



# Sailor

# Sailor

INSTRUCTIONBOOK FOR  
SAILOR PHONE PATCH UNITS  
H416 AND H2076



A/S S. P. RADIO · AALBORG · DENMARK

## INSTALLATION HINT PHONE PATCH H2076

### MODIFICATION OF RT2047

#### PHONE PATCH BLOCKING OF CHANNEL 16

In order not to transmit from phone patch on ch. 16, a diode has to be mounted on the main microprocessor in the VHF. A diode BAT43 with cathode on pin 21 (PD3) and anode on pin 32 (PB7).

The VHF has to be programmed with distress information on ch. 16.

#### MODULATION LEVEL ADJUSTMENT

The best telefax result is when the AF signal to the VHF is adjusted to be just below clipping level (5 kHz), while the distortion which occurs when clipping may cause errors, or even worse, no connection to the other telefax.

In many cases the output level has to be reduced in order to get communication through. This can easily be done with a screw driver through the adjustment hole in the upper cradle for the handset.

## INSTALLATION HINTS PHONE PATCH H2076

### MODIFICATION OF RT2047

#### PHONE PATCH BLOCKING OF CHANNEL 16

In order not to transmit from phone patch on ch. 16, a diode has to be mounted on the main microprocessor in the VHF. A diode BAT43 with cathode on pin 21 (PD3) and anode on pint 32 (PB7). The VHF has to be programmed with distress information on ch. 16.

#### MODULATION LEVEL ADJUSTMENT

The best telefax result is when the AF signal to the VHF is adjusted to just below clipping level (5 kHz), while the distortion which occurs when clipping may cause errors, or even worse, no connection to the other telefax.

In many cases the output level has to be reduced in order to get communication through. This can easily be done with a screw driver through the adjustment hole in the upper cradle for the handset.

Due to the different modulation sensitivity of the RT2047 it may be necessary to adjust the output level for the VHF.

The following guide line can be used if the VHF has not been readjusted.

Up to serial No. 332779	500 mV sensitivity
from serial No. 332779 to 336350	250 mV sensitivity
from serial No. 336350	150 mV sensitivity

The modulation level indicator acts as follows:

500 mV output: indicator will light well  
250 mV output: indicator will just light  
150 mV output: indicator will not light

If light is necessary with 150 mV output, R456 can be changed from 330 ohm to 120 ohm and the indicator will light well.

The phone patch is adjusted to 250 mV output with 150 mV input from line.

**ATTENTION!** The supply for line current to the telefax has to be stabilized, else unwanted noise may be added to the signal.

## CONTENTS

1. INTRODUCTION
  - 1.1. GENERAL DESCRIPTION
  - 1.2. TECHNICAL DATA
  - 1.3. CONTROLS
  - 1.4. PRINCIPLE OF OPERATION AND BLOCK DIAGRAMS
  - 1.5. DIRECTIONS FOR USE
2. INSTALLATION
3. SERVICE
  - 3.1. ADJUSTMENT PROCEDURE
4. CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS
5. PARTS LIST



## 1. INTRODUCTION

The SAILOR Phone Patch Units have been designed to comply with the demand for connection of a duplex VHF radiotelephone to a telephone line or to a telefax.

There are two types of phone patches for VHF use, i.e.:

SAILOR H416 for use together with the control unit C40X in the remote controlled VHF system RT146.

SAILOR H2076 for use together with RT2047 or other duplex communication sets.



## 1.1. GENERAL DESCRIPTION

### H416

SAILOR Phone Patch Unit H416 acts as a control unit for SAILOR VHF RT146.

SAILOR Phone Patch Unit H416 has a built-in remote control box H410 showing whether the VHF radiotelephone is in use.

SAILOR Phone Patch Unit H416 has separate squelch circuit.

SAILOR Phone Patch Unit H416 has a built-in modulation indicator.

SAILOR Phone Patch Unit H416 is prepared for use together with telefax.

SAILOR Phone Patch Unit H416 is provided with fittings for mounting of C40X.

SAILOR Phone Patch H416 is built into a corrosion resistant metal cabinet with green nylon finish, the inner cabinet with black nylon finish.

### H2076

SAILOR Phone Patch Unit H2076 is very easy to install together with SAILOR VHF RT2047.

SAILOR Phone Patch Unit H2076 can only operate on a duplex channel when it is connected to SAILOR VHF RT2047. No blocking of channel 16. (New version of RT2047).

SAILOR Phone Patch Unit H2076 has separate squelch circuit.

SAILOR Phone Patch Unit H2076 can be switched from phone patch mode to telefax mode.

SAILOR Phone Patch Unit H2076 has a built-in modulation indicator.

SAILOR Phone Patch Unit H2076 is prepared for loop current in telefax mode.

SAILOR Phone Patch Unit H2076 is provided with cradle for the VHF handset.

SAILOR Phone Patch Unit H2076 fits into the SAILOR Compact 2000 Programme.

SAILOR Phone Patch Unit H2076 is built into a corrosion resistant metal cabinet with green nylon finish on the top cover and with black nylon finish on the bottom cabinet.

## 1.2. TECHNICAL DATA

Line: AF output to line 100 mV  $\pm$  2 dB/600 ohm  
AF input from line 150 mV  $\pm$  10 dB/600 ohm

Telefax Line Current: 18V - 30 V DC  
20 - 75 mA

VHF: AF out TX 250 mV RMS  
AF in RX  
H416: 800 mV RMS  
H2076: 450 mV RMS

Side Tone Attenuation: 30 dB

Power Supply Variation: 12V DC - 10% to +30%

Power Consumption: 160 mA

Dimensions: H416: height: 220 mm  
width: 188 mm  
depth: 36 mm (with control unit C40X 130 mm)  
H2076: height: 212 mm  
width: 97 mm  
depth: 37 mm (with handset 110 mm)

### 1.3. CONTROLS

#### H416

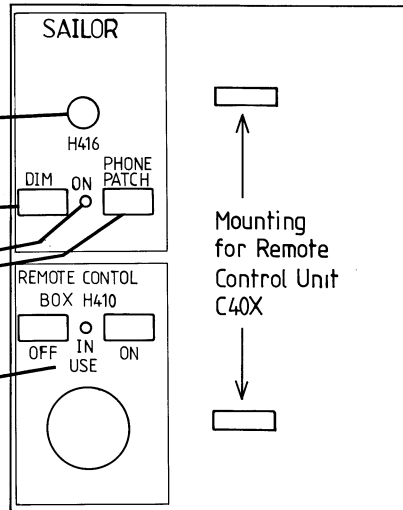
Modulation level adjust and indication behind cover

DIM

On and transmitting indicator

Phone patch on/off

H410 with connector for C40X and indicator for VHF in use



Phone patch off:

The VHF set works normally from remote control unit C40X.  
The telephone line is disconnected.  
The LED indicator in H410 lights up if the VHF set is in use.

Phone patch on:

The VHF set is transmitting on the channel which has been selected on the remote control unit C40X. The phone patch is only in operation, when C40X is switched on.  
The phone patch is connected to the telephone line.  
The on and transmitting indicator lights up.  
The loudspeaker in the remote control unit C40X is on during the phone patch transmission.

Modulation level:

When installing the phone patch unit H416, the signal level from the telephone line can be adjusted so that the transmitter is modulated correctly. The indicator flashes when the modulation level is correct.

DIM:

Dimmer control for the two LED's ON and IN USE.

"H410" on:

Switches on the remote control unit C40X.

off:

Switches off the remote control unit C40X and the phone patch unit if they are ON.



### 1.3. CONTROLS cont.:

#### H2076

On and transmitting indicator

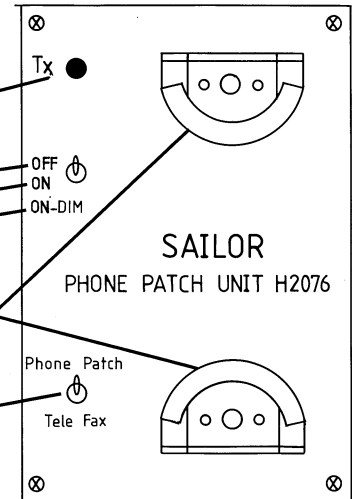
Phone patch unit off

Phone patch unit on

Indicator dimmed

Cradle for handset from  
the VHF RT2047.

Changes between phone patch and  
telefax.



Phone patch off:

The VHF RT2047 works normally.  
The telephone line and the telefax line  
are disconnected.

Phone patch on:

The VHF RT2047 transmits on the selected  
channel. New versions of RT2047 can only  
be phone patched on duplex channels (June  
1989).

The phone patch is connected to the telephone  
line or the telefax line.

The transmission indicator lights up.

The loudspeaker is on during the phone  
patch transmission.

Phone patch on - dim:

Same as above, except that the TX indication  
is dimmed.

Phone patch/Telefax:

Switch for changing between phone patch  
and telefax. On the telefax line the phone  
patch unit is prepared for loop current,  
which is necessary for some telefax units.

## 1.4. PRINCIPLE OF OPERATION AND BLOCK DIAGRAMS

When the phone patch unit is switched on, the "on relay" is activated and the connection to the telephone line or the telefax line is established.

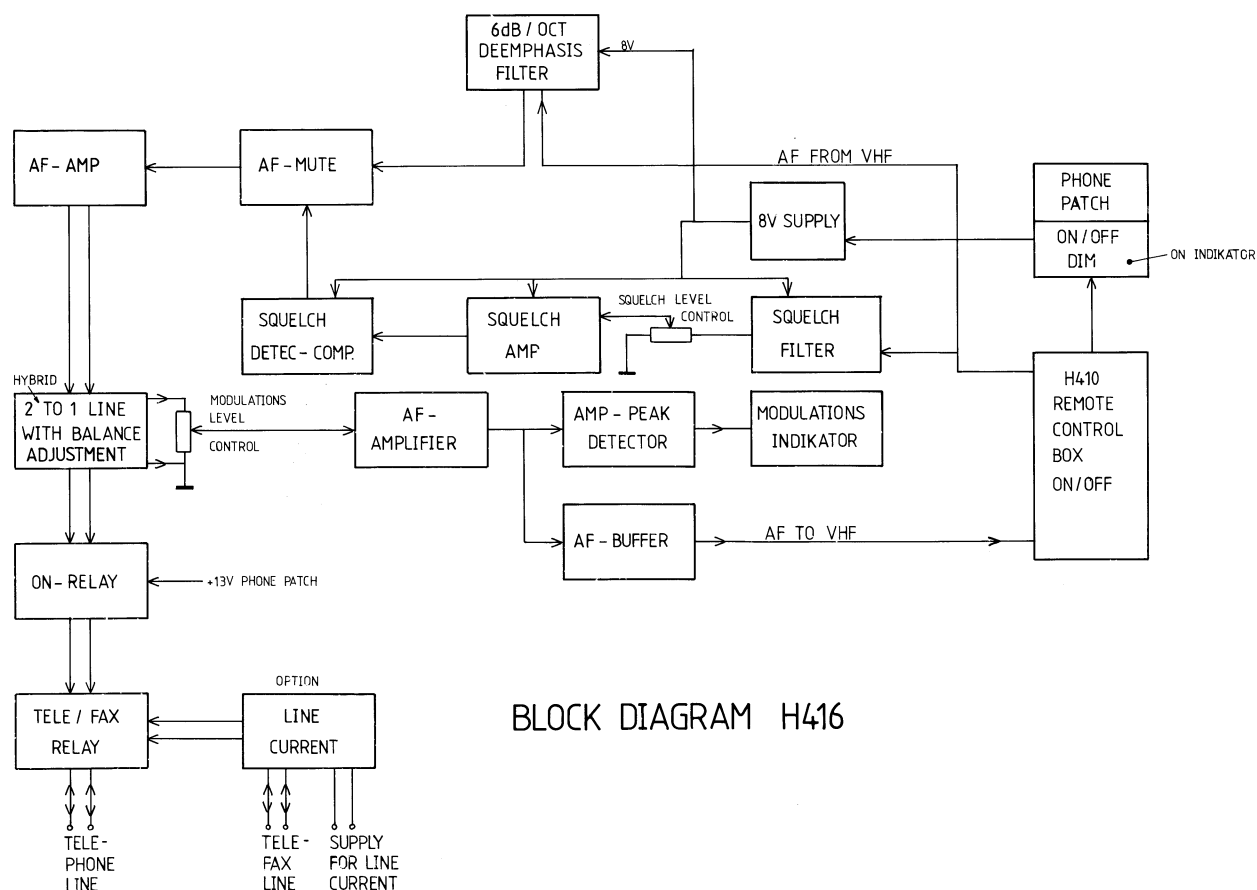
In the hybrid circuit, the line is split into 2 signals, one for the signal from the VHF, and one for the signal to the VHF.

The AF signal from the VHF is squelch controlled so that noisy signals are muted before they pass through the AF amplifier to the line.

In the phone patch unit H416, the AF signal from the VHF is deemphasized with 6 dB per octave in order to obtain the right frequency response.

The AF signal to the VHF passes through the modulation level control, (which can be adjusted by means of a screw-driver through a hole in the cabinet), and an AF amplifier, before it reaches the on/off switch. The on/off switch changes between the AF signal from the new jack for the VHF handset (off) and the amplified AF signal from the line (on). The modulation indicator shows if the modulation level is correct (just flashing).

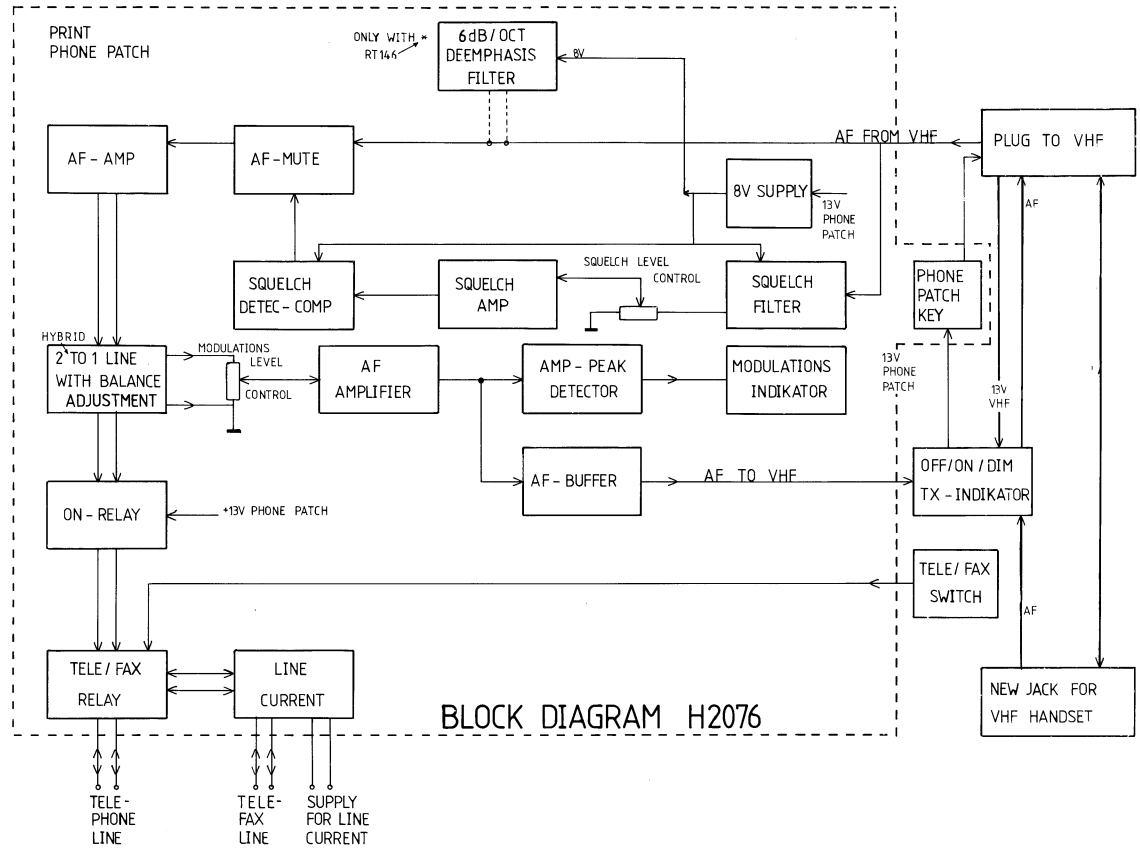
**BLOCK DIAGRAM H416**



**BLOCK DIAGRAM H416**

# 1.4. PRINCIPLE OF OPERATION AND BLOCK DIAGRAM cont.:

## BLOCK DIAGRAM H2076



## 1.5. DIRECTIONS FOR USE

### TELEPHONE

- a. Radio communication is established by means of the microtelephone to the VHF set.
- b. The number of the subscriber is dialed on the telephone.
- c. When telephone connection is established the function switch is set to "phone patch on", and the telephone line is now connected to the VHF set. The microtelephone must be placed in the telephone cradle and the microtelephone of the VHF set can be placed in the holder (remember that the dual watch (DW) on the remote control unit (C40X) must be switched off. The operator can monitor the connection from the loudspeaker of the VHF set. Possible interruptions in the conversation can be made by means of the telephone instrument. Here it is possible to communicate with each party.
- d. When the communication is finished the function switch is set to position "phone patch off".

### TELEFAX

- a. Radio communication is established by means of the microtelephone for the VHF set.
- b. When the connection is established with the other telefax terminal a tone is heard. The phone patch is switched on in telefax mode. Now the two telefax terminals are connected and they can be operated as normal telefax terminals. The operator can monitor the transmission from the loudspeaker of the VHF set or the microtelephone. Do not interrupt the transmission even though it sounds like noise.
- c. When the transmission is over, a tone can be heard and the phone patch can be turned off.

## 2. INSTALLATION

### H416

#### STRAPPING POSSIBILITIES

##### B Strapping

Normal factory strapping with standard control unit C40X. The dual watch must be turned off by the operator before turning phone patch on.

If you do not want the dual watch facility, see instruction book for Multi Remote VHF System, part 1, section 5.4.: MODIFICATION TO STOP DUAL WATCH FACILITY C40X.

##### A and C Strapping

Dual watch facility intact with DW function maintained, so that phone patch unit H416 locks the C40X on the selected channel.

Modification of control unit C40X is necessary.

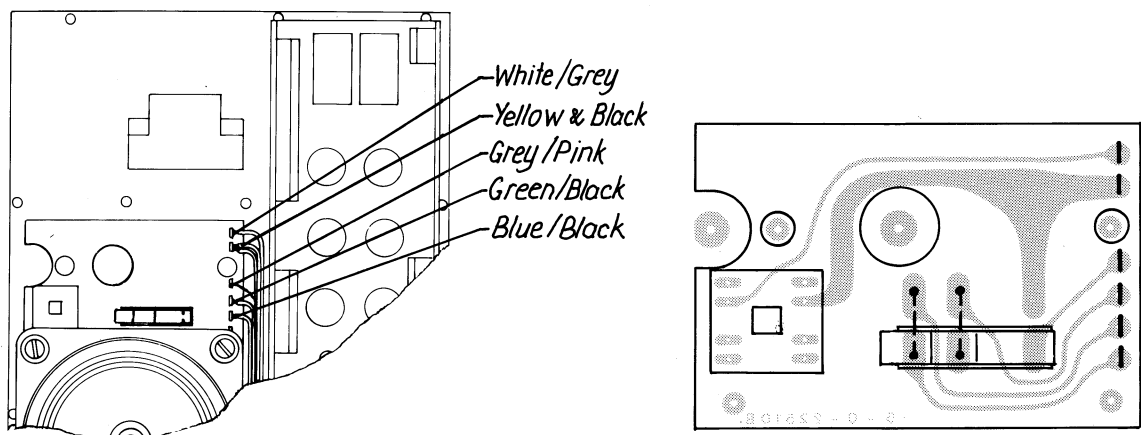
Security against start-up of remote control unit H410 without connected control unit is cancelled. This connection is used for dual watch control

#### MODIFICATION IN CONTROL UNIT C40X

The multicable must be stripped in both ends because extra wire grey/pink is used.

Connection in plug P601 between pin 1 and 6 must be removed and grey/pink wire is then soldered to pin 6.

In the control unit the grey/pink wire must be extended to print for switches and then soldered on vacant solder terminal nearest to the screw (see fig. below). The microswitch is moved to the vacant hole for extra switch near the loudspeaker. Two soldering lugs must be mounted across the PCB (see fig. below)



#### TELEFAX WITH H416

Phone patch unit H416 is prepared for use with telefax.

The "line/fax" terminal has to be connected to ground in order to use the fax output where it is possible to make a line current which some telefax terminals need in order to operate.

## 2. INSTALLATION cont.:

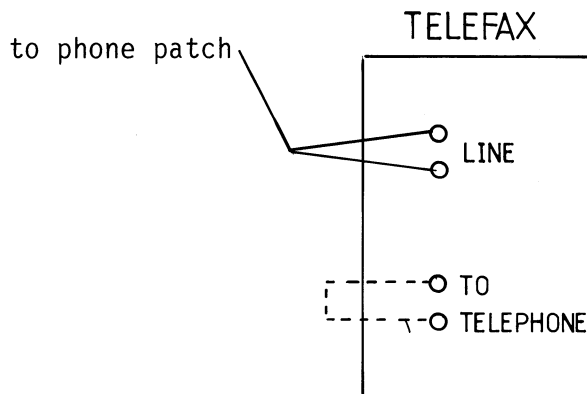
### LINE CURRENT IN TELEFAX MODE

It is possible to get a line current in telefax mode by connecting a power supply to the terminal next to the line terminals (+24V). If no insulating of the power supplies is necessary and it is a standard telefax terminal the internal 13 Volt phone patch voltage can be used.

If an external line current is used it is necessary to shorten the terminals for line current supplies in order to make the current loop complete.

### CONNECTION TO TELEFAX TERMINAL

If it is a simple telefax terminal where no possibilities exist for use or programming/strapping the fax in a way so that it does not need a current loop (OFF-HOOK DETECTION) it can be necessary to shorten the telephone line out of some telefax terminals in order to make the current loop complete.



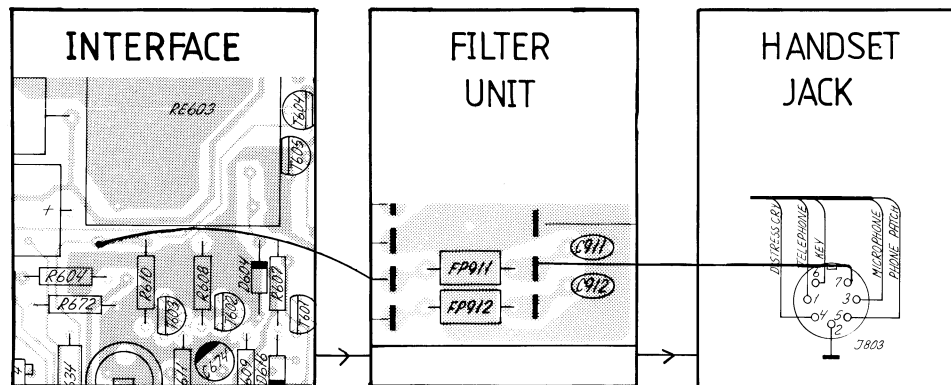


## 2. INSTALLATION cont.:

### H2076

#### MODIFICATION OF RT2047

In the VHF set it is necessary to make a connection from the internal 13V supply on the interface unit (spare via hole next to R610) through the filter unit (spare terminals) and to the handset connector pin 7 (spare) see fig. below.



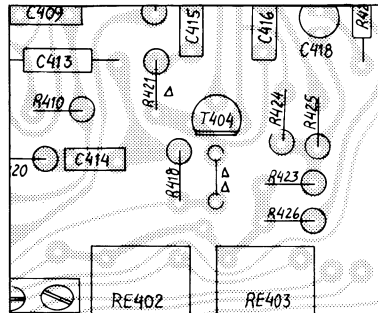
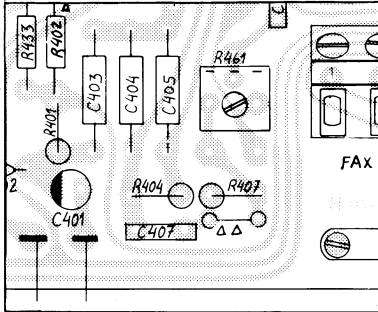
Telefax installation: please see the description of installation of H416.

### 3. SERVICE

#### EXCHANGE OF PC BOARD

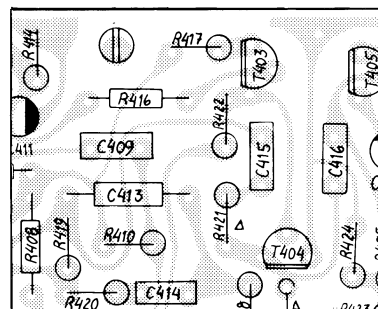
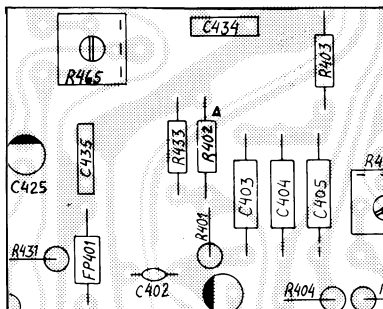
New PC Board for use in H416.

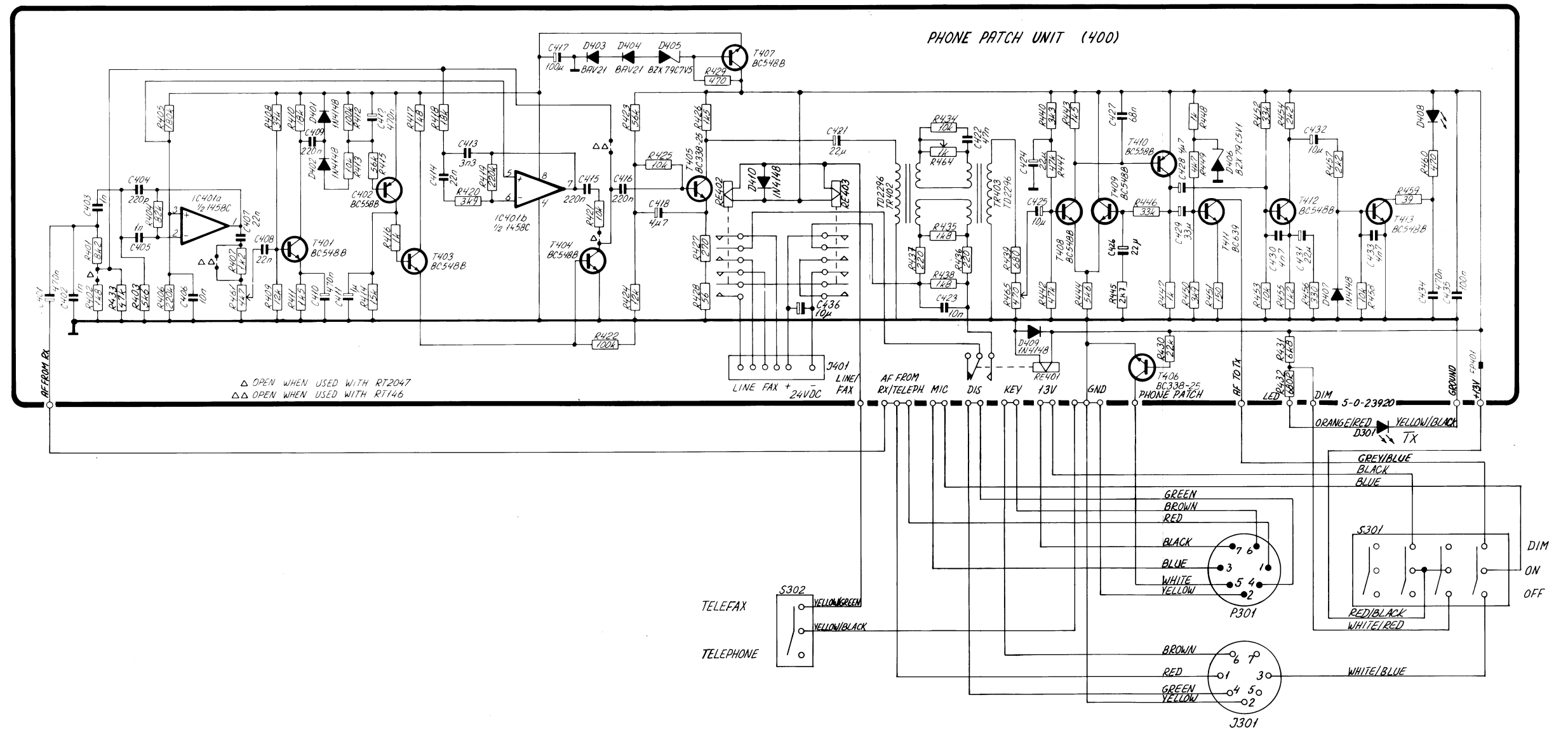
- cut the short connection of R407
- cut the short connection from C416 to R418



New PC Board for use in H2076

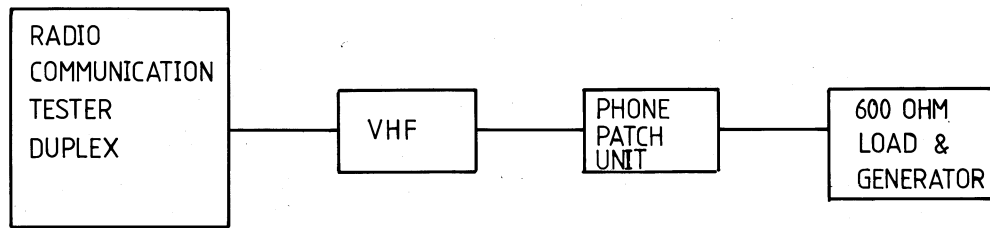
- cut R402
- cut R421





MAIN SCHEMATIC DIAGRAM  
PHONE PATCH UNIT H2076

### 3.1. ADJUSTMENT PROCEDURE



For adjustment of phone patch unit connect the unit as shown in the above drawing.

#### **BALANCE**

With normal test modulation (1 kHz tone 3 kHz deviation), phone patch unit on, and R465 fully clockwise, adjust R464 to minimum deviation on the modulation metre.

#### **MODULATION LEVEL**

Connect a 600 ohm signal generator to the line input with 1000 Hz and 0.1V.

Adjust R465 to give 3 kHz deviation on the VHF and check that the modulation indicator just starts to light.

#### **SQUELCH LEVEL**

Switch off the RF signal generator and adjust R461 just to mute the noise or adjust it to a desired signal to noise level.

## 4. CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS

### OFF/ON CONDITION

In the off condition, relay RE401 disconnects the phone patch from the line.

When the phone patch is turned on, the relay RE401 connects the hybrid circuit to the telephone line or the telefax line through relay RE402 and RE403. Relay RE402 shifts between telephone line and telefax line. Relay RE403 switches in the line current and C436 makes an AC decoupling of the line current supply.

The 13V phone patch supplies the 8V supply, the modulation amplifier and the phone patch key, which consists of transistor T406 pulling the phone patch key to ground. In phone patch H416 the phone patch key is placed on the print for switches (200) and consists of transistor T201.

### AF FROM VHF

#### Squelch

The signal from the VHF is fed to the active highpass filter IC401a. The filter attenuates signals below 10 kHz which means that talk will not be detected. The output of the filter is fed through the SQUELCH LEVEL CONTROL potentiometer R461 to the SQUELCH AMPLIFIER transistor T401. Then the signal is fed to the detector comprising the capacitor C412, the diodes D401, D402 and the resistors R412 and R413.

The rectified noise level is fed to the two mute buffer transistors, T402 and T403.

#### 6 dB/Oct Deemphasis Filter

The AF signal is only fed through this filter in the H416.

The filter provides a frequency response of -6 dB/Oct. in the range 0.3 to 3 kHz and limits the signals outside this range. The filter is an active filter and consists of IC401b and the surrounding resistors and capacitors.

#### AF - Mute - Amp.

The mute transistor is T404 which leads the signal to ground when muting.

The AF amplifier consists of the transistor T405 and the surrounding resistors and capacitors.

### HYBRID 2 TO 7 LINE

The hybrid circuit consists of the two transformers TR402, TR401 and the surrounding resistors which make the 600 ohm termination.

The balance adjustment is carried out on resistor R464.

### AF TO VHF

The AF signal from the hybrid 2 to 1 line is fed to the modulation level control resistor R465. From the modulation level control the AF signal is fed to the AF amplifier consisting of the three transistors T408, T409 and T410. From the amplifier the AF signal is fed to the AF buffer transistor T411 and to the modulation indicator circuit.

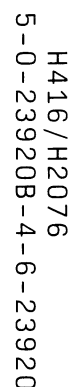
#### 4. CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS cont.:

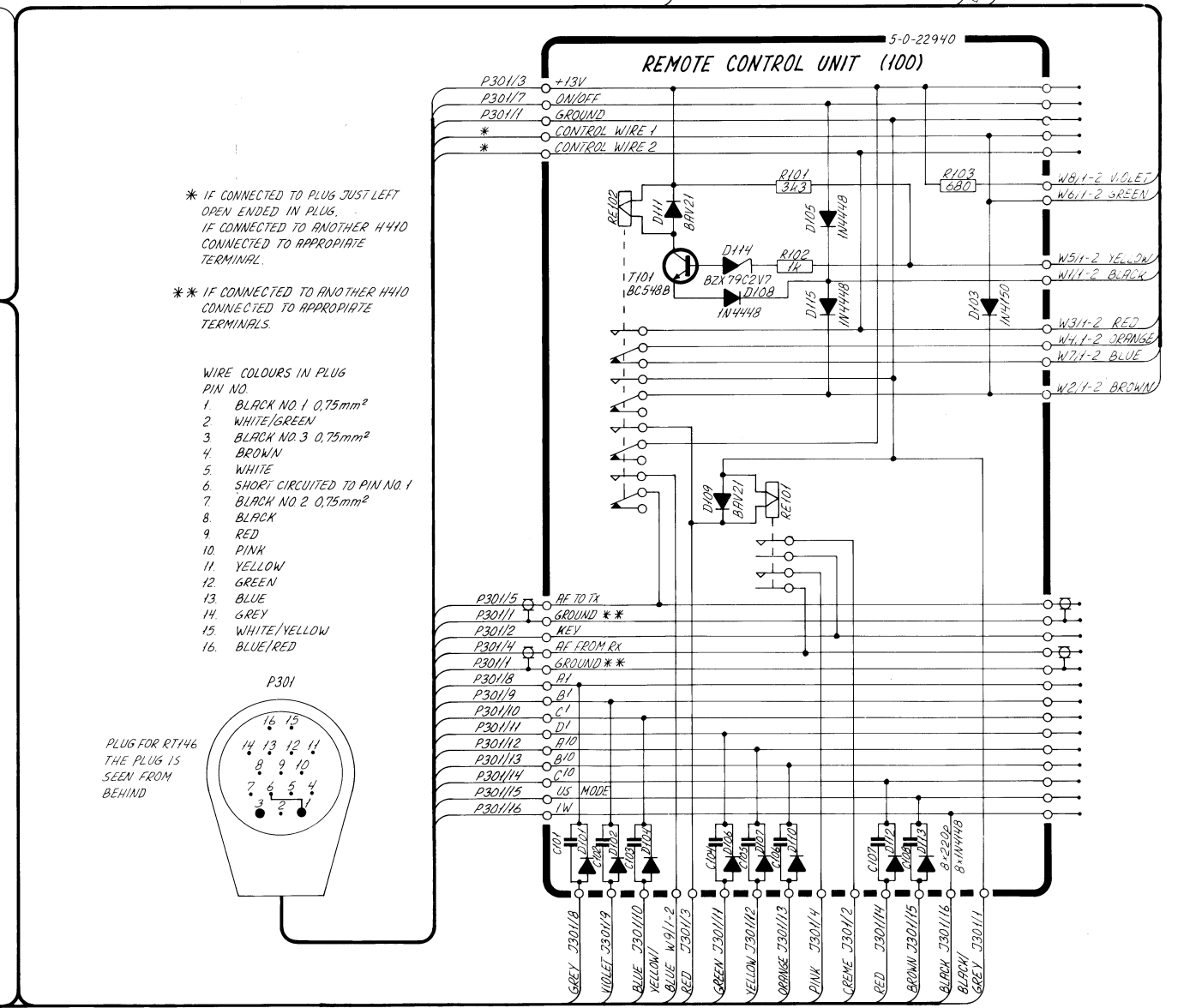
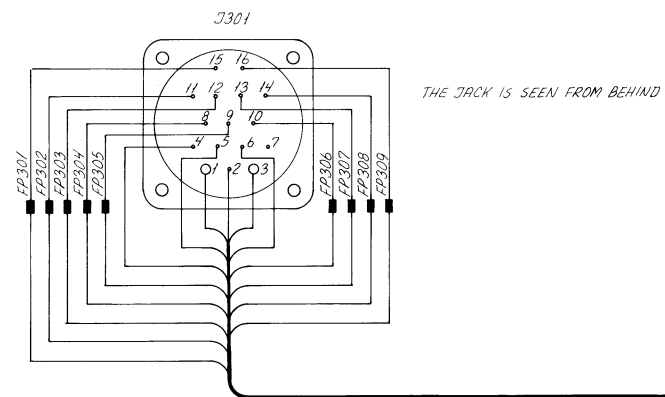
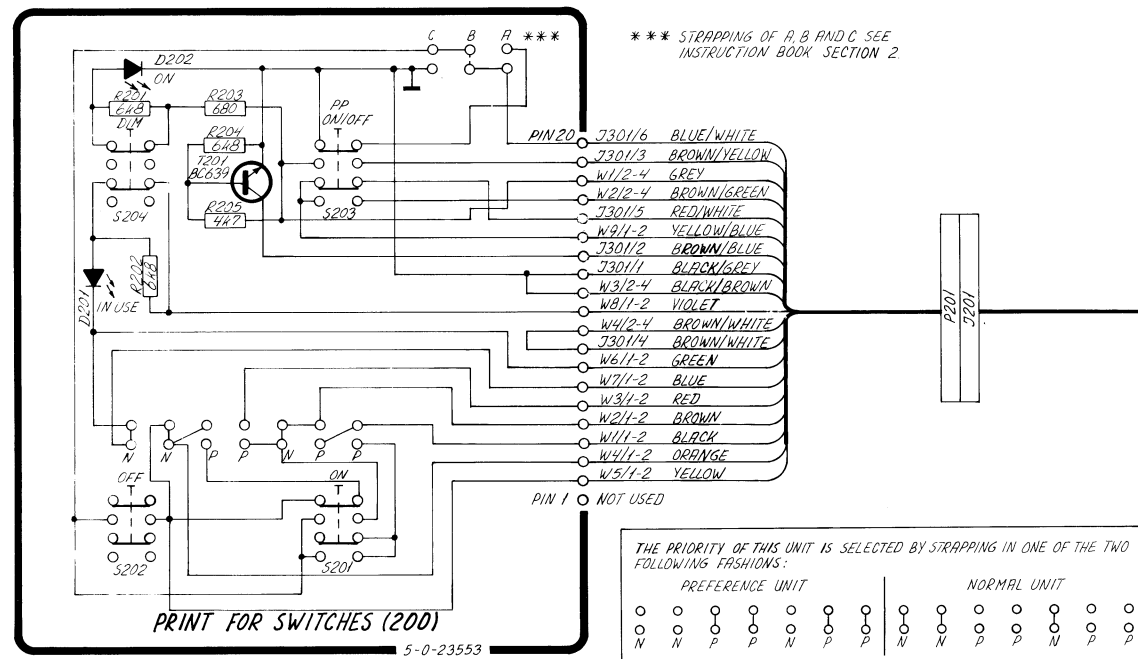
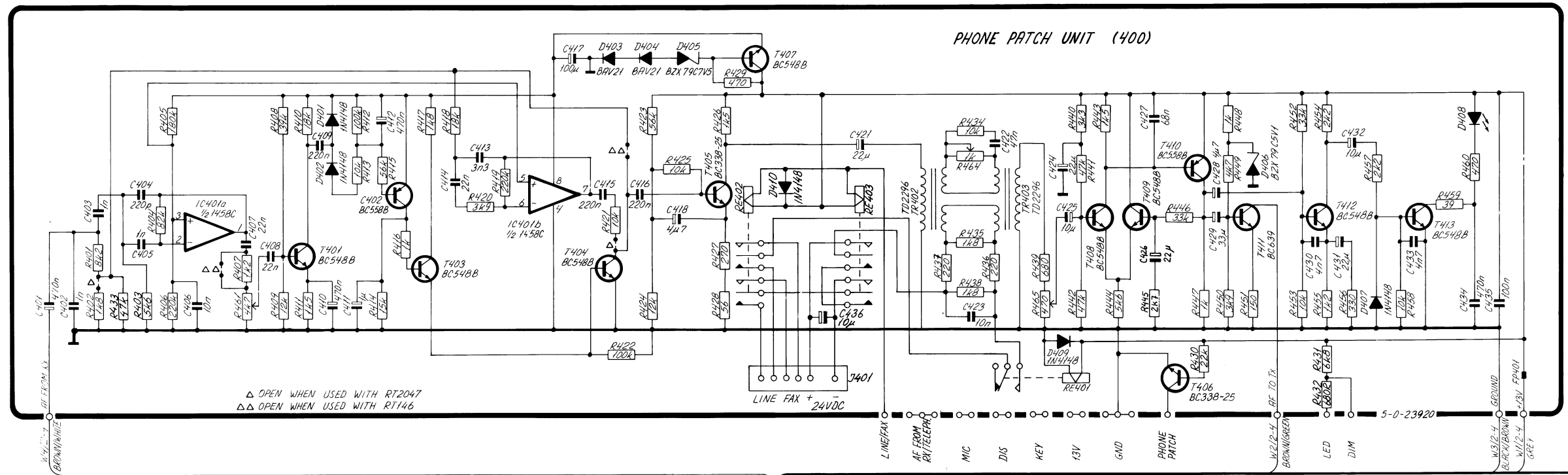
##### **MODULATION INDICATOR**

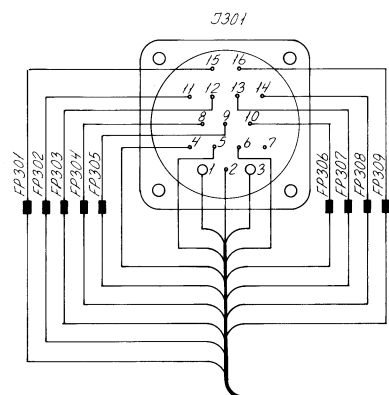
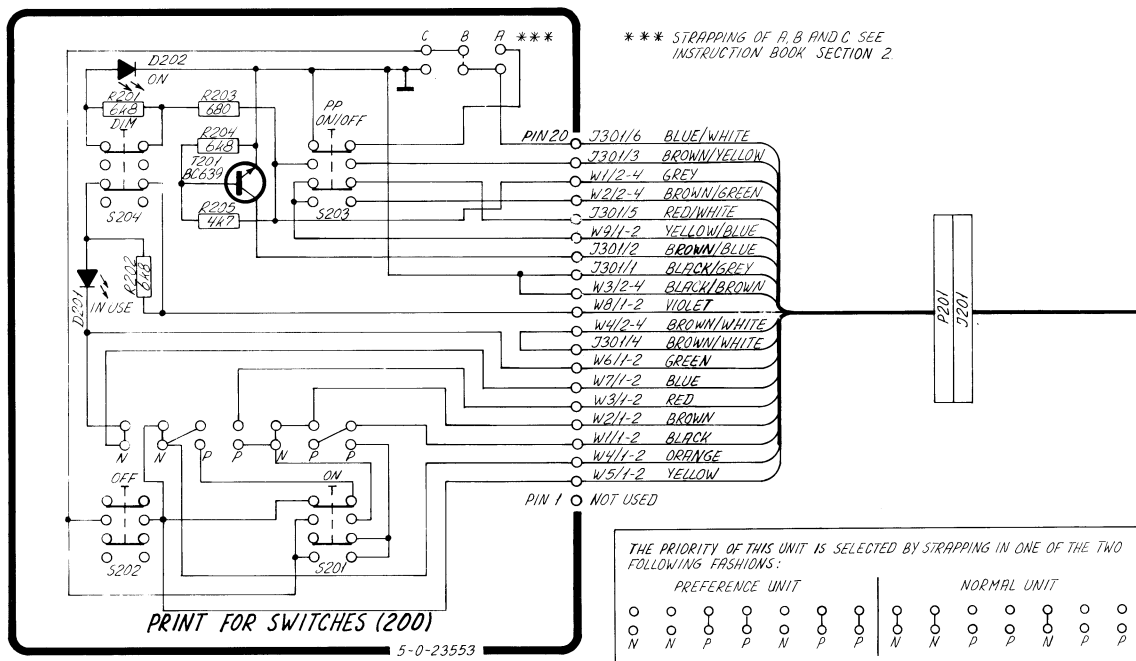
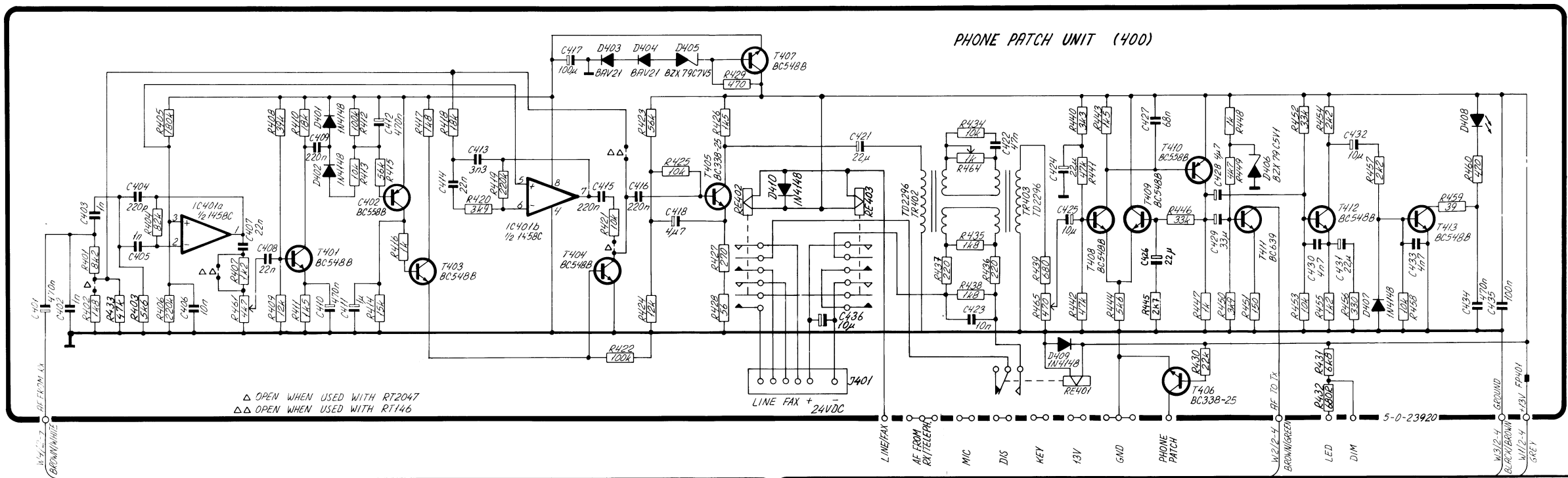
This circuit consists of the buffer transistor T412 and the driver transistor T413. D407 secures the transistor T413 from reverse break down on the basis emitter region. D408 is the indicator for the modulation.



**PHONE PATCH MODULE PCB**  
(common for H416 and H2076)







THE JACK IS SEEN FROM BEHIND

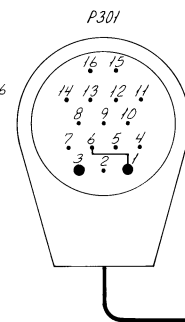
\* IF CONNECTED TO PLUG JUST LEFT  
OPEN ENDED IN PLUG.  
IF CONNECTED TO ANOTHER 4410  
CONNECTED TO APPROPRIATE  
TERMINAL.

\*\*\* IF CONNECTED TO ANOTHER H410  
CONNECTED TO APPROPRIATE  
TERMINALS.

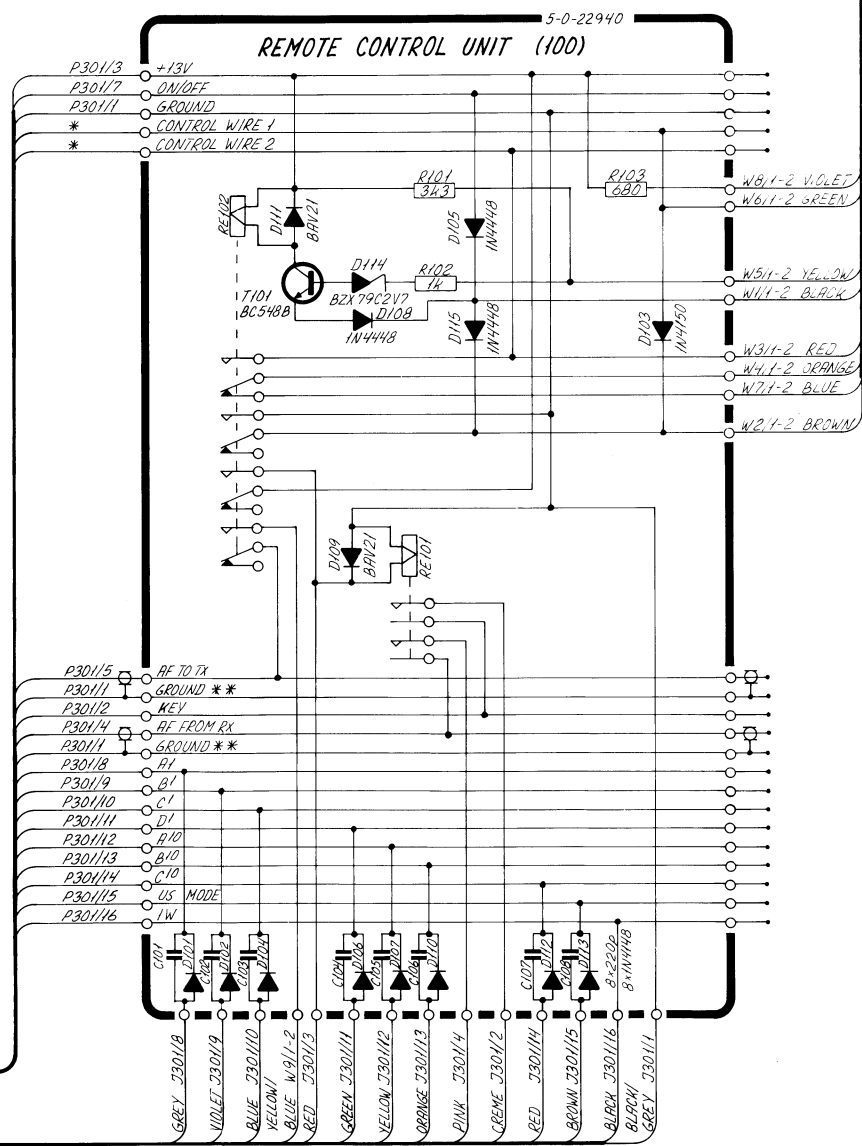
WIRE COLOURS IN PLUG

PIN NO.

- 1 BLACK NO. 1 0,75mm<sup>2</sup>
- 2 WHITE/GREEN
- 3 BLACK NO. 3 0,75mm<sup>2</sup>
- 4 BROWN
- 5 WHITE
- 6 SHORT CIRCUITED TO PIN NO. 1
- 7 BLACK NO. 2 0,75mm<sup>2</sup>
- 8 BLACK
- 9 RED
- 10 PINK
- 11 YELLOW
- 12 GREEN
- 13 BLUE
- 14 GREY
- 15 WHITE/YELLOW
- 16 BLUE/RED



PLUG FOR RT146  
THE PLUG IS  
SEEN FROM  
BEHIND



## REMOTE CONTROL UNIT (100) FOR H410/H416

1

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C101- C108	Capacitor ceramic	220pF -20/+80%	400V	Ferroperm	9/0129.9
D101	Diode			Philips	1N4148
D102	Diode			Philips	1N4148
D103	Diode			Philips	1N4150
D104	Diode			Philips	1N4148
D105	Diode			Philips	1N4448
D106	Diode			Philips	1N4148
D107	Diode			Philips	1N4148
D108	Diode			Philips	1N4448
D109	Diode			Philips	BAV21
D110	Diode			Philips	1N4148
D111	Diode			Philips	BAV21
D112	Diode			Philips	1N4148
D113	Diode			Philips	1N4148
D114	Diode, zener			Philips	BZX79C2V7
D115	Diode			Philips	1N4448
RE101	Reed relay (DPST)			Siemens	V23100-V43-12-B000
RE102	Relay (4PDT)			National	NF-4C-12V
R101	Resistor	3,3 Kohm $\pm$ 5%	0.33W	Philips	2322 211 13332
R102	Resistor	1 Kohm $\pm$ 5%	0.33W	Philips	2322 211 13102
R103	Resistor	680 Kohm $\pm$ 5%	0.33W	Philips	2322 211 13681
T101	Transistor			Philips	BC548B

## PRINT FOR SWITCHES (200) FOR H410/H416

1

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
D201	L.E.D. red	GeneralElect.	MV5753
D202	L.E.D. red	GeneralElect.	MV5753
R201	Resistor 6,8 Kohm $\pm$ 5% 0.33W	Philips	2322 211 13682
R202	Resistor 6,8 Kohm $\pm$ 5% 0.33W	Philips	2322 211 13682
R203	Resistor 680 ohm $\pm$ 5% 0.33W	Philips	2322 211 13681
R204	Resistor 6,8 Kohm $\pm$ 5% 0.33W	Philips	2322 211 13682
R205	Resistor 4,7 Kohm $\pm$ 5% 0.33W	Philips	2322 211 13472
S201	Mini Switch, Unimec, momentary	M.E.C.	MKII
S202	Mini Switch	M.E.C.	MKII
S203	Mini Switch	M.E.C.	MKII
S204	Mini Switch	M.E.C.	MKII
T201	Transistor	Philips	BC639
FP301- FP309	Ferrit bead	Kaschke	K3/1200/0,1Hz/4/2/7A
J301	Jack 16-polet	Hirschmann	MEB 160

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	PHONE PATCH H416/H2076		ESPERA	5-0-23920	600002
C401	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C402	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C403	CAPACITOR POLYSTYRENE	1n00F 1% 250VDC	PHILIPS	2222 430 81002	10.350
C404	CAPACITOR POLYSTYRENE	220pF 1% 630VDC	PHILIPS	2222 431 82201	10.409
C405	CAPACITOR POLYSTYRENE	1n00F 1% 250VDC	PHILIPS	2222 430 81002	10.350
C406	CAPACITOR CERAMIC	10nF -20/+80% 40V	FERROPERM	9/0141,8	15.740
C407	CAPACITOR MKT	22nF 5% 100VDC	ERO	MKT 1826-322/01 4-G	11.169
C408	CAPACITOR MKT	22nF 5% 100VDC	ERO	MKT 1826-322/01 4-G	11.169
C409	CAPACITOR MKT	220nF 5% 63VDC	ERO*	MKT 1826-422/06 4-G	11.182
C410	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C411	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	ELNA	RJ2-50-V-010-M-T12	14.506
C412	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C413	CAPACITOR POLYSTYRENE	3.3nF 1% 63V	*PHILIPS	2222 428 83302	10.213
C414	CAPACITOR MKT	22nF 5% 100VDC	ERO	MKT 1826-322/01 4-G	11.169
C415	CAPACITOR MKT	220nF 5% 63VDC	ERO*	MKT 1826-422/06 4-G	11.182
C416	CAPACITOR MKT	220nF 5% 63VDC	ERO*	MKT 1826-422/06 4-G	11.182
C417	CAPACITOR ELECTROLYTIC	100uF 20% 10VDC	ELNA	RJ3-10-V-101-M-T12	14.607
C418	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	ELNA	RJ2-50-V-4R7-M-T12	14.510
C421	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T12	14.514
C422	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C423	CAPACITOR CERAMIC	10nF -20/+80% 40V	FERROPERM	9/0141,8	15.740
C424	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T12	14.514
C425	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T12	14.512
C426	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T12	14.514
C427	CAPACITOR MKT	68nF 5% 63VDC	ERO	MKT 1826-368/01 4-G	11.178
C428	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	ELNA	RJ2-50-V-4R7-M-T12	14.510
C429	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C430	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C431	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T12	14.514
C432	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T12	14.512
C433	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C434	CAPACITOR MKT	470nF 5% 63VDC	ERO	MKT 1826-447/06 4-G	11.187
C435	CAPACITOR MKT	0.1uF 10% 63VDC	ERO	MKT 1826-410/06 5-G	11.136
C436	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T12	14.512
D401	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D402	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D403	DIODE GENERAL PURPOSE	BAV21 200V/0.25A	PHILIPS	BAV21	25.340
D404	DIODE GENERAL PURPOSE	BAV21 200V/0.25A	PHILIPS	BAV21	25.340

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
D405	DIODE ZENER	7.5V 5% 0.4W	PHILIPS	BZX79C7V5	26.539
D406	DIODE ZENER	5.1V 5% 0.4W	PHILIPS	BZX79C5V1	26.527
D407	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D408			G.I.*	MV5774B-15,2MM BEN	25.550
D409	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D410	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
FP401	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4.2/2.1/7 G K1201 405 442 075 021	35.011
IC401	INTEGRATED CIRCUIT	DUAL OPERATIONAL AMP.	TEXAS	MC1458P	31.215
R401	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 184 43822	01.722
R402	RESISTOR MF	1k8 OHM 5% 0.4W	PHILIPS	2322 181 53182	01.206
R403	RESISTOR MF	5k6 OHM 5% 0.4W	PHILIPS	2322 181 53562	01.218
R404	RESISTOR	82 KOHM 5% 0.33W	PHILIPS	2322 184 43823	01.747
R405	RESISTOR	180 KOHM 5% 0.33W	PHILIPS	2322 184 43184	01.756
R406	RESISTOR	220 KOHM 5% 0.33W	PHILIPS	2322 184 43224	01.758
R407	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 184 43122	01.702
R408	RESISTOR MF	39k OHM 5% 0.4W	* PHILIPS	2322 181 53393	01.239
R409	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 184 43123	01.727
R410	RESISTOR	18 KOHM 5% 0.33W	PHILIPS	2322 184 43183	01.731
R411	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 184 43152	01.704
R412	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 184 43104	01.750
R413	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R414	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 184 43153	01.729
R415	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 184 43563	01.743
R416	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R417	RESISTOR	1.8 KOHM 5% 0.33W	PHILIPS	2322 184 43182	01.706
R418	RESISTOR	18 KOHM 5% 0.33W	PHILIPS	2322 184 43183	01.731
R419	RESISTOR	220 KOHM 5% 0.33W	PHILIPS	2322 184 43224	01.758
R420	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 184 43392	01.714
R421	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R422	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 184 43104	01.750
R423	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 184 43563	01.743
R424	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 184 43123	01.727
R425	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R426	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 184 43152	01.704
R427	RESISTOR MF	270 OHM 5% 0.4W	PHILIPS	2322 181 53271	01.185
R428	RESISTOR	56 OHM 5% 0.33W	PHILIPS	2322 184 43569	01.668
R429	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 184 43471	01.691
R430	RESISTOR MF	22k OHM 5% 0.4W	PHILIPS	2322 181 53223	01.233
R431	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 184 43681	01.695
R432	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 184 43682	01.720
R433	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473	01.241
R434	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R435	RESISTOR MF	1k8 OHM 5% 0.4W	PHILIPS	2322 181 53182	01.206



POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R436	RESISTOR MF	220 OHM 5% 1.6W	PHILIPS	2322 191 32201	04.183
R437	RESISTOR MF	220 OHM 5% 1.6W	PHILIPS	2322 191 32201	04.183
R438	RESISTOR PMF	1k8 OHM 5% 1.6W	PHILIPS	2322 191 31802	04.205
R439	RESISTOR MF	680 OHM 5% 0.4W	PHILIPS	2322 181 53681	01.195
R440	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 184 43332	01.712
R441	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 184 43473	01.741
R442	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 184 43473	01.741
R443	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 184 43152	01.704
R444	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 184 43562	01.718
R445	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 184 43272	01.710
R446	RESISTOR MF	33k OHM 5% 0.4W	PHILIPS	2322 181 53333	01.237
R447	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R448	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 184 43102	01.700
R449	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 184 43472	01.716
R450	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 184 43392	01.714
R451	RESISTOR	150 OHM 5% 0.33W	PHILIPS	2322 184 43151	01.679
R452	RESISTOR	33 KOHM 5% 0.33W	PHILIPS	2322 184 43333	01.737
R453	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R454	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 184 43222	01.708
R455	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 184 43122	01.702
R456	RESISTOR	330 OHM 5% 0.33W	PHILIPS	2322 184 43331	01.687
R457	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 184 43222	01.708
R458	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 184 43103	01.725
R459	RESISTOR MF	39 OHM 5% 0.33W	PHILIPS	2322 184 43399	01.664
R460	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 184 43471	01.691
R461	PRESET CERMET	5k0 OHM 10% 0.5W	BOURNS	3386P-1-502	07.888
R464	PRESET CERMET	1k0 OHM 10% 0.5W	BOURNS	3386P-1-102	07.886
R465	PRESET CERMET	500 OHM 10% 0.5W	* BOURNS	3386P-1-501	07.885
RE401	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE402	RELAY	12VDC 2SH 1.25A	ZETLER	AZ 830-2C-12DSEA	21.030
RE403	RELAY	12VDC 2SH 1.25A	ZETLER	AZ 830-2C-12DSEA	21.030
T401	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T402	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
T403	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T404	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T405	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
T406	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
T407	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T408	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T409	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T410	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
T411	TRANSISTOR AF	NPN BC639 TO-92	PHILIPS	BC639	28.120
T412	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T413	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
TR402	TRANSFORMER	TD2296	TRADANIA	TD2296	22.130
TR403	TRANSFORMER	TD2296	TRADANIA	TD2296	22.130