

# ONKYO SERVICE MANUAL

## SYNTHESIZED FM STEREO/AM TUNER MODEL T-4038



Black model

|           |               |
|-----------|---------------|
| BUD, BUDN | 120V AC, 60Hz |
|-----------|---------------|

**SAFETY-RELATED COMPONENT WARNING!!**  
COMPONENTS IDENTIFIED BY MARK  $\Delta$  ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

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

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# SPECIFICATIONS

T-4038

## FM:

|                            |                                |
|----------------------------|--------------------------------|
| Tuning Range:              | 87.5-107.9MHz(200kHz steps)    |
| Usable Sensitivity:        | Mono: 11.2dBf, 2.0 $\mu$ V,IHF |
|                            | Stereo: 17.2dBf, 4.0 $\mu$ V   |
| 50dB Quieting Sensitivity: | Mono: 16.1dBf, 3.5 $\mu$ V     |
|                            | Stereo: 36.1dBf, 35 $\mu$ V    |
| Capture Ratio:             | 1.5dB                          |
| Image Rejection Ratio:     | 40dB                           |
| IF Rejection Ratio:        | 90dB                           |
| Signal-to-Noise Ratio:     | Mono: 73dB                     |
|                            | Stereo: 66dB                   |
| ACA:                       | 50dB IHF( $\pm$ 400kHz)        |
| AM Suppression Ratio:      | 50dB                           |
| Harmonic Distortion:       | Mono: 0.1%                     |
|                            | Stereo: 0.2%                   |
| Frequency Response:        | 30-15,000Hz $\pm$ 1.5dB        |
| Stereo Separation:         | 40dB at 1kHz                   |
|                            | 30dB at 70-10,000Hz            |
| Output voltage:            | 500mV                          |
| Muting level:              | 17.2dBf, 4 $\mu$ V             |

## AM:

|                        |                           |
|------------------------|---------------------------|
| Tuning Range:          | 530-1,620kHz(10kHz steps) |
| Usable Sensitivity:    | 25 $\mu$ V                |
| Image Rejection Ratio: | 40dB                      |
| IF Rejection Ratio:    | 30dB                      |
| Signal-to-Noise Ratio: | 40dB                      |
| Harmonic Distortion:   | 0.8%                      |
| Output voltage:        | 150mV                     |

## GENERAL:

|                                      |                                           |
|--------------------------------------|-------------------------------------------|
| Dimensions(W $\times$ H $\times$ D): | 435 $\times$ 73 $\times$ 265mm            |
|                                      | 17-1/8" $\times$ 2-7/8" $\times$ 10-7/16" |
| Weight:                              | 3.0kg., 6.6lbs.                           |

Specifications and features are subject to change without notice.

# SERVICE PROCEDURES

## 1.Safety-check out

(Only U.S.A. model)

After correcting the original service problem,perform the following safety check before releasing the set to the customer.

Connect the insulating-resistance tester between the plug of power supply cord and chassis.

Specifications: 3.3Mohm  $\pm$ 10% at 500V.

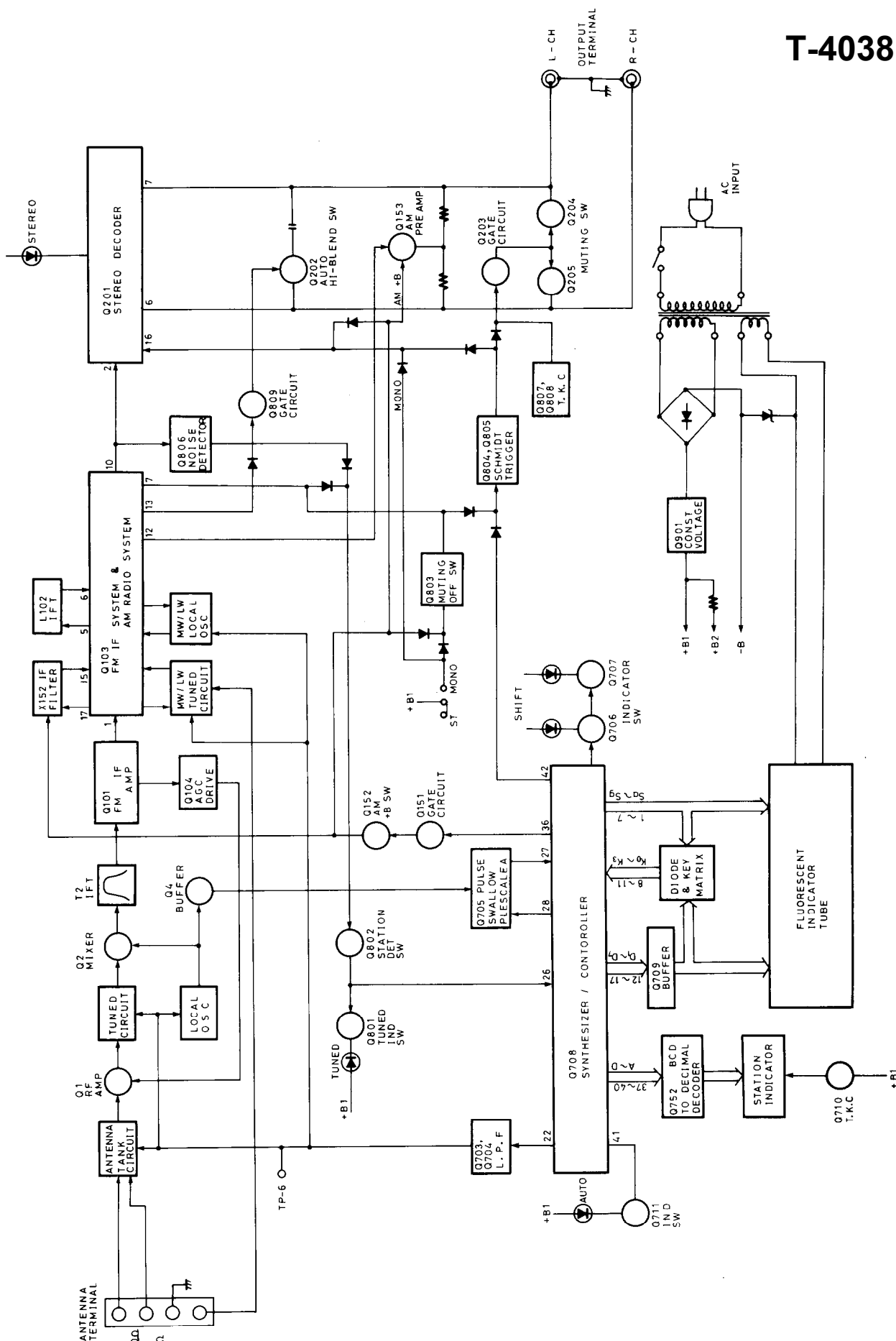
## 2.Memory preservation

This unit does not require memory preservation batteries.

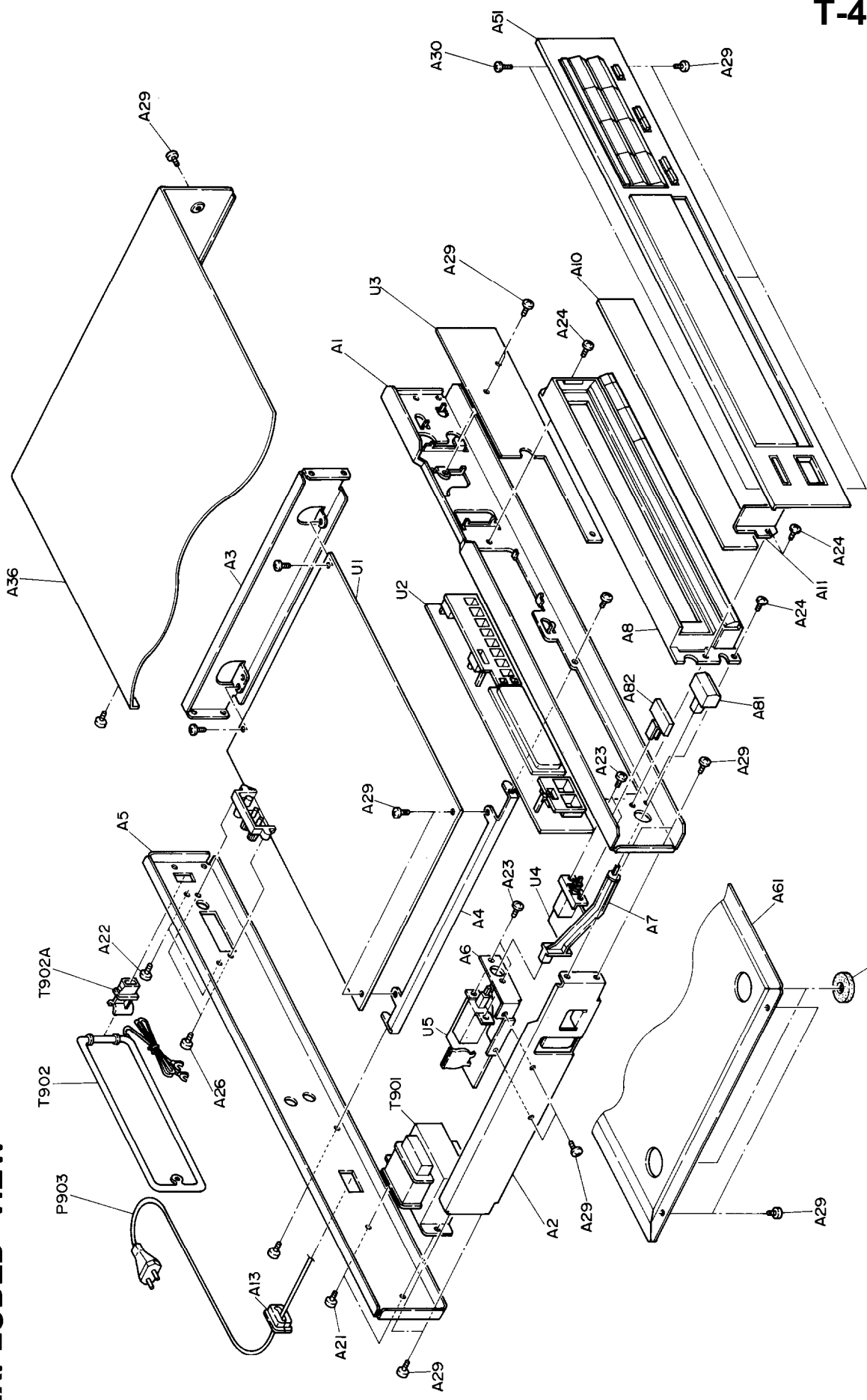
A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the back-up system. Note that since this is not a permanent memory,the power switch must be turned on and off a few times each month to keep the back-up system operative. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate and placement of the unit.

On the average, memory contents are protected over a period of 3 to 4 weeks (a minimum of 2 weeks) after the last time power has been turned off. This period is shorter when the unit is exposed to very high humidity or used in an area with an extremely humid climate.

**T-4038**



EXPLODED VIEW

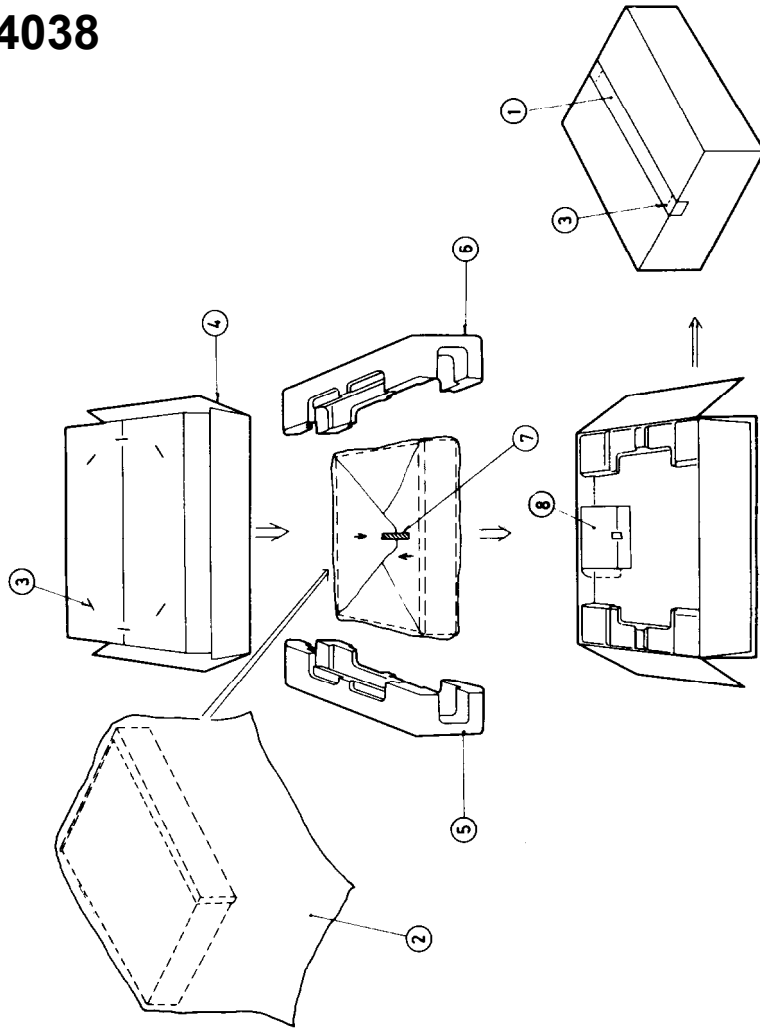


NOTE: THE COMPONENTS IDENTIFIED BY MARK  ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBERS SPECIFIED.

## PARTS LIST

| REF.NO. | PART NO.    | DESCRIPTION                                |
|---------|-------------|--------------------------------------------|
| A1      | 27110247B   | Front bracket                              |
| A2      | 27115130E   | Side bracket L                             |
| A3      | 27115169    | Side bracket R                             |
| A4      | 27130395    | Bracket,pc board                           |
| A5      | 27120827    | Back panel                                 |
| A6      | 27140990A   | Bracket,power switch                       |
| A7      | 27273030C   | Joint L                                    |
| A8      | 28322046-1A | Holder ass'y                               |
| A10     | 28133162A   | Back plate                                 |
| A11     | 28160110    | Holder                                     |
| A13     | 27300750    | Strainrelief                               |
| A21     | 838440089   | 4TTB+8C(BC),Tapping screw                  |
| A23     | 82143006    | 3P+6FN(BC),Pan head screw                  |
| A24     | 831430088   | 3TTW+8B(BC),Tapping screw                  |
| A26     | 834430108   | 3TTS+10B(BC),Tapping screw                 |
| A29     | 834430068   | 3TTS+6B(BC),Tapping screw                  |
| A30     | 838430068   | 3TTB+6B(BC),Tapping screw                  |
| A36     | 28184282A   | Top cover <b>Cx008</b>                     |
| A51     | 18658121    | Front panel ass'y <b>D8024</b>             |
| A61     | 27170224    | Bottom board                               |
| A62     | 27175011C   | Leg                                        |
| A81     | 28321905B   | Knob,Power                                 |
| A82     | 28322094A   | Knob,Mode                                  |
| P903    | 253123      | AS-UC-6#18,Power supply cord               |
| T901    | 2300088     | ANPT-915D,Power transformer                |
| T902    | 232085      | NMA-3034,AM loop antenna                   |
| T902A   | 27190105    | Holder,antenna                             |
| U1      | 18658500-1  | NARF-2600-1,Main pc board ass'y            |
| U2      | 18658501-1  | NADIS-2601-1,Display pc board ass'y        |
| U3      | 18658502-1  | NASW-2602-1,Function switch pc board ass'y |
| U4      | 18658503-1  | NASW-2603-1,Muting switch pc board ass'y   |
| U5      | 18658504-1  | NASW-2604-1, Power switch pc board ass'y   |

## PACKING VIEW



| REF.NO. | PART NO.            | DESCRIPTION                |
|---------|---------------------|----------------------------|
| 1       | 260012              | 50×700mm,Damplon tape      |
| 2       | 29100051            | 420 × 750mm,Poly-vinyl bag |
| 3       | 282301              | Sealing hook               |
| 4       | 29051280            | Master carton box          |
| 5       | 29090532B           | Pad R                      |
| 6       | 29090533E           | Pad L                      |
| 7       | 29110032            | W=15mm,Adhesive tape       |
| 8       | Accessary bag ass'y |                            |
|         | 292064A             | FM antenna                 |
|         | 232085              | NMA-3034,AM loop antenna   |
|         | 2010095             | Connection cord            |
|         | 29340983            | Instruction manual         |
|         | 29365006-7          | Warranty card <UDN>        |
|         | 29358002C           | Service station list <UDN> |
|         | 29100006A           | 250 × 350mm,Poly-vinyl bag |

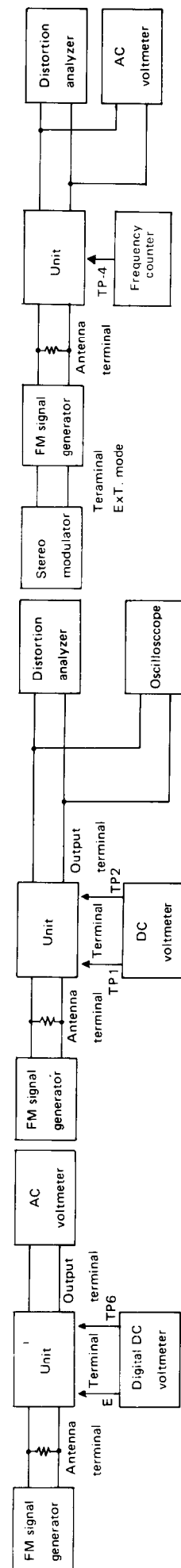
NOTE:<UDN>:Only U.S.A. model

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## ADJUSTMENT PROCEDURES

## FM section

| Item                  | Step | Connection of instrument | FM SG output                                  | Stereo modulator output   | Tuned frequency | Output indicator       | Adjustment point  | Adjust for       | Remarks                                                                                         |
|-----------------------|------|--------------------------|-----------------------------------------------|---------------------------|-----------------|------------------------|-------------------|------------------|-------------------------------------------------------------------------------------------------|
| Front end             | 1    | Fig.1                    | —                                             | —                         | 87.9MHz         | Digital DC voltmeter   | T1                | 1.2V $\pm$ 0.4V  | Usually not necessary to adjust.                                                                |
|                       | 2    |                          | 107.9MHz<br>1kHz, 75kHz devi.                 | —                         | 107.9MHz        | AC voltmeter           | TC1               | Maximum output   |                                                                                                 |
| I F                   | 1    | Fig.2                    | 98.1MHz<br>1kHz, 75kHz devi.<br>65dBf(60dB)   | —                         | 98.1MHz         | DC voltmeter           | L102<br>Primary   | 0V $\pm$ 20mV    | Set the mode switch to MONO. Repeat the steps 1 and 2 until no further adjustment is necessary. |
|                       | 2    |                          | —                                             | —                         | —               | Distortion analyzer    | L102<br>Secondary | Minimum          |                                                                                                 |
| V C O                 |      | Fig.3                    | 98.1MHz<br>1kHz, 75kHz devi.<br>65dBf(60dB)   | —                         | 98.1MHz         | Frequency counter      | R214              | 19kHz $\pm$ 10Hz | Set the mode switch to STEREO.                                                                  |
| Stereo distortion     |      | Fig.3                    | 98.1MHz<br>Ext. modulation<br>65dBf(60dB)     | L+R 1kHz<br>67.5kHz devi. | 98.1MHz         | Distortion analyzer    | T2                | Minimum          |                                                                                                 |
| Stereo separation     | 1    | Fig.3                    | 98.1MHz<br>Ext. modulation<br>65dBf(60dB)     | Lch. 1kHz                 | 98.1MHz         | Rch. AC voltmeter      | R204              | Minimum          | Maximum and same separation                                                                     |
|                       | 2    |                          | —                                             | Rch. 1kHz                 | —               | Lch. AC voltmeter      |                   | Minimum          |                                                                                                 |
| Tuned indicator level |      | Fig.2                    | 98.1MHz<br>1kHz, 75kHz devi.<br>20.2dBf(15dB) | —                         | 98.1MHz         | Tuned indicator        | R118              | Light on         |                                                                                                 |
| Auto Hi-blend level   |      | Fig.2                    | 98.1MHz<br>1kHz, 75kHz devi.<br>29.2dBf(24dB) | —                         | 98.1MHz         | Hi-blend switch (Q202) | R825              | off              |                                                                                                 |



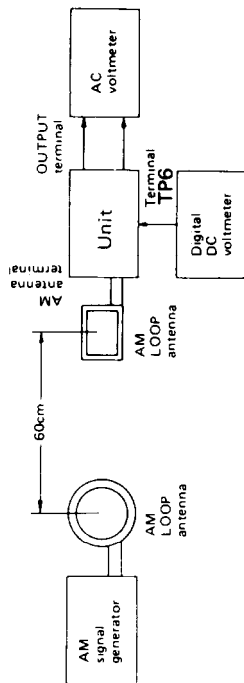
&lt;Fig.1&gt;

&lt;Fig.2&gt;

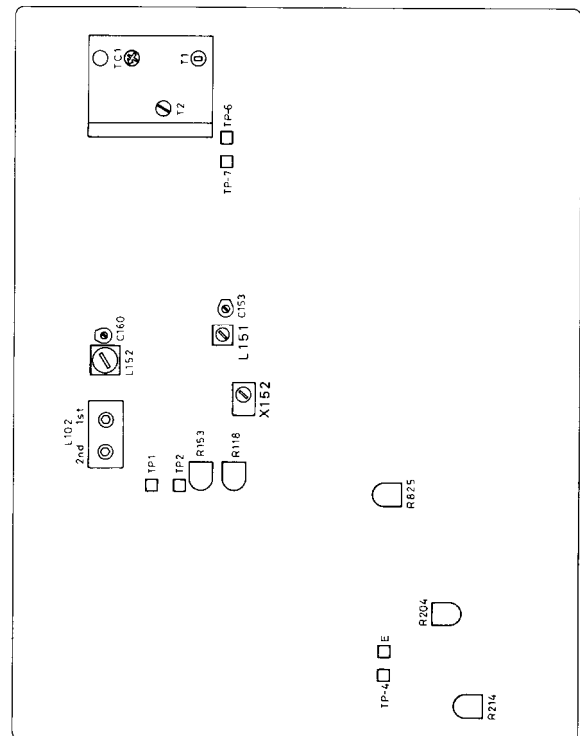
&lt;Fig.3&gt;

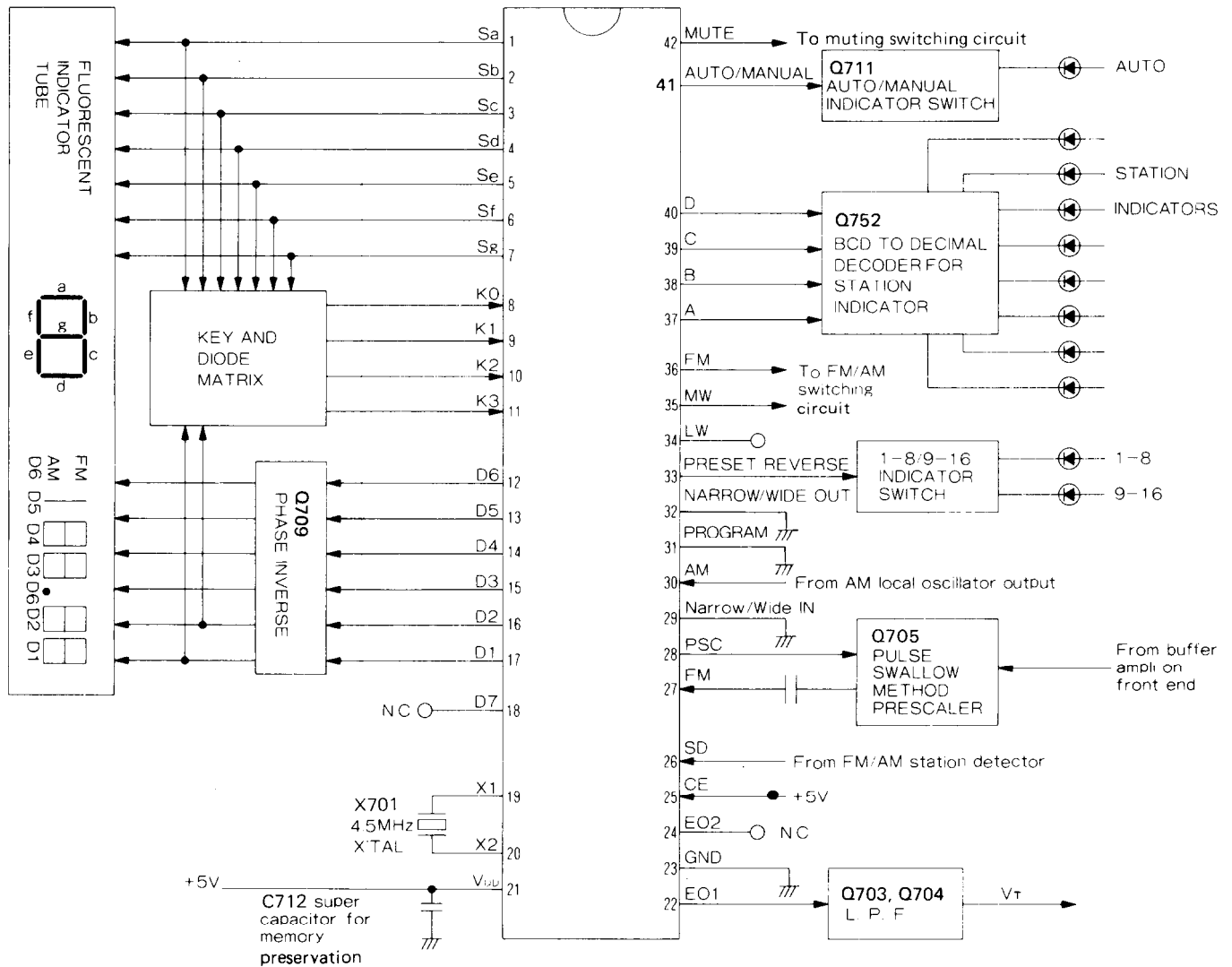
AM section

| Step | AM SG output                      | Tuned Frequency | Output indicator     | Adjustment point | Adjust for  | Remarks                                                            |
|------|-----------------------------------|-----------------|----------------------|------------------|-------------|--------------------------------------------------------------------|
| 1    | _____                             | 530kHz          | Digital DC voltmeter | L151             | 1.3V ± 0.1V | Repeat the steps 1 and 2 until no further adjustment is necessary. |
| 2    | _____                             | 1620kHz         |                      | C153             | 9.5V ± 0.1V |                                                                    |
| 3    | 600kHz, 60dB/m<br>400Hz 30% mod.  | 600kHz          | A C voltmeter        | L152             | Maximum     | Repeat the steps 3 and 4 until no further adjustment is necessary. |
| 4    | 1400kHz, 60dB/m<br>400Hz 30% mod. | 1400kHz         |                      | C160             | Maximum     |                                                                    |
| 5    | 1000kHz, 60dB/m<br>400Hz 30% mod. | 1000kHz         | A C voltmeter        | X152             | Maximum     |                                                                    |
| 6    | 1000kHz, 64dB/m<br>400Hz 30% mod. | 1000kHz         | TUNED indicator      | R153             | Light on    |                                                                    |



(fig. 5)



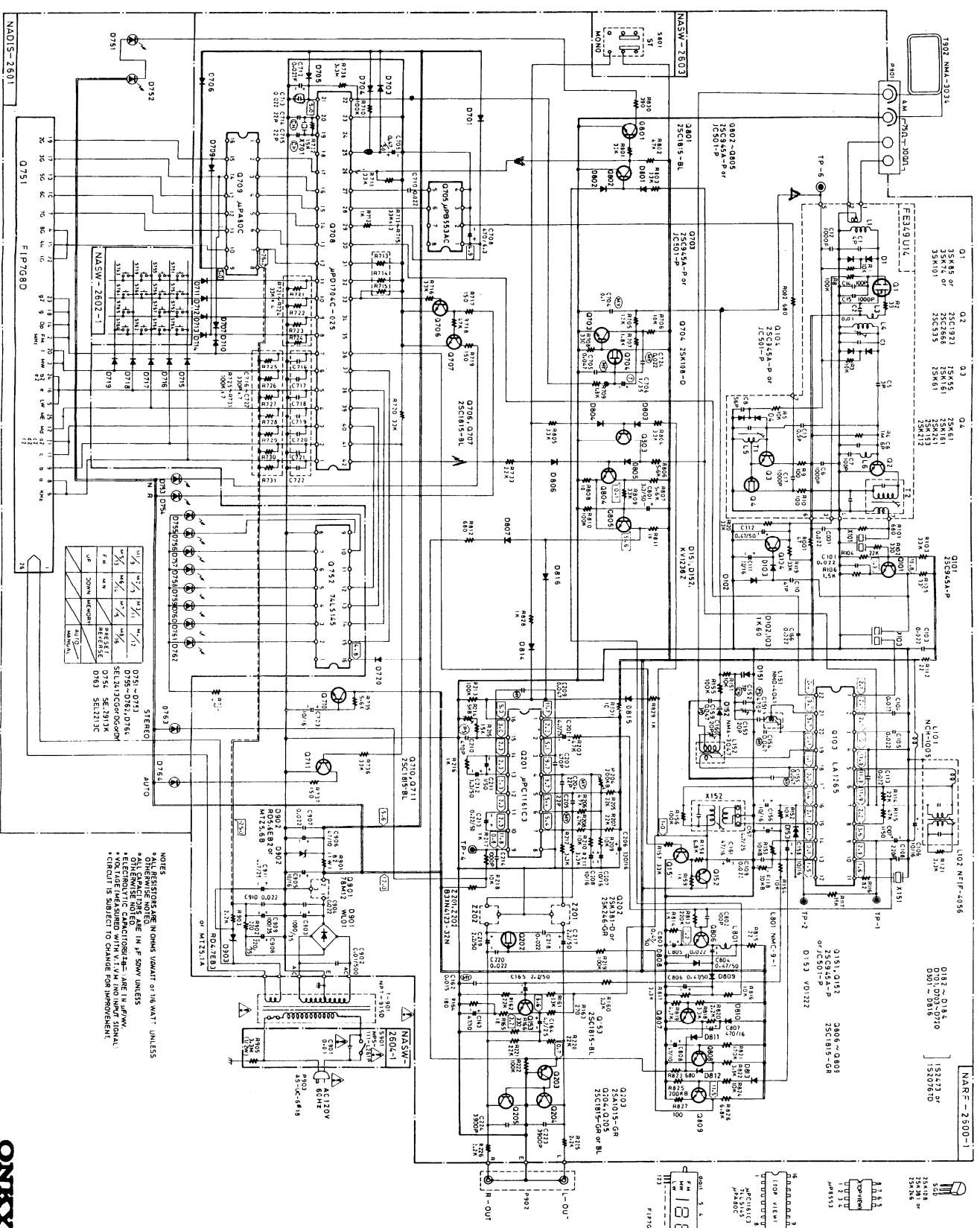


| Pin No. | Symbol          | Terminal                 | Description                                                                                                                                                                                                          |
|---------|-----------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 – 7   | Sa – Sg         | Segment outputs          | Display tube signal terminal output and key return signal source terminals; active high. Since these terminals can handle 30V, they are connected directly to the segment terminals of the fluorescent display tube. |
| 8 – 11  | K0 – K3         | Key return signal inputs | Terminals for input of the key return signals from external matrix circuit.                                                                                                                                          |
| 12 – 18 | D1 – D7         | Digit outputs            | Display tube digit output signal terminals; active low. D1 and D2 are used the key return signal source.                                                                                                             |
| 19, 20  | X1, X2          | X'tal                    | Connect to the 4.5MHz crystal oscillator.                                                                                                                                                                            |
| 21      | V <sub>DD</sub> | Power source input       | Device power source terminal; supplies 5V during normal operation and 2.5V from the super capacitor C712 for memory preservation.                                                                                    |



| Pin No.              | Symbol              | Terminal                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>T-4038</b> |
|----------------------|---------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 22, 24               | E01, E02            | Error outputs                     | Charge pump output of the phase detector with constitutes the PLL. Hight level is output when the divided oscillation frequency is higher than the reference frequency. In the opposite case, low level is output. Floating occurs when the frequencies match. The output is applied to the variable capacitor diode in the front end through the low pass filter Q703 and Q704. The output from both terminals is same, but only E01 is used. |               |
| 23                   | GND                 | Ground                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |
| 25                   | CE                  | Chip enable                       | Device selection signal input terminal. High level ... Normal operation<br>Low level ... Memory preservation                                                                                                                                                                                                                                                                                                                                   |               |
| 26                   | SD                  | Station detector signal input     | Input terminal for detecting whether or not a broadcast signal is being received during auto-tuning. Stopped by the high level.                                                                                                                                                                                                                                                                                                                |               |
| 27                   | FM                  | FM local oscillator signal input  | Input terminal for FM local oscillator is divided by 1/16 or 1/17 by prescaler Q705.                                                                                                                                                                                                                                                                                                                                                           |               |
| 28                   | PSC                 | Pulse swallow control output      | This terminal outputs a signal that switches the prescaler division ratio of Q705 to 1/16 or 1/17 when the pulse swallow method is used for division. (FM only)                                                                                                                                                                                                                                                                                |               |
| 29                   | NARROW/<br>Wide out | IF band width output              | Terminal for switching narrow and wide of IF band width.<br>Not used.                                                                                                                                                                                                                                                                                                                                                                          |               |
| 30                   | AM                  | AM local oscillator signal input  | Terminal for input of the AM local oscillator signal.                                                                                                                                                                                                                                                                                                                                                                                          |               |
| 31                   | PROGRAM             | Program selection signal output   | Terminal for indicator output whether or not the program mode.<br>Not used.                                                                                                                                                                                                                                                                                                                                                                    |               |
| 32                   | NARROW/<br>Wide out | IF band width switching output    | Terminal for specifications output of IF band width.<br>Not used.                                                                                                                                                                                                                                                                                                                                                                              |               |
| 33                   | Preset<br>Reverse   | Preset reverse indication output  | Terminal for indication output whether M1 – M8 or M9 – M16 the preset key.                                                                                                                                                                                                                                                                                                                                                                     |               |
| 34                   | LW                  | Band switching signal outputs     | Terminals for signal output switching of each band. High level is output from terminal of FM (pin no. 36) and low level is output from other terminals (pin no. 34 & 35) during FM reception. LW is not used with T-4038.                                                                                                                                                                                                                      |               |
| 35                   | MW                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |
| 36                   | FM                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |
| 37<br>38<br>39<br>40 | A<br>B<br>C<br>D    | Preset station indication outputs | Terminals for BCD code output of preset station indicator.                                                                                                                                                                                                                                                                                                                                                                                     |               |
| 41                   | AUTO/<br>MANUAL     | Auto/Manual indication output     | Terminal for indication output whether or auto the tuning mode.<br>This terminal becomes high during auto mode and low during manual mode.                                                                                                                                                                                                                                                                                                     |               |
| 42                   | MUTE                | Muting output                     | Output terminal which mutes the shock noise occurring when the PLL is released; active high. The muting signal is output as shown below.<br>UP/DOWN of manual/auto mode, preset memory is recalled, band switching and preset scan.                                                                                                                                                                                                            |               |

# SCHEMATIC DIAGRAM

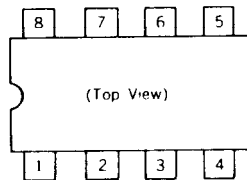


# BLOCK DIAGRAM OF IC

T-4038

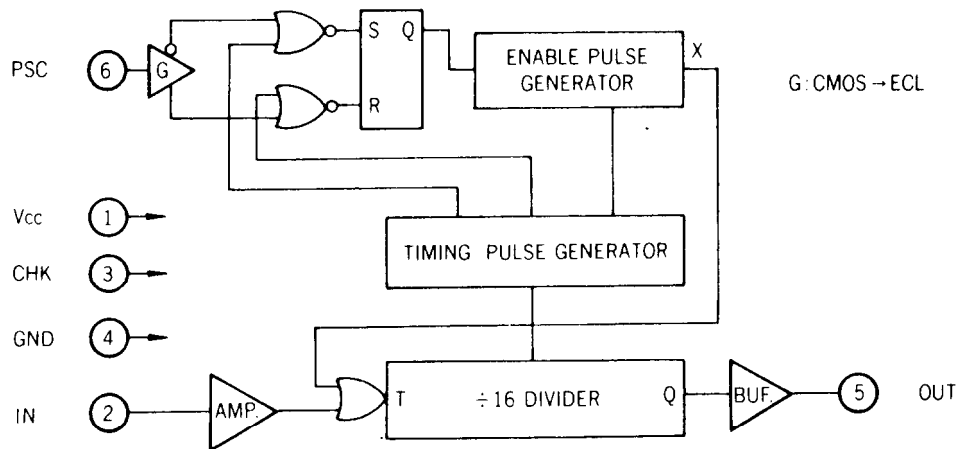
## $\mu$ PB553AC(Prescaler)

### Pin Connection

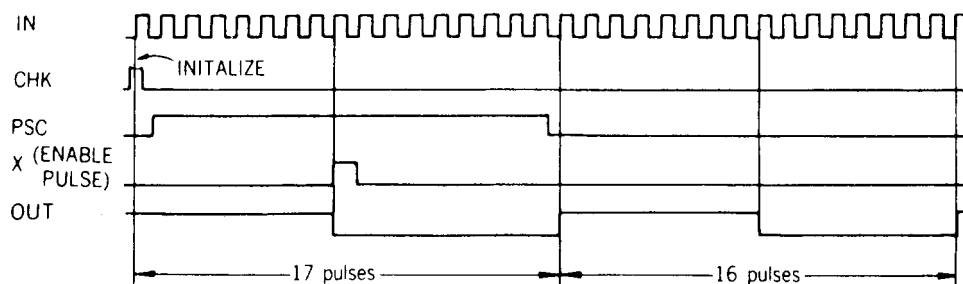


1. Pin 1 (Vcc)..... + 5 volts Supply
2. Pin 2 (IN)..... FM local oscillator signal input
3. Pin 3 (CHK)..... Check terminal
4. Pin 4 (GND)..... Ground terminal
5. Pin 5 (OUT)..... Prescaler terminal
6. Pin 6 (PSC)..... Prescaler control terminal
7. Pin 7,8..... Not connected

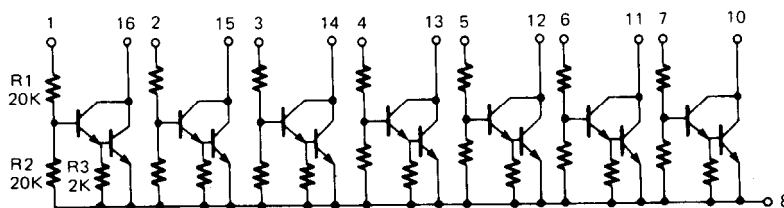
### Block Diagram



### Timing Chart



## $\mu$ PA80C(Buffer amplifier)



The block diagram illustrates the internal components of a stereo receiver, organized into two main vertical sections. The left section, labeled 1 through 8, contains the input and processing stages: 1. Input terminals for mono and stereo signals. 2. A 'TWE AMP' (Tweeter Amplifier) for mono signals. 3. A 'HF AMP' (High Frequency Amplifier) for stereo signals. 4. A 'STEREO DEMODULATOR' which receives signals from both the mono and stereo paths. 5. A 'POST AMP' (Post Amplifier) for the stereo signal. 6. A 'C CH AMP' (Center Channel Amplifier) for the mono signal. 7. A 'POST AMP' (Post Amplifier) for the center channel signal. 8. Output terminals for the amplified signals. The right section, labeled 9 through 16, contains the control and detection stages: 9. A 'STEREO LAMP DRIVER' which receives signals from the stereo and center channel post-amplifiers. 10. A 'PILOTTOR DETECTOR' which receives signals from the stereo and center channel post-amplifiers. 11. A 'PHASE LOCK DETECTOR' which receives signals from the stereo and center channel post-amplifiers. 12. A 'VCO' (Voltage Controlled Oscillator) which receives signals from the phase lock detector and the stereo and center channel post-amplifiers. 13. A '180° TO INVERTER' which receives signals from the phase lock detector. 14. A '180° TO INVERTER' which receives signals from the pilot detector. 15. A '180° TO INVERTER' which receives signals from the phase lock detector. 16. A 'ST-MONO SW VCO STOP SW' (Stereo-Mono Switch and VCO Stop Switch) which receives signals from the phase lock detector and the stereo and center channel post-amplifiers.

The diagram shows a 16-bit parallel adder circuit. It is composed of two 8-bit adders, labeled A and B, which are connected in parallel. The inputs are numbered 1 through 16, and the outputs are also numbered 1 through 16. A carry-in input, labeled 'C', is connected to the carry-in of adder A. The carry-out of adder A is connected to the carry-in of adder B. The carry-out of adder B is labeled 'C'.

| CIRCUIT NO. | PART NO. | DESCRIPTION              |
|-------------|----------|--------------------------|
| S801        | 250S5372 | NPS-122-L336,Push switch |

| CIRCUIT NO. | PART NO. | DESCRIPTION              |
|-------------|----------|--------------------------|
| C901        | 3500065A | ΔDE7150FZ103PAC400V/125V |

|       |          |                                    |
|-------|----------|------------------------------------|
| C901a | 27300601 | ΔSB-1925,Cover,capacitor           |
| Doc   | 4315033E | Δ 3 27300601 1/2W S Solid resistor |

25060092 NTM-1S33,Terminal GND

## MUTING SWITCH PC BOARD