

## SECTION C

### POWER SUPPLY UNIT - TECHNICAL DESCRIPTION

#### CONTENTS

- 1. INTRODUCTION
  - 1.1. General
  - 1.2. Standard Configurations
    - 1.2.1. Type 24/10 - 1A
    - 1.2.2. Type 24/25 - 2.5A
    - 1.2.3. Type 24/50 - 5A
- 2. CIRCUIT OPERATION
  - 2.1. Introduction
  - 2.2. Voltage Comparator and Thyristor Drive Circuit
  - 2.3. Current Limiting Circuit
  - 2.4. Fault Detection Circuit
    - 2.4.1. Battery Disconnect/Charge Fuse Rupture
    - 2.4.2. Zero Charge Current
    - 2.4.3. D.C. ON L.E.D.
  - 2.5. Output Fuses
- 3. PARTS LISTS & LAYOUT DIAGRAMS

## 1. INTRODUCTION

### 1.1. GENERAL

A range of Power Supply Units have been designed to meet the requirements of BS5839 Part 1, and they are suitable for use with the entire range of Tann Synchronome Fire Alarm Control Panels.

Each Power Supply Unit contains a mains powered Primary supply, and a Secondary charger/battery supply. The Secondary supply is monitored for charger fault and battery disconnect.

There are 3 types of charger (24/10, 24/25, 24/50) with maximum outputs of 1A, 2.5A and 5A respectively. Each of these is available as type PS (Power Supply) which is supplied complete with standby batteries; and type BC (Battery Charger) suitable for use with customer supplied batteries, or for use with a separate Tann Synchronome battery cabinet containing suitable cells.

### 1.2. STANDARD CONFIGURATIONS

#### 1.2.1. TYPE 24/10 - 1A

**BC 24/10** This is a Battery Charger (1A max. output) for use with external batteries. The charger output voltage is set during manufacture to 27.3V, to provide constant voltage float charging of 24V lead acid batteries. Automatic current limiting protects the circuit against excessive current output.

**PS 24/10/6** This is a 1A Power Supply Unit containing a type 24/10 (1A) charger as above, with 6Ah cells.

#### 1.2.2. TYPE BC24/25

**BC 24/25** This is a Battery Charger (2.5A max output) for use with external batteries. The charger output voltage is set during manufacture to 27.3V, to provide constant voltage float charging of 24V lead-acid batteries. Automatic current limit protects the circuit against excessive current output.

**PS 24/25/15** This is a 2.5A Power Supply Unit, containing a type 24/25 (2.5A) charger, as above, with 15Ah cells.

**PS 24/25/24** This unit is similar to the PS24/25/15 but contains 24Ah cells.

**PS 24/25/30** This unit is similar to the PS 24/25/15 but contains 30Ah cells.

1.2.3. TYPE 24/50-5A

- BC 24/50 This is a Battery Charger (5A max, output) for use with external batteries. The charger output voltage is set during manufacture to 27.3V, to provide constant voltage float charging of 24V lead-acid batteries. Automatic current limit protects the circuit against excessive current output.
- PS 24/50/15 This is a 5A Power Supply Unit containing a type 24/50 (5A) charger, with 15 Ah cells.
- PS 24/50/24 This unit is similar to the PS 24/50/15 but contains 24Ah cells.
- PS 24/50/30 This unit is similar to the PS 24/50/15 but contains 30Ah cells.

## 2. CIRCUIT OPERATION

### 2.1. INTRODUCTION

Type 24/10 and 24/25 charger circuits are identical in operation and differ only in certain component values.

The 24/50 charger circuit is similar in operation to the above but incorporates additional components to enable the higher output current to be obtained.

Except where otherwise stated, Type 24/10 circuit operation is described below:

A full-wave, unsmoothed D.C. supply is provided for the charger circuit via FS1, the mains transformer, and Diode Bridge D1-D4 (Bridge rectifier B1 in 24/50). The remainder of the circuitry can be divided into 3 sections.

- a) Voltage Comparator and Thyristor Drive (R11, T2, T3, Z1 and TH1).
- b) Current Limiting (R3, T1, D5).
- c) Fault Detection (D8, C4, T4; Z2, T5).

### 2.2. VOLTAGE COMPARATOR & THYRISTOR DRIVE CIRCUIT

The Thyristor TH1 acts as an electronic switch. When fired it connects the battery across the bridge rectifier output, allowing charging current to flow, via R3. Firing of the thyristor is controlled by T2 and T3 which form a voltage comparator.

A reference voltage is developed across Z1. This appears as a clipped, full wave rectified sine wave. As the voltage across Z1 increases to the reference level, C3 begins to charge through R7 producing a negative going ramp voltage at the base of T2. The emitter voltage of T2 is set by the current passed by T3. This is in turn controlled by the setting of RV1, which is effectively across the output of the charger. When the base-emitter voltage of T2 reaches approximately 0.6V T2 conducts and fires the thyristor, which allows current to flow for the remainder of the voltage cycle. (The 24/50 circuit uses a larger type of thyristor, the extra gate current required being provided by emitter followed T6).

When the bridge output voltage drops below the reference level, Z1 appears as a low resistance and discharges C3. The charging current is therefore a series of pulses.

As the battery voltage rises, the voltage at RV1 slider/T3 base, and therefore T3 emitter will also rise. As a result of this, the ramp voltage at T2 base has to reach a progressively more negative value before T2 conducts, charging current therefore flowing for a decreasing portion of the voltage cycle. Eventually, when the battery is fully charged (i.e. battery off-load voltage - 27.3V) charging current will have reduced to a low 'trickle charge' level.

2.3. **CURRENT LIMITING CIRCUIT.** The charging current drawn by the batteries is monitored by applying the potential across R3 to the base of T1, after smoothing by C1 and R4. As more current is drawn, T1 is biased further into conduction and its collector voltage rises. This effectively reduces the reference voltage across Z1, via D5, retarding the operating point of T2. More current is also drawn through the CHARGE CURRENT L.E.D., increasing its brightness. Eventually charging current is drastically reduced, preventing damage to the circuit.

2.4. **FAULT DETECTION CIRCUIT.**

2.4.1. **Battery Disconnect/Charge Fuse Rupture.**

The presence of the battery limits the charger output voltage to a maximum of approximately 27.3V. Should the battery be disconnected, the peak voltage from the charger exceeds the breakdown voltage of Z2 which passes current to charge C5. As a result T5 switches ON, illuminating the FAULT L.E.D. and producing a LOW Charger FAULT output via R18.

2.4.2. **Zero Charge Current**

As charging current pulse flow via D8, C4 cannot become charged. If for any reason no current flows, C4 charges up via R10 and switches T4 ON. This in turn switches T5 which gives a charger FAULT output as described above.

2.4.3. **D.C. ON L.E.D.**

This is also monitored for failure by D9. If the L.E.D. should fail open-circuit, then a LOW FAULT output will be provided via R18. D9 and R19 to -Ve.

2.5. **OUTPUT FUSES.**

The Primary and Secondary and Charger fuses protect the charger circuit against excessive current being drawn by the Primary and Secondary loads, and the battery.

D10 affords protection against reverse polarity connection to the battery. Should this occur, D10 will be forward biased, rupturing the CHARGE fuse and giving a fault indication (as described in 2.4.1.)

**Fig. 2.1. Type 24/10 & 24/25 Charger - Circuit**

### 3 .            P A R T S   L I S T S   &   L A Y O U T   D I A G R A M S

#### 3.1.            T Y P E   2 4 / 1 0

#### SCHEDULE NO.

T Y P E   B C 2 4 / 1 0   B A T T E R Y   C H A R G E R   A S S E M B L Y      F S 4 7 0 5 - 1

T Y P E   P S 2 4 / 1 0 / 6   P O W E R   S U P P L Y   A S S E M B L Y      F S 4 7 0 2 - 1

T Y P E   2 4 / 1 0   C H A R G E R   C H A S S I S   A S S E M B L Y      F S 4 6 3 1 - 1

T Y P E   2 4 / 1 0   C H A R G E R   P . C . B .   A S S E M B L Y      P S 4 6 2 1 - 1

# P A R T S   L I S T

PRODUCT		SCHEDULE NO.	
TYPE 24/10 CHARGER CHASSIS ASSEMBLY		FS 4631-1	
PART NO.	DESCRIPTION	QTY	COMPONENT NO.
PD4630-1	Chassis Sub-Assembly	1	
PS4621-1	24/10 Charger P.C.B. Assembly	1	
IBB25914-1	Mounting Pillar	3	
BO25918-1	Transformer	1	
110/1/41	Terminal Block 12 Way	1	
BA 4633-1	Terminal Block Label	1	
110/1/89	Terminal Block Mains	1	
150/1/44	Fuselink 2A	1	
356/1/5	Screw Self Tapping No. 6 x 3/8"	4	
140/1/26	Nut 'U'	4	
350/1/5	Screw Ch. Hd. M3 x 5	7	
470/14/2	Washer Plain M3	7	
IFC26075-1	Screw Ch. Hd. M3 x 14	2	
350/1/24	Screw Ch. Hd. M3 x 10	2	
160/1/2	Grommet Rubber $\frac{1}{4}$ " I.D. x 3/8" O.D.	1	
160/1/1	Grommet Rubber 3/16" I.D. x $\frac{1}{4}$ " O.D.	1	
FA4334-1	Mains Warning Label	1	
BA4634-1	Chassis Label	1	



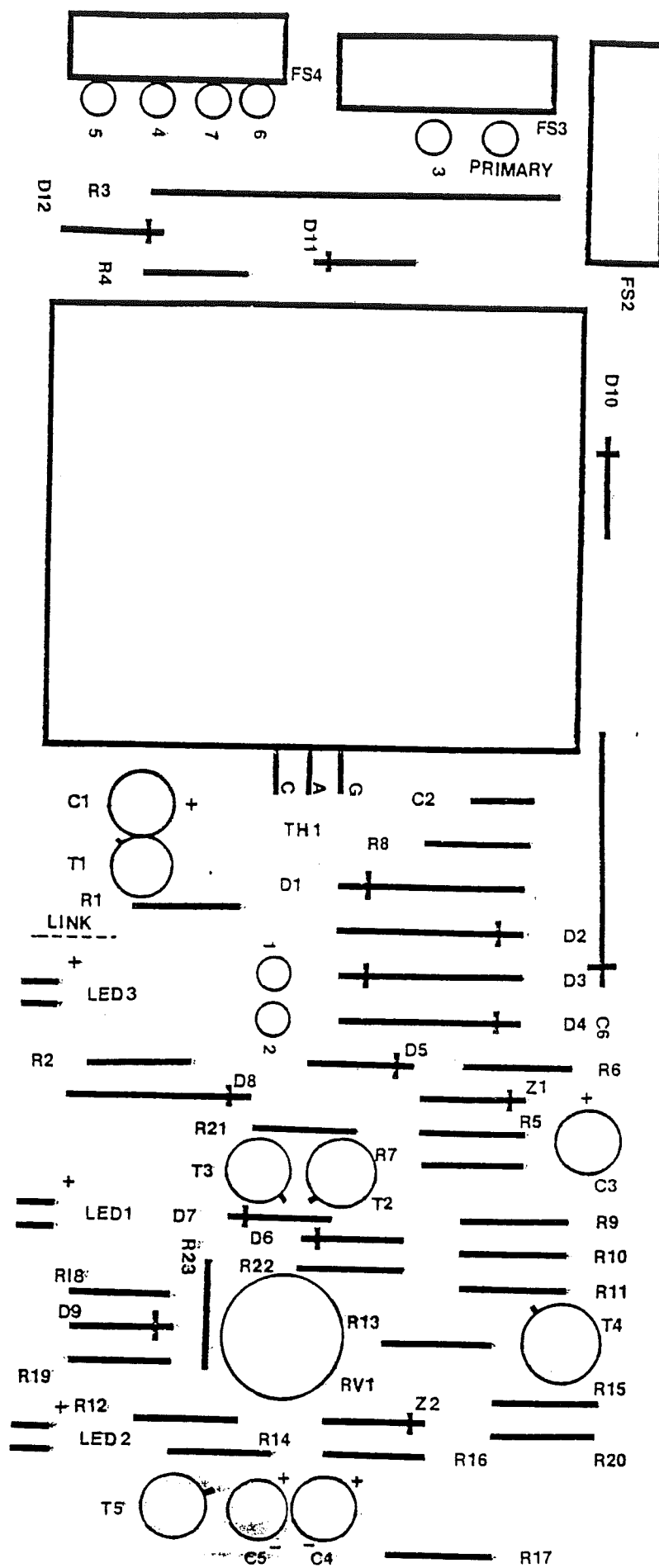


Fig. 4.3.1. Type 24/10 Charger - P.C.B. Layout.

# PARTS LIST

PRODUCT		SCHEDULE NO.	
TYPE 24/10 CHARGER P.C.B. ASSEMBLY/PAGE 2			
PART NO.	DESCRIPTION	QTY	COMPONENT NO.

380/2/40	L.E.D. (Green)	2	LED1, LED3.
380/2/42	L.E.D. (Yellow)	1	LED2
IBB25913-1	Heatsink	1	
150/1/27	Fuselink 2A (20mm)	3	FS2, FS3, FS4.
150/1/36	Fuseholder	3	FS2, FS3, FS4.
350/1/6	Screw Ch. Hd. M3 x 8	2	
256/1/1	Nut Hex. M3	2	
221/1/29	Wire Link Tinned Copper 22SWG x 25 Long	1	

# P A R T S   L I S T

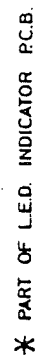
PRODUCT		SCHEDULE NO.	
TYPE 24/10 CHARGER P.C.B. ASSEMBLY		PS 4621-1	
PART NO.	DESCRIPTION	QTY	COMPONENT NO.
BC4620-1	Charger P.C.B.	1	
314/1/14	Resistor $\frac{1}{2}$ W 47R	1	R15
314/1/26	Resistor $\frac{1}{2}$ W 82R	1	R1
314/1/45	Resistor $\frac{1}{2}$ W 220R	1	R22
314/1/25	Resistor $\frac{1}{2}$ W 680R	1	R11
314/1/1	Resistor $\frac{1}{2}$ W 1K	5	R4, R9, R14, R16, R20.
314/1/22	Resistor $\frac{1}{2}$ W 2K2	10	R2, R5-R8, R12, R17-R19, R21.
314/1/27	Resistor $\frac{1}{2}$ W 2K7	1	R23
314/1/2	Resistor $\frac{1}{2}$ W 10K	1	R13
314/1/5	Resistor $\frac{1}{2}$ W 100K	1	R10
310/3/13	Resistor 6W 1R5	1	R3
312/2/2	Resistor Variable 470R	1	RV1
050/2/3	Capacitor 0 $\mu$ 1/250V	1	C2
050/1/40	Capacitor 15 $\mu$ /35V TANT	2	C3, C4.
050/1/47	Capacitor 100 $\mu$ /3V TANT	1	C1
050/1/44	Capacitor 100 $\mu$ /10V	1	C5
050/1/30	Capacitor 100 $\mu$ /63V ELECTROLYTIC	1	C6
380/1/30	Transistor BCY71	3	T1, T2, T3.
380/1/27	Transistor BC107	2	T4, T5.
380/2/43	Thyristor IR106C	1	TH1
380/2/2	Diode IN4003	11	D1-D9, D11, D12
380/2/20	Diode SIM3	1	D10
380/2/39	Zener Diode BZY88 6V8	1	Z1
380/2/45	Zener Diode BZY88 33V	1	Z2

# P A R T S   L I S T

PRODUCT	SCHEDULE NO.
TYPE BC24/10 BATTERY CHARGER ASSEMBLY	FS 4705-1
TYPE PS24/10/6 POWER SUPPLY ASSEMBLY **	FS 4702-1

PART NO.	DESCRIPTION	QTY	COMPONENT NO.
PD4671-1	Case Sub-Assembly *	1	
PD4672-1	Front Cover Sub-Assembly * (Silk screened to PC4674-1)	1	
PS 4631-1	24/10 Charger Chassis Assembly	1	
350/1/14	Screw Ch. Hd. M4 x 6	3	
470/14/7	Washer Plain M4	3	
140/1/36	Dzus Fastener *	1	
140/1/37	'O' Ring *	1	
221/1/28	Allen Key *	1	
BO26850-1	Serial No./Mod. Label Assembly	1	
BA4679-1	Battery Lead Assembly +Ve (Red 0.75mm <sup>2</sup> ) **	1	
BA4679-2	Battery Lead Assembly -Ve (Black 0.75mm <sup>2</sup> ) **	1	
BA4679-3	Battery Lead Assembly Inter-connecting (Grey 0.75mm <sup>2</sup> ) **	1	
* For optional front cover fastening using security key-lock; replace items marked * with the following:			
PD4671-2	Case Sub-Assembly	1	
PD4672-2	Front Cover Sub-Assembly (Silk screened to FC4671-1)	1	
190/1/5	Key Lock (500-E-3-A56)	1	

\*\* Items marked \*\* required for PS 24/10/6 only.



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