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7. Periphery and Options

7.1. *Periphery and options*

7.1.1. *How to use the serial interface on unit XC92*

A nine-pin and a twenty five-pin Sub-D connector are located on the front of the control unit XC92 (6 and 7 in Fig. 2.5), each of which is the connection to a serial interface. They correspond to the standard RS232-C (V.24) **with the exception** of the pin connections of the nine-pin connector for the handheld terminal. Each of the interfaces requires only three conductors: transmit, receive and zero.

The buffer control for entry and display is performed using XON and XOFF instructions (XON: ASCII decimal 17; XOFF: ASCII decimal 19) and therefore all the peripheral equipment to which such instructions apply may be connected.

The upper interface with the twenty five-pin connector is intended primarily for the connection of a printer, but it may also be used for the connection to a computer (see Fig. 11.5).

The handheld terminal is connected to and obtains its auxiliary supply from the lower interface with the nine-pin connector. Other terminals or a PC may also be connected by a cable (see Fig. 11.6) and connector having the corresponding pin connections (see Fig. 2.8).

7.1.2. *Telegram format*

The format of the telegram for transmission is:

- 1 start bit
- 8 data bits
- no parity
- 1 stop bit

Start	8 data bits	Stop

Fig. 7.1 Data telegram format

7.1.3. Signal levels

Logical "1" and logical "0" correspond to the following values for transmission and reception:

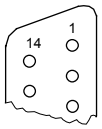
- Transmission: log. "1" -6 V DC
  log. "0" +6 V DC
- Reception: log. "1" -3 to -25 V DC
  log. "0" +3 to +25 V DC.

7.1.4. Pin connections

The pins of the two Sub-D connectors (6 and 7 in Fig. 2.5) have the following functions, the terms transmit and receive referring to the control unit XC92.

Upper twenty five-pin connector "serial interface":

- pin 1 GND
- pin 2 data transmission
- pin 3 data reception
- pin 7 signal zero



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Lower nine-pin connector "handheld terminal" (see Fig. 2.8):

- pin 1/6 +5 V DC
- pin 4/8 0 V
- pin 9 -15 V DC
- pin 2 data transmission
- pin 7 data reception
- pin 5 signal zero.

7.1.5. Data transfer rate

The baud rate for the transfer of data is set for both interfaces on the plug-in jumpers on the control unit XC92.

Caution! The auxiliary supply of the test set XS92b must be switched off before withdrawing the XC92 unit.

Two labelled rows of plugs are located on the second board from the left (seen from above), the front one is the "serial interface" and the rear one for the "handheld terminal". The data transfer rate which is set can be seen from the positions of the jumpers plugs. The following baud rates can be set from front to rear: 300, 600, 1200, 2400, 4800 (standard setting for the handheld terminal), 9600, 19200 and Var. The setting "Var." provides facility for setting the baud rate with the aid of the terminal firmware (inactive in the standard version).

7.1.6. Setting the baud rate on the handheld terminal

When the test set is switched on, the default value of 4800 Baud is set for the handheld terminal and displayed on it for the duration of the LED test (see Section 2.2.7.).

Should the display "*XS92b ready*" not appear or be illegible, or upon pressing keys either nothing or nonsensical symbols appear, then some value other than 4800 Baud is set on the control unit. The system will only function, however, when the settings on control unit and handheld terminal are the same.

The function ^B (press keys 'CTRL' and 'B' together) permits a lower value than 4800 Baud to be set on the handheld terminal. The following alternatives are possible: 300, 600, 1200 and 2400 Baud.

Upon entering ^B, the currently active handheld terminal Baud rate is displayed at first. The other Baud rates can be selected, e.g. 600 (present setting) - 1200 - 2400 - 4800 - 300 by repeatedly pressing ^B. The desired value is made the active baud rate by pressing 'ENTER'. The display "xxxx Baud" then disappears.

Whenever the auxiliary supply to the handheld terminal is interrupted (e.g. by switching the test set off), the default Baud rate of 4800 is restored when it is switched on again.

7.1.7. Hardware specifications

7.1.7.1. Processor board

Apart from the Intel processor 80186, the firmware for all equipment functions, manual operation and testing programs is located on the processor board of the XC92 control unit.

PROM: 4 sockets fitted with 27256 EPROM making a total of 128 kB.

RAM: 2 sockets fitted with 32 kB each. Of the total of 64 kB RAM, 6 kB are reserved for the program actually being processed or run. To permit the longest programs to be compiled, the programs are compiled to code as soon as they are entered and stored in the RAM in compressed form. They are only decompiled to ASCII format for display and printing purposes.

Ports: 2 serial ports used for:

Port 1: "handheld terminal"
- handheld terminal with 2 lines of 16 characters
- computer terminal option.

Port 2: "serial interface"
Printer or possibly host computer for data exchange and remote control.

7.1.7.2. Memory unit YS92

Hardware design

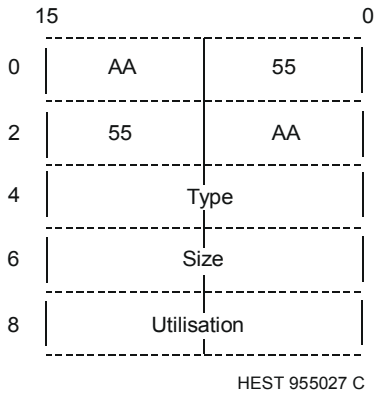
The memory unit YS92 is equipped with 8 sockets arranged in four blocks of two sockets (16 bit words) into which RAM, EEPROM or PROM chips are inserted as required.

Thus the following memory sizes are possible:

RAM	:	8 kB	element	16 kB / block
EEPROM	:	8 kB	element	16 kB / block
PROM	:	16 kB	element	32 kB / block.

To facilitate easy replacement of chips on the memory unit without having to change the firmware, addressing is related to the largest memory element (27128 with 32 kB per block). A consequence of this is that the use of memory elements having a smaller capacity results in gaps in the address sequences and this must be taken into account when allocating memory.

For efficient memory management, the first ten Bytes of every block must contain the following:



Check code

0 = RAM, 1 = EEPROM, 2 = PROM

Hexadecimal in multiples of 16 Bytes (paragraphs) (100H=4kB, 400H=16kB)

0 = test program, 1 = firmware

When the XS92b is switched on, the firmware examines the check code of all four blocks.

Blocks which do not have the correct check code are initialised as RAM's. Writing and reading sequences check whether 2 kB or 8 kB elements are fitted. A distinction cannot be made between RAM and EEPROM on the basis of the duration of a writing sequence.

Blocks which cannot be correctly initialised are ignored (no element inserted).

Memory management

For control purposes, the memory blocks are grouped as follows:

- every PROM block is a group on its own
- all EEPROM blocks form an EEPROM group
- all RAM blocks form a RAM group.

The memories are further subdivided into "records" of 64 Bytes. A program is therefore stored in several, not necessarily consecutive records referred to as a record chain. The header record of each group contains the addresses of two record chains.

10H: paragraph address of the first free record
12H: paragraph address of the first program header.

7.1.7.2.1. Utilisation of the memory unit

The purposes for which the four memory blocks (with 2 sockets each) are used can be determined for each one individually:

- test programs in PROM
- test programs in EEPROM or RAM
- PROM with firmware extensions
- no element fitted.

PROM : Write-protected memory groups can contain firmware extensions or test programs. PROM's with test programs must have a correct header record and be correctly linked. Each PROM block (2 sockets) is controlled separately and can thus be compiled independently of the other blocks. A test program cannot be distributed between two PROM blocks.

RAM/EEPROM: The total write/read memory capacity is available for test programs. Programs are distributed between the memory blocks. RAM and EEPROM may not be fitted in the same ancillary unit as there would be a risk of parts of programs being lost when the unit is switched off.

Supplementary information

When inserting EPROM's, it is essential to start with block 1. Further blocks of EPROM's or RAM/EEPROM's may then follow. No RAM/EEPROM block may be inserted before an EPROM block, proceeding in increasing order of block numbers.

After an EPROM block has been inserted, jumpers W11 to W13 of the block concerned must be placed in the "EPROM" position. Pin 1 on EEPROM's must be a ready/busy input, otherwise it is impossible to write data in them. A program memory board must be reinitialised using 'INI' every time a component is changed; this deletes all data not in EPROM's!

The following example illustrates the procedure for copying a program with a new name (e.g. with some change) where different kinds of components are fitted (also for RAM/EEPROM's).

Example

Run the editor with the new program name:	EDT name
Insert the program with the old name:	INC name
- edit the new program as required -	
Save the new program:	STO
(see Sections 6.2.1. and 6.3.2.)	

Caution: Do not transfer a program from an EPROM to a RAM/EEPROM with the same name!

7.1.8. Saving test programs

Account must be taken when storing test programs of the limited number of EEPROM writing cycles. For this reason stored programs are not shifted, instead changes to a testing program are written on top of the old version. Depending on the length of old and new versions, record addresses become either free or are newly occupied.

The first record of every program stored contains the following information:

Byte 0, 1	:	program length in Bytes
Byte 2 to 9	:	program name
Byte 16, 17	:	paragraph address of the next program header (0 if last program)
Byte 18, 19	:	paragraph address of the first data record.

7.1.9. Shift register for free records

The paragraph address of the first free record of a group is stored in the block header. The free records of a memory group are linked in forwards and backwards directions. Any records required are taken from the end of the chain, so that the pointer (paragraph address) in the block header does not have to be changed every time and too many write operations have to be executed.

7.2. Using a terminal or external computer with the test set XS92b

7.2.1. General

The test set XS92b is an independent stand-alone system with its own processor, handheld terminal, memory, firmware (operating system) and programming language. An exchange of data with other systems (terminals or computers) is possible via its two serial interfaces. 'On-line' control of the XS92b by an external computer is not possible.

But nevertheless the connection of one (PC) is of advantage for transferring parameter values and user programs. Parameters which have been prepared on a PC or are in the memory of some other device can be transferred to an XS92b test program. Test results can be transferred in the reverse direction from the XS92b to a PC, where they can be more conveniently evaluated and printed by suitable programs (tolerance checks, graphical representations etc.). Use of the control program 'XSWIN.EXE' makes the operation of the test set via a PC much more convenient.

Transferring user test programs from the test set enables them to be saved on other media (such as on floppy etc.) and also enables a library of test programs to be built up.

Test programs can be written as text files on a PC and then transferred to the test set.

The explanations which follow on the exchange of parameter settings and programs are illustrated in relation to PC applications (DOS operating systems). Different computers, peripheral equipment and connecting cables as shown in Figures 11.4 and 11.6 (see Section 10.2.2. ”Options”) may be used with the XS92b.

In the following text,

XS program means: the user test program in the XS92b
PC program means: the program in the external computer (PC).

7.2.2. XS92b and DOS PC

Connection to XS92b

Connection a PC with a 25 pin serial interface (COM#) which is connected to the 9 pin socket at the rear of the XS92b marked "Handheld terminal":

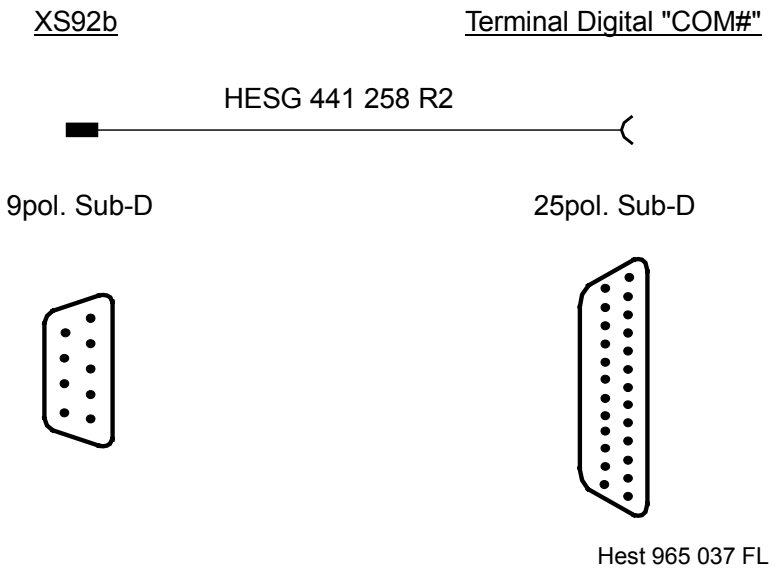


Fig. 7.2 Connecting cable YX92-2

Connection of a PC with a 9 pin serial interface (COM#) which is connected to the 9 pin socket at the rear of the XS92b marked "Handheld terminal":

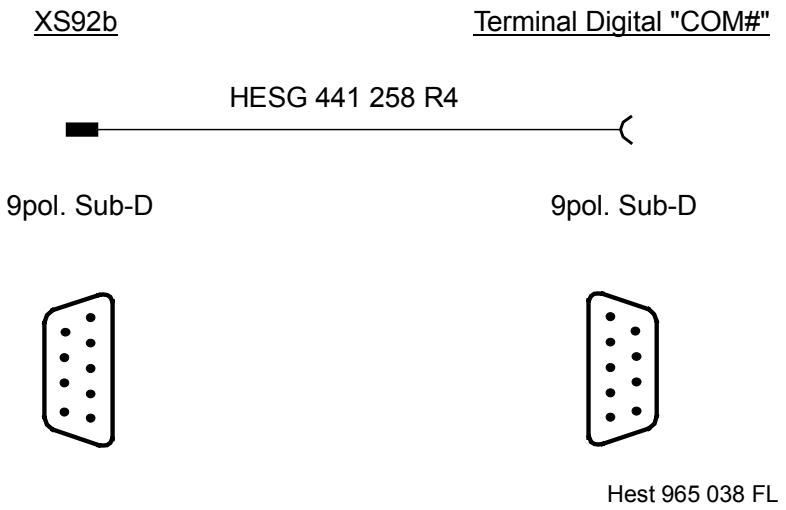


Fig. 7.3 Connecting cable YX92-4

Commissioning

A terminal emulation program is required to enable a PC to function as a terminal for the XS92b. The procedure for using the program "XSWIN" in a terminal mode is described below. "XSWIN" can be ordered from ABB (see Section 4.4.2.).

- Run “Setup” on disc 1 (or CD) to install the program on your PC.
- Select from WINDOWS Program Manager the path, the corresponding directory and the file XSWIN.EXE.
- Open the “File” and select the menu item “Open”.

After the main window has opened, select “Continue” and the folder “Terminal mode”.

The serial port (communication port) does not have to be initialised, providing the test set is set to its default value of 4800 Baud. If not, open the folder “RS-232C/Tools”.

As with the handheld terminal, the “Terminal” folder permits parameter codes to be directly entered.

Once the test set has been connected and switched on, you can start entering the commands.
If the test set XS92b does not respond, check the connections and settings of the serial interfaces (“COM#” and “Handheld terminal”).

7.3. Parallel connection of 2 current amplifiers

If an injection current higher than 20 A is needed for a test, it is permissible to connect two current amplifiers in parallel on test sets supplied after January 1995. The standard test set must be equipped with two changeover switches at the right-hand end of rack 1 (see Fig. 2.7 and Fig. 7.4).

The amplifier AI93 has to be connected in parallel for phase IL1 and IL2 on the front of the AC93 module.

Using 4mm diameter plugs: Connect "+I//" from IL2 to "+I//" of IL1 and "-I//" from IL2 to "-I//" of IL1 and connect the equipment under test to "I" and "-I//" of IL1.
Using test connector YX91: Connect "+I//" from IL2 to "+I//" of IL1 and use outputs "IR" and "N".

Place the changeover switch marked "I" (at the right-hand end of rack 1) in position "2//". This connects the two signals for amplifiers IL1 and IL2 (of racks 1 and 2 in the case of XS92a) in parallel and increases the injection current up to a maximum of 40 A.

The switches have no influence on the software and therefore the current entered via the control terminal may only be half the value of the desired injection current.

Caution!
Return the switch to position "1" after testing!

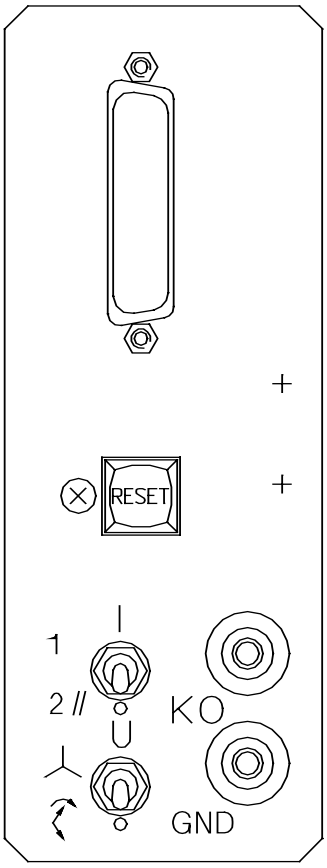


Fig. 7.4 Rack 1 showing the changeover switches

Parameter settings:

In order to inject two currents in parallel, the parameter "IRA" has to be set to "0" or "1" depending on the range required. The parameter for the kind of fault should be set to “Phase L1 to ground” (11). In the operator program XSWIN, open the “Control parameters” dialogue and select “1 current 0 to 40.0 A” for the “Injection current range”. In this case, the settings for "ZS", "ZL" and "I" take the parallel connection of two current amplifiers into account.

7.4. Ancillary voltage amplifier rack

The ancillary voltage amplifier rack enables two three-phase voltage systems to be injected. This is necessary, for example, for testing synchro-check equipment.

7.4.1. XS92b configuration

For the test set XS92b to be able to generate a second voltage system, it must be fitted with a unit type YU92a. The firmware installed in the control unit XC92 must be Version 2.6 or later.

The principle of operation and the control procedure are described in detail in Section 8.6.1.

Ancillary rack layout

The ancillary rack houses from left to right:

- EX92 supply input unit 115/230 V (±15 %)
- NF92-2 DC/DC converter
- AU92 three-phase voltage amplifier
- AX93 I/O unit.

The ancillary rack is supplied in a similar carrying case to that of the test set XS92b and can be carried on its own.

Technical data

The technical data of the voltage amplifier correspond to those of the voltage amplifier AU92 in the test set XS92b.

Signal input	:	0 to 10 V (peak)
Signal output	:	0 to 100 V (peak)
Amplification factor	:	10
Frequency range	:	0 to 50 kHz (3 dB point)
Rated power	:	25 VA/phase.

7.4.2. Set-up and connection

Ancillary rack 4 can be placed either on top of XS92b racks 1 and 2 or next to them.

The amplifier input signals are connected phase-by-phase from the front of the unit YU92a to the unit AX93 using BNC cables. The signal zero (electronic GND) is then connected via the BNC cable screens to the test set. Therefore the general rule applies in this case as well, that there may be no metallic connection with the current injection signals.
Nevertheless should such a connection be established by mistake, there is a fuse in the AX93 to protect against any balancing currents which may result.

The relay under test is connected to the sockets of the AX93 by 4 mm diameter laboratory cables.

The mains cable supplied is used to connect the 115/230 V AC power supply.

7.4.3. Commissioning and self-monitoring

After all the connections have been made, the equipment can be switched on at the m.c.b. on the EX92 unit.

The NF92 DC/DC converter must also be switched on. The voltage amplifier is protected against an overload or a short-circuit (see Section 10.1.6.).

The ancillary voltage amplifier rack can also be used for other purposes on its own without the test set XS92b.

7.4.4. YU92a with additional functions

If the injection unit YU92a is used in conjunction with a test set XS92b supplied after January 1995 (firmware Version V3.65), two variable phase voltages can be obtained from the AU92 by placing the switch ”U” on the right-hand side of rack 1 in the appropriate position (see Section 8.6.1.).

Caution!
Return the switch to the position marked "⅄" after testing!

The YU92a unit also has 6 signalling relay outputs which can be manually set by means of parameter "OU2" or automatically set by a test program (see Section 5.4.). The contacts are potentially-free and can be loaded up to 200 V and 500 mA DC.

7.5. Low-level signal interface outputs (YU93)

7.5.1. General

A hardware option enables the test set to provide low-level current and voltage signals in parallel to the amplifiers. These signals are made available at two 8 pin LEMO connectors on an additional YU93 unit in rack 1 (AD93), connector 1 (top) for the three phase voltages and the neutral voltage and connector 2 (bottom) for the three phase currents and the neutral current.

The voltages and currents are set to the standard values:

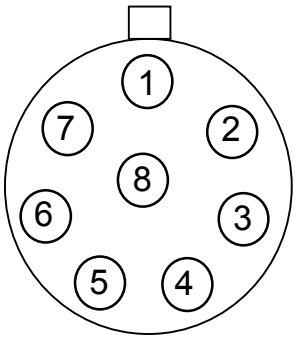
UN = 6.5 V corresponding to 100 V at the v.t. secondary

IN = 125 mV corresponding to 1 A at the c.t. secondary.

The ratio applies for all operating modes.

Signal output via the low-level signal interface is only possible with Version 3.10 of the firmware or higher.

7.5.2. Pin allocation



Pin 1: Phase L1 signal
Pin 2: Phase L1 ground
Pin 3: Phase L2 signal
Pin 4: Phase L2 ground
Pin 5: Phase L3 signal
Pin 6: Phase L3 ground
Pin 7: L1,L2,L3 neutral signal
Pin 8: L1,L2,L3 neutral ground

Fig. 7.5 Pin allocation

Connector 1 (top): Voltages

Connector 2 (bottom): Currents

Changeover switches: A changeover switch is located below connectors 1 and 2 for reversing the direction of the neutral current.

7.5.3. Operation

Output signals are simultaneously generated by the amplifiers and the low-level signal interface. The ratio for converting the values entered in the test set to the levels required for the low-level signal interface [LSI] is controlled by the parameter "SSI".

The parameter "SSI" is activated either from the handheld terminal or by entering the following command line in the “Terminal” dialogue of the operator software “XSWIN”:

	SSI = 100	
Input 57.7 V	→ 3.75 V at the LSI	UN (phase-to-neutral)
Input 1 A	→ 125 mV at the LSI	IN (phase-to-neutral)
	SSI = 110	
Input 63.5 V	→ 3.75 V at the LSI	UN (phase-to-neutral)
Input 1 A	→ 125 mV at the LSI	IN (phase-to-neutral)

Disable: SSI = 0

The parameter "SSI" has to be entered directly and does not appear in a parameter list.

Caution!

If SSI = 0 is not set, the amplifiers will inject the incorrect values during testing!

XS92a:

When using XS92a in conjunction with only one current amplifier, the parameter "IRA = 30" must be set in order to control all the phases at the low-level signal interface. It must be reset, however, to either "IRA = 0" or "IRA = 1" according to the required range for normal injection by the amplifiers, otherwise the current cannot be switched to S and T phase outputs.