



SERVICE MANUAL

DESKTOP CHARGER

BC-119N

MULTI-CHARGER

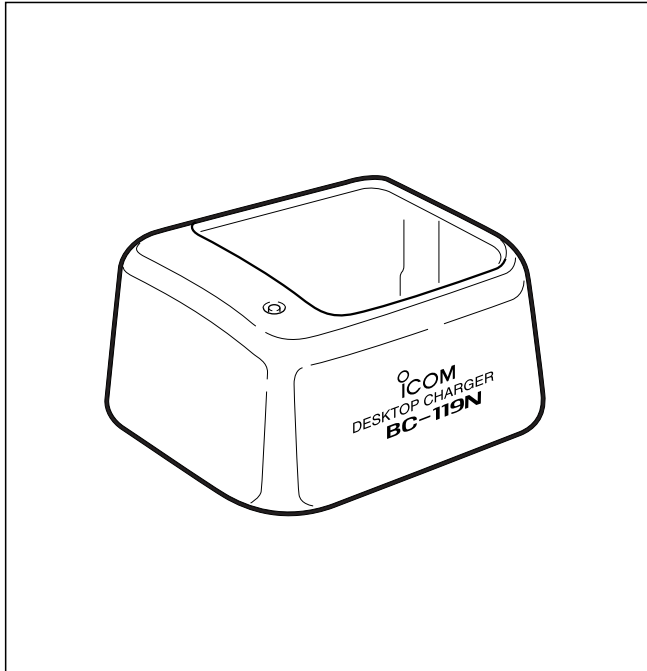
BC-121N

INTRODUCTION

This service manual describes the latest service information for the BC-119N DESKTOP CHARGER/BC-121N MULTI-CHARGER at the time of publication.

VERSIONS

Model	Version	Symbol	Supplied batt. adap.	AC adapter
BC-119N	U.S.A.	[USA]	—	BC-145A
		[USA-1]	AD-75	
	Europe	[EUR]	—	BC-145E
		[EUR-1]	AD-75	
	Australia	[AUS]	—	BC-145V
		[AUS-1]	AD-75	
	United Kingdom	[UK]	—	BC-145UK
		[UK-1]	AD-75	
General	[GEN]	—	—	
	[GEN-1]	AD-75		
BC-121N	General	[GEN]	—	—



ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

8010018700	Case	BC-119N	Chassis	5 pieces
8810008660	Screw B0 3x8 NI-ZU	BC-119N	Chassis	8 pieces
1110004700	S.IC S-80847ALNP-EEB	BC-121N	MAIN-A UNIT	1 piece
8810008660	Screw B0 3x8 NI-ZU	BC-121N	1800 cover	8 pieces

Addresses are provided on the inside back cover for your convenience.

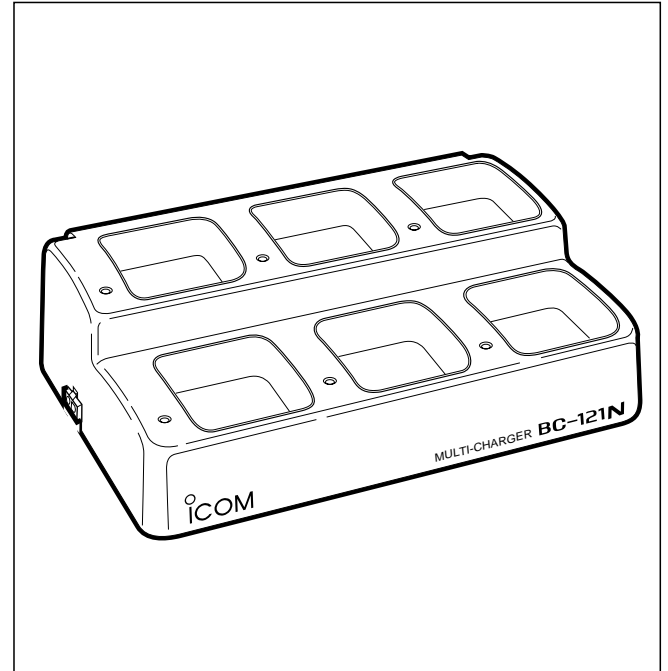
DANGER

NEVER connect the charger to an AC adapter or a DC power supply that uses more than 20 V (BC-121N: 16 V). Such a connection could cause a fire hazard and/or electric shock.

DO NOT expose the charger to rain, snow or any liquids.

DO NOT expose the charger to rain, snow or any liquids.

DO NOT reverse the polarities of the power supply when connecting the charger.



REPAIR NOTES

1. Make sure a problem is internal before disassembling the charger box.
2. **DO NOT** open the chassis until the charger is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the charger is defective.
6. **READ** the instructions of test equipment thoroughly before connecting equipment to the charger.

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SECTION 1 SPECIFICATIONS

• BC-119N

- Power supply requirement : 12 V to 20 V DC (negative ground)
- Dimensions (projections not included) : 115(W)×60(H)×103(D) mm; 4 1/2(W) × 2 1/4(H) × 4 1/16(D) in.
- Weight (adapters not included) : 200 g; 7.1 oz; 0.4 lbs

• BC-121N

- Power supply requirement : 12 V to 16 V DC (negative ground)
- Dimensions (projections not included) : 300(W)×93(H)×197(D) mm; 11 13/16(W) × 3 21/32(H) × 7 3/4(D) in.
- Weight (adapters not included) : 1.4 kg; 49.4 oz; 3.1 lbs

• COMMON

- Rapid charging current : 840 mA ±10 %
670 mA ±10 %
540 mA ±10 %
420 mA ±10 %
- Trickle charging current : 30 mA ±10 %
- Constant voltage (Lithium-ion battery) : 8.4 V ±0.1 V
- Electrostatic durability : Air discharge 8 kV
Contact discharge 4 kV
- Usable temperature range : +10°C to +40°C; +50°F to +104°F
- Rapid charging time : 1–2 hours.

All stated specifications are subject to change without notice or obligation.

SECTION 2 CIRCUIT DESCRIPTION

2-1 DC-DC CONVERTOR CIRCUIT (STEP-UP/DOWN CONVERTOR)

The DC-DC convertor circuit regulates the charging voltage from an AC adapter or a power supply to appropriate values for various battery pack.

The applied voltage from an AC adapter or a power supply is regulated at the step-up and down convertor circuit (Q5, D6, D7, L2). The regulated voltage is passed through the constant-current circuit.

• STEP-DOWN CONVERTOR CIRCUIT

The step-down convertor circuit activates when the charging voltage is lower than the applied voltage from an AC adapter or a power supply.

The applied voltage is chopped (turn ON and OFF) by the step-down convertor circuit. The chopper voltage (square wave) is passed through the smoothing circuit (C26) for conversion to DC voltage.

The step-down convertor circuit is controlled by the CPU (IC2) via the switching regulator (IC5, Q8, Q9) and driver (Q3, Q4, D4, D5) circuits.

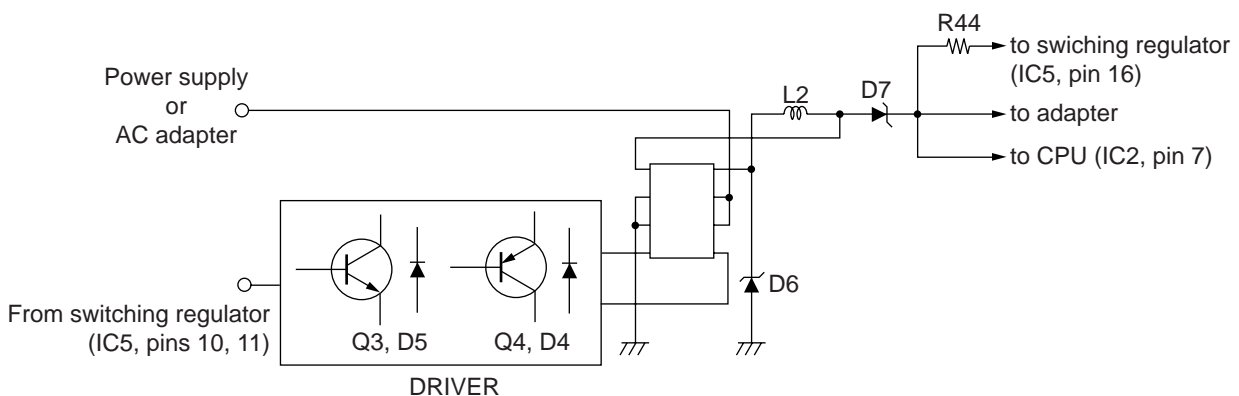
• STEP-UP CONVERTOR CIRCUIT

The step-up convertor circuit activates when the charging voltage is higher than the applied voltage from an AC adapter or a power supply.

The voltage passed through the step-up convertor circuit is chopped by the step-up convertor circuit.

Q5 is composed of two FETs (FET1 is pins 1–4, FET2 is pins 5–8). While FET2 is turned OFF, the same voltage as the applied voltage is output from the step-up convertor circuit. However, while FET2 is turned ON, stored energy at the coil (L2) is driven into flywheel diode (D7). In other words, a back electromotive force occurs when FET2 is turned ON. This electromotive force is used for the step-up voltage.

• STEP-UP/DOWN CONVERTOR CIRCUIT



2-2 CONSTANT-CURRENT CIRCUIT

The constant-current circuit consists of DC-DC convertor circuit (Q5, D6, D7, L2), IC4, IC5, R24, R44, and R45.

The current detector circuit (R24) detects a charging current and generates a voltage in proportion to the current. The generated voltage is applied to the amplifier section of IC4 (IC4a, pin 2).

The amplified voltage is applied to the CPU (IC2, pin 5) and the switching regulator (IC5, pin 1). The CPU (IC2) is output PWM signal from pin 2 to obtain stable output current. The signal is applied to the IC5 via the smoothing circuit (Q8, R32, C35) to convert to DC voltage. The DC voltage is applied to the switching regulator circuit (IC5, pins 2, 3, 15). The output current from switching regulator (IC5, pin 16) passes through the R44 and R45 to limit the maximum voltage. The output voltage is applied to the driver (Q3, Q4, D4, D5), and then applied to the DC-DC convertor circuit to obtain constant current.

2-3 REGULATOR CIRCUIT

Part of voltage from an AC adapter or a power supply are applied to the 1st regulator circuit (Q1, Q12) to convert to 12 V voltage signal. The 12 V signal is applied to the LED (DS1) and buffer amplifier (IC4b, pin 8).

Part of 12 V signals are applied to the 2nd regulator circuit (IC1, R25) to convert to the 5.15 V voltage signal. The 5.15 V signal is applied to the CPU (IC2, pin 25), voltage detector (IC3, pin 2), etc.

2-4 CHARGING CURRENT AND VOLTAGE CHART

IC2 pin number								Rapid charging current	Low-battery	Max. voltage
12	15	16	17	18	26	27	28			
AD-101	SW	BIT1	BIT2	BIT3	BIT4	BC-79	BC-119	(mA)	(V)	(V)
Low	High	Low	Low	High	Low	High	Low	840	6.1	8.4
Low	Low	High	High	High	Low	High	Low	840	3.0	11.5
Low	High	High	High	High	Low	High	Low	840	6.1	8.4
High	High	Low	Low	High	Low	High	Low	840	3.1	4.2
High	Low	High	High	High	Low	High	Low	840	6.1	8.4
High	High	High	High	Low	Low	Low	High	840	1.6	11.5
High	High	High	Low	High	Low	Low	High	670	1.6	11.5
High	High	Low	High	High	Low	Low	High	420	1.6	11.5
High	High	High	Low	High	High	Low	High	540	4.0	19.0
High	High	Low	High	High	High	Low	High	420	4.0	19.0
High	High	Low	Low	Low	High	High	High	670	4.0	15.2
High	High	High	Low	Low	High	High	High	670	2.5	11.5
High	Low	Low	High	Low	High	High	High	840	1.5	5.7
High	High	Low	High	Low	High	High	High	420	1.4	5.7
High	Low	High	High	Low	High	High	High	670	3.0	11.5
High	High	High	High	Low	High	High	High	840	3.0	11.5
High	High	Low	Low	High	High	High	High	540	1.6	19.0
High	Low	High	Low	High	High	High	High	420	3.5	13.4
High	High	High	Low	High	High	High	High	840	3.0	11.5
High	High	Low	High	High	High	High	High	840	3.0	11.5
High	Low	High	High	High	High	High	High	670	3.0	11.5
High	High	High	High	High	High	High	High	540	5.0	19.0
High	High	High	High	High	High	Low	High	Do not operate.		

2-5 CPU PORT ALLOCATIONS (IC2)

Pin number	Port name	Description
2	PWM	Outputs DC-DC convertor control signal. The signal is applied to the Q8 as "PWM" signal.
5	CURRENT	Input port for current detector A/D signal.
12	AD-101	Input port for adapter select signal.
15 16 17 18	SW BIT1 BIT2 BIT3	Input ports for adapter select signals.
19	RESET	Input port for the reset signal.
26 27 28	BIT4 BC-79 BC-119	Input ports for adapter select signals.

SECTION 3 ADJUSTMENT PROCEDURES

5-1 PREPARATION

■ REQUIRED TEST EQUIPMENT

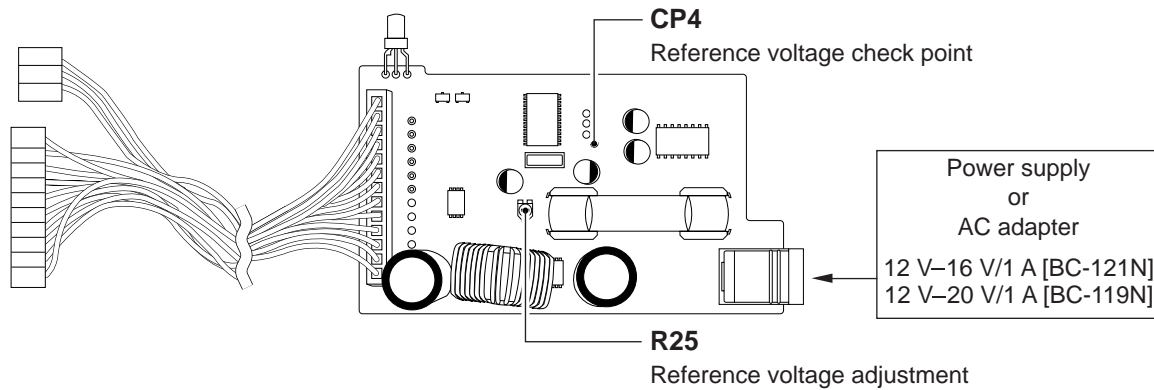
EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 12 V – 20 V DC Current capacity : 1 A or more	DC voltmeter	Input impedance : 50 k Ω /V DC or better Output level : 1–500 mV

5-2 TRIMMER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT	
		UNIT	LOCATION		UNIT	ADJUST
REFERENCE VOLTAGE	1 • Connect the power supply or AC adapter to the J1.	MAIN	Connect a DC voltmeter to the check point CP4.	5.15 V	MAIN	R25

[BC-121N ONLY]: Same adjustment as step 1 for MAIN-A–MAIN-F units.

• MAIN UNIT TOP VIEW



SECTION 4 PARTS LIST

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	
IC1	1110005350	S.IC	NJM2870F05-TE1
IC2	1140010280	S.IC	μPD789112AMC-512-5A4
IC3	1110004700	S.IC	S-80847ALNP-EEB-T2
IC4	1110005330	S.IC	NJM12904V-TE1
IC5	1110003070	S.IC	μPC494GS-E1
Q1	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q3	1530002060	S.TRANSISTOR	2SC4081 T107 R
Q4	1510000510	S.TRANSISTOR	2SA1576A T106R
Q5	1590003070	S.FET	UPA1890GR-9JG-E1
Q6	1510000510	S.TRANSISTOR	2SA1576A T106R
Q7	1510000510	S.TRANSISTOR	2SA1576A T106R
Q8	1530002060	S.TRANSISTOR	2SC4081 T107 R
Q9	1530002060	S.TRANSISTOR	2SC4081 T107 R
Q10	1590000430	S.TRANSISTOR	DTC144EUA T106
Q11	1590000430	S.TRANSISTOR	DTC144EUA T106
Q12	1590001190	S.TRANSISTOR	XP6501-(TX) .AB
D2	1160000070	S.DIODE	DAN202K T146
D3	1160000070	S.DIODE	DAN202K T146
D4	1750000550	S.DIODE	1SS355 TE-17
D5	1750000550	S.DIODE	1SS355 TE-17
D6	1790000680	S.DIODE	SB20-03P-TD
D7	1790000680	S.DIODE	SB20-03P-TD
D8	1750000550	S.DIODE	1SS355 TE-17
X1	6060000790	S.CERAMIC	CSTCR4M91G
L1	6200007660	S.COIL	LL1608-FHR10J
L2	6190001150	COIL	HK-08S050-2010
R1	7030000380	S.RESISTOR	MCR10EZJH 1 kΩ
R2	7030000380	S.RESISTOR	MCR10EZJH 1 kΩ
R3	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R4	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R5	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R6	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R7	7030003410	S.RESISTOR	ERJ3GEYJ 561 V (560 Ω)
R8	7030003410	S.RESISTOR	ERJ3GEYJ 561 V (560 Ω)
R9	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R10	7030003410	S.RESISTOR	ERJ3GEYJ 561 V (560 Ω)
R11	7030005501	S.RESISTOR	ERA3YKD 124V
R12	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R14	7030005981	S.RESISTOR	ERA3YED 333V
R15	7030007230	S.RESISTOR	ERA3YED 102V
R16	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R17	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R18	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R19	7030005671	S.RESISTOR	ERA3YKD 393V
R20	7030005501	S.RESISTOR	ERA3YKD 124V
R21	7410000950	S.ARRAY	EXB-V8V 102JV
R22	7410000950	S.ARRAY	EXB-V8V 102JV
R23	7030005321	S.RESISTOR	ERA3YED 103V
R24	7030009580	S.RESISTOR	ERJ8RSJ R12V
R25	7310002630	S.TRIMMER	RV-139 (RH03A3A12) 101
R26	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R27	7030005671	S.RESISTOR	ERA3YKD 393V
R28	7030005981	S.RESISTOR	ERA3YED 333V
R29	7030006091	S.RESISTOR	ERA3YED 822V
R30	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R31	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R32	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R33	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R34	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R35	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R36	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R37	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R38	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R39	7030003770	S.RESISTOR	ERJ3GEYJ 564 V (560 kΩ)
R40	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R41	7030003770	S.RESISTOR	ERJ3GEYJ 564 V (560 kΩ)

[MAIN UNIT]

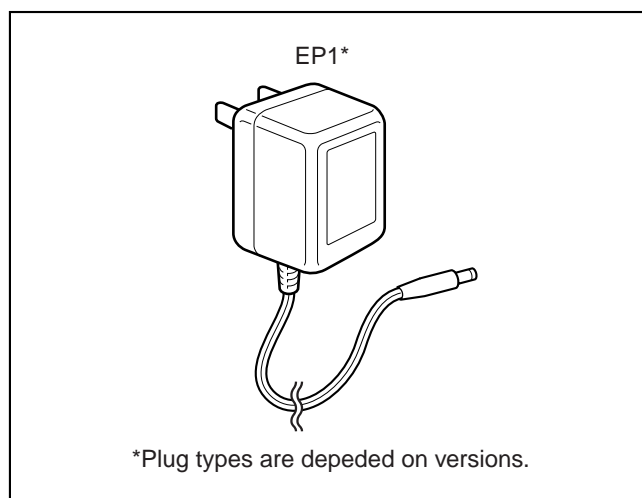
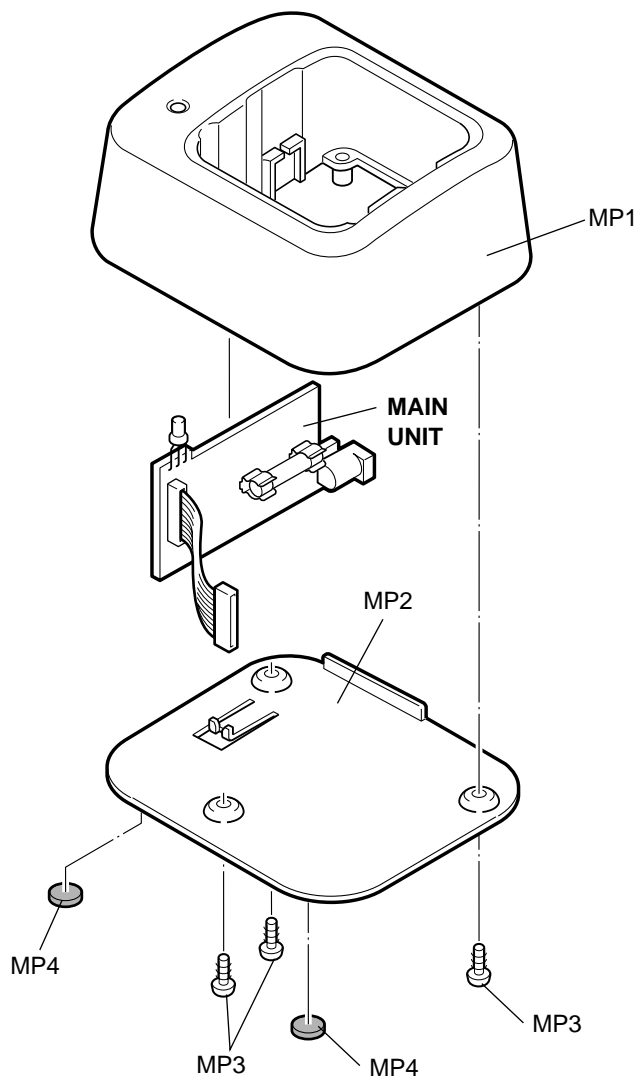
REF NO.	ORDER NO.	DESCRIPTION	
R42	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R43	7030003690	S.RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R44	7030005501	S.RESISTOR	ERA3YKD 124V
R45	7030005981	S.RESISTOR	ERA3YED 333V
R46	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R47	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R48	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R49	7030000380	S.RESISTOR	MCR10EZJH 1 kΩ
R50	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R51	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R52	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R53	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
C1	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C3	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C4	4510004630	S.ELECTROLYTIC	ECEV1CA100SR
C5	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C6	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C7	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C8	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C9	4510005430	S.ELECTROLYTIC	ECEV0JA220SR
C10	4510007920	ELECTROLYTIC	25 MV 470 CA
C11	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C12	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C13	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C14	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C15	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C16	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C17	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C18	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C19	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C20	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C21	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C22	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C23	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C25	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C26	4510007920	ELECTROLYTIC	25 MV 470 CA
C27	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C28	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C29	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C30	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C31	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C32	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C33	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C34	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C35	4510005430	S.ELECTROLYTIC	ECEV0JA220SR
C36	4510005430	S.ELECTROLYTIC	ECEV0JA220SR
C37	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C38	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C39	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C40	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C41	4030011600	S.CERAMIC	C1608 JB 1E 104K-T-N
C42	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C43	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C44	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
C45	4030006900	S.CERAMIC	C1608 JB 1H 103K-T-A
J1	6450000410	CONNECTOR	HEC0470-01-630
F1	5210000040	FUSE	FGB 2A
F2	5220000020	HOLDER	S-N5051
F3	5220000020	HOLDER	S-N5051
DS1	5040002150	LED	VRPG3349S-734
W1	8900010880	CABLE	OPC-1103
EP1	0910054243	PCB	B 5712C

[BC-121N ONLY]: MAIN-A–MAIN-F units are same parts as this parts list.

S.=Surface mount

SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

5-1 BC-119N



[CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8010018700	2505 case	1
MP2	8110007620	2505 cover	1
MP3	8810008660	Screw PH B0 3 × 8 NI-ZU (BT)	3
MP4	8930039620	Leg cushion (A)	2

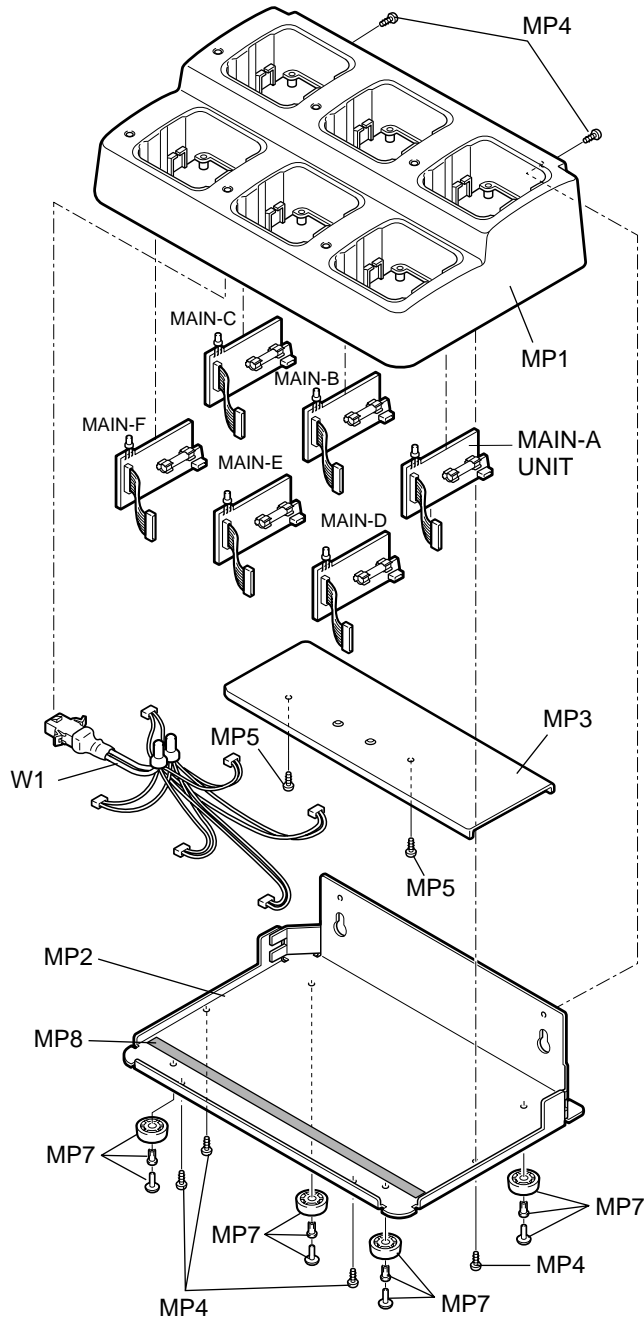
Screw abbreviations

B0: Self-tapping PH: Pan head NI-ZU: Nickel-Zinc

[ACCESSORIES]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
EP1	Optional product	Charger BC-145A [USA], [USA-1] Charger BC-145E [EUR], [EUR-1] Charger BC-145V [AUS], [AUS-1] Charger BC-145UK [UK], [UK-1]	1 1 1 1

5-2 BC-121N



[CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8510014530	1800 case (B)	1
MP2	8110005890	1800 cover	1
MP3	8930057960	2571 plate	1
MP4	8810008660	Screw PH BT M3 × 8 NI-ZU	6
MP5	8810008660	Screw PH BT M3 × 8 NI-ZU	2
MP7	8930040590	Rubber foot (K)	4
MP8	8930037900	Sheet BB	1
W1	8900011310	Cable OPC-1161	1

[ACCESSORIES]

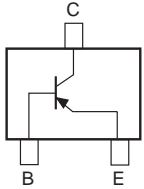
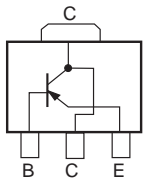
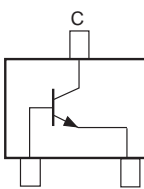
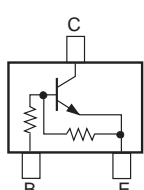
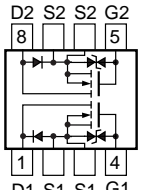
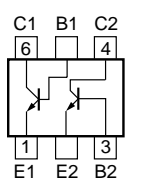
REF NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8930041660	Stand leg cushion (B)	4

Screw abbreviations

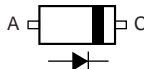
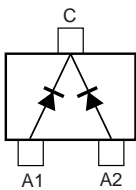
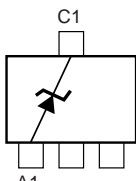
BT: Self-tapping PH: Pan head NI-ZU: Nickel-Zinc

SECTION 6 SEMI-CONDUCTOR INFORMATION

6-1 TRANSISTORS

NAME	SYMBOL	INSIDE VIEW
2SA1576 R	AEG	
2SB1132 R	BARB	
2SC4081 R	BR	
DTC144EU	26	
UPA1890 GR	A1890	
XP6501 AB	5N	

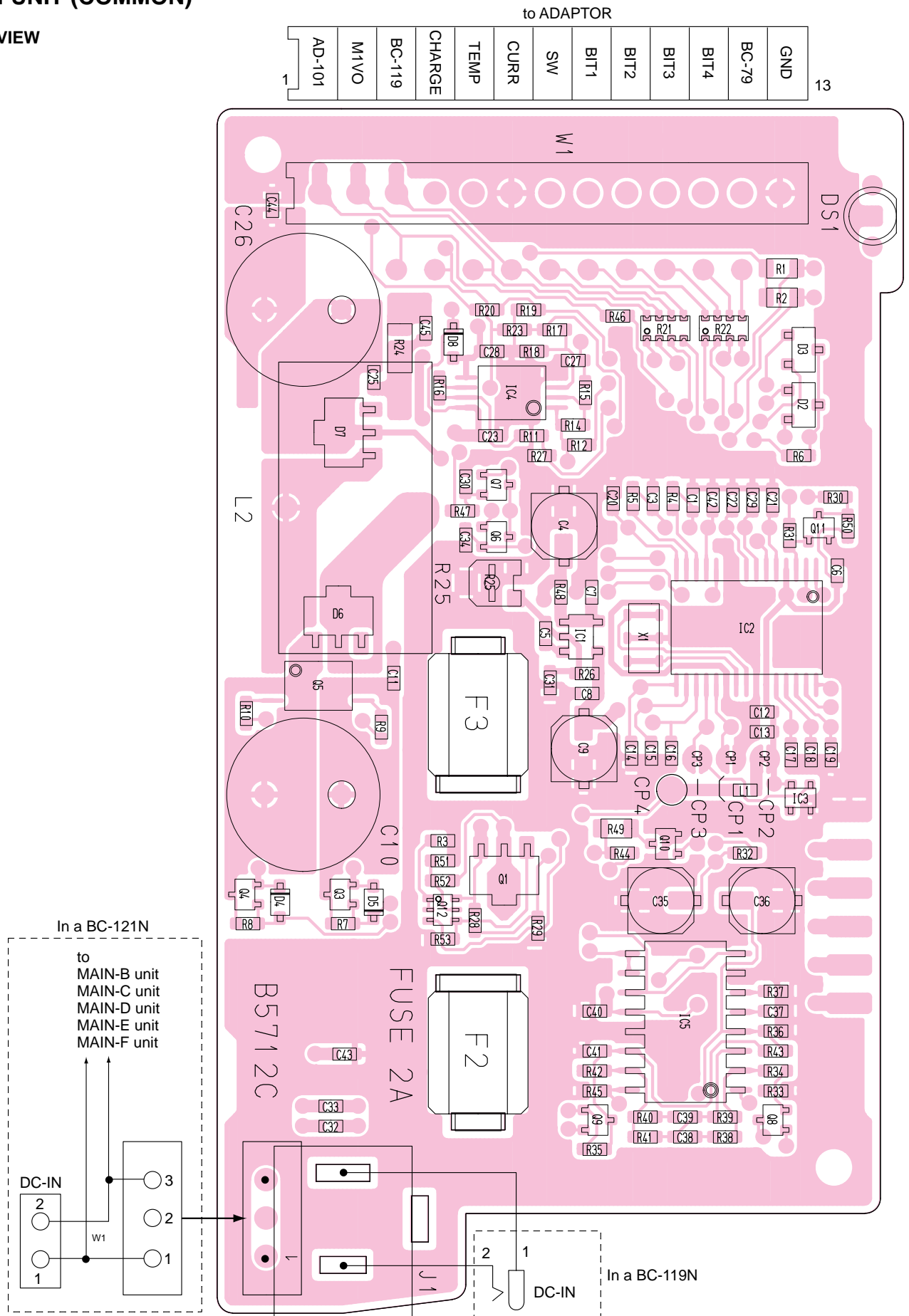
6-2 DIODES

NAME	SYMBOL	INSIDE VIEW
1SS355	A	
DAN202K	N	
SB20-03P	SC	

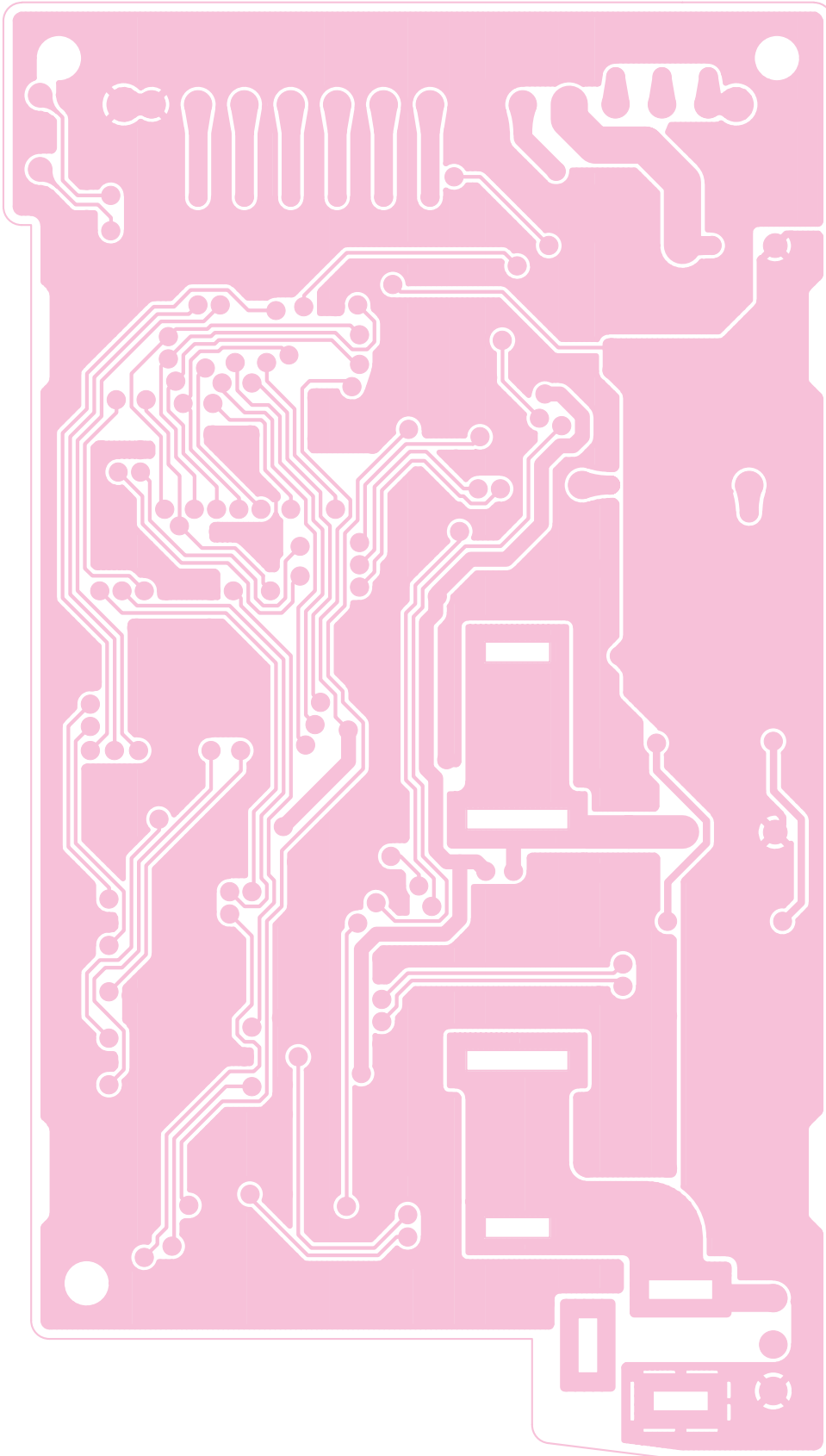
SECTION 7 BOARD LAYOUTS

MAIN UNIT (COMMON)

• TOP VIEW

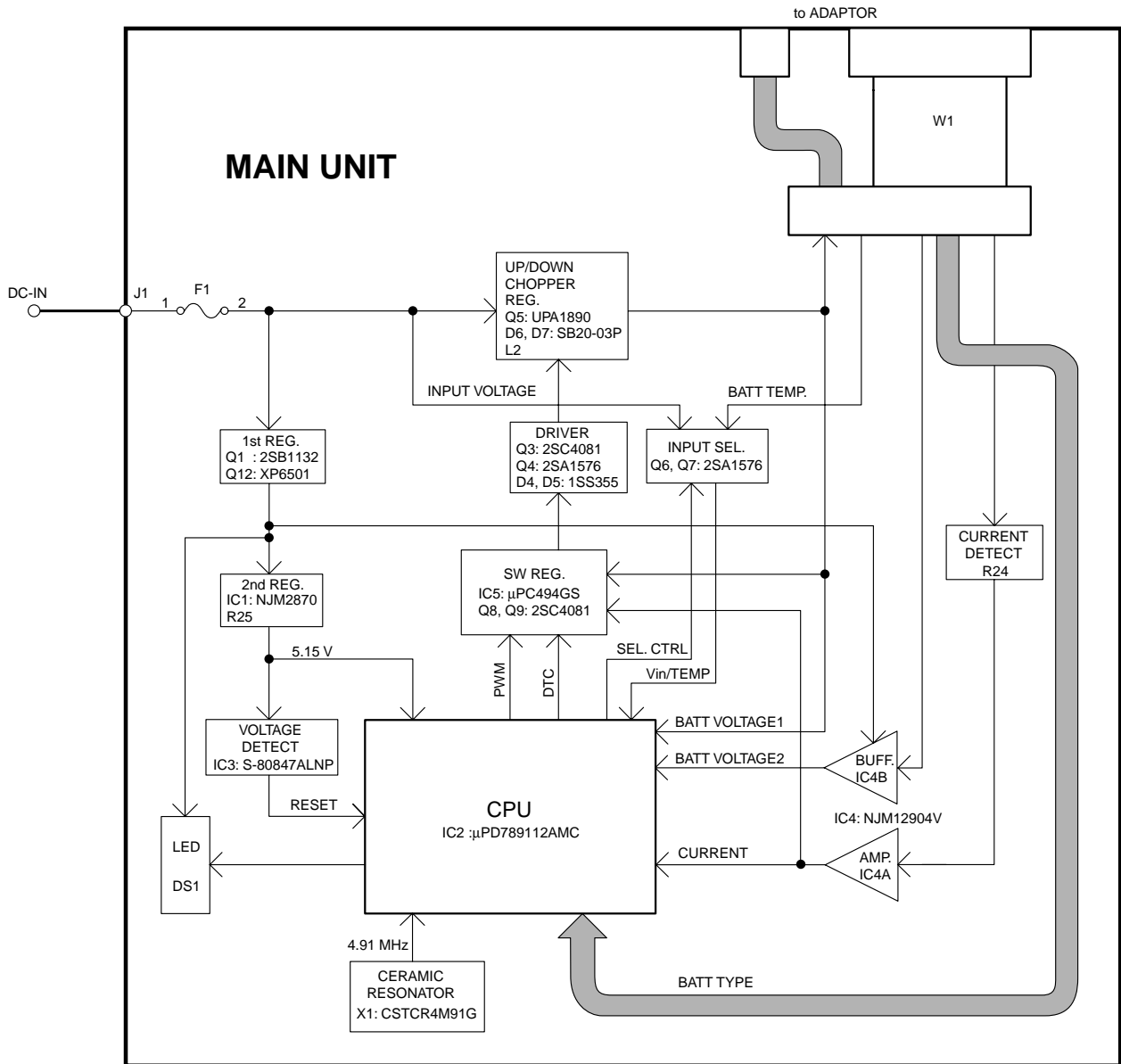


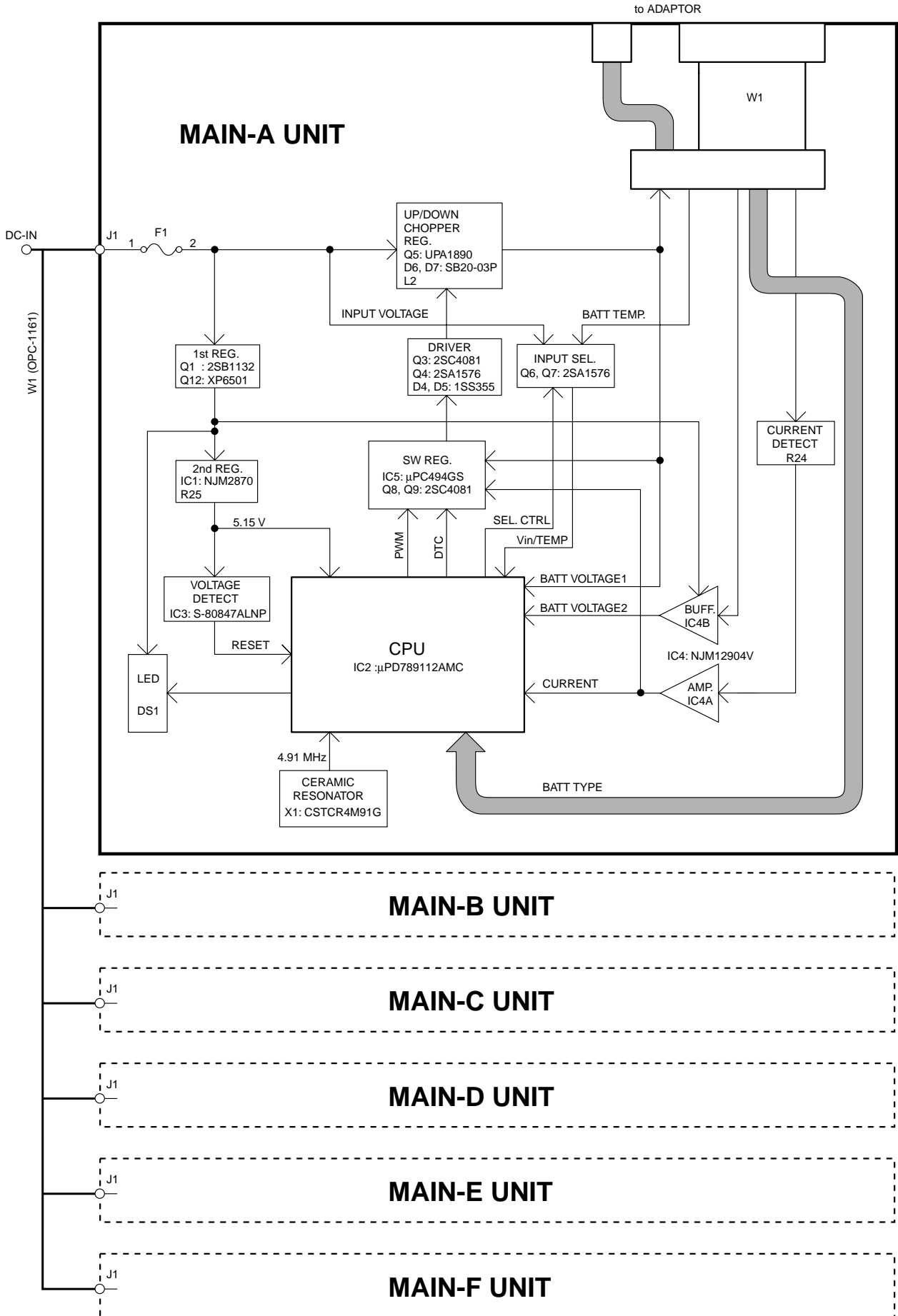
• BOTTOM VIEW



SECTION 8 BLOCK DIAGRAM

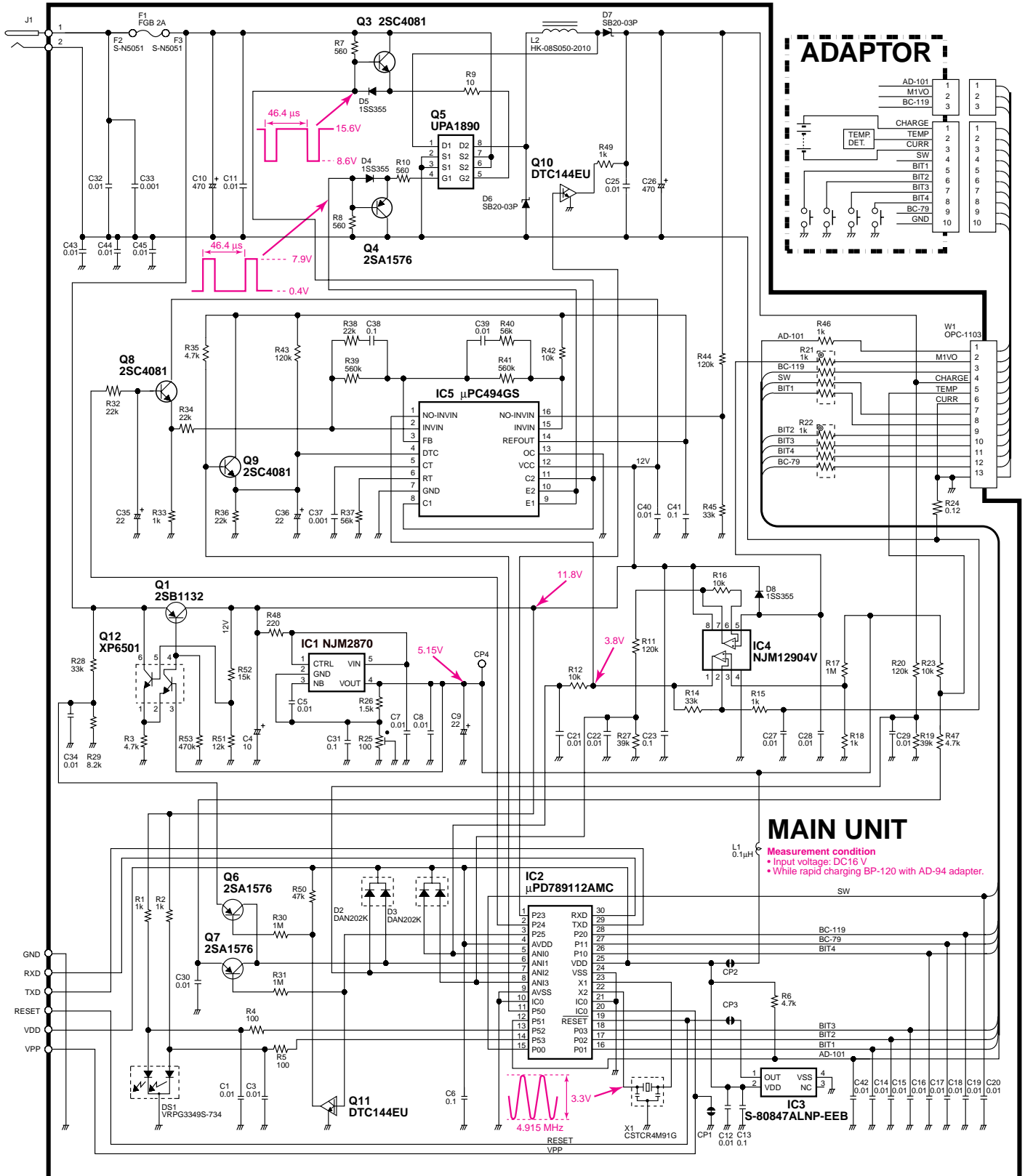
8-1 BC-119N



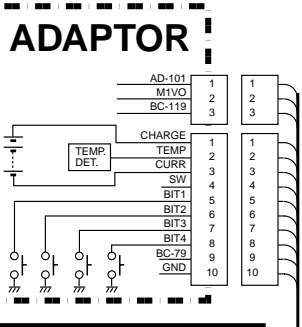
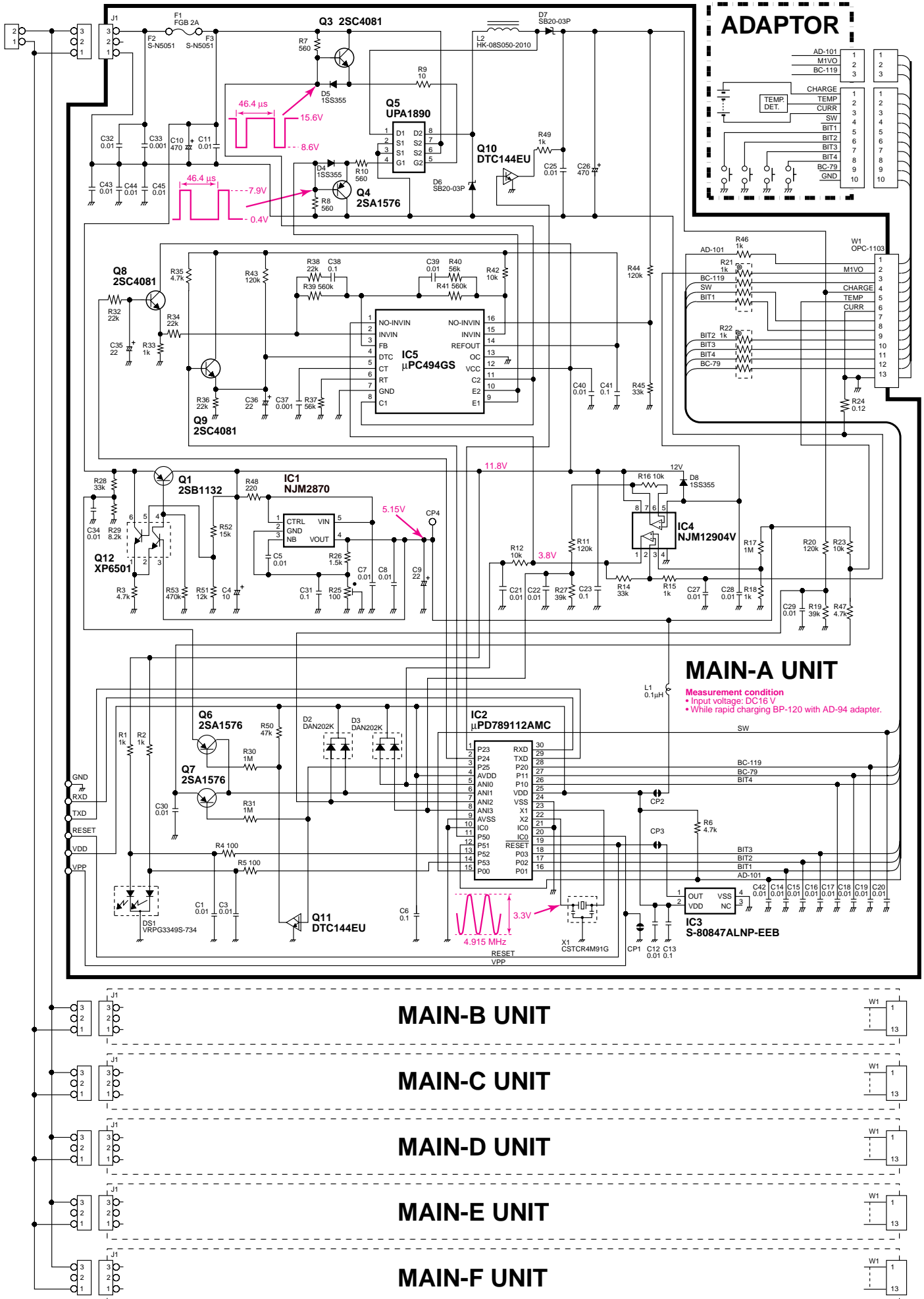


SECTION 9 VOLTAGE DIAGRAMS

9-1 BC-119N



9-2 BC-121N



MAIN-A UNIT

- Measurement condition**
- Input voltage: DC16 V
 - While rapid charging BP-120 with AD-94 adaptor.

MAIN-B UNIT

MAIN-C UNIT

MAIN-D UNIT

MAIN-E UNIT

MAIN-F UNIT

Icom Inc.

1-1-32, Kamiminami, Hirano-ku, Osaka 547-0003, Japan
Phone : 06 6793 5302
Fax : 06 6793 0013
URL : <http://www.icom.co.jp/world/index.html>

Icom America Inc.

<Corporate Headquarters>
2380 116th Avenue N.E., Bellevue, WA 98004, U.S.A.
Phone : (425) 454-8155 Fax : (425) 454-1509
URL : <http://www.icomamerica.com>
<Customer Service>
Phone : (425) 454-7619

Icom Canada

Glenwood Centre #150-6165
Highway 17 Delta, B.C., V4K 5B8, Canada
Phone : (604) 952-4266 Fax : (604) 952-0090
URL : <http://www.icomcanada.com>

Icom (Australia) Pty. Ltd.

A.B.N. 88 006 092 575
290-294 Albert Street, Brunswick, Victoria, 3056, Australia
Phone : 03 9387 0666 Fax : 03 9387 0022
URL : <http://www.icom.net.au>

Icom New Zealand

146A Harris Road, East Tamaki,
Auckland, New Zealand
Phone : 09 274 4062 Fax : 09 274 4708
URL : <http://www.icom.co.nz>

Beijing Icom Ltd.

1305, Wanshang Plaza, Shijingshan Road, Beijing China
Phone : (010) 6866 6337 Fax : (010) 6866 3553

Icom (Europe) GmbH

Communication Equipment
Himmelgeister Str. 100, D-40225 Düsseldorf, Germany
Phone : 0211 346047 Fax : 0211 333639
URL : <http://www.icomeurope.com>

Icom Spain S.L

Crta. de Gracia a Manresa Km. 14,750
08190 Sant Cugat del Valles Barcelona, SPAIN
Phone : (93) 590 26 70 Fax : (93) 589 04 46
URL : <http://www.icomspain.com>

Icom (UK) Ltd.

Unit 9, Sea St., Herne Bay, Kent, CT6 8LD, U.K.
Phone : 01227 741741 Fax : 01227 741742
URL : <http://www.icomuk.co.uk>

Icom France S.a

Zac de la Plaine, Rue Brindejonc des Moulinais
BP 5804, 31505 Toulouse Cedex, France
Phone : 561 36 03 03 Fax : 561 36 03 00
URL : <http://www.icom-france.com>

Asia Icom Inc.

6F No. 68, Sec. 1 Cheng-Teh Road, Taipei, Taiwan, R.O.C.
Phone : (02) 2559 1899 Fax : (02) 2559 1874

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