

# Systems Reference Library

#### FARGO for IBM 1401

FARGO (Fourteen-O-One Automatic Report Generating Operation) is a report generator that requires no expert knowledge of programming techniques. This manual explains the writing of report specifications and the preparation of FARGO control cards to produce the desired results. Reports can be prepared on blank paper or preprinted report forms.

The method requires a minimum of 4,000 positions of core storage and is applicable to card input files only.

For a list of associated publications and abstracts, see the *IBM 1401 and 1460 Bibliography*, A24-1495.

















#### Fourth Edition

This is a reprint of C24-1464-2 incorporating changes released in the following Technical Newsletter:

Form Number	Pages Affected	<u>Date</u>
N24-0231	10, 11, 14	July 24, 1964

Significant changes or additions to the specifications contained in this publication will be reported in subsequent revisions or Technical Newsletters.

Copies of this and other IBM publications can be obtained through IBM Branch Offices. A form is included at the back of this manual for readers' comments. If this form has been removed, address comments to: IBM Corporation, Programming Publications, Dept. 425, Rochester, Minn. 55901.

# Contents

Introduction	5
General Description	6
Report Specifications	6
Coding Sheets	8
Phase 4 (Form No. X24-6556)  Report-Heading Control Cards  Field-Headings Control Cards	8 8 8
Phase 1 (Form No. X24-6556)  Master-Report Control Card  Control-Break Control Cards	10 10 10
Phase 1 (Form No. X24-6557)  Constants Control Cards	11 11
Phase 3 (Form No. X24-6559)  Detail Control Cards	11 11
Phase 2 (Form No. X24-6558)  Total Control Cards	13 13
Automatic-Carriage-Control Operation	15
Operating Instructions	16
Program Halts	16
Patching	17
Multiply-Divide Optional Feature  Multiplication  Division  Half-Adjustments of Products and Quotients	20 20 22 26
FARGO General Program Operation and 1401 Core- Storage Organization	30
FARGO Report Examples  Register of Earnings and Deductions  Remittance Statement and Voucher Check	31 31 31
Index	50

FARGO, Fourteen-O-One Automatic Report Generating Operation, is a report generator that requires no expert knowledge of programming techniques. It is easy to learn and apply. Developed for the IBM 1401 Data Processing System, FARGO may be quickly adapted to many types of listed reports or groupprinted reports now prepared with unit-record equipment on blank paper or on preprinted forms.

In addition to providing the program for processing the input detail-data cards, FARGO provides for printing one title line, including page number, on each page of the report. It also provides for printing two lines of field headings used to designate the various columns of the report. The printing of this information, normally required when preparing reports on blank paper, is controlled by the carriage tape. One advantage of FARGO is that any number of different reports may be prepared in a continuous mode, provided the reports are prepared on blank paper and that the carriage-tape specifications are standardized for all the reports.

Requirements of the report, such as title and field headings, detail and/or total printing, carriage spacing, skipping, ejecting, etc., are first laid out on an IBM 1403 Printer Spacing Chart. The report specifications are then recorded on specially-designed FARGO con-

trol card coding-sheets (Phases 1, 2, 3 and 4). Control cards for each of the four phases are then punched on standard 5081-type cards. These are inserted behind their respective FARGO condensed-program decks, and all precede the detail data cards to be processed. The file is then loaded into the 1402 file feed. The operation is started by pressing the load key. The 1401 loads each phase of the FARGO program, and generates the program steps from the control cards that follow each phase.

In approximately 20 seconds, report printing is started. It continues without interruption until the report is finished. This procedure is graphically illustrated in Figure 1. If several reports are to be run consecutively, a separator card containing a lozenge (\$\mathbb{\pi}\$, 12-4-8) punch in card column one is placed behind the last detail data card for each report. This branches the generated program into the last card routine, ejects to the first printing line of the next form, and immediately begins reading-in the next program deck.

FARGO is designed primarily for IBM 1401 card systems having a minimum of 4,000 positions of core storage, and parallels the 407 approach to report preparation. It is a *load-and-go* system with no intermediate operations such as *symbolic assembly*.

#### **General Description**

Following is a list of operations that can be performed under FARGO control.

Print one full line (132 positions) of *Report Heading* on the first line of each page of the report (carriage-tape channel-1, including page numbers.

Skip to carriage-tape channel-2 and print a maximum of two full lines of columnar- or field-headings on each page of the report.

Skip to the body line of the report (carriage-tape channel-3).

List or group-print the body of the report.

Control on a maximum of four fields anywhere in the detailed data cards regardless of length.

Group-indicate a maximum of four fields on the first line of each minor control group.

Distinguish a maximum of 10 different types of detail cards and print results in the appropriate columns of the report. Each code used to identify a given type of card may be punched in the same column of the detail card, or a separate column may be used to identify each type up to a maximum of 10. If more than one card-column must be tested to identify a given type of card (multiple column type), a patching routine is generally required. Special provisions have been made within the FARGO program for accomplishing this type of patching. (See Patching.) However, two columns may be tested without patching if, as is frequently the case, a type of card is identified by a digit (1-9) in one column and a zone (usually an X) in another column. Example: 3 in column 6, X in column 80. (See Figure 25.)

Add, subtract, multiply, and divide detail data or totals.

Accumulate and print totals (with or without summary punching) for each control level, plus final totals at the end of the report. Minor totals are *rolled* into intermediate totals, intermediate totals into major, etc.

Space before or after printing, or skip to predetermined total-lines (carriage-tape channels 4 to 9).

Crossfoot detail data or totals, print the results on desired total levels, and print progressive totals where-ever desired.

Print totals horizontally or vertically for each total level on as many lines as desired.

Print multiple lines from one card (MLP).

Print reports on preprinted forms, including inverted forms with MLP printing. In such cases, specifications for report and field headings are not required.

Card count by types of cards and print card count totals on desired total levels.

Overflow or eject from form to form.

Print any number of different types of reports consecutively, provided that reports are prepared on continuous blank paper and that the carriage-tape specifications are standardized for all the reports.

#### **Report Specifications**

In developing report specifications, the first step is to lay out the report on an IBM 1403 Printer Spacing Chart (step 1 in Figure 1). This establishes the positions at which the various data will be printed and indicates the spacing or skipping between lines of printing. This step is always required for new reports but may not be necessary for existing reports, that is, reports that have been prepared previously with the 407. In such cases, the same spacing chart used in laying out the report for the 407 can be used with the FARGO system. If minor modifications are made in the conversion of the report from the 407 to the 1401 because of the greater printing capacity, a new layout using the 1403 printer spacing chart is necessary. Once the report layout is completed and the operations to be performed are clearly indicated, the next step (step 2 in Figure 1) is to record the specifications on FARGO coding sheets.

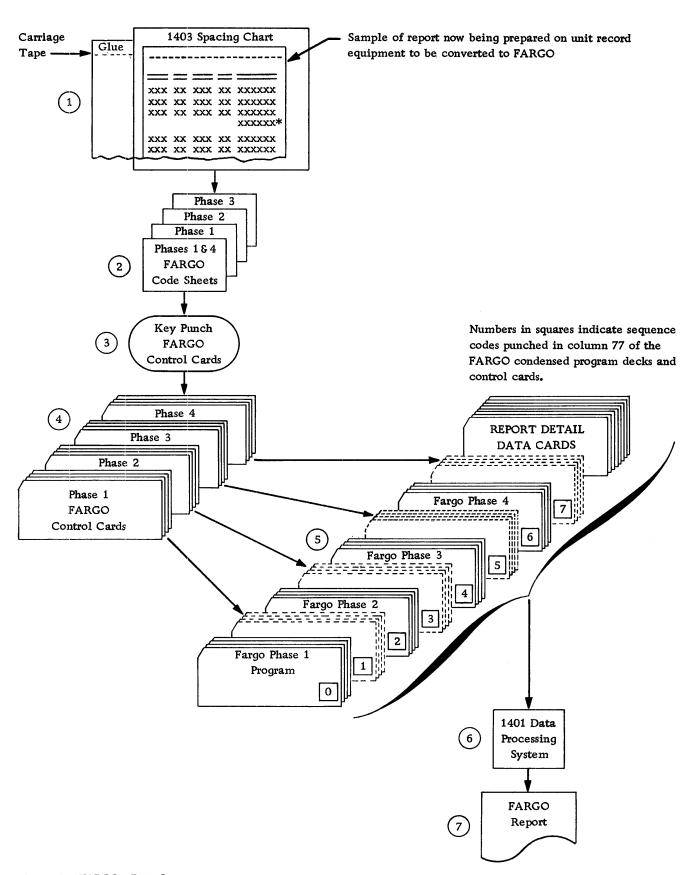


Figure 1. FARGO—Basic Steps

### **Coding Sheets**

Coding sheets (Figure 2) are designed to facilitate the recording of specifications in the FARGO language, following a few simple rules. The statements used to supply the information are based on the logic of the 407. Thus, any person with sufficient knowledge to develop IBM 407 specifications for a given report can learn and apply the FARGO language with very little training.

The areas on the coding sheets labeled Report, Programmed By, Page Nos., and Date are for the convenience of the programmer, but are not punched in the FARGO control cards. If the programmer assigns a number to the program for identification purposes, the number is entered in the area labeled Program Identification, 73-76. This number is later punched in each FARGO control card.

Each line of the coding sheets is identified by a preprinted sequence number in columns 77-80. These sequence numbers should be punched in the control cards. When the control cards for the four phases are properly inserted behind their respective FARGO condensed-program decks, the sequence numbers must be in ascending order as shown here.

		No. of	Sequence
Phase	Cards	Cards	Numbers
1	Condensed Program Deck	50	0001-0050
1	Control Cards	variable	1000-1xxx
2	Condensed Program Deck	32	2000-2031
2	Control Cards	variable	3010-3xxx
3	Condensed Program Deck	33	4000-4032
3	Control Cards	variable	5010-5xxx
4	Condensed Program Deck	12	6000-6011
4	Control Cards	variable	7001-70xx

The coding sheets for the four phases are described in the order in which they are normally filled out.

FORM NO. x24-6556

Phase 4 — Report-Heading Control Cards (two cards maximum).

Field-Headings Control Cards (four cards maximum).

Phase 1 — Master-Report Control Card (one card maximum).

Control-Break Control Cards (four cards maximum).

FORM NO. x24-6557

Phase 1 — Constants Control Cards (50 cards maximum).

FORM NO. x24-6559

Phase 3 - Detail Control Cards (variable)

FORM NO. x24-6558

Phase 2 — Total Control Cards (variable)

#### Phase 4 (Form No. X24-6556)

#### **Report-Heading Control Cards**

Two report-heading control cards (sequence numbers 7001 and 7002) provide a maximum of 132 positions of report-heading information that may be printed at the top of each page of the report (carriage-tape channel-1). Report-heading specifications are entered in columns 1-68 as follows:

Card Columns	Control Data
1	H - Report-Heading Control Card.
2	1 - First card. 2 - Second card.
3-68	Enter report-heading information (66 characters maximum for each card). Card 1 prints in positions 1-66, Card 2 prints in positions 67-132.

RULE: If a report heading is required, two cards always must be punched, and H1 control card must precede H2 control card. Depending on the length of the report heading and the print positions selected, either H1 or H2 control card may be blank in columns 3-68. The report heading may include the word PAGE anywhere on the line if page numbering is specified.

If a report heading is not required (preprinted forms),

these two control cards are omitted.

#### Field-Headings Control Cards

Four field-headings control cards (sequence numbers 7011-7014) provide two full 132 positions for field-heading information that may be printed on each page of the report following the report heading (carriage-tape channel-2). Field-headings specifications are entered in columns 1-68 as follows:

Card	
Columns	$Control\ Data$
1	F - Field-Heading Control Card.
2	<ol> <li>First Card.</li> <li>Second Card.</li> <li>Third Card.</li> <li>Fourth Card.</li> </ol>
3-68	Enter field-heading information (66 characters maximum for each card). Cards 1 and 2 print first line of field headings:  Card 1 - print positions 1-66.  Card 2 - print positions 67-132.  Cards 3 and 4 print second line of field headings:  Card 3 - print positions 1-66.  Card 4 - print positions 67-132.

RULE: If field headings are required, these four cards must enter the machine in ascending sequence. If not required (preprinted forms), they are omitted.

RULE: Whether or not report and/or field headings are specified, a blank card punched with the # (3-8) symbol in column 1 must be the last card in the combined program deck. In other words, it always precedes the first detail data card. This signals the end of FARGO program loading and the beginning of detail card processing.

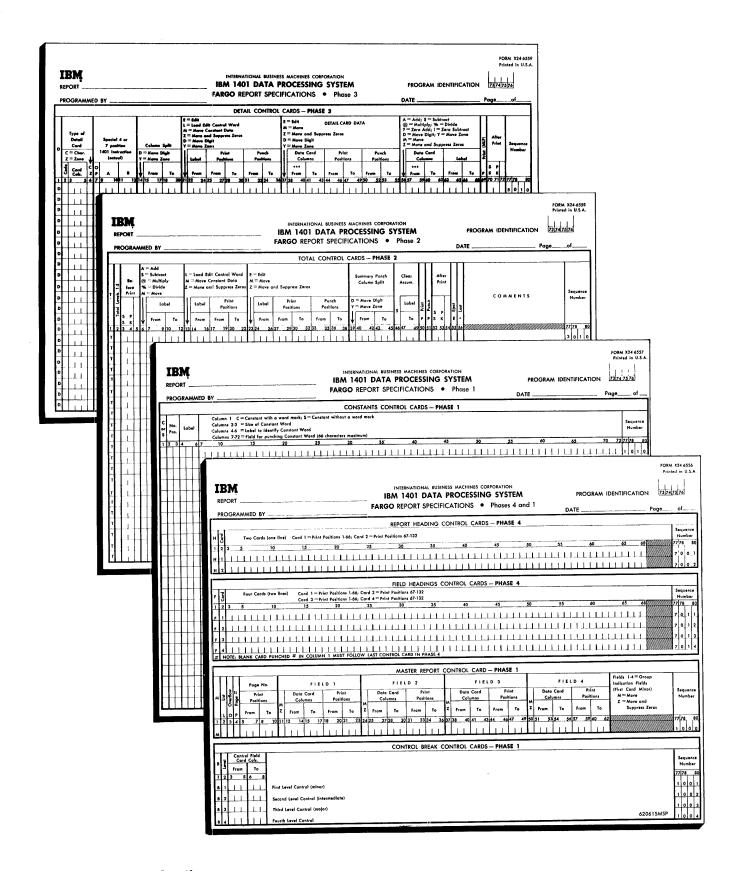


Figure 2. FARGO Coding Sheets

### Phase 1 (Form No. X24-6556)

#### Master-Report Control Card

This card (sequence number 1000), always punched M in column 1, specifies:

- 1. type of report (list or group-print).
- 2. page overflow, if desired.
- 3. page numbering, if desired.
- 4. positions selected to print the page number anywhere on the report-heading line.
- 5. data to be group-indicated on the first line of each minor control group of a *listed report only*.

The control data is entered in the various columns of the coding sheet as shown here.

Card Columns	Control Data
1	M - Master-Report Control Card.
2	L - List; Blank - Group Print.
3	O (alpha) - Page overflow to carriage-tape channel-1. Blank - No page overflow.
4	P - Page numbering if desired. Blank - No page numbering.
5-7 (from) 8-10 (to)	IBM 1403 print positions selected for printing page number on report-heading line. (From indicates the left-hand or high-order print position while to indicates the right-hand or units print position.)
11	First field to be group indicated.  M - Move  Z - Move and suppress zeros.
12-14 (from) 15-17 (to)	Location of data in detail card to be group-indicated. (From indicates the left-hand or high-order card column, while to indicates the right-hand or units card column.)
18-20 (from) 21-23 (to)	IBM 1403 print positions selected for printing first group-indicated field.
24-36	Second field to be group-indicated. Same format as Field $1.$
37-49	Third field to be group-indicated. Same format as Field 1.
50-62	Fourth field to be group-indicated. Same format as Field 1.

RULE: The master-report control card is always punched, even though it might be blank except for the M in column 1 and the sequence number (1000) in columns 77-80.

#### Control-Break Control Cards

These cards (sequence numbers 1001-1004) always punched B in column 1, specify the four control levels and define the card columns in which the control fields are punched in the detail cards. For a simple listed report with no controls, these cards are omitted. When controls are required, the specifications are recorded in columns 1-8 as follows.

Card Columns	Code	Control Data
1	В	Control-break control card.
2	1	First-level control (minor).
	2	Second-level control (intermediate).
	3	Third-level control (major).
	4	Fourth-level control.
3-5 (from)		Location of control field.
6-8 (to)		

#### **Split-Control Fields**

Normally, information in a given level control, identified by a single card-field heading, is punched in consecutive columns of the card. In some cases, the information may be punched in more than one card field but still in consecutive columns of the card. The various card fields involved may be treated as one-level control merely by specifying the level desired (1, 2, 3, or 4), and the high-order position of the left-most field (from) and the low-order position of the right-most field (to).

When a given level control (for example, minor) is split, that is, represented by two card fields that are not adjacent, one field is specified as minor (code 1) and the other field as intermediate (code 2). Because an intermediate control-break forces a minor total-level, all the total operations are specified in T1 (minor level) control cards in Phase 2. A single T2 (intermediate level) control card, coded SPS in columns 52-54, follows. However, no total operations are specified on the intermediate level. For each extra B-control card required in Phase 1, one total level is sacrificed in Phase 2.

#### Phase 1 (Form No. X24-6557)

#### **Constants Control Cards**

These cards, punched C or S in column 1, define the length of each constant word, the label used in the program when referring to the constant, and the characters that compose the constant word, with or without a word mark. Constant areas of core storage used to accumulate totals must be given a label. A maximum of 50 constants control cards may be used. Any combination of characters except PGE may be used as a label. The reason PGE cannot be used is that a 4-position constant area is reserved by the program to permit addressing the page number counter. If page numbering is not required, the counter may be used for other purposes in the program, in which case the counter must be referred to by the PGE label.

Because the number of constants control cards may vary from report to report, complete sequence numbers are not preprinted on the form. Only the hundreds position (column 78) need be entered, using 0 for the first 9 lines, then 1's, 2's, etc., as required to establish sequence. If more than one sheet is needed, skip the first line (sequence no. 1010) on all overflow sheets and continue numbering with the second line (1x20). The same numbering scheme applies to sequence numbers for *Total* and *Detail Control Cards* recorded on other forms.

Specifications for constants are recorded in columns 1-72 as follows.

Card	
Columns	Control Data
1	<ul> <li>C - Constant with a word mark,</li> <li>S - Special constant without a word mark,</li> </ul>
2-3	Number of positions in the constant word, including blanks.
4-6	Label assigned to identify the constant word when referring to it in the program.
7-72	Composition of the constant word (66 characters maximum).  Blank positions are considered characters.

#### Phase 3 (Form No. X24-6559)

#### **Detail Control Cards**

These cards, always punched D in column 1, specify the various operations to be performed for each type of detail card as follows.

- 1. Recognize type of card upon which operations specified in the same card are to be performed.
- 2. Move digits or zones from a single column of the detail card.
- 3. Transfer constant words to print/punch areas.
- 4. Transfer data from detail card to print/punch areas.
- 5. Perform arithmetic operations on detail-card data.
- 6. Print multiple lines from a single card.
- 7. After printing a detail line, skip to a carriage-tape channel, or space 1, 2, or 3 lines.

Detail-control-card specifications are recorded in columns 1 to 72 as follows.

Card	
Columns	Control Data
1	D - Detail Control Card.
2-6 If only one type of detail card, leave colu 2-6 blank. If more than one type (maxir	
	10), enter information in columns 2-6 as specified in the following rule.

RULE: For operations that are to be performed on all detail cards regardless of type, leave column 2 blank and enter ALL in columns 3-5. On the last ALL control card, also enter an asterisk (\*) (11-4-8) in column 2. ALL control cards must precede all other control cards punched D in column 1.

For operations that are to be performed on specific types of detail cards, enter in column 2 the type code, in columns 3-5 the column in the detail card that contains the type code, and in column 6 C for a character test or Z for a zone test. The C and Z codes in column 6 control the method to be used for determining the type of card indicated in column 2.

Applications of this rule are illustrated in the following examples.

For detail cards where no operation is to be performed, columns 1-6 of the detail control card must always be punched.

Applications of this rule are illustrated in the following examples.

Control Card Columns	_	Card Columns	Control Data
$\begin{array}{ccc} 1 & 2 & 345 & 6 \\ \hline D & ALL \end{array}$	Result	15-17 (from)	Enter the detail card column that contains the digit or zone to be moved.
D ALL ) D ALL ) D ALL )	Operations specified in these control cards are performed on all cards regardless of type.	18-20 (to)	Enter the card column to which the digit or zone is to be moved.
D * ALL )	Last ALL control card.		Control-card columns 14 through 20 are used
D - 080 C	Character test. Operations specified in this control card are performed on cards containing only an X (11-punch) in column 80.		primarily to move <i>credit X-punches</i> from some position of the data card to the units position of an amount field that is to be accumulated or edited. If the position from
D - 080 Z	Zone test. Operations specified in this control card are performed on cards containing an $X$ in column 80. This includes characters in the 11-zone ( $J$ to $R$ ).		which the X was moved must be cleared, another control card may be used to move a blank zone into the position from which the X was moved.
D & 080 C	Character test. Operations specified in this control card are performed on cards containing only a 12-punch in column 80.	21	<ul><li>E - Edit.</li><li>L - Load edit control word.</li><li>M - Move constant data.</li></ul>
D & 080 Z	Zone test. Operations specified in this control card are performed on cards containing a 12-punch in column 80. This includes char-		<ul> <li>Z - Move and suppress zeros.</li> <li>D - Move digit.</li> <li>Y - Move zone.</li> </ul>
D 0 000 G	acters in the 12-zone (A to I).	22-24	Enter the label assigned to the constant to be transferred to the print or punch areas.
D 6 080 C	Character test. Operations specified in this control card are performed on cards containing a 6-punch in column 80.	25-27 (from) 28-30 (to)	Print positions selected to print the constant data.
D 6 080 Z	No-Zone test. Operations specified in this control card are performed on cards containing no-zone punches (0, 11, 12) in col-	31-33 (from) 34-36 (to)	Summary-card columns selected to punch the constant data.
	umn 80. For this type of test, any digit from 1 through 9 can be used in column 2 of the control card.	37	<ul> <li>E - Edit detail data.</li> <li>M - Move detail data.</li> <li>Z - Move and suppress zeros from detail</li> </ul>
D Z 080 C	Character test. Operations specified in this control card are performed on cards containing the letter $Z$ (0-9) in column 80.		data. D - Move digit. Y - Move zone.
D Z 080 Z	Zero-Zone test. Operations specified in this control card are performed on cards containing a zero-zone punch. This includes special character (/) and letters S to Z. For this type of test, any of the characters mentioned can be used in column 2 of the contact.	38-40 (***from) 41-43 (to)	Location of field to be transferred. ***NOTE: To conserve on 1401 core storage, subsequent references to the same field in the same card types may be made by inserting asterisks in columns 38-40. This also applies to columns 57-59.
D 080 C	Blank-column test. Operations specified in	44-46 (from) 47-49 (to)	Print positions selected to print detail data.
D 080 Z	this control card are performed on cards that are blank in column 80.  No-Zone test. Operations specified in this	50-52 (from) 53-55 (to)	Summary-card columns selected to punch detail data.
D 080 Z	control card are performed on cards containing no-zone punches (0, 11, 12) in column 80. This test can be used to differentiate between an X80 or NX80 condition.	56	A - Add. S - Subtract. @ - Multiply (4-8 punch). % - Divide (0-4-8 punch). ? - Zero and Add (12-0 punch).
Card Columns	Control Data		! - Zero and Subtract (11-0 punch). D - Move digit. Y - Move zone.
7-13	Special 4- or 7-position instructions coded in actual IBM 1401 machine language, to be		<ul><li>M - Move.</li><li>Z - Move and suppress zeros.</li></ul>
	executed for specific types of cards, can be inserted in these columns. Instructions can also be used to branch to patching subrou-	57-59 (***from) 60-62 (to)	Location of field upon which operations coded in column 56 are to be performed.
	tines written in actual machine language. The specific patch point in the program must be determined by the programmer. Instructions for inserting patching subroutines are given under <i>Patching</i> .	63-65	Label assigned to constant upon which operations coded in column 56 are to be performed.
14	D - Move digit. Y - Move zone.	66-68	Label of core-storage positions to be used as accumulator, multiplier-product, or quotient-dividend-remainder.

Card Columns	Control Data
69	P - Print. Primarily used for MLP printing. A control card is required for each MLP line to be printed from the same type of card. Coding in column 69 is required for all MLP lines except the last. Printing the last line of an MLP card is automatic. All lines printed from an MLP card are single-spaced.
70-71	<ul><li>SP - Space after printing a detail line.</li><li>SK - Skip after printing a detail line.</li></ul>
72	<ul><li>1-3 - Single-, double-, or triple-space after printing.</li><li>4-9 - Skip to corresponding carriage tape channels.</li></ul>
	In a listed report, skipping or spacing indicated in columns 70-72 takes place after printing of the detail line for the particular type of card specified in column 2.
	In a group-printed report, skipping or spacing indicated in columns 70-72 causes no carriage operation. In such cases, skipping and spacing is controlled with T (Total) control cards entered in Phase 2.

RULE: When several control cards are entered for the same type of detail card, a skip or space instruction must be entered in the *last control card of each type*.

RULE: For printing and punching the same detail data, two separate control cards are required: one to move data to print positions, the other to move data to punch positions. This rule must be observed when entering data in control card columns 22-36 and 38-55.

# Phase 2 (Form No. X24-6558)

#### **Total Control Cards**

These cards, always punched T in column 1, specify the various operations to be performed for each class of total or each total within the same class. Operations include:

- 1. Skip to a carriage tape channel, space before and/or after total printing, or eject from form to form.
- 2. Add one total-level accumulator to a higher-level accumulator. Subtract one total-level accumulator from a higher-level accumulator. Multiply or divide one total by another on the same level.
- 3. Crossfoot totals on any total level desired.
- 4. Load or move constant data to the printer output area.
- 5. Move, move and suppress zeros, or edit accumulated totals to the print or punch areas.
- 6. Move digits or zones from a single storage position. For example, remove or add a sign to the units position of a total.
- 7. Clear accumulators.
- 8. Print constants on total levels to identify totals.
- 9. Print totals on total lines.

- 10. Print multiple lines of information read from a single card in Phase 3.
- 11. Punch summary cards.

Several totals within the same class, designated by field headings, may be printed horizontally on the same line, each under its appropriate column of the report. Or, they may be identified by constants and printed vertically on separate lines in the same column of the report. Examples:

#### **Horizontal Method**

Gross Earnings 150.00	Withholding Tax 27.00	F.I.C.A. 5.44	Other Deductions 10.00	Net Pay 107.56
	Vert	ical Metl	hod	
	Gross E	Carnings	150.00	
	Less W	HTax	27.00	
	F.	I.C.A.	5.44	
	Of	ther	10.00	
	Net Pay	U	107 56*	

Similarly, different classes of totals may be printed horizontally under designated report columns or vertically in the same report column.

Total-control-card specifications are recorded in columns 1 to 56 as follows.

Card	
Columns	Control Data
1	T - Total control card.
2	<ol> <li>1 - Minor-total level.</li> <li>2 - Intermediate-total level.</li> <li>3 - Major-total level.</li> <li>4 - Fourth-total level.</li> <li>5 - Fifth- (final) total level. (Occurs on last card runout with Sense Switch A turned ON.)</li> </ol>
3-4	<ul><li>SP - Space before total printing.</li><li>SK - Skip before total printing.</li></ul>
5	Enter 1-3 to space number of times designated.  Enter 4-9 to skip to corresponding carriage tape channels.  NOTE: Because normal single spacing is automatic, leave columns 3-5 blank if normal spacing is desired.
6	<ul> <li>A - Add.</li> <li>S - Subtract.</li> <li>@ - Multiply (4-8 punch).</li> <li>% - Divide (0-4-8 punch).</li> <li>M - Move.</li> </ul>
7-9 (from)	Label of accumulator read out of.
10-12 (to)	Label of accumulator read into.
13	<ul> <li>L - Load edit control word.</li> <li>M - Move constant data.</li> <li>Z - Move and suppress zeros.</li> </ul>
14-16	Label assigned to constant being moved or loaded.
17-19 (from) 20-22 (to)	Print positions selected to print constant data.
23	<ul><li>E - Edit total or constant data.</li><li>M - Move total or constant data.</li></ul>

Z - Move and suppress zeros from total or

constant.

Card Columns	Control Data	Card Columns Control Data
24-26	Label assigned to accumulator or constant.	54 Enter S to single space.
27-29 (from) 30-32 (to)	Print positions selected to print total or constant data addressed by the label coded in columns 24-26 of the same control card.	Enter 1-3 to obtain additional spaces beyond the normal single space (1 for double space, 2 for triple space, 3 for quadruple space).
33-35 (from) 36-38 (to)	Summary-card columns selected to punch total or constant data addressed by the label coded in columns 24-26 of the same control	Enter 1-9 to skip to corresponding carriage tape channels.  NOTE: When skipping to carriage-tape channel-1 after total
	card.	printing, report and field headings do not print.  RULE: When several totals within the same level are printed on
two separ	ing and punching from the same accumulator, ate control cards are required. One moves data positions, and the other moves data to punch	separate lines, the last T (Total) control card for each total level must contain a Skip, Space, or Eject instruction. If normal single spacing is desired, the last control card must be coded SPS in columns 52-54.
39	<ul> <li>D - Move digit (only) portion of a character from one card column to another in punch area.</li> <li>Y - Move zone (only).</li> </ul>	E - Eject form to carriage-tape channel-1 after total printing. Report and field headings will print on the next page
40-42	Summary-card column from which digit or zone is to be moved.	following the eject.  56 * - The last T control card specified in Phase 2 (Frame No. 2014 6FF)
43-45	Summary-card column to which digit or zone is to be moved.	Phase 2 (Form No. X24-6558) must contain an asterisk (*) punch in column 56.
46	S - Clear accumulator by subtracting it from itself.	RULE: When four control levels are specified in the problem, final-total operations are specified on level 5. When less
47-49	Label assigned to accumulator to be cleared.	than four control levels are specified, final-total operations are specified on the next higher level. Examples:  No controls, final-total operations are specified on
cumulator	th printing and punching from the same ac- , clear accumulator on the second control card, mation has been transferred to the print and as.	level 1.  Minor control only (level 1), final-total operations are specified on level 2.  Minor and intermediate controls (levels 1 and 2, re-
50	P - Print total line. All totals within the same level may be printed on one line or on separate lines.	spectively), final-total operations are specified on level 3.  Minor, intermediate and major controls (levels 1, 2 and 3, respectively), final-total operations are speci-
51	P - Punch total summary card. All totals within the same level may be punched in one card or in separate summary cards.	fied on level 4.  For all the conditions mentioned in these examples, the last final-total control card must contain an asterisk (*) punch in column 56.  If Final Totals are not required, a last-card-runout
52-53	<ul><li>SP - Space after total printing.</li><li>SK - Skip after total printing.</li></ul>	total-card for level 1, 2, 3, 4 or 5 must contain an asterisk in column 56.  The level is always one higher than the number of
		control levels specified in the problem.

# **Automatic-Carriage-Control Operation**

Page overflow is controlled by the letter O in column 3 of the master-report control card — Phase 1. Ejecting from form to form (carriage-tape channels 12 to 1), and skipping to carriage-tape channels 2 and 3, occur automatically as shown in Figure 3, depending on the presence or absence of report- and field-headings control cards — Phase 4.

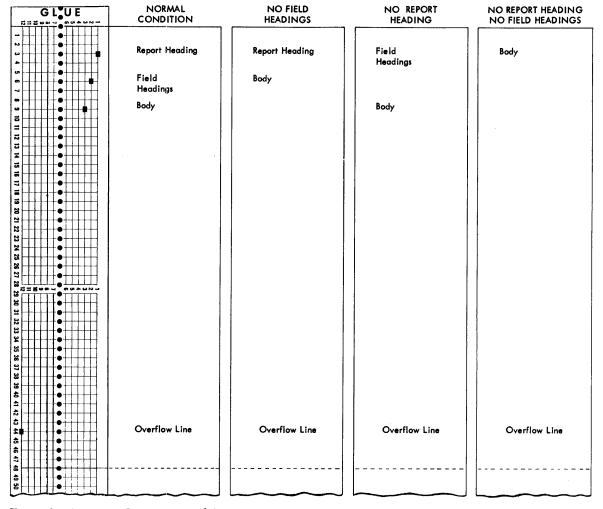


Figure 3. Automatic-Carriage-Control Operation

### **Operating Instructions**

To prepare reports with FARGO, proceed as follows:

- 1. Ready the IBM 1403 Printer.
  - a. Insert into the carriage the paper or form on which the report is to be printed. Make the necessary vertical and horizontal adjustments to properly position the form.
  - b. Insert the carriage tape punched as follows.

Normal Condition

Channel 1 - Report-heading line.

Channel 2 - First field-heading line.

Channel 3 - First body line.

Channels 4-9, if required. Skip-stops for predetermined line printing.

Channel 12 - Overflow line.

NOTE: For conditions other than normal, channels 2 and/or 3 may not be required. (See Figure 3.)

- c. Set feed-clutch knob to neutral position.
- d. Press carriage-restore key.
- e. Turn feed-clutch knob back to drive position.
- f. Press check-reset key on the 1403 printer.
- 2. Ready the 1401 Console.
  - a. Set mode switch to run position.
  - b. Set I/O check-stop switch to the on (up) position.
  - c. Set sense switch A to the on (up) position.
  - d. Press check-reset key on the 1401 console.
  - e. Press the start-reset key on the 1401 console.
- 3. Ready the 1402 read-punch unit.
  - a. Set reader switch to on.
  - b. Press the non-process runout read key to clear the read feed.
  - c. Place FARGO program and detail cards in the 1402 read unit in the sequence illustrated in Figures 1 or 6.
  - d. If summary punching, set punch switch to the on position.
    - 1. Press the non-process runout punch key to clear the punch feed.
    - 2. Place cards to be summary punched in the punch hopper.
  - e. Press check-reset key on the 1402 read-punch unit.
  - f. Press load key on the 1402 read-punch unit.

If the control cards punched from the FARGO coding sheets contain no errors, the program is loaded in approximately 20 seconds. Processing of detail data cards is started immediately thereafter. When the last card has left the hopper and the machine stops, press the start key on the 1402. If specified in the program, final totals print automatically on the runout.

### **Program Halts**

Program halts may occur not only during the loading of the FARGO program deck (Phases 1 to 4) but also during processing of the detail cards. Halts occurring during Phases 1 to 4 indicate that the control cards punched from the coding sheets are not in the proper sequence as shown in Figure 1. Or, if they are in the proper sequence, invalid codes are punched in column 1 of the control cards. Valid codes are M, B, C, S, T, D, H, F, or #. Codes other than these are invalid.

Following is a list of program halts, reason for halt, and procedure for restarting. When the halt occurs, the last card in the read stacker (NR) has an invalid code in column 1.

Storage Address Displayed	Phase	Reason for Halt
2639	1	Card has other than M.
2947	1	Card has other than B, C, or S.
2363	2	Card has other than T.
2379	3	Card has other than D.
3090	4	Card has other than H, F, or #.

To restart from any of these halts, proceed as follows.

- 1. Remove cards from read hopper.
- 2. Press non-process runout read key.
- 3. Remove the last three cards from the read stacker (NR). The first of these three cards is the control card in error.
- 4. Correct the error.
- 5. Replace the three cards in front of the cards taken from the read hopper.
- 6. Place the card file in the read hopper.
- 7. Press check reset key on the 1402.

CAUTION: Do not press the start reset key on the 1401 console.

8. Press start key on the 1402 read unit.

During processing of detail cards, if the machine stops with the red Stop Light on (1401 Console) and storage address 0157 displayed, a constants label has been referred to in one of the T or D control cards for which there is no corresponding constants control card. This may be due to misspelling the 3-character label abbreviation on the T or D control card. Or, it may be that constants control card was inadvertently omitted in the constants coding sheet. To restart, proceed as follows.

- 1. Remove all cards from read hopper and file feed.
- 2. Press non-process runout read key on the 1402.
- 3. Locate erroneous control card, make corrections, and restart from the beginning.

If the machine stops with the red Stop Light on and storage address 3547 displayed, the last card in the stacker is a type of card for which no entry was made on the Phase 3 code sheet.

During processing of detail cards, the program may hang up at an unknown address with the following lights on:

PROCESS

CHECK RESET

A- OR I-ADDRESS REGISTER.

The A-Address Register Light means that an edit control word entered in the constants coding sheet is too small for the data being edited. The I-Address Register Light means that a 1401 operation code represented by an invalid character is detected in storage.

To locate the edit control word that is too small for the data being edited, execute a STORAGE PRINT-OUT as follows.

- 1. Set mode switch to Storage Print-out.
- Press I-address register key and note address location displayed.
- Turn hundreds and thousands manual-address switches to digits corresponding to the hundreds and thousands positions displayed.
- 4. Press start key on the 1401 console.
- 5. Examine the storage print-out and find the I-address displayed in Step 2.
- 6. Go back from there to the first load (L) instruction. The A-operand of this instruction contains the storage address of the edit control word that is too small.
- 7. Locate constants control card, make corrections, and restart from the beginning.

To locate and correct an invalid character used as an operation code execute a STORAGE SCAN as follows.

- 1. Set mode switch to STORAGE SCAN.
- 2. Set manual-address switches to 0000.
- 3. Hold down the start key.
- 4. Machine stops when an invalid character is detected in storage. The storage position in error is shown in the storage-address display unit. The B-register displays the contents of the storage position in which the error is detected.

- 5. Locate the control card in which the invalid character is punched and remove it from the program deck.
- 6. Correct the error by punching a new control card and inserting it in the program deck.
- 7. To restart, a complete card runout and start reset is necessary.

### **Patching**

The term patching as used in connection with FARGO, means linking a special subroutine or library program to the main FARGO program. The linkage is accomplished by branching from a specific patch point in Phase 3 (detail control cards) or Phase 2 (total control cards) to the patch subroutine, then branching back to the main FARGO program, after the subroutine is executed.

With a 4k machine, at least 956 storage positions are available for storing patch subroutines. In some cases, depending upon the complexity of the report involved, more storage positions may be available. These subroutines must be entered into the machine in actual 1401 machine language. Therefore, a knowledge of 1401 programming or symbolic programming (SPS) is a prerequisite.

The specific patch point(s) for linking subroutines is determined by the programmer as he normally writes the FARGO instructions. These patch points are first recorded on Phase 3 and Phase 2 coding sheets as 4- or 7-position no-op instructions. They are changed later to unconditional branch instructions after the exact locations of the patch subroutines are determined.

#### Phase 3 — Detail No-Op Control Cards

At each point in Phase 3 where branching to subroutines is required, make an entry on the coding sheet in columns 1, 2-6, and 7-10 as shown in Figure 4.

																												0	ET	All	LC	0	NTI	RO	L	CA	\R[	S	_	PH	IA:	SE	3										
		C	rpe Deta	ail	1				eci						Co	olur	nn	Spl	it		L M Z D	= N = N	ad Aov love	e C	ons	tan	rol t Do pres	ta								M Z D	= N	Aov love		igit	,		DET			ARD	DA	ATA					
	_		Ch Zo				1		1 Ir (ac			ion						Digi Zone				Ļa	bel				Prin					Pur	ion		1				ta (						Pri	nt ions		ſ		Pu	nch tior		
	Code	,	Car Col	d s.		z						В			·	roi	n		To			F	rom		Fr	om		To			Fron	n	T					om	- 1	1	lo		Fr	om		1	To	Ī	Fro	m		To	•
1	2	က			5 (	6	7	8		10	11		13	14	15		17	18		20	21	22		24	25	2	7 2	8	30	31		33	34	;	16	37	38		40	41	4	13	44	4	16	47		95	<u> </u>	52	53		_
Ь	X	X	įΧ	. Ix	d	d	N	اه	01	اه			L			L			1	L			_1			ı		1	1		L			1			_1	_1			_1		1	1		_1			1_	1		i	
D			1	1	T	T		1				1	1			1	1		1	1		,	1		1		T	ı	1	Г				:	T					1			1	1	Ī	. 1	$\overline{}$	Τ	:	1	Π		

Figure 4

The *D* in column 1 is preprinted on the form. This indicates that branching to the patch subroutine is to occur during the *detail* portion of the program. The codes entered in columns 2-6 specify the type of detail card for which the patch subroutine is to be executed. The entry, No00 in columns 7-10, is the no-op instruction. This is changed later to an unconditional branch instruction (Bxxx), with xxx indicating the actual machine address of the patch subroutine.

#### Phase 2 — Total No-Op Control Cards

At each point in Phase 2 where branching to subroutines is required, make an entry on the coding sheet in columns 1, 2, and 39-45 as shown in Figure 5.

The T in column 1 is preprinted on the form and indicates that branching to the patch subroutine is to occur during the total portion of the program. Any digit from 1 to 5 entered in column 2 specifies the program level during which the patch subroutine is to be executed. The entry N788788 in columns 39-45 is the no-op instruction. This must be changed later by an instruction in the patch subroutine to an unconditional branch instruction (Bxxxbbb), with xxx indicating the actual machine address of the patch subroutine and bbb indicating blanks.

The FARGO program, including the no-op control cards that cause no machine operation, is completely tested with a representative deck of detail data cards and approved before the subroutines are inserted into the program deck. This is necessary because any change in the FARGO control cards after the subroutines are inserted affects the storage locations of the

generated report program, requiring changes in the subroutine instructions.

After the FARGO-generated portion of the report is satisfactorily tested, execute a STORAGE PRINT-OUT and examine it to determine:

- 1. the end of the FARGO-generated program.
- 2. storage location of patch points (no-op detail and total control cards).

The end of the generated program is determined by locating the report-heading information that is loaded into storage immediately after the last instruction from the detail control cards. If report-heading information is not specified in Phase 4, the end of the generated program is the last BE66 instruction. This instruction appears following the last generated instruction for each type of detail card specified in Phase 3. Therefore, the end of the generated program is either the last position of the report-heading information (including blanks), or the last BE66 instruction. The area available for storing the patch subroutines extends from this point (storage location 2358 or lower, depending upon the complexity of the report involved) to 3313. Thus, with a 4k machine, 956 storage positions or more are available for patch subroutines. Obviously, with machines of greater capacity, an additional amount of storage is available, starting with location 4000.

The storage location of each patch point is determined by visually scanning the storage print-out and finding the no-op instructions. Detail no-op instructions are identified by N888888. N888888 was recorded on the coding sheet as N788788 but changed by the FARGO program to N888888.

ſ		_	•												-									-		тот	ΑL	CON	1TF	OL	CA	RD:	S —	Pł	ΙA	SE	2		
T	ls 1-5		Be for Pri	e		s = @ %	= 1	btrac Vultip Vivide	oly			M	= Loa = Mo	ve C	onst	ant C	ata		м	=	Edit Move Move		nd Su	ıppı	ress	Zero	s						imar olum	•				Cled Accu	
	al Levels				1			La	bel				Lab	el		Pr Posi	int tions			ı	Label		ļ	Pri	int tior			Pu Posi	nch tior				love		-		s	La	bel
	Total	S S				$\downarrow$	Fr	om		То		$\downarrow$	Fro	m	Fre	om	т	0	↓		From		Fro	m		То		From		То	]↓	F	rom		T	0	ľ		Το
1	2	3	4	5		6	7	9	10		12	13	14	16	17	19	20	22	23	24		26	27	29	30	3:	2 3:	3 35	36	38	39	40	4	2 4	3	45	46	47	49
т	x		1				1	ı					1	ı	1	1	1	1					ı	1				11		ll	N	7	8   8	3	7   8	28			L
7			1				1	1						1	ì	1					1 1			1				1							1				

Figure 5

#### Converting No-Op Instructions

The control card containing the detail no-op instruction ( $\underline{N}000$ ) may be removed from the FARGO deck and replaced with a control card containing an unconditional branch instruction  $\underline{B}xxx$ . Or, it may remain in the deck in which case the no-op instruction must be converted to an unconditional branch instruction  $\underline{B}xxx$  by an instruction in the patch subroutine.

The control card containing the total no-op instruction ( $\underline{N}788788$ ) always remains in the FARGO deck. The no-op instruction, therefore, must be converted to an unconditional branch instruction  $\underline{B}xxxbbb$  by an instruction in the patch subroutine.

#### **Coding the Patch Subroutines**

As previously stated, a patch subroutine must be entered in storage in actual 1401 machine language. It may be written in symbolic language and assembled with an assembly processor as described in *IBM 1401 Symbolic Programming Systems*, Form C24-1480.

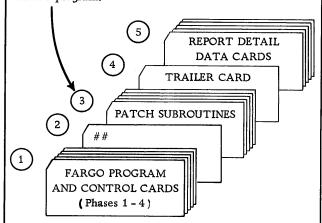
To branch back to the main FARGO routine after the subroutine is executed, the last instruction in each patch subroutine must be an unconditional branch instruction. For example, if a detail (Phase 3) no-op instruction (No00 converted to Bxxx) is in locations 1445-1448 as noted in the storage print-out, the last instruction in the subroutine used at this point must branch back to 1449. If a total (Phase 2) no-op instruction (N888888 converted to Bxxxbbb) is in locations 1201-1207 as noted in the storage print-out, the last instruction in the subroutine used at this point must branch back to location 1208.

If coded in SPS, the program is assembled after testing the FARGO portion of the job so that the origin address of the subroutine can be determined from the storage print-out. When the object program deck is created by the SPS assembly processor, the first two cards contain instructions to clear storage. These two cards must be removed from the deck. The rest of the object program deck (one instruction per card) can then be loaded directly behind Phase-4 control cards. Or it can first be condensed into multiple instructions per card with a condensing program as described in IBM 1401 Symbolic Programming Systems, Form C24-1480.

An example of a patch subroutine coded in actual machine language is shown in Figure 23-G. Another example of FARGO patching and linkage using SPS is shown in Figure 24.

#### NOTE:

If the 1401 does not have a Multiply-Divide optional feature, the Multiply-Divide Subroutines discussed in the 1401 Reference Manual can be patched into the FARGO program.



- 1. Combined FARGO Program and FARGO Control Cards
- 2. Last card in Phase 4 punched # in columns 1 and 2
- 3. Patch subroutine(s)
- Trailer card containing instructions to clear the read-in area, and branch to 3314(C14).
- 5. Report Detail Data Cards

Figure 6. FARGO with Patch Subroutine

#### Loading the Patch Subroutines

All patch subroutines are loaded immediately after the Phase-4 control cards. Normally, the last Phase-4 control card is punched # in column 1 of a blank card. To signal the FARGO program that patch-subroutine instruction cards are to be read into the system after Phase 4 is completed, this same card must also have a # punched in column 2. This causes the program to clear the read-in area (locations 1-80), set a word mark in location 001, read the next card, and then branch to location 001.

After the last patch subroutine is loaded, a clearand-branch trailer card must follow to clear the readin area, and branch to location C14 (3314), this being the starting location of the permanent FARGO program. The report detail cards immediately follow the trailer card.

The cards are run through the machine in the sequence illustrated in Figure 6.

## **Multiply-Divide Optional Feature**

If the multiply-divide optional feature is installed in the 1401, direct multiplication and division can be specified with FARGO detail and/or total (Phases 3 and 2) control cards. Before the proper entries can be made in these coding sheets, however, several factors must be considered.

#### Multiplication

Whenever FARGO report specifications involve a multiplying operation, the first thing that must be decided is the size of the product to be developed. As explained in the IBM 1401 Data Processing System Reference Manual, A24-1403, this is done by adding 1 to the sum of the number of digits in the multiplier and the multiplicand. Assuming a 3-digit multiplier and a 4-digit multiplicand, the size of the product can then be readily determined by the following formula:

3 (multiplier) plus 4 (multiplicand) plus 1 = 8 (size of product).

The multiplier may be fixed; that is, not punched in the detail cards but set up as a constant with an identifying label in Phase 1 for later reference in Phases 3 or 2. Or, it may be variable; that is, punched in each detail card or some specific type of card within a control group.

A fixed multiplier (example: 125) may be set up as a constant in one of several ways as shown in Figure 7.

A variable multiplier may be punched in known columns of all or specific types of detail cards.

Multiplicands are always variable and may be punched in known columns of all or specific types of detail cards. Or, they may be developed as a total in an accumulator and identified with an appropriate label. Although any 1-, 2-, or 3-character label may be used to identify an accumulator, many users of FARGO prefer to use labels corresponding to 407 counters; for example, 2A, 2B, etc., 4A, 4B, etc.

Experience has shown that this method of labeling accumulators often simplifies the conversion of report specifications from the 407 to the 1401.

Having determined the size of the product, set up a work area in storage for developing and retrieving the product. This is done by making two successive entries on the constants control cards coding-sheet (Phase 1) as shown in Figure 8.

			_	_			_																				_										_	(	0	NI	R	OL	С	Al	RD	S-	- 1	PH	A	SE	1		_	
C or S		lo. os.		Lo	ıbe	ıl			C.	olu olu	mn mn	s :	2-3 4-6	=	S Le	ize abe	of I t	Co o i	onsi der	tan ntif	t V y (	Voi Con	rd isto	ınt	W	ord		onst (66									·k																	
1	2	3	4	•		6	7			1	0					15						20						25					30					35	_					10				_	45	<u>;                                    </u>				50
C	0	3	1		2	5	,	12	15	F	1	1	l		L	L	1	1	1	1		<u> </u>	L	L	1	L	L	_1							L		L		L		L	1	1	l	[			L	L	L	$\perp$	L	1	
			Γ	4	,				1		1	ŀ	1		l	1	ı	1	1	1		1	l		l	1	1	1	1	1	1		Ш			L	l	١.	L	1	L	L		1	_1			<u></u>	L	L	L	L	丄	$\perp$
c	0	3	1	F	1	X	,	د	13	7	1	1			1	1	1	-	1	-		1	ı	1	1	1	i	_1								1		L	L	L	1	L	1	_1	1			L	L	L	L		$\perp$	
		Γ	T	•	1			1	1	ı	1	1			1	1	1	1	1			1		1	1	1	1	. 1								l	L	L	L	L	1	1.	1	1	_1			L	L	L	L		L	
c	0	3	,	ĸ,	X	X	,	2	14	n	1		(>	00	١	sta	PC	lip	g	fo	r	an	Y	th	re	8 (	ch	are	ct	er	, с	bc	)\$E	n	by	t	he	P	99	T.S.	m	me	T)				L	L	L	L	T		丄	
		Γ	Ť	1			Γ	1	ı	1	1	1			1	1	ī	1	1				ı	1	1	1	1	1	1	ı	1		1			ı	1	1	1	1	1	-	1	1	١		1			ı	1	ı	1	1

Figure 7

																												(	co	N:	ST	AN	ITS	C	0	NT	RC	)L	CA	RE	)S	_	PI	ΗA	SE	1			
C or S	N Po			Lab	ei		C	olun olun olun	nns nns	2-3 4-6	; =	= Si = Lo	ze ibe	of I to	Cor id	sta ent	nt ify	Wo Co	ns	i tan	t V	Vor	ď										rk		_														
П	2	3	14		6	7		10	_				15					20	5					25	1				30	)				35	5				40	1				4	5				50
c	0	3	M	P	R	010	2 6	) 	ı		N	<b>01</b>	E:	ł	1	1	1	1	1	1	- 1		1	١.	1	1	PC		1	1	1	1	1	1	1	Ī	Ī	1	m	1	ľ	1	1	ľ	ľ	rol)			
			Т			00			10		L	L	1	a L	ppl	lic	at	ion		mc	ore	ď	les	Cr	ipt	ive	10	abo	els 	n	aig	ht	<b>Ъ</b>		RT L	E	(ra	te)	aı	nd L	G	ES	1	gro	SS	ea	mi	ng	s)
						i	1	1	1	1	1	1	1	ı	1	1	1	1	1	1			!	1	ı	1	1		1	1	1	1	1		1	ı	ı		Ī	1	1	ŀ	l	}	ı	l		1	1 1

Figure 8

The first entry, C (constant with a word mark), sets up the three high-order (left-hand) positions of the product work area into which the 3-digit fixed or variable multiplier will be moved later with a T or D control card.

The second entry, S (constant without a word mark), sets up the five low-order (right-hand) positions of the product work area, thus establishing an 8-position product work area somewhere in storage.

#### Multiplying in Phase 3 with a Fixed Multiplier

Multiplying with a fixed multiplier (125) can be specified for all or any specific type of detail card by making the entries in columns 56-68 as shown in Figure 9.

The first or second entry? (whichever one is used) zeros (resets) and adds the constant 125 in the three high-order (left-hand) positions of the product area.

Entry @ multiplies the 4-digit multiplicand punched in columns 31-34 of the detail card by the fixed multiplier (125). When the multiplying operation is completed, the product is in the seven low-order positions of the product area, thus destroying the multiplier. The fixed multiplier, however, is still available for subsequent operations from the area labeled 125 or FIX.

Following the multiply operation @, another entry moves the product either to print positions and/or to an accumulator identified by a constant label. If the product is to be punctuated, an edit control word is first loaded into the desired print positions. The product is then moved to the same print positions with an E (edit) instruction.

#### Multiplying in Phase 3 with a Variable Multiplier

Multiplying with a variable multiplier can be specified for all or any specific type of detail card by making the entries in columns 56-68 as shown in Figure 10.

Entry? zeros (resets) and adds the variable 3-digit multiplier punched in columns 21-23 of the detail card into the three high-order (MPR) positions of the product area.

Entry @ multiplies the 4-digit multiplicand punched in columns 31-34 of the detail card by the variable 3-digit multiplier punched in columns 21-23 of the same card. The product is developed in the same manner as previously described.

Γ			_								-						_	_	_	_									D	ET	All	. c	0	NTF	OL	C	A	RDS	5 —	PH	IAS	E	3																		_
D			0	eta ar	d				7	ecic	sitic	n			_		_	Sį			L N Z D	= = =	Mo	d E	Co and Dig		int pp	Dat	Ze		1					2	۵ = 2 = 3 =	Mo	ve c ve C ve Z	one.			ETAI	eros		DA	TA					?	@ = 0 = : 0 = : 0 = :	Mul Zero Mov Mov Mov	Ad e D e a	d; ! = igit; nd Su	6 = = z y =	Dividero S Mov	obti e Z	one	
ľ		-		Ch Zo:	ar. ne		ı	,		l In (act			on					Dig Zor			II	١,	Lab	el .		,		rint itior					Pur osit	ions		$\parallel$			ata Colu				F	Pri Posit	int ions				Pun ositi	ch ions		Ш	L	Dat Ca	a C				Lai	oel	
l	3	3	9	ar	d	]		0			T	E	3		$\int$	Fre	m	T	Te	,	$\ $	Γ	Fro	m	Ī	Fro	m		To			Fron		T		$\ $	,	**		1	ľo		Fron	n		ľo		Fron	,	Te	•			*** rom		To		Fro	om.	   1	.
1	2	1				5 6	5	7	3	-	01	_	13	174		5	17	7118	3	20	12	2:	2	24	1 2	5	27	28	_	30	31		33	34	36	5 3	7 3	8	40	41	4	3 4	4	46	47	4	9 50	)	52	53	5	56	5 57	;	596	0	62	63	65	66	68
	1	T		ΙX	( <sub> </sub> )	Т	1	T	1	1	T	1	L			L	L	Ι	ı	l			L	L		L	L		1_	1						I		1	L	. 1			1	L		_1_		1_		L	1	?		LL	Ţ	L		/ 2	15	MI	PIR
Þ				1	1	T	I	Ţ	1	1		1	ı	l	Ī	1	L	Ι	1	L			L	l		Ĺ	L		I	1				_1				1			_L		L	L	L	_1_		L			L	L		LL		1	Ĺ	_1.	1		
Þ	X		Х	ĺΧ	ΊX	1	χĪ		i	ı	Ī	1	1	Π		ī	1	T	ı	1	Γ		ı	1		ı	ı		1	1				1	1	Ι		I	ı	1	1		i	L	l	1		1	ı	1	1	]?		LL		L	Ш	F I	X	MI	P R
_	1-	_		-	(1)	т.	_	T	1	i	Ť	1	1	Ī		1	1	T	1		Ī	T	1	1	T	1	ı		1	1				1	1	I		1	1	Ī	1	Ī	ı	١		1						6	0	3	/	و <sub>ا</sub> د	14		1	₽Ľ	DIT
Þ	Г			1		ľ	T	Ť	 	1	1	1	1	Î		1	1		1	1	Ī	1	1	1	Ī	1	1	Ī	1	1				1	1	T	T	1		ı	1		1	1		Ī		1		1	1			Ш			П	l.	1		

Figure 9

					_								_						_													DE	T,A	λIŁ	C	:0	ΝŢ	RC	)L	C.	ARI	os	_	Pł	łΑ	SE	3																					
_		ı	yp De Cc		il	•				eci						•	olı	ımı	. 5	pli			L = M = Z = D =	- M	ad Nov	e (	on nd Digi	stc Su t	ınt	Do	Wo ata									M Z D	= E = A = A	Hov Hov	ve e c	Digi	t		DET				D	ΑT						1	@ ? = D = M :	= Ad == Mo = Zer = Mo == Mo == Mo	ulti o A ove ove	oly; dd; Digi	% ! = t; Y	Ze =	ro i Mo	Sub ve Z	on	
D	T	=	= (	hc	or.		1	1	40	Ė	nstr	uct	ior	,	D	=	Mc	ve	Di	git		٦	ıſ			-			Р	rin	t		Т			Pur	ıch			1		Da	ıta	Car	ď				Pri	int				P	unci	1		11	Г	Do	oto	Car	d	T				
	1	z =	= <b>z</b>	on	10	٠,	u			(ac	tuc	I)			Y	=	Мо	ve	Zo	ne			Ш	La	bel				Pos	itic	ns		1		P	osif	ion	8		П		С	olu	mn	_			Pe	osit	ions				Pos	sitio	ns		П	L		Colu	mns		1		La	bel	
	ŧ		_			6	: [	0							П				1			1	П							1			1							Ш		**	,									1			1			Н		***	,						ŀ	
	ပြ		č	ard ols.			z			4	1		B		l٧	1	Fre	m	1	1	•	١	₩	Fe	om		1	ro	m	١	T	•	-	F	ron	,	•	To		₩	F	roff	n		To		F,	om	,	_ '	To		Fre	om		To		N		Fron	_	1	•	1	Fre	om		To
1	2	3			_ :	5 6	5	7	3		10	1	_	13	14	1			7 1	8	_2	0	21	2		24	25	_	27	2	8	_;	10	31		33	34		36	37	38		40	41		43	44		46	47		49	50	. 5	2 5	3	5	5	65	7	59	60	_ 6	26	3	65	6	56
D	x	x	ζį,	Χı	ıΧ	( x	d	-	ı	1	ı	ı			l		ı	ı	ļ	ī	ı	١	1	1	1			1	ı		ı	1		ı			1	1			l	1	١		1	ì	ı	1		L	1		L	1		L	L	?	١	בוי	1	o	2 -	3	1	1_	m	PI
	1					()	•		1	1	٦			l		Ī	1	1	1	1	1	Ī	Ī	1	1			 	1	T	1	1	1	1									ı		1			-			_ ·		1	1		1	ı	a	٥	<b>د</b> اد	1	O	3 15	1	1	ī	₽	D
D	1	ľ	• •	ب	K.	+	†	1			1				r	T			Ť			t	1		1		-			T			1											1						Γ,						,		Ť	T				1		1	1	T	1 1

Figure 10

#### Multiplying in Phase 2

Multiplying in Phase 2 (total control cards) always involves three labels. One label identifies a fixed- or group-multiplier. A second label identifies an accumulated multiplicand, while a third label identifies the product.

In establishing the size of the product, the same rule applies. However, because the multiplicand factor is an accumulated total, the maximum number of digits *expected* in the multiplicand must be predetermined before setting up a product work area.

Having determined the size of the product, make the appropriate C and S entries on the constants control cards coding-sheet (Phase 1) to set up the product work area.

During the Phase-3 (detail) portion of the program, a fixed multiplier set up with a constant control card, or a group multiplier punched in a specific detail card within the control group, is moved to the MPR portion of the product work area. The detail multiplicands are accumulated in a storage area labeled, for example, MCD. On any given total level in Phase 2, multiplication is specified by making the entry in columns 6-12 as shown in Figure 11.

Entry @ multiplies the accumulated multiplicand labeled MCD (or any other label chosen by the programmer) by the fixed- or group-multiplier moved to the MPR portion of the product work area during Phase 3. The product is developed in the product work

area labeled PDT (or any other label chosen by the programmer). For example, in a payroll application, the multiplier might be labeled RTE (rate), the multiplicand HRS (hours), and the product GES (gross earnings). In another application, the multiplier might be labeled UNP (unit price), the multiplicand QTY (quantity), and the product AMT (amount).

#### Division

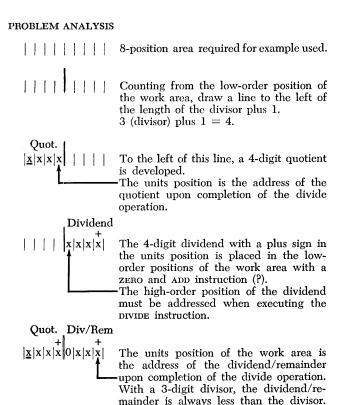
Whenever FARGO report specifications involve a dividing operation, a work area for accommodating the dividend and developing the quotient and dividend/remainder must be set up in storage with constants control cards in Phase 1. The size of this work area must be equal to the sum of the number of digits in the divisor and dividend, plus 1. Assuming a 3-digit divisor and a 4-digit dividend, the size of the work area can be readily determined by the following formula:

3 (divisor) plus 4 (dividend) plus 1 = 8-position work area.

Having determined the size of the work area, set up the area in sections to permit addressing specific locations of the quotient, dividend, and dividend/remainder. These sections must be set up in proper sequence, which may vary, depending on the size of the dividend and the divisor. For the example used, the following analysis of the problem illustrates how this sequence is established.

	П				A	\ =	Ad	d				<u> </u>								T						1	101	Α	L CO	٦N	TRC	οι	CA	RDS	S —	PH	ASE	2		
т	1-5 sle		Be for Prin		9	æ :	= M	otra ulti ivid ove	ply			М	=	Mo	ve C	ons	ontro tant l	Date		1	<b>W</b> =	Edit Move		nd Si	ıppı	ess :	Zero	s							mary Iumn				Cle Acc	
	Total Levels							Lc	be	ı			L	.ab	el		P Pos	rint itio				Label		(		int tions					nch ions				ove	-		s	L	abel
		s s	P K		$\ $	,	Fre	om		T	0	$ \downarrow$	-	Fro	m	·F	om		To	╢	$ar{ar{ar{ar{ar{ar{ar{ar{ar{ar{$	From		Fro	m		Го	Ĭ	From	n	T	o	↓	Fr	om		То	$\rfloor$		To
	2	3	4	5	٥	1	7		2 10	0	12	13	14		16	17	19	20	2:	2 2	3 2	24 2	6	27	29	30	3	23	13	35	36	38	39	40	42	43	45	46	47	49
т	X		L		6	رو	MIC	- 3	P	Į	T			L	L										1		1				1	<u> </u>			1		L_		L	<u></u>
Т							1	1			ſ			1			1		1 1			1 1		1	1	1	1					1			ı		1			 

Figure 11



Therefore, the position immediately to

the right of the quotient is always zero.

To set up the three sections of the work area in the sequence established by the foregoing analysis, make three entries in the constants control card coding-sheet as shown in Figure 12.

Entry C (constant with a word mark) sets up the 4-digit quotient section of the work area.

The first entry S (constant without a word mark) sets up the high-order position of the dividend. This position is addressed when executing the DIVIDE instruction.

The second entry S sets up the remaining low-order positions of the work area, thus establishing the 8-position work area required for the example used.

In some problems, the analysis will show that the quotient area and the dividend area overlap; that is, the high-order position of the dividend extends further to the left than the low-order position of the quotient. Example: 5-digit dividend, 2-digit divisor.

 $\begin{array}{c|c} Quot. & D/R \\ |\underline{x}|x|x|x|x|x|0|x|x| \\ Dividend \\ | & | & |x|x|x|x|x| \end{array}$ 

In such cases, the work area is set up in four sections as shown in Figure 13.

Other variations are presented later in this manual under Half-Adjustments of Products and Quotients.

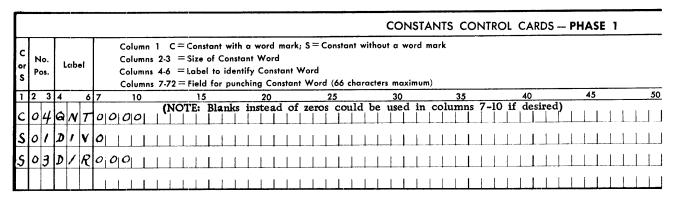


Figure 12

Γ				,																					(	01	VST.	۸N	١TS	СО	M	RO	ιc	ARI	)S -	- PI	HA:	SE	1				
C or S	1	No.		Lab	el			C	olui olui	mns mns	2-3 4-6	; = ; =	Siz La	e of bel	Coi o id	nsta enti	nt V ify C	ord onsi	ant	Wo	rd						ord		rk				,										
1	2	3	4		6	7			10	)				15				20				25				30				35			4	0			45	<u> </u>			50		
c	0	3	0	0	o	0	10	٥١١٥		1				- 1	- 1	1	1 1	- 1	1		1			1-	rog		- 1	L	1	L	1	Ш			Ш	_1				L			
s	0	1	D	1	٧	0	'I	ı		1	Th	is	la	bel	ad	dre	sses	th	e	hig	h-c	rde	rr	osi	tion	10	f th	e	div	iden	d v	whe	n e	xec	utir	g 1	he	di	ride	in	stri 	ctio	n.
s	I -	,	1					1		ı	Th	nis	la	bel	ad	dre	sse	th	e	low	-01	de	r po	osit	ion	of	the	و	ruot	ient	· <u> </u>			1		L_		Ш		1_	1_1		Ш
S	0	3	D	1	R	0	10	7 0	)	1	Th	is	la	bel	ad	dre	sse	th	ie	low	<b>-01</b>	dei	гр	osit	ion	of	the	: d	livi	deno	d a	nd	the	rei	nai	nde	r.	Ш		1	⊥.l		
							1	1	L	L	1						L				<u></u>	Ш		L		Ш		L	1_	LL				1	Ш		1	Ш		1	Ш		

Figure 13

#### Dividing in Phase 3 with a Fixed Divisor

Assuming that the fixed divisor (3 digits) is set up in storage with a label FIX, and the 4-digit dividend is punched in detail card columns 21-24, the divide instructions are recorded in detail control cards Phase-3 coding-sheet as shown in Figure 14.

Entry? zeros (resets) and adds the dividend punched in columns 21-24 in the four low-order positions of the work area placing a plus sign in the units position, if the dividend is positive.

Entry % addresses the high-order position of the dividend, divides it by the fixed divisor, and develops a 4-digit quotient in the high-order positions of the work area labeled QNT.

Following the divide operation, another entry moves the quotient to print positions and/or to accumulator identified by a constant label. If the quotient is to be punctuated, an edit control word is first loaded into the desired print positions; the quotient is then moved to the same print positions with an E (edit) instruction.

#### Dividing in Phase 3 with a Variable Divisor

Dividing with a variable divisor can be specified for all or any specific type of detail card. Assuming that the 4-digit dividend and the 3-digit divisor are punched in columns 21-24 and 25-27, respectively, the entries are made in columns 56-68 as shown in Figure 15.

Entry? zeros (resets) and adds the dividend punched in columns 21-24 in the four low-order positions of the work area placing a plus sign in the units position, if the dividend is positive.

Entry % addresses the high-order position of the dividend, divides it by the divisor punched in columns 25-27, and develops a 4-digit quotient in the high-order positions of the work area labeled QNT placing a sign in the units position of the quotient.

#### Dividing in Phase 2

Dividing in Phase 2 (total control cards) involves an accumulated factor that may be either the dividend or the divisor. Once the sizes of these factors are known, appropriate C and S entries, as previously described, are made on the constants control cards coding-sheet (Phase 1) to set up the work area.

Assume that the accumulated factor developed in Phase 3 (detail portion of the program) under the label AMT (amount) is to be used as the dividend. The divisor is either a fixed- or a group-divisor, properly identified with any label chosen by the programmer. On any given total level in Phase 2, division is specified

																								1	DET	AlL	C	01	ITR	οι	C/	RD	S —	PH	AS	3							_				<del></del>
0		-	ype Deta Car	il				pecia 7 pc	sitio	on			Col	umr	Sp.	ilit		L≃ M Z= D:	- M	ove	Cor and Dig		t D	ata							M Z D	= Me	ove ve d	and Digit			AIL C		D DA	r <b>A</b>			3	n = Move Move	ply; % = \dd; ! = ; Digit; Y =		one
ľ			Ch Zo				14	)) In (act			n		= M						Lat	el			Prin	it ons				unc						Care			Posi	rint ition	15		Punc		11		Card	La	bei
	9 O		Car Col:	d s.	c z	0 P		A		В		J	Fr	om	T	To		<b>↓</b>	Fre	om.		rom		T.		F	rom	Ī	To			Fre	-	Ι,		F.	om		To	From	Ī	To		*** From	To	From	To
ī	2	3		5	6	7	8		01		13	14	15	ī	7 18		20	21	22	24	25	7	7 2	8	30	31	3	333	4	36	37	18	40	41	43	44		47	45	200	52 5		56	+			66 68
٥	X	<u>د</u> ا	(LX	ΙX	X	L		L		1_	Ш		_1	I		LI			1	1		L			L	1	1	Ι	L			L	L		ı	Ī						11	Τ.	021			DIVR
D	X	X	( X	X	X	L				1_	Ц	Ш	1			Ш				1	L	L		1	1				11	L		ı	L		.1		1		1 1			11	%		11	FI/IX	DIIV
D			1_	1				1 1		1	П		1	1		1 1			I	1		_   [		ī	1		1		1	ı		1	1	1	ı		1	Γ	- <del></del>			1 1		1 1	11	1 1	

Figure 14

								_				_					_												DE	TΑ	IL	cc	INC	RC	)L	CA	RD:	5 —	PH	AS	E 3	)												
			Typ De C	ete		ı				7	scia por	itia	n			Co	olui	mn	Spli	it		L = M = Z = D =	= M	ove	Cor and Dig	it '	nt C	ata		•						M =	= Mc	ve d	and Digit			TAIL Zer		ARD D	DAT/	<b>\</b>				@ ? D M	= Add; = Multi = Zero A = Move = Move = Move	ply; % = .dd; ! = ; Digit; Y =	Divide Zero Sub = Move 7	Zon <del>e</del>
ľ		c = z =					1		14		Ins acti			n					igit one		7	I	Lab	el		P	Pri osit	nt ions		T		Pu	inch itior			$\prod$			Care				Pri	nt ions			uncl				Data Colu		Lo	bei
	3	9	C	ar	d s.		c z	C	•				В		U	F	ror	m		To	1		Fre	нт		Fron		1			Fre	om	Ι.	To		$\prod$	**	-	ī		Ī,	rom		To		From		To	1		*** From	To	From	To
1	2	3	3		_	5	6	7	8		10	11		13	14	15	_	17	18		20	21	2	24	25		27	28	3	03	1	3:	3 34		36	37 :		40	41	43	3 44		16	47	49		52 5		15	۷ 56:				66 68
D	X	1	Xι	X	<u> </u>	X	X			L	1		L	1			L	L	Ш	_1	I		T	L		Ш		1	1		L	L					1	L		1	Ī							11	:	_	0 2 1			DIVR
Ŀ	X	(12	Χļ	X	Ų	X	X			L	1		L	L			L	L	Ц		I	$\rfloor$	1	Ĺ		L		_1	L			L	L	L						1								11	1	10	0 2 5	0217		DIVIV
P			Į		İ					ı	1		l	l				l	1	1	١	I	i	1		 I I		1	I		1	1		 I I		I	1	1		ı		1 1	I	1		11		1 1	T	Ī	1	11	1 1	1 1

Figure 15

by making the entries in columns 6-12 as shown in Figure 16.

Entry ? zeros (resets) and adds the accumulated amount (AMT) in the low-order positions of the work area (D/R).

Entry % addresses the high-order position of the dividend (DIV), divides it by the divisor (xxx), and develops the quotient in the high-order positions of the work area labeled QNT.

Assume that the accumulated factor developed in Phase 3 under the label QTY (quantity) is to be used as the divisor. The dividend is either a fixed- or a group-dividend properly identified with any label chosen by the programmer. On any given total level in Phase 2, division is specified by making entries in columns 6-12 as shown in Figure 17.

Entry? zeros (resets) and adds the fixed- or group-dividend (xxx) into the low-order positions of the work area (D/R).

Entry % addresses the high-order position of the dividend (DIV), divides it by the accumulated quantity (QTY), and develops the quotient in the high-order positions of the work area labeled QNT.

								,																TOT	AL	COV	ITRC	)L (	CA	RD:	S — I	РНА	SE	2		
Т	els 1-5		Be for Pri	е		s = @ %	= Ad = Sul = M = D = M	otrac Jultip ivide	oly		١	M	= Load Ed = Move d = Move a	Constan	t D	ata		м	= Ed = M	ove	and	Supp	res	s Zeros	<b>.</b>				:		nmary olumn				Cled	
	Total Levels			Ī				La	bel				Label	Р	Pri osit	nt ions			La	bel		Pos	int				nch				Nove	-		s	La	bel
l		S S		1	1	$\downarrow$	Fre	om		То		$\downarrow$	From	Fron	n	T	0	V	F	om	F	rom		То		From	T	•	¥	Fı	rom	T	·o			То
1	2	3	4	5	1	6	7	9	10		12	13	14 16	17	19	20	22	23	24	26	27	29	3(	32	33	35	36	38	39	40	42	43	45	46	47	49
Т	Χ		1		ŀ	2	A IA	11 <i>T</i>	D		R		11			1	1			1		1					1	1					1		_1	
т	X		1			70	X	( X	D	/	v		(xxx :	tandi or g	ng ro	for up	r ar div	y so:	lab	el c	ho	sen	bу	the	pro	gram	mer	to	ic	len	tify	the	L			
Т			1		Ī			1		!			1 1							1				1 1				1					1			

Figure 16

	1.5		fo	e-		A S @ %	= :	Sul : M : D	btr Jul ivi	tip ide	ly				M	= 1	۸o	i Ed	Cor	sta	nt	Da	ta	rd eros	L	M	= Ed = M	ove		d S	unn	re				L	cc	N	TR	ΟL	C		Sum	nme	ary mn	Pu	nch			-	eai	
T	Total Levels		3	PK		Î		Fre		La	bel		•			L	ro	el			Pos	rin				 	La	bel			Pos	rin	ns	0		Fi		7	ions	То	$\left\{ \right.$		= N		re [ re Z	_			s		Lab	
1	2	13		4	5	٨	7			0	10	,		12	13	14	_	16	17		15	2	0	22	2 2	23	24		26	27	2	93	0	3	2 3	33	:	35	36	38	3 [	39	40		42	43		45	46	47		49
7	x		1			?	Г	1/	<u> </u>		Т		_				(x	xx lxe	si d	br br	idi  g	no ne	y f up	or di	1	ny id	la end	be		cho	ser	ı l	by	th	e	pr	og	rai	mn	ner	ľ	2	ide	ent	tify	t	he			_	_	$\perp$
Т	X					%	ľ				1				L.	<u> </u>		1												L	1_	1	1	1			_				1		-		L		<u></u>			L		Ш
T			1					L		-		1	_				L	1		1	L							1					_1_			1								<u></u>			i	;			!	:

Figure 17

#### Half-Adjustments of Products and Quotients

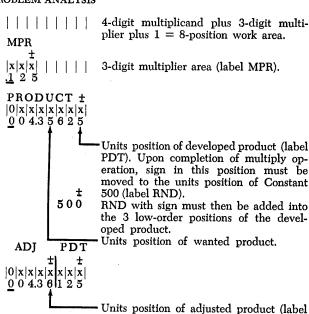
Products and/or quotients may be half-adjusted (rounded) by adding 5 to the position in the product or quotient immediately to the right of the wanted result. If the position to which the 5 is added stood at 5, 6, 7, 8, or 9, a carry occurs to the units position of the wanted result, thus rounding the product or quotient by adding the carry-over 1. If the position stood at 0, 1, 2, 3, or 4, the carry does not occur and the product or quotient is not adjusted. This procedure is often used to round out results to the nearest cent. The following examples illustrate.

#### **Product Adjustment**

Assume a 4-digit multiplicand (with two decimals) and a 3-digit multiplier (all decimals).

#### EXAMPLE

#### PROBLEM ANALYSIS



ADJ). Sign in units position of PDT must

be moved to units position of ADJ.

To set up the three sections of the 8-position work area (MPR, ADJ, PDT), the constant 500 (RND), and an edit control word (ECW) to edit the adjusted product, five entries are made in the constants control cards coding-sheet as shown in Figure 18.

Characters &CR in the edit control word are not required if the products are always positive. The zero (0) to the left of the decimal point suppresses all insignificant zeros to the left of the decimal point, and the & causes a space between the units position of negative amounts and CR symbols. Examples of edit printing:

.09 4.36 15.08 .07 CR 8.39 CR 29.06 CR

To make proper entries on the coding sheets for this example, base the specifications on the following assumptions.

- 1. Multiplication is to be accomplished for all detail data cards (Phase 3).
- 2. Multiplier is punched in columns 21-23, with an X punch in column 23 if negative.
- 3. Multiplicand is punched in columns 31-34, with an X punch in column 34 if negative.
- 4. Adjusted product (positive or negative) is to be edited and printed in print positions 101-109, with no sign if positive, and ca symbols if negative.

To accomplish item 4, make the following entries in addition to those required to perform the basic multiplication.

- 1. Move the plus or minus sign from the units position of the developed product to the units position of the constant RND 500.
- 2. Add RND with sign to the low-order positions of the developed product (PDT).
- 3. Move the sign from the units position of PDT to the units position of the adjusted product (ADJ).
- 4. Load edit control word (ECWbb0.bb&CR) to print positions 101-109.
- 5. Edit and print ADJ in print positions 101-109.

  Seven entries are required in various columns of detail control cards (Phase 3) coding-sheet as shown in Figure 19.

Γ														•																	CC	7	151	ΆΙ	NT	s ·	cc	ON	TR	Ol	. (	- CA	RE	s	_	Pŀ	HA	SE	: 1			
C or S	N Po			Lab	el			c	olu olu	mn	s 2	2-3 1-6	72	Si:	te d bel	of to	Cor o id	nste en	ant tify	W C	or on:	d star	nt \	Vo	rd										ork																	
-	2	3	4		6	7	,		1	0					15					2	0					.25					3	0				3	5					40					45	5				50
c	0	3	M	P	R		)   C	10	)	ı	ı	1	1		)	ı	1	1	1	1	i			ı	1			1	1	1	1	ı	1	1	ı	1	1	1	i	1	i	1					;	1	1	1	1	1 1
			Г	D	П	Т			1	١		-			>	V	Vo	rk	A	re	<b>a</b>	ı		l	1		 	1	1	1		1	1	1	1	ı	1		i	1	-	-					:	1	1	1	1	
S	o	3	₽	D	T	6	);0	0	)	1		1				L		1	1		ı				L	L	L	L	L	1	Ţ	1	Ī		1		1	_		1	1	1				_		L	L	L	L	<u>一</u> 山
V	0	3	R	N	D	1	Πα	٥١٥	2	1		_				1	1/2	2 4	ad	jus	t	cq	ns	tar	ıt	L	L	L	Ŀ	1	1	1					1			1	-	_						L	Ī	1	_	— 11
C	0	9	E	c	W	1	1	(	، إد	• [	-	ŀ	ፈ	C	R	L		1	1						ļ	l	L	L	1	l	1	1	1		1			1	1	1		1						L	L	L	L	
				ĺ			1	L	L							L	ı	ı	L	L				L		ı ·	L	l	l	1	1	ı	1		l					L	-					L	1	L	1	1	L	<u>—</u>

Figure 18

C C C C	XX	C Z 5 6	O P 7		(actua	8	- ;	Y = A	Aove .	Zone			Labe				int tions				unch sitions				Card		Pri			Pun						Card			Labe	) )
3 X	5   X   X	_	1-	8	10	<u> </u>	13 1	Y		-		<u>*</u>			Fr	om	١,	ī o	١,	rom	١,		$\ $	*** From	To	Fra	Posit	To	Fro		То	7		***		To		From		To
X.J	XX	_	1-	,	,		7	4:-				212	22	24			28		031		334	-	37			3 44	46		9 50	52		55	V		59		62		65 6	
				1 1	1 1	. 1 1	1		1 1	Ī	1		1		ı	ı	ı	1		1.		ı		11			ı	LI		1			?	0 2	1	0 2	3		_^	MIP
n	X X	Y X		ı			T		1		1		1		1	1	1	1				1		1.1			1	1.1					-1	0 3	1			L	7	PIZ
	XIX	1 1														L		1						_1_1_		$\prod$	1						/	L				PD	$\tau$	RIM
				1		. 1 1	T		1.1.		1					1		1						1.1	11		L						4			L		RIN	D	$\rho_{ J}$
							I		LL		L		_1_			L	1	_1				1		. 1 1			1						y					PLD	T	AJ
Χı	LXIX	ĺχ				 						L	EC	IW	110	01	1	019	7					11			L										L			_1_
X	XX	X	1				T		L L.			E.	AD	٦,	/10	01	1	oje	1			_1_		1.1			L					$\prod$				Ĺ	Ш			
2	(	(1 <b>X</b> 1) (1 <b>X</b> 1)	X XIXI) X XIXIX X XIXI)	( X X X  X X X  X X X  X X X	(1 <u>X1X X                                </u>	(1X1X X	(1X1X X		(  X   X	(XXXX)	(1X X X	(1X X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(IXIX X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X	(1X1X X

Figure 19

#### **Quotient Adjustment**

Assume a 6-digit dividend (with two decimals) and a 3-digit divisor (with no decimals).

#### EXAMPLE

-Extended quotient adjusted to 34.86 by 0034.856 ←  $125)\overline{4357.120}$ adding 5 to the units position. 375 Rule for placing the decimal point 607 500 in the quotient: Number of decimals in the divi-1071 dend minus the number of deci-712 (end of actual mals in the divisor equals the dividend) number of decimals in the quotient. 870 (dividend extended)  $\overline{120}$  (end of

division)

PROBLEM ANALYSIS 7-digit extended dividend plus 3-digit divisor plus 1 = 11-position work area. Quotient Line to the left of the number of 1 1 1 1 1 1 1 1 1 1 1 1 digits in the divisor plus 1 locates the extended quotient including sign in the units position. Dividend ± |x|x|x|x|x|x|x|4 3 5 7.1 2 0 -Units position of extended dividend (label EXD). Supplied by moving constant 0 or blank to EXD. Units position of actual dividend (label ACD). To signal end of division, sign in this position resulting from a ZERO AND ADD instruction must be removed and transferred to the units position of extended dividend before executing the divide instruction. High-order position of actual dividend (label DIV). This position is addressed when executing the divide operation. |x|x|x|x|x|x|x|x0 0 3 4.8 5 6 Units position of extended quotient (label EXQ). Upon completion of the divide operation, sign in this position must be moved to Constant 5 (RND). RND with sign must then be added to units position of extended quo-Adj.Quot. 0 0 3 4.8 6 1 0 1 2 0 Units position of adjusted quotient (label ADQ). Sign in units position of EXO must be moved to units position of ADQ. High-order position of ADQ.

To set up the various sections of the work area in the proper sequence and to set up other required constants as analyzed in the foregoing, make entries in the constants control cards coding-sheet as shown in Figure 20.

To make the proper entries on the coding sheets for this example, base the specifications on the following assumptions.

- 1. Division is to be accomplished for all detail data cards (Phase 3).
- 2. Dividend is punched in columns 31-36, with X punch in column 36 if negative.
- 3. Divisor is punched in columns 37-39, with X punch in column 39 if negative.
- 4. Adjusted quotient (positive or negative) is to be edited and printed in print positions 101-111 with no sign if positive and cr symbols if negative.

To develop adjusted quotient as specified, make entries in the various columns of the detail control cards (Phase 3) coding-sheet as shown in Figure 21.

٢																													C	) N	ST	۸N	ITS	. c	10:	۷TI	RO	L	CA	R	os	_	Pŀ	ΙA	SE	1								
Ĺ	Г		Τ			Γ												a w			ark	; S	=	Cor	sta	nt	wit	hou	ut a	w	ord	ma	rk																					
or	1	٧٥.	1	Lab	اء	l												nt V																																				
s	1 P	os.	1	Lub	•	1												fy C																																				
Ľ	L		L					Col	umi	ns :	7-7	2 =	Fi	əld	fo	r pu	incl	ing	C	ons	tan	t V	Vor	d (	66	cha	rac	ter	s m	axi	mu	n)																						
Ī	2	3	4		6	7			10					15					20					25	5				3	0				35					40					45	<u>_</u>		_		5	0				55
c	0	4	10	0	0	0	0	0	0	1	ı			ı	ı		l	Ne 					1		1		1	1	٦	Γ	1	1			1	l	$\prod$	L		<u> </u>	1		L	L			L	L		1	1	L	L	Ш
	Т	T	Т	T	Τ	П					_ •				-	3		Hi	gh	-0	rde	r	pc	sit	ío	n (	ì	ac	tu	al	di	/ld	en	d.			T																	
S	lo	"	L	) /	V	0					$\perp$		L	L	L	<u> </u>	L			L	L	L	L	1_	上	1	⅃	1		Д,	┸	┶	1	1	L	$\mathbb{L}_{-}$	$\perp I$	L	L.,	L	L	L	١	L.	1.			_L		1			1.	
ç	0	,	A	D	a	0	1	1	,	- 1	1		ı	1	ı	ı	i	Lo	w-	OI I	de:	r )	po:	iti	on I	(O)	f a	adj 	jus 	ted 	۱ q	uoi	tie:	nt.	ı	ı	۱(	ı	ı	ı	ı	1	ı	1	ı	ı	1	ı	ı	1	1	1	ī	1
۲	+	T	Т	T	Т	Т		1						L	L	L	L	In	w-	01	de	r 1	nO:	iti	on	0	f	ext	ten	de	a o	Juc	otic	ent	<u>.                                    </u>	L	┰	-		w	OF	K	Ā	RE	A		-	_1	-1		-4-		1	
S	0	1	ε	X	0	0	-	-	- 1	- 1	1		l		ı	ı		ا آ		ľ		ī,			Ī	1	1	1	1	Ī	-	]	1		Ì	l	Ц	1		Ë	Ī	Ī	Ī	Ī	Ī		1	1	1	1.	1			
	١.	Ι.	T.	T		П											•	Lo	w-	OI	de	r	pos	iti	on	0	f	act	tua	.1	liv	ide	end	١.			1																	
S	0	3	A	C	D	0	0	0			$\Box$		<u>L</u> .,	<u> </u>	L	L	L	ΙI		l	1							ŀ			1		1.		<u>L</u>	<u> </u>	Ц			L	L	L	L	<u> </u>	L	L	1_		1	L	$\perp$	$\perp$	L	
lς	0		6	×	7	0		1	1	1	1			1	ı	ı	ı	Lo	w-	·01	de	r j	po	iti	on	ုဝ	f	ext	ten	de	dٍ ٩	liv.	ide	nd	i	ŀ	J	ı	1	1	ı	i	1	ı	ı	ı	1	1	ı	1	ı	1	1	1
Y	۲	+	╀	+^	۲	۲			_1				Щ-	L	L	L		Co		<u></u>		<u></u>	_	ل-	1_	¥+,	1	4 .	41.	10	-	+-	-		1	L	1/	<u> </u>	<b>-</b>	<b>I</b>	1	L	١	<u></u>			_			_1_		-1		. 1
C	10	1	Ιz	R	o	0	1	1	-1	1	Ī		ı	1	١	ı	1		IIS	La.	n.	ZE	ľ	ľ	١			ή`	ui v	Ï		<b>י</b>	1	1	1	1	1	1	1	ł		1	1		1		-			1		1		
1	٦		П	Т													,	Cç	ns	ta	nt	5	to	h	alí	-a	djı	ust	q	uol	ie	nt.					,						,			_	,					1		1 1
C	10	′′	17	<b>\</b>	U	b							L	L	_	L		Щ		L.	_	<u> </u>	L	1_	Ţ.	1.	1	1		$\perp$	1			1	<b>L</b>	L	L		Ļ.,	١	<u></u>	L_	L	1	L		$\perp$		1					L
c	1	1	6	c	w	L	ا و		ŀ	0	۰			d	C	R		Ed			1		1	Ι.	1	1	L	1	1.	L	$\perp$	L			上			<u></u>	L.	_	L			L	L	L	_L_	1	1			1.	1	L
٦	6	,	A	L	4		<i>-</i>	-	1	1	1			1	1	1		Co	ns	ta	nt	bl	an	k,	use	d	to	n Je	no	ve Li	ы	anl	K Z	on	e t	0 1	uni	its	po	osi le	tio	n irk	of	20	etu	al wii	di th	iyi	de Ze	nd	,	1	ī	1 1
F	F	+	۲	+		H	1					_	L	L	L	_	<u> </u>	an	d	Ä	id	in	str W	uc	tio	n.	4	G-L	LGI	μ.	· A Y	اعجا	LEPA.	43	Pre			-11	1 64	t¥.	TAA.	4.1	1	., .	7	•7 •		-T-	4		L.	. 1	4	
ĺ			Ĺ			1	١	1	- 1	- 1	١			1	1	1	i	,	~	Ĩ .	1			ī	Ī	1	I	1	1	ı	1	1	1	1	ı	ļ	1	1	ļ	ı	1	ı	l	1	1	1	1	1	1.	1	1	1		

Figure 20

																			DE	T	AIL C	40	ITRO	L	CAI	RDS —	PH	ASE	3								_							
		Type of Detail Card			ecial	4 or			Co	lumn	. Sı	olit		L = M = Z = D =	Edit Load I Move Move Move Move	Co an Di	onstant d Supp git	Do	ata						z = D =	Edit Move Move a Move D Move Z	Pigit		DETA			DA	TA				3	@ = 0 = 0 = w =	Zero A Move Move	ply; .dd; Digi	% = ! = Z t; Y =	act Divide ero Sub Move ress Ze	Zone	
D	h	C = Char.	1		•	tructio	п	6		ove	:		┪	i٢	111010	Ť		rin	†	Т	F	Pun	ch	┪	iΓ	Data		i		Pri	int		Τ	Pu	ınch		٦ı		Data					
		z = Zone			(actu	al)				ove			╝		Label		Pos	sitio	ons		Po	ositi	ons	┙		Colu	mns			Posit	ions		╄	Pos	ition		41	L	Colu	mn		L	bel	
	900	Cord Cols.	0				,	$\prod$	F	rom		To		$\ $	From		From		To		From		To			*** From	T		Fra	m	1	o	F	om	] ,	Го	$\prod$		*** From		6	From	To	
1	2	3 5 6	7	8	10	11	13	14	15	1	7 11	3	20	21	22 2	4 2	25 2	7 2	8	30	31 :	33	34	36	37 3	B 40	41	43	44	46	47	49	9 50	5	2 53	5	5 5	6 57	7 59	60	62	63 6	5 66	_68
D	l <sub>x</sub>	XXXXX	T	П		T .			ı	ı		1.3			1.1.		11		1.1		_1_1						Ш	1	L	1	Ш		Ш				۵	>				2/8/	EX	Į,
		XXXXX			1		1		ı	i		1			1.1	Ì.	.1.1.		1.1		_1_1					11	. 1	1	Ш	1	_1				$\perp$	L	1?	0	1/8	0	3 6		AIC	10
		XXXXX		П	1	1	1	Γ		1		1		1	1.1		11		1 1				1.1			1.1		┙	L	L	П	L	$\perp$	_1_		_1	Y	4	LL	Ы		A <sub> C </sub>	DEX	
		XXXX			1	T	1				T	1			11		11	T	11							11.	1	1_	L		L				L	Ш	)	/		Ш		BL	4/4/	-17
		XXXXX		П	1	1	1	T		1		1					11	T	1 1							1.1	L				L	J.		Ц.		Ш	7/	60	317	0	3 19		0/	Ų
		XXXXX			1	1	1	T			Ť	<u> </u>		1	11		11		1 1							11		L	L	L	لــــــــــــــــــــــــــــــــــــــ			Ш		L	b	Y	, 1	L	ــــــــــــــــــــــــــــــــــــ	FX	RIA	/ 2
		(XIXIX	ı		1	1	1	T		<u>-</u>	T	1			11	T	11		1.1		11												_	L		L	1	1	LL	L	L	RM	DEX	()6
		(XIXIX)			 I		1	T		· I	1	 	1		11	Ī	11	T	1 1															Ш.			)	Y	11		LL	EX	AI	) 6
	1	XXIXIX			_ <del></del>	T	1			<b>.</b>	1	1	1	L	EICIV	V	101	,	///	1										1	1		1			L	1	1		_			41	1
		XXXXX			<u>-</u> -	1	ı	Γ			Ī	1	L		ADE	T		T					نــــــــــــــــــــــــــــــــــــــ			11			L	1	L	_1	1	LL		L	1	1	Ш	_	Ш	Ш	4	L
D	ľ		T	П	1	1	1					1			11	T	1.1		1.1	1	11			1				1	L			L				LL	$\perp$	1	11	_		$\perp$	11	L

Figure 21

# FARGO General Program Operation and 1401 Core-Storage Organization

The following table describes in summary the sequence of events occurring during the loading of the combined FARGO program decks and the control cards punched from the coding sheets.

#### Code in

Column 77 Program Operation and Core-Storage Organization

- FARGO Phase 1 program is loaded temporarily into locations 2618-3313.
   FARGO program is loaded permanently into locations 3314-3699 during Phase 1.
- 1 Phase-1 control cards coded M, B, C, and S modify the permanent FARGO program, load up to 50 constants into storage beginning with location 333, and set up a table in locations 3700-3999 indicating the location of each constant.
- 2 FARGO Phase-2 program is loaded temporarily into locations 2306-3313, canceling out the temporary FARGO Phase-1 program.
- 3 Phase-2 control cards coded T generate total instructions and load them into locations immediately following the constant area.
- 4 FARGO Phase-3 program is temporarily loaded into locations 2301-3313, canceling out the temporary FARGO Phase-2 program.
- 5 Phase-3 control cards coded *D* generate detail instructions and load them into locations immediately following the total instructions. The last instruction generated in Phase 3 will be BE66.
- 6 FARGO Phase-4 program is loaded into locations 3023-3313, canceling out a portion of the temporary FARGO Phase-3 program.
- Phase-4 control cards coded H load the report-heading information into locations immediately following the last BE66 instruction generated in Phase 3. The constant table in locations 3700-3999 set up during Phase 1 is cleared and the Phase 4 control cards coded F load the field-headings information into this area.
  - Location 2358 (or less) up to location 3313 is available for storing patch subroutines.

#### **FARGO Report Examples**

#### Register of Earnings and Deductions

This report will be listed on blank paper. Specifications include the following operations:

- 1. Report and Field Headings with overflow and page numbering.
- 2. Minor and Intermediate Controls.
- 3. Group-indication of control fields.
- 4. Addition and Subtraction (two types of detail data cards).
- 5. Three minor totals, three intermediate totals and three final totals. All amounts listed and total-printed will be edited.

Report format and completed FARGO coding sheets are shown in Figures 22-A to 22-E. An example of the finished report is shown in Figure 22-F.

#### Remittance Statement and Voucher Check

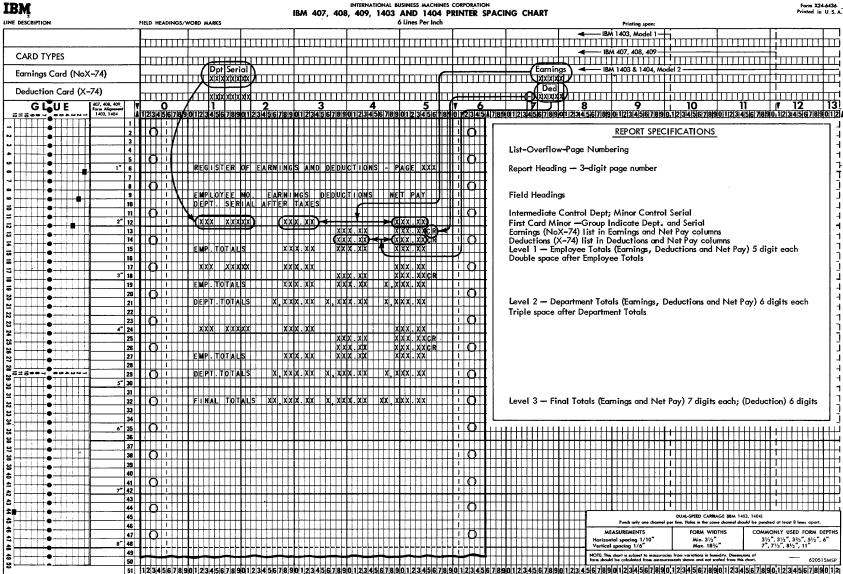
Statement and voucher check will be prepared on preprinted inverted forms. Statement portion of form provides for listing of debit and credit accounts payable items (4 types of detail data cards punched 1-4 in column 7), total printing of date, vendor number, and an edited statement total with floating \$.

Voucher check provides for date, vendor number, check number, and edited check amount with floating \$ on one line. This is followed by a space and 3-line printing of name, address, and city read into storage from a card punched — (11-punch) in column 7. A fourth line address, when required, is read into storage from a trailer address card punched & (12-punch) in column 7. Name and address cards precede detail data cards.

Specifications include punching of a summary card for both valid and void (overflow) checks. The summary cards, including those punched for void checks, will be used to prepare check registers and for check reconciliation.

Valid checks are printed and summary punched with FARGO instructions. Void checks are printed and summary punched with instructions from a patching subroutine.

Format of Remittance Statement and Voucher Check and completed FARGO coding sheets are shown in Figures 23-A to 23-G. Patch subroutine card format is shown in Figure 23-H. Examples of statements and checks are shown in Figure 23-J.



FORM X24-6556 Printed in U.S.A.

		49
	PROGRAMMED BY J. Johnson  PROGRAMMED BY J. Johnson  DATE 12/15/61 Page 1	of_ <del>*</del>
Ĩ	REPORT HEADING CONTROL CARDS - PHASE 4	
Ì	H 5 Two Cards (one line) Card 1 = Print Positions 1-66; Card 2 = Print Positions 67-132	Sequence
L	1 2 3 5 10 15 20 25 30 35 40 45 50 55 60 65 68	Number 77 78 80
	HI I I I I I I REGUSTERI I OFF ELARIMUNIGISI AIMA DIEDUCTUOMS - PIAGE I I I I I I I I I I I I	7001
	H 2 bt	7002
ſ		
ł	FIELD HEADINGS CONTROL CARDS — PHASE 4  Four Cards (two lines) Card 1 = Print Positions 1-66; Card 2 = Print Positions 67-132  Card 3 = Print Positions 1-66; Card 4 = Print Positions 47 132	Sequence
ŀ	Card 3 = Print Positions 1-66; Card 4 = Print Positions 67-132  1 2 3 5 10 15 20 25 30 35 40 45 50 55 60 65 68	Number
	FILL I EMPLOYES MOLIFEIMOLIES INGLIES INGLIES INGLIES INGENIAMIS I METIPALY	77 78 80
		7011
Ī	F3	7 0 1 2
		7014
(	# NOTE: BLANK CARD PUNCHED # IN COLUMN 1 MUST FOLLOW LAST CONTROL CARD IN PHASE 4	7015
ſ	MASTER REPORT CONTROL CARD — PHASE 1	
I	Page No. FIELD 1 FIELD 2 FIELD 3 FIELD 4 Fields 1-4 = Group	
	Indication Fields	Sequence
	Positions Columns Positions Columns Positions Columns Positions M M Solumns Positions M M M Solumns Positions M M M M M M M M M M M M M M M M M M M	Number
	LOP From To Z From To Suppress Zeros	
ı	1 2 3 4 5 7 8 10 11 12 14 15 17 18 20 21 23 24 25 27 28 30 31 33 34 36 37 38 40 41 43 44 46 47 49 50 51 53 54 56 57 59 60 62	77 78 80
L	MLOPOSTOSIGIZO(140/160/120/14M0)1;7021/0/17021/	1 0 0 0
	CONTROL BREAK CONTROL CARDS — PHASE 1	
	Control Field Card Cols.	Sequence
	From Fo	Number
ı	1 2 3 5 6 8 B 1 4 9 9 3 1 8 First land Control (minor)	
	B 1 0 1 7 0 2 8 First Level Control (minor)	1 0 0 1
		1 0 0 1 1 0 0 2

Figure
22-C

FORM X24-6557 Printed in U.S.A.

IBM
REPORT Register of Earnings and Seductions IBM 1401 DATA PROCESSING SYSTEM
FARGO REPORT SPECIFICATIONS • Phase 1

PROGRAM IDENTIFICATION 73/74/75/76

PROGRAMMED BY Page 2 of 4 DATE CONSTANTS CONTROL CARDS - PHASE 1 Column 1 C = Constant with a word mark; S = Constant without a word mark No. Columns 2-3 = Size of Constant Word Label Sequence Pos. Columns 4-6 = Label to identify Constant Word Number Columns 7-72 = Field for punching Constant Word (66 characters maximum) 1 2 3 4 15 20 25 45 50 72 77 78 COSEALOOOOO Employee Earnings Counter COLEANODODO Dept. Earnings Counter **D** 2 0 Final Earnings Counter C07 F A 3 0 0 0 0 0 0 0 0 1 COSDE 101010101 Employee Deductions Counter Dept. Deductions Counter COLDELOGOODO 1 0 5 0 Final Deductions Counter CO60 E3 00000000 0 6 0 Employee Net Pay Counter C 05 N 7 1 0000000 1 1070 Dept. Net Pay Counter COGN720000000 1 0 8 0 Final Net Pay Counter CO7NP300000000 CIOEMPEMPI. ITIOITALLISI 1 1 0 0 Total Identifications CI/DPTDIEIPITI.ITOITIAILISI CIZFINFIMALL MOTALLS

**IBM** REPORT Register of Carnings and Deductions IBM 1401 DATA PROCESSING SYSTEM PROGRAMMED BY \_

INTERNATIONAL BUSINESS MACHINES CORPORATION

PROGRAM IDENTIFICATION

FARGO REPORT SPECIFICATIONS • Phase 3

DATE 12/15/6/ Page 3 of 4

									v														DE	TΑ	IL C	01	ITRO	)L	C/	RD:	s –	- P	HA:	SE	3																		
D	C	Type Dete Car	ail d nar.			7 401	icial posi Inst	ition truct	1		) =	Colum	e D	igit		L A 2	.= x = y = y =	Mo Mo Mo	d Ed ve d ve d ve I	Con	stan Sup	t Di pre Prir	ss Zero			Pono.			M Z = D =	= Mo = Mo D	ove	and Dig Zon	pit ne ord		ess Zer	Pri	int	TA	Pur			@ ? = M	= Add; = Mult = Zero = Move = Move = Move	iply; Add; Digi and	% = ! = 2 it; Y = Supp	Divide Zero Su Move	btr Zo ero:	ne :	Print (MLP)	After Print		Sequ Non	
	900	Car Col	ď	C Z	0 P		GCIO	.,	<b>B</b>			Mov From			To			Fro		F	rom	siti	ons To	1	From	siti	To		╽	** Fro			ns To		From		ions To	١,	Posit From	To		∦	*** From	Umns 1	<u>.                                    </u>	Fron	Lab	To		S P S K	1		
	2 :	3	5	6	7 8		10	11	1	3 14	4 15	5	17	18	2	02	12	2	24	25		27 2	8 ;	30	31 ;	33 3	и	36	37	38	40	041		43	44 4	16	47 49	2 50	52	53	55	56 5	57 59	960	62	63	65	66 68	69	70 717	2 77	7 78	80
P	4	97	14	7	4	1	1	Ш	L	ļ	1	1	Ц	Ш		1	- 6	C	W	اه	1	5	<u>ाउ।</u>	5		1		Ц	E	017	116	, 0	18	٥	02	5	0 3 5	1	Ш.		Ц	A.	* * *	0	810	ш	Ц	EAIL	Н		5	0	1 0
0	_	017	114	z		L	L	Ц		┸		L	Ц	Ш	_L	4	. 8	١	<b> W</b>	0	4	6	<u> ।</u>	6		1		Ц	E	* #	4*	-0	18	0	0 4	4	0 5 6	1	Ш		$\sqcup$	A 1	<u> </u>	اه	810	ш	Ц	MPH	Ц	SP	/   5	9	2 0
0	- 4	217	14	z		l,	L	Ш	Ш			L	Ц	Ш	丄	1	. 6	١	W	0	<b>3</b>  .	5	0 4 :	5	11	$\perp$		Ц	E	017	26	٥ إ	18	0	0 3	5	01415	1	11		Ц	A :	* * *	01	80	ш	Ц	DIEI			5	6	3 0
P	- (	017	14	z		L				Y	1	7	14	0	80	2	L	: C	W	0	4	6	0 5]	۷.	11		L	Ц	ε	<b>*</b>  *	<b>4</b> ⊁	, 0	18	0	04	6	0 5]6					A	K  <b>* </b> *	0	810	للل	Ц	NPI		SIP	/ 5	٥	4 0
b		1	L			ı	1					1		_1	_1_	1		L	L						1.1		1	L					1.1		11		11			LL	┙	1	11	Ш	L						5	<u>.</u>	5 0
Ь		_	1			L						ı	ı	i	L			ı	į	ı	l		11				1	j			L		i i		1.1		11		H.				11	1	L.			1.1			5	<u>.</u>	6 0
D		1	_			1	1		 			ı		ı	1	I		1	i	ı	1		1.1		1.1		1	_		1	1		1 1		1.1		1		11	1			1.1		1			1 1			5		7 0
Р		1	1			ı	1	П		Τ		1		ı	-	T		1	1	ı	1	1	11		1.1		1		П	1	1	T	1 1		1 1		1.1	Ī	1 1	1	ı		1 1		1		ı	11			5		8 0
Р	1	1	1			1	1			T	T	1		ı	1	T	T	ı	1		1	1	1 1	1	1 1		ī		П		1	T	1 1	1	11		1 1	T	11				11		ī						5		9 0
Ь		i	1		1	i	1	П		Ť	Ī	1			1		T	- <del></del>	1		1		11	1	1.1	1	1	!			1	T	11		11		1 1	T	11				11		1			11	Γ		5	5	0 0
О		1	1	П	Ī	1	1	Π		1	T	 		1	1	T	T	ı			-		11	1	11	1	1		П	1	1	T	11		1 1		1 1	1	11				11		1			11			5		1 0
Р		1	ı		1	1	<u>.                                    </u>		 	T	T	 		ŀ	1	T	1	ı			1		11	1	1.1	T	1		П	<del></del> -	 	T	11		11		1 1	T	1 1	1			11		. 1			11			5	5	2 0
D		i	1			,	<u> </u>		 I I	T	T	 			_ <u>_</u> _	T	T	1	1				1 1	1	11	1	ı		П		1	T	11		1.1		1 1	1	11			Ī	11	Ti	1						5		3 0
D			1			<u> </u>	1			Ť	T	 I		-	1	T	T	1	ı				11	1	11	T	i		П		i	T	11		11			Ì	11			1	11					11	Ī		5		4 0
D		 	1			1	<u>.                                    </u>	П		Ť	T	1				1	T	1	ı	П	1	1	1 1	1	11	T	1		П		1	T	<del>                                     </del>		11		1 1	T	11				11					11	Γ		5	Т	5 0
D		<u> </u>	1			1	ī	Π	 	T	Ť	1		1	1	T	1	1	1		1	1		1		†					1	$\uparrow$		1	11			T	11		;		11		1				Γ		5		6 0
D		 				1	1	Г	<u></u> -	Ť	Ť	 I		<del></del>	<del></del>	1	T	<u>-</u>	 I	<u> </u>		1	<del>- 1 - 1</del>	1	1 1	†	. <del></del>		П		1	T	لب. ا ا		11				! !	ı	,	1	11		<del></del>			11	Г		5	$\top$	7 0
D			1	П		<u> </u>	<del>-</del> -			T	T	<del></del>			-	T	$\dagger$	1	<del> </del>	Г	L	+	1 1	7	<del> 1</del>	1			Π		1	T	11	1	<del></del> _	7		T	<del></del>		7	1	- <del>1</del>	1	_ <del></del> _				T		5	Т	8 0
D		 I	1			-	<u> </u>	Γ		Ť	T	<u> </u>			ı	1	T	<del> </del>	1	Ľ	1	1	<del></del>	1	11	$\dagger$	<b></b> _	 	П		1	1	1 1	1	11		1 1	T	11			T	11		ı			11			5		9 0
D			1		7	1	1	T	 	T	$\dagger$	<u> </u>		-	-	T	T	1	_		L	1	<del></del>	1	1 1	1	1		П		- <del></del>	T	1 1	1	11			T	<del></del>			1	_ <del></del>						T		5	Т	0 0
D		<del></del>	1	Ħ	T	L	- <del></del>	T	<b></b>	T	+	- <del></del>	1			t	$\dagger$	 	1		الل	7	1 1	+	 	+		L .	$\sqcap$		<del>_</del>	T	<u> </u>	7				T	_ <del></del>		$\Box$	$\top$	<del></del>		1			<del></del>	T		1,		1 0
ш	Щ.	_	٠.	_	4			_	<u> </u>	_	1		<u> </u>	ш		_	_	_	٠.	1	ш	_				-1		-	_	<u> </u>	<u> </u>	<u></u>	لب	_		ي								لسن				' '			-1-	-	

INTERNATIONAL BUSINESS MACHINES CORPORATION

PROGRAM IDENTIFICATION

1249

REPORT Register of Enemogy and Deductions IBM 1401 DATA PROCESSING SYSTEM

PROGRAMMED BY J. Johnson FARGO REPORT SPECIFICATIONS • Phase 2

FARGO REPORT SPECIFICATIONS • Phase 2

DATE /2//5/6/ Page 4 of 4

							0							TOTA	AL CON	NTROL	CA	RDS — I	HASE	2						7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Т	Sievels 1-3	Be- fore Print		s = @ %	Add Subtra Multi Divid Move	ply	м	= Move		Data ress Zero	۱ <sub>м</sub>	= Edit = Move = Move	Τ	ress Zeros				Summary Column	Split	1	Clear Accum.			fter		C O M M E N T S
	S	P			From	ibel To	$\left\  \cdot \right\ $	Label From	1	rint sitions To	-	Label	1	int tions To	1	inch itions To		= Move I = Move Z	•	s	Label To	Print	S	P K	T Eject	Number
耳	2 3	4	5	6	7 5	10 12	13	14 16	17 15	20 2	22 23	24 20	27 29	30 32	33 35	36 38	39	40 42	43 45	46	47 49	50 5	152	53 54	155 5	56 77 78 80
Ţ	1	┙		A	EAI	EAL																1	1,			Roll Employee Totale 3 0 1 0
Ţ	╚		1	A.	D E I	DE					L			_لــــــــــــــــــــــــــــــــــــ									L		П	to Dept. Total Counters 3 0 2 0
Ţ	1		1	A	MP l	MP																				3030
Ţ	4				1.1		L	EICIW	0 2 5	03	5E	EAI	0 2 5	035	11				11	s	E A I				H	Edit and clean 3040
	1						4	EICH	035	04	5 E	DIE!	035	01415						5	DIEI				П	Employere Totale 3050
							L	ELW	0146	05	6E	MPI	0 46	056							MPI				П	3060
			$\perp$		11	! ! _	L	EMIP	011	0 2	٥	11										₽	SI	PI	П	tolets and double space 3 0 7 0
Ľ	1	1_	4	A	EM 2	EA3															11					Roll Dept. Totals to 3 0 8 0
Ţ.	<u>l</u>	$\perp$	4	4	DE 12	DEF						11													П	Final Total Counters 3090
Ţ	4	1	4	4	4 P 2	NP3										LL		11					L			3 1 0 0
	1	┙	1				4	EICIW	0 2 5	03	s E	EAL	0 2 5	035						S	EAZ					Editandelean 3/10
			1				L	EICIW	035	04	5 €	DIEIZ	035	045	LL			11	_11	S	DEP				$\  \ $	Sept. Totale 3/20
山	$\downarrow$	1	1		Ш.		L	ECW	046	05	6 E	N P 2	046	0/5/6		:					MPZ					3 ! 3 0
<u>[]</u>	┖	$\perp$	$\perp$	1			L	D P T	0/1/	0 2	/				11						- 1	P	S	2	$\prod$	totale and totall space 3 1 4 0
	<u> </u>	$\perp$	1	1			L	FICIN	025	03	SE	E A 3	0 2 5	0 3 5					1 1	S	EA3					Edit and clear 3150
	1		1						1				1	01415						s	D E 3					Final Titals 3160
	1		$\downarrow$	1	Ш.		L	EICM	046	0 5	6 E	MP3	0 46	056					11	s	N P 3				$\prod$	3 1 7 0
	1		$\downarrow$	1			L	F/N	011	02	չ								11			P			E p	final total indepent 3 1 8 0
T			1	1																						3 90
Ţ	L	1	$\downarrow$	1								11			1_1_											3 0 0
T					Ш							11						1.1				I	L			3 1 0

		<del></del>
0		0
0	REGISTER OF EARNINGS AND DEDUCTIONS - PAGE 1	0
0	EMPLOYEE NO. EARNINGS DEDUCTIONS NET PAY	0
0	DEPT. SERIAL AFTER TAXES  1 00120 125.75 125.75	10
0	3.75 3.75CR 1.10 1.10CR	- 0
0	4.00 4.00CR EMP.TOTALS 125.75 8.85 116.90	
0	1 00121 85.00 85.00 4.75 4.75CR EMP.TOTALS 85.00 4.75 80.25	! 0
	1 00122 108.92 108.92 1.25 1.25CR	
0	3.00 3.00CR .80 .80CR	
0	.07 .07CR EMP.TOTALS 108.92 5.12 103.80	
0	DEPT.TOTALS 319.67 18.72 300.95	0
0	11 23815 185.00 185.00 EMP.TOTALS 185.00 .00 185.00	- 0
0	11 23816 160.00 160.00 25.00 25.00CR	
0	3.95 3.95CR EMP.TOTALS 160.00 28.95 131.05	0
0	11 23905 115.00 115.00 5.63 5.63CR 10.00 10.00CR	10
_	EMP.TOTALS 115.00 15.63 99.37	
0		
		-
0		0
0	REGISTER OF EARNINGS AND DEDUCTIONS - PAGE 2	0
0	EMPLOYEE NO. EARNINGS DEDUCTIONS NET PAY	10
0	DEPT. SERIAL AFTER TAXES 1 11 23919 5.00 5.00CR	
0	EMP.TOTALS .00 5.00 5.00CR DEPT.TOTALS 460.00 49.58 410.42	
0		- 0
0		10
0	124 01060 192.50 192.50 16.50 16.50CR 22.15 22.15CR	- 0
	3.10 3.10CR 3.10 3.10CR 41.75 150.75	!
0	124 01070 225.00 225.00 25.00CR	
0	EMP.TOTALS	10
0	22.00 22.00CR 10.00 10.00CR	0
0	EMP.TOTALS 155.45 32.00 123.45 DEPT.TOTALS 572.95 98.75 474.20	0
0		0
1 -	l I	0
		لــــــــــــــــــــــــــــــــــــــ

Figure 22-F. Register of Earnings and Deductions Report

# INTERNATIONAL BUSINESS MACHINES CORPORATION IRM 407 408 409 1403 AND 1404 PRINTED CRACIALS CHART

ARD TYPES	IBM 407, 408, 409, 1403 AND 1404 PRINTER SPACING CHART FIELD HEADINGS/WORD MARKS 6 Lines Per Inch Printing spon:	Printed
AME AND ADDRESS CARD (11 punch) in column 7	Vendor (FIRST LINE) Name (SECOND LINE) Name or Address (THIRD LINE) City or Address   (FIRST LINE) Name (SECOND LINE) Name or Address (THIRD LINE) City or Address	
RAILER ADDRESS CARD	\(\partial \partial \par	$\frac{1}{1}$
(12 punch) in column 7	WAXXXX S REPORT SPECIFICATIONS  Vendor MoDa Refer. Amount	
TAIL DATA CARD ink in col. 6: 1-2 in col. 7 11) in col. 6; 3-4 in col. 7	Vendor	7
MMARY CARD	Date   Vendor Check#   Amount   CONTROL REAK CONTROL CARD - Minor Control on Vendor (columns 1-5)	-
G L U E 1407, 408, 409.	MANA AND AND AND AND AND AND AND AND AND	1
5 = 5 mm ¬ mm + mm → 1403, 1404	12345678901200000000000000000000000000000000000	71
1	General Manufacturing Company — Endicott, N. Y. Code	
	We enclose   Invoice   Our Ref.   Invoice or   Discount or   5   AMOUNT     6   Mov.   Day   Number   Claim Amount   Allowance   O   AMOUNT     6   Move Trailer Address to TRL; space 1	
4	payment of	
1" 6	ittems listed   XX   XX   XXXX   XX   XX   XX   XX	14
7	XX   XX   XXXX     XX, XXX   XX, X	+
<del>                                      </del>	O CODES: XX XX XXXX XX XX XX XX XX XX XX XX XX	
9 10	1. Invoices	[-
	O 13. Discounts	1+
2" 12	4. Allowances	17
· · · · · · · · · · · · · · · · · · ·		1+
15	Overflow - Execute patch subroutine	
16	DETACH CHECK  O BEFORE DEPOSITING  Date  Vendor  TOTAL PAID -> \$XX, XXX.XX  TOTAL CONTROL CARDS  Refore print skin to carriage tape channel S	14
3" 18	O BEFORE DEPOSITING Date Vendor   O Before print skip to carriage tape channel 5  Move Statement and Check Date (SCD) to print area	1+
19	Move & Zero Supress Vendor (VFN) to print area	17
20 21	GENERAL MANUFACTURING COMPANY  Edit (EC2) TOT and print  NOTE: Although the first printing line	<del> </del>
22	indicated on line 4 of the carriage tape	
23	O 150 GENERAL BANK  1452 St. O   . printing of the first detail data card for	-114
3	each vendor occurs on Line 5 if only on address card or on Line 6 if two address	
28	PAY TO THE Date Vendor Check No. Amount Date Cards. This is because the last control	
27	ORDER OF VY/VY/VY/VY/VY/VY/VY/VY/VY/VY/VY/VY/VY/V	
± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ±	Pedures a space code (mel, on overrior	'     <del> </del>
5" 30	Add "!" (ONE) to Check No. (CKN)	<b>-</b> / ‡
31	Move Statement and Check Date (SCD) to print area	-
33	Move & Zero Suppress Vendor (VEN) to print area  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
6" 35	Edit (EC2) TOT and print	- 17
***************************************	Move Statement and Check Date (SCD) to punch area	1+
37	Morro Check No. (CVN) to purple one	
39	O We enclose Invoice Our Ref. Invoice or Discount or 3 AMOUNT Move TOT to punch area; remove sign from units position of TOT to punch area; remove sign from units position of TOT	1+
49	Clear TOT and punch Space 1 before print	1+
41	Move Name (NME) to print area and print	
7" 42	Move Address (ADD) to prink area and prink	1+
4	Move City (CTY) to print area and print  Move Trailer Address (TRL) to print area and print	
45	Move CLR to TRL to clear Trailer Address and skip to carriage tape channel 1	apo
9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	<u> </u>	RM
8" 48	Vertical spacing 1/6" Max. 18½" 7", 7½", 8	, 373 , 5½ ½", 11"
49 59	MOTE To about a spired to inspired the inspired part of the spired par	- 620
	12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890	NA ELETT

F	IBM  INTERNATIONAL BUSINESS MACHINES CORPORATION  REPORT And Land Check IBM 1401 DATA PROCESSING SYSTEM  PROGRAM IDENTIFICATION  FARGO REPORT SPECIFICATIONS • Phases 4 and 1	Printed in U.S.    2   4   9    3 74 75 76
L,	REPORT HEADING CONTROL CARDS — PHASE 4	
н	Two Cards (one line) Card 1 = Print Positions 1-66; Card 2 = Print Positions 67-132	Sequence Number
垣	2 3 5 10 15 20 25 30 35 40 45 50 55 60 65 68	77 78 80
Ш		7 0 0 1
н	2	7 0 0 2
<u> </u>	FIFTO LIFE DIVIGO CONTROL CLODE DIVIGO A	
F	FIELD HEADINGS CONTROL CARDS — PHASE 4  Four Cards (two lines) Card 1 = Print Positions 1-66; Card 2 = Print Positions 67-132	Sequence
H		Number
П	70 70 30 30 80	77 78 80
F		7 0 1 1
F		7 0 1 2
F		7 0 1 3
	4   1   1   1   1   1   1   1   1   1	7 0 1 4
<b>#</b>	NOTE: BLANK CARD PUNCHED # IN COLUMNS MUST FOLLOW LAST CONTROL CARD IN PHASE 4 To load patch subsortine	7015
	MASTER REPORT CONTROL CARD — PHASE 1	
П	Page No. FIELD 1 FIELD 2 FIELD 3 FIELD 4 Fields 1-4 Group	
	Indication Fields  ## Print Data Card Print Data Card Print Data Card Print Data Card Print (First Card Minor)	Sequence
<b> </b> ^	Positions Columns Positions Columns Positions Columns Positions Columns Positions Columns Positions Columns Positions Z = Move and	Number
П	LOP From To Z From To From To Z From To Suppress Zeros	
回	2 3 4 5 7 8 10 11 12 14 15 17 18 20 21 23 24 25 27 28 30 31 33 34 36 37 38 40 41 43 44 46 47 49 50 51 53 54 56 57 59 60 62	77 78 80
M		1 0 0 0
<u> </u>	CONTROL BREAK CONTROL CARDS — PHASE 1	
$\Box$	Control Field	
В	Card Cols.   From   Fo   Fo   Fo   Fo   Fo   Fo   Fo	Sequence Number
		77 78 80
В	1 995 905 First Level Control (minor)	1 0 0 1
В		
В		1 0 0 2
П		1 0 0 3
В	4 Fourth Level Control	1004

٦	Ħ	D'	a.	
J	u	٥,	Л	1
				◉
_		_		. /

PROGRAMMED BY

INTERNATIONAL BUSINESS MACHINES CORPORATION

PROGRAM IDENTIFICATION

i	1	2	4	8
	73	74	75	76

REPORT Remittance Statement and Noacher Check

IBM 1401 DATA PROCESSING SYSTEM

FARGO REPORT SPECIFICATIONS • Phase 1

DATE 12/10/61 Page 2 of 6

CONSTANTS CONTROL CARDS - PHASE 1 Column 1 C = Constant with a word mark; S = Constant without a word mark Columns 2-3 = Size of Constant Word No. Sequence Label Columns 4-6 = Label to identify Constant Word Number Pos. Columns 7-72 = Field for punching Constant Word (66 characters maximum) 1 2 3 4 25 30 35 40 70 72 77 78 Edit Control Word to obtain space between month and day (invoice date) COSIDA Edit Control Word for amounts listed on statement 410 EC1 1 0 2 0 Edit Control Word for total paid amount on statement and check 111 EC2 1030 Statement and check date (This card is changed daily) C085001121/15/1611 Vendor COS VENDIDIDIDI I I I 1050 "Total Paid" counter C 0 7 T 0 T 0 0 0 0 0 0 0 0 0 1060 First check # to be printed and punched is 19876. (This card is changed for every run) 1070 Constant "1" to increase check number QOIONEI 1080 Name (first line) 10,90 C24 NME Name or Address (second line) CLZZADD 1 4 0 0 City or Address (third line) CLOCTY City (fourth line trailer) CLANTRL 1 / 2 0 Label to clear out fourth line trailer information 0 0 IBM
REPORT Penittence Statement and Noacher Check IBM 1401 DATA PROCESSING SYSTEM

PROGRAM IDENTIFICATION

1248

FARGO REPORT SPECIFICATIONS • Phase 3 12/10/61 DATE Page 3 of 6 PROGRAMMED BY DETAIL CONTROL CARDS - PHASE 3 A = Add; S = Subtract E = Edit E = Edit **DETAIL CARD DATA** L = Load Edit Control Word @ = Multiply; % = Divide M = Move ? = Zero Add; ! = Zero Subtract M = Move Constant Data Type of Z = Move and Suppress Zeros D = Move Digit; Y = Move Zone Z = Move and Suppress Zeros After Detail Special 4 or D = Move Digit M = Move D = Move Digit Print Z = Move and Suppress Zeros Card 7 position Column Split Y = Move Zone Y = Move Zone Number 1401 Instruction C = Char. D = Move Digit Data Card Print Data Card Print Punch Punch Z = Zone (actual) Move Zone **Positions** Columns **Positions** Label **Positions Positions** Columns Label Card From From To From To From To From To To To To Cols. From 1011 20 21 22 68 69 70 71 72 77 78 2 3 30 31 36 37 38 40 41 43 44 46 47 55 56 57 62 63 59 60 M0101101015 5 0 1 0 Originally coded NOOL. After testing the main FARGO program and examining the storage printout, PXALLL it was changed to BKD1 (2201). This is the starting location of the patich subjoutine). 5 0 2 0 m 0018 01311 01017 Z WMIE 5 0 4 0 M 01312 01513 AIDID 01017 2 SIP 1 5 0 5 0 0 0 7 M 01514 01713 CITI 0801017Z M 01312 01513 TIRIL SP 1 5 0 6 0 E01018011101150119 5 0 7 0 10017 IIDIA 01/15 01/19 100176 2011201150121101214 100170 E|C|1 0|2|6 0|3|5 E 0311 9317 0216 01315 101017C M01017 01017 01416 01416 10017 6 EC1 0419 01518 EXXX01317 0419 01518 A \* 1 × 1 0 0 3 17 TIOIT D1201017C LIDA 0115 0119 E0018011101150119 020076 2011201150121101214 200170 LEICII 01216 01315 F 01311 01317 01216 01315 10201017 C M01017010170141601416 2010176 LEICI1 01419 01518 |E|\*|\*|\*|013|7|014|9|015|8 A XXX 01317 TIDIT 13/010/7/c E0018 0111 0115 0119 LIDA 0115 0119 30001710 20112011502110214 10/3/01017/c E 01311 01317 01316 01415 LECI 0316 0145 301017 M 01017 01017 01416 01416 30007 Y 0,0,6 0,3,7 EEE1 0419 01518 EXXX 01317 01419 01518 TI 017

IBN REPORT

INTERNATIONAL BUSINESS MACHINES CORPORATION

ittaine Statement and Nowher Charle IBM 1401 DATA PROCESSING SYSTEM

PROGRAM IDENTIFICATION

1248

PROGRAMMED BY F. Johnson FARGO REPORT SPECIFICATIONS • Phase 3

DATE 12/10/6/ Page 4 of 6

								0										DET	AIL C	:01	NTRO	LC	CAR	DS –	PHASI	Ε ;	3												
D		Type Del Ca	ail rd			Speci 7 p	ositio	n	D	Column			L = M Z = D	= Mo	ve ( ve a ve E	Const nd S Digit	tant l	ess Zeros	<del>,</del>	Pun	ıch.	7	E = Edit DETAIL CARD DATA  M = Move Z = Move and Suppress Zeros D = Move Digit Y = Move Zone Data Card Print Punch							A = Add; S = Subtract @ = Multiply; % = Divide ? = Zero Add; ! = Zero Subtract D = Move Digit; Y = Move Zone M = Move Z = Move and Suppress Zeros  Data Card				one	nt (MLP)	After Print		umber	
	_	= <b>z</b>	ne	۰₩	_	(ac	tval)			Move			4	Labe	ı		Posi		l .		ions	4	-	Colu		L	Posit		1	itions	11	Colu		La	bel	Prij		1	
L	Çode	Ca Co	ls.	z		A		В	V	From		To	V	From			om	To	From	_	То	N	/ F	*** From	То	_	From	То	From	То	V	*** From	To	From	To	P	S P S K		
	2	3	5	6	7	8	1011	13	14	15 1	7 18	20	21	22	24	25	27	28 30	31	33	34 3	63	7 38	40	41 43	44	4 46	47 49	50 5	2 53 55	56	57 59	60 62	63 65	66 68	69	70 71 7:	77 7	8 80
100	$\Box$	=	=	Ē	$\dashv$		+		Н		+	Ш	H		Ц	Ц		L_L_	$\sqcup$	H	11	+	╀	Щ		$\vdash$	Ш			+ $+$ $+$	-		ш		Ш	Н		377	
1	4	0	17	۷		Ш	+		H	_1.1	-	Щ	1	I D	Α	0	1 5	0/1/9	ш	Ц	11	4			011	$\top$			1	+++	<u> </u>				_1.1	Н		5 2	2 2 0
D	$\rightarrow$		217		Ш		_	Ш	$\sqcup$			LL	Н		Ц				نــــــــــــــــــــــــــــــــــــــ	Ц		Ž	20	1/12	0/15	0	12/	0 2 4		$\perp$	L				Ш	Ц		5 .	3 0
P	4	010	17	e		Ш	-	LL	Ц		1	Ш	L	Ejc	1	د اه	3 6	0 4 5		Ц	Ш	l	= 0	31	0317	0	1316	0 4 5			L					Ц		5 6	2 4 0
P	4	0 0	<u>17</u>	C					Ш	$\perp$		Ш	Ц			L			Ш		11	r	40	1017	0017	a	146	0 4 6								Ц		5 5	2 5 0
D	4	010	7	c				LL	У	00016	. 0	317	<u>'</u>	E۱C	1	010	419	0 5 8				E	= <del>}</del>	<del>*</del>  *	0 3 7	0	1419	0 5 8			A	***	0317		TOT	Ш	SIP	5 -	260
D			i.			11			Ĺ	Ш						J	L						L				1.1.									Ш	ı	5	7 0
D						1.1				1.1					ı		1				1.1			1 1	111		11	1.1	111	111			11		11		1	5	8 0
D			1			1.1				11				ı	,	1	1	1.1			1.1						11	1.1		1,,			1.1	1.1	11	П	i	5	9 0
D		1	1			1, 1		1 !		1 1			П	i			1	1 1			1 !	Ī	Ī	 	1 1		1 1	1 1								П		5	0 0
Ь		1	1			1.1		 I I		11	T	1 1	П	i		,	 I	1 1				Ť	Т	<del></del> -	1 1	T		1 1			ľ		1 1			П		5	1 0
D			1					1 1		1.1		I I	T				1		1		11	1				T		1 1		1 1	Γ					П		5	2 0
Ь			1			<del></del>		<del></del>		1 1	T						1	1 1				Ť	Т	<u> </u>		T		1 1		+++-	T					П		TT	
Б		-	1		H			——— 1 1	$\dagger$		T	LL_	T		H							t	Т	<u>Щ</u> ,		$\dagger$				† † †	H					H		5	
6	1				H		$\top$	<del></del>	П		t		$\dagger$									$\dagger$	+	<u></u>		t					t			<del>                                     </del>		H		5	4 0
<u> </u>	H		<u> </u>	$\vdash$	H		+	<u> </u>	H		t		Н		_					-		$\dagger$	+	<b>—</b> —		╁					╁					H		5	5 0
D	$\mid \cdot \mid$	<u></u> .		H	Н		+	<u> </u>	$\vdash$		+		H		Н					+		+	+	Щ.		$\vdash$				++-	$\vdash$	+			1-1-	H		5	6 0
6	$\vdash$		1_	$\vdash$	Н		+	LL.	$\forall$				$\forall$		니	L	_L_		Ш	+	Ш	+	+	Щ		+	Ш		- -	+ $+$ $+$ $+$	$\vdash$		Н-	++-	+-11-	H		5	7 0
٥	$\vdash$			Н	$\vdash$	Ш	+		$\vdash$		+	Ш	H		Ц			-11	Ш	+		+	+1	Щ	$+$ $\perp$ $\perp$	-	Щ	$\perp$	$\coprod$	+++	H			$\perp$	11	H		5	8 0
Н	$\mid \cdot \mid$	_		$\vdash$	$\vdash$		-	<u>LL</u> .	H		+	LL	H		$\sqcup$	L			Ш	+	$\perp \perp$	╂	+	ட		-	Ш	$\perp \perp \perp$		++-	H			111	11	H		5	9 0
٥	H				$\parallel$		+		$\vdash$	$\perp \perp$	+	LL	H		Ц					$\dashv$	11	+	+-	Ш		╀	44	$\perp \perp \perp$	$\vdash$ $\sqcup$		H			11	Ш	$\sqcup$	4	5	0 0
L	Ц		_					LL		11	$\perp$		Ш			$\perp$			L		11	1	L	Ш							L							5	1 0

REPORT Remittance Statement and Voucher Check

INTERNATIONAL BUSINESS MACHINES CORPORATION

IBM 1401 DATA PROCESSING SYSTEM

PROGRAM IDENTIFICATION

1248 73747576

FARGO REPORT SPECIFICATIONS • Phase 2 PROGRAMMED BY \_\_\_ 12/10/61 Page 5 of 6 TOTAL CONTROL CARDS - PHASE 2 bbA = A S = Subtract Summary Punch Clear After @ = Multiply L = Load Edit Control Word Column Split Print Accum. % = Divide fore M = Move Constant Data Z = Move and Suppress Zeros Print M = Move Z = Move and Suppress Zeros Sequence COMMENTS Print D = Move Digit Number Punch Label Label Label **Positions Positions Positions** Y = Move Zone From To From To 19 20 77 78 Skip to "Total Paid" line and move date to print area ISK5 MSCD0200217 3 0 1 0 Move and zero suppress vendor to print area Z VIEIN 01219 01313 3 0 2 0 Edit "Total Paid" amount and EICI20141801518 ETTOIT0141801578 303 Skip to check; add "1" to check #; move date to print area SKGA ONE CKIN M SICID 01210 01217 0 4 0 Move and zero suppress vendor to ZVEN 0219 033 0 5 0 Move and zero suppress check # to print area 3060 Z CKIN 01315 01319 Edit check total and print ECIZ 01418 01578 ETT 017 01418 01518 3070 Move date to punch area MSICID 001008 3 0 8 0 Move vendor to punch area MUEN 009013 3090 Move check # to punch area MCKIN 0114011 3 1 0 0 Move check total to punch area; remove sign; clear total and punch MITIOIT 0800255 01190213 Space; move name to print area and print ISPI M NME 0110 01313 3 1 2 0 Move address to print area and print MADD 0110 031 3 1 3 0 Move city to print area and MCITY 0/10 0/219 print Move trailer address to print area and print MTRL0110031 3 1 5 0 Clear trailer address and skip to M CILIR TIRL channel 1 3 1 6 0 LAST CARD RUNOUT 3 1 7 0 8 0 90 0 0

### INTERNATIONAL BUSINESS MACHINES CORPORATION

### **IBM 1401 PROGRAM CHART**

Program: Patch Subroutine for Remittance Statement and Voucher Check PAGE 6 of 6

Instruction								grai		er:	F. Johnson Date:	1:	2/10/61	<u>L</u>
Step   No.   Address   P   A     B   d   Remarks   Of Choracter   Inst.   Doto   Tot					Ins			<u> </u>						
			0	,	<u> </u>			В			Remarks	of (	Chara	cters
	No.	Address	Р	d			d			d		Inst.	Data	Total
A   K   O   C   O   S   3   3   7   Compare Vendor Number in columns 1-5 of all cards with Vendor Number stored in Location 333-337   16   4   K   7   B   5   O   O   V   If unequal, branch back to the first instruction in Phase 2   5   A   5   K   A   K   9   7   3   8   8   Add "1" to Check Number   7   3.4   3.5   K   3   K   3   7   V   8   Load Date into punch positions 1-8   Move Vendor Number stored in Location 376 into punch positions 9-13   7   K   3   K   5   M   D   C   V   D   D   D   D   D   D   D   D   D	1		ß	ĸ	1	0	@		 			5		5
3	ಎ	K06	В	7	3	,		ļ 	i 		in Phase 3			9
1	3	KIO	С	0	0	5	3	3	7			7		16
1	4	K17	В	5	o	0	1	i 	i 		If unequal, branch back to the first instruction in Phase 2	5		ત્રા
7   K   3   L   3   7   I   0   8   Load Date into punch positions 1-8   7   3   3   6   K   3   M   3   7   C   I   3   Move Vendor Number stored in Location 376 into punch   7   4   4   4   4   4   5   M   3   8   8   I   8   Move Vendor Number into punch positions 14-18   7   5   5   M   C   C   Load Date into punch positions 19-25   7   5   5   M   C   C   C   C   C   C   C   C   C	5	Kla	F	6				і —	! 		If equal, skip to carriage tape channel 6	2		23
Note	6	K24	A	K	9	9	3	8	8		Add "1" to Check Number	7		3.0
8 K 38 M 3 7 6 1 1 3 positions 9-13 7 44  9 K 45 M 3 8 8 1 1 8 Move Check Number into punch positions 14-18 7 56  10 K 5 2 M L O 6 1 2 5 Move V-O-I-D into punch positions 19-25 7 58  11 K 5 9 4 Punch summary card for voided check 1 57  12 K 6 0 L 3 7 1 2 2 7 Load Date into print positions 20-27 7 60  13 K 6 7 Z 3 7 6 2 3 3 9 Move and Zero Suppress Vendor into print positions 29-33  14 K 7 4 Z 3 8 8 2 3 9 Move and Zero Suppress Check Number into print positions 35-39  15 K 8 1 M L O 6 2 5 7 Move V-O-I-D into print positions 48-57 7 8  16 K 8 8 2 Print voided check 1 8  17 K 8 9 1 2 9 9 Clear print area 4 9 9 Clear print area 4 9 9 9 Constant "1" to increase Check Number for voided checks 1 9 9 9 1	7	K31	L	3	7	/	,	0	8			7		37
9 K45 M 3 8 8 1 1 8 Move Check Number into punch positions 14-18 7 56  10 K52 M L 0 6 1 2 5 Move V-0-1-D into punch positions 19-25 7 58  11 K59 4 Punch summary card for voided check 1 57  12 K60 L 3 7 1 2 2 7 Load Date into print positions 20-27 7 66  13 K67 Z 3 7 6 2 3 3 2 29-33 7 6 2 3 3 29-33 Move and Zero Suppress Vendor into print positions 29-34 Move and Zero Suppress Check Number into print positions 35-39  15 K81 M L 0 6 2 5 7 Move V-0-1-D into print positions 48-57 7 8  16 K88 2 Print voided check 1 8  17 K89 / 2 9 9 Clear print area 4 9 9  18 K93 F 1 Skip to carriage tape channel 1 Branch back to Location 731. This is the address of the first instruction in Phase 3 that follows BK01 9 9  20 K99 1 Constant "1" to increase Check Number for voided checks 1 9  NOTE: The following addresses of the various instructions in the patch subroutine were determined from the storage printout after testing the main FARGO program:  Address  K01 = Starting location (2201) of patch subroutine 337 = Location of low-order position of Vendor Number for compare purposes 371 = Statement and Check Date (label SCD)	8	K38	M	3	7	6	1	1	3		<u>-</u>	7		44
10   K 5 2   M L 0 6   1 2 5   Move V-O-I-D into punch positions 19-25   7   5 8	9		1	į	1	!		1/	8		Move Check Number into punch positions 14-18	7		51
Punch summary card for voided check    1	10	K52	M	L	0	6	1	ے	5		Move V-O-I-D into punch positions 19-25	7		58
Move and Zero Suppress Vendor into print positions   7   7.5	11		1	1	   	   		 			Punch summary card for voided check	,		59
Move and Zero Suppress Vendor into print positions   7   7.5	12	K60	L	3	7	1	2	ړ	7			7		66
Wove and Zero Suppress Check Number into print positions 35-39   Nove Notes and Zero Suppress Check Number into print positions 35-39   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Notes and Zero Suppress Check Number into print positions 48-57   Nove Nove Number into print positions 48-57   Nov	13			1	Į.	!		!	:			7		73
15   K 8 1   M L   D   L 2   5   7   Move V-O-I-D into print positions 48-57   7   3	Γ.			ŀ	1	,	1	Ī	!			7		80
17   K89   2   9   9	15		1	1	!	!	1		!		Move V-O-I-D into print positions 48-57	7		87
18   K 93   F	16	K 88	a		1	l I		 	 		Print voided check	,		88
19   K 95   B 7   3	17	K89	/	a	9	9		1	1		Clear print area	4	ļ .	92
first instruction in Phase 3 that follows BK01  K 99 1  Constant "1" to increase Check Number for voided checks  NOTE: The following addresses of the various instructions in the patch subroutine were determined from the storage printout after testing the main FARGO program:  Address  K01 = Starting location (2201) of patch subroutine  337 = Location of low-order position of Vendor Number for compare purposes  371 = Statement and Check Date (label SCD)	18	K 93	F	1	   			1	i i			2		94
Constant "1" to increase Check Number for voided checks   7   10   10   10   10   10   10   10	19	K 95	В	7	3	1		   	! !			4		98
NOTE: The following addresses of the various instructions in the patch subroutine were determined from the storage printout after testing the main FARGO program:  Address  K01 = Starting location (2201) of patch subroutine  337 = Location of low-order position of Vendor Number for compare purposes  371 = Statement and Check Date (label SCD)	20		1					<u> </u>	-		Constant "1" to increase Check Number for voided checks	<b>.</b>	/	99
NOTE: The following addresses of the various instructions in the patch subroutine were determined from the storage printout after testing the main FARGO program:  Address  K01 = Starting location (2201) of patch subroutine  337 = Location of low-order position of Vendor Number for compare purposes  371 = Statement and Check Date (label SCD)		(2306)	V	_	0	  -  -	1	-	D		Constant V-O-I-D to void overflow checks		7	106
Address  K01 = Starting location (2201) of patch subroutine  337 = Location of low-order position of Vendor Number for compare purposes  371 = Statement and Check Date (label SCD)						_					•	98	8	106
337 = Location of low-order position of Vendor Number for compare purposes 371 = Statement and Check Date (label SCD)	_	<u> </u>		Ad	dres	<u>s</u>					<u> </u>	-		
371 = Statement and Check Date (label SCD)								-			• • •			
276 - Vander Number (Isha) VEN)		T <sup>*</sup>		3	71 =	= St	aten	ne <b>nt</b>	and	d C	Check Date (label SCD)	1		
376 = Vendor Number (label VEN) 388 = Check Number (label CKN)	-	+1									•	+-	<b> </b>	+
500 = Location of first instruction in Phase 2 after control break										•	· ·		Ĺ	
731 = Location of instruction in Phase 3 immediately following BK01		†I												

Figure 23-G. Patch Subroutine Instructions

#### PATCH SUBROUTINE CARD FORMAT

			11	11111111		6666666	6667777	7777	778	
Card Columns	1234	567	8901	23456789		0123456	7890123	4567	890	
OGI G COLUMNIO			-7	-3.70107			1-2-5			
Tandam Camba	ŀ									
Leader Cards	000	010	1001							
#1			1001	-						
#2	,060	067	1001	_		_	l_		İ	
#3	074,	078	<u>106</u> 0	_		_		_		
			_	_						
Instruction Cards	1									
Step 1	L019	коі	1060	BK10@		A007080	M080007	B001	007	1
Step 2			1060			- '	_ `	-	- `	1
Step 3				C005337						1
Step 4				B500/				ł		1
•	1019	KOO	1060	E200/						
Step 5								1		
Step 6				ĀK99388					1	
Step 7				<u>L</u> 371108		ļ				1
Step 8				<u>M</u> 376113		ĺ				1
Step 9	L019	K45	1060	м388118						1
Step 10	L019	K52	1060	ML06125				Ì		
Step 11	L019	K59	1060	4				l		/
Step 12	L019	K60	1060	Ī371227		ŀ				1
Step 13	T019	K67	1060	Z376233						1
Step 14	T.019	K74	1060	Z388239				!	i	<b>\</b>
Step 15				ML06257						1
Step 16	1010	K88	1060	2			1			
Step 17			1060							1
Step 18			<u>1</u> 060		ŀ	1007080	1000007	DOOL	007	
Step 19	Fora	K95	<u>1</u> 060	B(3r		A001000	мо80007	BOOT	007	1
		1				1	i			
Constants Cards	1								l	
Step 20			1060				M080004			
Step 21	L007	L06	1060	V-0-I-D	1	A004080	M080004	B001	011	]
_	-		-	-		[-		_		
Clear & Branch Card			ĺ			/C14080				
	ı-	l	1-	( <b>–</b>	l	1-	1-	1-	-	l

NOTES: Card columns 1-4, 8-11, and 60-80 are prepunched as recommended in the IBM 1401 Reference Manual, Form A24-1403, under PROGRAM LOADING POLITIME

Underscored positions indicate position of word marks set by leader cards 1, 2 and 3.

Card columns 5-7 and 12-18 are key punched from the IBM 1401 Program Chart (Figure 23-G).

After loading the patch subroutine the clear and branch card clears read-in area 1-80 and branches to location C14 (3314). This is the address of the first instruction in the permanent FARGO program.

Figure 23-H. Patch Subroutine Card Format

1	T		Cana	val Manu	factu	ring Compar	ny - Endicott, N.	v		
0	We enclose	Invo		Our Ref.		voice or	Discount or			0
	check in full	Mo.		.}		m Amount	Allowance	Code	AMOUNT	
_	payment of									
0	items listed	11	15	3456		550.75		1	550.75	0
	l .	11	15			220.12	11.02	7	11.02-	1
0	CODES:	ii	18	3490		11.02	.,,,,_	2	11.02	0
	1. Invoices	11	20	3510			11.02		11.02-	
	, 2. Claims	11	30	4127		,460.27		1	39,460.27	_
0	3. Discounts	12	06		1	,000.00	20.00	3	1,000.00	0
	4. Allowances	12	06 08	1			10.00	4	10.00-	i
0	Ì	'-	•	7200			,,,,,,	ľ		0
	1			<u> </u>	L.,			L		
ļ	DETACH CHEC	ск	L				TOTAL PAID -	-		_
0	BEFORE DEPOS		3	Date		Vendor				0
	1									
0	1 000000000								000000000000000000000000000000000000000	
	! [ <b>6</b> ]	G	EN	ERAL			RING COMP	'AN	Y	
1	;   <b>8</b>				Er	dicott, N	. Y .			l   _
0	GENERAL								1452	0
	AND TRU								320	l I
	ENDICOT	I, N.	1.							0
0	PAY TO T	HE	Γ	Date			heck No.	[	Amount	
	ORDER OF	,		12/15/	61	815 1	9876		V-0-1-D	1
0										0
	B								8	1
	18					GEI	NERAL MANUFAC	CTU	RING COMPANY	
0	: 8					***************************************				0
									Treasurer	i I
0	0000000000	0000	<u> </u>	0000000	<i>3</i> 000	560000000	0000000000000000	ÓÓ	000000000000000000000000000000000000000	0
<b></b>	÷		Cana	anal Manu			ny - Endicott, N.	-,-		
0	We enclose	Invo		Our Ref.	,	voice or	Discount or	_		0
	check in full		Day	-1	_	m Amount	Allowance	Code	AMOUNT	
Ì	payment of		09	4285		030.86		ĭ	9,030.86	i
0	items listed	12	11	5117		500.00		1	500.00	0
1	1	12	12	5328		107 1.5	150.86	4	150.86-	
0	CODES:	12	13	5416 5417		123.45 876.55		1	123.45 876.55	0
	1. Invoices	`~		3411		0,0.33		'	01.0.55	
	.2. Claims									
0	3. Discounts								[!	0
	4. Allowances									
0	ı	]								0
	1	$\sqcup$			L					
	DETACH CHEC	cĸ	[	12/15/	61	815	TOTAL PAID -	-	\$51,350.00	
0	BEFORE DEPOS		, [	Date		Vendor			i	0
								_		
	0,200000000								000000000000000000000000000000000000000	0
		G	EN	ERAL			RING COMP	AN	ry  8  ;	
					En	dicott, N	.Y.			
0	GENERAL								1452	0
	AND TRUS								320	
	ENDICOTT	, N. 1	1.							$\sim$
	PAY TO T	HE	Γ	Date	Т	Vendor Cl	neck No.	ſ	Amount	
	ORDER OF	•	1	2/15/	61	815 1	9877		\$51.350.00	
0	! ISI									0
				NAL BU ORPORA		NA1				
		114 = 2	, ,	OKEUKA	111	GEN GEN	VERAL MANUFAC	TU	RING COMPANY	_
	4 ICN	4 ST	٠.						19901	$\cap$
0	NORTH			NEW YO	DRK					0
0	NORTH			NEW YO	ORK		V		Treasurer	0
0	NORTH	COTT	, 1			20000000	CC0CC0C0CCC	<b>00</b> 0	Treasurer 8	0

Figure 23-J. Remittance Statement and Voucher Check

				<del></del>				
0	  -   We enclose	Invoid		ufacturing Compa Invoice or	ny — Endicott, N Discount or	_		0
	check in full	Mo. I	Number	Claim Amount	Allowance	Code	AMOUNT	
0	items listed	11 0	6 3219	347.09		1	347.09	0
0	CODES:							0
0	2. Claims 3. Discounts 4. Allowances							0
0	I F							0
0	DETACH CHECE BEFORE DEPOS		12/15/ Date	61 1875 Vendor	TOTAL PAID -	-	\$347.09	0
	!			<del></del>				
0				MANUFACTI Endicott, N	JRING COMI		1Y	
O	GENERAL I	ST CO.			• - •		1452 320	0
0	PAY TO TE	HE	Date 12/15/		heck No.	[	Amount \$347.09	0
0	SUTCA	N, I	NC.	011 10131	17010	1	\$341,04 8	0
0	2710   ENDIC		NEW YO	ORK GE	NERAL MANUFA	CTU	RING COMPANY	0
0	<u>                                    </u>	00000	00000000		000000000000	000	occoccoccoccoccoccoccoccoccoccoccoccocc	0
	i <b></b>	<del>-</del>	neral Manu	facturing Compan	y - Endicott, N			;
0	We enclose check in full	Invoic Mo. D	e Our Ref.	Invoice or	Discount or Allowance	Code	AMOUNT	0
0	payment of items listed	11 1	4 3428 4 3428	750.33	37.52	1 3	750.33 37.52-	0
0	CODES:							0
0	2. Claims 3. Discounts 4. Allowances							0
0								0
0	DETACH CHEC		12/15/ Date	761 21264 Vendor	TOTAL PAID -	-	\$712.81	0
	0000000000	000000	<b>1000000000</b>	000000000000	<del>000000000000</del>	000	000000000000000000000000000000000000000	
)	Ø	GE	NERAL	MANUFACTU Endicott, N		AN	Y	0
0	GENERAL B	T CO.		Engleott, N	. 1 .		1452 320	0
0	PAY TO TH		Date		eck No.	F	Amount	0
0	1841			Y, INC.	16196	1	\$712.81 8	0
0			LINGTON LE, IND		ERAL MANUFAC	TUI		0
0	<u> </u>	000000	00000000	666666666666	20020000000	<u>000</u>	Treasurer	0
<del>;</del>		Gei	neral Manuf	acturing Company	/ - Endicott, N.	Υ.		
		Invoice	Our Ref.	Invoice or Claim Amount	Discount or Allowance	Code	AMOUNT	0

Figure 23-J. (2)

Figure 24.

Example of FARGO Patching and Linkage Using SPS

Programmed by

#### INTERNATIONAL BUSINESS MACHINES CORPORATION

FORM X24-1152 PRINTED IN U.S.A.

# IBM 1401 SYMBOLIC PROGRAMMING SYSTEM

Date \_\_\_\_\_

	IDIN THOU STANDOLIC TROOKS WILLIAM	
	CODING SHEET	
Program		

Page No. \_\_\_\_ of \_\_\_\_

Identification 76 80

	T			(A) OPERAN	ND	(B) OPERA	ND			
LINE	COUNT	LABEL	OPERATION	ADDRESS ±	CHAR. 2	ADDRESS ±	CHAR. ADJ.	ND.	d	COMMENTS 40 55
3 5	6 7	8 13	14 16	17 23	AUJ. 27	28 34	AUJ.	38	39	40 55
0,1,0			CILL	3.3.			<u> </u>			
0,2,0		* E X A M P	L E	O.F. FARG	O, PA	T.C.H.1.N.G	AND		L_	1.N.K.A.G.E. U.S.I.N.G. S.P.S
0,3,0		*					1			
0,4,0			ORG	1,4,4,5,	1		 			D. PATCH POINT
0,5,0				D.P.A.T.C.H.	1 , ,	, , , , ,	1			LINK TO DPATCH.
0,6,0	1			1,2,0,1,	1	1	1			T. PATCH POINT
0,7,0			B, ¦	T.P.A.T.C.H!	1	1 1 1 1 1	1 1 1 1			LINK TO TPATCH
0,8,0	0.3		Dict	<del>*</del> , , , , ,	1	1 1 1 1 1	<u> </u>			THREE BLANKS
0,9,0	1		ORG	2,4,0,0,	1	1 1 1 1 1	<u> </u>			BEGIN, PATCH AREA
1,0,0		D.P.A.T.C.H			1		<u> </u>			1,N,S,T,R,U,C,T,1,0,N,S, F,O,R
1,1,0		1 1 1 1 1	. !	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	stails	atch Subro	itine			DETAIL PATCH
1,2,0		<u> </u>					1			S.U.B.R.O.U.T.I.N.E.
1 3 0	1	<u> </u>			1		1 1 1			
1,4,0		1 1 1 1 1 1	B, ¦	1,4,4,9,	1		1 1			BR. BALK, TO FARGO
1,5,0	ļL.	TPATCH					1 1			1 N.S.T.R.U.C.T. 1.0.N.S. F.O.R
1,6,0			l 				1			TO, TAL PATCH
1,7,0	l			To	tal bat	ch Subrante	ne.			S.U.B.R.O.U.T.I.N.E.
1,8,0				( )	!	1 1 1 1 1	 			
1,9,0			$B_{\perp}$	1,2,0,8,)		1	1 1 <sub>1 1</sub>			BR BACK TO FARGO
2,0,0			END	3,3,1,4			1 J 1 1			CLEAR, AND BRANCH

Entry 040 -- ORG 1445 specifies the location of No00 (detail No-Op) in the FARGO generated program. NOTES:

Entry 050 -- B DPATCH will be converted during assembly to an actual machine language instruction (in this case BM00) and loaded over N000 in 1445-1448.

Entry 060 -- ORG 1201 specifies the location of N888888 (total No-Op) in the FARGO generated program.

Entry 070 -- B TPATCH will be converted during assembly to an actual machine language instruction and loaded over N888 followed by three blanks (entry 080).

Entry 090 -- In this example, the patch area begins in location 2400 converted to M00 during assembly. The last instruction in each subroutine must branch back to the proper point (B1449 and B1208) in the FARGO generated program.

Entry 200 -- The END card must branch back to 3314 to the first card read instruction of FARGO.

Example Method in Another. 앍 Identifying Types 엵 Cards when a Digit Is Punched Ħ One Column and an × (11 Punch)

IBM	
REPORT	

INTERNATIONAL BUSINESS MACHINES CORPORATION

# **IBM 1401 DATA PROCESSING SYSTEM**

PROGRAM IDENTIFICATION

	i	i	.
73	74	75	76

FARGO REPORT SPECIFICATIONS • Phase 3 PROGRAMMED BY .. DATE . Page\_ \_of\_\_ DETAIL CONTROL CARDS - PHASE 3 E = Edit A = Add: S = Subtract E = Edit DETAIL CARD DATA @ = Multiply; % = Divide L = Load Edit Control Word M = Move ? = Zero Add; ! = Zero Subtract M = Move Constant Data Type of Z = Move and Suppress Zeros D = Move Digit; Y = Move Zone Z = Move and Suppress Zeros After Detail Special 4 or M = MoveD = Move Digit D = Move Digit Print 7 position Z = Move and Suppress Zeros Sequence Card Column Split Y = Move Zone Y = Move Zone Number 1401 Instruction C = Char. D = Move Digit Data Card Print Punch Print Data Card Punch (actual) Positions  $z = z_{one}$ Y = Move Zone Columns Label **Positions Positions Positions** Columns Label \*\*\* From To From To From To From To From To From To From To From To From 1011 13 14 15 68 69 70 71 72 77 78 17 18 20 21 22 24 25 27 28 30 31 33 34 40 41 43 44 46 47 49 50 (Move X in column 80 to column 6) Y 01810 01016 (1 in column 6, NoX80) 01016 (2 in column 6, NoX80) 0201016 (3 in column 6, NoX80) 030060 (blank in column 6, NoX80) 01016 (1 in column 6, X80) J 01016 (2 in column 6, X80) (3 in column 6, X80) 0016 0 0 (blank in column 6, X80) 0,0,6 C 9 0

# Index

Automatic-Carriage-Control Operation	15	No-Op Control Cards	18
Coding Sheets Coding the Patch Subroutines Constants Control Cards	8 19 11	Operating Instructions	16 46
Control-Break Control Cards	10 19	Page Numbering Patch Subroutine Card Format	10 <b>4</b> 5
Detail Control Cards  Detail No-Op Control Cards  Dividing in Phase 2  Dividing in Phase 3 with a fixed Divisor  Dividing in Phase 3 with a Variable Divisor  Dividing in Phase 3 with a Variable Divisor  Division  Example method of identifying types of cards when a digit is punched in one column and an X in another	11 17 24 24 24 22 22	Patch Subroutine for Remittance Statement and Voucher Check	8 23 26
Example of FARGO patching and linkage using SPS  Examples of Card-Type Coding	48 12 47	Product Adjustment	26
FARGO General Program Operation and 1401 Core- Storage Organization	30 31 8	Quotient Adjustment       31,         Register of Earnings and Deductions       31,         Remittance Statement and Voucher Check       31,         Report Specifications       6,	37 47
General Description	6 37	Report-Heading Control Cards	8 26
Half-Adjustments of Products and Quotients Horizontal Method of Total Printing	26 13	Rules—Betail Control Cards	8 8
Introduction	5 47	Specifications for Register of Earnings and Deductions Report	32
Loading the Patch Subroutines	19	Specifications for Remittance Statement and Voucher	
Master-Report Control Card	10 20	Check	38 10
Multiply-Divide Optional Feature	20 22 21 22	Total Control Cards	18
Multiplying in phase 3 with a Variable Multiplier	21	Vertical Method of Total Printing	13

## **READER'S COMMENT FORM**

FARGO for IBM 1401

Form C24-1464-3

<ul> <li>Your comments, accompanied by answers to publications for your use. If your answer t</li> </ul>			
please explain in the space provided below.			
of IBM.		00	
	Yes	No	
• Does this publication meet your needs?			
• Did you find the material:			
Easy to read and understand?			
Organized for convenient use?			
Complete?			
Well illustrated?			
Written for your technical level?			
What is your occupation?			
• How do you use this publication?			
As an introduction to the subject?		As an instructor in a c	lass?
For advanced knowledge of the subject?		As a student in a class?	? 🗌
For information about operating procedur	·es?	As a reference manual	; <u> </u>
Other			
• Please give specific page and line references	with your o	comments when appropr	riate.
If you wish a reply, be sure to include your			

### **COMMENTS:**

• Thank you for your cooperation. No postage necessary if mailed in the U.S.A.

fold

fold

FIRST CLASS
PERMIT NO. 387
ROCHESTER, MINN.

#### BUSINESS REPLY MAIL

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY . . .

IBM Corporation Systems Development Division Development Laboratory Rochester, Minnesota 55901

Attention: Programming Publications, Dept. 425

fold

fold

IBM

International Business Machines Corporation Data Processing Division 112 East Post Road, White Plains, N.Y. 10601

International Business Machines Corporation Data Processing Division 112 East Post Road, White Plains, N.Y. 10601