

Fundamentals of Computers & Data Processing with Basic

WILSON T. PRICE

FUNDAMENTALS OF COMPUTERS

AND

DATA PROCESSING WITH BASIC

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HOLT, RINEHART AND WINSTON

New York Chicago San Francisco Philadelphia
Montreal Toronto London Sydney Tokyo
Mexico City Rio de Janeiro Madrid

Cover photograph courtesy of Gabe Palmer/The Image Bank

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Address correspondence to:

383 Madison Avenue, New York, NY 10017

Library of Congress Cataloging in Publication Data

Price, Wilson T.

Fundamentals of computers and data processing with
BASIC.

Includes index.

1. Basic (Computer program language) 2. Electronic
digital computers—Programming. 3. Business—Data
processing. I. Title.

HF5548.5.B3P74 1983 001.64'24 83-82

ISBN 0-03-063231-5

Printed in the United States of America

Published simultaneously in Canada

3 4 5 6 039 9 8 7 6 5 4 3 2 1

CBS COLLEGE PUBLISHING

Holt, Rinehart and Winston

The Dryden Press

Saunders College Publishing

Preface for the Student

To say that the computer has had a broad and significant impact on our lives would be an understatement at the least. Microcomputers are currently available for \$2000 or less which have computing powers in excess of large-scale machines costing a million or more dollars 25 years ago. If progress in transportation had proceeded at the same pace as that in computing, a round-the-world airline flight would take a matter of minutes and the average automobile would get well over 1000 miles per gallon. Indeed, high-speed computational devices have been a primary factor in rapidly changing techniques used in many areas. For instance, with the computational and information manipulation capabilities of the computer, the office clerk sees many of the office procedures significantly change, the accountant must adjust to dramatically changing accounting techniques, the business manager must learn to use highly sophisticated market forecasting tools, the engineer must become reoriented to a whole new set of ground rules in problem solving, and most importantly, the average individual must adjust to the manner in which computers affect her or his life. As a result, it seems important that every college student gain a basic knowledge about how this powerful tool affects our lives in so many ways and about how we can make it best serve our needs.

To facilitate the learning process, each of the first five sections of this book includes a number of built-in aids. The section openings include a set of learning objectives and a vocabulary list. Each module of Section 6 also includes a module objective. Study these and you will gain an insight into what is coming. Included within are exercises that are essentially "minute tests" to give you a feel for whether or not you caught the significant points of the preceding section. It is intended that each of these exercises be completed and checked before you proceed with pages that follow. If you feel the need for additional help, a student study guide is available. For each section or module it includes a vocabulary list, a more extended explanation of significant points, and a self-test. Answers to each self-test are also included. (Answers are given at the end of the section or module.)

The computer field is a vast and broad one and is rapidly changing. Most professionals in the field find it exciting and very challenging. Every effort has been made to reflect some of this excitement in this book and to design it so that it is easy and interesting for you to use. I hope that it meets this objective.

Wilson T. Price

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OBJECTIVES

The purpose of this section is to help you discover data processing concepts that are common to business. The vehicle for this is a hypothetical grocery business that evolves into a modern, automated supermarket. Through this example with its overall data processing problems and applications you will gain an insight into the following.

- The importance of efficient data handling and processing systems in business
- The need to analyze and carefully define systems for handling paperwork and processing
- Operations that are basic to business data processing, whether performed manually, mechanically, or with computers
- The overall concept of a system as the means and procedures by which an organization does a job
- Principles of files, records, and fields
- The concept of master-transaction processing
- Principles of records and files relative to the computer
- The routing and handling of paperwork and data within a business organization.
- The need for reports in the business operation
- Basic notions behind system design and analysis

Key terminology important in this section includes:

data collection	online
field	output
file	record
input	sort
Master Record	source document
master-detail processing	system
merge	Transaction Record
offline	Universal Product Code (UPC)

Introduction to PQR

BASIC CONCEPTS Whenever the average person hears the words "data processing," the word "computer," or even IBM, immediately comes to mind. We must not be saddled with that misconception. Our ancestors were processing data long before computers or the International Business Machines Corporation came into being. To operate virtually any business, records must be maintained and data processed. The information handling and processing functions that are vital to the existence of virtually every business can be grouped as follows:

- *Input.* Information must be entered into the processing system. For example, an order for goods must be written on an order form and then entered into the system.
- *Processing.* Once entered into a system the data must be processed. For instance, a sales order must be filled, a customer billed, accounts updated, and so on.
- *Storage.* The results of processing must be stored for later use.
- *Output.* The results of processing must be printed or otherwise recorded. For example, an end-of-the month summary and billing for each customer of a department store must be printed.
- *Retrieval.* Stored data must be readily accessible when it is needed.

It is important to note that the preceding operations make no reference to the computer. However, they are very significant since they are basic to the processing of data whether they are accomplished by the simplest of manual methods or through use of the computer.

THE NATURE OF BUSINESS To gain a better insight into the principles of data processing, let us consider a hypothetical wholesale grocery company. The PQR Wholesale Grocery Company was founded during the early 1930s. Although the founder knew the grocery business well, his background in accounting and bookkeeping was very limited. As a result his desk became buried in paperwork and his business began to flounder. One evening he sat down at his desk to ponder his problems and try to come up with some ideas. The results of his efforts are shown in Figure 1-1. It was quite clear that help was needed and so he hired a consulting company that specialized in such matters. The consultant, working with the founder, grouped the data processing functions of PQR as shown in Figure 1-2. Here we can see that the data processing operation can indeed become significant. The paperwork tasks include:

1. Incoming goods
 - Purchase order processing
 - Verification of receipt of goods
 - Accounts payable (money owed to suppliers)

Figure 1-1
Problems and
solutions.

<u>Problem</u>	<u>Needed</u>
1. Incorrect bills sent to some customers - none to others	An accounting system for all money owed by customers to PQR
2. Forgot to pay the utilities bill	An accounting system for all money owed by PQR to others
3. Ran out of canned corn	An inventory control system to keep an accurate record of everything in the warehouse
4. Overpaid the delivery truck driver	A payroll system to maintain an accurate record for each employee
5. Sales off on fresh fruits - too much spoilage	A sales forecasting and planning system

2. Internal processing
 - Inventory control of goods
3. Sale of goods to customers
 - Order handling and filling
 - Delivery
 - Accounts receivable (money owed to the company)
 - Collections
4. Institutional functions
 - Company payroll
 - Cost and price studies
 - Operating analysis

It is important to recognize that various segments of a data processing system are closely related and must not be considered independently of each other. For example:

- Sales projections are partially based on past sales.
- Purchasing is based on sales projections and existing inventory.
- Current inventories are based on purchases and sales.
- Billing and collecting are based on orders shipped.
- Payroll is based on all phases of the operation.
- And so on.

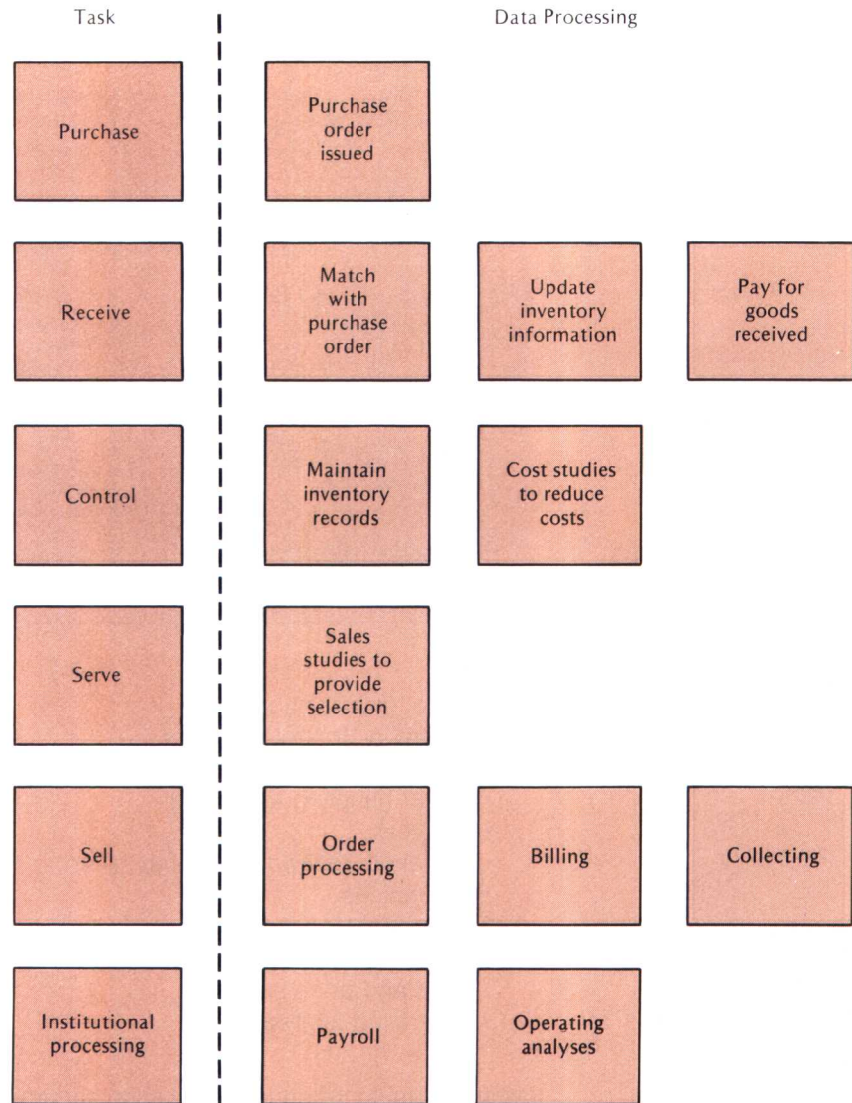


Figure 1-2
Data processing
functions at PQR.

Each portion of the system influences and is influenced by each other portion of the system.

The degree of success, or the failure, of any company depends to a large extent on the overall efficiency of its data processing systems. These systems may be simple, manual procedures for a very small company or they may be highly complex and involve the use of sophisticated computers in the case of a large corporation. However, the need for a well-planned system is as crucial to the well being of a small company as it is for a large corporation.

EXERCISE

- 1.1 Comment on the observation that "in any business, data processing operations are always carried out by the computer department."

The Customer Accounting System

With these thoughts in mind, let us turn our attention to one phase of the PQR data processing need—the *customer accounting system*. To keep things simple for this first example, it is assumed that the customer receives the goods at the time the order is placed or when the goods are delivered by PQR. Each customer maintains an account with PQR and is billed at the end of the month. Briefly, the customer accounting system involves maintaining customer account records for customer purchases and payments as follows:

- As each purchase is made the charges and other information are recorded.
- As each payment is received a receipt is prepared and recorded.
- At the end of the month each customer account is brought up to date by adding new charges and subtracting payments.
- When the account records are updated, a bill is prepared and mailed to each customer.

A broad simplification of this overall processing, illustrated in Figure 1-3, gives us an insight into the system. Basic to the system are the following data components.

Periodic input to the system:

- *Sales Order Records*
- *Payment Received Records*

Permanent information requiring periodic updating:

- *Customer Master Records*

These concepts are illustrated and described in Figures 1-4, 1-5, 1-6, and 1-7.

EXERCISE

- 1.2 What is the difference between the Payment Received Record and the monthly sales file?

Data Processing Aspects of This Case Study

BASIC TERMINOLOGY Before proceeding further with this case study, let us review the data processing concepts introduced by this example. The function of this system is to

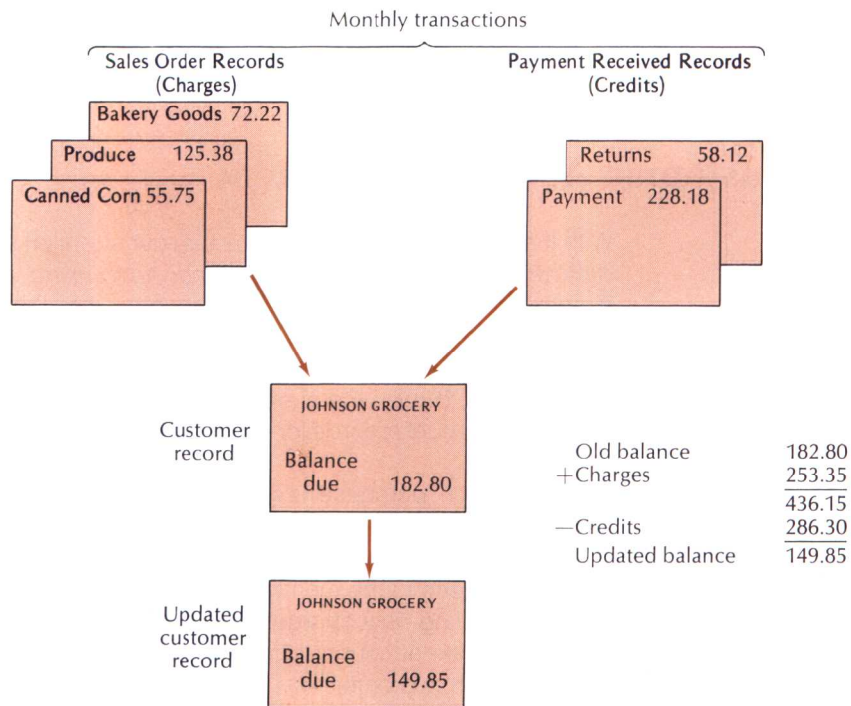


Figure 1-3
Updating a customer
account.

- Maintain a record of customer purchases and payments
- Prepare management reports summarizing sales
- Periodically update customer accounts
- Prepare customer billings

In general, the term *system* may be defined as

System The method or means by which an organization or individual accomplishes a task or set of tasks required by the organization.

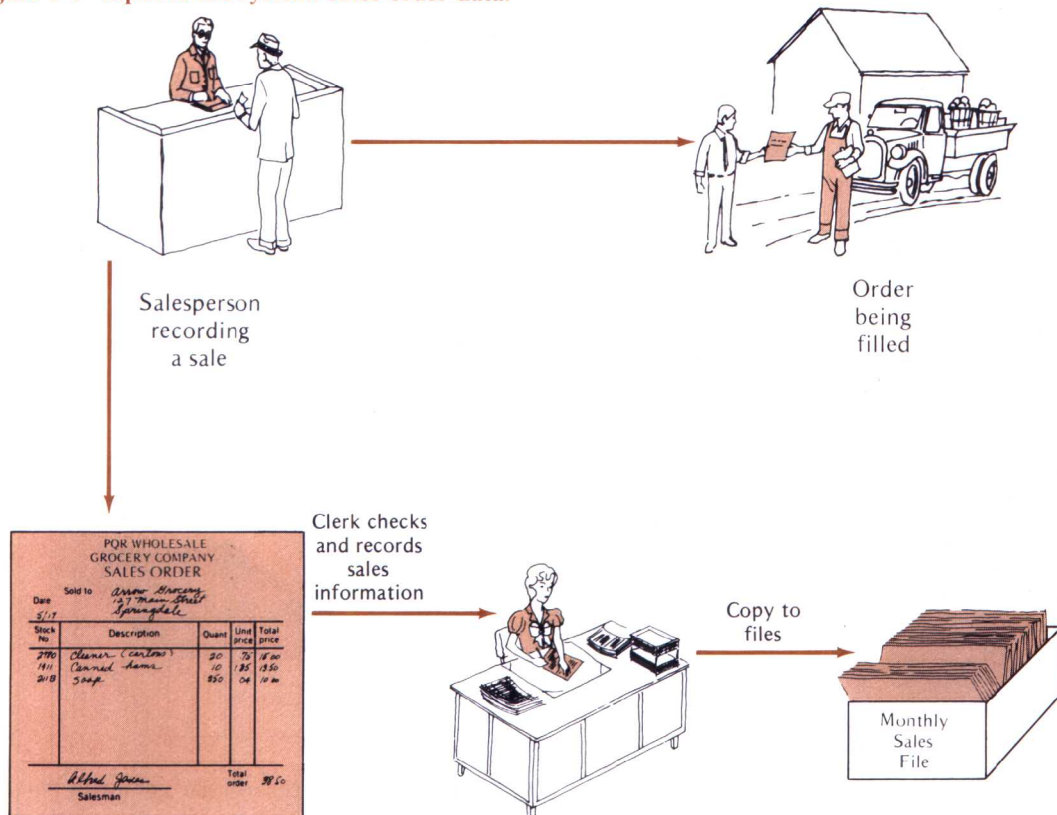
A person employed in data processing continually encounters systems. For example, all employees are quite concerned about their periodic paychecks, which are one of the end results of a *payroll* system. At first consideration, calculating take-home pay might appear to be a simple job, but it often involves one of the more complex systems in the operation of the average company. This complexity is usually caused by the many intricate deductions that are withheld, either at the employee's request or as required by the government. The actual printing of the check is a very small part of the operation. We should note that a payroll system can be manual for a very small company, or it can be highly automated for a large corporation.

Fundamental to PQR's customer accounting system is the *data base*,* that is, the basic set of information around which processing revolves. For PQR this is, of course, the Customer Master File consisting of the customer records. In a real-life situation these records would contain far more information on the customer than is shown in the simplified example. From the data base a broad set of reports can be prepared, such as those covering accounts that are past due and the sales patterns of various customers. Obviously, the broader the data base (that is, the more information contained in the customer record), the more versatile and useful it is to the management and employees of PQR.

The terms *file* and *record* are often confusing to the beginning data processing student. As we have seen, the Customer Master Record is a set of

*Database as a single word is defined in Section 4.

Figure 1-4 Input to the system: sales order data.



As each office copy of the Sales Order Form is received, it is transmitted to a clerk who checks the entries and records sales information. The Sales Order Form is then placed in a file drawer labeled *Monthly Sales File*, where it remains until the end of the month.

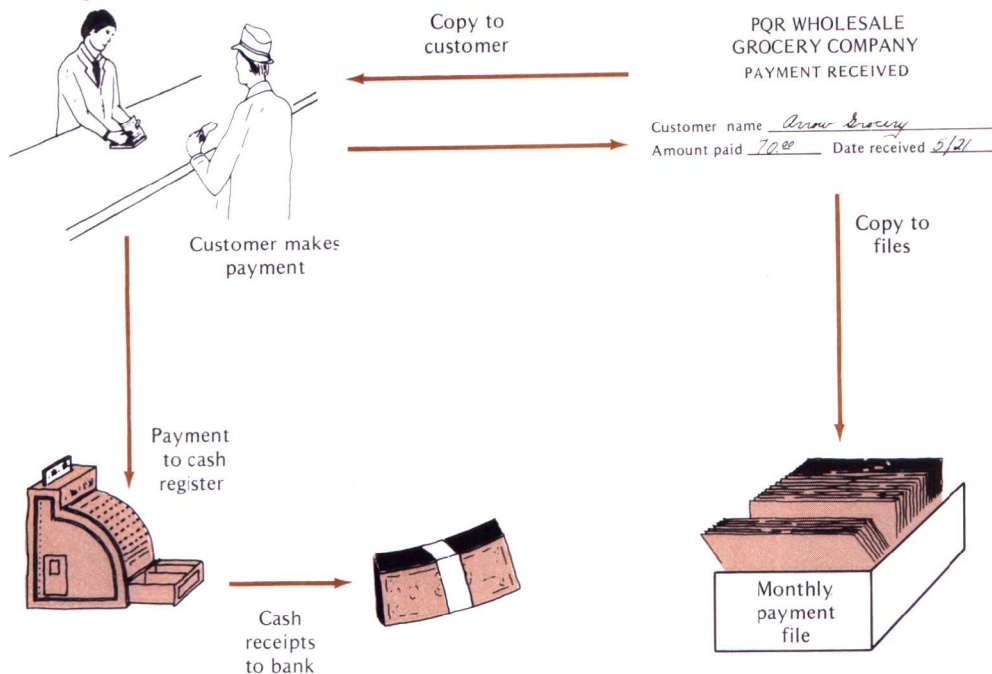
information describing a customer account. In general a record is defined as follows:

Record A group of related facts or *fields* of information treated as a unit.

Field A basic unit of information.

Thus the Master Record consists of the customer name *field*, the address *field*, and so on. The Payroll Record for the employees of a business firm would contain all fields relating to them for payroll processing, such as name, Social Security number, and pay rate. Similarly, each *Transaction Record (detail record)* in the PQR system includes data on one particular transaction, which may be a purchase or a payment. As we have seen, the collection of Master Records form the Master File, the Payment Records form the Payment File, and so on. In general we can think of a file as

Figure 1-5 Input to the system: payment received data.



As each payment is received, a clerk fills out a Payment Received Form and places the money in the cash register. There it remains until the end of the day, when it is taken to the bank. One copy of each Payment Received Record is given to the customer; the other is placed in a file drawer labeled *Monthly Payment File*, where it remains until the end of the month.

File The organized collection of all the records of a given type.

Thus we see the following relationships:

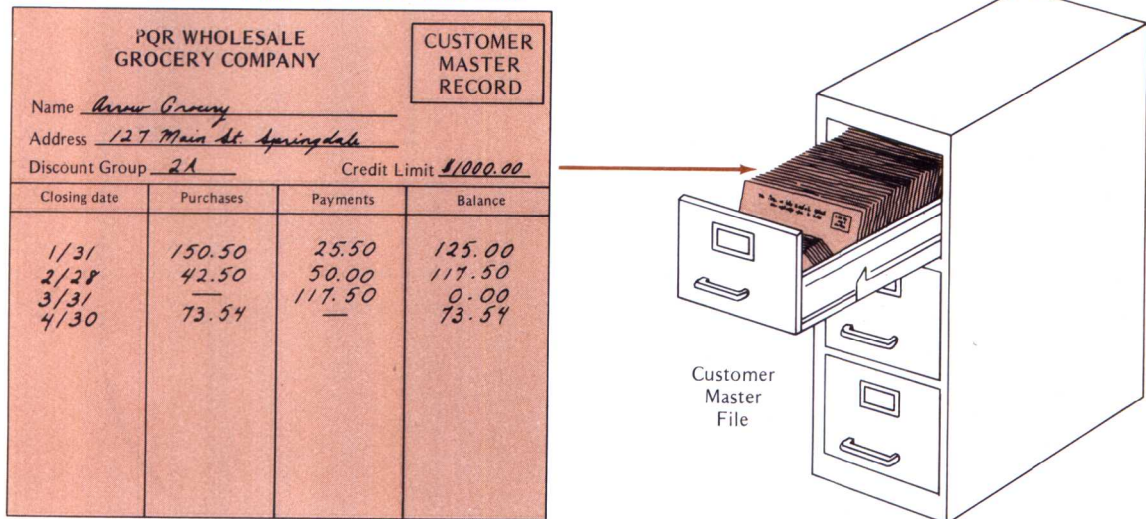
A COLLECTION OF RELATED **FIELDS** FORMS A **RECORD**.

A COLLECTION OF **RECORDS** FORMS A **FILE**.

The data base for our accounting system is the Customer Master File; the system itself consists of a basic procedure through which the end objective, that of maintaining customer records and preparing required reports, is achieved. This procedure illustrates the basic principles of data processing (whether manual or automated), namely, the *gathering*, *processing*, *storing*, and *transmitting* of information.

DATA COLLECTION AND RECORDING As the name implies, data collection is the gathering of the original information to be entered into the system. In the PQR system this occurred each time a salesperson wrote out a sales order or a payment receipt. Needless to say,

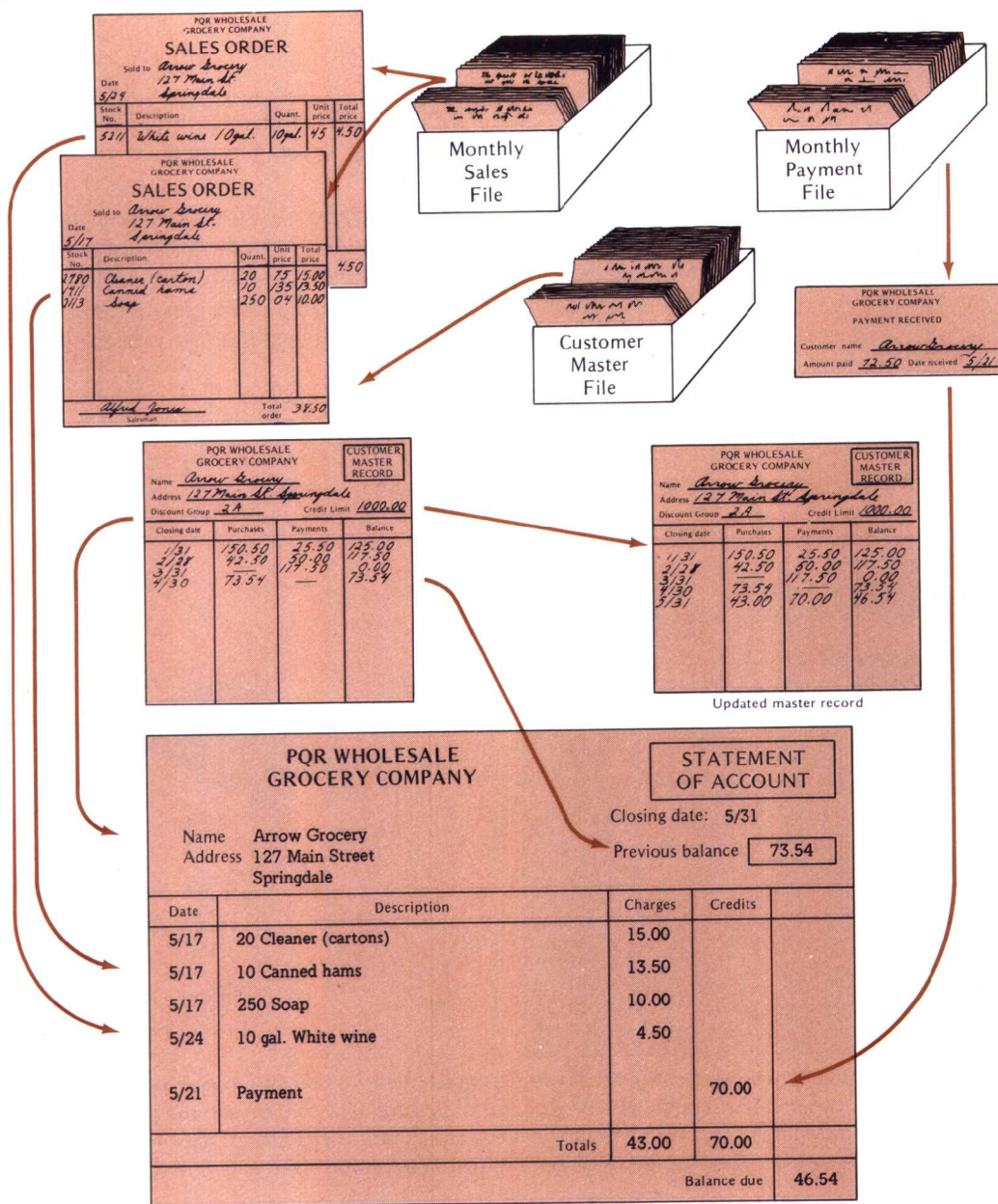
Figure 1-6 Customer Master Record and File.



For each customer of PQR, a *Customer Master Record* is maintained. The master record includes the company name, address, and other general data, as well as a monthly summary of transactions for that company. A master record is prepared for each new customer desiring an account with PQR. At the end of each month this record is updated by entering the summary of the monthly transactions (described in a later section of this section).

All of the Customer Master Records are stored in a file cabinet in alphabetic order. This file, called the *Customer Master File*. Note that the Customer Master File is simply a collection of all Customer Master Records arranged in a useful and logical order. The file does *not* contribute any additional information above and beyond that contained in the individual records.

Figure 1-7 Account updating procedure.



At the end of the month each customer account is updated using the data stored in the Monthly Payment File, the Monthly Sales File, and the Customer Master File. At this time a customer *Statement of Account* is prepared and mailed to the customer. We can see that master data from the Master File is *merged* with transaction data from the Payment and Sales Files to update the account and prepare the Statement of Account. The updated Master Record is also shown.