

F

RECEIVED

MLM-MU-78-69-004

JUL 0 1 1978

OSTI

INSTRUMENTATION FOR PRICETOWN I
IN-SITU COAL GASIFICATION PROGRAM

R. E. ZIELINSKI

P. W. SEABAUGH

O. R. AUSTIN

R. G. CORLEY

SEPTEMBER 8, 1978



Monsanto

MOUND FACILITY

Miamisburg, Ohio 45342

operated by

MONSANTO RESEARCH CORPORATION

a subsidiary of Monsanto Company

for the

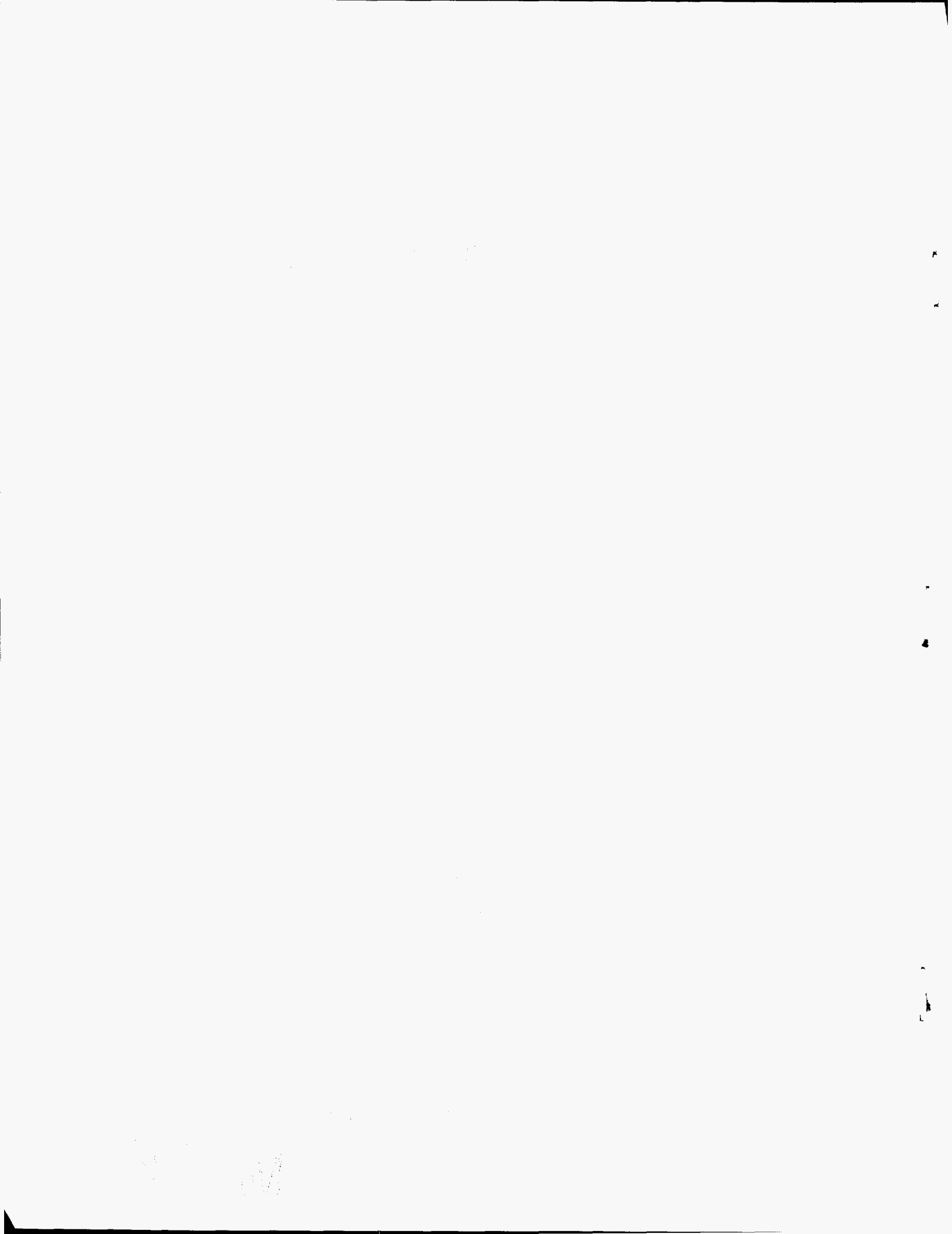
U. S. DEPARTMENT OF ENERGY

Contract No. EY-76-G-04-0053

AC04-76DP00053

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

MASTER



MLM-MU-78-69-004

INSTRUMENTATION FOR PRICETOWN I
IN-SITU COAL GASIFICATION PROGRAM

PREPARED BY: R. E. ZIELINSKI
P. W. SEABAUGH
O. R. AUSTIN
R. G. CORLEY

SEPTEMBER 8, 1978

MOUND FACILITY

Miamisburg, Ohio 45342

operated by

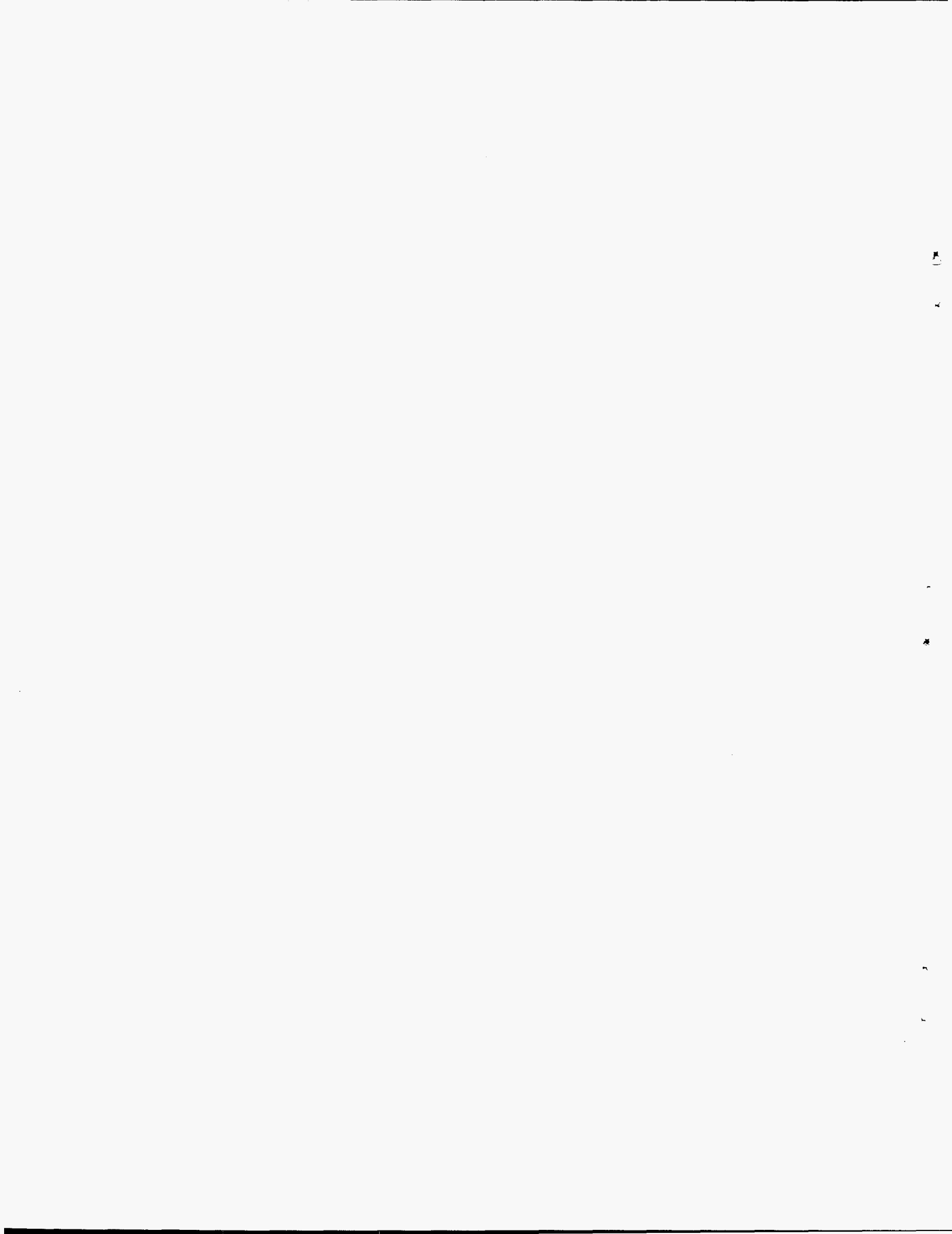
MONSANTO RESEARCH CORPORATION

a subsidiary of Monsanto Company

for the

U. S. DEPARTMENT OF ENERGY

Contract No. EY-76-C-04-0053



DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

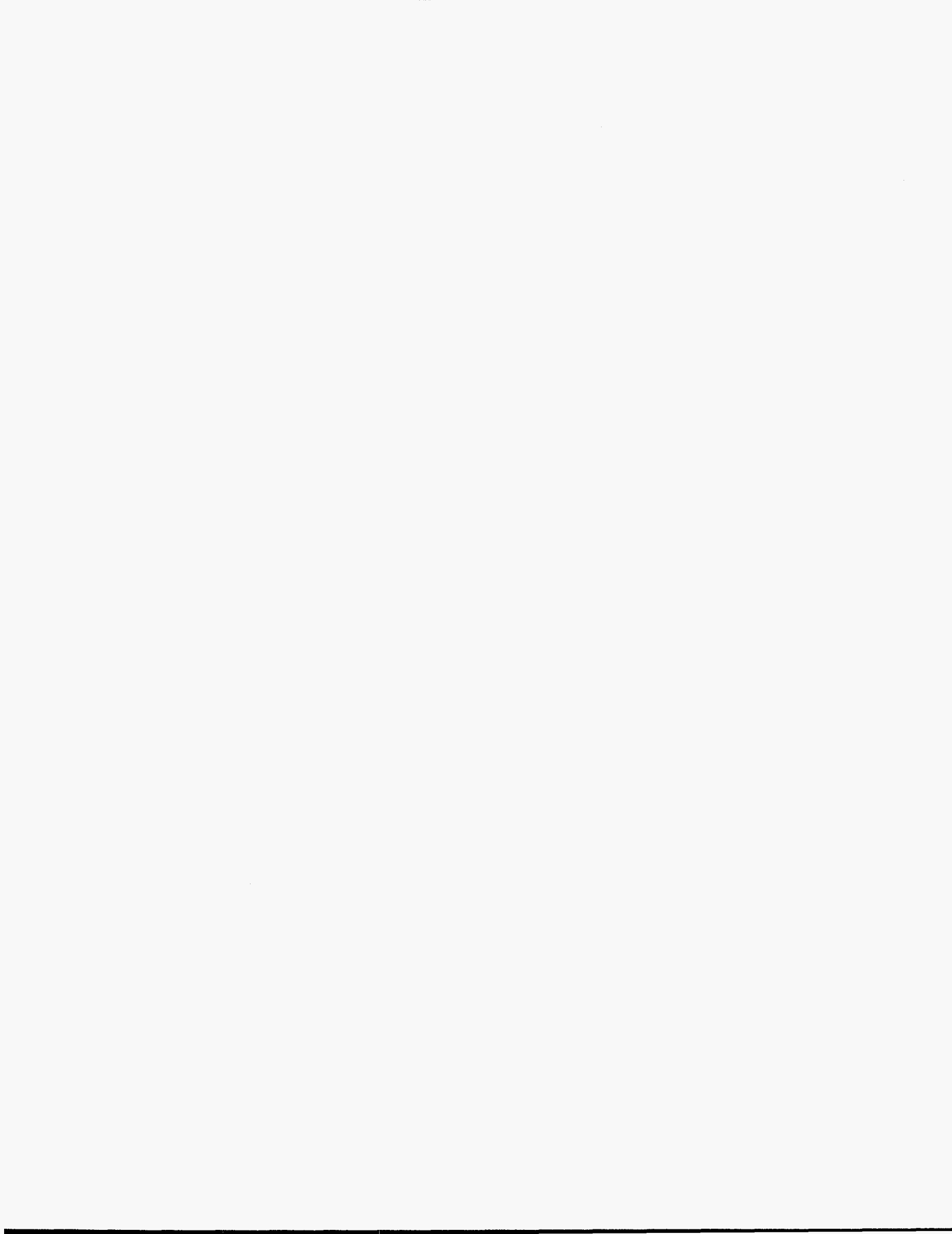
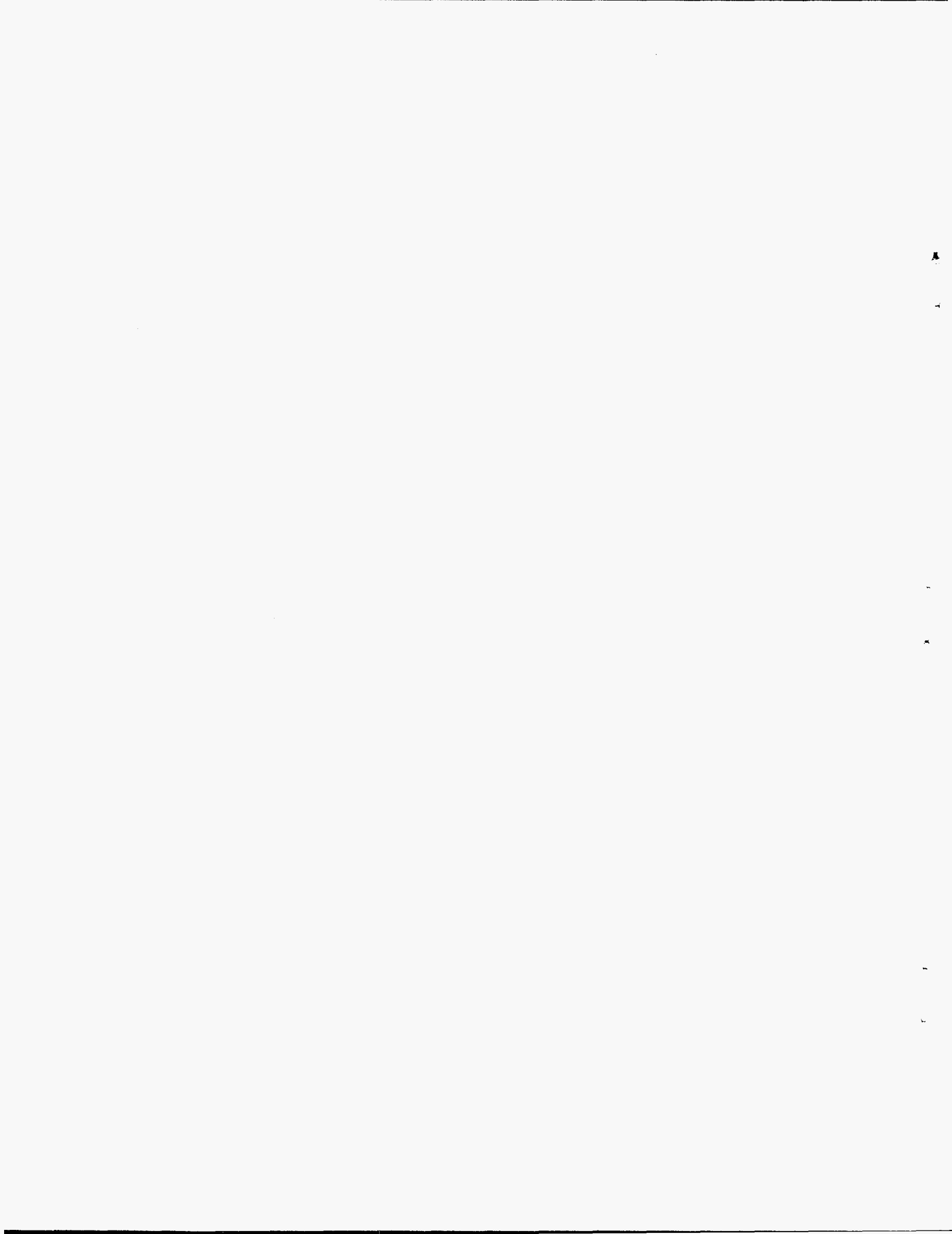


TABLE OF CONTENTS

1. INTRODUCTION.....	1
2. GAS TRAIN ANALOG INSTRUMENTATION.....	1
3. GAS ANALYSIS SYSTEM.....	3
4. AUTOMATIC DATA ACQUISITION AND CONTROL SYSTEM.....	10
5. LIST OF CONTRIBUTORS.....	25

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.



INSTRUMENTATION FOR PRICETOWN I IN-SITU COAL GASIFICATION PROGRAM

I. INTRODUCTION

The Morgantown Energy Technology Center (METC) is developing the technology required to recover the deep thin seam Eastern bituminous coal resource by gasification in-situ. The approach is to prove concepts through field tests and to support field testing with theoretical modeling.

METC is currently fielding Pricetown I, the first of two tests scheduled for the Pricetown, West Virginia, underground coal gasification field test. Pricetown I is a small-scale test designed to provide information concerning the in-situ characteristics of the Pittsburgh coal seam; to gain additional experience in the in-situ combustion and gasification of bituminous coal; and to evaluate the functional applicability of the linked vertical concept to recover the Eastern resources.

Mound Facility is participating with METC in the design and the implementation of the instrumentation necessary to monitor the surface and subsurface process and product gas stream; and acquire real-time gas analysis and subsurface thermal data. The principal objective of this effort is to provide an integrated instrumentation system that will permit rapid automatic monitoring of subsurface and surface variables and to ensure data storage, retrieval and reduction for process monitoring and results interpretation. Mound also will support METC with the manpower and technical assistance necessary to operate the field instrumentation during the in-situ testing.

II. GAS TRAIN ANALOG INSTRUMENTATION

The analog instrumentation will provide flow, pressure, and temperature monitoring and control systems for the high (≤ 1000 psig) and low (≤ 350 psig) compressed air injection piping systems which feed combustion air to the coal seam. Similar flow, pressure, and temperature instrumentation is to be applied to the product gas collection (750°F, 125 psig) system.

The instrument design will consist of using electronic transmitters, indicators, controllers and recorders with pneumatically operated control valves. The control panel will be a Fisher type modular design with a sixteen point annunciator, four indicating controllers,

twelve indicators and two three-pen recorders. A listing of the control panel instrument loops that will be provided are given in Table 1. The Loop Diagrams and Instrument Specifications are contained in Appendices 1 and 2.

III. GAS ANALYSIS SYSTEM

Introduction

The key to reliable, continuous on-line gas analysis is a well designed sample conditioning or clean-up system. The sample conditioner must prepare the gas for analysis, presenting to the analytical instruments a continuously flowing sample which is harmless to the instrument but which is unchanged in its compositional integrity. The sample conditioning system for the Pricetown I field test is designed to meet these basic requirements.

Details

A schematic diagram of the gas analysis system is shown in Figure 1.

The gas analysis is performed by equipment consisting of a mass spectrometer, two process gas chromatographs, and a chemoluminescent NO/NO_x analyzer. These instruments are time-shared between the various test wells and the product gas system under the direction of a computer. The source gas for analysis is selected by operation of automatic valves. Provision is made for manual operation in the event of computer failure, or when a special sample or calibration run is needed. The gas constituents analyzed for, the compositional ranges of, and the precision for the instrumental methods are listed in Table 2.

1. Product Gas. The product gas for analysis is taken from the process lines just downstream of the pressure reducing valve and ahead of the incinerator. Process conditions at this point during normal operation are anticipated to be 700°F and 5 to 45 psig.

To minimize downtime for maintenance and repairs, redundant conditioning systems are utilized on the product gas sample. That is, parallel, identical clean-up trains are provided from the sample point to the gas analysis room. However, only one of the clean-up trains is in use at a time. This will allow maintenance or reconditioning of one sample system while the other is in operation.

In operation, a portion of the hot process gas is removed from the process through a sample probe designed to exclude particulate materials and inserted into the process line. This gas receives substantial pre-conditioning prior to being transported 60-75' to the analyzer room for final clean-up and analysis. The pre-conditioning components are all mounted in a heated, insulated oven near the sample point and maintained at 350°F.

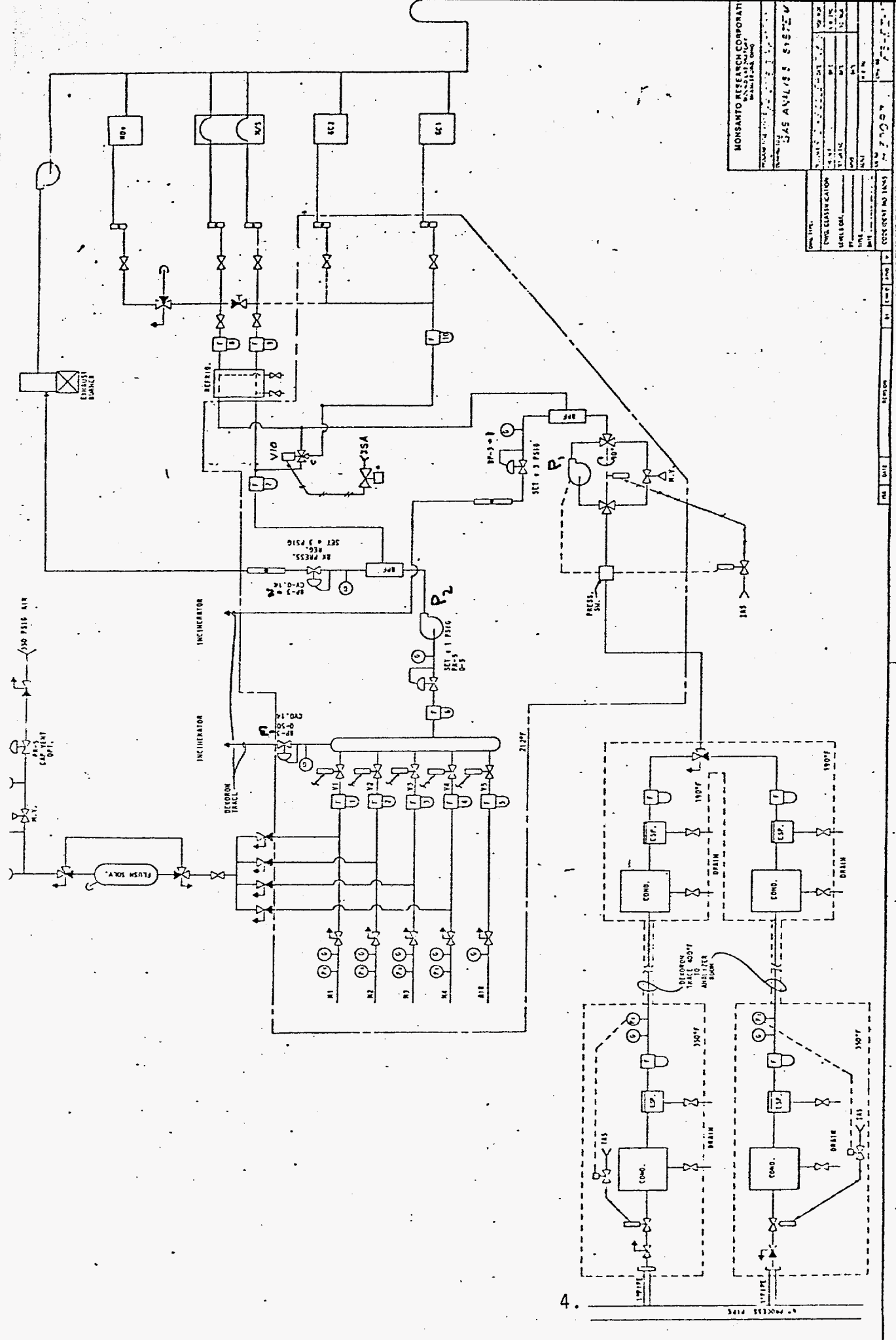
TABLE 1

Control Panel Instrument Loops

<u>Loop ID</u>	<u>Title</u>
PICA-10	Low pressure (350 psig) Air Header Control
PI-11	High Pressure (1000 psig) Air Pressure
FICA-20	High Pressure Air Flow Control
TI-30	High Pressure Air Temperature
PI-12	Low Pressure Air Pressure
FICA-21	Low Pressure Air Flow Control
TI-31	Low Pressure Air Temperature
FI-22,23	Product Gas Flow (High Volume, Low Pressure)
FI-33A, 33B	Product Gas Flow (Low Volume, High Pressure)
TI-24	Well Head P1-1 Temperature
PI-27	Well Head P1-1 Pressure
TI-25	Well Head P1-2 Temperature
PI-28	Well Head P1-2 Pressure
TI-26	Well Head P1-3 Temperature
PI-29	Well Head P1-3 Pressure
TI-32	Product Gas Header Temperature
PICA-17	Pressure Control-Product gas to Incinerator
ZA-50	CO Monitor/Alarm-Control Building
ZA-60	CO Monitor/Alarm-Well Heads

The following are local field mounted instruments:

TI-13	Wet Instrument Air Header Temperature Gauge
PI-14	Wet Instrument Air Header Pressure Gauge
PCV-15	Back-up Instrument Air Supply Regulator
PSV-16	Back-up Instrument Air Supply Pressure Relief
PAL-18	Low Instrument Air Header Pressure Alarm
PI-19	Instrument Air Header Pressure Gauge
PCV-20	Instrument Air Header Pressure Regulator



MONSANTO RESEARCH CORPORATION
 3000 NORTH BRIDGE AVENUE
 EMERYVILLE, OHIO 44029

GAS ANALYSIS SYSTEM

DATE	NO. OF	REV.	BY	CHKD.
11/15/77	1	1	J. J. ...	J. J. ...
DESIGNED BY	DATE	NO. OF	REV.	BY
J. J. ...	11/15/77	1	1	J. J. ...
CHECKED BY	DATE	NO. OF	REV.	BY
J. J. ...	11/15/77	1	1	J. J. ...
APPROVED BY	DATE	NO. OF	REV.	BY
J. J. ...	11/15/77	1	1	J. J. ...

Figure 1
 Schematic Diagram of Gas Analysis System for Pricetown I.

TABLE 2

Specifications for Coal Gasification Analyzers

<u>Constituents</u>	<u>Gas Chromatograph</u>		<u>Precision*</u>
	<u>Composition</u>	<u>Range</u>	
H ₂		0-25%	±2%
N ₂		0-100%	"
CO ₂		0-20%	"
CO		0-20%	"
CH ₄		0-50%	"
Argon/O ₂		0-25%	"
H ₂ O		0-20%	±5%
H ₂ S		0-3%	±2%
SO ₂		0-3%	"
Ethane		0-2%	"
Propane		0-2%	"
Butane		0-2%	"
HCN		0-2000 ppm	"
COS		0-1000 ppm	"
		<u>Mass Spectrometer</u>	
CH ₄		0-50%	±2%
CO		0-20%	"
H ₂		0-20%	"
O ₂		0-20%	"
CO ₂		0-20%	"
N ₂		0-100%	"
H ₂ S		0-3%	"
Argon		0-2%	"
		<u>Chemoluminescence</u>	
NO			±2%
NO ₂			"
NO _x			"

*Analyzer precision is defined as deviation in measurement of standard gas at any time, assuming weekly calibration.

A manual shut-off valve in the sample line is followed by an automatic valve which is activated by a pressure sensing switch (Px on the diagram) located slightly downstream in the sample line. The auto shut-off valve closes in the event of high pressure (≥ 60 psig) to protect other components of the sample system. Once the automatic over-pressure valve has closed it must be manually reset.

A small condenser is used in the pre-treatment oven to condense compounds in the gas stream which vaporize above 350°F . The gas leaving the condenser is at approximately 350°F and contains liquid droplets of tar and high boiling point compounds formed in the condenser. A manual drain valve is provided to periodically remove collected liquid from the condenser.

The function of the electrostatic precipitator (ESP) is to collect and remove, from the sample gas stream, solid particles and liquid droplets, whether entrained and carried out of the process or formed in the condenser. A manual drain is also provided on the ESP.

The filter following the ESP provides a final polish to the gas, trapping any mist or other particles which escape the ESP. This filter, as are all filters in the system, is a commercial item having a stainless steel body and an easily replaceable element.

The sample gas is conveyed from the pre-treatment oven to the gas analysis room via insulated, heat traced stainless steel tubing, $3/8$ in.-dia., maintained at 400°F . The sample, at this point, has been stripped of high boiling point compounds. Lower boiling point compounds which remain in the gas are kept vaporized by the hot sample line (400°F) and the gas is conveyed to the analyzer room for further cleanup prior to analysis.

Further cleanup is accomplished by first passing the 400°F gas through a condenser operated at 190°F where liquid droplets of light and middle weight oils are formed. This condenser is maintained at the lowest temperature (190°F) in the hot part of the clean-up system.

Another ESP, located just after the 190°F condenser, removes droplets and particulates. A drain is available on this ESP as well as on the 190°F condenser. A filter follows the ESP. These components, just described, are maintained at 190°F in an oven separate from the other components of the clean-up system. Redundancy is maintained through this point by having two, parallel 190°F ovens. A manual three-way selector valve in one of the ovens is used to select either one of the two parallel sampling trains.

The sample gas at this point is at approximately 190°F and has been stripped of tars and most of the oils. The 190°F gas from the selected sampling train flows into a higher temperature oven in which all hardware components are maintained at 212°F. The 212°F oven is closely coupled to the 190°F oven to prevent cold spots in the transition. The higher temperature reheats the gas and prevents condensation of lower boiling point compounds.

Since it is deemed desirable to sample the product gas even where there is no positive pressure in the process lines, an automatic pressure switch is provided to start pump P₁ if the pressure drops below approximately 5 psig. When the line pressure is sufficiently high, the pressure switch activates automatic valves to bypass the pump and turn it off. These components are located in the 212°F oven.

In this hotter zone, and following the pump/valve system, the sample gas flows into a bypass filter (BPF) through which a larger main flow passes unfiltered. A smaller sidestream is taken through the filter element of the BPF for additional cleaning of the gas going to the analytical instruments. The larger mainstream flow goes through a back-pressure regulator (BP-3-1, set to regulate at 3 psig), a rotameter, and on to the incinerator for disposal. The bypass filter enhances time response, allowing a high rate of flow while filtering and passing only a small flow to the analytical instruments.

The smaller sidestream is split to provide sample gas to the mass spec process flow loop and the NO_x analyzer continuously. If the computer so directs, 3-way valve V₁₀ is opened to also direct the process gas into the two gas chromatographs.

Sample gas to the NO_x analyzer and the mass spectrometer is cooled to a sub-ambient temperature with a refrigerated condensing system, filtered, and passed in separate streams into the two analyzers.

Split flows are taken from the GC stream to operate GC₁ and GC₂ in parallel. The sample gas for the GC's is not cooled, but is maintained at 212°F to preserve water and low boiling point organic materials in the gaseous state for measurement by the GC's.

All exhaust gases from the analyzers are passed to the incinerator or flare for disposal.

2. Test Wells. The sample conditioning system for the test wells, M₁ through M₄, is designed to operate independently of the downhole pressure. It is anticipated that this pressure may vary from 0 psig to about 350 psig.

Sample gas from the test wells is brought to the surface through $\frac{1}{4}$ " stainless steel tubing. At a depth of about 4' underground (below the prevailing frost line), Dekoron electrically traced and insulated sample line is coupled to the longer, unheated downhole tubing. The Dekoron line is used to convey the sample gas to the analyzer room and is operated at about 250°F to keep the withdrawn gas totally vaporized.

The test wells are sampled sequentially by operation of V_1 through V_5 as directed by the computer. However, at least one of these valves is open at all times. The valving logic is more fully discussed in a separate section, below.

Gas flow from the test well being sampled enters the main, 212°F oven from a Dekoron line. A pressure transducer (Px), located in the oven provides data to the computer for logging test well pressures. A gauge (G) is available for immediate indication of line pressure. A manual shut-off valve following the gauge is available for line isolation.

The gas flow is through a coarse filter (F_1 - F_5), the automatic valve, and into a ring manifold. The ring manifold minimizes the effects of dead volume inherent in valving a number of lines into a common point. F_6 is a filter in the common line from the ring manifold and provides finer filtering of the selected test well gas. PR-5 is a pressure regulator set to regulate at 1 psig.

A pump follows PR-5 and is used to increase the gas pressure up to 3 psig as set on the back pressure regulator BP-3-2. In the event that downhole pressure is atmospheric (0 psig), PR-5 will open fully and the pump will still provide 3 psig at its discharge. Thus as downhole pressure varies between 0 and 350 psig, the pump input is limited from 0 to 1 psig by PR-5, and the output remains constant at 3 psig. This identically matches the pressure available at the bypass filter in the product gas system so that equal pressures are presented to the downstream analytical instruments regardless of the gas source.

A bypass filter (BPF) takes the mainstream flow through a rotameter and to the incinerator for disposal. The filtered stream from the bypass filter goes through one channel of the refrigerated condenser, another filter, a flow adjusting rotameter, and into one channel of the mass spec.

The refrigerated condenser operates at 43°F and cools the sample gas to remove most of the water and light oils. Before analysis the gas will be at ambient temperature.

If directed by the computer, 3-way valve V_{10} is opened in the direction to take the test well sample into the two gas chromatographs.

Since the downhole pressure will at times be quite high, a means is provided at the ring manifold to increase the sample flow rate from the test wells under high pressure conditions. This is necessary since the compressed volumetric flow of gas is only a fractional part of the volume flow at atmospheric pressure. A backpressure regulator (BP-3-3) is set to bleed off excess gas at pressures above 25 psig and increase the flow as needed. The bleed gas is discharged to the incinerator.

A backflush system is coupled to the test well lines just ahead of the coarse filter, F_1 through F_5 , and is utilized to put either high pressure argon or a liquid solvent into the test well line for periodic cleaning. The backflush system is manually operated, completely subject to operator control

3. Time-Sharing Logic. The analytical instruments are time-shared between the various gas sources by having control valves V_1 through V_5 and V_{10} under the direction of the computer. Additionally, the mass spec instrument is directed by the computer through valving internal to the instrument to analyze either the product gas or the gas from the ring manifold (one of the test wells). See Section IV for details. Both of these gas streams flow continuously through the mass spec, although only one is being analyzed at a time.

The arrangement of the automatic valving is such that any gas source (M_1 through M_4 , or the product gas) can be connected to either the two GC's or the mass spec. The NO_x analyzer is not time-shared

Time-sharing logic is built around operation of the mass spec. Thus, in operation, the mass spec will alternately analyze the product gas and whichever of the test wells is connected to the ring manifold (through one of V_1 - V_5). The mass spec stream switching will be at the rate of about once every two and one-half minutes, toggling alternatively between test well gas and product gas.

Automatic valves V_1 to V_5 will be opened in sequence. However, one of the five will always be open to supply test well gas to the test well channel of the mass spec.

Maximum utility will be derived from the two GC's, which have approximately a fifteen minute analysis cycle time, by basing the selection of the source gas on the relatively high-speed mass spec analysis. In other words, the GC's will be directed to analyze the particular gas source of most interest as determined by the computer from the mass spec analysis. Valve V_{10} is the selector valve for GC's and is either in a position to flow product gas or test well gas to the GC's.

Summarizing the overall logic, the mass spec alternatively analyzes the test well gas and the product gas on approximately a five minute cycle. Both streams flow continuously through the instrument. As the product gas is being analyzed for a two and one-half minute period, the selected test well gas continues to flow. At the end of the product gas analysis period ($\sim 2\frac{1}{2}$ minutes) the mass spec begins analysis of the test well gas for a two and one-half minute period. The mass spec then switches back to the product gas, and after a very brief delay, the next well valve (V_1-V_5) is opened in sequence. Thus the mass spec analyzes the product gas alternatively with one of the test wells. This allows maximum time (5 minutes) for test well line purge, and devotes most of the overall analysis time to the product gas. The overall cycle time, assuming four test wells, would be twenty minutes.

The computer program will also allow the mass spec to dwell for more than one cycle on any test well having a gas composition of particular interest. However, the product gas will continue to be analyzed alternatively.

The two GC's, operated in parallel, will analyze the particular test well gas having the highest interest, as determined by the computer from the mass spec analysis. The gas stream to the GC's is selected by operation of V_{10} .

Although the normal sequence of valve operation will be controlled by the computer, all valves will have manual override switches for opening and closing valves independently of the computer and in case of computer failure.

4. Data Logging. Analytical data will be recorded independently of the computer. Each GC has an analog strip chart recorder for preserving GC outputs. A digital data logger will be used to collect output data from the mass spec and NO_x analyzers.

IV. AUTOMATED DATA ACQUISITION AND CONTROL SYSTEM

Introduction

A real-time automated data acquisition system should include features such as dependability, ease of maintenance, rapid problem isolation and backup capability. A schematic diagram of the Pricetown I system indicating such features as well as the overall layout is shown in Figure 2.

General Description of the Automated Data Acquisition and Control System

The four satellite microprocessors are interfaced to a host minicomputer

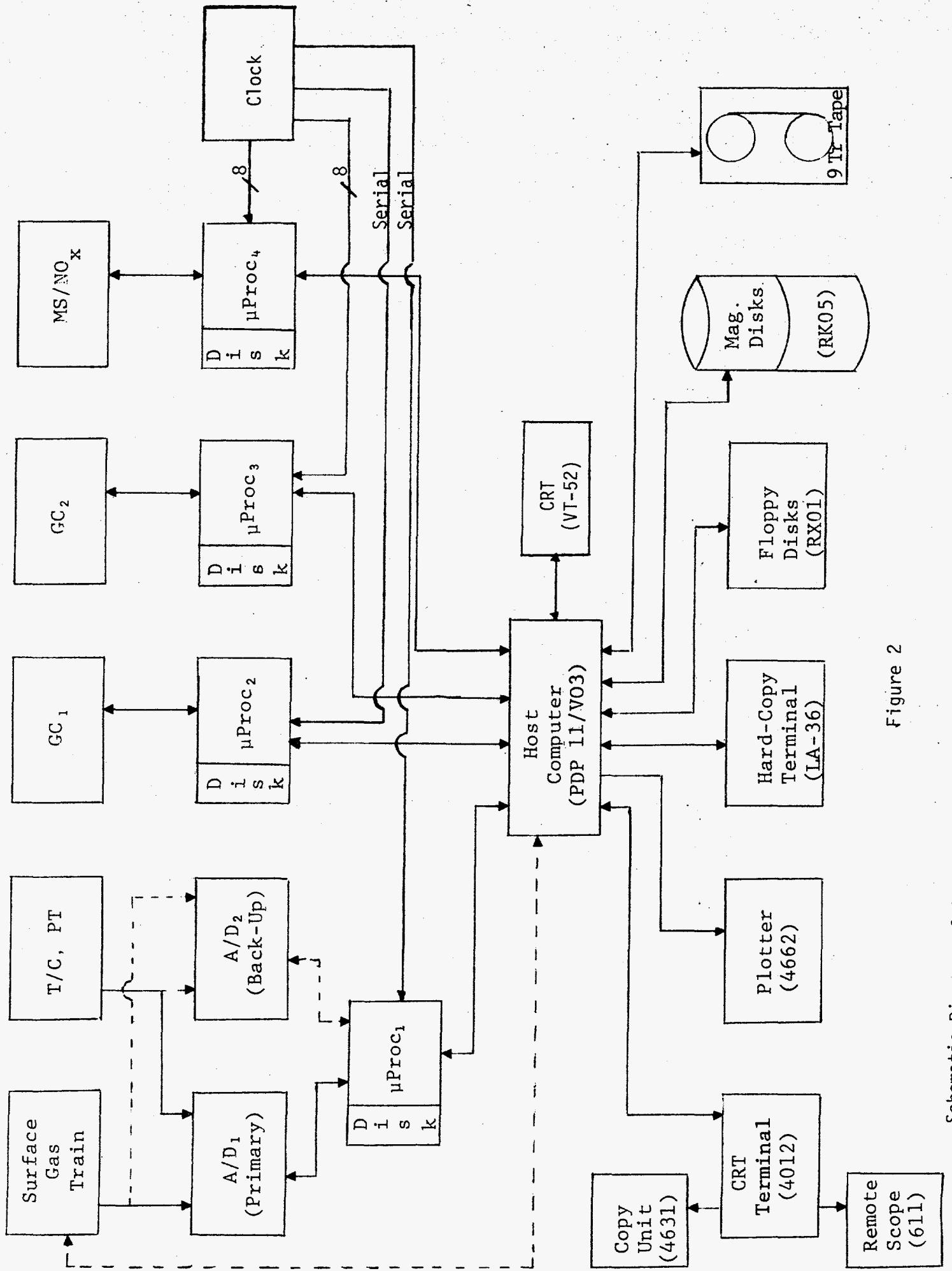


Figure 2

Schematic Diagram of Automated Data Acquisition and Control System for Pricetown I.

(LSI-11) which acts as a data collector-concentrator. As indicated in Figure 2 each satellite microprocessor is assigned a specific acquisition and/or control function. For example, microprocessor 4 provides signals to the gas chromatograph satellites when its detection algorithm detects unusual data occurrences. All satellites record data on diskettes as the data are collected. The diskette is managed as a first-in, first-out (FIFO) buffer so as to always have as many current data items as possible on the diskette. Consequently the oldest data items are overlaid by the most current data items.

Data items are transmitted from the satellite microprocessors upon command from the host computer. The position of the data item last sent is maintained by the satellite processor so that the satellite software can detect the situation where the diskette FIFO buffer overflows before the host computer receives the data item. This overflow condition is transmitted to the host computer on the first opportunity.

Each satellite microprocessor maintains a time-of-day clock which is updated from a signal received from the clock module. All satellites are based on a M6800 microprocessor and all software for these microprocessors is coded in assembler language. The clock module is based on an INTEL 8080 microprocessor and is also coded in assembler language.

Three basic categories are collected by the described data acquisition and control system. They are temperature readings and associated emf readings from each of the 40 downhole thermocouples (10 per monitoring well); gas compositions obtained by mass spectrometry, NO_x analyzer and gas chromatography from each monitoring well and the product stream; and process variables and alarms associated with the gas train system. The acquired data are passed to the host computer where they are partitioned into various file structures for graphic control and report purposes. On a schedule basis all acquired data are written on an IBM format compatible magnetic tape for a historical record and for further data analysis.

1. Gas Train Variables. Analog signals, 4-20 ma D.C., from the terminals of the analog display on the control panel are routed to a Digitrend Data Logger for transmission to the host computer system. These signals are generated and transmitted from differential pressure, pressure, and temperature transducers and thermocouples strategically placed along the gas train.

For the high pressure, low volume injection air (reverse link mode) differential pressure, pressure, and temperature transducers designated as FICA-20, PI-11 and TI-30, respectively, are monitored and used for mass inflow computations. Likewise differential pressure, pressure, and temperature transducers designated as FICA-21, PI-12 and TI-31, respectively, are monitored and used for mass inflow computations during the low pressure, high volume injection air for the forward gasification mode.

A backpressure control loop designated as PICA-17 and placed downstream from the orifice metering station is used to monitor the backpressure. The PICA-17 instrument loop provides product gas header backpressure regulation. The purpose is to keep the product gas flow from exceeding 250 ft/sec. To measure the product gas flow during the reverse link, signals from two differential transducers designated as FI-33A and FI-33B are used. Because they monitor parallel piping only one of these transducers is active at any given time. Similarly, differential pressure transducers labeled FI-22 and FI-23 are used to monitor the differential pressure during the high volume, low pressure product gas flow for the forward gasification. A temperature transducer upstream from the orifice metering station is used to measure the product gas temperature.

As just indicated, data from these data nodes are collected for process monitoring, mass flow computations, and process control. Normally the data will be collected at the rate of one data point per 12 minutes. But the data collection rate also can be event driven by unusual data occurrences and can be as high as one data point per 15 seconds. The actual data density is controlled by two parameters passed to microprocessor 1 from the host computer. If, however, the host computer should fail, the microprocessor will operate from a set of default parameters. The mass flows will be computed by the classical mass flow equation

$$Q = K \sqrt{(\Delta P \times P)/T}$$

where the differential pressure (ΔP) is in inches, the pressure (P) is in psia, and the temperature (T) is in degrees Rankine. The constant K has a dependence on orifice size, and the compressibility and specific gravity of the gas and will be updated when changes in the gas composition occur, as determined by mass spec analysis. If the mass spec is down then gas chromatographic analysis will be used.

In addition the pressure transducer located in the gas chromatograph oven will collect and log pressure data for the four test wells. The data density will depend on events occurring both in the product and test well gas streams. But again the maximum rate would be one point per 15 seconds.

2. Temperature Data. As indicated in Figure 2 the temperature signals are routed to a Digitrend Data Logger, processed through microprocessor 1, and then transmitted to the host computer. Data will be collected from each of 40 thermocouples, 10 per test well, and a total of six readings per thermocouple will be acquired, four temperature readings and two diagnostic readings. The relative positions of these thermocouples in the coal seam, the overburden, the underburden, and the two interfaces between the coal and over- and underburden are shown in Figure 3.

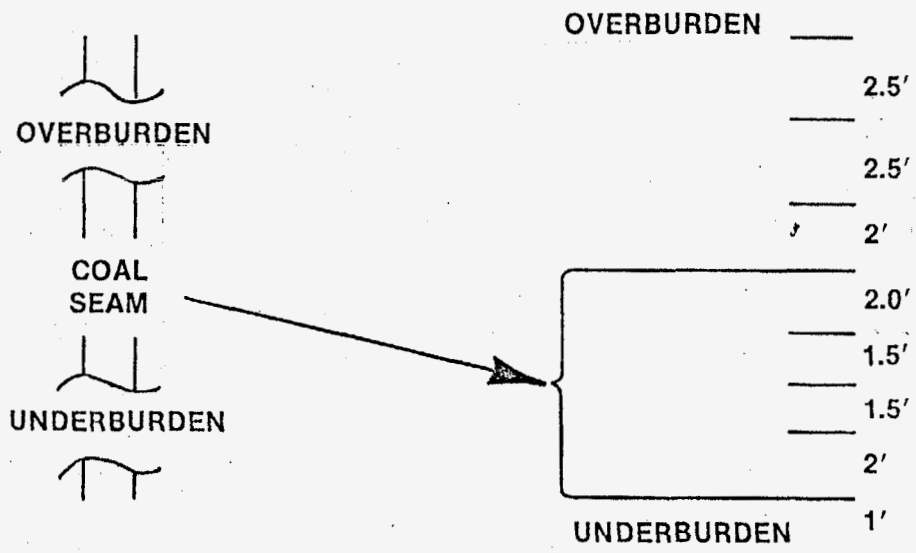


Figure 3
Relative positions of Thermocouples in Coal Seam.

Data from the thermocouples will be used to locate and map the burn front, and for modeling purposes. Although the normal collection rate will be one data point (channel reading) per 12 minutes, the data collection rate can be event driven by unusual data occurrences and can reach a maximum rate of one data point per 15 seconds. Like the surface gas train variables, the actual data density will depend on events and on parameters determined from current data and then passed to microprocessor 1 from the host computer. Temperature readings will be adjusted in the host computer using grout, shale and coal conductivities. A projected maximum number of data points to be collected for the project is given in Table 3 and an overview flow diagram for the collection of temperature information is shown in Figure 4.

Available graphics are listed in the graphics section.

3. Gas Composition Data. The gas composition of the product and monitoring wells gas streams is analyzed by mass spectrometric and gas chromatographic methods using a Perkin-Elmer Model MGA 1200 mass spectrometer system and two Bendix Model 7170 process chromatograph systems; and a chemiluminescent NO/NO_x analyzer dedicated to the product gas stream. Figure 5 is a schematic showing the relationship between the analytical systems and the gas streams.

Under the direction of microprocessor 4 mass spectrometer and gas chromatograph analytical systems are time-shared among the gas streams through control valves V₁ through V₅ and V₁₀ which are shown in Figure 1. For greater details on the analytical system including the valving and timing logic, see the section on the description of the Pricetown I gas analysis system.

The integration of microprocessor 4 which controls and collects data from the mass spectrometer system, and interacts with the microprocessors that control and collect data from the gas chromatograph system is depicted in Figure 2.

As also indicated in the section on the description of the Pricetown I gas analysis system the real-time control of the gas chromatographs will be directed by microprocessor 4 after analysis of the mass spec data obtained from the different gas streams. The actual switching among gas streams will be determined by unusual data occurrences which will be detected by the computer code residing in microprocessor 4 and with the aid of a parameter passed from the host computer. Should the host computer fail, the microprocessor will operate with a default parameter.

A flow diagram for the collection of mass spec and gas chromatograph data is shown in Figure 6. For the process stream the mass spec data rate will be approximately one measurement per five minutes and the gas chromatograph rate will be approximately one measurement per 30 minutes. With the four test wells the overall mass spec cycle time will be 20 minutes and the overall gas chromatograph cycle will be approximately 2½ hours for normal conditions. However, the actual data density will depend on the number of unusual data occurrences detected.

TABLE 3

PROJECTED DATA DENSITY AND FILES FOR THE DIFFERENT DATA SOURCES

<u>Type</u>	<u>Source</u>	<u>No. of this Type</u>	<u>No. Rdgs. per Type</u>	<u>Total No. per Data Get</u>	<u>Base Time Block (B.T.B.)</u>	<u>Total No. /B.T.B.</u>	<u>Total No. /Hour</u>	<u>Total No. /Shift</u>	<u>Total No. /Day</u>	<u>Total No. (180 days) /Project</u>	<u>Total No. of Files</u>
T/C	Digitrend Data Logger	40	6	240	12 min.	240	1200	9600	28800	10,057,000*	40
GC	GC P Product Well	2	7	14	30 min.	14	28	224	672	120,960	1
GC ₂	MS P Test Wells	2	7X4 Wells	56	2.5 hrs.	56	---	224	616	110,880	1
51 M.S.	MS P Product Well	1	8	8	2.5 min.	8	192	1536	4608	829,440	1
M.S.	MS P Test Wells	4	8	32	10 min.	32	192	1536	4608	829,440	1
Gas Train	Diff. Pressure variable, pressure and temperature transducers on gas train system	20	1	20	12 min.	20	100	800	2400	846,720 *	20

*assumed that for 2% of the time, data would be acquired at the maximum rate of 1-data point per 15sec.

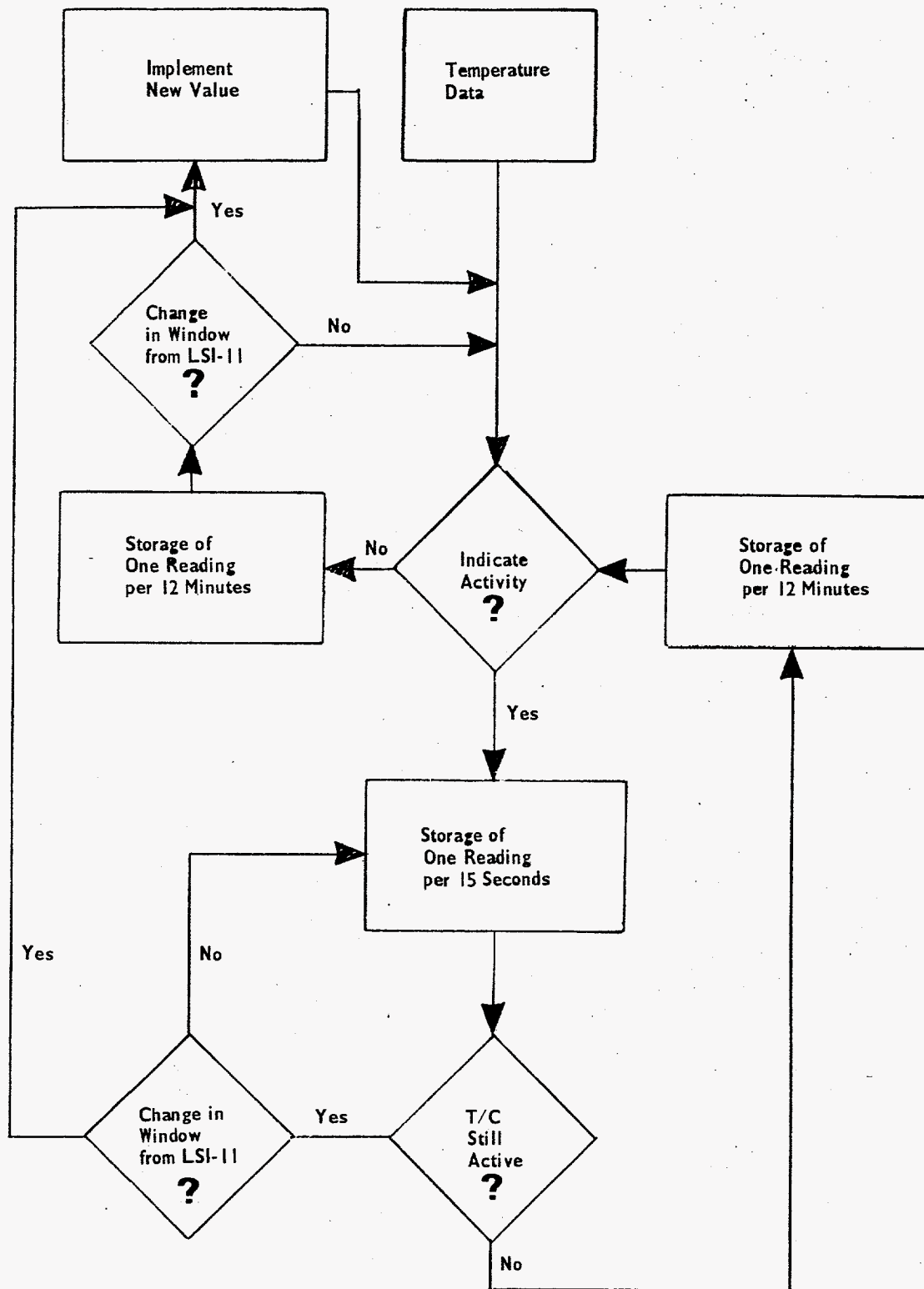


Figure 4
 Overview Working Flow Diagram for Collection of Downhole Temperature Data.

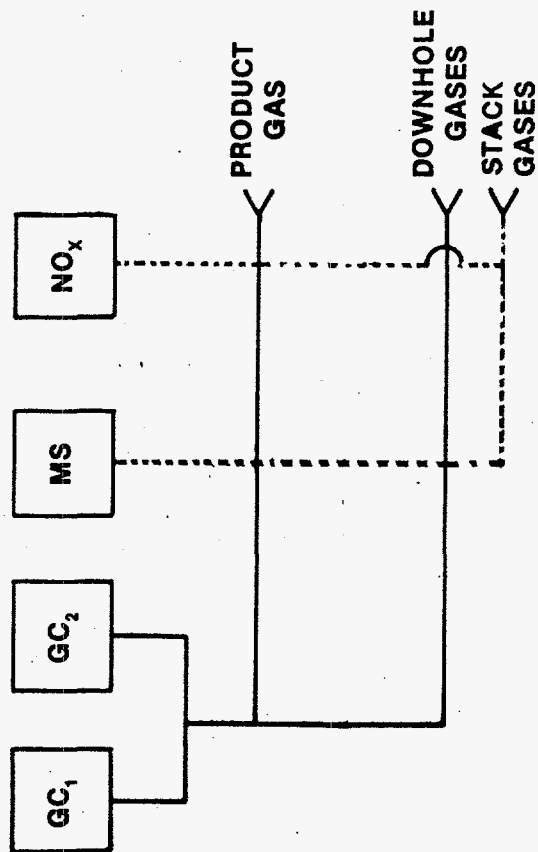


Figure 5

Schematic Relationship between the Analytical Systems and the Gas Streams.

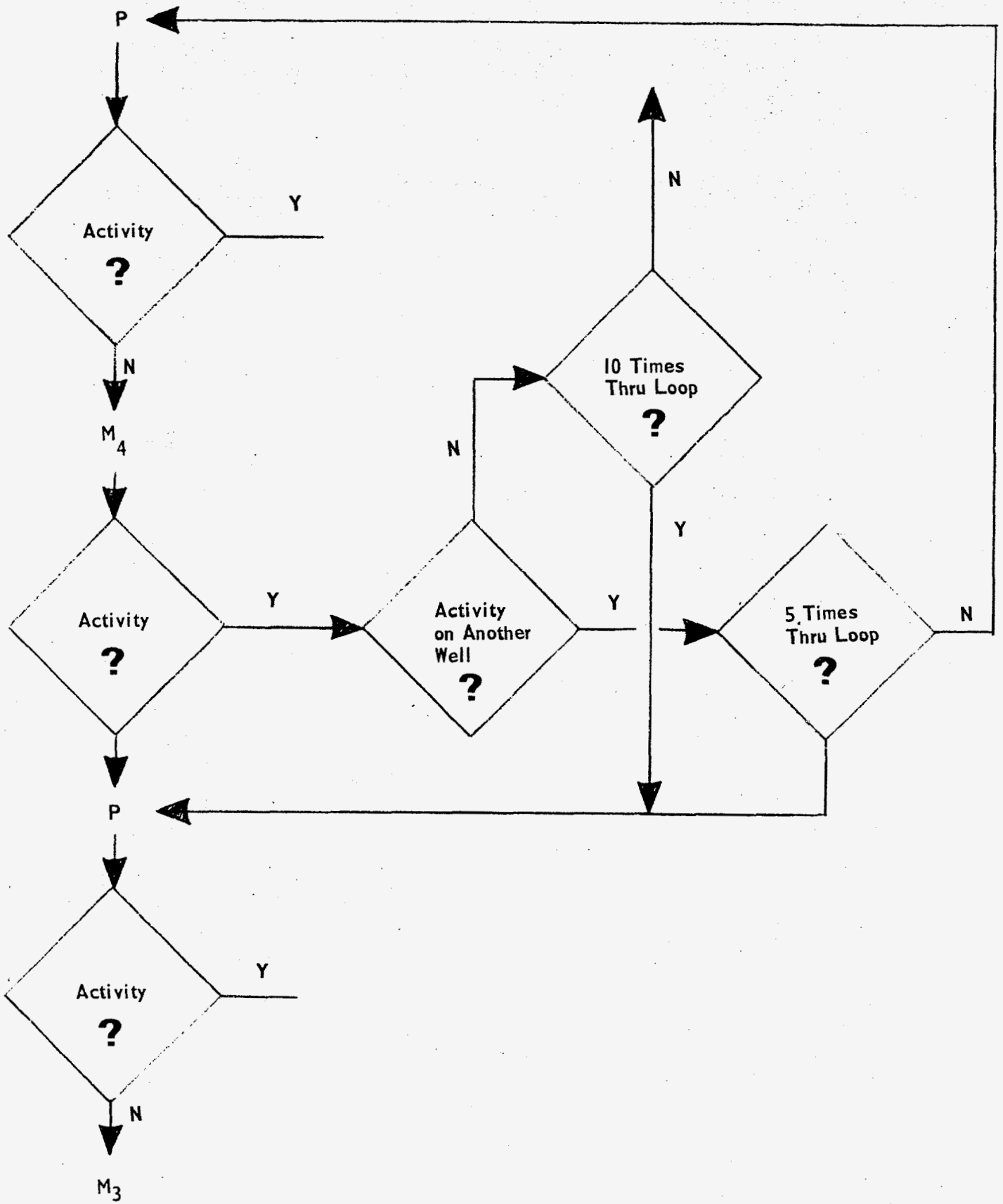


Figure 6
 Working Flow Diagram for Collection of Mass Spec and
 Gas Chromatograph Data

Table 3 lists the projected number of data points. These data will be used for modeling, monitoring, heat content (BTU) computation and as an aid in the development of a process control system.

4. Data Acquisition Software (Temperature and Gas Train Variables). This code records data on a diskette for transmission to the host computer. Keeps an entry for each of the 40 thermocouples and the 20 gas train variables. The code detects and flags unusual data occurrences and transmits that event to the host computer.
5. Data Acquisition Software (Mass Spectrometer and Control Code). This code controls the mass spectrometer, detects and flags unusual data occurrences, and sends control signals to the GC satellites. All MS data is recorded on a diskette and sent to the host computer. Data acquisition is initiated by selecting a specific inlet, reading the data, recording the data on a diskette, reading the NO_x data, and recording on the diskette.
6. Data Acquisition Software (Gas Chromatograph). This code records the data on a diskette associated with each microprocessor. In the normal mode data will be collected on the product gas stream and one of the test well gas streams on a shift interval. Upon command of the Mass Spectrometer and Control code, the GC's will acquire data from the selected gas stream. The GC's will return to normal mode upon command from the controlling microprocessor or after a period of time, of approximately 15 minutes, during which no change is recorded.
7. Background Software. The background software will include graphics, report generation, file structure and file handling, operator interface (operate system and respond to alarm), executive, and calculation modules. The graphics module will plot temperature data, gas chromatograph and mass spectrometer data, gas train variable, mass balance computations, heat content computations,

All plots on the graphics terminal will be for the most recent 30 data points. For example, if hourly average temperature value are to be displayed, then the last 30 hourly temperature averages would be plotted. Because the acquisition rate can be event driven for temperature readings and the gas train variable the possibility exist that any given set of 30 data point might include a mix of time intervals. The automatic scaling of the

axis or axes would reflect this for the viewer. Should a gap(s) occur in a data set, this gap likewise would be reflected in the plot. Up to four concurrent data plots are possible on one graph. Plots available on the graphic terminal are given in Table 4. Any of these display plots can be generated on demand but normally hard copies of these plots are issued on a scheduled basis. The frequency is indicated in Table 4. Report quality plots from the flatbed plotter also will be available and normally will be available on demand. Those plots available are the ones indicated for the graphics terminal.

The report generation module will provide an event report for the shift and a composite one for the day. This module also will generate a listing of the daily averages for the gas train variables, a list of the high and low compositions, pressures and flows. Likewise a heating value report will be generated.

Creation of new files, updates of existing files, deletions of obsolete files, backup of critical files and monitoring of file organization on the disks are functions of the background file structure module. The background operator module initiates entries into the event file, graphics, system messages such as clean tape heads, load paper, etc., and operator requested messages from help files. A list of files is given in Table 5. The background executive module calls the graphics module, the report module, the file structure module, the operator interface module, and the calculation module. It also performs system checks to verify the condition of peripherals and relays messages to the operator on status, information for the event log and comments from previous shifts.

The calculation module computes mean values, generates statistics and in general provides the computations needed for control, graphic and report purposes.

Overall the background tasks are projected to use approximately 95% of the host computer time.

8. Foreground Software. This software handles all prompts and messages between the operator and the foreground tasks. It responds to operator input, controls the hardware diagnostics, queues the data acquisition for the background tasks, communicates with the background executive, initiates the acquisitions of status reports, and detects equipment failure. In addition this software attends to the normal boilerplate activities associated with the system. Approximately 5% of the host computer time will be devoted to this software.

TABLE 4

PLOTS AVAILABLE ON THE GRAPHIC TERMINAL

<u>Type</u>	<u>Number</u>	<u>Title</u>	<u>Source</u>	<u>No. of Lines/ Points</u>	<u>When</u>	<u>Where</u>	<u>Defaults and Type of Data</u>
1	4	Temp vs Time	Digitrend	4/30	Daily	TEK	4 T.C.'s in coal seam on TEK Hourly and daily averages.
2	1	SO ₂ & H ₂ S vs Time	GC1 & GC2	1/30	Daily	TEK	Raw data on TEK
3	1	CH ₄ /CO vs Time	MS	1/30	Daily	TEK	Hourly average on TEK
4	1	CO vs Time	MS	2/30	Daily	TEK	Hourly average on TEK
5	1	BTU & CH ₄ vs Time	GC1	1/30	Daily	TEK	Raw data on TEK
6	1	CO/CO ₂ vs Time	MS	2/30	Daily	TEK	Hourly average on TEK
7	1	CH ₄ /H ₂ vs Time	MS	1/30	Daily	TEK	Hourly average on TEK
8	1	N, C, H & O Mass Balance vs Time	Mass Balance Calculations	2/30	Daily	TEK	Hourly average on TEK
9	1	H ₂ & CO vs Time	GC1	2/30	Shift	TEK	Raw data on TEK
10	1	N (injection) & N (product) vs Time	Calculated Values	1/30	Shift	TEK	Hourly average on TEK
11	1	H ₂ O vs Time	GC1	1/30	Daily	TEK	Raw data on TEK

TABLE 4 (Continued)

PLOTS AVAILABLE ON THE GRAPHIC TERMINAL

<u>Type</u>	<u>Number</u>	<u>Title</u>	<u>Source</u>	<u>No. of Lines/ Points</u>	<u>When</u>	<u>Where</u>	<u>Defaults and Type of Data</u>
12	1	Back Pressure vs Time	Digitrend	1/30	Daily	TEK	Hourly average on TEK
13	1	PI1, PI2, PI3 Pressure vs Time	Digitrend	2/30	Daily	TEK	Hourly average on TEK
14	1	PI1, PI2, PI3, PGH Temperature vs Time	Digitrend	2/30	Daily	TEK	Hourly average on TEK
23. 15	1	M1, M2, M3, M4 Pressure vs Time	Digitrend	1/30	Daily	TEK	Hourly average on TEK
16	1	Flow Rate (P) & Flow Rate (I) vs Time	Digitrend	1/30	Daily	TEK	Hourly average on TEK

TABLE 5

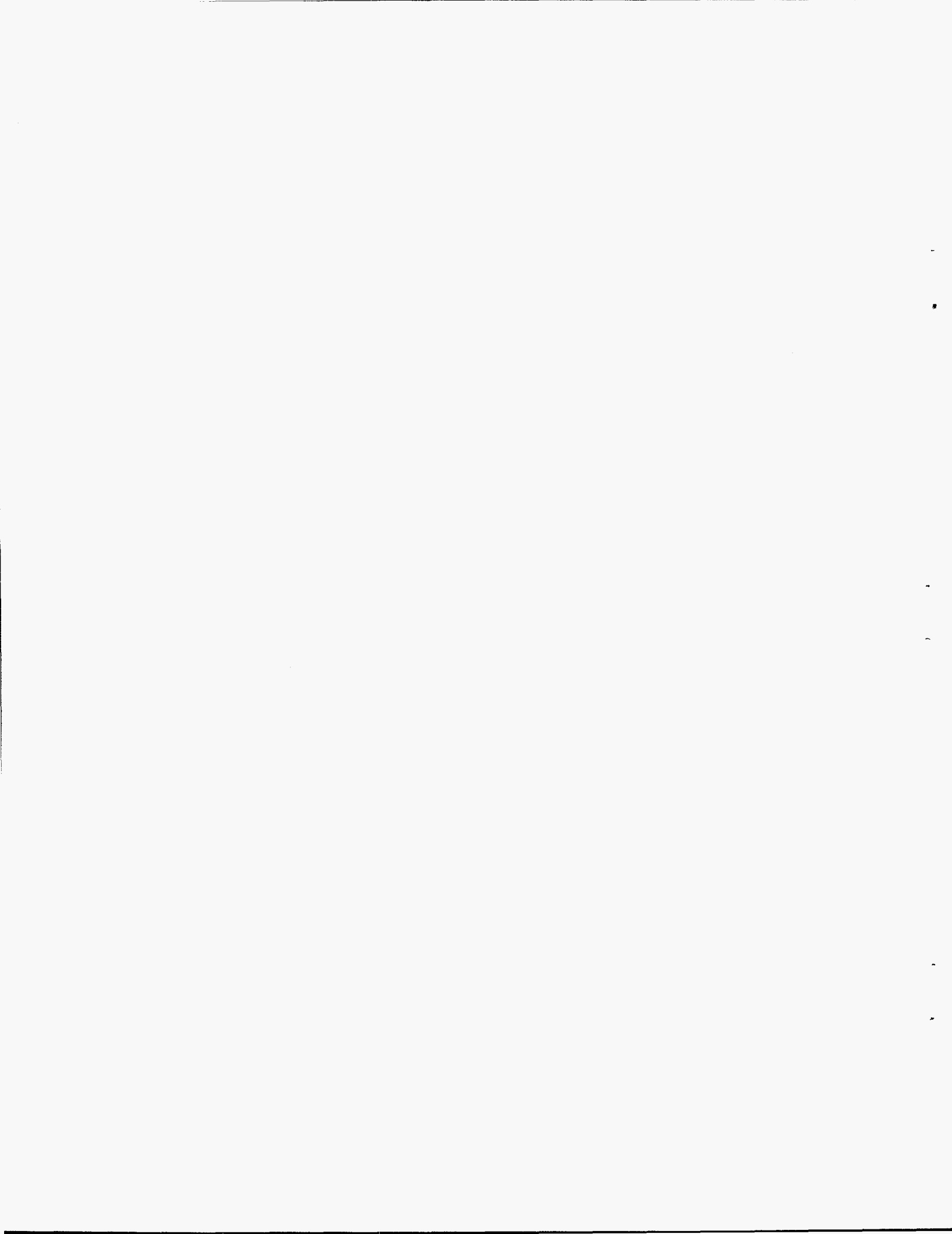
DATA FILES FOR BACKGROUND SOFTWARE

1. 40 Files for T/C data
2. Utility file that contains depths of T/C's high and low values for TEMPS, GAS COMPS, PRESSURES & flows for last 5 days
3. 3 files for product well (GC1, GC2, MS)
4. 3 files for injection well (GC1, GC2, MS)
5. 12 files for monitoring wells (4 wells ea GC1, GC2, MS)
6. 20 files for containing gas train data
7. BTU file
8. Flow rate file
9. Mass balance file
10. 2 event files (shift & day)
11. System messages
12. Operator requested messages

V. CONTRIBUTORS

The following have contributed input for this report:

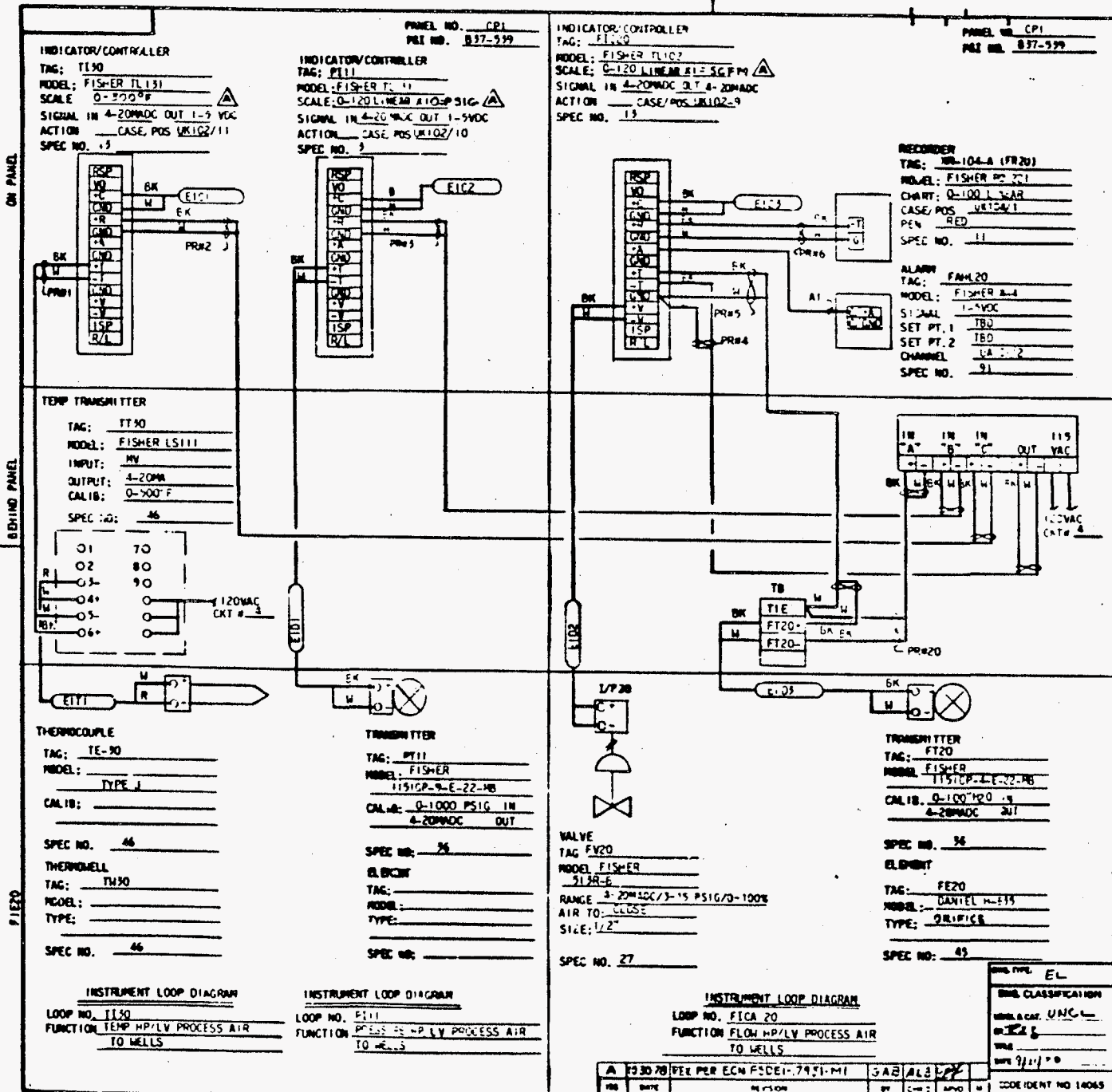
O. R. Austin
A. F. Ciramella
D. L. Clark
J. F. Combs
R. G. Corley
D. L. Fallert
W. E. Kesling
R. C. Kessler
P. W. Seabaugh
W. K. Walker
R. E. Zielinski



APPENDIX I

LOOP DIAGRAMS





INSTRUMENT LOOP DIAGRAM																														
LOOP NO. TI 50	FUNCTION: TEMP HP/LV PROCESS AIR TO WELLS	DATE: 9/11/70	BY: [Signature]																											
LOOP NO. PI 11	FUNCTION: PRESSURE HP/LV PROCESS AIR TO WELLS	DATE: 9/11/70	BY: [Signature]																											
LOOP NO. FICA 20	FUNCTION: FLOW HP/LV PROCESS AIR TO WELLS	DATE: 9/11/70	BY: [Signature]																											
<table border="1"> <tr> <td>DESIGNED</td> <td>DATE: 6-5-70</td> <td>PROJ. NO.</td> </tr> <tr> <td>CHECKED</td> <td>DATE:</td> <td>ISS. ENG.</td> </tr> <tr> <td>REVIEWED</td> <td>DATE:</td> <td>ISS. MGR.</td> </tr> <tr> <td>APPROVED</td> <td>DATE: 9/11/70</td> <td></td> </tr> <tr> <td>SCALE</td> <td></td> <td></td> </tr> <tr> <td>REV. NO.</td> <td></td> <td></td> </tr> <tr> <td>APP. NO.</td> <td>10097</td> <td></td> </tr> <tr> <td>DATE</td> <td>9-11-70</td> <td></td> </tr> <tr> <td>DRWG. NO.</td> <td>FSCEI-17961</td> <td></td> </tr> </table>				DESIGNED	DATE: 6-5-70	PROJ. NO.	CHECKED	DATE:	ISS. ENG.	REVIEWED	DATE:	ISS. MGR.	APPROVED	DATE: 9/11/70		SCALE			REV. NO.			APP. NO.	10097		DATE	9-11-70		DRWG. NO.	FSCEI-17961	
DESIGNED	DATE: 6-5-70	PROJ. NO.																												
CHECKED	DATE:	ISS. ENG.																												
REVIEWED	DATE:	ISS. MGR.																												
APPROVED	DATE: 9/11/70																													
SCALE																														
REV. NO.																														
APP. NO.	10097																													
DATE	9-11-70																													
DRWG. NO.	FSCEI-17961																													

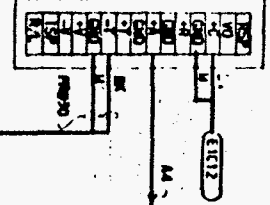
A	9/30/70	PER	PER	ECM	FSCEI-7951-M1	GAB	ALB	[Signature]
NO.	DATE	BY	CHKD	APPROV	BY	CHKD	APPROV	BY

FIELD

BEHIND PANEL

ON PANEL

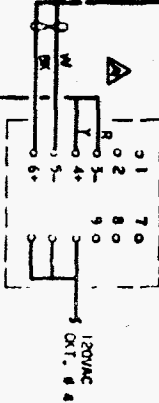
INDICATOR/CONTROLLER
TAG: T132
MODEL: FISHER T131
SCALE: 0-1000°F
SIGNAL IN: 4-20mA DC OUT: 1-5VDC
ACTION: CASE/POS. UN1017/A
SPEC. NO.: 13



PANEL NO. CP1
PANEL NO. B72541

RECORDED
TAG: _____
MODEL: _____
CHART: _____
CASE/POS: _____
PBR: _____
SPEC. NO.: _____
ALARM: _____
TAG: T132
MODEL: FISHER B-1
SIGNAL: 1-5VDC
SET PT 1: _____
SET PT 2: _____
CHANNEL: UN1017/A
SPEC. NO.: 91

TEMP. TRANSMITTER
TAG: T132
MODEL: FISHER T131
INPUT RV: _____
OUTPUT: 4-20mA DC
CALIB: 0-1000°F
SPEC. NO.: 46

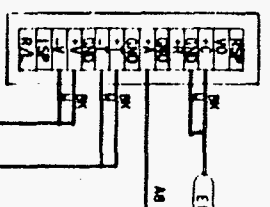


RESISTANCE
TAG: T132
MODEL: _____
TYPE: K
CAL. NO.: _____
SPEC. NO.: 44

VIA VE
TAG: _____
MODEL: _____
NAME: _____
AIR TO: _____
SIZE: _____
SPEC. NO.: _____

INSTRUMENT LOOP DIAGRAM
LOOP NO. T132
FUNCTION: TEMP, PRESS, POS, GAS TO
INDICATOR

INDICATOR/CONTROLLER
TAG: P117
MODEL: FISHER P1101
SCALE: 0-100 LINEAR 21: P316/A
SIGNAL IN: 4-20mA DC OUT: 4-20mA DC
ACTION: CASE/POS. UN1017/A
SPEC. NO.: 13



PANEL NO. CP1
PANEL NO. B72541

RECORDED
TAG: _____
MODEL: _____
CHART: _____
CASE/POS: _____
PBR: _____
SPEC. NO.: _____
ALARM: _____
TAG: P117
MODEL: FISHER B-1
SIGNAL: 1-5VDC
SET PT 1: _____
SET PT 2: _____
CHANNEL: UN1017/A
SPEC. NO.: 91

E104
E105



TRANSMITTER
TAG: P117
MODEL: FISHER
RANGE: 0-100 PSIG
CALIB: 0-100 PSIG
SPEC. NO.: 46

VIA VE
TAG: P117
MODEL: FISHER
RANGE: 0-100 PSIG
AIR TO: GREEN
SIZE: 3"
SPEC. NO.: 27

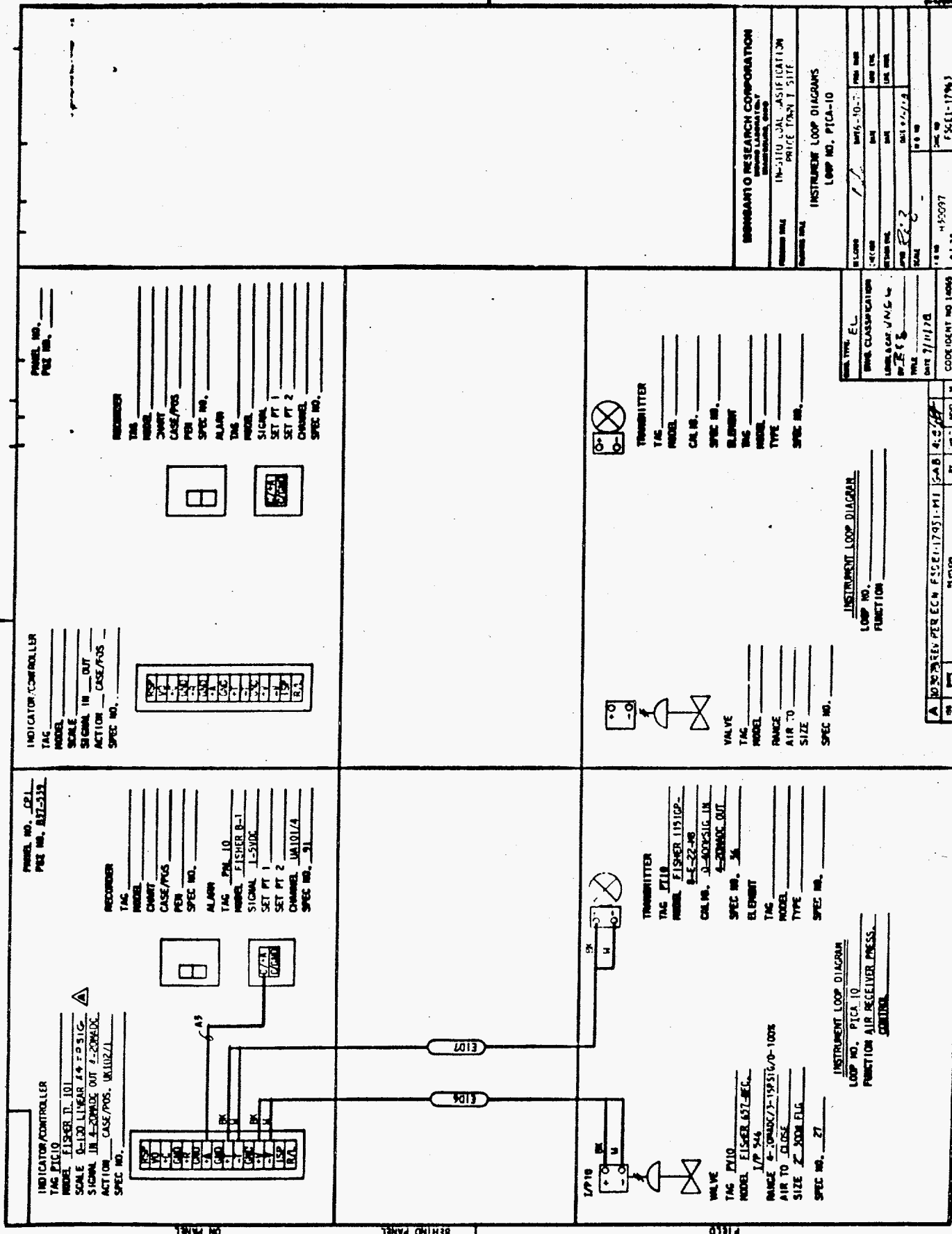
INSTRUMENT LOOP DIAGRAM
LOOP NO. P117
FUNCTION: PRESS, POS, GAS TO
INDICATOR

REV	BY	DATE	DESCRIPTION
1

DRW CLASSIFICATION	DATE	BY	APP. NO.
UNCL

DOMINANTO RESEARCH CORPORATION
IN-SITU LOCAL CALIBRATION
INSTRUMENT LOOP DIAGRAM
LOOP NO. T132, P117

DATE	BY	APP. NO.
...



INDICATOR/CONTROLLER
TAG _____
MODEL _____
SCALE _____
SIGNAL IN _____ OUT _____
ACTION CASE/POS _____
SPEC NO. _____

INDICATOR/CONTROLLER
TAG _____
MODEL _____
SCALE _____
SIGNAL IN _____ OUT _____
ACTION CASE/POS _____
SPEC NO. _____

INDICATOR/CONTROLLER
TAG FIC10
MODEL FISHER D-101
SCALE 0-100 LINEAR 4-20 SIG.
SIGNAL IN 4-20MA DC OUT 4-20MA DC
ACTION CASE/POS. UK102/1
SPEC NO. _____

RECORDER
TAG REC10
MODEL FISHER B-1
SIGNAL 1-5VDC
SET PT 1 _____
SET PT 2 _____
CHANNEL UA101/4
SPEC NO. 91

RECORDER
TAG _____
MODEL _____
SCALE _____
SIGNAL IN _____ OUT _____
ACTION CASE/POS _____
SPEC NO. _____

TRANSMITTER
TAG _____
MODEL _____
CAL. NO. _____
SPEC NO. _____
ELEMENT _____
TAG _____
MODEL _____
TYPE _____
SPEC NO. _____

VALVE
TAG _____
MODEL _____
RANGE _____
AIR TO _____
SIZE _____
SPEC NO. _____

TRANSMITTER
TAG FIC10
MODEL FISHER 11910P-4E-22-4B
COIL NO. 0-0003SIG IN 4-20MA DC OUT 4-20MA DC
SPEC NO. 34
ELEMENT _____
TAG _____
MODEL _____
TYPE _____
SPEC NO. _____

VALVE
TAG FIC10
MODEL FISHER 637-REC.
RANGE 0-100MA DC/3-15V SIG./0-100%
AIR TO CLOSE
SIZE Z 3008 FLG
SPEC NO. 27

INSTRUMENT LOOP DIAGRAM
LOOP NO. _____
FUNCTION _____

INSTRUMENT LOOP DIAGRAM
LOOP NO. FIC10
FUNCTION AIR RECEIVER PRESS. CONTROL

BERNARDI RESEARCH CORPORATION
Instruments, Controls, and
Instrumentation, Inc.
10000 W. 10th Ave., Suite 100
Denver, Colorado 80231
PHONE 303-751-1111
FAX 303-751-1112

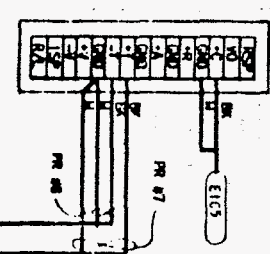
INSTRUMENT LOOP DIAGRAMS
LOOP NO. FIC10-10

DATE 7/11/78
CODE IDENT NO 1006

A 30202025 PER ECN FIC10-17931-MI CAB 4:0/8

DATE 7/11/78
CODE IDENT NO 1006
FSC11-17931

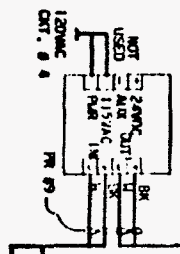
INDICATOR/CONTROLLER
 TAG: FT33A
 MODEL: FISHER I-111
 SCALE: 0-100 LINEAR 496:5CFM
 SIGNAL IN: 4-20MA DC OUT: 1-5VDC
 ACTION: CASE/PMS, UK109/111
 SPEC NO.: 13



RECORDER
 TAG: _____
 MODEL: _____
 CHART: _____
 CASE/PMS: _____
 PEN: _____
 SPEC NO.: _____
 ALARM: _____
 TAG: _____
 MODEL: _____
 SIGNAL: _____
 SET PT 1: _____
 SET PT 2: _____
 CHANNEL: _____
 SPEC NO.: _____

PANEL NO. 021
 PWT NO. 87-241

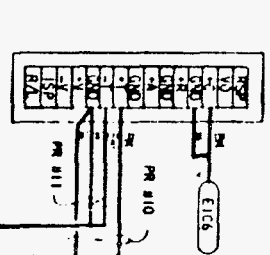
SQ. RT EXTRACTOR
 TAG: FT33A
 MODEL: ACH-1A000
 IN: 4-20MA DC OUT: 4-20MA
 SPEC NO.: 13



VALVE
 TAG: _____
 MODEL: _____
 ELEMENT: _____
 TAG: FT33A
 MODEL: DANIEL JORDON
 AIR TO: _____
 SIZE: _____
 SPEC NO.: _____

INSTRUMENT LOOP DIAGRAM
 LOOP NO. FT33A
 FUNCTION: LV/HP FLOW PROD. CAS
 TO INDICATOR

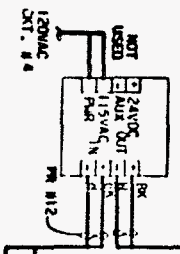
INDICATOR/CONTROLLER
 TAG: FT33B
 MODEL: FISHER I-111
 SCALE: 0-100 LINEAR 496:5CFM
 SIGNAL IN: 4-20MA DC OUT: 1-5VDC
 ACTION: CASE/PMS, UK109/112
 SPEC NO.: 13



RECORDER
 TAG: _____
 MODEL: _____
 CHART: _____
 CASE/PMS: _____
 PEN: _____
 SPEC NO.: _____
 ALARM: _____
 TAG: _____
 MODEL: _____
 SIGNAL: _____
 SET PT 1: _____
 SET PT 2: _____
 CHANNEL: _____
 SPEC NO.: _____

PANEL NO. 021
 PWT NO. 87-241

SQ. RT EXTRACTOR
 TAG: FT33B
 MODEL: ACH-1A000
 IN: 4-20MA DC OUT: 4-20MA
 SPEC NO.: 13



VALVE
 TAG: _____
 MODEL: _____
 ELEMENT: _____
 TAG: FT33B
 MODEL: DANIEL JORDON
 AIR TO: _____
 SIZE: _____
 SPEC NO.: _____

INSTRUMENT LOOP DIAGRAM
 LOOP NO. FT33B
 FUNCTION: LV/HP FLOW PROD. CAS
 TO INDICATOR

NO	DATE	DESCRIPTION
1		ISSUED FOR PER ECH F33B-17871-P1
2		ISSUED FOR PER ECH F33B-17871-P2
3		ISSUED FOR PER ECH F33B-17871-P3
4		ISSUED FOR PER ECH F33B-17871-P4
5		ISSUED FOR PER ECH F33B-17871-P5
6		ISSUED FOR PER ECH F33B-17871-P6
7		ISSUED FOR PER ECH F33B-17871-P7
8		ISSUED FOR PER ECH F33B-17871-P8
9		ISSUED FOR PER ECH F33B-17871-P9
10		ISSUED FOR PER ECH F33B-17871-P10

NO	DATE	DESCRIPTION
1		ISSUED FOR PER ECH F33B-17871-P1
2		ISSUED FOR PER ECH F33B-17871-P2
3		ISSUED FOR PER ECH F33B-17871-P3
4		ISSUED FOR PER ECH F33B-17871-P4
5		ISSUED FOR PER ECH F33B-17871-P5
6		ISSUED FOR PER ECH F33B-17871-P6
7		ISSUED FOR PER ECH F33B-17871-P7
8		ISSUED FOR PER ECH F33B-17871-P8
9		ISSUED FOR PER ECH F33B-17871-P9
10		ISSUED FOR PER ECH F33B-17871-P10

NO	DATE	DESCRIPTION
1		ISSUED FOR PER ECH F33B-17871-P1
2		ISSUED FOR PER ECH F33B-17871-P2
3		ISSUED FOR PER ECH F33B-17871-P3
4		ISSUED FOR PER ECH F33B-17871-P4
5		ISSUED FOR PER ECH F33B-17871-P5
6		ISSUED FOR PER ECH F33B-17871-P6
7		ISSUED FOR PER ECH F33B-17871-P7
8		ISSUED FOR PER ECH F33B-17871-P8
9		ISSUED FOR PER ECH F33B-17871-P9
10		ISSUED FOR PER ECH F33B-17871-P10

HOWEAM/O RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

IN-SITU CALIBRATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

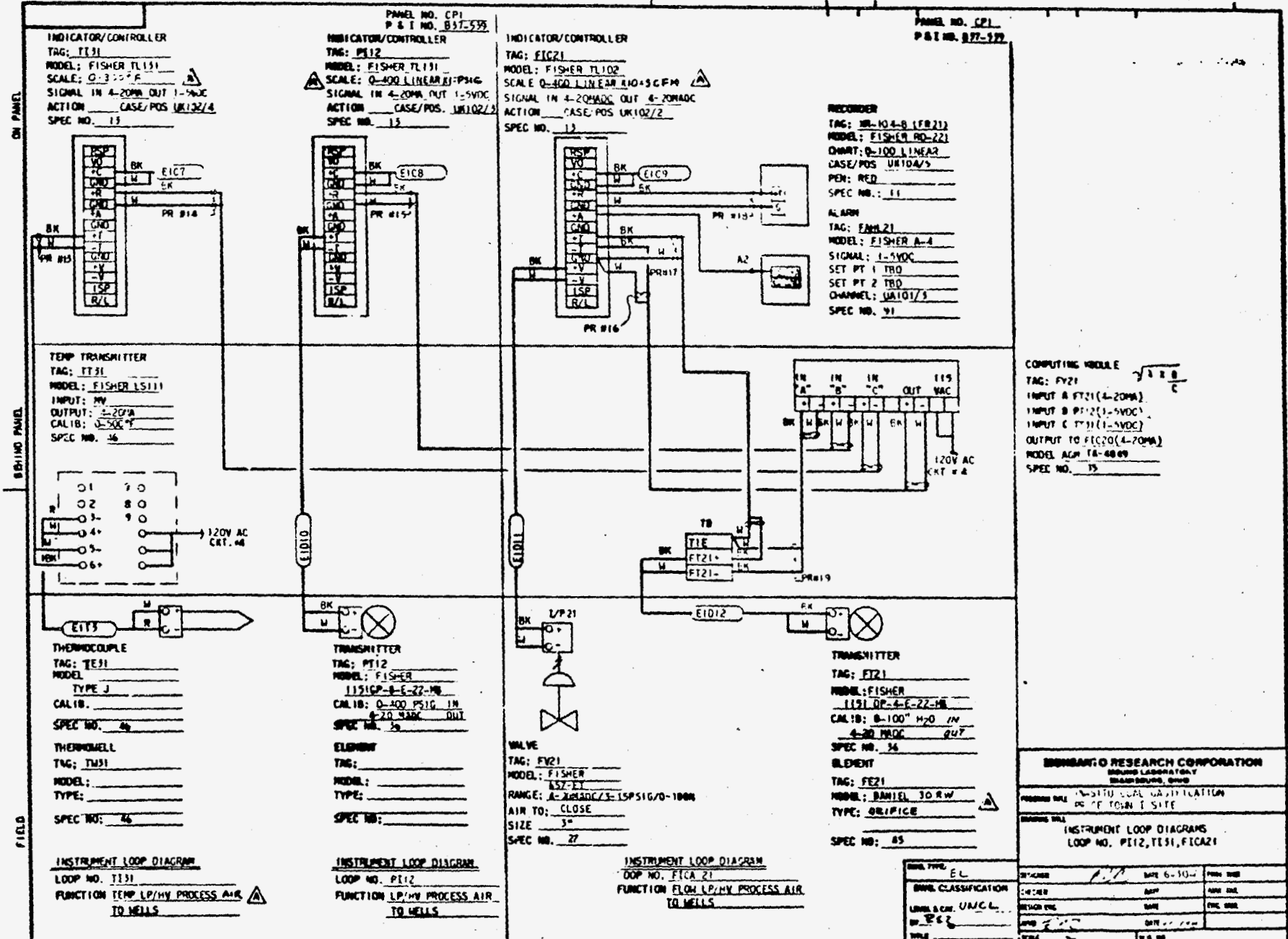
RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B

RESEARCH CORPORATION
 INSTRUMENT LOOP DIAGRAMS
 LOOP NO. FT33A, FT33B



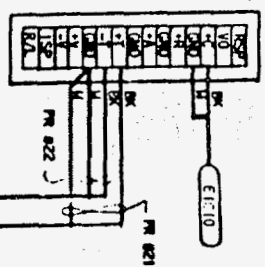
ON PANEL

BEHIND PANEL

FIELD

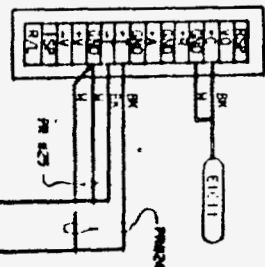
PANEL NO. 021
PWT NO. 817541

INDICATOR/CONTROLLER
TAG E122
MODEL FISHER II 132
SCALE 0-100 LINEAR 1.50:5.00FM
SIGMA IN 4-20MAV OUT 1-5VDC
ACTION CASE/PVS UN103/2
SPEC NO. 13



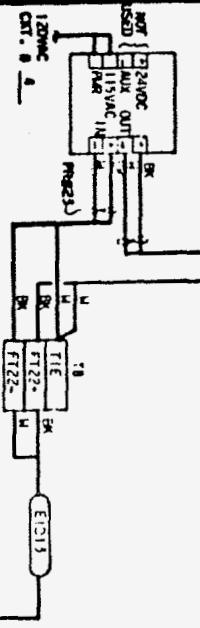
RECEIVER
TAG _____
MODEL _____
CHART _____
CASE/PVS _____
PVS _____
SPEC NO. _____
ALARM _____
TAG _____
MODEL _____
SIGMA _____
SET PT 1 _____
SET PT 2 _____
CHANNEL _____
SPEC NO. _____

INDICATOR/CONTROLLER
TAG E123
MODEL FISHER II 131
SCALE 0-2 LINEAR 1.000:5.00FM
SIGMA IN 4-20MAV OUT 1-5VDC
ACTION CASE/PVS UN103/3
SPEC NO. 13



RECEIVER
TAG _____
MODEL _____
CHART _____
CASE/PVS _____
PVS _____
SPEC NO. _____
ALARM _____
TAG _____
MODEL _____
SIGMA _____
SET PT 1 _____
SET PT 2 _____
CHANNEL _____
SPEC NO. _____

SO. RT EXTRACTOR
TAG E122
MODEL AOM 1A0000
IN 4-20MA OUT 4-20MA
SPEC NO. 15

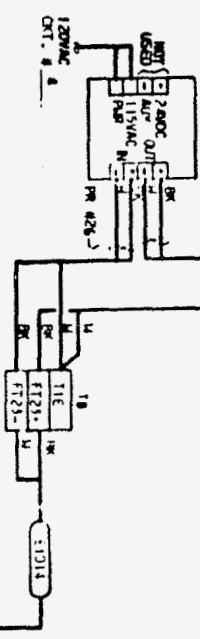


TRANSMITTER

VALVE
TAG _____
MODEL _____
RANGE _____
AIR TO _____
SIZE _____
SPEC NO. _____

INSTRUMENT LOOP DIAGRAM
LOOP NO. E122
FUNCTION HVLP FLOW PROD. GAS
TO INCUBATOR

SO. RT EXTRACTOR
TAG E123
MODEL AOM 1A0000
IN 4-20MA OUT 4-20MA
SPEC NO. 15



TRANSMITTER

VALVE
TAG _____
MODEL _____
RANGE _____
AIR TO _____
SIZE _____
SPEC NO. _____

INSTRUMENT LOOP DIAGRAM
LOOP NO. E123
FUNCTION HVLP FLOW PROD. GAS
TO INCUBATOR

Table with 4 columns: ID, DATE, REVISION, and DESCRIPTION. Row 1: A, 10/20/79, 1, REVISION.

Table with 4 columns: PART NO., QTY, UOM, and DESCRIPTION. Row 1: 311128, 1, EA, COORDINATOR 100005.

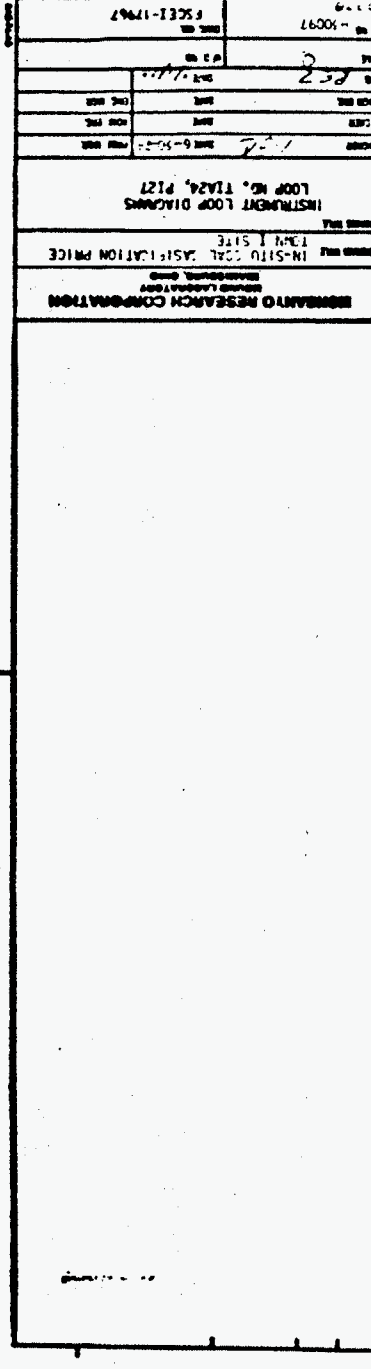
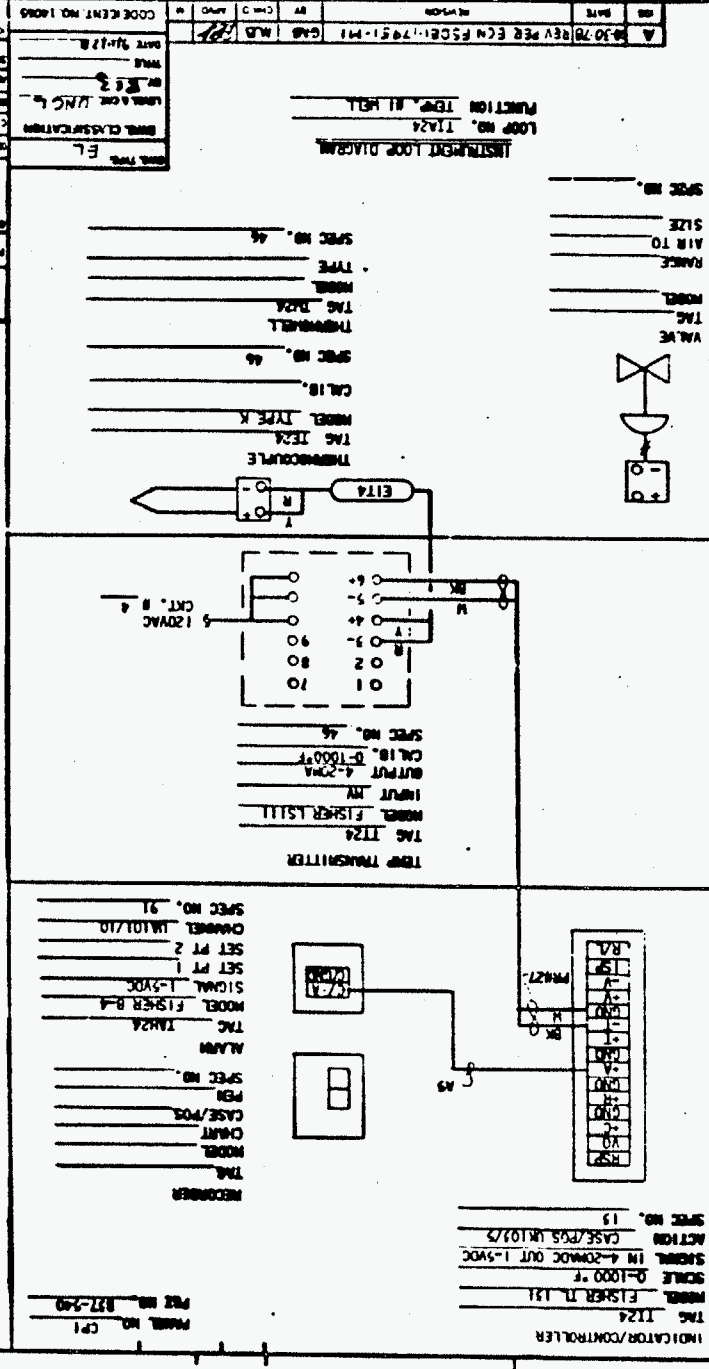
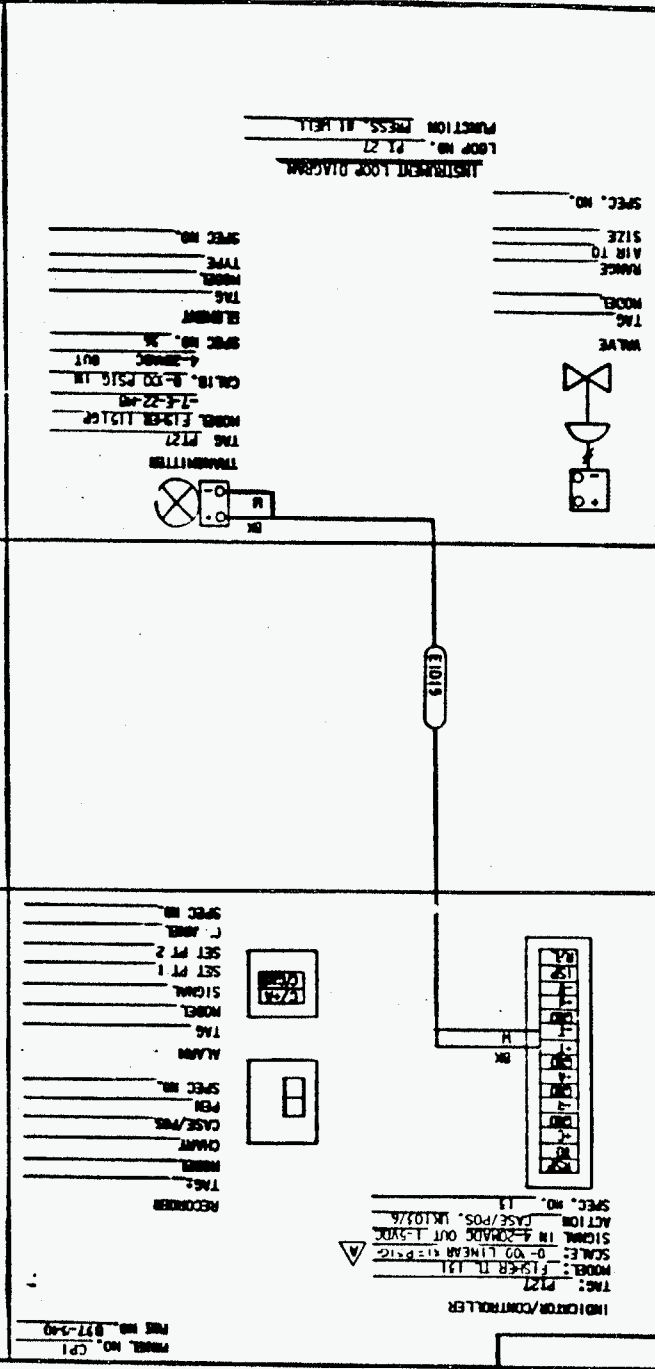
Table with 4 columns: DATE, TIME, BY, and CHECKED. Row 1: 11/20/97, 11:50:37, [Signature], [Signature].

RESEARCH TO RESEARCH CORPORATION
ANALYTICAL DIVISION
IN-SITU ANALYSIS
PREF. ANALYSIS SITE
LOOP NO. E122, E123

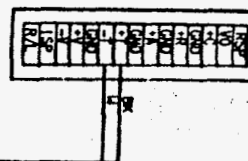
FIELD

BEHIND PANEL

ON PANEL



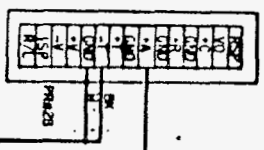
INDICATOR/CONTROLLER
TAG: P123
MODEL: FISHER T1131
SCALE: 0-100 LINEAR I/P-SIG
SIGNAL: I/A-20VDC OUT I-SVDC
ACTION: CASE/POS. 0.101/8
SPEC. NO. 13



RECORDER
TAG: _____
MODEL: _____
CHART: _____
CASE/POS: _____
PEN: _____
SPEC. NO.: _____
ALARM: _____
TAG: _____
MODEL: _____
SIGNAL: _____
SET PT 1: _____
SET PT 2: _____
CHANNEL: _____
SPEC. NO.: _____

PANEL NO. 021
P/N NO. 872-548

INDICATOR/CONTROLLER
TAG: T123
MODEL: FISHER T1131
SCALE: 0-1000 F
SIGNAL: I/A-20VDC OUT I-SVDC
ACTION: CASE/POS. A101/7
SPEC. NO. 11



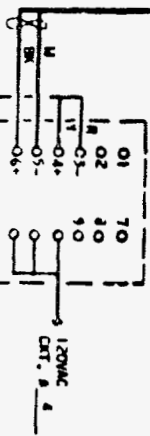
RECORDER
TAG: _____
MODEL: _____
CHART: _____
CASE/POS: _____
PEN: _____
SPEC. NO.: _____
ALARM: _____
TAG: T123
MODEL: FISHER B-1
SIGNAL: I-SVDC
SET PT 1: _____
SET PT 2: _____
CHANNEL: UN101/LL
SPEC. NO. 31

PANEL NO. 021
P/N NO. 872-548

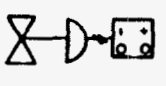
BEHIND PANEL

ON PANEL

FID16



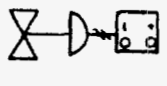
TEMP. TRANSMITTER
TAG: T123
MODEL: FISHER L3111
INPUT: RTD
OUTPUT: 4-20MA
CALIB.: 0-1000°F
SPEC. NO. 36



VALVE
TAG: _____
MODEL: _____
ELEMENT: _____
TAG: _____
MODEL: _____
TYPE: _____
SPEC. NO.: _____



TRANSMITTER
TAG: T123
MODEL: FISHER T1131GP
CALIB.: 0-100 PSIG I/A
4-20VDC OUT
SPEC. NO. 36



VALVE
TAG: _____
MODEL: _____
ELEMENT: _____
TAG: _____
MODEL: _____
TYPE: _____
SPEC. NO.: _____



TEMPERATURE
TAG: T123
MODEL: _____
TYPE: _____
CALIB.: _____
SPEC. NO.: 36

INSTRUMENT LOOP DIAGRAM
LOOP NO. 1123
P/N NO. 872-548

INSTRUMENT LOOP DIAGRAM
LOOP NO. T123
FUNCTION: I/A-20VDC

NO	DATE	BY	REVISION
1	NOV 21 1967	PER	REV

DATE	BY	REVISION
NOV 21 1967	PER	REV

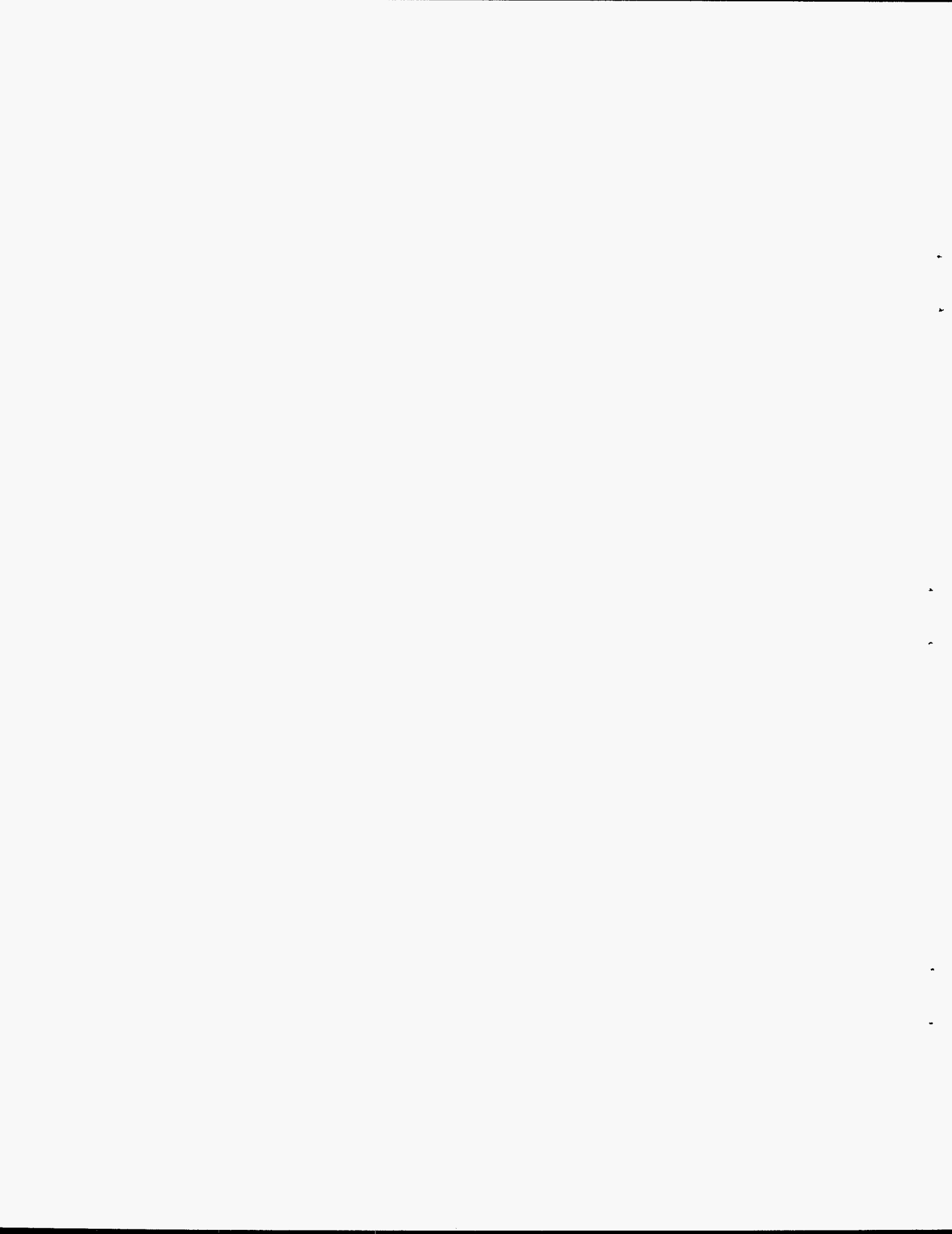
DATE	BY	REVISION
NOV 21 1967	PER	REV

ROMANTIC RESEARCH CORPORATION

IN-SITU CALIBRATION

INSTRUMENT LOOP DIAGRAMS

LOOP NO. T123, P123



APPENDIX 2

INSTRUMENT SPECIFICATIONS



Monsanto

Monsanto		INSTRUMENT INDEX				REVISED	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	OWI NO.
LOCATION		PROJECT PRICE TOWN-FIELD TEST AREA				0	2-12-74	D.C.				JOB 10370	FSB 1799
						1	10-2-73	RC			CEA	DEPT OR AREA	SHEET
											8252		1 of 6
MANUFACTURER	MODEL	P.O. NUMBER	INSTR CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR LOOP DIAG FSCEI	SPEC NO.	SERVICE & REMARKS				EFD	INSTRUMENT NUMBER
								350 PSIG AIR HEADER					
FISHER	115IGP	25466	0-400PSIG	V-1 24"		17963	36	GAUGE PRESS XMITTER					PT-10
FISHER	TL101	25448	0-100 LIN	CPI			13	PRESS INDIC CONTROLLER					PTC-10
FISHER	540	25447	4-20MA/2-15*	MTD ON PV-10			27	CUR-PNEU XDUCER					T/P-10
FISHER	657-BFC	25447	FAIL OPEN	2"-LP-1" I			27	2" C.S. BODY PRESS CONTROL VALVE					PV-10
FISHER	B-1			CPI			91	LOW PRESS ALARM					PAL-10
ASHCROFT	1320 B	25687	0-500 PSIG					350 PSIG HEADER PRESSURE					PI-10
								1000 PSIG AIR FLOW SYSTEM					
FISHER	115IGP	25466	0-1000PSIG	1" HP-1/2" I		17961	36	GAUGE PRESS XMITTER					PT-11
FISHER	TL131	25448	0-120 LIN	CPI			13	GAUGE PRESS INDICATOR					PI-11
								350 PSIG AIR FLOW SYSTEM					
FISHER	115IGP	25466	0-400PSIG	4" LP-1/2" I		17965	36	GAUGE PRESS XMITTER					PT-12
FISHER	TL131	25448	0-100 LIN	CPI			13	GAUGE PRESS INDICATOR					PI-12
								ASHCROFT					
ASHCROFT	50E I	25687	50-550 F	1" IA			51	AIR TO INSTR AIR DRYER					TI-13
								ASHCROFT					
ASHCROFT	1320E	25530	0-100PSIG	1" IA			49	AIR TO INSTR AIR DRYER					PI-14
FARRIS	26EA12	25528	360 PSIG	4" LP-1" I			52	AIR RECEIVER VENT					PSV-1
FARRIS	1000	25528	100 PSIG	1" I L			52	INSTR AIR LINE VENT					PSV-2

99 101 (11/74)

DACH CE

Monsanto

INSTRUMENT INDEX		REVISION	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	DWG NO.		
PROJECT: PRICETOWN-FIELD TEST		0	7-12-78	D.E.				JOB 10378	F58 17999		
LOCATION: _____ AREA: _____		1	10-6-78	R.G.			CEA	DEPT OR AREA	SHEET		
							8252		2 OF 6 1		
MANUFACTURER	MODEL	P.O. NUMBER	INSTR CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR LOOP DIAG FSCEI-	SPEC NO. IS-	SERVICE & REMARKS		EFD	INSTRUMENT NUMBER
FISHER	620	25447	75 PSIG	1" LP			42	BACK-UP INSTR AIR PRESS REGULATOR			PCV-15
FISHER	620	25608	75 PSIG	1" IA			42	INSTR AIR HEADER PRESS REGULATOR			PCV-110
FISHER	1151GP	25446	0-100PSIG	6"-PG-3" I		17962	36	PRODUCT GAS BACK PRESS CONTROL GAUGE PRESS XMITTER			PT-17
FISHER	TL101	25449	0-100WIN	CPI			13	PRESS INDIC CONTROLLER			PIC-17
FISHER	546	25447	4-20MA/2-15"	MTI ON PV-17			27	CUR-PNEU XDUCER			TIP-17
FISHER	1051-V100	25447	FAIL CLOSE	6" PG-3" I			27	4" 316SS POLY PRESS CONTROL VALVE			PV-17
FISHER	A-1			CPI			71	HI-LO PRESS ALARM			PAHL-17
STATIC-O-RING	6NN-K5	25469	75 PSIG	1" IA			47	GAUGE PRESS SWITCH			PS-18
FISHER	J-1			CPI		17960	91	LOW PRESS ALARM			PAL-18
DANIEL	H-835 & F-50	25529	0-120PSIG	1"-HP-1/2" I		17961	45	1000 PSIG AIR FLOW SYSTEM 1" C.S. HONED METER TUBE & ORIFICE PLATE			FE-20
FISHER	1151DP	25466	0-100WIN	1"-HP-1/2" I			36	LIFE PRESS XMITTER			FT-20
AGM ELECTRONICS	TA-4049	25470	0-K1H/P/T	2F1			15	FLOW COMPUTER MODULE			FY-20
FISHER	TL102	25448	0-100WIN	2F1			13	PROCESS AIR FLOW CONTROLLER			FIC-20
FISHER	546	25447	4-20MA/2-15"	MTI ON FV-20			27	CUR-PNEU XDUCER			TIP-20
FISHER	513R-B	25447	FAIL OPEN	1"-103-AIR			27	1/2" C.S. BODY FLOW CONTROL VALVE			FV-20
FISHER	A-1			CPI			91	HI-LO FLOW ALARM			FAHL-20

Monsanto

Monsanto		INSTRUMENT INDEX				REVISED	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	DWG. NO.
LOCATION		PROJECT PRICE TOWN - FIELD TEST				0	9-17-78	DG			CEA	JOB 10376	F3017999
		AREA				1	12-8-78				8252	DEPT OR AREA	SHEET 3 of 6
MANUFACTURER	MODEL	P.O. NUMBER	INSTR CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR LOOP DIAG FSCEI-	SPEC NO.	SERVICE & REMARKS				EFD	INSTRUMENT NUMBER
DANIEL	30RW	25529	0-100"WC	4"-LP-1 1/2" I		17965	15	350 PSIG AIR FLOW SYSTEM					
FISHER	1151DP	25466	0-100"WC	4"-LP-1 1/2" I			36	4" C.S. ORIFICE FLANGE/ORIFICE PLATE					FE-21
AGM ELECTRONICS	TA-4049	25470	0-KVh P/T	CPI			15	DIFF. PRESS XMITTER (FLOW)					FT-21
FISHER	TL102	25448	0-100 LIN	CPI			12	FLOW COMPUTER MODULE					FY-21
FISHER	546	25447	4-20MA/3-15"	WELL #1			27	PROCESS AIR FLOW CONTROLLER					FIC-21
FISHER	657-ET	25447	FAIL OPEN	4"-LP-1 1/2" I			27	3" C.S. BODY FLOW CONTROL VALVE					IVP-21
FISHER	A-1			CPI			91	HI-LO FLOW ALARM					FAHL-21
HV/LP FLOW PRODUCT GAS													
DANIEL	705-DS	25529	0-100"WC	6"-PG-3" I		17966	15	6" ORIFICE FLANGE/ORIFICE PLATE					FE-22
FISHER	1151DP	25466	0-100"WC	6"-PG-3" I			36	DIFF. PRESS XMITTER (FLOW)					FT-22
AGM ELECTRONICS	TA 4000	25470	SQ. RT. EXT.	CPI			15	FLOW COMPUTER MODULE					FY-22
FISHER	TL132	25448		CPI			12	PRODUCT GAS FLOW INDICATOR					FI-22
HV/LP FLOW PRODUCT GAS													
VICKERY-SIMS		25468		6"-PG-3" I		17966	15	6" VENTURI FLOW TUBE					FE-23
FISHER	1151DP	25466	0-100 LIN	6"-PG-3" I			36	DIFF. PRESS XMITTER (FLOW)					FT-23
AGM ELECTRONICS	TA 4000	25470	SQ. RT. EXT.	CPI			15	FLOW COMPUTER MODULE					FY-23
FISHER	TL132	25449		CPI			12	PRODUCT GAS FLOW INDICATOR					FI-23
PRODUCT GAS WELL #1													
FISHER				WELL PI-1		17967	46	TYPE K DUAL TC - 1/2" IPT CR-MOTW					TE-24
FISHER	LS111	25448	0-1000°F	CPI			46	T2/T TEMP XMITTER					TT-24
FISHER	TL131	25446	0-1000°F	CPI			12	PRODUCT GAS TEMP INDICATOR					TI-24
FISHER	B-1			CPI			91	LO TEMP ALARM					TAL-24

Monsanto

INSTRUMENT INDEX		REVISED	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	DWG. NO.	
PROJECT: PRICETOWN - FIELD TEST		0	7-17-78	DC				F3B10378	F3B17999	
AREA:		1	10-6-78	PC			CEA	DEPT OR AREA	SHEET	
LOCATION:							8252		4 of 6	
MANUFACTURER	MODEL	P.O. NUMBER	INSTR. CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR. LOOP DIAG FSC/EI-	SPEC NO.	SERVICE & REMARKS	EFD	INSTRUMENT NUMBER
								PRODUCT GAS WELL #2		
FISHER				WELL PI-2		17968	46	TYPE K DUAL TC - 1/2" NPT CR-MD TW		TE-25
FISHER	LS111	25448	0-1000°F	CPI			46	TC/I TEMP XMITTER		TI-25
FISHER	TL131	25446	0-1000°F	CPI			13	PRODUCT GAS TEMP INDICATOR		TI-25
FISHER	B-1			CPI			91	LO-TEMP ALARM		TAL-25
								PRODUCT GAS WELL #3		
				WELL PI-3		17969	46	TYPE K DUAL TC - 1/2" NPT CR-MD TW		TE-26
FISHER	LS111	25448	0-1000°F	CPI			46	TC/I TEMP XMITTER		TI-26
FISHER	TL131	25446	0-1000°F	CPI			13	PRODUCT GAS TEMP INDICATOR		TI-26
FISHER	B-1			CPI			91	LO-TEMP ALARM		TAL-26
								PRODUCT GAS WELL #1		
FISHER	115IGP	25448	0-300 L/W	WELL PI-1		17967	36	GAUGE PRESS XMITTER		PI-27
FISHER	TL131	25446	0-300 L/W	CPI			13	PRODUCT GAS PRESS INDICATOR		PI-27
								PRODUCT GAS WELL #2		
FISHER	115IGP	25448	0-300 L/W	WELL PI-2		17968	36	GAUGE PRESS XMITTER		PI-28
FISHER	TL131	25446	0-300 L/W	CPI			13	PRODUCT GAS PRESS INDICATOR		PI-28
								PRODUCT GAS WELL #3		
FISHER	115IGP	25448	0-300 L/W	WELL PI-2		17969	36	GAUGE PRESS XMITTER		PI-29
FISHER	TL131	25446	0-300 L/W	CPI			13	PRODUCT GAS PRESS INDICATOR		PI-29

Monsanto

MANUFACTURER		MODEL	P.O. NUMBER	INSTR CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR LOOP DIAG FSC	SPEC NO. IS-	SERVICE & REMARKS	EFD	INSTRUMENT NUMBER
LOCATION		PROJECT PRICETOWN - FIELD TEST		AREA				CEA 8252		SHEET 5 OF 6	
FISHER			25448		1"-HP-1/2" I		17961	46	TYPE J TC WITH 3/4" NPT 316SS TW		TE-30
FISHER		LS111	25448	0-300°F	CPI			46	TC/I TEMP XMITTER		TT-30
FISHER		TL131	25446	0-300°F	CPI			13	HP/LV AIR TEMP INDICATOR		TI-30
FISHER			25448		4"-LP-1 1/2" I		17965	46	TYPE J TC WITH 3/4" NPT 316SS TW		TE-31
FISHER		LS111	25448	0-300°F	CPI			16	TC/I TEMP XMITTER		TT-31
FISHER		TL131	25446	0-300°F	CPI			13	LP/HV AIR TEMP INDICATOR		TI-31
FISHER			25448		6"-PG-3" I		17962	46	TYPE K DUAL TC - 3/16" NPT CR-MO TW		TE-32
FISHER		LS111	25448	0-1000°F	CPI			46	TC/I TEMP XMITTER		TT-32
FISHER		TL131	25446	0-1000°F	CPI			13	PRODUCT GAS TEMP INDICATOR		TI-32
FISHER		B-1			CPI			91	LO-TEMP GAS TO INCINERATOR		TAL-32
DANIEL		705DS	25529		1 1/2"-PG-3" I		17964	45	LV/HP FLOW PRODUCT GAS		FE-33A
FISHER		1151DP	25466	0-100" WC	1 1/2"-PG-3" I			36	DIFF. PRESS XMITTER		FT-33A
AGM ELECTRONICS		TA4000	25470	SQRT EXT	CPI			15	FLOW COMPUTER MODULE (SQRT)		FY-33A
FISHER		TL131	25448	0-100 LIN	CPI			13	PRODUCT GAS FLOW INDICATOR		FI-33A
DANIEL		705DS	25529		1 1/2"-PG-3" I		17964	45	1 1/2"-C.S HONED SECTION		FE-33B
FISHER		1151DP	25466	0-100" WC	1 1/2"-PG-3" I			36	DIFF. PRESS XMITTER		FT-33B
AGM ELECTRONICS		TA4000	25470	SQRT EXT	CPI			15	FLOW COMPUTER MODULE (SQRT)		FY-33B
FISHER		TL131	25607	0-100 LIN	CPI			13	PRODUCT GAS FLOW INDICATOR		FI-33B
FISHER (ALLOY ENG)					6"-PG-3" I			51	3/4" NPT CR-MO TW		TW-35
ASHCROFT		600B	25627	200-1000°F	6"-PG-3" I			51	PRODUCT GAS TEMP INDICATOR		TI-35

Monsanto

INSTRUMENT INDEX

LOCATION	PROJECT	AREA	REVISED	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	DWG. NO.
	PRICE TOWN-FIELD TEST		0	9-11-75	DC				F5010376	F5017991
			1	10-16-75	DC			CEA	DEPT OR AREA	SHEET
								8252		6 of 6
										REV 1

MANUFACTURER	MODEL	P.O. NUMBER	INSTR CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR LOOP DIAG	SPEC NO.	SERVICE & REMARKS	EFD	INSTRUMENT NUMBER
FISHER	AL-401	25448		CPI		17960	10	ANNUNCIATOR 16 PTS		UA-101
FISHER	MC-702			CPI		17951	08	12 PACK CASE UNIVERSAL MTD.		UK-102
FISHER	TL-113			CPI			13	TRANSFER SERVICE STATION		ZK-102
FISHER	MC-702			CPI			08	12 PACK CASE UNIVERSAL MTD.		UK-103
FISHER	MC-702			CPI			08	12 PACK CASE UNIVERSAL MTD		UK-104
FISHER	RD-221			CPI			11	THREE PEN RECORDER		XR-104A
FISHER	RD-221			CPI			11	THREE PEN RECORDER		XR-104B
FISHER	768			CPI			20	PRIMARY POWER SUPPLY		EU-110
FISHER	769			CPI			20	BACK-UP POWER SUPPLY		EU-111
ACOPIAN	A24 MT210	25537		CPI			20	TREND RECDR POWER SUPPLY		EU-104
GISMO	CP-1	25533						CONTROL PANEL CP-1 DWGS FSCEI-17951, 53, 54, 55		CP-1
MSA	704			CONTROL RM				CO MONITOR - ANALYSER		AI-1
FISHER	B-1			CONTROL RM		17971		CO MONITOR AUTO SAMPLER		AY-1
FISHER	B-1			CPI		17960		H1 CO CONTROL BLDG		AAH-1
MSA	704			GAS MEAS BLDG				CO MONITOR - ANALYSER		AI-2
FISHER	B-1			GAS MEAS BLDG		17971		CO MONITOR AUTO SAMPLER		AY-2
FISHER	B-1			CPI		17960		H1 CO FIELD STATIONS		AAH-2

IS Number vs. Instrument Type

CONTROL PANEL MOUNTED INSTRUMENTS

- (IW) IS 08 - INSTRUMENT CASE - For accomodating one or more control panel instruments.
- IS 10 - ANNUNCIATOR - Single or multiple station alarm device with display for each station. Plug-in alarm cards are IS 91.
- IS 11 - RECORDER - or multiple recorder with driven chart and one or more pens.
- IS 12 - RECORDER/CONTROL STATION - Control station with measurement pen recorder.
- IS 13 - INDICATOR/CONTROL STATION - Control station with measurement indicator. Includes service transfer station, indicators.
- IS 14 - COMPUTER SET STATION - Control panel interface for computer supervisory control and DDC.
- IS 15 - FUNCTION COMPUTING STATION - Station which performs an analog computation. Includes square root extractors, multiplier/divider, and high-low signal selector.
- IS 18 - MULTIPOINT TEMPERATURE INDICATOR/RECORDER - Multiple point switched input temperature indicator or recorder.
- IS 20 - POWER SUPPLY - Power supplies for energizing control panel instruments from AC line.
- IS 24 - TRANSDUCER/RELAY - Signal transducer, converter and alarm device such as transmatations - NOT I/P's installed on control valves

FIELD MOUNTED INSTRUMENTS

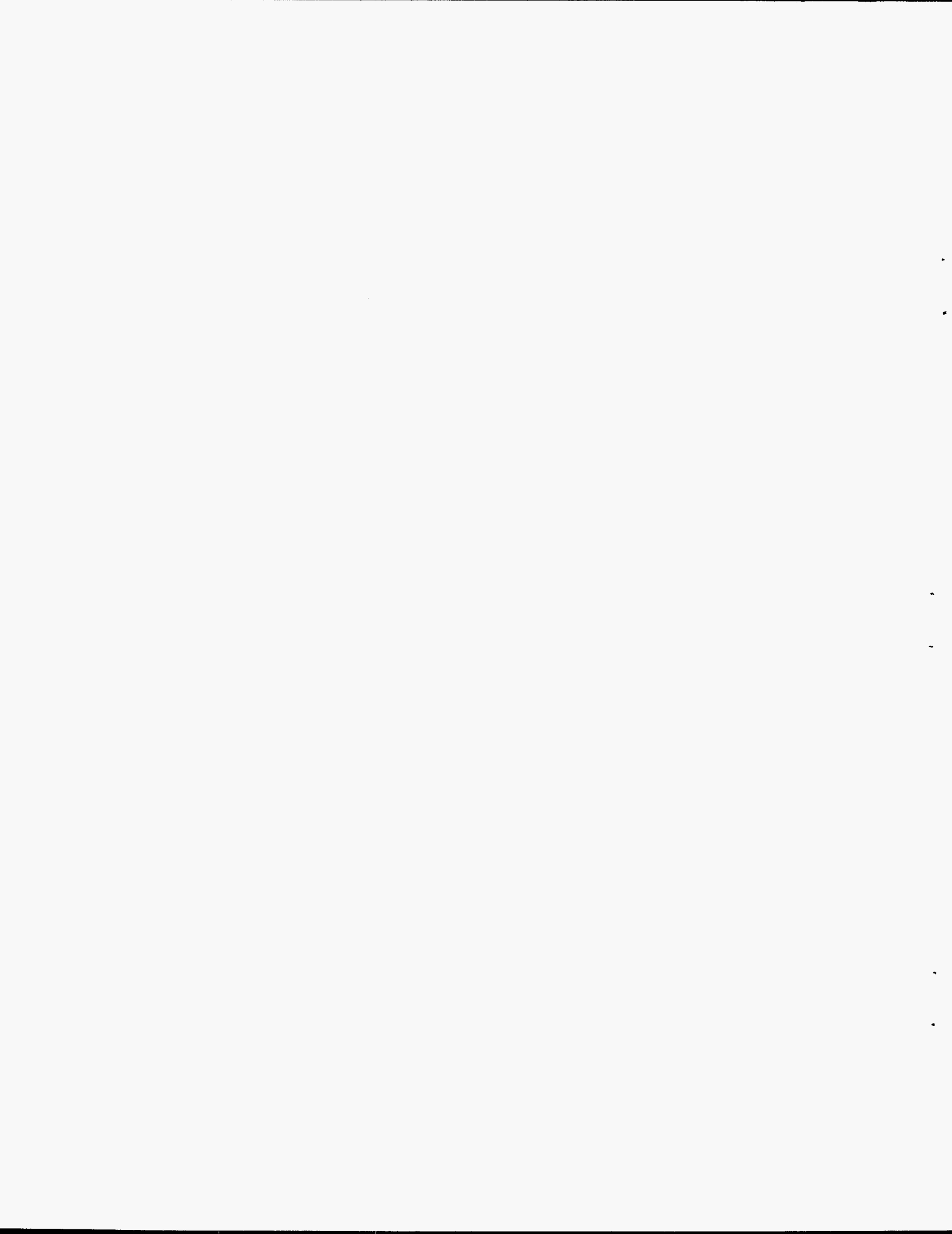
- IS 26 - PRESSURE REGULATING VALVE - Self-contained pressure reducing or back pressure regulator.
- IS 27 - CONTROL VALVE - All types except butterfly valves.
- IS 28 - BUTTERFLY VALVE - All types.
- IS 29 - SOLENOID VALVE - All types.
- IS 30 - CONTROL VALVE - All types.
Superseded by IS 27 and 28.

- IS 31 - ON-OFF VALVE - All types-w/accessories.
- IS 32 - MAG FLOW METER - Includes primary and converter.
- IS 33 - TURBINE METER - Includes primary and converter.
- IS 34 - LEVEL DISPLACER - Pneumatic or electronic displacer level transmitters and controllers.
- IS 35 - LEVEL PROBE - Capacitance probe, ultrasonic nuclear level gage and all others for liquids and solids - Not pressure and displacer types.
- IS 36 - PRESSURE ACTUATED TRANSMITTER - Pressure transmitters for gage, absolute, flow d/p, level measurement. Includes flange mounted and integral orifice types.
- IS 37 - FLOW PROBE - Flow primaries and transmitters other than orifice meter types - includes annubar, pitot tube, Taylor pitot-venturi, flow nozzles and target meter. - Not rotameter and turbine meter.
- IS 38 - LOAD CELL WEIGHT SYSTEM - Hydraulic or electrical types and secondaries.
- IS 39 - FIELD MOUNTED CONTROLLER - General purpose pneumatic controller with case for field mounting.
- IS 40 - PHELEMENT - Primary element for solution potential analyzers (pH, ORP & Selective Ion).
- IS 41 - PH TRANSMITTER - Secondaries for pH, ORP & Selective Ion.
- IS 43 - FILLED SYSTEM TEMPERATURE INSTRUMENT - All classes, pneumatic and electronic, transmitters or controllers, indicating and non-indicating.
- IS 44 - ROTAMETER - All types.
- IS 45 - ORIFICE METERING ELEMENTS - Meter runs, orifice plates and flanges.
- IS 46 - TEMPERATURE ELEMENT/TRANSMITTER - Thermocouples, resistance bulbs and/or transmitters.
- IS 47 - PROCESS ACTUATED SWITCH - Switches actuated directly by a flow, pressure, level or temperature measurement when a set point is reached.

- IS 49 - PRESSURE GAGE OR MANOMETER - All types, including receiver gages. For Commodity gages, use IS 67.
- IS 50 - LEVEL GAGE - Transparent, reflex and magnetic types.
- IS 51 - TEMPERATURE INDICATOR - All types of thermometers.
- IS 52 - RELIEF VALVE - All types.
- IS 53 - RUPTURE DISC - All types.
- IS 54 - CONSERVATION VENT - All types.
- IS 55 - POSITIVE DISPLACEMENT METER - Gear, piston and compound types.

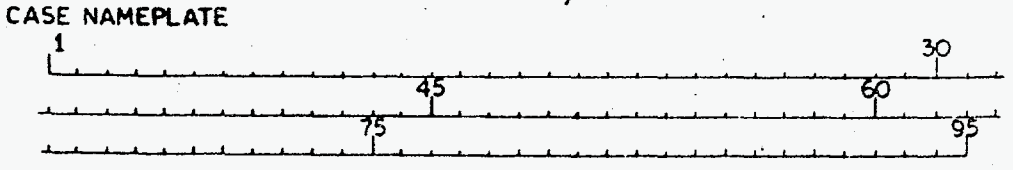
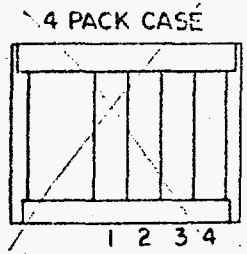
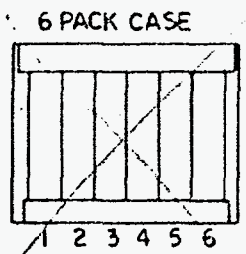
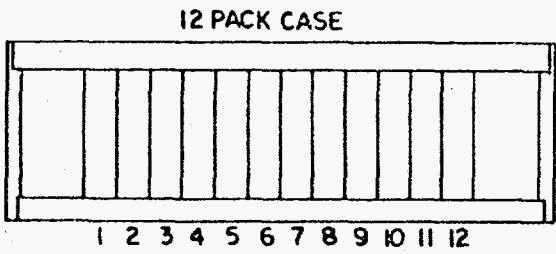
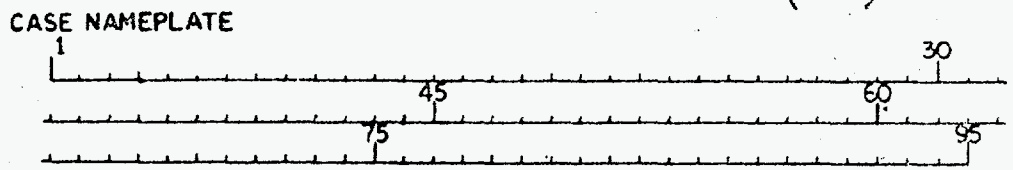
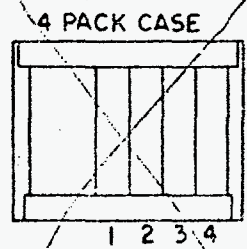
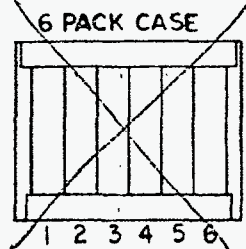
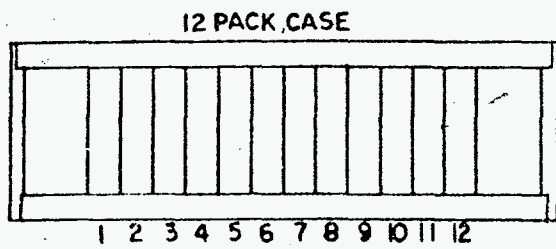
MISCELLANEOUS INSTRUMENTS

- IS 56 - PNEUMATIC SELECTOR SWITCH - All types.
- IS 57 - PROGRAMMER - Pulse actuated stepping drum (Tenor) programmers - Not timer operated types.
- IS 58 - TIMER PROGRAMMER - Motor driven cam operated switch type.
- IS 59 - TIMER - Electronic or electromechanical delay types, indicating or non-indicating.
- IS 60 - COUNTER - Electromechanical or electronic types, indicating or non-indicating.
- IS 67 - Reserved category for handling of commodity instrument items - never printed.
- IS 91 - ALARM CARD - Plug in circuit assemblies for alarm annunciators (IS 10).
- IS 96, 97, 98, and 99 - BLANK IS FORM - To be used where existing IS types are not applicable.



MONSANTO	FISHER AC ² CASE SPECIFICATION	COMPANY	PLANT	SPEC NO.	
		MRC	MDUND	15-08	
LOCATION		AUTH NO	DEPT	AREA	SHEET
					1 OF

ITEM 12 Pack Case	ITEM 12 Pack Case	CASE NAMEPLATE (1 LINE) 12 PACK-95 CHARACTERS MAX 6 PACK-45 CHARACTERS MAX 4 PACK-45 CHARACTERS MAX
QUANTITY	QUANTITY	
TAG UK-102	TAG UK-103	
MODEL MC-702	MODEL MC-702	
MOUNTING SPEED NUT <input type="checkbox"/>	MOUNTING SPEED NUT <input type="checkbox"/>	
UNIVERSAL <input checked="" type="checkbox"/>	UNIVERSAL <input checked="" type="checkbox"/>	
NUMBER OF 1" BLANKS	NUMBER OF 1" BLANKS	



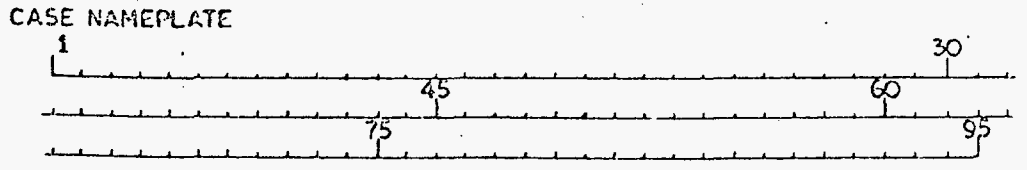
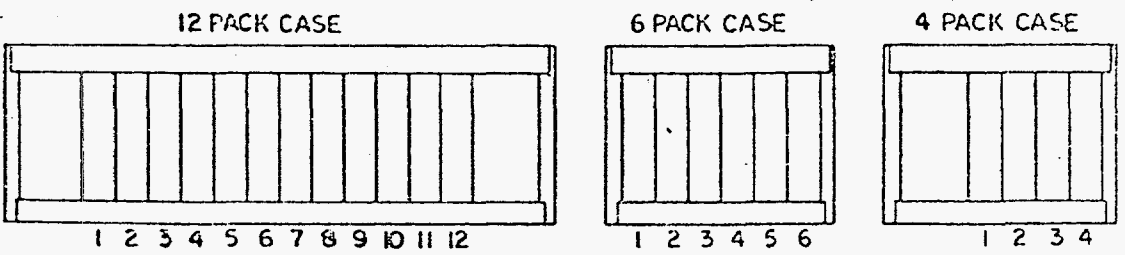
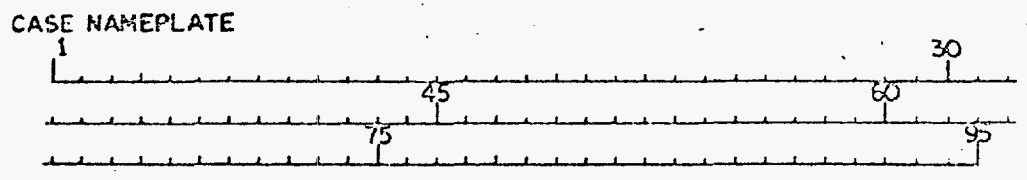
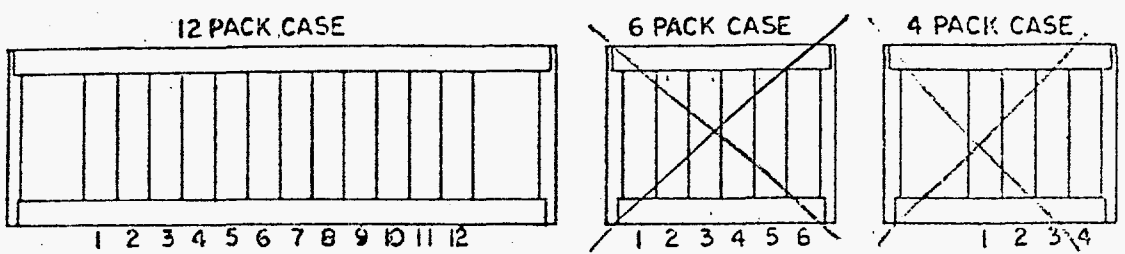
SPECIAL CONSTRUCTION AND/OR OPTIONS

MANUFACTURER		P.O. NO.	
REV.			

MONSANTO	FISHER AC ² CASE SPECIFICATION	COMPANY	PLANT	SPEC NO.	
		MRC	MOUND	15-08	
LOCATION		AUTH NO.	DEPT	AREA	SHEET REV
					2 OF

ITEM	12 Pack Case	ITEM	
QUANTITY	Q.P.	QUANTITY	
TAG	UK-124	TAG	
MODEL	INC-702	MODEL	
MOUNTING	SPEED NUT <input type="checkbox"/> UNIVERSAL <input checked="" type="checkbox"/>	MOUNTING	SPEED NUT <input type="checkbox"/> UNIVERSAL <input type="checkbox"/>
NUMBER OF 1" BLANKS	FOUR	NUMBER OF 1" BLANKS	

CASE NAMEPLATE (1 LINE)
 12 PACK-95 CHARACTERS MAX
 6 PACK-45 CHARACTERS MAX
 4 PACK-45 CHARACTERS MAX



SPECIAL CONSTRUCTION AND/OR OPTIONS

MANUFACTURER				P.O. NO.			
REV.	▲			▲			
	▲			▲			

Monsanto COMPANY	ANNUNCIATOR SPECIFICATIONS	PLANT	SPEC NO.	
		AUTH NO.	DEPT OR AREA	IS: 10
LOCATION				REV
				1 OF 1

Instrument No. **UA-101**

ANNUNCIATOR CASE ENGRAVING

ANNUNCIATOR MODEL NO	AL-402
NUMBER OF POINTS	16
ALARM SEQUENCE	ISA-1
FIRST OUT SEQUENCE OPTION	YES
POWER REQUIREMENT	117 V 60HZ

RELAY CONTACT ARRANGEMENT AND RATING

UNIVERSAL MOUNTING CLAMP KIT	YES
BOLT MOUNTING KIT	---
CONDUIT PANEL	---
TYPE MINI EXTENDER CARD	---

WINDOW ARRANGEMENT:
(FRONT)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

PT N°	INPUT SIGNAL	MODULE TYPE	NAMEPLATE COLOR	NAME PLATE ENGRAVING (ALTRS & SPACES / LINE MAX.)			
				LINE #1	LINE #2	LINE #3	LINE #4
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

PURCHASING	Manufacturer	Fisher
	Catalog No.	AL-402
	P.O. No.	
	Price	

REV. DATE	△								
	△								
	△								
	△								

Monsanto		RECORDER SPECIFICATIONS		COMPANY		PLAN		SPEC. NO.	
				MRC		MOUND		IS 11	
LOCATION		AUTH. NO.		DEPT.	AREA	SHEET	REV.	1 of	
Instrument No.		XR-104A			XR-104B				
Service									
LOCATION - PANEL		CP-1			CP-1				
Number Of Pens		three			three				
Pen Number 1 Color		Red			Red				
Pen Number 2 Color		Blue			Blue				
Pen Number 3 Color		Green			Green				
SCALE: Number 1									
Size - Type									
Color		Red			Red				
Range		0-100 LINEAR			0-100 LINEAR				
Multiplier									
SCALE: Number 2 Number 3									
Size - Type									
Color		Blue - Green			Blue		Green		
Range		0-100L		0-100L		0-100L		0-100L	
Multiplier									
CHART: Size - Type									
Range		0-100 LINEAR			0-100 LINEAR				
Number									
Drive Volt. - Speed									
MEASUREMENT INPUT									
Range - Units		4-20		MADC		4-20		MADC	
From		VARIOUS INPUTS			VARIOUS INPUTS				
Power Supply Req.									
Elec. Area Class.		GEN PURP			GEN PURP				
Nameplate Engraving									
Red Pen									
Blue Pen									
Accessories:									
Bezel Color									
RANGE PLUGS		3 @ AC131			3 @ AC131				
PURCHASING									
Manufacturer		FISHER			FISHER				
Catalog No.		RD221			RD 221				
P.D. No.									
Price									
REV. DATE	△								
	△								
	△								
	△								

CS-20(11-73)

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.			
						AUTH NO.		DEPT OR AREA		IS- 13	SHEET	REV	
LOCATION								1 OF					
Instrument No.		PIC-10				PI-12		FIC-21					
Service		PROCESS AIR LOW PRESS				PROCESS AIR LOW PRESS		PROCESS AIR LP/HV					
Location - Panel or Equipment No.		CPI				CPI		CPI					
RECEIVER	Record Indicate Control		INDIC/CONTROL				INDICATE		INDIC/CONTROL				
	*Number of Points		ONE				ONE		ONE				
	Chart	Size & Type		X				X		X			
		Range											
		Drive	Speed										
	Scale	Size & Type		8 1/2" MOVABLE				2 1/4" FIXED		8 1/2" MOVABLE			
Range		0-100 LIN				0-400 LIN		0-400 LIN					
Ratio, Cascade, Computer - Set		MANUAL											
Auto - Manual By Pass		(YES) NO		YES NO		(YES) NO		YES NO		(YES) NO			
CONTROLLER	Location		(INTEG) REMOTE		INTEG. REMOTE		(INTEG. REMOTE)		(INTEG. REMOTE)		(INTEG. REMOTE)		
	Proportional Band %		10-1000%										
	Auto-Reset Mode		NO (SLOW) FAST		NO SLOW FAST		NO (SLOW) FAST		NO SLOW FAST		NO (SLOW) FAST		
	Rate Mode		YES (NO)		YES NO		YES (NO)		YES NO		YES (NO)		
On Measurement Increase Instrument Output		INC. (DEC)		INC. DEC		INC. (DEC)		INC. DEC		INC. (DEC)			
SIGNALS	Measurement Input	Range & Units		4-20 MADC				4-20 MADC		4-20 MADC			
		From		PT-10				PT-12		FY-21			
	Controller Output	Range & Units		4-20 MADC						4-20 MADC			
		To		PV-10						FV-21			
	Set Point		Range & Units		MANUAL						MANUAL		
Power Supply - Electric, Pneumatic		24VDC				24VDC		24VDC					
Electrical Area Classification		NEMA I				NEMA I		NEMA I					
Accessories or Special Features													
REMARKS	RANGE PLUG		AC 131				AC 131		AC 131				
	NAME PLATE												
	LINE 1		PIC-10				PI-12		FIC-21				
	LINE 2		PROCESS AIR				PROCESS AIR		PROCESS AIR				
	LINE 3		LOW PRESS				LOW PRESS		LP/HV				
LINE 4		X5 PSIG				X1 PSIG		X10 SCFM					
Manufacturer		FISHER				FISHER		FISHER					
*Receiver Catalog No.		-				TL131		TL102					
*Controller Catalog No.		TL101											
P.O. No.													
Price													
REV. DATE	①						④						
	②						⑤						
	③						⑥						
	④						⑦						

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.			
				AUTH NO.		DEPT OR AREA		IS- 13			
LOCATION								SHEET 2 OF			
Instrument No.		PI-11		FIC-20							
Service		PROCESS AIR HIGH PRESS		PROCESS AIR HP/LV							
Location - Panel or Equipment No.		CPI		CPI							
RECEIVER	Record Indicate Control		INDICATE		INDIC/CONTROL						
	*Number of Points		ONE		ONE						
	Chart	Size & Type		X		X					
		Range									
		Drive	Speed								
Scale	Size & Type		2 1/4" FIXED		8 1/2" MOVABLE						
	Range		0-120 LIN		0-120 LIN						
Ratio, Cascade, Computer - Set		—		MANUAL							
Auto - Manual By Pass		YES NO		YES	NO	<input checked="" type="radio"/> YES	NO	YES	NO		
Location		INTEG. REMOTE		INTEG.	REMOTE	<input checked="" type="radio"/> INTEG.	REMOTE	INTEG.	REMOTE		
Proportional Band %											
Auto-Reset Mode		NO SLOW FAST		NO	SLOW	FAST	NO	<input checked="" type="radio"/> SLOW	FAST		
Rate Mode		YES NO		YES	NO	YES	<input checked="" type="radio"/> NO	YES	NO		
On Measurement Increase Instrument Output		INC. DEC.		INC.	DEC.	<input checked="" type="radio"/> INC.	DEC.	INC.	DEC.		
SIGNALS	Measurement Input	Range & Units		4-20 MADC		4-20 MADC					
		From		PT-11		FY-20					
	Controller Output	Range & Units		—		4-20 MADC					
		To		—		FV-20					
Set Point	Range & Units		—		—						
	From		—		MANUAL						
Power Supply - Electric, Pneumatic		24VDC		24VDC							
Electrical Area Classification		NEMA I		NEMA I							
Accessories or Special Features		RANGE PLUG		AC 131		AC 131					
NAME PLATE		LINE 1		PI-11		FIC-20					
		LINE 2		PROCESS AIR		PROCESS AIR					
		LINE 3		HIGH PRESS		HP/LV					
		LINE 4		X10 PSIG		X1 SCFM					
Manufacturer		FISHER		FISHER							
*Receiver Catalog No.		TL131									
*Controller Catalog No.						TL102					
P.O. No.											
Price											
REV. DATE	①										
	②										
	③										
	④										


Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.		
						AUTH NO.		DEPT OR AREA		IS- 13		SHEET
LOCATION								3 OF				
Instrument No.		PIC-17						FI-22				
Service		PROD GAS						PRODUCT GAS				
								LOW PRESS				
Location - Panel or Equipment No.		CPI						CPI				
3 6*	RECEIVER	Record Indicate Control		INDIC/CONTROL				INDICATE				
		*Number of Points		ONE				ONE				
		Chart	Size & Type		X				X			
			Range									
			Drive	Speed								
		Scale	Size & Type		8 1/2" MOVABLE				8 1/2" MOVABLE			
Range												
Ratio, Cascade, Computer - Set		MANUAL				-						
Auto - Manual By Pass		YES		NO		YES		NO		YES		
CONTROLLER	Location		INTEG.		REMOTE		INTEG.		REMOTE		INTEG.	
	Proportional Band %		10-100%									
	Auto-Reset Mode		NO		SLOW		FAST		NO		SLOW	
	Rate Mode		YES		NO		YES		NO		YES	
	On Measurement Increase Instrument Output		INC.		DEC		INC.		DEC		INC.	
SIGNALS	Measurement Input	Range & Units		4-20MADC				4-20MADC				
		From		PT-17				FY-22				
	Controller Output	Range & Units		4-20MADC				X				
		To		PV-17								
	Set Point	Range & Units		-				X				
From		MANUAL										
Power Supply - Electric, Pneumatic		24VDC				24VDC						
Electrical Area Classification		NEMA I				NEMA I						
REMARKS	Accessories or Special Features											
	RANGE PLUG		AC131				AC131					
	NAME PLATE											
	LINE 1		PIC-17				FI-22					
	LINE 2		PROD GAS TO									
LINE 3		INCINERATOR										
LINE 4												
Manufacturer		FISHER				FISHER						
*Receiver Catalog No.												
*Controller Catalog No.		TL101				TL132						
P.O. No.												
Price												
REV. DATE	1											
	2											
	3											
	4											

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.		
						AUTH NO.		DEPT OR AREA		IS- 13	SHEET	REV
LOCATION								4 OF				
Instrument No.		FI-23				TI-24						
Service		PRODUCT GAS LOW PRESS				PRODUCT GAS WELL#1						
Location - Panel or Equipment No.		CPI				CPI						
3 6*	RECEIVER	Record Indicate Control		INDICATE				INDICATE				
		*Number of Points		ONE				ONE				
		Chart	Size & Type		X				X			
			Range									
			Drive	Speed								
		Scale	Size & Type		2 1/4" FIXED				2 1/4" FIXED			
Range			0-5				0-1000					
Ratio, Cascade, Computer - Set												
Auto - Manual By Pass		YES		NO		YES		NO		YES		
CONTROLLER	Location		INTEG.		REMOTE		INTEG.		REMOTE		INTEG.	
	Proportional Band %											
	Auto-Reset Mode		NO		SLOW		FAST		NO		SLOW	
	Rate Mode		YES		NO		YES		NO		YES	
On Measurement Increase Instrument Output		-		INC.		DEC		INC.		DEC		
SIGNALS	Measurement Input	Range & Units		4-20MADC				4-20MADC				
		From		FY-23				TT-24				
	Controller Output	Range & Units		-				-				
		To		-				-				
	Set Point	Range & Units		-				-				
From		-				-						
Power Supply - Electric, Pneumatic		24VDC				24VDC						
Electrical Area Classification		NEMA I				NEMA I						
Accessories or Special Features		RANGE PLUG				AC 131						
		NAME PLATE				AC 131						
LINE 1		FI-23				TI-24						
LINE 2		HV/LP				TEMP						
LINE 3		PROD GAS				WELL#1						
LINE 4		X1000 SCFM										
Manufacturer		FISHER				FISHER						
*Receiver Catalog No.		TL131				TL131						
*Controller Catalog No.												
P.O. No.												
Price												
REV. DATE	6						4					
	1						5					
	2						A					
	3						A					


Per 7*

		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.	
						AUTH NO.		DEPT OR AREA		IS- 13	
LOCATION								5 OF			
Instrument No.		TI-25				TI-26					
Service		PRODUCT GAS WELL#2				PRODUCT GAS WELL#3					
Location - Panel or Equipment No.		CPI				CPI					
RECEIVER	Record Indicate Control		INDICATE				INDICATE				
	*Number of Points		ONE				ONE				
	Chart	Size & Type		X				X			
		Range									
		Drive	Speed								
	Scale	Size & Type		2 1/4" FIXED				2 1/4" FIXED			
Range		0-1000				0-1000					
Ratio, Cascade, Computer - Set		-				-					
Auto - Manual By Pass		YES <input type="checkbox"/> NO <input type="checkbox"/>		YES <input type="checkbox"/> NO <input type="checkbox"/>		YES <input type="checkbox"/> NO <input type="checkbox"/>		YES <input type="checkbox"/> NO <input type="checkbox"/>		YES <input type="checkbox"/> NO <input type="checkbox"/>	
CONTROLLER	Location		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		
	Proportional Band %										
	Auto-Reset Mode		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		
	Rate Mode		YES NO		YES NO		YES NO		YES NO		
On Measurement Increase Instrument Output		INC. DEC		INC. DEC		INC. DEC		INC. DEC		INC. DEC	
SIGNALS	Measurement Input	Range & Units		4-20MADC				4-20MADC			
		From		TT-25				TT-26			
	Controller Output	Range & Units		-				-			
		To		-				-			
	Set Point	Range & Units		-				-			
From		-				-					
Power Supply - Electric, Pneumatic		24VDC				24VDC					
Electrical Area Classification		NEMA I				NEMA I					
Accessories or Special Features											
REMARKS	RANGE PLUG		AC131				AC131				
	NAME PLATE										
	LINE 1		TI-25				TI-26				
	LINE 2		TEMP				TEMP				
	LINE 3		WELL#2				WELL#3				
LINE 4											
Manufacturer		FISHER				FISHER					
*Receiver Catalog No.		TL131				TL131					
*Controller Catalog No.											
P.O. No.											
Price											
REV. DATE	0						A				
	1						S				
	2						A				
	3						A				
PURCH.	2										
	4										
	5										
	5										

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.			
				AUTH NO.		DEPT OR AREA		IS- 13			
LOCATION								SHEET 6 OF			
Instrument No.		PI-29		TI-30							
Service		PRODUCT GAS W		PROCESS AIR LP/HV							
Location - Panel or Equipment No.		CPI		CPI							
RECEIVER	Record Indicate Control		INDICATE		INDICATE						
	*Number of Points		ONE		ONE						
	Chart	Size & Type		X		X					
		Range									
		Drive	Speed								
	Scale	Size & Type		2 1/4" FIXED		2 1/4" FIXED					
Range		0-500 ← 0-300		0-300							
Ratio, Cascade, Computer - Set											
Auto - Manual By Pass		YES	NO	YES	NO	YES	NO	YES	NO		
CONTROLLER	Location		INTEG.	REMOTE	INTEG.	REMOTE	INTEG.	REMOTE	INTEG.	REMOTE	
	Proportional Band %										
	Auto-Reset Mode		NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST
	Rate Mode		YES	NO	YES	NO	YES	NO	YES	NO	
On Measurement Increase Instrument Output		INC.	DEC	INC.	DEC	INC.	DEC	INC.	DEC		
SIGNALS	Measurement Input	Range & Units		4-20MADC		4-20MADC					
		From		PT-29		TT-30					
	Controller Output	Range & Units		---		---					
		To		---		---					
	Set Point	Range & Units		---		---					
From		---		---							
Power Supply - Electric, Pneumatic		24VDC		24VDC							
Electrical Area Classification		NEMA I		NEMA I							
Accessories or Special Features											
RANGE PLUG		AC131		AC131							
NAME PLATE											
LINE 1		PI-29		TI-30							
LINE 2		PRESSURE		TEMP							
LINE 3		WELL #3		AIR TO							
LINE 4				WELLS							
Manufacturer		FISHER		FISHER							
*Receiver Catalog No.		TL131		TL131							
*Controller Catalog No.											
P.O. No.											
Price											
REV. DATE	0				4						
	1				5						
	2				6						
	3				7						

Per 7*

		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.		
						AUTH NO.		DEPT OR AREA		IS- 13		SHEET
LOCATION								7 OF				
Instrument No.		PI-27				PI-28						
Service		PRODUCT GAS WELL #1				PRODUCT GAS WELL #2						
Location - Panel or Equipment No.		CPI				CPI						
RECEIVER	Record Indicate Control		INDICATE				INDICATE					
	*Number of Points		ONE				ONE					
	Chart	Size & Type		X				X				
		Range										
		Drive	Speed									
	Scale	Size & Type		2 1/4" FIXED				2 1/4" FIXED				
Range		0-500 + (0-300)				0-500 + 0-300						
Ratio, Cascade, Computer - Set												
Auto - Manual By Pass		YES NO		YES NO		YES NO		YES NO				
CONTROLLER	Location		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE			
	Proportional Band %											
	Auto-Preset Mode		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST			
	Rate Mode		YES NO		YES NO		YES NO		YES NO			
On Measurement Increase Instrument Output		INC. DEC		INC. DEC		INC. DEC		INC. DEC				
SIGNALS	Measurement Input		Range & Units		4-20MADC				4-20MADC			
	Controller Output		Range & Units		PT-27				PT-28			
	Set Point		From		---				---			
			To		---				---			
	Power Supply - Electric, Pneumatic		24VDC				24VDC					
Electrical Area Classification		NEMA I				NEMA I						
REMARKS	Accessories or Special Features											
	RANGE PLUG		AC 131				AC 131					
	NAME PLATE											
	LINE 1		PI-27				PI-28					
	LINE 2		PRESSURE				PRESSURE					
LINE 3		WELL #1				WELL #2						
LINE 4												
Manufacturer		FISHER				FISHER						
*Receiver Catalog No.		TL131				TL131						
*Controller Catalog No.												
P.O. No.												
Price												
REV. DATE	①											
	②											
	③											
	④											

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.			
						AUTH NO.		DEPT OR AREA		IS- 13		SHEET	REV
LOCATION								8 OF					
Instrument No.		TI-31						TI-32					
Service		PROCESS AIR						PRODUCT GAS					
		HP/LV											
Location - Panel or Equipment No.		CPI						CPI					
RECEIVER	Record Indicate Control		INDICATE						INDICATE				
	*Number of Points		ONE						ONE				
	Chart	Size & Type		X				X					
		Range											
		Drive	Speed										
	Scale	Size & Type		2 1/4" FIXED						2 1/4" FIXED			
Range		0-300						0-500					
Ratio, Cascade, Computer - Set													
Auto - Manual By Pass		YES		NO		YES		NO		YES			
CONTROLLER	Location		INTEG.		REMOTE		INTEG.		REMOTE		INTEG.		
	Proportional Band %												
	Auto-Reset Mode		NO		SLOW		FAST		NO		SLOW		
	Rate Mode		YES		NO		YES		NO		YES		
On Measurement Increase Instrument Output		INC.		DEC		INC.		DEC		INC.			
SIGNALS	Measurement Input	Range & Units		4-20MADC						4-20MADC			
		From		TT-31						TT-32			
	Controller Output	Range & Units		-						-			
		To		-						-			
	Set Point	Range & Units		-						-			
From		-						-					
Power Supply - Electric, Pneumatic		24VDC						24VDC					
Electrical Area Classification		NEMA I						NEMA I					
Accessories or Special Features													
REMARKS	RANGE PLUG		AC 131						AC 131				
	NAME PLATE												
	LINE 1		TI-31						TI-32				
	LINE 2		TEMP						TEMP				
	LINE 3		AIR TO						PROD GAS				
LINE 4		WELLS						TO INC.					
Manufacturer		FISHER						FISHER					
*Receiver Catalog No.		TL131						TL131					
*Controller Catalog No.													
P.O. No.													
Price													
REV. DATE	1												
	2												
	3												
	4												

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.		
						AUTH NO.		DEPT OR AREA		IS- 13		SHEET
LOCATION								9 OF		1		
Instrument No.		FI-33A						FI-33B				
Service		PRODUCT GAS						PRODUCT GAS				
		HP/LV						HP/LV				
Location - Panel or Equipment No.		CPI						CP-1				
3 6*	RECEIVER	Record Indicate Control		INDICATE				INDICATE				
		*Number of Points		ONE				ONE				
		Chart	Size & Type		X				X			
			Range									
			Drive	Speed								
		Scale	Size & Type		2 1/4" FIXED				2 1/4" FIXED			
			Range		0-100 LIN				0-40 LIN			
		Ratio, Cascade, Computer - Set										
		Auto - Manual By Pass		-YES- -NO-		YES NO		-YES- -NO-		YES NO		
		CONTROLLER	Location		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE	
Proportional Band %												
Auto-Reset Mode			NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST			
Rate Mode			YES NO		YES NO		YES NO		YES NO			
On Measurement Increase Instrument Output			INC. DEC		INC. DEC		INC. DEC		INC. DEC			
SIGNALS	Measurement Input	Range & Units		4-20 MA DC				4-20 MA DC				
		From		FY-33B				FY-33B				
	Controller Output	Range & Units		X				X				
		To										
	Set Point	Range & Units										
From												
Power Supply - Electric, Pneumatic		24VDC				24VDC						
Electrical Area Classification		NEMA I				NEMA I						
Accessories or Special Features												
RANGE PLUG		AC 131				AC 131						
NAME PLATE												
LINE 1		FI-33A				FI-33B						
LINE 2		HP/LV				HP/LV						
LINE 3		PROD GAS				PROD GAS						
LINE 4		X 1 SCFM				X 1 SCFM						
Manufacturer		FISHER				FISHER						
*Receiver Catalog No.		TL131				TL131						
*Controller Catalog No.		A				A						
P.D. No.												
Price												
REV. DATE	① ISSUED TO PURCH FI-33A		DC 6-75		④							
	② ISSUED TO PURCH FI-33B		R6C 7-6-78		⑤							
	③				⑥							
					⑦							

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC				DIVISION		PLANT		*SPEC NO.			
						AUTH NO.		DEPT OR AREA		IS- 13		SHEET	REV
LOCATION		10 OF											
Instrument No.		ZK-102											
Service		TRANSFER STATION											
Location - Panel or Equipment No.		INST CASE UK102											
RECEIVER	Record Indicate Control		TRANSFER STA.										
	*Number of Points		MULTIPLE										
	Chart	Size & Type		<div style="font-size: 2em; text-align: center;">X</div>									
		Range											
		Drive	Speed										
	Scale	Size & Type		BLANK									
Range		=											
Ratio, Cascade, Computer - Set													
Auto - Manual By Pass		YES NO		YES NO		YES NO		YES NO		YES NO			
CONTROLLER	Location		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		
	Proportional Band %												
	Auto-Reset Mode		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		
	Rate Mode		YES NO		YES NO		YES NO		YES NO		YES NO		
On Measurement Increase Instrument Output		INC. DEC		INC. DEC		INC. DEC		INC. DEC		INC. DEC			
SIGNALS	Measurement Input	Range & Units		NONE									
		From		-									
	Controller Output	Range & Units		4-20MADC									
		To		MULTIPLE									
	Set Point	Range & Units		NONE									
From		-											
Power Supply - Electric, Pneumatic		24 VDC											
Electrical Area Classification		NEMA I											
Accessories or Special Features													
REMARKS	RANGE PLUG		-										
	NAME PLATE												
	LINE 1		ZK-102										
	LINE 2												
	LINE 3												
LINE 4													
LINE 5													
LINE 6													
LINE 7													
LINE 8													
LINE 9													
LINE 10													
PURCH.	Manufacturer		FISHER										
	*Receiver Catalog No.												
	*Controller Catalog No.		TL-113										
	P.O. No.												
	Price												
REV. DATE	0												
	1												
	2												
	3												
		4		5		6		7					

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS	DIVISION	PLANT	SPEC NO.	
			AUTH NO.	DEPT OR AREA	IS- 15 SHEET	REV
LOCATION					1 OF	0
Instrument No. <u>FY-20 & FY-21</u>						
Service						
Equipment No. or Line No. & Size						
Process Material						
Flow Computer to solve Gas Flow Equation $Q = K \sqrt{(h) \times (P) \div (T)}$						
Input Signals: B & C are 1-5VDC ; A is 4-20maDC						
Output Signal : 4-20maDC						
Power Supply : 115VAC, 60HZ						
INSTR#: <u>FY-20</u>			Instr#: <u>FY-21</u>			
A=h=0-100"WC=4-20maDC=0-1.0 Multiplier Flow = 0-120 scfm			A=h=0-100"WC=4-20maDC=0-1.0 Multiplier Flow = 0-4000 scfm			
B=P=14.7-1014.7PSIA=1-5VDC=.04-1.137 Multiplier			B=P=14.7-1014.7PSIA=1-5VDC=.04-1.137 Multiplier			
C=T=460-960°Fabs=1-5VDC=.60-1.263 Multiplier			C=T=460-960°Fabs=1-5VDC=.60-1.263 Multiplier			
<u>Max. h - Normal P & T CONDITION:</u>			<u>Max. h - Normal P & T CONDITION:</u>			
h=100"WC=5.0VDC=1.0 FACTOR			h=100"WC=5.0VDC=1.0 FACTOR			
P=1014.7PSIA=4.34VDC=1.0 FACTOR			P=1014.7PSIA=4.52VDC=1.0 FACTOR			
T=760°Fabs=4.17VDC=1.0 FACTOR			T=760°Fabs=4.17VDC=1.0 FACTOR			
OUTPUT = (1.0) x (1.0) ÷ (1.0) = 1.0 = 20maDC			OUTPUT = (1.0) x (1.0) ÷ (1.0) = 1.0 = 20maDC			
<u>Normal h, P & T CONDITION:</u>			<u>Normal h, P & T CONDITION:</u>			
h=70.7"WC=3.0VDC=0.5 FACTOR			h=70.7"WC=3.0VDC=0.5 FACTOR			
P & T AS ABOVE			P & T AS ABOVE			
OUTPUT = (0.5) x (1.0) ÷ (1.0) = 0.5 = 12maDC			OUTPUT = (0.5) x (1.0) ÷ (1.0) = 0.5 = 12maDC			
PURCHASING						
Manufacturer		AGM Electronics				
Catalog No.		TA 4049				
P.O. No.						
Price						
REV. DATE	△	ISSUED FOR PURCHASE	RGC 6-2-76	△		
	△			△		
	△			△		
	△			△		

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		SPEC NO.	
				AUTH NO.		DEPT OR AREA		IS- 20	
LOCATION _____								SHEET REV	
								1 OF 1	
Instrument No.				EU-110		EU-111		EX-112	
Service				Power Supply		Backup		Batty Back-up Power System	
Equipment No. or Line No. & Size									
Process Material									
Location: Panel No.				CP-1		CP-1		Control Room	
Function: Primary, Back-up, Battery B/U				Primary		Back-up		Batty Back-up	
Signals: Input Volt & Freq				117V, 60HZ		117V, 60HZ		117V, 60HZ	
Input Power or Rating				3amp		3amp		700 watts	
Input from									
Output Voltage (S)				+5, ±15, +24VDC		+5, ±15, +24VDC			
Output Power or Rating								450 watts/30min	
Output to				UA-101, UK-102		UA-101, UK-102		EU-110, -111	
Output load adjust (ohms)									
Transfer Speed									
Alarm Set Pt.									
Alarm Set Pt.									
Input Fuse				2.0amps		2.0amps			
Output Fuse									
Elec Area Class				Nema I		Nema I		Nema I	
Cabinet: Mounting				U-Channel		V-Channel		Wall Mtd	
Options: Ni-Cad Batty with Mtg Rack								Model BATT4	
Purchasing				Manufacturer		Fisher		Fisher	
				Catalog No.		768		769	
				P.O. No.		A		A	
				Price		A		A	
REV. DATE				1		ISSUED FOR PURCH		DC 6-78	
				2		DELETED EX-112		RGC 7-578	
				3					
				4					



Monsanto

CONTROL VALVE SPECIFICATION

COMPANY

PLANT

SPEC NO.

IS- 27

AUTH NO.

DEPT

AREA

SHEET

REV

LOCATION

INSTRUMENT NUMBER

PV-10

FV-20

SERVICE

AIR HDR. CONTROL

HP AIR FLOW

LINE NUMBER

2"-LP-1" I A

1"-HP-1/2" I A

PROCESS MATERIAL

COMP. AIR

COMP. AIR

DESIGN DATA

FLOW	LIQ	(GAS)	STM	LIQ	GAS	STM	LIQ	(GAS)	STM	LIQ	GAS	STM
FLOW TEMPERATURE, T _f	300° F			300° F			300° F					
WORKING PRESSURE (PSIG INLET)	400 PSIG			700 PSIG								
VALVE TO CLOSE AGAINST (PSIG)	400 PSIG			1000 PSIG								
SP GR (LIQ @ T _f , GAS @ 60F, 14-7 PSIA)	1.0			1.0								
VISCOSITY @ T _f	0.024			0.024								
VAPOR PRESSURE @ T _f , PSIA												
NORMAL FLOW	0			3750			100			125		
MAX FLOW												
FLOW UNITS: SCFM, SCFH, GPM, #/HR	SCFM			SCFM			SCFM					
% TRAVEL	69			400			80			100		
Δp												
FLOW C _v , C _g , OR C _s	CV=19.2						CV=0.52					

VALVE SPECIFICATION

VALVE BODY SIZE	300#			300#			300#			300#		
BODY RATING & END CONNECTION	SCR (FLG)			SCR (FLG)			SCR (FLG)			SCR (FLG)		
BODY MATERIAL	CARBON STEEL			CARBON STEEL			CARBON STEEL			CARBON STEEL		
TRIM SIZE	1/2"			1/2"			1/4"			1/4"		
MAXIMUM C _v , C _g , OR C _s	CV=35			CV=35			CV=95			CV=95		
SEATS	(SP) DP			(SP) DP			(SP) DP			(SP) DP		
TRIM MATERIAL	STAINLESS STL			STAINLESS STL			STAINLESS STL			STAINLESS STL		
TYPE INNER VALVE	EQ 70			EQ 70			MICRO FLUTE			MICRO FLUTE		
FLOW TENDS TO	CLOSE (OPEN)			CLOSE (OPEN)			CLOSE (OPEN)			CLOSE (OPEN)		
PACKING	TEFLON			TEFLON			TEFLON			TEFLON		
GUIDING	SKIRT (TOP) BTM			SKIRT (TOP) BTM			SKIRT (TOP) BTM			SKIRT (TOP) BTM		
VALVE ACTUATOR	(DIAPH) PISTON			(DIAPH) PISTON			(DIAPH) PISTON			(DIAPH) PISTON		
ON AIR FAILURE VALVE	CLOSES (OPENS)			CLOSES (OPENS)			CLOSES (OPENS)			CLOSES (OPENS)		
ACTUATOR SIZE	BY VENDOR 3-15 PSI			BY VENDOR 3-15 PSI			BY VENDOR 3-15 PSI			BY VENDOR 3-15 PSI		
SPRING RANGE												

SIGNAL FROM CONTROLLER - UNITS (4-20 MA DC) (4-20 MA DC) (4-20 MA DC) (4-20 MA DC)

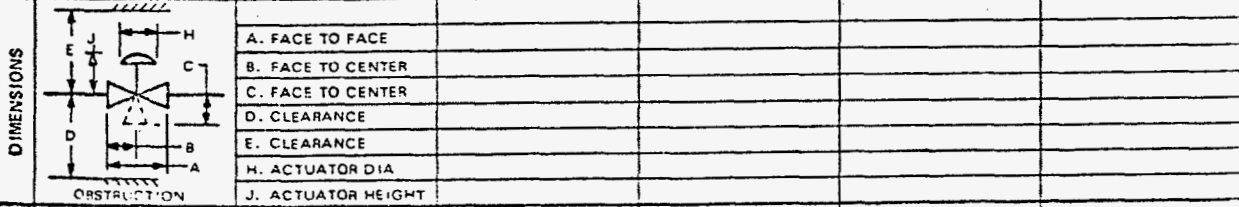
VALVE POSITIONER	MODEL NO.	BYPASS	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	INPUT	OUTPUT	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI

I/P TRANSDUCER	MODEL NO.	NEMA	546	4.7	546	4.7
	INPUT	OUTPUT	4-20 MA	3-15 PSI	4-20 MA	3-15 PSI

SOLENOID	SOLENOID VALVE - PIPED & MOUNTED	YES	NO	BY OTHERS	YES	NO	BY OTHERS	YES	NO	BY OTHERS	YES	NO	BY OTHERS
	ON ELECTRICAL FAILURE CONTROL VALVE	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS
	SOLENOID COIL VOLTAGE - STD	OTHER	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz	120V 60Hz
	SOLENOID COIL TYPE - CLASS	MOLDED	A F H	YES	NO	A F H	YES	NO	A F H	YES	NO	A F H	YES

MAX. C_g & C_v @ DES. CONDITIONS 1180 & 33.8 32 & 34

INSTALLATION DETAIL NO.



PURCH.	VALVE MANUFACTURER	FISHER	FISHER
	VALVE CATALOG NUMBER	657-RFC	513R-B

REV	LINE No. REF	DC 9-12-78	A
-----	--------------	------------	---

Monsanto

CONTROL VALVE SPECIFICATION

COMPANY

PLANT

SPEC NO.

AUTH NO.

DEPT

AREA

SHEET

REV

LOCATION

IS- 27
2 OF 0

INSTRUMENT NUMBER		FV-21			PV-17				
SERVICE		LP AIR FLOW			GAS HDR. CONTROL				
LINE NUMBER		4" LP-1/2" I			6" PG-3" I				
PROCESS MATERIAL		COMPR AIR			PRODUCT GAS				
DESIGN DATA	FLOW	LIQ	(GAS)	STM	LIQ	(GAS)	STM		
	FLOW TEMPERATURE, T _f	300°F			750°F				
	WORKING PRESSURE (PSIG INLET)	350 PSIG			147 PSIG				
	VALVE TO CLOSE AGAINST (PSIG)	350 PSIG			350 PSIG				
	SP GR (LIQ @ T _f , GAS @ 60F, 14-7 PSIA)	1.0			0.83				
	VISCOSITY @ T _f	0.024							
	VAPOR PRESSURE @ T _f , PSIA								
	NORMAL FLOW	3000			3500				
	MAX FLOW	3750			5000				
	FLOW UNITS: SCFM, SCFH, GPM, #/HR	SCF TA			SCFM				
% TRAVEL Δp	64 30			45					
FLOW: C _v , C _g , OR C _s	CV=49			CV=254					
VALVE SPECIFICATION	VALVE BODY SIZE	3"			4" (WAFER)				
	BODY RATING & END CONNECTION	300#	SCR	(FLG)	600#	SCR	(FLG)		
	BODY MATERIAL	CARBON STL			316 SS				
	TRIM SIZE	3/16			1/2				
	MAXIMUM C _v , C _g , OR C _s	CV=121			CV=160				
	SEATS	(SP)	DP		(SP)	DP			
	TRIM MATERIAL	STAINLESS STL			STAINLESS STL				
	TYPE INNER VALVE	EQ %			VEE BALL				
	FLOW TENDS TO	CLOSE	(OPEN)		CLOSE	(OPEN)			
	PACKING	TEFLON			GRAPHITE				
	GUIDING	SKIRT	TOP	BTM	SKIRT	TOP	BTM		
	VALVE ACTUATOR	(DIAPH)	PISTON		(DIAPH)	PISTON			
ON AIR FAILURE VALVE	CLOSES	(OPENS)		CLOSES	(OPENS)				
ACTUATOR SIZE	5" NEMA			5" NEMA					
SIGNAL FROM CONTROLLER - UNITS	4-20 MA DC			4-20 MA DC					
VALVE POSITIONER	MODEL NO.	2511			2511				
	INPUT	3-15 PSI			3-15 PSI				
	OUTPUT	3-15 PSI			3-15 PSI				
I/P TRANSDUCER	MODEL NO.	546			546				
	INPUT	4-20 MA			4-20 MA				
	OUTPUT	3-15 PSI			3-15 PSI				
SOLENOID	SOLENOID VALVE - PIPED & MOUNTED	YES	NO	BY OTHERS	YES	NO	BY OTHERS		
	ON ELECTRICAL FAILURE CONTROL VALVE	CLOSES	(OPENS)		CLOSES	(OPENS)			
	SOLENOID COIL VOLTAGE - STD	120V 60Hz			120V 60Hz				
	SOLENOID COIL TYPE - CLASS	MOLDED	A	F	H	MOLDED	A	F	H
	SOLENOID VALVE MANUFACTURER								
SOLENOID VALVE CATALOG NUMBER									
MAX. C _g + C _i @ DES. CONDITIONS		4210 #34.8			6600 #36				
INSTALLATION DETAIL NO.									
DIMENSIONS		A. FACE TO FACE	81-DIR SEAL RINGS						
		B. FACE TO CENTER	ALLOY 6-LDG						
		C. FACE TO CENTER	EDGE OF BALL						
		D. CLEARANCE	440C BUSHING						
		E. CLEARANCE							
		H. ACTUATOR DIA							
		J. ACTUATOR HEIGHT							
PURCH.	VALVE MANUFACTURER	FISHER			FISHER				
	VALVE CATALOG NUMBER	657-ET			1051-V100				
	PURCHASE ORDER NUMBER								
REV	Δ	REV. SIZE, MAT'L			D.C. 9-11-77				
	Δ								
	Δ								

Per 7*
4*

Monsanto COMPANY		* PRESSURE INSTRUMENT SPECIFICATIONS			DIVISION			PLANT			* SPEC NO. IS 36			
LOCATION _____					AUTH NO.			DEPT OR AREA			SHEET		REV	
											2 OF		1	
Instrument No.		PT-12												
Service		COMPR. AIR												
		LOW PRESS												
Equipment No. or Line No. & Size		4" LP-1/2" I			A									
Process Material		AIR												
3	CASE	Blind, Indicating, Record, Control, Transmit		BLIND			A							
		Mounting: Flush, Surface, Yoke		2" YOKE										
		CHART	Size & Type		X									
			Range											
			Drive	Speed										
SCALE	Size & Type		=			A								
	Range													
6	ELEMENT	Number		ONE										
		Span & Units		0-400 PSIG										
		Range Limits		0-170/1000 PSIG										
		Material & Type		316 SS DIAPH										
SIGNALS	PROCESS INPUT	Liquid, Gas, Cond. Vapor		COMPR. AIR										
		Min. Press.	Normal Press.	Max. Press.	0	400								
	INSTRUMENT OUTPUT	Range & Units		4-20 MADC										
		To		PIC-12										
Power Supply - Electric, Pneumatic		24VDC MAX												
Electrical Area Classification		CL I, DIVI-D												
CONTROLLER TRANSMITTER	Proportional Band %		X											
	Auto Reset Mode		NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST
	Rate Mode		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	Auto - Manual Bypass		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	On Measurement Increase Instrument Output		INC.	DEC	INC.	DEC	INC.	DEC	INC.	DEC	INC.	DEC	INC.	DEC
Piped & Mt'd Air Supply Reg.		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	
Output Gage, 3/8" (For Xmitter)		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	
REMARKS	Accessories or Special Features													
	LINEAR METER		NONE			A								
	PROCESS CONNECTIONS		1/2" NPT											
	PROCESS FLG & ADAPTOR		316 SS											
	BODY MATERIAL		316 SS											
PURCH.	Manufacturer		FISHER											
	*Catalog No.		1151GP-8-E-22-MB											
	P.O. No.		A											
	Price													
	A	CHGD MFG R ISSUED F/PURCH		DC	6-78	A								
	A	DELETE METER, ADD MODEL No.		R6C	7-6-78	A								
	A	LINE No. REV		DC	9-1278	A								
	A					A								

Per 8*
4*
5*

Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS			DIVISION	PLANT	*SPEC NO. IS 36		
LOCATION					AUTH NO.	DEPT OR AREA	SHEET	REV	
							3 OF	1	
Instrument No.		FT-20			FT-21				
Service		PROCESS AIR			PROCESS AIR				
Equipment No. or Line No. & Size		HI PR/LO VOL 1"HP-1/2" I			LO PR/HI VOL 4"LP-1/2" I				
Process Material		AIR			AIR				
CASE	Blind, Indicating, Record, Control, Transmit		BLIND Δ			BLIND Δ			
	Mounting: Flush, Surface Yoke		2" YOKE			2" YOKE			
	CHART	Size and Type		X			X		
		Range							
	SCALE	Drive		X			X		
Speed									
Flow, Level, Pressure		FLOW			FLOW				
Bellows, Diaphragm, Other		DIAPH.			DIAPH.				
*Span & Units		0-100" WC			0-100" WC				
Range Limits		0-150" WC			0-150" WC				
Body Rating @ 60°F		2000 PSIG			2000 PSIG				
*Body Material		316SS			316SS				
Element Material		316SS			316SS				
Wetted Parts Material		316SS			316SS				
Extended Diaph. Length									
Fluid Sp. Gr.									
SIGNALS	PROCESS INPUT		Liquid, Gas, Cond. Vapor			AIR			
	Operating Pressure		1000 PSIG			350 PSIG			
	INSTRUM. OUTPUT		Range & Units			4-20MADC			
	To		FY-20			FY-21			
Power Supply - Electrical, Pneumatic		24VDC			24VDC				
Electrical Area Classification		CLI-DIVII-D			CLI-DIVII-D				
CONTROLLER	Proportional Band %								
	Auto-Reset Mode		NO	SLOW	FAST	NO	SLOW	FAST	
	Rate Mode		YES	NO	YES	NO	YES	NO	
	Auto-Manual By Pass		YES	NO	YES	NO	YES	NO	
	On Measurement Increase Instrument Output		INC.	DEC	INC.	DEC	INC.	DEC	
	Pipe & Mt'd Air Supply Reg.		YES	NO	YES	NO	YES	NO	
Output Gage, 3/4" Size		YES	NO	YES	NO	YES	NO		
REMARKS	Accessories or Special Features								
	SQ RT METER		NONE Δ			NONE Δ			
	PROCESS CONNECTION		1/2" NPT			1/2" NPT			
PURCH.	Manufacturer		FISHER			FISHER			
	Catalog No.		1151DP-4-E-22-MB			1151DP-4-E-22-MB			
	P.O. No.		Δ			Δ			
	Price								
REV. DATE	Δ CHGD MFG & ISSUED/PURCH		DC	6-78	Δ				
	Δ DELETE METER, ADD MODEL No.		RGC	7-6-78	Δ				
	Δ REV. LINE No.		DC	4-12-78	Δ				
	Δ				Δ				

Per 7
4

Monsanto COMPANY		*PRESSURE INSTRUMENT SPECIFICATIONS			DIVISION			PLANT			* SPEC NO.		
					AUTH NO.			DEPT OR AREA			IS- 36		SHEET
LOCATION											4 OF 1		
Instrument No.		PT-17						PT-27					
Service		PRODUCT GAS						PRODUCT GAS					
Equipment No. or Line No. & Size		6" PG-3" I Δ						WELL PI-1					
Process Material		GAS						GAS					
CASE	Blind, Indicating, Record, Control, Transmit				BLIND Δ			BLIND Δ					
	Mounting: Flush, Surface, Yoke				2" YOKE			2" YOKE					
	CHART	Size & Type				 			 				
		Range				 			 				
	SCALE		Size & Type		= Δ		= Δ						
Range													
ELEMENT	Number				ONE			ONE					
	Span & Units				0-100 PSIG			0-100 PSIG \rightarrow 0-300					
	Range Limits				0-50/300 PSIG			0-50/300 PSIG					
	Material & Type				316SS DIAPH			316SS DIAPH					
SIGNALS	PROCESS INPUT		Liquid, Gas, Cond. Vapor		GAS			GAS					
	INSTRUMENT OUTPUT		Range & Units		4-20 MADDC			4-20 MADDC					
	To				PIC-17			PI-27					
	Power Supply - Electric, Pneumatic				24VDC MAX			24VDC MAX					
Electrical Area Classification				CLI DIV II-D			CLI DIV II-D						
CONTROLLER TRANSMITTER	Proportional Band %				 			 					
	Auto Reset Mode				NO SLOW FAST			NO SLOW FAST			NO SLOW FAST		
	Rate Mode				YES NO			YES NO			YES NO		
	Auto - Manual Bypass				YES NO			YES NO			YES NO		
	On Measurement Increase Instrument Output				INC DEC			INC DEC			INC DEC		
	Piped & Mt'd Air Supply Reg.				YES NO			YES NO			YES NO		
	Output Gage, 3/4" (For Xmitter)				YES NO			YES NO			YES NO		
REMARKS	Accessories or Special Features				LINEAR METER NONE Δ			NONE Δ					
	PROCESS CONNECTIONS				1/2" NPT			1/2" NPT					
	PROCESS FLG & ADAPTION				316 SS			316 SS					
PURCH.	Manufacturer				FISHER			FISHER					
	*Catalog No.				115IGP-7-E-22-MB			115IGP-7-E-22-MB					
	P.O. No.				Δ			Δ					
	Price												
Δ		CHGD MFG'S ISS. F/PURCH		DC 6-76		Δ							
Δ		REV. LINE No.		DC 9-12-78		Δ							
Δ						Δ							
Δ						Δ							

Per 7*

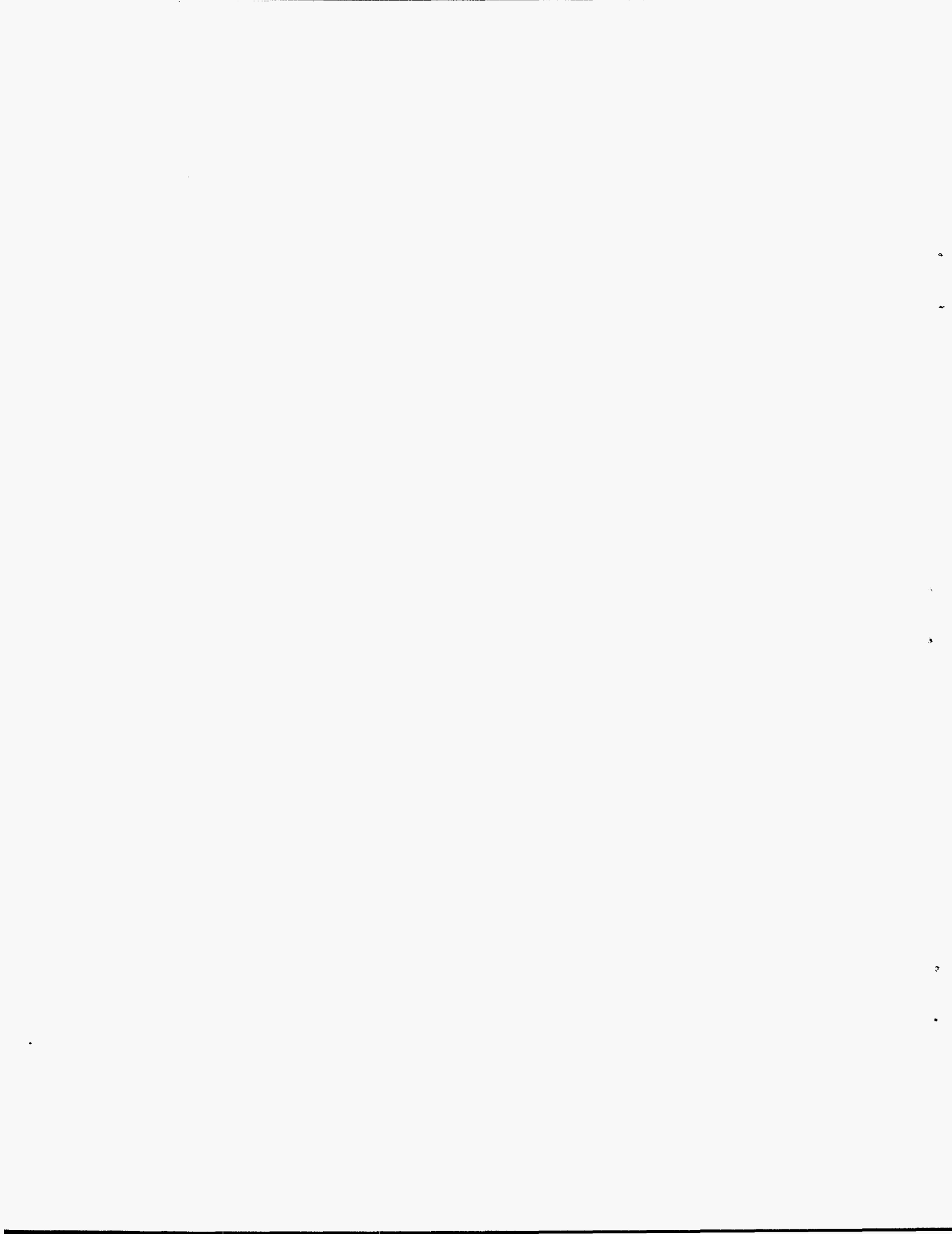
Monsanto COMPANY		* PRESSURE INSTRUMENT SPECIFICATIONS				DIVISION			PLANT			* SPEC NO.								
						AUTH NO.			DEPT OR AREA			IS 30		SHEET	REV					
LOCATION												5 OF 1								
Instrument No.		PT-28							PT-29											
Service		PRODUCT GAS							PRODUCT GAS											
Equipment No. or Line No. & Size		WELL PI-2							WELL PI-3											
Process Material		GAS							GAS											
CASE	Blind, Indicating, Record, Control, Transmit		BLIND A							BLIND A										
	Mounting: Flush, Surface, Yoke		2" YOKE							2" YOKE										
	CHART	Size & Type		X				X			X		X							
		Range																		
		Drive	Speed																	
SCALE	Size & Type		= A							= A										
	Range																			
ELEMENT	Number		ONE							ONE										
	Span & Units		0-100 PSIG → (0-300)							0-100 PSIG → (0-300)										
	Range Limits		0-50/300 PSIG							0-50/300 PSIG										
	Material & Type		316SS DIAPH							316SS DIAPH										
SIGNALS	PROCESS INPUT		Liquid, Gas, Cond. Vapor		GAS							GAS								
	INSTRUMENT OUTPUT		Range & Units		4-20 MADC							4-20 MADC								
	To		PI-28							PI-29										
	Power Supply - Electric, Pneumatic		24VDC MAX							24VDC MAX										
Electrical Area Classification		CLI-DIV II-D							CLI-DIV II-D											
CONTROLLER TRANSMITTER	Proportional Band %																			
	Auto Reset Mode		NO		SLOW		FAST		NO		SLOW		FAST		NO		SLOW		FAST	
	Rate Mode		YES		NO		YES		NO		YES		NO		YES		NO			
	Auto - Manual Bypass		YES		NO		YES		NO		YES		NO		YES		NO			
	On Measurement Increase Instrument Output		INC		DEC		INC		DEC		INC		DEC		INC		DEC			
	Piped & Mt'd Air Supply Reg.		YES		NO		YES		NO		YES		NO		YES		NO			
	Output Gage, 3/2" (For Xmitter)		YES		NO		YES		NO		YES		NO		YES		NO			
REMARKS	Accessories or Special Features																			
	LINEAR METER		NONE A							NONE A										
	PROCESS CONNECTIONS		1/2" NPT							1/2" NPT										
	PROCESS FLG ADAPTION		316 SS							316 SS										
PURCH.	Manufacturer		FISHER							FISHER										
	*Catalog No.		115IGP-7-E-22-MB							115IGP-7-E-22-MB										
	P.O. No.		A							A										
	Price																			
△		CHGD MFG & ISSUED F/P/ROU		DC 6-78		△														
△		DELETE METER, ADD MODEL NO.		R6L 7-6-78		△														
△						△														
△						△														

Per 8*
4*
5*

Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS		DIVISION			PLANT			*SPEC NO.	
				AUTH NO.			DEPT OR AREA			SHEET	REV
LOCATION										IS 36	6 OF 1
Instrument No.		FT-22		FT-23							
Service		PRODUCT GAS LOW PRESSURE		PRODUCT GAS LOW PRESSURE							
Equipment No. or Line No. & Size		8"PG-3" I Δ		6"PG-3" I Δ							
Process Material		GAS		GAS							
CASE	Blind, Indicating, Record, Control, Transmit		BLIND Δ		BLIND Δ						
	Mounting: Flush, Surface Yoke		2" YOKE		2" YOKE						
	CHART	Size and Type		 		 					
		Range		 		 					
	Drive		 		 						
Speed		 		 							
SCALE	Size & Type		= Δ		= Δ						
	Range		 		 						
DIFFERENTIAL UNITS	Flow, Level, Pressure		FLOW		FLOW						
	Bellows, Diaphragm, Other		DIAPHRAGM		DIAPHRAGM						
	*Span & Units		0-100" W.C.		0-100" W.C.						
	Range Limits		0-150" W.C.		0-150" W.C.						
	Body Rating @ 60°F		2000 PSIG		2000 PSIG						
	*Body Material		316 SS		316 SS						
	Element Material		316 SS		316 SS						
	Wetted Parts Material		316 SS		316 SS						
	Extended Diaph. Length										
	Fluid Sp. Gr.										
SIGNALS	PROCESS: Liquid, Gas, Cond. Vapor		GAS		GAS						
	INPUT: Operating Pressure		50-350 PSIG		50-350 PSIG						
	INSTRUM. RANGE & UNITS		4-20 MADC		4-20 MADC						
	OUTPUT: To		FY-22		FY-23						
Power Supply - Electrical, Pneumatic		24 VDC MAX		24 VDC MAX							
Electrical Area Classification		CL I GRD. DIV II		CL I GRD. DIV II							
CONTROLLER	Proportional Band %		 		 						
	Auto-Reset Mode		NO SLOW FAST		NO SLOW FAST						
	Rate Mode		YES NO		YES NO						
	Auto-Manual By Pass		YES NO		YES NO						
	On Measurement Increase Instrument Output		INC. DEC		INC. DEC						
Pipe & M'd Air Supply Reg.		YES NO		YES NO							
Output Gage, 3/2" Size		YES NO		YES NO							
REMARKS	Accessories or Special Features										
	SO RT METER		NONE Δ		NONE Δ						
	PROCESS CONNECTIONS		1/2" NPT		1/2" NPT						
PURCH.	Manufacturer		FISHER		FISHER						
	Catalog No.		1151 DP-4-E-22-MB		1151 DP-4-E-22-MB						
	P.O. No.		Δ		Δ						
	Price		Δ		Δ						
REV. DATE	① CHGD MFG & ISSUE P/PURCH		DC 6-78 Δ								
	② DELETE METER, ADD MODEL NO.		R6C 7-6-78 Δ								
	③ REV LINE No.		DC 9-12-78 Δ								
	④										

Per 8*
4*
5*

Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS			DIVISION	PLANT	*SPEC NO. IS-36							
LOCATION _____					AUTH NO.	DEPT OR AREA	SHEET	REV						
							7 OF	1						
Instrument No.		FT-33A			FT-33B									
Service		PROD. GAS			PROD. GAS									
Equipment No. or Line No. & Size		HI-PRESS 1 1/2" PG-3" I Δ			HI-PRESS 1 1/2" PG-3" I Δ									
Process Material		PROD. GAS			PROD. GAS									
CASE	Blind, Indicating, Record, Control, Transmit		BLIND Δ			BLIND								
	Mounting: Flush, Surface Yoke		2" YOKE			2" YOKE								
	CHART	Size and Type	X			X								
		Range												
	SCALE	Drive							Speed					
Size & Type		Range												
Flow, Level, Pressure		FLOW							FLOW					
Bellows, Diaphragm, Other		DIA.			DIAPH.									
*Span & Units		0-100" W.C.			0-100" WC									
Range Limits		0-150" W.C.			0-150" WC									
Body Rating @ 60°F		2,000 PSIG			2000 PSIG									
*Body Material		316 SS			316 SS									
Element Material		316 SS			316 SS									
Wetted Parts Material		316 SS			316 SS									
Extended Diaph. Length		—												
Fluid Sp. Gr.														
SIGNALS	PROCESS: Liquid, Gas, Cond. Vapor		GAS			GAS								
	INPUT Operating Pressure		350 PSIG			350 PSIG								
	INSTRUM. Range & Units		4-20MADC			4-20MADC								
	OUTPUT To		FY-33A			FY-33B								
Power Supply - Electrical, Pneumatic		24VDC			24VDC									
Electrical Area Classification		CLTGRDDIVE			CLTGRDDIVII									
CONTROLLER	Proportional Band %		X			X								
	Auto-Reset Mode								NO	SLOW	FAST	NO	SLOW	FAST
	Rate Mode								YES	NO	YES	NO	YES	NO
	Auto-Manual By Pass								YES	NO	YES	NO	YES	NO
	On Measurement Increase Instrument Output								INC.	DEC.	INC.	DEC.	INC.	DEC.
	Pipe & Mt'd Air Supply Reg.								YES	NO	YES	NO	YES	NO
Output Gage, 3/8" Size		YES	NO	YES	NO	YES	NO							
REMARKS	Accessories or Special Features													
	SQ RT METER		NONE Δ			NONE								
	PROCESS CONNECTIONS		1/2" NPT			1/2" NPT								
PURCH.	Manufacturer		FISHER			FISHER								
	Catalog No.		1151 DP-A-E-22-MB			1151 DP-A-E-22-MB								
	P.O. No.		Δ			Δ								
	Price													
REV. DATE	Δ CHGD MFG R & ISSUED F/PURCH		DC	6-78	Δ									
	Δ ADDED MODEL NO & FT-33B		RGC	7-5-78	Δ									
	Δ REV LINE NO.		DC.	9-12-78	Δ									
	Δ				Δ									



10*
3*
4*
5*

Monsanto COMPANY		*DIRECT OPERATED *PRESSURE REGULATING *VALVE SPECIFICATIONS			DIVISION			PLANT			* SPEC NO.	
					AUTH NO.			DEPT OR AREA			IS- 42	
LOCATION _____											1 of 1	
Valve No.		PCV-15						PCV-16				
Service		BACK-UP AIR						PRESS CONTL				
Line Number & Size		1" LP			A			1" TA			A	
Process Material		COMPR. AIR						INSTR AIR				
Operating Data	Flow Temperature	300° F						150° F				
	Working Pressure (PSIG Inlet)	350 PSIG						80 PSIG				
	Valve to Close Against (PSIG.)	350 PSIG						100 PSIG				
	Sp. Gr. @ Flow Temp.	1.0										
Design Conditions Gas @ 60°F 14.7 PSIA Liquid @ Flow Temp.	Normal Flow	5										
	Max. Flow	22						22				
	Units: SCFM, SCFH, GPM or #/Hr.	SCFM						SCFM				
	Fluid	LIQ.	(GAS)	STM	LIQ.	GAS	STM	LIQ.	(GAS)	STM	LIQ.	GAS
Calculation Sheet No.	Inner Valve Travel, % @ Design Flow							5-15				
	ΔP Cv (Calc.) @ Design Cond.											
	Guiding	SKIRT TOP BTM			SKIRT TOP BTM			SKIRT TOP BTM			SKIRT TOP BTM	
Valve Specifications	*Valve Body Size	1"						1"				
	Valve Port Size	1/8"						1/2"				
	Body Rating & Conn. Size	300# ASA 1"						300#, 1" NPT				
	Body Material	CARBON STEEL						CARBON STEEL				
	Trim Material											
	Type Inner Valve	QUICK OPNG						QUICK OPNG				
	Seats (Double or Single)	(SP)	DP		SP	DP		(SP)	DP		SP	DP
	Valve actuator (Diaph or Piston)	(DIAPH)	PISTON		DIAPH	PISTON		(DIAPH)	PISTON		DIAPH	PISTON
	Mat of Const (Diaph or Piston)	NEOPRENE						NEOPRENE				
	Lubricator	-						-				
Spring Setting	Spring Range	40-100 PSIG						40-100 PSIG				
	On Increased Pressure Valve	OPENS	(CLOSES)		OPENS	CLOSES		OPENS	(CLOSES)		OPENS	CLOSES
Type of Regulator	SELF-OPERATING						SELF-OPNG					
REMARKS	Accessories or Special Features											
DIMENSIONS												
PURCHASING	Manufacturer	FISHER						FISHER				
	*Catalog No.	620						620				
	P.O. No.							A				
	Price											
REV. DATE	Δ	ISSUED FOR PURCH			DC	6-76		Δ				
	Δ	ADDED REV-16 FOR PURCH			RGC	7-577		Δ				
	Δ	REV. LINE No.			DC	9-1278		Δ				
	Δ							Δ				



Per 10*
3*
4*

Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO.	
				AUTH NO.	DEPT OR AREA	IS- 45	SHEET
LOCATION _____						1	OF 0
Instrument No.		FE-20			FE-21		
Service		PROCESS AIR			PROCESS AIR		
		HP/LV			LP/HV		
Process Material		AIR			AIR		
Line No.		1"-HP-1/2" I			4"-LP-1/2" I		
Line Size, Schedule		1" SCH 80			4" SCH 40		
SERVICE	Upstream Operating Conditions	Flowing Press. P _f	1000 PSIG		350 PSIG		
		Flowing Temp. T _f	300 °F		300 °F		
		Sp. Gr. @ T _f	1.0		1.0		
		Viscosity CP @ T _f	0.024		0.024		
		Sp. Gr. @ 60°F	1.0		1.0		
		Supercompr. Factor @ T _f					
		Steam Quality, %	—		—		
		Steam Superheat, F	—		—		
	Flow at Base Conditions 60F & 14.73 PSIA Barometric Pressure at Location _____ In. Hg.	Liquid, Gas or Steam	AIR		AIR		
		Minimum Flow	0		300		
		Normal Flow	100		3000		
		Maximum Flow	120		4000		
		Units of Flow	SCFM		SCFM		
		Meter Range	0-150"WC		0-150"WC		
8* 9* 10* FLANGES	*Size & Type - W.N., S.O., Scr., Van Stone ⁽¹⁾	1" HONED SECT.		4" WELD NECK			
	*Rating & Facing	600# RF ASA		300# RF ASA			
	Material - Flange & R.T.J. Ring or Gasket ⁽¹⁾	CARBON STEEL		CARBON STEEL			
	Taps - Type, Size & Orientation (R2.3 Std)	3/8" NPT		1/2" NPT			
ORIFICE PLATE	Type of Plate (R2.3 Std)	CONCENTRIC		CONCENTRIC			
	Plate Material & Thickness	316 SS, 1/8"		304SS, 1/8"			
	Pipe ID (D), In.	0.957		4.026"			
	Orifice ID (d), In.	0.36312		2.59145			
	d/D Ratio (β)	0.37944		0.64368			
	Meter Range - Inches Water Dry	100"WC		100"WC			
	Type of Meter	DRY, d/P		DRY, d/P			
	Drain or Vent Hole	NONE		NONE			
	Chart or Scale Range						
	Chart Factor						
Calculation Sheet No.							
REMARKS	TYPE ORIFICE PLATE	F-50		520			
	GASKETS, THICKNESS/MAT'L	1/16" ASBESTOS		1/16" ASBESTOS			
All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material							
PURCH.	Manufacturer	DANIEL		DANIEL			
	*Catalog Number	H-835		30RW			
	Purchase Order Number						
	Price						
REV	△	ISSUED FOR PURCH	DC	6-27-78	△		
	△				△		
	△				△		
	△				△		



FE-20

E0040 P 1
5/17/78

PIPE, ORIFICE, AND METER DATA

ACTUAL PIPE DIAMETER 0.95700 INCHES
DRAIN OR VENT DIAMETER 0.0 INCHES

TYPE OF ORIFICE TAPS FLANGE

MAX. DIFF. * BETA RATIO * ORIF. DIAM
IN. H2O INCHES

50.000	0.44770	0.42845
100.000	0.37944	0.36312
150.000	0.34394	0.32915
200.000	0.32022	0.30645
250.000	0.30336	0.29031
300.000	0.29023	0.27775
350.000	0.27921	0.26787
400.000	0.27046	0.25883

UPSTREAM CONDITIONS

FLUID NAME HI PRESS AIR
FLUID CONDITION GAS
MAXIMUM FLOW 7199.996 SCFH
RATIO OF NORMAL TO MAXIMUM FLOW 0.83300
NORMAL FLOW 5997.594 SCFH

FLOWING TEMPERATURE 300.0 DEG F
FLOWING PRESSURE 1015.000 PSIA

VISCOSITY 0.02400 CP
DENSITY AT FLOWING CONDITIONS 3.61000 LB/FT3
DENSITY AT 60 F AND 1 ATM 0.07640 LB/FT3
HEAT CAPACITY RATIO, CP/CV 1.39000
PIPE REYNOLDS NO. AT NORMAL FLOW 126085.3

* COMPUTED BY PROGRAM, TABLE CONTROL CODE = 1

21
11
10
6
8
7
9
5
4
3

PRINTED IN U.S.A.

FE-21

F0040 P 2
5/17/78

PIPE, ORIFICE, AND METER DATA

ACTUAL PIPE DIAMETER 4.02600 INCHES
DRAIN OR VENT DIAMETER 0.0 INCHES

TYPE OF ORIFICE TAPS FLANGE

MAX. DIFF. * BETA RATIO * ORIF. DIAM
IN. H2O INCHES

50.000	0.73709	2.96752
100.000	0.64368	2.59145
150.000	0.59046	2.37718
200.000	0.55416	2.23105
250.000	0.52700	2.12169
300.000	0.50551	2.03518
350.000	0.48787	1.96417
400.000	0.47301	1.90434

UPSTREAM CONDITIONS

FLUID NAME LO PRESS AIR
FLUID CONDITION GAS
MAXIMUM FLOW 239999.938 SCFH
RATIO OF NORMAL TO MAXIMUM FLOW 0.75000
NORMAL FLOW 179999.938 SCFH

FLOWING TEMPERATURE 300.0 DEG F
FLOWING PRESSURE 365.000 PSIA

VISCOSITY 0.02400 CP
DENSITY AT FLOWING CONDITIONS 1.29700 LB/FT3
DENSITY AT 60 F AND 1 ATM 0.07640 LB/FT3
HEAT CAPACITY RATIO, CP/CV 1.39000
PIPE REYNOLDS NO. AT NORMAL FLOW 899492.9

* COMPUTED BY PROGRAM, TABLE CONTROL CODE = 1

PRINTED IN U.S.A.

12
11
10
9
8
7
6
5
4
3

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION	PLANT	SPEC NO.	
LOCATION				AUTH NO.	DEPT OR AREA	15-45 SHEET	REV
						3 OF	3
Instrument No.	FE-23		11				
Service	PRODUCT GAS						
Equipment No. or Line No. & Size	6" PG-3" I		4				
Process Material	PROD. GAS						
PIPE SCHEDULE	6" SCH 40						
VENTURI TUBE MATL.	1/4 CR 1/2 MOLY		3				
VENTURI TUBE LENGTH	2 FT. 8 IN.						
THROAT DIAMETER	BY VENDOR						
THROAT MATERIAL	304 SS						
MAX. FLOW	5000 SCFM						
NORM FLOW	3500 SCFM						
MIN. FLOW	0						
DENSITY @ 60°F @ 14.7 PSIA	0.0668 #/ft ³		3				
DENSITY @ NORM FLOW COND.	0.2725 #/ft ³		3				
SUPERCOMP FACTOR							
GAS MOL. WT.	25.3		3				
VISCOSITY CP @ F.T.							
BETA RATIO							
ΔP INCHES WATER	100						
<u>NORMAL FLOW CONDITIONS:</u>							
FLOWING TEMP	750°F		3				
FLOWING PRESSURE	125 PSIG						
MAX. FLOW	5000 SCFM						
DENSITY #/FT ³	0.2725						
<u>ABNORMAL FLOW CONDITIONS:</u>							
FLOWING TEMP	750°F		3				
FLOWING PRESSURE	47 PSIG						
MAX FLOW	5000 SCFM						
DENSITY #/FT ³	0.1205						
<u>MAXIMUM PRESSURE</u>							
600 PSIG } 3							
<u>MAXIMUM TEMPERATURE</u>							
950°F } 3							
PROVIDE ISET CALCULATIONS FOR NORMAL FLOW CONDITIONS 3							
PURCHASING							
Manufacturer		VICKERY-SIMMS					
Catalog No.							
P.O. No.							
Price							
REV. DATE	Δ	ISSUED FOR PURCH	DC 6-78	Δ	REV. LINE No.	DC	9/12/78
	Δ	CORRECTIONS	RGC 6-29-78	Δ			
	Δ	CORRECTIONS	D.C. 7-26-78	Δ			
	Δ	DENSITIES & CONSTR MATL	RGC 8-28-78	Δ			

Per 10*
3*
4*

Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO.	
				AUTH NO.	DEPT OR AREA	IS-45	SHEET
LOCATION						4 OF	3
Instrument No.		FE 33A		FE 33B			
Service		PRODUCT GAS		PRODUCT GAS			
Process Material		PRODUCT GAS		PRODUCT GAS			
Line No.		1 1/2" FG-3" I		1 1/2" FG-3" I		A	
Line Size, Schedule		1 1/2" SCH 80		1 1/2" SCH 80		A	
SERVICE	Upstream Operating Conditions	Flowing Press. P _f	350 PSIG	350 PSIG			
		Flowing Temp T _f	750 °F	750 °F			
		DENSITY @ T _f	.711	.711			
		Viscosity CP @ T _f					
		DENSITY @ 60 F / 1 ATM	.067	.067			
		Supercompr. Factor @ T _f					
		Steam Quality, %					
	Steam Superheat, F						
	Flow at Base Conditions 60 F & 14.73 PSIA Barometric Pressure at Location _____ In. Hg.	Liquid, Gas or Steam	GAS	GAS			
		Minimum Flow	0	0			
		Normal Flow	2400	2400			
		Maximum Flow	9600	9600			
		Units of Flow	SCFH	SCFH			
		Meter Range	0-9600 SCFH	0-9600 SCFH			
FLANGES	*Size & Type - W.N., S.O., Scr'd., Van Stone ⁽¹⁾	1/2" WELD NECK	1/2" WELD NECK				
	*Rating & Facing	600 # RF ASA	600 # RF ASA				
	Material - Flange & R.T.J. Ring or Gasket ⁽¹⁾	316 SS STEEL	316 SS STEEL				
	Taps - Type, Size & Orientation (R2.3 Std)	1/2" NPT	1/2" NPT				
ORIFICE PLATE	Type of Plate (R2.3 Std)	CONCENTRIC	CONCENTRIC				
	Plate Material & Thickness	316 SS	316 SS				
	Pipe ID (D), in.	1.5	1.5				
	Orifice ID (d), in.	.58735	.58735				
	d/D Ratio (β)	.39157	.39157				
	Meter Range - Inches Water Dry	0-100" W.C.	0-100" W.C.				
REMARKS	Type of Meter	DRY D/P	DRY D/P				
	Drain or Vent Hole	NONE	NONE				
	Chart or Scale Range						
	Chart Factor						
	Calculation Sheet No.	SIMPLEX HOLDER	SIMPLEX HOLDER				
	TYPE ORIFICE PLATE	MODEL 500	MODEL 500				
	ORIFICE PLATE SEAL UNIT	MS, 316SS	MS, 316SS				
	All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material						
	PURCH.	Manufacturer	DANIEL	DANIEL			
		*Catalog Number	705DS-	705DS-			
Purchase Order Number							
Price							
REV	ISSUED FOR PURCH	6-27-78	DC	REV. LINE NO	DC	1/12/78	
	REVISED / CORRECTED	7-26-78	D.C.				
	REV PIPE ID, d/D, ORIFICE	7-31-78	D.C.				
	REVISED / CORRECTED	9-5-78	D.C.				

ES 103 (10/66) (1) ENTER PIPING SPECIFICATION FOR RADIUS OR PIPE TAPS

FE-33A, 33B
LOW VOLUME HIGH PRESSURE PRODUCT GAS

E0040 P
9/5/78

PIPE, ORIFICE, AND METER DATA

ACTUAL PIPE DIAMETER 1.5000 INCHES
DRAIN OR VENT DIAMETER 0.0 INCHES

TYPE OF ORIFICE TAPS FLANGE

MAX. DIFF. * BETA RATIO * ORIF. DIAM
IN. H2O INCHES

50.000	0.46168	0.69252
100.000	0.39157	0.58735
150.000	0.35449	0.53174
200.000	0.33063	0.49595
250.000	0.31319	0.46979
300.000	0.29961	0.44941
350.000	0.28858	0.43287
400.000	0.27971	0.41956

UPSTREAM CONDITIONS

FLUID NAME LV-HP PR GAS
FLUID CONDITION GAS
MAXIMUM FLOW 9599.996 SCFH
RATIO OF NORMAL TO MAXIMUM FLOW 0.70000
NORMAL FLOW 6719.996 SCFH

FLOWING TEMPERATURE 750.0 DEG F
FLOWING PRESSURE 364.700 PSIA

VISCOSITY 0.01000 CP
DENSITY AT FLOWING CONDITIONS 0.71100 LB/FT3
DENSITY AT 60 F AND 1 ATM 0.06700 LB/FT3
HEAT CAPACITY RATIO, CP/CV 1.30000
PIPE REYNOLDS NO. AT NORMAL FLOW 189701.0

* COMPUTED BY PROGRAM, TABLE CONTROL CODE = 1

Per 10*
3*
4*

Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO.	
				AUTH NO.	DEPT OR AREA	IS 45	SHEET
LOCATION _____						2 OF	2
Instrument No.					FE 22		
Service					PRODUCT GAS		
Process Material							
Line No.					8" FG-3" I	A	
Line Size, Schedule							
SERVICE	Upstream Operating Conditions	Flowing Press. P _f		125 PSIG			
		Flowing Temp T _f		750° F			
		Density @ T _f		2.72 #/FT ³	A		
		Viscosity CP @ T _f					
		Density @ 60° F		0.067 #/FT ³	A		
		Supercompr. Factor @ T _f					
	Flow at Base Conditions 60° F & 14.73 PSIA Barometric Pressure at Location _____ In. Hg.	Liquid, Gas or Steam		GAS			
		Minimum Flow		0			
		Normal Flow		210,000			
		Maximum Flow		300,000			
	Units of Flow		SCFH				
	Meter Range		0-300,000				
FLANGES	*Size & Type - W.N., S.O., Scrld., Van Stone ⁽¹⁾			6" Weld Neck			
	*Rating & Facing			600# ANSI			
	Material - Flange & R.T.J. Ring or Gasket ⁽¹⁾			316 S Steel	A		
	Taps - Type, Size & Orientation (R2.3 Std)			1/2" NPT			
ORIFICE PLATE	Type of Plate (R2.3 Std)			CONCENTRIC			
	Plate Material & Thickness			316 SS			
	Pipe ID (D), in.			6.065			
	Orifice ID (d), in.			3.98984	A		
	d/D Ratio (β)			0.65785	A		
	Meter Range - Inches Water Dry			100" W.C.			
	Type of Meter			DRY D/P			
	Drain or Vent Hole			NONE			
	Chart or Scale Range						
	Chart Factor						
REMARKS	Calculation Sheet No.			SIMPLEX HOLDER			
	TYPE ORIFICE PLATE			MODEL 500			
	ORIFICE PLATE SEAL UNIT			MS, 316SS	A		
All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material							
PURCH.	Manufacturer			DANIEL			
	*Catalog Number			705-DS			
	Purchase Order Number						
	Price						
REV	△	ISSUED FOR PURCH	DC	6-17-78	△		
	△	REVISED/CORRECTED	DC	7-26-78	△		
	△	REVISED/CORRECTED	DC	9-5-78	△		
	△	REV. LINE NO.	DC	7-17-78	△		

FE-22
HIGH VOLUME LOW PRESSURE PRODUCT GAS

E0040 P 2
9/5/78

PIPE, ORIFICE, AND METER DATA

ACTUAL PIPE DIAMETER 6.06500 INCHES
DRAIN OR VENT DIAMETER 0.0 INCHES

TYPE OF ORIFICE TAPS FLANGE

MAX. DIFF. * BETA RATIO * ORIF. DIAM
IN. H2O INCHES

50.000	0.75072	4.55311
100.000	0.65785	3.98984
150.000	0.60362	3.66095
200.000	0.56711	3.43950
250.000	0.53979	3.27384
300.000	0.51820	3.14291
350.000	0.50050	3.03552
400.000	0.48559	2.94510

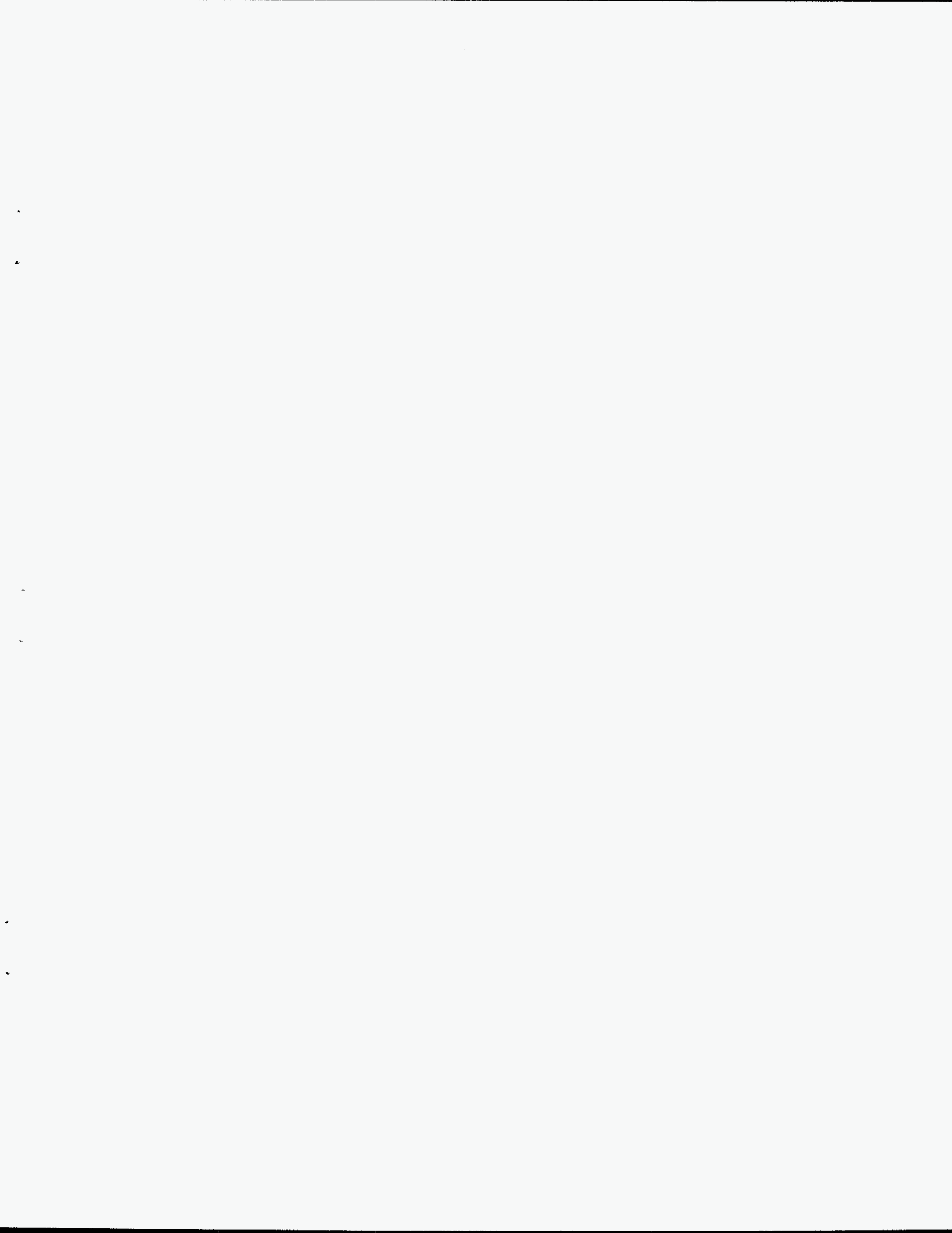
UPSTREAM CONDITIONS

FLUID NAME HV-LP PR GAS
FLUID CONDITION GAS
MAXIMUM FLOW 299999.938 SCFH
RATIO OF NORMAL TO MAXIMUM FLOW 0.70000
NORMAL FLOW 209999.938 SCFH

FLOWING TEMPERATURE 750.0 DEG F
FLOWING PRESSURE 139.700 PSIA

VISCOSITY 0.01000 CP
DENSITY AT FLOWING CONDITIONS 0.27200 LB/FT3
DENSITY AT 60 F AND 1 ATM 0.06700 LB/FT3
HEAT CAPACITY RATIO, CP/CV 1.30000
PIPE REYNOLDS NO. AT NORMAL FLOW 1466154.0

* COMPUTED BY PROGRAM, TABLE CONTROL CODE = 1



Monsanto		TEMPERATURE TRANSMITTER SPECIFICATIONS		DIVISION		PLANT		SPEC NO.	
				AUTH NO.		DEPT AREA		SHEET REV	
LOCATION								15 46	
								2 OF	
Instrument No.	TT-24	TT-25	TT-26						
Service	Product Gas	Product Gas	Product Gas						
Equipment No. or Line No. & Size	CP-1	CP-1	CP-1						
Process Material									
TRANSMITTER									
TYPE	TC/I	TC/I	TC/I						
RANGE	0-1000°F	0-1000°F	0-1000°F						
INPUT SIGNAL	T/C TYPE K	T/C TYPE K	T/C TYPE K						
OUTPUT SIGNAL	4-20 MADC	4-20 MADC	4-20 MADC						
OUTPUT TO	TI-24	TI-25	TI-26						
INPUT-OUTPUT ISOLATION	YES	YES	YES						
POWER SUPPLY	115V, 60HZ	115V, 60HZ	115V 60HZ						
ELEC AREA CLASS	GEN PURP	GEN PURP	GEN PURP						
TYPE MOUNTING	RACK	RACK	RACK						
THERMOCOUPLE ELEMENT									
ISA TYPE	K	K	K						
WIRE MATERIAL & GAUGE	Chr-Alumel	Chr-Alumel	CHR-ALUMEL						
ELEMENT LENGTH	9"	9"	9"						
INSULATOR TYPE	CERAMIC	CERAMIC	CERAMIC						
SHEATH MATERIAL	316SS	316SS	316 SS						
GROUNDED TIP	YES	YES	YES						
CONNECTION HEAD									
COVER TYPE	SCREWED	SCREWED	SCREWED						
THERMOCOUPLE END THREAD SIZE	1/2" NPT	1/2" NPT	1/2" NPT						
CONDUIT END THREAD SIZE	1/2" NPT	1/2" NPT	1/2" NPT						
GROUND CONNECTION	YES	YES	YES						
THERMOWELL									
MATERIAL	316SS	316SS	316 SS						
CONNECTION SIZE-RATING	1/2" NPT	1/2" NPT	1/2" NPT						
PROCESS CONNECTION MATERIAL	316SS	316 SS	316 SS						
PROCESS CONN. SIZE-RATING	3/4" NPT	3/4" NPT	3/4" NPT						
LENGTH "U"	7 1/2"	7 1/2"	7 1/2"						
EXTENSION	4"	4"	4"						
ACCESSORIES									
TYPE AC-141 RFI FILTER	NO	NO	NO						
PURCHASING									
Manufacturer	FISHER	FISHER	FISHER						
Catalog No.	LS111	LS111	LS111						
P.O. No.									
Price									
REV. DATE									
0									
1									
2									
3									

CS-2211-701

Monsanto		ELECTRONIC TRANSDUCER		COMPANY	PLANT		SPEC NO.	
LOCATION		SPECIFICATIONS		AUTH NO.	DEPT	AREA	IS 46	
Instrument No.		TT-30		TT-31		TT32		
Service		PROCESS AIR		PROCESS AIR		PROD. GAS		
Equipment No. or Line No. & Size		HP/LV		LP/HV				
Process Material		AIR		AIR		GAS		
CASE	Blind, Indicating, Transmitting	BLIND/XMTR		BLIND/XMTR		BLIND/XMTR		
	Function - Switch, EMF/I, Res./I, etc.	EMF/I (TC)		EMF/I (TC)		EMF/I (TC)		
	Mounting - Flush, Surface, Yoke	RACK MTD		RACK MTD		RACK MTD		
	Size & Type							
	Span & Units							
	Range Limits INPUT-OUTPUT ISOLATION	YES		YES		YES		
Up or Down Scale on Electrical Failure	UP	DOWN	UP	DOWN	UP	DOWN	UP	
	UP	DOWN	UP	DOWN	UP	DOWN	UP	
Up or Down Scale on Burnout Failure	UP	DOWN	UP	DOWN	UP	DOWN	UP	
	UP	DOWN	UP	DOWN	UP	DOWN	UP	
SIGNAL	Measurement Input	T/C TYPE J		T/C TYPE J		T/C TYPE J		
	*Span & Units	0-500°F		0-500°F		0-500°F		
	From	TE-30		TE-31		TE-32		
	Instrument Output	4-20MADC		4-20MADC		4-20MADC		
	To	TI-30		TI-31		TI-32		
Power Supply - Electrical	115V, 60HZ		115V, 60HZ		115V, 60HZ			
Electrical Area Classification	GEN PURP		GEN PURP		GEN PURP			
ELEMENT	Type	(TC) RESIST		(TC) RESIST		(TC) RESIST		
	*Wire Material & Gauge	IRON-CONSTAN		IRON-CONSTAN		IRON-CONSTAN		
	Length	9"		9"		9"		
	Insulator Type	CERAMIC		CERAMIC		CERAMIC		
	I.S.A. Type	J-GROUNDED		J-GROUNDED		J-GROUNDED		
	*Resistance Element Material	-		-		-		
Resist. Bulb Dia. and Material	-		-		-			
WELL	Well Material	316 SS		316 SS		316 SS		
	PROCESS CONN.	Construction	PIPE COUPLG		PIPE COUPLG		PIPE CPLG	
		Size & Rating	3/4" NPT		3/4" NPT		3/4" NPT	
		Material	316SS		316SS		316SS	
	Length Below Thread or Flange "U"	7 1/2"		7 1/2"		7 1/2"		
	Female Thread Size	1/2"-14 NPT		1/2"-14 NPT		1/2"-14 NPT		
Lagging Extension "T"	NONE		NONE		NONE			
ASSEMBLY	Stamping							
	Nipple & Union Length "A"	NONE		NONE		NONE		
	Thermocouple End - Thread Size	1/2"-14 NPT		1/2"-14 NPT		1/2"-14 NPT		
	Conduit End - Thread Size	1/2"-14 NPT		1/2"-14 NPT		1/2"-14 NPT		
Ground Connection	YES		YES		YES			
PURCHASING	Manufacturer	FISHER		FISHER		FISHER		
	Catalog No.	LS111		LS111		LS111		
	P.O. No.							
	Price							
REV. DATE	△			△				
	△			△				
	△			△				
	△			△				

CS-21(11-72)

Per 7*
3*

Monsanto COMPANY LOCATION _____	* PRESSURE GAUGE SPECIFICATIONS	DIVISION	PLANT	*SPEC NO. IS- 49
		AUTH NO.	DEPT OR AREA	SHEET 1 OF _____

GENERAL NOTES:				
		* PI-13		PI-10
		PI-14		

ELEMENT	*Span & Units	0-160PSIA	0-500PSIG	
	Type	Bourdon	BOURDON	
	Element Material	Bronze	BRONZE	
	Socket Material	Bronze	BRONZE	
	Connection Size & Type	1/2" NPT	1/2" NPT	
	Connection Orientation	Bottom	BOTTOM	
CASE	*Dial Size	4 1/2"	4 1/2"	
	Dial Color Scheme	BLK on white	BLK ON WHITE	
	Case Material (Style Case)	SS	SS	
	Ring Type	Bayonet lock	BAYONET LOCK	
	Mounting Type	STEM	STEM	
	Crystal Material	Glass	GLASS	
	Micrometer Zero Adjustment	yes	YES	
	Safety Release Type	yes	YES	
MOVEMENT	Movement Material	SS	STD.	
	Guaranteed Accuracy	1/2%	1/2%	
CHEMICAL SEAL	Body Material	X		
	Diaphragm Material			
	Fill Liquid			Cleanout Connection
	Proc. Temp °C			AMB. Temp °C
	Process Connections Size & Type			
	Manufacturer's Ty. & Model			
REMARKS	Accessories & Special Features			
PURCH.	Manufacturer	Ashcroft	ASHCROFT	
	*Catalog No.	1320B	1320B	
	P.O. No.			
	Quantity Required			
	Price			
REV. DATE	△		△	
	△		△	
	△		△	
	△		△	

Monsanto		INSTRUMENT SPECIFICATIONS		PLANT		SPEC NO.	
				AUTH NO.	DEPT	AREA	IS- 47
LOCATION		PRESSURE SWITCH				1 OF 0	
Instrument No.		PS-18		10			
Service		Instr Air Fail					
Equipment No. or Line No. & Size		1" I A					
Process Material		Dry Instr Air					
GENERAL:							
Oper. Temperature		Ambient					
Temp. Limits		0-150°F					
Pressure Rating		150 psig					
Housing Material		Aluminum					
Diaphragm Material		Buna-N					
Calibration Spring		Steel					
Mounting		Base-					
Low Pressure Conn.		1/4" NPT					
High Pressure Conn.		-					
Electrical Conn.		3/4" NPT					
SWITCH:							
Type		SPDT					
Micro Switch No.		BZ-R					
Contact Arrangement							
Rating Volts-Amps		480 V-15A					
Operating Range		10-180 psig					
Dead Band @ Min. Set Pt.		1.5 psig					
Dead Band @ Max. Set Pt.		5 psig					
Set Point							
On Meas. Inc. Switch		OPENS					
Elec. Area Class.		NEMA IV					
Conduit Conn.		3/4" NPT					
ACCESSORIES:							
Environmental Switch (MIL)							
Explosion-Proof Housing							
PURCHASING		Manufacturer		Static-O-Ring			
		Catalog No.		6NN-K5			
		P.O. No.					
		Price					
REV. DATE	0	CHGD PS-17 TO PS-18	RBC	6-28	△		
	1	LINE No.	DC	9-17-78	△		
	2				△		
	3				△		

CLS
36
1-74

Per 7*
3*

Monsanto COMPANY LOCATION _____	* PRESSURE GAUGE SPECIFICATIONS	DIVISION	PLANT	*SPEC NO. IS- 49
		AUTH NO.	DEPT OR AREA	SHEET 1 OF _____

GENERAL NOTES:	INSTRUMENT NOS.			
		* PI-13		PI-10
		PI-14		

6*	ELEMENT	*Span & Units	0-160PSIA	0-500PSIG		
		Type	Bourdon	BOURDON		
		Element Material	Bronze	BRONZE		
		Socket Material	Bronze	BRONZE		
		Connection Size & Type	1/2" NPT	1/2" NPT		
		Connection Orientation	Bottom	BOTTOM		
5*	CASE	*Dial Size	4 1/2"	4 1/2"		
		Dial Color Scheme	BLK on white	BLK ON WHITE		
		Case Material (Style Case)	SS	SS		
		Ring Type	Bayonet lock	BAYONET LOCK		
		Mounting Type	STEM	STEM		
		Crystal Material	Glass	GLASS		
		Micrometer Zero Adjustment	yes	YES		
		Safety Release Type	yes	YES		
		4*	MOVEMENT	Movement Material	S.S.	STD.
				Guaranteed Accuracy	1/2%	1/2%
2	CHEMICAL SEAL	Body Material	X	X		
		Diaphragm Material	X	X		
		Fill Liquid	Cleanout Connection			
		Proc. Temp °C	AMB. Temp °C			
		Process Connections Size & Type				
		Manufacturer's Type & Model				
4*	PURCH.	Accessories & Special Features				
		Manufacturer	Ashcroft	ASHCROFT		
		*Catalog No.	1320B	1320B		
		P.O. No.				
		Quantity Required				
2	REV. DATE	1				
		2				
		3				
		4				

Per 7*
3*

Monsanto COMPANY LOCATION _____	* PRESSURE GAUGE SPECIFICATIONS	DIVISION	PLANT	*SPEC NO.
		AUTH NO.	DEPT OR AREA	IS: 49 SHEET REV

GENERAL NOTES 	INSTRUMENT NOS.	• PI-13	PI-10
		PI-14	

ELEMENT	*Span & Units	0-160PSIA	0-500PSIG
	Type	Bourdon	BOURDON
	Element Material	Bronze	BRONZE
	Socket Material	Bronze	BRONZE
	Connection Size & Type	1/2" NPT	1/2" NPT
	Connection Orientation	Bottom	BOTTOM

CASE	*Dial Size	4 1/2"	4 1/2"
	Dial Color Scheme	BLK on white	BLK ON WHITE
	Case Material (Style Case)	SS	SS
	Ring Type	Bayonet lock	BAYONET LOCK
	Mounting Type	STEM	STEM
	Crystal Material	Glass	GLASS
	Micrometer Zero Adjustment	YES	YES
	Safety Release Type	YES	YES

MOVEMENT	Movement Material	S.S.	STD.
	Guaranteed Accuracy	1/2%	1/2%

CHEMICAL SEAL	Body Material	X	
	Diaphragm Material	X	
	Fill Liquid	Cleanout Connection	
	Proc. Temp °C	AMB. Temp °C	
	Process Connections Size & Type	Manufacturer's Ty. & Model	

REMARKS	Accessories & Special Features		

PURCH.	Manufacturer	Ashcroft	ASHCROFT
	*Catalog No.	1320B	1320B
	P.O. No.		
	Quantity Required		
	Price		

REV. DATE	④								
	①								
	②								
	③								

Monsanto COMPANY		INDICATING THERMOMETERS - THERMOWELL SPECIFICATIONS		DIVISION		PLANT		* SPEC NO.			
				AUTH NO.		DEPT OR AREA		IS 51			
LOCATION				9174				SHEET REV			
GENERAL NOTES:				TI-13		TI-35		OF			
1	INSTRUMENT NOS.										
2	THERMOMETER	Type	BI-METAL		GAS						
		Span & Units	50-550°F		200-1000						
		Dial Size	5"	Color	BLACK/WHITE	4 1/2"	BLACK/WHITE				
		Case Material	316 SS		316 SS						
		Actuation	BI-METAL		GAS						
		Connection Size & Type	1/2" NPT		1/2" NPT						
		Stem Material	316 SS		316 SS						
		Stem Position	REAR		REAR						
		Stem Length	9"		9"						
		ORIENTATION		EVERYANGLE		EVERYANGLE					
3	WELL	Well Material		C. STEEL		C. STEEL					
		Process Connection	Construction		SCREWED		SCREWED				
			Size & Rating		3/4"		3/4"				
			Material		C. STEEL		C. STEEL				
		Length Below Thread or Flange "U"		4 1/2"		4 1/2"					
		Female Thread Size		3/4"		3/4"					
		Lagging Extension "T"		3"		3"					
		Plug & Chain Req'd		YES		C.S.		YES		C.S.	
		Stamping									
		THERMOWELL									
ALLOY ENGR. MODEL #		94-2601-U4 1/2"		3/4"-385L-U4 1/2"							
4	PURCH.	Manufacturer		ASHCROFT		ASHCROFT		DURA TEMP			
		*Catalog No.		50E1		600B					
		P.O. No.									
		Quantity Required									
		Price									
REV. DATE	△				△						
	△				△						
	△				△						



Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION	PLANT	SPEC NO.	
				AUTH NO.	DEPT OR AREA	IS- 91	SHEET
LOCATION						1	OF
Instrument No.		PAL-10		PAHL-17			
Service							
Equipment No. or Line No. & Size							
Process Material							
LOCATION							
CASE NO.		UA-101		UA-101			
POSITION		1		6			
CARD SPEC.							
TYPE CONTACT ANALOG, DEV		ANALOG		ANALOG			
INPUT FORM							
CONTACT							
ALARM ON OPEN, CLOSED							
ANALOG							
SET PT NO.1		4.0 VDC		3.0 VDC			
ALARM ON RISING, FALLING		FALLING		FALLING			
SET PT NO.2							
ALARM ON RISING, FALLING							
DEVIATION							
SET PT (VOLTAGE DIFF)							
NAME PLATE							
COLOR		WHITE		WHITE			
LINE 1		LO		Hi-Lo PRESSURE			
LINE 2		PRESSURE		PRODUCT GAS			
LINE 3		AIR		TO ENGINEER			
LINE 4		HEADER					
OPTIONS							
FIRST OUT SEQUENCE		YES		YES			
DISCRETE OUTPUT/TEST INHIBIT							
PURCHASING		Manufacturer		FISHER		FISHER	
		Catalog No.		B 4		A 4	
		P.O. No.					
		Price					
REV. DATE	△			△			
	△			△			
	△			△			
	△			△			

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS	DIVISION	PLANT	SPEC NO.	
			AUTH NO.	DEPT OR AREA	IS 91	SHEET
LOCATION					OF	
Instrument No.		PAL - 1B		FAHL-20		
Service						
Equipment No. or Line No. & Size						
Process Material						
LOCATION						
CASE NO.		UA-101		UA-101		
POSITION		12		2		
CARD SPEC.						
TYPE CONTACT ANALOG, DEV		CONTACT		ANALOG		
INPUT FORM						
CONTACT						
ALARM ON OPEN, CLOSED		OPEN				
ANALOG						
SET PT NO.1				4.8VDC		
ALARM ON RISING, FALLING				RISING		
SET PT NO.2				2.2 VDC		
ALARM ON RISING, FALLING				FALLING		
DEVIATION						
SET PT (VOLTAGE DIFF)						
NAME PLATE						
COLOR		WHITE		WHITE		
LINE 1		LO		HI-LO FLOW		
LINE 2		PRESSURE		HP/LV PROCESS		
LINE 3		INSTRUMENT		AIR TO		
LINE 4		AIR		INCINERATOR		
OPTIONS						
FIRST OUT SEQUENCE		YES		YES		
DISCRETE OUTPUT TEST INHIBIT						
PURCHASING						
Manufacturer		FISHER		FISHER		
Catalog No.		J4		A4		
P.O. No.						
Price						
REV. DATE	△			△		
	△			△		
	△			△		
	△			△		

