MAINTENANCE MANUAL

CEC/IMC DIGITAL AUDIO SWITCH
T1 CONCENTRATOR CARD 188D6300P1
E1 CONCENTRATOR CARD 188D6300P2

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DESCRIPTION

GENERAL

Concentrator Cards are mounted on hinged horizontal panels at the rear of the CEC/IMC Digital Audio Switch cabinet. The use of Concentrator Cards standardizes connector pin-outs, cable types, and cable routing in and out of the CEC/IMC. External connectors on most Concentrator Cards are standard 50-pin Champ® connectors pinned-out for punch blocks. This allows connections to punch blocks via standard 25-pair Telco cables.

Each Concentrator Card is inserted into either audio paths or data paths into and out of the CEC/IMC. Audio paths include EDACS site audio, conventional radio system audio, C3 console audio and logging recorder audio. Data paths include RS-232/RS-422 serial control data signals to and from GETC uplinks, C3 consoles, the System Manager Computer and the CEC/IMC Manager (MOM PC) computer. As the CEC/IMC is greatly expandable, these listings are non-inclusive.

Except for the MOM Concentrator Card and T1/E1 Concentrator Card, which is covered by this maintenance manual, all other CEC/IMC Concentrator Cards convert the signal arrangement of the CEC/IMC Backplane 24-pin dual-row connectors to 50-pin Champ® connectors.

T1/E1 CONCENTRATOR CARD

Specifications

Height	5 inches
Width	4.25 inches
Internal Connectors	Four dual-row 24-pin headers
External Connectors	Eighteen RJ-11 receptacles

ERICSSON

Associated Cables (Internal to CEC/IMC)	193D1100P1 (PA2xx–J1/J3) 19D903628P52 (PA1xx–J2/J4) 188D6988P1 (Controller Card PA2xx–J11-15/21-25)
Associated Cables (External to CEC/IMC)	RPM1132507 (J5/J6–PI) RPM1132508 (J5/J6–CSU) Customer Supplied Cables

NOTE

See LBI-38938 for installation details.

Description

The CEC/IMC T1/E1 Concentrator Card is used exclusively for T1/E1 audio and data signal connections between the CEC/IMC Digital Audio Switch and an external T1/E1 device. This is accomplished by concentrating multiple RS-232 RJ-11 and T1/E1 line RJ-11 cables to two pairs of 24-pin cables that connect to the CEC/IMC Backplane.

Each T1 or E1 Concentrator Card includes T1/E1 line interfaces for up to 2 T1/E1 Interface Cards (TECs). The T1 and E1 Concentrator Cards also include 8 RS-232 serial port interfaces for each of the two possible T1/E1 Interface Cards. These serial ports can be multiplexed onto T1/E1 channels depending on TEC configuration. Each Concentrator Card can interface with two TECs or a redundant pair of TECs.

NOTE

TEC redundancy is not supported in the initial T1/E1 interface software release.

A T1 (188D6300P1) or E1 (188D6300P2) Concentrator Card is not interchangeable between T1 and E1 operation; the Concentrator Card must match the CEC/IMC operating mode (T1 or E1). The T1 and E1 Concentrator Cards have different coupling transformers and the T1 Concentrator Card has twelve additional resistors (R1 through R12).

T1/E1 Concentrator Card connectors J1 through J4 are the dual-row 24-pin connectors on the internal-side of the CEC/IMC. Inside the CEC/IMC cabinet a Concentrator Card cable connects J1, J2, J3, and J4 to the CEC/IMC Backplane. J1 and J2 connect to the primary or first (A) TEC and J3 and J4 connect to the redundant, or second, (B) TEC. Connectors J1and J3 carry the T1/E1 signals and LINE_RELAY_EN as well as serial/subrate ports 1-3 and half of port 4. Connectors J2 and J4 carry the other half of port 4, ports 5-8, the common Rx clock (RX_CLK_A, RX_CLK_B), and power (+5V_A, +5V_B) for the relays.

Connectors J5 and J6 are the RJ-11 modular connectors connecting the T1/E1 Concentrator Card to the external T1/E1 device. Connectors J11 through J18 are the RJ-11 modular connectors providing subrate ports 1 through 8, respectively, for TEC A. Connectors J21 through J28 are the RJ-11 modular connectors providing subrate ports 1 through 8, respectively, for TEC B.

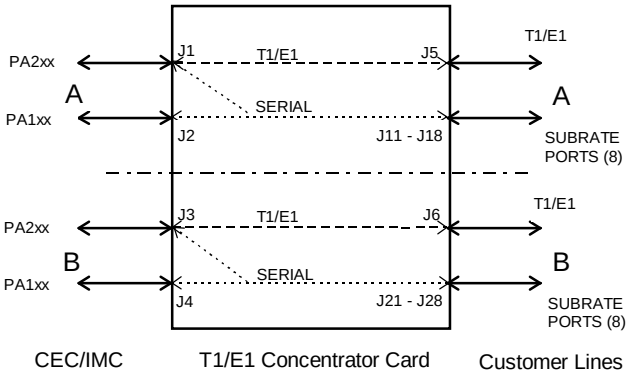
Operation

The CEC/IMC T1/E1 Concentrator Card provides interfaces for redundant and non-redundant operating modes. These modes are:

- Two non-redundant TECs with two T1/E1 lines
- One TEC with redundant (2) T1/E1 lines
- Redundant TEC pair with one T1/E1 line
- Redundant TEC pair and redundant (2) T1/E1 lines

Two non-redundant TECs with two T1/E1 lines

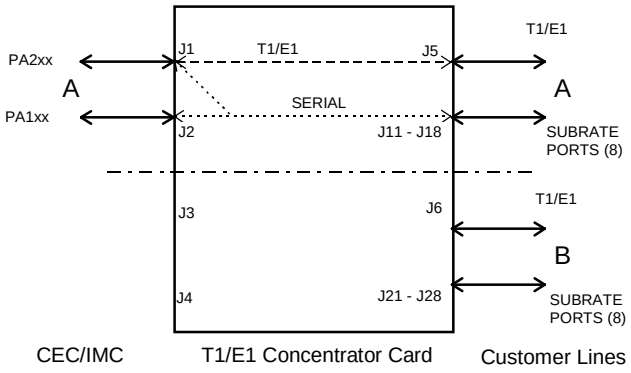
A T1/E1 Concentrator Card can support two non-redundant TECs as shown in the below diagram. The T1/E1 Concentrator Card could be considered as two separate cards, each supporting a single TEC. With each TEC operating independently of the other, TEC A knows nothing (and cares nothing) about TEC B, and vice-versa.



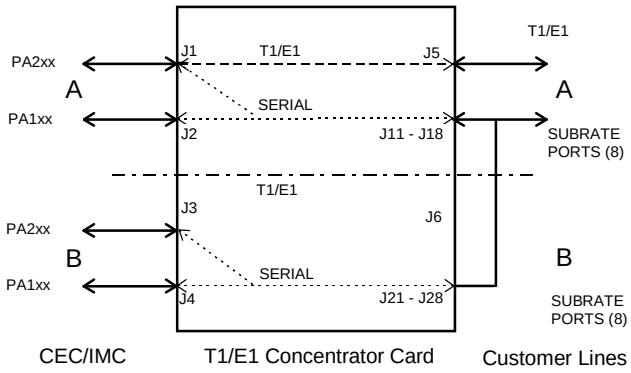
2 TECs – 2 T1/E1 Lines

One TEC with redundant (2) T1/E1 lines

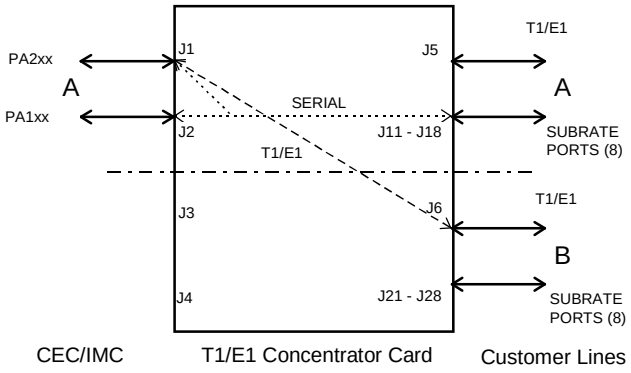
A T1/E1 Concentrator Card can also provide a single TEC with redundant line capability (T1/E1 signal only) as shown below. If the TEC senses a fault condition on its primary T1/E1 line (A), it will cause the T1/E1 Concentrator Card to switch the T1/E1 signal path to the secondary/redundant T1/E1 line (B). The serial signal path (subrate ports) is not switched to Port B. The Subrate Ports A will remain connected to TEC A.



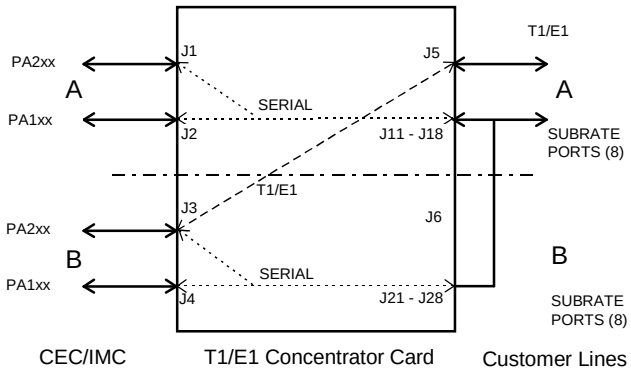
1 TEC – 2 T1/E1 Lines (before switching)



2 TECs 1 T1/E1 Line (before switching)



1 TEC – 2 T1/E1 Lines (after switching)



2 TECs 1 T1/E1 Line (after switching)

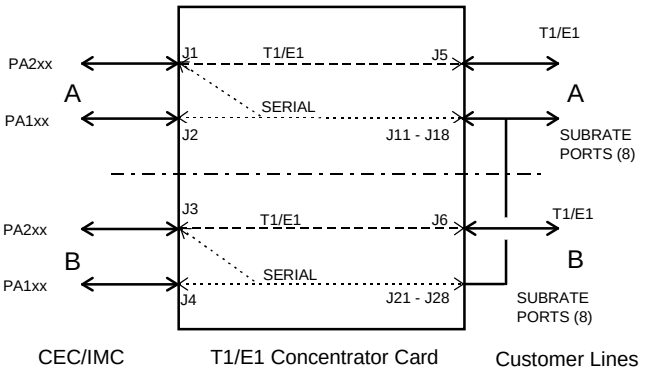
Redundant TEC pair with one T1/E1 line

A T1/E1 Concentrator Card can support a single T1/E1 line with redundant TECs as shown below. In the below scenario TEC A would be the primary TEC, connected to T1/E1 Line A and TEC B would be the secondary/redundant TEC, in an idle/standby mode. TEC A would "control" the T1/E1 Concentrator Card because it is the primary TEC. If TEC B becomes the primary TEC, the T1/E1 Concentrator Card would switch TEC B to T1/E1 Line A, which would take over T1/E1 interface responsibility.

If the subrate ports are being utilized in this redundancy mode the port connections should be paralleled. This enables TEC B to have access to the subrate ports if it becomes the primary TEC.

Redundant TEC pair and redundant (2) T1/E1 lines

This operating mode is very similar to the two non-redundant TECs with two T1/E1 lines (first case) in which the T1/E1 Concentrator Card could be considered as two separate cards, each supporting a single TEC operating independently of the other. However, in this mode only one interface (A or B) is used at a particular time and the subrate ports should be paralleled. Also, there is no T1/E1 Concentrator Card relay activation (no TEC control). TEC switching (and line switching) is handled within the CEC/IMC.



2 TECs – 2 T1/E1 Lines

For more detailed information about the above TEC redundant and non-redundant operating combinations refer to *T1/E1 Interface Card 188D5909P1 Maintenance Manual* (LBI-39107).

Control Relays

Each T1/E1 Interface Card (TEC) is equipped with an open-collector relay control output. This output (LINE_RELAY_ENable) controls the two relays (K1 and K2) on the T1/E1 Concentrator Card. LINE_RELAY_ENable signals from the two TECs of a redundant TEC pair are paralleled together at the T1/E1 Concentrator Card. Drive control (the ability to energize the relays) is granted only when a TEC is in primary mode. If the Concentrator Card is being used in a non-redundant mode LINE_RELAY_Enable will never be activated from the TECs.

During normal operation, with either one TEC or a TEC pair, relays K1 and K2 are de-energized, TEC A is connected to Line A, and TEC B to Line B. These relays are maintained in a de-energized state by the TEC open-collector (Q9 on the TEC) output—LINE_RELAY_EN—operating in the high/OFF state.

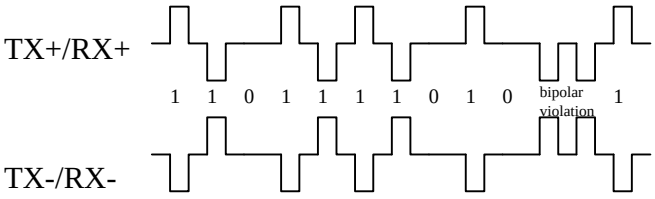
During some redundant configuration modes the relays are energized. Relays K1 and K2 are energized when the TEC open-collector (Q9 on the TEC) output—LINE_RELAY_EN—goes to the low/ON state, which creates a current flow from the load sharing power supply through the coils of K1 and K2. When K1 and K2 are energized the relays switch from Normally Open (NO) to Normally Closed (NC); TEC A will be connected to Line B, and TEC B will be connected to Line A. One TEC with redundant (2) T1/E1 lines and Redundant TEC pair with one T1/E1 line operating modes operate in this manner.

T1/E1 Line Connections

T1/E1 signal connections between the TEC and the line coupling transformers on the T1/E1 Concentrator Card are provided by four (4) bi-polar connections identified XL1, XL2, RL1, and RL2. XL1 and XL2 are the ternary transmit connections and RL1 and RL2 are the ternary receive connections from the line coupling transformers.

The T1/E1 signals present at the RJ-11 connectors are in a differential bipolar signal format called Symmetrical Pair Alternate Mark Inversion (AMI). AMI is a line code that uses alternating pulses (positive and negative) of 50% duty cycle to represent binary ones, a binary zero (0) is represented by the absence of a pulse. The pulses alternate, after a one (1) represented by positive pulse the next binary one (1) must be represented by a negative pulse. A bipolar violation is when two successive pulses of the same polarity occur. Bipolar violations are sometimes used to maintain ones density (for clock extraction) during long strings of zeroes.

Symmetrical Pair **A**lternate **M**ark **I**nversion



Line Coupling Transformers

The line coupling transformers on the T1 and E1 Concentrator Cards provide proper impedance matching for the T1 or E1 line. The transformer interface is designed so that the same transformer can be used on the TX and RX paths. The TX path does not use the center tap transformer configuration. The TEC outputs a 2.5VDC reference voltage, VDD2, for the receive line coupling transformer center tap.

T1 Concentrator Card

The T1 Concentrator Card transformers have 26+26:69 windings (VAC402/558). The resistor combination described below provides a 100Ω T1 line impedance. The transmit transformers have a 4.31Ω series resistance between the transformer and the TEC on both lines of the transmit pair. The 4.31Ω resistance is formed by two 12.1Ω resistors (R1-R4, R7-R10) and a 15.0Ω resistor (R20, R21, R24, R25) in parallel.

$$\frac{1}{\frac{1}{12.1\Omega}+\frac{1}{12.1\Omega}+\frac{1}{15.0\Omega}} = 4.31\Omega$$

The T1 receive transformers are center tapped on the TEC side and have a 28.76Ω resistance across the positive terminal (RL1) and the center tap (VDD2) and another 28.76Ω resistance across the negative terminal (RL2) and

the center tap (VDD2). The 28.76Ω resistance is formed by a 54.9Ω resistor (R5, R6, R11, R12) in parallel with a 60.4Ω resistor (R22, R23, R26, R27).

$$\frac{1}{\frac{1}{54.9\Omega}+\frac{1}{60.4\Omega}} = 28.76\Omega$$

E1 Concentrator Card

The E1 Concentrator Card transformers have 26+26:52 windings (VAC402/556). The resistor combination described below provides a 120Ω E1 line impedance. The transmit transformers have a 15.0Ω series resistor (R20, R21, R24, R25) between the transformer and the TEC on both lines of the transmit pair.

The receive transformers are center tapped on the TEC side and have a 60.4Ω resistor (R22, R26) across the positive terminal (RL1) and the center tap (VDD2) and another 60.4Ω (R23, R27) resistor across the negative terminal (RL2) and the center tap (VDD2). Resistors R1-R12 are not populated on the E1 Concentrator Card.

Load Sharing Power Supply

A load sharing power supply (+5V) is created for the relays by a pair of diodes (D1 and D2). Load sharing allows the concentrator card to function if either one of the +5V supplies (from the TECs) fails or is not present. Resistor R20 ensures that the diodes are always forward biased and provide current no matter how little current the relays draw. Capacitor C3 provides filtering for the power supply.

Test Points

The only test points on the card are +5V (TP1) and GND (TP2).

TABLE 1 – T1/E1 CONCENTRATOR CARD PIN-OUTS (J1)

INTERNAL CONNECTOR (24-PIN)	EXTERNAL CONNECTORS (RJ-11)	CARD DEVICES	SIGNAL NAME	SIGNAL USE
J1	J11 – J14	T1, T2, K1, K2		
1		K1–16, K2–16	LINE_RELAY_EN	Concentrator Card relay control
2		T1–3, T1–5	XL1_A	TEC A Transmit Line
3		T1–6, T1–8	XL2_A	TEC A Transmit Line
4		T2–3	RL1_A	TEC A Receive Line
5		T2–5, T2–8	VDD2_A	TEC A 2.5 VDC Reference Voltage
6		T2–6	RL2_A	TEC A Receive Line
7	J11–4		TX1_232_A	TEC A Subrate Port 1 RS-232 transmit data
8	J11–6		TX1_CLK_232_A	TEC A Subrate Port 1 RS-232 transmit clock
9	J11–2		RX1_232_A	TEC A Subrate Port 1 RS-232 receive data
10	J11–3		RX1_CLK_232_A	TEC A Subrate Port 1 RS-232 receive clock
11	J11–5		GND	TEC A Subrate Port 1 RS-232 data ground
12	J12–5		GND	TEC A Subrate Port 2 RS-232 data ground
13	J12–4		TX2_232_A	TEC A Subrate Port 2 RS-232 transmit data
14	J12–6		TX2_CLK_232_A	TEC A Subrate Port 2 RS-232 transmit clock
15	J12–2		RX2_232_A	TEC A Subrate Port 2 RS-232 receive data
16	J12–3		RX2_CLK_232_A	TEC A Subrate Port 2 RS-232 receive clock
17	J13–4		TX3_232_A	TEC A Subrate Port 3 RS-232 transmit data
18	J13–6		TX3_CLK_232_A	TEC A Subrate Port 3 RS-232 transmit clock
19	J13–2		RX3_232_A	TEC A Subrate Port 3 RS-232 receive data
20	J13–3		RX3_CLK_232_A	TEC A Subrate Port 3 RS-232 receive clock
21	J13–5		GND	TEC A Subrate Port 3 RS-232 data ground
22	J14–5		GND	TEC A Subrate Port 4 RS-232 data ground
23	J14–4		TX4_232_A	TEC A Subrate Port 4 RS-232 transmit data
24	J14–6		TX4_CLK_232_A	TEC A Subrate Port 4 RS-232 transmit clock

TABLE 2 – T1/E1 CONCENTRATOR CARD PIN-OUTS (J2)

INTERNAL CONNECTOR (24-PIN)	EXTERNAL CONNECTORS (RJ-11)	CARD DEVICES	SIGNAL NAME	SIGNAL USE
J2	J11 – J18	N/A		
1	J14–2		RX4_232_A	TEC A Subrate Port 4 RS-232 receive data
2	J14–3		RX4_CLK_232_A	TEC A Subrate Port 4 RS-232 receive clock
3	J15–4		TX5_232_A	TEC A Subrate Port 5 RS-232 transmit data
4	J15–6		TX5_CLK_232_A	TEC A Subrate Port 5 RS-232 transmit clock
5	J15–2		RX5_232_A	TEC A Subrate Port 5 RS-232 receive data
6	J15–3		RX5_CLK_232_A	TEC A Subrate Port 5 RS-232 receive clock
7	J15–5		GND	TEC A Subrate Port 5 RS-232 data ground
8	J16–5		GND	TEC A Subrate Port 6 RS-232 data ground
9	J16–4		TX6_232_A	TEC A Subrate Port 6 RS-232 transmit data
10	J16–6		TX6_CLK_232_A	TEC A Subrate Port 6 RS-232 transmit clock
11	J16–2		RX6_232_A	TEC A Subrate Port RS-232 receive data
12	J16–3		RX6_CLK_232_A	TEC A Subrate Port 6 RS-232 receive clock
13	J17–4		TX7_232_A	TEC A Subrate Port 7 RS-232 transmit data
14	J17–6		TX7_CLK_232_A	TEC A Subrate Port 7 RS-232 transmit clock
15	J17–2		RX7_232_A	TEC A Subrate Port 7 RS-232 receive data
16	J17–3		RX7_CLK_232_A	TEC A Subrate Port 7 RS-232 receive clock
17	J17–5		GND	TEC A Subrate Port 7 RS-232 data ground
18	J18–5		GND	TEC A Subrate Port 8 RS-232 data ground
19	J18–4		TX8_232_A	TEC A Subrate Port 8 RS-232 transmit data
20	J18–6		TX8_CLK_232_A	TEC A Subrate Port 8 RS-232 transmit clock
21	J18–2		RX8_232_A	TEC A Subrate Port 8 RS-232 receive data
22	J18–3		RX8_CLK_232_A	TEC A Subrate Port 8 RS-232 receive clock
23			+5V_A	5 VDC Power from TEC A
24	J11 thru J18–1		RX_CLK_A	common subrate port synchronous data clock from TEC A

TABLE 3 – T1/E1 CONCENTRATOR CARD PIN-OUTS (J3)

INTERNAL CONNECTOR (24-PIN)	EXTERNAL CONNECTORS (RJ-11)	CARD DEVICES	SIGNAL NAME	SIGNAL USE
J3	J21 – J24	K1, K2, T3, T4		
1		K2–16, K1–16	LINE_RELAY_EN	Concentrator Card relay control
2		T3–3, T3–5	XL1_B	TEC B Transmit Line
3		T3–6, T3–8	XL2_B	TEC B Transmit Line
4		T4–3	RL1_B	TEC B Receive Line
5		T4–5, T4–8	VDD2_B	TEC B 2.5 VDC Reference Voltage
6		T4–6	RL2_B	TEC B Receive Line
7	J21–4		TX1_232_B	TEC B Subrate Port 1 RS-232 transmit data
8	J21–6		TX1_CLK_232_B	TEC B Subrate Port 1 RS-232 transmit clock
9	J21–2		RX1_232_B	TEC B Subrate Port 1 RS-232 receive data
10	J21–3		RX1_CLK_232_B	TEC B Subrate Port 1 RS-232 receive clock
11	J21–5		GND	TEC B Subrate Port 1 RS-232 data ground
12	J22–5		GND	TEC B Subrate Port 2 RS-232 data ground
13	J22–4		TX2_232_B	TEC B Subrate Port 2 RS-232 transmit data
14	J22–6		TX2_CLK_232_B	TEC B Subrate Port 2 RS-232 transmit clock
15	J22–2		RX2_232_B	TEC B Subrate Port 2 RS-232 receive data
16	J22–3		RX2_CLK_232_B	TEC B Subrate Port 2 RS-232 receive clock
17	J23–4		TX3_232_B	TEC B Subrate Port 3 RS-232 transmit data
18	J23–6		TX3_CLK_232_B	TEC B Subrate Port 3 RS-232 transmit clock
19	J23–2		RX3_232_B	TEC B Subrate Port 3 RS-232 receive data
20	J23–3		RX3_CLK_232_B	TEC B Subrate Port 3 RS-232 receive clock
21	J23–5		GND	TEC B Subrate Port 3 RS-232 data ground
22	J24–5		GND	TEC B Subrate Port 4 RS-232 data ground
23	J24–4		TX4_232_B	TEC B Subrate Port 4 RS-232 transmit data
24	J24–6		TX4_CLK_232_B	TEC B Subrate Port 4 RS-232 transmit clock

TABLE 4 – T1/E1 CONCENTRATOR CARD (J4)

INTERNAL CONNECTOR (24-PIN)	EXTERNAL CONNECTORS (RJ-11)	CARD DEVICES	SIGNAL NAME	SIGNAL USE
J4	J21 – J28	N/A		
1	J24–2		RX4_232_B	TEC B Subrate Port 4 RS-232 receive data
2	J24–3		RX4_CLK_232_B	TEC B Subrate Port 4 RS-232 receive clock
3	J25–4		TX5_232_B	TEC B Subrate Port 5 RS-232 transmit data
4	J25–6		TX5_CLK_232_B	TEC B Subrate Port 5 RS-232 transmit clock
5	J25–2		RX5_232_B	TEC B Subrate Port 5 RS-232 receive data
6	J25–3		RX5_CLK_232_B	TEC B Subrate Port 5 RS-232 receive clock
7	J25–5		GND	TEC B Subrate Port 5 RS-232 data ground
8	J26–5		GND	TEC B Subrate Port 6 RS-232 data ground
9	J26–4		TX6_232_B	TEC B Subrate Port 6 RS-232 transmit data
10	J26–6		TX6_CLK_232_B	TEC B Subrate Port 6 RS-232 transmit clock
11	J26–2		RX6_232_B	TEC B Subrate Port 6 RS-232 receive data
12	J26–3		RX6_CLK_232_B	TEC B Subrate Port 6 RS-232 receive clock
13	J27–4		TX7_232_B	TEC B Subrate Port 7 RS-232 transmit data
14	J27–6		TX7_CLK_232_B	TEC B Subrate Port 7 RS-232 transmit clock
15	J27–2		RX7_232_B	TEC B Subrate Port 7 RS-232 receive data
16	J27–3		RX7_CLK_232_B	TEC B Subrate Port 7 RS-232 receive clock
17	J27–5		GND	TEC B Subrate Port 7 RS-232 data ground
18	J28–5		GND	TEC B Subrate Port 8 RS-232 data ground
19	J28–4		TX8_232_B	TEC B Subrate Port 8 RS-232 transmit data
20	J28–6		TX8_CLK_232_B	TEC B Subrate Port 8 RS-232 transmit clock
21	J28–2		RX8_232_B	TEC B Subrate Port 8 RS-232 receive data
22	J28–3		RX8_CLK_232_B	TEC B Subrate Port 8 RS-232 receive clock
23			+5V_B	5 VDC Power from TEC B
24	J21 thru J28–1		RX_CLK_B	common subrate port synchronous data clock from TEC B

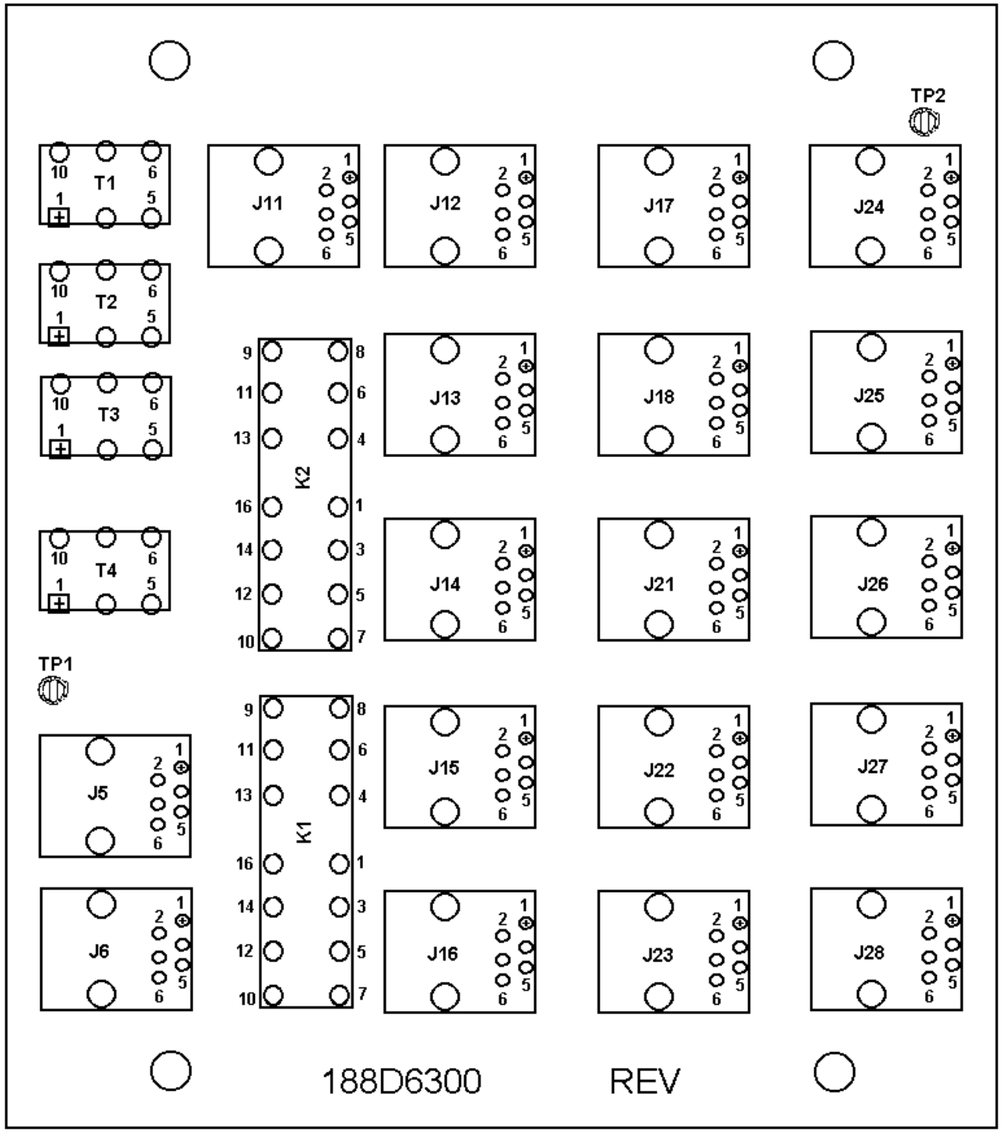
T1/E1 CONCENTRATOR CARD

T1 Concentrator Card (188D6300P1)

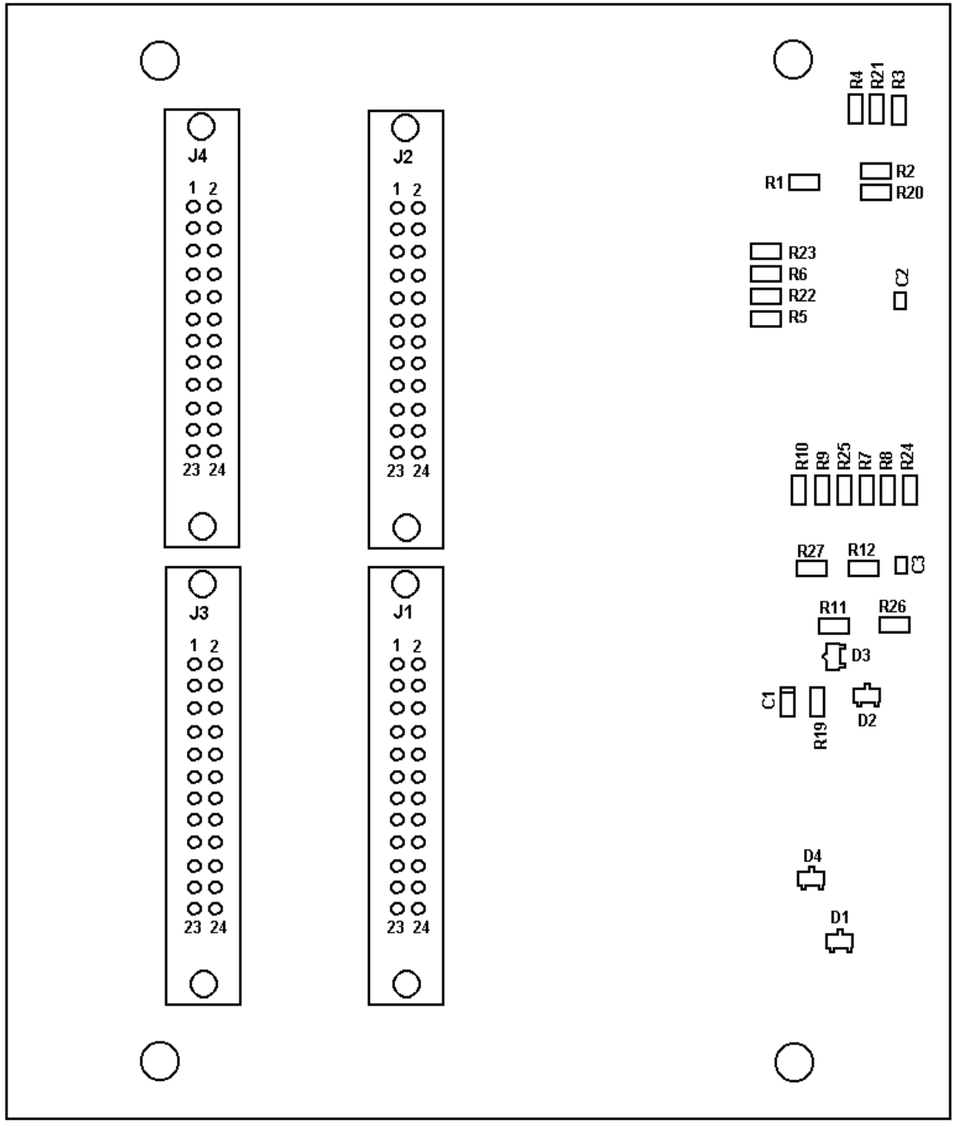
SYMBOL	PART NUMBER	DESCRIPTION
		----------CAPACITORS ----------
C1	19A705205P12	Tantalum: .33 uF, 16 VDCW; sim to Sprague 293D.
C2 and C3	19A702052P4	Ceramic: 680 pF ±10%, 50 VDCW.
		---------- DIODES ----------
D1 thru D4	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
		---------- JACKS ----------
J1 thru J4	19B235546P7	Connector, header: 24-position double row; sim to AMP 102156-5.
J5 and J6	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
J11 thru J18	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
J21 thru J28	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
		---------- RELAYS ----------
K1 and K2	19B235003P3	Miniature: 4 Form C contacts (4PDT); sim to AROMAT DS4E-M-DC5V.
		----------RESISTORS----------
R1 thru R4	19A702931P9	Metal film: 12.1 ohms ±1%, 200 VDCW, 1/8 w.
R5 and R6	19A702931P72	Metal film: 54.9 ohms ±1%, 200 VDCW, 1/8 w.
R7 thru R10	19A702931P9	Metal film: 12.1 ohms ±1%, 200 VDCW, 1/8 w.
R11 and R12	19A702931P72	Metal film: 54.9 ohms ±1%, 200 VDCW, 1/8 w.
R19	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R20 and R21	19A702931P18	Metal film: 15.0 ohms ±1%, 200 VDCW, 1/8 w.
R22 and R23	19A702931P76	Metal film: 60.4 ohms ±1%, 200 VDCW, 1/8 w.
R24 and R25	19A702931P18	Metal film: 15.0 ohms ±1%, 200 VDCW, 1/8 w.
R26 and R27	19A702931P76	Metal film: 60.4 ohms ±1%, 200 VDCW, 1/8 w.
		----------TRANSFORMERS----------
T1 thru T4	REG13559/2	Coupling, encapsulated: 3 windings, 2.67:1:1 turns ratio.
		---------- TEST POINTS ----------
TP1 and TP2	344A3367P1	Metal loop with orange insulator.

E1 Concentrator Card (188D6300P2)

SYMBOL	PART NUMBER	DESCRIPTION
		---------- CAPACITORS----------
C1	19A705205P12	Tantalum: .33 uF, 16 VDCW; sim to Sprague 293D.
C2 and C3	19A702052P4	Ceramic: 680 pF ±10%, 50 VDCW.
		---------- DIODES ----------
D1 thru D4	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
		---------- JACKS ----------
J1 thru J4	19B235546P7	Connector, header: 24-position double row; sim to AMP 102156-5.
J5 and J6	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
J11 thru J18	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
J21 thru J28	344A3288P1	Modular jack: 6-position; sim to AMP 520425-3.
		---------- RELAYS ----------
K1 and K2	19B235003P3	Miniature: 4 Form C contacts (4PDT); sim to AROMAT DS4E-M-DC5V.
		----------RESISTORS----------
R19	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R20 and R21	19A702931P18	Metal film: 15.0 ohms ±1%, 200 VDCW, 1/8 w.
R22 and R23	19A702931P76	Metal film: 60.4 ohms ±1%, 200 VDCW, 1/8 w.
R24 and R25	19A702931P18	Metal film: 15.0 ohms ±1%, 200 VDCW, 1/8 w.
R26 and R27	19A702931P76	Metal film: 60.4 ohms ±1%, 200 VDCW, 1/8 w.
		----------TRANSFORMERS----------
T1 thru T4	REG13559/1	Coupling, encapsulated: 3 windings, 2:1:1 turns ratio.
		---------- TEST POINTS ----------
TP1 and TP2	344A3367P1	Metal loop with orange insulator.



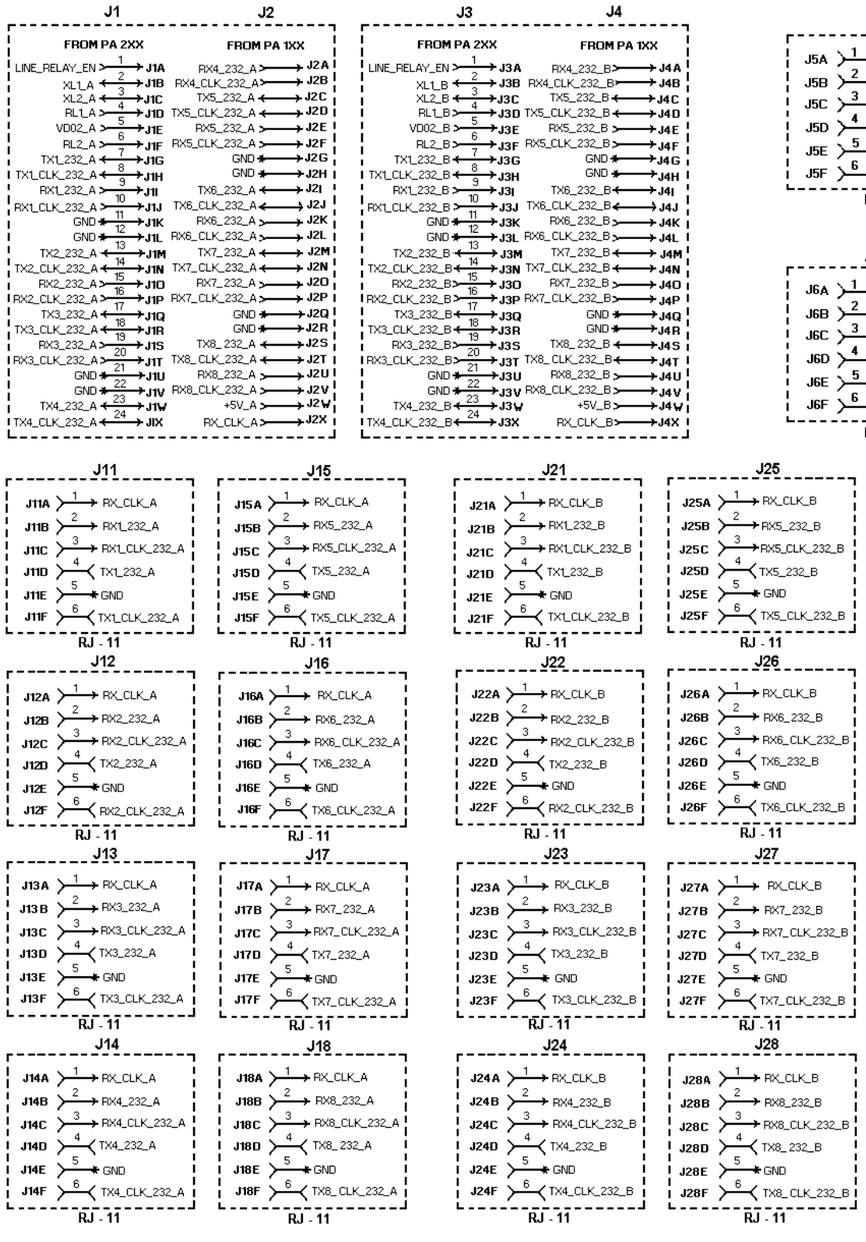
EXTERNAL TO CEC/IMC

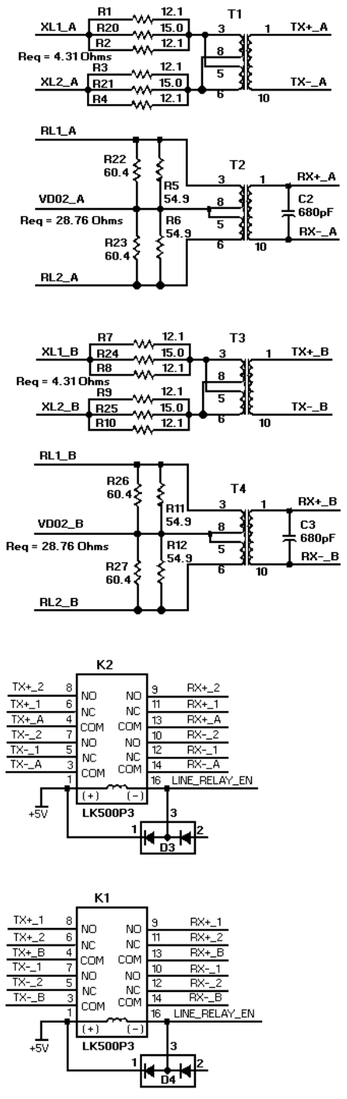


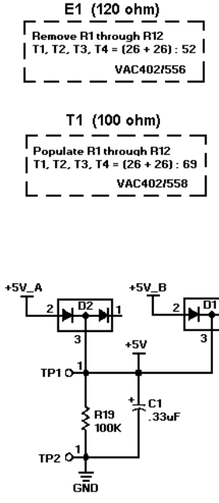
INTERNAL TO CEC/IMC

T1/E1 CONCENTRATOR CARD
188D6300P1
188D6300P2

(188D6300, Rev. 2)







E1 (120 ohm)
Remove R1 through R12
T1, T2, T3, T4 = (26 + 26) : 52
VAC402/556

T1 (100 ohm)
Populate R1 through R12
T1, T2, T3, T4 = (26 + 26) : 69
VAC402/558

T1/E1 CONCENTRATOR CARD
188D6300P1
188D6300P2
(188D6302, Rev. 1A)

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