An Approach to Improve Management Visibility Within the Procurement and Financial Group at Goldstone

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This article is one in a series of articles which have been written and pertains to improvements in the operational efficiency of the data management systems at the Goldstone Deep Space Communications Complex (GDSCC). This particular article addresses the existing procurement and financial management data system at GDSCC, identifies management requirements for better visibility, describes a proposed computerized data management system, summarizes results to date, and identifies plans for future development.

I. Present System

The current GDSCC Procurement and Financial (GPF) data management system is a manual data acquisition, information handling, retrieval, processing, and reporting system. The GPF group maintains records of all purchase requests, status of such records, purchase orders, receipts, invoices, and disbursements of funds for material and supplies under their cognizance.

Purchase requisitions which are prepared by various cost centers are forwarded to the GPF group and contain basic requisition data such as: cost account number, cost center identification, purchase requisition (PR) number, PR date of preparation, GPF receiving date, description of item to be ordered, quantity requested, unit of measurement, unit number, and unit price. Figure 1 is a sample PR worksheet.

Purchase orders are prepared by the GPF group after a supplier has been selected and a contract secured. Data contained on the purchase order (PO) reflect the confirmation of the ordered quantity, unit of measurement, PO item number, PO unit price as well as the PO number, PO preparation date, and vendor promise date. Figure 2 is a sample purchase order form.

Receiving Reports contain information on actual items received from the vendor. Figure 3 is a sample form in use at GDSCC.

Transactions or queries regarding the status of any item in the existing data base are documented via manual data entries, sorting, updating, and processing. This type of data handling is somewhat laborious, inefficient, time-consuming, and susceptible to data errors. To acquire data for several standard procurement and financial reports from the existing data management system for decision making requires the GPF group to invest on the average 32 man-hours per report.

II. Requirements

Over and above the general requirements identified in Ref. 1, i.e., provide support with reduced resources, implementation of a centralized management data base system, and permit analytical assessment of manpower planning and budget estimating, the DSN management imposed the following guidelines to improve the operational efficiency of the GPF group:

(1) Provide the capability to effectively respond to budget variation in a timely manner.

(2) Provide a cost-effective capability for financial analysis and planning.

(3) Provide more efficient control techniques with respect to cost center expenditures and budget projections.

(4) Reduce the per unit cost and man-hours expended per report generated.

(5) Improve the integrity (reliability) of the GPF data base.

III. Proposed Computerized Data Management System

To facilitate the above requirements, it was determined after reviewing the various functions performed by the GPF personnel that file updating, searching, data processing, information handling, and the report generation functions were tractable to a computerized system.

Figure 4 shows an overview of the proposed computerized GPF data management system. It indicates that the GPF personnel will input pertinent data, via remote data entry terminals, to the data base and all information handling, updating, sorting, searching of files, storage, and report generation will be performed by the computer.

Users of the data base have been identified to be: JPL/DSN management, GDSCC Operations management, GPF management, GDSCC Facility Maintenance Work Control Center (WCC) planners, and, finally, the originator of the initial PR.

The data requirements and information needs of these users vary. The JPL and Goldstone Facility Management's interest leans toward expenditures versus budget situations. The Goldstone Procurement Section and the Goldstone Facility Maintenance WCC planners are interested in outstanding Purchase Requisitions/ Purchase Orders in reference to functional planning and work load analysis. Financial Planning is concerned about the committed and obligated funds and the disbursement of various cost center funds. And, finally, the originator is concerned with status of his requested items.

Typical reports required by management are:

(1) Monthly/Quarterly Expenditure Reports

(2) Material Budget Account Reports

(3) Disbursement to Small Vendors Report

(4) Weekly Procurement Activity Reports

(5) Cost Accounting Reports

(6) Followup Status Reports (overdue items)

Three major files are required to accommodate the financial related data and provide the essential statistics for management reports. They are: (1) a Vendor File which contains eight fields per computer record; (2) the Purchase File containing a total of 23 data fields per record; and (3) a Disbursement File consisting of 7 fields per record.

The structure of the computer files is shown in Tables 1–3, and sample Computer Status Codes for PR/POs are tabulated in Table 4.

IV. Status of the GPF Data Base

In addition to establishing the major data files, their contents and record layouts per file, a file generator program and an update program have been developed.

A file generator program is required to input data to computer-generated files; housekeeping routines are necessary for file updating and querying the GPF data base; and special purpose application programs are necessary for generating management reports and analyses.

The file generator program permits the GPF personnel to enter initial PR data, PO data, receiving report information, invoice data, freight charge statistics, dis-

bursement, and vendor information into the computer. This program is end-user oriented in that it permits PR/PO data and receiving report information which arrives at a different point in time at the purchasing group to be stored in the computer in a similar fashion. Prompting information for the user is available to minimize an extensive training program and permits front end editing to improve data base integrity.

As for housekeeping functions, an update program was developed to update computer files for those items most frequently modified by the GPF personnel. Specifically, this program allows purchase requisition changes in the account number, quantity requested, unit of measurement, unit price, and PR status. It further permits PO-related changes of a similar nature. To accommodate other changes, the existing MBASIC editor and edit-aid program are available for performing limited housekeeping and modifications of GPF files.

Application programs are currently being developed to achieve the specified management requirements. It is anticipated that as the data base expands during FY77, budget analysis per cost center and account, work load analysis of the GPF group, and vendor performance analyses can be conducted. Under the assumption that certain application programs have been written and given the basic data in the three major files, the GPF data management system will be able to respond to such queries as identified in Table 5. This latter list is by no means exhaustive.

V. Anticipated Results of Development Work

With the capability described above, it is assumed that the following improvements in the GPF group's operating efficiency will be detected:

(1) A reduction in man-hours expended on report preparation or analyses conducted.

(2) Elimination of computational error.

(3) An increase in GPF data base integrity.

(4) Development of efficient data acquisition, information handling, and processing procedures.

(5) An expanded capability in GPF reporting not previously available in the manual data recording system.

Additional areas where improvement is anticipated encompass such categories as: manpower utilization, organization of data files, timeliness of management reports based on current data, planning and availability of more pertinent information on overall obligated, committed, and disbursed funds per cost center or account.

VI. Future Plans

The major tasks planned for this fiscal year are as follows:

(1) Train GPF users on how to interface with the computer, create data and history files, and initiate management reports.

(2) Determine approximately six specific application programs required for management decision making.

(3) Develop and implement management programs.

(4) Transfer operations of GPF data management system to GPF group.

VII. Conclusion

The GPF on-line computerized data management system will contribute to increasing GDSCC Procurement and Planning group's efficiency and provide added visibility to JPL/DSN management with respect to GDSCC's expenditures and disbursements. Utilizing modern computer technology will result in further benefits, namely, a speedup in decision making, a reduction in clerical tasks, rapid data retrieval, and a general streamlining of the organization's operation.

Reference

1. Maiocco, F. R., and Hume, J. P., "Computerizing Goldstone Facility Maintenance Data for Management Decisions," in *The Deep Space Network Progress Report 42-32*, pp. 310–330, Jet Propulsion Laboratory, Pasadena, Calif., Apr. 15, 1976.

Table 1. Structure of Purchase File

Field	Item	Field size	Format
1	Account	5	N
2	Cost Center	4	A/N
3	Purchase Requisition Number	6	N
4	Purchase Requisition Date	6 (MMDDYY)	N
5	Purchase Requisition Receiving Date	6 (MMDDYY)	N
6	Quantity Requested	4	N
7	Purchase Requisition Unit of Measurement	2	A
8	Purchase Requisition Item	2	N
9	Purchase Requisition Unit Price	8	N
10	Status*	1	A/N
11	Revision	1	N
12	Purchase Order Number	6	N
13	Purchase Order Date	6 (MMDDYY)	N
14	Vendor Promise Date	6 (MMDDYY)	N
15	Vendor Code	4	A/N
16	Quantity Ordered	4	N
17	Purchase Order Unit of Measurement	2	A
18	Purchase Order Item	2	N
19	Purchase Order Unit Price	8	N
20	Receiving Report Number	6	N
21	Receiving Report Date	6 (MMDDYY)	N
22	Quantity Received	4	N
23	Receiving Report Unit of Measurement	2	A

A = alpha character
N = numeric character
A/N = alphanumeric character
*See Table 4.

Table 2. Structure of Disbursement File

Field	Item	Field size	Format
1	Purchase Order	6	N
2	Invoice Number	6	N
3	Invoice Date	6 (MMDDYY)	N
4	Freight Charge	5	N
5	Check Number	8	N
6	Date Paid	6 (MMDDYY)	N
7	Dollar Value	10	N

N = numeric character

Table 3. Structure of Vendor File

Field	Item	Field size	Format
1	Vendor Code	4	A/N
2	Vendor Name	36	A
3	Vendor Address	36	A/N
4	Zip Code	5	N
5	Vendor Size	1	A
6	Rating	2	A/N
7	Vendor Phone Nr.	10	N
8	Contact	15	A

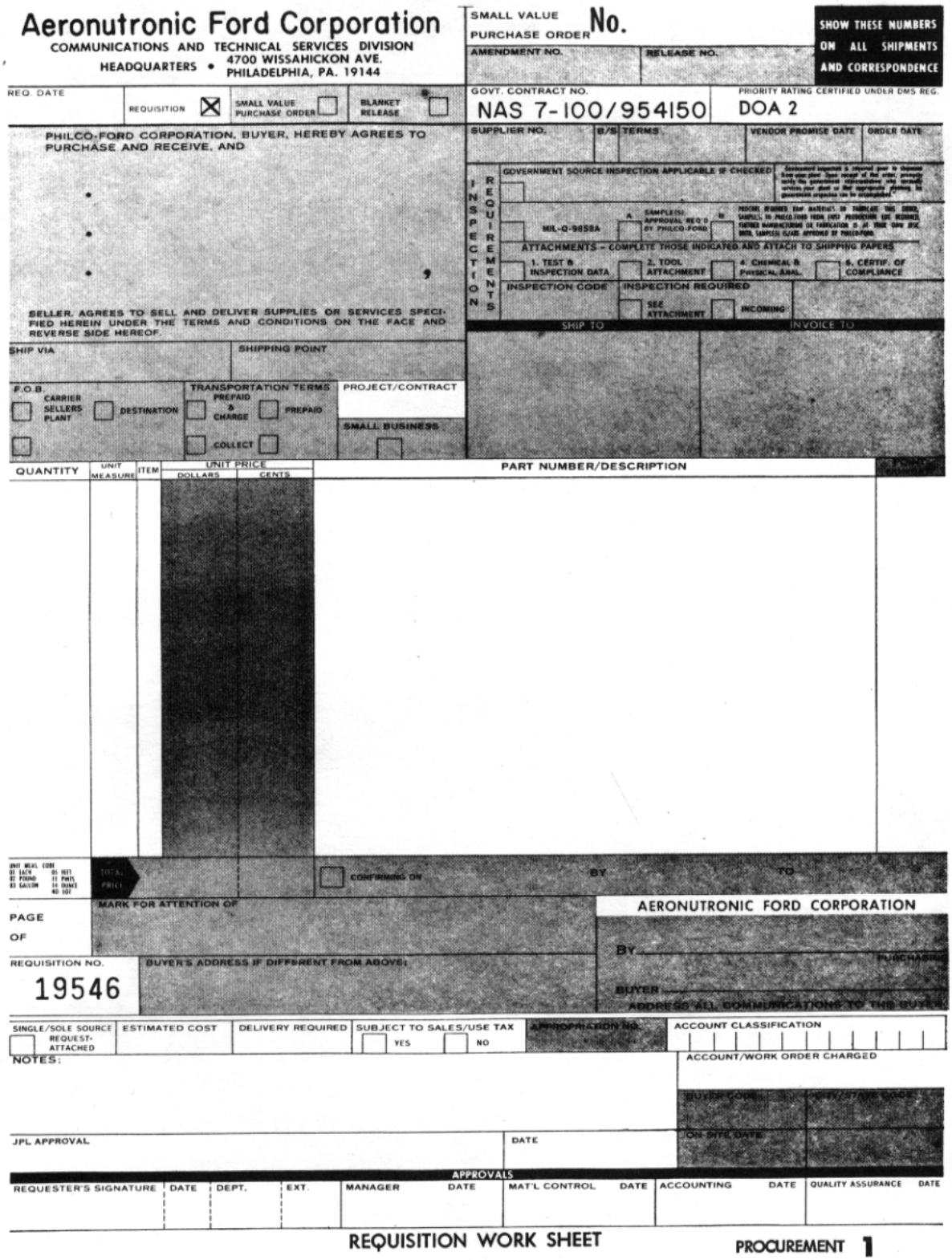
A = alpha character
N = numeric character
A/N = alphanumeric character

Table 4. Sample status codes for computer input

Status code	Description
0	Routine
1	Urgent
2	Subcontract
3	Repair
4	Urgent, Subcontract
5	Urgent, Repair
6	Subcontract, Repair
7	Urgent, Subcontract, Repair
8	Petty Cash
9	Quotation
A	Quotation, Urgent
B	Quotation, Subcontract
C	Quotation, Repair
D	Quotation, Urgent, Subcontract
E	Quotation, Urgent, Repair
F	Quotation, Subcontract, Repair
G	Quotation, Urgent, Subcontract, Repair
X	Cancellation

Table 5. Possible aspects to be analyzed

Number of Purchase Requisitions written per month
Number of Purchase Requisitions written per Cost Center
Number of Purchase Requisitions written per account
Outstanding Purchase Requisitions per Cost Center
Outstanding Purchase Requisitions per account
Total outstanding Purchase Requisitions at any given time
Number of cancelled Purchase Requisitions per Cost Center
Total number of cancelled Purchase Requisitions at any given time
Number of urgent Purchase Requisitions written per Cost Center
Number of urgent Purchase Requisitions written at any given time
Number of revisions made per Cost Center
Number of revisions made at any given time
Number of Purchase Orders written per month
Number of Purchase Orders written per Cost Center
Number of Purchase Orders written per account
Outstanding Purchase Orders per Cost Center
Outstanding Purchase Orders per account
Outstanding Purchase Orders at any given time
Time period to convert Purchase Requisitions to Purchase Orders
Time period between *promised* and *actual* delivery dates
Number of outstanding items per Purchase Order
Number of cancelled Purchase Orders per Cost Center
Number of cancelled items per Cost Center
Total Number of cancelled Purchase Orders at any given time
Total Number of Invoices received at any given time
Number of outstanding invoices at any given time
Freight Charges paid out per account
Freight Charges paid out to individual Vendors
Number of checks written toward a given Purchase Order
Total Disbursement per Cost Center
Total Disbursement per account
Total Disbursement of petty cash per Cost Center
Total Disbursement of petty cash at any given time
Performance rating of vendors
Total Disbursement to small business
Total Disbursement to large business



Aeronutronic Ford Corporation
COMMUNICATIONS AND TECHNICAL SERVICES DIVISION
HEADQUARTERS • 4700 WISSAHICKON AVE. PHILADELPHIA, PA. 19144

SMALL VALUE PURCHASE ORDER No.

SHOW THESE NUMBERS ON ALL SHIPMENTS AND CORRESPONDENCE

AMENDMENT NO. | RELEASE NO.

REQ. DATE | REQUISITION ☒ | SMALL VALUE PURCHASE ORDER ☐ | BLANKET RELEASE ☐

GOVT. CONTRACT NO. NAS 7-100/954150 | PRIORITY RATING CERTIFIED UNDER DMS REG. DOA 2

PHILCO-FORD CORPORATION, BUYER, HEREBY AGREES TO PURCHASE AND RECEIVE, AND

SELLER, AGREES TO SELL AND DELIVER SUPPLIES OR SERVICES SPECIFIED HEREIN UNDER THE TERMS AND CONDITIONS ON THE FACE AND REVERSE SIDE HEREOF.

SUPPLIER NO. | B/S | TERMS | VENDOR PROMISE DATE | ORDER DATE

INSPECTION REQUIREMENTS

GOVERNMENT SOURCE INSPECTION APPLICABLE IF CHECKED

MIL-Q-9858A | A SAMPLE(S) APPROVAL REQ'D BY PHILCO-FORD | B

ATTACHMENTS – COMPLETE THOSE INDICATED AND ATTACH TO SHIPPING PAPERS

1. TEST & INSPECTION DATA | 2. TOOL ATTACHMENT | 4. CHEMICAL & PHYSICAL ANAL. | 6. CERTIF. OF COMPLIANCE

INSPECTION CODE | INSPECTION REQUIRED: SEE ATTACHMENT | INCOMING

SHIP TO | INVOICE TO

SHIP VIA | SHIPPING POINT

F.O.B. CARRIER SELLERS PLANT | DESTINATION

TRANSPORTATION TERMS: PREPAID & CHARGE | PREPAID | COLLECT

PROJECT/CONTRACT

SMALL BUSINESS

QUANTITY	UNIT MEASURE	ITEM	UNIT PRICE DOLLARS	UNIT PRICE CENTS	PART NUMBER/DESCRIPTION	

UNIT MEAS. CODE: 01 EACH, 02 POUND, 03 GALLON, 05 FEET, 11 PINTS, 14 OUNCE, 40 LOT

TOTAL PRICE | CONFIRMING ON | BY | TO

PAGE OF | MARK FOR ATTENTION OF

AERONUTRONIC FORD CORPORATION

BY _____ PURCHASING

BUYER _____

ADDRESS ALL COMMUNICATIONS TO THE BUYER

REQUISITION NO. 19546 | BUYER'S ADDRESS IF DIFFERENT FROM ABOVE:

SINGLE/SOLE SOURCE REQUEST-ATTACHED | ESTIMATED COST | DELIVERY REQUIRED | SUBJECT TO SALES/USE TAX: YES | NO | APPROPRIATION NO. | ACCOUNT CLASSIFICATION

NOTES:

ACCOUNT/WORK ORDER CHARGED

BUYER CODE | ENTY/STATE CODE

JPL APPROVAL | DATE | ON SITE DATE

APPROVALS

REQUESTER'S SIGNATURE	DATE	DEPT.	EXT.	MANAGER	DATE	MAT'L CONTROL	DATE	ACCOUNTING	DATE	QUALITY ASSURANCE	DATE

REQUISITION WORK SHEET

PROCUREMENT 1

Fig. 1. Requisition Work Sheet

Aeronutronic (Ford)

COMMUNICATION SYSTEMS DIVISION

HEADQUARTERS • 3900 WELSH ROAD
WILLOW GROVE, PA. 19090

SHOW THESE NUMBERS ON ALL SHIPMENTS AND CORRESPONDENCE	PURCHASE ORDER NO	RELEASE NO.
PRIME CONTRACT NO.		PRIORITY RATING CERTIFIED UNDER DMS REG. 1

SUPPLIER NO.	B/S	PAYMENT TERMS	VENDOR PROMISE DATE	ORDER DATE

REQ. DATE	REQUISITION ☐	SMALL VALUE PURCHASE ORDER ☐	BLANKET RELEASE ☐

Aeronutronic Ford Corporation, BUYER, HEREBY AGREES TO PURCHASE AND RECEIVE AND

SELLER, AGREES TO SELL AND DELIVER SUPPLIES OR SERVICES SPECIFIED HEREIN UNDER THE TERMS AND CONDITIONS ON THE FACE AND REVERSE SIDE HEREOF.

SUPPLIER PRODUCT ASSURANCE REQUIREMENTS

THE FOLLOWING CLAUSES OF SPAR ATTACHMENT, CTS 243, ARE INVOKED ON THIS ORDER:

INSPECTION CODE	DATA	CODE	CONTRACT OR PROJECT ▶

SHIP TO	MARK FOR / STOREROOM

SHIP VIA	SHIPPING POINT
F.O.B.	TRANSPORTATION TERMS
☐ CARRIER SELLER'S PLANT ☐ DESTINATION	☐ PREPAID & CHARGE ☐ PREPAID ☐ COLLECT

QUANTITY	UNIT MEAS.	ITEM	UNIT PRICE DOLLARS	UNIT PRICE CENTS	PART NUMBER	DESCRIPTION	REQUISITION NUMBER	POINT NO.	CODE

UNIT MEAS. CODE: 01 EACH, 02 POUND, 03 GAL, 05 FEET, 08 PAIR, 11 PINTS, 14 OUNCE, NO LOT

TOTAL PRICE ▶ ☐ CONFIRMING THE ORDER PLACED ON: BY TO

PAGE OF

INVOICE TO ACCOUNTS PAYABLE: (ATTACH PROOF OF SHIPMENT: POSTAL RECEIPT: BILL OF LADING: ETC.)
☐ HEADQUARTERS ☐ ADDRESS

REQUISITION NUMBER: 545349

BUYER'S ADDRESS WHEN DIFFERENT FROM HEADQUARTERS ADDRESS

Aeronutronic Ford Corporation

BY _____ PURCHASING CODE

BUYER _____

ADDRESS ALL COMMUNICATIONS TO THE BUYER

SINGLE/SOLE SOURCE ☐ REQUEST ATTACHED	ESTIMATED COST	DELIVERY REQUIRED		ACCOUNT CLASSIFICATION	EXP. CLASS.

NOTES:

ACCOUNT/WORK ORDER CHARGED

BUYER CODE | APPROPRIATION NO.

ON-SITE DATE

APPROVALS

REQUESTER'S SIGNATURE	DATE	DEPT	EXT.	MANAGER	DATE	MAT'L CONTROL	DATE	ACCOUNTING	DATE	QUALITY ASSURANCE	DATE

CTS 120 7/75 PREVIOUS EDITIONS MAY NOT BE USED PRINTED IN U.S.A.

2

Fig. 2. Purchase order form

GOLDSTONE RECEIVING REPORT

NO. 006102

SUPPLIER NAME				P.O NO.	
PACKING SLIP NO.	PREPARED BY		VIA		
REC STATION	DEPT NO. OR AREA		ATTENTION OF		
DATE RECEIVED	DISC CODE	DISP CODE	RATE	DATE INSPECTED	STAMP

LINE ITEM	QTY & UNIT	PART NO./DESCRIPTION	QTY REJ	QTY ACC

REMARKS

VOUCHER NO	
RECEIVED BY	DATE

Accounting JPL 5790/DSIF (12/71)

Fig. 3. Goldstone **Receiving Report**

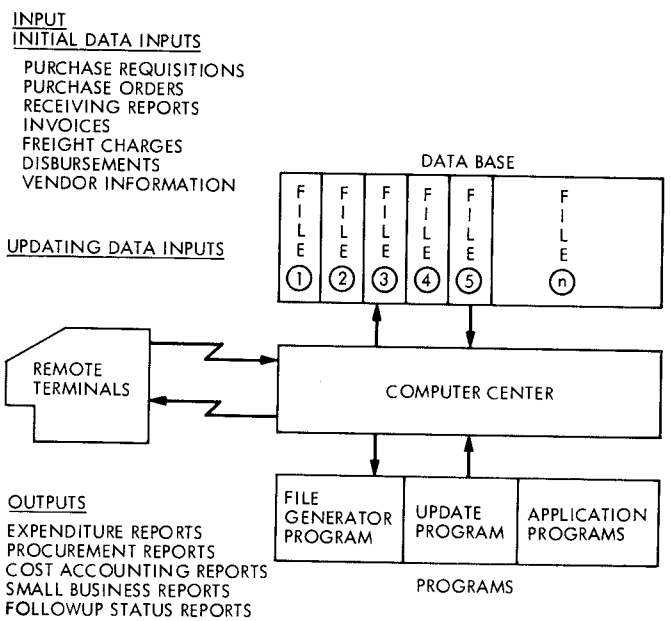


Fig. 4. General view of the computer data base system