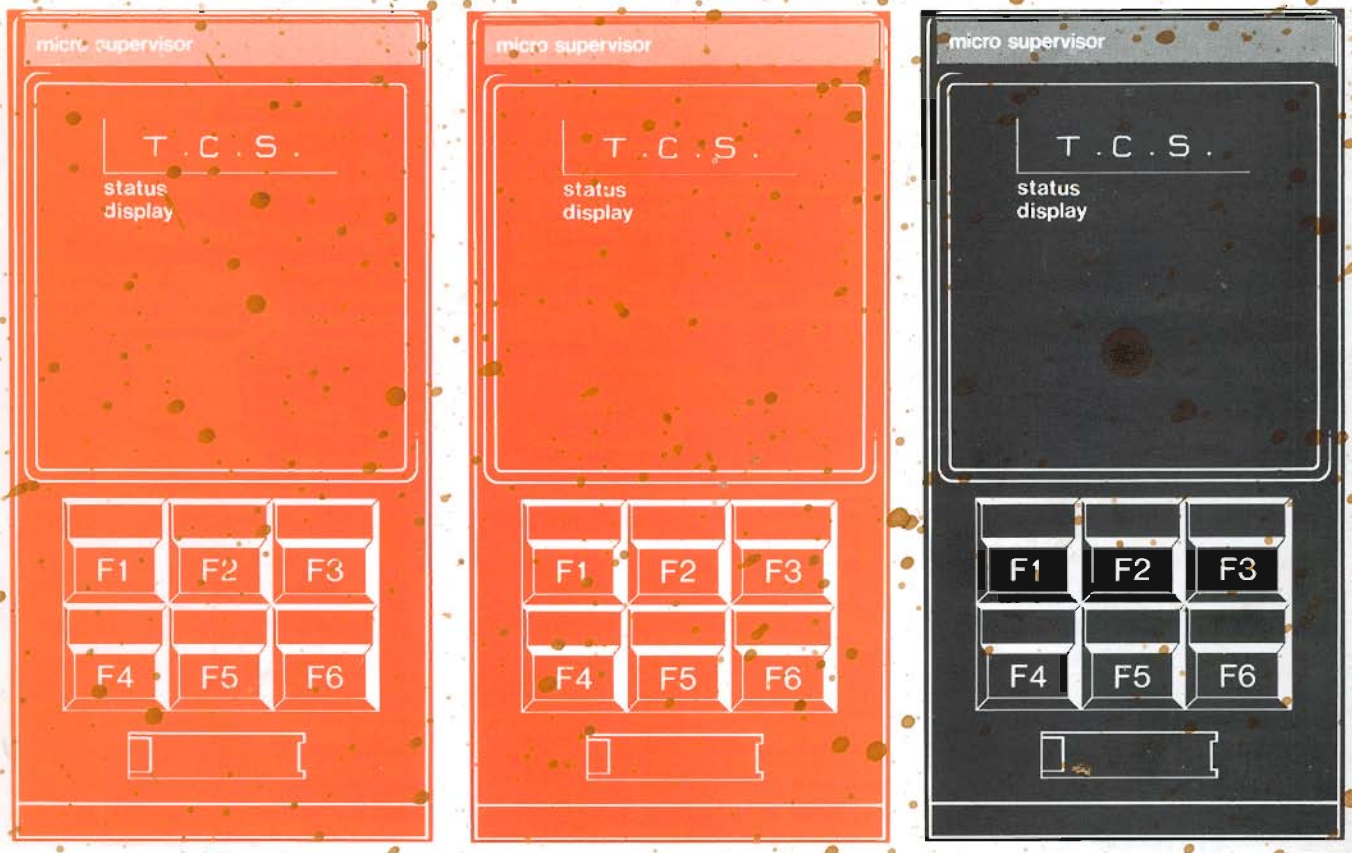
micro-supervisor

tcs

system 6000

6445



product specification

Micro-supervisor: Features

- 2 × RS422 serial ports for Maxi-Vis system communications and local instrument communications; 3 RS232 serial ports for local operator terminal and local printer terminal.
- 8 digital inputs/8 digital outputs.
- Extensive library of fixed words.
- 16 internal timers.
- Pseudo channel and instrument capability.
- Sophisticated high level programming language 'TCS Forth'.
- Internal clock and calendar.
- Computation and sequencing System 6000 instruments via RS422 bus.
- 64 internal variables.
- All current instruments supported (except 6850).
- Self-configuring.
- Standard hardware – no options.
- In-built diagnostics and error reporting.

Description

The 6445 Micro-Supervisor uses the well-proven hardware and software of the System 6000 Instruments to provide soft-wired interconnection and sequencing of a group of TCS Intelligent Instruments.

The 6445 uses a variant of the standard 72mm wide multi-channel microprocessor based instrument.

The front fascia is simplified providing an eight-digit alpha-numeric display for program status, plus six programmable function pushbuttons.

Two of the conventional I/O cards of the standard multi-channel instrument are replaced by dual UART cards providing four additional serial links. The third and fourth I/O cards provide eight digital inputs/eight digital outputs respectively.

The 6445 may be set up to configure its database automatically by polling the instruments connected. Alternatively, it may be manually configured and programmed from a 8271 TCS Programming Terminal (Epson PX8).

The 'TCS Forth' high level programming language allows both arithmetic and boolean computation similar to the 6433 Programmable Signal Processor. The 6445 derives its database for its program from its own digital I/O, the I/O of the instruments connected, the programmable parameters within the connected instruments and any configured pseudo channels. The 6445 includes 16 timers, 64 internal variables, an internal clock and calendar.

The user memory is 8K RAM and 8K EE PROM. Programs are developed in RAM by using a 8271 TCS Programming Terminal (Epson PX8) plugged into the front panel or connected to the secondary terminal port. A program developed in RAM can be fixed into EEROM from the programming device. The programs, however, always run from RAM and this allows programs to be loaded into RAM, edited, and then debugged before the original program is replaced.

Operator Controls and Displays

Identity/Diagnostic Display

Row of 8 red, 17 segment alphanumeric LEDs displaying:

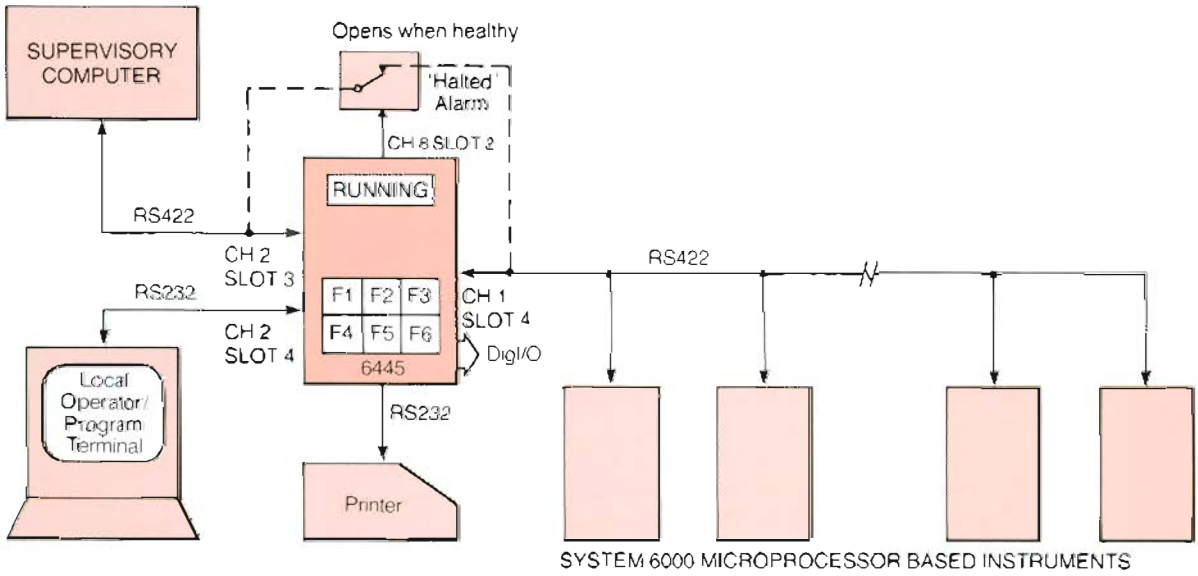
1. Status Data
2. Error/Diagnostic
   - 'HALTED'
   - NUL CFIG
   - DB OVRFL
   - CARD1 ER
   - CARD2 ER
   - CARD3 ER
   - CARD4 ER
   - E2ROM ER
   - PG SC CR
   - RT ERROR
3. Programmed Operating Displays
   - defined by the 'TCS Forth' Program.

N B Error/Diagnostic Displays will flash over any programmed display.

Operator Controls

Six function pushbuttons that may be used within the 'TCS Forth' program to provide manual control. Function pushbuttons labelled F1 to F6 inclusive.

Typical Configuration



Applications

- Sequencing and logic for plant batch control.
- Data logging.
- Soft-wired instrument configurations.
- Computer control strategies.
- Local plant operating interface.

Instrument Capacity

The maximum number of instruments that may be supervised by the 6445 Micro-Supervisor and their application depends on three main factors.

1. Bus Loading
2. Database Size
3. 6445 Scan Rate

1. Bus Loading

Maximum of 16 instruments may be connected to the instrument port.

(Assuming that the other requirements of available memory, selection rates and scan rates are met, the 8245 Communications Buffer may be used to increase the number of instruments above sixteen.)

2. Database Size

(Polled Parameters Stored Within the 6445 Database.)

Total memory available for instrument configuration is 5120 bytes.

Instrument Types Supported and Memory Requirements:

Type No.	Functional Description	Memory Usage
6360/63/56/66/55	Positional Single Loop Controllers	56 bytes per loop
6350/51/52/53/58	Positional Single Loop Controllers	40 bytes per loop
6434/35	8 Channel Flow Totaliser	40 bytes per channel
6432/33/Analogue	8 Channel Real/Pseudo Analogue Input or Output Card	320 bytes
6432/33/Digital	8 Channel Real/Pseudo Digital Input or Input Card	20 bytes

Psudo channels configured in the 6445 database have the same memory usage as Real I/O.

3. 6445 Scan Rate

The average time taken for the 6445 to update the complete database from the instruments depends on the following factors:

(a) The number of instruments, and the I/O card types connected to the instrument bus

(b) The rate of change of plant parameters, i.e changes in process variables or outputs.

(c) The average rate at which parameters are changed from the supervisory computer, i.e. manual changes, plus changes requested by the supervisory sequencing tasking system, plus point display selections.

To allow an approximation of the achievable scan time to be made, the following tables gives the best and worst case scan times Calculations for the total scan time can be found in the 6445 technical manual.

N B. It is recommended that TCS Projects Department is consulted before time critical or large database applications are implemented.

Instrument Scan Times

Instrument Type	Best Case	Best Case Conditions	Worst Case	Worst Practical Case Conditions
6350/60 (Single Loops)	6.5ms	No Changes/Poll	24ms	3 Parameter Changes/Poll (PV, OP and SP)
6358/6434 (8 Channel)	52ms	No Changes/Poll	156ms	2 Parameter Changes/ Channel Poll
6432/6433 (8 Channel) Analogue Card	6.5ms	No Changes/Poll	47ms	1 Parameter Change/ Channel/Poll
6432/6433 (8 Channel) Digital Card	6 5ms	No Changes/Poll	15ms	1 Parameter Change/ Channel/Poll

N.B. The worst case scan time/instrument is on power up or at a complete database change.

6350/60 – 50msecs
6358/6434 – 360msecs/8 Channels
6432/6433 Analogue Card – 320msecs/8 Channels
6432/6433 Digital Card – 22msecs/8 Channels

Computer Parameter Changes

Average time for computer parameter change = 100ms

The Scan Time Calculation is described in the 6445 technical manual

N.B For most practical systems, a maximum scan time of 300ms is appropriate.

Example: 16 × 6350 Controllers
1 Computer Change/Second

Scan Time (Best) = 115.5ms
Scan Time (Worst) = 512ms

Software Specification

Programming Language

Stack-oriented FORTH like language with enhancements for input/output, timing, etc.

Program Memory

8 KByte RAM
8 KByte EE PROM

Database

All polled database parameters from the connected instruments.

Enquiry polled parameter set for each configured pseudo channel or instrument.

Data Format

32 bit floating point with optimisation for logical data, flags, etc.

Timer precision – 1 bit corresponds to 2 milliseconds (maximum count about 7 weeks).

Configuration

Two methods of configuring the Micro-Supervisor to its instrumentation are provided.

AUTO and MANUAL

In MANUAL CONFIGURATION mode, the database is built up using a VDU terminal through the instrument front panel (as for 6433 programming)

In AUTO CONFIGURATION mode, a command initiated by the programming terminal causes the 6445 to scan the instrumentation connected to it to automatically generate the database.

Diagnostic messages relating to the 6445 health only are also displayed.

Communications

The 6445 Micro-Supervisor is fitted with three RS232 ports and two RS422 ports for serial data communications

One RS232 port is available via the front socket panel and is used for the Programming Terminal (VT100, BBCB or Epson PX8). The other RS232 and RS422 ports are available on the module rear connector pins for connection to the instrument bus, supervisory computer system, local operator interface, and/or printer.

The RS232 ports via the rear connectors have selectable parity, number and stop bits, data bits and baud rate.

Programming Terminal

Configurations may be entered using any RS232 teletype-compatible VDU plugged into either the front panel socket of the 6445, or the secondary terminal at the rear This allows statement entry, editing and listing

Data Rate

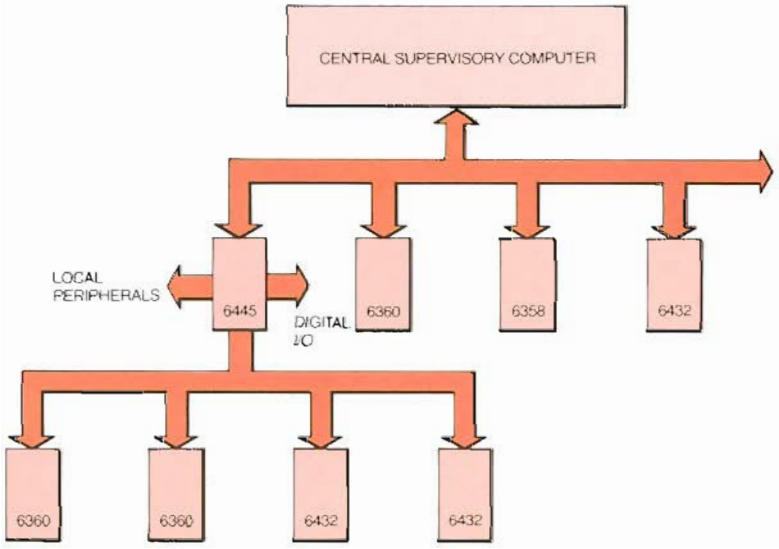
Selectable from 110, 300, 600, 1200, 2400, 3600, 4800 or 9600.

Character length – 10 bits made up of

1 start + 1 data + 1 parity (even) + 1 stop (2 stop bits at 110 baud).

Multi-Drop Supervisory Link

Every System 6000 instrument contains an RS422 communications port which enables it to send and receive command parameters over a simple four-wire link connected to other intelligent devices. The use of RS422 and the transmission of information in Binary data format makes it particularly easy to communicate with the System 6000 instruments. To hook into a distributed control system requires no modification to the instrument and no further expenditure on options. The four-wire link is simply connected up so that the instrument becomes part of the distributed control system The illustration shows how an array of instruments can be connected to a supervisory computer which has an RS422 serial port, via the Micro-Supervisor providing links to standby or plant strategy computers If the computer only has an RS232 senal port then an 8245 Communications Buffer unit can be used to carry out the required RS232 to RS422 conversion as shown.



Specification

Transmission Standard
4-wire RS422 (0-5 V).

Line Impedance
120-240 ohm twisted pair.

Line Length
4000 ft max. (at 9600 baud).

Number of Units/Line
16.

Data Rate
Selectable from 110, 300, 600, 1200, 2400, 3600, 4800 or 9600 baud.

Character Length (Binary)
11 bits – 300 to 9600 baud.
12 bits – 110 baud (2 stop).

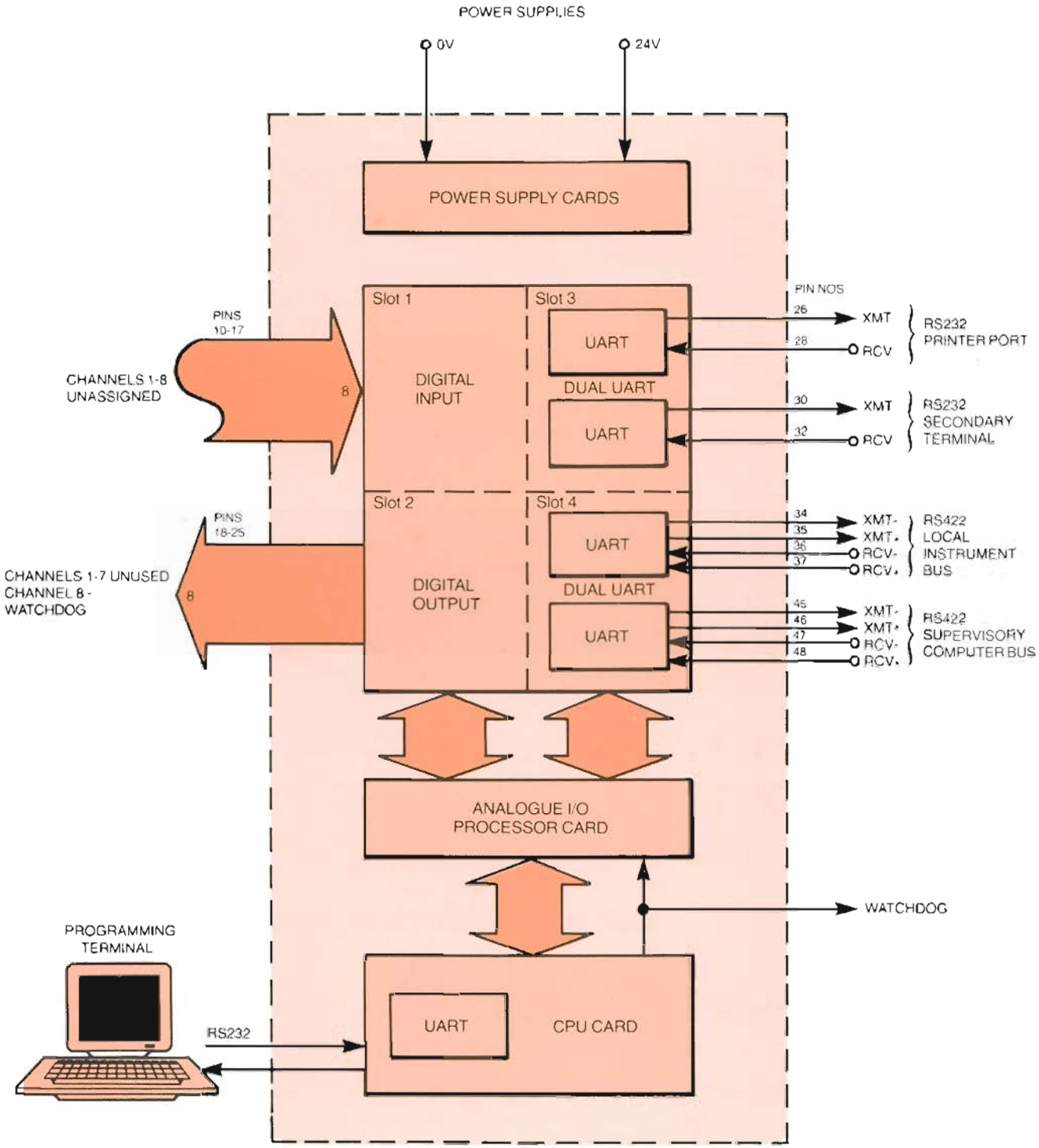
Protocol

All microprocessor based instruments in the System 6000 range employ a standard ANSI protocol known as BI-SYNCH. The exact form of BI-SYNCH implemented within System 6000 corresponds with the American National Standard Specification:

ANSI – X3 28 – 2.5 – A4 Revision 1976

The Microsupervisor uses only the Binary Protocol which offers the most efficient transmission speed by compressing the data into a binary format, and also supports additional features like Multi-Parameter and Enquiry Polling.

Hardware Specification



6445 BLOCK DIAGRAM

Digital Inputs

Number of Inputs
8.

Input Functions
8 channels unassigned.

Input Voltage Levels
15V = Logic One.
0V = Logic Zero.

Input Impedance
100k Ohm pulldown to 0V (gives 150 A logic one current).

Digital Output

Number of Outputs
8 external non-isolated outputs.

Output Functions
7 unused, channel 8 communication changeover (microsupervisor failure).

Output Voltage Level
15V = Logic One.
0V = Logic Zero.

Output Drive Capability
2k2 open collector pull-up to +15V supply, maximum logic zero sink current = 16mA.

Power Supplies

Input Voltage
(May be unsmoothed, full-wave rectified AC.)
20-30V DC recommended operating range.
19-35V DC absolute maximum input limits.

Input Current
600mA.

Input Fuse Rating
2A.

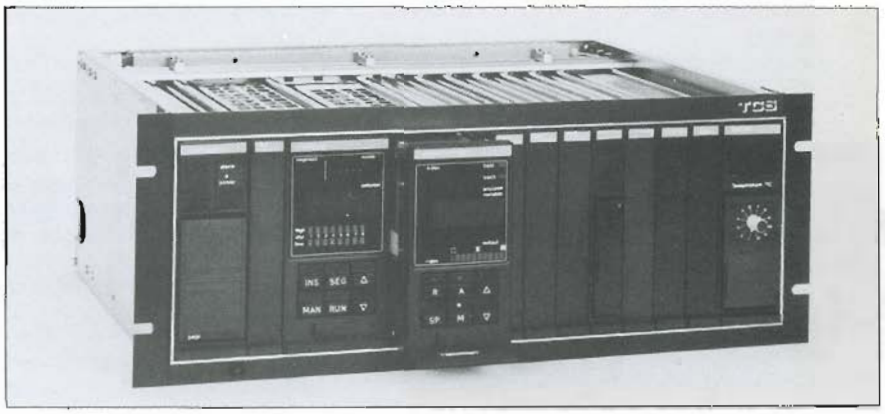
Power Failure Detect Threshold
When input voltage falls below 16.5 ± 0.5V.

Mechanical Details

All System 6000 microprocessor based instruments are supplied in 72mm wide metal housings fitted with front-panel fascias and catch handles for module retention. These may be used with a wide variety of rack and panel mounting hardware as illustrated in the examples below.

7000 Series Racks

Up to six 6445 Micro-Supervisors may be fitted into a 700 series 19-inch rack as shown. Interconnections between instruments are made by wire wrapping while external connections may be brought out to two rows of 64-way screw terminal blocks fitted to the hinge down rear door. The 7000 series rack is also available with a panel mounting option and a 10-inch half rack version for mounting up to three 6445s can also be supplied.



7900 Powered Sleeves

The 7900 powered sleeve allows a 6445 to be mounted with a mains power unit. This is incorporated in the associated 7445 Rear Termination Assembly which gives access to all module connections via screw terminals. The 7900 assembly is available in single, 3-way, or 6-way versions for mounting in panels from 1.5mm to 6.5mm thick. A 6-way 19 inch rack mounting version can also be supplied.

Overall dimensions in mm of housings illustrated:

	7000 Rack	7900 Sleeve
Width:	482	105
Height:	177	177
Depth:	380	423

Panel cut-out dimensions in mm:

	7000 Rack	7900 Sleeve
Width:	448.2	88 2
Height:	166.3	166.3

Details

For further details refer to.

6445 Micro-Supervisor Technical Manual.

6445 Facts Card.

7445 Rear Termination Assembly.

7900 Single or Multi-Way Sleeve Assembly for Microprocessor-Based Instrumentation.

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Advanced Instrumentation

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