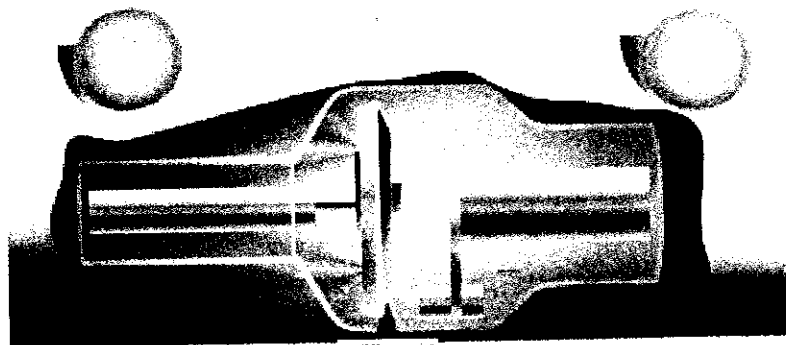


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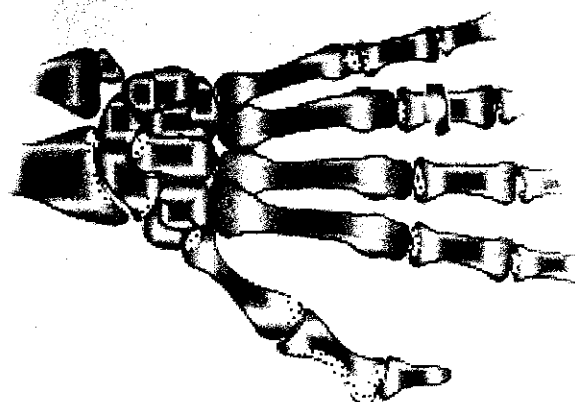
4 Cochran Road
(440) 519-1555

Solon, Ohio 44139
Fax (440) 519-1556

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Philips Medion X-Ray Controls Maintenance Course



Presented by: **DITEC, Inc.**

SIX-TIME WINNERS of 24x7 Readers' Choice Award

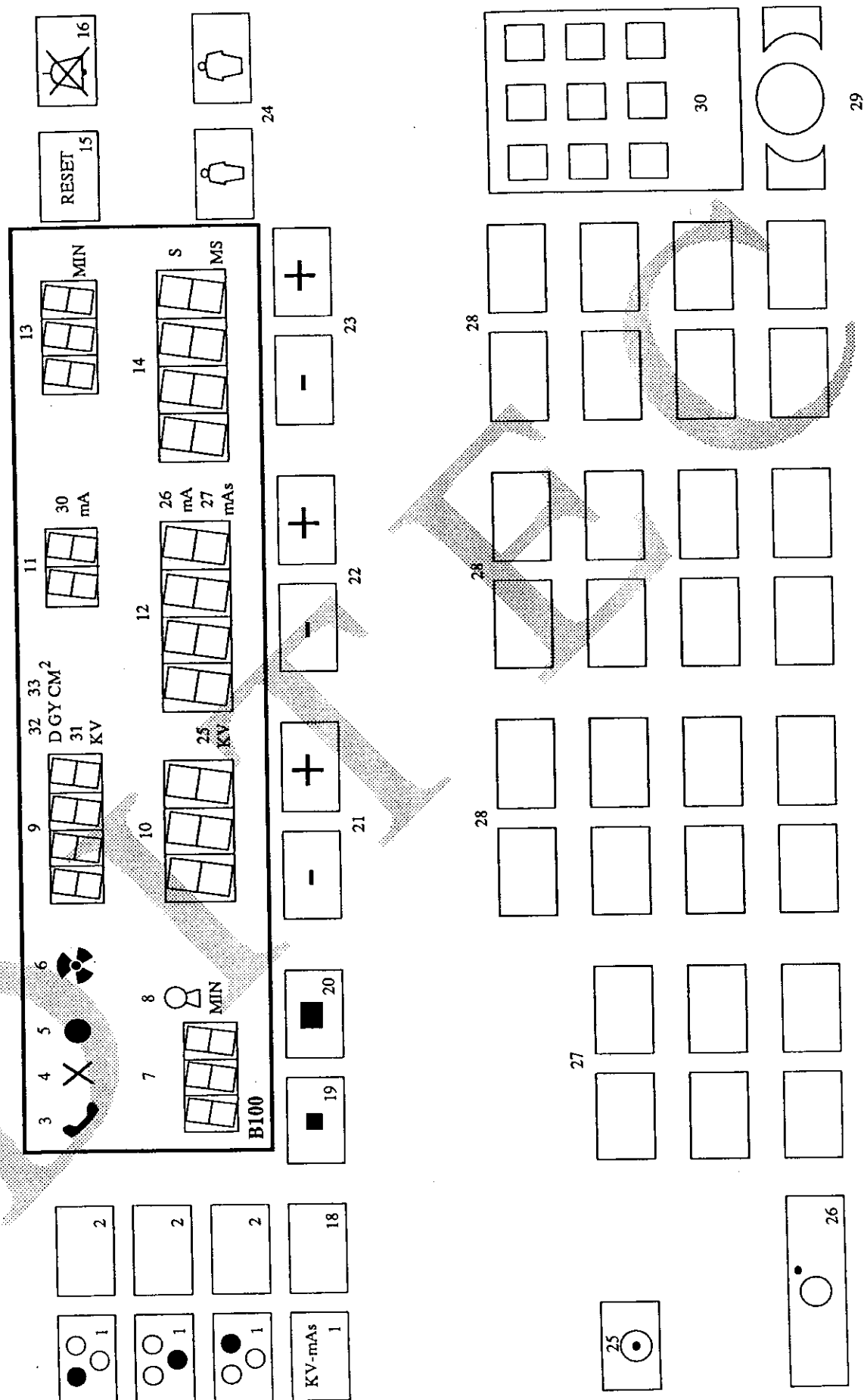
Best Service Training Program or Aid - Diagnostic Imaging Maintenance Levels I, II, III
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TECHNICAL DATA

	MEDIO 30 CP-H	50 CP-H	65 CP-H
	380 .5 ohm	.3 ohm	.2 ohm
	440 .5 ohm	.3 ohm	.2 ohm
	480 .5 ohm	.3 ohm	.2ohm
Line Reg.	15%	13%	13%
Output	400mA at 80KV 320mA at 100KV 200mA at 150KV	600mA at 80KV 500mA at 100KV 320mA at 150KV	700mA at 85KV 650mA at 100KV 400mA at 150KV
KV Ctrl	High Frequency	High Frequency	High Frequency
Fil Ctrl	High Frequency	High Frequency	High Frequency
KV Range	40KV to 150KV	40KV to 150KV	40KV to 150KV
mA Range	5mA to 400mA	5mA to 600mA	5mA to 700mA
mAs Range	1mAs to 850mAs	1mAs to 850mAs	1mAs to 850mAs
Time Range	3 ms to 6 sec	3 ms to 6 sec	3 ms to 6 sec
AEC Time	3 ms to 4 sec	3 ms to 4 sec	3 ms to 4 sec
Fluoro KV	40KV to 110KV	40KV to 110KV	40KV to 110KV
KV Accuracy	+/- 5% +/- 2KV	+/- 5% +/- 2KV	+/- 5% +/- 2KV

	MEDIO 30 CP-H	50 CP-H	65 CP-H
mA Accuracy	+/- 15% +/- 1mA	+/- 15% +/- 1mA	+/- 15% +/- 1mA
mAs Accuracy	+/- 15% +/- 1mAs	+/- 15% +/- 1mAs	+/- 15% +/- 1mAs
Timer Accuracy	+/- 2% +/- 1ms	+/- 2% +/- 1ms	+/- 2% +/- 1ms
Fluoro KV	+/- 5% +/- 2KV	+/- 5% +/- 2KV	+/- 5% +/- 2KV
Fluoro mA	+/- 10% +/- .1mA	+/- 10% +/- .1mA	+/- 10% +/- .1mA
Tubes	RO Only	RO or SRO	RO or SRO

CONTROL MODULE



B200

CONTROL MODULE SWITCH FUNCTIONS

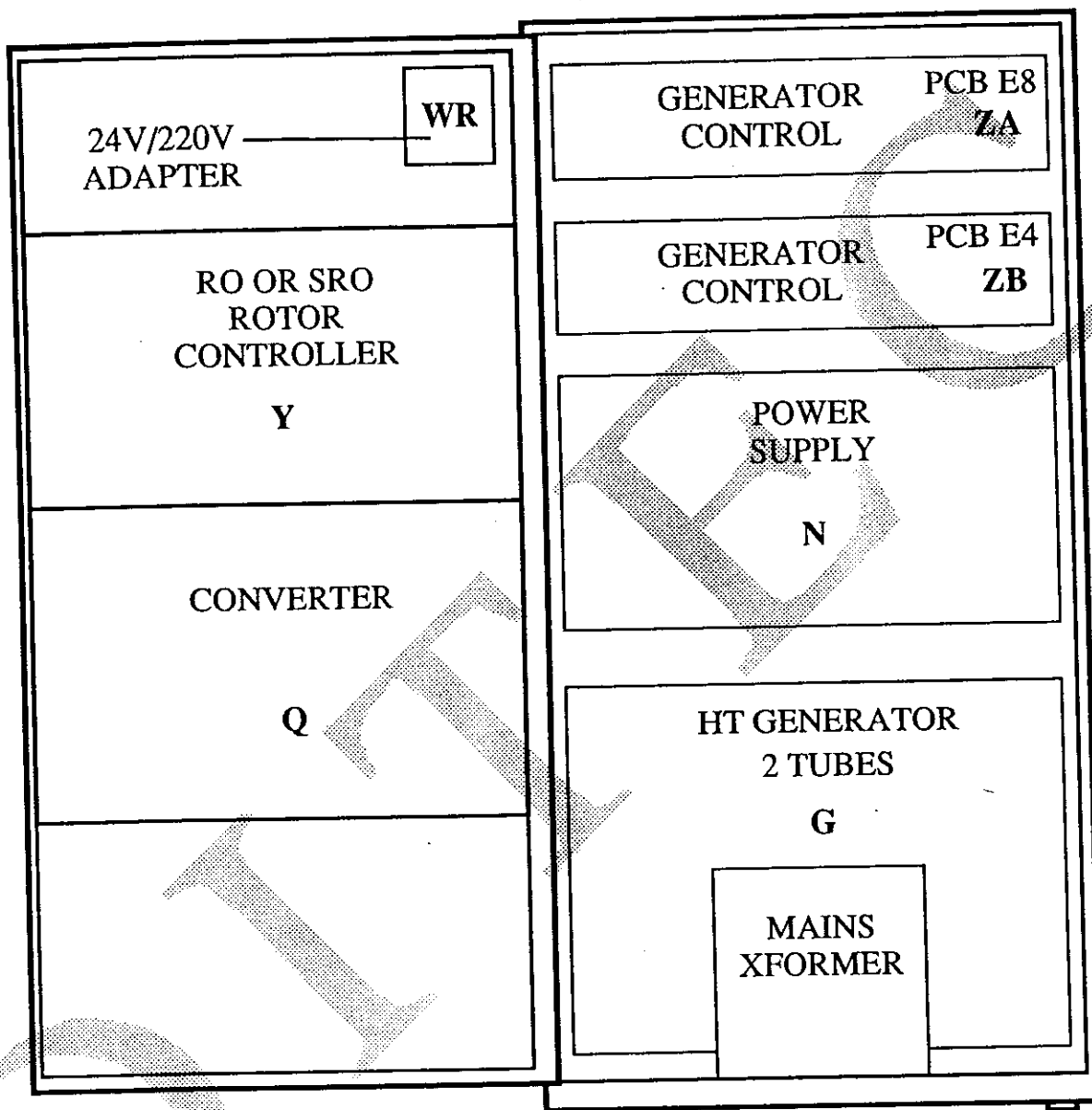
1. AMPLIMAT measuring field buttons
2. Film/screen buttons
3. Service symbol
4. Faulty exposure indication
5. "Ready indication"
6. X-ray "on" indication
7. Density display
8. Tube housing heat limit
9. Display of fluoroscopic KV
10. Display of radiographic KV
11. Display of fluoroscopic mA
12. Display of mA or mAs; depending upon the technique concerned
13. Display of fluoroscopic time (min.)
14. Display of radiographic exposure time (ms)
15. Reset button for:
 - Fluoroscopic time
 - Faulty exposure indication
16. Reset button for audible signal "RESET BUZZER"
17. Technique selection (KV-mAs)
18. Technique selection "fixed current" (KV-mA-ms)
19. Small focus
20. Large focus
21. Plus/minus buttons for KV (radiography)
22. Plus/minus buttons for mA/mAs (radiography)
23. Plus/minus buttons for ms (radiography)
24. Patient thickness compensation buttons (+ or - PTC)
25. Generator "ON"
26. Generator "OFF"

27. Exam/aux unit buttons (LD: technique buttons)

28. APRT buttons

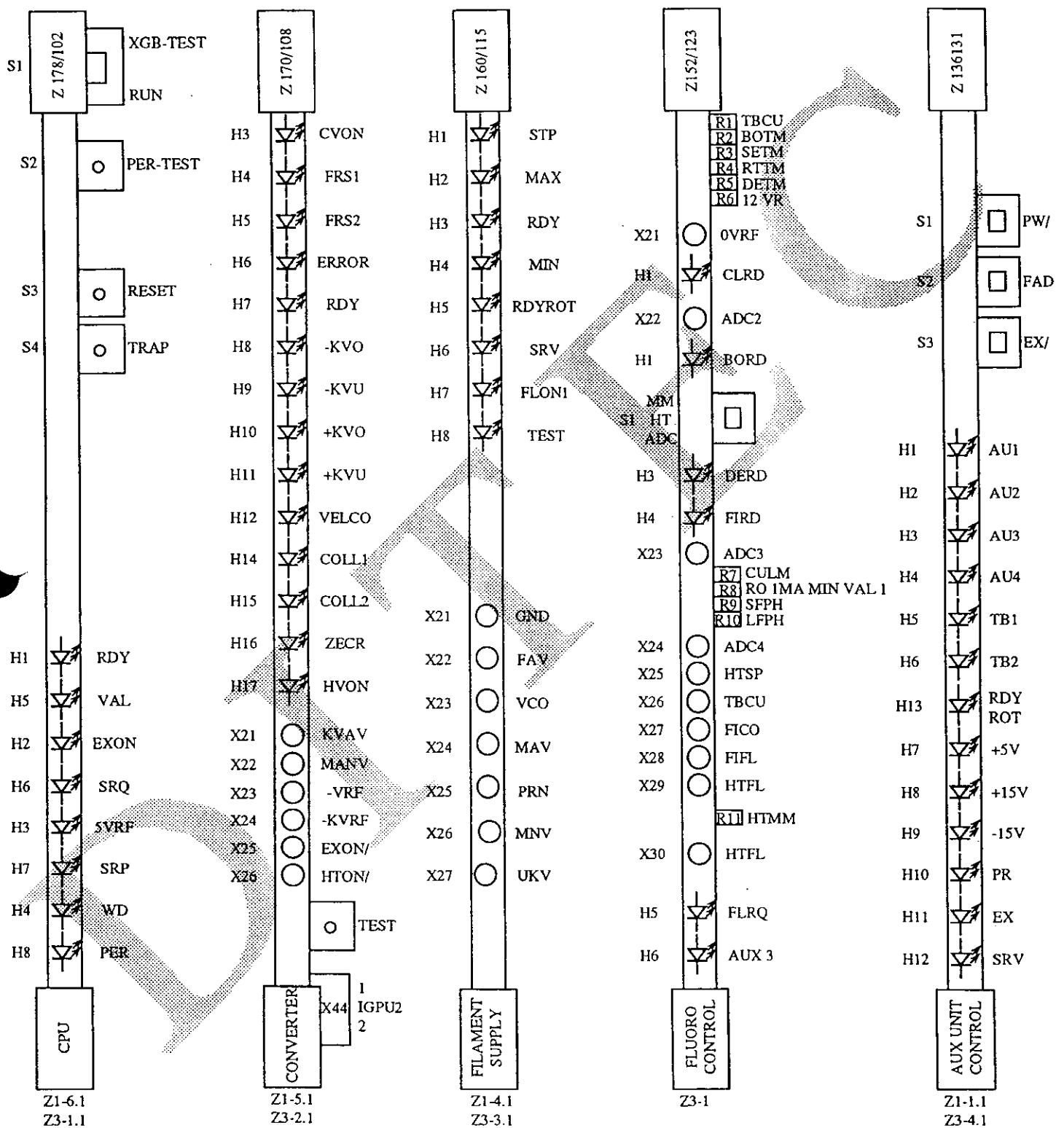
29. Preparation/exposure switch

30. The protective cover conceals 9 buttons for generator program setting

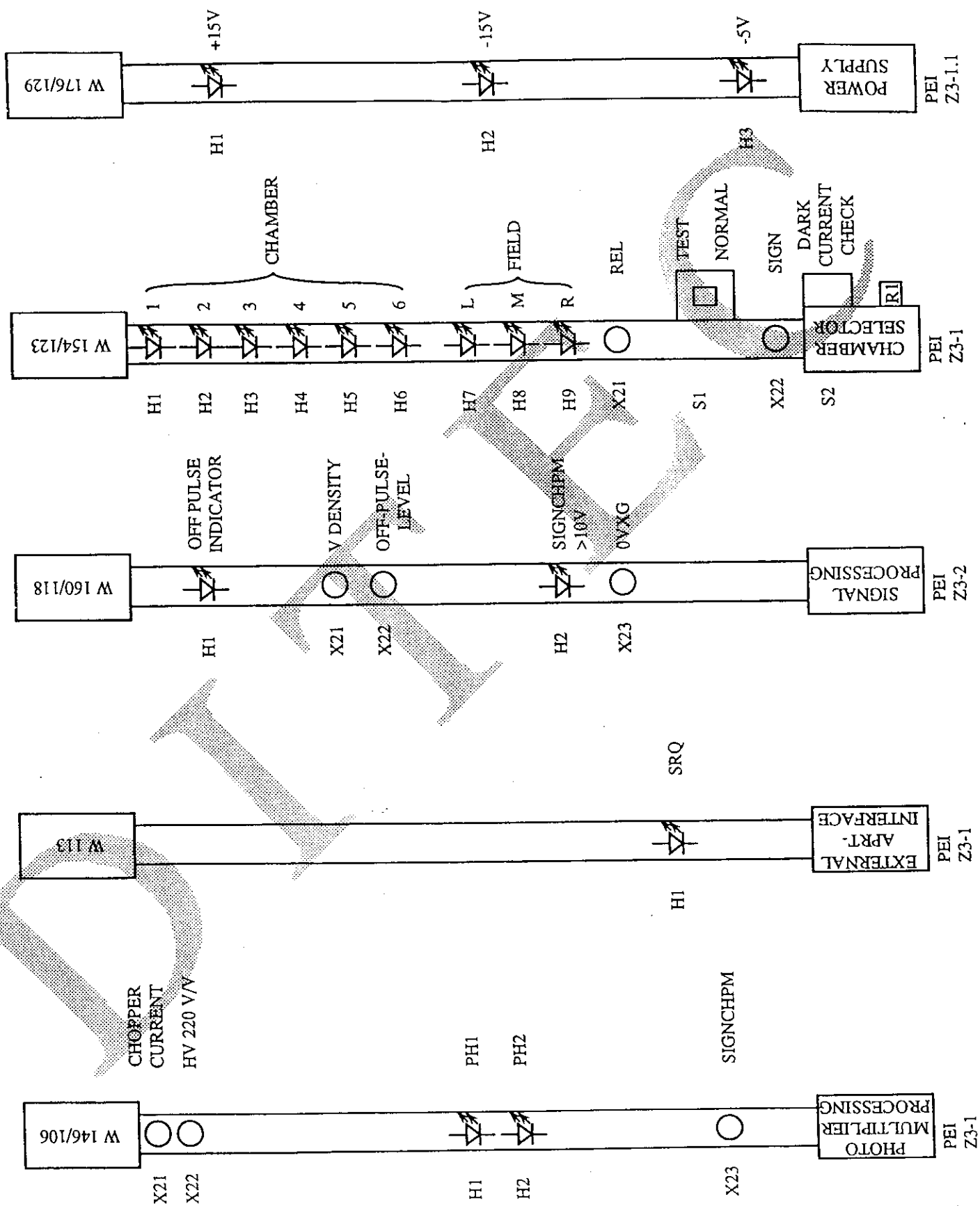


**PHILIPS MEDIO 30/50/65 X-RAY CONTROL
E CABINET LAYOUT**
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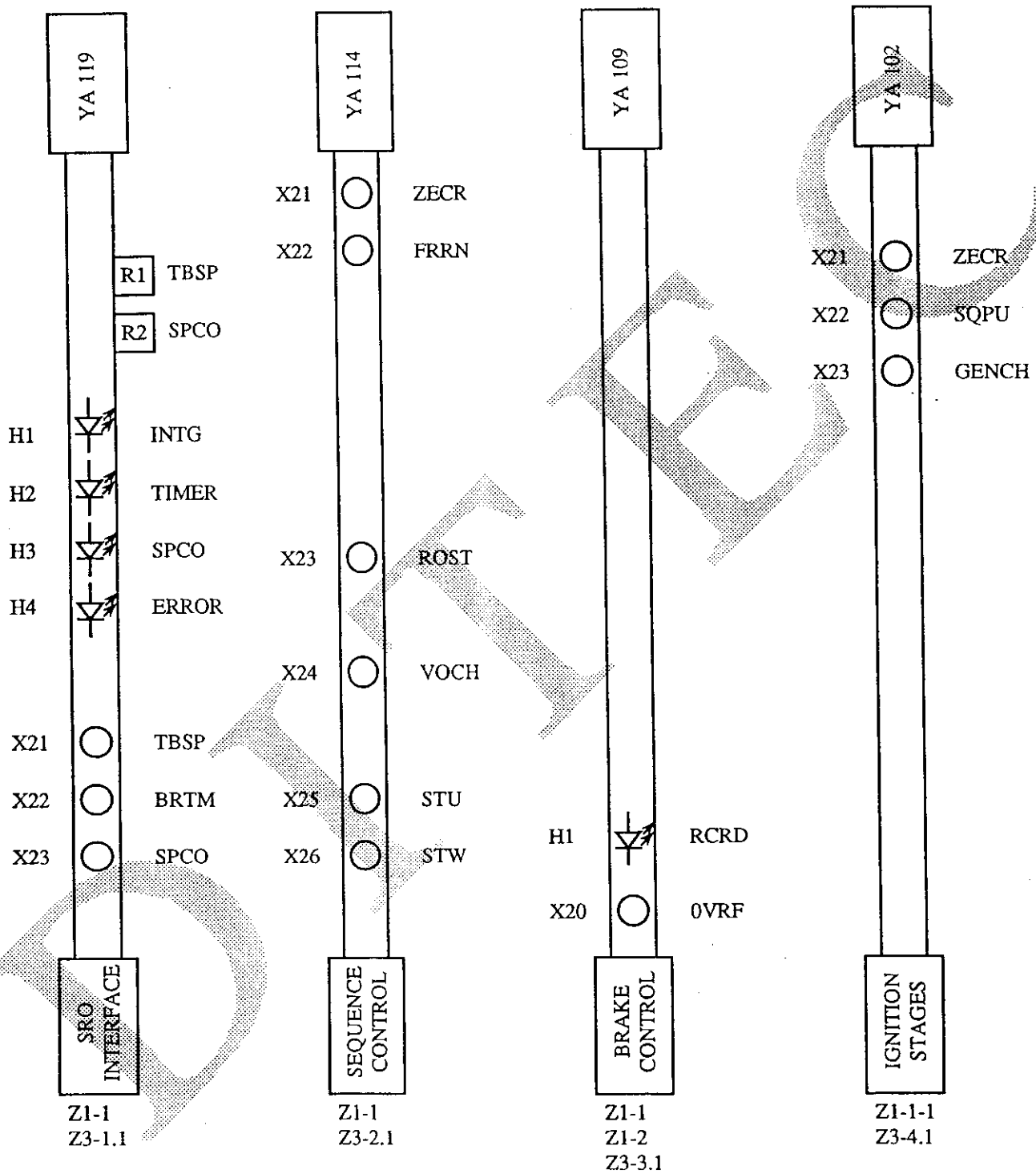
PHILIPS MEDIO CENTRAL ELECTRONIC LAYOUT



PHILIPS MEDIO OPTICAL RACK LAYOUT



PHILIPS MEDIO SRO ROTOR CONTROL LAYOUT



LED INDICATIONS

<u>BOARD #</u>	<u>BOARD NAME</u>	<u>INDICATION</u>	<u>MEANING</u>
ZA136	AUX UNIT CONTROL	PW (SWITCH)	PREPARATION WITHOUT POWER
		FAD (SWITCH)	FILAMENT ADJUST
		EX (SWITCH)	NO EXPOSE REQUEST
		H1 (YELLOW)	AUX 1 SELECT
		H2 (YELLOW)	AUX 2 SELECT
		H3 (YELLOW)	AUX 3 SELECT
		H4 (YELLOW)	AUX 4 SELECT
		H5 (YELLOW)	TUBE 1 SELECT
		H6 (YELLOW)	TUBE 2 SELECT
		H7 (YELLOW)	+5 VOLT SUPPLY
		H8 (YELLOW)	+15 VOLT SUPPLY
		H9 (YELLOW)	-15 VOLT SUPPLY
		H10 (YELLOW)	PREP ON
		H11 (YELLOW)	EXPOSE ON
ZA160	FILAMENT	H12 (RED)	SERV. ON IF,PW,FAD,EX SELECTED
		H14 (YELLOW)	AUX 5 SELECT
		H3 (GREEN)	FILAMENT READY
		H6 (RED)	SERVICE MODE VIA W1
		H4 (RED)	MINIMUM FILAMENT
		H2 (RED)	MAXIMUM FILAMENT
		H1 (RED)	FILAMENT STOP

<u>BOARD #</u>	<u>BOARD NAME</u>	<u>INDICATION</u>	<u>MEANING</u>
ZA178	CENTRAL PROCESSOR UNIT	H1 (GREEN)	CPU READY
		H5 (GREEN)	DATA VALID
		H2 (YELLOW)	EXPOSE ON
		H6 (GREEN)	SERVICE REQUEST
		H3 (RED)	5 VOLT REFERENCE
		H7 (GREEN)	SERVICE RESPONSE
		H4 (RED)	WRITE
		H8 (GREEN)	PERFORM
YA119	SRO INTERFACE	H1 (YELLOW)	IGNITION
		H2 (YELLOW)	TIMER
		H3 (YELLOW)	SET POINT READY
		H4 (RED)	ERROR IN ROTOR POINT
YA109	BRAKE CONTROL	H1 (GREEN)	ROTOR CONTROL READY
			ON-STANDBY
			OFF-ACCEL
			ON-FREE RUN
ZB160	SIGNAL PROCESSING	H1 (YELLOW)	OFF PULSE
		H2	SIGNAL,CHECK > 10V

BOARD #BOARD NAMEINDICATIONMEANING

ZB154

CHAMBER
SELECTION

H1 (YELLOW)

CHAMBER SELECTED

H2 (YELLOW)

CHAMBER 2 SELECTED

H3 (YELLOW)

CHAMBER 3 SELECTED

H4 (YELLOW)

CHAMBER 4 SELECTED

H5 (YELLOW)

CHAMBER 5 SELECTED

H6 (YELLOW)

CHAMBER 6 SELECTED

H7 (YELLOW)

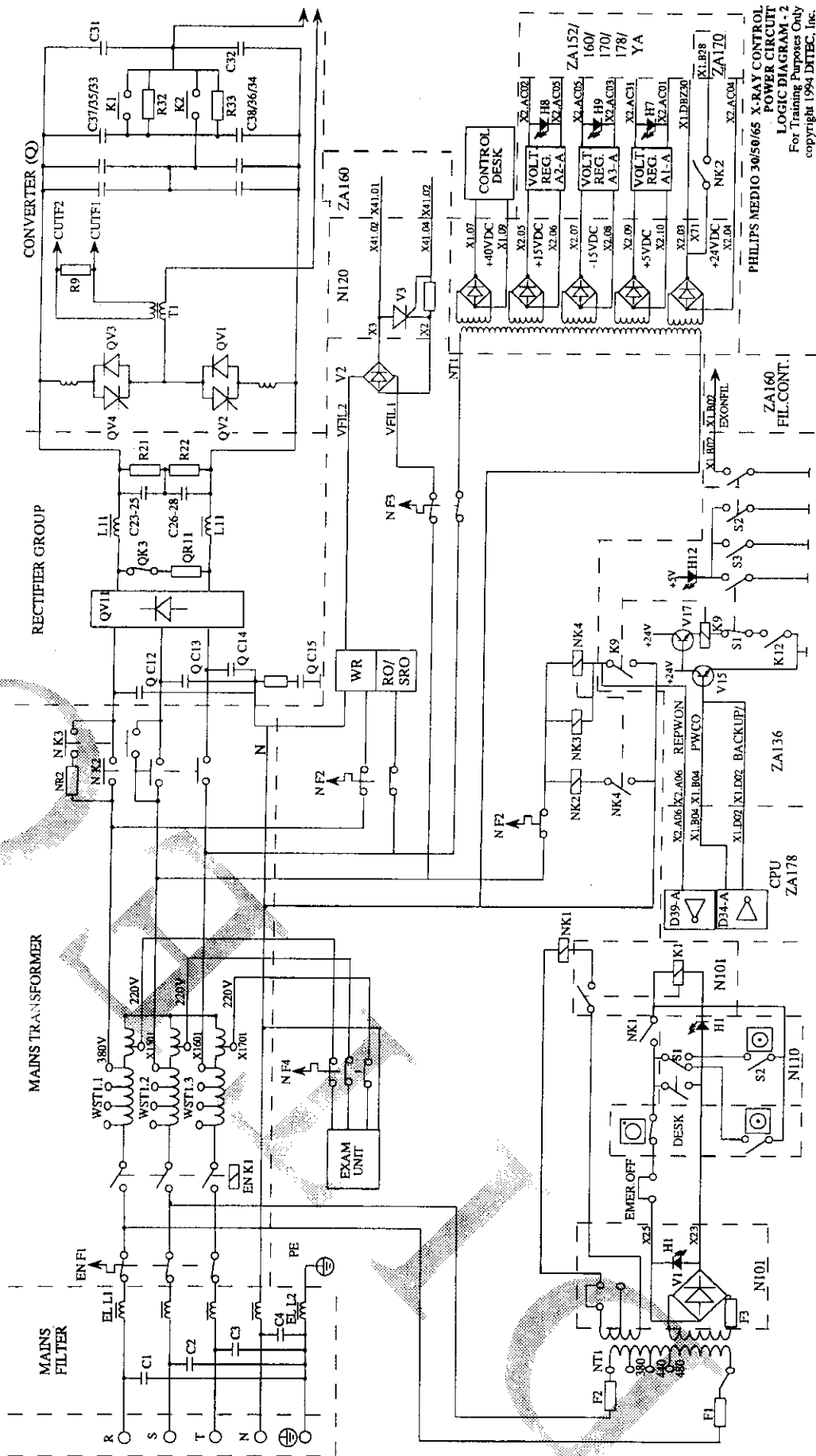
LEFT FIELD

H8 (YELLOW)

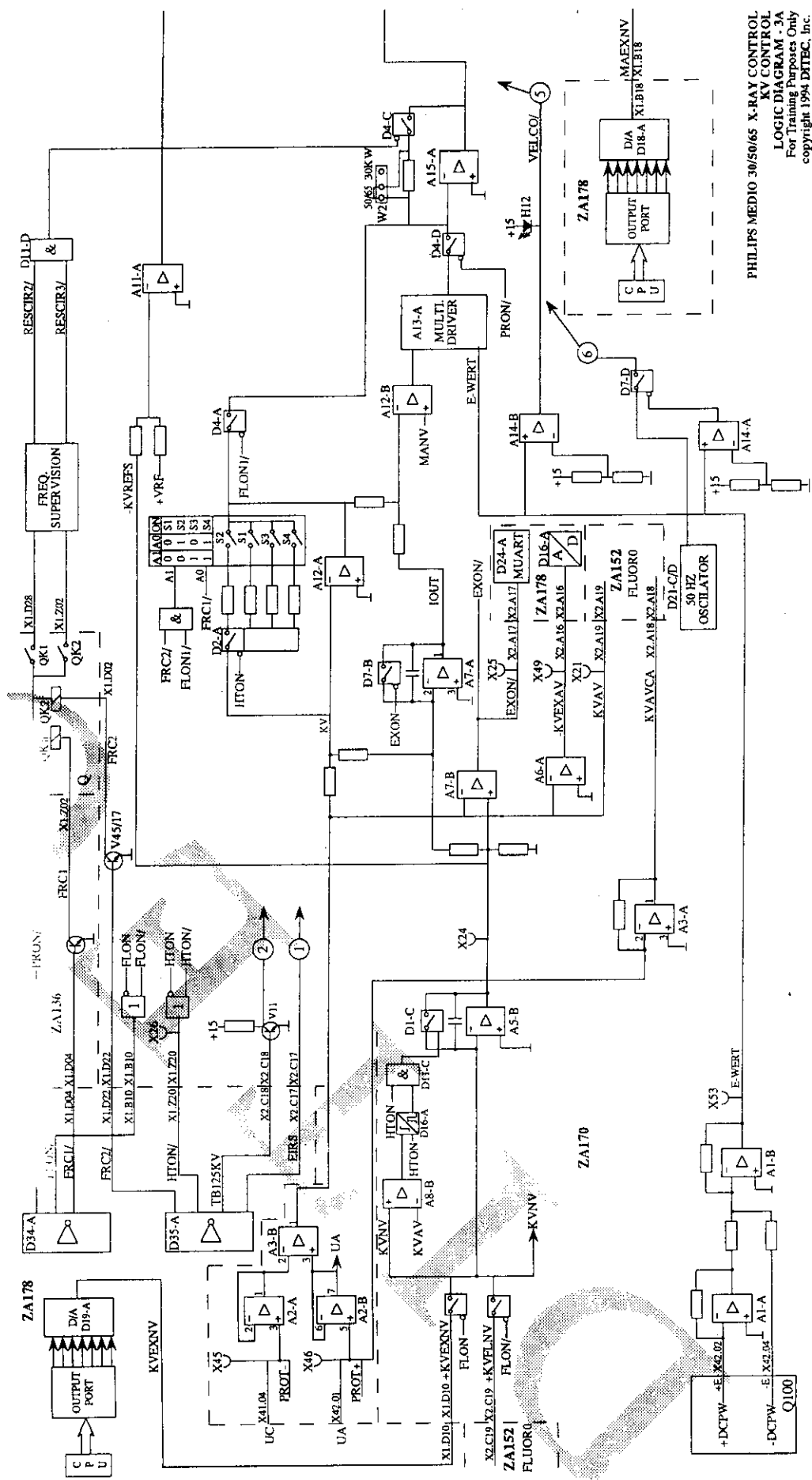
MIDDLE FIELD

H9 (YELLOW)

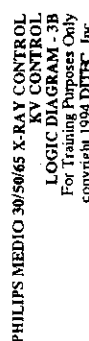
RIGHT FIELD

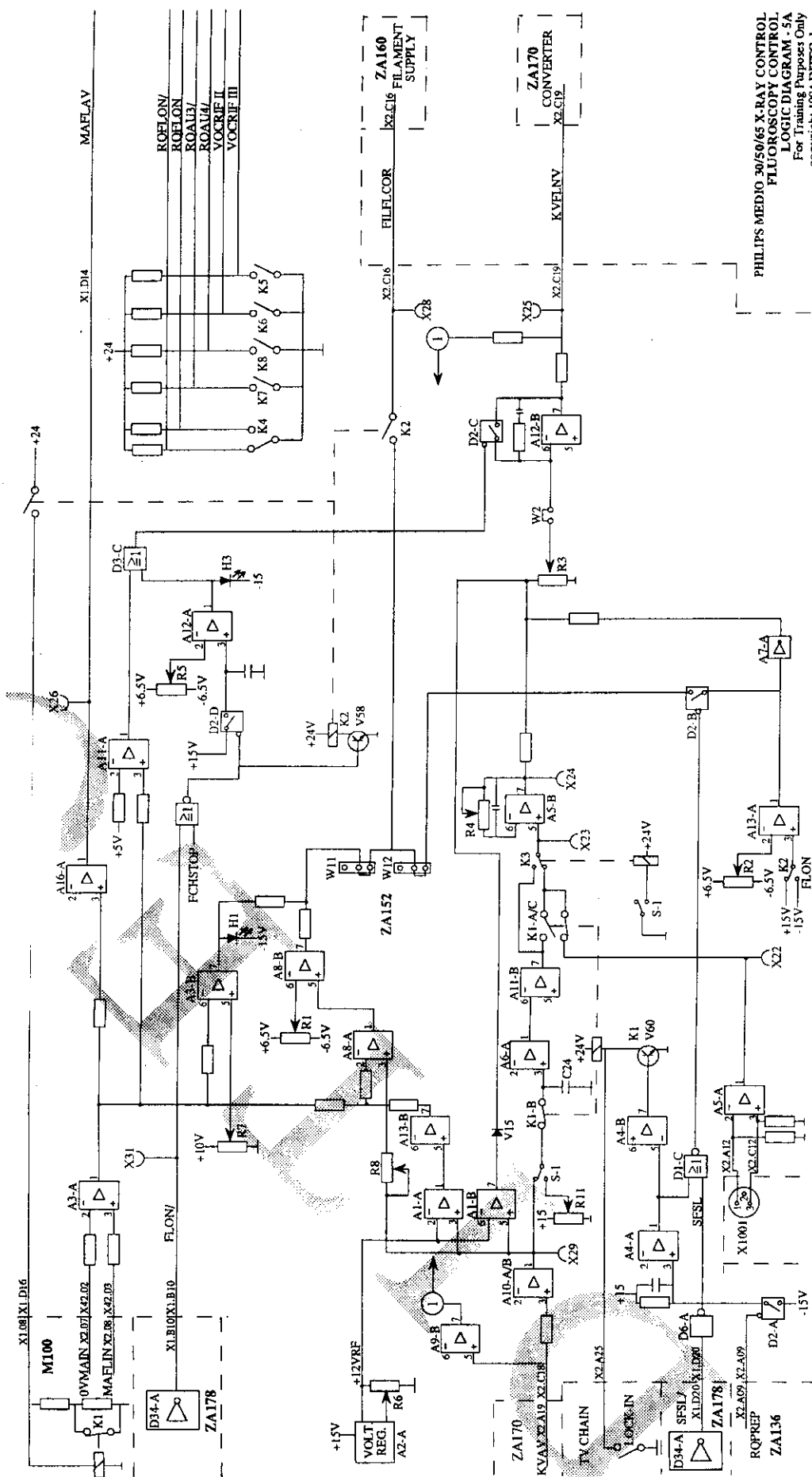


PHILIPS MEDIO 30/50/65 X-RAY CONTROL
POWER CIRCUIT
LOGIC DIAGRAM - 2
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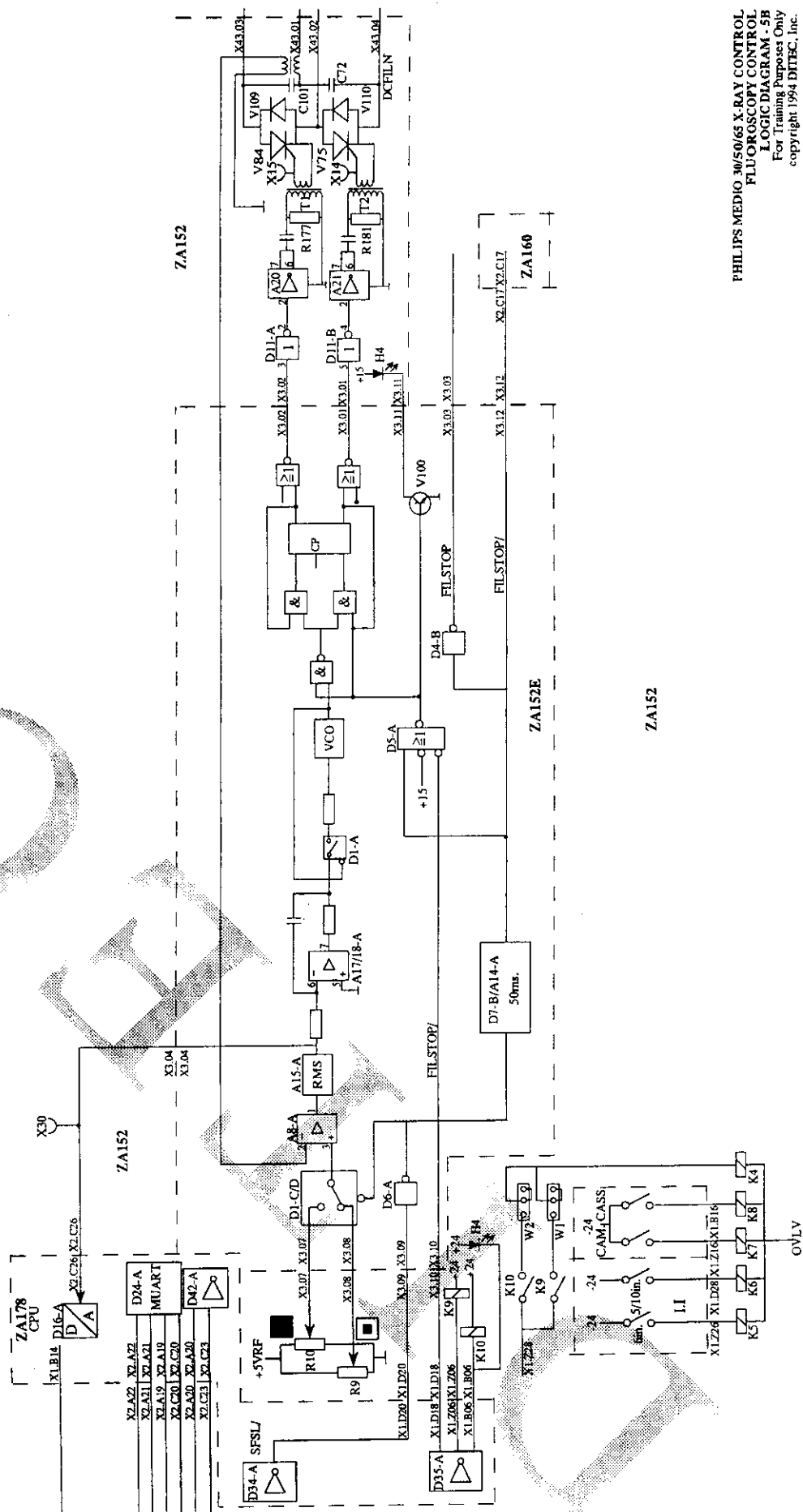


PHILIPS MEDIO 30/50/65 X-RAY CONTROL
KV CONTROL
LOGIC DIAGRAM - 3A
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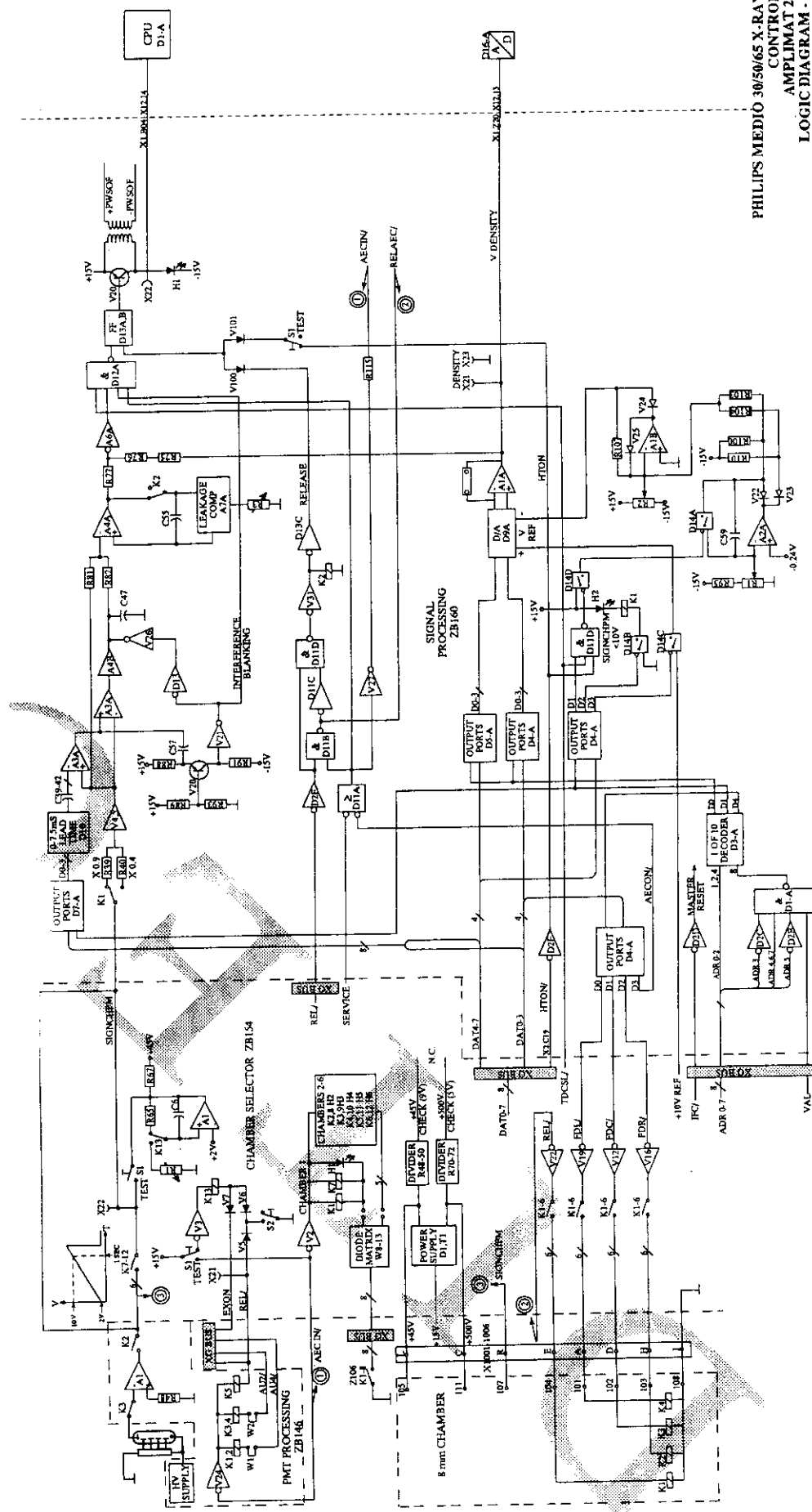


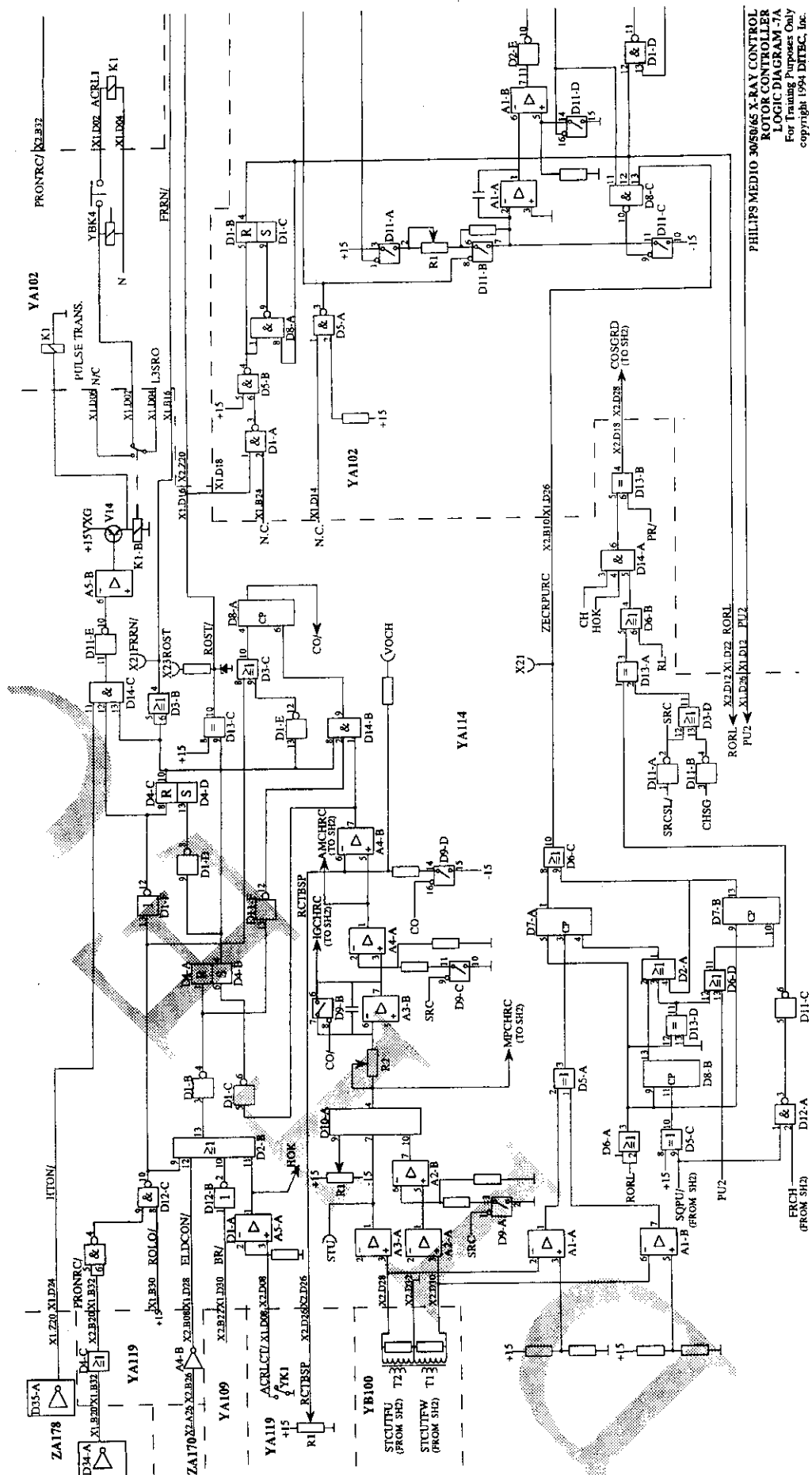
PHILIPS MEDIO 30/50/65 X-RAY CONTROL
FLUOROSCOPY CONTROL
LOGIC DIAGRAM - 5A
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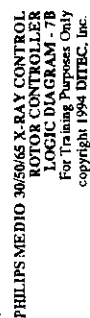


PHILIPS MEDIO 30/50/65 X-RAY CONTROL
FLUOROSCOPY CONTROL
LOGIC DIAGRAM - 5B
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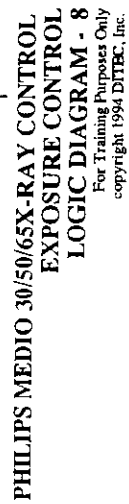
PHILIPS MEDIO 30/50/65 X-RAY
CONTROL
AMPLIMAT 20
LOGIC DIAGRAM - 6
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**PHILIPS MEDIO 30/50/65 X-RAY CONTROL
ROTOR CONTROLLER
LOGIC DIAGRAM - 7B**
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**PHILIPS MEDIO 30/50/65X-RAY CONTROL
EXPOSURE CONTROL
LOGIC DIAGRAM - 8**
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ERROR CODE LIST

<u>ERROR #</u>	<u>STATUS</u>	<u>DESCRIPTION</u>
E000	INIT 0	RAM CHIP ERROR
E010	INIT 0	CPU DEFECTIVE
E020	INIT 0	EPROM, CHECKSUM ERROR
E100	INIT 0	WATCHDOG ERROR
E110	INIT 0	BINARY CHANNEL 1
E111	INIT 1	BINARY CHANNEL 1
E112	INIT 2	BINARY CHANNEL 1
E113	STANDBY	BINARY CHANNEL 1
E114	FLUORO	BINARY CHANNEL 1
E115-6	PREP	BINARY CHANNEL 1
E117-9	EXP	BINARY CHANNEL 1
E11A-E	APR	BINARY CHANNEL 1
E120	INIT 0	BINARY CHANNEL 2
E121	INIT 1	BINARY CHANNEL 2
E122	INIT 2	BINARY CHANNEL 2
E123	STANDBY	BINARY CHANNEL 2
E124	FLUORO	BINARY CHANNEL 2
E125-6	PREP	BINARY CHANNEL 2
E127-9	EXP	BINARY CHANNEL 2
E12A-E	APR	BINARY CHANNEL 2
E130	INIT 0	XGB BUS DATA
E131	INIT 0	APR CHECKSUM ERROR
E133	STANDBY	APR CHECKSUM ERROR
E134	FLUORO	APR CHECKSUM ERROR
E13C-E	APR	APR CHECKSUM ERROR
E140	INIT 0	NO EOC SIGNAL IN ADC
E141	INIT 1	DENSITY VALUE VARIED
E143	STANDBY	DENSITY VALUE VARIED
E144	FLUORO	DENSITY VALUE VARIED
E14A-B	APR	DENSITY VALUE VARIED
E150	INIT 0	ADC TOLERANCE ERROR
E151	INIT 1	ADC TOLERANCE ERROR
E152	INIT 2	ADC TOLERANCE ERROR
E153	STANDBY	ADC TOLERANCE ERROR
E154	FLUORO	ADC TOLERANCE ERROR
E155-6	PREP	ADC TOLERANCE ERROR
E157-9	EXP	ADC TOLERANCE ERROR
E15A-E	APR	ADC TOLERANCE ERROR
E160	INIT 0	MUART/INTERRUPT/TIMER
E178	EXP	BACKUP TIMER STOPS EXP

<u>ERROR #</u>	<u>STATUS</u>	<u>DESCRIPTION</u>
E21X-22X		NO DESK CONNECTION
E33X E335 E33A-E	STANDBY, FLUORO PREP APR	REPWON NOT OK REPWON NOT OK REPWON NOT OK
E413 E414 E420 E421 E422 E423 E424 E433 E435 E437-9	STANDBY FLUORO INIT 0 INIT 1 INIT 2 STANDBY FLUORO STANDBY PREP EXP	DENSITY VOLTAGE ERROR DENSITY VOLTAGE ERROR XGB LOG ERROR XGB LOG ERROR XGB LOG ERROR XGB LOG ERROR XGB LOG ERROR XGB LOG ERROR IN PD INTERFACE 100 XGB LOG ERROR IN PD INTERFACE 100 XGB LOG ERROR IN PD INTERFACE 100
E513 E514 E515 E517 E51A-E E523 E525 E52A-E E538 E549 E554 E567-9	STANDBY FLUORO PREP EXP APR STANDBY PREP APR EXP EXP FLUORO EXP	CONVERTER NOT READY CONVERTER NOT READY CONVERTER NOT READY CONVERTER NOT READY CONVERTER NOT READY EXON = 1 BEFORE EXP EXON = 1 BEFORE EXP EXON = 1 BEFORE EXP KV BEYOND TOLERANCE KV 50MS AFTER EXP STOP KV EXCEEDS 130 KV NO EXON 30MS AFTER HTON
E613 E614 E615 E617 E61A-3 E624 E628 E633 E634 E635-6 E638 E63A-E	STANDBY FLUORO PREP EXP APR FLUORO EXP STANDBY FLUORO PREP EXP APR	FILAMENT CIRCUIT READY FILAMENT CIRCUIT READY FILAMENT CIRCUIT READY FILAMENT CIRCUIT READY FILAMENT CIRCUIT READY MA BEYOND TOLERANCE MA BEYOND TOLERANCE FILAMENT CURRENT BEYOND TOLERANCE FILAMENT CURRENT BEYOND TOLERANCE FILAMENT CURRENT BEYOND TOLERANCE FILAMENT CURRENT BEYOND TOLERANCE FILAMENT CURRENT BEYOND TOLERANCE

<u>ERROR #</u>	<u>STATUS</u>	<u>DESCRIPTION</u>
E713	STANDBY	SRO NOT AT STANDBY
E715	PREP	SRO NOT AT STANDBY
E723	STANDBY	SRO BRAKE MALFUNCTION
E72A-E	APR	SRO BRAKE MALFUNCTION
E733	STANDBY	SRO BRAKE MALFUNCTION
E73A-E	APR	SRO BRAKE MALFUNCTION
E745	PREP	RDY ROT NOT ON AFTER 2 SEC
E755	PREP	RDY ROT ON AFTER 330 MS IN PREP
E95X	STANDBY	STANDBY FIL. CURRENT BEYOND +/- 15%
E95A-3	APR	STANDBY FIL. CURRENT BEYOND +/- 15%
EA12	INIT 2	NO EXAM/AUX UNIT SELECTED
EA1A	APR	NO EXAM/AUX UNIT SELECTED
EA21	INIT 1	NO EXAM/AUX UNIT SELECT POSSIBLE
EA2A	APR	NO EXAM/AUX UNIT SELECT POSSIBLE
EA82	INIT 2	RQ PREP NOT STABLE
EA83	STANDBY	RQ PREP NOT STABLE
EA84	FLUORO	RQ PREP NOT STABLE
EA85-6	PREP	RQ PREP NOT STABLE
EA87-8	EXP	RQ PREP NOT STABLE
EA93	STANDBY	RQ FLON NOT STABLE
EA94	FLUORO	RQ FLON NOT STABLE
EA95-6	PREP	RQ FLON NOT STABLE
EB03	STANDBY	ESID SWITCH OPEN
EB0A-E	APR	ESID SWITCH OPEN
EB10	INIT 0	SWITCH PRESSED UPON INIT OR CHANGE OF AUX
EB13	STANDBY	SWITCH PRESSED UPON INIT OR CHANGE OF AUX
EB14	FLUORO	SWITCH PRESSED UPON INIT OR CHANGE OF AUX
EB28	PREP	4 SEC OR 600 MAS IN AEC EXP
EB33	STANDBY	THOL
EB3A-E	APR	THOL
EB46	PREP	50 KW AND PRON ACTIVE > 30 SEC
EB49	EXP	50 KW AND PRON ACTIVE > 30 SEC
EB54	FLUORO	BUZZER RESET NOT WITHIN < 5 MIN

<u>ERROR #</u>	<u>STATUS</u>	<u>DESCRIPTION</u>
EC15	EXP	PD 100 NOT READY OR NOT IN PARK POSITION
EC17	EXP	PD 100 SCAN CALCULATION NOT END BEFORE SCAN BOOST TIME
EC27	EXP	LOWER MEASURE POT NOT REACHED IN 300 MS AFTER START
EC37	EXP	UPPER SCAN POSITION NOT REACHED 400 MS AFTER TEST EXP
EC48	EXP	UPPER MEASURE POSITION NOT REACHED 300 MS AFTER START OF TEST EXPOSURE
EC58	EXP	LOWER SCAN POSITION NOT REACHED IN 1000 MS AFTER START
EC67-8	EXP	PD 100 OPERATION TERMINATED PREMATURELY
EF		SAME AS EB
SFA 1 (IN FLUORO KV DISPLAY)		STAND FAILURE, HHS CONTACT RELEASE DECADE (AUX 1-4)

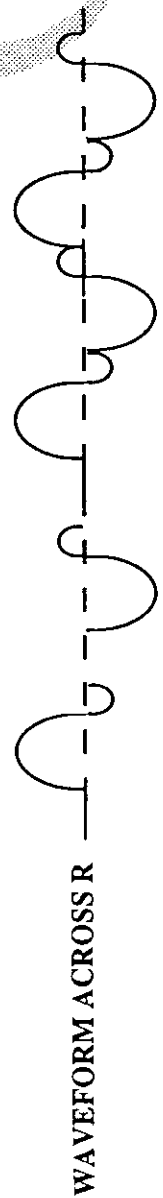
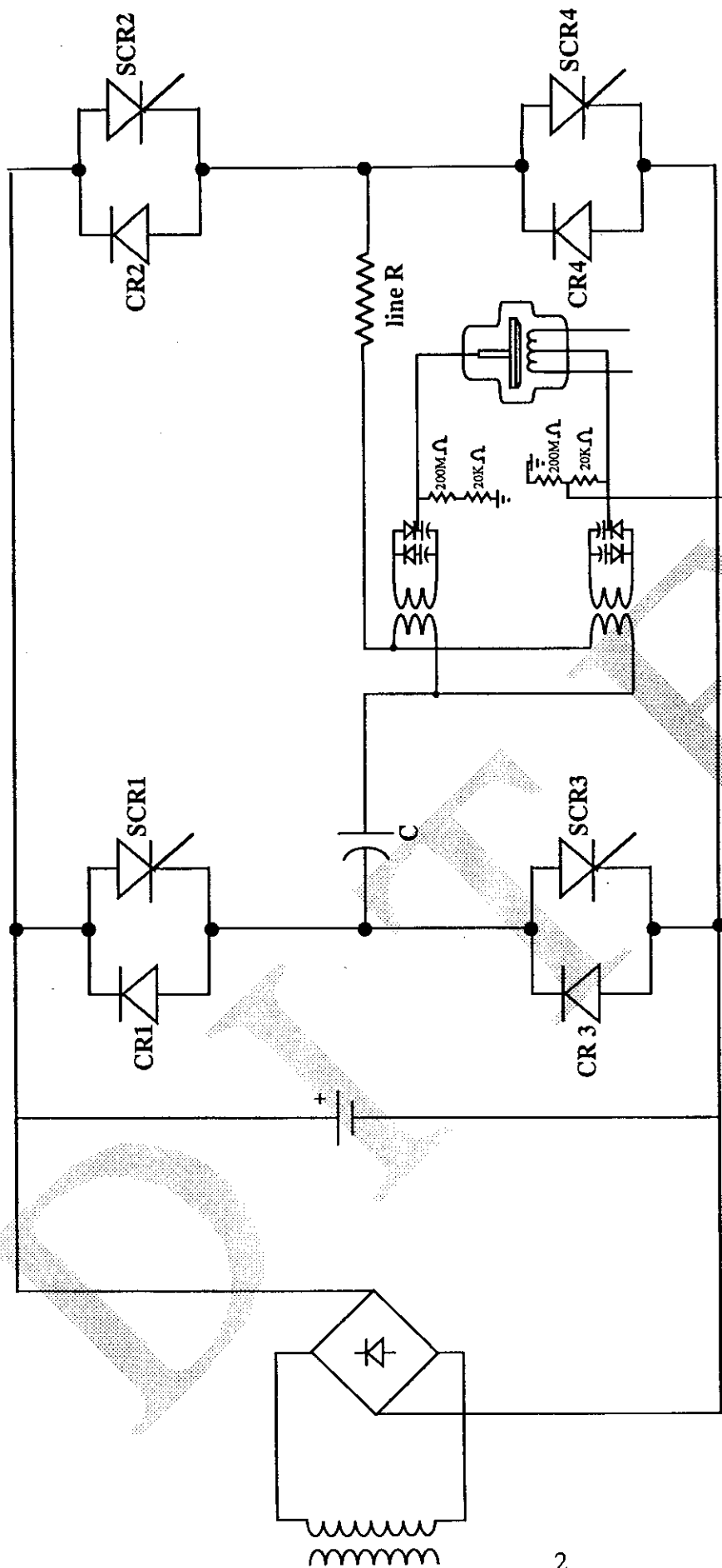
HIGH FREQUENCY KV CIRCUITS

The following figure demonstrates the concepts of high frequency circuits.

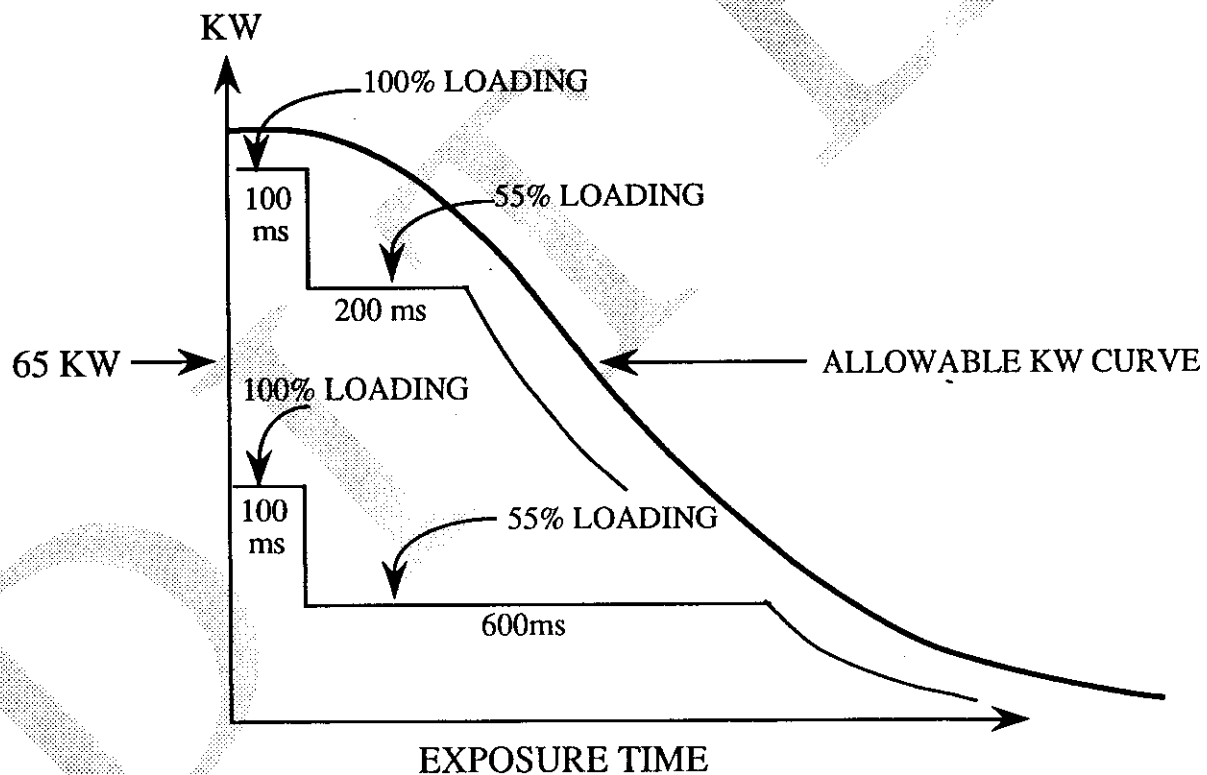
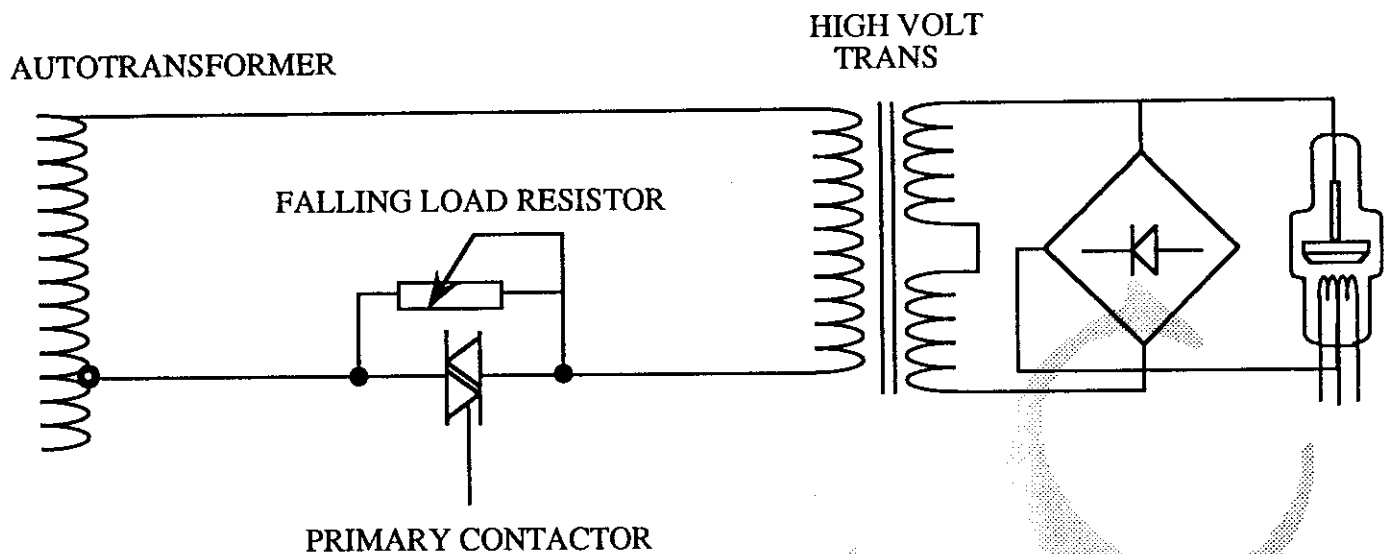
The power supply provides the operating voltage for the circuit. By turning on SCR1 and SCR4 current flows through the resistor in one direction. Once the capacitor C is charged current stops and the magnetic field around the coil L collapses keeping current flowing in the same direction. Then the capacitor discharges through the diode CR1 and CR4 turning off the SCR's and causing the ringing apparent in the waveform.

The process is repeated with the other set of SCR's for the negative part of the waveform. This circuit is called high frequency because the natural frequency of the shut off is generally high, therefore the firing of the SCR's can be controlled at some high frequency. Since this is a self shutting off circuit, it is short circuit proof. It is not open circuit proof since the coil must discharge, even across an open circuit. This would cause damage to the circuitry.

By controlling the frequency at which the SCR's are turned on, the average current through L can be controlled. If we connect filaments or the high voltage transformer to the secondary of L, the mA or KV can be controlled.

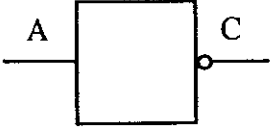
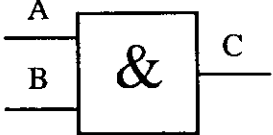
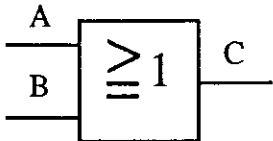
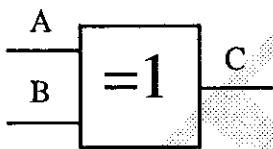
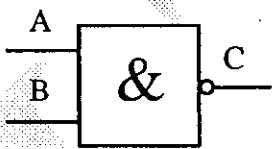
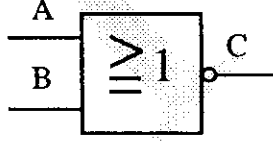
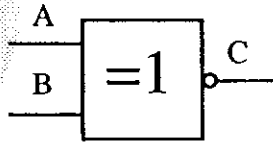


HIGH FREQUENCY KV CONTROL
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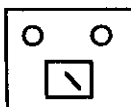


**PHILIPS MEDIO 30/50/65
FALLING LOAD CONCEPTS**
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LOGIC SYMBOLS

OPERATION	SYMBOLS	INPUT CONDITIONS	OUTPUT
NOT		A=1	C=0
AND		A=1 and B=1	C=1
OR		A=1 or B=1	C=1
EX-OR		A=1 and B=0 or A=0 and B=1	C=1
NAND		A=1 and B=1	C=0
NOR		A=1 or B=1	C=0
EX-NOR		A=1 and B=0 or A=0 and B=1	C=0

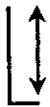
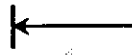
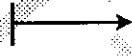
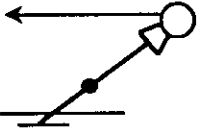
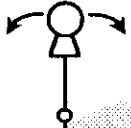
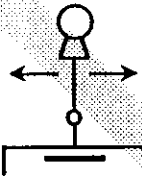
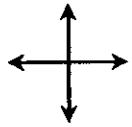
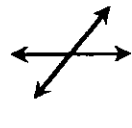
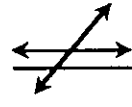
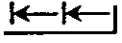
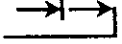
SWITCHES AND CONTROLS

	ON - MAINS
	OFF- MAINS
	ON - Auxiliary Circuits
	PREP
	OFF - Auxiliary Circuits
	Increase or decrease of a value without steps
	Increase or decrease of a value with steps
	Increase or decrease of a value without steps - rotary
	Increase or decrease of a value with steps - Rotary
	Increase or decrease of a value with On/Off - Rotary
	START - Initiate
	STOP - Terminate
	Manual Operation
	Automatic Operation
	Handswitch
	Footswitch
	Operation from a control - Console

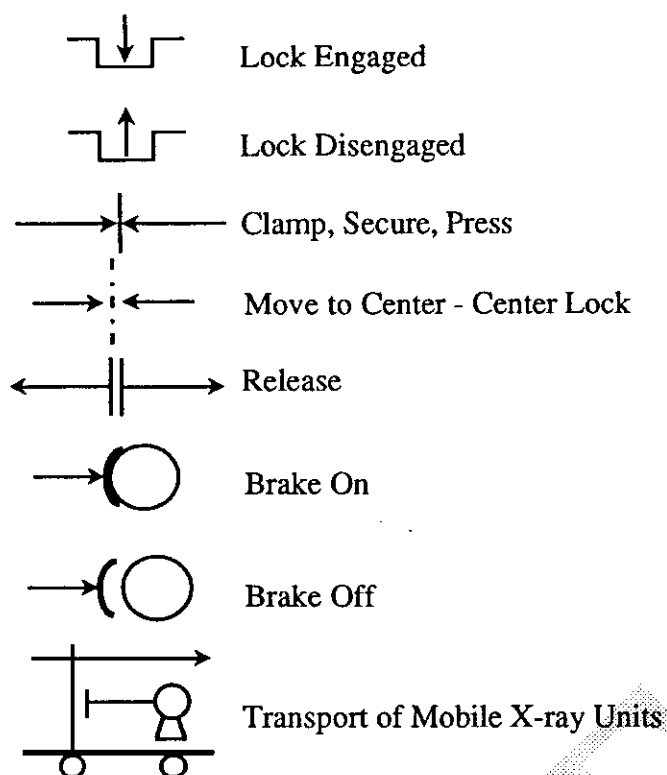
RAD, FLUORO, FOCUS, PATIENT TYPE, GRIDS

	Direct Radiography
	Indirect Radiography - Formerly all Radiography
	Fluoroscopy
	Micro focus
	Small Focus
	Large Focus
	Fat Patient
	Average Patient
	Thin Patient
	Stationary Grid
	Moving Grid
	Without Grid

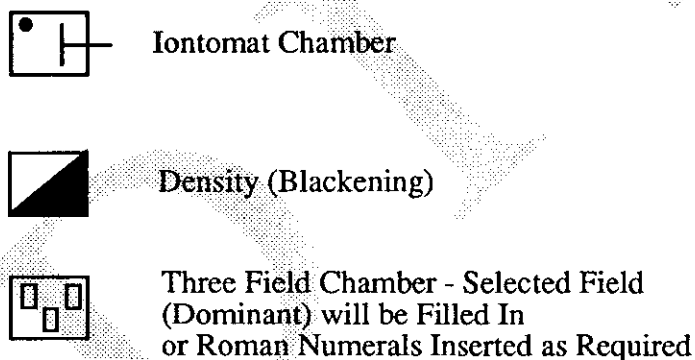
TABLES MECHANICAL MOVEMENT

	Table Tilting About a Horizontal axis		Move Tabletop or Footrest Longitudinally
	Table Tilt to Upright		Move Footrest Toward Head
	Table Tilt to Horizontal		Move Footrest Toward Foot
	Table Tilt Head Down		Movement in Direction of Arrow to a Limit
	Table Top Rotating About its Longitudinal Axis		Movement in Direction of Arrow Away from a Limit
	Raise Table Top		Movement in Direction of Arrow
	Lower Table Top		Movement in Two Directions
	Tomography (Planigraphy)		Movement in Two Directions vertically
	Oblique Setting of Tomo Unit		Movement in Two Directions to and from the Operator
	Longitudinal Movement of Tomo Unit		Movement in Four Directions Vertical and Horizontal
	Setting Slice Level		Movement in Four Directions Horizontal
	Adjust Slice in Direction of Arrow		Free Movement of Tabletop in Four Directions - Floating
			Stepped Tabletop Movement Toward the Head
			Stepped Tabletop Movement Toward the Feet
			Rotation In Two Directions Pendulum
			Rotation In Two Directions About an Axis

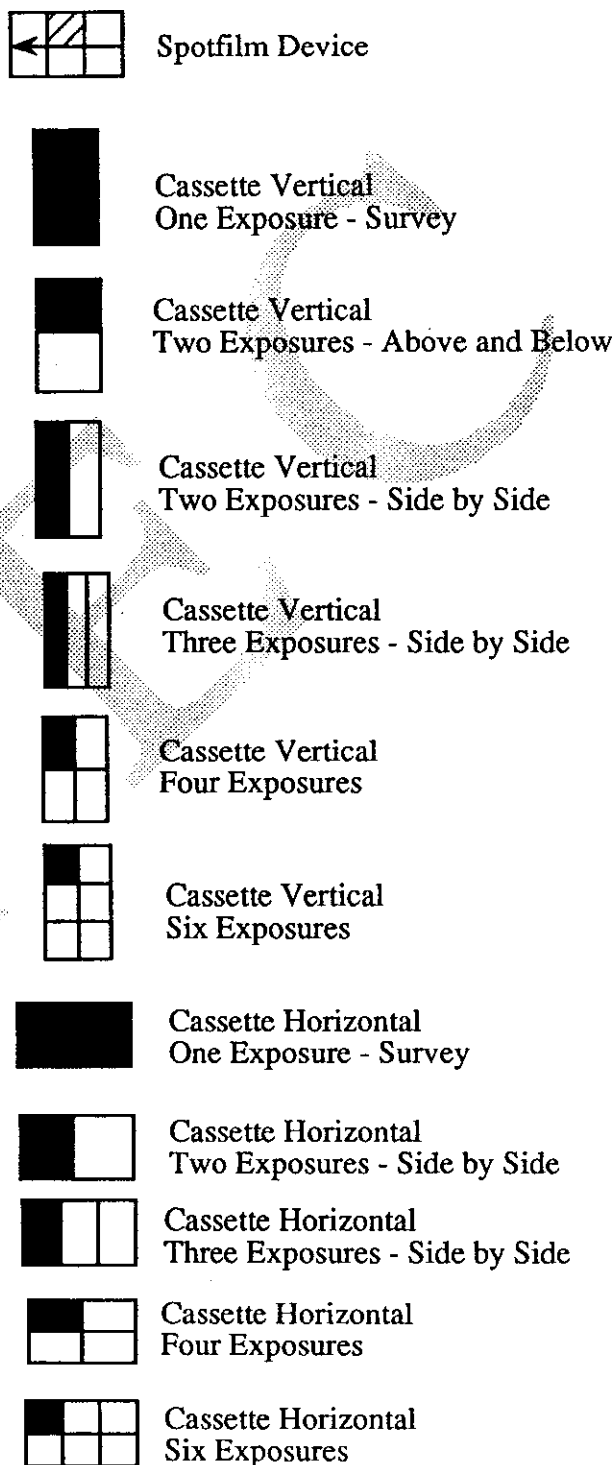
TABLES MECHANICAL MOVEMENT cont'd



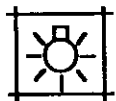
AUTOMATIC EXPOSURE CONTROL (IONTOMAT)



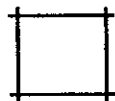
SPOTFILM FORMAT SELECTION



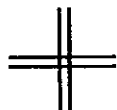
DIAPHRAGMS, CONES



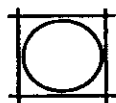
Limited Field Illumination



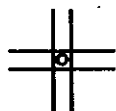
Slot Diaphragm or Collimator Open



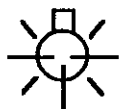
Slot Diaphragm or Collimator Closed



Iris Diaphragm Open



Iris Diaphragm Closed



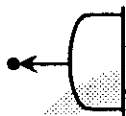
Light Beam Indicator



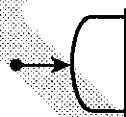
Compression Cone



Without Compression Cone

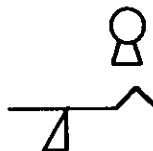


Compression

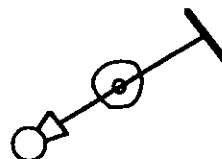


Decompression

EXAMINATION UNITS



Urology Table



Skull Unit



C-Arm



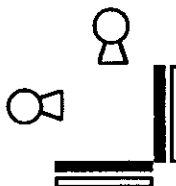
Mammography



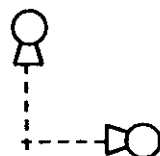
Cut Film Changer, Cassette
Changer - Single Plane



Cut Film Changer, Cassette
Changer - Biplane



Biplane X-ray Unit,
Simultaneous Exposure

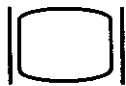


Biplane X-ray Unit, Without
Simultaneous Exposure

TELEVISION, IMAGE INTENSIFIERS



Television in General



TV Monitor



Monitor Brightness Control



Monitor Contrast control



Image Intensifier



Image Intensifier - Normal Size Image

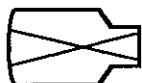
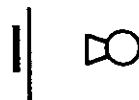


Image Intensifier - Enlarged Image

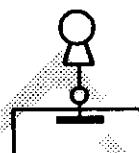
INSTALLATIONS (EXAMINATION UNITS)



Bucky Table



Bucky Wall Stand



Tomographic Unit
(Planigraphy)



Tilting Table with
Overtable Tube

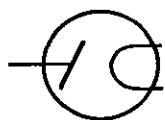


Tilting Table with
Undertable Tube



Photofluorographic Unit

MISCELLANEOUS SYMBOLS



X-ray Tube



X-ray Tube Emitting Radiation



X-ray Tube Assembly



Timer



Acoustic Signal



Signal Lamp



Calibration mark - Scales



Danger Warning



Loudspeaker



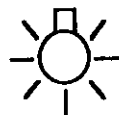
Intercom



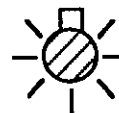
Intercom Speak



Intercom Listen



Lamp - White or Room Lighting



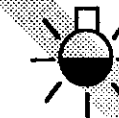
Lamp - Red for Darkroom



Lamp - Green



Lamp - Blue



Indirect Lighting - for Scales, Controls, etc.



% mA Loading



Tube Arc