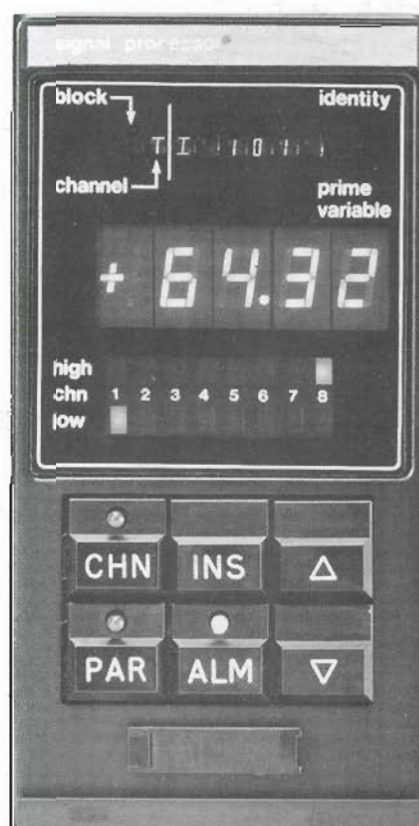




signal processor



system  
6000  
6432



product  
specification

# Signal processor: Features

- 32 input/output channels in 4 blocks of 8.
- Each block type specified as analogue or digital.
- Each block type specified as input or output.
- Linearisation/characterisation specified separately on each analogue input channel.
- Selected analogue channels displayed in engineering units.
- Comprehensive logic state change detection facilities on digital input channels.
- Digital outputs can be used for local alarm routing strategy.
- LED indication of logic state of complete 8-channel digital blocks.
- Microprocessor technology and solid-state displays.
- Remote monitoring and supervision via a serial link.

## Description

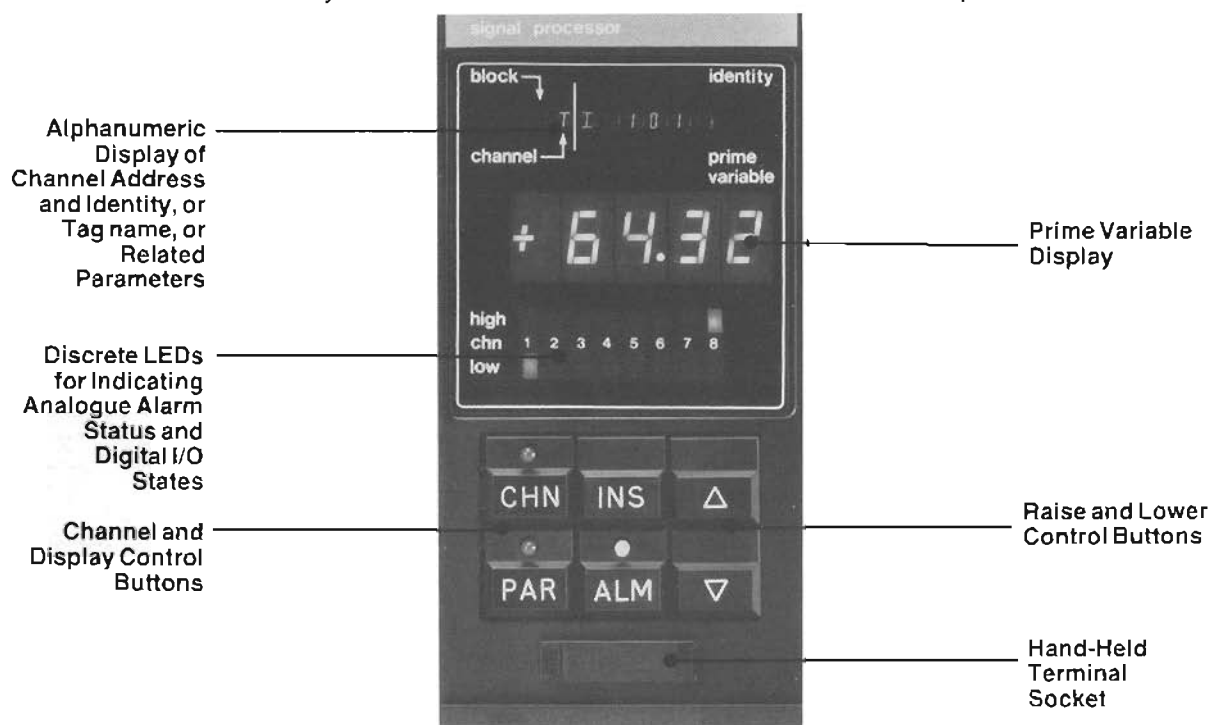
The 6432 signal processor is a 32-channel device configured as 4 fully independent blocks of 8 channels. Each block may be analogue or digital in type and consists of 8-way input or output cards. These are plugged into the 4 I/O slots available within the instrument depending upon the required function. The characteristics of each input/output channel, such as linearisation type and absolute alarm levels for analogue inputs, are set up by means of a plug-in hand-held terminal. This is compatible with all TCS microprocessor-based instruments and ensures the security of

the settings which are retained in a battery-supported memory.

The front panel displays individual analogue values in engineering units together with a complete 8-channel alarm overview for analogue inputs. The logic state of digital channels is displayed via 2 rows of 8 status LEDs. An 8-character alphanumeric display indicates the block and channel number or the tag name of the I/O channel being monitored. The front panel push-buttons may be used to alter analogue or digital outputs, analogue input alarm levels, or

analogue output limits.

The current status of all 32 channels are stored as a data base in the 6432's non-volatile memory so that it can serve as a local data gathering and processing unit. The provision of an RS422 communications interface enables the instrument to become a remote input/output peripheral for an intelligent device which may simply monitor or update the parameters of a network of 6432s using the link. The use of a TCS Communications Buffer Unit enables RS232, TTL and fibre-optic interfaces to be implemented.



## Operator displays and controls

### Operator displays

#### Digital Readout

(for analogue input or output variables)  
4-digit, orange LED display with sign and decimal point.

#### Status Display

2 rows of 8 red LEDs programmed to indicate for each channel:

- HI/LO alarm status for analogue inputs.
- HI/LO logic level for digital inputs or outputs.

LEDs flash for alarm or logic state changes until acknowledged.

#### Identity/Diagnostic Display

Row of 8 red 17-segment alphanumeric LEDs displaying 64 character ASCII to indicate:

- Block and channel numbers/tag names.
- Instrument diagnostic messages.

### Operator controls

#### Display Mode Selection

1 non-illuminated push-button with alternate action, Inspect (INS) selects primary or secondary display modes.

#### Channel Selection

1 illuminated push-button, Channel Select (CHN) with integral green LED.

- Selects display channel via Raise/Lower buttons in primary mode (LED off).
- Selects command parameter on alphanumeric display via Raise/Lower buttons in secondary mode (LED on).

#### Parameter Value

1 illuminated push-button, Parameter Value (PAR) with integral green LED.

- Alters analogue or digital output levels via Raise/Lower buttons in primary mode (LED off)
- Alters command parameter value via Raise/Lower buttons in secondary mode (LED on).

#### Function Selection

2 non-illuminated push-buttons:

Raise (▲) increments or scrolls forward,  
Lower (▼) decrements or scrolls backward as described above, when (CHN) or (PAR) are depressed.

#### Alarm Acknowledge

1 illuminated push-button, Alarm (ALM) with integral red LED flashes whenever an analogue input alarm or digital state change alarm occurs, goes steady when acknowledged

Note: Alphanumeric display indicates:

- Tag name with no buttons pressed.
- Block and channel number (BC) if (ALM), (▲) or (▼) pressed.
- BC in primary mode if (CHN) or (PAR) pressed.
- Command parameter in secondary mode if (CHN) or (PAR) pressed.



# Applications

Multi-channel analogue monitoring unit with switchable display  
Manual loading station with multiple

outputs  
Multi-channel digital alarm collection unit with local status displays

Data gathering and processing peripheral for remote supervisory computer

The powerful combination of sophistication with flexibility means that the 6432 signal processor has been used in all of the above applications. All System 6000 instruments use standard

voltage and current levels for their analogue and digital interfaces. This means that 6432s may be connected to each other or to other System 6000 instruments to implement complex

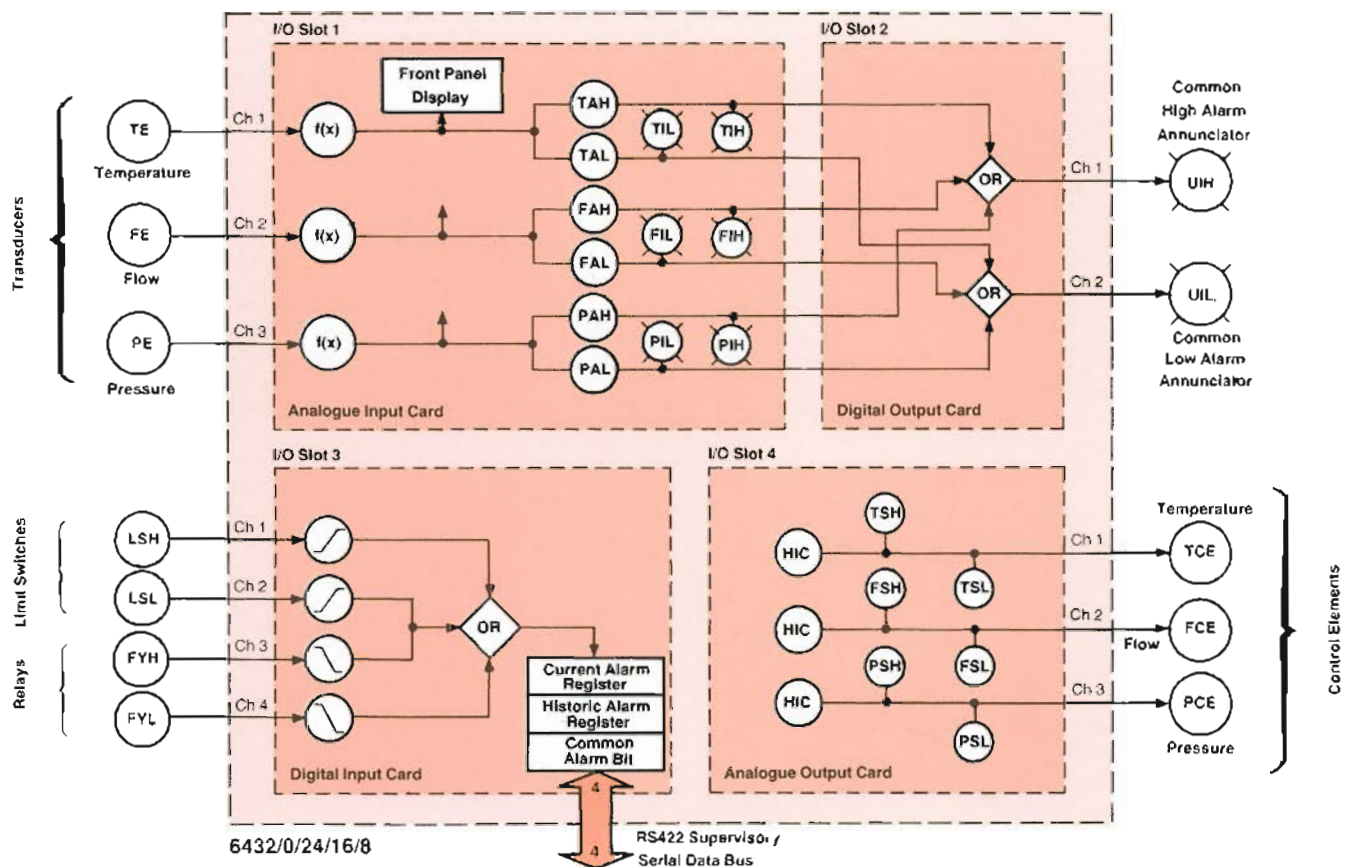
monitoring and control strategies. Some typical application examples are shown below with a single instrument configured as a 6432/0/24/16/8

## Analogue Inputs (I/O Slot 1)

Three channels of an 8-way analogue input card (type 0) are illustrated here monitoring different process variables. Each channel has its own range in engineering units, linearisation function, and filtering applied. Any channel may be selected for front panel display and each may be programmed with separate high and low absolute alarm levels. The example shows how the alarm routing functions of the 6432 can connect all the high alarms to the channel 1 output of I/O slot 2, and the low alarms to channel 2.

## Digital Outputs (I/O Slot 2)

This card is an 8-way digital output card (type 24) and is used in conjunction with the analogue input card of I/O slot 1 for alarm routing. Output channels 1 and 2 are dedicated to the common high and low alarms leaving 6 spare channels available for other purposes. These outputs may be used to drive local indicators, annunciator panels, or relays for implementing a pre-determined alarm strategy.



## Digital Inputs (I/O Slot 3)

Four channels of an 8-way digital input card (type 16) are shown monitoring the state of external relays, limit switches, or other logic inputs. Channels 1 and 2 are programmed to detect low to high state transitions, while channels 3 and 4 will detect high to low transitions. The current logic state of each input can be displayed on the front panel status LEDs and be monitored via the RS422 data link. Separate 8-bit high and low historic alarm registers and a common change of state alarm bit may also be accessed via this link

## Analogue Outputs (I/O Slot 4)

Three channels of an 8-way analogue output card (type 8) are used as manual loading stations for output actuators. Each output value may be displayed on the front panel readout in engineering units and altered locally via the Raise/Lower push-buttons, or remotely via the serial data link. In addition, each channel can have separately programmable high and low output limits and can produce 0-10V or 1-5V output levels

# Communications

Every System 6000 microprocessor based instrument is fitted with an RS232 port and an RS422 port for serial data communications. The RS232 port is available via a front-panel socket and is used for the 8260 Hand-held

programming terminal. The RS422 port is available on the module rear connector pins and is bussed onto the supervisory data link common to all modules. All parameters that can be monitored via the 8260 terminal can

also be accessed and updated via the supervisory data link, apart from the channel number mnemonic CN. Each block is accessed by the supervisory computer calling up a different unit identifier number.

## Hand-held terminal link

Each System 6000 instrument can be set up using a plug-in 8260 Hand-held terminal. Every parameter is accessed by means of a simple 2 character command mnemonic and all data is entered directly in engineering units. This technique ensures the accuracy and security of parameter settings

### Specification

#### Transmission Standard

2-wire RS232/V24 ( $\pm 12V$ )

#### Data Rate

300 baud

#### Character Length

10 bits made up of:

1 start + 7 data + 1 parity (even) + 1 stop



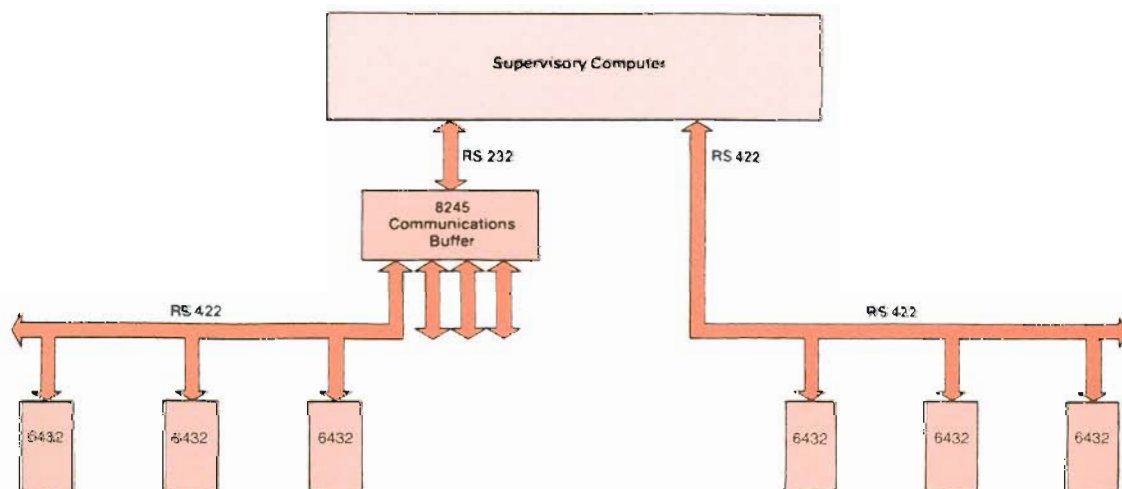
The photograph shows an 8260 terminal plugged into the front panel of a 6432 processor. A full list of the available command parameters is given in the 6432 Facts Card.

## 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 ASCII or Binary data format makes it particularly easy to

communicate with the 6432 processor. To hook the 6432 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 6432 becomes part of the distributed control system. The illustration shows

how an array of 6432s can be directly connected to a supervisory computer which has an RS422 serial port. If the computer only has an RS232 serial 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 (0-5V).

#### Line Impedance

120-240ohm 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 (ASCII/Binary)

10/11 bits - 300 to 9600 baud.

11/12 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:

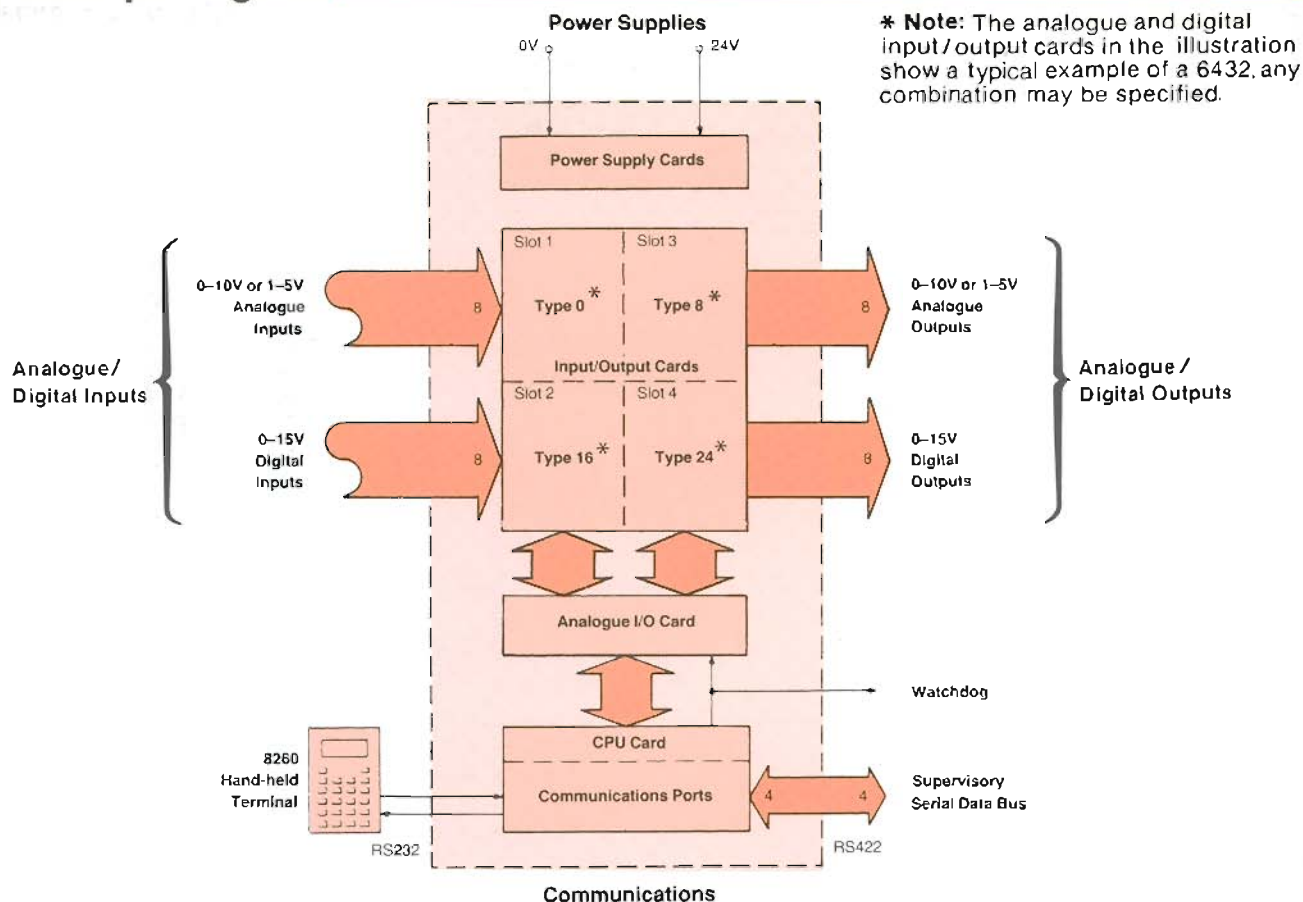
ANSI - X3.28 - 2.5 - A4 Revision 1976

TCS have implemented both an ASCII and Binary version of this protocol within each instrument.

The ASCII mode is simplest to use as all data is transmitted in ASCII characters. The Binary mode offers a 4 to 1 increase in transmission speed by compressing the data into a binary format, and also supports additional features like Multi-Parameter and Enquiry Polling.



# Input/Output signals



\* Note: The analogue and digital input/output cards in the illustration show a typical example of a 6432, any combination may be specified.

## Analogue input cards

### Number of Channels

8 direct non-isolated inputs.

### Input Signal Levels

0-10V or 1-5V range selectable by software.

### Resolution

12 bit binary ADC (.025%) hardware applied to inputs.  
15 bit binary representation obtained after digital input filtering and signal averaging giving resolution of 1 digit in  $\pm 9999$ .

### Accuracy

$\pm 1$  LSB max. over 0-50°C range for hardware.  
 $\pm 1$  digit of reading for 0-4000 range,  
 $\pm 2$  digits of reading for 0-8000 range,  
 $\pm 3$  digits of reading for 0-9999 range, after input filtering.

### Sampling Rate

ADC samples each channel every 304ms. (8 channels enabled)

### Input Impedance

100kohm pull-down to 0V on all channels.

### Input Signal Processing

Linear (normal or inverse).  
Normalised square root.  
Type J, K, T, S, R, E, B thermocouples.  
Platinum resistance thermometers.  
User specified linearisation functions

## Analogue output cards

### Number of Channels

8 direct non-isolated outputs.

### Output Signal Levels

0-10V or 1-5V range selectable by software.

### Output Circuit Type

Medium-term analogue sample-and-hold circuits preceded by DAC.

### Output Resolution

12 bit binary (.025%) giving 2.5mV minimum analogue voltage steps.

### 0-10V Output Accuracy

$\pm 1$  LSB max. over 0-50°C range.

### Sample and Hold

DAC updates each channel every 304ms. (8 channels enabled).

### Output Drift Rate Under Watchdog Failure Conditions

1/2mV/sec maximum (equivalent to 1% of full scale in 3 minutes).

### Output Drive Capability

$\pm 5$ mA for direct voltage outputs.

## Digital input cards

### Number of Inputs

8 non-latched non-isolated inputs.

### Input Voltage Levels

15V = logic one.  
0V = logic zero.

### Input Impedance

100kohm pull-down to 0V (gives 150 $\mu$ A logic one current).

### Input Sampling Rate

All inputs sampled once every 38ms.

## Digital output cards

### Number of Outputs

8 non-isolated outputs.

### Output Voltage Levels

15V = logic one.  
0V = logic zero.

### Output Drive Capability

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

### Output Update Rate

All outputs updated once every 38ms.

## 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

550mA without hand-held terminal.  
650mA with hand-held terminal.

### Input Fuse Rating

2A.

### Power Failure Detect Threshold

When input voltage falls below 16.5  $\pm$  0.5V.

### Memory Standby Battery

3.5V Lithium type.  
500mAh rating.  
8-10 year shelf life.  
5 year life minimum on continuous standby.

# Signal processing characteristics

## Analogue Inputs

### Primary Variable

Range — low, high —9999 to +9999.

### Alarm Limits

Separate absolute LO, HI alarms

Range — low, high —9999 to +9999  
with 1/2% hysteresis of PV span

### Alarm Routing

LO, HI alarms of any channel may be separately routed to any channel of a digital output block.

### Input Over-Range

1–5V inputs have indication when PV less than 0.5V or greater than 5.5V.

## Analogue Outputs

### Primary Variable

Range — low, high —9999 to +9999

### Output Limits

Separate LO, HI limits

range — low, high —9999 to +9999

## Digital Inputs

### Alarms

Each bit can be masked to generate a state change alarm on LO to HI, HI to LO transitions or both.

## Digital Outputs

### Alarms

Each bit can be masked to generate a state change alarm on LO to HI, HI to LO transitions or both.

## Instrument Alarm Facilities

### Alarm Registers

Two 8×8 bit registers provided per I/O block for indicating separate current HI/LO alarm status and historic HI/LO alarm status of each channel.

### Collected Alarm Bit

Single bit in mode status word indicates common collected alarm change of state for all 32 I/O channels.

## Ordering information

All units are ordered in the format:

**6432/A/B/C/D**

Where A, B, C, & D are the input/output block types to be fitted into the I/O slots 1, 2, 3 & 4 respectively.

The input/output block types available are shown in the adjacent table.

**NOTE:** Slots with no I/O cards fitted must be specified with an X.

Example:— 6432/0/0/24/X

Configuration is:—

Slots 1 and 2 — 8 channel analogue inputs.

Slot 3 — 8 channel digital output.

Slot 4 — no card fitted.

Order Code	I/O card type
0	8 channel analogue input
8	8 channel analogue output
16	8 channel digital input
24	8 channel digital output
X	no card fitted

## 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 6432 signal processors may be fitted into a 7000 series 19 inch rack as shown. Interconnections between instruments are made by wire wrapping while external connections may be brought out to 2 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 6432s can also be supplied.



## 7900 powered sleeves

The powered sleeve allows a 6432 to be mounted with a mains power unit. This is incorporated in the associated 7432 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 housing 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:

**6432**

32 channel signal processor technical manual.

**6432**

Facts Card

**7432**

Signal processor rear termination assembly.

**7900**

Single or multi-way sleeve assembly for microprocessor based instrumentation.



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