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INSTRUMENTATION FOR PRICETOWN I
IN-SITU COAL GASIFICATION PROGRAM

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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-C-04-0053

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PREPARED BY: R. E. ZIELINSKI
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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

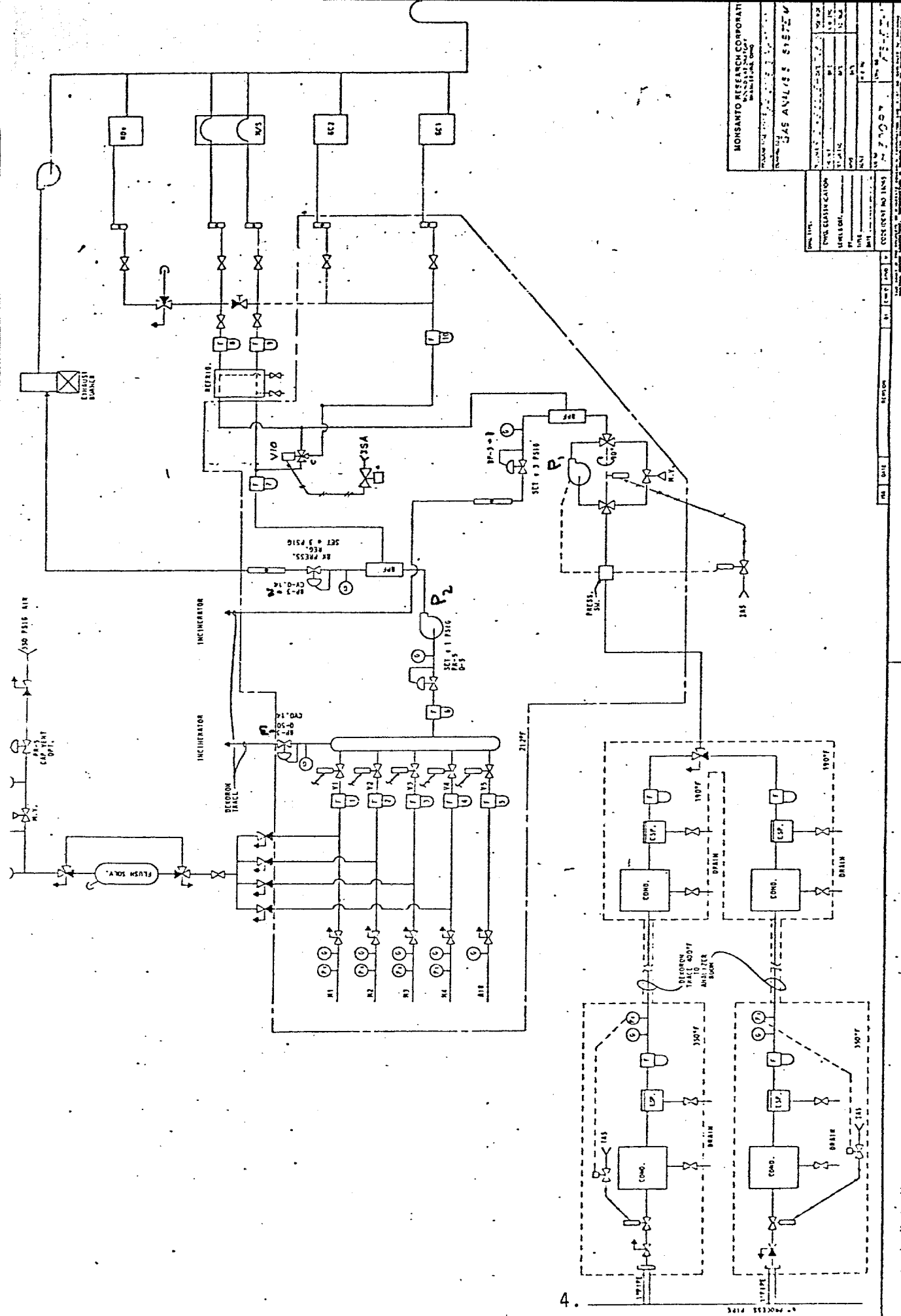


Figure 1

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 P_1 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 V_{10} 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 GC_1 and GC_2 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, M_1 through M_4 , 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 (P_x), 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 course 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

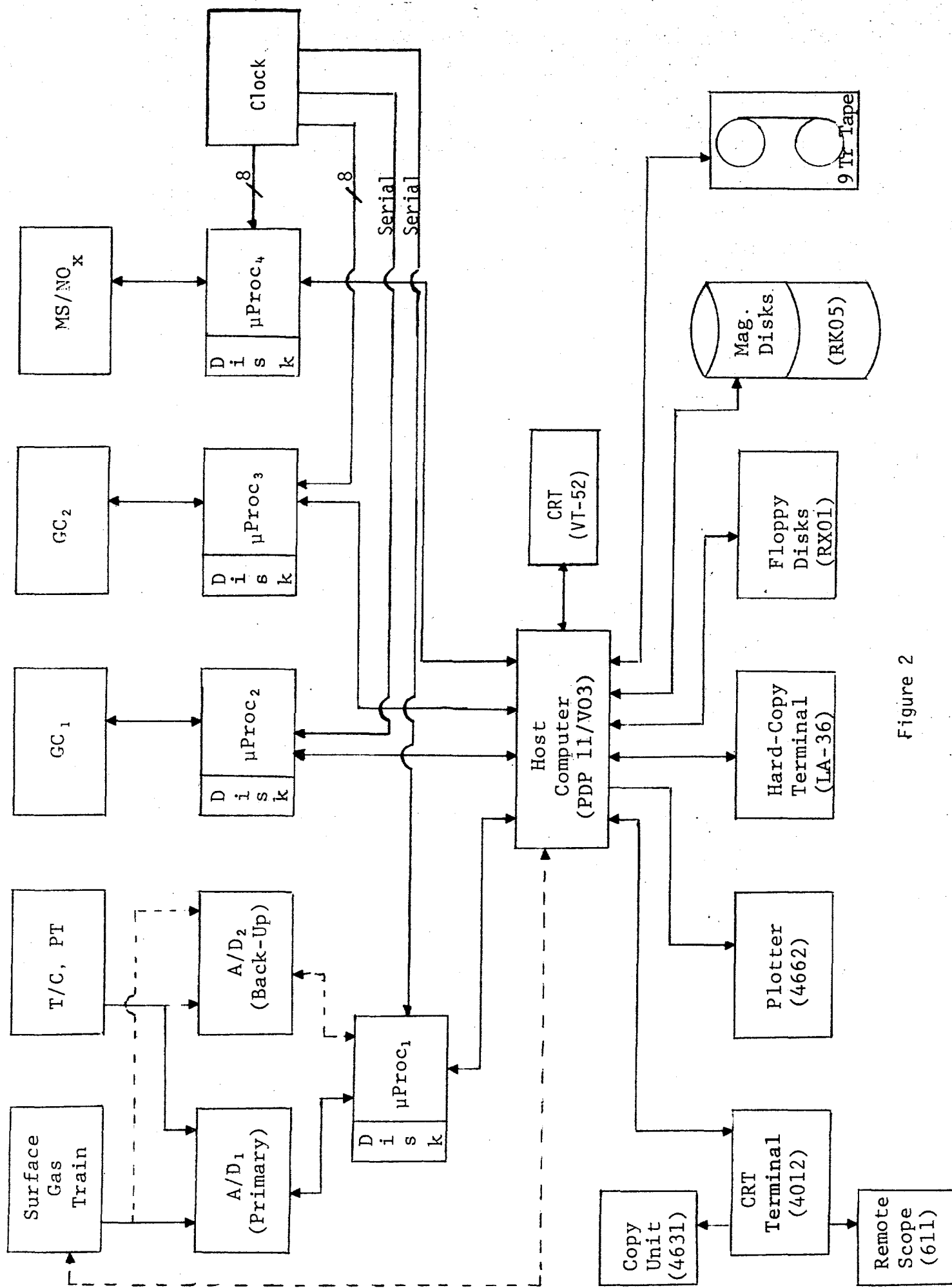


Figure 2

(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 a 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.

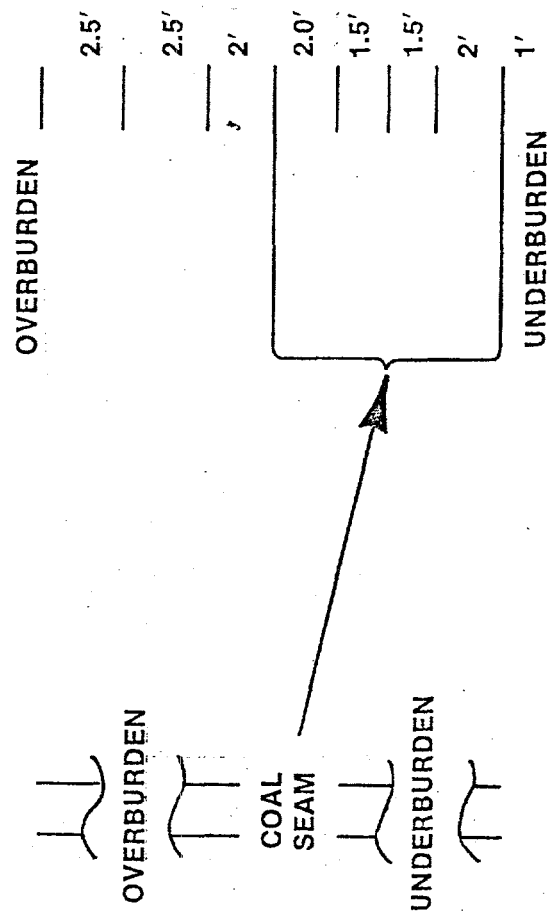


Figure 3
Relative positions of Thermocouples in Coal Seam.

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
M.S.	M.S. 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.

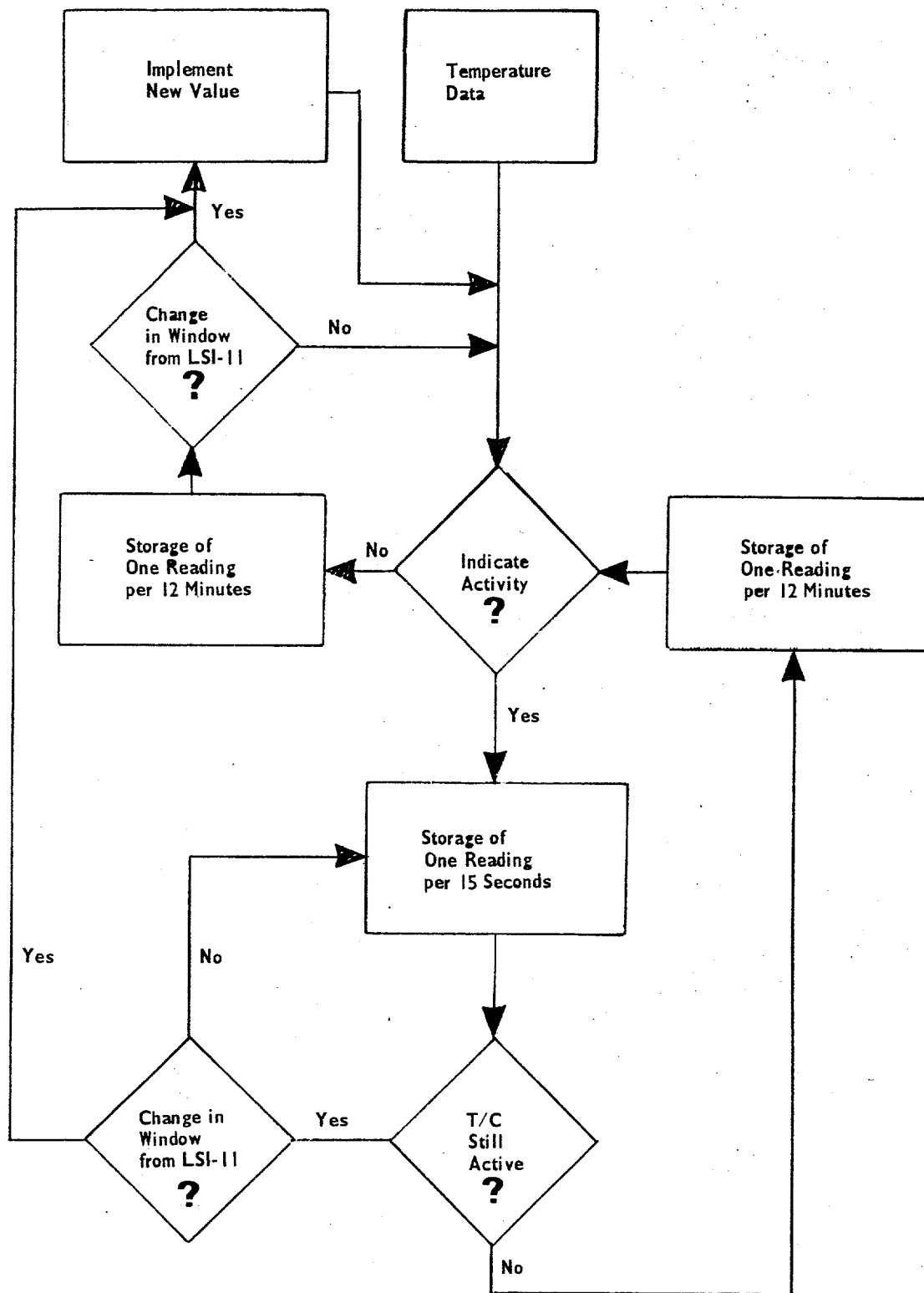


Figure 4
Overview Working Flow Diagram for Collection of Downhole Temperature Data.

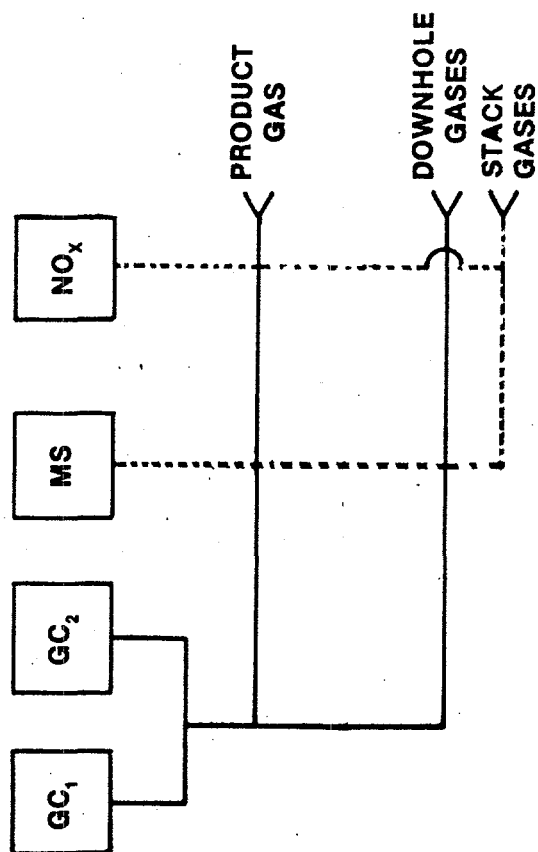


Figure 5

Schematic Relationship between the Analytical Systems and the Gas Streams.

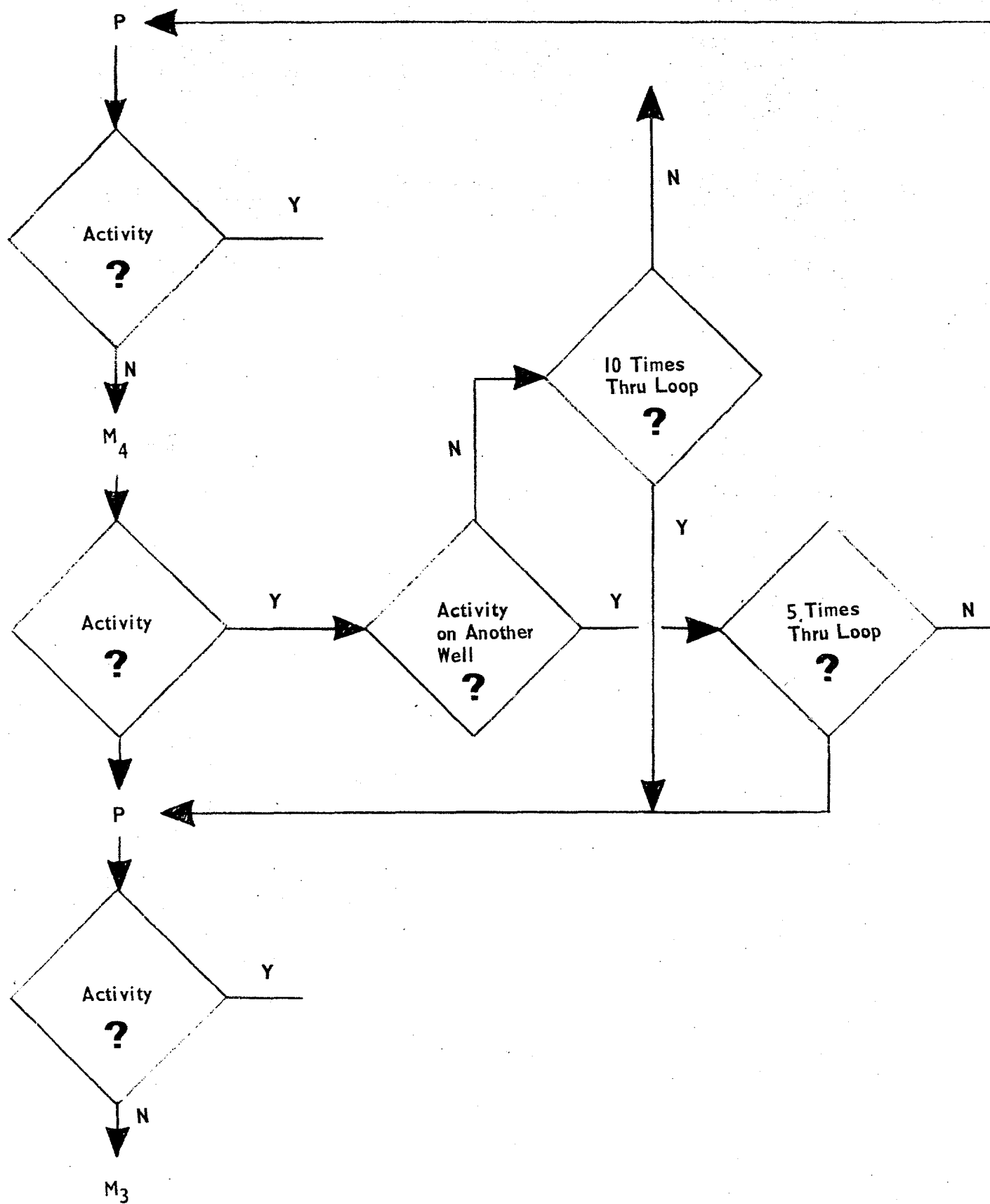


Figure 6
Working Flow Diagram for Collection of Mass Spec and
Gas Chromatograph Data

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
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:

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J. F. Combs
R. G. Corley
D. L. Fallert
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R. C. Kessler
P. W. Seabaugh
W. K. Walker
R. E. Zielinski

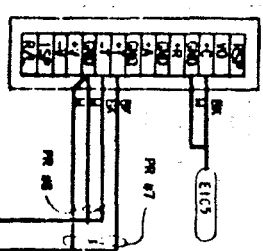
APPENDIX I

LOOP DIAGRAMS

FIELD		BEHIND PANEL		ON PANEL			
INDICATOR/CONTROLLER TAG: T132 MODEL: FISHER T131 SCALE: 0-1000°F SIGMA: IN 4-20mA OUT 1-5VDC ACTION: CASE/POS. UN107/4 SPEC NO.: 13 RECORDER TAG: _____ MODEL: _____ CHART: _____ CASE/POS: _____ PEN: _____ SPEC NO.: _____ ALARM TAG: T132 MODEL: FISHER B-1 SIGMA: 1-5VDC SET PT 1: _____ SET PT 2: _____ CHARGE: UN101/8 SPEC NO.: 91		TEMP. TRANSMITTER TAG: T132 MODEL: FISHER L3111 INPUT: RT OUTPUT: 4-20mA DC CALIB: 0-1000°F SPEC NO.: 46 TEMPERATURE TAG: T132 MODEL: _____ TYPE: K CALIB: _____ SPEC NO.: 46 VALVE TAG: _____ MODEL: _____ NAME: _____ AIR TO: _____ SIZE: _____ SPEC NO.: 46		INDICATOR/CONTROLLER TAG: T137 MODEL: FISHER T131 SCALE: 0-100 LINEAR 11: P316/A SIGMA: IN 4-20mA OUT 4-20mA ACTION: CASE/POS. UN107/1 SPEC NO.: 13 RECORDER TAG: _____ MODEL: _____ CHART: _____ CASE/POS: _____ PEN: _____ SPEC NO.: _____ ALARM TAG: T137 MODEL: FISHER B-1 SIGMA: 1-5VDC SET PT 1: _____ SET PT 2: _____ CHARGE: UN101/8 SPEC NO.: 91		TRANSMITTER TAG: T117 MODEL: FISHER 1131C2-7-5-22-70 CALIB: 0-100 PSIG 1B 4-20mA DC OUT SPEC NO.: 36 VALVE TAG: T117 MODEL: FISHER 1071-B/100 RANGE: 4-20mA DC 1-19 PSIG 0-100% AIR TO: OPEN SIZE: 3" SPEC NO.: 27	
INSTRUMENT LOOP DIAGRAM LOOP NO. T132 FUNCTION: TEMP. PRESS. POS. GAS TO INDICATOR		INSTRUMENT LOOP DIAGRAM LOOP NO. T137 FUNCTION: TEMP. PRESS. POS. GAS TO INDICATOR		INSTRUMENT LOOP DIAGRAM LOOP NO. T117 FUNCTION: TEMP. PRESS. POS. GAS TO INDICATOR			
DOMINANT RESEARCH CORPORATION IN-SITU LOCAL DISPOSITION PROVE FROM F SITE		INSTRUMENT LOOP DIAGRAM LOOP NO. T132, T137		INSTRUMENT LOOP DIAGRAM LOOP NO. T132, T137			

[illegible]

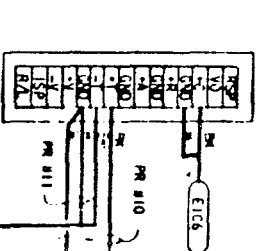
PROD. NO. 021
 FBI NO. B77-541



ACCOUNTER	
TAG	_____
NAME	_____
COUNTY	_____
CASE NOS	_____
PER	_____
SPEC NO.	_____
ALBUM	
TAG	_____
MODEL	_____
S/CAM	_____
SET PT 1	_____
SET PT 2	_____
CHANNEL	_____
SPEC NO.	_____

INDICATOR/CONTROLLER
TAG: F3918
MODEL: FISHER T-11
SCALE: 0-100 LB/IN 4 1/4 = 5 CFM
SIGMA 14 4-20MA OUT 1-5VDC
ACTION: CASE/POS UN103/12
SPEC NO: 13

Forma. no. CP1
FNU no. 127-261



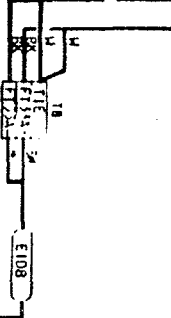
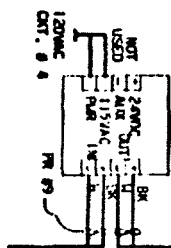
RECOMMEND

TAG _____
MODEL _____
CHART _____
CLASS/PKS _____
PEN _____
SPEC. NO. _____

ALARM

TAG _____
MODEL _____
SIC/CHAL _____
SET PT 1 _____
SET PT 2 _____
CHANNEL _____
SPEC. NO. _____

SQ. RT EXTRACTOR:
TAG FY34
MODEL ACM-1A400
IN 4-2PM OUT 4-2PM
SPEC NO. 13



IDENTITY: TERN
TAC: FTJJA

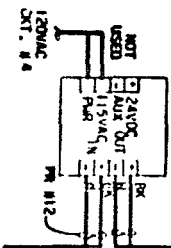
NAME	FISHER, L12102
AGE	45-52 yrs
CR. 10.	0-100 H2O 10
4-200005	OUT
SPEC NO.	1/4
ELEMENT	
THE FE31A	
MODEL, DANIEL 7090S	
TYPE	DRILLIE
SPEC NO.	43

INSTRUMENT LOOP DIAGRAM
LOOP NO. F131A
FUNCTION LV/HIP FLOW PROD. GAS
TO INCINERATOR

50, AT EXTRACTOR
TAE E3318
MODEL ACH-1A-0001
IN & OUT & 100A
SPEC NO. 12

NOT USED
24VDC
115VAC
PWR IN
BK
PR 011

120VAC
XT. #4



FINANCIAL TRENDS



VALVE

TAG _____

MODEL _____

RANGE _____

AIR TO _____

SIZE _____

MODEL 5158R 112102

44-22-2R

CALIB. 0-100" H₂O

4-20MA DC OUTPUT

SPEC NO. 34

ELEMENT

TAG FE318

MODEL DANIEL JORDS

TYPE ORIFICE

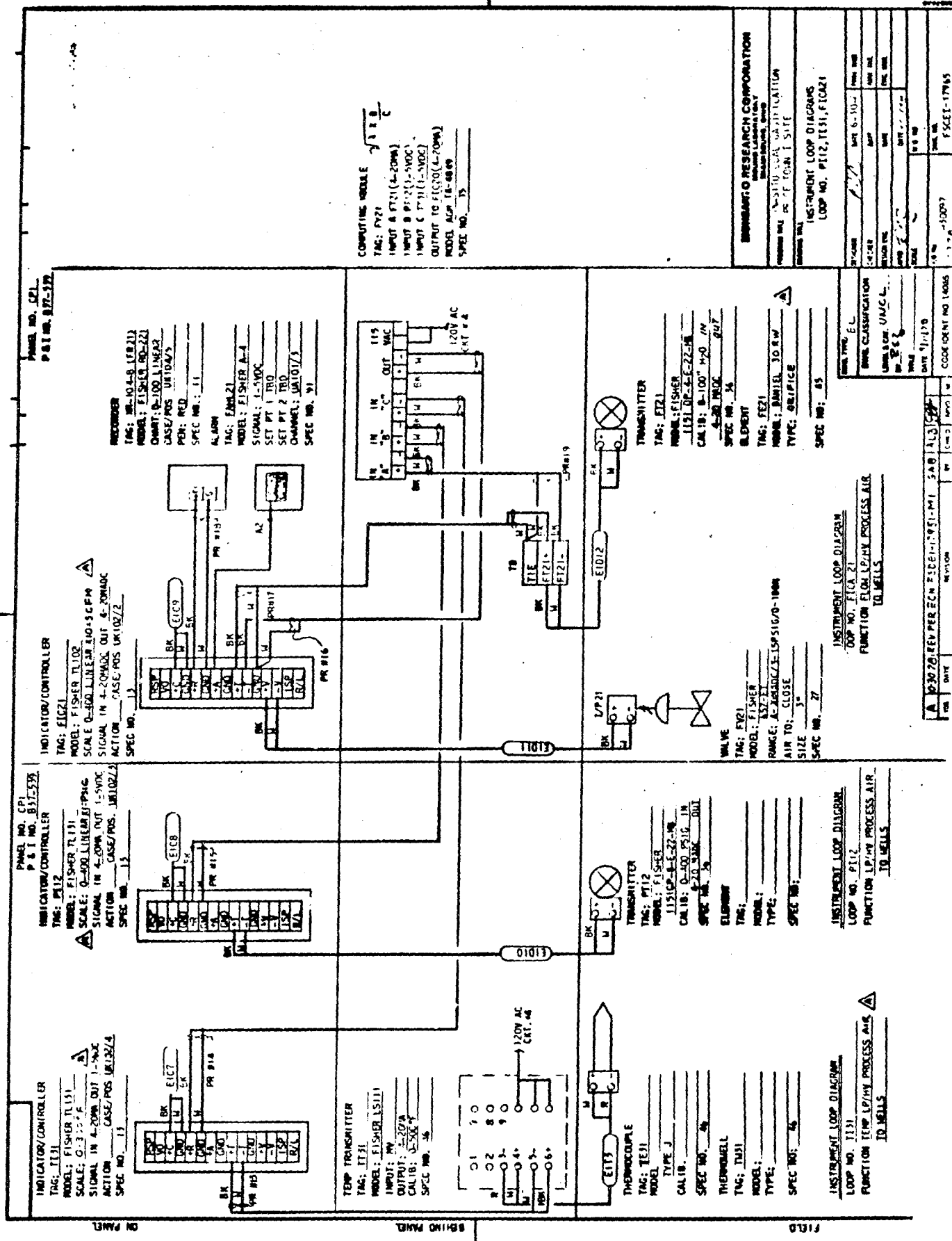
SPEC NO. 75

INSTRUMENT LOOP DIAGRAM
LOOP NO. F1338
FUNCTION LV24 FLOW PROD. GAS

A	00078	BEA PER ECM FSCN-17951-M1	5AB	ACB	10
MS	DATE	REASON	BY	DATE	TIME

[illegible]

HOWMAN TO RESEARCH CORPORATION
SCIENCE LABORATORY
6000 BUCKLEY, OHIO
IN-STUDY ON CLASSIFICATION
PAGES 1-5117
HOWMAN TO



INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965

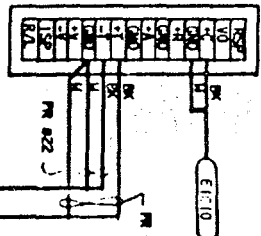
INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965

INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965

INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965

INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965

INSTRUMENT LOOP DIAGRAM	
LOOP NO. PT12	PT12, TEST, FIC21
FUNCTION: TEMP LP/HV PROCESS AIR	
TO WELLS	
REVISION	
NO.	DATE
1	10/30/70
2	REV PER EICEN-7051-M1
3	SAB 1413
4	CODE NO. 14005
5	FSCET-17965



RECOMMEND		ALARM	
TAG	MODEL	TAG	MODEL
CHART		SIGNAL	
CASE/POS		SET PT 1	
PER		SET PT 2	
SPEC NO.		CHANNEL	
		SPEC NO.	

TAC ETCZ
MODEL P198EN PL 131
SCALE 0.5 LINEAL 10mm = 5C 674
SHOWN IN 4-2MAC OUT 1-5VDC
ACTION CSE/POS UN10/3
SPEC NO. 13

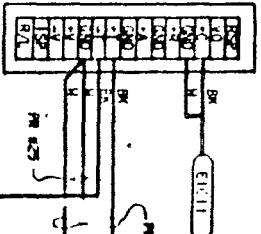
P1

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

BR K L M

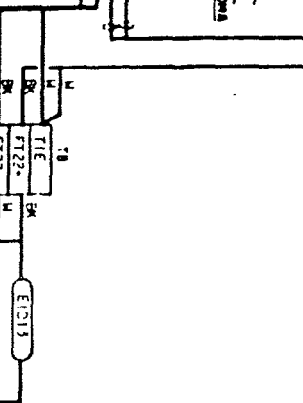
ETC11

FM 425



TAG	_____
AREA	_____
CHART	_____
CASE/POS	_____
PEN	_____
SPEC NO.	_____
ALARM	_____
TAC	_____
MODEL	_____
SIGNAL	_____
SET PT 1	_____
SET PT 2	_____
CHARGE	_____
SPEC NO.	_____

SR, AT EXTRACTOR
TAG FY72
MODEL ACR 114000
IN 4-TON OUT 4-TON
SFC NO. 15



50. AT EXTRACTOR

746 P223

MODEL ACM 1A000

1A & 20MA OUT & 20MA

SPEC NO. 15

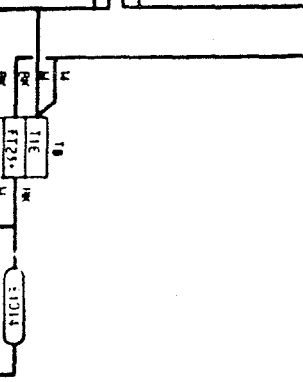
NOT 200C

USED 40V OUT

15VAC N

120VAC

CRT. # 4



TRANSMITTER

T6 F122

MODEL F19-GR 11310P

A-E-22-08

CAL 18. 0-100% H₂O IN

4-20MA DC OUT

SPRCE NO. 34

R. BORT

FE22

MODEL DANIEL 70905

TYPE ORIFICE

SPEC NO. 43

The symbol consists of a square box on the left with two circles inside, representing a solenoid. A horizontal line connects this box to a diamond-shaped symbol, which represents a 3/2-way valve. The diamond has two triangles inside, one pointing left and one pointing right, indicating the valve's function.

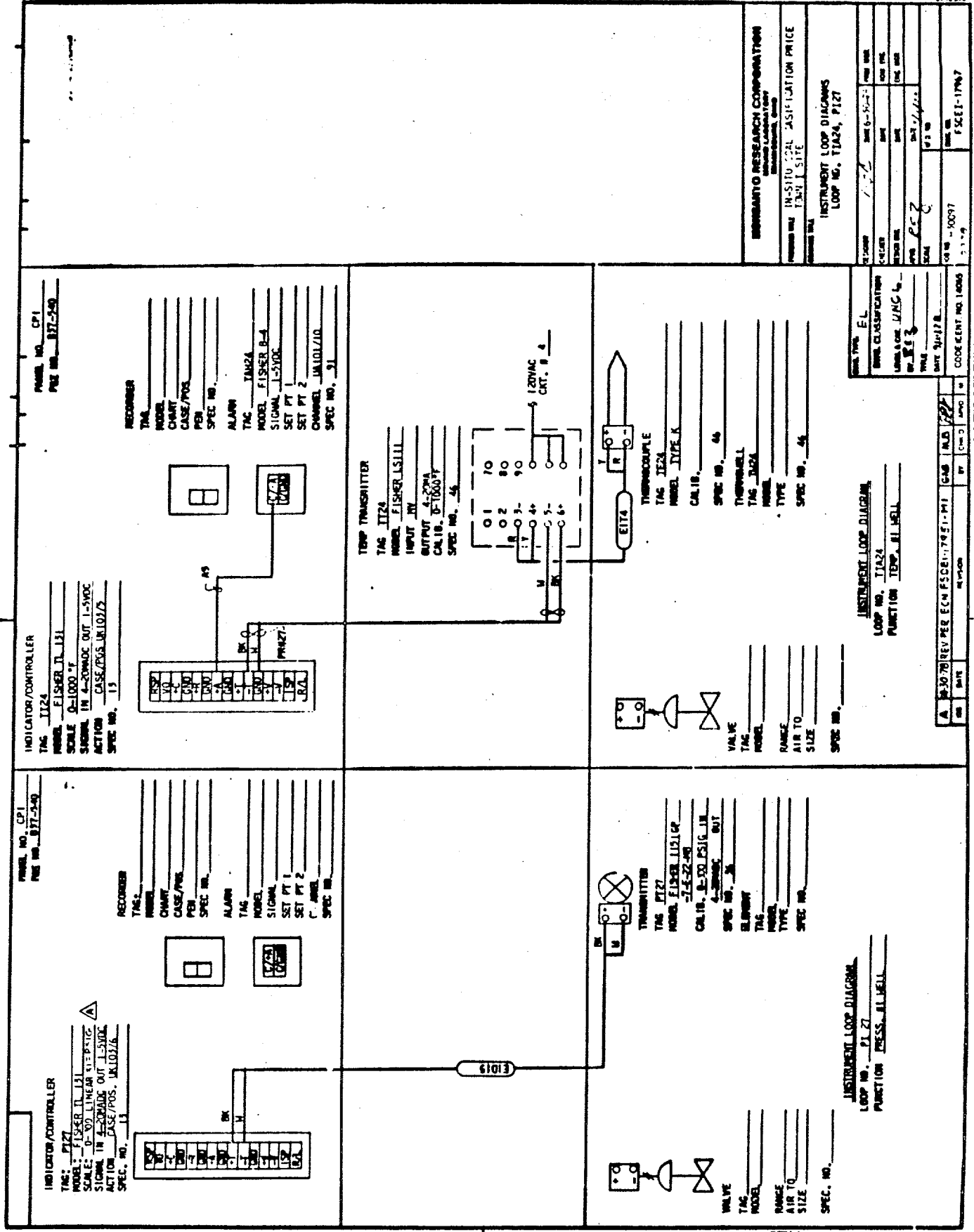
TRANSITTER
TAE F125
MODEL FISHER 1151DP
44-32-0
CM 18 0-100° H2O IN
4-ARMED OUT
SPEC NO. 8
ELEMENT
TAE F125
MODEL VIDEOM-SIMS
TYPE VERTICAL TUBE
SPEC NO. 9

INSTRUMENT LOOP DIAGRAM
LOOP NO. 1
FUNCTION W/AF SLOD PROD. GA
TO INCINERATOR

INSTRUMENT LOOP DIAGRAM
LOOP NO. F123
FUNCTION MW/HP FLOW PROG. GAS
TO INCUBATOR

A	1070	REPERE EN FICEL-1795-41	1070	1070
1070	1070	1070	1070	1070

[illegible]



ON PANEL

BEHIND PANEL

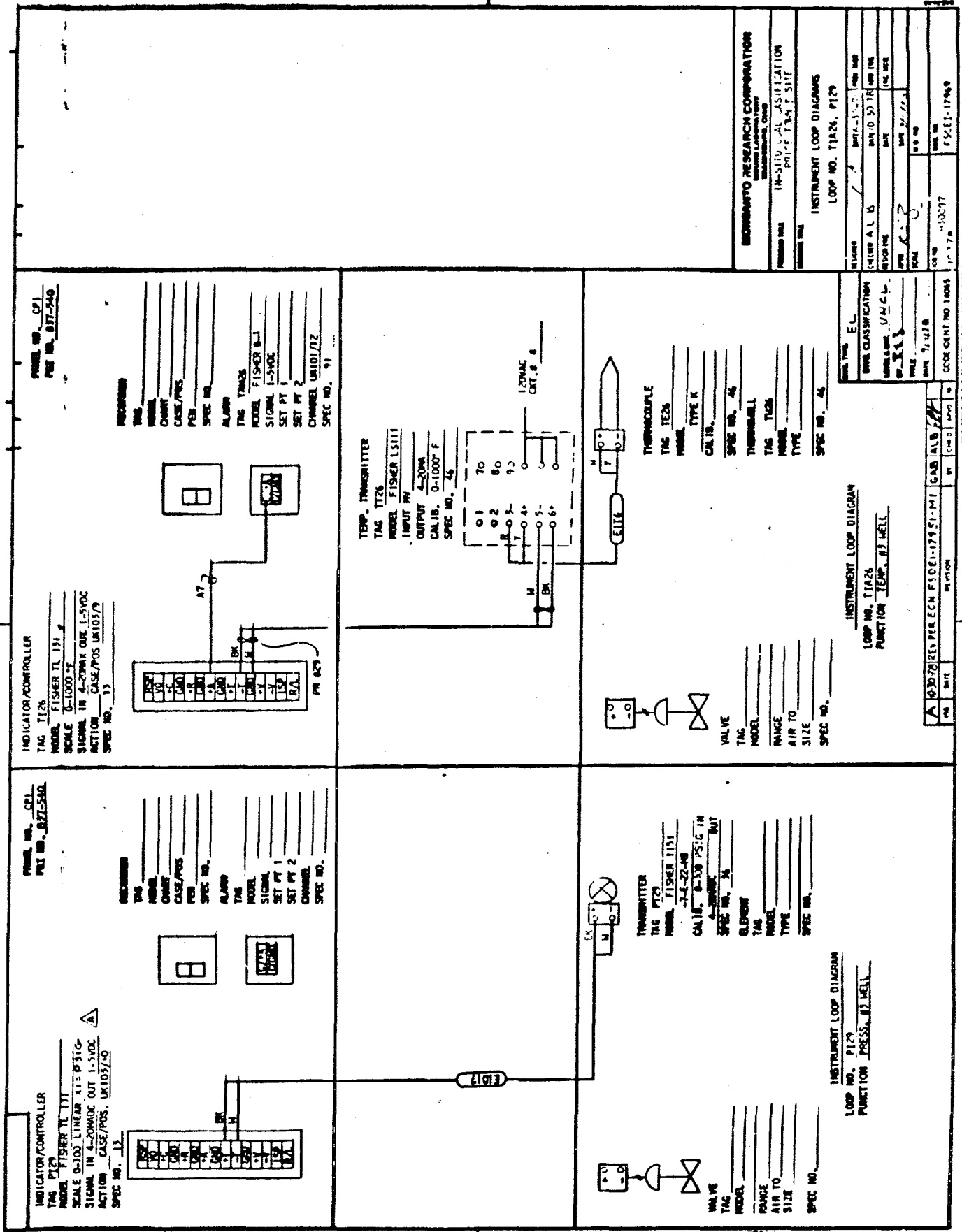
FIELD

RESEARCH CORPORATION
INSTRUMENT LOOP DIAGRAMS
LOOP NO. 1124, 1127

INSTRUMENT LOOP DIAGRAMS
LOOP NO. 1124, 1127

INSTRUMENT LOOP DIAGRAMS
LOOP NO. 1124, 1127

INDICATOR/CONTROLLER TAG: 1124 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13	RECORDER TAG: 1124 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13	TEMP TRANSMITTER TAG: 1124 MODEL: FISHER ILS111 INPUT: IN OUTPUT: 4-20VDC CALIB: 0-1000 °F SPEC. NO. 46	VALVE TAG: 1124 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13
INDICATOR/CONTROLLER TAG: 1127 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13	RECORDER TAG: 1127 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13	TEMP TRANSMITTER TAG: 1127 MODEL: FISHER ILS111 INPUT: IN OUTPUT: 4-20VDC CALIB: 0-1000 °F SPEC. NO. 46	VALVE TAG: 1127 MODEL: FISHER ILS111 SCALE: 0-1000 °F SIGNAL: IN 4-20VDC OUT 1-5VDC ACTION: CASE/POS. IN 10/2 SPEC. NO. 13



ON PANEL

BEHIND PANEL

FIELD

BERNARDINO RESEARCH CORPORATION

12-3110-21 AS/12/12

12-3110-21 AS/12/12

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

REVISION	DATE	BY	CHKD	DATE	BY
1	10/10/78	RESEARCH	ESCE	11/25/81	MI
2	10/10/78	RESEARCH	ESCE	11/25/81	MI
3	10/10/78	RESEARCH	ESCE	11/25/81	MI
4	10/10/78	RESEARCH	ESCE	11/25/81	MI
5	10/10/78	RESEARCH	ESCE	11/25/81	MI
6	10/10/78	RESEARCH	ESCE	11/25/81	MI
7	10/10/78	RESEARCH	ESCE	11/25/81	MI
8	10/10/78	RESEARCH	ESCE	11/25/81	MI
9	10/10/78	RESEARCH	ESCE	11/25/81	MI
10	10/10/78	RESEARCH	ESCE	11/25/81	MI

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

INSTRUMENT LOOP DIAGRAM
LOOP NO. T126, P129

APPENDIX 2

INSTRUMENT SPECIFICATIONS

Monsanto

LOCATION		PROJECT		INSTRUMENT INDEX		PRICE TOWN-FIELD TEST		AREA		INSTRUMENT INDEX		PLANT		COMPANY		JOB NO		SHEET		REV	
MANUFACTURER	MODEL	P.O. NUMBER	INSTR. CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR. LOOP DIAG	INSTR. NO.	DATE	BY	APPROVED	DATE	BY	APPROVED	DATE	BY	APPROVED	DATE	BY	APPROVED	DATE	BY
FISHER	1151GP	25446	0-400PSIG	V-1 24"		17963	36	2-7-78	PC		10-2-78	PC		10-2-78	PC		10-2-78	PC		10-2-78	PC
FISHER	TL101	25448	0-100LIN	CPI			13														
FISHER	546	25447	4-20MA/2-5V	MTD 2N P-10			27														
FISHER	657-RFC	25447	FAIL OPEN	2" LP-1" I			27														
FISHER	B-1			CPI			91														
ASHCROFT	1320B	25687	0-500PSIG																		
FISHER	1151GP	25446	0-1000PSIG	1" HP-1/2" I		17961	36														
FISHER	TL131	25448	0-120LIN	CPI			13														
FISHER	1151GP	25446	0-400PSIG	4" LP-1/2" I		17965	36														
FISHER	TL131	25448	0-100LIN	CPI			13														
ASHCROFT	50E I	25687	50-550°F	1" I/A			51														
ASHCROFT	1320E	25530	5-110PSIG	1" I/A			49														
FARRIS	26EA12	25526	360PSIG	4" LP-1" I			52														
FARRIS	1000	25526	100PSIG	1" I/A			52														

100 11/78

DASH CE

Monsanto

INSTRUMENT INDEX

LOCATION

PROJECT PRICETOWN-FIELD TEST

AREA

REVISED	DATE	BY	CHANGED	APPROVED	COMPANY	PLANT	DOC NO.
1	11-27-78	RC				JOG 10378	FSB 17999
	11-27-78	RC				0171 ON AREA	SHEET 2 of 6
						8252	REV 1

MANUFACTURER	MODEL	P.O. NUMBER	INSTN CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTN LOOP DIAG	SPEC. NO.	SERVICE & REMARKS	ED	INSTRUMENT NUMBER
FISHER	620	25447	75 PSIG	1" LP			42	BACKUP INSTR AIR PRESS REGULATOR		PCV-15
FISHER	620	25608	75 PSIG	1" IA			42	INSTR AIR HEADER PRESS REGULATOR		PCV-10
FISHER	11516P	25446	0-100 PSIG	6" PG-3" I		17962	36	PRODUCT GAS BACK PRESS CONTROL		PI-17
FISHER	TL101	25449	0-100 LBN	CPI			13	GAUGE PRESS XMITTER		PIC-11
FISHER	546	25447	4-20MA/2-15" MTE ON FV-11				27	CUR-FLOW XDUCER		IIP-17
FISHER	1051-V100	25447	FAIL CLOSE	6" PG-3" I			27	4" 3/16" SS POLY PRESS CONTROL VALVE		PV-17
FISHER	A-1			CPI			71	HI-LO PRESS ALARM		PAHL-17
STATIC-O-RING	6NN-K5	25464	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	0-120 SCFM	1" HP-1 1/2" I		17961	45	1000 PSIG AIR FLOW SYSTEM		FE-20
FISHER	11512P	25446	0-100 PSIG	1" HP-1 1/2" I			36	1" C. HONED METER TUBE FLOW RATE		ET-20
AGM ELECTRONICS	TA-4049	25449	0-100 PSIG	2" I			15	LIFE PRESS XMITTER		EY-20
FISHER	T-102	25449	0-100 PSIG	2" I			15	FLOW COMPUTER MODULE		FIG-20
FISHER	546	25447	4-20MA/2-15" MTE ON FV-11				27	PROTECT AIR FLOW XDUCER		IIP-20
FISHER	513RB	25447	FAIL OPEN	1" PG-3" I			27	1/2" C. BODY FLOW CONTROL VALVE		FV-20
FISHER	A-1			CPI			91	HI-LO FLOW ALARM		PAHL-20

Monsanto

LOCATION		PROJECT		PRICE TOWN - FIELD TEST		INSTRUMENT INDEX		DATE		BY		CHECKED		APPROVED		COMPANY		PLANT		DWG. NO.	
								9/17/78		DC						CIA		J0810376		F3017999	
								12-8-78								8252		DIPT 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		INSIP. LOOP DIAG		SPEC. NO.		SERVICE & REMARKS		EFD		INSTRUMENT NUMBER	
												FSC E I -		IS							
DANIEL FISHER	30RW	25529	0-100"WC	4"-LP-1 1/2" I				17965	15								350 PSIG AIR FLOW SYSTEM				FE-21
AGM ELECTRONICS	1151DP	25466	0-100"WC	4"-LP-1 1/2" I					36								4" C.C. ORIFICE FLANGE/ORIFICE PLATE				ET-21
FISHER	TA-4049	25470	0-KV5P/T	CPI					15								DIFF. PRESS. XMITTER (FLOW)				EY-21
FISHER	TL102	25449	0-100 LIN	CPI					12								FLOW COMPUTER MODULE				EIC-21
FISHER	546	25447	4-20MA/3-15V	WELCH 11-21					27								PROCESS AIR FLOW CONTROLLER				I/P-21
FISHER	657-ET	25447	FAIL OPEN	4"-LP-1 1/2" I					27								2" C.C. BODY FLOW CONTROL VALVE				EY-21
FISHER	A-1			CPI					91								HI-LO FLOW ALARM				FAHL-21
DANIEL FISHER	705-DS	25529	0-100"WC	6"-PG-3" I				17966	15								HV/LP FLOW PRODUCT GAS				FE-22
AGM ELECTRONICS	1151DP	25466	0-100"WC	6"-PG-3" I					26								4" C.C. ORIFICE FLANGE/ORIFICE PLATE				ET-22
FISHER	TA-4000	25470	50-RT-EXT	CPI					15								DIFF. PRESS. XMITTER (FLOW)				EY-22
FISHER	TL132	25449		CPI					12								FLOW COMPUTER MODULE				EI-22
VICKERY-SIMS																	PRODUCT GAS FLOW INDICATOR				
FISHER	1151DP	25466	0-100 LIN	6"-PG-3" I				17966	15								HV/LP FLOW PRODUCT GAS				FE-23
AGM ELECTRONICS	TA-4000	25470	50-RT-EXT	CPI					26								6"-VENTURI FLOW TUBE				ET-23
FISHER	TL132	25449		CPI					15								DIFF. PRESS. XMITTER (FLOW)				EY-23
FISHER									13								FLOW COMPUTER MODULE				EI-23
FISHER																	PRODUCT GAS FLOW INDICATOR				
FISHER	LS111	25448	0-1000°F	WELL PI-1				17967	45								PRODUCT GAS WELL #1				TE-24
FISHER	TL131	25446	0-1000°F	CPI					46								TYPE K DUAL TC-1/2" DIPT CR-MOTW				TI-24
FISHER	B-1			CPI					13								TC-1/2" TEMP XMITTER				TI-24
FISHER									91								PRODUCT GAS TEMP. INDICATOR				TI-24
FISHER																	LO TEMP ALARM				TAL-24

INSTRUMENT INDEX

REVISED	DATE	BY	CHECKED	APPROVED	C COMPANY	PLANT	DWG. NO.
2	4-13-78	RC				F501778	F501779
1	10-1-78				CIA	DFT ON DATA	SHEET 4 of 6
					8252		1

[illegible]

Monsanto

INSTRUMENT INDEX

PROJECT PRICETOWN - FIELD TEST

LOCATION	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, ETC.	SPEC NO.	SERVICE & REMARKS	EPD	INSTRUMENT NUMBER
	FISHER		25448		1"-HP-1 1/2" I		17961	46	TYPE J TC WITH 3/4" NPT 316SS TW		TE-20
	FISHER	LS111	25449	0-300°F	CPI			46	TC/I TEMP XMITTER		TI-20
	FISHER	TL131	25446	0-300°F	CPI			13	HP/LV AIR TEMP INDICATOR		TI-20
	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			46	TC/I TEMP XMITTER		TI-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 - 3/4" NPT CR-MO TW		TE-32
	FISHER	LS111	25448	0-1000°F	CPI			46	TC/I TEMP XMITTER		TI-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		
	FISHER	1151DP	25466	0-100"WC	1 1/2"-PG-3" I			36	1 1/2" 316SS ORIFICE FITTING		FE-33A
	AGM ELECTRONICS	TA4000	25470	SQRT EXT	CPI			15	DIFF. PRESS. XMITTER		FT-33A
	FISHER	TL131	25448	0-100 LIN	CPI			13	FLOW COMPUTER MODULE (SQRT)		FY-33A
									PRODUCT GAS FLOW INDICATOR		FI-33A
	DANIEL	705DS	25529		1 1/2"-PG-3" I		17964	45	1 1/2" - C.S. HONED SECTION		FL-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	25467	0-100 LIN	CPI			13	PRODUCT GAS FLOW INDICATOR		FI-33B
	FISHER (ALLOY ENCL)				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

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INSTRUMENT INDEX		REVISOR	DATE	BY	CHECKED	APPROVED	COMPANY	PLANT	DOC NO.
PRICE TOWN-FIELD TEST		9	9-16-78	BC			8252	FGS/0378	FGS/1791
			10-16-78					DEPT OR AREA	SHEET
									6 of 6

MANUFACTURER	MODEL	P.O. NUMBER	INSTR. CALIB. OR VALVE ACTION	LOCATION FIELD, PANEL, LINE NO. OR EQUIP. NO.	INSTALL. DETAIL REQUIRED	INSTR. LOG & DIAG	SPEC NO.	SERVICE & REMARKS	EFO	INSTRUMENT NUMBER
FISHER	AL-401	25448		CP1		17960	10	ANNUNCIATOR 16 PTC		UA-101
FISHER	MC-702			CP1		17951	08	12 PACK CASE UNIVERSAL MTD.		UK-102
FISHER	TL-113			CP1			13	TRANSFER SERVICE STATION		ZK-102
FISHER	MC-702			CP1			08	12 PACK CASE UNIVERSAL MTD.		UK-103
FISHER	MC-702			CP1			08	12 PACK CASE UNIVERSAL MTD.		UK-104
FISHER	RD-221			CP1			11	THREE PEN RECORDER		XR-104A
FISHER	RE-221			CP1			11	THREE PEN RECORDER		XR-104B
FISHER	768			CP1			20	PRIMARY POWER SUPPLY		EU-110
FISHER	769			CP1			20	BACK-UP POWER SUPPLY		EU-111
ACOPLAN	A24 MT210	25537		CP1			20	TREND REC'DR POWER SUPPLY		EU-104
GISMO	CP-1	25533						CONTROL PANEL CP-1		CP-1
MSA	704			CONTROL RM				CO MONITOR ANALYZER		AI-1
FISHER	B-1			CP1		17971		CO MONITOR AUTO SAMPLER		AY-1
MSA	704			GAS HEATS BLDG				CO MONITOR ANALYZER		AI-2
FISHER	B-1			CP1		17963		CO MONITOR AUTO SAMPLER		AY-2
								HICO 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 transmatons - 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 MRC	PLANT MOUND	SPEC NO. IS- 08	
		AUTH NO	DEPT	AREA	SHEET 1 OF
LOCATION					

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 one	QUANTITY one	
TAG UK-102	TAG UK-103	
MODEL MC-702	MODEL MC-702	
MOUNTING SPEED NUT ☐ UNIVERSAL ☒	MOUNTING SPEED NUT ☐ UNIVERSAL ☒	
NUMBER OF 1" BLANKS	NUMBER OF 1" BLANKS	

12 PACK CASE

6 PACK CASE

4 PACK CASE

CASE NAMEPLATE

12 PACK CASE

6 PACK CASE

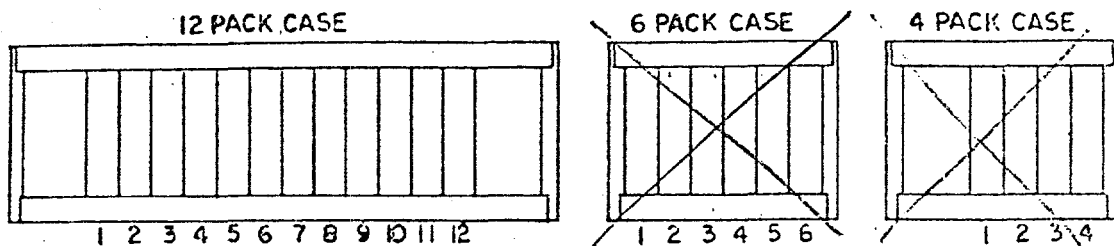
4 PACK CASE

CASE NAMEPLATE

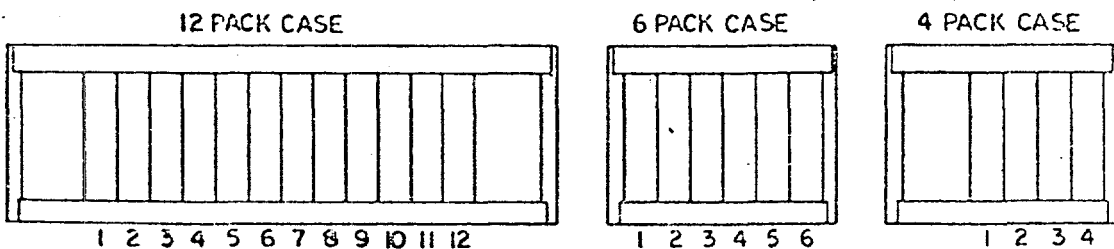
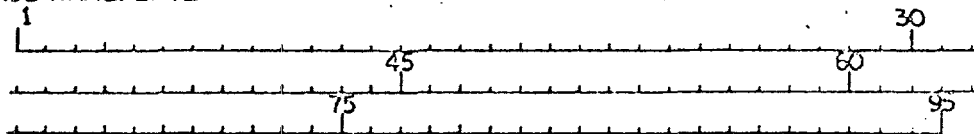
SPECIAL CONSTRUCTION AND/OR OPTIONS

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

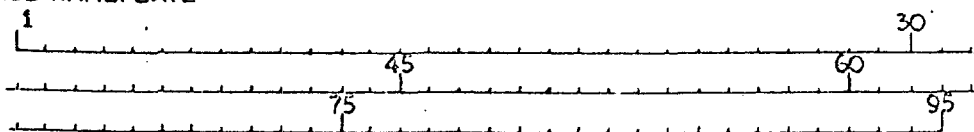
MONSANTO		FISHER AC ² CASE SPECIFICATION		COMPANY MRC	PLANT MOUND		SPEC NO. IS-08	
LOCATION				AUTH NO.	DEPT	AREA	SHEET 2 OF	REV
ITEM	12 Pack Case	ITEM		CASE NAMEPLATE (1 LINE)				
QUANTITY	0.00	QUANTITY		12 PACK-95 CHARACTERS MAX				
TAG	UK-124	TAG		6 PACK-45 CHARACTERS MAX				
MODEL	MC-502	MODEL		4 PACK-45 CHARACTERS MAX				
MOUNTING	SPEED NUT ☐	MOUNTING	SPEED NUT ☐					
	UNIVERSAL ☒		UNIVERSAL ☒					
NUMBER OF 1" BLANKS	FOUR	NUMBER OF 1" BLANKS						



CASE NAMEPLATE



CASE NAMEPLATE



SPECIAL CONSTRUCTION AND/OR OPTIONS

MANUFACTURER				P.O. NO.			
REV	1			REV	1		
	2				2		
	3				3		

Monsanto COMPANY		ANNUNCIATOR SPECIFICATIONS		PLANT AUTH NO.		SPEC NO. IS- 10 SHEET 1 OF 1																	
LOCATION																							
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 60 HZ																			
RELAY CONTACT ARRANGEMENT AND RATING																							
UNIVERSAL MOUNTING CLAMP KIT				YES																			
BOLT MOUNTING KIT				—																			
CONDUIT PANEL				—																			
TYPE MINI EXTENDER CARD				—																			
WINDOW ARRANGEMENT: (FRONT) <table border="1" style="float: right; margin-top: 10px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> </table>								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4																				
5	6	7	8																				
9	10	11	12																				
13	14	15	16																				
PT	INPUT	MODULE	NAMEPLATE	NAME PLATE ENGRAVING (ALTRS & SPACES / LINE MAX.)																			
N°	SIGNAL	TYPE	COLOR	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																			
REV. DATE		Catalog No.		AL-402																			
1		P.O. No.																					
2		Price																					
3																							
4																							
5																							
6																							
7																							
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9																							
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11																							
12																							
13																							
14																							
15																							
16																							

Monsanto		RECORDER SPECIFICATIONS		COMPANY MRC		PLAN MOUND		SPEC NO. IS 11	
LOCATION				AUTH NO.		DEPT		AREA	
								SHEET 1 OF 1	
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.O. No.									
Price									
REV. DATE	0								
	1								
	2								
	3								

CS-20(11-73)

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO. IS 13		
LOCATION				AUTH NO.		DEPT OR AREA		SHEET 1 OF		
Instrument No.		PIC-10				PI-12		FIC-21		
Service		PROCESS AIR				PROCESS AIR		PROCESS AIR		
		LOW PRESS				LOW PRESS		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		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	
	CONTROLLER	Location	(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		
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 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								
		From	MANUAL						MANUAL	
Power Supply - Electric, Pneumatic		24VDC				24VDC		24VDC		
Electrical Area Classification		NEMA I				NEMA I		NEMA I		
REMARKS	Accessories or Special Features									
	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	
PURCH.	Manufacturer		FISHER				FISHER		FISHER	
	*Receiver Catalog No.		—				TL131		TL102	
	*Controller Catalog No.		TL101							
	P.O. No.									
	Price									
REV. DATE	△				△					
	△				△					
	△				△					
	△				△					

Per 7

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.		
LOCATION				AUTH NO.		DEPT OR AREA		IS- 13 SHEET REV		
								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		X		X	
		Range								
		Drive Speed								
Scale	Size & Type	2 1/4" FIXED				8 1/2" MOVABLE				
	Range	0 - 120 LIN				0 - 120 LIN				
CONTROLLER	Ratio, Cascade, Computer - Set					MANUAL				
	Auto - Manual By Pass	YES NO		YES NO		YES NO		YES NO		
	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	Range & Units		4-20 MADC		4-20 MADC				
	Input	From		PT-11		FY-20				
	Controller	Range & Units		—		4-20 MADC				
	Output	To		—		FV-20				
	Set Point	Range & Units		—		—				
		From		—		MANUAL				
	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-11				FIC-20				
	LINE 2	PROCESS AIR				PROCESS AIR				
	LINE 3	HIGH PRESS				HP / LV				
	LINE 4	X 10 PSIG				X 1 SCFM				
PURCH.	Manufacturer	FISHER				FISHER				
	*Receiver Catalog No.	TL 131								
	*Controller Catalog No.					TL 102				
	P.O. No.									
	Price									
REV. DATE	①									
	②									
	③									
	④									

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.		
LOCATION				AUTH NO.		DEPT OR AREA		IS- 13 SHEET 3 OF REV		
Instrument No.		PIC-17				FI-22				
Service		PROD GAS				PRODUCT GAS				
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 NO		YES NO		
CONTROLLER	Location		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE		INTEG. REMOTE	
	Proportional Band %		10-100%							
	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		4-20MADC		4-20MADC				
		From		PT-17		FY-22				
	Controller Output	Range & Units		4-20MADC		X				
		To		PV-17						
	Set Point	Range & Units		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				
2 4* 5*	*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 5 OF REV			
LOCATION		Instrument No.		TI-25		TI-26					
Service		PRODUCT GAS		PRODUCT GAS		PRODUCT GAS					
Location - Panel or Equipment No.		WELL #2		WELL #3		WELL #3					
Location - Panel or Equipment No.		CPI		CPI		CPI					
RECEIVER	Record Indicate Control	INDICATE		INDICATE		INDICATE					
	*Number of Points	ONE		ONE		ONE					
	Chart	Size & Type	 		 		 		 		
		Range									
		Drive Speed									
	Scale	Size & Type	2 1/4" FIXED		2 1/4" FIXED		2 1/4" FIXED				
Range		0-1000		0-1000		0-1000					
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	Range & Units	4-20MADC		4-20MADC		4-20MADC				
		Input	From		From		From				
	Controller	Range & Units	—		—		—				
		Output	To		To		To				
	Set Point	Range & Units	—		—		—				
		From	—		—		—				
Power Supply - Electric, Pneumatic		24VDC		24VDC		24VDC					
Electrical Area Classification		NEMA I		NEMA I		NEMA I					
Accessories or Special Features		—		—		—					
REMARKS	RANGE PLUG		AC131		AC131		AC131				
	NAME PLATE		—		—		—				
	LINE 1		TI-25		TI-26		TI-26				
	LINE 2		TEMP		TEMP		TEMP				
	LINE 3		WELL #2		WELL #3		WELL #3				
	LINE 4		—		—		—				
PURCH.	Manufacturer		FISHER		FISHER		FISHER				
	*Receiver Catalog No.		TL131		TL131		TL131				
	*Controller Catalog No.		—		—		—				
	P.O. No.		—		—		—				
	Price		—		—		—				
REV. DATE	0										
	1										
	2										
	3										

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.		
LOCATION				AUTH NO.		DEPT OR AREA		IS 13 SHEET 6 OF		
Instrument No.		PI-29				TI-30				
Service		PRODUCT GAS				PROCESS AIR				
		W				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		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		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	Range & Units		4-20MADC		4-20MADC				
	Input	From		PT-29		TT-30				
	Controller	Range & Units		—		—				
	Output	To		—		—				
	Set Point	Range & Units		—		—				
		From		—		—				
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		PI-29				TI-30			
	LINE 2		PRESSURE				TEMP			
	LINE 3		WELL #3				AIR TO			
	LINE 4						WELLS			
PURCH.	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					

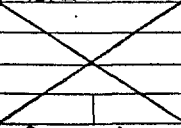
Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO. IS- 13		
LOCATION		AUTH NO.		DEPT OR AREA		SHEET		REV		
						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	 		 					
		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
	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	Range & Units		4-20MADC		4-20MADC				
	Input	From		PT-27		PT-28				
	Controller Output	Range & Units		—		—				
		To		—		—				
	Set Point	Range & Units		—		—				
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									
PURCH.	Manufacturer		FISHER		FISHER					
	*Receiver Catalog No.		TL131		TL131					
	*Controller Catalog No.									
	P.O. No.									
REV. DATE	Price									
	0				4					
	1				5					
	2				6					
	3				7					

Per 7*

Monsanto COMPANY		RECEIVER - CONTROLLER SPECIFICATION ELECTRONIC - PNEUMATIC		DIVISION		PLANT		*SPEC NO.	
				AUTH NO.		DEPT OR AREA		IS- 13 SHEET REV 9 OF 1	
LOCATION									
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						
			Range						
			Drive						
		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
		CONTROLLER	Location		INTEG.	REMOTE	INTEG.	REMOTE	INTEG.
Proportional Band %									
Auto-Reset Mode			NO	SLOW	FAST	NO	SLOW	FAST	
Rate Mode			YES	NO	YES	NO	YES	NO	
On Measurement Increase Instrument Output			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							
		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		FI-33A		FI-33B				
	LINE 2		HP/LV		HP/LV				
	LINE 3		PROD GAS		PROD GAS				
	LINE 4		X 1 SCFM		X 1 SCFM				
2 4* 5*	PURCH.	Manufacturer		FISHER		FISHER			
		*Receiver Catalog No.		TL 131		TL 131			
		*Controller Catalog No.							
		P.D. No.		10		1			
		Price							
REV. DATE	1	ISSUED TO PURCH FI-33A	DC	6-75	4				
	2	ISSUED TO PURCH FI-33B	R6C	7-678	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 SHEET 10 OF		
LOCATION										
Instrument No.		ZK-102								
Service		TRANSFER STATION								
Location - Panel or Equipment No.		INST CASE UK102								
3 6*	RECEIVER	Record Indicate Control		TRANSFER STA.						
		*Number of Points		MULTIPLE						
		Chart	Size & Type							
			Range							
			Drive			Speed				
		Scale	Size & Type	BLANK						
Range	=									
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	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								
REMARKS	Accessories or Special Features									
	RANGE PLUG		-							
	NAME PLATE									
	LINE 1		ZK-102							
	LINE 2									
	LINE 3									
	LINE 4									
2 4* 5*	PURCH.	Manufacturer		FISHER						
		*Receiver Catalog No.								
		*Controller Catalog No.		TL-113						
		P.O. No.								
		Price								
REV. DATE	0				4					
	1				5					
	2				6					
	3				7					

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		SPEC NO.																																																	
LOCATION				AUTH NO.		DEPT OR AREA		IS 15																																																	
								SHEET 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: <u>B & C are 1-5VDC ; A is 4-20ma DC</u>																																																									
Output Signal: <u>4-20ma DC</u>																																																									
Power Supply: <u>115VAC, 60HZ</u>																																																									
Instr #: <u>FY-20</u>					Instr #: <u>FY-21</u>																																																				
$A = h = 0 - 100"WC = 4-20ma DC = 0 - 1.0 \text{ Multiplier}$ $Flow = 0 - 120 scfm$					$A = h = 0 - 100"WC = 4-20ma DC = 0 - 1.0 \text{ Multiplier}$ $Flow = 0 - 4000 scfm$																																																				
$B = P = 14.7 - 1014.7 PSIA = 1-5VDC = .014 - 1.197$ Multiplier					$B = P = 14.7 - 414.7 PSIA = 1-5VDC = .04 - 1.137$ Multiplier																																																				
$C = T = 460 - 960^{\circ}F abs = 1-5VDC = .60 - 1.263$ Multiplier					$C = T = 460 - 960^{\circ}F abs = 1-5VDC = .60 - 1.263$ Multiplier																																																				
<u>Max. h - Normal P & T CONDITION:</u>					<u>Max. h - Normal P & T CONDITION:</u>																																																				
$h = 100"WC = 5.0VDC = 1.0 \text{ FACTOR}$ $P = 1014.7 PSIA = 4.34VDC = 1.0 \text{ FACTOR}$ $T = 760^{\circ}F abs = 4.17VDC = 1.0 \text{ FACTOR}$ $OUTPUT = (1.0) \times (1.0) \div (1.0) = 1.0 = 20ma DC$					$h = 100"WC = 5.0VDC = 1.0 \text{ FACTOR}$ $P = 414.7 PSIA = 4.52VDC = 1.0 \text{ FACTOR}$ $T = 760^{\circ}F abs = 4.17VDC = 1.0 \text{ FACTOR}$ $OUTPUT = (1.0) \times (1.0) \div (1.0) = 1.0 = 20ma DC$																																																				
<u>Normal h, P & T CONDITION:</u>					<u>Normal h, P & T CONDITION:</u>																																																				
$h = 70.7"WC = 3.0VDC = 0.5 \text{ FACTOR}$ $P \& T \text{ AS ABOVE}$ $OUTPUT = (0.5) \times (1.0) \div (1.0) = 0.5 = 12ma DC$					$h = 70.7"WC = 3.0VDC = 0.5 \text{ FACTOR}$ $P \& T \text{ AS ABOVE}$ $OUTPUT = (0.5) \times (1.0) \div (1.0) = 0.5 = 12ma DC$																																																				
<table border="1"> <thead> <tr> <th colspan="2">PURCHASING</th> <th colspan="2">AGM Electronics</th> <th colspan="2"></th> <th colspan="2"></th> </tr> <tr> <th>Manufacturer</th> <th>Catalog No.</th> <th colspan="2">TA 4049</th> <th></th> <th></th> <th></th> <th></th> </tr> <tr> <th>P.O. No.</th> <th>Price</th> <th colspan="2"></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>ISSUED FOR PURCHASE</td> <td>RGC</td> <td>6-2-78</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td>3</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										PURCHASING		AGM Electronics						Manufacturer	Catalog No.	TA 4049						P.O. No.	Price							1	ISSUED FOR PURCHASE	RGC	6-2-78	1				2				2				3				3			
PURCHASING		AGM Electronics																																																							
Manufacturer	Catalog No.	TA 4049																																																							
P.O. No.	Price																																																								
1	ISSUED FOR PURCHASE	RGC	6-2-78	1																																																					
2				2																																																					
3				3																																																					

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		SPEC NO.	
LOCATION				AUTH NO.		DEPT OR AREA		IS- 20	
								SHEET 1 OF 1	
Instrument No.		EU-110		EU-111		EX-112			
Service		Power Supply		Back-up		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, 60 HZ		117V, 60 HZ		117V, 60 HZ			
Input Power or Rating		3 amp		3 amp		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		2.0 amps		2.0 amps					
Output Fuse									
Elec Area Class		Nema I		Nema I		Nema I			
Cabinet: Mounting		U-Channel		U-Channel		Wall Mtd			
Options: Ni-Cad Batty with Mtg Rack						Model BATF4			
Purchasing		Manufacturer		Fisher		Fisher		Fisher	
Catalog No.		768		769		764			
P.O. No.		A		A		A			
Price									
REV. DATE	0	ISSUED FOR PURCH	DC	6-78	A				
	1	DELETED EX-112	RGC	7-578	B				
	2				C				
	3				D				

Monsanto		CONTROL VALVE SPECIFICATION		COMPANY		PLANT		SPEC NO.			
LOCATION				AUTH NO.		DEPT		IS- 27			
						AREA		SHEET 1 OF			
INSTRUMENT NUMBER		PV-10				FV-20					
SERVICE		AIR HDR. CONTROL				HP AIR FLOW					
LINE NUMBER		2"-LP-1" I				1"-HP-1/2" I					
PROCESS MATERIAL		COMPR. AIR				COMPR. AIR					
DESIGN DATA	FLOW	LIQ	(GAS)	STM	LIQ	GAS	STM	LIQ	(GAS)	STM	
	FLOW TEMPERATURE, T _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 @ 60°F, 14-7 PSIA)	1.0						1.0			
	VISCOSITY @ T _f	0.024						0.024			
	VAPOR PRESSURE @ T _f , PSIA										
	NORMAL FLOW	0			3750			100			
	MAX FLOW							125			
	FLOW UNITS: SCFM, SCFH, GPM, #/HR	SCFM						SCFM			
% TRAVEL	69			400			80				
ΔP							100				
FLOW C _v , C _g , OR C _s	CV = 19.2						CV = 0.52				
VALVE SPECIFICATION	VALVE BODY SIZE	2"						1/2"			
	BODY RATING & END CONNECTION	300# SCR (FLG)			SCR FLG			300# (SCR) FLG			
	BODY MATERIAL	CARBON STEEL						CARBON STEEL			
	TRIM SIZE	1/2"			CV=35			1/4"			
	MAXIMUM C _v , C _g , OR C _s							CV=95			
	SEATS	(SP) DP			SP DP			(SP) DP			
	TRIM MATERIAL	STAINLESS STL						STAINLESS STL			
	TYPE INNER VALVE	EQ 70						MICRO FLUTE			
	FLOW TENDS TO	CLOSE (OPEN)			CLOSE OPEN			CLOSE (OPEN)			
	PACKING	TEFLON						TEFLON			
GUIDING	SKIRT (TOP) BTM			SKIRT TOP BTM			SKIRT TOP BTM				
VALVE ACTUATOR	(DIAPH) PISTON			DIAPH PISTON			(DIAPH) PISTON				
ON AIR FAILURE VALVE	CLOSES (OPENS)			CLOSES OPENS			CLOSES (OPENS)				
ACTUATOR SIZE	BY VENDOR 3-15 PSI						BY VENDOR 3-15 PSI				
SIGNAL FROM CONTROLLER - UNITS		4-20 MA DC			4-20 MA DC			4-20 MA DC			
VALVE POSITIONER	MODEL NO.	EYPASS			YES NO			YES NO			
	INPUT	OUTPUT			PSI PSI			PSI PSI			
	AIR SUPPLY	REGULATOR			PSI YES NO			PSI YES NO			
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			
	AIR SUPPLY	REGULATOR			30 PSI (YES) NO			30 PSI (YES) NO			
SOLENOID	SOLENOID VALVE - PIPED & MOUNTED	YES NO			BY OTHERS			YES NO			
	ON ELECTRICAL FAILURE CONTROL VALVE	CLOSES OPENS			CLOSES OPENS			CLOSES OPENS			
	SOLENOID COIL VOLTAGE - STD	OTHER			120V 60Hz			120V 60Hz			
	SOLENOID COIL TYPE - CLASS	MOLDED			A F H			A F H			
	SOLENOID VALVE MANUFACTURER										
	SOLENOID VALVE CATALOG NUMBER										
MAX. C _v & C _g DES. CONDITIONS		1180 & 33.8						32 & 34			
INSTALLATION DETAIL NO.											
DIMENSIONS		A. FACE TO FACE									
		B. FACE TO CENTER									
		C. FACE TO CENTER									
		D. CLEARANCE									
		E. CLEARANCE									
		H. ACTUATOR DIA									
		J. ACTUATOR HEIGHT									
PURCH.	VALVE MANUFACTURER	FISHER						FISHER			
	VALVE CATALOG NUMBER	657-RFL						513R-R			
	PURCHASE ORDER NUMBER										
REV	LINE NO. REF	DC 9-12-78									

Monsanto

Monsanto		CONTROL VALVE SPECIFICATION		COMPANY		PLANT		SPEC NO.		
LOCATION				AUTH NO.		DEPT		SHEET		
								2 OF 0		
INSTRUMENT NUMBER		FV-21				PV-17				
SERVICE		LP AIR FLOW				GAS HDR. CONTROL				
LINE NUMBER		4" LP-1/2" I		A		6" PG-3" I		A		
PROCESS MATERIAL		COMPR AIR				PRODUCT GAS				
DESIGN DATA	FLOW	LIQ	(GAS)	STM	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 @ 60°F, 14-7 PSIA)	1.0						0.83		
	VISCOSITY @ T _f	0.024								
	VAPOR PRESSURE @ T _f , PSIA									
	NORMAL FLOW	3000			3750			3500		
	MAX FLOW							5000		
	FLOW UNITS: SCFM, SCFH, GPM, L/HR	SCF/A						SCFM		
% TRAVEL	64			30			45			
FLOW	C _v , C _g , OR C _s			CV=49			CV=254			
VALVE SPECIFICATION	VALVE BODY SIZE		3"				4" (WAFER)		A	
	BODY RATING & END CONNECTION		300# SCR (FLG)		SCR		FLG		600# SCR (FLG)	
	BODY MATERIAL		CARBON STL				316 SS		A	
	TRIM SIZE		3/16		CV=121				CV=160	
	SEATS		(SP) DP		SP		DP		(SP) DP	
	TRIM MATERIAL		STAINLESS STL				STAINLESS STL			
	TYPE INNER VALVE		EQ %				VEE BALL			
	FLOW TENDS TO		CLOSE (OPEN)		CLOSE		OPEN		CLOSE (OPEN)	
	PACKING		TEFLON				GRAPHITE			
	GUIDING		SKIRT TOP BTM		SKIRT		TOP BTM		SKIRT TOP BTM	
	VALVE ACTUATOR		(DIAPH) PISTON		DIAPH		PISTON		(DIAPH) PISTON	
	ON AIR FAILURE VALVE		CLOSES OPENS		CLOSES		OPENS		CLOSES OPENS	
	ACTUATOR SIZE		5" NEMA		PSI				PSI	
	SPRING RANGE		5" NEMA		PSI				PSI	
	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		
	INPUT	OUTPUT		PSI		PSI		PSI		
	AIR SUPPLY	REGULATOR		PSI		PSI		PSI		
I/P TRANSDUCER	MODEL NO.	NEMA		546		47		546		
	INPUT	OUTPUT		4-20 MA		3-15 PSI		4-20 MA		
	AIR SUPPLY	REGULATOR		30 PSI		(YES) NO		30 PSI		
SOLENOID	SOLENOID VALVE - PIPED & MOUNTED		YES NO		BY OTHERS		YES NO		BY OTHERS	
	ON ELECTRICAL FAILURE CONTROL VALVE		CLOSES OPENS		CLOSES OPENS		CLOSES OPENS		CLOSES OPENS	
	SOLENOID COIL VOLTAGE - STD		OTHER		120V 60Hz		120V 60Hz		120V 60Hz	
	SOLENOID COIL TYPE - CLASS		MOLDED		A F H		YES NO		A F H	
	SOLENOID VALVE MANUFACTURER									
SOLENOID VALVE CATALOG NUMBER										
MAX. C _g + C _i @ DES. CONDITIONS		4210		\$34.8				6600		
INSTALLATION DETAIL NO.										
DIMENSIONS			A. FACE TO FACE				81-DIR SEAL RING			
			B. FACE TO CENTER				ALLOY 6-LDG			
			C. FACE TO CENTER				EDGE OF BALL			
			D. CLEARANCE				440C PUSHING			
			E. CLEARANCE							
			H. ACTUATOR DIA							
			J. ACTUATOR HEIGHT							
PURCH.	VALVE MANUFACTURER		FISHER				FISHER			
	VALVE CATALOG NUMBER		657-ET				1051-V100			
	PURCHASE ORDER NUMBER									
REV	REV. SIZE, MAT'L		D.C. 9-11-78		A					
					A					
					A					

Per 7*

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Monsanto COMPANY		*PRESSURE INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		*SPEC NO.			
LOCATION				AUTH NO.		DEPT OR AREA		IS: 360			
								SHEET 1 OF 1			
Instrument No.		PT-10		PT-11							
Service		COMPR AIR		COMPR AIR							
		LOW PRESS		HIGH PRESS							
Equipment No. or Line No. & Size		V-1 24" A		1"HP-1 1/2" T A							
Process Material		AIR		AIR							
CASE	Blind, Indicating, Record, Control, Transmit	BLIND A		BLIND A							
	Mounting: Flush, Surface, Yoke	2" YOKE		2" YOKE							
	CHART	Size & Type	X		X						
		Range	X		X						
		Drive Speed	X		X						
SCALE	Size & Type	= A		= A							
	Range	=		=							
ELEMENT	Number	ONE		ONE							
	Span & Units	0-400 PSIG		0-1000 PSIG							
	Range Limits	0-170/1000 PSIG		0-500/3000 PSIG							
	Material & Type	316 SS DIAPH		316 SS DIAPH							
SIGNALS	PROCESS INPUT	Liquid, Gas, Cond. Vapor	COMPR AIR		COMPR AIR						
		Min. Press.	Normal Press.	Max. Press.	0	400	0	1000			
	INSTRUMENT OUTPUT	Range & Units	4-20 MADCL		4-20 MADCL						
		To	PIC-10		PIC-11						
	Power Supply - Electric, Pneumatic	24 VDC MAX		24 VDC MAX							
	Electrical Area Classification	CL I, DIV II-D		CL I, DIV II-D							
CONTROLLER TRANSMITTER	Proportional Band %	X		X							
	Auto Reset Mode	NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST	
	Rate Mode	YES	NO	YES	NO	YES	NO	YES	NO	YES	
	Auto - Manual Bypass	YES	NO	YES	NO	YES	NO	YES	NO	YES	
	On Measurement Increase Instrument Output	INC.	DEC	INC.	DEC	INC.	DEC	INC.	DEC	INC.	
	Piped & Mt'd Air Supply Reg.	YES	NO	YES	NO	YES	NO	YES	NO	YES	
	Output Gage, 3/2" (For Xmitter)	YES	NO	YES	NO	YES	NO	YES	NO	YES	
	Accessories or Special Features										
	LINEAR METER	NONE A		NONE A							
	PROCESS CONNECTIONS	1/2" NPT		1/2" NPT							
PROCESS FLG. & ADAPTER	316 SS		316 SS								
BODY MATERIAL	316 SS		316 SS								
PURCH.	Manufacturer	FISHER		FISHER							
	*Catalog No.	1151GP-8-E-22-MB		1151GP-9-E-22-MB							
	P.O. No.										
	Price										
	△	CHGD MFRG & ISSUED F/PURCH	DC	6-78	△						
	△	DELETE METER, ADD MODEL NO.	R6C	7-678	△						
	△	LINE NO. REV	DC	9-12-78	△						
	△				△						

Per 7*

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Monsanto COMPANY		* PRESSURE INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		* SPEC NO.	
LOCATION				AUTH NO.		DEPT OR AREA		SHEET	
								REV	
Instrument No.		PT-12						IS 36	
Service		COMPR. AIR						2 OF 1	
Equipment No. or Line No. & Size		LOW PRESS							
Process Material		4" LP-1/2" I		2					
Blind, Indicating, Record, Control, Transmit		AIR							
Mounting: Flush, Surface, Yoke		BLIND		1					
Size & Type		2" YOKE							
CHART									
Range									
Drive									
Speed									
SCALE									
Range									
Number		ONE							
Span & Units		0-400 PSIG							
Range Limits		0-170/1000 PSIG							
Material & Type		316 SS DIAPH							
PROCESS		Liquid, Gas, Cond. Vapor		COMPR. AIR					
INPUT		Min. Press.		Normal Press.		Max. Press.			
		0		400					
INSTRUMENT		Range & Units		4-20 MADC					
OUTPUT		To		PIC-12					
Power Supply - Electric, Pneumatic		24VDC MAX							
Electrical Area Classification		CL I, DIV II-D							
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	
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	
Accessories or Special Features									
LINEAR METER		NONE		1					
PROCESS CONNECTIONS		1/2" NPT							
PROCESS FLG & ADAPTOR		316 SS							
BODY MATERIAL		316 SS							
Manufacturer		FISHER							
*Catalog No.		1151GP-8-E-22-MB							
P.O. No.		A							
Price									
CHG'D MFG & ISSUED F/PURCH		DC 6-78		A					
DELETE METER, ADD MODEL No.		R6C 7-6-78		A					
LINE No. REV		DC 9-12-78		A					
				A					

Per 8*
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Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		*SPEC NO. IS 36		SHEET 3 OF 1	
LOCATION				AUTH NO.		DEPT OR AREA		REV			
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		BLIND							
	Mounting: Flush, Surface Yoke	2" YOKE		2" YOKE							
	CHART	Size and Type		Size and Type							
	Range										
	Drive	Speed		Speed							
SCALE	Size & Type										
	Range										
DIFFERENTIAL UNIT	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	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 INPUT	Liquid, Gas, Cond. Vapor		AIR		AIR					
	Operating Pressure	1000 PSIG		350 PSIG							
	INSTRUM. OUTPUT	Range & Units		4-20MADC		4-20MADC					
	To	FY-20		FY-21							
POWER SUPPLY	Power Supply - Electrical, Pneumatic	24 VDC		24 VDC							
	Electrical Area Classification	CL I-DIV II-D		CL I-DIV II-D							
CONTROLLER	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			
	Auto-Manual By Pass	YES NO		YES NO		YES NO		YES NO			
	On Measurement Increase Instrument Output	INC. DEC		INC. DEC		INC. DEC		INC. DEC			
	Pipe & Mt'd Air Supply Reg.	YES NO		YES NO		YES NO		YES NO			
REMARKS	Output Gage, 3/4" Size	YES NO		YES NO		YES NO		YES NO			
	Accessories or Special Features	SQ RT METER PROCESS CONNECTION		NONE 1/2" NPT		NONE 1/2" NPT					
PURCH.	Manufacturer	FISHER		FISHER							
	Catalog No.	1151DP-4-E-22-MB		1151DP-4-E-22-MB							
	P.O. No.										
	Price										
REV. DATE	①	CHGD RFG & ISSUED/PURCH	DC	6-76	①						
	②	DELETE METER, ADD MODEL No.	RGC	7-6-78	②						
	③	REV. LINE No.	DC	4-12-78	③						
	④				④						

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Monsanto COMPANY		*PRESSURE INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		*SPEC NO.		
LOCATION				AUTH NO.		DEPT OR AREA		IS- 36		
								SHEET 4 OF 1		
Instrument No.		PT-17				PT-27				
Service		PRODUCT GAS				PRODUCT GAS				
Equipment No. or Line No. & Size		6" PG-3" I		A		WELL PI-1				
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								
		Range								
		Drive								
SCALE	Size & Type	=		A		=		A		
	Range									
ELEMENT	Number	ONE				ONE				
	Span & Units	0-100 PSIG				0-100 PSIG		0-300		
	Range Limits	0-50/300 PSIG				0-50/300 PSIG				
	Material & Type	316 SS DIAPH				316 SS DIAPH				
SIGNALS	PROCESS INPUT	Liquid, Gas, Cond. Vapor		GAS		GAS				
	INSTRUMENT OUTPUT	Range & Units	4-20 MADC				4-20 MADC			
		To	PIC-17				PI-27			
	Power Supply - Electric, Pneumatic		24VDC MAX				24VDC MAX			
	Electrical Area Classification		CL I DIV II-D				CL I DIV II-D			
CONTROLLER TRANSMITTER	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	
	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, 3/4" (x For Xmitter)		YES NO		YES NO		YES NO		YES NO	
	Accessories or Special Features									
REMARKS	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'S ISS. F/PURCH		DC 6-78		A					
	REV. LINE No.		DC 9-12-78		A					
					A					
					A					

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Monsanto COMPANY		* PRESSURE INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		* SPEC NO.		
				AUTH NO.		DEPT OR AREA		IS 36 SHEET 5 OF 1		
LOCATION										
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	X		X		X		X	
		Drive	X		X		X		X	
SCALE	Size & Type	=		A		=		A		
	Range	=		A		=		A		
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 MADCL		4-20 MADCL		4-20 MADCL			
		To	PI-28		PI-29		PI-29			
	Power Supply - Electric, Pneumatic	24VDC MAX				24VDC MAX				
CONTROLLER TRANSMITTER	Electrical Area Classification	CLI-DIV II-D				CLI-DIV II-D				
	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		
	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		
	Accessories or Special Features									
	REMARKS	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									
2	△ CHGD MFG & ISSUED F/P/PROJ	DC	6-78	△						
	△ DELETE METER, ADD MODEL NO.	R6L	7-6-78	△						
	△			△						
	△			△						

Per 8*
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Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		*SPEC NO. IS 36		
LOCATION				AUTH NO.		DEPT OR AREA		SHEET 6 OF 1		
Instrument No.		FT-22		FT-23						
Service		PRODUCT GAS		PRODUCT GAS						
		LOW PRESSURE		LOW PRESSURE						
Equipment No. or Line No. & Size		8"PG-3" I A		6"PG-3" I A						
Process Material		GAS		GAS						
CASE	Blind, Indicating, Record, Control, Transmit	BLIND A		BLIND A						
	Mounting: Flush, Surface Yoke	2" Yoke		2" Yoke						
	CHART	Size and Type	X		X					
		Range	X		X					
		Drive Speed	X		X					
SCALE	Size & Type	= A		= A						
		Range								
DIFFERENTIAL UNIT	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	GAS		GAS						
	INPUT	Liquid, Gas, Cond. Vapor		Liquid, Gas, Cond. Vapor						
		Operating Pressure		50-350 PSIG		50-350 PSIG				
	INSTRUM.	Range & Units		4-20 MADC		4-20 MADC				
	OUTPUT	To		FY-22		FY-23				
CONTROLLER	Power Supply - Electrical, Pneumatic	24 VDC MAX		24 VDC MAX						
	Electrical Area Classification	CLT GRD. DIV III		CLT GRD. DIV III						
	Proportional Band %	NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		NO SLOW FAST		
	Auto-Reset Mode	YES NO		YES NO		YES NO		YES NO		
	Rate Mode	YES NO		YES NO		YES NO		YES NO		
REMARKS	Auto-Manual By Pass	YES NO		YES NO		YES NO		YES NO		
	On Measurement Increase Instrument Output	INC. DEC		INC. DEC		INC. DEC		INC. DEC		
	Pipe & M'd Air Supply Reg.	YES NO		YES NO		YES NO		YES NO		
	Output Gage, 3/2" Size	YES NO		YES NO		YES NO		YES NO		
	Accessories or Special Features	NONE A		NONE A						
PURCH.	Manufacturer	FISHER		FISHER						
	Catalog No.	1151 DP-4-E-22-MB		1151 DP-4-E-22-MB						
	P.O. No.	A		A						
	Price									
	REV. DATE	CHGD MFG & ISSUE F/PURCH		DC 6-78		A				
REV. DATE	DELETE METER, ADD MODEL NO.		R6C 7-6-78		A					
	REV LINE No.		DC 9-12-78		A					
					A					

Per 8*
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Monsanto COMPANY		*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS		DIVISION		PLANT		*SPEC NO. IS-36		
LOCATION				AUTH NO.		DEPT OR AREA		SHEET 7 OF 1		
Instrument No.		FT-33A				FT-33B				
Service		PROD. GAS				PROD. GAS				
Equipment No. or Line No. & Size		H1-PRESS 1 1/2" PG-3" I		12		H1-PRESS 1 1/2" PG-3" I		12		
Process Material		PROD. GAS				PROD. GAS				
CASE	Blind, Indicating, Record, Control, Transmit		BLIND		1		BLIND			
	Mounting: Flush, Surface Yoke		2" YOKE				2" YOKE			
	CHART	Size and Type	X				X			
		Range								
	SCALE	Drive	Speed							
Size & Type		Range								
DIFFERENTIAL UNIT	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		4-20 MADC				4-20 MADC			
	OUTPUT To		FY-33A				FY-33B			
	Power Supply - Electrical, Pneumatic		24 VDC				24 VDC			
Electrical Area Classification		CLT GRD DIV				CLT GRD DIV				
CONTROLLER	Proportional Band %		X		X		X		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	
	Auto-Manual By Pass		YES NO		YES NO		YES NO		YES NO	
	On Measurement Increase Instrument Output		INC. DEC		INC. DEC		INC. DEC		INC. DEC	
	Pipe & Mt'd Air Supply Reg.		YES NO		YES NO		YES NO		YES NO	
REMARKS	Output Gage, 3/8" Size		YES NO		YES NO		YES NO		YES NO	
	Accessories or Special Features		NONE		1		NONE			
	SQ RT METER		1/2" NPT				1/2" NPT			
PURCH.	Catalog No.		1151 DP-A-E-22-MB				1151 DP-A-E-22-MB			
	P.O. No.		1				1			
	Price									
	Manufacturer		FISHER				FISHER			
REV. DATE	CHGD MFG R & ISSUED F/PURCH		DC 6-78		1					
	ADDED MODEL NO & FT-33B		RGC 7-5-78		3					
	REV LINE NO.		DC 9-12-78		3					
					3					

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4*
5*

Monsanto COMPANY LOCATION _____		*DIRECT OPERATED *PRESSURE REGULATING *VALVE SPECIFICATIONS		DIVISION		PLANT		*SPEC NO.		
				AUTH NO.		DEPT OR AREA		IS- 42 SHEET 1 OF 1 REV 1		
Valve No.		PCV-15				PCV-16				
Service		BACK-UP AIR				PRESS CNTRL				
Line Number & Size		1" LP		2		1" TA		2		
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				22				
	Max. Flow	22				SCFM				
	Units: SCFM, SCFH, GPM or #/Hr.	SCFM				SCFM				
	Fluid	LIQ.	(GAS)	STM	LIQ.	GAS	STM	LIQ.	(GAS)	STM
	Inner Valve Travel, % of Design Flow					5-15				
	ΔP Cv (Calc.) of Design Cond.									
Calculation Sheet No.										
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	
	Matl of Const (Diaph or Piston)	NEOPRENE				NEOPRENE				
	Lubricator									
	Isolating Valve									
	Packing									
Guiding	SKIRT	TOP	BTM	SKIRT	TOP	BTM	SKIRT	TOP	BTM	
Spring Setting		75 PSIG				75 PSIG				
*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.									
	Price									
REV. DATE	Δ	ISSUED FOR PURCH	DC	6-78	Δ					
	Δ	ADDED REV-16 FOR PURCH	RGC	7-577	Δ					
	Δ	REV. LINE No.	DC	9-1278	Δ					
	Δ				Δ					

Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO. IS- 45	
LOCATION				AUTH NO.	DEPT OR AREA	SHEET	REV
						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		
FLANGES	*Size & Type - W.N., S.O., Scrd., 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	④	ISSUED FOR PURCH	DC	6-27-78	④		
	①				⑤		
	②				⑥		
	③				⑦		

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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. IN. H2O	* BEIJA RATIO	* ORIF. DIAM 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	0.27991	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

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

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION	PLANT	SPEC NO. IS-45	
LOCATION				AUTH NO.	DEPT OR AREA	SHEET	REV
						3 OF	3
Instrument No.	FE-23		1				
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 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 #/ft³		3				
DENSITY @ NORM FLOW COND.	0.2725 #/ft³		3				
SUPERCOMP FACTOR							
GAS MOL. WT.	25.3		3				
VISCOSITY CP @ F.T.							
BETA RATIO							
ΔP INCHES WATER	100						
NORMAL FLOW CONDITIONS:							
FLOWING TEMP	750°F		3				
FLOWING PRESSURE	125 PSIG						
MAX. FLOW	5000 SCFM						
DENSITY #/ft³	0.2725						
ABNORMAL FLOW CONDITIONS:							
FLOWING TEMP	750°F		3				
FLOWING PRESSURE	47 PSIG						
MAX FLOW	5000 SCFM						
DENSITY #/ft³	0.1205						
MAXIMUM PRESSURE			3				
MAXIMUM TEMPERATURE		600 PSIG 950°F					
PROVIDE 1 SET CALCULATIONS FOR NORMAL FLOW CONDITIONS 3							
PURCHASING		VICKERY-SIMMS					
Manufacturer							
Catalog No.							
P.O. No.							
Price							
REV. DATE	ISSUED FOR PURCH		DC 6-78	3	Rev. LINE No.	DC 9/12/78	
	CORRECTIONS		RGC 6-29-78	3			
	CORRECTIONS		DC 7-26-78	3			
	DENSITIES & CONSTR MATL		RGC 8-28-78	3			

P. 10*
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Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO.
LOCATION				AUTH NO.	DEPT OR AREA	IS- 45 SHEET 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		
Line Size, Schedule		1 1/2" SCH 80		1 1/2" SCH 80		
SERVICE	Upstream Operating Conditions	Flowing Press. P ₁	350 PSIG	350 PSIG		
		Flowing Temp T ₁	750 °F	750 °F		
		DENSITY @ T ₁	.711	.711		
		Viscosity CP @ T ₁				
		DENSITY @ 60 F / 1 ATM	.067	.067		
		Supercompr. Factor @ T ₁				
	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., Scrd., Van Stone ⁽¹⁾	1 1/2" WELD NECK	1 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.			
	Type of Meter	DRY D/P	DRY D/P			
	Drain or Vent Hole	NONE	NONE			
REMARKS	Chart or Scale Range					
	Chart Factor					
	Calculation Sheet No.	SIMPLEX HOLDER	SIMPLEX HOLDER			
	TYPE ORIFICE PLATE	MODEL 500	MODEL 500			
PURCH.	ORIFICE PLATE SEAL UNIT	MS, 316 SS	MS, 316 SS			
	All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material					
	Manufacturer	DANIEL	DANIEL			
REV	*Catalog Number	705DS-	705DS-			
	Purchase Order Number					
	Price					
	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.					

FE-33A, 33B

E0040 P

LOW VOLUME HIGH PRESSURE PRODUCT GAS

9/5/78

PIPE, ORIFICE, AND METER DATA

ACTUAL PIPE DIAMETER	1.50000 INCHES
DRAIN OR VENT DIAMETER	0.0 INCHES

TYPE OF ORIFICE TAPS FLANGE

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

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4*

Monsanto COMPANY		*FLOW MEASURING *ELEMENT SPECIFICATIONS		DIVISION	PLANT	*SPEC NO. IS 45	
LOCATION _____				AUTH NO.	DEPT OR AREA	SHEET 2 OF	REV 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		.272 #/FT ³		A	
		Viscosity CP @ T_f					
		Density @ 60°F		.067 #/FT ³		A	
		Supercompr. Factor @ T_f					
		Steam Quality, %					
	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				
8* 9* th 7*	FLANGES	*Size & Type - W.N., S.O., Scrd., 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			
6*	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)		.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					
2 5*	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	①	ISSUED FOR PURCH	DC. 6-17-78	A			
	②	REVISED/CORRECTED	D.C. 7-26-78	B			
	③	REVISED/CORRECTED	D.C. 9-5-78	C			
	④	REV. LINE NO.	D.C. 7-12-78	D			

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
ORAIN OR VENT DIAMETER		0.0 INCHES
TYPE OF ORIFICE TAPS		FLANGE
MAX. DIFF. IN. H2O	* BETA RATIO	* ORIF. DIAM 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.	
LOCATION				AUTH NO.	DEPT	AREA	IS 46
							SHEET 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, 60 HZ	115V, 60 HZ	115V 60 HZ				
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	316 SS	316 SS	316 SS				
GROUNDING 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	316 SS	316 SS	316 SS				
CONNECTION SIZE-RATING	1/2" NPT	1/2" NPT	1/2" NPT				
PROCESS CONNECTION MATERIAL	316 SS	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 AG-141 RFI FILTER	NO	NO	NO				
PURCHASING							
Manufacturer	FISHER	FISHER	FISHER				
Catalog No.	LS III	LS III	LS III				
P.O. No.							
Price							
REV. DATE	0			1			
	1			2			
	2			3			
	3			4			

CS-2271-7M

Monsanto		ELECTRONIC TRANSDUCER		COMPANY		PLANT		SPEC NO.	
LOCATION		SPECIFICATIONS		AUTH NO.		DEPT AREA		IS. 46 SHEET 1 OF 1	
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	
SIGNAL	Up or Down Scale on Electrical Failure	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN
	Up or Down Scale on Burnout Failure	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN
	Measurement Input	T/C, RB, Other		T/C TYPE J		T/C TYPE J		T/C TYPE J	
	*Span & Units	0-500°F		0-500°F		0-500°F		0-500°F	
	From	TE-30		TE-31		TE-32		TE-32	
	Instrument Output	Range & Units		4-20MA DC		4-20MA DC		4-20MA DC	
ELEMENT	To	TI-30		TI-31		TI-32		TI-32	
	Power Supply - Electrical	115V, 60HZ		115V, 60HZ		115V, 60HZ		115V, 60HZ	
	Electrical Area Classification	GEN PURP		GEN PURP		GEN PURP		GEN PURP	
	Type	(TC) RESIST		TC RESIST		(TC) RESIST		(TC) RESIST	
	*Wire Material & Gauge	IRON-CONSTAN		IRON-CONSTAN		IRON-CONSTAN		IRON-CONSTAN	
	Length	9"		9"		9"		9"	
WELL	Insulator Type	CERAMIC		CERAMIC		CERAMIC		CERAMIC	
	I.S.A. Type	J-GROUNDED		J-GROUNDED		J-GROUNDED		J-GROUNDED	
	*Resistance Element Material	—		—		—		—	
	Resist. Bulb Dia. and Material	—		—		—		—	
	Well Material	316 SS		316 SS		316 SS		316 SS	
	PROCESS CONN.	Construction		PIPE COUPLG		PIPE COUPLG		PIPE CPLG	
ASSEMBLY	Size & Rating	3/4" NPT		3/4" NPT		3/4" NPT		3/4" NPT	
	Material	316SS		316SS		316SS		316SS	
	Length Below Thread or Flange "U"	7 1/2"		7 1/2"		7 1/2"		7 1/2"	
	Female Thread Size	1/2"-14 NPT		1/2"-14 NPT		1/2"-14 NPT		1/2"-14 NPT	
	Lagging Extension "T"	NONE		NONE		NONE		NONE	
	Stampons								
PURCHASING	Nipple & Union Length "A"	NONE		NONE		NONE		NONE	
	Thermocouple End - Thread Size	1/2"-14 NPT		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		1/2"-14 NPT	
	Ground Connection	YES		YES		YES		YES	
REV. DATE	Manufacturer	FISHER		FISHER		FISHER		FISHER	
	Catalog No.	LS111		LS111		LS111		LS111	
	P.O. No.								
	Price								
REV. DATE	△				△				
	△				△				
	△				△				
	△				△				

CS-2110-72

Monsanto		INSTRUMENT SPECIFICATIONS		PLANT		SPEC NO.	
LOCATION		PRESSURE SWITCH		AUTH NO.	DEPT	AREA	IS 47
							SHEET 1 OF 0
Instrument No.		PS-1B		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		1500 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					
Catalog No.		6 NN-K5					
P.O. No.							
Price							
REV. DATE		CHGD PS-17 to PS-18		RGC 6-28		4	
		LINE No.		DC 9-12-78		5	
						6	
						7	

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Monsanto COMPANY		INDICATING THERMOMETERS - THERMOWELL SPECIFICATIONS		DIVISION	PLANT	SPEC NO. IS 51		
LOCATION		AUTH NO. 9174		DEPT OR AREA		SHEET	REV	
GENERAL NOTES:		TI-13		TI-35				
INSTRUMENT NOS.								
THERMOMETER	Type	BI-METAL		GAS				
	Span & Units	50-550°F		200-1000				
	Dial Size	5"	EXONWH	4 1/2"	EXONWH			
	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				
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							
	REMARKS	THERMOWELL						
ALLOY ENGR. MODEL#		94-2601-U4 1/2"	3/4"-385L-U4 1/2"					
PURCH.	Manufacturer	ASHCROFT		ASHCROFT		DURATEMP		
	*Catalog No.	50EI		600B				
	P.O. No.							
	Quantity Required							
REV. DATE	Price							
	△							
	△							
	△							

Monsanto					PLANT	SPEC NO.
LOCATION _____		SPECIFICATIONS PRESSURE-VACUUM RELIEF VALVE		AUTH NO.	DEPT AREA	SHEET REV. <u>1</u> OF ____
Instrument No.	PSV-1					
Service	COMPRESSED AIR					
Equipment No. or Line No. & Size	V-1 AIR RECEIVER					
Process Material	350 PSIG AIR					
Valve Size	1 X 2					
Source Of Relieving Press.						
Source Of Relieving Vac.						
Normal Operating Temp.	300° F					
Normal Operating Pressure	0-350 PSIG					
Factory Set Pressure	360 PSIG					
Factory Set Vacuum						
Capacity of Valve	1409 SCFM @ 10%					
Capacity Required						
Thru Valve	750 SCFM					
Orifice I.D. Required	0.123 SQ. IN.					
Orifice I.D. Selected	0.196 SQ. IN.					
MATERIALS OF CONSTRUCTION						
Body						
Trim						
Seat Inserts						
Weatherhood						
Type Inner Valve						
Connections						
INLET	1" 300# RF FLG					
OUTLET	2" 150# RF FLG					
REMARKS						
PURCHASING	Manufacturer		Farris			
	Catalog No.		2GEAL2			
	P.O. No.					
	Price					
REV. DATE	△ 1			△ 4		
	△ 2			△ 5		
	△ 3			△ 6		
				△ 7		

CS-6 (11-73)

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CS-6 (11-73)

[illegible]

[illegible]

[illegible]

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION	PLANT	SPEC NO.
LOCATION				AUTH NO.	DEPT OR AREA	IS- 91 SHEET OF
Instrument No.		TAL-25		TAL-26		
Service						
Equipment No. or Line No. & Size						
Process Material						
LOCATION						
CASE NO.		UA-101		UA-101		
POSITION		10		11		
CARD SPEC.						
TYPE, CONTACT, ANALOG, DEV		ANALOG		ANALOG		
INPUT FORM						
CONTACT						
ALARM ON OPEN, CLOSED						
ANALOG						
SET PT NO.1		2.8VDC		2.8VDC		
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						
LINE 2		LO TEMP		LO TEMP		
LINE 3		WELL No. 2		WELL No. 3		
LINE 4						
OPTIONS						
FIRST OUT SEQUENCE		YES		YES		
DISCRETE OUTPUT, TEST INHIBIT						
PURCHASING		FISHER		FISHER		
Manufacturer		B-4		B-4		
Catalog No.						
P.O. No.						
Price						
REV. DATE						
A						
A						
A						
A						

Monsanto COMPANY		INSTRUMENT SPECIFICATIONS		DIVISION	PLANT	SPEC NO. IS-91
LOCATION		AUTH NO.	DEPT OR AREA	SHEET OF		
Instrument No.		TAL-32		AAH-1	AAH-2	
Service						
Equipment No. or Line No. & Size						
Process Material						
LOCATION						
CASE NO.		VA-101		VA-101	VA-101	
POSITION						
CARD SPEC.						
TYPE, CONTACT, ANALOG, DEV		ANALOG		CONTACT	CONTACT	
INPUT FORM						
CONTACT						
ALARM ON OPEN, CLOSED				OPEN	OPEN	
ANALOG						
SET PT NO.1						
ALARM ON RISING, FALLING						
SET PT NO.2						
ALARM ON RISING, FALLING						
DEVIATION						
SET PT(VOLTAGE DIFF)						
NAME PLATE						
COLOR		WHITE		HI-CO	HI-CO	
LINE 1		LO-TEMP		IN	IN	
LINE 2		PRODUCT GAS		BLOG	FIELD	
LINE 3		TO INCUBATOR				
LINE 4						
OPTIONS						
FIRST OUT SEQUENCE		YES		YES	YES	
DISCRETE OUTPUT/TEST INHIBIT						
PURCHASING	Manufacturer	FISHER		J4	J4	
	Catalog No.	B-4				
	P.O. No.					
	Price					
REV. DATE	⑧			④		
	①			⑤		
	②			⑥		
	③			⑦		

