Microwave Oven


## NN-S215WF <br> NN-S215MF <br> NN-S235WF <br> NN-S235MF <br> NN-S235BF

QPQ(Australia \& New Zealand)
HPE(Hong Kong)
YPQ(Singapore)
MPQ(Malaysia)
TPE(Thailand, Indonesia)
LPK(Philippines)
YTE(Others)
KTE(UAE)
PTE( Iran)
KPQ(Kuwait, Doha, Qatar, Oman, Bahrain, Pakistan)
STM(Saudi Arabia)
ZPE(CIS Countries)

## Specification

| Model | S215WF/MF | S235WF/MF/BF |
| :---: | :---: | :---: |
| Power Source: |  |  |
| Power Requirement: | 1200W(Except STM) <br> 1100W(STM 50Hz) <br> 1500W(STM 60Hz) | 1200W(Except STM) <br> 1100W(STM 50Hz) <br> 1500W(STM 60Hz) |
| Output: | 800W | 800W |
| Microwave Frequency: | 2450 MHz |  |
| Timer: | 30 min . | 29min.90sec |
| Outside Dimensions: | $364 \mathrm{~mm}(\mathrm{D}) \times 482 \mathrm{~mm}(\mathrm{~W}) \times 284 \mathrm{~mm}(\mathrm{H})$ |  |
| Oven Cavity Dimensions: | $330 \mathrm{~mm}(\mathrm{D}) \times 325 \mathrm{~mm}(\mathrm{~W}) \times 218 \mathrm{~mm}(\mathrm{H})$ |  |
| Weight: | 11.0kg |  |
| PbF | This product with PbF |  |
| Specifications subject to change without notice. |  |  |

## WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

## WARNING

1. This product should be serviced only by trained, qualified personnel.
2. Check for radiation leakage before and after every servicing according to the "procedure for measuring radiation leakage."
3. If the unit cannot be repaired on site, advise the customer not to use until unit is repaired.
4. There are special components used in the microwave oven which are important for safety. These parts are marked with a $\triangle$ on the replacement parts list. It is essential that these critical parts be replaced only with the manufacture's specified parts to prevent microwave leakage, shock, fire, or other hazards. Do not modify the orginal design.

This service manual covers products for following markets.
When troubleshooting or replacing parts, please refer to the country/area identifications shown below for your applicable product specification.


## CAUTION

## About lead free solder (PbF)

Distinction of PbF PCB: PCBs (manufactured) using lead free solder will have a PbF stamp on the PCB.
Caution: $\bullet \mathrm{Pb}$ free solder has a higher melting point than standard solder; Typically the melting point is $30-40^{\circ} \mathrm{C}$ higher. Please use a high temperature soldering iron. In case of the soldering iron with temperature control, please set it to $370 \pm 10^{\circ} \mathrm{C}$.
Pb free solder will tend to splash when heated too high (about $600^{\circ} \mathrm{C}$ )

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## 1 FEATURE CHART

| FEATURE | MODEL | NN-S215WF/MF |
| :--- | :---: | :---: |
| Three Stage Cooking | - | NN-S235WF/MF/BF |
| Turbo Defrost | - | 0 |
| Auto Cook | - | 0 |
| Power Level Select | - | 0 |
| Variable Power Control | - | 0 |
| Child Safety Lock | O | 0 |

## 2 CONTROL PANEL



## Pull Door Handle:

Pull to open the door. Opening the door during cooking will stop the cooking process without cancelling the program. Cooking resumes as soon as the door is closed. The oven light will turn on and stay on whenever the door is opened. It is quite safe to open the door at any time during a cooking program and there is no risk of microwave exposure.

## 3 OPERATION AND DIGITAL PROGRAMMER CIRCUIT TEST PROCEDURE

### 3.1. $\quad$ Time Cooking for Two Stage

| OPERATION | SCROLL DISPLAY |
| :---: | :---: |
| 1. Plug the power supply cord into wall outlet. |  |
| 2. Place a water load in the oven. |  |
| 3. Press Micro Power Pad once to set high power. <br> (1st stage) |  |
| 4. Set for 10 Seconds. |  |
| 5. Press Micro Power Pad 5 times to set low power. (2nd stage) |  |
| 6. Set for 1 minute. |  |
| 7. Press Start Pad. |  |
| 7. When 1st stage cooking time has elapsed. Oven beeps twice and automatically switches to 2nd stage cooking. |  |
| 8. When 2nd stage cooking time has elapsed, oven beeps 5 times and shuts off. |  |

### 3.2. Turbo Defrost

| OPERATION |  | SCROLL DISPLAY |
| :--- | :---: | :---: | :---: |
| 1. PressTurbo Defrost1.0 kg <br> Pad to set the weight for 1.0 kg. | High Med Low |  |

### 3.3. Auto Cook

|  | $300$ |
| :---: | :---: |
| 2 2. Press Start pad. |  |
|  | 4*30 |
| 3. When cooking time has elapsed, Oven beeps 5 times and shuts off. | : |

### 3.4. Auto Reheat



### 3.5. To Set Child Satety Lock

| OPERATION | SCROLL DISPLAY |
| :--- | :---: |
| 1. Press <br> continuously. "Child" appears in <br> the display. | High Med Low |
|  |  |

### 3.6. To Reset Child Lock

| OPERATION | SCROLL DISPLAY |
| :--- | :--- |
| 1. Press Stop / Reset <br> times continuously. | pad <br> in the display. |

## 4 SCHEMATIC DIAGRAM

### 4.1. NN-S215 (QPQ, ZPE)



### 4.2. NN-S215 (EXCEPT QPQ \& ZPE)



### 4.3. NN-S235



## 5 DESCRIPTION OF OPERATING SEQUENCE

### 5.1. Variable power cooking control (NN-S235)

The coil of power relay B (RY1) is energized intermittently by the digital programmer circuit, when the oven is set at any power selection except for High power position. The digital programmer circuit controls the ON-OFF time of power relay B contacts in order to vary the output power of the microwave oven from "Low" to "High" power. One complete ON and OFF cycle of power relay B is 22 seconds. The relation between indications on the control panel and the output of the microwave oven is as shown in table.
NOTE:
The ON/OFF time ratio does not correspond with the percentage of microwave power since approximately 2 seconds are required for heating of magnetron filament.

| POWERSETTING | OUTPUT POWER(\%) APPROX. | ON-OFF TIME OFPOWER RELAY B (RY1) |  |
| :---: | :---: | :---: | :---: |
|  |  | ON(SEC) | OFF(SEC) |
| HIGH | 100\% | 22 | 0 |
| MEDIUM-HIGH | 70\% | 17 | 5 |
| MEDIUM | 50\% | 13 | 9 |
| MEDIUM-LOW | 30\% | 8 | 14 |
| LOW | 15\% | 5 | 17 |
| DEFROST | 30\% | 8 | 14 |

### 5.2. Variable power cooking control (NN-S215)

The vari-power controller controls the ON-OFF time of the varipower switch to vary the output power of the microwave oven from "Low" to "High". The vari-power controller is a part of the timer assembly. The timer assembly consists of timer motor, timer switch, vari-power switch and the combination of gears, cam and actuater level.
One complete cycle of the vari-power controller is 30 senconds, in which the vari-power switch is turned "ON" or "OFF" by the cam rotation in the $30 \pm 2$ second period.
By controlling the timing of the vari-power switch "ON" period, the 220 or 240 V AC supplied to the high voltage transformer is interrupted intermittently so that the average output power of the microwave oven is varied.
Table shows the timing chart of vari-power switch operation in response to the power setting on the control panel.

## NOTE:

The ON/OFF time ratio does not correspond with the percentage of microwave power since approximately 2 seconds are required for heating of magnetron filament.

| Variable Power Cooking |  |  |  |
| :---: | :---: | :---: | :---: |
| POWER SETTING | OUTPUT POWER(\%) | ON-OFF TIME OF POWER RELAY B (RY1) |  |
|  | APPROX. | ON(SEC) | OFF(SEC) |
| HIGH | 100\% | 30 | 0 |
| MEDIUM-HIGH | 70\% | 23.2 | 6.8 |
| MEDIUM | 55\% | 16.5 | 13.5 |
| MEDIUM-LOW | 30\% | 9.8 | 20.2 |
| LOW | 15\% | 5 | 25 |
| DEFROST | 30\% | 9.8 | 20.2 |

### 5.3. Turbo Defrost, Auto Reheat, Auto Cook control (NN-S235)

When those Auto Control feature is selected and the Start Pad is tapped:

1. The digital programmer circuit determines the power level and cooking time to complete cooking and indicates the operating state in the display window.
Table shows the corresponding cooking times for respective serving or weight by categories.
2. When cooking time in the display window has elapsed, the oven turns off automatically by a control signal from the digital programmer circuit.
Turbo Defrost

| WEIGHT SELECTED | COOKING TIME |
| :---: | :---: |
| 1.0 KG | 9 min .36 sec. |

Auto Reheat
Auto Reheat

| WEIGHT SELECTED | COOKING TIME |
| :---: | :---: |
| 2 SERV | 3 min .10 sec. |

Auto Cook

| Auto Cook |  |  |
| :---: | :---: | :---: |
| CATEGORY WEIGHT SELECTED COOKING TIME <br> Vegetable 100 g 1 min .50 sec. |  |  |

## 6 CAUTIONS TO BE OBSERVED WHEN TROUBLESHOOTING

Unlike many other appliances, the microwave oven is highvoltage, high-current equipment. Though it is free from danger in ordinary use, extreme care should be taken during repair.

## CAUTION

Servicemen should remove their watches whenever working close to or replacing the magnetron.

### 6.1. Check the grounding

Do not operate on a 2-wire extension cord. The microwave oven is designed to be grounded when used. It is imperative, therefore, to make sure it is grounded properly before beginning repair work.

### 6.2. Warning about the electric charge in the high voltage capacitor

For about 30 seconds after the oven is turned off, an electric charge remains in the high voltage capacitor. When replacing or checking parts, remove the power plug from the outlet and short the terminal of the high voltage capacitor (terminal of lead wire from diode) to chassis ground with an insulated handle screwdriver to discharge.

## WARNING

There is high-voltage present, with high-current capabilities in the circuits of the high voltage winding and filament winding of the high voltage transformer. It is extremely dangerous to work on or near these circuits with oven energized.
DO NOT measure the voltage in the high voltage circuit including filament voltage of magnetron.

## WARNING

Never touch any circuit wiring with your hand nor with an insulated tool during operation.


### 6.3. When parts must be replaced, remove the power plug from the outlet.

### 6.4. When the 8 Amp fuse is blown due to the operation of short switch:

## WARNING

When the 8 Amp fuse is blown due to operation of the interlock monitor switch, you must replace all of the components (Primary latch switch, Door switch, Short switch and Power relay B (RY1)).

1. This is mandatory. Refer to "Adjustments and Measurement" for these switches.
2. When replacing the fuse, confirm that it has the appropriate rating for these models.
3. When replacing faulty switches, be sure mounting tabs are not bent, broken or otherwise deficient in their ability to hold the switches.

### 6.5. Avoid inserting nails, wire, etc. through any holes in the unit during operation.

Never insert a wire, nail or any other metal object through the lamp holes on the cavity or any other holes or gaps, because such objects may work as an antenna and cause microwave leakage.

### 6.6. Confirm after repair

1. After repair or replacement of parts, make sure that the screws of the oven, etc. are neither loose nor missing.
Microwaves might leak if screws are not properly tightened.
2. Make sure that all electrical connections are tight before inserting the plug into the wall outlet.
3. Check for microwave energy leakage. (Refer to procedure for measuring microwave evergy leakage.)

## CAUTION

MICROWAVE RADIATION
USE CAUTION NOT TO BECOME EXPOSED TO RADIATION FROM THE MICROWAVE MAGNETRON OR OTHER PARTS CONDUCTING MICROWAVE ENERGY.

## IMPORTANT NOTICE

1.The following components have potentials above 2000 V while the appliance is operated.

* Magnetron
* High voltage transformer
* High voltage diode
* High voltage capacitor

Pay special attention to these areas.
2. When the appliance is operated with the door hinge or magnetron adjusted incorrectly, the microwave leakage can exceed more than $5 \mathrm{~mW} / \mathrm{cm}^{2}$. After repair or exchange, it is very important to check that magnetron and the door hinge is correctly installed.

## 7 DISASSEMBLY AND PARTS REPLACEMENT PROCEDURE

### 7.1. Magnetron

1. Discharge the high voltage capacitor.
2. Remove 1 screw holding air guide A \& reinforce bracket.
3. Disconnect 2 high voltage lead wires from magnetron filament terminals.
4. Remove 4 screws holding the magnetron.

## NOTE:

After replacement of the magnetron,tighten mounting screws properly in an X pattern, making sure there is no gap between the waveguide and the magnetron to prevent microwave leakage.

## CAUTION

When replacing the magnetron, be sure the antenna gasket is in place.

## CAUTION

When connecting 2 filament lead wires to the magnetron terminals, be sure to connect the lead wires in the correct position. The lead wire of high volatge transformer should be connected to "F terminal" and the lead wire from high voltage capacitor should be connected to "FA terminal".


### 7.2. Digital Programmer Circuit (DPC) and membrane key board.

NOTE:
Be sure to ground any static electric charge built up on your body before handling the DPC.

1. Release 1 flat cable from D.P.C board holding on the oven cavity.
2. Remove 1 screw holding escutcheon base and slide the escutcheon base upward slightly.
3. Remove 1 screws holding D.P.C board.
4. Separate D.P.C board from tabs on the escutcheon base and remove D.P.C board.
5. Remove rubber connector.
6. Separate display from tabs on the escutcheon base and remove display.

To replace membrane key board
7. Push the upper part of key board (display window portion) from back of escutcheon base, and peel off escutcheon sheet \& membrane key board completely from escutcheon base.
NOTE:

1. The membrane key board is attached to the escutcheon base with double faced adhesive tape. Therefore, applying hot air such as using a hair dryer is recommended for smoother removal.
2. When installing new membrane key board, make sure that the surface of escutcheon base is cleaned sufficiently so that any problems (shorted contacts or uneven surface) can be avoided.
3. Alignment position of membrane key board is as follows;
Membrane key board: Right and upper edges
Escutcheon sheet: Right and upper edges


### 7.3. Low voltage transformer and/or power relays (RY1, RY2)

NOTE:
Be sure to ground any static electric charge built up on your body before handling the DPC.

1. Disconnect all connectors from D.P.C..
2. Remove 2 screws holding D.P.C. board on the oven cavity.
3. Using solder wick or a desoldering tool and 30W soldering iron, carefully remove all solder from the terminal pins of the low voltage transformer and/or power relays.

## NOTE:

Do not use a soldering iron or desoldering tool of more than 30 watts on DPC contacts.
4. With all the terminal pins cleaned and separated from DPC contacts, remove the defective transformer/power relays. Replace components, making sure all terminal pins are inserted completely. Resolder all terminal contacts carefully.


### 7.4. Timer

1. Disconnect all lead wires from timer.
2. Remove 1 screw holding escutcheon base and slide the escutcheon base upward slightly.
3. Remove 3 screws to detach timer from escutcheon base.
4. Remove 2 knobs from timer shaft.


### 7.5. Fan motor

1. Disconnect 2 lead wires from fan motor terminals.
2. Remove 1 screw holding diode (U) on side of the oven.
3. Disconnent 2 H.V. lead wires which linking to H.V. transformer from H.V. capacitor terminals.
4. Remove 3 screws holding orifice assy and detach the orifice assy from oven assy.
5. Remove fan blade from the motor shaft by pulling it straight out.
6. Remove 2 screws holding fan motor on orifice assy and detach the fan motor from orifice assy.


### 7.6. Door assembly

1. Remove door $C$ from door $E$ by carefully pulling outward starting from upper right hand corner using a flat blade screwdriver.
2. Separate door $E$ from tabs on door $A$ and remove door $A$.
3. Remove door screen B from door A.
4. Remove handle spring which hitching door handle, seperate door handle from door A by pulling outward door handle slightly, moving it towards the side of door A and out.
5. Open Door E at the opening angle of approximately $10^{\circ}$ (Note: The door cannot be removed if the opening angle is greater than $10^{\circ}$ ).
6. Remove the door E from its hinges by pushing the door E's bottom upward and out.
7. Remove door key and door key spring from door E .
8. Replace other components.

## NOTE:

Door alignment is crucial. If door is misaligned, apply pressure until alignment is achieved.
NOTE:
After replacement of the defective component parts of the door, reassemble, and perform microwave leakage test.


### 7.7. Turntable motor

1. Remove the motor cover by breaking off at the 4 spots indicated by arrows with a cutter or the like.

## NOTE:

After breaking off the motor cover, make sure that cut-off portions are properly trimmed off or bent to inside so that no sharp edges will be exposed to the outside.
2. Disconnect 2 lead wires connected to the turntable motor.
3. Remove the turntable motor by removing 1 screw.

## NOTE:

After reinstalling the new turntable motor and reconnecting the 2 lead wires, reinstall the motor cover by rotating it around $180^{\circ}$, tucking the 2 tabs under the base into the 2 provided slots, then screw the single tab to the base using a screw.



## 8 COMPONENT TEST PROCEDURE

## CAUTION

1. High voltage is present at the high voltage terminal of the high voltage transformer during any cook cycle.
2. It is neither necessary nor advisable to attempt measurement of the high voltage.
3. Before touching any oven components, or wiring, always unplug the oven from its power source and discharge the high voltage capacitor.

### 8.1. Primary Latch Switch, (Door Switch and Power Relay B) Interlocks.

1. Unplug the lead connectors to Power Relay B and verify continuity of the power relay B 1-2 terminals.
2. Unplug lead connectors to primary Latch switch and Door Switch.
3. Test the continuity of switches at door opened and closed positions with ohm meter (low scale).
Normal continuity readings should be as follows.

|  | Door Opened | Door Closed |
| :--- | :---: | :---: |
| Primary Latch Switch | $\infty \Omega$ (open) | $0 \Omega$ (close) |
| Door Switch | $\infty \Omega$ (open) | $0 \Omega$ (close) |
| Power Relay B | $\infty \Omega$ (open) | $\infty \Omega$ (open) |

### 8.2. Short Switch \& Monitor

1. Unplug lead wires from H.V.transformer primary terminals.
2. Connect test probes of ohm meter to the disconnected leads of the H.V. Transformer.
3. Test the continuity of short switch with door opened and closed positions using lowest scale of the ohm meter. Normal continuity readings should be as follows.

| Door Opened | Door Closed |
| :---: | :---: |
| $0 \Omega$ | $\infty \Omega$ |

### 8.3. High voltage transformer

1. Remove connectors from the transformer terminals and check continuity.
2. Normal (cold) resistance readings should be as follows: Secondary winding Approx. $80 \Omega \sim 120 \Omega$
Filament winding
Approx. $0 \Omega$
Primary winding
Approx. $0 \Omega \sim 1 \Omega$


### 8.4. High voltage capacitor

1. Check continuity of capacitor with meter on highest OHM scale.
2. A normal capacitor will show continuity for a short time, and then indicate $9 \mathrm{M} \Omega$ once the capacitor is charged.
3. A shorted capacitor will show continuous continuity.
4. An open capacitor will show constant $9 \mathrm{M} \Omega$.
5. Resistance between each terminal and chassis should be infinite.


### 8.5. Magnetron

Continuity checks can only indicate an open filament or a shorted magnetron. To diagnose for an open filament or shorted magnetron:

1. Isolate magnetron from the circuit by disconnecting the leads.
2. A continuity check across magnetron filament terminals should indicate one ohm or less.
3. A continuity check between each filament terminal and magnetron case should read open.


### 8.6. Variable power controller

- Isolate variable power switch from the circuit by disconnected 2 leads.
- In order to check if variable power controllor is operating normally, follow the test procedures below.

1. Select any power other than "High" and start the oven.
2. Check continuity between both terminals of the variable power switch.
3. Variable power controller (timer and variable power switch) is working proporty it the ohm meter reads open and $0 \Omega$ within $30 \pm 2$ seconds interval as shown in table on P.9.


Timer
Motor Coil (1-M)

### 8.7. Diode (U)

1. Isolate the diode (U) from the circuit by disconnecting the leads.
2. With the ohmmeter set on the highest resistance scale, measure the resistance across the diode terminals. Reverse the meter leads and again observe the resistance reading.Meter with 6V, 9 V or higher voltage batteries should be used to check the front-to-back resistance of the diode, otherwise an infinite resistance may be read in both directions.
A normal diode's resistance will be infinite in one direction and several hundred $\mathrm{K} \Omega$ in the other direction.


NOTE: OHMMETER SHOULD HAVE A MINMUM 6 VOLT BATTERY.

| FORWARD | REVERSE |
| :--- | :---: |
| SEVERAL <br> HUNDRED $K \Omega$ | $\infty \Omega$ |

3. With the ohmmeter set on the highest resistance scale, measure the resistance across the protector diode terminals. Reverse the meter leads and again observe the resistance reading.
A normal protector diode's resistance will be infinite in both directions. It is faulty if it shows continuity in one or both directions.


### 8.8. Membrane key board (Membrane switch assembly)

Check continuity between switch terminals, by tapping an appropriate pad on the key board. The contacts assignment of the respective pads on the key board is as shown in digital programmer circuit.

## 9 MEASUREMENTS AND ADJUSTMENTS

### 9.1. Adjustment of Primary latch switch, Secondary latch switch and Short switch.

1. Mount the Primary latch swith, the Secondary latch switch and the Short switch to the door hook assembly as shown in ILL.
NOTE:
No specific individual adjustments during installation of the Primary latch switch, Secondary latch switch or Short switch to the door hook are required.
2. When mounting the door hook assembly to the oven assembly, adjust the door hook assembly by moving it in the direction of the arrows in the illustration so that the oven door will not have any play in it. Check for play in the door by pulling the door assembly. Make sure that the latch keys move smoothly after adjustment is completed. Completely tighten the screws holding the door hook assembly to the oven assembly.
3. Reconnect the short switch and check the coninuity of the monitor circuit and all latch switches again by following the component test procedures.


### 9.2. Measurement of microwave output

The output power of the magnetron can be determined by performing IEC standard test procedures. However, due to the complexity of IEC test procedures, it is recommended to test the magnetron using the simple method outlined below.
Necessary Equipment:

- 1 liter beaker
- Glass thermometer
- Wrist watch or stopwatch


## NOTE:

Check the line voltage under load.Low voltage will lower the magnetron output. Take the temperature readings and heating time as accurately as possible.

1. Fill the beaker with exactly one liter of tap water. Stir the water using the thermometer and record the water's temperature. (recorded as T1).
2. Place the beaker on the center of glass tray.

Set the oven for High power and heat it for exactly one minute.
3. Stir the water again and read the temperature of the water. (recorded as T2).
4. The normal temperature rise at High power level for each model is as shown in table.

TABLE (1L-1min.test)

| RATED OUTPUT | TEMPERATURE RISE |
| :---: | :---: |
| 800 W | Min. $12.6^{\circ} \mathrm{F}\left(7.0^{\circ} \mathrm{C}\right)$ |

## 10 TROUBLESHOOTING GUIDE

1. Check grounding before checking for trouble.
2. Be careful of high voltage circuit.
3. Discharge high voltage capacitor.
4. When checking the continuity of the switches or the high voltage transformer, disconnect one lead wire from these parts and then check continuity with the AC plug removed. To do otherwise may result in a false reading or damage to your meter.
When disconnecting a plastic connector from a terminal, you must hold the plastic connector instead of the lead wire and then disconnect it, otherwise lead wire may be damaged or the connector cannot be removed.
5. Do not touch any parts of the circuitry on the digital programmer circuit, since static electric discharge may damage this control panel. Always touch yourself to ground while working on this panel to discharge any static charge in your body.
6. 240 V AC is present on the digital programmer circuit (Terminals of power relay's and primary circuit of low voltage transformer). When troubleshooting, be cautious of possible electrical shock hazard.

First of all operate the microwave oven following the correct operating procedures in order to find the exact cause of any trouble.

|  | SYMPTOM | CAUSE | CORRECTIONS |
| :---: | :---: | :---: | :---: |
| 1. | Oven is dead. <br> Fuse is OK. <br> No display and no operation at all. | 1. Open or loose lead wire harness <br> 2. Open thermal cutout <br> 3. Open low voltage transformer <br> 4. Defective DPC | Check fan motor if thermal cutout is defective. |
| 2. | No display and no operation at all. Fuse is blown. | 1. Shorted lead wire harness <br> 2. Defective primary latch switch (NOTE 1) <br> 3. Defective short switch (NOTE 1) <br> 4. Shorted H.V. capacitor <br> 5. Shorted H.V. transformer (NOTE 2) <br> 6. Shorted diode (U) | Check adjustment of primary, secondary latch switch and short switch including door. |
|  |  | NOTE 1: All of these switches must be replaced at the same time. <br> Check continuity of power relay B (RY1)'s contacts (between 1 and 2 ) and if it has continuity replace power relay B ( RY 1 ) also. <br> NOTE 2: When H.V. transformer is replaced, check diode and magnetron also. |  |
| 3. | Oven does not accept key input(Program) | 1. Key input is not proper in-sequence <br> 2. Open or loose connection of membrane key pad to DPC (Flat cable or rubber connector) <br> 3. Shorted or open membrane key board <br> 4. Defective DPC | Refer to operation procedure. <br> Refer to DPC troubleshooting. |
| 4. | Fan motor turn on when oven is plugged in with door closed. | 1. Misadjustment or loose wiring of secondary latch switch <br> 2. Defective secondary latch switch | Adjust door and latch switches. |
| 5. | Timer starts count down but no microwave oscillation. <br> (No heat while oven lamp and fan motor turn on) | 1. Off-alignment of latch switches <br> 2. Open or loose connection of high voltage circuit especially magnetron filament circuit <br> NOTE: Large contact resistance will cause lower magnetron filament voltage and cause magnetron to lower output and/or be intermittent. <br> 3. Defective high voltage component <br> H.V. transformer <br> H.V. capacitor <br> H.V. diode (U) <br> Magnetron <br> 4. Open or loose wiring of power relay B (RY1) <br> 5. Defective primary latch switch <br> 6. Defective DPC or power relay B (RY1) | Adjust door and latch switches. <br> Check high voltage component according to component test procedure and replace if it is defective. <br> Refer to DPC troubleshooting |
| 6. | Oven can program but timer does not start countdown. | 1. Open or loose wiring of secondary latch switch <br> 2. Off-alignment of secondary latch switch <br> 3. Defective secondary latch switch | Adjust door and latch switches. |
| 7. | Microwave output is low. Oven takes longer time to cook food. | 1. Decrease in power source voltage <br> 2. Open or loose wiring of magnetron filament circuit. (Intermittent oscillation) <br> 3. Aging change of magnetron | Consult electrician |
| 8. | Fan motor turns on and turntable rotates when door is opened. | 1. Shorted primary latch switch. |  |


|  | SYMPTOM | CAUSE | CORRECTIONS |
| :---: | :---: | :---: | :---: |
| 9. | Oven does not operate and return to plugged in mode as soon as start pad is pressed. | 1. Defective DPC | Check the grounding lead wire and D.P.C. board. |
| 10. | Loud buzzing noise can be heard. | 1. Loose fan and fan motor <br> 2. Loose screws on H.V. transformer |  |
| 11. | Turntable motor does not rotate. | 1. Open or loose wiring of turntable motor <br> 2. Defective turntable motor |  |
| 12. | Oven stops operation during cooking. | 1. Open or loose wiring of primary and secondary latch switch <br> 2. Operation of thermal cutout | Adjust door and latch switches. |
| 13. | 15A fuse is blown. | 1. Shorted lead wire harness <br> 2. Defective short switch <br> 3. Defective primary latch switdh <br> 4. Shorted H.V. capacitor <br> 5. Shorted H.V. diode <br> 6. Defective magnetron <br> 7. Shorted H.V. transformer <br> 8. Shorted diode (U) <br> 9. Defective power relays <br> 10. Defective DPC | Check adjustment of latch switches and door <br> Replace H.V. Diode and protector diode (*NOTE) Replace Magnetron and protector diode (*NOTE) <br> Replace H.V. Transformer and protector diode (*NOTE) |
|  |  | NOTE : Be sure to replace protector diode together with those H.V. components. In this case, only D2 of protector diode may be shorted due to faulty H.V. component. Therefore, if protector diode is not replaced together, high voltage transformer will be damaged (over heated). |  |

### 10.1. Trouble related to Digital Programmer Circuit

| SYMPTOM | STEP | CHECK | RESULT | CAUSE/CORRECTIONS |
| :--- | :---: | :--- | :--- | :--- |
| No display when oven is first plugged in | 1 | Fuse pattern of DPC | Normal | $\rightarrow$ Open(NOTE) | \(\left.\begin{array}{l}Shorted circuit of ZNR, <br>

L.V.T,Oven Lamp etc. <br>
Replace DPC\end{array}\right]\)

NOTE
Procedure of fuse pattern repairing is as follows:

1. When the fuse pattern (PF2) opens.
(1) Remove jumper wire (PF1).
(2) Insert the removed jumper wire (PF1) to "(PF2)"position and solder it. If both "PF1" and "PF2" fuse patterns are open, please replace DPC.
2. When the fuse pattern (PF4) opens.
(1) Remove jumper wire (PF3).
(2) Insert the removed jumper wire (PF3) to "(PF4)" position and solder it. If both "PF3" and "PF4" fuse patterns are open, please replace DPC.

NOTE:*At the time of these repairs, made visual inspection of the varistor for burning damage and examine the transformer with tester for the presence of layer shortcircuit (check primary coil resistance).
If any abnormal condition is detected, replace the defective parts.

| No key input | 1 | Membrane switch continuity | Abnormal | Membrane switch |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Normal | IC-1 |
| No beep sound | 1 | IC-1 pin 29 voltage | Abnormal | IC-1 |
|  |  |  | Normal | BZ210, Q210 |
| Power relay A(RY-2) does not turn on even though the program had been set and the start pad in tapped | 1 | IC-1 pin 1 voltage while operation | Abnormal | IC-1 |
|  |  |  | Normal=5V | $\rightarrow$ Step 2 |
|  | 2 | Short circuit between collector and Emitter of Q225 | Still not turn on | RY-2 |
|  |  |  | RY-2 turns on | Q225 |
| No microwave oscillation at any power | 1 | IC-1 pin 4 voltages while operation at high power | Abnormal | IC-1 |
|  |  |  | Normal=5V | $\rightarrow$ Step 2 |
|  | 2 | Transistor Q223 \& Q224 | Abnormal | Q223 and (or) Q224 |
|  |  |  | Normal | RY-1 |
| Dark or unclear display | 1 | Replace display and check operation | Normal | DISPLAY |
|  |  |  | Abnormal | IC-1 |
| Missing or lighting of unnecessary segment | 1 | Replace IC-1 and check operation | Normal | IC-1 |
|  |  |  | Abnormal | DISPLAY |

### 10.2. How To CHECK THE SEMICONDUCTORS USING AN OHM METER

Diode




PNP Transistor 2SA
2SB

Digital Transistor
PNP Transistor

|  | FORWARD | REVERSE |
| :---: | :---: | :---: |
| A-K | SMALL | $\infty$ |


|  | FORWARD | REVERSE |
| :---: | :---: | :---: |
| B-E | SMALL | $\infty$ |
| B-C | SMALL | $\infty$ |
| C-E | $\infty$ | $\infty$ |


|  | FORWARD | REVERSE |
| :---: | :---: | :---: |
| E-B | SMALL | $\infty$ |
| C-B | SMALL | $\infty$ |
| C-E | $\infty$ | $\infty$ |


|  | FORWARD | REVERSE |
| :---: | :---: | :---: |
| $\mathrm{E}-\mathrm{B}$ | $10 \mathrm{k} \Omega-30 \mathrm{k} \Omega$ | $10 \mathrm{k} \Omega-30 \mathrm{k} \Omega$ |
| $\mathrm{C}-\mathrm{B}$ | $50 \mathrm{k} \Omega-90 \mathrm{k} \Omega$ | $\infty$ |
| $\mathrm{C}-\mathrm{E}$ | $40 \mathrm{k} \Omega-80 \mathrm{k} \Omega$ | $\infty$ |

## 11 EXPLODED VIEW AND PARTS LIST

### 11.1. EXPLODED VIEW



### 11.2. PARTS LIST

## NOTE:

1. When ordering replacement part(s), please use part number(s) shown in this part list.

Do not use description of the part.
2. Important safety notice:

Components identified by mark have special characteristics important for safety.
When replacing any of these components, use only manufacture's specified parts.

## NOTE:

"A" parts are supplied by CSD (Japan)
"F" parts are supplied by PHAMOS (China)


| Ref. No. |  | Part No. | Part Name \& Description | Pcs/Set | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 21 | $\triangle$ | J61784T00AP | MICRO SWITCH | 1 | SHORT SWITCH |
| 22 | $\triangle$ | 2M211A-M1J | MAGNETRON | 1 | EXCEPT STM |
| 22 | $\triangle$ | 2M210-M1J | MAGNETRON | 1 | STM |
| 23 | 今 | F60906N60XP | H.V.CAPACITOR | 1 | EXCEPT LPK \& STM |
| 23 | $\triangle$ | F6090-1H70 | H.V.CAPACITOR | 1 | LPK |
| 23 | $\triangle$ | F60906S20SN | H.V.CAPACITOR | 1 | STM |
| 24 |  | F60376S10XP | CAPACITOR BRACKET | 1 |  |
| 25 | $\triangle$ | F621B6S10HP | H.V.TRANSFORMER | 1 | HPE, TPE, YTE, KTE, PTE, ZPE |
| 25 | $\triangle$ | F621B6S10LP | H.V.TRANSFORMER | 1 | LPK |
| 25 | $\triangle$ | F621B6S10MP | H.V.TRANSFORMER | 1 | QPQ, MPQ, YPQ, KPQ |
| 25 | $\triangle$ | F621B6S20ST | H.V.TRANSFORMER | 1 | STM |
|  |  |  |  |  |  |
| 26 | A | F605V6N60xP | DIODE (U) | 1 |  |
| 27 | $\triangle$ | ANE 6230270BP | FUSE | 1 |  |
| 29 |  | F63266S10xP | TURNTABLE MOTOR | 1 |  |
| 30 | $\triangle$ | F900C6S10QP | AC CORD W/PLUG | 1 | QPQ |
| 30 | $\triangle$ | F900C6S10YT | AC CORD W/PLUG | 1 | S215*F (HPE, MPQ, YTE, KTE, KPQ) |
| 30 | $\triangle$ | F900C6S20Yt | AC CORD W/PLUG | 1 | S235*F (HPE, MPQ, YTE, KTE, KPQ) |
| 30 | $\triangle$ | F900C6S10TP | AC CORD W/PLUG | 1 | S215*F (TPE, PTE) |
| 30 | $\triangle$ | F900C6S10zP | AC CORD W/PLUG | 1 | ZPE, S235*F (TPE, PTE) |
| 30 | $\triangle$ | F900C6S10YP | AC CORD W/PLUG | 1 | S215*F (YPQ) |
| 30 | $\triangle$ | F900C6S20YP | AC CORD W/PLUG | 1 | S235*F (YPQ) |
| 30 | $\triangle$ | F900C6S10LP | AC CORD W/PLUG | 1 | S215WF (LPK) |
| 30 | $\triangle$ | F900C6S20AP | AC CORD W/PLUG | 1 | S235WF (LPK) |
| 30 | $\triangle$ | F90006S20ST | AC CORD W/PLUG | 1 | STM |
| 31 | $\triangle$ | F61456N00AP | THERMAL CUTOUT | 2 | $-20^{\circ} \mathrm{C}$ ON , $120^{\circ} \mathrm{C}$ OFF |
| 32 |  | F60366S10xP | CAPACITOR INSTALLATION BRACKET | 1 |  |
| 33 |  | F11656S10xP | REINFORCE BRACKET | 1 |  |
| 34 |  | F60706S10xP | INSULATE BRACKET | 1 |  |
| 35 |  | F603Y6S20@P | D.P.CIRCUIT (DU) | 1 | S235*F (QPQ \& ZPE) |
| 35 |  | F603Y6S20ST | D.P.CIRCUIT (DU) | 1 | S235WF (STM) |
| 35 |  | F603Y6S20XP | D.P.CIRCUIT (DU) | 1 | S235*F (EXCEPT QPQ, STM \& ZPE) |
|  |  |  |  |  |  |
| 36 |  | F00065540MN | CAUTION LABEL | 1 | YPQ |
| 37 |  | F00068100HN | CAUTION LABEL | 1 | EXCEPT ZPE |
| 38 |  | F00065E90zP | CAUTION LABEL | 1 | ZPE |
|  |  |  |  |  |  |
| 41 |  | F02846S10HYP | NO. LABEL | 1 | S215WF YPQ |
| 41 |  | F02846S10SYP | NO. LABEL | 1 | S215MF YPQ |
| 41 |  | F02846S20HYP | NO. LABEL | 1 | S235WF YPQ |
| 41 |  | F02846S20SYP | NO. LABEL | 1 | S235MF YPQ |
| 45 |  | XTWFA4+12T | SCREW | 4 | FOR MAGNETRON |
| 46 |  | XTWFA4+12D | SCREW | 3 | FOR CABINET BODY |
| 47 |  | XTTFA4+6BN | SCREW | 2 | FOR CABINET BODY SIDE |
| 49 |  | F02395E20KN | CORD CAUTION LABEL | 1 | KTE, PTE, KPQ, STM |
| 51 |  | F60305G60HN | INCANDESCENT LAMP | 1 | HPE |
| 52 |  | F61525H00AP | SOCKET | 1 | HPE |
| 53 |  | F692Y6S10@P | NOISE FILTER (U) | 1 | S215WF (QPQ \& ZPE) |

### 11.3. DOOR ASSEMBLY



| Ref. No. |  | Part No. | Part Name \& Description | Pcs/Set | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: |
| D1 |  | F30186S10XP | DOOR KEY A | 1 |  |
| D2 | 今 | F301A6S10HXP | DOOR A (U) | 1 | S215WF (EXCEPT QPQ \& ZPE), S235WF (EXCEPT QPQ) |
| D2 | $\triangle$ | F301A6S10HAP | DOOR A (U) | 1 | S215WF (QPQ, ZPE), S235WF (QPQ) |
| D2 | $\triangle$ | F301A6S10SXP | DOOR A (U) | 1 | S215MF, S235MF |
| D2 | A | F301A6S10BAP | DOOR A (U) | 1 | S235BF |
| D3 | $\triangle$ | F302K6S10XP | DOOR E (U) | 1 |  |
| D4 |  | F30216S10XP | DOOR KEY SPRING | 1 |  |
| D5 | 今 | F30856S10XP | DOOR C | 1 |  |
|  |  |  |  |  |  |
| D6 | ¢ | F31455G10XN | DOOR SCREEN A | 1 |  |
| D7 |  | F31466S10XP | DOOR SCREEN B | 1 |  |
| D8 |  | F30126S10KXP | DOOR HANDLE | 1 | S215WF (EXCEPT QPQ \& ZPE), S235WF (EXCEPT QPQ) |
| D8 |  | F30126S10HXP | DOOR HANDLE | 1 | S215WF (QPQ, ZPE), S235WF (QPQ) |
| D9 |  | F30216S10XP | HANDLE SPRING | 1 |  |
| D10 |  | F01729660JP | CAUTION LABEL B | 1 | QPQ |
| D10 |  | F02459660AP | DHHS LABEL | 1 | LPK |

### 11.4. WIRING MATERIALS



| Ref. No. |  | Part No. | Part Name \& Description | PCs/Set |  |
| :---: | :--- | :--- | :--- | :--- | :--- |
| W1 | F030A-6S10 | LEAD WIRE HARNESS | 1 | S215WF (QPQ, ZPE) |  |
| W1 | F030A6S10XP | LEAD WIRE HARNESS | 1 | S215WF/MF (EXCEPT QPQ \& ZPE) |  |
| W1 | F030A6S20XP | LEAD WIRE HARNESS | 1 | S235WF/MF/BF |  |

### 11.5. PACKING AND ACCESSORIES



| Ref. No. | Part No. | Part Name \& Description | Pcs/Set | Remarks |
| :---: | :---: | :---: | :---: | :---: |
| P1 | F00036S10QP | INSTRUCTION MANUAL | 1 | QPQ |
| P1 | F00036S10HP | INSTRUCTION MANUAL | 1 | HPE, TPE, YTE, MPQ, YPQ, LPK |
| P1 | F00036S10KP | INSTRUCTION MANUAL | 1 | KTE, PTE, KPQ, STM |
| P1 | F00036S10ZP | INSTRUCTION MANUAL | 1 | ZPE |
| P2 | F01026S10HQP | PACKING CASE,PAPER | 1 | S215WF (QPQ) |
| P2 | F01026S10HHP | PACKING CASE,PAPER | 1 | S215WF (HPE, TPE, MPQ, YPQ, LPK) |
| P2 | F01026S10HYT | PACKING CASE, PAPER | 1 | S215WF (YTE) |
| P2 | F01026S10HKT | PACKING CASE, PAPER | 1 | S215WF (KTE, PTE) |
| P2 | F01026S10HKP | PACKING CASE,PAPER | 1 | S215WF (KPQ) |
| P2 | F01026S10HzP | PACKING CASE,PAPER | 1 | S215WF (ZPE) |
| P2 | F01026S10SHP | PACKING CASE, PAPER | 1 | S215MF (TPE, YPQ) |
| P2 | F01026S10SYT | PACKING CASE,PAPER | 1 | S215MF (YTE) |
| P2 | F01026S20HQP | PACKING CASE,PAPER | 1 | S235WF (QPQ) |
| P2 | F01026S20HHP | PACKING CASE, PAPER | 1 | S235WF (HPE, TPE, MPQ, YPQ, LPK) |
| P2 | F01026S20HYT | PACKING CASE, PAPER | 1 | S235WF (YTE) |
| P2 | F01026S20HKT | PACKING CASE, PAPER | 1 | S235WF (KTE, PTE) |
| P2 | F01026S20HKP | PACKING CASE, PAPER | 1 | S235WF (KPQ, STM) |
| P2 | F01026S20HZP | PACKING CASE, PAPER | 1 | S235WF (ZPE) |
| P2 | F01026S20SHP | PACKING CASE, PAPER | 1 | S235MF (TPE, YPQ) |
| P2 | F01026S20SYT | PACKING CASE, PAPER | 1 | S235MF (YTE) |
| P2 | F01026S20SZP | PACKING CASE, PAPER | 1 | S235MF (ZPE) |
| P2 | F01026S20BZP | PACKING CASE, PAPER | 1 | S235BF (ZPE) |
| P3 | F01045G40XN | UPPER FILLER | 1 |  |
| P4 | F01056S10XP | LOWER FILLER | 1 |  |
| P5 | F01066S10XP | P.E BAG | 1 |  |
|  |  |  |  |  |
| P6 | F01075G10XN | DOOR SHEET | 1 |  |
| P7 | A06015G10XN | COOKING TRAY | 1 |  |
| P8 | F01136E70XP | TRAY STYROL | 1 |  |
| P9 | F00065G40AP | CAUTION LABEL | 1 | QPQ |
| P10 | F9164-5G10 | EARTH LEAD | 1 | TPE |
| P11 | F00324040XN | EARTH CAUTION LABEL | 1 | TPE |
| P12 | F01924T00AP | SHEET | 1 | S215MF, S235MF/BF |
| P13 | F04456S20HTP | OVERLAY | 1 | S235WF (TPE) |
| P13 | F04456S20HMP | OVERLAY | 1 | S235WF (MPQ, YPQ) |
| P13 | F04456S20HKT | OVERLAY | 1 | S235WF (KTE, PTE,KPQ, STM) |
| P13 | F04456S20STP | OVERLAY | 1 | S235MF (TPE) |
| P13 | F04456S20SMP | OVERLAY | 1 | S235MF (YPQ) |

### 11.6. ESCUTCHEON BASE ASSEMBLY



| Ref. No. | Part No. | Part Name \& Description | Pcs/Set | Remarks |
| :---: | :---: | :---: | :---: | :---: |
| E1 | F603L6S20QP | D.P.CIRCUIT (AU) | 1 | S235WF (QPQ) |
| E1 | F603L6S20HP | D.P.CIRCUIT (AU) | 1 | S235*F (HPE, TPE, YTE) |
| E1 | F603L6S20MP | D.P.CIRCUIT (AU) | 1 | S235*F (MPQ, YPQ) |
| E1 | F603L6S20LP | D.P.CIRCUIT (AU) | 1 | S235WF (LPK) |
| E1 | F603L6S20KP | D.P.CIRCUIT (AU) | 1 | S235WF (KPQ) |
| E1 | F603L6S20KT | D.P.CIRCUIT (AU) | 1 | S235WF (KTE, PTE) |
| E1 | F603L6S20ST | D.P.CIRCUIT (AU) | 1 | S235WF (STM) |
| E1 | F603L6S20ZP | D.P.CIRCUIT (AU) | 1 | S235*F (ZPE) |
| E2 | F630Y6S20HQP | MEMBRANE SWITCH (U) | 1 | S235WF (QPQ) |
| E2 | F630Y6S20HHP | MEMBRANE SWITCH (U) | 1 | S235WF (HPE, TPE, YTE, MPQ, YPQ, LPK) |
| E2 | F630Y6S20HKT | MEMBRANE SWITCH (U) | 1 | S235WF (KTE, PTE,KPQ, STM) |
| E2 | F630Y6S20HzP | MEMBRANE SWITCH (U) | 1 | S235WF (ZPE) |
| E2 | F630Y6S20SHP | MEMBRANE SWITCH (U) | 1 | S235MF (TPE, YTE, YPQ) |
| E2 | F630Y6S20SZP | MEMBRANE SWITCH (U) | 1 | S235MF (ZPE) |
| E2 | F630Y6S20BZP | MEMBRANE SWITCH (U) | 1 | S235BF (ZPE) |
| E3 | F80346S20SXP | ESCUTCHEON BASE | 1 | S235WF |
| E3 | F80346S20HXP | ESCUTCHEON BASE | 1 | S235MF |
| E3 | F80346S20BXP | ESCUTCHEON BASE | 1 | S235BF |
| E4 | F67006S20XP | RUBBER CONNECTOR | 1 | S235WF/MF/BF |
| E5 | AEDDHJ6S20XP | DISPLAY | 1 | S235WF/MF/BF |
|  |  |  |  |  |
| E7 | F80346S10HQP | ESCUTCHEON BASE | 1 | S215WF (QPQ) |
| E7 | F80346S10HHP | ESCUTCHEON BASE | 1 | S215WF (HPE, TPE, YTE, MPQ, YPQ, LPK) |
| E7 | F80346S10HKT | ESCUTCHEON BASE | 1 | S215WF (KTE, PTE,KPQ) |
| E7 | F80346S10HzP | ESCUTCHEON BASE | 1 | S215WF (ZPE) |
| E7 | F80346S10SHP | ESCUTCHEON BASE | 1 | S215MF (TPE, YTE, YPQ) |
| E8 | F60016S10XP | TIMER | 1 | S215WF/MF (EXCEPT LPK) |
| E8 | F60016S10LP | TIMER | 1 | S215WF (LPK) |
| E9 | F80206S10KXP | TIMER KNOB | 1 | S215WF/MF |
| E10 | F83926S10KXP | TIMER KNOB | 1 | S215WF/MF |

## 12 DIGITAL PROGRAMMER CIRCUIT (NN-S235WF/MF/BF)

### 12.1. SCHEMATIC DIAGRAM




### 12.2. PARTS LIST

| Ref. No. | Part No. | Part Name \& Description | Pcs/Set | Remarks |
| :---: | :---: | :---: | :---: | :---: |
| BZ210 | AEFBAT2001wQ | BUZZER | 1 | 2.0 KHz |
| C12 | AECETS1V221B | AL CHEM CAPACITOR | 1 | 220uF/35v |
| C222 | AECUU06C101J | CHIP CAPACITOR | 1 | 100PF/50V |
| C11, C12, C223, C350, C351 | AECUT06F104Z | CHIP CAPACITOR | 5 |  |
| C220, 2221 | AECUN06F105z | CHIP CAPACITOR | 2 | 1 $\mu \mathrm{F} / 10 \mathrm{~V}$ |
| C13 | AECETS1C220B | CHIP CAPACITOR | 1 | 22uF/16V |
| C1 | ECQU2A474BP7 | CAPACITOR | 1 |  |
| C2, c3 | ECTJ10222ME | CAPACITOR | 2 | 0.0022 $\mathrm{F} / 250 \mathrm{~V}$ |
| CN1, CN2, CN7, CN8 | F62146D00xN | CONNECTOR | 4 |  |
| CN3 | K1KA03AA0115 | CONNECTOR | 1 |  |
| CN4 | F03536S20XP | LEAD WIRE HARNESS | 1 |  |
| CN5 | K1MN11A00008 | CONNECTOR | 1 |  |
| CN6 | F65906S20xP | Flat Cable | 1 | 11 pin |
| L1 | F621A6S20AP | FILTER COIL | 1 |  |
| Cx320 | EFOEC8004A4 | CERAMIC RESONATOR | 1 | 8.00 MHz |
| D14, D220-D225, D228 | AESS133T-77 | DIODE | 8 |  |
| D1 | AERZ511KSBN | VARISTOR | 1 |  |
| D2, D3 | AERZ102KSBN | VARISTOR | 2 |  |
| D11 | AESSRCT1A6-E | DIODE | 1 |  |
| IC1 | MN101C78ADF | L.S.I. | 1 |  |
| IC350 | COEBE0000401 | CMOS CHIP | 1 |  |
| Q10 | 2SD1859TV2Q | TRANSISTOR | 1 |  |
| Q11, Q220 | 2SA1037AK | CHIP TRANSISTOR | 2 |  |
| Q222 | AESA14EKE | CHIP DIGI-TRANSISTOR | 1 |  |
| Q14, Q210, Q225, Q 230 | AESC23JKE | CHIP DIGI-TRANSISTOR | 4 |  |
| Q224,2231 | 2SC2412KT146 | CHIP TRANSISTOR | 2 |  |
| Q223 | B1ACGF000004 | AUDION | 1 |  |
| R350 | AERJ06J102R | CHIP RESISTOR | 1 | 1K $, 1 / 10 \mathrm{~W}, 5 \%$ |
| R221, R223 | AERJ06J104R | CHIP RESISTOR | 2 | 100k $\Omega, 1 / 10 \mathrm{~W}, 5 \%$ |
| R225, R227 | AERJ06J152R | CHIP RESISTOR | 2 | $1.5 \mathrm{~K} \Omega, 1 / 10 \mathrm{~W}, 5 \%$ |
| R220 | AERJ06J222R | CHIP RESISTOR | 1 | 2.2k $, 1 / 10 \mathrm{~W}, 5 \%$ |
| R13 | AERJO6J223R | CHIP RESISTOR | 2 | 22S, 1/10W, 6\% |
| R10, R11 | AERJO6J331R | CHIP RESISTOR | 2 | 330 $2,1 / 10 \mathrm{~W}, 4 \%$ |
| R40-R46, R340, R341 | AERJ06J334R | CHIP RESISTOR | 9 | 330k $, 1 / 10 \mathrm{~W}, 6 \%$ |
| R222 | AERJ06J363R | CHIP RESISTOR | 1 | 36K $\Omega, 1 / 10 \mathrm{~W}, 7 \%$ |
| R12, R224, R351 | AERJ06J472R | CHIP RESISTOR | 3 | $4.7 \mathrm{~K} \Omega, 1 / 10 \mathrm{~W}, 6 \%$ |
| R211 | D0AF102JA155 | CARBON RESISTOR | 1 | $1 \mathrm{~K} \Omega, 1 / 4 \mathrm{~W}, 5 \%$ |
| R15, R223 | D0AF103JA155 | CARBON RESISTOR | 2 | $10 \mathrm{~K} \Omega, 1 / 4 \mathrm{~W}, 5 \%$ |
| R12, R13, R222 | DOAF104JA155 | CARBON RESISTOR | 3 | $100 \mathrm{~K} \Omega, 1 / 4 \mathrm{~W}, 5 \%$ |
| R210 | D0AF332JA155 | CARBON RESISTOR | 1 | 3. $3 \mathrm{~K} \Omega, 1 / 4 \mathrm{~W}, 5 \%$ |
| R225 | D0AF470JA155 | CARBON RESISTOR | 1 | 47 $\Omega$, 1/4W, 5\% |
| RY1 | AEGG5G1A12 | POWER RELAY | 1 |  |
| RY2 | AEBLD118 | POWER RELAY | 1 |  |
| T10 | AETP 284 T0AP | LOW VOLTAGE TRANSFORMER | 1 |  |
| ZD10 | BOBA4R400002 | ZENER DIODE | 1 |  |
| 2D11 | AESZMTZJ5R6B | ZENER DIODE | 1 |  |
| F1 | A62316010BP | FUSE HOLDER | 2 |  |

