Service Manual

FM/AM STEREO RECEIVER
SA-5460
(X), (XG), (XGH), (XSD), (XSW), (XE)

TECHNICAL SPECIFICATIONS (IHF)
Specifications are subject to change without notice for further improvement.

AMPLIFIER SECTION
1kHz continuous power: both channels driven 78W + 78W (4Ω)
66W + 66W (8Ω)
20Hz ~ 20kHz continuous power: both channels driven 72W + 72W (4Ω)
65W + 65W (8Ω)
Power bandwidth: both channels driven at 8Ω 10Hz ~ 40kHz, -3dB
Total harmonic distortion: 0.1% at rated power (20Hz ~ 20kHz)
0.05% at half power (1kHz)
Intermodulation distortion: 0.1%
Damping factor: PHONO 56 (8Ω), 27.5 (14Ω)
Input sensitivity and impedance: PHONO 2.5mV/47KΩ
AUX, TAPE 2 PLAYBACK 150mV/35KΩ
TAPE 1 PLAYBACK, REC/PLAY input 180mV/40KΩ

PHONO maximum input voltage: (1kHz, RMS) 150mV
S/N (PHF, A1): PHONO 78 dB
AUX 96dB
Frequency response: PHONO RIAA Standard curve ±2dB
AUX 20Hz ~ 20kHz, ±2.5dB
Ton controls: BASS 50Hz ±10dB, ±18dB
TREBLE 10kHz ±12dB, ±18dB
 Loudness control (volume at -30dB): 50Hz, ±4dB
Output voltage: TAPE 1 REC OUT 180mV
TAPE 2 REC OUT 150mV
TAPE 1 REC/PLAY output 30mV
High filter: 7kHz, -6dB/oct
Low filter: 100Hz, -6dB/oct.

FM TUNER SECTION
Frequency range: 88 ~ 108MHz
Antenna terminals: 300Ω (balanced) 75Ω (unbalanced)
Sensitivity: 6μV
Total harmonic distortion: MONO 0.1% STEREO 0.25%
S/N: MONO 75dB STEREO 72dB
Frequency response: 20Hz ~ 151kHz, ±0.02dB ~ 0.08dB
Alternate channel selectivity: 70dB
Cardio ratio: 1.58:1
Image rejection at 90MHz: 53dB
IF rejection at 9MHz: 80dB
AM suppression: 55dB
Stereo separation: 1kHz 45dB
10kHz 35dB
Leak current: ~65μA (15kHz) ~75μA (3kHz)

AM TUNER SECTION
Frequency range: 525 ~ 1605kHz
Sensitivity: 3μV
Selectivity: 225kHz
Image rejection at 100kHz: 47dB
IF rejection at 100kHz: 40dB

GENERAL
Power consumption: 500W
Power supply: 110V/120V/220V/240V
Dimensions (W x H x D): 500 x 150 x 420mm (19-1/16" x 5 29/32" x 16-17/32")
Weight: 14kg (30.9 lb)

VERSTÄRKERTEIL
RMS-Verstärkung bei 1kHz: beide Kanäle zusammen ausgeteilt 2 x 78W (4Ω)
RMS-Verstärkung bei 20Hz ~ 20kHz: beide Kanäle zusammen ausgeteilt 2 x 72W (4Ω)
Leistungsbandbreite (beide Kanäle zusammen ausgeteilt): 10Hz ~ 40kHz, ±3dB
Harmonische Verzerrungen:
Kennleistung bei 40Hz ~ 16kHz, 4Ω 0.1%
Kennleistung bei 250Hz: 8000Hz, 4-1 4Ω 0.5%
Dämpfungsfaktor: 55 (8Ω), 27.5 (4Ω)
Eingangsempfindlichkeit & Impedanz: PHONO 2.5mV/47KΩ
AUX, TAPE 2 PLAYBACK 150mV/35KΩ
TAPE 1 PLAYBACK, REC/PLAY Wiedergabe 180mV/40KΩ

PHONO Maximal Eingangspegel: (1kHz RMS) 150mV
Freundschaftsspannung: Kennleistung PHONO 65dB
50mV Ausgangsleistung PHONO 50dB
Frequenzgang: PHONO 20Hz ~ 20kHz, 50dB
Klangfarbe: BÄSSE 50Hz ±13dB ±31dB
HÖCHSTFREQUENZEN 10kHz ±12dB ±22dB
Geläuterte Lautstärkeregelung (Lauteinst. ~30dB): 50Hz ±6dB
Ausgangspegel: TAPE 1 REC OUT 180mV
TAPE 1 REC/PLAY Aufnahme 30V
TAPE 2 REC OUT 150mV

UKW TUNERTEIL
Empfangsbereich: 88 ~ 108MHz
Antennenanschluss: 300Ω (symmetrisch) 75Ω (symmetrisch)
Empfindlichkeit: 1.5μV, 20dB Freundschaftsspannungsbetrieb 300Ω
1.5μV, 20dB Freundschaftsspannungsbetrieb 75Ω
0.9μV, 20dB Freundschaftsspannungsbetrieb 75Ω
Harmonische Verzerrungen:
MONO 0.1% STEREO 0.25%
Freundschaftsspannungsbetrieb MONO 56dB STEREO 54dB
Frequenzgang: 20Hz ~ 151kHz, ±0.02dB ~ 0.08dB
Selektivität: 70dB
Gleichtasten-Auswahl: 1kHz
Spiegelabtastung bei 9MHz: 53dB
AM-Ausgangsbetrieb: 55dB
AM-Übertragung: 47dB
Stereo Überschreitungsbetrieb: 45.5dB bei 1kHz, 35dB bei 10kHz
Trägeheit (1kHz, 30kHz): ~65μA bei 1kHz ~75μA bei 3kHz
Beträger: ±1kHz
Bandbreite: ZF-Versickerung 250kHz
UKW-Demodulator 1300kHz

UKW AM TUNER TEIL
Empfangsbereich: 525 ~ 1605kHz
Empfindlichkeit: 30μV
Selektivität: 55kHz
Spiegelabtastung bei 100kHz: 47dB
ZF-Frequenz bei 100kHz: 40dB

ALLEMEINE DATEN
Leistungsaufnahme: 500W
Netzspannungsauswahl: 110V/120V/220V/240V
Abmessungen (B x H x T): 500 x 150 x 420mm
Gewicht: 14kg

Technics

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan
**BLOCK DIAGRAM**

![Block Diagram Image]

**DIAL CORD INSTALLATION GUIDE**

1. Dial cord length is 91\(\frac{3}{4}\)" (230cm).
2. Tuning gang is positioned at maximum capacity. (Frequency is minimum)
3. Arrow marks (1 ~ 8) indicated correct order and direction of stringing dial cord.

**TO REMOVE CABINET**

1. Loosen two (2) metal clamp-mounting screws, nos. ① and ② as shown in fig. 1.
2. Remove four (4) cabinet-mounting screws, nos. ③ ~ ⑥ as shown in fig. 2.
3. Remove cabinet from chassis in arrow direction 1 to 2, as shown in fig. 2.
4. To reassemble, reverse above procedure.

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Fig. 1

Fig. 2
**SERVICE AID**

- **FM soft muting**

  When moving the tuning point away from the point of maximum output (optimum tuning) the signal output gradually decreases until it reaches zero output. (between stations.) In conventional muting circuits a sharp "popping" noise is heard when tuning, due to the sudden (switch-like) action of the muting circuit from zero signal to full output. This "Soft muting" circuit lets the sound fade more gradually, making it more natural and pleasant to listen to.

- **Circuitry principles**

  This circuit makes use of the VBE characteristics of TR102 (2SC828). (Refer to fig. 1.) The detected voltage from the FM IF input signal is applied to the base of TR102. When the FM input signal increases this voltage increases, causing the emitter current, to increase, which, in turn, decreases the collector voltage of TR102, making the collector voltage approahe ground potential. Because the collector of TR102 is connected to the IC101 IF amplifier through the muting switch, a change in the collector voltage will control the output of the IC101 IF amplifier. When the FM input signal increases to the point that the base voltage of TR102 reaches its operating point (about 0.6V), the output of IC101 reaches maximum.

  ![Fig. 1.](image)

**FM RF ALIGNMENT INSTRUCTIONS**

Only Set for Germany

<table>
<thead>
<tr>
<th>MESSENDER</th>
<th>Schaltung</th>
<th>Frequenz</th>
<th>Skalenzeiger-Einstellung des Empfängers (abstand)</th>
<th>Anzeige (Röhrenvoltmeter oder Oszillosgraph)</th>
<th>Abgleich</th>
<th>Bemerkungen</th>
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<tbody>
<tr>
<td>FM HF-ABGLEICH</td>
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<td>Anschluß an den FM Antennenanschluß über die künstliche. FM Antenne (Vgl., Abb. 1)</td>
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<td>87.5 MHz (100% Mod bei 400 HZ)</td>
<td>87.5 MHz (0 mm)</td>
<td>Output meter über Lautsprecherschwingspule anschließen.</td>
<td>L5 (Oszillatorspule)</td>
<td>Auf max. Ausgang abgleichen</td>
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<tr>
<td>- 90 MHz (17.2 mm)</td>
<td>- 106 MHz (174.1 mm)</td>
<td>&quot;</td>
<td>L3 (Zwischenkreis)</td>
<td>L2 (Antennenspule)</td>
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<tr>
<td>CT3 (OSZ, Trimmer)</td>
<td>CT2 (DET, Trimmer)</td>
<td>CT1 (ANT, Trimmer)</td>
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<td>-</td>
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</table>
ALIGNMENT INSTRUCTIONS

MAIN AMP (lco) ALIGNMENT

Notes:
1. The "5-6" adjustment should be started about 5 minutes after setting the power switch to the ON position.
2. Speakers switch to OFF position.
3. Connect DC VTM between TP602 and TP603 (left channel), TP604 and TP605 (right channel).
4. Adjust VR801 (left channel) and VR902 (right channel) to 12mv on DC VTM indication.

Note:
1. Muting switch............................OFF
2. Band selector switch..........................AM/FM AUTO (FM, RF, FM/FM)
3. 3000/3 dummy antenna..................Refer to fig. 3.
4. Speaker switch..............................ON
5. Mode switch..............................MONO
6. Maintain line voltage at rated voltage.
7. Output of signal generator should be no higher than necessary to obtain an output reading.

SIGNAL GENERATOR OR SWEEP GENERATOR CONNECTION FREQUENCY
DIAL SETTING [DISTANCE] INDICATOR [VTVM or SCOPE] (DISTORTION METER) ADJUSTMENT POINTS REMARKS

AM ALIGNMENT

3 High side through 0.001pF to AM antenna terminal. Common to chassis. 455kHz (Set for England to 47kHz).
Point of non-interference
Connect vertical amplifier of scope to TP1 through D2 (IF).
T1 (1st IF) (P) T2 (2nd IF) (S) T3 (IF. Trig)
Adjust for maximum output.

3 Fashion loop of several turns of wire and rabbit signal into loop of tuner.
600kHz (30kHz Mod. with 400Hz) 600kHz (115k (31.5mm))
Connect VTM or scope to speaker terminal of receiver.
L6 (OSC Coil) L8 (ANT CoLL) Adjust for maximum output. Adjust L4 by moving coil bobbin along ferrite core.
C1 (OSC Trimmer) C4 (ANT Trimmer) Adjust for maximum output. Repeat steps (3) and (4).

FM/IF ALIGNMENT

3 No signal
Point of non-interference. Tuning meter at.
T1b (DISCR IF/I(Al) Orange Core
Adjust for center position of tuning meter.

FM-RF ALIGNMENT

3 Connect to FM antenna terminal through FM dummy antenna.
90kHz (100kHz Mod. with 400Hz) 90kHz (5kHz (19.2mm))
Connect VTM or scope to speaker terminal of receiver.
L2 (OSC Coil) L3 (IDT Coil) L4 (ANT Coil)
Adjust for maximum output.

3 Connect to FM antenna terminal through FM dummy antenna.
106kHz (100kHz Mod. with 400Hz) 106kHz (6kHz (176.2mm))
Connect VTM or scope to speaker terminal of receiver.
C1 (OSC Trimmer) C4 (IDT Trimmer) C4 (ANT Trimmer) Adjust for maximum output. Repeat steps (3) and (17).

FM MONO DISTORTION ALIGNMENT

3 Connect to FM antenna terminal through FM dummy antenna.
100kHz (100kHz Mod. with 400Hz) 100kHz
Connect distortion meter to speaker terminal of receiver.
T1b (DISCR IF/I(II) Green Core
Adjust for minimum distortion meter indication.

FM SIGNAL METER ALIGNMENT

3 Apply 100kHz FM signal of 100 dB, 400Hz 30% modulation to FM antenna terminal through FM dummy antenna.
3 Apply 100kHz for about 4.7 point of signal meter indication.
3 Adjust VR104 for about 4.7 point of signal meter indication.
3 Tuning 100kHz for maximum output by speaker terminal.

SOFT MUTING LEVEL ALIGNMENT Refer to SERVICE AID on page 4.

1. Muting switch to "off".
2. Apply 60dB 1kHz mono RF signal to the antenna terminals.
3. Adjust Volume Control of receiver to indicate 0dB on meter across speaker terminals.

FM MPX PILOT ALIGNMENT

Using a frequency counter
1. 99kHz Non-modulated mono signal applied to set.
2. Muting switch to "on".
3. Connect frequency counter to TP401 through resistor (100kΩ). (5)
4. Adjust VR102 to 1kHz ±30Hz.

Using alternate system
1. Apply stereo signal from generator or stereo station to receiver.
2. Adjust VR102 until stereo indicator lights up. Cement arm of VR102 as shown in fig. 4.

STEREO SEPARATION ALIGNMENT

Note:
1. Stereo modulator........................Connect stereo modulator output to EXT. MOD. terminal of signal generator.
2. Internal OSC..............................1kHz. Pilot signal modulation 10%
3. Signal generator........................Frequency approximately 98kHz. Output level 72dB (1kHz). Modulation to FM.
4. Mode switch..............................FM AUTO
5. Monitor line voltage at rated voltage.

SIGNAL GENERATOR CONNECTION Stere0 MODULATOR MODE and MOD RATE INDICATOR (VTVM or SCOPE) ADJUSTMENT POINTS REMARKS

12 FM antenna terminal through dummy antenna. L (and R) 30% Modulation. Connect VTM or scope to speaker terminals through low pass filter. Refer to fig. 5.
VR102 Adjust for minimum right (and left) output.

Alignment Points (FM/AM RF & IF Circuit)

Fig. 3

Alignment Points (AF Amplifier Circuit)

Fig. 5

Fig. 6

Stereo OFF Position
Stereo ON Position (Indicator Lighting) Adjust Point of Pilot Circuit

Dial Scale and Start Point of Dial Pointer

Fig. 6
**BLOCK DIAGRAM OF INTEGRATED CIRCUIT**

- IC1 (SV1A1151)
  AM RF, OSC, MIX, IF AMP & AM DETECTOR CIRCUIT

- IC102 (SV1A1156)
  FM MULTIPLEX CIRCUIT

- IC101 (SV1A1230)
  FM IF AMP, FM DETECTOR & Muting CIRCUIT

- IC201, 202 (SV1A7129P)
  EQUALIZER AMPLIFIER

**INPUT & TAPE DECK CONNECTION TERMINAL CIRCUIT BOARD**

**SPEAKER PROTECTION CIRCUIT . . . . . . . . . . . . . . . . . . . . Only Set for England (XE)**

- Printed Circuit Board

**CIRCUIT OF POWER SUPPLY . . . . . . . . . Only Set for England (XE)**

Note:
- S101: Power switch in "ON" position.
- S103: Voltage selector switch in "220V" position.

Note: indicates that only parts specified by the manufacturer be used for replacement in critical circuits.

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**Addition Thermal Protection Circuit**
22. DC voltage measurements are taken with DC voltmeter from chassis ground.

- ○ FM/AM non signal condition
- □ FM stereo signal reception
- ( ) FM muting to "ON" position

**IMPORTANT SAFETY NOTICE**

THE SHADED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR SAFETY. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SHADED AREAS OF THE SCHEMATIC.
### REPLACEMENT PARTS LIST

#### Important Safety Notice
Components identified by shaded areas have special characteristics important for safety. When replacing any of these components use only manufacturer’s specified parts.

#### NOTE
1. Part numbers are indicated on most mechanical parts.
2. Please use this part number for parts order.

#### Ref. No. | Part No. | Part Name & Description | Per Set | Remarks
--- | --- | --- | --- | ---
**IC1** | SY42A153 | AM IF Amplifier | 1 | 
**IC101** | SY1A7310-1 | FM IF Amplifier & Discriminator | 1 | 
**IC102** | SY1A7155-1 | FM Mixer | 1 | 
**IC201, 202** | SY42A729P | Equalizer Amplifier | 2 | 

#### INTEGRATED CIRCUITS

#### TRANSISTORS

#### DOIO | 0A90 | AGC | 2 | 
#### DO10, 102 | 1A950 | Mixed Switching | 7 | 
#### DO117 | 14V Zener, Voltage Stabilizer | 1 | 
#### DO19 | 2XVZ047-2 | Voltage | 1 | 
#### DO30, 905, 703 | 2SO988CT-2 | Rectifier | 4 | 

#### COILS and TRANSFORMERS

#### T1 | RL2M201 | D.C. Transformer | 1 | 
#### T11 | RL2M202 | Power Transformer | 2 | 

#### CERAMIC FILTERS

#### T1001 | 3E82 | Rectifier | 2 | 

#### THERMISTORS

#### T3801, 601 | R1702 | Thermistor | 2 | 

#### RESISTORS

#### S1 | ER02ST304 | 100K, 1/4W, ±5% Carbon | 1 | 
#### S2 | ER02ST470 | 4.7K, 1/4W, ±5% Carbon | 1 | 
#### S3 | ER02ST151 | 100Ω, 1/4W, ±5% Carbon | 1 | 
#### S4 | ER02ST122 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S5 | ER02ST172 | 4.7K, 1/4W, ±5% Carbon | 1 | 
#### S6 | ER02ST172 | 8.2K, 1/4W, ±5% Carbon | 1 | 
#### S7 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S8 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S9 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S10 | ER02ST172 | 4.7K, 1/4W, ±5% Carbon | 1 | 
#### S11 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S12 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S13 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S14 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S15 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S16 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S17 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S18 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S19 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S20 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S21 | ER02ST172 | 4.7K, 1/4W, ±5% Carbon | 1 | 
#### S22 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S23 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S24 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S25 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S26 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S27 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S28 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S29 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S30 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 
#### S31 | ER02ST172 | 1K, 1/4W, ±5% Carbon | 1 | 

#### SPEAKERS TERMINAL CIRCUIT BOARD
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<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Part Name &amp; Description</th>
<th>Per Set</th>
<th>Remarks</th>
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<td>L101</td>
<td>SLA005</td>
<td>FM Antenna Cap</td>
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<td>SLA0011</td>
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<td>ELS077</td>
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**THERMISTORS**

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<td>R401</td>
<td>ERS03T104</td>
<td>1000Ω, 1/8W, ±5% Carbon</td>
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<td>R402</td>
<td>ERS03T104</td>
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<td>R403</td>
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<td>ERS03T104</td>
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**RESISTORS**

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**CERAMIC FILTERS**

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**PHONOSTAT**

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<td>RHA01</td>
<td>RHA251</td>
<td>Phonostat, Drive Amplifier Circuit</td>
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**POSITOR**

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<td>Posistor, Drive set for England [X1]</td>
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**SA-940-S**
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<tbody>
<tr>
<td>R103</td>
<td>ER25K4181</td>
<td>18KΩ, 5W, ±5% Metalcar</td>
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<td>R104</td>
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<tr>
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<td>ER25K1622</td>
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<td>R106</td>
<td>ER25K2210</td>
<td>10KΩ, 5W, ±5% Carbon</td>
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<td>R107</td>
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<td>R108</td>
<td>ER25K1M</td>
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<tr>
<td>R109</td>
<td>ER25K220</td>
<td>56KΩ, 5W, ±5% Carbon</td>
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<tr>
<td>R112</td>
<td>ER25K4704</td>
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<tr>
<td>R113</td>
<td>ER25K8202</td>
<td>8K2Ω, 5W, ±5% Carbon</td>
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<tr>
<td>R114</td>
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**VARIABLE RESISTORS**

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<tr>
<td>VR101</td>
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**CAPACITORS**

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**COMPONENTS**

**VARIABLE CAPACITOR**

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<th>Part Name &amp; Description</th>
<th>Per Set</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>CR1, 2, 3, 4, 5 (C1, 2, 3, 4, 5)</td>
<td>EV525A000R0</td>
<td>0Ω, ±5%</td>
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**LAMPS**

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<tbody>
<tr>
<td>FL1</td>
<td>XAM183105A</td>
<td>15W, 120V</td>
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<td>FL2</td>
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**FUSES**

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<tr>
<td>FM60, 82</td>
<td>X210 40G</td>
<td>40A, 480V</td>
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<tr>
<td>FS60</td>
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**SWITCHES**

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<tr>
<td>HN6606</td>
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