ELEVATOR EC CONTROLS
SIMPLE. SOLID. SUPPORTABLE.

Pixel Hydraulic Controller Conformance Document and Compliance Test Procedures ASME A17.1-2019/ B44-19

GENERAL COMMENTARY

The purpose of this document is to serve as guide in describing the statements of conformance and test procedures required by TSSA in the "Application for Registration of a Design Submission Under Ontario's ***Technical Standards and Safety Act*** Elevating Devices Regulation" for Pixel Hydraulic controllers for the following sections:

1. DEFINITIONS
2. DESIGN CONSEPTS
3. PART C1 (SCHEMATICS REFERENCES AND STATEMENTS OF COMPLIANCE)
4. PART C2 (STATEMENTS OF CONFORMANCE)
5. PART D2 TEST PROCEDURES
6. PART C2 TEST PROCEDURES
7. PART D1 TEST PROCEDURES
8. ADDITIONAL TEST PROCEDURES

NOTE: It is recommended to read the DEFINITIONS and DESIGN CONSEPTS sections below to gain a better understanding of the entire document contents.

1. DEFINITIONS

Primary components of the Pixel Control System that are referenced in this compliance document are defined here.

Pixel Main Microprocessor (P-MP). P-MP is the main control processor in the Pixel control system and is responsible for executing the logical operations of the elevator control system in a safe and code-compliant manner. These operations include elevator movement, door operations, passenger/user interaction, and controlling signal fixtures. In this document, inputs, represented by a triangle, and outputs, represented by a rectangle, associated with this processing unit are indicated with a signal acronym followed by the subscript "MP" (example: $EQRST_{MP}$). On the controller prints, inputs and outputs that are monitored and created by the main processor are shown as in Figure 1 immediately below:

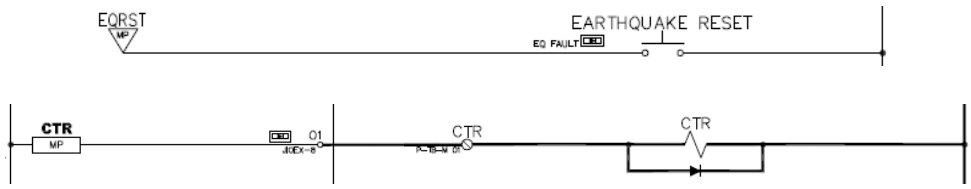


Figure 1. Representation of main processor input and output circuits

Pixel Safety Processor 1 (SP1). SP1 is one of two safety monitoring and control processor units, responsible for the oversight of physical elevator movement. Implemented via a microprocessor and associated software, SP1 is one of two gateways through which the activation of the main motor contactor(s) and power to valves circuits are controlled. A second safety monitoring and control processor unit (SP2) is the other gateway. P-MP does not directly control the motor contactor(s) or power to valves circuits; it controls them through the safety monitoring and control processors. On the controller prints, inputs read by SP1 and outputs generated by SP1 are shown as in Figures 2 and 3.

Pixel Safety Processor 2 (SP2). SP2 is one of two safety monitoring and control processor units, responsible for the oversight of physical elevator movement. Implemented via a programmable logic device, SP2 is one of two gateways through which the activation of the main motor contactor(s) and power to valves circuit are controlled. A second safety monitoring and control processor unit (SP1) is the other gateway. P-MP does not directly control the motor contactor(s) or power to valves circuit; it controls them through the safety monitoring and control processors. On the controller prints, inputs read by SP2, and outputs generated by SP2 are shown as in Figures 2 and 3.

Figure 2. Schematic representation of redundant safety processor input circuits. In this example, the governor switch is monitored by both SP1 and SP2 processors through independent input circuits represented by the triangle symbols on the left hand side.

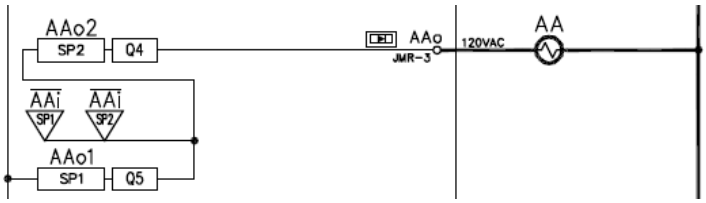


Figure 3. Schematic representation of redundant safety processor output circuits. In this example the AA contactor will only be energized when **both** SP1 and SP2 assert their respective outputs ($AAo1_{SP1}$ and $AAo2_{SP2}$). Associated inputs AAi_{SP1} and AAi_{SP2} are used to verify that the solid-state output devices are operating as expected.

Pixel Safety and Logical Network. The Pixel Safety and logic Network is housed in two printed circuit boards (PCBs). The P-MP board houses the elevator logic microprocessor (NXP-LPC4357-208), and the P-MPIO board houses both the SP1 microprocessor (NXP-LPC1758FBD80) and the SP2 programmable logic device (Lattice-LFXP2-5E-5TN144C FPGA). These two PCBs are connected by a fifty-pin connector through which the following safety communication signals are shared:

a. CAB CAN BUS, Landa Aux. Sensor Head information
b. D_485 Drive, Speed Command from MP to hoist motor drive unit
c. R_485_Sel, Landa Main Sensor Head information
d. SPI, Serial communications among all three processors.
e. Power Supply and Common

Pixel P-MP. The Pixel P-MP PCB houses the elevator logic microprocessor (NXP-LPC4357-208, which executes the elevator control logic) and the graphical user interface (GUI) which is the vehicle for installation and adjustment interaction.

Pixel P-MPIO. The Pixel P-MPIO PCB houses the SP1 safety microprocessor (NXP-LPC1758FBD80), the SP2 safety FPGA (Lattice-LFXP2-5E-5TN144C), and all the safety input-output circuitry.

Pixel Top of Car Microprocessor (P-TOC). P-TOC resides on the top of the elevator cab and communicates with P-MP and SP1 via a CAN bus connection. The TOC is responsible for the direct control of the door operator as directed by the P-MP (when the operator is located on top of the elevator cab) and reads one of the two redundant absolute elevator positioning system readers (the "Auxiliary Reader"). The position data value read from the Auxiliary Reader is communicated to P-MP and SP1 via a CAN bus connection.

Landa Positioning System (Landa). Landa is comprised of three main components:

- Landa Main Car Position Reader (Main Reader)
- Landa Auxiliary Car Position Reader (Auxiliary Reader)
- Encoded steel tape that runs the length of the elevator travel

The Main Reader and Auxiliary Reader are each capable of reading and reporting absolute elevator position to an accuracy of 0.8 millimeters. Each reader is self-diagnosing, able to detect internal optical sensor failures (each sensor head utilizes an array of optical sensors to read the encoded steel tape) and failures in reading the encoded steel tape (e.g., tape mounting failure, excessive misalignment of tape and reader).

2. DESIGN CONCEPTS

The following sections describe the way in which safety-related monitoring and control is accomplished by the Pixel controller.

NOTE: Pixel hydro-S, hydraulic Elevator Controller original design, listed under TSSA file number: TSSA-2017-01364, design is A17.1 2010/ B44-10, was certified by TSSA to be code compliant using the A17.1 2013/ B44-13 requirements.

How Pixel determines the position and movement (speed and direction) of the cab in the hoistway. Car position information is acquired from an absolute positioning system (Landa) that utilizes redundant sensor head units (Main Reader and Auxiliary Reader) that each read a fixed encoded steel hoistway tape. Each reader can independently resolve the car position within 0.8 millimeters.

The Pixel Main Microprocessor Board (P-MP), the Safety Processor 1 (SP1) and Safety Processor 2 (SP2) read the car's position from the Main Reader via a twisted shielded pair of wires, terminated at the "SELECTOR PORT" on the P-MP board. (Refer to pages 4, 6 and 6b of the controller prints.)

The Pixel Top of Car Microprocessor (P-TOC) reads the car's position from the Auxiliary Reader and broadcasts this data via a CAN bus connection to (SP1) and P-MP. The CAN bus connection is shown in the controller prints terminating at the "CAB CAN PORT" on the P-MP board. (Refer to pages 4, 6 and 6b of the controller prints.)

How Pixel identifies the locations of key elevator positions. Safety-critical elevator positions (e.g., floor locations, terminal landing speed profile speeds/positions) are learned and stored, independently in the P-MP, SP1, and SP2 non-volatile memory locations, as part of the controller installation process. This information is referenced in various safety-related checks and operations (e.g., leveling overspeed, speed monitoring as the car approaches the terminal landings).

How critical device statuses are read by the Pixel control system entities. The statuses of the critical safety devices that are connected to the Pixel control system (electrical protective devices such as stop switches, car gate(s), and hoistway door locks) are evaluated by P-MP, SP1, and SP2. SP1 and SP2 each see the status of these devices directly, via independent safety input channels (two channels for each signal). The controller circuitry that routes these electrical signals to each safety processor is split at the connection point of the external device and is routed through separate and independent circuit components, preventing the Pixel control system from being susceptible to a common mode failure of the electronics. The independent circuitry is indicated diagrammatically on the controller prints as shown in Figure 4 below, with each independent input circuits indicated with a

triangular input symbol. The processing unit to which each circuit is routed is indicated by the label inside the triangular graphic (e.g., “SP1” means that the circuit is routed to SP1).

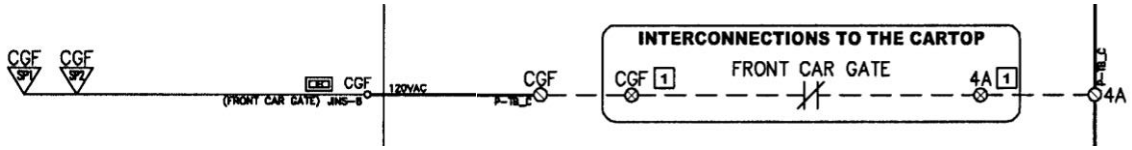


Figure 4. Schematic representation of independent input circuitry for safety-critical circuits

SP1 and SP2 each communicate the statuses of these critical devices to the P-MP for its awareness. The P-MP also serves to validate the input statuses reported by SP1 against the input statuses reported by SP2. An inconsistency between the statuses reported by SP1 and SP2 causes to remove the elevator from service, as it would indicate a failure of the input circuitry of one of the two safety systems.

Shown below (Figure 5) is the **Pixel Input-Output Flow Diagram**, representing the input and output information flow within Pixel, where all safety inputs are routed through SP1 and SP2 processors before allowing them to reach the MP for elevator logic processing, and all outputs from the MP elevator logic will be routed through the SP1 and SP2, where they will be summed with the safety logic to either allow or override MP elevator logic commands based on system status.

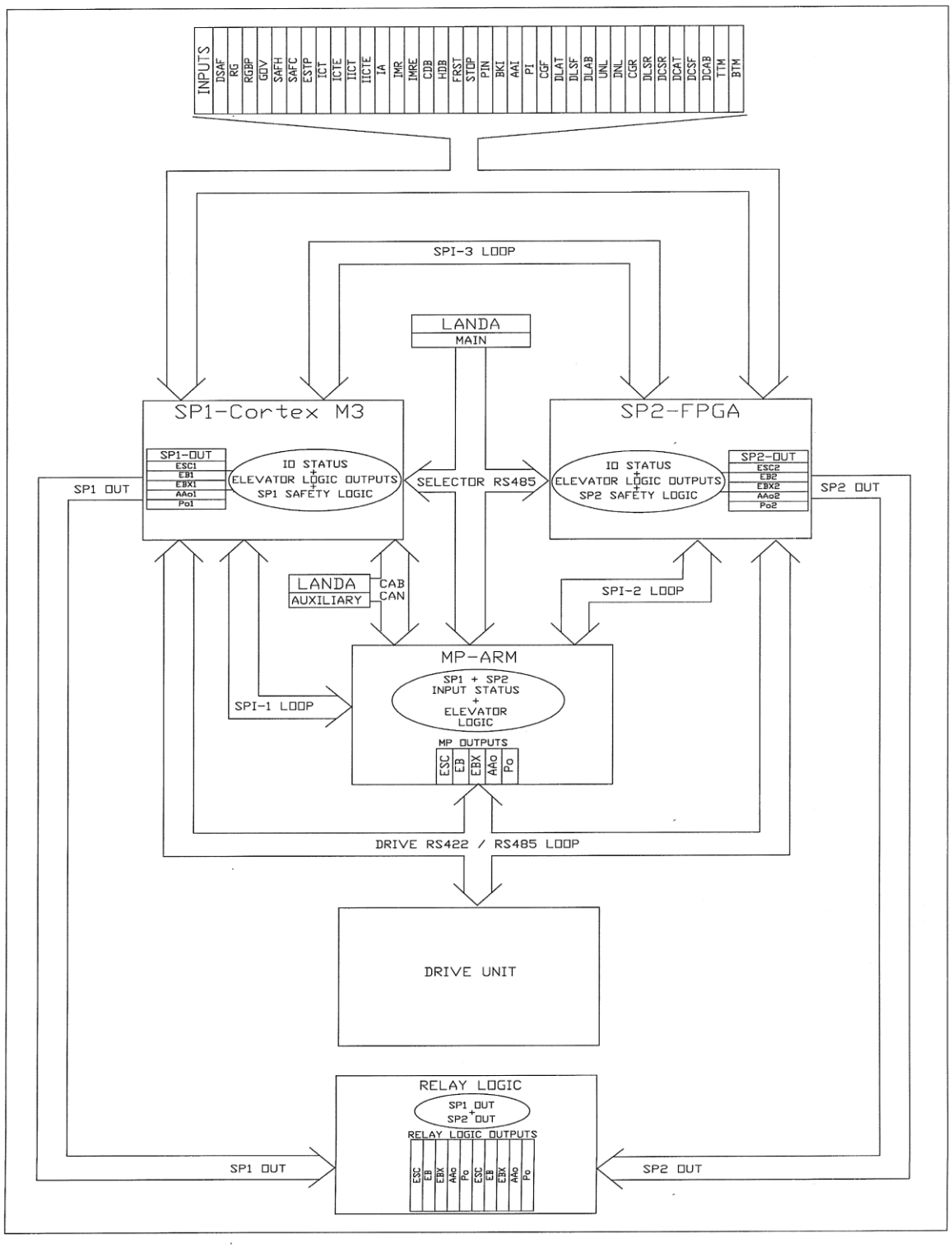


Figure 5. Pixel Input-Output Flow Diagram

How the Pixel control system validates the position values read from the Landa positioning system. The car position data values read from the Main Reader and Auxiliary Reader are continuously compared against each other, independently by the P-MP, SP1, and SP2, to validate that each reader is operating in accordance with the other. Each reader is self-diagnosing in that each is designed to detect when it can no longer reliably read the encoded hoistway tape due to internal failures, inadequate installation, or installation failures.

Because the Main Reader and Auxiliary Reader each read the same encoded steel hoistway tape, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared to validate that this offset is maintained throughout the operation of the elevator, any variance in this offset causes to remove the elevator from service, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry.

NOTE: The Main and Auxiliary Readers, Encoded Stainless Steel Tape and mounting accessories are referred to as the Landa Positioning system (or Landa).

3. PART C1 (SCHEMATICS REFERENCES AND STATEMENTS OF COMPLIANCE)

Provide an electrical schematic drawing indicating conformance with 3.25, 3.26 & 3.27 for Hydraulic Elevators.

SCHEMATICs REFERENCES AND STATEMENTS OF COMPLIANCE

Identification and explanations of the implementation of devices and/or the interface of devices to the Pixel control system are described here. References to pages of the Pixel controller prints are provided.

3.25: Terminal Stopping Devices

3.25.1 Normal Terminal Stopping Devices

3.25.1.1:

The Normal Stopping Means and Normal Terminal Stopping Means are described below.

The Normal Stopping Means is comprised of the following**:**

- Landa Main Car Position Reader (Main Reader)
- Pixel Main Processor (P-MP) and P-MP Learned Landings Positions

The Normal Terminal Stopping Means is implemented in a dually independent and redundant manner.

The first implementation is comprised of:

- Landa Auxiliary Car Position Reader (Auxiliary Reader)
- Pixel Safety Processor 1 (SP1) and SP1 Learned Terminal Landings Speed Profile and learned normal limits

The redundant implementation is comprised of:

- Landa Main Car Position Reader (Main Reader)
- Pixel Safety Processor 2 (SP2) and SP2 Learned Terminal Landings Speed Profile and learned normal limits

The Terminal-Speed Reducing means

- Landa Main Car Position Reader (Main Reader)
- Pixel Safety Processor 2 (SP2) and SP2 Learned Terminal landings Speed Profile

The redundant implementation is comprised of:

- Landa Auxiliary Car Position Reader (Auxiliary Reader)
- Pixel Safety Processor 1 (SP1) and SP1 learned Terminal landings Speed Profile
- UPS Slowdown Mechanical Limit in series with the UP High Speed Valve

The operation of each of the Normal Terminal Stopping Means involves the determination of car speed based upon the change in car position as indicated by its respective Reader, and the indication of car position (proximity to the terminal landings) provided by that Reader. When either SP1 or SP2 determines that the car's speed is inappropriate (too high) for its position relative to a terminal landing, Normal Terminal Stopping Devices, it raises an Emergency Slowdown Fault, NTS Up Slowdown Fault or NTS Down Slowdown Fault with the following behavior:

If SP1 raises an NTS fault it will turn on its $ESCO_{SP1}$ output to remove power from the High Speed valves to slow down the car (refer to page 1 of the controller prints for ESCO relay coil and contact circuits). If SP2 raises the NTS fault it will turn on its $ESCO_{SP2}$ output to remove power from the High Speed valves to slow down the car (refer to page 1 of the controller prints for ECSO relay coil and contact circuits).

Note: If both SP1 and SP2 raise the fault simultaneously, each independently follows behavior described above.

Note: ESCO is a force guided relay contactor, and its operation is validated before each start.

3.25.1.1(a) A common member for the Normal Stopping Means, the Normal Terminal Stopping Means, and the Speed-Reducing means is an encoded steel tape. The encoded steel tape provides an absolute position value when read. The presence of the encoded steel tape is monitored by both SP1 and SP2 safety processors. A Main Selector and Aux Selector Fault will be declared by SP1 and/or SP2 respectively if the tape is not detected and power to the Valve Solenoids and Pump Motor will be removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

3.25.1.1(b) The encoded steel tape runs the entire length of the hoistway. The Landa Main and Auxiliary sensor heads are mounted on top of the cab.

3.25.1.2: Location of Stopping Devices

The Main and Auxiliary Readers are mounted on the car, and each reads a stationary encoded steel hoistway tape mounted in the hoistway. The car's location on the hoistway is continuously read from the encoded steel tape (whether the car is moving or standing still).

3.25.1.3: Requirements for stopping devices on the Car or in the Hoistway

Pixel stopping devices are not operated by a cam. Refer to page QR5 of the controller prints for Landa sensor heads and tape mechanical layout.

3.25.1.4: Requirements for stopping devices in a Machine Room, Control Room, or Overhead space

Pixel stopping devices are always located on the Cab.

3.25.2: Terminal Speed-Reducing Devices

3.25.2.1: Where Required

The Emergency Terminal Speed-Reducing Devices are implemented in a dually independent and redundant manner by following devices:

The Terminal Speed-Reducing means

- Landa Main Car Position Reader (Main Reader)
- Pixel Safety Processor 2 (SP2) and SP2 Learned Terminal landings Speed Profile

The redundant implementation is comprised of:

- Landa Auxiliary Car Position Reader (Auxiliary Reader)
- Pixel Safety Processor 1 (SP1) and SP1 earned Terminal landings Speed Profile
- UPS Slowdown Mechanical Limit in series with the UP High Speed Valve

The operation of each of the Emergency Terminal Speed-Reducing Devices involves the determination of car speed based upon the change in car position as indicated by its respective Reader, and the indication of car position (proximity to the terminal landings) provided by that Reader.

The redundant Emergency Terminal Speed-Reducing means are inherently independent of the redundant Normal Terminal Stopping Devices, due to the independence and redundancy of the safety processor/position sensor pairs, each of which implement both the Normal Terminal Stopping Means and the Emergency Terminal Speed-limiting Means. For the Up direction of travel a mechanical Slowdown switch, UPS, is placed in series with the Up high speed valve and adjusted to prevent the plunger from striking the limit of travel at a speed above 50 ft/min, refer to page 1 of the prints.

3.25.2.2.1 and 3.25.2.2.2: When either of the Emergency Terminal Speed-Reducing Devices determines that the car's speed is inappropriate (too high) for its position relative to a terminal landing, it removes power to the Valve Solenoids and Pump Motor as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Turn off EB1-EB2 & EB1X-EB2X to remove power to the U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminals RG1 and RG2 feeding valve solenoid circuits on page 1 of the prints.
b. Turn on ESCO contactor, to drop voltage to the common side of the high speed valves through ESCOsp1 or/ and $ESCO_{SP2}$ outputs, refer to page 1 of the prints.

3.25.2.2.3: The car position data values read from the Main Reader and Auxiliary Reader are continuously compared against each other, independently by the P-MP, SP1, and SP2, to validate that each reader is operating in accordance with the other. Each reader is self-

diagnosing in that each is designed to detect when it can no longer reliably read the encoded hoistway tape due to internal failures, inadequate installation, or installation failures.

Because the Main Reader and Auxiliary Reader each read the same encoded steel hoistway tape, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared to validate that the offset is maintained throughout the operation of the elevator, any variance in this offset is cause to remove the elevator from service and will not be permitted to restart, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry.

3.25.2.3: Section does not apply. Pixel's Terminal Speed Reducing Devices are not mechanically or hydraulically implemented.

3.25.2.4: Requirements for Electrical Means

3.25.2.4.1 and 3.25.2.4.2: The car position data values read from the Main Reader and Auxiliary Reader are continuously compared against each other, independently by the P-MP, SP1, and SP2, to validate that each reader is operating in accordance with the other. Each reader is self-diagnosing in that each is designed to detect when it can no longer reliably read the encoded hoistway tape due to internal failures, inadequate installation, or installation failures.

Because the Main Reader and Auxiliary Reader each read the same encoded steel hoistway tape, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared to validate that the offset is maintained throughout the operation of the elevator, any variance in this offset is cause to remove the elevator from service and will not be permitted to restart, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry.

3.25.2.4.3:
Section does not apply. Pixel's Terminal Speed Reducing Devices are not mechanically or hydraulically implemented.

3.25.2.4.4(a)(1):
When either of the Emergency Terminal Speed- Reducing Devices determines that the car's speed is inappropriate (too high) for its position relative to a terminal landing, it removes power to the Valve Solenoids and Pump Motor will be removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

3.25.2.4.4(a)(2):
The U and D Relay contacts in series with the valve circuits are verified to be off before the car is allowed to restart. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).

The EB1-EB2 & EB1X-EB2X relays are cycle tested prior to every run to ensure integrity to perform function of removing power to the U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

The car position data values read from the Main Reader and Auxiliary Reader are continuously compared against each other, independently by the P-MP, SP1, and SP2, to validate that each reader is operating in accordance with the other. Each reader is self-diagnosing in that each is designed to detect when it can no longer reliably read the encoded hoistway tape due to internal failures, inadequate installation, or installation failures. Because the Main Reader and Auxiliary Reader each read the same encoded steel hoistway tape, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared validating that the offset is maintained throughout the operation of the elevator, any variance in this offset causes to remove the elevator from service and will not be permitted to restart, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry

3.25.2.4.4(b): Refer to section 3.25.1 above for compliance.

3.25.2.4.5: Section does not apply; Pixel's design is for elevator with two means required for upward movement, a pump unit coupled with a valve system.

2.25.3.3: The Final Terminal Stopping Switches are not required

3.26: Operating Devices and Control Equipment

3.26.1.1: Operating Devices and Control Equipment
Operating devices and Control Equipment shall conform to Section 2.26; Devices listed in subsections of section 2.26.1 shall comply as described in each subsection. Devices that are disallowed as described under each subsection (if applicable) shall not be used. Devices that are shown on the controller prints if not provided with controller are assumed to be code compliant for the purpose of this submittal and are noted as provided by others in this document.

2.26.1.2: Car-Switch operation is not part of Pixel scope Design.

2.26.1.3: Section does not apply to Hydraulic Elevators

2.26.1.4: Inspection Operation, Modified per Section 3.26.2
The Pixel control system provides for the following types of inspection operation with following hierarchy:

1. Top of Car Inspection
2. In-car Inspection
3. Hoistway Access
4. Machine Room Inspection

The signals that place the elevator on each of these modes of operation are routed to safety processors SP1 and SP2 via independent and separate inputs:

1. Top of Car Inspection: ICT_{SP1} and ICT_{SP2}
2. In-car Inspection: IIC_{SP1} and IIC_{SP2}
3. Hoistway Access Inspection: IA_{SP1} and IA_{SP2}
4. Controller Inspection: $IMR1_{SP1}$ and $IMR2_{SP2}$

SP1 and SP2 serve as a point of validation for the input circuitry related to the inspection mode inputs. If a single failure of an input circuit device occurs, the redundant inspection mode input circuit ensures that the car is removed from automatic operation in spite of that failure. The Car Top, In Car, Access inspection switch mode and Machine Room inspection inputs are cycle tested to ensure that the failure of an infrequently used input circuit is detected prior to each run. Refer to page 3 of the controller prints to see the redundant inputs for the top of car inspection switch, the in-car inspection switch, the hoistway access enable switch, and the machine room inspection switch. Refer to page 6 of the controller prints to see the wiring of the car top, in car, and access inspection switches, and the connection of the common side of these switches to bus 4CT (the voltage bus created through the contact of the cycle-test relay CTR), and to page 3 of the controller prints for the machine room inspection switch.

The safety processors transfer the state of the top of car inspection, in-car inspection, hoistway access, and Machine Room inspection and enable inputs to P-MP.

The main processor P-MP enforces the operational hierarchy among these modes of operation per Table R-1.

2.26.1.4.1 General Requirements

2.26.1.4.1(a)(1)(a): The Pixel control system provides for the following types of inspection operation:

1. Top of Car Inspection – required as stated in this subsection
2. In-car Inspection
3. Hoistway Access
4. Controller Inspection

2.26.1.4.1(a)(1)(b): The Pixel control system is not designed to be installed in a hoistway space. As a result, all circuits and devices specified in section 2.7.6.5.1(b) are accessible from outside the hoistway. No provision for an Inspection and Test Panel (section 2.7.6.5) exists.

2.26.1.4.1(a)(2): The Pixel control system provides for the following types of inspection operation:

1. Top of Car Inspection - subsection 2.26.1.4.1(a)(1)(a)
2. In-car Inspection – permitted in subsection 2.26.1.4.1(a)(2)(a)
3. Hoistway Access
4. Controller Inspection – permitted in subsection 2.26.1.4.1(a)(2)(c)

2.26.1.4.1(b)(1) through 2.26.1.4.1(b)(3): The inspection switches shall comply with the requirements of this subsection in construction and labeling.

2.26.1.4.1(b)(4): Operation of the elevator when on any mode of Inspection operation listed above shall comply with the requirements stated in this subsection. The mechanical operation of the inspection switches shall comply with section 2.26.1.4.1(b)(4)(b).

2.26.1.4.1(b)(5): Operation of the elevator by the inspection operating devices shall be disabled when the inspection switch is in the NORMAL position.

2.26.1.4.1(c): The inspection operating devices are shown along with their respective inspection switches on pages 3 and 6 of the controller prints. The operating devices shall be continuous-pressure devices and be labeled as required in this subsection.

2.26.1.4.1(d)(1): The speed of the car while on any mode of Inspection shall not exceed 0.75 m/s (150 ft/min). This speed is monitored by two independent means, SP1 and SP2 (along with the Auxiliary and Main Readers, respectively). Should either SP1 or SP2 determine that the speed of the car exceeds the speed allowed by this subsection; it removes power from the Valve Solenoids and Pump Motor if running on the up direction as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

The speed of the cab is calculated from the Main and Auxiliary Landa sensor heads, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared to validate that the offset is maintained throughout the operation of the elevator, any variance in this offset is cause to remove the elevator from service, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry.

2.26.1.4.1(d)(2): Inspection operations are subject to the electrical protective devices required by 2.26.2. SP1 and SP2 monitor the status of the electrical protective devices and disallow movement of the car should one of these protective devices be activated.

2.26.1.4.2 Top-of-Car Inspection Operation

2.26.1.4.2(a): A stop switch shall be installed as required by this subsection. Refer to page 6 of the controller prints to see the stop switch (labeled on the controller prints as “CARTOP INSPECTION STOP SW.”) located in the car safety circuit (which terminates at terminal SAFC).

2.26.1.4.2(b): The type and location of the transfer switch shall comply with the requirements of this subsection.

2.26.1.4.2(c) and 2.26.1.4.2(d): An enable button shall be provided and located as described in this section to qualify the operation of the Top-Of-Car Inspection operating devices. Refer to page 6 of the controller prints to see the wiring of this button to the control system. The signal from this button is monitored by SP1 and SP2 via redundant inputs $ICTE_{SP1}$ and $ICTE_{SP2}$. SP1 and SP2 only allow operation of the car while on Top-of-Car Inspection operation if this enable button is pushed. Refer to page 3 of the controller prints to see the redundant safety inputs $ICTE_{SP1}$ and $ICTE_{SP2}$.

2.26.1.4.2(e): Portable Top-of-Car Inspection operating devices shall comply with the requirements of this subsection.

2.26.1.4.2(h): The location of the Top-of-Car Inspection operating devices shall comply with the requirements of this subsection.

2.26.1.4.3 In-Car Inspection Operation

2.26.1.4.3(a) and 2.26.1.4.3(b): The type and location of the transfer switch shall comply with the requirements of this subsection.

2.26.1.4.3(c): If top-of-car inspection operation is enabled, in-car inspection operation is rendered inoperative by P-MP, SP1 and SP2.

2.26.1.4.3(d): The in-car inspection transfer switch shall not enable hoistway access. A separate input is provided to enable hoistway access operation. Refer to page 3 of the controller prints to see the redundant hoistway access enable inputs (labeled IA_{SP1} and IA_{SP2}). Refer to page 6 of the controller prints to see the connection of the hoistway access enable switch to terminal IA.

2.26.1.4.4 Machinery Space Outside the Hoistway, Machine Room, Control Space Outside the Hoistway, Control Room, Pit, Landing, and Working Platform Inspection Operations
The Pixel control system does not provide for any of these types of inspection operations.

2.26.1.5 Inspection Operation with Open Door Circuits
2.26.1.5(a) and 2.26.1.5(b): The Car Door Bypass and Hoistway Door Bypass switches are in the Pixel controller enclosure. The Pixel controller shall be located outside the hoistway. Refer to page 3 of the controller prints to see these switches, labeled “CAR DOOR BYPASS” and “HOISTWAY DOOR BYPASS”. These switches are located on the main Pixel control board P-MP.

The two operating positions of each of these switches are each routed to a separate input ($CDB1_{SP1}$ and $CDB2_{SP2}$ for the Car Door Bypass switch, and $HDB1_{SP1}$ and $HDB2_{SP2}$ for the Hoistway Door Bypass switch). This ensures that a single circuit failure can be detected and will not render either of these transfer switches inoperative.

2.26.1.5.1: Each of the switches is single-pole, double-throw in design. When placed in one position, the contact closure associated with the opposite position is positively opened mechanically and is to cycle tested via the CTR1 output; refer to page 3 of the prints.

2.26.1.5.2: The labeling of the positions of each of the switches is “BYPASS” and “OFF”. Refer to page 3 of the controller prints.

2.26.1.5.3: The Car Door Bypass and Hoistway Door Bypass switches are each protected against failure by the type of switch used, and the method in which the statuses of each of the switches is monitored. The Car Door Bypass and Hoistway Door Bypass switches are mechanically-operated switches which in and of themselves do not:

- render any electrical protective device inoperative
- permit the car to move beyond the leveling or truck zone with open car or hoistway door contacts
- permit speeds in excess of those specified in sections 2.12.7.4.2, 2.26.1.4.1(d)(1), or 2.26.1.6.6
- permit the car to revert to normal operation
- render any car door contact or hoistway door interlock contact ineffective

The positions of these switches are read by SP1 and SP2, which along with P-MP determine and control the operation of the car. Should a failure of a solid state input device occur, it is detected by SP1 and SP2 and the car is not allowed to operate.

2.26.1.5.4: When either SP1 or SP2 detects that either the Car Door Bypass or Hoistway Door Bypass switch has been placed in the BYPASS position, automatic operation of the elevator is disabled. Operation of the elevator is then limited to top-of-car inspection or in-car inspection. The hierarchy of the inspection operations is enforced by the P-MP.

2.26.1.5.5 Through 2.26.1.5.6: The operation provided by the Pixel system complies with these subsections.

2.26.1.5.8: The required verbiage specified in this subsection is provided adjacent to the switches on the P-MP board.

2.26.1.6.6 Operation in Leveling or Truck Zone as per 3.26.3 Anticreep and Leveling Operation

3.26.3.1.1: Pixel controller design through Landa provides automatic two way releveling operation where Pixel activates the leveling, Up or Down, valve and monitors speed not to exceed 0.125 m/s (25 ft/min). Refer to section **2.26.1.6.6: As modified by 3.26.3.2** below for further design compliance.

3.26.3.1.2: The Dead Zone area by design is limited to 1/4” above or below the landing fully level position, movement of the cab outside this position range triggers a releveling operation.

3.26.3.1.3: Pixel controller design provides automatic two way releveling operation.

3.26.3.1.4(a): Releveling operation in the up direction is disabled by Pixel's firmware when its input for battery lowering (alternate power) becomes active and through hardware as follows:

a. For Delta & Y-Delta controllers: The main power supply is monitored through a three-phase power monitor, whose contact is in series with the pump motor contactor, and the motor contactor has a contact in series with the up valves circuits. Refer to page 4 of the prints for phase monitor interface circuits and to page 1 for AA motor contactor auxiliary contact in series with the up valves circuits.

b. For Solid State Starter: The Solid-State Starter incorporates as part of its design a three-phase power monitor that will disable its operation and prevent the UTS relay to energize and feed power to the up valves circuits. Refer to page 4 of controller prints for solid state starter interface and UTS relay coil and page 1 for UTS relay contact in series with the up valves circuits.

c. SP1 and SP2 safety processors monitor the U relay contact in series with the up valve circuits through UNL_{SP1} and UNL_{SP2} inputs. If contact fails to open while output is turned off, an Up Relay Latching fault will be declared and relays EB1-EB2 & EB1X-EB2X will be set to off to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

3.26.3.1.4(b)(c): Sign by others.

3.26.3.1.5: The following devices when activated will prevent Anticreep, releveling up, operation:
a. All EPDS except Emergency stop Switch, broken rope switch, door locks, car gates.
b. Recycling mode of operation
c. Inspection (Car Top, In Car, and Machine Room)
d. Hoistway Access
e. Low Oil protection
f. Oil Tank Temperature

2.26.1.6.1Through 2.26.1.6.2: Devices described in subsections 2.26.1.6.1 through 2.26.1.6.2, where applicable, shall comply with the requirements stated in these subsections.

2.26.1.6.3: The Pixel leveling zone is limited by design to a maximum of 6" above and 6" below any landing.

2.26.1.6.4: The Pixel leveling zone by design is the same as the truck zone and is limited by design to a maximum of 6" above and 6" below any landing

2.26.1.6.5: The Pixel Leveling zones by design do not allow for zone overlapping.

2.26.1.6.6: As modified by 3.26.3.2 the speed of the car while leveling into a landing shall not exceed 0.125 m/s (25 ft/min). This speed is monitored by two independent means, SP1 and SP2 (along with the Auxiliary and Main Readers, respectively). Should either SP1 or SP2 determine that the speed of the car exceeds the speed allowed by this subsection; it removes power from the Valve Solenoids and Pump Motor if running in the up direction as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

The speed of the cab is calculated from the Main and Auxiliary Landa sensor heads, the value that each reader obtains can be directly validated against the value read by the other. The readers are mounted in a cartop mounting assembly (bracket) which maintains a fixed linear positional offset between the two readers. This offset is learned and the values reported by the readers are continuously compared to validate that this offset is maintained throughout the operation of the elevator, any variance in this offset is cause to remove the

elevator from service, as it would indicate a failure of one of the two position readers and/or associated data communication circuitry.

2.26.1.6.7: The Pixel Inner Landing zone, Dead Zone Parameter, is limited by design to a maximum of 3" above and 3" below any landing.

2.26.2 Electrical Protective Devices (EPDS) As Specified by 3.26.4

The Electrical Protective devices in sections **2.26.2.1, 2.26.2.3, 2.26.2.6 through 2.26.2.9, 2.26.2.11, 2.26.2.13, 2.26.2.18, 2.26.2.20, 2.26.2.22 through 2.26.2.27, 2.26.2.31 through 2.26.2.39** EPDS, as required, are wired in series as part of the Car and Hoistway safety string. These EPDS are monitored redundantly by SP1 and SP2 through safety inputs $SAFH_{SP1}$ and $SAFH_{SP2}$ and $SAFC_{SP1}$ and $SAFC_{SP2}$ respectively. Should either SP1 or SP2 detect that the car or hoistway safety string open it removes power from the pump motor as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 for motor contactors interface, page 1 for motor wiring, and to pages 6 and 3 of the controller's prints for the EPDS location within the safety string and the redundant SAFC and SAFH inputs.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

2.26.2.2 Motor Generator Running Switch

Section does not apply to Pixel Hydraulic control systems

2.26.2.4 Motor Field Sensing Means
Section does not apply to Pixel Hydraulic control systems

2.26.2.5 and 2.26.2.21 Emergency Stop Switch and In-Car Stop Switch
The redundant Emergency Stop Switch, or the In-Car Stop switch, $ESTP_{SP1}$ and $ESTP_{SP2,}$ inputs are continuously verified against each other (the corresponding inputs must match between SP1 and SP2), and they are cycle tested at the end of each run. These inputs are cycle-tested via a relay contact (CTR) that removes power from the electrical bus (4CT) that feeds these inputs. When power is removed from this bus $ESTP_{SP1}$ and $ESTP_{SP2}$ are checked to verify that they have changed state as expected. Should any of these inputs fail to change state as expected, the car is not allowed to restart. Refer to page 7 of the controller prints for switch wiring and page 3 of the controller prints for $ESTP_{SP1}$ and $ESTP_{SP2}$ inputs.
While car is not operating in Fire Service Recall mode and upon detection by SP1 or SP2 safety processors of the opening of the Emergency Stop Switch an Emergency Stop Switch Fault is declared and power to the pump motor and valve circuits is removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 for motor contactors interface, page 1 for motor wiring, and to pages 6 and 3 of the controller's prints for the EPDS location within the safety string and the redundant SAFC and SAFH inputs.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

Note: Refer to Fire Service Emergency Stop switch verification for Pixel behavior upon detection of opening of the Emergency Stop Switch.

2.26.2.10 Speed-Governor Switch

The redundant Governor Switch, GOV_{SP1} and $GOV_{SP2,}$ inputs are continuously verified against each other (the corresponding inputs must match between SP1 and SP2), and they are cycle tested at the end of each run. These inputs are cycle-tested via a relay contact (CTR) that removes power from the electrical bus (4CT) that feeds these inputs. When power is removed from this bus GOV_{SP1} and GOV_{SP2} are checked to verify that they have changed state as expected. Should any of these inputs fail to change state as expected, the car is not allowed to restart. Refer to page 3 of the controller prints for switch wiring and for GOV_{SP1} and GOV_{SP2} inputs. Upon detection by SP1 or SP2 safety processors of the opening of the Governor Switch a Governor Switch Opened Latching Fault is declared and power to the pump motor and valve circuits is removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 for motor contactors interface, page 1 for motor wiring, and to pages 6 and 3 of the controller's prints for the EPDS location within the safety string and the redundant SAFC and SAFH inputs.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

Once Governor Switch Opened latching fault is raised, the car will not be allowed to move until the car overspeed governor electrical contact is reset to the normal operating state;

the controller's System Fault Reset button is pressed. Refer to page 3 of the controller prints to see the governor electrical contact (labeled "GOVERNOR SWITCH") and the System Fault Reset button.

2.26.2.12 Emergency Speed-Limiting Devices

Refer to Section 3.25.1 above for compliance.

2.26.2.14 Hoistway Door Interlocks and Hoistway Door Electric Contacts

2.26.2.15 Car Door and Gate Electric Contacts

The Hoistway Door Interlocks, Hoistway Door Electric Contracts, and Car Door and Gate Electric Contacts are divided, for monitoring, into the following redundant inputs:

a. $DLAT_{SP1}$ and $DLAT_{SP2}$ Door Lock Access Top
b. $DLAB_{SP1}$ and $DLAB_{SP2}$ Door Lock Access Bottom
c. $DLSF_{SP1}$ and $DLSF_{SP2}$ Front Door Lock String
d. $DLSR_{SP1}$ and $DLSR_{SP2}$ Rear Door Lock String
e. $DCAT_{SP1}$ and $DCAT_{SP2}$ Door Closed Access Top
f. $DCAB_{SP1}$ and $DCAB_{SP2}$ Door Closed Access Bottom
g. $DCSF_{SP1}$ and $DCSF_{SP2}$ Front Door Closed String
h. $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String
i. CGF_{SP1} and CGF_{SP2} Car Gate Front
j. CGR_{SP1} and CGR_{SP2} Car Gate Rear

Each pair of inputs are continuously verified against each other (the corresponding inputs must match between SP1 and SP2), and they are cycle tested at the end of each run. These inputs are cycle-tested via a relay contact (CTR) that removes power from the electrical bus (4CT) that feeds these inputs. When power is removed from this bus these inputs are checked to verify that they have changed state as expected. Should any of these inputs fail to change state as expected, the car is not allowed to restart. Refer to page 3 of the controller prints for switches wiring and inputs.

While car is outside the trucking zone, it will not be permitted to start if any of the switches are not in the closed position, if the car is already moving and one of the switches opens the P-MP will execute a stop sequence, and the car will not be allowed to restart until all door switches are in the closed position.

If stop sequence is not executed a sequence override fault is declared and power to the pump motor and valve circuits is removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.

b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 for motor contactors interface, page 1 for motor wiring, and to pages 6 and 3 of the controller's prints for the EPDS location within the safety string and the redundant SAFC and SAFH inputs.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

If car is operating on Inspection Access mode and is within the top access zone, the $DLAT_{SP1}$ and $DLAT_{SP2,}$ Door Lock Access Top, are ignored, if is within the bottom access zone, the $DLAB_{SP1}$ and $DLAB_{SP2,}$ Door Lock Access Bottom, are ignored and in both cases the CGF_{SP1} and $CGF_{SP2,}$ Car Gate Front, if access operation is assigned to front doors, or CGR_{SP1} and $CGR_{SP2,}$ Car Gate Rear, if access operation is assigned to Rear doors.

If car is operating on Car Top Inspection and the Car Door Bypass switch is set to Bypass the CGF_{SP1} and $CGF_{SP2,}$ Car Gate Front, and CGR_{SP1} and $CGR_{SP2,}$ Car Gate Rear, Are ignored, and if the Hoistway Door Bypass switch is set to Bypass the $DLAT_{SP1}$ and $DLAT_{SP2,}$ Door Lock Access Top, $DLAB_{SP1}$ and $DLAB_{SP2,}$ Door Lock Access Bottom, $DLSF_{SP1}$ and $DLSF_{SP2,}$ Front Door Lock String, $DLSR_{SP1}$ and $DLSR_{SP2,}$ Rear Door Lock String, $DCAT_{SP1}$ and $DCAT_{SP2,}$ Door Closed Access Top, $DCAB_{SP1}$ and $DCAB_{SP2,}$ Door Closed Access Bottom, $DCSF_{SP1}$ and $DCSF_{SP2,}$ Front Door Closed String, $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String Are ignored.

2.26.2.16 Emergency Terminal Stopping Devices

Refer to Section 3.25.2 above for compliance.

2.26.2.19 Motor-Generator Overspeed Protection

Section does not apply to Pixel Hydraulic control systems

2.26.2.28 Car Door Interlock
The Car Door Interlock prevents the door from opening outside the truck zone are, if the doors open the car gate will open. Refer to section 2.26.2.15 above for Car Door and Gate Electric Contacts compliance.

2.26.2.29 Ascending Car Overspeed Protection
Section does not apply to Pixel Hydraulic control systems

2.26.2.30 Unintended Movement Device
Section does not apply to Pixel Hydraulic control systems

2.26.3 Contactors and Relays for Use in Critical Operating Circuits

Pixel design complies with requirements for sections 2.26.8.2 and 2.26.9.3. Section 2.26.9.7 does not apply to Pixel design, Pixel Hydraulic is not designed to interface to a motor generator control system.

2.26.4 Electrical Equipment and Wiring

2.26.4.2 Pixel elevator controllers bear the CSA approval and are listed under file # 068101_0_000.

2.26.4.3 The devices covered by 2.26.2, EPD devices, should meet requirements the requirements of 2.26.4.3.1 or 2.26.4.3.2

2.26.4.3.1 Elevator Controls only supplies devices for 2.26.2.12 and 2.26.2.16, which are exempt from this requirement. Refer to sections 2.26.2.12 and 2.26.2.16 above for device code compliance.

2.26.4.3.2 Covered as Section 2.26.4.3.1 above.

2.26.4.4 Pixel control has independently been tested by CKC Laboratories, and a report is in their files under Report # 91656-3.

2.26.5 The Hoistway Door Interlocks, Hoistway Door Electric Contracts, Car Door and Gate Electric Contacts, door open and closed positions are monitored through the following inputs:

a. $DLAT_{SP1}$ and $DLAT_{SP2}$ Door Lock Access Top
b. $DLAB_{SP1}$ and $DLAB_{SP2}$ Door Lock Access Bottom
c. $DLSF_{SP1}$ and $DLSF_{SP2}$ Front Door Lock String
d. $DLSR_{SP1}$ and $DLSR_{SP2}$ Rear Door Lock String
e. $DCAT_{SP1}$ and $DCAT_{SP2}$ Door Closed Access Top

f. $DCAB_{SP1}$ and $DCAB_{SP2}$ Door Closed Access Bottom
g. $DCSF_{SP1}$ and $DCSF_{SP2}$ Front Door Closed String
h. $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String
i. CGF_{SP1} and CGF_{SP2} Car Gate Front
j. CGR_{SP1} and CGR_{SP2} Car Gate Rear
k. $DOLF_{MP}$ and $DOLR_{MP}$
l. $DCLF_{MP}$ and $DCLR_{MP}$

(a) The car will be prevented from starting an automatic run from any position in the hoistway if the doors are not fully closed and locked, except as permitted for re-leveling the car into position as permitted in section 2.26.1.6.

(b) The doors will be prevented from closing if:
   a. Both the Door Open Limit contact ($DOLF_{MP}$ or $DOLR_{MP}$) and Door Close Limit contact ($DCLF_{MP}$ or $DCLR_{MP}$, respectively) are open, or
   b. The Door Open Limit contact ($DOLF_{MP}$ or $DOLR_{MP}$) is open, and the associated Car Gate Contact (CGF or CGR, respectively) appears to be closed, or
   c. The Door Open Limit contact ($DOLF_{MP}$ or $DOLR_{MP}$) is open, and the associated Door Lock Contacts appear to be closed (DLAB, DLSF, DLAT, or DLAB, DLSR, DLAT respectively, as appropriate)
   d. The Door Open Limit contact ($DOLF_{MP}$ or $DOLR_{MP}$) is open, and the associated Door Close Contacts appear to be closed (DCAB, DCSF, DCAT, or DCAB, DCSR, DCAT respectively, and as applicable and appropriate

2.26.6 Pixel Delta and Y-Delta pump motor starting design provides a Reverse Phase Monitor devise refer to page 2 and 4 of controller prints for reverse phase monitor circuits interface, and for Solid State Starter motor starting phase reversal protection is part of the solid state starter unit design.

2.26.7 The Pixel controller design does not include the application of capacitors or other devices that would make Electrical Protective Devices ineffective.

Note: SP1 and SP2 safety processors monitor the Electrical Protective Devices and determine whether to allow or prevent elevator operation; refer to Design Concepts section above for their functional description.

2.26.8 Section does not apply to Pixel Hydraulic control systems

2.26.9.3 Protection Against Failures

List of components verified against failures prior to allowing the car to start an automatic run:

1. Landa Positioning System
2. EB1-EB2, EBX1-EBX2, emergency brake relays

3. AA, Motor Contactor, used as Delta or Solid State Starter output
4. P, potential Contactor, used as Y for Y-Delta design only
5. BK, Contactor, used as auxiliary motor protection contactor for Delta and Y-Delta designs only.
6. ESCO Emergency Slowdown command contactor
7. SP1 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
8. SP2 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
9. P-MP Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
10. $AAo1_{SP1}$ and $AAo2_{SP2}$ AA Contactor control outputs
11. $Po1_{SP1}$ and $Po2_{SP2}$ P Contactor control outputs
12. Safety Inputs:
    a. GOV_{SP1} and GOV_{SP2} Governor
    b. $SAFH_{SP1}$ and $SAFH_{SP2}$ Safety String Hoistway
    c. $SAFC_{SP1}$ and $SAFC_{SP2}$ Safety String Cab
    d. ICT_{SP1} and ICT_{SP2} Car top Inspection
    e. $ICTE_{SP1}$ and $ICTE_{SP2}$ Car top Inspection Enable
    f. IIC_{SP1} and IIC_{SP2} In Car Inspection
    g. IIC_{SP1} and IIC_{SP2} In Car Inspection Enable
    h. IA_{SP1} and IA_{SP2} Hoistway Access
    i. $ESTP_{SP1}$ and $ESTP_{SP2}$ COP Emergency Stop
    j. IMR_{SP1} and IMR_{SP2} Machine Room Inspection
    k. $IMRE_{SP1}$ and $IMRE_{SP2}$ Machine Room Inspection Enable
    l. CDB_{SP1} and CDB_{SP2} Car Door Bypass
    m. HDB_{SP1} and HDB_{SP2} Hoistway Door Bypass
    n. $DLAT_{SP1}$ and $DLAT_{SP2}$ Door Lock Access Top
    o. $DLAB_{SP1}$ and $DLAB_{SP2}$ Door Lock Access Bottom
    p. $DLSF_{SP1}$ and $DLSF_{SP2}$ Front Door Lock String
    q. $DLSR_{SP1}$ and $DLSR_{SP2}$ Rear Door Lock String
    r. $DCAT_{SP1}$ and $DCAT_{SP2}$ Door Closed Access Top
    s. $DCAB_{SP1}$ and $DCAB_{SP2}$ Door Closed Access Bottom
    t. $DCSF_{SP1}$ and $DCSF_{SP2}$ Front Door Closed String
    u. $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String
    v. CGF_{SP1} and CGF_{SP2} Car Gate Front
    w. CGR_{SP1} and CGR_{SP2} Car Gate Rear

2.26.9.3.1 There are no magnetically operated switches, contactors, or relays associated with the Leveling or truck zone.

2.26.9.3.1(a) Because of the redundant and independent safety processors and their respective input circuits, the failure of a single solid state device will not render the detection means inoperative, and because one of the safety processors, SP2, is not a software system, the failure of a software system will not render the detection means inoperative.

2.26.9.3.1(b) Refer to Section 2.26.1.6 above for compliance

2.26.9.3.1(c) The speed of the car under any mode of inspection or Inspection Access shall not exceed 0.75 m/s (150 ft/min) or 0.125 m/s (25 ft/min) while leveling into a landing. This speed is monitored by two independent means, SP1 and SP2 (along with the Auxiliary and Main Readers, respectively). If either SP1 or SP2 determine that the speed of the car exceeds the speed allowed by this subsection an Inspection Overspeed or Leveling Overspeed fault is declared and power to the pump motor and valve circuits is removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 for motor contactors interface, page 1 for motor wiring, and to pages 6 and 3 of the controller's prints for the EPDS location within the safety string and the redundant SAFC and SAFH inputs.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

2.26.9.3.1(d) The electrical contact from the mechanical device provided to stop vertical car movement to create a vertical clearance as required by 2.7.4.5 should be wired in series with the Car Top Inspection switch feeding SP1 and SP2 car top inspection inputs ICT_{SP1} and $ICT_{SP2,}$ to place the car on car top inspection mode if contact is placed on the open position. Refer to section 2.26.1.4 above for Inspection modes of operation compliance.

2.26.9.3.1(e) Refer to section 2.26.2.15 for Car Door and Gate Electric Contacts, section 2.26.1.4 for Inspection modes of operation compliance and section 2.26.1.5 for Inspection Operation with Open Door Circuits.

2.26.9.3.2

2.26.9.3.2(a) Because of the redundant and independent safety processors and their respective input circuits, the failure of a single solid state device will not render the detection means inoperative, and because one of the safety processors, SP2, is not a software system, the failure of a software system will not render the detection means inoperative.

2.26.9.3.2(b) Compliance met through section 2.26.9.3.2(a) above.

2.26.9.4

Methods used to verify components used to comply with Section 2.26.9.3, and prevent the car from starting a run:

List of components verified against failures prior to allowing the car to start an automatic run:

1. Landa Positioning System
2. EB1-EB2, EBX1-EBX2, emergency brake relays
3. AA, Motor Contactor, used as Delta or Solid State Starter output
4. P, potential Contactor, used as Y for Y-Delta design only
5. BK, Contactor, used as auxiliary motor protection contactor for Delta and Y-Delta designs only.
6. ESCO Emergency Slowdown command contactor
7. SP1 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
8. SP2 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
9. P-MP Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
10. $AAo1_{SP1}$ and $AAo2_{SP2}$ AA Contactor control outputs
11. $Po1_{SP1}$ and $Po2_{SP2}$ P Contactor control outputs
12. Safety Inputs:
    a. GOV_{SP1} and GOV_{SP2} Governor

b. $SAFH_{SP1}$ and $SAFH_{SP2}$ Safety String Hoistway
c. $SAFC_{SP1}$ and $SAFC_{SP2}$ Safety String Cab
d. ICT_{SP1} and ICT_{SP2} Car top Inspection
e. $ICTE_{SP1}$ and $ICTE_{SP2}$ Car top Inspection Enable
f. IIC_{SP1} and IIC_{SP2} In Car Inspection
g. IIC_{SP1} and IIC_{SP2} In Car Inspection Enable
h. IA_{SP1} and IA_{SP2} Hoistway Access
i. $ESTP_{SP1}$ and $ESTP_{SP2}$ COP Emergency Stop
j. IMR_{SP1} and IMR_{SP2} Machine Room Inspection
k. $IMRE_{SP1}$ and $IMRE_{SP2}$ Machine Room Inspection Enable
l. CDB_{SP1} and CDB_{SP2} Car Door Bypass
m. HDB_{SP1} and HDB_{SP2} Hoistway Door Bypass
n. $DLAT_{SP1}$ and $DLAT_{SP2}$ Door Lock Access Top
o. $DLAB_{SP1}$ and $DLAB_{SP2}$ Door Lock Access Bottom
p. $DLSF_{SP1}$ and $DLSF_{SP2}$ Front Door Lock String
q. $DLSR_{SP1}$ and $DLSR_{SP2}$ Rear Door Lock String
r. $DCAT_{SP1}$ and $DCAT_{SP2}$ Door Closed Access Top
s. $DCAB_{SP1}$ and $DCAB_{SP2}$ Door Closed Access Bottom
t. $DCSF_{SP1}$ and $DCSF_{SP2}$ Front Door Closed String
u. $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String
v. CGF_{SP1} and CGF_{SP2} Car Gate Front
w. CGR_{SP1} and CGR_{SP2} Car Gate Rear

2.26.9.5 (Direct Current Motors)

Section does not apply to Pixel Hydraulic control systems

2.26.9.6 (Alternating Current Motors)

Section does not apply to Pixel Hydraulic control systems

2.26.9.7, 2.26.9.8, and 2.26.10 Sections do not apply to Pixel Hydraulic control systems.

2.26.11

Pixel controller during set up “learns” the fully level position, of each landing, of the cab in the hoistway, such position will be used to center the parameters for Leveling Zone, area where the car will engage leveling, Door Zone, area where the cab door operation is permitted, and Dead Zone, area where the car is considered to be fully leveled with the floor. Refer to Fig 1 below.

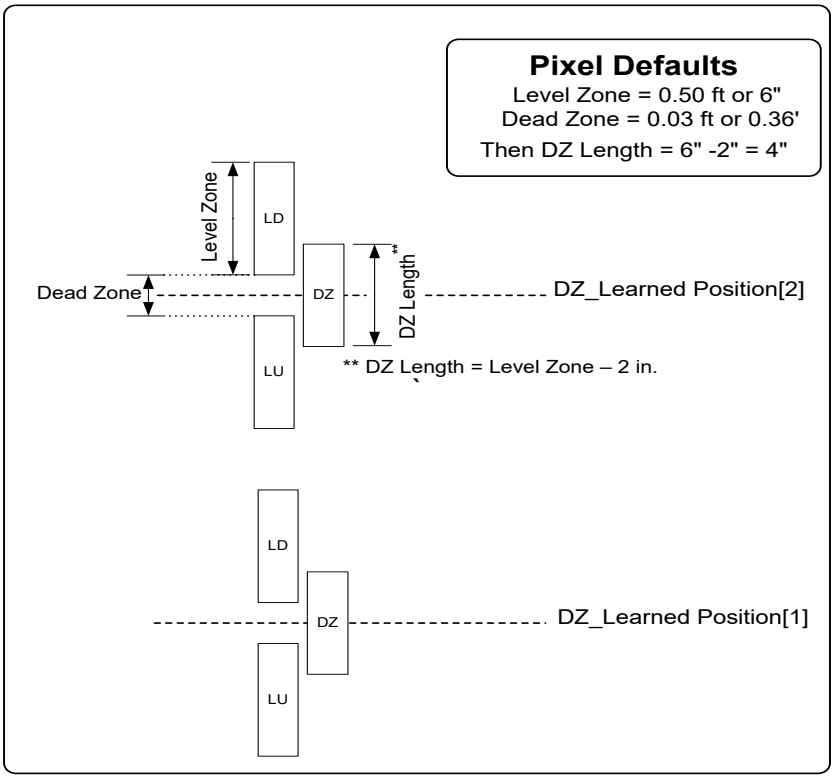


Figure 1. Virtual LU, LD , DZ, and Dead Zone

As the car approaches a landing it will engage level Zone area and it will continue to travel into the area where the Level Zone and the Door Zone overlap, within this area the cab door will be allowed to open if preopening option is enabled, the car will continue to travel into the Dead Zone area, until Level Zone stops. The Dead Zone Area represents the separation between Level Zone Up and Level Zone Down where the car is considered to be fully leveled with the landing. In the event that a fully leveled car position changes the car will be automatically repositioned, Re-Leveled, into the Dead Zone area as soon as the Leveling Zone Up or Down position is engaged.

2.26.12 Provided by others.

2.27 Emergency Operation and Signaling Devices

2.27.1 Provided by others.

2.27.1.2 The Emergency Bell is provided by others; refer to page 6 and 7 of the controller's prints for its wiring interface to the Emergency Stop Switch.

2.27.2 Pixel control behavior complies with Emergency or Standby Power System requirements

2.27.3 Pixel control behavior complies with Fire Phase 1 and Fire Phase 2 Emergency modes of operation, exception to Section 2.27.3.5 Pixel design does not provide for multi-compartment elevators interface.

2.27.4 Pixel control behavior complies with Firefighters Emergency Operation for Non automatic Elevators.

2.27.5 Pixel control behavior complies with Firefighters Emergency Operation for Automatic Elevators with designated attendant operation.
Refer to Section 2.7.11 for Occupant Evacuation Operation Compliance.

2.27.6 Pixel control behavior complies with Firefighters Emergency, Occupant Evacuation Operation for Inspection Operation.
Refer to Section 2.7.11 for Occupant Evacuation Operation Compliance.

2.27.7, 2.27.8 and 2.27.9 Provided by others.

2.27.11 Pixel design is under development to provide Optional Occupant Evacuation Operation.

2.28 Provided by others.

2.29 Equipment Identification provided by others, the control equipment for each elevator is provided in its own per car controller enclosure.

2.30 Provided by others.

3.26.5 Phase Reversal and Failure Protection

For Delta & Y-Delta controllers: The main power supply is monitored through a three phase power monitor, whose contact is in series with the pump motor contactor, and the motor contactor has an auxiliary contact in series with the up valves circuits. Refer to page 4 of the prints for phase monitor interface circuits and to page 1 for AA motor contactor auxiliary contact in series with the up valves circuits.

For Solid State Starter: The Solid State Starter incorporates as part of its design a three phase power monitor that will disable its operation and will prevent the UTS relay to energize and feed power to the up valves circuits. Refer to page 4 of controller prints for

solid state starter interface and UTS relay coil and page 1 for UTS relay contact in series with the up valves circuits.

SP1 and SP2 safety processors monitors If U relay contact in series with the up valve circuits through UNL_{SP1} and UNL_{SP2} inputs, if contact fails to open while output is to be off, an Up relay Latching fault will be declared and relays EB1-EB2 & EB1X-EB2X will be set to off to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

3.26.6 Control and Operating Circuits

3.26.6.1 Pixel design does not require any switches to stop the elevator at the terminal landings. Refer to sections 3.25.1 and 3.25.2 above for terminal stopping devices design compliance.

3.26.6.2 Pixel design complies with these requirements

3.26.6.3 Pixel design incorporates for Delta and Y-Delta a motor starter interfaces an auxiliary electromechanical contactor in series with the Pump Motor, for Solid State motor starter interface through the solid state motor starter electronic and FC electromechanical contactor. Refer to page 1 of the prints for motor starter and valve interface circuits.

3.26.6.4 Section does not apply to Pixel Hydraulic control systems. Refer to section 3.26.6.3 above.

3.26.6.5 Oil Tank Temperature is provided as an interface to a temperature sensor such as when actuated will remove power from the motor contactor and trigger an Oil Over Temperature Latching Fault. Refer to page 4 of the controller prints for Oil High Temperature sensor interface.

3.26.6.5(a) Upon declaration of Oil Over Temperature Latching Fault power to the Pump motor is removed.

3.26.6.5(b) The Oil Over Temperature Latching Fault will prevent the car from initiating any up movement.

3.26.6.5(c) The car will be brought to the lowest landing, and its behavior will comply with sections 3.26.9.2 and 3.26.9.3. Refer to such sections for further compliance explanations.

3.26.7 Recycling Operation for Multiple or Telescopic Plungers

Pixel design complies with requirements for this mode of operation, the speed Is monitored to not exceed 0.10 m/s (20 ft/min) while lowering or leveling up into bottom landing. This speed is monitored by two independent means, SP1 and SP2 (along with the Auxiliary and Main Readers, respectively). If either SP1 or SP2 determine that the speed of the car exceeds the speed allowed by this subsection Leveling Overspeed fault is declared and power to the pump motor and valve circuits is removed as follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relays fail to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

3.26.8 Pressure Switch

Pixel design complies with the Pressure Switch requirements; refer to page 5 of the controller prints for switch and LPS input interface.

3.26.9 Low Oil Protection

Pixel design complies with the Low Oil Requirements by motoring the amount of time the pump has been running without stopping, Motor Limit Timer, or through a dedicated Low Oil input switch; refer to page 5 of the controller prints for switch and LOIL input interface.

Once either the Motor Limit Timer expires or the Low Oil Switch activates, a Motor Limit Latching Fault is triggered, and the car is brought to the lowest landing and shut down until the System Fault Reset is pressed through unlatch fault status. The in car door open button will allow the opening of the doors provided the car is within the Dead Zone area.

3.26.10 Auxiliary Power Supply

Pixel design complies with the Auxiliary Power Supply Requirements; auxiliary power supply is monitored through the BPL input refer to page 5 of the controller prints for switch and BPL input interface and to page 1 for Auxiliary Power unit and Main Line Disconnect interface wiring.

3.27 Emergency Operation and Signaling Devices

2.27.1 Provided by others.

2.27.1.2 The Emergency Bell is provided by others; refer to page 6 and 7 of the controller's prints for its wiring interface to the Emergency Stop Switch.

2.27.2 Pixel control behavior complies with Emergency or Standby Power System requirements

2.27.3 Pixel control complies with Fire Phase 1 and Fire Phase 2 Emergency modes of operation, exception to Section 2.27.3.5 Pixel design does not provide for multi-compartment elevators interface, as modified by section 3.27, 3.27.1, 3.27.2, 3.27.3 and 3.27.4.

2.27.4 Pixel control behavior complies with Firefighters Emergency Operation for Non automatic Elevators.

2.27.5 Pixel control behavior complies with Firefighters Emergency Operation for Automatic Elevators with designated attendant operation.
Refer to Section 2.7.11 for Occupant Evacuation Operation Compliance.

2.27.6 Pixel control behavior complies with Firefighters Emergency, Occupant Evacuation Operation for Inspection Operation.
Refer to Section 2.7.11 for Occupant Evacuation Operation Compliance.

2.27.7, 2.27.8 and 2.27.9 Provided by others.

2.27.11 Pixel design is under development to provide Optional Occupant Evacuation Operation.

2.28 Provided by others.

2.29 Equipment Identification provided by others, the control equipment for each elevator is provided in its own per car controller enclosure.

2.30 Provided by others.

4. PART C2 (STATEMENTS OF CONFORMANCE)

In addition to the schematic, provide a written conformance document to explain how compliance with the following requirements is met (where applicable) if it is not possible to demonstrate compliance in the schematic.

Item 2001

2.12.7.3.2 (2.12.7.3.3 for 2019): Independent Speed Control on Access

All modes of Inspection operation share the Inspection Speed, limited to 150 ft/ min and the Inspection Trip Speed Parameter, limited to a maximum value of 20% over Inspection Speed parameter, the Inspection Speed is monitored by two independent means, SP1 and SP2 (along with the Auxiliary and Main Readers, respectively). If either SP1 or SP2 determine that the speed of the car exceeds the speed allowed by this subsection, it removes power from pump motor and valve coil solenoid.

Pixel design through its Landa Position system monitors the speed of cab for all modes of operation including Inspection Access. Inspection Speed and Inspection Overspeed parameters are provided and transferred to both SP1 and SP2 safety processors during configuration transfer for the safety processors to be able to monitor and determine if the cab is travelling at a speed larger than the allowed programmed threshold inspection overspeed, if either SP1 or SP2 determine that the speed of the car exceeds the speed allowed it will remove power from the Pump Motor and Valves as Follows:

Pump Motor

a. Y-Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, drop P, Y contactor, through $Po1_{SP1}$ and $Po2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
b. Delta: Drop AA, delta contactor, through $AAo1_{SP1}$ and $AAo2_{SP2}$ outputs, and drop BK, Delta Aux. contactor through BK_{mp} output.
c. Solid State Starter Enable is removed through AAo1SP1 and AAo2SP2 outputs, opening connection between IN1-IN2 and A1 terminals, disabling the power pole SCR-SCR Bypass contactors providing power to the motor.

   Refer to page 4 of controller prints for motor contactors interface and page 1 for motor wiring.

Valve Solenoids

a. Drop U or D Relay outputs to drop voltage to valve circuits. Refer to page 5 of controller prints for U and D Relay Coils interface, and to page 1 for U and D contacts in series with the valves and the UNL_{SP1} and UNL_{SP2} and DNL_{SP1} and DNL_{SP2} (U and D relay contacts monitored by SP1 and SP2).
b. If U or D relay fails to drop, drop EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 &

EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminal RG2 feeding valve solenoid circuits on page 1.

Item 2002
2.19.1.2: Ascending Car Overspeed Protection
Does not apply to Hydraulic Elevators

Item 2003
2.19.2.2: Unintended Car Movement Protection
Does not apply to Hydraulic Elevators

Item 2004 & Item 2005
2.25.4.1: ETSL is Independent of NTS & 2.25.4.2: ETSD is Independent of NTS
For Items 2004 and 2005 compliance please refer to sections 3.25.1 and 3.25.2 above.

Item 2006
2.26.1.4.1(d)(1): Independent Speed Control on Inspection
Refer to Item 2001 above for compliance.

Item 2007
2.26.4.3.2: SIL Certification (Includes Conditions of Certification)
Pixel submittal does not include any SIL Certifications.

Item 2008
2.26.7: Installation of Capacitors or Other Devices
The Pixel controller design does not include the application of capacitors or other devices that would make Electrical Protective Devices ineffective.

Note: SP1 and SP2 safety processors monitor the Electrical Protective Devices and determine whether to allow or prevent elevator operation; refer to Design Concepts section above for their functional description.

Item 2009
2.26.8.2: Two Means to Remove Power from the Brake
Section does not apply to Pixel Hydraulic systems

Item 2010
2.26.9.3: Single Ground / Single Failure
Refer to sections 2.26.9.3 Protection against Failures above for compliance.

Item 2011

2.26.9.4: Redundancy and Checking

Refer to sections 2.26.9.4 above for compliance and to page 6B of the controller prints for Landa Main Reader and Auxiliary sensor heads wiring utilizing two independent communication channels to convey its position information.

Item 2012

2.26.9.5/ 2.26.9.6:

Sections do not apply to Pixel Hydraulic systems.

Item 2013

3.26.6.3 Two Means to Remove Power

Pixel design incorporates for Delta and Y-Delta a motor starter interfaces an auxiliary electromechanical contactor in series with the Pump Motor, for Solid State motor starter interface through the solid state motor starter electronic and FC electromechanical contactor. Refer to page 1 of the prints for motor starter interface.

3.26.6.4: Two Means to Remove Power

Not applicable to Pixel design utilizing a Pump Motor and Valve to control upward movement, see section 3.26.6.3 above

5. PART D2 TEST PROCEDURES

Provide a written test procedure for the items listed below. Provide a written procedure for the tests of 8.10.2 and 8.10.3 that cannot be easily demonstrated in the field or for those tests which require specific test instructions to demonstrate compliance. The procedure should follow the same sequence of the tests in 8.10.

Items Section D2: 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309.

In addition, written test procedures are required for the following items from following Sections:
C2: 2010, 2011, 2012.
D1: 2202, 2210, 2213, 2219, 2220, 2224, 2227, 2228, 2232, 2233, 2236, 2237, 2238, 2240, 2242.

Item 2301
2.27.2 Emergency or Standby Power System

Comment: This series of tests should be skipped for installations that do not utilize an emergency power generator that can run one (or more) elevator(s).

To prepare for testing the logical operation of the control system (testing the system without actually invoking the emergency power generator), refer to the control system prints to locate the connection terminal to which the emergency power status contact is wired (the contact of the emergency power generator that is used to reflect whether power is being supplied by the commercial source or from the generator). This terminal is labeled "EPI". Determine the polarity of this contact (i.e., open or closed when on emergency power). Emergency power conditions will need to be simulated by either shunting the status contact or by disconnecting the field wire at the EPI terminal, depending upon this polarity.

Also, refer to the control system prints to locate the connection terminal to which an emergency power pre-transfer contact is wired (a contact of the emergency power system that indicates that a transfer back to commercial power is imminent). This terminal is labeled "EPPT". Determine the polarity of this contact (i.e., open or closed when a transfer back to commercial power is imminent). This pre-transfer condition will need to be simulated (in Test Procedure 2301.4) by either shunting the status contact or by disconnecting the field wire at the EPPT terminal, depending upon this polarity.

Test Procedure 2301.1 (sequential lowering):

1. Remove power from all controllers (including the group supervisor, if applicable).
2. Simulate the activation of the emergency power status contact from the emergency power generation system, as discussed in the Comment section above.
3. Simultaneously restore power to all controllers.

4. Verify that the "ELEVATOR EMERGENCY POWER" indicator at the designated level lobby is illuminated.
5. Verify that the cars return sequentially to the emergency power recall floor, as required by Section 2.27.2.4.4(a) through Section 2.27.2.4.4(d).
6. As each car performs its recall process, verify that the visual indicator associated with each car (if required by Section 2.27.2.4.3) illuminates once the car has completed its recall operation, as required by Section 2.27.2.4.3.
7. Stringent and complete testing will require that steps 1 through 6 above are repeated with one or more cars placed on Designated Attendant Operation (if applicable), Inspection Operation, and Firefighter's Emergency Operation.

Test Procedure 2301.2 (automatic car selection, multi-car system with selection switch):

1. Place the selection switch labeled "ELEVATOR EMERGENCY POWER" in the "AUTO" position.
2. Carry out Test Procedure 2301.1. Once the sequential recall process has completed for all cars, move on to Step 3 of this test procedure.
3. Once the cars have completed the sequential recall process, verify that a car (or cars, up to the rated capacity of the emergency power generator) is selected to run on generator power, per the requirements of section 2.27.2.4.5.
4. Verify that the proper visual indicator (adjacent to the manual selection switch(es), as referenced in Section 2.27.2.4.6) is illuminated when a car is selected to run.

Test Procedure 2301.3 (manual car selection, multi-car system with selection switch):

1. Place the selection switch labeled "ELEVATOR EMERGENCY POWER" in a position that is associated with one of the elevators.
2. Carry out Test Procedure 2301.1. Once the sequential recall process has completed for all cars, move on to Step 3 of this test procedure.
3. Once the cars have completed the sequential recall process, verify that the car that is selected to run via the manual selection switch(es) is selected to run on generator power, per the requirements of section 2.27.2.4.5.
4. Verify that the proper visual indicator (adjacent to the manual selection switch(es), as referenced in Section 2.27.2.4.6) is illuminated when a car is selected to run.
5. Move the position of the manual selection switch to select a different car to run. Verify that the car that was previously selected is allowed (if moving) to continue running until it stops (at which point it is deselected). Once the previously selected car has been deselected, verify that the newly selected car is allowed to operate.
6. Verify that the proper visual indicator (adjacent to the manual selection switch(es), as referenced in Section 2.27.2.4.6) is illuminated when the new car is selected to run, and verify that all other indicators of that type are turned off.
7. Repeat the manual selection process for all cars.

Test Procedure 2301.4 (transition from Emergency Power to commercial power):

1. This test should be performed once the system has been placed in emergency power operation (by following the steps in Test Procedure 2301.1 above).
2. Simulate the activation of the emergency power pre-transfer contact as discussed in the Comment section above (if one is available).
3. Verify that a running car will stop at the next available floor and open its doors.
4. Simulate transfer of power back to commercial power by first removing power from all controllers.
5. Simulate the return to commercial power by reversing the action taken in Step 2 of Test Procedure 2301.1.
6. Reverse the action taken in Step 2 of this test procedure.
7. Restore power to all controllers.
8. Verify that all cars return to normal operation.

Item 2302
2.27.3.1.6(m) Phase I Emergency Recall Operation
Comment: This test should be skipped for installations that do not utilize a load weighing device.

Test Procedure 2302:

1. Place a full load in the elevator. To simulate the detection of a heavy load by the load weighing device, place a jumper across the contact that is wired to the Heavy Load Input (HLI) and/or the contact that is wired to the Overload input (OLI) on the controller. [Note that these contacts may be wired to the P-TOC board, located on the cartop. Refer to the controller prints for the specific installation.]
2. Place the car on Fire Recall Operation by moving the Fire Recall Switch to the ON position.
3. Verify that the car responds to Fire Recall Operation as required by section 2.27.3.1.6.

Item 2303
2.27.3.3.1(l) Phase II Emergency In-Car Operation

Comment: This test should be skipped for installations that do not utilize a load weighing device.

Test Procedure 2303:

1. Place a full load in the elevator. To simply simulate the declaration of a heavy load by the load weighing device, place a jumper across the contact that is wired to the Heavy Load Input (HLI) and/or the contact that is wired to the Overload input (OLI) on the controller. [Note that these contacts may be wired to the P-TOC board, located on the cartop. Refer to the controller prints for the specific installation.]
2. Place the car on Fire Recall Operation by moving the Fire Recall Switch to the ON position.

3. Once the car has completed its recall to the Fire Recall floor, place the car on Fire Phase II operation by moving the in-car "Fire Operation" switch to the ON position.
4. Verify that the car operates as required by section 2.27.3.3.

Item 2304
2.27.3.3.6 Phase II Emergency In-Car Operation

Note: During this test one or more fuses will blow (F50). Refer to the controller prints and make sure that appropriate replacement fuses are readily available.

Test Procedure 2304:

1. Place the car on Fire Service Phase II operation.
2. Board the elevator and travel to the bottom landing (if necessary).
3. Open the elevator door and exit the elevator.
4. Open a (the) hall call pushbutton station at the bottom landing.
5. Using a wire jumper, simulate an accidental ground on the "landing side of the hoistway enclosure" by momentarily shorting the hall buttons voltage bus terminal V+ on the hall node boards to the hall button fixture enclosure.
6. Verify that the operation of the car remains in accordance with section 2.27.3.3.
7. Turn off the power to the controller and replace fuses F50 and F50F as required.

Item 2305
2.27.3.4 Interruption of Power

Test Procedure 2305.1 (retention of Fire Phase 1 status through power loss):

1. This test is most efficiently performed with an assistant in the elevator who can register car calls and operate the Door Open Button.
2. Move car to a floor other than the designated Fire Recall floor by registering a car call.
3. Once the car arrives at the floor hold the door open using the Door Open Button.
4. Initiate Fire Phase 1 recall by moving the Fire Recall switch to the ON position (keep holding the door open using the Door Open Button).
5. Remove power from the controller.
6. With power OFF, turn the Fire Recall switch to the OFF position.
7. Restore power to the controller.
8. Allow the door to close (release the Door Open Button).
9. Verify that the system remains on Fire Phase 1 operation, and that the car operates as required under Fire Phase I operation.

Test Procedure 2305.2 (retention of Fire Phase 1 status through power loss):

1. Move car to a floor other than the designated Fire Recall floor by registering a car call.
2. Initiate Fire Phase 1 Recall by moving the Fire Recall switch to the ON position.

3. Allow the car to move away from the floor (it should move toward the Fire Recall floor).
4. Remove power from the controller (with the car in between floors).
5. With power OFF, turn the Fire Recall switch to the OFF position.
6. Restore power to the controller.
7. Verify that the car moves toward the Fire Recall floor.
8. Once it reaches a floor, verify that the car completes the recall to the Fire Recall floor as required under Fire Phase I operation.

Test Procedure 2305.3 (retention of Fire Phase 2 status through power loss):

1. This test is most efficiently performed with an assistant in the elevator who can register car calls and manipulate the Fire Phase 2 switch.
2. Place the elevator on Fire Phase 2 Operation and move it to an upper floor by registering a car call.
3. Leave the Fire Phase 2 switch in the ON position.
4. Leave the doors closed.
5. Remove power from the elevator controller.
6. Restore power to the elevator controller.
7. Verify that the car will not move (except for releveling operation as required).
8. Verify (by observing the car's position indicator) that the floor position is re-established immediately.
9. Verify that the car will then respond to car calls as appropriate under Fire Phase 2 operational requirements.

Test Procedure 2305.4 (retention of Fire Phase 2 status through power loss):

1. This test is most efficiently performed with an assistant in the elevator who can register car calls and operate the Door Open Button and Door Close Button.
2. Place the elevator on Fire Phase 2 Operation and move it to a floor other than the fire recall floor.
3. Leave the Fire Phase 2 switch in the ON position.
4. Open the elevator doors fully using constant pressure on the door open button.
5. Remove power from the elevator controller.
6. Restore power to the elevator controller.
7. Verify that the doors do not close automatically. The closing of the doors must remain "constant pressure operation" as required by Fire Phase 2 operation.
8. Verify (by observing the car's position indicator) that the floor position is re-established immediately.
9. Verify that the car will then respond to car calls as appropriate under Fire Phase 2 operational requirements.

Test Procedure 2305.5 (retention of Fire Phase 2 status through power loss):

1. This test is most efficiently performed with an assistant in the elevator who can register car calls and manipulate the Fire Phase 2 switch.
2. Place the elevator on Fire Phase 2 Operation and move it to a floor other than the fire recall floor.
3. Open the door fully using the Door Open Button and then place the Fire Phase 2 key switch in the HOLD position.
4. Remove power from the controller.
5. Restore power to the controller.
6. Verify that the car will not move (except for releveling operation as required).
7. Verify (by observing the car's position indicator) that the floor position is re-established immediately.
8. Verify that the doors will remain open as required by Fire Phase 2 HOLD operation.

Item 2306
3.19.4.7.6: Sealing of the Overspeed Valve
Follow the valve manufacturer instructions to verify operation and sealing procedures.

Item 2307
3.17.3.2.2(a): Deleted, and original 3.17.3.2.2 revised and re-designated **3.17.3.2.1 on Plunger Gripper - Inspection and Test Means.**
Follow the Plunger Gripper manufacturer instructions to verify Inspection and testing procedures.

Item 2308 and 2309
3.27.1, 2, 3 & 4 Phase I and Phase II under Special Conditions
Tests demonstrate the behavior of a car during Fire Service Phase 1 or Phase II in conjunction with the following special conditions:

a. Low Oil Protection, input terminal "LOIL"
b. Auxiliary Power. Refer to Item 2240 Auxiliary Power Operation below for testing procedure instructions
c. Oil High Temperature, input terminal "MOL2"

Instructions to trigger conditions a or c above:

a. Identify the condition to be verified and locate input on prints.
b. Be ready to disconnect the wire feeding the input if normally open contact or Jump input if normally closed contact is used to active input

Special Condition and Fire Phase 1:

a. Place an elevator technician in the car to verify door open button opens the door.
b. Drive the car to the top landing.
c. Place the Machine Room Inspection switch to INSP position.

d. Turn main line disconnect off.
e. Activate either Main Fire or Alternate Fire Service, the one that will not recall the elevator to the bottom landing, by removing and isolating the field wire for FRS or FRA from controller terminal strip.
f. Activate LOI or Oil High Temperature, input.
g. Turn the main line disconnect on.
h. Place the Machine Room Inspection switch to NORMAL position.
i. Observe the car to move to the fire recall landing and open the doors and the Fire Warning Indicator turns off.
j. Observe the car closing the doors after 15 seconds of being opened.
k. Instruct elevator technician to press the door open button and observe the doors to open.
l. Turn main line disconnect off
m. Rewire FRS or FRA wire to controller terminal strip.
n. Deactivate LOI or LOI or Oil High Temperature, input
o. Turn the main line disconnect on.
p. Reset fire service phase 1 recall mode of operation by returning the car to the main landing and rotating the fire recall switch to reset then to off position.

Auxiliary Power and Fire Phase 2:

a. Place an elevator technician in the car to drive the car on fire service phase 2 mode of operation.
b. Drive the car to the top landing.
c. Place the Machine Room Inspection switch to INSP position.
d. Turn the main line disconnect off.
e. Instruct elevator technician in the car to place the fire service phase 2 switch to the on position.
f. Activate LOI or Oil High Temperature, input.
g. Place the Machine Room Inspection switch to NORMAL position.
h. Turn the main line disconnect on.
i. Instruct elevator technician in the car to drive the doors to verify open and close behaviors to correspond to fire service phase 2 behaviors.
j. Instruct elevator technician in the car to drive the car to a lower landing and observe fire phase 2 behaviors until car is driven to the bottom landing.
k. Turn main line disconnect off
l. Deactivate LOI or LOI or Oil High Temperature, input
m. Instruct elevator technician in the car to place the fire service phase 2 switch to Off position.
n. Turn the main line disconnect on.
o. Reset fire service phase 1 recall mode of operation by returning the car to the main landing and rotating the fire recall switch to reset then to off position.

6. PART C2 TEST PROCEDURES

Test procedures for double boxed items in Part C2, as indicated in Part 2 for items 2010, 2011, 2012

Item 2010
2.26.9.3 Protection Against Failures
Single Ground

Critical Component: N/A

Redundant Component: F4A Fuse

Monitored Component: N/A

Test Verification of Single Ground:

a. Place the car on Machine Room Inspection.

NOTE: The Single Ground Test can be performed either automatic or inspection operation.

NOTE: The system logic is driven by a source of 110 Volts AC, and has one side already connected to ground, the 3 bus, the other side to the 4A power bus protected by a fuse feeding the logic power. Any accidental grounding will result in a blown fuse F4A, which will remove controller power to the safety string and logic circuits.

b. Short terminal SAFH to ground. Verify that fuse F4A blows, and the Pixel screen displays **Safety String Open Fault**.
c. Turn the main controller power off.
d. Replace fuse F4A.
e. Turn the main power to controller on.
f. Confirm that the Pixel screen displays **No Faults**.
g. Remove the car from Machine Room Inspection.

Test Verification Landa™ Redundant Position System

Critical Component: **Landa**™ Main and Auxiliary Position Sensor Heads

Redundant Component: **Landa**™ Main and Auxiliary Position Sensor Heads

Monitored Component: Car Speed, and Position

NOTE: The following tests verify that Pixel can safely position the cab using either of the two independent sensor heads that comprise the Landa™ positioning system.

The Pixel control uses a dual head positioning system – Landa™– incorporating a positional encoded tape that runs the entire length of the hoistway. This system enables each sensor head to provide absolute position information independent of the other. Refer to page 6 of the prints for Landa™ interface circuits.

The Main Positioning head communicates its absolute position to the main processor via dedicated RS485 serial port while the Auxiliary Positioning head communicates its absolute position to the main processor via CAN.

The Landa™ positioning system verifies absolute cab position to 0.032” (0.8mm) accuracy throughout the entire length of the hoistway.

The Pixel computer network, MPU, will “learn” and then build a positional image of the entire hoistway including:

- Door Zone or Trucking Zone, one per landing
- Top and Bottom Access Limits
- Mid hoistway position
- Physical open position for the top and bottom normal limit switches
- A speed profile deceleration ramp for the top and bottom landings

NOTE: The landing zones are limited to a maximum of six inches plus or minus learned position and are set at a factory default of three inches.

The learn process – once performed and verified during elevator installation – will be transferred and permanently stored by the three microprocessors that make up the Pixel controller’s main processing unit (MP, SP1, SP2). The learning process must be accomplished and transferred to both safety processors before the car can be run on any passenger automatic mode of operation.

NOTE: Pixel always “knows” the car position by reading it from the encoded tape and validating it through comparison to the learned/stored positional image.

Verification of Landa™ Main Sensor Head:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from responding to hall call demand.

b. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

c. Enter a car call to a floor several floors away from current car position (for a two stop elevator place a call to the other floor).

d. While car is running, unplug the Main Selector RJ45 cable labeled "SELECTOR" from Pixel MP, and observe that Pixel displays a **Main Selector Fault**, makes an emergency slowdown, and positions the elevator cab at the next available landing.

e. Pixel will remove the car from service until proper Landa™ Main sensor head communications is re-established.

f. Verify that the car will not respond to car calls.

g. Reconnect the RJ45 cable to the Pixel MP. Confirm that Pixel clears the **Main Selector Fault**, and that the car responds to car call demand.

h. Return the CAPTURE and TEST switches to their off positions, which will enable the car to return to Automatic Mode of operation and serve hall call demand.

Verification of Landa™ Auxiliary Sensor Head:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE, which will prevent the car from responding to hall call demand.

b. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

c. Enter a car call to a floor several floors away from current car position (for a two stop elevator place a call to the other floor).

d. While car is running, unplug the cable labeled "CAB CAN" from the Pixel MP, and observe that Pixel displays briefly **SP1 Aux. Selector Comm. Fault**, before being overwritten by a higher priority **CAB Comm. Fault**, makes an emergency slowdown, and positions the elevator cab at the next available landing.

e. Pixel will remove the car from service until proper Landa™ Auxiliary sensor head communication and CAB communications are re-established.

f. Verify that the car will not respond to car calls.

g. Reconnect the RJ45 cable to the Pixel MP. Confirm that Pixel clears the **CAB Comm. Fault and SP1 Aux. Selector Comm. Fault,** and that the car to respond to car call demand.

h. Return the CAPTURE and TEST switches to their off positions, which will enable the car to return to Automatic Mode of operation and serve hall call demand.

Item 2011

2.26.9.4 Methods to Satisfy 2.26.9.3

The car position data values read from the Main Reader and Auxiliary Reader are continuously compared against each other, while the car is running or at rest, independently by the P-MP, SP1, and SP2, to validate that each reader is operating in accordance with the other. Each reader is self-diagnosing in that each is designed to detect when it can no longer reliably read the encoded hoistway tape due to internal failures, inadequate installation, or installation failures.

Verification of operation is included as part of test procedure for **2.26.9.3 Protection Against Failures** above.

The following safety inputs are verified against failures by cycle testing after each run before allowing the car to start another:

List of components verified against failures prior to allowing the car to start an automatic run:

1. Landa Positioning System
2. EB1-EB2, EBX1-EBX2, emergency brake relays
3. AA, Motor Contactor, used as Delta or Solid State Starter output
4. P, potential Contactor, used as Y for Y-Delta design only
5. BK, Contactor, used as auxiliary motor protection contactor for Delta and Y-Delta designs only.
6. ESCO Emergency Slowdown command contactor
7. SP1 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
8. SP2 Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
9. P-MP Learned terminal speed profiles, landing positions and virtual limit positions Flash memory contents Integrity.
10. $AAo1_{SP1}$ and $AAo2_{SP2}$ AA Contactor control outputs
11. $Po1_{SP1}$ and $Po2_{SP2}$ P Contactor control outputs
12. Safety Inputs:
    a. GOV_{SP1} and GOV_{SP2} Governor
    b. $SAFH_{SP1}$ and $SAFH_{SP2}$ Safety String Hoistway
    c. $SAFC_{SP1}$ and $SAFC_{SP2}$ Safety String Cab
    d. ICT_{SP1} and ICT_{SP2} Car top Inspection
    e. $ICTE_{SP1}$ and $ICTE_{SP2}$ Car top Inspection Enable
    f. IIC_{SP1} and IIC_{SP2} In Car Inspection
    g. IIC_{SP1} and IIC_{SP2} In Car Inspection Enable
    h. IA_{SP1} and IA_{SP2} Hoistway Access
    i. $ESTP_{SP1}$ and $ESTP_{SP2}$ COP Emergency Stop
    j. IMR_{SP1} and IMR_{SP2} Machine Room Inspection
    k. $IMRE_{SP1}$ and $IMRE_{SP2}$ Machine Room Inspection Enable

l. CDB_{SP1} and CDB_{SP2} Car Door Bypass
m. HDB_{SP1} and HDB_{SP2} Hoistway Door Bypass
n. $DLAT_{SP1}$ and $DLAT_{SP2}$ Door Lock Access Top
o. $DLAB_{SP1}$ and $DLAB_{SP2}$ Door Lock Access Bottom
p. $DLSF_{SP1}$ and $DLSF_{SP2}$ Front Door Lock String
q. $DLSR_{SP1}$ and $DLSR_{SP2}$ Rear Door Lock String
r. $DCAT_{SP1}$ and $DCAT_{SP2}$ Door Closed Access Top
s. $DCAB_{SP1}$ and $DCAB_{SP2}$ Door Closed Access Bottom
t. $DCSF_{SP1}$ and $DCSF_{SP2}$ Front Door Closed String
u. $DCSR_{SP1}$ and $DCSR_{SP2}$ Rear Door Closed String
v. CGF_{SP1} and CGF_{SP2} Car Gate Front
w. CGR_{SP1} and CGR_{SP2} Car Gate Rear

To verify integrity of monitoring inputs a cycle test operation is automatically performed prior to each automatic run. To verify cycle test functional operation, follow steps below that use the GOV input for a failed cycle test verification:

1. Place the car on Test and Capture
2. Turn power to controller off
3. Remove and insulate the field wire from terminal GOV.
4. Jump terminal GOV to terminal 4A to simulate a latched cycle test input.
5. Turn controller power on
6. Place a car call and allow the car to travel to the commanded landing.
7. Pixel will automatically perform a Cycle test at the destination landing, verify display shows a Cycle test fault and that the car cannot be commanded to move by entering car calls
8. Turn power off
9. Remove jumper from GOV to 4A
10. Connect the field wire from step 3 above to GOV terminal.
11. Turn Power on
12. Verify the fault remains through power lost
13. Press the System Fault Reset push button in the P-MP board to clear fault and return car to service
14. Place Test and Capture switches to off position.

NOTE: The remaining listed input components can be verified by repeating Procedure above

Item 2012
2.26.9.5 / 2.26.9.6 Sections do not apply to hydraulic elevators.

7. PART D1 TEST PROCEDURES

Test procedures for double boxed items in Part D1, as indicated in Part 2 for items 2202, 2210, 2213, 2219, 2220, 2224, 2227, 2228, 2232, 2233, 2236, 2237, 2238, 2240 and 2242 for safety and/or EPD devices.

Item 2202
2.26.2.4 Section does not apply to hydraulic elevators

Item 2210
2.26.2.12 Section does not apply to hydraulic elevators

Item 2213
2.26.2.16 Emergency Terminal Stopping Devices
Pixel elevator controllers comply with section 2.25.4.2 and are except for complying with section 2.26.2.16

Item 2219
2.26.2.29 Section does not apply to hydraulic elevators.

Item 2220
2.26.2.30 Section does not apply to hydraulic elevators.

Item 2224
2.25.2 Normal Terminal Stopping Devices
The NTS Slowdown test forces the car to execute an emergency slowdown into the terminal landing (up or down), energizing the ESCO contactor to drop voltage to the common side of the high speed valves through ESCO $_{SP1}$ or/ and ESCO$_{SP2}$ outputs, ,utilizing the Landa Auxiliary sensor head Only to verify that the failure of the primary terminal slowdown device, the Main Land Sensor head, does not prevent the car from landing into terminal landing position, the NTS Slowdown tests are accomplished using simple menu driven process and the procedures below:

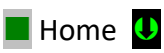
Down Direction:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to the top landing by entering a Car Call.

c. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

d. Navigate to:



Install

Code Compliance Tests

Safeties Speed Tests

NTS Slowdown Test

NOTE: The **NTS Slowdown Test** parameter "Slowdown Position" represents the hoistway position at which the car must start its deceleration into the bottom landing (relative to the down normal limit).

Press the **Run Test** soft key to start the **NTS Slowdown Test** run or the **Back** soft key to abort test run.

CAUTION: Once the Run Test soft key has been pressed, the car will accelerate to contract speed in the down direction and run past the Slowdown Position.

e. Observe that the Display shows a **NTS Overspeed** Trip latching fault, and that the car slows down into the bottom landing.

f. Press the System Fault Reset key to clear the fault and enable the car to run.

Up Direction:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to the bottom landing by entering a Car Call.

c. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

d. Navigate to:

Home

Install

Code Compliance Tests

Safeties Speed Tests

NTS Slowdown Test

NOTE: The **NTS Slowdown Test** parameter "Slowdown Position" represents the hoistway position at which the car must start its deceleration into the top landing (relative to the up normal limit).

Press the **Run Test** soft key to start the **NTS Slowdown Test** run or the **Back** soft key to abort test run.

CAUTION: Once the Run Test soft key has been pressed, the car will accelerate to contract speed in the up direction and run past the Slowdown Position.

g. Observe that the Display shows a **NTS Overspeed** Trip latching fault, and that the car slows down into the top landing.

e. Press System Fault Reset key to clear the fault and enable the car to run.

Item 2227

2.26.1.6.6 Overspeed Protection within the Truck Zone

Leveling Overspeed monitors cab speed while the car is running within the door zone or trucking zone and is in the process of leveling into a landing. Use the following process for verification:

NOTE: Leveling Trip Speed does not monitor the target final programmed leveling speed. Pixel's car landing zone approach is normally greater than the final programmed leveling speed code permits speeds of up to 25 ft/min within the leveling zone.

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

c. Navigate to:

Home

Install

Code Compliance Tests

Overspeed Tests

Leveling Overspeed

NOTE: The Leveling Overspeed display shows the programmed Leveling speed parameter, overspeed tripping speed setting, and prompts for entry of the leveling tripping speed parameter to be use when running a leveling trip detection test. Enter a speed below the current leveling speed parameter setting before running test.

Press the **Run Test** soft key to enable – for the next leveling run only – to detect **Leveling Overspeed** condition using the **Test Leveling Overspeed** parameter or the **Back** soft key to abort test run.

d. Enter a Car Call to run the car.

e. Observe that the Fault Display entry for the safety processors shows a Leveling Overspeed latching fault as the car slows down into the target landing's door zone, and that the car comes to a halt.

f. Verify the car will not accept a command to run while the latched fault is present.

g. Press the System Fault Reset key to clear the fault and enable the enable the car to accept a command to move.

h. Verify that the car re-levels into the closest landing

i. Set place the TEST and CAPTURE switches to off, which will enable the car to accept hall calls and return to Automatic Mode operation.

Item 2228
2.26.1.6.7 Inner landing Zone

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to a terminal landing.

c. Place the car on Independent Service and barricade the doors.

WARNING: Place approved barricade across elevator door opening. Station qualified supervision at opening. PREVENT ACCIDENTAL INGRESS ATTEMPT DURING TEST.

d. Place the car on Hoistway Access operation.

e. Drive the car on Access Operation 3 inches above or below the landing.

f. Remove from Access operation and observe that the car will not start repositioning into a landing until after doors have closed.

g. Remove the car from Independent Service

h. Set Capture switch, located on the MP board, to OFF to return car to automatic mode of operation.

Item 2233

3.25.2 Terminal Speed Reducing Devices

The Emergency Terminal Stop test forces the car to execute an emergency stop at the terminal landing (up or down), by Turning off EB1-EB2 & EB1X-EB2X to remove power to U and D relay coils and the valve circuits. Refer to page 3 of controller prints for EB1-EB2 & EB1X-EB2X relay coils interface, page 5 for EB1-EB2 & EB1X-EB2X relay contacts in series with U and D relay Coils, and page 2 for power to terminals RG1 and RG2 feeding valve solenoid circuits on page1 and Turning on ESCO contactor, to drop voltage to the common side of the high speed valves through ESCOsp1 or/ and $ESCO_{SP2}$ outputs, refer to page 1 of the prints.

Down Direction:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to the top landing by entering a Car Call.

c. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

d. Navigate to:

Home

Install

Code Compliance Tests

Safeties Speed Tests

Emergency Terminal Stop

NOTE: The **Slowdown Position** parameter represents the hoistway position at which the car must start its deceleration into the bottom landing (relative to the down normal limit).

Press the **Run Test** soft key to start the **Emergency Terminal Stop** test run or the **Back** soft key to abort test run.

CAUTION: Once the Run Test soft key has been pressed, the car will accelerate to contract speed in the down direction and run past the Slowdown Position.

e. Observe that the Display shows an **ETS Overspeed** Trip latching fault, and that the car comes to a halt.

f. Press the System Fault Reset key to clear the fault and enable the car to reposition into the closest landing.

Up Direction:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to the bottom landing by entering a Car Call.

c. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

d. Turn controller power off, jump terminals UHV to UHS to prevent the UPS switch from removing power to the up High Speed Valve.

e. Turn controller Power on

f. Navigate to:

Home

Install

Code Compliance Tests

Safeties Speed Tests

Emergency Terminal Stop

NOTE: The **Slowdown Position** parameter represents the hoistway position at which the car must start its deceleration into the top landing (relative to the up normal limit).

Press the **Run Test** soft key to start the **Emergency Terminal Stop** test run or the Back soft key to abort test run.

CAUTION: Once the Run Test soft key has been pressed, the car will accelerate to contract speed in the up direction and run past the Slowdown Position.

g. Observe that the Display shows an **ETS Overspeed** Trip latching fault, and that the car comes to a halt.

h. Press the System Fault Reset key to clear the fault and enable the car to reposition into the closest landing.

i. Turn controller power off, remove jumper from terminals UHV to UHS to prevent the UPS switch from removing power to the up High Speed Valve.

j. Turn controller Power on

UPS Slowdown Switch verification:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.

b. Drive the car to the bottom landing by entering a Car Call.

c. Set the TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.

d. Turn controller power off, remove and isolate the field wire from the UPS switch connecting to UHS terminal, refer to page 1 of the prints.

e. Turn Power on to controller

f. Place a car call to the next available up landing and observe that the car runs at leveling speed, verifying that the UPS switch is in series with the UP high Speed valve; allow the car to stop at the next landing.

g. Turn power off to the controller, connect isolated field wire from the UPS switch to UHS terminal

h. Turn Power on to controller and return the CAPTURE and TEST switches to the OFF position.

Item 2236

3.26.5 Phase Reversal and Failure Protection.

Test simulates power phase leg switching and phase loss to trigger the reverse phase and phase loss protection devices in the control unit for Delta, Y-Delta and Solid State Starter units as follows:

1. **Delta and Y-Delta controls**:
   a. Turn main Line disconnect off.

b. Place the Machine Room Inspection switch to INSP.
c. Remove FL3 fuse, to verify phase loss detection.
d. Turn the main line disconnect on.
e. Verify that the car cannot be commanded to move up on Machine room Inspection
f. Turn main Line disconnect off.
g. Install FL3 fuse
h. Interchange wires for L1 and L2 terminals on the Reverse Phase Monitor unit to verify phase reversal
i. Turn the main line disconnect on.
j. Verify that the car cannot be commanded to move up on Machine room Inspection
k. Turn main Line disconnect off.
l. Interchange back wires for L1 and L2 terminals.
m. Turn the main line disconnect on.
n. Verify that the car can be commanded to move up on Machine room Inspection.
o. Switch Machine Room Inspection switch to Normal.

2. Solid State Starter control units:

a. Turn main Line disconnect off.
b. Place the Machine Room Inspection switch to INSP.
c. Remove and Isolate L3 power wire from solid state starter unit, to verify phase loss detection.
d. Turn the main line disconnect on.
e. Verify that the car cannot be commanded to move up on Machine room Inspection
f. Turn main Line disconnect off.
g. Rewire L3 power wire to solid state starter unit
h. Interchange power wires for L1 and L2 terminals on the solid state starter unit to verify phase reversal
i. Turn the main line disconnect on.
j. Verify that the car cannot be commanded to move up on Machine room Inspection
k. Turn main Line disconnect off.
l. Interchange back wires for L1 and L2 terminals.
m. Turn the main line disconnect on.
n. Verify that the car can be commanded to move up on Machine room Inspection.
o. Switch Machine Room Inspection switch to Normal.

Item 2237

3.26.7 Recycling Operation for Multiple or Telescopic Plungers

To trigger Recycling operation set the Piston Synch. Start time to the current clock hour time navigating to:

- Home
- Adjust
- Car Performance
- Hydraulic Options
- **Piston Synch Start** ; set time to current clock hour

NOTE: The Piston Synchronization will start as soon as the car finishes with current demand, observe the car travel past the Down Normal Virtual Limit Position.

a. Enter a Car Call to observe Piston Synchronization to be temporarily aborted and reinitiated once demand is completed.

b. Reset Piston Synch Start time to its original setting.

Item 2238

3.26.8 Pressure Switch

To trigger Pressure Switch operation follows instructions below:

NOTE: To verify operation an elevator technician must be inside the cab with 2-way radio communications to be instructed to activate the door open button during test.

a. Drive the car to a landing and allow the elevator technician to enter the cab.
b. Turn main Line disconnect off.
c. Remove and isolate LPS field wire from controller terminal strip.
d. Turn the main line disconnect on.
e. Verify Pixel Display Low Pressure Switch Fault
f. Verify doors will not open automatically
g. Instruct elevator technician inside the car to press and hold the door open button and observe the doors opening from constant pressure.
h. Turn main Line disconnect off.
i. Rewire LPS field wire to controller terminal strip
j. Turn the main line disconnect on.
k. Verify that Low Pressure Switch fault has cleared from Pixel display

Item 2240

3.26.10 Auxiliary Power Operation

Tests demonstrates that a car utilizing limited power source, from a Rescuvator Device, moves in the down direction and allows for passenger to exit elevator cab automatically while also enforcing requirement for Fire Service Phase 1 & 2 modes of operation while operating with Auxiliary Power Operation as follows:

Instructions to trigger Auxiliary Power activation:

a. Turn main line disconnect off.
b. Jump Terminals 9 and 10 in Rescuvator unit terminal strip.
c. Place the Test switch in Rescuvator unit in the up position.

Automatic Mode Operation:

a. Place an elevator technician in the car to verify door open button opens the door.
b. Drive the car to the top landing.
c. Activate Auxiliary Power by placing the Test switch in the Rescuvator unit to the Up position and observe Pixel display to show Battery Lowering.
d. Observe the car to move to the bottom landing and open the doors.
e. Observe the car closing the doors after 15 seconds of being opened.
f. Instruct elevator technician to press the door open button and observe the doors to open.
d. Place the Test switch in the Rescuvator unit in the down position
g. Remove Jumper from Terminals 9 and 10 in Rescuvator unit terminal strip.
h. Turn the main line disconnect on.

Auxiliary Power and Fire Phase 1:

a. Place an elevator technician in the car to verify door open button opens the door.
b. Drive the car to the top landing.
c. Place the Machine Room Inspection switch to INSP position.
d. Turn main line disconnect off.
e. Activate either Main Fire or Alternate Fire Service, the one that will not recall the elevator to the bottom landing by removing and isolating the field wire for FRS or FRA from controller terminal strip.
f. Place the Machine Room Inspection switch to NORMAL position.
g. Activate Auxiliary Power by placing the Test switch in the Rescuvator unit to the Up position and observe Pixel display to show Battery Lowering.
h. Observe the car to move to the fire recall landing and open the doors and the Fire Warning Indicator turns off.
i. Observe the car closing the doors after 15 seconds of being opened.
j. Instruct elevator technician to press the door open button and observe the doors to open.
k. Place the Test switch in the Rescuvator unit in the down position

l. Remove Jumper from Terminals 9 and 10 in Rescuvator unit terminal strip.
m. Rewire FRS or FRA wire to controller terminal strip.
n. Turn the main line disconnect on.
o. Reset fire service phase 1 recall mode of operation by returning the car to the main landing and rotating the fire recall switch to reset then to off position.

Auxiliary Power and Fire Phase 2:

a. Place an elevator technician in the car to drive the car on fire service phase 2 mode of operation.
b. Drive the car to the top landing.
c. Place the Machine Room Inspection switch to INSP position.
d. Turn main line disconnect off.
e. Instruct elevator technician in the car to place the fire service phase 2 switch to the On position.
f. Place the Machine Room Inspection switch to NORMAL position.
g. Activate Auxiliary Power by placing the Test switch in the Rescuvator unit to the Up position and observe Pixel display to show Battery Lowering.
h. Instruct elevator technician in the car to drive the doors to verify open and close behaviors to correspond to fire service phase 2 behaviors.
i. Instruct elevator technician in the car to drive the car to a lower landing and observe fire phase 2 behaviors until car is driven to the bottom landing.
j. Place the Test switch in Rescuvator unit in the down position
k. Remove Jumper from Terminals 9 and 10 in Rescuvator unit terminal strip.
l. Instruct elevator technician in the car to place the fire service phase 2 switch to Off position.
m. Turn the main line disconnect on.
n. Reset fire service phase 1 recall mode of operation by returning the car to the main landing and rotating the fire recall switch to reset then to off position.

Item 2242

5.2.1.4.4 Car Top Prop

Section does not apply to controller equipment.

8. ADDITIONAL TEST PROCEDURES

NOTE: Refer to Pixel controller manual "Pixel Hydraulic Installation and adjustment.pdf" Section 6, CODE COMPLIANCE VERIFICATION, for additional compliance verification test procedures.

1. ASME A17.1 Entry 2.27.3.1.6 (c), Emergency Stop Switch functionality during Fire Phase 1 recall operation.

"2.7.3.1.6 *(c)* When provided, the in-car stop switch (see 2.26.2.21) or the emergency stop switch in the car (see 2.26.2.5) shall not be made ineffective."

a. Drive the car to a landing away from the main fire recall landing
b. When the car is stopped, place the Emergency Stop Switch to Stop position.
c. Activate the main fire recall switch or Main Fire Recall FRS input.
d. Verify that the car will not move towards the fire recall landing, even do main fire recall mode has been initiated.
e. Place the Emergency Stop Switch to Run position and observe that the car initiates its fire recall operation.
f. Once the car starts to move place the Emergency Stop Switch to Stop position and observe the car stopping.
g. Place the Emergency Stop Switch to Run position and allow the car to complete its fire recall operation.
h. Reset the main fire recall operation.

NOTE: To verify behavior for the alternate fire recall operation, change main fire recall for alternate fire recall on steps a through h above.

2. Executable Software, USI, Verification

The executable software version for the elevator logic and safety 1 microprocessors can be viewed navigating to:

Home

Install

About

Software version: Parameter displays Elevator Microprocessor Logic Version

SP1 Software version: Parameter displays Safety Microprocessor Version

The executable software version for the safety 2 processor, the FPGA, can be viewed using the following procedure:

a. Set the CAPTURE switch, located on the MP board, to CAPTURE which will prevent the car from servicing Hall Calls.
b. Set TEST switch, located on the MP board, to TEST which will enable Test Mode operation and disable door operation.
c. Place the controller on Machine Room Inspection, then navigate to:

Home

Install

File Transfer

Remote CRC Check

SP2

Firmware version: Parameter displays the FPGA firmware version.

[end document]