

ONKYO® SERVICE MANUAL

Digital Surround Processor MODEL ED-301

UWT	120V/220~230V AC, 50/60Hz
UDT	120V AC, 50Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK Δ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

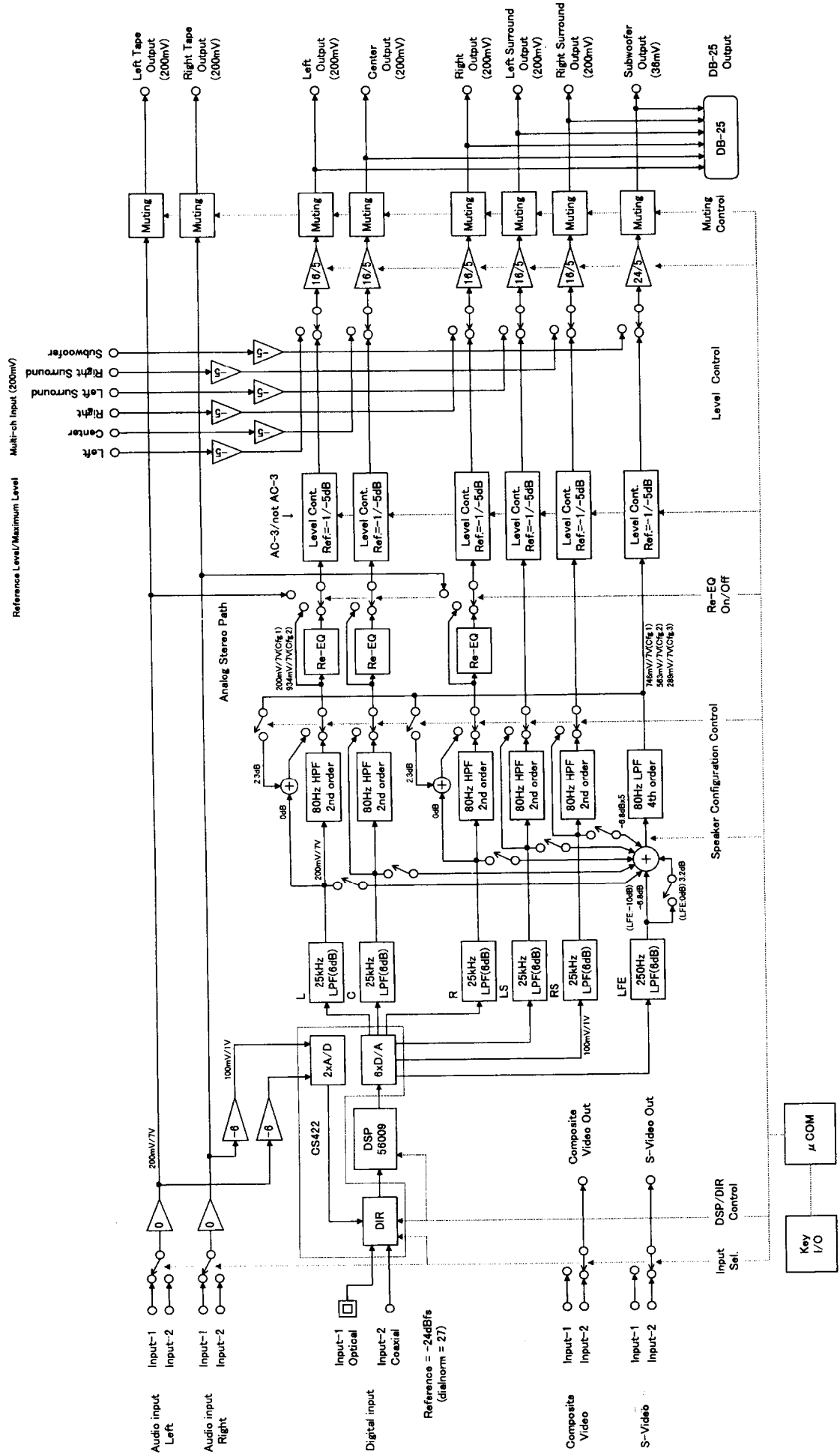
SPECIFICATIONS

Frequency response:		20Hz - 20kHz(+0dB/-3dB)
Input sensitivity and impedance:	Input-1/2	200mV at 50kohm
	Multi-channel Audio input (L/R/C/LS/RS)	200mV/27kohm
	Video in	(composite) 1V P-P/75ohm
		(S-Video Y) 1V P-P/75ohm
		(S-Video C) 0.28V P-P/75ohm
	Coaxial	0.5V P-P/75ohm
Output level and impedance:	Output	200mV/470ohm
	Multi-channel Audio output (L/R/C/LS/RS)	200mV/470ohm
	(SW)	36mV/470ohm
	(composite)	1V P-P/75ohm
	(S-Video Y)	1V P-P/75ohm
	(S-Video C)	0.28V P-P/75ohm
	(Digital input)	96dB(IHF-A)
Signal to noise ratio:	Optical/Coaxial	96dB(IHF-A)
	Input-1/2(2V input)	0.08%
Harmonic distortion:	L/R(1kHz,0dBFS,PCM)	
Power supply rating:	AC230V,50Hz	
	AC120/220-230V,50/60Hz	
Power consumption:	22W	
Dimensions (W x H x D)	435 x 91 x 302mm	
	(17-1/8" x 3-9/16" x 11-7/8")	
Weight:	4.2kg (9.3LBs)	

Specifications and external appearance are subject to change without notice because of product improvement.



BLOCK DIAGRAM

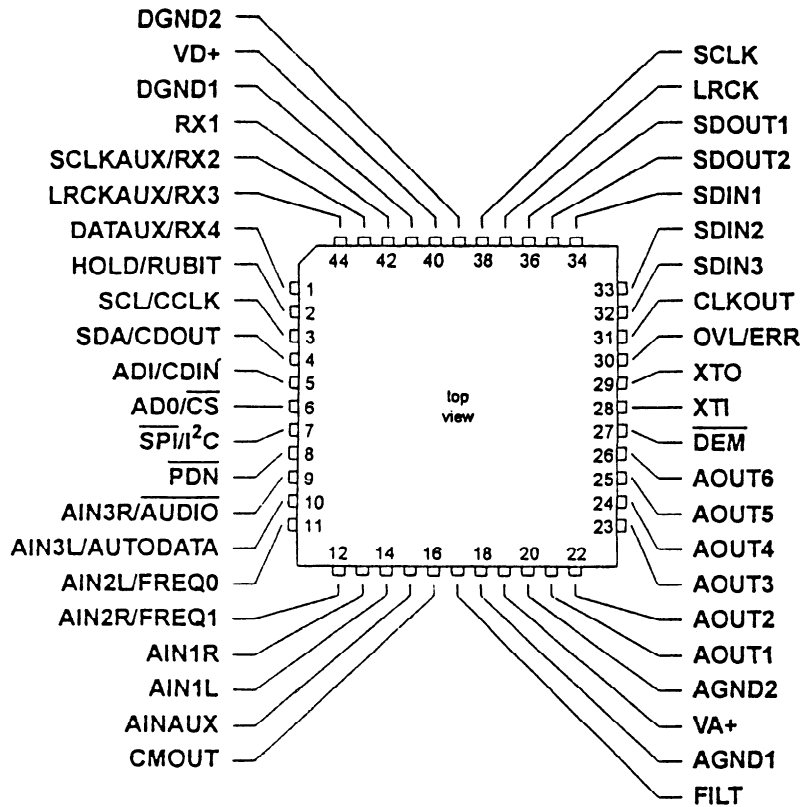


PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	27111069	Front bracket
	27111070	Front bracket <G>
2	838130088	3TTB+6B, Self-tapping screw
3	838430107	3TTB+10S (BC), Self-tapping screw
5	27100362	Chassis
7	27190266	KGLS-12RF, Holder
8	260208	Binder
10	27300750	△ Bushing, cord
12	27175380	Leg
14	831430088	3TTW+8B (BC), Self-tapping screw
15	830440069	4TTC+6C (BC), Self-tapping screw
18	27301396	HL-28-0, Clamp
22	28184670B	Top cover
	28184687A	Top cover <G>
23	838430088	3TTB+8B (BC), Self-tapping screw
	838230088	3TTB+8B (NI), Self-tapping screw <G>
25	27212002	Front panel
	27212003	Front panel <G>
28	28135244	Badge
	28135245	Badge <G>
30	28325465	Knob, power
	28325516	Knob, power <G>
32	28191827	Clear plate
	28191828	Clear plate <G>
51	27122462	Rear panel <D>
	27122463	Rear panel <P/T>
	27122465	Rear panel <W>
F901	252192	△ 0. 4A-TSC, Primary fuse <D/W>
F902	252087	△ 0. 2A-SE-EAWK, Primary fuse <P/T/W>
P701	2047321012	NCFC7-321012, Flat cable
P901	253192HIT	△ AS-UC-6#18 (SPT-2), Power supply cord <D>
	253193HIT	△ AS-CEE, Power supply cord <P/T/W>
T901	2301330	△ NPT-1340D, Power transformer <D>
	2301331	△ NPT-1340P, Power transformer <P/T>
	2301332	△ NPT-1340DG, Power transformer <W>
U1	1W178540-1A	NADIS-6340-1A, Display circuit pc board ass'y <D>
	1W178540-1B	NADIS-6340-1B, Display circuit pc board ass'y <P/T>
	1W178540-1C	NADIS-6340-1C, Display circuit pc board ass'y <W>
U2	1W178541-1A	NAPS-6341-1A, Power supply circuit pc board ass'y <D>
	1W178541-1B	NAPS-6341-1B, Power supply circuit pc board ass'y <P/T>
	1W178541-1C	NAPS-6341-1C, Power supply circuit pc board ass'y <W>
U3	1W178542-1A	NASW-6342-1A, Power switch pc board ass'y <D>
	1W178542-1B	NASW-6342-1B, Power switch pc board ass'y <P/T>
	1W178542-1C	NASW-6342-1C, Power switch pc board ass'y <W>
U4	1W178543-1C	NASW-6343-1C, Voltage selector switch pc board ass'y <W>
U5	1W178544-1	NADG-6344-1, Digital circuit pc board ass'y
U6	1W178545-1	NAVD-6345-1, Video terminal pc board ass'y

MICROPROCESSOR CONECTION DIAGRAM

IC102:CS4226

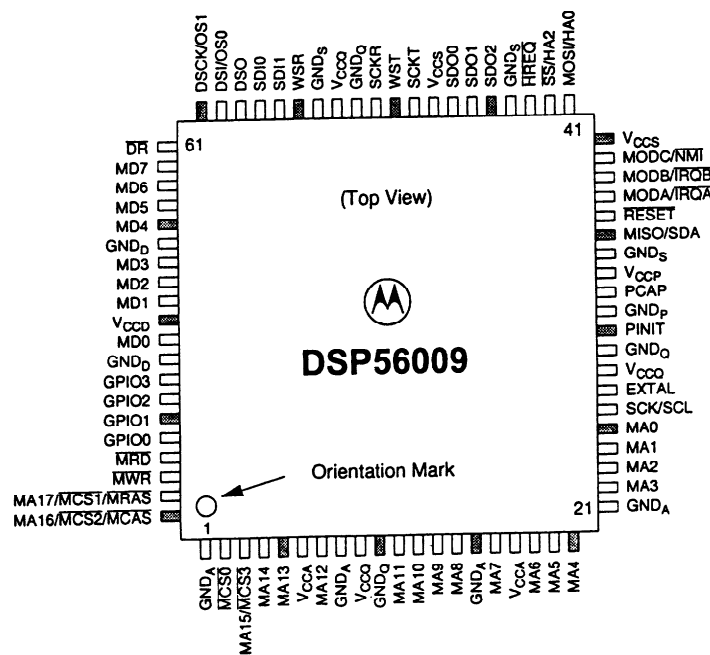


IC102 SURROUND SOUND CODEC

Pin No	Port name	I/O	Description	Pin No	Port name	I/O	Description
1	DATAAUX/RX4	I	Auxiliary data input / receiver channel 4	23	AOUT3	O	The analog outputs from the 6 D/A converters.
2	HOLD/RUBIT	I/O	S/PDIF receiver user bit / HOLD control	24	AOUT4	O	The analog outputs from the 6 D/A converters.
3	SCL/CCLK	I/O	Serial control interface clock	25	AOUT5	O	The analog outputs from the 6 D/A converters.
4	SDA/CDOUT	O	Serial control data out	26	AOUT6	O	The analog outputs from the 6 D/A converters.
5	ADI/CDIN	I	Address bit / serial control data in	27	DEM	O	De-emphasis control
6	AD0/CS	O	Address bit / control post chip select	28	XT1	-	Crystal connections
7	SPI/I ² C	I/O	Control post format	29	XTO	-	Crystal connections
8	PDN		Power down pin	30	OVL/ERR	O	Overload indicator
9	AIN3R/AUDIO	I	Right channel multiplexer input 3/AC3 and MPEG detect output	31	CLKOUT	O	Master clock output
10	AIN3R/AUTODATA	I	Right channel multiplexer input 3/AC3 and MPEG detect output	32	SDIN3	I	Serial data input 3
11	AIN2L/FREQ0	I	Left channel multiplexer input 2/channel status freq.bit	33	SDIN2	I	Serial data input 2
12	AIN2R/FREQ1	I	Right channel multiplexer input 2/channel status freq.bit	34	SDIN1	I	Serial data input 1
13	AIN1R	I	Right channel multiplexer input 1	35	SDOUT2	O	Serial data output 2
14	AIN1L	I	Left channel multiplexer input 1	36	SDOUT1	O	Serial data output 1
15	AINAUX	I	Auxiliary line level input(non A/D converter)	37	LRCK	I/O	Left/Right select signal I/O
16	CMOUT	O	Common mode output	38	SCLK	I/O	DSP serial port clock I/O
17	FILT		PLL loop filter pin	39	DGND2	-	Digital ground
18	AGND1	-	Analog ground	40	VD+	-	Digital power input(+5V)
19	VA+	-	Analog power input	41	DGND1	-	Digital ground
20	AGND2		Analog ground	42	RX1		Receiver channel 1
21	AOUT1	O	The analog outputs from the 6 D/A converters.	43	SCLKAUX/RX2	I/O	Auxiliary bit clock input or output / receiver channel 2
22	AOUT2	O	The analog outputs from the 6 D/A converters.	44	LRCKAUX/RX3	I/O	Auxiliary word clock input or output / receiver channel 3

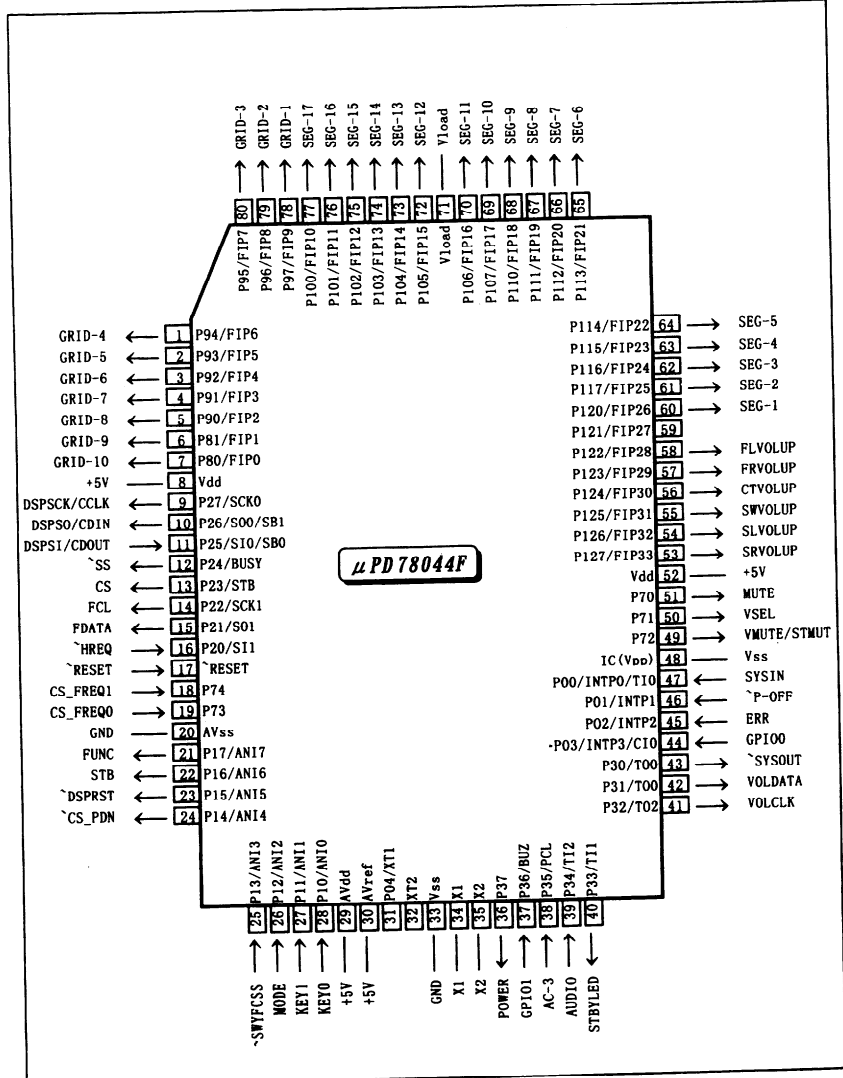
Q701 : μ PD78044FGF (8-BIT SINGLE CHIP MICROPROCESSOR)

Port No	Port name	I/O	Description	Port No	Port name	I/O	Description
1-7	GRID-4~GR11	O	Output port for FIP grid	37	GPIO1	I	Connect to GPIO1 of DSP(56009)
8	V _{DD}	O	+ power supply	38	AC-3	I	Input port for AUTO DATA signal H:AC3 or MPEG
9	DSPSCK/CCLF	O	Serial clock output port for serial interface	39	AUDIO	I	Input port for AUDIO signal L:AUDIO
10	DSPSO/CDIN	O	Serial data output port for serial interface	40	STBYLED	O	Standby -LED(not use)
11	DSPSI/CDOU1	I	Serial data input port for serial interface	41	VOLCL	O	Serial clock output port for CK terminal of electric volume
12	SS	O	Output port from SS terminal of DSP56009	42	VOLDATA	O	Serial clock output port for DATA terminal of electric volume
13	\overline{CS}	O	Output port of chip selector	43	SYSOUT	O	RI output port
14	FCL	O	Serial clock output port for CL-terminal of function switch	44	GPIO0	I	Connect the GPIO1 of DSP
15	FDATA	O	Serial data output port for CL-terminal of function switch	45	ERR	I	OVL/ERR input signal port. H:OVER LEVEL(at analog input)
16	HREQ	I	Connect to the HREQ of DSP(56009)	46	P-OUT	I	Detect power failure
17	RESET	I	System reset input port	47	SYSIN	I	RI input port
18	CS FREQ1	I	Checking a sampling freq. of CS4226	48	V _{SS}		Connect to V _{SS}
19	CS FREQ0	I	Checking a sampling freq. of CS4226	49	VMUTE	O	Output signal for VIDEO MUTE
20	AV _{SS}		Ground for A/D converter	50	VSEL	O	VIDEO1/2 selector output port. L:VIDEO1 H:VIDEO2
21	FUNC	O	Output port for ST terminal of function switch	51	MUTE	O	Muting signal output port for MULT-CH
22	STB	O	Output port for STB terminal of electric volume	52	V _{DD}		+5V
23	DSPRST	O	Output port for reset terminal of DSP56009	53	SRVOLUP	O	SR volume gain up output port
24	CS PDN	O	Output port for controled power supply	54	SLVOLUP	O	SL volume gain up output port
25	SWYFCSS	I	Selecting the CONFIG MODE	55	SWVOLUP	O	SW volume gain up output port
26	MODE	I	Input port for detect a categories	56	CTVOLUP	O	CT volume gain up output port
27-28	KEY1 to KEY0	I	Key input	57	FRVOLUP	O	FR volume gain up output port
29	AV _{DD}		Analog power supply for A/D converter	58	FLVOLUP	O	FL volume gain up output port
30	AVREF		Reference power supply for A/D converter	59			Not connect
31	P04/XT1		Sub-System clock (not use)	60-70	SEG-1 to SEG-11	O	Segment driver for FIP
32	XT2		Sub-System clock (not use)	71	V _{LOAD}		Connect the FIP controller/driver with pull down resister
33	V _{SS}		Ground	72-77	SEG-12 to SEG-17	O	Segment driver for FIP
34	X1		Connecting crystal for main-system	78-80	GRID-1 to GRID-3	O	Grid driver for FIP
35	X2		Connecting crystal for main-system				
36	POWER	O	Power supply port for power control				



Note: An OVERBAR indicates the signal is asserted when the voltage = ground (active low). To simplify locating the pins, each fifth pin is shaded in the illustration.

IC103 : MICROPROCESSOR CONNECTION DIAGRAM



Q103 DSP MICROPROCESSOR TERMINAL DESCRIPTION

Port No	Port name	I/O	Description	Port No	Port name	I/O	Description	Port No	Port name	I/O	Description
1	GND _A	-	S-address bus ground	31	GND _P	-	PLL ground	61	\overline{DR}	I	Debug request
2	$\overline{MCS0}$	0	Memory chip select 0	32	PCAP	I	PLL filter capacitor	62	MD7		
3	MA15/ MCS3	0	Memory address lines 15 Memory chip select3	33	V _{CCP}	-	PLL power	63	MD6		
4	MA14	0	Memory address lines 0-14	34	GND _S	-	Serial interface ground	64	MD5		
5	MA13	0	Memory address lines 0-13	35	MISO/SDA	I/O	SPI master-in-slave-out I ² C serial data and acknowledge	65	MD4		
6	V _{CCA}	-	Address Bus power	36	\overline{RESET}	I	Reset	66	GND _D		Data Bus ground
7	MA12	0	Memory address lines 0-12	37	MODA/ \overline{IRQA}	I	Mode select A External interrupt request A	67	MD3		
8	GND _A	-	Address Buss ground	38	MODB/ \overline{IRQB}	I	Mode select B External interrupt request B	68	MD2		
9	V _{CCQ}	-	Quiet power	39	MODC/ NMI	I, edge-triggered	Mode select C	69	MD1		
10	GND _Q	-	Quiet ground	40	V _{CCS}	-	Non-maskable interrupt request	70	V _{CCD}		Data Bus power
11	MA11	0	Memory address lines 0-11	41	MOSI/HA0	I/O	Serial interface power	71	MD0		
12	MA10	0	Memory address lines 0-10	42	$\overline{SS/HA2}$	I	SPI master-out-slave-in I ² C slave address 0	72	GND _D		Data Bus ground
13	MA9	0	Memory address lines 0-9	43	\overline{HREQ}	I	SPI slave select	73	GPIO3		GPIO lines can be used for control and handshake functions between the DSP and external circuitry.(GPIO0 to 3)
14	MA8	0	Memory address lines 0-8	44	GND _S	I	I ² C slave address 2	74	GPIO2		
15	GND _A	-	S-address bus ground	45	SDO2	0	Host request	75	GOIO1		
16	MA7	0	Memory address lines 0-7	46	SDO1	0	Serial interface ground	76	GPIO0		
17	V _{CCA}	-	Address Bus power	47	SDO0	0	Serial data output 2	77	\overline{MRD}		Memory read strobe
18	MA6	0	Memory address lines 0-6	48	V _{CCS}	-	Serial data output 1	78	\overline{MWR}		Memory write strobe
19	MA5	0	Memory address lines 0-5	49	SCKT	I/O	Serial data output 0	79	MA17/ $\overline{MCS1/MRAS}$	0	Memory address line 17 Memory chip select 1
20	MA4	0	Memory address lines 0-4	50	WST	I/O	Serial interface power	80	MA16/ $\overline{MCS2/MCAS}$	0	Memory row address strobe Memory chip select 2 Memory column address strobe
21	GND _A	-	S-address bus ground	51	SCKR	I/O	Serial clock transmit				
22	MA3	0	Memory address lines 0-3	52	GND _Q	-	Word select transmit				
23	MA2	0	Memory address lines 0-2	53	V _{CCQ}	-	Receive serial clock				
24	MA1	0	Memory address lines 0-1	54	GND _S	-	Quiet ground				
25	MA0	0	Memory address lines 0-0	55	W _{SR}	I/O	Quiet power				
26	SCK/SCL	I/O	SPI serial clock I ² C serial clock	56	SDI1	I	Serial interface ground				
27	EXTAL	I	External clock/crystal	57	SDI0	I	Word select receive				
28	V _{CCQ}	-	Quiet power	58	DSO	0	Serial data input 1				
29	GND _Q	-	Quiet ground	59	DSI/OS0 On-chip	I	Serial data input 0				
30	PINIT	I	PLL initialization	60	DSCK/OS1	I	Debug serial output Debug serial input Operating status 0 Debug serial clock Operating status 1				

*1: Standard output, open-drain output, or input.
(General purpose I/O signals)

PARTS LIST

REF No	PARTS NAME	PARTS No	DESCRIPTION	
C102, C105, C110, C134, C140, C202, C204, C212, C206, C209, C210, C705, C707	ELECT C	354721019	CE04W6. 3V-100M	
C120-C125, C901, C902	ELECT C	354781009	CE04W50V-10M	
C126	TF C	374725615	EQ0-B50V-561K	
C127	TF C	374726824	EQ0-B50V-682J	
C128	ELECT C	354782209	CE04W50V-22M	
C129, C341, C342-C346	TF C	374721024	EQ0-B50V-102J	
C136, C404	TF C	374722234	EQ0-B50V-223J	
C205, C422-C424, C501-C506, C702, C918, C921	ELECT C	354780229	CE04W50V-2. 2M	
C305, C306, C531-C536, C903, C904, C909, C910	ELECT C	354744709	CE04W16V-47M	
C307, C308, C371-C376, C434-C436	ELECT C	354742209	CE04W16V-22M	
C311, C312, C398, C399, C411-C414, C418, C419, C439-C444	ELECT C	354761009	CE04W35V-10M	
C319, C320, C541-C546	TF C	374723324	EQ0-B50V-332J	
C328, C547	ELECT C	354782299	CE04W50V-0. 22M	
C331-C336	TF C	374723924	EQ0-B50V-392J	
C351-C356	TF C	374721524	EQ0-B50V-152J	
C361-C366	TF C	374723315	EQ0-V50V-331K	
C377	TF C	374721034	EQ0-B50V-103J	
C378	TF C	374724734	EQ0-V50V-473J	
C379, C381-C385, C391-C395, C403	TF C	374722244	EQ0-V50V-224J	
C405	TF C	374721244	EQ0-V50V-124J	
C425-C430	TF C	374721224	EQ0-B50V-122J	
C431-C433	TF C	374722224	EQ0-B50V-222J	
C453, C454, C507, C508, C907, C908	ELECT C	354761009	CE04W35V-10M	
C521-C526	ELECT C	354724719	CE04W6. 3V-470M	
C703	EDL C	3000076 or 3000078	EECS5R5T104 or DX-5R5L104	
C704	MMT C	375524744	MMT50V-474J	
C706	ELECT C	354780109	CE04W50V-1M	
C913, C914	ELECT C	354761029	CE04W35V-1000M	
C920	ELECT C	354742229	CE04W16V-2200M	
C922	ELECT C	354764709	CE04W35V-47M	
C923	ELECT C	354781019	CE04W50V-100M	
D101, D102	C-D	223234R2	1SS352	
D301, D302	C-D	223234R2	1SS352	
D701-D704	C-D	223234R2	1SS352	
D705, D706, D903, D904	ZENER D	224490510R2	UDZ5. 1B	
D901	ZENER D	224490620R2	UDZ6. 2B	
D905, D907-D915	DIODE	22380035	GP104003E	
D916, D917	C-D	223234R2	1SS352	
E201	RETAINER	27141059	GND	
JL201	JUMPER LEAD	5J150606H	JL5 150 H	
JL201a	WIRE HOL	25051109	NSCT-5P896	
JL901a	SOCKET	25050272	NSCT-8P100	
L101, L701	CHOKE COIL	231237K470R2	NCH-1479	
L102	CHOKE COIL	231237K022R2	NCH-1471	N
L103	CHOKE COIL	231237K470R2	NCH-1479	
L104	CHOKE COIL	233454M022	NCH-1452 022M	
P101	JACK	25045300	NPJ-6PDBL159	
P102	PIN JACK	25045473	NPJ-1PDBL291	
P103, P301	JACK	25045549	NPJ-2PDBL370	N
P104, P302	PIN JACK	25045303	NPJ-4PDBL162	
P303	SOCKET	25052131	NSCT-25P2029	N
P701a	SOCKET	25051839	NSCT-32P1626	
P702	PLUG	25055038	NPLG-2P29	

REF No	PARTS NAME	PARTS No	DESCRIPTION
Q101	IC	222740046R10	74HCU04 (TC74HCU04F)
Q102	IC	22241218R3	CS4226-K0 N
Q103	IC	22241219R3 or 22241235R3	DSPF58009FJ88 or XCF58009FJ88 N
Q301-Q304	TR	2215410R2	RN1441
Q305, Q306, Q308	IC	22240581R1	NJM4565M
Q307	IC	22240943R2	TC9103AF
Q309-Q316, Q321-Q326	IC	22240581R1	NJM4565M
Q317	IC	22240981R2	TC9102AF
Q318, Q319, Q320	IC	22241220R2	TC9459F N
Q327-Q344	TR	2215410R2	RN1441
Q345	TR	2213510 or 2214350 or 2212115	DTA114ES or RN2202 or 2SC2458-GR
Q346, Q348	TR	2213284 or 2212115	2SC1740S-R or 2SC2458-GR
Q347	IC	22241221R2	TC9104AF N
Q349	TR	2213510 or 2214350	DTA114ES or RN2202
Q701	IC	22241223	MPD78044F0F-111
Q702	TR	2214490R2	RN1404
Q902	TR	2211643 or 2211644	2SA905-Y
Q903, Q904, Q905	TR	2202114 or 2202115	2SD2061-D or 2SD2061-E
Q906	TR	2211354 or 2211353	2SA949-Y or 2SA949- 0
Q907	IC	222780125	78M12HF
Q907a, Q908a	HEAT-SINK	27160179	HEAT-SINK
Q907b, Q908b	SCREW	838430107	3TTB+10S (BC)
Q908	IC	222790125	79M12HF
Q909	IC	222780565JRC	78M50 (NJM78M50FA)
Q910	TR	2211653 or 2211654	2SC2235-0 or 2SC2235-Y
R903-R906	METAL O R	443628204	RS1WBJ-82
R909-R913	METAL R	453530224	RNU1/2WCJ-2.2
R915	METAL O R	443624714	RS1WBJ-470

(NADC-6345) Video terminal PC Board

REF No	PARTS NAME	PARTS No	DESCRIPTION
U101	PHT CP	24120037	TORX178A
X101	CRYSTAL	3010266	XTL-18.432M
X701	CERA LOCK	3010242	GST5.00MGW
C211, C317, C318, C406-C410, C415-C417, C917	ELECT C	354741009	CE04W10V-10M
JL201b	SOCKET	25050269	NSCT-5P97
P201	SOCKET	25051568	NSCT-12P1355
P202	JACK	25045299	NPJ-3PDYE158
Q201	IC	222840531R10	4053BF (TC4053BF) N
Q202, Q204, Q205, Q206	TR	2213284 or 2212115	2SC1740S-R or 2SC2458-GR
Q203, Q207, Q208 or	TR	2212286 or 2212285	2SC2878-B or 2SC2878-A

(NADIS-6340) Display PC Board

REF No	PARTS NAME	PARTS No	DESCRIPTION
Q703	FL TUBE	212187	10-BT-2056K
Q703a	HOLDER	27190943	(FL)
S701-S716	PUSH SW	25035652T	NPS-111-S604
JL901	JUMPER LEAD	8J150606H	JAMPER LEAD UL2651
P701b	SOCKET	25051876	NSGT-32P1663

(NAPS-6341) Power supply PC Board

REF No	PARTS NAME	PARTS No	DESCRIPTION
C915, C916, C925, C926	CERA C	335621030T	CK45F50V-103Z
JL901b	WIRE HOL	25051112	NSGT-8P899
P902	PLUG	25055675	NPLG-2P631
R917-R919	METAL R	453530394T	RNU1/2W6J-3.9
F901a, F902a	FUSE HOLDER	25050065	YSH403T

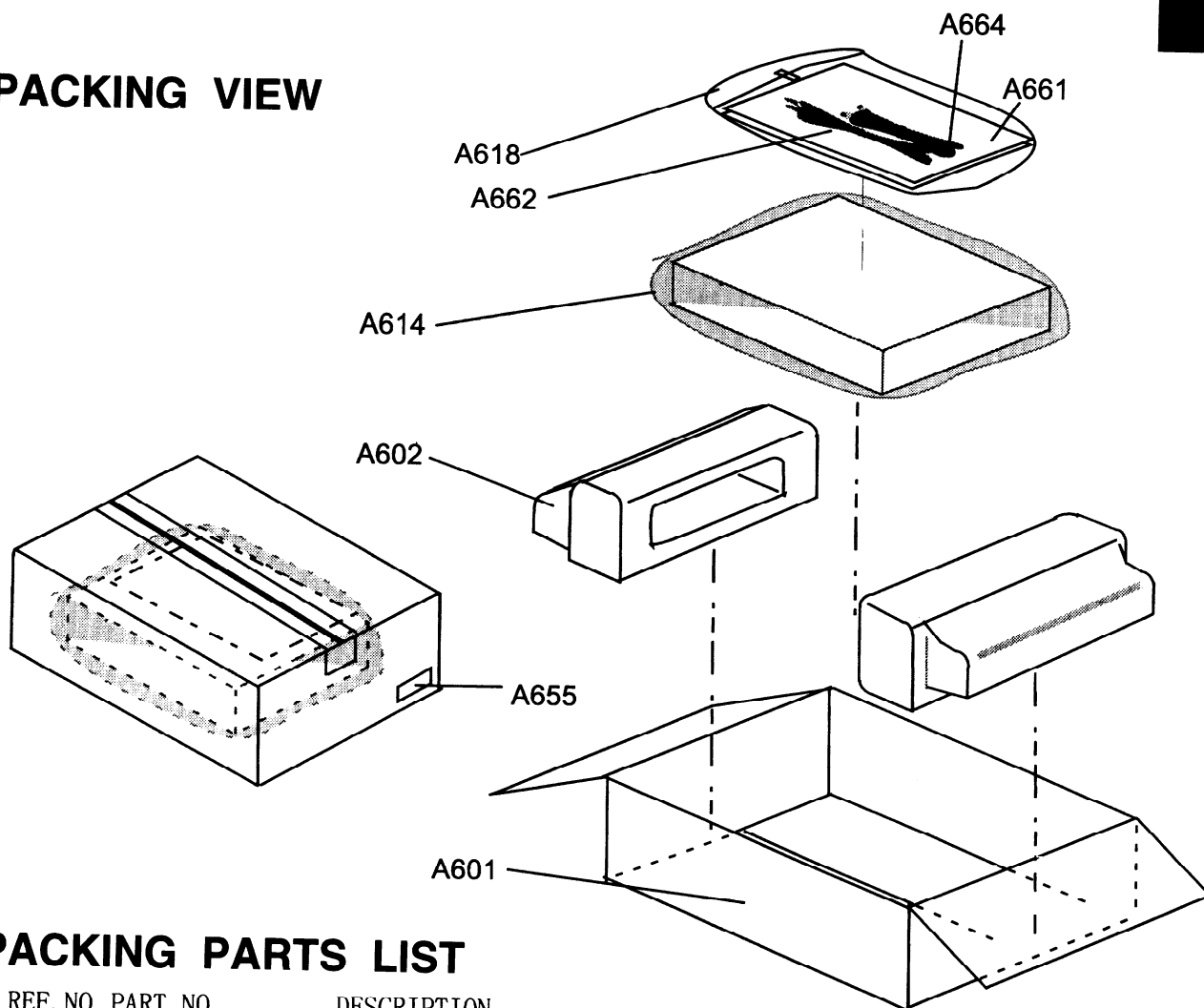
(NASW-6342) Power switch PC Board

REF No	PARTS NAME	PARTS No	DESCRIPTION
S901	P SW	25035636	NPS-111-L590P
C927A	IS C	3500191	DE7150F-103M
C927B	IS C	3500191	DE7150F-103M
C927C	IS C	3500191	DE7150F-103M

(NASW-6343) Voltage sel. PC Board

REF No	PARTS NAME	PARTS No	DESCRIPTION
S902	SLIDE SW	25065437	NSS-22157P

PACKING VIEW

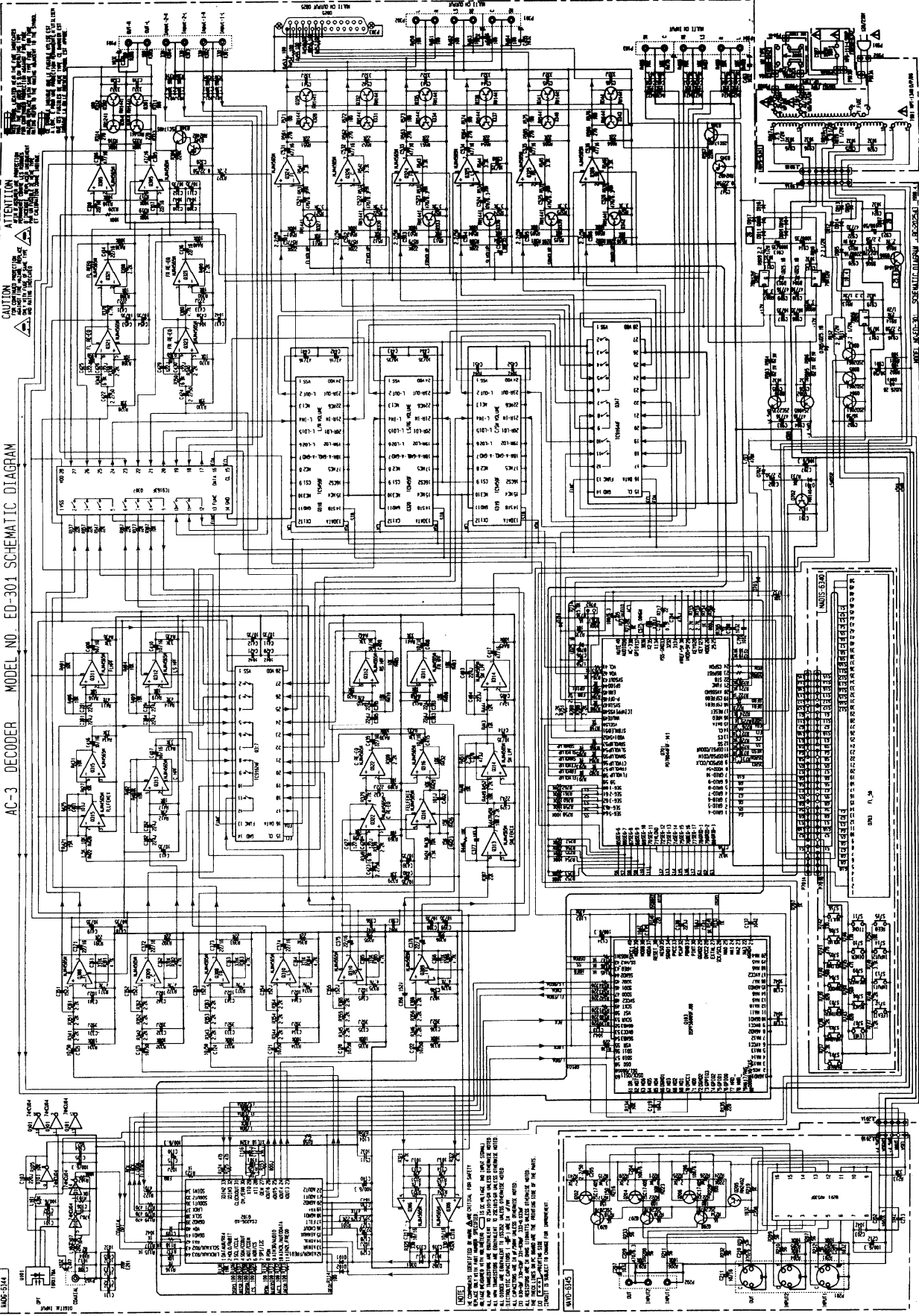


PACKING PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
A601	29053281	Carton box
A601	29053282	Carton box <G>
A602	29091834	Pad
A610	29110077	PP tape
A612	261504	PAPER TAPE
A614	29100097-1A	Styrene bag for unit
A618	29100034-1A	Styrene bag for accessory
A620	282301	Staple
A622	29110071	PP tape
A651	29365019B	Warranty card <D>
A653	29358002K	SS list <D>
A655	29362297	Label UPC <D>
A655	29362298	Label EAN <P/T/W>
A655	29362299	Label EAN <G>
A661	29342566	Instruction manual
A662	2010098A or	Audio connection cord
A663	2010277	Audio connection cord
A664	2010330	Remote control cord
A670	29342567	Instruction manual U3 <P>
A671	29342568	Instruction manual U3 <P>
A673	29342569	Instruction manual T <T/W>
A675	25055040	CV-K-1, Conversion plug <W>

SCHEMATIC DIAGRAM

AC-3 DECODER MODEL NO. ED-301 SCHEMATIC DIAGRAM



CAUTION
DO NOT TOUCH THE TUBES OR OTHER COMPONENTS WHILE THE UNIT IS PLUGGED INTO THE WALL OUTLET.

NOTE
1. THE TUBES ARE IDENTIFIED BY THE LETTERS A THROUGH H AND THE NUMBERS 1 THROUGH 100. THE TUBES ARE LISTED IN THE TUBE LIST ON PAGE 10 OF THIS MANUAL.
2. THE TUBES ARE IDENTIFIED BY THE LETTERS A THROUGH H AND THE NUMBERS 1 THROUGH 100. THE TUBES ARE LISTED IN THE TUBE LIST ON PAGE 10 OF THIS MANUAL.
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