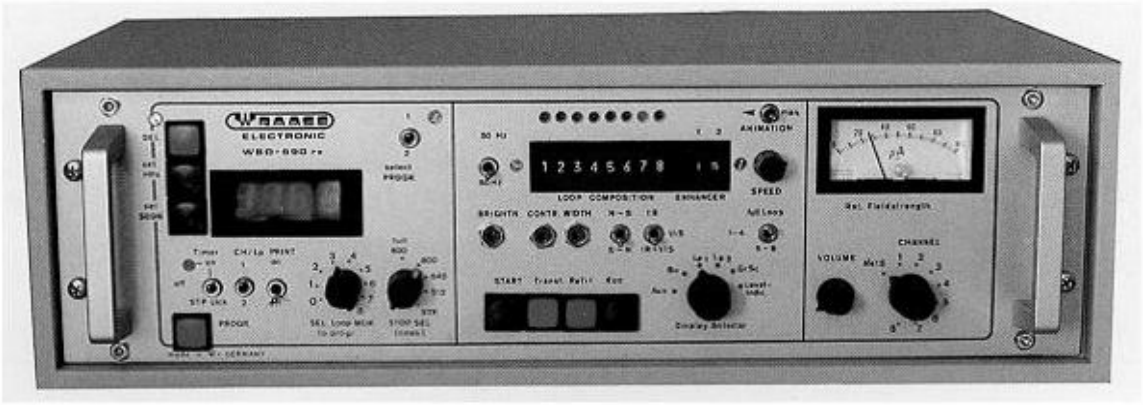
WRAASE

WSD-690rx (AN/GRQ-27)
Weather Satellite Receiver

OPERATING MANUAL
&
Technical Documentation



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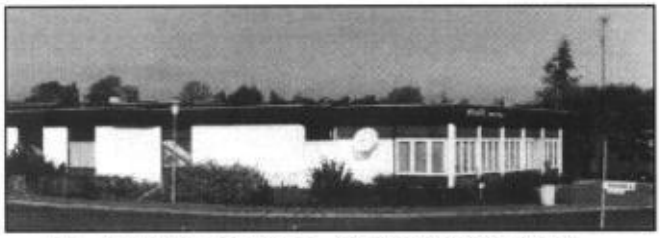

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DESCRIPTION AND LEADING PARTICULARS.

1.1 GENERAL.

1.2 The complete WEATHER SATELLITE RECEIVING SYSTEM consists of the **WSD-690rx** SATELLITE RECEIVER, an outdoor ANTENNA SYSTEM with PREAMPLIFIER and S-BAND-CONVERTER, the DISPLAY MONITOR(s) and additional video equipment, like videorecorder(s) or video printer(s).

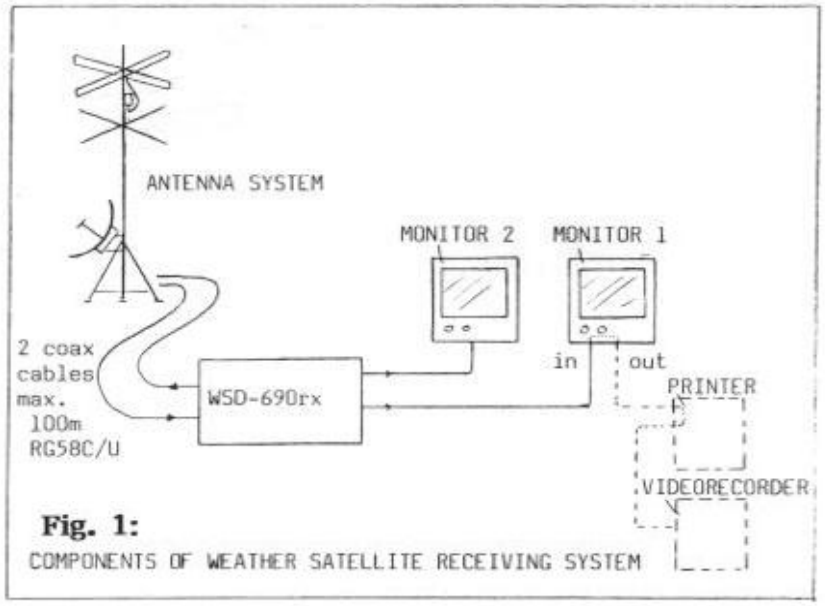


Fig. 1:
COMPONENTS OF WEATHER SATELLITE RECEIVING SYSTEM

The **WSD-690rx** unit contains a VHF-RECEIVER, an arrangement of IMAGE MEMORIES and a PROGRAMMABLE TIMER.

1.3 WSD-690rx IMAGE MEMORY STRUCTURE.

1.4 LOOP MEMORIES.

For the generation of time lapse loops of the weather process a number of image memories are necessary which have to be filled up automatically with satellite shots of exact the same geographic area taken at fixed time intervals. In the **WSD-690rx** eight loop memories are provided and an additional loop with another eight memory locations is optional available.

It should be mentioned that the loop memories can also be used to store single images instead of film loops.

1.5 BUFFER MEMORY and TRANSFER OPERATIONS.

In the **WSD-690**-system the eight loop memories are not directly (real-time) filled up with the receiving signal ; instead, incoming picture information is first written into a buffer memory and then, if desired, fast-speed-shifted into a selected loop memory location. This image-TRANSFER is released either manually by pressing the TRANSFER button or automatically by the PROGRAMMABLE TIMER.

Due to the buffer system, loading of the loop memories is invisible and does not disturb the continuous display of the loop.
Furthermore, independent of the loop display, the present (real-time) transmissions can be watched at buffer output via the second MONITOR output, and the decision, if and in which memory the picture shall be retained, can be made after it has been completed in the buffer memory.

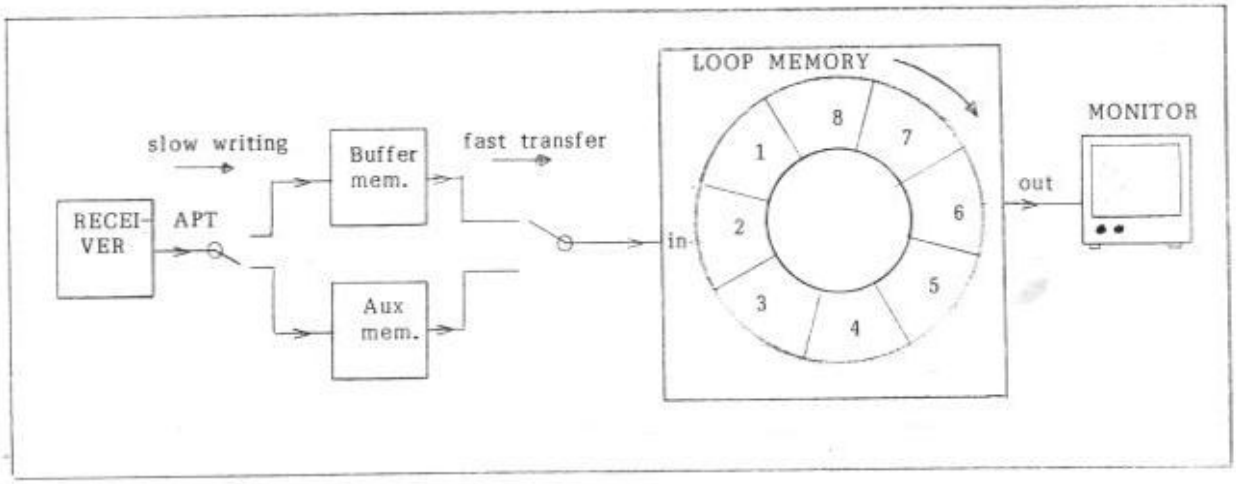


Fig.2: Simplified block diagram of Buffer/Aux and LOOP memory arrangement.

1.6 AUXILIARY MEMORY and RETRANSFER OPERATIONS.

To add even more flexibility to the system, an additional buffer memory, called "AUXILIARY MEMORY" is provided. Memory-system features are completed by a RETRANSFER capability from LOOP to BUFFER memory, which, together with the TRANSFER operation, allows to shift memory contents from any location in the system to nearly any other location.

Thus, the following shift operations are available:

1.7 LIST OF AVAILABLE SHIFT OPERATIONS.

$Bu \longrightarrow Lp_1$
$Bu \longrightarrow Lp_2$
$Aux \longrightarrow Lp_1$
$Aux \longrightarrow Lp_2$
$Lp_1 \longrightarrow Bu$
$Lp_2 \longrightarrow Bu$
$Lp_1 \longrightarrow Lp_2 = Lp_1 \longrightarrow Bu \longrightarrow Lp_2$
$Lp_2 \longrightarrow Lp_1 = Lp_2 \longrightarrow Bu \longrightarrow Lp_1$
Bu:= BUFFER MEMORY
Aux:= AUXILIARY MEMORY
Lp_1 := FIRST LOOP (8 possible locations)
Lp_2 := SECOND LOOP (8 possible locations).

All TRANSFER and RETRANSFER operations are selectable by a single rotary switch: DISPLAY SELECTOR (control # (5)).

A detailed illustration of the internal BUS STRUCTURE and the different TRANSFER/RETRANSFER SOURCES/DESTINATIONS related to the different switch positions is given on the next page.

1.8 INTERNAL BUS STRUCTURE OF **WSD-690**-SYSTEM.

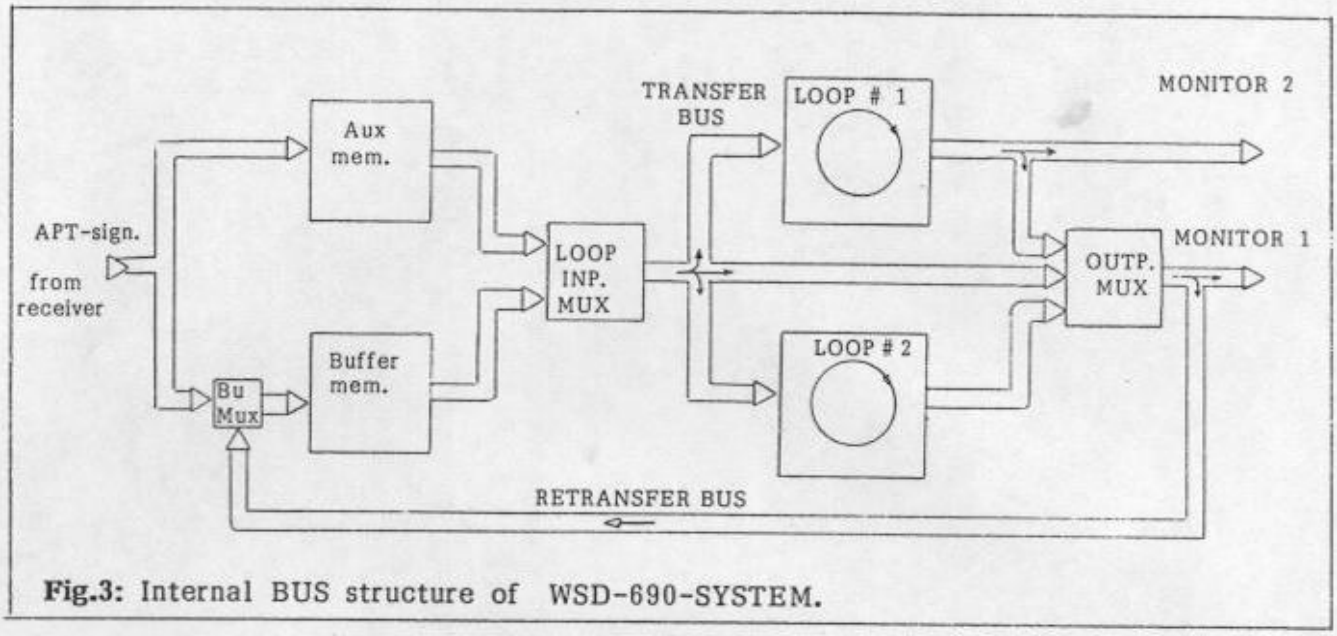


Fig.3: Internal BUS structure of WSD-690-SYSTEM.

The above block diagram shows the memory-bus-structure of the WSD-690rx. The received signal is fed at slow (real-time) data rate into Bu or Aux memory, as front panel selected (switch ⑤).
A LOOP INPUT MULTIPLEXER is provided to select Bu or Aux memory as input source to the LOOP MEMORIES for FAST DATA TRANSFER.
The contents of LOOP #1 is always output via the "MONITOR 2" rear panel connector. "MONITOR 1" is the universal output that can be switched to:

Bu output, Aux output, Lp_1 output, Lp_2 output } (via LOOP INPUT MUX, see Fig.3)

and in addition to a grayscale generator or a level indicator circuit (not shown).

The RETRANSFER BUS feeds the BUFFER MEMORY from the OUTPUT MULTIPLEXER, i.e. Lp_1, Lp_2 and Aux memory contents can be routed back to Bu memory.

1.9 TABLE OF DISPLAY SELECTOR CONTROL FUNCTIONS:

DISPLAY SELECTOR position	Receiving signal is written into	MONITOR 1 will display	TRANSFER from ... to	RETRANSFER from ... to
AUX	AUX MEMORY	AUX MEM.	AUX to LOOP 1	AUX to Bu
Bu	Bu MEMORY	Bu MEM.	Bu to LOOP 1	Clears Bu
Lp_1	Bu MEMORY	LOOP 1	Bu to LOOP 1	LOOP 1 to Bu
Lp_2	Bu MEMORY	LOOP 2	Bu to LOOP 2	LOOP 2 to Bu
GrSc	Bu MEMORY	Grayscale		GrSc to Bu
Level-Indic.	Bu MEMORY	Levelindicat.		

DISPLAY SELECTOR CONTROL FUNCTIONS

SECTION 2 : REAR PANEL CONNECTORS AND CONTROLS

2.1 Fig.4.

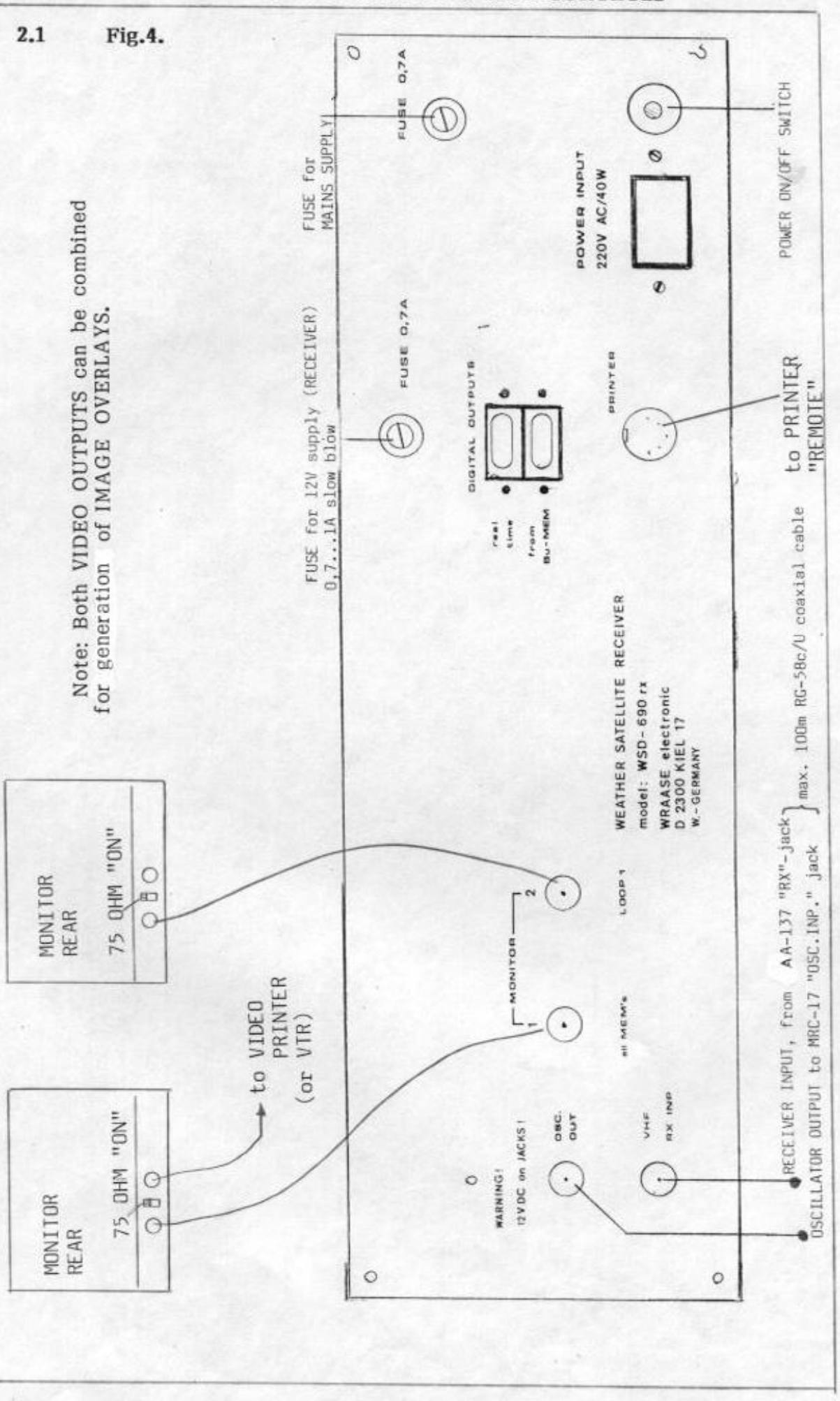


Fig.4: WSD-690rx REAR PANEL CONNECTORS AND CONTROLS

SECTION 2 : REAR PANEL CONNECTORS AND CONTROLS

2.1 Fig.4.

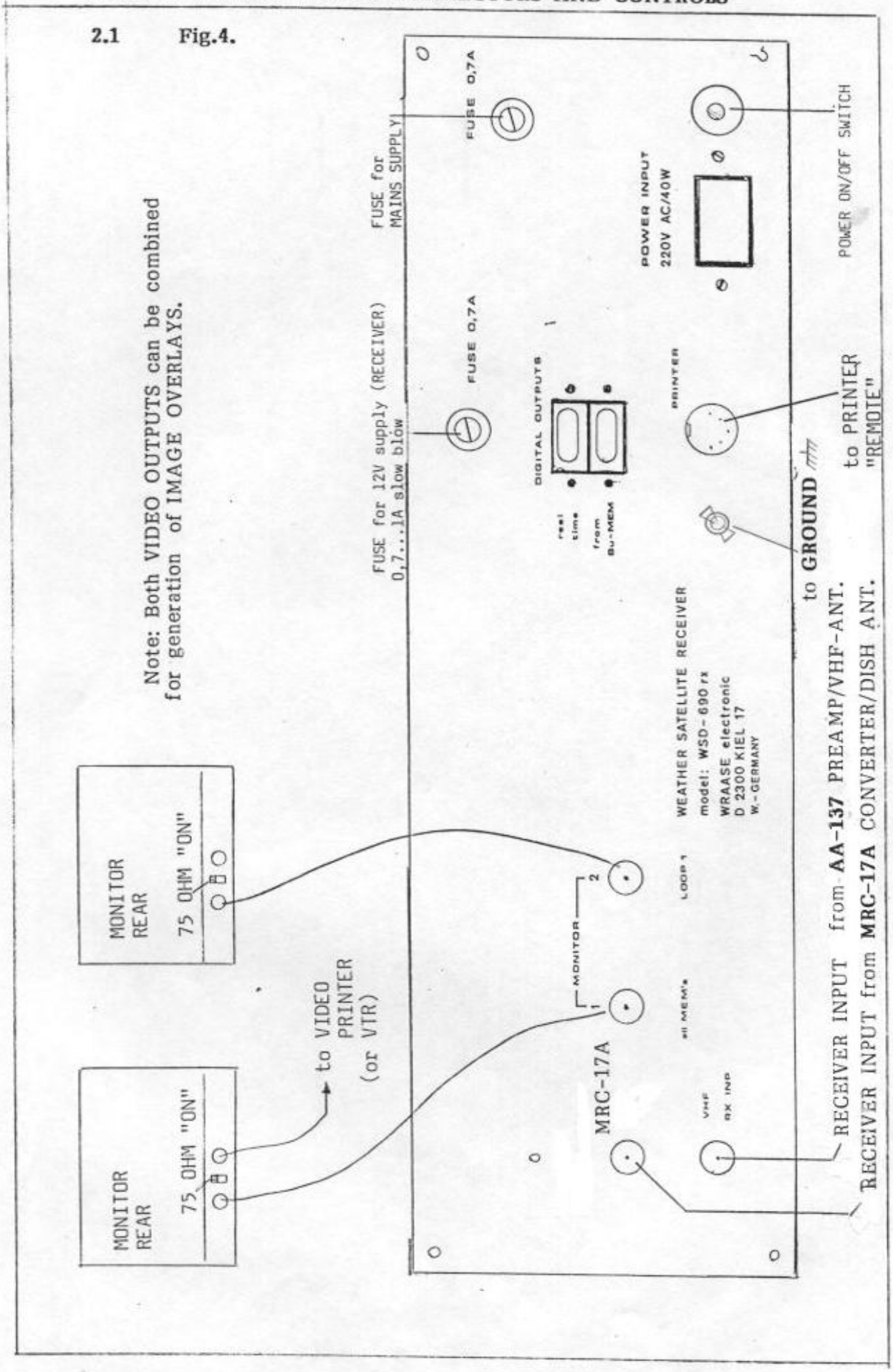


Fig.4: WSD-690rx REAR PANEL CONNECTORS AND CONTROLS

SECTION 3
FRONT PANEL CONTROLS AND INDICATORS.

3.1 LOCATION AND REFERENCE NUMBERS.

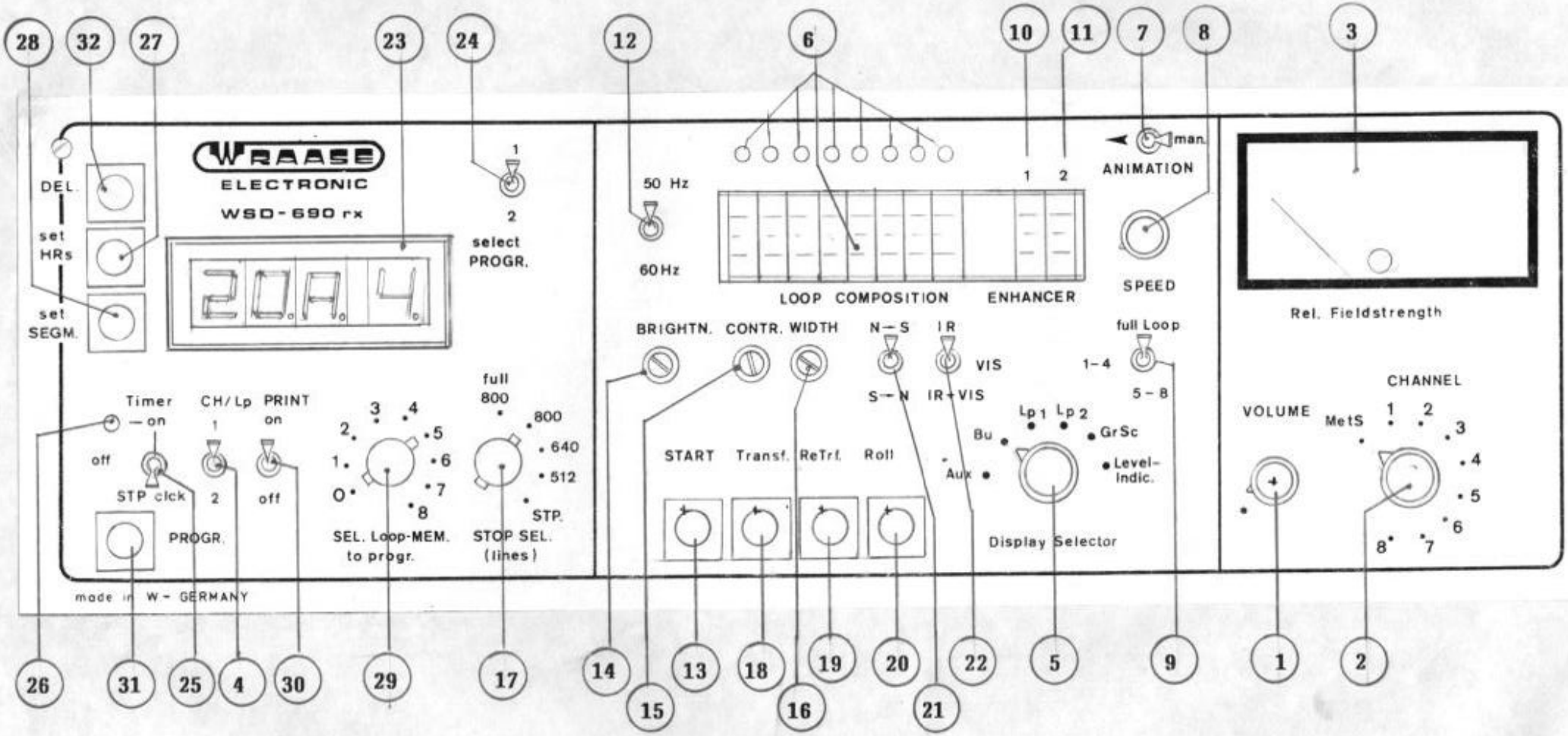


Fig. 5: WSD-690rx FRONT PANEL CONTROLS AND INDICATORS.

3.2 ASSIGNMENT OF FRONT PANEL CONTROLS AND INDICATORS (SUMMARY)

(1) VOLUME. Adjusts volume of built-in speaker.

(2) CHANNEL. Channel selector switch of built-in VHF-receiver and METEOSAT/NOAA - selector.

(3) REL. FIELDSTRENGTH. Relative fieldstrength meter of VHF-receiver.

(4) CH./Lp. 1 - 2 . Selects METEOSAT Channel 1 or 2 (also for timer-programming).

(5) DISPLAY SELECTOR. Selects video signal to be displayed via rear connector "MONITOR 1". Selects also destination (Bu or Aux) for receiving signal and transfer/retransfer source/destination according to table 1.9.

(6) LOOP COMPOSITION. Code switch array for composing loops, with associated LED-row, indicating present loop position.

(7) ANIMATION. Manual/automatic loop animation selector switch.

(8) ANIMATION SPEED. Adjusts speed of loop circulation.

(9) FULL LOOP/ 1-4 / 5-8. Selects display of the full loop (max. 8 pict.) or two smaller loops (max. 4 pict.).

(10) ENHANCER 1. Selects enhancement curve applied to "MONITOR 1" rear video output connector.

(11) ENHANCER 2. Selects anhancement curve applied to "MONITOR 2" rear video output connector (loop 1).

(12) 50 - 60 Hz. Selects 50 or 60 Hz video output signal.

(13) START. Manually starts reception into buffer (Bu) or auxiliary (Aux) memory.

(14) BRIGHTN. Brightness control for input signal, (screwdriver adjustable).

(15) CONTR. Contrast control for input signal (screwdr. adj.)

(16) WIDTH. Horizontal width control for input signal, (screwdriver adjustable).

(17) STOP SELECT (lines). Selector switch for internal generated write-stop of input-signal (preselects 512-line portion of 800-line METEOSAT picture to be stored).

(18) TRANSFER. Transfers Bu or Aux memory content to the loop memory selected by the active loop-composition code switch (6) .

(19) RETRANSFER. Shifts pictures from loop memories to Buffer or from Aux-memory to Bu-memory (ref. to table 1.9).

(20) ROLL. Adjusts vertical position of Bu- and Aux-memory content .

(21) N - S / S - N . North-South/ South-North -reverse switch, (turns pictures in Aux and Bu - memory upside-down).

(22) IR - VIS - IR+VIS. Selects reception of IR, VIS or IR+VIS of NOAA-APT-signal (switch only active during NOAA-reception).

(23) 4-DIGIT-DISPLAY of PROGRAMMABLE TIMER CLOCK.

(24) SELECT PROGRAM 1 - 2. Selects timer program memory bank 1 or2.

(25) TIMER ON-OFF / STOP CLOCK. Activates automatic timer controlled storage of METEOSAT-pictures. Stops clock during programming procedure and for setting it to the correct time.

(26) TIMER ON. Indicator LED for timer operation.

(27) SET HOURS. Press to increment hours by 1.

(28) SET SEGMENT. Press to increment segments by 1.

(29) SELECT LOOP MEMORY TO PROGRAM. Selects loop memory for timer programming.

(30) PRINT ON-OFF. For programming automatic printing. (If not desired, switch can be used for other purposes, see p.18)

(31) PROGRAM. Press to programm the information presetted by switches (17) , (29) , (30) , (4) .

(32) DELETE. Press together with (31) with selector (29) in position Ø to clear the program memory bank selected by (24) .

3.3 FRONT PANEL CONTROLS AND INDICATORS (IN DETAIL) .

Page 5 shows all front panel operating controls and page 6 gives a short description of their use. More detailed information related to these controls is listed below:

(1) **VOLUME**

Adjusts loudness of internal loudspeaker, does not affect picture quality..

(2) **CHANNEL** ; rotary switch.

Selects METEOSAT or NOAA receiving mode and selects the NOAA frequency channel. The following switch positions are provided:

MetS := METEOSAT reception (or GOES or other geostationary satellites using the same transmission system).

1 := VHF CHANNEL 137,500 MHz , NOAA 10 .

2 := VHF CHANNEL 137,620 MHz , NOAA 9.

3 := VHF CHANNEL ~~137,680~~ MHz ,

4...8 := Free positions for future satellites.

(3) **Rel. Fieldstrength** ; µA-meter.

Indicates relative fieldstrength of satellite signal being received and shall be observed during dish antenna adjustment to find the correct antenna direction to the satellite.

(4) **CH / Lp** ; 2-position toggle switch.

This switch selects the METEOSAT dissemination channel 1 or 2. Channel 2 = 1694,5 MHz; Channel 1 = 1691,0 MHz. „ A1"

An additional LOOP-SELECTION FUNCTION can be added to this switch by inserting a jumper wire inside the WSD-690rx unit, which will cause all preprogrammed CH.1-formats to be transferred into Loop 1 and all preprogrammed CH.2-formats to be transferred into Loop 2 (if fitted). Information about the jumper location is given further below.

Note: The METEOSAT Channel selector switch has been placed in the left section of the front panel where the controls for setting the programmable timer are situated, because also the METEOSAT--CHANNEL-NUMBER can be programmed into the timer program memory for automatic channel switching during timer controlled operation of the system.

(5) **Display Selector** ; rotary switch / 6 positions.

This switch controls several memory input/output functions:

a) Selects video signal to be sent out via "MONITOR 1" rear panel jack:

Aux := Auxiliary memory output, Lp2 := Loop 2

Bu := Buffer memory output, GrSc:= Grayscale generator,

Lp1 := Loop 1 Lev.Ind.:= Level Indicator.

(5) **Display Selector** , continued.

b) Determines whether Aux memory (position "Aux") or Buffer memory (all other positions) is used as input memory for the receiving signal.

c) Selects source and destination for the manual TRANSFER function, operated by pushbutton (18): In position "Aux", aux memory contents will be transferred to LOOP 1, in position "Bu", buffer memory contents will be transferred to LOOP 1, the same in the positions "Lp $_1$", "GrSc." and "Level Indic.". If "Lp $_2$" is selected, buffer memory contents can be transferred to LOOP 2 (if fitted).

Note: The exact internal LOOP memory destination is determined by the setting of the active code switch in the "LOOP COMPOSITION" code switch array (6) .

d) Selects source and destination of the RETRANSFER function operated by pusbutton (19) : In position "Aux" retransfer is possible from Aux memory to Buffer mem. , in position "Bu" the Buffer will be cleared. In position "Lp_1" retransfer from LOOP 1 and in position "Lp_2" from LOOP 2 to Buffer memory is possible. The other two positions are identical with "Lp_1" regarding the RETRANSFER function.

Note: The exact internal LOOP memory source for RETRANSFER is determined by the setting of the active code switch in the "LOOP COMPOSITION" code switch array (6) .

A summary of the different functions of the **Display Selector** is given in table **1.9.**

(6) **LOOP COMPOSITION** , LED row with code switch array.

The eight loop positions -indicated by the eight LED's- can be associated with any loop memory by setting the respective code switches.
By setting a zero into the next higher position, the loop can be limited to any length shorter than eight steps.

Setting two adjacent code switches to the same number will produce an elongated display of the specific memory.

The code switches can be programmed for reversed or shuttling display of the weather process.

Note 1: Manual transfer takes place into the loop memory location selected by the active code switch (below the lighting LED).

Note 2: Retransfer take place from the loop memory location selected by the active code switch.

Note 3: Depending of the setting of the **Display Selector** , LOOP 1 or LOOP 2 is controlled by the LOOP COMPOSITION switch array.

(7) **ANIMATION** , toggle switch, 3 positions.

Activates time lapse animation of loop memories.
3 positions:
middle position := Animation is switched off.
"man." := Flipping the toggle to the right advances the loop by one step.
"◁" := In the left position with the toggle pointing to the LED row, the loop is continuously scanned by a variable clock (control (8)).

(8) **ANIMATION SPEED ;** control knob.

Adjusts animation speed of displayed loop.

(9) **Full Loop / 1-4 / 5-8** ; 3-position toggle switch.

Selects display of the full loop or two smaller (half) loops.
This switch provides a means of selecting two small loops without modifying the setting of the code switches (6) , thus allowing effective comparison between the two loops (f.e. IR and VIS).

3 positions: "full" := full loop, mem. 1 ... max. 8.
"1 - 4 " := first half loop, mem. 1... max. 4.
"5 - 8 " := second half loop, mem. 5 ... max. 8.

Note: This switch affects both loops, 1 and 2.

(10) **ENHANCER 1,** 16-position code switch.

Selects enhancement curve applied to "MONITOR 1" rear panel video output connector.

(11) **ENHANCER 2 ,** 16-position code switch.

Selects enhancement curve applied to "MONITOR 2" rear panel video output connector (Loop 1 output).

(12) **50 Hz - 60 Hz ,** 2-position toggle switch.

Selects 50 Hz or 60 Hz video output signal on both video outputs.
In order to get a flicker-free display, 60 Hz should be selected.
However, if external 50 Hz video equipment like video recorders or video printers shall be used, the 50 Hz -position can be selected.

Note for users of the P60U video printer: The printer can operate either on 60 or on 50Hz (rear panel switchable). However, in the 60Hz mode (525 lines), several lines at the top of the picture will not be printed, whereas in the 625-lines-mode (50Hz) the picture will be printed completely without loss of information.

(13) **START ,** pushbutton.

Pressing this button will start writing of incoming picture information into buffer or aux-memory (as selected by DISPLAY SELECTOR switch (5))

Note 1: Operating this pushbutton is only necessary to start reception of NOAA APT-signals. On METEOSAT reception START and PHASING is automatically executed during receipt of the startsignal which is transmitted at the beginning of each METEOSAT picture.

Note 2: When the button is pressed, phasing is automatically executed by detection of the line sync burst, which is always present in the NOAA APT-signal. If once correctly started, the signal will not go out of phase during the full satellite pass, even if there are signal drop-outs.

(14) **BRIGHTNESS** ; screwdriver adjustable control.

Adjusts brightness level of incoming signal before memorizing (DC level to A/D converter).

(15) **CONTRAST ;** screwdriver adjustable control.

Adjusts amplitude of incoming signal before memorizing .

Note to controls (14) + (15) : Once correctly set, there is normally no need

to modify the setting of these controls. However, due to temperature variations and aging of the equipment it may be necessary to adjust these controls from time to time. For easy checking of proper adjustment, a LEVEL INDICATOR FUNCTION with display via the video monitor is provided: Set the DISPLAY SELECTOR switch (5) to "Level-Indic." During reception of the METEOSAT start or stop tone the displayed sine wave should fill the full picture area without having flat tops. If this is not the case, adjust (14) and (15) until such a display is achieved.

Note: If BRIGHTNESS control (14) is incorrectly set, proper start and phasing of the METEOSAT signal cannot be guaranteed.

(16) **WIDTH** ; screwdriver adjustable control.

Adjusts horizontal width of incoming picture information during reception (before memorizing). If correctly set, the line sync burst (vertical bar with thin black and white lines) just disappeares behind the left margin of the picture field during METEOSAT reception.
Once correctly set, there is normally no need to modify the setting of this control. However, due to temperature variations and aging of the equipment, slight corrections may be necessary from time to time.

(17) **STOP SELECT (lines)** ; 5-step rotary switch.

Selects the number of lines after which writing stops automatically and waits for the next startsignal. Thus it can be determined which 512-line part of the 800-line METEOSAT picture will be stored.

5 switch-position are provided:

512 lines := Stop after 512 lines, i.e. the lower part will be stored;

640 lines := Stop after 640 lines, i.e. the middlepart will be stored;

800 lines := Stop after 800 lines, i.e. the upper part will be stored;

full 800 lines := Stop after 800 lines, but nearly the full METEOSAT format will be stored with a slight reduction in vertical resolution, because every third line is left out.

STOP := Permanent STOP; as long as this position is selected, any reception of picture information is interrupted, even timer controlled reception.

The STOP SELECT switch provides an additional function: SINGLE STOP, i.e. reception stops immediately but starts again when the next startsignal is received (METEOSAT start tone or START button pressed).
SINGLE STOP is released by rotating the STOP SELECT knob to an adjacent position and back to the old position.

Note 1: Due to the TV standard (525 or 625 lines) it is not possible to display a full 800-line METEOSAT image without loss in vertical resolution.

Note 2: Automatic stop after a selected number of lines is only operational during METEOSAT reception, when receiving NOAA satellites, reception must be stopped manually.

Note 3: The STOP SELECT SWITCH has been placed in the left section of the front panel where the controls for setting the programmable timer are situated, because also the STOP SELECT FUNCTION can be programmed into the timer program memory for automatic selection of a specific picture area during timer controlled operation of the system.

(18) **TRANSFER;** pushbutton.

Pressing this button will immediately transfer the contents of the input memory (Aux or Buffer) to the LOOP memory being selected by the active code switch (6) . Input memory contents will be retained, so that multiple transfer operations to different LOOP memory locations are possible. Detailed information about transfer sources and destinations are given in table **1.9.**
TRANSFER can be operated at any time without disturbing normal reception.

(19) **RETRANSFER;** pushbutton.

Pressing this button will shift the image from the LOOP memory location being selected by the active code switch (6) to buffer memory. LOOP memory contents will be retained.
With the DISPLAY SELECTOR switch (5) in position "Aux", aux-memory contents can be shifted to buffer memory with aux-memory contents being retained.
For detailed information about RETRANSFER sources and destinations see table **1.9** .

The main purposes of the RETRANSFER FUNCTION are:
a) to make LOOP memory contents available through the digital output, which has only access to Aux and Buffer memory.

b) to reverse a picture being "upside-down" in one of the LOOP memories, because reversal can only be applied to Aux and Buffer memory (f.e. GOES formats are disseminated reversed through METEOSAT).

(20) **ROLL;** pushbutton.

When pressing this button Aux- and Buffer-memory contents will be shifted in the vertical direction.
Important note: Do not operate this button before writing into the input memory has been stopped. Otherwise partly damage to the already stored image may result.

(21) **N - S / S - N;** 2-position toggle switch.

North-south / south-north reverse switch; turns pictures in Aux and Bu memory upside-down and shall be set according to the flight direction of the satellite during NOAA reception. During METEOSAT reception the S-N -position is used, except if GOES formats are received .
This reversal switch can be operated at any time without disturbing normal reception.
Note: The image will be transferred to the LOOP as selected by this switch.

(22) **IR / VIS / IR + VIS;** 3-positions toggle switch.

This switch, which is only operational during NOAA reception, selects whether infrared (IR) or visible (VIS) information or both (IR+VIS) will be received and stored.

3 positions: "IR":= The IR portion of the NOAA APT signal is written into Bu or Aux memory as selected by switch (5).
"VIS":= The VIS portion is written into Aux or Bu memory as selected by switch (5) .
"IR + VIS":= IR is written into Bu and VIS into Aux memory, independent of the position of switch (5) .

Note: For correct relation of the switch positions to IR and VIS, proper START must have been executed by pressing pushbutton (13) .

(23) **PROGRAMMABLE CLOCK TIMER DISPLAY ;** 4-DIGITS, 3 POINTS.

Displays time (UTC) and program memory data. The left two digits are a standard 24-h display. Due to the METEOSAT formats being transmitted in 4-minute-intervals, only 4-minute segments of the hour are used in the WSD-690-timer. The 15 segments of the hour are displayed as hexadecimal numbers: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E. 0 stands for the first METEOSAT format transmitted at 2 minutes after the full hour, 1 stands for the second format starting at 6 minutes after the hour, etc.

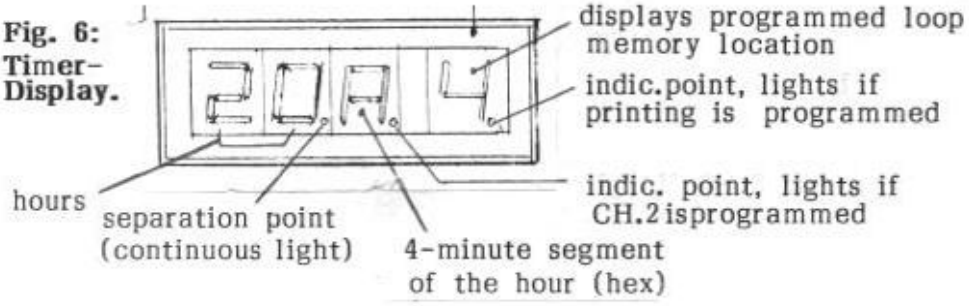


Fig. 6: Timer-Display.

(24) **SELECT PROGRAM;** 2-position toggle switch.

Selects timer program memory bank 1 or 2. The timer program memory capacity is 720 bytes, arranged in 2 switchable banks, 360 bytes each. 360 bytes are sufficient to program one complete 24 h cycle (24 x 15).

(25) **TIMER ON-OFF , STOP CLOCK;** 3-position toggle switch.

Activates automatic, timer controlled storage of METEOSAT pictures. Stops clock during programming and clock-setting procedure.

In the "timer on" position the system is controlled by the timer program, however the timer will only become active during time intervals with stored program information (loop memory destinations), in between normal manual operation of the system is possible.
In the middle position the timer is disabled.

In the down position ("STP clck") the clock is stopped for time setting and programming.

(26) **TIMER ON;** indicator LED .

Lights when timer controlled operation is switched on.

(27) **SET HOURS;** pushbutton.

Press to increment hours by one.

(28) **SET SEGMENTS;** pushbutton.

Press to increment segments by one.

(29) **SELECT LOOP MEMORY TO PROGRAM;** rotary switch, 9 positions.

Selects loop memory for timer programming. The zero is the neutral number and must be programmed into all hour-segments during which the timer shall be inactive. Therefore the zero-position is selected during the clearing process of the program memory which has to be executed before writing a new programm.

(30) **PRINT : ON - OFF;** 2-position toggle switch.

Set to "ON" position if a print instruction shall be programmed into the program memory. Automatic printing will only start, if together with print instruction a loop memory location (not zero) is programmed.

(30) **PRINT** , continued:

If the automatic printing function is not required, but the optional second LOOP MEMORY is fitted, a LOOP SELECTION FUNCTION can be given to this switch by inserting a jumper wire inside the WSD-690rx unit. Information about the jumper location is given further below.

(31) **PROGRAM;** pushbutton.

Press to program the information preset by the switches (17) , (29) , (30) , (4) into the timer program memory.

(32) **DELETE;** pushbutton.

When pressing this button all program memory locations are scanned by a very fast rate. If pressed together with the "PROGR." button with selector switch (29) in the zero-position the selected program memory bank will be cleared.

Note: When pressing this button the accurate time display is lost and the setting of the clock has to be renewed.

SECTION 4.

OPERATING THE WSD-690rx.

4.1 RECEIVER SECTION. The receiver section of the WSD-690rx is controlled by the two knobs (①, ②) in the right section of the front panel.

Switch ② is the VHF-CHANNEL SELECTOR SWITCH and METEOSAT/NOAA MODE SELECTOR. For METEOSAT reception it has to be set to **"MetS."** The METEOSAT CHANNEL SELECTOR is located in the left part of the front panel : toggle switch ④ . During setting up and first check of the equipment, it should be set to up-position "CH.1", because CH.2 does not continuously transmit.
The other eight positions of the VHF-CHANNEL-SELECTOR ② select VHF-CHANNELS of POLAR ORBITER SATELLITES, like NOAA. Internal mode switching of the APT decoder and antenna selection is executed automatically. The receiver is supplied with the following frequency channels:

POSITION		MHz
1	137,500 MHz	
2	137,620	
3	137,~~800~~795	
4	137,300	

POSITION		MHz
5	137,400	
6	137,850	
7	-.-	
8	-.-	

Crystals for any frequency in the 137 ... 138 MHz range can be supplied by WRAASE-electronic.

Control ① is the volume control for the built-in speaker. It does not affect the picture quality.

The relative fieldstrength of the satellite being received is indicated on the meter ③ . It is strongly recommended to watch the meter during dish antenna adjustment to find the correct direction to the METEOSAT satellite (maximum meter reading).

4.2 RECEIVING METEOSAT.

Set the "CHANNEL" rotary switch ② to **MetS** ,

If no timer controlled operation is desired, make sure that the **"Timer"** switch ㉕ is in **"off"** (middle) position. (LED ㉖ does not light).

Set switch ④ **"CH./Lp"** to the desired METEOSAT CHANNEL (normally 1).

Set the**"DISPLAY SELECT"** switch to **"Aux"** or **"Bu"** , depending in which memory the received picture shall be written. (Normally "Bu").

Decide which part of the image shall be stored and set **"STOP SEL."** ⑰ accordingly. Normally **"800"** is used. See Section "FRONT PANEL CONTROLS AND INDICATORS" for further information about switch ⑰ .

Check from time to time that the signal sounds clear and noise-free and the needle of the rel. fieldstrength-meter ③ is in the upper half of the scale.

The continuous METEOSAT transmission will be received via the selected memory (Bu or Aux) and dispayed via the "MONITOR 1" rear panel jack. Each new image will erase and replace the old image line by line.

While continuous reception is achieved thru BUFFER or AUX memory, specific images can be retained by transfer to one of the LOOP-MEMORIES either manually by pressing the **"Transf."**-button (18) or automatically controlled by the timer clock.

MANUAL TRANSFER can be released at any time and the image will be transferred as it is in Bu or Aux memory. MANUAL TRANSFER takes place into the LOOP MEMORY LOCATION selected by the active LOOP COMPOSITION CODE SWITCH (6) . Note that only the code switch under the lighting LED is operational.

TIMER CONTROLLED TRANSFER is automatically executed in the moment when writing into Bu or Aux memory stops (i.e. the picture has been completely received). The LOOP MEMORY LOCATION is then selected by the TIMER CLOCK PROGRAMM (and independent of the setting of the "Loop Composition" switches). Note, that timer-controlled transfer will only be executed, if the **Timer** is switched **on** (LED (26) lights).

LOOP MEMORY CONTENTS can be viewed either via a separate monitor connected to the "MONITOR 2" output jack on the rear panel or on the same monitor ("MONITOR 1" output), if DISPLAY SELECTOR (5) is set to **"Lp1"**. (Reception of the continuous METEOSAT transmission will continue undisturbed thru the BUFFER memory).

4.3 SIGNAL LEVEL ADJUSTMENT.

For getting best and equal picture quality over long periods it is important to be able to monitor the input signal levels in order to be able to make slight adjustments of the CONTRAST and BRIGHTNESS levels (controls (14) and (15)), if necessary.
A built-in LEVEL INDICATOR CIRCUIT provides level indication on the videomonitor if DISPLAY SELECTOR switch (5) is set to **"Level-Indic."**. Then the monitor is performing the function of an oscilloscope with a vertical time scale and a horizontal amplitude scale. The left and right limits of the white display field represent the upper and lower level limits. Note, that the display will be reversed by the North-South-Reverse Switch (21) .

The CONTRAST CONTROL (15) adjusts the signal amplitude and the BRIGHTNESS CONTROL (14) the DC-level, i.e. it shifts the display horizontally to the right or left. (Controls are screwdriver operated).

Correct setting of these controls can be best checked during START or STOP TONE transmissions of the METEOSAT , because the display should then show a sine wave at maximum amplitude. The sine wave should just fill the display field without having flat tops.

For special purposes it may be desirable to choose a different setting of the contrast and brightness levels, f.e. when low contrast pictures are received or if a special enhancement shall be applied to specific grey levels. In all cases, the LEVEL INDICATOR is helpful to find the desired level configuration and to return to the standard setting.

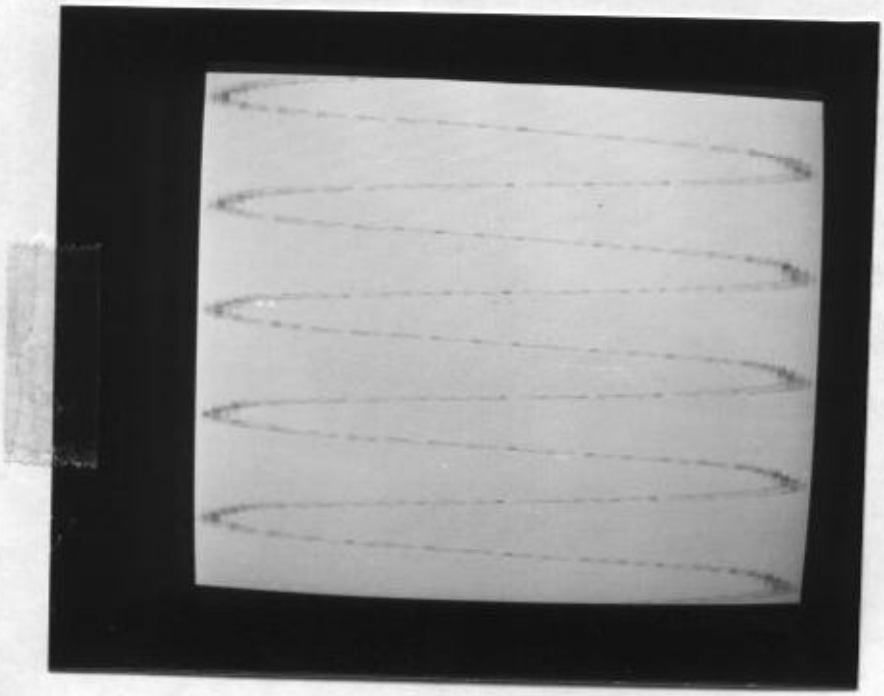
Examples are show on the next page.

Note: When LEVEL INDICATION is selected on DISPLAY SELECTOR (5), normal operation of the system is continued, i.e. the receiving signal is written into BUFFER memory and automatic TRANSFER is executed as preprogrammed.

Correct setting of the BRIGHTNESS level is necessary for proper START and PHASING of the METEOSAT pictures.

Fig. 7:

LEVEL INDICATOR DISPLAY during METEOSAT START TONE transmission. CONTRAST and BRIGHTNESS correctly adjusted.



4.4 LOOP COMPOSITION

The code switch array (6) allows composition of film loops of any length in any order. There is a maximum of 8 positions in the loop which are represented by 8 LED's. To each of the LED's any memory can be associated by the code switch underneath the LED. A "0" in the row will reset the loop to the first LED-position.

The loop memories are filled up according to the timer clock program. Independent of the order programmed in the timer, any other order can be chosen for display. Pictures can be left out or doubled for extended display, even reversed or shuttling display can be selected.

Manually operated step-by-step-display of the loop is achieved by flipping the toggle of switch (7) to the right. Setting this switch to the left position will start automatic scanning of the loop. Scanning speed can be varied by the "animation speed" control knob (8) from about 0,5 to 10 pictures per sec.

Example 1: Display memories 2,3,7 as a loop

2	3	7	0	X	X	X	X

X:= don't care

Example 2: Display memories 1,2,3,4,5 as a loop with elongated display of the last picture which is in memory 3:

1	2	3	3	4	5	0	X

Example 3: Display 2,4,6,8 as forwards-backwards-animation (shuttling) with memory 6 containing the latest image:

8	2	4	6	6	4	2	0

Switch (9) is provided for recalling 2 different (smaller) loops without the need of setting the code switches to a different combination.

It selects display of either the full loop (mem. 1 ... 8) or the first half loop (mem. 1 ... 4) or the second half loop (mem. 5 ... 8). If the timer clock is programmed so that the 2 loops are recorded in these memories, the display of the two loops can be selected by a flip of the switch and therefore it is easy to compare both.
To take most advantage of this feature it is recommended to use one half loop for the D2 format (IR) and the other half loop for CO3 (VIS). During night the D2-loop can be extended to all 8 memories.

The loop-splitting is also available for smaller loops of 2 or 3 memories, for example:
first loop will be mem. 1,2,3,
second loop mem.5,6,7

1	2	3	0	X	X	X	X

4.5 ADDITIONAL LOOP MEMORY (optional)

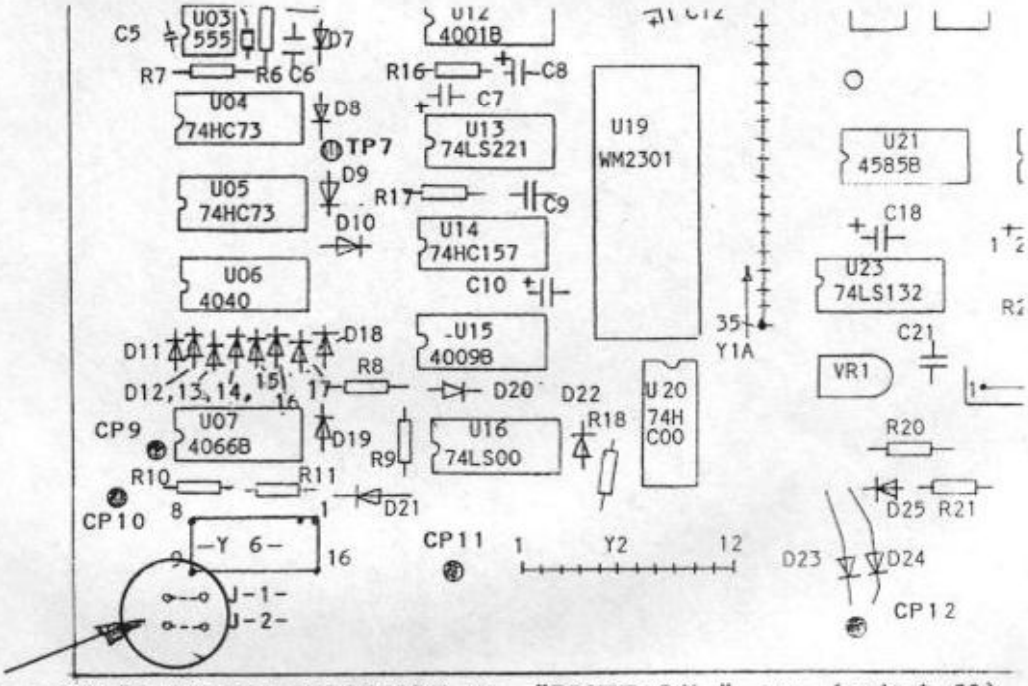
The **WSD-690rx** has provision for an additional LOOP MEMORY BOARD with another eight image memories, which can be retrofitted.

By fitting an internal wire jumper connection automatic timer controlled LOOP SELECTION CAPABILITY can be achieved. Depending on the jumper position either the METEOSAT CHANNEL SWITCH **"CH./Lp"** or the **"PRINT"** switch can be used for programming LOOP #1 or LOOP #2. Information about the jumper location is given further below.

MANUAL TRANSFER and DISPLAY of the SECOND LOOP is selected by DISPLAY SELECTOR-position **"Lp 2"**. (See table "DISPLAY SELECTOR CONTROL FUNCTIONS" on page 3).

If **"Lp 2"** is thus selected, also the LOOP COMPOSITION code switch array does control the SECOND LOOP.

Fig. 8: Location of jumper wires on main pc-board for LOOP #2 selection



J 2 adds LOOP #2 SELECT FUNCTION to "PRINT ON " -pos. (switch 30)
J1 adds LOOP #2 SELECT FUNCTION to "2"-pos. of "CH/Lp" switch (4)

4.6. ENHANCER OPERATION

The WSD-690rx contains two independent ENHANCER CIRCUITS, which are associated with the two independent video outputs. Both enhancers are programmed with the same set of 16 enhancement curves. Code switch (10) (enhancer #1) controls the enhancement curve applied to the "MONITOR 1" ("all MEM's") rear panel video output, switch (11) (enhancer #2) that one applied to the "MONITOR 2" output (LOOP 1). Thus different enhancements can be applied to the same image or LOOP and can be simultanuoulsly viewed on the two monitors. The effect of the different enhancement curves can easily be checked by switching to the greyscale generator (Display Selector (5)).

4.7 PROGRAMMABLE CLOCK TIMER.

4.8 GENERAL.

The **WSD-690rx-** system contains a 24-h-PROGRAMMABLE TIMER which allows automatic strorage and/or printing of METEOSAT pictures. All LOOP MEMORY LOCATIONS can be individually accessed by the timer program. The timer contains sufficient memory capacity to cover the full 24-h METEOSAT SCHEDULE with 2 different selectable programs.

Beside the loop memory selection, four more functions can be automatically executed by the timer program : STOP SELECT, METEOSAT CHANNEL SELECT, LOOP SELECT, PRINT. (LOOP SELECT must be combined with CHANNEL SELECT or PRINT).

For increased programming efficiency the built-in 24-h-QUARTZ-CLOCK is only advanced every 4 minutes instead of every minute. Thus the hour is divided into 15 segments, which are displayed as hexadecimal numbers.

SEGMENT DISPLAY	stands for METEOSAT IMAGE, starting at ... minutes after the hour
0	2
1	6
2	10
3	14
4	18
5	22
6	26
7	30
8	34
9	38
A	42
B	46
C	50
D	54
E	58

For further information about the CLOCK TIMER DISPLAY see section "FRONT PANEL CONTROLS AND INDICATORS".

The CLOCK-DISPLAY is directly coupled to the PROGRAM MEMORY ADDRESS , i.e. each combination of the left three digits represents a program memory location. For the purpose of setting and programming, the 4-minute clock pulses can be disconnected from the main timer circuit by lowering switch (25) to "STP. clck." - position.

For incrementing the segment- and hour-counter during setting or programming procedure, the two pushbuttons "SET SEGM." (28) and "SET HRs" (27) are provided.

When pressing the "PROGR." button (31) , the information, presetted by the switches "SEL. LOOP MEM. to progr." (29) , "STOP SEL." (17) , "CH/Lp" (4) and "PRINT" (30) is transferred into the program memory location represented by the displayed time segment.

Fig.9: Programmable Timer Controls

4.9 PROGRAMMING PROCEDURE

Before starting programming procedure it is recommended to prepare a program list as proposed below:

HOUR	SEGM.	FORMAT	MEMORY	STOP SEL.	CHANNEL	PRINT
00	2		1	800	1	-
00	8		5	full 800	2	on
00	A		2	800	1	-
01	2		3	800	1	-
01	A		4	800	1	-
02	2		1	800	1	-
02	A		2	800	1	-
02	E		6	full 800	2	-
....	...	...	...	...	...	...

Programming procedure:

(1) STOP CLOCK : Set switch (25) to down position "STP clck",

(2) SELECT PROGRAM MEMORY BANK 1 or 2 by switch (24).

(3) CLEAR the selected progr. mem. bank: Press DEL. (32) together with PROGR. (31) with SEL. LOOP -MEM. (29) in position **"0"** . for about one second.

(4) Step to TIME SEGMENT to be programmed ((27) and (28))

(5) SET SWITCHES (29) , (17) , (4) and (30)

(6) PRESS PROGRAM BUTTON (31)

(7) VERIFY correct programming of LOOP MEMORY, CHANNEL and PRINT by checking the display.

(8) Select next TIME SEGMENT to be programmed.

. . .

It is not necessary to program the time segments in a special order.

4.10 ERASING A PROGRAM MEMORY LOCATION.

(1) Step display to the time segment to be erased.

(2) Set (29) "SEL. LOOP-MEM. to progr." to " **0** ".

(3) Press "PROGR." button (31) .

(4) Verify proper erasing by checking that the MEMORY DISPLAY (most right digit) shows "0".

4.11 MODIFYING A PROGRAM MEMORY LOCATION.

(1) Step display to the time segment to be modified.

(2) Set switches (29) , (17) , (4) **and** (30) to the new position.

(3) Press "PROGR." button (31) .

(4) Verify proper modification by checking the display.

4.12 SETTING THE TIMER CLOCK TO UTC.

The accuracy of the internal quartz clock is about ± 5 seconds per week. The clock should be set so that the segment-display advances in the middle of the 27-seconds pause between two METEOSAT image transmissions. Thus there are ± 14 seconds to overcome deviations of the quartz frequency.

For setting the timer clock, first stop the clock by lowering switch (25) to "**STP clck.**" position. Check the UTC time on any reference clock, step the display to the next time segment and listen to the METEOSAT signal. Wait for the STOP SIGNAL of the current transmission and about 15 seconds after the STOP SIGNAL SET SWITCH (25) to the MIDDLE or UP position to START the clock.

Note 1: Setting of the clock has to be renewed after each PROGRAMMING, ERASING or MODIFYING of the program memory.

Note 2: Due to variations of the quartz frequency the accuracy of the time display has to be checked at least every 3 weeks and corrected if necessary.

Note 3: Accuracy requirement is only ± 2 minutes, if all programmed images are received on METEOSAT CH. 1 and the "**full 800**" STOP SELECT-FUNCTION is not used either preprogrammed nor during continuous reception . The point of time when the segment-display advances can then be set to about 1 minute after the START SIGNAL.
Time accuracy check-intervals can then be extended to 4 months.

4.13 ADDITIONAL INFORMATION ABOUT TIMER OPERATION

Even if switched on by switch (25) , the timer program has only power over the receiver-system during those time-segments which are programmed by a LOOP MEMORY LOCATION NUMBER different from ZERO, i.e. in the timer-on-condition the system continuously reads the programmed loop memory location number and it only reacts if a number different from zero is present. Therefore all unused time-segments have to be set to loop memory location "zero" which is neutral.

If NOAA reception is selected by switch (2) , the timer is disconnected from the receiver-system regardless the position of switch (25) .

4.14 RECEIVING NOAA APT SIGNALS.

For NOAA reception set the CHANNEL SELECTOR switch (2) to the desired channel. Use switch (22) to select infrared (IR), visible (VIS) or both (IR+VIS). If "IR+VIS" is selected , the VIS image is written into BUFFER and the IR image into AUX MEMORY.
If only VIS or only IR shall be recorded, select AUX or Bu memory, whichever is preferred.

As soon as the satellite signal has come up to a noise-free tone, press the "START" button (13) . Phasing is then automatically executed by detection of the line sync burst. The signal will not go out of phase during the full satellite pass, even if there are complete signal drop-outs.

Set switch (21) N-S/S-N according to the expected satellite passing direction. If wrong selection has been made, the switch can be operated any time during image reception without affecting already received image data.
Whenever desired, already received image data can be transferred to any LOOP MEMORY LOCATION by operating the "TRANSFER" button (18) . Select the LOOP MEMORY LOCATION by setting the active code switch under the lighting LED (6) to the desired number before pressing the "TRANSF." button.

As soon as the most interesting part of the satellite pass has been received, writing should be stopped by switch (17) to avoid erasing of the image by noise or unwanted picture information.

Note 1: The first four positions of the "STOP SELECT" switch (17) are not operational during NOAA reception.

Note 2: The PROGRAMMABLE TIMER is disconnected from the receiver system in the NOAA mode.

4.15 AUTOMATIC PRINTER OPERATION

For automatic timer controlled printing an additional wire connection (beside the video cord) from the WSD-690rx rear panel DIN jack "PRINTER" to the "REMOTE" jack on the front of the printer is necessary.

If automatic printing is desired, the "PRINT" switch (30) has to be set to the "ON" position during the programming procedure (see chapter 4.9). Note, that in addition a LOOP MEMORY LOCATION different from zero has to be selected, even if the image to be printed is not needed in one of the LOOP MEMORY locations . It is recommended to select the LOOP MEMORY LOCATION which is filled up next after the print command anyway. Thus confusion by the unwanted image in the LOOP can be reduced to a minimum.

Note: Keep the "PRINT" switch (30) in the "off" position during normal operation of the system, otherwise every image will printed.

When leaving the system with automatic printing programmed, make sure that the printer video cord is connected to the "MONITOR 1" output and the "DISPLAY SELECTOR" switch (5) is set to "Bu" or "aux" position.

4.16 USING THE DIGITAL OUTPUTS

In the WSD-690rx-system two DIGITAL OUTPUTS are provided, which are both **parallel** outputs of digital image data . Each picture element ("PIXEL") is represented by a 6-bit wide parallel data byte, coded in the BCD code, i.e. the 64 grey levels are represented by the binary numbers 000000 (black) to 111111 (white).

The REAL TIME DIGITAL OUTPUT (upper socket) supplies the image data as they are received in real time. To control data transfer to the external equipment, the pixel-clock (PIN 12) and a START/STOP + LINE START SIGNAL (PIN 5) is supplied. The external equipment must accept the data in the given speed of 0.48 ms per pixel (512 pixels per line).

The "FROM BU-MEMORY" DIGITAL OUTPUT supplies the image data as they are stored in the BUFFER MEMORY.
Data from this output are only available after reveiving (writing) of new information has stopped (either automatically or manually by switch (17)).
In addition the METEOSAT signal should be disconnected from the receiver section during digital data transfer by simply setting the CHANNEL SEL. switch (2) to any position different from "MetS".
Data transfer will be controlled from the external equipment by two signals: The pixel clock (to PIN 12) and the START/STOP signal (to PIN 5).

As long as PIN 5 has H-level no data transfer is possible. When set to L-level data transfer is enabled and starts with the next pixel clock pulse applied to PIN 12 with the first (most left) pixel of the first line (on screen top). With each pixel clock pulse the internal pixel counter is incremented by one thus presenting all pixels of the line one by one at the output pins . After all 512 pixels of the first line have been scanned through the next line is automatically selected by pixel clock pulse 513 and so on. After 262144 clock pulses the complete contents of the buffer has been transmitted.

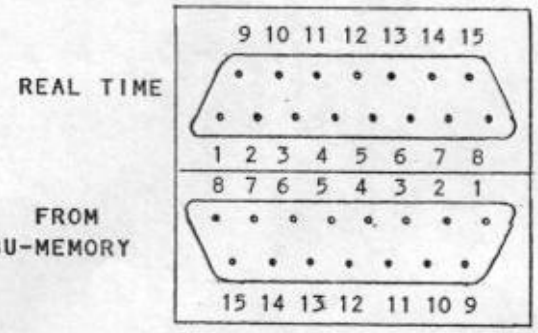
During data output the BUFFER MEM. DISPLAY will move (scroll) line by line in the vertical direction thus showing the line being transferred always on the top of the image field (similar to the receive mode).
Pixel clock frequency can be as slow as desired, the upper limit is 100µs (10kHz).

Before starting data transfer from buffer memory the "ROLL" button (20) can be operated to move the desired starting line to the top of the screen.

All signals on the DIGITAL OUTPUT sockets are TTL.

Fig.10: DIGITAL OUTPUTS: Assignment of connector pins and timing diagrams

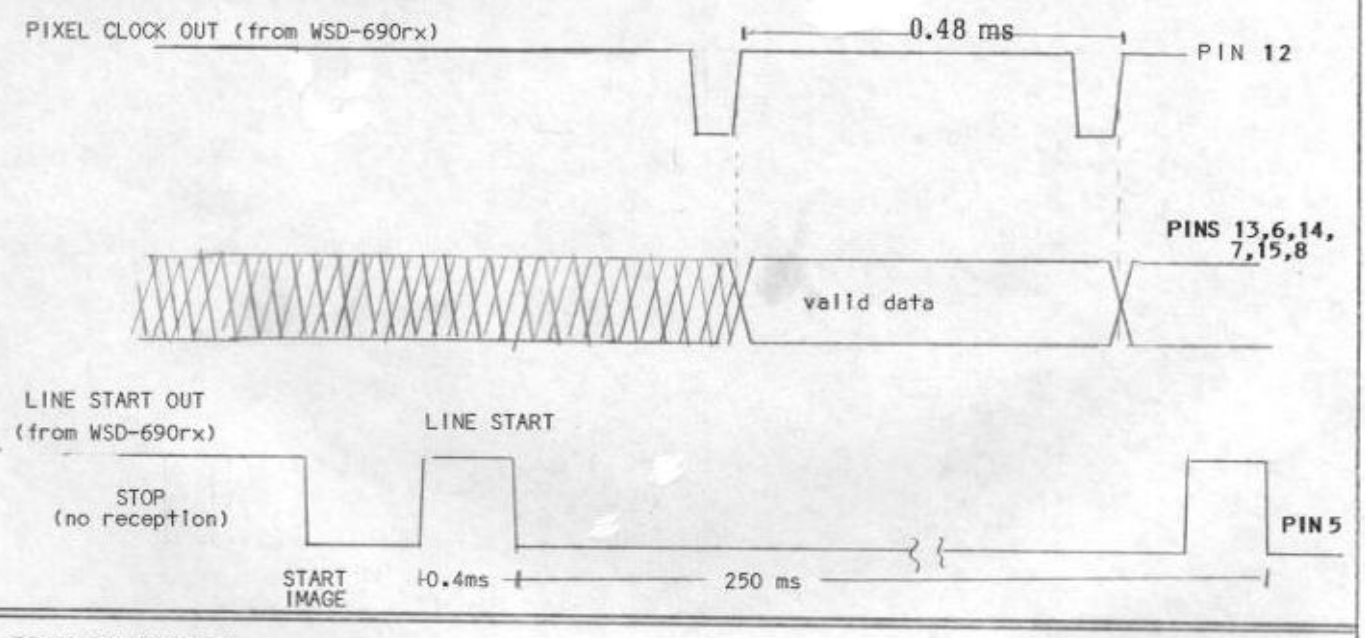
DIGITAL OUTPUTS



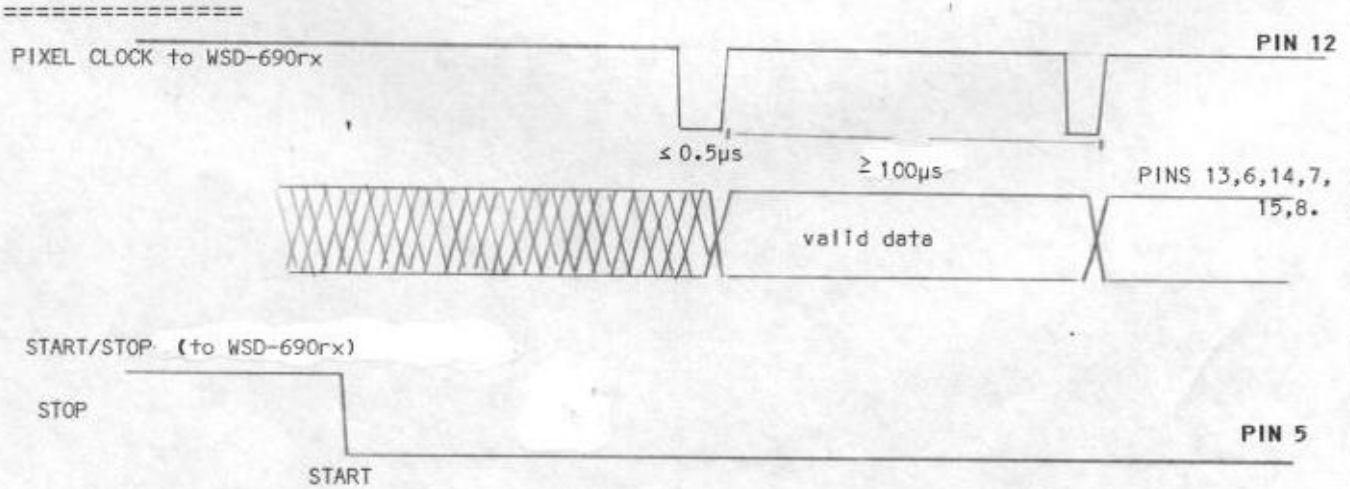
	REAL TIME	FROM BU-MEM.
4	GROUND	GROUND
5	LINE START OUT	START/STOP
6	DATA B OUT	DATA B OUT
7	DATA D OUT	DATA D OUT
8	DATA F MSB OUT	DATA F MSB OUT
12	PIXEL CLCK OUT	PIXEL CLCK INPUT
13	DATA A LSB OUT	DATA A LSB OUT
14	DATA C OUT	DATA C OUT
15	DATA E OUT	DATA E OUT

ALL SIGNALS HAVE TTL LEVEL

REAL TIME DIGITAL OUTPUT



FROM BU-MEMORY



ENHANCER PROM 2 LISTING

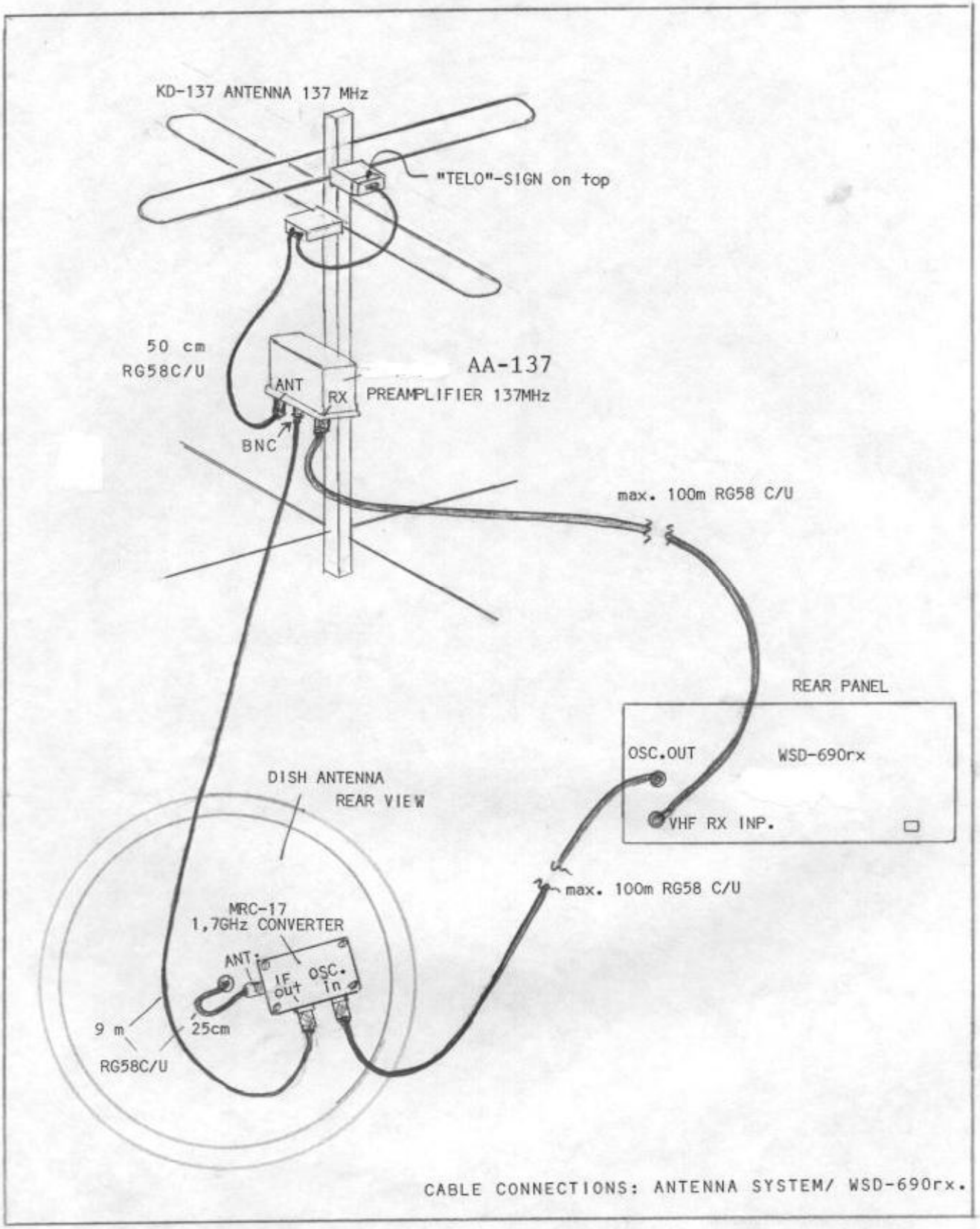
	0000:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
	0010:	02	05	07	0A	0C	0F	11	14	16	19	1A	1B	1C	1D	1E	1F
8	0020:	20	21	22	23	24	25	26	27	28	29	2A	1D	1D	1D	27	27	MB
	0030:	27	01	01	01	0A	14	1E	28	32	3C	3C	3C	3C	3C	3C	3C
	0040:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
9	0050:	00	00	04	0A	10	16	1C	22	28	2E	34	3A	3F	1D	1E	1F	
	0060:	20	21	23	24	25	27	28	29	2A	2B	2C	1E	1E	1E	1E	27	JG
	0070:	27	27	27	11	11	00	00	10	20	30	3F	3F	3F	3F	3F	3F	
	0080:	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	
10	0090:	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	0B	04	04	00	00	3F	IB
	00A0:	36	31	26	21	18	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	
	00B0:	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	0F	
	00C0:	00	00	04	08	0C	10	14	18	1C	20	24	28	2C	30	33	00	
11	00D0:	04	08	0C	10	14	18	1C	20	24	28	2C	30	33	00	00	0B	FC
	00E0:	18	23	2F	37	37	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	
	00F0:	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	
	0100:	00	00	00	00	00	00	00	00	00	01	02	03	04	05	06	07	
12	0110:	08	09	0A	0C	0F	11	13	15	17	19	1C	1E	20	23	25	27	
	0120:	29	2B	2D	30	00	00	00	0C	11	16	1B	20	25	2A	2F	34	EC
	0130:	39	3F	00	00	00	2A	2A	2A	3F	3F	3F	3F	3F	3F	3F	3F	
	0140:	00	01	03	04	06	07	09	0A	0C	0D	0F	10	12	13	15	16	
13	0150:	18	19	1B	1C	1E	1F	21	22	24	25	27	28	2A	2B	2D	2E	LOW
	0160:	30	30	31	31	32	32	33	33	34	34	35	35	36	36	37	37	LINEAR
	0170:	38	38	39	39	3A	3A	3B	3B	3C	3C	3D	3D	3E	3E	3F	3F	
	0180:	00	00	01	01	02	02	03	03	04	04	05	05	06	06	07	07	
	0190:	08	08	09	09	0A	0A	0B	0B	0C	0C	0D	0D	0E	0E	0F	0F	HIGH
14	01A0:	10	12	13	15	16	18	19	1B	1C	1E	1F	21	22	24	25	27	LINEAR
	01B0:	28	2A	2B	2D	2E	30	31	33	34	36	37	39	3A	3C	3D	3F	
	01C0:	00	01	02	04	05	06	08	09	0A	0C	0D	0E	10	11	12	14	
	01D0:	15	16	18	19	1A	1C	1D	1E	1F	1F	1F	1F	1F	1F	1F	1F	HIGH/
15	01E0:	1F	1F	1F	1F	1F	1F	1F	1F	20	21	22	24	25	26	28	29	LOW
	01F0:	2A	2C	2D	2E	30	31	32	34	35	36	38	39	3A	3C	3D	3F	LINEAR

NHANCER PROM 1
) ... 7

NHANCER PROM 2
... 15

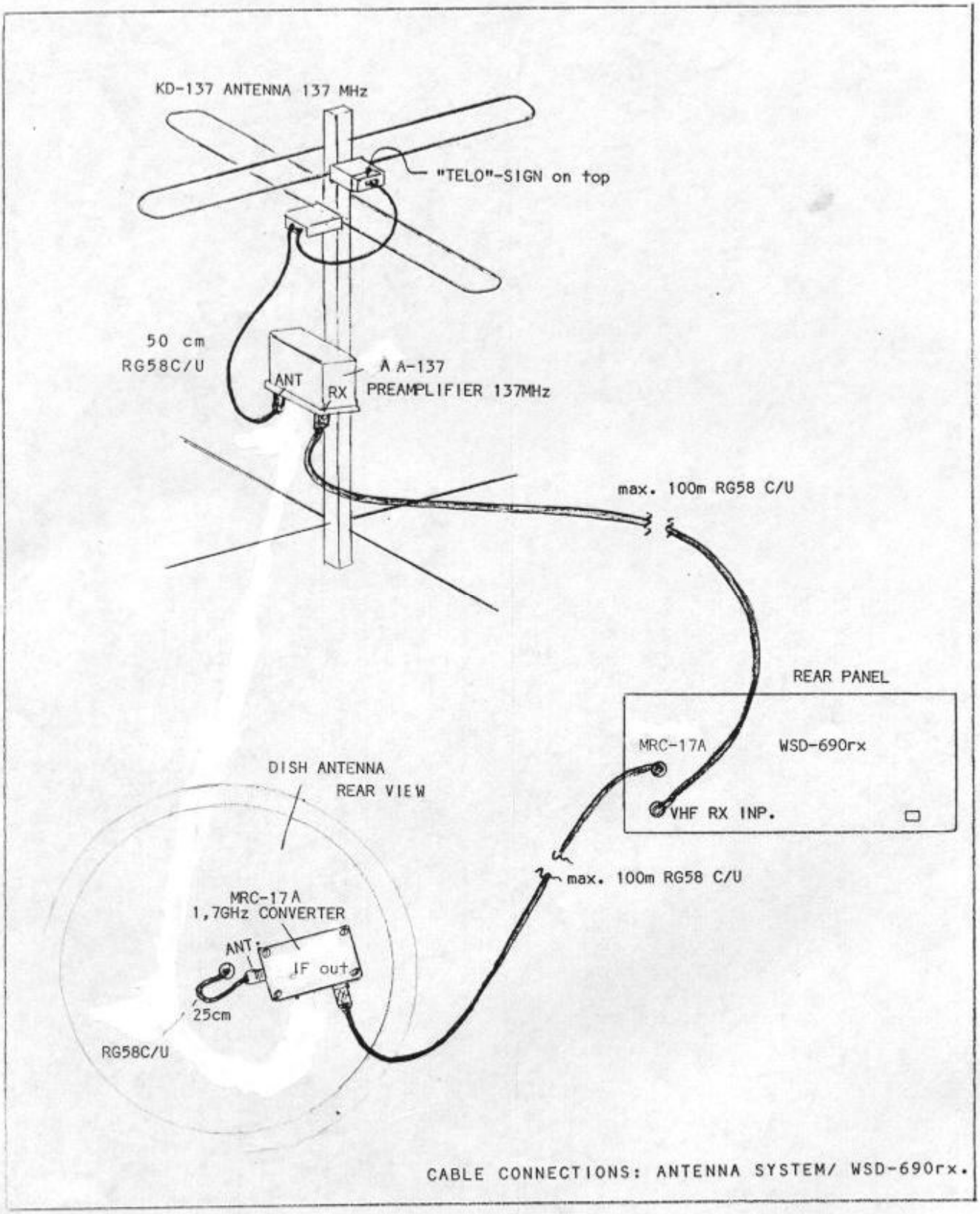
```
0000: 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0010: 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
0020: 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
0030: 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
0040: 01 03 05 07 09 0B 0D 0F 13 14 15 16 17 18 19 1A
0050: 1B 1C 1D 1E 1F 1F 20 20 21 22 22 23 24 24 25 26
0060: 26 27 28 28 29 2A 2B 2B 2C 2D 2D 2E 2F 2F 30 31
0070: 32 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 3F
0080: 00 02 04 06 08 0A 0C 0E 0F 10 11 12 13 14 15 16
0090: 17 18 19 19 1A 1A 1B 1B 1C 1C 1D 1D 1E 1E 1F 1F
00A0: 20 20 21 21 22 22 23 23 24 24 25 25 26 26 27 27
00B0: 28 29 2A 2B 2C 2D 2E 2F 30 32 34 36 38 3A 3C 3E
00C0: 00 00 00 00 01 01 02 02 03 03 04 04 05 06 07 08
00D0: 09 0A 0C 0D 0E 10 11 13 14 15 17 19 1A 1C 1D 1F
00E0: 21 22 24 25 27 28 2A 2B 2D 2E 30 31 33 34 35 36
00F0: 37 38 39 3B 3C 3C 3D 3E 3E 3F 3F 3F 3F 3F 3F 3F
0100: 00 00 00 01 02 02 03 04 05 06 07 07 08 09 0A 0B
0110: 0C 0D 0E 0F 11 13 14 16 18 19 1B 1D 1E 1F 21 23
0120: 25 27 28 29 2A 2B 2C 2D 2E 2E 2F 30 30 31 32 32
0130: 33 34 35 36 37 37 38 38 39 39 3A 3B 3C 3D 3E 3F
0140: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0150: 00 00 00 02 04 06 08 0A 0C 0E 0F 10 12 14 16 18
0160: 1A 1C 1E 1F 20 22 24 26 28 2A 2C 2E 30 32 34 36
0170: 38 3A 3C 10 11 12 14 16 30 32 34 36 38 3A 3E 3F
0180: 00 00 00 00 01 02 03 04 04 05 06 07 07 08 09 0A
0190: 0A 0B 0C 0C 0D 0D 0E 0E 0F 0F 10 11 13 15 17 18
01A0: 1A 1C 1D 1F 20 21 22 23 24 25 26 27 28 29 2A 2C
01B0: 2D 2F 30 31 32 33 34 35 36 37 38 3A 3B 3C 3F 3F
01C0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01
01D0: 00 00 00 00 00 02 04 06 08 0A 0C 0D 0F 10 12 14
01E0: 16 18 1A 1C 1F 20 21 23 25 27 29 2B 2D 2F 30 31
01F0: 32 33 34 36 38 3A 3C 3F 3F 3F 3F 3F 3F 3F 3F 3F
0200: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0210: 02 05 07 0A 0C 0F 11 14 16 19 1A 1B 1C 1D 1E 1F
0220: 20 21 22 23 24 25 26 27 28 29 2A 1D 1D 1D 27 27
0230: 27 01 01 01 0A 14 1E 28 32 3C 3C 3C 3C 3C 3C 3C
0240: 00 00 00 00 01 02 03 04 04 05 06 07 07 08 09 0A
0250: 0A 0B 0C 0C 0D 0D 0E 0E 0F 0F 10 11 13 15 17 18
0260: 1A 1C 1D 1F 20 21 22 23 24 25 26 27 28 29 2A 2C
0270: 2D 2F 30 31 32 33 34 35 36 37 38 3A 3B 3C 3F 3F
0280: 00 00 00 01 02 03 04 05 06 07 08 09 0A 0A 0B 0C
0290: 0D 0E 0F 0F 10 11 12 13 14 15 16 17 18 19 1A 1B
02A0: 1C 1E 1F 20 21 22 23 24 25 26 27 29 2A 2C 2D 2E
02B0: 2F 30 31 32 33 0F 0F 0F 3F 3F 3F 3F 3F 3F 3F 3F
02C0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
02D0: 07 07 07 0F 0F 0F 17 17 17 1F 1F 1F 27 27 27 2F
02E0: 2F 2F 37 37 37 3F 3F 3F 00 00 00 00 00 00 00 00
02F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0300: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0310: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0320: 00 00 00 00 00 00 00 00 07 07 07 0F 0F 0F 17 17
0330: 17 1F 1F 1F 27 27 27 2F 2F 2F 37 37 37 3F 3F 3F
0340: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 02
0350: 04 06 08 0A 0C 0E 10 12 14 16 18 19 1A 1C 1D 1E
0360: 1F 21 22 24 25 27 28 29 2B 2C 2D 12 12 12 12 12
0370: 00 00 00 00 1F 1F 1F 1F 3F 3F 3F 3F 3F 3F 3F 3F
0380: 00 00 01 01 02 02 03 03 04 04 05 05 06 06 07 07
0390: 08 08 09 09 0A 0A 0B 0B 0C 0C 0D 0D 0E 0E 0F 0F
03A0: 10 12 13 15 16 18 19 1B 1C 1E 1F 21 22 24 25 27
03B0: 28 2A 2B 2D 2E 30 31 33 34 36 37 39 3A 3C 3D 3F
03C0: 00 01 03 04 06 07 09 0A 0C 0D 0F 10 12 13 15 16
03D0: 18 19 1B 1C 1E 1F 21 22 24 24 27 28 2A 2B 2D 2E
03E0: 30 30 31 31 32 32 33 33 34 34 35 35 36 36 37 37
03F0: 38 38 39 39 3A 3A 3B 3B 3C 3C 3D 3D 3E 3E 3F 3F
0400: 00
```

Section 5 : CABLE CONNECTIONS: Antenna System / WSD-690rx

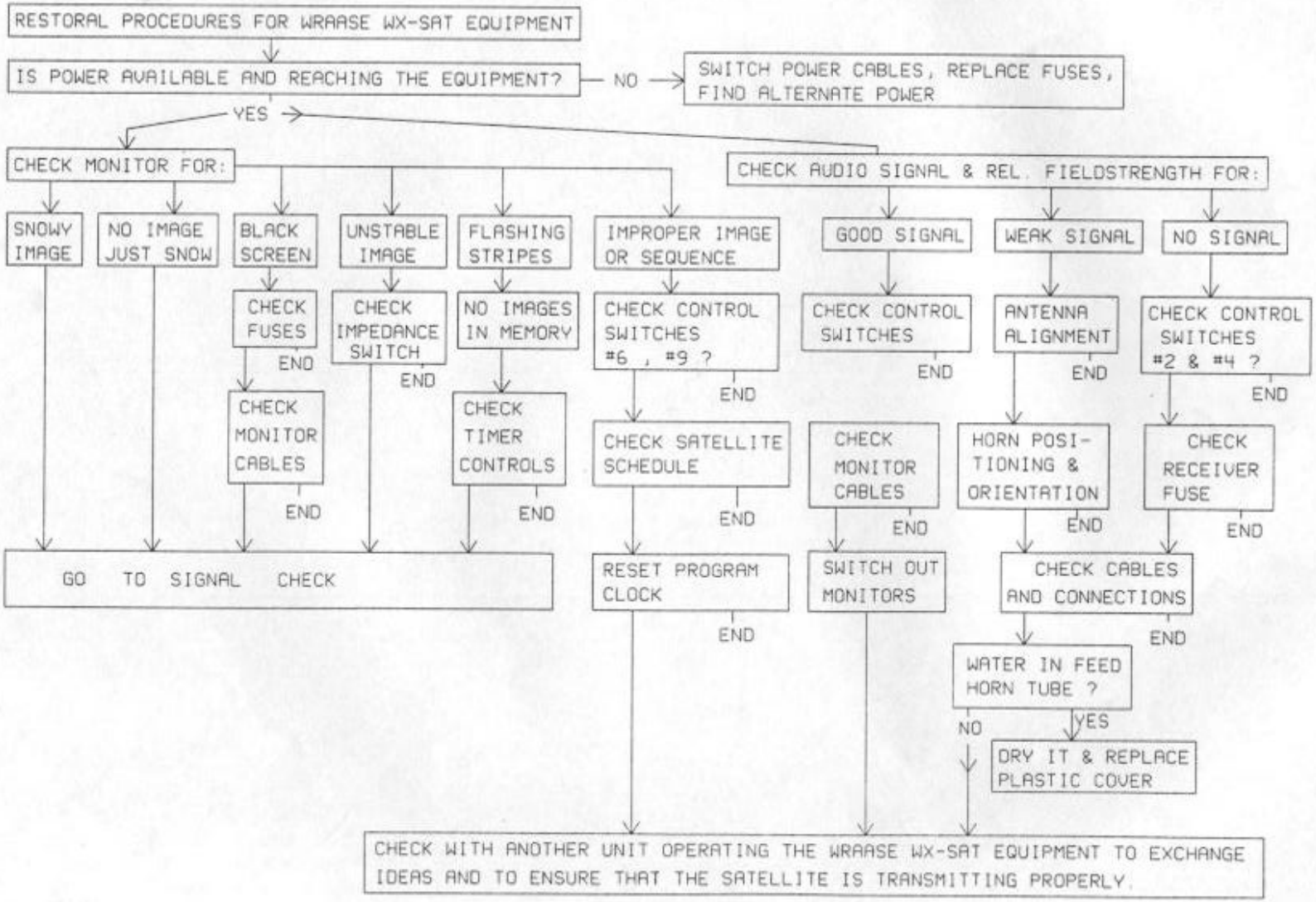


CABLE CONNECTIONS: ANTENNA SYSTEM/ WSD-690rx.

Section 5 : CABLE CONNECTIONS: Antenna System / WSD-690rx

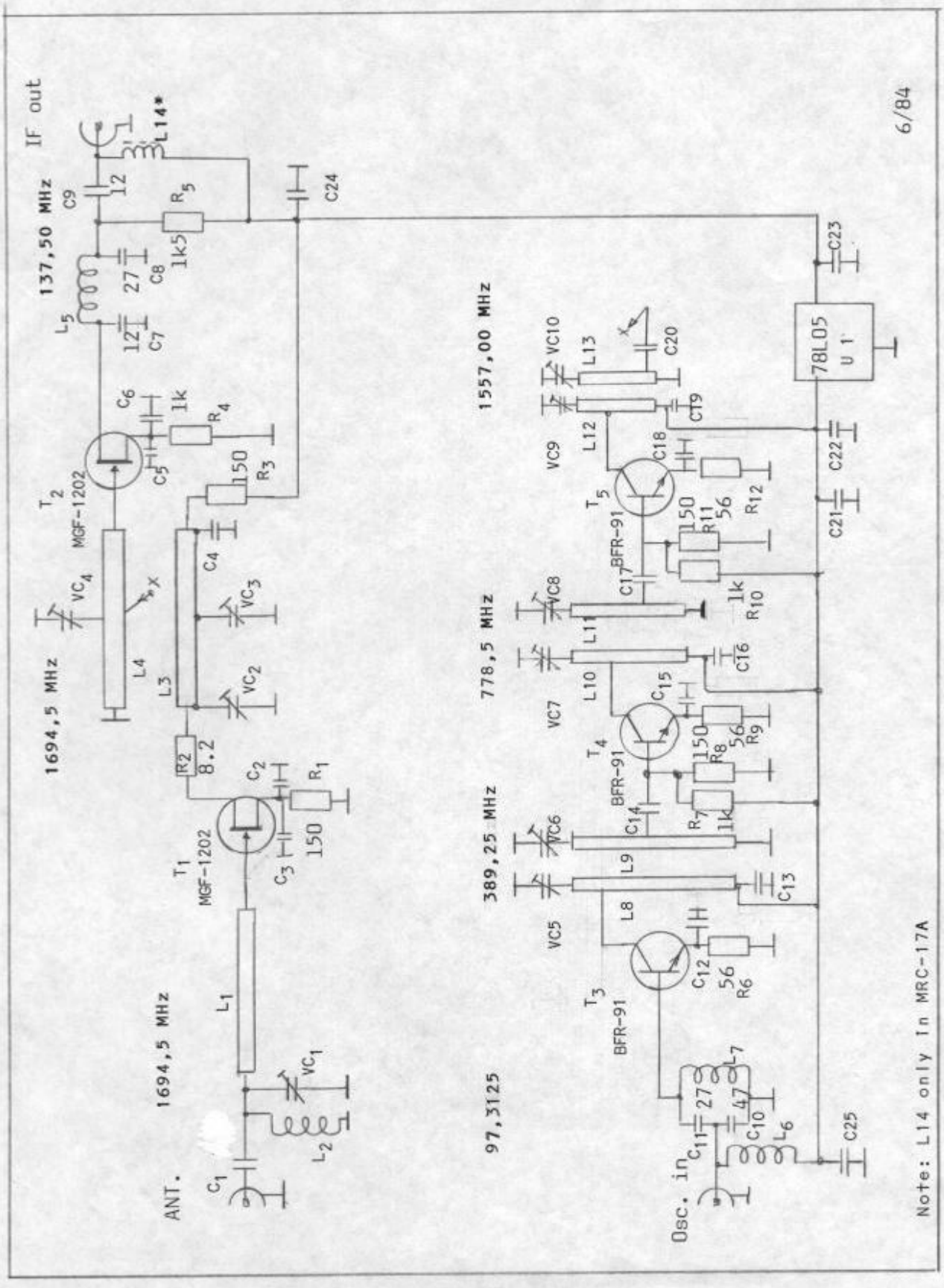


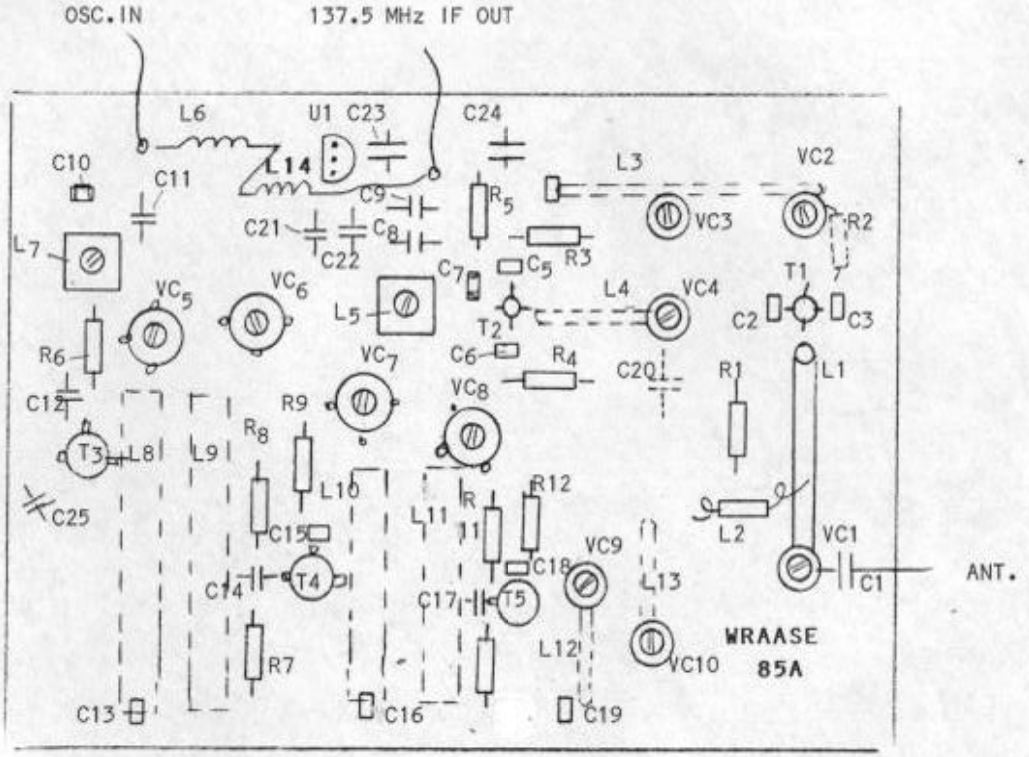
CABLE CONNECTIONS: ANTENNA SYSTEM/ WSD-690rx.


RESTORAL PROCEDURES FOR WRAASE WX-SAT EQUIPMENT
IS POWER AVAILABLE AND REACHING THE EQUIPMENT?
NO
SWITCH POWER CABLES, REPLACE FUSES, FIND ALTERNATE POWER
YES
CHECK MONITOR FOR:
CHECK AUDIO SIGNAL & REL. FIELDSTRENGTH FOR:
SNOWY IMAGE
NO IMAGE JUST SNOW
BLACK SCREEN
UNSTABLE IMAGE
FLASHING STRIPES
IMPROPER IMAGE OR SEQUENCE
GOOD SIGNAL
WEAK SIGNAL
NO SIGNAL
CHECK FUSES
END
CHECK IMPEDANCE SWITCH
END
NO IMAGES IN MEMORY
CHECK CONTROL SWITCHES #6 , #9 ?
END
CHECK CONTROL SWITCHES
END
ANTENNA ALIGNMENT
END
CHECK CONTROL SWITCHES #2 & #4 ?
END
CHECK MONITOR CABLES
END
CHECK TIMER CONTROLS
END
CHECK SATELLITE SCHEDULE
END
CHECK MONITOR CABLES
END
HORN POSI-TIONING & ORIENTATION
END
CHECK RECEIVER FUSE
END
GO TO SIGNAL CHECK
RESET PROGRAM CLOCK
END
SWITCH OUT MONITORS
CHECK CABLES AND CONNECTIONS
END
WATER IN FEED HORN TUBE ?
NO
YES
DRY IT & REPLACE PLASTIC COVER
CHECK WITH ANOTHER UNIT OPERATING THE WRAASE WX-SAT EQUIPMENT TO EXCHANGE IDEAS AND TO ENSURE THAT THE SATELLITE IS TRANSMITTING PROPERLY.

SECTION 6 TECHNICAL DRAWINGS

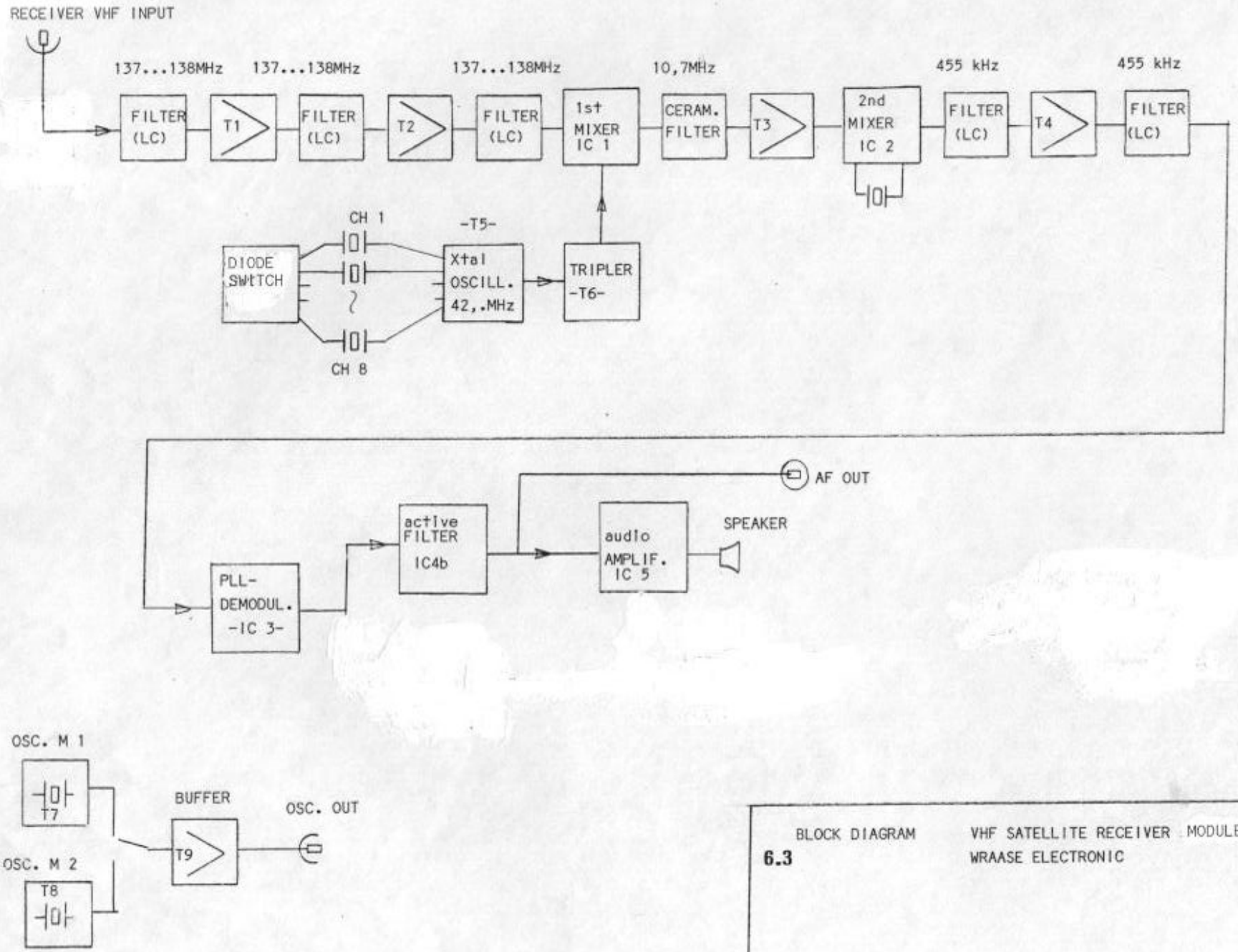
6.1 MRC-17A METEOSAT CONVERTER , Circuit Diagram



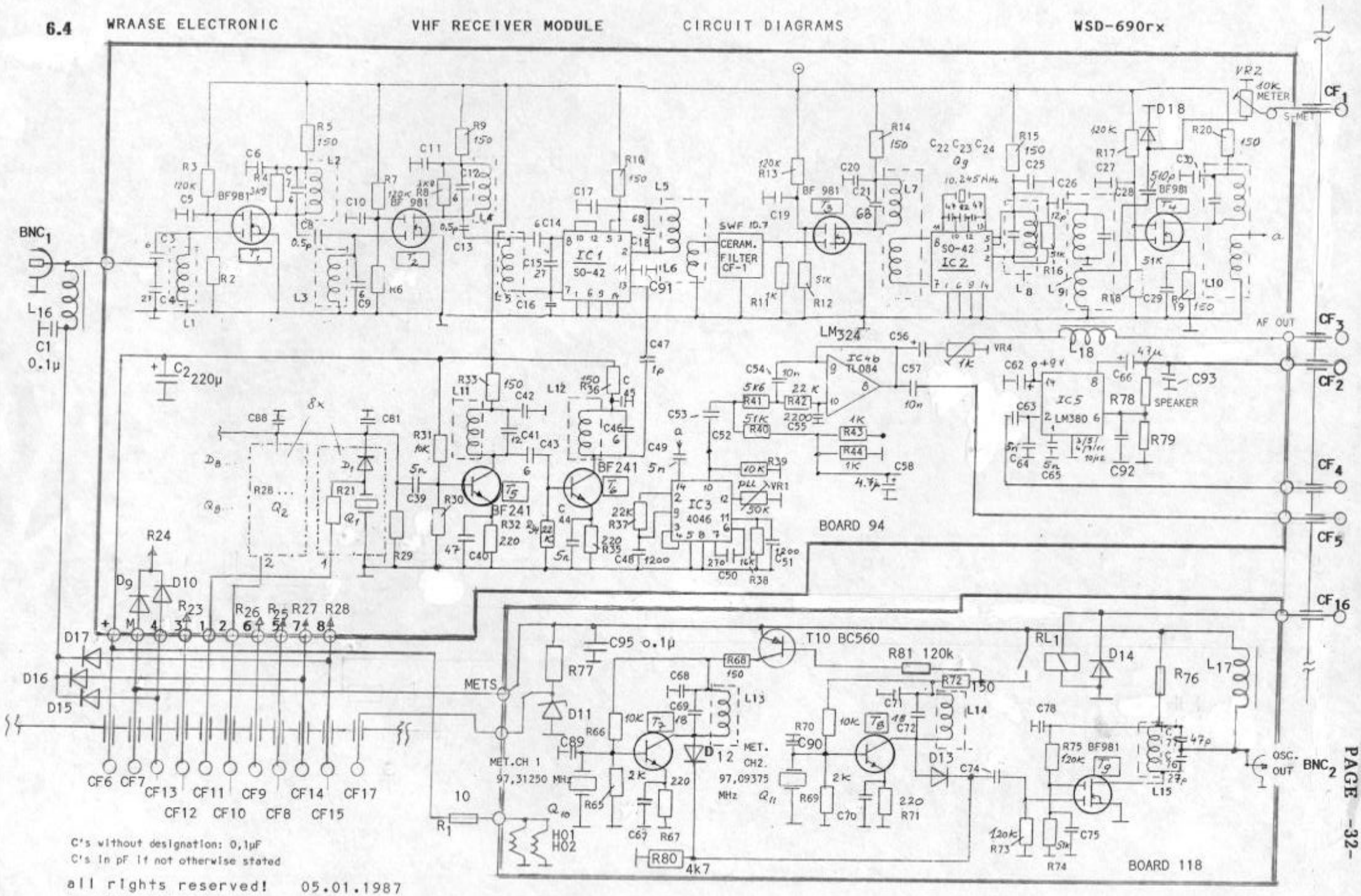


6.2

WRAASE ELECTRONIC
1.7 GHz CONVERTER MRC-17/MRC-17A
BOARD 85A COMPONENT LOCATION



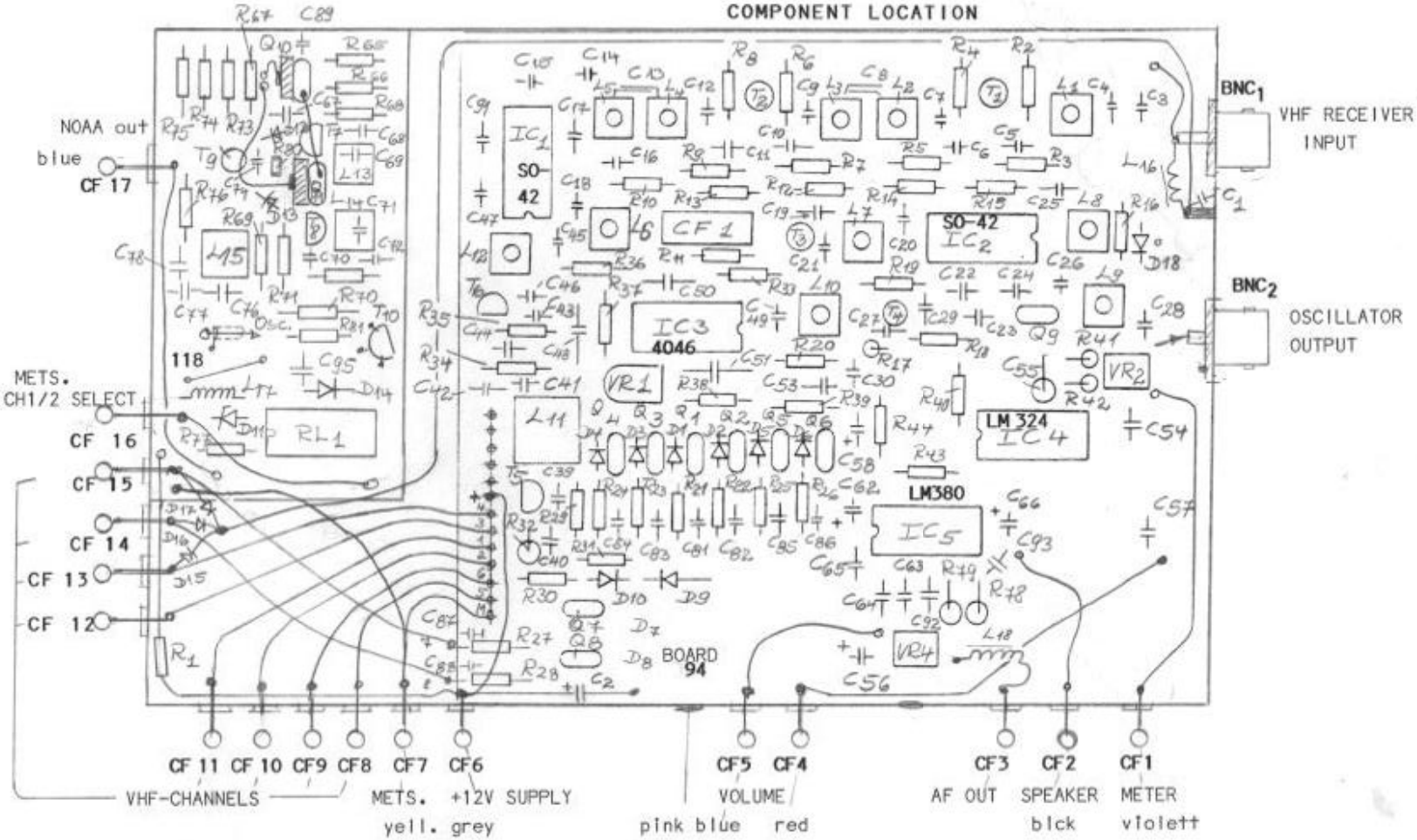
BLOCK DIAGRAM	VHF SATELLITE RECEIVER	MODULE 94/118
6.3	WRAASE ELECTRONIC	



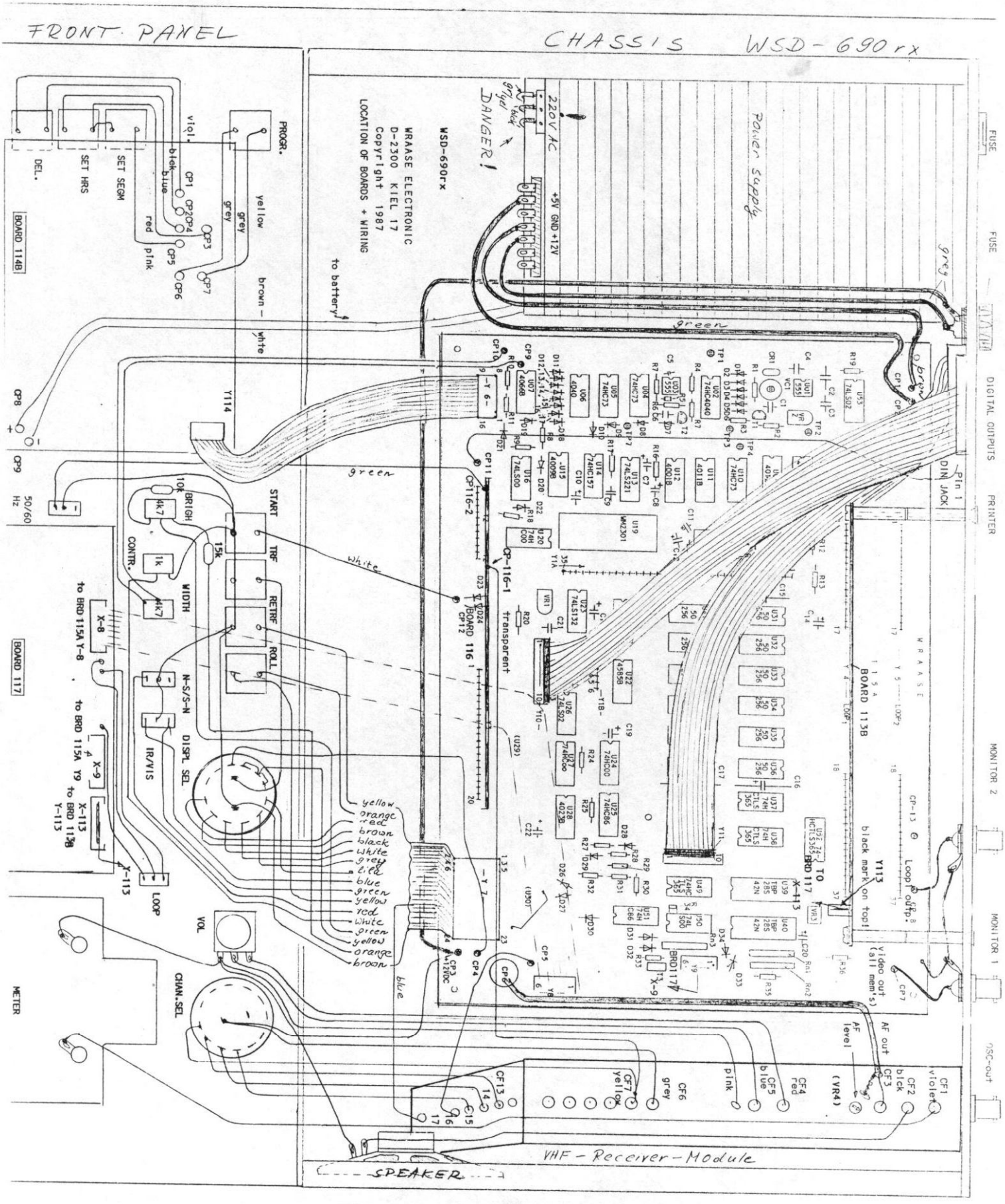
6.5 WSD 690rx. WRAASE ELECTRONIC

VHF RECEIVER MODULE: BOARDS 94 + 118

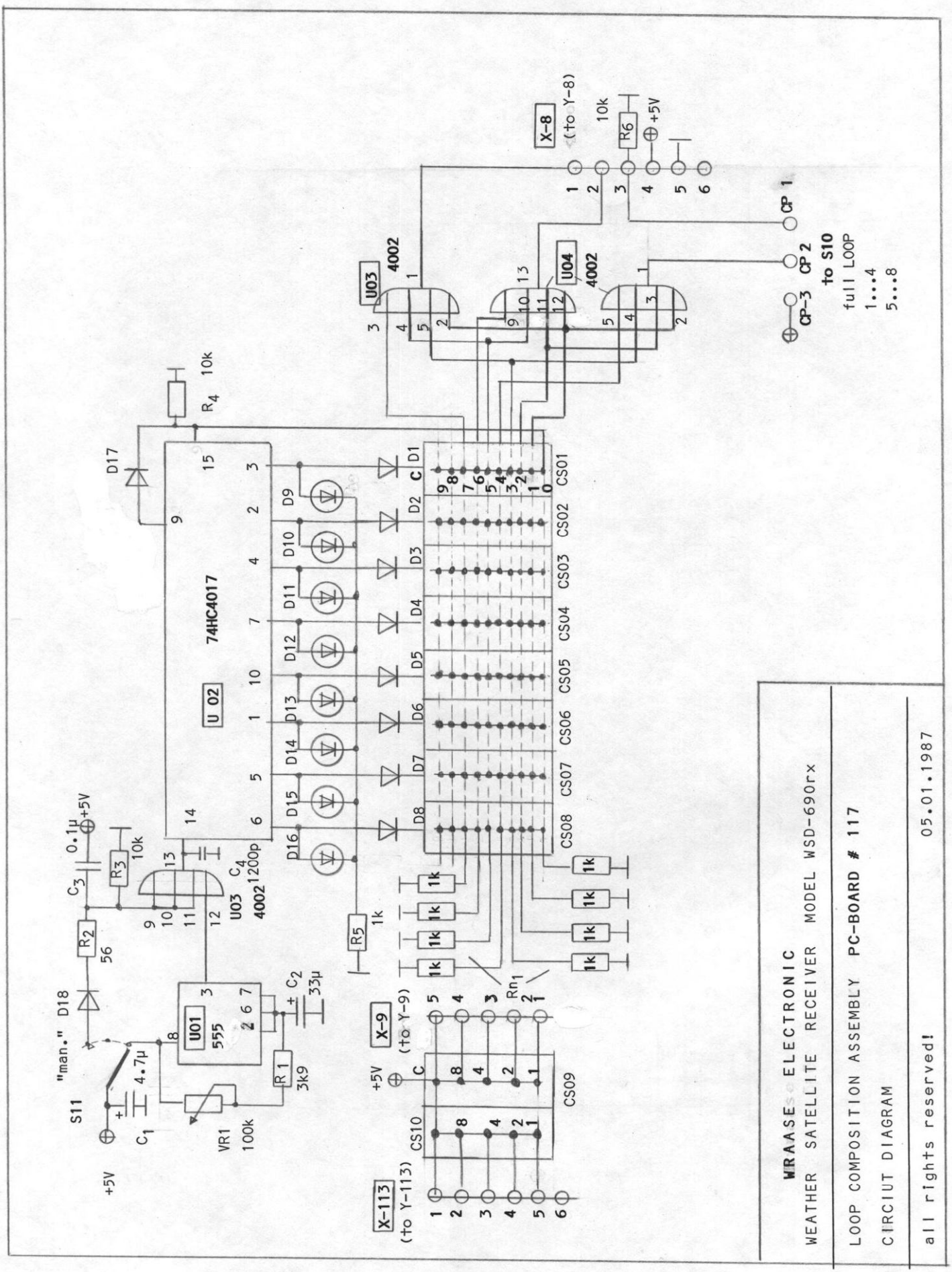
COMPONENT LOCATION



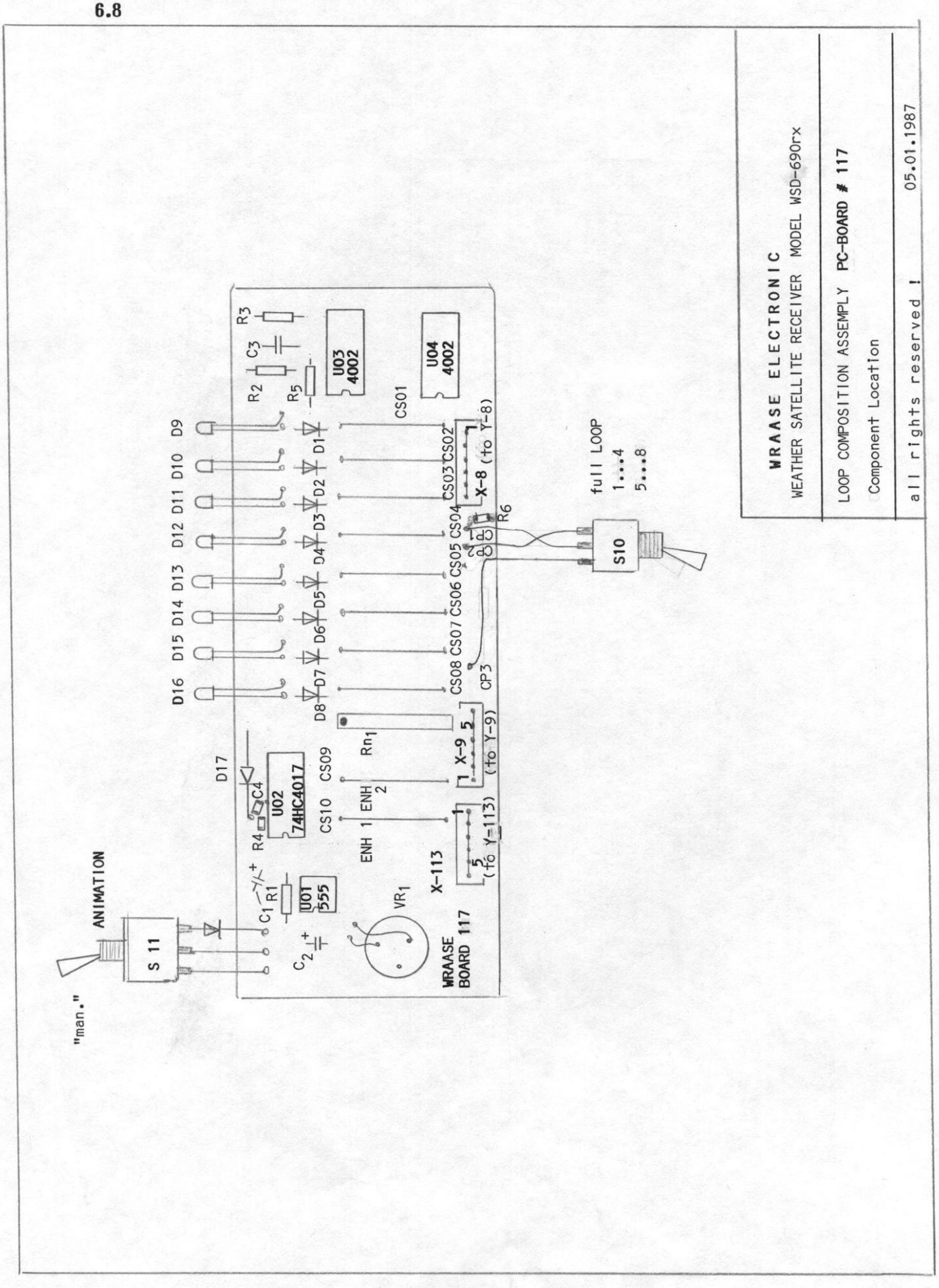
6.6 CHASSIS and FRONT PANEL WIRING



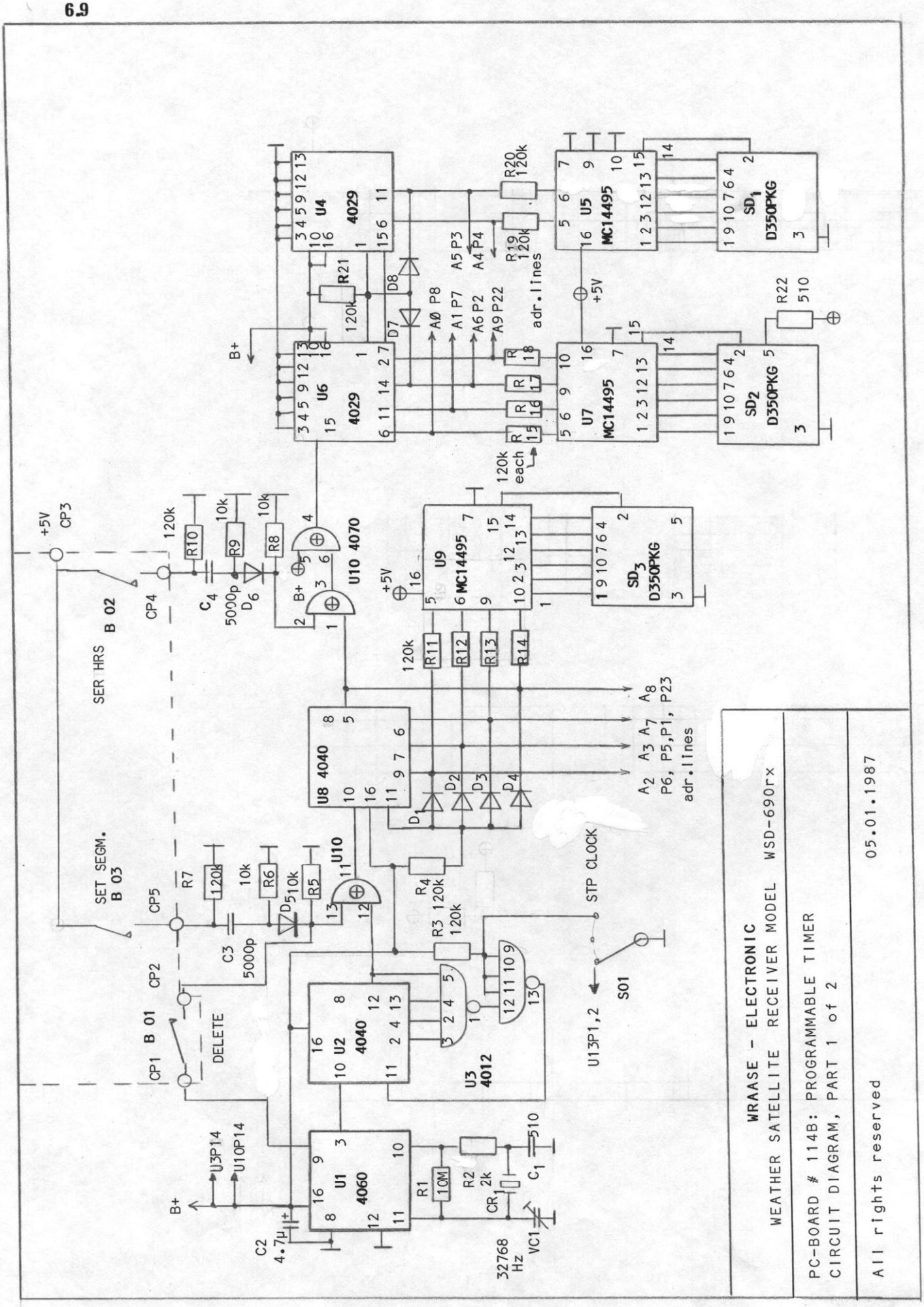
6.7


WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
LOOP COMPOSITION ASSEMBLY PC-BOARD # 117
CIRCIUT DIAGRAM
all rights reserved!
05.01.1987
74HC4017
U 02
U01 555
U03 4002
U04 4002
"man." D18
S11
VR1 100k
R1 3k9
R2 56
R3 10k
R4 10k
R5 1k
R6 10k
C1 4.7µ
C2 33µ
C3 0.1µ
C4 1200p
Rn1
X-8 (to Y-8)
X-9 (to Y-9)
X-113 (to Y-113)
CP 1
CP 2
CP-3
to S10
full LOOP
1...4
5...8

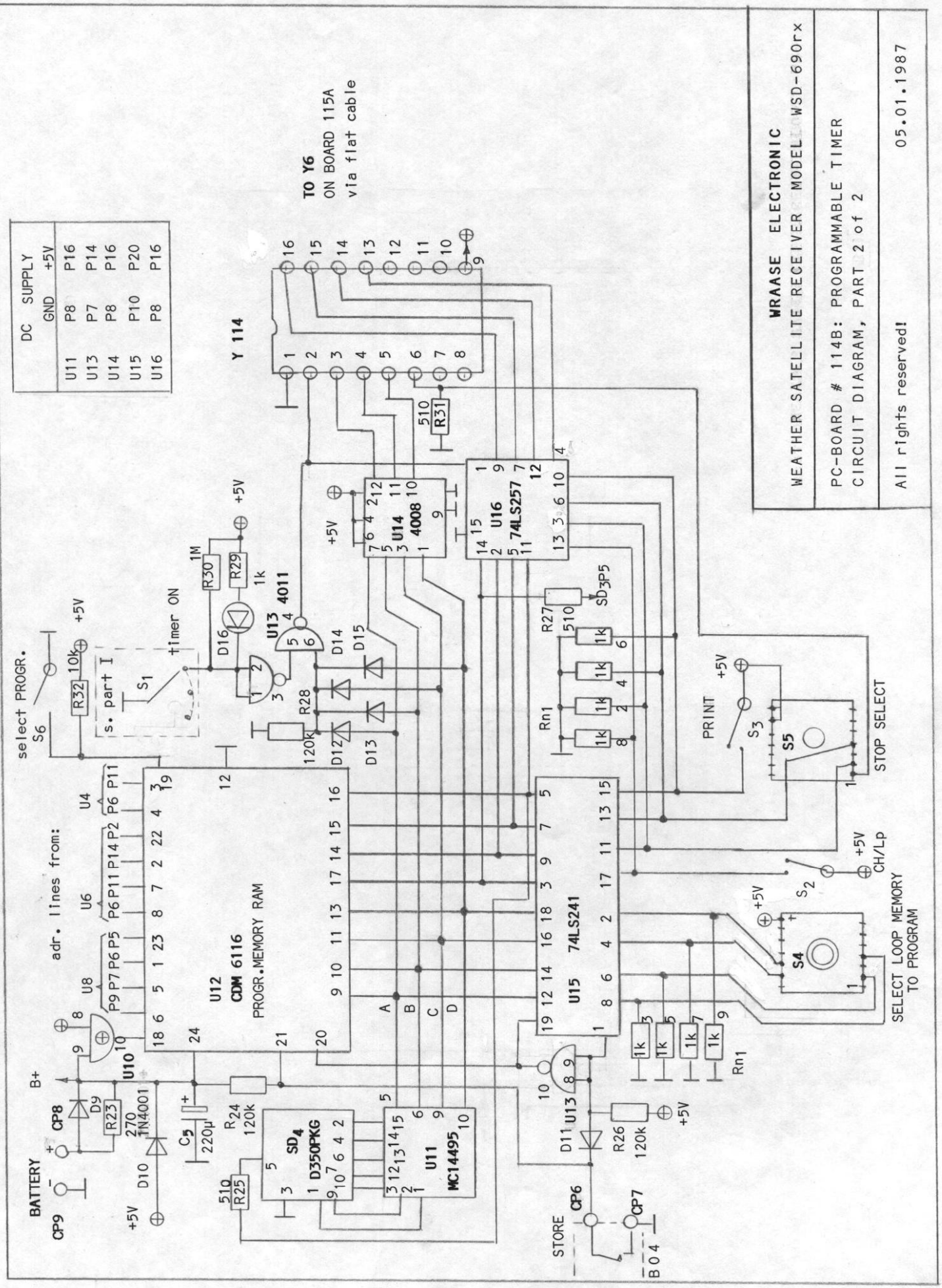
6.8


WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
LOOP COMPOSITION ASSEMPLY PC-BOARD # 117
Component Location
all rights reserved !
05.01.1987
ANIMATION
"man."
S 11
WRAASE BOARD 117
U01 555
U02 74HC4017
U03 4002
U04 4002
X-113
X-9 (to Y=113)
X-8 (to Y-8)
X-9 (to Y-9)
S10
full LOOP
1...4
5...8
VR1
Rn1
CP3
R1
R2
R3
R4
R5
R6
C1
C2
C3
C4
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
CS01
CS02
CS03
CS04
CS05
CS06
CS07
CS08
CS09
CS10
ENH 1
ENH 2

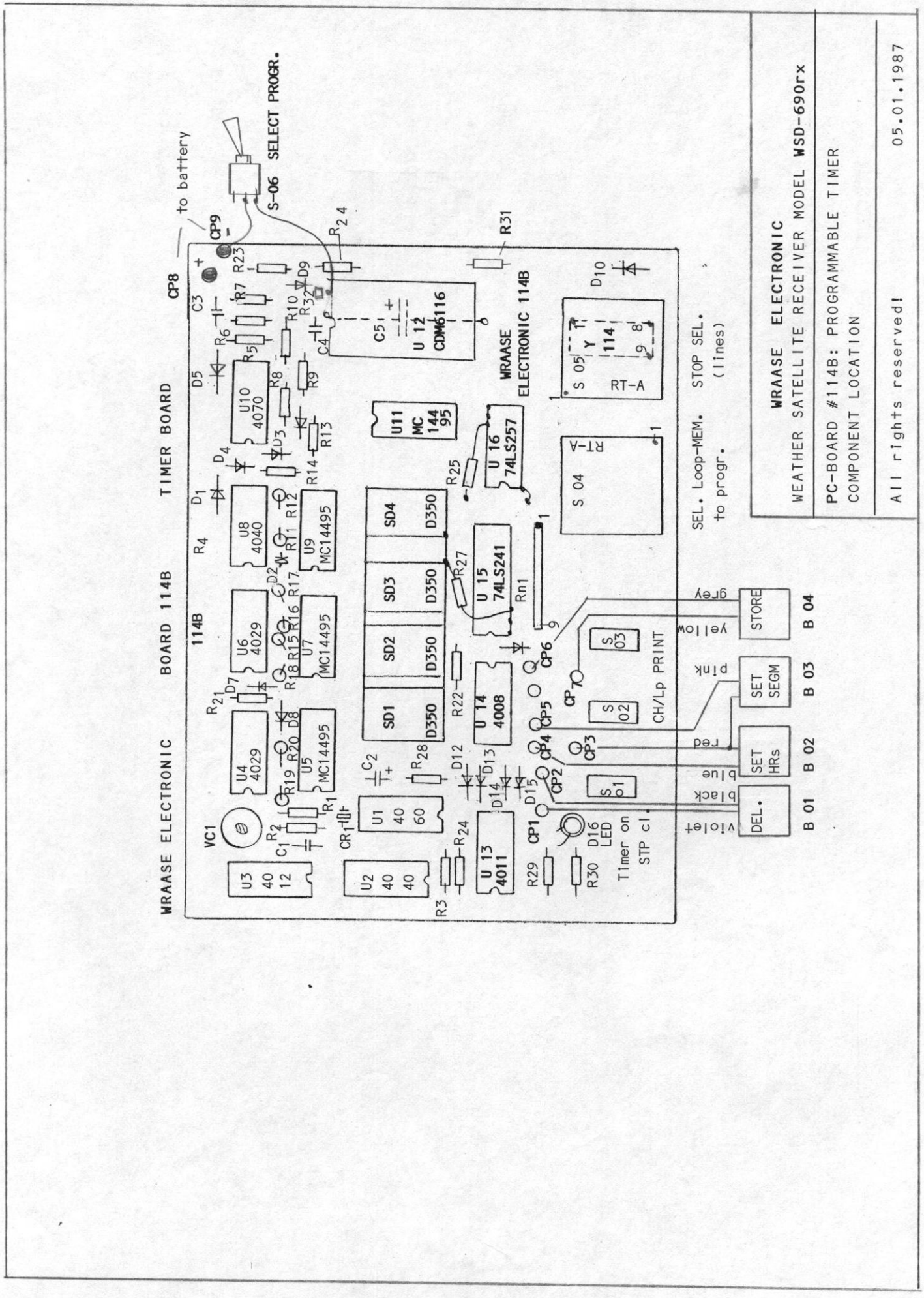
6.9


WRAASE - ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
PC-BOARD # 114B: PROGRAMMABLE TIMER
CIRCUIT DIAGRAM, PART 1 of 2
05.01.1987
All rights reserved
U1 4060
U2 4040
U3 4012
U4 4029
U5 MC14495
U6 4029
U7 MC14495
U8 4040
U9 MC14495
U10 4070
SD1 D350PKG
SD2 D350PKG
SD3 D350PKG
B+
+5V
CP1 B 01 DELETE
CP2
CP3
CP4 SER HRS B 02
CP5 SET SEGM. B 03
STP CLOCK
S01
U13P1,2
U3P14
U10P14
C1 510
C2 4.7µ
C3 5000p
C4 5000p
D1 D2 D3 D4 D5 D6 D7 D8
R1 10M
R2 2k
R3 120k
R4 120k
R5 10k
R6 10k
R7 120k
R8 10k
R9 10k
R10 120k
R11 120k
R12 120k
R13 120k
R14 120k
R15 120k each
R16 R17 R18 R19 120k
R20 120k
R21 120k
R22 510
CR1 32768 Hz
VC1
A0 P8
A1 P7
A2 P6, P5, P1, P23
A3 A7 A8
A4 P4
A5 P3
A6 P2
A9 P22
adr.lines

6.10

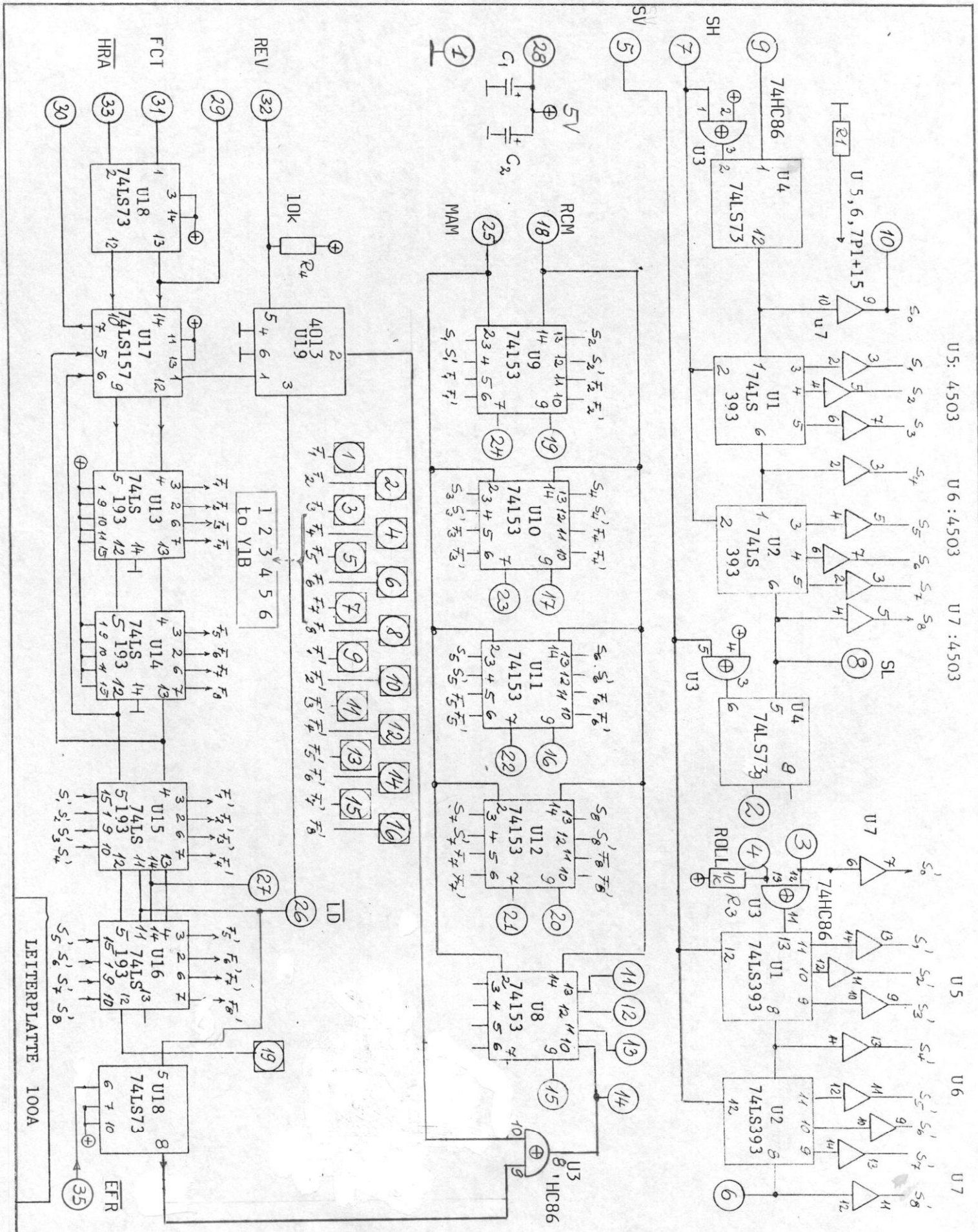

WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
PC-BOARD # 114B: PROGRAMMABLE TIMER
CIRCUIT DIAGRAM, PART 2 of 2
All rights reserved!
05.01.1987
DC SUPPLY
GND +5V
U11 P8 P16
U13 P7 P14
U14 P8 P16
U15 P10 P20
U16 P8 P16
TO Y6
ON BOARD 115A
via flat cable
Y 114
BATTERY
CP9
CP8
B+
D9
1N4001
R23
270
U10
D10
C5
220µ
R24
120k
SD4
D350PKG
R25
510
U11
MC14495
U12
CDM 6116
PROGR.MEMORY RAM
adr. lines from:
U4
U6
U8
select PROGR.
S6
R32
10k
+5V
timer ON
S1
s. part I
R30
1M
R29
1k
D16
U13
4011
R28
120k
D12
D13
D14
D15
U14
4008
U16
74LS257
R31
510
R27
510
SD3P5
Rn1
1k
PRINT
S3
S5
STOP SELECT
S2
CH/Lp
S4
SELECT LOOP MEMORY
TO PROGRAM
U15
74LS241
R26
120k
D11
STORE
CP6
CP7
B04

6.11

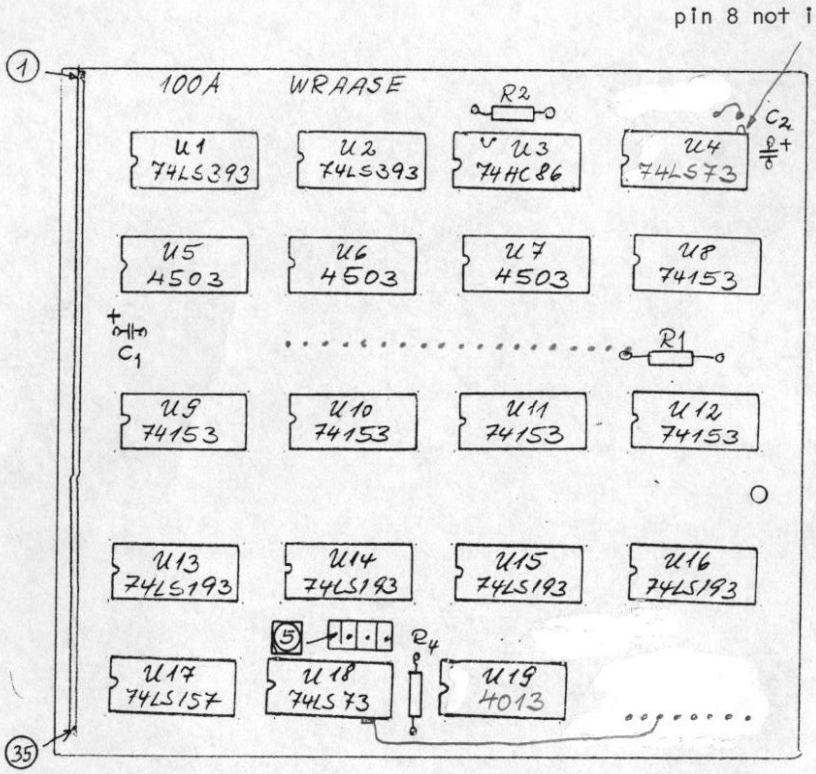

WRAASE ELECTRONIC BOARD 114B TIMER BOARD
114B
to battery
CP8
CP9
S-06 SELECT PROGR.
VC1
U1 40 60
U2 40 40
U3 40 12
U4 4029
U5 MC14495
U6 4029
U7 MC14495
U8 4040
U9 MC14495
U10 4070
U11 MC 144 95
U12 CDM6116
U13 4011
U14 4008
U15 74LS241
U16 74LS257
WRAASE ELECTRONIC 114B
SD1
SD2
SD3
SD4
D350
S 01
S 02
S 03
S 04
S 05
RT-A
RT-B
Y 114
CH/Lp PRINT
SEL. Loop-MEM. STOP SEL.
to progr. (lines)
DEL.
SET HRs
SET SEGM
STORE
violet
black
blue
red
pink
yellow
grey
B 01 B 02 B 03 B 04
Timer on STP cl.
D16 LED
WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
PC-BOARD #114B: PROGRAMMABLE TIMER
COMPONENT LOCATION
All rights reserved!
05.01.1987

6.12

PC - BOARD #100A CIRCUIT DIAGRAM , ADDRESS GENERATION a. MULTIPLEXERS



R 1... R 5	10k
C1,C2	3,3µ



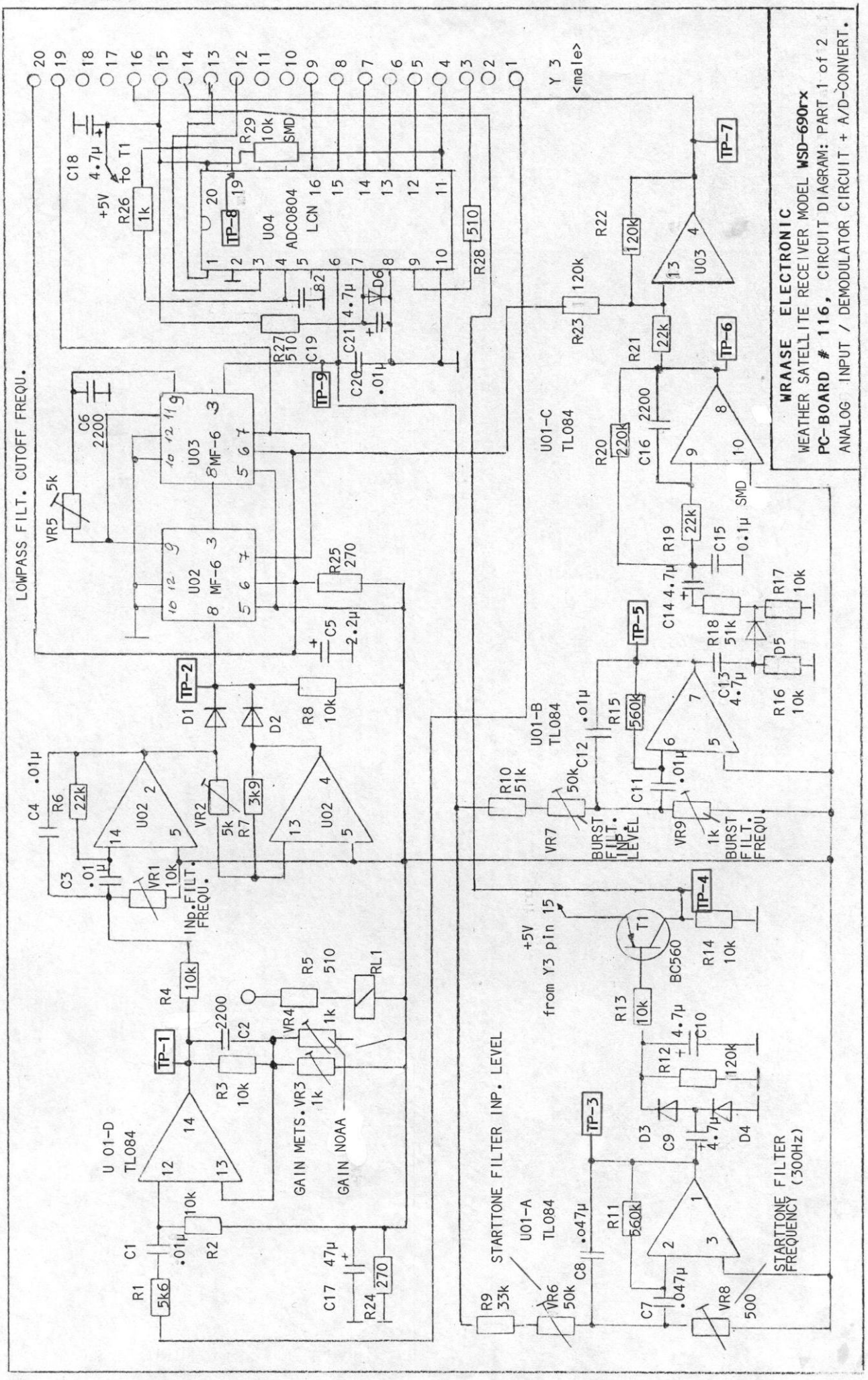
Leiterplatte 100A Bestückungsplan

WRAASE

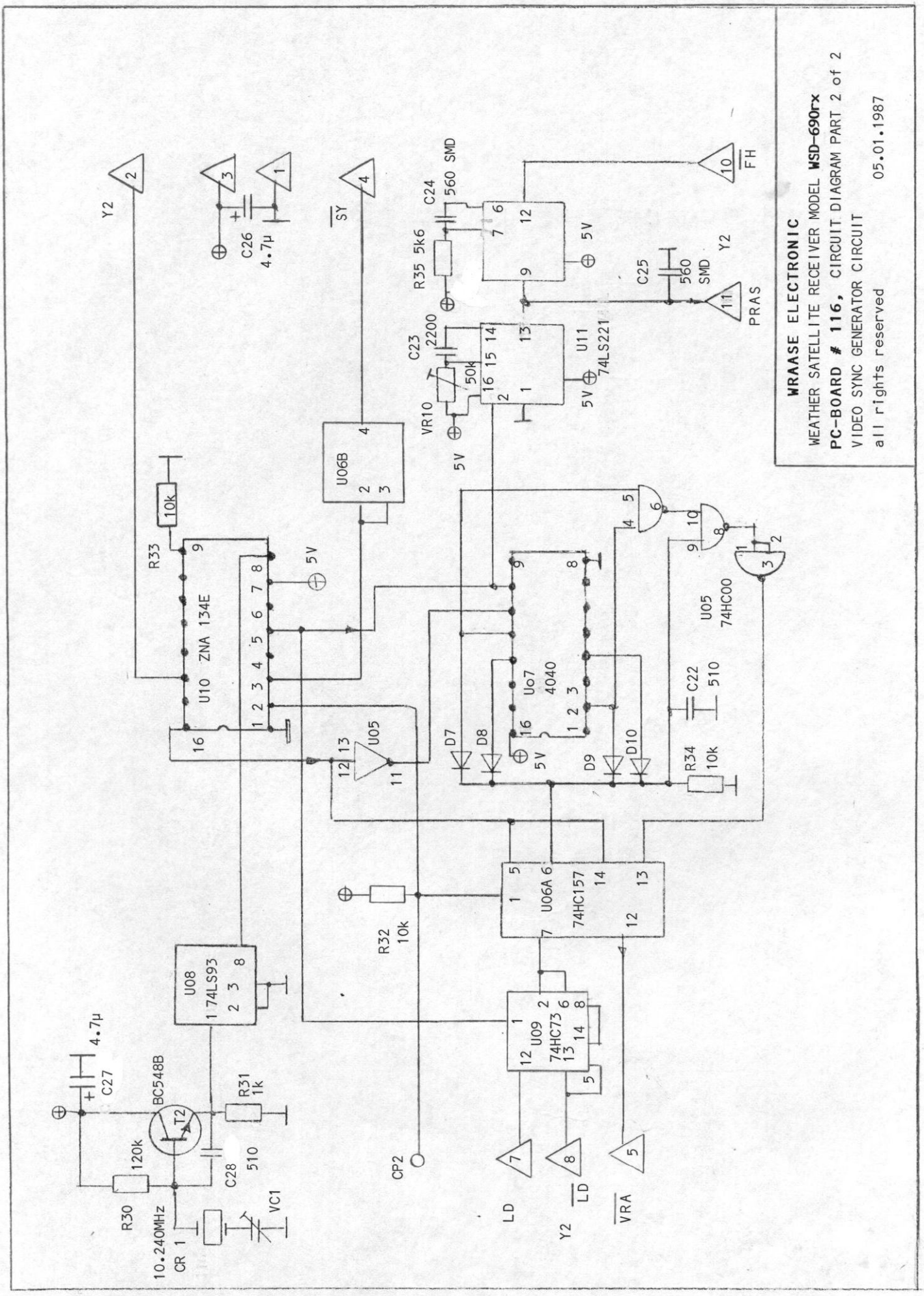
PC-BOARD #100A
COMPONENT LOCATION

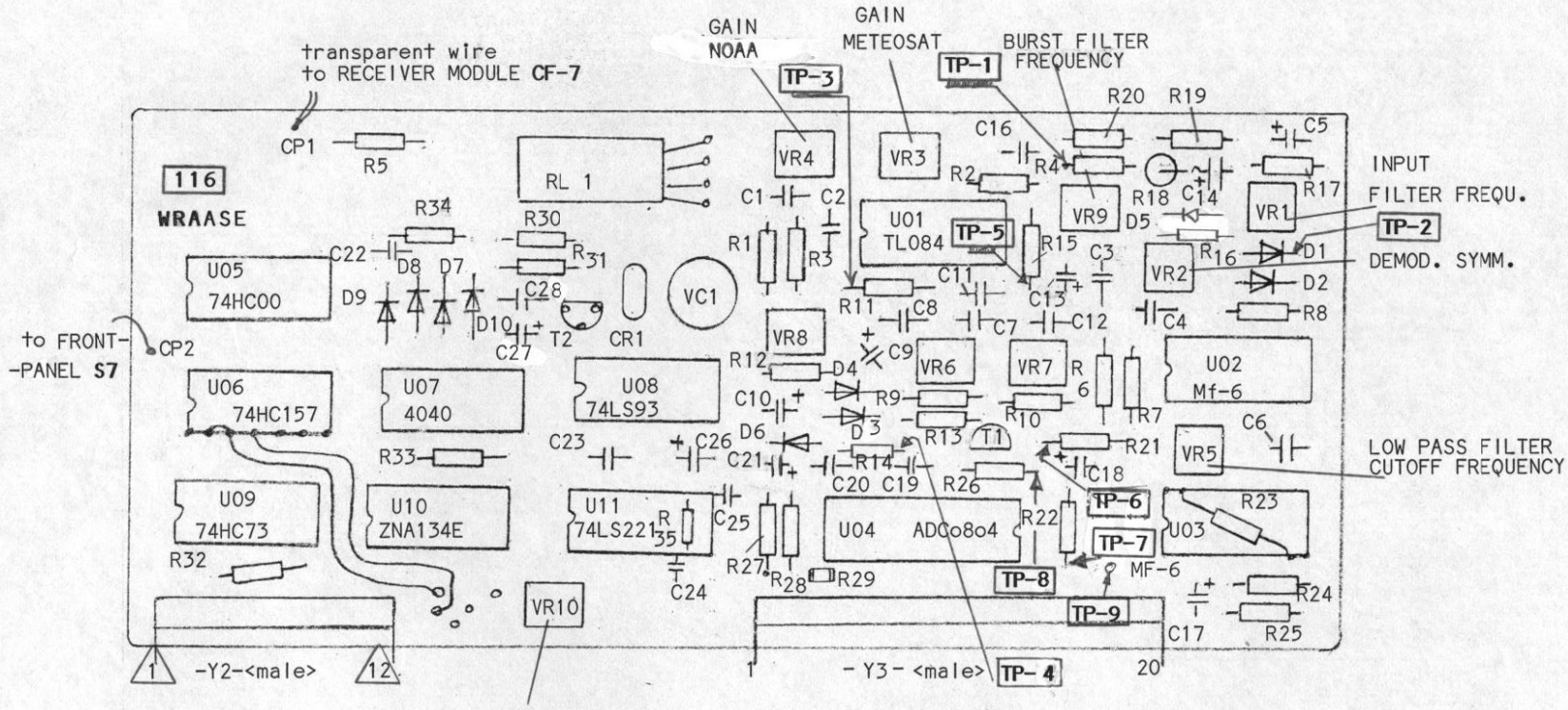
WRAASE ELEKTRONIK
2300 ALTENHOLZ/Kiel
7/85

6.14


WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
PC-BOARD # 116, CIRCUIT DIAGRAM: PART 1 of 2
ANALOG INPUT / DEMODULATOR CIRCUIT + A/D-CONVERT.
LOWPASS FILT. CUTOFF FREQU.
INP. FILT. FREQU.
GAIN METS. VR3
GAIN NOAA
STARTTONE FILTER INP. LEVEL
STARTTONE FILTER FREQUENCY (300Hz)
BURST FILT. INP. LEVEL
BURST FILT. FREQU.
U01-A TL084
U01-B TL084
U01-C TL084
U01-D TL084
U02 MF-6
U03 MF-6
U04 ADC0804 LCN
Y 3 <male>
from Y3 pin 15
to T1
BC560
SMD

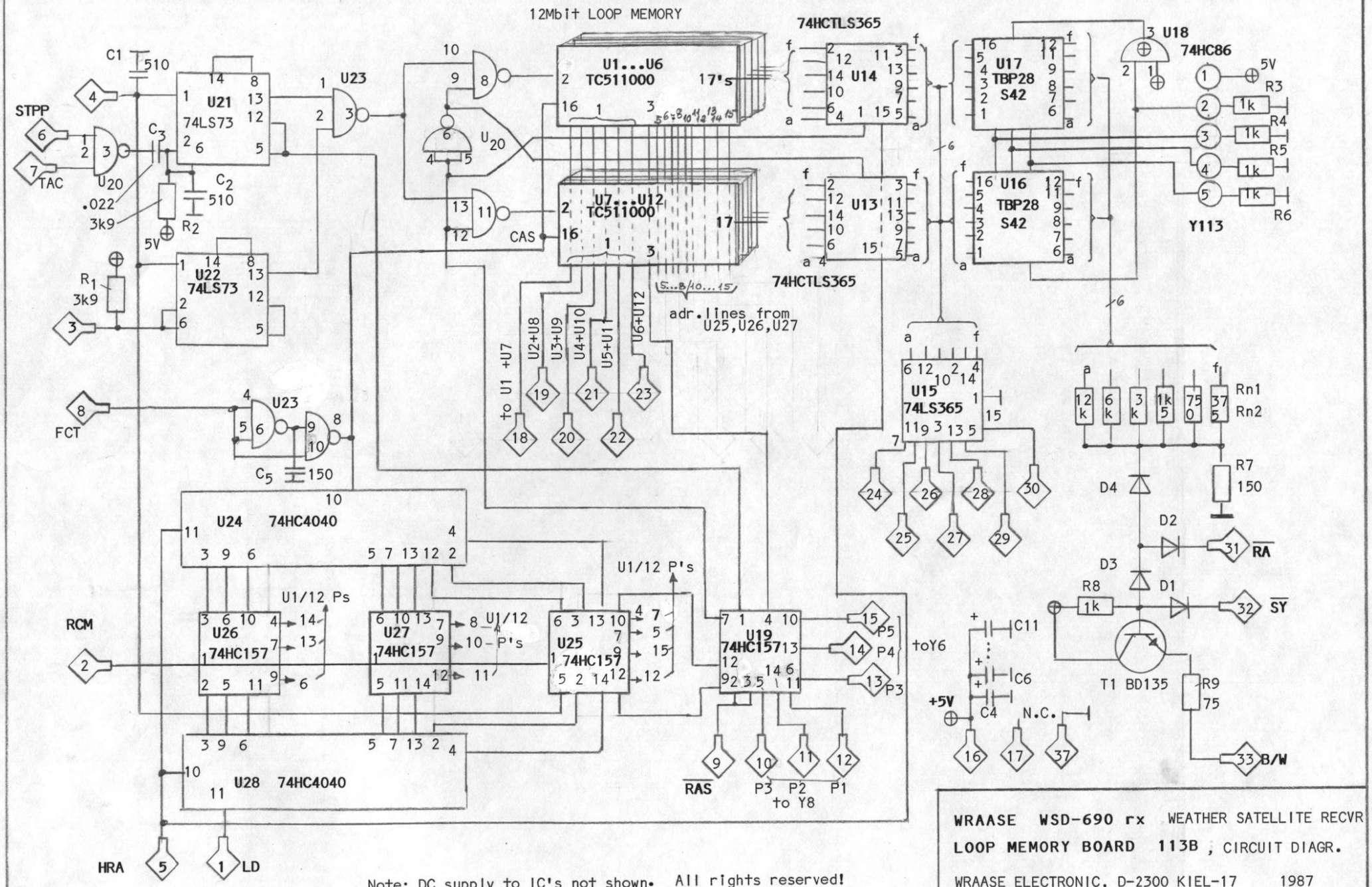
6.15


WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL WSD-690rx
PC-BOARD # 116, CIRCUIT DIAGRAM PART 2 of 2
VIDEO SYNC GENERATOR CIRCUIT
all rights reserved 05.01.1987
Y2
SY
FH
PRAS
LD
LD
VRA
CP2
10.240MHz
CR 1
R30 120k
C27 4.7µ
C28 510
VC1
R31 1k
T2 BC548B
U08 74LS93
U10 ZNA 134E
R33 10k
U06B
U06A 74HC157
U09 74HC73
U05 74HC00
U07 4040
U11 74LS221
R32 10k
R34 10k
R35 5k6
C22 510
C23 2200
VR10 50k
C24 560 SMD
C25 560 SMD
C26 4.7µ
D7
D8
D9
D10
5V



VR8: 300Hz START TONE FILTER FREQUENCY
VR6: 300Hz FILTER INPUT LEVEL
VR7: BURST FILTER INPUT LEVEL

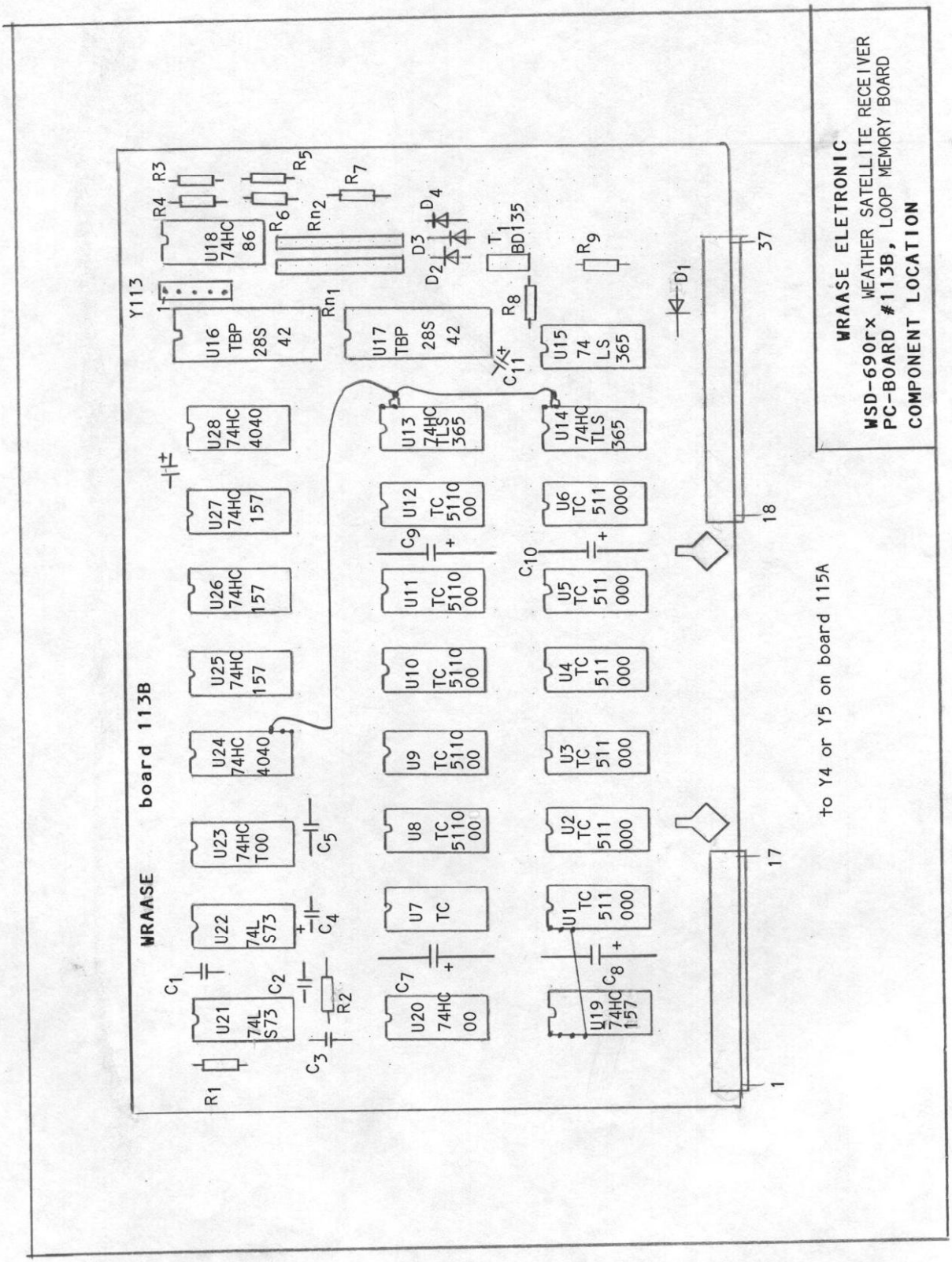
WRAASE ELECTRONIC
WEATHER SATELLITE RECEIVER MODEL **WSD-690rx**
PC-BOARD # 116: ANALOG INP. & VIDEO SYNC. GENER. CIRCUIT
COMPONENT LOCATION

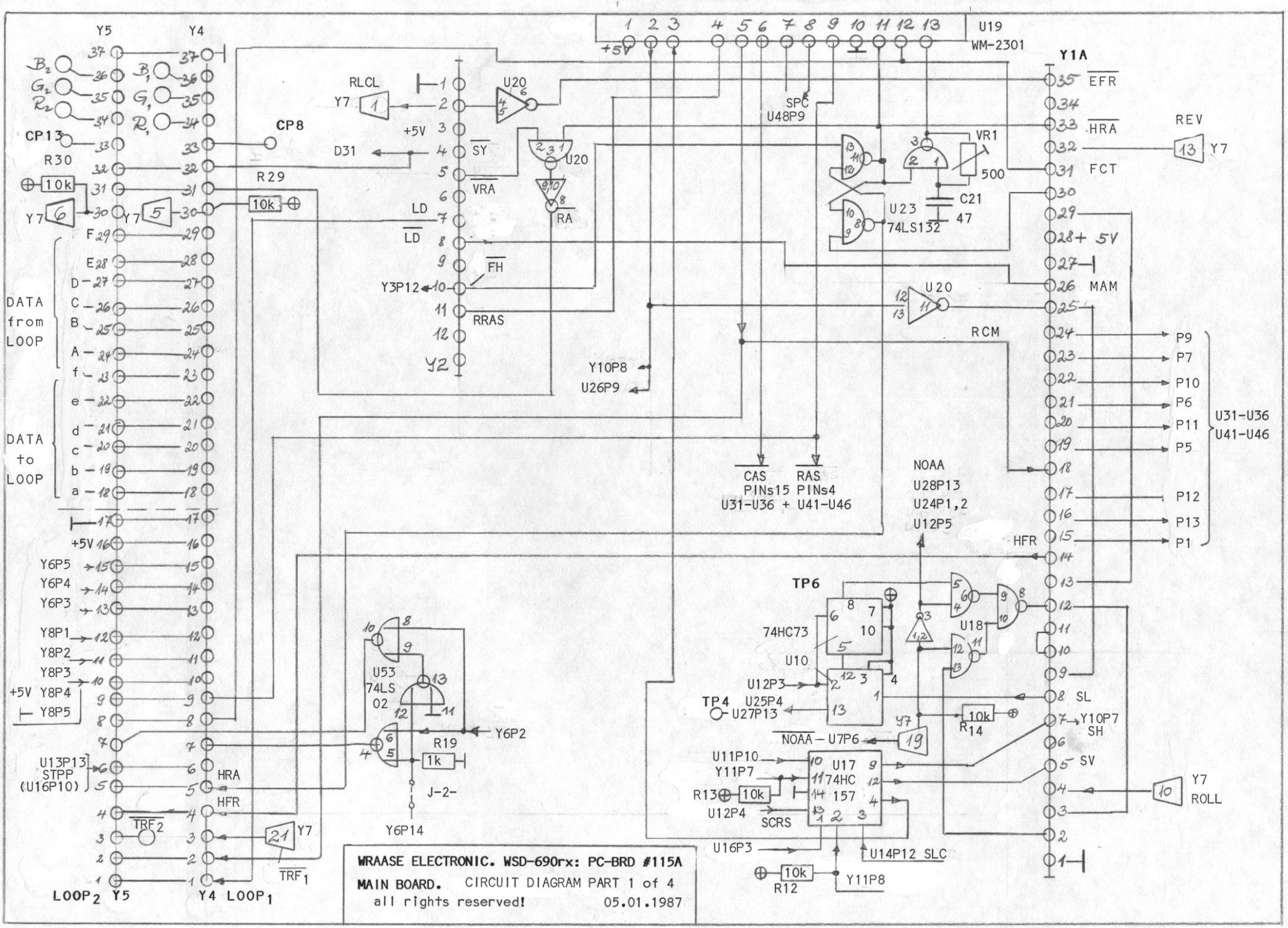


Note: DC supply to IC's not shown.

WRAASE WSD-690 rx WEATHER SATELLITE RECVR
LOOP MEMORY BOARD 113B , CIRCUIT DIAGR.
WRAASE ELECTRONIC, D-2300 KIEL-17 1987

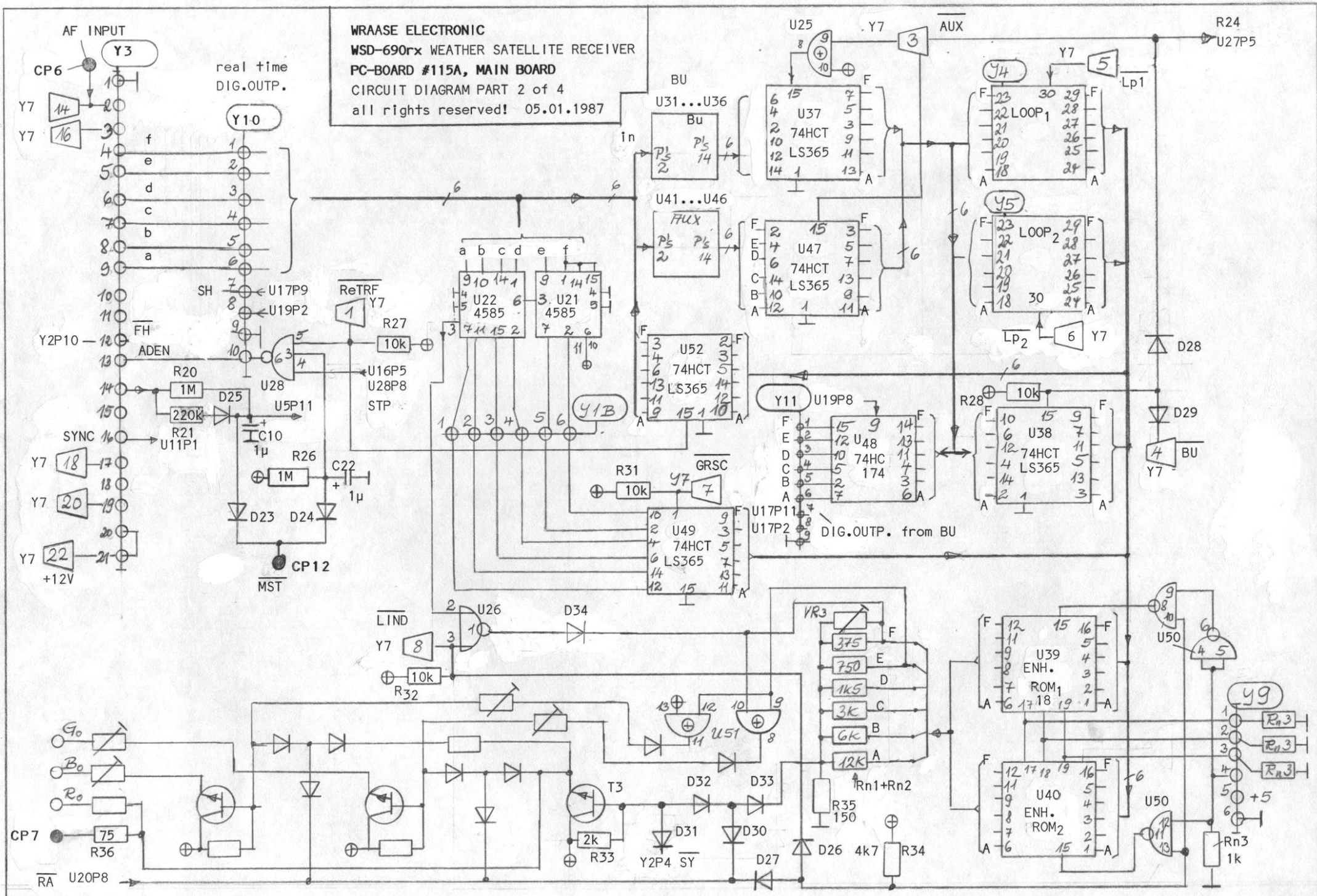
6.18


WRAASE board 113B
Y113
U16 TBP 28S 42
U17 TBP 28S 42
U18 74HC 86
U15 74 LS 365
U28 74HC 4040
U27 74HC 157
U26 74HC 157
U25 74HC 157
U24 74HC 4040
U23 74HC T00
U22 74L S73
U21 74L S73
U20 74HC 00
U19 74HC 157
U13 74HC TLS 365
U14 74HC TLS 365
U12 TC 5110 00
U11 TC 5110 00
U10 TC 5110 00
U9 TC 5110 00
U8 TC 5110 00
U7 TC
U6 TC 511 000
U5 TC 511 000
U4 TC 511 000
U3 TC 511 000
U2 TC 511 000
U1 TC 511 000
R1
R2
R3
R4
R5
R6
R7
Rn1
Rn2
R8
R9
C1
C2
C3
C4
C5
C7
C8
C9
C10
C11
D1
D2
D3
D4
T1 BD135
1
17
18
37
to Y4 or Y5 on board 115A
WRAASE ELETRONIC
WSD-690rx WEATHER SATELLITE RECEIVER
PC-BOARD #113B, LOOP MEMORY BOARD
COMPONENT LOCATION

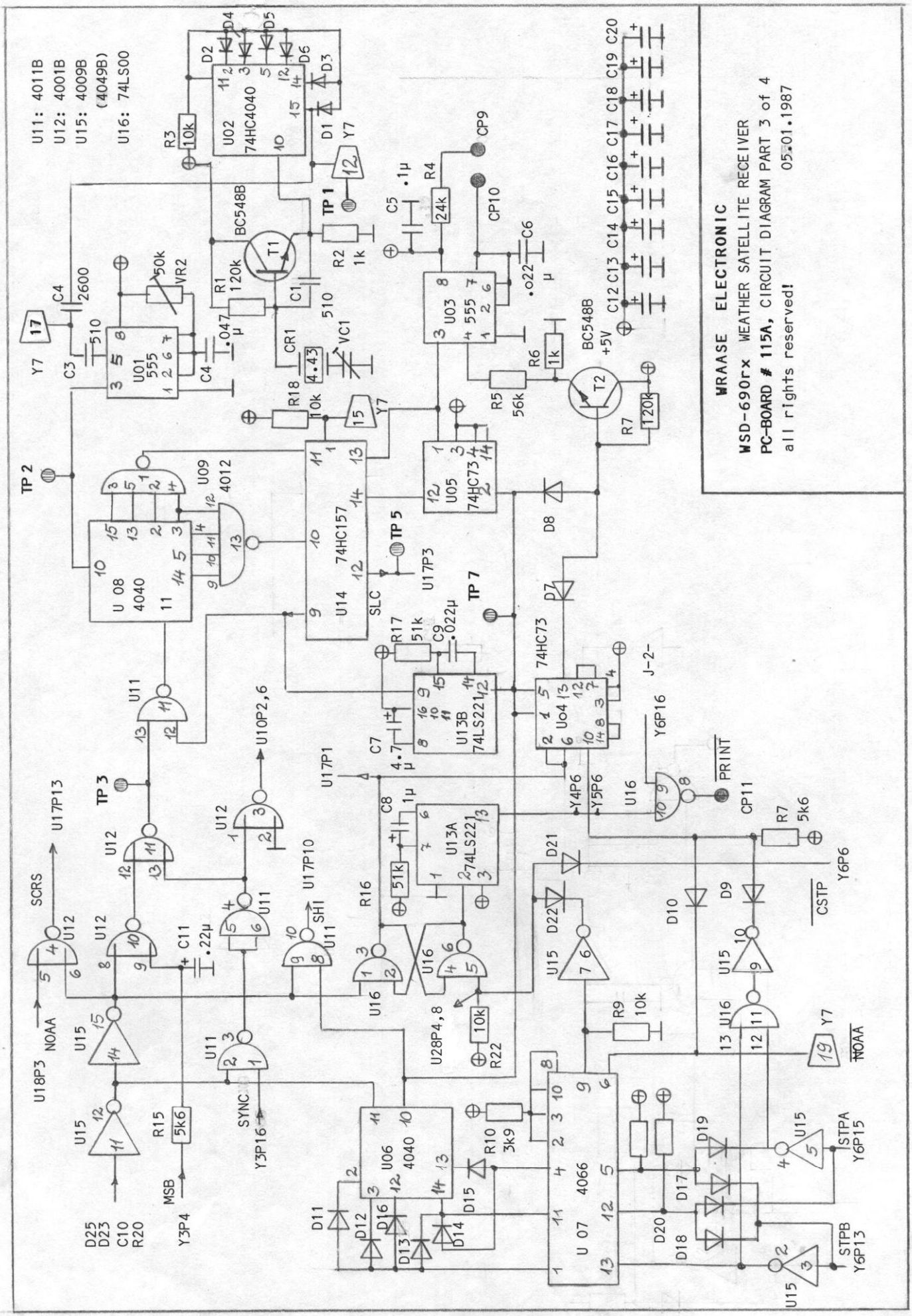


WRAASE ELECTRONIC. WSD-690rx: PC-BRD #115A
MAIN BOARD. CIRCUIT DIAGRAM PART 1 of 4
 05.01.1987

WRAASE ELECTRONIC
WSD-690rx WEATHER SATELLITE RECEIVER
PC-BOARD #115A, MAIN BOARD
CIRCUIT DIAGRAM PART 2 of 4



6.21


U11: 4011B
U12: 4001B
U15: 4009B (4049B)
U16: 74LS00
WRAASE ELECTRONIC
WSD-690rx WEATHER SATELLITE RECEIVER
PC-BOARD # 115A, CIRCUIT DIAGRAM PART 3 of 4
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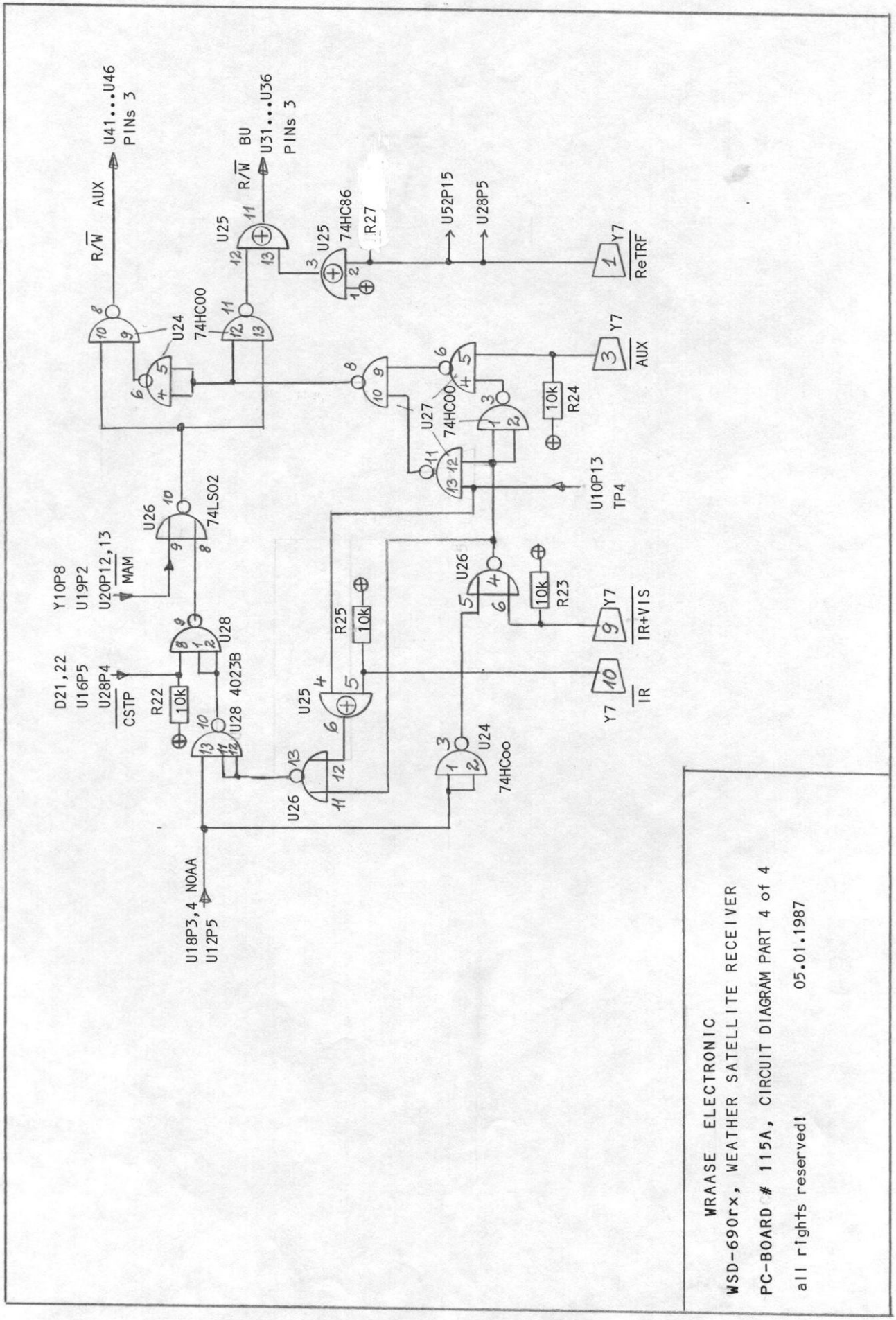
05.01.1987
U01 555
U02 74HC4040
U03 555
U04
U05 74HC73
U06 4040
U07 4066
U08 4040
U09 4012
U11
U12
U13A 74LS221
U13B 74LS221
U14 74HC157
U15
U16
T1 BC548B
T2 BC548B
VR2 50k
R1 120k
R2 1k
R3 10k
R4 24k
R5 56k
R6 1k
R7 120R
R9 10k
R10 3k9
R15 5k6
R16 51k
R17 51k
R18 10k
R22 10k
C1 510
C3 510
C4 2600
C4 .047 µ
C5 .1µ
C6 .022 µ
C7 4.7 µ
C8 1µ
C9 .022µ
C11 .22µ
VC1 4.43
CR1
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D25
D23
C10
R20
TP 1
TP 2
TP 3
TP 5
TP 7
CP9
CP10
CP11
Y7
SCRS
NOAA
SYNC
MSB
SLC
SHI
PRINT
CSTP
STPA
STPB
U18P3
U17P13
U17P10
U17P1
U17P3
U10P2,6
U28P4,8
Y3P16
Y3P4
Y4P6
Y5P6
Y6P16
Y6P6
Y6P15
Y6P13
J-2-
+5V

6.22


U41...U46 PINs 3
R/W AUX
U31...U36 PINs 3
R/W BU
U25 74HC86
R27
U52P15
U28P5
Y7 ReTRF
U24 74HC00
U27 74HC00
Y7 AUX
10k R24
U10P13 TP4
Y10P8
U19P2
U20P12,13 MAM
U26 74LS02
D21,22
U16P5
U28P4 CSTP
R22 10k
U28 4023B
R25 10k
U25
U26
U24 74HC00
10k R23
Y7 IR+VIS
Y7 IR
U18P3,4 NOAA
U12P5
WRAASE ELECTRONIC
WSD-690rx, WEATHER SATELLITE RECEIVER
PC-BOARD # 115A, CIRCUIT DIAGRAM PART 4 of 4
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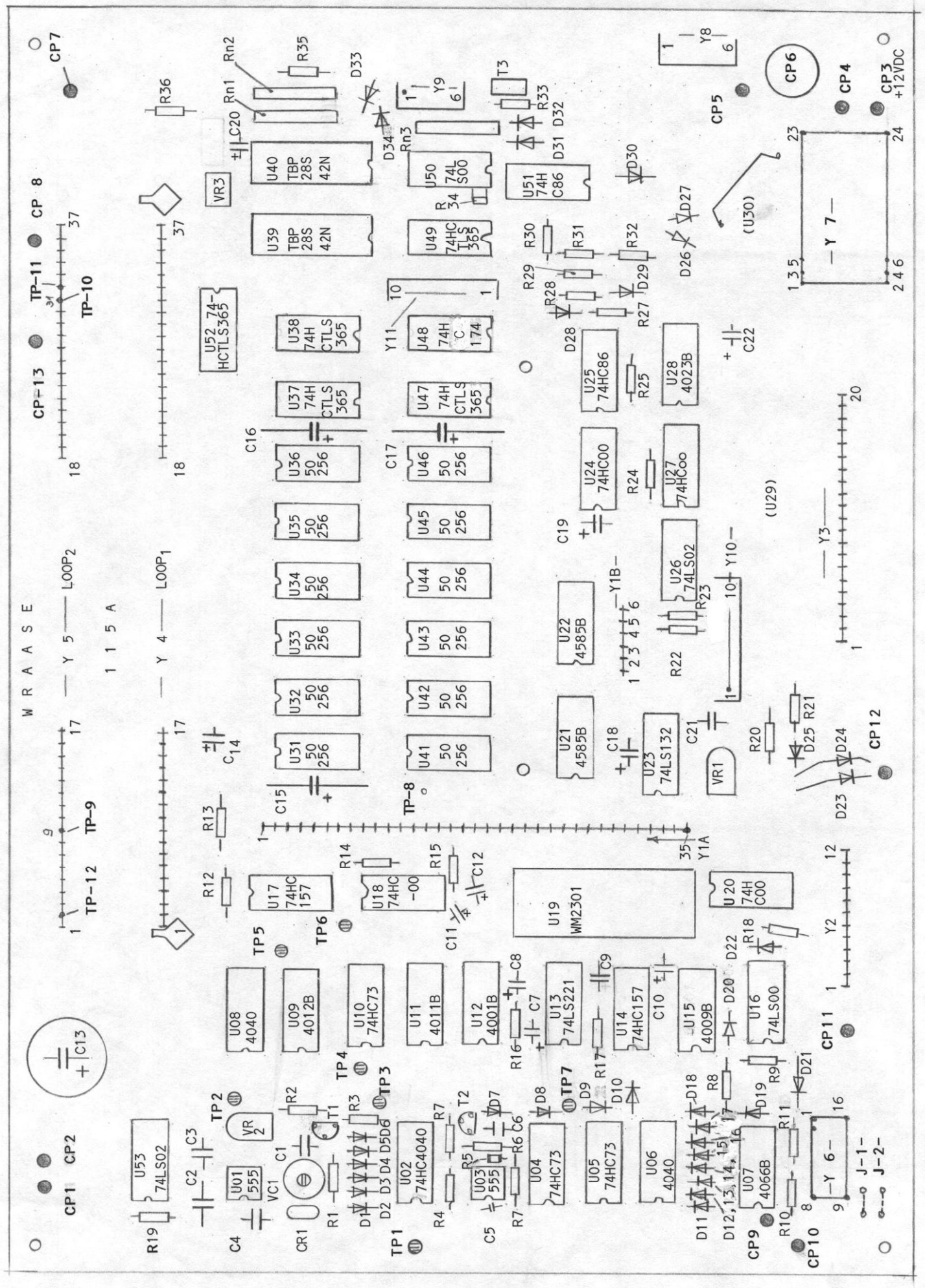
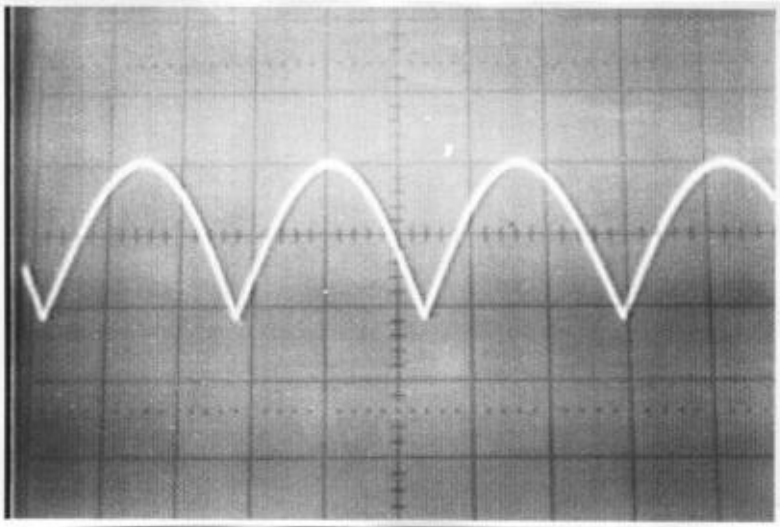
05.01.1987

6.23 WRAASE ELECTRONIC, WSD-690rx WEATHER SATELLITE RECEIVER **PC-BRD #115A MAIN BRD.** COMPONENT LOCATION



SECTION 7: OSCILLOSCOPE PATTERNS

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of ANALOG INPUT CIRCUIT (BRD 116)



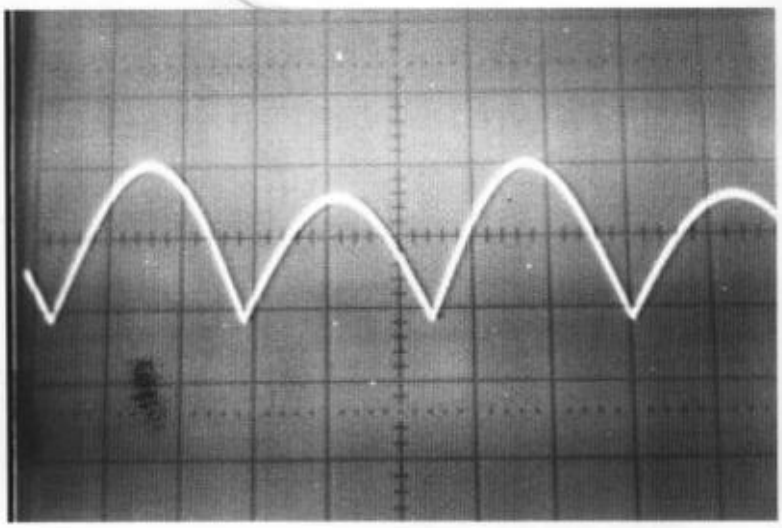
7.1

BOARD 116

TP-2

VERT. : 2V/DIV
HOR. : 0,1ms/DIV

with correct adjustment of VR 2

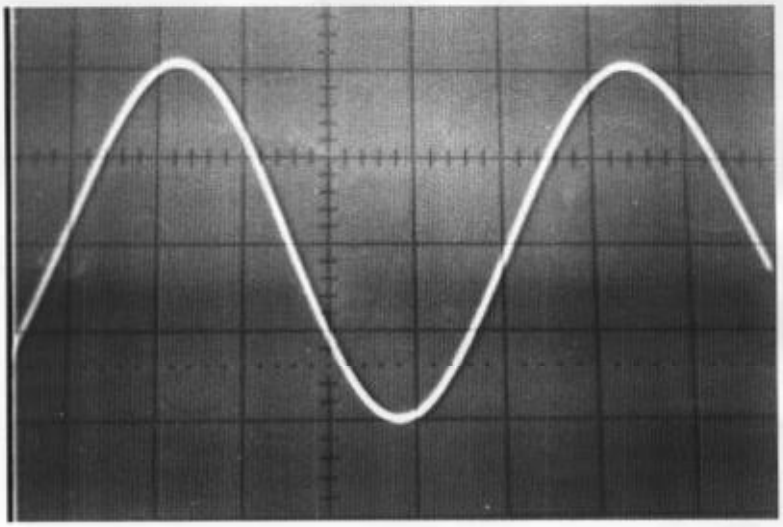


7.2

BOARD 116

TP-2

with wrong adjustment of VR 2



7.3

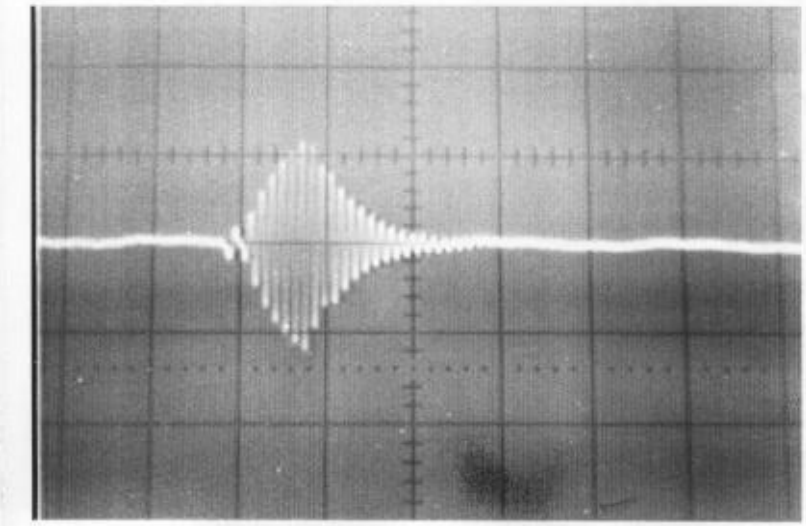
BOARD 116

TP-3

VERT: 2V/DIV
HOR: 10 ms/DIV

during reception of 300 Hz START-SIGNAL

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of ANALOG INPUT CIRCUIT (BRD 116) -continued-

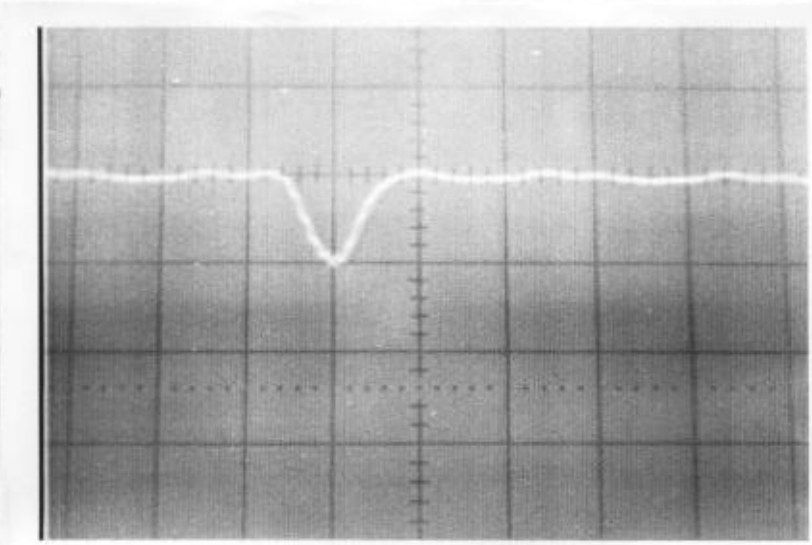


7.4

BOARD 116

TP-5

VERT.: 2V/DIV
HOR.: 10 ms/DIV

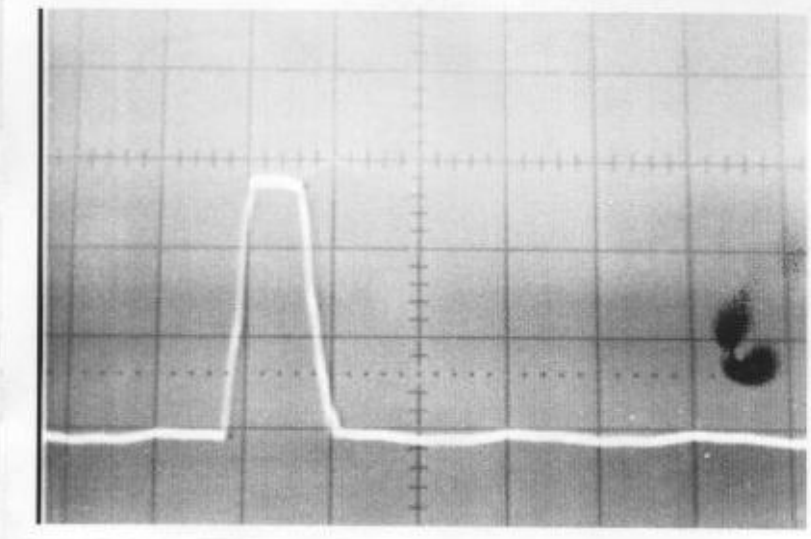


7.5

BOARD 116

TP-6

VERT.: 2V/DIV
HOR.: 10ms/DIV



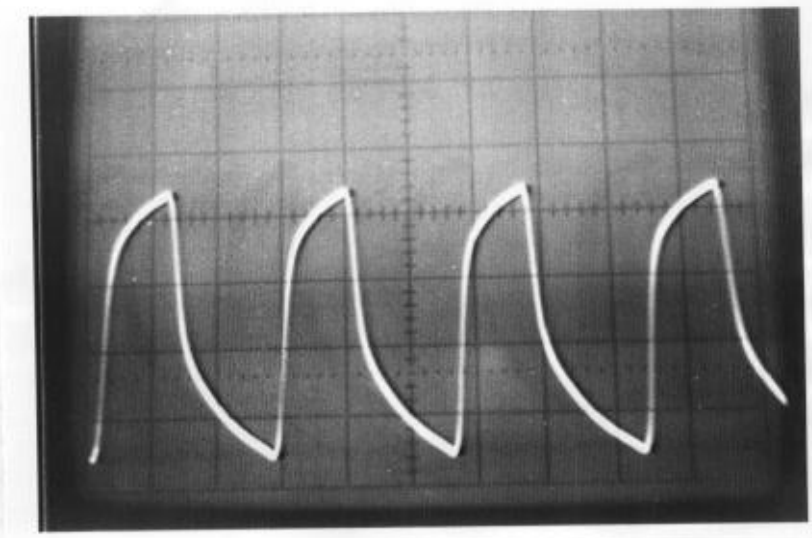
7.6

BOARD 116

TP-7

VERT.: 2V/DIV
HOR.: 10ms/DIV

WRAASE wsd-690rx: OSCILLOSCOPE PATTERNS of ANALOG INPUT CIRCUIT (BOARD 116)
-continued-



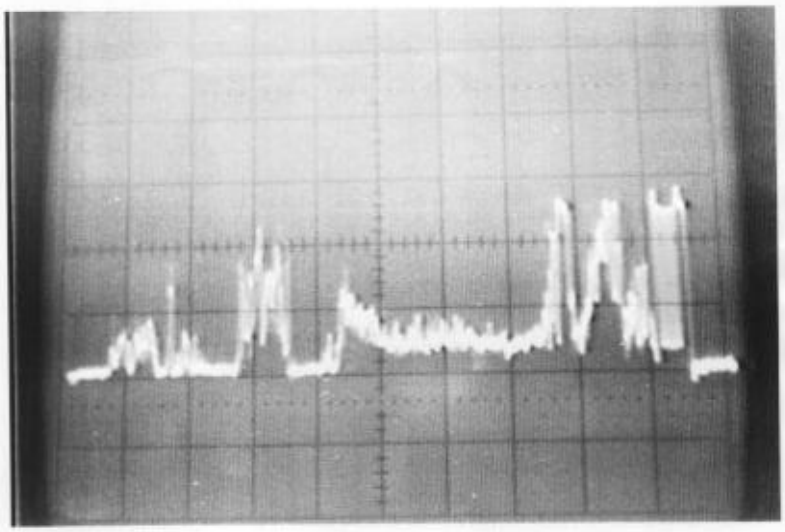
BOARD 116

7.7

TP-8

VERT.: 1V/DIV
HOR.: 0,2µS/DIV

7.8

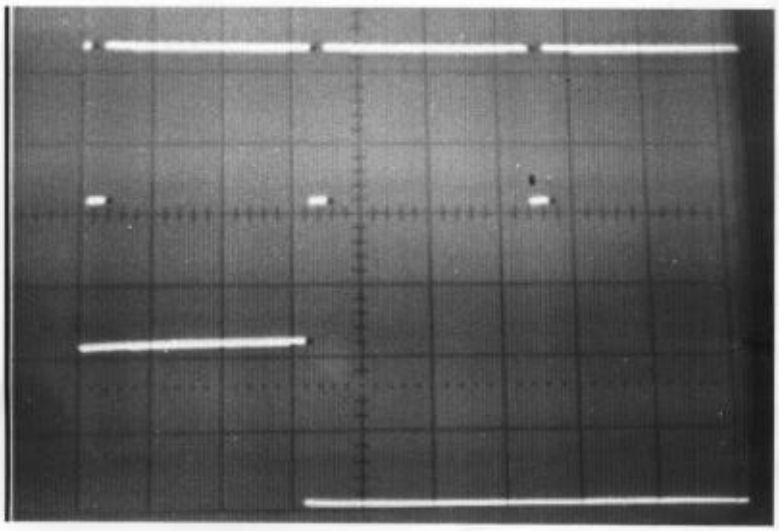


BOARD 116

TP-9

VERT.: 1V/DIV
HOR.: 200 mS/DIV

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of VIDEO SYNC CIRCUIT on BOARD 116



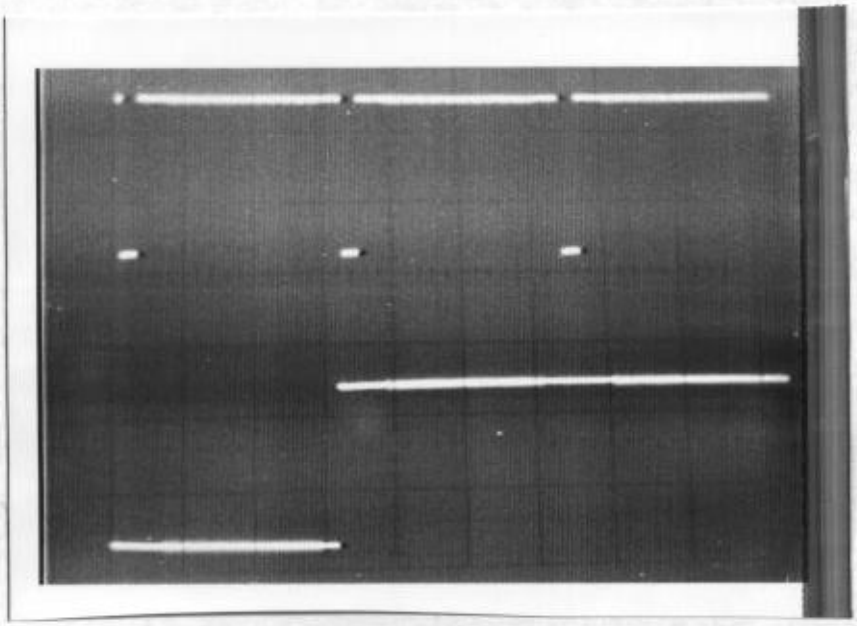
7.9
BOARD 116

4 Y-2 $\overline{SY}$

HORIZ. SYNCPULSES

7 Y-2 LD

VERT.: 2V/DIV
HOR.: 20µS/DIV

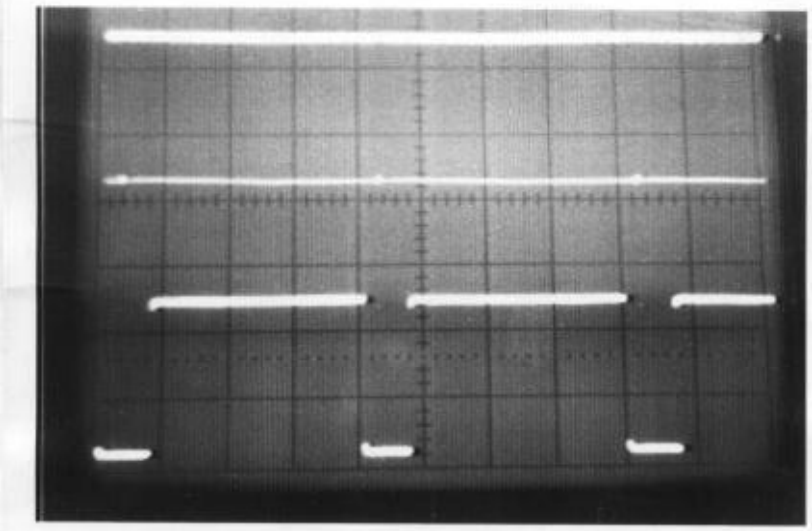


BOARD 116
7.10

4 Y-2 $\overline{SY}$

8 $\overline{LD}$

VERT.: 2V/DIV
HOR.: 20µS/DIV



7.11

BOARD 116

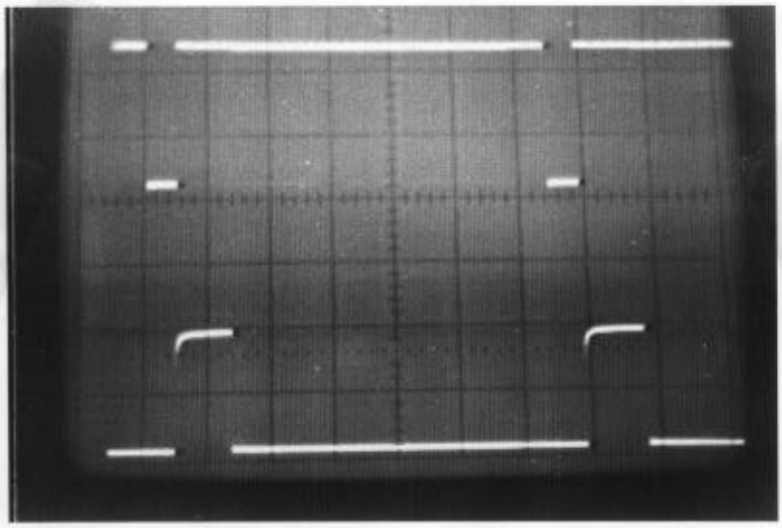
4 Y-2 $\overline{SY}$

5 Y-2 $\overline{VRA}$

VERT.: 2V/DIV
HOR.: 5mS/DIV

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of VIDEO SYNC CIRCUIT on BOARD 116 (continued)

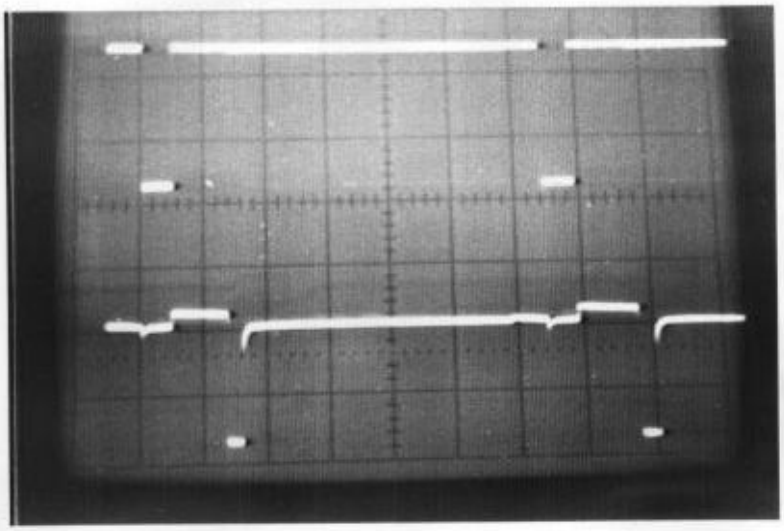
7.12
BOARD 116



△4 Y-2 SY
horiz. syncpulses

△11 Y-2 PRAS

VERT.: 2V/DIV
HOR.: 10µS/DIV

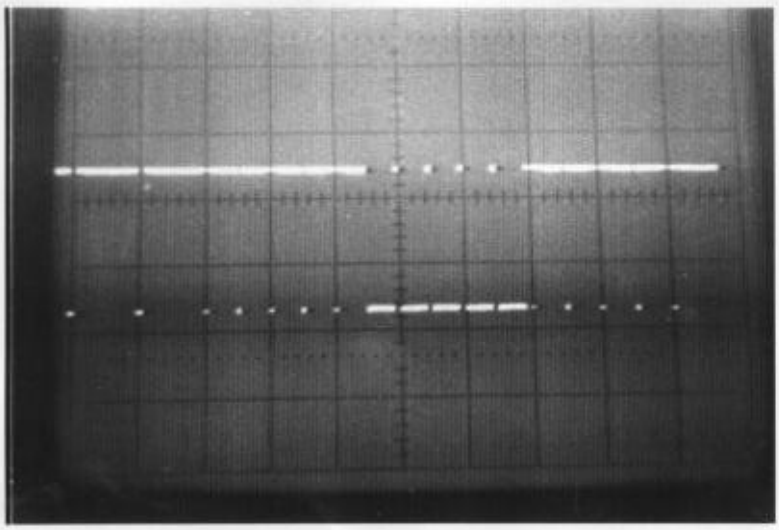


7.13 BOARD 116

△4 Y-2 SY

△10 Y-2

VERT.: 2V/DIV
HOR.: 10µS/DIV

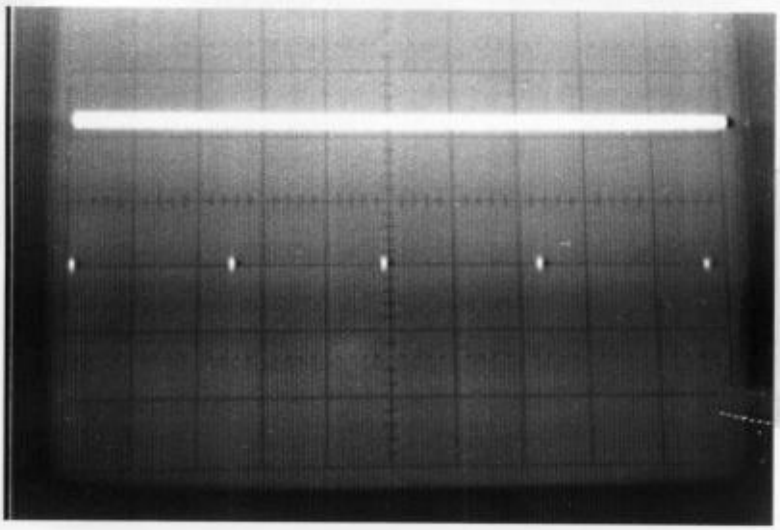


7.14 BOARD 116

△4 Y-2 SY
VERTICAL SYNCPULSE

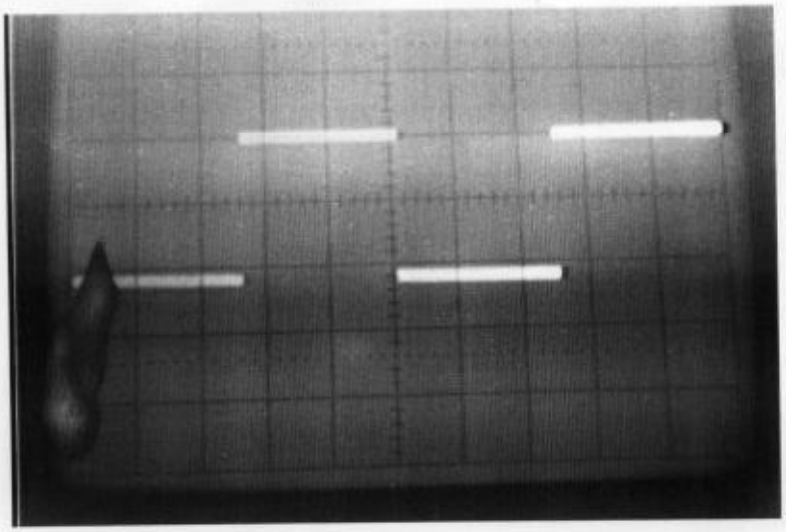
VERT.: 2V/DIV
HOR.: 64µS/DIV

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of MAIN BOARD #115A



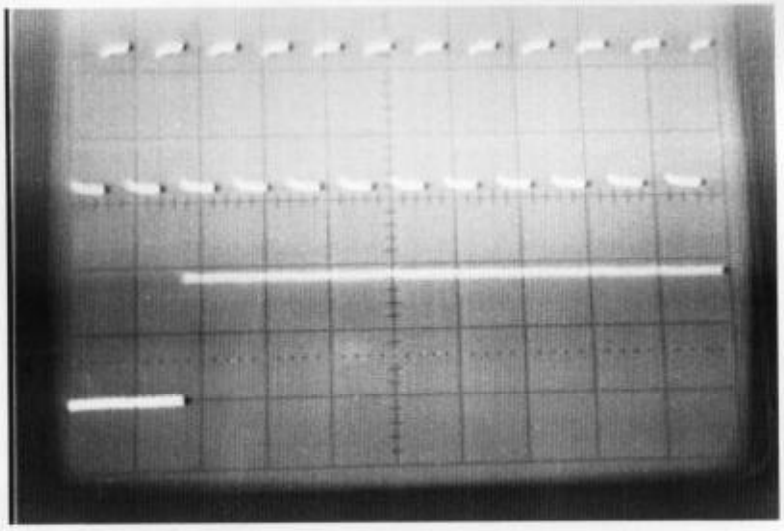
7.15 BOARD 115A

TP-5
VERT.: 2V/DIV
HOR.: 0.2 ms/DIV



7.16 BOARD 115A

TP-6
VERT.: 2V/DIV
HOR.: 0.2 s/DIV

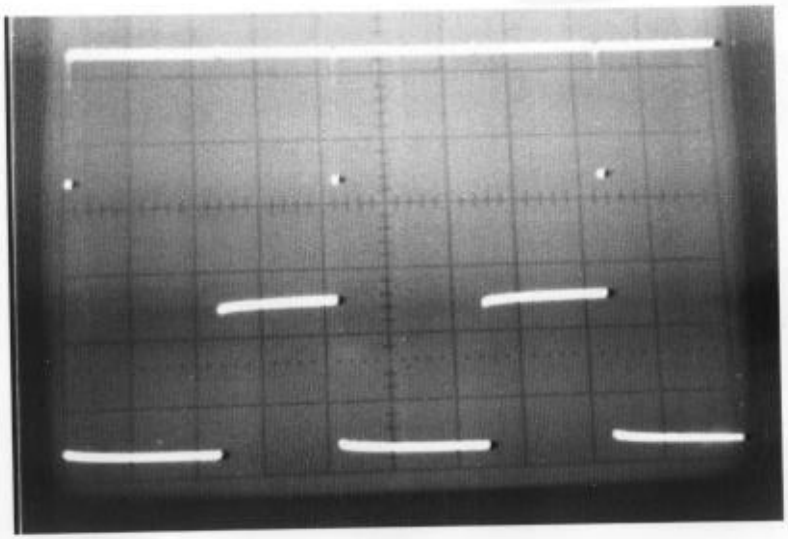


7.17
BOARD 115A

TP -1
VERT.: 2V/DIV
HOR.: 0.5 ms/DIV

TP-7

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of MAIN PC BOARD # 115A (continued)



7.18

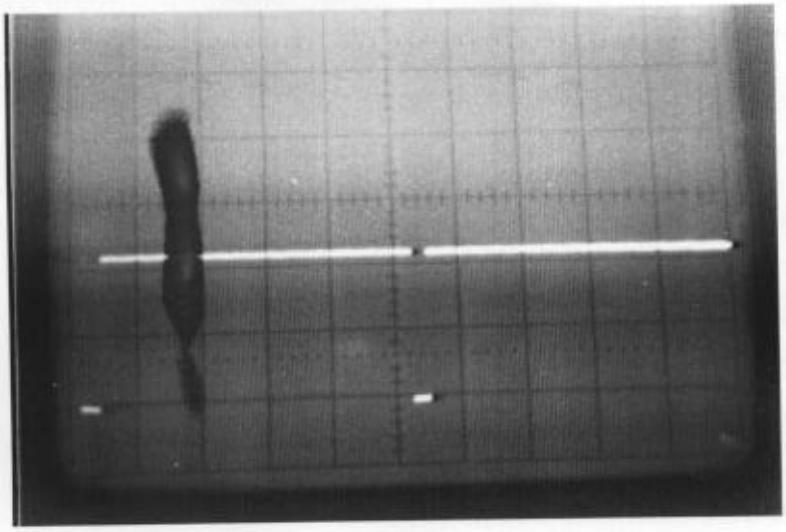
BOARD 115A

TP-2

VERT.: 2V/DIV
HOR.: 0.1 ms/DIV

TP-1

2V/DIV

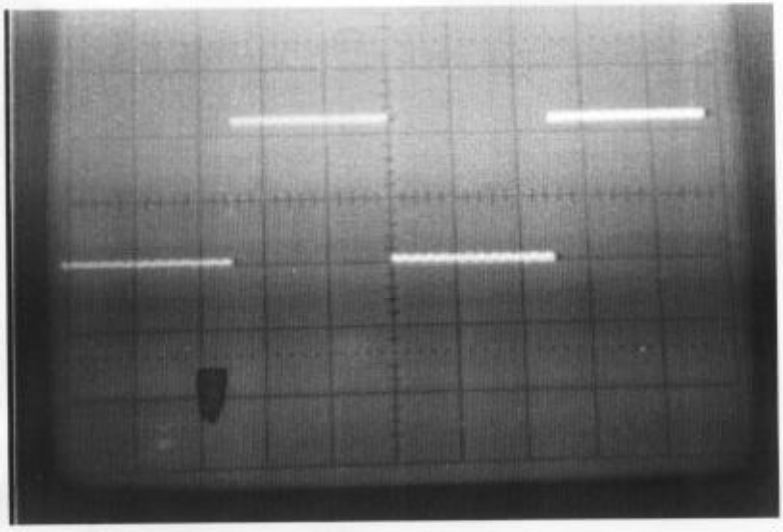


7.19

BOARD 115A

TP-3
START BUTTON (13) pressed

VERT.: 2V/DIV
HOR.: 50 ms/DIV



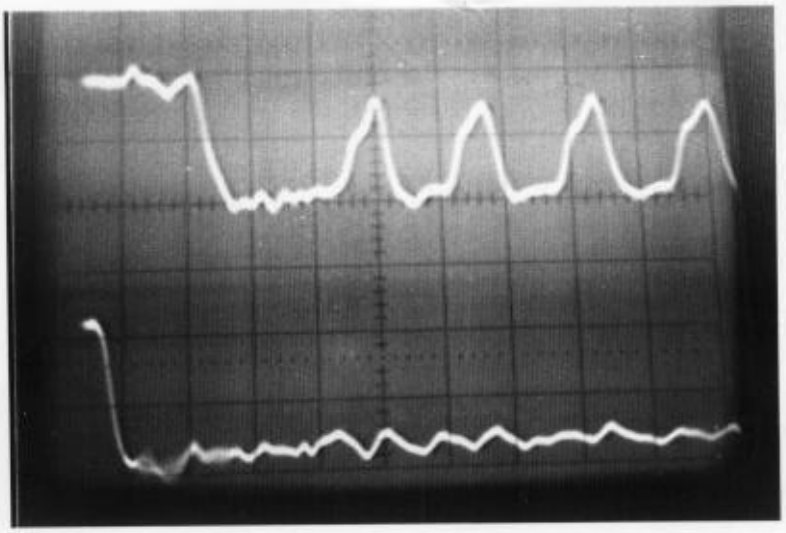
7.20

BOARD 115A

TP-4

VERT.: 2V/DIV
HOR.: 100 ms/DIV

WRAASE WSD-690rx: OSCILLOSCOPE PATTERNS of MAIN PC BOARD # 115A (continued)



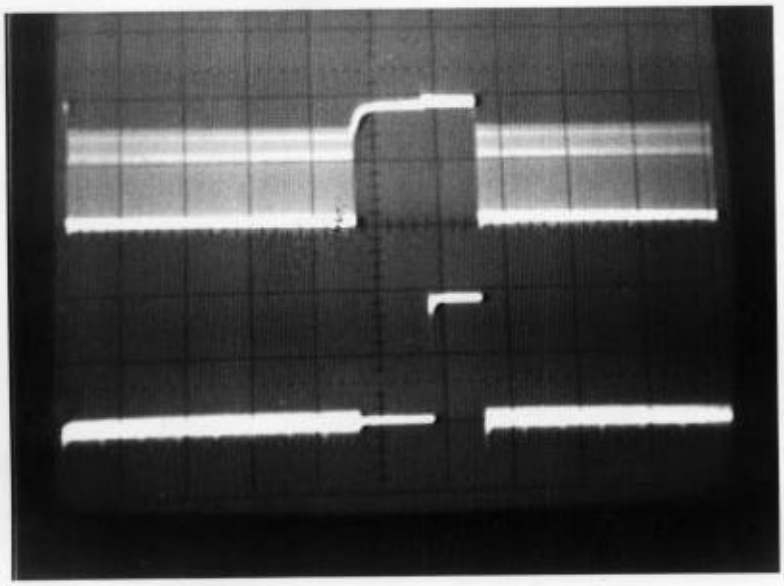
7.21

BOARD 115A

TP-8 CAS

VERT.: 2V/DIV
HOR.: 50ns/DIV

TP 9 RAS (Y5P9)
2V/DIV



7.22

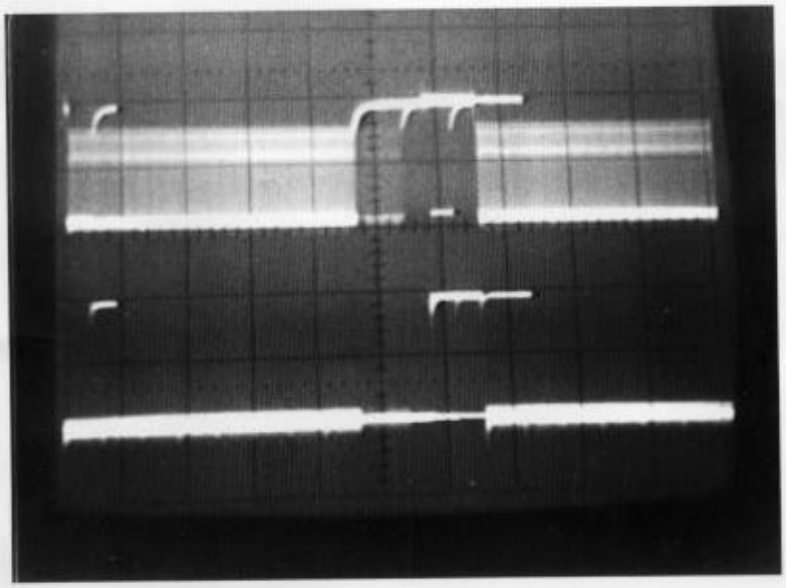
same as above, but
different time scale:

HOR.: 10 µs/DIV

TP-8

TP-9

<not receiving>



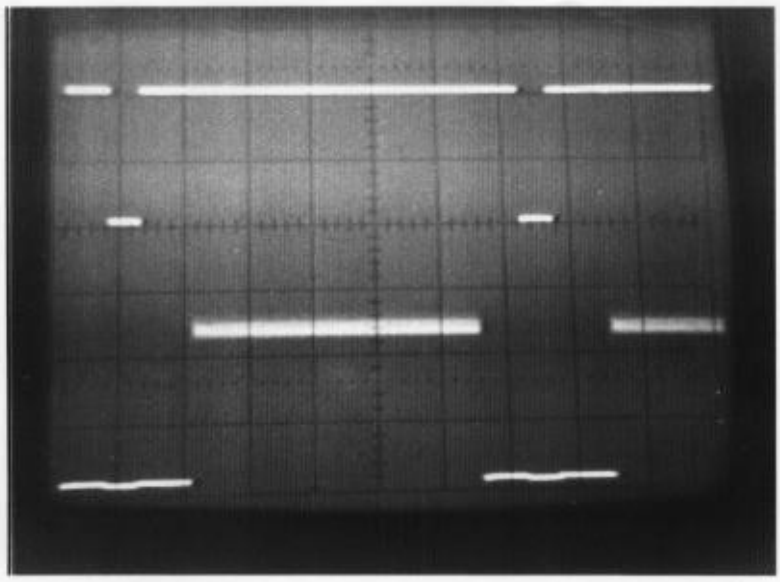
7.23

same as above, but
with receiving signal

TP-8 CAS

TP-9 RAS

WRAASE WSD-690 rx: OSCILLOSCOPE PATTERNS of MAIN PC BOARD # 115A (continued)



7.24

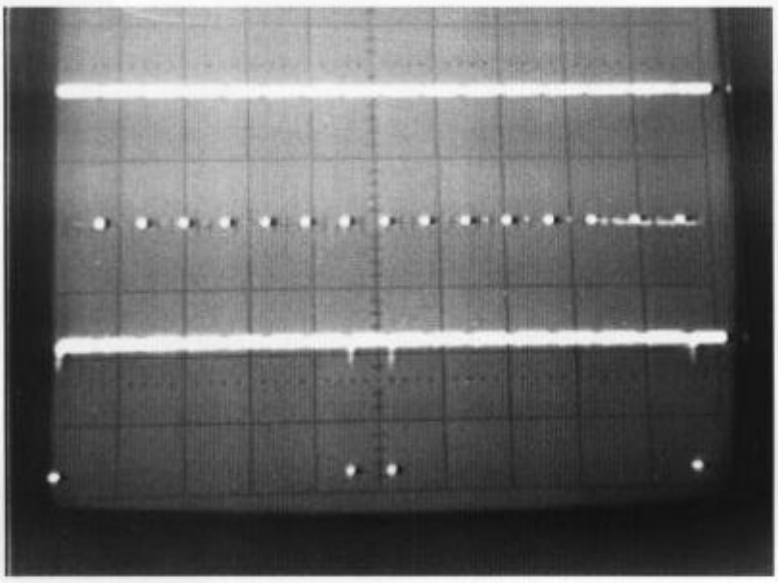
BOARD 115A

TP-11 $\overline{SY}$

VERT.: 2V/DIV
HOR.: 10µs/DIV

TP-10 $\overline{RA}$

VERT.: 2V/DIV



7.25

BOARD 115A

TP-11 $\overline{SY}$

VERT.:2V/DIV
HOR.: 0.1µs/DIV

TP-12 $\overline{RCM}$

VERT.: 2V/DIV

SECTION 8:

REPLACEABLE PARTS

8.1 GENERAL INFORMATION

This section contains a list of replaceable parts of the **WSD-690rx** Weather Satellite Receiver and **MRC-17A** S-Band Converter.

There is an individual list for each Printed Circuit Board Assembly. Note, that the same reference designator may be used for different parts on different boards.

Ordering Information:

If no special WRAASE Stock-Number is statet in the list, use the following part identification code:

Circuit Reference - Board No. - Model - Serial-No.

Example: **R12-85A-WSD-690rx-0039**

To order a part not listed in tables 8.1 to 8.9, give a complete description of the part and include its function and location.

To order a replacement part, address order or inquiry to

WRAASE ELEKTRONIK
ERSATZTEILLAGER
Kronsberg 10
D- 2300 KIEL -17

.-.-.-.-.-.-.-.

Reference Designators

B	= pusbutton	Q	= quartz crystal
BNC	= BNC jack	R	= resistor
C	= capacitor	RL	= relais
CF	= feed-through capacitor	Rn	= resistor network
CR	= quartz crystal	S	= switch
CS	= code switch	SD	= 7-segment-display
D	= diode	SH	= fuse holder
DIN	= DIN jack	SM	= meter
EF	= power line filter	SPR	= speaker
FCA	= flat cable assembly	T	= transistor
GW	= glass window	U	= integrated circuit
H	= PTC resistor	VC	= variable capacitor
IC	= integrated circuit	VR	= variable resistor
L	= inductor	VRF	= variable resistor, 10 turns
NCB	= battery assembly		
NMC	= power supply assembly		

Note: If not otherwise specified, all resistors are carbon film , 1/8 W, 5%.

REPLACEABLE PARTS: PC-BOARD #85A in **MRC-17A METEOSAT CONVERTER**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 150 OHMS	**all R's** metal film 0.4W 5%
R 2		R: 8.2 OHMS	
R 3		R: 150 OHMS	
R 4		R: 1k	
R 5		R: 1k5	
R 6		R: 56 OHMS	
R 7		R: 1k	
R 8		R: 56 OHMS	
R 9		R: 56 OHMS	
R 10		R: 1k	
R 11		R: 56 OHMS	
R 12		R: 56 OHMS	
C 1		C: 27 pF, cer. NPO, 50V DC	
C 2 thru C 6		C: 560 pF, cer. SMD CHIP, 50V DC	
C 7		C: 12 pF, cer. SMD CHIP, 50V DC	
C 8		C: 27 pF, cer., 50V DC	
C 9		C: 12 pF, cer., 50V DC	
C 10		C: 47 pF, cer. ,NPO, SMD CHIP, 50V DC	
C 11		C: 27 pF, cer., NPO, 50V DC	
C 12		C: 0.1 µF , cer., 50V DC	
C 13		C: 0.1 µF, cer., 50V DC	
C 14		C: 6 pF, cer., 50V DC	
C 15, C 16		C: 560 pF, cer. SMD CHIP, 50V DC	
C 17		C: 6 pF, cer., 50V DC	
C 18, C 19		C: 560 pF, cer. , SMD CHIP, 50V DC	
C 20		C: 6 pF, cer., 50V DC	
C 21		C: 0.1µF, cer. , 50V DC	
C 22		C: 2.2µF, tantalum, 35V DC	
C 23		C; 0.1µF, cer., 50V DC	
C 24, C 25		C: 0.1µF, cer., 50V DC	
L 1		INDUCTOR WIRE	
L 2	137-Y002-00	RF-CHOKE	
L 3. L4		INDUCTOR WIRE	
L 5	137-5061-00	VHF COIL	
L 6		RF-CHOKE	
L 7	137-5061-00	VHF-COIL	
L 8 thru L 11		INDUCTOR STRIPLINE	
L12, L 13		INDUCTOR WIRE	
L 14	137-Y003-00	RF-CHOKE	

REPLACEABLE PARTS PC-BOARD #85A in **MRC-17A METEOSAT CONVERTER** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
T 1 , T 2		TRANSISTOR: MGF-1202	
T 3 thru T 5		TRANSISTOR: BFR 91	
U 1		IC: 78L05	
VC 1 thru VC 4	B70-D126-00	C: var. , cer. , 0.5 ... 3 pF	
VC 5, VC 6	B70-D260-50	C: var., mica, 2 ... 20 pF	
VC 7, VC 8	B70-D260-10	C: var., mica, 1 ... 6 pF	
VC 9, VC 10	B70-D126-00	C: var., cer., 0.5 ... 3 pF	

REPLACEABLE PARTS: PC-BOARD #118
PC-BOARD # 94 in VHF RECEIVER MODULE of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 10 OHMS, 2W	
R 2		R: 51 k	
R 3		R: 120 k	
R 4		R: 3k9	
R 5		R: 150 OHMS	
R 6		R: 10 k	
R 7		R: 120 k	
R 8		R: 3k9	
R 9		R: 150 OHMS	
R 10		R: 150 OHMS	
R 11		R: 1 k	
R 12		R: 51 k	
R 13		R: 120 k	
R 14		R: 150 OHMS	
R 15		R: 150 OHMS	
R 16		R: 51 k	
R 17		R: 120 k	
R 18		R: 51 k	
R 18		R: 150 OHMS	
R 19		R: 150 OHMS	
R 20		R: 150 OHMS	
R 21 thru R 29		R: 5k6	
R 30		R: 1 k	
R 31		R: 10 k	
R 32		R: 220 OHMS	
R 33		R: 150 OHMS	
R 34		R: 22 k	
R 35		R: 220 OHMS	
R 36		R: 150 OHMS	
R 37		R: 22 k	
R 38		R: 16 k	
R 39		R: 10 k	
R 40		R: 51 k	
R 41		R: 5k6	
R 42		R: 22 k	
R 43		R: 1 k	
R 44		R: 1 k	
R 45 thru R 64		not assigned	
R 65		R: 2 k	
R 66		R: 10 k	
R 67		R: 220 OHMS	
R 68		R: 150 OHMS	
R 69		R: 10 k	

PC-BOARD #118

REPLACEABLE PARTS : PC-BOARD #94 in VHF RECEIVER MODULE of **WSD-690rx** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
R 70		R: 10 k	
R 71		R: 220 OHMS	
R 72		R: 150 OHMS	
R 73		R: 120 k	
R 74		R: 51 k	
R 75		R: 120 k	
R 76		R: 56 OHMS	
R 77		R: 510 OHMS	
R 78		R: 120 k	
R 79		R: 10 k	
R 80		R: 4k7 SMD CHIP	
R 81		R: 120 k	
R02 thru R 81		Carbon film resistors 1/8W, 5%	
VR 1		VR: 50 k , horizontally mounted variable resistor	
VR 2		VR: 10 k , vertically mounted variable resistor	
VR 3		not assigned	
VR 4		VR: 5 k , vert. mounted variable resistor	
C 1		C: 0.1µF, cer. CHIP, 50V DC	
C 2		C: 220µF, electr., 25V DC	
C 3		C: 6 pF, cer. CHIP, 50V DC	
C 4		C: 27 pF, cer. , 50 V DC	
C 5		C: 0.1µF, cer. CHIP, 50V DC	
C 6 thru C 11		C: 0.1µF, cer. CHIP, 50V DC	
C 12		C: 6 pF, cer. CHIP, 50V DC	
C 13		C: 0.5 pF	
C 14		C: 6 pF, cer. CHIP, 50V DC	
C 15		C: 39 pF, cer. CHIP, 50V DC	
C 16, C 17		C: 0.1µF, cer. CHIP, 50V DC	
C 18		C: 68 pF, cer. CHIP, 50V DC	
C 19, C 20		C: 0.1µF, cer. CHIP, 50V DC	
C 21		C: 68 pF, cer. CHIP, 50V DC	
C 22		C: 47 pF, cer., 50V DC	
C 23		C: 82 pF, cer., 50V DC	
C 24		C: 47 pF, cer. CHIP, 50V DC	
C 25		C: 0.1µF, cer. CHIP, 50V DC	
C 26		C: 12 pF cer., 50V DC	
C 27		C: 0.1µF, cer., 50V DC	
C 28		C: 510 pF,poly, 100V DC	
C 29, C 30		C: 0.1µF, cer. CHIP	

REPLACEABLE PARTS: PC BOARD #94 in VHF RECEIVER MODULE of **WSD-690rx** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
C 31 thru C 38		not assigned	
C 39		C: 5000 pF, cer., 50V DC	
C 40		C: 47 pF, cer., 50V DC	
C 41		C: 12 pF, cer., 50V DC	
C 42		C: 0.1µF, cer. CHIP, 50V DC	
C 43		C: 6 pF, cer. CHIP, 50V DC	
C 44		C: 5000 pF, cer., 50V DC	
C 45		C: 0.1µF, cer. CHIP, 50V DC	
C 46		C: 6 pF cer. CHIP, 50V DC	
C 47		C: 6pF, cer. CHIP, 50V DC	
C 48		C: 1200 pF, styroflex, 63V DC	
C 49		C: 5000 pF, cer., 50V DC	
C 50		C: 270 pF, poly, 100V DC	
C 51		C: 1200 pF, styroflex, 63V DC	
C 52		not assigned	
C 53		C: 0.1µF, cer. CHIP, 50V DC	
C 54		C: 0.01µF, poly, 63V DC	
C 55		C: 2200 pF, poly, 50V DC	
C 56		C: 4.7µF, tantalum, 16V DC	
C 57		C: 0.01µF, poly, 63V DC	
C 58		C: 4.7µF, elyt, 25V DC	
C 59 thru C 61		not assigned	
C 62		C: 47µF, elyt, 25V DC	
C 63		C: 0.1µF, cer. CHIP, 50V DC	
C 64, C 65		C: 5000 pF, cer., 50V DC	
C 66		C: 47 µF, elyt, 25V DC	
C 67		C: 68 pF, cer. CHIP, 50V DC	
C 68		C: 0.1µF, cer. CHIP, 50V DC	
C 69		C: 18 pF, cer. CHIP, 50V DC	
C 70		C: 68 pF, cer. CHIP, 50V DC	
C 71		C: 0.1µF, cer. CHIP, 50V DC	
C 72		C: 18 pF, cer. CHIP, 50V DC	
C 73		not assigned	
C 74		C: 4pF, cer. CHIP, 50V DC	
C 75		C: 0.1µF, cer. CHIP, 50V DC	
C 76		C: 27 pF, cer., 50V DC	
C 77		C: 47 pF, cer. CHIP, 50V DC	
C 78		C: 0.1µF, cer. CHIP , 50V DC	
C 79, C 80		not assigned	
C 81 thru C 88		C: 0.1µF, cer. CHIP, 50V DC	

REPLACEABLE PARTS: PC-BOARD #118
PC-BOARD #94 in VHF RECEIVER MODULE of **MSD-690rx** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
C 89, C 90		C: 4 pF, CHIP,cer., 50V DC.	
C 91		C: 0.1µF, cer. CHIP, 50V DC	
C 92		C: 0.01µF, cer., 50V DC	
C 93, C 94		C: 0.1µF, cer. CHIP, 50V DC.	
H 01, H02	B82-E188-00	PTC-resistor	
L 1 thru L 5	137-5061-00	VHF-COIL	
L 6, L 7	137-1070-00	IF-FILTER 10,7 MHz	
L 8 thru L 10	137-4550-00	IF-FILTER 455 kHz	
L 11	137-0042-00	OSC.-COIL	
L 12 thru L 15	137-5061-00	VHF-COIL	
L 16	137-Y003-00	RF-CHOKE	
L 17	137-Y003-00	RF- CHOKE	
L 18	137-Y004-00	RF- CHOKE	
D 1 thru D 10		Diode, SI, 1N 4148	
D 11		Diode, ZENER : BZX79C3V6	
D 12 thru D 14		Diode, Si: 1N 4148	
D 15 thru D 17		Diode, SI: 1N 4001	
D 18		Diode, Ge: AA 119	
T 1 thru T 4		Transistor, FET: BF-981	
T 5, T 6		Transistor, Si-RF: BF 241	
T 7, T 8		Transistor, Si-RF: BFR-93A	
T 9		Transistor, FET: BF-981	
T 10		Transistor, Si-PNP: BC-560	
IC 1, IC 2		IC: VHF-MIXER: SO-42-P (SIEMENS	
IC 3		IC: PLL-CIRCUIT: 4046	
IC 4		IC: OP-AMP: LM-324	
IC 5		IC: AUDIO-AMPL.: LM-380	
CF 1	137-SWF1-07	CERAMIC FILTER 10.7 MHz	
RL-1	RLD-0511-02	Relais, REED	
BNC 1, BNC 2		BNC-JACK	

REPLACEABLE PARTS: PC-BOARD #94 + 118 in VHF-RECEIVER MODULE of **WSD-690rx** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
Q 1 thru Q 3		not fitted	
Q 4		QUARTZ CRYSTAL: 42.266 MHz	
Q 5, Q 6		not fitted	
Q 7		QUARTZ CRYSTAL: 42.30666 MHz	
Q 8		QUARTZ CRYSTAL: 42.100 MHz	
Q 9		QUARTZ CRYSTAL: 10.245 MHz	
Q 10		QUARTZ CRYSTAL: 97.3125 MHz	
Q 11		QUARTZ CRYSTAL: 97.09375 MHz	
CF 01 thru CF 17		Capacitor: FEED-TROUGH: 4700 pF, 100V DC	

REPLACEABLE PARTS: CHASSIS and FRONTPANEL of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
B01, B04, B05, B08	720.29720	Pushbutton, red	
B02, B03, B06, Bo7	720.29740	Pushbutton, green	
S-7, S-8	720.00103	Toggle switch: ON - ON , 2 positions	
S-9 , S-10	720.10103	Toggle switch: ON - OFF - ON : 3 positions	
S-11	720.20103	Toggle switch: ON - MOMENTARY ON, 3 positions	
S-12	715.60620	Rotary switch, 6 positions, 2 segments	
S-13	715.61220	Rotary switch, 12 positions	
S-14	717.00202	SWITCH for 220V POWER INPUT	
VR-F-1	560.47010	Resistor, variable 10 turns, screwdriver op. 4k7	
VR-F-2	560.10010	Resistor, variable 10 turns, screwdr. op., 1 k	
VR-F-3	560.47010	Resistor, variable,10 turns, screwdriver op., 4k7	
VR-F-4	575.10030	Resistor, variable, 100k w. Switch	
VR-1-117	571.10030	Resistor, variable, 100k linear.	
SM-1	775.10001	µA-METER, 100µA, KYORITSU KB-75 with frame	
SPR-1	790.80070	LOUDSPEAKER, 8 OHMS	
R-F-1	510.10020	Resistor, 10k	
R-F-2	510.15020	Resistor, 15k	
FR-1	000.69010	Plastic frame for TIMER DISPLAY	
GW-1	000.69011	GLASS WINDOW, red, for TIMER DISPLAY	
FCA-1	332.21601	FLAT CABLE ASSEMBLY, 16 wires	
FCA-2 thru FCA-4	332.20625	PLAT CABLE ASSEMBLY, 6 wires	
FCA-5,FCA-6	332.21025	FLAT CABLE ASSEMBLY, 10 wires	
SH-1	770.00001	FUSE HOLDER (for FUSE 5 x 20 mm)	
DIN-1	311.05000	DIN JACK, 5 pin, 180°	
NCB-38	930.69030	BATTERY ASSEMBLY	
NMC-105	930.69005	POWER SUPPLY ASSEMBLY	
EF-1	333.17251	POWER LINE FILTER with EURO-JACK	
TBD-30	000.10001	TOP COVER PLATE	
TBD-31	000.19275	CASE, 19", 3 UNITS	
TBD-32	061.03005	SCREW DIN963 M3x5	
	031.05012	SCREW DIN7985 M5x12	
	051.05020	SCREW DIN933 M5x20	
	031.03005	SCREW DIN84 M3x5	

REPLACEABLE PARTS: PC-BOARD #117,LOOP COMPOSITION ASSEMBLY of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 3k9	
R 2		R: 56 OHMS	
R 3		R: 10 k	
R 4		R: 10 k SMD chip	
R 5		R: 1 k	
R 6		R: 10 k SMD chip	
Rn 1		Resistor network 8 x 1 k	
VR 1		Variable resistor 100 k linear	
C 1		C: 4.7µF, elyt, 50V DC	
C 2		C: 33 µF, elyt, 16V DC	
C 3		C: 0.1µF, poly, 100V DC	
C 4		C: 1200 pF, ceram., 50V DC SMD chip	
D 1 thru D 8		Diode, Si: 1N 4148	
D 9 thru D 16		L.E.D. , red, 3 mm	
D 17, D 18		Diode, Si: 1N 4148	
U 01		IC: NE 555	
U 02		IC: 74HC4017	
U 03		IC: 4002	
U 04		IC: 4002	
S 10		Toggle switch: on-off-on, 3-position	
S 11		Toggle switch: on - on, 2-position	
CS 01 thru CS 08		CODE SWITCH: 0...9, decimal code	
CS09,CS10		CODE SWITCH: 0...15, BCD code	

REPLACEABLE PARTS: PC-BOARD #114B, PROGRAMMABLE TIMER of **WSD-690rx** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
U 01		IC: 4060	
U 02		IC: 4040	
U 03		IC: 4012	
U 04		IC: 4029	
U 05		IC: MC 14495	
U 06		IC: 4029	
U 07		IC: MC 14495	
U 08		IC: 4040	
U 09		IC: MC 14495	
U 10		IC: 4070	
U 11		IC: MC 14495	
U 12		IC: CDM 6116	
U 13		IC: 4011	
U 14		IC: 4008	
U 15		IC: 74LS241	
U 16		IC: 74LS257	
S 01		Toggle switch on-off-on , 3-position	
S 02		Toggle switch on - on , 2-position	
S 03		Toggle switch on - on , 2-position	
S 04		Rotary switch BCD-code "RT-A"	
S 05		Rotary switch BCD-code "RT-A"	
S 06		Toggle switch on - on, 2 positions	
SD 1 thru SD 4		7-segment-LED-display D350PKG	

REPLACEABLE PARTS: PC-BOARD #114B, PROGRAMMABLE TIMER of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 10M	
R 2		R: 2k	
R 3		R: 120k	
R 4		R: 120k	
R 5		R: 10k	
R 6		R: 10k	
R 7		R: 120k	
R 8		R: 10k	
R 9		R: 10k	
R 10		R: 120k	
R 11 thru R 21		R: 120k	
R 22		R: 510 OHMS	
R 23		R: 270 OHMS	
R 24		R: 120k	
R 25		R: 510 OHMS	
R 26		R: 120k	
R 27		R: 510 OHMS	
R 28		R: 120k	
R 29		R: 1k	
R 30		R: 1M	
R 31		R: 510 OHMS	
R 32		R: 10k SMD	
Rn1		Resistor network 8 x 1k	
C 1		C: 510 pF, poly, 100V DC	
C 2		C: 4.7µF, tantalum, 10V DC	
C 3 thru C 4		C: 5000 pF, cer., 50V DC	
C 5		C: 220µF, electr., 25V DC	
VC 1		C: Variable, mica, 2-30 pF	
D 1 thru D 9		Diode, Si: 1N 4148	
D 10		Diode, Si: 1N 4001	
D 11 thru D 15		Diode, Si: 1N 4148	
D 16		L.E.D. red, 3 mm	
CR 1		QUARTZ CRYSTAL: 32768 Hz with P.T.C. heating resistor	

REPLACEABLE PARTS: PC-BOARD # 100A , ADDRESS GENERATION AND MULTIPLEXERS of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 10k	
R 2		R: 10k	
R 3		not assigned	
R 4		R: 10k	
C 1, C 2		C: 3.3µF (or 2.2µF), tantalum, 35V DC	
U 1		IC: 74HC393	
U 2		IC: 74HC393	
U 3		IC: 74HC86	
U 4		IC: 74LS73	
U 5 thru U 7		IC: 4503	
U 8 thru U 12		IC: 74HC153	
U 13 thru U 16		IC: 74HC193	
U 17		IC: 74LS257	
U 18		IC: 74LS73	
U 19		IC: 4013	

REPLACEABLE PARTS: PC-BOARD #116, ANALOG INP. and VIDEO SYNC GENER. CIRCUITS of **WSD-690rx**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 5k6	
R 2		R: 10k	
R 3		R: 10k	
R 4		R: 10k	
R 5		R: 510 ohms	
R 6		R: 22k	
R 7		R: 3k9	
R 8		R: 10k	
R 9		R: 33k	
R 10		R: 51k	
R 11		R: 560k	
R 12		R: 120k	
R 13		R: 10k	
R 14		R: 10k	
R 15		R: 560k	
R 16		R: 10k	
R 17		R: 10k	
R 18		R: 51k	
R 19		R: 22k	
R 20		R: 220k	
R 21		R: 22k	
R 22		R: 120k	
R 23		R: 120k	
R 24		R: 270 ohms	
R 25		R: 270 ohms	
R 26		R: 1k	
R 27		R: 510 ohms	
R 28		R: 510 ohms	
R 29		R: 10k SMD	
R 30		R: 120k	
R 31		R: 1k	
R 32		R: 1ok	
R 33		R: 10k	
R 34		R: 10k	
R 35		R: 5k6	

REPLACEABLE PARTS: PC-BOARD #116, ANALOG INP. & VIDEO SYNC. (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
C 1		C: 0.01µF, poly, 63V DC	
C 2		C: 2200 pF poly, 50V DC	
C 3		C: 0.01µF, poly, 63V DC	
C 4		C: 0.01µF, poly, 63V DC	
C 5		C: 2.2µF, tantalum, 35V DC	
C 6		C: 2200 pF, poly, 50V DC	
C 7		C: 0.047µF, poly, 63V DC	
C 8		C: 0.047µF, poly, 63V DC	
C 9		C: 4.7µF, electr., 50V DC	
C 10		C: 4.7µF, electr., 50V DC	
C 11		C: 0.01µF, poly, 63V DC	
C 12		C: 0.01µF, poly, 63V DC	
C 13		C: 4.7µF, electr., 50V DC	
C 14		C: 4.7µF, tantalum, 10V DC	
C 15		C: 0.1µF, cer., SMD	
C 16		C: 2200 pF, poly, 50V DC	
C 17		C: 47µF, electr., 25V DC	
C 18		C: 4.7µF, tantalum, 10V DC	
C 19		C: 82 pF, cer., 50V DC	
C 20		C: 0.01µF, poly, 63V DC	
C 21		C: 4.7µF, tantalum, 10V DC	
C 22		C: 510 pF, poly, 100V DC	
C 23		C: 2200 pF, poly, 50V DC	
C 24		C: 560 pF, cer., 50V DC, SMD	
C 25		C: 560 pF, cer., 50V DC, SMD	
C 26		C: 4.7 µF, tantalum, 10V DC	
C 27		C: 4.7 µF, tantalum, 10V DC	
C 28		C: 510 pF, poly,100V DC	
VC 1		C: var., mica, 1.8 - 22 pF	
D 1 thru D 10		Diode, Si: 1N 4148	
T 1		Transistor, Si, PNP: BC 560	
T 2		Transistor, Si, NPN: BC 548B	
CR 1		QUARTZ CRYSTAL : 10.240 MHz	

REPLACEABLE PARTS: PC-BOARD #116, ANALOG INP. & VIDEO SYNC GEN. (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
U 01		IC: TL084 CDP	
U 02		IC: MF6CN-50	
U 03		IC: MF6CN-50	
U 04		IC: ADC0804 LCN	
U 05		IC: 74HC00	
U 06		IC: 74HC157	
U 07		IC: 4040	
U 08		IC: 74LS93	
U 09		IC: 74HC73	
U 10		IC: ZNA134E	
U 11		IC: 74LS221	

REPLACEABLE PARTS: PC-BOARD # 113B, LOOP MEMORY BOARD of **WSD-690rx.**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 3k9	
R 2		R: 3k9	
R 3 thru R 6		R: 1k	
R 7		R: 150 OHMS	
R 8		R: 1k	
R 9		R: 75 OHMS	
Rn 1		Resistor network 7 x 12k	
Rn 2		Resistor network 7 x 1k5	
C 1		C: 510 pF , poly, 100V DC	
C 2		C: 510 pF , poly, 100V DC	
C 3		C: 0.022 µF, poly, 63V DC	
C 4		C: 4,7µF, tantalum, 10V DC	
C 5		C: 150 pF, styroflex, 63V DC	
C 6 thru C 11		C: 4.7µF, tantalum, 10V DC	
D 1, D 2		Diode, Ge : AA 119	
D 3, D 4		Diode, Si : 1N 4148	
T 1		Transistor, Si, NPN: BD 135	
U 01 thru U 12		IC: TC 511000P-12 <-10>	
U 13, U 14		IC: 74HCTLS365	
U 15		IC: 74LS365	
U 16, U 17		IC: TBP 28S42 (or 74S472)	
U 18		IC: 74HC86	
U 19		IC: 74HC157	
U 20		IC: 74HC00	
U 21, U 22		IC: 74LS73	
U 23		IC: 74HCT00	
U 24		IC: 74HC4040	
U 25 thru U 27		IC: 74HC157	
U 28		IC: 74HC4040	

REPLACEABLE PARTS: **PC-BOARD 115A, MAIN Brd. WSD-690rx.**

Circuit Reference	WRAASE Stock No.	Description	Note
R 1		R: 120k ohms	
R 2		R: 1k	
R 3		R: 10k	
R 4		R: 24k	
R 5		R: 56k SMD	
R 6		R: 1k	
R 7		R: 5k6	
R 8		R: 10k	
R 9		R: 10k	
R 10		R: 3k9	
R 11		R: 10k	
R 12		R: 10k	
R 13		R: 10k	
R 14		R: 10k	
R 15		R: 5k6	
R 16		R: 51k	
R 17		R: 51k	
R 18		R: 10k	
R 19		R: 1k	
R 20		R: 1M	
R 21		R: 220k	
R 22		R: 10k	
R 23		R: 10k	
R 24		R: 10k	
R 25		R: 10k	
R 26		R: 1M	
R 27 thru		R: 10k	
R 32			
R 33		R: 2k	
R 34		R: 4k7 SMD	
R 35		R: 150 ohms	
R 36		R: 75 ohms	
Rn 1		Resistor network 7 x 12k ohms	
Rn 2		Resistor network 7 x 1k5 ohms	
Rn 3		Resistor network 6 x 1k ohms	
VR 1		R: var. 500 ohms horiz.	
VR 2		R: var. 50k ohms horiz.	
VR 3		R: var. 50k ohms vert.	

REPLACEABLE PARTS: PC-BOARD #115A MAIN Brd.- WSD-690rx. (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
C 1		C: 510 pF poly 100V DC	
C 2		C: 2600pF styroflex 50V DC	
C 3		C: 510 pF poly 100V DC	
C 4		C: 0.047 µF poly 63V DC	
C 5		C: 0.1 µF cer. SMD 50V DC	
C 6		C: 0.022 µF poly, 63V DC	
C 7		C: 4.7 µF tantalum, 10V DC	
C 8		C: 1 µF tantalum, 35V DC	
C 9		C: 0.022 µF, poly, 63V DC	
C 10		C: 1 µF , tantalum, 35V DC	
C 11		C: o.22 µF, electr., 50V DC	
C 12		C: 4.7 µF, tantalum, 10V DC	
C 13		C: 2200 µF, electr., 25V DC	
C 14 thru C 20		C: 4.7 µF, tantalum, 10V DC	
C 21		C: 47 pF, cer., 50V DC	
C 22		C: 1 µF, tantalum,35V DC	
C 23		C: 4.7 µF, electr., 25V DC	
VC 1		C: var., mica, 1.8-22 pF	
D 1 thru D 29		Diode, Si: 1N 4148	
D 30		Diode, Ge: AA119	
D 31 thru D 34		Diode, Si: 1N 4148	
T 1, T 2		Transistor , Si: BC 548B	
T 3		Transistor, SI : BD 135	
CR 1		QUARTZ CRYSTAL: 4433.619 kHz	

REPLACEABLE PARTS: **PC-BOARD # 115A. MAIN Brd.- WSD-690rx.** (continued)

Circuit Reference	WRAASE Stock No.	Description	Note
U01		IC: NE 555	
U02		IC: 74HC4040	
U03		IC: NE 555	
U04		IC: 74HC73	
U05		IC: 74HC73	
U06		IC: HEF 4040	
U07		IC: MC 14066B	
U08		IC: HEF 4040	
U09		IC: CD 4012	
U10		IC: 74HC73	
U11		IC: 4011B	
U12		IC: 4001	
U13		IC: 74LS221	
U14		IC: 74HC157	
U15		IC: 4009	
U16		IC: 74LS00	
U17		IC: 74HC157	
U18		IC: 74HC00	
U19		IC: WM 2301	
U20		IC: 74HC00	
U21		IC: HEF 4585B	
U22		IC: HEF 4585B	
U23		IC: 74LS132	
U24		IC: 74HC00	
U25		IC: 74HC86	
U26		IC: 74LS02	
U27		IC: 74HC00	
U28		IC: 4023B	
U29		Not assigned	
U30		Not assigned	
U31 thru U36		IC: HM 50256	
U37		IC: 74HCTLS365	
U38		IC: 74HCTLS365	
U39, U40		IC: TBP 28S42N (or DM 74S472N)	
U41 thru U46		IC: HM 50256	
U47		IC: 74HCTLS365	
U48		IC: 74HC174	
U49		IC: 74HCTLS365	
U50		IC: 74LS00	
U51		IC: 74HC86	
U52		IC: 74HCTLS365	
U53		IC: 74LS02	