25 CHANNEL UNIT LOCAL WORKSTATIONS

LIST OF ILLUSTRATIONS

25.1 CHLW-IDENTIFICATIONS

Type-number:	PTS-6895
Test-Program:	TERTST4.1 and higher releases
Channel:	Hardware Channel (DMA is implemented in channel unit)
Devices:	Those devices with a Local Workstation interface. viz.
also Secondary-,	Modular Device Adaptor, MDA 6411
Work-stations)	Terminal Printer, TP 6371
	Visual Display Unit, VDU 6347, VDU 6381
	General Printer, GP 6374
	Compact Financial Terminal, CFT 6280

Power-consumption :	+5 Volt	: 2.9 A +/- 0.1A
	-5 Volt	: 10 mA +/- 1 mA (made from -18 Volt)
	+16 Volt	: 55 mA +/- 3 mA (made from +18 VOlt)

Transmission information:

Line configuration:	Multidrop, 1 line
Number of workstations:	Max. 32, typical 6-8
Cable:	3 twinned pairs, max. length 750 metres
Type of transmission:	A-synchronous, self clocked serial data, NRZI, full duplex
Line procedure:	HDLC/X27, with polling
Character format:	8 bits, without parity
Max. Packet length	259 bytes (3 bytes in Packet Header plus 256 characters)
Speed of transmission:	96k bits per second

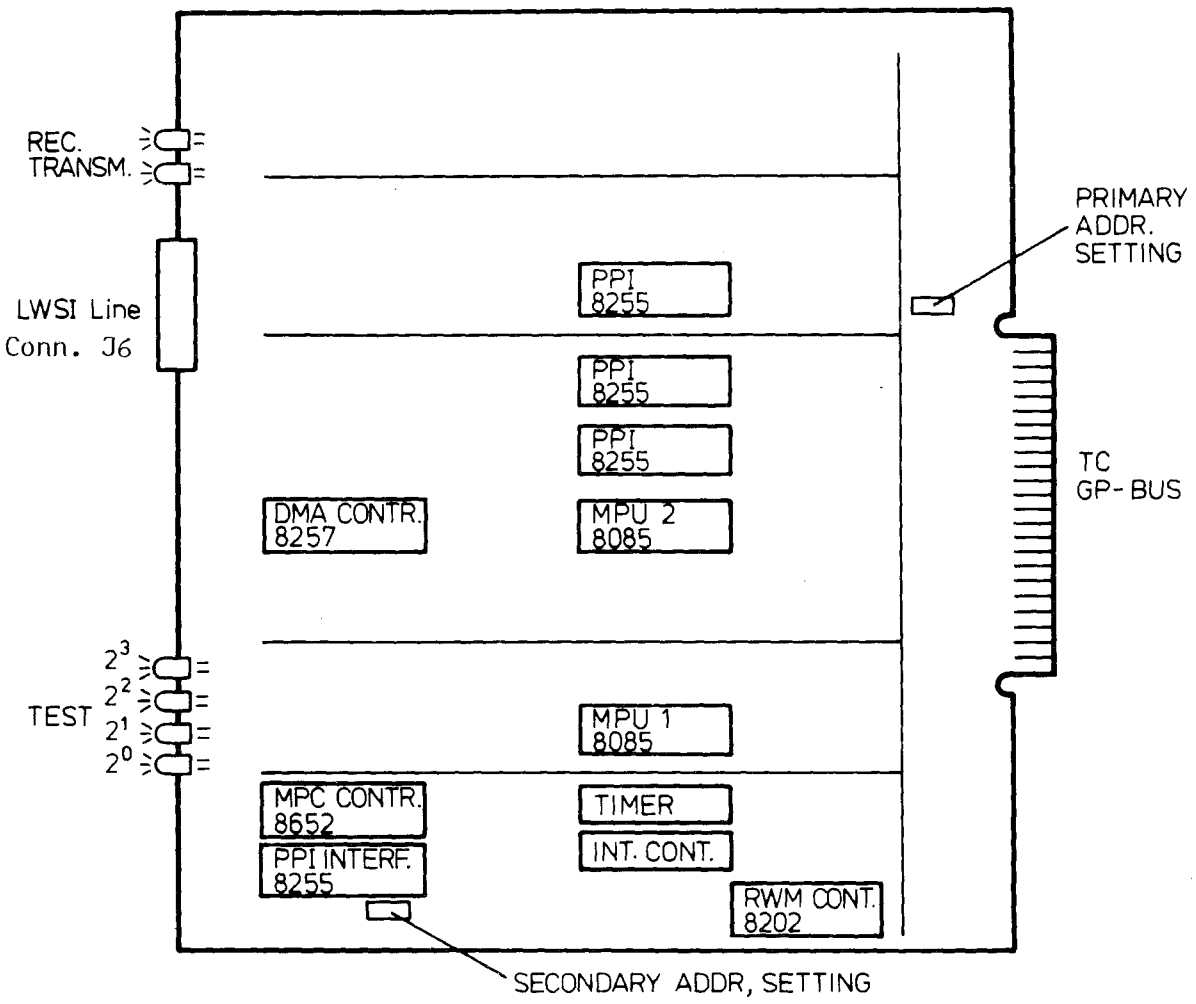


Figure 25.1 LAYOUT OF CHLW

STRAP-SETTING CONTROL UNIT ADDRESS

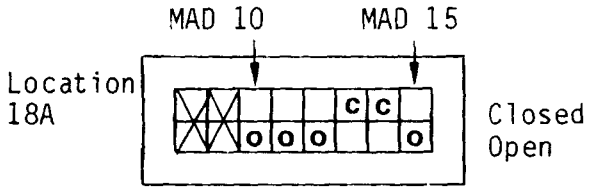
CHLW used as Primary: Prim. Addr. switches: CHLW1 /06
CHLW2 /07
CHLW3 /26
CHLW4 /27
Second. Addr. switches: Don't care

CHLW used as Secondary: Prim. Addr. switches: Don't care
Second. Addr. switches: 0 - 31, (switches at '0' = WS NR. 32) depending on Software

INTERRUPT LEVEL:
No straps available; is software set.

The Interrupt level can be: (decimal)

CHWL1: 26
CHWL2: 27
CHWL3: 24
CHWL4: 25

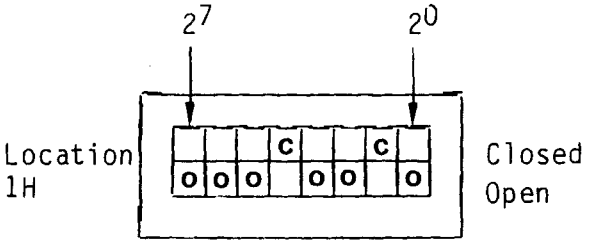


Primary Address: 06 CHLW1
07 CHLW2

Decimal Interrupt Level: 26 CHLW1
(Software Set) 27 CHLW2

MAD	Closed	Open	
10		X	2^5
11		X	2^4
12		X	2^3
13	X		2^2
14	X		2^1
15		X	2^0

Example:
Primary
Address 06

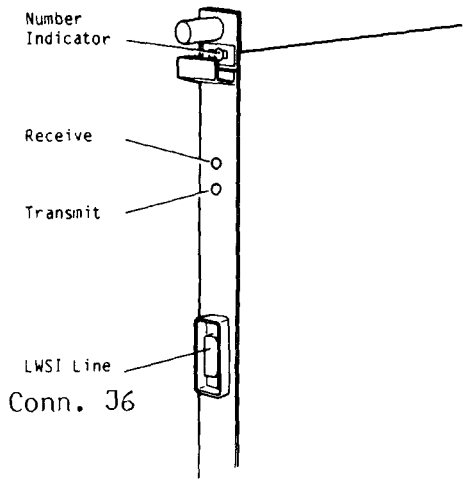


Secondary Address: 00 - 1F

	Closed	Open
2^7		X
2^6		X
2^5		X
2^4	X	
2^3		X
2^2		X
2^1	X	
2^0		X

Example:
Work station
address 18 (/12)

Figure 25.2 EXAMPLES OF PRIMARY & SECONDARY ADDRESS SETTING



Number Indicator:
CHLW1: slide to show 1
CHLW2: slide to show 2

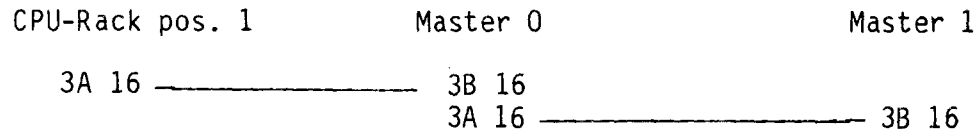
Figure 25.3 NUMBER INDICATOR

As a Direct Memory Access function is implemented in CHLW, the control unit is a master during transfers of information between the TC's main memory and the memory of the CHLW.
For this reason this control unit must be connected in the Master priority chain, the OKO-OKI line.

The priority level must be according the following table:

Priority level	Master	Remark
0	DMA (CURD 80 MDisc.)	Highest priority
1	IOP 1 (Dev. Addr. 08-0F)	
2	CHLW	
3	CHRW	
4	CPU	Not wired.

The bus priority line OKO/OKI originates from the Bus Controller, located on the CPU board, and the line is wired in the following way:



In case a master with higher priority is not used the others are advanced one level.

CAUTION

If a CHLW is removed from the rack the OKO/OKI on that rack position must be linked in order not to break the line for masters with lower priority.

25.3 INTERFACE CONNECTIONS

Connector J6:

Signal Name	Pin No.	Type	Remark
Data In	2	Input	To CHLW from WSs
Data In N	4	Input	" " " "
Data Out	3	Output	From CHLW to WSs
Data Out N	5	Output	" " " "
Signal Ground	7		

Figure 25.4 RELATION PIN NUMBER /SIGNAL

The input-line wires are clamped to signal ground by two resistors, each 560 Ohm at the CHLW.
Signal levels are according to CCITT X27 specification.

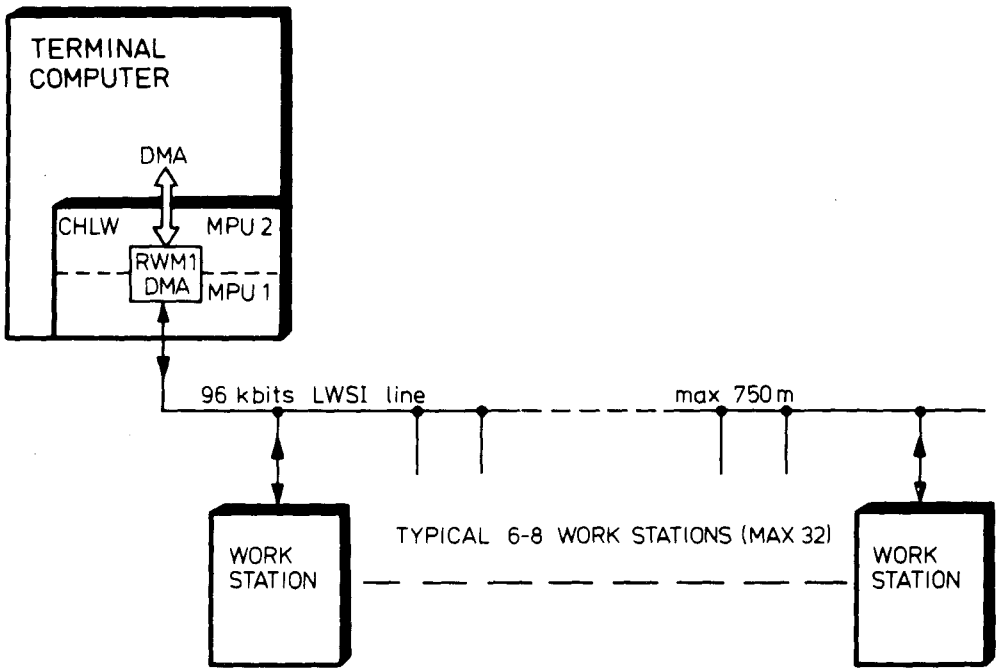


Figure 25.5 LWSI CONFIGURATION

For cabling See Chapter 2 "Installation"

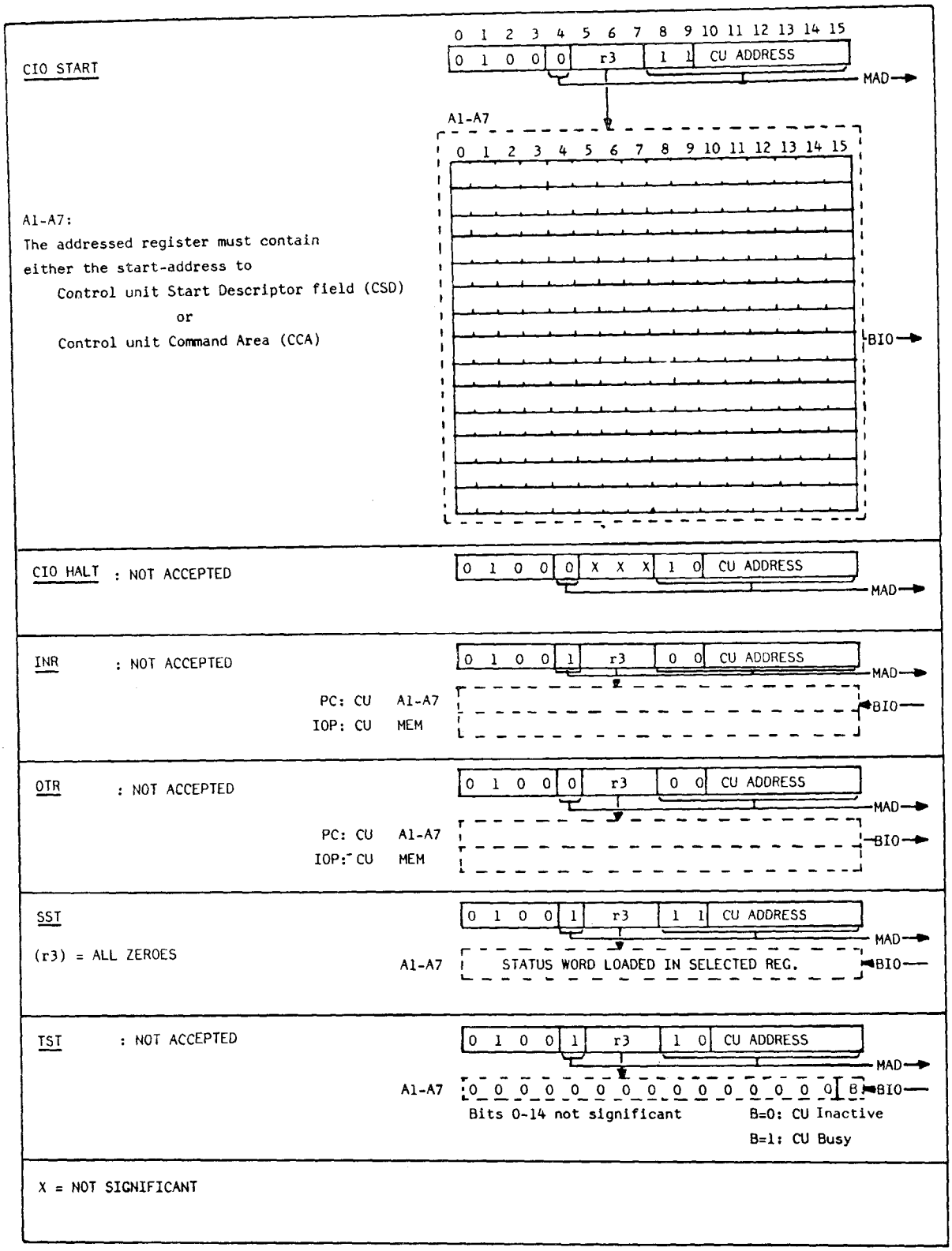


Figure 25.6 INSTRUCTION-/COMMAND-WORD FORMATS

COMMAND/RESPONSE INTERFACE BLOCKS

INITIALIZATION OF CHLW:

After power-on the CHLW is in Reset state and has to be initialised. During initialisation three control blocks are transferred from main memory to CHLW memory, viz. Control unit Start Descriptor (CSD), Control unit Interface Descriptor (CID) and Control unit Command Area (CCA).
Before the CCA is transferred to CHLW the control unit tests itself. (See diagnostic tests).

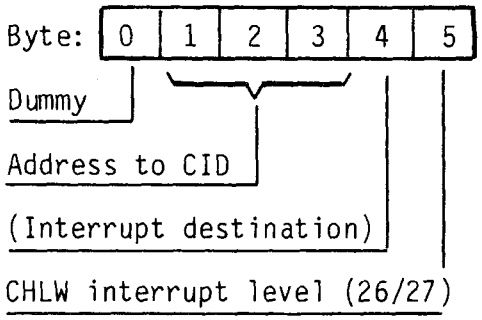


Figure 25.7 LAYOUT OF CSD

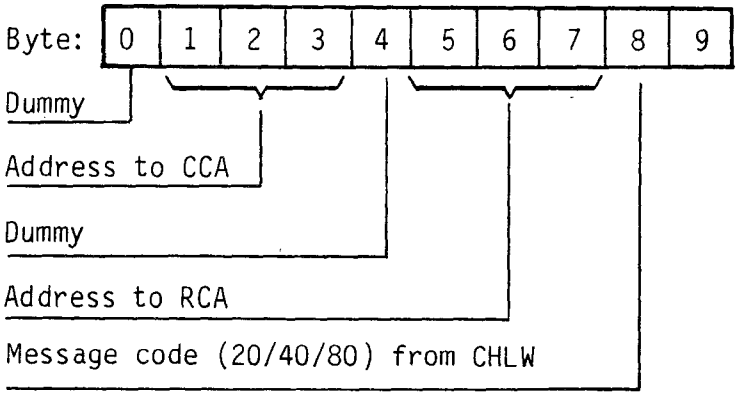
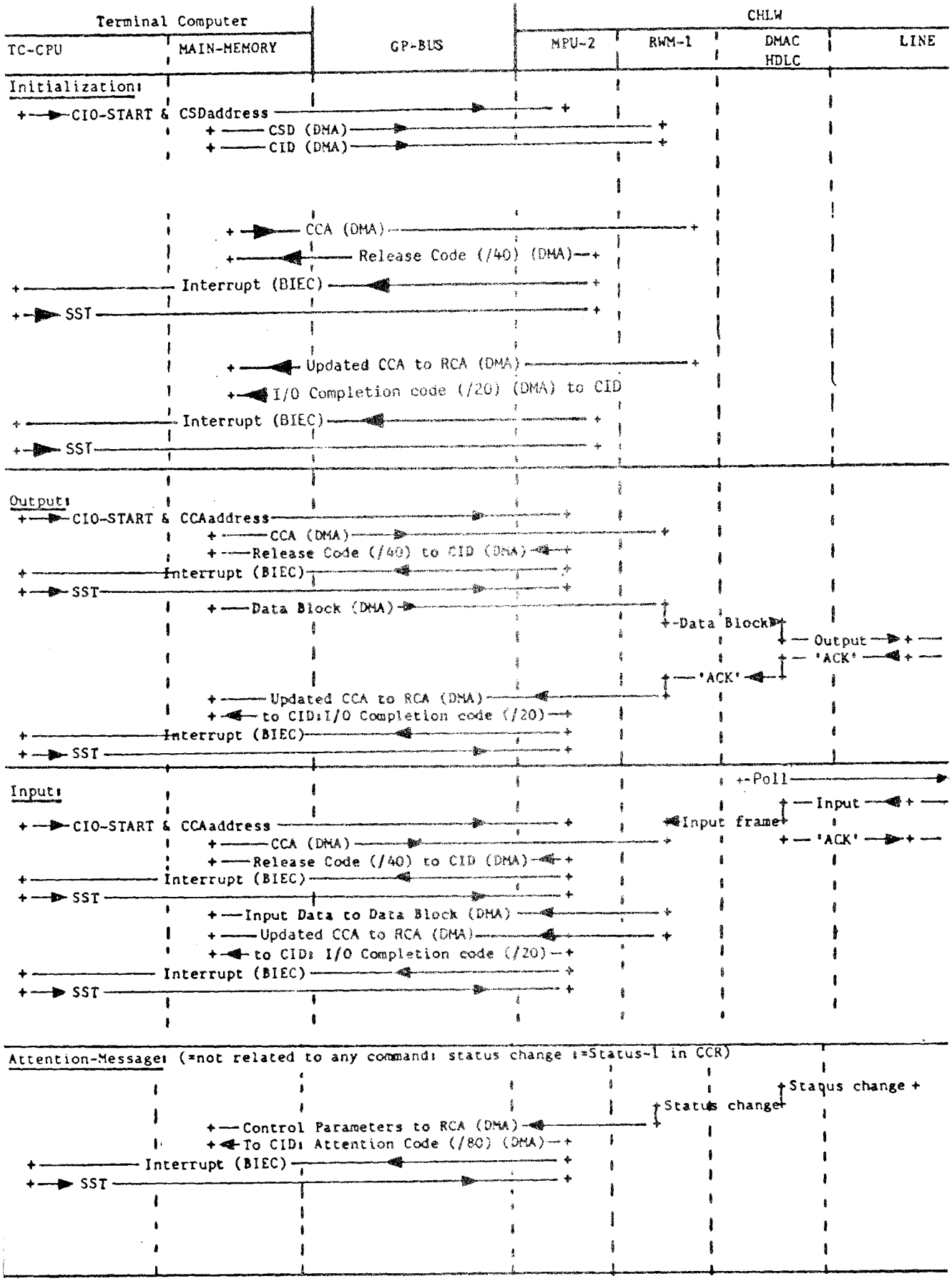


Figure 25.8 LAY-OUT OF CID

After the CHLW has completed a command it transfers a message code to byte 8 of CID in main memory, an updated CCA Response Communication Area (RCA) in main memory, and interrupts the CPU at level as stated in byte 5 of CSD. (Software set Interrupt level of CHLW).
The start address of RCA is stated in CID.

For transfer of the blocks see figure 26.9 Data Flow Initialisation, Output, Input, Attention Message.



Following messages can be given:
If the WS is disconnected: No Connection
If the CHLW has reset the Link: Link Reset
If the CHLW has re-established the data link: Communication Re-established
The information is put in Status-1 of RCA.

Figure 25.9 DATA-FLOW INITIALISATION, OUTPUT, INPUT, ATTENTION MESSAGE

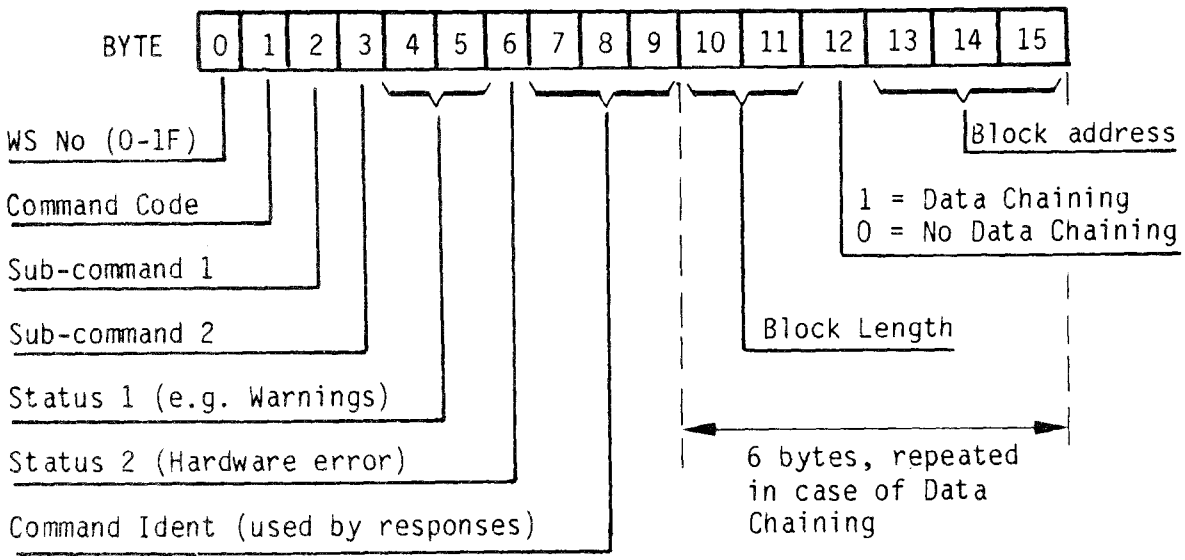


Figure 25.10 LAYOUT OF CCA/RCA

Three different message codes can be received from CHLW:

- Release code: /40
- I/O Completion Code: /20
- Attention Code : /80

CHLW sends the Release Code if CSD and CID or if CCA is transferred to the memory of the CHLW. Customer software now can fill these blocks with new information.

CHLW sends I/O Completion Code after a command is completely executed. The Attention Code is send by CHLW if there has been a change in the hardware somewhere in the network or at the CHLW. This code has no relation to any command.

Directly after transfer of one of these codes the CHLW interrupts the CPU via the BIEC lines. These interrupts must be reset by means of an SST instruction.

All transfers between TC's main memory and the CHLW are controlled by the Direct Memory Access part of the CHLW. (Hardware Channel). As the CHLW is acting as a Master, the control unit must be taken into the Master priority chain by means of OKO-OKI signal. The priority order is set by the Customer's application.

COMMAND CODES FOR CHLW

The CHLW recognizes the following command codes set in byte 1 of CCA. There are three types of command codes, with some commands additional information has to be sent in special formatted information blocks.

Command Code Hex	Command	Command Type	Remark
20	General Read	Input	From any WS
21	Specific Read	"	From addressed WS
40	Standard Write	Output	To addressed WS
41	Fast Write	"	To addressed WS with high priority
80	Test CU	Supervisory	Starts CHLW internal tests
81	Terminate (Not used)	"	Software Reset of CHLW
82	Close Line	"	Resets line parameters
83	Get DLS Statistics	"	Statistics for an addressed WS are transferred to TC.
84	Get Line Statistics	"	Statistics for the line counters are fetched to TC.
85	Open Data Link	"	Establishes a connection to a specified WS.
86	Open Line	"	Defines the type of line and sets the line parameters.
87	Read Local Memory	"	Read from RWM1 on CHLW to specified memory area in TC.
88	Cancel	"	Cancels a previously sent Read command.
89	Close Data Link		Closes the data link for a specific WS.

Figure 25.11 COMMAND CODES FOR CHLW

WS- Work Station

25.5 DIAGNOSTIC TESTS

In the software of the CHLW are implemented 4 diagnostic test types:

- Start-up test
- In-line test
- On-line test
- Off-line test (=Start-up test)

The outcome of the test is displayed in hex. format on four leds at the front of the CHLW.
Line-activity is indicated by 2 yellow leds: one for transmit data and one for received data.

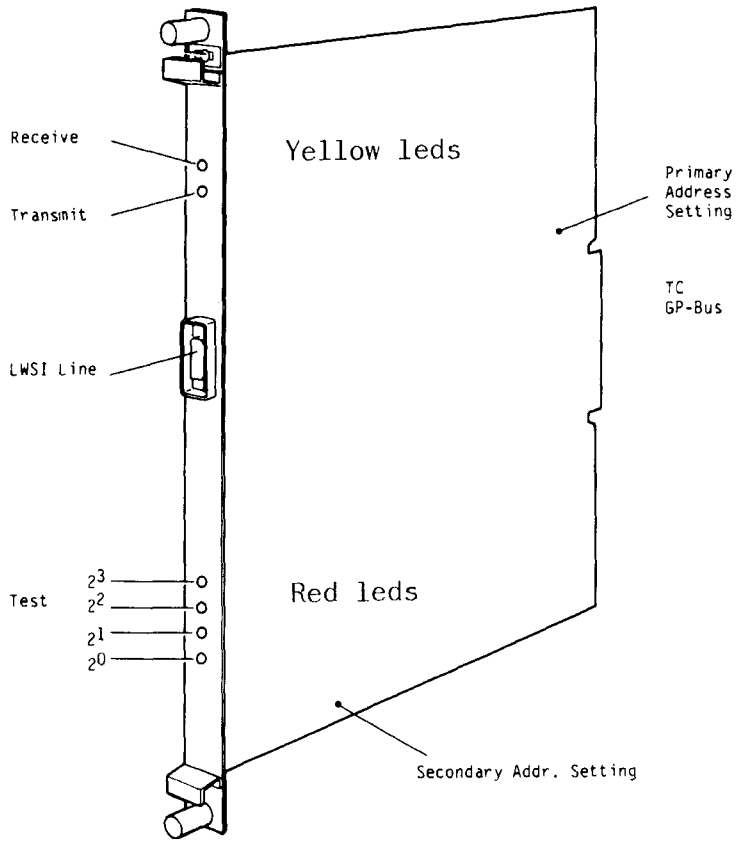


Figure 25.12 POSITION OF LEDs

START-UP TEST AND OFF-LINE TEST

The Start-up test and the Off-line test are exactly the same but initiated in different ways. Start-up test is started by "power-up".
The Off-line test is started when the IPL button or the Master-Clear button are pressed. The test-codes are shown in the figure below.

In case of an error the leds for the corresponding code are flashing.

If led(s) are flashing the CHLW has put itself into NOT OPERABLE mode and will not respond to any command from the host program.
The test can be started again by means of power-off/on, IPL- or MCL-button.

The following internal logic are tested during the test:

- MPU1
- ROM1 (all data is LRC checked)
- RWM1 (all locations are written into, read and reset)
- MPU2
- ROM2 (all data is LRC checked)
- RWM2 (all locations are written into, read and reset)

TEST CODE Hex	2^3 2^2 2^1 2^0	Meaning
0	0 0 0 0	No error, and "TEST CU"-command received
1	0 0 0 ⊛	ROM 1 error, MPU 1
2	0 0 ⊛ 0	ROM 2 error, MPU 2
3	0 0 ⊛ ⊛	Not used
4	0 ⊛ 0 0	RWM 1 error, bit 0/1, MPU 1
5	0 ⊛ 0 ⊛	RWM 1 error, bit 2/3, MPU 1
6	0 ⊛ ⊛ 0	RWM 1 error, bit 4/5, MPU 1
7	0 ⊛ ⊛ ⊛	RWM 1 error, bit 6/7, MPU 1
8	⊛ 0 0 0	RWM 2 error, MPU 2
9	----	Not used
A	⊛ 0 ⊛ 0	HDLC error/Data loop error
B	----	Not used
C	----	Not used
D	----	Not used
E	⊛ ⊛ ⊛ 0	Test OK, but no "Test CU" yet, not flashing.
F	⊛ ⊛ ⊛ ⊛	Hardware reset received, not flashing.

Figure 25.13 TEST CODES START-UP/OFF-LINE TEST

To switch the CHLW from RESET to NORMAL OPERATION mode from the host program the TEST CU command must be given.
This command is only accepted if no error was detected in the Start-up test. The TEST CU command starts the Start-up test all over again.
It takes about 10 seconds between a reset and accepting the TEST-CU command.

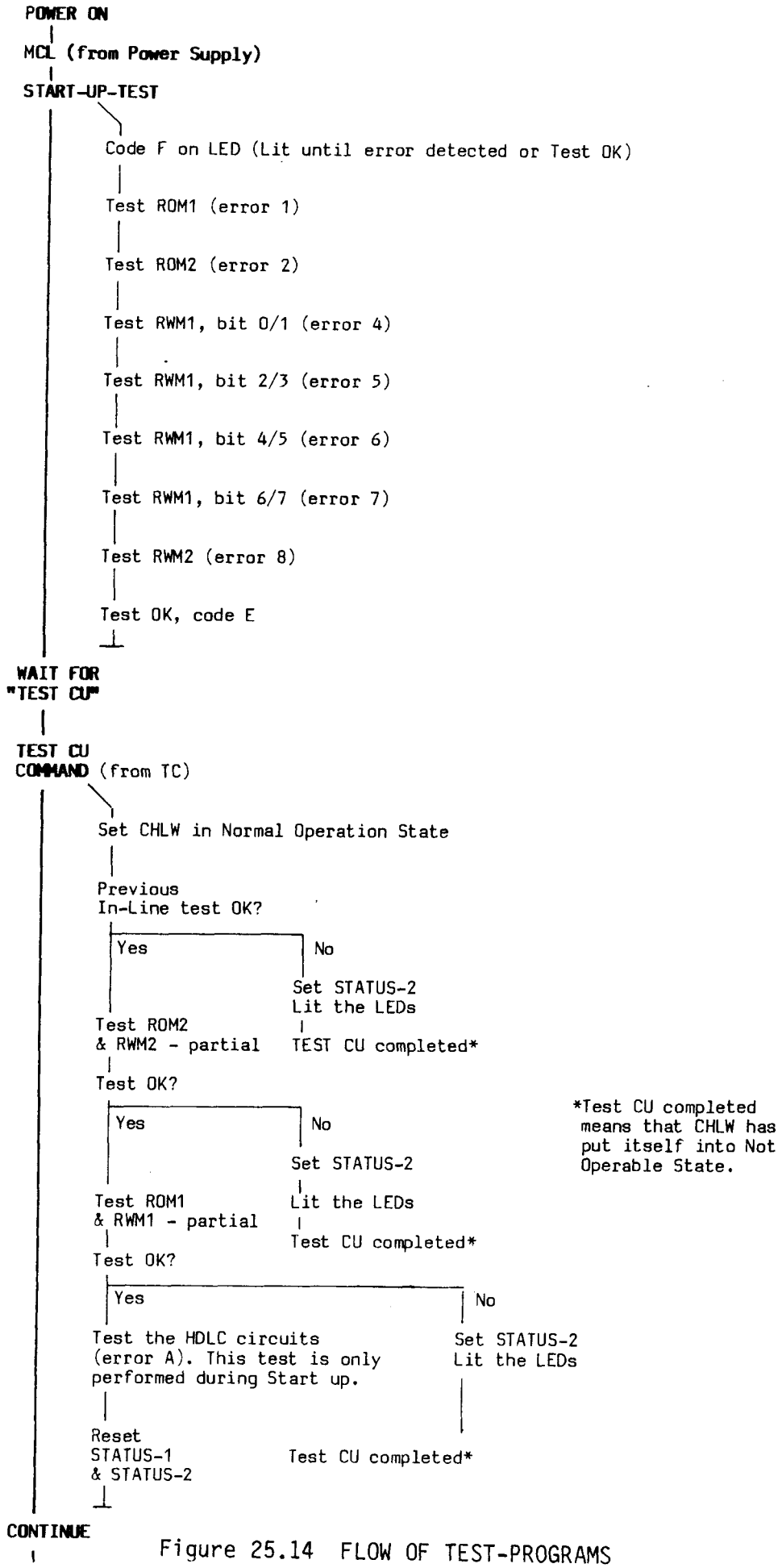


Figure 25.14 FLOW OF TEST-PROGRAMS

IN-LINE TEST

The In-line test is activated several times by CHLW during run-time without affecting the user's application.
The codes B and C in the figure below indicate that an error has been detected. The CHLW, however, will continue its normal execution in order to allow the host program to detect the error by means of a TEST-CU command

TEST CODE Hex	2^3 2^2 2^1 2^0	MEANING
B	Ø 0 Ø Ø	MPU1 error, not flashing
C	Ø Ø 0 0	MPU2 error, not flashing
D	Ø Ø 0 Ø	Not used

Figure 25.15 ERROR CODES IN-LINE TEST

ON LINE TEST

The On-line test if activated by means of a TEST CU command during the time the CHLW is in NORMAL OPERATION mode.

The following actions are taken:

- If the In-line test previous has detected an error the TEST CU command is immediately executed.
- A ROM2 and a simple RWM2 test is performed. If an error is detected the appropriate leds, as shown in the figure below, are lit.
- A ROM1 and a simple RWM1 test is performed. If an error is detected the appropriate leds, as shown in the figure below, are lit.
- If no error is detected the TEST CU command is completed with the fields STATUS-1 and STATUS-2 in the RCA set to zero.

In case of an error the Test Code is duplicated in the 4 least significant bits of the STATUS-2 field after the TEST CU command has been completed.

TEST CODE **Hex**	2^3 2^2 2^1 2^0	**Meaning**
1	0 0 0 Ø	ROM 1 error, MPU 1
2	0 0 Ø 0	ROM 2 error, MPU 2
3	0 0 Ø Ø	Not used
4	0 Ø 0 0	RWM 1, bit 0/1, MPU 1
5	0 Ø 0 Ø	RWM 1, " 2/3, MPU 1
6	0 Ø Ø 0	RWM 1, " 4/5, MPU 1
7	0 Ø Ø Ø	RWM 1, " 6/7, MPU 1
8	Ø 0 0 0	No error, and "TEST CU"-command received

Figure 25.16 TEST CODES ON-LINE TEST

FAULT FINDING AIDS

TEST- AND TRANSMIT/RECEIVE LEDS:

The fault symptoms that can be discovered during runtime are shown in the flow-chart below together with advised remedy.

Use the Test LEDs and the Transmit and Receive LEDs on the CHLW board to trace the faults. Besides, watch the operation of the devices during the OFF-LINE TEST when the Test-switch is set ON at respective main module of the work stations.

TEST PROGRAMS

To test the network and connected terminals the test-program TERTST4.1 and higher releases may be used.

See description of TERTST for details.

LWSI-DATASCOPE

The LWSI-Datascope is a VDU 6347 which is used for looking at data sent on the LWSI line in a running system. To make the VDU 6347 to a datascope, the program held in three PROMs 2716 and one 2732 must be exchanged and a keyboard must be connected to the display. The keyboard is to be used for communication between the operator and the datascope.

The VDU can be connected to any drop point and by using a standard VDU drop cable it is possible to look at data sent from the terminal computer to one or more secondary work stations.

Using a specially prepared VDU drop cable, where the receiving line wires are changed, it is possible to look at data sent from the secondary stations, e.g. MDA 6411, to the terminal computer.

The use of the LWSI-Datascope is described in a separate manual - **LWSI-Datascope, Operator's Guide.**

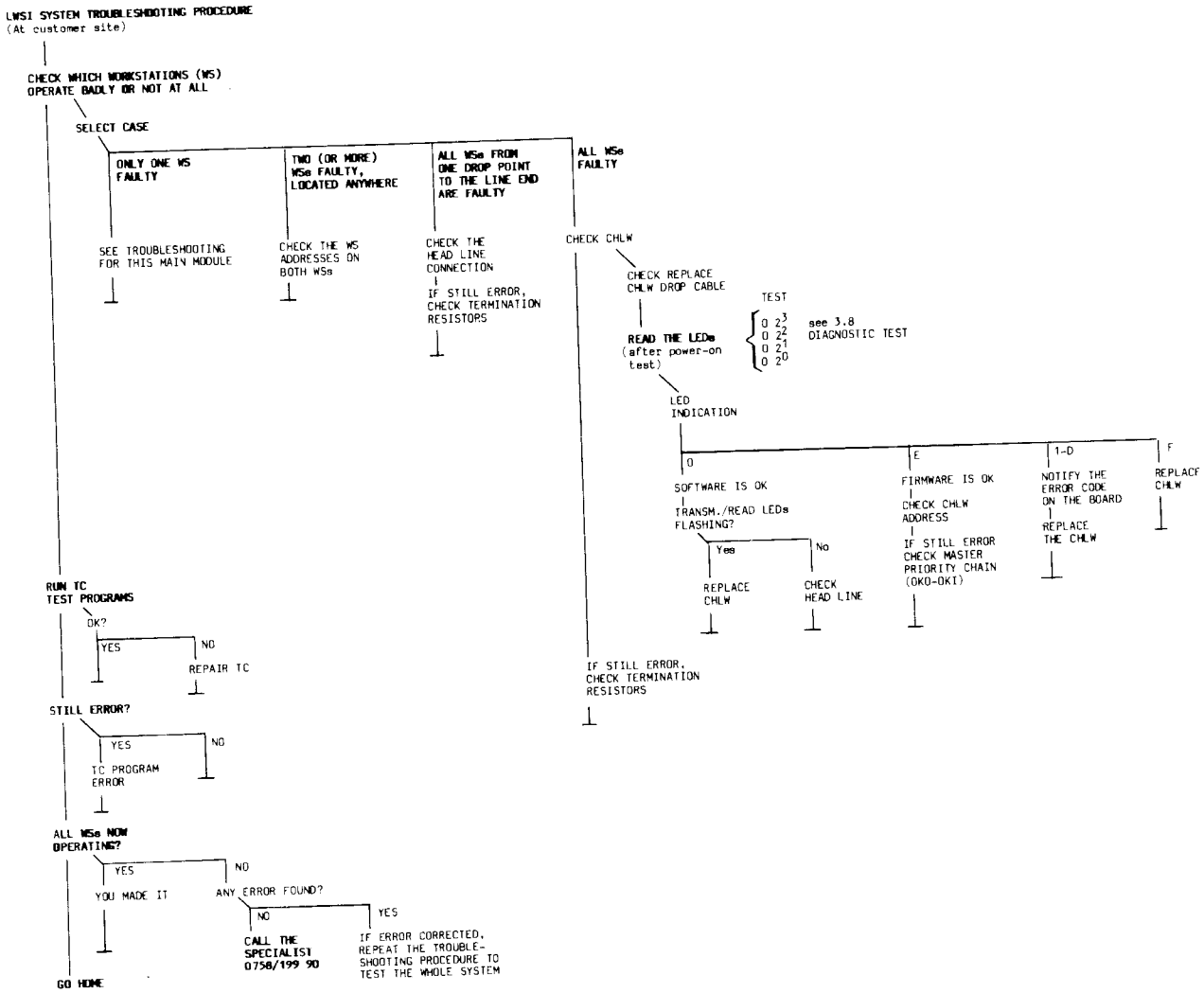


Figure 25.17 TROUBLE-SHOOTING PROCEDURE