GE Medical Systems

Technical Publications

2119701–100

Revision 4

MP Phase 4 + Vascular Option Generator Central Listings

do not duplicate

ATTENTION

LES APPAREILS À RAYONS X SONT DANGEREUX À LA FOIS POUR LE PATIENT ET POUR LE MANIPULATEUR SI LES MESURES DE PROTECTION NE SONT PAS STRICTEMENT APPLIQUEES

Bien que cet appareil soit construit selon les normes de sécurité les plus sévères, la source de rayonnement X représente un danger lorsque le manipulateur est non qualifié ou non averti. Une exposition excessive au rayonnement X entraîne des dommages à l'organisme.

Par conséquent, toutes les précautions doivent être prises pour éviter que les personnes non autorisées ou non qualifiées utilisent cet appareil créant ainsi un danger pour les autres et pour elles–mêmes.

Avant chaque manipulation, les personnes qualifiées et autorisées à se servir de cet appareil doivent se renseigner sur les mesures de protection établies par la Commission Internationale de la Protection Radiologique, Annales 26 : Recommandations de la Commission Internationale sur la Protection Radiologique et les normes nationales en vigueur.

WARNING

X–RAY EQUIPMENT IS DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful x–ray beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to x–radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the Recommendations of the International Commission on Radiological Protection, contained in Annals Number 26 of the ICRP, and with applicable national standards.

ATENCION

LOS APARATOS DE RAYOS X SON PELIGROSOS PARA EL PACIENTE Y EL MANIPULADOR CUANDO LAS NORMAS DE PROTECCION NO ESTAN OBSERVADAS

Aunque este aparato está construido según las normas de seguridad más estrictas, la radiación X constituye un peligro al ser manipulado por personas no autorizadas o incompetentes. Una exposición excesiva a la radiación X puede causar daños al organismo.

Por consiguiente, se deberán tomar todas las precauciones necesarias para evitar que las personas incompetentes o no autorizadas utilicen este aparato, lo que sería un peligro para los demás y para sí mismas.

Antes de efectuar las manipulaciones, las personas habilitadas y competentes en el uso de este aparato, deberán informarse sobre las normas de protección fijadas por la Comisión Internacional de la Protección Radiológica, Anales No 26: Recomendaciónes de la Comisión Internacional sobre la Protección Radiológica y normas nacionales.

ACHTUNG

RÖNTGENAPPARATE SIND EINE GEFAHR FÜR PATIENTEN SOWIE BEDIENUNGSPERSONAL, WENN DIE GELTENDEN SICHERHEITSVORKEHRUNGEN NICHT GENAU BEACHTET WERDEN

Dieser Apparat entspricht in seiner Bauweise strengsten elektrischen und mechanischen Sichereitsnormen, doch in den Händen unbefugter oder unqualifizierter Personen wird er zu einer Gefahrenquelle. Übermäßige Röntgenbestrahlung ist für den menschlichen Organismus schädlich.

Deswegen sind hinreichende Vorsichtsmaßnahmen erforderlich, um zu verhindern, daßunbefugte oder unqualifizierte Personen solche Geräte bedienen oder sich selbst und andere Personen deren Bestrahlung aussetzen können.

Vor Inbetriebnahme dieses Apparats sollte sich das qualifizierte und befugte Bedienungspersonal mit den geltenden Kriterien für den gefahrlosen Strahleneinsatz durch sorgfältiges Studium des Hefts Nr. 26 der Internationalen Kommission für Strahlenschutz (ICRP) vertraut machen: Empfehlungen der Internationalen Kommission für Strahlenschutz und anderer nationaler Normenbehörden.

WARNING

VOLTAGE PRESENT

Before any intervention in the positioner cabinet Switch **OFF** INT1 and DJ1 on the motor drive supply (VPE1A1A23).

Turn **OFF** power to cabinet (VAMP power unit positioner CB)

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WARNING

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**
- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

AVERTISSEMENT

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**
- **NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.**
- **LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.**

WARNUNG

- **DIESES KUNDENDIENST–HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**
- **VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST–HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

AVISO

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

ATENÇÃO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A' CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

警告

・このサービスマニュアルには英語版しかありません。
・ＧＥＭＳ以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。
・このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないで下さい。
・この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

注意:

- 本维修手册仅存有英文本。
- 非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。
- 未详细阅读和完全了解本手册之前，不得进行维修。
- 忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	July 15, 1995	MP Phase 4 (Ph. 4) + Vascular Option Generator. New sm Part No. 2119701−100 (old Part No.: 36004387).
1	October 16, 1996	Updated INT/2 Board
2	December 2, 1997	Updated Measure and Commutation Board (SPR BUCge29090)
3	August 18, 1998	Updated table 9–2, ST3 closed inst. of open (SPR BUCge36525)
4	February 20, 2001	Modified section 16 (COSEL MODEL) and added new section 17 (Introduction of ASTEC LVPS) (SPR BUCge60730)

LIST OF EFFECTIVE PAGES

PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER
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Safety Instructions	4				
i thru viii	4				
1 thru 66	4				

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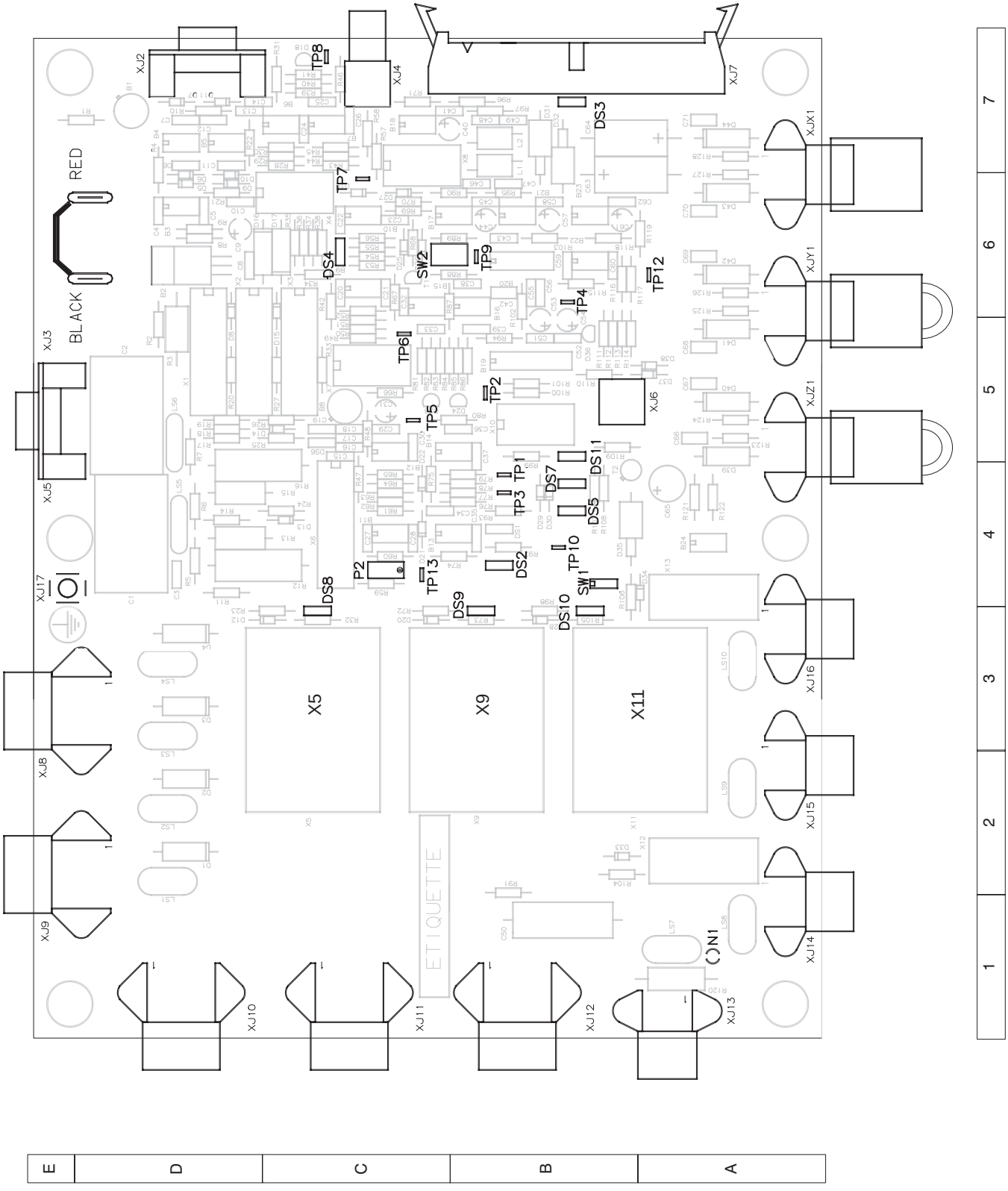
SECTION 1
MP Phase 41 A1 A1 MEASURE AND COMMUTATION BOARD 2131256

ILLUSTRATION 1
MP PHASE 41 A1 A1 MEASURE AND COMMUTATION BOARD



1–1 Switches

Switch	NOTES	SCHEMATIC LOCATION	FUNCTION	LAYOUT LOCATION
SW1	Frequency selection for HV relay	3–G1	50 Hz or 60 Hz	B4
SW2	ON : Dissymetry enable	5–C3	Normal setting for dissymetry detection	C6
	OFF : Dissymetry disable		Test setting for HV divider calibration	

1–2 Adjustments

Pot.	NOTES	SCHEMATIC LOCATION	SETTINGS	LAYOUT LOCATION
P2	kV Probe Adjust	5–F3	1 V = 20 kV	C4

1–3 Test points

TEST POINT	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL VALUE OR RANGE	LAYOUT LOCATION
TP1	KV+	4–D4	DC	0 V to +10 V scale: 1 V = 8 kV	B5
TP2	(KV–) – (KV+) for dissymetry	5–E3	DC	–10 V to+10 V	B5
TP3	+ (KV–)	5–G3	DC	0 V to +10 V	B4
TP4	SMA	1–D4	DC	+7.2 V	B6
TP5	KV–	4–E1	DC	0 V to 10 V scale: 1 V = 8 kV	C5
TP6	DKV–	4–D1	DC	0 V to 10 V	C6
TP7	KV	4–A3	DC	–10 V to +10 V scale: 1 V = 8 kV (0 V = 80 kV)	C7
TP8	SKV	4–E3	DC	+10.5 V	C7
TP9	DISS	5–B3	DC	0 V to +15 V	B6
TP10	GND	2–D3	DC	0 V	B4
TP12	MAX	1–C4	DC	0 V to +15 V	A6
TP13	KV PROBE	5–E4	DC	0 V to +7.5 V scale: 1 V = 20 kV	C4

1–4 Indicator lights

LED (DS) or NEON (N)	COLOR	SCHEMATIC LOCATION	INDICATION	LAYOUT LOCATION
DS1	Green	2–C3	P15V	B4
DS2	Green	2–C2	N15V	B4
DS3	Green	2–G4	PKV–	B7
DS4	Green	2–F4	PKV+	C6
DS5	Green	2–G3	mA x 10	B4
DS6	Green	2–E4	TST	C5
DS7	Green	2–F3	mA x 1	B4
DS8	Green	2–F4	Tube 2 (see table)	C4
DS9	Green	2–E4	Tube 3 (see table)	B4
DS10	Green	2–D4	Tube 4 (see table)	B4
DS11	Green	2–D3	FLUORO (mA x 0.1)	B5
N1	Neon	3–G2	220 V AC present	B1

TABLE 1 **mA RANGE LEDS**

DS11	DS7	DS5	mA range	Measurement scale on XJ6 (BNC)
0	0	1	10 to 80 mA	20 mA for 1 V
0	1	0	100 to 1250 mA	200 mA for 1 V
1	0	0	0 to 20 mA (fluoro)	2 mA for 1 V

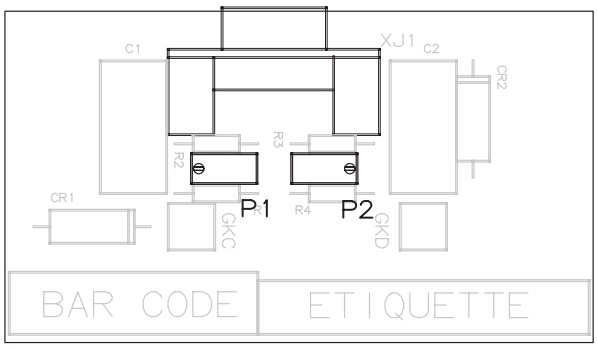
TABLE 2 **TUBE SELECTION LEDS**

DS8	DS9	DS10	Tube selected
0	0	0	Tube 1
1	0	0	Tube 2
1	1	0	Tube 3
1	1	1	Tube 4

1 = LED lit

SECTION 2
MP PHASE 41 A1 A2 HV DIVIDER BOARD

ILLUSTRATION 2
MP PHASE 41 A1 A2 HV DIVIDER BOARD LAYOUT



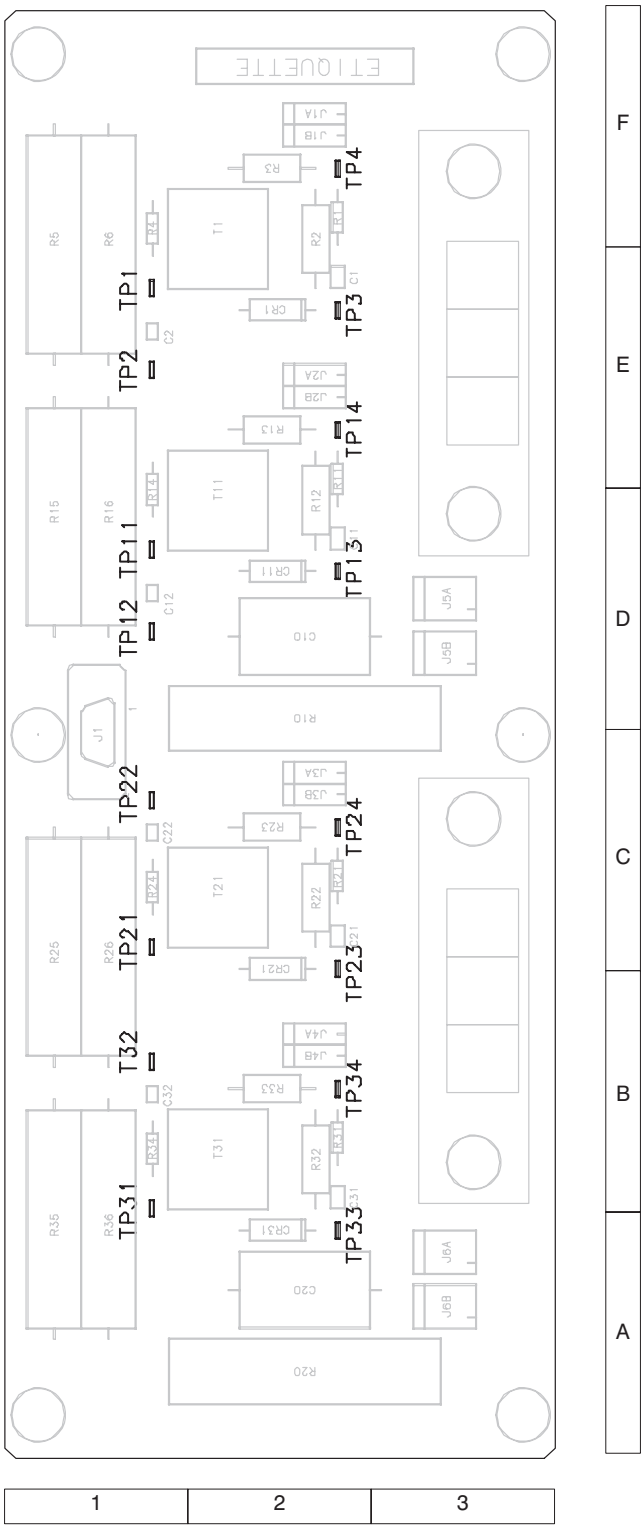
2–1 Adjustments

Pot.	NOTES	SCHEMATIC LOCATION	SETTINGS
P1	kV measure +	D3	Adjust voltage ratio and overshoot adjustment (1 V = 8 kV)
P2	kV measure –	D2	

These potentiometers are factory set and paint-locked.

SECTION 3
MP PHASE 41 A1 A3 QUENCH BOARD 218181

ILLUSTRATION 3
MP PHASE 41 A1 A3 QUENCH BOARD LAYOUT (PART 1)



3–1 Test points

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
TP1	Trigger control	A9	Analog	0 V–48 V	E1
TP2	24 V	A11	Analog	24 V	E1
TP3	Trigger voltoge	A4	Analog	0 V–10 V	E2
TP4	Cathode voltage	B4	Analog		F2
TP11	Trigger control	C9	Analog	0 V–48 V	D1
TP12	24 V	B10	Analog	24 V	D1
TP13	Trigger voltoge	B4	Analog	0 V–10 V	D2
TP14	Cathode voltage	C4	Analog		E2
TP21	Trigger control	E9	Analog	0 V–48 V	C1
TP22	24 V	D10	Analog	24 V	C1
TP23	Trigger voltoge	D4	Analog	0 V–10 V	C2
TP24	Cathode voltage	E4	Analog		C2
TP31	Trigger control	F9	Analog	0 V–48 V	A1
TP32	24 V	E11	Analog	24 V	B1
TP33	Trigger voltoge	E4	Analog	0 V–10 V	A2
TP34	Cathode voltage	F4	Analog		B2

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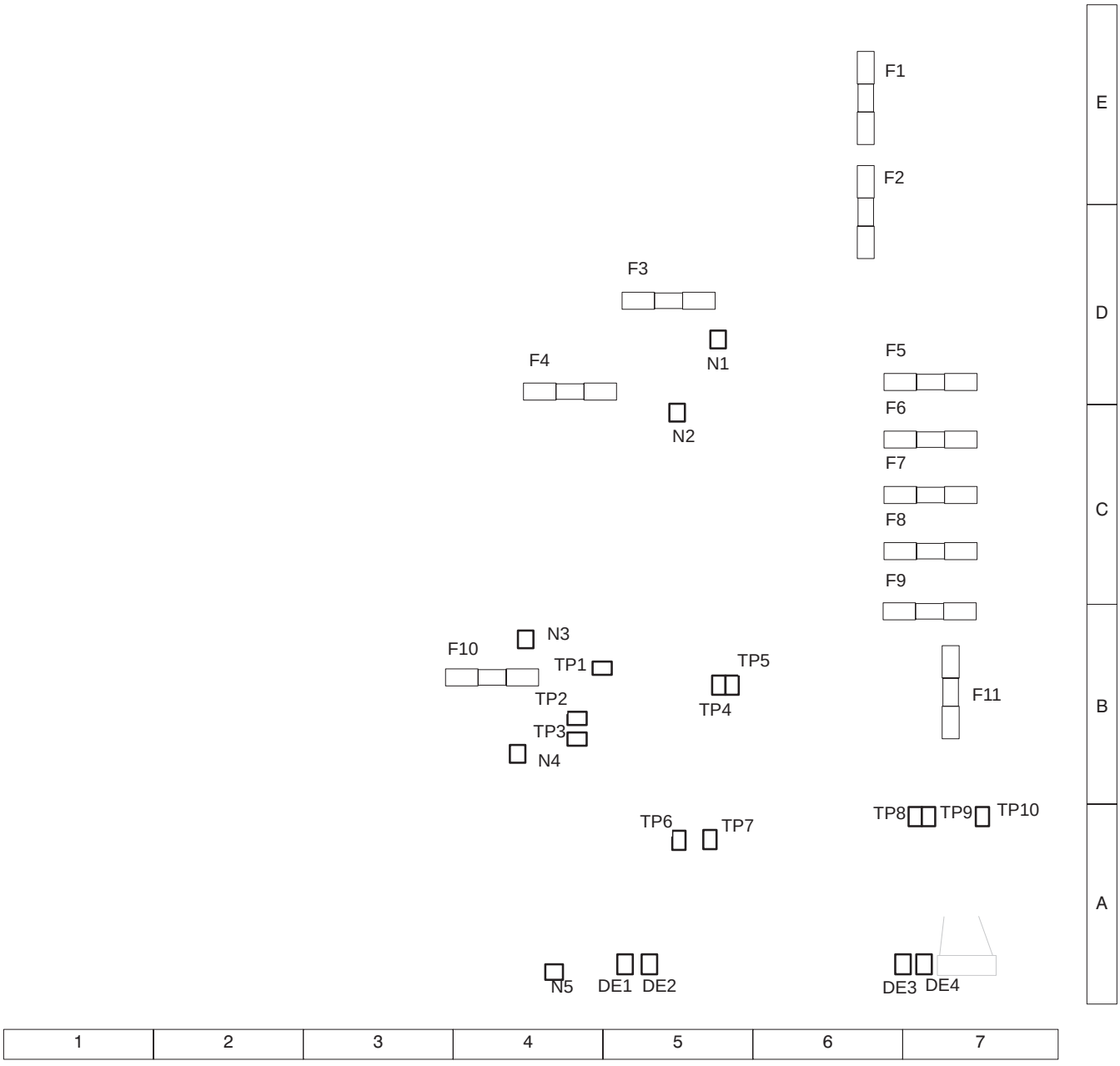
SECTION 4
MP Phase 41 A4 A1 AC SUPPLY BOARD 45203921

ILLUSTRATION 4
MP PHASE 41 A4 A1 AC SUPPLY BOARD LAYOUT



4–1 Indicator lights

LED (DE) or NEON (N)	COLOR	SCHEMATIC LOCATION	SETTINGS	LAYOUT LOCATION
DE1	Green	2–C4	Enable Init. power control (± E Power ON)	A5
DE2	Red	2–C5	Fault on ± 300 V DC	A5
DE3	Green	3–B7	Line Supply present	A7
DE4	Green	3–B4	AUX Power present	A7
N1	Amber	1–J4	220 V TR1 present	D5
N2	Amber	1–K11	Ø2 } 3-phase voltages present	C5
N3	Amber	1–K11	Ø1 } 3-phase voltages present	B4
N4	Amber	1–L11	Ø3 } 3-phase voltages present	B4
N5	Amber	1–D14	300 V DC present E>80 V	A4

4–2 Fuses

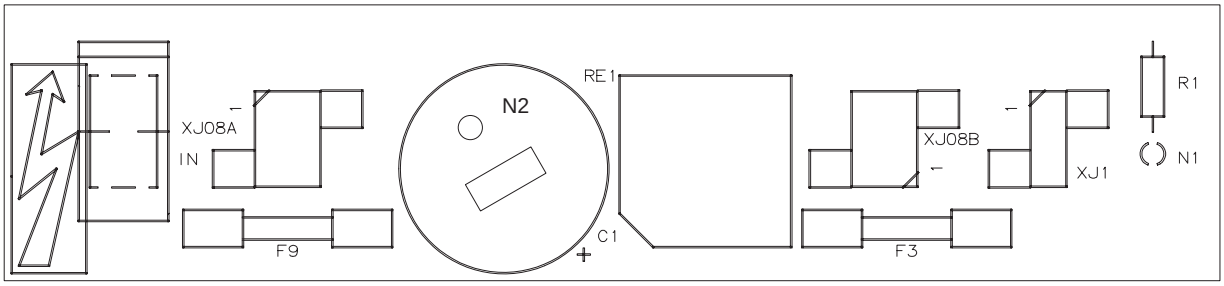
FUSE	FUNCTION	SCHEMATIC LOCATION	VALUE	LAYOUT LOCATION
F1	1st TR1 secondary winding protect	1–I4	250 V 0.5 A SB	E6
F2	2nd TR1 secondary winding protect	1–I4	250 V 0.5 A SB	E6
F3	Not used			
F4	LV+ Switching Supply protect	1–K10	250 V 6.25 A SB	D4
F5	Inverter 2 Fan Supply protect	1–N6	250 V 0.5 A SB	D6
F6	Inverter 1 Fan Supply protect	1–N7	250 V 0.5 A SB	C6
F7	Fan Supply Cabinet protect	1–N8	250 V 0.5 A SB	C6
F8	HV Switches protect	1–N10	250 V 3.2 A SB	C6
F9	Not used			
F10	Coil X2 protection	1–K9	250 V 0.5 A SB	B3
F11	LV Supply protect	1–N5	250 V 6.25 A SB	B7

4–3 Test points

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL VALUE OR RANGE	ILLUSTRATION LOCATION
TP1	0/12 VB ON	2–O7	DC	0	B4
TP2	present (+ 300 V)	2–N5	DC	1 V = 200 V	B4
TP3	+ E Fault	2–J5	DC	0 V – 12 V	B4
TP4	Full Power Control Enable	2–C3	DC	0 V – 12 V	B5
TP5	Init Power Control Enable	2–C3	DC	0 V – 12 V	B5
TP6	Phase monitor check	3–F6	DC	0 V – 12 V	A5
TP7	Power ON	3–C4	DC	0 V – 12 V	A5
TP8	AUX Power Enable	3–A5	DC	0 V – 12 V	A6
TP9	Enable Shunt of R22	3–A6	DC	0 V – 12 V	A7
TP10	0/12 VA ON	3–H7	DC	0	A7

SECTION 5
MP PHASE 41 A4 A2 ON/OFF SERVICE BOARD 45561065

ILLUSTRATION 5
MP PHASE 41 A4 A2 ON/OFF SERVICE BOARD LAYOUT



5–1 INDICATOR LIGHTS

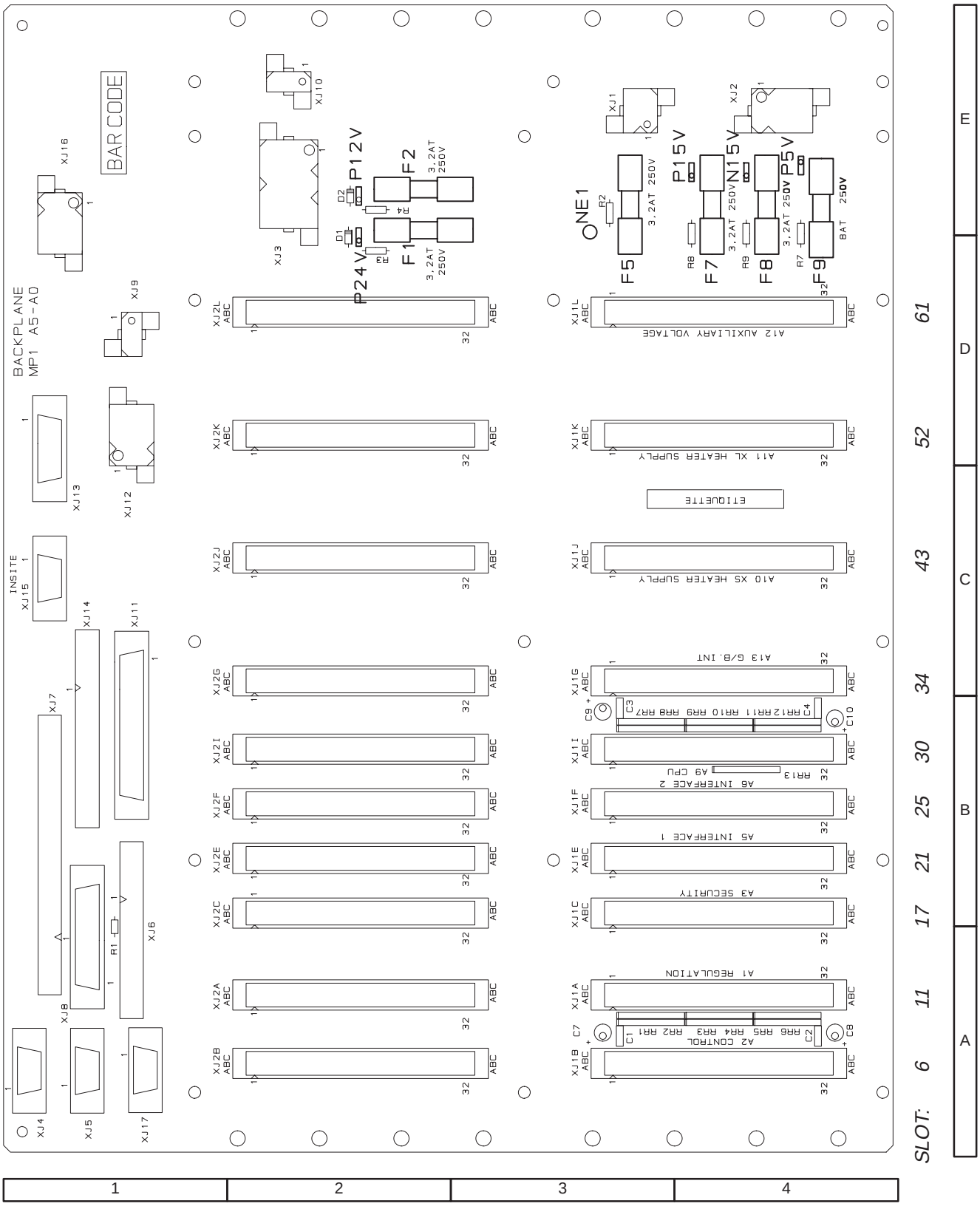
NEON	COLOR	INDICATION	SCHEMATIC LOCATION
N1	Amber	INPUT POWER	L2
N2	Amber	DC POWER	K2

5–2 FUSES

FUSE	FUNCTION	SCHEMATIC LOCATION	VALUE
F3	TR1 primary winding protect	M2	250 V 0.5 A SB
F9	LV supply protect	N2	250 V 6.25 A SB

SECTION 6
MP PHASE 41 A5 CONTROL CARD RACK BACKPLANE 2127663

ILLUSTRATION 6
MP PHASE 41 A5 CONTROL CARD RACK BACKPLANE LAYOUT



6–1 INDICATOR LIGHTS

LED or NEON	COLOR	SCHEMATIC LOCATION	NAME AND FUNCTION		LAYOUT LOCATION
P 24 V	Green	4–E5	+ 24 V ON	(Inverter gate supply)	E2
P 12 V	Green	4–E5	+ 12 V ON		E2
P 15 V	Green	1–E4	+ 15 V ON	(from LV Supply)	E4
N 15 V	Green	1–E3	– 15 V ON	(from LV Supply)	E4
P 5 V	Green	1–E5	+ 5 V ON	(from LV Supply)	E4
Neon NE1	Amber	5–E6	200 V AC OK	(for auxiliary voltage board)	E3

6–2 FUSES

FUSE	TYPE	SCHEMATIC LOCATION	NAME AND FUNCTION		LAYOUT LOCATION
F1	3.2 AT 250 V	4–D5	+ 24 V ON	(Inverter gate supply)	D2
F2	3.2 AT 250 V	4–D5	+ 12 V ON		E2
F5	3.2 AT 250 V	5–D6	200 V AC OK	(for auxiliary voltage board)	E3
F7	3.2 AT 250 V	1–D4	+ 15 V ON	(from LV Supply)	E4
F8	3.2 AT 250 V	1–D3	– 15 V ON	(from LV Supply)	E4
F9	8 AT 250 V	1–D4	+ 5 V ON	(from LV Supply)	E4

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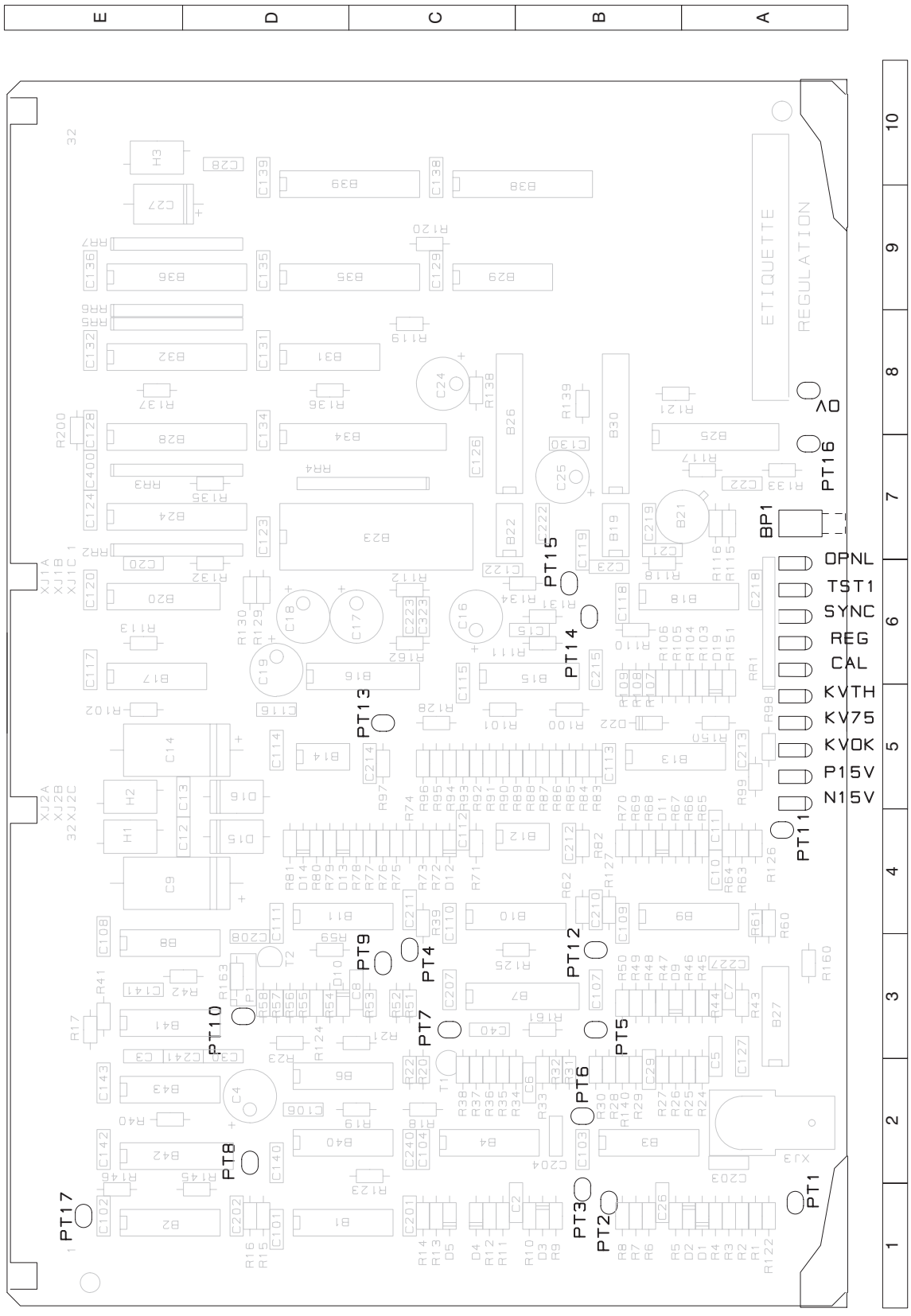
SECTION 7
MP PHASE 41 A5 A1 REGULATION BOARD 2125964

ILLUSTRATION 7
MP PHASE 41 A5 A1 REGULATION BOARD LAYOUT



7–1 INDICATOR LIGHTS

LED	COLOR	SCHEMATIC LOCATION	FUNCTION	LAYOUT LOCATION
N15V	Green	2–F2	– 15 V ON	A5
P15V	Green	2–F2	+ 15 V ON	A5
KVOK	Green	4–B7	kV MEAS within± 10 % kV REF	A5
KV75	Green	4–B7	kV MEAS > 75 % kV REF	A5
KVTH	Green	4–B7	kV MEAS > kV THRESHOLD	A5
CAL	Yellow	4–B7	CALIBRATION MODE	A6
REG	Yellow	4–B7	Non Linear regulation	A6
SYNC	Green	4–B7	Exposure started	A6
TST1	Yellow	4–B7	Synchro simulation (diagnostic)	A6
OPNL	Yellow	4–B7	Open Loop Control	A6

7–2 SWITCH

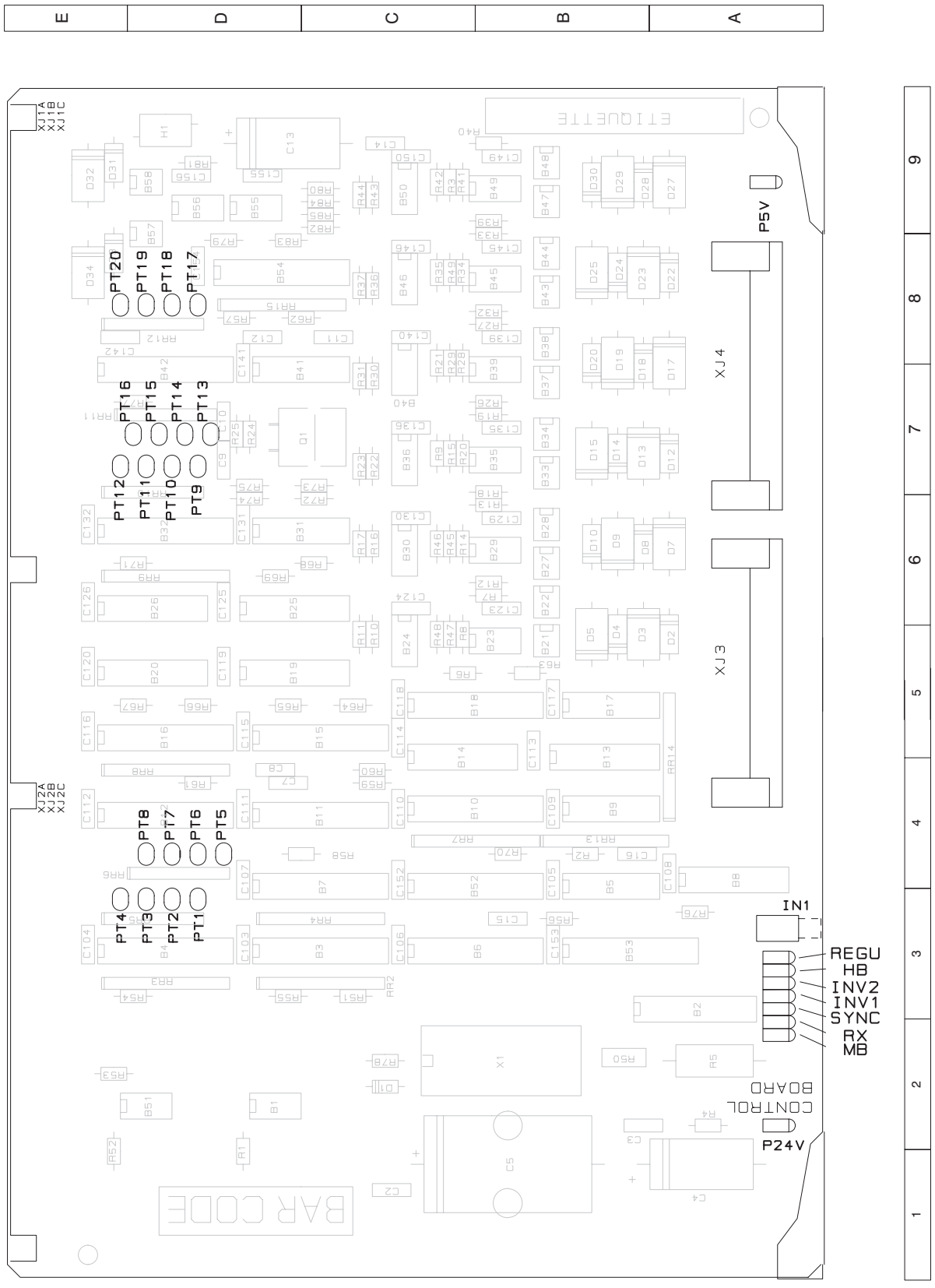
SWITCH	FUNCTION	SCHEMATIC LOCATION	COMMENT	LAYOUT LOCATION
BP1	LED test	4–B6	Press switch to light all LEDs.	A7

7–3 TEST POINTS

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	ILLUSTRATION LOCATION
OVL	Logic ground	1–D1	0/5 V	0 V	A8
OVA	Analog ground	2–F2	0/15 V	0 V	A8
PT1	REF – 10 V	2–D1	DC	–10 V	A1
PT2	kV measurement	3–F8	DC	–10 to +10 V	B1
PT3	MEAS KV	3–E6	DC	0 to 10 V	B1
PT4	VCO Input	4–C2	DC	–10 to 0 V	C3
PT5	∫ kV MEAS–kV MEAS	3–C8	pulse	–10 to +10 V	B3
PT6	kV peak	3–E3	DC	0 to 10 V	B2
PT7	ERROR	4–F6	DC	0 to 10 V	C3
PT8	FREQ	4–A2	Pulse	0 to 5 V	D2
PT9	VERR	4–C5	DC	0 to 10 V	C3
PT10	VERR integrated	4–D5	DC	0 to 10 V	D3
PT11	KV REF	2–D6	DC	0 to 10 V	A4
PT12	kV CORRECTED	2–B4	DC	0 to 1 V	B3
PT13	KV THRESHOLD	2–A3	DC	0 to 1 V	C5
PT14	D.KV CORRECTED	2–D3	DC	0 to 10 V	B6
PT15	D.KV THRESHOLD	2–D3	DC	0 to 10 V	B6
PT16	ASSIGNMENT	2–A8	DC	0 to +10 V	A7

SECTION 8
MP PHASE 41 A5 A2 CONTROL BOARD 2126768

ILLUSTRATION 8
MP PHASE 41 A5 A2 CONTROL BOARD LAYOUT



8–1 INDICATOR LIGHTS

LED	COLOR	SCHEMATIC LOCATION	FUNCTION	LAYOUT LOCATION
P24V	Green	2–E1	+ 24 V ON	A2
MB	Yellow	1–G5	Mini bridge operation	A2
RX	Yellow	1–G6	X–Ray Exposure Control	A2
SYNC	Green	1–G6	Exposure Started	A3
INV1	Yellow	1–G6	Inverter 1 Control	A3
INV2	Yellow	1–G6	Inverter 2 Control	A3
HB	Yellow	1–G6	Half bridge operation	A3
REGU	Yellow	1–G5	Non Linear regulation	A3
P5V	Green	3–B3	+ 5 V ON	A9

8–2 SWITCH

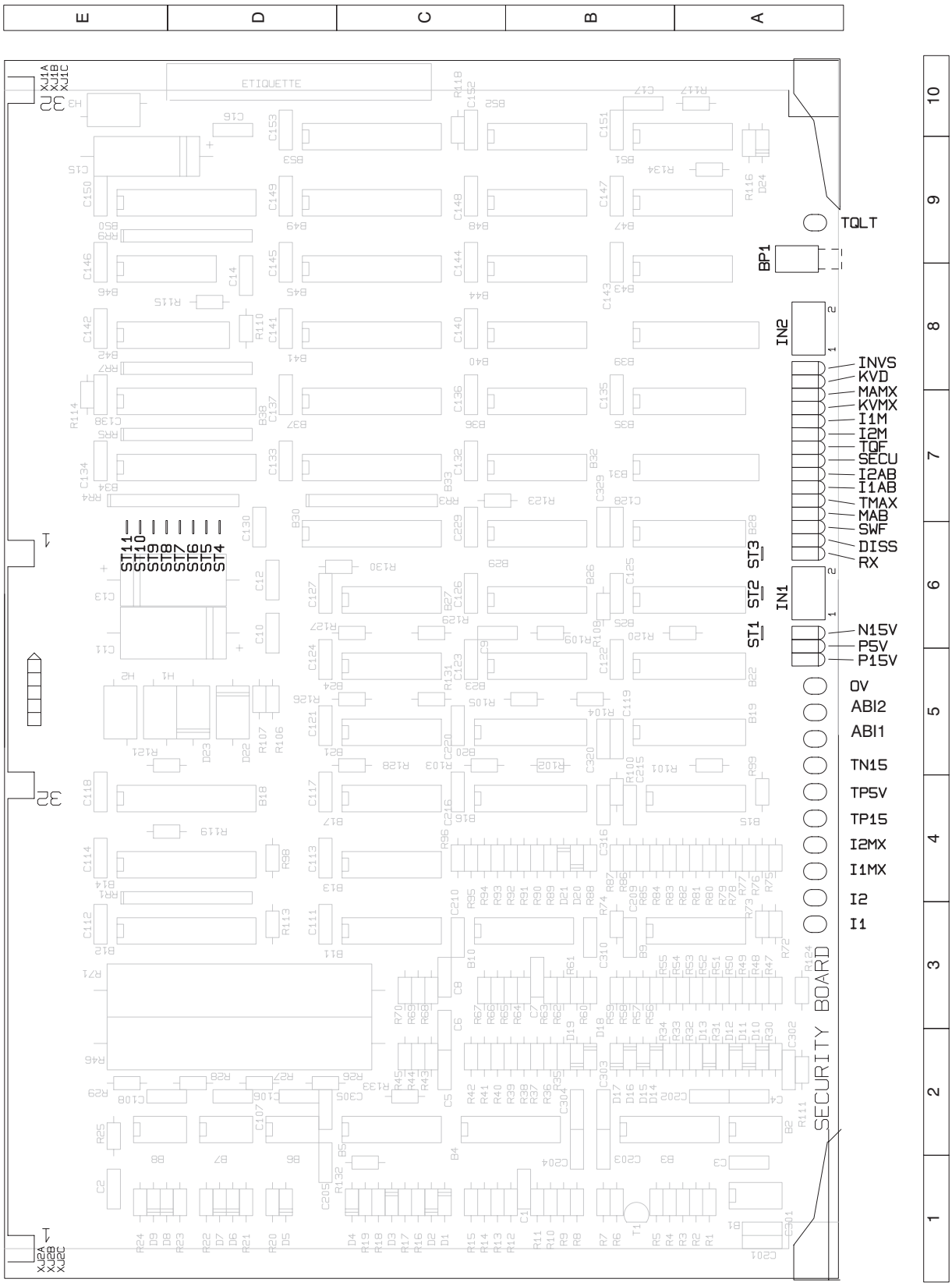
SWITCH	FUNCTION	SCHEMATIC LOCATION	COMMENT	LAYOUT LOCATION
IN1	LED test	1–G4	Press switch to light all LEDs.	A3

8–3 TEST POINTS

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
PT1	RFB2	2–B6	Pulse	0 V/5 V	D3
PT2	RHB1	2–B6	Pulse	0 V/5 V	D3
PT3	RFB1	2–B6	Pulse	0 V/5 V	D3
PT4	PINV1	2–B6	Pulse	0 V/5 V	E3
PT5	PINV2	2–B4	Pulse	0 V/5 V	D4
PT6	$\overline{\text{SYNCHRO}}$	2–B4	Pulse	0 V/5 V	D4
PT7	X–Ray Exposure	2–C4	Pulse	0 V/5 V	D4
PT8	RHB2	2–C4	Pulse	0 V/5 V	D4
PT9	P61	2–B8	Pulse	0 V/5 V	D7
PT10	P51	2–B8	Pulse	0 V/5 V	D7
PT11	P31	2–C8	Pulse	0 V/5 V	D7
PT12	P41	2–C8	Pulse	0 V/5 V	E7
PT13	P11	2–C6	Pulse	0 V/5 V	D7
PT14	P21	2–C6	Pulse	0 V/5 V	D7
PT15	P32	2–C3	Pulse	0 V/5 V	D7
PT16	P42	2–C3	Pulse	0 V/5 V	D7
PT17	P52	2–B4	Pulse	0 V/5 V	D8
PT18	P62	2–B4	Pulse	0 V/5 V	D8
PT19	P22	2–B4	Pulse	0 V/5 V	D8
PT20	P12	2–B4	Pulse	0 V/5 V	E8

SECTION 9
MP PHASE 41 A5 A3 SECURITY BOARD

ILLUSTRATION 9
MP PHASE 41 A5 A3 SECURITY BOARD LAYOUT



9–1 SWITCHES

SWITCH	FUNCTION	SCHEMATIC LOCATION	NOTES	LAYOUT LOCATION
IN1	Selects mode of MAINS ON signal Switch on position 2: CPU enables+ 300 V Switch on position 1: + 300 V is always OFF	2–B5	 IN1 must be in position 2 in application mode Position 1 is used for troubleshooting	A6
IN2	Selects the mode of reset for SECURITY signal Switch on position 2: Fault detected is reset after delay (1, 2, or 4 ms) Switch on position 1: Fault detected is reset at end of the exposure	2–C6	 IN2 must be in position 2 in application mode Position 1 is used for troubleshooting	A8
BP1	LED test	2–A6	All LEDs light when switch is depressed	A9

9–2 JUMPERS

JUMPER	FUNCTION	SCHEMATIC LOCATION	POSITION	LAYOUT LOCATION
ST1	2 ms delay selected for reset after fault	2–D6	Open	A6
ST2	1 ms delay selected for reset after fault	2–D6	Open	A6
ST3	4 ms delay selected for reset after fault	2–D6	Closed (soldered)	A6
ST4	Address Selection	1–G5	All jumpers must be soldered	D6
ST5	Address Selection	1–G5		
ST6	Address Selection	1–G5		
ST7	Address Selection	1–G5		
ST8	Address Selection	1–G5		E6
ST9	Address Selection	1–G5		
ST10	Address Selection	1–G5		
ST11	Address Selection	1–G5		

9–3 INDICATOR LIGHTS

LED	COLOR	SCHEMATIC LOCATION	FUNCTION	ILUSTRATION LOCATION
P15V	Green	6–F2	+ 15 V ON	A5
P5V	Green	6–F4	+ 5 V ON	A6
N15V	Green	6–F1	– 15 V ON	A6
RX	Yellow	2–B2	X–Ray Exposure Control	A6
DISS	Red	2–B7	Dissymetry between HV+ and HV–	A6
SWF	Red	2–B3	Security Switch	
MAB	Red	2–B3	± 300 V absent	A7
TMAX	Red	2–B3	Time out fault	A7
I1AB	Red	2–B3	No current in inverter 1	A7
I2AB	Red	2–B3	No current in inverter 2	A7
SECU	Red	2–B4	Fault is detected	A7
TQF	Red	2–B7	Thyristor tq fault	A7
I2M	Red	2–B7	Current max in inverter 2	A7
I1M	Red	2–B7	Current max in inverter 1	A7
KVMX	Red	2–B7	KV MEAS > KV max.	A7
MAMX	Red	2–B7	mA tube > mA tube max.	A7
KVD	Red	2–B6	KV MEAS drop	A8
INVS	Yellow	2–B6	Inverters enabled	A8

9–4 Test points (TP)

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	ILLUSTRATION LOCATION
I1	Current sense of inverter 1	3–F4	AC	± (V < 15 V)	6–A3
I2	Current sense of inverter 2	4–F4	AC	± (V < 15 V)	
I1MX	Current max in inverter 1	3–B6	DC	5 V	
I2MX	Current max in inverter 2	4–B6	DC	5 V	6–A4
TP15	+ 15 V ON	6–F3	DC	+ 15 V	
TP5V	+ 5 V ON	6–F5	DC	+ 5 V	
TN15	– 15 V ON	6–F1	DC	– 15 V	
ABI2	No current in inverter 2	4–A4	DC	5 V	
ABI1	No current in inverter 1	3–A4	DC	5 V	6–A5
0V	0/5 V and 0/15 V	6–F4	DC	0 V	
TQLT	Inverter 1 or inverter 2 tq is reached	5–C1	DC	5 V	6–A9

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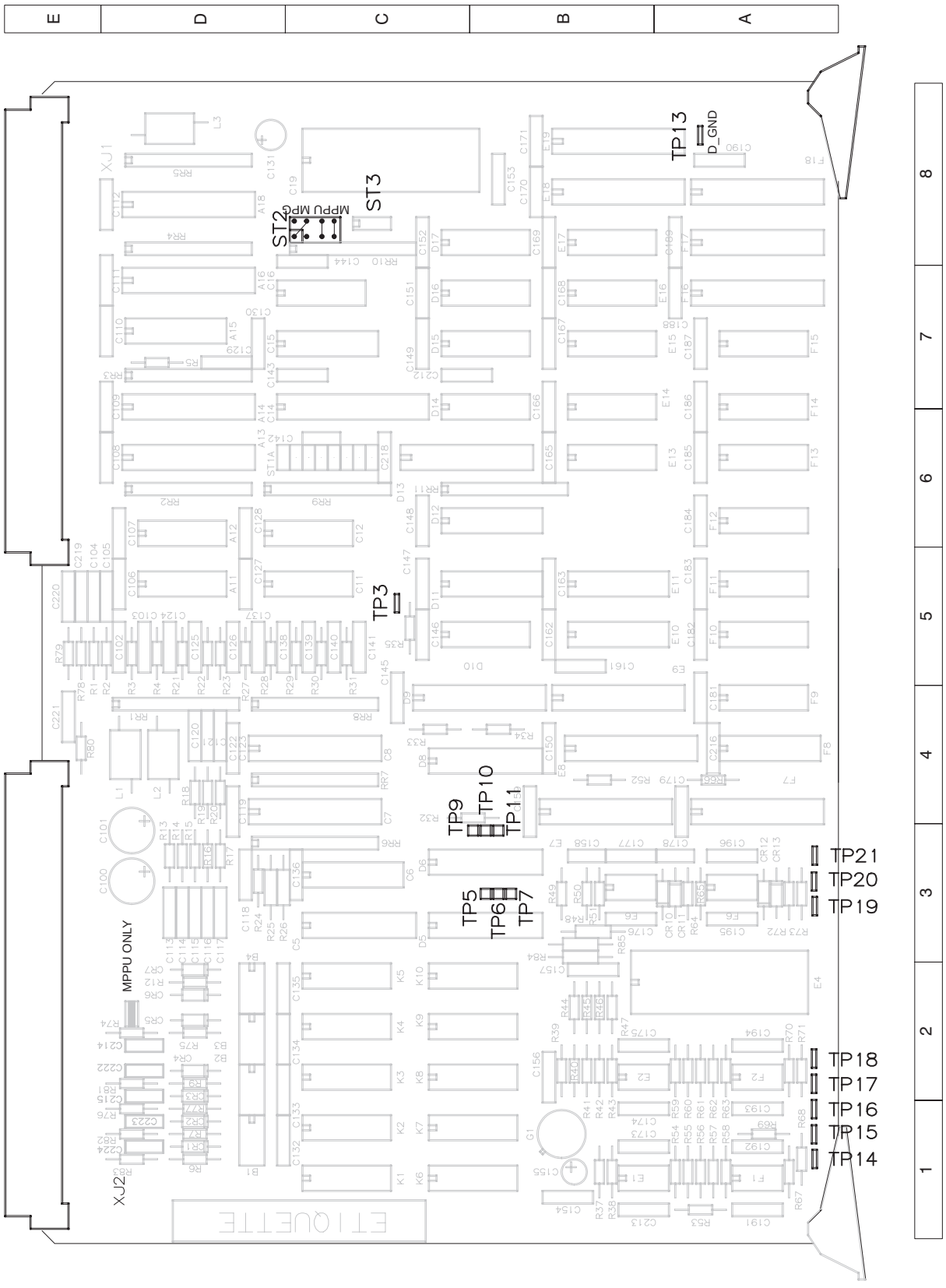
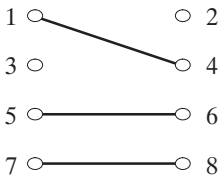
SECTION 10
MP PHASE 41 A5 A5 INTERFACE 1 BOARD 36004541

ILLUSTRATION 10
MP PHASE 41 A5 A5 INTERFACE 1 BOARD LAYOUT



10–1 SWITCHES

JMP	FUNCTION	SCHEMATIC LOCATION	POSITION	LAYOUT LOCATION
ST2	Interrupt vector selection	9–A3		C8
MP Phase 4	Connect 0 V starter to ground	6–G3	ON Jumper must be always connected for MP Phase 4	D2

10–2 ADJUSTMENTS

R	FUNCTION	SCHEMATIC LOCATION	POSITION	LAYOUT LOCATION
R25	Hardware version for MP fimrware backward compatibility	6–A4	Does not exist	D3
R26		6–A4	Exist only for MP Phase 2	D3

10–3 TEST POINTS

TEST POINT	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
TP3	MEASURE mAs	6–E3	Pulse	0 V/5 V	C5
TP4–12	Not used	11–F3, E3			
TP13	D–GND (0/5 V)	6–B1	dc	0 V	A8
TP14	MEASURE ICH XS	10–F4	dc	1 V/1 A	A1
TP15	MEASURE ICH XL	10–F3	dc	1 V/1 A	A1
TP16, 17	Not used	10–F3			
TP18	+ XL ASSIGNMENT	4–D3	dc	1 V/1 A	A2
TP19	+ XS ASSIGNMENT	4–D2	dc	1 V/1 A	A3
TP20	REF –10 V	4–D4	dc	–10 V	A3
TP21	A–GND (0/15 V)	4–D1	dc	0 V	A3

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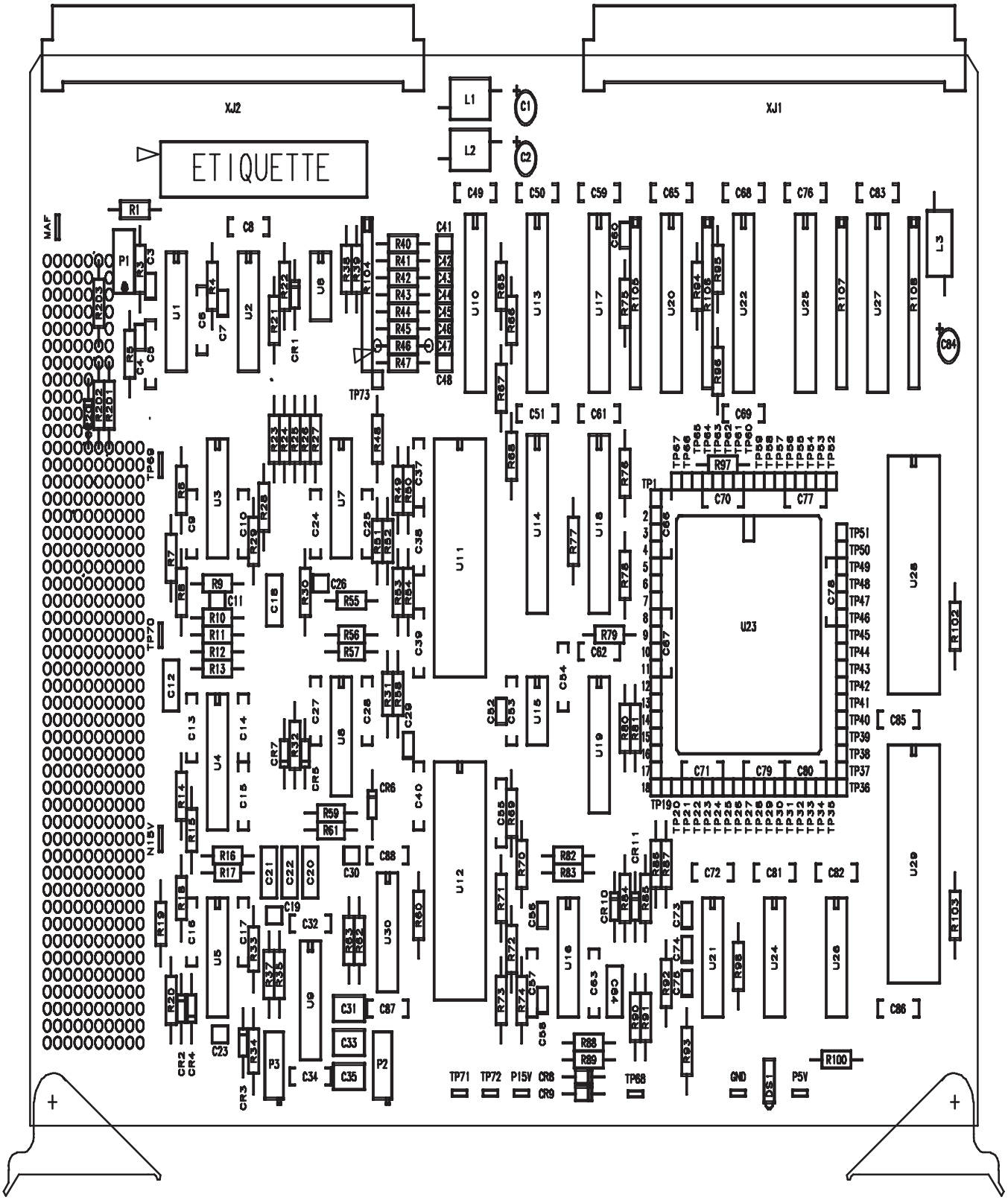
SECTION 11
MP PHASE 41 A5 A6 INTERFACE 2 BOARD 21293744−3

ILLUSTRATION 1–1
MP PHASE 41 A5 A6 INT/2 BOARD LAYOUT



11–1 TEST POINTS

TP	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
TP1–67 Mainly for factory use, but test points listed below may be useful:		sheet 3			B/C-6/7
TP22	EXP_CMD	3–E6			B/C-6/7
TP23	_EXP_ON	3–H7			B/C-6/7
TP24	_KV>75%_KVREF	3–F6			B/C-6/7
TP25	_GRID_CTRL	3–F6			B/C-6/7
TP26	_F_MAX_EN	3–F7			B/C-6/7
TP28	_BIAS_EN	3–F7			B/C-6/7
TP29	_GRID_EN	3–F7			B/C-6/7
TP30	_GRID_PULSE_CTRL	3–E7			B/C-6/7
TP31	KV_ACQ_EN	3–F7			B/C-6/7
TP32	XRAY_EXP_CONTROL	3–E7			B/C-6/7
TP33	_EXP_75	3–E7			B/C-6/7
TP34	_PLSDSYS	3–D8			B/C-6/7
TP42	_MB_EN	3–C9			B/C-6/7
TP51	_MB_REF	3–B8			B/C-6/7
TP52	For factory use	sheet 3			B/C-6/7
TP53	_MB_CDE	3–A8			B/C-6/7
TP66	QUENCH CTRL	3–B5			B/C-6/7
TP67	GRID_PULSE_OK	3–B5			B/C-6/7
TP68	mA Demand	5–B4	DC	10 V	A6
TP69	Bias Feedback	8–D6	DC	10 V	C2
TP70	Bias Demand	8–B7	DC	10 V	B2
TP71	For factory use	9–D3			A4
TP72	ADC input	9–B5		10 V	A4
TP73	For factory use	2–E7			C3
P5V	+ 5 V Supply	11–C4	DC	+5 V	A7
GND	0 / 15 V	10–F6	DC	0 V	A7
P15V	+ 15 V Supply	11–E3	DC	+15 V	A5
MAF	mA Feedback	5–C7			D1
N15V	–15 V	11–F3	DC	–15 V	B2

11–2 ADJUSTMENTS

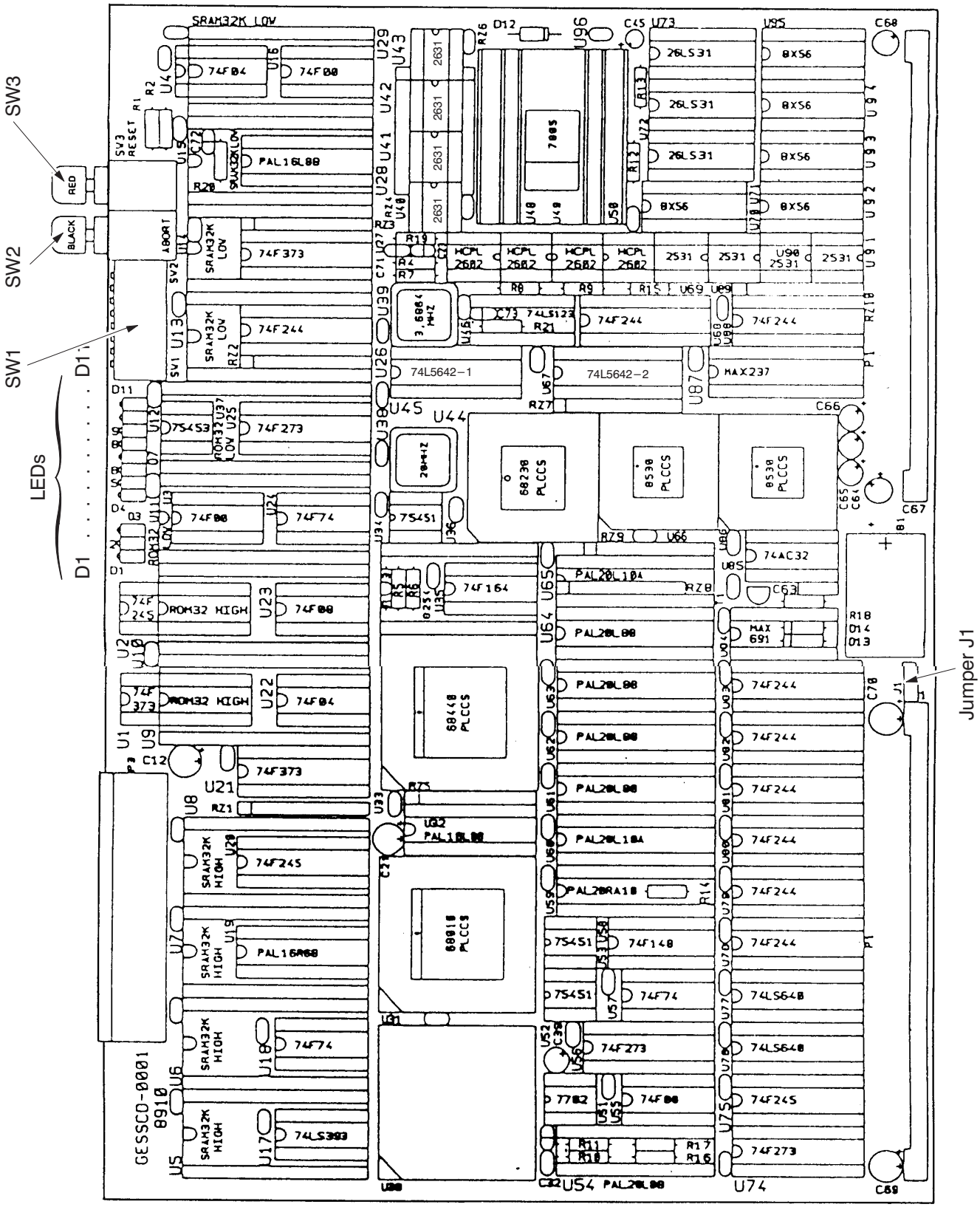
P	FUNCTION	SCHEMATIC LOCATION	SETTING	LAYOUT LOCATION
P1	mA LOOP	5–D5	According to installation and calibration procedures.	D1
P2	XS LEAD FILTER	7–B4		A4
P3	XL LEAD FILTER	6–B4		A3

11–3 LEDs

LED	COLOR	SCHEMATIC LOCATION	INDICATION	LAYOUT LOCATION
DS1	Green	11–D4	5 V DC supply present	A7

SECTION 12
MP PHASE 41 A5 A9 CPU BOARD

ILLUSTRATION 11
MP PHASE 41 A5 A9 CPU BOARD LAYOUT



12–1 SWITCHES AND JUMPERS

SWITCH	NOTES	SCHEMATIC LOCATION	FUNCTION
SW1	Position code	Schematic 2 of 6	Used for diagnostics See direction 19 121
SW2	Black PB	Schematic 1 of 6	ABORT used for warm start firmware debug only
SW3	Red PB	Schematic 1 of 6	RESET Hardware and firmware
JUMPER	**NOTE**	**SCHEMATIC LOCATION**	**POSITION**
J1		Schematic 2 of 6	Not used

12–2 LEDs

LED	COLOR	SCHEMATIC LOCATION	INDICATION
D1	Red	Schematic 3 of 6	HALT Major disfunction or diagnostic problem
D2	Green	Schematic 1 of 6	RUNNING
D3	Orange	Schematic 3 of 6	DMA Communication visible only in loop mode during DMA diagnostic test
D4	Red	Schematic 2 of 6	D4 to D11 Lit successively during application (Normal mode)
D5	Red		
D6	Red		
D7	Red		
D8	Red		
D9	Red		Different meanings in Diagnostic mode (See direction 19 121)
D10	Red		
D11	Red		D11 normally flashes in application.

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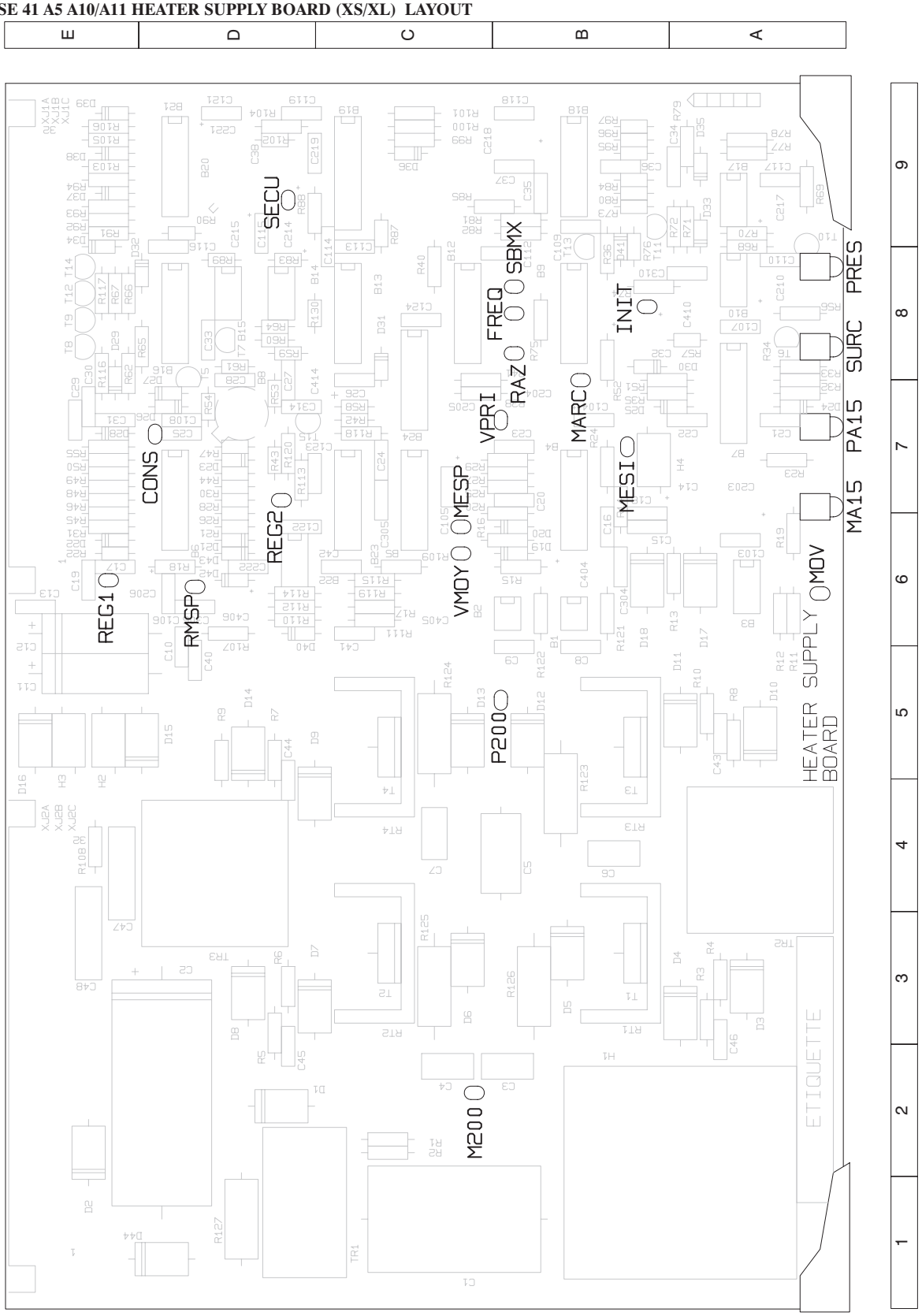
SECTION 13
MP PHASE 41 A5 A10/A11 HEATER SUPPLY BOARD (XS/XL)

ILLUSTRATION 12
MP PHASE 41 A5 A10/A11 HEATER SUPPLY BOARD (XS/XL) LAYOUT



13–1 LEDs

LED	COLOR	SCHEMATIC LOCATION	FUNCTION	LAYOUT LOCATION
MA15	Green	3–E2	–15 V ON	A7
PA15	Green	3–E2	+15 V ON	A7
SURC	Red	1–A4	Overload Ich detection or missing filament	A8
PRES	Yellow	1–A3	Ich >1 A rms	A8

13–2 TEST POINTS

TEST POINT	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
MOV	0 / ± 15 V	3–F2	DC	0 V	A6
P200	+ 200 V	2–C3	DC	+200 V ± 10 %	B5
M200	0 / + 200 V	2–C3	DC	0 V	C2
MESI	Ich Value	1–D1	DC	+1 V/1 A rms	B7
REG1	RMSP–CONS	1–F4	DC	–15 V to +5 V	E6
REG2	REG1 + VMOY	1–D4	DC	+2.7 V to +15V	D6
FREQ	Frequency running	1–C4	Pulse	15 kHz < Freq < 60 kHz	B8
INIT	Inverter enable	2–H4	DC	0 V to +15 V	B8
MARC	Inverter ON	1–F3	DC	0 V to +15 V	B7
RAZ	Security RAZ	1–E3	Pulse	Positive Pulse 1 ms 0 V to +15 V	B8
SBMX	Boost security Max	1–C3	DC	0 V to + 15 V	B8
MESP	Primary current transformer (/10)	2–D2	AC	0 V to 0.6 V rms	C6
VPRI	MESP x23	1–G3	AC	+ 1 V/1 A rms	B7
VMOY	Ich mean	1–E4	DC	+ 1 V/1 A rms	C6
RMSP	Ich RMS	1–G3	DC	+ 1 V/1 A rms	D6
SECU	5.5 A or 7.1 A Security X 1.03 or 10 A in BOOST	1–C2	DC	+ 5.7 V or 7.3 V + 10 V	D9
CONS	Ich Demand	1–G4	DC	– 1 V/1 A rms	D7

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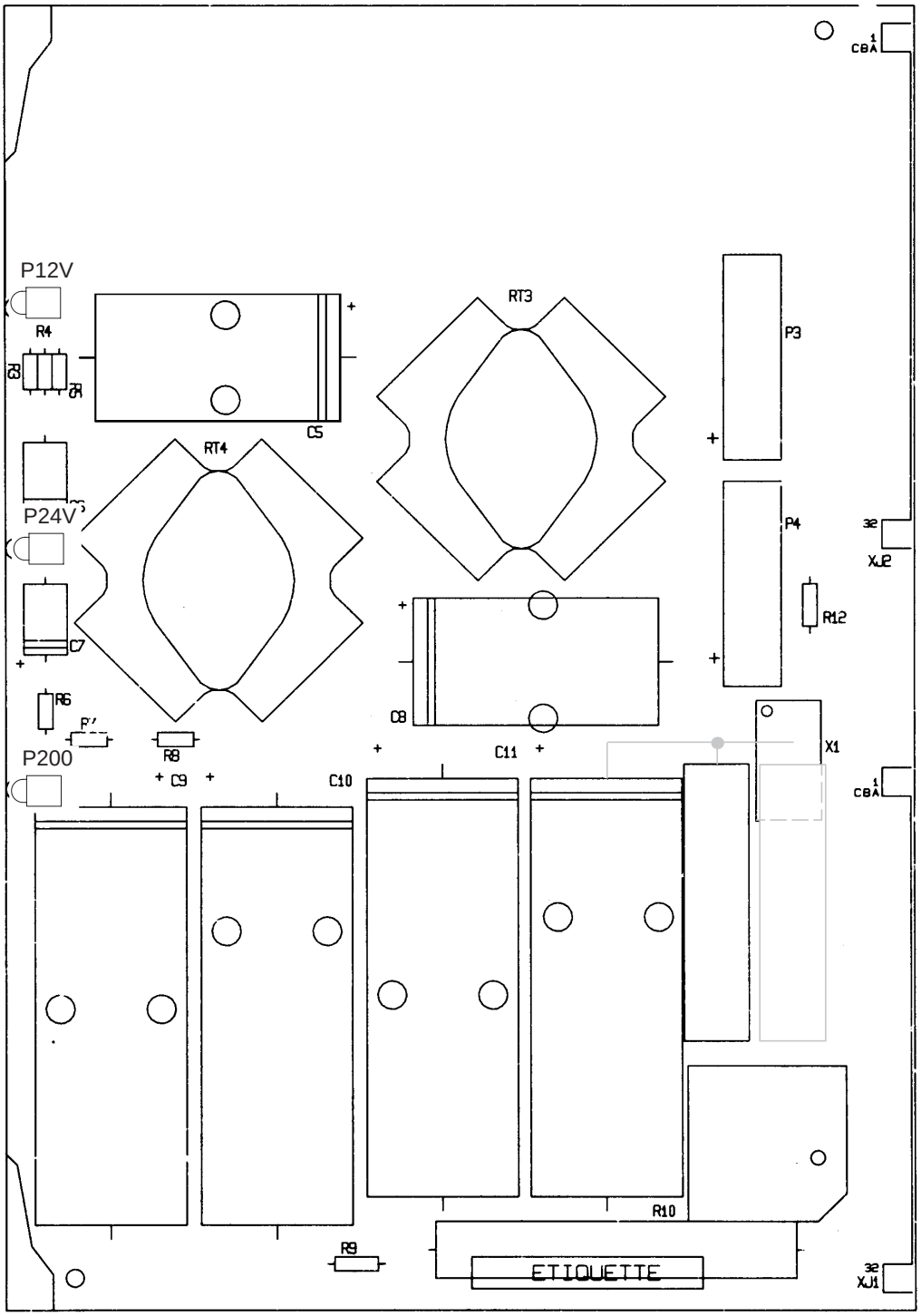
SECTION 14
MP PHASE 41 A5 A12 AUXILIARY VOLTAGE BOARD 45563250

ILLUSTRATION 13
MP PHASE 41 A5 A12 AUXILIARY VOLTAGE BOARD LAYOUT



1	2	3	4

14–1 Indicator lights

LED	COLOR	SCHEMATIC LOCATION	INDICATION	LAYOUT LOCATION
P12V	Green	1–D4	12 V dc present	D1
P24V	Green	1–D6	24 V dc present	C1
P200	Green	1–D7	200 V dc present	B1

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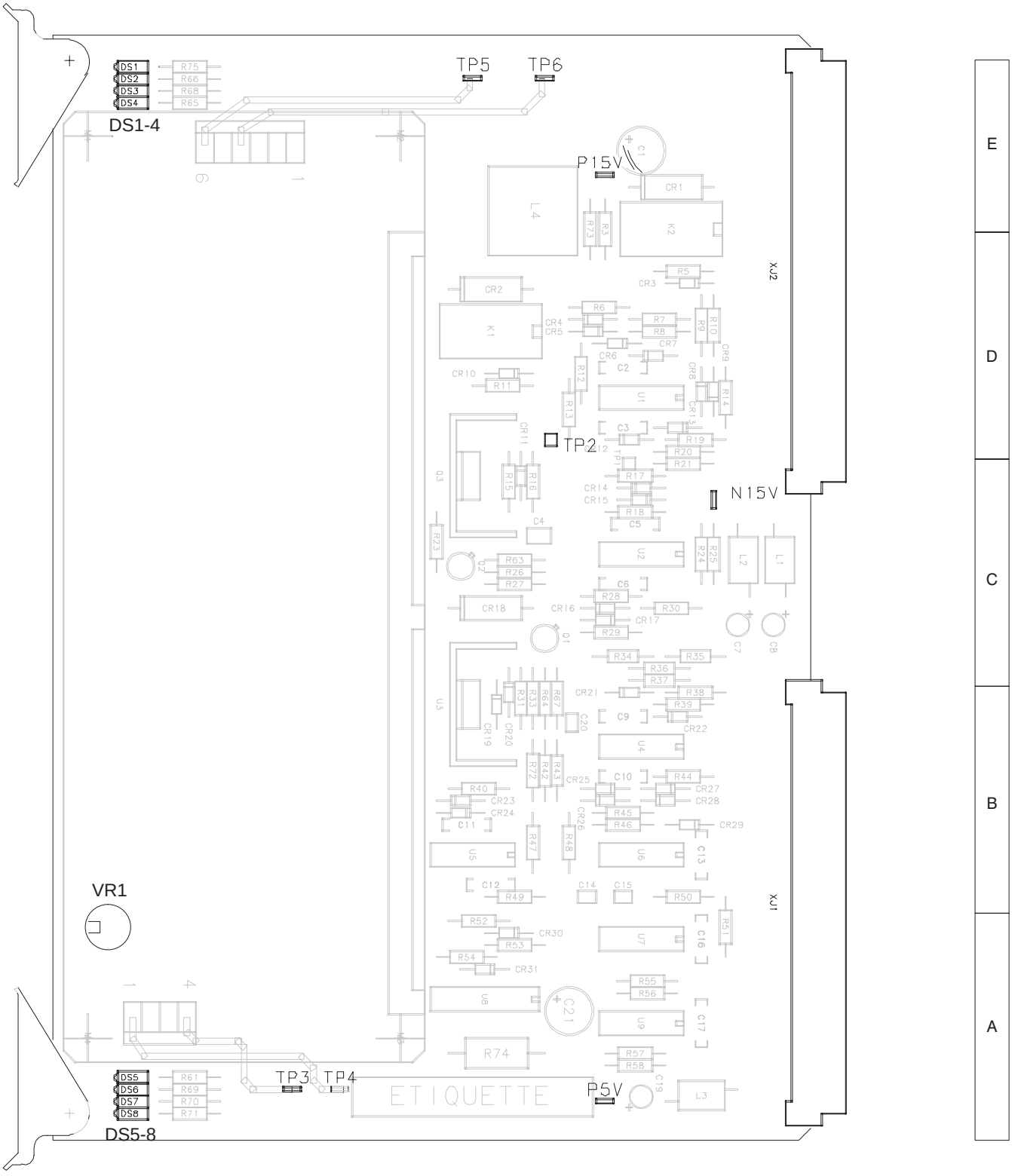
SECTION 15
MP PHASE 41 A5 A13 GRID/BIAS INTERFACE BOARD 2127682

ILLUSTRATION 14
MP PHASE 41 A5 A13 GRID/BIAS INTERFACE BOARD LAYOUT



15–1 ADJUSTMENTS

P	FUNCTION	SCHEMATIC LOCATION	SETTING	LAYOUT LOCATION
P1	35 V adjustment		According to installation and calibration procedures.	A1

15–2 LEDs

LED	COLOR	SCHEMATIC LOCATION	INDICATION	LAYOUT LOCATION
DS1	Green	3–C9	+BIAS INV SUPPLY	A4
DS2	Green	1–D8	+GRID INV SUPPLY	A4
DS3	Green	1–E8	V +15	A4
DS4	Green	4–B8	V36	A4
DS5	Green	3–F5	BIAS ON	E4
DS6	Green	2–A9	GRID FUNCT OK	E4
DS7	Red	2–E9	GRID CMD	E4
DS8	Green	3–C8	BIAS ENABLE	E4

15–3 TEST POINTS

TEST POINT	NOTES	SCHEMATIC LOCATION	SIGNAL TYPE	TYPICAL RANGE	LAYOUT LOCATION
TP1	BIAS ON	3–E7	DC	10–15 V	B1
TP2	GRID PULSE	2–C6	Pulse	0 V/5 V	B2
TP3	0V (V36)	4–B8	DC	0 V	E3
TP4	36 V	4–A8	DC	36 V ±10%	E3
TP5	0 V (220 V)	4–B4	AC	220 V	A2
TP6	220 V	4–A4	AC		A2
N15V	–15 V	4–E4	DC	–15 V ±5%	C1
P5V	+5 V	4–F4	DC	+5 V ±5%	E2
P15V	+15 V	4–C4	DC	+15 V ±5%	A2

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SECTION 16
MP PHASE 41 A5 A20 LOW VOLTAGE SUPPLY (COSEL MODEL)

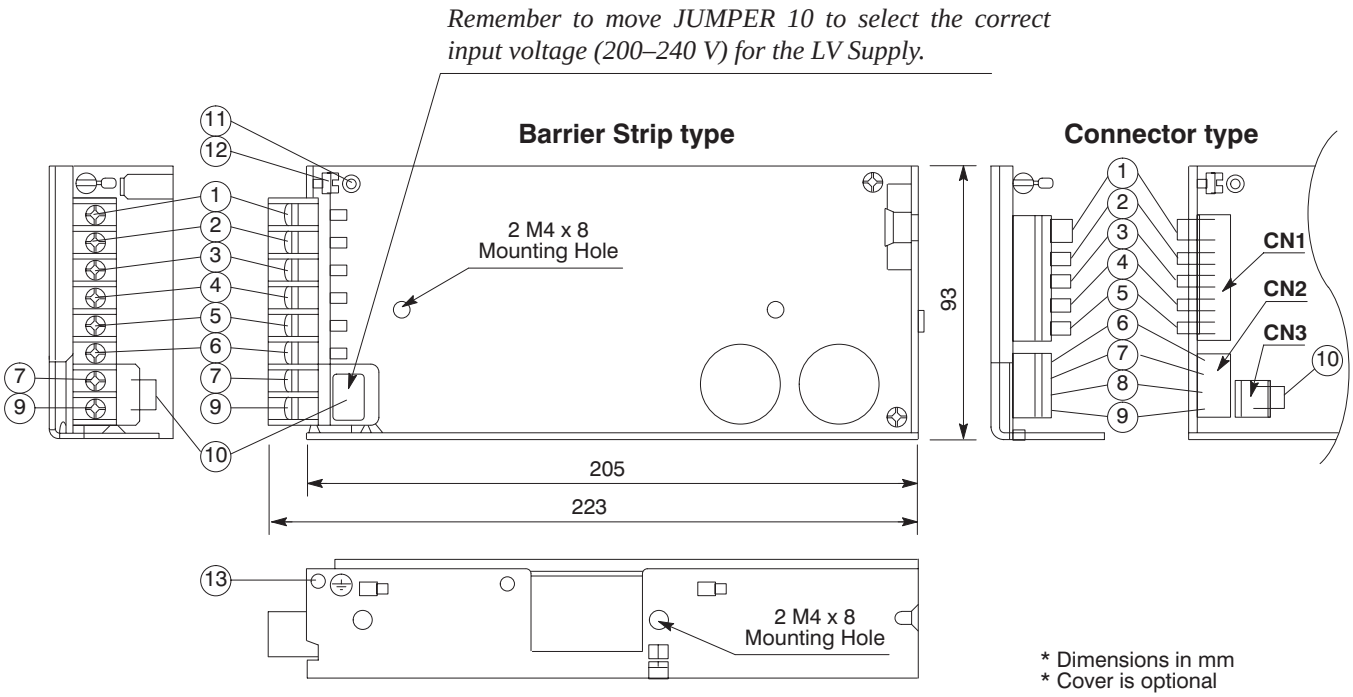
Note: On the COSEL LVPS, the cable harness is located at the top.

Position the voltage selector jumper (10) according to the line input (110 V/220 V) to select 220 V at the LV supply input. See Illustration 15.

Adjust the Output Voltage Adjust potentiometer (12) to obtain 5.1 V ±1% (dc) at TP5V (reference 0 VL) on the Interface 2 Board MP Phase 41 A5 A6.

Note: We must adjust for 5.1 V at the Interface 2 Board in order to have 5 V at the CPU.

ILLUSTRATION 15
MP Phase 41 A5 A20 LOW VOLTAGE SUPPLY (SOSEL MODEL)



1. +5 V Output terminal
2. +5 V GND terminal
3. +12 V (+15 V) Output terminal
4. ±12 V (±15 V) GND terminal
5. –12 V (–15 V) Output terminal
6. FG Signal Ground
7. AC (L) Input terminal
8. NC
9. AC (N) Input terminal
10. 100/200 V Input voltage selector (Short 100-120 V/Open 200-240 V)
11. Output indicator
12. Output voltage adjust
13. Protection Ground ⏚

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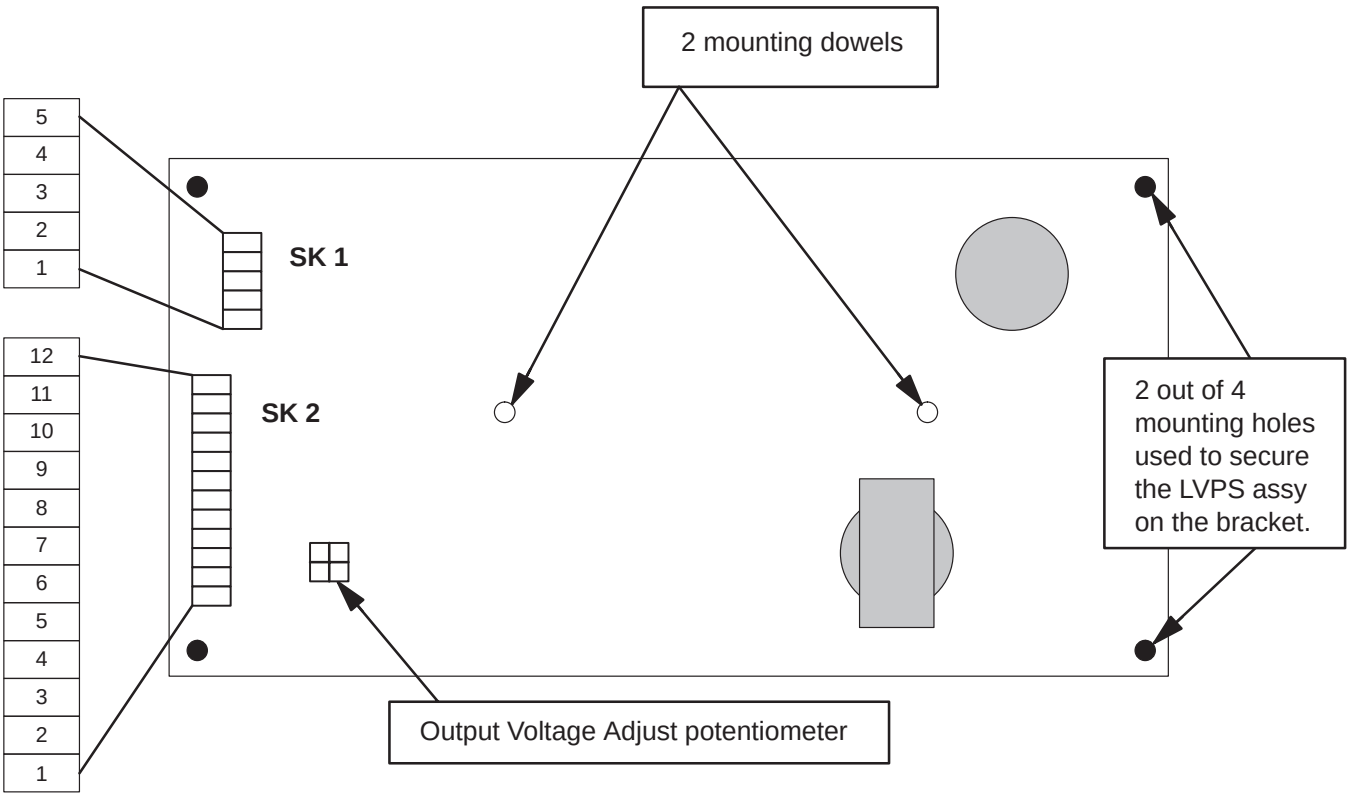
SECTION 17
MP PHASE 41 A5 A20 LOW VOLTAGE SUPPLY (ASTEC MODEL)

Note: On the ASTEC Low Voltage Power Supply, the cable harness is located at the bottom.

Adjust the Output Voltage Adjust potentiometer (18) to obtain 5.1 V ± 1% (dc) at TP5V (reference 0 VL) on the Interface 2 Board MP Phase 41 A5 A6.

Note: We must adjust for 5.1V at the Interface 2 Board in order to have 5V at the CPU.

ILLUSTRATION 16
MP Phase 41 A5 A20 LOW VOLTAGE SUPPLY (ASTEC MODEL)



SK1–1 : Ground
SK1–2 : Not connected
SK1–3 : AC (N) Input
SK1–4 : Not connected
SK1–5 : AC (L) Input

SK2–1 : + 5 V Output
SK2–2 : + 5 V Output
SK2–3 : Not connected
SK2–4 : Common
SK2–5 : Common
SK2–6 : Not connected
SK2–7 : Common
SK2–8 : + 15 V Output
SK2–9 : Not connected
SK2–10 : – 15 V output
SK2–11 : Not connected
SK2–12 : Not connected

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SECTION 18
MP PHASE 41 A6 STABILIZER

Wire from stabilizer transformer to stabilizer capacitor:
Wire marked “50” for 50Hz line frequency.
Wire marked “60” for 60Hz line frequency.

Note: The unused wire is to be left unconnected.

Plug from stabilizer transformer XJ501 of MP Phase 41 A6 to connector XJ3 of Power Unit Electronics MP Phase 41 A5:
Cable W132 marked “50Hz” for 50Hz line frequency.
Cable W133 marked “60Hz” for 60Hz line frequency.

Note: The unused cable is to be left unconnected.

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SECTION 19
MP PHASE 42 A1 A1 VOLTAGE SELECTION PANEL

Three voltage selection straps:

Each strap to be installed in the appropriate one of its seven possible positions, according to the nominal line voltage (360, 380, 400, 420, 440, 460, or 480V).

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