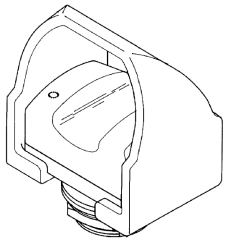
OPTO-TOUCH® OTB Series Optical Touch Button

Datasheet

Momentary Action Optical Touch Buttons



- Zero-force touch-activated photoelectric replacements for mechanical push buttons
- Momentary-action touch buttons with SPDT electromechanical relay or solid-state outputs
- Optimized for easy mounting with a 30 mm threaded base
- Ergonomic design eliminates hand, wrist and arm stress
- Field covers included to prevent inadvertent activation from loose clothing, debris, etc.

WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Models

Model[1]	Voltage	Output	Connection[2]
OTBVN6	10 to 30 V dc	Complementary NPN (sinking) outputs	6-foot attached cable
OTBVN6QD			4- pin quick-disconnect
OTBVP6		Complementary PNP (sourcing) outputs	6-foot attached cable
OTBVP6QD			4-pin quick-disconnect
OTBA5	120 V ac	SPDT electromechanical relay output	6-foot attached cable
OTBA5QD			5-pin quick-disconnect
OTBB5	220/240 V ac		6-foot attached cable
OTBB5QD			5-pin quick-disconnect
OTBVR81	20 to 30 V ac or dc[3]		6-foot attached cable
OTBVR81QD			5-pin quick-disconnect

Important... Read this before proceeding!

The user is responsible for satisfying all local, state, and national laws, rules, codes, and regulations relating to the use of this product and its application. Banner Engineering Corp. has made every effort to provide complete application, installation, operation, and maintenance instructions. Please contact a Banner Applications Engineer with any questions regarding this product.

The user is responsible for making sure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this product, and with the machinery it controls. The user and any personnel involved with the installation and use of this product must be thoroughly familiar with all applicable standards, some of which are listed within the specifications. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.

1 To order a model with polycarbonate upper housing (others are polysulfone), add the suffix "L" to the model number. For example, OTBVN6L.
2 Models with a quick disconnect require a mating cordset.
3 20 to 30 V dc power may be applied without regard to polarity.

Overview

Banner Optical Touch Buttons (OTB) are touch-activated photoelectric switches designed to replace capacitive touch switches and mechanical push buttons. The OPTO-TOUCH's SPDT electromechanical relay or solid-state output (depending upon model) is activated when a finger, introduced into the "touch area" (yoke) of the switch, interrupts the OPTO-TOUCH's infrared sensing beam.

Banner Optical Touch Buttons are ergonomically designed to eliminate the hand, wrist, and arm stresses associated with mechanical push buttons. They require absolutely no physical pressure to operate. LED indicators light for "power on" and "output activated".

All models are highly resistant to EMI, RFI, and ambient light interference. OTBs have a black polysulfone (or red polycarbonate) upper housing and fiber-reinforced thermoplastic polyester base. Polycarbonate models have the letter "L" in their model number suffix. Environmental considerations for use of the two types differ; see the specifications. The 30 mm threaded base on all models provides easy mounting, and Banner Optical Touch Buttons are easily retrofitted to existing machines.

Rugged polypropylene (TP) field covers are supplied with all models to avoid inadvertent switch actuation because of objects (such as loose clothing or debris) that might accidentally block the sensing beam. The polypropylene material is capable of absorbing high impact (even at low temperatures) and is highly resistant to abrasion and to damage by most chemicals. Additional field covers with various colors and/or a larger size are available (see *Accessories* on page 5).

Safety Instruction: A field cover is supplied with this OPTO-TOUCH. Install the cover, as shown in the drawing page 1, to minimize the possibility of unintended switch operation. If this cover is missing or has become lost or damaged, contact Banner Engineering immediately for a no-charge replacement.

Installing the OTBs

Install the OPTO-TOUCH Optical Touch Buttons so the environment does not adversely affect the means of actuation. Severe contamination of the touch area (yoke) of the switch or other environmental influences may cause slow response or false energized (on) conditions.

Mount the buttons to protect them from accidental or unintentional operation. Use the supplied field covers, or user supplied shields, covers, rings, collars, dividers, or similar protection to prevent accidental switch actuation and to discourage use of forearms or elbows.

Consider ergonomic principles to avoid unnecessary fatigue in the installation of the hand controls. Install the touch buttons at a height and in a location that will be comfortable for the user. See ANSI B11.TR1 *Ergonomic Guidelines*, and EN894 *Safety of Machinery-Ergonomic Requirements-Control Actuators* for more information.

Mount the buttons a safe distance from moving machine parts, as determined by the appropriate standard (e.g. ANSI B11.19, ISO 13851). It must not be possible for the operator or other non-qualified persons to relocate them. Failure to establish and maintain the required distance may result in an increased risk of harm.

If OPTO-TOUCH Optical Touch Buttons are used to initiate machines or operations in which false operation of an Optical Touch Button could be dangerous, point-of-operation safeguarding devices and/or related safety controls must be installed and maintained to meet all appropriate OSHA regulations, ANSI B11 machine safety standards (e.g. ANSI B11.19) or other relevant regulations.

CAUTION: Hand Controls—The environment in which hand controls are installed must not adversely affect the means of actuation. Severe contamination or other environmental influences may cause slow response or false energized (on) conditions of mechanical or ergonomic buttons. This may result in exposure to a hazard.

CAUTION: Install Hand Controls to Prevent Accidental Actuation

Total protection for the two-hand control system from defeat is not possible. However, **the user is required by U.S. and International standards to arrange and protect hand controls to minimize the possibility of defeat or accidental actuation.**

WARNING: Never use an OPTO-TOUCH Optical Touch Button as an actuator in an emergency stop (E-Stop) circuit. E-Stop actuators must be purely mechanical devices that require no power to operate. OPTO-TOUCH Optical Touch Buttons require power to operate and **must not be used as E-Stop actuators under any circumstances**.

Two-Hand Control

Two-Hand Control is an operator actuating control that initiates a machine cycle through the synchronous use of both buttons and concurrent actuation during the hazardous portion of the machine cycle. Synchronous use is defined as the actuation of both buttons within 500 ms of each other. If one or both buttons are released, an immediate stop command is issued to the machine control and the hazard ceases at any point in the machine cycle.

Alternatively, Two-Hand Trip is similar, but typically initiates a full machine cycle and does not cause a stop or cessation of the hazard if either or both the buttons are released. Two-Hand Trip is typically used on single-cycle or full-revolution machines.

In addition to general installation requirements above, Two-Hand Control/Trip can be used for simple machine cycle actuation and must comply with (ANSI) NFPA 79 and/or ISO 60204-1. If the Two-Hand Control/Trip is also used for safeguarding, additional requirements must be complied with and are found in ANSI B11.19, ISO 13851 and other relevant regulations. In either case, the machine (safety) control must also provide the appropriate level of safety performance (risk reduction) as determined by a risk assessment and the functions of anti-tiedown and anti-repeat.

The level of the safety performance of a Two-Hand Control/Trip system is dependent on the actuating controls (buttons) and the circuitry/logic monitoring those actuating controls (THC modules, Safety Controllers, etc.). Typically, systems incorporating OPTO-TOUCH Optical Touch Buttons are limited to Type IIIA or IIIB per ISO 13851. If a Type IIIC system is required, STB Self-Checking Optical Touch Buttons (datasheet p/n*64136*) and an appropriate Two-Hand Control logic module or Safety Controller (e.g. AT-FM-10K, SC26/XS26, SC22) can comply with the additional requirements.

Anti-tiedown requires the release of both buttons before a subsequent cycle can be re-initiated. This applies after a cycle has been completed or if a stop has otherwise occurred. Anti-tiedown function must be designed to ignore false input signals. False signals include (but are not limited to) voltage transients, contact bounce, and EMI or RFI noise. Two-Hand Control logic modules and Safety Controllers with anti-tiedown are available, which include circuitry to minimize the possibility of false actuation.

Anti-repeat function causes a stop at the end of the machine cycle and requires release of all actuating controls (e.g., buttons) before another cycle or stroke can be initiated. The anti-repeat function must be incorporated into the machine and/or the machine (safety) control.

Other installation considerations include that the actuating controls (e.g. buttons) must be arranged far enough apart so that the operator cannot operate both actuating controls using one arm or hand. And, both actuating controls must be located far enough away from the nearest hazard that the operator cannot reach the hazard with a hand or other body part before the hazardous motion or situation ceases. Installation considerations, including the separation distance (safety distance) and calculations to determine this distance are found in ANSI B11.19 or ISO 13851.

WARNING: Location of Touch Button Controls

Hand controls must be mounted a safe distance from moving machine parts, as determined by the appropriate standard. It must not be possible for the operator or other non-qualified persons to relocate them. **Failure to establish and maintain the required safety distance could result in serious injury or death.**

WARNING: Point-of-Operation Guarding

When properly installed, a two-hand control device provides protection only for the hands of the machine operator. **It may be necessary to install additional safeguarding,** such as safety light screens, additional two-hand controls, and/or hard guards, **to protect all individuals from hazardous machinery.**

Failure to properly guard hazardous machinery can result in a dangerous condition which could lead to serious injury or death.

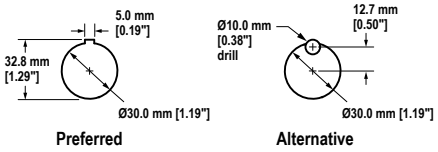
WARNING: Safety Circuit Integrity

A risk assessment must be performed to determine the appropriate safety circuit integrity level or category to ensure the expected risk reduction is achieved and all relevant regulations and standards are met (see ANSI B11.0 and ANSI B11.19, ISO 12100 and ISO13849-1 or the appropriate standards).

Mounting Hole Information

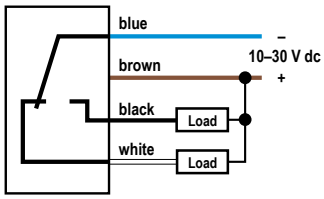
The OPTO-TOUCH has a 30 millimeter threaded base which fits directly into a standard mounting hole for an oiltight push button. A lock ring, supplied with each OPTO-TOUCH, can be used to prevent switch rotation.

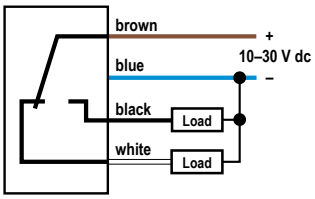
The mounting hole details shown at the right are used for the OPTO-TOUCH and also for standard oiltight push buttons and their legend plates. The drawing at the far right shows how to approximate the keyway using a drill hole.



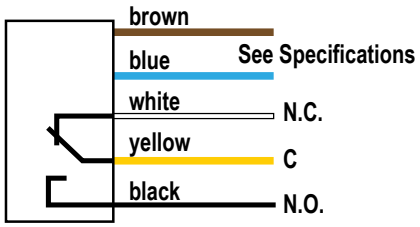
Wiring Diagrams

NPN Models	PNP Models





AC and AC/DC Models



Voltage Specifications

OTBA5 models: 105 V ac to 130 V ac

OTBB5 models: 210 V ac to 250 V ac

OTBVR81 models: 20 V ac/dc to 30 V ac/dc

Note: For OTBVR81 Models, connection of dc power is without regard to polarity.

Specifications

Supply Voltage

Supply voltage varies, depending on the model ordered:
- 105 V ac to 130 V ac
- 210 V ac to 250 V ac (50/60Hz)
- 10 V dc to 30 V dc
- 20 V ac/dc to 30 V ac/dc (at 25 mA, exclusive of load)

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Protection

100 ms delay on power-up; outputs do not conduct at this time
Models with solid-state outputs are protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Configuration:

AC and ac/dc models: All models have SPDT electromechanical relay (one N.O. contact, one N.C. contact)
DC-only models:
- OTBVN6 models have complementary NPN sinking outputs
- OTBVP6 models have complementary PNP sourcing outputs

Indicator LEDs

Two indicator LEDs. One lights whenever power is applied; the other lights whenever the switch is activated

Operating Temperature

–20 °C to +50 °C (–4 °F to +122 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Environmental Considerations

Models with polysulfone housing): Prolonged exposure to direct outdoor sunlight causes embrittlement of the polysulfone housing. Window glass effectively filters longer wavelength ultraviolet and provides excellent protection from sunlight. Contact Banner Engineering regarding outdoor applications.
Models with polycarbonate housing: Avoid prolonged exposure to hot water and moist high-temperature environments above 66 °C (150 °F). Avoid aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons, and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.

Construction

Black polysulfone (or red polycarbonate) upper housing and fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Totally encapsulated, non-metallic enclosure. Threaded base has M30 x 1.5 external threads and 1/2-in NPSM internal threads. Base requires a 1-3/16-in diameter mounting hole (fits most standard automotive- size jumbo legend plates and oiltight pushbutton holes).
Field cover: Polypropylene copolymer (supplied)

Certifications

2399833

E71083

E164886

Ambient Light Immunity

120,000 lux (direct sunlight)

EMI/RFI Immunity

Highly resistant to both single and mixed EMI and RFI noise sources

Response Time

100 ms ON/OFF

Cable

AC and ac/dc Quick-disconnect (QD) models require a MBCC-512 5-conductor cable (purchased separately).
DC-only Quick-disconnect (QD) models require model MBCC- 412 4-conductor mini-style cable
Models with attached cable (non-QD models): 2 m (6 ft) PVC-jacketed, 22 AWG 4- or 5-conductor cable

Output Rating:

AC and ac/dc models:
- Maximum voltage is 250 V ac or 30 V dc
- Maximum current is 7 amps (resistive load), 1 HP maximum
- Minimum load is .05 watts (dc), .05VA (ac)
- Mechanical life of relay is 50,000,000 operations (minimum)
- Electrical life of relay is 100,000 operations (minimum) at full resistive load
- Transient suppression recommended when switching inductive loads

DC models:
- 150 mA maximum load (each output)
- ON-state saturation voltage: less than 1 V at 10 mA; less than 1.5 V at 150 mA
- OFF-state leakage current: less than 1 µA

Environmental Rating

NEMA 1, 3, 4, 4X, 12, and 13; IEC IP66

Required Overcurrent Protection

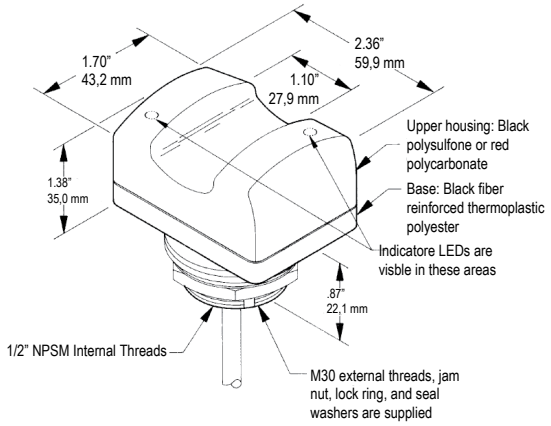
WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

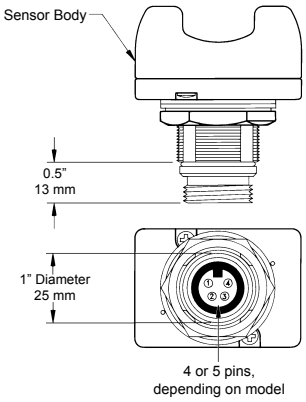
Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *www.bannerengineering.com*.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

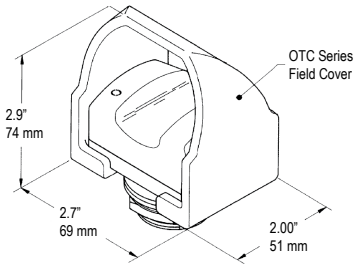
Dimensions

OPTO-TOUCH



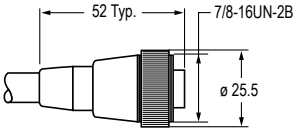
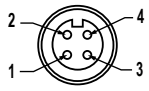


Field Cover

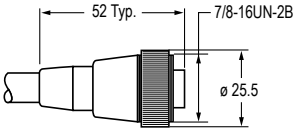
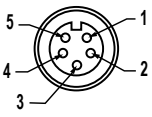


Accessories

Cordsets (4-pin Mini-style)

4-Pin Mini-Style Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MBCC-412	3.66 m (12 ft)			
MBCC-430	9.14 m (30 ft)			

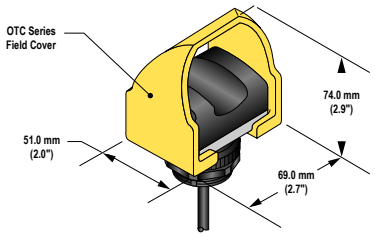
Cordsets (5-pin Mini-Style)

5-Pin Mini-Style Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-506	1.83 m (6 ft)	Straight		 1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White
MBCC-512	3.66 m (12 ft)			
MBCC-530	9.14 m (30 ft)			

Field Covers

Field covers are designed to prevent inadvertent activation of optical touch buttons by objects that accidentally block the sensing beam. Field covers are constructed of rugged polypropylene and are highly resistant to abrasion and to damage by most chemicals.

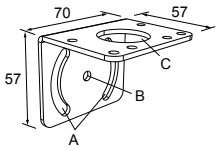
A variety of colors is available, allowing color-coding when multiple touch buttons are used. Note that when a field cover is used, it also blocks a portion of the job light (VTB only). An optional larger size field cover that accommodates a gloved hand is available (OTCL-1-xx), see datasheet p/n *171993*.

Model	Description	
OTC-1-BK	Black cover	
OTC-1-GN	Green cover	
OTC-1-RD	Red cover	
OTC-1-YW	Yellow cover	

Mounting Brackets

SMB30MM

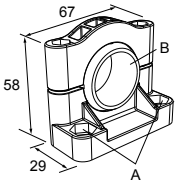
- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor



Hole center spacing: A = 51, A to B = 25.4
Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1

SMB30SC

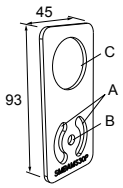
- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0

SMBAMS30P

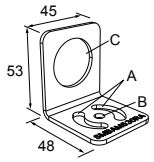
- Flat SMBAMS series bracket
- 30 mm hole for mounting sensors
- Articulation slots for 90°+ rotation
- 12-ga. 300 series stainless steel



Hole center spacing: A=26.0, A to B=13.0
Hole size: A=26.8 x 7.0, B=ø 6.5, C=ø 31.0

SMBAMS30RA

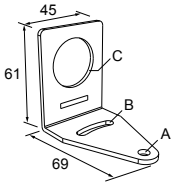
- Right-angle SMBAMS series bracket
- 30 mm hole for mounting sensors
- Articulation slots for 90°+ rotation
- 12-ga. (2.6 mm) cold-rolled steel



Hole center spacing: A=26.0, A to B=13.0
Hole size: A=26.8 x 7.0, B=ø 6.5, C=ø 31.0

SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel



Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

Ordering Information

OPTO-TOUCH Optical Touch Buttons are shipped with a black field cover. A black field cover will be received if the OPTO-TOUCH is ordered by its model number (only). A red, yellow, or green field cover may be specified instead by ordering the OPTO-TOUCH using the appropriate 5-digit part number from the table. Field covers may also be ordered separately.

Model	Black Cover	Red Cover	Yellow Cover	Green Cover
OTBA5	27986	35058	35078	35098
OTBB5	27987	35062	35082	35102
OTBVR81	33080	35066	35086	35106

Model	Black Cover	Red Cover	Yellow Cover	Green Cover
OTBVN6	28591	35070	35090	35110
OTBVP6	28589	35074	35094	35114
OTBA5QD	28149	35059	35079	35099
OTBB5QD	28150	35063	35083	35103
OTBVR81QD	34078	35067	35087	35107
OTBVN6QD	28585	35071	35091	35111
OTBVP6QD	28590	35075	35095	35115
OTBA5L	32167	35060	35080	35100
OTBB5L	32254	35064	35084	35104
OTBVR81L	34040	35068	35088	35108
OTBVN6L	33706	35072	35092	35112
OTBVP6L	34110	35076	35096	35116
OTBA5LQD	32255	35061	35081	35101
OTBB5LQD	32256	35065	35085	35105
OTBVR81LQD	34041	35069	35089	35109
OTBVN6LQD	35057	35073	35093	35113
OTBVP6LQD	34997	35077	35097	35117

Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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