

PROC-FC/CB/P&P/KPD-4366/2019 For Up-gradation of RIC Package I & II at Kunner Plant

Sr.No	Query	Response from OGDCL
1	As per attached SOR Annexure I Page Number 2 of 4 “wiring drawing and sequence of operation for existing system is enclosed with this scope.” Is missing, please share for review and record?	OGDCL: Attached please find wiring drawing and sequence of operation for existing system.
2	We are Planning Site Visit as per SOR clause “Requirements from bidder” point 1 to understand the job scope on dated 11 June 2019. Please confirm the technical team availability and arrange pickup of our team from Hyderabad Sindh Pakistan to Kunnar Site and Vice Versa?	OGDCL: Yes, your Team can visit our Plant site on 13th or 14th June, 2019. Please share details of your Technical Team (Name, Designation, CNIC, Contact Number) for prior security approval & transportation.
3	<p>As per SOR Annexure II “Modifications required in existing system:” point 1 “In existing system, switches are being used for tripping of following signals which are intended to be replaced with Pressure Transmitters for continuous monitoring as well as tripping of these critical parameters. The Pressure Transmitters are intended to be installed in Panel and Customer’s supplied Tubing from Package will be connected with these Pressure Transmitters inside Panel. Bidder shall be responsible for supply of required Pressure Transmitters (already included in scope of supply) programming / configuration of these signals for continuous monitoring as well as tripping of below mentioned signals:</p> <p>Please Clarify following for above?</p> <ul style="list-style-type: none"> a- Pressure Transmitters will be installed in Existing Panel (if Any of Pressure Switches), or we have to include separate Panel for all 08 Pressure Transmitters for each RIC? b- Pressure Transmitter Installation, testing, calibration and Loop testing till Control Panel will be in vendor scope? Or vendor scope is only programming / configuration of these Pressure Transmitter signals? c- Whether Power/signal Cable Laying and Termination till Controller Panel is Vendor scope of work Or OGDCL team will lay and terminate the cable? d- Pneumatic Tubing and all tubing accessories will be provide by OGDCL or its vendor scope of supply? e- Panel Mounting Bracket of Pressure Transmitter and Two Way Manifold will be provide by OGDCL or its vendor scope of supply? 	<p>OGDCL: Our recommendation is to install pressure transmitters inside panel to avoid extra mounting frame, cabling & tubing. SS Tubing for the process parameters in existing system is already available till the existing panel. However, you may quote as per your convenience considering all the material & services required for separate panel of pressure transmitters is in bidder’s scope.</p> <p>OGDCL:</p> <ul style="list-style-type: none"> a. Our recommendation is to install pressure transmitters inside panel to avoid extra mounting frame, cabling & tubing. SS Tubing for the process parameters in existing system is already available till the existing panel. However, you may quote as per your convenience considering all the material & services required for

		<p>separate panel of pressure transmitters is in bidder's scope.</p> <ul style="list-style-type: none"> b. Pressure Transmitter Installation, testing, calibration and Loop testing till Control Panel will be in Vendor scope. c. Wiring / termination of field instruments with new system will be performed by OGDCL staff under supervision of bidder's representative. d. Yes, Pneumatic Tubing and all tubing accessories will be provide by OGDCL. e. Panel Mounting Bracket of Pressure Transmitter and Two Way Manifold will be provided by Bidder.
<p>4</p>	<p>1. As per SOR Annexure II "Modifications required in existing system:" Point 3 & 4 "In existing control philosophy, recycle valve is controlled via 3-15 psi control signal. Since after up-gradation this control signal will be electronic based 4-20mA from Controller's Analogue output module. In existing control governor is controlled via 3-15 psi control signal. Since after up-gradation this control signal will be electronic based 4-20mA from Controller Analogue output module therefore 01 no. I/P convertor is required for converting 4-20mA signal to 3-15psi control signal for existing Governor Assembly.</p> <p>Please Clarify following for above?</p> <ul style="list-style-type: none"> a- Installation of I/P Converter is Vendor scope of work or in OGDCL scope? b- Instrument Air (Free of oil, water, and dust) Supply required for I/P Converter. Please confirm availability 	<p>OGDCL:</p> <ul style="list-style-type: none"> a. It is in VENDOR Scope b. Instrument Air will be supplied by OGDCL.

A shutdown fault input detected by one of up to 32 sensing switches, or a manual or remote stop signal causes MicroGuard-II to close the Main Fuel Valve and start the Aux Lube Pump for the post-lube cycle. After a short delay (FF), the ignition system is grounded by Relay 7, the engine comes to a full stop and MicroGuard-II displays the first-out shutdown cause and any alarms that preceded it. If the stop signal is caused by a fault, not a manual stop, alarm/horn and shutdown Relays (5 and 6) energize and remain energized until reset by panel keys, or remotely by the optional RS-422/485 serial link.

A great deal of flexibility is provided to the user. For instance, setting the Pre-lube Timer to zero causes the engine to be started immediately upon receipt of a start signal without the delay of a pre-lube cycle. The Gas Engine sequence is also adaptable to diesel engines, since it can be configured for multiple crank attempts.

4.4 Gas Engine Operating Procedure

This procedure describes in step-by-step fashion how to start and stop the engines. Read it in conjunction with Figure 4-4, *Gas Engine Startup and Shutdown Displays*, a one-page flow chart of the procedure. See also Section 4.2, *Basic Operating Procedures*, for handling alarms and shutdowns, Test Mode, and View Mode. In the following, each display is shown and is followed by an explanation.

A MANUAL STOP

**SHUTDOWN
POWER FAILURE**

Display shows cause of previous stop or shutdown. Example at left shows Manual stop using STOP key or remote stop input. At right is a powerdown, if configured RESET TO LOCKOUT.

Press ACCEPT, RESET if display is flashing **SHUTDOWN**.

A SYSTEM READY

A MANUAL STOP

System is awaiting START key to begin the starting sequence, or SELECT key to enter View Mode and review channels.

Press START to begin the starting sequence.

- Engine must be stopped. After a power failure, for example, wait until Tach 1 detects no rotation.
- START erases the alarm history and starts a new one.

PRELUBE: 0408

(408 seconds left in pre-lube cycle)

- Monitoring continues for Class A alarms.
- Aux Lube Pump Relay 1 operates.
- Pre-lube Timer FA begins counting down

PRELUBE: TURBO

MicroGuard-II is configured for Turbo Boost and is waiting for the turbocharger to reach Turbo CTS (F8) before beginning crank.

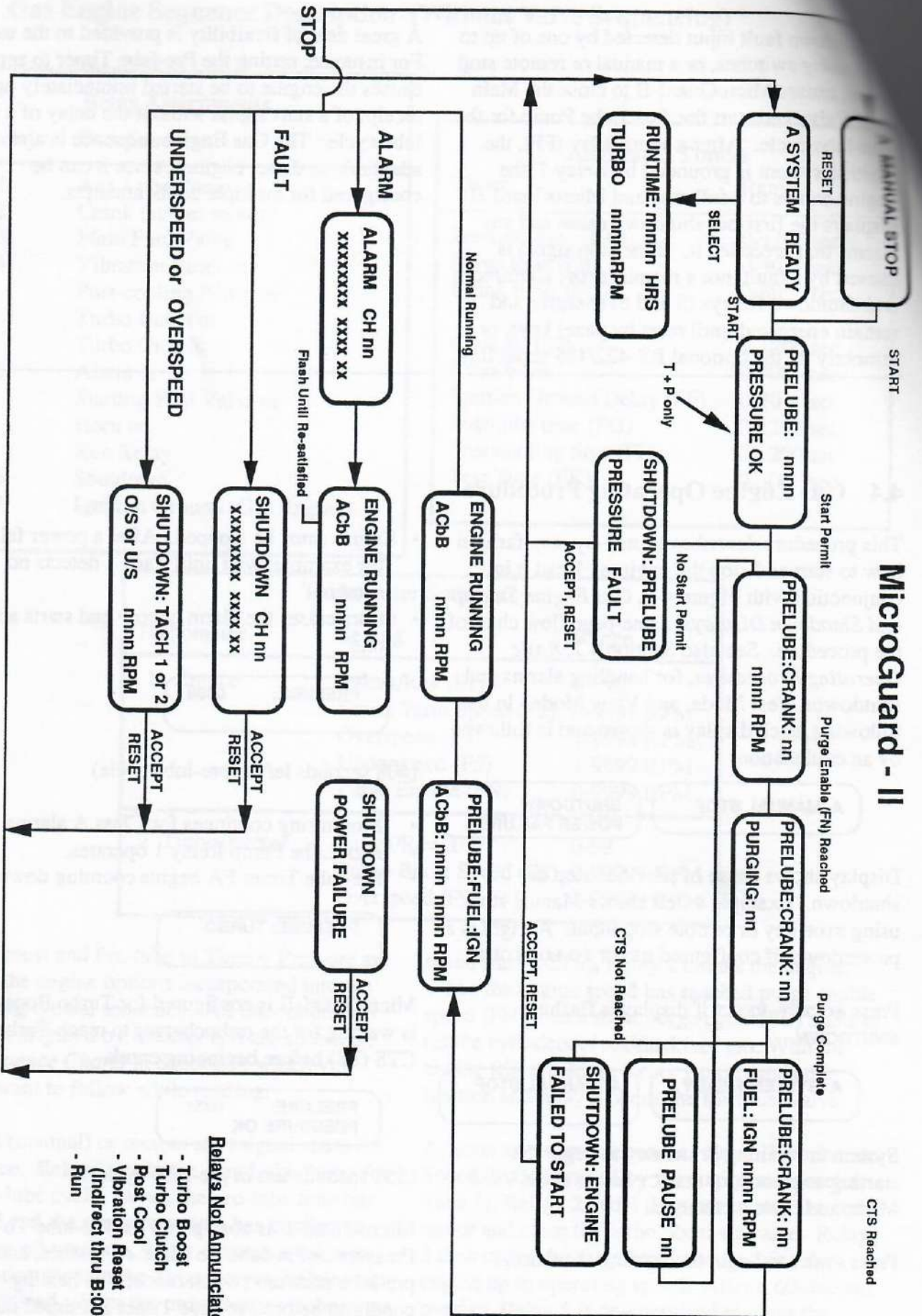
**PRELUBE: 0351
PRESSURE OK**

(351 seconds left in pre-lube cycle)

MicroGuard-II is configured for Pre-lube To Pressure or Pre-lube To Time + Pressure, and the pre-lube pressure switch reached its healthy condition before Pre-lube Timer FA timed out.

MicroGuard - II

CTS Reached



Relays Not Annunciated

- Turbo Boost
- Turbo Clutch
- Post Cool
- Vibration Reset (Indirect thru B:0000)
- Run

Fig. 4-4 Gas Engine: Startup and Shutdown Displays

**SHUTDOWN:PRELUBE
PRESSURE FAULT**

MicroGuard-II is configured for Pre-lube to Pressure or Pre-lube to Time + Pressure, and the pre-lube pressure switch did *not* reach its healthy state before Pre-lube Timer F9 timed out.

**PRELUBE:CRANK:19
0150 RPM**

(19 seconds left to crank)

MicroGuard II is waiting for Tach 1 to reach purge permit speed (FN).

**PRELUBE:CRANK:16
PURGING: 07**

(16 seconds left to crank)
(7 seconds left to purge)

- Pre-lube conditions have been satisfied to start cranking.
- Engine RPM has enabled the purge cycle.
- Pre-lube pump (Relay 1) is running.
- Relay 2 is energized to crank the engine for the purge cycle.
- Crank Timer FC is counting down.
- Purge Timer FB is counting down.

**PRELUBE:CRANK:05
FUEL:IGN:0128RPM**

(5 seconds left to crank)
(128 = measured RPM, Tach 1)

- Pre-lube pump is still running.
- Purge cycle is complete.
- Relay 2 continues to crank the engine.
- Fuel Relay (3 or 5) is energized and fuel is on.
- Relay 7 is energized to unground the ignition.

**PAUSE:08
:0000RPM**

(8 seconds pause remaining until next crank attempt)

Fuel and ignition relays are de-energized.

MicroGuard II has been configured for multiple crank attempts. At the end of the pause the sequence including purge cycle must be repeated from the start of cranking.

**SHUTDOWN: ENGINE
FAILED TO START**

Engine did not reach crank termination speed (CTS, parameter F2) before Crank Timer FC timed out.

**ENGINE RUNNING
AC B0059 0389RPM**

(59 seconds left for Class B timer)
(389 = measured RPM, Tach 1)

- Prelube pump (relay 1) continues to run. Engine has reached crank termination speed.
- All Class A channels are being monitored.
- Class B timer FD is counting down.
- Class b channels are bypassed, no b is displayed until the Class b Timer FE has timed out (time left is not displayed).
- Class C and B channels are being individually monitored as they become healthy.
- If any shutdown channel being monitored becomes unhealthy, MicroGuard II shuts the engine down and flashes SHUTDOWN.
- If any alarm channel being monitored becomes unhealthy, MicroGuard II flashes ALARM.
- To acknowledge alarms and shutdowns, see Sections 4.2.5, New Alarm, and 4.2.6, Shutdowns.
- A, C, B flash if alarm channels of those classes remain unhealthy after being acknowledged.
- In addition, C flashes if any Class C channels have not yet become healthy.

**ENGINE RUNNING
ACbB0035**

(35 seconds left for Class B Timer)
(564 = measured RPM, Tach 2)

- Class b Timer FE has timed out so b is displayed.
- All Class b channels are now being monitored (in addition to the channels described above.)
- Aux Lube Pump (relay 1) is stopped.

ENGINE RUNNING
ACbB 1064 RPM

(1064 = measured RPM, Tach 1)

This is the normal running display - engine is running within underspeed F5 and overspeed F3 limits.

All timers used at startup have timed out.

See also Section 4.2.4, *RPM, Normal Running*.

A MANUAL STOP

or

**A MANUAL STOP
POSTLUBE: 0020**

Engine was stopped by manual STOP or a remote stop input

SHUTDOWN
(Cause is displayed)

or

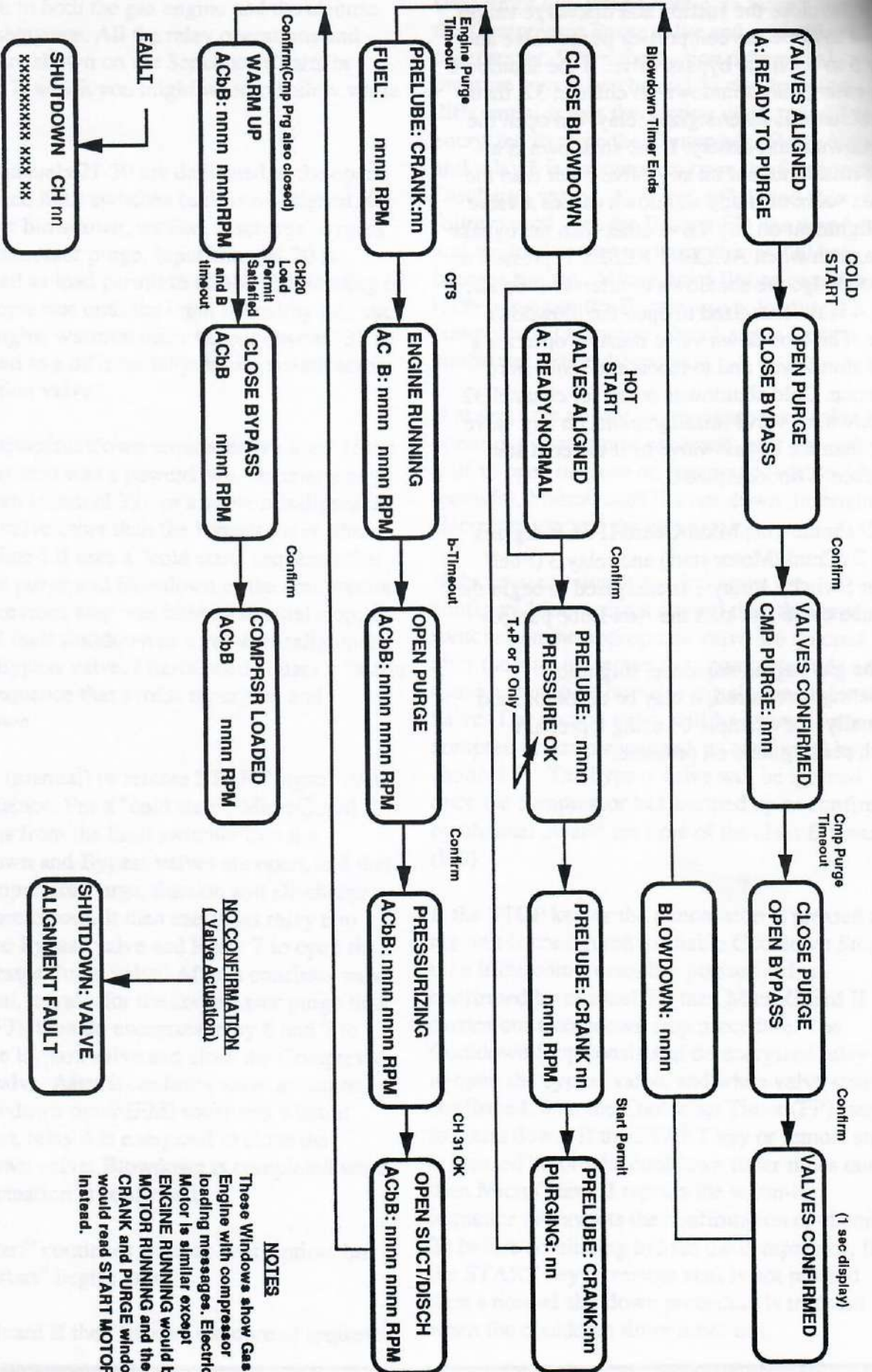
ALARM
(Cause is displayed)

Alarms or shutdowns can occur at any time. See Sections 4.2.5, *New Alarms*, and 4.2.6, *Shutdowns*, for the procedure to acknowledge alarms and shutdowns and to display the alarm history.

On any fault shutdown or local (manual) or remote stop, MicroGuard-II:

- Starts Post-lube Timer FG to energize Relay 1, thereby operating the Aux Lube Pump.
- De-energizes Fuel Relay 3 to cut off fuel.
- De-energizes Ignition Grounding Relay 7 (after delay FF, used to burn up residual gas), grounding the ignition system.
- Bypasses Class C, b, and B channels so they cannot create alarms or shutdowns.
- If configured for Post-cooling, starts Timer FH to energize Relay 4, thereby operating the cooling pump.

MicroGuard-II



NOTES

These Windows show Gas Engine with compressor loading messages. Electric Motor is similar except ENGINE RUNNING would be MOTOR RUNNING and the CRANK and PURGE windows would read START MOTOR instead.

Fig. 4-7 . Valve Sequencing: Startup and Shutdown Displays

4.8 GAS ENGINE VALVE SEQUENCING OPERATING PROCEDURE, START-UP

4.8.1 Overview

This procedure describes a step-by-step fashion how to start and stop the engine. Read it in conjunction with Figure 4-7, Gas engine Valve Sequencing Start-up and Shutdown Displays, a one-page flow chart of the procedure. See also Section 4.2, Basic Operating Procedures, for handling alarms and shutdowns, Test Mode and View Mode. In the following, each display is shown and is followed by an explanation.

4.8.2 Cold Start

**VALVES ALIGNED
A: READY TO PURGE**

The previous shutdown was a powerdown, channel 32 (Emergency Shutdown) or a valve misalignment on any valve other than the bypass valve. The compressor has been vented to atmosphere (blowdown) and MicroGuard II will perform a "cold start".

MicroGuard-II has confirmed from limit switches connected to channels 21-30 that the valves are in the following ready to start configuration:

Channel 22	Blowdown Valve	Open
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 28	Bypass Valve	Open
Channel 29	Comp. Purge Valve	Closed

All 7 relays are de-energized, all Class A shutdown channels are healthy.

Press **START**

**OPEN PURGE
CLOSE BYPASS**

Relays 6 (Bypass) and 7 (Compressor Purge) are energized.

**VALVES CONFIRMED
CMP PURGE: 105**

(105 seconds remaining in purge cycle)

The following valve positions have been confirmed (within 40 seconds):

Channel 22	Blowdown Valve	Open
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 27	Bypass Valve	Closed
Channel 30	Comp. Purge Valve	Open

**CLOSE PURGE
OPEN BYPASS**

- Compressor Purge Timer (FH) has timed out
- Relays 6 & 7 are de-energized

VALVES CONFIRMED

The blowdown timer (FM) begins counting down.

The following valve positions have been confirmed (within 40 seconds),

Channel 22	Blowdown Valve	Open
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 28	Bypass Valve	Open
Channel 29	Comp. Purge Valve	Closed

BLOWDOWN: 0200

(20 seconds remaining in the blowdown cycle)

CLOSE BLOWDOWN

Relay 4 (blowdown) is energized.

4.8.3 Warm Start

The following valve positions have been confirmed (within 40 seconds if from cold start):

Channel 21	Blowdown Valve	Closed	(19 seconds left to crank)
Channel 23	Suction Valve	Closed	(20 = measured RPM, Tach 1))
Channel 25	Discharge Valve	Closed	
Channel 28	Bypass Valve	Open	
Channel 29	Comp. Purge Valve	Closed	

The valve positions just listed resulted from either a manual stop or a fault shutdown from *other than* channel 32 (Emergency Shutdown) or a misalignment fault on the bypass valve or any other system shutdown such as overspeed. The compressor has *not* been vented to the atmosphere since the last cold start. When **START** is pressed, a "warm start" sequence will take place, that is, no blowdown or purge of the compressor.

Press **START** (for a warm start). If a warm start, at this point display would be:

**VALVES ALIGNED
A: READY NORMAL**

(If already in the "cold start" sequence, MicroGuard-II proceeds without pressing **START** again).

**PRELUBE: 1178
VALVES ALIGNED**

(1178 seconds left in prelube)

- The valve positions listed above have been confirmed.
- Relay 1 (Aux-Lube Pump) is energized.
- The prelube timer is counting down.

**PRELUBE: 0956
PRESSURE OK**

(19 seconds left in prelube cycle)

- The Pre-lube Timer is counting down.
- MicroGuard-II is configured for Prelube To Time + Pressure, and the prelube pressure switch reached its healthy condition before Prelube Timer FA timed out.

**PRELUBE: CRANK: 19
0020RPM**

- Pre-lube conditions have been satisfied to start cranking.
- Pre-lube pump (Relay 1) is running.
- Relay 2 is energized to crank the engine.
- Crank Timer FC is counting down.

**PRELUBE: CRANK: 15
PURGING : 07**

(15 seconds left to crank)
(7 seconds left to purge)

Engine RPM has reached the purge enable speed (FN).

Purge timerFB is counting down.

**PRELUBE: CRANK;12
FUEL 0379RPM**

(12 seconds left to crank)
(379 = measured RPM, Tach 1)

- Pre-lube pump (Relay 1) continues to run.
- Purge cycle is complete.
- Relay 2 continues to crank the engine.
- Fuel Relay 3 is energized and fuel is on.

**PAUSE: 08
0000RPM**

(8 seconds pause remaining until next crank attempt)

- Fuel and ignition relays are de-energized.
- Purge cycle must also be repeated.

MicroGuard II has been configured for multiple crank attempt. At the end of the pause the sequence including purge cycle must be repeated from the start of cranking.

**SHUTDOWN: ENGINE
FAILED TO START**

Engine did not reach crank termination speed (CTS, parameter F2) before Crank Timer FC timed out.

ENGINE RUNNING
AC B0247 0389 RPM

(247 seconds left for B-Timer)
(389 = measured RPM, Tach 1)

- Pre-lube pump (Relay 1) continues to run.
- Engine has reached crank termination speed.
- All Class A channels are being monitored
- Class B Timer (parameter FD) is counting down.
- Class b channels are bypassed—no b is displayed until the Class b Timer (parameter FE) has timed out (time left is not displayed).
- Class C and B channels are being individually monitored as they become healthy.
- If any shutdown channel being monitored becomes unhealthy, MicroGuard II shuts the engine down and flashes **SHUTDOWN**.
- If any alarm channel being monitored becomes unhealthy, MicroGuard II flashes **ALARM**.
- To acknowledge alarms and shutdowns, see Section 4.2.5, *New Alarm*, and 4.2.6, *Shutdowns*.
- **A, C, B** flash if alarm channels of those classes remain unhealthy after being acknowledged.
- In addition, **C** flashes if any Class C channels have not yet become healthy.

OPEN PURGE
ACbB:0189 0564RPM

(189 seconds left for B Timer)
(564 = measured RPM, Tach 1)

- Class b Timer FE has timed out so b is displayed.
- All Class b channels are now being monitored (in addition to the channels described above).
- Aux Lube Pump (Relay 1) is stopped.
- When the b Timer times out, relay 7 (Compressor Purge valve) is energized to pressurize the compressor.

PRESSURIZING
ACbB:0104 0564RPM

(104 seconds left for B-Timer)
(564 = measured RPM, Tach 1)

The following valve positions have been confirmed (within 40 seconds):

Channel 21	Blowdown Valve	Closed
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 28	Bypass Valve	Open
Channel 30	Comp. Purge Valve	Open

OPEN SUCT/DISCH
ACbB:0094 0564RPM

(94 seconds left for B-Timer)
(564 = measured RPM, Tach 1)

The Suction Valve Differential Pressure switch (on channel 31) has confirmed low differential across the suction valve within 10 minutes, de-energizing Relay 7 (Compressor Purge) and energizing Relay 5 (Suction/Discharge).

If channel 31 does not confirm low differential pressure, MicroGuard II begins a warm shutdown.

WARM UP
ACbB:0085 0620RPM

(85 seconds left for B-Timer)
(620 = measured RPM, Tach 1)

The following valve positions have been confirmed (within 40 seconds):

Channel 21	Blowdown Valve	Closed
Channel 24	Suction Valve	Open
Channel 26	Discharge Valve	Open
Channel 28	Bypass Valve	Open
Channel 29	Comp. Purge Valve	Closed

CLOSE BYPASS
ACbB 0625RPM

(B-Timer timed out)
(625 = measured RPM, Tach 1)

Load permit has been confirmed by a healthy condition on channel 20.
Relay 6 (bypass valve) is energized when the B

timer has timed out and when channel 20 load permit has reached a healthy condition.

**COMPRSR LOADED
ACbB 1064RPM**

(1064 = measured RPM, Tach 1)

The following valve positions have been confirmed (within 40 seconds):

Channel 21	Blowdown Valve	Closed
Channel 24	Suction Valve	Open
Channel 26	Discharge Valve	Open
Channel 27	Bypass Valve	Closed
Channel 29	Comp. Purge Valve	Closed

- This is the normal running display — engine is running within underspeed (parameter F5) and overspeed (parameter F3) limits.
- All timers used at start-up have timed out.
- All valves except Suction (CH23, CH24) and Bypass (CH27, 28) remain as shown above when the compressor is loaded and running. If the Suction or Bypass valves are configured as “Controlled”, then their movements are ignored.
- For shutdowns, refer to Section 4.10.
- See also Section 4.2.4, RPM, Normal Running.

4.9 Electric Motor Valve Sequencing Operating Procedure

4.9.1 Overview

This procedure describes in step-by-step fashion how to start and stop the engine. Read it in conjunction with Figure 4-7, Gas engine Valve Sequencing Start-up and Shutdown Displays, a one-page flow chart of the procedure. See also Section 4.2, Basic Operating Procedures, for handling alarms and shutdowns, Test Mode and View Mode. In the following, each display is shown and is followed by an explanation.

4.9.2 Cold Start

**VALVES ALIGNED
A: READY TO PURGE**

The previous shutdown was a powerdown, channel 32 (Emergency Shutdown) or a valve misalignment valve other than the bypass valve. The compressor has been vented to atmosphere (blowdown) and MicroGuard II will perform a “Cold start”.

MicroGuard II has confirmed from limit switches connected to channels 21-30 that the valves are in the following ready to start configuration:

Channel 22	Blowdown Valve	Open
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 28	Bypass Valve	Open
Channel 29	Comp. Purge Valve	Closed

All 7 relays are de-energized, all Class A shutdown channels are healthy.

Press START.

**OPEN PURGE
CLOSE BYPASS**

Relays 6 (bypass) and 7 (compressor purge) are energized.

**VALVES CONFIRMED
CMP PURGE: 105**

(105 seconds remaining in purge cycle.)

The following valve positions have been confirmed (within 40 seconds):

Channel 22	Blowdown Valve	Open
Channel 23	Suction Valve	Closed
Channel 25	Discharge Valve	Closed
Channel 27	Bypass Valve	Closed
Channel 30	Comp. Purge Valve	Open

**CLOSE PURGE
OPEN BYPASS**

- Compressor Purge timer (FJ) has timed out.
- Relays 6 and 7 are de-energized.

VALVES CONFIRMED

- The blowdown timer (FM) begins counting down.



Fig. 7-1 Gas Engine Sequence Chart

1. Start mlt
Pre-lube terminated by FA.
(Turbo Boost Only)

2. Crank Starts
Turbo: Tach 2 CTS (FB)
Non-Turbo: Pre-lube terminated by FA.

3. Tach 1 surpases.
Purge Enable (FN)

4. Endline Purge Ends:
(FB)

5. Crank Ends:
Tach 1 CTS (F2)

6. "y" Timer
Countdown Ends (FE)

7. "B" Timer
Countdown Ends (FD)

8. 60 second Overlap with Main Fuel Valve.

9. Ignition Ground-Delay (FF) - If Programmed.

10. Post-lube (FG)

11. Post-cool (FH)

Note: Relays 5 & 6 (Alarm/Horn & Shutdown) only operate during a fault and go off with ACCEPT (Horn) then RESET (Alarm and Shutdown).

TIMING DIAGRAM

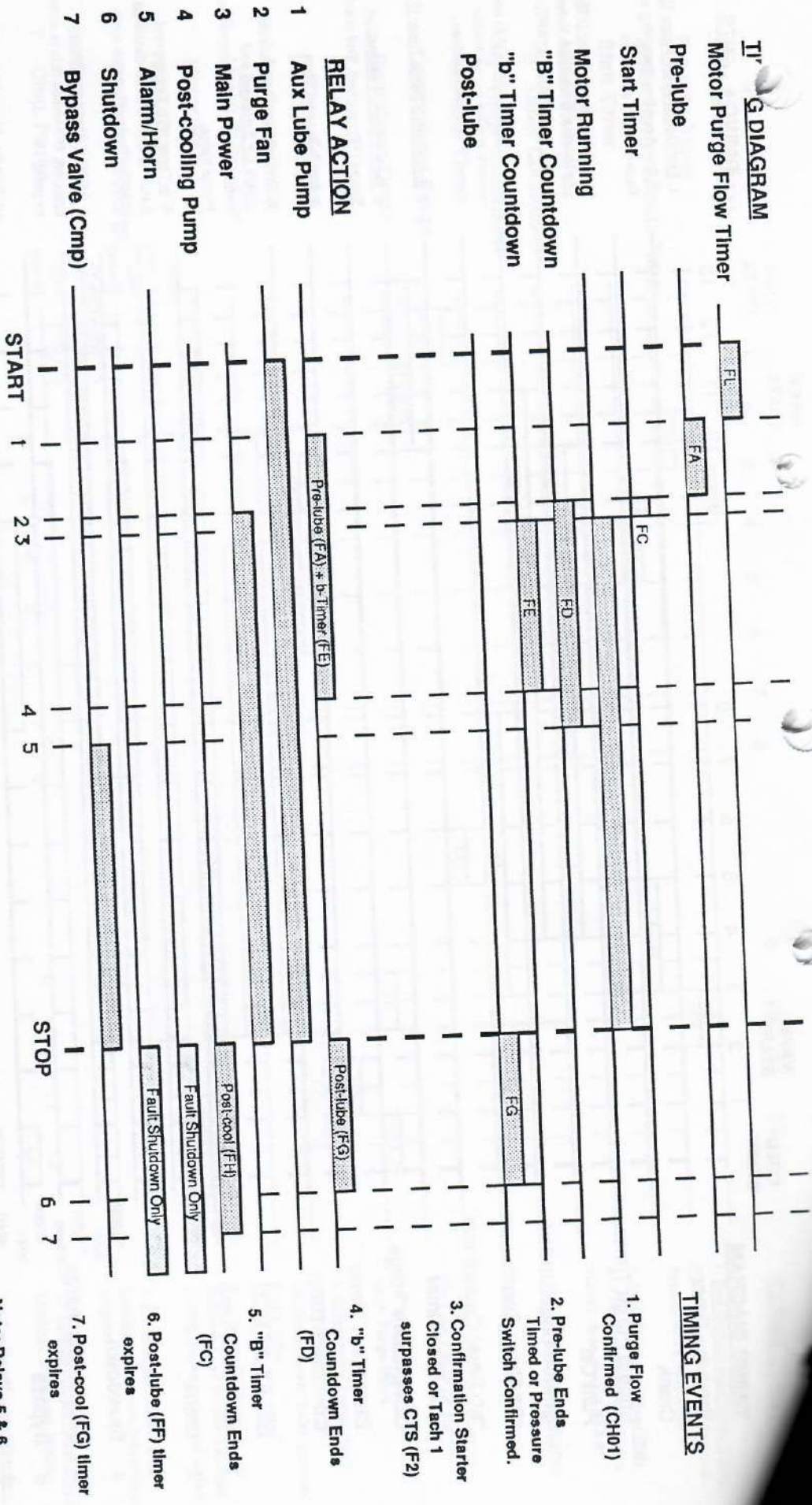
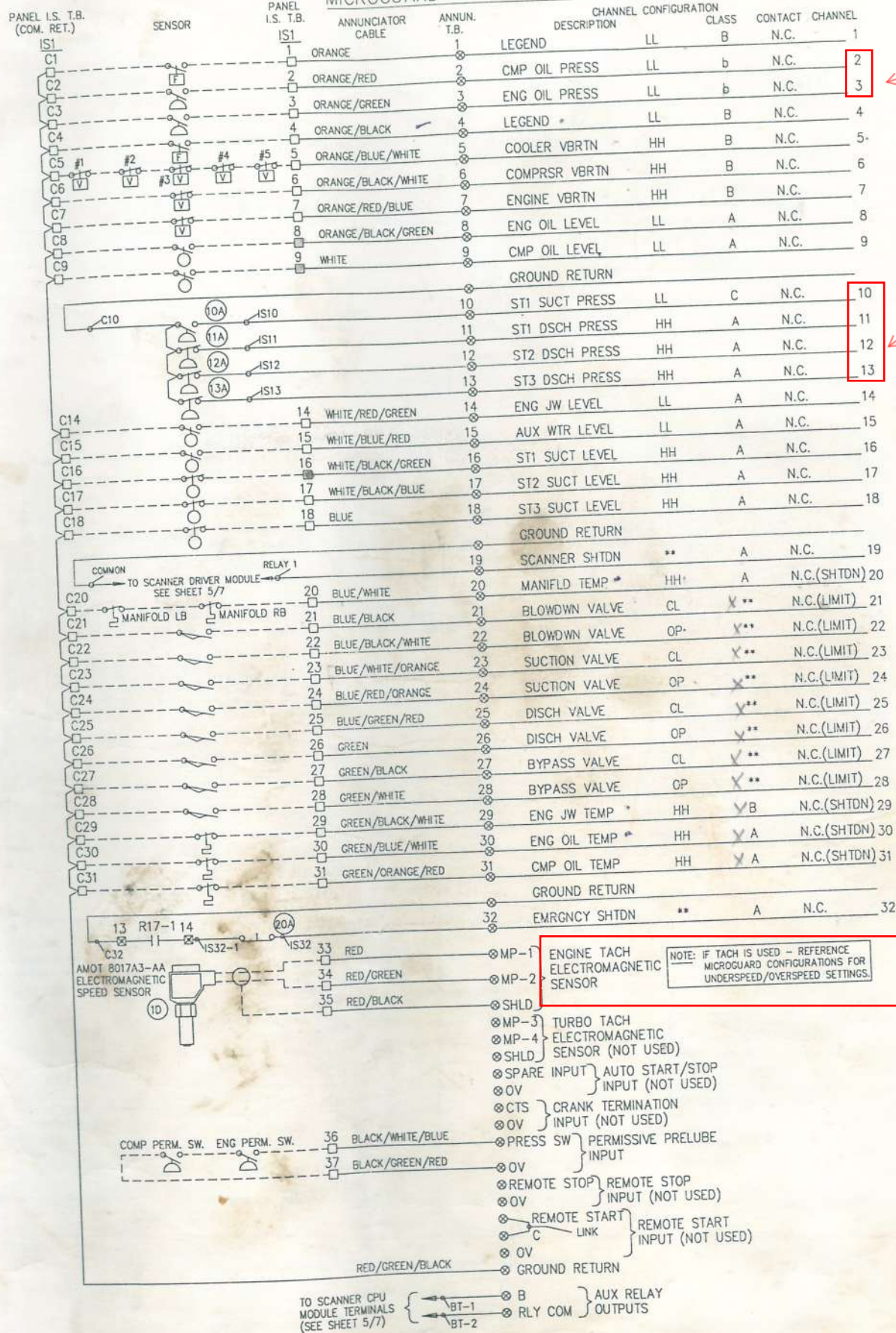


Fig. 7-2 Electric Motor Sequence Chart

WIRING DRAWING (ANNEXURE-A)

Intrinsically Safe Terminal Block

MICROGUARD INTRINSIC SAFE WIRING



Conversion from switches to Transmitter is required

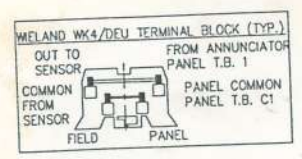
Conversion from switches to Transmitter is required

WIRE COLOUR CODE

220 VAC HOT	BLACK
220 VAC SWITCHED	BROWN
220 VAC NEUTRAL	WHITE
GROUND	GREEN
INTRINSIC CIRCUIT	PURPLE
INTRINSIC COMMON	YELLOW
+24 VDC	RED
24 VDC SWITCHED	ORANGE
-24 VDC	BLUE
BARRIER DC INPUT	GREY

TERMINAL & WIRE LEGEND

220VAC/24VDC PANEL TERMINAL	□
I.S. PANEL TERMINAL	⊠
SCANNER TERMINAL	⊞
WEIDMULLER RELAY TERMINAL	⊞
ANNUNCIATOR TERMINAL	⊞
SKID TERMINAL	△
CUSTOMER TERMINAL	▲
MICROGUARD POWER SUPPLY & RELAY OUTPUT TERMINALS	⊞
SCANNER POWER SUPPLY & RELAY OUTPUT TERMINALS	⊞
PANEL WIRE	----
SKID WIRE	-----
INTERCONNECT WIRE	+++++



Frequency to PLC readable converter 4-20mA is required

MICROGUARD S/D LEGEND

1 - LO LUBRICATOR FLOW #1
4 - LO LUBRICATOR FLOW #2

INTRINSICALLY SAFE WIRING

GAUGE RANGE

2A	0-1500 PSI
2B	0-3000 PSI
2C	0-5000 PSI
2D	0-9000 PSI

ITEM	DESCRIPTION	RANGE: SET
40A-C	CHEMIQUIP PLYS460-N GAUGE MINDER (3600 PSI)	SHIPPED LOOSE
39A	TRANSZORB CBLTZ-36 MVS INPUT PROTECTION	ASSEMBLY
38A	RTD - 25"	SHIPPED LOOSE
37A	FISHER ROC407H FLOBOSS CONTROLLER	
36A	FISHER RS4G MULTI-VARIABLE REMOTE SENSOR	SHIPPED LOOSE
35A-B	OMRON LY4-220VAC C/W PTF14A-E BASE	BY S.M.L.
34A	AMOT SCANNER 8606B12 7 SLOT CARD RACK	
33A	AMOT THERMOCOUPLE MODULE 64071X001	
32A	AMOT SCANNER 8615A30 220 VAC P.S.	
31A	AMOT SCANNER 8605B0 DISPLAY MODULE	
30A-B	FISHER MTG-129 MOUNTING BRACKET	5-35 PSI
29A	FISHER 64-27 REGULATOR	SHIPPED LOOSE
28A	FISHER RC12 RTD CABLE ASSEMBLY	CABLE
27A	SPARTAN CBL08-36 ROC 407 INTERNAL GV101	3-15 PSI
26A	FISHER 4150KR-227 CONT 0-5000 PSI SSBT	3-15 PSI
25A	FISHER 4150K-223 CONT 0-1500 PSI SSBT	220 VAC
24A	ASCO EF8320G200-220 SOLENOID	
23A	MOORE 61FE LO SELECT RELAY	
22A	FISHER 2506-3 REC. CONT. (3-15 PSI IN/6-30 PSI OUT)	
21A-B	WKA 111.10/600 2 1/2" GAUGE	0-60 PSI
20A	TM ZB2BT4 MAINTAINED RED PB C/W ZB2BT102	BY S.M.L.
19A	FISHER 67AFR-362 REGULATOR	5-35 PSI
18A	FISHER 2506-1 RECEIVER CONTROLLER	3-15 PSI
17A	FISHER 67-450 REG C/W 2185L012	5-35 PSI
16A	FISHER 67-450 REG C/W 2185L011	5-35 PSI
15A-B	WKA 111.10/300 2 1/2" GAUGE	0-30 PSI
14A-B	WHITE B-42X54-KN SELECTOR	
13A	CCS DUAL SNAP 646GZE10-7011 PRESS SWITCH	SET 3680 PSI R
12A	CCS DUAL SNAP 646GZE9-7011 PRESS SWITCH	SET 2575 PSI R
11A	CCS DUAL SNAP 6900GZE22 PRESS SWITCH	SET 1555 PSI R
10A	CCS DUAL SNAP 6900GZE22 PRESS SWITCH	SET 900 PSI F
9A-D	WKA 910.12/9091262 PULSATION DAMPENERS	316SS
8A-D	ISOLATION VALVE - 1/4" 316SS	BY S.M.L.
7A	AMOT 64157X1 X.P. ENCLOSURE	
6A	WEIDMULLER 11022.1 RELAY-230 VAC	BY S.M.L.
5A-J	ASCO EF8320G202-220 SOLENOID (QTY. 9)	220 VAC
4A	ISOLATION VALVE - 3/8" CARBON STEEL	BY S.M.L.
3A	FISHER 64-202 REG C/W 1188579X042	35-100 PSI
2A-D	WKA 233.53 4" S.S. LIQUID FILLED GAUGE	
1A-D	10-AMOT MICROGUARD 8017A3-AA SENSOR	SHIPPED LOOSE
I.S. TB	1C-AMOT MICROGUARD 64064X CABLE ASSEMBLY	
TB1,2,3	1B-AMOT MICROGUARD 8612B3-220 VAC P.S.	
	1A-AMOT MICROGUARD 8602C0 ANNUNCIATOR	
	AMOT MICROGUARD SYSTEM 10638X003	
	WELAND WK4/DEU TERM. BLK.(QTY. 29)	BY S.M.L.
	WELAND WK4/U TERM. BLK.(QTY. 10)	BY S.M.L.

REV.	DESCRIPTION	BY	DATE
1	SPARTAN AS BUILT	AW	97/11/20

SPARTAN CONTROLS LTD.

ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR ENERFLEX Manufacturing

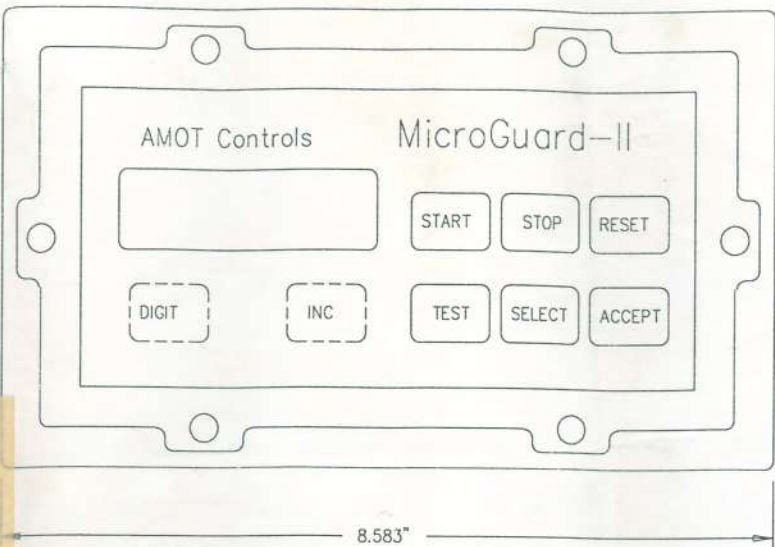
RANNA TRADERS / OGDC - PAKISTAN
JOB #97093 P.O.#741668

DRAWN	AW	CHK'D	SPARTAN PROJ. COORDINATOR	LLL
DATE	97/10/17	DATE		
ENERFLEX DWG. NO. CPS97093		DWG. NO.	NZ-3891	SHT 4/7 REV 1

SERIAL NO:NZ-3891

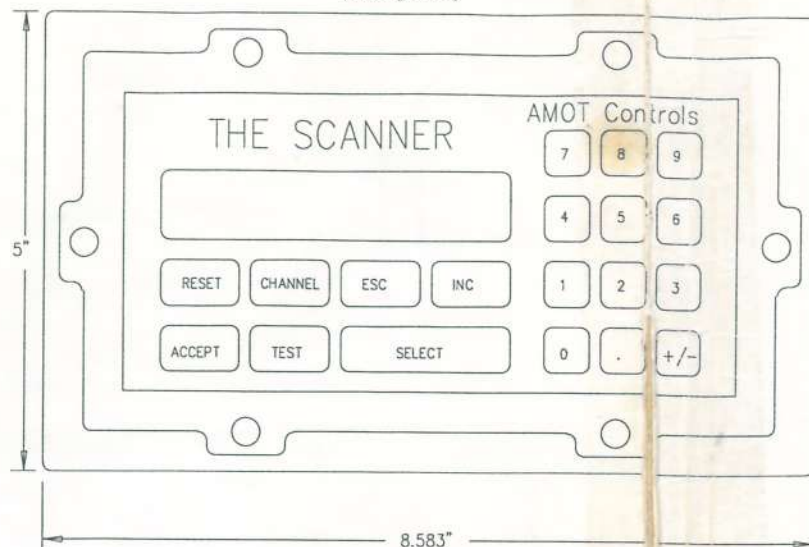
AMOT MICROGUARD II ANNUNCIATOR

(MODEL #8602C0)

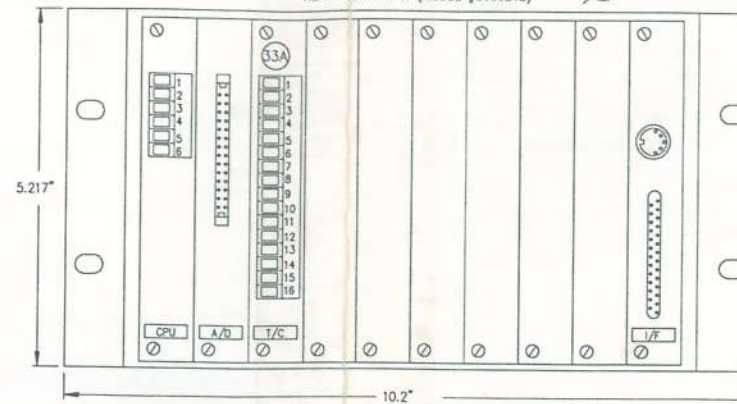


AMOT SCANNER DISPLAY MODULE

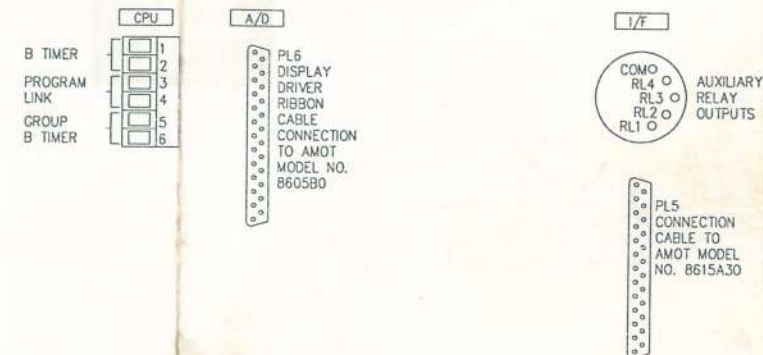
(MODEL #8605B0)



AMOT SCANNER CARD RACK
REAR VIEW-N.T.S. (MODEL #8606B12)

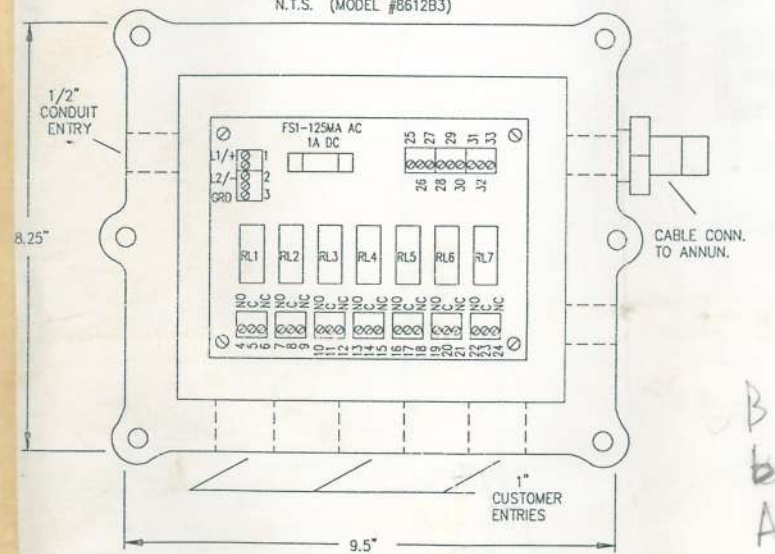


SCANNER CARD RACK CONNECTION DETAILS



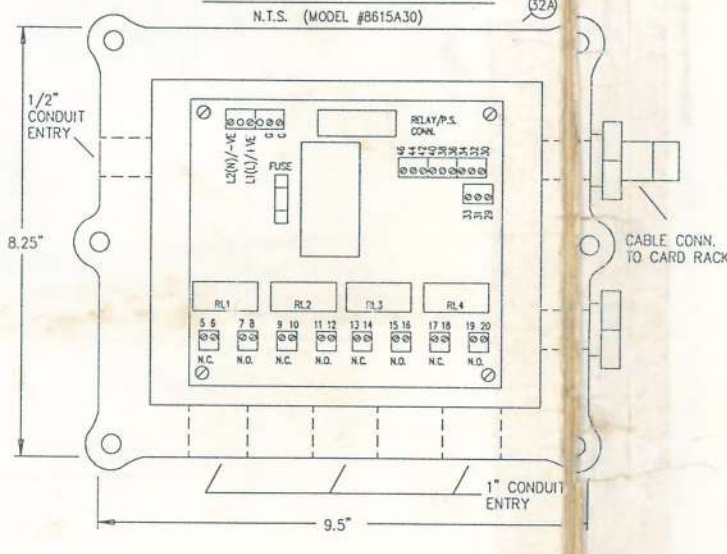
MICROGUARD POWER SUPPLY

N.T.S. (MODEL #8612B3)



SCANNER POWER SUPPLY

N.T.S. (MODEL #8615A30)



SEQUENCE:	MICROGUARD CONFIGURATIONS (VER. 3.90)
CONFIG SEQUENCE: ENGINE*	F3 CONFIG TACH 1 OVERSPEED: 1250 RPM
CONFIG VALVE SEQUENCING: ON	F4 CONFIG TACH 1 OVERSPEED TEST: ALARM
CONFIG VALVE SEQUENCING: 1	F5 CONFIG TACH 1 UNDERSPEED: 600 RPM
CONFIG RELAY G1: AUX LUBE	F6 CONFIG TACH 1 UNDERSPEED: ALARM SHUTDOWN
CONFIG RELAY G2: CRANK	F7 CONFIG TACH 2 PULSES/REV: 90
CONFIG RELAY G3: MAIN FUEL	F9 CONFIG TACH 2 OVERSPEED: 90000 RPM
CONFIG RELAY G4: BLOWDOWN VALVE	FA CONFIG PRELUBE: 120 SEC.
CONFIG RELAY G5: SUCT/DISCH VALVE	FB CONFIG ENG PURGE: 1 SEC.
CONFIG RELAY G6: BYPASS VALVE	FC CONFIG CRANK: 30 SEC.
CONFIG RELAY G7: IGNITION GROUND	FD CONFIG CLASS B: 120 SEC.
CONFIG: 1 CRANK ATTEMPTS	FE CONFIG CLASS b: 20 SEC.
CONFIG BYPASS V.V: CONTROLLED	FF CONFIG IGN GRD: 03 SEC.
CONFIG SUCTION V.V: UNCONTROLLED	FG CONFIG POST LUBE: 180 SEC.
CONFIG START: WARM AND COLD	FJ CONFIG CMP PURGE: 30 SEC.
CONFIG COOLDOWN STOP: DISABLED	FK CONFIG TEST: 180 SEC.
CONFIG AUTO STOP/START: DISABLED	FM CONFIG BLOWDOWN: 10 SEC.
CONFIG PRE-LUBE: TIME	FN CONFIG PURGE ENABLE: 50 RPM
CONFIG FUEL RELAY: ENERGIZE TO RUN	FO CONFIG FUEL DELAY: 2 SEC.
CONFIG CLASS C BYPASS: DISABLED	
CONFIG POWER FAILURE: RESET TO LOCKOUT	
CONFIG WARM BLOWDOWN: DISABLED	

SCANNER CONFIGURATIONS (VERSION 4.30)
CONFIG AVERAGING GROUPS: (NOT USED)
CONFIG CLASS B TIMER: 120 SEC.
CONFIG CLASS b TIMER: 15 SEC.
COMMUNICATIONS:
SET BAUD RATE: 4800
CONFIG ADDRESS: 04
CONFIG PROTOCOL: MODBUS RTU

REV.	DESCRIPTION	BY	DATE
2	SPARTAN AS BUILT	TBC	97/11/14
1	DEL ITEM 33B	AW	97/10/17

SPARTAN CONTROLS LTD.

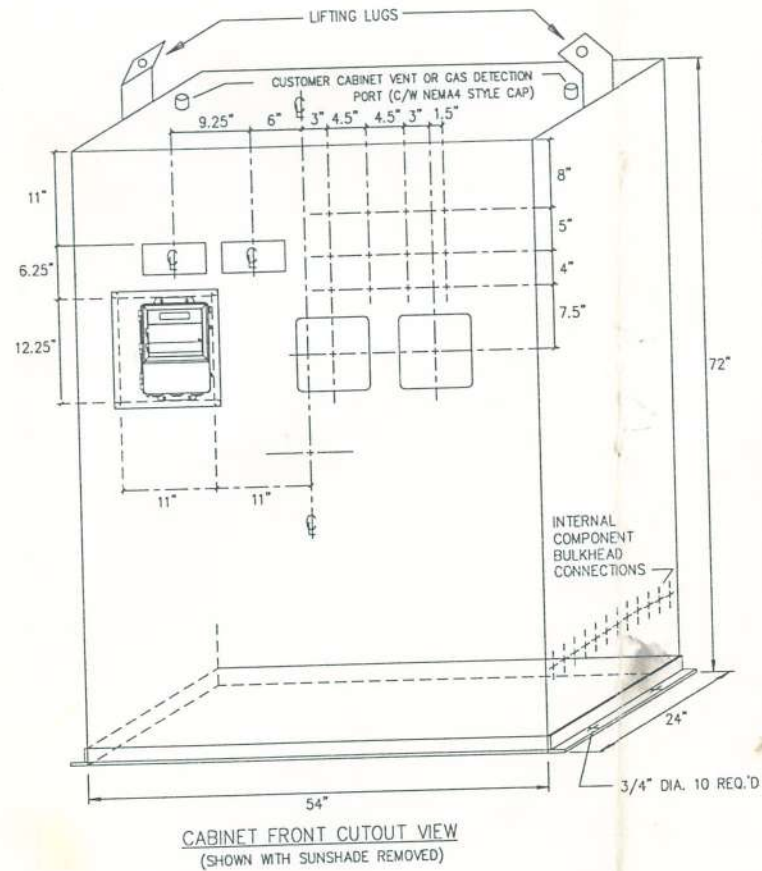
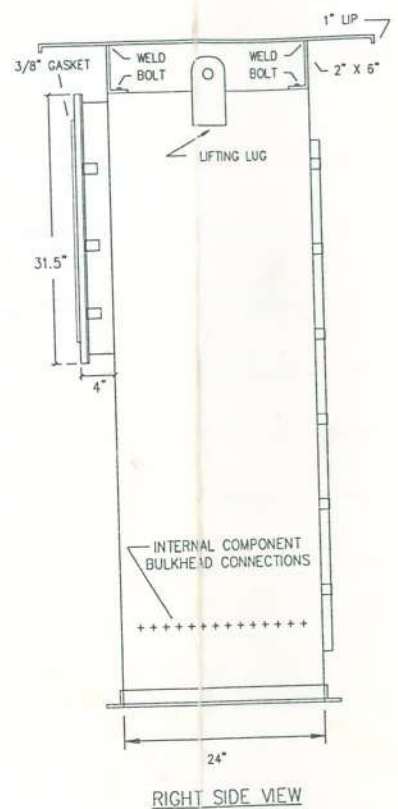
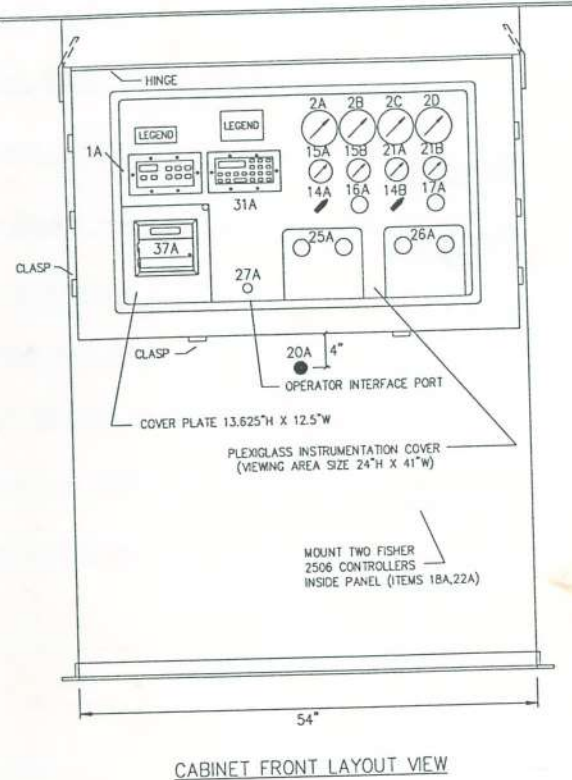
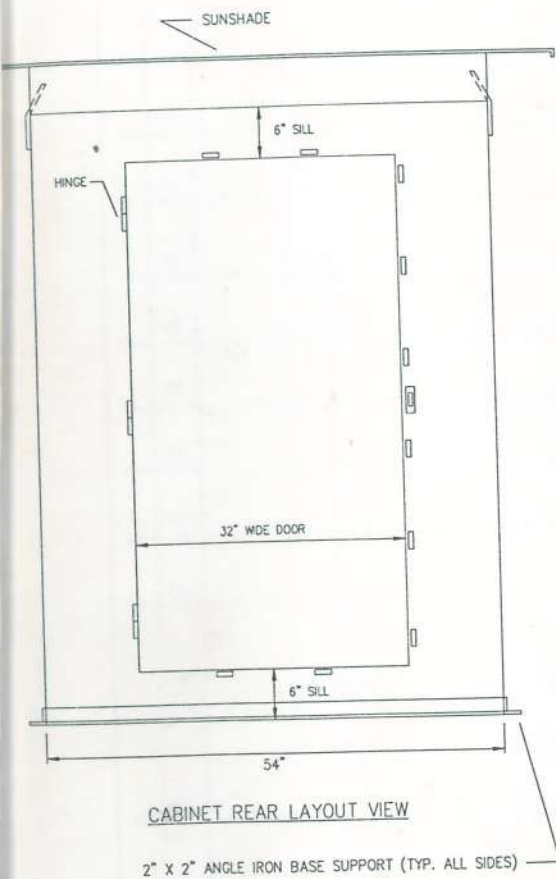
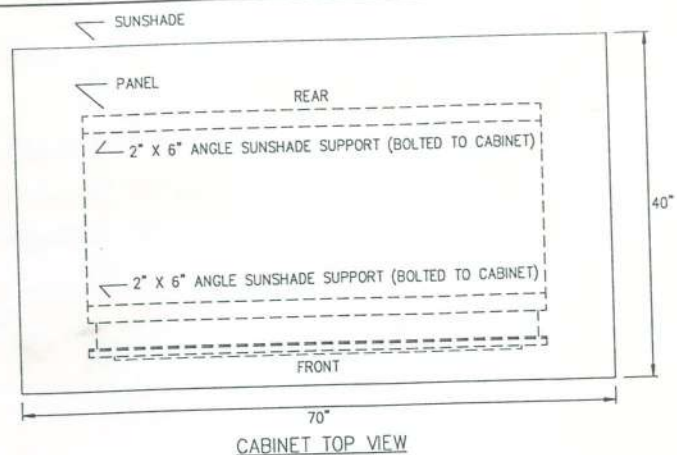
ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR
ENERFLEX Manufacturing
OGDC / PAKISTAN
JOB #97092 P.O.#741667

DRAWN	PEM	CHK'D		SPARTAN PROJ. COORDINATOR	LLL
DATE	97/10/03	DATE			
ENERFLEX DWG. NO.	CPS97092	DWG. NO.	NZ-3890	SHT	REV
				7/7	2

SERIAL NO:NZ-3890

2

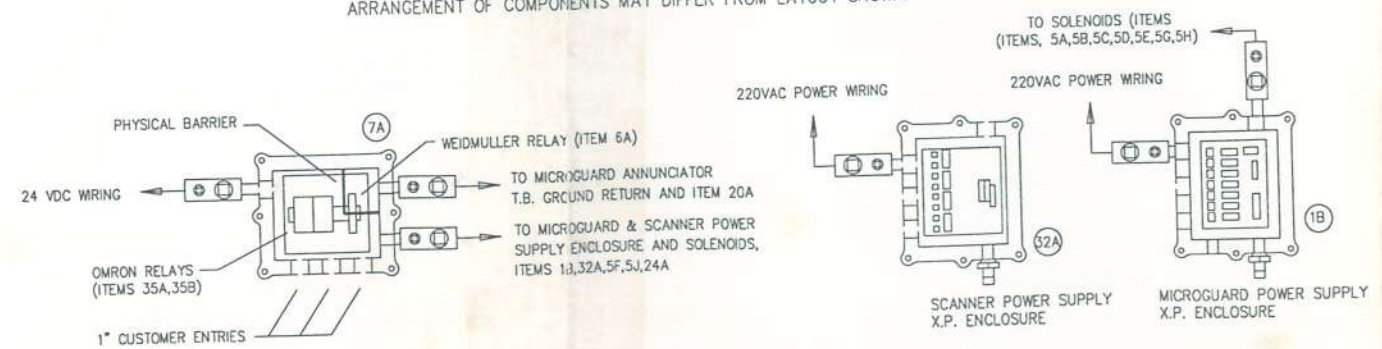
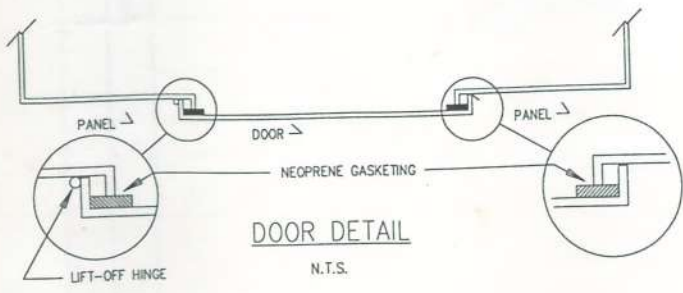
14.P



- CONSTRUCTION NOTES:**
- NEMA 4 CABINET, COMES WITH A SINGLE REAR ACCESS DOOR ENCLOSED BOTTOM AND PLEXIGLASS INSTRUMENTATION COVER C/W CLASPS
 - SUNSHADE REQUIRED (REMOVABLE FOR SHIPPING)
 - PAINT COLOUR: ASA-61 GREY
 - CIRCUIT TUBING TO BE 1/4" NATURAL NYLON II
 - PROCESS TUBING TO BE 1/4" 316SS
 - ALL FITTINGS TO BE 1/4" SWAGelok 316SS
 - ALL PNEUMATIC COMPONENTS SHOWN IN OPERATING STATE
 - NO ROBERTSON SCREWS IN PANEL CONSTRUCTION
 - SCL/SML PRECONSTRUCTION MEETING REQUIRED
 - ELECTRICAL AREA CLASSIFICATION: CLASS 1, DIV 2, GROUP D, TEMP CODE T1

ITEM	LAMACOID TAG	SIZE	COLOUR
2A	SUCT PRESS ST 1	1X3	WHITE
2B	DISCH PRESS ST 1	1X3	WHITE
2C	DISCH PRESS ST 2	1X3	WHITE
2D	DISCH PRESS ST 3	1X3	WHITE
14A	GOVERNOR SIGNAL AUTO/MAN	3X3	WHITE
14B	BYPASS VALVE SIGNAL AUTO/MAN	3X3	WHITE
15A	AUTO GOVERNOR SIGNAL	1X3	WHITE
15B	MAN GOVERNOR SIGNAL	1X3	WHITE
16A	MAN GOVERNOR CONTROL	1X3	WHITE
17A	MANUAL BYPASS VALVE CONTROL	1X3	WHITE
18A	AUTO GOVERNOR CONTROLLER	1X3	WHITE
20A	EMERGENCY SHUTDOWN PUSH TO STOP	1X3	RED
21A	AUTO BYPASS VALVE SIGNAL	1X3	WHITE
21B	MANUAL BYPASS VALVE SIGNAL	1X3	WHITE
22A	AUTO BYPASS VALVE CONTROLLER	1X3	WHITE
25A	SUCT SENSING MASTER CAPACITY CONTROLLER	1X3	WHITE
26A	DISCH SENSING MASTER CAPACITY CONTROLLER	1X3	WHITE

GENERAL CONDUIT LAYOUT
ARRANGEMENT OF COMPONENTS MAY DIFFER FROM LAYOUT SHOWN.



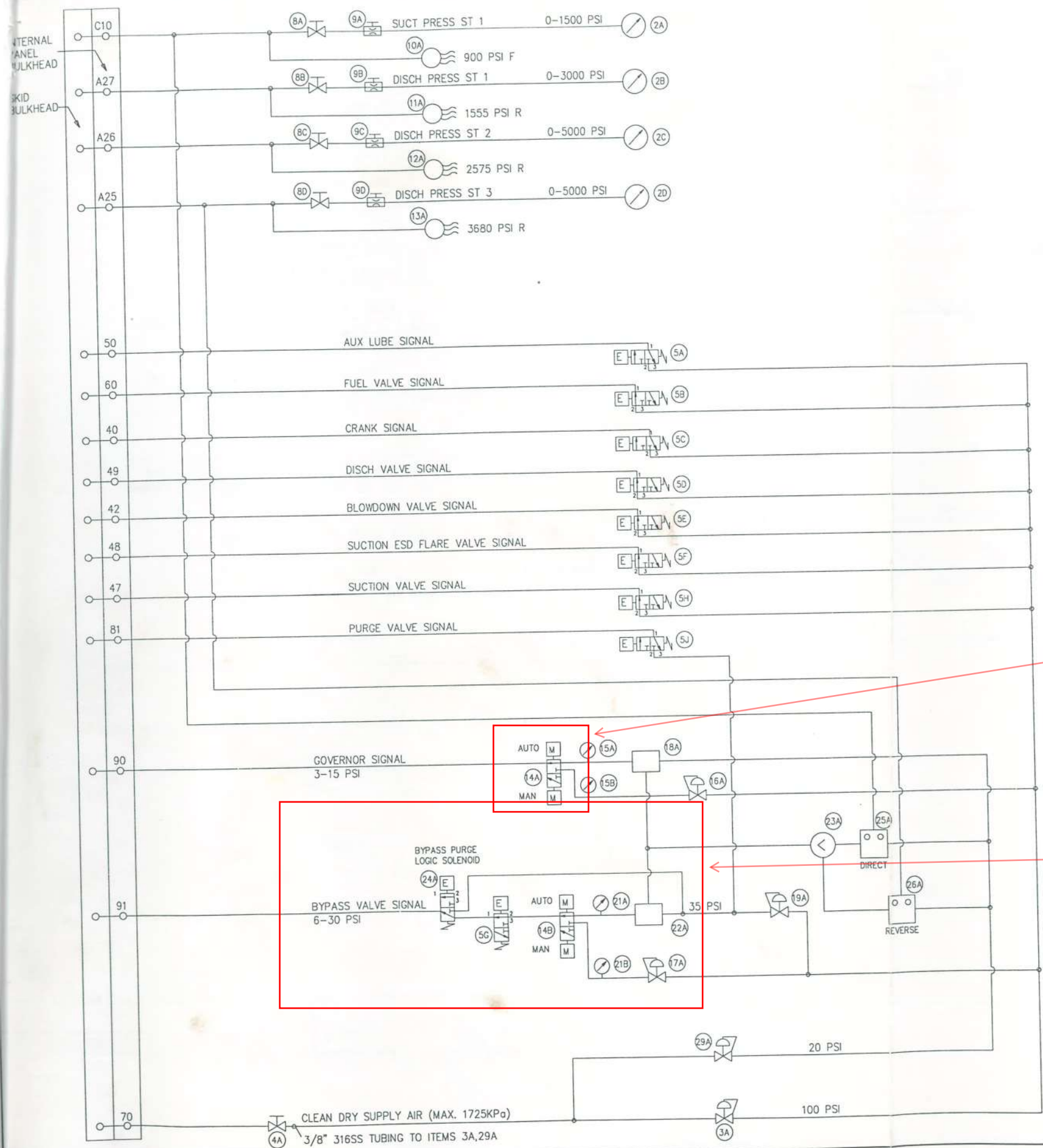
ALL COMPONENTS REQUIRING CUSTOMER TERMINATION TO BE MOUNTED AT LEAST 18" FROM BOTTOM OF THE PANEL AND HIGHER WHEN POSSIBLE.

SERIAL NO: NZ-3891

1	SPARTAN AS BUILT	AW	97/11/20
REV.	DESCRIPTION	BY	DATE

SPARTAN CONTROLS LTD.
 ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR
ENERFLEX Manufacturing
 RANNA TRADERS / OGDC - PAKISTAN
 JOB #97093 P.O.#741668

DRAWN	AW	CHK'D	SPARTAN PROJ.	LLL
DATE	97/10/17	DATE	COORDINATOR	
ENERFLEX DWG. NO.	CPS97093	DWG. NO.	NZ-3891	SHT 1/7 REV 1

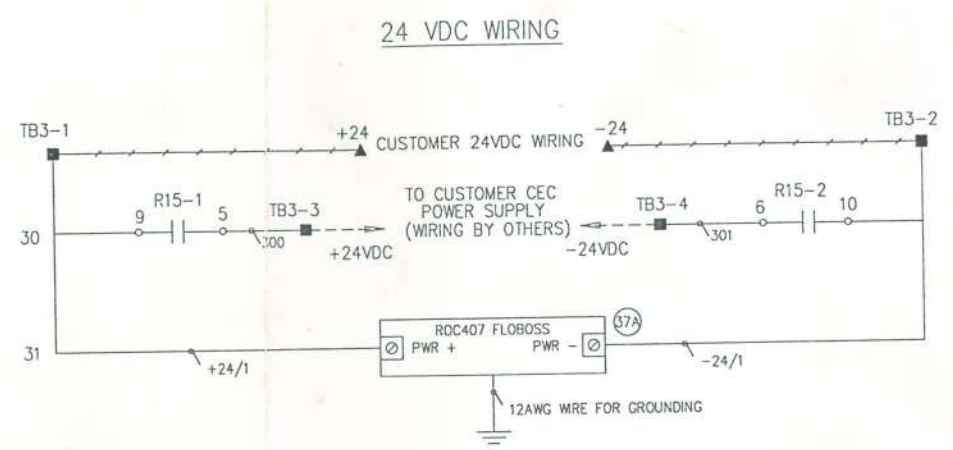
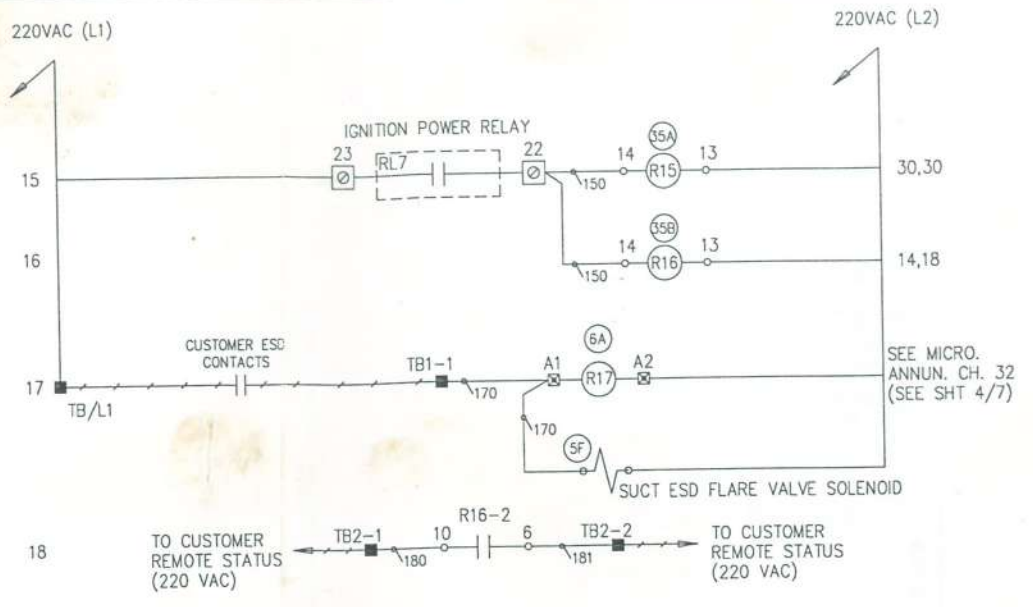
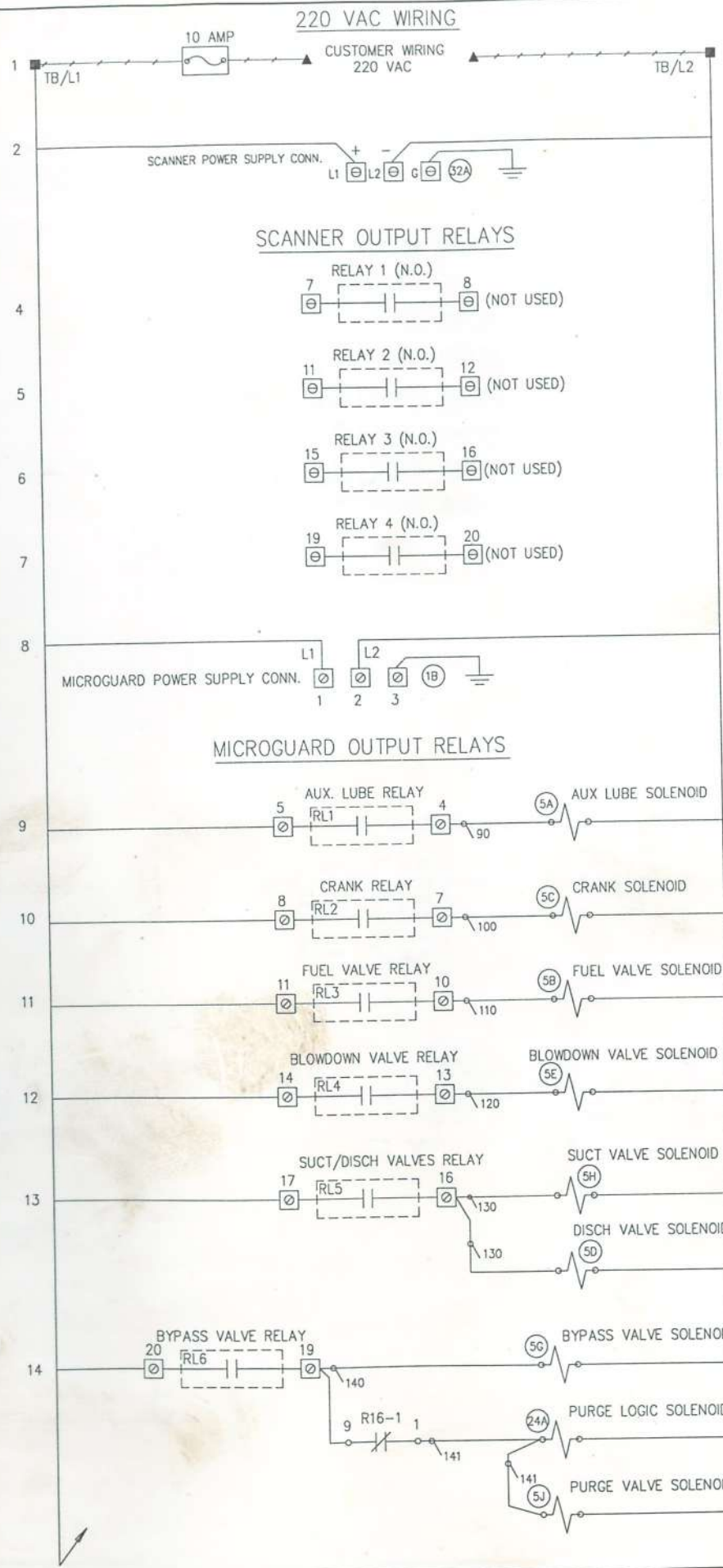


I to P converter is required 3-15psi. One analogue output is required.

Pneumatic signal from existing control system so it will be removed. Now we require analogue output and smart positioner. Analogue input is also required for controlling pressure.

SERIAL NO: NZ-3891

1	SPARTAN AS BUILT	AW	97/11/20
REV.	DESCRIPTION	BY	DATE
 SPARTAN CONTROLS LTD. ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR ENERFLEX Manufacturing RANNA TRADERS / OGDC - PAKISTAN JOB #97093 P.O.#741668			
DRAWN	AW	CHK'D	SPARTAN PROJ. COORDINATOR
DATE	97/10/17	DATE	LLL
ENERFLEX DWG. NO. CPS97093	DWG. NO.	NZ-3891	SHT 2/7 REV 1



WIRE COLOUR CODE

220 VAC HOT	BLACK
220 VAC SWITCHED	BROWN
220 VAC NEUTRAL	WHITE
GROUND	GREEN
INTRINSIC CIRCUIT	PURPLE
INTRINSIC COMMON	YELLOW
+24 VDC	RED
-24 VDC	ORANGE
24 VDC SWITCHED	BLUE
BARRIER DC INPUT	GREY

TERMINAL & WIRE LEGEND

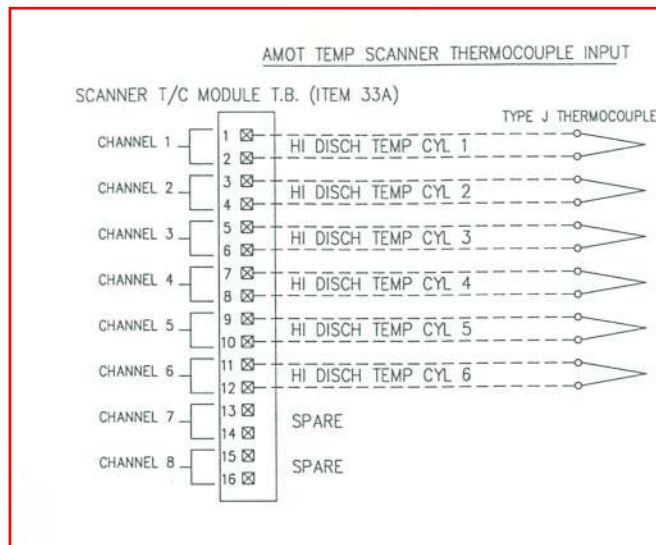
220VAC/24VDC PANEL TERMINAL	■
I.S. PANEL TERMINAL	□
SCANNER TERMINAL	⊗
WEIDMULLER RELAY TERMINAL	⊠
ANNUNCIATOR TERMINAL	⊙
SKID TERMINAL	△
CUSTOMER TERMINAL	▲
MICROGUARD POWER SUPPLY & RELAY OUTPUT TERMINALS	⊚
SCANNER POWER SUPPLY & RELAY OUTPUT TERMINALS	⊛
PANEL WIRE	—
SKID WIRE	- - - -
INTERCONNECT WIRE	+++++

220 VAC/24 VDC WIRING

SERIAL NO:NZ-3891

1	SPARTAN AS BUILT	AW	97/11/20
REV.	DESCRIPTION	BY	DATE
SPARTAN CONTROLS LTD.			
ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR ENERFLEX Manufacturing			
RANNA TRADERS / OGDC - PAKISTAN			
JOB #97093 P.O.#741668			
DRAWN	AW	CHK'D	SPARTAN PROJ. LLL
DATE	97/10/17	DATE	COORDINATOR
ENERFLEX DWG. NO. CPS97093	DWG. NO.	NZ-3891	SHT 3/7 REV 1

SCANNER THERMOCOUPLE MODULE WIRING



(SP1) ALARM SETPOINT	(SP2) SHUTDOWN SETPOINT	(SP3) CONTROL SETPOINT	CLASS	ALARM RELAY	CONTROL RELAY	S/D RELAY	SENSOR FAIL RELAY
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1
°F RISING	300 °F RISING	9999 °F RISING	A	2	0	1	1

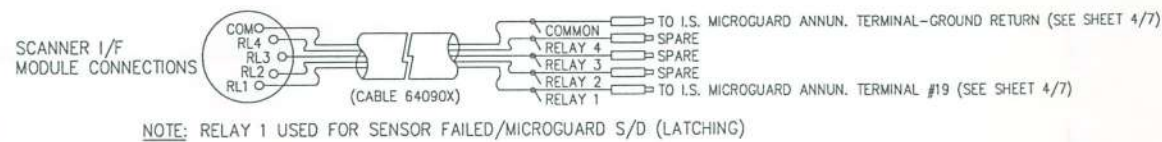
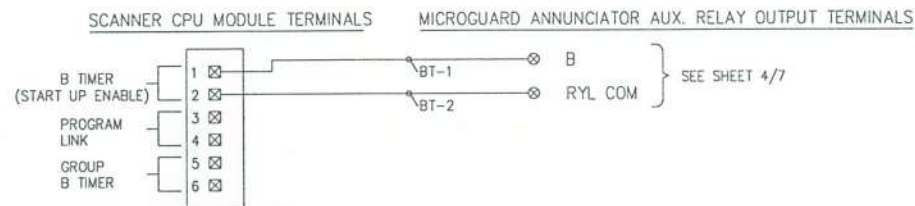
WIRE COLOUR CODE

220 VAC HOT	BLACK
220 VAC SWITCHED	BROWN
220 VAC NEUTRAL	WHITE
GROUND	GREEN
INTRINSIC CIRCUIT	PURPLE
INTRINSIC COMMON	YELLOW
+24 VDC	RED
24 VDC SWITCHED	ORANGE
-24 VDC	BLUE
BARRIER DC INPUT	GREY

Scanner not available. Its obsolete. Not available in the market. Need to be replaced with thermocouple card on PLC

TERMINAL & WIRE LEGEND

220VAC/24VDC PANEL TERMINAL	■
I.S. PANEL TERMINAL	□
SCANNER TERMINAL	⊠
WEIDMULLER RELAY TERMINAL	⊞
ANNUNCIATOR TERMINAL	⊙
SKID TERMINAL	△
CUSTOMER TERMINAL	▲
MICROGUARD POWER SUPPLY & RELAY OUTPUT TERMINALS	⊗
SCANNER POWER SUPPLY & RELAY OUTPUT TERMINALS	⊕
PANEL WIRE	—————
SKID WIRE	-----
INTERCONNECT WIRE	+++++

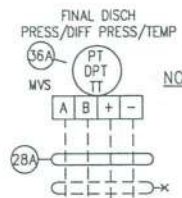


INTRINSICALLY SAFE WIRING

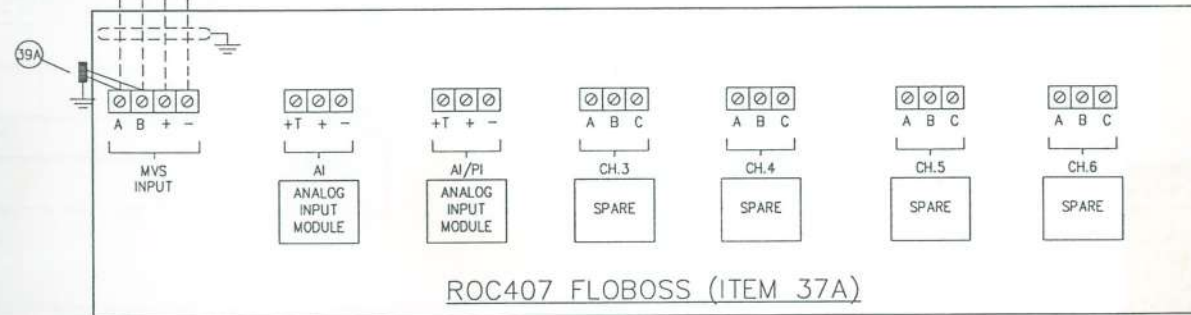
SERIAL NO:NZ-3891

1	SPARTAN AS BUILT	AW	97/11/20
REV.	DESCRIPTION	BY	DATE
 SPARTAN CONTROLS LTD. ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR <i>ENERFLEX Manufacturing</i> RANNA TRADERS / OGDC - PAKISTAN JOB #97093 P.O.#741668			
DRAWN	AW	CHK'D	SPARTAN PROJ. COORDINATOR
DATE	97/10/17	DATE	LLL
ENERFLEX DWG. NO. CPS97093	DWG. NO.	NZ-3891	SHT 5/7 REV 1

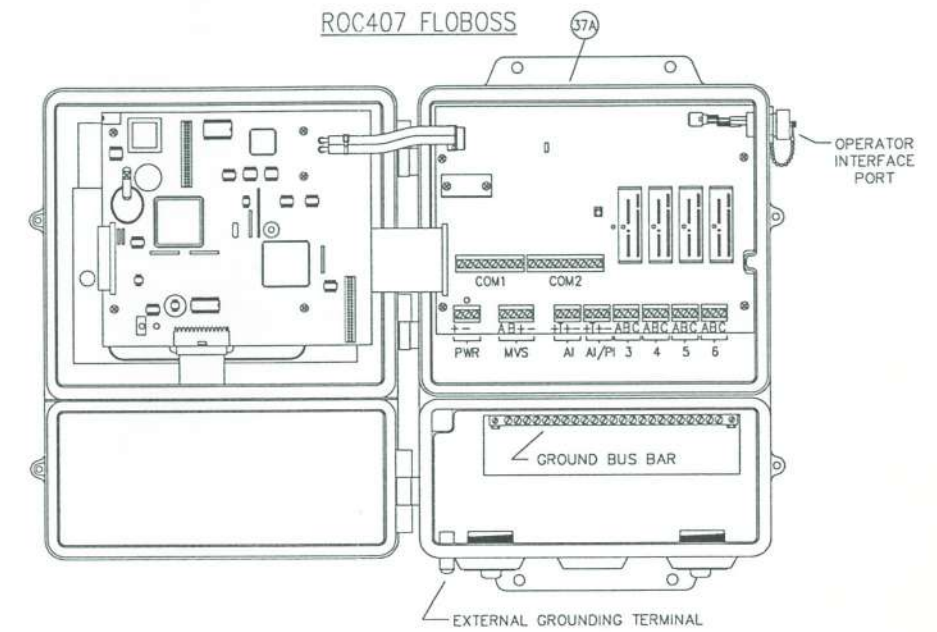
FLOBOSS WIRING DIAGRAM



NOTE: ITEMS 40A-C TO BE INSTALLED ON UPSTREAM OF FISHER MVS (ITEM 36A) FOR (ONE) FINAL DISCH PRESS AND (TWO) DIFFERENTIAL PRESSURES PROCESS CONNECTIONS.



ROC407 FLOBOSS (ITEM 37A)

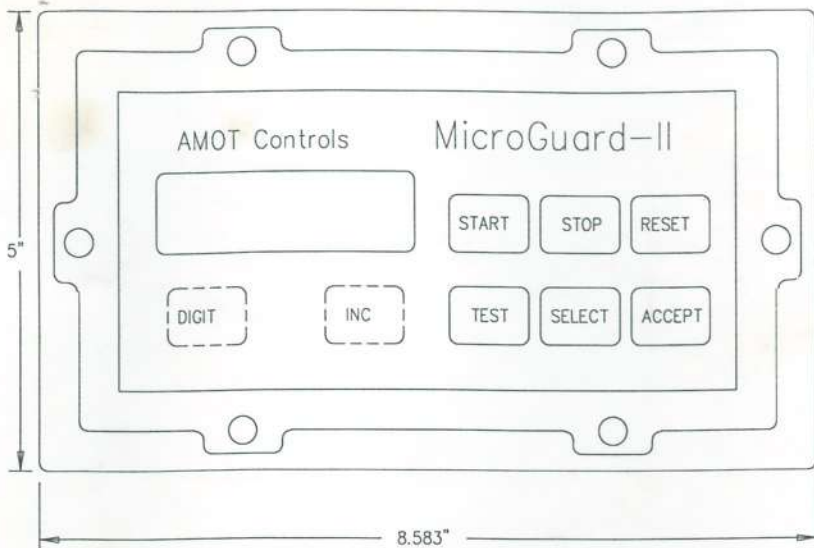


1	SPARTAN AS BUILT	AW	97/11/20
REV.	DESCRIPTION	BY	DATE
 SPARTAN CONTROLS LTD. ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR ENERFLEX Manufacturing RANNA TRADERS / OGDC - PAKISTAN JOB #97093 P.O.#741668			
DRAWN	AW	CHK'D	SPARTAN PROJ.
DATE	97/10/17	DATE	COORDINATOR
ENERFLEX DWG. NO.	CPS97093	DWG. NO.	NZ-3891
		SHT	REV
		6/7	1

SERIAL NO:NZ-3891

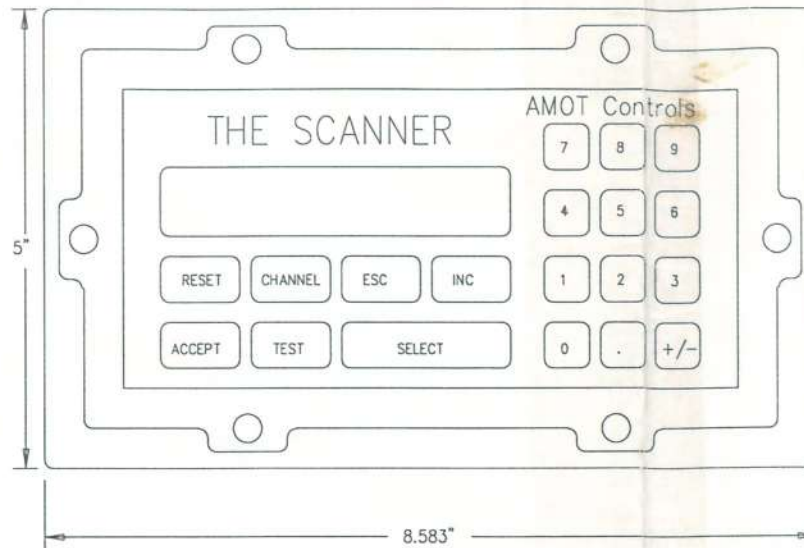
AMOT MICROGUARD II ANNUNCIATOR

(MODEL #8602CO)

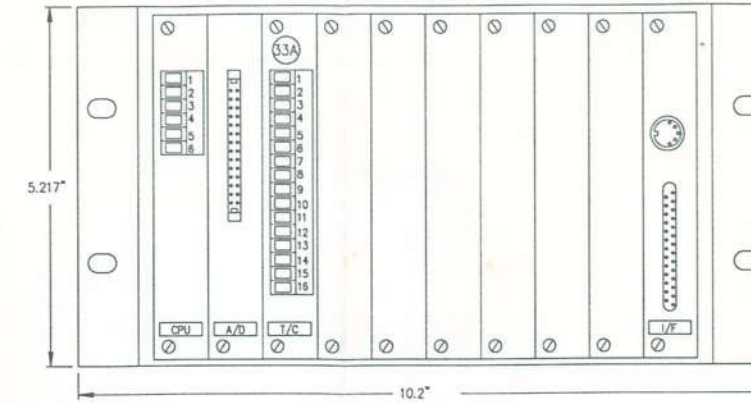


AMOT SCANNER DISPLAY MODULE

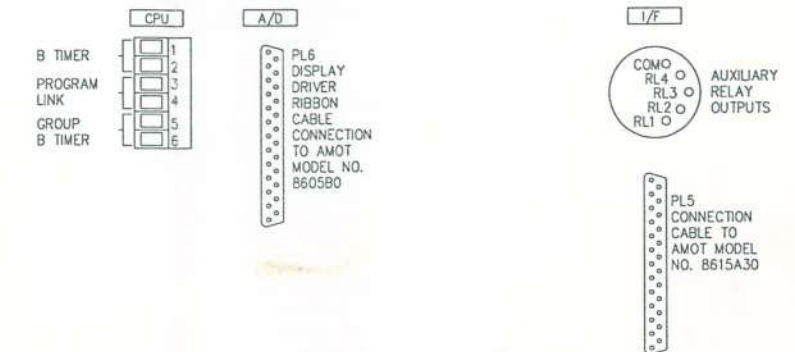
(MODEL #860580)



AMOT SCANNER CARD RACK
REAR VIEW-N.T.S. (MODEL #8606B12)

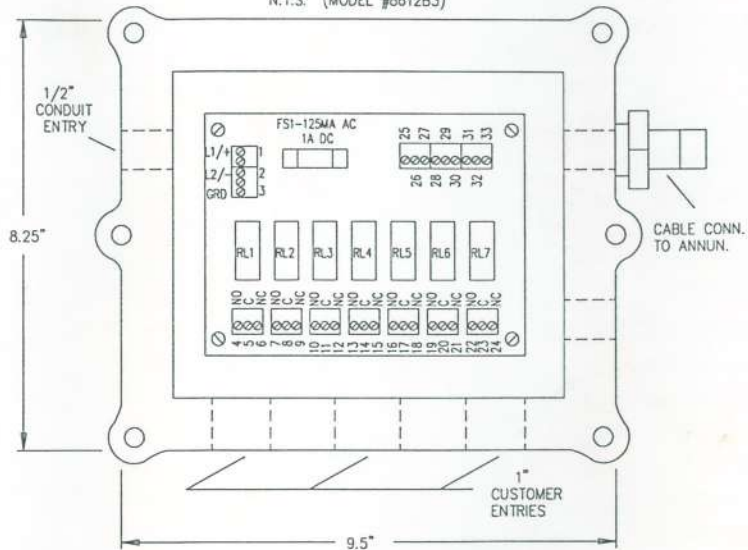


SCANNER CARD RACK CONNECTION DETAILS



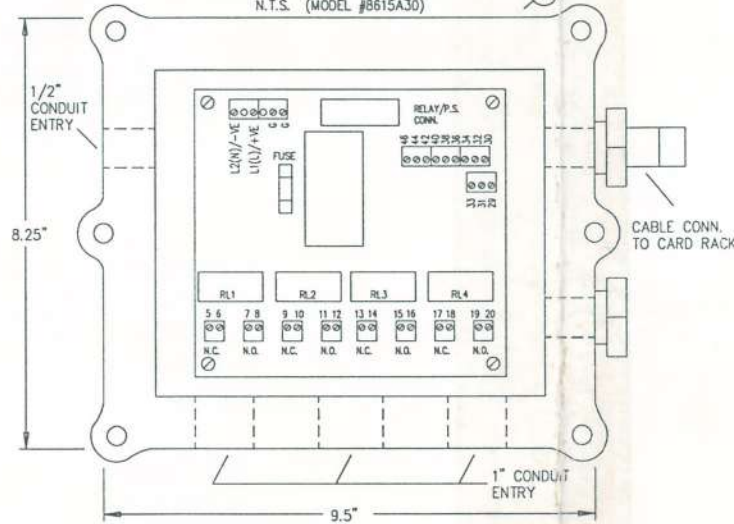
MICROGUARD POWER SUPPLY

N.T.S. (MODEL #8612B3)



SCANNER POWER SUPPLY

N.T.S. (MODEL #8615A30)



SEQUENCE:	MICROGUARD CONFIGURATIONS (VER. 3.90)	F3 CONFIG TACH 1 OVERSPEED: 1250 RPM
CONFIG SEQUENCE: ENGINE		F4 CONFIG TACH 1 OVERSPEED TEST: ALARM
CONFIG VALVE SEQUENCING: ON		F5 CONFIG TACH 1 UNDERSPEED: 600 RPM
CONFIG VALVE SEQUENCING: 1		F6 CONFIG TACH 1 UNDERSPEED: ALARM
CONFIG RELAY G1: AUX LUBE		F7 CONFIG TACH 2 PULSES/REV: 90
CONFIG RELAY G2: CRANK		F9 CONFIG TACH 2 OVERSPEED: 90000 RPM
CONFIG RELAY G3: MAIN FUEL		FA CONFIG PRELUBE: 120 SEC.
CONFIG RELAY G4: BLOWDOWN VALVE		FB CONFIG ENG PURGE: 1 SEC.
CONFIG RELAY G5: SUCT/DISCH VALVE		FC CONFIG CRANK: 30 SEC.
CONFIG RELAY G6: BYPASS VALVE		FD CONFIG CLASS B: 120 SEC.
CONFIG RELAY G7: IGNITION GROUND		FE CONFIG CLASS b: 20 SEC.
CONFIG: 1 CRANK ATTEMPTS		FF CONFIG IGN GRD: 03 SEC.
CONFIG BYPASS VLV: CONTROLLED		FG CONFIG POST LUBE: 180 SEC.
CONFIG SUCTION VLV: UNCONTROLLED		FJ CONFIG CMP PURGE: 30 SEC.
CONFIG START: WARM AND COLD		FK CONFIG TEST: 180 SEC.
CONFIG COOLDOWN STOP: DISABLED		FM CONFIG BLOWDOWN: 10 SEC.
CONFIG AUTO STOP/START: DISABLED		FN CONFIG PURGE ENABLE: 50 RPM
CONFIG PRE-LUBE: TIME		FO CONFIG FUEL DELAY 2 SEC
CONFIG FUEL RELAY: ENERGIZE TO RUN		
CONFIG CLASS C BYPASS: DISABLED		
CONFIG POWER FAILURE: RESET TO LOCKOUT		
CONFIG WARM BLOWDOWN: DISABLED		
CHANNELS:		
CONFIG HIGHEST NO. OF CHANNELS USED: 1-31		
COMMUNICATION:		
CONFIG BAUD RATE: 9600		
CONFIG ADDRESS: 01		
CONFIG PROTOCOL: MODBUS RTU } NOT USED		
T* PARAMETERS:		
F1 CONFIG TACH 1 PULSES/REV: 208		
F2 CONFIG TACH 1 CTS: 200 RPM		

SCANNER CONFIGURATIONS (VERSION 4.30)	
CONFIG AVERAGING GROUPS : (NOT USED)	
CONFIG CLASS B TIMER: 120 SEC.	
CONFIG CLASS b TIMER: 15 SEC.	
COMMUNICATIONS:	
SET BAUD RATE: 4800	} NOT USED
CONFIG ADDRESS: 04	
CONFIG PROTOCOL: MODBUS RTU	

REV.	DESCRIPTION	BY	DATE
1	SPARTAN AS BUILT	AW	97/11/20

SPARTAN CONTROLS LTD.

ELECTRONIC COMPRESSOR PROTECTION AND CONTROL SYSTEM FOR
ENERFLEX Manufacturing
RANNA TRADERS / OGDC - PAKISTAN
JOB #97093 P.O.#741668

DRAWN	AW	CHK'D	SPARTAN PROJ. COORDINATOR	LLL
DATE	97/10/17	DATE		

ENERFLEX DWG. NO. CPS97093	DWG. NO. NZ-3891	SHT 7/7	REV 1
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SERIAL NO:NZ-3891