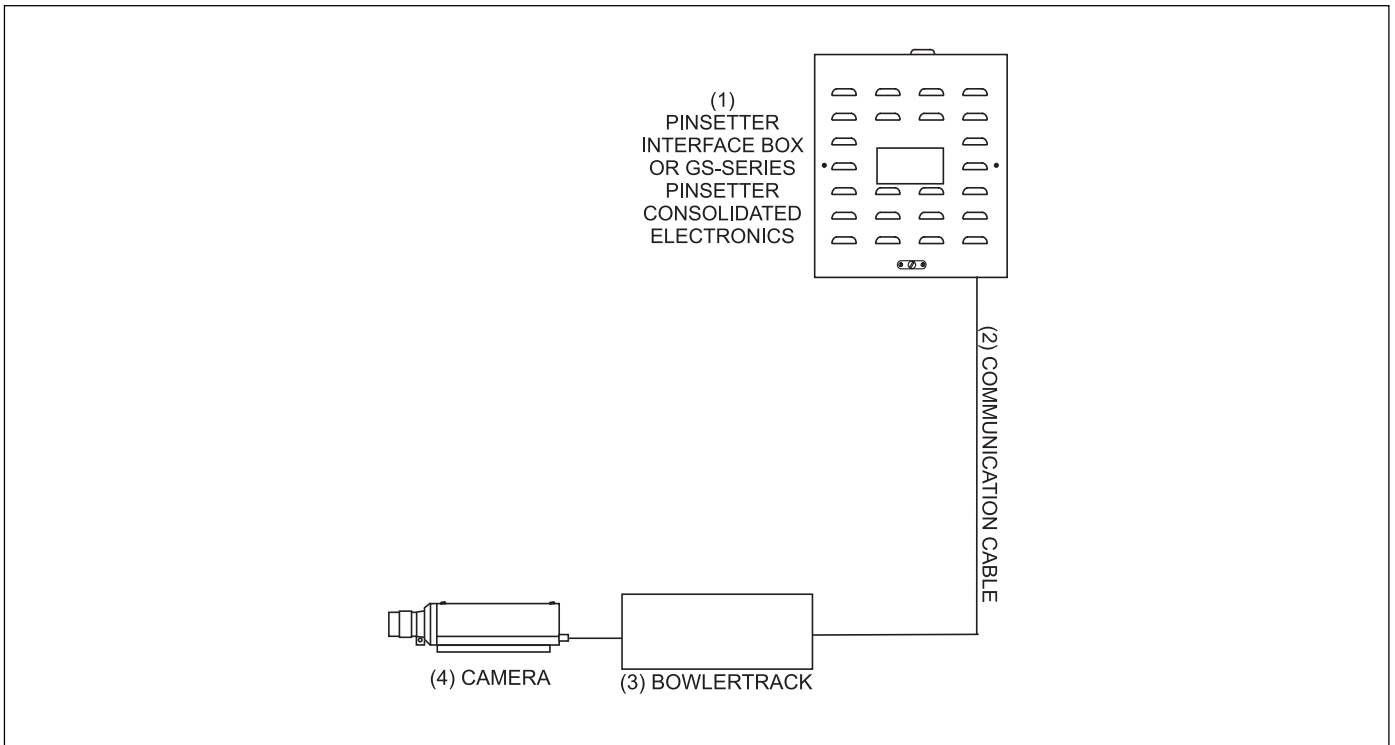

Contents

General Information	1
BowlerTrack Chassis	2
BowlerTrack PCB	3
Connections	3
HDLC Adapter	6
Power Transformer	7
Selecting the Input Voltage	7
Power Relay	8
BowlerTrack Camera	9
Camera Alignment	9
Cable Diagrams	11

Intentionally Blank

General Information

The BowlerTrack system monitors the trajectory of the bowling ball as it rolls down the lane. The system consists of a BowlerTrack chassis and a BowlerTrack camera. These components interact with the Lane Group Processor (LGP) of the lane pair through the Pinsetter Interface Box and the LLAN cable for systems with nondirect connect pinsetters or through the consolidated electronics and LLAN cable on systems with direct connect GS-Series pinsetters.. Refer to the figure titled *Camera, BowlerTrack PCB, and Comline Connection*.



Camera, BowlerTrack PCB, and Comline Connection

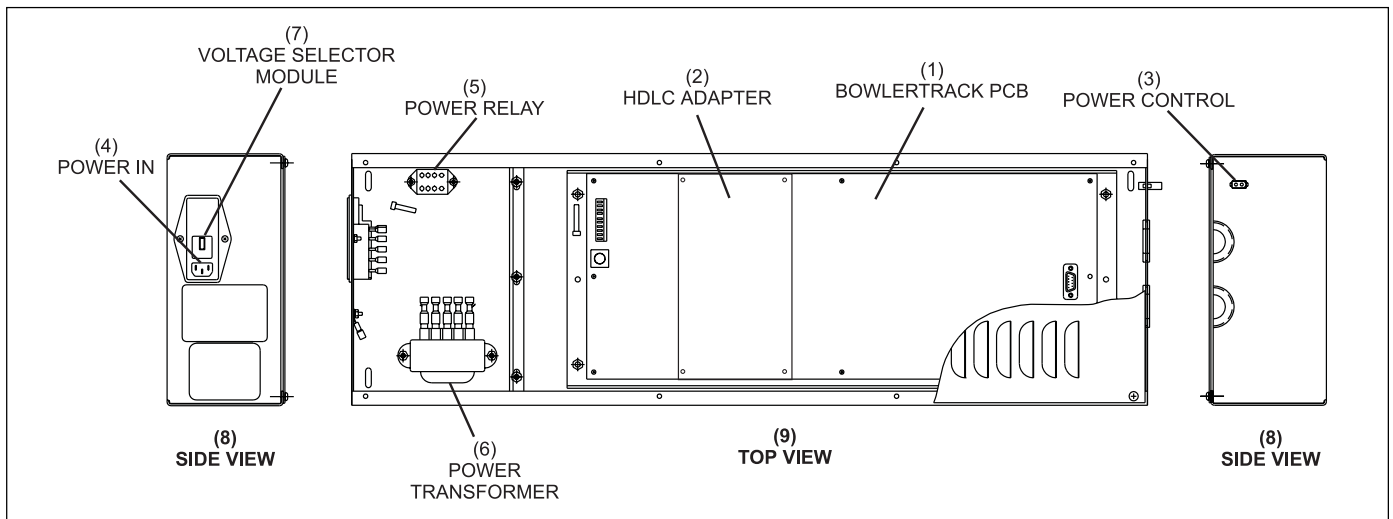
- (1) PINSETTER INTERFACE BOX OR GS-SERIES PINSETTER CONSOLIDATED ELECTRONICS (2) COMMUNICATION CABLE (3) BOWLERTRACK
(4) CAMERA

In operation, the BowlerTrack PCB receives the trajectory information from the camera. The PCB then calculates the actual trajectory and speed of the ball. This information is then translated by a PCB located in either the BowlerTrack chassis or the pinsetter interface box. It is then sent to the LGP via the Local LAN cable where it is stored and maintained. Upon request from the bowler, the information is sent to the console screen.

The BowlerTrack chassis and camera are normally mounted to the ceiling soffit between a pair of lanes and is positioned directly over the foul line.

BowlerTrack Chassis

The BowlerTrack chassis contains at least one circuit board, referred to as the BowlerTrack PCB. This board is responsible for processing the video obtained from the camera to calculate the ball speed and trajectory. A second board, called the HDLC Adapter, may be mounted on top of the BowlerTrack PCB to translate the information for the chassis so that it can communicate to the LGP. (In some installations, the HDLC PCB may be located in the pinsetter interface box on the curtain wall.) Also included in the chassis is a power transformer, power relay, and universal power input receptacle that supplies the voltage required by the PCB(s). Refer to the figure titled *BowlerTrack Chassis*.



BowlerTrack Chassis

- | | | |
|---------------------------------------|------------------|-----------------------|
| (1) BOWLERTRACK PRINTED CIRCUIT BOARD | (2) HDLC ADAPTER | (3) POWER CONTROL |
| (4) POWER IN | (5) POWER RELAY | (6) POWER TRANSFORMER |
| (7) VOLTAGE SELECTOR MODULE | (8) SIDE VIEW | (9) TOP VIEW |

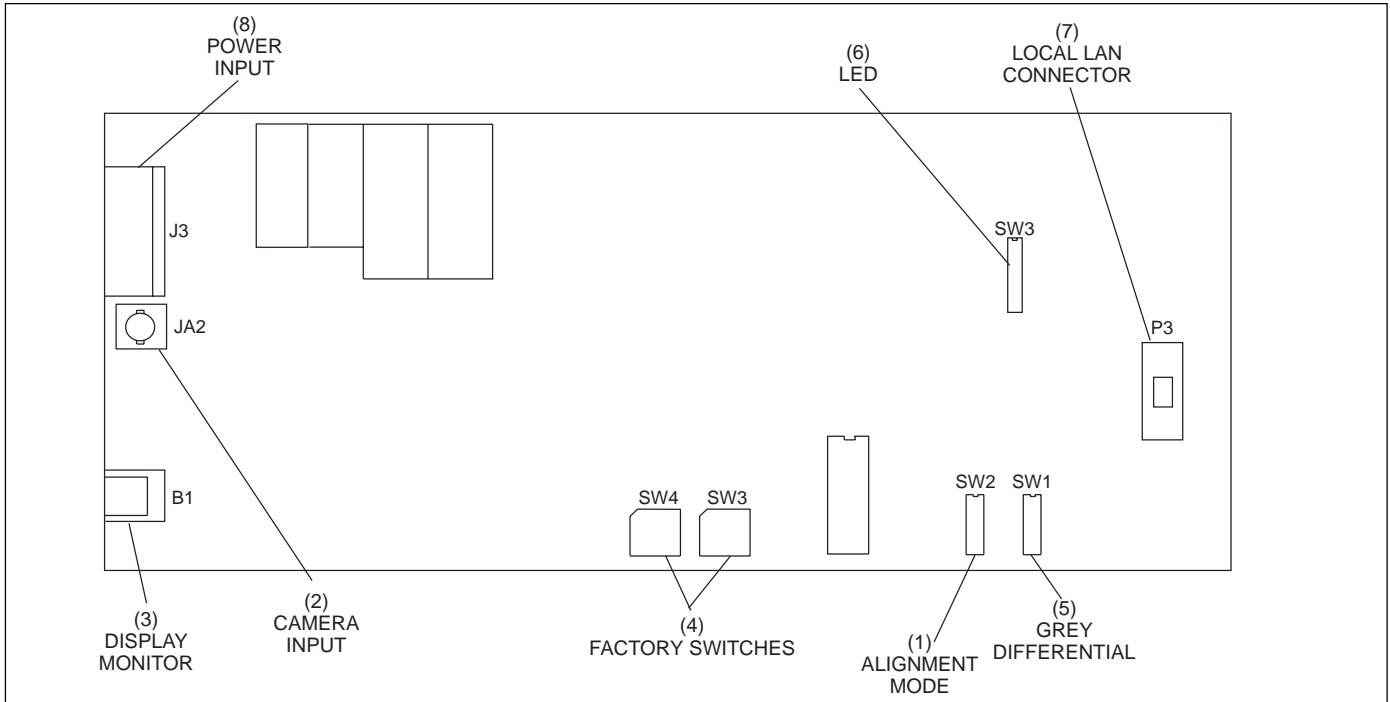
The functions of the components on the BowlerTrack Chassis are:

- (1) **BowlerTrack PCB** - This board is responsible for all BowlerTrack functions.
- (2) **HDLC Adapter** - This board is responsible for translation information being sent between the LGP and the BowlerTrack PCB. This board is not used for installations with non-direct connect GS-series pinsetters. In some installations, this PCB is located in the pinsetter interface box (if installed).
- (3) **Power Control** - Not used. See Power Relay.
- (4) **Power In** - Receptacle for main input voltage.
- (5) **Power Relay** - Relay used to power the BowlerTrack PCB. The relay is wired so power is always on.

- (6) **Power Transformer** - This transformer changes the input voltage to a lower voltage that the BowlerTrack PCB can use.
- (7) **Voltage Selector Module** - A slide-in module that allows the user to select either 120 VAC or 240 VAC as the main input voltage. This modulator also contains fuses to protect incoming power.

BowlerTrack PCB

The BowlerTrack PCB is responsible for calculating the trajectory of the bowling ball from the information it receives from the BowlerTrack Camera. Refer to the figure titled *BowlerTrack PCB (Part No. 68-100758-4xx)*.



BowlerTrack PCB (Part No. 68-100758-4xx)

Connections

The functions of the BowlerTrack PCB components are as follows:

- (1) **Alignment Mode (SW2)** - Setup switch used during the camera alignment procedure. The switches are used in the following way:

No. 1 Not Used

No. 2 Frequency Setting

Off = 60 Hertz

On = 50 Hertz

No. 3 Type of Camera

Off = Vidicon

On = CCD

No. 4 CCD Camera Type

Off = Hitachi CCD

On = Phillips CCD

No. 5 Not Used

No. 6 Lane Select for Calibration

Off - Right Lane Select

On - Left Lane Select

Nos. 7 & 8 Camera Calibrating

No. 7	No. 8	Function
Off	Off	Normal Operation
Off	On	Alignment Grid Display
On	Off	Check Calibration
On	On	8-Line Calibration

- (2) **Camera Input (JA2)** - Connection for the BowlerTrack Camera.
- (3) **Display Monitor (B1)** - Connection for the monitor used during the camera alignment procedure.
- (4) **Factory Switches (SW3 and SW4)** - Factory preset, do not adjust.
- (5) **Grey Differential (SW1)** - Setup switch used to adjust the PCB for lighting conditions of the bowling center. These switches are preset during installation and should not be changed.
- (6) **LED (Light-Emitting Diode)** - Display lights used to determine the operating condition for the BowlerTrack System. The lights have the following meanings:

LED	10	9	8	7	6	5	4	3	2	1
	V	S	EM	COM	LS	LS	LS	RS	RS	RS

V - Not vertically aligned, vertical white line is not centered on the ball return capping.

S - Camera is skewed.

EM - One or both of the EEPOTS are at maximum voltage. This usually indicates an aging Vidicon camera that may require a tube replacement or the iris setting on the camera is improper.

COM (Comline Status) - Flashes to indicate the status of the communication to the Pinsetter Interface Box.

LS - Left lane BowlerTrack state, reference the following chart.

RS - Right lane BowlerTrack state, reference the following chart.

LED 6	LED 5	LED 4	(LS)
LED 3	LED 2	LED 1	(RS)
Off	Off	Off	Lane not calibrated
Off	Off	On	Calibrated, waiting for ball
Flashing			Tracking ball
On	On	On	Calculating ball position and speed

LED's appearance during power-up:



LEDs 1, 2, and 3 will be off (right lane not calibrated).

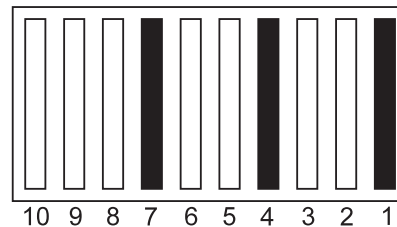
LEDs 4, 5, and 6 will be off (left lane not calibrated).

LED 7 will be flashing comline status.

LED 8 should be off.

LEDs 9 and 10 will be on.

LED's appearance after calibration (normal operation):



LED 1 will be on (right lane calibrated and ready).

LED 4 will be on (left lane calibrated and ready).

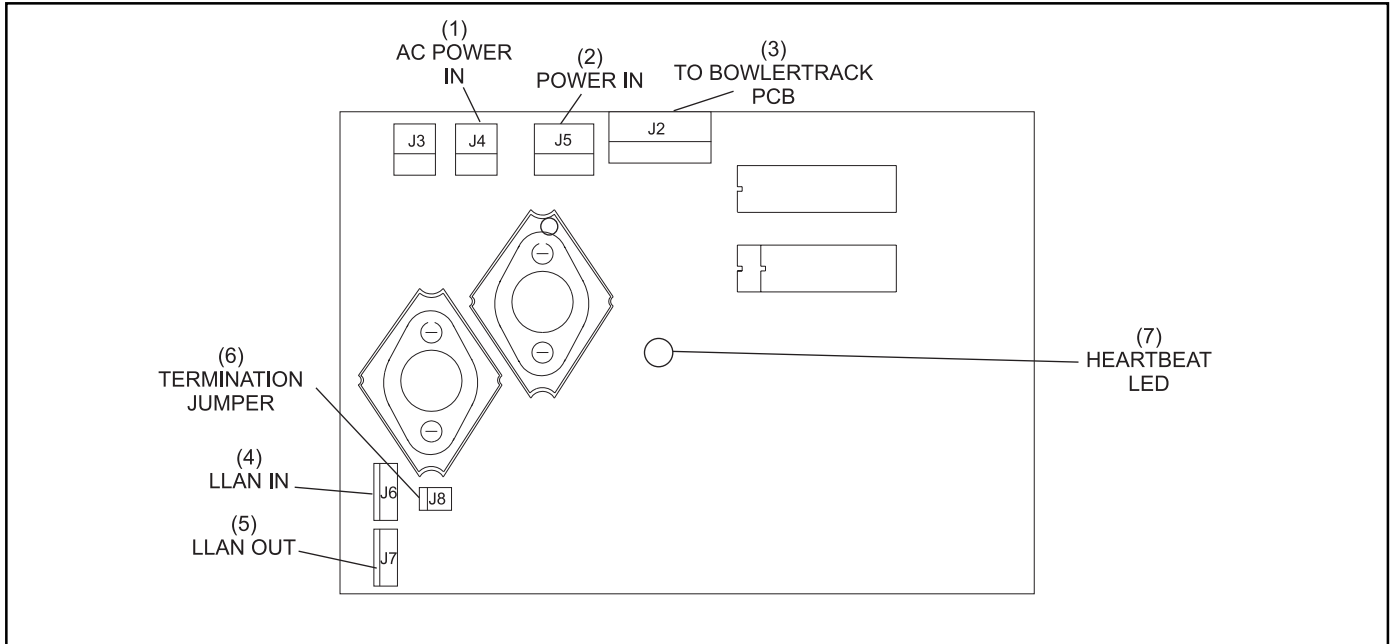
LED 7 will be flashing comline status.

LEDs 8, 9, and 10 should be off.

- (7) **Local LAN Connector (P3)** - Connection for the lane pair Local LAN going to the Pinsetter Interface Box or J2 of the HDLC Adapter PCB.
- (8) **Power Input (J3)** - Connection for the alternating current (AC) voltage coming from the power transformer.

HDLC Adapter

The HDLC Adapter translates the information being transferred between the BowlerTrack PCB and the LGP for all installations except those with non-direct connect GS-Series pinsetters after January 2000. Refer to the figure titled *HDLC Adapter PCB*.



HDLC Adapter PCB

- | | | |
|--------------------------------------|---------------------------------------|-----------------------------|
| (1) AC POWER IN (J4) | (2) POWER IN (J5) | (3) TO BOWLERTRACK PCB (J2) |
| (4) LOCAL LOCAL AREA NETWORK IN (J6) | (5) LOCAL LOCAL AREA NETWORK OUT (J7) | (6) TERMINATION JUMPER (J8) |
| (7) HEARTBEAT LED (7) | | |

The functions of the connections and jumpers on the HDLC Adapter PCB are:

AC Power In (J4) - Connection for A/C voltage coming from power transformer. The PCB generates 12 VDC from this input.

AC Power In (J3) - Connection for A/C voltage coming from power transformer. The PCB generates 5 VDC from this input.



BowlerTrack PCB (J2) - Connection to the BowlerTrack PCB connection P3. This is the input of the BowlerTrack information for translation.

Heartbeat LED (D1) - This LED flashes to indicate when communication to the LGP is correct. If communication is present, the LED should blink with the pattern flash, flash, pause.

LLAN In (J6) - Connection for the LLAN cable originating at the LGP I/O PCB.

LLAN Out (J7) - Connection to additional devices that need to connect to LLAN.

LLAN Termination Jumper (J8) - Jumper used to terminate the LLAN if it does not continue to additional devices. See the jumper as shown below.

Configuration	Jumper Setting
No additional devices connected to J7	Short Pins 1 and 2 (T) 
Additional devices attached to J7	Short Pins 2 and 3 (U) 

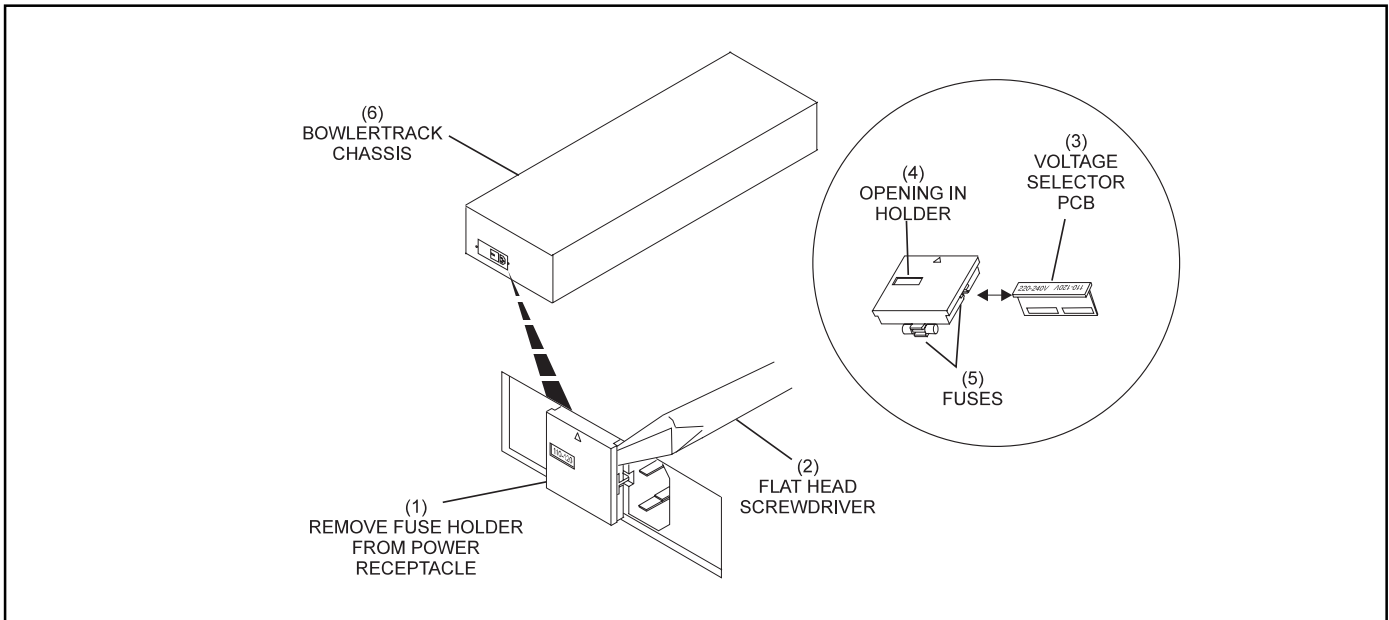
Power Transformer

The Power Transformer is responsible for producing approximately 5 VAC that is required by the BowlerTrack PCB. This power is routed through a relay located near the transformer. Input to the transformer can be either 120 VAC or 240 VAC. The power input desired is selected by a Voltage Selector Module located near the Power Input Receptacle mounted on the side of the chassis. Refer to the cable diagram titled *BowlerTrack (Part No. 68-100830-4xx)*.

Selecting the Input Voltage

To select the input voltage for the Power Transformer, do the following:

1. Disconnect the power cord from the BowlerTrack Chassis.
2. Using a flat head screwdriver, remove the fuse holder from the power receptacle.
3. Remove the Voltage Selector PCB from the holder assembly.
4. Insert the Voltage Selector PCB so the desired voltage rating can be seen through the opening in the holder. Refer to the figure titled *Selecting Input Voltage for the Transformer*.
5. Examine the fuses in the holder to verify the proper fuse rating according to the chart below.



Selecting Input Voltage for the Transformer

- (1) REMOVE FUSE HOLDER FROM POWER RECEPTACLE
- (2) FLAT HEAD SCREWDRIVER
- (3) VOLTAGE SELECTOR PRINTED CIRCUIT BOARD
- (4) OPENING IN HOLDER
- (5) FUSES
- (6) BOWLERTRACK CHASSIS

Ratings for the fuses located in the BowlerTrack Chassis are:

Input Voltage	Fuse Rating
120 VAC	.5 AMP
220 VAC	.25 AMP

6. Replace the fuse holder in the power receptacle.
7. Connect the power cord to the transformer and reapply power to the BowlerTrack Chassis.

Power Relay

The power relay located in the BowlerTrack Chassis is used to route the voltage from the Power Transformer to the BowlerTrack PCB. The relay is wired so that the power goes through the normally closed set of contacts. This allows power to reach the PCB without the need to energize the relay. As a result, the PCB is always powered. When replacing the BowlerTrack chassis verify that the relay is wired correctly for use in a Frameworkx System. Typically chassis' are sent from the factory wired for use in a BowlerVision System which uses the normally open set on contacts.

BowlerTrack Camera

The BowlerTrack Camera is used to track the bowling ball as it rolls down the lane. This information is sent to the BowlerTrack PCB to be processed.

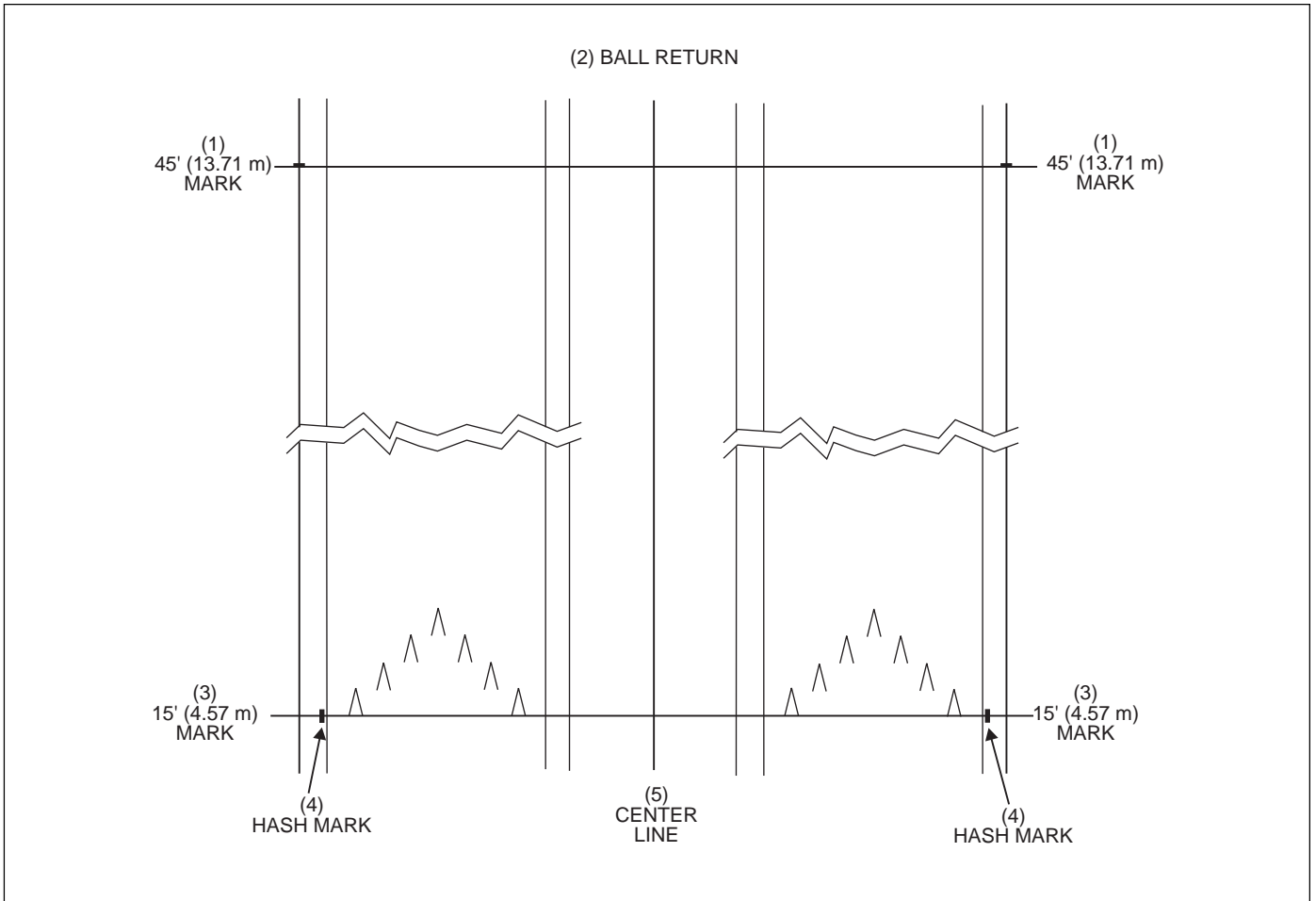
Camera Alignment

1. Connect a viewing monitor to the BowlerTrack PCB using an RCA to RCA connector cable. Attach the cable at the PCB connector labeled “Video Out” (B1).
2. Set the No. 8 switch on SW2 to the “ON” position. An alignment grid will appear on the viewing monitor.
3. The “F” stop setting on the CCD Camera lens should be set to f2.0 under normal lighting conditions or f3.5-f4.0 for brighter conditions.
4. Loosen the camera mounting bracket and position the camera as follows:
 - a. Center the camera so that the vertical line in the alignment grid is on the center of the ball return capping. Refer to the diagram titled *Alignment Grid Positioning*.
 - b. Position the camera so that the horizontal lines are positioned at the bottom of the outside arrows (15' or 4.57 m) and the black marks on the division capping (45' or 13.71 m). Refer to the diagram titled *Alignment Grid Positioning*.
 - c. Position the camera so that the “hash” marks are positioned at the outside edge of the gutters. Refer to the diagram titled *Alignment Grid Positioning*.

NOTE: *If the alignment of the vertical line and the hash marks cannot be achieved, adjust the SW3, SW4 switches located on the BowlerTrack PCB. These switches allow the movement of the vertical line left or right. SW3 moves the line in small increments and SW4 moves it in large increments.*

5. Set switch No. 8 on SW2 to the “OFF” position and observe the calibration LEDs.
6. After waiting one minute, verify that only LEDs 1 and 4 remain on and LED 7 is flashing. No other lights should be on.

NOTE: *Repeat steps 2 through 4 until the LEDs react as described in step 5. For more information about the LEDs, refer to the BowlerTrack PCB information of this section.*



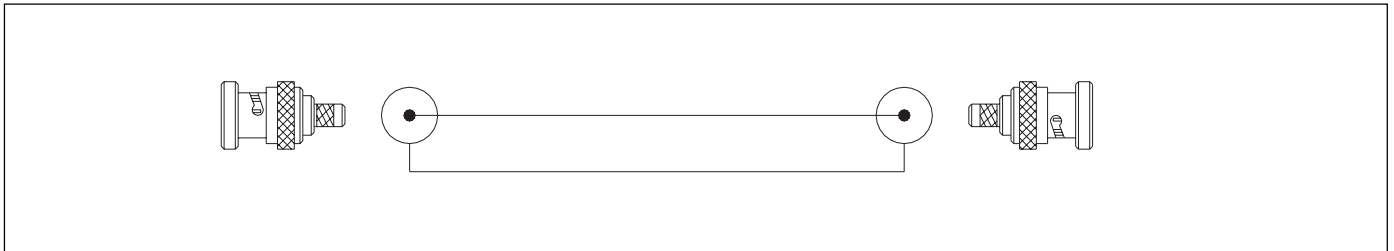
Alignment Grid Positioning

(1) 45' (13.71 m) MARK
 (4) HASH MARK

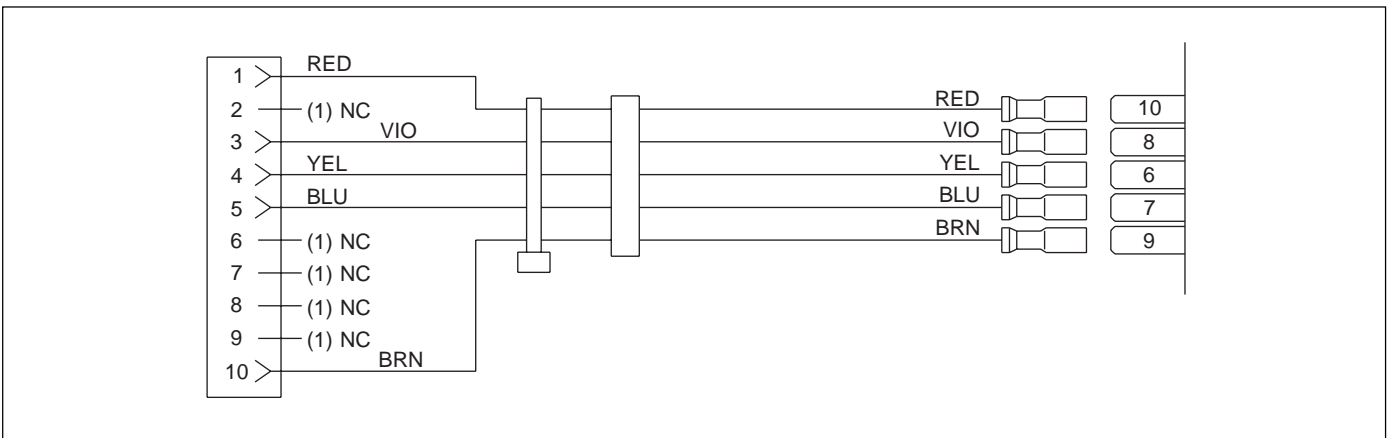
(2) BALL RETURN
 (5) CENTER LINE

(3) 15' (4.57 m) MARK

Cable Diagrams



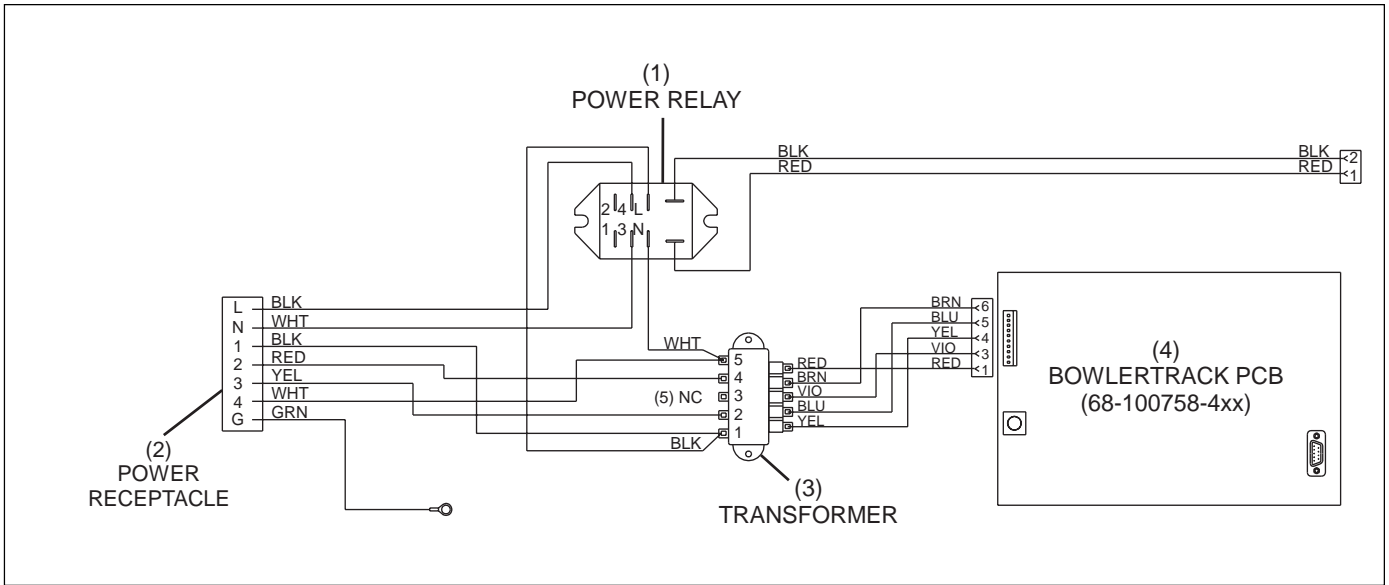
BowlerTrack to Camera Video Cable (Assembled) (Part No. 68-100503-000)



Transformer to BowlerTrack PCB Power Cable (Part No. 68-100827-000) - Original BowlerTrack Chassis

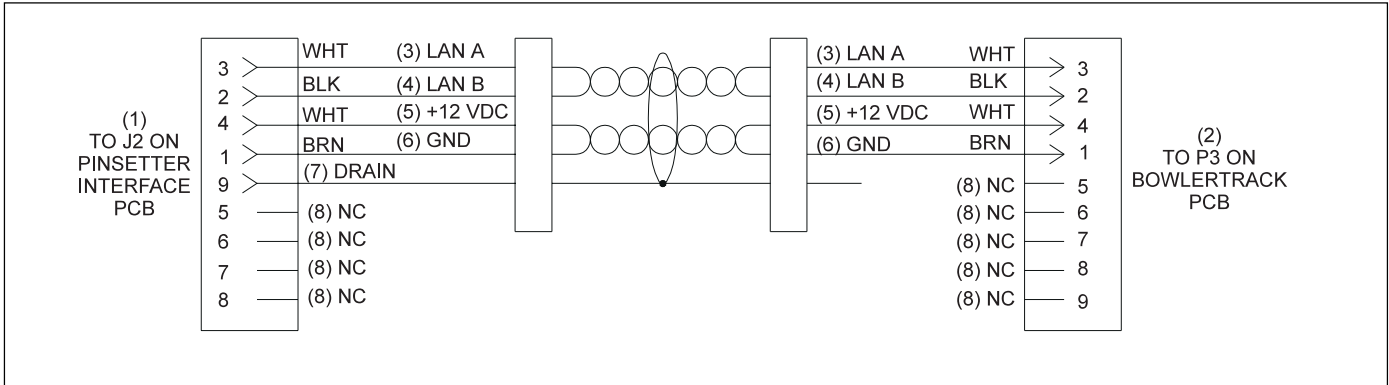
(1) NO CONNECTION

BRN=BROWN, BLK=BLACK, RED=RED, ORN=ORANGE, YEL=YELLOW, GRN=GREEN, BLU=BLUE, VIO=VIOLET, GRY=GREY, WHT=WHITE



BowlerTrack (Part No. 68-100830-4xx) - Original BowlerTrack

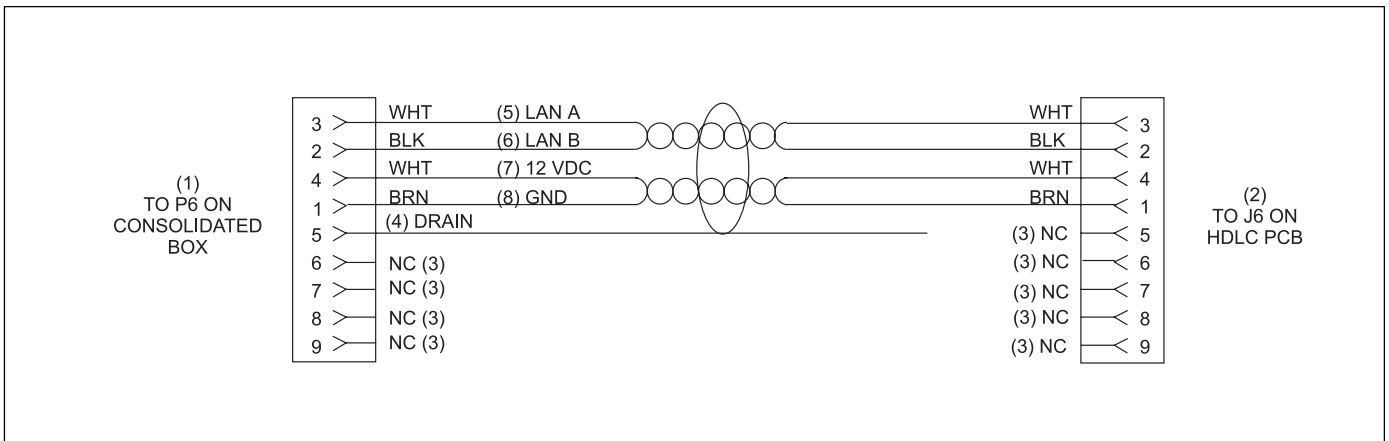
- | | | |
|----------------------------------------------------------|----------------------|-----------------|
| (1) POWER RELAY | (2) POWER RECEPTACLE | (3) TRANSFORMER |
| (4) BOWLERTRACK PRINTED CIRCUIT BOARD
(68-100758-4xx) | (5) NO CONNECTION | |



Overhead Local LAN Cable (Part No. 68-101017-000) - HDLC BowlerTrack

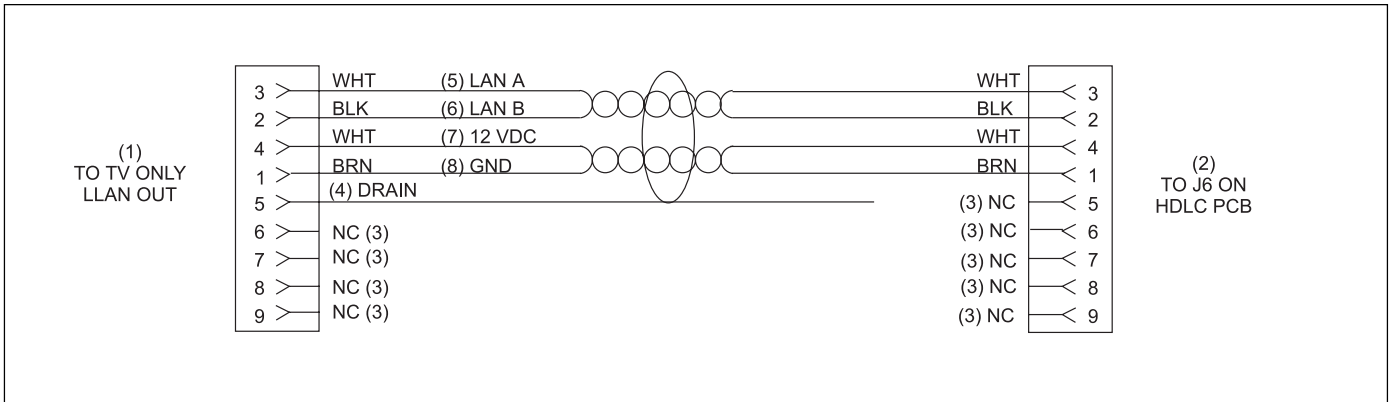
- | | | |
|--------------------------------------------------------|------------------------------------------------|--------------------------------|
| (1) TO J2 ON PINSETTER INTERFACE PRINTED CIRCUIT BOARD | (2) TO P3 ON BOWLERTRACK PRINTED CIRCUIT BOARD | (3) LOCAL AREA NETWORK A BOARD |
| (4) LOCAL AREA NETWORK B | (5) +12 VOLTS DIRECT CURRENT | (6) GROUND |
| (7) DRAIN | (8) NO CONNECTION | |

BRN=BROWN, BLK=BLACK, RED=RED, ORN=ORANGE, YEL=YELLOW, GRN=GREEN, BLU=BLUE, VIO=VIOLET, GRY=GREY, WHT=WHITE



LLAN Cable for Centers Without TV Only Monitors (Part No. 57-300678-000) - Direct Connect GS Pinsetters

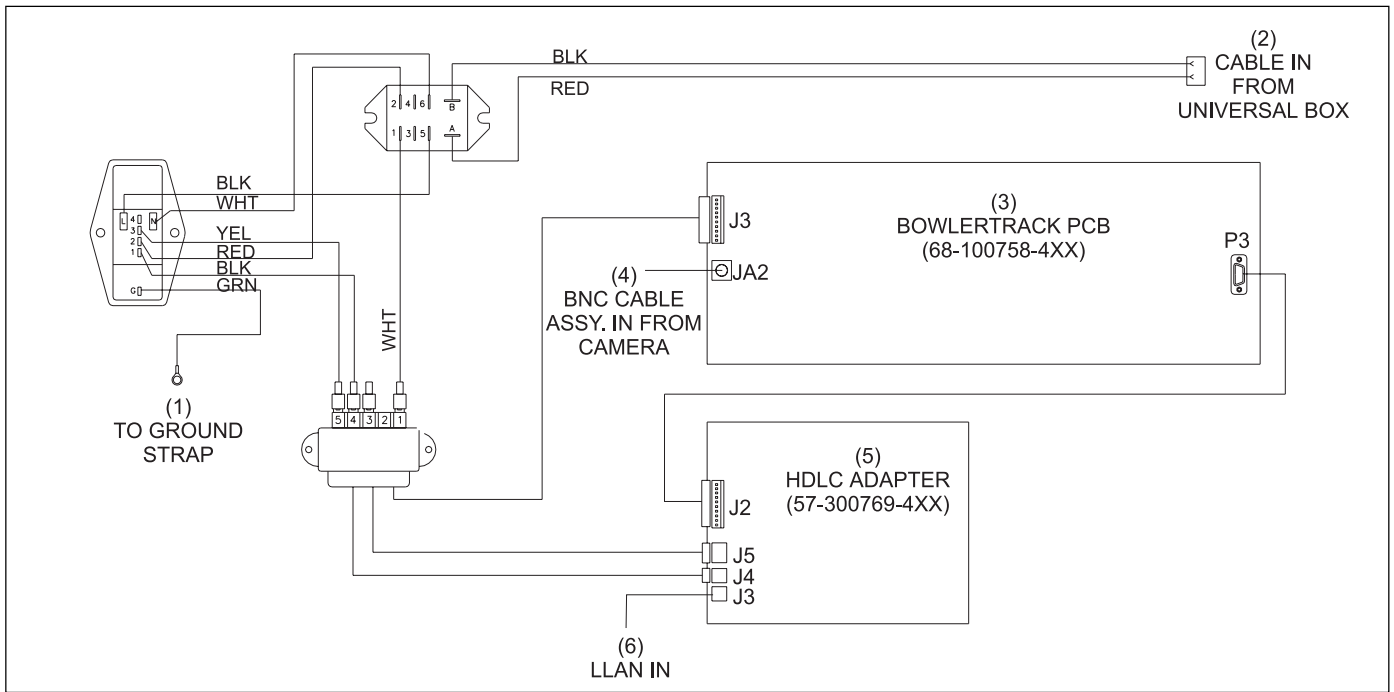
- | | | |
|-------------------------------|---------------------------|--------------------------|
| (1) TO P6 ON CONSOLIDATED BOX | (2) TO J6 ON HDLC PCB | (3) NO CONNECTION |
| (4) DRAIN | (5) LOCAL AREAN NETWORK A | (6) LOCAL AREA NETWORK B |
| (7) 12 VOLTS DC | (8) GROUND | |



LLAN Cable for Centers With TV Only Monitors (57-300679-000) - All Installations Except Non-Direct Connect GS Pinsetters

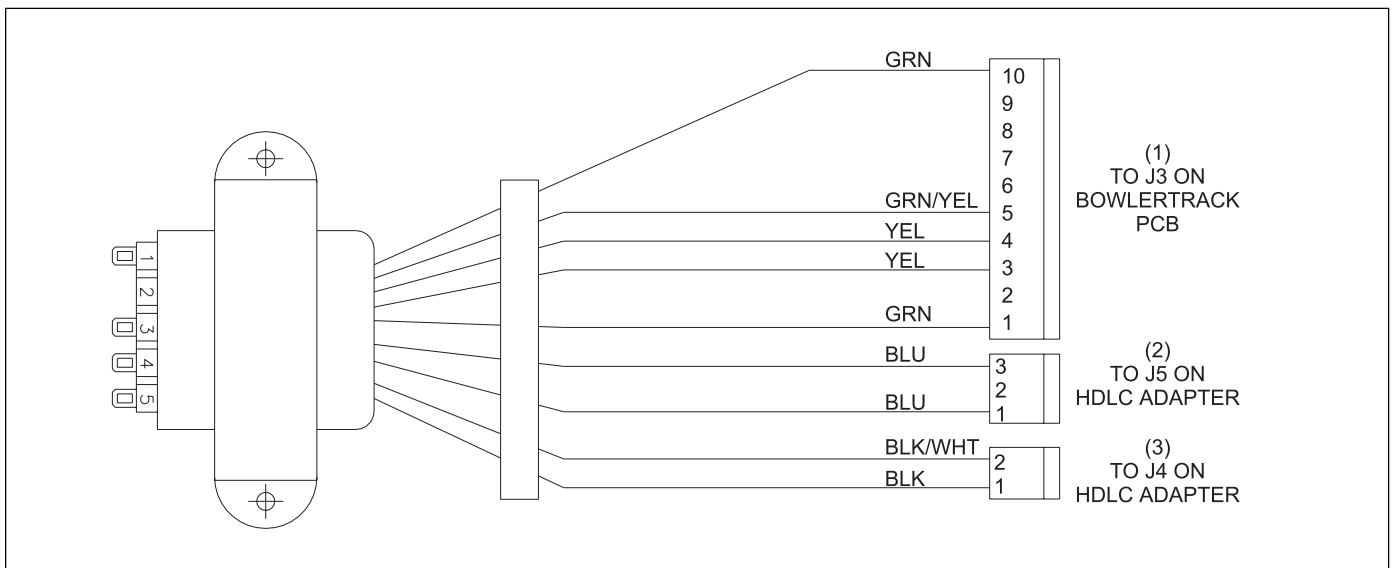
- | | | |
|---------------------------------------------|---------------------------|--------------------------|
| (1) TO TV ONLY LOCAL LOCAL AREA NETWORK OUT | (2) TO J6 ON HDLC PCB | (3) NO CONNECTION |
| (4) DRAIN | (5) LOCAL AREAN NETWORK A | (6) LOCAL AREA NETWORK B |
| (7) 12 VOLTS DC | (8) GROUND | |

BRN=BROWN, BLK=BLACK, RED=RED, ORN=ORANGE, YEL=YELLOW, GRN=GREEN, BLU=BLUE, VIO=VIOLET, GRY=GREY, WHT=WHITE



BowlerTrack HDLC Assembly (57-300755-4XX)

- | | | |
|---------------------------------------|----------------------------------|-------------------------------------|
| (1) TO GROUND STRAP | (2) CABLE IN FROM UNIVERSAL BOX | (3) BOWLERTRACK PCB (68-100758-4XX) |
| (4) BNC CABLE ASSEMBLY IN FROM CAMERA | (5) HDLC ADAPTER (57-300769-4XX) | (6) LOCAL LOCAL AREA NETWORK IN |



Transformer to BowlerTrack PCB and HDLC Adapter

- | | | |
|------------------------------|---------------------------|---------------------------|
| (1) TO J3 ON BOWLERTRACK PCB | (2) TO J5 ON HDLC ADAPTER | (3) TO J4 ON HDLC ADAPTER |
|------------------------------|---------------------------|---------------------------|

BRN=BROWN, BLK=BLACK, RED=RED, ORN=ORANGE, YEL=YELLOW, GRN=GREEN, BLU=BLUE, VIO=VIOLET, GRY=GREY, WHT=WHITE