



SECTION 13 - TECHNICAL INFORMATION	2
Introduction	2
Controller Devices	3
System Processing Unit (SPU)	3
Description.....	3
Jumper Configuration	3
Component Identification Table	4
System Processing Unit Link Board (SPU-LINK)	4
SPU-Link LED Indicators	5
SPU-Link Input / Output Interface	5
SPU-Link Communication Ports	6
SPU-Link Control Panel	7
Serial Module Interface (SMI & SMIC).....	8
Serial Module Interface I/O Base Board (SMI)	8
Serial Module Interface Controller Board (SMIC)	9
CAR DEVICES	10
Car Position Transducer (CPT).....	10
Car Distribution Panel (EPU-Link Board).....	11
Elevator Processing Unit (EPU)	12
NOTES	13



SECTION 13 - TECHNICAL INFORMATION

Introduction

The **FUTURA™** controller is based on distributed processing technology. The main system processor (**S**ystem **P**rocessing **U**nit [SPU]) communicates with “smart” microcontrollers (reviewed in this section) over a high speed communication network (SWIFT LINK) providing an all digital, powerful, multiprocessor system. The EPU COP processor handles all **C**ar **O**perating **P**anel functions, including car call latching, lamp illumination intensity, and access codes, when in the security operation. Without additional burden to the SPU, the **FUTURA™** PI fixtures provide all required COP buzzer tones and illumination levels to match the car lighting. Most of these “smart” controllers connect as easily as a telephone extension, providing quick installation and servicing.



Controller Devices

System Processing Unit (SPU)

Description

The system processor 'U1' is based on a highly integrated Intel 20MHZ 16-bit embedded micro-controller using 256K bytes of CMOS nonvolatile memory, 512K bytes of FLASH memory for the program and 128K bytes of EEPROM memory for the SWIFT BIOS. The CMOS memory and a Real Time Clock controller chip is powered by two batteries during power loss. The Lithium batteries have a shelf life of 10 years. Note that the program memory and the system parameters are located in the Flash memory and are not affected by loss of battery power. An SBX expansion port is provided and used for an MG drive system. An optional VGA interface (J3A and J3B) is also provided.

The SPU has a temperature control chip, which will trigger at 140°F (60C). This will cause the cars to stop normally at the nearest floor and open their doors. The service type will be displayed as Overload (Thermal Overload).

The SPU requires only 5VDC to operate (adjust to 5.1VDC on SPU-LINK test points). For MG jobs, an additional +/- 15VDC supply is located in the chassis and provides power for the SBX interface.

SPU Board

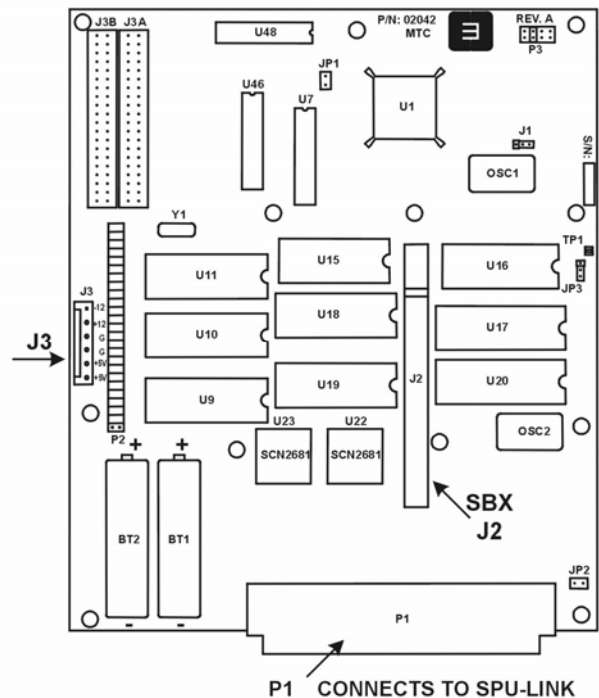


Figure 13-1

Jumper Configuration

J#	PIN	REQ	FUNCTION
JP1	1-2	OUT	186 Watchdog to the SPU watchdog timer
JP2	1	OUT	SBX option 1
	2	OUT	SBX OPTION 2
JP3	1-2	OUT	+12VDC power for Flash memory. DO NOT CONNECT
	2-3	IN	Enables Flash memory paging.
J1	1-2	IN	Software operation strobe to the SPU watchdog timer
J1	2-3	OUT	Diagnostic strobe to the SPU watchdog timer. Note: If this jumper is inserted, the SPU will not reboot under certain conditions.
P2	1-2 * thru 47-48	IN	SPU interrupt control matrix. Note: * (15-16, 29-30) are OUT (see below)
P2	15-30	IN	Wire-wrap: One second clock update
P2	16-29	IN	Wire-wrap: Real Time Clock
P2	49-50	OUT	SPU interrupt control matrix
P3	5-6	IN	Bus Clock. All other jumper on P3 must be removed

Table-1



Component Identification Table

FUNCTION	LOCATION	DEFINITION
CMOS RAM	U18, U17	Battery-backed CMOS Non Volatile Static Memory
FLASH	U19, U20	Non Volatile FLASH program and parameter memory
EEPROM	U15, U16	Non Volatile Read Only Memory (System BIOS)
PALS	U7, U46, U48	Programmable Array Logic
Power Connector	J3	Power connector: -12V, +12V, COM, COM, +5V, +5V Note: +/- 15VDC for MG SBX-414
VGA Conn.	J3A, J3B	VGA interface board connector

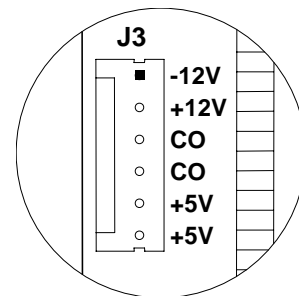


Table 2

System Processing Unit Link Board (SPU-LINK)

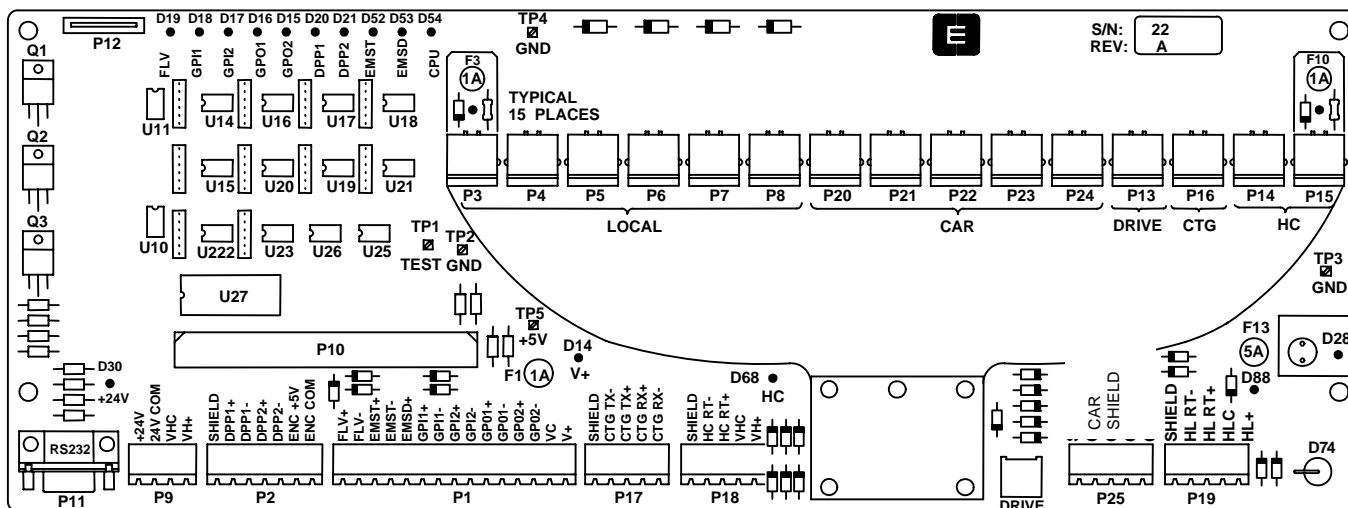


Figure 13-2

The SPU-LINK is mounted on the front of the SPU chassis and provides the communication interface to the "Smart" peripherals. The primary function of the SPU-LINK is to protect and provide the drivers for the communication lines, the DPP interface, and three input and output control ports. It has an RS-232 (P11, DB-9 connector) port to permit communication with a terminal or a PC. Note that the Radio Shack, or other similar terminal PC's used with the SWIFT-5000, can also operate with the FUTURA controller (Port Setting: 19,200 Baud, 8-bits and no parity).

Note: The +5VDC SPU supply should be between 5.00 and 5.20 VDC. Test points TP5 (+5V), and TP1 (GND) should be used to check SPU power Supply voltage.

SPU-Link LED Indicators

Numerous indicators are provided for quick diagnostics. The following table describes the LED status:

LED STATUS	
NAME	DESCRIPTION
FLV	at Floor Level
GPI1	General Purpose Input # 1
GPI2	Group Comm. handshake
GPO1	General Purpose Output # 1
GPO2	Group Comm. handshake. If ON, then this car is in the Group
+24VPWR	+24V Input (P9 +24V, 24VCOM)
HC PWR	+24Volt Hall Call interface power (connector P9 VHC , VH+)

Table 3

LED STATUS	
NAME	DESCRIPTION
DPP1	Digital Position Pulse #1 (Input)
DPP2	Digital Position Pulse #2 (Input)
EMST	Emergency Stop Output (controls CEN)
EMSD	Emergency Stop Input (CEN feedback)
CPU	FLASHING indicates if that the SPU is running.
V+ PWR	+24V Output (Check F1 if LED is Off)
HL PWR	+24V for Hall Lanterns (Check F13 if LED is Off)
TELCO JACK	All LEDs associated with the 8-pin jacks (except HC ports). Check fuses if LED is Off. The input power is from +24VPWR (D30).
TELCO HC ports	D71 and D72 HC power. Hall Call SMI power. NOTE: Diode D74 prevents reverse voltage to be applied to the HC ports.

SPU-Link Input / Output Interface

The following table describes the I/O interface:

FUNCTION	TB Marking	I/O	VOLT	DEVICE	DESCRIPTION
FLV	FLV+, FLV-	Input	24VDC	U5	At Floor Level. Signal from the CPT.
EM Stop	EMST+, EMST-	Output	24VDC	U6, Q1	Emergency stop control from the SPU. Located in the control line of the CEN contactor.
EM Slowdown	EMSD+	Input	24VDC	U4	Emergency stop in the CEN control line. Indicates that a device has shut the car down.
GPI1	GPI1+, GPI1-	Input	24VDC	U3	General Purpose Input
GPI2	GPI2+, GPI2-	Input	24VDC	U2	General Purpose Input
GPO1	GPO1+,GPO1-	Output	24VDC	U7, Q2	General Purpose Output
GPO2	GPO2+,GPO2-	Output	24VDC	U8, Q3	General Purpose Output

Table 4

**SPU-Link Communication Ports**

The SPU LINK has six discrete communication channels routed to twenty physical ports. These ports are available from an 8-pin TELCO connector or from a removable screw type terminal block to be used with twisted pair communication cables. The following table describes the communication channels and their associated ports:

COMM NAME	COM	PORT	DEVICES	TERMINATION	PROTECTION	CONTROLLER FUNCTION
RS 232	1	P11	U27 (235CPG)	none	D44-D51	Human Interface
CTG	2	P17	Rx: U22 (75176) Tx: U21 (75176)	J14 (+) J15 (T) J13 (-)	D59+, D60 D58+, D57	Car To Group Communication. Links all the cars for dispatching functions. Note: P16 (TELCO) port is used for diagnostic purpose.
LOCAL	5	P3, P4, P5, P6, P7, P8	Rx: U18 (75176) Tx: U17 (75176)	J5 (+) J6 (T) J4 (-)	D26+, D27 D25+, D24	HYC, MRC, GP2
DRIVE	3	P13	Rx: U26 (7601) Tx: U16 (75176)	J17 (+) J16 (T) J18 (-)	D65+,D66 D64+,D63	Isolated Digital Drive Comm. Not Used on Hydro Controllers
CAR LOCAL	6	P20, P21, P22, P23, P24	Rx: U20 (75176) Tx: U15 (75176)	J23 (+) J24 (T) J22 (-)	D79+, D80 D78+, D77	TOC, COP, CC1, POS, HL (smi)
CAR Remote	6	P25	Rx: U25 (7601) Tx: U19 (75176)	J29 (+) J28 (T) J30 (-)	D91+, D92 D90+, D89	Isolated Car communication to the CPT or the CDP boards. TOC, EPU-COP, EPU-(CC1-CC4), FUTURA PI
HC	4	P14, P15 P18	Rx/Tx: U14 (75176)	J8 (+) J7 (T) J9 (-)	D62+, D61	Half Duplex Hall Call communication. Interconnects all the cars with the Hall Call interface. The VGA communication adapter also plugs on this bus.
HL	6	P19	Rx/Tx: U23 (75176)	J26 (+) J27 (T) J25 (-)	D82+,D81	Half Duplex Hall Lantern communication

Table 5

+24VDC Power “P9”

Car functions: The SPU-LINK distributes the 24VDC power to all the SMI interface ports, to the I/O interface (V+ & VC) and to the Hall Lantern interface (HLC & HL+). The 24VDC local car power is connected to connector P9-1&2 (+24V & 24V COM) at the factory.

Group functions: According to the job configuration, the group 24VDC power is connected to P9-3&4 (VHC & VH+) and is distributed to the Hall Call (HC) ports.

Encoder Interface “P2”

Car Position Transducer (CPT): The DPP signals, DPP1 and DPP2, are sent from the car top position reader and must be shielded at P2-1 (SHIELD). These signals are in quadrature and are used to locate the car and to calculate the velocity (DPP1), and to determine the car direction (DPP2). Indicator LEDs are provided. Note that the voltage level at this connector is 5VDC.



SPU-Link Control Panel

The Control Panel interface port (P12) interconnects to the push-button/LED PC board via a flat cable type connector. To insert the cable, the top portion of the connector must be pulled to permit the ribbon cable (with the blue plastic facing down) to be inserted. The top portion is then pushed-back to squeeze the ribbon cable and provide the connection. The following table describes the control panel operation:

Control Panel Operation			
PB NAME	PB FUNCTION	LED	LED FUNCTION
SPU	STM: Setup Mode commands on Inspection. Press SPU until the Display LED turns Green (3 sec), then release and press the Display button momentarily. The Display button will alternately flash Red/Green.	OFF	Invalid Condition
		RED	Power Up or Reset (SPU not running)
		GREEN	Normal Operation
DISPLAY	Rotate the motor room diagnostic screen from car to car (x) to group.	OFF RED/ GREEN	Normal Condition Flashing Red/Green: Special operation during inspection. See SPU PB function
DISCONNECT	Changes the car service from Normal to Door Disconnect to Group Disconnect back to Normal	OFF RED RED	Doors are normal operation One flash: Door Disconnect Operation Doors will not open and car will only respond to car calls Two rapid flashes: Group disconnect Car will only respond to car calls and door will open and close normally
RESET	Reset the Counterweight Derailment Reset Earthquake latch Reset Gate/Lock Fault Reset Rope Gripper	OFF RED RED RED RED	Normal One flash: Counterweight derailment Two flashes: Earthquake Three flashes: Gate/Lock Fault On Steady: Rope Gripper Fault

Table 6

Serial Module Interface (SMI & SMIC)

The SMI and SMIC boards are always used in pairs, permitting an interface with 24 I/O circuits. The SMI connects to the communication link via an 8-pin TELCO connector (P4). This connector provides the serial communication transmit and receive signals as well as the 24VDC power.

The SMI can accept all of the I/O functions. It can be used with dedicated functions or with general purpose optional features.

Serial Module Interface I/O Base Board (SMI)

The I/O modules plug in directly in the sockets provided at each module M1 through M24. Each I/O module has both input connections brought to the terminal block. Refer to the SMI data sheets for TB/Module pin relationship. No addressing is required on the SMI. The addressing is performed on its controller, the SMIC.

The 5VDC power required for the I/O modules and the SMIC controller is provided by a high performance isolated DC-DC converter located at "U1" (HDF-2405). The isolated converter plugs-in at U1.

Card guides are provided to hold and secure the SMIC.

SMI Board

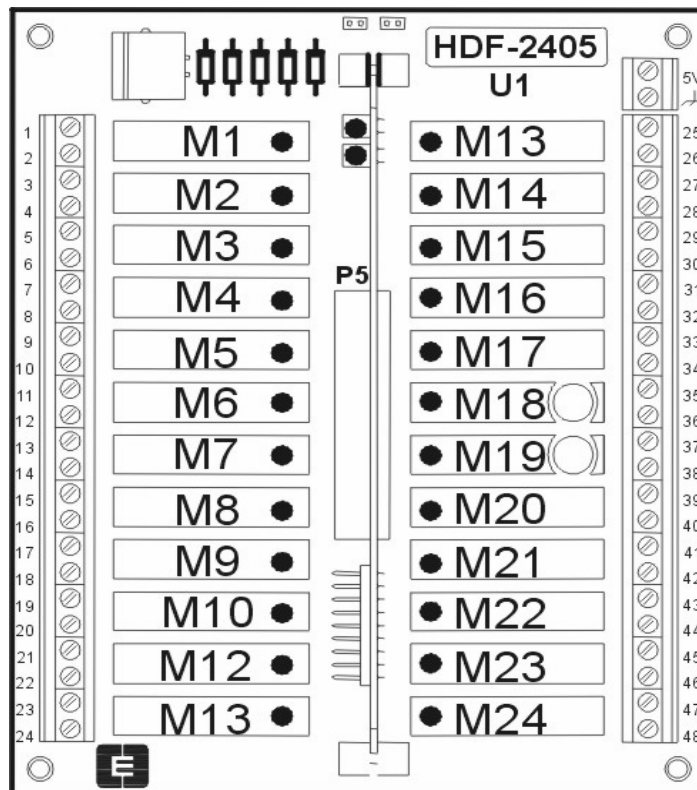


Figure 13-3



Serial Module Interface Controller Board (SMIC)

The SMIC is based on a highly integrated 8052 type microcontroller. It interconnects to the SMI via "P1". Two LEDs are provided to indicate: D1 (red LED) a reset condition which occurs at power-up or a watchdog timer reset, and D2 (green LED) which pulses when the micro-controller is communicating.

SMIC Board

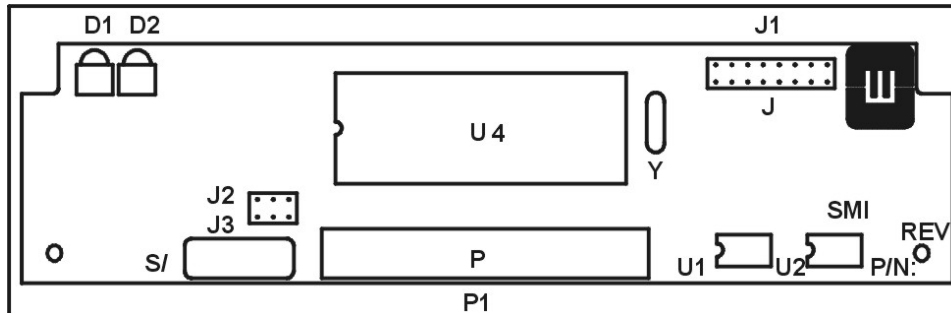


Figure 13-4

The following table lists the jumper configuration for the SMIC board.

J#	PIN	REQ	FUNCTION
J1	1-2	OUT	Termination Common
	3-4	OUT	Termination +5V
	5-6	OUT	Termination
J1	7-8	Refer to SMI Data Sheets	Address 32
	9-10		Address 16
	11-12		Address 8
	13-14		Address 4
	15-16		Address 2
	17-18		Address 1
J2	1-2	Refer to SMI Data Sheets	Module 17 Normal mode
	2-3		Module 17 gated by module 6
J3	1-2	Refer to SMI Data Sheets	Module 19 Normal mode
	2-3		Module 19 gated by module 8

Table 7



CAR DEVICES

Car Position Transducer (CPT)

The primary position transducer, located on the car top, has its own microcontroller, which interfaces with the digitizer, leveling, and preset transducers. The car position in the hoistway is digitized through a stationary steel perforated tape. The position digitizer uses two sensors (DPP1 & DPP2) to determine the direction (quadrature), velocity (within one percent) and the car position. It permits a 0.1875 inch (4.8 mm) resolution accuracy for the entire length of the hoistway. Other sensors are used to interface with the leveling (ULZ, UFLZ, MLZ, DFLZ, & DLZ) and absolute preset vanes (OP, PR1-PR32) located on the tape. During setup, the SPU learns the floor position as well as the Slowdown Limit Position and stores this data in Flash memory.

Leveling

The automatic two way leveling device provided is designed to govern the leveling of the car to within 1/4" (6.4 mm) above or below the landing sill. Any over travel, under travel, or rope stretch returns the car level to the landing sill.

The DZ connector sends the At Floor Level (FLV) and the Door Zone (DZ) signals to the main controller.

Load weighing – Hydro’s Special per Job Basis

Another function of the Car Position Transducer "CPT" is to interface with compatible load cells to measure the car load. After initial calibration, the controller will compensate for load cell variation and for the car position in the hoistway. This data is used by the dispatching system for car load information required in measuring traffic intensity and also for the main terminal dispatching. The car uses this data for anti-nuisance, by-passing, and for an overload condition.

SPU-LINK direct connections (w/o EPU-LINK):

The CPT can be configured to operate directly from the SPU-LINK twisted-pairs communication cables. The two communication cables connect at J1 while the DPP, DPP1, FLV & DZ signals connect at P20. The JP5 communication configuration jumper must be inserted.

SPU-LINK connections with CDP:

If a Communication Distribution Panel CDP is used, the 8-pin telephone cable connects at P1, and the two 4-conductor TELCO cables connect at DZ and DPP. The JP5 communication configuration jumper must be removed.

The CPT requires 24VDC to operate. The power connects at J1 (+24V, 24VCOM). When the microcontroller is powered and operates normally, the D1 (RUN) LED should illuminate. Note that the DC/DC converter U9 (HDF-2405) must be present for the CPT to operate. If the Load Weighing function is desired, U8 (HDF-2415) must be inserted.

Car Position Transducer

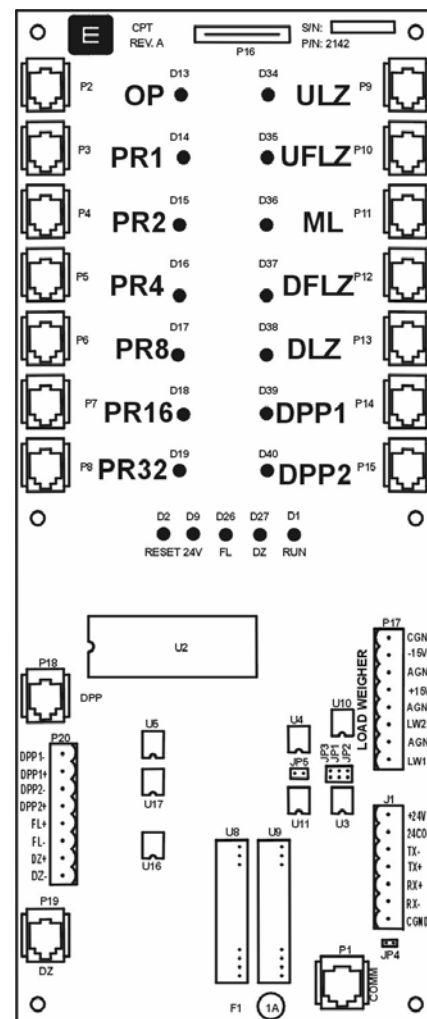


Figure 13-5

**Car Distribution Panel
(EPU-Link Board)**

The Car Distribution communication Panel (EPU-Link) is always located on the car (normally in the Top of Car [TOC] chassis).

The TOC operates from the 24VDC supply (connector JP11 +24V & 24VCOM) and requires a 5VDC DC/DC converter located at U6.

The primary function of the EPU-Link is to interface the traveling cable to the car “smart controllers”. Connectors JP8, JP9 & JP10 provide the traveling cable terminal connections while the 4-pin TELCO connectors DZ and DPP and the 8-pin TELCO connectors CPT, FDOOR, RDOOR, PI-1, PI-2, COPS, CC1, CC2, CC3, CC4 & DIAG provide the quick connection to the “smart controllers”. Status indicating LEDs and fuses are provided for the “smart” links.

EPU-Link Board

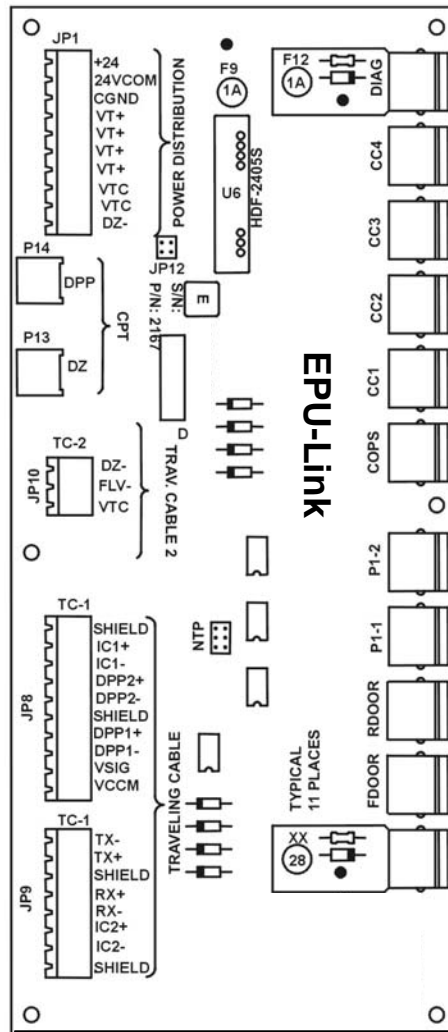


Figure 13-6



Elevator Processing Unit (EPU)

The Elevator Processing Unit (EPU) is located normally in the car station if space permits, or in the Top Of Car (TOC) box.

The EPUs are used for the Car Operating Panel (COP) signals and for all the Car Calls. The EPUs telephone communication cable plugs at P1. 24VDC power is required and is wired to the Input Power connector (+24V & 24VCOM).

Note: *The EPUs operate on 24VDC (signals and lamping). Input connectors J1 & J2, and Output connectors J3 & J4 are interconnected (meaning that J1 pin 1 is connected to J2 pin 1, J3 pin 1 is connected to J4 pin 1).*

Refer to the SMI Data sheets for job related EPU jumper configuration.

Note: *The main car station call push-button contacts connect at J1, and the main car station Button Lamps connect at J3. The auxiliary car station call push-button contacts connect at J2, and the auxiliary car station Button Lamps connect at J4.*

Elevator Processing Unit (EPU)

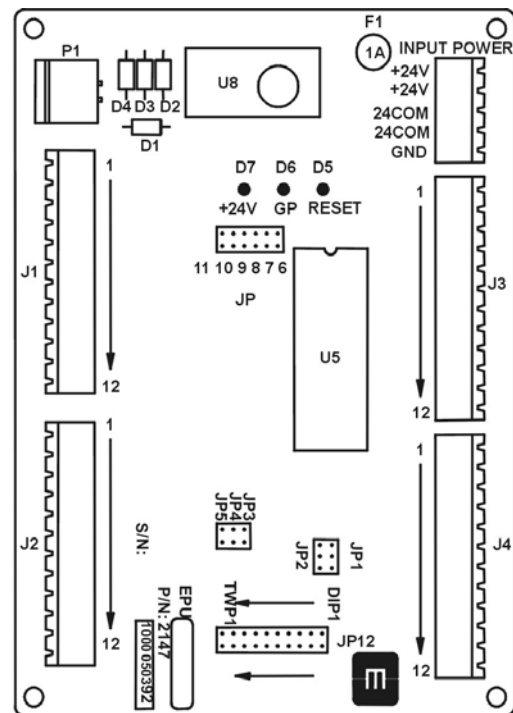


Figure 13-7

