

Components Interfacing with the CIO Panel



The tables shown below list the functions of various components that interface with the CIO panel.

SWITCH SETTINGS	
Component	Function
Horn Buttons	Manual and automatic operation of the horn is possible
Alerter	To verify the condition of the operator of the locomotive.
EC: Start, Isolate, Run	Selection of locomotive operating mode.
Engine Start Request	Manual request for execution of automatic diesel engine start procedure.
Engine Shutdown	Shuts down the engine.
AESS Suspend	Delays an automatic engine shutdown for 120 minutes.
Lead Sand	Engineer request for sanding.
Diagnostic Access	Sets Smart Displays to Level 2 security access.
Generator Field Breaker	Status of generator field breaker on operator's control stand.

TRAINLINE INPUTS	
Component	Function
2 - Signal and Alarm Bell	Signal from another locomotive indicating need for attention from operator.
3 - DV	One of four trainlines used to indicate throttle call (notch).
5 - Emergency Sand	Signal calling for sand due to emergency brake action.
6 - Generator Field	Signal indicating power-up for propulsion system.
7 - CV	One of four trainlines used to indicate throttle call (notch).
8 & 9 - Reverse	Indicates call for reverse movement of locomotive.
9 & 8 - Forward	Indicates call for forward movement of locomotive.
10 - Wheel Slip	Signal indicating wheel slip is occurring on another locomotive.
12 - BV	One of four trainlines used to indicate throttle call (notch).
15 - AV	One of four trainlines used to indicate throttle call (notch).
16 - Engine Run	Indicates status of trainline fuel pump breaker.
17 - Dynamic Brake Set-Up	Call for dynamic brake set-up from another locomotive.
21 - Dynamic Brake Start	Call to start dynamic braking from another locomotive.
22 - Air Compressor Synchronization	Signal to synchronize air compressor operation among locomotives in a consist.
23 - Trainline Sand	Call for sanding action from another locomotive.



SENSOR INPUTS	
Speed Sensor Inputs	
Component	Function
DB Blower Motor Speed Sensors #1 & #2 (BMS1 & BMS2)	These sensors provide information that can be related to the amount of cooling air that is flowing through the dynamic braking resistor grids while the AC4400 is in dynamic braking or self-loading.
Air Compressor Motor (ACS)	Provides information about whether or not the air compressor drive motor is operating and at what speed.
Pressure Sensor Inputs	
Air Reservoir Pressure Sensor (ARPS)	Measures the air pressure at the output of the first main air reservoir.
Temperature Sensor Inputs	
Ambient Temperature (AT) sensor	Indicates the temperature of the air around the locomotive.
Battery Temperature Sensor (BTS)	Indicate the temperature in the battery box.
Current Sensor Inputs	
Auxiliary Motor Supply Phase Current (ACT1, ACT2, & ACT3) Sensors)	Provide measurements of the output current in each phase of the auxiliary alternator motor supply winding.
Battery Charging (BCM) Sensor	Measures current to or from the battery.

DEVICE DRIVER OUTPUTS	
Component	Function
Crank Position Selection	Selects inverters that are used to start the diesel engine.
DB Contactors	Activates the contactors that direct DC power from the main bus to the dynamic braking grids.
Air Compressor Control	Selects operating mode of the motor driving the air compressor
Diesel Engine Start Circuit	Applies battery current to the main bus so that it can go to the inverters to be converted to AC current; the AC current will be directed to the TA, which is used as an AC motor to turn the diesel engine crankshaft and start the diesel engine.
AA Start-Up Circuit	Uses a relay to apply battery current to the AA field winding to start power output from the AA.
AESS Start Control	Uses a relay to automatically start the diesel engine, if, and only if, the CCA automatically shuts the engine down.
Electronic Air Dryer	Activates air dryers on the output of the air compressor.
Alarm Bell	Activates the alarm bell to call attention to some condition on the locomotive.



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Sand Control Magnet Valves	Controls flow of sand to enhance adhesion.
Pneumatic Drain Valves	Controls air-operated main reservoir drain valves.
Trainline Activation for DP	Drives the various trainlines on ES43BBi locomotive, such as T/Ls 6 (generator field), 24 (dynamic braking), 23 (sanding), and 22 (air compressor synchronization).

DEVICE STATUS INPUTS	
Component	Function
Crank Transfer Switch (CTS)	After selecting the proper position for the CTS, the CIO panel will verify that the CTS has moved correctly to one of three possible positions: primary crank position, secondary crank position, or motor position.
Auxiliary Cab Door Interlocks	Indicates proper closure of all the auxiliary cab doors.
Filter Capacitor Discharge Relays (FDCR1 & FDCR2)	Allows CCA to indicate when the safety system has been activated. Both FDCR relays are controlled by the auxiliary cab door interlock switches.
PCS Open	Checks if an emergency or penalty brake application has deactivated the propulsion system.
Reverser Not Centered	Senses if a direction call has been made at the reverser.
Throttle in Motoring	Senses if the throttle has moved out of idle to a notch setting.
Horn	Indicates that the air horn is being operated.
Crank Warning Bell	Checks ON/OFF status of engine crank warning bell.
Parking Brake	Checks application of parking brake
Fuel Pump Relay Shutdown	Checks status of FPR/FPC, indicating operation of fuel pump motor.
Air Brake Breaker	Checks ON/OFF status of ABCB.
Exhauster Motor Circuit Breaker (EMB)	Checks to see if the EMB has tripped.
Fuel Pump Breaker	Checks ON/OFF status of FPB.
Pre-lube Pump Breaker	Checks ON/OFF status of PLCB.
Fuel Tank Monitor Breaker	Checks ON/OFF status of FTB.
Radio Power Supply	Checks ON/OFF status of RPS.



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DETECTION CIRCUIT INPUTS	
Component	Function
TA Protection	Checks the operation of the TAP panel. If it has tripped, the Smart Displays respond by taking the TAC off-line.
Propulsion Ground Fault	Determines if a ground fault exists on the propulsion. The Smart Displays respond by executing fault isolation, mitigation, and/or propulsion system shutdown processes.
Auxiliary Motor Ground Fault	Determines if a ground fault exists on the auxiliary motor supply lines. CIO panel reports to the Smart Displays.
Battery Charger Ground Fault	Determines if an AC or DC ground fault exists on the battery charging and low-voltage supply circuits. The Smart Displays try to determine the source of the AC fault and act to eliminate it if possible. They also determine the presence of a DC ground and report for repair.
Alternator Excitation Ground Fault	Determines if a ground fault exists on the excitation supply lines or in the alternator field windings; CIO panel reports to the Smart Displays.
Dynamic Brake Grid Failure	Checks for resistor grid failures.

