Logic Analyzers
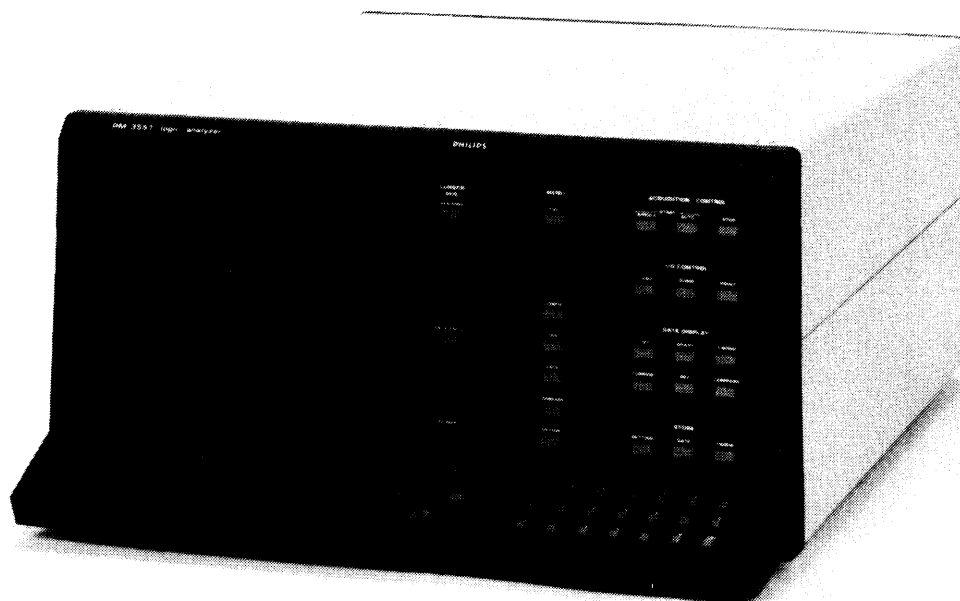# PM 3551A/10/30/50/70

Operating manual

A PUBLICATION OF THE SCIENTIFIC AND INDUSTRIAL EQUIPMENT DIVISION

PHILIPS

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1.2. FEATURES

A functionally organized keyboard/softkey structure in combination with an interactive menu-display serve the user in setting up and entering parameters for triggering, capturing, comparing and counting the activities of the system under test.

The extensive triggering capability of the 7 sequential trigger-words, that can be combined with clock and trigger-qualifiers, permits capturing data from complex system activities or from deep branched or nested loops. Each trigger-word has the same width as the number of input channels of the various models.

The sequence of the different trigger-words used can be defined by the use of an IF, THEN, ELSE algorithm, with the possiblity of placing a certain amount of delay between the statements.
In this mode triggering can be selected as True or False.
A notable feature of this mode is that the selected trigger sequence can be specified as true or alternatively as not true. This latter mode is called "Trigger on Sequence Break" mode and provides the capability of triggering when a defined repetitive pattern (eg. a loop or a polling sequence) is broken or not executed in the specified order.

The moment of capturing data can be delayed by states and/or trigger occurrences and/or time.

The Logic Analyzer can also be used for making time measurements.
A readout of the elapsed time between two points in a programm can be obtained.

Special features of note here are the COMBI and the SYNC modes.
The COMBI mode allows the state section to be triggered by the timing section or vice-versa, while in the SYNC mode the displays of a number of timing channels are cross-referenced with state sampling. This enables analysis of critical state/time relationships.

Data to be captured is clocked into the analyzer on selected clock edges of one of the three selectable clock sources. For each clock used, there are up to four qualifiers available.

In the COMPARE mode, a comparison can be made between captured data and stored data in the formats: List or Timing.

The instrument automatically stores the current mode- and function instrument-setting, when the mains voltage supply is switched off.

After switching on, the instrument comes up in the initial default mode- and function setting.
All analyzer models can be equipped with the option (non-volatile memory) to store up to 4 additional settings. Here each setting is stored and retrieved under a label.

In the TIMING mode, glitches of a duration of as little as 5 nanoseconds can be captured from the data-stream.

The PM 3551A can be equipped with a 4 channel 300MHz timing option, independently of the presence of the 8 channel 50 MHZ section.
This allows high precision timing measurements.

Other options are the options board with standard RS232C printer output.
This board can be equiped with an GPIB control interface, or a RS232C control interface, both providing full remote control of the instrument.

The options board is also a prerequisite for installation of disassembly-packages, and the non-volatile setting memory.
The disassembly-packages allow the user to view captured data in the mnemonic language of the most currently available 8 and 16-bit microprocessors.

Data is entered into the analyzer via 8-channel pods, each provided with its own threshold adjustment. A variety of convenient Pod-attachments are available for connecting the system under test to the analyzer.

A comprehensive built-in diagnostic program can be used as an aid to test the various functions of the analyzer and to assist in fault-finding.

C H A R A C T E R I S T I C S

2. CHARACTERISTICS

The instrument has been designed and tested according to IEC Publication 348 for Class I instruments and has been supplied in a safe condition. The present Operating Manual contains information and warnings which should be followed by the purchaser to ensure safe operation and to maintain the instrument in a safe condition.

Properties expressed in numerical values with stated tolerances are guaranteed for ambient temperatures of +5 deg.C ... +40 deg.C unless stated otherwise. Numerical values without tolerances are typical and represent the characteristics of an average instrument. This specification is valid after the instrument has warmed up for 15 minutes.

OPERATION MODES:
- Logic State Analyzer only
- Logic Timing Analyzer only
- Combi Mode where the LSA can enable the triggering of the LTA or vice-versa.
- SYNC Mode where timing analyzer data is cross-referenced with the state analyzer data.

TYPES:

Type-numbers	PM3551A/10	PM3551A/30	PM3551A/50	PM3551A/70
No of State Channels	35	35	59	59
No of 50MHz Timing Channels	-	8	-	8

THRESHOLD — — — — — — — — — — —   500mV SIGNAL SWING
CENTERED AT
THRESHOLD
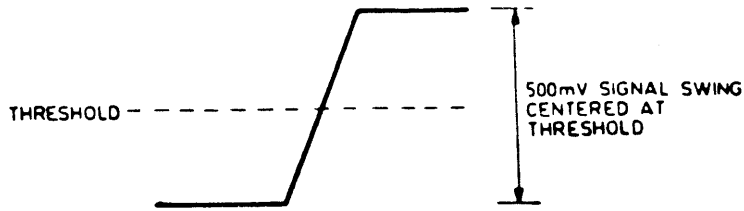
MA 10030

Fig.2.1 Minimal signal swing

ACTIVE CLOCK EDGE

SET-UP
TIME   HOLD
TIME

DATA-AND
QUALIFIER INPUTS
(AT PROBE TIP)

CLOCK PULSE
WIDTH   ∫ CLOCK EDGE
SELECTED

CLOCK REPETITION TIME

CLOCK SIGNAL

} CLOCK EDGE
SELECTED
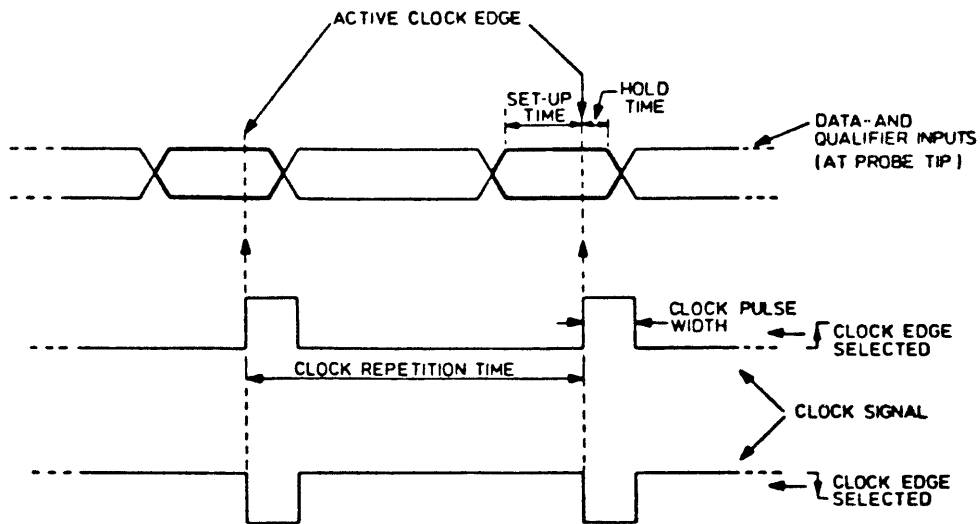
MA 10531 N

DESCRIPTION	VALUE
DATA AND QUALIFIER SET-UP	25 ns
DATA AND QUALIFIER HOLD	0 ns
CLOCK PULSE WIDTH	20ns(min)
CLOCK REPETITION TIME	70ns(min)

MA10531

Fig.2.2 Definition of terms and times

2.1 LOGIC STATE ANALYZER

Data Input	: PM3551A/10: 35 channels max. via 5 Pods PM 8821
	PM3551A/30: 35 channels max. 27 via 4 Pods
	PM 8821 + 8 via 1 Pod PM8825
	PM3551A/50: 59 channels max. via 8 Pods PM 8821
	PM3551A/70: 59 channels max. 51 via 7 Pods
	PM8821 + 8 via 1 Pod PM8825
Pod Type	: PM8821 and PM8825 8-ch. input probe Pods to be connected at the rear of the instrument.

Following values are typical values and specified at the probe tip(s)

Impedance	: 4 MOhm//6 pf
Max. input voltage	: -50 V to +50 V
Threshold	: Selectable per Pod. Fixed TTL, ECL or VARiable between -3V and +12 V in 100mV steps.
Max. sensitivity	: 500 mV pp signal swing, centered on the threshold voltage (see Fig. 2.1).
Set-up and hold times	: Data set-up time minimum 25ns Data hold time minimum 0ns Both related to the active clock edge at the probe tip (see Fig. 2.2).
Data aquisition	: Data collected is selectable from:
	a. states i.e. all combinations at inputs are clocked in.
	b. occurrances i.e. only certain types of words are acquired.
	c. combination of both.

Clock

Source	: External (synchronous) clocking.
Number of clocks	: Three separate clocks can be acquired via 3 leads of a Pod PM8821.
Threshold	: Same specification as data input (see also Fig. 2.1).
Impedance and max. input voltage	: Same specification as data input

Clock repetition   : Min. 70ns (see Fig. 2.2).
time

Clockpulse width   : Min. 20ns (see Fig. 2.2).

Sampling   : Selectable on positive or negative clock
                            edge.

Clock qualifiers

Number   : 2...4 clock qualifiers
                            (input via a Pod PM8821)
                            Two clock qualifiers are fixed, the other
                            two are interchangeable with two data
                            channels.

Threshold   : Same specification as data input (see also
                            Fig. 2.1).

Impedance and   : Same specification as data input
max. input voltage

Sampling   : At clock edge and at selected qualifier
                            level. True and False combinations
                            are possible (see Fig. 2.2).

Selection   : "1" for a high level
                            "0" for a low level
                            "X" for don't care (qualifier not in use).

Set-up and hold   : Data set-up time minimum 25ns
times   Data hold time minimum 0ns
                            Both related to the active clock edge at
                            the probe tip (see Fig. 2.2).

Memory

Format   : The memory depth is 1K (=1023) bits per channel.
                            A second memory of the same size is available
                            as a reference memory for comparison

Triggering

Source   : 1) Internal, 2) Manual or 3) External
                            (External socket TRIG IN is also input
                            for trigger qualifier)

1) Internal   : Triggering on up to 7 words, each delayed by a delay counter, can be selected for:

. Parallel and Quasi parallel triggering

. Sequential triggering (ARM word(s) enable the TRIG word)

. Immediate Sequential Triggering. Word N must be followed immediately by word N+1.

For all trigger modes, all combinations can be made with up to 7 words, clocks and delays.

Trigger words can be selected for "true" or "false" triggering.

The number of triggers can be preset and counted (see: Delay and Counter).

2) Manual   : Operator controlled STOP button.

3) External i.e.   : Via input socket TRIG IN and PM8800 or
external trigger   PM 8810 probes. This input acts as an
or   enable for the internal trigger logic
trig. qualifier   and is selectable as edge or level active.

The external input offers the following possibilities:

. When the internal trigger word is set as all don't cares, this input acts as an external trigger.

. When the internal trigger word is defined this input acts as a trigger qualifier.

. Connection for PM8810 Logic Trigger Probe

Following values are typical values and apply only when the specified probe is used.

Input Impedance   : 5 MOhm // 15 pf

Max. Input Voltage   : $\pm$ 50 V

Threshold   : Fixed TTL

Sensitivity   : 500 mV$_{pp}$ signal swing (see Fig. 2.1)

Set-up and hold   : Signal set-up time minimum 30ns
times when PM8800   Signal hold time minimum 0ns
is used   Both related to the active clock edge at
the probe tip (see Fig. 2.2).
(use the 'delayed' function in the trigger menu)

Set-up and hold   : Signal set-up time minimum 50ns
times when PM8810   Signal hold time minimum 5ns
is used   Both related to the active clock edge at
                         the probe tip.
                         (use the ´not-delayed´ function in the
                         trigger menu)

Delay   : In the trigger menu, delay can be specified
                         in the range of 0 to 64k steps
                         - as states of clock(s)
                         - in occurrences of word(s)
                         - in time

Outputs   : -MATCH OUT. Is activated by the MATCH
                         OUTPUT ON WORDS:-statement in the trigger
                         sequence list.
                         The output is TTL high when the trigger
                         word occurs, and remains high until the
                         next trigger word occurs.
                         The delay between input probe tip (PM 8821)
                         and the Match out connector amounts to:
                         3 state clock cycles +50 +/-15 nS.
                         The pulse length is always more than 60 nS.

                         -RUN OUT. The output is TTL high during
                         data acquisition.
                         The delay between internal start and stop,
                         and the output is 25 +/-15 nS.

                         Output specification:
                         -TTL compatible
                         -Source current 3 mA at Voh= 2,4 V.
                         -Sink current   3 mA at Vol= 0,5 V.
                         -Short-circuit proof.
                         -Max. ext. voltage + or -25 V.

Selective data acquisition
    Selection   : Up to two different blocks of selective
                         data acquisition can be selected.

    Block limits   : Start on a certain word or on START.
                         End on a certain word, word+trigger delay,
                         or END.

    Selected data   : Samples on specified clock(s).

                         -A specific word and samples on specified
                         clock(s).

-One specific word.

-A specific word followed by a number (max. 255) samples on specified clocks.
This can be limited by a max. repeat of 512

Counter   : In Selective data menu, between specified start and finish, a counter can count:
-Samples with specific clock(s)
-Specific words
-Time

2.2 LOGIC TIMING ANALYZER

Data Input   : 8 channels via 1 Pod

Pod Type   : PM8825, to be connected at the rear of the instrument.

Following values are typical values and specified at the probe tip(s).

Impedance   : 1 MOhm // 5 pf

Max. Input voltage   : -50V to +50V

Threshold   : TTL, ECL or VARiable between -3 and +12V in 100mV steps.

Max. sensitivity   : $\pm$ 200 mV. with respect to threshold level.

Maximum non-detect-
able pulse width   : 24 ns (=set up, + hold time + sample interval)

Channel to channel   : <3 ns
skew

Glitch detection   : Selectable over all 8 channels. Glitches from 20ns sample period down to 5ns, selectable by user.

Clock

Source   : Internal
                        Fixed 20 ns (i.e. 50 MHz), transitional clocking system (refer to chapter 8).

Memory

Depth   : 1/4 K bits per channel. (recording up to 256×10^6 samples)

Triggering

Source   : 1) Internal, 2) Manual, 3) External and 4) Glitch

1) Internal   : 3 modes: Word
                                  Word + Glitch
                                  Glitch after window
                        Triggering selectable on leading or trailing edge of word match.
                        Timing and State can be combined in COMBI mode and SYNC mode.

2) Manual   : Operator controlled STOP.

3) External : Via input socket TRIG IN (T15-1) and PM8800 probe. This input is edge active. Values apply only when the belonging PM8800 probe is used.
This input can be used as input for a trigger- or glitch qualifier signal.

Trigger filter : Selectable between 20ns--300ns, in 20ns steps.

Input impedance : 5 MOhm // 15 pf

Max. input voltage : ± 50 V

Threshold level : Same voltage at PM 8800 probe tip as at the input of the PM 8825 Pod.

Sensitivity : 300 mVp-p with respect to threshold level.

Min. pulse width : 5 ns.

4) Glitchtriggering : Triggering on glitches on one selected channel with a selected glitch width of minimum 5 ns. up to a maximum of N sample intervals where N is selectable between 1 and 15. One sample interval is 20 ns.

Glitch window : Defining a window by an arming word (start) plus a delay (finish) within which the analyzer is looking for glitches.

Glitch-qualifier
or
Trigger-qualifier : Via input socket TRIG IN and PM8800 probe with the same characteristics as under ´External´.
Used as a glitch-qualifier, an extra trigger condition is added to the glitch-triggering.
Used as a trigger-qualifier it enables the selected timing triggerword to be extended with one bit.

Delay : 1) Time delay and 2) Final delay

1) Time delay : Max. 20×2^{20} nsec. =20971 usec. via a 20 bit counter which counts in steps of 20 nsec.
2) Final delay : Max. 255 transitions

Output : MATCH OUT: ECL level, High, when the selected trigger word is true until the next trigger word appears. (output via BNC connector at rear side)

Input : TRIG IN: (input via BNC connector at rear side).

2.3 OPERATION

Operation is by key actions combined with various data or menu
displays. The keys are divided into two key fields, see also the front
panel lay-out, Fig.3.2.

Front panel keys   : Allow user direct access to the analyzer
                          display modes and control functions.

Key-board keys   : Allow the user to enter the required
                          parameters within a display mode. This
                          keyboard is based on a combination of hard-
                          keys (for cursor control and HEX value
                          entry) and soft-keys (when entry is not a
                          HEX character).

2.4 DISPLAY

The display is a green phosphor 9 inch video display.
This video display can show a maximum of 24 text lines when
the instrument is in a full menu mode.
When in data display mode the display is divided into three
fields (see also front panel layout, Fig.3.2).

Heading   : The top 6 lines of the display which
                          contain a condensed menu display.

Data field   : The centre 16 lines of the display.
                          This area contains the data display.

Softkey function   : The bottom 2 lines of the display which
field   display the functions of the softkeys
                          located under the display.

EXEERNAL_DISPLAY   : Via BNC output connector COMP VIDEO
                                     at the rear side of the instrument.
- Display scan   : Non-interlaced
- Number of display lines   : Total 312, visible 256
- Cable matching impedance   : 75 Ohm
- Polarity   : High level is bright
- Sync pulses   : 20%...40% of total
- Line frequency   : 15600 Hz
- Frame frequency   : 50 Hz
- Max video bandwidth   : 10,7 MHz
- External display timing   : See figure 2.3.
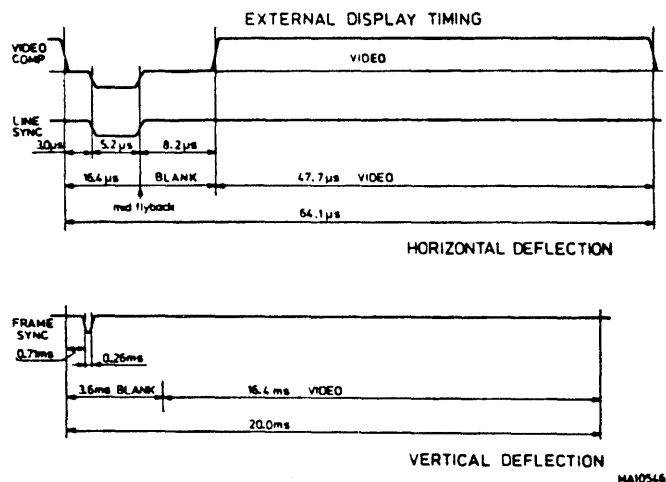
Fig.2.3 External display timing

2.5 DISPLAY MODES

Data display   : State list display; binary, octal, decimal,
                      hexadecimal, ASCII or combinations of these.
                      Inverted display by groups or by individual
                      channels is possible.

                    : Graphic display; data magnitude is plotted
                      against sample sequence.

                    : Timing display; 8 channel format, vertical
                      expansion by channel delete, horizontal
                      scale continuously controllable.

Menu display   : For specification of parameter set-ups the
                      following menus can be displayed:
                      - Configuration menu
                      - Trigger menu (State or Timing)
                      - Data menu
                      - Compare menu
                      - Option menu

2.6 COMPARE MODE

Memory
: A reference memory is available to store the contents of the acquisition memories of both state and timing. This memory can also be loaded via the optional interface.

Store
: With the store function, data contained in the acquisition memory is copied into the reference memory.

Modes
: Full compare:
The two entire memories are compared.

Compare Mask:
Channels over which the compare takes place and the limits of the compare with respect to the trigger point are defined by the user.

Offset:
Shift of stored data (masked) with respect to current data.

Skew:
Timing only
This allows deviation of an edge in the current data with respect to stored data.

Search:
Stops continuous compare process when an inequality is found, or counts equalities or inequalities.

2.7 POWER SUPPLY

Safety Class
: I   IEC-348, ECMA-57

Nominal mains-voltage ranges
: 110...127 Vac ± 10%
or
220...240 Vac ± 10%

Mains fuses 4A delayed (2x), both mains-voltage ranges

Nominal frequency range
: 50...60 Hz ± 10%

Power consumption
: 130 VA   PM 3551A/10
: 250 VA   PM 3551A/30
: 180 VA   PM 3551A/50
: 280 VA   PM 3551A/70

2.8 ENVIRONMENTAL CHARACTERISTICS

The characteristics are valid only if the instrument is checked in accordance with the official checking procedure. Details of these procedures and failure criteria are supplied on request by the PHILIPS organization in you country, or by N.V. PHILIPS' GLOEILAMPENFABRIEKEN, TEST AND MEASURING DEPARTMENT, EINDHOVEN, THE NETHERLANDS.

-CLIMATIC CONDITIONS

Ambient temperature

Rated range of use	+ 5 ...+ 40	Deg.C
Limit range of operation	0 ...+ 45	Deg.C
Limit range for storage and transport	-40 ...+ 70	Deg.C

Relative humidity

Rated range of use	20% ... 80%	Non condensing
Limit range for storage and transport	5% ... 95%	

Altitude

Rated range of use	up to 5000 m.
Limit range for storage and transport	up to 15000 m.

Mains Interruption

10 ms (nominal mains supply)	No influence on settings and data storage.

-MECHANICAL CONDITIONS

Vibration

Rated range of use   Negligible value

Limit range for   0.28 mm(p-p)   Frequency range
storage and transport   max. 20 m/s^2 10 ... 150 Hz

Bump

Rated range of use   10 m/s^2 6 ms

Limit range for   100 m/s^2 1000X, 6 ms in each
storage and transport   of 3 directions

ELECTROMAGNETIC COMPATIBILITY (EMC)

Electromagnetic Interference (EMI)

Conducted interference   level B   VDE 0871
                          10 kHz ... 30 MHz

Radiated interference   level B   VDE 0871

Electromagnetic susceptibility (EMS)

Conducted susceptibility

Transients on mains   Assymetrical only
connections (ingoing)

Fast low energy pulses

Pulse height   1500 V max.   No damage to occur

Rise time   35 ns. max.
Pulse width   100 ns. approx.
Source impedance   150 Ohm max.

2.9 PHYSICAL CHARACTERISTICS

Dimensions

Width	450 mm
Heigth incl. feet	242 mm
Heigth excl. feet	227 mm
Depth max.	570 mm
Depth min.	496 mm

Weigth

Net, without accessories and options   17 kg(approx.)
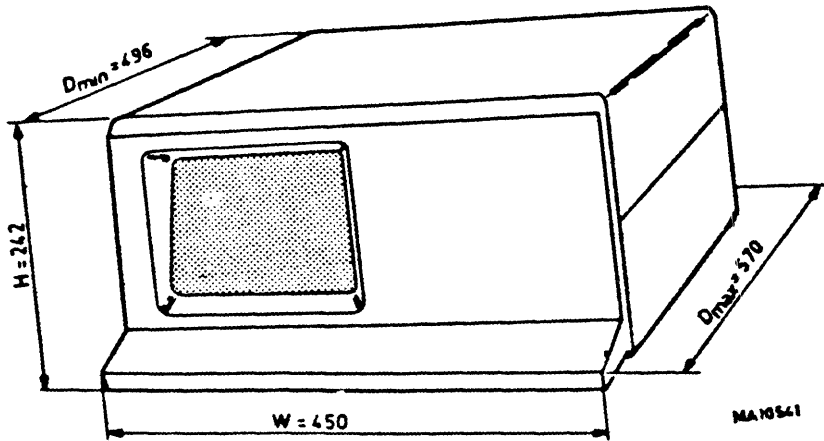
Fig.2.4 Dimensional drawing

2.10 ACCESSORIES AND OPTIONS

-Accessories included in delivery:

1	Operating manual	
5	8-channel pods (with PM 3551A/10)	PM 8821
4	8-channel pods (with PM 3551A/30)	PM 8821
8	8-channel pods (with PM 3551A/50)	PM 8821
7	8-channel pods (with PM 3551A/70)	PM 8821
1	8-channel timing pod (with PM 3551A/30 & /70)	PM 8825

-Instrument "upgrading" options (These options are field-installable):

PM 8850/00	DISA A (Z80, 8085, 68000)
PM 8850/10	DISA N (Intel)
PM 8850/20	DISA M (Motorola)
PM 8850/30	DISA Z (Zilog)
PM 8850/40	DISA R (Rockwell/RCA/NS)
PM 8850/81	Non-volatile memory for storage of 4 user-defined instrument settings for PM 8851/00.
PM 8850/82	Same as PM 8850/81 but for PM 8851/20 and /40.

The above PM 8850/xx options can be installed on the Options board PM 8851/00/20 or /40.

PM 8851/00	Options board with printer output for PM 3551 and 3551A.
PM 8851/20	Options board with printer output + RS 232C control interface for PM 3551 and PM 3551A.
PM 8851/30	8 channel 50 MHz timing analyzer (T50-1,2) for PM 3551.
PM 8851/40	Options board with printer output + IEEE 488 (IEC 625) control interface for PM 3551 and PM 3551A.
PM 8851/50	24 channel state analyzer option (S15-3) for PM 3551.
PM 8851/80	4 channel timing analyzer 300 MHz option for PM 3551.
PM 8852/30	8 channel 50 MHz timing analyzer (T50-1,2) for PM 3551A.
PM 8852/50	24 channel state analyzer option (S15-3) for PM 3551A.
PM 8852/80	4 channel timing analyzer 300 MHz option for PM 3551A.

The printer output is always RS232C.

-Optional accessories:

PM 8800	External trigger probe (set of four probes)
PM 8810	Logic trigger probe
PM 8811	Serial data pod
PM 8817/40	Personality adaptor for 40-pin micro processors
PM 8817/64	Personality adaptor for 64-pin micro processors
	The wiring interface box PM 8816 of the PM 8817/40/64 personality adaptors must be wired by the user.

A PM 8817 consists of a PM 8815 Pod nozzle, a wiring interface box PM 8816, and a micro processor test clip with ribbon cable PM 8815/40/64.

The following personality adaptors are specific for the
disassembler of the indicated micro processors.

Adaptor	Microprocessor
PM 8817/10	6800/02/08
PM 8817/12	NSC800
PM 8817/19	68000
PM 8817/20	8085
PM 8817/21	8048
PM 8817/22	Z80
PM 8817/23	Z8002
PM 8817/24	R6502/12
PM 8817/26	6809/E
PM 8817/27	8086/8088
PM 8817/28	8080

Parts of accessories:

PM 8815/00	Set of 5 Pod nozzles for personality adaptor.
PM 8815/40	40-pin clip with ribbon cable.
PM 8815/64	64-pin clip with ribbon cable.
PM 8816/40	Wiring interface box for 40-pin micro processors
PM 8816/64	Wiring interface box for 64-pin micro processors Boxes PM 8816/40/64 must be wired by the user.
PM 8816/..	Wiring interface box (pre-wired) for commonly used micro processors. They are available in the same versions as the PM 8817.
PM 8819/00	Extension kit for PM 8821 (leads, clips and nozzle)
PM 8819/10	54 coloured leads for PM 8821 (length 26 cm)
PM 8819/20	35 measuring clips
PM 8819/30	50 mini dualclips
PM 8819/40	54 coloured leads for PM 8825 (length 12 cm)

Note: For more information refer to the chapter 9.

G E N E R A L   D I R E C T I O N S

3.0 GENERAL DIRECTIONS

3.1 WARNINGS AND INFORMATION FOR THE USER

- It is recommended that this section is read completely before
  switching on the instrument.
- This instrument has been designed and tested in accordance with
  IEC Publication 348, Class 1, Safety Requirements for Electronic
  Measuring Instruments and has been supplied in safe condition.
  This Manual contains information and warnings, all of which must be
  considered to ensure safe and reliable operation of the instrument.
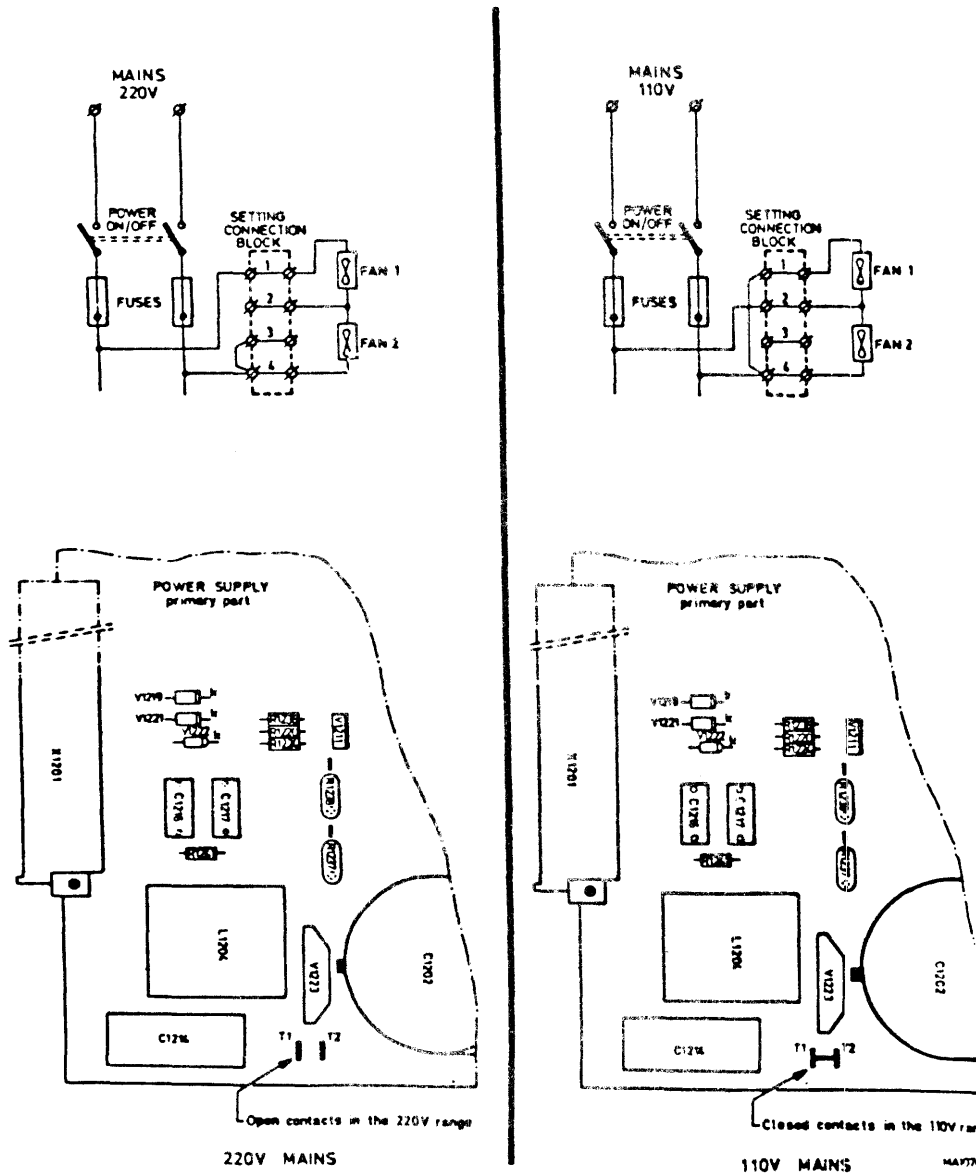

Fig. 3.1 Connecting for 220 V or 110 V range mains voltage.

Mains adaption

- Before connecting the instrument to the mains supply, ensure that it set to the correct voltage range. To do this, the upper cabinet plate has to be removed and it can be seen if some connections of the power supply compartment are set to the relevant voltage range. Range settings are shown in figure 3.1.
New instruments are shipped with the voltage range setting correct for the country of destination.

Earthing

- Before switching on, the instrument shall be connected to a protective earth conductor in one of the following ways:

  . via the protective earth terminal at the rear of the instrument, identified by the symbol (⏚).
  . via the earth wire in the three-core mains cable.

  The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension cord without protective conductor. Replacing the mains plug is at the user's own risk.

  WARNING: Any interruption of the protective conductor inside or outside the instrument, or disconnection of the protective earth terminal, is likely to render the instrument dangerous. Intentional interruption is discouraged. When an instrument is brought from a cold to a warm environment, condensation may cause a hazardous condition. Ensure, therefore, that the earthing requirements are strictly adhered to.

Cooling

-Take care that the forced air flow through the instrument is not obstructed. Do not place any instruments or papers on the top of the instrument to avoid excessive heating-up.
-Do not use the instrument when the built-in fans are not running.
Refer also to: Maintenance.

Adjustment, replacement of parts and repair

- When the instrument is connected to the mains, terminals may be live, and the opening of the covers or the removal of parts (except those to which access can be gained by hand) is likely to expose live parts.
- The instrument shall be disconnected from all voltage sources before it is opened for any adjustment, repair, replacement or maintenance.
- Capacitors inside the instrument (specially in the power supply unit and the video display unit) may still be charged even if the instrument has been disconnected from all voltage sources.
- Any adjustment, repair or maintenance of the instrument, when opened under voltage, should be avoided as far as possible, and, if inevitable, should only be carried out by a skilled person who is aware of the hazards involved.

- Never remove a circuit-board or component until the instrument has been switched-off for at least one minute.
- Ensure that only fuses with the required rated current and of the specified type are used for replacement.
The use of make-shift fuses and the short-circuiting of fuse holders is prohibited.

Maintenance

- Cooling
Check the vent holes and the dust filter (located in the bottom plate) once a year.
If necessary free the holes (use pressurized air).
When the filter is clogged with dust, it must be cleaned.

Older instruments are provided with a plastic fiber dust filter.
We recommend you to have this filter replaced by the standard metal mesh filter.

- Cleaning
If necessary, the VDU glass surface, the front panel, and the cabinet-plates may be cleaned with a soft pad, cloth, or cotton-wool with some water and common houshold cleansing, or some alcohol or white spirit.
Do not use abbresive cleaning pads or materials.

Lithium battery

The battery back-up instrument setting memory is energized by a 3,6V lithium battery located on the lower board of the ´sandwich´-print assembly above the motherboard.
This battery requires no special maintenance.
Bad battery condition is generally indicated by the message SETTING INVALID when selecting a saved or stored setting.
A battery in bad condition must be replaced (call your local Philips Service Organization).

Note that this battery may never be opened, nor short-circuited, nor be thrown in open fire.

Defects and abnormal stresses

- Whenever it is likely that the protection has been impaired, the instrument should be made inoperative and secured against any further operation.
- The protection is likely to have been impaired if, for example, the instrument:
  . shows visible damage.
  . fails to perform its intended functions.
  . has been subjected to prolonged storage under unfavourable conditions.
  . has been subjected to severe stresses during transport.

Diagnostic self test

- The instrument is provided with a comprehensive diagnostic self test programm as an aid to fault-finding.

This programm is started if any-one of the keys on the front-panel is kept depressed, while the mains voltage of the instrument is switched-on (or if the internal reset button is pressed with a front panel key depressed).
Pressing the QUIT-soft key, which is shown in the diagnostic test returns the instrument to the normal operation programm.
More information about the diagnostis programm is given in the SERVICE MANUAL of this instrument.

Turning power on

For connecting and detailed preparation for use refer to chapter 6.

- The instrument is turned on by switching the power ON/OFF
  switch at the rear of the instrument to ON. See also figure 3.3
- Check that the built-in fans are running.
- The initial configuration menu appears on the display.

3.2 DESCRIPTION OF CONTROLS, CONNECTORS AND DISPLAY

This section describes the operation and function of controls and sockets on the instrument. The front panel's functional areas as well as the controls in those areas are explained in the sequence they would normally be used by the operator.

3.2.1 F R O N T P A N E L
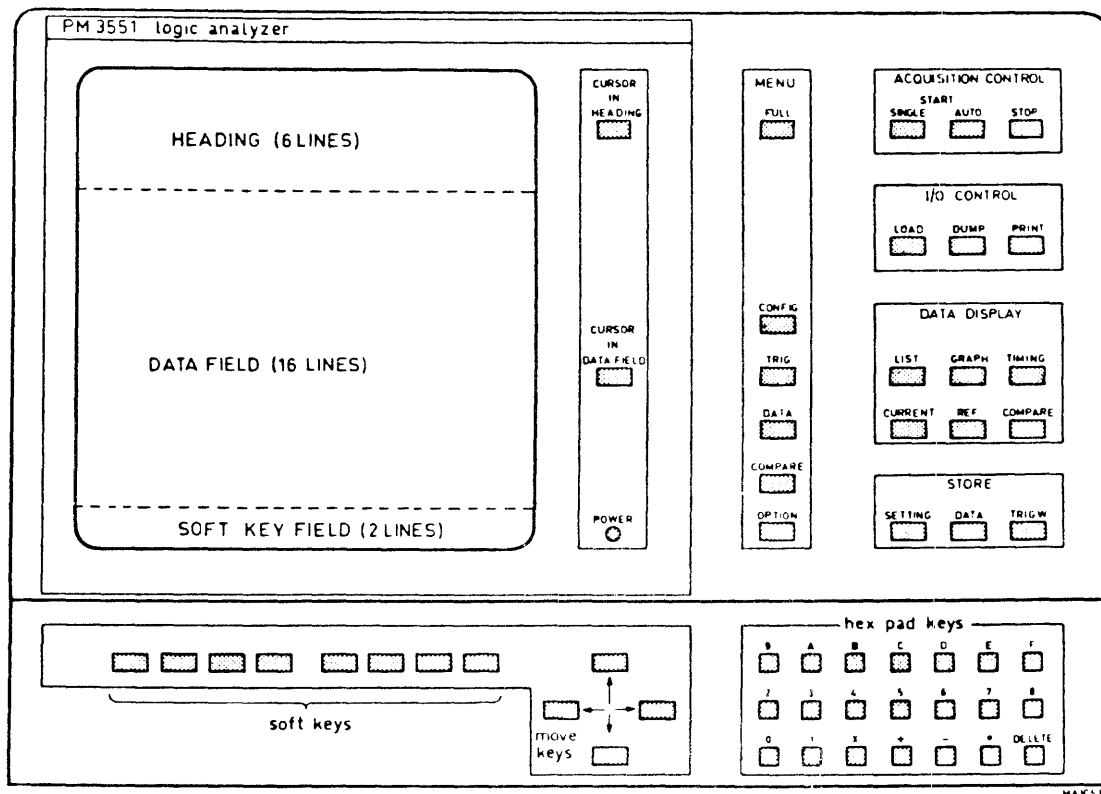
Fig. 3.2 Front panel

CURSOR position area

CURSOR IN HEADING	: This button forces the cursor into the heading (this is the condensed menu).
CURSOR IN DATA FIELD	: This button forces the cursor into the data field.

The cursor can be located on one character only, or on a group of characters. The cursor generally consists of a reverse video block combined with a blinking character.
The cursor can be moved with the four move keys.

POWER (lamp) : Indicates that the instrument is switched-on.
(The main switch and fuses are located at the rear panel).

MENU area

FULL   : Selects a Full menu (refer to Menu Description).
CONFIG   : Selects the Configuration menu
TRIG   : Selects the Trigger menu
              (When both the State- and the Timing analyzers have been
              selected, this key gives alternatively the state- and the
              timing trigger menus)
DATA   : Selects the Data menu
COMPARE   : Selects the Compare menu
OPTION   : Selects the Options menu

ACQUISITION CONTROL area

START SINGLE : Starts a single shot data acquisition action.
START AUTO   : Starts automatic restart (repetitive) data acquisition.
STOP   : Stops data acquisition in single, as well as in auto mode.

I/O CONTROL area (only active if an interface option has been installed)

LOAD   : The analyzer memory is loaded with data from a storage
              device, or controller.
DUMP   : The analyzer memory contents is transferred to a storage
              device or controller.
PRINT   : The analyzer memory contents is transferred to a printer.

DATA DISPLAY area

LIST   : Memory contents is displayed in a list format.
GRAPH   : Memory contents is displayed in a graph format.
              LIST and GRAPH display apply only to the State Analyzer.
TIMING   : Memory contents is displayed as blockform signals
              This applies only to the Timing Analyzer.

CURRENT   : The contents of the current memory is displayed.
REF   : The contents of the reference memory is displayed.
COMPARE   : The contents of the current memory and the contents
              of the reference memory are compared.

STORE area

SETTING   : The settings of the analyzer are stored
              (only if an option PM 8850/80 has been installed).
DATA   : The contents of the current memory is copied into
              the reference memory.
TRIGW   : The cursor word (which is the uppermost word of the
              displayed data list) is copied into the cursored
              trigger word in the trigger menu.

SOFTKEYS

There are 8 softkeys, located directly underneath the display.
Each active softkey function is displayed in inverse video, just above
the key. A disabled softkey function is presented in normal video.

MOVE KEYS (scroll,shift)

These keys have two functions:
-Positioning of the cursor in the menus, or in the label line in the data field.
-Scrolling the data list, or horizontal shift of the timing display window.

HEX KEYS

The hex keys (0---F) permit hexadecimal input for the various settings.
    X   = don't care
    .   = decimal sign
DELETE = deletes full numerical input

3.2.2 R E A R P A N E L
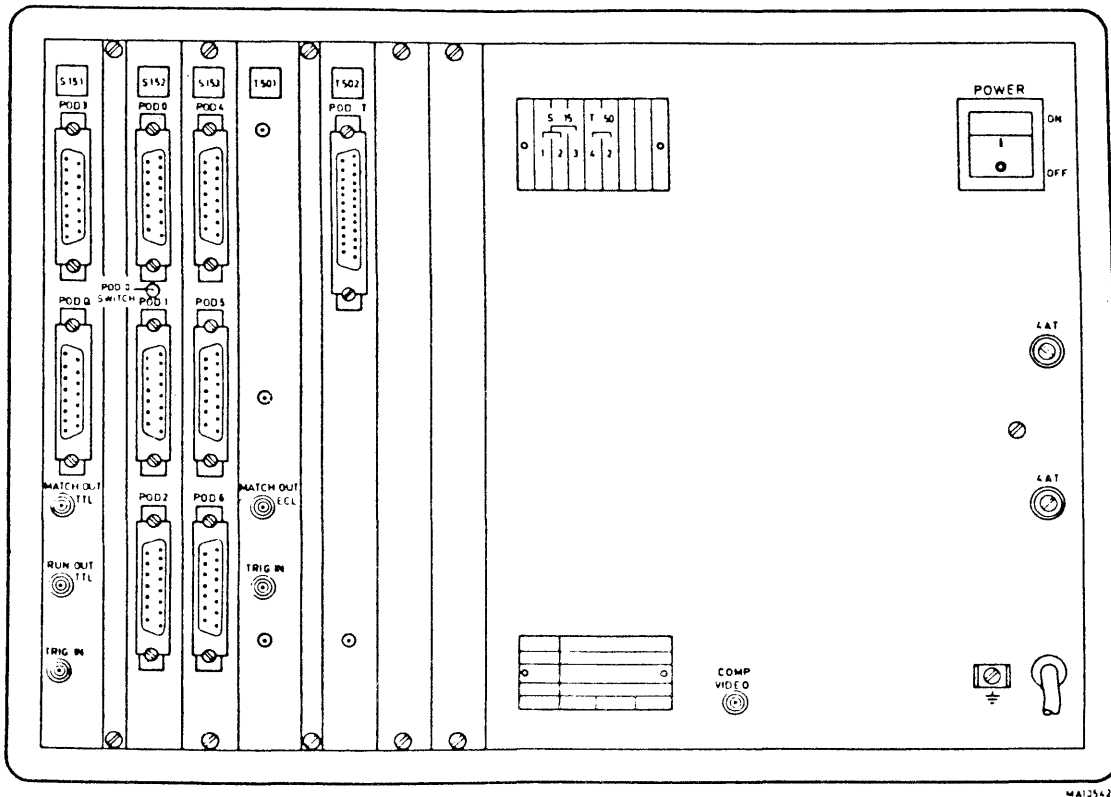
Fig. 3.3 Rear panel

Seen from the rear, you find from left to right the following unit indication:

-S15-1 S15-2 S15-3 (the latter only in versions /50 and /70)
  S indicates State Analyzer p.c. boards.

-T50-1+2 (both only in versions /30 and /70)
  T indicates Timing Analyzer p.c. boards.

-OPT-X (instructions for field fitting are given in chapter 10 of this manual)

On above mentioned units you will find the following:

  State section

On S15-1 and S15-2 the input connectors are located for Pod #0, Pod #1, Pod #2, Pod #3 and Pod #Q.

Pod #0...Pod #3 are data inputs; Pod #Q is input for clocks and qualifiers (two of the qualifiers may be used as data channels).
On S15-3 the input connectors are located for Pod #4, Pod #5 and Pod #6.
All these inputs are 15 pins input connectors to connect PM 8821 Pods.

On S15-1 three BNC connectors are present:
-MATCH OUT delivers an active high TTL signal if a trigger word occurs.
-RUN OUT is delivering an active high TTL signal during data
  acqusition, i.e. between start and stop (final triggering).

-TRIG IN features triggering of the data acquisition with an external signal. The external signal must be fed via the PM 8800 probe and is specified as TTL level at the probe tip.

Timing section

On T50-1+2 the following connectors are present:
-POD #T 25 pins input connector for 8 timing channels (via Pod PM 8825).
-MATCH OUT BNC connector, delivering a high active ECL signal during the time that the selected trigger word is true and clock pulse(s) is (are) present.
-TRIG IN BNC connector features triggering of the data acquisition with an external signal.
The external signal must be fed via the PM 8800 probe and can be selected between -3V and +12V at the probe tip.
An unused input is regarded as a "0".

Pod #0 and Pod #T relation
There are two possibilities to apply the Pod #0 signals to the State Analyzer input.
This depends on the position of the switch which is present at the rear of the instrument at unit S15-2. The switch can be manipulated through the rear panel by e.g. a ball point pen or a small screw driver.

In the ´in´-position Pod #0 of the State Analyzer is interconnected with Pod T of the Timing Analyzer. The Pod #0 input of the State Analyzer is not activated.
In the ´out´-position there is no interconnection between both Pods; Pod #0 and Pod T can be used separately.

General section
-Mains switch
-Two fuses 4 Amps (delayed action) for both the 110V and 220V ranges.
-Mains cord provided with gnd wire
-Separate gnd connection
-ADJUST VEIL allows brightness adjustment of the veil in the timing display.
-COMP VIDEO BNC output giving a video signal (1.25 Vp-p) to connect an external video display. This signal includes line- and frame sync pulses.

Brightness adjustment
At the LEFT HAND SIDE of the instrument;
-Screw driver adjustment for brightness of the display.

DESCRIPTION OF THE MENUS

4 DESCRIPTION OF THE MENUS

WHAT'S A MENU?

A menu is a survey of specific functions, parameters and values which apply to a certain main analyzer mode or function.

There are full menus and condensed menus.
A full menu states full detailed information and requires the whole display area.
A condensed menu states just the most relevant information leaving room for a display field for data.

The following menus are selectable:
-Configuration menu
-Trigger menu state section
-Trigger menu timing section
-Selective data acquisition menu
-Compare menu
-Options menu

For each full menu a condensed menu is available (options menu excepted). Changes in a full menu are automatically copied in the corresponding condensed menu; changes in condensed menus are not all copied in the corresponding full menu.

Selectable functions are indicated by the cursor and the labels above the softkeys.
The cursor, which puts the selected function or value in inversed video, can be positioned with the four arrow keys.
Note that with each new cursor position, the softkey functions may change.

By pressing the relevant softkey the function or parameter is selected.

When you switch-off the instrument, all settings in the menus remain stored in a battery back-up memory. The configuration menu photographs in this chapter show the default values of the settings after switching on.

First we discuss the full menus.

4.1   FULL MENUS

..1.1   CONFIGURATION MENU

General information

In this chapter we discuss the menus of an Instrument provided with 35 or 59 state channels and 8 timing channels, so skip numbers or functions which are not applicable in your Instrument.

Press the FULL- and the CONFIG key in the MENU area.
(after switching-on the instrument display shows always the initial full Configuration Menu)
Note that the current instrument setting is always saved in a battery back-up memory, when the mains voltage is switched off.
In the following we discuss the menus as in the initial setting.

```
                    CONFIGURATION MENU

     MODE        59 CHANNEL STATE WITH 8 TIMING

     CLOCKS      CLOCKS        QUALIFIERS Q0 Q1 Q2 Q3
                 CLK0= f       TRUE       X  X  X  X
                 CLK1= ʅ       TRUE       X  X  X  X
                 CLK2=OFF

     DATA INPUT  THRESHOLD AND CLOCKS VS. LABELS

     POD-Q POD#6   POD#5  POD#4   POD#3 POD#2   POD#1  POD#0
      TTL   TTL     TTL    TTL     TTL   TTL     TTL    TTL

     ┌───┬─────┐ ┌─────┬─────┐ ┌─────┬───────┐ ┌─────┬────────┐
     0 AAAAAAAAAAA BBBBBBBBBBBBBBBB CCCCCCCCCCCCCCCCC DDDDDDDDDDDDDDDDD
     1 _____ EEEEEEEEEEEEEEEEE EFFFFFFFFFFFFFFFF GGGGGGGGGGGGGGGGG
     CLK INT=                                          TTTTTTTT

     FORMAT  AAA  BBBB  CCCC  DDDD  EEEE  FFFF  GGGG
     LOGIC   POS POS   POS   POS   POS   POS   POS
     BASE    HEX HEX   HEX   HEX   HEX   HEX   HEX

     ┌───────────CLOCKS────────────┐ ┌────────QUALIFIERS──────────────┐
     │ OFF    f     ʅ   │ TRUE   FALSE    1      0      X
```

Fig. 4.1 Full Configuration Menu

MODE

The following modes are selectable:

COMBI   This mode applies typically for combinative use of
             both the State Analyzer and the Timing Analyzer.
             Each Analyzer is capable of enabling the triggering of
             the other Analyzer (LSA enables LTA, or LSA waits for LTA).
             Start data acquisition is common for both Analyzers.

STATE   In this mode your instrument is a State Analyzer only.

TIME   Now you have a Timing Analyzer only (max 8 channels).

SYNCED   The Timing Analyzer will now run ´time-referenced´ with the
             State Analyzer. The Timing Analyzer being triggered by the
             ENABLE LTA command.
             Both Analyzers work on their own sample clock, but reference
             is obtained between both captured data.
             You will miss two timing channels; they are used for
             synchronization purposes between both analyzers.
             Samples captured with the State Analyzer are marked in
             the timing diagram.

STORED   If the non-volatile memory PM8850/80 is built-in, this key
             is enabled. You can recall one out of four stored complete
             instrument settings. Refer to page 4.6.

SAVED   Pressing this key recalls the complete instrument setting
             as it was when the instrument was switched off.
             If the instrument setting was not correct at the moment of
             switching-off, the message INVALID SETTING will be shown
             when the saved key is pressed.

CLOCKS

Allows you to select the active clocks and clock-edges.
Also the corresponding qualifiers and their polarity can be selected.
Note that at least one clock must be selected.

DATA INPUT THRESHOLD AND CLOCKS VS. LABELS

In this field you can select labels per active clock, and the logic
threshold voltage per Pod.
In the 35-channel state analyzer version this field consists of the
following two fields.

THRESHOLD

A correct threshold voltage is important to obtain a reliable logic
level detection of the input signals.
The threshold voltage is selectable per Pod.
You can select TTL, ECL, or VAR.
VAR is any value between-3V and +12V, and must be entered via the HEX
key pad.

LABELING

This function allows you to label groups of input channels; the same
labels remain present in all further displays.
Available labels are A---G.
Channels of adjacent Pods can be grouped together by giving them the
same label.
Labels may be allocated in any order in this field, but the resulted
display format (see the FORMAT line) is always in alphabetical order.
Certain rules apply to the allocation of labels:
-Labels must be allocated on a contiguous block basis.
-The same label can be allocated to two or more clock sources,
 provided it covers the same channel inputs.

Note that the labeling is also related to the base-selection which is
discussed in the next points.

Timing channels have basically label T (for timing) with a channel
number. If the capture mode has been selected the label C applies.

LOGIC
This function and the BASE (see point 6) one have a combined cursor.
Logic applies to the logic (polarity) of the input signals.
Often positive logic is used, where ´1´ is a high voltage, and
´0´ is a low voltage.
An exception is e.g. IEEE/IEC bus logic, where a ´1´ is a low voltage
and a ´0´ is a high voltage.
In this case pressing the NEG soft key will result in the active low
systems signals being displayed as 1´s.

BASE
The base is the numerical base, or the code in which the data will be
represented.
The base can be binary, hexadecimal, octal, decimal or ASCII7.
The base selection is related to the above channel-labeling.
Generally a specific number of bits is used per base setting.
E.g. if octal base has been selected, the labeling must be logically
in a group of three channels (though other numbers are allowed).
The value of non-activated bits in a group depends on the selected
logic, selected threshold, etc.

The STORED softkey allows selection of one out of four settings of the non-volatile memory (PM 8850/80/82). The settings are stored under label 1--4.

The SAVED softkey recalls the setting as it was at the moment you switched-off the instrument before (this is retained in a battery back-up memory).
After switching-on, the instrument menus are always in the initial default setting.

If your instrument is not equiped with a non-volatile memory, skip the following STORE and RECALL functions.

-How to STORE a SETTING.

  Press the Store Setting key in the STORE field (the cursor stops blinking).
  The message ENTER LABEL NR appears on the screen (generally preceeded by the NO FREE LABELS message).
  Enter the label nr via the hex keypad. After entering, the store action is started, and you can continue with the operation.
  Only switching-off the mains voltage during the store action will disturb the setting to be stored. At the end of the store cycle the message STORED ON LB X appears (X is the entered number).
  Note that it takes approx. 10 Sec. (typ.) up to 1 Min. 20 Sec. (max.) to store one complete setting.

-How to RECALL a SETTING

  Select the full configuration menu. Cursor on configuration mode.
  Press the STORED softkey.
  The softkey functions are now:

  --#1--   --#2--   --#3--   --#4--   -ENTER   -NONE-   ------   ------

Press the relevant label number softkey and press the ENTER softkey.
If erroneously a wrong label number softkey has been pressed, correct this by pressing the NONE softkey.

```
|---------------------------------------------------------------------|
|                                                                     |
|      Experience has proven that it is quit useful to note the       |
|         setting details of each stored setting for yourself.        |
|                                                                     |
|---------------------------------------------------------------------|
```

4.1.2   TRIGGER MENU

Press the FULL- and the TRIG key in the MENU area.

Note that in versions PM 3551A/30/70 there are two trigger menus.
One for the state analyzer and one for timing analyzer.
In the COMBI-mode, these menus are alternately displayed by pressing
the TRIG key.

State trigger menu

```
                    STATE TRIGGER MENU
            TRIGGER ON SEQUENCE TRUE
        1 FIND WORD 1 DELAY = 100    STATES OF CLK 0
        2 FIND WORD 2
  )     3 FIND WORD 3 OR 4
            IF WORD 3 THEN STEP 1 ELSE STEP 4
        4 FIND WORD 5 DELAY = 1000   STATES OF CLK 0+1
        5 END. MATCH OUT ON WORDS: 5


        WD CLK AAAA BBBB CCCC DDDD EEEE FFFF GGGG 0 F
         1  0  XXX XXXX XXXX XXXX                 X T
  2      2  0  7E6 021C 4C00 22FF                 X T
         3  1                    00438 4C66 00FF  X T
         4  1                    00438 3A67 F4FF  X T
         5  0  7E6 021C 4412 10FF                 X T



           0    1    2
```

Fig. 4.2   State Trigger Menu

This menu is divided in 3 main fields, from top to bottom:

        STATE TRIGGER MENU
   -    TRIGGER ON SEQUENCE TRUE, OR -BREAK

   -    SEQUENCE
   -       -
   -       --

        TRIGGER-WORDS
   --   -
   --   -

TRIGGER ON SEQUENCE TRUE, OR -BREAK

       1.Trigger on sequence true

         In this mode a number of conditions must be fullfilled in a
         specific order to obtain triggering.

       2.Trigger on sequence break

         A number of conditions must be sequentially fullfilled; if the
         sequence is broken triggering occurs.

SEQUENCE

      In this field you can write the trigger sequence order.
      This list is divided in steps, numbered from 1 onwards.
      The various trigger words are labelled as 1--6 (or 7).
      You can enter trigger words, delays, if-then-else conditions and so on.

      Note that these trigger words can also be used in the selective data
      acquisition- and the compare menu.
      For detailed information on the trigger sequence possibilities refer
      to chapter:

      Note that in the Combi mode linkage can be made between the State-
      analyzer- and the Timing analyzer triggering.
      Two functions are possible:
      -Enable LTA   : The State analyzer enables triggering
                   of the Timing analyzer.
      -Wait for LTA : The State analyzer starts the Timing analyzer.
                   After triggering (incl. the delays) of the Timing
                   analyzer, the next trigger word of the State analyzer
                   is enabled.

TRIGGER WORDS

      Trigger words are initiated in the trigger sequence list.
      As soon as a word has been selected in the sequence list, it appears
      in the 'don't care'-form in the trigger word list.
      Note that the trigger words can only be set in binary-, octal- or
      hexadecimal form.

      Words 1--6 are the principal trigger words. Each of these words can
      also be used by a delay counter (delay on occurences) in the
      trigger step were it is used as the trigger word.
      At the same time, each of the words 1--6 may be used with:
      -the selective data acquisition, to define start and stop of sample
       windows.
      -the counter, to define start and stop of the counter window.
      -the compare function, to define the start and stop of the memory
       block to be compared.

      Two more words, word A and word B, are available:
      They can be used as:
      -an occurences delay counter in every trigger step
      -a word to be captured by selective data acquisition
      -a word to be counted by the counter
      In addition word B can also be used as a trigger word in the trigger
      sequence; in this case word B is labelled as word 7.

In the heading of the trigger word list you find:

WD   CLK   <LABELS>   Q   F

In which:
WD is trigger word number.
CLK is the clock source for that trigger word.
<Labels> is the indication of the selected channel labels.
Q is the polarity of the external trigger word qualifier, or the
external trigger edge signal. See below.
F is the definition (true or false) of the trigger word with
qualifier.

In the trigger word list you find the trigger words as soon as they
are initiated in the trigger sequence list.

Note that clock numbers, qualifiers, and the True or False condition
are enterend via the softkeys.
The trigger word itself is entered via the hex keyboard.

Some trigger qualifier details.
Q is the éxternal trigger word qualifier, or the external trigger edge
signal, and must be applied to the TRIG IN connector at the rear of
the State Analyzer (S15.1).
Note that this signal controls all trigger word qualifiers as far
as they have been specified. With the control cursor positioned on
the qualifier of the trigger word, the soft key labels are:

DELAYED EDGE   DELAYED LEVEL NOT DELAYED
--|--   --|--   --|--   --O--   --H--   --L--   --X--   -----

Note that the Delayed Edge- and Delayed Level functions apply to the
Logic Probe PM 8800. These functions compensate the delay of the data
Pods (PM 8821).
The Not Delayed functions apply to the PM 8810 Trigger Probe, or it
may be a TTL signal applied via a coax. cable.

Delayed- and Not Delayed qualifier functions do not work together.

Note that edge triggering works as a latch function. Once the selected
qualifier input edge signal has passed, it remains latched for the
rest of the trigger sequence. Accordingly, the edge trigger can only
be selected once in the trigger sequence. Combinations of one edge
qualifier and two or more level qualifiers are possible.

Trigger Sequence Softkeys Functions

In the following we give an example with some principal trigger
functions. In this example we succesively pressed the left-most
softkey.
For more information on trigger functions refer to chapter. 5.2.

TRUE   BREAK   -----   -----   -----   -----   -----   -----

selects the main trigger mode.
Sequence TRUE means triggering after fulfilment of all trigger
conditions.

Sequence BREAK means triggering is obtained if a trigger word is found
which is not in the right sequence.
In the sequence break trigger mode, one trigger word per step can be
set. Each trigger word may be with or without delay, the last step
refers (with a GOTO statement) to a step earlier in the list to obtain
the sequence.
Note that in the following example, if WRD1 or WRD2 is found in the
sequence WRD3->WRD4->WRD5->WRD3 also triggering occurs (also if WRD1
or WRD2 are sampled with another clock). Refer to Fig. 4.3.

1 FIND WORD 1
2 FIND WORD 2
3 FIND WORD 3
4 FIND WORD 4
5 FIND WORD 5
6 GOTO STEP 3
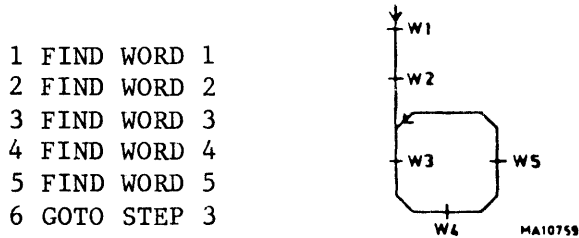
Fig. 4.3 Example of trigger on sequence break.

If the initial setting TRUE is desired, press the -> or V key to
proceed.

-------FIND WORD------
    1   1->2   1 OR 2   -----   -----   -----   END   EDIT

The Find Word keys control the trigger word selection in this step.
    1   = find word 1
1->2   = find word 1, immediately followed by word 2 (next clock
                        sample; no matter which clock).
1 OR 2 = find word 1 or word 2 (this can be:
                        a Boolean relation:
                        find word 1 or find word 2,
                        or a conditional relation when combined
                        with If ---- Then ---- statement.

END   puts the END statement in the next step, after which the
        trigger output signal(s) can be selected, if required.
        The END statement is not selectable in the first step.

EDIT   The sequence list is aborted from the cursor position
        downwards, permitting easy modification.


```
                              -----LTA-----
DELAY   -----     -----     ENABLE   WAIT   NEXT     -----     -----
```

DELAY   If this key is pressed, the delay value can be entered via
        the decimal keys of the hex key pad.
        After entering the delay value use the appropriate soft key
        key to obtain the unity of delay being selected.

ENABLE/WAIT LTA is the trigger-linkage function.
-ENABLE LTA The Logic State Analyzer enables triggering of the
             Timing Analyzer. This is selectable in the COMBI-
             as well as in the SYNC mode.
-WAIT LTA   The triggering of the Logic State Analyzer is enabled
             by triggering of the Timing Analyzer.

NEXT   initiates the next step in the sequence.


```
STATES   OCCUR   USEC     MSEC     SEC     -----    -----    -----
```

If DELAY has been selected these softkey functions become available.

STATES   The delay is a number of state clocks (0--65535).
          The clocks activated in the configuration menu or a
          combination of these clocks can be specified.
OCCUR   The delay is by occurances (0--65535) of a specific word.
          This word can be the same word as used in the trigger step
          itself, or word A.
USEC MSEC SEC
          Provide a delay in time. (0--999 for usec and msec;
                                    0--65 for sec.)


```
---------------------ON CLOCKS------------------------
   0       1       2      0+1      0+2     1+2     0+1+2    -----
```

          Here you can select the clock(s) related to the earlier selected
          states delay.
          Note that the ´+´ sign means a logic ´OR´.

```
---------IF WORD----------
 2        2->3   2 OR 3    -----      -----    NEXT     -----    -----
```

        Gives the possibility to check for 1, or 2 or an immediate follow
of two words, combined with the delay function.
If key NEXT is pressed the next trigger step is initiated, and we
just have a simple form of delay.

```
-IN---    -AT--
DELAY     DELAY    -----     -----      -----     -----     -----     -----
```

        Here you can extend the trigger delay function.
The above trigger word(s), or combination of words can be
selected to be found during the delay, or at the end of the
delay. Pressing either of these, results in the appropriate
soft key text, being entered into the trigger sequence plus the
prompt ´THEN STEP´. Following this we must enter the step number
to which we require the trigger sequence to brancg to, if the
´IF...THEN´ condition is meet. Upon entering entering this step
number via the hex pad the soft keys respond with the following:

```
ELSE
STEP      -----     -----      -----     -----    NEXT      -----     -----
```

        If the NEXT key is pressed, a new step is generated. In addition
the instrument assumes that, if the ´IF...THEN´ condition is not
fulfilled, the trigger sequence should continue from this new
step number. Should we not require this, then use of the
´ELSE STEP´ key enables free definition of the step number at
which the trigger sequence should continue.

Up to now we completed an example of a rather extended trigger step.
Try other trigger functions for your self.

4.13

Timing trigger menu

```
                    TIMING TRIGGER MENU

        TRIGGERMODE    WORD

                             EXT ┌─CHAN─┐
                                 76543210
        TRIGGER OCCURS AT     WORD X  00001111 VALID > OR = 100 nSEC


        TIME DELAY          0    nSEC

        FINAL DELAY         127  TRANSITIONS


         TIMING CHANNEL LABELS:
        7=CLK   6=ST   5=RD   4=WR   3=CEN  2=PORT  1=INT  0=BIT7



    nSEC   ASIG   nSEC  ───   ────   ────   ────   ────
```

Fig. 4.4 Timing Trigger Menu

The main functions in this menu are, from top to bottom:

                TIMING TRIGGER MENU
        -TRIGGER MODE

        -TRIGGER OCCURS AT

        -TIME DELAY

        -FINAL DELAY

        -TIMING CHANNEL LABELS

Triggering can be done with the aid of a trigger word, a glitch,
and a trigger window. The trigger word includes the external trigger
/trigger qualifier.

The trigger glitch can be selected on one channel; the trigger bit on
that channel in the trigger word is then automatically switched off.

Note that with glitch triggering, triggering occurs at the trailing
edge of the glitch.

TRIGGER MODE
    The following main trigger modes are selectable here:
    -WORD
    -GLITCH IN WORD
    -GLITCH IN WINDOW
    If glitch triggering has been selected, the glitch-line appears in the
    trigger menu.

TRIGGER OCCURS AT/AFTER ---

Five different trigger functions are possible:

1) AT WORD
   Triggering occurs when the
   trigger word has been true
   for at least the selected
   valid time.
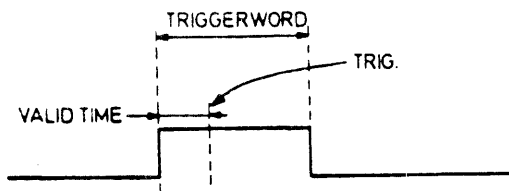
2) AFTER WORD
   Triggering occurs at the
   trailing edge of the
   trigger word, if this
   word has been true for
   at least the valid time.
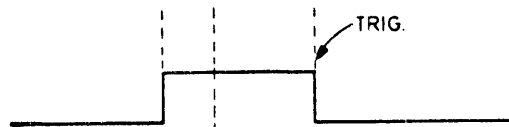
3) AT WORD AND GLITCH
   Triggering occurs when
   the trigger word has
   been true for at least
   the valid time, and a
   glitch is present in
   the remaining time of
   the word.
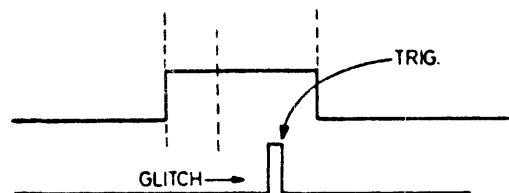
4) AT WORD AND GLITCH
   IN WINDOW
   Triggering occurs when
   the trigger word has
   been true for at least
   the valid time, and a
   glitch has been present
   in the following window.
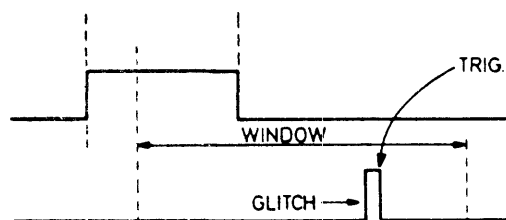
5) AFTER WORD AND
   GLITCH IN WINDOW
   Triggering occurs when
   the trigger word has
   been true for at least
   the valid time, and a
   glitch has been present
   in the window following
   the trailing edge of
   the trigger word.
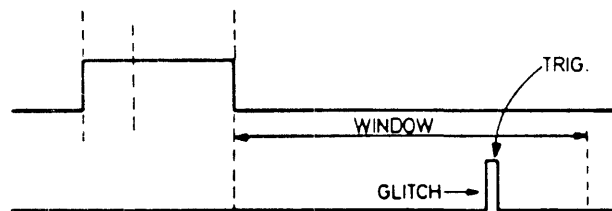
Of course you noticed already
that the glitch valid time
could be set at a higher value
than e.g. the word valid time.
In this case triggering occurs
if the trailing edge of the
glitch is present in the
remaining time of the trigger
word.
The same applies to
glitch-in-window triggering.
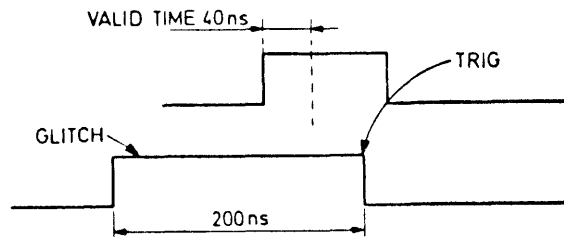
To be exactly, note that the
glitch triggering in the timing
display is as shown in next figure.
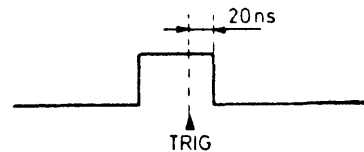
EXT
Next thing you can select is the external trigger qualifier. This
signal can be a 0, 1, or X.

CHAN
The eight bits of the trigger word are displayed here. Each bit
(except those bits which have been switched-off in the Configuration
menu) can be set to a 0, 1, or X.

VALID > OR =
This is the valid time setting for the trigger word (and the
qualifier). Adjustable time: 20...300nS.
The trigger condition must be true for at least the selected time.
In this way you can suppress erroneously triggering due to parasitic
glitches.

If the glitch triggering has been selected, also the ´glitch line´ is
displayed.
The trigger glitch can be selected on one of the timing channels.

VALID < OR =
This is the valid time setting for the trigger glitch.
Glitches which are longer than the selected time are neglected.
Adjustable time: 20...300nS.
Note that the capture mode effectively prelongs a glitch shorter
than 20ns to 20ns.

The next line shows:
TIME DELAY if you have selected trigger on WORD or GLITCH IN WORD, or
TRIGGER WINDOW if you have selected GLITCH IN WINDOW.
The time is selectable via the decimal keys of the hex keyboard
(max. approx. 20 mS).

-TIME DELAY
This is the delay between presence of the trigger condition and the
start of the final delay.
-WINDOW
This is a time window during which a trigger glitch can be detected.
This window opens at the end of the valid time of the trigger word, or
at the trailing edge of the trigger word (AT or AFTER respectively).
Triggering occurs if during this time window a glitch of less than the
specified length occurs.

The next line shows:
FINAL DELAY
This is the delay which gives pre-, center- or post data with
respect to the end of the Time Delay.
The final delay can be set with the softkeys PRE, CENTRE and POST,
or can be set to any value between 0 and 255 with the decimal keys
of the hex keyboard.
PRE   : The memory of the timing analyzer is filled with data
             present just before the end of the time delay (delay=25).
CENTRE   : The memory is filled with data ´centered´ before as
             well as after the end of the time delay (delay=127).
POST   : The memory is filled with data appearing just after
             the end of the time delay (delay=230).
If pre- or post trigger data setting is selected via the softkeys,
a default overlap of 25 transitions is used.
Refer to Fig. 4.5.
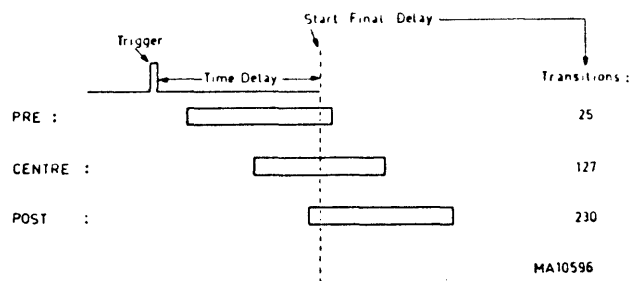
TIME DELAY and FINAL DELAY

Fig. 4.5 Time Delay and Final Delay

TIMING CHANNEL LABELS
With the cursor on this function one can compose a label-name for each of
the eight timing channels. The various softkey functions enable alpha-
numerical label-names of max. 4 characters, and are reproduced in the
timing diagram.

4.1.3   DATA MENU

Press the FULL- and the DATA key in the MENU area.
If you had selected a stored mode before, the data menu will be as it was
stored.

```
                    DATA ACQUISITION MENU

            DATA SELECTION:BLOCK 1+2 ON
              1.CAPTURE    :CLOCKS 0
                SAMPLE FROM:WORD 1        TO:WORD 2
              2.CAPTURE    :CLOCKS 1
                SAMPLE FROM:WORD 2        TO:WORD 5 + DELAY
              COUNTER      :ON
                COUNT      :TIME
                START AFTER:WORD 1
                FINISH AT  :WORD 2

    WD CLK  AAA BBBB CCCC DDDD EEEE FFFF GGGG  9 F
     A   0  XXX XXXX XXXX 0020                 X T
     B   0  XXX XXXX XXXX 0040                 X T

     1   0  XXX XXXX XXXX XXXX                 X T
     2   0  7E6 021C 4C00 22FF                 X T
     3   1                      00438 4C66 00FF X T
     4   1                      00438 3A67 F4FF X T
     5   0  7E6 021C 4412 10FF                 X T


    ┌DELAYED  EDGE┐ ┌DELAYED LEVEL┐ ┌─NOT DELAYED─┐
     █ f █  █ ↑ █  █ ↑ █  █ 0 █  █ H █ █ L █ █ X █ ────
```

Fig. 4.6   Data Menu

Now the SELECTIVE DATA ACQUISITION MENU is on the display.
This menu has two functions:
1. Selection of data which will be stored in the Analyzer´s memory.
2. Enabling of a counter which counts the number of specific
   samples (word- or clock related), or the time between two
   selected words.

Both functions may be enabled at the same time.

Note that this menu applies only to the State Analyzer, and works
in both the trigger sequence true- and trigger sequence break modes.

The data menu is divided in 3 main fields, from top to bottom:

```
            **SELECTIVE DATA ACQUISITION MENU**
    -DATA SELECTION: (BLOCK1)
                     (BLOCK2)


    -COUNTER:---


    -WORDS LIST
         -
         -
```

DATA SELECTION can be switched on or off.
DATA SELECTION means making a selection of the data to be stored in
the Analyzer's memory.
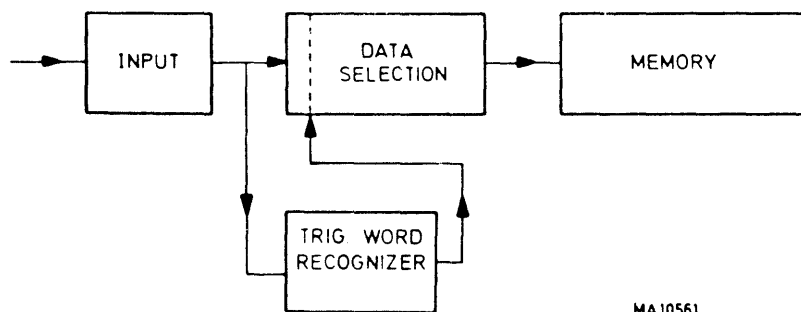
Fig. 4.7   Principal Block Diagram Data Selection

Data selection is very usefull, when collecting certain groups of
data from a programm run, e.g. jump routines in a repetitive loop.

Selective data acquisition is effective in so-called blocks;
two different blocks can be defined at the same time. The blocks
are numbered with 1 and 2.

Four kinds of selective data acquisition are possible:

ONLY CLOCKS
-Only samples on specified clock(s)

WORD AND CLOCKS
-Only words A or B and samples on specified clock(s)

ONLY WORDS
-Only words A or B

WORD A + DELAY
-Only words A followed by a certain number (1--255) of samples on the
 specified clock(s). This number of samples is the same for both
 blocks.
 REPEAT   This combination may be repeated a number of times (1--512).
 ALWAYS   The word A +delay capture combination runs continuously
           up to the end.

Some restrictions on the use of words A and B in selective data
acquisition:
Two or three items of the following list don't go together:
-Trigger on sequence break
-Selective data acquisition with word A and delay
-Selective data acquisition with word B
So only one of these three may be selected, otherwise one of the
following error messages can be displayed:
-NOT A+DLY + BRK
-NOT WRD B + BRK
-NOT WD B+ A+DLY

Blocks are defined by a START and an END.
The start of a block can be:
-START, this is the start of data acquisition.
-WORD, this can be any of the words of the trigger menu.
-WORD+DELAY, this enables starting of data acquisition, when the delay
            counter following a specified word is fulfilled.
The end of a block can be:
-END, this is the end of data acquisition, so the final triggering.
      END can be used if the block starts with START, or with a WORD .

-NEXT, this is the following event in the trigger sequence.
      It can be the next word found, or the fulfilling of the
      following delay counter. Very usefull for conditional branches.

      NEXT can only be selected if the block starts with a WORD.

-WORD, this is a word of the trigger list.
      If for start a word has been selected, the number of the end
      word may not be lower than that of the start word.

-WORD+DELAY, a word can be followed by the delay coupled to that word
            in the trigger menu.

COUNTER

The counter is a function which can count samples or time between two
defined points.
Counting can be specified as:
ONLY CLOCKS, the number of samples with the specified clock(s)
            will be counted.
WORDS+CLOCKS, only words A or B with the specified clock(s) will be
            counted.
ONLY WORDS, only words A or B are counted.
TIME, time measurement

The count result is indicated in the State List display.

The counter is only enabled in a window. This window is defined by
a start and an end, and can be set as follows:

START AT can be specified by START, or by a word of the trigger list.
      START is the start moment of data acquisition
      WORD is one of the words of the trigger list.
      WORD+DELAY is one of the words of the trigger list with the delay
      coupled to that word.
FINISH AT can be specified by END, NEXT, or WORD.
      END is the end of data acquisition (final triggering)
      NEXT is the next word in the list.
      WORD is one of the words of the trigger list.
      WORD+DELAY is one of the words of the trigger list with the delay
      coupled to that word.

WORD LIST
      This list shows the words as selected in the trigger menu with
      words A and B.
      Words A and B serve as words to be counted.
      Word B appears only if it is not used as word 7 in the trigger
      list.

Note that the trigger words as selected in the trigger menu cannot be
changed in the selective data menu. For selection of the words A and B
and the belonging qualifiers refer to the trigger menu description.

4.1.4   COMPARE MENU

Press the FULL- and the COMPARE key in the MENU area.


```
                         COMPARE MENU

              IF AUTO THEN:SPEED IMMED
                          :STOP ON COMPARE EQUAL

                   STATE SECTION:ON

              COMPARE LABELS  :
                  ▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓
              COMPARE BLOCK   :FROM CUR MEM/LINE# +40   TO +200
                              :REF MEM/LINE# +44
              COMPARE CLOCKS  :0


                   TIMING SECTION:OFF




              ▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓

                  ┌────────────ONLY CLOCK────────────┐
        0+1+2  ▓▓▓ 0 ▓▓▓ ▓▓▓ 1 ▓▓▓  2   ▓▓0+1▓▓  0+2    1+2    ─────
```

Fig. 4.8   Compare Menu

Now the Compare menu is on the display; we have now the possibility
to compare two blocks of data.
One block is current data (stored in the acquisition memory),
the other block is data in the reference memory of the analyzer.

Comparison can be done for data in the state section as well for data
in the timing section, and can be done in both the manual- and the
auto start mode.
Note that also comparison is possible in the COMBI- and SYNC modes.

The main functions in the compare menu are:

                    COMPARE MENU

                    -IF AUTO THEN   :--

                    -STATE SECTION :--

                    -TIMING SECTION:--

IF AUTO THEN :
The auto restart display time is adjustable here. This is the time
between final triggering, and the start of the next data acquisition.
You can adjust this time between 1...9 sec, or IMMEDiate.
With Immed the maximum compare frequency rate is obtained.

Note that this setting is not only applicable in the Compare mode, but also in the non-compare auto mode.

In the Auto Compare mode the following functions are selectable:
-STOP ON COMPARE EQUAL
 Data acquisition and comparison continue until an equal compare has been found.

-STOP ON COMPARE NOT EQUAL
 Data acquisition and comparison continue until an unequal compare has been found.

-COUNT FAILURES AND SUCCESSES
 Data acquisition and comparison continue until you press the STOP key. In the meantime the numbers of FAILURES (unequal-comparisons) and SUCCESSES (equal comparisons) are counted.
 The results are presented in the data display.

STATE SECTION :
This function can be switched on or off.

COMPARE LABELS:
Gives the possibility to select which labels, must be compared.
Selection of the labels is done with the soft keys.

COMPARE BLOCK:
With this function you can define the blocks in the current- and reference memory which must be compared.
Note that thanks to the versatile compare features, data blocks in different areas of both memories can be compared, refer to Fig. 4.10.

CURRENT
DATA
MEMORY

REFERENCE
DATA
MEMORY
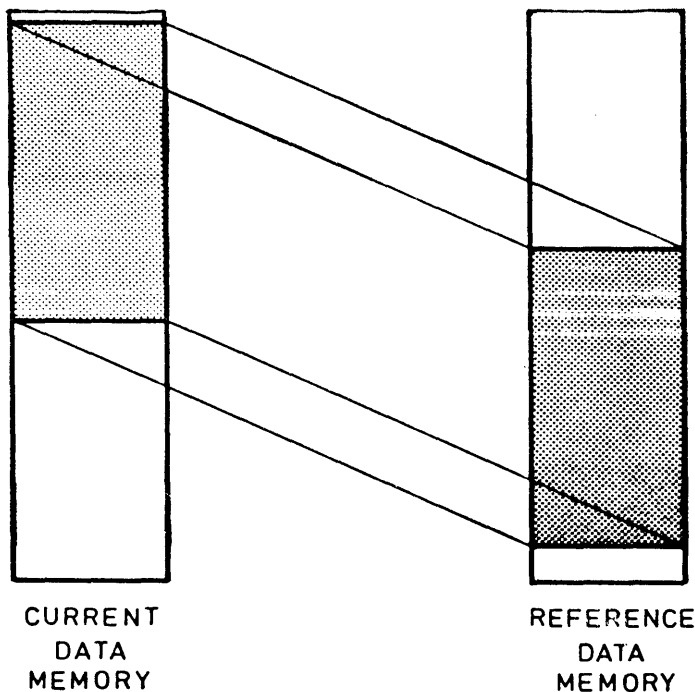
Fig. 4.10 Comparison of shifted memory blocks

In this case a line number, or a word number limit specification is required.

The beginning of a block can be defined with:
-MEM/LINE# this may be any number between -1023 and +1023.
-TOP this is the beginning of the memory.
-WORD this is a word of the trigger list.

The end can be defined with:
-MEM/LINE# this may be any number between -1023 and +1023.
-BOTTOM this is the end of the memory.
-WORD this is a word of the trigger list. The word number must be
    higher than that of the word defining the start of the block.

When MEM or LINE numbers have been entered, the compare function searches for MEM or LINE numbers which are present in both memories. So a lower number may be entered to point to the beginning of a block, and a higher number may be entered to point to the end of a block. Compare from MEM or LINE# -1023 to MEM or LINE# +1023 is possible.

Compare from TOP to BOTTOM can be used if the start of data acqusition is fixed; e.g. with selective data acquisition starting from WORD1. If also pre-trigger data might be present in the memory, compare from top to bottom is not recommended because the start of data acquisition generally is not fixed.

The block length of the reference memory is always the same as the length of the current memory block.

Depending on the selected current memory limits, the reference memory limits are generally specified as SAME. In case VAR has been selected, a MEM/LINE# in the reference memory can be specified as start of the reference memory block.

Line number off-set and cursor displacement
It stands to reason that reference data and current data must be sampled with the same instrument setting such as trigger word, delay, etc.
However if data have been sampled with different trigger delay, note that the following may happen.
In this example we assume that the trigger delay was 200 in the reference data, and 300 in the current data; we want to compare current data line numbers -10 to 10, with reference data starting with line number 0.
After comparison we select succesively Current-, Reference-, and Compare display as indicated in Fig. 4.9.1--3. If screen overflow occurs in Compare display select hex label base.

First (Fig. 4.9.1) we select the Current display with the cursor on TRIG.
When we select now the Reference data display, note that the cursor position is at 10 (this is because current line -10 was compared with reference line 0, so current data line TRIG (=0) corresponds with reference line 10).

When we select now the Compare display, we will see the combination of the former two displays. In the current list the unequals are displayed in reverse video. Line numbers 11 and 12 of the current list show no unequals, and line numbers 21 and 22 in the reference list are not displayed, because they where not included in comparison.

Next we go back to Current display and put the cursor at e.g. 100 (refer to Fig. 4.9.2). Switching-over to the Reference display, we´ll find line number 110 in the top of the list (this is the same difference as in Fig. 4.9.1).
In the Compare display we don´t find any unequal in the current list, and no data in the reference data at all (these sections of the memories have not been compared).

In the last example (Fig. 4.9.3) the cursor displacement is shown. Assume we select the Current display and put the cursor at line number 288. Line number 288 to 300 incl. are displayed.
When we now select reference display we will see line numbers 188 to 200 incl. on the display. Did you expect line numbers 298 to 310? Because the trigger delay for the reference data was only 200 (see above), line number 200 is the last line in the reference display. When we switch back to the Current display we will now find line numbers 178 to 190 incl., so due to the difference in the number of post-trigger lines the cursor has been displaced.
The same phenomena of cursor displacement will appear when switching over from Current display to Reference display and vice versa.

COMPARE CLOCKS
It is also possible to select samples for comparison by their clocks.

STATE COMPARE PRINCIPLE
After the compare function has been started, the analyzer searches for an unequal in the memories, starting from the beginning of the sections to be compared. As soon as an unequality has been found, the message NEQ is displayed, and the analyzer starts the data list display routine.
If no unequality is found, the compare function runs up to the very last character at the end of the sections to be compared. Next the EQ message is displayed, and the data list display is started.
Note that it may take a considerable time to compare memories to the full extend (from line 0 to 1022 over 35 channels may take up to 57 sec.).
So it is quite handy to delete data for compare, in which you are not really interested.
Note that in SW rel. 1.0 and 1.1 automatically a compare is executed after pressing the Store Data key. This costs time, because then two memories with the same contents are compared.

DISPLAY:

CURRRENT (DELAY: 300)	REFERENCE (DELAY: 200)	COMPARE
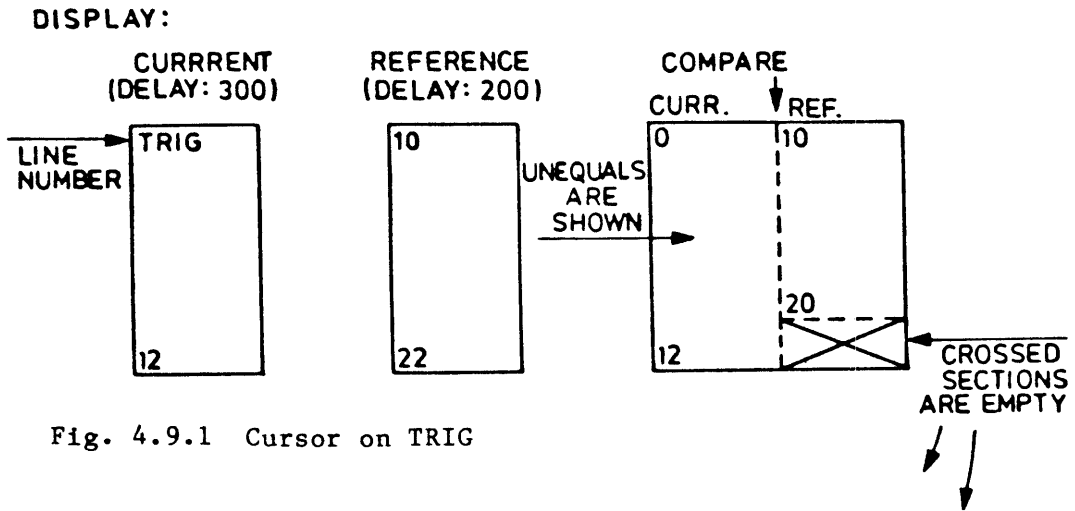
Fig. 4.9.1 Cursor on TRIG
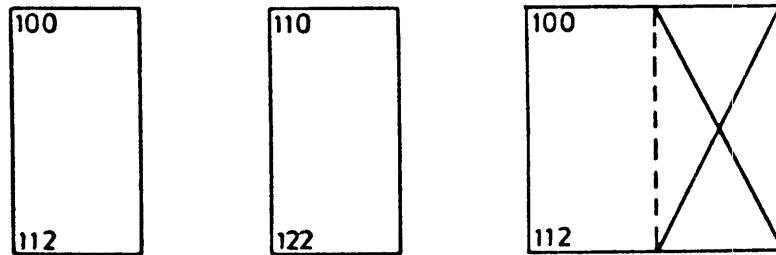
Fig. 4.9.2 Cursor on +100
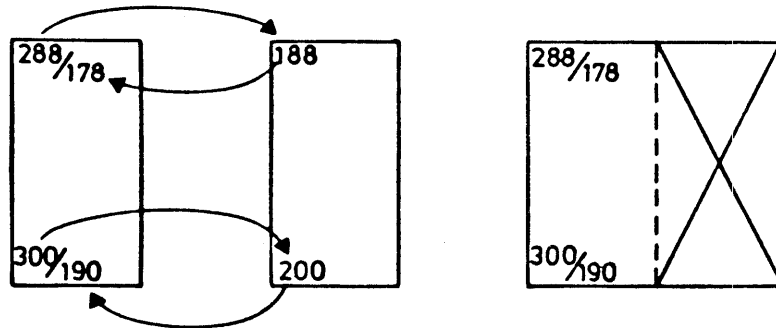
Fig. 4.9.3 Cursor displacement

MA1076B

Fig. 4.9 List line or mem number off-set and cursor displacement examples with compare.

TIMING SECTION :
Can be switched on or off. Refer to Fig. 4.10.1 and 4.10.2.

COMPARE CHANNELS
Each channel can be switched on or off for comparison.

:FROM TRIG
Can be switched on or off.
Refer to Fig. 4.10.1 and 4.10.2.

COMPARE CHANNELS
Each channel can be switched on or off for comparison.

:FROM TRIG
Time value of the beginning of the block to be compared with respect
to the trigger point (+ or -).

:LENGTH
Time value of the length of the block to be compared.

:SKEW
This is the maximum time value of the allowed difference between a
current edge and the corresponding reference edge (absolute value).
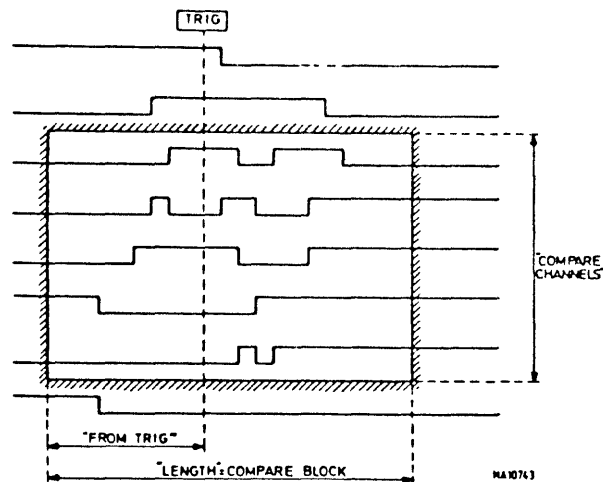
Fig. 4.10.1 Timing compare
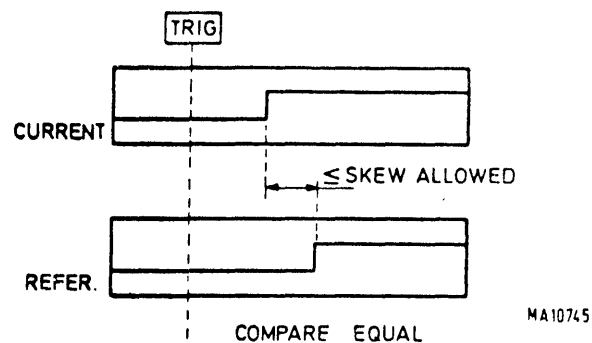
Fig. 4.10.2 Maximum allowed skew with timing compare

4.1.5 OPTIONS MENU

Press the OPTION key in the MENU area.

OPTIONS MENU

```
PRINTER  -ON                    IEEE488  -ON
BAUD RATE-9600                  ADDRESS  -26
SEND     -PAGE                  SEPARATOR-CRLF


DISASSEMBLERS
A-PACKAGE MOTOROLA INTEL
- Z80     - 6800   - 8080
- 8085    - 6809   - 8085
- 68000   - 68000  - 8086MIN
                   - 8086MAX
```

```
OFF   ON  ————  ————   ————  ————  ————  ————
```

Fig. 4.11 Options Menu

Now the options menu is on the display.

The main sections of this menu are:

OPTIONS MENU

INTERFACE:

DISASSEMBLERS:

INTERFACE

The interface can be a:
-Printer interface only.
-IEEE-488 talker/listener interface, and RS232C printer interface.
-RS232C control interface, and RS232C printer interface.

Printer:
The printer must be provided with an RS232C interface. The Baud-rate
of the Logic Analyzer I/O can be set to the standard values from
110 to 9600.

The printer driver is controlled by putting the cursor at the PRINTER
line and pressing the softkeys ON or OFF.
With the cursor at the BAUD RATE line the Baud rate can be set with
the softkeys.

With the cursor at the SEND line, the following print-commands are selectable:

DISPLAY PAGE
The printer prints a copy of the analyzer´s display.

ALL DATA
All data captured by the state analyzer as well as the condensed menu, is sent to the printer.
There are three possibilities to print out the state information.
-Current list
-Reference list
-Compare list

Current list
The contents of the current memory i.e. the acquisition memory is sent to the printer.
This mode is obtained by pressing the Current key in the Data Display field, i.e. calling up the current listing on the screen prior to pressing the Print key.

Reference list
The contents of the reference memory is sent to the printer. This is obtained by pressing the Ref key in the Data Display field prior to pressing the Print key.

Compare list
If the state section of the Compare menu has been filled-in, calling up a compare list on the screen by pressing the Compare key in the Data Display field will result in the compare list to be sent to the printer upon pressing the Print key.
The current list and the reference list will be printed next to each other. Differences between both memories will be underlined in the current memory list.

DATA+MENUS
The full instrument setting and the data in the acquisition memory are sent to the printer.

ALL MENUS
The full instrument settings are sent to the printer.

The print action is started by pressing the I/O CONTROL Print key (the printer starts with a form feed).
The print action is halted by pressing this key again.

DISASSEMBLERS

A Disassembler is a programm which converts the machine code of a specific
micro processor into the corresponding assembly language.
In fact a disassembler is similar to the resident processor micro-
programms. Only a disassembler translates the machine code, where the micro
processor executes the machine code.
The disassembler programm knows how to distinguish opcode from data.

Disassembler programs are located in various disassembler packages, as
indicated below:

Disassembler Package:	Features
A	Most common micro processors
M	Motorola micro processors
N	Intel micro processors
Z	Zilog micro processors
R	Other micro processors and IEEE488/IEC625 disa

A disa package consists of a small p.c.board provided with some proms.
Disa packages (max. 4) are located on the options board.

For detailed information such as installation, connection, etc. refer to
chapter 9.

A disassembler program is selected by putting the cursor on the specific
micro processor on the display, and pressing the activ ON softkey. This
automatically sets the labels, base and logic in the configuration menu for
the selected micro processor (check this).

Disassembler display:
The header of a LIST display shows the selected micro processor and the
specific assembly functions such as:
-Status
-Addres
-Data
-Mnemonics
-Operand
-Int

The following softkey functions are possible:

DISPLAY   or   DISPLAY
FORMAT   POSIT
The Display Format function permits control of the Blank, Recall and Invert
functions.
The Display Position function permits control of the data cursor, such as
Cursor, Find, Page+ and Page-.
For more information on the display control refer to chpt: List Display.

SYNC   or   SYNC
AUTO   MANUAL
A disassembler program requires micro processor status information to
distinguish instruction code from data etc., otherwise correct disassembly
is not possible.
Some types of micro processors (e.g. 8085) deliver sufficient status
information; in this case the AUTO- and MANUAL SYNC softkeys are not
activated.
With other micro processors, a selection can be made of Automatic
Synchronization, or Manual Synchronization. See below.

SELECT   or   SELECT
STATE   DISA
If the Select State function has been selected the disassembly functions
disappear from the display. Any additional signal information next to the
disassembler, is also displayed.
If the Select Disa function has been selected the complete disassembly
functions are on the display, without any additional signal information.

Manual Sync functions
Select the Disassembler program in the Options menu.
Start a single shot data acquisition (no selective data, nor compare data
activated).
Depress Sync Manual.
Depress Select Disa.
The disassembler presumes that the upmost line of the data list is
an instruction, or the first byte of an instruction, and takes this line as
a sync reference for the disassembler program.

Depress Display Format.
The disassembler program is now in the Retain Sync mode, this means that
when scrolling or paging the data list on the display, the original sync
reference remains. (note that the softkey shows Set New Mansync, this means
that the disassembler is in the Retain Mansync mode).
Data lines before the sync reference can not be disassembled.

If now the Set New Mansync key is depressed, (the key shows Retain Mansync)
the sync reference is always the upmost line of the data list. Each time
after scrolling or paging, the upmost data line is automatically taken as a
new sync reference.

When a disassembler has been selected the configuration is automatically
set for the specific micro processor.
Normally this configuration need not to be changed. However the
configuration can be adopted to met special requirements.
To this end, after selection of the disassembler you can switch back to the
configuration menu and change e.g. clocks or qualifiers. The labels however
cannot be changed.

For full details on specific micro processor disassemblers, connection,
etc. refer to chapter 9.

SETTING MEMORY

This is a non-volatile memory which stores up to four different instrument settings. This memory consists of a small p.c. board provided with some EEPROMs, and is located on the I/O and Options board; refer to ???
Note that there is a STORED and a SAVED softkey in the Configuration menu. For directions for use refer to the description of the Congiguration menu.

4.2 CONDENSED MENUS

GENERAL INFORMATION

A condensed menu is meant as a "quick reference guide" when you are looking
at a data display, and contains the most important information of
the corresponding full menu.
There is a condensed menu for each available full menu (except the option
menu).
A condensed menu is displayed in the upper six display lines, above
the data.
Generally settings present in the condensed menu can be changed by pressing
the Cursor in Heading key, positioning the cursor, and entering the desired
setting.

The menu name is always in the centre of the top line.
The top left corner locates the operator warnings, such as:
INVALID KEY, OVERRANGE, etc.
The right top corner is reserved for the acquisition message.
Direct after start of acquisition the message: ACQUISITION STARTED
is given.
In the following descriptions is presumed that one of the keys LIST,
GRAPH, or TIMING has been depressed.

CONDENSED CONFIGURATION MENU

Press the CONFIG key.

```
                    CONFIGURATION MENU
        CLK0=ƒ ABCD___ CLK1=ƒ ____EFG CLK2=OFF

        FORMAT AAAA BBBB CCCC DDDD EEEE FFFF GGGG
        LOGIC  POS POS  POS  POS  POS  POS  POS
        BASE   HEX HEX  HEX  HEX  HEX  HEX  HEX

        LIST CURRENT STATE    COUNTER = 197 µSEC        MEM
        MEM #  AAAA BBBB CCCC DDDD EEEE FFFF GGGG
        2  377               03FF 0012 08FF
        2  378               03FF 0002 08FF
        2  379               03FF 0002 08FF
        2  380               03FF 0002 08FF

        2  381               03FF 0032 08FF
        2  382               03FF 0002 08FF
        2  383               03FF 0012 08FF
        2  384               03FF 0002 08FF
        2  385               03FF 0072 08FF

        2  386               03FF 0002 08FF
        2  387               03FF 0072 08FF
        2  388               03FF 0002 08FF
        2  389               03FF 0012 08FF

        ┌──────LABEL──────┐ ┌──────────────┐ ┌────────────┐
        BLANK  INV  RECALL CURSOR  FIND  NEXT  PAGE+  PAGE-
```

Fig. 4.12 Condensed Configuration Menu

The top line of the condensed menu shows which clocks have been activated,
and the corresponding channel labels.
The three remaining lines show the display format, -logic and -base of
the input data.

CONDENSED TRIGGER MENU

Press the TRIG key.
Remember that in the Combi mode pressing this key, consecutively displays
the State-, and the Timing trigger menu.

Condensed state trigger menu

```
                      STATE TRIGGER MENU
W1  0  7E6 021C 4A66 0000
W2  0  7E6 021C 3A11 4000
W3  1                3FF 0012 0800

FINAL DELAY = 1000  STATES OF CLK 0+1

LIST CURRENT STATE     COUNTER = 1.6  uSEC              TRIG
LINE # AAA BBBB CCCC DDDD EEEE FFFF GGGG
    516 7E6 021C 3A11 4000
    517 7E6 021C 2E61 0000
    518 7E6 021C 3000 1400
    519 7C5 0006 8C00 0200

    520 7C5 0006 8E1C 3200
    521 7E6 021C 4412 1000
    522 7E6 021C 4602 0100 03FF 0002 0800
    523 7E6 021C 4800 1000
    524 7E6 021C 4A66 0000

    525 7E6 021C 4C00 2200
    526 7E6 021C 4E4E 7500
    527 7E6 021C 5012 1000
    528 7E5 0006 8C00 0200
```

Fig. 4.13 Condensed State Trigger Menu

The triggerwords are displayed with active clock edge, and triggerword
false or true indications.
Maximum four triggerwords are displayed.
If you selected more than four triggerwords in the full triggermenu,
only the last four words are displayed here.
With the cursor up and down keys the remaining trigger words can be
scrolled visible.
If a final delay (this is the delay after the last trigger word) has been
selected, it is also displayed here.

The word in the top line of the data list can be copied in the trigger
words in the condensed menu.
-Put the cursor in the heading (this is the condensed menu).
-Set the cursor on the desired word in the condensed menu. If required use
 the scroll function to obtain another word in the trigger list.
-Press the STORE TRIGW key.

Condensed timing trigger menu
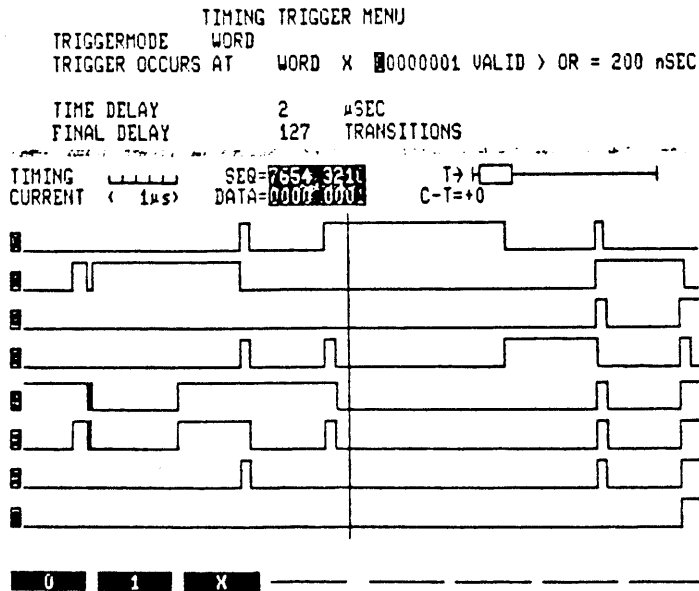
Fig. 4.14 Condensed Timing Trigger Menu

As an exception the condensed timing trigger menu shows all the timing trigger parameters.
The first line shows the Trigger Mode.
The second line shows the Trigger Qualifier, the Trigger Word and the minimal time (Valid For) during which the trigger condition must be true.
The third line (if present) shows the active channel glitch detection, with the selected valid time.
The next line shows the Time Delay, or the Time Window
The last line shows the Final Delay.

CONDENSED DATA MENU

Press the DATA key.

```
                    DATA ACQUISITION MENU
             DATA SELECTION:BLOCK 1+2 ON
               1.CAPTURE    :CLOCKS 0
                 SAMPLE FROM:WORD 1         TO:WORD 2
               2.CAPTURE    :CLOCKS 0
                 SAMPLE FROM:WORD 3         TO:WORD 4

       LIST CURRENT STATE                              TRIG
       LINE #  AAAA BBBB CCCC DDDD EEEE FFFF GGGG

       WRD1    7E6 021C 4A66 0000
       1  -22  7E6 021C 4C00 2200
       1  -21  7E6 021C 4E4E 7500
       1  -20  7E6 021C 5012 1000
       1  -19  7E5 0006 8C00 0200
       1  -18  7E5 0006 8E1C 3200
       1  -17  7E6 021C 3212 1000
       1  -16  7E6 021C 3402 0100
       1  -15  7E6 021C 3600 0200
       1  -14  7E6 021C 3867 F400
       WRD2    7E6 021C 3A11 4000
       WRD3    7C5 0006 8C00 0200
       2  -11  7C5 0006 8E1C 3200

          LABEL
       BLANK   INV  RECALL  CURSOR  FIND  NEXT  PAGE+  PAGE-
```

Fig. 4.15   Condensed Data Acquisition Menu

If data selection was enabled, the related block limits and
captured samples are given here, in the same lay-out as
in the full menu.
The counter setting is not shown in the condensed data selection
menu.

CONDENSED COMPARE MENU

Press the COMP key.

```
                      COMPARE  MENU
                  STATE SECTION:ON
             AAAA BBBB CCCC DDDD EEEE FFFF GGGG
         COMPARE BLOCK   :FROM CUR MEM/LINE#  +40   TO +200
                         :REF MEM/LINE#  +44
           COMPARE CLOCKS  :0

    LIST CURRENT STATE      COUNTER = 197  uSEC              TRIG
    MEM  #  AAAA BBBB CCCC DDDD EEEE FFFF GGGG

     2  377                      03FF 0012 08FF
     2  378                      03FF 0002 08FF
     2  379                      03FF 0002 08FF
     2  380                      03FF 0002 08FF

     2  381                      03FF 0032 08FF
     2  382                      03FF 0002 08FF
     2  383                      03FF 0012 08FF
     2  384                      03FF 0002 08FF
     2  385                      03FF 0072 08FF

     2  386                      03FF 0002 08FF
     2  387                      03FF 0072 08FF
     2  388                      03FF 0002 08FF
     2  389                      03FF 0012 08FF

           ┌──────LABEL──────┐   ┌─────────────┐   ┌─────────────┐
           │ BLANK │ INV │ RECALL │ CURSOR │ FIND │ NEXT │ PAGE+ │ PAGE- │
```

Fig. 4.16   Condensed Compare Menu

Condensed state compare menu.

This menu shows:
State section: ON
The block limits in the current memory as well as in the reference memory.
The clocks to be compared.

DESCRIPTION OF THE DATA DISPLAYS

5.   DATA DISPLAYS

There are two groups of data displays:
-List display
-Timing display (only with versions PM 3551/30/70)

The List display represents data from the Logic State Analyzer.
The Timing display shows data from the Logic Timing Analyzer.

Each data display is accompanied with a condensed menu, located at
the top of the data display. For description of the condensed menus
refer to chapter 4.2.

The display is divided in the following sections, from top to bottom:

(Error Message)   Menu Name   (Run)

                     Condensed Menu

    -------------- Data Display Heading ---------trig/man
        -
        -
        -                   Data Display
        -
        -
        -
        -

The menu name is always in the centre of the top line.
The top left corner locates the error messages, such as:
 INVALID KEY, OVERRANGE, etc.
The right top corner is reserved for the acquisition message.
Direct after start of acquisition the message: ACQUISITION STARTED
is given.

If the CURSOR IN HEADING key has been depressed, settings in the menu
can be changed.
If the CURSOR IN DATA FIELD key has been depressed, control is given
over the displayed data.

A specific data display is always selected by pressing the relevant
key in the DATA DISPLAY area.

The source for the data display can be selected with the keys:
CURRENT which displays the data from the current memory
REF   which displays the data from the reference memory
COMPARE which displays data from the current memory, and compares it
        with the reference memory data.
        Inequalities are indicated by reversed video presentation in
        the LIST, and underling in the TIME display. There is no GRAPH
        compare display.

In the following description of the displays, keys CURSOR IN DATA
FIELD and CURRENT have been depressed.

5.1 LIST

Press the LIST key.

```
                         STATE TRIGGER MENU
        W1  0  7E6 021C 4A66 0000
        W2  0  7E6 021C 3A11 4000
        W3  1                   83FF 0012 0800

        FINAL DELAY = 1000  STATES OF CLK 0+1

        LIST CURRENT STATE     COUNTER = 1.6  mSEC            TRIG
        LINE # AAAA BBBB CCCC DDDD EEEE FFFF GAGA

          516 7E6 021C 3A11 4000
          517 7E6 021C 2E61 0000
          518 7E6 021C 3000 1400
          519 7C5 0006 8C00 0200

          520 7C5 0006 3E1C 3200
          521 7E6 021C 4412 1000
          522 7E6 021C 4602 0100  03FF 0002 0800
          523 7E6 021C 4800 1000
          524 7E6 021C 4A66 0000

          525 7E6 021C 4C00 2200
          526 7E6 021C 4E4E 7500
          527 7E6 021C 5012 1000
          528 7E5 0006 8C00 0200
```

Fig. 5.1   Data List Display

List heading

The heading of the list display contains the following information:

LIST CURRENT STATE
MEM OR LIN NO < Selected Labels >

LIST	: The name of the display
CURRENT,	
REFERENCE or	
COMPARE	: The source of the displayed data.
STATE	: Means State list.
OLD	: Is shown if settings have been changed after acquisition.
MEM or LIN NO	: Memory address number or line number.

This is the sequential numbering of the samples in the memory.

MEM NO is used if the trigger word is not in the memory. E.g. final delay greater than 1023 samples.

LIN NO indicates that the trigger word is in the memory and gives the relation between the sample number and the trigger word.
The trigger word itself has number 0, but is indicated with TRIG.
Forgoing trigger words (arm words) are indicated as WRD1, WRD2 etc.
Samples before the trigger word have a ´-´ number;
samples after the trigger word have a ´+´ number.

Label line   This line shows the labels as selected in the
                    configuration menu.
                    With the cursor in the heading, labels can be deleted
                    or recalled, or the value can be inverted (refer to
                    the LABEL soft keys). See below.

List display

Data is represented under the selected labels, according to the
selected base, polarity, etc.
The list is generally 13 lines long; the top line is the data cursor
line.
The data cursor line is used as a reference between the list display
and the timing display in the sync mode, and the graph display, in
which the data cursor is a vertical solid line.
If no data are present in the memory, the list display is empty.

List set-up

The data list set-up is depending on the relation between
clocks and labels as selected in the configuration menu.

If each label is sampled with a specific clock, the succesive clock
number samples will be displayed next to each other (parallel display).
Refer to the following two examples:

CONFIG. MENU   LIST DISPLAY

1)
CL 0 label A   A   B   C
CL 1 label B   CL 0   CL 1   CL 2
CL 2 label C   -   -   -
                    -          -   -
                    -          -   -

2)
CL 0 label C   A   B   C
CL 1 label B   CL 2   CL 1   CL 0
CL 2 label A   -   -   -
                    -          -   -
                    -          -   -

Note that a clock 0 sample always starts a new line of the table.
A clock 1 sample is positioned on the same line when it follows
the clock 0 sample. In the same way a clock 2 sample is put on the
same line when it follows a clock 1 or a clock 0 sample.
If no clock 0 sample is present, a clock 1 sample can start a new
line. If no clock 0 and no clock 1 samples are present, a clock 2
sample starts a new line.
On the other hand, channels sampled by different clocks but with the
same label, will be displayed under the same label without any further
clock indication (serial display).

As there is no direct time relation between two successive lines of
the data list, there is also no time relation between samples with
different clocks on the same line. However the minimal time here is
longer than one clock cycle.

Softkey functions

With the cursor in the DATA FIELD the following softkeys are shown:

----- LABEL --------   ---------------------   -----------
BLANK INV. RECALL   CURSOR FIND NEXT   PAGE+ PAGE-

The LABEL functions control the presentation of the channels or
groups as shown in the List heading.
Pressing the BLANK key blanks the related column of data, resulting in
information being deleted from the screen and replaced by a column of
points.
The label-character is replaced by a dash.
With the RECALL key the column of data can be recalled.
The INV. softkey inverts the value in the related column; the label
is now shown as a undercase character. If this key is pressed again
the non-inverted values come back. Also if RECALL is pressed on an
inverted column, the non-inverted values come back.

The next group: CURSOR, FIND, NEXT, PAGE+, and PAGE- controls the
data cursor as a viewing-aid over the memory. Soft scroll of the list
is possible with the CURSOR SCROLL keys.
The top line of the displayed data list is the cursor word.
The NEXT softkey is only activated if a specific cursor word has been
selected.
With the PAGE+ and PAGE- softkeys the cursor can be paged through the
memory (this is + or - 13 lines respectively).

Pressing the CURSOR softkey shows the following softkey labels:

----   ----   ----   ----   -TOP-   BOTTOM ENTER   ABORT

Pressing TOP shifts the data list in such a way that the first memory
address appears on the top line of the list on the display.
Pressing BOTTOM shifts the data list such that the last memory address
appears in the bottom line of the list of the display.
Also a line number can now be given via the hex keypad, and entered by
pressing the ENTER softkey. A line number may be preceded with a ´+´
or a ´-´ sign.
Pressing the DELETE key on the hex pad resets the line number you just
typed before the ENTER softkey is pressed.
Pressing the ABORT softkey resets the cursor functions; the display
remains unchanged.
On pressing the FIND key the following soft key functions are shown:

                          MEM
----   ----   ----   CONT   TRIG   WORD   ----   ABORT

Pressing MEM CONT enables the entry of a user defined word via the hex
pad.

After pressing MEM CONT the following softkeys are activated:

```
____    ____    ____    ____    ____    COPY    ENTER    ABORT
```

Instead of the channel label indication above the data list, now a row
of dots is shown. The memory contents to be searched can now be
selected.
Note that there is a difference between a . (dot) and an X (don't
care).
-A . (dot) can be data or a space.
-An X (don't care) is only data.
The memory contents can be selected via the hex pad, also the . and
the X. In ASCII only the . and X are functioning.

By pressing the COPY softkey, the memory contents in the top line of
the data list on the display is copied.
Or a value can be entered via the hex key pad and pressing the ENTER
softkey.
Pressing the ABORT softkey resets this input.

Instead of using the MEM CONT function, also the TRIG softkey can be
pressed. This shifts the data list such, that the trigger word comes
in the top line of the data list.
The third possibility is by pressing the WORD softkey. Now one of the
words as selected in the trigger sequence list, can be selected to
appear in the top line of the list on the display.

The NEXT softkey functions if a Mem Contents, or one of the words of
the trigger list has been selected.
By pressing the NEXT softkey the next selected memory contents or
word appears in the top line of the data list on the display.
The NEXT function remains activ until labels have been changed in the
Configuration menu.

The NEXT function works for both the current- and the reference
memory.

When the Compare Display has been selected, the NEXT softkey puts the
next unequal comparison line in the top of the list. If there are no
unequals the NEXT softkey is not activated.

The NEXT function steps wrap-around through the memory for selected
memory conyents, or a word; or unequal comparisons in compare
display.

Cursor functions
_____

SCROLL UP, SCROLL DOWN   These functions feature soft scroll of
                         the data list.

SHIFT <- and -> control the set cursor position.

5.1.1 SELECTIVE DATA DISPLAY

```
                  DATA ACQUISITION MENU
         DATA SELECTION:BLOCK 1+2 ON
             1.CAPTURE    :CLOCKS 0
               SAMPLE FROM:WORD 1          TO:WORD 2
             2.CAPTURE    :CLOCKS 0
               SAMPLE FROM:WORD 3          TO:WORD 4

LIST CURRENT STATE                                  TRIG
LINE #  AAAA BBBB CCCC DDDD EEEE FFFF GGGG

WRD1    7E6 021C 4A66 0000
1  -22  7E6 021C 4C00 2200
1  -21  7E6 021C 4E4E 7500
1  -20  7E6 021C 5012 1000

1  -19  7E5 0006 8C00 0200
1  -18  7E5 0006 8E1C 3200
1  -17  7E6 021C 3212 1000
1  -16  7E6 021C 3402 0100
1  -15  7E6 021C 3600 0200

1  -14  7E6 021C 3867 F400
WRD2    7E6 021C 3A11 4000
WRD3    7C5 0006 8C00 0200
2  -11  7C5 0006 8E1C 3200


        ┌──────LABEL──────┐ ┌──────────────────┐ ┌─────────┐
        │BLANK│ INV │RECALL│ │CURSOR│ FIND│ NEXT │ │PAGE+│ PAGE-
```

Fig. 5.2 Selective Data Display

After triggering the display shows the selected data blocks with
indication 1 or 2 before each data line in the list.
If block 1 overlaps block 2, the indication 1 remains until the end of
block 1.

5.1.2 COMPARE DISPLAY

For comparison of data lists the following preparations are required:
-Store the reference data in the reference memory. This can be done
 by pressing the STORE DATA key by which data in the current memory
 is copied into the reference memory, or by storing external data
 via the I/O interface.
-Set the compare conditions in the state compare menu.

After pressing the DATA DISPLAY COMPARE key, both memories are compa-
red and the result of the comparison is displayed.

```
                  COMPARE MENU
               STATE SECTION:ON
            AAAA BBBB CCCC DDDD
      COMPARE BLOCK    :FROM CUR TOP TO BOTTOM
                       :REF SAME
      COMPARE CLOCKS   :0

LIST COMPARE STATE    COMPARED FROM MEM/LINE# -26 TO    0 TRIG
LINE # AAAA BBBB CCCC DDDD                                 NEQ

     -26 7E6 021C 4900 1000    -40 7E6 021C 5012 1000
 WRD1  7E6 021C 4A66 C000    -39 7E5 0006 8C00 0200
     -24 7E6 021C 4C00 3200    -38 7E5 0006 8E1C 3200
     -23 7E6 021C 4E4E 7500    -37 7E6 021C 3212 1000
     -22 7E6 021C 5012 1100    -36 7E6 021C 3402 0100
     -21 7E6 0006 9C00 0200    -35 7E6 021C 3600 0200
     -20 7E6 0006 3E1C 3200    -34 7E6 021C 3867 F400
     -19 7E6 021C 3E18 1000    -33 7E6 021C 3A11 4000
     -18 7E6 021C 3402 4400    -32 7E6 021C 2E61 0000
     -17 7E6 021C 3500 0200    -31 7E6 021C 3000 1400
     -16 7E6 021C 3867 F400    -30 7C5 0006 8C00 0200
 WRD2  7E6 021C 3A11 4000    -29 7C5 0006 8E1C 3200
     -14 7E6 021C 2E61 4000    -28 7E6 021C 4412 1000

  OFF   ON  ————  ————  ————  ————  ————  ————
```

Fig. 5.3 List display in the compare mode.

If no screen overflow occurs, both the current memory and the compare
block of the reference memory are displayed. If screen overflow
occurs, only the current memory is displayed.
Unequal bits or values are displayed in the current memory list in
reverse video.
COMP is indicated in the list heading and the compare result EQ or NEQ
is displayed.
Not-equal data will be displayed in reverse video.

State compare is also possible in the auto mode, featuring stop on
compare equal or not equal, or contioously counting failures and
successes.

5.2   GRAPH DISPLAY

Press the GRAPH key.

```
                    STATE TRIGGER MENU
       W1  0  7E6 021C 4A66 0000
       W2  0  7E6 021C 3A11 4000
       W3  0  7C5 0006 8C00 0200
       W4  0  7E6 021C 3402 0X00
        FINAL DELAY = 1000  STATES OF CLK 0


       GRAPH 10X  L=#44    CURSOR ON LINE #95    (CLK0)    R=#147
       CURRENT    TRIG'D   DATA=3000 (HEX)


       ██  8E1C




       LABEL=C




       ██  2E61


      ┌──HOR SCALE──┐   ┌──────────VERTICAL SCALE──────────┐
       █ 1X █  10X   █LABEL█ CHANGE  █LOWER█ █UPPER█ SHIFT █BEST█
```
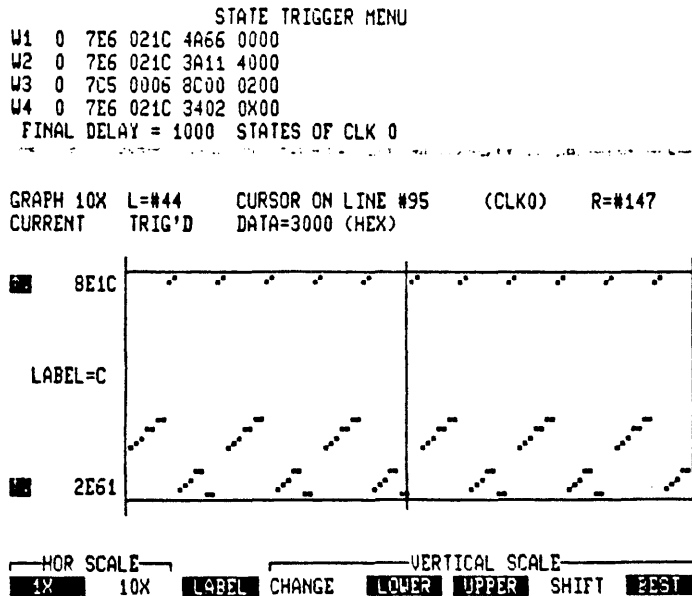
Fig. 5.4   Graph Display

A graph display gives a graphical representation of the contents of a
specified label, of the state analyzer memory.
The label may not be wider than 32 channels (=FFFFFFFF$_H$), nor may the
label-base be in ASCII.

The graphic display consists principally of dots. The vertical position of
a dot represents an analogue value.
The values of the upper and lower limit lines are selectable. Their values
are indicated at the left hand side of these lines.
All values higher than the upper limit, or lower than the lower limit, are
represented as single off-scale dots.

The horizontal axis of the graph is the sequence of the samples (from left
to right).
The resolution (max. number of positions) is:
        Horizontally: 104
        Vertically : 50 (+ 2 off-scale)

The horizontal scale can be set to X1 or X10.
In the X1 mode the memory depth is represented along the horizontal axis.
As only 104 dots resolution is available, some dots (max. 10) may be
positioned above each other. With samples having close analogue values one
dot may represent more than one sample.
In the X10 mode, 1/10th part of the memory is displayed; the part of the
memory can be selected with the data cursor (see below).
In the X10 mode each dot represents one sample.

The solid vertical line in the graph display is the data cursor. This is the same as the cursor in the data list display. Note that for correct reading of the contents of the data cursor the graph display must be in the X10 mode.
The dotted vertical line in the graph display is the position of the trigger word.

The main sections in the graph display are:

  Error Message   Menu Name   Acquisition on/off

                  Condensed Menu

```
GRAPH 1X   L=#xx    Cursor on Line#=Trig (Clock 0)        R=#yy
CURRENT    TRIG^D   Data= 00111111
     000000FF -------upper limit----------------------------
```

LABEL=A

```
     00000000 -------lower limit----------------------------
```

Graph heading

The following information is in the heading:
-Graph display with the horizontal expansion factor (X1 or X10).
-Data source (current or reference memory).

-Cursor position with respect to the data, and the cursor contents.

-The numbers of the first and the last sample on the graph display, as present in the data list. Also the trigger words can be indicated here.

Graph display
The upper- and lower limit lines control the vertical representation of the display. Sample values not fitting in between the limit lines are positioned just above the upper line or just below the lower line.
The value of the limit lines can be set as indicated below, and are generally shown in the same base as the selected label.

Softkey functions


```
--HOR -SCALE--          -----------VERTICAL SCALE------------
 X1    X10     LABEL    CHANGE   LOWER   UPPER   SHIFT   BEST
```

HOR SCALE X1 and X10
These keys set the horizontal expansion factor.

LABEL
After pressing this key the label to be displayed in the graph display, can be choosen.

VERTICAL SCALE
-CHANGE
Pressing this key presents the following softkey functions:

----- ----- ----- ----- ----- MINIMUM MAXIMUM ENTER
The value of the indicated limit line can now be selected (the
selected limit line is indicated with the symbol AV on the display).
When pressing MINIMUM or MAXIMUM, the corresponding value is given to
the limit line. The minimum or maximum value is the minimum or maximum
value present in the label in the display.

The value can also be entered via the hex keyboard (after setting the
value press the ENTER key).
Note that only 8 digits are available for the value of the limit lines. If
more space is required, the base changes automatically to hexadecimal.

-LOWER
This key selects the lower limit line to be changed.

-UPPER
This key selects the upper limit line to be changed.

-SHIFT
This key selects both upper and lower limit lines to be changed. Now the
AV symbol is with both lines. Both line values can be set with the cursor
AV keys.
Both lines will be shifted for the same amount, up or down. This results in
a window moving over the analogue values.

-BEST
After pressing the BEST key the upper limit line is set to the maximum
value present in the samples on the display, and the lower limit line
is set to the lowest value present in the samples on the display. This
features a best possible resolution display.

Cursor functions

The data cursor in the graph display can be moved through the data with the
<--> keys.
Note that in the graph X1 display the cursor can be moved through the data
in the memory. In the graph X10 display however, the cursor stands still in
the centre of the display while the data are moving along the display
with respect to the cursor.

Independent of activation of the CHANGE key, the scroll cursor keys can be
used.
With these keys the value of the limit lines indicated with the AV symbol
will change.

5.3 TIMING DISPLAY

Press the TIMING key.
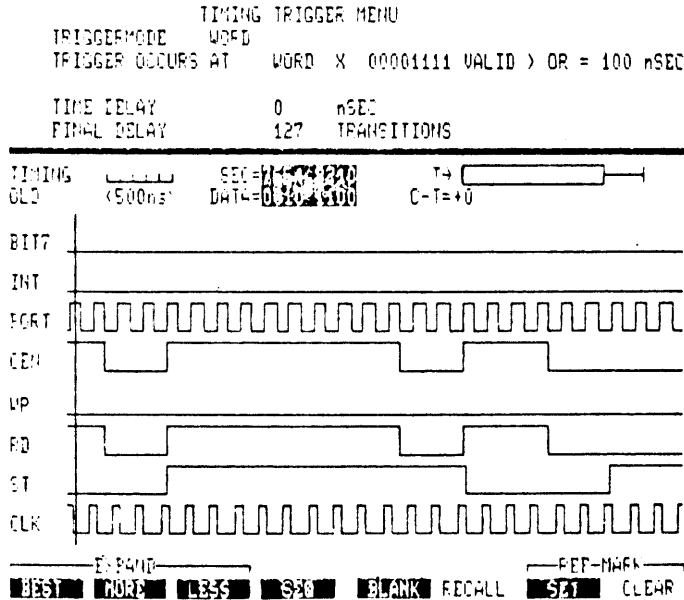
Fig. 5.5 Timing Display

Heading

The heading of the timing display contains the following information, from left to right:

TIMING : The name of the display
CURRENT: The source of the data.

|_|_|_|_|_| Time scale, gives a quick impression of the value of
<   10ms   >   the time axis.

SEQ=7654 3210 SEQ is the sequence of the channels as displayed on the
DATA=0100 0010 screen, from bottom upwards.
               DATA is the corresponding contents of the data cursor.
               Blanked channels and their data cursor contents are
               shown in normal video.

T-> |--|‾‾‾‾‾‾‾‾|--| This is the Display-in-Memory symbol.
               The whole length between the vertical end lines
               of this symbol, represents the whole memory of
               the Logic Timing Analyzer.
               The rectangle on the line represents that section
               of the memory which is displayed on the screen.

               The T with the arrow shows whether the trigger
               word is in the memory, or not.
               The arrow pointing to the right means that the
               trigger word is in the memory.
               The arrow pointing to the left means that the
               trigger word is not in the memory.

C-T=   C-R=   C-E=

C-T is the time between the cursor and the trigger sample.

C-R is the time between the cursor and the reference marker (this is only shown if the reference marker has been set).

C-E is the time between the cursor and the end of the memory in case of manual triggering (STOP).

Waveform-display

The display shows the waveforms of the input channels as captured in the memory. The channel labels are as selected in the trigger menu.
If no pulses are present on a channel, the logic level of that channel is indicated by the level of the line with respect to the channel number at the left hand side.
The solid vertical line is the data cursor; its contents is given after DATA in the heading. This cursor is used as a viewing-aid, and can be moved with the SHIFT <--> keys.
The dotted vertical line is the trigger sample.

Cursor- and trigger sample contents.
Note that the contents of the data cursor, or of the trigger sample refers to the pulses which are located directly at the right-hand side of these lines. Refer to Fig. 5.6.
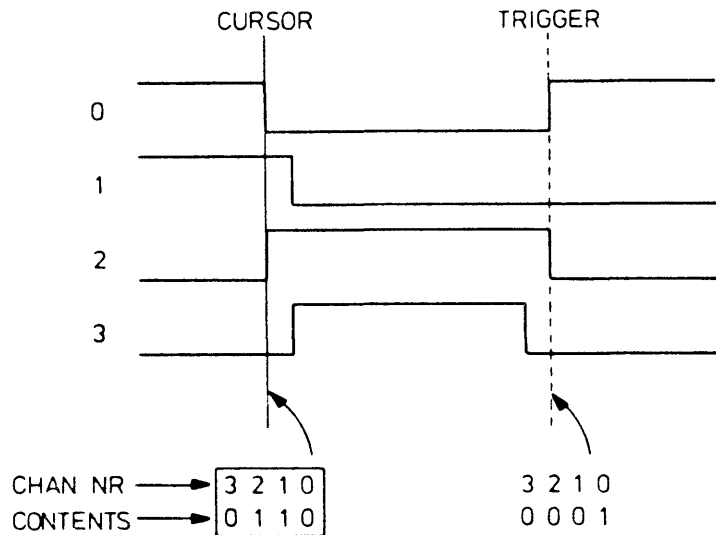
CONTENTS OF DATA CURSOR AND TRIGGER WORD APPLY
TO THE RIGHT-HAND SIDE OF THE LINES

Fig. 5.6 Cursor- and Trigger Contents.

Softkey functions

The following soft key labels are shown:

```
------EXPAND------                          -REF- MARK-
BEST   MORE   LESS   SEQ   BLANK   RECALL   SET   CLEAR
```

The EXPAND functions control the time axis of the timing diagram:

-BEST shows the timing diagram just overlapping the display. If BEST has been choosen and you press LESS the waveform limit(s) will lay before the end of the display.
-MORE stretches the timing diagram, with expansion around the cursor position.
-LESS compresses the timing diagram (around the cursor position)
Look at the Display-in-Memory symbol if you try these functions.

SEQ controls the sequence of the timing channels on the display.
After pressing this key, the functions DEFAULT and ENTER appear.
Pressing DEFAULT forces the default sequence of the timing channels on the display.
Instead of DEFAULT, the required sequence can be entered via the HEX pad keys 0--7. Also channels with user-defined label names can be re-arranged.
The same channel can be positioned more than one time on the display.
The DELETE key can be used to correct false inputs.
After setting of the required sequence, press key ENTER. The original soft key functions reappear.

BLANK and RECALL functions work together, and control the number of the channels on the display. The blanked channels can be recalled with the RECALL key.

The REF- MARK function controls the reference marker with the SET and CLEAR softkeys.
This marker can be used for time measurement between two points on the timing diagram. If the marker is set, the C-R= formulae appears in the heading.
If key SET is depressed a reference marker appears on the screen. The default position of this marker is on the cursor.
When activating the SHIFT <--> keys the cursor is shifted over the diagram, trailing a half-tone veil. The C-R= formulae indicates the time between the veil limits. The veil limits need not be necessairely on the screen.

Cursor functions

SCROLL
If one or more channels on the display has been blanked, the Scroll function can be activated.
This function features smooth vertical displacement of the timing waveforms.
During scroll blanked channels appear on the screen, and others are disappearing, independent of the selected channel sequence.

SHIFT <-->

The SHIFT <--> keys feature horizontal movement of the data cursor.
In the first instance the data cursor moves through the waveforms on
the display. As soon as the end of the display has been reached, the
data cursor sticks to his position, and the waveforms start moving
thus showing another part of the memory. Look also at the Display-in-
Memory symbol in the display heading.

5.3.1 TIMING COMPARE

For comparison of timing diagrams the following preparations are
required:

-Store the reference data in the reference memory. This can be done
 by pressing the STORE DATA key by which data in the current memory
 is copied into the reference memory, or by storing external data
 via the I/O interface.
-Set the compare conditions in the timing compare menu.

After pressing the DATA COMPARE key, the result of the comparison is
displayed.
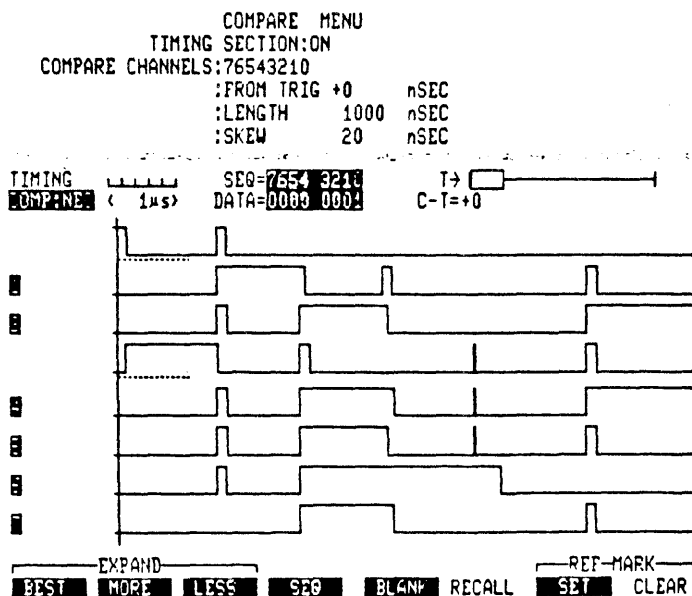
Fig. 5.7 Timing diagram compare mode

COMP is indicated in the list heading and the compare result EQ or NEQ
is displayed. If COMP is displayed in reverse video the cursor is in
the compare block as specified in the compare menu.
Not-equal timing data will be indicated by dotted lines, and the
relative channel numbers are blinking.

Timing compare is also possible in the auto mode, in three different
ways:
-Stop if equal.
-Stop if not equal.
-Count failures and successes.

5.4 SYNC MODE

In the sync mode, the timing analyzer is triggered by the ENABLE LTA statement in the trigger sequence of the state analyzer.

```
                    STATE TRIGGER MENU
W1  0  7E6  021C  4A66  0000
W2  0  XXX  XXXX  XXXX  XXXX
W3  0  7E6  021C  4412  0010
W4  0  7E6  021C  4800  0010


TIMING    ⎍⎍⎍⎍      SEQ=__543210      T→⟨        ⟩────────┤
CURRENT  ⟨  5µs⟩    DATA=__01 0000    C-T=-80ns
```
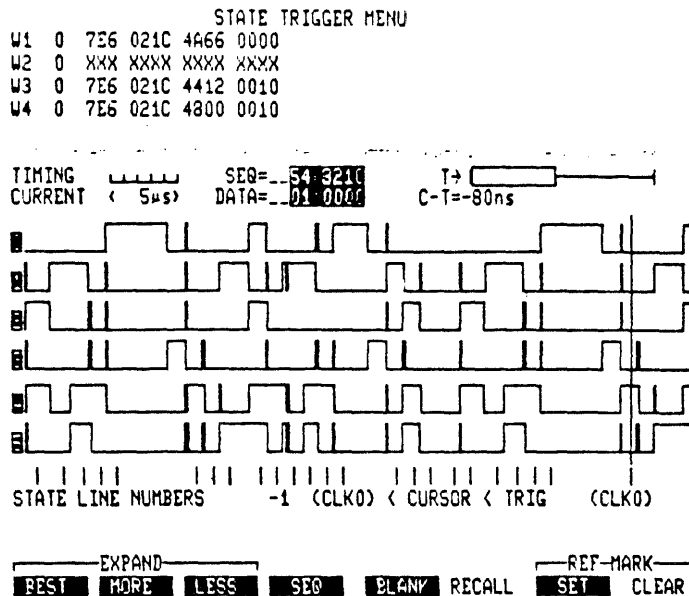
Fig. 5.8 Timing diagram sync mode

As explained in the description of the sync mode menu, there are now six timing channels max.
On the display under the timing diagram, a marker line, and state line numbers are present.

The markers represent the corresponding state samples. The state line number gives the position of the cursor with respect to the state samples.
The clock sources of the state samples is given between brackets.
When going from timing- to state display, the cursor position is maintained, i.e. the top line of the state list corresponds to the cursor position, and the state line number in the timing display, when going from the state display to the timing display the timing cursor will be in its original position, it does not follow the state cursor.

NO SYNC POSSIBLE
This message appears under the sync timing display if the instrument cannot find the proper coupling between the state list and the timing diagram. This is when the word belonging to the ENABLE LTA statement in the trigger list is not present in the state analyzer memory.

CONNECTION

6.   CONNECTION


```
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
x    It is recommended to connect the Logic Analyzer, having the      x
x Configuration menu on the display, because there is strong relation- x
x    ship between this display and the practical measuring set-up.     x
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```


6.1 CONNECTION OF THE INPUTS

All data, clock, and clock-qualifier input signals from the System under
test are applied via (8-channel) Pods.
The Pod identification as indicated on the rear panel of the Analyzer
corresponds to the Pod labelling on the display.
Note that the ground input of each Pod must be connected to a good circuit
ground in the Sytem under test.
Each Pod plug connction at the rear of the Analyzer, can be mechanically
locked by means of the latching bracket mounted on the input connectors.

Applicable Pods:
      State Analyzer : PM 8821
      Timing Analyzer: PM 8825

Before you proceed check all connections you made.

Data input
Data input uses Pods #0...#6 of the State Analyzer section, and Pod T
of the Timing Analyzer.

There are two possibilities to apply the Pod #0 signals to the State
Analyzer input.
This depends on the position of the switch which is present at the rear of
the instrument at unit S15-2. The switch can be manipulated through the
rear panel by e.g. a ball point pen or a small screw driver.

 In the ´in´-position Pod #0 of the State Analyzer is interconnected with
 Pod T of the Timing Analyzer. The Pod #0 input of the State Analyzer is
 not activated.

 In the ´out´-position there is no interconnection between both Pods;
 Pod #Q and Pod T can be used separately.

Note that changing above Pod #0 input set-up, does not influence the
functions of the COMBI or SYNC modes.

Clock inputs

-State Analyzer
The clock signals must be applied via Pod #Q as in following table:

Clock	Pod input nr.
CLK0	7
CLK1	6
CLK2	5

-The Timing Analyzer has no external clock input.

Clock qualifier inputs

-State analyzer
The qualifier signals (max. 4) must be applied via Pod #Q, as in following table:

Qualifier	Pod input nr.
Q0	4
Q1	3
Q2	2
Q3	1

Independent of the number of clocks and/or qualifiers used, 3 channels of Pod #Q (input nrs. 0,1 and 2) are on the display.
Input 0 remains always available as a data channel.
Inputs 1 and 2 become available as data-channels when Q3 respectively Q2 are not in use (if these qualifiers have been set as don't care).

-The Timing Analyzer has no external clock qualifier input.

Personality Adaptor

If you're tired of connecting all those separate Pod input wires, to the hard-to-reach micro processor tags, the PM 8817 Personality Adaptor is of good help.
The PM 8817 is available in various versions, corresponding to the most common micro processors. Refer to chapter 2: Accessories and Options.

The PM 8817 consists of a micro processor test clip, a wiring interface box (PM 8816/..), and a number of Pod nozzles. The wiring interface box is provided with the appropriate wiring for a specific micro processor.
The PM 8816/40 and /64 are user-programmable interface boxes which can be wired according to required micro processor test configuration.

6.2 WHAT ELSE TO CONNECT?
Except above inputs some more connections can be made.

Logic State Analyzer
-Input:
TRIG IN can be used as:
-trigger source or,
-trigger qualifier.
The signal must be applied to the TRIG IN coaxial connector at the rear of the state analyzer unit S15-1.
The signal must be a TTL signal which can be applied via a 50 ohm coax cable, or via the standard (5:1) probe PM 8800. Check the setting of the trigger qualifier in the State Trigger menus.

-Outputs:
MATCH OUT delivers a TTL high signal at detection of the selected trigger word until the next trigger word (or final triggering) appears.

RUN OUT   delivers a TTL high signal during data acquisition
          i.e. between start and final triggering of the Logic State
          Analyzer.

Logic Timing Analyzer
-Input:
TRIG IN can be used as an external trigger source (e.g. from the
system under test),
as well as trigger qualifier.

-Output:
MATCH OUT delivers an ECL high signal during presence of the trigger
word.

Video Interface Unit
Output:
COMP VIDEO delivers a video signal to drive an additional video
display, or a video printer.

U S E R   M E S S A G E   L I S T

7. USER MESSAGE LIST

    User messages flash in the left top- and the right top corner of the
    display. The right top corner shows generally data acquisition status
    information.

    After triggering, the message TRIG appears in the right corner of the data-
    heading. After manual triggering (key Stop), the message MAN is shown.

    The following messages are possible:

    ACQ. CLOCK OFF : A clock has been selected in the data menu, which is
                      not activated in the configurationn menu.

    ALREADY STORING: The Store setting action is already running.

    BAD EEPROM   : During the Store setting action, a fault is
                      encountered in the non-volatile memory.

    BATTERY EMPTY   : This is the battery of the resident setting-memory
                      (Saved function).

    BEGIN OF MEMORY: In the graph- and in the timing display; the cursor
                     position has been set at the beginnng of the memory.

    CLOCK EMPTY   : No samples taken by the specified clock source
                      present in the memory, or a clock has been activated
                      without any label.

    COMPARE BUSY   : Internal compare program is running.

    COMP.LENGTH NEQ: Length of the compared blocks is not equal.

    CURSOR ADJUSTED: In the timing diagram; the analyzer has shifted the
                     cursor to the valid data area.

    CURSOR ON TRIGW: The cursor must be on the trigger word, to copy a new
                     word into the trigger word.

    CURSOR→TRIGWORD: Trigger word has been copied from the cursor
                     contents.

    DISA CONF. SET : The Analyzer configuration has been set by the
                      selected disassembler.

    END OF MEMORY   : In the graph- and in the timing display; the cursor
                      position has been shifted to the end of the memory.

    ENTER 0--7   : In the timing diagram; enter a channel number.

    ENTER 0,1 ONLY : In the graph display a limit value can only be
                      entered with 0´s and 1´s when the label-base is
                      binary.

    ENTER 0-7 ONLY : In the graph display a limit value can only be
                      entered with numbers in the octal range.

    ENTER 0-9 ONLY : In the graph display a limit value can only be
                      entered with numbers in the decimal range.

ENTER LABEL NR : Enter a label number to store a setting (Applies
only with non-volatile setting memory option).

ERROR IN VALUE : In configuration menu; threshold voltage not entered
properly (e.g. 5..)

FRACTION ERROR : The fraction does not correspond to the value
mentionned in the specification or the unities.

FROM NOT IN CUR: The ´from´ limit is not in the current memory
(state compare mode).

FROM NOT IN REF: The ´from´ limit is not present in the reference
memory (state compare mode).

ILL. MATCH WORD: Example Trigger sequence true:

    1. Find Word 1 or Word 2
       if Word 1 then step 3 else step 2
    2. Find Word 3
    3. Find Word 4
    4. End. Match out on Word: 3

In this example the match-out signal appears in two
cases:
-One, if Word 1 has been found in step 1
because in step 3 the sequence controller supposes
that the foregoing step was step 2 and thus the match-
out signal is generated.
-Second, if Word 2 has been found in step 1. The
match-out signal is generated when the sequence
controller jumps from step 2 to step 3.

The solution is to insert an extra Find Word step
between step 2 and step 3.

ILL. START WORD: WRD1 or WRD2, combination in trigger menu may not be
used in selective data acquisition menu.
WRD1>WRD2: WRD1 may not be used in selective data
acquisition menu.

ILL. STOP WORD : Refer to foregoing.

INVALID ADDRESS: Attempts are made to set a not allowed device address
in the GPIB-menu.

KEY NOT ACTIVE : Not-active softkey pressed.

KEY NOT VALID : Wrong key pressed.

LABEL CHANGED : If a label in the graph display has been deleted in
the configuration menu, the graph display automatical-
ly selects the first label in use.

LABEL EMPTY   : With the store triggerword function.
An attempt was made to copy a trigger word from the
data list (top line), having a different label
setting then the current trigger word.

LABEL IN ASCII : A label in ASCII-base is not permitted in the graph mode.

LABEL PROTECTED: The label setting (or logic or base) cannot be changed. It is fixed by the activated disassembler.

LABEL >32 BITS : The selected label being wider than 32 bits, cannot be applied in the graph display. Correct the label-base.

LIMITED SPACE : Screen overflow may occur if a label at the right-hand side of the label line in the configuration menu is converted to ASCII.

LOWER = UPPER : In the graph display when the lower limit value reaches the upper limit using the roll-up function.

LP NOT READY : Appears approx. 20 s after pressing the Print key, if the printer is not ready for printing.

LSA NO CLOCK : No clock input since acquisition start.

LSA:STEP X WRD : Indicates trigger status of the State Analyzer.
or DLY X is the trigger step number.

LTA DELAY : The Timing analyzer is waiting in the final delay.

LTA NO INPUT : No input signals on the Timing Analyzer.

LTA NO TRIGW : -The Timing analyzer has not yet triggered.
-The Timing analyzer is not yet enabled by the State analyzer.

LTA RUN : The Timing Analyzer has been started, but not yet triggered.

MAXIMUM REACHED: In the graph display when the maximum value of the upper limit has been reached.

MINIMUM REACHED: In the graph display when the minimum value of the lower limit has been reached.

NO ASCII INPUT : An ASCII character can not be entered.

NO COMMON CHNLS: No common channels for comparison (timing compare).

NO COMMON AREA : No common data area for comparison (timing compare).

NO CURRENT DATA: Reference store not possible due to missing data.

NO DATA PRESENT: No data present in the selected memory.

NO DOTS PRESENT: In the graph display, when no data are available to be displayed. E.g. in X10 mode.

NO END : In State trigger menu; no END statement at end of trigger sequence (true) list.

NO FREE LABELS : All setting labels occupied (only with non-volatile
                  setting memory option).

NO REF. DATA   : No reference data available for comparison.

NO ROLL DOWN   : In the timing diagram; end of downwards soft scroll,
                  or all eight channels on the display.

NO ROLL UP   : In the timing diagram; end of upwards soft scroll,
                  or all eight channels on the display.

NO STATE LABELS : In configuration menu; if no labels have been
                  selected for the state analyzer.

NO SYNC   : A disassembler programm does not find synchronization.

NO SYNC POSSIBLE: -This message appears under the SYNC MODE timing
                  display, if the trigger word belonging to the ENABLE
                  LTA statement in the trigger list is not present in
                  the memory of the state analyzer, or
                  -If an IF statement is present in the trigger list
                  and the state memory is full.
                  If NO SYNC POSSIBLE (1) or (2) is shown, check the
                  two coax. cables which connect T50-2 and S15.

NO SYNC+BREAK   : When trigger on sequence break, and the SYNC mode
                  is selected.

NO TIME LABELS : In configuration menu; if no labels have been
                  selected for the timing analyzer.

NO TIMETRG MENU : If the Timing analyzer has not been selected, you
                  cannot select the timing trigger menu.

NOT A+DLY + BRK : Word A+delay may not be used in selective data
                  acquisition, in the trigger on sequence break mode.

NOT AVAILABLE   : Option or function not installed.

NOT BOTH TRIG´D : No normal triggering in current- and/or reference
                  memory in the Timing analyzer.

NOT FOUND   : Memory word or sample as questionned is not present
                  in the valid data memory.

NOT SELECTED   : In the timing diagram; a channel is selected which
                  has been switched-off in the configuration menu.
                  If an attempt to print is made and the printer has
                  not yet been activated in the options menu.

NOT WD B+ A+DLY : Use of word B and word A+delay is not allowed in
                  selective data acquisition.

NOT WRD B + BRK : Word B may not be used in selective data acquisition,
                  in the trigger on sequence break mode.

ONLY 20nS STEPS : In the timing diagram; time resolution is 20 nSec.

OVERRANGE : Attempts are made to enter either a too high -, or a too low number or value.

P Q6543210T OUT: The indicated Pod(s) has not been connected at the rear of the Logic Analyzer.

PREPARING ACQUISITION START : The analyzer starts data acquisition.

PRESS ENTER : Press the ENTER softkey to enter the new value.

PRINT STOPPED : Print action has been aborted by pressing the Print key.

PRINTKEY TO END: Printer activity can be halted by pressing the Print key again.

REF.DATA STORED: Confirms that the reference memory just has been filled with data from the current memory.

SCREEN OVERFLOW: A line (e.g. FORMAT) is too long. Change over to e.g. hexadecimal values.

!SDA ACTIV! : If a Disassembler has been selected and you activate Selective Data Acquisition.

SEARCHING : The instrument is searching for a specific sample in the memory.

SELECT FULLMENU: With the printer activated and ´All Menus´ selected. Press the Full key.

SELECT ´LIST´ : With the printer activated and ´All Data´ selected, and if no list on the display.
Press the List key.

SELECT SECTION : The Data Display Compare function has been selected, without previous activation of the compare function.

SEQ DEFAULT : In the timing diagram; the channel sequence has been changed to default, after changes of settings in the configuration menu.

SETTING INVALID: -The instrument setting was not correct when you switched off the mains voltage earlier.
-In the Timing trigger menu incorrect value (e.g. 5..).

SW RELEASE 51-XX: Identifier of the instrument´s system software. Shown after switching-on.

SPLIT LABEL : In configuration menu; in case of incorrect setting of the labels.
Equal label arrangement for different clocks is allowed.
´Scrambled´ label arrangement is not allowed.
Refer to the examples in Fig. 7.1.

STEP INCOMPLETE: In State trigger menu; step not complete.

STOP ACQ. FIRST: If data acquisition is running (Single shot or Auto mode) some functions or parameters cannot be changed; so first press the STOP key.

STORING BUSY : With the non-volatile memory. It is not possible to recall a certain setting label, before the current storage action is completed.

´TO´ NOT IN CUR: The ´to´ limit is not in the current memory (State compare).

´TO´ NOT IN REF: The ´to´ limit is not in the reference memory (State compare).

TRIG CLOCK OFF : A clock has been selected in the trigger menu, which is not activated in the configuration menu.

UNDEFINED STEP : In State trigger menu; jump in trigger sequence list to an undefined step.

UPPER = LOWER : In the graph display when the upper limit value reaches the lower limit using the roll-down function.

USE BIN,OCT,HEX: In State trigger menu; trigger words can only be set in binary-, octal- or hexadecimal form.

USE DECIMAL KEY: In configuration menu; when setting the threshold voltages do not use the hex keys.

USE SOFTKEY : Press a softkey.

VALUE ADJUSTED : In the graph display, the entered limit-value is automatically corrected such that the upper limit value is always higher than, or equal to the lower limit value.

WAIT NOT AT END: In the State trigger menu, after ´Wait for LTA´ a trigger word must be present. If you select this word as a don´t care trigger word, the State analyzer will trigger on the Timing analyzer trigger signal.

WORD LABELLING : With many trigger words in the memory this may cost some time. (In case all samples in the memory should be labelled, this takes more than 30 s).

WORD NOT IN CUR: That word is not in the current memory.

WORD NOT IN REF: That word is not in the reference memory.

WORDNO TOO HIGH: If words have been used in the selective data acquisition menu, which are skipped in the trigger menu.

WRD+DLY OVERLAP: When two overlapping blocks of data have been selected in the data acquisition menu, and sample WRD + clock delay has been selected.

WRONG DISPLAY : With the printer activated and the Page print selected, not the proper display on the screen. Press List or Full Menu.

35CHANNELS ONLY: If a 68000-disassembler is choosen in a 35-channel
analyzer.

```
CLK0  ---  --------  --------  --------  --------  --------  --------  AAA--AAA
```

or,

```
CLK0  ---  A--------  --A------  -A-A-A--  --------  ------A-  ------A-  -------A
```

Above is allowed.

```
CLK0 AAA BBBBBBBB CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
CLK1 AAA BBBBBBBB CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
```

Above is allowed; same labels for more than one clock.
Displays a data list without clock reference.

```
             V
CLK0 AAA BBBBBBBA CCCCCCCC DDDDDDDD EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
```

or,

```
CKL0 AAA AAAAAAAA BBBBBBBB CCCCCCCC EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
CKL1 AAA AAA---AA BBBBBBBB CCCCCCCC EEEEEEEE FFFFFFFF GGGGGGGG GGGGGGGG
```

Above is not allowed; label A cannot be grouped.
Gives SPLIT LABEL operation lock.

Fig. 7.1. Some split-label examples

O P E R A T I O N

8. OPERATION

8.1 GENERAL

In this chapter we discuss operation hints, clarified with some examples.

The following subjects will be discussed.
-Triggering
-Selective data acquisition
-Compare mode
-Combi mode
-Synced mode

8.2 TRIGGERING
General information

Why Triggering?
Triggering gives you all means to obtain that section of a program you just wanted in the analyzer's memory.

Your tools are:
-Up to 8 selectable triggerwords
-Various delays or counters (on samples, occurances, or time)
-Sophisticated IF/THEN ELSE trigger menu composition language

There are two main possibilities of triggering:
1. Trigger on sequence true
2. Trigger on sequence break

In the following some details on the trigger sequence set up will be discussed.

TRIGGER SEQUENCE DETAILS
The trigger menu is built-up of a number of sequential steps.
The next step is initiated when you press softkey NEXT.
The last step is always an END.

FIND WORD 1
This means that triggerword 1 must be present in the input stream before the analyzer proceeds to the next step in the sequence.

FIND WORD 1 > 2
As above, but the next sample following word 1 must be word 2, (no matter which clock).

FIND WORD 1 OR 2
As above, but word 1 or word 2 must be present.
The OR-structure can be extended by a conditional jump to another step in the list.

E.g.:
FIND WORD 1 OR 2
IF WORD 1 THEN STEP 4 ELSE STEP 5
means that if word 1 is found, action is transferred to step 4, and
if word 2 is found the next step will be 5.
The ELSE STEP statement may be omitted.

IF WORD 1, or 1 > 2, or 1 OR 2
This structure is always followed by one of the delay statements:
IN DELAY or,
AT DELAY

After a FIND WORD statement a DELAY can be added.
This can be by:
-States   : the delay counter counts the specified number of the
              required state clocks.
-Occurances: the delay counter counts a specified number of
              occurances of a specified word.
-Time   : a specified time delay is used.

The use of an IF WORD statement after a delay has been set enables
conditional branches of the trigger sequence on the following
conditions.

In delay: The word is to be found before the delay is finished.

At delay: The word is to be found on the sample which immediately
          follows the end of the delay count.

Specifying either IN or AT DELAY results in the generation of
THEN STEP...ELSE STEP.
So enabling the entry of the step to which trigger control should be
transferred.

Delay on samples means that every sample no matter which clock, counts
down the delay by one.
Delay on occurances means that every selective.
Delay on time speaks for itself.

FIND WORD 1 DELAY 1000 SAMPLES
FIND WORD 2
This means that after finding word 1 in the input stream, a delay
of 1000 samples must pass, before the analyzer looks for word 2.

HINT: CLOCK IDENTIFIER
      One data bit channel can be used as identifier for the clock.
      Apply the clock signal to a free data bit.
      With a positive-going clock a ´0´ bit is shown; with a negative-going
      clock a ´1´ bit is shown.
      This obtained by the zero-hold time of the clocks.

8.3 SELECTIVE DATA ACQUISITION
      FROM WORD X (+delay value) TO WORD Y (+delay value)
      Words X and Y are words which have been registered in the trigger
      sequence list.
      Also the facultative delay values are in the trigger sequence list
      mentionned adjacent to the triggerwords.

If a certain block is present many times in the input stream,
       the blocks are ´glued´ together in the analyzer memory.

       For words X and Y can be used triggerwords 1---7 as registered in the
       trigger sequence list.

8.4 COMPARE MODE

GENERAL

In the compare mode, data in the acquisition memory is compared with
data in the reference memory.
Both the state analyzer as well as the timing analyzer have a compare
mode, and have their own reference memory.
After comparison unequal data are accented in the data displays.
The reference memories can be filled with data by:
-Copying data from the acquisition memory, or
-Externally supplied data (via the I/O interface).
Comparison of data can be done in the single shot mode, and in the
auto mode.
In the auto mode a counter is available to count equal, or unequal
comparisons.

Compare Stop on Equal, or Stop on Not-equal
_____

In the following diagram the Stop- and Count-functions are given for the
various modes.

TIME	STATE	\<SECTION ON\> COMPARE EQ	NEQ	NOTCMP	OFF
SECTION	COMPARE EQ	Y N	N C Y	N Y	Y N
ON	COMPARE NEQ	N C Y	N C Y	N C Y	N C Y
	NOT COMPARE	N Y	N C Y	N Y	N Y
OFF		Y N	N C Y	N Y	N N

Stop on Equal   : N= Does not stop
                    Y= Stops

Stop on Notequal: N= Does not stop
                    Y= Stops

Count   : Count Equals if a Y is stated.
                    Counts Notequals if a C is stated.

TIMING ANALYZER

Transitional clocking

Two requirements for an analyzer are contradictory:
-High sampling rate
-Large memory depth

In transitional clocking in fact two memories are used.
One memory stores only the different input bit patterns. As long
as an input bit pattern does not change no new address in this memory
will be selected.
In parallel to this bit pattern memory, is a memory which saves
the time duration of each different input bit pattern.
The input bit patterns are always sampled with the 20 nS clock and
also the time duration memory resolution is 20 nS.
The time duration memory is 20 bits wide. If a sample takes longer
than the capacity of these 20 bits, the next address of the
memory is selected and a new 20 bits time duration is available.
Due to this principle a high sample resolution and a virtual deep
sample memory is obtained.

PM 3551A Operating manual Chapt. 9   SW 2.0   IGB409

December 2, 1983

INTERFACE AND OPTIONS

9499 500 13011

9. INTERFACE AND OPTIONS

INTRODUCTION

This chapter gives information on the available options and how they must be built-in.

After pressing the OPTION key, the display shows all selectable I/O and disassembler functions.

The I/O functions depend on the built-in option board. See following tabel.

Option board: Function:
PM 8851/00   Printer output only (1 interface).

PM 8851/20   Printer output and RS 232C control (2 interfaces).

PM 8851/40   Printer output and IEEE control (2 interfaces).

For installation instructions for an Option board refer to chapter 10.

9.1 PRINTER INTERFACE

The printer interface is the standard RS 232C interface in all 3 cases.
Any RS 232C printer can be used; some possibilities are:
-Philips PC 1423/00
-Lear and Siegler Ballistic 310
-Epson MX80

For use of the printer with the PM 3551(A), refer to chapter 4.1.5.

The printer must be connected according to the following diagram.

Female plug to PM 3551 / Male plug to Printer

(FG)	1	—	1 (FG)	FRAME GROUND
(TXD)	2		2 (TXD)	TRANSMIT DATA
(RXD)	3		3 (RXD)	RECEIVE DATA
(RTS)	4		4 (RTS)	REQUEST TO SEND
(CTS)	5		5 (CTS)	CLEAR TO SEND
(DSR)	6		6 (DSR)	DATA SET READY
(SG)	7		7 (SG)	SIGNAL GROUND
(DCD)	8		8 (DCD)	DATA CARRIER DETECT
(DTR)	20		20 (DTR)	DATA TERMINAL READY
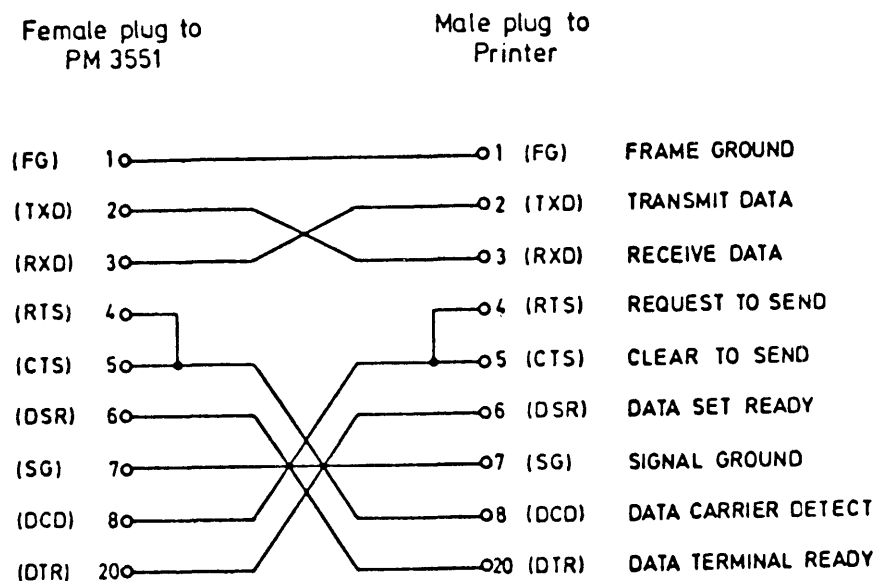
MA 10742

Fig. 9.1 RS 232C printer connection cable
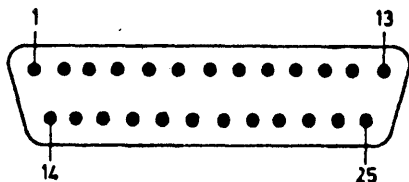
Fig. 9.2 RS 232C connector

PRINT CHARACTERS
Some special characters on the PM 3551(A) display are replaced by printable
characters as indicated in following table:

DISPLAY CHARACTER -->PRINTED CHARACTER

Character	Code	Character	Code
⊥	21	!	7C
Γ	2D	-	68
	2D	-	69
	2D	-	6A
	2D	-	7F
	30	0	77
	31	1	76
	3C	<	63
	3E	>	62
	75	μ	75

Recommended printer switch settings:

-Epson MX80

1-on	2-on	3-off	4-off
5-on	6-on	7-off	8-off

OPTION BOARD SUB-FUNCTIONS

An option board can be provided with the following sub-functions:

DISASSEMBLER PACKAGES:

Disa A:	Most common micro processors	=PM 8850/00
Disa M:	Motorola micro processors	=PM 8850/20
Disa N:	Intel micro processors	=PM 8850/10
Disa Z:	Zilog micro processors	=PM 8850/30
Disa R:	Other micro processors	=PM 8850/40

NON-VOLATILE MEMORY (for instrument settings)   =PM 8850/80

This is a memory package to store 4 user-defined instrument settings.
For installation instructions for the sub-functions refer to chapter 10.

Note:
The Non-volatile memory consists of two EEproms mounted on a small p.c.
board, and is available in two versions:
PM 8851/81 for the Option board PM 8851/00
PM 8851/82 for the Option boards PM 8851/20 and /40.

Both versions are identical, though the PM 8851/81 includes three
additional Proms.

The PM 8851/81/82 must be mounted on the Option board as indicated in
Fig. 9.3.
With the PM 8851/81, the three Proms as indicated in Fig. 9.3 must be
replaced by the Proms included in the delivery of the PM 8851/81.

For operation refer to chapter 4.
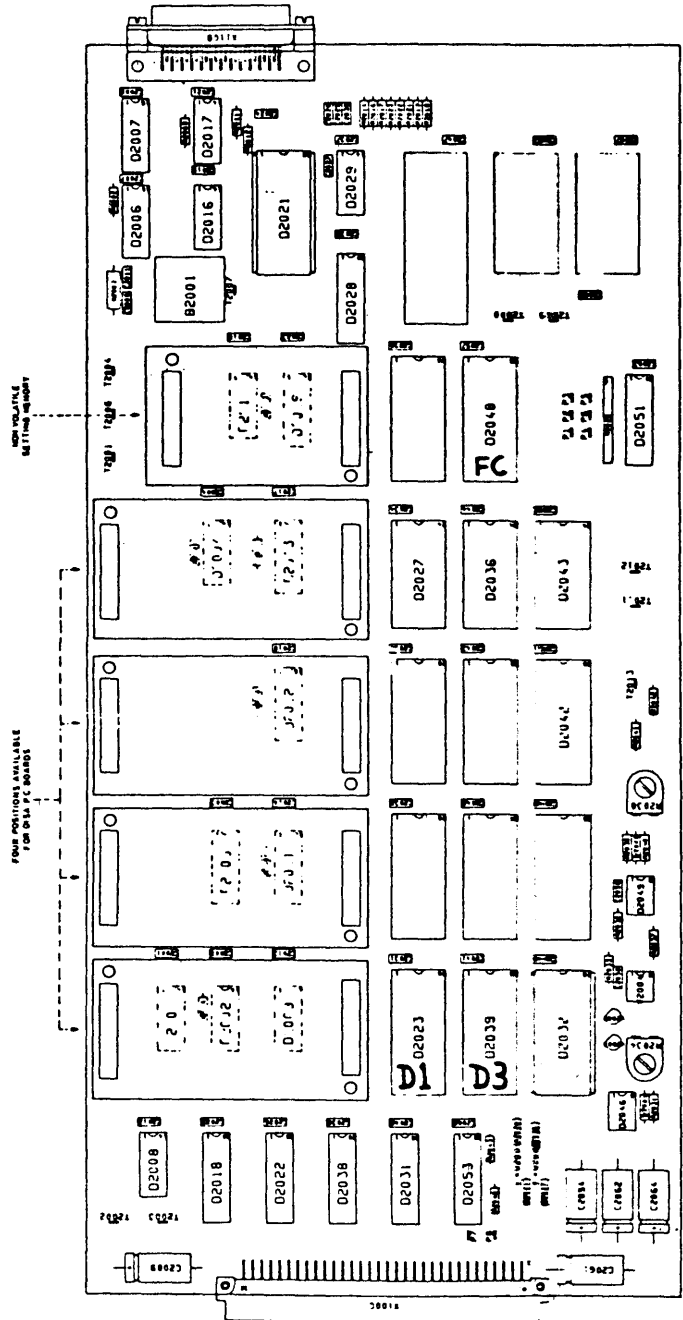
Fig. 9.3 Location of the disa units and the non-volatile memory on the Option board PM 8851. Proms D1, D3 and FC must be replaced when installing the non-volatile memory on Option board PM 8851/00.

9.2 DISASSEMBLERS GENERAL

When selecting a disassembler package via the menu, the display shows the
name of this package and the release number, e.g. ´A PACK 51-1.0´.

Once a certain disassembler has been selected via the menu, the
configuration is automatically set according to the specific micro
processor disassembler requirements.
The disassembler-configuration cannot be changed as long as the
disassembler remains activated.
Pods and labels which are not in use in the disassembler, are free to be
used next to the disassembler. This additional signal information will be
shown in the Disa-state display, but not in the Disa-display itself. Refer
to chapter 4 (Disassemblers).

The disassembler-configurations are given in following text with
the various micro processors.

If a disassembler programm does not know whether a certain byte is an
opcode or not, ´***´ is displayed instead of the mnemonics.
If a disassembler programm reads an opcode for a certain byte and that
opcode does not exist for that micro processor, ´ILLEGAL´ is displayed.

All obtained mnemonics are as they are published in the manufacturer´s
handbooks.
In the following we discuss the connection and the display of the various
Disassemblers.

DISASSEMBLER-ACCESORIES PM 8815, PM 8816 and PM 8817.

In order to accomodate connection of the micro processor under test to the
Logic Analyzer input, the PM 8817 can be used. Refer to Fig. 9.4.

PM 8815/00   PM 8816/- -   PM 8815/40/64
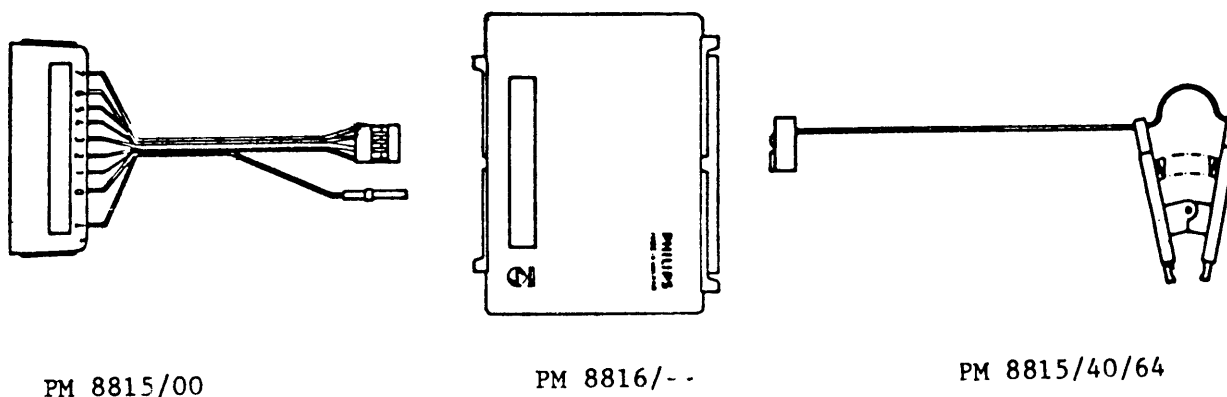
Fig. 9.4   PM 8817 Micro processor personality adaptor

The PM 8817 is a complete personality adaptor, consisting of:
-A micro processor test clip with ribbon cable (PM 8815/40 or /64).
-A wiring-interface box (PM 8816/..).
-A set of Pod-nozzle connectors (PM 8815/00).

The following versions of the personality adaptors are available:

Adaptor	Microprocessor
PM 8817/10	6800/02/08
PM 8817/12	NSC800
PM 8817/19	68000
PM 8817/20	8085
PM 8817/21	8048
PM 8817/22	Z80
PM 8817/23	Z8002
PM 8817/24	R6502/12
PM 8817/26	6809/E
PM 8817/27	8086/8088
PM 8817/28	8080
PM 8817/30	8031/8051

All above personality adaptors are provided with a specific prewired
interface box PM 8816/..

PM 8817/40   For 40-pin micro processors.
PM 8817/64   For 64-pin micro processors.

The PM 8817/40 and /64 are provided with an interface box PM 8816/40 and
/64 resp., which must be wired by the user.

The following replacement parts are available for above personality
adaptors.

-PM 8815/00 Set of 5 Pod nozzles for personality adaptor.
            Each nozzle can be mated to the PM 8821 or PM 8825 Pod at
            one side, and via the smaller plugs to the PM 8816
            interface box.
            The number of required Pod nozzles depends on the number of
            Pods for the disassembler inputs, and the possible Pods for
            addiional signal information.

-PM 8815/40 40-pin micro processor clip with ribbon cable, connecting
            to the PM 8816 interface box. See above.
-PM 8815/64 Same as PM8815/40 but 64-pin.

-PM 8816/.. interface box. This box is available in the same versions,
            and for the same micro processors as the complete
            personality adaptors, see above.
            E.g. PM 8816/22 is an interface box for the Z80.

-PM 8816/40 Interface box for 40-pin micro processors.
-PM 8816/64 Interface box for 64-pin micro processors.

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X                                                     X
X   Note:                                             X
X   A disassembler requires a specific connection of the input   X
X   channels, otherwise correct disassembly is not possible.   X
X                                                     X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Wiring the PM 8816/40/64

This wiring can be made by the user himself according to the micro
processor to be tested. Refer to the enclosed specific micro processor
connection lists.
To this end open the box, and y´ll find numbered plug (knife) contacts.
It is recommended to use the wire and the insertion tool as supplied, in
order to make the connections as indicated in the following chapters.
The insulation of the wire need not to be stripped; these contacts cut
through the insulation.
Don´t apply more than two wires in one contact.

        Wire specification: Standard UN-R1072
                            Solid silver plated annealed copper wire,
                            with PTFE insulation.
                            AWG 30
                            Nominal conductor dia. 0,25mm.
                            Nominal conductor cross section 0,05 mm^2
                            Overall dia. 0,55 mm approx.

        Insertion tool for plug contacts:
                            Manufacturer: Scotchflex 3M
                            Type   : 3522

In the following lists the connections are given, which must be made in the
interface box to adapt the circuit to the specific micro processor.
In this lists the various Pod inputs are given as well as the numbering of
the cpu contacts. These indications can also be found in the interface box
itself.
N.C. in the connection lists means not connected.

The active clock edges in the following lists are indicated with ´P´ or ´N´
meaning Positive-, or Negative-going edge respectively.

When a Pod is not in use for the disassembler, this Pod can be used for
additional data display. Also not used channels of Pod #Q (indicated as
´free´) can be used for this purpose.
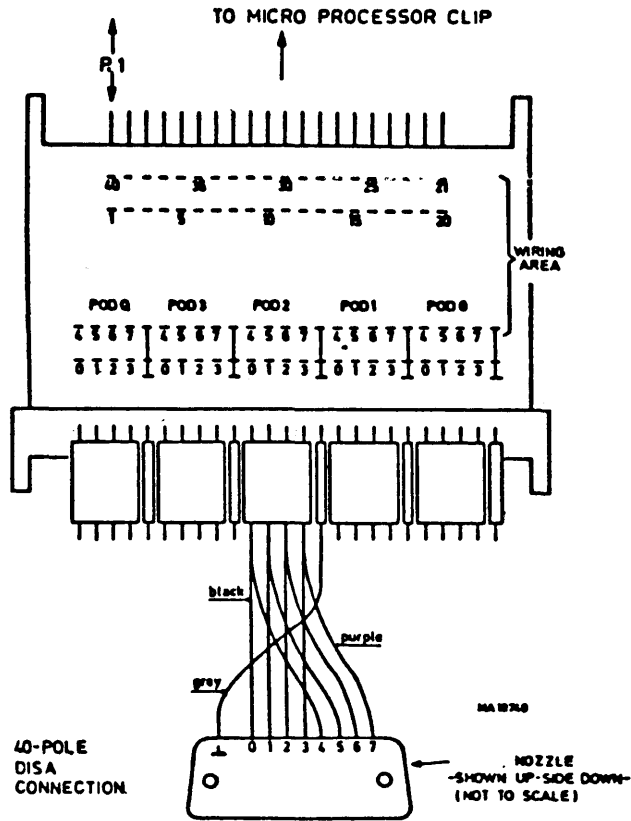
Fig. 9.5 40-pin personality adaptation via PM 8817/40
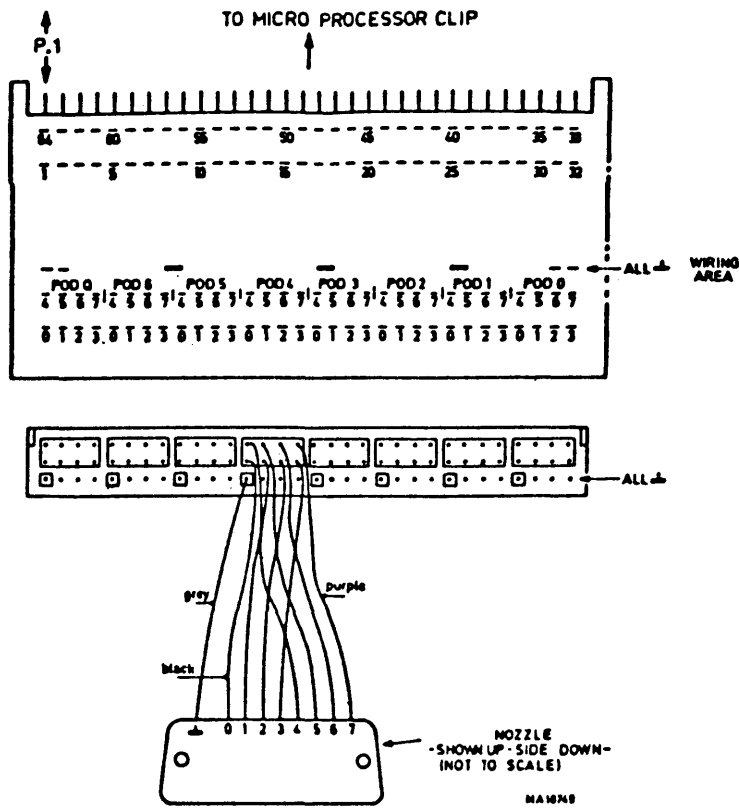
Fig. 9.6 64-pin personality adaptation via PM 8817/64

9.3   <u>DISASSEMBLER CONNECTIONS AND DISPLAY</u>

```
        AAAA
       AAAAAA
      AAA  AAA
     AAA    AAA
   AAAAAAAAAAAA
  AAAAAAAAAAAAAA
  AAA          AAA
 AAA            AAA
```

DISASSEMBLER PACKAGE A

PM 8850/00

This package features disassembly programms for the following micro processors:

-Z80	Page 9.12
-8085	Page 9.14
-68000	Page 9.17

Software release: A PACK 51-1.1

*** Z80 ***

CONNECTION

POD0--CPU			POD#3--CPU	
CLK0	7--19	(MREQN)	7-- 5	(A15)
CLK1	6--20	(IOREQN)	6-- 4	(A14)
CLK2	5--N.C.		5-- 3	(A13)
Q0	4--28	(RFSHN)	4-- 2	(A12)
Q1	3--N.C.		3-- 1	(A11)
	2--27	(M1N)	2--40	(A10)
	1--21	(RDN)	1--39	(A9)
	0--N.C.(free)		0--38	(A8)
GND--29			GND--29	

POD#2--CPU		POD#1--CPU	
7--37	(A7)	7--13	(D7)
6--36	(A6)	6--10	(D6)
5--35	(A5)	5-- 9	(D5)
4--34	(A4)	4-- 7	(D4)
3--33	(A3)	3-- 8	(D3)
2--32	(A2)	2--12	(D2)
1--31	(A1)	1--15	(D1)
0--30	(A0)	0--14	(D0)
GND--29		GND--29	

Pod #0 is free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
CLK0=P	TRUE	1	X	X	X
CLK1=P	TRUE	1	X	X	X
CLK2=OFF					

	POD-0	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------
	CLK1=AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <ST> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory address number.

*** Z80 *** (cont´d)

\<ST\>
This is the processor status information represented in two bits.

\<ST\>	Status
00	No function
01	Interrupt acknowledge
10	Read from PIO
11	Write to PIO

\<ADDR\>
This is the hexadecimal memory address.

\<DT\>
This is the hexadecimal data.

\<MNEMONICS\>
This column shows the disassembled Z80-instructions.

\<INT\>
This column shows a ´non maskable´ interrupt as ´NMI´; the other interrupts are shown as ´INT´.

*** 8085 ***

CONNECTION

	POD-Q--CPU	
CLK0	7--30	(ALE)
CLK1	6--32	(RDN)
CLK2	5--31	(WRN)
Q0	4--38	(HLDA)
	3--N.C.	
	2--29	(S0)
	1--33	(S1)
	0--34	(IO/MN)
	GND--20	

POD#3--CPU	
7--28	(A15)
6--27	(A14)
5--26	(A13)
4--25	(A12)
3--24	(A11)
2--23	(A10)
1--22	(A9)
0--21	(A8)
GND--20	

POD#2--CPU	
7--19	(AD7)
6--18	(AD6)
5--17	(AD5)
4--16	(AD4)
3--15	(AD3)
2--14	(AD2)
1--13	(AD1)
0--12	(AD0)
GND--20	

POD#1 and POD#0 are free for other
signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	0	X	X	X
	CLK1=P	TRUE	0	X	X	X
	CLK2=P	TRUE	0	X	X	X

LABEL	POD-Q	POD#3	POD#2	POD#1	POD#0
	CLK0=AAA	BBBBBBBB	BBBBBBBB	--------	--------
	CLK1=---	--------	CCCCCCCC	--------	--------
	CLK2=---	--------	CCCCCCCC	--------	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <STA> <ADDR> <DT> <MNEMONIC> <INTRPT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

<STA>
This is the processor status information represented in three bits.

*** 8085 *** (cont´d)

```
<STA>  Status
------------------------------
000   -
001   -
010   Memory read
011   I/O read
100   Memory write
101   I/O write
110   Opcode fetch
111   Interrupt acknowledge
```

\<ADDR>
This is the hexadecimal memory address.

\<DT>
This is the hexadecimal data.

\<MNEMONIC>
This column shows the disassembled 8085-instructions.

\<INTRPT>

The following interrupts can be recognized: TRAP, INTR, RST5.5, RST6.5, and RST7.5. If an interrupt cannot be recognized, UNINT (Unidentified Interrupt) is displayed.

In case of DMA activity, the microprocessor delivers no clock signals so DMA samples are not taken-in.

*** __8085__ *** (cont'd)

Because both RDN and WRN are used as clocks, also all read and write activity is sampled, together with the complete address.

Except the standard mnemonics as published in the data handbooks, also the following instructions (accompanied with a '+') can be disassembled:

08_H=DSUB   (Double Subtraction)
        (H)(L)=(H)(L)-(B)(C)

10_H=ARHL   (Arithmetic right shift of H and L)
        (H7)=(H7) (Hn-1)=(Hn) (L7)=(H0) (Ln-1)=(Ln) (CY)=(L0)

18_H=RDEL   (Rotate D and E left through carry)
        (Dn+1)=(Dn) (D0)=(E7) (CY)=(D7) (En+1)=(En) (E0)=(CY)

28_H=LDHI   (Load D and E with H and L plus immediate byte)
        (D)(E)=(H)(L)+byte

38_H=LDSI   (Load D and E with SP plus immediate byte)
        (D)(E)=(SPH)(SPL)+byte

CB_H=RSTV   (Restart on overflow)
        ((SP)-1)=(PCH) ((SP)-2)=(PCL) (SP)=(SP)-2 (PC)=40_H

$D9_H$=SHLX   (Store H and L indirect through D and E)
        ((D)(E))=(L) ((D)(E)+1)=(H)

DD_H=JNX5   (Jump if X5 flag is reset)
        If (not X5): (PC)=(byte3)(byte2)

ED_H=LHLX   (Load H and L indirect through D and E)
        (L)=((D)(E)) (H)=((D)(E)+1)

FD_H= JX5   (Jump if X5 flag is set)
        lf (X5): (PC)=(byte3)(byte2)

*** 68000 ***

CONNECTION

POD0--CPU

```
CLK0   7-- 7 (UDS)
CLK1   6-- 8 (LDS)
CLK2   5--N.C.
  Q0   4--N.C.
  Q1   3--N.C.
       2--23 (IPL2)
       1--24 (IPL1)
       0--25 (IPL0)
     GND--16 or 53
```

POD#6--CPU

```
       7--22 (BERR)
       6--17 (HALT)
       5-- 9 (R/W)
       4-- 7 (UDS)
       3-- 8 (LDS)
       2--26 (FC2)
       1--27 (FC1)
       0--28 (FC0)
     GND--16 or 53
```

POD#5--CPU

```
       7--52 (A23)
       6--51 (A22)
       5--50 (A21)
       4--48 (A20)
       3--47 (A19)
       2--46 (A18)
       1--45 (A17)
       0--44 (A16)
     GND--16 or 53
```

POD#4--CPU

```
       7--43 (A15)
       6--42 (A14)
       5--41 (A13)
       4--40 (A12)
       3--39 (A11)
       2--38 (A10)
       1--37 (A9)
       0--36 (A8)
     GND--16 or 53
```

POD#3--CPU

```
       7--35 (A7)
       6--34 (A6)
       5--33 (A5)
       4--32 (A4)
       3--31 (A3)
       2--30 (A2)
       1--29 (A1)
       0--N.C.
     GND--16 or 53
```

POD#2--CPU

```
       7--54 (D15)
       6--55 (D14)
       5--56 (D13)
       4--57 (D12)
       3--58 (D11)
       2--59 (D10)
       1--60 (D9)
       0--61 (D8)
     GND--16 or 53
```

POD#1---CPU

```
       7--62 (D7)
       6--63 (D6)
       5--64 (D5)
       4-- 1 (D4)
       3-- 2 (D3)
       2-- 3 (D2)
       1-- 4 (D1)
       0-- 5 (D0)
     GND--16 or 53
```

POD#0 is free for other signal inputs.

Note: All above connections are pre-wired in the PM 8817/19.

*** 68000 *** (cont´d)

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=P	TRUE	X	X	X	X
	CLK1=P	TRUE	X	X	X	X
	CLK2=OFF					

POD-Q	POD#6	POD#5	POD#4	POD#3	POD#2	POD#1	POD#0
CLK0 AAA	BBCCCDDD	EEEEEEEE	EEEEEEEE	EEEEEEEE	FFFFFFFF	FFFFFFFF	--------
CLK1 AAA	BBCCCDDD	EEEEEEEE	EEEEEEEE	EEEEEEEE	FFFFFFFF	FFFFFFFF	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <I> <H> <M> <S> <ADDRES> <DATA> <FC> <MNEMONIC> <OPERAND>

In which:
<I> = Interrupt signals
<H> = Halt signals
<M> = Mode of operation
<S> = Status signals

Opcodes are sampled by clock0 thus the mnemonics are displayed behind this clock.
Interrupts will be recognized; behind the interrupt opcode is shown which IPL lines have been activated.
DMA activity is not sampled.

Free Pod
POD#0 is not used for disassembly purposes.
This Pod can be used to display additional data if required.
The desired connections can be made in the interface block, refer to Fig. 9.6.

DETAILED DISPLAY INFORMATION

<LINE #/MEM #> The line number with respect to the triggerword, or the memory address number.

<I> Interrupt signals <IPL2, IPL1, IPL0>	Interrupt level
0	7
1	6
2	5
3	4
4	3
5	2
6	1
7	0 (= no interrupt)

*** 68000 *** (cont'd)

<H> Halt signals

<BERR, HALT>	Description
0	BERR and HALT active
1	HALT active
2	BERR active
3	No halt instruction

<M> Mode of operation

<R/W, UDS, LDS>	Description
0	WRITE (word)
1	WRITE (upper-byte)
2	WRITE (lower-byte)
3	-
4	READ (word)
5	READ (upper-byte)
6	READ (lower-byte)

<S> Status signals

<FC2, FC1, FC0>	Description
0	(unassigned)
1	User data
2	User programm
3	(unassigned)
4	(unassigned)
5	Supervisor data
6	Supervisor programm
7	Interrupt acknowledge

<ADDRES> Hexadecimal address <A23..A0> -> 16 Mega-bytes

<DATA> Hexadecimal data <D15..D0>

<FC> Function codes

<FC2, FC1, FC0>	Description
UF	(unassigned)
UD	User data
UP	User Programm
UF	(unassigned)
UF	(unassigned)
SD	Supervisor data
SP	Supervisor programm
IA	Interrupt acknowledge

<MNEMONIC> Opcode compilation

<OPERAND> 0, 1 or 2 <operand-part> separated by a comma.

```
MMM          MMM
MMMM         MMMM
MMMMM       MMMMM
MMM MMMMM MMM
MMM   MMM   MMM
MMM          MMM
MMM          MMM
MMM          MMM
```

DISASSEMBLER PACKAGE M
MOTOROLA

PM 8850/20

This package features disassembly programms for the following micro processors:

-6800/02/08   Page 9.21
-6809/E   Page 9.23
-68000   Page 9.25

Software release: M PACK 51 1.1

*** 6800/02/08 ***

CONNECTION

PODQ--CPU

```
CLK0  7--37  (∅)
CLK1  6--N.C.
CLK2  5--N.C.
   Q0  4-- 5  (VMA)
   Q1  3-- 7  (BA)
       2--34  (R/WN)
       1--(free)
       0--(free)
     GND--*)
```

POD#3--CPU

```
       7--25  (A15)
       6--24  (A14)
       5--23  (A13)
       4--22  (A12)
       3--20  (A11)
       2--19  (A10)
       1--18  (A9)
       0--17  (A8)
     GND--*)
```

POD#2--CPU

```
       7--16  (A7)
       6--15  (A6)
       5--14  (A5)
       4--13  (A4)
       3--12  (A3)
       2--11  (A2)
       1--10  (A1)
       0-- 9  (A0)
     GND--*)
```

POD#1--CPU

```
       7--26  (D7)
       6--27  (D6)
       5--28  (D5)
       4--29  (D4)
       3--30  (D3)
       2--31  (D2)
       1--32  (D1)
       0--33  (D0)
     GND--*)
```

*) GND pin of the specific micro processor.

POD#0 is free for other signal inputs.

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	1	0	X	X
	CLK1=OFF					
	CLK2=OFF					

	POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0= A--	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY

The following columns are displayed:
\<LINE #/MEM #> \<S> \<ADDR> \<DT> \<MNEMONIC> \<INT>

\<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory address number.

<div align="center">

***   6800/02/08   *** (cont´d)

</div>

`<S>`

This is the processor status information represented in one bit.

```
<S>   Status
-----------
 0    Write
 1    Read
```

`<ADDR>`

This is the hexadecimal memory address.

`<DT>`

This is the hexadecimal data.

`<MNEMONIC>`

This column shows the disassembled 6800/2/8-instructions.

`<INT>`

The interrupts RESET, IRQ and NMI can be displayed. If unsufficient data is available UNINT may be displayed.

DMA activity is not sampled (Q1=0).

L O G I C   A N A L Y Z E R

P M   3 5 5 1 (A)

Concerns: M-Pack: improved 6809/E Disassembler

Software identifier: M-PACK. 51-1.2

With earlier versions of this disassembler package, incorrect disassembly
could occur due to the presence of ´dead cycles´ produced by the CPU.

Except the disassembler programm also the analyzer input connections have
been modified, to avoid this problem.
The CLK1-signal has been added.

The enclosed updated 6809/E pages can be inserted in your PM 3551(A)
Operating manual.

9499 500 13311

*** 6809/E ***

CONNECTION

PODQ--CPU

CLK0	7--34	(E)
CLK1	6-- 6	(BA)
CLK2	5-- N.C.	
Q0	4-- 6	(BA)
Q1	3-- N.C.	
Q2	2-- 5	(BS)
Q3	1--32	(R/WN)
	0--	(free)
GND--	1	(Vss)

POD#3--CPU

7--23	(A15)
6--22	(A14)
5--21	(A13)
4--20	(A12)
3--19	(A11)
2--18	(A10)
1--17	(A9)
0--16	(A8)
GND-- 1	(Vss)

POD#2--CPU

7--15	(A7)
6--14	(A6)
5--13	(A5)
4--12	(A4)
3--11	(A3)
2--10	(A2)
1-- 9	(A1)
0-- 8	(A0)
GND-- 1	(Vss)

POD#1--CPU

7--24	(D7)
6--25	(D6)
5--26	(D5)
4--27	(D4)
3--28	(D3)
2--29	(D2)
1--30	(D1)
0--31	(D0)
GND-- 1	(Vss)

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	0	X	X	X
	CLK1=N	TRUE	X	X	X	X
	CLK2=OFF					

LABEL		POD-Q	POD#3	POD#2	POD#1	POD#0
	CLK0=	AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------
	CLK1=	AA-	--------	--------	--------	--------

DISPLAY

The following columns are displayed:
<LINE#/MEM#> <ST> <ADDR> <DT> <MNEMONIC> <INT>

<LINE#/MEM#>
This is the line number with respect to the triggerword, or the memory
address number.

*** 6809/E ***

CONNECTION

POD-Q--CPU		POD#3--CPU	
CLK0	7--34 (E)	7--23	(A15)
CLK1	6-- N.C.	6--22	(A14)
CLK2	5-- N.C.	5--21	(A13)
Q0	4-- 6 (BA)	4--20	(A12)
Q1	3-- N.C.	3--19	(A11)
Q2	2-- 5 (BS)	2--18	(A10)
Q3	1--32 (R/WN)	1--17	(A9)
	0-- (free)	0--16	(A8)
	GND-- 1 (Vss)	GND-- 1	(Vss)

POD#2--CPU		POD#1--CPU	
7--15	(A7)	7--24	(D7)
6--14	(A6)	6--25	(D6)
5--13	(A5)	5--26	(D5)
4--12	(A4)	4--27	(D4)
3--11	(A3)	3--28	(D3)
2--10	(A2)	2--29	(D2)
1-- 9	(A1)	1--30	(D1)
0-- 8	(A0)	0--31	(D0)
GND-- 1	(Vss)	GND-- 1	(Vss)

SETTINGS

Following settings are selected automatically.

CLOCKS

CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
CLK0=N	TRUE	0	X	X	X
CLK1=OFF					
CLK2=OFF					

	POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0= AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <ST> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

<ST>
This is the processor status information represented in two bits.

<ST>	Status
00	Write
01	Read
1x	Interrupt acknowledge

***   6809/E   *** (cont'd)

<ST>
This is the processor status information represented in two bits.

```
        <ST>  Status
        -----------------------------
         00  Write
         01  Read
         1x  Interrupt acknowledge
```

<ADDR>
This is the hexadecimal memory address.

<DT>
This is the hexadecimal data.

<MNEMONIC>
This column shows the disassembled 6809/E-instructions.

<INT>
The interrupts RESET, IRQ, FIRQ and NMI can be displayed. If unsufficient information is available, UNINT may be displayed.

DMA activity is not sampled (Q0=0).

VMAN activity (non-valid memory address acces) is not shown in the synced part of the Disa display.

SYNCHRONIZATION
When a lot of '***' messages is displayed under mnemonics with the 6809/E, this means that the disassembler programm does not find correct synchronization.
In this case select manual synchronization as described in chapter 4.

***   6809/E   *** (cont'd)

<div align="center">

*** 6809/E *** (cont´d)
</div>

<ADDR>
This is the hexadecimal memory address.

<DT>
This is the hexadecimal data.

<MNEMONIC>
This column shows the disassembled 6809/E-instructions.

<INT>
The interrupts RESET, IRQ, FIRQ and NMI can be displayed. If unsufficient information is available, UNINT may be displayed.

DMA activity is not sampled (Q1=0).

SYNCHRONIZATION
When a lot of ´***´ messages is displayed under mnemonics with the 6809/E, this means that the disassembler programm does not find correct synchronization.
In this case select manual synchronization as described in chapter 4.

*** 68000 ***

CONNECTION

POD0--CPU	
CLK0	7-- 7 (UDS)
CLK1	6-- 8 (LDS)
CLK2	5-- N.C.
Q0	4-- N.C.
Q1	3-- N.C.
	2--23 (IPL2)
	1--24 (IPL1)
	0--25 (IPL0)
	GND--16 or 53

POD#6--CPU
7--22 (BERR)
6--17 (HALT)
5-- 9 (R/W)
4-- 7 (UDS)
3-- 8 (LDS)
2--26 (FC2)
1--27 (FC1)
0--28 (FC0)
GND--16 or 53

POD#5--CPU
7--52 (A23)
6--51 (A22)
5--50 (A21)
4--48 (A20)
3--47 (A19)
2--46 (A18)
1--45 (A17)
0--44 (A16)
GND--16 or 53

POD#4--CPU
7--43 (A15)
6--42 (A14)
5--41 (A13)
4--40 (A12)
3--39 (A11)
2--38 (A10)
1--37 (A9)
0--36 (A8)
GND--16 or 53

POD#3--CPU
7--35 (A7)
6--34 (A6)
5--33 (A5)
4--32 (A4)
3--31 (A3)
2--30 (A2)
1--29 (A1)
0-- N.C.
GND--16 or 53

POD#2--CPU
7--54 (D15)
6--55 (D14)
5--56 (D13)
4--57 (D12)
3--58 (D11)
2--59 (D10)
1--60 (D9)
0--61 (D8)
GND--16 or 53

POD#1---CPU
7--62 (D7)
6--63 (D6)
5--64 (D5)
4-- 1 (D4)
3-- 2 (D3)
2-- 3 (D2)
1-- 4 (D1)
0-- 5 (D0)
GND--16 or 53

POD#0 is free for other
signal inputs.

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=P	TRUE	X	X	X	X
	CLK1=P	TRUE	X	X	X	X
	CLK2=OFF					

POD-Q	POD#6	POD#5	POD#4	POD#3	POD#2	POD#1	POD#0
CLK0 AAA	BBCCCDDD	EEEEEEEE	EEEEEEEE	EEEEEEEE	FFFFFFFF	FFFFFFFF	--------
CLK1 AAA	BBCCCDDD	EEEEEEEE	EEEEEEEE	EEEEEEEE	FFFFFFFF	FFFFFFFF	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <I> <H> <M> <S> <ADDRES> <DATA> <FC> <MNEMONIC> <OPERAND>

In which:
<I> = Interrupt signals
<H> = Halt signals
<M> = Mode of operation
<S> = Status signals

Opcodes are sampled by clock0 thus the mnemonics are displayed behind this clock.
Interrupts will be recognized; behind the interrupt opcode is shown which IPL lines have been activated.
DMA activity is not sampled.

Free Pod
Pod#0 is not used for disassembly purposes.
This Pod can be used to display additional data if required.
The desired connections can be made in the interface block, refer to Fig. 9.6.

DETAILED DISPLAY INFORMATION

<LINE #/MEM #>   This is the linenumber with respect to the triggerword, or the memory address number.

<I>	Interrupt signals <IPL2, IPL1, IPL0>	Interrupt level
	0	7
	1	6
	2	5
	3	4
	4	3
	5	2
	6	1
	7	0 (= no interrupt)

***   68000   ***   (cont'd)

<H>   Halt signals

<BERR, HALT>	Description
0	BERR and HALT active
1	HALT active
2	BERR active
3	No halt instruction

<M>   Mode of operation

<R/W, UDS, LDS>	Description
0	WRITE (word)
1	WRITE (upper-byte)
2	WRITE (lower-byte)
3	-
4	READ (word)
5	READ (upper-byte)
6	READ (lower-byte)

<S>   Status signals

<FC2, FC1, FC0>	Description
0	(unassigned)
1	User data
2	User programm
3	(unassigned)
4	(unassigned)
5	Supervisor data
6	Supervisor programm
7	Interrupt acknowledge

<ADDRES>   Hexadecimal address   <A23..A0> -> 16 Mega-bytes

<DATA>   Hexadecimal data   <D15..D0>

<FC>   Function codes

<FC2, FC1, FC0>	Description
UF	(unassigned)
UD	User data
UP	User Programm
UF	(unassigned)
UF	(unassigned)
SD	Supervisor data
SP	Supervisor programm
IA	Interrupt acknowledge

<MNEMONIC>   Opcode compilation

<OPERAND>   0, 1 or 2 <operand-part> separated by a comma.

```
NNN      NNN
NNNN     NNN
NNNNN    NNN
NNNNNN NNN
NNN NNNNNN
NNN   NNNNN
NNN    MNNN
NNN      NNN
```

DISASSEMBLER PACKAGE N
INTEL

PM 8850/10

This package features disassembly programms for the following micro processors:

8031/8051	Page 9.29
8080	Page 9.31
8085	Page 9.33
8086/8088 Min. mode	Page 9.36
8086/8088 Max. mode	Page 9.37
8086/8088 Min. and Max.	Page 9.38

Software release: N PACK 51 2.0

RE: LOGIC ANALYZER PM 3551(A)

SUBJECT: PROBLEMS IN THE DISASSEMBLER N-PACKAGE (INTEL) REL 1.0

Using the 8080 and 8085 disassemblers in this package, problems may occur,
due to wrong clock-setting.
This applies to: 8080: clock 2 only,
                 8085: clock 1 and 2.

When the disassembler has been selected, the clock edge selection as
shown in the configuration display is correct, though the actual active
clock edges are not according to the display.

The temporary solution to this fault is to key once again the setting of
the clock(s) according to the configuration menu, after selection of the
disassembler.

Using the Save memory does not help as the Disa is not saved.

In the next N-Package software release, this problem will be solved.

***   8031/8051   ***

CONNECTION

<pre>
        POD0--CPU   POD#3--CPU

   CLK0   7--30 (ALE)   7--28 (A15)
   CLK1   6--29 (PSEN)   6--27 (A14)
   CLK2   5--17/16 (RD/WR)-See text.   5--26 (A13)
   Q0   4-- N.C.   4--25 (A12)
   Q1   3-- N.C.   3--24 (A11)
   Q2   2-- (free)   2--23 (A10)
   Q3   1--12 (INT0)   1--22 (A9)
          0--13 (INT1)   0--21 (A8)
          GND--20   GND--20
</pre>

<pre>
        POD#2--CPU

          7--32 (AD7)
          6--33 (AD6)
          5--34 (AD5)
          4--35 (AD4)
          3--36 (AD3)
          2--37 (AD2)
          1--38 (AD1)
          0--39 (AD0)
          GND--20
</pre>

Pods #0 and #1 are free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	X	X	X	X
	CLK1=N	TRUE	X	X	X	X
	CLK2=P	TRUE	X	X	X	X

	POD-0	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=-AA	BBBBBBBB	BBBBBBBB	--------	--------
	CLK1=---	--------	CCCCCCCC	--------	--------
	CLK2=---	--------	CCCCCCCC	--------	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <ST> <ADDR> <DT> <MNEMONIC> <INTERRUPT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

***   8031/8051   *** (cont´d)

<ST>
This column shows both the INT0 and INT1 interrupt input status, refer to
following table.

<ST>	INT0	INT1	Remarks
11	1	1	No interrupt input
01	0	1	Interr. inp. 0, or gate control input for counter 0.
10	1	0	Interr. inp. 1, or gate control input for counter 1.
00	0	0	Both interrupt inputs 0 and 1 active.

<INTERRUPT>
-8031
Following interrupts can be displayed:
´EXT.INT0´, ´EXT.INT1´,´INT.TIM0´,´INT.TIM1´ and ´SER.PORT´. This
information is obtained from the call-addresses.

-8051
With this processor no interrupts are indicated. In case of an interrupt
the internal Rom is accessed.

CLK2
The CLK2 source can be the Read-, or the Write signal from the micro-
processor or both.
This can be selected by jumper setting inside the PM 8816/30 interface box.
If both signals have been selected, the signals are combined with an
AND-gate in the PM 8816 box.
  Note
In the 8031/8051 manual the Read signal is specified with a minimal
data-holdtime (TRHDX) of 0 nS.
In time-critical applications, this may cause incorrect data-sampling in
the Logic Analyzer, when the combined Read/Write signal is used as a clock-
source. This is caused by the AND-gate in the PM 8816, which delays the
signal approx. 15 nS.

Remarks
With both 8031/8051 micro processors, the disassembler does not have any
access to the internal memory activities of the processors. In this case
the Address column in the Disa display shows addresses but the Data and
Mnemonic columns remain empty.

*** 8080 ***

CONNECTION

POD0--CPU

CLK0	7--19	(SYNC)
CLK1	6--17	(DBIN)
CLK2	5--18	(WRN)
Q0	4--	N.C.
Q1	3--	N.C.
Q2	2--	(free)
Q3	1--	(free)
	0--	(free)
GND--	2	

POD#3--CPU

7--36	(A15)
6--39	(A14)
5--38	(A13)
4--37	(A12)
3--40	(A11)
2-- 1	(A10)
1--35	(A9)
0--34	(A8)
GND-- 2	

POD#2--CPU

7--33	(A7)
6--32	(A6)
5--31	(A5)
4--30	(A4)
3--29	(A3)
2--27	(A2)
1--26	(A1)
0--25	(A0)
GND-- 2	

POD#1--CPU

7-- 6	(D7)
6-- 5	(D6)
5-- 4	(D5)
4-- 3	(D4)
3-- 7	(D3)
2-- 8	(D2)
1-- 9	(D1)
0--10	(D0)
GND-- 2	

Pod #0 is free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	X	X	X	X
	CLK1=N	TRUE	X	X	X	X
	CLK2=P	TRUE	X	X	X	X

	POD-0	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=---	--------	--------	AAAAAAAA	--------
	CLK1=---	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------
	CLK2=---	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <ST> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory address number.

<ST>
This is the processor status information represented in two hexadecimal characters.

***   8080   *** (cont´d)

<ST> Status

UU   Memory write
U4   Stack write
10   I/O write
23   Interrupt acknowledge
2B   Interrupt acknowledge while Halt
42   I/O read
82   Memory read
86   Stack read
8A   Halt acknowledge
A2   Instruction fetch

<INT>
They are simply shown as ´INT´.

In case of DMA activity, the microprocessor delivers no clock signals so DMA samples are not taken-in.

*** 8085 ***

CONNECTION

PODQ--CPU

```
CLK0   7--30   (ALE)
CLK1   6--32   (RDN)
CLK2   5--31   (WRN)
  Q0   4--  N.C.
  Q1   3--  N.C.
  Q2   2--29   (S0)
  Q3   1--33   (S1)
       0--34   (IO/MN)
     GND--20
```

POD#3--CPU

```
       7--28  (A15)
       6--27  (A14)
       5--26  (A13)
       4--25  (A12)
       3--24  (A11)
       2--23  (A10)
       1--22  (A9)
       0--21  (A8)
     GND--20
```

POD#2--CPU

```
       7--19  (AD7)
       6--18  (AD6)
       5--17  (AD5)
       4--16  (AD4)
       3--15  (AD3)
       2--14  (AD2)
       1--13  (AD1)
       0--12  (AD0)
     GND--20
```

POD#1 and POD#0 are free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	X	X	X	X
	CLK1=P	TRUE	X	X	X	X
	CLK2=P	TRUE	X	X	X	X

	POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=AAA	BBBBBBBB	BBBBBBBB	--------	--------
	CLK1=---	--------	CCCCCCCC	--------	--------
	CLK2=---	--------	CCCCCCCC	--------	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <STA> <ADDR> <DT> <MNEMONIC> <INTRPT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory address number.

*** 8085 *** (cont'd)

\<STA\>
This is the processor status information represented in three bits.

\<STA\>	Status
000	-
001	-
010	Memory read
011	I/O read
100	Memory write
101	I/O write
110	Opcode fetch
111	Interrupt acknowledge

\<ADDR\>
This is the hexadecimal memory address.

\<DT\>
This is the hexadecimal data.

\<MNEMONIC\>
This column shows the disassembled 8085-instructions.

\<INTRPT\>
The following interrupts can be recognized: TRAP, INTR, RST5.5, RST6.5, and RST7.5. If an interrupt cannot be recognized, UNINT (Unidentified Interrupt) is displayed.

In case of DMA activity, the microprocessor delivers no clock signals so DMA samples are not taken-in.

Because both RDN and WRN are used as clocks, also all read and write activity is sampled, together with the complete address.

*** 8085 *** (cont'd)

Except the standard mnemonics as published in the data handbooks, also the following instructions (accompanied with a '+') can be disassembled:

08_H=DSUB   (Double Subtraction)
                 (H)(L)=(H)(L)-(B)(C)

10_H=ARHL   (Arithmetic right shift of H and L)
                 (H7)=(H7) (Hn-1)=(Hn) (L7)=(H0) (Ln-1)=(Ln) (CY)=(L0)

18_H=RDEL   (Rotate D and E left through carry)
                 (Dn+1)=(Dn) (D0)=(E7) (CY)=(D7) (En+1)=(En) (E0)=(CY)

28_H=LDHI   (Load D and E with H and L plus immediate byte)
                 (D)(E)=(H)(L)+byte

38_H=LDSI   (Load D and E with SP plus immediate byte)
                 (D)(E)=(SPH)(SPL)+byte

CB_H=RSTV   (Restart on overflow)
                 ((SP)-1)=(PCH) ((SP)-2)=(PCL) (SP)=(SP)-2 (PC)=40_H

$D9_H$=SHLX   (Store H and L indirect through D and E)
                 ((D)(E))=(L) ((D)(E)+1)=(H)

DD_H=JNX5   (Jump if X5 flag is reset)
                 If (not X5): (PC)=(byte3)(byte2)

ED_H=LHLX   (Load H and L indirect through D and E)
                 (L)=((D)(E)) (H)=((D)(E)+1)

FD_H= JX5   (Jump if X5 flag is set)
                 If (X5): (PC)=(byte3)(byte2)

*** 8086/8088 MIN. MODE ***

CONNECTION

```
   PODQ--CPU                      POD#3--CPU

CLK0   7--25 (ALE)                 7-- N.C.
CLK1   6--32 (RDN)                 6--28 (M/ION)
CLK2   5--29 (WRN)                 5--27 (DT/RN)
   Q0  4--30                       4--33 (MN/MXN)
   Q1  3-- N.C.                    3--35 (A19/S6)
   Q2  2--    (free)               2--36 (A18/S5)
   Q3  1--    (free)               1--37 (A17/S4)
       0--    (free)               0--38 (A16/S3)
      GND-- 1 and 20            GND-- 1 and 20


   POD#2--CPU                      POD#1--CPU

   7--39 (AD15)                    7-- 9 (AD7)
   6-- 2 (AD14)                    6--10 (AD6)
   5-- 3 (AD13)                    5--11 (AD5)
   4-- 4 (AD12)                    4--12 (AD4)
   3-- 5 (AD11)                    3--13 (AD3)
   2-- 6 (AD10)                    2--14 (AD2)
   1-- 7 (AD9)                     1--15 (AD1)
   0-- 8 (AD8)                     0--16 (AD0)
 GND-- 1 and 20                  GND-- 1 and 20

   (Pod#2 with the
   8088 is A8--15)
```

POD#0 is free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	0	X	X	X
	CLK1=P	TRUE	0	X	X	X
	CLK2=P	TRUE	0	X	X	X

		POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL		CLK0=---	-AA-DDDD	DDDDDDDD	DDDDDDDD	--------
		CLK1=---	----BBCC	EEEEEEEE	EEEEEEEE	--------
		CLK2=---	----BBCC	EEEEEEEE	EEEEEEEE	--------

*** 8086/8088 MAX. MODE ***

CONNECTIO

POD#Q--CPU	POD#0--8288 (See text)	POD#3--CPU

```
        POD#Q--CPU          POD#0--8288              POD#3--CPU
                            (See text)
      CLK0   7--   <-ALE(EXT)->7--5 ALE          7-- N.C.
      CLK1   6--32 RDN                           6--28 (S2)
      CLK2   5--   <-WRN(EXT)->5--8 AMWCN or,    5--27 (S1)
        Q0   4--30              9 MWTCN  *)      4--33 (MN/MXN)
        Q1   3-- N.C.                            3--35 (A19/S6)
        Q2   2--   (free)                        2--36 (A18/S5)
        Q3   1--   (free)                        1--37 (A17/S4)
               0--   (free)                        0--38 (A16/S3)
            GND-- 1 and 20                      GND-- 1 and 20
```

```
        POD#2--CPU                   POD#1--CPU

         7--39 (AD15)                7-- 9 (AD7)
         6-- 2 (AD14)                6--10 (AD6)
         5-- 3 (AD13)                5--11 (AD5)
         4-- 4 (AD12)                4--12 (AD4)
         3-- 5 (AD11)                3--13 (AD3)
         2-- 6 (AD10)                2--14 (AD2)
         1-- 7 (AD9)                 1--15 (AD1)
         0-- 8 (AD8)                 0--16 (AD0)
        GND-- 1 and 20              GND-- 1 and 20
```

(Pod#2 with the 8088 is A8--15)

POD#0 inputs 0--3 and 6 are free for other signal inputs.

*) Pin 8 or 9 of the system controller 8288 depending on accessability
   (no difference for the disassembler programm. Refer to 'Remarks').
In the Max mode PODQ inputs 5 and 7 respectively, must be connected
to the ALE and WRN signals generated by the system controller 8288
(via Pod #0). This is done by putting both the jumpers ALE and
WRN in the PM 8816/27 interface box in the EXT (=Max mode) position.
Refer to Fig. 9.7. The 8288 must control all 8086/8088 activity (AEN
must be constant low).
There is no need to change the wiring inside the PM 8816 box, to
change the circuit for disassembly from the Min. mode to the Max.
mode, vice versa. Just selecting the jumper setting is sufficient.

The CLK2 signal can be the memory write pulse or the I/O write pulse.
If the I/O write pulse is used, interrupt detection is not possible.
This may give loss of synchronization.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	X	X	X	X
	CLK1=P	TRUE	X	X	X	X
	CLK2=P	TRUE	X	X	X	X

	POD#Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=----	-AA-DDDD	DDDDDDDD	DDDDDDDD	--------
	CLK1=----	----BBCC	EEEEEEEE	EEEEEEEE	--------
	CLK2=----	----BBCC	EEEEEEEE	EEEEEEEE	--------

*** 8086/8088 MIN. and MAX. MODE ***

The following information applies to the 8086/8088 in both the Min. and the Max. mode.

DISPLAY

The Disa display shows the following columns:
<LINE#/MEM#> <MW> <P1> <S> <ADDRS> <CODE> <MNEMONIC> <INTERRUPT>

<LINE #/MEM #>
The line number with respect to the triggerword, or the memory address number. These numbers may be used as a cross-reference between disa- and state display.

<MW>
Two bits, from left to right:

M	: 1	Memory selected	Note, this bit is inverted in the 8088 Min
	0	I/O selected	mode Disa display, for compatibility with
			the other 8086/8088 Disa displays.
W	: 1	Write	
	0	Read	

<P1> and <S>
These columns show the status of bits S6--S3 on clock 1 or 2.

    P (S6): 1 Co-processor action
            0 CPU action

    I (S5), with a CPU action, this bit represents the PSW interrupt
             enable bit status, at the moment of bus transaction.
             With co-processor actions, I=0 for 8087-actions and
                                        I=1 for 8089-actions.

    S (S4,3) with CPU actions this column shows the number of the accessed
             segment.

             0 Extra segment
             1 Stack segment
             2 Code segment, or none (IO/INTA)
             3 Data segment

<ADDRS>
This is the hexadecimal memory address.
In the disa-display, the address of the first byte of an opcode or of a data-transfer is shown. So it is possible that an odd address is shown in the disa-display, while in the state-display an even address is shown.

<CODE>
Under this column in the disa-display, the bytes of an instruction are shown (max. 6).

<MNEMONIC>
Shows the instruction mnemonics. Prefixes are shown as separate instructions. Addresses and address off-sets are preceeded by an ´@´, to distinguish them from immediate data.

***   8086/8088 MIN. and MAX. MODE   *** (cont'd)

\<INTERRUPT>
When an interrupt arrives, NMI or INT is shown, with the corresponding
decimal type-code. The interrupt is followed by two interrupt vector read
actions and three stack write actions. Also software interrupts are
signalled.
Interrupt acknowledge signals are not shown.

REMARKS

  -Auto Sync sets the synchronization point of the disassembler after the
   first recognized control transfer (Jump or Call) in the sampled data.
   The disassembly continues until an address-discrepancy occurs, or until a
   data-transfer-instruction with missing data is encountered, or until the
   end of the acquisition memory.
   Outside the 'sync'-section the disassembler shows: '****', on code segment
   read cycles. This indicates for which lines Manual sync may be obtained.

  -With Man Sync the even byte of the selected line is taken as disassembler
   synchronization point, except when the address is odd (8086).

  -Due to the instruction queue structure of the 8086 micro processor, we may
   find some code segment read actions on the data bus which are not executed.
   Sometimes the Auto-sync disassembler cannot find out whether a certain
   conditional jump instruction has been executed or not. The relation
   between an instruction and corresponding data may be wrong. A line number
   jump will give an indication to this.

  -When co-processors such as the 8087 (or the 8089) have been connected to
   the 8086, only the data read action is shown in case of an ESC(ape)
   instruction. The addresses of the 8087 read and write actions are shown
   in the state display, but not in the disassembler display.

  -Due to the fast rise times of the processor signals, there is a possibility
   that cross-talk occurs between the connection wires around the microproces-
   sor. In this case we recommend you to set the threshold voltage for PodQ
   to a less critical value (we found that 1.9V threshold voltage setting
   gave better results than TTL level; use the VAR control).
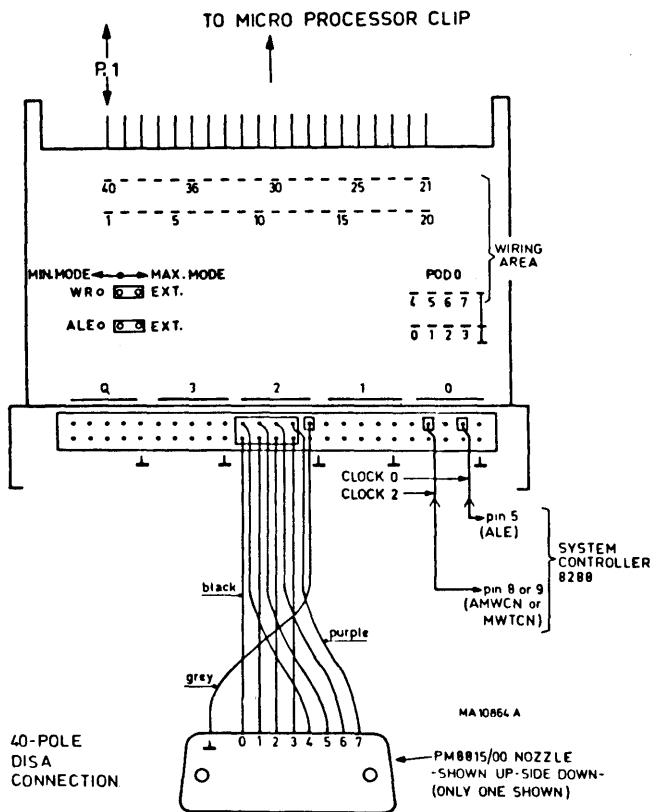
Fig. 9.7 8086/8088 in Max. mode, connection of the 8288-system-
controller clock signals, via the PM 8816/27 box.

```
RRRRRRRRR
RRRR      RRR
RRR         RRR
RRRR      RRR
RRRRRRRRR
RRR       RRR
RRR         RRR
RRR          RRR
```

DISASSEMBLER PACKAGE R

PM 8850/40

This package features disassembly programms for the following micro processors:

Software release: R PACK 51 1.0

***   1802/1804/1806-/04A/05A/06A   ***

CONNECTION

POD-Q--CPU

```
CLK0  7--34  (TPA)
CLK1  6--33  (TPB)
      5--  N.C.
      4--  N.C.
      3--  N.C.
      2-- 5  (SC1)
      1-- 6  (SC0)
      0--16  (EMSN)
    GND--20
```

POD#3--CPU

```
      7--32  (MA7)
      6--31  (MA6)
      5--30  (MA5)
      4--29  (MA4)
      3--28  (MA3)
      2--27  (MA2)
      1--26  (MA1)
      0--25  (MA0)
    GND--20
```

POD#2--CPU

```
      7-- 8  (BUS7)
      6-- 9  (BUS6)
      5--10  (BUS5)
      4--11  (BUS4)
      3--12  (BUS3)
      2--13  (BUS2)
      1--14  (BUS1)
      0--15  (BUS0)
    GND--20
```

POD#1 and POD#0 are free for other
signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=P	TRUE	X	X	X	X
	CLK1=P	TRUE	X	X	X	X
	CLK2=OFF					

		POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=	---	BBBBBBBB	--------	--------	--------
	CLK1=	AAA	CCCCCCCC	DDDDDDDD	--------	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <STA> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

<STA>
This is the processor status information represented in three bits.

First and second bit (SC0 and SC1)	Status
00	Instruction fetch
01	Instruction under execution
10	DMA request processing
11	Acknowledging an interrupt request

Third bit:

0	External memory selected
1	No external memory selected

<ADDR>
This is the (16-bit) hexadecimal memory addres, sampled by TPA and TPB.

<DT>
This is the hexadecimal data.

<MNEMONIC>
This column shows the disassembled processor instructions.

<INT>
Interrupts are represented by ´INT´.

Direct memory access is represented by ´DMA´.

***   NSC800   ***

CONNECTION

POD#Q--CPU

```
CLK0   7--30   (ALE)
CLK1   6--32   (RD)     *)
CLK2   5--26   (INTA)
  Q0   4--28   (RFSH)
  Q1   3--35   (BACK)
  Q2   2--34   (IO/M)
  Q3   1--27   (S1)
       0--29   (S0)
     GND--20
```

POD#2--CPU

```
       7--19   (AD7)
       6--18   (AD6)
       5--17   (AD5)
       4--16   (AD4)
       3--15   (AD3)
       2--14   (AD2)
       1--13   (AD1)
       0--12   (AD0)
     GND--20
```

POD#3--CPU

```
       7-- 8   (A15)
       6-- 7   (A14)
       5-- 6   (A13)
       4-- 5   (A12)
       3-- 4   (A11)
       2-- 3   (A10)
       1-- 2   (A9)
       0-- 1   (A8)
     GND--20
```

POD#1 and POD#0 are free for other
signal inputs.

*) or a ´combined´ signal of
    RD and WR(pin 31).
    See text.

SETTINGS

Following setting is selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	1	1	X	X
	CLK1=P	TRUE	X	1	X	X
	CLK2=P	TRUE	X	1	X	X

LABEL		POD-Q	POD#3	POD#2	POD#1	POD#0
	CLK0=	AAA	BBBBBBBB	BBBBBBBB	--------	--------
	CLK1=	---	--------	CCCCCCCC	--------	--------
	CLK2=	---	--------	CCCCCCCC	--------	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <STA> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

*** NSC800 *** (cont'd)

<STA>
This is the processor status information represented by three bits.

The first bit indicates memory- or I/O action:
0 Memory action
1 I/O action

Second and third bit (S1 and S0)	Status.
00	Halt
01	Write
10	Read
11	Opcode fetch

<ADDR>
This is the hexadecimal memory address.

<DT>
This is the hexadecimal data.

<MNEMONIC>
This column shows the disassembled NSC800-instructions.

<INTERRUPT>
Interrupts can be distinguished if sufficient data are present.
The following interrupts can be displayed: 'NMI', 'RSTA', 'RSTB', 'RSTC', 'INTR MODE 0, 1 or 2'.

Clock 1
The Clock 1 source can be the Read signal or the combined Read/Write signal.
This can be selected by jumper setting inside the PM 8816/12 interface box.
If both signals have been selected, the signals are combined with an AND-gate in the PM 8816 box.
 Note
In time-critical applications however, use of the combined Read/Write signal as clock 1 source, may cause incorrect data-sampling in the Logic Analyzer due to delay of the Read signal. This is caused by the AND-gate in the PM 8816, which delays the signal approx. 15 nS.

*** R6502/6512 ***

CONNECTION

POD#Q--CPU

```
CLK0  7--39  (PHI 2)
CLK1  6--39  (PHI 2)
      5--N.C.
      4--N.C.
      3--N.C.
Q2    2-- 2  (RDY)
Q3    1--34  (RD/WR)
      0-- 7  (SYNC)
   GND-- 1 or 21
```

POD#3--CPU

```
   7--25  (A15)
   6--24  (A14)
   5--23  (A13)
   4--22  (A12)
   3--20  (A11)
   2--19  (A10)
   1--18  (A9)
   0--17  (A8)
GND-- 1 or 21
```

POD#2--CPU

```
   7--16  (A7)
   6--15  (A6)
   5--14  (A5)
   4--13  (A4)
   3--12  (A3)
   2--11  (A2)
   1--10  (A1)
   0--10  (A0)
GND-- 1 or 21
```

POD#1--CPU

```
   7--26  (D7)
   6--27  (D6)
   5--28  (D5)
   4--29  (D4)
   3--30  (D3)
   2--31  (D2)
   1--32  (D1)
   0--33  (D0)
GND-- 1 or 21
```

Pod #0 is free for other signal inputs.

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=N	TRUE	X	X	1	1
	CLK1=N	TRUE	X	X	X	0
	CLK2=OFF					

		POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=	AAA	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------
	CLK1=	AAA	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY
The following columns are displayed:
<LINE #/MEM #> <STA> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

***   R6502/6512   *** (cont'd)

<STA>
This is the processor status information represented in three bits.
First bit (RDY):
0   Delays execution of any cycle
1   No delayed

Second bit (RD/WR):
0   Write
1   Read

Third bit (SYNC):
0   Normal
1   Start of opcode fetch

<ADDR>
This is the hexadecimal memory address.

<DT>
This is the hexadecimal data.

<MNEMONIC>
This column shows the disassembled R6502/6512-instructions.

<INT>
The following interrupts can be recognized: 'NMI', 'IRQ', 'RST'.
If insufficient data is available to distiguish a certain interrupt,
'UNINT' is displayed.

DMA activity is neglected by the RDY signal (which is a micro processor
input) as qualifier Q2.

If the RDY signal is not used in the System-under-test, the Q2 input of the
Logic Analyzer (Pod-Q point 2) must be connected to a logic '1' level.

```
ZZZZZZZZZ
ZZZZZZZZZ
     ZZZZ
    ZZZZ
   ZZZZ
  ZZZZ
ZZZZZZZZZ
ZZZZZZZZZ
```

DISASSEMBLER PACKAGE Z
ZILOG

PM 8850/30

This package features disassembly programms for the following micro processors:

-Z80   Page 9.49
-Z8001 Page 9.51
-Z8002 Page 9.53

Software release: Z PACK 51 1.0

*** Z80 ***

CONNECTION

POD#Q--CPU			POD#3--CPU		
CLK0	7--19	(MREQN)	7--	5	(A15)
CLK1	6--20	(IOREQN)	6--	4	(A14)
CLK2	5--N.C.		5--	3	(A13)
Q0	4--28	(RFSHN)	4--	2	(A12)
Q1	3--N.C.		3--	1	(A11)
	2--27	(M1N)	2--40		(A10)
	1--21	(RDN)	1--39		(A9)
	0--N.C.(free)		0--38		(A8)
	GND--29		GND--29		

POD#2--CPU		POD#1--CPU		
7--37	(A7)	7--13		(D7)
6--36	(A6)	6--10		(D6)
5--35	(A5)	5-- 9		(D5)
4--34	(A4)	4-- 7		(D4)
3--33	(A3)	3-- 8		(D3)
2--32	(A2)	2--12		(D2)
1--31	(A1)	1--15		(D1)
0--30	(A0)	0--14		(D0)
GND--29		GND--29		

Pod #0 is free for other signal inputs.

SETTINGS

Following setting is selected automatically.

CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
CLK0=P	TRUE	1	X	X	X
CLK1=P	TRUE	1	X	X	X
CLK2=OFF					

	POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------
	CLK1=AA-	BBBBBBBB	BBBBBBBB	CCCCCCCC	--------

DISPLAY

The following columns are displayed:
<LINE #/MEM #> <ST> <ADDR> <DT> <MNEMONIC> <INT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

<ST>
This is the processor status information represented in two bits.

```
<ST>   Status
--------------------------
00   No function
01   Interrupt acknowledge
10   Read from PIO
11   Write to PIO
```

<ADDR>
This is the hexadecimal memory address.

<DT>
This is the hexadecimal data.

<MNEMONICS>
This column shows the disassembled Z80-instructions.

<INT>
This column shows a 'non maskable' interrupt as 'NMI'; the other interrupts are shown as 'INT'.

*** Z8001 ***

CONNECTION

POD#Q--CPU		POD#3--CPU	
CLK0	7--34 (AS)	7--	N.C.
CLK1	6--19 (DS)	6--	N.C.
CLK2	5-- N.C.	5--	N.C.
Q0	4--29 (BUSAK)	4--30	(R/W)
	3-- N.C.	3--20	(ST3)
	2-- N.C.	2--21	(ST2)
	1-- N.C.	1--22	(ST1)
	0-- N.C.	0--23	(ST0)
GND--36		GND--36	

POD#2--CPU		POD#1--CPU	
7-- 9	(AD15)	7--45	(AD7)
6--10	(AD14)	6--44	(AD6)
5-- 6	(AD13)	5--41	(AD5)
4-- 5	(AD12)	4--43	(AD4)
3-- 4	(AD11)	3--40	(AD3)
2-- 3	(AD10)	2--39	(AD2)
1-- 2	(AD9)	1--38	(AD1)
0--48	(AD8)	0-- 1	(AD0)
GND--36		GND--36	

POD#0--CPU	
7-- N.C.	
6--47	(SN6)
5--46	(SN5)
4--42	(SN4)
3--24	(SN3)
2--37	(SN2)
1--25	(SN1)
0--26	(SN0)
GND--36	

Note: The Z8001 is provided with 48 pins. To connect the Z8001 to the
Analyzer Pods we recommend you to use the personality adaptor
PM 8817/64 (which has a 64-pole clip). Mount the CPU clip such, that
connections 1 to 48 of the clip make contact to the corresponding
processor pins. Leave the connections 49 to 64 of the clip unused.
The personality box (PM 8816) must be wired according to the above
connection list.

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=P	TRUE	1	X	X	X
	CLK1=P	TRUE	1	X	X	X
	CLK2=OFF					

		POD-Q	POD#3	POD#2	POD#1	POD#0
LABEL	CLK0=	---	---ABBBB	DDDDDDDD	DDDDDDDD	-CCCCCCC
	CLK1=	---	--------	EEEEEEEE	EEEEEEEE	--------

*** __Z8001__ *** (cont'd)

__DISPLAY__

The following columns are displayed:
<LINE #/MEM #> <STA> <SN> <ADDR> <DATA> <MNEMONIC> <INTERRUPT>

<LINE #/MEM #>
This is the line number with respect to the triggerword, or the memory
address number.

<STA>
This is the processor status information, represented in two columns:
    The first column shows a 0 or a 1.
    0   Write
    1   Read

The second column displayes the hexadecimal value of (0--F) of the
status information according to the following table:

Status	Transaction type
0	Internal operation
1	Memory refresh
2	Standard I/O
3	Special I/O
4	Segment trap
5	Non-maskable interrupt acknowledge
6	Non-vectored interrupt acknowledge
7	Vectored interrupt acknowledge
8	Data address memory
9	Stack address memory
A	Data address memory - EPU transfer (Extended Processing Unit)
B	Stack address memory - EPU transfer
C	Programm address memory (subsequent word)
D	Programm address memory (first word)
E	EPA transfer (Extended Processing Architecture)
F	Reserved

<SN>
This is the hexadecimal value of the 7-bit memory-segment number.

<ADDR>
This is the hexadecimal value of the 16-bit memory address number.

<DATA>
This is the hexadecimal value of the 16-bit data.

<MNEMONIC>
This column shows the disassembled Z8001-instructions.

<INTERRUPT>
This column shows the interrupts: NMI, NVI, NI, and SEG TRAP.

*** Z8002 ***

CONNECTION

POD#--CPU

CLK0   7--29   (AS)
CLK1   6--17   (DS)
       5--N.C.
QU   4--24   (BUSAK)
       3--N.C.
Q2   2-- free
Q3   1-- free
       0-- free
GND--31

POD#3--CPU

7--free
6--free
5--free
4--25   (R/W)
3--18   (ST3)
2--19   (ST2)
1--20   (ST1)
0--21   (ST0)
GND--31

POD#2--CPU

7-- 8   (AD15)
6-- 9   (AD14)
5-- 5   (AD13)
4-- 4   (AD12)
3-- 3   (AD11)
2-- 2   (AD10)
1-- 1   (AD9)
0--39   (AD8)
GND--31

POD#1--CPU

7--38   (AD7)
6--37   (AD6)
5--35   (AD5)
4--36   (AD4)
3--34   (AD3)
2--33   (AD2)
1--32   (AD1)
0--40   (AD0)
GND--31

Pod#0 is free for other signal inputs.

SETTINGS

Following settings are selected automatically.

CLOCKS	CLOCKS	QUALIFIERS	Q0	Q1	Q2	Q3
	CLK0=P	TRUE	1	X	X	X
	CLK1=P	TRUE	1	X	X	X
	CLK2=OFF					

LABEL		POD-Q	POD#3	POD#2	POD#1
	CLK0=	---	---ABBBB	CCCCCCCC	CCCCCCCC
	CLK1=	---	--------	DDDDDDDD	DDDDDDDD

DISPLAY
The following columns are displayed:
<LINE #> <STA> <ADDR> <DATA> <MNEMONIC> <INTERRUPT>

For further description refer to the Z8001 (except for the <SN> column).

OPTIONS FOR LOGIC ANALYZER PM 3551(A)

***   INSTALLATION INSTRUCTIONS   ***

PM 8851/00/20/40 = Options board.
PM 8850/..   = Disa packages and Non-volatile memory

OPTIONS BOARD

1. Disconnect the instrument from the mains.

2. Remove the upper cabinet plate. Rotate the quick-fasteners only slightly, to prevent them falling apart.

3. Remove the panel section at the rear of the instrument, which closes the gap for the options board.
Refer to the unit location plate at the rear.

4. The options board itself has been provided with <u>soldering tags</u> (p.7 and p.8) used for unit identification; the tags are located near the mother-board connector.
Refer to enclosed Fig. 1.

   -If the options board is mounted in the PM 3551, these points must be open.

   -If the options board is mounted in the PM 3551A, these points must be interconnected.

5. Carefully shift the options board into the cabinet.
Check the correct aligning of the mother board connector and press the board firmly to the correct position.

6. PM 3551 only.
At the right-hand side of the instrument, on the S 15-1 board, you will find the unit-identifier switch (8 section DIP switch).
Set section 4 of this switch to the lower position.
For full information on the switch setting refer to the User Manual on the PM 3551, code number 9499 500 12211.

7. PM 3551 only:
Incidentally, it may happen after building-in of an option, that persistent display failures occur, such as character distortion, or a dotted line on one display line. This can be caused by the micro processor on the LSA 15-1 board. If this micro processor is an 8085-A version, we recommend you to replace him by an 8085-AH version, or still better by an 8085-A2. The micro processor 8085-A2 is available from S&I Service DTE Eindhoven on request.

8. Mount the cabinet plate.
If the instrument is not working properly, switch off, and check the mother board connector contacting.

OPTION BOARD SUB-FUNCTIONS

An option board can be provided with the following sub-functions:

-DISASSEMBLER PACKAGES:

Disa A:	Most common micro processors	=PM 8850/00
Disa M:	Motorola micro processors	=PM 8850/20
Disa N:	Intel micro processors	=PM 8850/10
Disa Z:	Zilog micro processors	=PM 8850/30
Disa K:	Other micro processors	=PM 8850/40

The disa packages, or non-volatile memory can be mounted as indicated in Fig. 1. Up to four disa boards can be built-in. There is no specific place for a specific disa board.
Check the correct position and use the supplied mounting material.

NON-VOLATILE MEMORY:

This is a memory package (PM 8850/80) to store 4 user-defined instrument settings.

Note:
The Non-volatile memory consists of two EEproms mounted on a small p.c. board, and is available in two versions:

-PM 8851/81 for the Option board PM 8851/00
-PM 8851/82 for the Option boards PM 8851/20 and /40.

Both versions are identical, though the PM 8851/81 includes three additional Proms.

With the PM 8851/81, the three Proms D1, D3 and FC on the option board as indicated in Fig. 1, must be replaced by the Proms included in delivery.
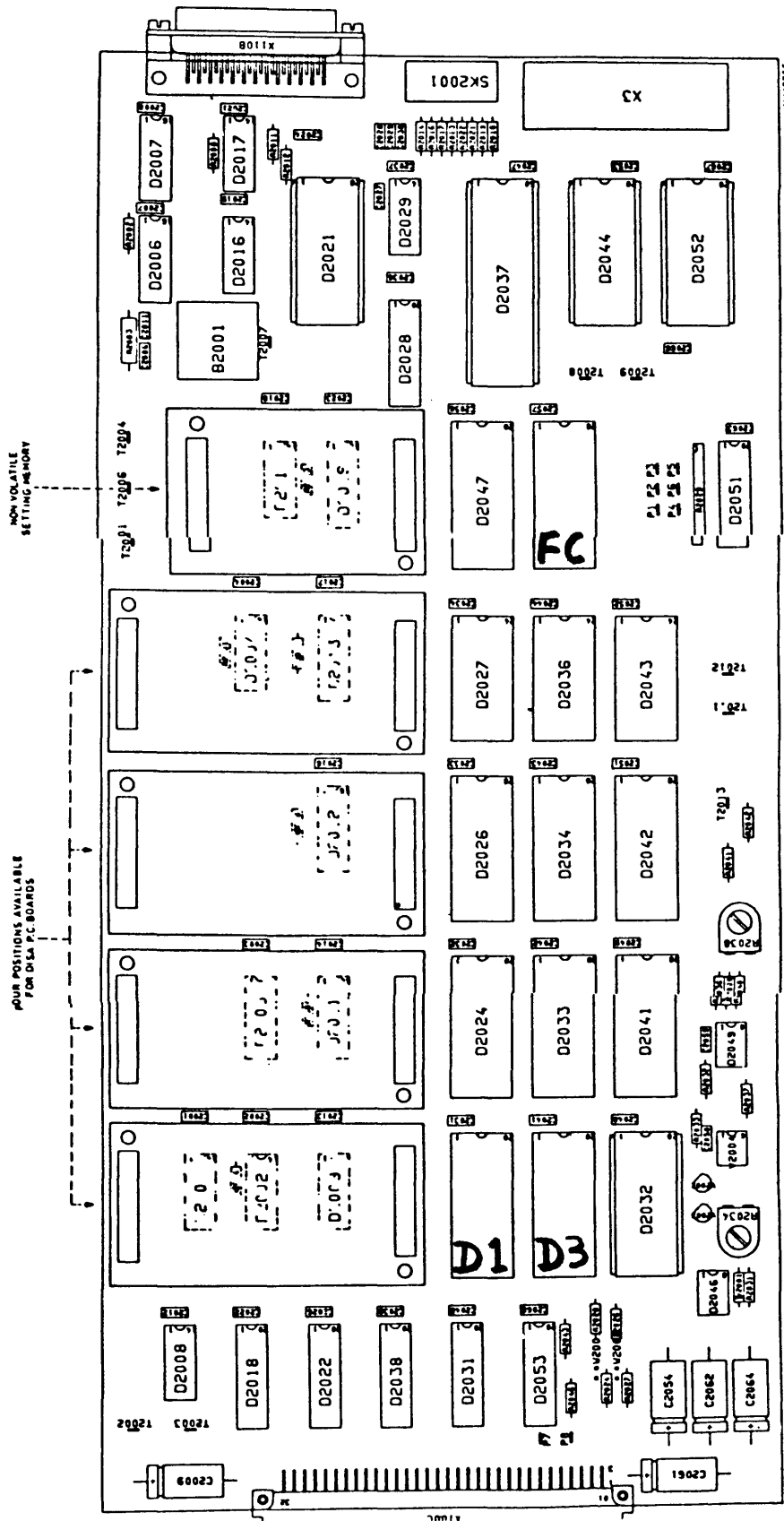The PM 8851/81/82 must be mounted as indicated in Fig. 1.

Fig. 1. Location of the disa units and the non-volatile memory on the option board PM 8851. Proms D1, D3 and FC must be replaced when installing the non-volatile memory on the PM 8851/00.

INSTALLATION INSTRUCTIONS

FOR OPTIONS

10   INSTALLATION INSTRUCTIONS

CONTENTS:

This chapter describes how to install the optional units in the
PM 3551 Logic Analyzer.
After building-in, check the function of the option according to the
description of the menus and the data displays (chapter 4 and 5).

IMPORTANT

Unit identification of the Option board (PM 8851/xx) and the Timing
analyzer (PM 8851/30).

These units have been provided with soldering tags which are used
for unit identification. The tags are located near the motherboard-
connector (on the Timing analyzer there are two pairs of tags).
Refer to Fig. 10.4.1 (p7 and p8).

-If a unit is mounted in a PM 3551, these points may not be inter-
 connected.

-If a unit is mounted in the PM 3551A, these points must be inter-
 connected.

PM 8851/50

= S15-3 + 3 PM 8821 PODS

ADDITIONAL 24-CHANNEL STATE FOR ANALYZER PM 3551/10/30

*** INSTALLATION INSTRUCTIONS ***

These instructions describe how to install S15-3 in the Logic Analyzer
PM 3551. The S15-3 features an extra 24 channels for the State Analyzer,
obtaining a total of 59 State Analyzer channels.
This unit can be built into the PM 3551/10 and PM 3551/30, changing the
type numbers to PM 3551/50 and PM 3551/70 respectively.

Proceed as follows:
-Disconnect the instrument from the mains.

-Remove the upper and the bottom cabinet plates. Rotate the quick-fasteners
 only slightly, to prevent them falling apart.

-Remove the panel section which closes the gap for S15-3 at the rear.
 Refer to the unit location plate at the rear of the instrument.

-Remove carefully the S15-1 and S15-2 assembly. Check for internal
 interconnection cables.

-Mount the S15-3 p.c. board onto the S15-1 and S15-2 assembly. Remove the
 six screws from the S15-2 board. Mount the six spacers (included in the PM
 8851/50) in the freed holes. Check the plug connections between the boards.
 Use the six screws to mount the S15-3.

-Carefully bend the four orange capacitors located on S15-3 near the mother
 board connector somewhat downwards, to prevent that they are damaged when
 the unit is shifted into the instrument.

-Carefully insert the obtained assembly into the cabinet. Check that the
 shifting assembly does not touch the Proms on the memory extension board.
 Check the correct aligning of the mother board connectors and press the
 units firmly to the correct position.

-Connect the instrument to the mains voltage and switch on.
 If the instrument is not working properly, switch off, and check the mother
 board connector contacting.

-Mount the cabinet plates. Connect the three PM 8821 Pods.

PM 8851/30

= T50-1+2 + PM 8825 POD

8-CHANNEL 50 MHz TIMING ANALYZER FOR ANALYZER PM 3551/10/50

*** INSTALLATION INSTRUCTIONS ***

Introduction

These instructions describe how to install the unit T50-1+2 in the Logic Analyzer PM 3551. This unit consists of two p.c. boards, mounted together and features eight 50MHz timing channels.
The unit can be built into the PM 3551/10 and PM 3551/50, changing the type numbers to PM 3551/30 and PM 3551/70 respectively.

**> The installment (or removal) of the Timing Analyzer includes modification of the secundary board of the power supply unit.

Proceed as follows:
-Disconnect the instrument from the mains.

-Remove the upper and bottom cabinet plates. Rotate the quick-fasteners only slightly, to prevent them falling apart.

-Lift the fan assy located over the power supply unit.
Remove the secundary supply unit. This is the unit located at the inner side in the power supply compartment.
Short circuit the diodes V1265 and V1266 by soldering two wires as indicated in Fig. 2. These diodes must be short-circuited to compensate for the voltage drop caused by the increased current consumption, refer to Fig. 1. (The current consumption amounts to 14 Amps approx.).
Mount the secundary supply unit again.
Mount the fan assy again.
-Remove the panel section which closes the gap for T50-1+2 at the rear.
Refer to the unit location plate at the rear of the instrument.

-Remove the state analyzer from the instrument.
If your state analyzer has been provided with 59 channels, unit S15-3 must be temporary removed from the state analyzer assy.
Connect the two coax cables between the timing analyzer and unit S15-2 of the state analyzer as indicated in Fig. 3.
While doing this, the units must be partly shifted into the instrument.
Right from T50-2, these cables pass downwards through the p.c. board sliding frame, (laying underneath the sliding frame) and pass upwards just before S15-2.
The longer cable connects X512--X908.
Remount unit S15-3 if present.

-Carefully insert the units in the cabinet.
Check for correct alignment of the motherboard connectors and press the units firmly to the correct position.

-Connect the 16-pole flat cable (included in delivery) between T50-2
and S15-2. Refer to Fig. 3.
This cable interconnects both the Pod #0 input of the State Analyzer with
the Pod T input of the Timing analyzer depending on the switch at the rear
the analyzer.

There are two possibilities to apply the Pod #0 signals to the State
Analyzer input.
This depends on the position of the switch which is present at the rear of
the instrument at unit S15-2. The switch can be manipulated through the
rear panel by e.g. a ball point pen or a small screw driver.

In the ´in´-position Pod #0 of the State Analyzer is interconnected with
Pod T of the Timing Analyzer. The Pod #0 input of the State Analyzer is
not activated.
In the ´out´-position there is no interconnection between both Pods; Pod #0
and Pod T can be used separately.

Note that changing above Pod #0 input set-up, does not influence the
functions of the COMBI or SYNC modes.

-Connect the instrument to the mains voltage and switch on.
If the instrument is not working properly, switch off, and check the mother
board connector contacting.
Connect the Pods and check the function of the SYNC mode. (Refer to the
Operating Manual).
If under the timing display the message NO SYNC POSSIBLE with (1) or (2) is
shown, check the connections of the two coax cables.

-Mount the cabinet plates.

Enclosed drawings:
Fig. 10.3.1 Circuit diagram secundary power supply.
Fig. 10.3.2 P.c. board secundary power supply.
Fig. 10.3.3 Connections between T50-1 and S15-2.

Fig. 10.3.1 Circuit diagram secundary power supply.

SOLDER 2 SHORT-CIRCUIT WIRES IF T 50-1+2 IS BUILT IN.

R1251

R1253 R1252

D 1253

V1251

C1254 R1254

V1252

V1253

C1256 R1256

V1254

R 1250

V1264

V1261

D1252

C 1255

D 1254 D 1256

C 1258

C 1259

L 1253

C 1261

C 1263

C 1262

V1263

C1264

C1266

V1266

V1265

X 1251

MA10726
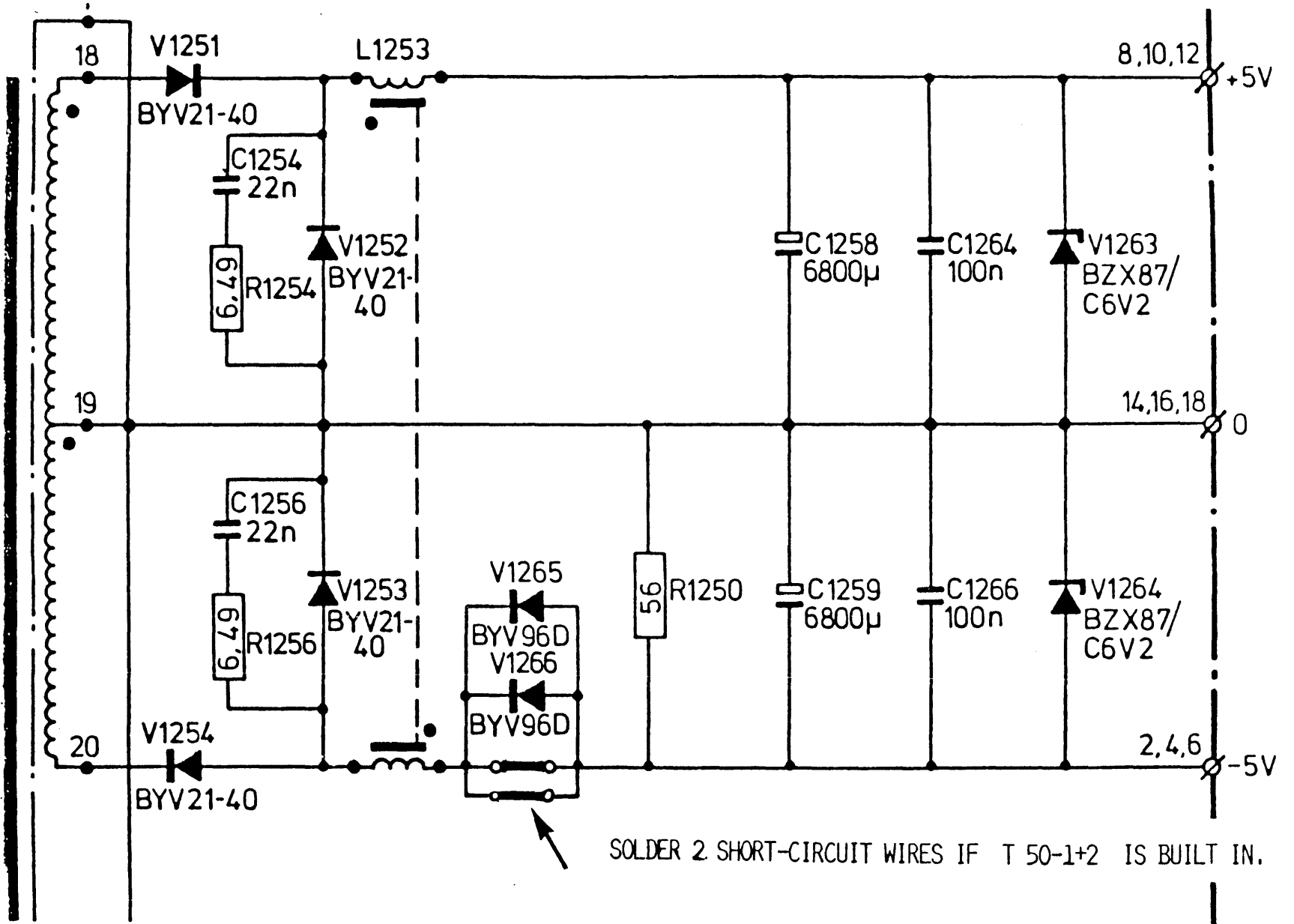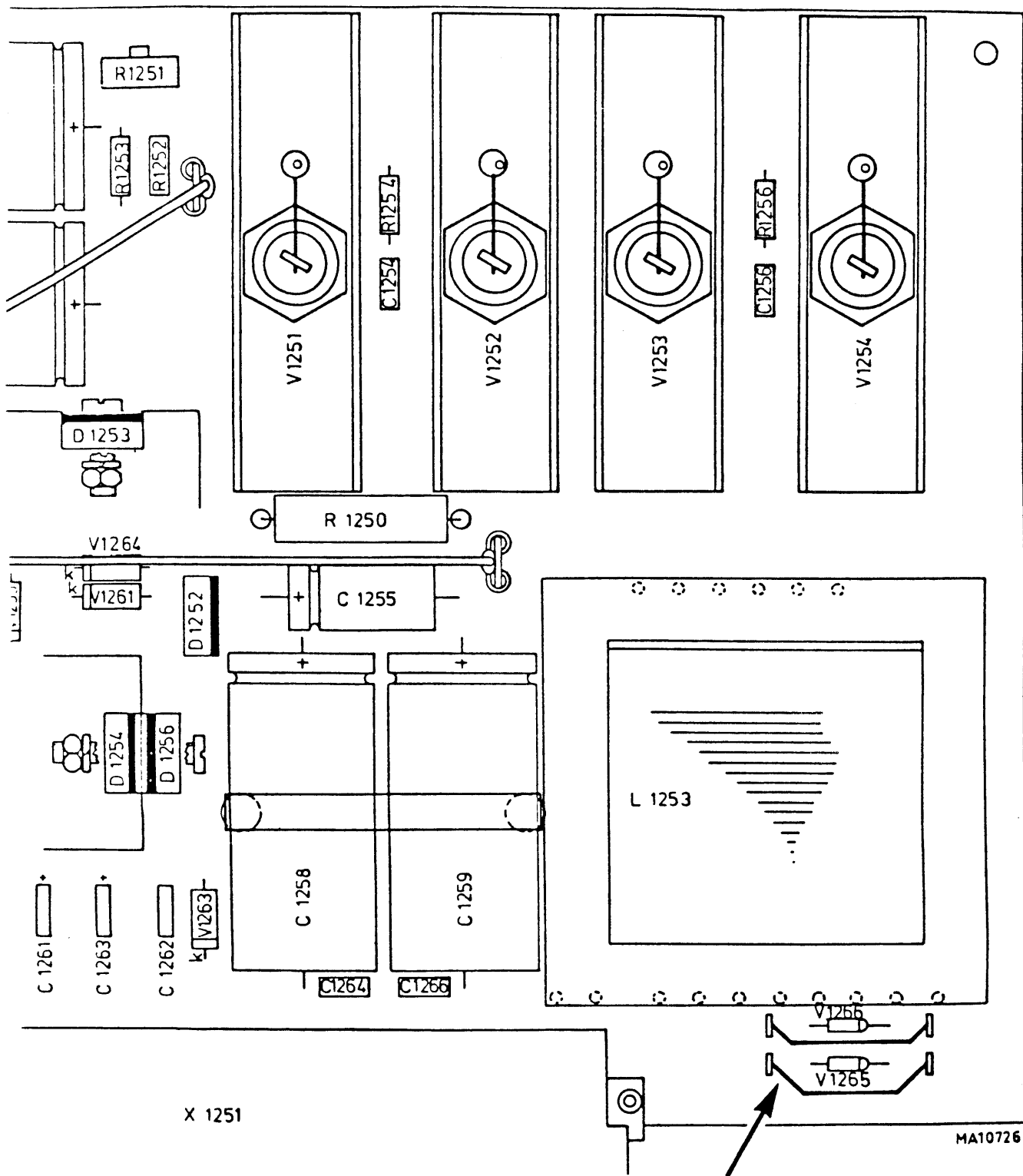
SOLDER 2 SHORT-CIRCUIT WIRES IF T 50-1+2 IS BUILT IN.

Fig. 10.3.2 P.c. board secundary power supply.

MOTHER BOARD

TIMING ANALYZER

STATE ANALYZER

THE LOCATION OF X511 AND X512
IS IDENTICAL ON S15-2 AND S15-3.

X511
(UPPER)

X512
(LOWER)

X909

TO X511

TO X512

TWO COAX CABLES
INTERCONNECTING:

T50-2	S15-2 or S15-3
X908 ⟷	X512
X909 ⟷	X511

THESE CABLES PASS
UNDERNEATH THE
P.C. BOARD SLIDING FRAME

X908

LONGER CABLE

16 POLE FLAT CABLE

X501

X901

S15-1 S15-2 S15-3 T50-1 T50-2

S15-3
ONLY PRESENT IN
59 STATE CHAN-
NEL VERSIONS

MA10763

Fig. 10.3.3 Connections between T50-1 and S15

PM8851/00/20/40

OPTIONS BOARDS FOR LOGIC ANALYZER PM 3551

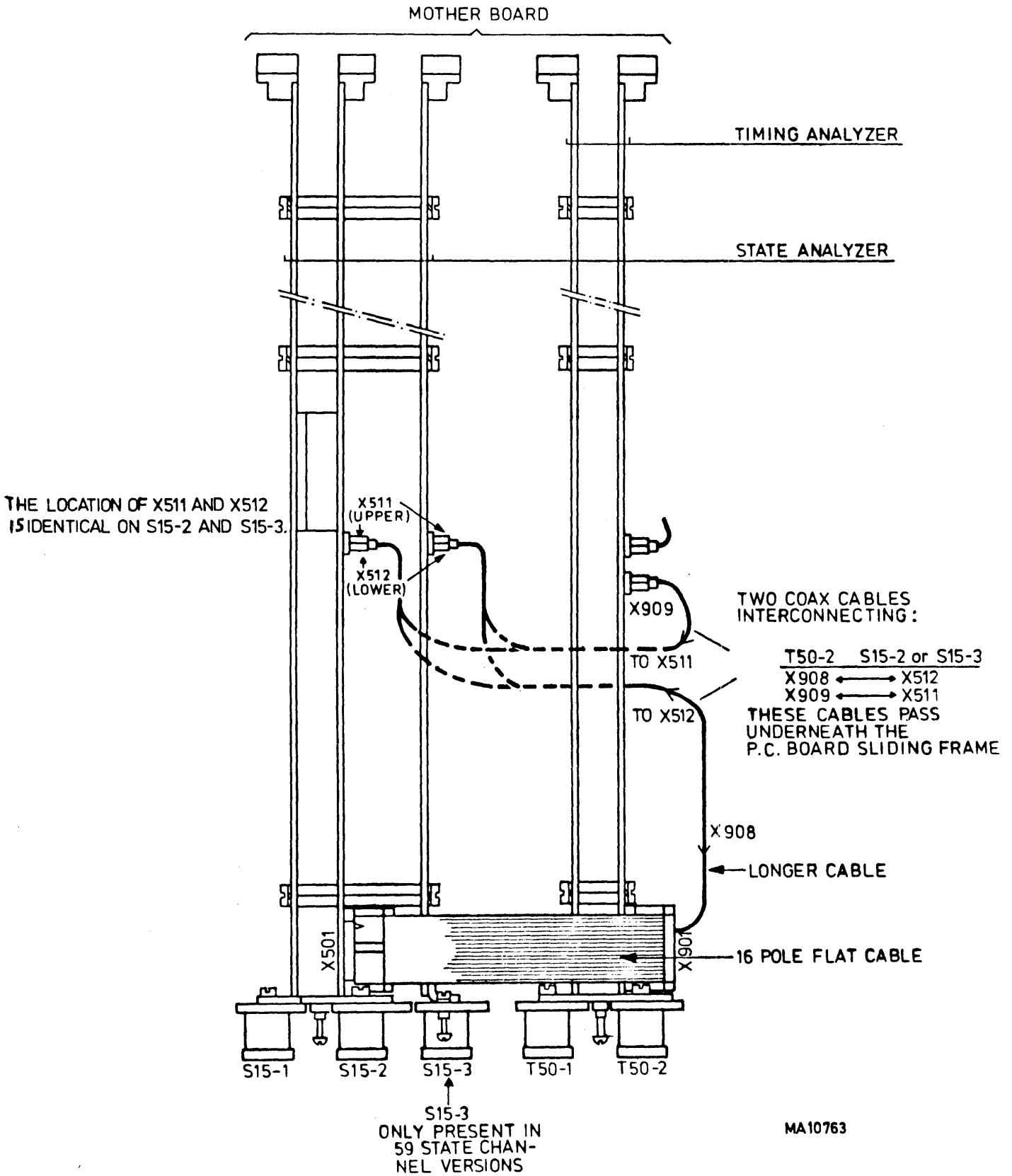PM 8851/00= Options board with printer output.
/20= The same as -/00 but with additional RS 232C control interface.
/40= The same as -/00 but with additional IEEE 488 (IEC 625) control-interface.

***   INSTALLATION INSTRUCTIONS   ***

1.Options Board (OPT-1).

Proceed as follows:
-Disconnect the instrument from the mains.

-Remove the upper cabinet plate. Rotate the quick-fasteners only slightly,
 to prevent them falling apart.

-Remove the panel section which closes the gap for the options board at the
 rear.
 Refer to the unit location plate at the rear of the instrument.

-Carefully shift the options board into the cabinet.
 Check the correct aligning of the mother board connector and press the
 option board firmly to the correct position.

-Connect the instrument to the mains voltage and switch on.
 The options menu must now be selectable.
 If the instrument is not working properly, switch off, and check the mother
 board connector contacting.

-Mount the cabinet plate.

2.Disa´s and non-volatile memory

-Remove the option board.

-The disa´s and non-volatile memory can be mounted as indicated in
 Fig. 10.4.1.
 Up to four disa boards can be built-in. There is no specific place for a
 specific disa board.
 Check the correct position and use the supplied mounting material.

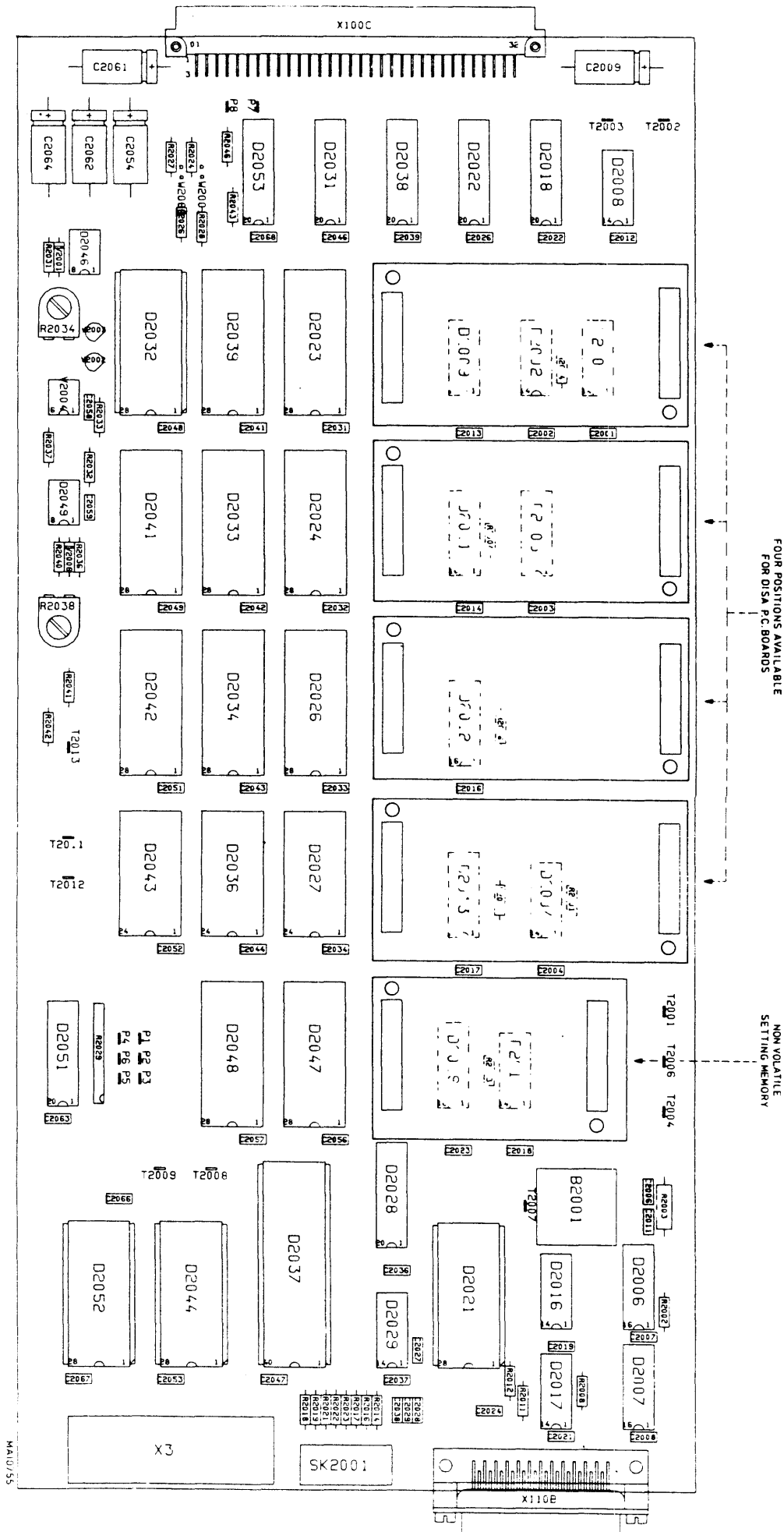-Mount the option board in the instrument.

Fig. 10.4.1 Location of disa boards and non-volatile memory board.

P M 8 8 5 1 / 4 0

I E E E - 4 8 8 G P I B I N T E R F A C E

F O R T H E L O G I C A N A L Y Z E R P M 3 5 5 1

CONTENTS   Page

1. INTRODUCTION

The PM 8851/40 option is an IEEE-488 (IEC-625) bus talker/listener interface for the Logic Analyzer PM 3551A.
This interface provides complete remote control of the Logic Analyzer.
The Talker/Listener functions enable the Logic Analyzer to be included in a multi-device automation system, under control of a system controller.

For typical controller requirements refer to the T&M Instrumentation Systems Support (ISS) notes:
-ISS 1   CBM Commodore as controller
-ISS 2   System 4400 BASIC rel. 2.1 IEC-bus programming
-ISS 3   HP-85 as IEC(IEEE)-bus controller

Other publications:
-Philips´ Instrumentation System Reference Manual (9499 997 00411)
-Digital Instrument Course Books:
 Part 4: IEC625 Bus Interface (9498 829 00311)
 Part 5: Logic Analyzers (9498 825 01711)

All publications available at:
-S & I Service Publications
 Building TQ V-II
 Nederlandse Philips Bedrijven B.V.
 5600 MD Eindhoven, The Netherlands

The unit is also provided with a standard RS232C printer output, and can also contain disassembler packages and the non-volatile setting memory.
For the printer output specifications and functions refer to the Operating Manual of the PM 3551A.

2. SPECIFICATIONS

IEEE-488 Interface Option

Device address	: Selectable at 1--30. Default setting at delivery 26. Default setting selectable with a DIP-switch at the rear of the unit.
Bus drive mode	: DIO 1--8 open collector output. Sink current 48 mA.
Control lines	: DAV, NRFD, NDAC
Management lines	: IFC, ATN, SRQ, REN, EOI

Interface function table:

Interface function	Ident.	Description
Source handshake	SH1	Complete capability
Acceptor handshake	AH1	Complete capability
Talker function	T6	Basic talker, serial poll, unaddress if MLA
Listener function	L4	Basic listener, unaddress if MTA
Service request	SR1	Complete capability
Remote/local	RL1	Complete capability
Parallel poll	PP0	No capability
Device clear	DC1	Complete capability
Device trigger	DT1	Complete capability
Controller	C0	No capability

Command data code	: 7-bit ASCII for commands. 8 bits for data (setting, ref.mem. etc.). Video: 7-bit ASCII, bit 8 for inverse video.
Characters	: All ASCII-characters in the ASCII-table columns 2, 3, 4 and 5 are transferred, the remaining ones as well as graphic symbols are transferred as spaces. Refer to the ASCII coding table (Page 11.6).

Command syntax	: Header : 2 alpha characters
	Body : 1--3 characters
	Separator between header and body
	      : Space (20_H)
	Record separator
	      : Selectable:
	      NL, CR, ETB, ETX, or CRLF,
	      default CRLF.
	      Together with the record separator the EOI line' must be ´1´.
	      With CRLF the EOI line must be ´1´ during LF.
	      Refer to chapter 7.

Status byte information : 2 normal and 6 abnormal status messages.
Refer to chapter 7.

Bus connector   : Conform IEEE-488.

Bus cables   : IEEE: PM 9487/10 (1m)
                               PM 9487/20 (2m)
                               PM 9487/40 (4m)

                         IEC : PM 9480/00 (1m)
                               PM 9481/00 (2m)
                               PM 9482/00 (4m)

Adaptor connectors   : PM 9483/50   IEEE-female to IEC-male.
                         PM 9483/51   IEC-female to IEEE-male.

Controller requirements :
In principle each system-controller provided with an IEEE-bus
interface can be used.
For complete analyzer-data-storage the controller must be able to
handle at least 13K bytes. (A reference memory storage needs 11K; a
full instrument setting needs approx. 2K).

The following controllers have been tested with the PM 3551:

HP-85

CBM-PC

PM 4400

11.6

ASCII coding table

ROW ↓	b4 b3 b2 b1	Col 0 b7=0 b6=0 b5=0 ISO-7bit	dec equiv	ATN=1	Col 1 b7=0 b6=0 b5=1 ISO-7bit	dec equiv	ATN=1	Col 2 b7=0 b6=1 b5=0 ISO-7bit	dec equiv	ATN=1	Col 3 b7=0 b6=1 b5=1 ISO-7bit	dec equiv	ATN=1	Col 4 b7=1 b6=0 b5=0 ISO-7bit	dec equiv	ATN=1	Col 5 b7=1 b6=0 b5=1 ISO-7bit	dec equiv	ATN=1	Col 6 b7=1 b6=1 b5=0 ISO-7bit	dec equiv	ATN=1	Col 7 b7=1 b6=1 b5=1 ISO-7bit	dec equiv	ATN=1
0	0 0 0 0	NUL	0		DLE	16		SP	32	0	0	48	16	@	64	0	P	80	16	`	96	0	p	112	16
1	0 0 0 1	SOH	1	GTL	DC1	17	LLO	!	33	1	1	49	17	A	65	1	Q	81	17	a	97	1	q	113	17
2	0 0 1 0	STX	2		DC2	18		"	34	2	2	50	18	B	66	2	R	82	18	b	98	2	r	114	18
3	0 0 1 1	ETX	3		DC3	19		#	35	3	3	51	19	C	67	3	S	83	19	c	99	3	s	115	19
4	0 1 0 0	EOT	4	SDC	DC4	20	DCL	$	36	4	4	52	20	D	68	4	T	84	20	d	100	4	t	116	20
5	0 1 0 1	ENQ	5	PPC	NAK	21	PPU	%	37	5	5	53	21	E	69	5	U	85	21	e	101	5	u	117	21
6	0 1 1 0	ACK	6		SYN	22		&	38	6	6	54	22	F	70	6	V	86	22	f	102	6	v	118	22
7	0 1 1 1	BEL	7		ETB	23		'	39	7	7	55	23	G	71	7	W	87	23	g	103	7	w	119	23
8	1 0 0 0	BS	8	GET	CAN	24	SPE	(	40	8	8	56	24	H	72	8	X	88	24	h	104	8	x	120	24
9	1 0 0 1	HT	9	TCT	EM	25	SPD	)	41	9	9	57	25	I	73	9	Y	89	25	i	105	9	y	121	25
10 A	1 0 1 0	LF	10		SUB	26		*	42	10	:	58	26	J	74	10	Z	90	26	j	106	10	z	122	26
11 B	1 0 1 1	VT	11		ESC	27		+	43	11	;	59	27	K	75	11	[	91	27	k	107	11	{	123	27
12 C	1 1 0 0	FF	12		FS	28		,	44	12	<	60	28	L	76	12	\	92	28	l	108	12	|	124	28
13 D	1 1 0 1	CR	13		GS	29		-	45	13	=	61	29	M	77	13	]	93	29	m	109	13	}	125	29
14 E	1 1 1 0	SO	14		RS	30		.	46	14	>	62	30	N	78	14	^	94	30	n	110	14	‾	126	30
15 F	1 1 1 1	SI	15		US	31		/	47	15	?	63	UNL	O	79	15	_	95	UNT	o	111	15	DEL	127	31

ADDRESSED COMMAND GROUP   UNIVERSAL COMMAND GROUP   LISTEN ADDRESS GROUP   TALK ADDRESS GROUP   SECONDARY ADDRESS GROUP

3. MAKING OPERATIONAL

3.1 Preparation

For installation instructions of the complete unit refer to chapter 10 of
the PM 3551A Operating manual.

-IEEE connector
 Refer to the following list and Fig. 11.2.

Pin #	Signal name	Description
1	DIO 1	Data in/out 1
2	DIO 2	Data in/out 2
3	DIO 3	Data in/out 3
4	DIO 4	Data in/out 4
5	EOI	End, or Identify
6	DAV	Data valid
7	NRFD	Not ready for data
8	NDAC	Not data accepted
9	IFC	Interface clear
10	SRQ	Service request
11	ATN	Attention
12	SHIELD	Connection cable shielding
13	DIO 5	Data in/out 5
14	DIO 6	Data in/out 6
15	DIO 7	Data in/out 7
16	DIO 8	Data in/out 8
17	REN	Remote enable
18	GND	Ground (6)
19	GND	Ground (7)
20	GND	Ground (8)
21	GND	Ground (9)
22	GND	Ground (10)
23	GND	Ground (11)
24	GND	Logic ground

-Device address setting

The default device address can be set with the DIP-switch at the rear-panel
of the option board. Refer to Fig. 11.2.
Switch-sections 6--8 are not used.
In the first production series instruments a 5-section switch has been
mounted.
If address 31 has been set on the switch, the instrument automatically
changes this number to 30.
The setting of the switch is read at power-on, and when IEEE 'on' softkey
is pressed in the options menu.
If desired the address can be changed under local mode operation through
the options menu.

-Separator setting

To meet the separator requirements of the automatic test-system, the
analyzer command separator can be set to one of the following values:

Separator	ASCII value	
	(hex)	(dec)
´NL´	0A	10
´CR´	0D	13
´ETX´	03	3
´ETB´	17	23
´CRLF´	0D+0A	13+10

At the same time the separator is transferred, the ´EOI´-line must be ´1´
(for the talker as well as for the listener).
With ´CRLF´ the ´EOI´-line must be ´1´ only during the ´LF´ transfer.

3.2 Switching-on.

The first time the GPIB ´on´ softkey in the options menu is pressed, the
display shows the message: ´IEEE-488 REL 1.0´
The ´GPIB´-option is default ´on´ at power-on.

OPTIONS MENU

PRINTER -ON
BAUD RATE-9600
SEND   -PAGE

IEEE488 -ON
ADDRESS -25
SEPARATOR-CRLF

DISASSEMBLERS
A-PACKAGE MOTOROLA INTEL
- Z80   - 6800 - 8080
- 8085   - 6809 - 8085
- 68000   - 69000 - 8086MIN
                  - 8086MAX

OFF ON —— —— —— —— —— ——

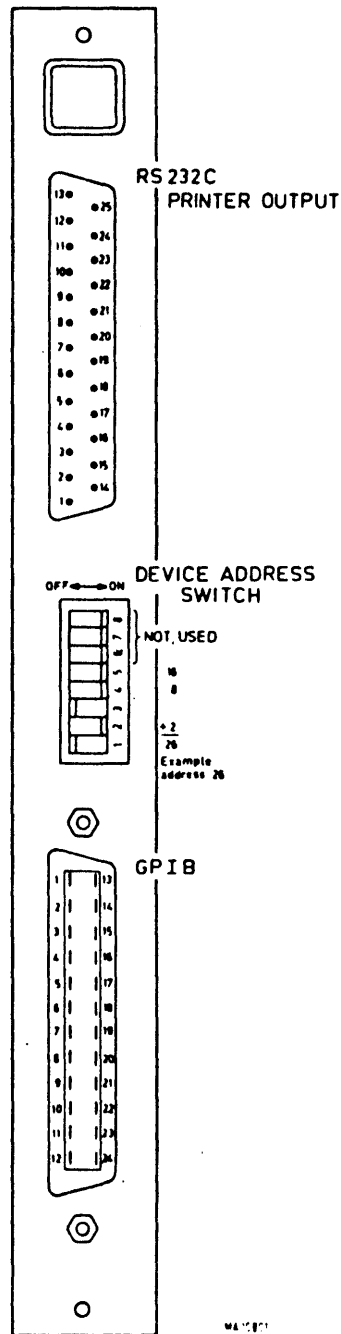Fig. 11.1 Option menu

Fig. 11.2   Rear view Option board with from top to bottom: standard
            RS232C printer output, IEEE device address switch and IEEE
            control interface connector.

4. COMMAND CODE FORMAT

IEEE commands for the PM 3551A are sent over the IEEE-bus as a string
of ASCII characters.
Each individual command consists of two parts:
-Header, specifying the function class, and
-Body, defining the function itself.
Header and body are always separated by a ´space´ (␣).

Header

The command header consists always of two alpha characters.

Body

A body may consist of:
- -one alpha character.
- -three alpha characters.
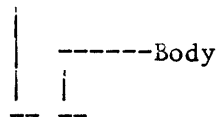- -one alpha character and one or three numerical characters.
- -one numerical character.

Multiple body´s separated by a comma can follow a single header.
A command or a sequence of consecutive commands must be terminated by
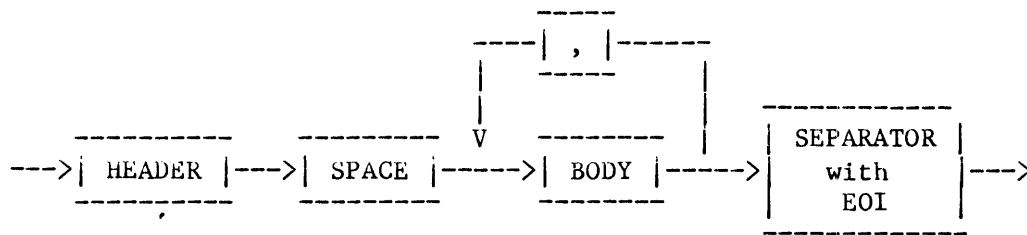the selected separator, and the ´EOI´-line being ´1´.

Example:

```
---------Header
|
|    ------Body
| |
-- --                         K =Keypad
KC␣U8                         C =Cursor
                              U8=Up, 8 times
```


SYNTAX DIAGRAM

```
                                       -----
                                  ----| , |------
                                  |    -----      |
                                  |               |
          ----------  ---------- V  --------      |   -------------
   --->| HEADER |--->| SPACE |----->| BODY |----->|   | SEPARATOR |
          ----------  ----------    --------      |   |   with    |--->
                                                  --->|    EOI    |
                                                      -------------
```

5. COMMAND CODE SURVEY

The IEEE-talker/listener option features three levels of operation:

-Key level.
-Menu level.
-Instrument level.

5.1 Key level

The key level is the lowest level of control. At this level every key present on the analyzer´s front panel is represented by an IEEE command.
Sending such a command over the IEEE bus causes the analyzer to respond in exactly the same way as to a key pressure. Thus the analyzer can be operated under IEEE control in exactly the same way as under manual control.

Below a survey of key-level commands is given.

```
KS⌴1       Softkey 1
"  ⌴"         "
"  ⌴"         "
KS⌴8       Softkey 8
```

-Cursor control keys

```
KC⌴U       Cursor up,   or data roll, one step
KC⌴D       Cursor down, or data roll, one step
KC⌴L       Cursor to the left,  or shift data, one step
KC⌴R       Cursor to the right, or shift data, one step
```

This instruction can be followed by a number, to produce more than one step. The maximum allowed number is 15.
A single number may be preceded by a ´zero´.

Examples:
KC⌴U
KC⌴D2
KC⌴L08
KC⌴R14

-Key pad keys

```
KP⌴0       Key pad keys 0--9.
"   "
"   "
KP⌴9

KP⌴A       Key pad keys A--F.
"   "
"   "
KP⌴F
```

```
KP_DNC       Key pad keys X, +, -, and . respectively.
KP_POS
KP_NEG
KP_DOT

KP_DEL       Key pad key DELETE
```

-Cursor position keys

```
CP_H         Cursor in Heading
CP_D         Cursor in Datafield
```

-Acquisition control keys

```
AC_S         Start single data acquisition
AC_A         Start auto (=repetitive) data acquisition
AC_H         Stop data acquisition
```

-I/O control keys

```
PC_L         Peripheral control load
PC_D         Peripheral control dump
PC_P         Peripheral control print
```

-Data display keys

```
DD_L         List display
DD_G         Graphic display
DD_T         Timing display
DD_A         Display current memory
DD_R         Display reference memory
DD_C         Display data compare
```

-Store keys

```
ST_S         Store setting
ST_D         Store data
ST_T         Store (=copy) triggerword
```

-Menu keys

```
MN_S         Select Configuration menu
MN_T         Select Trigger menu
MN_D         Select Data menu
MN_C         Select Compare menu
MN_E         Select Options menu

MN_F         Select Full menu
```

5.2 Menu level

At the menu level, transfer of instrument menu settings between analyzer and controller is possible.
So a data base of several menu´s for particular applications can be present at the controller.
Two command sets can be distinguished at the menu level: Transfer commands, and Load commands.

Transfer commands

TR‿F	Transfer configuration menu.
TR‿S	Transfer state trigger menu.
TR‿T	Transfer timing trigger menu.
TR‿D	Transfer data menu.
TR‿C	Transfer compare menu.
TR‿E	Transfer option menu.

Menu´s are transfered with length bytes and sum check.
Additionally, the Load command code is added towards the beginning of the data block.

Load commands

LF	Load configuration menu
LS	Load State trigger menu
LT	Load Timing trigger menu
LD	Load Data menu.
LC	Load Compare menu.
LE	Load Option menu.

Load commands differ from others in that the command code is included in the data block sent after a TR (transfer) command. Thus a menu can be loaded by sending the data block.

5.3 Instrument level

At the Instrument level, transfer of complete instrument settings, reference memory, and screen information is possible.

The loading of a complete instrument setting allows fast start-up after power-on.

TR‿I	Transfer full Instrument setting. This command initiates the transfer of all settings from the analyzer to the controller. At the beginning of the data block the Load instrument setting command code LI is added.
TR‿R	Transfer of Reference memory allows analysis of captured data as well as modifications to the contents of the reference memory to be made.

The next two commands are reserved for the transfer of video information from the analyzer to the controller.

TR␣Ldd   Transfers a video Line (64 characters) from the analyzer to the controller.
dd stands for the line number to be transfered.
The lines on the video screen of the analyzer are numbered from 1 (top line) to 24 (bottom line). A leading ´0´ is not allowed.

A line string consists of 64 characters, without length-bytes, checksum and header, but with separator.

State list display:
TR␣L1---6 : For condensed menu.
TR␣L7,L8 : For heading lines of the state list.
TR␣L9---21: For all state list lines.
TR␣L22   : Returns an empty string.
TR␣L23,L24: For softkey label lines.

Graph or Timing display:
TR␣L1---6 : For condensed menu.
TR␣L7,L8 : For heading lines of the graph/timing display.
TR␣L9---22: Returns empty strings.
TR␣L23,L24: For softkey label lines.

TR␣V   Transfers the full video screen.

Full menu:
24 lines of 64 characters each, are transferred in one string without header, length bytes and checksum.
The string consists of:
22 menu lines and
 2 softkey label lines.

State or Disa list:
23 lines of 64 characters each, are transferred in one string without header, length bytes and checksum.
The string consists of:
 6 condensed menu lines,
 2 list heading lines,
13 state list lines,
 2 softkey label lines.

,Graph, or Timing display:
10 lines of 64 characters each, are transferred in one string without header, length bytes and checksum.
The string consists of:
 6 condensed menu lines,
 2 graph/timing heading lines,
 2 softkey label lines.

Note that non-printable characters, e.g. graphic symbols, are replaced by spaces (20_H).
Reverse video characters are transfered with the eight´ bit being ´1´.
Neither the line- nor the full screen transfers are accompanied by length bytes and checksum.

6. SERVICE REQUEST

The analyzer can signal the need for service to the controller by asserting the SRQ-line on the GPIB bus.
Upon detection of an active SRQ-line, the controller suspends its current activity, and starts a polling sequence to determine the source of the SRQ.
To this extend, the controller should execute a serial poll routine, subsequently addressing all devices active on the bus.
The analyzer responds to a serial poll by putting the Status byte on the bus. The format of this byte is shown in Fig. 11.3.
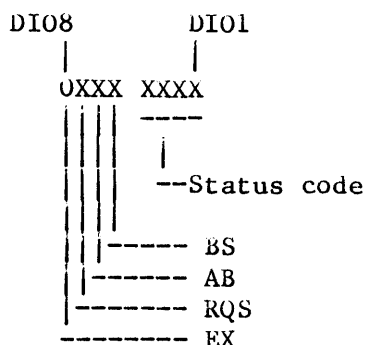
```
DIO8            DIO1
 |               |
 |               |
OXXX XXXX
||||  ----
||||   |
||||   --Status code
||||
|||----- BS
||------- AB
|-------- RQS
--------- EX
```

Fig. 11.3 Status byte

BIT	SYMBOL	DESCRIPTION	VALUE
DIO8	EX	EXTENDED	Always ´0´
DIO7	RQS	REQUEST SERVICE	´1´= SERVICE REQUESTED
DIO6	AB	ABNORMAL/NORMAL	´1´= ABNORMAL
			´0´= NORMAL
DIO5	BS	DEVICE BUSY	´1´= BUSY
			´0´= READY

Explanation:

EXTENDED   : DIO8 is not used.

RQS   : When set, the analyzer asserted its SRQ-line, and requires service from the controller.

AB   : If AB= ´1´: Abnormal condition. An error occured which requires controller intervention.
             If AB= ´0´: Normal condition.   No direct controller action necessary.
             The status of the analyzer, either normal, or abnormal is specified by the Status Code . Refer to following tables.

BS   : If BS= ´1´: Device Busy. Indicating that the analyzer data-acquisition is running.
           : If BS= ´0´: Device Ready. Indicating that the analyzer data-acquisition has been stopped.

STATUS CODE: Four bits are used to determine a maximum of 16 different states.
Two condition types are distinguished: normal and abnormal.
The status byte is only valid after a service request.

Normal condition codes:

Status Code	Value	Description
0000	0	Reserved
0001	1	Data Acquisition Stopped
0010	2	Data-compare Stop
0011	3	Reserved
0100	4	Reserved
0101	5	Reserved
0110	6	Reserved

Abnormal conditions codes:

Status Code	Value	Description
0111	7	Data transfer checksum error
1000	8	Faulty menu requested/GPIB menu change prohibited.
1001	9	Reserved
1010	10	Reserved
1011	11	Separator missing or wrong
1100	12	Reserved
1101	13	Too-much-data error in receiving data
1110	14	Too-few-data error in receiving data
1111	15	Command syntax error

Abnormal service requests are always enabled, thus an error condition will always lead to the generation of a service request.
Normal conditions will cause a service request only when they have been enabled (normal service requests are default <u>disabled</u> after power-on).
For this purpose, the following commands are available:

    SR_0   Enable all normal service requests
    SR_1   Enable normal service request 1
    SR_2   Enable normal service request 2
    SR_5   Disable all normal service requests
    SR_6   Disable normal service request 1
    SR_7   Disable normal service request 2

Note that this GPIB interface has no Parallel Poll capability.

7. PROGRAMMING GUIDE LINES.

7.1 Key level programming

The key level command set can be used to set-up the analyzer in the same way, as you should do with local operation.
In doing so, it should be considered that the controller receives no feed-back of the result of the commands sent to the analyzer. For instance, moving the cursor could result in a new line of softkey functions becoming active.
This strong relationship between current cursor position and softkey functions should be maintained throughout the whole controller programm.

To facilitate control programm writing, it is strongly recommended that the user writes the programm using the analyzer in the local mode; simulating the sequence of key commands.

Nevertheless, setting-up the analyzer this way is complex, and the writing of such a programm could be time consuming.
For ease of use, the user could set-up the instrument for a particular application manually, and subsequently transfer the instrument setting. Or for that matter the menu´s he wants to store, to the controller.
Afterwards, this setting can be loaded in the analyzer at once, after system power-up.

The key level operation mode is quite useful however to achieve slight modifications to certain menu´s between successive measurements e.g. changing a triggerword, or a triggerdelay.
To start and stop the data-acquisition can also be done conveniently, using the appropriate key level commands.

7.2 Menu level programming

Using the menu transfer, and load commands, the user can create a data-base of menu´s allowing him to set-up the analyzer for a particular measurement.
A wide range of applications can be covered by combining certain menu´s.

7.3 Instrument level programming

Apart from setting-up the analyzer by means of a single command, the transfer of the reference memory can be exploited to obtain the acquired data from the analyzer, and process it at the controller.
To this extend, the format in which the data is stored, can be found in chapter 8.

Alternatively, the data shown on the analyzer´s video display can be transferred to the controller for analysis-purposes. In particular, disassembly listings can be transferred, to make the powerful disassembly possibilities of the PM 3551A available to the controller.

8.BLOCK DATA STRUCTURE

The command TR_R sent by the controller initiates transfer of a data block with the following structure:

    Header-->Separator-->Preamble-->Length bytes-->DAB´s (data bytes)-
    ->Checksum-->Separator.

For detailed description refer to the following list.
Fig. 11.4 gives detailed information on the data structure as stored in the reference memory of the state analyzer.

The length of this data transfer block is always the same, independent of the version of the instrument (PM 3551/10/30/50/70), and independent of the selected analyzer configuration.

Information on data which are not present in the analyzer must be considered as invalid data.
Example: With the PM 3551/10/50, DAB1...1024 in this data block contain non-valid data, because there is no timing analyzer memory present.

Detailed data structure list

>Header	´L´	´LR´ command (load reference memory)
	´R´	
>Separator	´⌴´	Space (=20$_H$)
>Preamble	´#´	´#B´ indicates: 8-bit coded data bytes with
	´B´	two length bytes and a one-byte checksum.
>Length-	MSB	Length bytes (number of DAB´s and checksum
bytes	LSB	byte) (Length: MSB=28$_H$, LSB=29$_H$).
>Datablock	DAB 1...1024	Coded information on data in the reference memory of the timing analyzer.
	DAB 1025...2048	Pod#6
	DAB 2049...3072	Pod#5
	DAB 3073...4096	Pod#4 (DAB 1025...9216 are data in
	DAB 4097...5120	Pod Q the reference memory of the
	DAB 5121...6144	Pod#3 state analyzer)
	DAB 6145...7168	Pod#2
	DAB 7169...8192	Pod#1
	DAB 8193...9216	Pod#0
	DAB 9217...10240	Coded information on trigger words in the memory etc.
	DAB 10241	´1´= Data in reference memory. ´0´= No data in reference memory.
	DAB 10242...10243	LS- and MS byte resp. of STPREF (See Note).
	DAB 10244	Coded information on the trigger words in the memory.
	DAB 10245	Coded information on Trig or Stop.
	DAB 10246...10247	LS- and MS byt´ ´sp. of STRREF (See Note).
	DAB 10248...10280	Coded information on display attributes etc.
>Checksum	One-byte	Modulo-256 checksum of all DAB´s.
>Separator	One or two bytes	NL, CR, ETB, ETX, or CRLF.

Note:

STPREF contains the last address of the valid data section of the reference memory +1.

STRREF contains the first address of the valid data section of the reference memory -1.

Refer to Fig. 11.4
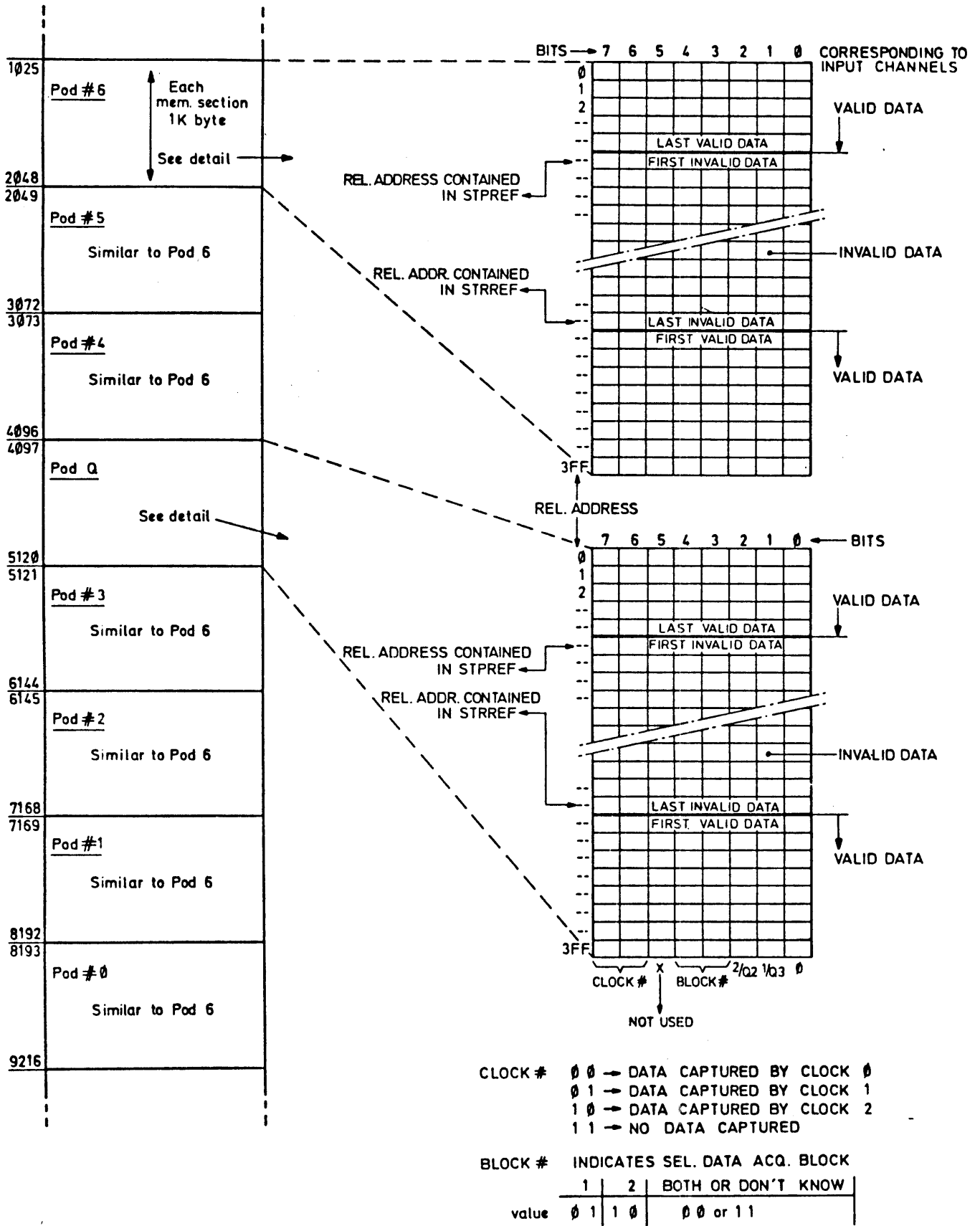
Fig. 11.4 State analyzer reference memory data structure.

P M 8 8 5 1 / 2 0

RS 232-C C O N T R O L I N T E R F A C E O P T I O N

RS 232-C Note

9499 500 13111

This Interface board has been delivered to you with all necessary option monitor software, except for the KS 232-C control software.

It means that you can perform now the following operations:

1) Normal printing operation via ´Print´-key and Option-menu.

2) Normal disassembler operation, with selectable disassemblers via the Option-menu.

3) Normal non-volatile memory operation via ´Stored´-softkey and ´Store Setting´-key.

After post-delivery of the additional control software, you are also able to do KS 232-C control actions, such as:

1) Load and Dump actions of instrument settings, plus reference data with the (dedicated) digital mini-cassette recorder PM 4202.

2) Remote control of the PM 3551A.

The control software will be delivered in a set of Proms that can easily be installed by yourself on this RS 232-C interface board.
With the post-delivery of this control software you will also receive:

1) Installing instructions.

2) Operating description of the KS 232-C control interface, including specification and command set overview.

3) RS 232-C operation check procedure description.

RS 232-C   C O N T R O L   I N T E R F A C E   O P T I O N

***   UNDER PREPARATION   ***

PROBLEM REPORTS

AND CHANGE REQUESTS

11. <u>PROBLEM REPORTS AND CHANGE REQUESTS</u>

   In the back of this manual you will find some Problem Reports/
   Change Request forms.

   INTRODUCTION

   This dual purpose form can be used as either a Problem Report
   form, or as a Change Request form, but not for both at the same
   time.

   The form can be used as a Problem Report only when the equipment
   does not meet the specifications detailed in the PM 3551 Manuals,
   or when it cannot be repaired through normal service/repair.
   Alternatively, the form can be used as a Change Request to
   describe suggested enhancement or improvements.

   <u>Note:</u>
   Use a separate form for each Problem Report or Change Request,
   thus do not enter more than one subject on a form.

***> Before filling in a form, either remove the three layers
   required per report, or place a hard paper sheet under the third
   layer to ensure that only the required number of sheets are
   copied.
   These forms are carbon coated, therefore no additional carbon
   paper is required.
                                                              ->

INSTRUCTIONS FOR COMPLETING

SECTION	REQUIREMENTS
PURPOSE:	Indicate the type of report with a cross in the appropriate box.
PRIORITY:	Indicate the suggested priority with a cross in the appropriate box.
SUBMITTED BY:	Fill in full name and address, because the yellow copy will be returnd for acknowledgement of reception of the form while using window envelopes. Therefore use a typewriter, or write capitals using a ballpoint pen. Write only on the dotted lines. Do not forget your telephone and telex number.
DESCRIPTION:	Give a complete description of the problem or suggested modification.
ATTACHED MATERIALS	Do not forget to indicate whether or not you have attached diskettes, listings or other documents. Attachments are very useful for quick responses because it gives details of the problem.
AFFECTED HW/SW (Hardware/Software)	Please give the requested details of the relevant HW/SW configuration. It helps us to judge whether an update may be required, or not.
PHILIPS USE ONLY	These boxes are completed by the T&M Service Dept. Eindhoven. The yellow copy will be returned with the PR- or CR number, date of reception, etc.

After completion, mail the entire set, top form plus copies to
the mailing address listed at the bottom of the form.