Most likely only the call out computer is locked up, but you should check by turning off the power to your computer and then rebooting the software. Then call back the on-site computer to make sure it is still operating. If it does not respond to your call, it is locked up too and needs to be rebooted by turning the power off.

FAX OPTION

Adding fax capability to the *OMEGA PLUS* system allows the Control Center to send fax notification of system problems such as dirty filters (when a sensor is installed in the unit), zone temperature deviation from set points and faulting Relay Modules or Zone Thermostats. Up to two fax machines may be notified. A dedicated telephone line is required for this option. Remote communication may also be included into the fax package. This would allow a service technician to contact the building using an off site computer. He would then be able to monitor or modify any system variables. Fax notification will occur under these conditions:

1. Fax notification will occur if a zone thermostat or units relay module fails to communicate with the Control Center for a five minute period. "FAULT" is displayed on the screen when a part does not communicate. If the problem is not resolved, the fax notification will continue every day at 5:00 AM.

2. Fax notification will occur if any zone thermostat temperature deviates more than five degrees above the zones individual cooling set point or five degrees below zones individual heating set point. A one hour grace period after a scheduled change in set points will allow the system the time needed to bring zone temperatures into an acceptable range before fax notification can begin. If after the one hour period zone temperatures are not in an acceptable range or any time after the one hour grace period should the temperatures move out of range, fax notification will begin. Any zone not within an acceptable range will be listed as shown below:

   Tues Nov 12, 1995 10:22 AM
   PROBLEM WITH BUILDING:
   WEST COAST CENTER
   2733 Oak Park Dr. Los Angeles, CA 90027
   PLEASE CONTACT THE BUILDING BY MODEM OR SEND SERVICE PERSONNEL.

   Zone 3 " FRONT LOBBY" is not within specified limits.
   Current temperature at the stat is 78.4
   Damper position is 100%
   Zone 3, System 2, Current heat set point is 69. Cool set point 72.
   Requested operating mode is "Cool 2"
   Unit discharge temperature is 60 degrees.

3. Fax notification will occur when any units filter does not allow enough air to flow to satisfy an optional dirty filter switch mounted in the unit. If after a five minute period the problem has not been corrected a fax will be sent specifying the unit with the problem. If the problem is not resolved, the fax notification will continue every day at 5:00 AM.

HARDWARE SET UP

Connect the internal fax modem to the dedicated telephone line with the phone cable provided. The connector should be plugged into the jack marked "To Line." Do not use the jack marked "To Phone." If there is a switch on the modem by the phone jacks confirm that it is on setting #2.

FAX PROGRAM SET UP

Quit the operating program by pressing the "Ctrl" and "Q" keys together. This will place you in "MENU 1" of the Shell program. While in the Shell program, select #4 for more options. When the "MENU 2" appears, select #8 "Fax Set up Program." Follow the instructions in the program to set up the fax software. You may leave the set up program with the fax capability enabled or disabled. If you leave it enabled the program will fax if any of the above conditions are met. It is advisable to leave the fax disabled until all start up problems are taken care of.

Once finished, return to the operating program by selecting #3 on "MENU 1". Remember, if any zones or relay modules are "Faulting" or any other conditions listed above are met, the system will fax this information after 5 minutes of operation. (So expect it to happen when you start the system).

While in the operating program you may disable or enable the fax capability by pressing the "ENTER" key then pressing the "Ctrl" key and the "F" key together.

BILLING PROGRAM

Part #OBSW

The Billing program is designed to set up, review and bill accounts in association with *OMEGA PLUS* software. A data base is created by the *OMEGA PLUS* system recording a series of overtime requests. The Billing program can be run on any IBM compatible computer. To operate the program the data base called OT.OMN must be retrieved from the *OMEGA PLUS* Control Center at the job site. The OT.OMN data base may be retrieved at the building or by remote communication over a phone line if communications software and a modem are available.

To retrieve the OT.OMN data base at the building interrupt the building operations by pressing the "CTRL" key and the "Q" key together. Once in the Shell program press the ESC key and press 1 then"ENTER." Place a 3.5" 1.44 meg. disk with a copy of the Billing software into the "A" drive. At the C prompt type copy OT.OMN A: Then press the return key. The message 1 file(s) copied should appear on the screen. If it does not you have not copied the file. Try again. When the file is copied return the building to Computer control by typing in menu theN press #3.

To start the Billing program type in the word " Billing" and press "ENTER." The program should now begin to run and display a menu.

INITIALIZE TENANT FILE: Once the operating menu is displayed, a tenant file must be created. To do this, select the "1" key. It is not necessary to press "ENTER" after this selection. On the next screen, you will be given a warning, that if you select "Yes" at this point of the program, you will erase the file we need to create. This first time, it is OK to select "Y" but not in the future unless you wish to erase all the tenants in the existing file and create a new file. If you need to add, delete, or modify this file in the future, use those options which appear on the main menu. To proceed press the "Y" key. Now, answer the questions the computer ask:.

Give the tenant name.
How to bill: By the "H" Hour or "M" minute.
The charge per hour or minute.
The number of zones this tenant will be billed for.
The identification or address number of the tenant's zones.

The computer will prompt you on each of these questions. It will display "(1)" for the first zone to be assigned to this tenant. Answer with the first zone number the tenant is assigned. The computer will continue prompting you until it satisfies the number of zones this tenant will be billed for.

Once this series of questions is answered, the computer will ask you if you want to "ADD ANOTHER" tenant. If your answer is "yes", the above question will be repeated for another tenant. If you answer "no", the program will return to the Billing menu.

IF YOU MAKE A MISTAKE ON AN ENTRY AS THESE QUESTIONS ARE ASKED, YOU MUST CONTINUE ON. YOU CANNOT GO BACK . TO CORRECT THE WRONG ANSWER, USE THE "MODIFY" FUNCTION ON THE BILLING MENU.

The "ADD TENANT" "DELETE TENANT", and "MODIFY" functions all work the same way as the "INITIALIZE TENANT FILE." Just answer the questions to ADD, DELETE or MODIFY any tenant information.

"VIEW TENANT" allows you to view all information about tenants in the file.

"BILLING MENU" allows you to review the "STATUS REPORT" and to initiate the "BILLING" procedure.

The "STATUS REPORT" displays the actual file of overtime requests, the date, time on and off, and zone location that requested the overtime use.

The "BILLING" option allows you to create bills. Once you have chosen item "6" on the main menu, a new menu will appear with three selections, "STATUS REPORT", "BILLING" and "EXIT TO MAIN MENU." Once you have made a choice, enter the number and "ENTER." The "STATUS REPORT" will do just that: List the information in the OT.OMN file. Once you have reviewed it, press "ENTER" to return to the menu.

Choose "BILLING" and you will get another menu which will allow you to create bills and either view them on the screen, ("ON SCREEN DISPLAY"), have them printed out, ("TO LINE PRINTER") or "EXIT TO BILL MENU."

	DAMPER QTY.	SIZE	TYPE	TAG
PROJECT_____	_____	_____	5.0	_____
LOCATION_____	_____	_____	5.0	_____
MECH ENG_____	_____	_____	5.0	_____
CONTRACTOR_____	_____	_____	5.0	_____
CONTROLS *OMEGA PLUS*	_____	_____	5.0	_____
	_____	_____	5.0	_____
Number of *OMEGA* zone thermostats _____	_____	_____	5.0	_____

***OMEGA PLUS* CONTROL CENTER:** The *OMEGA PLUS* Control Center is the system decision maker. The Control Center can simultaneously control 99 HVAC units and 99 zone dampers in any combination. Additional data lines may be ordered to increase capacity to 198. The Control Center polls groups of HVAC units and their zones at different intervals depending on the number of HVAC units the Control Center needs to communicate with. Zone temperatures and damper positions are collected and then analyzed. Compressors and heaters are turned on and off based on this information. **MODEM:** The modem is a separate item internal to the *OMEGA PLUS* computer. When it is added, it will allow remote modification or monitoring of all package units and zones in the system.

SOFTWARE: *OMEGA PLUS* is a software-controlled system. *OMEGA PLUS* software stores zone ID numbers, min/max damper position, temperature offsets, daily on/off times, weekend/holiday schedules and special events. The software is field configured to match the air conditioning system of any building. Tenant changes and additions are easily entered into the program with a few keystrokes. This air conditioning control system can be quickly reprogrammed to meet changes in the building's control strategy.

CLOCK/CALENDAR: The Control Center has a built in 365 day, 24 hour, 10 year battery-backed, clock/calendar. The clock can be set for as many daily or weekly operations as desired.

DATA LINES: A simple twisted pair of wires is daisy chained from the Control Center to each zone stat. The twisted pair should be equal to Belden 8740 solid, PVC coated, standard plenum-rated wire.

RELAY MODULE: An *OMEGA PLUS* relay module replaces the thermostat of each conventional HVAC unit. The type of Relay Module type must be specified. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate Heat Pumps that energize the reversing valve in the heat mode.

DISCHARGE AIR TEMPERATURE CAPACITY CONTROLLER: A Relay Module Sensor (RMS) will be installed in the discharge air duct to monitor the cooling or heating capacity of the HVAC unit as building load increases or decreases. When using a strip heater, the RMS should be installed downstream of the inside coil and upstream of the strip heater. Overheat and/or low air protection for the strip heater shall be recommended by the strip heater manufacturer.

T600 NO ZONE APPLICATION: The *OMEGA PLUS* system can control any combination of Gas/Electric units, Heat Pumps, Split Systems and Air Handling units with or without zones. With *OMEGA PLUS* a unit without zones is called a "NO ZONE" system and is controlled by an T600 thermostat. The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.
The T600 stat has a momentary contact switch that allows the occupant to "override" a scheduled night or weekend setback. Local setpoints may be changed, within software modifiable ranges, by pressing the up or down buttons on the front cover.

***OMEGA T577* ZONE STAT:** *OMEGA* zone stat contains all of the serviceable electronic parts needed to control a zone. The stat contains a readout which displays zone temperature in either Fahrenheit or Centigrade. The location of all electronic parts under the stat cover makes servicing the *OMEGA* damper an extremely simple operation. There is no programming needed to start up a zone stat. The zone stat gives the occupant the capability of varying the zone setpoint plus or minus 3 degrees from the system's setpoint by pressing the up or down buttons located on the front cover. This feature can be removed, if necessary. The zone stat also has a momentary contact switch that allows the occupant to "override" a scheduled night or weekend setback. Automatic changeover information and maximum and minimum setpoints for the damper are supplied by the Control Center.

***OMEGA* 5.0 ROUND DAMPERS:** Each unit is made up of 20 to 22 gauge galvanized steel duct, an elliptical damper and two run-stall motors. The damper travels through 45 degrees between the full open and full closed positions in two minutes. The limited travel, elliptical shape and modulation capability give the damper the ability to closely track the zone airflow requirements. The rest of the electronics for the zone are located on the zone stat. This simplifies installation and service calls.

***OMEGA* 5.0 RECTANGULAR DAMPERS:** Each unit is made of 20 gauge "snap-lock" steel frame with S & Drive duct connections. A 16 gauge formed steel blade closes on a 45 degree angle, in an opposed fashion, for improved control. Formed steel blade stops incorporate a gasket for quiet operation and improved structural rigidity. The damper is an opposed blade design. A drive open/drive closed motor controls the damper position. Sizes range from 8 X 8 to 48 x 48.

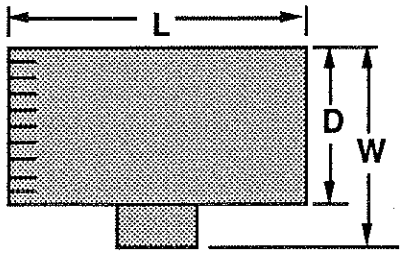
TYPICAL DAMPER & DUCT SIZES*

Duct Diameter	Nominal CFM	Duct Velocity FPM	Damper ΔP " WC
6"	110	540	.014
8"	250	700	.015
10"	410	750	.015
12"	660	850	.022
14"	1000	925	.035
16"	1450	1070	.036
18"	2000	1100	.036

* These air quantities were derived from a duct sizing chart .1" friction loss per 100' of duct. All CFMs listed above are approximate. For accurate selection use duct sizing table or device.

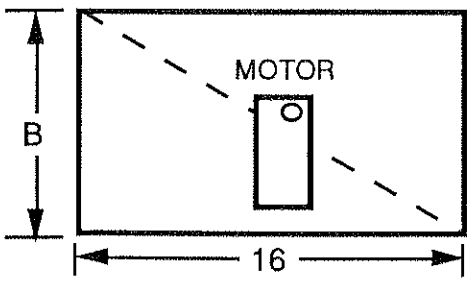
ROUND DIMENSIONAL DATA

PART #	SIZE	D	L	W
OM06	6	6"	10"	9"
OM08	8	8"	10"	11"
OM10	10	10"	12"	13"
OM12	12	12"	14"	15"
OM14	14	14"	16"	17"
OM16	16	16"	18"	18 1/2"
OM18	18	18"	20"	20 1/2"

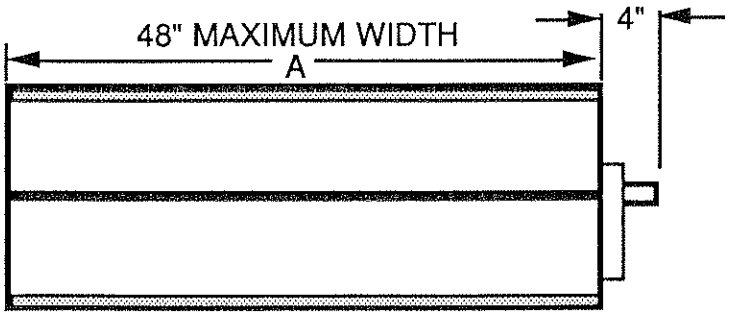


RECTANGULAR DAMPER

SELECT FROM 8 X 8 THRU 48 X 48



WIDTH	HEIGHT	DEPTH
A	B	16



Rectangular dampers should not operate above 1500 FPM

Part Number OMCD W X H

BYPASS DAMPER with Velocity Sensor: The Bypass Damper allows excess air to flow from the supply to the return side of th HVAC unit. It is controlled by a velocity sensor or static pressure controller which maintains a constant CFM through the unit as zone in the system throttle down.

ROUND BYPASS DAMPERS: Each unit is made up of 20-22 gauge galvanized steel. The damper is made in the form of an ellips edged with a foam gasket and only travels through 45 degrees from the full open to full closed position. This limited travel and speci shape give the damper the ability to closely control the amount of air bypassed from the supply to the return side of the HVAC un Each unit includes a run open and a run closed 24V damper motor, solid state Bypass Controller and is operated by a field supplie velocity sensor, or static pressure controller.

RECTANGULAR BYPASS DAMPERS: The rectangular damper is made from 16 gauge roll formed extra rigid steel blade Approximately 6" on center with 1/2" overlap. Each unit includes a 24V damper motor, solid state Bypass Controller and is operated b a field supplied velocity sensor, or static pressure controller. Rectangular sizes range from 8 X 8 to 48 X 48.

Velocity Sensor — Part #OMVS
Static Pressure Sensor — Part #101ASPC

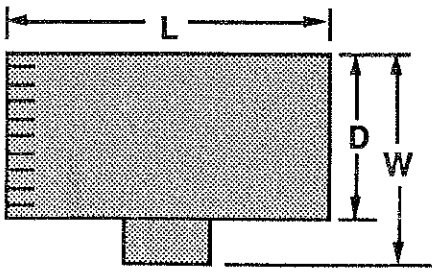
ROUND BYPASS CAPACITIES

PRESSURE DROP ▶	.07"	.1"	RECOMMENDED .2"
VELOCITY FPM ▶	1500 FPM*	1800 FPM*	2500 FPM*
DIA. ▼	CFM	CFM	CFM
6"	250	315	437
8"	470	567	787
10"	820	990	1375
12"	1060	1260	1750
14"	1590	1890	2675
16"	1850	2250	3125

* FPM = Feet Per Minute

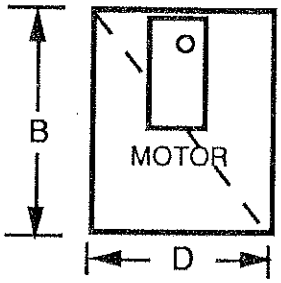
ROUND DIMENSIONAL DATA

PART #	SIZE	D	L	W
OBP06	6	6"	18"	9"
OPB08	8	8"	18"	11"
OBP10	10	10"	18"	13"
OBP12	12	12"	24"	15"
OBP14	14	14"	24"	17"
OBP16	16	16"	24"	18 1/2"

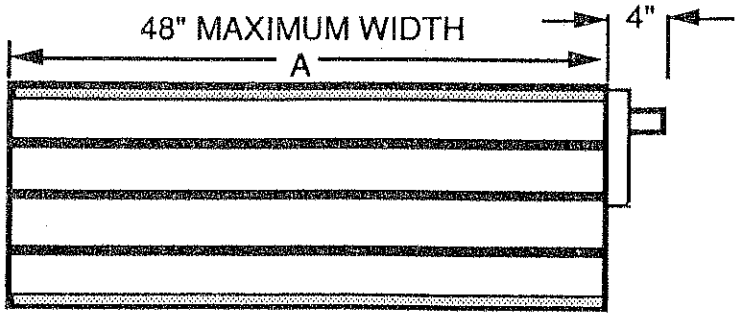


RECTANGULAR BYPASS DAMPERS

SELECT FROM 8 X 8 THRU 48 X 48



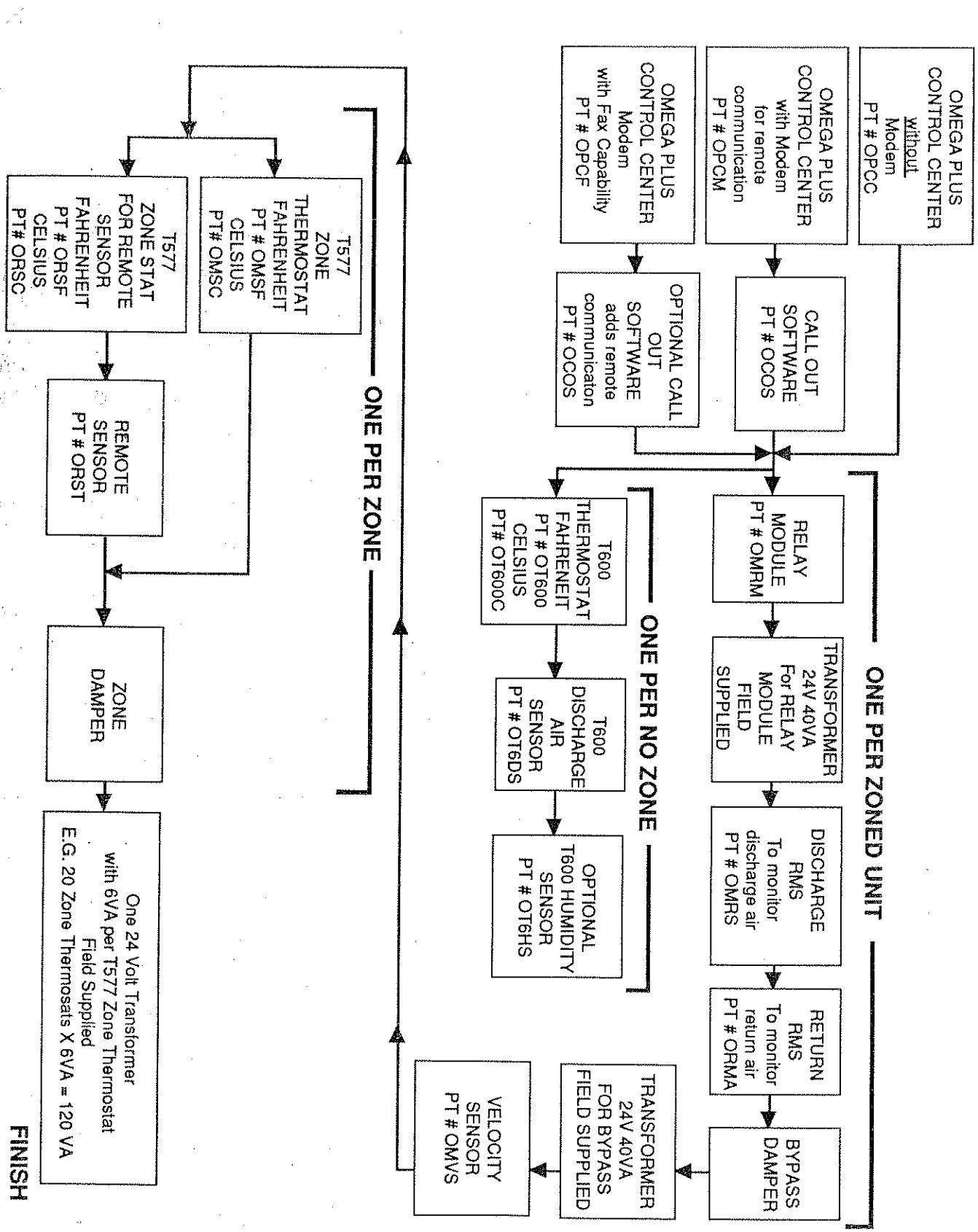
WIDTH	HEIGHT	DEPTH
A	B	16

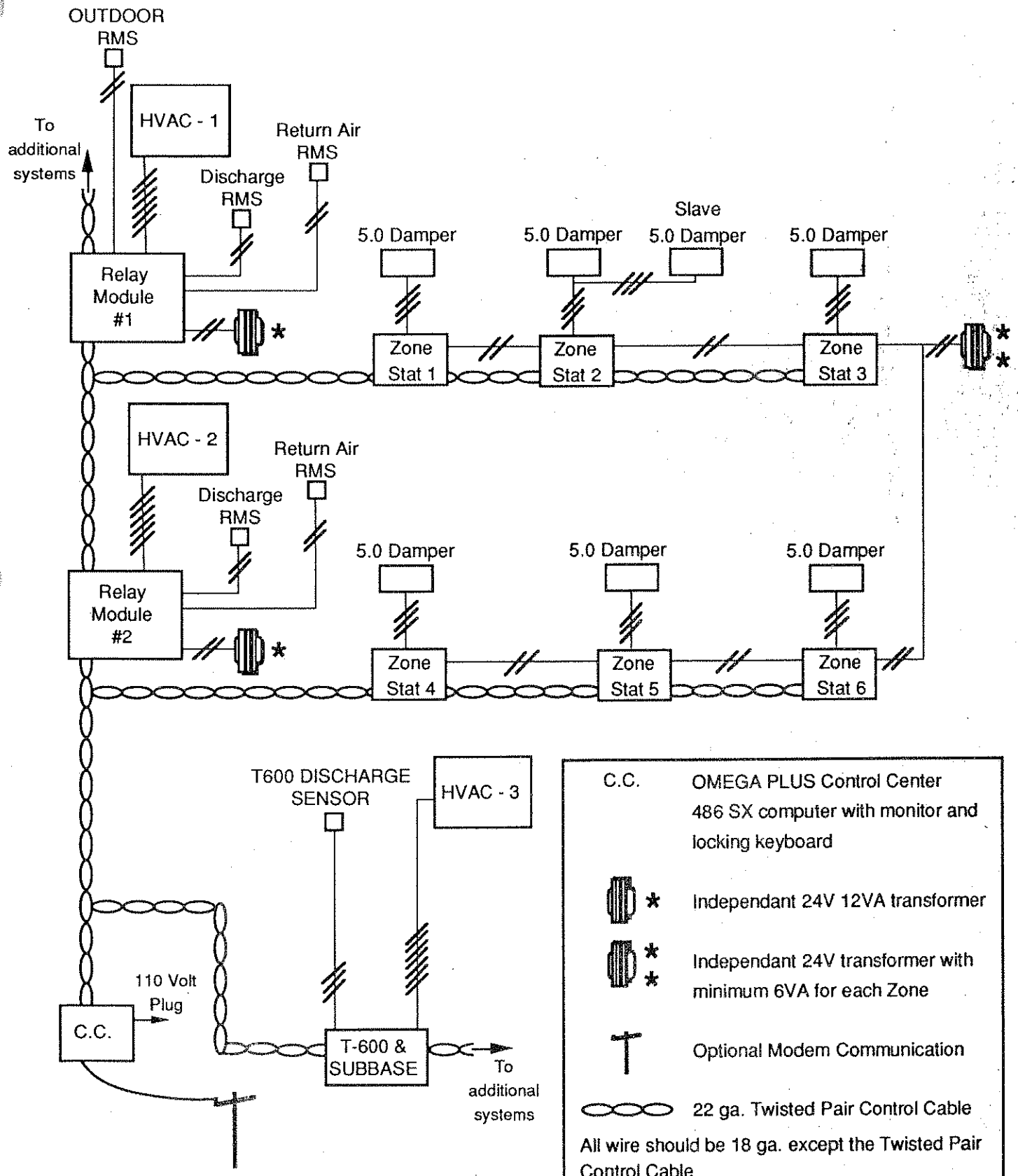


Rectangular bypass dampers should operate at 1500 FPM.
E.G. A 24" x 12" damper = 2 square feet.
2 square feet X 1500FPM = 3000 CFM.

Part Number OBP W X H

PARTS SELECTION FLOW CHART





C.C. OMEGA PLUS Control Center 486 SX computer with monitor and locking keyboard

* Independant 24V 12VA transformer

* * Independant 24V transformer with minimum 6VA for each Zone

Optional Modem Communication

22 ga. Twisted Pair Control Cable

All wire should be 18 ga. except the Twisted Pair Control Cable

PART 1 GENERAL

1.01 DESCRIPTION

A. The work specified under this section includes furnishing, installing and placing into operation Direct Digital Control (DDC) temperature controls for the mechanical systems.

B. Furnish and install a variable air volume/zone control system(s) allowing a single zone heating/cooling unit to be controlled from more than one thermostat.

C. All items of equipment, materials, and labor necessary and/or incidental to the hereinafter specified sequence of operations shall be provided with the control system. Items such as auxiliary controls, interlocks, relays, or other sequencing devices shall be fully coordinated with the heating and cooling equipment approved for the installation.

D. All control wiring required for this installation shall be included and shall be tagged. Complete submittal data, wiring diagrams and sequences shall be furnished and approved before installation is begun.

E. The DDC electronic controls shall perform the functions of coordinating a variable volume/variable temperature system operation. System to include zone thermostats, relay modules, computer system controller, zone dampers, bypass damper(s), bypass controller, etc.

F. The relay modules and zone thermostats shall interface via a twisted pair communication Data Line to the Control Center. The Control Center shall communicate with each relay module and zone thermostat using the polling operation. The polling operation is repeated for each heating/cooling unit relay module and it's zone thermostats once a minute for buildings with 1-14 heating/cooling units and once every two minutes for buildings with 15-28 heating/cooling units. For any building with more than 28 heating/cooling units, the polling process will be customized for that application. The Control Center shall use the information gathered to control the operation of the heating/cooling units.

G. Other sections of these specifications apply to this section. Refer to all other sections for a complete description of the work.

1.02 QUALITY CONTROL

A. The control system shall be manufactured by California Economizer or approved equal. Pre-approval is required for control systems not listed above.

B. The control system shall be installed and tested by the installing mechanical contractor or trained personnel designated by the contractor. The contractor shall certify to the architect that the control systems are performing in accordance with the requirements of the project as outlined in the construction drawings and project specifications.

1.03 SUBMITTALS

A. Contractor shall submit complete wiring diagrams as well as a detailed control sequence explaining the operation of each piece of equipment for the temperature control system. These submittals shall be in compliance with the specifications or shop drawings and shall be forwarded to the Architect.

PART 2 PRODUCTS: SHALL INCLUDE THE FOLLOWING BUT NOT LIMITED TO:

2.01 COMPUTER CONTROL CENTER

A. The Computer Control Center will control up to 99 HVAC units and up to 99 zone dampers. The Control Center shall contain 4 com lines which may be allocated for data line, modem use or fax capability.

B. The Computer Control Center will consist of an IBM 486 compatible computer which shall contain a minimum of 1 meg of memory a hard drive and one 1.44 meg 3.5" floppy disk drives. The Control Center shall contain a monitor (color is optional) and a key board to access software and program information about the system. All program, operating and monitoring information will read out in English. A "HELP" program will provide information about the system programming and operation.

C. The Computer Control Center shall contain a program which will poll each heating/cooling unit relay module and it's zone thermostats or T600 thermostats once a minute for buildings with 1-14 heating/cooling units and once every two minutes for buildings with 15-28 heating/cooling units. For any building with more than 28 heating/cooling units, the polling process will be customized for that application. Compressors and heaters will be turned on and off based upon this information. The relay module and one zone thermostat shall have the capability to control a Single Zone system. A zone damper or bypass damper will not be required for the Single Zone application.

D. The Computer Control Center shall have the ability to be upgraded to fax capability which will allow the Control Center to send fax notification of system problems such as dirty filters and zone temperature deviation from set points to up two fax machines. A dedicated telephone line is required for this option.

E. The Computer Control Center will be supplied with a 365 day clock/calender and will display time in hours, minutes and AM or PM. (A twenty four hour clock is available in Canada.) It will be capable of multiple on and off times which may be scheduled for each day or with a common 5-day week, 2-day weekend schedule and must allow scheduling setups or setbacks at any time during the hour. Each schedule shall be capable of individual heat and cool setpoints and operation times with optimum start capability.

F. The Computer Control Center shall be capable of providing and displaying in English without the use of codes the following for each zone damper: Individual zone maximum and minimum damper position by programming the percent open, monitoring capability of the zone damper position in percent open, current zone temperature, individual zone heating/cooling setpoints, offset request of no more than a six degree range and a 20 character alpha numeric zone location. After-hours override request will be recognized by monitoring a momentary contact switch on any zone thermostat. This request shall be displayed at the Control Center during the override period. The override shall be limited to a preset time period of up to two hours and can be canceled from the requesting zone at any time. The zone which requested the override and length of time the override occurred shall be recorded and available for retrieval for one year.

G. The Computer Control Center shall be capable of providing and displaying in English without the use of codes the following for a no zone system controlled by a T600 thermostat: current zone temperature, individual zone heating/cooling setpoints. After-hours override request will be recognized by monitoring a momentary contact switch located at the T600 thermostat. This request shall be displayed at the Control Center during the override period. The override shall be limited to a preset time period of up to two hours and can be canceled from the requesting T600 at any time. The T600 system which requested the override and length of time the override occurred shall be recorded and available for retrieval for one year.

H. The Computer Control Center shall be provided with 110 volt AC power. A surge protector must be used.

I. The Computer Control Center shall operate any combination of gas/electric, heat pump or split systems. It shall be capable of controlling 2 stages of cooling, 2 stages of heating and the fan for each system.

2.02 RELAY MODULE

A. Each zoned heating and cooling unit shall be provided with a relay module to communicate with the Computer Control Center. The type of Relay Module must be specified for a Heat Pump. The three types available are RM1-Z Gas/Electric, RM1-Z Heat Pump "O" and RM1-Z Heat Pump "B". The Gas/Electric version will operate all, one and two stage, Gas/Electric package and split systems units. The Heat Pump "O" version will operate Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate Heat Pumps that energize the reversing valve in the heat mode.

B. It shall contain 5 relays that will initiate requested stages of heating and cooling from the Computer Control Center. A transceiver shall give the relay module the ability to send information and receive instructions from the Computer Control Center over a two-wire twisted pair. Two rotary switches shall be used to give each relay module its own identity. The relay module shall have the capability of reporting the discharge and return air temperatures of the heating and cooling unit and the outside air temperature taken by remote sensors. The Relay Module shall also have an optional dirty filter sensor. The relay modules shall contain a failsafe program that will allow it to control to default temperatures in the event that the Control Center communication is interrupted for more than 7 minutes. The return air temperature sensor shall be the controlling temperature during this mode.

2.03 T600 NO ZONE THERMOSTATS

A. Each no zone heating and cooling unit shall be provided with a T600 thermostat capable of communicating with the Computer Control Center. The T600 thermostat shall contain all of the serviceable electronic parts needed to control a single HVAC Unit. No relay packs are necessary. The T600 type must be specified. The three types available are T600-G/E Gas/Electric, T600-O Heat Pump "O" and T600-B Heat Pump "B". The Gas/Electric version will operate all, one and two stage Gas/Electric package and split systems units. The Heat Pump "O" version will operate one and two stage Heat Pumps which energize the reversing valve in the cool mode. The Heat Pump "B" version will operate one and two stage Heat Pumps that energize the reversing valve in the heat mode.

B. Power shall be supplied by the HVAC Units transformer.

C. The T600 thermostat shall have an LED temperature readout which can display in either Fahrenheit or Celsius.

D. The stat shall contain one microprocessor to process temperature information from the temperature sensor and control information from the Computer Control Center. The microprocessor shall make heat and cool control decisions based on temperature information received from the Control Center. A transceiver shall give the stat the ability to send information and receive instructions from the Control Center over a two-wire twisted pair. Electronic identity switch shall be used to give each T600 stat its own identity.

E. Two accessible push buttons, on the thermostats cover will allow the selection of a temperature range between 55 to 91 degrees. An offset range to limit thermostat settings can be selected from the Control Center. The offsets may be set in a maximum range from 55 to 91 degrees or a minimum range of zero which would allow no local offset from the system setpoints. Programmed and actual setpoints shall be displayed at the Control Center.

F. A momentary contact switch on the T600 stat will allow the occupant to override a scheduled setback/setup for a preset time period, 2 hours. This can be canceled at any time from the stat which requested the override.

G. The T600 stat shall have remote sensor capability.

H. A T600 discharge sensor shall provide the T600 with discharge temperature information which may be accessed by the Computer Control Center.

2.04 ZONE DAMPERS

A. Each round damper shall consist of 20-22 gauge galvanized steel round duct fitted with an elliptical damper to assure linear air flow, two full stall 24 volt modulating motors which shall not draw more than 12 VA and one drive assembly. No other electronic parts shall be mounted on the zone damper. The pipe shall be crimped on one end and straight on the other for ease of installation.

B. Each Rectangular damper unit is made of 20 gauge "snap-lock" steel frame with S & Drive duct connections. A 16 gauge formed steel blade closes on a 45 degree angle, in an opposed fashion, for improved control. Formed steel blade stops incorporate a gasket for quiet operation and improved structural rigidity. The damper is an opposed blade design. A pair of run stall, drive open/drive closed motors control the damper position.

2.05 ZONE THERMOSTAT

A. The zone thermostat shall contain all of the serviceable electronic parts needed to control a zone damper.

B. All zone thermostats in the system must be capable of operating off of one 24 volt transformer. A minimum of 6VA must be supplied to each thermostat.

C. The zone thermostat shall have an LED temperature readout which can display in either Fahrenheit or Celsius.

D. The stat shall contain one microprocessor to process temperature information from the temperature sensor and control information from the Computer Control Center. The microprocessor shall modulate the damper on a percent setting to deliver the proper amount of air to accommodate individual zone needs. A transceiver shall give the stat the ability to send information and receive instructions from the Control Center over a two-wire twisted pair. Electronic identity switch shall be used to give each stat its own identity.

E. Two push buttons shall be accessible outside the thermostats cover. These buttons shall give the occupant the capability of changing the zone setpoint plus or minus 3 degrees from the system setpoints. The zone occupant will not have the ability to alter their setpoint by more than plus or minus 3 degrees from the system setpoint. This capability of altering the zone setpoint may be overridden so no deviation from system setpoint is allowed. Offset information will be displayed at the Computer Control Center. The offset will not alter the temperature readout on the thermostat LCD or at the Control Center .

F. A momentary contact switch on the stat will allow the occupant to override a scheduled setback/setup for a preset time period, 2 hours. This can be canceled at any time from the stat which requested the override.

G. Automatic changeover information and maximum and minimum damper setting will be supplied by the Computer Control Center.

H. The zone stat shall take more than one minute but not more than two minutes to drive the modulating damper from full open to full closed. This shall prevent the over and under shooting of the required setpoint.

I. Multiple dampers (up to 4) may be slaved from one zone stat.

J. The zone stat shall have the capability to control one stage of a supplemental auxiliary heating device.

K. The zone stat shall have remote sensor capability.

2.06 BYPASS DAMPER(S)

A. A bypass damper(s) shall be installed at each air handling unit to allow excess air to flow from the supply to the return side of the unit.

B. The bypass damper shall be controlled by a velocity or static pressure sensor mounted in the unit or supply duct and shall maintain a constant airflow through the unit regardless of the volume of air being delivered to the building.

2.07 DISCHARGE AIR TEMPERATURE CAPACITY CONTROLLER

A. A Relay Module Sensor (RMS) shall be installed in the discharge air duct to monitor the cooling or heating capacity of the HVAC unit as building load increases or decreases. If the supply air temperature drops below 52 degrees F, the Relay Module shall break the Y2 wire controlling the second stage of cooling. If supply air temperature drops below 48 degrees F, the Relay Module shall break the Y1 wire controlling the first stage of cooling. If the temperature goes above 125 degrees F, (106 degrees for heat pumps) the Relay Module shall break the W2 wire controlling the second stage of heating. If the supply air temperature goes above 130 degrees F, (110 degrees for heat pumps) the Relay Module shall break the W1 wire controlling the first stage of heating. In both cases there shall be a 5 minute delay to prevent short cycling of the compressor or heater.

B. When using a strip heater, the RMS shall be installed downstream of the cooling coil and upstream of the strip heater. Overheat and/or low air protection for the strip heater shall be recommended by the strip heater manufacturer.

2.08 TRANSFORMERS AND WIRING

A. All 24 Volt transformers shall be properly sized to furnish adequate voltage and amperage for the system.

B. A 120 volt AC outlet will be supplied for the Computer Control Center. A surge protector is recommended.

C. Individual transformers must be used for each Relay Module.

D. One 24 volt transformer may be used to power all zone thermostats in the system. A minimum of 6VA must be supplied to each thermostat.

E. The bypass damper will be operated from an independent 24 Volt, 40VA transformer. The bypass transformer will be connected to the load side of the blower motor starter.

F. Transformers and wire shall be sized to provide no less than 24V at each of the components. Adequate VA must be supplied to each component.

G. All wiring should be 18 ga. solid thermostat wire except the two wire twisted pair data lines. The two wire twisted pair must be wired with 22 ga. twisted pair control cable.

H. All transformers and wiring shall be furnished by the installing contractor.

PART 3 EXECUTION

3.01 CONTROL SEQUENCES:

A. Computer Control Center

1. The Control Center shall be capable of performing all functions as detailed in section 2.01 of the specifications. In addition, the Control Center shall be able to accomplish the following:

2. The Computer Control Center shall use a vote system to determine demand for heating or cooling based on the number of zones requesting a particular mode for each heating/cooling unit. If any zone is 1 degree over the individual zone cool set point, it will be considered as a cool call. If any zone is 1 degree below the individual zone heat set point, it will be considered as a heat call. In this way the mode which has the greatest demand will initiate cooling or heating operation. Once the mode has been established, the Control Center will look at all the temperatures which activated the unit operation. Any zone temperature 1 degree above the individual zone setpoint shall initiate first stage operation. Any zone temperature 2 degree above the individual zone setpoint shall initiate second stage operation. Once this decision has been made operation will continue until zone temperatures satisfy. Changeover shall only occur when the Control Center sees more votes for the opposite mode. The changeover shall be controlled by the Control Center which will provide a five minute lock out between heating and cooling operation. The five minute lock out shall also separate sequential heating /cooling calls.

   a. Remote communication - The Control Center shall have the capability with the addition of an on-site internal modem, remotely located PC, and appropriate software, to allow remote modification or monitoring of the Computer Control Center, relay modules and all of the zones in the system. The Control Center shall also have the capability to fax a message to two fax machines in the event of system problems.

B. Relay Module

1. The relay module shall be capable of performing all functions as detailed in section 2.02 and 2.07 of the specifications

C. T600 Thermostat

1. The T600 thermostats shall be capable of performing all functions as detailed in section 2.03 of the specifications.

D. Zone Thermostat

1. The zone thermostats shall be capable of performing all functions as detailed in section 2.05 of the specifications.

E. Bypass Damper Control

1. A bypass, damper as described in section 2.06 of the specifications, shall be controlled by a solid state control center in the bypass damper .

2. The bypass control center shall base its control decision on CFM through the HVAC unit instead of using static pressure as a basis of decision.

3. A solid state velocity sensor, placed as described in section 2.06, shall provide the information to the bypass control center.

4. The bypass damper control center shall modulate the bypass damper to maintain a constant airflow through the HVAC unit.

OMEGA PLUS™

Hot Line (800) 228-2966

Rev. AUGUST 1995

PART # OMPM

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The Zoning Systems Company

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