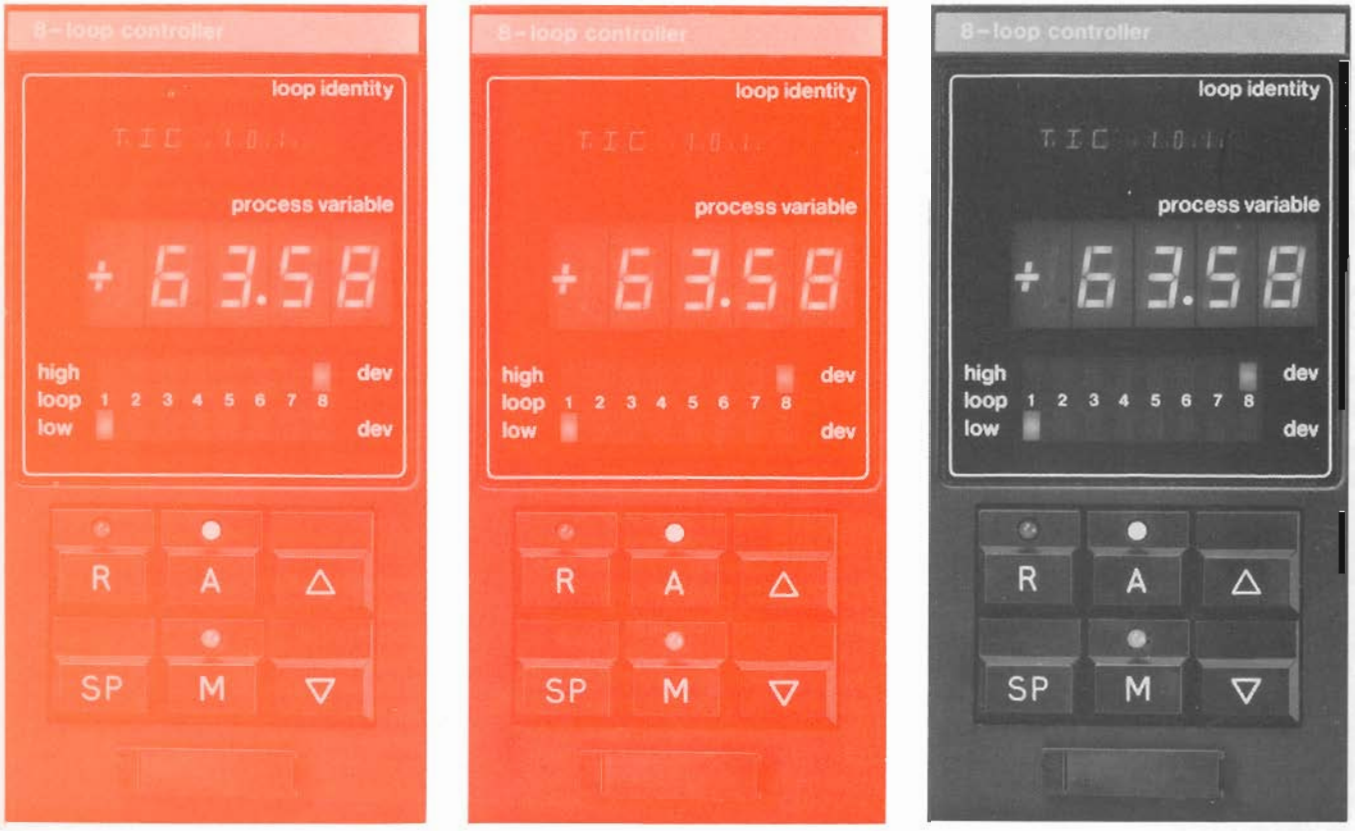
8~loop process controller

system 6000 6358



product specification

8-loop controller: Features

- Multi-loop economy.
- Panel mounting.
- PID or ON/OFF control and setpoint trim.
- Comprehensive digital display.
- Built-in diagnostic routines.
- Remote access via an RS422 port.
- Field proven unit with a two year warranty.
- Alphanumeric display of loop identity.

Description

The 6358 microprocessor-based multi-loop controller performs eight separate 3-term PID control functions.

Each loop accepts two analogue inputs, one being the process variable and the other (if used) being either a remote setpoint (for cascade operation) or a trim input. Two outputs per loop are provided, the first being the 3-term control signal and the other either an analogue retransmitted process variable or a logic signal indicating the loop's hi/lo alarm status. Options are available to provide the 3-term control signal as a 4-20mA analogue signal, or a digital time-proportioned signal, as an alternative to the standard 0-10v analogue signal.

The characteristics of each control loop, such as 3-term control constants and input linearisation type, are set up by means of a plug-in hand-held terminal which is compatible with all TCS microprocessor-based instruments. Its use ensures security of the settings which are retained in a battery-supported memory.

The front panel provides a continuous alarm overview of the eight loops and operates as a conventional analogue unit on the loop selected for display and manipulation. Push-buttons raise/lower the setpoint or output of a loop and change control mode between Manual, Automatic and Remote. The loop number and tag of the loop being adjusted is shown on an 8-character alphanumeric display

Supervision and monitoring of the unit is enabled by the provision of an RS422 communications interface. This allows an intelligent device to monitor or update the parameters of a network of controllers using the link. Utilising a TCS 8245 Communications Buffer Unit, interfaces to RS232, TTL and fibre-optic systems may be implemented.

The diagnostic routines run by the microprocessor enable fault-finding error messages to be displayed on the front panel. This feature and the solid-state design enhances the reliability of the instrument

Operator displays and controls

Operator displays

Digital Readout

(for process variable, setpoint, and 3-term output) 4-digit, orange LED display with sign and decimal point.

Deviation Status Display

2 rows of red LEDs programmed to indicate for each loop.

(i) HI/LO deviation error when steady.

(ii) HI/LO deviation alarm when flashing.

Identity/Diagnostic Display

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

(i) Loop numbers/names.

(ii) Instrument diagnostic messages.

Operator controls

Control Mode Selection

3 illuminated push-buttons:
Manual (M) with integral yellow LED
Local Auto (A) with integral green LED
Remote Auto (R) with integral green LED.

Function Selection

2 non-illuminated push-buttons
Raise (▲) increments the output when Manual (M) is pressed, or increments the setpoint when (SP) is pressed
Lower (▼) decrements the output when Manual (M) is pressed, or decrements the setpoint when (SP) is pressed

Loop Selection

Raise (▲) used alone increments the loop number from 1 to 8 then back to 1, (displayed on the alphanumeric readout while depressed). The loop name is displayed when the button is released.

Lower (▼) used alone decrements the loop number and produces the same display as Raise (▲).

Display Selection

1 non-illuminated push-button (SP) causes the digital readout to display the current setpoint while pressed.

NOTE: Pressing the Manual, Auto or Remote Auto buttons causes the digital readout to display the current output level and the loop number on the alphanumeric display.

Applications

Engine component testing
Water treatment
Glass annealing

Environmental chamber control
Plastics extruder control
Effluent treatment

Dryer control
Chemical pilot plants
Gas processings

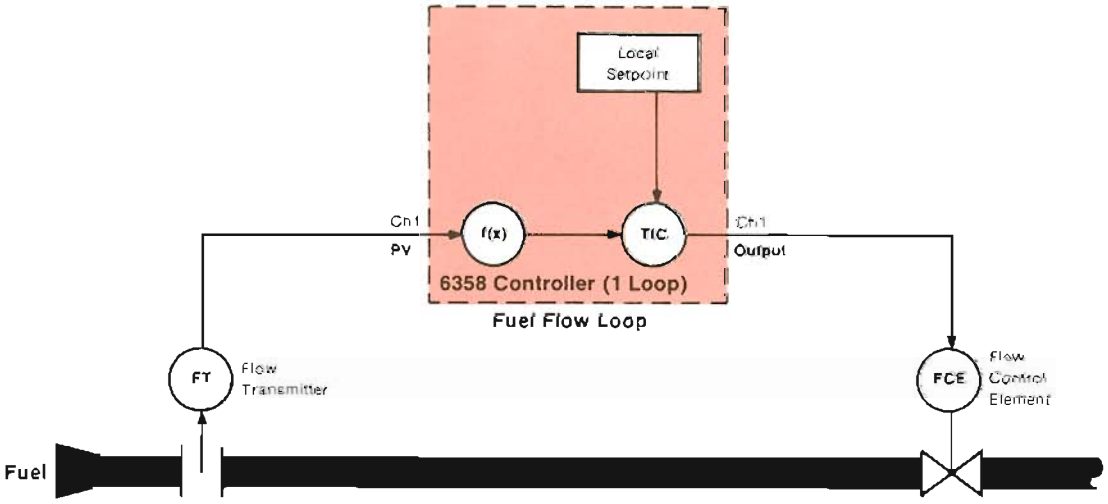
The powerful combination of sophistication with flexibility means that the 6358 controller has found ready application in all of the above processes and industries

All System 6000 instruments use standard voltage and current levels for their analogue and digital interfaces

Due to the 8-loop configuration of the 6358 controller, separate control procedures can be carried out concurrently. Typical applications are in the Manual or Local Auto Mode, and the Remote Auto Mode, examples of which are illustrated below.

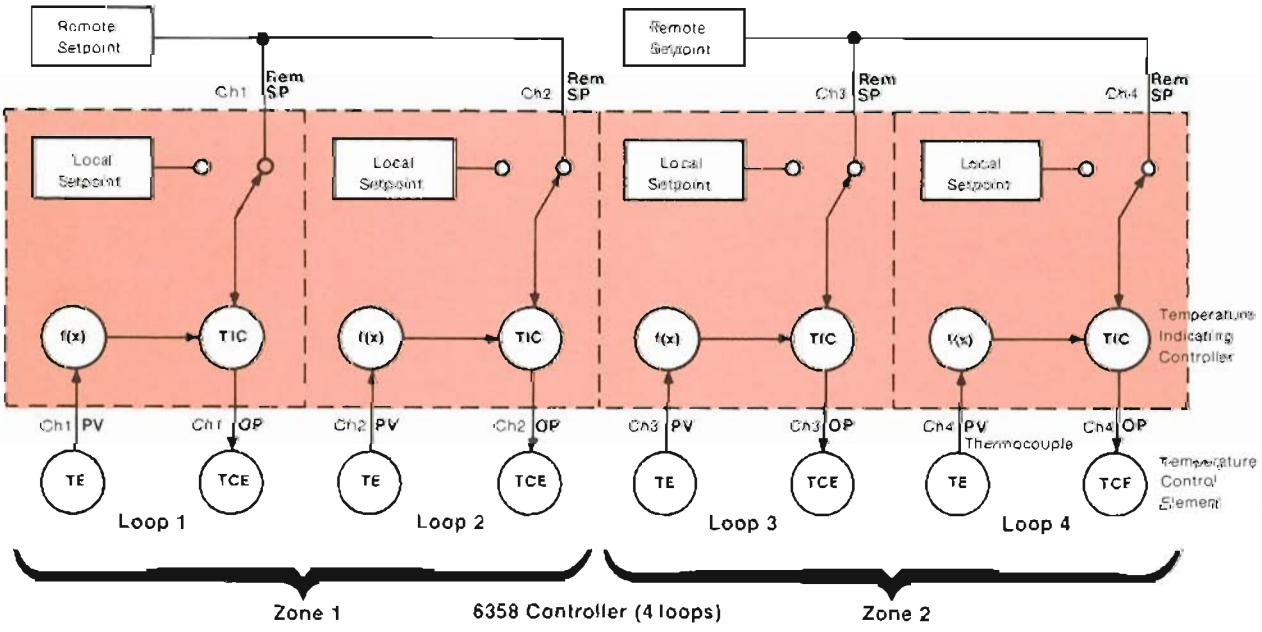
Manual or Local Auto Mode

The example shows a process flow being controlled by one loop of the 6358 controller. The flow rate is transmitted to the controller as a Process Variable, which is linearised and compared with the Local Setpoint. The Channel 1 output is used to control the flow via the flow control elements.



Remote Auto Mode

This example shows a similar control configuration as above but with the added option of the remote setpoint which will be tracked by the Local Setpoint as long as the loop is in Remote. Four loops of the 6358 controller have been used in this case to produce a zone control system, commonly used in oven or environmental chamber control.



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 loop number mnemonic LN. Each loop is accessed by the supervisory computer calling up a different unit identifier number.

Hand-held terminal link

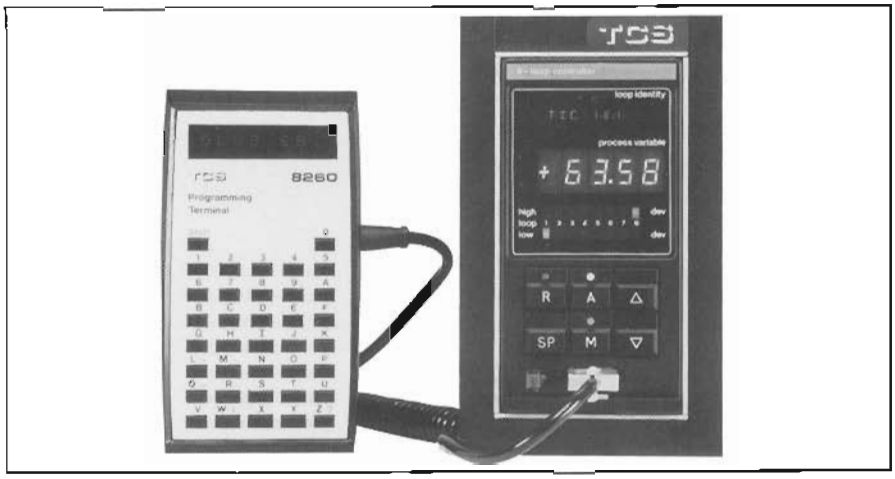
Each System 6000 instrument can be set up using a plug-in 8260 Hand-held terminal. Every parameter is accessed by means of a simple 2 character command mnemonic and all data is entered directly in engineering units. This technique ensures the accuracy and security of parameter settings.

Specification

Transmission Standard
2-wire RS232/V24 (± 12V).

Data Rate
300 baud.

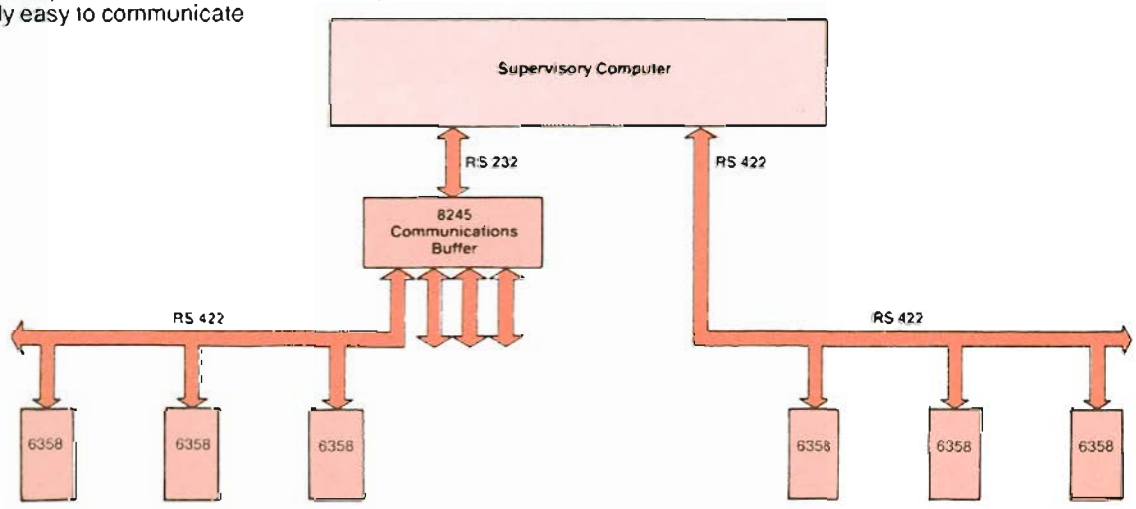
Character Length
10 bits made up of:
1 start + 7 data + 1 parity (even) + 1 stop.



The photograph shows an 8260 terminal plugged into the front panel of a 6358 controller. A full list of the available command parameters is given in the 6358 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 6358 controller. To hook the 6358 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 6358 becomes part of the distributed control system. The illustration shows how an array of 6358s 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
120-240 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 (ASCII/Binary)
10/11 bits — 300 to 9600 baud.
11/12 bits — 110 baud (2 stop).

Protocol

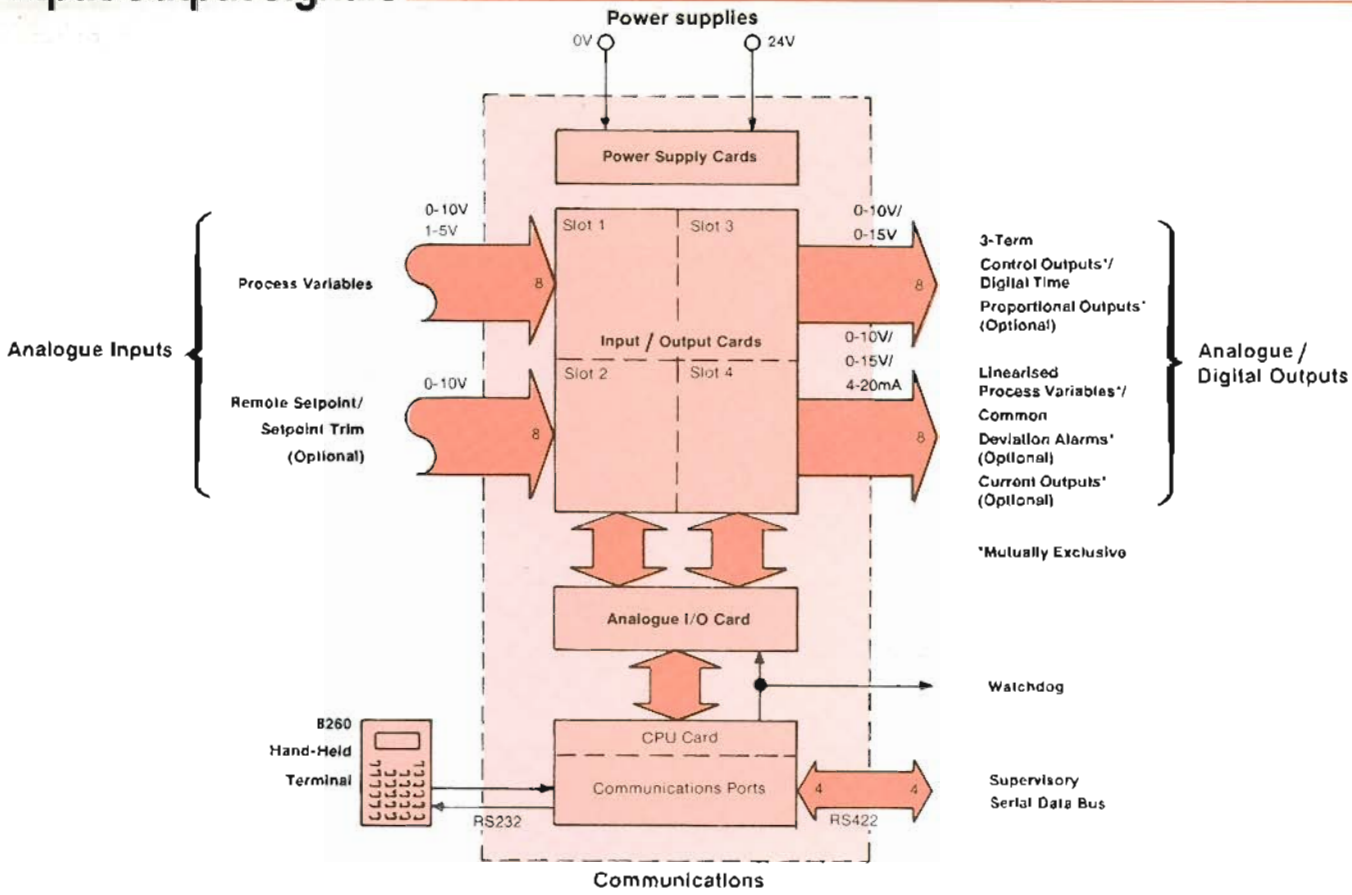
All microprocessor-based instruments in the System 6000 range employ a standard ANSI protocol known as BI-SYNCH. The exact form of BI-SYNCH implemented within System 6000 corresponds with the American National Standard specification:

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



Analogue inputs

Number of Channels
8 direct non-isolated inputs as standard plus 8 optional inputs.

Channel Functions
Slot 1, channels 1 to 8 = process variable inputs.
Slot 2, channels 1 to 8 = remote setpoint/ setpoint trim (optional)

Input Signal Levels
Direct inputs are 0-10V range.
(Slot 1 inputs can be 4-20mA (1-5V) range with external sense resistors.)

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 ± 9999.

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

Sampling Rate
ADC samples each channel every 304ms (8 loops enabled)

Input Impedance
100K ohm pull-down to 0V on all channels

Input Signal Processing
(Slot 1 PV inputs only)
Linear (normal or inverse)
Normalised square root.
Type J, K, T, S, R, E, B thermocouples
Platinum resistance thermometers.
User specified linearisation functions

Analogue outputs

Number of channels
8 direct non-isolated outputs as standard (except where digital time-proportioned outputs used) plus 8 optional outputs.

Channel Functions
Slot 3, channels 1 to 8 = 3-term control outputs. (Mutually exclusive with digital time-proportioned outputs).
Slot 4, channels 1 to 8 = Process Variable outputs (optional and mutually exclusive with common deviation alarms digital outputs).

Output Signal Levels
Direct outputs are 0-10V range.

Output Circuit Type
Medium-term analogue sample-and-hold circuits preceded by DAC

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

0-10V Output Accuracy
± 1 LSB max. over 0-50°C range.

Sample and Hold
DAC updates each channel every 304ms. (8 loops enabled).

Output Drift Rate Under Watchdog Failure Conditions
½mV/sec maximum (equivalent to 1% of full scale in 3 minutes).

Output Drive Capability
± 5mA for direct voltage outputs

Current outputs

Number of Channels
8 optional non-isolated outputs

Channel Functions
Slot 4, channels 1 to 8 = 3-term control outputs, current return path. (Must be used in conjunction with an analogue output in Slot 3, which provides the current send path).

Output Signal Levels
Outputs are 4-20mA range.

Output Circuit Type
Voltage to current converter from 0-10V (as produced by analogue output in Slot 3) to 4-20mA.

Output Resolution
12 bit binary (.025%) giving minimum current steps of 3.9µA. Overall accuracy 0.5% worst case.

Digital outputs

Number of Outputs
2 × 8 optional non-isolated outputs plus Watchdog.

Output Functions
Slot 3 outputs 1 to 8 = digital time-proportioned 3-term control outputs (mutually exclusive with analogue 3-term control outputs)
Slot 4, outputs 1 to 8 = common deviation alarms (optional and mutually exclusive with process variable analogue 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
Each loop alarm output is updated every 304ms. (8 loops enabled).

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 ± 0.5V.

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

3-term control characteristics

Algorithm Sampling Period
304ms (8 loops enabled).

Setpoint
Range — low, high −9999 to +9999.
Limits — low, high −9999 to +9999.

Setpoint Trim
Range – low, high −9999 to +9999 in engineering units.

Alarm Limits (on deviation)
Low, high 0 to 9999 with hysteresis of ½% of setpoint span.

Input Filter Range (channel 1 only)
0 to 60 sec (first order).

Control Output
Range – 0 to 99.99% = 0-10V.
Limits — low, high, 0 to 99.99%.
Raise/lower rate in manual — 0 to 99.99% in 20 sec with accelerating action.

Proportional Band Range
0 to 999.9%.

Integral Time Constant
Range 0.01 to 99.99 minutes.
0 = off.

Derivative Time Constant
Range 0.01 to 99 99 minutes.
0 = off.

Ordering details

6358: 8-Loop Controller with 8-way PV inputs and 8-way 3-term control outputs.

/TRIM: Additional 8-way Analogue input card providing Setpoint Trim or Remote Setpoint input facilities for each loop.

/RPV: Additional 8-way Analogue output card providing re-transmitted PV output facilities for each loop.

/ALM: Additional 8-way Digital output card providing common deviation alarms for each loop.

/MA: Additional 8-way Current output card providing 4-20mA 3-term outputs.

/TPO: 8-way Digital output card replacing the standard 0-10V 3-term Analogue output card, providing digital time-proportioned 3-term outputs.

NOTE: The ALM, MA and RPV options are mutually exclusive. The MA and TPO options are also mutually exclusive.

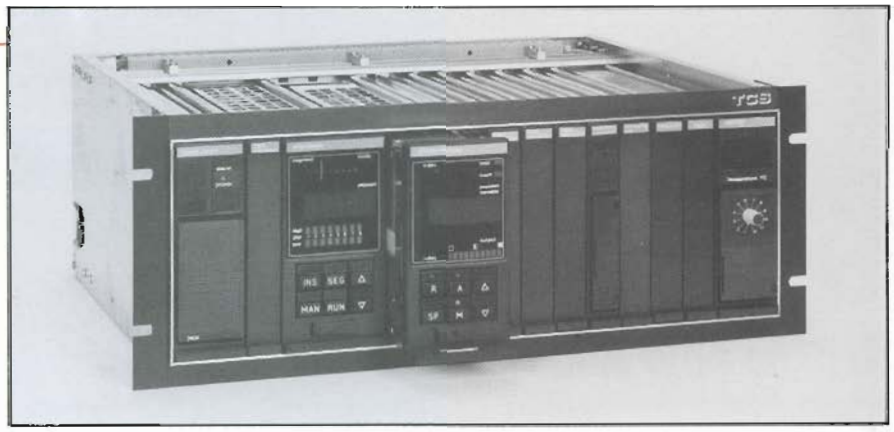
EXAMPLE: 6358/TRIM/ALM — 8-Loop Controller with Setpoint Trims and Deviation Alarms on each loop.

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 6358 controllers may be fitted into a 7000 series 19 inch rack as shown. Interconnections between instruments are made by wire wrapping while external connectior s 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 6358s can also be supplied.



7900 powered sleeves

The powered sleeve allows a 6358 to be mounted with a mains power unit. This is incorporated in the associated 7358 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:

6358 8-loop microprocessor-based controller technical manual.

6358 Facts Card.

7358 Process controller rear termination assembly.

7900 Single or multi-way sleeve assembly for microprocessor-based instrumentation.

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HA075414U001
Issue 3.1 Oct 85