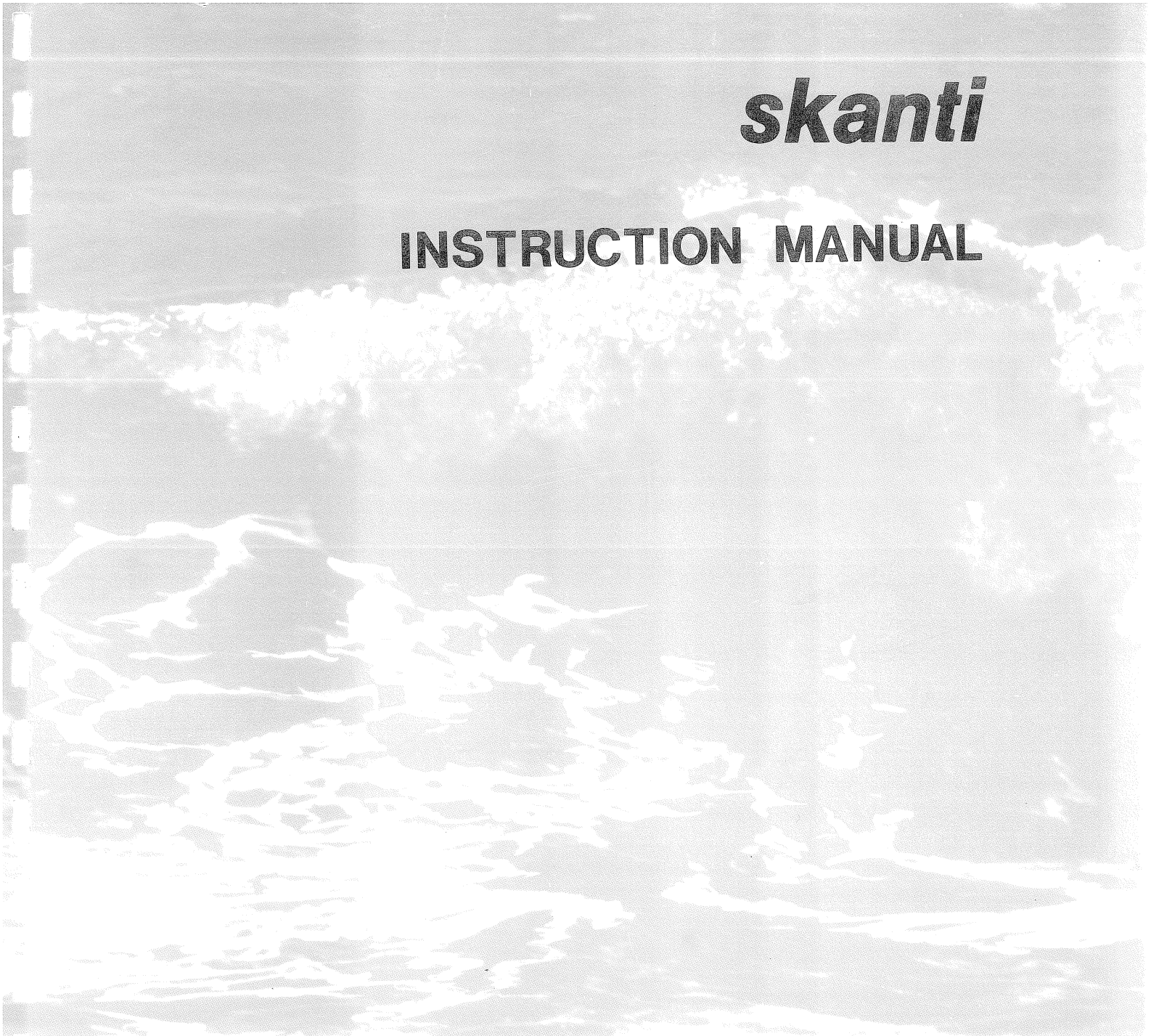
skanti

INSTRUCTION MANUAL



WATCH RECEIVER 2182 kHz

TYPE WR 6000

500 7-81
91000023
1 udgave

skanti

WR 6000 INSTRUCTION MANUAL

Skandinavisk Teleindustri Skanti A/S
34, Kirke Værløsevej – DK 3500 Værløse – Denmark

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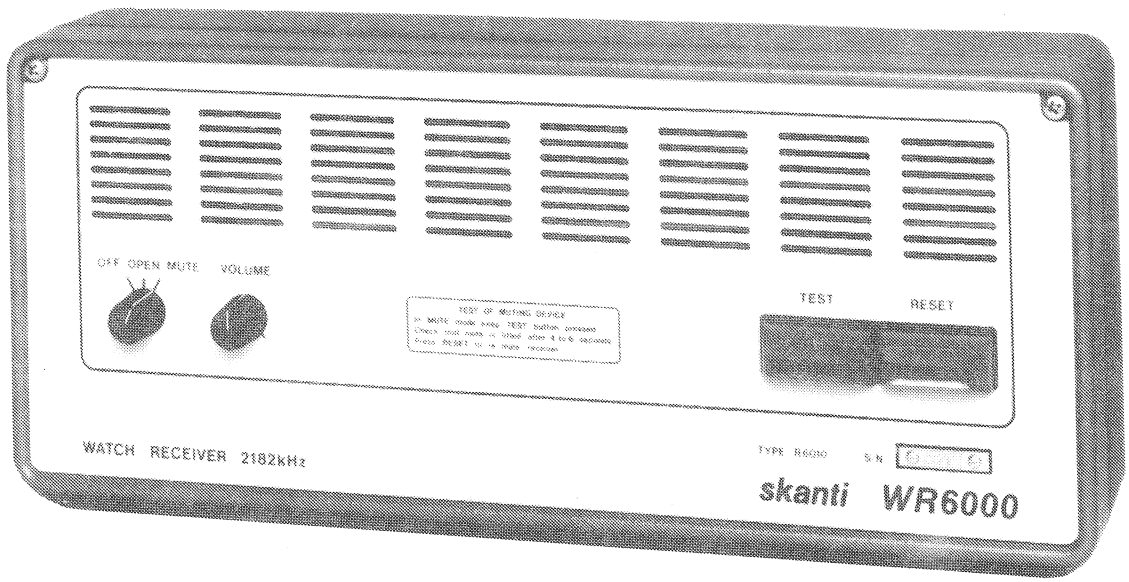
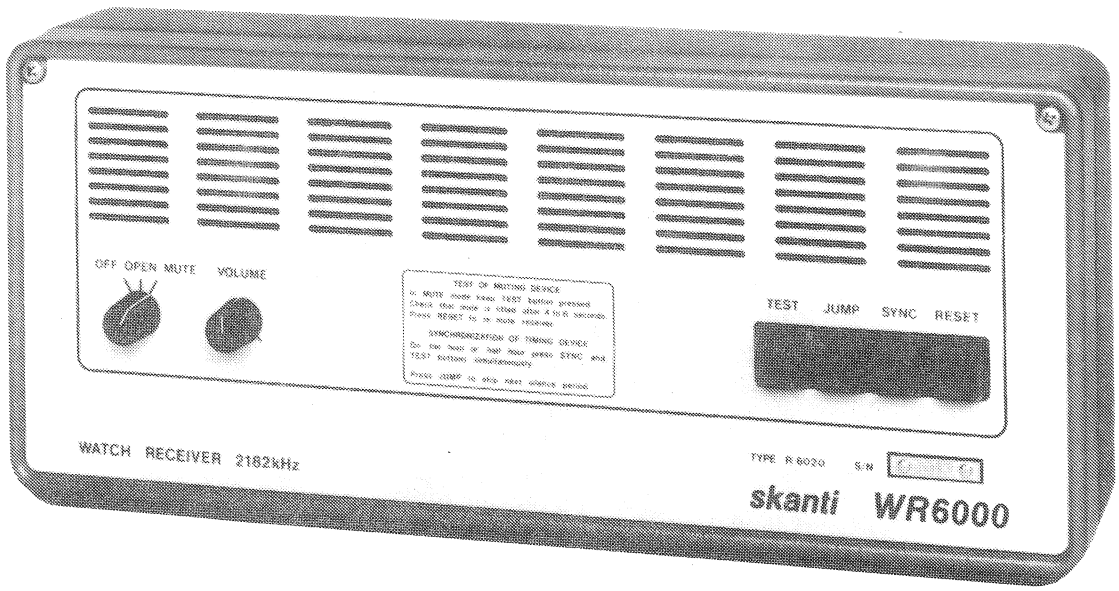
Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this manual. Whenever practicable corrections will be listed on a correction sheet inside the front cover of this manual.

WR6000 INSTRUCTION MANUAL

CONTENTS



TYPE R6010



TYPE R6020

Fig. 1

1. INTRODUCTION TO WR6000

The SKANTI WR 6000 radiotelephone distress frequency watch receiver complies with the SOLAS 74 convention and the ITU Radio Regulations. It meets the latest CEPT, FCC, and MPT specifications as well as the national requirements of most countries.

The WR 6000 can be delivered in two versions, type R 6010 which has no internal clock and type R 6020 where internal clock is installed. The clock is used for de-muting of the receiver during the so-called silence periods and is only required in certain countries where specified in their regulations.

The two different versions are shown on Fig. 1.

The WR 6000 is operated in either OPEN- or MUTE-mode. In OPEN-mode there is normal reception on 2182 kHz. In MUTE-mode the loudspeaker will keep silent until a distress or navigational warning signal has been received for about 5 sec. The receiver will then work as if OPEN-mode is selected until it is manually reset and thereby switched back to MUTE-mode again.

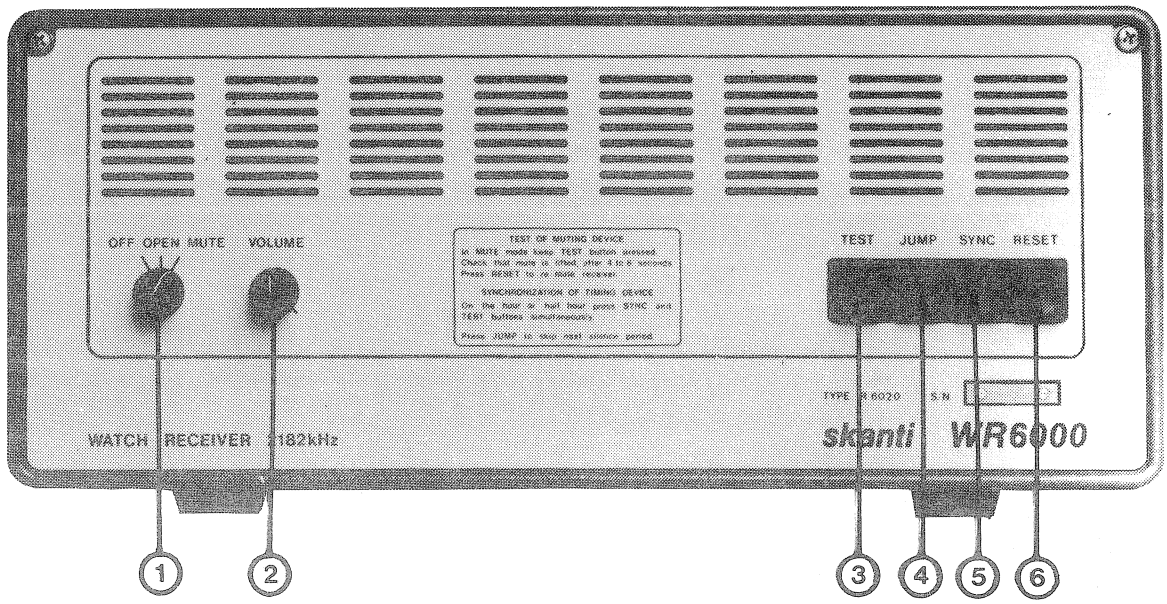
An internal test generator for a two-tone alarm signal enables the user to check the de-muting circuit.

The volume control has a preset minimum setting, ensuring that a distress message will be reproduced with an audible sound level.

The WR 6000 is housed in a non-metallic, non-magnetic cabinet and designed for direct bulkhead mounting.

The receiver supply voltage can be 24V DC and/or 110V/220V AC.

2. OPERATING CONTROLS



Please note that it is the watch receiver type R 6020 which is shown on the photo. The watch receiver type R 6010 has no JUMP and SYNC. pushbuttons. The description of the operating controls applies to both types of receivers, except where pointed out in the text.

① OFF: Supply to receiver switched off.

OPEN: Receiver switched on for normal reception of all signals on 2182 kHz.

MUTE: Receiver switched on, but the loudspeaker will stay silent until a distress- or navigational warning signal has been received for 5 sec. Then OPEN-mode is automatically selected.

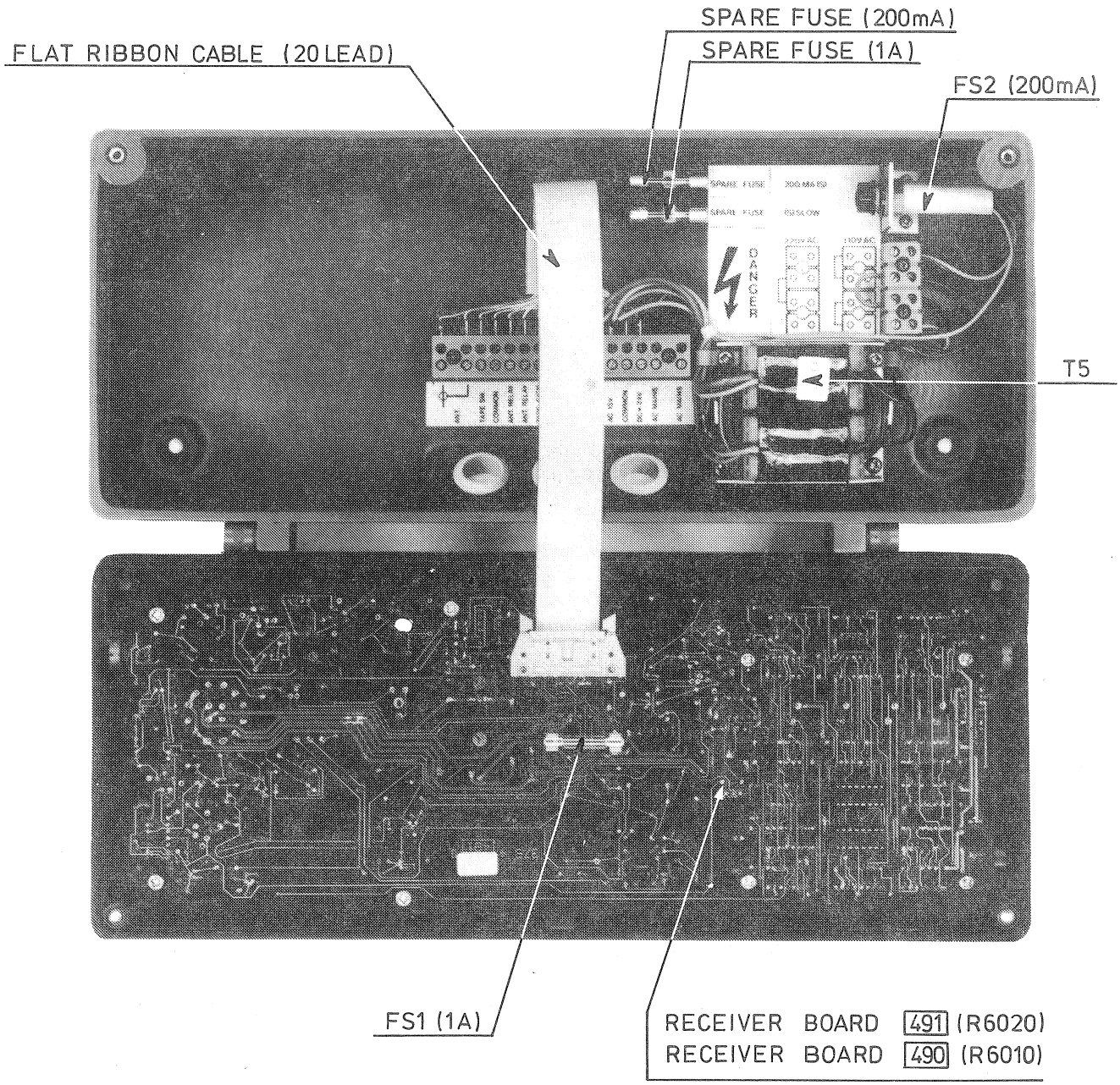
② VOLUME: The volume control determines the AF-level of the receiver. It is possible to adjust the output power from about 2 mW to maximum power.

③ TEST: Test of de-muting circuit. Select MUTE-mode and keep the TEST button pressed until the receiver de-mutes. This should happen within 4 to 6 sec.

④ JUMP: (Type R 6020 only) Pressing JUMP causes the receiver to leave out the next de-muting period.

⑤ SYNC: (Type R 6020 only) The SYNC and TEST buttons have to be pressed simultaneously on the hour or half hour, corresponding to the beginning of the radiotelephone silence periods, to set the internal clock. If the synchronization is accomplished with the receiver in MUTE mode, the mute will be suspended for 3 minutes (e.g. 10,00 - 10,03 or 10,30 - 10,33). Thereafter the receiver will de-mute every hour and half hour for 3 minutes.

⑥ RESET: Brings receiver back to MUTE-mode when it has been suspended by the clock or by a two-tone distress signal.


SPARE FUSE (200mA)
SPARE FUSE (1A)
FLAT RIBBON CABLE (20 LEAD)
FS2 (200mA)
T5
FS1 (1A)
RECEIVER BOARD 491 (R6020)
RECEIVER BOARD 490 (R6010)

3. INSTALLATION

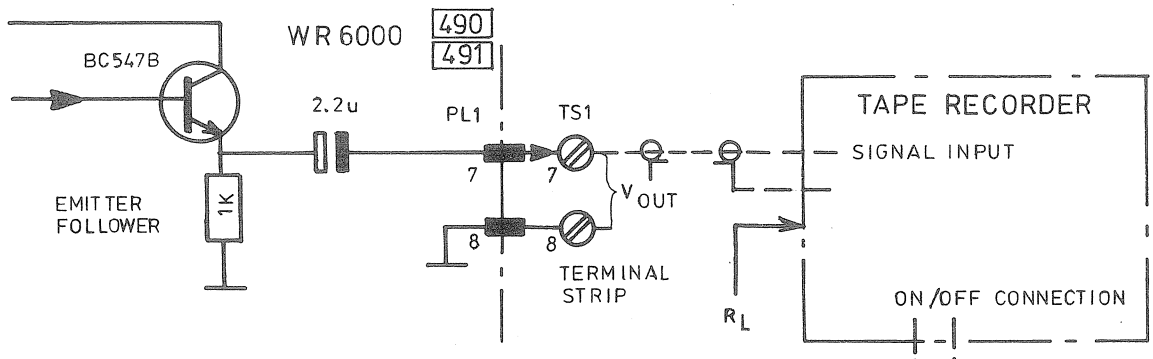
3.1. Cabinet Mounting:

The WR 6000 receiver is designed for direct mounting on the bulkhead. The drawing on page 3-4 shows the dimensions and a drilling plan for the necessary holes.

3.2. Cable Connections:

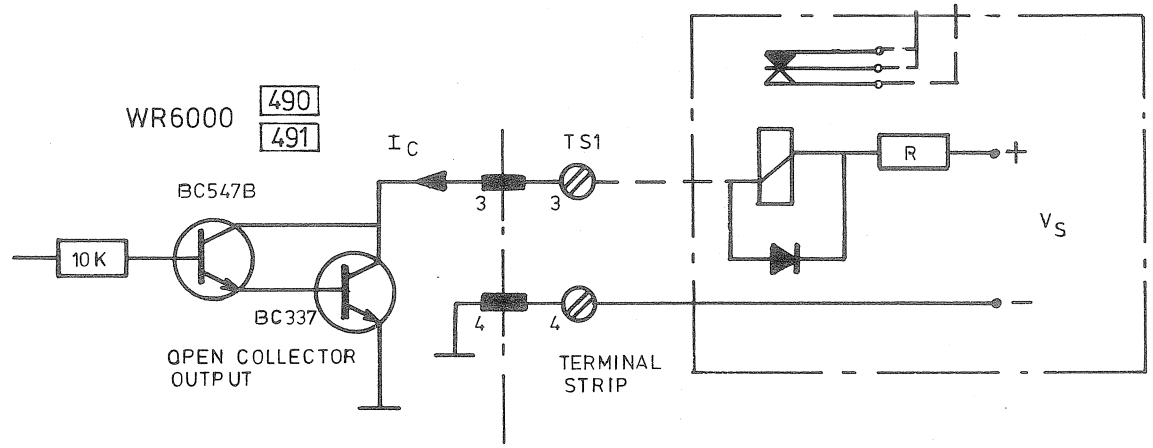
All the cables for inputs and outputs of the receiver are entered through the rubber cable inlets and connected to the terminal strip in the bottom of the cabinet as shown on page 3-5.

3.2.1. Tape Signal Output:



V_{OUT} = 800 mV_{RMS} FOR 30% MOD (R_L MIN. 600Ω)

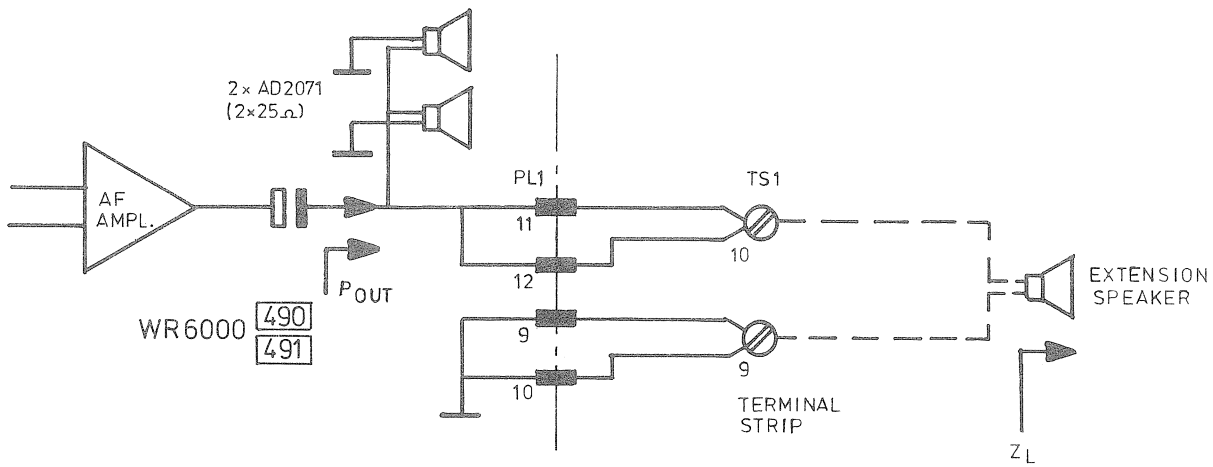
3.2.2. Tape Switch Output



V_S MAX = 45 VOLT

I_C MAX = 0.5A

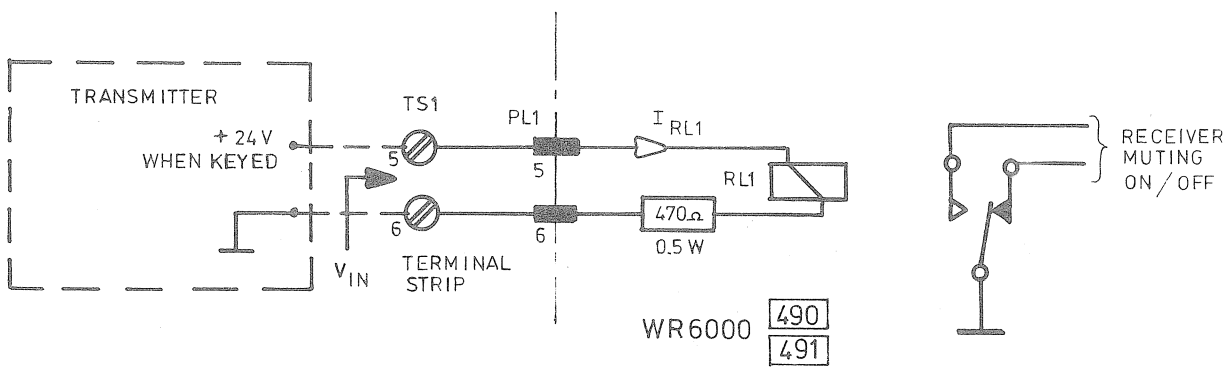
3.2.3. Extension Speaker Output:



$Z_L = \infty$ (NO EXT. SPEAKER) $\Rightarrow P_{OUT}$ MAX. = 1W

Z_L MIN. = 8Ω $\Rightarrow P_{OUT}$ MAX. = 2W

3.2.4. Antenna Relay Input:



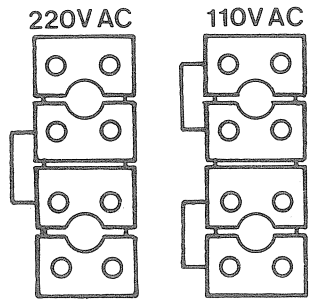
V_{IN} = 24V DC (+30% - 10%) $\Rightarrow I_{RL1} \leq 35$ mA

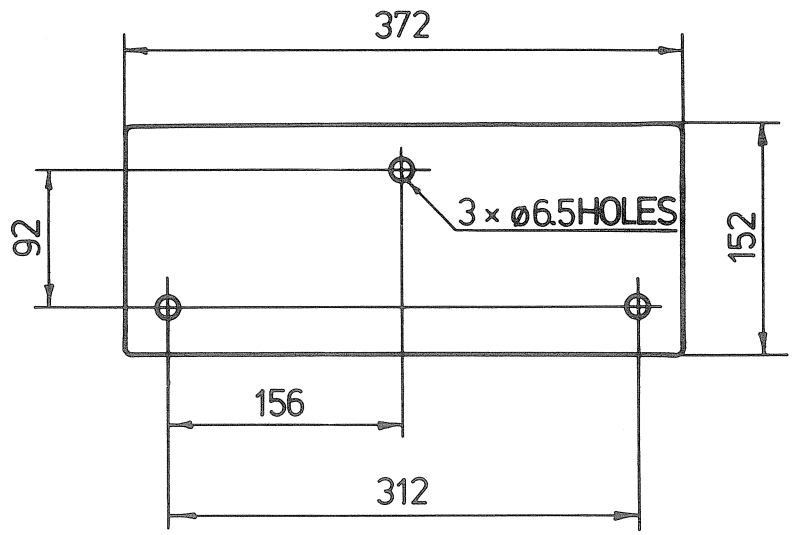
3.3. Supply Voltage Input:

The WR 6000 supply voltage can be 24V DC and/or 110V/220V AC.

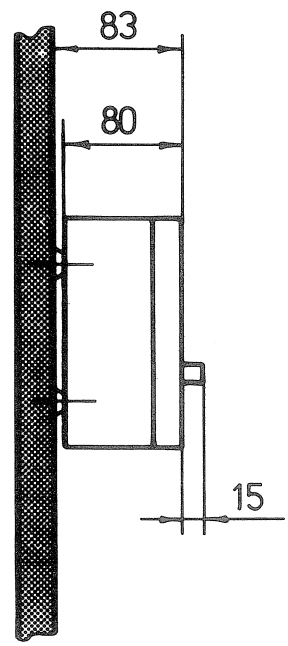
The primary connections of the mains transformer are wired for 220V AC when delivered from SKANTI as shown on the figure below.

When the supply voltage from the ship's mains is 110V AC only, the primary connections must be rewired for this voltage as shown on the figure below.





DRILLING PLAN



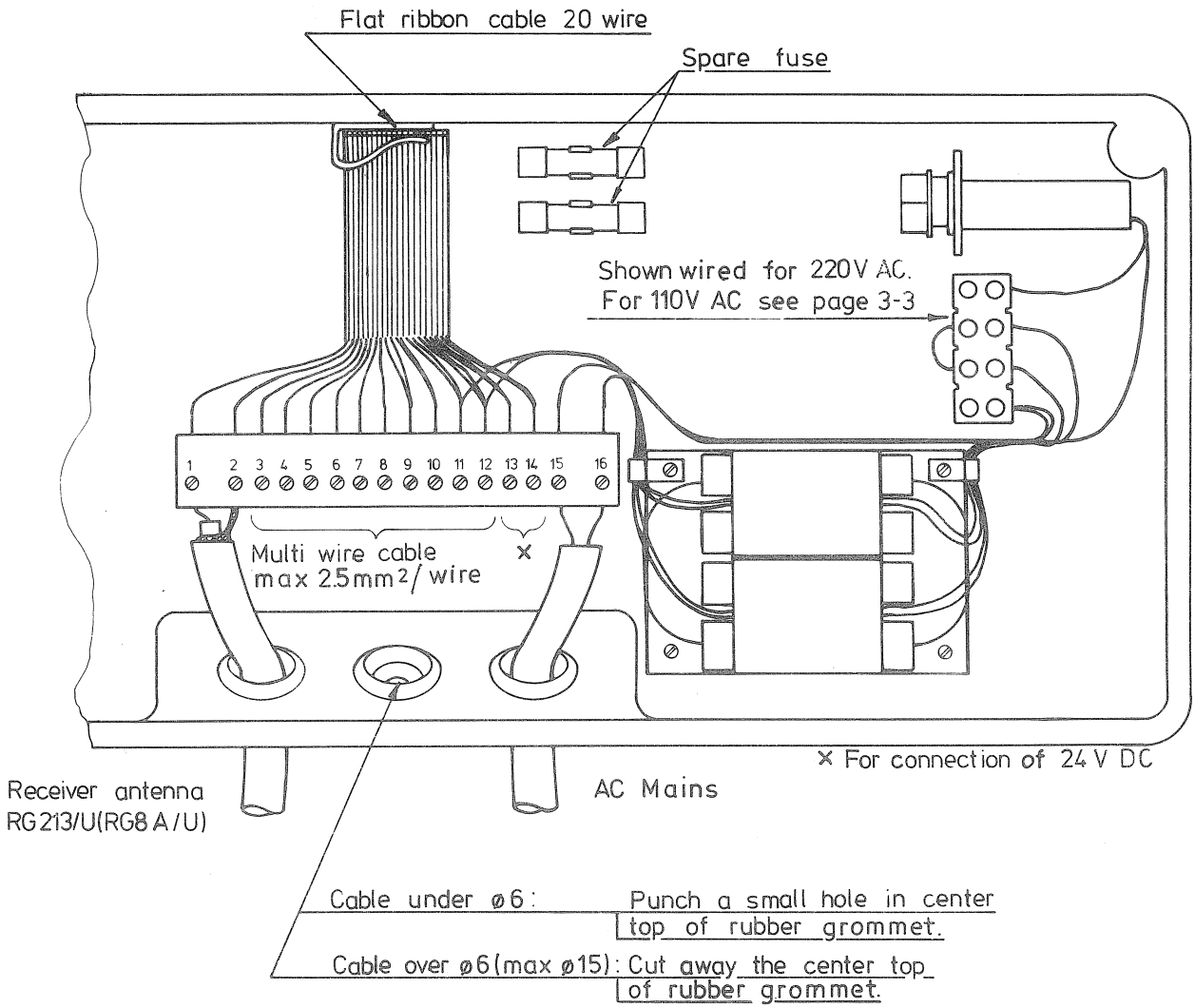
BULKHEAD MOUNTING

MOUNTING OF R6010 AND R6020

TOLERANCES: ±1mm

DIMENSIONS IN mm

345 402 41



1	ANT.	Antenna.
2		
3	TAPE SW.	Tape recorder control.
4	COMMON	
5	ANT. RELAY	Antenna relay.
6	ANT. RELAY	
7	TAPE SIGN.	Tape recorder.
8	COMMON	
9	COMMON	External speaker min. 8 ohm.
10	SPEAKER	
11	AC 15V	15V AC from transformer (interconnection).
12	AC 15V	
13	COMMON	Battery supply 24V DC
14	DC + 24V	
15	AC MAINS	Mains supply 220V AC or 110V AC.
16	AC MAINS	

CABLE CONNECTION WR6000

4. TECHNICAL DATA

The SKANTI WR 6000 is a superheterodyne distress frequency watch receiver which complies with the SOLAS 74 convention and the latest CEPT, FCC and MPT specifications as well as the national requirements of most countries.

4.1. RF-Section

Receiving Frequency:	2182 kHz $\pm$ 30 Hz
Antenna:	7-30 metres
Classes of Emission	A2, A2H, A3, A3H
Sensitivity:	Antenna input for 10 dB Sinad < 5.6 uV (15dB/1uV) measured with 10 ohms + 250 pF artificial antenna
Selectivity:	- 6 dB: BW $\geq \pm$ 2.7 kHz -60 dB: BW $\leq \pm$ 10 kHz
Blocking Level:	> 110 dB
Cross Modulation:	> 100 dB
Intermodulation:	> 85 dB

4.2. AF-Section

Frequency Range:	200 Hz - 2.7 kHz + 0/- 6 dB
Output Power:	1 W (internal loudspeaker = 12 ohm) 2 W (with external loudspeaker = 8 ohm)
Min. Loading Impedance:	8 ohm
Distortion:	$\leq$ 5 %
AF Preset Gain:	14 dB Range
AF Reduction when muted:	> 55 dB relative to 50 mW output power into 12 ohm.
AGC:	< 3 dB Variation in output power for input signals from 15dB/1uV to 10dB/1uV
Tape Output:	800 m V_{RMS} for 30 % mod., R_L min. 600 ohm.

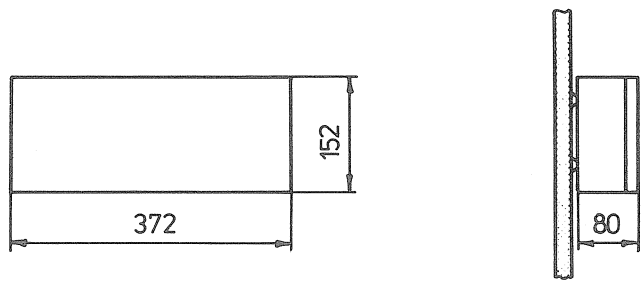
4.3. Clock Accuracy

(Type R 6020 only)
Variations are less than 5 sec/week.

4.4. Power Requirements:

Supply Voltage:	110/220 V AC (± 10 %) 50 - 60 Hz and/or 24 V DC (+30 %, -10 %) Connection will not earth supply battery.
Consumption:	< 10 W
Muting Relay:	24 V DC (+30 %, -10 %)
Tape Switch:	Open collector output max. 45 V, 0.5 A

4.5. Dimensions (mm):



R 6010 and R 6020

4.6. Weight: 2.2 kgs.

5. FUNCTIONAL DESCRIPTION

(see WR 6000 Block Diagram page 7-9)

The WR 6000 is a superheterodyne receiver with a fixed 2182 kHz receiving frequency and 455 kHz IF frequency. The entire receiver is mounted on a single printed circuit board, which is interconnected to a terminal strip by a flat fibbon cable with a 20 pole connector. All incoming cables are connected to this terminal strip as is the mains transformer which is located in the bottom of the cabinet.

5.1. Receiver Signal Path:

The received RF signal from the antenna is fed to the fixed tuned 2182 kHz input filter.

The switch shown on the block diagram short circuits the RF signal when the mute relay is activated. The mute relay can be activated during transmitting periods of nearby transmitters where muting of the WR 6000 is required.

The RF signal is converted in the mixer to a 455 kHz IF signal. The output of the mixer is filtered in a narrow-band ceramic bandpass filter and fed to the two-stage AGC-controlled IF amplifier. The output of this amplifier is via a tuned circuit transferred to the detector which in principle is a balanced mixer. The second input of this mixer has a high gain clipping amplifier which removes the amplitude modulation from the incoming signal. The IF signal is also fed to this input which results in an output from the mixer that contains a spectrum around zero and one around 910 kHz (2 x IF). The AF signal passes through the 910 kHz band stop filter and the FET mute switch to the tape amplifier and output amplifier with volume control and 3 kHz low-pass filter.

The 910 kHz signal is high-pass filtered, amplified and detected to produce an AGC-voltage which controls the IF gain of the receiver.

The 2637 kHz XO delivers the injection signal to the mixer. The XO signal is also frequency divided to give the various reference frequencies for the logic circuits.

5.2. Logic Circuits:

The AF signal is fed to the 2200 Hz detector which gives a low output level when detecting a 2200 Hz $\pm$ 90 Hz tone.

Each time the output level of the 2200 Hz detector changes e.g. on the negative respectively positive edge of the output pulse a short pulse is produced inside the 2 Hz detector.

If the 2200 Hz detector receives 8 periods of the alarm signal (1300 Hz/2200 Hz) 16 pulses will be generated.

By means of these pulses the 2 Hz detector measures whether the 2200 Hz detector output is within specifications or not. The output must be low for 200-300 msec and high for 200-400 msec according to the on and off periods of the two tones in the alarm signal.

After 16 consecutive pulses the counter activates the switch control which closes the mute switch. When the mute switch closes, the AF signal is allowed to pass through to the output amplifier and tape amplifier, and the tape switch output is activated.

The mute switch is opened again by pressing the RESET pushbutton or by briefly switching the OFF/OPEN/MUTE switch to position OPEN.

If one of the 8 periods of the received alarm signal is outside the specified time limits, the counter will be reset and the mute switch will stay open (no AF output) until 8 consecutive correct periods have been received.

The built-in test generator can be switched on by the TEST-pushbutton. The generator feeds an alarm signal to the 2200 Hz detector to the same input as for normal received distress signals. In this way all the logic circuits can be checked for correct de-coding of two-tone signals. If it functions correctly, the signal will be fed to the loudspeaker after 4 to 6 seconds.

The 2 Hz, 50 % duty cycle, signal is used as a reference signal for the clock divider and for changing the division ratio of the two-tone frequency divider (÷6/÷10).

The output of the latter is 2637 Hz and 4395 Hz. These frequencies are again divided by 2 in the test generator which then gives us approx. the 1300 Hz and the 2200 Hz.

The clock divider is only mounted in the WR 6000, type R 6020.

This type has two additional pushbuttons which are called SYNC and JUMP.

The clock divider generates an on-pulse every half hour followed by an off-pulse 3 minutes later. These pulses are fed to the switch control which de-mutes the receiver during these 3 minutes.

As the 3 minutes intervals must occur at the beginning of every full or half hour during the day, the clock divider can be synchronized by pressing the SYNC- and TEST-pushbuttons simultaneously exactly on the full or half hour of the day.

When the JUMP-pushbutton is briefly pressed the switch control flip-flops are reset by which the next coming 3 minutes interval is left out.

5.3. Power Supply:

The WR 6000 can be powered from 24V DC and/or 110V/220V AC mains.

The OFF/OPEN/MUTE-switch controls the power supply. In position OFF

the AC- and DC-inputs are both disconnected at the input to the 12V regulator. The primary side of the mains transformer is not disconnected in this position.

There are two internal DC voltages, $12V_1$ and $12V_2$ which come from the same regulator but which are separated by filtering. $12V_1$ is the DC supply for the receiver section and $12V_2$ is the DC supply for the logic circuits.

6. SERVICE AND MAINTENANCE

Normal maintenance just consists of keeping the cabinet clean and dry. If the receiver is not functioning correctly, then check that the adjacent installation is not faulty. If the loudspeaker is completely silent, independent of any control setting, check that fuses are not blown.

6.1. Fuses:

The DC power input fuse is placed on the printed circuit board and the AC mains fuse is placed in the bottom of the cabinet. Disconnect supply voltages to receiver before replacing fuses. Always replace the fuse with the correct rated spare fuse.

6.2. Fuse Ratings:

110/220V AC Mains	0.2 A Slow-acting
24V DC	1 A Quick-acting

size 6.3 x 32 mm

6.3. Spare Parts List:

		Part No.
Standard Shipborne Spares		
1	Fuse 0.2 A Slow-acting (6.3 x 32 mm)	720 220 00
1	Fuse 1 A Quick-acting (6.3 x 32 mm)	720 310 00
Depot Spares:		
[490]	Receiver Board (for type 6010)	107 449 01
[491]	Receiver Board (for type 6020)	107 449 11
1 pce	Mains Transformer (T5)	385 401 91
10 pcs	Fuse 0.2 A Slow-acting (FS2)	720 220 00
10 pcs	Fuse 1 A Quick-acting (FS1)	720 310 00
1 pce	20 Lead Flat Ribbon Cable	375 401 51
1 pce	Control Knob	412 000 61
1 pce	Plain Cap for Control Knob	412 000 63

7. CIRCUIT DIAGRAMS

7.1. Symbol Explanation

7.1.1 Arrows:

A black arrow on a line indicates in which direction an AC-signal flows.

A white arrow on a line indicates in which direction the information of a DC signal flows. An exception from this rule is the supply lines and their connections, which are always indicated by a supply voltage level or its associated label.

7.1.2 Logic circuits:

A small circle at an external input means that the specific input is active LOW, i.e. it produces the desired function, in conjunction with other inputs if its voltage is the lower of the two logic levels in the system, otherwise the specific input is HIGH.

A clock input is indicated by an open triangle. A small circle at a clock input means that the outputs change on the HIGH to LOW clock transition.

A small circle at an output indicates that when the function designated is true, the output is LOW.

Inputs and outputs are labelled with labels as described in table 7.1.

7.1.3 Logic Functions:

Logic functions are labelled with labels in brackets. an active LOW function is given a bar over the label.

7.1.4 Voltages:

Typical DC voltages are indicated on the circuit diagrams next to the points to which they refer and are marked with a "V".

Typical logic levels are indicated in brackets (LOW/HIGH) on the circuit diagrams next to the point to which they refer and are marked with a "V".

Typical AC voltages are likewise indicated on the circuit diagrams. They are marked with "Vpp" or "mVpp".

ABBREVIATIONS

A	= ampere, amperes
B	= battery, motor
C	= capacitor
Car.	= carbon
Cer.	= cereamic
CF	= ceramic filter
D	= diode
F	= farad, fan
FS	= fuse
H	= henry
k	= kilo or 10^{3}
L	= inductor
LS	= loudspeaker
lin.	= linear
log.	= logarithmic
m	= milli or 10^{-3}
M	= mega or 10^{6}
ME	= instrument
MF	= metal film
Mi	= mica
MP	= metallized paper
u	= micro or 10^{-6}
n	= nano or $1o^{-9}$
NPO	= temp. coefficient 0
N150	= temp. coefficient -150
NTC	= neg. temp. coefficient
P	= pico or 10^{-12}
PL	= connector (plug)
Polyes.	= polyester
Polyst.	= polystyrene
PTC	= pos. temp. coefficient
Q	= transistor
R	= resistor
RL	= relay
S	= switch
SK	= connector (socket)
SL	= lamp
T	= transformer
Tan	= tantalum electrolytic capacitor
U	= integrated circuit
V	= working voltage DC or volts
Vl	= valve
Vac.	= working voltage AC
Var.	= variable
Vpp	= peak to peak voltage
Varicap	= variable capacitance diode
ww	= wire wound
W	= watt, watts
W.alum	= wet aluminium electrolytic
X	= crystal, crystal osc. or crystal filter

Table 7.1

Label	Short for	Meaning
A	Trig Input	triggers one-shot on falling edge
A_x	Address	selects a memory location (data word) or a multiplexer input.
B	Trig Input	triggers one-shot on rising edge
B/D	Binary/Decimal	selects counting mode (modulus 16 or 10)
BI	Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display)
C_xY	Control Signal	programmable bidirectional hand-shake signal to/from peripheral
CEP, CET	Clock Enable	enables clock signal to counter
CP	Clock Pulse	edge activated input for updating synchronous circuit
CS_x	Chip Select	selects a memory or peripheral circuit (bus slave)
D_x	Data	input to D flip-flop and register or bidirectional information path for bus connected device
E	Enable Input	enables clock signal
EO	Enable Output	activates output(s) from combinatorical circuit.
EQ	Enable Output	activates output(s) from sequential circuit.
HLT	Halt	suspends MPU activity and releases busses.
I_xY	Input Data	input for combinatorical circuit
IRO_y	Interrupt Request	wired-OR flag from peripheral to MPU indicating interrupt detected.

Table 7.1 (continued)

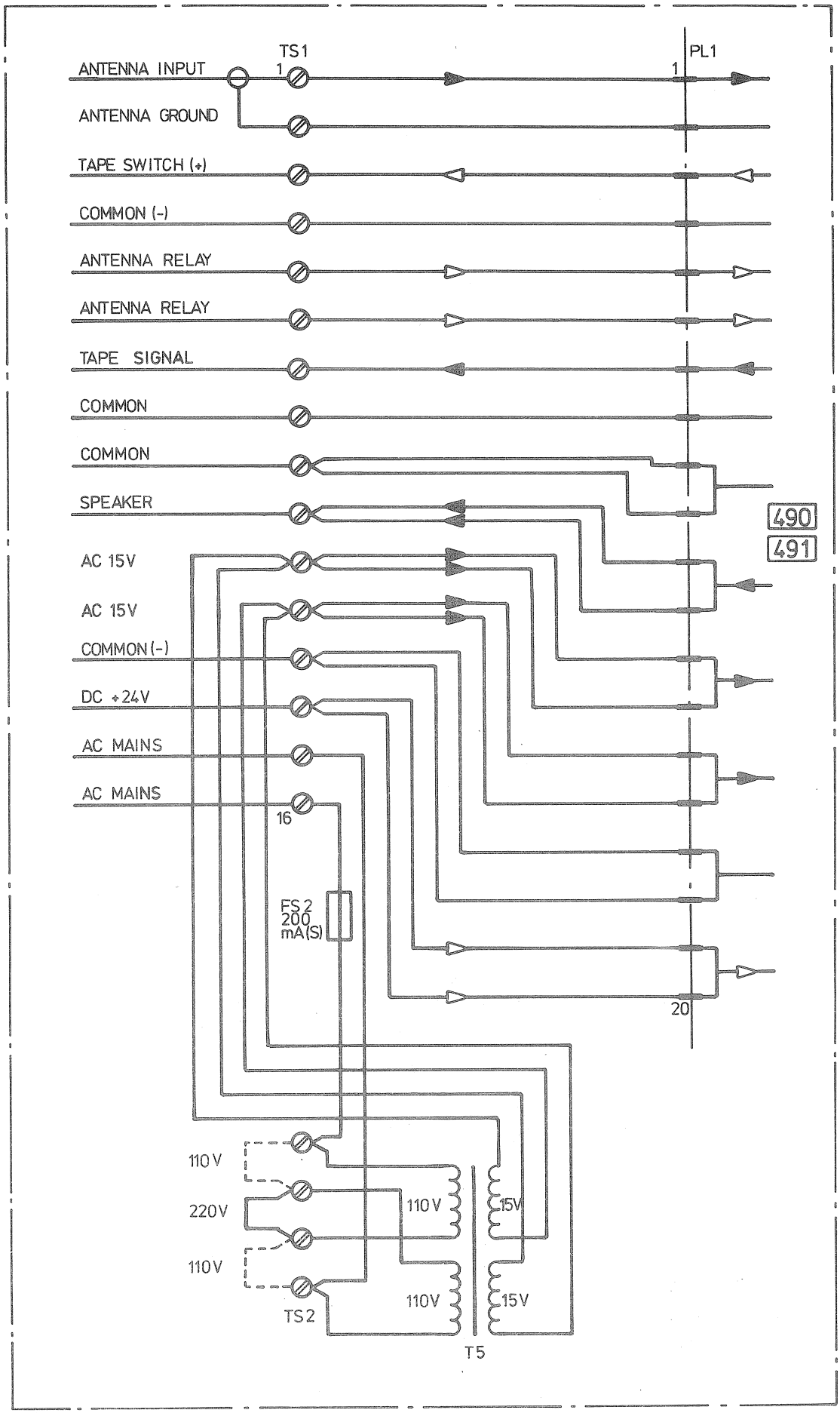
Label	Short for	Meaning
J, K	Data	input to J-K flip-flop
K_x	Mode Select	selects counting mode for programmable counter
LE	Latch Enable	updates latching register
LT	Lamp Test	Activates all outputs on BCD-to-7 segment decoder
MR	Master Reset	input for initializing MPU or clearing programmable registers in peripheral circuit
MRDY	Memory Ready	hand-shake flag to MPU indicating new bus cycle may be started
NMI	Non-maskable Interrupt	flag to MPU, which cannot be masked softwarewise indicating interrupt detected
O_x	Output	output from combinatorical circuit
P_xY	Data (bidirectional)	input to programmable counter or programmable bidirectional signal to/from peripheral
PE	Parallel Enable	loads P_x data into programmable counter
Q_x	Output	output from sequential circuit
R	Reset	forces flip-flop(s) to LOW state
RBI	Ripple Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display) if data correspond to leading zero, when decoders are cascaded.
RS_x	Register Select	addresses programmable registers in peripheral circuit
S	Set	forces flip-flop(s) to HIGH state
S_y	Select Data	selects data path through multiplexer

Table 7.1 (continued)

Label	Short for	Meaning
SYNC	Synchronize	issued from bus master (MPU) to synchronize data transfer
TC	Terminate Count	output from counter indicating new cycle started (corresponds to carry or borrow depending on counting direction)
TS	Timing Select	pins for connecting external timing components for multivibrator
U/D	Up/Down	selects counting direction
VMA	Valid Memory Address	issued from bus master (MPU) to indicate stable address bus
WI	Write Input	input to bus slave to make it accept data from master
WQ	Write Output	output from bus master (MPU) when it is a data source.

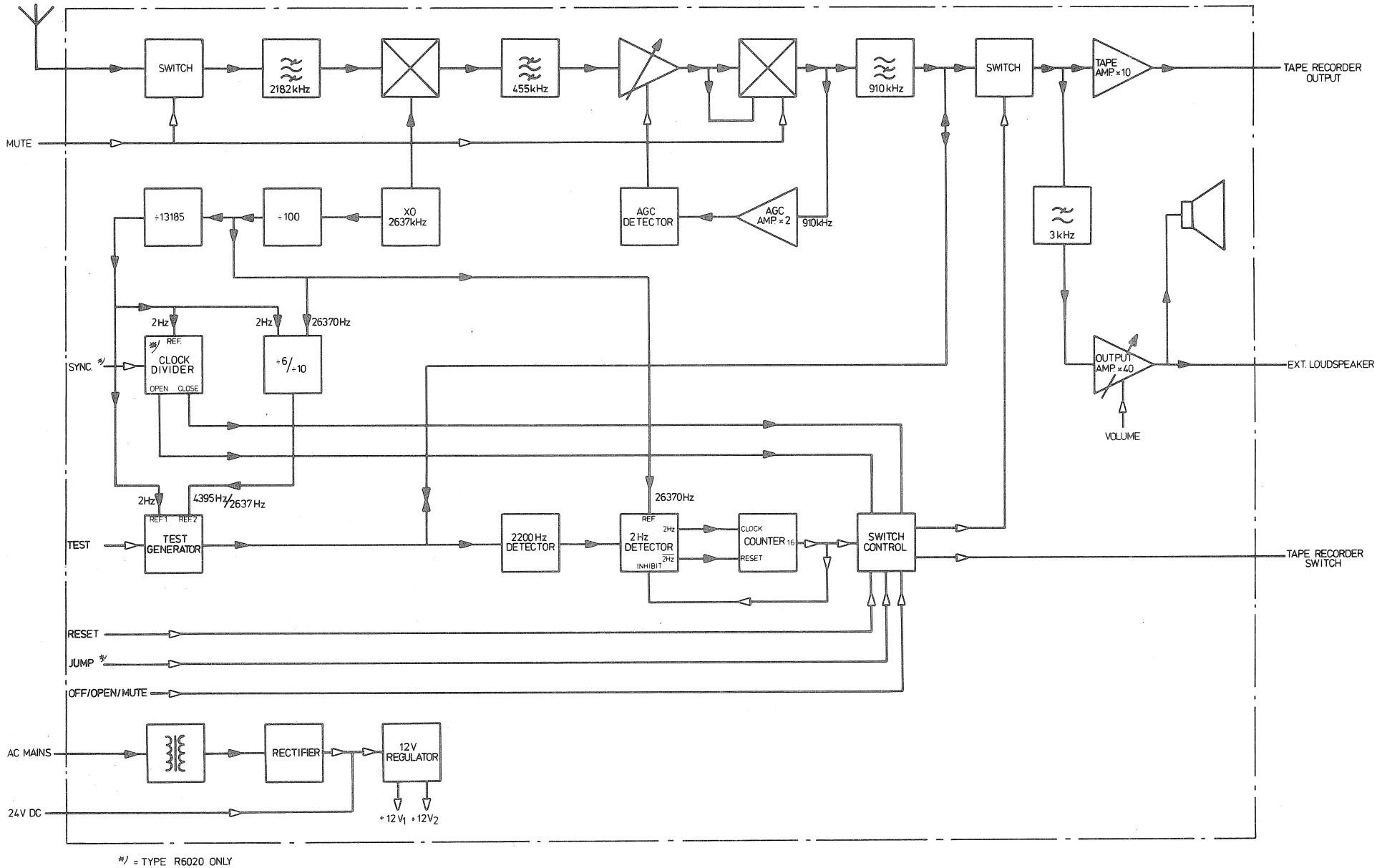
(1) "x" is a numerical index (zero origin indexing) corresponding to bit position

(2) "y" is an alphabetical index used for multiple ports.



995 402 31

WIRING DIAGRAM, WR6000

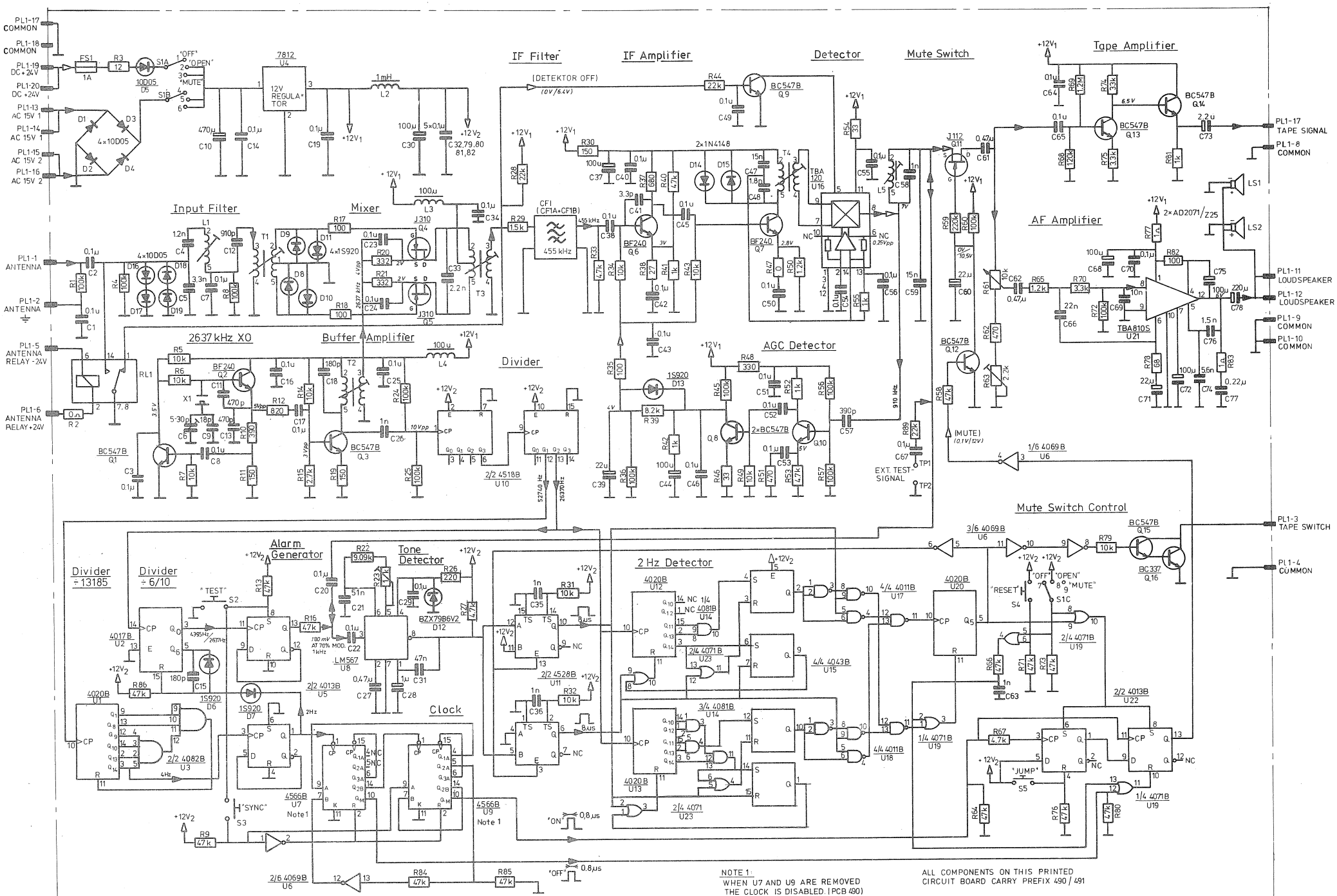


*/ = TYPE R6020 ONLY

7-9

995 402 21

BLOCK DIAGRAM, WATCH RECEIVER WR6000



MAIN DIAGRAM

RECEIVER BOARD 995 4 490/491 (2)