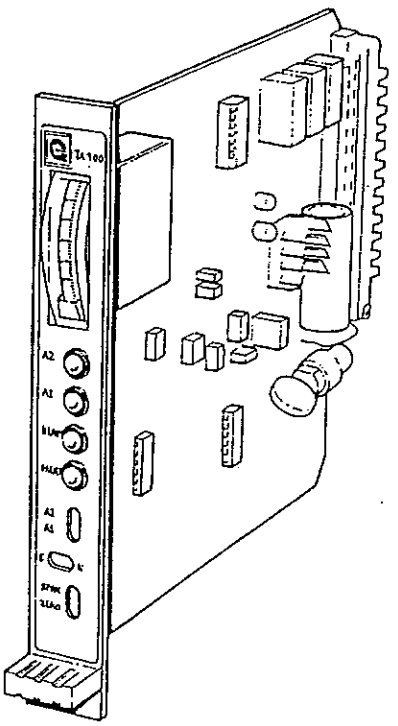
General Monitors

Model TA100/200
Modular Trip Amplifiers (Hydrocarbon and Hydrogen Sulphide)



Instruction Manual

General Monitors reserves the right to change published specifications and designs without prior notice.

Part No. 710-049
Rev. H 10/91

Warning

1. Correct functioning of this instrument must be verified by carrying out a calibration check at least every ninety (90) days. See section 4.
2. Take note of sub-section 3-5 Sensor Poisons
3. Install and maintain all hazardous area equipment in accordance with the relevant regulations and practices of the country concerned. See Section 3- Installation.
4. In the case of hydrocarbon instruments (TA100) high off-scale meter readings may indicate an explosive concentration of gas at the sensor. A subsequent fall in indicated gas concentration does not imply that safe working conditions have been restored.
5. The supply voltage to the TA100/200 must not exceed 24VDC in order to comply with the relevant approval of the analogue sensor in use.

Warranty

General Monitors warrants all of its products to be free from defects in workmanship or material under normal use and service within the periods specified in the individual data sheets.

General Monitors will repair or replace, without charge, any equipment found to be defective during the warranty period.

Full determination of the nature and responsibility for defective or damaged equipment will be made by General Monitors personnel.

Defective or damaged equipment must be shipped prepaid to the General Monitors plant or distributor from which shipment was made.

Gas detection elements which have been poisoned by contaminants are not included in this warranty.

In all cases this warranty is limited to the cost of the equipment supplied by General Monitors.

The customer will assume all liability for the misuse of the said equipment by its employees or other personnel.

Introduction

1-1 General Description

This Instruction Manual refers to the Models TA100 and TA200 modular five level indicating trip amplifiers.

Both of these modules have a standard 0-22mA input signal requirement. The meter of the TA100 is scaled in % LEL and is suitable for use in association with the General Monitors SC110 Hydrocarbon Analogue Sensor. The TA200 module is designed for Hydrogen Sulphide monitoring applications with the Model ST210 H2S Analogue Sensor. The meter is available scaled in the ranges 0-20ppm, 0-50ppm or 0-100 ppm.

These modules are both visually and mechanically compatible with other modules in the '01' Series range and may be intermixed in rack or panel mounting chassis assemblies having a maximum of four, eight or sixteen channels. Note that every channel in this system is provided with a coding strip which dedicates that channel to a particular type of module and inadvertent reversal of modules is thereby eliminated.

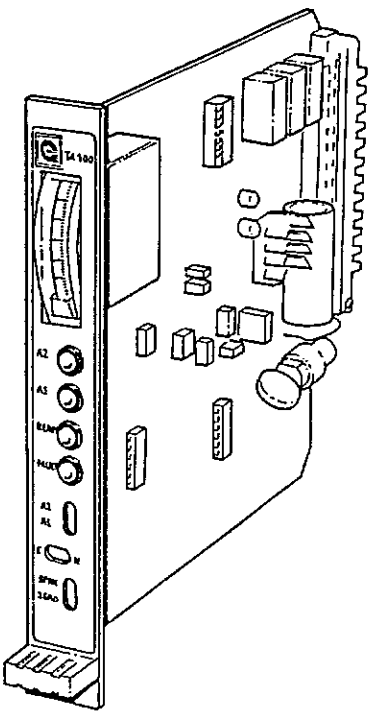
Both modules are offered with the full range of alarm reflash, open collector and relay outputs and latching or non-latching functions. Over-range latching is provided for the TA100 as standard. Non-standard versions suitable for input signals other than 0-22mA are available subject to the usual commercial constraints.

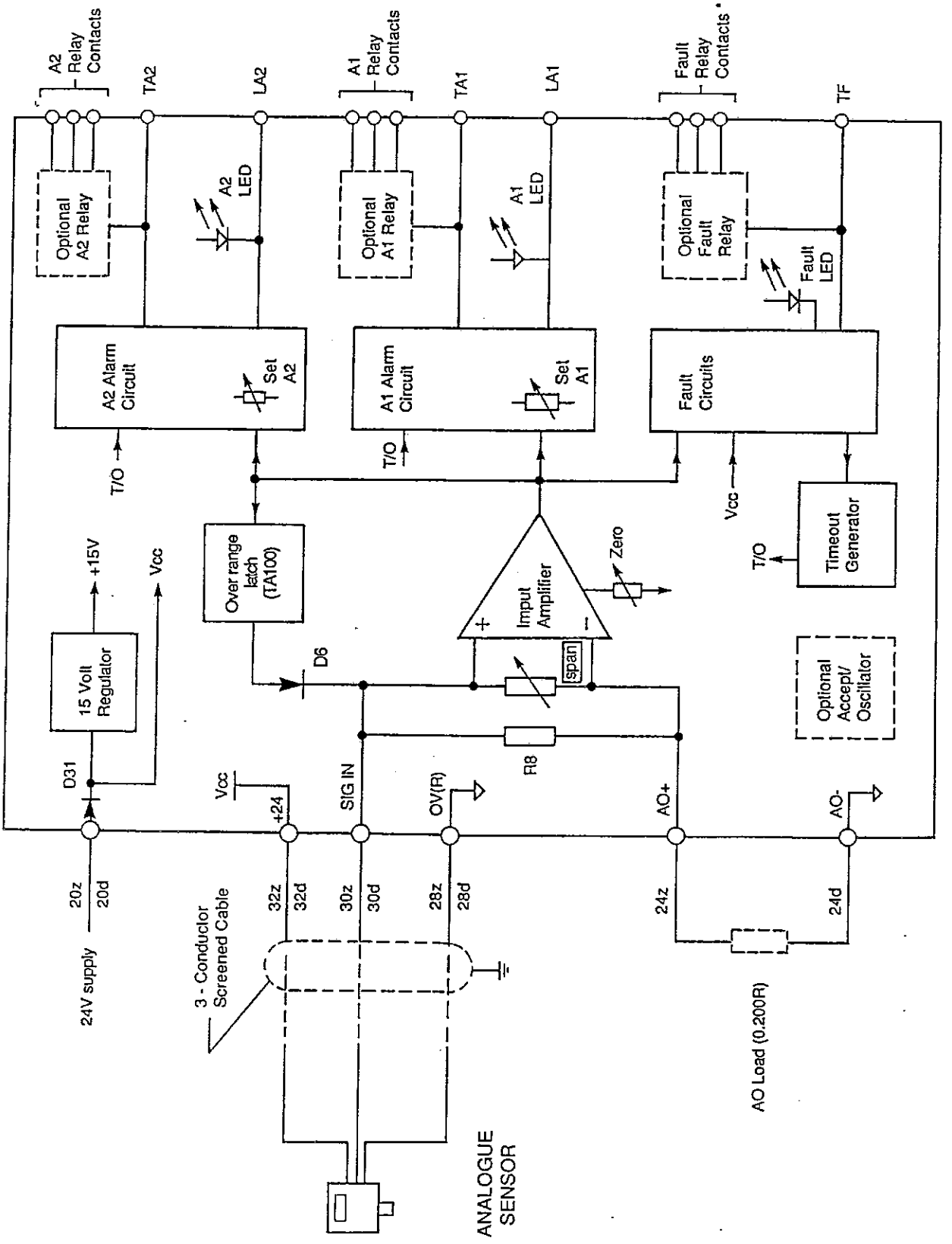
Interconnection is by means of a DIN 41612 two part connector which facilitates field servicing and system expansion or re-configuration. Termination options include screw, tab, crimp, or wire-wrap.

The user is referred to the instruction manuals relevant to any equipment used in association with these trip amplifiers and is advised to take note of relevant warnings contained in this document.

A comprehensive range of accessories is available to facilitate the installation and reliable operation of the instrument.

General Monitors is recognised as a leader in the field of gas detection and a dedicated team of experts is always available to provide advice or service as required.





TA1[illegible]00 Module (* Fault circuit is normally energised)

4 TA100/200 Modules

Each module contains all of the electronic circuitry required to support a General Monitors Analogue Sensor.

The modules interface with the customers cabinet wiring by means of a two-part connector which conforms to the DIN 41612 standard. The male part of the thirty-two way connector is mounted on the rear of the Control Module card and mates with the corresponding female part which is mounted in the chassis.

This termination method is common to all modules in the range, thus facilitating the production of systems for mixed applications. In order to avoid the possibility of inadvertent module reversal in such mixed systems, each channel is coded by means of a coding strip so that only the correct module type may be inserted in any channel position.

The front panel incorporates the following indicators and controls:

- Edgewise meter, scaled 0-100% LEL or ppm
- Red 'A1' and 'A2' LED gas alarm indicators
  Green 'READY' indicator
- Yellow 'FAULT' indicator
- Calibration Door mechanism and switch

For details concerning these controls and indicators refer to Section 4.

1-5 Trip Amplifier Options

The following options are available on the Model TA100 (P/N F44-005) and TA200 (P/N F24-005) and must be specified when ordering as shown in the example below.

-TO-Option
This is the basic version having open collector alarm outputs but without relays or the ACCEPT/ OSCILLATOR circuitry. The following outputs are provided.

TA1 – NPN open collector 'A1' alarm (Pin 12z)
LA1 – As TA1 but with internal pull-up (Pin 14d)
TA2– As TA1, but referenced to 'A2' alarm (Pin 14z)
LA2 – As LA1, but referenced to 'A2' alarm (Pin 16z)
CAL – Pull down to 0.7V approximately in CAL mode (Pin 18z)
AO+ – 4.20mA analogue output (600 ohms) (Pin 24z)
AO– – Negative line of AO+ (Pin 24d)

-TA-Option
This incorporates all of the facilities of the TO option but also includes the ACCEPT/OSCILLATOR circuitry, giving the following additional features:

Reflash of A1 and A2 indicators for new alarms
Modulation of LA1 and LA2 outputs by the Oscillator
Alarm Accept input, giving steady alarm indication and steady LA1 and LA2 outputs (Pin 18d)
Unaccepted Alarm Outputs – An open-collector output normally high, which goes low in the event of an unaccepted alarm (Pin 10d)
Flashing Fault indication

-RO- Option
This is similar to the -TO- option except that the following features are added:

SPDT FAULT relay (Pins 2z, 2d and 4z)
SPDT 'A1' relay (Pins 6z, 8z and 10z)
SPDT 'A2' relay (Pins 4d, 6d and 8d)

Note that the FAULT relay is always energised in NORMAL operation. The 'A1' and 'A2' relays may be normally energised or normally de-energised.

-RA- Option
This combines the facilities of both the TA and RO options.

Any of the four previous options may be additionally fitted with diode (D50) for Fault outputs to activate when Trip Amplifier goes into CAL mode. To specify this option, add the suffix 'F' to the part number, e.g. F44-005-TAF.

1-2 Principle of Operation

The module derives its power from a 24V (nominal) DC source (pins 20z, 20d). An internal stabilised 15V electronics rail is derived from this supply

An analogue sensor, having a normal output in the range 4-20mA is connected via a three-conductor screened cable. It derives its power from the 24V (nominal) output of the trip amplifier (pins 32z, 32d) and drives the input circuitry via the SIG IN connections (Pins 30z, 30d). The remaining conductor is connected to the system OV (pins 28z, 28d).

A ground-referenced analogue load (200 ohms maximum) may be inserted in the analogue loop between AO+ (Pin 24z) and AO– (pin 24d). If not required, these pins should be shorted.

The analogue input signal develops a differential input voltage across the R8 SPAN network (100 ohms standard). This is amplified by the input amplifier, which has a gain of five. An offset may optionally be applied using the ZERO potentiometer, which is also used for simulating gas conditions in calibration mode for the purpose of setting the 'A1' and 'A2' alarm levels.

An over-range latch is incorporated and is active when diode D6 is present, as in the TA100. This is activated at an input signal level of 21mA and causes the indicated gas level to read in excess of full scale until reset by a Master Reset signal (momentary OV applied to pin 16d).

The output of the input amplifier is monitored by the A1 and A2 alarm comparators, which activate their respective alarm circuits when their user-resettable trip levels are exceeded. In normal operation, the open-collector outputs TA1 and TA2 together with their optional relays, switch on (normally de-energised) or off (normally energised). In calibration mode these outputs do not switch.

Auxiliary outputs LA1 and LA2 switch in sympathy with their respective indicators irrespective of the calibration/normal condition.

A one-minute timeout generator inhibits gas alarms at switch-on and following the correction of a fault condition.

Optional accept/oscillator circuitry performs an alarm reflash function at the occurrence of a new alarm. This causes the relevant A1 and / or A2 indicators to flash. The circuit is reset by a momentary OV applied to the ACC input (pin 18d).

The fault circuitry monitors the power rail and analogue signal loop. Input signals less than 1mA generate a fault condition. Signals between 1mA and 2.5mA indicate a remote calibration condition. A local/remote calibration output is provided (pin 18z).

1-3 Description of components

Item		Notes	Qty
1	TA100 or TA200	1	1 per channel
2	Chassis	2	1
3	Facilities module (P/N F47-017)	3	Optional
4	Termination (See sub-section 1-7)		1 per channel
5	Analogue Sensor		1 per channel
6	Sensor accessories		Optional
7	Blank panel	4	As required
8	Extender card (P/N F47-066)		Optional
9	Calibration equipment		As required
10	Instruction manual (P/N 710-049)		As required
11	Calibration tool (P/N 220-005)		1

Notes:
1. Select TA100 (P/N F44-005) or TA200 (P/N 24-005)
2. Select E47-060-16, -8 or -4 for 16, 8 or 4 channel versions respectively, rack mounting
   Select E47-160-16, -8 or -4 for 16, 8 or 4 channel versions respectively, panel mounting
3. Refer to Sub-section 1-8
4. Select P/N E47-039 for TA100 or E24-039 for TA200

Please consult your General Monitors representative for information and advice on special requirements.

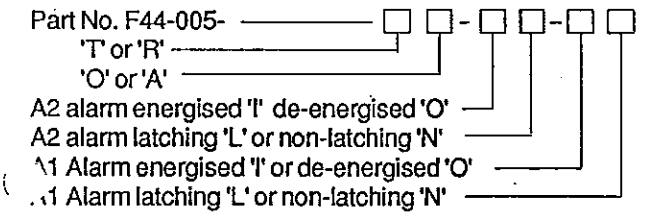
Alarm Configurations

As previously noted, the 'FAULT' alarm is **always** energised in **normal** operation and de-energises in a **Fault** condition. No latching capability exists for the 'Fault' alarm.

The 'A1' and 'A2' gas alarms may be configured as follows:

A1	Normally de-energised	Insert link P1-0
A1	Normally energised	Insert link P1-1
A2	Normally de-energised	Insert link P2-0
A2	Normally energised	Insert link P2-1
A1	Non-latching	Remove diode D24
A1	Latching	Insert diode D24
A2	Non-latching	Remove diode D13
A2	Latching	Insert diode D13

The above configurations may be modified by the user, if required. When ordering, the configurations may be defined verbally or, using the usual General Monitors conventions, may be defined as follows:



If the configuration is not specified, the -OL-OL format will be shipped.

1-6 Chassis Assembly (P/N E47-060)

The chassis assembly consists of two black anodized end-plates, with integral mounting slots, and five extruded aluminium sections mounted between them. Four of these sections are fitted with M3 tapped strips and plated steel spacer strips which serve to align the black Noryl card guides on which the Control Modules slide. Connector mounting strips are attached to the extruded sections at the rear of the Chassis and are used to mount the DIN 41612 connectors for termination purposes.

The rear part of each channel code strip is mounted adjacent to its connector on the Connector Mounting Strip. A channel is coded by inserting red plastic Coding Pins in the slots provided. Refer to the User Information Drawing (E44-038) for details.

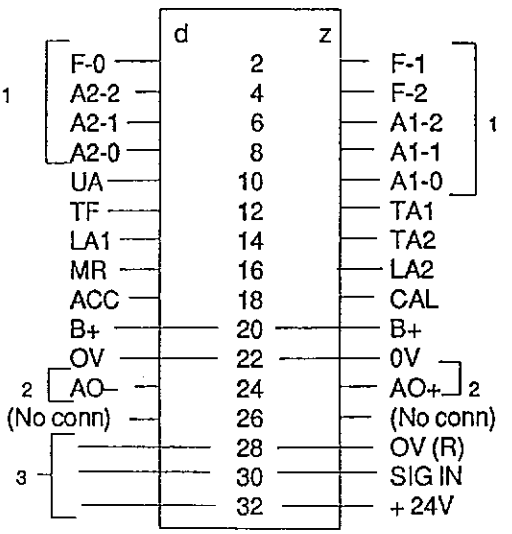
Chassis Assembly P/N E47-160

This Chassis Assembly is similar in constructions to Chassis P/N E47-060 except that the end plates are adapted to panel mounting using self locking M6 fasteners, in conjunction with a Bezel (see User Information Drawing).

1-7 Termination Options

A variety of termination options are available for the female DIN 41612 connector mounted at the rear of the chassis. All of these options are fully compatible with the male connector mounted on the Control Modules in the range.

The connector pin designations for the trip amplifiers are shown in the following diagram as they appear looking from the rear of the chassis.



Notes:

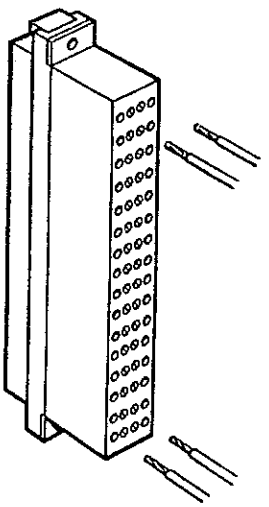
1 These relay contact outputs are relevant only if relays are fitted.
2 These pins should be shorted if an analogue output is not required
3 Analogue Sensor connections

a) Screw Termination P/N 311-014

This 32-way connector conforms to the DIN 41612 specification. Use
a) Single conductor 0.5mm2 - 1.5mm2, or
b) Stranded conductor 0.5mm - 1.5mm2 or
c) 16 AWG conductor stranded, or
d) 2 x stranded conductor twisted together each 0.75mm2 or
e) 2 x 20 AWG conductor stranded twisted together

The insulation stripping length is 10mm in each case. A slotted conical drive screw is turned in a clockwise direction after the conductors are fully inserted in the two apertures provided, thus providing a secure and vibration-proof termination.

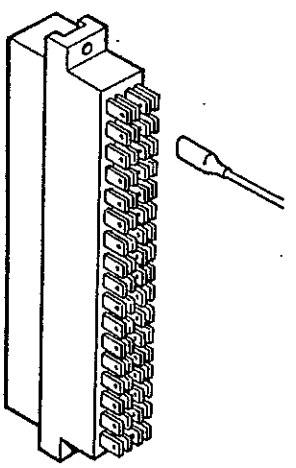
Manufacturer:	Phönix
Connector:	P/N 22 85 195 (Type SFL/F32/ZD
Insulation housing:	Green fibre glass reinforced 6.6 polyamide
Spring contacts:	CuSn6 with 0.8 micron hard gold plating
Screw contacts:	CuSn39 with nickel plating
CSA Single core:	0.5mm$_2$ to 1.5mm$_2$
CSA stranded:	0.5mm$_2$ to 1.5mm$_2$
Stripping length:	10mm
Max current:	4A
Rated voltage:	250 VAC
Insulation:	250 VAC to VDE 0110 Gr.C.
Mounting Components:	Screw M2.5 x 8 (P/N 100-002) 2 per connector



b) Tab Type Termination (P/N 311-023)

This 32 way connector conforms to the DIN 41612 specification. Use
(a) Stranded conductor 0.5mm - 1.5mm2, or
(b) 16 AWG conductor stranded, or
(c) 2 x stranded conductor twisted together each 0.75mm2, or
(d) 2 x 20 AWG conductor stranded twisted together.

Manufacturer:	Phönix
Connector - Tab	(P/N 22 85 344 (SFL (2-2.8-08) F32/ZD)
Insulation housing:	Green, fibre glass reinforced 6.6 polyamide
Spring contacts:	CuSn6 with 0.8 micron hard gold plating
Tab contacts:	CuSn6 with gold plating
Max current:	4A
Rated voltage:	250 VAC
Insulation:	250 VAC to VDE 0110 Gr. B, valid for fully insulated receptacles
Mounting Components:	Screw M2.5 x 8 (P/N 100-002) 2 per connector



c) Wire Wrap Termination P/N 311-024
This 32 way connector confirms to the DIN 41612 specification

Manufacturer:	Harting Elektronik
Connector :	Wire Wrap P/N 09 06 032 6 831
Insulation bonding:	Thermoplastic resin, polycarbonate
Spring contacts:	CuSn with hard gold plating
Max current:	4A
Rated voltage	125 VAC
Insultation:	125 VAC to VDE 0110 Gr. C
Mounting Components:	Screw M2.5 x 8 (P/N 100-002) 2 per connector

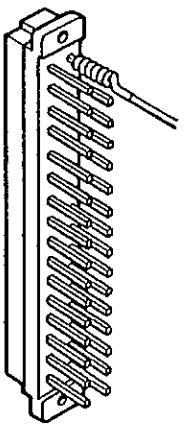
d) Crimp Termination P/N 311-025

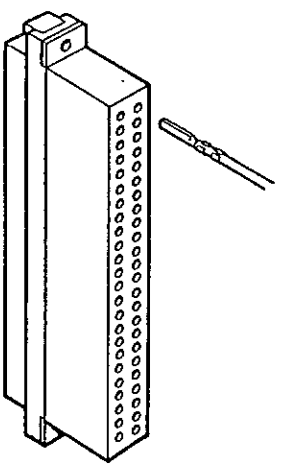
This connector conforms to the DIN 41612 specification. Use
(a) Stranded conductor 0.5mm - 1.5mm2, or
(b) 16 AWG conductor stranded, or
(c) 2 x stranded conductor twisted together each 0.75mm2, or
(d) 2 x 20 AWG conductor stranded twisted together

The moulded plastic body incorporates 48 numbered apertures but only a maximum of 32 of these are relevant to this application.

For reliable connections it is most important that the correct crimps and tool are employed. The specified crimps are suitable for conductors between 0.5mm2 and 1.5mm2. The insultation stripping length is 4mm.

Manufacturer:	Harting Elektronik
Connector:	Crimp housing 09 06 048 3201
Crimp Contacts:	09 06 000 8472
Insulation housing:	Thermoplastic resin polycarbonate
Crimp contacts:	CuSn with hard gold plating
Max current:	4A
Rated voltage:	125 VAC
Insulation:	125VAC to VDE 0110 Gr. C
Mounting Components:	Screw M2.5 x 8 (P/N 100-002) 2 per connector
Crimping Tool:	P/N 09 99 000 0077
Crimp removal tool:	P/N 09 99 000 0087





1-8 Facilities Module

The Facilities Module is an optional assembly which plugs into the right-hand side next to the last control module position in a 4, 8 or 16 Channel Chassis.

F47-017-1
01 and Trip Amplifier module with Master Reset Option.
F47-017-2
01 & Trip Amplifier module with Accept Option
F47-017-3
01 & Trip Amplifier module with Master Reset and Accept Option.

F47-117
The F47-117 Facilities Module is designed to provide common alarm outputs for A1, A2 Fault and unaccepted alarm. A1, A2 and Fault may or may not be supplied with relays.

The UA buss is switched low when an alarm is activated on any channel, this turns transistor Q8 on thus energising relay K4. The voltage developed across the coil of K4 turns on transistor Q9 which in turn switches off transistor Q10 which allows IC1-5 or IC1-6 to switch on depending upon whether it is an A1 or A2 alarm. This gives an open collector output on 24d for A1 or 24z for A2.

The fault relay K3 is normally energised, IC1-7 is normally switched on. When a control module goes into fault a logic high signal appears on the Tf buss. This turns transistor Q7 on, thus pulling the collector of Q7 and input to IC1-7 low causing IC1-7 to switch off, thus de-energising IC3 fault relay and the Tf open collector on 12d.

A1 and A2 circuits are similar, so only A1 will be dealt with. When an A1 alarm occurs the A1 buss is pulled low. This switches on transistor Q2 which allows capacitor C4 to charge up. Capacitor C4 is necessary as when the accept/reflash option is installed on the control module the LA1 buss will pulse at the same frequency as the LED's. Capacitor C4 prevents the common alarm output from following suit When C4 is sufficiently charged it switches transistor Q4 on which in turn switches on IC1-3 and IC1-4 giving both a relay output where fitted and two open collector outputs. Resistors R12, R14, R16 and transistor Q6 are necessary when normally energised relays or open collector A1 output is required.

During calibration, the cal buss is held low and hence the base of transistors Q3 and Q4 via diodes D1 and D4 respectively.

The card is powered through D11 and protected by fuse FS1 smoothed by capacitors C5 and C6.

F47-117-TO-O
01 & Trip Amplifier module with Master Reset and Accept Option, Open Collector Outputs and Unaccepted alarm relay output. Normally de-energised alarms.
F47-117-RO-O
01 and Trip Amplifier module with Master Reset and Accept Option, Open Collector outputs, Relay outputs and Unaccepted Alarm relay outputs. Normally de-energised alarms.
F47-117-TO-1
As TO-0 with normally energised alarms
F47-117-RO-1
As RO-O with normally energised alarms

Pin Assignments for the Facilities Module are as follows:

	d	z	
CF-0	2	2	CF-1
CA2-2	4	4	CF-2
CA2-1	6	6	CA1-2
CA2-0	8	8	CA1-1
UA BUSS	10	10	CA1-0
CTF	12	12	CTA1
LA1 BUSS	14	14	CTA2
MR BUSS	16	16	LA2 BUSS
ACC BUSS	18	18	CAL BUSS
B+ BUSS	20	20	B+ BUSS
OV BUSS	22	22	OV BUSS
CUA 1	24	24	CUA 2
CLA 1	26	26	CLA 2
TF BUSS	28	28	OV
OV	30	30	UAR-0
UAR-1	32	32	UAR-2

Please consult your General Monitors representative for technical and commercial details.

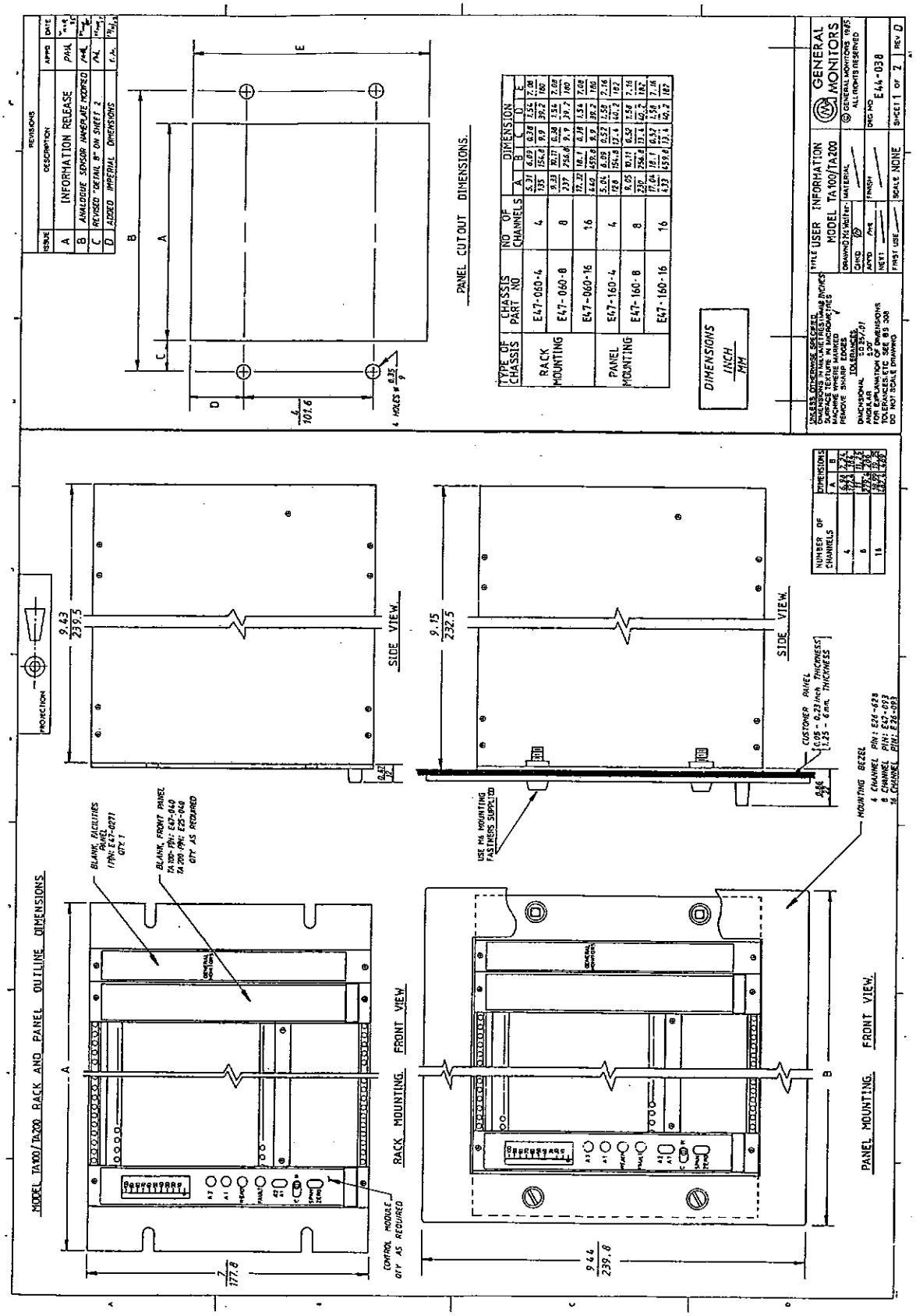
1-9 Motherboard (P/N F47-052)

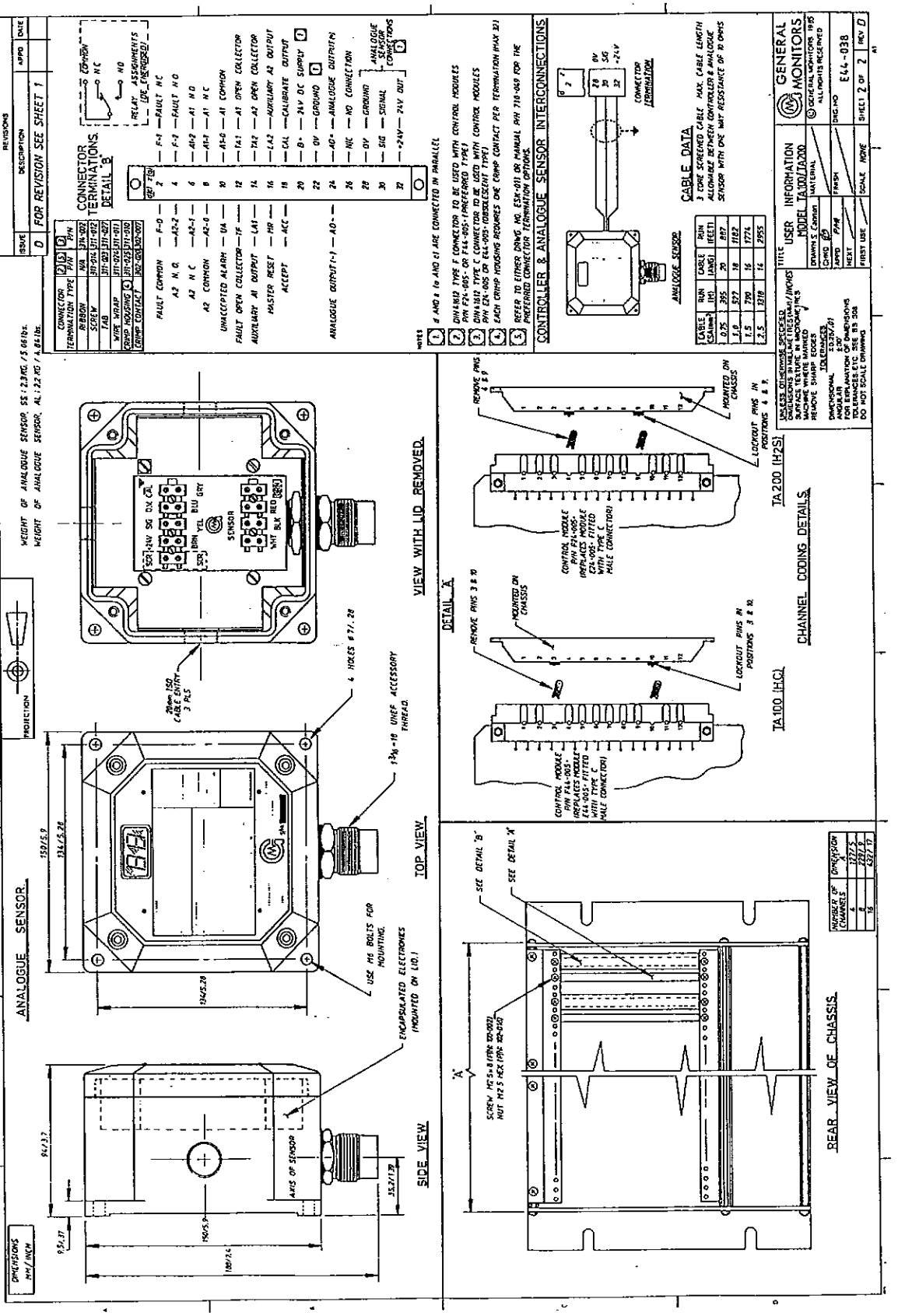
The Motherboard is designed to eliminate the requirement to hard wire the connections which it may be necessary to common. It is designed for use in connection with the F47-117 Common Alarm Facilities Module.

Analogue output terminals AO+ and AO– are linked on the PCB. The trace must be cut if external analogue output is required. The following control module outputs are bussed to the facilities module..

0 volts	22d and z
+ 24 volts	24d and z
Accept	18d
Cal. Mode	18z
Master Reset	16d
LA2	16z
LA1	14d
UA	10d
Fault	12d

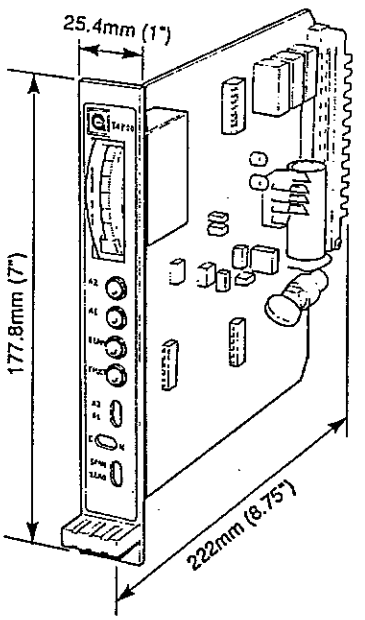
The fault open collector output goes open in fault mode, hence to achieve a trigger signal it is necessary to connect a diode and resistor as shown on drawing No. F47-063 Mother Board Schematic Diagram.


PANEL CUTOUT DIMENSIONS.
DIMENSIONS INCH MM
SIDE VIEW.
RACK MOUNTING. FRONT VIEW.
PANEL MOUNTING. FRONT VIEW.
MODEL TA100/TA200 RACK AND PANEL OUTLINE DIMENSIONS
MOUNTING BEZEL
CUSTOMER PANEL
USE M4 MOUNTING FASTENERS SUPPLIED
GENERAL MONITORS


CONTROLLER & ANALOGUE SENSOR INTERCONNECTIONS
CONNECTOR TERMINATIONS DETAIL 'B'
CABLE DATA
ANALOGUE SENSOR
VIEW WITH LID REMOVED
TOP VIEW
SIDE VIEW
DETAIL 'A'
CHANNEL CODING DETAILS
TA200 (H2S)
TA100 (HCL)
REAR VIEW OF CHASSIS
USER INFORMATION MODEL TA100/TA200
GENERAL MONITORS
E44-038

General Monitors

Model TA100/TA200



Specification

2-1 System Specifications

Application:	Trip amplifier
Measuring range:	TA100: 0-100% LEL TA200, 0-20, 0-50 or 0-100 ppm
No of channels:	1 per Control Module
Channel isolation:	Fully independent operation
Module location:	Protected non-hazardous environment
Transducer location:	Hazardous area (refer to appropriate data sheet
Long term drift:	< 5% FSD over one year
Temperature variation:	< 7% FSD over temperature range
Humidity variation:	< 3% FSD from 20 to 90% RH
Accuracy:	± 5% FSD
Vibration variation:	< 3% FSD at 5 m/s^2 over 10 to 500Hz
Power up variation:	< 3% FSD within 5 minutes

2-2 Control Module (P/N F47-005)

Mechanical

Height:	177.8mm (7", 4U)
Width:	25.4mm (1")
Depth:	222mm (8.75")
Weight:	300 grams (approx)
Mounting:	Chassis (P/N E47-060 or E47-160)
Termination:	Connector DIN 41612 Type 'F'

Environmental

Storage temperature:	–40 to + 66°C (– 40°F to 150°F)
Operating temperature:	– 18 to + 66°C (0°F to 150°F)
Humidity range:	20 to 90% RH non-condensing

Electrical

Supply voltage:	20 - 24 VDC
Supply fuse:	1A Char 'T' (5 x 20mm)
Varistor rating:	7 J
Input impedance:	100 ohms
AO load:	0-200 ohms
Alarm output:	TF, TA1, TA2 (-T- option) 100mA TF, TA1, TA2 (-R- option) 50mA LA1, LA2 50mA
Relay contact ratings:	110 VAC/125 VDC 1.25 A, 30W, 50 VA
Master reset load:	3mA at 15V
Accept load:	220 µA at 15V
Timeout period:	60 seconds.

Installation

3-1 On Receipt of your Equipment

All items of equipment shipped by General Monitors are pre-packed in stout containers and enclosed in a shock-absorbing filling which affords a considerable degree of protection against physical damage. The contents should be carefully removed and checked against the enclosed packing slip.

Any discrepancies between the contents and the packing slip must be reported to General Monitors within ten days of receipt of the shipment. General Monitors cannot be held responsible for shortages not reported within this period.

Damage to the contents of a shipment should be brought to the attention of the carrier immediately and a claim filed.

All subsequent correspondence with General Monitors must specify the equipment part numbers and serial numbers.

3-2 Chassis Installation

The chassis should be mounted in a non-hazardous protected environment.

The chassis should be subjected to a minimum of shock and vibration. Although the module is to a great extent immune to electromagnetic interference, it should not be mounted in close proximity to radio transmitters or similar equipment.

The modules require a free air circulation in order to avoid excessive heat build-up inside the enclosure. If controllers are to be stacked vertically within an enclosure, forced air circulation will be required.

In installations where two or more control module types are to be mixed in one chassis, check that the individual channel coding strips match the channel application.

The coding strips are pre-configured at the factory and the male portion is provided ready mounted on each Control Module. The female portion, when provided unmounted with the Control Module for system expansion, must be fastened in position on the Connector Mounting Strip so as to mate with its counterpart on the Control Module.

Connectors for system expansion should be fastened in a similar fashion, using the screws provided.

Do not over-tighten the connector or coding strip fasteners, as this may damage the plastic mouldings.

3-3 Installation of Analogue Sensor Assemblies

The assemblies should be installed in the hazardous areas in accordance with the relevant regulations and practices of the country concerned. The mounting should be as free from shock and vibration as possible, and must be accessible for calibration purposes.

> CAUTION
> Under no circumstances must a sensor be connected to or disconnected from an instrument which is powered up. This will seriously damage or destroy the sensor. Sensors damaged in this manner are not covered under warranty.

Sensors should always be mounted pointed down, so as to avoid accumulation of moisture and particulate deposits.

Various sensor accessories are available to minimise the effects of rain, wind and particulate matter.

3-4 Analogue Sensor Locations

Refer to the installation instruction section of the appropriate manual.

3-5 Sensor Poisons

Sensors may be adversely affected by prolonged exposure to certain atmospheres. These in the main are chemical poisons although other substances such as silicones coat the sensor surfaces, thus rendering them insensitive to gas. Refer to the appropriate section of the manual for the sensor that is to be employed.

3-6 Recommendations for Sensor Field Cables

The sensor cable should be a three-core stranded cable of sufficient cross sectional area to support the Analogue Sensor that is to be used. Due to the low levels of sensor signal many industrial environments will require the use of a screened cable to guard against extraneous electrical noise. This screen should be enclosed in a suitable insulating outer jacket, and should be grounded at the controller end of the cable only.

Care should be taken, particularly at the sensor end, that the screen does not come into contact with any metal conduit or junction box.

Avoid running sensor cables close to high power cables, radio transmission lines or cables subject to pulses of high current.

Where a chassis is to be located some distance from a cluster of sensors, a multi-core screened cable and marshalling box may be employed. Each sensor may then be connected to the marshalling box using a three-core screened cable, where the cores are individually joined into the multi-core cable by means of high-quality joints. The individual screening braids should be connected to an insulated buss bar which is then connected to the braid of the multi-core cable. Electrical contact between the screens and the marshalling box metalwork should be avoided. The marshalling box may be grounded to power ground as required.

3-7 Sensor Cable Termination

Remove the sensor junction box lid to reveal the numbered terminal strip. The recommended terminal assignments are given below.

Colour	Designation
Brown	+24V
Yellow	SIG
Blue	OV

Connect the sensor cable as required.

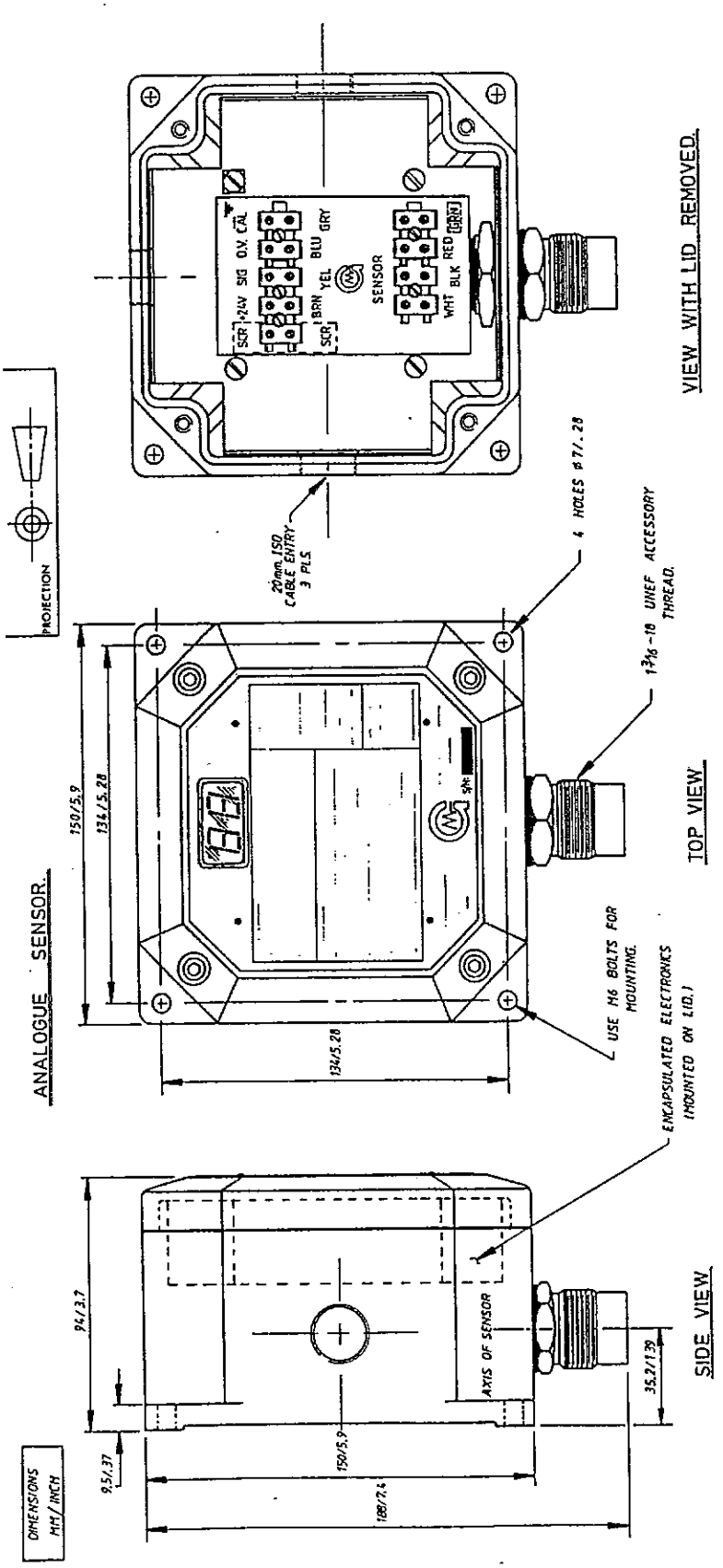
Ensure that the outer braiding of a screened cable cannot come into contact with the junction box or continuity plate.

Ensure that all connections are tight. Terminate the sensor cable conductors on the intermediate terminals at the rear of the chassis. The screen should be terminated on the system ground buss as appropriate to the connection system being used.

Designation	Termination
OV	28z/d
Sig	30z/d
+24V	32z/d

3-8 Analogue Output Termination

The analogue output is a 4-20mA current signal which will operate into any resistive load between 0 and 200 ohms. Loads in excess of this maximum value will result in a Fault indication. Where the analogue output is not being used to drive external equipment, it is a common oversight to omit the analogue output terminations during system installation, which gives rise to FAULT displays on all channels. This may be avoided by shorting the AO+ (Pin 24z) and AO- (Pin 24d) terminals at some convenient point during installation.


WEIGHT OF ANALOGUE SENSOR, SS.: 2.3 KG. / 5.06 lbs
WEIGHT OF ANALOGUE SENSOR, AL.: 2.2 KG. / 4.84 lbs.
PROJECTION
ANALOGUE SENSOR.
VIEW WITH LID REMOVED.
TOP VIEW
SIDE VIEW
SCR
+24V
SIG
0 V. CAL
BRN
YEL
BLU
GRY
SENSOR
WHT
BLK
RED
GRN
20mm. 150 CABLE ENTRY 3 PLS
4 HOLES ø 7/.28
$1\frac{3}{16}$-18 UNEF ACCESSORY THREAD.
150/5.9
134/5.28
USE M6 BOLTS FOR MOUNTING.
ENCAPSULATED ELECTRONICS (MOUNTED ON LID.)
94/3.7
AXIS OF SENSOR
35.2/1.39
9.5/.37
188/7.4
DIMENSIONS MM/INCH

3-9 Relay Terminations

These terminations are applicable only when relays have been specified and are otherwise open circuits on the Control Module. Relay outputs are labelled as shown in the following table, where it is assumed that the relays are de-energised.

Relay	Common	Normally Open	Normally Closed
A2	A2-0 = Pin 8d	A2-2 = Pin 4d	A2-1 = Pin 6d
A1	A1-0 = Pin 10z	A1-2 = Pin 6z	A1-1 = Pin 8z
Fault	F-0 = Pin 2d	F-2 = Pin 4z	F-1 = Pin 2z

Note that the 'FAULT' relay is always configured in a normally energised format and de-energises in a FAULT condition. The 'A1 and A2' relays may be normally energised, using links 'P1-1 and P2-1'.

The relay contacts are rated at 110 VAC, 1.25 A, 30W 50 VA, but ensure that the panel wiring and intermediate terminations are compatible with the voltage, current and power requirements of the load. Inductive loads will generally require suppression devices such as clamping diodes or varistors. Capacitive loads may require current limiting so as to limit inrush currents to a safe value below the maximum rating of the contacts.

3-10 Open-Collector Outputs

The operation of these outputs is fully described in Section 6 of this manual and output specifications are given in Section 2.

The output terminations are repeated in the following table for convenience.

Alarm Output	Main Output	Auxiliary Output
A2	TA2 = Pin 14z	LA2 = Pin 16z
A1	TA1 = Pin 12z	LA1 = Pin 14d
Fault	TF = Pin 12d	

The A1 and A2 open-collector outputs are fitted with isolating diodes so these outputs may be commoned together. The fault output of modules can be commoned by using the fault relay contacts. To common the fault output in conjunction with a common Facilities Module, the TF open collector output of each card must be connected via a 10K resistor to the D.C. supply and also via a diode IN4148 (anode to TF output) to the TF input of the Facilities Module.

3-11 Power Supply Connections

The positive rail of the 24 volt supply should be connected to Pins 20z and / or 20d. Similarly the 0 volt supply should be connected to Pins 22z and / or 22d. Care should be taken, particularly if the supplies are looped from one channel to the next, that cable of adequate cross-section is used.

In general, use cables as short as possible in order to avoid substantial voltage drops between the supply and the chassis.

3-12 Master Reset and Accept Signals

Both of these inputs, if required by the options chosen for the Control Modules, should be fitted with single-pole Normally Open switches, connected between the respective terminals and ground.

3-13 Power from AC Mains

A 110/220/240 VAC 50/60 Hz mains power unit is available. This may be mounted at any convenient location adjacent to the chassis and is a 19" rack x 2U high configuration. One power unit is sufficient to power a full rack of modules. Power Unit Part No. A00-020.

3-14 Caution Note

Externally applied high voltages may be present on the relay contact terminals. These will generally be independent of the supply to the control module and caution should be exercised when working in this area. Electric shocks felt when wiring the alarm relay contacts on a low voltage DC system indicate the presence of unsuppressed inductive loads and should be investigated.

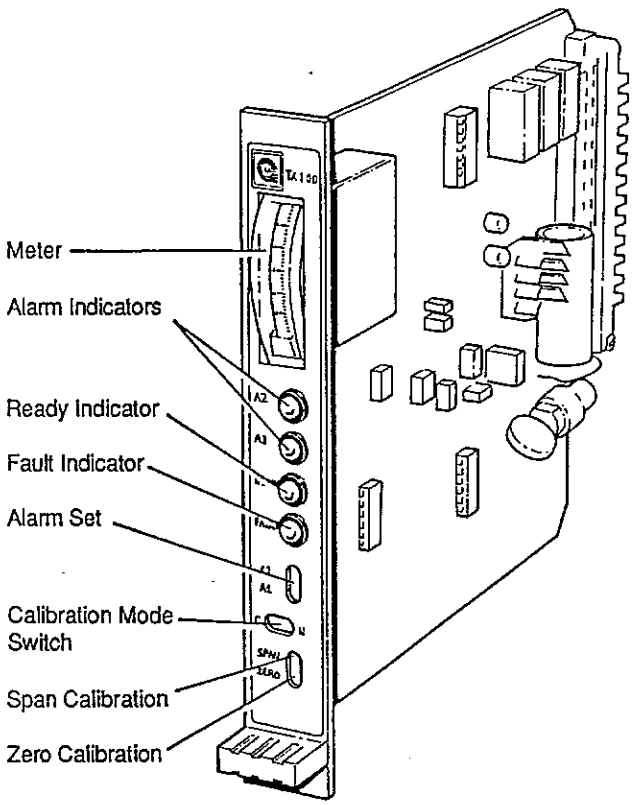
3-15 Initial System Power-Up

1 Using the calibration door tool, (P/N 220-005) place all channels in Calibration mode by sliding the CAL door actuators to the left.

Note that the A1 and A2 main outputs and relays, if fitted, will be held in standby condition in this mode, although the front panel alarm indicators will be active. The TF, LA1 and LA2 outputs are also active in CAL mode.

2 Apply power to the system as appropriate, and observe the indicators on the front panel of each control module.

Under normal conditions, the meter reading will settle in the range 0-100% FSD and no front panel indicators will illuminate during the time-out period of approximately one minute. Should a FAULT indicator continue to flash, refer to Section 6.



Operating Instructions

The chassis will normally be mounted in a control room in direct view of the operating personnel. The alarm indicators chosen for this instrument provide an unambiguous display even in high ambient lighting conditions.

Function of Indicators and Controls

4-1 % LEL Meter (TA100)

This analogue meter is scaled from 0-100% of the lower explosive level (LEL) of the gas/air mixture to which each channel has been calibrated.

Readings in excess of 100% LEL indicate that the concentration of gas in the vicinity of that channel's sensor, presents a serious potential hazard. Such over-range indications are latched and must be manually reset by the master reset switch.

Should a system malfunction occur, the fault indicator will be lit and the meter will read under-range.

4-2 ppm H2S Meter (TA200)

The analogue meter is scaled from 0-100 parts per million (ppm) Hydrogen Sulphide (H2S) gas. Due to the logarithmic response of the sensor to H2S readings under 5ppm cannot be accurately read on an instrument of this range.

NB 0-50 and 0-20 ppm ranges are also available.

Should a system malfunction occur, the Fault indicator will be lit and the meter will read under-range.

4-3 Ready Indicator

This green light-emitting-diode (LED) normally glows with a steady light indicating that the channel is operational, and the time-out period of 60 seconds is complete.

4-4 Alarm Indicators

The red 'A1' and 'A2' LED indicators are illuminated whenever the gas concentration at the sensor exceeds the set-point level to which the alarms have been pre-set. In normal operation this action will be accompanied by a gas alarm output signal and the change over of the alarm relay contacts, if fitted.

4-5 Fault Indicator

This indicator is normally off. When lit, it indicates a fault in the system and the Fault circuitry isolates the gas alarm circuitry. If Latching gas alarm circuitry was fitted, this will remain in the condition that existed before the fault occurred.

The Operator should refer to Section 6 for guidance when dealing with a system malfunction.

Note that both the FAULT and READY indicators will be illuminated if the controller is in Calibration mode.

4-6 Calibration Mode

Using the special tool provided (P/N 220-005) the Calibration Door is moved to the left. The module is then in Calibration Mode and the user has access to the Span/Zero, A1 and A2 adjustment potentiometers.

In Calibration mode the gas alarm outputs are disabled, although the A1 and A2 indicators remain active as does the Fault circuitry. The yellow FAULT indicator is illuminated steadily.

Note also that the CAL output on Pin 18d of the connector is held low in Calibration Mode.

4-7 Master Reset Switch

Modules which are wired for Latching Operation will remain in the active condition even when the gas concentration at the affected sensors drops below the set-point levels. Depressing the momentary-action Master Reset Switch will cancel these alarms, together with a latched over-range condition, if present.

Operation of the switch will have no visible effect if the gas concentration is above the set-point levels.

4-8 Accept Switch

(This section applies only to modules fitted with the Accept/Oscillator option).

Whenever a new gas alarm occurs on a module, the appropriate A1 and A2 alarm indicators flash to indicate a new alarm condition. Activation of the accept switch causes these indicators to remain steadily illuminated until they are either re-flashed by a new alarm or reset by a master reset or a falling gas concentration if non-latching alarm circuitry is fitted.

A flashing fault indication does not respond to an accept signal.

4-9 Calibration Instructions

Refer to the appropriate section of the Instruction Manual for the Analogue Sensor being used.

4-10 Alarm Settings

A1 Alarm

Rotate the zero potentiometer to give a meter reading corresponding to the desired A1 alarm set-point. Rotate the A1 alarm potentiometer in a clockwise direction if the A1 alarm indicator is already illuminated. Otherwise rotate this potentiometer in an anti-clockwise direction until the A1 alarm indicator just begins to flash.

Note that even if latching gas alarm circuits have been incorporated, these will operate as non-latching circuits in Calibration Mode. This facility minimises the risk of inadvertent alarms due to calibration door closure with active alarms.

A2 Alarm

Rotate the A2 alarm potentiometer to give a meter reading corresponding to the desired A2 alarm set-point. Rotate the A2 alarm potentiometer in a clockwise direction if the A2 alarm indicator is already illuminated. Otherwise rotate this potentiometer in a anti-clockwise direction until the A2 alarm indicator just begins to flash.

Rotate the zero potentiometer in an anti-clockwise direction so that the alarm indicators are extinguished. Note that some hysteresis is present in the alarm trip levels. This is required to prevent relay chatter.

Using the zero potentiometer recheck the alarm set-points and then set the meter to read 0% LEL using the zero potentiometer.

The Alarm set-points are now adjusted for this channel. Repeat for all remaining channels.

4-11 Pre-set Adjustments

The following information is included for the benefit of a service engineer. These adjustments have been pre-set at the factory and should only require re-setting in the event of a component replacement.

4-12 Set electronics supply rail to + 15V

Using a digital voltmeter set the electronics supply rail to 15.00 volts using the potentiometer VR3 'set 15V'.

4-13 Set Meter Mechanical Zero

Set the analogue input current to 4.00 mA. Ensure that the zero potentiometer is fully anti-clockwise (FC2-1 Pin 8 at 2 volts). Adjust the meter to give a reading of zero using the adjuster at the rear of the meter body.

Maintenance

5-1 Maintenance

Once correctly installed, systems require very little maintenance other than Routine Re-calibration. (See Section 4) and periodic inspection.

Sensor heads exposed to the elements may require a little grease on the accessory mounting threads occasionally. The greases used must be free from silicones (refer to Sub-section 3-5 Sensor Poisons) and have a high melting point. Alternatively, PTFE tape may be used.

The removal of particulate matter from sensor accessories may be facilitated by the use of an appropriate halogen-free solvent. Water or ethanol are examples of suitable solvents. The accessories should be thoroughly dried, with compressed air if necessary, before refitting to the sensor body.

General Monitors strongly recommends that the complete system, including all alarm circuitry, be tested at least annually and that the following checks be incorporated.

CHECK

1 All sensor assemblies for effectiveness of mounting positions so that modifications to plant layout have not affected this.

2 Security of mounting of sensor assemblies.

3 Sensor flame arresters for clogging due to water, oil, dust or paint.

4 Sensor accessories, where fitted.

5 Condition and fastening of cables.

6 Connections for tightness and damage.

7 Cooling air filters, where fitted. Ensure that replacement filters are clean and dry.

8 Operation of complete system on stand-by supplies, where fitted, for the full prescribed time.

9 Spare parts stocks (See Section 7)

5-2 Storage

Electronic modules should be stored in a clean dry area and within the temperature range quoted in the specification (refer to Section 2).

When prolonged storage is anticipated, modules should be sealed, together with a desiccant, into plastic bags and double wrapped for protection.

Both Hydrocarbon and Hydrogen Sulphide sensors should be stored as above, but note that in the latter case the RED CAP supplied with the sensor should be in position throughout the storage period.

Some degradation of the dielectric present in aluminium electrolytic capacitors will occur during prolonged storage, and after one year the initial leakage currents of these components may be up to one hundred times the leakage measured when new. It is therefore advisable to reform the dielectrics of these components after prolonged unpowered storage using the following method.

Remove the control modules from the chassis. Obtain a current and voltage limited DC power supply and set the output voltage to zero. Set the current limit to 100mA. Connect the supply in the correct polarity across the electrolytic capacitor. Slowly raise the applied voltage to nominal and observe that the current drain stabilises. Repeat for each module.

Basic Fault Finding

Included in this Section is a trouble shooting table. The information presented here is designed to cope with the more common faults which appear during system commissioning and operation and which are repairable by a competent operator.

Should the various actions suggested in the table fail to restore normal operation, the affected module may be replaced and sent for repair. A replacement control module will require calibration to gas (Refer Section 4).

On no account should repair of an electronic module be undertaken by anyone other than General Monitors personnel or authorised representative. Failure to comply with this requirement will invalidate the Warranty.

6-1 Basic Fault Finding

Symptoms	Possible Causes	Action
No front panel indicators alight and all meters less than zero	Loss of power to chassis	Check power supply to chassis
Intermittent or continuous fault indication	Low supply voltage	Ensure supply conforms to specification (22-32 VDC)
	Analogue output load in excess of specification	Check AO loads (200 ohms maximum)
	Analogue input currents less than 1mA	Check SIG IN circuitry
Meter reading less than zero. No fault indication	Module fuse blown	Replace fuse (1A Char 'T')
Meter reading normal, but no LED indication	Module in 60 seconds timeout period	Await completion of timeout
Fault & Ready indicators both ON continuously	Module in CAL mode	Slide CAL door right using calibration tool
	Remote sensor in CAL mode	Check for correctness of indication

6-2 Typical Values

The following table may be used as a guide to typical parameter values during servicing. Items marked with an asterisk(*) are factory set initially, and should not normally require re-adjustment.

Parameter	Design Value	Approx Range	Units	Circuit Ref.	Set using
Supply voltage	24	22-32	V	B+	–
Low voltage trip	20.5	±5%	V	IC 1-4	–
Low voltage hysteresis	1.6	–	V	R51	–
Regulated voltage	15.00	13-17	V	IC3	VR3*
Varistor rating	7	-	J	MOV 1,2	–
Supply interruption	20	–	mS	IC1-4	–
Timeout period	60	±10%	S	IC6	–
Sig. current	4-20	0-22	mA	R8, R9 VR2	VR2
Sig. Offset	4	FSD	mA	VR1	VR1
Common mode range	0-4	0-4	V	–	AO load
Over-range trip	21.5	21-22	mA	IC1-1	–
Cal mode trip	2	1-2.5	mA	IC 1-2,3	–
Fault trip	1	±10%	mA	IC1-4	–
Alarm set-point	–	0 FSD	–	IC2-3,4	VR4,5
AO load	–	0-200	ohms	–	–
Cal load voltage	B+	0-B+	V	Q1	–
Cal load current	10	0-10	mA	Q1	–
Relay contact voltage	110	–	VAC	K1,2,3	–
Relay contact current	1.25	–	A	K1,2,3	–
Relay contact rating	50	–	VA	K1,2,3	–
Open collector current	100	See Section 2	mA	TAF, TA1 TA2	
Auxiliary output current	50	–	mA	LA1, LA2	–

6-3 Circuit Description - Model TA100/TA200 Control Modules

Power Supply

The 24V (nominal) direct current supply appears on Pins 20z and 20d (B+) and on Pins 22z and 22d (OV). Diode D31 prevents damage to the equipment should the polarity of the supply be inadvertently reversed.

Fuse FS1 (5 x 20mm) is rated 1A Characteristic 'T' and protects both the electronics and the out going Vcc rail on pins 32z and 32d (+ 24V). Excessive voltage transients appearing on the supply are absorbed by the varistor MOV 1. Capacitors C9 and C2 attenuate low and high frequency noise on the Vcc supply.

6-4 Voltage Regulator Circuit

IC3 integrated circuit is a monolithic voltage regulator which operates in the linear mode and is internally protected against both current and power overload. Diodes D7 and D8 provide reverse voltage protection and capacitors C2, C3 and C4 improve stability and transient response. An internal temperature compensated reference voltage is developed across diode D8 and this is used in conjunction with potentiometer 'R3 to generate the 15V supply.

6-5 Input Amplifier

The analogue input current appears on pins 30z and 30d (SIG IN). It then flows through the parallel combination of resistors R8, R9 and potentiometer VR2 'span' before exiting via pin 24z (AO+).

The module will support a maximum external load of 200 ohms, connected between pin 24z (AO+) and system OV, which is available on pin 24d (AO–). These pins should be shorted if no external load is present.

In the standard module, resistors R8, R9 and potentiometer VR2 are equivalent to a 100 ohm insertion impendance.

The input voltage generated across the input network is coupled to the differential amplifier IC2-1 by resistors R7 and R10. Resistor R11 sets the amplifier gain at five and capacitor C1 provides high frequency roll-off. Resistor R6 connects to the offset adjustment divider formed by resistor R1 and potentiometer VR1 'zero'. This potentiometer is used to simulate a gas condition for alarm set-point adjustment and may also be used to provide an offset for 'dead-zero' inputs.

Transient over-voltage protection is provided by varistor MOV 2 and diodes D1, 2, 3 and 4.

6-6 Over-range Latch

The output of the over-range detector IC1-1 (pin 13) is normally low but switches high if the output of amplifier IC2-1 (pin 8) exceeds 10.5 volts.

This occurs when the input level reaches approximately 110% FSD. Regenerative feedback is then applied through diode D6. The module may be reset using the master reset switch, which diverts latching current to ground via diode D5.

Over-range latching is not normally employed in Hydrogen Sulphide modules (TA200) and may be removed from Hydrocarbon modules by snipping diode D6.

6-7 Alarm Circuits

The A1 and A2 gas alarm circuits are identical, so that only the A2 circuit need be described.

Operational amplifier IC2-3 is configured as a comparator with approximately 5% hysteresis due to regenerative feed-back through resistor R23.

In normal operation the voltage present on the output of amplifier IC2-1 representing gas concentration, is compared with the user-preset voltage on the slider of potentiometer VR4 representing the A2 alarm set-point.

When the comparator set-point voltage is exceeded, the comparator output (Pin 1) switches High and other conditions permitting, drives the Darlington output inverters IC7-1, -2, -3 Low.

Alarm latching is achieved by regenerative feed-back through resistor R20 and diode D13. Thus when IC3-1 Pin 11 switches Low, transistor Q2 is switched On and the logic High condition on the cathode of diode D10 is reinforced. Capacitor C5 introduces a delay so as to prevent spurious triggering.

The application of a Master Reset cancels the A2 alarm (via diode D11) only if the alarm comparator output is Low. Diode D13 is removed if non-latching operation is required.

An open collector alarm output is provided on connector Pin 14z TA2. This may optionally be normally de-energised, via programming link P2-0 or normally energised if P2-1 is used.

Note that both IC7-1 and IC7-2 inverters are inhibited in CAL mode, due to the diversion of drive current through diode D12 when the CAL signal is low.

The red LED alarm indicator (LED 1) is driven by inverter IC7-3 and is illuminated whenever IC2-3 switches on. Note that this output is routed to connector Pin 16z LA2 and is present even in CAL mode.

The Alarm circuitry is inhibited during Timeout due to a logic high on the anode of diode D9, which forces the comparator into an off condition for the sixty second timeout interval at power-up or following the clearing of a Fault condition.

6-8 Open-Collector Outputs

The provision of true open-collector low-offset transistor outputs is incompatible, in practical terms, with full voltage, current and power limiting of such outputs. The philosophy in this range of Control Modules is to provide all user accessible transistor outputs from one integrated circuit (IC7) containing seven Darlington circuits. This device is mounted in a socket to allow for convenient field replacement and may be regarded as a semiconductor fuse. The device is very conservatively rated and should provide the same high level of reliability that exists elsewhere in the Control Module circuitry.

The outputs are shown in the following table:

Alarm	Main Output	Auxiliary Output
A2	TA2 = Pin 14z	LA2 = Pin 16z
A1	TA1 = Pin 12z	LA1 = Pin 14d
Fault	TF = Pin 12d	

The Main outputs TA2, TA1 and TF are true open-collector outputs, unless relays are fitted, in which case they are used to drive the relay coils in parallel with any external load. The TA2 and TA1 outputs are inhibited by placing the module in Calibration Mode but the TF output is not.

The Auxiliary outputs LA2 and LA1 drive the A2 and A1 LED indicators together with any external load.

All open-collector outputs are fitted with isolation diodes to allow for the commoning of these outputs.

The LA2 and LA1 outputs have two possible modes of operation:

1 - Accept/Oscillator not fitted

In this case the LA2 and LA1 outputs operate concomitantly with the TA2 and TA1 outputs, with the exception that they are not inhibited in Calibration Mode.

2 - Accept/Oscillator fitted

In this case the LA2 and LA1 outputs have three possible conditions. These are:

* Off in the absence of a gas alarm
* Flashing at the frequency of the Oscillator in a gas alarm condition, prior to the receipt of an Accept signal or following a new gas alarm.
* On steadily in the presence of a gas alarm condition, following the receipt of an Accept signal.

An open-collector output is provided to indicate the presence of an unaccepted alarm. This output goes low on detecting a new alarm and will go high when the alarm is accepted. This facility is only available when the Accept/Oscillator option is fitted.

6-9 Accept/Oscillator Circuit

This optional circuit is used to provide an alarm reflash capability.

Integrated circuit IC5 and associated components is configured as an astable multi-vibrator whose output (Pin 3) drives the Fault indicator directly and modulates the gas alarm indicators via diodes D18 and D35.

The oscillator is normally in a quiescent condition (Pin 3 high) and is activated by a High on either IC4 (Pin 3) or IC2-2 (Pin 14).

A High on IC2 (Pin 14) occurs in a Fault condition, transistor Q5 is switched ON and the Fault indicator (LED 4) flashes at the frequency of the IC5 oscillator.

A High on IC4 (Pin 3) is caused by a gas alarm. In this case the VTH line goes Low via diode D14 or diode D26 and a negative-going pulse is received on IC4 (Pin 2). This pulse sets the IC4 bistable latch, causing the output (Pin 3) to go High. It will remain in this condition until reset by a High level on Pin 6, due to either the receipt of an Accept signal on the connector (Pin 18d) or a High level on the VTH line due to the resetting of the gas alarm circuitry. In the latter case, this may be due to either the automatic resetting of non-latching alarm circuits or the application of a Master Reset signal for latching circuits.

When the output of IC4 (Pin 3) goes high, the MPSA06 transistor is switched on resulting in an open-collector UA signal.

6-10 Timeout Generator

The timeout generator circuit, consisting of integrated timer IC6 and associated components is designed to provide a delay of one minute, after either application of power or a fault indication, during which operation of the alarm circuits is disabled. During the timeout period, capacitor C15 charges from +15V rail through resistor R62. When the capacitor voltage equals 10V, the output of IC6 (pin 3) changes to OV from + 15V, the green LED (LED 3) is switched On and the alarms are enabled.

6-11 Under-range Fault Detector

Should the analogue input current drop from its normal level of 4mA to less than 1mA, the output of the operational amplifier IC2-2 switches to a logic high and transistor Q5 is switched ON. The normally active fault output on connector pin 12d 'TF' is de-energised, the yellow Fault LED (LED 4) is illuminated and the output signal of the timeout generator (IC6) is switched 'high' to disable the alarms via diodes D9 and D20. The green LED is switched off at this time.

6-12 Supply Fault Detector

Integrated comparators IC1-4 and its associated components form the fault detector.

This open-collector output device is normally off, but its output (pin 1) switches to a 'low' condition if the supply voltage falls below 20.5V. This causes the input amplifier output to fall to approximately zero, which is detected by the under-range fault detector as before.

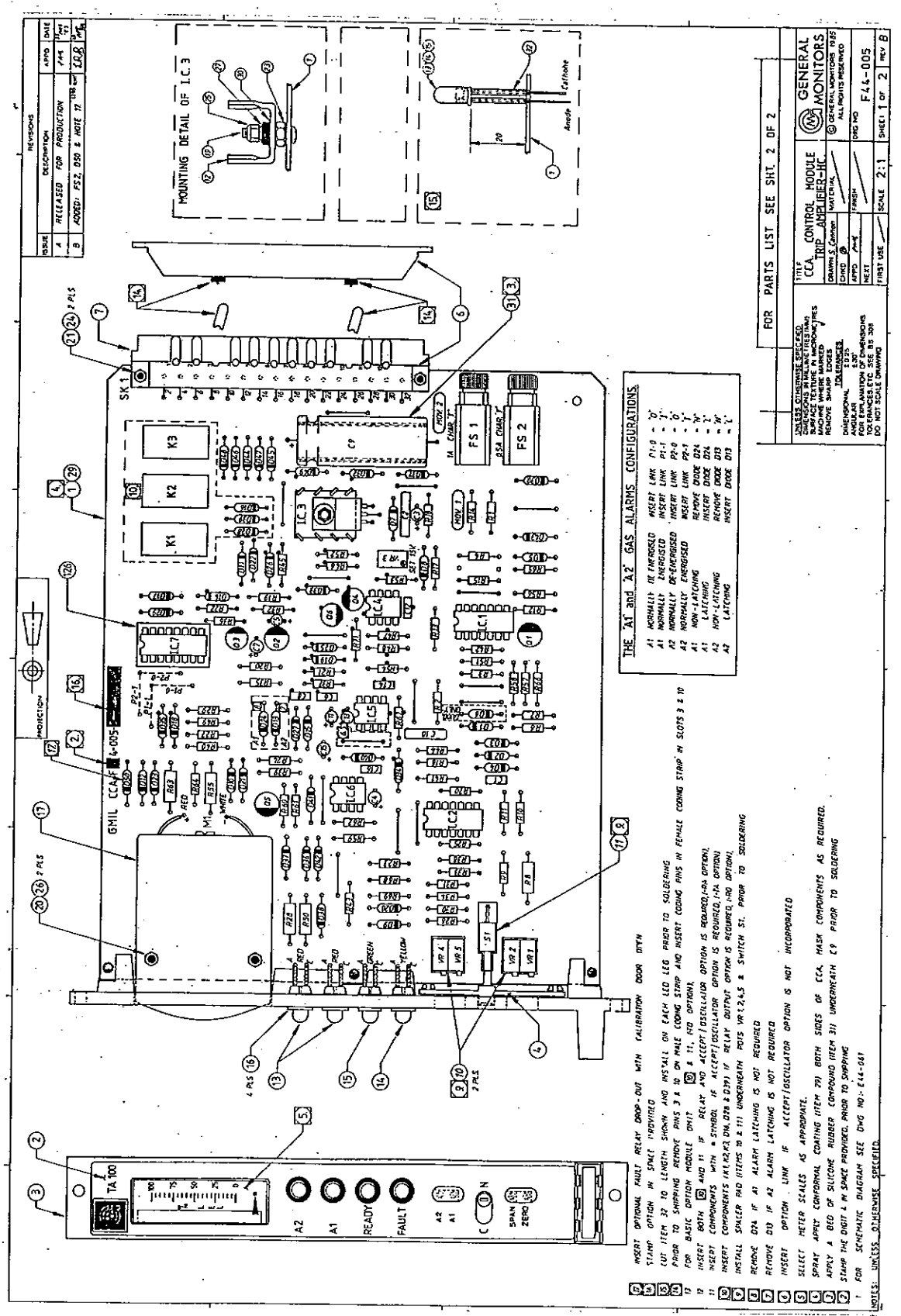
6-13 Remote Cal Detector

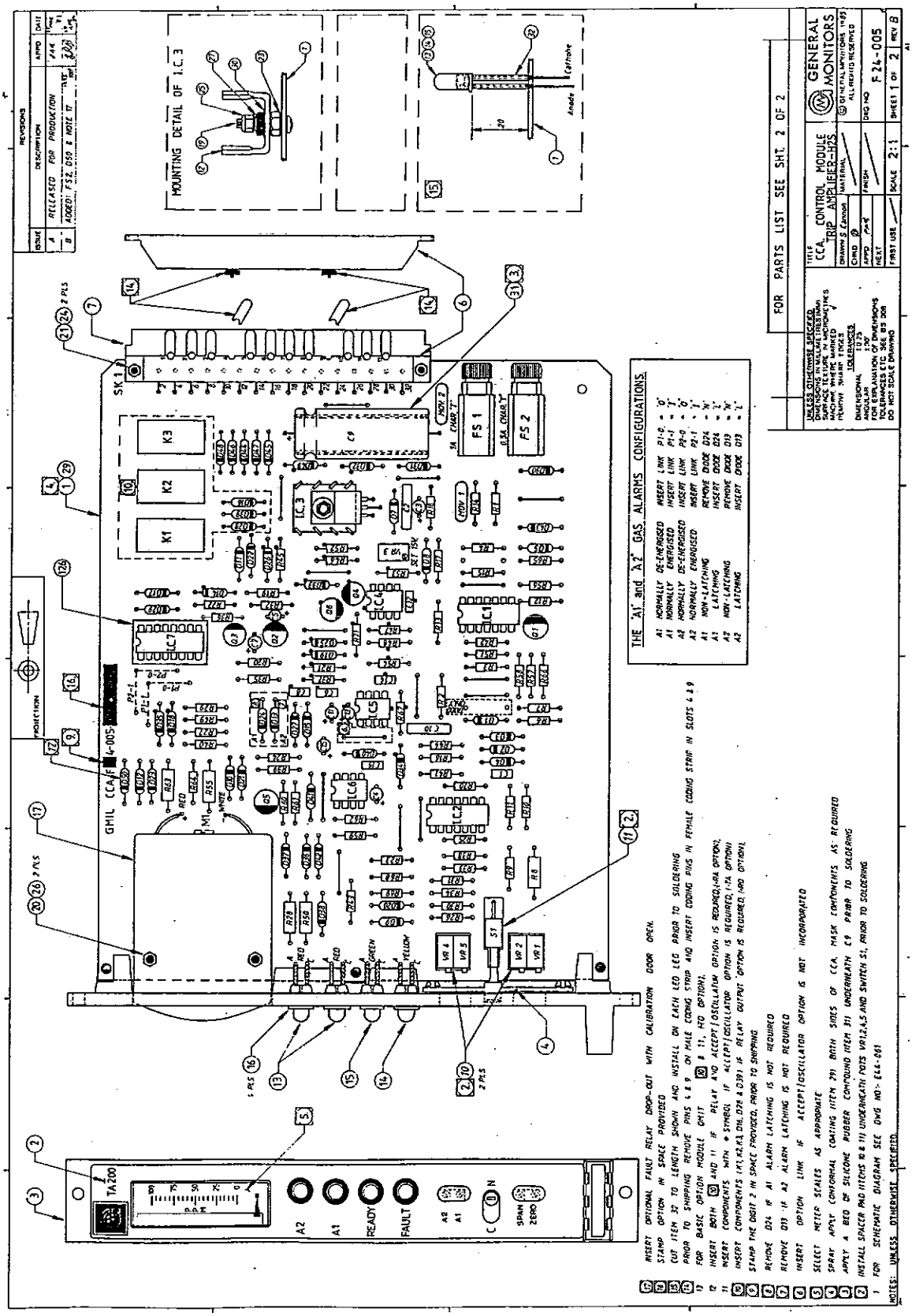
The output of comparator IC1-2 is low in normal operation. Transistor Q1 is therefore normally off. Calibration mode is detected at an input current between 1mA and 2.5mA, causing IC1-2 to switch off and allowing transistor Q1 to switch on. When this occurs, the yellow LED (LED 4) is illuminated steadily and the CAL output (pin 18z) is taken low. The green LED (LED 3) continues to glow steadily.

Note that the lower levels of input current activate the fault circuitry, IC1-3 switches low and the CAL detector is therefore de-activated. When this occurs the green LED will be off and only the yellow Fault LED will be on.

6-14 Optional Alarm Relays

Where relay outputs are required, relays K1, K2 and K3 may be specified. Note that the open-collector type outputs TA2, TA1 and TF are still available for customer use but at a reduced maximum current capability.


MOUNTING DETAIL OF I.C.3
THE 'A1' and 'A2' GAS ALARMS CONFIGURATIONS
FOR PARTS LIST SEE SHT. 2 OF 2
TITLE CCA CONTROL MODULE TRIP AMPLIFIER-HC
GENERAL MONITORS
DRAWN S. Cotton
DRG NO F44-005
SCALE 2:1
SHEET 1 OF 2
REV B
TA100
A2
A1
READY
FAULT
SPAN
ZERO


MOUNTING DETAIL OF I.C.3
THE 'A1' and 'A2' GAS ALARMS CONFIGURATIONS
FOR PARTS LIST SEE SHT. 2 OF 2
GENERAL MONITORS
TITLE CCA. CONTROL MODULE TRIP AMPLIFIER-TA25
DRG NO F 24-005
SHEET 1 OF 2 REV B
TA200
A2
A1
READY
FAULT
SPAN
ZERO