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Panasonic

Matsushita Communication Industrial Co., Ltd

GD87 Calibration Specification

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Prepared by: **Yuichi Kimura** Approved by: **Masamichi Horie**

Signature: Signature:

Position: **Senior Engineer** Position: **Project Leader**

Authorized by: **Hironori Yajin**

Signature:

Position: **Manager**

Summary of changes

Change Note Number	Date	Change Note Number	Date	Change Note Number	Date
Rev.0.1	10th.Jun.2002				

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1. Introduction

2. Scope

3. Relevant Documents

- Design Policy Review Documents
- RF Control Interface Specification for GD87
- Test and Calibration Specification for GD87
- GSM 05.05, Radio transmission and reception
- GSM 11.10,Mobile Station (MS) conformance specification

4. Abbreviations

SG	Signal Generator
PL	Power Level
RSSI	Received Signal Strength Indication
AGC	Automatic Gain Control

5. RF Part

In RF part, items being calibrated are listed as below.

- Transmit power output level
- Rx RSSI

Sub clauses below show the detail.

5.1. Transmit Power Output Level

5.1.1. Purpose

Tx Output Power has to be strictly managed to follow GSM 11.10 (3GPP TS 51.010) and keep SAR value in the certain value. Therefore, it is calibrated for whole power level, all bands and entire frequency range.

5.1.2. Equipment and its condition

Peak Power meter should be utilized.

5.1.3. Initial Condition for units (MS)

Following is the initial condition required for units (MS).

Mode	Testset TEST mode
Band	E-GSM
Channel	62ch on E-GSM mode
PL	5
DAC Value	Default value (*see Default Value List*)
Supply Voltage	4.2V at the ***battery terminal***

5.1.4. Calibrating Channel

As seen in the following table, calibrating frequency band is separated to some segments, and a representative channel range is allocated on each segment. *In order to manage calibrating channels strictly and considering power calibration will be implemented at some lines in the factory, channel range is allocated (not a unique channel).*[5)]

Band	Segment	Calibrating Channel	Channel Range
E-GSM	B-ch	975	975 - 1010
	L-ch	1	1011 - (0) - 36
	M-ch	50	37 – 89
	H-ch	100	90 - 124
DCS	B-ch	512	512 - 550
	L-ch	600	551 - 651
	M-ch	700	652 - 752
	H-ch	800	753 - 853
	T-ch	870	854 - 885
PCS	B-ch	512	512 - 540
	L-ch	580	541 - 620
	M-ch	662	621 - 699
	H-ch	740	700 - 779
	T-ch	795	780 - 810

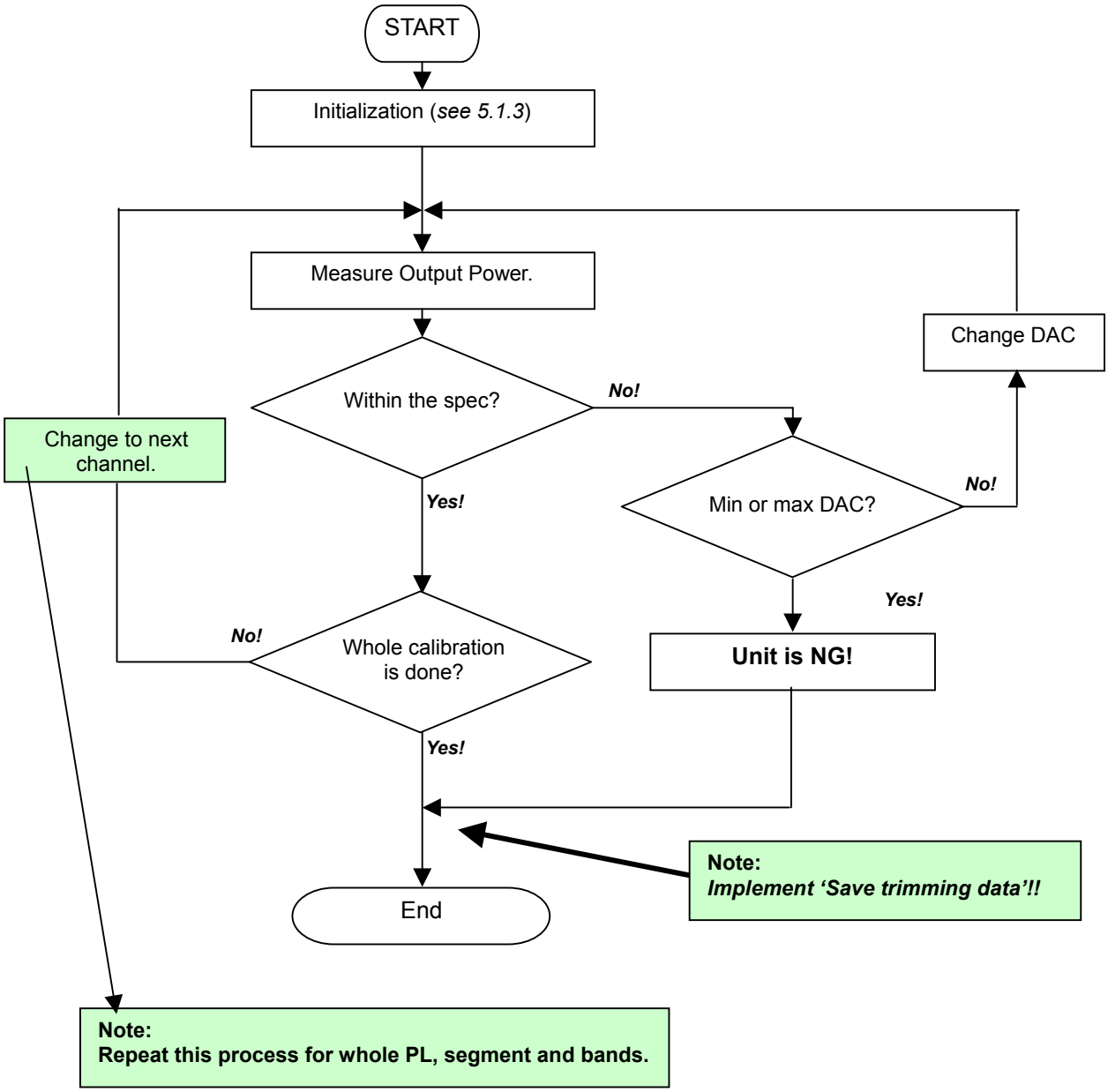
PCS 1900

PL	Output Power Level (dBm)				
	Target			Spec	
	Min	Typ	Max	Min	Max
0	29.5	29.75	30.0	29.5	30.0
1	27.5	28.0	28.5	27.0	29.0
2	25.5	26.0	26.5	25.0	27.0
3	23.5	24.0	24.5	23.0	25.0
4	21.5	22.0	22.5	21.0	23.0
5	19.5	20.0	20.5	19.0	21.0
6	17.5	18.0	18.5	17.0	19.0
7	15.5	16.0	16.5	15.0	17.0
8	13.5	14.0	14.5	13.0	15.0
9	11.5	12.0	12.5	11.0	13.0
10	9.5	10.0	10.5	9.0	11.0
11	7.5	8.0	8.5	7.0	9.0
12	5.5	6.0	6.5	5.0	7.0
13	3.5	4.0	4.5	3.0	5.0
14	1.5	2.0	2.5	1.0	3.0
15	-0.5	0.0	0.5	-1.0	1.0

In addition, relatively, difference of power output level in each power level should be kept as;
$0.5dB =< (PL_n-PL_{n+1}) =< 3.5dB$.

5.1.6. Procedure

Following chart indicates the procedure of Output power calibration.



5.2. RSSI Calibration

5.2.1. Purpose

Component tolerances will affect the receiver mid-band gain and frequency response. Unless the gain of the receiver is known, it is not possible to select the most appropriate AGC setting and give the correct RXLEV reporting to the network. The reference point for RSSI calibration is in the center of each E-GSM 900 / DCS 1800/ PCS1900 band of ARFCNs due to receiver front end frequency response.

5.2.2. Equipment and its condition

SG or GSM Simulator is utilized. Following condition should be used.

Center Frequency	f_{Rx} + 68kHz (C.W.) in case of SG f_{Rx} (GMSK modulated) in case of SG or Simulator
RF Input Level	-90dBm

5.2.3. Initial Condition for units (MS)

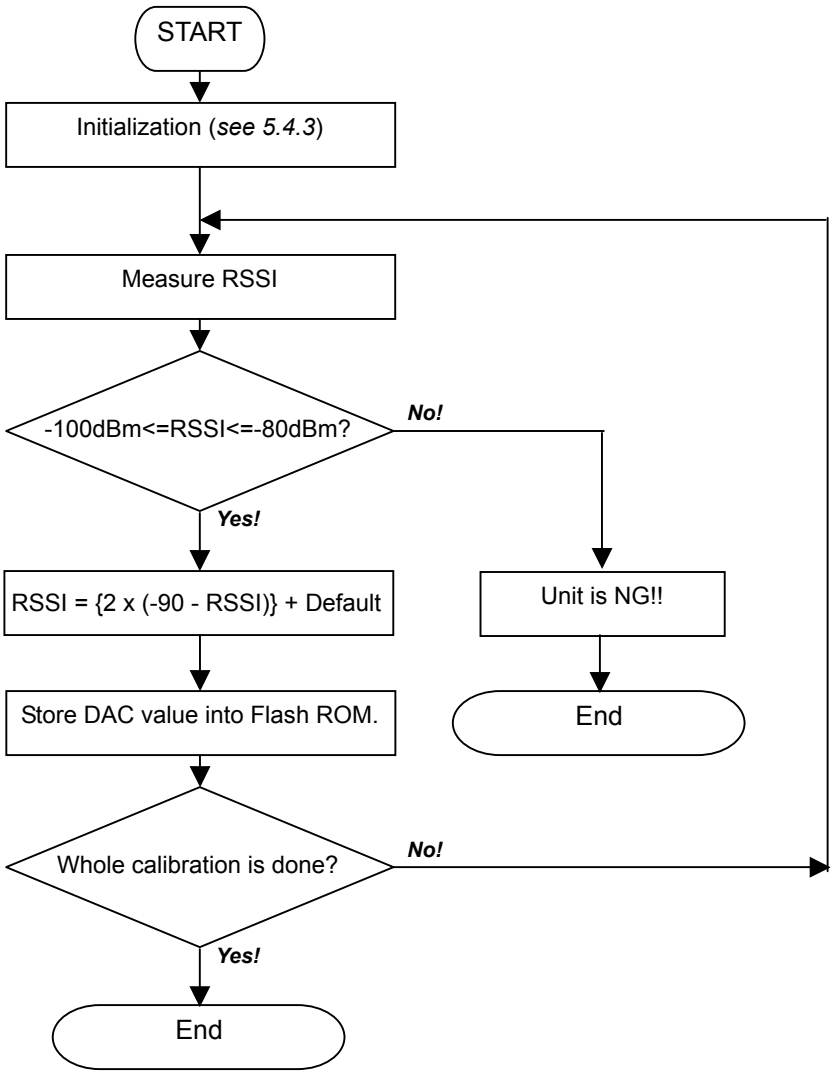
Mode	Testset TEST mode
Band	E-GSM
Channel No	Mch (See 5.4.4)
Mixer Gain	High
AGC Setting	**50 dB**[3)]
DAC Value	Default (*see Default Value List*)
Supply Voltage	3.7V at the ***battery terminal***

5.2.4. Channel separation of RSSI calibration

The channel separation of RSSI calibration is as follows. [5)]

	Band	Cal.ch	Ch Range
E-GSM 900	Bch	980	975 – 1010
	Lch	1	1011 – 36
	Mch	45	37 – 89
	Hch	105	90 - 124
DCS 1800	Bch	530	512 – 550
	Lch	590	551 – 651
	Mch	705	652 – 752
	Hch	830	753 – 853
	Tch	870	854 - 885
PCS 1900	Bch	520	512 – 540
	Lch	570	541 - 620
	Mch	661	621 – 699
	Hch	740	700 – 779
	Tch	800	780 - 810

5.2.5. Procedure



6. Calibration of Baseband Part

7. Battery Voltage AD Calibration

7.1. Purpose

The GD87 mobile monitors battery voltage periodically using VBAT of IOTA for battery status display and battery charge control. This value is linear but also includes an offset error caused by IOTA tolerances. Therefore the battery voltage calibration values are prepared for GD87 mobile at high and low voltages to calibrate the offset error. Both are used for calculation of battery voltage. They are:

REF_VOLT_HIGH (Reference high voltage of battery) - System Trimming Data number 0xD1

REF_VOLT_LOW (Reference low voltage of battery) - System Trimming Data number 0xD2

7.2. Method

1) Enter TESTSET test mode. (Initial setting: VBAT= 3.7V, no connection to EXT_PWR.)
2) Set VBAT to 4.2V
3) Send Write ASIC register Command: R0 (D2, D3, D4, D5, D6, D7)=(0,0,0,0,0,0)
4) Send Control Output Command: ADAC on.
5) Send Set Charge Mode Command: Constant Voltage mode.
6) Read IOTA VBAT.
7) If reading value is outside of range (*614 +/-50 dec*). Then unit is fail, otherwise set REF_VOLT_HIGH to reading value.
8) Set VBAT to 3.0V.
9) Read IOTA VBAT.
10) If reading value is outside of range (*439 +/-50 dec*). Then unit is fail, otherwise set REF_VOLT_LOW to reading value.

8. Battery Temperature AD Calibration

8.1. Purpose

The GD87 mobile monitors battery temperature periodically by using ADIN2 of IOTA for battery charge control and battery detection. This value is linear but also includes an offset error caused by IOTA and pull-up tolerances. The absolute accuracy of the measurements at temperature extremes is less critical than for voltage measurement so only one measurement is made at nominal temperature to calibrate the offset error. Further measurements are made at the temperature extremes to verify the offset readings are within acceptable limits.

BAT_TEMP_OFFSET (Battery temperature ADC offset) - System Trimming Data number 0xD0

8.2. Method

1) Enter TESTSET test mode. (Initial setting: VBAT = 3.7V, no connection to EXT_PWR.)
2) Connect 10k0 ohm resistor between BAT_TEMP and GROUND.
3) Send Write ASIC register Command: R0 (D2, D3, D4, D5, D6, D7)=(0,0,0,0,0,0)
4) Send Control Output Command: ADAC on and others off.
5) Send Set DAC Data Command: Auxiliary DAC (*933 dec*).
6) Read IOTA ADIN2.
7) If reading value is outside of range (*208 +/-40 dec*). Then unit has failed; otherwise calculate difference between the reading value and theoretical value of (208 dec).
8) Set calculated value (“reading value” - 208) to BAT_TEMP_OFFSET. Use signed char data format.
9) Disconnect 10k0 ohm and connect 27k0 ohm between BAT_TEMP and GROUND.
10) Read IOTA ADIN2.
11) If (“reading value” - BAT_TEMP_OFFSET) is outside of range (*436 +/-70 dec*). Then unit is fail.
12) Disconnect 27k0 ohm and connect 5k60 ohm between BAT_TEMP and GROUND.
13) Read IOTA ADIN2.
14) If (“reading value” - BAT_TEMP_OFFSET) is outside of range (*125 +/-30 dec*). Then unit is fail.
15) Disconnect 5k60 ohm resistor.
16) Send Control Output Command: All Off.

9. Charging Voltage set D/A Calibration

9.1. Purpose

The GD87 mobile controls battery charging using a FET switch circuit to regulate the charging current. The gate voltage is controlled by the DAC in IOTA.
Li-Ion battery requires accurate control of the voltage when being charged and, as the FET switch is used under non-saturated gate voltage (i.e. FET drain current is not saturated) it is important to calibrate the DAC output value that produces the required battery voltage. This is called the Reference Output Voltage.
It is also necessary to determine what effect one DAC step has on the ADC reading of VBAT in order for the Quiescent Current measurement at termination of Li-Ion charging.

DA_REF (Reference Output voltage of DAC) - System Trimming Data number 0xD3

9.2. Method

1) Enter TESTSET test mode. (Initial setting: VBAT = 3.7V, EXT_PWR = 5.8V)
2) Send Write ASIC register Command: R0 (D2, D3, D4, D5, D6, D7)=(0,0,0,0,0,0)
3) Connect 82.0 ohm, 1-watt resistor between VBAT and GROUND. (Note that this gives 50mA)
4) Send Control Output Command: ADAC on, CHARGE_ON on.
5) Send Set Charge Mode Command: Constant Voltage mode.
6) Send Set DAC Data Command: Charger DAC (628 *dec*). Then disconnect VBAT supply.
7) Measure VBAT voltage. If measured voltage is inside of range 4.2V +/- 5mV then go to step 10), otherwise calculate DA_STEP as difference voltage between measured voltage and 4.2V divided by 7.4mV. (DA_STEP = {"measured voltage" - 4.2V} / 7.4mV) rounded to nearest integer.
8) Send Set DAC data Command: previous DAC data - DA_STEP.
9) Repeat steps 7) and 8) until measured voltage is inside of range 4.2V +/- 5mV.
10) Check final setting DAC data. If final setting DAC data is inside of range (*628+/- 100 dec*). Then set that data to DA_REF (Program System Trimming data), otherwise unit is fail.

10. Charging Current ADC Calibration

10.1. Purpose

It is important to monitor the current when charging Li-Ion battery both to protect against over-current and to determine when charging is complete. GD87 uses VCCS and MADC (ICHG) of IOTA to measure charging current periodically as an amplified voltage across a sense resistor. This reading value of charging current includes an offset error caused by tolerances of buffered amplifiers in Nausica and in the sense resistor. As the accuracy of the measurement is most important around the charge complete value, the GD87 mobile uses a single point measurement to calculate the offset at that value.

C_COMPLETE_OFFSET (Charge Complete current offset) - System Trimming Data number 0xD6

10.2. Method

This calibration must follow on from Charging Voltage set D/A calibration.

11) Read IOTA ICHG.
12) If “reading value” is outside of range (94±60 *dec*)*1 then unit is fail, otherwise calculate difference between reading value and theoretical value of 94dec.
Set calculated value (“reading value” – 94) to C_COMPLETE_OFFSET. Use signed char data format.
13)Send Control Output Command: All Off

11. Frequency Precision Check of 32.768kHz oscillator

11.1. Purpose

The GD87 mobile has the Clock function, and the oscillation frequency of the crystal is 32.768kHz +/- 100ppm. This frequency value is nearly nominal value but also includes an offset error caused by the floating capacity of the PCB. However the crystal of a large frequency error against the gap from the design value must be detected and eliminated. For the purpose, the mobile executes the real time clock auto compensation function to examine the inaccuracy of the 32kHz crystal against the 13MHz clock (input 26MHz clock divided by 2) over 1 second and then calculate the number of 32kHz cycles in error over an hour period. This value is programmed into the RTC_COMP_MSB_REG and RTC_COMP_LSB_REG. (in 2’s complement). After this, the compensated mobile shall read their registers’ value directly and return it to the jig. The jig shall judge whether it go into within the limits.
The value of real time clock auto compensation function is also used to improve the precision of the real time clock.

note :This command must be used after the TCXO calibrations.

11.2. Method

1) Enter TESTSET test mode. (Initial setting: VBAT = 3.7V, no connection to EXT_PWR.)
2) Send 32kHz Clock Auto Compensation And Read RTC Compensation Registers Command.
3) If returned data is outside of range (returned data:[T.B.D]) then the unit is fail, otherwise the unit is pass.

12. Camera White Balance Calibration

12.1. Purpose

The GD87 Camera module has white balance calibration function, because it has the tolerance of color gain curves against color temperature. White balance movable range is set up against light souce color temperature after maximum and minimum limit each of red gain and blue gain decided

Camera_white_barance_Rmim (Rmin)	- System Trimming Data number 0xe8
Camera_white_barance_Rmax (Rmax)	- System Trimming Data number 0xe9
Camera_white_barance_Bmin (Bmin)	- System Trimming Data number 0xea
Camera_white_barance_Rmax (Bmax)	- System Trimming Data number 0xeb

12.2. Method

(1) Enter TESTSET test mode. (Initial setting: VBAT = 3.7V, no connection to EXT_PWR.)
(2) Send Control Camera Command (Start Preview Mode).
(3) Photo the white chart, which has irradiated the lighting of 6200±100[K] color temperature equally.
(4) Send Read Camera Resistor (address:0x58). This value is the maximum of red gain (Rmax).
(5) Send Read Camera Resistor (address:0x59). This value is the minimum of blue gain (Bmin).
(6) Maximum of blue gain (Bmax) and minimum of red gain (Rmin) are obtained by calculation. The formula are [T.B.D]
(7) Set Rmin, Rmax, Bmin and Bmax value to Camera_white_barance_Rmim, Camera_white_barance_Rmax, Camera_white_barance_Bmim and Camera_white_barance_Bmax.

13. Parts List

Attached on the next page

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PARTS LIST

7/31/2002 3:48 PM

Upper Unit

Ref.No.	Part No.	Value
C3001	F1G1A104A012	0.1UF
C3002	F1G1A104A012	0.1UF
C3003	ECJ0EC1H330J	33PF
C3004	ECJ0EC1H330J	33PF
C3005	CC1005	0F
C3006	CC1005	0F
C3007	CC1005	0F
C3008	CC1005	0F
C3009	CC1005	0F
C3010	CC1005	0F
C3011	CC1005	0F
C3012	CC1005	0F
C3022	F1H0J1050009	1UF
C3023	ECJ0EC1H470J	47PF
C3024	CC1005	0F
C3025	CC1005	0F
C3101	F3E0J1060008	10UF
C3102	F1G1A104A012	0.1UF
C3103	ECJ0EC1H470J	47PF
C3104	F1H0J1050009	1UF
C3201	F3E0J1060008	10UF
C3301	ECST1AZ105R	1UF
C3302	ECST1AZ105R	1UF
C3401	ECJ0EC1H100D	10PF
C3402	ECJ0EC1H100D	10PF
C3405	CC1005	0F
CN3001	K1KA70A00036	
CN3002	K1MN07B00078	
CN3003	K1MN05B00065	
CN3004	K1MN21B00052	
CN3101	K1KB26A00037	
D3401	MAZS0470GL	
D3402	MAZS0470GL	
DS3201	B3ABB0000030	
DS3202	B3AZB0000020	
DS3203	200205100005	
DS3204	200205100005	
DS3301	B3RBC0000023	
FL3401	EXC24CP221U	
Q3001	B1GBCFGN0005	4.7K
Q3003	B1GBCFNA0001	47K
Q3201	B1ABCF000100	
R3001	ERJ2GEJ181X	180O
R3002	ERJ2GEJ181X	180O

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
C106		ECUE1H030C	ECUE1H030C	3PF
C107		ECJ0EC1H330	ECJ0EC1H330	33PF
C110		ECJ0EC1H470	ECJ0EC1H470	47PF
C111		ECJ0EC1H220	ECJ0EC1H220	22PF
C112		ECJ0EC1H220	ECJ0EC1H220	22PF
C113		ECJ0EC1H220	ECJ0EC1H220	22PF
C114		ECJ0EC1H470	ECJ0EC1H470	47PF
C115		ECUE1H040C	ECUE1H040C	4PF
C116		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C118		F3F1A156000	TCA1A156M8	15UF
C119		ECJ0EC1H470	ECJ0EC1H470	47PF
C121		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C126		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C128		ECUE1H040C	ECUE1H040C	4PF
C129		ECUE1H030C	ECUE1H030C	3PF
C130		ECJ0EC1H330	ECJ0EC1H330	33PF
C131		ECJ0EC1H220	ECJ0EC1H220	22PF
C133		ECUE1H020C	ECUE1H020C	2PF
C134		ECJ0EC1H220	ECJ0EC1H220	22PF
C135		ECUE1H020C	ECUE1H020C	2PF
C136		ECUE1H020C	ECUE1H020C	2PF
C137		ECUE1H010C	ECUE1H010C	1PF
C138		ECUE1H040C	ECUE1H040C	4PF
C139		ECUE1H030C	ECUE1H030C	3PF
C140		ECJ0EC1H330	ECJ0EC1H330	33PF
C144		ECJ0EC1H220	ECJ0EC1H220	22PF
C148		ECJ0EC1H101	ECJ0EC1H101	100PF
C149		ECJ0EC1H101	ECJ0EC1H101	100PF
C152		ECJ0EC1H470	ECJ0EC1H470	47PF
C153		ECJ0EC1H220	ECJ0EC1H220	22PF
C154		F1G1H122000	GRM36B122K	0.0012UF
C156		F1G1A104A01	LMK105BJ104	0.1UF
C157		ECJ0EC1H680	ECJ0EC1H680	68PF
C158		ECJ0EC1H101	ECJ0EC1H101	100PF
C215		ECJ0EB1H332	ECJ0EB1H332	0.0033UF
C217		ECJ0EC1H120	ECJ0EC1H120	12PF
C218		ECUE1H020C	ECUE1H020C	2PF
C219		ECUE1H030C	ECUE1H030C	3PF
C220		F1G1E181A04	TMK105CH181	180PF
C222		ECUE1H030C	ECUE1H030C	3PF
C223		ECUE1H030C	ECUE1H030C	3PF
C224		ECJ0EC1H220	ECJ0EC1H220	22PF
C225		ECJ0EC1H220	ECJ0EC1H220	22PF
C226		ECJ0EC1H120	ECJ0EC1H120	12PF

Upper Unit

Ref.No.	Part No.	Value
R3003	ERJ2GEJ181X	180O
R3004	ERJ2GEJ181X	180O
R3005	EXB24VR000X	0O
R3006	EXB24VR000X	0O
R3007	EXB24VR000X	0O
R3008	EXB24VR000X	0O
R3017	ERJ2GEJ104X	100KO
R3018	EXB24VR000X	0O
R3020	ERJ2GE0R00X	0O
R3102	D0GA104JA010	100KO
R3201	ERJ2GEJ471X	470O
R3202	ERJ2GEJ181X	180O
R3203	ERJ2GEJ221X	220O
R3204	ERJ2GEJ331X	330O
R3205	ERJ2GEJ471X	470O
R3206	ERJ2GEJ471X	470O
R3207	ERJ2GEJ471X	470O
R3208	ERJ2GEJ104X	100KO
R3209	ERJ2GEJ473X	47KO
R3210	ERJ2GEJ104X	100KO
R3301	ERJ2GE0R00X	0O
R3302	ERJ2GE0R00X	0O
R3303	RY1005	990MO
S3001	EVQPQHB55	
U3001	C0JBAE000092	
U3002	C0ZBZ0000683	
U3101	C0CBAAC00144	
U3301	C0CBABB00045	

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
C227		ECJ0EC1H120	ECJ0EC1H120	12PF
C233		F1G1H271A40	GRM36B271K	270PF
C234		F1G1H271A40	GRM36B271K	270PF
C235		ECJ0EC1H220	ECJ0EC1H220	22PF
C236		ECUE1H030C	ECUE1H030C	3PF
C301		F1H0G475000	CM105B475M	4.7UF
C304		ECUE1H030C	ECUE1H030C	3PF
C305		F1H0J1050013	JMK107BJ105	1UF
C306		F1H1H391000	GRM1882C1H	390PF
C307		ECHU1H102JX	ECHU1H102JX	0.001UF
C308		ECHU1C103JX	ECHU1C103JX	0.01UF
C309		ECUE1H030C	ECUE1H030C	3PF
C351		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C352		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C353		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C354		F1G1A104A01	LMK105BJ104	0.1UF
C355		F1G1H102A45	GRM36B102K	0.001UF
C356		F1G1H102A45	GRM36B102K	0.001UF
C357		F1G1H102A45	GRM36B102K	0.001UF
C358		ECJ0EC1H270	ECJ0EC1H270	27PF
C359		ECJ0EC1H220	ECJ0EC1H220	22PF
C401		F5A421050003	CAD12X5R105	1UF
C403		F1H0J1050013	JMK107BJ105	1UF
C404		ECJ0EC1H330	ECJ0EC1H330	33PF
C458		F1G1A104A01	LMK105BJ104	0.1UF
C2101		F1G1H180A40	GRM36CH180	18PF
C2102		F1G1H180A40	GRM36CH180	18PF
C2103		F1G1A104A01	LMK105BJ104	0.1UF
C2104		F1G1A104A01	LMK105BJ104	0.1UF
C2105		F1G1A104A01	LMK105BJ104	0.1UF
C2106		F1G1A104A01	LMK105BJ104	0.1UF
C2107		F1G1A104A01	LMK105BJ104	0.1UF
C2108		F1G1A104A01	LMK105BJ104	0.1UF
C2109		F1G1A104A01	LMK105BJ104	0.1UF
C2110		F1G1A104A01	LMK105BJ104	0.1UF
C2111		F1G1A104A01	LMK105BJ104	0.1UF
C2112		F1G1H100A00	MCH155A100	10PF
C2201		F1H1A105A02	LMK107BJ105	1UF
C2202		F1G1A104A01	LMK105BJ104	0.1UF
C2204		F1G1A104A01	LMK105BJ104	0.1UF
C2205		F1H0J1050004	GRM39B105K	1UF
C2301		F1H0J1050004	GRM39B105K	1UF
C2303		F1J1A4750006	LDK212BJ475	4.7UF
C2304		ECJ0EC1H270	ECJ0EC1H270	27PF
C2305		F1G1C223000	GRM36B223K	0.022UF
C2306		F1G1H102A45	GRM36B102K	0.001UF
C2307		F1J1A4750006	LDK212BJ475	4.7UF
C2309		F1J1A4750006	LDK212BJ475	4.7UF

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
C2311		F1J1A4750006	LDK212BJ475	4.7UF
C2313		F1J1A4750006	LDK212BJ475	4.7UF
C2315		F1H0J1050004	GRM39B105K	1UF
C2317		F1H0J1050004	GRM39B105K	1UF
C2318		F1G1A104A01	LMK105BJ104	0.1UF
C2319		F1G1H471A40	GRM36B471K	470PF
C2320		ECJ0EC1H270	ECJ0EC1H270	27PF
C2321		ECJ0EC1H270	ECJ0EC1H270	27PF
C2322		F1G1A104A01	LMK105BJ104	0.1UF
C2323		ECJ0EC1H470	ECJ0EC1H470	47PF
C2401		F1G1A104A01	LMK105BJ104	0.1UF
C2402		ECJ0EC1H270	ECJ0EC1H270	27PF
C2403		ECJ0EC1H270	ECJ0EC1H270	27PF
C2404		F1G1A104A01	LMK105BJ104	0.1UF
C2405		F1G1A104A01	LMK105BJ104	0.1UF
C2406		F1G1A104A01	LMK105BJ104	0.1UF
C2407		F1J0J4750005	GRM40-034B4	4.7UF
C2408		F1H1A224A00	GRM39B224K	0.22UF
C2409		F1G1A104A01	LMK105BJ104	0.1UF
C2410		F1J0J4750005	GRM40-034B4	4.7UF
C2411		F1H0J1050004	GRM39B105K	1UF
C2412		ECJ0EB1C103	ECJ0EB1C103	0.01UF
C2413		F1G1A104A01	LMK105BJ104	0.1UF
C2414		F1G1A104A01	LMK105BJ104	0.1UF
C2416		F1G1A104A01	LMK105BJ104	0.1UF
C2417		F1G1A104A01	LMK105BJ104	0.1UF
C2418		F1G1A104A01	LMK105BJ104	0.1UF
C2420		F1H0J1050004	GRM39B105K	1UF
C2423		F1G1A104A01	LMK105BJ104	0.1UF
C2425		F1G1A104A01	LMK105BJ104	0.1UF
C2504		F1G1A104A01	LMK105BJ104	0.1UF
C2505		F1G1A104A01	LMK105BJ104	0.1UF
C2506		F1J0J4750005	GRM40-034B4	4.7UF
C2514		F1G1H100A00	MCH155A100D	10PF
C2515		F1G1H100A00	MCH155A100D	10PF
C2516		F1G1A104A01	LMK105BJ104	0.1UF
C2517		F1G1A104A01	LMK105BJ104	0.1UF
C2519		F1G1H151A00	MCH155A151J	150PF
C2521		F1H0J1050004	GRM39B105K	1UF
C2522		F1G1H151A00	MCH155A151J	150PF
C2525		F1G1H101A42	UMK105CH101	100PF
C2526		F1H1A105A02	LMK107BJ105	1UF
C2527		ECST0JZ475R	ECST0JZ475R	4.7UF
C2528		F1G1C333000	C1005JB1C333	0.033UF
C2530		ECJ0EC1H270	ECJ0EC1H270	27PF
C2531		F1G1H101A42	UMK105CH101	100PF
C2532		F1G1H100A00	MCH155A100D	10PF
C2533		F1H0J1050004	GRM39B105K	1UF
C2540		F1H1A474000	GRM39B474K	0.47UF
C2544		ECJ0EC1H270	ECJ0EC1H270	27PF
C2545		ECJ0EC1H270	ECJ0EC1H270	27PF
C2546		F1G1H100A00	MCH155A100D	10PF
C2547		F1G1H100A00	MCH155A100D	10PF
C2601		ECJ0EC1H470	ECJ0EC1H470	47PF
C2602		ECJ0EC1H390	ECJ0EC1H390	39PF

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
C2604		ECJ0EC1H470	ECJ0EC1H470	47PF
C2605		ECJ0EC1H470	ECJ0EC1H470	47PF
C2607		ECJ0EC1H470	ECJ0EC1H470	47PF
C2624		F1G1A104A01	LMK105BJ104	0.1UF
C2626		F1G1H100A00	MCH155A100D	10PF
C2627		F1G1H100A00	MCH155A100D	10PF
C2629		ECJ0EC1H470	ECJ0EC1H470	47PF
C2701		F1G1A104A01	LMK105BJ104	0.1UF
C2702		F1G1A104A01	LMK105BJ104	0.1UF
C2703		F1G1H101A42	UMK105CH10	100PF
C2704		F1G1H102A45	GRM36B102K5	0.001UF
C2705		F1G1A104A01	LMK105BJ104	0.1UF
C2706		F1G1A104A01	LMK105BJ104	0.1UF
C2707		F1G1H101A42	UMK105CH10	100PF
C2708		F1G1H331A40	GRM36B331K5	330PF
C2709		F1G1H101A42	UMK105CH10	100PF
C2711		F1G1H101A42	UMK105CH10	100PF
C2712		F1G1H102A45	GRM36B102K5	0.001UF
C2713		F1G1H101A42	UMK105CH10	100PF
C2714		F1G1A104A01	LMK105BJ104	0.1UF
C2715		F1G1A104A01	LMK105BJ104	0.1UF
C2717		F1H0J1050004	GRM39B105K(	1UF
C2718		F1G1H101A42	UMK105CH10	100PF
C2719		F1H0J1050004	GRM39B105K(	1UF
CN101		PY76037A	PY76037A	
CN2501		PY76038A	PY76038A	
CN2601		K1KB70A0003	AXK79507003	
CN2701		PY80002A	PY80002A	
CN2702		JA80007A	JA80007A	
D2301		B0JCMD00001	RB160M-30TR	
D2302		B0JCDD00000	RB521S-30TE61	
D2401		MAZS0750ML	MAZS0750ML	
D2402		MAZS0750ML	MAZS0750ML	
D2403		MAZS0750ML	MAZS0750ML	
D2502		MAZS0470GL	MAZS0470GL	
D2503		MAZS0470GL	MAZS0470GL	
D2601		MA2S11100L	MA2S11100L	
D2602		MAZS0470GL	MAZS0470GL	
D2603		MAZS0470GL	MAZS0470GL	
D2604		MAZS0470GL	MAZS0470GL	
D2605		MAZS0470GL	MAZS0470GL	
D2606		MAZS0470GL	MAZS0470GL	
D2607		MAZS0470GL	MAZS0470GL	
D2608		MAZS0470GL	MAZS0470GL	
D2609		MAZS0470GL	MAZS0470GL	
D2610		MAZS0470GL	MAZS0470GL	
D2611		MAZS0470GL	MAZS0470GL	
D2612		MAZS0470GL	MAZS0470GL	
D2613		B0JCDD00000	RB521S-30TE61	
D2614		B0JCDD00000	RB521S-30TE61	
D2615		B0JCDD00000	RB521S-30TE61	
D2616		B0JCDD00000	RB521S-30TE61	
D2617		B0JCDD00000	RB521S-30TE61	
D2701		MAZS0750ML	MAZS0750ML	
D2702		MAZS0750ML	MAZS0750ML	

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
D2703		B0BD6R80000	UMZ6.8ENTR	
D2705		MAZS0750ML	MAZS0750ML	
D2706		B0JCDD00000	RB521S-30TE61	
D2707		B0BD6R80000	UMZ6.8ENTR	
D2708		B0BD6R80000	UMZ6.8ENTR	
D2709		B0JCDD00000	RB521S-30TE61	
DS2601		B3ABB000015	SML-410MWT86	
DS2602		B3ABB000015	SML-410MWT86	
DS2603		B3ABB000015	SML-410MWT86	
DS2604		B3ABB000015	SML-410MWT86	
DS2605		B3ABB000015	SML-410MWT86	
DS2606		B3ABB000015	SML-410MWT86	
DS2607		B3ABB000015	SML-410MWT86	
DS2608		B3ABB000015	SML-410MWT86	
DS2609		B3ABB000015	SML-410MWT86	
DS2610		B3ABB000015	SML-410MWT86	
DS2611		B3ABB000015	SML-410MWT86	
DS2612		B3ABB000015	SML-410MWT86	
DS2613		B3ABB000015	SML-410MWT86	
DS2614		B3ABB000015	SML-410MWT86	
FL101		EXCML16A270	EXCML16A270U	
FL102		FL80019A	FL80019A	
FL201		J0D1967B0003	MFE1960BBU10	
FL202		J0C1967B0004	SAFSD1G96FA0T02R00	
FL2501		EXC24CP221U	EXC24CP221U	
FL2504		J0JAC0000011	BK1005HM102-T	
FL2601		J0HABB00001	KNA32200-W3	
FL2602		J0HABB00001	KNA32200-W3	
FL2603		J0HABB00001	KNA32200-W3	
J2501		JY80001A	JY80001A	
L101		ELJRF6N8JF2	ELJRF6N8JF2	6.8NH
L105		ELJRF56NJF2	ELJRF56NJF2	56NH
L106		ELJRF15NJF2	ELJRF15NJF2	15NH
L107		ELJRF15NJF2	ELJRF15NJF2	15NH
L108		ELJRF2N7DF2	ELJRF2N7DF2	2.7NH
L109		ELJRF2N7DF2	ELJRF2N7DF2	2.7NH
L110		ELJRF82NJF2	ELJRF82NJF2	82NH
L111		ELJRF82NJF2	ELJRF82NJF2	82NH
L112		ELJRF33NJF2	ELJRF33NJF2	33NH
L113		ELJRF33NJF2	ELJRF33NJF2	33NH
L114		ELJRF4N7JF2	ELJRF4N7JF2	4.7NH
L206		ELJRF2N7DF2	ELJRF2N7DF2	2.7NH
L207		ELJRF3N3DF2	ELJRF3N3DF2	3.3NH
L209		ELJRF22NJF2	ELJRF22NJF2	22NH
L210		ELJRF5N6JF2	ELJRF5N6JF2	5.6NH
L211		ELJRF4N7JF2	ELJRF4N7JF2	4.7NH
L215		ELJRF4N7JF2	ELJRF4N7JF2	4.7NH
L216		ELJRF3N9JF2	ELJRF3N9JF2	3.9NH
L217		ELJRF3N9JF2	ELJRF3N9JF2	3.9NH
L221		ELJRF4N7JF2	ELJRF4N7JF2	4.7NH
L228		ELJRF15NJF2	ELJRF15NJF2	15NH
L351		G1C1R0K0000	LK16081R0K-T	1UH
L2503		G1C82NJ0000	HK160882NJ-T	82NH
L2504		G1C82NJ0001	HK100582NJ-T	82NH
L2505		G1C82NJ0001	HK100582NJ-T	82NH

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
L2601		G1C22NJ0000	HK 1608 22NJ	22NH
L2701		G1A4R7E0000	LQH3C4R7M5	4.7UH
M1		3DH001002AA	3DH001002AAA	
M2		3DH001004AA	3DH001004AAA	
M3		3DH001006AA	3DH001006AAA	
Q101		B1GHCFJJ000	UMB11NTN	
Q102		B1GDCFJJ000	DTA114EETL	10K
Q201		B1ABBA00001	BFP540FGEG	
Q2101		B1GDCFNA00	DTA144TETL	990M
Q2301		B1DHCC0000	RTQ035P02TR	
R101		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R102		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R103		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R105		ERJ2GEJ470X	ERJ2GEJ470X	47O
R106		ERJ2GEJ470X	ERJ2GEJ470X	47O
R107		EXB24AT7AR5	EXB24AT7AR5X	
R108		EXB24AT4AR3	EXB24AT4AR3	50O
R113		ERJ2GEJ152X	ERJ2GEJ152X	1.5KO
R114		ERJ2GEJ152X	ERJ2GEJ152X	1.5KO
R115		ERJ2RKF123X	ERJ2RKF123X	12KO
R116		ERJ2GEJ561X	ERJ2GEJ561X	560O
R117		ERJ2GEJ221X	ERJ2GEJ221X	220O
R151		ERJ2GEJ271X	ERJ2GEJ271X	270O
R154		ERJ2GEJ101X	ERJ2GEJ101X	100O
R157		ERJ2GE0R00X	ERJ2GE0R00X	0O
R158		ERJ2GEJ472X	ERJ2GEJ472X	4.7KO
R159		ERJ2GEJ273X	ERJ2GEJ273X	27KO
R160		ERJ2GEJ153X	ERJ2GEJ153X	15KO
R161		ERJ2GEJ153X	ERJ2GEJ153X	15KO
R162		ERJ2GEJ470X	ERJ2GEJ470X	47O
R163		ERJ2GEJ470X	ERJ2GEJ470X	47O
R201		ERJ2GEJ822X	ERJ2GEJ822X	8.2KO
R202		ERJ2GEJ330X	ERJ2GEJ330X	33O
R204		ERJ2GE0R00X	ERJ2GE0R00X	0O
R205		ERJ2GEJ561X	ERJ2GEJ561X	560O
R301		ERJ2GEJ202X	ERJ2GEJ202X	2KO
R302		ERJ2GEJ182X	ERJ2GEJ182X	1.8KO
R303		ERJ2GEJ472X	ERJ2GEJ472X	4.7KO
R351		ERJ2GEJ472X	ERJ2GEJ472X	4.7KO
R2101		D0GA104JA01	MCR01MZSEJ	100KO
R2102		D0GA104JA01	MCR01MZSEJ	100KO
R2103		ERJ2GEJ472X	ERJ2GEJ472X	4.7KO
R2104		D0GA104JA01	MCR01MZSEJ	100KO
R2105		D0GA104JA01	MCR01MZSEJ	100KO
R2107		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2205		D0GA4R7JA01	MCR01MZSEJ	4.7O
R2301		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R2303		ERJ2RKF104X	ERJ2RKF104X	100KO
R2304		ERJ6GEYJ470	ERJ6GEYJ470	47O
R2305		ERJ6RSFR15V	ERJ6RSFR15V	0.15O
R2306		D0GA473JA01	MCR01MZSEJ	47KO
R2307		ERJ2GEJ472X	ERJ2GEJ472X	4.7KO
R2308		D0GA222JA01	MCR01MZSEJ	2.2KO
R2401		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R2402		ERJ2GEJ103X	ERJ2GEJ103X	10KO

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
R2403		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R2404		D0GA224JA01	MCR01MZSEJ	220KO
R2405		D0GA104JA01	MCR01MZSEJ	100KO
R2407		D0GA104JA01	MCR01MZSEJ	100KO
R2411		ERJ2GEJ103X	ERJ2GEJ103X	10KO
R2501		ERJ2GEJ561X	ERJ2GEJ561X	560O
R2502		D0GA222JA01	MCR01MZSEJ	2.2KO
R2503		D0GA104JA01	MCR01MZSEJ	100KO
R2504		D0GA513JA01	MCR01MZSEJ	51KO
R2507		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2508		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2509		D0GA333JA00	MCR01MZSJ3	33KO
R2510		D0GA333JA00	MCR01MZSJ3	33KO
R2511		D0GA124JA01	MCR01MZSEJ	120KO
R2512		D0GA124JA01	MCR01MZSEJ	120KO
R2513		ERJ2GEJ470X	ERJ2GEJ470X	47O
R2514		D0GA102JA01	MCR01MZSEJ	1KO
R2515		D0GA222JA01	MCR01MZSEJ	2.2KO
R2601		ERJ2GEJ470X	ERJ2GEJ470X	47O
R2602		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2603		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2604		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2605		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2606		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2607		D0GA102JA01	MCR01MZSEJ	1KO
R2608		D0GA102JA01	MCR01MZSEJ	1KO
R2609		D0GA102JA01	MCR01MZSEJ	1KO
R2610		D0GA102JA01	MCR01MZSEJ	1KO
R2611		D0GA102JA01	MCR01MZSEJ	1KO
R2612		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2613		EXB24V181JX	EXB24V181JX	180O
R2615		EXB24V181JX	EXB24V181JX	180O
R2616		EXB24V181JX	EXB24V181JX	180O
R2617		EXB24V181JX	EXB24V181JX	180O
R2618		EXB24V181JX	EXB24V181JX	180O
R2620		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2621		ERJ2GEJ221X	ERJ2GEJ221X	220O
R2622		D0GA181JA01	MCR01MZSEJ	180O
R2623		D0GA181JA01	MCR01MZSEJ	180O
R2627		EXB24V181JX	EXB24V181JX	180O
R2701		ERJ2GEJ331X	ERJ2GEJ331X	330O
R2702		ERJ2GEJ470X	ERJ2GEJ470X	47O
R2703		ERJ2GE0R00X	ERJ2GE0R00X	0O
R2704		ERJ2GEJ822X	ERJ2GEJ822X	8.2KO
R2706		D0GA4R7JA01	MCR01MZSEJ	4.7O
R2707		D0GA4R7JA01	MCR01MZSEJ	4.7O
R2708		ERJ2GEJ561X	ERJ2GEJ561X	560O
R2709		EXB24V331JX	EXB24V331JX	330O
R2710		EXB24V331JX	EXB24V331JX	330O
R2711		EXB24V331JX	EXB24V331JX	330O
R2712		EXB24V331JX	EXB24V331JX	330O
R2713		ERJ3GE0R00V	ERJ3GEY0R0(	0O
RV2501		D4ED1270A00	AVR-M1005C270MTABB	
RV2502		D4ED1270A00	AVR-M1005C270MTABB	
RV2503		D4ED1270A00	AVR-M1005C270MTABB	

Upper Unit

Ref.No.	Part No.	Value

Lower Unit

Ref.No.	Destination	Part No.	Mfrs Part No.	Value
BT2301		200111010002	ML614R	
RV2505		D4ED1270A00	AVR-M1005C270MTABB	
RV2506		D4ED1270A00	AVR-M1005C270MTABB	
RV2701		D4ED1270A00	AVR-M1005C270MTABB	
U101		C1CB0000152	PMB6256V V1.1	
U102		C1CB0000147	PMB2256V V1.1	
U103		C5CB0000004	PF08123B-03-TB	
U104		EHF2NT1810	EHF2NT1810	
U105		J2FZ00000004	ASM7018808T-2304	
U106		J2GE0000001	LDC21897M20B-027	
U150		C1CB0000151	HD155174ANPEB	
U350		H1D2605B000	MAA3233A	
U401		C0DBZFC0003	R5323N001B-TR	
U2101		UZ80028A	UZ80028A	
U2102		C0JBAN00020	TC7MA138FK(EL)	
U2103		C0JBAE00014	TC7SZ32FU(TE85L)	
U2201		C3ZBQ000000	MC-2D446311AF9-D75X-CR2	
U2202		C0DBZFC0001	R1111N201B-TR	
U2301		UY76253A	UY76253A	
U2401		UY76206B	UY76206B	
U2402		C1CB0000146	BU8793KN-E2	
U2501		C1BB0000061	LM4890MMX	
U2502		C1BB0000074	BH7826FVM-TR	
X2701		JS76006A	JS76006A	
Y2101		H0J327200022	MC-146A	