TECHNICAL INSTRUCTIONS

U551

Using the U551

The U551 is part of a family of control modules designed specifically for heat pump and fan coil applications. The U551 has:

- five digital outputs
- two LogiStat inputs
- three general purpose inputs
- one analog output

The U551 communicates with other U-Line modules on the Unet using BACnet MS/TP protocol over EIA-485 twisted pair wire. The U551 module communicates with the CMnet through Unet Interface modules (UNIs). The UNI must use one of the following module drivers to communicate with the U551:

- For WebCTRL systems, the DRV_UNI16 or DRV_UNI32 module driver
- For SuperVision systems, the U1M, U3M, U5M, or UNM module driver

If communication with the UNI is lost, the U551 can be programmed with a backup default algorithm to maintain space temperature. Refer to the appropriate UNI module driver technical instruction for instructions on setting up this default algorithm.

The U551 module is programmed with a Graphic Function Block (GFB), which is transferred into the UNI. Depending on the software you are using, GFBs written for U-Line modules must be created in Eikon for WebCTRL or Eikon using the Zone GFB option; refer to the *Eikon for WebCTRL User's Guide* or the *Eikon User's Guide* for more information.

NOTE   To operate this module based on a schedule, the UNI must be networked with a gateway module.

U551 modules have been designed to meet low-end, high-volume terminal control applications. As a result, time-critical applications (such as short time delays and trend intervals of less than one minute) should not be used with these modules. ALC recommends that all time delay functions and trend intervals in U551 FBs be set to at least one minute.

CAUTION   If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Specifications

POWER   24VAC ±10%, 12VA, 50-60Hz.

INPUTS   three inputs configurable for thermistor, 0 to 5VDC, or dry contact; two LogiStat inputs.

INPUT RESOLUTION   10 bit.

DIGITAL OUTPUTS   five relay outputs, rated at 1A.

ANALOG OUTPUTS   one analog output, 0-10VDC, 5mA maximum drive capability.

OUTPUT RESOLUTION   8 bit.

COMMUNICATION   9600 bps or 38.4 kbps, automatically detected (determined by UNI module).

ENVIRONMENTAL OPERATING RANGE   0 to 130 °F (-17.8 to 54.4 °C); 5 to 95% relative humidity, non-condensing.

STATUS INDICATION   Visual (LED) indicators.

MEMORY   60KB Flash EPROM and 2KB of RAM, 8KB non-volatile storage for default algorithm and configuration data.

PROTECTION   Metal oxide Varistor (power, analog inputs, and output relay). Transient voltage suppressor (analog output). Zener and opto isolation protection (communications).
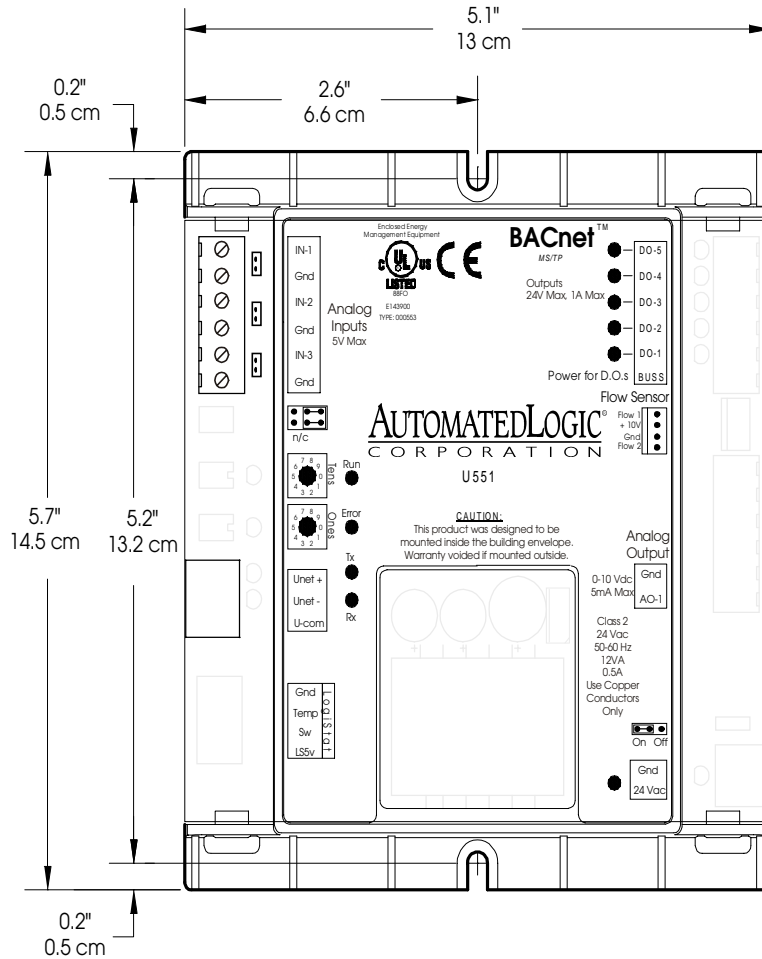
LISTED BY   PAZX (UL 916).

Figure 1. U551 Layout and Dimensions

JOB START-UP

WebCTRL and SuperVision require different module drivers and Eikon software. The appropriate module drivers, Eikon for WebCTRL or Eikon 3.0a or later, and a sample U-Line GFB can be downloaded from Automated Logic Corporation's web site (http://www.automatedlogic.com). You can also order a copy of Eikon for WebCTRL or Eikon on CD through Order Administration.

Job Start-Up for WebCTRL
For a WebCTRL system, you need these items to properly start up and support U-cards:

- UNI/16 with the DRV_UNI16 module driver, or UNI/32 with the DRV_UNI32 module driver

- Eikon for WebCTRL

- U-Line Zone GFBs

Job Start-Up for SuperVision
For a SuperVision system, you need these items to properly start up and support U-cards:

- UNI/16 with the U1M module driver, UNI/30 with the U3M module driver, UNI/32 with the UNM module driver, or UNI/59 with the U5M module driver

- Eikon 3.0a or later

- U-Line Zone GFBs

If you have InterOp Tools version 3.0, you must install Eikon 3.0a or the InterOp Tools Service Pack 1. There is no cost for Eikon 3.0a.

Start-Up Checklist

1. Use the appropriate version of Eikon for WebCTRL or Eikon 3.0a or later to create GFBs for U-Line modules. Be sure to enable the Zone GFB option in Eikon for WebCTRL or Eikon. Refer to "Writing GFBs for the U551" on page 9 for more information.

2. Use the appropriate module driver. (See "Job Start-Up" on page 3.)

3. Connect the U-Line modules to the Unet and the UNI.

4. Transfer the U-Line modules' GFBs to the UNI.

Mounting

Screw the U551 into an enclosed panel using the mounting holes provided on the cover plate. Be sure to leave about 2 inches (5 centimeters) on each side for wiring.

Addressing

The U551 has dual rotary switches for assigning the board address. The top switch corresponds to the tens digit and the bottom switch corresponds to the ones digit (see Figure 2). The U551's address must be the same as its FB number in the UNI.

For example, if the module's FB number is nine, set the tens switch to zero and the ones switch to nine.
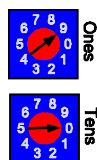

Figure 2. Dual Rotary Address Switches

The U551's BACnet Device Instance number can be assigned by the UNI or individually specified. This number is shown on the UNI Properties page in WebCTRL or on the UNI Status page in SuperVision.

Power Wiring

The Unet follows the same specifications as a legacy CMnet. Refer to the *Technical Handbook* for details on legacy CMnets. Also refer to the *Technical Handbook* for detailed information on daisy-chain, star, and hybrid wiring configurations.

There is a special wire available that contains a pair of 14AWG wires for power and a pair of 22AWG wires for communication. This wire is available from:

Magnum Cable Corporation
Cleveland, OH 44110-0500
(800) 421-0820
Product number A3U-LINE

CAUTION The U551 modules are Class 2 devices (less than 30VAC, 100VA maximum). Take appropriate isolation measures when mounting a U551 module in a control panel where Non-Class 2 devices (120V and greater) or wiring are present.

You can power several modules from the same transformer by daisy-chaining the power from one U-Line module to the next. You must maintain the same polarity.

Do not exceed 100VA or 500 feet (152.4 meters) total of 14AWG wire. The maximum number of modules on one transformer can be figured by dividing the VA of the transformer by the sum of the VA of the module plus the VA of any accessories. For example, if the module's power is 9VA, accessories per module equal 6VA, and the transformer is 100VA, you could have up to 6 modules on the network. See the formula in Figure 3 and the example in Figure 4.

$$\frac{VA \text{ (transformer)}}{VA \text{ (module)} + VA \text{ (accessories)}} = \begin{array}{l}\text{Maximum \#}\\\text{of modules}\\\text{(rounded down)}\end{array}$$

Figure 3. Figuring Maximum Number of Modules

$$\frac{100VA}{9VA + 6VA} = \begin{array}{l}6.67 \text{ or}\\6 \text{ modules maximum}\end{array}$$

Figure 4. Example of Figuring Maximum Number of Modules

A +10V output is also available to power the optional UASF device for dual duct systems.

The U551 has an operating range of 21.6VAC to 26.4VAC. Whenever possible, connect and verify power and communications to all modules before connecting any inputs or outputs.

1. Remove the U551's power jumper or place it in the off position. This prevents the module from being powered up before verifying correct voltage.

2. Make sure the 24VAC power source is off.

3. Connect the power wires to the module's power terminals labeled 24VAC and Gnd.

4. Turn the 24VAC power source on.

5. Make sure that 24VAC is present at the module's power input terminals.

6. Set the module's address. Refer to "Addressing" on page 4 for details.

7. Replace the module's power jumper or place it in the on position.

    When the module turns on, the Run LED turns on and begins blinking. The Run LED blinks once every two seconds until communication is established, then blinks twice per second when operating normally. Refer to "LEDs" on page 11 for more information.

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COMMUNICATIONS WIRING

There is a special wire available that contains a pair of 14AWG wires for power and a pair of 22AWG wires for communication. See "Power Wiring" on page 4 for details.

Note that the communication wire is unshielded. Shielded cable is not required for the Unet.

In most circumstances, you should have a PROT485 within 250 feet of any U-line module on the Unet for surge protection. However, depending on the frequency of electrical surges in your area, the 250-foot recommendation may vary. For example, if you have frequent electrical storms in your area, you may want to use more PROT485s; if you have few electrical storms, you may want to use fewer PROT485s. If the entire Unet is less than 250 feet, place at least one PROT485 at the opposite end of the network from the UNI. For details about the PROT485, refer to the *ARC156 CMnet Wiring Technical Instructions*. Make sure that all modules and the PROT485 use the same polarity throughout the Unet. You must use a repeater after every 32 modules or 3,000 feet.

The Unet baud rate is determined by the UNI module and is automatically detected by the U551. You can set or change the Unet baud rate to 9600 bps or 38.4 kbps on the UNI. The U551 begins using the new baud rate after ten seconds.

If the module is not communicating with the UNI, the module's color is as follows:

• For WebCTRL systems, the module's color is purple.

• For SuperVision systems, the module's color is coral.

1. Remove the module's power jumper or place it in the off position.

2. Check the Unet communication wiring for shorts, grounds, or opens.

3. Connect the Unet communication wires to the Unet Port (see Figure 1 on page 3).

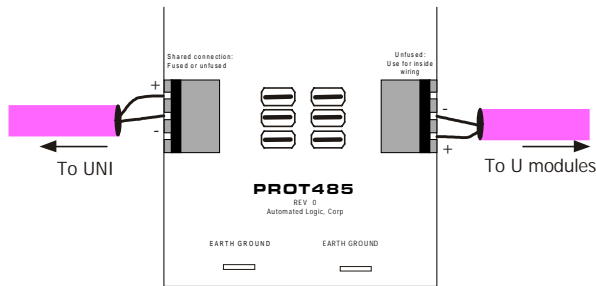Replace the module's power jumper. You must transfer memory to the UNI before the U551 is recognized.

Figure 5. Using the PROT485 on the Unet

Communicating Through the LogiStat Port

You can connect your workstation to the Unet and the ARC156 or Legacy CMnet network segment using a LogiStat sensor. While connected, the UNI does not allow a restart (zap), a memory transfer, or any other action that would break the passthrough connection.

The LogiStat Port connection does not apply in WebCTRL.

To communicate through the LogiStat port, the U551 must:

- be connected to a UNI on an ARC156 network segment
- use the appropriate module driver

  For SuperVision systems, use a version 6.01d or later of the U1M, U3M, U5M, or UNM module driver

Communication speed is fixed at 1200 baud.

1. Connect the computer's serial port to the EIA-232 port of the APT using a standard straight-through cable.

2. Set the APT's Mode Select switch to TTL (see Figure 6 on page 7).

   If you are using a LogiStat Plus without supplemental power to the APT, make sure the LED on the Logistat Plus is on indicating that it can provide power to the APT. If the LED is not on, you can provide power to the APT using the Supplemental Power +5V dc connection (see Figure 6 on page 7) and the special power cable to a laptop keyboard jack, or an external supply, such as a 5V dc transformer.

3. Define the connection type.

   In SuperVision v3.0, define the connection as Access Port.

   In SuperVision v2.6, define the connection as Direct Connect.

4. Set the baud rate at 1200 bps.

5. Attach the LogiStat Adaptor cable (ALC part number 235022) to the APT cable. Use this assembly to connect the APT's Access Port to the LogiStat's LogiPort.

   While connected, the LogiStat Pro displays "LP" indicating that the LogiStat Pro will not respond to input from the keypad.

   NOTE When the LogiStat Adaptor cable is inserted into the LogiPort, the U551 can no longer read the LogiStat inputs. The U551 continues to use the last valid temperature and setpoint adjust readings obtained before the cable was inserted into the LogiPort. If the occupancy override timer was active when the connection was made, it continues to count down, but no new values can be obtained for these inputs until the LogiStat Adaptor cable is removed. See the *Eikon for WebCTRL Microblock*
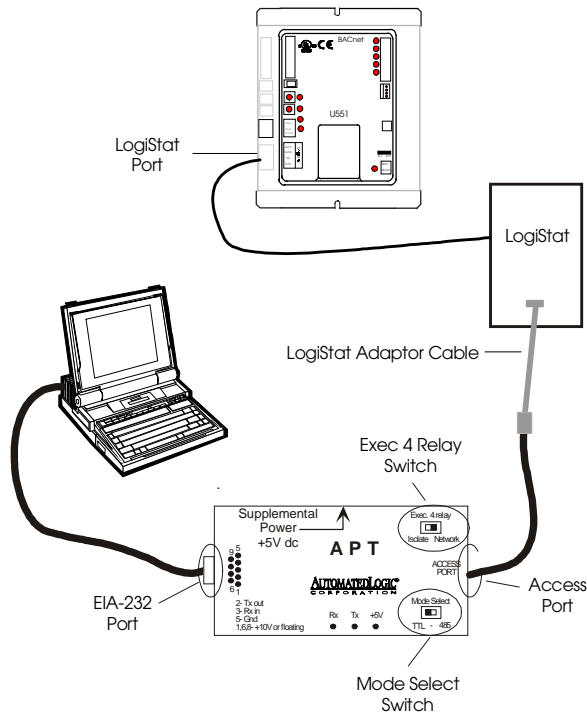
Figure 6. Using the LogiPort

Reference Guide or the *Eikon Microblock Reference Guide* for more information about the LogiStat microblock.

6. Disconnect the LogiStat Adaptor cable from the LogiStat's LogiPort when finished to allow the U551 to read inputs from the LogiStat.

Input Wiring

The U551 inputs support the types of signals listed below. The LogiStat, LogiStat Plus, and LogiStat Pro sensors are supported through the module's LogiStat port. The U551 provides five inputs: two on the LogiStat port and three analog inputs. Refer to Table 1 for information about wire length, gauge, and shielding. Make sure the U551's power is off before wiring any inputs or outputs.

NOTE If you are using both flow sensors on a UDF, disable the U551's IN-3 input by removing its jumper. Disabling the IN-3 allows a second flow sensor input (Flow #2)

on the UDF to be read through the flow sensor on the U551.

- Thermistor: Precon type 2 (10kohm at 77°F). Input voltages should range between 0.489V and 3.825V for thermistors.

- 0 to 5VDC: When using 0 to 5VDC signals, remove the pull up jumpers of the U551. The pull up jumpers are located behind the input port. You must remove the cover to access the pull up jumpers. The output impedance of a 0 to 5VDC source must not exceed 10kohms. The input impedance of the U551 is approximately 1Mohm.

- Dry Contact: A 5VDC wetting voltage is used to detect contact position. This results in a 0.5mA maximum sense current when the contacts are closed.

Table 1. Input Wiring Restrictions

Input	Maximum Length	Minimum Gauge	Shielding
Universal	50 feet 15 meters	24AWG	shielded and grounded to module's "-" or Gnd terminal
LogiStat Sensors	100 feet 30 meters	22AWG	unshielded

No pulse accumulation inputs are allowed in U551 FBs, except for the override button on the LogiStat.

Using the LogiStat

Use Figure 7 and Figure 8 on page 8 to wire a LogiStat, LogiStat Plus, or LogiStat Pro to the U551.

Automated Logic Corporation recommends a specific wire to connect the U551 to the LogiStat. This 22AWG solid copper wire is available from Magnum Cable Corporation, product number A3LOGISTAT.
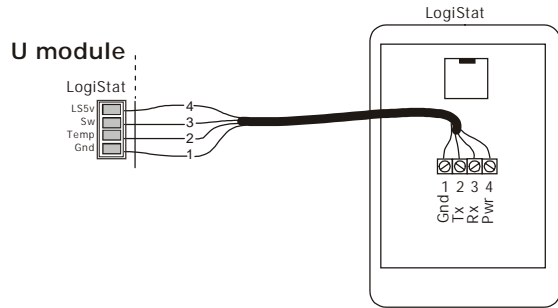
Figure 7. Connecting the LogiStat to the U551

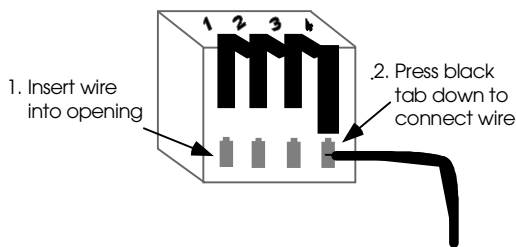Strip 1/4 inch off the ends of the wires before connecting.

1. Insert wire into opening

2. Press black tab down to connect wire

Figure 8. Flip Lever Wiring

Refer to the section "Writing GFBs for the U551" on page 9 for more information about using a LogiStat sensor.

Digital Output Wiring

The U551 has five digital outputs that can be connected to a maximum of 24 Volts AC/DC (see Figure 9). Each output is a dry contact (rated at 1A maximum) that is configured as normally open.
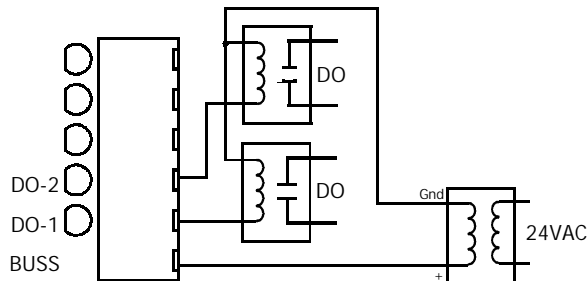

Figure 9. Digital Output Wiring

Be sure the module's power is off before connecting any inputs or outputs.

To verify each output's operation, lock the output to a known condition using the Function Block's Properties page in WebCTRL or the Parameter page in SuperVision, then make sure the equipment operates as specified.

Analog Output Wiring

The U551 has one analog output that supports voltage devices from 0 to 10VDC (see Figure 10). The device being controlled must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the module.
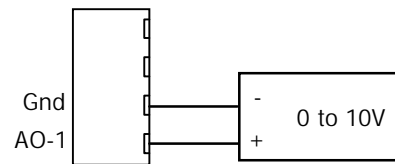

Figure 10. Analog Output Wiring

Be sure the U551's power is off before wiring any inputs or outputs. Connect the output wiring to the screw terminals on the module.
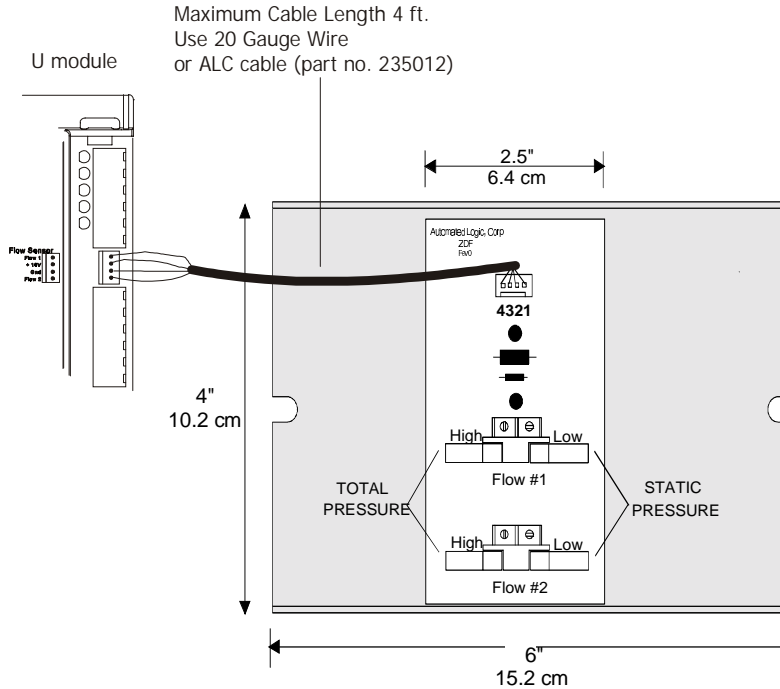
To verify each output's operation, lock the output to a known condition on the Function Block's Properties page in WebCTRL or the Parameter page in SuperVision, then make sure the equipment operates as specified.

Using Flow Sensors

The U551 controls air flow in the zone using:

- a USF (single) or UDF (dual) air flow sensor and an actuator connected to two digital outputs

In a dual duct system, you can use the module's built-in actuator for one duct and the UASF for the other. You must indicate which of these methods you are using for flow control on the UNI module driver's Properties page in WebCTRL or on the

U module

Maximum Cable Length 4 ft.
Use 20 Gauge Wire
or ALC cable (part no. 235012)

2.5"
6.4 cm

Automated Logic Corp.
ZDF
Rev0

4321

High Low
Flow #1

TOTAL
PRESSURE

STATIC
PRESSURE

High Low
Flow #2

4"
10.2 cm

6"
15.2 cm

NOTE: When making a sensor cable, disregard the numbers imprinted on the plastic connector.

Figure 11. Using the UDF

Parameter page in SuperVision. Refer to one of the UNI technical instructions documents for details.

If you use a flow sensor with the U551, use the Airflow microblock in the U551's GFB.

To connect the sensor, make sure the U551's power is off first. Attach the total or high pressure line from the VAV box to the module's HI side, and attach the static pressure line to the module's LO side. Connect the USF to the U551 as shown in Figure 11.

To ensure an accurate reading from the flow sensor, use the Airflow microblock in the module's GFB. You must calibrate this microblock using the instructions on the FB's Properties page in WebCTRL or Parameter page in SuperVision. Refer to the *Eikon for WebCTRL Microblock Reference Guide* or the *Eikon Microblock Reference Guide* for more information.

NOTE When installing the UDF, be sure to permanently remove the W4 jumper as shown in Figure 12 prior to performing test and balance.

IN-1
W2
Gnd
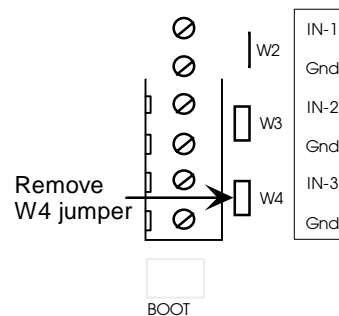IN-2
W3
Gnd
Remove
W4 jumper → W4
IN-3
Gnd

BOOT

Figure 12. Removing the W4 Jumper

Writing GFBs for the U551

Depending on whether you are using a WebCTRL or a SuperVision system, you must use either Eikon for WebCTRL or Eikon 3.0a or later to create GFBs for the U551. Be sure

to enable the Zone GFB option in Eikon when making the GFB.

A sample U-Line GFB is available at Automated Logic Corporation's web site (http://www.automatedlogic.com). Use this sample as a guideline for creating your own GFBs. A default algorithm can be loaded into the U-card to provide stand-alone control functions if communications between the U-card and the UNI are disrupted. Refer to the appropriate UNI module driver technical instruction for instructions on setting up this default algorithm. The U551's Graphic Function Block is stored in the UNI module, which must use one of the following module drivers:

- For WebCTRL systems, the DRV_UNI16 or DRV_UNI32 module driver.

- For SuperVision systems, the U1M, U3M, UNM, or U5M module driver.

When using a LogiStat sensor with the U551, include a LogiStat microblock and a Zone Control microblock in the module's GFB. The LogiStat microblock supports the LogiStat, LogiStat Plus, and LogiStat Pro sensors.

If you are using WebCTRL, you do not need to enter point identifiers for this microblock in Eikon for WebCTRL or WebCTRL. If you are using SuperVision, you do not need to enter channel numbers for this microblock in Eikon or SuperVision. For more information, refer to the *Eikon for WebCTRL Microblock Reference Guide* or the *Eikon Microblock Reference Guide*.

You do not need to use BACnet microblocks when writing the GFB, unless you have a BACview Keypad Display connected to the UNI. You must then use BACnet point microblocks to access U551 points through the keypad.

Point Identifiers

A point can be identified in WebCTRL by its point number and point type; in SuperVision, a point is identified by its channel number. On both systems, expander number zero represents I/O points on the U551.

Point Identifiers in WebCTRL

Enter the point identifiers in Eikon for WebCTRL before the FB is made or on the FB's Properties page in WebCTRL. Set the type, number, and minimum and maximum present values for each point on the U551. Select a physical point type from the POINT TYPE field and enter the number of the input or output. If needed, enter an expander number. To scale a linear signal type, enter the appropriate minimum and maximum present values on the microblock's dialog box.

If you are not using a LogiStat in a WebCTRL system but would like to use the two inputs that are available on the LogiStat port, assign an address of 16 for the temperature input and 17 for the setpoint input.

Channel Numbers in SuperVision

Refer to Table 2 and Table 3 for channel numbers for each physical point on the U551. The channel number, offset, and gain for each point can be entered in Eikon before the Function Block is made, or on the FB's Parameter page in SuperVision.

Table 2. Digital Outputs

I/O Type	Signal Type	Channel Number
DO 1	Digital	11
DO 2	Digital	12
DO 3	Digital	13
DO 4	Digital	14
DO 5	Digital	15

Table 3. Inputs

I/O Type	Signal Type	Channel Number	Range	Offset	Gain
IN-1	Thermistor	31	-17° to 213° F -27° to 100.6° C	0.00 0.00	15.88 15.69
	Volts	31	0 to 5V	†	†
	Digital	21			
IN-2	Thermistor	32	-17° to 213° F -27° to 100.6° C	0.00 0.00	15.88 15.69
	Volts	32	0 to 5V	†	†
	Digital	22			
Sw	Thermistor	A3	-17° to 213° F -27° to 100.6° C	0.00 0.00	15.88 15.69
	Digital	B3			
	LogiStat	‡			
Temp	Thermistor	A1 or A2‡‡	45° to 100° F 7.22° to 37.8° C	0.00 0.00	15.88 15.69
	LogiStat	‡			
IN-3 or UDF 2	Thermistor	33	-17° to 213° F -27° to 100.6° C	0.00 0.00	15.88 15.69
	Volts	33	0 to 5V		
	Digital	23			
	UDF 2 Flow (CFM)	‡‡‡			
Flow input	Flow (sensor units)	‡‡‡			

† Use the Point Help feature of SuperVision for Windows v2.0 or later to determine offset and gain for these types of inputs.
‡ Channel numbers for these inputs are set by the LogiStat microblock and do not need to be manually entered in SuperVision or Eikon.
‡‡ A1 is 10-second averaged. A2 is not averaged.
‡‡‡ Channel numbers for these inputs are set by the Airflow Control microblock and do not need to be manually entered in SuperVision or Eikon.

Table 4. Analog Outputs

Point	Signal Type	Channel Number	Range	Offset	Gain
AO 1	Analog	41	0 to 10VDC	0.00	0.0625

LEDs

The U551 modules have diagnostic LEDs to assist troubleshooting.

Table 5. Run LED

Status	Meaning
2 times per second	Normal operation.
5 times per second	Transferring firmware.
Once every 2 seconds	Auto-detecting baud rate.

Table 6. Error LED

Status	Meaning
2 times per second	Firmware error. Transfer memory to the module to correct.
Solid on	Hardware failure.

Power - On when the module is on.

Rx - On when the module receives data.

Tx - On when the module transmits data.

DO1 - On when digital output 1 is active.

DO2 - On when digital output 2 is active.

DO3 - On when digital output 3 is active.

DO4 - On when digital output 4 is active.

DO5 - On when digital output 5 is active.

PRODUCTION DATE

To determine when a module was manufactured, check the module status report for the module in WebCTRL or SuperVision. Refer to the appropriate user's guide for more information about the module status report.

A sticker on the back of the module also shows the date the module was manufactured. The first three characters on the sticker indicate the type of module. The next two characters show the year and month of manufacture. (The month digit is in hexadecimal.)