BT-1 Beam Tracker

Datasheet

Photoelectric diagnostics sensor



- A simple, convenient, and time-saving way to evaluate photoelectric system performance
- Receives light from all modulated photoelectric emitters and transmits light to photoelectric receivers to check system operation
- A valuable tool for locating the center of the sensing beam when installing long-range opposed mode photoelectric sensor pairs
- Locates sources of severe EMI or RFI noise
- Selfcontained and powered by a standard 9 V battery that provides about 10 hours of continuous use (or, typically, hundreds of tests)
- Includes an aiming sight and a convenient mounting hole for a strap or a cord

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Overview

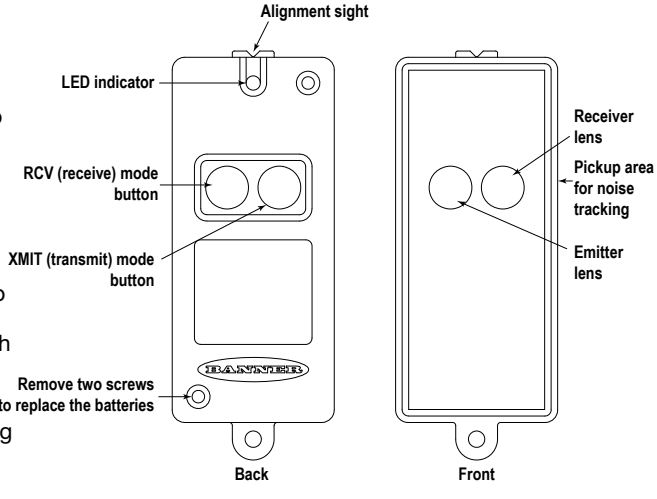
Use the Banner BT-1 Beam-Tracker™ to troubleshoot any modulated photoelectric system. The BT-1 can receive any modulated photoelectric light source and has a built-in high frequency emitter detectable by any Banner photoelectric receiver as well as by those of most other photoelectric manufacturers.

Use the BT-1 to check sensor alignment in opposed photoelectric systems by locating the center of a beam when installing long range opposed pairs. The BT-1 may also be used to quickly check for light output from any infrared remote control. When the transmit button is pushed, the BT-1 emits a 70 kHz modulated infrared beam. Most modulated photoelectric receivers, if functioning properly, respond to this beam at close range.

The BT-1 includes Banner's exclusive Alignment Indicating Device™ (patent #4356393) that displays the relative strength of the light it receives from a modulated source.

In receive mode, the LED flash rate corresponds to the beam's intensity. A weak or failed light source is easily verified. The BT-1 also responds to a severe level of electromechanical or radio frequency interference. Trace the path to the noise source by observing the flash rate of the BT-1's Alignment Indicating Device.

If you have a question about the use of the BT-1 or about any other Banner product, contact the applications group at Banner Engineering Corp or your local Banner sales engineer.



Operating Instructions

Check the Light from Modulated Emitters

The BT-1 Beam-Tracker™'s receive mode can detect the light from any modulated emitter.

To check an emitter, follow these instructions.

1. Press and hold the RCV button on the back of the BT-1.
   The indicator LED blinks once to indicate the BT-1 is ready to receive a signal.

Original Document
03490 Rev. A

4 October 2019

03490

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2. Point the lens of the BT-1 directly at the emitter to be tested.
   A functioning emitter will light the BT-1's indicator LED. No response of the indicator LED suggests failure of the emitting element or of the emitter's modulation (oscillator) circuitry.

The BT-1 includes Banner's exclusive Alignment Indicating Device (AID), which displays the relative intensity of a modulated light source.

The indicator LED flashes at a rate directly proportional to the amount of modulated light gathered by the BT-1's lens. A pulse rate of about one per second indicates a marginal amount of light signal. A steady "on" condition of the LED occurs at pulse rates higher than about 20 per second.

The BT-1 cannot be used to measure excess gain, since gain is determined by the amplifier and by the optical characteristics of the receiver used in the sensing system.

Align the Emitter-Receiver

Use the BT-1 Beam-Tracker™'s receive mode to align emitter-receiver photoelectric sensor pairs, particularly for emitter-receiver pairs placed at long range.

The biggest problem when using separate emitters and receivers is marginal alignment. At ranges within a few feet, most modulated systems have enormous power, which makes alignment very simple. However, it often is important to optimize alignment, even at close range, where high excess gain is needed to "burn through" contamination.

1. Apply power to the emitter, which is mounted in place.
2. Press and hold down the RCV button.
3. Move the BT-1 to find the emitter's beam and walk slowly back to the receiver location.
   The BT-1 senses the emitter's beam with approximately the same sensitivity as the equivalent Banner receiver.
4. If the beam is lost, use the sight at the top of the case to help re-establish beam tracking. At the receiver location, use the Alignment Indicating Device to find the center of the beam.
5. With the center of the beam located, rotate the BT-1 to determine the best angular position for the receiver.
   At long scanning distances, accurate angular sensor alignment is even more important than vertical and horizontal placement.
6. After the receiver has been permanently mounted, use the receiver's AID (if available) or temporarily reduce the receiver's sensitivity, incrementally, until alignment can no longer be improved.

Test the Receiver Function

The BT-1 includes a high frequency infrared (invisible) emitter that is recognized at short range by most modulated photoelectric receivers, including all Banner receivers.

Transmit mode of the BT-1 cannot be used to test a receiver for its range specification.

To check receiver operation, follow these instructions.

1. Point the BT-1 directly at the lens of the receiver.

   Hold the BT-1 within a few inches of the lens of any receiver under test.
2. Press the XMT button.
   A working receiver responds to the BT-1's modulated beam, as indicated by the receiver's alignment indicator and/or by a change of state of the receiver's output.

The indicator LED of the BT-1 will be on and flashing slowly when the XMT button is pressed. If the LED doesn't light up when the BT-1 is in transmit mode, replace the battery.

Locate the Source of Noise

By design, the BT-1 is sensitive to electrical noise, both EMI and RFI. This allows the BT-1 to be used to locate the source of severe levels of interference that could cause false operation of electronic equipment like sensors, counters, data recorders, and programmable logic controllers.

1. To locate a suspected noise source, press the RCV button (BT-1 in the receive mode).
2. If necessary, cover the receiver lens of the BT-1 to prevent a response to any modulated light in the area, including any light from fluorescent fixtures.
   The noise pick-up area is on the side of the housing, next to the RCV button. When a high level of steady noise is detected, the BT-1's Alignment Indicator Device (AID) LED flashes at a rate proportional to the strength of the interference.

3. Move the BT-1 in all directions and observe the flash rate of the AID.

   Electromagnetic interference (EMI) is readily coupled to and conducted along cables, and so the source of EMI is often discovered by tracking along wireways. It is normal in these situations for the interference level to alternately rise and fall along a long cable or wireway. However, the average flash rate of the Alignment Indicating Device increases as the noise source is approached. Common sources of EMI include lighting fixtures and controls, motors, generators, and contactors.

   EMI emissions are distributed uniformly across the radio frequency spectrum. Radio interference, however, occurs most often at a specific frequency or within a narrow band of frequencies. As a result, one electronic instrument may be radically affected by the presence of radio frequency interference (RFI), while another similar instrument in the same area may appear completely immune. The BT-1 is designed to respond to RFI falling anywhere within the common radio frequency spectrum and can easily track any source of RFI. Severe levels of RFI are usually tracked across open areas. The pulse rate of the BT-1' s Alignment Indicating Device increases rapidly as the RF noise source is approached. Common generators of RFI include in-plant two-way radios, stepper motor controls, computers, and CRTs.

Not all sources of noise are continuous. For example, an arcing relay may emit a burst of EMI and RFI when its contacts open. If a burst of noise occurs while the BT-1's receiver is on (the RCV button is pressed), the noise appears as a quick flash of the BT-1's indicator LED. An intermittent noise source may be tracked by relating the flash of the BT-1s LED to an electromechanical event or sound (for example, a machine indexing, a motor starting, etc.).

Replace the Battery

1. Check the battery by pressing the XMT button.
   A good battery lights the indicator LED on the BT-1. The LED pulses at a slow rate, even when no modulated light is reaching the lens.
2. To replace the battery, remove the two screws at the back of the housing.
3. Remove the discharged battery and insert a new battery.

   The BT-1 uses a common style 9 V (NEDA 1604) battery. An alkaline battery will yield over ten hours of continuous use.
4. Properly dispose of used batteries according to local regulations.

Specifications

Supply Voltage
9 V battery for about 10 hours of continuous use (or, typically hundreds of tests)

Indicators
Exclusive, patented Alignment Indicating Device system (AID™, US patent #4356393) displays the relative strength of the light it receives from a modulated source.
When the receive button is pressed, an LED indicates the presence of a modulated light beam and flashes at a rate that corresponds directly to the beam's intensity. A suspected weak or failed light source is easily verified.

Construction
Cycolac T® (registered trademark of General Electric)

Beam
70 kHz modulated infrared beam

Application Notes
In receive mode, the BT-1 responds to a severe level of electromagnetic or radio frequency interference. Trace the path of the noise source by observing the flash rate of the Alignment Indicating Device.

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