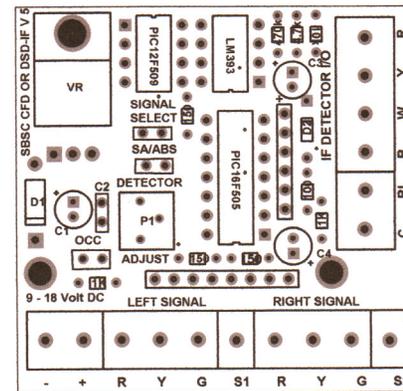


# South Bend Signal Company LLC

“Making Your Railroad Real”  
www.sbsignal.com

## Infrared Detector/Signal Driver For Crossing Signals



### CFD-IF (V3)

CFD-IF Manual 2010

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### **Description**

The **CFD-IF** is a detector/signal driver which provides detection and signaling for grade crossing signals.

#### **Specifications**

- 12 -18volt DC operation (unregulated)
- 100 ma power draw per board
- Uses infrared state -of-the-art detection device with sensitivity control
- Bi-directional providing signal control in both directions of travel
- three detector sets one for each end of the Grade Crossing block and at the crossing
- Compatible with any train control system: DC or DCC

#### **Materials Needed**

- small Phillips and slotted screw driver
- 1/8<sup>th</sup> and 1/4<sup>th</sup> drill bits and power drill
- 12-18volt DC power source (**not the throttle supply**)
- Wires cutters and wire strippers
- Appropriate hook-up wire (22 gauge)

**Note: The CFD-IF may not work correctly in all cases. Interference from errant RF signals and IF throttle controls and other IF sources may cause the detector to work erratically.**

## **Crossing Gates or other Crossing Devices**

The **CFD-IF** is supplied with terminals for devices such as crossing gates which can be operated using the CFD-IF. To use the CFD-IF to control crossing gates or other crossing devices using stall type switch machines or small DC motors connect one wire from the motor to the **S1** connection and one wire to the **S2** connection. You will have to determine which wire from the motor is to be connected to which terminal on the **CFD-IF**.

**Caution: The CFD-IF is capable of driving DC motors or servos capable of running at 5 volts and drawing not more than 60 milliamps. Exceeding these parameters will damage the CFD-IF board.**

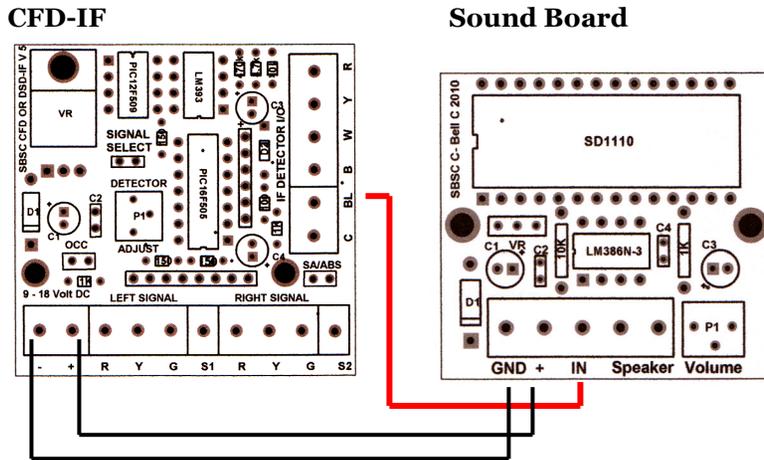
Below is a **logic table** for **S1** and **S2**

<b>Detector</b>	<b>S1 State (clear)</b>	<b>S2 State (detected)</b>
Off	LOW (ground)	HIGH (positive)
On	HIGH (positive)	LOW (ground)

## Connecting SBSC Crossing Bell (Option)

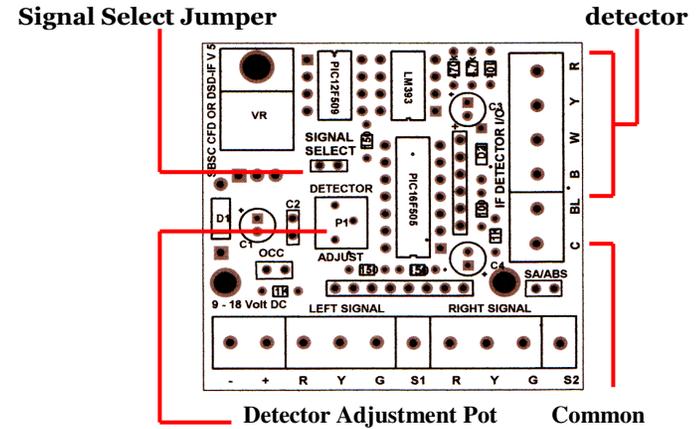
The CFD-IF has an output terminal (BL) is connects to power ground when the board is detecting an IF input. A sound device such **South Bend Signal Companies Sound Board's (CB)** input (IN) is connected to the CFD-IF BL. This will turn on the crossing bell when a train is being detected. See the CB manual for details about the sound board and speaker connections.

Figure 5



## CFD-IF Terminal Descriptions

Refer to the diagram of the CFD-IF board below to become familiar with the terminals and there purpose.



- + (input) Power wire 12 volt-18 DC \*
- (input) ground wire 12 volt-18 DC

### Left and Right Block Input/Output Terminals

- G LEFT & RIGHT (output) wire to crossing signal
- Y LEFT & RIGHT (output) common wire to crossing signal
- R LEFT & RIGHT (output) wire to crossing signal
- S1 (output) wire to device motor
- S2 (output) wire to device motor
- BL (output) activate crossing bell (ground)
- C (output) Common for color light signals

### Detector Terminals (2 Detector Sets per Block)

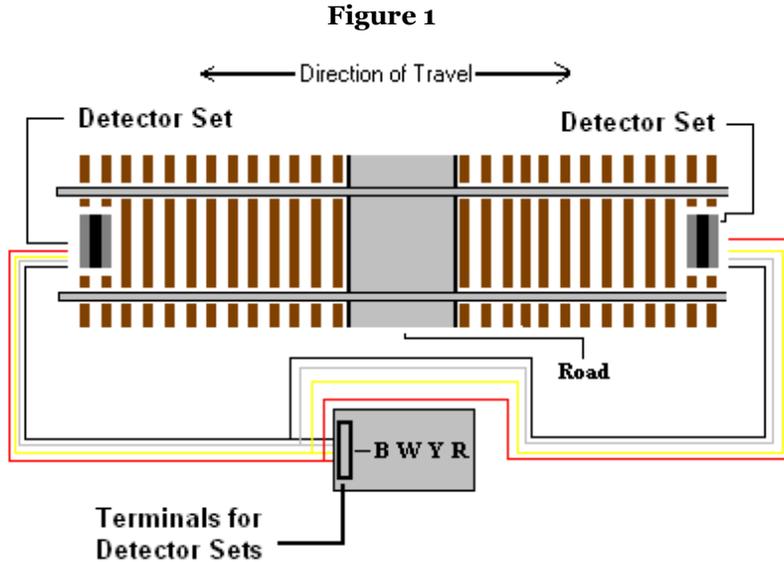
- R (input) Red wire: Receiver inputs from detector sets
- Y (output) Yellow wire: Emitter output to detector sets
- W (output) White wire: common ground to detector sets
- B (output) Black wire: positive power to Receiver

Jumper Blocks: **Signal Select** Remove for common positive, leave on for common ground crossing signals;

**Use a separate DC power supply for this signal system. Do not use power from the rails or other throttle sources to power this system. Failure to improperly power this system may damage the board. SBSC will not be responsible for improperly connecting the system to an incorrect power source.**

## Step [1] Establishing a Grade Crossing Block

The first step if installation is to establish a grade crossing block. A grade crossing block is a section of track that protects a grade crossing at the intersection of a road and tracks which are protected by signals. **Figure 1** below illustrated this.



The detector sets are positioned between the rails where the signals are activated to allow enough warning that a train is approaching. There is one detector set at each end of the grade crossing block. See **Figure 1**.

## Detector Set Description

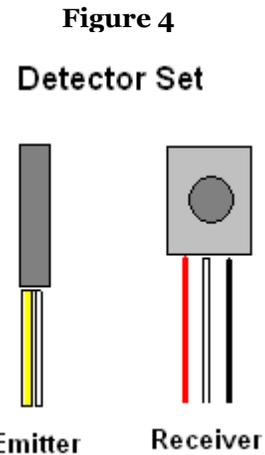
Each **CFD-IF** comes with 2 detector sets. A set consists of an **Emitter** and a **Receiver**. When the signal system is connected to 12-18 volts, the emitter sends out an infrared beam at a particular frequency and wave length. The receiver is calibrated to this same frequency and wave length. When the detector set is covered by a locomotive or any piece of rolling stock, the beam from the emitter is bounced off the bottom of rolling stock and is recognized by the receiver causing the receiver to transmit a signal to the CFD-IF microcontroller that a detection has been made. The microcontroller then turns the crossing signals on.

The emitter has a **YELLOW** and **WHITE** wire connected to it. The **Receiver** has **RED**, **WHITE**, and **BLACK** wires connected to it.

The **WHITE** wire is the common ground for both the emitter and the receiver. A common wire can connect the white wires from the emitter and receiver then connected to the terminal marked **W** on the detector terminal section on the CFD-IF board.

If you find that you are experiencing intermittent false detections turn the detector adjustment pot (blue) board. This decrease will (counter clockwise) or increase (clockwise) the amount of infrared light coming from the emitter.

**Figure 4** below shows how the emitter and receiver look.



## Step [6] Testing the Signal System

Connect the signal power source to the power bus (**12-18 volt DC**). Check to see that each detector works properly by running a locomotive or car over the detector. The crossing signals within a block should be flashing red and the crossing bell should be on as well for each detector covered in that block.

The volume can be adjusted for the crossing bell. To adjust the volume, remove the four screws from the front of the bell cabinet. Carefully remove the front cover. In the lower right corner is an adjustment pot (blue) which will adjust the volume by turning the adjustment screw on the pot. Place a piece of rolling stock over a detector and turn the screw to achieve the desired volume.

If everything checks out OK then you are finished. Congratulations! You have successfully installed your crossing signal system. The signals will work automatically. Now you can just run trains and enjoy the added realism of a signal system to your railroad.

Again, thanks for the business.

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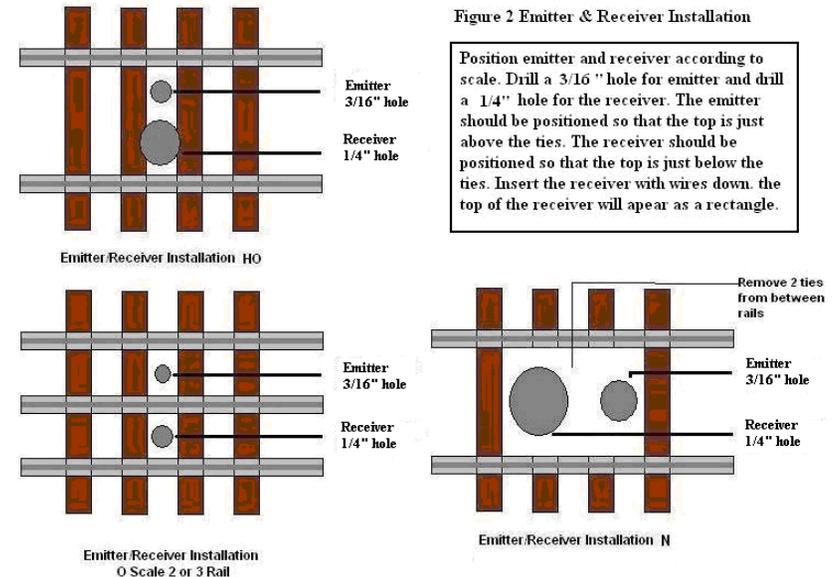
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## Step [2] Mounting Detectors

After establishing the Crossing block for your layout, one detector set (emitter and receiver) is mounted at each end of the crossing block and one at the grade crossing. See **Figure 1**. To mount the detectors remove ballast between the ties in the mounting area. Drill a 3/16<sup>th</sup> inch hole for the emitter and a 1/4<sup>th</sup> inch hole for the receiver in the positions shown in **Figure 2** according to the scale.



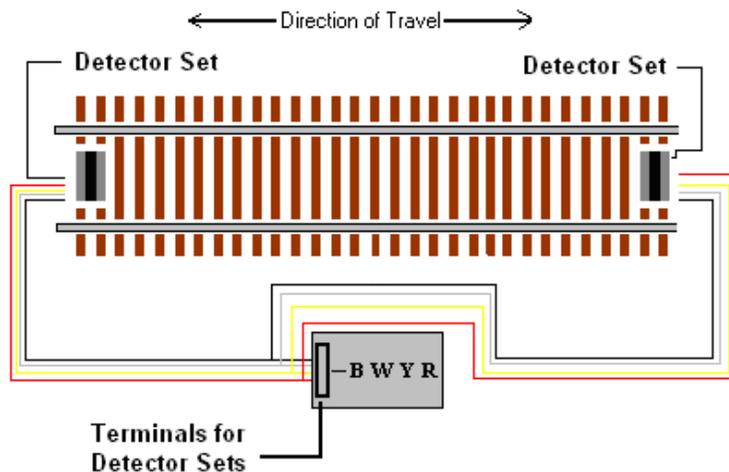
Insert the detector set into the holes drilled. The top of the receiver should be facing up, not the dome up. The receiver will see the IF light from the top of the package. See **Fig 4 D**. Be careful when inserting the emitter and receiver that you do not crimp the leads inside the shrink wrap tubing which will cause them to short and not work properly. Check to make sure they are working properly by connecting them to the CDF-IF board as described in **STEP [4]**.

After you are sure they are working properly you can cement the **Emitter** and **Receiver** from the top. The **Emitter** should be flush with the top of the ties and the top of the **Receiver** even with the bottom of the ties.

## Step [4] Connecting the Detectors to the CFD-IF

**WARNING: Do not make connections to the CFD-IF board with power applied to the board. (See page 9 for a description of the detector sets)** After you have determined the location of the Grade Crossing, connect the wires from each detector set to the appropriate **CFD-IF** terminals on the left side of the board marked **B W Y R**. There are four wires for each detector set Red, White, and Black for the receiver, and Yellow and White for the emitter. Connect the white wires from the emitter and receiver together. Connect a length of wire from these white wires to the terminal for the detectors marked **W**. Connect a wire from the yellow wire on the emitter to the terminal marked **Y** of the Detector terminals. Attach a wire to the red wire on the receiver and connect it to the detector terminals **R**. Repeat these connects for the detector set at the other end of the Grade Crossing Block. Connect the second detector set's red wire to **R**. See **Figure 3** for details.

**Figure 3**



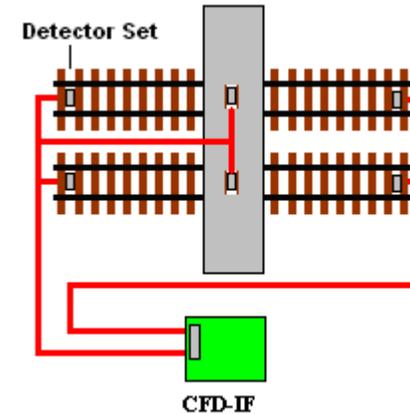
Connect each **CFD-IF** to the power supply using pieces of wire connected to the + and - terminals on the card to the power supply. The power to the **CFD-IF** should be 12volt-18 DC unregulated either from a transformer connected to the house supply or a 12 volt battery. **DO NOT CONNECT THE RELAY CARD TO THE TRACK POWER. Doing so may damage the Relay Card. SBSC will not be responsible for incorrectly powering the CFD-IF with an inappropriate power source.** Connect the power supply to you power source. Check to see if the detected light goes on when each of the detectors in a block are covered. When the red light is off the detectors are clear.

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## Multiple Track Applications

If the grade crossing signals protect more than one track, you will need to add additional detector sets for the each addition track. Follow the instruction supplied with the detector sets for the proper installation of a multiple track installation. You run a wire bus from the CFD-IF board to all the detectors

**Figure 3A**



## Step [5] Connecting Signals to the CFD-IF

Follow the instructions supplied with the signals to properly install them. Run wire from the crossing signals to the **CFD-IF**. Connect each color wire from the crossing signal to its appropriate terminal on the **CFD-IF** marked **G Y R**; one signal for the left terminals and one for the right terminals. **The Y terminal is the common lead to the signal.** For common ground signals, leave the red signal select jumper on. For common positive signals remove the red signal select jumper off.

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