touch-plate®
LIGHTING CONTROLS

Ultra BACnet Manual

touch-plate® LIGHTING CONTROLS

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Preparation

Unpack the Ultra and inspect the contents for damaged or missing products. If any problems arise, please contact Touch-Plate at 260.426.1565 for assistance.

Precautions

The Ultra hardware is designed to be in environments that have a temperature range of 0-60°C (non-condensing atmosphere). Installing in an environment outside of these parameters will shorten the life span of the hardware.

Touch-Plate recommends the use of 18 to 22 AWG wire for low voltage wiring of contact closure products, 18 AWG wire for all 24v power connections, and 16 AWG wire for Smart Switch Stations.

All 120VAC wiring must use wire as specified by National Electric Code for load size and wire length.

Compatible Hardware

The Ultra is a smart control station that can be a part of a networked, intelligent system.

Warranty

Touch-Plate warrants this product against defects in materials or workmanship, under normal use, for a period of ONE (1) year from date of shipment. If a defect arises and a valid claim is received within the Warranty Period, Touch-Plate will repair or replace the product at no charge.

This warranty does not apply to:

a. Damage to unit(s) caused by accident, acts of God, inappropriate installation, faulty installation, or any negligent use;
b. Unit(s) which have been subject to being taken apart or otherwise modified;
c. Unit not used in accordance with instructions;
d. The finish on any portion of the product, such as surface and/or weathering, as this is considered normal wear and tear;
e. Non-Touch-Plate hardware installed by the user;
f. Damage caused by Non-Touch-Plate products;
g. Damage caused by operating the product outside the permitted or intended uses described by Touch-Plate;
h. -or- Specific plans or Specific application requirements, unless the plans and specifications have been forwarded to Touch-Plate and Touch-Plate has approved and accepted the plans in writing.

EXCEPT AS PROVIDED IN THIS WARRANTY, TOUCH-PLATE IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, INCLUDING BUT NOT LIMITED TO, INSTALLATION OR REPLACEMENT LABOR COSTS.

Ultra BACnet Product Overview

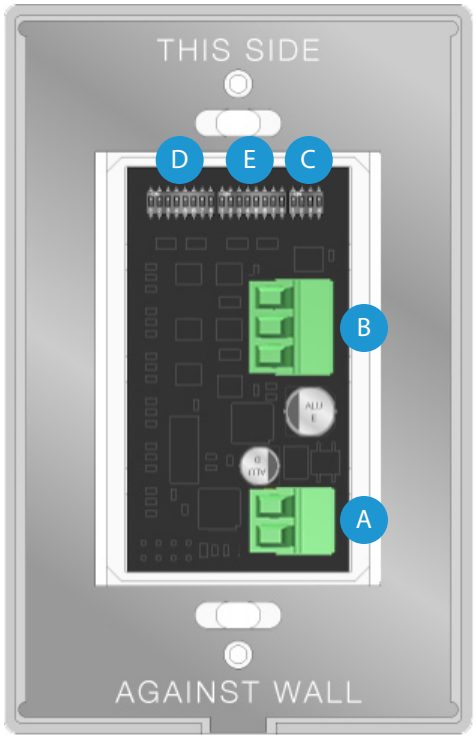
The Ultra BACnet is a powerful and versatile smart control station with the capability to control both relays and dimmers in either a standalone or BACnet integrated system.

The Ultra BACnet can run at the fastest time possible when the MS/TP network is optimized for speed.

To ensure that there is not increased latency and/or delay in loads turning on after a command is issued, use the following to allow for the fastest response time possible.

- Place 10 or fewer smart control stations on each MS/TP network. There can be up to 127 smart control stations on a single MS/TP network, but latency will increase if not optimized and using subscribe COV's for the binary inputs.
- Do not combine lighting with other types of devices, such as HVAC, security, access control, fire and safety, on the same MS/TP network. When possible, isolate the lighting system onto its own MS/TP network.
- If multiple Ultra's are on one MS/TP network, place the controller on the same MS/TP network for optimal performance.

Board Items	Options	Board Position	Page #
Low Voltage Connections	18-24 VAC/VDC Power Connection	A	4
	MS/TP RS485 Connection	B	5
Dip Switches	RS485 Terminations	C	6
	MS/TP Address	D	7
	Baud Rate / Options	E	6

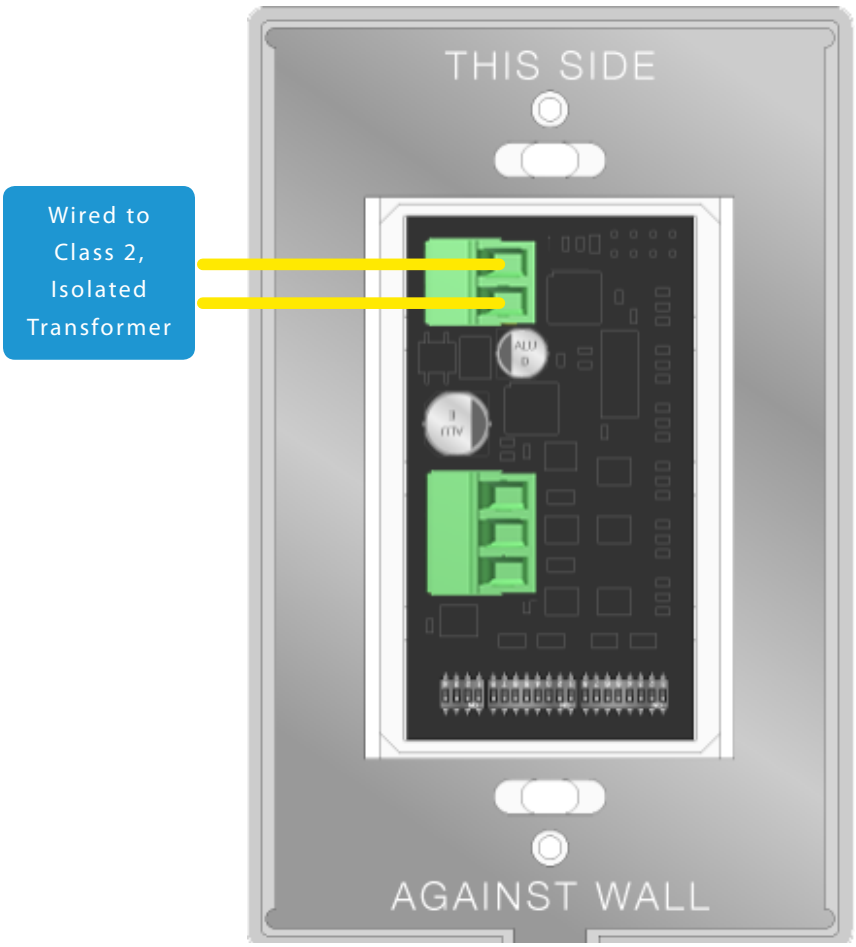


Ultra BACnet Power Wiring

To correctly bring power to the Ultra Station, use the wiring diagram below.

Power must be a Class 2, Isolated Transformer, with a rating of 12 - 24 VAC/VDC.

Wire must be Axlink 22/01PSH + 18/2C or an equivalent wire.

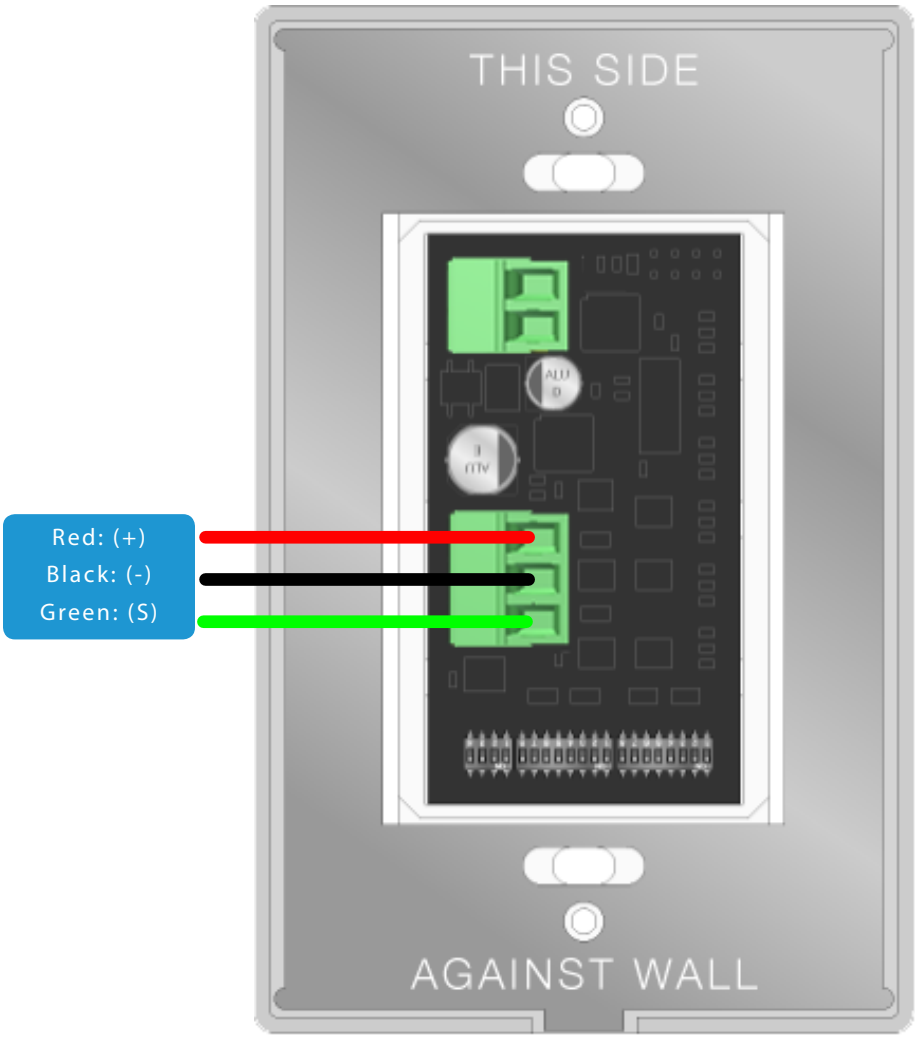


Ultra BACnet MS/TP RS485 Wiring

To correctly wire the MS/TP RS485 connection to the Ultra Station, use the wiring diagram below.

- **Shield or Ground for MS/TP RS485 connection must be isolated from the ground on the power supply. Using the same ground will create a direct short across the diode bridge and damage the unit.**

Wire must be Axlink 22/01PSH + 18/2C or an equivalent wire.



Ultra BACnet RS-485 Termination Dip Switches

Dip Switches 1-4 set the RS485 Terminations.

Option	1	2	3	4
RS485 Termination (Non-Inverting Input Pull Up; 510 Ohms)	ON	OFF	OFF	OFF
RS485 Termination (Inverting Input Pull Up; 510 Ohms)	OFF	ON	OFF	OFF
RS485 Termination (Line to Line Termination; 120 Ohms)	OFF	OFF	ON	OFF
4th Switch Not used (Always OFF)	--	--	--	OFF

Ultra BACnet Baud Rate / Option Dip Switches

Dip Switches 1-2 set the Baud Rate.

Dip Switches 4-5 set the Options.

Option	1	2	3	4	5	6	7	8
Baud Rate - 9600	OFF	OFF	--	--	--	--	--	--
Baud Rate - 19200	ON	OFF	--	--	--	--	--	--
Baud Rate - 38400	OFF	ON	--	--	--	--	--	--
Baud Rate - 76800	ON	ON	--	--	--	--	--	--
LED Color and Intensity - ON *	--	--	--	ON	--	--	--	--
LED Color and Intensity - OFF **	--	--	--	OFF	--	--	--	--
Factory Reset - ON ***	--	--	--	--	ON			
Factory Reset - OFF	--	--	--	--	OFF			

* The LED becomes active. Color and intensity are set to the color and intensity in the corresponding AV.

**The LED color and intensity are stored in the corresponding AV. The corresponding BO determines whether the LED is active or not.

***When turned on for 10 seconds the station is returned to factory defaults. The Device ID returns to 68501 and all COV's are cleared.

Setting the BACnet MS/TP Address (MAC)

The Address Dip Switches are used to set the BACnet MS/TP Address.

Normally, these Dip Switches come from the factory pre-programmed to Address #1.

Use the setting diagram to change the Address if needed. Note that for the address changes to take effect, a power cycle needs to occur.

Address	1	2	3	4	5	6	7	8 Unused
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
Through Address 127 - Use the table below to calculate the MS/TP Address								

Valid addresses are from 1 to 127. Addresses are set using the seven Address Dip Switches, which each have a value noted in the chart below. Dipswitch 8 is unused and should be left in the OFF postion.

Address Dip Switch	1	2	3	4	5	6	7	8
Value	1	2	4	8	16	32	64	Unused

The values of all switches in the ON position are added together and the total is equal to the address. See the examples below:

MS/TP Address 1: Turn on switch 1 only, and leave all other Address switches off.

MS/TP Address 13: Turn on switches 1, 3 and 4. The value of those switches are 1 + 4 + 8 = 13.

PIC Statement

Vendor Name:	Touch-Plate® Lighting Controls
Product Name:	Ultra BACnet Smart Control Station
Product Model Number:	ULT-B
Applications Software Version:	1.6c
Firmware Revision:	2.49
BACnet Protocol Revision:	7 (135-2008)

BACnet Standardized Device Profile (Annex L): BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B

Segmentation Capability: Not supported

Table of Objects

OBJECT EXPLANATION					
Table No.	Object	Object Type	Value	Object ID	Used For
BI1	Momentary Switch Inputs	Binary Input	0 = Off, 1 = On	BI1 - BI6	To report button presses of Control Stations
BI2	Maintain Switch Inputs	Binary Input	0 = Off, 1 = On	BI101 - BI106	To report button holds of Control Stations
BO1	LED Controls	Binary Output	0 = Off, 1 = On	BO1-BO6	Pilot Control when not in Consensio Mode
AV1	Control Station LED Modes	Analog Value	See chart in appendix for values.	AV1 -AV6	To control Control Stations flash, color, and intensity of LED lights
AV2	Device Options	Analog Value	1 = infinite COV On 0 = infinite COV Off	AV100	To resubscribe to COVs with no expiration of the subscription write a 0 value for Lifetime when subscribing
AV3	Input Change Buffer	Analog Value	1-6 and 1001-1006	AV1001	To read button presses and releases remotely
AV4	Baud Rate	Analog Value	9600, 19200, 38400, 76800	AV1002	To read or change the Baud Rate
AV5	Device Instance	Analog Value	1 to 4194303 Default: 68501-68999	AV1003	To read or change the Device ID or Device Instance
AV6	MSTP Address	Analog Value	1 to 127	AV1004	To read or change the MSTP address
DO1	Device Object	Device Object	0 to 4194303	DEV68501-DEV68999	Describing properties of the device to the BACnet network

Binary Inputs - Momentary Inputs

Object ID: BI1 – BI6
Used for: Smart control stations

Momentary BI Objects (BI1 - BI6) will toggle between 0 and 1 between each button press. When the system is first powered up, the input defaults to 0. COVs (if subscribed) will be generated by each button press. Button release events are ignored on these objects.

For example, if BI1 = 0 and button 1 is pressed, BI1 will now be 1. The next time the button is pressed, it will read 0.

COV Operation: When an input has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = Level of the input (0 or 1)
- Status_Flags = Always false

Table BI1

BINARY INPUT OBJECT PROPERTIES FOR MOMENTARY INPUTS	
Binary Input Property	Value
Object_Identifier	BI# Where # = Input Button Number (Range 1 to 6)
Object_Type	3
Object_Name	"Momentary0#" Where # = Input Button Number (Range 1 to 6)
Present_Value	This value toggles between 1 and 0 with each button press.
Device_Type	"Momentary Contact"
Status_Flags	All flags are false.
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Polarity	0 = Normal
Inactive_Text	"Off"
Active_Text	"On"

Binary Inputs - Maintain Inputs

Object ID: BI101 – BI106
Used for: Smart control stations
Values: Button press = 1, Button release = 0 Relay control and monitoring

Maintain BI Objects (BI101 - BI106) will go to 1 when a button is pressed and then to 0 when the button is released. COVs (if subscribed) will be generated by each button press and release.

COV Operation: When an input has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = Level of the input (0 or 1)
- Status_Flags = Always false

Table BI2

BINARY INPUT OBJECT PROPERTIES FOR MAINTAIN INPUTS	
Binary Input Property	Value
Object_Identifier	BI10# Where # = Input Button Number (Range 1 to 6)
Object_Type	3
Object_Name	"Maintained0#" Where # = Input Button Number (Range 1 to 6)
Present_Value	1 = Button Press or Contact Closed 0 = Button Release or Contact Open
Device_Type	"Maintain Contact"
Status_Flags	All flags are false.
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Polarity	0 = Normal
Inactive_Text	"Off"
Active_Text	"On"

Analog Value - Control Station LED Mode

Object ID: AV1 – AV6
Used for: LED lights (pilots) on control stations.
Values: The assigned value for this object sets the color, flash and intensity for the LED. See Appendix I and II (Pages 17-18) for a chart of color, intensity, and flash pattern values.

The Ultra will build a dynamic database of LEDs. The range is 1 to 6. For each smart control station that is connected to the input device network, this will allocate 6 LED Modes in the object database.

The Control Station LED Mode can be controlled by writing to the Present_Value. LED intensity is common to all LEDs. The last intensity written to any LED will set the intensity for all LEDs.

Even if the addressing on the input devices is not sequential, although not recommended, the system will create the numbering for AV database sequentially. AV1 will always correspond to the first LED on the lowest addressed input device, while the highest AV will always reference the last LED on the highest addressed output device.

If the actual device address and LED assignment need to be determined, this information will be stored in the Object_Name name property as shown in table AV1.

Table AV1

ANALOG VALUE OBJECT PROPERTIES FOR LED MODES	
Analog Value Property	Value
Object_Identifier	AV# Where # = LED Number (Range 1 to 6)
Object_Type	2
Object_Name	"Pilot0#" Where # = LED Number (Range 1 to 6)
Present_Value	This value is used to set the 1. Intensity 2. Color 3. Flash Pattern See LED Modes in the Appendix for details on setting these values.
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Priority_Array	BACnet Priority Array

Analog Value - Device Options

Object ID: AV100

Values: 1 = Enables the user to write 0 to the COV lifetime, which enables indefinite COV mode, in which the subscriptions will not expire.
0 = All COV subscriptions will expire according to the lifetime that was written to them when they were initially set up.

Device Options are useful for operator workstations that do not resubscribe before the current COV expires. By default, all COV values expire. If it is desired to continue to receive messages that buttons were pressed, either resubscribe before the current COV expires or enable indefinite COVs. This object affects all subscription objects within that device.

COV Lifetime: When a COV operation is performed, the COV lifetime has to be set (the time for which the subscription will continue).

COV Lifetime Value = > 0: The subscription will expire after the set time, according to the lifetime that was written to them when they were set up.

COV Lifetime Value = 0: Subscriptions do not expire. Before the COV lifetime to 0 can be set, first enable the Ultra to accept 0 as a COV lifetime value by writing 1 to the AV100 object.

For further information see table AV2.

To enable indefinite COV mode:

1. Write 1 to the AV100 object.
2. Set the COV lifetime to 0 for each subscription that you want to be infinite.

Table AV2

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE OPTIONS	
Analog Value Property	Value
Object_Identifier	AV100
Object_Type	2
Object_Name	"Device Options"
Present_Value	1 = enabling infinite COVs, else = 0 (Default)
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0

Analog Value - Input Change Buffer

Object ID: AV1001

Values: 0 = No presses or releases.
1-6= Button press on corresponding input.
1001-1006 = Button release on corresponding input.

The Input Change Buffer object polls and reports every button press and release on every input. This includes button presses and releases from control stations, virtual button presses from sensors, Contact Closure Inputs, and smart switch hubs. These get stored in a buffer that can be read from the Input Change Buffer AV101 Object. This object also supports COVs. For operator workstations that cannot do COV subscriptions, polling via AV1001 can be used to reduce latency.

The values in the Present Value property follow the numbering conventions of the Momentary and Maintain Binary Input Objects.

An example would be if a user presses a button that can be read on Momentary or Maintain Binary Input 6, then reading the Input Change Buffer will return a value of 6, indicating that button 6 was pressed. A button release is signified by the input number plus 100, so once a user releases the button then a value of 106 will be read.

COV Operation: When an Input Change AV has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = the last button press or release that occurred. The value for a button press can be a value from 1 to 128. For a button release, add 1000 to the input number.
- Status_Flags are always false.

Table AV3

ANALOG VALUE OBJECT PROPERTIES FOR INPUT CHANGE BUFFER	
Analog Value Property	Value
Object_Identifier	AV1001
Object_Type	2
Object_Name	"Input Change Buffer"
Present_Value	Queues up all button presses so a controller can read input changes at a fast rate without using COVs. COVs are supported if desired. Button Press = Input # Button Release = Input # + 1000
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0

Analog Value - Baud Rate

Object ID: AV1002

Used For: Setting the MSTP baud rate for the device. Available baud rates are: 9600, 19200, 38400 and 76800

You can use this object to read the current baud rate or to change it.

If you change the baud rate the new baud rate will not start until the unit has been power cycled.

Table AV4

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE INSTANCE	
Analog Value Property	Value
Object_Identifier	AV1002
Object_Type	2
Object_Name	"Baud Rate"
Present_Value	Baud Rate value
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0

Analog Value - Device Instance

Object ID: AV1003

Used For: Is a BACnet system-wide unique identifier that is pre-set by the factory to a unique ID of 68501 - 68999 when ordered with the device instance assigned on a label located on the top left of the Ultra.

You can use this object to read the current device instance or to change it.

If you change the device instance, the Device Object ID will change from 68XXX. If you change the device instance AV1003 to a value of 70000, then the Device Object ID will be 70000.

Table AV5

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE INSTANCE	
Analog Value Property	Value
Object_Identifier	AV1003
Object_Type	2
Object_Name	"Device Instance"
Present_Value	Device instance value
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0

Analog Value - MSTP Address

Object ID: AV1004
Used For: Is for setting the MSTP Address.

If you change the MSTP Address the unit will reset automatically and the new address will change immediately.

Table AV6

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE INSTANCE	
Analog Value Property	Value
Object_Identifier	AV1004
Object_Type	2
Object_Name	"MSTP Address"
Present_Value	MSTP Address value
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0

Device Object - Device Object

Object ID: DEV68XXX
Used For: The Device Object states the capabilities of the Ultra

If you change the device instance, the Device Object ID will change from its default of 68XXX. If you change the device instance AV1003 to a value of 70000, then the Device Object ID will be 70000.

Table DO1

DEVICE OBJECT PROPERTIES	
Device Object Properties	Value
Object_Identifier	Default = 68XXX Where XXX = 501 - 999
Object_Name	"BAC10142XXXXXXXX"*
Object_Type	8
System_Status	0 = Normal
Vendor_Name	"Touch-Plate Lighting Controls"
Vendor_Identifier	68
Model_Name	"ULT-B (10142)"
Firmware_Revision	"2.49"
Application_Software_Version	"1.6c"
Protocol_Version	1
Protocol_Revision	7
Protocol_Services_Supported	SubscribeCOV, readProperty, readPropertyMultiple, writeProperty, writePropertyMultiple, reinitializeDevice who-Has, who-Is
Protocol_Object_Types_Supported	Analog_Value Binary_Input Binary_Output Device
Object_List	List all the objects in the Object Database
Max_APDU_Length_Accepted	480
Segmentation_Supported	3 = no-segmentation
Max_Segments_Accepted	1
APDU_Timeout	3000
Number_Of_APDU_Retries	0
Device_Address_Binding	List is always empty
Database_Revision	1
Max_Master	Range is 1 to 127

* The XXXXXXXX stands for the Device Instance

Appendix I - PIC Statement

Vendor Name:	Touch-Plate® Lighting Controls
Product Name:	Ultra BACnet Smart Control Station
Product Model Number:	ULT-B
Applications Software Version:	1.6c
Firmware Revision:	2.49
BACnet Protocol Revision:	7 (135-2008)

Product Description:

This unit is a wall station with up to 6 buttons that are mapped to binary input objects. Each button can be read as a momentary or maintain input. Each button has a 3 color pilot LED that can be controlled via analog value object. Each pilot can support 7 colors, 3 intensity levels, with 8 flash patterns. MS/TP MAC address, baud rate, termination and biasing may be set using DIP switches. The inputs support subscribed Change of Value (COV) operation.

BACnet Standardized Device Profile (Annex L): BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B

Segmentation Capability: Not supported

Standard Object Types Suppported:

STANDARD OBJECT TYPES SUPPORTED				
Object	Create	Delete	Optional Properties	Custom Properties
Binary Input	N	N	DEVICE_TYPE, RELIABILITY, INACTIVE_TEXT, ACTIVE_TEXT	---
Analog Value	N	N	---	---

DataLink Layer Options: MS/TP master, baud rate(s): 9600, 19200, 38400, 76800

Device Address Binding: Is static device binding supported? No

Networking Options: No routing or BBMD functions are supported.

Character Sets Supported: ANSI X3.4

Appendix II - LED Modes

This chart shows the values to write to the Present_Value property of AV1-6 object. These values allow you to set the control station LEDs to the desired intensity, color and flash pattern.

Color	Intensity	Slow Flash	Slow Flash Reverse	Fast Flash	Fast Flash Reverse	Wink	Wink Reverse	On
Red	25%	9	10	11	12	13	14	15
Red	50%	73	74	75	76	77	78	79
Red	75%	137	138	139	140	141	142	143
Red	100%	201	202	203	204	205	206	207
Green	25%	17	18	19	20	21	22	23
Green	50%	81	82	83	84	85	86	87
Green	75%	145	146	147	148	149	150	151
Green	100%	209	210	211	212	213	214	215
Blue	25%	25	26	27	28	29	30	31
Blue	50%	89	90	91	92	93	94	95
Blue	75%	153	154	155	156	157	158	159
Blue	100%	217	218	219	220	221	222	223
Yellow	25%	33	34	35	36	37	38	39
Yellow	50%	97	98	99	100	101	102	103
Yellow	75%	161	162	163	164	165	166	167
Yellow	100%	225	226	227	228	229	230	231
Purple	25%	41	42	43	44	45	46	47
Purple	50%	105	106	107	108	109	110	111
Purple	75%	169	170	171	172	173	174	175
Purple	100%	233	234	235	236	237	238	239
Cyan	25%	49	50	51	52	53	54	55
Cyan	50%	113	114	115	116	117	118	119
Cyan	75%	177	178	179	180	181	182	183
Cyan	100%	241	242	243	244	245	246	247
White	25%	57	58	59	60	61	62	63
White	50%	121	122	123	124	125	126	127
White	75%	185	186	187	188	189	190	191
White	100%	249	250	251	252	253	254	255

Troubleshooting Guide

1. If the LEDs on the control stations do not flash.
    a. Verify that the wiring is correct.
    b. Verify that all devices are connected to power.
    c. Verify the baud rate on the Ultra.
2. If there are communication problems with a remote panel far away, use the following steps to solve the problem.
    a. Verify that the baud rate is correctly set.
    b. If this doesn't solve the problem, slow down the baud rate to improve communication.
    c. All devices have to run at the same baud rate. If the baud rate is changed on the Ultra, all devices on the system have to have their baud rates changed.

Frequently Asked Questions

1. What is the Device ID?
    a. The Device ID is a value that ranges from 0 to 4194302 to uniquely identify a BACnet device on a network. Touch-Plate sets the Device ID between 68000 to 68999. This is based on Touch-Plate's BACnet ID of 68.
    b. Although this is not a required practice, it will help create a unique ID when other manufacturers use this method. This value can be changed to any of the valid values.
2. What if there is no response from the main controller?
    a. Verify that there are not conflicts with the MS/TP MAC addresses. Each device on a MS/TP network must have unique MS/TP MAC address.

touch-plate®
LIGHTING CONTROLS

Touch-Plate Ultra BACnet Manual
Revision: 2.0c

touch-plate®
ENVIRONMENTALLY
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