REAL-TIME PREDICTIVE MODELING

FOR THE

GAS PIPELINE DISPATCHER

by

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INTERCOMP

The concept of predictive modeling for "What if?" and contingency analysis is well established for electric power dispatching. We are currently completing the first such system for gas pipeline network dispatching. The model accounts for fully transient flow of gas through pipelines and equipment. Based on flow forecasts, 16 hour predictions of pressure, horsepower, and fuel are made. The system continually tracks the SCADA data base so that the line-pack distribution is current. In addition to answering "What if?" questions, the system supports risk analysis, leak detection, and strategy evaluation. The model can be used for pack and draft analysis, compressor fuel optimization, and operator training.

INTRODUCTION

Many electric power dispatch centers currently utilize real-time predictive simulation as an operating aid. A computer model is used to test proposed operating strategies before their actual implementation, thus the concept is often referred to as on-line load flow analysis.

To implement this concept within a power dispatch center, a computer model of the power generation/distribution system is built and interfaced to the Supervisory Control and Data acquisition (SCADA) system. The model is driven with operating and status information present in the SCADA data base and is interfaced with the SCADA console and CRT to allow rapid interactive response with the dispatcher.

The model answers questions posed by the Power Dispatcher; such as: "What is the new system status if a key breaker trips?" Accurate and responsive answers to "What if?" questions as this give the Dispatcher added understanding of the present operation; and more importantly, insight into future operating conditions.

There exists a real and current need to use the same real-time predictive modeling concept as an aid in the operating of complex pipeline systems. Each and every day, problems arise which the pipeline operator or his supervisor must deal with, given only limited information. The resulting decisions determine to a large extend how efficient the pipeline operation will be and whether or not demand curtailment will occur.

In electric power distribution systems, little energy is "stored" and transients tend to damp out rapidly. In gas pipelines, however, the pipeline itself acts as a storage vessel, adding "capacitance" which greatly lengthens the system response time. As a result significant lead times are necessary before a gas demand "sees" a change in flowrate made a a remote source. The lead times can often be measured in hours, compared with milliseconds in electric systems. The net result is that the gas dispatcher must plan ahead and make major supply changes or demand curtailments well in advance of critical situations.

Fig. 1 shows an example which demonstrates the concept of lead time in gas pipelines. Two supplies are present in the system, a gas plant which supplies gas at relatively low cost and a storage field which can supply gas at peak demands, but at higher cost. Two demands are present: an interruptable (at high cost) industrial sale and a non-interruptable residential. Peak demands from the residential sale may necessitate interrupting the industrial, but a lower cost alternative is to bring additional gas from storage. However, several hours are required for increases in supply to be "felt" at the demand points. To achieve cost effective operation, the dispatcher must forecast the high demand many hours before it actually occurs and increase supply with sufficient lead time to satisfy demand.

A real-time system model would provide the pipeline operator with a predictive capability, which can be used very effectively in solving day to day operating problems. INTERCOMP currently has such a Real-Time Predictive Model (RTPM) in its final stages of completion. The system is being developed as an aid to dispatching gas in a major pipeline in New Zealand. The RTPM continually tracks the SCADA system data base so that it is always "in step" with the current state of the pipeline system. In addition to answering "What if?" questions, the system supports contingency (risk) analysis, leak detection, and strategy generation/ evaluation. Typical applications of the RTPM are pack and draft analysis, compressor fuel optimization, and operator training.

The following sections of this paper outline briefly the Real-Time Predictive Model concept, and discuss some of the benefits it can add to a gas dispatch system.

Dispatching Objectives

The supply to a typical pipeline is often derived from one or more gas processing plants. Gas originating from gas wells or associated gas from crude production is processed in the treatment plants. The cost efficiency of these plants depends in part upon stability of delivery rate. Under emergency conditions, gas can be flared at the plant in order to avoid shut-down. Demands on the pipeline (as on almost any pipeline with several users) are projected to be variable. Since the pipeline is both a small reservoir as well as a conduit, overall efficiency will be improved if its line-pack capabilities can be effectively used.

The operator of the gas pipeline is faced with a classic "dispatching" problem. He must achieve a balance between supply and demand whicle maintaining an efficient operation. His dispatching objectives can be summarized by the following:

- Balance supply and demand
- Maintain deliveries
- Minimize plant changes
- Minimize gas flaring
- Minimize fuel consumption (compressors)
- Detect and control disasters (leaks)
- Detect data inconsistencies
- Detect deterioration of flow efficiency
- Minimize future risk
- Plan for contingencies

In order to meet these objectives the operator must be continually aware of past, current, and future performance of the system.

Operational Resources

Fortunately the operator has a good deal of flexibility and several operational resources at his disposal to satisfy the foregoing objectives. These consist of:

- The ability to flare gas at supply locations
- Curtailment of gas demand
- Compressor scheduling
- Supply flexibility with proper notice
- System line-pack
- Real-time information through SCADA
- Monitoring future performance with the RTPM

These resources allow the operator to examine the alternatives intelligently and best utilize the flexibilities of the pipeline system to meet his immediate goals.

With proper notice, gas supply rate at the supply locations can be slowly increased or decreased. The requests for increased gas demand must be balanced against supply. In some cases, the operator can curtail demand if supply is not available. Sudden, unexpected cut backs in demand can cause flaring in order to prevent plant shut-down if the line is fully packed.

The Role of Scada

Perhaps the most important resource available to the Gas Pipeline Dispatcher is information on the current stature of the pipeline and its equipment. In a modern Dispatch Center, this information is furnished by the Supervisory Control and Data Acquisition (SCADA) system. Real-time information in continually brought back by SCADA, giving the Dispatcher a "snapshot" of system performance.

The use of SCADA within both the electric power and pipeline industry is well known. Fig. 2 is a block diagram representing the application of SCADA to a simple pipeline system. As shown in the figure, SCADA is comprised of a central computer and console, along with remote terminal units which serve as the system's data gathering "arms".

Numerous companies market SCADA systems; hardware and software can be obtained separately or a SCADA vendor can furnish a complete "package". In the case of the New Zealand project, both hardware and basic SCADA software were furnished by TRW Controls, Inc. in Houston, Texas.

The SCADA master stations consists of dual Data General Nova 3/D central processors interlinked to provide automatic failover operation. Two operator's consoles are present, each equipped with two full color CRT's, alphanumeric keyboard, special function keyboard, and a data logger. A complete set of computer peripherals is also provided for program maintenance.

The Role of the RTPM

However, useful it is, the SCADA system only tells the dispatcher the real-time status of his pipeline - that is, what is happening now. To do his job efficiently, the dispatcher needs one additional resource, a computer based real-time transient model of his system, coupled to his real-time data base. From this, he can derive what the predicted effects of a given mode of operation will be, thereby gaining tremendous insight into the operation of his system. The predictive capability, furnished by the RTPM, provides the operators with on-line automatic forecasts of future system performance.

The Real-Time Predictive Model provides a key management link between dispatching objectives and operational resources. Its ability to predict the future allows the operator to plan the best schedule of alternatives to meet his future needs.

The RTPM provides the operator with a teammate whose job it is to support the following functions:

- Continuous monitoring of future performance
- Planning tool with "What if?" capability
- Study-Training tool
- Fuel optimization
- Contingency analysis
- Strategy utilization

In addition, the teammates's job is to check all the telemetered data for consistency, keep a lookout for deterioration of line efficiency or the development of leaks, and watch for unexpected supply or demand changes. In general, if anything the operator ought to notice occurs, the teammate must alert him to this fact. Operating on a computer tied to the SCADA system, the RTPM will do all these tasks and stand ready to support "What if?" analysis with the operator. Moreover, the RTPM can do it so quickly that the dispatcher never has to feel that his teammate is the bottleneck in planning.

THE PREDICTIVE MODEL CONCEPT

The ability to predict pressure changes that result from the transient flow of gas in the pipeline system is the heart of the RTPM. The predictive model used for this purpose is called TGAS. The TGAS program provides solutions to the system of partial differential equations governing fluid flow in pipeline networks. The solution technique is stable and efficient, and when compared to field data in difficult problems, achieved excellent results. A detailed description of the program itself and the solution technique is discussed elsewhere.[1]

In order to understand how predictions are made in real-time, consider the single pipeline shown in Fig. 3 with one supply and one demand. The operator knows that supply will be constant for the 16 hours, but he forecasts that demand will vary. He submits this forecast to the RTPM whcih then asks TGAS to make a pressure prediction. TGAS's prediction is displayed by the RTPM as a trend with alarm limits. He finds that the maximum allowable pressure limit (MAOP) is not violated at the supply point, but the pressure is predicted to fall below the contract minimum at the demand point.

The operator must then request a modification in future supply and/or demand forecast in order to balance the system. Each new forecast it "Tested" using TGAS through the RTPM to make sure that no alarm limits are reached in the future. This planning capability is called "Test Mode" and provides a basic "What if?" feature to the operator.

The RTPM uses TGAS and real-time information from the Supervisory Control and Data Aquisition System (SCADA) to monitor the system continuously. The SCADA data base is refreshed every 15 seconds. This information is saved by the RTPM which periodically provides new predictions about the future performance of the system.

Based upon the current forecast/schedule and current system state, the RTPM periodically provides an "automatic prediction" of future condition of the system with no intervention from the operator.

When the RTPM is automatically monitoring the system in this fashion, it is functioning in Active Mode. In addition to monitoring, the active mode supports several automatic features discussed later. Active mode operation of the RTPM is separate from its use as a planning "What if?" tool.

The monitoring function depends heavily on good and accurate forecasts of supply and demand, as well as schedules of operating equipment and other parameters such as temperature. The demand forecast is developed from customer requests, historical performance, weather data, and other factors. This forecast is normally updated once a shift, or more often as required. The equipment and parameter schedule is usually not modified very often, but it provides the operator with the ability to adjust key background parameters.

Predictive Alarms

In the course of providing automatic prediction of system pressures, the RTPM may detect that a major system constraint is violated. Examples are, violation of pipeline maximum allowable operating pressure (MAOP) or failure to meet a contract minimum sale pressure at a given future time. If the RTPM predicts such a future condition, a predictive alarm is generated and the operator is alerted. If the alarm still exists after two hours it will be reissued. If an alarm condition corrects itself, it is automatically removed from all alarm lists.

RTPM/SCADA Operation

Fig. 4 gives an overview of the relationship between the RTPM, SCADA, and the actual pipeline system. The SCADA system provides a 15 second scan of the pipeline system by polling each Remote Terminal Unit (RTU). The data obtained on each scan is stored in the SCADA Data Base until requested by the RTPM. The SCADA executive supports all console operations including function buttons and CRT display.

RTPM acquires real-time data from SCADA in Active mode and updates the "Current State" of the system. Using a base state, forecast, and system configuration, TGAS provides a prediction of future performance. The results of this prediction are available to produce alarms, trends, or summary tables.

In Test mode the base state required by TGAS can be the Current State of the system or an "Archived" state from some previous pipeline operational condition. "Test Cases" are generated by editing the forecast to represent a "What if?" question. The results of the Test mode predictions are also available to produce alarms, trends, or summary tables, but in some cases with slightly different formats from thos in Active mode.

Results from both Active and Test mode are passed to the SCADA executive for display on the console. The RTPM is an information system only and does not send supervisory commands back out to the pipeline RTU's.

RTPM HARDWARE

The RTPM operating hardware consists of the operator consoles, loggers, video copiers, the NOVA 3/D central processor unit (CPU) and associated peripherals, AP-120B array processor, and the Inter-Computer Communications Subsystem which provides the link between the SCADA System and the RTPM. A schematic of a typical system configuration is shown in Fig. 5. A peripheral switch (PS) is provided so that the RTPM has access to the card reader and line printer, although they are seldom used.

The consoles provide the focal point for interaction between the operator and the RTPM. However, the consoles are not directly tied to the RTPM CPU , but are instead coupled to whichever SCADA CPU is currently prime. The results generated by the RTPM must be passed through the prime SCADA CPU for display on any console.

Each of the three operator consoles consists of two color CRT's, an alphanumeric keyboard (ANK), and a special function keyboard (SFKB). This hardware supports the man-machine interface through which the dispatcher communicates with the RTPM and SCADA systems. The SFKB is assigned to either the RTPM or the SCADA system by depressing a SCADA mode or RTPM mode button. In addition to simplifying the software support of the panel this also allows the RTPM to have an extended set of function buttons beyond the basic set allocated to its operation.

Each CRT supports SEVEN colors: white, green, yellow, magenta, red, cyan, and blue. Displays are made up from alphanumeric, standard, and special symbols. Black and white video copy devices are available so that trends may be "copied" on demand after selecting one CRT and "freezing" a particular page.

The NOVA 3/D central processor with 64K words of memory, a 10 megabyte moving head disk system with one fixed and one removable platter, and a terminal printer make up the basic RTPM computer configuration.

To this configuration is also interfaced on an AP-120B array processor. In addition, the card reader and line printer can be manually switched to either the RTPM CPU or SCADA CPU #2. Both the RTPM CPU and the SCADA CPU #2 have floating point hardware so that they can be manually switched for backup purposes.

The array processor is a peripheral arithmetic computing unit designed for high speed performance of floating point multiplication and addition. The unit is intended to work in parallel with a host computer, in this case the RTPM NOVA 3/D. Because of its special internal structure, the array processor is particularly well suited to the performance of large numbers of repetitive floating point arithmetic calculations. Since TGAS can make particularly good use of this "number crunching" capability, it is housed in the AP-120B.

Man/Machine Interface

The RTPM is primarily an information system that responds interactively to Dispatcher requests. As with SCADA, the commnication interface must be human-engineered for highly effective dispatcher/RTPM interaction.

The dispatcher communicates with the RTPM through the SCADA console. A set of special buttons for the RTPM are placed on the console special function keyboard (SFKB). The SFKB is shown in Fig. 6. These buttons allow rapid, one button access to the special RTPM operating modes available, and simplify the man/machine interface to a great extent. A brief functional description of the RTPM function keys is given in Table 1.

Most of the information resulting from the operation of the RTPM will be presented to the dispatcher on the CRT screen. The RTPM utilizes three basic output formats to convey information to the dispatcher:

- o Tabular summaries
- o Alarm report summaries
- o Trend displays

The operator is most familiar with tabular summaries and alarm reports displayed to him as one or a series of CRT images or "pages". Tabular data is the format normally used by SCADA to convey information. Trend displays are plots of a quantity, such as pressure or flow, versus time for a given location. From a human engineering viewpoint, graphical displays cause greater retention of more critical data than a CRT tabular page format. In addition, the multiple colors available on the CRT allow the dispatcher to conveniently compare the results of several test or "What if?" cases.

An example trend display is shown in Fig. 7. Although reproduced here in black and white, the display utilizes all of the seven colors avaiable on the operator's CRT. In the upper left hand block appear seven solid squares, representing each one of the seven colors available. The first square is designated "PRESS @ AB", meaning the trend line shown in that color is the pressure at location "AB". The next block down lists one or more special functions available; if the cursor is moved next to "tabulate", for example, the trend lines on the CRT display will be summarized as tabular values.

The block in which the trend line is shown has a dotted vertical line through its center. This line corresponds to the present time, the horizontal distance to the left representing 10 hours of past history, the distance to the right representing 14 hours of prediction. The horizontal dashed line represents an alarm limit; if a trended quantity falls below this limiting value, a <u>predictive alarm</u> is generated. The vertical (y-axis) scales of the graph are adjusted automatically to keep the graph on a scale large enough so that the trend information can be grasped readily.

<u>RTPM FEATURES</u>

Besides its function as an on-line predictive model, the RTPM supports several other basic capabilities:

- o Test Mode
- o Strategy Generation
- o Contingency Analysis
- o Operator Training
- o Leak Detection

The most common operator usage of the RTPM is expected to be as a planning tool in <u>Test Mode</u>. If customers request increase or decrease in delivery, if the gas supply has an upset, if predictive alarms are generated, or if real-time data deviates from forecast, then the RTPM may be used to prepare a new future operating plan. The operator will develop this new plan by sequentially testing several alternatives until the best solution is found.

In Test Mode, the RTPM will answer a "What if?" question posed by the Dispatcher in the form of a schedule of changes to the system. The changes can either be keyed in directly as a trial "forecast/schedule" or obtained by modifying a schedule archive saved by the computer system.

The results of test cases are displayed using CRT trending of key variables over the past and into the future. In addition, tabular and alram summary CRT pages can be produced. The entire Test Mode operation is summarized in Fig. 8. Multiple test cases can be prepared on a single trend display. The number of test cases that may be compared on a single page will depend upon the number of variables being trended. The maximum number of trends is limited by color selection to seven. A system overview is also available through the summary tables generated for each test case.

Strategy Generation

In order to help the dispatcher in making a decision, the RTPM, upon sensing an alarm, will automatically begin searching for feasible corrective measures. This is accomplished by automatically evaluating a series of strategies. A strategy is a collection of predefined actions which represent modification to the current system forecast flows/equipment schedules. Examples are alternatives such as additional supplies, gas storage, control setting changes, curtailments, and the like.

Often more than one corrective strategy exists in which case it is important to select the best one, that is the one with the lowest cost,least impact on demands, or the one which satisfies some other criterion. The RTPM automatically tests a series of strategies and presents only those which are feasible (that is, those that don't generate alarms) to the dispatcher. He may then select a corrective action from a series of feasible alternatives when an upset occurs.

Contingency Analysis

One of the primary objectives in dispatching a pipeline system is its operation in a smooth and reliable manner. For example, a gas transmission network serving industrial and residential customers cannot afford a severe outage. An additional function of the RTPM is to periodically make a risk or contingency analysis of the gas system. At set intervals RTPM will simulate the sudden loss in turn of major gas supplies or equipment beginning from the predicted system status at a fixed time in the future. By applying all possible alternate resources (i.e. strategies) in the minimum feasible time after the loss, the RTPM will determine the survival time in the event of a major upset. In the event that the system operation is projected to be such that a risk of failure exists, the RTPM will compute for each supply or equipment center a risk window, i.e., the time interval in the future during which a sudden loss of that supply/equipment will cause unavoidable system failure. then the dispatcher will be alerted to this risk, so that he can evaluate it in terms of the duration of the risk window to determine whether corrective action is necessary. If so, he has ample lead time during which he may be able to intervene with a strategy to close a window.

Operator Training

A key application of the RTPM will be its use in training gas dispatchers. Normally dispatchers are given minimal formal training and learn to operate the system through "on the job" training and apprenticeship. It commonly takes many months (and sometimes years) to produced an experienced operator. This is due in part to the fact that the key learning situations occur occasionally in the normal operation of a gas system. New operators tend to gain the most experience from stress or "upset" situations which occur infrequently.

To use RTPM for training, a series of training scenarios are developed from operating situations which have happened previously. These are posed as hypothetical problems to which the trainee must respond. The trainee views the situations as historical trends or summaries generated by the RTPM operating in Test Mode. The trainee then submits a response to the situation as a series of commands to the RTPM, which predicts the results of the trainee's problem solutions. Both the instructor (supervisor) may view the gas pipeline's simulated response (as predicted by the RTPM) and make appropriate changes to the trainee's strategy, or move to a new problem. The procedure is summarized in Fig. 9.

In a few weeks of being confronted with problem situations and trying various responses, a novice dispatcher can see the equivalent of several years of operation.

Leak Detection

A very desirable side benefit of coupling TGAS, the transient fluid flow model which forms the basis of the RTPM, with real-time data from the SCADA system is automatic detection and location of leaks. The operating information being acquired from the SCADA system is analyzed using TGAS with two methods, termed:

- Model Assisted Volume Balance (MAVB)
- Model Assisted Leak Location (MALL)

Both approaches utilize the pressure, temperature, and flow data from SCADA, but in slightly different ways.

The Model Assisted Volume Balance is an enhancement of the traditional volumetric balance technique of leak detection. Using a transient flow model to analyze the real-time data from the SCADA system, great improvements can be made in detection time over other state-of-the-art techniques. an improvement of 100 fold or more in detection speed can be attained over the standard volume balance.

The Model Assisted Leak Locator uses real-time pressure and flow data to detect and approximate the location of a leak. The data is fed into the transient fluid flow model in such a way as to force the model to agree with the telemetered information. The presence of a leak in the pipeline forces a similar leak to occur in the model, whose relative magnitude and approximate location is then reported to the dispatcher as an alarm.

A key advantage of these leak detection procedures is that they are entirely automatic, utilizing the information contained in the SCADA system data base, and require no analysis on the part of the pipeline dispatcher.

Compressor Fuel Optimization

The predictive capabilities of the RTPM can be utilized to develop a compressor operating schedule which reduces the fuel used for gas transmission. The fuel burned to fire compressors is gas which is processed but which cannot be sold, and as a result represents a large direct operating cost for the system. Under steady operations, little fuel can be saved as shown in Fig. 10. However, the schedule developoed must also minimize frequent machine start-up and shut-down cycles to avoid mechanical problems and maintenance cost. Using the RTPM the Dispatcher can try various compressor operating schedules as test cases over a give forecast period. Compressor horsepower and fuel usage predictions are generated by the RTPM as standard trends. By generating several alternative schedules on a trial and error basis the dispatcher can determine whether the current operating schedule reduces fuel use or not, as shown in Fig. 11. Substantial savings in systems with large variations in daily load flow are not unrealistic, according to previous studies.[3]

SUMMARY

1. INTERCOMP is in the final stages of completing a Real-Time Predictive Model (RTPM) for a gas distribution system in New Zealand.

2. The Real-Time Predictive Model acquires data on the current operating state of the pipeline from a Supervisory Control and Data Acquisition (SCADA) system. The system continually tracks the operation of the pipeline using the SCADA information and is always "in step" with the real-time pipeline status.

3. The RTPM furnishes 16 - 24 hour predictions of pipeline system pressures, line-pack, compressor horsepower, and other important data on a continuous basis. This information is made available to the dispatcher in the form of trends and summarized on the SCADA console CRT.

4. The RTPM supports "What if?" or Test Mode capability in which effects of proposed operating strategies can be evaluated before implementation.

5. The RTPM also supports risk (contingency) analysis, strategy generation, and leak detection as standard features. Typical applications include pack and draft analysis, operator training, and compressor fuel optimization.

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2. Archer, David; Dupont, Todd; Krueger, Kathryn A.; and Rachford, Henry H.,Jr.; "Modeling Pipeline Operation with Changing Gas Composition", presented at Pipeline Simulation Interest Group Meeting, San Antonio, Texas, October, 1979.

3. Rachford, Henry H.,Jr.: "Care Can Reduce Gas Pipeline Fuel Use", Oil and Gas Journal, July 16, 1973, pp. 93 - 96.

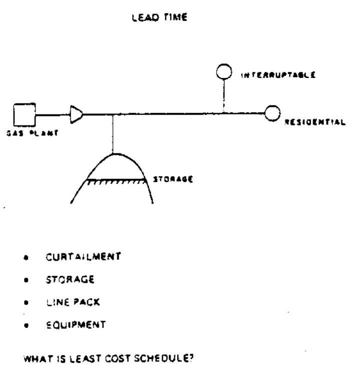

FIGURE 1—LEAD TIME

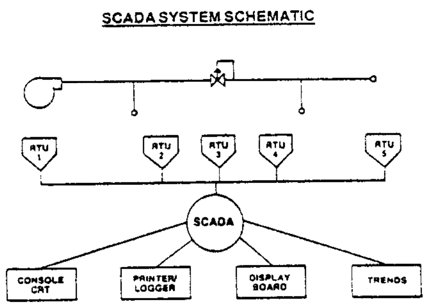

FIGURE 2—SCADA SYSTEM SCHEMATIC

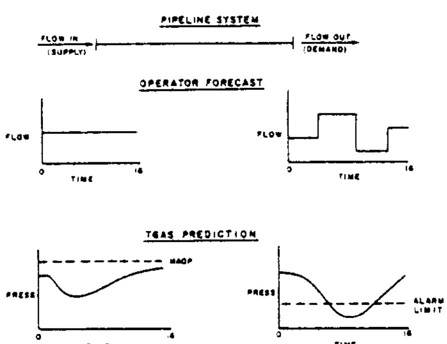

FIGURE 3—PREDICTIVE MODEL CONCEPT

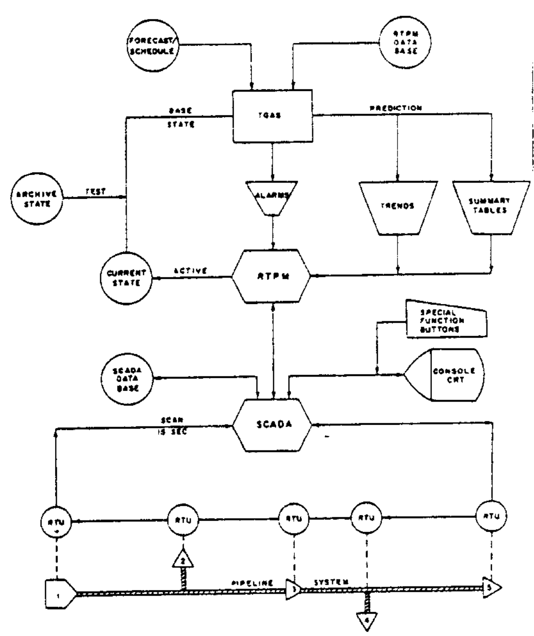

FIGURE 4—RTPM OPERATION OVERVIEW

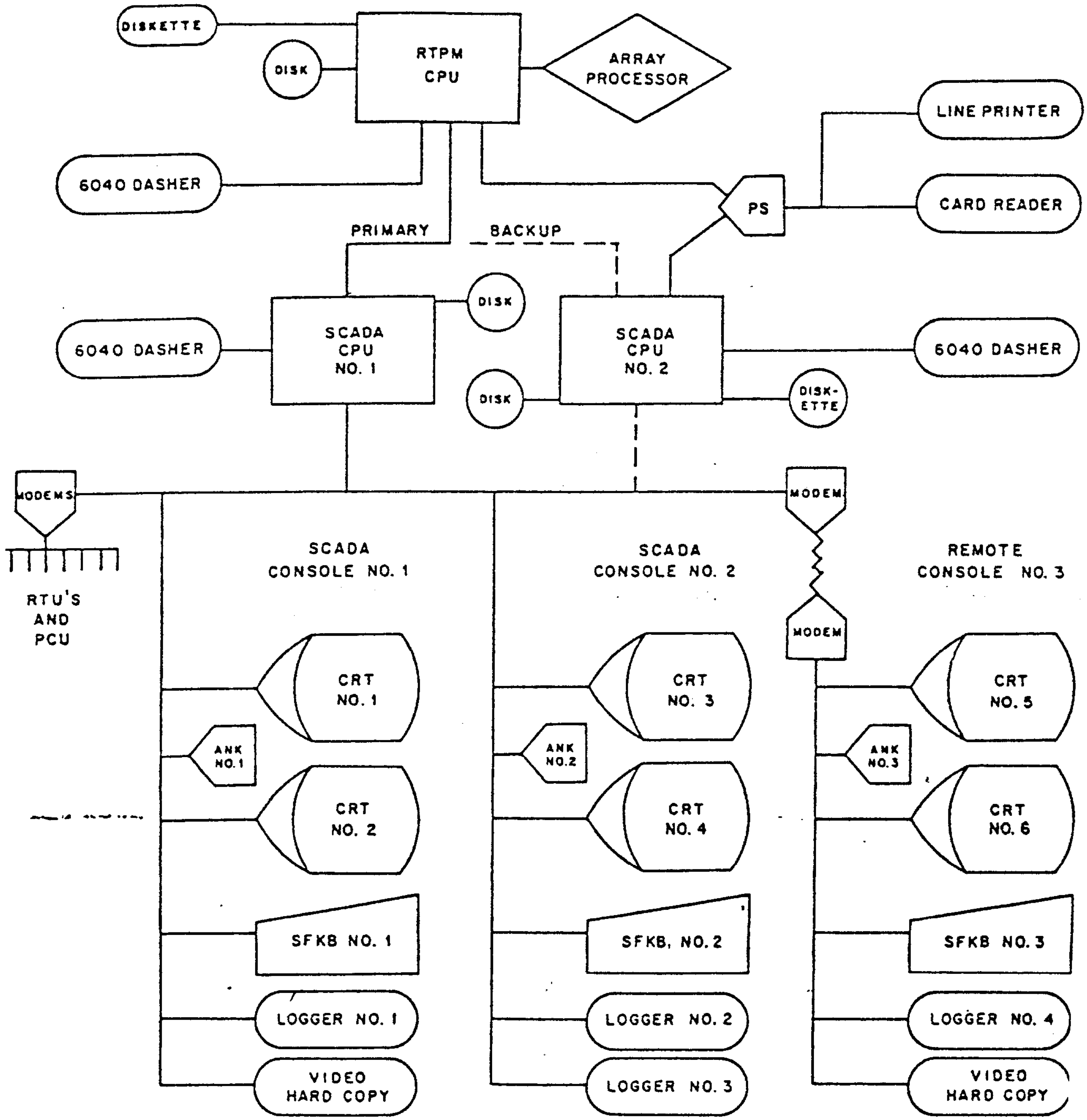

FIGURE 5—OVERALL SYSTEM SCHEMATIC

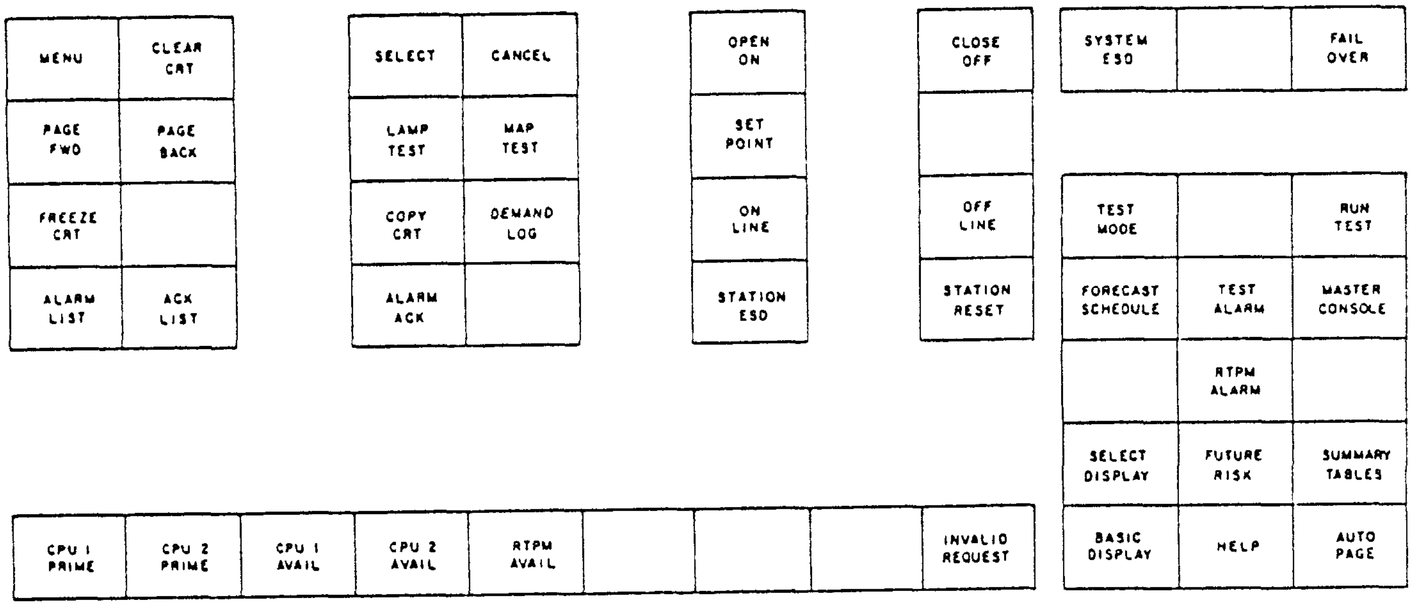

FIGURE 6—SPECIAL FUNCTION KEYBOARD

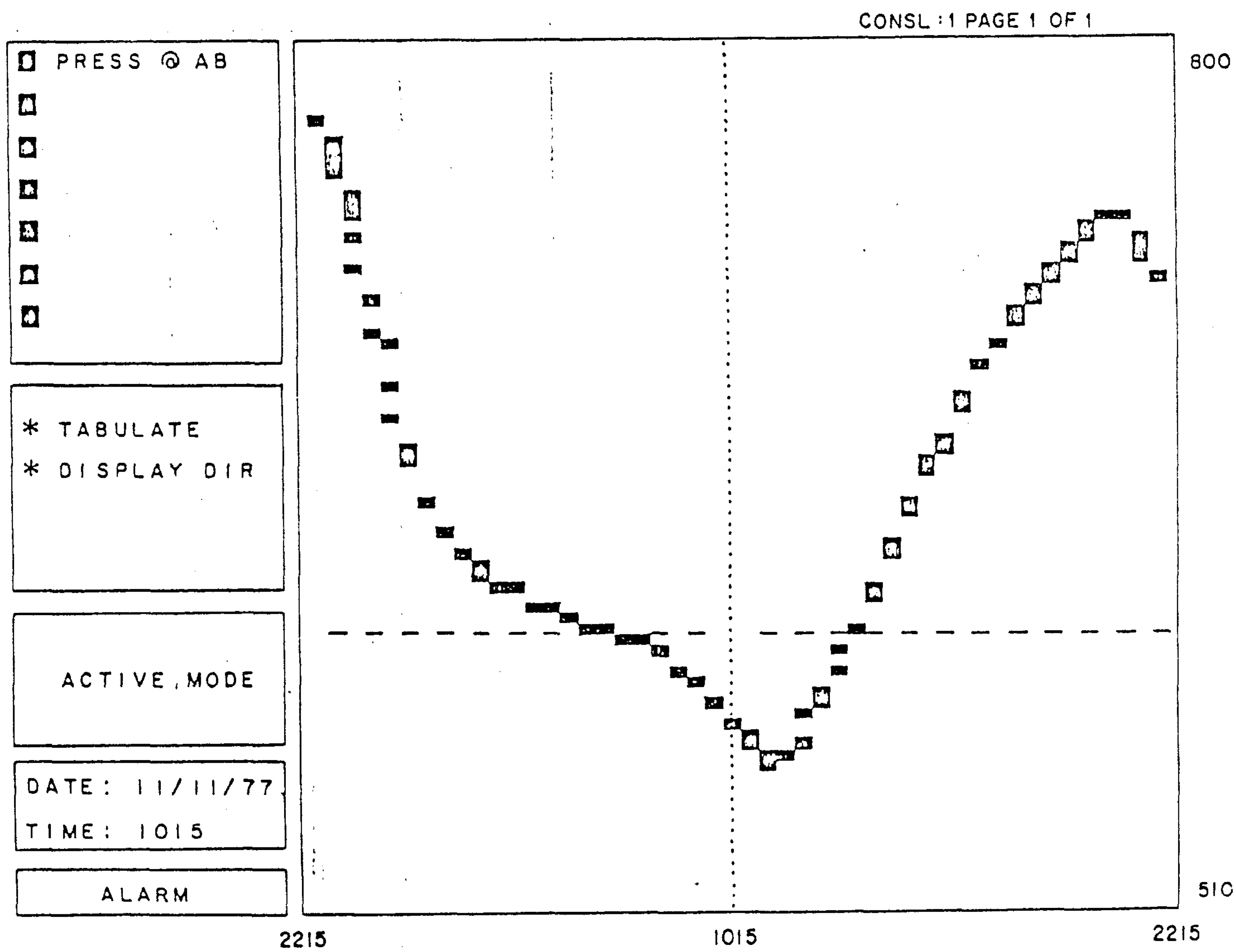

FIGURE 7—ACTIVE MODE TREND

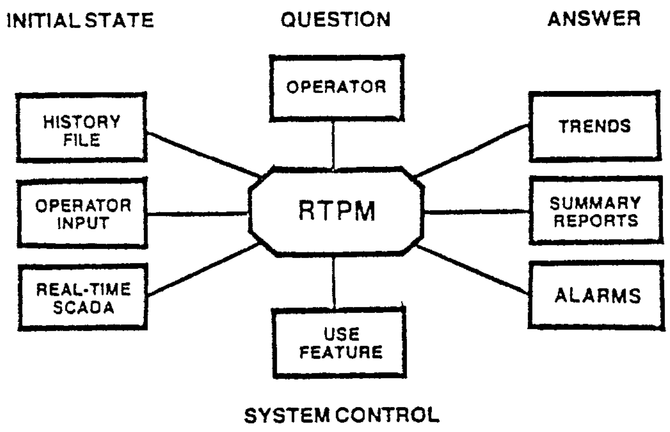

FIGURE 8—SYSTEM CONTROL

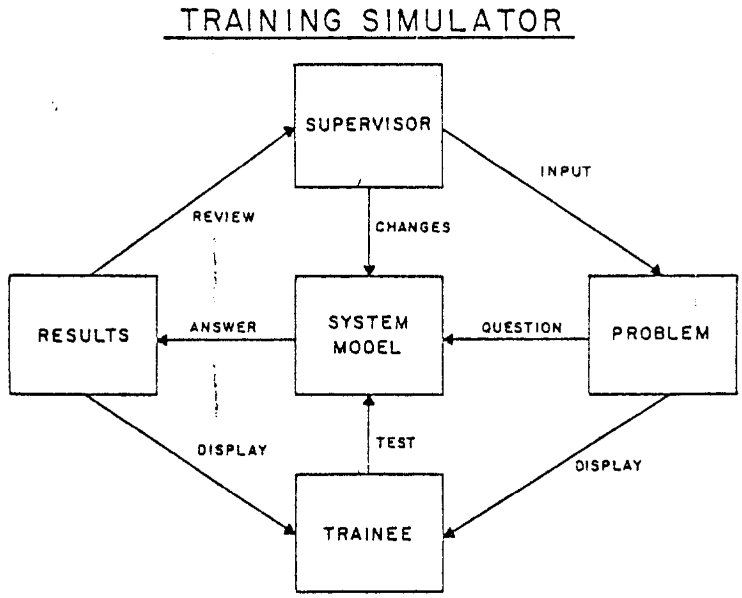

FIGURE 9—TRAINING SIMULATOR

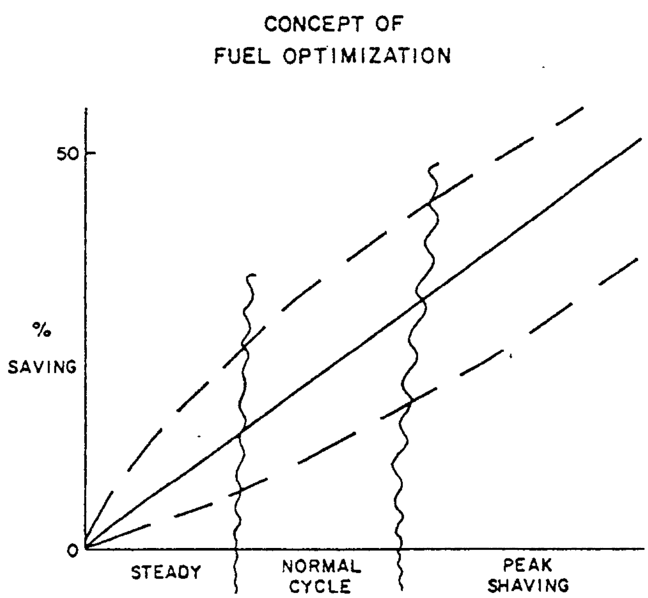

FIGURE 10—CONCEPT OF FUEL OPTIMIZATION

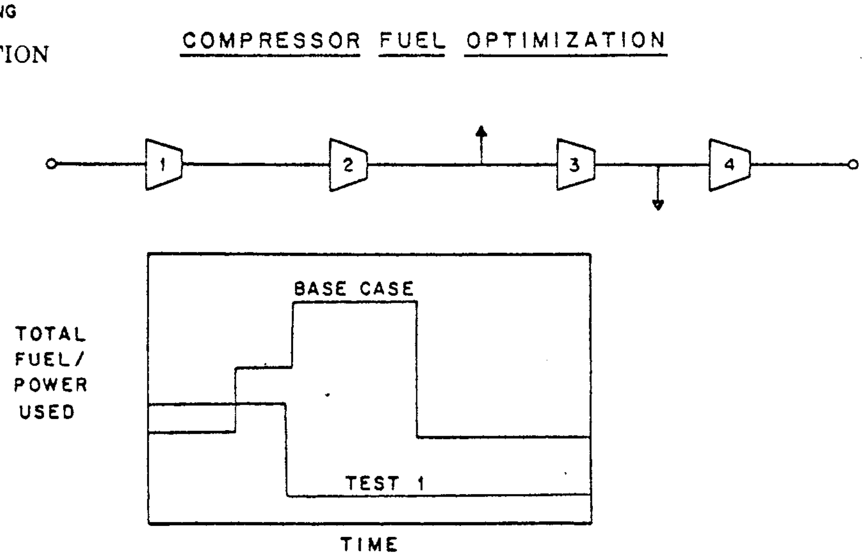

FIGURE 11—COMPRESSOR FUEL OPTIMIZATION

TABLE 1—RTPM SPECIAL FUNCTION KEYS

BUTTON	FUNCTION
TEST MODE	Initiates or terminates RTPM test mode. It is backlighted when in test mode.
RUN TEST	Initiates the exectuion of the current test case.
FORECAST/SCHEDULE	In test mode initiates the modification of the forecast/schedule by bringing up a directory of functions. In active mode this initiates a review of the current forecast/schedule.
TEST ALARM	Backlighted when alarm conditions exist in the last test run. Depressing the button will bring a list of test alarms.
MASTER CONSOLE	When selected allows the operator at that console to adopt active forecasts and schedules.
RTPM ALARM	When this button is backlighted, it indicates that RTPM has detected one or more Active Mode alarm conditions. Depressing the button will bring up a directory of unacknowledged alarms.
SELECT DISPLAY	Pressing this button will bring up a directory of displays which the dispatcher can select for display on the CRT.
FUTURE RISK	Brings up a risk summary table showing the results of the last contingency analysis. The button is backlighted if there are risk alarms.
SUMMARY TABLES	When depressed brings up the first of a series of summary tables on the selected CRT.
BASIC DISPLAY	This button will bring up a short automatically paged sequence of preselected pages which show the most useful information about the status of the pipeline system.
HELP	Brings up a directory of functions which the operator can select to give him detailed procedures to aid him in the use of the RTPM.
AUTO PAGE	Used to cycle multi-page displays or to stop such cycling.