

### GENERAL

Electrical power for the Citation XLS comes primarily from DC sources originating with the starter/generators, the Auxiliary Power Unit (APU) or the battery. A receptacle below the left engine pylon is provided for connection of a 28 VDC external power unit.

### ALTERNATING CURRENT (AC) POWER

The Citation XLS utilizes a single alternating current (AC) inverter to power the electroluminescent panel lighting. In addition, AC power from engine-driven alternators is used to power the electrically heated windshield. For a complete system description, refer to Anti-Ice/Deice description in this section.

#### NOTE

Avionics equipment in the Citation XLS is DC-powered, and therefore does not require the use of AC inverters.

### DIRECT CURRENT (DC) POWER

The direct current (DC) power distribution system consists of two separate and independent DC power sources which supply the system. In the event these DC power sources fail, the battery system will supply emergency power to selected systems. The direct current (DC) power distribution system consists of a battery system, an APU system, two 300 amp starter/generators, two Generator Control Units (GCUs), a distribution system, a battery switch, an avionics switch, two generator control switches, two ammeters and a voltmeter with a selector switch. A description of various components follows.

### BATTERY SYSTEM

The battery system consists of the battery, the battery disconnect relay and associated switches. The 44-amp battery is used to provide power for engine starting, and to provide power to the emergency battery bus in the event of a dual generator failure.

The battery is located in the left hand aft fairing and has an overboard vent. A battery disconnect relay is provided for the battery. During normal operation, the relay remains in a de-energized position. During a battery overtemperature condition, the battery may be disconnected by operating the BATTERY DISCONNECT switch on the pilot's circuit breaker sub-panel. The switch is also intended for ground operation in the event a starter relay becomes welded closed.

The battery condition may be continuously monitored using the cockpit temperature gage. Battery temperatures should remain well below 63°C (145°F) during all operations. Anytime battery temperature exceeds 63°C (145°F), the red BATT O'TEMP annunciator illuminates. If temperature continues to climb and exceeds 71°C (160°F), the red BATT O'TEMP > 160° annunciator will flash and trigger the MASTER WARNING annunciator.

#### NOTE

- The battery must be serviced per the Maintenance Manual when the battery temperature exceeds 63°C (145°F).
- The emergency lights, if illuminated in emergency operation, will continue to use the airplane battery power until the airplane battery voltage is lower than its own emergency battery pack voltage.

## Cessna Citation XLS - Electrical

The three-position control switch for the battery is normally located on pilot's switch panel, and is labeled BATT, OFF and EMER. Placing the switch to the BATT position closes the battery and emergency relays and powers the battery bus, emergency bus and both main DC buses. This position also enables external power to supply the entire system.

In the OFF position, battery or external power is isolated from all but the hot battery bus. With the battery switch in the EMER (emergency) position and both generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

LH and RH Start PCB's	Fwd and Aft Emergency Light Battery Packs
LH and RH Ignition	Standby Pitot and Static Heaters
COMM 1	Pilot's and Copilot's Audio Panels
NAV 1	Glare shield and Overhead Floodlights
AHRS 2	Standby HSI
LH Eng Display	Standby Radio Control Head
RMU I	Interior Entry Lights
Flap Control	Landing Gear Control and Indication
Two-Position Stabilizer	Hydraulic Control

The standby flight display unit will continue to operate on its own emergency battery pack. This battery pack also provides 5 volt emergency instrument lighting.

### NOTE

In some cases, it may be prudent to turn OFF unneeded systems in order to conserve the airplane's battery.

## APU SYSTEM

The onboard auxiliary power unit (APU) generates and provides auxiliary bleed air and auxiliary electric power. Auxiliary bleed air is used for the environmental system and door seals. Auxiliary electric power may be used to power all onboard electrical systems. The APU can provide both auxiliary bleed air and electric power on the ground without the engines running or in the air up to an altitude of 30,000 feet.

The Auxiliary Power Unit (APU) electrical system consists of a 300 Amp starter/generator, starter relay, control and monitor PC boards, and associated switches. The APU system is used to provide battery assisted engine starts and ground cooling.

## STARTER/GENERATORS

A starter/generator is located on each engine and is wired directly to the power Junction Box. The starter/generator is driven by engine rotation through the accessory gear box, and is air cooled using engine bypass air. In ground operations (ground idle) each starter/generator is rated at 200 amps (which may be exceeded momentarily for start). At maximum operating altitude, each starter/generator is rated at 300 amps.



# DIRECT CURRENT SIMPLIFIED SCHEMATIC

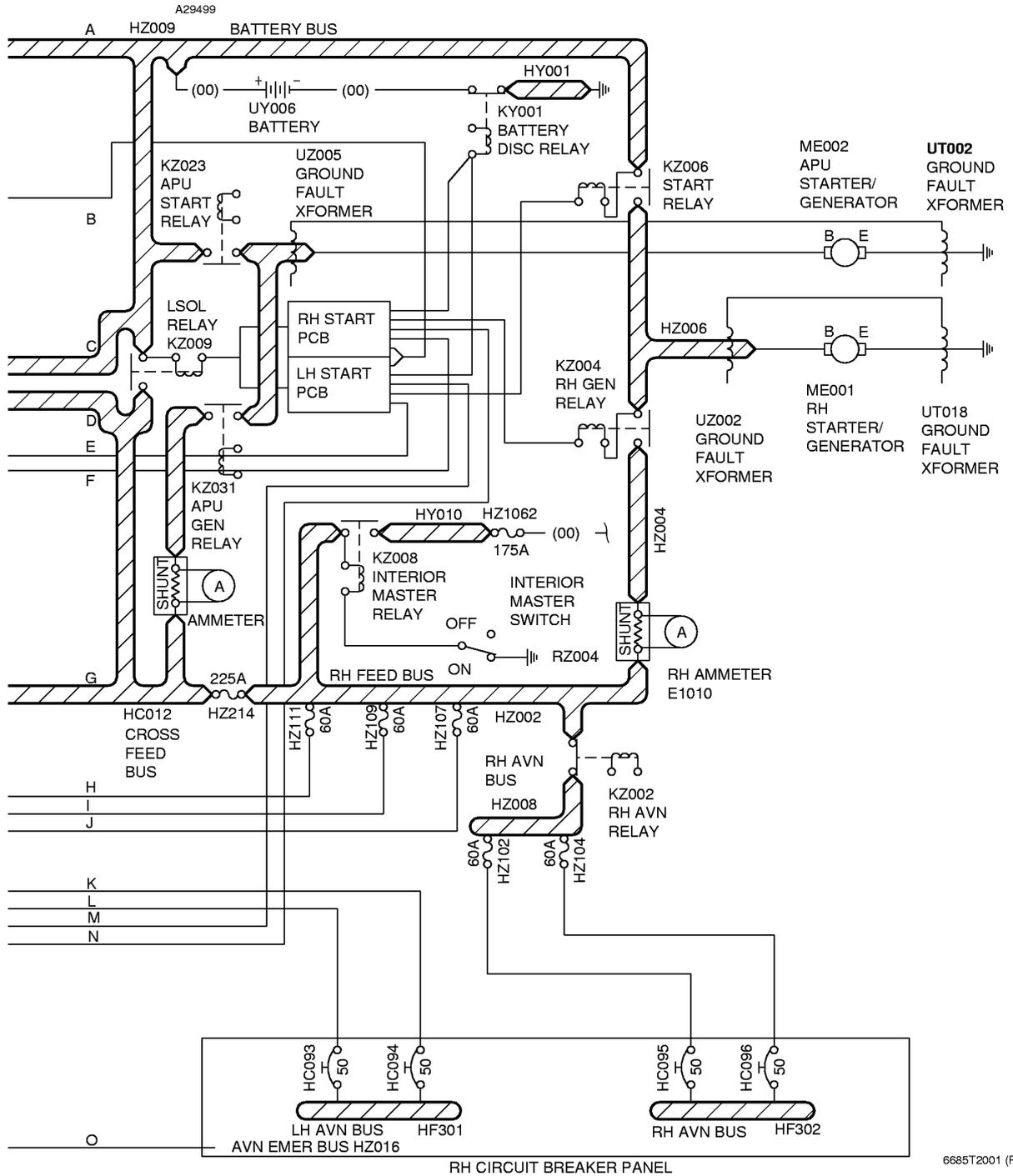


Figure 2-13 (Sheet 2)

## GENERATOR CONTROL UNIT (GCU)

Two GCUs, one for each starter/generator, are installed in the tailcone area above the aft power junction box. The GCU is used to control the operation of the starter/generator and provides the following control features:

1. Voltage regulation at 28.5 VDC.
2. Load sharing to within 40 amps in parallel operation.
3. Overvoltage protection at 35.0 VDC.
4. Reverse current control of the line contactor.
5. Generator feeder ground fault protection.
6. Start contactor control and field-weakening during start.
7. Overspeed sensing and protection resulting from sheared starter shaft.
8. Generator self-excitation and subsequent regulation without an external source of power (such as a battery).
9. Generator deactivation when the firewall shut-off is activated.

## EXTERNAL POWER

External direct current (DC) power can be connected to the airplane through a receptacle located on the left side of the fuselage. When external power is connected, the external power relay energizes and connects the power source to the hot battery bus. Positioning the battery switch to BATT energizes the battery and emergency relays allowing external power to be connected to the entire DC system. Ground power requirements dictate a 28-volt unit, with a nominal capability of 1000 amperes current. If an adjustable power unit is used, it should be adjusted to provide a setting of 1000 amperes. A ground power unit with a soft start capability is preferable. The battery should be disconnected if the airplane is to be on a ground power unit for a prolonged period of time.

## DIRECT CURRENT (DC) POWER INDICATORS

The indicators consist of two ammeters, a voltmeter and two amber generator failure lights. The ammeters function as load meters indicating the load being carried by each generator.

The voltmeter is wired through the battery switch and will indicate the voltage of the hot battery bus any time the battery switch is in the BATT or EMER position. The voltmeter selector switch can be rotated to the LH or RH GEN positions to check generator voltage output. Since the voltmeter reads the highest voltage on the bus, an accurate check of one generator is obtained only with the opposite one off the line.

Should either generator fail, the associated power relay will open, removing the generator from the system and illuminating the appropriate L or R GEN OFF annunciator panel light. Should both generators fail, the MASTER WARNING light will also illuminate. This is the only condition under which amber annunciator light illumination will trigger the MASTER WARNING.

## Cessna Citation XLS - Electrical

# ELECTRICAL BUSESSES

### EMERGENCY BUS

AHRS 2  
 AUDIO 1 (only when EMER is selected, otherwise this is on the Avionics Bus)  
 AUDIO 2  
 COMM 1  
 LH START PCB  
 RH START PCB  
 LH ENGINE DISPLAY  
 FLAP CONTROL  
 FLOOD LIGHTS  
 GEAR CONTROL  
 GEAR WARNING  
 LH IGNITION  
 RH IGNITION  
 NAV 1  
 STAB CONTROL  
 STANDBY HSI  
 STANDBY P/S HEATER

### BATTERY BUS

AFT EMERG LTS  
 AFT/FWD COMP LTS  
 BATTERY DISC RELAY  
 BATTERY VOLTAGE  
 CABIN DOOR  
 ELT (AVN)  
 FWD EMERG LTS  
 INTERIORS  
 LH START CONTROL PCB  
 RH START CONTROL PCB

### FEED BUS

LH BUS SENSE  
 RH BUS SENSE  
 LH LANDING/RECOG LTS  
 RH LANDING/RECOG LTS  
 LH LIMITER  
 RH LIMITER  
 OXY/SEAT BELT  
 LH PRECOOLER CONTROL  
 RH PRECOOLER CONTROL  
 TAIL FLOOD LTS

### AVIONICS BUS

ADC 1  
 ADC 2  
 ADF 1  
 ADF 2  
 AFIS  
 AHRS 1  
 AUDIO 1 (WARN)  
 AUDIO 2 (WARN)  
 CABIN DISPLAY  
 COMM 2  
 DISPLAY CONTROL 1  
 DISPLAY CONTROL 2  
 DME 1  
 DME 2  
 ETAWS  
 FLIGHT PHONE  
 HF  
 IC 1  
 IC 2  
 MFD  
 MFD CONTROL  
 NAV 2  
 PFD 1  
 PFD 2  
 RAD ALT  
 RADAR  
 RADAR CONTROL  
 TCAS  
 WARN  
 XPDR 1  
 XPDR 2

### CROSSFEED BUS

COCKPIT WEMAC FAN  
 LH IGNITOR SOURCE  
 RH IGNITOR SOURCE  
 LH LANDING LTS  
 LH LANDING/RECOG LTS

### GENERATOR BUS

LH GENERATOR  
 RH GENERATOR  
 LH START CONTROL PCB  
 RH START CONTROL PCB  
 LH VOLTMETER  
 RH VOLTMETER

### ELECTRICAL BUS

AHRS AUX BATT  
 ANTI-COLLISION LTS  
 AOA  
 AOA HEATER  
 A/P SERVO  
 AUTO TEMP  
 BATT TEMP  
 LH BOOST PUMP  
 RH BOOST PUMP  
 CABIN DOOR MONITOR  
 CENTER CLOCK  
 CENTER PNL LTS  
 CVR  
 EL PNL/PNL FLD  
 EMERG PRESS  
 LH ENGINE ANTI-ICE  
 RH ENGINE ANTI-ICE  
 LH ENG COMP  
 RH ENG COMP  
 RH ENGINE DISPLAY  
 ENGINE VIB MON  
 LH FIRE DETECT  
 RH FIRE DETECT  
 FLT HOUR METER  
 FUEL CONTROL  
 LH FUEL QTY  
 RH FUEL QTY  
 LH F/W SHUTOFF  
 RH F/W SHUTOFF  
 GLARESHIELD FANS  
 MANUAL TEMP  
 NAV  
 NORM PRESS

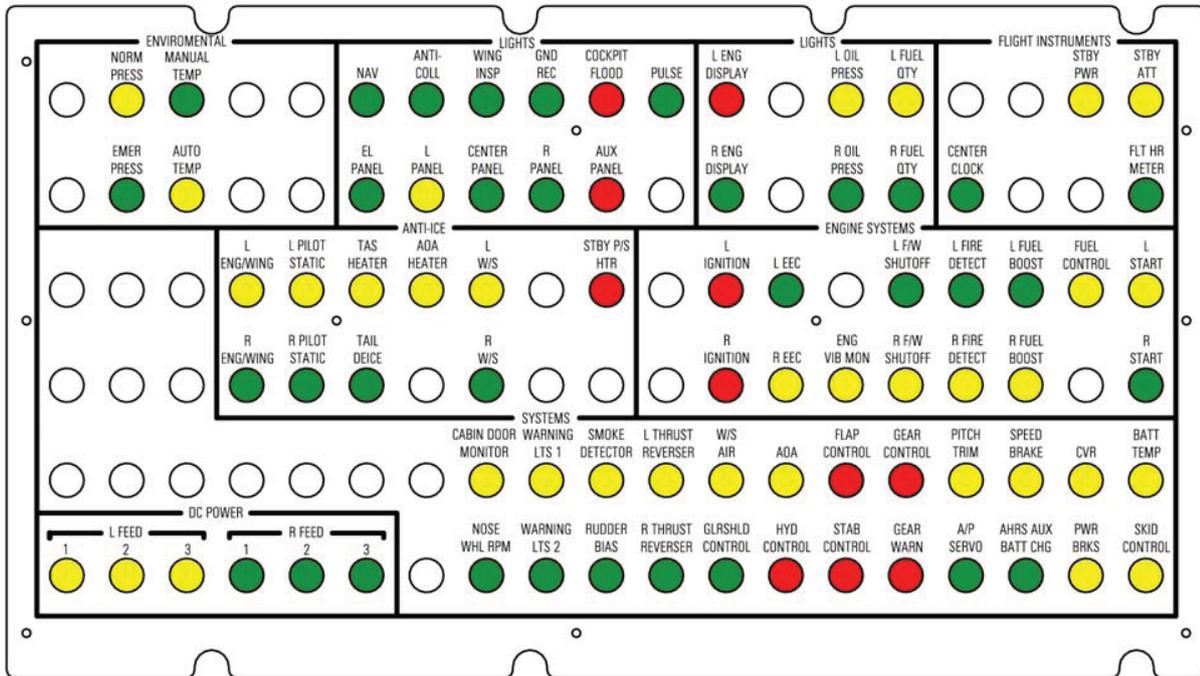
### ELECTRICAL BUS

(continued)

LH OIL PRESS  
 RH OIL PRESS  
 LH PANEL LTS  
 RH PANEL LTS & MAP  
 LTS  
 PITCH TRIM  
 LH PITOT/STATIC  
 RH PITOT/STATIC  
 PULSE LIGHTS  
 PWR BRAKES  
 RUDDER BIAS  
 SKID CONTROL  
 SPEED BRAKES  
 STANDBY (ATT) PWR  
 LH START  
 RH START  
 TAIL DEICE  
 TAS HEATER  
 LH THRUST  
 REVERSER  
 RH THRUST  
 REVERSER  
 WARNING LTS 1  
 WARNING LTS 2  
 WING INSPECTION LT  
 W/S AIR  
 LH W/S ANTI-ICE  
 RH W/S ANTI-ICE

# LEFT CIRCUIT BREAKER PANEL

A29500



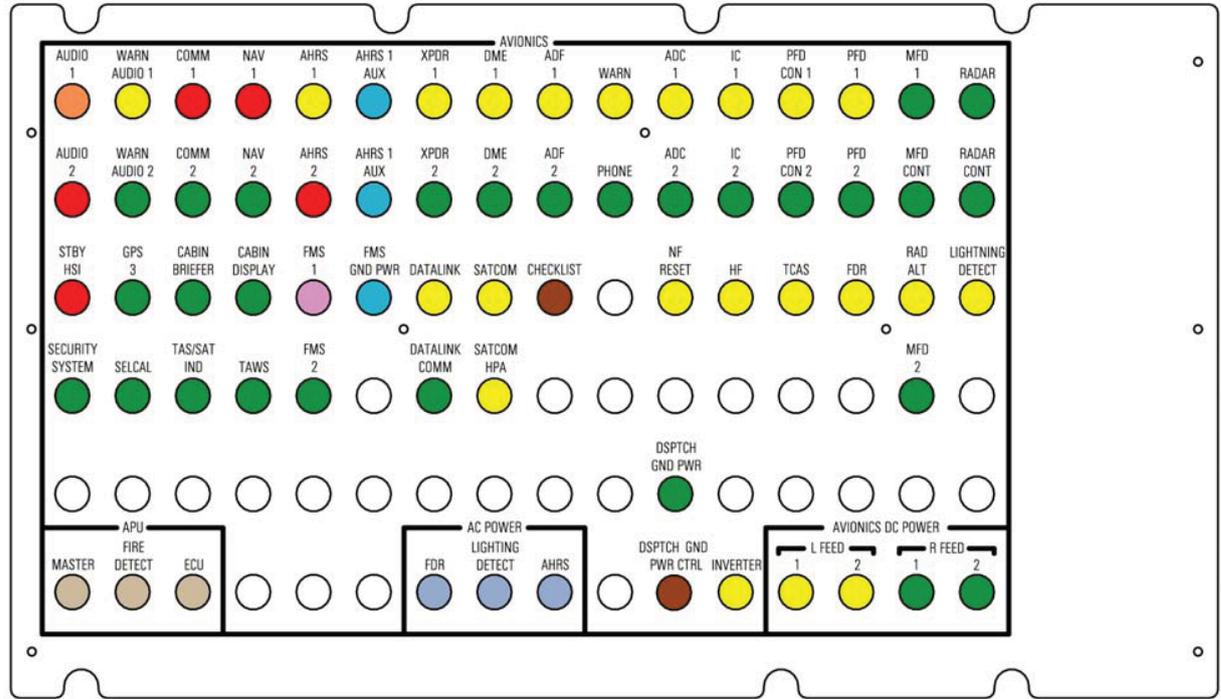
- LH BUS
- RH BUS
- EMER BUS

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Figure 2-14 (Sheet 1 of 2)

## RIGHT CIRCUIT BREAKER PANEL

A29501



-  LH AVN BUS
-  RH AVN BUS
-  AVN EMER BUS
-  AHRS AUX PWR BUS
-  LH AVN BUS SWITCHES TO AVN EMER BUS WHEN BATT IS SWITCHED TO EMER
-  SWITCHES BETWEEN AHRS AUX PWR BUS AND LH AVN BUS BASED ON BATT SWITCH AND AVIONICS SWITCH POSITION
-  AC POWER BUS
-  RH FEED BUS
-  BATTERY BUS

9912T526-25

Figure 2-14 (Sheet 2)

## ENGINE STARTING

Depressing either engine start button closes the respective start relay and provides DC power to the engine starter. Power to close the solenoid start relays and energize ignition comes from the battery bus, requiring the battery switch to be in the BATT position. Automatic ignition sequencing takes place with both engine ignition switches in the NORM position.

A white light in each starter button indicates power on the contacts of the respective start relay. The starter operation is terminated when the speed sensor in the generator control unit removes power from the start relay at approximately 38% N<sub>2</sub>. The automatic start sequence can be terminated at any time by pushing the cockpit START DISG switch located between the start buttons, which will open the start relay and halt the start sequence. During engine start, when the generator output exceeds battery voltage and/or is in parallel with the other generator (within 40 amperes), the starter/generator reverts to generator operation. The power relay closes and supplies power to the respective DC bus. Current will then flow from either main DC bus through the battery bus, battery relay and hot battery bus, providing battery charging. The APU system also provides battery assisted engine starts.

The airplane is equipped with a cross start capability which utilizes the generator of an operating engine to assist starting the second. This is accomplished by both start relays closing when the second start is initiated routing power through the hot battery bus to the other engine. On all cross starts, the operating engine should be set at 52 to 53% N<sub>2</sub> to ensure proper torque on the generator shaft. Cross generator start capability is disabled with weight off the left main gear squat switch in order to prevent cross starts in flight.

Starts being made with external power may be accomplished with the generator switches in either the ON or OFF position, however, it is recommended that they be turned OFF during the start. If the generator switch is placed in the ON position the generator control unit will automatically initiate the generator mode after engine start. If the generator switch is placed in the OFF position, the generator mode will be initiated by manually placing the generator switch to the ON position. External power is automatically disconnected when either generator is supplying power to the bus. In order to start the second engine by external power, the generator supplying voltage to the bus must be disconnected by placing the generator switch to the OFF position.

An overvoltage protection system is provided during use of an external power. The control unit monitors the external power voltage and will de-energize the external power relay if the voltage is above 32.5 volts. External power cannot be reapplied to the airplane until the voltage has been interrupted, after a start termination which has been caused by an overvoltage condition.

For battery starts and under all normal flight conditions, the generators are left in the GEN position.

## CIRCUIT BREAKERS

Push-to-reset, pull-off type circuit breakers, with the amperage rating marked on each breaker, are installed in panels located on both sides of the cockpit. The panels are readily accessible to the flight crew during flight. The panels shown are typical installations for the XLS.

Additional circuit breakers to which flight crew access is not essential, are located in the tailcone junction boxes.