



Instructions

1104 BATTERY PACK

CHANGE INFORMATION

Please check for change information
at the rear of these Instruction Sheets



Instructions

1104 BATTERY PACK

DESCRIPTION

The 1104 portable 12v DC power pack is designed to power the Type 2225 Option 07 oscilloscope. The unit contains a battery charger and a sealed lead acid battery.

CONTROLS, CONNECTORS AND INDICATORS

The push button and battery meter located on the 1104 side panel provides a means for monitoring the appropriate level of charge within the battery. The meter is calibrated to position the needle at mid scale with the battery voltage at 11.8volts. If the needle settles in the red area of the scale when the push button is depressed, the battery requires recharging.

Two flying lead connectors provide DC or AC power to the 2225 Option 07. With the 1104 correctly connected to the 2225 oscilloscope, power is derived from the 1104 internal battery in the absence of mains voltage. With mains voltage connected to the 1104, oscilloscope power is derived from that source, and the 1104 will automatically trickle charge the battery.

BATTERY PERFORMANCE

The 2225 Option 07 will run for approximately two hours from a fully charged battery, whilst operating between 20 and 30 degrees C, ambient. Running time will be degraded when operating outside these temperatures. Operating the scope with high INTENSITY levels will also degrade running time. The 1104 trickle charger will restore the battery to a fully charged condition in approximately sixteen hours. Under conditions of continued cyclic use, it is recommended that the 1104 be charged for a minimum of 36 hours every 10 cycles to maintain battery capacity.

ASSEMBLY PROCEDURE

To connect the 1104 to the 2225 Opt 07, first remove the two screws from the back panel of the 1104. (Back panel carries fuse data label). Remove the two cable wrap retainers, the cable clip, and mains cable from the back panel of the 2225. Install these onto the back panel of the 1104 using the same three screws that held the cable retainers to the 2225. Install the two screws taken from the 1104 onto the 2225 back panel of the oscilloscope. Connect the two flying leads from the 1104 to the 2225. Mate the 2225 to the 1104 using the mounting clips provided. **APPLY HAND PRESSURE TO THE CLIPS SO THAT THEY ISNAP! OVER THE EDGES OF THE PANELS TO WHICH THEY ALIGN.** The 2225 is now ready for use in either AC or DC powered modes.

OPERATION

CAUTION

Prior to connecting the 1104 to an AC power source CHECK that THE LINE VOLTAGE SELECTOR SWITCHES on !BOTH! the 1104 and the 2225 are set to the voltage range which matches the AC power source available in your locality. Also check that the line fuses in !BOTH! the 1104 and the 2225 are of correct value. The fuse ratings for both 115 AC volt and 230 AC volt operation are specified on the fuse data labels located on the 1104 and 2225 instrument panels, and also within each instrument manual.

Note. The 1104 is shipped with the LINE VOLTAGE SELECTOR set to 115V and fitted with a 1 Amp 3AG fuse.

1104 Battery Pack

To operate the oscilloscope from a mains voltage source connect the mains supply lead to the mains socket on the side panel of the 1104. Depress the oscilloscope front panel POWER ON switch.

The 2225 will automatically switch over to the battery power source if the mains supply to the 1104 is interrupted, or disconnected. There will be several seconds delay before the 2225 resumes operation on DC power in the event of this happening. The 2225 will also automatically disconnect and stop operating when the DC power source voltage drops to approximately 11 volts. An off load DC voltage level of 11.8 volts is required to start the 2225.

To charge the battery, connect the 1104 to an AC power source. The green LED situated on the side panel of the 1104 will light up to indicate that battery charging is taking place. The 1104 will trickle charge the battery at all times that the mains voltage source is connected to the 1104, including when the 2225 oscilloscope is turned off, or when the 1104 is isolated from the 2225.

MAINTENANCE

The 1104 Power Supply requires no routine maintenance. Battery life is dependant upon usage and handling.

BATTERY REMOVAL**WARNING**

The lead acid battery used in this instrument is capable of delivering a large amount of current in a short time. Care must be taken not to short out the battery terminals.

Disconnect the 1104 from the mains voltage supply. Separate the 1104 from the 2225 using the quick release actuators on the two mounting clips. Remove the 1104 front and back panels. Remove the cabinet top. Disconnect the battery leads from the battery. Lay the 1104 onto one side. Remove the two screws which secure the battery bracket to the cabinet bottom. Remove the bracket and return the 1104 to it's upright position. Lift the battery clear of the 1104 cabinet.

Reverse this procedure to install the battery.

SERVICING**WARNING**

These servicing and calibration instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Disconnect the battery leads from the battery terminals before carrying out any servicing operations.

The 1104 is fitted with fuses at three locations. The accessible side panel fuse protects the 1104 input circuitry. Only fuses with ratings identified on the 1104 back panel fuse data label should be used at this location.

A 5 amp fuse is fitted between the battery terminals and the DC output lead. This limits the maximum current that can be drawn from the battery in the event of a malfunction appearing at the DC output lead terminals.

A 2 amp fuse is fitted at the output of the regulator circuit to provide battery protection should the regulator malfunction.

Both fuses are internally hard wired to the PCB.

CALIBRATION

Equipment required

A DC power source with a 12 volt output. (The 1104 load current demand will be less than 1mA). A DC Voltmeter with a 15 volt range.

To calibrate the 1104 it is necessary to remove the front and back panels and the cabinet top. Disconnect the battery leads from the battery.

Connect the DC power source to the 1104 battery leads. Positive rail to red battery lead. Adjust the power source for an 11.8 volt output.

Depress the 1104 side panel push button switch. Adjust R5 to set the 1104 meter needle at the centre of the meter scale.

This is not a critical adjustment.

Disconnect the 12 volt DC power source from the 1104 battery leads.

Connect the DC Voltmeter, in parallel with a 1K resistor, to the 1104 battery leads. Set the voltmeter range to allow for a 15 volt reading.

CAUTION

Check that the 1104 Line Voltage Selector Switch is set to match the local power supply voltage before proceeding with the next step.

Connect the 1104 to the mains voltage source. Adjust R6 for a 13.65 volt reading on the DC voltmeter, (+/- 0.15 volts). This adjustment is critical. Misadjustment will influence battery lifetime and charging characteristics.

This completes the 1104 calibration.

CIRCUIT DESCRIPTION

AC voltage applied at the 1104 input is transformer coupled, rectified, and smoothed to produce 18 volts DC at pin 3 of u1, (dependent upon the AC voltage input amplitude). The input AC voltage is also routed to a flying lead, required to supply AC power via the 1104 to the 2225 oscilloscope. The AC voltage supply appearing at the flying lead output bypasses the 1104 line fuse, F1.

Regulator u1 provides a constant output voltage to the lead acid battery, B1. The voltage appearing at the battery flying lead terminals is set with R6 adjustment for 13.65 volts. The voltage regulator supplies a maximum charging current of 1.5 amps rms to the battery. Larger current demands cause the regulator to go into current limit. CR3 limits the reverse voltage appearing across the regulator under input short circuit conditions.

DS1 provides a visual indication that battery charging is taking place. M1 is energised when switch S2 is depressed and calibrated with R5 adjustment. With S2 activated, the output of the regular is taken low thereby reverse biasing CR4. DS1 extinguishes, indicating that charging is no longer taking place. Under these conditions M1 draws current from the battery source giving an indicating of battery charge status.

F2 protects the battery and output circuitry in the event of a regulator malfunction. F3 provides battery protection should a short circuit condition appear at the 12 volt DC flying lead output.

1104 Battery Pack**ACCESSORIES**

Standard accessories shipped with the 1104 are listed in Table 1.

Optional accessories are listed in Table 2.

The 1104 is shipped from the factory with the Line Voltage Selector set to 115 volts, and with a 1 Amp, 3AG type fuse fitted as standard. Customers will have to set the 1104 Line Voltage Selector to match their local power supply voltage source. The line fuse holder can accommodate either 3AG or 20mm style fuse caps. The 20mm fuse cap is supplied as a standard accessory. Please refer to the optional accessories listed in Table 2 to find the power cord and fuse details suitable for your local working conditions.

TABLE 1**Standard Accessories**

| Description | Part Number |
|-------------------------------|-------------|
| Fuse Cap 20mm | 200-2265-00 |
| Fuse 0.5Amp, 3AG | 159-0032-00 |
| Mounting Clip, (Two Included) | 344-0431-00 |
| Instruction Sheet | 070-7020-00 |

TABLE 2**Optional Accessories**

| Description | Part Number |
|------------------------|-------------|
| Battery 12 Volt, 12 Ah | 146-0074-00 |

Power cords, 2.5m

| Description | Part Number |
|----------------------------|-------------|
| Standard (USA) | 161-0104-00 |
| Option A1 (Europe) | 161-0104-06 |
| Option A2 (United Kingdom) | 161-0104-07 |
| Option A3 (Australia) | 161-0104-05 |
| Option A4 (North America) | 161-0104-08 |
| Option A5 (Switzerland) | 161-0167-00 |

Fuses**115 Volt Operation**

| | |
|--|-------------|
| Fuse 1.0 A, 250V 3AG, 0.25X1.25in, Slow | 159-0019-00 |
| Fuse 0.8A, 250V, 20mm | 159-0244-00 |

230 Volt Operation

| | |
|---|-------------|
| Fuse 0.5A, 250V 3AG, 0.25X1.25in, Slow | 159-0032-00 |
| Fuse 0.4A, 250V, 20mm | 159-0121-00 |

ELECTRICAL CHARACTERISTICS

Battery *

| Characteristic | Information |
|---|--|
| Battery type | Sealed Lead Acid Battery |
| Battery Capacity | 12V, 12Ah |
| Battery Shelf Life | 12 months @ 20°C (Without Recharge) |
| Charging Time at ambient temperature 20°C to 30°C, (68°F to 86°F) | Approximately 16 Hours at nominal line voltage for a 98% charge. |

Charger Unit

| | |
|--------------------------------|--------------------------------------|
| Battery Status Indicator Range | 8.2V to 12.9V +/- 20% |
| Integral Trickle Charger | 1.5A rms maximum at 13.65V +/- 0.15V |
| Charger Power Output | 20 Watts maximum |
| Line Voltage Ranges | |
| 115V Setting | 95 VAC to 128 VAC |
| 230V Setting | 190 VAC to 250 VAC |
| Line Frequency | 48 Hz to 440Hz |

MECHANICAL CHARACTERISTICS

| | |
|------------------------|------------------|
| Weight of Battery Pack | 6.5kg (14.4 lbs) |
| Height | 137mm (5.4 in) |
| Width (with clips) | 340mm (13.39 in) |
| Depth | 168mm (6.62 in) |

ENVIRONMENTAL CHARACTERISTICS

| Characteristic | Information |
|--|---|
| Temperature Operating | 0°C to 40°C (32°F to 104°F) |
| Nonoperating with battery | -20°C to 50°C (-4°F to 122°F) |
| without battery | -55°C to 75°C (-67°F to 167°F) |
| Altitude Operating | To 4500m (15,000 ft.) Maximum operating temperature falls 1°C per 300m (1000 ft.) above 1,500m (5,000 ft.) |
| Nonoperating | To 15,000m (50,000 ft.) |
| Radiated and Conducted Emission Requirements | Meets VDE 0871 Class B and FCC Regulations |



YUASA

MAINTENANCE-FREE RECHARGEABLE BATTERY

NP12-12 12V 12Ah

| CHARGING INSTRUCTION (AT 20°C) | | | CAUTION: ● AVOID SHORT CIRCUIT. ● DO NOT CHARGE IN A SEALED CONTAINER. |
|--------------------------------|--------------------|-----------------|--|
| | VOLTAGE REGULATION | INITIAL CURRENT | |
| STANDBY USE | 13.50~13.80V | No Limit | |
| CYCLIC USE | 14.4~15.0V | 3.0A Max. | |

YUASA BATTERY CO., LTD.

MADE IN JAPAN

1104 Battery Pack

Replaceable Electrical Parts – 1104

| Ckt No | Tektronix Part No. | Serial/Model No | | Name and Description | Mfr Code | Mfr Part Number |
|--------|--------------------|-----------------|----------|--|----------|-------------------|
| | | Eff | Discont. | | | |
| A1 | 671-0780-00 | | | CKT BOARD ASSY:CHARGER | 80009 | 671-0780-00 |
| A1B1 | 146-0074-00 | | | BATTERY,LEAD ACID:12AH,12V | | ORDER BY DESCR |
| A1C1 | 290-0916-00 | | | CAP.,FXD,ELCTLT:2200uF,35V | 55680 | VLB1V222HRA |
| A1C2 | 281-0775-01 | | | CAP.,FXD,CER 0.1uF,50V | 54583 | MA13 ZV5 1H104M |
| A1C3 | 290-0267-00 | | | CAP.,FXD,ELCTLT:1uF,35V | 56289 | 173D1 105X0035V |
| A1CR1 | 152-1067-00 | | | SEMICONV DEVICE:SILICON,100V,3A | 80009 | 1N5401 |
| A1CR2 | 152-1067-00 | | | SEMICONV DEVICE:SILICON,100V,3A | 80009 | 1N5401 |
| A1CR3 | 152-0400-00 | | | SEMICONV DEVICE:SILICON,400V,1A | 04713 | 1N4936 |
| A1CR4 | 152-1067-00 | | | SEMICONV DEVICE:SILICON,100V,3A | 80009 | 1N5401 |
| A1DS1 | 150-1223-00 | | | LT EMITTING DIO:GREEN,565NM,25mA MAX | 80009 | HLM3910 |
| A1F1 | 159-0019-00 | | | FUSE CARTRIDGE:3AG,1.0A,250V,SLOW BLOW | 75915 | 313001 |
| A1F2 | 159-0203-00 | | | FUSE AXIAL:2A, | 75915 | 251002 |
| A1F3 | 159-0059-00 | | | FUSE AXIAL:5A,125V | 75915 | 251005 |
| A1J1 | 131-3905-00 | | | CONN,RCPT,ELEC:PWR,250VAC,6A,CKT BD MT | TKODY | L2157 |
| A1J4/1 | 174-1315-00 | | | CABLE ASSY,3.18 AWG,230mm L,GRY/BLK | 80009 | ORDER BY DESCR |
| A1J4/2 | 174-1314-00 | | | CABLE ASSY,3.18 AWG,230mm L,GRY/RED | 80009 | ORDER BY DESCR |
| A1M1 | 149-0058-00 | | | METER:1mA FSD,345 ohm,20% | K2504 | 258-833 |
| A1R1 | 313-1241-00 | | | RES.,FXD,CMPSN:240 OHM,5%,0.2W | 57668 | TR20JE 240E |
| A1R2 | 313-1222-00 | | | RES.,FXD,CMPSN:2.2K OHM,5%,0.2W | 57668 | TR20JE 02K2 |
| A1R3 | 321-0102-00 | | | RES.,FXD,FILM:1K OHM,1%,0.125W | 24546 | RB14FXE 113E |
| A1R4 | 302-0681-00 | | | RES.,FXD,CMPSN:680 OHM,10%,0.5W | 24546 | FP1/2 680 OHM 10% |
| A1R5 | 311-1228-00 | | | RES.,VAR.,NONWIR:10K OHM,10%,0.5W | 32997 | 3386 F-T04-252 |
| A1R6 | 311-1224-00 | | | RES.,VAR.,NONWIR:500 OHM,10%,0.5W | 32997 | 3386 F-T04-501 |
| A1S1 | 260-2116-00 | | | SWITCH SLIDE:DPDT,5/10A,125/250V | 22753 | SE1022SGCEPRH1<RA |
| A1S2 | 260-1421-00 | | | SWITCH PUSHBUTTON:DPDT, | 59821 | 2KAAD100000512 |
| A1T1 | 120-1812-00 | | | XFMR.,PWR.,STPDN: | 80009 | 120-1812-00 |
| A1V1 | 156-1161-00 | | | SEMICONV DEVICE,VOLTREG:POS,ADJ,15W | 04713 | LM317T |
| A1VR1 | 152-0217-00 | | | SEMICONV DEVICE:ZENER,400mW,8.2V,5% | 04713 | 1N756A |

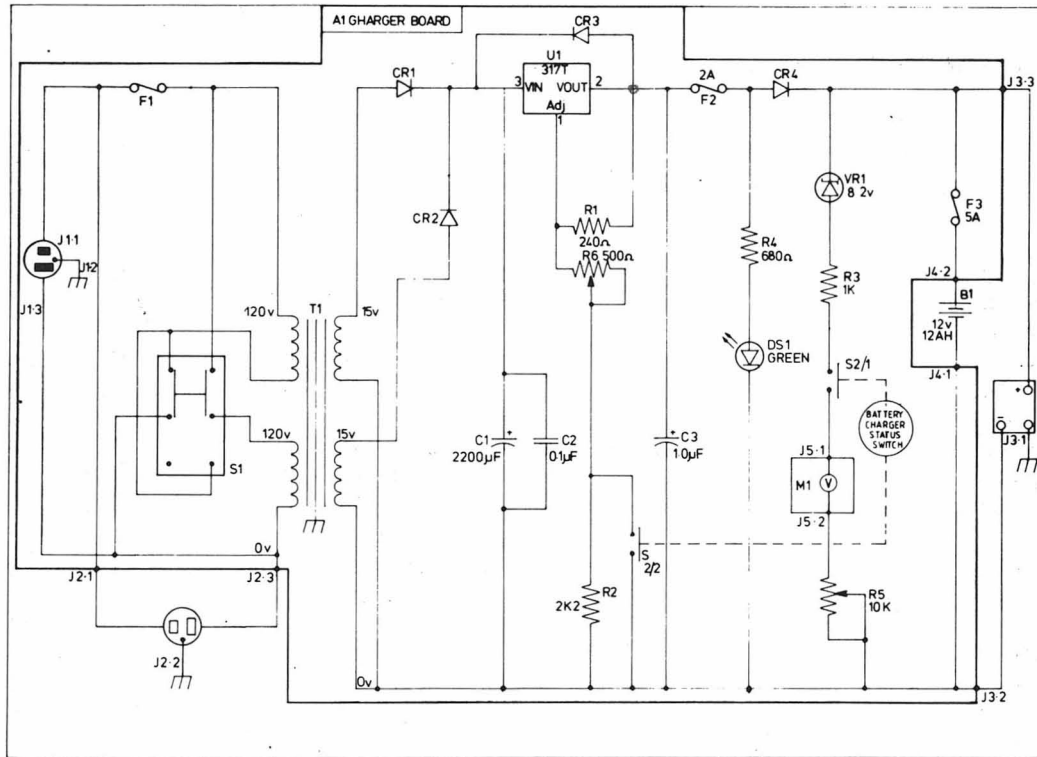


Figure 1. 1104 circuit diagram

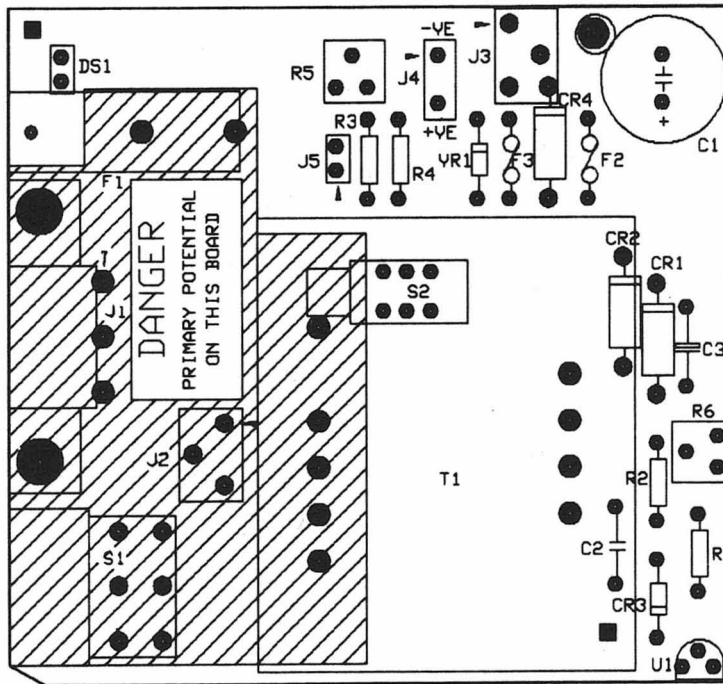


Figure 2. 1104 circuit board assembly

1104 Battery Pack

Replaceable Electrical Parts – 1104, Illustrated

| Fig & Index No | Tektronix Part No. | Serial/Model No Eff Discnt. | Qty | Name and Description | Mfr Code | Mfr Part Number |
|----------------------|-----------------------|-----------------------------------|-----|------------------------------------|-------------|--------------------|
| 3-1 | 200-3335-02 | | 1 | PANEL:FRONT | 80009 | 200-6004-00 |
| -2 | 211-0630-00 | | 4 | SCREW:FLAT,POZI,6-32X1.125,STEEL | 80009 | 211-0630-00 |
| -3 | 211-0648-00 | | 4 | SCREW:PAN HEAD,6-32X0.625,STEEL | 80009 | 211-0648-00 |
| -4 | 211-0538-00 | | 1 | SCREW:FLAT HEAD,6-32X0.375,STEEL | 80009 | 211-0558-00 |
| -5 | 211-0558-00 | | 1 | SCREW:BINDER HEAD,6-32X0.250,NYLON | 80009 | 211-0538-00 |
| -6 | 441-1882-00 | | 1 | CHASSIS:CABINET BOTTOM,ALUMINUM | 80009 | 441-1882-00 |
| -7 | 212-0122-00 | | 2 | SCREW:PAN,POZI,8-32X0.5,STEEL | 01536 | ORDER BY DESCR |
| -8 | 200-3335-00 | | 1 | PANEL:BACK | TKOEJ | ORDER BY DESCR |
| -9 | 407-3762-00 | | 1 | BRACKET:XFMR SUPPORT | 80009 | 407-3762-00 |
| -10 | 129-1283-00 | | 1 | SPACER POST:2.5INCHES LONG | 80009 | 129-1283-00 |
| -11 | 166-0432-00 | | 2 | TUBE MYLAR: | 81200 | ORDER BY DESCR |
| -12 | 210-1003-00 | | 6 | WASHER:FLAT,0.2ID,0.438OD,BRASS | 12337 | ORDER BY DESCR |
| -13 | 212-0553-00 | | 2 | SCREW:PAN HEAD10-32X1.5,STEEL | 80009 | 212-0553-00 |
| -14 | 210-1003-00 | | 6 | WASHER:FLAT,0.2ID,0.438OD,BRASS | 12337 | ORDER BY DESCR |
| -15 | 342-0829-00 | | 1 | WASHER:MICRO | TKOEJ | ORDER BY DESCR |
| -16 | 220-0410-00 | | 2 | NUT:HEX,KEP,10-32X0.312,BRASS | 80009 | 220-0410-00 |
| -17 | 210-0812-00 | | 2 | WASHER:FLAT,0.188ID.375OD,FIBRE | 83309 | ORDER BY DESCR |
| -18 | 210-1003-00 | | 6 | WASHER:FLAT,0.2ID,0.438OD,BRASS | 12337 | ORDER BY DESCR |
| -19 | | | 1 | TRANSFORMER:SEE REPL | 80009 | 120-10003-00 |
| -20 | 210-0994-00 | | 1 | WASHER:FLAT,0.126ID,0.25OD,STEEL | 12327 | ORDER BY DESCR |
| -21 | 210-0406-00 | | 1 | NUT:HEX,4-40X0.156,BRASS | 73743 | 12161-5Ø |
| -22 | 210-0054-00 | | 1 | WASHER:COMPRESSION | 8009 | 210-0054-00 |
| -23 | | | 1 | REGULATOR:SEE REPL | | |
| -24 | | | 1 | BATTERY:SEE REPL | | |
| -25 | 343-1405-00 | | 1 | CLAMP:BATTERY,ALUMINIUM | 80009 | 343-1405-00 |
| -26 | 211-0534-00 | | 5 | SCREW:PAN,POZI,6-32X0.312,STEEL | 01536 | ORDER BY DESCR |
| -27 | 390-1050-00 | | 1 | CABINET TOP:ALUMINUM | 80009 | 390-1050-00 |
| -28 | | | 1 | CABLE:SEE REPL | | |
| -29 | | | 1 | CABLE:SEE REPL | | |
| -30 | | | 1 | CIRCUIT BD ASSY:SEE REPL | | |
| -31 | | | 1 | SWITCH PUSHBUTTON:DPDT,SEE REPL | | |
| -32 | 366-1512-00 | | 1 | SWITCH END: | 80009 | 366-1512-00 |

Replaceable Mechanical Parts – 1104, Not Illustrated

| Fig & Index No | Tektronix Part No. | Serial/Model No Eff Discnt. | Qty | Name and Description | Mfr Code | Mfr Part Number |
|----------------------|-----------------------|-----------------------------------|-----|-----------------------------------|-------------|--------------------|
| | 161-0244-00 | | 1 | CABLE ASSY,DCPWR:3.18AWG,125V | 80009 | 161-0244-00 |
| | 161-0245-00 | | 1 | CABLE ASSY,ACPWR:3.18AWG,250V | 80009 | 161-0245-00 |
| | 162-0508-00 | | 1 | SLEEVING:RED,1.25 INCHES | 80009 | 162-0508-00 |
| | 200-2264-00 | | 1 | FUSE CAP:3AG | S3629 | FEK 031 1666 |
| | 200-2265-00 | | 1 | FUSE CAP:20mm | TK0861 | FEK 031 1663 |
| | 204-0906-00 | | 1 | BODY,FUSEHOLDER:3AG FUSES | S3629 | TYPE FAU 031 3573 |
| | 210-0006-00 | | 3 | WASHER:LOCK,0.146ID,INTL,STEEL | 09772 | ORDER BY DESCR |
| | 210-0054-00 | | 1 | WASHER:LOCK,0.118ID,SPLIT,STEEL | 86928 | ORDER BY DESCR |
| | 210-0407-00 | | 2 | NUT:HEX,6-32X0.25,BRASS | 73746 | 3038-402 |
| | 210-0457-00 | | 2 | NUT:HEX,KEP,6-32X0.312,STEEL | 78189 | 511-061800-00 |
| | 210-0802-00 | | 1 | WASHER:FLAT,0.152ID,0.213OD,STEEL | 12327 | ORDER BY DESCR |
| | 210-0803-00 | | 1 | WASHER:FLAT,0.152ID,0.375OD,STEEL | 12327 | ORDER BY DESCR |
| | 211-0510-00 | | 2 | SCREW:PAN,POZI,6-32X0.375,STEEL | TK0435 | ORDER BY DESCR |
| | 211-0534-00 | | 2 | SCREW:PAN,POZI,6-32X0.312,STEEL | 01536 | ORDER BY DESCR |
| | 334-7302-00 | | 1 | LABEL:SET 1104 | 80009 | 334-7302-00 |
| | 334-1378-01 | | 2 | LABEL:SERIAL NUMBER | 80009 | 334-1378-01 |
| | 334-1906-00 | | 1 | LABEL:MADE IN GUERNSEY | 80009 | 334-1906-00 |
| | 334-3379-00 | | 1 | LABEL:GROUND SYMBOL | 80009 | 334-3379-00 |
| | 334-6879-00 | | 1 | LABEL:FUSE RATING | TK0DA | ORDER BY DESCR |
| | 342-0804-00 | | 1 | WASHER:SHOULDER, | 80009 | 342-0804-00 |
| | 344-0431-00 | | 2 | CLIP:MOUNTING | 80009 | 344-0431-00 |
| | 346-0238-00 | | 1 | BRACKET:GND,ALUMINIUM | 80009 | 346-0238-00 |
| | 358-0161-00 | | 2 | STRAIN RELIEF:STRAIGHT | 28520 | ORDER BY DESCR |
| | 361-0382-00 | | 2 | SWITCH SPACERS: | 80009 | 361-0382-00 |
| | 384-1099-00 | | 1 | SWITCH EXTENSION BAR: | 80009 | 384-1099-00 |

1104 Battery Pack

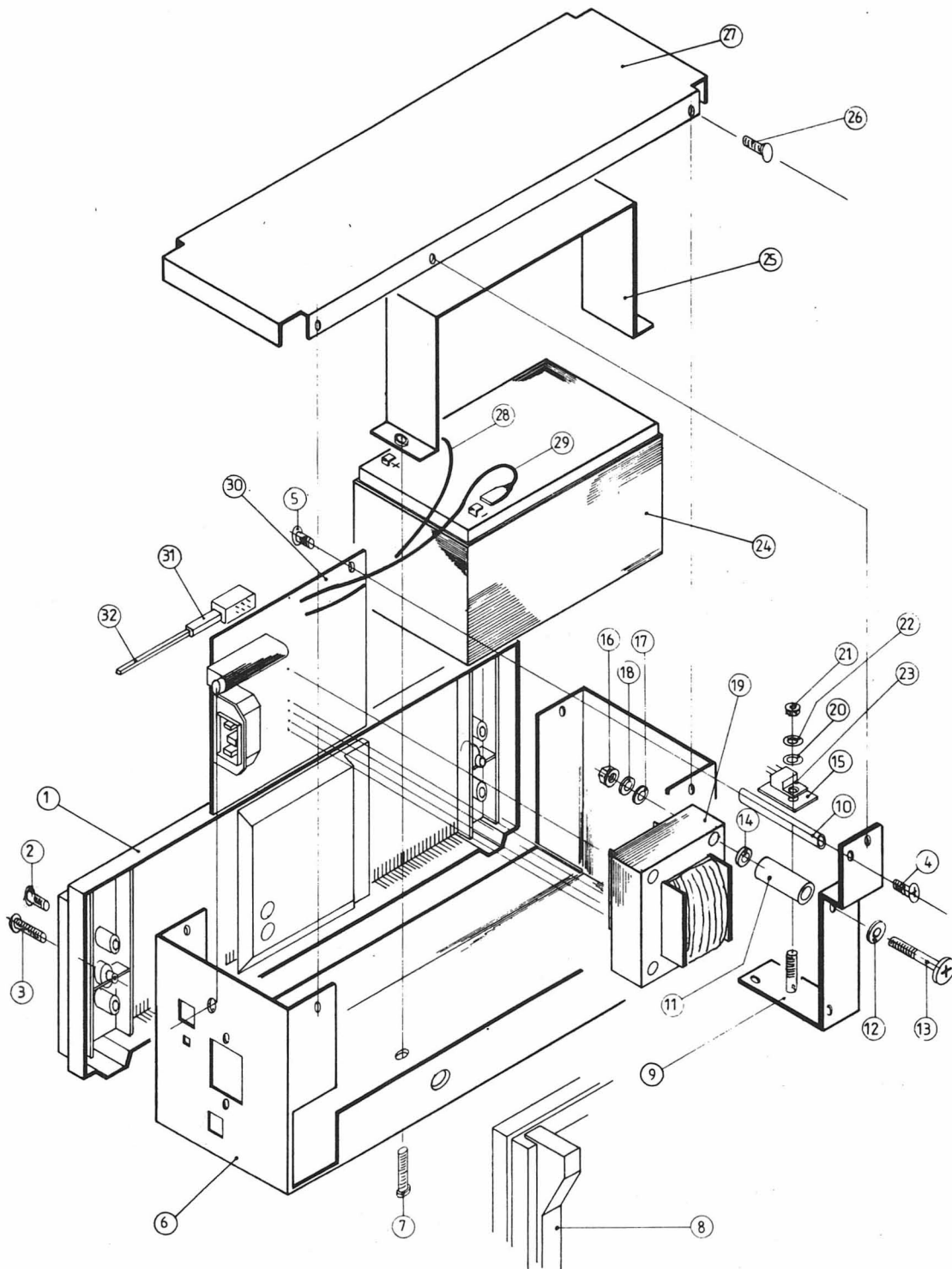


Figure 3. 1104 exploded view