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MASTER INFORMATION DATA ACQUISITION SYSTEM

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FIGURES

MASTER INFORMATION DATA ACQUISITION SYSTEM

A. INTRODUCTION

At present, nuclear plant operators must rely on long lists, memory, drawings and legwork to determine if it is appropriate to release work to the plant. This takes excessive time and places the operator under stress to perform the task quickly. This increases the potential for mistakes. These complexities can be reduced by an information system that provides real-time component and work status, technical information, and safety information required to determine if work should be released for execution.

The Master Information Data Acquisition System (MIDAS), being developed and implemented at the Fast Flux Test Facility, is a computerized data base management system that maintains real-time status of components affected by work, maintains real-time work status, provides component technical and safety information and integrates the components functionally. Real-time refers to a 60-second update and retrieval capability. Components are defined as instruments, valves, dampers, breakers and equipment.

B. MIDAS PHYSICAL CONSTRUCTION

MIDAS' physical architecture is composed of a large main frame host computer accessed by a remote intelligent terminal. The terminals are configured as multi-drop clusters utilizing synchronous communication with the main frame computer. Each cluster contains a controller, disc drive, printer and one or more terminals. Figure 1 depicts the physical MIDAS system.

C. MIDAS SOFTWARE

The software structure of MIDAS is contained in three parts (Figure 2):

- MIDAS transaction software
- MIDAS Component Index (MCI) data base
- Work Control Log (WCL) data base

The transaction software is written in COBOL and the data bases are designed using DMS 1100.

MIDAS transaction software maintains the central intelligence and control for the system. This software provides edit, report and query features. The specific functions of these features are shown on Figure 3.

The MCI stores component technical and safety information. The data in the MCI is categorized as definition, design, function, safety and integration. Figure 5 is a schematic representation of the MCI structure.

The components in the MCI are integrated as a function of physical location, design, safety and functional relationships. Physical location, design and safety parametrical integration is an inherent integration of any data base that provides data element select criteria for reports and queries. Functional relationship integration is provided for in MIDAS via Functional Equipment Group (FEG) categorization.

FEG is a hierarchical configuration representing component function and interrelationship. The hierarchical structure is system, subsystem (from an operational point of view), process and function (Figure 6), Plant Piping and Instrument Diagrams (P&IDs) are scoped and labeled to determine their hierarchy (Figure 7). After scoping is complete, the P&ID components

are attached to their respective FEG(s), Figure 8. FEG grouping provides for Out-of-Service classification (i.e., component status), specifies component impact potential and standardizes the component interrelationship for consistent communications.

The WCL stores work documents and affected components information. The data in the WCL is categorized as definition, processing, safety, status and integration information. Figure 4 is a schematic representation of the WCL structure.

Specific data elements in the WCL are automatically input in the WCL records by the MCI. These data elements are Functional Equipment Group and Technical Specification. Automatic data element input by the MCI provides component verification and assures reliability of information. That is, when a component is entered into the WCL, the MCI verifies the components existence. If the component exists, then the MCI returns with the appropriate data information. If the component does not exist in the data base, then the system flags a warning to the user so that appropriate action can then be taken.

D. USER/MIDAS INTERACTION

The user interacts with MIDAS via queries and reports. Search/Report MCI and Search/Report WCL provide data base query capability. Reports are provided as a function of specific report requests.

Search and report queries allow the user to compose a multi-level select, scan and sort request as a function of specific data elements in each data base. The request defines a specific subgroup of records within a data base, either MCI or WCL, to be reported to the user. (Figures 9 and 10 display the Search/Report MCI and the Search/Report WCL screens respectively).

The MCI and WCL reports are processed as on-line, on-line batch, and batch, depending on the complexity and requirements of the specific report (Figure 11).

The reports are designed to provide the operator with the necessary technical and plant status information to enhance his work release decision-making.

E. SUMMARY

MIDAS provides real-time work and component status as a function of the Work Control Log (WCL). Status is maintained and tracked with regard to Tag-Out status, Out-of-Service status, and document status. Component integration and technical and safety information is provided by the MIDAS Component Index (MCI). This information is provided directly to the user upon request. This information is also provided directly to the WCL as a function of component input to the WCL document prior to the documents release for execution.

REFERENCES

1. William L. Livingston, "The Impact of Three Mile Island on Process Control Computer Technology", Control Engineering (May 1980).

2. Abdo A. Husseiny and Zeinab A. Sabri, "The Identification of the Impacts of Maintenance and Testing upon the Safety of LWR Power Plants", Quarterly Progress Report, submitted to Sandia Labs., LWR Safety Technology Program (July 1979).

3. D. E. Dickey, "A Human-Engineered Reactor Control Panel", Nucleonics, 18(12):80, 82 (December 1960).

4. J. R. Gabriel, "Automated Reasoning About Plant Failure Analysis. Plant Representation Databases", Argonne National Laboratory Intra-Laboratory Memo, (April 1981).

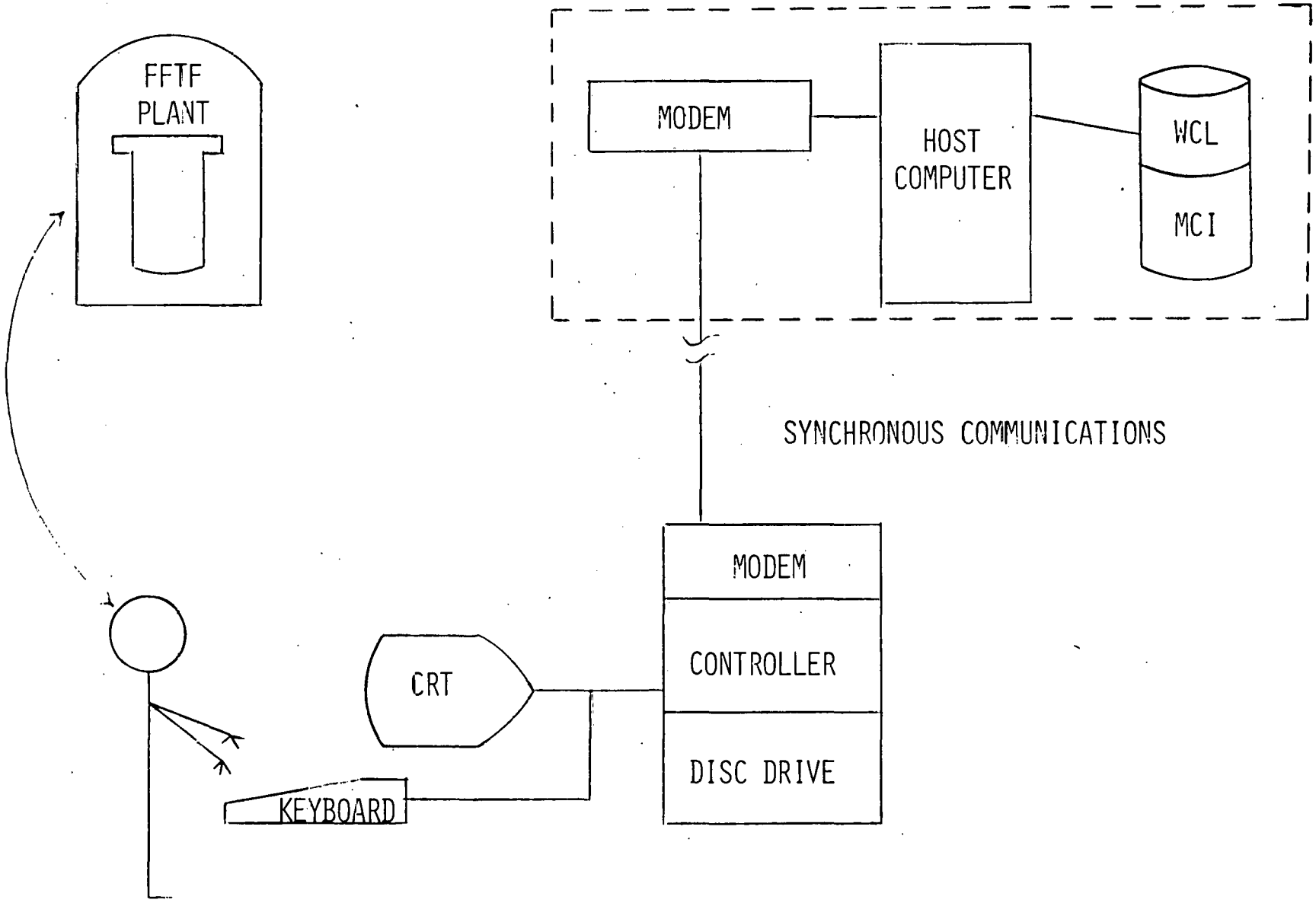


FIGURE 1. MIDAS PHYSICAL MAKEUP

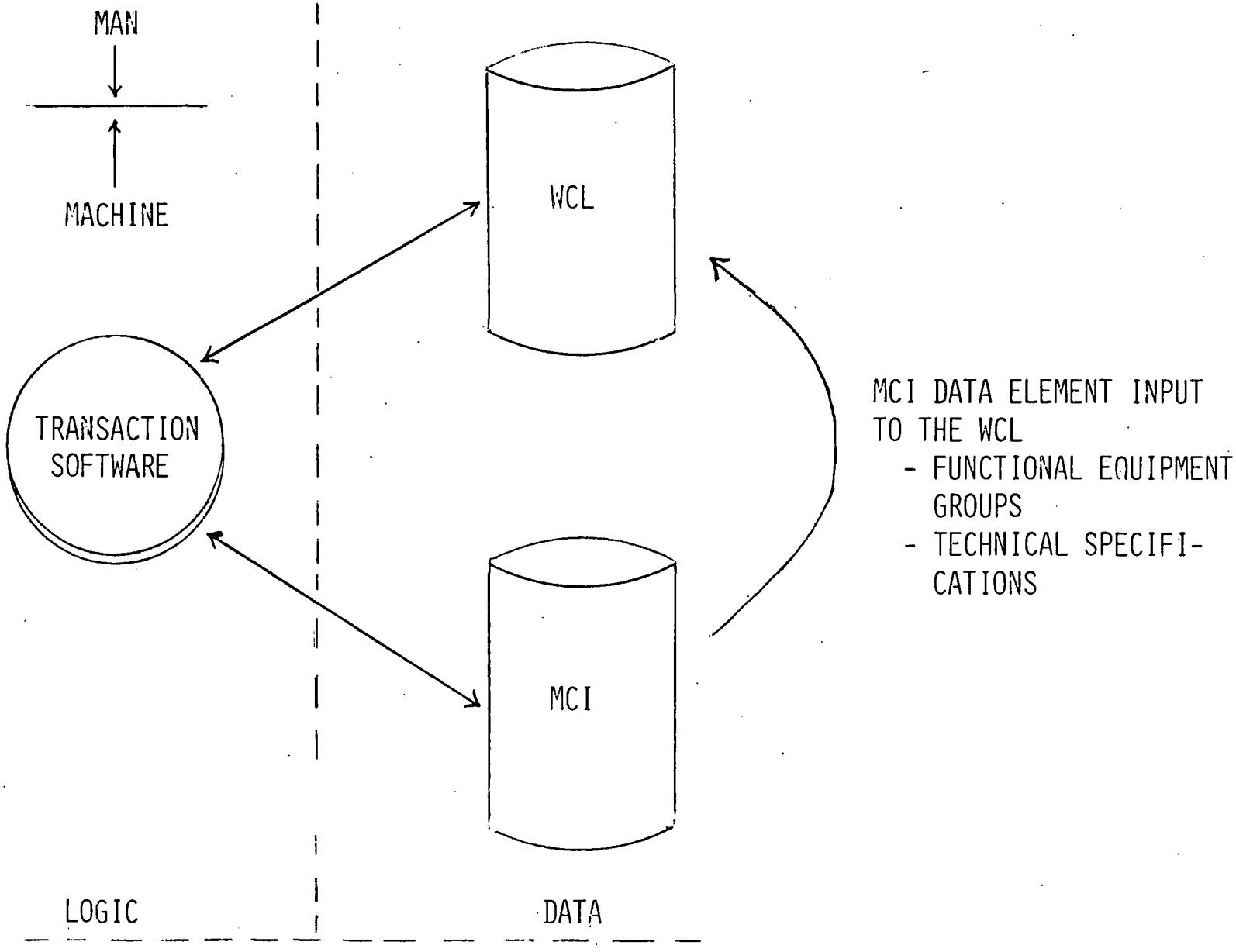


FIGURE 2. MIDAS SOFTWARE

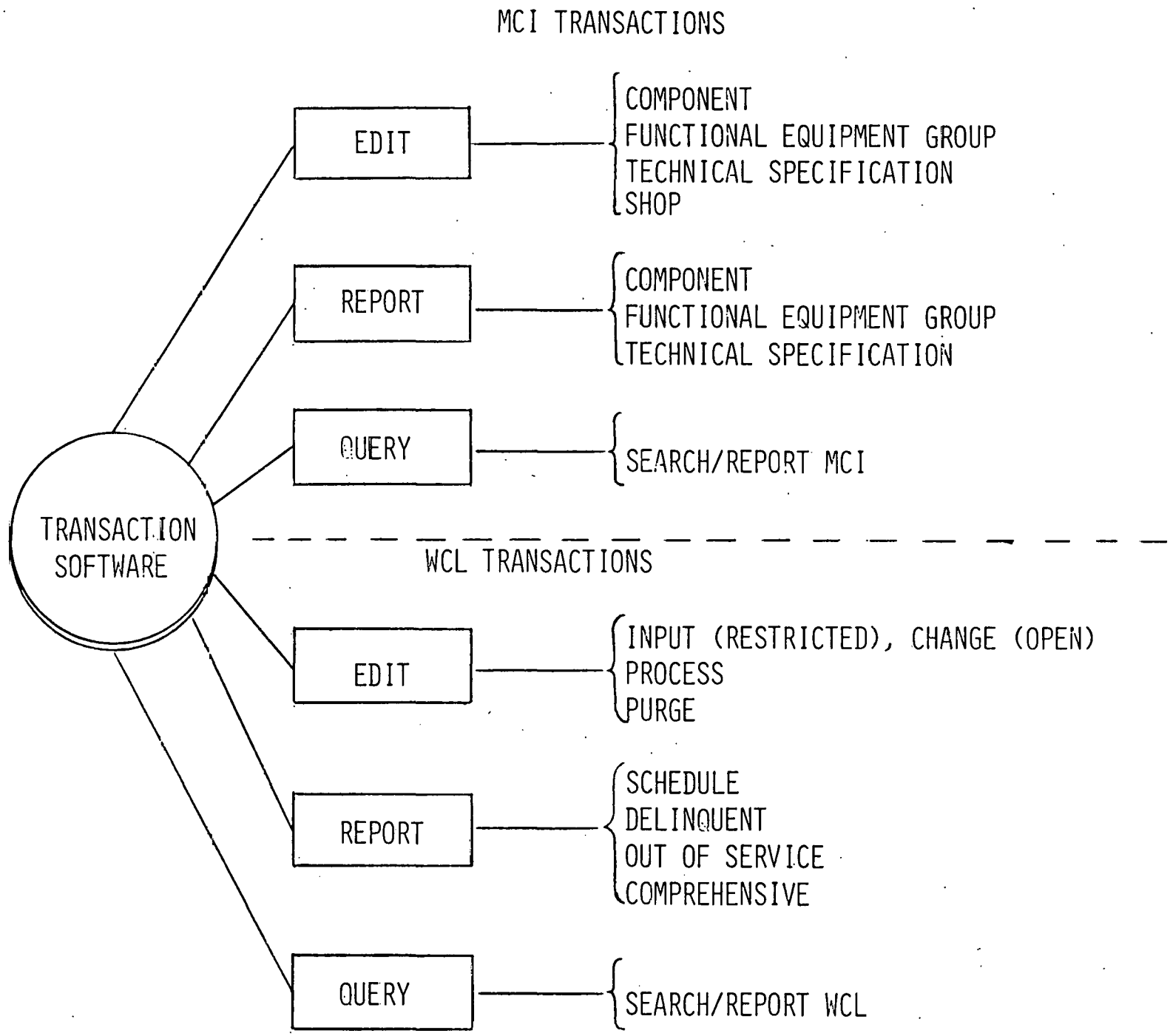


FIGURE 3. TRANSACTION SOFTWARE FUNCTIONS

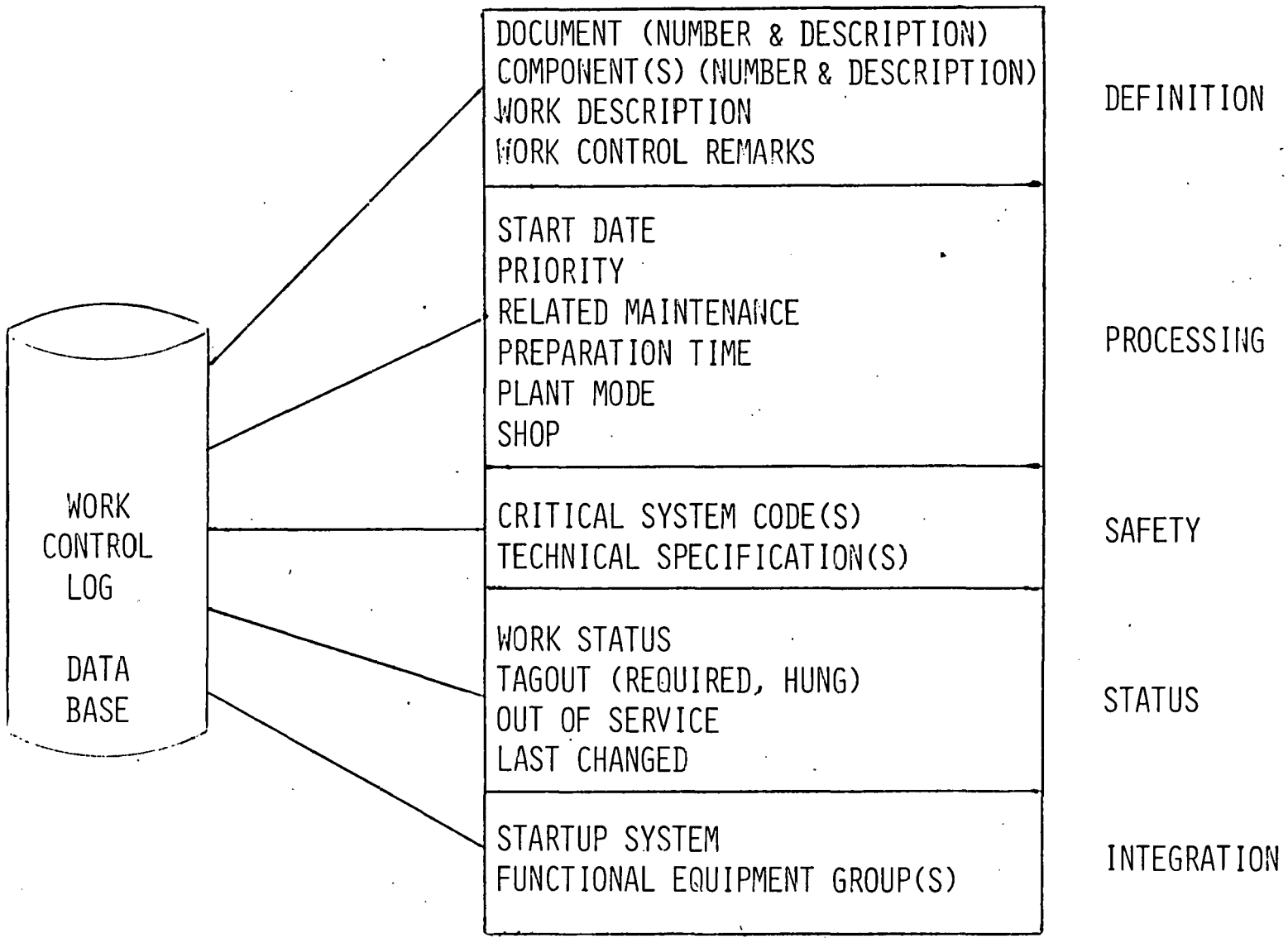
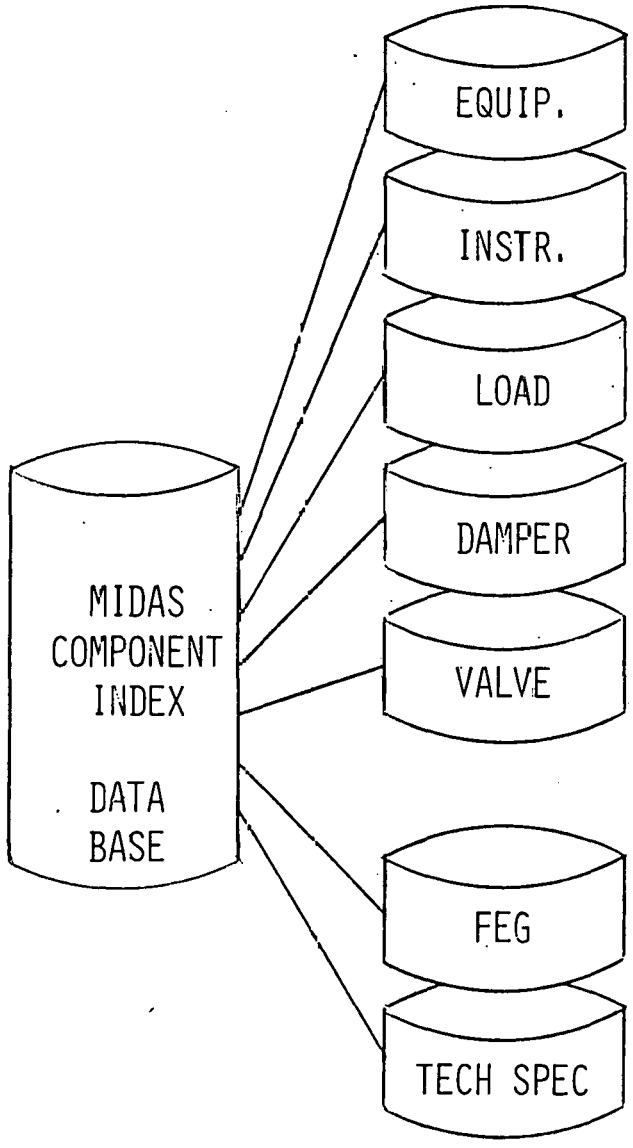


FIGURE 4. WORK CONTROL LOG DEFINITION



COMPONENT (NUMBER, TYPE, DESCRIPTION) LOCATION (BUILDING, CELL) POWER INTERRUPT CABLE NUMBER	DEFINITION
VOLT RATING POWER RATING PHYSICAL CHARACTERISTICS FAILURE POSITION	DESIGN
SCHEMATIC NUMBER LOOP/LOGIC DIAGRAM SOLENOID/PNEUMATIC DIAGRAM PIPING & INSTRUMENTS DIAGRAM	FUNCTION
TECHNICAL SPECIFICATION CRITICAL SYSTEM CODE	SAFETY
LOOP NUMBER SYSTEM FUNCTIONAL EQUIPMENT GROUP	INTEGRATION

FIGURE 5. MIDAS COMPONENT INDEX DEFINITION

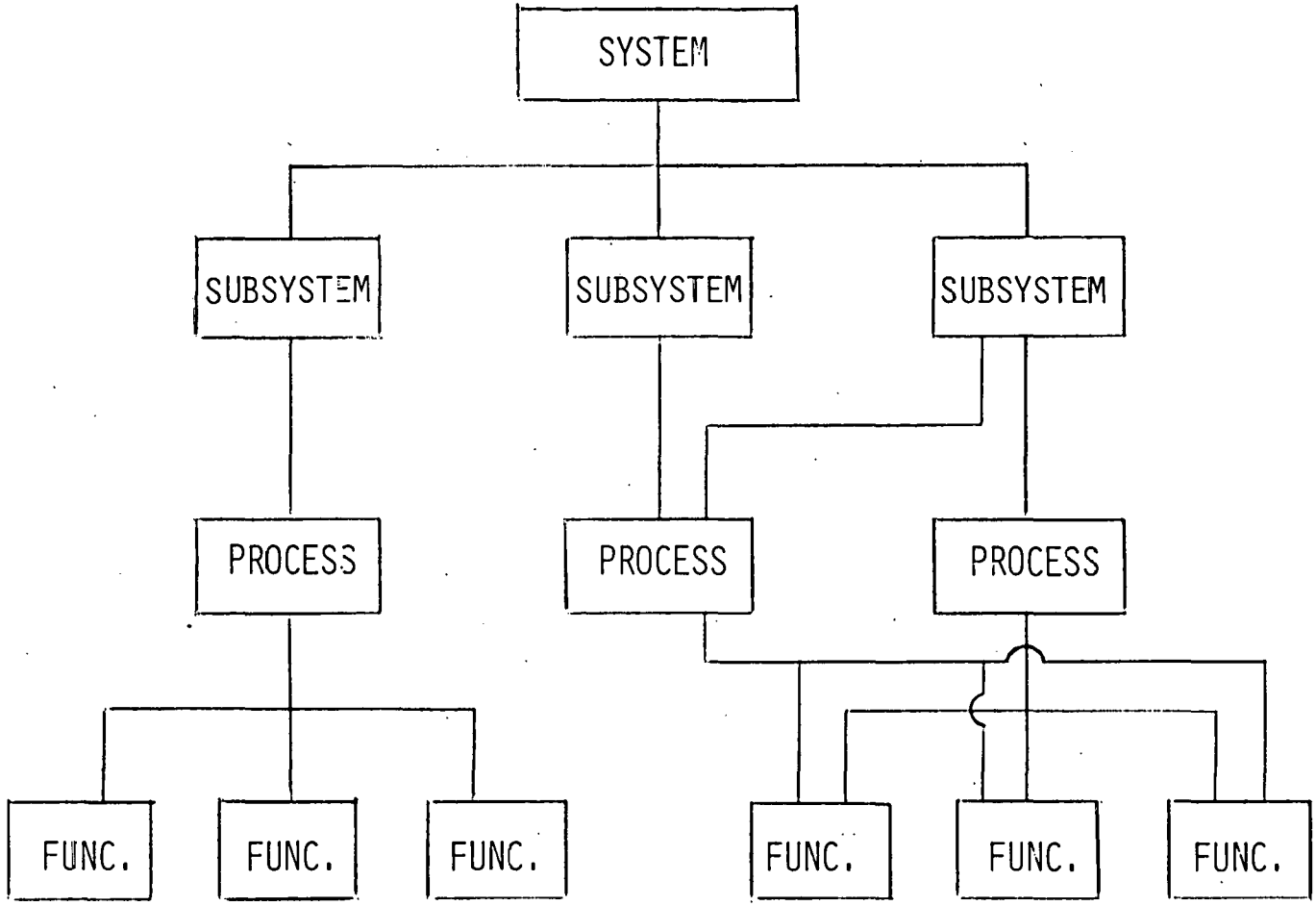


FIGURE 6. FEG HIERARCHICAL STRUCTURE

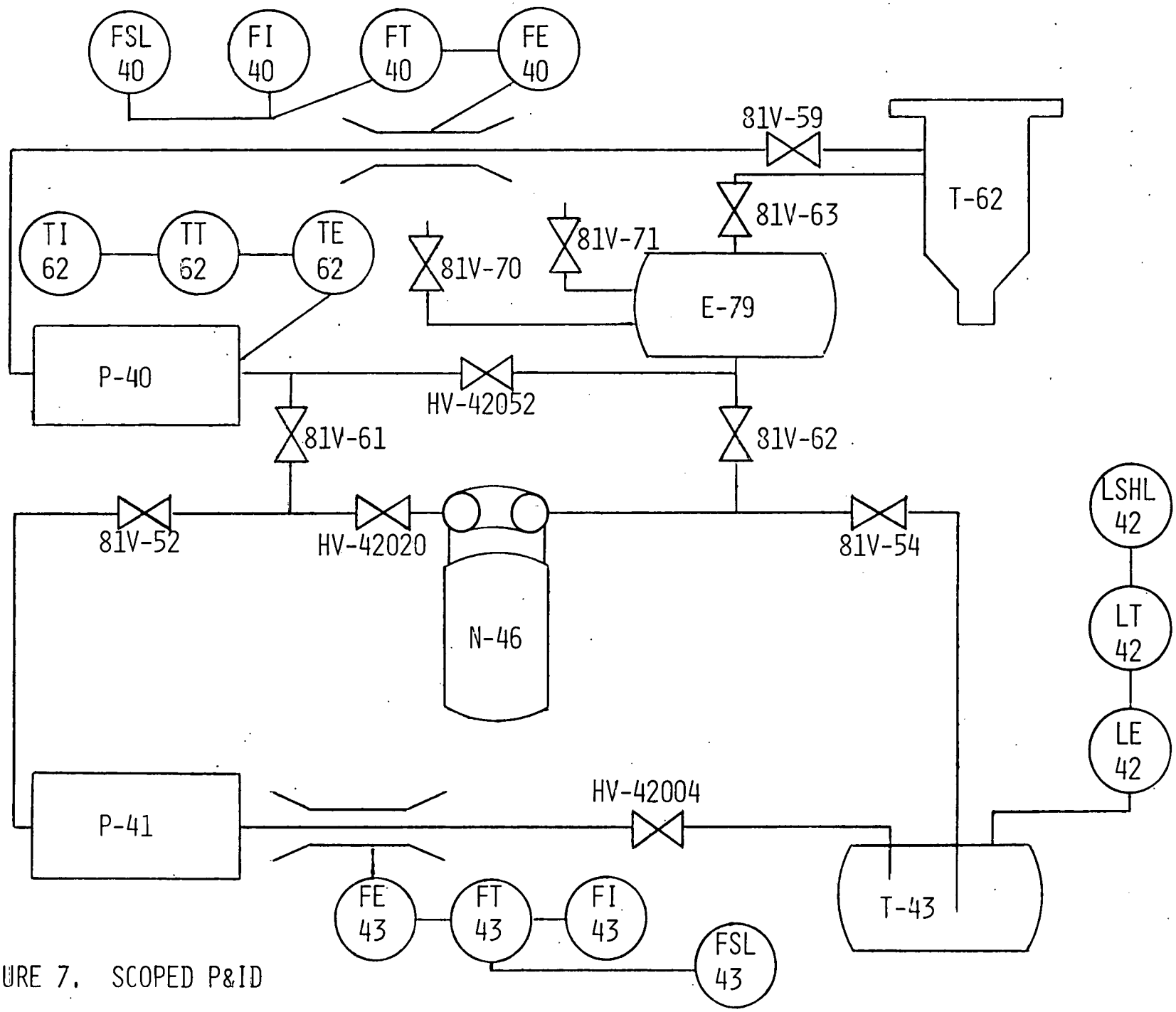


FIGURE 7. SCOPED P&ID

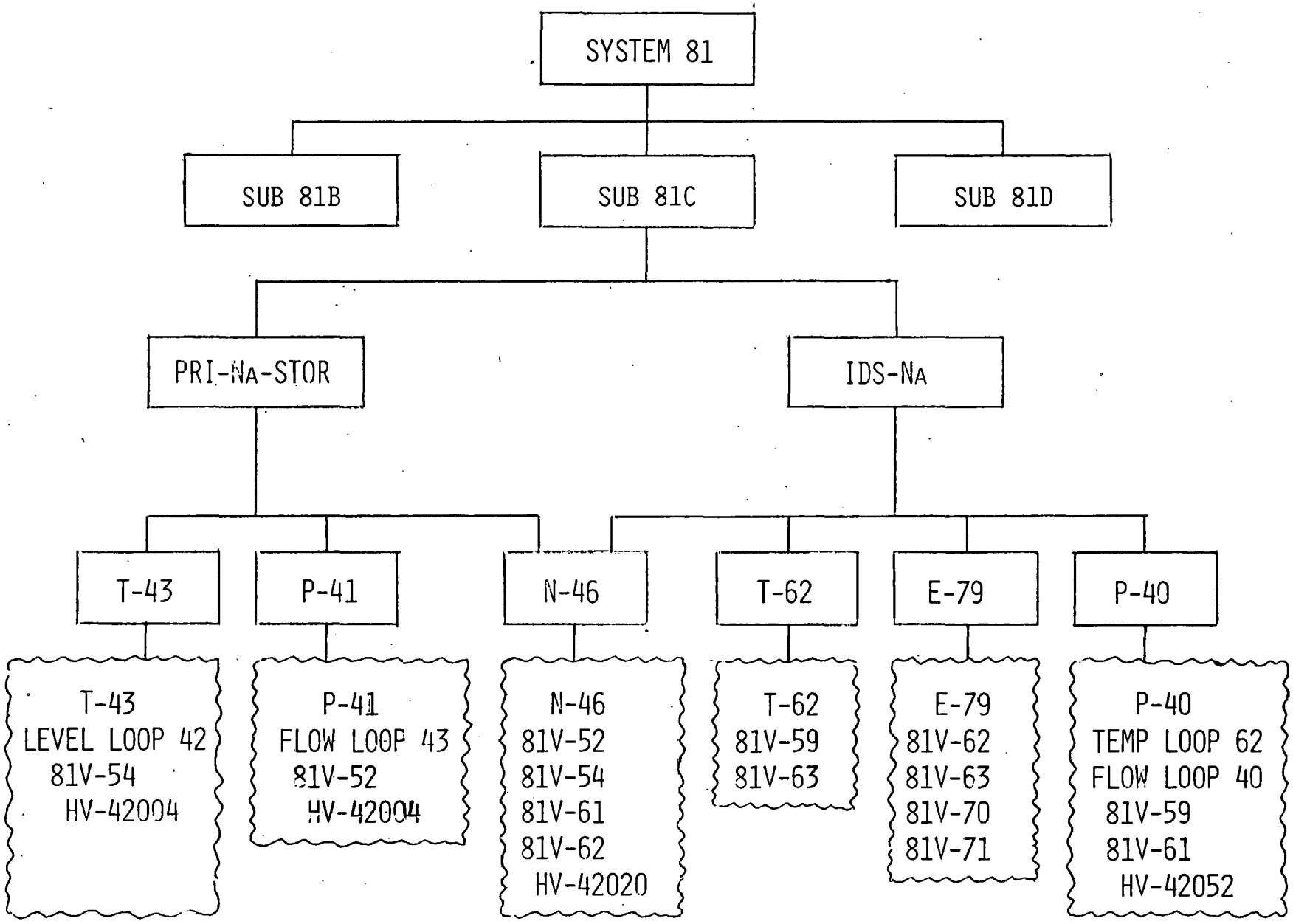


FIGURE 8. FEG STRUCTURE WITH COMPONENTS ATTACHED

SEARCH/REPORT INDEX

COMPONENT TYPE _

COMPONENT _____-_____-__ SCAN? _

	SEARCH	LIMIT	SELECT	SORT
SYSTEM STARTUP	___	___	___	-
FEG No.	___-____-____	___-____-____	___-____-____	-
P&ID No.	_____	_____	_____	-
CELL	____	____	____	-
CRITICAL SYSTEM	____	____	____	-
TECH SPEC No.	17._____	17._____	17._____	-
SCHEMATIC No.	_____	_____	_____	-
EQUIPMENT No.	_____-_____-__	_____-_____-__	_____-_____-__	-
LOOP/LOGIC DIAG.	_____	_____	_____	-
LOOP No.	_____	_____	_____	-
PANEL	__-____-__	__-____-__	__-____-__	-

OUTPUT MODE _

FIGURE 9. SEARCH/REPORT MCI

SEARCH/REPORT WCL

	SEARCH	LIMIT	SORT
DOCUMENT NO./TYPE	__-_____/-	__-_____/-	-
TAG-OUT	__-_____	__-_____	-
COMPONENT	_____-_____-__	_____-_____-__	-
WORK STATUS	_____	_____	-
START DATE	__-__-__	__-__-__	-
FEG NO.	___-___-____	___-___-____	-
PRIORITY	__	__	-
SHOP	X-___	X-___	-
DOC. S/U SYSTEM	___	___	-
CRITICAL SYSTEM	____	____	-
RELATED MAINTENANCE	_____	_____	-
TECH SPEC NO.	17._____	17._____	-
LAST CHANGED	__-__-__/____	__-__-__/____	-

OUTPUT MODE

FIGURE 10. SEARCH/REPORT WCL

MCI REPORTS

- FEG (ON-LINE AND BATCH)
- TECHNICAL SPECIFICATION (ON-LINE AND BATCH)
- COMPONENT (ON-LINE)

WCL REPORTS

- COMPREHENSIVE (BATCH)
- RELEASE (ON-LINE BATCH)
- DELINQUENT (ON-LINE BATCH)
- OUT-OF-SERVICE (ON-LINE BATCH)

FIGURE 11. MIDAS REPORTS