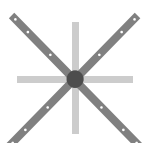
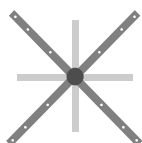
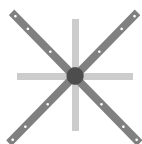
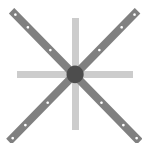
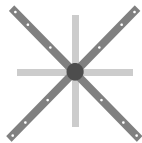
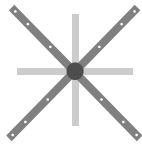
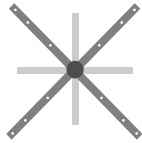
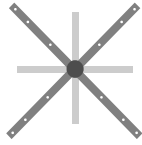


ENVIRO-TEC[®]
ENGINEERING FOR EXCELLENCE



DDC CONTROL SYSTEM

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

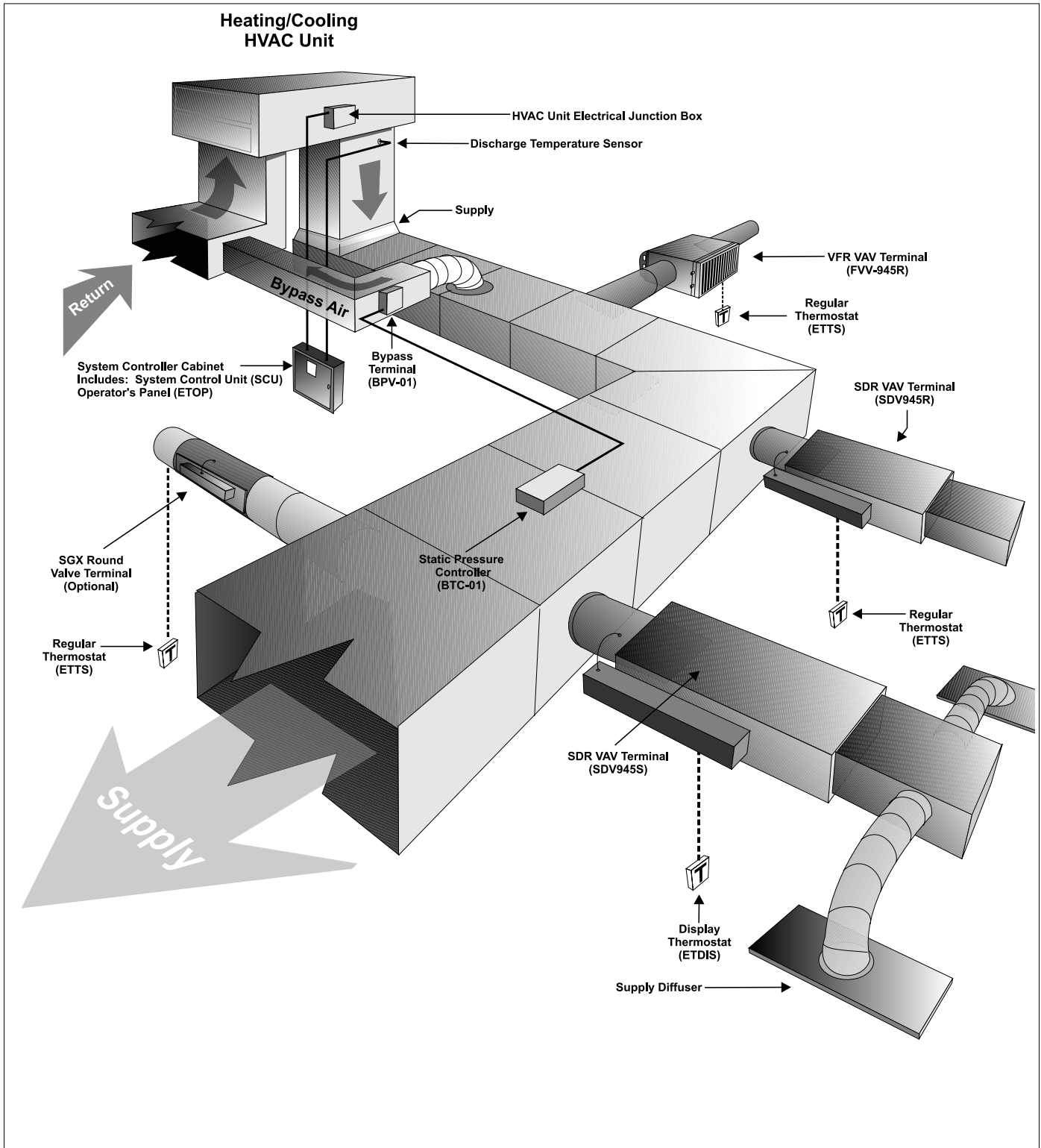
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August, 1997

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Largo, FL

Typical ETVT-II (VVT) System Configuration



Typical Conventional System Configuration

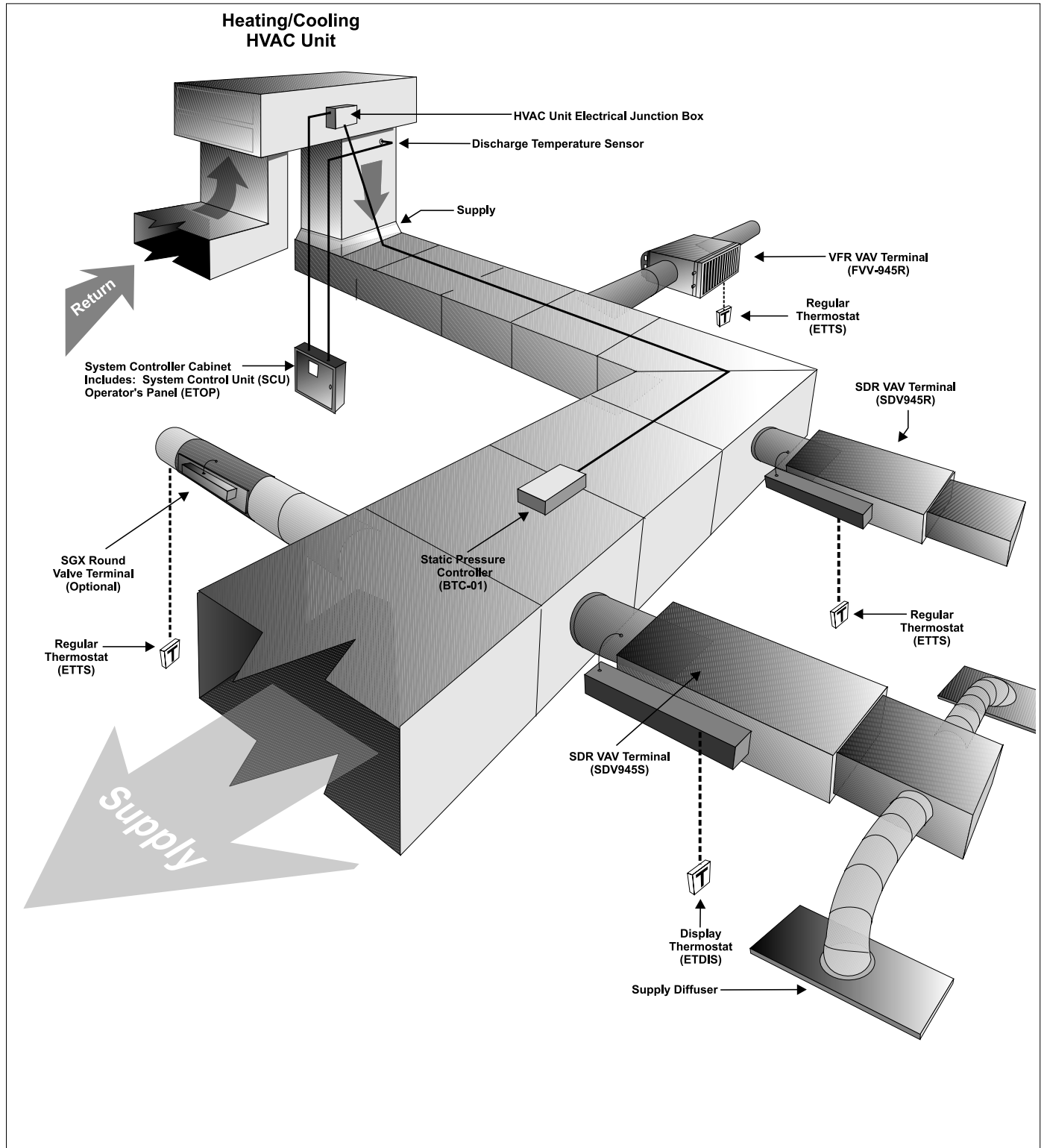


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Chapter 1

ENVIRO-TEC DDC CONTROL SYSTEM GENERAL COMPONENT DESCRIPTIONS

A. **System Control Unit - (SCU)**

The System Control Unit or SCU supports many functions provided by the Enviro-Tec DDC control system. Among these functions are:

1. Internal Clock/Calendar function for mode and auxiliary contact scheduling.
2. Modem communications support for the entire system.
3. Package or Air Handling unit control when utilizing a VVT type configuration.
4. Communication interface for the VAV zone terminal network.
5. Communication interface for the inter-SCU network.
6. Operator Interface Panel.

There are four different models of System Control Unit with two different output configurations to the package unit or air handling unit. They are:

1. **SCUA8**

This SCU control sequence provides 8, field definable, dry contact outputs with field adjustable anti-cycle timers. This controller is a microprocessor based, stand-alone device with nonvolatile memory. This controller may be networked via an RS485 protocol, twisted, shielded pair cable with up to 64 VAV terminals and a BTC static pressure controller. It may also be linked to 99 other SCU's and their VAV terminals via a separate RS485, twisted and shielded pair cable network. The SCUA8 controller consists of the ETOP (operators panel), the ETDUA8 (system control board), the ETDUX8 (output board), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only), the ETDSDL (discharge duct temperature sensor) and a wall mounted control enclosure. The SCUA8 control sequence may be found on drawing number 16564.

2. **SCUA4A2**

This SCU control sequence provides 4, field definable, dry contact outputs with field adjustable anti-cycle timers. It also provides for two modulating outputs for the control of chilled and/or hot water valves at the air handler with field adjustable throttling range voltages anywhere between 0 VDC to 10 VDC. This controller is a microprocessor based, stand-alone device with nonvolatile memory. This controller may be networked via an RS485 protocol, twisted, shielded pair cable with up to 64 VAV terminals and a BTC static pressure controller. It may also be linked to 99 other SCU's and their VAV terminals via a separate RS485, twisted and shielded pair cable network. The SCUA4A2 controller consists of the ETOP (operators panel), the ETDUA8 (system control board), the ETDUX4A2 (output board), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only), the ETDSDL (discharge duct temperature sensor) and a wall mounted control enclosure. The SCUA4A2 control sequence may be found on drawing number 16874.

3. **SCULT8**

This SCU control sequence provides the same functions as the SCUA8 with the addition of Logging and Trending capabilities. The Logging and Trending option will be explained in a separate manual. The SCULT8 controller consists of the ETOP (operators panel), the ETDULT (system control board), the ETDUX8 (output board), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only), the ETDS (discharge duct temperature sensor) and a wall mounted control enclosure. The SCULT8 control sequence may be found on drawing number 17290.

4. SCULT4A2

This SCU control sequence provides the same functions as the SCUA4A2 with the addition of Logging and Trending capabilities. The Logging and Trending option will be explained in a separate manual. The SCULT4A2 controller consists of the ETOP (operators panel), the ETDULT (system control board), the ETDUX4A2 (output board), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only), the ETDSD (discharge duct temperature sensor) and a wall mounted control enclosure. The SCULT4A2 control sequence may be found on drawing number 17289.

B. Static Pressure Controller - (BTC)

The static pressure control sequence or BTC gives duct static pressure control capability to the Enviro-Tec DDC control system. There are two different models of BTC for two different static pressure control applications. They are:

1. BTC01

This BTC control sequence, powered by 24 VAC control voltage from the BPV01, gives stand-alone DDC static pressure control by providing 24 VAC damper open and damper close signals to control in parallel 1, 2 or 3 bypass terminals. The bypass control BTC01 is used in systems with a constant volume supply fan. This controller is a microprocessor based, stand-alone device with nonvolatile memory. This controller may be networked via an RS485 protocol, twisted and shielded pair cable with VAV terminals and an SCU or operate in a stand-alone mode. The BTC01 controller consists of the ETDD6V (static pressure control board), the Dwyer A-302 (static pressure sensing probe) and a duct mounted control enclosure. The BTC01 control sequence may be found on drawing number 15459.

2. BTC02

This BTC control sequence, requiring 24 VAC control voltage from an external power source, gives stand-alone DDC static pressure control by providing a modulating 0 VDC to 10 VDC control signal which may be utilized to control either a variable frequency fan motor drive, inlet vane type variable volume fan or discharge damper actuator. This controller is a microprocessor based, stand-alone device with nonvolatile memory. This controller may be networked via an RS485 protocol, twisted and shielded pair cable with VAV terminals and an SCU, or it can operate in a stand-alone mode. The BTC02 controller consists of the ETDD6V (static pressure control board), the Dwyer A-302 (static pressure sensing probe) and a duct mounted control enclosure. The BTC02 control sequence may be found on drawing number 16777.

C. Bypass Terminal - (BPV)

The Bypass Terminal or BPV is used in conjunction with the BTC01 static pressure controller on a constant volume type package unit system. There is no inlet airflow measurement probe in this terminal as it is being controlled by pressure as opposed to volume. There are two different models of the BPV bypass terminal. They are:

1. BPV01

This BPV control sequence is the primary bypass terminal in either a single or multiple bypass terminal application. The BPV01 has an on board control voltage transformer that supplies power not only to itself, but to the secondary bypass terminal or terminals (BPV02) and the BTC01 static pressure controller. The BPV01 does, however, rely on the BTC01 for damper actuator control voltage signals. The BPV01 consists of the SDR type bypass terminal itself, the ETACTRTAD (90 degree rotary damper actuator with AC to DC rectifier board), the control voltage transformer and a primary line voltage disconnect switch (for control voltage transformer only). The BPV01 control sequence may be found on drawing number 15459.

2. BPV02

This BPV bypass terminal is the second and, if required, third bypass terminal of a multiple bypass terminal application. The BPV02 has no on board control voltage transformer and relies on the BTC01 for damper actuator control voltage signals. The BPV02 consists of the SDR type bypass terminal itself and the ETACTRTAD (90 degree rotary damper actuator with rectifier board). The BPV02 control sequence may be found on drawing number 15459.

D. Single Duct VAV Terminal - (SDV945)

The single duct VAV terminal control sequence or SDV945 provides stand-alone DDC, pressure independent control capability to the single duct VAV terminal. This controller is a microprocessor based, stand-alone device with nonvolatile memory as well as three 24 VAC discrete outputs and a 0 VDC to 10 VDC modulating output to support local heating devices. This controller is linked via a Quick Wire, pre-terminated cable to either the ETTS (R) regular thermostat or the ETDIS (S) display thermostat. The “R” or “S” suffix on the SDV945 control sequence designates which thermostat is used. This controller may be networked via an RS485 protocol, twisted, shielded pair cable with other VAV terminals, a BTC static pressure controller and an SCU, or it can operate in a stand-alone mode. The SDV945 consists of the SDR or SGX single duct type terminal (standard) with the “FlowStar” inlet probe, the ETDSD (inlet duct temperature sensor), the ETDD2F (zone control board), either the ETTS or ETDIS thermostat, the ETACTRT (DC, 90 degree rotary damper actuator), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only) and control enclosure. The SDV945R control sequence may be found on drawing number 15550. The SDV945S control sequence may be found on drawing number 15551.

E. Variable Volume Fan Powered VAV Terminal - (FVV945)

The variable volume parallel, fan powered VAV terminal control sequence or FVV945 provides stand-alone DDC, pressure independent control capability to the parallel fan powered VAV terminal. This controller is a microprocessor based, stand-alone device with nonvolatile memory as well as three 24 VAC discrete outputs and a 0 VDC to 10 VDC modulating output to support the fan motor and local heating devices. This controller is linked via a Quick Wire, pre-terminated cable to either the ETTS (R) regular thermostat or the ETDIS (S) display thermostat. The “R” or “S” suffix on the FVV945 control sequence designates which thermostat is used. This controller may be networked via an RS485 protocol, twisted, shielded pair with other VAV terminals, a BTC static pressure controller and an SCU, or it can operate in a stand-alone mode. The FVV945 consists of the VFR parallel fan powered VAV terminal with the “FlowStar” inlet probe, the ETDSD (inlet duct temperature sensor), the ETDD2F (zone control board), either the ETTS or ETDIS thermostat, the ETACTRT (DC, 90 degree rotary damper actuator), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only) and control enclosure. The FVV945R control sequence may be found on drawing number 15458. The FVV945S control sequence may be found on drawing number 15547.

F. Constant Volume Fan Powered VAV Terminal - (FCV945)

The constant volume series, fan powered VAV terminal control sequence or FCV945 provides stand-alone DDC, pressure independent control capability to the series fan powered VAV terminal. This controller is a microprocessor based, stand-alone device with nonvolatile memory as well as three 24 VAC discrete outputs and a 0 VDC to 10 VDC modulating output to support the fan motor and local heating devices. This controller is linked via a Quick Wire, pre-terminated cable to either the ETTS (R) regular thermostat or the ETDIS (S) display thermostat. The “R” or “S” suffix on the FCV945 control sequence designates which thermostat is used. This controller may be networked via an RS485 protocol, twisted, shielded pair with other VAV terminals, a BTC static pressure controller and an SCU, or it can operate in a stand-alone mode. The FCV945 consists of the CFR series fan powered VAV terminal with the “FlowStar” inlet probe, the ETDSD (inlet duct temperature

sensor), the ETDD2F (zone control board), either the ETTS or ETDIS thermostat, the ETACTRT (DC, 90 degree rotary damper actuator), a control voltage transformer, a primary line voltage disconnect switch (for control voltage transformer only) and control enclosure. The FCV945R control sequence may be found on drawing number 15548. The FCV945S control sequence may be found on drawing number 15549.

G. Thermostats - ETTS or ETDIS

1. ETTS (Regular Thermostat)

The ETTS thermostat is a wall mounted device which incorporates a space temperature sensor, a hidden temperature set point dial, an unoccupied mode override button and a network communications port. The thermostat body is a locking type utilizing set screws to attach the cover to the base. There are 3 different ETTS models. The standard ETTS is for use with one VAV terminal. The ETTS2 model may be used with 2 VAV terminals and the ETTS3 may be used with 3 VAV terminals. This thermostat is connected to the VAV terminal via a Quick Wire, pre-terminated cable. The ETTS consists of the ETTS thermostat board, the thermostat cover and base as well as wall board and 2" X 4" single gang box attaching hardware. The ETTS is used when there is a "R" suffix designated on the VAV terminal control sequence.

2. ETDIS (Display Thermostat)

The ETDIS thermostat is a wall mounted device which incorporates a space temperature sensor, an unoccupied mode override button and a network communications port as well as a 4 digit, LED display with 6 button keypad. This LED display enables the Heating and Cooling temperature set points to be viewed continuously, or the current terminal CFM, current space temperature, current inlet duct temperature and terminal controller address may be viewed by pressing a series of buttons on the keypad. The ETDIS also enables complete terminal set point configuration via use of the ETKEY and a series of HEX codes representing those configurations. The thermostat body is a locking type utilizing set screws to attach the cover to the base. This thermostat is connected to the VAV terminal via a Quick Wire, pre-terminated cable. The ETDIS consists of the ETDIS thermostat board, the thermostat cover and base as well as wall board and 2" X 4" single gang box attaching hardware. The ETDIS is used when there is a "S" suffix designated on the VAV terminal control sequence.

H. Quick Wire Pre-Terminated Cables - (QW)

The Quick Wire thermostat cables are pre-terminated for accurate and rapid termination of the thermostat. The cable is a six conductor device with a 1/4" by 1/4" square, female connector on each end. The cable itself is available with either a plenum or non-plenum rated jacket. This cable is also available in two standard lengths, either 25 or 50 feet. Longer, non-standard lengths are also available. The plenum rated 25 and 50 foot cables are designated as the QW25 and QW50 respectively. The non-plenum rated cables incorporate a "N" suffix with the cable designation.

I. Communication Interface Converter - (ETINT1)

The ETINT1 is an RS485 to RS232 converter utilized when communicating with any system device or the entire system via a desktop or laptop computer. The ETINT1 connects to the serial RS232 port on the computer and links to any system device with a QW6N cable. The ETINT1 is equipped with 2 red LED's. One LED indicates active communication transmission (TX) and one LED indicates active communication reception (RX).

J. Modem Interface Cable - (ETNUL)

The ETNUL is a null modem cable required in the use of a modem connection with the SCU. This cable works in conjunction with the ETINT1 converter and the QW6N cable to establish a modem communication link to the system.

**K. Access Tool - (ETKEY)**

The ETKEY is an access tool used in conjunction with the ETDIS display thermostat to alter the configuration of a VAV terminal or BTC static pressure controller. The ETKEY may also be used to lock out the operators panel keypad on the SCU to prevent unauthorized access to system configuration set points. The ETKEY uses the same female connector as the Quick Wire cables with a jumper wire added.

L. Quick Wire Cable Coupler - (ETQWX)

The ETQWX allows for the coupling of two Quick Wire cables in the field should the situation arise that a single cable is not of sufficient length.

M. Bus Communication Adapter - (ETRS)

The ETRS cable allows for communication directly to the RS485 bus via a computer in conjunction with the ETINT1 and two QW6N cables.

N. Front End PC Communication Converter Card - (ETCOMV)

The ETCOMV is the permanent connection version of the ETINT1. The ETCOMV fits into an empty slot on the front end computer mother board and permanently occupies one of the available RS232 serial ports via a connection with the #85031 cable assembly. Either the SCU or a VAV terminal network may be routed to the ETCOMV for permanent, on site communication capability.

O. Duct Temperature Sensor - (ETDSD and ETDSL)

The duct temperature sensors are utilized at the inlet of all VAV terminals and the discharge of the air handling unit. They sense the duct temperature by altering their internal resistance as temperature changes. This resistance is sensed by the controller and translated into actual temperature. The short sensor or ETDSD is found in the inlet of the VAV terminals. The long sensor or ETDSL is supplied with the SCU and requires field mounting to sense the discharge temperature of the air handling unit.

P. Remote Temperature Sensors - (ETDSL25 and ETDSL50)

The remote temperature sensor is used instead of the wall mounted thermostat in applications where a wall mounted device is not acceptable. This sensor is generally located in the return duct of the space and allows the controller to sense the return air temperature. The remote sensor is available in 25 and 50 foot lengths and utilizes a Quick Wire cable.

Chapter 2

ENVIRO-TEC DDC CONTROL SYSTEM COMPONENT INSTALLATION GUIDELINES

A. Inspection

Upon receipt of any and all equipment supplied by Environmental Technologies, check for any shipping damage. Report any damage found immediately to the carrier. Also, inspect all equipment before and after installation for damage caused by abuse or mishandling.

B. Coordination of Trades

Contractor must insure that all trades involved in the handling, installation, wiring and startup of any Enviro-Tec DDC control system components be supplied with a copy of this Operations and Maintenance manual as well as submitted control sequence data and/or drawings prior to installation. This is a critical step that must be taken in order to avoid damage that would void any warranties, written or implied, covering the system component in question.

C. Location of Component Installation

Accessibility must be considered when locating and installing the various Enviro-Tec DDC system components. Typically, these components will be wired after installation and access to some components may be necessary during start up or balancing of the system. Insure that the control enclosure covers on all system components can be removed without interference from walls, ductwork, conduit, hanger brackets, etc. Components may not be mounted in locations where ambient temperatures will exceed 125 degrees F or fall below 35 degrees F. Components may not be installed in locations which are not protected from the weather as the control enclosures are not weatherproof or weather resistant.

D. VAV Terminal Installation - SDV, FVV or FCV Control Sequences

The VAV terminals should be hung in the horizontal position with the terminal tag arrow pointing up. Sheet metal hanger straps of sufficient gauge are required. If flexible ducting is used for inlet connections, make sure that a compression strap is utilized to insure an airtight joint. Discharge slip and drive joints should be sealed to insure an airtight connection.

E. Bypass Terminal Installation - BPV Control Sequences

The BPV bypass terminals should be hung in the horizontal position with the terminal tag arrow pointing up. Sheet metal hanger straps of sufficient gauge are required. Bypass terminals may be installed in one of two configurations. The first would be in a ducted return system. In this configuration, the bypass terminal would be located between the supply and return ducts. The BPV inlet is ducted to the supply duct and the discharge is ducted to the return duct. This is the configuration that is recommended for use with series or parallel fan powered VAV terminals. The second configuration is an open plenum return system. In this configuration, the BPV inlet is ducted to the supply duct and the discharge is open to the plenum space. No branch takeoffs may be located upstream of the bypass terminal inlet. If an economizer is used, be certain that the return air damper does not close off or interfere with the bypass terminal and its associated ductwork.

F. Static Pressure Controller - BTC Control Sequences

The BTC static pressure controller should be installed two thirds to three quarters of the way down the supply duct. Installing the static pressure sensor too close to the central unit may cause erratic control. If multiple supply duct trunks are used, install the BTC static pressure controller on the trunk with greatest potential air volume usage. The BTC static pressure controller **MUST** be installed with the Dwyer A-302 pickup probe pointing into the airflow. **DO NOT** remove the Dwyer A-302 static pressure probe from the BTC control enclosure and mount remotely. The transducer on the BTC controller is calibrated for the specific amount of tubing used to connect it to the static pressure probe. A 3/8" to 1/2" hole must be drilled into to the duct. The probe is to be fitted into the hole and the control enclosure is to be attached to the duct using at least two sheet metal screws. If insulated ducting is used, be certain that the probe has completely penetrated the insulation and is free in the air stream. Insure that there is no leakage around the pickup probe after installation. Use approved duct sealant if required.

G. Thermostats - ETTS and ETDIS

Thermostats are shipped separately from the VAV terminal units via parcel post ground shipment unless otherwise specified. Store these parts in a secure location until time for installation. Either the ETTS regular thermostat or the ETDIS display thermostat will function with any of the three types of VAV terminal control sequences. If there are both types of thermostats on the job, be sure that the correct type of thermostat is installed in the specified location. Choose the location of the thermostat in the space carefully. Avoid locating the thermostat above any heat generating devices such as printers, refrigerators, space heaters, etc. These devices will cause the temperature sensor to register a false reading. These thermostats are designed for horizontal mounting and may be attached directly to wall board or a 2" X 4" single gang box. Mounting hardware for either installation method is supplied with each thermostat. It may also be necessary to seal the Quick Wire cable opening to eliminate the possibility of cooler or warmer air in the wall from influencing the space temperature sensor. Use one of the following two methods for mounting the thermostat.

G.1 - Wall Board Mounting (Figure G.1)

- a. Drill holes in wall for Quick Wire cable and both wall anchors. Feed cable through wall and insert the two wall anchors provided into the appropriate holes.
- b. Run Quick Wire cable through L-shaped opening in the thermostat base and loosely fasten base to wall using the two screws provided. Level base and tighten screws.
- c. Mount thermostat PC board onto thermostat base so that the set point dial (ETTS) or LED display (ETDIS) is at the top. Use the small guide pins on the thermostat base to align the two components. Insert the two plastic retaining pins supplied into the opposite corners of the thermostat base from the guide pins.
- d. Insert Quick Wire cable end into the bottom communication port on the thermostat PC board. The cable end is keyed to go in one way only. **DO NOT FORCE** the cable end onto the bottom communications port. Be sure to tuck away any loose cable under the PC board so that it does not interfere with the cover.
- e. Snap the thermostat cover onto the base. Make sure that the vertical slots in the cover are on the left side and the "Enviro-Tec" logo is on the right side. Align the cap screw cover locking holes on both sides and install the two 4-40 painted cap screws provided. Tighten cover locking screws till snug.

G.2 - 2" X 4" Single Gang Box Mounting (Figure G.2)

- a. Install 2" X 4" single gang box into wall. Insure that box is recessed between 1/8" and 1/4" below wall surface. Mounting bracket must have room to be recessed below flush level of wall in order for thermostat to flush mount to wall.

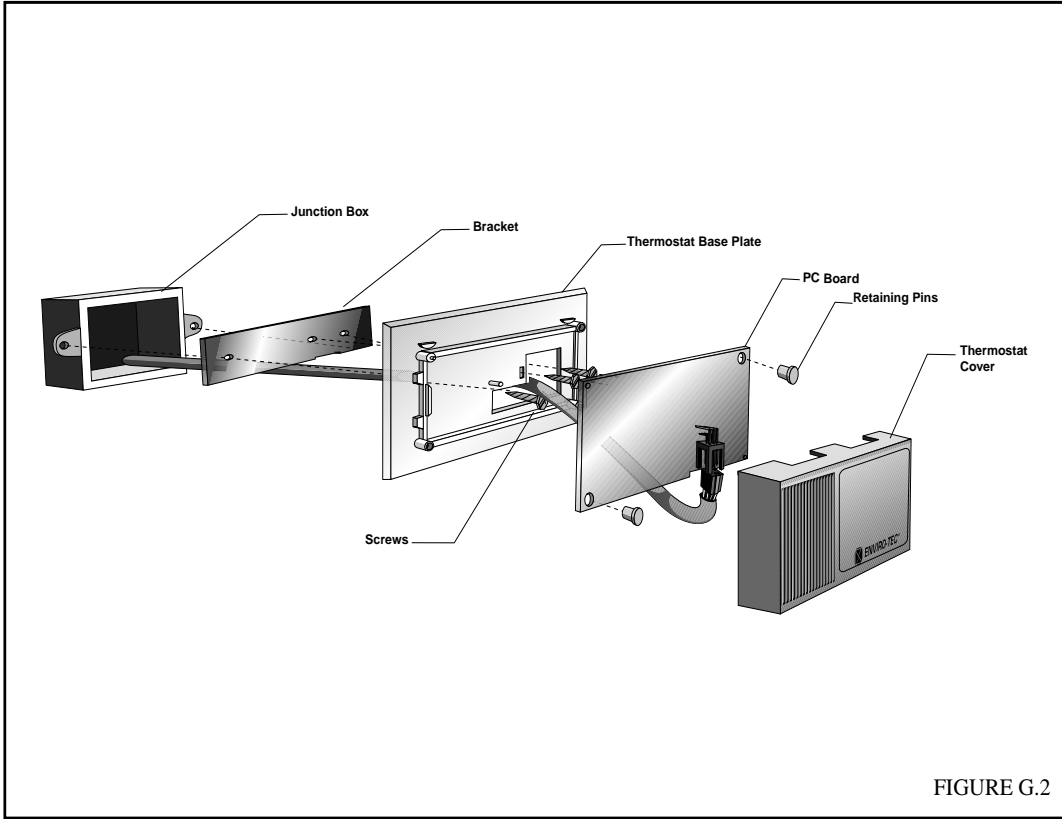
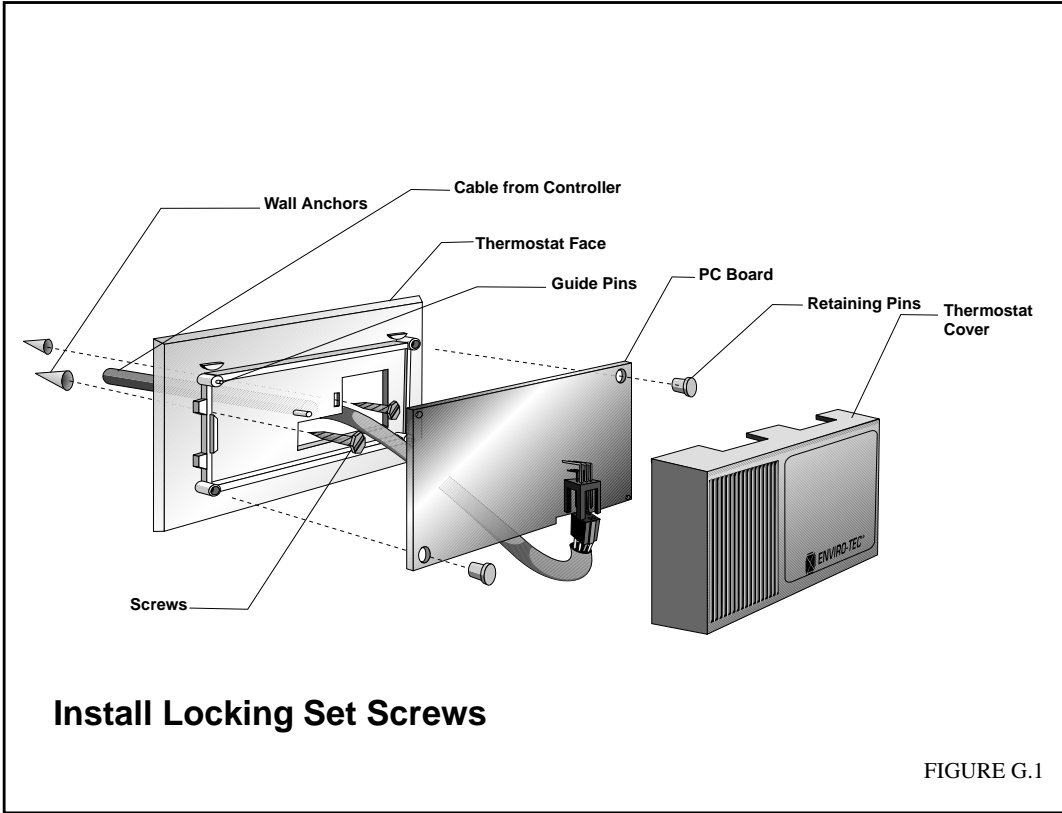
- b. Install screw provided through right hand hole in mounting bracket into right hand threaded tab on 2" X 4" single gang box. Loosely tighten. Level mounting bracket and securely tighten screw.
- c. Run Quick Wire cable through L-shaped opening in the thermostat base. Install screw provided through left hand holes of both thermostat base and mounting bracket and into the left hand threaded tab of 2" X 4" single gang box. Loosely tighten screw.
- d. Install screw provided through center slot in thermostat base and into center hole of mounting bracket. Loosely tighten. Level thermostat base and securely tighten both left hand and center screws.
- e. Mount thermostat PC board onto thermostat base so that the set point dial (ETTS) or LED display (ETDIS) is at the top. Use the small guide pins on the thermostat base to align the two components. Insert the two plastic retaining pins supplied into the opposite corners of the thermostat base from the guide pins.
- f. Insert Quick Wire cable end into the bottom communication port on the thermostat PC board. The cable end is keyed to go in one way only. **DO NOT FORCE** the cable end onto the bottom communications port. Be sure to tuck away any loose cable under the PC board so that it does not interfere with the cover.
- g. Snap the thermostat cover onto the base. Make sure that the vertical slots in the cover are on the left side and the "Enviro-Tec" logo is on the right side. Align the cap screw cover locking holes on both sides and install the two 4-40 painted cap screws provided. Tighten the locking screws till snug.

H. System Control Unit - SCU

The SCU should be mounted to the wall in a mechanical room or utility closet using the mounting flanges provided. When choosing the location for the SCU, consideration must be given to the fact that this control unit must be wired into the air handling and/or package unit, VAV terminal network, inter-SCU network, discharge temperature sensor and line voltage. Also, the SCU should **NOT** be located where it would be subjected to humidity or extremes in temperature. Do not exceed an ambient temperature range of 35 degrees F to 95 degrees F. Also, do not exceed a humidity range of 10% to 95% RH non-condensing.

I. Discharge Temperature Sensor - ETDSDL

Locate the discharge temperature sensor in the supply duct downstream from the coils. This location must represent the true air handler discharge temperature. Due to varying configurations, this location may differ by system. Trial and error positioning may be required. The discharge temperature sensor requires a 3/8" hole in the duct for insertion and is secured using two self tapping sheet metal screws.



Chapter 3

ENVIRO-TEC DDC CONTROL SYSTEM COMPONENT WIRING GUIDELINES

A. WARNING:

DO NOT APPLY POWER TO ANY ENVIRO-TEC SYSTEM COMPONENT BEFORE READING AND COMPLYING WITH ALL OF THE SECTIONS IN THIS CHAPTER AS WELL AS THE INDIVIDUAL CONTROL SEQUENCE WIRING DRAWINGS AND THEIR NOTES. THESE DRAWINGS CAN BE FOUND IN CHAPTER 4 OF THIS MANUAL AS WELL AS ON THE INSIDE OF THE CONTROL ENCLOSURE COVERS OF EACH SYSTEM COMPONENT. FAILURE TO COMPLY WITH THIS INSTRUCTION MAY RESULT IN VOIDING OF THE PRODUCT WARRANTY.

B. General

1. Local building codes should be checked to determine the necessity of using conduit or plenum rated cable.
2. Communications, thermostat and DC voltage control wiring should not be routed close to any cable or conduit with cable carrying an AC voltage, electrically powered machinery or fluorescent lighting in order to reduce the possibility of electrical noise interference.
3. Control sequence wiring diagrams for all Enviro-Tec DDC controls are found in Chapter 4 as well as on the inside of the control enclosure cover of each system component.
4. Duct temperature sensor, communication and optional contact closure wiring terminations are made via screw terminals. To complete a proper connection, strip 1/4" of insulation from the wire. Turn screw in terminal fully counterclockwise. Insert stripped portion of wire only into terminal and turn screw fully clockwise till securely tight. Do not over tighten screws.
5. All 24 VAC power and output connections are made with 1/4" spade lug quick connecting type terminals except for the ETDD6V control board used in the BTC01 and BTC02 control sequences. This alternative method is used so that there is a distinct difference between AC power connections and DC control and communication connections.

C. Communications Wiring

Communications wiring is the most critical portion of the Enviro-Tec DDC control system installation. The means of routing the communications cable, and the connection method itself are critical in assuring a smooth and trouble free start up of the system. The type of cable which must be used to "Network" all of the system components together is called "twisted and shielded pair with drain". This type of cable consists of two insulated conductors, one black and one either red or white, twisted around each other over the length of the cable. The two twisted conductors are wrapped in a foil shield and a third, non-insulated conductor or "drain", runs with the foil over the length of the cable and allows for easy termination of the shield. Table C lists suitable "Alpha" and "Belden" cable cross reference part numbers. The following four guidelines **MUST** be adhered to in order to insure a successful and operational control system communication network.

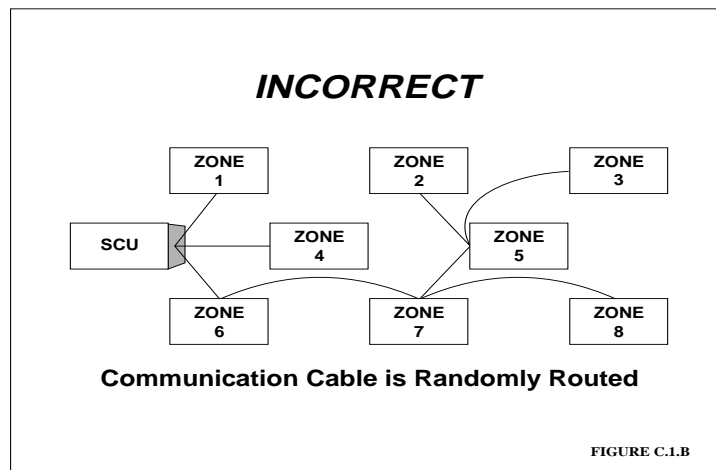
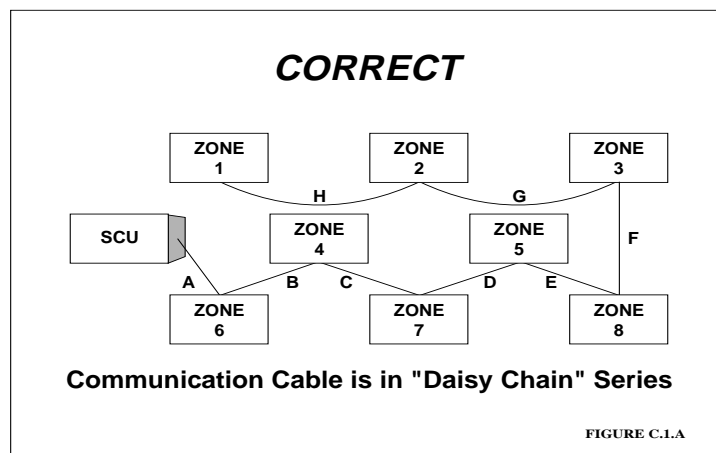
Suggested Wire Types for Various Functions

Type	PLENUM RATED		NON-PLENUM RATED	
	Alpha	Belden	Alpha	Belden
Communications	58411	87761	2211C	9462
BTC-01, BPV-01, BPV-02	58114	88444	1174C	8444

Table C

1. Cable Routing

As shown in figure C.1.a, the communication network must be routed in a true, serial “Daisy Chain” type of configuration. The network must begin at the SCU (if applicable) and be connected to the next communicating device. From that device, the cable must continue to the next device only. With the exception of the first and last device on each network which should have only one communication cable terminated at its’ respective communication port, each remaining device should have only two cables terminated at it’s communication port. One cable in and one cable out. This method is to be used on both the SCU to VAV terminal network and the SCU to SCU network. The network shown in figure C.1.b is incorrect. “Sub-loops”, “T’s” and “Star” type network routing is unacceptable.



2. Conduit Usage

If conduit is used at any point in the communications network, DO NOT run communications cable in the same conduit with any AC voltage signal. The voltage level is immaterial. Any AC voltage signal in conduit with communications cable will induce noise and break up or possibly even eliminate the network communication capability. RS485 network communication cable, in or out of conduit, should be routed at least six inches away from any conductors carrying an AC voltage signal, in or out of conduit.

3. Cable Termination

As shown in figure C.3, only one inch of foil shielding should be removed from the communication cable when preparing to terminate the conductors. The foil shield is designed to reject RF interference from the conductors carrying the RS485 signal. Removing more than one inch of foil will potentially turn the unshielded conductor into an RF antenna which will induce noise onto the network and once again, break up or possibly eliminate communication capability.

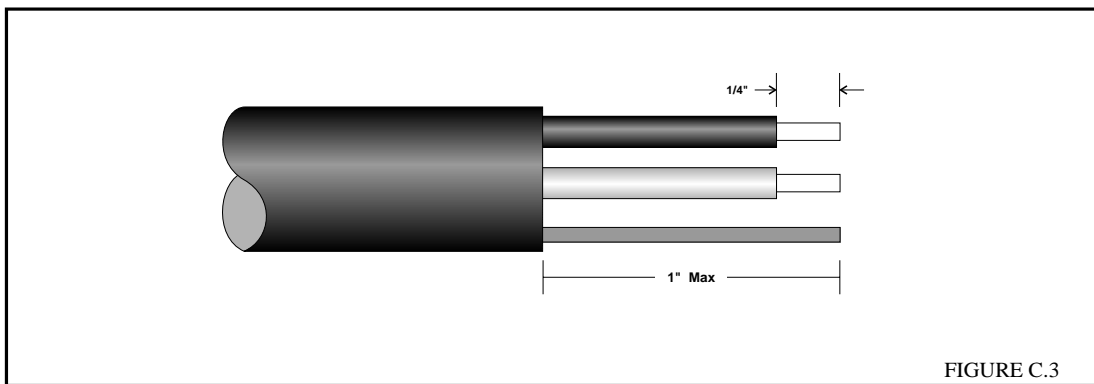


FIGURE C.3

4. Alternating Drain Connections

Each section of communication cable is terminated at each end to a communicating device. In order to eliminate the possibility of a “Ground Loop”, or noise running back and forth over a conductor, the drain wire in the communication cable should be terminated at only one end. With the drain attached to ground at one end only, any induced noise on the conductors has to go to ground and stay there as the path back over the conductor to an alternate ground has been eliminated. See figure C.4 for detail. When utilizing a SCU on a VAV terminal zone network, make the first network drain connection at the SCU zone network communication port.

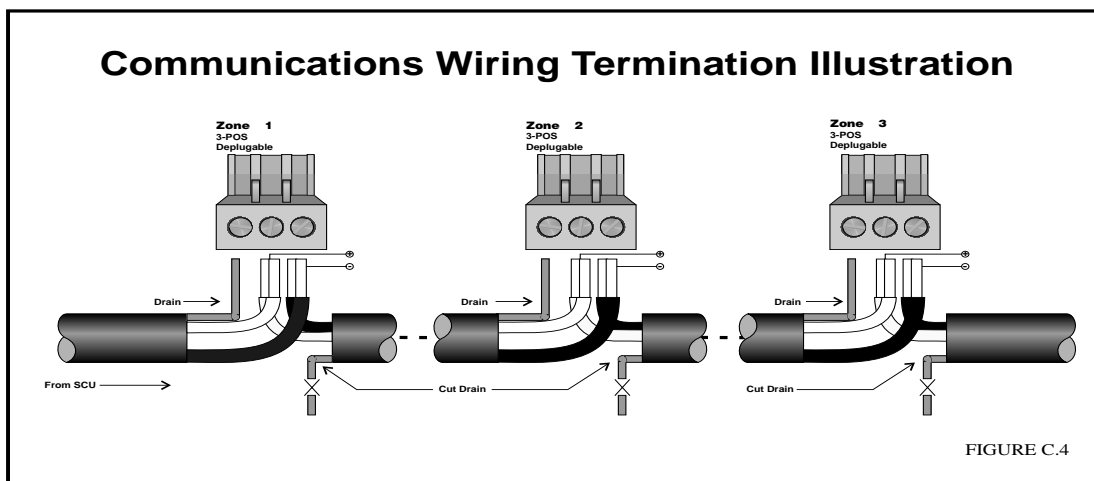


FIGURE C.4

D. Power Wiring**1. Standard Control Transformer**

The Enviro-Tec DDC system components are equipped with standard control voltage transformers. Ensure that the primary voltage rating on the transformer matches the primary voltage to be used. When connecting building power to a control voltage transformer, it is critical to also attach the building ground wire to the grounding lug or pigtail provided in the control enclosure. This grounding of the control enclosure is so important because the Enviro-Tec DDC controls reference all communication and analog signals to ground. Without this reference, communication, air flow measurement and temperature measurement would not be possible.

2. Distributed 24 VAC

Should a distributed 24 VAC power source be utilized, there are several important points to observe. The first is to insure that the transformer chosen is of sufficient VA rating to supply 24 VAC to all VAV terminal controllers under full load. The VA requirement for each control sequence is listed on the individual control sequence drawing. The second is to insure that the wire used is of sufficient gauge to supply 24 VAC to all VAV terminal controllers under full load. The third, and most important, is to observe the polarity of the 24 VAC connections on all of the controllers. Terminals 15 and 16 are the 24 VAC power connections on all controllers. For reasons of safety and noise suppression, terminal 15 is the GROUNDED NEUTRAL leg of the 24 VAC input. Terminal 16 is the PHASE leg of the 24 VAC input. Reversing the leads will damage the controller and void the warranty. It is the responsibility of the installing contractor to insure that the above steps are taken if a distributed 24 VAC power source is utilized in conjunction with the operation of an Enviro-Tec DDC control system.

E. Control Wiring

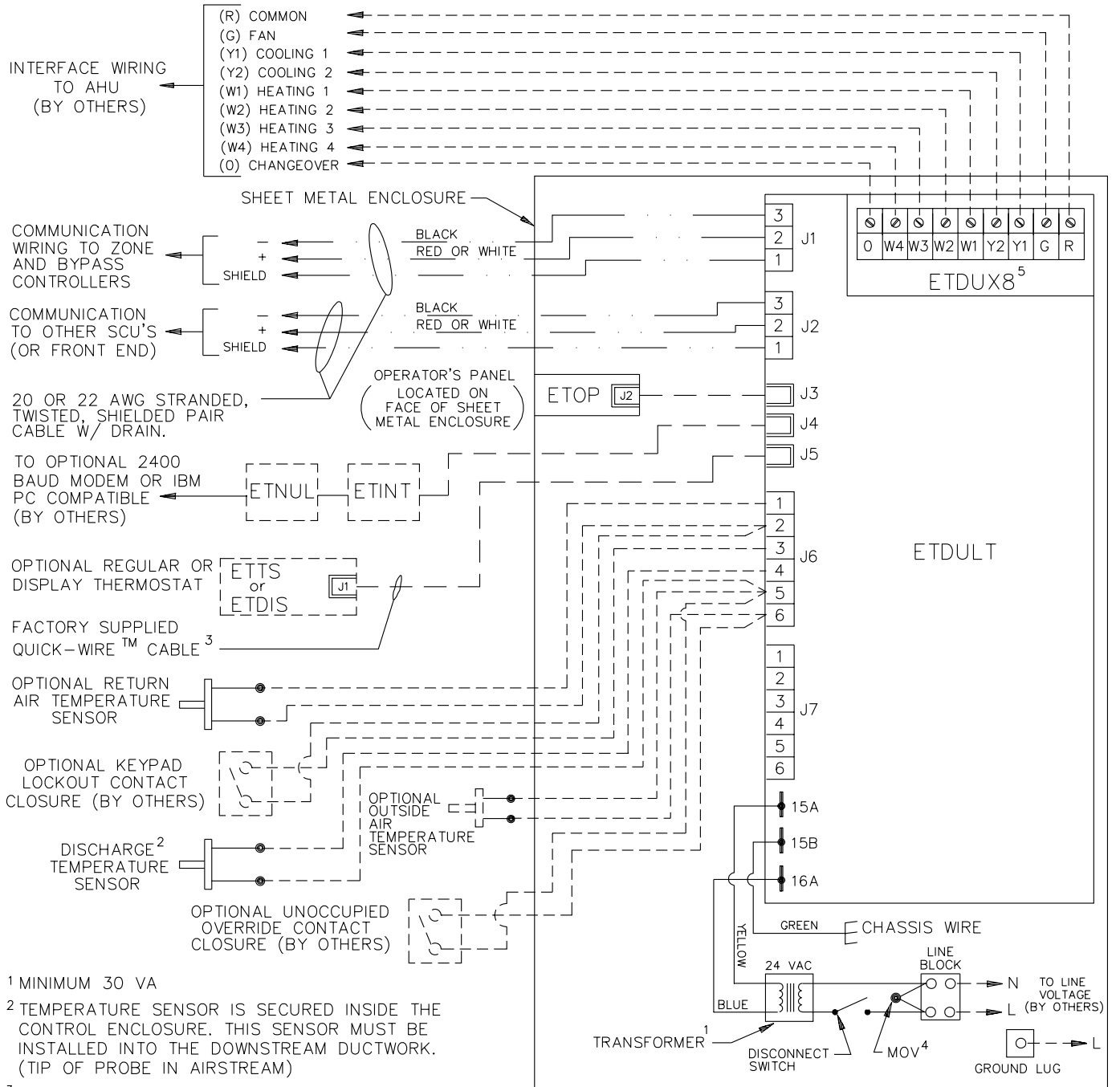
Any field control wiring which may be required is clearly indicated on the individual control sequence drawings. Examples would be the cable between the BTC01 static pressure controller and the BPV01 bypass terminal, the cable between the SCU and the packaged rooftop unit, the cable between the individual VAV terminal controller and a hot water valve, etc. Local building codes should be consulted for cable requirements. Load VA ratings and distance of wire run are to be taken into consideration when determining required wire gauge. Since there is no way for the factory to know what the local codes or distance of wire runs will be on any given installation where the Enviro-Tec DDC control system will be utilized, the responsibility of determining the correct wire gauge and type rests with the installing contractor.

F. External Device Wiring

Modulating and floating point hot or chilled water valves, contactors, etc., are sometimes used in conjunction with and controlled by the Enviro-Tec DDC control system. When connecting an external device to an Enviro-Tec controller, first check the VA rating of the device. Then check the VA available from the control transformer after it supplies power to the controller. The VA available is listed in the notes of the individual control sequence. If the VA draw of the device exceeds the available VA of the control transformer, it is the responsibility of the installing contractor to supply an additional transformer to power the external device. Also, some water valves require an isolated control signal common. If this is so, a separate transformer will be required to power the valve as the signal common of the Enviro-Tec DDC controller is common to the grounded neutral leg of the 24 VAC power input.

Chapter 4**ENVIRO-TEC® DDC CONTROL SYSTEM
CONTROL SEQUENCE DRAWINGS**

Page.	Control Sequence	Drawing Number
21	SCU-LT8	17290
22	SCU-LT4A2	17289
23	BTC-01, BPV-01, BPV-02	15459
24	BTC-02	16777
25	SDV942R	15545
26	SDV942S	15546
27	SDV945R	15550
28	SDV945S	15551
29	FVV945R	15458
30	FVV945S	15547
31	FCV945R	15548
32	FCV945S	15549
33	SDV945DL	17304
34	FVV945DL	17308
35	FCV945DL	17306
36	Air Flow Curves	15883



- 1 MINIMUM 30 VA
- 2 TEMPERATURE SENSOR IS SECURED INSIDE THE CONTROL ENCLOSURE. THIS SENSOR MUST BE INSTALLED INTO THE DOWNSTREAM DUCTWORK. (TIP OF PROBE IN AIRSTREAM)
- 3 CABLE IS TERMINATED AT FACTORY & MUST BE ROUTED AND PLUGGED INTO CONTROLLER & SPACE SENSOR IN FIELD. CABLE MUST BE ORDERED SEPARATELY.
- 4 SELECT MOV PER LINE VOLTAGE

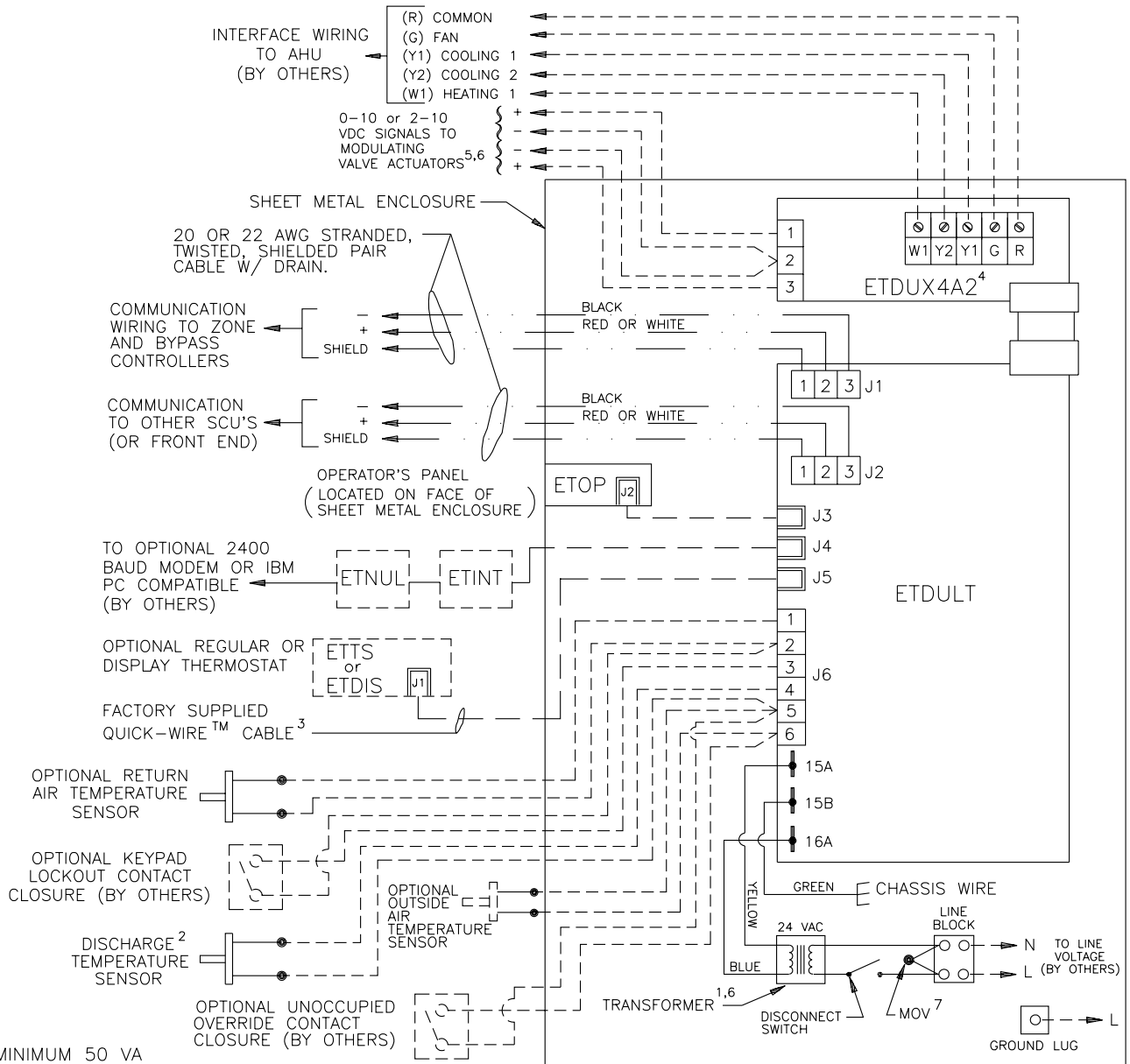
LINE VOLTAGE	MOV PART NO.
120	C10DK221
208	C10DK391
220	C10DK391
240	C10DK431
277	C10DK621

⁵ ETDUX8 RELAY COILS TO OPERATE AT 24 VAC CONTROL VOLTAGE. MAXIMUM 50 VA CONTACT CURRENT DRAW.

- - - - - FIELD WIRING
 - - - - - FIELD COMMUNICATION WIRING
 - - - - - QUICK-WIRE™ CABLE
 - - - - - FACTORY WIRING
 - - - - - FIELD RS232 COMMUNICATION WIRING-
 - - - - - FACTORY SUPPLIED AND TERMINATED CABLE

SCU-LT8 • System Control Unit

Factory certified submittal drawings available upon request.



¹ MINIMUM 50 VA

² TEMPERATURE SENSOR IS SECURED INSIDE THE CONTROL ENCLOSURE. THIS SENSOR MUST BE INSTALLED INTO THE DOWNSTREAM DUCTWORK. (TIP OF PROBE IN AIRSTREAM)

³ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPERATELY.

⁴ ETDUX4A2 RELAY COILS TO OPERATE AT 24 VAC CONTROL VOLTAGE. MAXIMUM 50 VA CONTACT CURRENT DRAW.

⁵ OUTPUTS ARE SOFTWARE CONFIGURABLE AS HEATING OR COOLING

⁶ 20 VA MAXIMUM IS AVAILABLE FROM SUPPLIED CONTROL TRANSFORMER TO POWER VALVES

⁷ SELECT MOV PER LINE VOLTAGE:

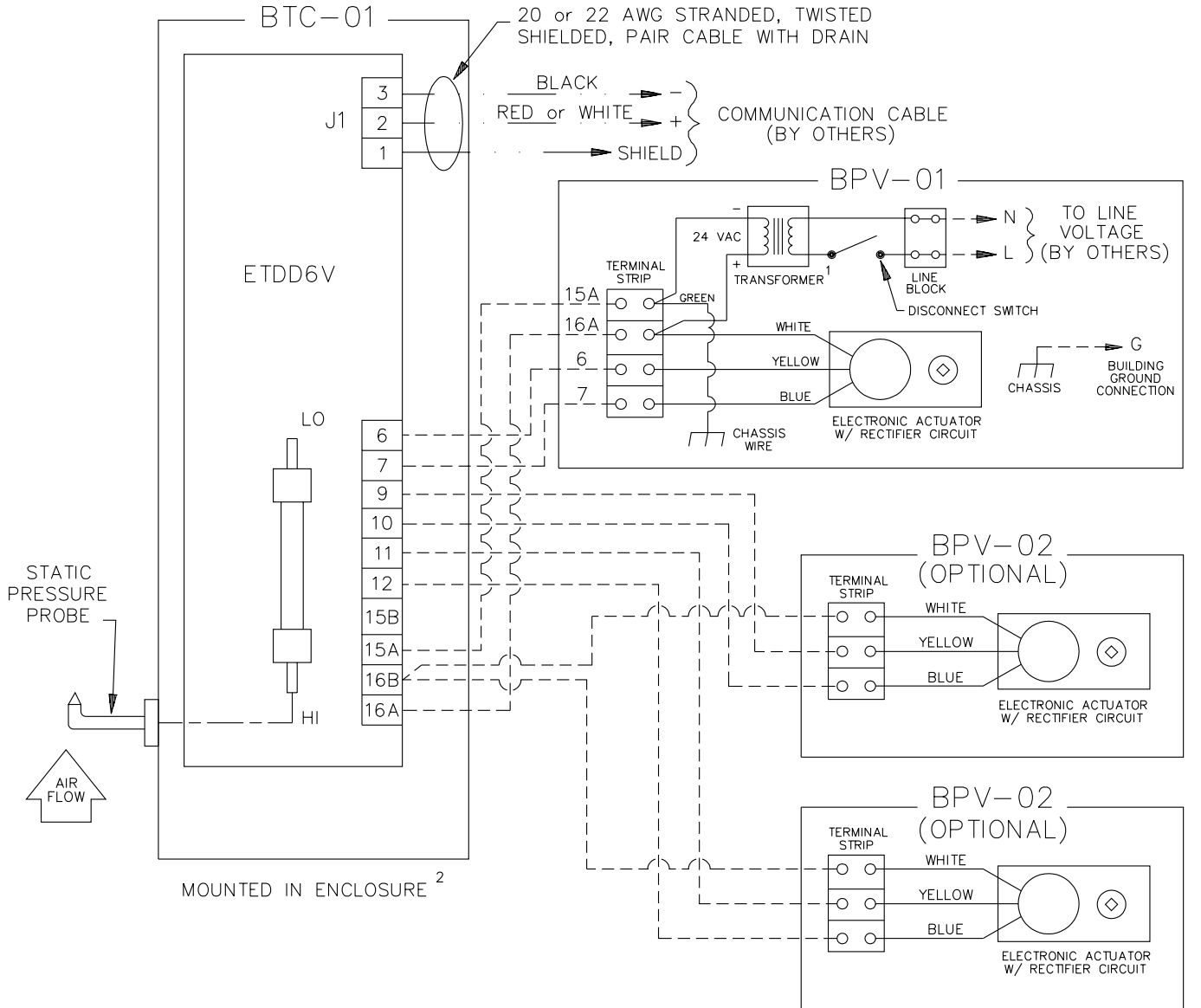
LINE VOLTAGE	MOV PART NO.
120	C10DK221
208	C10DK391
220	C10DK391
240	C10DK431
277	C10DK621

- FIELD WIRING
- FIELD COMMUNICATION WIRING
- QUICK-WIRE™ CABLE
- FACTORY WIRING
- FIELD RS232 COMMUNICATION WIRING-
- FACTORY SUPPLIED AND TERMINATED CABLE

SCU-LT4A2 • System Control Unit

Factory certified submittal drawings available upon request.

This control sequence provides static pressure control. Pressure is sensed in the range of 0.5 – 2.5 w.g. pressure differential. As static pressure in the main duct increases, one, two, or three relief dampers open to bypass airflow to the system return, thus maintaining constant system static pressure.



¹ MINIMUM 30 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, SWITCH AND LINE BLOCK WILL NOT BE SUPPLIED. ADHERE TO POWER REQUIREMENTS. 24 VAC, ±10%, 30 VA MINIMUM. POLARITY BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

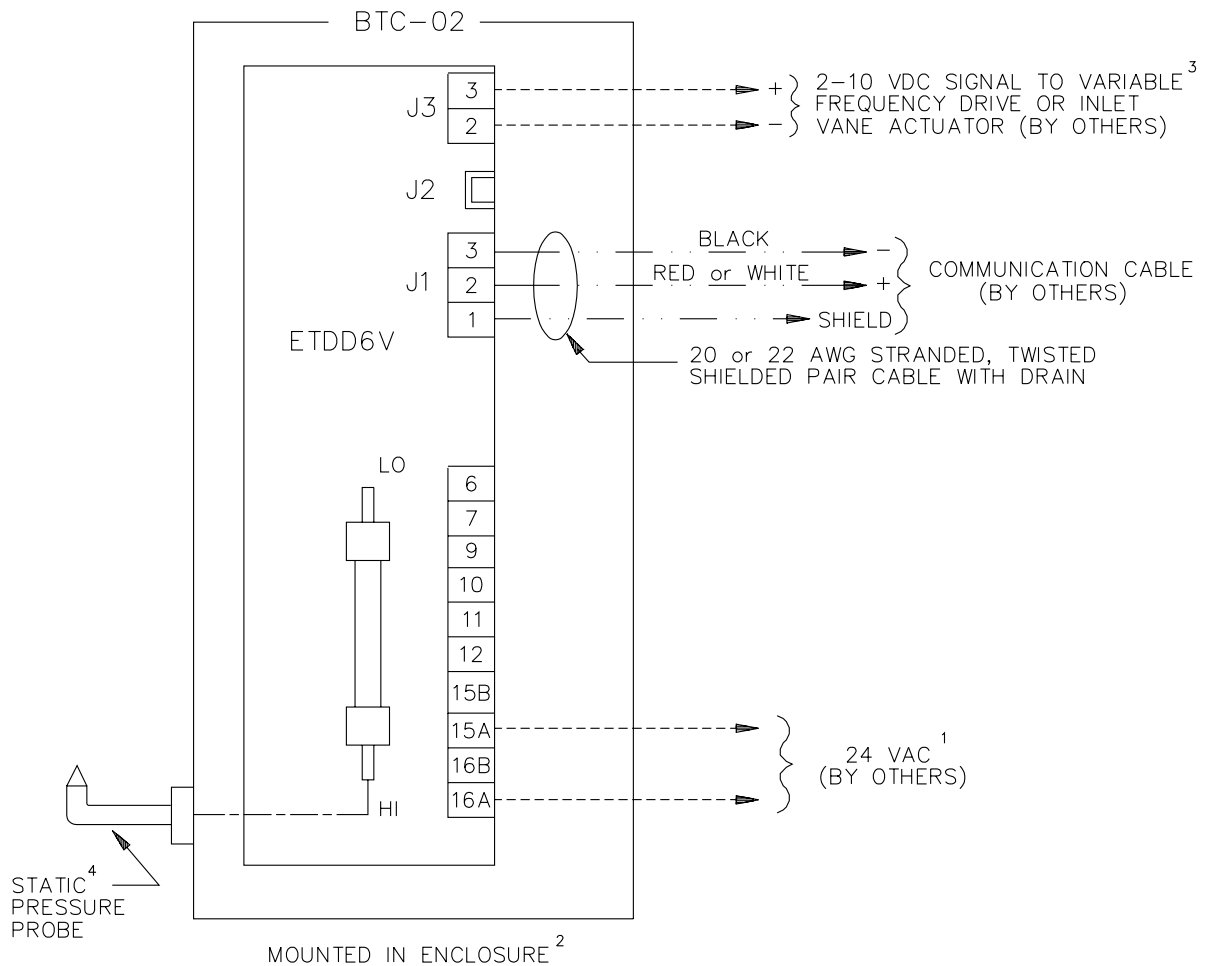
² MOUNTED (BY OTHERS) AT LOCATION WHERE STATIC PRESSURE IS TO BE SENSED.

CAUTION: REVERSING 24 VAC WIRING FROM BPV-01 TO BTC-01 WILL CAUSE SERIOUS DAMAGE TO ALL CONTROLLERS ON COMMUNICATIONS LOOP.

BTC-01, BPV-01, BPV-02

Factory certified submittal drawings available upon request.

This control sequence provides static pressure control in conjunction with a variable frequency drive or inlet vane actuator. Pressure is sensed in the range of 0.5–2.5 inch w.g. pressure differential. As static pressure in the main duct increases, a 2–10 VDC signal decreases thus maintaining constant system static pressure.



¹ ADHERE TO POWER REQUIREMENTS OF ETDD6V CONTROLLER. 24 VAC +15%, -10%, MINIMUM 20 VA GROUNDING OF TERMINAL 15A SIDE OF 24 VAC AT SOURCE MAY BE REQUIRED.

² MOUNTED (BY OTHERS) AT LOCATION WHERE STATIC PRESSURE IS TO BE SENSED.

³ "-" (TERMINAL J3-2) IS COMMON TO TERMINAL 15A, IF TERMINAL 15A IS GROUNDING, TERMINAL J3-2 BECOMES GROUNDING.

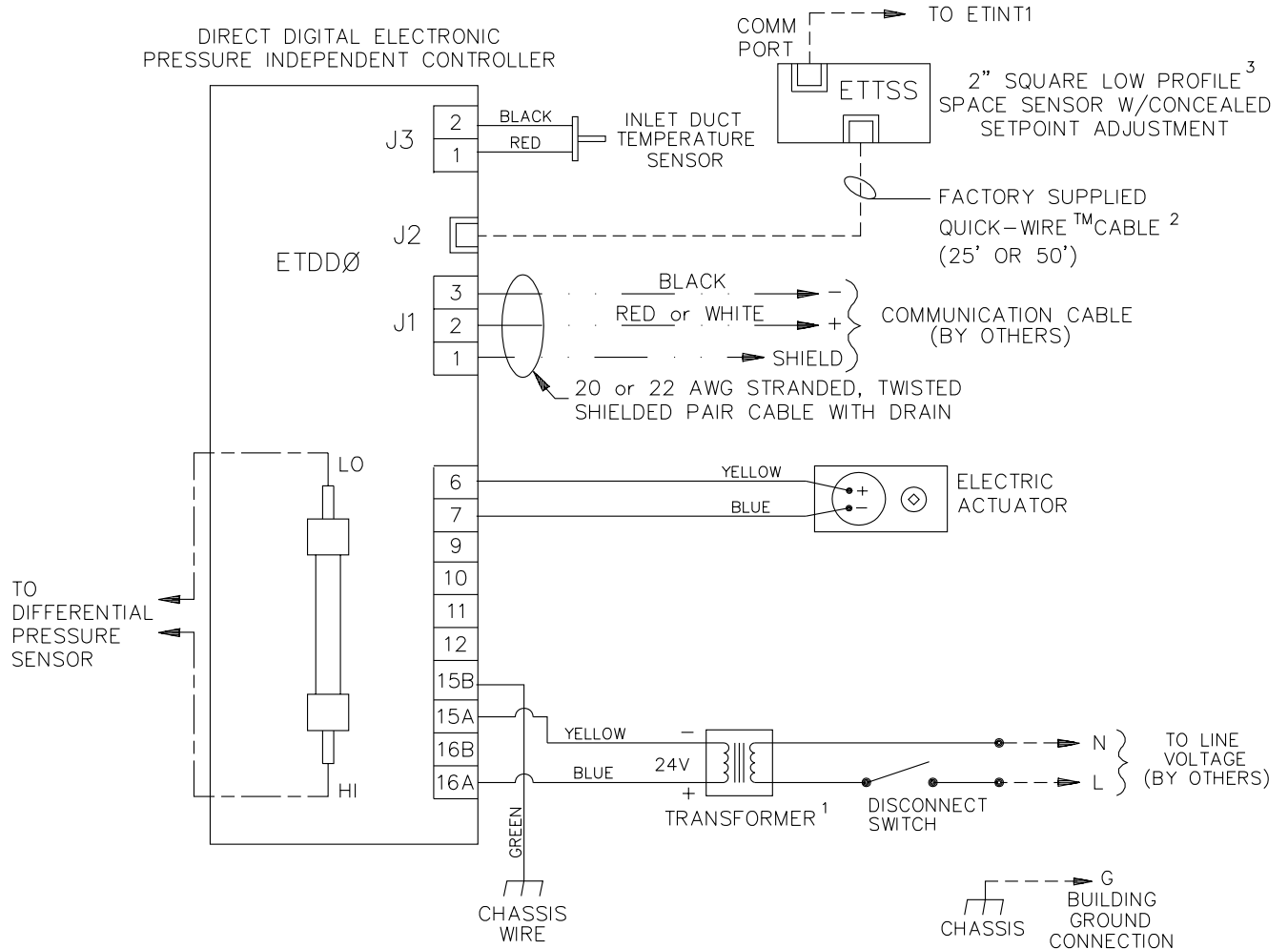
⁴ STATIC PRESSURE PROBE MUST NOT BE MOUNTED REMOTELY.

----- FACTORY TUBING
 ----- FIELD WIRING
 ----- FACTORY WIRING

BTC-02

Factory certified submittal drawings available upon request.

This control sequence provides single duct cooling with changeover. A concealed temperature setpoint adjustment is provided at the space sensor.



¹ MINIMUM 20 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO BOTH CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

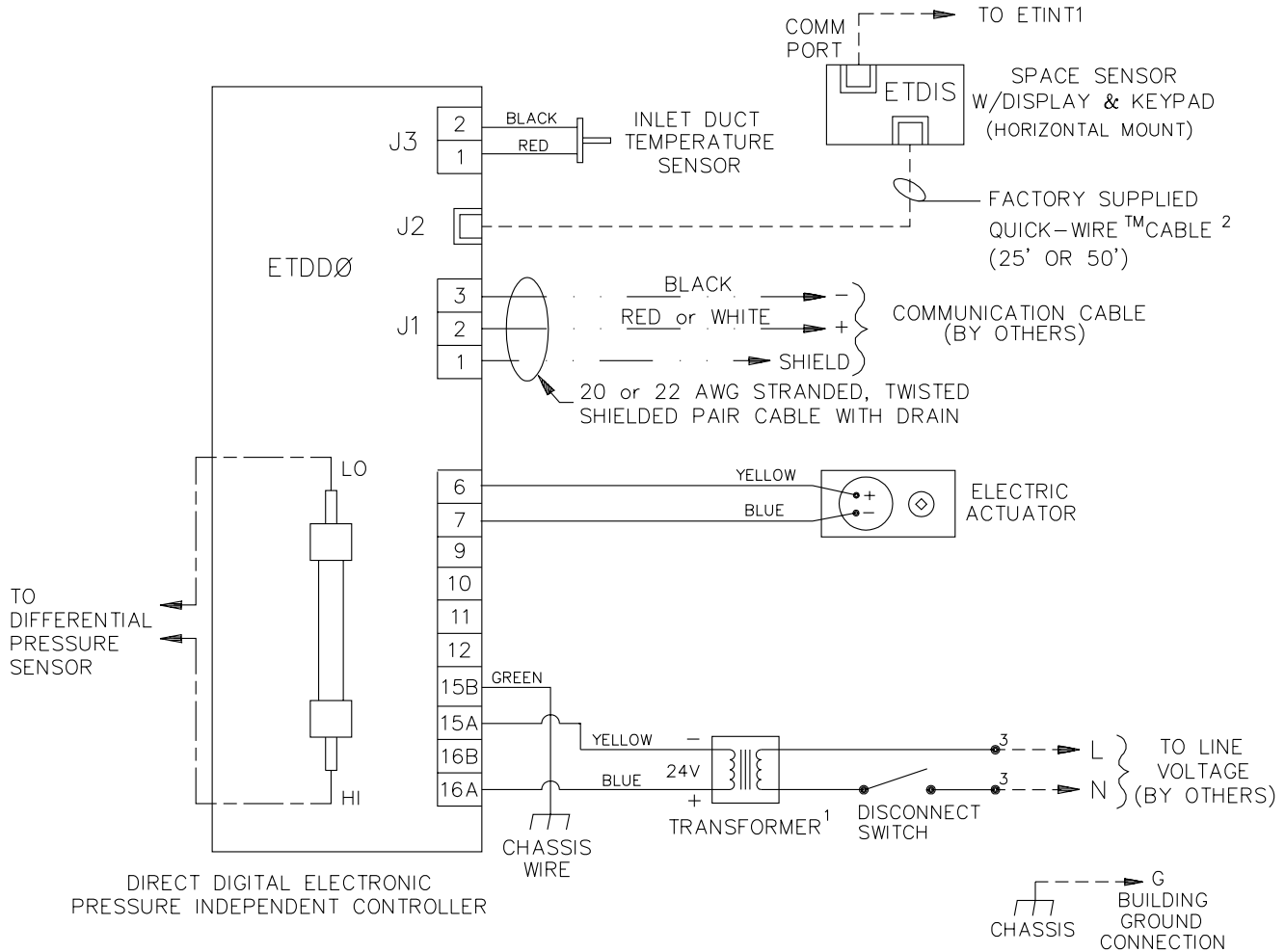
³ OPTIONAL EXPOSED SETPOINT WITH FAHRENHEIT OR CENTIGRADE SCALE AVAILABLE.

- FACTORY TUBING
- FACTORY WIRING
- - - - FIELD WIRING
- - - - QUICK-WIRE™ CABLE ²
- FIELD COMMUNICATION WIRING

SDV942R

Factory certified submittal drawings available upon request.

This control sequence provides single duct cooling with changeover.
A digital display and keypad are provided at the space sensor.



¹ MINIMUM 20 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO BOTH CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

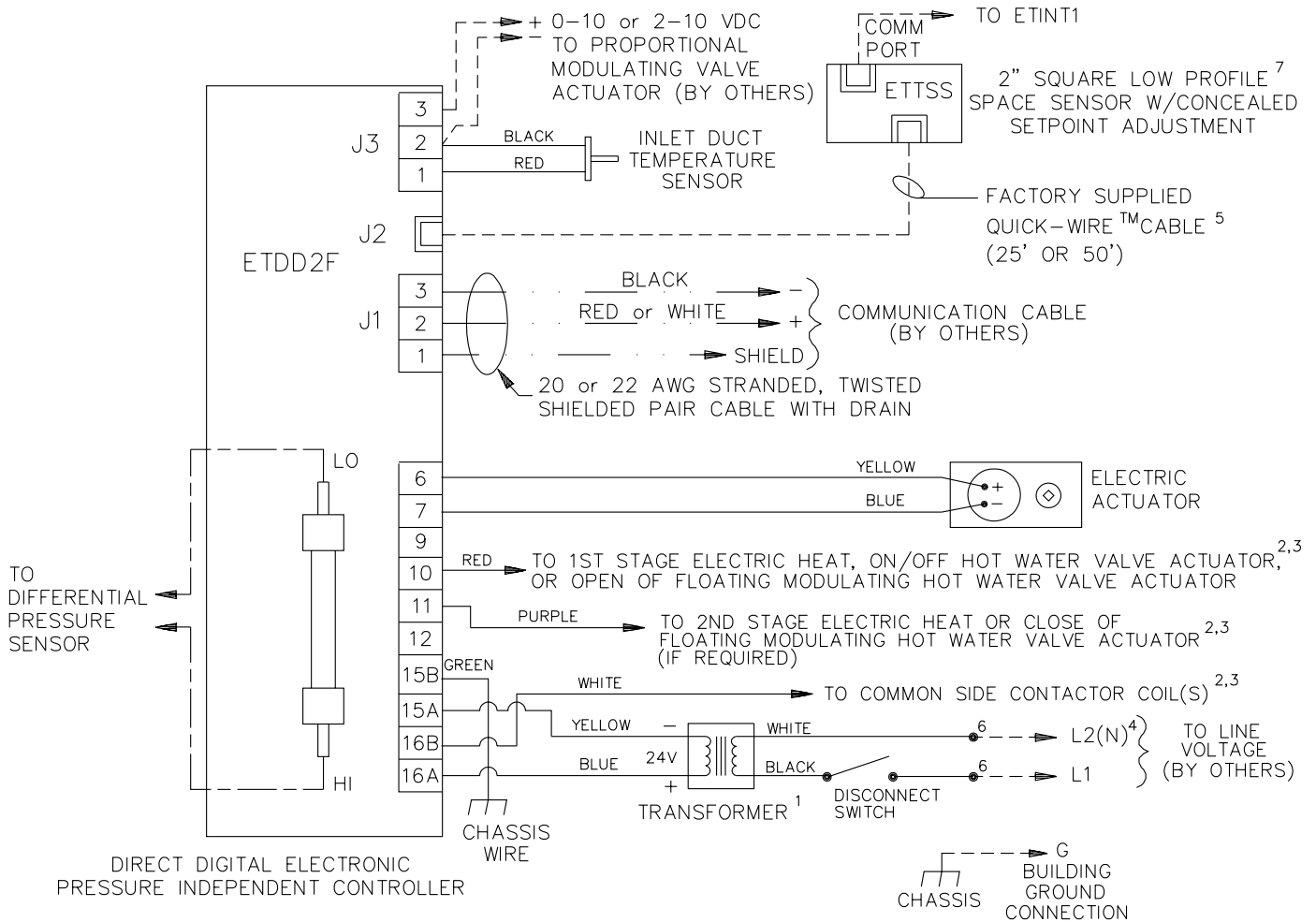
³ 6" WIRES WITH WIRENUTS WILL BE PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS).

- FACTORY TUBING
- FACTORY WIRING
- - - - - FIELD WIRING
- - - - - QUICK-WIRE™ CABLE ²
- FIELD COMMUNICATION WIRING

SDV942S

Factory certified submittal drawings available upon request.

This control sequence provides single duct cooling with changeover and one or two stages of electric or hot water heat. A concealed temperature setpoint adjustment is provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA. IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

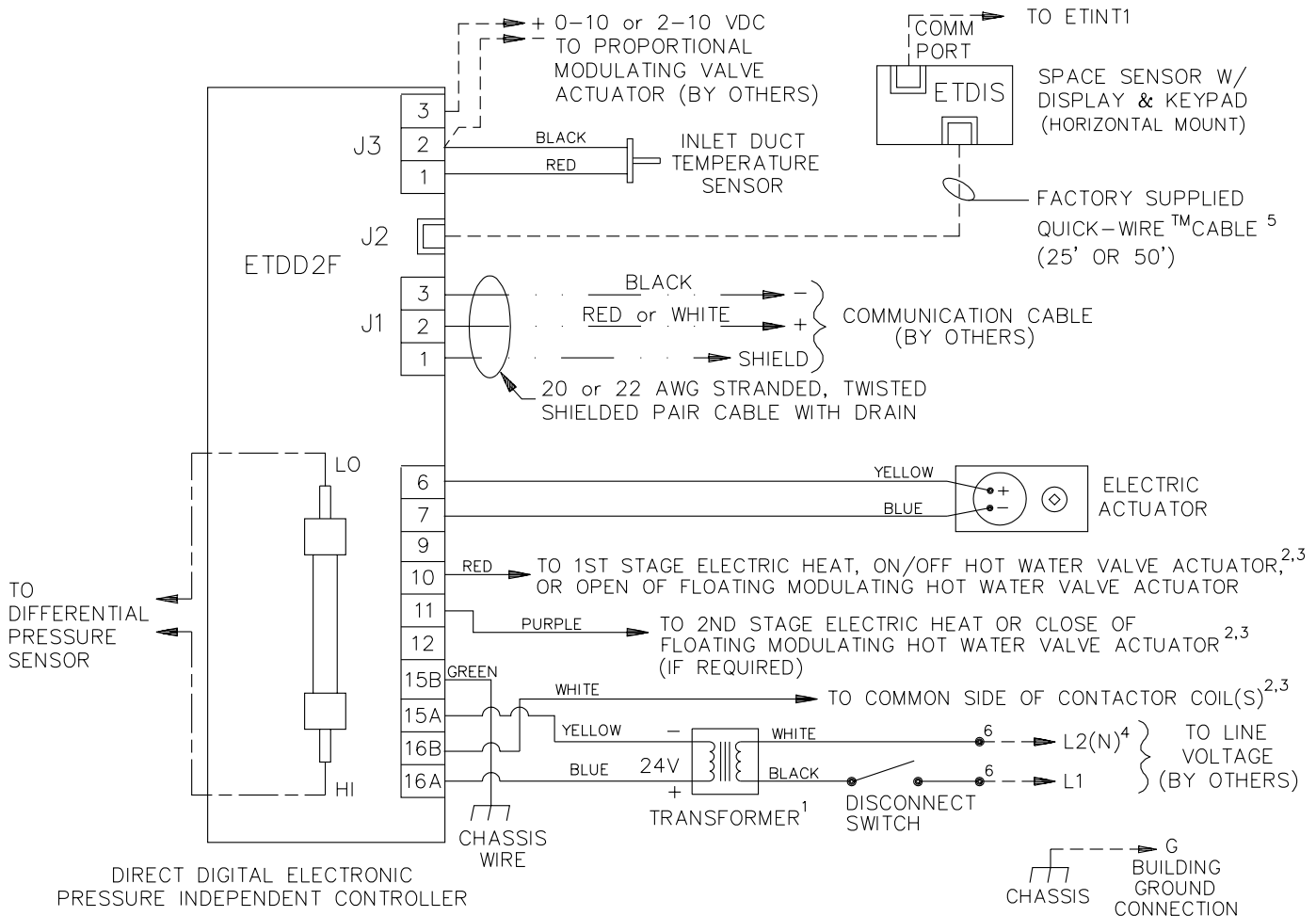
⁷ OPTIONAL EXPOSED SETPOINT WITH FAHRENHEIT OR CENTIGRADE SCALE AVAILABLE

- — — — — FACTORY TUBING
- FACTORY WIRING
- - - - - FIELD WIRING
- - - - - QUICK-WIRE™ CABLE ⁵
- FIELD COMMUNICATION WIRING

SDV945R

Factory certified submittal drawings available upon request.

This control sequence provides single duct cooling with changeover and one or two stages of electric or hot water heat. A digital display and keypad are provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

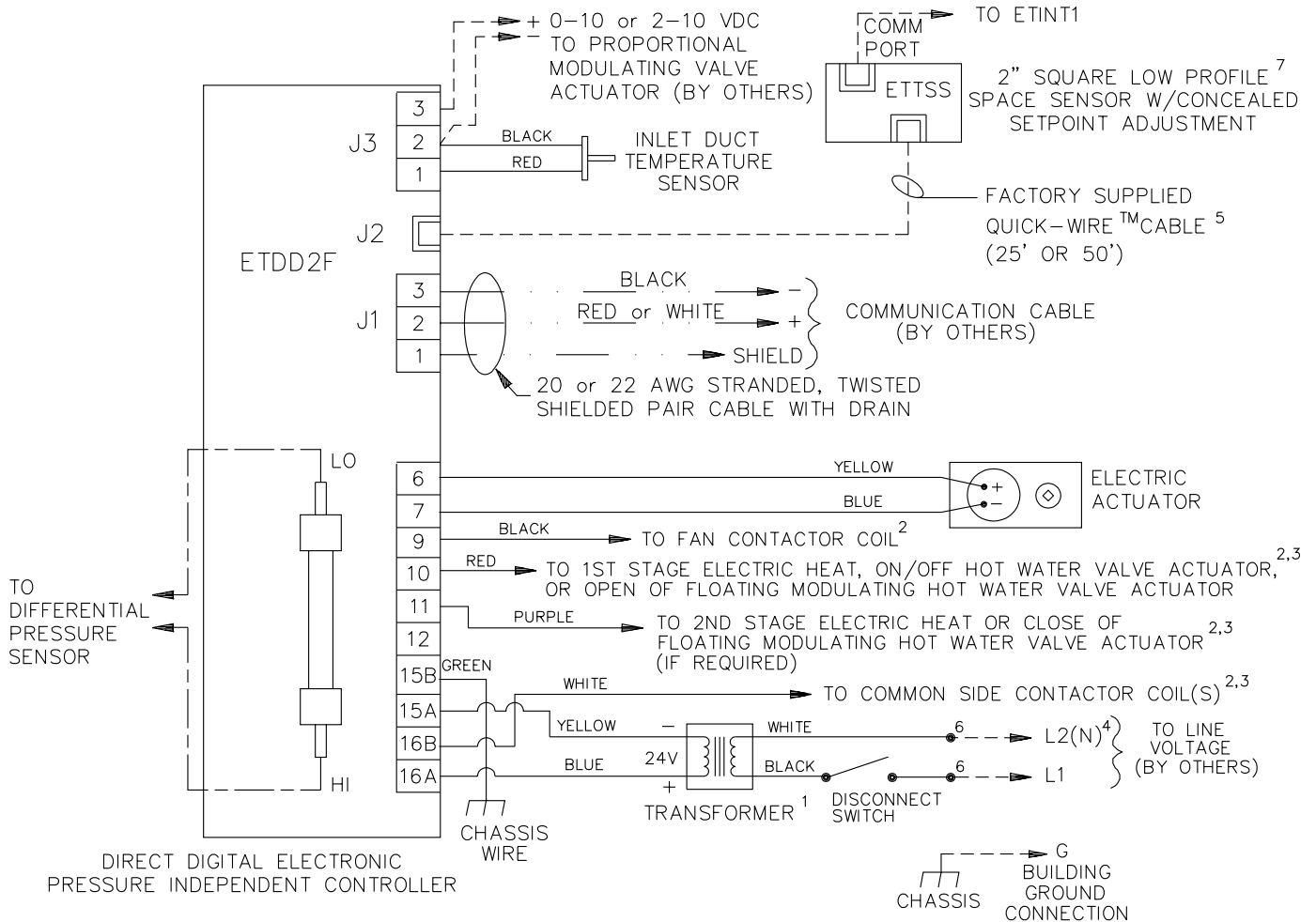
⁵ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO BOTH CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

SDV945S

Factory certified submittal drawings available upon request.

This control sequence provides intermittent fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A concealed temperature setpoint adjustment is provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

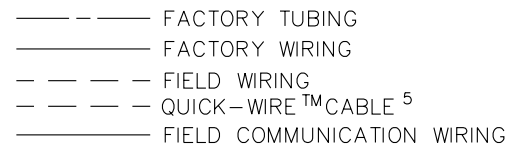
³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

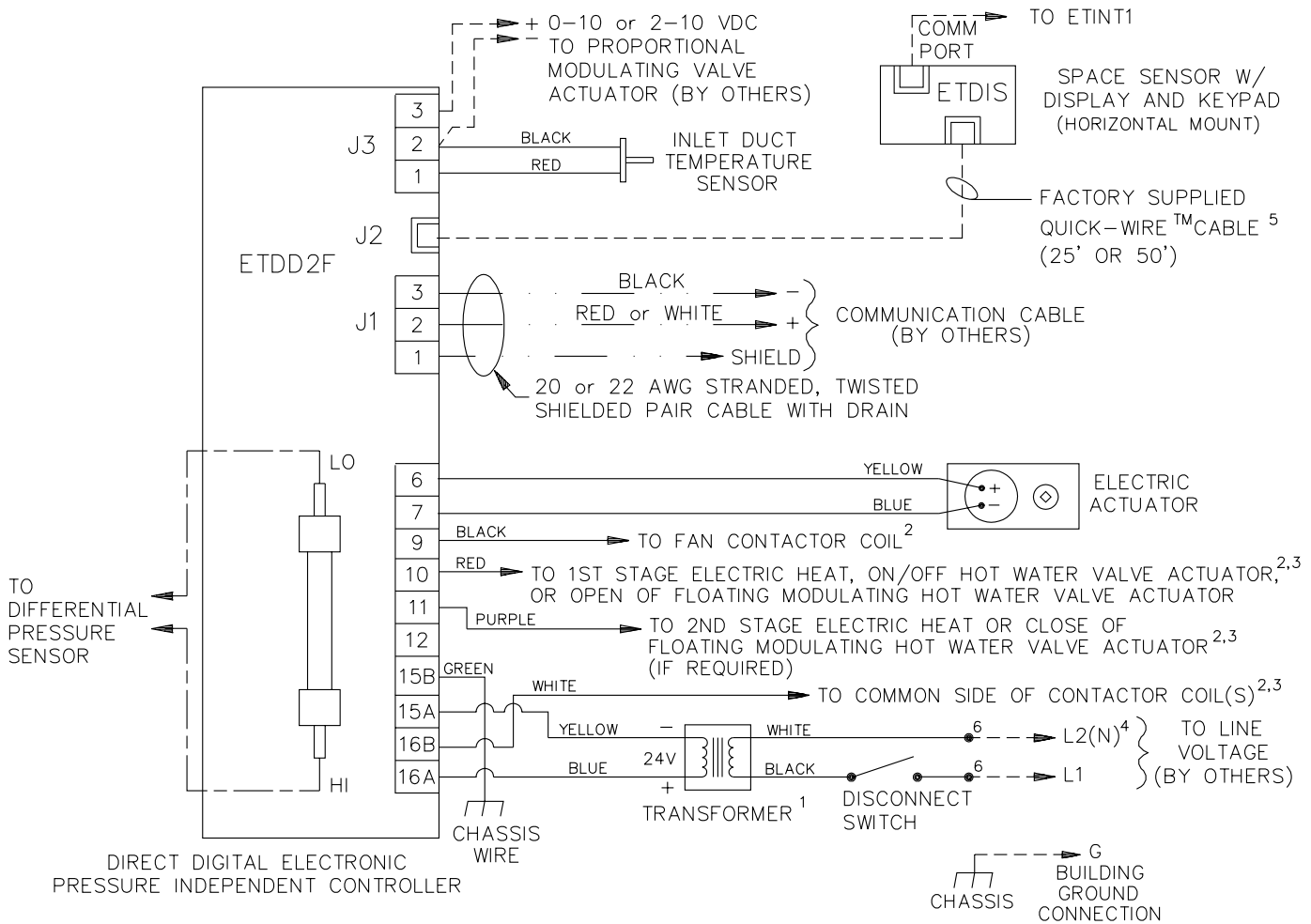
⁷ OPTIONAL EXPOSED SETPOINT WITH FAHRENHEIT OR CENTIGRADE SCALE AVAILABLE



FVV945R

Factory certified submittal drawings available upon request.

This control sequence provides intermittent fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A digital display and keypad are provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

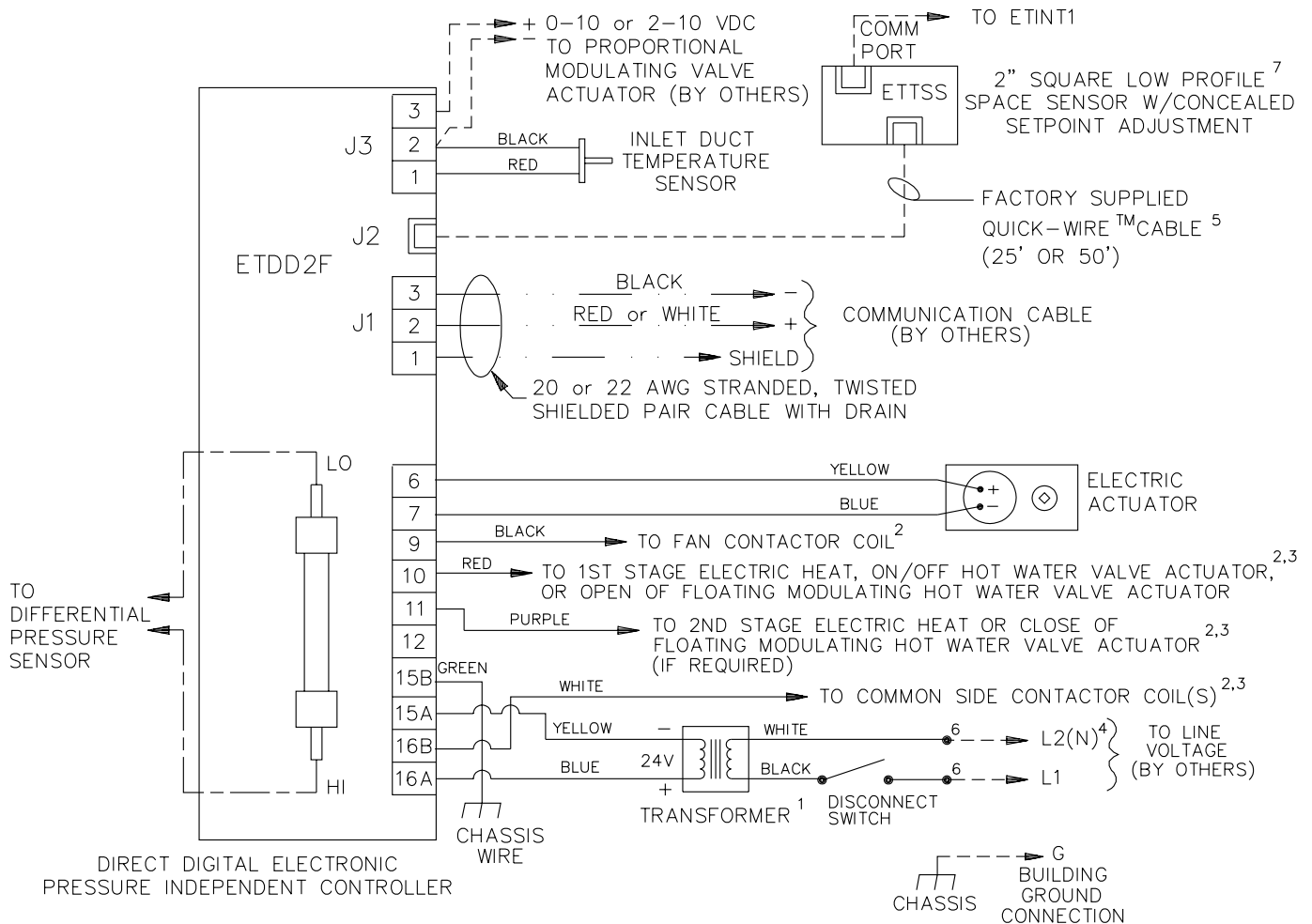
⁵ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

FVV945S

Factory certified submittal drawings available upon request.

This control sequence provides constant fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A concealed temperature setpoint adjustment is provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ CABLE IS TERMINATED AT FACTORY AND MUST BE ROUTED AND PLUGGED INTO CONTROLLER AND SPACE SENSOR IN FIELD. CABLES MUST BE ORDERED SEPARATELY.

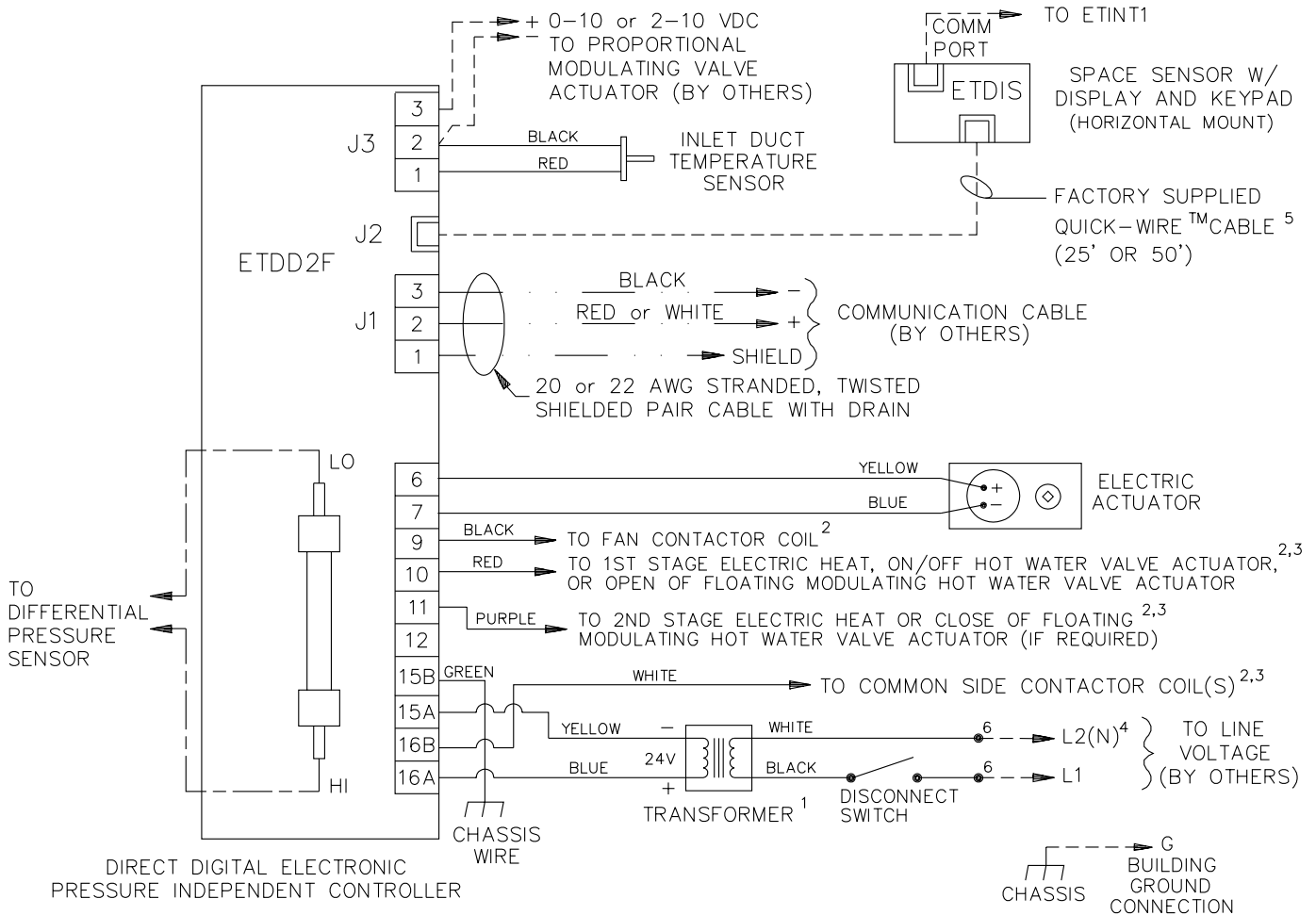
⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

⁷ OPTIONAL EXPOSED SETPOINT WITH FAHRENHEIT OR CENTIGRADE SCALE AVAILABLE

FCV945R

Factory certified submittal drawings available upon request.

This control sequence provides constant fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A digital display and keypad are provided at the space sensor.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF
TRANSFORMER, ADHERE TO CONTROLLER
POWER REQUIREMENTS: 24 VAC, ± 10%,
20 VA MINIMUM. POLARITY MUST BE KEPT
CONSTANT FROM ONE TERMINAL TO ANOTHER
OR SERIOUS DAMAGE TO SOURCE AND
CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER
VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE
RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT
TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED,
FIELD WIRING IS REQUIRED.

- — — — — FACTORY TUBING
- FACTORY WIRING
- - - - - FIELD WIRING
- - - - - QUICK-WIRE™ CABLE⁵
- FIELD COMMUNICATION WIRING

⁴ LINE VOLTAGE WIRING IS DEPENDENT
ON THE HEATER LINE VOLTAGE
REQUIREMENTS. REFER TO HEATER
WIRING FOR CONNECTION.

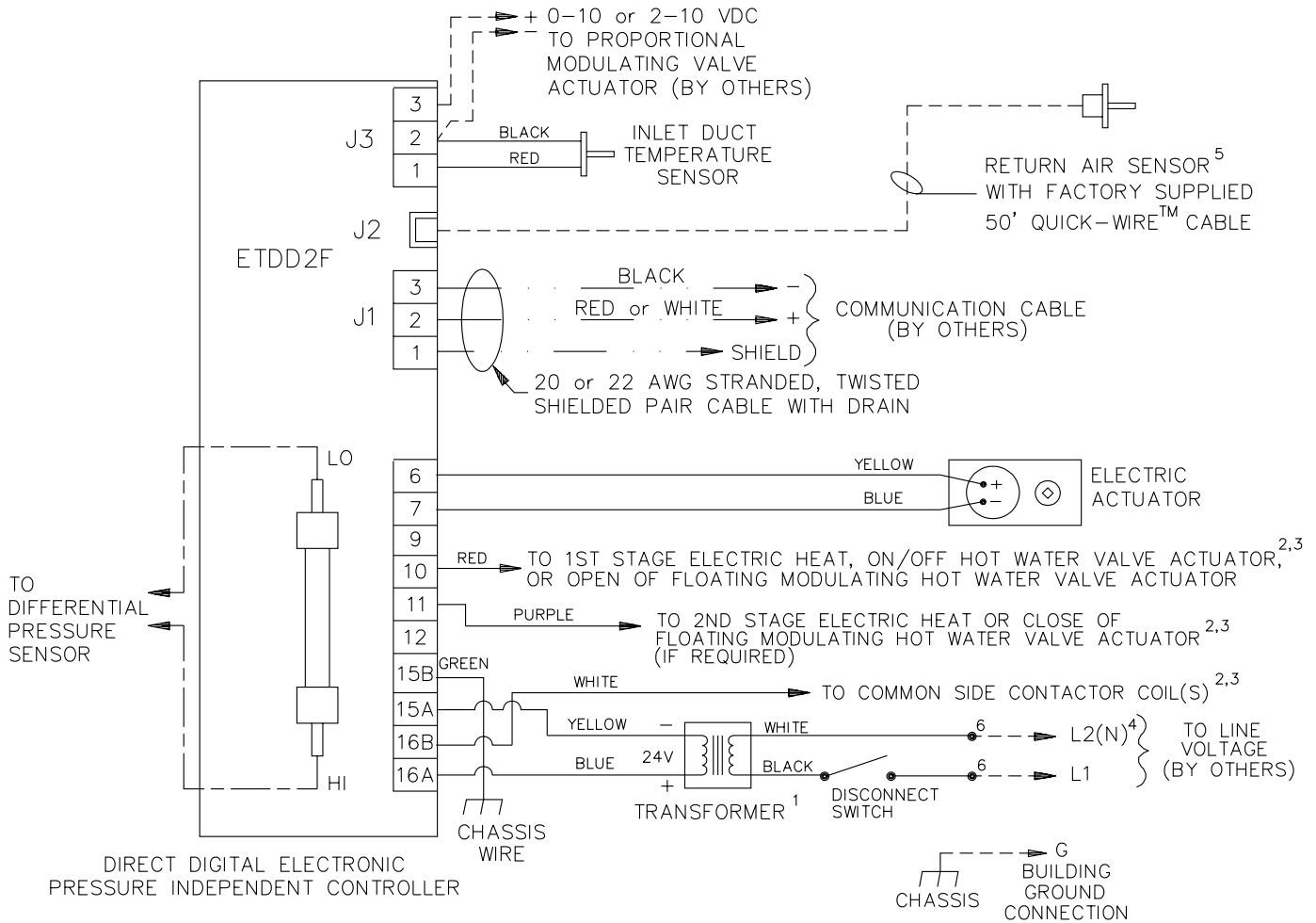
⁵ CABLE IS TERMINATED AT FACTORY AND
MUST BE ROUTED AND PLUGGED INTO BOTH
CONTROLLER AND SPACE SENSOR IN FIELD.
CABLES MUST BE ORDERED SEPARATELY.

⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR
FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

FCV945S

Factory certified submittal drawings available upon request.

This control sequence provides single duct cooling with one or two stages of electric or hot water heat and changeover. A return air temperature sensor is provided.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

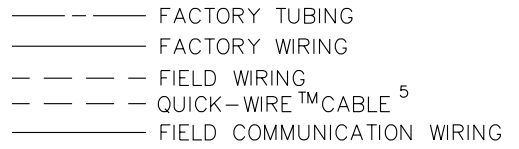
² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ RETURN AIR SENSOR IS TERMINATED AT FACTORY AND MUST BE MOUNTED IN RETURN AIR GRILLE, ROUTED AND PLUGGED INTO CONTROLLER IN FIELD BY OTHERS.

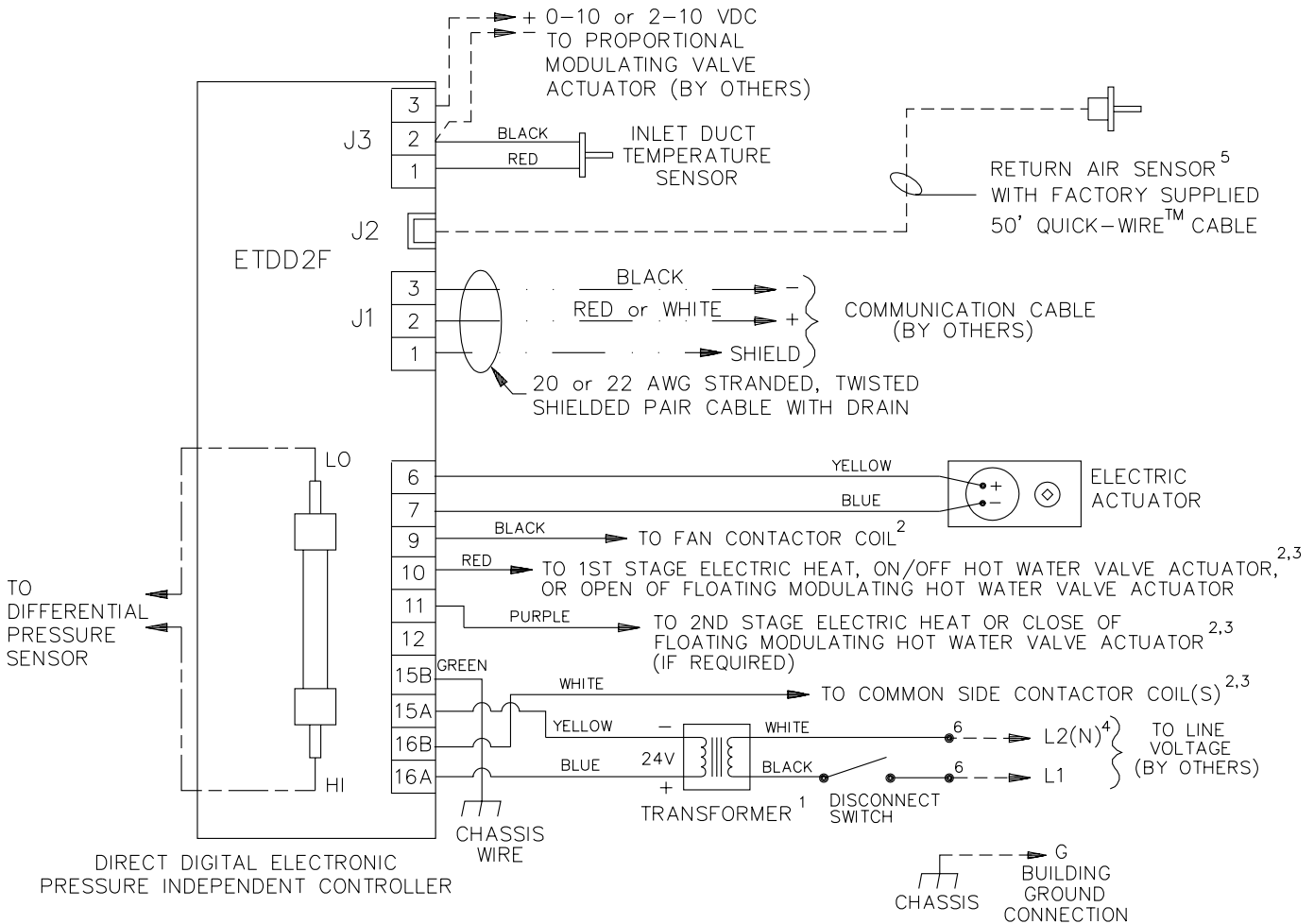
⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)



SDV945DL

Factory certified submittal drawings available upon request.

This control sequence provides intermittent fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A return air temperature sensor is provided.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ RETURN AIR SENSOR IS TERMINATED AT FACTORY AND MUST BE MOUNTED IN RETURN AIR GRILLE, ROUTED AND PLUGGED INTO CONTROLLER IN FIELD BY OTHERS.

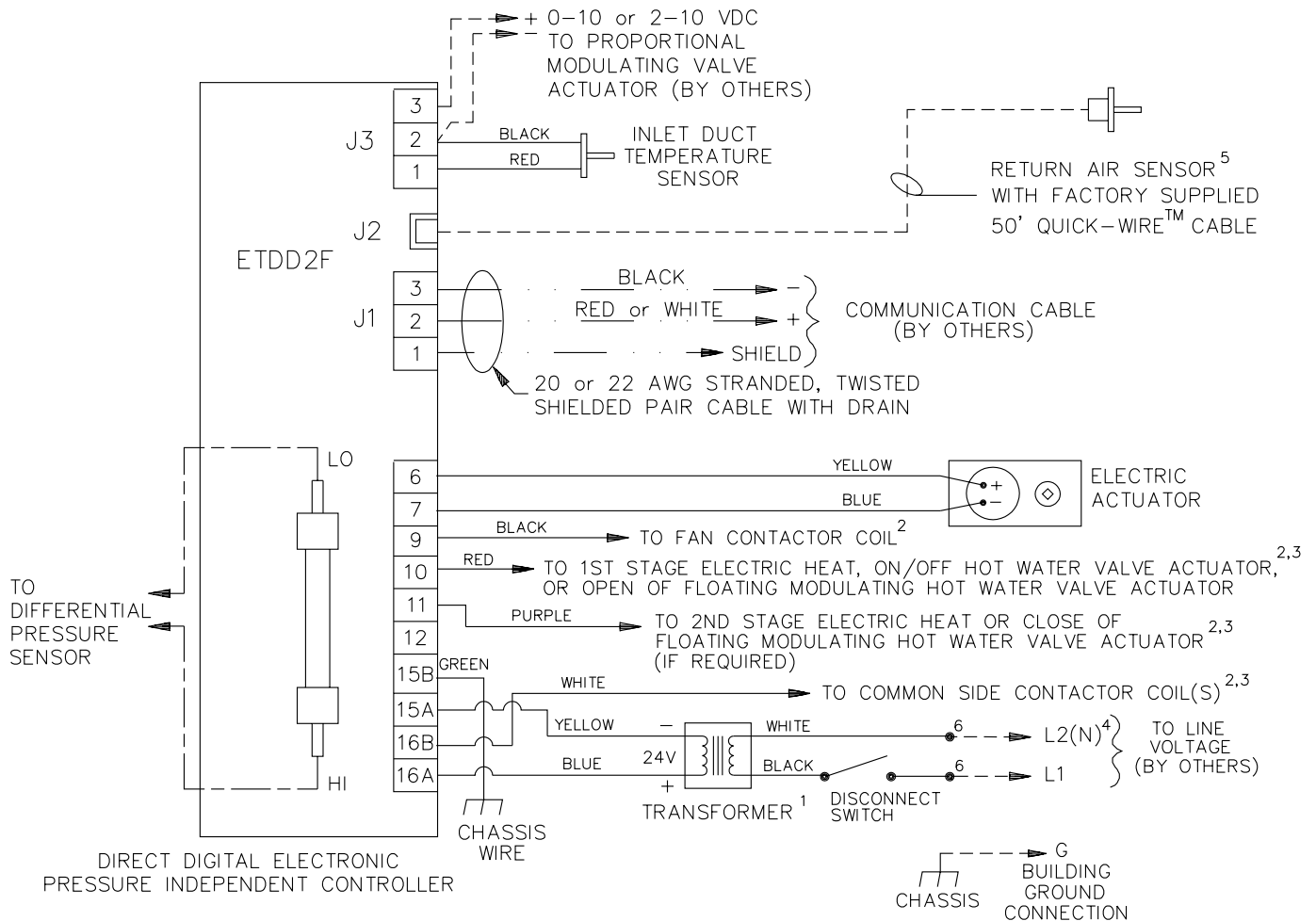
⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)

- — — — — FACTORY TUBING
- FACTORY WIRING
- - - - - FIELD WIRING
- - - - - QUICK-WIRE™ CABLE ⁵
- FIELD COMMUNICATION WIRING

FVV945DL

Factory certified submittal drawings available upon request.

This control sequence provides constant fan powered variable primary air volume control with changeover and one or two stages of electric or hot water heat. A return air temperature sensor is provided.



¹ MINIMUM 50 VA
IF 24 VAC BY OTHERS IS USED IN LIEU OF TRANSFORMER, ADHERE TO CONTROLLER POWER REQUIREMENTS: 24 VAC, ± 10%, 20 VA MINIMUM. POLARITY MUST BE KEPT CONSTANT FROM ONE TERMINAL TO ANOTHER OR SERIOUS DAMAGE TO SOURCE AND CONTROLS MAY RESULT.

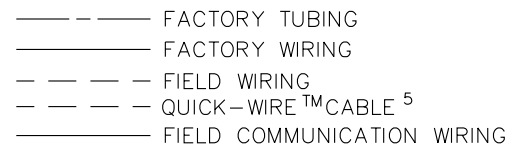
² 24 VAC HOLDING COIL, MAXIMUM 15 VA.
IF ADDITIONAL VA RATING IS REQUIRED FOR WATER VALVE ACTUATOR OR RELAY COIL, ETC., IT IS THE RESPONSIBILITY OF OTHERS TO SUPPLY SUFFICIENT TRANSFORMER CAPABILITY.

³ IF HOT WATER REHEAT IS USED, FIELD WIRING IS REQUIRED.

⁴ LINE VOLTAGE WIRING IS DEPENDENT ON THE HEATER LINE VOLTAGE REQUIREMENTS. REFER TO HEATER WIRING FOR CONNECTION.

⁵ RETURN AIR SENSOR IS TERMINATED AT FACTORY AND MUST BE MOUNTED IN RETURN AIR GRILLE, ROUTED AND PLUGGED INTO CONTROLLER IN FIELD BY OTHERS.

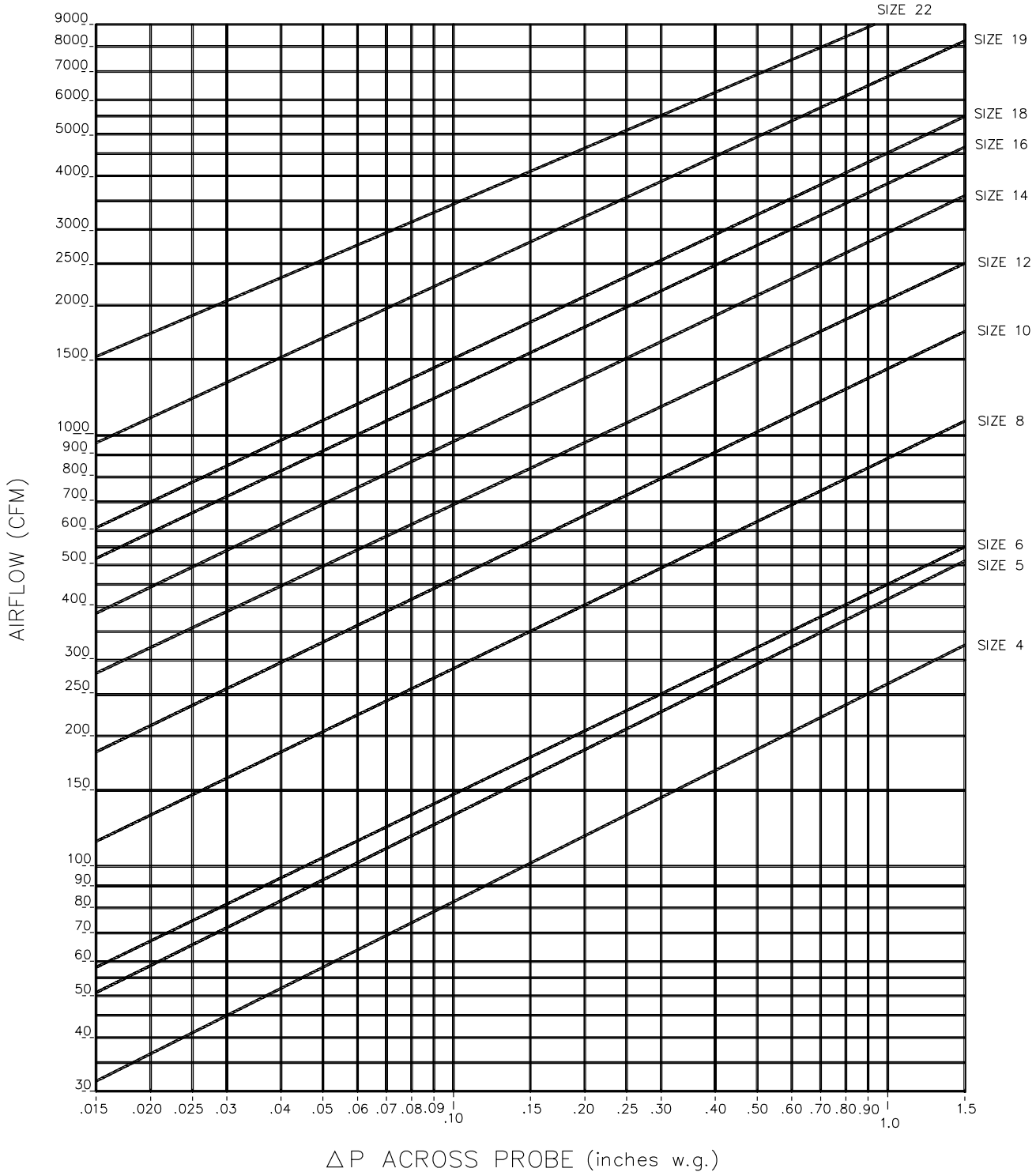
⁶ 6" WIRES WITH WIRENUTS PROVIDED FOR FIELD WIRING OF LINE VOLTAGE (BY OTHERS)



FCV945DL

Factory certified submittal drawings available upon request.

PRIMARY AIR
INLET SIZE



For optimum control accuracy, a straight section of duct at least 1.5 duct diameters long and the same diameter as the inlet collar should be installed upstream of the terminal inlet. Sizes 6 through 22 utilize Flowstar™ multi-axis center averaging sensor; Sizes 4 and 5 utilize single-axis, linear averaging multi-point sensor.

AIRFLOW CURVES

Factory certified submittal drawings available upon request.

Chapter 5

ENVIRO-TEC DDC CONTROL SYSTEM SOFTWARE CONFIGURATION AND OPERATION

A. **Software Component Identification**

There are several different software programs that are utilized by the Enviro-Tec DDC control system. Each of these different programs perform a specific series of functions and must work in conjunction with the other programs in the system. The SCU, BTC and VAV terminal controllers operate from a program that is stored in an IC chip called an EPROM (Erasable, Programmable, Read Only Memory). These EPROM's are downloaded at the factory with a fixed set of operating instructions. Each EPROM also has a label on it that identifies the type and revision of software which it contains. The following are some of the current revisions that can be found on the EPROM labels:

ENVIRO-TEC
ETDU-A-008D-52A0

This is the current label found on the SCU controller board. "ETDU" designates the SCU program. The "A" designates the Intel N80C196KB microprocessor being used on board. (If the label does not contain the "A", the controller is using the older Intel N80C198 microprocessor) The "008D" designates the software revision of the program. The "52A0" designates the program checksum.

ENVIRO-TEC
ETDD-A-6V-004B-ECCC

This is the current label found on the BTC controller board. "ETDD" designates either a VAV terminal or BTC controller. The differentiation is made by the "6V" which designates the BTC program. The "A" designates the Intel N80C196KB microprocessor being used on board. (If the label does not contain the "A", the controller is using the older Intel N80C198 microprocessor) The "004B" designates the software revision of the program. The "ECCC" designates the program checksum.

ENVIRO-TEC
ETDD-A-008G-1593

This is the current label found on the VAV terminal controller board. "ETDD" without being followed by "6V" designates a VAV terminal program. The "A" designates the Intel N80C196KB12 microprocessor being used on board. (If the label does not contain the "A", the controller is using the older Intel N80C198 microprocessor) The "008G" designates the software revision of the program. The "1593" designates the program checksum.

The remaining software programs utilized by the Enviro-Tec DDC control system are found on a system diskette supplied with each job. Currently, there are 3 Enviro-Tec programs stored on diskette. These programs will be explained in subsequent sections of this chapter. They are:

1. "VTMON" This is the system configuration and monitor program.
2. "SETADDR" This is the unit set address program.
3. "M1SETUP" This is the modem configuration program.

Program revisions will be constantly upgraded as improvements and enhancements are made to the Enviro-Tec DDC product line. The policy at Enviro-Tec is to upgrade these software programs so that they are backward compatible. This means that today's program will work on the same network as a future upgraded program without any complications.

B. Determining a Unit Address

Because all Enviro-Tec DDC control system components are connected on a communications network, there must be some way to identify each separate controller from the others. This is accomplished by giving each controller its own unique name or "address". There is a specific structure to the scheme used to assign an address to each system component.

First, the SCU. Up to 100 SCU's may be networked together on the inter-SCU network. The address of the SCU will also designate its system number. An SCU can be addressed as 000, 100, 200, 300, 400 up to 9900. Respectively, SCU address 000 would be system 0, SCU address 100 would be system 1, SCU address 2100 would be system 21, etc.

Second, the BTC. Each SCU can accommodate 1 BTC on its zone network. The BTC address will always end with 65. The system number will precede the BTC address 65 on each system zone network. Respectively, the system 0 BTC would have an address of 65, the system 8 BTC would have an address of 865, the system 42 BTC would have an address of 4265, etc.

Third, the VAV terminal controller. Each SCU can accommodate up to 64 VAV zone terminal controllers on its system zone network. As with the BTC's, the VAV terminal controller's address will be preceded with the system number. Respectively, system 0, VAV terminal 3 would have an address of 3; system 5, VAV terminal 16 would have an address of 516; system 80, VAV terminal 63 would have an address of 8063, etc.

For convenience of addressing the different components on a zone network, the components do not have to be wired in any particular numerical address order. The SCU, however, must be wired at the physical beginning of the zone network. Also, you cannot install components belonging to different SCU systems on the same zone network.

C. Setting a Unit Address

After determining the unit address for each system component, this information must then be downloaded to the individual controller. There are several different methods by which this task may be accomplished. They are:

1. For the SCU, the SETADDR program or the SCU operators panel may be used.
2. For the BTC and the VAV terminal, the ETDIS display thermostat or the SETADDR program may be used.
 - a. **To address the SCU with the SCU operators panel.** After turning on the SCU power in accordance with the instructions in chapter 6, "Current Mode" and "Standby" will be displayed. Press and release the Enter button 15 times and "SCU Identifier" will be displayed. Press and release the Next button 1 time. "Unit Address" will be displayed. Enter the desired SCU address. Press and release the Mode button 1 time. Press and release the "0" button 1 time. Press and release the Enter button 1 time. "System Control Unit" will be displayed. The SCU address has been set.
 - b. **To address any system component with the SETADDR program.** This procedure requires an IBM compatible computer, the system diskette supplied with the job, the ETINT1 and QW6N cables supplied with the job. Begin by inserting the system diskette into the computer's floppy disk drive. Insert the ETINT1 cable's 9 pin female connector into the computer's serial communication port. Note which communications port is being used (1,2, etc.). Insert either end of the QW6N cable into the free end of the

ETINT1 cable. Turn the computer on and allow it to boot from the system diskette. Plug the free end of the QW6N cable into any 6 pin communication port on the device to be addressed. On the SCU, there are ports on the ETDUA8 mother board as well as a port on the front of the operators panel. On the VAV terminal, the port on the top of the thermostat would be the most convenient. On the BTC, the port is on the controller itself. At the DOS prompt "A:", type "SETADDR" if port 1 is being used. If port 2,3 or 4 is being used, type "SETADDR 2" for port 2, etc. The computer will read the file from disk and display the following:

```
Set Address - 002 Copyright (c) 1993 Environmental Technologies, Inc.  
Current Address: 101  
Type in new address or Press <ESC> key to exit...  
Enter new address:
```

The standard address default is either 001 or 101. Simply enter the address number required, press the <ENTER> key and the new unit address is now set. Remove the QW6N cable end from the system component that has just been addressed, move to the next component and repeat only the addressing procedure. There is no need to turn the computer off after each component is addressed.

- c. **To address the BTC or the VAV terminal with the ETDIS display thermostat.** The ETDIS display thermostat may be used alone or in conjunction with an ETTS regular thermostat to set the unit address on a VAV terminal controller.

If the VAV terminal controller uses an ETDIS display thermostat, insert the ETKEY (shipped with the ETCOMPAC communication package) into the communication port at the top of the ETDIS display thermostat.

If the VAV terminal controller uses an ETTS regular thermostat, insert one end of the QW6N cable into the communication port at the top of the ETTS regular thermostat and the other end into the bottom port of the ETDIS display thermostat. Insert the ETKEY (shipped with the ETCOMPAC communications package) into the communication port at the top of the ETDIS display thermostat.

In either case, the following will be displayed on the ETDIS display:

00 UA

Press the MODE button on the ETDIS. The current unit address will be displayed, example:

101

Using the COOLING adjust buttons, set the desired unit address. The right arrow button will increase the address number and the left arrow button will decrease the address number. Use the HEATING adjust buttons to set the desired system number. Again, the right arrow button will increase the system number and the left arrow button will decrease the system number.

Once the unit address is set, remove the ETKEY from the ETDIS display thermostat. The Heating and Cooling setpoints will be displayed again. The address is now set in the EEPROM memory chip. If an ETDIS has been used in conjunction with an ETTS, remove the QW6N cable and the ETDIS at this time. Move on to the next unit.

To set the unit address in the BTC, the ETDIS and QW6N cable combination must be inserted directly into the communication port on the ETDD6V static pressure control board. The above steps may then be utilized.

D. Running the VTMON setup and monitor program

To communicate with an Enviro-Tec DDC control system via the VTMON software, the following will be required:

1. An IBM compatible, DOS based computer, laptop or desktop.
2. The VTMON system disk found in the ETCOMPAC communication package.
3. The ETINT1 interface cable found with the ETCOMPAC communication package.
4. The QW6N 6 foot communication cable, also found with the ETCOMPAC.

Insert the ETINT1 cable's 9 pin female connector into the computer's serial communication port. Note which communications port is being used (1,2, etc.). Insert either end of the QW6N cable into the free end of the ETINT1 cable. Turn the computer on and allow it to boot from the system diskette or on-board fixed disk drive. If booting the computer from a fixed disk drive, do not attempt to run the VTMON program out of "Windows". The VTMON program is strictly a "DOS" based operation and attempting to operate out of "Windows" may cause the computer to "lock-up".

Plug the free end of the QW6N cable into the 6 pin communication port on any system device. At the DOS prompt (A: or C:), type VTMON and press the enter key. The drive will access the disk, read the program and display the following on the screen:

```
VTMON 2.08a - Copyright (c) 1993 Environmental Technologies, Inc.  
( Press any key to continue. )
```

The 2.08a shown above is a program revision level and may change as program enhancements are made and upgrades are written. By pressing any key, the "ETI DDC NETWORK" screen will be displayed, the program will attempt communication with all system components on the network and initialize the communication routine of the SCU on the network if one is found. Note that the operator's panel on the SCU will display "InterSCU PC Com in Progress" and the keypad on the operator's panel will be disabled during VTMON operation.

E. Using the VTMON setup and monitor program

Once the VTMON program has accessed the Enviro-Tec DDC control system, it will be necessary to "maneuver" through the program to setup and monitor the various system components. The following keys will allow for the manipulation of the VTMON program.

1. Cursor navigation keys. The up, down, left and right arrow keys will move the cursor to the desired data location to access an address or alter setup data.
2. Screen change keys. The page up and page down keys allow the screens to be scrolled through. Once a system component has been accessed, the page up and page down keys allow the operator to view the different screens related to that unit.
3. Data alteration. Once data is altered, the enter key will insure that the information is stored in the EEPROM chip and also automatically advances the cursor to the next data location.
4. Data Entry keys. The numeric, alphabetic, space bar and minus keys are used to change the various configuration settings. Note that some configurations utilize a decimal point. In most cases, this decimal point is fixed. For example, to enter a temperature of 74.5 degrees, simply type in 745 and the decimal point will automatically be inserted. To enter a negative value in a configuration, type in the minus after entering a numerical value.

5. Data Erase. The backspace key will erase or delete entered data one character at a time.
6. Optional Data configuration settings. Some configurations have a fixed set of options to choose from. The space bar will toggle through those options.
7. Returning to the Network Monitor screen. The Esc key will return the program to the Network Monitor screen from any other screen.
8. Exit the program. Pressing the Alt and X keys simultaneously will exit the VTMON program and return to DOS from the Network Monitor screen.

F. Command Line Options

When calling up the VTMON program, several options are available to “customize” the program for specific needs. These options are entered after the VTMON program name at the DOS prompt. The options are identified as either a number or letter, depending on the individual option. A space must separate the program name (VTMON) and the option designation. Multiple options may be used at the same time. These options are:

1. Serial communication port. The VTMON program automatically defaults to the number 1 serial communications port on the PC. If, however, a different communication port is used such as 2, 3 or 4, this must be designated on the command line so that the program will know which port to communicate from. For instance, if serial port number 2 is used, type: VTMON 2 This will cause the program to communicate through serial communication port number 2.
2. Black and White screen display. When using a non-color, monochrome computer display, the command line option “b” should be used. This will produce a higher resolution display with sharper features on the black and white or monochrome monitor. Type: VTMON b
3. Modem communication. When calling into an Enviro-Tec DDC system from a remote location, the command line option “m” should be used. This option will prompt the operator to enter the proper modem number to establish a communication link. Type: VTMON m
4. Non-SCU system. When initiating communication with the VTMON program to a system with no SCU, the command line option “n” should be used. This will format the program to eliminate the SCU search when network communication is established. Type: VTMON n
5. Maintenance and Override. When a diagnostic, maintenance or balancing need occurs, the command line option “d” should be used. The diagnostic mode of operation allows for the manual override of outputs, an additional screen at the end of each individual component screen set to display low level controller information and communication error status at the bottom of any screen. Type: VTMON d.
6. 9600 Baud Communication. When an internal ETCOMV card is used in a PC to communicate directly to the Enviro-Tec DDC zone bus, the command line option “f” should be used. This will tell the PC to boost the communications baud rate from 2400 to 9600 for a direct, on the bus communication link. This option will not function when using the ETINT1 communication interface cable. Type: VTMON f.

ETI DDC NETWORK

SCU
BTC

RTU - 3
S.P. CONTROL - 3

Discharge Temp.:
Static Pressure:

57.3
1.25

14:00
03/07/95

Press <F1> for Help

Space Temp	Htng Setpt	Cing Setpt	Temp Offset	Airflow Actual	Setpt	Duct Temp
76.8	73.0	77.0	0.0	75	62	57.7
76.0	74.0	78.0	0.0	94	100	57.4
77.6	73.0	77.0	0.0	261	280	57.8
76.6	74.0	78.0	0.0	65	50	58.0
75.5	72.0	76.0	0.0	61	50	58.0
71.8	68.0	72.0	0.0	388	373	58.0

- 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - 10
 - 11
 - 12
 - 13
 - 14
- ◆
- Ken's Office
 - Hallway
 - Break Room
 - Bill's Room
 - Conference Rm
 - Jerry's Room

System: 1
InterSCU Com

ETI DDC NETWORK

SCU RTU - 3

BTC S.P. CONTROL - 3

Discharge Temp.: 57.3

Static Pressure: 1.25

14:00

03/07/95

Occupied Cooling

Press <F1> for Help

	Space Temp	Htng Setpt	Clng Setpt	Temp Offset	Airflow Actual	Setpt	Duct Temp
1							
2					5	62	57.7
3					4	100	57.4
4					61	280	57.8
5					5	50	58.0
6					1	50	58.0
7					88	373	58.0
8							
9							
10							
11							
12							
13							
14							

Ken's Office

Hallway

Break Room

Bill's Room

Conference

Jerry's Roo

Reading Configuration

65%

Online
14

“ETI DDC NETWORK” Screen

(see previous page for screen example)

This is the network monitor screen. It lists all of the responding controllers on the network and includes the critical operating parameters of each. There is a “Diamond” that scrolls down the left side of this screen. As the diamond pauses next to each controller address, it updates all of the information displayed from that controller. Since the first ETI DDC NETWORK screen displays only up to address 14, the “Page Down” and “Page Up” keys will scroll to additional screens up to address 64 and back.

The following system information is displayed and updated on this screen continuously:

1. Discharge Temp: Air handling unit discharge temperature.
2. System Mode: Occupied or Unoccupied Mode.
3. Time of day and date.
4. System Operating Status: Cooling, Heating, Ventilation or Standby.
5. Static Pressure: Pressure in inches of water column.

The following VAV terminal information is displayed and updated on this screen continuously:

1. VAV terminal address and user established identifier.
2. Space Temp: VAV control zone temperature in degrees F.
3. Htng Setpt: Heating temperature setpoint.
4. Clng Setpt: Cooling temperature setpoint.
5. Temp Offset: Degrees space temp is above cooling or below heating setpoint.
6. Airflow Actual: Current actual primary airflow through VAV terminal in CFM.
7. Airflow Setpt: Current setpoint for primary airflow through VAV terminal in CFM.
8. Duct Temp: VAV terminal inlet duct temperature in degrees F.
9. System: System number (0-99) currently being communicated with. (Upper left corner)
10. Polling time: Time in seconds till next system polling. (Lower right corner)
11. Online/Offline: Indicates whether VTMON program is communicating. (Lower left corner)

On the sample screen, pictured on the previous page, notice the reverse video block highlighting address number 2. This block will allow access to whichever unit name (SCU or BTC) or address (VAV terminal) it highlights. The up arrow and down arrow keys will move this block up and down the address column so that the desired address may be accessed. To access a specific unit, move the reverse video block to the unit address or name desired and press the Enter key. A “Reading Configuration” block will appear in the center of the screen. The sample screen displayed on the next page shows that the enter key was pressed while the reverse video block was located on address number 2. The “Reading Configuration” block shows that the computer running the VTMON program has read 65% of the VAV terminal unit 2 configuration. When 100% of the configuration has been downloaded, the program will display the first VAV terminal screen for unit 2 automatically.

System: 1

System Control Unit - Monitor

InterSCU Com

Zone Controllers

Number Responding 6
 Cooling Votes 328
 Heating Votes 40
 Overriding Zone 0

Air Temperature

Discharge Temperature 57.3 °F
 Return Temperature ****. * °F
 Outside Temperature ****. * °F

Scheduling

Date 03/07/95
 Time 13:11
 Day Tuesday

Output Control

-----Operation Mode-----
 Occupied Cooling
 -----AHU Relay Control-----
 1. Fan ON 00:00 min.
 2. Cooling 1 ON 00:00 min.
 3. Cooling 2 OFF 03:20 min.
 4. Heating 1 OFF 00:00 min.
 5. Heating 2 OFF 00:00 min.
 6. Auxiliary 1 ON 00:00 min.
 7. Auxiliary 2 OFF 00:00 min.
 8. Changeover ON 00:00 min.

Cycle Timers

Cooling to Heating 00:00 min.
 Heating 00:00 min.
 Heating to Cooling 00:00 min.
 Cooling 04.25 min.

Online

31

“System Control Unit - Monitor” Screen
(see previous page for screen example)

The System Control Unit - Monitor screen displays all current operating information related to the system. See the sample screen displayed on the previous page. None of the data on this screen can be altered by the operator. Any setpoint or parameter changes must be made in subsequent screens. There are 5 information blocks within this screen. The information in each block updates in real time as quickly as the computer running the VTMON program will allow.

1. **Zone Controllers** (VAV terminal communication and voting information.)
 - a. Number responding: Number of VAV terminal controllers responding to the system polling.
 - b. Cooling Votes: Number of cooling votes recorded during the last system polling.
 - c. Heating Votes: Number of heating votes recorded during the last system polling.
 - d. Overriding Zone: Unit address where an unoccupied override has been pushed.

2. **Scheduling** (Current time and date information.)
 - a. Date: Current date in day/month/year format.
 - b. Time: Current time in 24 hour clock format.
 - c. Day: Current day of week in Sunday through Saturday format.

3. **Cycle Timers** (Mode of operation timer information.)
 - a. Cooling to Heating: Ventilation cycle time remaining in change from cooling to heating.
 - b. Heating: Heating cycle time remaining till mode change decision is made.
 - c. Heating to Cooling: Ventilation cycle time remaining in change from heating to cooling.
 - d. Cooling: Cooling cycle time remaining till mode change decision is made.

4. **Air Temperature** (System temperature information.)
 - a. Discharge Temperature: Air handler unit discharge temperature in degrees F.
 - b. Return Temperature: Optional air handler unit return air temperature in degrees F. If no sensor is connected to this input, a series of asterisks will be displayed.
 - c. Outside Temperature: Optional outside air temperature in degrees F. If no sensor is connected to this input, a series of asterisks will be displayed.

5. **Output Control** (System mode and SCU output status.)
 - a. Operation Mode: Occupied or Unoccupied, Cooling or Heating or Ventilation or Standby.
 - b. AHU Relay Control: SCU dry contact status.
 1. Left column displays output relay assignments.
 2. Center column displays output relay status.
 3. Right column displays anti-cycle timer status of output relay.

System: 1

System Control Unit - Schedule

InterSCU Com

Occupied Schedule

Sunday	00:00 to 00:00	00:00 to 00:00
Monday	07:30 to 19:00	21:00 to 23:00
Tuesday	07:30 to 19:00	00:00 to 00:00
Wednesday	07:30 to 19:00	00:00 to 00:00
Thursday	07:30 to 19:00	00:00 to 00:00
Friday	07:30 to 19:00	00:00 to 00:00
Saturday	08:00 to 12:00	00:00 to 00:00
Holiday	00:00 to 00:00	00:00 to 00:00

Holidays

1. 00/00 to 00/00
2. 00/00 to 00/00
3. 00/00 to 00/00
4. 00/00 to 00/00
5. 00/00 to 00/00
6. 00/00 to 00/00
7. 00/00 to 00/00
8. 00/00 to 00/00
9. 00/00 to 00/00
10. 00/00 to 00/00
11. 00/00 to 00/00
12. 00/00 to 00/00
13. 00/00 to 00/00
14. 00/00 to 00/00
15. 00/00 to 00/00
16. 00/00 to 00/00

Set Time Clock

Set New Date	03/07/95
Set New Time	13:10
Set New Day	Tuesday
Daylight Savings	Yes

“System Control Unit - Schedule” Screen
(see previous page for screen example)

The System Control Unit - Schedule screen is utilized to set up the daily occupied scheduling, the holiday period scheduling, as well as the time of day, date, day of week and daylight saving time compensation option. See sample screen displayed on previous page. There are 3 set up blocks within this screen to handle the above function.

- 1. Occupied Schedule** (Daily system occupied times.)
 - a. Left column displays day of week and holiday designation. The holiday designation applies to all holiday periods assigned in the “Holidays” block to the right.
 - b. Center column displays the first available daily occupied mode. From and to occupied times must be set in 24 hour clock format. If no occupied period is desired, use the “00:00 to 00:00” format entry.
 - c. Right column displays the second available daily occupied mode. From and to occupied times must be set in 24 hour clock format. If no occupied period is desired, use the “00:00 to 00:00” format entry.

- 2. Set Time Clock** (System clock/calendar)
 - a. Set New Date: Set current date using a day/month/year format.
 - b. Set New Time: With “Daylight Savings Time” set to “No”, enter current, standard time in 24 hour clock format.
 - c. Set new Day: With the spacebar, toggle through choices till current day of week appears.
 - d. Daylight Savings: With spacebar toggle to “Yes” or “No” option. When set to “Yes”, the internal calendar will automatically compensate for seasonal changes into and out of daylight savings time.

- 3. Holidays** (Alternate holiday period scheduling.)
 - a. Left column displays holiday number. 16 different holiday periods are available.
 - b. Right column allows entry of specific holiday period in day/month format.

System Control Unit - Auxiliary Schedule

Auxiliary Output Scheduling

	AUX1	AUX2	AUX3
Sunday	00:00 to 00:00	18:30 to 24:00	00:00 to 00:00
Monday	08:00 to 15:00	18:30 to 07:30	00:00 to 00:00
Tuesday	08:00 to 15:00	18:30 to 07:30	00:00 to 00:00
Wednesday	08:00 to 15:00	18:30 to 07:30	00:00 to 00:00
Thursday	08:00 to 17:00	18:30 to 07:30	00:00 to 00:00
Friday	08:00 to 17:00	00:00 to 00:00	00:00 to 00:00
Saturday	10:00 to 14:00	00:00 to 00:00	00:00 to 00:00
Alternate	06:00 to 09:00	00:00 to 00:00	00:00 to 00:00

Alternate Days

	Schedule	Plus Override	Schedule
1.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
2.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
3.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
4.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
5.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
6.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
7.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00
8.	00/00 to 00/00	00/00 to 00/00	00/00 to 00/00

“System Control Unit - Auxiliary Schedule” Screen
(see previous page for screen example)

The System Control Unit - Auxiliary Schedule screen is utilized to set up the daily operation of any SCU output relays defined as Auxiliary 1, 2 or 3. These schedules may or may not be different from the standard system occupied schedule. These auxiliary output relays may be used to control any system external device that will respond to a dry contact closure. Enviro-Tec will not accept any responsibility for the operation of any such device as the auxiliary output relay is merely performing an external timeclock function. See sample screen displayed on previous page. There are 2 setup blocks within this screen to handle the above functions.

- 1. Auxiliary Output Scheduling** (Daily auxiliary output relay scheduling.)
 - a. Left column displays day of week and Alternate designation. The alternate designation applies to all alternate periods assigned in the “Alternate Days” block for that auxiliary output relay.
 - b. Aux1 column displays the from and to daily on time schedule for auxiliary control relay number 1. From and to on times must be set in 24 hour clock format. If no on time is desired, use the “00:00 to 00:00” format entry.
 - c. Aux2 column displays the from and to daily on time schedule for auxiliary control relay number 2. From and to on times must be set in 24 hour clock format. If no on time is desired, use the “00:00 to 00:00” format entry.
 - d. Aux3 column displays the from and to daily on time schedule for auxiliary control relay number 3. From and to on times must be set in 24 hour clock format. If no on time is desired, use the “00:00 to 00:00” format entry.

- 2. Alternate Days** (Alternate day period auxiliary output relay operation.)
 - a. Left column displays alternate day period number. There are 8 alternate schedules available.
 - b. The 3 alternate day columns correspond with the 3 individual auxiliary output relay time schedules. The alternate day periods allow for alternate on time operation of the specific output relays. Alternate day periods must be entered in day/month format.
 - c. The bottom line of the alternate days block allows for 2 separate options. These options may be selected by toggling the spacebar.
 1. Schedule: The auxiliary output relay will be on during schedule time only.
 2. Plus Override: The auxiliary output relay will be on during schedule time and any user initiated unoccupied override time.

System Identity Settings

SCU Identifier RTU - 3
 SCU Address 300

Sensor Calibration

Duct Temp Adjust -1.0 °F
 Return Temp Adjust 0.0 °F
 Outside Temp Adjust 0.0 °F

System Configuration

Mode Selected By Majority Vote
 Total Cycle Time 30 min
 Minimum Cooling 5 min
 Minimum Heating 5 min
 Duct Purge 2 min

Logging Control

Logging Interval 0 min
 Log Alarm No Alarm ()
 Logging Configuration 1

Logging Configuration Description

[Discharge Tmp] [Occupied Status] [Operating Mode] [Zone / BTC Response]
 [Relay Status] (Return Tmp) Outside Tmp) (Votes Counted)

“System Control Unit - Configuration Settings” Screen
(see previous page for screen example)

The System Control Unit - Configuration Settings screen is utilized to configure the operating parameters of the system control unit itself. See sample screen displayed on previous page. There are 5 setup blocks within this screen to handle the following functions.

- 1. System Identity Settings** (System name and address.)
 - a. SCU Identifier: A name or designation given to the specific SCU that may consist of up to 16 alphanumeric characters. This identifier will appear on the ETI DDC Network screen.
 - b. SCU Address: System unit address given to a specific SCU between 0 and 9900, in increments of 100.

- 2. System Configuration** (SCU control mode and timing functions)
 - a. Mode Selected By: There are 2 options which may be toggled by the space bar for this selection:
 1. Majority Vote: When the current cycle timer (System Control Unit - Monitor screen) counts down to 0, the controller will look at the results of the last polling to determine the next control mode based on the majority of votes. If there are no heating or cooling votes present, the controller will assume that all of the VAV terminal temperature setpoints are satisfied and switch to the ventilation mode.
 2. Time Cycling: This option applies the percentage of cooling and heating demand to a fixed time cycle. When the current total cycle timers (Both heating and cooling cycle timers) count down to 0, the controller looks at the results of the last polling. The total number of votes is broken down into percentage of cooling and percentage of heating demand. Those percentages are then applied to the Total Cycle Time. Heating will be the active mode first. When that mode time cycle has counted down to 0, the smaller of the 2 will become active. When this cycle time has counted down to 0, the entire process restarts.
 - b. Total Cycle Time: Used only when the “Time Cycling” option above is selected.
 - c. Minimum Cooling: Minimum cooling cycle time before controller looks at results of most recent polling and decides whether to stay in cooling or change modes. Majority vote option only. In time cycling, set to zero.
 - d. Minimum Heating: Minimum heating cycle time before controller looks at results of most recent polling and decides whether to stay in heating or change modes. Majority vote option only. In time cycling, set to zero.
 - e. Duct Purge: Ventilation time between cooling and heating mode changes. Applies to both options.

- 3. Sensor Calibration** (Temperature sensor calibration adjustments.)
 - a. Duct Temp Adjust: Air handler discharge temperature sensor calibration adjustment. Add or subtract the number of degrees and/or tenths of degrees required to adjust the temperature reading to match that of a calibrated device. If subtracting a value, enter the minus sign after entering the numeric value.
 - b. Return Temp Adjust: Air handler return temperature sensor (optional) calibration adjustment. Add or subtract the number of degrees and/or tenths of degrees required to adjust the temperature reading to match that of a calibrated device. If subtracting a value, enter the minus sign after entering the numeric value.
 - c. Outside Temp Adjust: Outside air temperature sensor (optional) calibration adjustment. Add or subtract the number of degrees and/or tenths of degrees required to adjust the temperature reading to match that of a calibrated device. If subtracting a value, enter the minus sign after entering the numeric value.

4. **Logging Control** (Logging and Trending program setup)
 - a. This setup block will be discussed in a separate logging and trending program manual.

5. **Logging Configuration Description** (Logging and Trending program configuration.)
 - a. This configuration block will be discussed in a separate logging and trending program manual.

System Control Unit - AHU Control Settings

InterSCU Com

System: 1

Valve Modulation Control

Cooling Fully On Above 70.0 °F
 Cooling Fully Off Below 50.0 °F
 Heating Fully Off Above 120.0 °F
 Heating Fully On Below 90.0 °F
 ----Cooling Throttle Range: A01----
 Full On 10 Volt Full Off 0 Volt
 ---Heating Throttle Range: A02 ---
 Full On 10 Volt Full Off 0 Volt

Cooling Stage Control

	Off Below	On Above
Cooling 1	51.0 °F	59.0 °F
Cooling 2	56.0 °F	64.0 °F
Cooling 3	0.0 °F	0.0 °F
Cooling 4	0.0 °F	0.0 °F
Cooling 5	0.0 °F	0.0 °F
Cooling 6	0.0 °F	0.0 °F
Cooling 7	0.0 °F	0.0 °F

Relay Output Mapping / Anticycles

1. Fan 0 sec
2. Cooling 1 300 sec
3. Cooling 2 300 sec
4. Heating 1 30 sec
5. Heating 2 30 sec
6. Auxiliary 1 0 sec
7. Auxiliary 2 0 sec
8. Changeover 0 sec

Heating Stage Control

	On Below	Off Above
Heating 1	110.0 °F	120.0 °F
Heating 2	105.0 °F	115.0 °F
Heating 3	0.0 °F	0.0 °F
Heating 4	0.0 °F	0.0 °F
Heating 5	0.0 °F	0.0 °F
Heating 6	0.0 °F	0.0 °F
Heating 7	0.0 °F	0.0 °F

Online

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“System Control Unit - AHU Control Settings” Screen

The System Control Unit - AHU Control Settings screen is utilized to configure the output parameters to the Air Handling Unit from the SCU. See sample screen displayed on previous page. There are 4 setup blocks within this screen to handle the following functions.

- 1. Valve Modulation Control** (Modulating valve control on SCUA4A2 and SCULT4 only.)
 - a. Cooling Fully On Above: Chilled water valve output at designated fully on voltage when air handler discharge temperature is greater than or equal to this value in degrees F and system is in cooling mode. Total output voltage range is 0 to 10 VDC.
 - b. Cooling Fully Off Below: Chilled water valve output at designated fully off voltage when air handler discharge temperature is less than or equal to this value in degrees F and system is in cooling mode. Total output voltage range is 0 to 10 VDC.
 - c. Heating Fully Off Above: Hot water valve output at designated fully off voltage when air handler discharge temperature is greater than or equal to this value in degrees F and the system is in heating mode. Total output voltage range is 0 to 10 VDC.
 - d. Heating Fully On Below: Hot water valve output at designated fully on voltage when air handler discharge temperature is less than or equal to this value in degrees F and the system is in heating mode. Total output voltage range is 0 to 10 VDC.
 - e. AO1 assignment: AO1 or Analog Output 1 may be assigned as either a Cooling or Heating valve output. This selection can be made by toggling the space bar.
 - f. AO1 Throttling Range: This allows the output voltage range of the analog output to be configured to match the throttling range of the modulating valve being used. Full On Volts and Full Off Volts can be set by toggling the spacebar to increment the selection by 1 VDC intervals.
 - g. AO2 assignment: AO2 or Analog Output 2 may be assigned as either a Cooling or Heating valve output. This selection can be made by toggling the space bar.
 - h. AO2 Throttling Range: This allows the output voltage range of the analog output to be configured to match the throttling range of the modulating valve being used. Full On Volts and Full Off Volts can be set by toggling the spacebar to increment the selection by 1 VDC intervals.

- 2. Relay Output Mapping / Anticycles** (Output relay and anticycle configuration.)
 - a. Left column indicates the output relay number assignment.
 - b. Center column allows for the “Mapping” or assignment of the function of the relay. One of 19 different functions may be assigned to each relay. The relay assignment is accomplished by toggling the spacebar till the desired function appears. The 19 options are:
 1. Fan: Air handler unit fan control.
 2. Changeover: Water source heat pump changeover valve control. Relay is active in cooling mode.
 3. Cooling 1 thru Cooling 7: Cooling mode has 7 possible stages of control.
 4. Heating 1 thru Heating 7: Heating mode has 7 possible stages of control.
 5. Auxiliary 1 thru Auxiliary 3: There are 3 possible auxiliary contacts.
 - c. Right column allows for an “Anticycle” time to be assigned to each output relay individually as required. An anticycle time is the amount of time a relay will be held inactive after it has received an off command from the controller. The primary purpose of this function is to prevent the short cycling of whatever equipment is being controlled by the individual output relay. The most common use of this function is to keep from short cycling compressors.

3. **Cooling Stage Control** (Discharge temperature control of the cooling stages.)
 - a. Left column indicates cooling stage number assignment.
 - b. “Off Below” column allows the turn off discharge temperature for the different cooling stages to be configured.
 - c. “On Above: column allows the turn on discharge temperature for the different cooling stages to be configured.

4. **Heating Stage Control** (Discharge temperature control of the heating stages.)
 - a. Left column indicates heating stage number assignment.
 - b. “On Below” column allows the turn on discharge temperature for the different heating stages to be configured.
 - c. “Off Above: column allows the turn off discharge temperature for the different heating stages to be configured.

System: 3 Static Pressure Monitor & Configuration Settings

Pressure Sensor
Static Pressure 1.18 in wg

Control Settings

Identifier	Engineering BTC
Unit Address	365
Bypass Pressure Setpoint	1.20 in wg
Bypass Pressure Deadband	0.05 in wg
Damper Modulation Band	0.10 in wg
VFD Pressure Setpoint	1.00 in wg
VFD Pressure Deadband	0.05 in wg
Pressure Offset Adjust	0.00 in wg
Pressure Slope Adjust	0.00 in wg
VFD full scale response time	2 min

Logging Control

Logging Interval	1 min
Log Alarm	No Alarm ()

“Pressure Sensor Monitor & Configuration Settings” Screen
(see previous page for screen example)

The Pressure Sensor Monitor & Configuration Settings screen allows for the configuration of all duct static pressure control parameters. This screen also allows for the real time monitoring of the current system duct static pressure. See sample screen on previous page. There is 1 monitor block and 1 setup block within this screen to handle the following functions.

1. Pressure Sensor

- a. Static Pressure: Real time system duct static pressure update in inches of water.

2. Control Settings (Static pressure control parameters.)

- a. Identifier: A name or designation given to the specific BTC that may consist of up to 16 alphanumeric characters. The first of the characters entered must be an alpha character. This identifier will appear on the ETI DDC Network screen.
- b. Unit Address: Since the BTC address will always be 65 on any of the 100 possible systems, only the system number in front of the 65 will change. 165, 365, 2465, etc.
- c. Bypass Pressure Setpoint: Desired system duct static pressure setpoint down to hundreds of an inch of water to be controlled by up to 3 bypass terminals.
- d. Bypass Pressure Deadband: A control range above and below the pressure setpoint where the controller is satisfied with the actual static pressure. As shown in the sample screen, with a pressure setpoint of 1.25 in. wg. and a deadband of .02 in. wg., the controller would be satisfied with an actual static pressure range of between 1.23 in. wg. and 1.27 in. wg.
- e. Damper Modulation Band: Since the ETI DDC control system uses a damper actuator control method called “pulse width modulation”, some form of pulse output control to the damper actuator is required. Pulse width modulation simply means that the closer to the setpoint value the actual value becomes, the shorter the output pulses to damper actuator become. The damper modulation band tells the controller how close to setpoint the pressure needs to be before switching from continuous to pulse width modulation operation.
- f. VFD (Variable Frequency Drive) Pressure Setpoint: Desired system duct static pressure setpoint down to hundreds of an inch of water to be controlled by a 0 - 10 VDC modulating output to a VFD.
- g. VFD (Variable Frequency Drive) Pressure Deadband: A control range above and below the pressure setpoint where the controller is satisfied with the actual static pressure. As shown in the sample screen, with a pressure setpoint of 1.25 in. wg. and a deadband of .02 in. wg., the controller would be satisfied with an actual static pressure range of between 1.23 in. wg. and 1.27 in. wg.
- h. Pressure Offset Adjust: The ability to calibrate the starting point of the static pressure curve. The offset is the software equivalent of an electronic Zero adjust.
- i. Pressure Slope Adjust: The ability to calibrate the slope of the static pressure curve. The slope is the software equivalent of an electronic Gain adjust.
- j. VFD full scale response time: When utilizing the modulating 0 VDC thru 10 VDC output to control a frequency drive or inlet vanes on an air handler fan, The VFD full scale response time may be adjusted to between 20 seconds and 2 minutes. This simply states the shortest amount of time that the controller will allow the output signal to ramp from 0 VDC to 10 VDC.

3. Logging Control (Logging and Trending program configuration.)

- a. This configuration block will be discussed in a separate logging and trending program manual.

Zone 306 - Monitor

System: 1

Temperature Control

50...55...60...65...70...75...80...85...90

Room Temperature 71.6 °F
 Cooling Setpoint 72.0 °F
 Heating Setpoint 68.0 °F
 Duct Temperature 57.7 °F
 Outside Air Temp. **** * °F

Airflow Control

0.....125.....250.....375.....500

Current Airflow 335 CFM
 Airflow Setpoint 327 CFM

Status

Local Heat Mode No Local Heat
 Operational Mode Occupied
 Unoccupied Override 0:00 min
 Total Override Time 0:00 min.

Outputs

Cooling Level 63.7%
 Heating Level 0.0%
 Cooling Votes 63 Votes
 Heating Votes 0 Votes

“Zone (Address) - Monitor” Screen

(see pages 59 and 61 for screen examples)

The Zone - Monitor screen displays all current operating information related to the VAV zone terminal. See the sample screen displayed on the previous page. Some of this information is displayed in graphical form with different colors representing various parameters. None of the data or setpoints on this screen can be altered by the operator with the exception of the “Total Override Time”. Any setpoint or parameter changes must be made in subsequent screens. There are 4 information blocks within this screen. The information in each block updates in real time as quickly as the computer running the VTMON program will allow.

- 1. Temperature Control** (Actual and setpoint temperature data displayed in degrees F.)
 - a. Room Temperature: Current VAV zone terminal thermostat temperature
 - b. Cooling Setpoint: Current VAV zone terminal cooling setpoint. This setpoint may have been established either at the thermostat or through the software.
 - c. Heating Setpoint: Current VAV zone terminal heating setpoint. This setpoint may have been established either at the thermostat or through the software.
 - d. Duct Temperature: Current VAV zone terminal inlet duct temperature.
 - e. Outside Air Temp: If the optional outside air temperature sensor is being utilized at the SCU, this data is sent down the network during the polling process and displayed here. If the optional outside air temperature sensor is not used at the SCU, a series of asterisks will be displayed here.

- 2. Airflow Control**
 - a. CFM scale: This scale reflects the range in CFM between the minimum and maximum allowable CFM setpoints entered into the individual VAV zone terminal controller.
 - b. Current Airflow: Actual primary airflow through the VAV zone terminal in CFM.
 - c. Airflow Setpoint: Current airflow setpoint for the individual VAV zone terminal determined by the PID algorithm based on current temperature demand.

- 3. Status** (Current mode and timer status.)
 - a. Local Heat Mode: Current status of VAV zone terminal controlled heat if any.
 - b. Operational Mode: Current mode status, either Occupied, Unoccupied or Override.
 - c. Unoccupied Override: Countdown timer showing time till VAV zone terminal controller switches from unoccupied override to unoccupied mode. This timer becomes active when the “On” button is pushed on the thermostat when the system is in the unoccupied mode.
 - d. Total Override Time: This register accumulates the total amount of time that the VAV zone terminal has been in unoccupied override mode. This information is generally used to charge tenants for excess energy usage. The time in the register can be reset to 0 by using the “Ctrl C” command. See the sample screen on next page.

- 4. Outputs** (Current PID algorithm output status.)
 - a. Cooling Level: Percentage of output determined by the PID algorithm based on temperature demand in the current occupied or unoccupied cooling mode.
 - b. Heating Level: Percentage of output determined by the PID algorithm based on temperature demand in the current occupied or unoccupied heating mode.
 - c. Cooling Votes: Number of individual VAV zone terminal cooling votes being sent to the SCU during polling. This number is determined by the controller applying the cooling level percentage to the total number of votes that the terminal has been configured with in the current occupied or unoccupied cooling mode.
 - d. Heating Votes: Number of individual VAV zone terminal heating votes being sent to the SCU during polling. This number is determined by the controller applying the heating level percentage to the total number of votes that the terminal has been configured with in the current occupied or unoccupied heating mode.

System: 1

Zone 306 - Monitor

InterSCU Com

Temperature Control

Room Temperature	71.6 °F
Cooling Setpoint	72.0 °F
Heating Setpoint	68.0 °F
Duct Temperature	58.6 °F
Outside Air Temp.	**** * °F

Clear All Override Time Counters? (Yes (N)o

Current Airflow

359 CFM

Airflow Setpoint

361 CFM

Status

Local Heat Mode	No Local Heat
Operational Mode	Occupied
Unoccupied Override	0:00 min
Total Override Time	0:00 min.

Outputs

Cooling Level	69.2%
Heating Level	0.0%
Cooling Votes	69 Votes
Heating Votes	0 Votes

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ZONE 306 - User Settings

System: 1

Unit Identity Settings

Zone Identifier JERRY'S OFFICE
Zone Address 306

Thermostat Settings

Lock Setpoints? No
Locked Stat
Cooling Setpoint 74 °F
Heating Setpoint 70 °F

Unoccupied Mode

Cooling Setpoint 90 °F
Heating Setpoint 50 °F
Override Time 30 min.

Online

“Zone (Address) - User Settings” Screen

The Zone - User Settings screen allows identifier, address and temperature setpoint configuration. See the sample screen on the previous page. There are 2 setup blocks within this screen to handle the following functions.

- 1. Unit Identity Settings** (VAV zone terminal name and address.)
 - a. Identifier: A name or designation given to the specific VAV zone terminal that may consist of up to 16 alphanumeric characters. The first of the characters entered must be an alpha character. This identifier will appear on the ETI DDC Network screen.
 - b. Unit Address: An address of between 1 and 64 must be assigned to the VAV zone terminal. No. 2 terminals on the zone bus network may have the same address. The system number must be entered in front of the address unless the system number is 0.

- 2. Thermostat Settings**
 - a. Lock Setpoints: This option allows for the cooling and heating setpoints to be locked. The yes and no options can be toggled with the spacebar.
 - b. Locked Stat Cooling Setpoint and Heating Setpoint: These setpoint parameters will be cooling and heating setpoints if the Lock Setpoints option is set to yes.

- 3. Unoccupied Mode**
 - a. Cooling Setpoint: The cooling setpoint will change to this value when the system switches into unoccupied mode.
 - b. Heating Setpoint: The heating setpoint will change to this value when the system switches into unoccupied mode.
 - c. Override Time: This is the amount of time in minutes that the VAV zone terminal will put the system into unoccupied override when the On button is pressed at the thermostat. The real time counter may be monitored on the Zone - Monitor screen.

Zone 504 - General Configuration Settings

Airflow Control

Cooling Maximum	800 CFM
Cooling Minimum	50 CFM
Heating Maximum	1250 CFM
Heating Minimum	200 CFM
WarmUp Maximum	1250 CFM
WarmUp Minimum	200 CFM
Local Heat FLOW	1000 CFM

Damper Control

Deadband	40 CFM
Modulation Band	175 CFM

Thermostat Control

Maximum Setpoint Allowed	80.0 °F
Minimum Setpoint Allowed	65.0 °F

Regular Thermostat

Cooling Setpoint Offset	2.0 °F
Heating Setpoint Offset	2.0 °F

Display Thermostat

Minimum Deadband	4.0 °F
Displayed Temp Adjust	0.0 °F

Logging Control

Logging Interval	1 min
Log Alarm	No Alarm ()

Maximum Votes

Occupied Cooling	100 Votes
Occupied Heating	100 Votes
Unoccupied Cooling	100 Votes
Unoccupied Heating	100 Votes

“Zone (Address) - General Configuration Settings” Screen

The Zone - General Configuration Settings screen allows for the adjustment of the parameters which control the VAV zone terminal limits. See the sample screen on the previous page. There are 4 setup blocks within this screen to handle the following functions.

1. **Airflow Control** (Individual mode specified CFM setpoint limits.)
 - a. Cooling Maximum: Maximum allowable specified CFM setpoint for cooling mode.
 - b. Cooling Minimum: Minimum allowable specified CFM setpoint for cooling mode.
 - c. Heating Maximum: Maximum allowable specified CFM setpoint for heating mode.
 - d. Heating Minimum: Minimum allowable specified CFM setpoint for heating mode.
 - e. Warm Up Maximum: Maximum allowable specified CFM setpoint for warm-up mode. (Future option)
 - f. Warm Up Minimum: Minimum allowable specified CFM setpoint for warm-up mode. (Future option)
 - g. Local Heat Flow: For a VAV zone terminal that is equipped with it’s own local heating capability. When the zone demand is for heat and the primary inlet air temperature is lower than the heating setpoint, the local heat flow value will become the CFM setpoint.

2. **Damper Control**
 - a. Deadband: A control range above and below the CFM setpoint where the controller is satisfied with the actual CFM. As shown in the Zone - Monitor sample screen, with a setpoint of 327 CFM and a deadband of 40 CFM, the controller would be satisfied with an actual CFM range of between 287 CFM and 367 CFM. See table 5-1 for recommended deadband settings per terminal size.
 - b. Modulation Band: Since the ETI DDC control system uses a damper actuator control method called “pulse width modulation,” some form of pulse output control to the damper actuator is required. Pulse width modulation simply means that the closer to the setpoint value the actual value becomes, the shorter the output pulses to damper actuator become. The damper modulation band tells the controller how close to CFM setpoint the actual CFM needs to be before switching from continuous to pulse width modulation operation. See table 5-1 for recommended modulation band settings per terminal size.

Table 5-1

Terminal Size	Minimum CFM	Maximum CFM	Deadband CFM	Modulation Band
4	35	225	25	100
5	55	350	30	150
6	65	550	40	175
8	120	1000	50	200
10	195	1600	60	300
12	280	2300	70	350
14	400	3100	75	400
16	550	4100	100	500

Note* Maximum and Minimum CFM’s listed in table 5-1 are recommended absolute VAV terminal limits. These values will probably not reflect the design CFM flows on a specific installation.

3. **Logging Control** (Logging and Trending program configuration.)
 - a. This configuration block will be discussed in a separate logging and trending program manual.
4. **Thermostat Control** (Thermostat setpoint range limitations.)
 - a. Maximum Setpoint Allowed: Maximum cooling setpoint that the VAV zone terminal controller will recognize regardless of actual thermostat setting.
 - b. Minimum Setpoint Allowed: Minimum heating setpoint that the VAV zone terminal controller will recognize regardless of actual thermostat setting.
5. **Regulate Thermostat** (Establish cooling/heating deadband for use with ETTS thermostat.)
 - a. Cooling Setpoint Offset: Number of degrees F above the thumbwheel setpoint on the thermostat that will be designated as the controller cooling setpoint.
 - b. Heating Setpoint Offset: Number of degrees F below the thumbwheel setpoint on the thermostat that will be designated as the controller heating setpoint.
6. **Display Thermostat** (ETDIS thermostat.)
 - a. Minimum Deadband: Minimum allowable deadband between cooling and heating setpoint. Should the displayed heating setpoint on the ETDIS thermostat be set closer to the cooling setpoint than this deadband value, the cooling setpoint will become the master and subtract the deadband value from itself to establish a new heating setpoint. Recommended deadband is 3 or 4 degrees F.
 - b. Displayed Temp Adjust: This option gives the ability to alter the room temperature display at the ETDIS display thermostat only. The temperature display may be altered by a positive or negative entry in degrees F.
7. **Maximum Votes** (Mode/terminal priority capability.)
 - a. Each VAV zone terminal has the capability of being assigned an operating priority in comparison to the other VAV zone terminals on the same system. This is accomplished by assigning “Votes” to each terminal in each of the 4 operating modes. Each terminal controller has the capability of being programmed with anywhere between 0 and 255 votes in each of these operating modes. The more votes a terminal controller is assigned in a particular mode, the more capability it has to influence the SCU as to which mode will be chosen when the decision is made.

Zone 306 - Low Level Configuration Settings

Box Configuration

Mode Control Use SCU Scheduling
 Box Type SDV945-Standard
 Box Size 6 inches

Sensor Calibration

Airflow Slope 0.00 %
 Airflow Offset 0 CFM
 Space Temp Adjust 0.0 °F
 Duct Temp Adjust 0.0 °F
 Temp Setpoint Adjust 0.0 °F

PID Temperature Control

Kp 33.33 Ki 0.04 Kd 0.00
 Maximum Integral Value 30000

Output Control

Fan	On	Off
Heat 1	1.0 °F	0.5 °F
Heat 2	2.0 °F	0.5 °F
Heat 3	3.0 °F	1.0 °F
Heat 3	0.0 °F	0.0 °F
Fan	10000 CFM	0 CFM
Duct Temp Cut off		90.0 °F
-----Floating Point Modulation-----		
Start Offset		1.0 °F
Throttling Range		3.0 °F
Valve Full Stroke		120.0 sec
Valve Min Step		5.0 sec
-----Proportional Modulation-----		
Start Offset		1.0 °F
Throttling Range		3.0 °F
-----Analog Output-----		
Full On	10 Volt	Full Off 2 Volt

“Zone (Address) - Low Level Configuration Settings” Screen
(see previous page for screen example)

The Zone - Low Level Configuration Settings screen allows for the adjustment of parameters which control VAV zone terminal inputs and outputs. See the sample screen on the previous page. There are 4 setup blocks within this screen to handle the following functions.

1. **Box Configuration** (Defines VAV terminal type to controller.)
 - a. **Mode Control:** This configuration determines which of the 3 currently available scheduling options will be used. (A fourth auxiliary schedule routine will be available in the near future.) These options are selected by toggling the space bar.
 1. Use SCU Scheduling: The VAV zone terminal controller will switch back and forth between occupied and unoccupied modes in conjunction with the schedule that has been programmed into the SCU schedule screen.
 2. Stat ON/OFF Timer: The VAV zone terminal controller will respond only to the “ON” button located at the zone terminal thermostat. The VAV terminal will remain in the occupied mode after the “ON” button is pressed for the amount of time programmed into the “Override Timer” option in the “Zone - User Settings” screen.
 3. Stat ON/OFF Switch: The VAV zone terminal controller will toggle between its occupied and unoccupied setpoints each time the “ON” button located at the zone terminal thermostat is pressed.
 - b. **Box Type:** This configuration tells the controller exactly what type of VAV terminal it is installed on. These selections will tell the controller not only which type of terminal but which type of local heat capability, if any, the terminal has been equipped with. There are 13 different options which may be selected by toggling the space bar.
 1. SDV942 Standard: This option designates a single duct terminal with no local heat capability using the ETDD0 controller board.
 2. SDV945 No Local Reheat: This option designates a single duct terminal with no local heat capability using the ETDD2F controller board. This controller is equipped to control local heat if the equipment is added at a later date.
 3. SDV945 Staged Heat: This option designates a single duct terminal with either 1, 2 or 3 stages of local electric heat or a stage of hot water heat using a N.C. spring return valve actuator.
 4. SDV945 Tri-State Heat: This option designates a single duct terminal with a floating point type hot water valve.
 5. SDV945 Proportional Heat: This option designates a single duct terminal with a modulating, proportional type hot water valve or SCR controlled electric heat.
 6. FVV945 No Local Reheat: This option designates a parallel, variable volume, fan powered terminal with no local heat capability using the ETDD2F controller board. This controller is equipped to control local heat if the equipment is added at a later date.
 7. FVV945 Staged Heat: This option designates a parallel, variable volume, fan powered terminal with either 1 or 2 stages of local electric heat or a stage of hot water heat using an N.C. spring return valve actuator.
 8. FVV945 Tri-State Heat: This option designates a parallel, variable volume, fan powered terminal with a floating point type hot water valve.
 9. FVV945 Proportional Heat: This option designates a parallel, variable volume, fan powered terminal with a modulating, proportional type hot water valve or SCR controlled electric heat.
 10. FCV945 No Local Reheat: This option designates a series, constant volume, fan powered terminal with no local heat capability using the ETDD2F controller board. This controller is equipped to control local heat if the equipment is added at a later date.

11. FCV945 Staged Heat: This option designates a series, constant volume, fan powered terminal with either 1 or 2 stages of local electric heat or a stage of hot water heat using an N.C. spring return valve actuator.
 12. FCV945 Tri-State Heat: This option designates a series, constant volume, fan powered terminal with a floating point type hot water valve.
 13. FVV945 Proportional Heat: This option designates a series, constant volume, fan powered terminal with a modulating, proportional type hot water valve or SCR controlled electric heat.
- c. **Box Size:** This configuration tells the controller what size inlet the VAV zone terminal has. This is a most critical parameter for a pressure independent controller as the box size determines how the controller will convert the flow transducer information into actual CFM. This option is selected by toggling the space bar. Available sizes are 4, 5, 6, 8, 10, 12, 14, 16, 19 and 22.
- 2. Sensor Calibration** (Analog input signal calibration.)
- a. **Airflow Slope:** This calibration parameter is the equivalent to an electronic “Gain” adjustment. The unit of slope is percentage (%) and refers to the slope of the airflow curve (Chapter 4, dwg no. 15883) for the VAV zone terminal box size. To enter a minus (-) value, enter the numeric value, then press the minus (-) key to make the entry a negative number. Do not press the minus (-) key first. See chapter 7 for calibration instructions.
 - b. **Airflow Offset:** This calibration parameter is the equivalent to an electronic “Zero” adjustment. The units are in CFM and the entry will add to or delete from the actual CFM reading by the same number. To delete from the actual reading, enter the numeric value, then press the minus (-) key to make the entry a negative number. Do not press the minus (-) key first. See chapter 7 for calibration instructions.
 - c. **Space Temp Adjust:** This calibration parameter allows for the adjustment of the displayed space temperature to match that of a calibrated temperature measuring device. To delete from the actual reading, enter the numeric value, then press the minus (-) key to make the entry a negative number. Do not press the minus (-) key first.
 - d. **Duct Temp Adjust:** This calibration parameter allows for the adjustment of the displayed duct temperature to match that of a calibrated temperature measuring device. To delete from the actual reading, enter the numeric value, then press the minus (-) key to make the entry a negative number. Do not press the minus (-) key first.
 - e. **Temp Setpoint Adjust:** For use with the ETTS regular thermostat only. This calibration parameter allows for the adjustment of the displayed cooling and heating setpoint when the ETTS thermostat is used to insure that the dial setpoint matches the display. To delete from the actual reading, enter the numeric value, then press the minus (-) key to make the entry a negative number. Do not press the minus (-) key first.
- 3. PID Temperature Control** (Proportional, Integral and Derivative. Adjustment not advised.)
- a. **Kp:** This represents the proportional segment of the PID algorithm. The proportional finds the difference between the actual space temperature and the setpoint. This difference is called the error or offset.
 - b. **Ki:** This represents the integral segment of the PID algorithm. The integral determines how long the offset has existed and forms an accumulated offset over time. This total offset over time is called the “integral sum”. This integral sum is updated over 30 second time periods.
 - c. **Kd:** This represents the derivative segment of the PID algorithm. The derivative determines the rate at which the offset is changing.
 - d. **Maximum Integral Value:** This value represents the integral limit or ceiling that the PID algorithm will accept.

4. Output Control (Local heat control parameters.)

There are four sections to this setup block. The first deals with the “On” and Off” setpoints controlling the “Staged” outputs on the controller. The second deals with the operating parameters controlling a “Tri-State”, floating point hot water valve. The third deals with the operating parameters controlling either a “Proportional”, modulating hot water valve or SCR controlled electric heat. The fourth sets the “Full On” and “Full Off” DC voltage outputs within the 0 to 10 VDC range that the “Proportional” control is capable of maintaining.

- a. On - Off: The “On” column temperature parameters deal with the number of degrees and tenths of degrees F below heating setpoint that the specified output will become energized. The “Off” column temperature parameters deal with the number of degrees and tenths of degrees F below heating setpoint that the specified output will become de-energized.
- b. Fan: Used in conjunction with the “FVV945” box types. Designates the turn on and turn off space temperature for the VAV zone terminal fan motor.
- c. Heat 1: Used in conjunction with any “Staged Heat” box type. Designates the turn on and turn off space temperature for the first stage of VAV zone terminal local heat.
- d. Heat 2: Used in conjunction with any “Staged Heat” box type. Designates the turn on and turn off space temperature for the second stage of VAV zone terminal local heat.
- e. Heat 3: (Special order only) Used in conjunction with any “Staged Heat” box type. Designates the turn on and turn off space temperature for the second stage of VAV zone terminal local heat.
- f. Fan: (Optional) Used in conjunction with the “FVV945” box types. Designates the turn on and turn off Primary Airflow CFM for the VAV zone terminal fan motor. Most design specifications call for the parallel fan powered terminal to energize the fan on temperature demand. However, there are some design specifications that call for the parallel fan powered terminal to energize the fan based on primary CFM. This parameter option would be used in those situations.
- g. Duct Temp Cutoff: Used with any local heat capable VAV zone terminal. Designates the VAV zone terminal inlet duct temperature limit in degrees F where local heat should not be energized.

5. Floating Point Modulation (Tri-State local heat control.)

- a. Start Offset: This parameter designates the number of degrees and tenths of degrees F below heating setpoint that the floating point hot water valve will begin to open.
- b. Throttling Range: This parameter designates the number of degrees and tenths of degrees F below the Start Offset that the floating point hot water valve will be fully open.
- c. Valve Full Stroke: This parameter tells the controller what the full close to full open travel time is in seconds of the actual floating point hot water valve being used.
- d. Valve Min Step: This parameter determines the minimum time that the valve open or valve close output will be energized at any given time.

6. Proportional Modulation (Proportional local heat control.)

- a. Start Offset: This parameter designates the number of degrees and tenths of degrees F below heating setpoint that either the modulating hot water valve will begin to open or the SCR will begin to energize the electric heat.
- b. Throttling Range: This parameter designates the number of degrees and tenths of degrees F below the Start Offset that either the modulating hot water valve will be fully open or the SCR will drive the electric heat fully on.

7. Analog Output (Proportional local heat control.)

- a. Full On: This parameter designates what DC voltage within the 0 to 10 VDC output range that either the modulating hot water valve will be fully open or the SCR will drive the electric heat fully on.
- b. Full Off: This parameter designates what DC voltage within the 0 to 10 VDC output range that either the modulating hot water valve will be fully closed or the SCR will drive the electric heat fully off.

System: 1
InterSCU Com

Zone 306 - Local Auxiliary Schedule

Local Occupied Schedule

Sunday	00:00 to 00:00
Monday	00:00 to 00:00
Tuesday	00:00 to 00:00
Wednesday	00:00 to 00:00
Thursday	00:00 to 00:00
Friday	00:00 to 00:00
Saturday	00:00 to 00:00
Holiday	00:00 to 00:00

Local Heat WarmUp Schedule

Sunday	00:00 to 00:00
Monday	00:00 to 00:00
Tuesday	00:00 to 00:00
Wednesday	00:00 to 00:00
Thursday	00:00 to 00:00
Friday	00:00 to 00:00
Saturday	00:00 to 00:00
Holiday	00:00 to 00:00

Local Holidays

1. 00/00 to 00/00
2. 00/00 to 00/00
3. 00/00 to 00/00
4. 00/00 to 00/00
5. 00/00 to 00/00
6. 00/00 to 00/00
7. 00/00 to 00/00
8. 00/00 to 00/00
9. 00/00 to 00/00
10. 00/00 to 00/00
11. 00/00 to 00/00
12. 00/00 to 00/00
13. 00/00 to 00/00
14. 00/00 to 00/00
15. 00/00 to 00/00
16. 00/00 to 00/00

“Zone (Address) - Auxiliary Schedule” Screen
(see previous page for screen example)

The Zone - Auxiliary Schedule screen will allow for the individual occupied/unoccupied scheduling of each VAV zone terminal. This option is not currently available but will be in the near future. See the sample screen on the previous page. There are 3 setup blocks within this screen to handle the following functions.

- 1. Local Occupied Schedule** (Daily VAV zone terminal occupied times.)
 - a. Left column displays day of week and holiday designation. The holiday designation applies to all holiday periods assigned in the Local Holidays block to the right.
 - b. Center column displays the first available daily local occupied mode. From and to occupied times must be set in 24 hour clock format. If no occupied period is desired, use the “00:00 to 00:00” format entry.
 - c. Right column displays the second available daily local occupied mode. From and to occupied times must be set in 24 hour clock format. If no occupied period is desired, use the “00:00 to 00:00” format entry.

- 2. Local Heat Warm-up Schedule** (Local heat application only.)
 - a. Left column displays day of week and holiday designation. The holiday designation applies to all holiday periods assigned in the Local Holidays block to the right.
 - b. Right column displays the available daily and holiday warm-up times.

- 3. Local Holidays** (Alternate holiday period scheduling.)
 - a. Left column displays holiday number. 16 different holiday periods are available.
 - b. Right column allows entry of specific holiday period in day/month format.

Auxiliary Commands and “Help” Screens (see pages 77 - 86 for screen examples)

Every screen in the VTMON program has an available “Help” screen. These screens are designed to give the start up technician or system operator a quick reference to the auxiliary commands available for use with the VTMON program. These auxiliary commands are broken down into two different categories, Standard commands and Diagnostic Mode commands.

The standard commands are available to the operator at any time during standard program operation, provided that the program is in the applicable screen. Diagnostic Mode commands are available only when the command line option “D” is used while initiating the VTMON program.

Each command includes either a “Function” key, the “Alt” key or the “Ctrl” key. In the case of the “Alt” or “Ctrl” keys, the proper key must be pressed simultaneously with the corresponding alpha or numeric key. For example, to perform a software reset on a controller, the <Alt> and <Z> keys must be pressed at the same time.

Although each help screen displays a brief overview of each command, the following are more detailed explanations of each.

1. Standard Commands

a. <F1>

This command will cause the appropriate “Help” menu screen to appear for whichever VTMON program screen is currently being viewed.

b. <Alt> <E>

This command is used only in the “System Control Unit - Configuration Settings” screen. It will cause a pop up box to appear which will allow the entry or editing of an individual SCU password. See chapter 9 for complete password instructions.

c. <Alt> <S>

This command is used only in the “System Control Unit - Configuration Settings” screen. It will cause a pop up box to appear which will allow the entry or editing of a multiple SCU system password. See chapter 9 for complete password instructions.

d. <Alt> <R>

This command will cause a “Read” box to appear. This function will cause the computer to read the stored parameters from an SCU, BTC or VAV zone terminal controller. It will then store the data into a computer disk file that is created when a file name is entered into the “Read” box.

e. <Alt> <W>

This command will cause a “Write” box to appear. This function will cause the computer to read the stored parameters from the computer file name entered into the “Write” box. These parameters will then be downloaded into the controller currently being accessed, overwriting the existing parameters being stored in that controller.

f. <Alt> <Z>

This command will cause a software reset to be executed either in the controller currently being accessed or, from the “ETI DDC Network” screen, the controller address where the reverse video block is currently located.

- g. <Alt> <T>
This command will cause the update “Diamond” which scrolls down the left side of the “ETI DDC Network” screen and updates the controller address data to immediately return to the top of the screen.
- h. <Alt> <C>
This is a dual purpose command, depending on which screen is currently being accessed. In the “ETI DDC Network” screen, it will clear all displayed data and cause the update “Diamond” to return to the top of the screen and begin a new screen update. In the “Zone - Monitor” screen, it will clear and reset both the “Unoccupied Override” timer and the accumulated “Total Override Time” counter.
- i. <Alt> <U>
This command will cause the controller to change to unoccupied mode when the zone is under SCU schedule control. The controller will return to occupied mode after one poll is initiated by the SCU.
- j. <Alt> <O>
This command will cause the controller to change to occupied mode when the zone is under SCU schedule control. The controller will return to unoccupied mode after one poll is initiated by the SCU. This command will function only if the controller is accessed by the VTMON program.
- k. <Alt> <N>
This command will cause the controller to leave any special mode that has been commanded and return to the “Normal” operating mode. It will also cause the activation of a recently altered unit address that was entered into the “User Settings” screen.
- l. <Alt> <A>
This command will cause all SCU’s, BTC’s and zone controllers to leave any special mode that had been commanded and return to “Normal” operating mode. It will also cause the activation of any recently altered unit address that was entered into a “User Settings” screen on any controller.
- m. <F6>
This command will cause the suspension of the automatic polling process initiated by the SCU while the computer is running the VTMON program and is connected to the system. The SCU or SCU’s will return to automatic polling when the VTMON program communication to the system is terminated. If the “D” (debug) command line option is not being used, the polling countdown timer at the lower right hand corner of the screen will be removed.
- n. <F7>
The command will cause the automatic polling process initiated by the SCU to be re-established if it has been suspended by the <F6> command.
- o. <F9>
This command will shift communication to the next lower system number in a multisystem network.
- p. <F10>
This command will shift communication to the next higher system number in a multisystem network.
- q. <Alt> <P>
This command will initiate an immediate, single SCU polling of the network. This command functions only when the VTMON program is in “Inter-SCU” communication mode. (The VTMON program will default to the “Inter-SCU” communication mode.) Functions even if the SCU’s automatic polling is suppressed.

- r. <Ctrl> <F>
This command will send a form feed command to any parallel printer attached to the computer running to the VTMON program.

2. Diagnostic Mode Commands

- a. <F8>
This command will clear and reset the communication “Percentage of Error” counter found at the bottom of every screen when running the VTMON program in the debug mode.
- b. <Alt> <O>
This command will cause the SCU to leave the “Automatic” mode and enter the override modes sequentially each time the <Alt> <O> keys are pressed. The system will go from “Automatic” to “Cooling Override” to “Heating Override” to “Fan Override” and back to “Automatic” mode. This command will function only while the SCU is being accessed by the VTMON program.
- c. <Alt> <1>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #1. The zone controller will open the damper fully and set the modulating output to the fully off voltage. The BTC will open damper actuator #1 only, turn off all other damper actuator outputs and set the modulating output to 2.5 VDC.
- d. <Alt> <2>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #2. The zone controller will close the damper fully and set the modulating output to the fully off voltage. The BTC will close damper actuator #1 only, turn off all other damper actuator outputs and set the modulating output to 3.4 VDC.
- e. <Alt> <3>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #3. The zone controller will turn on the fan output and set the modulating output to the fully off voltage. The BTC will open damper actuator #2 only, turn off all other damper actuator outputs and set the modulating output to 5 VDC.
- f. <Alt> <4>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #4. The zone controller will turn on staged heat output #1 and set the modulating output to 1/3 of it’s total voltage. The BTC will close damper actuator #2, turn off all other damper actuator outputs and set the modulating output to 6.7 VDC.
- g. <Alt> <5>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #5. The zone controller will turn on staged heat output #2 and set the modulating output to 2.3 of it’s total voltage. The BTC will open damper actuator #3, turn off all other damper actuator outputs and set the modulating output to 7.5 VDC.
- h. <Alt> <6>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #6. The zone controller will turn on staged heat output #3 and set the modulating output to it’s full on voltage. The BTC will close damper actuator #3, turn off all other damper actuator outputs and set the modulating output to 10 VDC.

- i. <Alt> <7>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #7. The zone controller will turn off all outputs. The BTC will turn off all outputs.
- j. <Alt> <8>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn on output relay #8. The zone controller will set its modulating output to 10 VDC. The BTC will open all 3 damper actuators simultaneously.
- k. <Alt> <9>
This command provides various functions depending on the unit being accessed by the VTMON program. The SCU will turn off all 8 output relays. The zone controller will set its modulating output to 0 VDC. The BTC will close all 3 damper actuators simultaneously.
- l. <Alt> <L>
This command provides various functions depending on the unit being accessed by the VTMON program and is used for calibration purposes only. The zone controller will drive the damper actuator to control at the minimum cooling CFM. The BTC will allow the “Offset” calibration factor to be adjusted.
- m. <Alt> <H>
This command provides various functions depending on the unit being accessed by the VTMON program and is used for calibration purposes only. The zone controller will drive the damper actuator to control at the maximum cooling CFM. The BTC will allow the “Slope” calibration factor to be adjusted.

HELP SCREEN

These commands affect this selection bar highlighted controller unit.

- <Enter> Enters controller unit screen that is highlighted.
- <Alt> <1> Open damper. Turn analog output to setpt "off".
- <Alt> <2> Close damper. Turn analog output to setpt "off".
- <Alt> <3> Fan on. Turn analog output to setpt "off".
- <Alt> <4> 1st stage heat on. Turn analog output to 1/3 setpt "on".
- <Alt> <5> 2nd stage heat on. Turn analog output to 2/3 setpt "on".
- <Alt> <6> 3rd stage heat on. Turn analog output to setpt "on".
- <Alt> <7> Damper outputs/heat stages off, analog output to setpot "off".
- <Alt> <8> Analog output to maximum: \approx 10 Volts.
- <Alt> <9> Analog output to minimum: \approx 0 Volts.
- <Alt> <N> Return this unit to normal mode, activate new address.
- <Alt> <A> Return all units to normal mode, activate all new addresses.

_____ Press <ESC> key to exit Help _____

ETI DDC Network Monitor

System: 1

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- <Arrows> Moves highlighted selection bar up or down to chosen unit.
 - <Enter> Enters controller unit screen that is highlighted.
 - <PgDn> Moves to the monitor screen scanning higher system addresses.
 - <Alt> <T> Repositions the reading prompt () to the top of the Screen.
 - <Alt> <C> Clear screen. Restart the reading prompt* ().
 - <Alt> <O> Change highlighted zone controller unit to occupied mode.
 - <Alt> <U> Change highlighted zone controller unit to unoccupied mode.
 - <Alt> <R> Reads setpoint data from highlighted unit to disk file.
 - <Alt> <W> Writes setpoint data from disk file to highlighted unit.
 - <Alt> <N> Return highlighted unit to normal mode, activate new addresses.
 - <Alt> <A> Return all units to normal mode, activate all new addresses.
 - <F6> Suspends automatic polling by SCU.
 - <F7> Allows Scu to begin automatic polling.
 - <F9> Switches display screen to the next lower SCU system.
 - <F10> Switches displays screens to the next higher SCU system.
 - <Alt> <P> Initiates single and immediate Polling by all SCUs.
 - <Ctrl> <F> Send a "form feed" command to printer port LPT1.
 - <Alt> <Z> Initiates software reset of highlighted controller.
 - <Alt> <X> Exits VTMon program.
- _____ Press <ESC> key to exit Help _____

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System Control Unit — Monitor

HELP SCREEN

- <PgDn> Moves down to controller units setpoint screen.
 - <Alt> <R> Reads setpoint data from this controller unit to disk file.
 - <Alt> <W> Writes setpoint data from disk file to this controller unit.
 - <Alt> <N> Return this unit to normal mode, activate all new addresses.
 - <Alt> <A> Return all units to normal mode, activate all new addresses.
 - <F6> Suspends automatic polling by SCU.
 - <F7> Allows SCU to begin automatic polling.
 - <F8> Resets diagnostics counters "Read: #", "Error: #", "% Error".
 - <F9> Switches display screen to the next lower SCU system.
 - <F10> Switches display screens to the next higher SCU system.
 - <Alt> <P> Initiates single and immediate Polling by all SCUs.
 - <Ctrl><F> Send a "form feed" command to printer port LPT1.
 - <Alt> <Z> Initiates software reset of this controller unit.
 - <Alt> <X> Exits VTMon program.
 - <Esc> Exits from controller unit screen to Network Monitor Screen.
- Press <PgDn> for Special Commands / <Esc> key exits Help _____

System Control Unit — Monitor

HELP SCREEN

<Alt> <0> Switch SCU to next Cooling/Heating/Fan Override or Auto mode.
<Alt> <1> Engages output relay #1
<Alt> <2> Engages output relay #2
<Alt> <3> Engages output relay #3
<Alt> <4> Engages output relay #4
<Alt> <5> Engages output relay #5
<Alt> <6> Engages output relay #6
<Alt> <7> Engages output relay #7
<Alt> <8> Engages output relay #8
<Alt> <9> Engages output relay #9
<Alt> <N> Return this unit to normal mode, activate new address.
<Alt> <A> Return all units to normal mode, activate new address.

_____ Press <Esc> key to exit Help _____

System Control Unit - Configuration Settings

HELP SCREEN

- <Arrows> Moves cursor to item to be changed, enters data if changed.
- <Enter> Enters data into setpoint item that cursor is on.
- <PgUp> Moves up to controller units setpoint screen.
- <PgDn> Moves down to controller units setpoint screen.
- <Alt> <E> Allows editing of an SCU password used for system access.
- <Alt> <S> Allows setting of all SCU passwords used for systems access.
- <Alt> <R> Reads setpoint data from this controller unit to disk file.
- <Alt> <W> Writes setpoint data from disk file to this controller unit.
- <Alt> <N> Return this unit to normal mode, activate all new addresses.
- <Alt> <A> Return all units to normal mode, activate all new addresses.
- <F6> Suspends automatic polling by SCU.
- <F7> Allows SCU to begin automatic polling.
- <F8> Resets diagnostics counters "Read: #", "Error: #", "% Error".
- <Alt> <P> Initiates single and immediate Polling by all SCUs.
- <Ctrl><F> Send a "form feed" command to printer port LPT1.
- <Alt> <Z> Initiates software reset of this controller unit.
- <Alt> <X> Exits VTMon program.
- <Esc> Exits from controller unit screen to Network Monitor Screen.

Static Pressure Monitor & Configuration Settings

HELP SCREEN

<Arrows> Moves cursor to item to be changed, enters data if changed.
 <Enter> Enters data into setpoint item that cursor is on.
 <Alt><R> Reads setpoint data from this controller unit to disk file.
 <Alt> <W> Writes setpoint data from disk file to this controller unit.
 <Alt> <N> Return this unit to normal mode, activate new address.
 <Alt> <A> Return all units to normal mode, activate all new addresses.
 <F6> Suspends automatic polling by SCU.
 <F7> Resets Diagnostics counters "Read: #", "Error: #", "%Error".
 <F8>
 <Alt> <P> Initiates single and immediate Polling by all SCUs.
 <Ctrl><F> Send a "form feed" command to printer port LPT1.
 <Alt><Z> Initiates software reset of highlighted controller.
 <Alt><X> Exits VTMon program.
 <ESC> Exits from controller unit screen to Network Monitor Screen.
 — Press <PgDn> for Special Commands / <Esc> key exits Help —

Static Pressure Monitor & Configuration Settings

HELP SCREEN

<Alt> <L> Allows setting BTC Offset Adjust for min calibrated pressure.
<Alt> <H> Allows setting BTC Slope Adjust for max calibrated pressure.
<Alt> <1> Open damper 1, 2&3 off. VFD 1/4 output: = 2.5 Volts.
<Alt> <2> Close damper 1, 2&3 off. VFD 1/3 output: = 3.4 Volts.
<Alt> <3> Open damper 2, 1&3 off. VFD 1/2 output: = 5.0 Volts.
<Alt> <4> Close damper 2, 1&3 off. VFD 2/3 output: = 6.7 Volts.
<Alt> <5> Open damper 3, 1&2 off. VFD 3/4 output: = 7.5 Volts.
<Alt> <6> Close damper 3, 1&2 off. VFD maximum output: = 10 Volts.
<Alt> <7> All damper outputs off. VFD min output: = 0 Volts.
<Alt> <8> Opens all dampers.
<Alt> <9> Closes all dampers.
<Alt> <N> Return this unit to normal mode, activate new address.
<Alt> <A> Return all units to normal mode, activate all new addresses.

_____ Press <Esc> key to exit Help _____

Zone 306 — Monitor

HELP SCREEN

- <PgDn> Moves down to controller units setpoint screen.
 - <Alt> <C> Clear and reset all override time counters.
 - <Alt> <O> Change this controller unit to occupied mode.
 - <Alt> <U> Change this controller unit to unoccupied mode.
 - <Alt> <R> Reads setpoint data from disk file to this controller unit.
 - <Alt> <W> Writes setpoint data from disk file to this controller unit.
 - <Alt> <N> Return this unit to normal mode, activate new address.
 - <F6> Suspend automatic polling by SCU.
 - <F7> Allows SCU to begin automatic polling.
 - <F8> Resets diagnostics counters "Read: #", "Error: #", "% Error".
 - <F9> Switches display screen to the next lower SCU system.
 - <F10> Switches display screens to the next higher SCU system.
 - <Alt> <P> Initiates single and immediate Polling by all SCUs.
 - <Ctrl> <F> Send a "form feed" command to printer port LPT1.
 - <Alt> <Z> Initiates software reset of this controller unit.
 - <Alt> <X> Exits VTMon program.
 - <ESC> Exits from controller unit screen to Network Monitor Screen.
- Press <PgDn> for Special Commands / <Esc> key exits Help —

Zone 306 — Monitor**HELP SCREEN**

- <Alt> <L> Sets zone controller to min cool air flow setpoint. {Offset}
 - <Alt> <H> Sets zone controller to max cool air flow setpoint. {Slope}
 - <Alt> <1> Open damper. Turn analog output to setpt "off".
 - <Alt> <2> Close damper. Turn analog output to setpt "off".
 - <Alt> <3> Fan on. Turn analog output to setpoint"off".
 - <Alt> <4> 1st stage heat on. Turn analog output to 1/3 setpt "on".
 - <Alt> <5> 2nd stage heat on. Turn analog output to 2/3 setpt "on".
 - <Alt> <6> 3rd stage heat on. Turn analog output to setpt "on".
 - <Alt> <7> Damper outputs/heat stages off, analog output to setpt "off".
 - <Alt> <8> Analog output to maximum: » 10 Volts.
 - <Alt> <9> Analog output to minimum: » 0 Volts.
 - <Alt> <N> Return this unit to normal mode, activate new address.
 - <Alt> <A> Return this unit to normal mode, activate new address..
- _____ Press <Esc> key to exit Help _____

ZONE 306 — User Settings

HELP SCREEN

- <Arrows> Moves cursor to item to be changed, enters data if changed.
- <Enter> Enters data into setpoint item that cursor is on.
- <PgUp> Moves up to controller units setpoint screen.
- <PgDn> Moves down to controller units setpoint screen.
- <Alt> <E> Allows editing of an SCU password used for system access.
- <Alt> <S> Allows setting of all SCU passwords used for systems access.
- <Alt> <R> Reads setpoint data from this controller unit to disk file.
- <Alt> <W> Writes setpoint data from disk file to this controller unit.
- <Alt> <N> Return this unit to normal mode, activate all new addresses.
- <Alt> <A> Return all units to normal mode, activate all new addresses.
- <F6> Suspends automatic polling by SCU.
- <F7> Allows SCU to begin automatic polling.
- <F8> Resets diagnostics counters "Read: #", "Error: #", "% Error".
- <Alt> <P> Initiates single and immediate Polling by all SCUs.
- <Ctrl><F> Send a "form feed" command to printer port LPT1.
- <Alt> <Z> Initiates software reset of this controller unit.
- <Alt> <X> Exits VTMon program.
- <Esc> Exits from controller unit screen to Network Monitor Screen.

Diagnostic Mode Test Variable Screens
(see page 89 for screen example)

The SCU, BTC and zone controllers each have their own low level, test variable screens. These screens will be displayed only when the “D” (Diagnostic) command line option is used while initiating the VTMON program. The test variables or debug screen can be found by accessing a controller and paging down through all of the standard screens. The debug screen will be the very last screen found.

The information contained within the test variables screen is useful in various troubleshooting functions which may be performed by an on site technician or by the factory via a modem connection. The following is a line by line explanation of each screen.

1. “System Control Unit - Test Variables” Screen (See sample screen)

A. Operational Variables

1. Version: Designates the software version number that is programmed into the EPROM memory chip on board the controller.
2. Revision: Designates the revision of the software version number that is programmed into the EPROM memory chip on board the controller.
3. CPU Program Type: Designates the type of microprocessor that must be utilized with the above software version and revision.
4. Unit Addr High: High byte of controller unit address. Same as system number. (0-99)
5. Unit Addr Low: Low byte of controller unit address. Zone number on system. (1-64)
6. Command: Displays the last command sent to the SCU from the VTMON program. As soon as that command is executed, the display returns to “No Command”.
7. Special Mode: Displays the controllers current operating mode as commanded by the VTMON program. If no special mode has been commanded, “Normal Mode” will be displayed.
8. Analog Output 1: Displays the “AO1” analog output register value between 0 and 255 bits. This translates to 0 bits = 0 VDC and 255 bits = 10 VDC.
9. Analog Output 2: Displays the “AO2” analog output register value between 0 and 255 bits. This translates to 0 bits = 0 VDC and 255 bits = 10 VDC.
10. AI0 - Outside Temp: Analog input that is being read on the controllers first A/D port. This port is assigned to the outside air temperature sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor. This sensor is optional and not required for system operation.
11. AI1 - Key Lock: Analog input that is being read on the controllers second A/D port. This port is assigned to the operators panel keypad lockout function. Possible values are between 0 and 16,368. If the ETKEY has been inserted into the “Stat” port on the ETDUA8 SCU mother board to lock out the operators keypad, the display will be some value close to 0. If the ETKEY has not been used, the display will be some value close to 16,368.

12. AI2 - Duct Temp: Analog input that is being read on the controllers third A/D port. This port is assigned to the AHU discharge duct temperature sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor. This sensor is NOT optional and IS required for system operation.

13. AI3 - Inlet Temp: Analog input that is being read on the controllers fourth A/D port. This port is assigned to the AHU inlet or return air temperature sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted,” possibly indicating a failed sensor. This sensor is optional and not required for system operation.

B. Aux A/Ds at J7-#

This block is for factory use only.

C. Communications Flag Byte

This block is for factory use only.

System: 1

System Control Unit - Test Variables

InterSCU Com

Operational Variables

Version	9
Revision	-
CPU Program Type	80C196
Unit Addr High	1
Unit Addr Low	44
Command	No Command
Special Mode	Normal Mode
Analog Output 1	147
Analog Output 2	255
A10 - Outside Temp	* 9412
* Sensor Open/Not Connected	
A11 - Key Lock	16355
A12 - Duct Temp	* 16352
* Sensor Open/Not Connected	
A13 - Inlet Temp	* 16354
* Sensor Open/Not Connected	
Aux A/Ds at J7-#	
A/D-1 L	6 A/D-3 L 15
A/D-4	5471 A/D-6 L 15

Communications Flag Byte

1. SCU PASSDOWN BITS OFF
2. SCU BUS RECEIVING OFF
3. TNET TRANSMITTING OFF
4. SBUF TX LOADED ON
5. PASS DOWN BYTE OFF
6. INITIATE POLLING OFF
7. SCU BUS ACTIVE ON
8. SCU BUS RECV GIP OFF

Online

Read:

205

Error: 0

% Error:

0.0%

49

2. “Static Pressure Controller - Test Variables” Screen (See sample screen, page 92)**A. Internal Operational Variables**

1. Version: Designates the software version number that is programmed into the EPROM memory chip on board the controller.
2. Revision: Designates the revision of the software version number that is programmed into the EPROM memory chip on board the controller.
3. CPU Program Type: Designates the type of microprocessor that must be utilized with the above software version and revision.
4. Unit Addr High: High byte of controller unit address. Same as system number. (0-99)
5. Unit Addr Low: Low byte of controller unit address. Zone number on system. (1-64)
6. Command: Displays the last command sent to the SCU from the VTMON program. As soon as that command is executed, the display returns to “No Command”.
7. Special Mode: Displays the controllers current operating mode as commanded by the VTMON program. If no special mode has been commanded, “Normal Mode” will be displayed.
8. Stack Peak: Indicates where memory is being overwritten.
9. AI0 - Pressure: Analog input that is being read on the controllers first A/D port. This port is assigned to the static pressure sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor.
10. AI1 - Unused: Analog input that is being read on the controllers second A/D port. This port is currently not being used.
11. AI2 - Unused: Analog input that is being read on the controllers third A/D port. This port is currently not being used.
12. AI3 - Unused: Analog input that is being read on the controllers fourth A/D port. This port is currently not being used.
13. Press Bit Count: Displays the static pressure analog input register bit value. Possible values are between 0 and 1023 bits.
14. Static Pressure: Actual static pressure measurement displayed in inches of water gain.
15. Analog Output: Displays the “AO1” analog output register value between 0 and 255 bits. This translates to 0 bits = 0 VDC and 255 bits = 10 VDC.
16. Digital Outputs: This number represents the decimal equivalent of the binary total of the active damper actuator outputs. In normal mode, there would be 3 display possibilities, 0 for no outputs on, 21 for outputs 1, 3 and 5 on and 42 for outputs 2, 4 and 6 on.
17. Ticks: Program timer ticks measured in 7 AC cycle segments.

18. Damper Timer: Factory use only.
19. SCU Timer Check: Count down timer to disregard last SCU command to open damper.
20. Stat Key: 191 Filler: Values read from ETDIS display stat processor during setup or monitoring via use of ETDIS display stat. Factory use only.
21. Stat D0: Display character sent to first ETDIS display stat LED indicator.
22. Stat D1: Display character sent to second ETDIS display stat LED indicator.
23. Stat D2: Display character sent to third ETDIS display stat LED indicator.
24. Stat D3: Display character sent to fourth ETDIS display stat LED indicator.
25. Stat Display: Factory use only.
26. Smart Stat: Factory use only.
27. Response Time Count: Factory use only.
28. Pressure Pivot Pt: Static pressure curve point at which calibration pivot occurs.
29. Display Offset Adj: Factory calibration use only.
30. Stored Offset Adj: Factory calibration use only.
31. Display Slope Adj: Factory calibration use only.
32. Stored Slope Adj: Factory calibration use only.
33. Calib Slope Adj: Factory calibration use only.

Static Pressure Controller - Test Variables

Internal Operational Variables

Version	4	Ticks	46
Revision	B	Damper Timer	55
CPU Program Type	80C196	SCU Timer Check	240
Unit Addr High	1	Stat Key: 191 Filler	0
Unit Addr Low	109	Stat D0 0 Stat D1	49
Command	No Command	Stat D2 50 Stat D3	53
Special Mode	Normal Mode	Stat Display	0
Stack Peak	194	Smart Stat	0
A10 - Pressure	4911	Response Time Count	2
A11 - Unused	415	Pressure Pivot Pt	0.75 wg
A12 - Unused	63	Display Offst Adj	-0.10 wg
A13 - Unused	64	Stored Offset Adj	-0.10 wg
Press Bit Count	307	Display Slope Adj	0.00 wg
Static Pressure	1.23 wg	Stored Slope Adj	0.00 wg
Analog Output	55	Calib Slope Adj	0.00 wg
Digital Outputs	0		

3. “Zone (Address) - Test Variables (See sample screen, page 95)**A. Internal Operational Variables**

1. Version: Designates the software version number that is programmed into the EPROM memory chip on board the controller.
2. Revision: Designates the revision of the software version number that is programmed into the EPROM memory chip on board the controller.
3. CPU Program Type: Designates the type of microprocessor that must be utilized with the above software version and revision.
4. Unit Addr High: High byte of controller unit address. Same as system number. (0-99)
5. Unit Addr Low: Low byte of controller unit address. Zone number on system. (1-64)
6. Command: Displays the last command sent to the SCU from the VTMON program. As soon as that command is executed, the display returns to “No Command”.
7. Special Mode: Displays the controllers current operating mode as commanded by the VTMON program. If no special mode has been commanded, “Normal Mode” will be displayed.
8. Digital Outputs: This number represents the decimal equivalent of the binary total of the active digital outputs.
9. Analog Output: Displays the analog output register value between 0 and 255 bits. This translates to 0 bits = 0 VDC and 255 bits = 10 VDC.
10. AI0 - Airflow: Analog input that is being read on the controllers first A/D port. This port is assigned to the airflow sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor.
11. AI1 - Space Temp: Analog input that is being read on the controllers second A/D port. This port is assigned to the space temperature sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor.
12. AI2 - Duct Temp: Analog input that is being read on the controllers third A/D port. This port is assigned to the duct temperature sensor. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted”, possibly indicating a failed sensor.
13. AI3 - Stat Temp Spt: Analog input that is being read on the controllers fourth A/D port. This port is assigned to the ETTS regular thermostat temperature setpoint only. Possible values are between 0 and 16,368. If an asterisk (*) is displayed, the analog input channel is either “Open” or “Shorted,” possibly indicating a failed sensor.
14. Outside Air Temp: This temperature display is received from the SCU if the SCU is utilizing the optional outside air temperature sensor.
15. Cal Min AirFl Pt: Minimum airflow point on which the airflow curve pivots during calibration.

16. Temp Offset: Actual temperature offset above cooling setpoint or below heating setpoint displayed by the “ETI DDC Network” screen for each VAV zone terminal unit address.
17. Temp Spt: Space temperature setpoint dialed in on the ETTS regular thermostat if used.
18. Prev Space Temp: Used to calculate rate of change in space temperature for PID calculation.
19. Float Pt Spt: Next scheduled output “On” timer value when “Floating Point” type hot water valve is used.
20. Float Pr Timer: Scheduled output “On” timer active countdown for “Floating Point” type hot water valve.
21. CV Fan Timer: Series fan powered terminal fan motor delay “On” timer. Used to prevent backwards fan motor rotation.
22. Damper Timer: Factory use only.
23. Sys Ticks Timer: Program timer ticks measured in 7 AC cycle segments.
24. Derivative: PID algorithm derivative counter.
25. Timer: PID algorithm derivative timer.
26. Integral: Clnng 0.0 Htng 0.0: Summation of cooling or heating required for use in integral portion of PID algorithm.
27. Stat Spt: Clnng Htng: Thermostat setpoint values for cooling and heating.
28. Stat Disp: Control character for ETDIS thermostat display. Factory use only.
29. Smart Stat Count: Active timer showing count since ETDIS display thermostat was last read.
30. Stat Key: Filler: Values read from ETDIS display stat pick processor. Factory use only.
31. Stat D0: Display character sent to first ETDIS display stat LED indicator.
32. Stat D1: Display character sent to second ETDIS display stat LED indicator.
33. Stat D2: Display character sent to third ETDIS display stat LED indicator.
34. Stat D3: Display character sent to fourth ETDIS display stat LED indicator.

Zone 305 - Test Variables

System: 1

Internal Operational Variables

Version	8	Cal Min AirFl Pt	75	CFM
Revision	F	Temp Offset	0.0	
CPU Program Type	80C196	Temp Spt	69.8	
Unit Addr High	1	Prev Space Temp	75.5	
Unit Addr Low	49	Float Pt Spt	0	
Command	No Command	Float Pt Timer	0	
Special Mode	Normal	CV Fan Timer	180	
Digital Outputs	0	Damper Timer	21	
Analog Output	0	Sys Ticks Timer	27	
AI0 - Airflow	12207	Derivative: 0.1 Timer	22	
AI1 - Space Temp	* 6663	Integral: CIng 0.0 Htng	0.0	
AI2 - Duct Temp	* 9328	Stat Spt: CIng 76 Htng	68	
AI3 - Stat Temp Spt	* 9328	Stat Disp	0	
Outside Air Temp	* -20000	Smart Stat Count	9	
* Sensor Open / Not Connected		Stat Key: 128 Filler	255	
		Stat D0	54	Stat D1
		Stat D2	55	Stat D3

41

% Error: 0.0%

0

Error:

1001

Read:

Online

Chapter 6

ENVIRO-TEC DDC CONTROL SYSTEM COMPONENT START UP GUIDELINES

A. VAV Zone Terminals

1. Check all power and communication wiring terminations to the zone terminal control enclosure. Ensure that all wiring and associated termination's are in compliance with the guidelines presented in Chapter 3 of this manual. The 3 position connector on RS485 communication terminal J1 should be left unplugged at this time.
2. Measure the incoming line voltage supplying the control transformer. Insure that it matches the primary voltage rating listed on the transformer. Remove any tools and equipment from the control enclosure. Move control transformer disconnect switch to the "On" position. If a distributed 24 VAC power source is to be used, repeat item 1 at all terminals before activating the 24 VAC power source.
3. The red "DG" or Diagnostic LED will begin flashing at a rate of approximately one cycle per second. Also, depending on the current communication mode, the red "RX" or Receive and "TX" or Transmit LED's may flash intermittently.
4. The "Network" address may now be set into the DDC VAV controller. Either the "Setaddr" set address program, used in conjunction with a computer or the "ETDIS" display thermostat method can be utilized. Instructions for both methods of setting a unit address are found in Chapter 5 of this book. These methods are equally acceptable. The 3 position connector on RS485 communication terminal J1 should be plugged in at this time.
5. The above 4 steps need to be repeated at all Single Duct and Fan Powered VAV terminals.

B. Bypass Terminals and Static Pressure Controllers

1. Check all power and control wiring termination's to the bypass terminal control enclosure(s) and the static pressure controller. Insure that all wiring and associated termination's are in compliance with the guidelines presented in Chapter 3 of this manual. The 3 position connector on RS485 communication terminal J1 of the static pressure controller (BTC) should be left unplugged at this time.
2. Measure the incoming line voltage supplying the control transformer located in the BPV-01 control enclosure. Insure that it matches the primary voltage rating listed on the transformer. Remove any tools and equipment from the control enclosure. Move control transformer disconnect switch to the "On" position. If a distributed 24 VAC power source is to be used, repeat item 1 at all terminals before activating the 24 VAC power source.
3. Once the 24 VAC supply is activated, check the duct mounted BTC-01 controller. The red "DG" or Diagnostic LED will begin flashing at a rate of approximately one cycle per second. Also, depending on the current communication mode, the red "RX" or Receive and "TX" or Transmit LED's may flash intermittently.

4. The “Network” address may now be set into the DDC static pressure controller. Either the “Setaddr” set address program, used in conjunction with a computer or the “ETDIS” display thermostat method can be utilized. Instructions for both methods of setting a unit address are found in Chapter 5 of this book. These methods are equally acceptable. The 3 position connector on RS485 communication terminal J1 should be plugged in at this time.
5. The above 4 steps need to be repeated at all Static Pressure controllers and Bypass terminals.

C. System Control Units

1. Check all power and control wiring terminations to the System Control Unit enclosure. Insure that all wiring and associated terminations are in compliance with the guidelines presented in Chapter 3 of this manual. The 3 position connectors on RS485 communication terminals J1(VAV Zone buss) and J2 (Inter SCU buss) should be left unplugged at this time.
2. On the ETDUX8 and ETDUX4A2 output boards, just below the dry contact modules, there are 2 slide switches. One is a cooling override switch and one is a heating override switch. Both of these switches need to be in the “OFF” position (to the right) during start-up. These switches are ONLY for emergency operation should a total SCU failure occur. They are designed to bypass the dry contacts for manual operation of either the first stage of heating or cooling in conjunction with the fan. These differ from the “COOL” and “HEAT” override buttons on the front of the SCU operators panel which are controlled by discharge temperatures programmed into the memory.
3. Measure the incoming line voltage supplying the control transformer located in the SCU enclosure. Ensure that it matches the primary voltage rating listed on the transformer. Remove any tools and equipment from the control enclosure. Move control transformer disconnect switch to the “On” position. It is not recommended that the SCU be powered by a distributed 24 VAC control voltage loop. The isolation transformer supplied with the SCU should be used.
4. The red “DG” or Diagnostic LED on the ETDUA8 control board will begin flashing at a rate of approximately one cycle per second. Also, depending on the current communication mode, the red “RX” or Receive and “TX” or Transmit LED’s on both the Zone bus and SCU bus may flash intermittently.
5. Check the operators panel on the front of the SCU. Insure that the liquid crystal display reads “Current Mode STANDBY” immediately upon power up. If the display reads any of the override functions such as Heating, Cooling or Fan, press the “AUTO” button on the operators panel keypad to switch the SCU back to normal control mode.
6. The “Network” address may now be set into the System Control Unit. The “Setaddr” set address program, used in conjunction with a computer must be utilized. Instructions for setting a SCU unit address are found in Chapter 5 of this book. The 3 position connector on RS485 communication terminal J1 should be plugged in at this time. If the system has multiple SCU’s, the 3 position connector on RS485 communication terminal J2 should be left disconnected until these steps have been completed on the remaining systems.

D. Software Configuration

1. Enviro-Tec DDC controls are downloaded at the factory with default values that will allow the individual controller to function in an acceptable fashion in a stand alone mode. Network addresses must be set before the controllers may function together and communicate as a system. These

default values will most likely NOT match the engineered specifications for a particular job. The default settings in each SCU, BTC and Zone controller must be checked and modified if necessary to comply with engineered job specifications. Also, insure that VAV terminal sizes are compatible with design specification minimum and maximum CFM's. Compare specified design CFM's for all VAV terminals with hose listed in Table D.1.

VAV Terminal
(Values in CFM)

SIZE	MINIMUM	MAXIMUM
4	35	225
5	55	350
6	65	550
8	120	1000
10	195	1600
12	280	2300
14	400	3100
16	550	4100

Table D.1

2. Insure that the correct "Box Type" and "Box Size" are entered in the Zone controller "Low Level Configuration Settings" screen, "Box Configuration" block. If local VAV terminal heat is to be used, the "Output Control" block has to be configured to operate within engineered specifications.
3. If a parallel fan powered terminal is used, the number of degrees Fahrenheit below heating setpoint for the fan to be turned on must be set in the "Low Level Configuration" screen "Output Configuration" block.
4. If a series fan powered box is used, the following sequence of events will occur which will prevent the fan from being energized if the wheel is spinning backwards. This sequence of events will occur after either a power up, soft reset or a switch from unoccupied to occupied mode.
 - a. The damper will begin to close.
 - b. A 4 minute delay timer on the fan output will begin countdown.
 - c. The damper takes a maximum of 2 minutes to come to a complete close.
 - d. There will be at least a 2 minute period where the fan wheel will not be exposed to primary air. During this time, the fan wheel will stop spinning.
 - e. When the 4 minute timer has counted down, the fan output on the controller will then be activated.
5. If a "SCU" or System Control Unit is to be used, insure that the Time of Day, occupied schedule and "On/Off" heating and cooling stage discharge temperatures are set properly. The Time of Day should be factory set as well as heating and cooling stage discharge temperature defaults. These defaults may not be appropriate for the particular rooftop or package unit being controlled by the Enviro-Tec DDC system. Check the unit manufacturers operating specifications.
6. All setup capabilities on all Enviro-Tec DDC control components must be checked during the start-up procedure. Due to the flexibility of these controls, it is impossible to anticipate the field requirements which must be met on any particular installation. It is the responsibility of the start-up technician to insure that all setpoint values downloaded into these controllers are accurate and applicable to each particular installation.

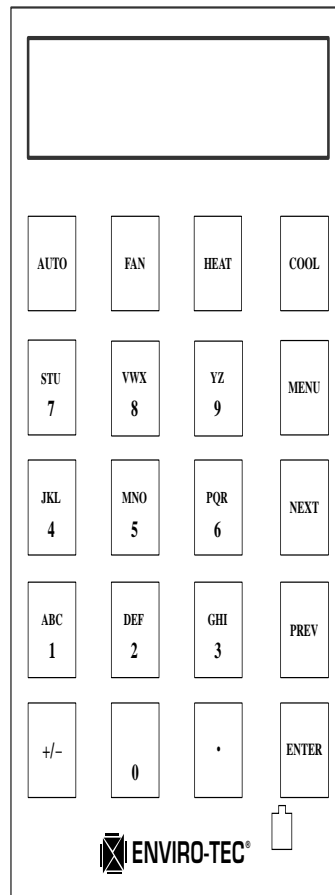
Chapter 7

ENVIRO-TEC DDC CONTROL SYSTEM SCU OPERATORS PANEL & ETDIS OPERATION

A. ETOP Operators Panel Operation

The ETOP operators panel is located on the front door of the SCU enclosure. The ETOP is equipped with a 2 row, 16 character, liquid crystal display and a 20 button keypad. There is also a Quick Wire connection communication port on the ETOP. All functions that can be monitored and/or altered via the VTMON program may also be monitored and/or altered, 1 line at a time, on the ETOP.

If there is a requirement to limit access to the ETOP for security reasons, the keypad may be locked out. Insert the ETKEY into the “Stat” port on the ETDUA8 SCU motherboard. This will effectively disable the ETOP keypad. The program line block that was being displayed when the ETKEY was inserted will continue to update normally, even though the keypad itself has been locked out.



1. The following is a description of the ETOP function keys:

- a. AUTO: This key will return the system to automatic control from any of the override functions.
- b. FAN: This key will put the system into fan override. This override function will ignore the normal scheduling operation.
- c. HEAT: This key will put the system into heat mode override. This override function will ignore the normal scheduling operation as well as automatic mode selection based on demand. Heat override will control discharge temperature based on programmed parameters.
- d. COOL: This key will put the system into cool mode override. This override function will ignore the normal scheduling operation as well as automatic mode selection based on demand. Cool override will control discharge temperature based on programmed parameters.
- e. MENU: This key will prompt the operator to enter the unit address desired for access.
- f. NEXT: This key allows the operator to scroll forward through the program lines 1 at a time.
- g. PREV: This key allows the operator to scroll backwards through the program line 1 at a time.
- h. ENTER: This key allows the operator to scroll forward through the program 1 page at a time. The pages are denoted by bold type and a “Diamond” symbol in the following program line listing blocks.

2. Selecting a Controller to Access

- a. Press the MENU button. The display will change to:

ENTER ADDRESS:

- b. Enter the system address of the desired controller (SCU - 0, BTC - 65, zone - 1-64):

ENTER ADDRESS:

12

- c. Press the ENTER button. The display will change to:

ZONE CONTROLLER

12

- d. The operator may now scroll through the program line blocks as required by using the NEXT, PREV and ENTER buttons.
- e. To alter the data in any program line block, use the numeric portion of the keypad to enter the required information. To clear or set to 0 the information in any program line block, press the decimal (“.”) button. For fixed, selection type entries, such as YES/NO, press the zero (0) button to toggle the choices. Once the data in a program line block has been altered as required, press the NEXT, PREV, MENU or ENTER button to store the new data and move on.

System Control Unit Operator's Panel Displays

SYSTEM CONTROL UNIT	Output 6 OFF	Tuesday 2 To 00:00	Set New Day 20
Current Mode \blacktriangleright VENTILATION	Output 7 OFF	Wednesday 1 From 09:00	Set New Year 92
Zones Responding 18	Output 8 OFF	Wednesday 1 To 17:00	Set New Hour 14
Cooling Votes 200	Anticycle 1 0 sec	Wednesday 2 From 00:00	Set New Minutes 35
Heating Votes 600	Anticycle 2 0 sec	Wednesday 2 To 00:00	Set New Weekday Tuesday
Overriding Zone 0	Anticycle 3 0 sec	Thursday 1 From 09:00	Daylight Savings YES
Current Date \blacktriangleright 01/20/92	Anticycle 4 0 sec	Thursday 1 To 17:00	Holiday 1 From \blacktriangleright 00/00
Current Time 14:35	Anticycle 5 0 sec	Thursday 2 From 00:00	Holiday 1 To 00:00
Schedule Day Tuesday	Anticycle 6 0 sec	Thursday 2 To 00:00	Holiday 2 From 00:00
Cooling To Heating \blacktriangleright 120 sec	Anticycle 7 0 sec	Friday 1 From 08:00	Holiday 2 To 00:00
Heating 1040 sec	Anticycle 8 0 sec	Friday 1 To 17:00	Holiday 3 From 00:00
Heating To Cooling 120 sec	Sunday 1 From \blacktriangleright 00:00	Friday 2 From 00:00	Holiday 3 To 00:00
Cooling 520 sec	Sunday 1 To 00:00	Friday 2 To 00:00	Holiday 4 From 00:00
Discharge Temp \blacktriangleright 74.0 °F	Sunday 2 From 00:00	Saturday 1 From 10:00	Holiday 4 To 00:00
Return Air Temp 72.4 °F	Sunday 2 To 00:00	Saturday 1 To 12:00	Holiday 5 From 00:00
Outside A: Temp 71.5 °F	Monday 1 From 09:00	Saturday 2 From 15:00	Holiday 5 To 00:00
Mode \blacktriangleright OCCUPIED	Monday 1 To 17:00	Saturday 2 To 17:00	Holiday 6 From 00:00
Output 1 ON	Monday 2 From 00:00	Holiday 1 From 00:00	Holiday 6 To 00:00
Output 2 OFF	Monday 2 To 00:00	Holiday 1 To 00:00	Holiday 7 From 00:00
Output 3 OFF	Tuesday 1 From 09:00	Holiday 2 From 00:00	Holiday 7 To 00:00
Output 4 OFF	Tuesday 1 To 17:00	Holiday 2 To 00:00	Holiday 8 From 00:00
Output 5 OFF	Tuesday 2 From 00:00	Set New Month \blacktriangleright 1	Holiday 8 To 00:00

Holiday 9 From 00:00	Thur Aux1 From 00:00	Aux1 Out Control AUX SCHEDULE	AllDy4 Aux2 To 00:00
Holiday 9 To 00:00	Thur Aux1 To 00:00	Sunday Aux2 From ♦ 00:00	AllDy5 Aux2 From 00:00
Holiday 10 From 00:00	Fnday Aux1 From 00:00	Sunday Aux2 To 00:00	AllDy5 Aux2 To 00:00
Holiday 10 To 00:00	Fnday Aux1 To 00:00	Monday Aux2 From 00:00	AllDy6 Aux2 From 00:00
Holiday 11 From 00:00	Sat Aux1 From 00:00	Monday Aux2 To 00:00	AllDy6 Aux2 To 00:00
Holiday 11 To 00:00	Sat Aux1 To 00:00	Tues Aux2 From 00:00	AllDy7 Aux2 From 00:00
Holiday 12 From 00:00	Altern Aux1 From 00:00	Tues Aux2 To 00:00	AllDy7 Aux2 To 00:00
Holiday 12 To 00:00	Altern Aux1 To 00:00	Wednes Aux2 From 00:00	AllDy8 Aux2 From 00:00
Holiday 13 From 00:00	AllDy1 Aux1 From ♦ 00:00	Wednes Aux2 To 00:00	AllDy8 Aux2 To 00:00
Holiday 13 To 00:00	AllDy1 Aux1 To 00:00	Thur Aux2 From 00:00	Aux2 Out Control AUX SCHEDULE
Holiday 14 From 00:00	AllDy2 Aux1 From 00:00	Thur Aux2 To 00:00	Sunday Aux3 From ♦ 00:00
Holiday 14 To 00:00	AllDy2 Aux1 To 00:00	Fnday Aux2 From 00:00	Sunday Aux3 To 00:00
Holiday 15 From 00:00	AllDy3 Aux1 From 00:00	Fnday Aux2 To 00:00	Monday Aux3 From 00:00
Holiday 15 To 00:00	AllDy3 Aux1 To 00:00	Sat Aux2 From 00:00	Monday Aux3 To 00:00
Holiday 16 From 00:00	AllDy4 Aux1 From 00:00	Sat Aux2 To 00:00	Tues Aux3 From 00:00
Holiday 16 To 00:00	AllDy4 Aux1 To 00:00	Altern Aux2 From 00:00	Tues Aux3 To 00:00
Sunday Aux1 From ♦ 00:00	AllDy5 Aux1 From 00:00	Altern Aux2 To 00:00	Wednes Aux3 From 00:00
Sunday Aux1 To 00:00	AllDy5 Aux1 To 00:00	AllDy1 Aux2 From ♦ 00:00	Wednes Aux3 To 00:00
Monday Aux1 From 00:00	AllDy6 Aux1 From 00:00	AllDy1 Aux2 To 00:00	Thur Aux3 From 00:00
Monday Aux1 To 00:00	AllDy6 Aux1 To 00:00	AllDy2 Aux2 From 00:00	Thur Aux3 To 00:00
Tues Aux1 From 00:00	AllDy7 Aux1 From 00:00	AllDy2 Aux2 To 00:00	Friday Aux3 From 00:00
Tues Aux1 To 00:00	AllDy7 Aux1 To 00:00	AllDy3 Aux2 From 00:00	Friday Aux3 To 00:00
Wednes Aux1 From 00:00	AllDy8 Aux1 From 00:00	AllDy3 Aux2 To 00:00	Sat Aux3 From 00:00
Wednes Aux1 To 00:00	AllDy8 Aux1 To 00:00	AllDy4 Aux2 From 00:00	Sat Aux3 To 00:00

Altern Aux3 From 00:00	Minimum Heating 5 min	Output 7 Type AUXILIARY 2	Htng 1 On Below ♦ 150.0 °F
Altern Aux3 To 00:00	Duct Purge 2 min	Output 8 Type AUXILIARY 3	Htng 2 On Below 145.0 °F
AltDy1 Aux3 From ♦ 00:00	Discharg Temp Adj ♦ .0 °F	Out 1 Anticycle ♦ 0 sec	Htng 3 On Below 140.0 °F
AltDy1 Aux3 To 00:00	Return Temp Adj 0 °F	Out 2 Anticycle 300 sec	Htng 4 On Below 135.0 °F
AltDy2 Aux3 From 00:00	Outside Temp Adj .0 °F	Out 3 Anticycle 300 sec	Htng 5 On Below 130.0 °F
AltDy2 Aux3 To 00:00	Logging Interval ♦ 1 min	Out 4 Anticycle 90 sec	Htng 6 On Below 125.0 °F
AltDy3 Aux3 From 00:00	Logging Alarm NO ALARM	Out 5 Anticycle 30 sec	Htng 7 On Below 120.0 °F
AltDy3 Aux3 To 00:00	Logged Data CONFIGURATION 1	Out 6 Anticycle 0 sec	Htng 1 Off Above ♦ 150.0 °F
AltDy4 Aux3 From 00:00	M Clng On Above ♦ 60.0 °F	Out 7 Anticycle 0 sec	Htng 2 Off Above 145.0 °F
AltDy4 Aux3 To 00:00	M Clng Off Below 45.0 °F	Out 8 Anticycle 0 sec	Htng 3 Off Above 140.0 °F
AltDy5 Aux3 From 00:00	M Htng Off Above 120.0 °F	Clng 1 Off Below ♦ 64.0 °F	Htng 4 Off Above 135.0 °F
AltDy5 Aux3 To 00:00	M Htng On Below 100.0 °F	Clng 2 Off Below 58.0 °F	Htng 5 Off Above 130.0 °F
AltDy6 Aux3 From 00:00	AO1 Throt Mode HEATING	Clng 3 Off Below 58.0 °F	Htng 6 Off Above 125.0 °F
AltDy6 Aux3 To 00:00	Analog1 Full On 2 Volt Output	Clng 4 Off Below 60.0 °F	Htng 7 Off Above 120.0 °F
AltDy7 Aux3 From 00:00	Analog1 Full Off 0 Volt Output	Clng 5 Off Below 62.0 °F	EDITING PASSWORD (enter password)
AltDy7 Aux3 To 00:00	AO2 Throt Mode COOLING	Clng 6 Off Below 64.0 °F	
AltDy8 Aux3 From 00:00	Analog2 Full On 6 Volt Output	Clng 7 Off Below 66.0 °F	
AltDy8 Aux3 To 00:00	Analog2 Full Off 0 Volt Output	Clng 1 On Above ♦ 55.0 °F	
Aux3 Out Control PLUS OVERRIDE	Output 1 Type ♦ FAN	Clng 2 On Above 57.0 °F	
SCU Identifier: ♦ (enter SCU name)	Output 2 Type COOLING 1	Clng 3 On Above 59.0 °F	
Unit Address 500	Output 3 Type COOLING 2	Clng 4 On Above 61.0 °F	
Mode Selected By ♦ MAJORITY VOTE	Output 4 Type HEATING 1	Clng 5 On Above 63.0 °F	
Total Cycle Time 20 min	Output 5 Type HEATING 2	Clng 6 On Above 65.0 °F	
Minimum Cooling 5 min	Output 6 Type AUXILIARY 1	Clng 7 On Above 67.0 °F	

System Controller Operator's Panel Displays

ZONE CONTROLLER 5	Occ Hing Setpt 72 °F	Unocc Hing Voles 100 votes	Fan Off Airflow 10000 CFM
Total Override ◆ 120 min	Unocc Cing Setpt 90 °F	Mode Control ◆ USE SCU SCHEDULE	Duct Temp Cutoff 100.0 °F
Room Temperature ◆ 75.2 °F	Unocc Hing Setpt 50 °F	Box Type SDV942 STANDARD	Outside T Cutoff 100.0 °F
Cooling Setpoint 75.0 °F	Override Time 60 min	Box Size 8 inch	Fit Start Offset ◆ 1.0 °F
Heating Setpoint 72.0 °F	Cooling Maximum ◆ 800 CFM	Airflow Slope ◆ .00 %	Fit Thrott Range 3.0 °F
Duct Temperature 54.0 °F	Cooling Minimum 100 CFM	Airflow Offset 0 CFM	Fit Full Stroke 60.0 sec
Current Airflow ◆ 94 CFM	Heating Maximum 800 CFM	Room Temp Adjust .0 °F	Fit Minimum Step 3.0 sec
Airflow Setpoint 90 CFM	Heating Minimum 100 CFM	Duct Temp Adjust 0 °F	Prop Start Offset ◆ 4.0 °F
Operational Mode ◆ OCCUPIED	Reheat Airflow 0 CFM	Temp Setpt Adjust .0 °F	Prop Thrott Rang 3.0 °F
Unocc Override 0 sec	Damper Deadband ◆ 50 CFM	Airflow Kp ◆ 33.33	Analog Full On : 10 Volt Output
Damper Open OFF	Damper Mod Band 500 CFM	Airflow Ki .04	Analog Full Off : 2 Volt Output
Damper Close OFF	Logging Interval ◆ 1 min	Airflow Kd .0	
Fan Output OFF	Logging Alarm NO ALARM	AI Max Integral 30000	
Heat 1 Output OFF	Maximum Setpoint ◆ 90 °F	Fan On Offset ◆ 1.0 °F	
Heat 2 Output OFF	Minimum Setpoint 50 °F	Heat 1 On Offset 1.5 °F	
Heat 3 Output OFF	Cing Setpt Offset 2.0 °F	Heat 2 On Offset 2.0 °F	
Cooling Level ◆ 12.5 %	Hing Setpt Offset 2.0 °F	Heat 3 On Offset 2.5 °F	
Heating Level 0.0 %	Min Deadband 4.0 °F	Fan Off Offset 0.5 °F	
Cooling Voles 12 votes	Display Adjust 0.0 °F	Heat 1 Off Offset 0.5 °F	
Heating Voles 0 votes	Occ Cing Voles 100 votes	Heat 2 Off Offset 0.5 °F	
Lock Setpoints ◆ NO	Occ Hing Voles 100 votes	Heat 3 Off Offset 0.5 °F	
Occ Cing Setpt 75 °F	Unocc Cing Voles 100 votes	Fan On Airflow 0 CFM	

Bypass Controller Operator's Panel Displays

BYPASS TERMINAL CONTROLLER	
Static Pressure	◆ 0.78 in wg
Damper 1 Open	OFF
Damper 1 Close	OFF
Damper 2 Open	OFF
Damper 2 Close	OFF
Damper 3 Open	OFF
Damper 3 Close	OFF
B P Press Setpt	◆ 0.75 in wg
Bypass Deadband	0.05 in wg
Damper Mod Band	0.50 in wg
VFD Press Setpt	0.75 in wg
VFD Deadband	0.05 in wg
P Offset Adjust	0.00 in wg
P Slope Adjust	0.00 in wg
Logging Interval	◆ 1 min
Logging Alarm	NO ALARM

B. ETDIS Display Thermostat Operation

As stated in previous sections, the ETDIS display thermostat is a versatile tool which can be utilized not only as a thermostat, but also as a service tool. As a thermostat, the ETDIS operates in the standard mode and allows the monitoring of not only cooling and heating setpoints, but also the status of various other VAV zone terminal functions. When connected to a BTC, it will continuously display the current static pressure. As a service tool, the ETDIS operates in the configuration mode. The ETKEY is required to put the ETDIS into configuration mode and it is then capable of altering configuration parameters in both the BTC and zone controllers.

1. Standard Mode

- a. Heating setpoint: Press the right or left heating buttons to increase or decrease the setpoint.
- b. Cooling setpoint: Press the right or left cooling buttons to increase or decrease the setpoint.
- c. Current Space Temp: Press and hold the Mode button to display the current space temp.
- d. Current CFM: Press the Mode and left Heating buttons simultaneously and hold to display the current airflow in CFM through the VAV zone terminal.
- e. Current Duct Temp: Press the Mode and right Heating buttons simultaneously and hold to display the current VAV zone terminal inlet duct temperature.
- f. Current Unit Address: Press the Mode and On buttons simultaneously and hold to display the VAV zone terminal unit address.
- g. Unoccupied Override: Press the On button to place the VAV zone terminal controller into the unoccupied override mode. The unoccupied display of “OFF” will be replaced by the occupied heating and cooling setpoints. When the unoccupied override timer counts down to zero, the display will return to “OFF” and the VAV zone terminal controller will automatically return to unoccupied mode.

2. Configuration Mode

To convert the ETDIS into its configuration mode, the ETKEY must be inserted into the top, 6 pin communication port. As shown on the following several pages, the function will appear in an alphanumeric format.

To scroll through the various parameters, press the “ON” button until the desired parameter appears on the 4 character LED display.

Once the parameter is located, press the “MODE” button to view the current parameter value. To alter that value, use the left and right Heating buttons to increase and decrease the values by 100. Use the left and right Cooling buttons to increase and decrease the values by 1.

When the setup or alteration process is complete, remove the ETKEY from the top communication port. Any data that was altered will then automatically be stored in the controller and the Heating and Cooling setpoints will again be displayed.

Display Stat Zone Configuration Mode Displays for Zone Controller

Setting	LED Display	Format	Units
Unit Address	00 U A	NNNN	----
Balancing Low	01 b L	NNNN	CFM
Balancing High	02 b H	NNNN	CFM
Remote Control for Special Mode	03 r C	NN	[1]
Lock Setpoints?	04 L o	NN	0=No, 1=Yes
Occupied Cooling Setpoint	05 o C	NN	°F
Occupied Heating Setpoint	06 o H	NN	°F
Unoccupied Cooling Setpoint	07 U C	NN	°F
Unoccupied Heating Setpoint	08 U H	NN	°F
Unoccupied Override Time	09 o t	NNNN	minutes
Cooling Maximum Airflow	10 C A	NNNN	CFM
Cooling Minimum Airflow	11 C I	NNNN	CFM
Heating Maximum Airflow	12 H A	NNNN	CFM
Heating Minimum Airflow	13 H I	NNNN	CFM
Local Heat Airflow	14 L H	NNNN	CFM
Damper Deadband	15 d E	NNNN	CFM
Damper Modulation Band	16 d o	NNNN	CFM
Logging Interval	17 L I	NNNN	minutes
Log Alarm	18 L A	N	[2]
Temperature Setpoint Maximum	19 t A	NN.N	.1 °F
Temperature Setpoint Minimum	20 t I	NN.N	.1 °F
Cooling Setpoint Offset	21 C S	NN.N	.1 °F
Heating Setpoint Offset	22 H S	NN.N	.1 °F
Minimum Temperature Deadband	23 t d	NN.N	.1 °F
Displayed Temperature Adjust	24 d A	NN.N	.1 °F
Occupied Cooling Votes	25 o o	NNN	votes
Occupied Heating Votes	26 o E	NNN	votes
Unoccupied Cooling Votes	27 U o	NNN	votes
Unoccupied Heating Votes	28 U E	NNN	votes
Scheduling Control	29 S C	N	[3]
Box Type	30 b I	NN	[4]
Box Size	31 b S	NN	inches
Airflow Slope Adjust	32 A S	NN.NN	.01 %
Airflow Offset Adjust	33 A o	NNNN	CFM
Space Temperature Adjust	34 S A	NNN.N	.1 °F
Duct Temperature Adjust	35 d A	NNN.N	.1 °F
Temperature Setpoint Adjust	36 t A	NNN.N	.1 °F
Airflow Proportional Constant	37 A P	NN.NN	----
Airflow Integral Constant	38 A I	NN.NN	----
Airflow Derivative Constant	39 A d	NN.NN	----
Airflow Maximum Integral	40 A A	NNNN	----
Fan On Offset	41 F n	NNN.N	.1 °F
Heat 1 On Offset	42 1 n	NNN.N	.1 °F
Heat 2 On Offset	43 2 n	NNN.N	.1 °F

Heat 3 On Offset	44	3 n	NNN.N	.1 °F
Fan Off Offset	45	F F	NNN.N	.1 °F
Heat 1 Off Offset	46	1 F	NNN.N	.1 °F
Heat 2 Off Offset	47	2 F	NNN.N	.1 °F
Heat 3 Off Offset	48	3 F	NNN.N	.1 °F
Fan Airflow On	49	A n	NNNN	CFM
Fan Airflow Off	50	A F	NNNN	CFM
Reheat Duct Temperature Cutoff	51	r d	NNN.N	.1 °F
Reheat Outside Temperature Cutoff	52	r o	NNN.N	.1 °F
Floating Point Start Offset	53	F o	NNN.N	.1 °F
Floating Point Throttling Range	54	F l	NNN.N	.1 °F
Floating Point Full Stroke Time	55	F S	NNN.N	.1 sec
Floating Point Minimum Step Time	56	F P	NNN.N	.1 sec
Proportional Modulated Start Offset	57	P o	NNN.N	.1 °F
Proportional Modulated Throttling Range	58	P l	NNN.N	.1 °F
Analog output voltage at completely on	59	A n	NN	volts
Analog output voltage at completely off	60	A o	NN	volts
Clear Zone Stored Password	61	C P	N	[5]

- [1] 0 = Normal Operation,
 1 = Open Damper and turn proportional output to setpoint off,
 2 = Close Damper and turn proportional output to setpoint off,
 3 = Turn Fan On and turn proportional output to setpoint off,
 4 = Turn 1st Stage Heat On/Tri-State valve open and proportional output goes to 1/3 setpoint on,
 5 = Turn 2nd Stage Heat On/Tri-State valve close and proportional output goes to 2/3 setpoint on,
 6 = Turn 3rd Stage Heat On and proportional output goes to full setpoint on,
 7 = All Stage Heating and Tri-State output off and turn proportional output to setpoint off,
 8 = Proportional output at maximum voltage » 10 Volts,
 9 = Proportional output at minimum voltage » 0 Volts,
 32 = Software Reset,
 34 = High Balancing Mode(using VTMon), 35=Low Balancing Mode(using VTMon).

- [2] 0 = No Alarm Condition, 1 = Indication of Error when writing to EEPROM Memory.

- [3] 0 = Use SCU Schedule, 1 = Use Smart Stat On/Off Timer, 2=Use Smart Stat On/Off Switch.

- [4] 0 = SDV942 Standard, 1 = SDV945 No Local Reheat,
 2 = SDV945 with Staged (and Proportional) Local Heat control,
 3 = SDV945 with Tri-State (and Proportional) Local Heat control,
 4 = FVV945 No Local Reheat (Variable Volume Fan control only),
 5 = FVV945 with Staged (and Proportional) Local Heat control,
 6 = FVV945 with Tri-State (and Proportional) Local Heat control,
 7 = FCV945 No Local Reheat (Constant Volume Fan control only),
 8 = FCV945 with Staged (and Proportional) Local Heat control,
 9 = FCV945 with Tri-State (and Proportional) Local Heat control,
 10 = SDV945 Proportional Local Heat control,
 11 = FVV945 Proportional Local Heat control,
 12 = FCV945 Proportional Local Heat control.

- [5] 0 = Normal Operation, 1 = Command to Clear Zone's stored Password.

* If both Heating Dec & Cooling Inc are pressed in current setting mode, 0 or minimum is set.

Display Stat Configuration Mode Displays for BTC Controller

Setting	LED Display	Format	Units
Unit Address	00 U A	NN65	----
Remote Control for Special Mode	01 r C	NN	[1]
Bypass Pressure Setpoint	02 b P	N.NN	.01 Wg
Bypass Pressure Deadband	03 b d	N.NN	.01 Wg
Damper Modulation Band	04 d o	N.NN	.01 Wg
V F Drive Pressure Setpoint	05 F P	N.NN	.01 Wg
V F Drive Pressure Deadband	06 F d	N.NN	.01 Wg
Pressure Offset Adjustment	07 P o	N.NN	.01 Wg
Pressure Slope Adjustment	08 P S	N.NN	.01 Wg
V F Drive Full Scale Response Time	09 F r	NN	[2]
Logging Interval	10 L I	NNNN	minutes
Log Alarm	11 L A	N	[3]
Analog Input measured	12 A I	NNNN	A / D Counts
Clear Zone Stored Password	13 C P	N	[4]

- [1] 0 = Normal Operation,
 1 = Open Damper 1 and turn V F Drive output on 1/4,
 2 = Close Damper 1 and turn V F Drive output on 1/3,
 3 = Open Damper 2 and turn V F Drive output on 1/2,
 4 = Close Damper 2 and turn V F Drive output on 2/3,
 5 = Open Damper 3 and turn V F Drive output on 3/4,
 6 = Close Damper 3 and turn V F Drive output completely on,
 7 = All Damper controlling outputs turned off and turn V F Drive output completely off,
 8 = Open all Dampers and turn V F Drive output off,
 9 = Close all Dampers and turn V F Drive output off,
 30 = Simulates SCU opening dampers,
 32 = Software Reset,
 37 = Set Low pressure calibration,
 36 = Set High pressure calibration.
- [2] 2 = 2 minutes, 3 = 1½ minutes, 4 = 1 minute, 5 = 50 seconds,
 6 = 40 seconds, 8 = 30 seconds, 10 = 25 seconds, 13 = 20 seconds.
- [3] 0 = No Alarm Condition, 1 = Indication of Error when writing to EEPROM Memory.
- [4] 0 = Normal Operation, 1 = Command to Clear Zone's stored Password.

* If both Heating Dec & Cooling Inc are pressed in current setting mode, 0 or minimum is set.

Chapter 8

ENVIRO-TEC DDC CONTROL SYSTEM STATIC PRESSURE, AIRFLOW and TEMPERATURE CALIBRATION PROCEDURES

As stated previously, all of the analog input data utilized by the Enviro-Tec DDC control system can be calibrated by software, if required. This data consists of static pressure, airflow and various temperature readings. The following procedures are a guide to the calibration of these readings.

A. Temperature Readings

Temperature readings consist of: Space Temp, Inlet Temp, Outside Temp and Discharge Temp. These readings may be adjusted by calibration should they be inaccurate in any way. There is also a calibration for the temperature setpoint on the ETTS regular thermostat. Occasionally, the displayed temperature setpoint and the indicated temperature setpoint on the ETTS will not coincide. To calibrate any of these readings, simply enter the number of degrees and/or tenths of degrees F required to adjust the display. If this entry is a negative number, press the minus (-) key AFTER the numeric entry is made, not before.

B. Airflow Readings

When calibrating the airflow reading of a VAV zone terminal, the entire airflow curve of the terminal is being adjusted. The low or minimum end of the curve is adjusted using the “Offset” calibration. This is the equivalent of an electronic “Zero” calibration. The high or maximum end of the curve is adjusted using the “Slope” calibration. This is the equivalent of an electronic “Gain” calibration.

In the event that an airflow calibration is required, the following procedure may be used to correct any inaccuracies in the displayed CFM.

Step 1:

Using a PC, run the VTMON program using command line option D. (see the chapter 5 section on using command line options.) Enter into the screen of the VAV zone terminal that is to be calibrated. Type the <Alt><L> command. This will cause the controller to ignore the current CFM setpoint and force the minimum cooling CFM to become the artificial current setpoint.

Step 2:

Watching the Zone - Monitor screen, wait till the actual CFM reading settles down to within the deadband of the minimum cooling CFM setpoint. With a calibrated flow hood, measure the actual CFM flowing through the zone diffusers.

Step 3:

If the actual and displayed readings are outside the design specification, enter the difference between the two in the “Airflow Offset” calibration location in the Zone - Low Level Configuration Settings screen. If a negative number is required, press the minus (-) key after the entry to subtract from the actual reading. Do not press the minus (-) before making the numeric entry.

Step 4:

Check the Zone - Low Level Configuration screen and insure that the “Slope” is set to “0%”. Type the <Alt><H> command. This will cause the controller to ignore the current CFM setpoint and force the maximum cooling CFM to become the artificial current setpoint.

Step 5:

Watching the Zone - Monitor screen, wait till the actual CFM reading settles down to within the deadband of the maximum cooling CFM setpoint. With a calibrated flow hood, measure the actual CFM flowing through the zone diffusers.

Step 6:

If the actual and displayed readings are outside the design specification, calculate the required slope percentage using the following formula:

$$\text{Slope \%} = 10\% \times \frac{(\text{Measured Airflow} - \text{Displayed Airflow Reading})}{(\text{Displayed Airflow Reading} - \text{Calibration Offset})}$$

Step 7:

Enter the calculated slope % in the “Airflow Slope” calibration location in the Zone - Low Level Configuration Settings screen. If a negative number is required, press the minus (-) key after the entry to subtract from the actual reading. Do not press the minus (-) before making the numeric entry.

Step 8:

Enter the <Alt><N> command which will instruct the controller to return to the normal control mode.

C. BTC Initial Setup

Because strict accuracy (within .02 wg) is usually not necessary for proper and safe static pressure control, and because controller calibration is accomplished at the factory, this reduced set of start-up instructions can be followed which will result in excellent static pressure control.

Step 1:

If using a PC, run the VTMON program using command line option D. (see the chapter 5 section on using command line options.) If using the ETDIS display stat, follow the chapter 7 section using Display-Stat Configuration Mode Displays for BTC Controller.

Step 2:

Set Bypass Pressure Setpoint and VFD Pressure Setpoint to .2 wg. Set both VFD Pressure Deadband and Bypass Pressure Deadband to .05 wg.

Step 3:

If using the VTMON program, enter into the Static Pressure monitor screen and type <Alt><L> (for low pressure calibration). This can be confirmed by paging down to the next screen called STATIC PRESSURE CONTROLLER - TEST VARIABLES and checking the special mode indicator. If using the ETDIS display stat, set the remote control to 37 (which stands for low pressure calibration).

Step 4:

Set Pressure Offset Adjust to 0.

Step 5:

Next, using the VTMON program, return to the Static Pressure monitor screen and type <Alt><H> (for high pressure calibration). To confirm again, press <PgDn> to STATIC PRESSURE CONTROLLER - TEST VARIABLES and check Special Mode indicator. If using the ETDIS display stat, set the remote control to 36 (which stands for high pressure calibration).

Step 6:

Set Pressure Slope Adjust to 0.

Step 7:

Type <Alt><A> to set all controllers back to normal and then enter in static pressures that are desired for system operation. If using an ETDIS display stat, set remote control to 0, which stands for normal operation. Also, set system static pressure setpoints following the guidelines in chapter 7 using Display-Stat Configuration Mode Displays for BTC Controller.

D. BTC Static Pressure Calibration

In the event that a static pressure calibration is required, the following procedure may be used to correct any inaccuracies in the displayed actual static pressure.

Step 1:

Install the BTC and connect to either the Bypass Valves (BPV), the Variable Frequency Drive (VFD), or both, in accordance with the submittal drawings found in chapter 4. Connect a Manometer, Magnahelic or other pressure sensing device on a separate probe located in the same vicinity as the BTC. Energize system in accordance with the procedures outlined in chapter 6.

Step 2:

If using a PC, then run the VTMON program using command line option D. (see the chapter 5 section on using command line options.) If using the ETDIS display thermostat, follow the guidelines in chapter 7 using Display-Stat Configuration Mode Displays for BTC Controller.

Step 3:

- a. If using either bypass damper control or VFD only: Set Bypass Pressure Setpoint and VFD Pressure Setpoint to some minimum value, i.e. from .1 to .3 wg. Set both VFD Pressure Deadband and Bypass Pressure Deadband to .05 wg.
- b. If using both the bypass damper control and the VFD: Set VFD Pressure Setpoint to some minimum value, i.e. from .1 to .3 wg. Set Bypass Pressure Setpoint at least .3 wg above the chosen VFD Pressure Setpoint. Set both VFD Pressure Deadband and Bypass Pressure Deadband to .05 wg.

Step 4:

If using the VTMON program, access the Static Pressure monitor screen and type <Alt><L> (for low pressure calibration). This can be confirmed by paging down to the next screen called STATIC PRESSURE CONTROLLER - TEST VARIABLES and checking the Special Mode indicator. If using the ETDIS display stat, set remote control to 37 (which stands for low pressure calibration).

Step 5:

After setting a pressure setpoint the static pressure controller reading should fall or rise to the new pressure setpoint value +/- the dead band setting. If the pressure doesn't quite reach the static pressure setpoint then it may be necessary to calibrate to a slightly higher pressure or to reduce the actual pressure by commanding VAV box dampers to open. This latter case is accomplished by pressing <Alt><1> keys when each zone is highlighted in the Network Monitor screen.

Step 6:

Once the pressure reading settles to around the static pressure setpoint, +/- the dead band, a comparison should be made between the static pressure being read by the controller and pressure being measured by the calibrated pressure sensing device. To correct for any error between the two, enter into the Pressure Offset Adjustment the pressure difference that needs to be added to or subtracted from the controllers reading so that it will equal the calibrated pressure sensing device reading.

Pressure Offset Adjust = actual measured pressure - uncorrected Controller Static Pressure

Step 7:

Next, using the VTMON program, return to the Static Pressure monitor screen and type <Alt><H> (for high pressure calibration). To confirm again, press <PgDn> to STATIC PRESSURE CONTROLLER - TEST VARIABLES and check Special Mode indicator. If using the ETDIS display stat, set remote control to 36 (which stands for high pressure calibration).

Step 8:

Set Bypass Pressure Setpoint and VFD Pressure Setpoint to some maximum calibration value. This maximum value will be the highest pressure that is ever required as an accurate reading. Remember, the duct work will actually need to get up to this pressure (and somewhat beyond) to calibrate the system at the maximum calibration pressure chosen. Therefore consideration needs to be given as to what pressures the duct work can withstand and what maximum pressures are possible to obtain. Suggested maximum pressure is in the range from 1.2 to 2 wg. The VFD Pressure Deadband and Bypass Pressure Deadband should be set from .05 wg to .20 wg.

Step 9:

When the pressure reading settles once again around the static pressure setpoint, +/- the dead band setting, another comparison should be made between the static pressure being read by the controller and the pressure being measured by the calibrated pressure sensing device. (If the pressure doesn't settle down and the system uses a VFD, increase VFD full scale response time.) This time, correct the pressure reading value by entering the pressure difference into the pressure slope adjustment. Reduce or increase Pressure Slope Adjustment until static pressure is within acceptable tolerances of measured pressure.

Pressure Slope Adjust = actual measured pressure - uncorrected displayed Controller Static Pressure

Step 10:

Type <Alt><A> to set all controllers back to normal and then enter in static pressures that are desired for system operation. If using an ETDIS display stat, set remote control to 0, which stands for normal operation. Also, set system static pressure setpoints following the guidelines in chapter 7 using Display-Stat Configuration Mode Displays for BTC Controller.

Chapter 9

ENVIRO-TEC DDC CONTROL SYSTEM SYSTEM PASSWORD OPERATION

The VTMON program has been given password protection capability. This is designed to protect the system against non-authorized parameter modifications. The password resides in the non-volatile memory on board the SCU. Each SCU may have it's own password on a multi SCU system, or they may all use the same password.

There is no password loaded into the SCU memory when shipped from the factory. This means that there is unlimited access to the system until such time as a password is loaded into the SCU memory. It is important to remember that the VTMON program will also allow the system to be monitored by an operator without the password, but no parameters may be altered.

A. To install a password using the VTMON program, use the following steps.

1. Access the system with the VTMON program normally.
2. Once into the "ETI DDC Network" screen, access the SCU.
3. Once into the "System Control Unit - Monitor" screen, press the "Page Down" key 3 times. This will display the "System Control Unit - Configuration Settings" screen.
4. To begin the password entry mode for the SCU currently being accessed only, press the <Alt><E> keys simultaneously. The "Editing Password" block will be displayed in the middle of the screen. See the sample screen on the following page.
5. To begin the password entry mode for all of the SCU's networked together on the system, press the <Alt><S> keys simultaneously. The "Editing Password" block will be displayed in the middle of the screen. See the sample screen on the following page.
6. Enter the desired password. The password may consist of up to 16 alphanumeric or keyboard characters. When completed, press the "Enter" key to leave the password entry mode. This will set the new password into the SCU's memory. Press the "ESC" key to exit without changing the password.
7. To confirm the password that was entered is correct, press either <Alt><E> or <Alt><S>. Edit if incorrect and press the "Enter" key or, if correct, press either the "Esc" key or the "Enter" key. This step may be repeated as many times as necessary.
8. To deactivate a password, repeat steps 1 thru 5. Press the "Delete" key, then the "Enter" key. This will cause all blanks to be displayed in the "Editing Password" block. The password will now be deactivated. Press the "Enter" key to leave the password entry mode.
9. To alter the password, use the same steps that are utilized to enter a new password.

System: 1
InterSCU Com

System Control Unit - Configuration Settings

System Identity Settings

SCU Identifier RTU - 3

SCU Address 300

Sensor Calibration

Duct Temp Adjust -1.0 °F

Return Temp Adjust 0.0 °F

Outside Temp Adjust 0.0 °F

System Control

Mode Select

Total Cycle 1

Minimum Cooling 5 min

Minimum Heating 5 min

Duct Purge 2 min

Editing Password: (SCU - Password)

0 min

Alarm ()

1

Logging Configuration

Logging Configuration Description

[Discharge Tmp] [Occupied Status] [Operating Mode] [Zone / BTC Response]

[Relay Status] (Return Tmp) Outside Tmp) (Votes Counted)

Online
30

B. To Access a Password Protected System using the VTMON program.

1. Run the VTMON program. The standard copyright statement is displayed. After pressing any key, the “ETI DDC Network” screen will be displayed with the password request box in the center.
2. The password request box states “Enter Password”. The operator must enter the password at this time. The operators entry will be displayed in X’s.
3. If the correct password has been entered, the VTMON program will allow unrestricted access to the system.
4. If an incorrect password has been entered, the following choices will be displayed:
 - a. Retry in case mistake was made entering password
 - b. Password incorrect, enter in Monitor Mode only
 - c. Exit program altogether
5. A maximum of 5 minutes are allowed for retrying password entries. This is to prevent tying up the system. If the operator has not entered the correct password within 5 minutes, the program will automatically exit itself.

C. Password Operation Using the ETOP Operators Panel

1. Confirm that a stat key is not being used to lock the operators keypad. This is done by installing a stat key into the quick connector jack labeled STAT on the SCU board in the Operators Panel. If the keypad responds at all, then it has not been locked.
2. Press the “Enter” key continuously until the program line block “EDITING PASSWORD” (the last line block in the SCU program) is displayed on the first line of liquid crystal display. The second line will display the password when one has been entered.
3. To enter a password:
 - a. To enter a number, press the key with that number on it, then press the “0” key.
 - b. To enter a lower case letter, press the key with the desired letter on it, then press either the 1, 2 or 3 key depending on which position the desired letter occupies on the key. For instance, to enter a lower case “s”, press the “STU” key and then the number “1” key, indicating that “s” is the first letter on the key.
 - c. To enter an upper case letter, press the key with the desired letter on it, then press the key above either the 1, 2 or 3 key which would be either the 4, 5 or 6 depending on which position the desired letter occupies on the key. For instance, to enter an upper case “O”, press the “MNO” key and then the number “6” key. The “6” key is pressed because “O” is the 3rd letter on the “MNO” key and the “6” key is above the “3” key.
 - d. To enter a space, press the “YZ” key and then the “3” key. Since there is no third letter on the “YZ” key, the third space is blank and becomes a space on the display.
 - e. To shift the cursor to the right, press the “.” (decimal) key. To shift the cursor to the left, press the “+/-” key.
 - f. To eliminate a password, enter “spaces” for all characters in the existing password and deactivate password checking, enter "spaces" for all characters in the existing password.

Chapter 10

ENVIRO-TEC DDC CONTROL SYSTEM SYSTEM MODEM CAPABILITIES

The Enviro-Tec DDC control system is equipped with the capability of being connected to a modem for remote monitoring and setup capability. With each Enviro-Tec DDC installation, modem connection hardware and software are supplied. A modem is not supplied. The Enviro-Tec DDC control system is designed to communicate with an external, "HAYES" (registered trademark of the Hayes Corp.) compatible, 2400 baud capable, external modem.

The supplied modem connection hardware consists of the following:

- 1) ETNUL modem cable.
- 2) ETINT1 converter cable
- 3) QW6N communication cable

This hardware is connected, with the modem (supplied by others) to the system in the following order:

[SCU]——— —[QW6N]———[ETINT1]———[ETNUL]———[Modem]———[Phone Line]

* Note: The QW6N cable connects to the SCU ETDUA8 motherboard in the port labeled "Modem". It can also be connected to the front comm port of the Operators Panel, into the top of any thermostat or even into the empty quick connector jack on the BTC control board. In fact, the modem QW6N cable can be connected to any available open quick connector jack.

There are 2 versions of the supplied modem software. The older version is named "M_SETUP" and was designed for the Hayes compatible, 2400 baud modems only. The 2nd and more recent version is named "M1SETUP" and was designed for use by some 9600 and 14400 baud modems as well as for the standardized Hayes compatible, 2400 baud modems. Recent developments in modem technology have made this addition necessary.

In order for the modem to operate with the Enviro-Tec DDC system, it must be set up with the proper modem "AT" commands. This is the function of the modem setup program (M_SETUP or M1SETUP). The modem setup program downloads to the modem a variety of operating conditions. It does this by sending individual AT commands to the modem which tell it to answer an incoming call in the correct time frame and manner as well as how to transfer bytes of data in a certain, accepted manner to and from the DDC system. The program also tells the modem to store this information in its non-volatile memory, so check at this time to see if the modem being used requires a battery for a backup power supply.

A. To accomplish the Modem Setup, the following steps must be followed:

1. Connect the modem to any convenient PC with an available serial communication port using a standard serial communication cable (Not the ETNUL cable supplied with the Enviro-Tec DDC system). Note the serial comm port number being used on the PC. Power up the modem.
2. Either download the modem setup program onto the PC's hard drive or run the program directly off of the diskette in either drive A or B. Type in either "M_SETUP" or "M1SETUP" depending on which program is available. Press the "Enter" key to run the program.
3. After the PC loads the program, the following will be displayed on the screen:

——WARNING! PROGRAM COMPLETION WILL ALTER STORED MODEM SETUP! ——

This M1SETUP 2.01 program Initializes ETDDC system communications linking for a 2400 bps Hayes-compatible type Modem along with some other types of 9600 or 14,400 modems.

Press <ENTER> to continue setup or, <ESC> to quit and exit program.

4. After pressing the <ENTER> key, the following will be displayed on the screen:

What serial port (Comm 1-4) on this PC is the modem connected to?

{ If unknown, type <ENTER> for default of Com 1, <ESC> to quit and exit. }

What Interrupt Request Level (IRQ 3-5) number is your PC's Com port using?

{ If unknown, type <ENTER> for most common PC industry standard: }

{ Default of IRQ 3. Press <ESC> to quit and exit. }

Attempting Modem connection and setup. Please wait a moment.

Type <Alt> <S> to stop Modem setup program.

5. When the setup program has been successfully completed, the following will be displayed on the screen:

————— SUCCESSFUL MODEM SETUP —————

This Modem has been successfully setup as a telephone communication device for the ETDDC system.

This modem can now be turned off and moved to a convenient ETDDC access point where it can be plugged directly into the ETDDC system using an ETVT null modem cable and an INT1 connector. It can be plugged into either an SCU operator's panel (in or out of box), a thermostat, or even the unused quick-wire connector on the bypass controller board.

Press <ENTER> or any key to quit and exit program.

6. If the setup program fails to accomplish a successful modem setup, a message like the following will be displayed on the screen to help in determining what corrective might be applicable:

Unable to setup modem to receiving mode because of returned data error! This could be caused by a mouse or some other device being on this com port! Suggested corrective action is to try choosing a different Com Port number and possibly changing modem-PC connection to a different Com port connector.

Nothing was returned to the com port by the modem.

(Check to see if you are connected to the right Com port and modem is on.)

Please press any key to try again, or press <Alt><X> to quit.

B. Establishing Modem Communication with the Enviro-Tec DDC system

To establish a modem communication link to the Enviro-Tec DDC control system from a remote location, the following are required:

- * A copy of the VTMON program.
- * A PC with either an internal or external modem.
- * A dedicated phone line.

1. Type "VTMON M" to initiate the VTMON program in the modem call out mode.
2. After reading the disk, the following will be displayed on the screen:
Type in the phone number to call.
Allowed: Numbers, small letters (which correspond to numbers) and the special commands:
 'W' which causes a wait for a 2nd dial tone,
 ',' (comma) which will delay 2 seconds each before dialing is continued,
 'P' which starts pulse dialing,
 'T' which starts tone dialing (default), and special characters '# * ABCD' used only in tone dialing mode.

All other letters and characters are ignored, including '-' and spaces.

Phone Number:

3. After entering the phone number, the following will be added onto the screen. During this time, the modem's SD and RD lights should blink if using an external modem.
Type in the phone number to call.
Allowed: Numbers, small letters (which correspond to numbers) and the special commands:
 'W' which causes a wait for a 2nd dial tone,
 ',' (comma) which will delay 2 seconds each before dialing is continued,
 'P' which starts pulse dialing,
 'T' which starts tone dialing (default), and special characters '# * ABCD' used only in tone dialing mode.

All other letters and characters are ignored, including '-' and spaces.

Phone Number: 8135413531

Attempting Modem connection and setup. Please wait a moment.

Type Alt S to stop Modem setup program.

4. After a successful PC to Modem setup connection, the modem will dial the number and the following will be displayed on the screen:
Type in the phone number to call.
Allowed: Numbers, small letters (which correspond to numbers) and the special commands:
 'W' which causes a wait for a 2nd dial tone,
 ',' (comma) which will delay 2 seconds each before dialing is continued,
 'P' which starts pulse dialing,
 'T' which starts tone dialing (default), and special characters '# * ABCD' used only in tone dialing mode.

All other letters and characters are ignored, including '-' and spaces.

Phone Number: 8135413531

Attempting Modem connection and setup. Please wait a moment.

Type Alt S to stop Modem setup program.

Dialing number now.

5. If a successful connection has been made over the phone and the receiving modem has picked up, the standard VTMON program screens will be displayed. If the connection attempt was not successful then an error message like the following will be displayed on the screen. This may help give an indication of what went wrong.

Type in the phone number to call.

Allowed: Numbers, small letters (which correspond to numbers) and the special commands:

‘W’ which causes a wait for a 2nd dial tone,

‘,’ (comma) which will delay 2 seconds each before dialing is continued,

‘P’ which starts pulse dialing,

‘T’ which starts tone dialing (default), and special characters ‘# * ABCD’ used only in tone dialing mode.

All other letters and characters are ignored, including ‘-’ and spaces.

Phone Number: 8135413531

Attempting Modem connection and setup. Please wait a moment.

Type Alt S to stop Modem setup program.

Dialing Modem now.

Carrier was lost or never detected.

Please press any key to try again, or press Alt X to quit.

Should this occur, please re-check all connections and setup procedures.

Chapter 11

ENVIRO-TEC DDC CONTROL SYSTEM COMPONENT TROUBLESHOOTING

This chapter is included to aid in identifying malfunctioning components. Many apparent problems are due to incorrect software setup (e.g. unit won't energize cooling because it has been placed in heating override.) Make sure system software setup and zone configurations are correct before proceeding with this section.

The "Debug" version of the VTMON program can be useful in determining if the source of a problem is with a component or the configuration. Inputs may be changed and observed through the program, and outputs may independently energized or de-energized in order to test the device in question.

The procedures below assume that both factory and field wiring has been checked and is correct.

A. SCU

In the section below the controller circuit board is referred to as ETDUA/ETSCU since it may be either model. The circuit board incorporating the relays and optional analog output is referred to as ETDUX.

STEP	ACTION	RESULT	PROCEED TO
1.0	Check 5 VDC (+/- 0.3 VDC) at test loops labeled "+5V" and "COM" on ETDUA/ETSCU.	Good	1.1
		Bad	2.0
1.1	Check for flashing DIA (Diagnostic) LED [see Chapter 6, Section A.4].	Good	1.2
		Bad	5.3
1.2	Check Zone communications (Zone Bus TXD and RXD LED's flash every minute).	Good	1.3
		Bad	Chap 12
1.3	Check SCU communications (in multiple SCU systems only, SCU Bus TXD and RXD LED's flash when VTMON program is run).	Good	1.4
		Bad	Chap 12
1.4	Check Operator's Panel Display and Function [Chapter 7, Section A].	Good	1.5
		Bad	3.0
1.5	Check HVAC unit control [Chapter 5, System Control Unit - Monitor screen].	Good	1.6
		Bad	4.0
1.6	Unit is operational.		
2.0	Check for 24 VAC +4/-2 VAC at quick connect terminals 15 & 16 of ETDUA/ETSCU.	Good	2.1
		Bad	2.5
2.1	Turn off power, check Fuse on ETDUA/ETSCU.	Good	2.3
		Bad	2.2
2.2	Replace fuse. Go to 2.3.		
2.3	Disconnect ETOP cable from J2 on ETDUA/ETSCU, turn on power, check 5 VDC.	Good	2.4
		Bad	5.3
2.4	Plug Operator's Panel cable into J2 on ETDUA/ETSCU check 5 VDC.	Good	1.1
		Bad	5.0

STEP	ACTION	RESULT	PROCEED TO
2.5	Check for correct line voltage (CAUTION: May be lethal).	Good Bad	5.2 5.1
3.0	Replace Operator's Panel QW cable with a known working QW cable.	Good Bad	5.10 3.1
3.1	Connect a computer to the ETDUA/ETSCU using the connector normally used for the Operator's Panel QW cable (J3), and run VTMON.	Good Bad	5.11 5.3
4.0	Check discharge temperature through Operator's Panel or VTMON program against actual temp.	Good Bad	4.4 4.1
4.1	Reading incorrect by less than 10 F: Reading incorrect by more than 10 F or at limit of range:		4.2 4.3
4.2	Using VTMON program, display thermostat, or SCU Operator's Panel, correct thermostat temperature reading [Chapter 8, Section A]. If problems remain, go to 4.4.		
4.3	Remove discharge temperature sensor wires from ETDUA/ETSCU and measure resistance (3 Kohm at 77 F, 6 Kohm at 50 F).	Good Bad	5.3 5.5
4.4	Problem with contact closure outputs: Problem with analog outputs:		4.5 4.7
4.5	Remove wire from ETDUX output in question (Y1-Y2, W1-W4, O); if no output works, remove fan wire (G). Touch wire to R and listen for relay to make in HVAC unit.	Good Bad	4.6 5.4
4.6	Re-install wire removed in previous step. Using the "Debug" mode of the VTMON program [Chapter 5, Section F.5] and the "Alt" commands [Chapter 5, Auxiliary Commands and "Help" screens, Sections 2.c through 2.k], set ETDUX output in question on, then off. If no output works set G output on, then off.	Good Bad	5.8 5.9
4.7	Remove the hot water valve actuator connections from J3 of the zone controller. Using the Operator's Panel [Chapter 7, Section A] or VTMON program [Chapter 5, System Control Unit AHU Control Settings screen], set both the Full On and Full Off values of AO1 to 10 VDC and verify the voltage (+/- 0.1 VDC) on J3, terminals three (+) and two (-). Repeat the procedure for 5 VDC and 0 VDC.	Good Bad	4.8 5.6
4.8	Repeat step 4.7 for AO2, taking measurements at J3, terminals one (+) and two (-).	Good Bad	5.7 5.6
5.0	Replace Operator's Panel, recheck ETDUA/ETSCU fuse, replace fuse if necessary.		
5.1	Correct incoming voltage problem.		

STEP	ACTION	RESULT	PROCEED TO
5.2	Check all 24 VAC wiring and replace transformer.		
5.3	Recheck wiring, if good, replace ETDUA/ETSCU.		
5.4	Recheck HVAC unit wiring. Refer to HVAC unit troubleshooting instructions.		
5.5	Recheck wiring and replace discharge temperature sensor (ETDSDL).		
5.6	Recheck wiring, if good, replace ETDUX.		
5.7	Refer to hot water valve actuator literature to determine problem with hot water valve actuator.		
5.8	Problem is in software configuration. Refer to Chapter 5.		
5.9	Reassign function to an unused output. If no output is unused, or no output works, replace ETDUX, ETDUA/ETSCU and ribbon cable.		
5.10	Replace Operator's Panel QW cable.		
5.11	Replace Operator's Panel.		
B.	Pressure Relief System		
1.0	Check 5 VDC (+/- 0.3 VDC) at test loops labeled "+5V" and "COM" on ETDD6V.	Good Bad	1.1 2.0
1.1	Check for flashing DG (Diagnostic) LED [Chapter 6, Section B.3].	Good Bad	1.2 4.2
1.2	Check communications (TX and RX LED's flash every minute).	Good Bad	1.3 Chap 12
1.3	Check operational control by changing static pressure setpoint and observing a corresponding increase or decrease of system pressure.	Good Bad	1.4 3.0
1.4	Unit is operational.		
2.0	Check for 24 VAC +4/-2 VAC at quick connect terminals 15 & 16 of ETDD6V.	Good Bad	2.1 2.3
2.1	Check Fuse on ETDD6V.	Good Bad	4.2 2.2
2.2	Replace fuse. Recheck 5 VDC.	Good Bad	1.1 4.2

STEP	ACTION	RESULT	PROCEED TO
2.3	Check for correct line voltage (CAUTION: May be lethal).	Good	4.1
		Bad	4.0
3.0	Control Sequence is BTC-01: Control Sequence is BTC-02:		3.1
			3.7
3.1	Remove wires going to BPV-01 from quick connect terminals 6 and 7 of ETDD6V circuit board. Touch the term. 7 wire to terminal 15 and verify BPV-01 damper closes: touch the term. 6 wire to terminal 15 and verify BPV-01 damper opens.	Good	3.2
		Bad	4.3
3.2	For Multiple Relief Terminal Systems, Repeat 4.1, using terminals 10 & 11 (open and close) for the 2nd Relief Terminal (BPV-02), or terminals 12 & 13 (open and close) for the 3rd Relief Terminal (also BPV-02).	Good	3.3
		Bad	4.3
3.3	Reconnect actuator wires. Remove tubing from flow transducer on the circuit board and verify 5 VDC (+/- 0.3 VDC) between wire loops labeled "TP3" ("VF") and "COM".	Good	3.4
		Bad	4.2
3.4	Using a short length of tubing, gently blow through the "HI" side of the transducer and verify voltage between wire loops labeled "TP3" ("VF") and "COM" approaches 0 VDC.	Good	3.5
		Bad	4.2
3.5	Check tubing from static pressure sensor to flow transducer on circuit board for leaks, kinks and connection to "HI" side.	Good	3.6
		Bad	4.4
3.6	Make sure inlet of static pressure sensor is pointing into direction of airflow.	Good	1.4
		Bad	4.5
3.7	Remove the connections from J3 of the ETDD6 circuit board. Using the "Debug" mode of the VTMON program [Chapter 5, Section F.5] and the "Alt" commands [Chapter 5, Auxiliary Commands and "Help" screens, Section 2], set the analog output to 0 VDC (Alt 7), 5 VDC (Alt 3) and 10 VDC (Alt 6) and verify that these voltages are present at the analog output.	Good	4.6
		Bad	4.2
4.0	Correct incoming voltage problem.		
4.1	Check all 24 VAC wiring and replace transformer.		
4.2	Recheck wiring, if good, replace ETDD6V.		
4.3	Recheck wiring, if good, replace failed actuator.		
4.4	Correct tubing problems.		

STEP	ACTION	RESULT	PROCEED TO
4.5	Reposition static pressure sensor.		
4.6	Refer to inlet vane actuator or variable frequency drive literature to determine problem.		
C.	Zone Terminals		
1.0	Check 5 VDC (+/- 0.3 VDC) at test loops labeled "+5V" and "COM" on ETDD circuit board.	Good Bad	1.1 2.0
1.1	Check for flashing DG (Diagnostic) LED [Chapter 6, Section B.3].	Good Bad	1.2 9.3
1.2	Check communications (TX and RX LED's flash every minute).	Good Bad	1.3 Chap 12
1.3	Check operational control by changing temperature setpoint and observing the appropriate response. Problem with Damper Motion: Problem with Space Sensor: Problem with Airflows: Problem with Inlet Temperature: Problem with Fan/24 VAC Heat Output: Problem with Analog Heat Output:		 3.0 4.0 5.0 6.0 7.0 8.0
1.4	Unit is operational.		
2.0	Check for 24 VAC +4/-2 VAC at quick connect terminals 15 & 16 of ETDD.	Good Bad	2.1 2.5
2.1	Remove power. Check Fuse on ETDD.	Good Bad	2.3 2.2
2.2	Replace fuse. Go to 2.3.		
2.3	Disconnect thermostat cable from J1. Turn on power. Recheck 5 VDC.	Good Bad	2.4 9.3
2.4	Reconnect cable to J1. Recheck 5 VDC.	Good Bad	1.1 9.2
2.5	Check for correct line voltage (CAUTION: May be lethal).	Good Bad	9.1 9.0
3.0	Using VTMON program [Chapter 5, Section F.5] and the "Alt" commands [Chapter 5, Auxiliary Commands and "Help" screens, Section 2] or display thermostat [Chapter 7, Section B.2], drive the terminal's damper open.	Good Bad	3.1 3.2

STEP	ACTION	RESULT	PROCEED TO
3.1	Using VTMON program or display thermostat, drive the terminal's damper closed.	Good Bad	5.0 3.2
3.2	Measure the voltage across the motor terminals. Verify 1-3 VDC.	Good Bad	3.3 9.3
3.3	Actuator is stalled. Loosen set screws from damper shaft and drive open and closed.	Good Bad	9.9 9.7
4.0	If space sensor is an ETTS (Regular Thermostat), go to 4.2. Check if ETDIS (Display Thermostat) display is lit.	Good Bad	4.1 4.3
4.1	Check function of buttons [Chapter 7, Section B.1].	Good Bad	4.5 4.3
4.2	If setpoints are locked [Chapter 5, Zone (Address) - User Settings screen, Section 2.a.], go to 4.5. Turn setpoint dial and verify setpoint changes using VTMON program.	Good Bad	4.5 4.3
4.3	Remove space sensor from wall and connect to zone control using a known working QW cable. Recheck display and buttons (ETDIS) or setpoint (ETTS).	Good Bad	9.10 4.4
4.4	Connect a known working space sensor through QW6 cable.	Good Bad	9.5 9.3
4.5	Using VTMON program, display thermostat, or SCU Operator's Panel, verify thermostat temperature reading is same as actual temperature.	Good Bad	9.11 4.6
4.6	Reading incorrect by less than 10 F: Reading incorrect by more than 10 F or at limit of range:		4.7 9.5
4.7	Using VTMON program, display thermostat, or SCU Operator's Panel, correct thermostat temperature reading [Chapter 8, Section A].		
5.0	Remove tubing from flow transducer on circuit board and verify 5 VDC (+/- 0.3 VDC) between wire loops labeled "TP3" ("VF") and "COM".	Good Bad	5.1 9.3
5.1	Using a short length of tubing, gently blow through the "HI" side of the transducer and verify voltage between wire loops labeled "TP3" ("VF") and "COM" approaches 0 VDC.	Good Bad	5.2 9.3
5.2	Check tubing from flow probe to flow transducer on circuit board for leaks, kinks and connection to "HI" side.	Good Bad	9.3 9.8
6.0	Reading incorrect by less than 10 F: Reading incorrect by more than 10 F or at limit of range:		6.1 6.2

STEP	ACTION	RESULT	PROCEED TO
6.1	Using VTMON program, display thermostat, or SCU Operator's Panel, correct thermostat temperature reading [Chapter 8, Section A].		
6.2	Remove discharge temperature sensor wires from ETDD terminals and measure resistance (3Kohm at 77 F, 6Kohm at 50 F).	Good Bad	9.3 9.6
7.0	Remove the wire from the bad fan or heat output terminal on the zone controller. Touch it to terminal 15 and verify that the relay or hot water coil energizes.	Good Bad	9.3 7.1
7.1	Bad device is hot water valve actuator: Bad device is fan or electric heat:		9.12 9.13
8.0	Using the "Debug" mode of the VTMON program [Chapter 5, Section F.5] and the "Alt" commands [Chapter 5, Auxiliary Commands and "Help" screens, Section 2], set the analog output to 0 VDC (Alt 9) and 10 VDC (Alt 8) and verify that these voltages (+/- 0.2 VDC) are present at the analog output.	Good Bad	9.12 9.3
9.0	Correct incoming voltage problem.		
9.1	Check all 24 VAC wiring and replace transformer.		
9.2	Check all wiring then replace fuse. If fuse blows again, replace ETDD circuit board.		
9.3	Recheck wiring, if good, replace ETDD circuit board.		
9.4	Problem is in loop wiring. See Chapter 12.		
9.5	Replace Space Sensor.		
9.6	Replace inlet temperature sensor.		
9.7	Replace actuator.		
9.8	Correct tubing problems.		
9.9	Re-install actuator, making sure screw in tab holding actuator to side of terminals is slightly loose.		
9.10	Replace space sensor QW cable.		
9.11	Space sensor is operational.		
9.12	Refer to hot water valve actuator literature to determine problem with hot water valve actuator.		
9.13	Determine the fault in the fan and or electric heat circuits (usually wiring, or a defective relay or safety device).		

Chapter 12

ENVIRO-TEC DDC CONTROL SYSTEM COMMUNICATIONS TROUBLESHOOTING

If all the instructions regarding communications wiring presented previously in this manual are followed, it is unlikely there will be a problem with communications. However, since one error in wiring the communications loop can cause all units to fail to communicate, troubleshooting the loop may first seem to be a difficult and confusing task. This need not be the case, however, if the task is approached in a logical and orderly manner.

A. Type of Problem

There are several types of communications related problems which require different methods to troubleshoot. Use of the VTMON program is highly recommended for troubleshooting all of these problems.

1. Communications solid to some or most units, but one or more do not communicate at all. See Section C.
2. Individual units will respond with direct connection (through space sensor), but no other units can be accessed. See Sections B, C and D.
3. Units respond occasionally, but erratically and slowly. See Sections B, C and D.
4. Unit won't respond through space sensor connection. See Section F.

B. Wiring problems

As discussed previously in this manual, no units should be plugged into the loop until a pre-power check is performed. Also, communications should be checked after each unit's communications plug is connected. If a unit is attached, and suddenly all communications is lost, it may be a wiring problem rather than a problem with the unit itself. Check to make sure the plug has been correctly inserted into the board: plugging it in backwards will definitely cause problems with all communications. Also, if the plug is wired backward, communications will function until the backwards plug is connected, then it will cease.

Wiring the communications loop in a star or stub configuration, or leaving long lengths of untwisted/unshielded wire at communications connectors can cause erratic communications. The only solution for problems caused by this type of poor installation is to rewire the loop and/or re-terminate the cable at the controls.

C. Voltage Check

If communications problems persist, measure the DC voltage from red or white to shield, and black to shield. When communications is not occurring (TXD and RXD LED's on ETDUA/ETSCU are not flashing), these should be 3.3 and 1.7 VDC, respectively (+/- 0.2 VDC). NOTE: If the loop in question is a zone bus, it must be plugged into ETDUA/ETSCU for this test to be valid.

D. Splitting Method

If there are only a few units on a loop, they may be unplugged one at a time until the problem unit is found; however, with a larger number of units on a loop this procedure would be extremely time consuming. To isolate the problem, split the loop in half: if communications resumes with the connected units, the problem resides in the disconnected half. If communications does not resume, the problem resides in the connected half of the loop. Keep splitting the loop in half until the problem unit is found.

EXAMPLE: A loop of sixteen zone controllers and an SCU shows no communications. Connect a PC to the Operator's Panel and run the VTMON program. Disconnect the cable leading from the eighth unit on the loop to the ninth unit on the loop. If communications do not result with the first eight units, disconnect the cable leading from the fourth unit to the fifth unit. Assuming the first four units now begin communicating, this means that one of units which are fifth through eighth on the loop has a problem. Reconnect the cable leading from the fourth to the fifth unit, and disconnect the cable leading from the sixth to the seventh unit. If the first six units are communicating, then the problem lies with the seventh or eighth unit. Reconnect all disconnected wires, making sure that wiring is done correctly. Unplug the seventh unit. If all units except the seventh now communicate, the seventh unit should be replaced.

E. Zone Bus Communications Problems with Individual Units

If high voltage has been applied to the loop, one or more of the RS485 IC's may have been damaged. This device is the eight (8) pin integrated circuit located between the LED's and the loop communication connectors. It is inserted in a socket so it may be replaced without requiring the whole circuit board to be replaced. An RS485 IC from a known working (and communicating) board may be used to determine if this is the problem.

Power should be removed from both the donor board and the problem board before attempting this replacement. When inserting the IC, make sure not to bend any of it's pins. Also make sure the dot on the IC is closest to the end of the socket where the decoupling capacitor (small, oval, yellow or blue component) is located. If it is necessary to order one of these IC's, the ETI part number is 8905, and the Texas Instruments' part number is SN75176P.

If the unit in question still does not communicate, after the RS485 IC has been replaced, the unit itself should be replaced.

F. Space Sensor Communication Problems

Remove the space sensor QW cable and connect directly to the space sensor connection (J2) on the zone controller. If the unit still does not communicate, replace the zone controller. If it does communicate, the space sensor or QW cable is defective. Use a known good space sensor to determine which component to replace.