

# SAILOR



TECHNICAL MANUAL  
FOR  
BATTERY CHARGER N2174



S.P. RADIO A/S · AALBORG · DENMARK

## 3 SERVICE

### 3.1 MAINTENANCE

When the SAILOR N2174 has been correctly installed, the maintenance of the charger can, dependent on the environments and working hours, be reduced to a performance check at the service workshop at intervals not exceeding 5 years.

A performance check list is enclosed in the section 3.4 PERFORMANCE CHECK.

Also inspect cables and plugs for mechanical defects and corrosion.

Any repair of the set should be followed by a check described in the section 3.5 NECESSARY ADJUSTMENT AND CHECK AFTER REPAIR.

### 3.2 RECOMMENDED TEST EQUIPMENT

Multimeter: Philips PM2518X

Oscilloscope: Philips PM3214

### 3.3 TROUBLE SHOOTING

Trouble shooting, repair and check of the N2174 should only be performed by persons, who have sufficient technical knowledge and the necessary test equipment at their disposal.

To do some service of the SCR rectifier bridge, the blower frame can be turned upwards and placed in a service position (see chapter 4.1. MECHANICAL DISASSEMBLING AND MODULE LOCATION.)

When placed in service position, AC mains power may be connected and the N2174 can work normally even with full load.

1. The battery is gassing:
  - a) The charging current is too high for the battery type.
  - b) The *upper level* voltage is too high.
  - c) The *trickle charge* voltage is too high.
  - d) N2174 is strapped for wrong battery type.
  - e) The battery is defective.
2. N2174 can not switch on in MANUAL mode.
  - a) Fuse F1-5 or F2-5 is blown out.
  - b) Blower circuit is out of order.
  - c) Temperature on the SCR heatsink is too high (maybe blower failure).
3. N2174 can not switch on in AUTOMATIC mode.
  - a) Fuse F1-5 or F2-5 is blown out.
  - b) Blower circuit is out of order.
  - c) Temperature on the SCR heatsink is too high (maybe blower failure).
  - d) The output is short circuited.
  - e) The battery voltage is below 5V.

### 3.4 PERFORMANCE CHECK

To handle the performance check in an easy way, it is recommended to connect the N2174 to a disconnected connection board (module 3 or module 4) used for the charger.

Any value, which differs too much from the values given in this chapter, should lead to a repair of the circuit or module in question.

Hints to locate some faults are given in the chapter 3.3 TROUBLE SHOOTING.

The given values in this chapter is basically for 24V **maintenance free lead-acid batteries**.  
If the battery temperature sensor is connected, the values are only valid if the battery temperature is 25° degree centigrade.

Values for Nickle-Cadmium batteries (NiCd) are for the 20 cells type.

### 3.4.1 PERFORMANCE CHECK OF MANUAL CHARGE MODE

1. Connect the N2174 to the charger connection board (module 3 or module 4).
2. Connect the N2174 to the AC mains, which it is strapped for. See 5.3 MAIN SCHEMATIC DIAGRAM. Normally the N2174 is strapped for 220V AC.
3. Connect a small dummy load to the output. A resistor of 27 ohm/50W is sufficient to get a proper regulation.
4. On the connection boards are placed three positions for a strap. The positions are marked REMOTE, AUTO and MAN. Normally the strap is placed in REMOTE position. Now move the strap to MAN position and the N2174 is switched on in MANUAL charge mode. The output voltage is fluctuating, but that is normal because the battery is missing.
5. With a voltmeter across the output, read the voltage to  $29\text{VDC} \pm 0.5\text{V}$ .
6. Connect a new dummy load of 0.77 ohm/900W to the output. It can be made by paralleling several power resistors.
7. Read the output voltage to  $23\text{VDC} \pm 2\text{V}$ . The output current is approx. 30A.
8. Let it run with full load and check that the blower switches on within 6 minutes.
9. Move the strap on the connection board back to REMOTE position.

### 3.4.2 PERFORMANCE CHECK OF AUTOMATIC CHARGE MODE

1. Connect the N2174 to the charger connection board (module 3 or module 4).
2. Connect the N2174 to the AC mains, which it is strapped for. See 5.3 MAIN SCHEMATIC DIAGRAM. Normally the N2174 is strapped for 220V AC.
3. Connect a small dummy load to the output. A resistor of 27 ohm/50W is sufficient to get a proper regulation.
4. The remote voltage sense terminals called +VS and -VS must be connected to the dummy load.
5. On the AUTOMATIC module check that a strap is placed in P5 in MS position, and also check that a strap is placed in P3 (TS-OFF position). For NiCd the strap is in **NiCd** position.
6. On the connection boards are placed three positions for a strap. The positions are marked REMOTE, AUTO and MAN. Normally the strap is placed in REMOTE position. Now move the strap to AUTO position.
7. With a voltmeter across the output, read the voltage to 0V. The N2174 is not switched on, because the battery is missing.
8. Connect to the output a small power supply capable of delivering 1.5A and adjustable up to 32V.

9. The small power supply is set to a voltage not less than 7.5V. Then the N2174 is switched on and the small power supply can be disconnected.
10. At first the output voltage is approx. 34VDC, but after 10 seconds the voltage falls down to  $27.3V \pm 0.2V$ . This is the *trickle charge* voltage.
11. On the connection board move the strap back to REMOTE position. The N2174 is now switched off.
12. Connect again the small power supply to the output and set it to 24.0V.
13. The AUTOMATIC module is now in *charge* mode. All LED on the module is alight. After 10 seconds the LED D31-2 (marked TRICKLE) is off.
14. Turn up slowly the voltage from the small power supply until D31-2 (marked TRICKLE) turns on and then read the voltage to  $28.8VDC \pm 0.2V$ . This is the *upper level shift* and the N2174 is now in *trickle charge* mode. ( $30.5VDC \pm 0.2V$  for NiCd).
15. Turn back the voltage from the small power supply until D30-2 (marked CHARGE) turns on and read the voltage to  $25.8VDC \pm 0.2V$ . ( $27.5VDC \pm 0.3V$  for NiCd). This is the *lower level shift* and the N2174 is now in *charge* mode.
16. Connect again the small power supply to the output and set it for a voltage over 5V to cancel the fault-stop circuit.
17. On the connection board now move the strap to AUTO to switch on the N2174.
18. While running, connect to the output a new dummy load of 0.77 ohm/900W and read the output voltage to  $23VDC \pm 1V$ . The output current is 30A.
19. Connect an oscilloscope to the output and read the ripple voltage to max.  $3V_{pp}$ .
20. Let it run with full load and check that the blower switches on within 6 minutes.
21. **Remember** to move back the strap to REMOTE position on the connection board.
22. An other way to start up the N2174 in AUTOMATIC charge mode while connected to a dummy load, is to short circuit R15-2 a short moment to cancel the fault-stop circuit.

### 3.5 NECESSARY CHECK AND ADJUSTMENT AFTER REPAIR

*CHANGE OR REPAIR OF THE MANUAL CONTROL (module 1).*

Execute chapter **3.4.1 PERFORMANCE CHECK OF MANUAL CHARGE MODE.**

Adjust if necessary the output voltage to  $29.0VDC \pm 0.2V$  with R4-1.

Execute chapter **3.4.2 PERFORMANCE CHECK OF AUTOMATIC CHARGE MODE.**

Adjust if necessary the output voltage to  $23.0VDC \pm 0.2V$  with R60-2. (Current limiter for 30A).

*CHANGE OR REPAIR OF THE AUTOMATIC CONTROL (module 2).*

Execute chapter **3.4.2 PERFORMANCE CHECK OF AUTOMATIC CHARGE MODE.**

Adjust if necessary the *trickle* voltage to  $27.3VDC \pm 0.1V$  with R39-2. (For Nickle-Cadmium the strap at P3 is placed in **NiCd** position. Adjust the *trickle* voltage to  $28.4VDC \pm 0.1V$  for NiCd).

Adjust the *upper level* voltage to  $28.8VDC \pm 0.1V$  with R63-2. (For Nickle-Cadmium the strap at P3 is placed in **NiCd** position. Adjust the *upper level* voltage to  $30.5VDC \pm 0.1V$  for NiCd).

The adjustment is done by turning R63-2 full/clockwise. Then connect the small dummy load, and set the small power supply for  $28.8VDC$  ( $30.5VDC$  for NiCd) which turns on the LED D30-2 (CHARGE). Turn slowly R63-2 counter clockwise just until the LED D31-2 (TRICKLE) turns on.

Adjust if necessary the output voltage to  $23VDC \pm 0.2V$  with R60-2. (Current limiter for 30A).



## CONTENTS

<b>1</b>	<b>GENERAL INFORMATION</b>	<b>1-1</b>
1.1	INTRODUCTION	1-1
1.2	PRINCIPLE OF OPERATION	1-1
1.3	TECHNICAL DATA	1-3
<b>2</b>	<b>INSTALLATION</b>	<b>2-1</b>
2.1	DIMENSIONS AND DRILLING PLAN	2-1
2.2	ELECTRICAL CONNECTIONS AND ASSEMBLING	2-2
2.3	FUSE BOX H2182	2-11
2.4	FUSE BOX H2183	2-12
<b>3</b>	<b>SERVICE</b>	<b>3-1</b>
3.1	MAINTENANCE	3-1
3.2	RECOMMENDED TEST EQUIPMENT	3-1
3.3	TROUBLE SHOOTING	3-1
3.4	PERFORMANCE CHECK	3-1
3.5	NECESSARY CHECK AND ADJUSTMENT AFTER REPAIR	3-3
<b>4</b>	<b>MECHANICAL DESCRIPTION</b>	<b>4-1</b>
4.1	MECHANICAL ASSEMBLING / DISASSEMBLING AND UNITS LOCATION	4-1
<b>5</b>	<b>CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS</b>	<b>5-1</b>
5.1	MANUAL CONTROL (MODULE 1) S.P.NO. 626444	5-1
5.2	AUTOMATIC CONTROL (MODULE 2) S.P.NO. 626445	5-5
5.3	CONN. SINGLE BATTERY CHARGER (MODULE 3) SP NO. 626446	5-11
5.4	CONN. DUAL BATTERY CHARGER (MODULE 4) SP NO. 626447	5-15
5.5	MAIN SCHEMATIC DIAGRAM N2174	5-18
<b>6</b>	<b>PARTS LISTS</b>	<b>6-1</b>

## CONTENTS

<b>1</b>	<b>GENERAL INFORMATION</b>	<b>1-1</b>
1.1	INTRODUCTION	1-1
1.2	PRINCIPLE OF OPERATION	1-1
1.3	TECHNICAL DATA	1-3

## 1 GENERAL INFORMATION

### 1.1 INTRODUCTION

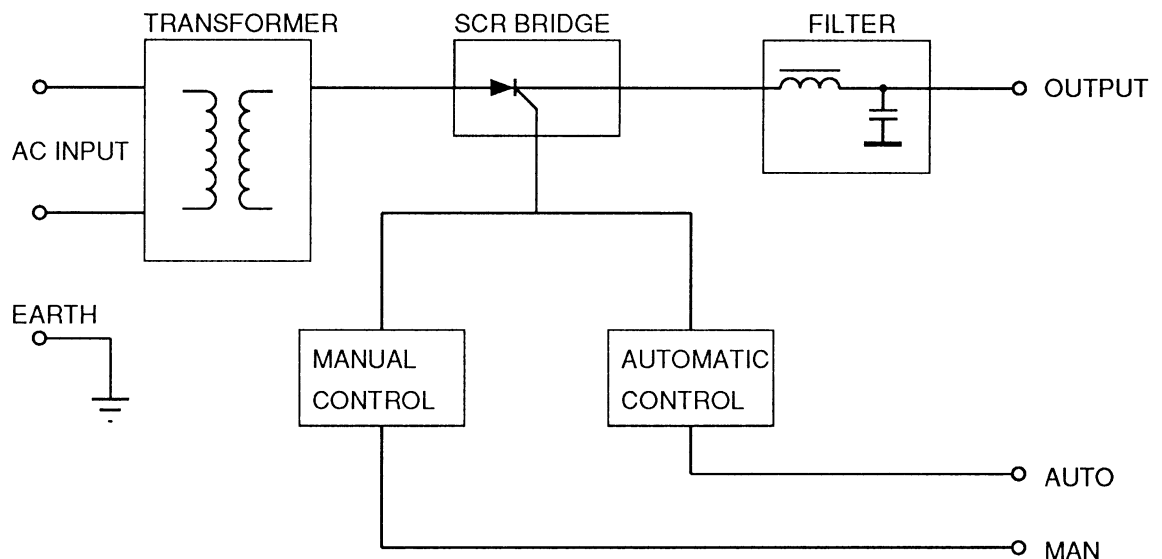
The Sailor N2174 Battery Charger is especially developed to charge the **maintenance free** lead-acid batteries and the **Nickel Cadmium** batteries.

The Sailor N2174 is designed in harmony with the Sailor HF SSB Shortwave Programme, but can also stand alone to charge any 24V batteries.

The Sailor N2174 is remote controlled.

### 1.2 PRINCIPLE OF OPERATION

#### BLOCKDIAGRAMME FOR N2174



The Battery Charger N2174 can operate in two ways: **manual** mode or **automatic** mode.

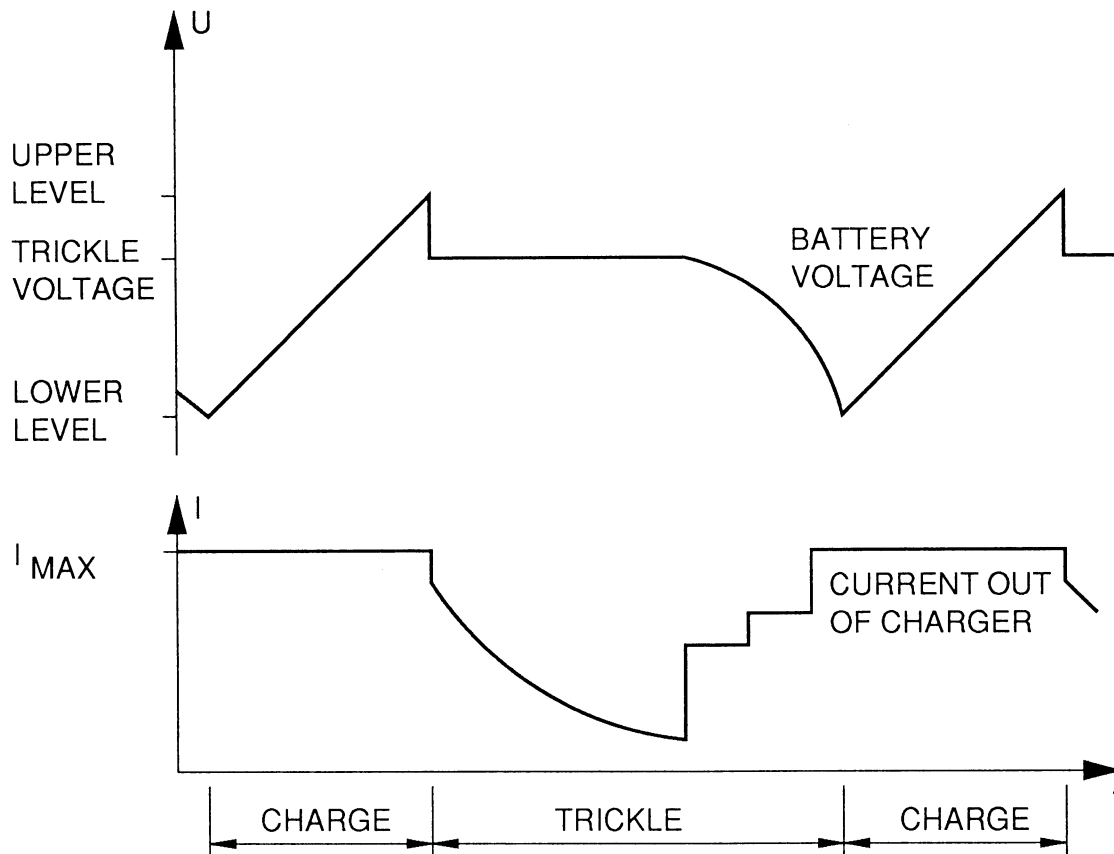
The **manual** mode is only recommended to use when the automatic module is out of order, because there is only a simple regulation of the battery charge condition. When using the **manual** mode the battery must be under close supervision even the N2174 from factory is limited to deliver max. 29V and approx. 30 A.

In **automatic** mode the N2174 is charging in two state: Main **Charge** and **Trickle** charge.

In main **charge** mode the N2174 is working as a constant current generator until the battery voltage is reaching the upper level voltage (gassing voltage). At this level the N2174 is changing state to **trickle** charge mode and is now working as a constant voltage generator to maintain a constant voltage to the battery.

To ensure maximum battery capacity the N2174 is provided with remote voltage sense wires. If the battery is loaded more than the charger is able to supply, the battery voltage eventually goes under the lower level voltage which again changes the N2174 into **charge** mode and so on (see figure for *typical charge curve*).

## TYPICAL CHARGE CURVE



For charging **Nickel Cadmium** batteries, which demand a higher voltage, a strap is moved on the automatic module followed by an adjustment of the output voltage according to the battery type in question.

If the battery is placed in environment with extreme temperatures, a temperature sensor can be connected to N2174 to correct the charge voltage to prolong the battery lifetime.

The N2174 is designed to be controlled from a remote switch box H2180 or from the console H2192, where the amp. meter and the volt meter are placed. The current **shunt** should be placed remote near the battery e.g. in the fuse box H2182.

The N2174 is also designed to operate two in parallel to deliver a current of 60A. This is done by dedicating one of them to be **master** and the other as **slave**. The configuration is done by moving a strap on the automatic module in the **slave** unit and connect some wires on the connection board.



## 1.3 TECHNICAL DATA

### BATTERY CHARGERS

#### GENERAL

Input voltage:	110V-127V-220V-240V AC +/- 10%
Input frequency:	48 - 65 Hz
Noise into Mains:	better than CEPT
Operating temperature:	-15°C to +55°C
On/Off and MAN/AUTO:	From external switches placed in remote box H2180 or in the console control H2192 where also meters for battery voltage and current are placed.
Trickle voltage (factory adjusted):	27.3V DC at 1A load, lead-acid batteries.
Upper level (factory adjusted):	28.8V DC, lead-acid batteries.
Sensor to monitor battery temp.:	Option

#### N2174 AUTOMATIC MODE

Output current (factory adjusted):	30A
Ripple voltage (rms) at 30A:	4%
Input current at full load:	8A, 220V

#### N2174 MANUAL MODE

Output voltage (adjustable):	29V DC at 1A load
Output current:	approx. 30A
Input current at full load:	8A, 220V

#### N2174 DUAL AUTOMATIC MODE

Output current (factory adjusted):	60A
Ripple voltage (rms) at 60A:	4%
Input current at full load:	16A, 220V

#### N2174 DUAL MANUAL MODE

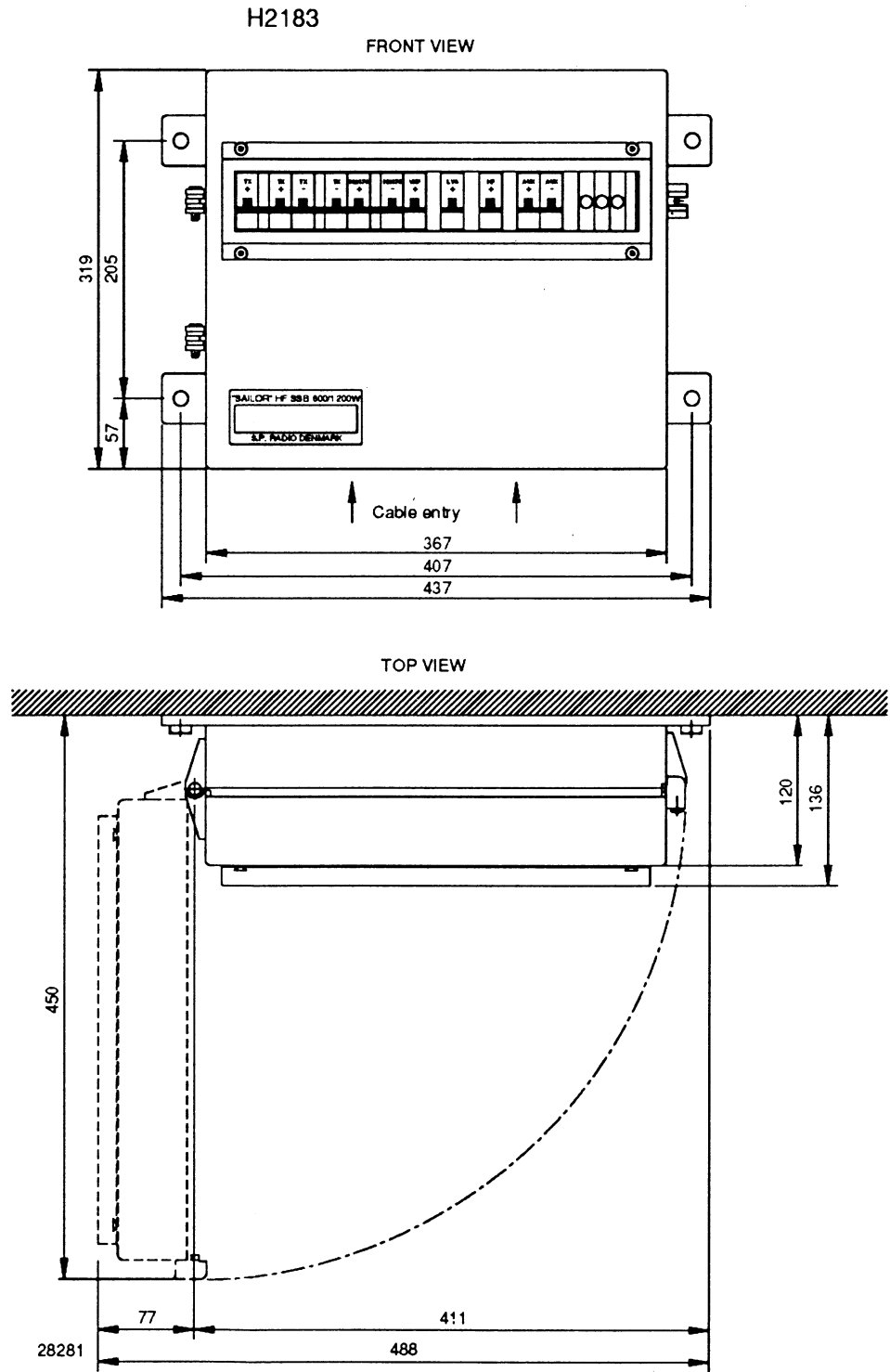
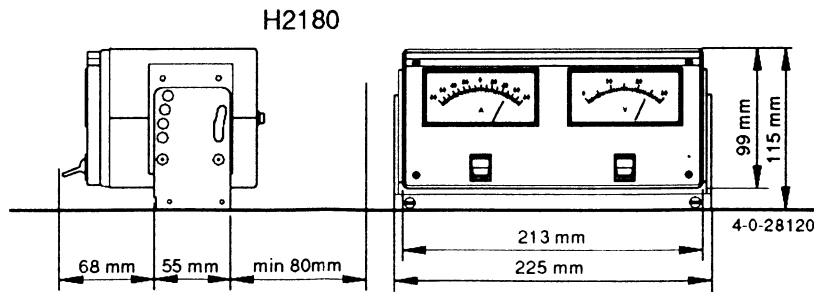
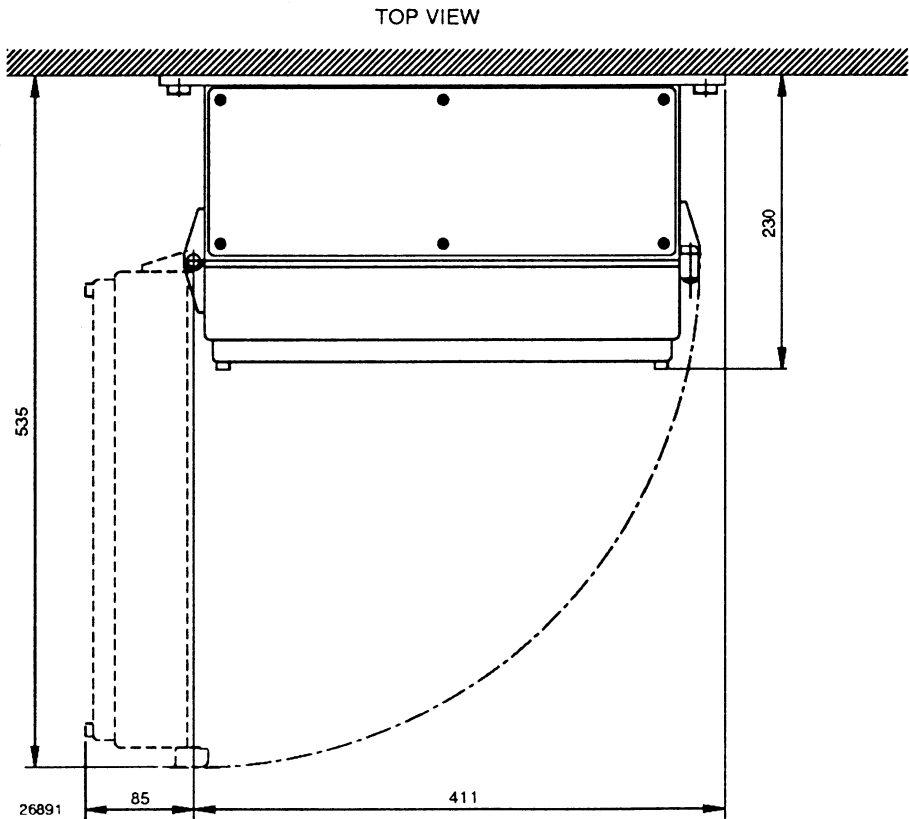
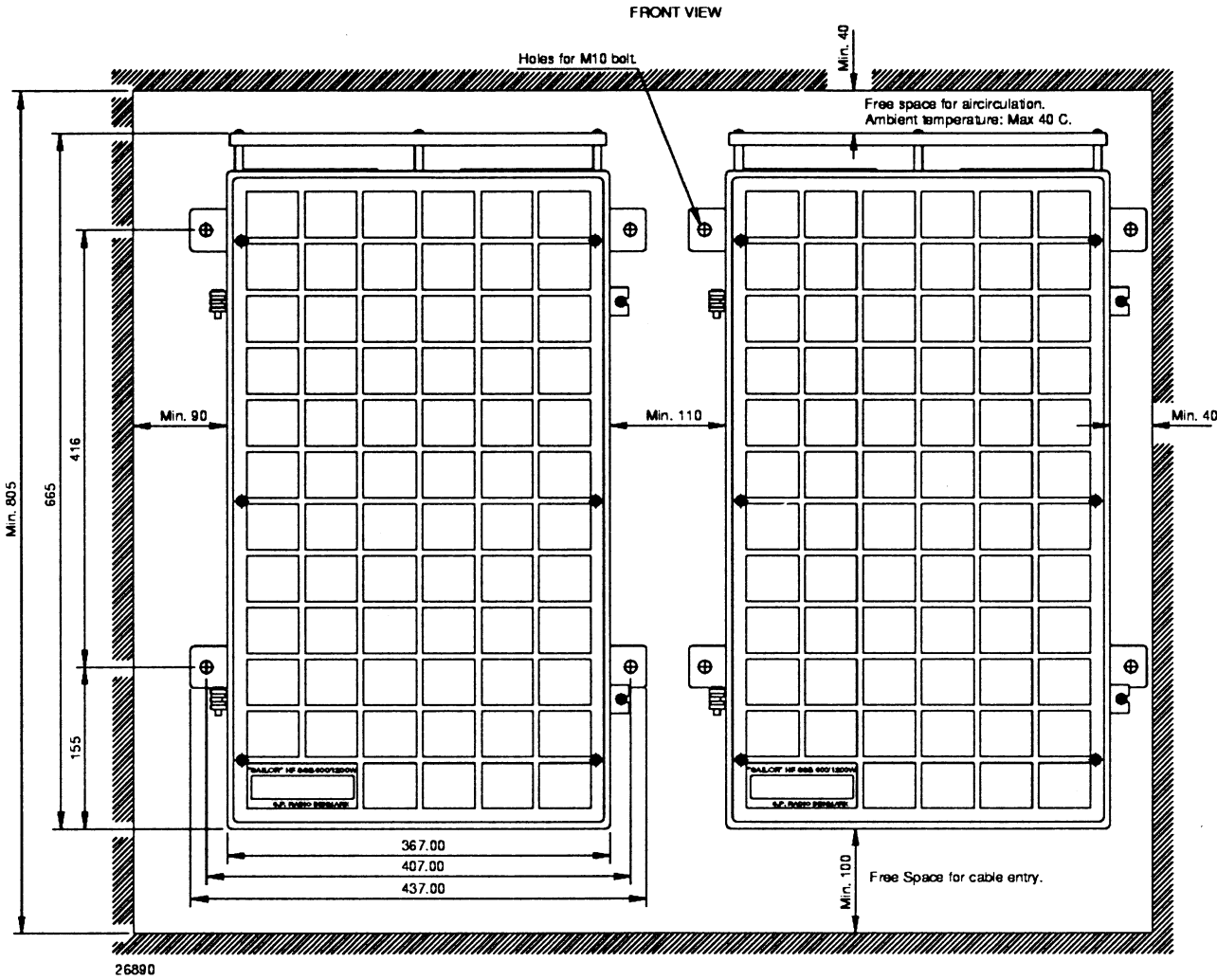
Output voltage (adjustable):	29V DC at 1A load
Output current:	approx. 60A
Input current at full load:	16A, 220V

## CONTENTS

<b>2</b>	<b>INSTALLATION</b>	<b>2-1</b>
2.1	DIMENSIONS AND DRILLING PLAN	2-1
2.2	ELECTRICAL CONNECTIONS AND ASSEMBLING	2-2
2.3	FUSE BOX H2182	2-11
2.4	FUSE BOX H2183	2-12

2 INSTALLATION

2.1 DIMENSIONS AND DRILLING PLAN



## 2.2 ELECTRICAL CONNECTIONS AND ASSEMBLING

### CABLE 9

#### MAINS TO N2171:

220V MAINS:Current: approx 6 Amp.

Mains fuse min. 10 Amp.

3 x 1.5 mm<sup>2</sup> max. length 12 metres

110V MAINS:Current: approx 12 Amp.

Mains fuse min. 16 Amp.

3 x 2.5 mm<sup>2</sup> max. length 10 metres

CONNECTION BOARD (5)	SIGNAL
ST1 and ST2	
1	GND
2	LIVE
3	NEUTRAL

### CABLE 12

#### BATTERY TO T2131:

When N2170 is in a separate cabinet.

Use following cable: 2.5 mm<sup>2</sup> max. length 10 metres.

When N2170 is in the same cabinet as T2131.

Use cable as shown in the table below:

Current consumption: 50 Amp.

LENGTH IN METRES	2	3.2	5	8	10	13	16	24	34
CABLE DIMENSION	6	10	16	25	35	50	70	95	120

### CABLE 18

#### MAINS TO N2174:

220V MAINS:Current: approx 8 Amp.

Mains fuses 16 Amp.

3 x 1.5 mm<sup>2</sup> max. length 12 metres

110V MAINS:Current: approx 16 Amp.

Mains fuses 25 Amp.

3 x 2.5 mm<sup>2</sup> max. length 10 metres

N2174			SIGNAL
ST2	ST6	ST12	
1	1	1	GND
2	2	2	LINE
3	3	3	NEUTRAL

### CABLE 19

#### N2174 TO H2180:

Multicable: 6 x 0.75 mm<sup>2</sup> max. length 15 metres

Multicable: 6 x 1.5 mm<sup>2</sup> max. length 30 metres

N2174			H2180	SIGNAL
ST7	ST5	ST11		
1	1	1	1	- SHUNT
2	2	2	2	+ SHUNT
3	3	3	3	-VS
4	4	4	4	MAN
5	5	5	5	26V
6	6	6	6	AUTO

### CABLE 20

#### N2174 TO H2182/H2183 (SHUNT):

4 x 1.0 mm<sup>2</sup> max. length 10 metres

4 x 2.5 mm<sup>2</sup> max. length 25 metres

N2174			SIGNAL
ST6	ST4	ST10	
1	1	1	- VS
2	2	2	+ VS
3	3	3	- SHUNT
4	4	4	+ SHUNT

### CABLE 21

#### N2174 TO H2182/ (BATTERY):

+ BATT. and - BATT. cable dimensions in mm<sup>2</sup>

Current 30A

LENGTH IN METRES	8	13	22	30	40
CABLE DIMENSION	10	16	25	35	50

### CABLE 22

#### H2182 to battery:

+ BATT. and - BATT. Cable dimensions in mm<sup>2</sup>

Current approx. 70A

LENGTH IN METRES	2.5	4	6	8	12
CABLE DIMENSION	16	25	35	50	70

### CABLE 26

#### N2174 TO H2182/H2183

(Temperature sensor):

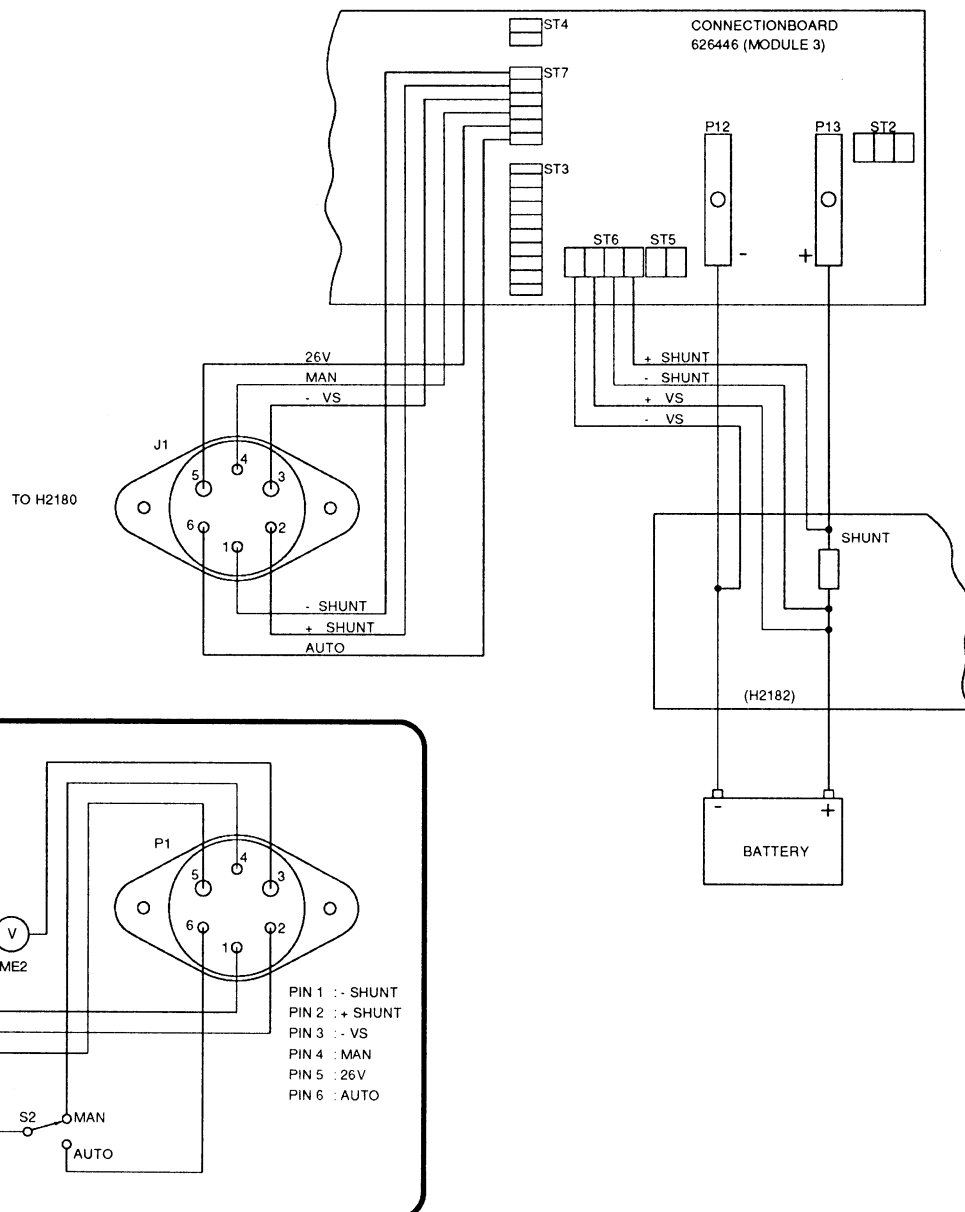
Multicable: 2 x 0.5 mm<sup>2</sup> max. length 50 metres

N2174			SIGNAL
ST4	ST2	ST8	
1	1	1	-TS
2	2	2	+TS



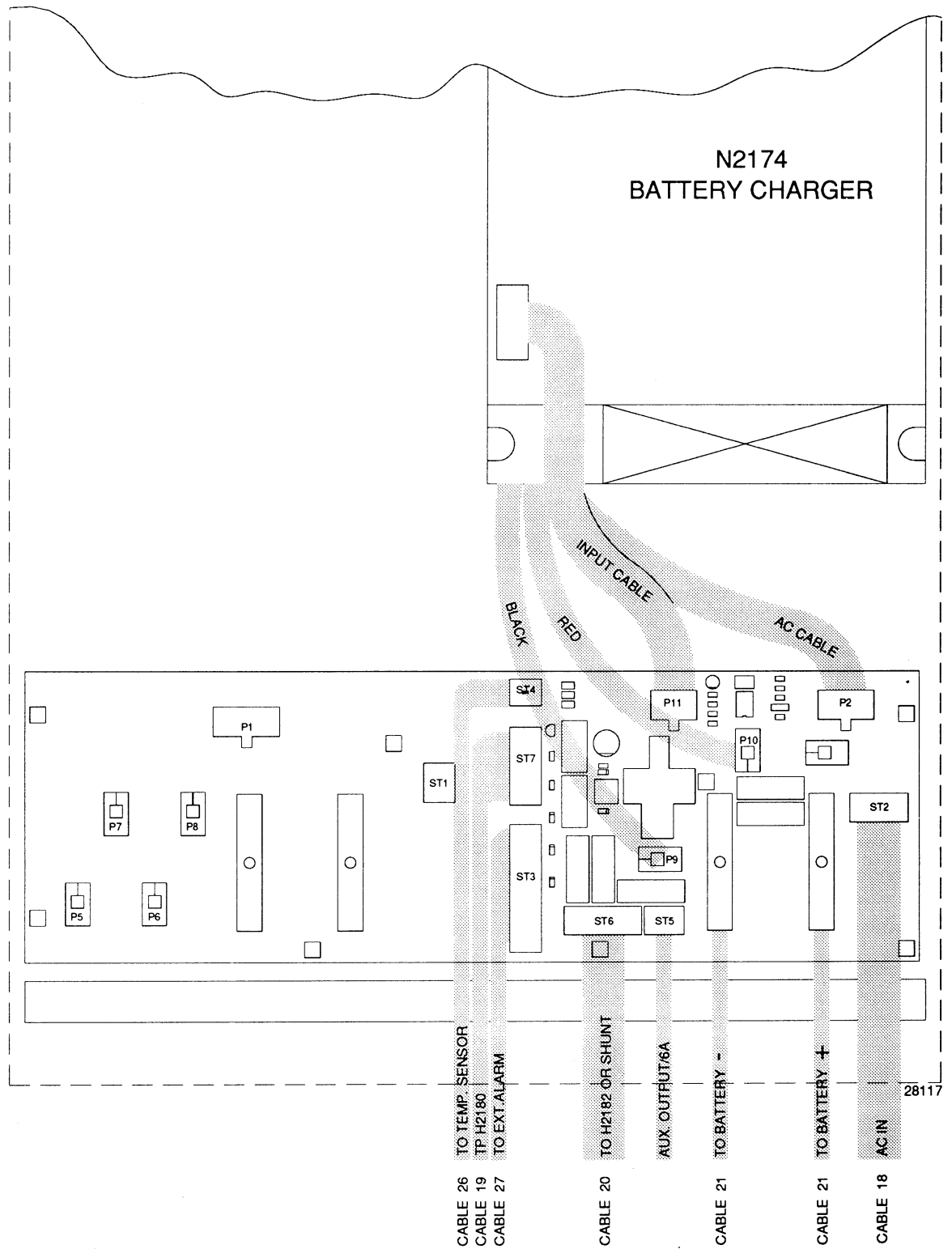


# CONNECTION TO H2180 FOR N2174 30 AMP BATTERY CHARGER



28223

## CONNECTION TO N2174 SINGLE



**CABLE 12****BATTERY TO T2131:**

**When N2170 is in a separate cabinet.**  
Use following cable: 2.5 mm<sup>2</sup> max. length 10 metres.

**When N2170 is in the same cabinet as T2131.**

Use cable as shown in the table below:  
Current consumption: 50 Amp.

LENGTH IN METRES	2	3.2	5	8	10	13	16	24	34
CABLE DIMENSION	6	10	16	25	35	50	70	95	120

**CABLE 18****MAINS TO N2174:**

220V MAINS: Current: approx 8 Amp.  
Mains fuses 16 Amp.  
3 x 1.5 mm<sup>2</sup> max. length 12 metres  
110V MAINS: Current: approx 16 Amp.  
Mains fuses 25 Amp.  
3 x 2.5 mm<sup>2</sup> max. length 10 metres

N2174			SIGNAL
ST2	ST6	ST12	
1	1	1	GND
2	2	2	LINE
3	3	3	NEUTRAL

**CABLE 19****N2174 TO H2180:**

Multicable: 6 x 0.75 mm<sup>2</sup> max. length 15 metres  
Multicable: 6 x 1.5 mm<sup>2</sup> max. length 30 metres

N2174			H2180	SIGNAL
ST7	ST5	ST11		
1	1	1	1	- SHUNT
2	2	2	2	+ SHUNT
3	3	3	3	-VS
4	4	4	4	MAN
5	5	5	5	26V
6	6	6	6	AUTO

**CABLE 20****N2174 TO H2182/H2183 (SHUNT):**

4 x 1.0 mm<sup>2</sup> max. length 10 metres  
4 x 2.5 mm<sup>2</sup> max. length 25 metres

N2174			SIGNAL
ST6	ST4	ST10	
1	1	1	- VS
2	2	2	+ VS
3	3	3	- SHUNT
4	4	4	+ SHUNT

**CABLE 23****N2174 TO N2174 (for dual operation):**

+ OUTPUT. and - OUTPUT. Cable dimensions 6 mm<sup>2</sup> Current approx. 30A. max. length 2 metres

N2174-I	N2174-II	SIGNAL
P5	P11	- OUTPUT
P6	P12	+ OUTPUT

**CABLE 24****N2174 DUAL TO H2183 / BATTERY:**

+ BATT. and - BATT. Cable dimensions in mm<sup>2</sup>  
Current 60A.

LENGTH IN METRES	6	10	14	22	30
CABLE DIMENSION	16	25	35	50	70

**CABLE 25****N2174 TO N2174 / (Control signals):**

Multicable: 3 x 0.5 mm<sup>2</sup> max. length 30 metres

**CABLE 26****N2174 TO H2182/H2183****(Temperature sensor):**

Multicable: 2 x 0.5 mm<sup>2</sup> max. length 50 metres

N2174			SIGNAL
ST4	ST2	ST8	
1	1	1	-TS
2	2	2	+TS

**CABLE 28****H2183 to battery:**

+ BATT. and - BATT. Cable dimensions in mm<sup>2</sup>  
Current approx. 140A

LENGTH IN METRES	1.2	2	3	4	6
CABLE DIMENSION	16	25	35	50	70

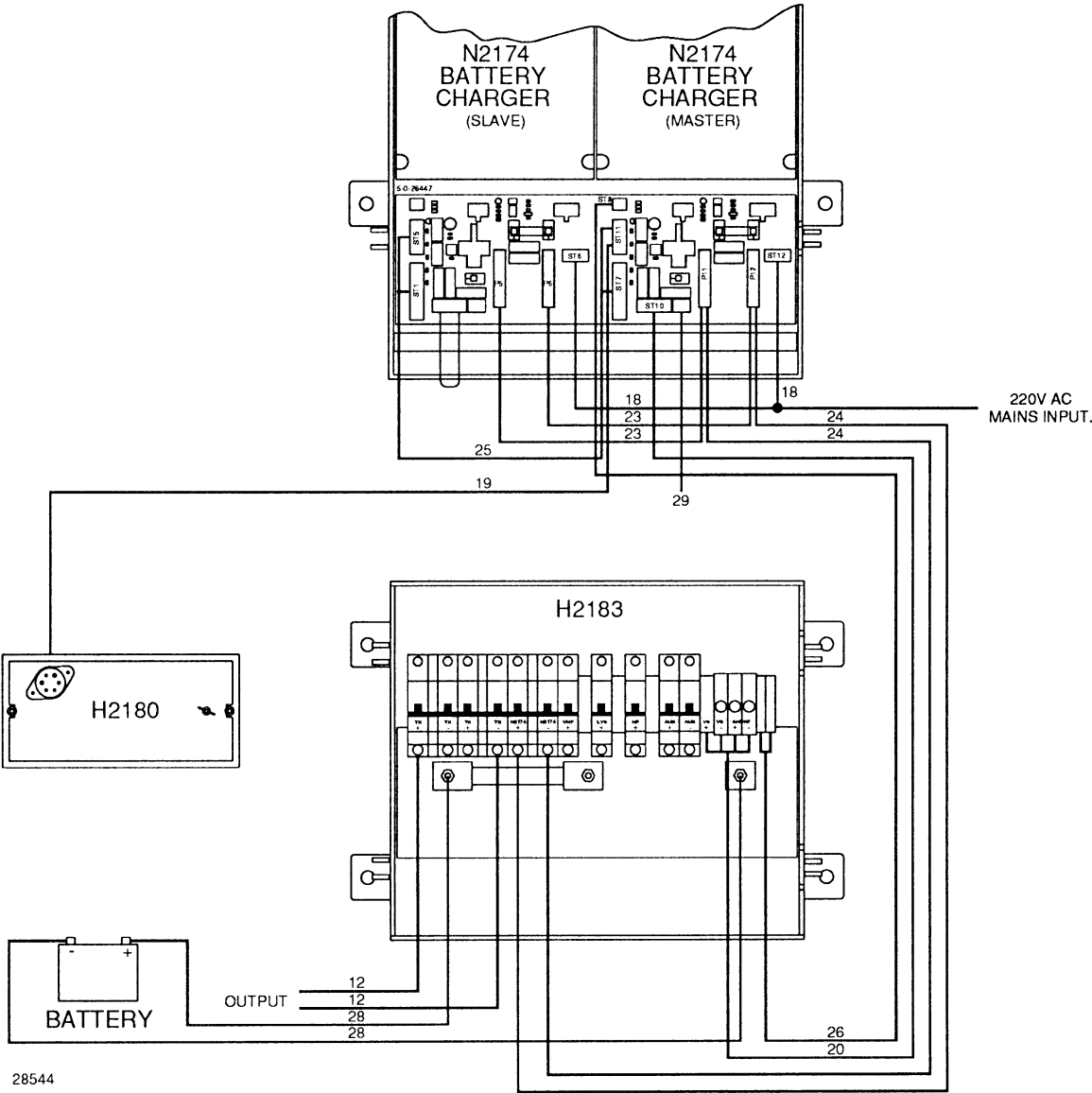
**CABLE 29****N2174 TO AUX. OUTPUT:**

2 x 2.5 mm<sup>2</sup> Cable max. length 10 metres  
Current max. 6A

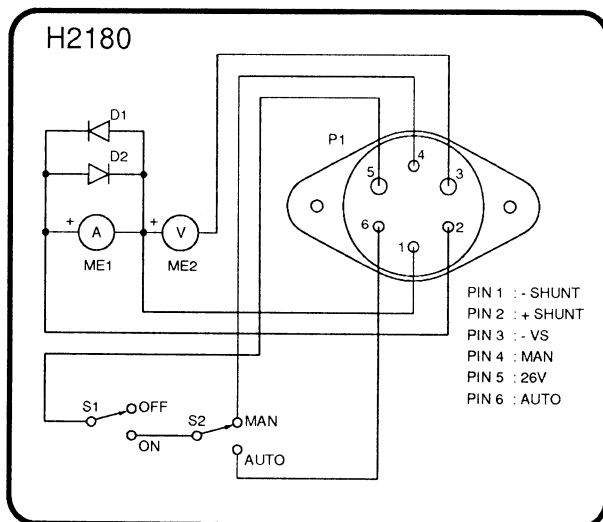
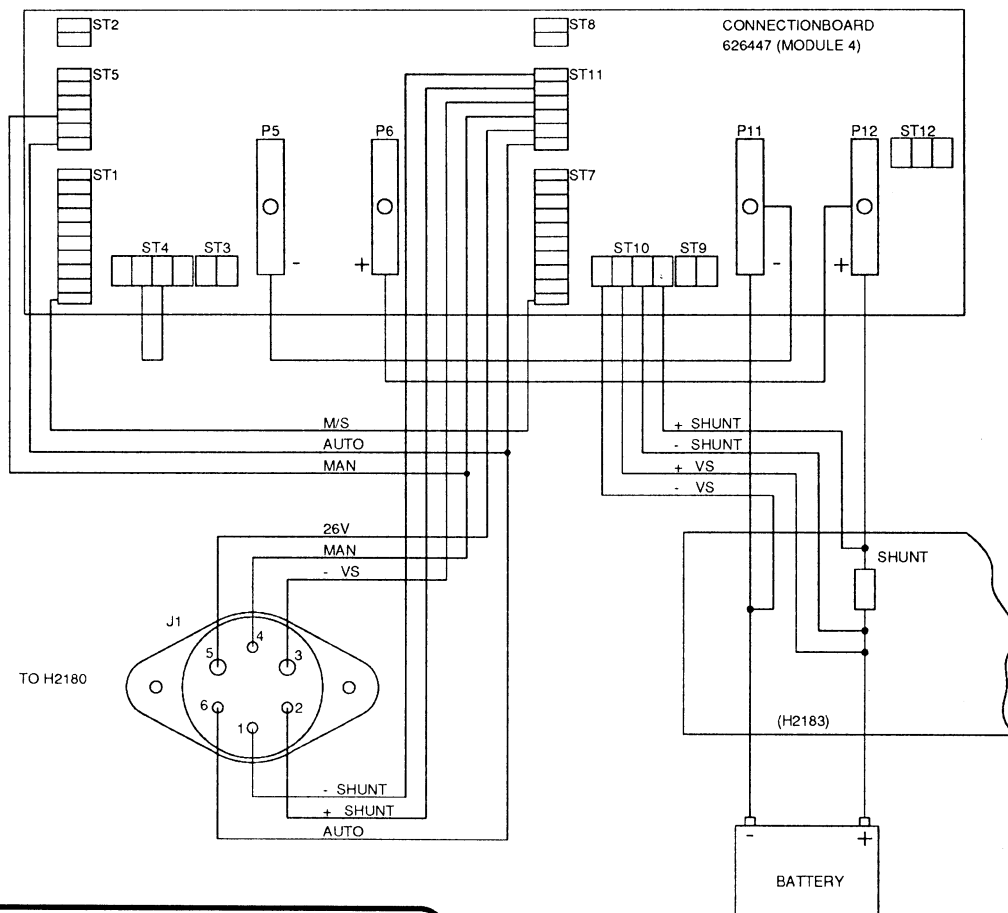
N2174			SIGNAL
ST5	ST3	ST9	
1	1	1	-BATT
2	2	2	+BATT



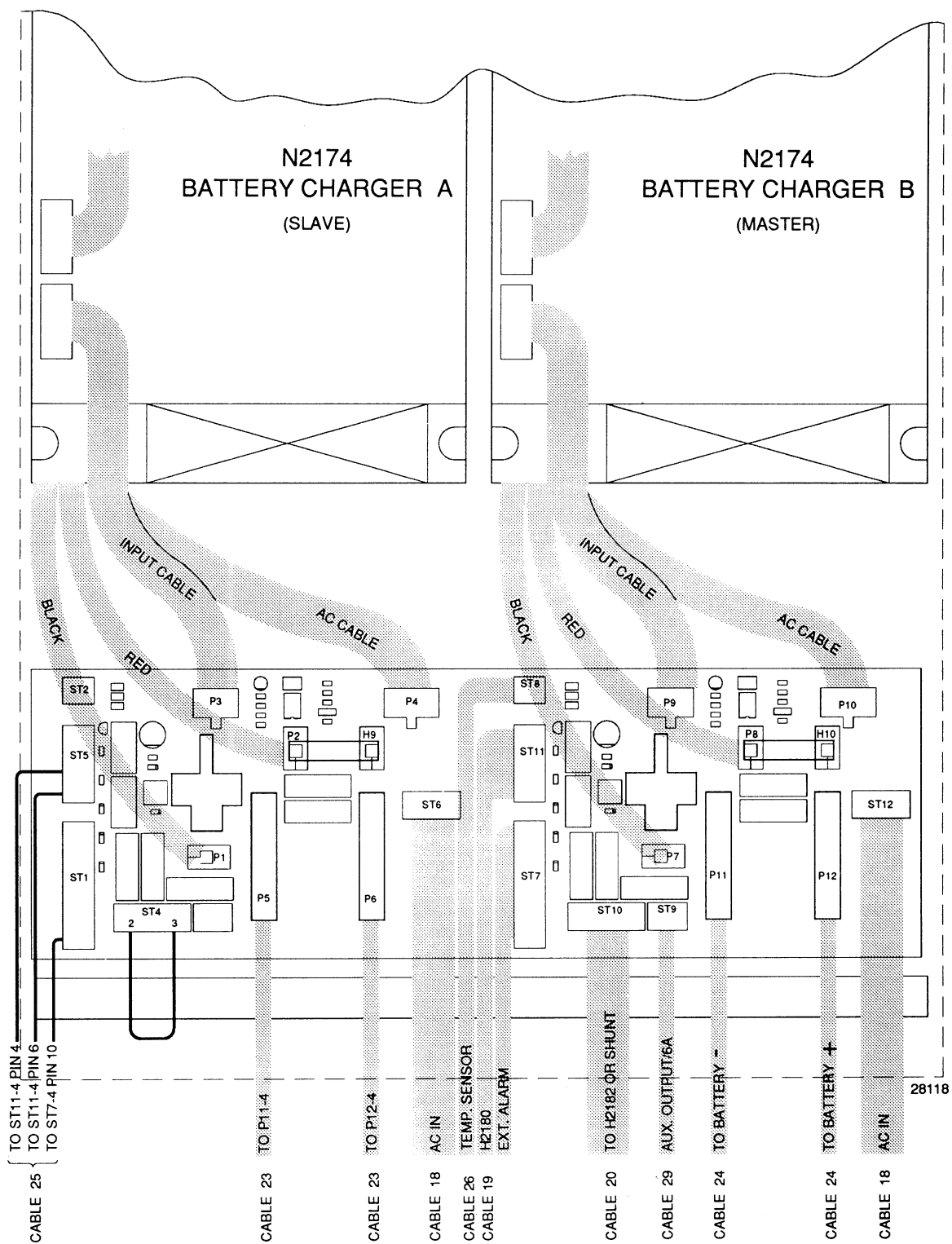
60 AMP BATTERY CHARGER



# **CONNECTION TO H2180 FOR N2174 60 AMP DUAL BATTERY CHARGER**



## CONNECTION TO N2174 DUAL







2.3 FUSE BOX H2182

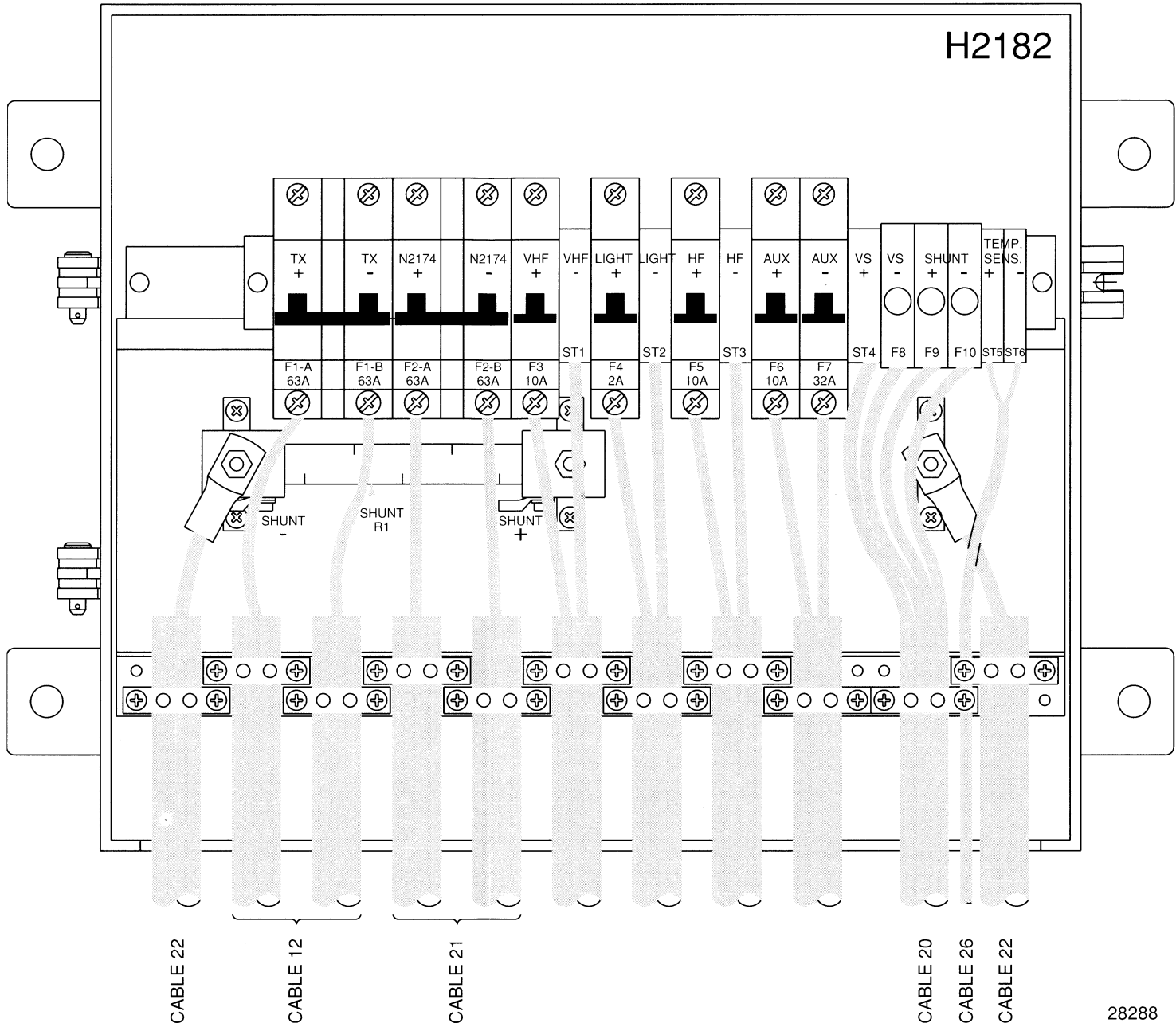
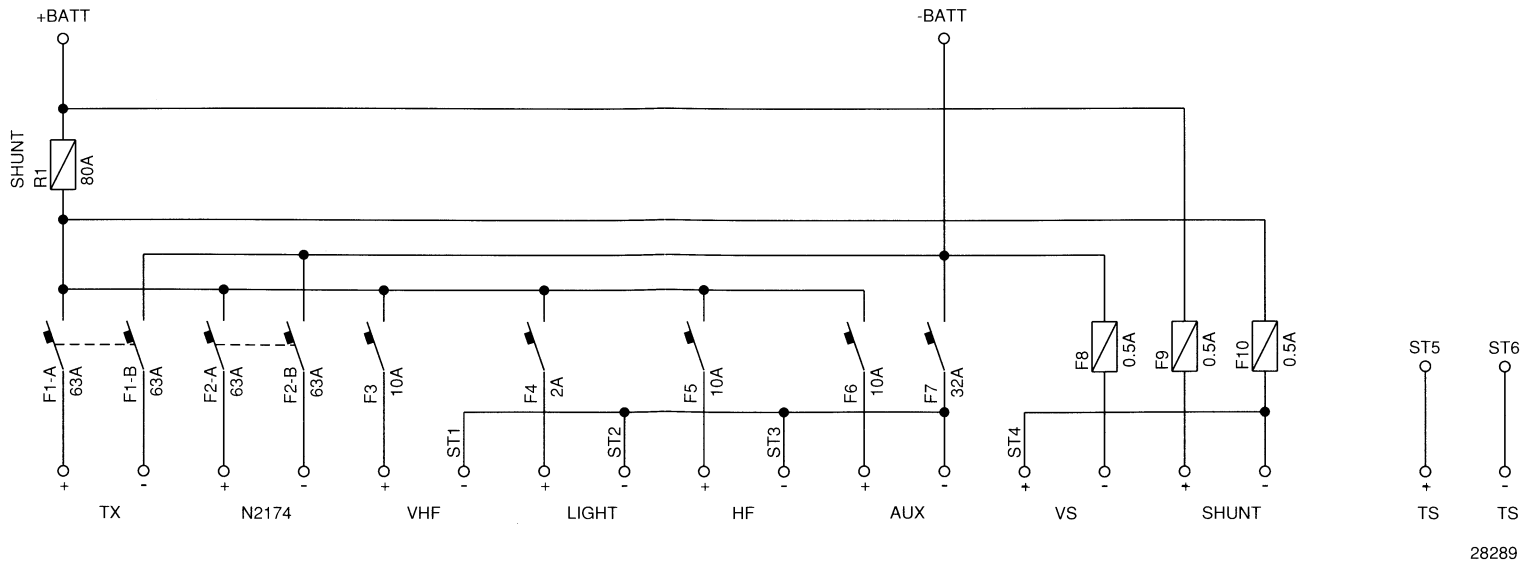


DIAGRAM FOR FUSE BOX H2182



2.4 FUSE BOX H2183

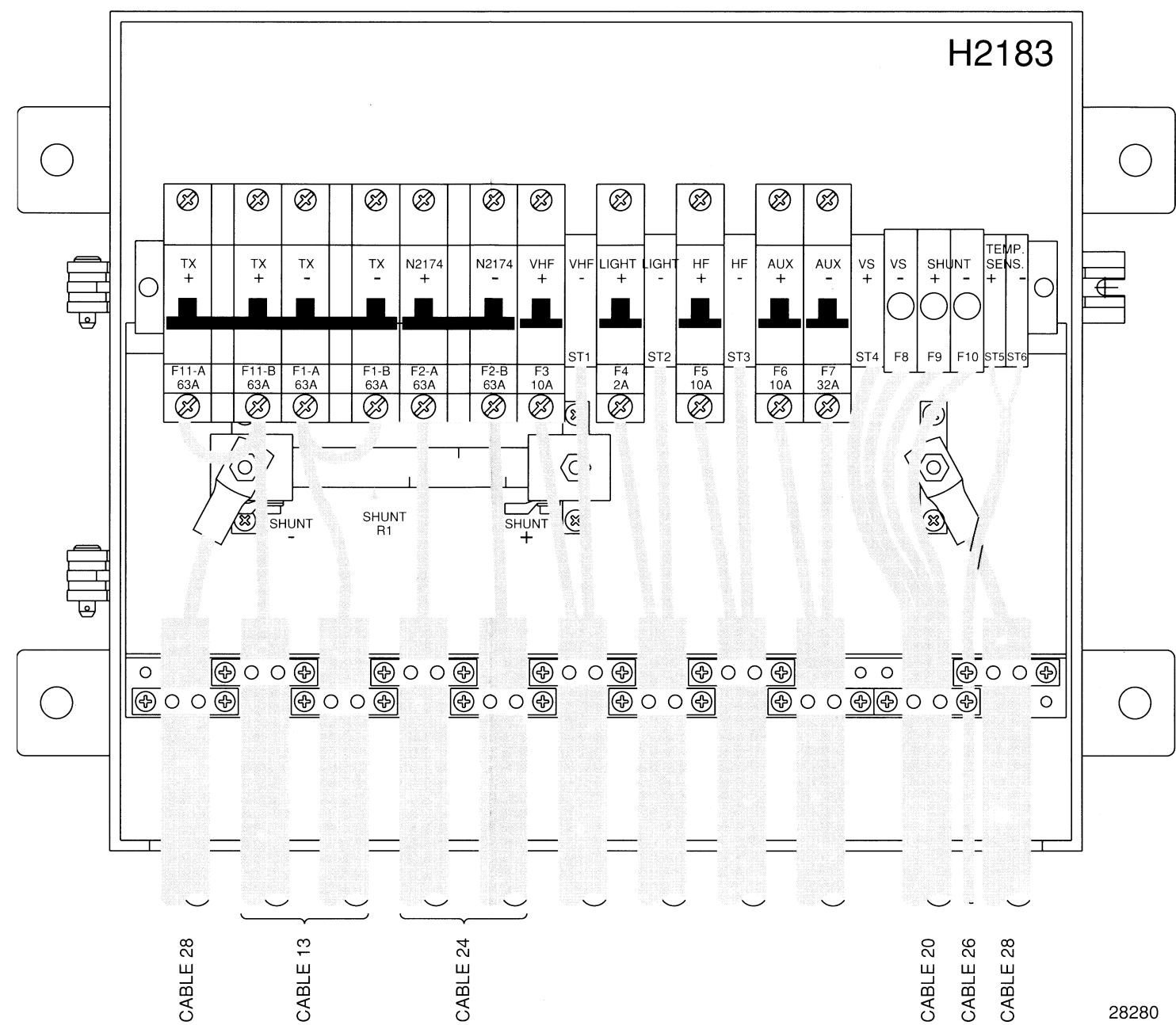
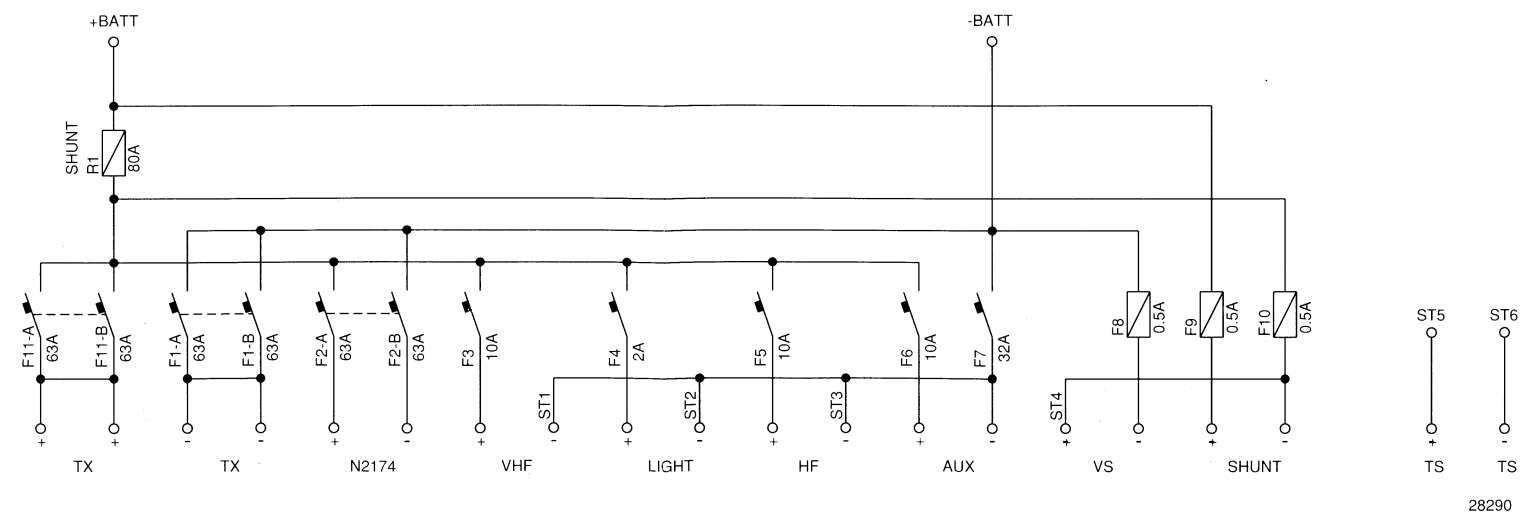


DIAGRAM FOR FUSE BOX H2183



## CONTENTS

<b>3</b>	<b>SERVICE</b>	<b>3-1</b>
3.1	MAINTENANCE	3-1
3.2	RECOMMENDED TEST EQUIPMENT	3-1
3.3	TROUBLE SHOOTING	3-1
3.4	PERFORMANCE CHECK	3-1
3.5	NECESSARY CHECK AND ADJUSTMENT AFTER REPAIR	3-3

### 3 SERVICE

#### 3.1 MAINTENANCE

When the SAILOR N2174 has been correctly installed, the maintenance of the charger can, dependent on the environments and working hours, be reduced to a performance check at the service workshop at intervals not exceeding 5 years.

A performance check list is enclosed in the section 3.4 PERFORMANCE CHECK.

Also inspect cables and plugs for mechanical defects and corrosion.

Any repair of the set should be followed by a check described in the section 3.5 NECESSARY ADJUSTMENT AND CHECK AFTER REPAIR.

#### 3.2 RECOMMENDED TEST EQUIPMENT

Multimeter: Philips PM2518X

Oscilloscope: Philips PM3214

#### 3.3 TROUBLE SHOOTING

Trouble shooting, repair and check of the N2174 should only be performed by persons, who have sufficient technical knowledge and the necessary test equipment at their disposal.

To do some service of the SCR rectifier bridge, the blower frame can be turned upwards and placed in a service position (see chapter 4.1. MECHANICAL DISASSEMBLING AND MODULE LOCATION.)

When placed in service position, AC mains power may be connected and the N2174 can work normally even with full load.

1. The battery is gassing:
  - a) The charging current is too high for the battery type.
  - b) The *upper level* voltage is too high.
  - c) The *trickle charge* voltage is too high.
  - d) N2174 is strapped for wrong battery type.
  - e) The battery is defective.
2. N2174 can not switch on in MANUAL mode.
  - a) Fuse F1-5 or F2-5 is blown out.
  - b) Blower circuit is out of order.
  - c) Temperature on the SCR heatsink is too high (maybe blower failure).
3. N2174 can not switch on in AUTOMATIC mode.
  - a) Fuse F1-5 or F2-5 is blown out.
  - b) Blower circuit is out of order.
  - c) Temperature on the SCR heatsink is too high (maybe blower failure).
  - d) The output is short circuited.
  - e) The battery voltage is below 5V.

#### 3.4 PERFORMANCE CHECK

To handle the performance check in an easy way, it is recommended to connect the N2174 to a disconnected connection board (module 3 or module 4) used for the charger.

Any value, which differs too much from the values given in this chapter, should lead to a repair of the circuit or module in question.

Hints to locate some faults are given in the chapter 3.3 TROUBLE SHOOTING.

The given values in this chapter is basically for 24V **maintenance free lead-acid batteries**.

If the battery temperature sensor is connected, the values are only valid if the battery temperature is 25° degree centigrade.

Values for other types such as Nickel-Cadmium batteries must be found in data sheet for the battery type in question.

### 3.4.1 PERFORMANCE CHECK OF MANUAL CHARGE MODE

1. Connect the N2174 to the charger connection board (module 3 or module 4).
2. Connect the N2174 to the AC mains, which it is strapped for. See 5.3 MAIN SCHEMATIC DIAGRAM. Normally the N2174 is strapped for 220V AC.
3. Connect a small dummy load to the output. A resistor of 27 ohm/50W is sufficient to get a proper regulation.
4. On the connection boards are placed three positions for a strap. The positions are marked REMOTE, AUTO and MAN. Normally the strap is placed in REMOTE position. Now move the strap to MAN position and the N2174 is switched on in MANUAL charge mode. The output voltage is fluctuating, but that is normal because the battery is missing.
5. With a voltmeter across the output, read the voltage to 29VDC +- 0.5V.
6. Connect a new dummy load of 0.77 ohm/900W to the output. It can be made by paralleling several power resistors.
7. Read the output voltage to 23VDC +- 2V. The output current is approx. 30A.
8. Let it run with full load and check that the blower switches on within 6 minutes.
9. Move the strap on the connection board back to REMOTE position.

### 3.4.2 PERFORMANCE CHECK OF AUTOMATIC CHARGE MODE

1. Connect the N2174 to the charger connection board (module 3 or module 4).
2. Connect the N2174 to the AC mains, which it is strapped for. See 5.3 MAIN SCHEMATIC DIAGRAM. Normally the N2174 is strapped for 220V AC.
3. Connect a small dummy load to the output. A resistor of 27 ohm/50W is sufficient to get a proper regulation.
4. The remote voltage sense terminals called +VS and -VS must be connected to the dummy load.
5. On the AUTOMATIC module check that a strap is placed in P5 in MS position, and also check that a strap is placed in P3 (TS-OFF position).
6. On the connection boards are placed three positions for a strap. The positions are marked REMOTE, AUTO and MAN. Normally the strap is placed in REMOTE position. Now move the strap to AUTO position.
7. With a voltmeter across the output, read the voltage to 0V. The N2174 is not switched on, because the battery is missing.
8. Connect to the output a small power supply capable of delivering 1.5A and adjustable up to 30V.

9. The small power supply is set to a voltage over 5V. Then the N2174 is switched on and the small power supply can be disconnected.
10. At first the output voltage is approx. 34VDC, but after 10 seconds the voltage falls down to 27.3V  $\pm$  0.2V. This is the *trickle charge* voltage.
11. On the connection board move the strap back to REMOTE position. The N2174 is now switched off.
12. Connect again the small power supply to the output and set it to 24.0V.
13. The AUTOMATIC module is now in *charge* mode. All LED on the module is alight. After 10 seconds the LED D31-2 (marked TRICKLE) is off.
14. Turn up slowly the voltage from the small power supply until D31-2 (marked TRICKLE) turns on and then read the voltage to 28.8VDC  $\pm$  0.2V. This is the *upper level shift* and the N2174 is now in *trickle charge* mode.
15. Turn back the voltage from the small power supply until D30-2 (marked CHARGE) turns on and read the voltage to 25.8VDC  $\pm$  0.2V. This is the *lower level shift* and the N2174 is now in *charge* mode.
16. Connect again the small power supply to the output and set it for a voltage over 5V to cancel the fault-stop circuit.
17. On the connection board now move the strap to AUTO to switch on the N2174.
18. While running, connect to the output a new dummy load of 0.77 ohm/900W and read the output voltage to 23VDC  $\pm$  1V. The output current is 30A.
19. Connect an oscilloscope to the output and read the ripple voltage to max. 3V<sub>pp</sub>.
20. Let it run with full load and check that the blower switches on within 6 minutes.
21. **Remember** to move back the strap to REMOTE position on the connection board.
22. An other way to start up the N2174 in AUTOMATIC charge mode while connected to a dummy load, is to short circuit R15-2 a short moment to cancel the fault-stop circuit.

### 3.5 NECESSARY CHECK AND ADJUSTMENT AFTER REPAIR

*CHANGE OR REPAIR OF THE MANUAL CONTROL (module 1).*

Execute chapter **3.4.1. Performance check of manual charge mode.**

Adjust if necessary the output voltage to 29.0VDC  $\pm$  0.2V with R4-1.

Execute chapter **3.4.2. Performance check of automatic charge mode.**

Adjust if necessary the output voltage to 23.0VDC  $\pm$  0.2V with R60-2. (Current limiter for 30A).

*CHANGE OR REPAIR OF THE AUTOMATIC CONTROL (module 2).*

Execute chapter **3.4.2. Performance check of automatic charge mode.**

Adjust if necessary the *trickle* voltage to 27.3VDC  $\pm$  0.1V with R39-2. (see data sheet for Nickel-Cadmium battery, if that type is connected to the charger, to adjust the *trickle* voltage for that type).

Adjust the *upper level* voltage to 28.8VDC  $\pm$  0.1V with R63-2. (see data sheet for Nickel-Cadmium battery, if that type is connected to the charger, to adjust the *upper level* voltage for that type).

The adjustment is done by turning R63-2 full/clockwise. Then connect the small dummy load, and set the small power supply for 28.8VDC which turns on the LED D30-2 (CHARGE). Turn slowly R63-2 counter clockwise just until the LED D31-2 (TRICKLE) turns on.

Adjust if necessary the output voltage to 23VDC  $\pm$  0.2V with R60-2. (Current limiter for 30A).

## CONTENTS

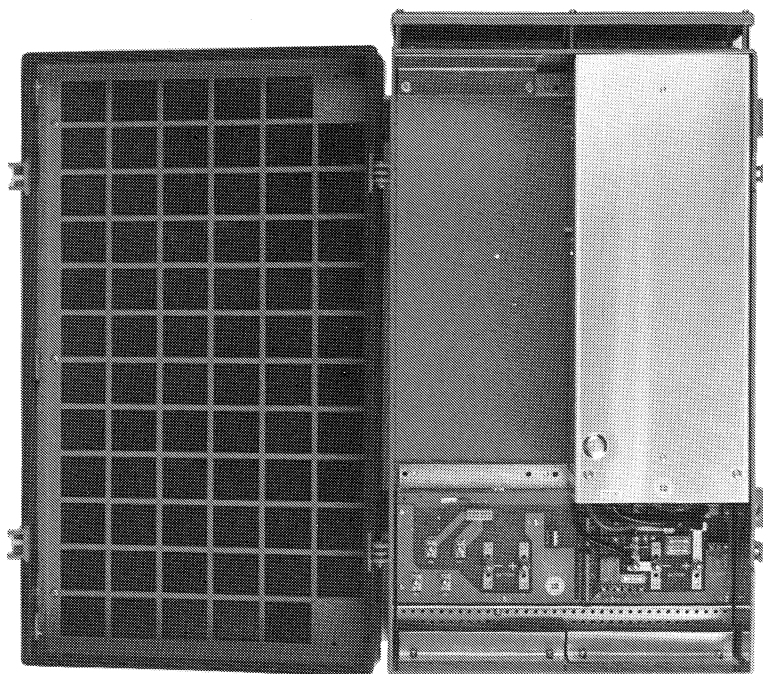
<b>4</b>	<b>MECHANICAL DESCRIPTION</b>	<b>4-1</b>
4.1	MECHANICAL ASSEMBLING / DISASSEMBLING AND UNITS LOCATION	4-1



## 4 MECHANICAL DESCRIPTION

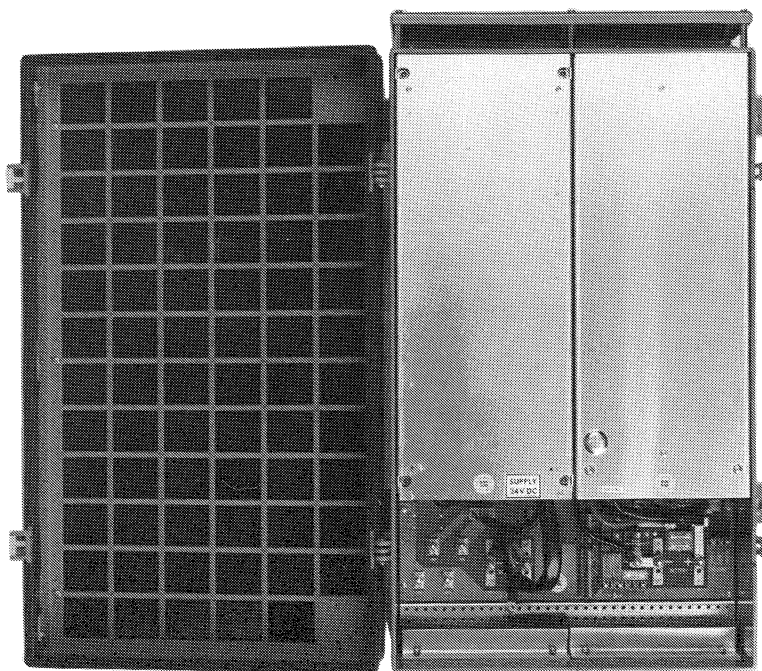
### 4.1. MECHANICAL ASSEMBLING / DISASSEMBLING AND UNITS LOCATION

#### SINGLE 30 AMP

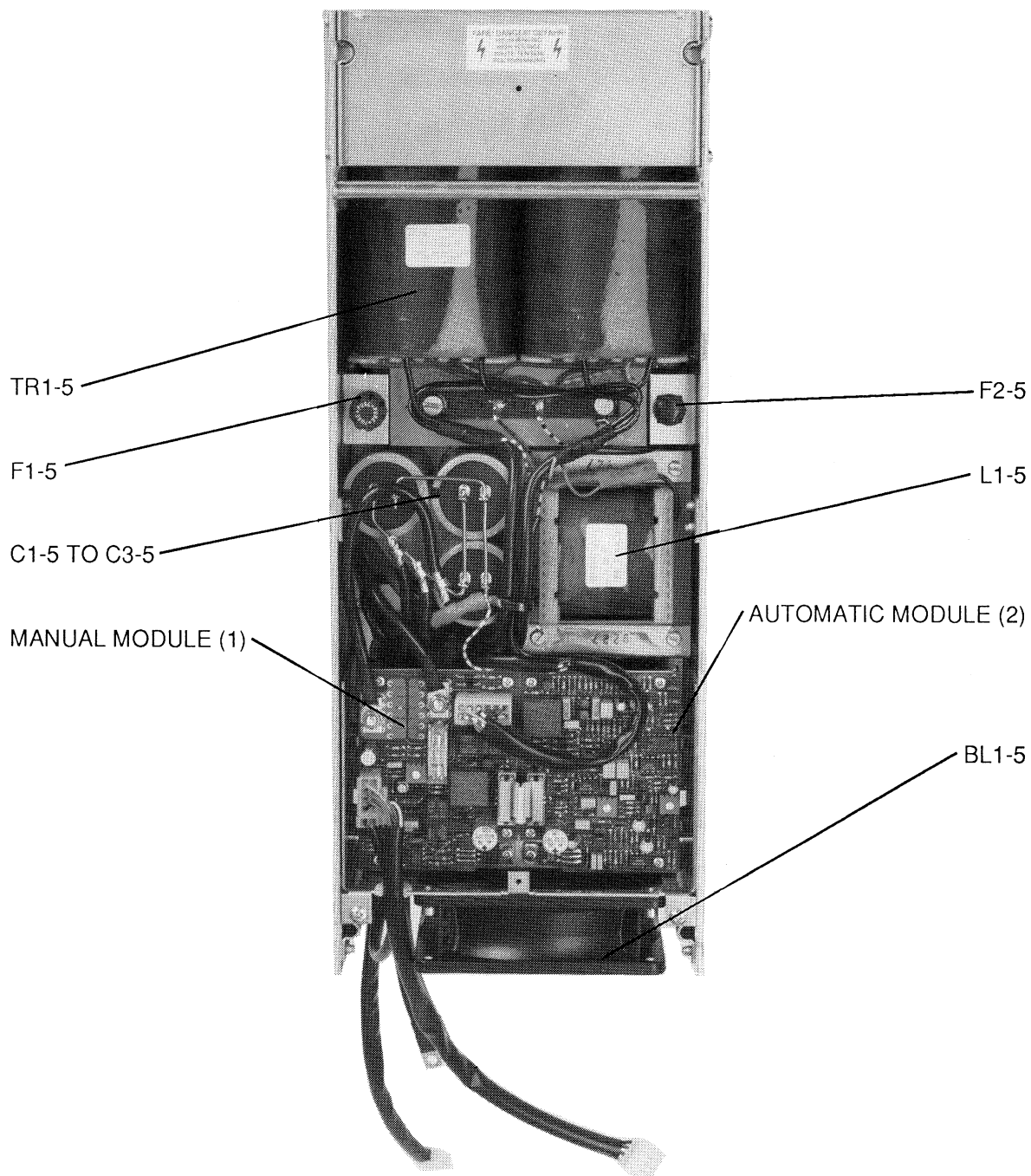


501303

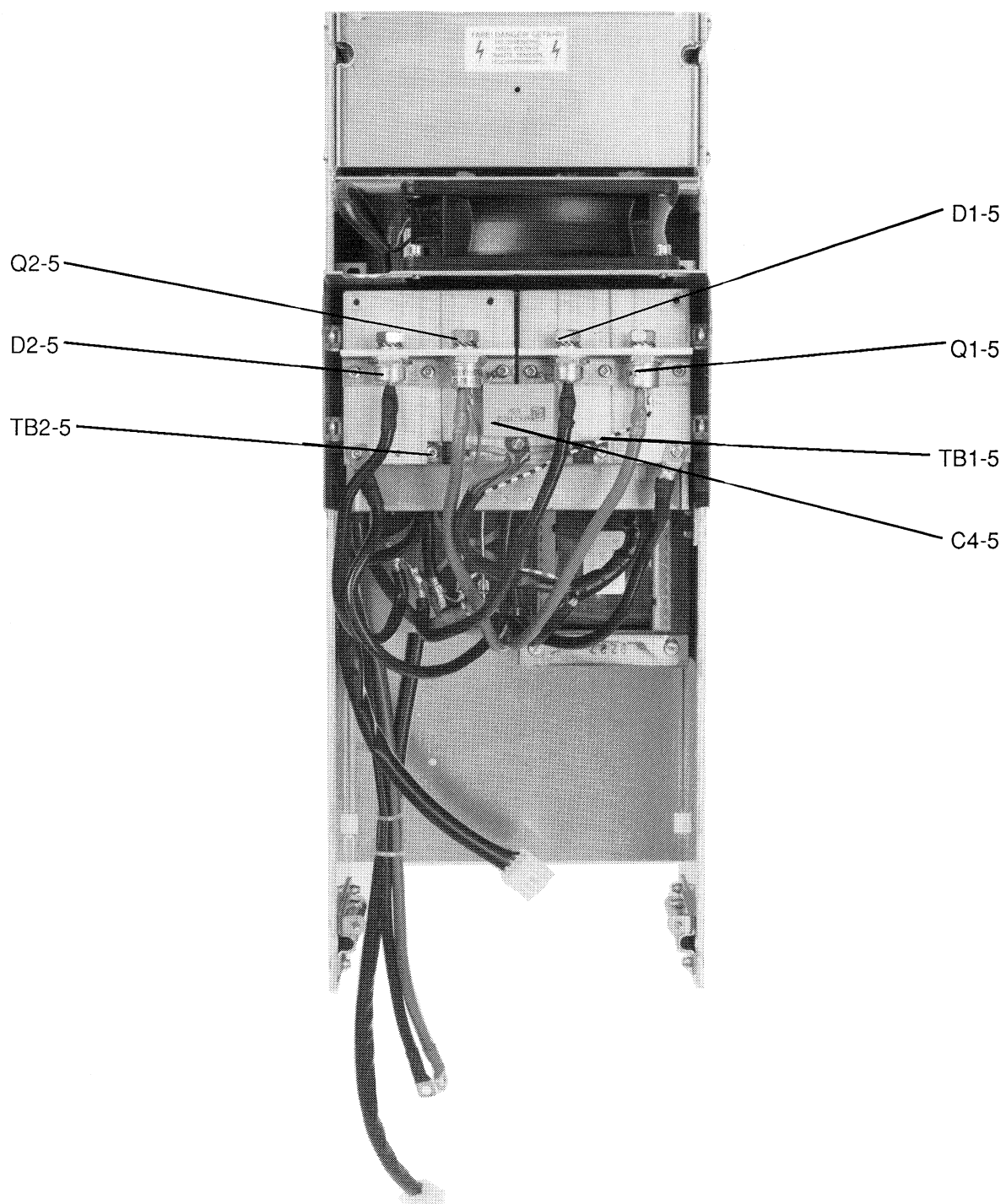
#### DUAL 60 AMP



501302



501298



501299

## CONTENTS

<b>5</b>	<b>CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS</b>	<b>5-1</b>
5.1	MANUAL CONTROL (MODULE 1) S.P.NO. 626444	5-1
5.2	AUTOMATIC CONTROL (MODULE 2) S.P.NO. 626445	5-5
5.3	CONN. SINGLE BATTERY CHARGER (MODULE 3) SP NO. 626446	5-11
5.4	CONN. DUAL BATTERY CHARGER (MODULE 4) SP NO. 626447	5-15
5.5	MAIN SCHEMATIC DIAGRAM N2174	5-18

## 5 CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS

### 5.1 MANUAL CONTROL (MODULE 1) S.P.NO. 626444

#### TRIGGER PULSE OSCILLATOR

This module also serves as an internal connection board, where all the cables inside N2174 are connected. The charger can work only with the MANUAL module present. If the AUTOMATIC module is out of order, it can be removed for repair while the charger is working in MANUAL mode. However, this mode is not recommended for long term charging, because of the simplified regulation of the output voltage to the battery.

In MANUAL mode the SCR's are triggered by a line synchronised relaxation oscillator performed by the unijunction transistor Q2. To synchronise the circuit to the line frequency, the circuit is connected to the 46V AC output from the transformer TR1-5.

When the output voltage comes over the reference voltage from D4, the transistor Q1 is switching off the oscillator and the SCR's are shut down until the output voltage again is falling. This maximum output voltage, which is depending on battery type, is adjusted with R4.

The output current runs through the resistors R24 to R29 and generates a voltage, which also shuts down the oscillator by Q5 when the current exceeds approx. 30A.

The change over from MANUAL mode to AUTOMATIC mode is done by the relay RE2.

To switch off the MANUAL charge mode the relay RE1 is switched off by a remote switch.

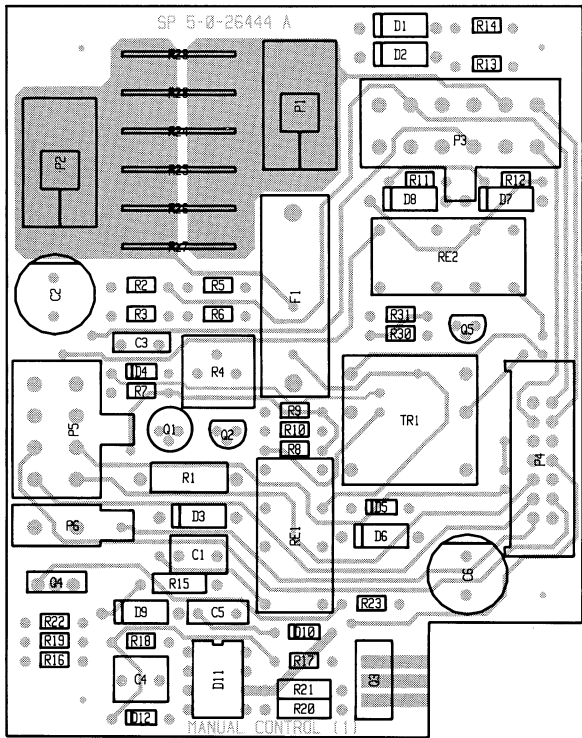
#### BLOWER CIRCUIT

The blower is supplied by approx. 27VDC. This voltage is taken from the 46V AC transformer output and is rectified by D1 and D2. The FET Q3 is connected as a ripple clipper and the clipping level is controlled by the shunt regulator D11 by means of R20 and R21.

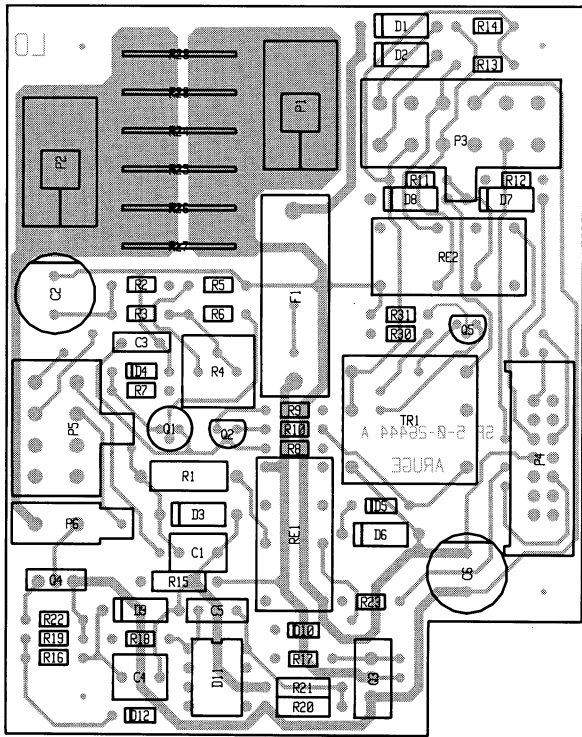
To switch on the blower a thermal breaker TB1-5 is placed on the heatsink for the SCR's. This thermal breaker turns on Q4, which again turns on the blower.

The voltage from Q3 called 26V is also used to supply the relays RE1 and RE2 via remote switches to switch on the MANUAL mode or the AUTOMATIC mode. The 26V is led through a thermal breaker TB2-5, which switches off the supply for the relays if the temperature on the SCR heatsink exceeds 90° degree centigrade in case of blower failure. This will shut down the charger until the temperature again comes under approx. 70°.

COMPONENT LOCATION MANUAL CONTROL MODULE 1



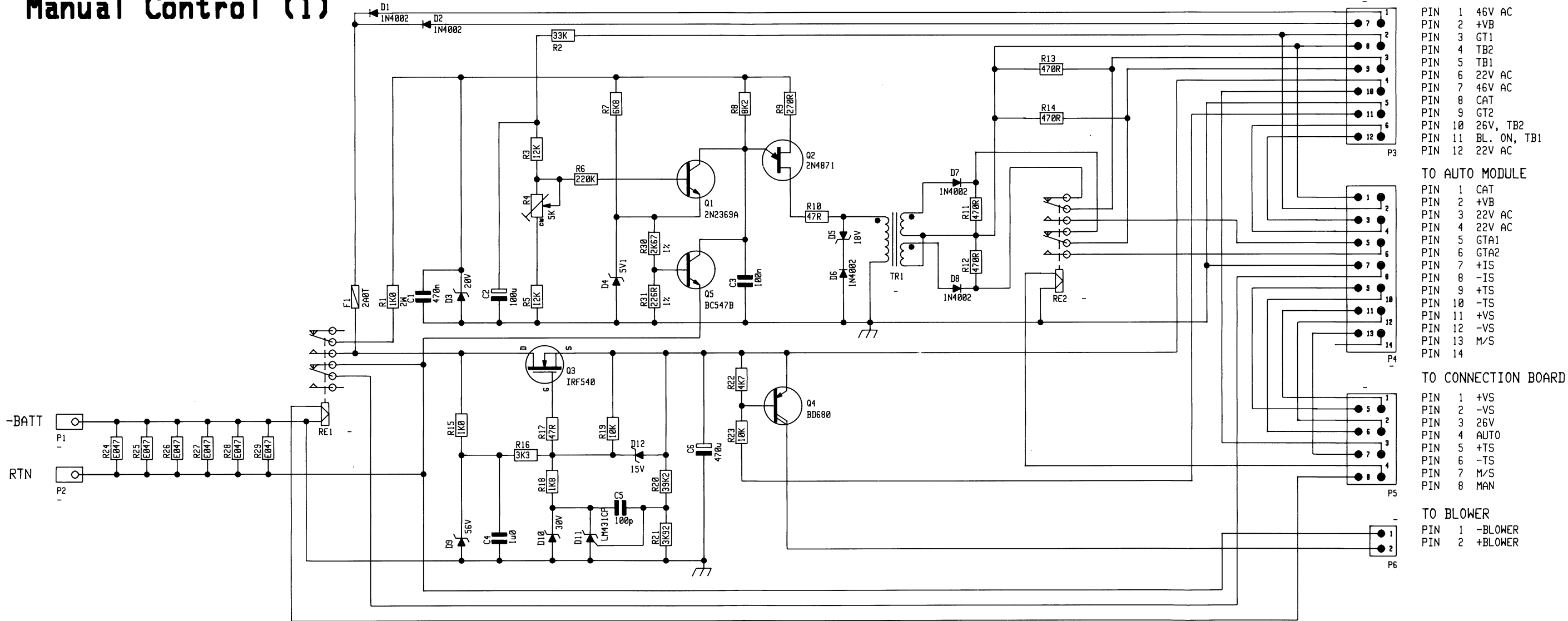
View from component side with upper side tracks.



View from component side with lower side tracks.

MANUAL CONTROL MODULE 1

Manual Control (1)



- PIN 1 46V AC  
PIN 2 +VB  
PIN 3 GT1  
PIN 4 TB2  
PIN 5 TB1  
PIN 6 22V AC  
PIN 7 46V AC  
PIN 8 CAT  
PIN 9 GT2  
PIN 10 26V, TB2  
PIN 11 BL. ON, TB1  
PIN 12 22V AC

- TO AUTO MODULE  
PIN 1 CAT  
PIN 2 +VB  
PIN 3 22V AC  
PIN 4 22V AC  
PIN 5 GTA1  
PIN 6 GTA2  
PIN 7 +IS  
PIN 8 -IS  
PIN 9 +TS  
PIN 10 -TS  
PIN 11 +VS  
PIN 12 -VS  
PIN 13 M/S  
PIN 14

- TO CONNECTION BOARD  
PIN 1 +VS  
PIN 2 -VS  
PIN 3 26V  
PIN 4 AUTO  
PIN 5 +TS  
PIN 6 -TS  
PIN 7 M/S  
PIN 8 MAN

- TO BLOWER  
PIN 1 -BLOWER  
PIN 2 +BLOWER

4-0-26444A

4-0-26444A





## 5.2 AUTOMATIC CONTROL (MODULE 2) S.P.NO. 626445

### CONTROLLED REFERENCE VOLTAGE VCR

The voltage regulator U1 produces a stable 15V supply for the on board circuits. To produce a reference voltage for the output voltage regulation, a circuit is build around U3. This circuit is highly stable but is also changeable according to the charger application, which is determined by placing a strap in P2.

**Strap placed in P2 (TS-ON)** means the temperature correction circuit around U2.1 is connected to the reference voltage regulator U3, which means the temperature sensor is connected to N2174. The reference voltage **VCR** will increase with decreasing temperature and visa versa. This causes the output *trickle* voltage and the *upper level* shift voltage to follow a temperature curve, which is characteristic of **lead-acid** batteries. The temperature coefficient of a 24V **lead-acid** battery is approx. -48 mV per degree centigrade. This temperature correction circuit may be used if the battery is placed in extreme temperature environment.

**Strap placed in P3 (TS-OFF)** means the temperature circuit is disconnected, but the charger is now in a **normal** condition for charging **maintenance free lead-acid** batteries.

**Strap placed in P4 (NiCd)** means that the output voltage is higher and therefor is able to charge batteries of the **Nickel-Cadmium** type. Depending on battery type the *trickle* voltage and the *upper level shift* voltage has to be adjusted. This is done by R39 and R63.

### FAULT-STOP

If the temperature sensor placed at the battery is short circuited or if the battery voltage is below approx. 4V, the circuit around U2.2 will shut down the **automatic** charge mode until the fault is removed.

### SYNCHRONISED PULSE TRIGGER

The circuit consisting of Q3, Q4, D11, D12 and C8 generates a line synchronised ramp voltage. This ramp is compared with the DC level from the current limiter U5.2 or from the voltage regulation circuit U5.1. This comparison is done by U4.1, which generate a pulse width modulated signal to control the SCR trigger pulses created by the astable multivibrator of Q5 and Q6.

### OUTPUT VOLTAGE REGULATION

The U4.2 is a buffer for the remote voltage sense wires, which senses the battery voltage at the battery in order to cancel voltage loss in the cable between the charger and the battery. This circuit is protected against accidentally wrong connection of the remote sense wires. The output signal of U4.2 is led to the fault stop circuit U2.2, to the level shift circuit and to the error amplifier U5.1. The error amplifier compares the battery voltage to the reference voltage VCR to create a signal to control the duty cycle of the SCR trigger pulses, which again regulates the output voltage and the current to the battery. When the charger is in the **trickle** charge mode, the transistor Q8 is ON, which gives a constant output voltage, which can be adjusted by R39.

When the charger is in **charge** mode the output voltage has to be higher to drive maximum current into the battery, this is done by turning off Q8. The state of Q8 is controlled by the level shift circuit around U7. This is called the **MASTER** configuration, where the strap of P5 is placed over pin 1 and pin 2 (MS position).

If it is required to control the output voltage by an other N2174 charger unit working in parallel, the strap of P5 is placed over pin 2 and pin 3 (SL position). This is called the **SLAVE** configuration.

### CURRENT LIMITER

The current sense resistors R24-1 to R29-1 for the current limiter circuit U5.2 are placed on the **manual control** (module 1). The reference voltage for the current limiter comes from D29 and is compared to the current sense voltage from module 1. The current limiter can be adjusted by means of R63.

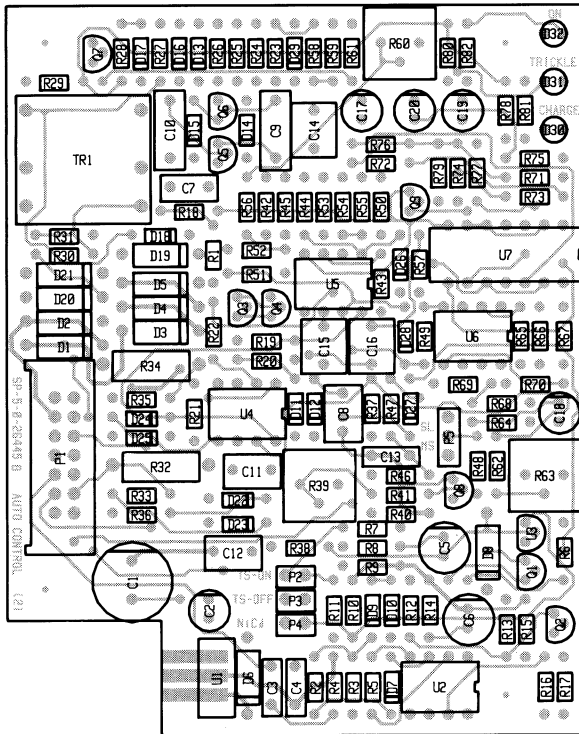
**LEVEL SHIFT CIRCUIT**

The output from U4.2 is led to the voltage follower and filter U6.1. When the battery voltage is exceeding the *upper level*, determined by R63, the comparator U6.2 goes high. This causes the gates U7 to turn off Q9 and by R79 the Q8 is turned on in order to reduce the output voltage of the charger to *trickle charge* level. When the battery voltage goes under the *lower level*, the comparator U6.2 goes low, which again turns off the Q8 and the charger goes into *charge* mode and so on. The *lower level* is approx. 10% below the *upper level*. The gates U7 performs delay for the shifting time. When the charger has changed to one state, it stays there for 10 seconds before it can be changed back. This is to prevent transients to unstable the shifting from one state to the other.

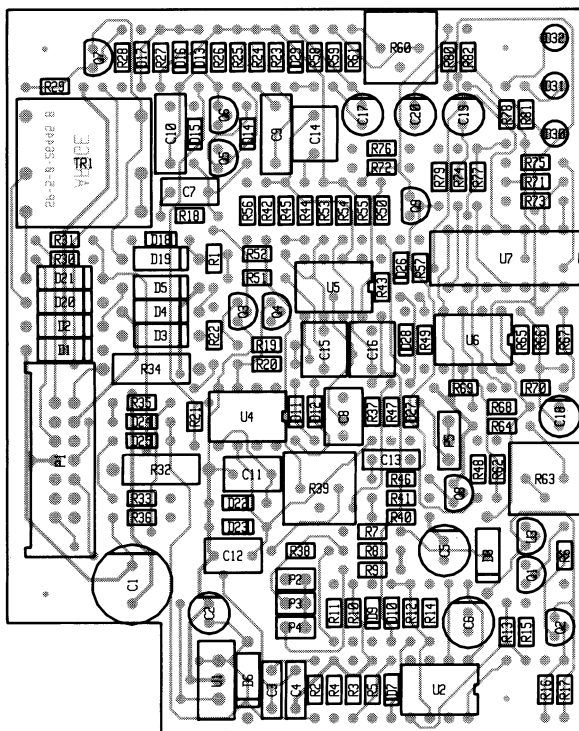
The LED's is indicators to tell in what state the charger is working in. That might be useful when adjusting the *level shift* with R63. When in *charge* mode the D30 (marked CHARGE) is ON and when in *trickle* mode the D31 (marked TRICKLE) is ON. The D32 (marked ON) indicates that AC mains power is on.



## COMPONENT LOCATION AUTOMATIC CONTROL MODULE 2



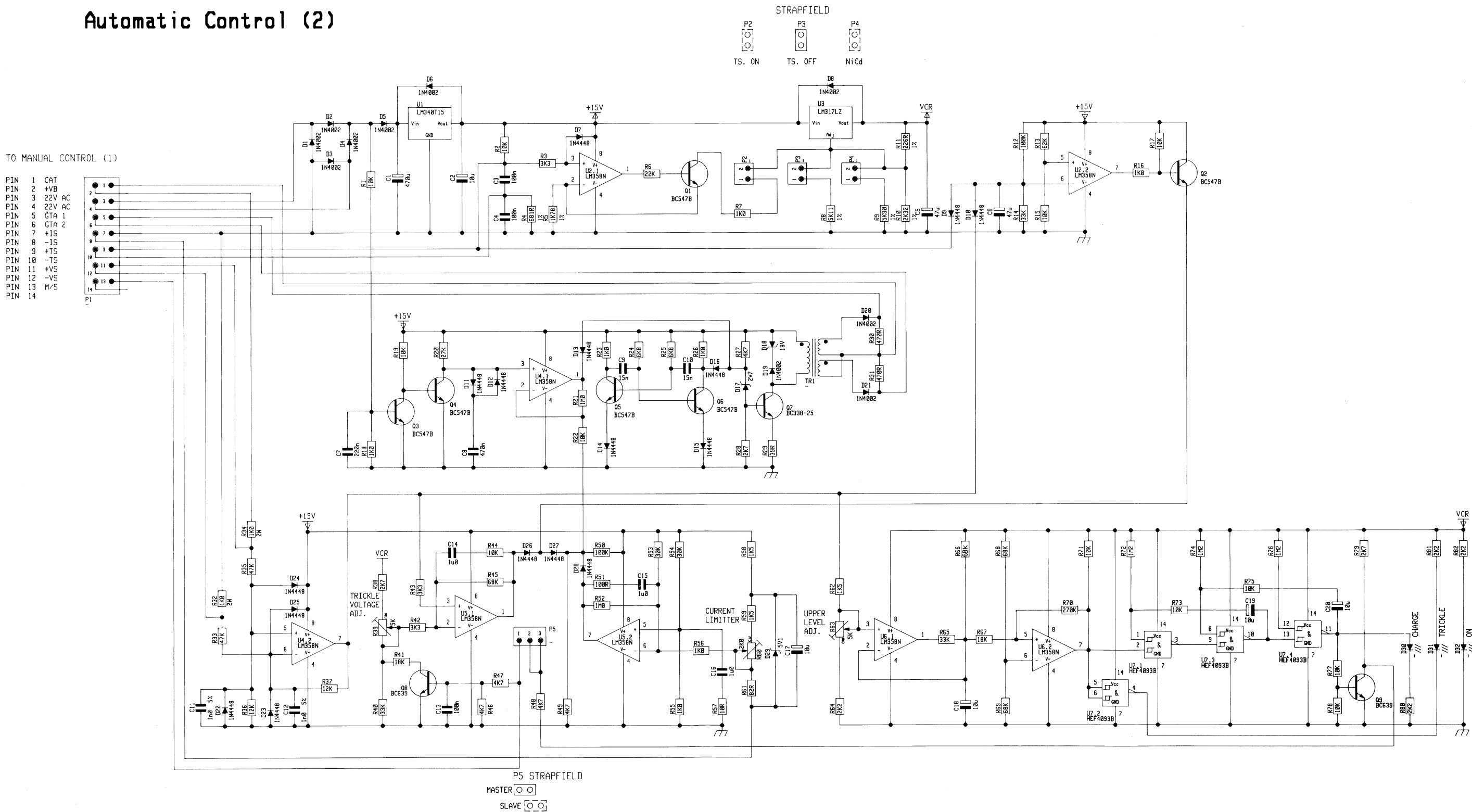
View from component side with upper side tracks.



View from component side with lower side tracks.

AUTOMATIC CONTROL MODULE 2

Automatic Control (2)



4-0-26445D

### 5.3 CONN. SINGLE BATTERY CHARGER (MODULE 3) SP NO. 626446

#### CIRCUIT DESCRIPTION

The connection board consist of two part: One part for connection to the power supply N2170 and one part for connection to the BATTERY CHARGER N2174. The part for the N2174 contains the connections for the REMOTE BOX N2180, for the FUSE BOX N2182, for the battery temperature sensor, for the voltage alarms and for an auxillary output.

The battery voltage and the charge current are monitored by the remote voltage sense wires (+VS and -VS) and by the current shunt wires (+SHUNT and -SHUNT), connected to the connection board and led to the REMOTE BOX N2180.

Connections for the voltage alarms can be connected in several ways depending on the need. The relay RE2 is activated by the "26V" from N2174. When the AC mains fails, the "26V" disappears and the relay RE2 falls. This might be used to give alarm for AC mains failure.

The comparator U1 is a **battery low detector**, which switches off the relay RE1, if the battery voltage goes under a preset value set by R2. Normally it is set for detecting battery voltage under 24VDC.

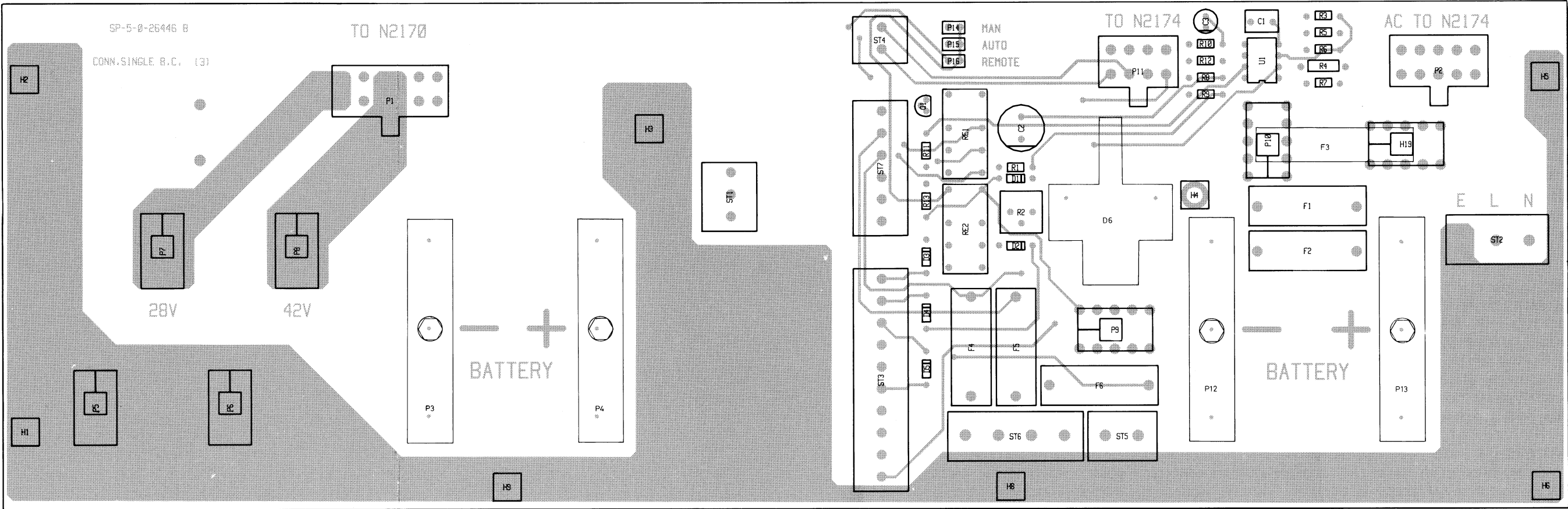
The diode D6 protects against reverse polarity of the battery.

The connection board also contains a **service strapfield**. It might be useful during adjustment of the charger N2174, if the REMOTE BOX H2180 is placed far away. The strapfield has the same function as the switches in H2180. Normally the strap is placed in REMOTE position, which means the H2180 is controlling the N2174. Moving the strap to MAN position means that the N2174 is forced to charge in MANUAL mode. Moving the strap to AUTO position means that the N2174 is forced to charge in AUTOMATIC mode. Remember to move the strap back to REMOTE position when the adjustment of the N2174 is completed.

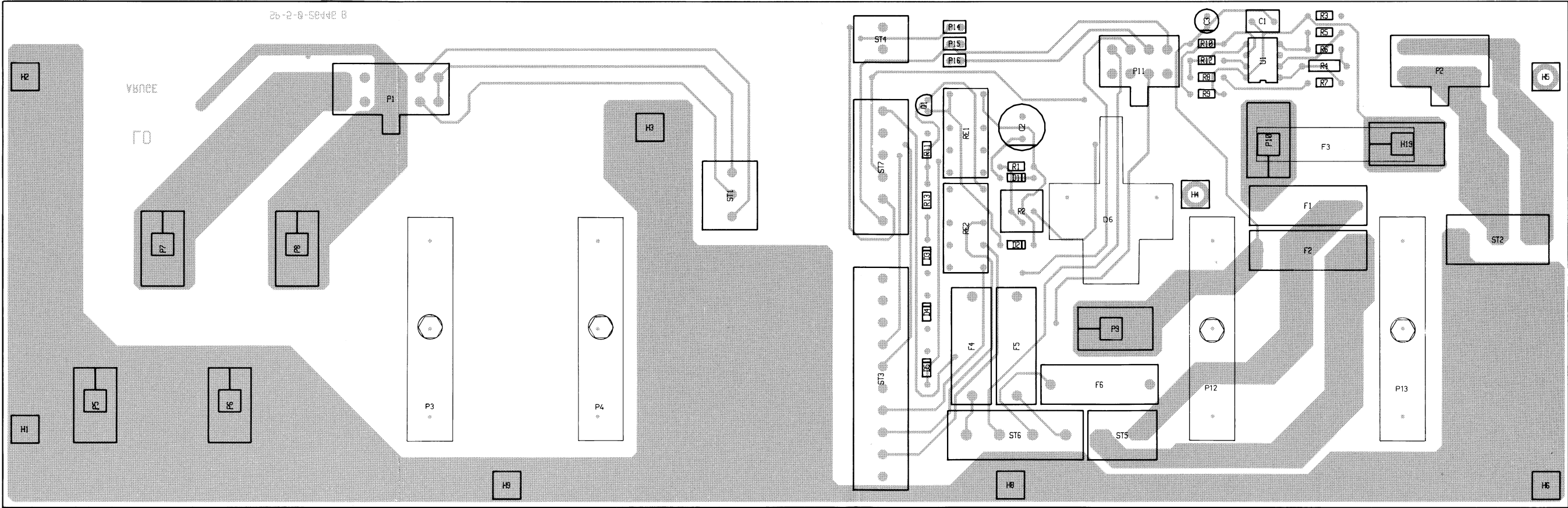
#### ADJUSTMENT OF BATTERY LOW DETECTOR

Disconnect the connection board from the battery and connect a power supply to the output terminals for the battery and set it for 24.0VDC. Turn R2 fully counter clockwise and the relay RE1 is activated. Then turn R2 slowly clockwise just until the relay RE1 falls. Now the RE1 will fall when battery voltage goes under 24.0V and will not be activated again before the battery voltage is over 25.5V.

COMPONENT LOCATION CONN. SINGLE BATTERY CHARGER MODULE 3



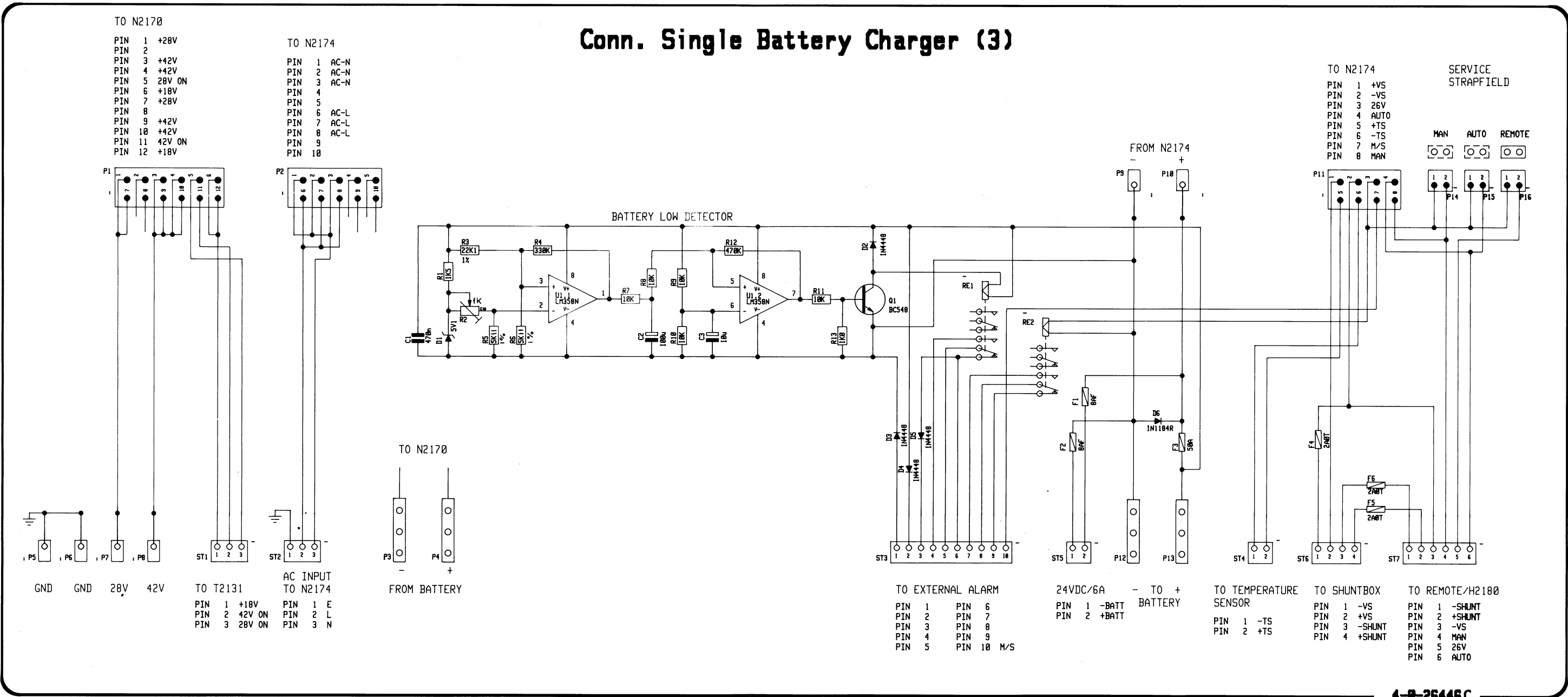
View from component side with upper side tracks.



View from component side with lower side tracks.

CONN. SINGLE BATTERY CHARGER MODULE 3

4-0-26446C



4-0-26446C





## 5.4 CONN. DUAL BATTERY CHARGER (MODULE 4) SP NO. 626447

### CIRCUIT DESCRIPTION

The connection board consist of two equal parts. One part for each N2174. The two N2174 can be connected as two separate and independent chargers, but the two N2174 can also be connected in parallel (DUAL) to form a high current charger of 60A. In DUAL operation the outputs from both N2174 are connected together. One N2174 is designated MASTER and the other N2174 as SLAVE. The designation is determined by a strap placed in the AUTOMATIC module in N2174 (see circuit description for that module). On the connection board the SLAVE unit is connected to the MASTER unit by three wires. That is the MAN wire (ST5 pin 4 to ST11 pin 4), the AUTO wire (ST5 pin 6 to ST11 pin 6) and the M/S wire (ST1 pin 10 to ST7 pin 10). In DUAL operation only the MASTER part of the connection board (normally designated N2174-II) is connected to the environment. It contains all the connections for the REMOTE BOX N2180, for the FUSE BOX N2182, for the battery temperature sensor, for the voltage alarms and for an auxiliary output.

The battery voltage and the charge current are monitored by the remote voltage sense wires (+VS and -VS) and by the current shunt wires (+SHUNT and -SHUNT), connected to the connection board and led to the REMOTE BOX N2180.

Connections for the voltage alarms can be connected in several ways depending on the need. The relay RE4 is activated by the "26V" from N2174. When the AC mains fails, the "26V" disappears and the relay RE4 falls. This might be used to give alarm for AC mains failure.

The comparator U2 is a **battery low detector**, which switches off the relay RE3, if the battery voltage goes under a preset value set by R16. Normally it is set for detecting battery voltage under 24VDC.

The diodes D6 and D12 protects against reverse polarisation of the battery.

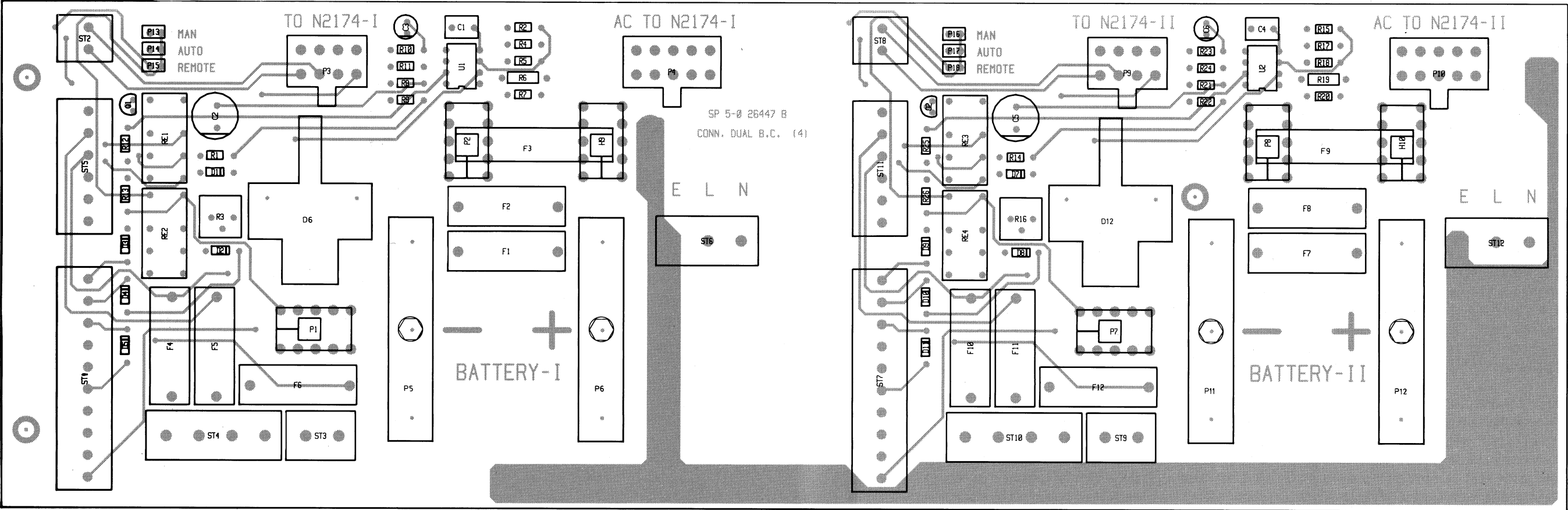
The connection board also contains a **service strapfield**. It might be useful during adjustment of the charger N2174, if the REMOTE BOX H2180 is placed far away. The strapfield has the same function as the switches in H2180. Normally the strap is placed in REMOTE position, which means the H2180 is controlling the N2174. Moving the strap to MAN position means that the N2174 is forced to charge in MANUAL mode. Moving the strap to AUTO position means that the N2174 is forced to charge in AUTOMATIC mode. Remember to move the strap back to REMOTE position when the adjustment of the N2174 is completed.

### ADJUSTMENT OF BATTERY LOW DETECTOR

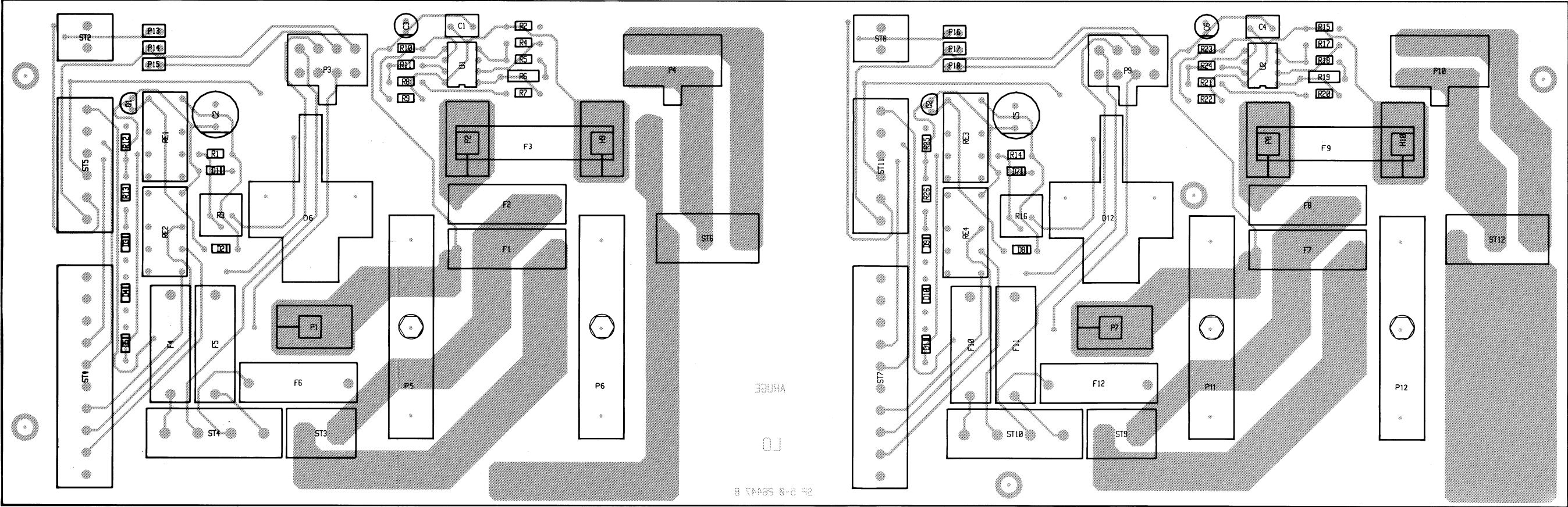
Disconnect the connection board from the battery and connect a power supply to the output terminals for the battery and set it for 24.0VDC. Turn R16 fully counter clockwise and the relay RE3 is activated. Then turn R16 slowly clockwise just until the relay RE3 falls. Now the RE3 will fall when battery voltage goes under 24.0V and will not be activated again before the battery voltage is over 25.5V.

The other part of the connection board can be adjusted in the samme way.

COMPONENT LOCATION CONN. DUAL BATTERY CHARGER MODULE 4

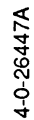


View from component side with upper side tracks.

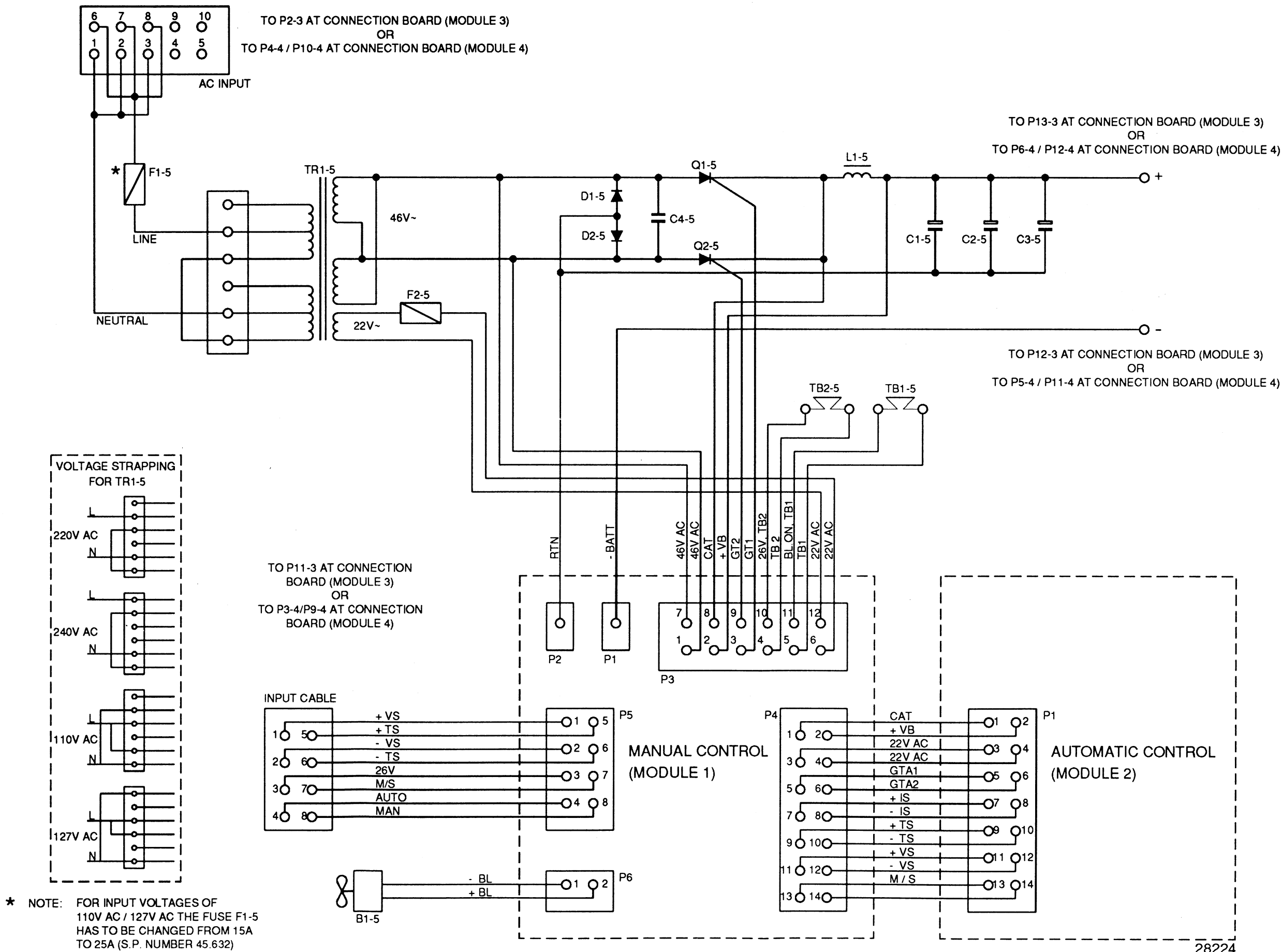


View from component side with lower side tracks.

### Conn. Dual Battery Charger (4)



5.5 MAIN SCHEMATIC DIAGRAM N2174



**CONTENTS**

**6 PARTS LISTS**

**6-1**

## 6 PARTS LISTS

BATTERY CHARGER UNIT 600W			HF SSB PROGRAMME	ESPERA	0-0-26440	726440
POSITION	DESCRIPTION			MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	1 POLE FUSEHOLDER	342.014		WICKMANN	342.014	78.393
VARIOUS	1 POLE FUSEHOLDER	FEP031 1001		SHURTER	FEP031 1001	78.423
-1	MANUAL CONTROL (MODULE 1)	N2174		ESPERA	5-0-26444A 4-0-26444A	626444
-2	AUTO CONTROL (MODULE 2)	N2174		ESPERA	5-0-26445B 4-0-26445D	626445
BL1-5	FAN 24VDC	119x119x38mm		PAPST	4124 KX	60.100
C1-5	CAPACITOR ELECTROLYTIC	10000uF -10/+50% 63VDC		PHILIPS	2222 050 68103 & 4322 043 05581 & 4322 043 05561	14.870
C2-5	CAPACITOR ELECTROLYTIC	10000uF -10/+50% 63VDC		PHILIPS	2222 050 68103 & 4322 043 05581 & 4322 043 05561	14.870
C3-5	CAPACITOR ELECTROLYTIC	10000uF -10/+50% 63VDC		PHILIPS	2222 050 68103 & 4322 043 05581 & 4322 043 05561	14.870
C4-5	CAPACITOR MKT	6u8F 10% 100VDC		PHILIPS	2222 373 21685	11.084
F1-5	FUSE	15AM Ø6.3x32mm		LITTELFUSE	311015	45.630
F2-5	FUSE	5x20mm 500mA M 250V		ELU	172000	45.513
L1-5	CHOKE FIXED	2mH/30A 50Hz		TRADANIA A/S	6-0-27671A	20.257
TB1-5	THERMAL BREAKER	ON: 70 centigrade		AIRPAX	67F070	44.056
TB2-5	THERMAL BREAKER	OFF: 90 centigrade		AIRPAX	67L090	44.075
TR1-5	TRANSFORMER MAINS	1k3VA N2174		TRADANIA A/S	6-0-27672B	22.188

MANUAL CONTROL (MODULE 1) N2174			ESPERA	5-0-26444A 4-0-26444A	626444
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C1-1	CAPACITOR MKT	470nF 20% 63VDC	ERO	MKT 1826-447/06 6-G	11.188
C2-1	CAPACITOR ELECTROLYTIC	100uF -20/+50% 63VDC	ELNA	RJ2-63-V-101-M-F	14.620
C3-1	CAPACITOR MKT	100nF 5% 63VDC	PHILIPS	2222 370 79104	11.135
C4-1	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	2222 370 79105	11.190
C5-1	CAPACITOR CERAMIC	100pF 5% NPO 50VDC	NKE	DT 380 758L CH 101 J 50V	15.136
				FLAT PACK	
C6-1	CAPACITOR ELECTROLYTIC	470uF -20/+50% 40VDC	ELNA	RJ3-50-471-M-F	14.650
D1-1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D2-1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D3-1	DIODE ZENER	20V 5%	THOMSON-CSF	BZV47C20	26.772
D4-1	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS	BZX79C5V1	26.527
D5-1	DIODE ZENER	18V 5% 0.4W BZX79C18	PHILIPS	BZX79C18	26.564
D6-1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D7-1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D8-1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D9-1	DIODE ZENER	56V 5%	THOMSON-CSF	BZV47C56	26.788
D10-1	DIODE ZENER	30V 5% 0.4W BZX79C30	PHILIPS	BZX79C30	26.578
D11-1	DIODE SHUNT REGULATOR	PROGRAMMABLE TL431C	MOTOROLA	TL431CP	26.997
D12-1	DIODE ZENER	15V 5% 0.4W BZX79C15	PHILIPS	BZX79C15	26.561
F1-1	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
P1-1	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P2-1	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P3-1	MULTIPLUG	2x6 POLES PCB VERSION	MOLEX	39-28-1123	78.221
P4-1	PLUG	2x7 POLES	3M	3598-6002 / 7614-6002 JL	78.254
P5-1	MULTIPLUG	2x4 POLES PCB VERSION	MOLEX	39-28-1083	78.218
P6-1	PLUG 2POLES		MOLEX	39-28-1023	78.215
Q1-1	TRANSISTOR RF SWITCH	2N2369A	MOTOROLA	2N2369A	28.315
Q2-1	TRANSISTOR UNJUNCTION	2N4871	MOTOROLA	2N4871	29.810
Q3-1	TRANS.POW.MOSFET N-CHANN.	100V/27A/85mOHM IRF540	MOTOROLA	IRF540	29.402
Q4-1	TRANSISTOR	BD680	MOTOROLA*	BD680	29.338
Q5-1	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
R1-1	RESISTOR PMF	1kΩ OHM 5% 2W	PHILIPS	2322 194 13102	04.200
R2-1	RESISTOR MF	33k OHM 5% 0.33W	PHILIPS	2322 180 73333	02.508
R3-1	RESISTOR MF	12k OHM 5% 0.33W	PHILIPS	2322 180 73123	02.498
R4-1	PRESET CERMET	5kΩ OHM 10% 0.5W	BOURNS	3386P-1-502	07.888
R5-1	RESISTOR MF	12k OHM 5% 0.33W	PHILIPS	2322 180 73123	02.498
R6-1	RESISTOR MF	220k OHM 5% 0.33W	PHILIPS	2322 180 73224	02.528
R7-1	RESISTOR MF	6k8 OHM 5% 0.33W	PHILIPS	2322 180 73682	02.492
R8-1	RESISTOR MF	8k2 OHM 5% 0.33W	PHILIPS	2322 180 73822	02.494
R9-1	RESISTOR MF	270 OHM 5% 0.33W	PHILIPS	2322 180 73271	02.458
R10-1	RESISTOR MF	47 OHM 5% 0.33W	PHILIPS	2322 180 73479	02.440

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R11-1	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R12-1	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R13-1	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R14-1	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R15-1	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R16-1	RESISTOR MF	3k3 OHM 5% 0.33W	PHILIPS	2322 180 73332	02.484
R17-1	RESISTOR MF	47 OHM 5% 0.33W	PHILIPS	2322 180 73479	02.440
R18-1	RESISTOR MF	1k8 OHM 5% 0.33W	PHILIPS	2322 180 73182	02.478
R19-1	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R20-1	RESISTOR MF	39k2 OHM 1% 0.6W	PHILIPS	2322 156 13923	03.439
R21-1	RESISTOR MF	3k92 OHM 1% 0.6W	PHILIPS	2322 156 13922	03.409
R22-1	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R23-1	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R24-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R25-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R26-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R27-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R28-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R29-1	RESISTOR	47m OHM 5% 0.6W	MODULOHM I/S	98247/47U-J-MI-A-1	06.233
R30-1	RESISTOR MF	2k67 OHM 1% 0.25W	PHILIPS	2322 157 12672	02.209
R31-1	RESISTOR MF	226 OHM 1% 0.25W	PHILIPS	2322 157 12261	02.213
RE1-1	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
RE2-1	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
TR1-1	TRANSFORMER	3:1:1	SCHAFFNER	IT 244	22.000

## AUTO CONTROL (MODULE 2) N2174

ESPERA

5-0-26445A

626445

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C1-2	CAPACITOR ELECTROLYTIC	470uF -20/+50% 40VDC	ELNA	RJ3-50-471-M-F	14.650
C2-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C3-2	CAPACITOR MKT	100nF 5% 63VDC	PHILIPS	2222 370 79104	11.135
C4-2	CAPACITOR MKT	100nF 5% 63VDC	PHILIPS	2222 370 79104	11.135
C5-2	CAPACITOR ELECTROLYTIC	47uF 20% 25VDC	ELNA	RJ2-25-V-470-M-F1	14.524
C6-2	CAPACITOR ELECTROLYTIC	47uF 20% 25VDC	ELNA	RJ2-25-V-470-M-F1	14.524
C7-2	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78224	11.095
C8-2	CAPACITOR MKT	470nF 20% 63VDC	ERO	MKT 1826-447/06 6-G	11.188
C9-2	CAPACITOR MKT	15nF 5% 250V	ERO	MKT1818	11.170
C10-2	CAPACITOR MKT	15nF 5% 250V	ERO	MKT1818	11.170
C11-2	CAPACITOR POLYPROPYLENE	1nF 5% 10VDC	ERO	KP 1830-210/01-4-GW	13.398
C12-2	CAPACITOR POLYPROPYLENE	1nF 5% 10VDC	ERO	KP 1830-210/01-4-GW	13.398
C13-2	CAPACITOR MKT	100nF 5% 63VDC	PHILIPS	2222 370 79104	11.135
C14-2	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	2222 370 79105	11.190
C15-2	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	2222 370 79105	11.190
C16-2	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	2222 370 79105	11.190
C17-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C18-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C19-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C20-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
D1-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D2-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D3-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D4-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D5-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D6-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D7-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D8-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D9-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D10-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D11-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D12-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D13-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D14-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D15-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D16-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D17-2	DIODE ZENER	2V7 5% 0.4W BZX79C2V7	PHILIPS	BZX79C2V7	26.506
D18-2	DIODE ZENER	18V 5% 0.4W BZX79C18	PHILIPS	BZX79C18	26.564
D19-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D20-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100



POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
D21-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D22-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D23-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D24-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D25-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D26-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D27-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D28-2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D29-2	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS	BZX79C5V1	26.527
D30-2	DIODE LIGHT EMITTING	Ø3mm RED LOW CURRENT	H.P.	HLMP-K150-OPTION 002	25.662
D31-2	DIODE LIGHT EMITTING	Ø3mm RED LOW CURRENT	H.P.	HLMP-K150-OPTION 002	25.662
D32-2	DIODE LIGHT EMITTING	Ø3mm RED LOW CURRENT	H.P.	HLMP-K150-OPTION 002	25.662
P1-2	PLUG	2x7 POLES	3M	3598-6002 / 7614-6002 JL	78.254
P2-2	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P3-2	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P4-2	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P5-2	PLUG	1/10" SIL SQ.PINS 3 POLES	AMP	0-826629-3 (0-826647-3)	78.323
Q1-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q2-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q3-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q4-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q5-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q6-2	TRANSISTOR AF	BC547B NPN TO-92	PHILIPS	BC547B	28.067
Q7-2	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
Q8-2	TRANSISTOR AF	NPN BC639 TO-92	PHILIPS	BC639	28.120
Q9-2	TRANSISTOR AF	NPN BC639 TO-92	PHILIPS	BC639	28.120
R1-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R2-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R3-2	RESISTOR MF	3k3 OHM 5% 0.33W	PHILIPS	2322 180 73332	02.484
R4-2	RESISTOR MF	681 OHM 1% 0.25W	PHILIPS	2322 157 16811	02.223
R5-2	RESISTOR MF	2k0 OHM 5% 0.33W	PHILIPS	2322 180 73202	02.479
R6-2	RESISTOR MF	22k OHM 5% 0.33W	PHILIPS	2322 180 73223	02.504
R7-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R8-2	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R9-2	RESISTOR MF	5k90 OHM 1% 0.25W	PHILIPS	2322 157 15902	02.220
R10-2	RESISTOR MF	2k32 OHM 1% 0.25W	PHILIPS	2322 157 12322	02.225
R11-2	RESISTOR MF	226 OHM 1% 0.25W	PHILIPS	2322 157 12261	02.213
R12-2	RESISTOR MF	100k OHM 5% 0.33W	PHILIPS	2322 180 73104	02.520
R13-2	RESISTOR MF	62k OHM 5% 0.33W	PHILIPS	2322 180 73623	02.515
R14-2	RESISTOR MF	33k OHM 5% 0.33W	PHILIPS	2322 180 73333	02.508
R15-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R16-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R17-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R18-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R19-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R20-2	RESISTOR MF	27k OHM 5% 0.33W	PHILIPS	2322 180 73273	02.506
R21-2	RESISTOR MF	1M OHM 5% 0.33W	PHILIPS	2322 180 73105	02.544
R22-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R23-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R24-2	RESISTOR MF	6k8 OHM 5% 0.33W	PHILIPS	2322 180 73682	02.492
R25-2	RESISTOR MF	6k8 OHM 5% 0.33W	PHILIPS	2322 180 73682	02.492
R26-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R27-2	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R28-2	RESISTOR MF	2k7 OHM 5% 0.33W	PHILIPS	2322 180 73272	02.482
R29-2	RESISTOR MF	39 OHM 5% 0.33W	PHILIPS	2322 180 73399	02.438
R30-2	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R31-2	RESISTOR MF	470 OHM 5% 0.33W	PHILIPS	2322 180 73471	02.464
R32-2	RESISTOR PMF	1k0 OHM 5% 2W	PHILIPS	2322 194 13102	04.200
R33-2	RESISTOR MF	47k OHM 5% 0.33W	PHILIPS	2322 180 73473	02.512
R34-2	RESISTOR PMF	1k0 OHM 5% 2W	PHILIPS	2322 194 13102	04.200
R35-2	RESISTOR MF	47k OHM 5% 0.33W	PHILIPS	2322 180 73473	02.512
R36-2	RESISTOR MF	12k OHM 5% 0.33W	PHILIPS	2322 180 73123	02.498
R37-2	RESISTOR MF	12k OHM 5% 0.33W	PHILIPS	2322 180 73123	02.498
R38-2	RESISTOR MF	2k7 OHM 5% 0.33W	PHILIPS	2322 180 73272	02.482
R39-2	PRESET CERMET	5k0 OHM 10% 0.5W	BOURNS	3386P-1-502	07.888
R40-2	RESISTOR MF	33k OHM 5% 0.33W	PHILIPS	2322 180 73333	02.508
R41-2	RESISTOR MF	18k OHM 5% 0.33W	PHILIPS	2322 180 73183	02.502
R42-2	RESISTOR MF	3k3 OHM 5% 0.33W	PHILIPS	2322 180 73332	02.484

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R43-2	RESISTOR MF	3k3 OHM 5% 0.33W	PHILIPS	2322 180 73332	02.484
R44-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R45-2	RESISTOR MF	68k OHM 5% 0.33W	PHILIPS	2322 180 73683	02.516
R46-2	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R47-2	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R48-2	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R49-2	RESISTOR MF	4k7 OHM 5% 0.33W	PHILIPS	2322 180 73472	02.488
R50-2	RESISTOR MF	100k OHM 5% 0.33W	PHILIPS	2322 180 73104	02.520
R51-2	RESISTOR MF	100 OHM 5% 0.33W	PHILIPS	2322 180 73101	02.448
R52-2	RESISTOR MF	1M OHM 5% 0.33W	PHILIPS	2322 180 73105	02.544
R53-2	RESISTOR MF	30k OHM 5% 0.33W	PHILIPS	2322 180 73303	02.507
R54-2	RESISTOR MF	30k OHM 5% 0.33W	PHILIPS	2322 180 73303	02.507
R55-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R56-2	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R57-2	RESISTOR MF	10 OHM 5% 0.33W	PHILIPS	2322 180 73109	02.424
R58-2	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R59-2	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R60-2	PRESET CERMET	2k0 OHM 5% 0.5W	BOURNS	3386P-1-202-11	07.887
R61-2	RESISTOR MF	82 OHM 5% 0.33W	PHILIPS	2322 180 73829	02.446
R62-2	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R63-2	PRESET CERMET	5k0 OHM 10% 0.5W	BOURNS	3386P-1-502	07.888
R64-2	RESISTOR MF	2k2 OHM 5% 0.33W	PHILIPS	2322 180 73222	02.480
R65-2	RESISTOR MF	33k OHM 5% 0.33W	PHILIPS	2322 180 73333	02.508
R66-2	RESISTOR MF	68k OHM 5% 0.33W	PHILIPS	2322 180 73683	02.516
R67-2	RESISTOR MF	18k OHM 5% 0.33W	PHILIPS	2322 180 73183	02.502
R68-2	RESISTOR MF	68k OHM 5% 0.33W	PHILIPS	2322 180 73683	02.516
R69-2	RESISTOR MF	68k OHM 5% 0.33W	PHILIPS	2322 180 73683	02.516
R70-2	RESISTOR MF	270k OHM 5% 0.33W	PHILIPS	2322 180 73274	02.530
R71-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R72-2	RESISTOR MF	1M2 OHM 5% 0.33W	PHILIPS	2322 180 73125	02.546
R73-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R74-2	RESISTOR MF	1M2 OHM 5% 0.33W	PHILIPS	2322 180 73125	02.546
R75-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R76-2	RESISTOR MF	1M2 OHM 5% 0.33W	PHILIPS	2322 180 73125	02.546
R77-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R78-2	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R79-2	RESISTOR MF	2k7 OHM 5% 0.33W	PHILIPS	2322 180 73272	02.482
R80-2	RESISTOR MF	2k2 OHM 5% 0.33W	PHILIPS	2322 180 73222	02.480
R81-2	RESISTOR MF	2k2 OHM 5% 0.33W	PHILIPS	2322 180 73222	02.480
R82-2	RESISTOR MF	2k2 OHM 5% 0.33W	PHILIPS	2322 180 73222	02.480
TR1-2	TRANSFORMER	3:1:1	SCHAFFNER	IT 244	22.000
U1-2	POS. VOLTAGE REG. FIXED	15V/1A MC7815/LM340T	MOTOROLA	MC7815CT	31.090
U2-2	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
U3-2	VOLTAGE REG. ADJUSTABLE	Io=0.1A LM317L	TEXAS	TL317CLP	31.145
U4-2	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
U5-2	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
U6-2	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
U7-2	QUAD 2-INP.NAND SCHM.TRI	MC14093BCP	SIGNETICS*	HEF 4093 BP	33.300

## CONNECTION BOARD N2174 SINGLE &amp; N2174/N2170

S.P.RADIO A/S 0-0-26398

726398

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	DISTANCE PIECE	Ø4.8x0.8x8mm	OJD	4,8X0,8X8 MESS.	63.106
VARIOUS	SPARE FUSES FOR CON.BOARD	CONNECTION BOARDS	S.P.RADIO	0-0-27794	727794
VARIOUS	SCREW M3x12mm PHJX-Z	DIN 7985	HFC	HFC9041 M3x12 PHJX-Z DIN 7985	86.956
-3	CONNECTION SINGLE BATTERY	CHARGER/MODULE 3/N2170/74	ESPERA	5-0-26446B	626446
D6-3	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R) 1 191 017 005	25.165
F3-3	FUSE	50A 11x41mm	BOSCH	DIN 72 581 - B 50	45.702
R1	SHUNT 80A-75mV		SIFAM	SHUNT MEDIUM CURRENT 80A-75mV	23.160

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
CONNECTION SINGLE BATTERY CHARGER (MODULE 3) N2170/74			ESPERA	5-0-26446B	626446
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C1-3	CAPACITOR MKT	470nF 20% 63VDC	ERO	MKT 1826-447/06 6-G	11.188
C2-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C3-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
D1-3	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS	BZX79C5V1	26.527
D2-3	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D3-3	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D4-3	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D5-3	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D6-3	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R)	25.165
F1-3	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F2-3	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F3-3	FUSE	50A 11x41mm	BOSCH	1 191 017 005	45.702
F4-3	FUSE	2AT 250V 5x20mm	ELU	DIN 72 581 - B 50 179 120 2AT	45.508
F5-3	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
F6-3	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
P1-3	MULTIPLUG	2x6 POLES PCB VERSION	MOLEX	39-28-1123	78.221
P2-3	MULTIPLUG	2x5 POLES PCB VERSION	MOLEX	39-28-1103	78.220
P3-3			ESPERA	2-0-25057 *	200878
P4-3			ESPERA	2-0-25057 *	200878
P5-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P6-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P7-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P8-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P9-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P10-3	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P11-3	MULTIPLUG	2x4 POLES PCB VERSION	MOLEX	39-28-1083	78.218
P12-3			ESPERA	2-0-25057 *	200878
P13-3			ESPERA	2-0-25057 *	200878
P14-3	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P15-3	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P16-3	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
Q1-3	TRANSISTOR AF	BC548 NPN TO-92	PHILIPS	BC548 (-A/-B/-C)	28.070
R1-3	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R2-3	PRESET CERMET	1k0 OHM 10% 0.5W	BOURNS	3386P-1-102	07.886
R3-3	RESISTOR MF	22k1 OHM 1% 0.25W	PHILIPS	2322 157 12213	02.234
R4-3	RESISTOR MF	330k OHM 5% 0.4W	PHILIPS	2322 181 53334	01.262
R5-3	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R6-3	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R7-3	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R8-3	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R9-3	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R10-3	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R11-3	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R12-3	RESISTOR MF	470k OHM 5% 0.33W	PHILIPS	2322 180 73474	02.536
R13-3	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
RE1-3	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
RE2-3	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
ST1-3	TERMINAL BLOCK	3 POLES 1.5mm2	PTR	AK300/3b m.MESS.SKRUER	81.026
ST2-3	TERMINAL BLOCK	3 POLES 2.5mm2	PTR	AK110/3DS m.MESS.SKRUER	81.037
ST3-3	TERMINAL BLOCK	10 POLES 1.5mm2	PTR	AK300/10b m.MESS.SKRUER BLÄ	81.017
ST4-3	TERMINAL BLOCK	2 POLES 1.5mm2	PTR	AK300/2b m.MESS.SKRUER BLÄ	81.023
ST5-3	TERMINAL BLOCK	2 POLES 2.5mm2	PTR	AK110/2DS m.MESS.SKRUER	81.035
ST6-3	TERMINAL BLOCK	4 POLES 2.5mm2	PTR	AK110/4DS m.MESS.SKRUER	81.038
ST7-3	TERMINAL BLOCK	6 POLES 1.5mm2	PTR	AK300/6b m.MESS.SKRUER BLÄ	81.016
U1-3	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
<b>CONNECTION BOARD N2174 DUAL</b>			<b>S.P.RADIO A/S 0-0-26398</b>		<b>726399</b>
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	DISTANCE PIECE	Ø4.8x0.8x8mm	OJD	4,8X0,8X8 MESS.	63.106
VARIOUS	SPARE FUSES FOR CON.BOARD	CONNECTION BOARDS	S.P.RADIO	0-0-27794	727794
VARIOUS	SCREW M3x12mm PHJX-Z	DIN 7985	HFC	HFC9041 M3x12 PHJX-Z	86.956
-			R.S.	172-761/T18R	90.500
-4	CONNECTION DUAL BATTERY	CHARGER (MODULE 4) N2174	ESPERA	5-0-26447B	626447
D6-4	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R)	25.165
D12-4	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R)	25.165
F3-4	FUSE	50A 11x41mm	BOSCH	1 191 017 005	45.702
F9-4	FUSE	50A 11x41mm	BOSCH	DIN 72 581 - B 50	45.702
R1	SHUNT 80A-75mV		SIFAM	SHUNT MEDIUM CURRENT 80A-75mV	23.160

<b>CONNECTION DUAL BATTERY CHARGER (MODULE 4) N2174</b>			<b>ESPERA</b>	<b>5-0-26447B</b>	<b>626447</b>
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C1-4	CONNECTION DUAL BATTERY	CHARG.(4) FOR N2174 DUAL		5-0-26447B/ 1-0-26447	52.017
C2-4	CAPACITOR MKT	470nF 20% 63VDC	ERO	MKT 1826-447/06 6-G	11.188
C3-4	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C4-4	CAPACITOR MKT	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C5-4	CAPACITOR MKT	470nF 20% 63VDC	ERO	MKT 1826-447/06 6-G	11.188
C6-4	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
D1-4	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
D2-4	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS	BZX79C5V1	26.527
D3-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D4-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D5-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D6-4	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R)	25.165
D7-4	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	PHILIPS	BZX79C5V1	26.527
D8-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D9-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D10-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D11-4	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D12-4	DIODE POW.RECT.35A/100VDC	1N1184R/BYX52-300R	INT.RECTIFIER	1N1184R INCL.HARDWARE (1N1185R,-86R,-90R)	25.165
F1-4	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F2-4	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F3-4	FUSE	50A 11x41mm	BOSCH	1 191 017 005	45.702
F4-4	FUSE	2AT 250V 5x20mm	ELU	DIN 72 581 - B 50	45.508
F5-4	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
F6-4	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
F7-4	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F8-4	FUSE	8AF 250V Ø5x20mm	ELU	171 100 8AF (DIN 41571/1)	45.561
F9-4	FUSE	50A 11x41mm	BOSCH	1 191 017 005	45.702
F10-4	FUSE	2AT 250V 5x20mm	ELU	DIN 72 581 - B 50	45.508
F11-4	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
F12-4	FUSE	2AT 250V 5x20mm	ELU	179 120 2AT	45.508
P1-4	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P2-4	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P3-4	MULTIPLUG	2x4 POLES PCB VERSION	MOLEX	39-28-1083	78.218

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
P4-4	MULTIPLUG	2x5 POLES PCB VERSION	MOLEX	39-28-1103	78.220
P5-4			ESPERA	2-0-25057 *	200878
P6-4			ESPERA	2-0-25057 *	200878
P7-4	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P8-4	CONNECTION ELEMENT	FOR M5 SCREW	ESPERA	1-0-25860	225860
P9-4	MULTIPLUG	2x4 POLES PCB VERSION	MOLEX	39-28-1083	78.218
P10-4	MULTIPLUG	2x5 POLES PCB VERSION	MOLEX	39-28-1103	78.220
P11-4			ESPERA	2-0-25057 *	200878
P12-4			ESPERA	2-0-25057 *	200878
P13-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
P14-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
P15-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
P16-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
P17-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
P18-4	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2	78.322
				(0-826647-2)	
Q1-4	TRANSISTOR AF	BC548 NPN TO-92	PHILIPS	BC548 (-A/-B/-C)	28.070
Q2-4	TRANSISTOR AF	BC548 NPN TO-92	PHILIPS	BC548 (-A/-B/-C)	28.070
R1-4	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R2-4	RESISTOR MF	22k1 OHM 1% 0.25W	PHILIPS	2322 157 12213	02.234
R3-4	PRESET CERMET	1k0 OHM 10% 0.5W	BOURNS	3386P-1-102	07.886
R4-4	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R5-4	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R6-4	RESISTOR MF	330k OHM 5% 0.4W	PHILIPS	2322 181 53334	01.262
R7-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R8-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R9-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R10-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R11-4	RESISTOR MF	470k OHM 5% 0.33W	PHILIPS	2322 180 73474	02.536
R12-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R13-4	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
R14-4	RESISTOR MF	1k5 OHM 5% 0.33W	PHILIPS	2322 180 73152	02.476
R15-4	RESISTOR MF	22k1 OHM 1% 0.25W	PHILIPS	2322 157 12213	02.234
R16-4	PRESET CERMET	1k0 OHM 10% 0.5W	BOURNS	3386P-1-102	07.886
R17-4	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R18-4	RESISTOR MF	5k11 OHM 1% 0.25W	PHILIPS	2322 157 15112	02.228
R19-4	RESISTOR MF	330k OHM 5% 0.4W	PHILIPS	2322 181 53334	01.262
R20-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R21-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R22-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R23-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R24-4	RESISTOR MF	470k OHM 5% 0.33W	PHILIPS	2322 180 73474	02.536
R25-4	RESISTOR MF	10k OHM 5% 0.33W	PHILIPS	2322 180 73103	02.496
R26-4	RESISTOR MF	1k0 OHM 5% 0.33W	PHILIPS	2322 180 73102	02.472
RE1-4	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
RE2-4	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
RE3-4	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
RE4-4	RELAY	24VDC 2SH. 2A	OMRON	G5V-2-24 VDC	21.327
ST1-4	TERMINAL BLOCK	10 POLES 1.5mm2	PTR	AK300/10b m.MESS.SKRUER BLÅ	81.017
ST2-4	TERMINAL BLOCK	2 POLES 1.5mm2	PTR	AK300/2b m.MESS.SKRUER BLÅ	81.023
ST3-4	TERMINAL BLOCK	2 POLES 2.5mm2	PTR	AK110/2DS m.MESS.SKRUER	81.035
ST4-4	TERMINAL BLOCK	4 POLES 2.5mm2	PTR	AK110/4DS m.MESS.SKRUER	81.038
ST5-4	TERMINAL BLOCK	6 POLES 1.5mm2	PTR	AK300/6b m.MESS.SKRUER BLÅ	81.016
ST6-4	TERMINAL BLOCK	3 POLES 2.5mm2	PTR	AK110/3DS m.MESS.SKRUER	81.037
ST7-4	TERMINAL BLOCK	10 POLES 1.5mm2	PTR	AK300/10b m.MESS.SKRUER BLÅ	81.017
ST8-4	TERMINAL BLOCK	2 POLES 1.5mm2	PTR	AK300/2b m.MESS.SKRUER BLÅ	81.023
ST9-4	TERMINAL BLOCK	2 POLES 2.5mm2	PTR	AK110/2DS m.MESS.SKRUER	81.035
ST10-4	TERMINAL BLOCK	4 POLES 2.5mm2	PTR	AK110/4DS m.MESS.SKRUER	81.038
ST11-4	TERMINAL BLOCK	6 POLES 1.5mm2	PTR	AK300/6b m.MESS.SKRUER BLÅ	81.016
ST12-4	TERMINAL BLOCK	3 POLES 2.5mm2	PTR	AK110/3DS m.MESS.SKRUER	81.037

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
U1-4	DUAL OP AMP	LM358N	TEXAS	LM358P
U2-4	DUAL OP AMP	LM358N	TEXAS	LM358P

### REMOTE CONTROL UNIT H2180 FOR N2174 BATTERY CHARGER S.P.RADIO A/S H2180 802180

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
D1	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)
D2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)
ME1	PANEL METER	SCALED 80-0-80 AMP.	SIFAM	29WF/75-0-75mV SCALED 80/0/80A
ME2	PANEL METER	SCALED 0-30V	SIFAM	29WF/0-30V, SCALED 0-30V
P1	PLUG	6 POLES	HIRSCHMANN	973 021-100 6 pole Male for Chassis
S1	ROCKER SWITCH	DPDT 0N-NONE-ON 4A/250VAC	CARLINGSWITCH	6 10 1 2 4 2 1-0-0
S2	ROCKER SWITCH	DPDT 0N-NONE-ON 4A/250VAC	CARLINGSWITCH	6 10 1 2 4 2 1-0-0

### HF SSB H2182 FUSE BOX, 30 Amps. S.P.RADIO A/S HF SSB H2182 802182

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	CABINET,FUSE BOX H2182/3	S.P.RADIO A/S	0-0-28250	728250
VARIOUS	FUSE ARRANGEMENT H2182	S.P.RADIO A/S	0-0-28252	728252

### FUSE ARRANGEMENT H2182 S.P.RADIO A/S 0-0-28252 728252

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
F1	CIRCUIT BREAKER FUSED	2 POLES 440VAC-110VDC/63A	AEG	E82 U63A / 11.022.200.871
F2	CIRCUIT BREAKER FUSED	2 POLES 440VAC-110VDC/63A	AEG	E82 U63A / 11.022.200.871
F3	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F4	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/2A	AEG	E81 U 2A / 11.022.100.735
F5	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F6	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F7	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/32A	AEG	E81 U32A / 11.022.120.854
F8	FUSE	5x25mm 10A M 250V	ELU	17252510000
F9	FUSE	5x25mm 10A M 250V	ELU	17252510000
F10	FUSE	5x25mm 10A M 250V	ELU	17252510000
R1	SHUNT 80A-75mV	SIFAM	SHUNT MEDIUM CURRENT 80A-75mV	23.160
ST1	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST2	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST3	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST4	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST5	THROUGH TERMINAL BLOCK		WEIDMULLER	SAK2,5/35 3804.6
ST6	THROUGH TERMINAL BLOCK		WEIDMULLER	SAK2,5/35 3804.6

### HF SSB H2183 FUSE BOX, 60 Amps. S.P.RADIO A/S HF SSB H2183 802183

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	STICKER FOR H2183	FUSEBOX	VESTERBRO SER	9-3-28449
VARIOUS	CABINET,FUSE BOX H2182/3	S.P.RADIO A/S	0-0-28250	728250
VARIOUS	FUSE ARRANGEMENT H2183	S.P.RADIO A/S	0-0-28253	728253

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
----------	-------------	------------	------	------------

## FUSE ARRANGEMENT H2183

S.P.RADIO A/S 0-0-28253

728253

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
	STREAMER H2183	H2183	9-3-28367A	53.587
		WEIDMULLER	EW35 3835.6	81.042
F1	CIRCUIT BREAKER FUSED	2 POLES 440VAC-110VDC/63A	AEG	E82 U63A / 11.022.200.871
F2	CIRCUIT BREAKER FUSED	2 POLES 440VAC-110VDC/63A	AEG	E82 U63A / 11.022.200.871
F3	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F4	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/2A	AEG	E81 U 2A / 11.022.100.735
F5	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F6	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/10A	AEG	E81 U10A / 11.022.120.809
F7	CIRCUIT BREAKER FUSED	1 POLE 440VAC-48VDC/32A	AEG	E81 U32A / 11.022.120.854
F8	FUSE	5x25mm 10A M 250V	ELU	17252510000
F9	FUSE	5x25mm 10A M 250V	ELU	17252510000
F10	FUSE	5x25mm 10A M 250V	ELU	17252510000
F11	CIRCUIT BREAKER FUSED	2 POLES 440VAC-110VDC/63A	AEG	E82 U63A / 11.022.200.871
R1	SHUNT 80A-75mV		SIFAM	SHUNT MEDIUM CURRENT 80A-75mV
ST1	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST2	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST3	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST4	THROUGH TERMINAL BLOCK	16mm2	WEIDMULLER	SAK16/35 - 3806.6
ST5	THROUGH TERMINAL BLOCK		WEIDMULLER	SAK2,5/35 3804.6
ST6	THROUGH TERMINAL BLOCK		WEIDMULLER	SAK2,5/35 3804.6