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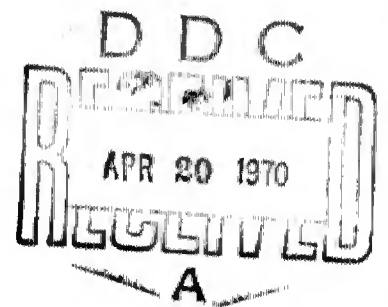
AUTHORITY

USNAFL ltr dtd 19 May 1972

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TR-1233
28 JANUARY 1970

NAFI publication

APPLIED RESEARCH DEPARTMENT

WIRE
ROUTING FOR
AUTOMATIC,
PROGRAM
INSTRUCTED
TOOLS

D D C

APR 20 1970

A

USER'S MANUAL

NAVAL AVIONICS FACILITY

INDIANAPOLIS, INDIANA 46218

175

NAFI TR-1233

ADDENDUM #1   6 April 1970

NAFI TR-1233, Wire Routing for Automatic, Program Instructed Tools -
User's Manual, dated 28 January 1970.

Make the following addition:

WIRE WRAP PROGRAM UROUTM. This section should be inserted following
page 159.

WIRE WRAP PROGRAM UROUTM

SYSTEM: FORTRAN IV

DEVELOPMENT JOB ORDER: 59021-L840-6

PURPOSE: The WRAPIT system has eight patterns incorporated for making a wire connection. Often a WRAPIT user has a critical wire which he desires to have routed through certain channels away from other sensitive wires. With the WRAPIT system such critical routing is not easily, and often not at all, obtained and, resultantly, must be hand-programmed. UROUTM allows the WRAPIT user to specify his own routing, within the limitations of the Gardner-Denver Wire Wrap Machine, and alleviates generating machine instructions and machine binary. UROUTM chooses all necessary tool movements, chooses table rotation position and sets the output in standard WRAPIT Wire Wrap Machine Control Card format.

INPUT DATA: UROUTM uses three types of input data supplied by the user:

1. A wiring boundaries information card as in the WRAPIT system.

2. Module Definition cards as in the WRAPIT 1 input.

3. Routing information cards. In the routing information cards, wrapping points and via points may be specified either by module-pin designation, where the module name has been identified in the module definition cards, or by X-Y coordinates with respect to the wire plate (0,0). The rules for listing routing data points are given in Appendix 1. Also required of each routing information card is the following data:

COLUMNS	DATA
69	Drawing Revision
70	Card Code
71	Wire Code
72 thru 75	Signal Number
76	Z Level
77 thru 80	Card Sequence Number

Example 1 shows routing information data and the results.
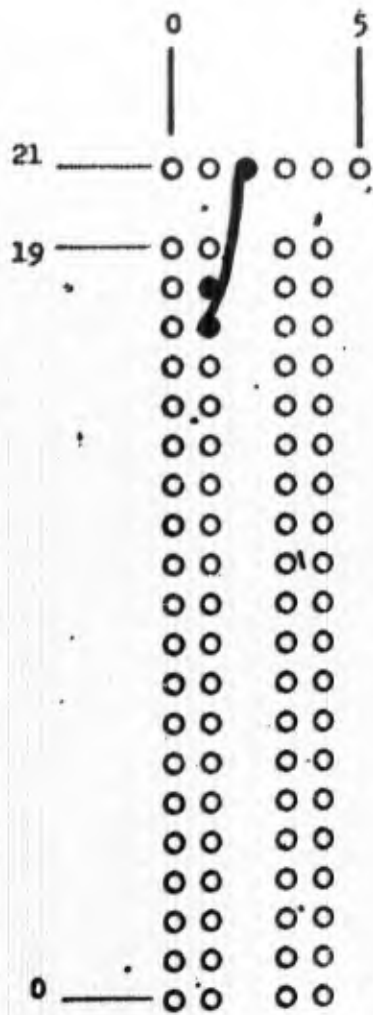
NOTICE TO USERS

EXAMPLE 1

CASES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	69	70	71	72	73	74	75	76	77	78	79	80
1	2	,	2	1	/	1	,	1	8	/	A	0	1	3	8	*							A	1	A		1	0	1				7	4
2	A	0	1	1	4	/	A	0	1	1	3	/	0	,	6	/	A	0	1	0	6	*	B	1	A		2	7	2		2	1	2	
3	0	,	1	2	/	A	0	1	2	3	/	5	,	2	/	A	0	3	0	7	*		A	1	A	7	1	0	3					4
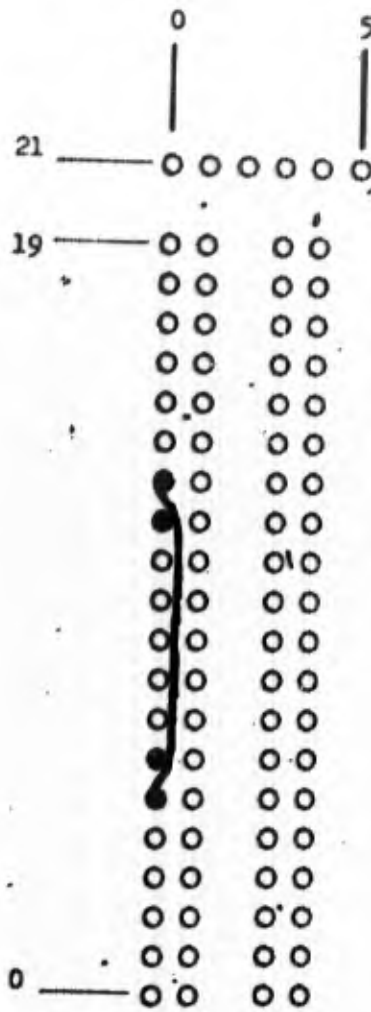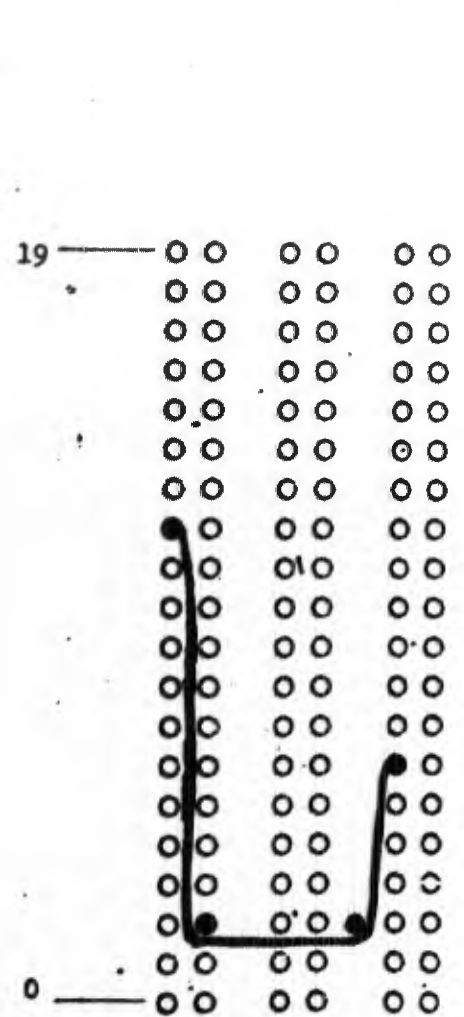
	CASE 1	CASE 2	CASE 3
FROM	(1,17)	(0,5)	(0,12)
VIA	(1,18)	(0,6)	(1,2)
VIA		(0,12)	(5,2)
TO	(2,21)	(0,13)	(6,6)
TRP	2	2	1
Z	1	2	3

INPUT DATA SETUP AND PROGRAM USAGE: The three types of data mentioned
above must be set up as follows:

```
                          ┌─────────────────────┐
                          │ Routing Infor-      │
                          │ mation Cards        │
                      ┌───┴─────────────────┐   │
                      │ One Blank Card      │   │
                  ┌───┴─────────────────┐   │   │
                  │ *Module             │   │   │
                  │  Definition Cards   │   │   │
              ┌───┴─────────────────┐   │   ┘
              │ Wiring              │   ┘
              │ Boundaries          │
              │ Information Card     │
              └─────────────────────┘
```
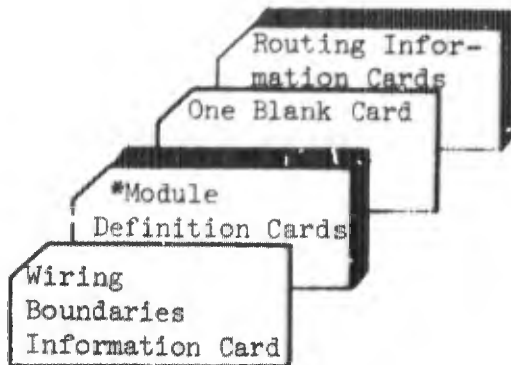
        To use the program, it is necessary to submit the data with a
Computer Work Request to D/842, Location Col. G-2. Example 2 shows a
typical Computer Work Request. The time estimate at the top of the page
should be made by four minutes plus one minute for each ten routing
information cards.

ERROR CHECKS: The following messages are provided by the program and
the meaning is explained here:

        1. A MODULE NAME IN THE FOLLOWING CARD WAS USED, BUT NOT DEFINED -
This message indicates that the user has defined a routing point with
module-pin information, but has not previously defined the module name in
the Module Definition cards.

        2. IN THE FOLLOWING CARD ONE DRESSING FINGER IS USED, BUT IT IS TOO
FAR FROM EITHER WRAP TOOL - The constraints on the Wire Wrap Machine
require that a via point be 1/10 inch from the wrapping tool in the X
direction when the pallet is in its wrapping position. Thus, when one via
point is used, the two end points and the via point must be either in
different rows or in different col-mns (both conditions are not necessary),
and in either case the via point must be between the wrapping tools (row-
wise or columnwise, respectively) and 1/10 inch in the difference direction
from one of the wrapping tools. In the case of this message, the via
point is not at that 1/10 inch distance.

* MODULE DEFINITION CARDS need not be included if all routing information
  is given in X-Y coordinates; however, the blank card must be included.

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/81)

TIME	
CATEGORY	B2

WIZ ☐

FRIDAY

FORTRAN ☒ IV

☐ _____

Problem Name UROUT M

Problem Number F4-07-69-37
(To be assigned by D/840.)

Problem Originator   Name USER'S NAME

Dept. USER'S DEPT. Ext. USER'S PHONE

Job order for labor only USER'S JOB ORDER

Programmer_____

Coder_____

Special Instructions: _____

_____

_____

_____

_____

_____

_____

EXAMPLE 2

3.   FINGER AND WRAPPING TOOL POSITIONS ARE NOT ACCEPTABLE IN THE FOLLOWING CARD - This is a general catch-all message which indicates that all possible table rotation positions have been tried and none produced an end point-via point position relation which is acceptable to the Wire Wrap Machine. In each of the above messages, the card in error is listed directly below the message.
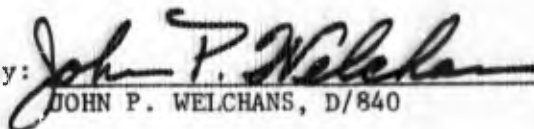
OUTPUT: UROUTM output is two-fold:

1.   A computer printout

   a.   Error messages will be contained in the printout.

   b.   The message STATEMENT 9 EXECUTED followed by the contents of a card means that the routing information card has been read and is being processed.

2.   Wire Wrap Machine Control Cards. These are in the same format as those generated by the WRAPIT system. If an end point is given in X-Y coordinates, no module-pin information will be supplied for that end point on the output card.
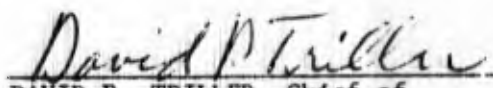
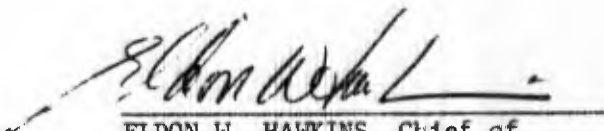BLANK PAGE

NAFI TR-1233

ABSTRACT

This report contains user information about the Wire Routing
for Automatic, Program Instructed Tools (WRAPIT) system programs and the
associated support programs for the Gardner-Denver Wire-Wrap Machine,
Model 14F-22X22X.025. The programs are WRAPIT 1, WRAPIT 2, WRAPIT 3,
WRAPIT RESEQUENCE, WRAPIT WIRE DENSITY ANALYSIS, AND WIRE WRAP DOCUMENTATION
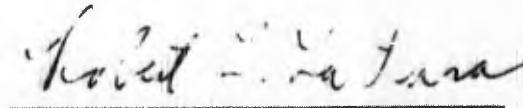GENERATOR, all developed at Naval Avionics Facility, Indianapolis (NAFI).

Prepared by: _____
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Approved by: _____
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_____
ELDON W. HAWKINS, Chief of
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_____
ROBERT L. LAFARA, Manager of
Computer Research Division D/840

PREFACE

This report represents the present status of the continuing effort at Naval Avionics Facility, Indianapolis, to provide computer programs to make the use of the Gardner-Denver Wire Wrap Machine an easier and less time-consuming task.

In February 1961, NAFI received a Gardner-Denver Wire Wrap Machine, Model 14F-20X20X.2. This was purchased by Special Projects Office for Polaris support. The machine operated on .2 inch centers, wrapped only 24 AWG wire, and could handle a maximum wrap plate of 20 inches X 20 inches. Originally, all card decks for this machine were supplied from outside sources. To facilitate the preparation of card decks at NAFI, a computer program was written in assembly language for the IBM-650 computer. In June 1962, NAFI's present computer, a GE-225, was delivered and a new program was written, also in machine language, for that computer. Some of the logic of these early programs has been incorporated in the present programs.

With the advent of smaller logic modules, it became desirable to mount such modules on Wire Wrap plates with pins on .1 inch centers. Since the Model 14F-20X20X.2 machine could not handle such plates, it was necessary to use hand wrapping techniques. To assist in preparing FROM-TO wiring lists for hand wrapping, another computer program was written in August 1964. Some of the logic of that program is also incorporated in the programs which are the subject of this report.

In September 1967, NAFI received and purchased the Gardner-Denver Wire Wrap Machine Model 14F-22X22X.025. The machine is numerically controlled by punched computer cards or by manual input through the card reader-keypunch. The efficient manner of numerical control is obviously via previously punched computer cards. Two methods are available to generate the punched computer cards: hand generation by a technically proficient person following rigid guidelines, or computer generation

following the same rigid guidelines. In addition to saddling a
potentially creative person with the automaton work of hand generation,
the individual doing such work tends to incorporate errors by incorrect
punching, small addition errors, forgotten offsets, etc. With this fact
in mind, Mr. Harley Ham, D/844, was directed to begin work on the present
computer program to generate the punched cards. This work was begun
several months before the arrival of the Wire Wrap Machine and was turned
over to me for completion approximately one year later.

This report contains user information on the computer programs
developed by NAFI for numerical control of the Wire Wrap Machine. The
time lapse between initialization of the project and the appearance of
this report is due to the many changes which have been found necessary and
incorporated during that time.

Throughout the project, the technical assistance of Mr. Harley Ham,
D/844 and Mr. Melvin Swager, D/924 was invaluable.

This report was reviewed for accuracy by Mr. David Triller,
Manager of D/924, Mr. Walter Wheeler, D/216, and Mr. Melvin Swager, D/924.

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LIST OF FIGURES

LIST OF FIGURES (continued)

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I. INTRODUCTION

The purpose of this report is to give the reader "user information" about the Wire Routing for Automatic, Program Instructed Tools (WRAPIT) programs developed by the Naval Avionics Facility, Indianapolis (NAFI). General program descriptions are given in Section II which include characteristics of the Gardner-Denver Wire Wrap machine which affect each of the programs. In Section III, the reader is taken step-by-step through the WRAPIT MAINLINE SYSTEM usage, i.e., the normal flow from the job requestor's information to the final documented usable output. Section IV explains the purpose and the usage of the WRAPIT support programs. These are the programs which allow the job requestor to change his Wire Wrap machine data and maintain usable, documented data. Section V explains to the reader how he can handle certain situations without a detailed knowledge of the Gardner-Denver Wire Wrap machine and without a detailed knowledge of the WRAPIT programs. Finally, in Sections VI and VII, the reader receives a look at the operations which are performed on the data from the time the job requestor submits his job to the Computer Operations Branch until he receives his usable, documented output.

II. PROGRAM DESCRIPTIONS

A. GENERAL

The WRAPIT programs are written for the Gardner-Denver Wire Wrap Machine, Model 14F-22X22X.025. This Wire Wrap machine can handle a wire plate with dimension 22 X 42 inches by shifting the Pallet Longitudinal Position (PLP). However, the machine can wrap only when stationary in a PLP, thus allowing for a maximum distance between pins being connected by one wire of 22 inches in each direction. The WRAPIT programs as developed by NAFI will not cause the Wire Wrap machine to shift PLP and, as a result, can handle at most a 22 X 22 inches wire plate.

This model Wire Wrap machine is capable of wrapping pins which are spaced on a square grid in integral multiples of the basic .025 inch increment. The WRAPIT programs from NAFI will handle only square grids which are spaced in integral multiples of .1 inch.

Within the aforementioned delimitations, the functions of the WRAPIT MAINLINE SYSTEM are:

1. To translate modular wiring data into coded Wire Wrap machine instructions.

2. To punch instructions and associated data on cards in the proper format for direct use on the Wire Wrap machine and for easy visual interpretation.

3. To provide drawing documentation, and

4. To provide an aid for finding and eliminating wire density build-up problems.

To supplement the WRAPIT MAINLINE SYSTEM, two support programs have been added. The functions of these two programs are:

1. To resequence a machine instruction deck in accordance with Wire Wrap machine specifications, and

2. To provide drawing documentation for machine instruction decks which have undergone changes.

With this basic overview, we shall proceed through each program.

B. WRAPIT 1, F-01-68-42, FIZMOP

   1. Definitions:

      a. Signal Number - A number between -999 and 9999 which is assigned to all pins receiving a common signal from a continuously connected wire net.

      b. Module - A set of 40 connector pins arranged in two rows of twenty pins.

      c. Module Number - A three character alphanumeric name assigned uniquely to a single module.

      d. Module Orientation - The alignment of a module so that pins 1 through 20 are arranged such that if pin 5 has (X, Y) value (x, y), then pin 6 has (X, Y) value (x, y+1) and pin 7 has (X, Y) value (x, y+2).

      e. Module Definition Card - A computer input card which for a given module assigns a module number and the X-Y coordinates of the number 1 pin of that module with respect to the wire plate (0, 0).

      f. Module Termination Card - A computer input card which specifies a pin within a module and assigns to that pin a signal number.

      g. Z Level - A reference number designating a distance from the base of a pin to the beginning of the wrapping. Level 1 signifies the base; level 2 signifies one-third of the pin length; level 3 signifies two-thirds of the pin length.

      The initial program of the WRAPIT MAINLINE SYSTEM, WRAPIT 1, serves three primary functions. First, WRAPIT 1 serves to translate the module-pin information supplied by the job requestor into wire plate X-Y coordinates. Second, WRAPIT 1 serves to interconnect pins receiving a common signal in a manner such that in the majority of cases wire lengths are near minimum and the number of wires crossing mounting hardware areas is minimal. Third, WRAPIT 1 assigns Z wrap levels beginning with level 2 and alternating levels 1 and 2 throughout any common signal wire string.

In its first capacity as a module-pin to X-Y coordinates translator, WRAPIT 1 uses module definition input cards and module termination input cards, both of which are supplied by the job requestor. The method the program uses is to match the module number from the module termination card with the module number from a module definition card, and then to use the additional information in each of the matching module number cards to generate the X-Y coordinates of the pin being considered.

Although the WRAPIT 1 program arranges the wiring connections, the job requestor tells the program which pins are to be wired together and whether there is a priority to the wiring sequence. Thus, in the program's second function, the job requestor specifies which pins are to be wired to receive a common signal by assigning all such pins a unique signal number and by grouping all common signal number module termination cards together. By grouping the module termination cards in any specific signal number in the sequence of wiring desired and by giving the computer the appropriate signal, the job requestor receives the sequence of wiring requested. When the job requestor does not specify a routing sequence, the sequence generated will zig-zag back and forth in the X direction while progressing from minimum Y to maximum Y. This sequence was chosen on the theory, and in most past cases, fact, that the distance between modules will be less in the X direction while mounting hardware will be located between rows of modules in the Y direction.

In the function of WRAPIT 1 of assigning Z levels, the program will not assign level 3. This is done for several reasons, some of which are explained later.

In the event of data faults, error printouts have been provided. These diagnostics are not intended to detect all job requestor errors, only those that experience has shown are most prevalent. These error printouts cover duplicate module termination cards in one signal number, only one module termination card in a signal number, and a module termination card specifying a pin in an undefined module number.

For output, WRAPIT 1 generates a punched card for each wire to be wrapped and a card summary printout.

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C. WRAPIT 2, F-01-68-34, FIZMOP

1. Definitions

   a. Machine Binary - A base 2 representation of a number between zero (0) and 2047 punched in a single card column with a 12 punch representing 2^0, an 11 punch representing 2^1, a zero (0) punch representing 2^2, ..., an 8 punch representing 2^{10} and a 9 punch used as a parity punch to insure an odd number of punches in any machine binary column.

   b. Wire-Wrap Machine Control Card - A computer output card with machine binary instructions in columns 1 through 14 for connecting and routing a single wire on the Gardner-Denver Wire-Wrap machine.

   c. Z-Level - A reference number designating a distance from the base of a pin to the beginning of the wrapping. Level 1 signifies the base; level 2 signifies one-third of the pin length; level 3 signifies two-thirds of the pin length.

   d. Numerical Sort - A clerical operation performed on the numbers in a given column of a deck of punched cards which arranges all like numbers together and in a specified order.

   e. Wiring Boundaries - Imaginary edges of the wire plate defined in the X direction and in the Y direction by the minimum and the maximum distances from the Gardner-Denver Wire Wrap zero reference to any pin when the wire plate is mounted on the Wire Wrap machine pallet.

   f. Wrapping Tool - Gardner-Denver Wire Wrap machine part which wraps a given length of wire on a wrapping pin, thereby forming a connection.

   g. Dressing Finger - Gardner-Denver Wire Wrap machine part which forms a wire being connected into a shape as instructed and deposits the wire at the correct height.

   h. Wire Plate Origin (0, 0) - The intersection of the minimum X direction and the minimum Y direction wiring boundaries.

The second program of the WRAPIT MAINLINE SYSTEM, WRAPIT 2, uses WRAPIT 1 output cards as input and serves three functions. The first function of WRAPIT 2 is to choose a wire pattern, through the use of a set group of rules, to connect two pins. In its second function, WRAPIT 2 generates all the necessary machine instructions and punches Wire-Wrap machine control cards. The third function of WRAPIT 2 is to provide drawing documentation for the job requestor.

In the interim between the execution of WRAPIT 1 and the execution of WRAPIT 2, numerical sorts are performed on the WRAPIT 1 output. The first and least significant sort is performed on the Table Rotation Position (TRP). The next sort separates the deck into A tool Z-level stacks. Cards of the bottom Z level (level 1) are then sorted so that the shortest wires are wrapped first. Cards for each of the other two levels are then sorted so that the shortest wires are wrapped last, thereby providing "tie-downs". The decks are then merged in Z-level order 1, 2, 3 and sorted to put all non-machine made interconnections last for WRAPIT 2 input.

Also, during this interim period, man-machine interaction is most practical, for the job requestor can change the order of the input cards or the information on the cards to suit his purposes. This capability will be explained later in the program usage sections.

In the process of choosing a wiring pattern, WRAPIT 2 considers three things, viz., the X distance between pins, the Y distance between pins and the distance from the pins to the wiring boundaries as defined in the WRAPIT 2 input. The foremost considerations in choosing a pattern are the X and the Y distances between pins so that some pattern of those illustrated in Fig. 1 is satisfied. If the chosen pattern would run outside the wiring boundaries, a new TRP is selected, all necessary coordinate transformations are done and the selection process begins again. Note should be taken that the program does not consider any other wire when generating a pattern and, thus, can cause wire density problems. When the pattern is chosen, the program sets up whatever dressing fingers are needed and proceeds to its next function - that of generating machine binary.

DEFINITIONS

```
AT----A TOOL
BT----B TOOL
AFD---A FRONT DRESSING FINGER
BFD---B FRONT DRESSING FINGER
ARD---A REAR DRESSING FINGER
BRD---B REAR DRESSING FINGER
ATX---A TOOL X MOVE
BTX---B TOOL X MOVE
ATY---A TOOL Y MOVE
BTY---B TOOL Y MOVE
AFDY--AFD Y MOVE
ARDY--ARD Y MOVE
BFDY--BFD Y MOVE
BRDY--BRD Y MOVE
```

WIRE PATTERNS FIGURE 1

PATTERN CODE	MACHINE MOVES	WIRE ROUTING (1/10 INCH UNITS)

1	ATX AFDY BTX BTY ATY	
2*	ATX BTY BTX AFDY ATY	
3	ATX ATY BTX BTY	
.4	ATX ATY BTX BFDY ARDY BTY	
5	ATX AFDY BTX BFDY ATY BTY	
6	ATX BTY BTX AFDY BRDY ATY	
7*	ATX ATY BTX BFDY BTY	
8	ATX BTY BTX ATY	

* ONE OF THE DISTANCES IN THIS PATTERN MUST EQUAL 2

In generating the machine binary, WRAPIT 2 takes into account that the instructions to the wrapping tools and the dressing fingers will not be with reference to the wire plate (0, 0), but with reference to the Gardner-Denver Wire Wrap machine (0, 0). The necessary translation from wire plate coordinates to Wire Wrap machine coordinates is taken care of by the same input information that determined the wiring boundaries. The other consideration in generating the machine binary is a set of offset constants defined by Gardner-Denver. These offset constants are included by WRAPIT 2 whenever and wherever applicable.

The final function of WRAPIT 2 is to provide printout in the form of wiring list drawing documentation. The drawing documentation is in a "B size drawing" format suitable for microfilming. The method for making changes in drawing documentation is described in a later section. The documentation is given in the following sequence: (1) machine wraps, Z level 1; (2) machine wraps, Z level 2; (3) machine wraps, Z level 3; (4) manual wraps, Z level 1; etc. All drawing documentation supplied by this program and by WRAPIT 3 is official wiring list drawing documentation.

In the event of data faults, an error message has been provided. If an error occurs in an A or B tool or dressing finger in either X or Y coordinate, the coordinate in error, the card column containing the error and the card number will be typed out, leaving the drawing documentation intact. Also, the machine control card mentioned in the error type-out will have an error punch, a minus punch, in card column 76.

For output, WRAPIT 2 provides a machine control card deck for the Gardner-Denver Wire Wrap machine and the previously mentioned drawing documentation. The machine control card deck consists of one card for each wire to be wrapped and will have columns 15 through 80 printed out on the head of the card.

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D. WRAPIT DENSITY, F4-11-69-40, FORTRAN IV

1. Definitions

a. Machine Binary - A base 2 representation of a number between
zero (0) and 2047 punched in a single card column with a 12
punch representing 2^0, an 11 punch representing 2^1, a zero
(0) punch representing 2^2, $\cdots$, an 8 punch representing 2^{10}
and a 9 punch used as a parity punch to insure an odd number
of punches in any machine binary column.

b. Wire-Wrap Machine Control Card - A computer output card with
machine binary instructions in columns 1 through 14 for
connecting and routing a single wire on the Gardner-Denver
Wire-Wrap machine.

c. Wiring Boundaries - Imaginary edges of the wire plate defined
in the X direction and in the Y direction by the minimum and
the maximum distances from the Gardner-Denver Wire Wrap machine
zero reference to any pin when the wire plate is mounted on the
Wire Wrap machine pallet.

d. Pattern Code - A one digit number representing a certain wiring
pattern; all pattern codes are graphically defined in Fig. 1.

DEFINITIONS

AT----A TOOL
BT----B TOOL
AFD---A FRONT DRESSING FINGER
BFD---B FRONT DRESSING FINGER
ARD---A REAR DRESSING FINGER
BRD---B REAR DRESSING FINGER
ATX---A TOOL X MOVE
BTX---B TOOL X MOVE
ATY---A TOOL Y MOVE
BTY---B TOOL Y MOVE
AFDY--AFD Y MOVE
ARDY--ARD Y MOVE
BFDY--BFD Y MOVE
BRDY--BRD Y MOVE

WIRE
PATTERNS
FIGURE 1

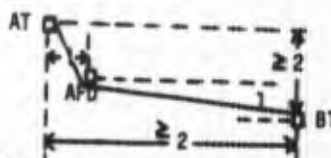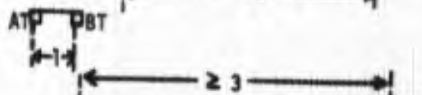| PATTERN CODE	MACHINE MOVES	WIRE ROUTING (1/10 INCH UNITS)
1	ATX AFDY BTX BTY ATY	
2*	ATX BTY BTX AFDY ATY	
3	ATX ATY BTX BTY	
4	ATX ATY BTX BFDY ARDY BTY	
5	ATX AFDY BTX BFDY ATY BTY	
6	ATX BTY BTX AFDY BRDY ATY	
7*	ATX ATY BTX BFDY BTY	
8	ATX BTY BTX ATY	

* ONE OF THE DISTANCES IN THIS PATTERN MUST EQUAL 2

13
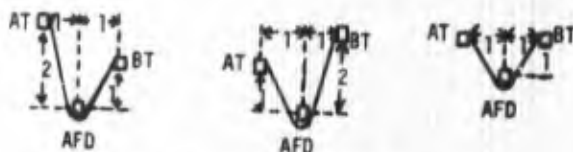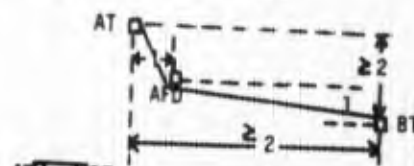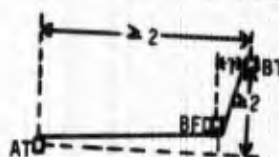
e. Density Map - A rectangular array of symbols (defined in
    Table 1) wherein each symbol represents a .1 inch square whose
    vertices are intersections of X and Y coordinates on a wrap
    plate and each symbol denotes the number of wires which pass
    through that .1 inch square.

The third program in the WRAPIT MAINLINE SYSTEM, WRAPIT DENSITY,
is a diagnostic program designed to save time and expense involved in
wrapping a wire plate and then looking for density problems. The program
is constrained by computer memory requirements to an 11 X 11 inches wire
plate on .1 inch increments as mentioned in Section II-A.

DENSITY MAP SYMBOLS

CHARACTERS	NUMBER OF WIRES
-	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15
G	16
H	17
*	≥ 18

TABLE 1

For input, WRAPIT DENSITY uses the "machine wraps" part of the Wire Wrap Machine Control Card deck generated by WRAPIT 2. To define the size of the plate, the wiring boundaries information card of WRAPIT 2 is used. All the information necessary for finding exactly where a single wire runs is carried on each card in the form of termination points, via points, Table Rotation Position, Z-level, and pattern code. All of this information is used by, and necessary for, the WRAPIT DENSITY program.

Additional input information is required from the job requestor. This additional information consists of the maximum Z-level on which wires will run, the maximum number of wires the job requestor will allow in any .1 inch square on the plate and the type of map(s) the job requestor wishes to receive. At this point in this manual, the information about the maximum Z-level may seem rather useless to the reader inasmuch as the WRAPIT MAINLINE SYSTEM only assigns Z-levels 1 and 2. However, later in this manual in Section V-A, an explanation is given of how to use Z-level 3. The maximum number of wires information is input to help the job requestor eliminate density problems. If any .1 inch square on the wire plate has more than the maximum number of wires allowed by the job requestor, a listing of each wire passing through that .1 inch square will be given. For the .1 inch square grid, a maximum of ten (10) wires per .1 inch square per Z-level is recommended although the job requestor is at liberty to set his own limit. Later in this manual in Section V-E, the elimination of density problems is discussed. The type of map(s) information is used to tell the Computer Operations clerical staff the exact setup of the input to WRAPIT DENSITY. All the types of maps are defined in Table 2. The information discussed in this paragraph is to be put on the Computer Work Request under special instructions in the following form:

(max. Z-level, max. number of wires) TYPE _____.

As would be expected, if WRAPIT DENSITY is not to be run, then this information need not be included.

For output, WRAPIT DENSITY supplies the map(s) as specified by the job requestor and lists all wires which pass through the .1 inch squares with more than the maximum number of wires allowed by the job

WIRE CODES

SYMBOL	DEFINITION
A	30 AWG INSULATEl
B	26 AWG INSULATED
C	24 AWG INSULATED
D	22 AWG INSULATED
E	20 AWG INSULATED
F	30 AWG UNINSULATED
G	INNER CONDUCTOR OF COAX
H	OUTER CONDUCTOR OF COAX
J	BLACK CONDUCTOR OF TWISTED PAIR
K	WHITE CONDUCTOR OF TWISTED PAIR
M	BLACK CONDUCTOR OF TWISTED TRIAD
N	WHITE CONDUCTOR OF TWISTED TRIAD
P	RED CONDUCTOR OF TWISTED TRIAD
R	SINGLE CONDUCTOR SHIELDED
S	SHIELD OR DRAIN WIRE
T	BUSS BAR

TABLE 2

requestor. To facilitate interpretation of the density map(s), a clear plastic overlay marking the position of the coordinate intersections is available at NAFI.

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E. WRAPIT 3, F-11-68-20, FIZMOP

1. Definitions

a. Signal Number - A number between -999 and 9999 which is assigned to all pins receiving a common signal from a continuosuly connected wire net.

b. Wiring Boundaries - Imaginary edges of the wire plate defined in the X direction and in the Y direction by the minimum and maximum distances from the Gardner-Denver Wire Wrap machine zero reference to any pin when the wire plate is mounted on the Wire Wrap machine pallet.

c. Wire Wrap Machine Control Card - A computer output card with machine instructions in columns 1 through 14 for connecting and routing a single wire on the Gardner-Denver Wire Wrap machine.

d. Wire Code - A single letter specifying the type of connection to be used between the pins of the card carrying the wire code. Only the codes in Table 3 may, and must be used, although they may be redefined by the user.

e. Complete By Signal Number - The grouping of all the cards from the Wire Wrap machine control card deck so that common signal numbers appear together.

The last program of the WRAPIT MAINLINE SYSTEM, WRAPIT 3 uses the sorted output of WRAPIT 2 and serves two functions. The first function of WRAPIT 3 is that of a documentation generator listing all common signal numbers together in a B size drawing format. The second function of the program is to approximate the total length of wire of each type listed in Table 2 that will be used on each plate wrapped by the Wire Wrap machine control card deck being processed.

Before the execution of WRAPIT 3, the wiring boundaries definition card is updated by including in the last four columns the page number of the last page of drawing documentation generated by WRAPIT 2

CARD CODES

SYMBOL	DEFINITION
1	MACHINE WRAP
2	HAND WRAP
3	BUSSING/STRAPPING
4	GROUND/POWER PLANE

TABLE 3

and the drawing documentation generated by WRAPIT 3 will then have been consecutively sequenced from WRAPIT 2 to WRAPIT 3.

Also, before the execution of WRAPIT 3, the Wire-Wrap machine control card deck is twice sorted and listed to provide for visual checking of the wrapped plates by the Wire-Wrap machine operation personnel. These listings, sorted on pin coordinates, are grouped by Z-level in such a manner as to be able to find connections from any pin with ease. In one listing, the A tool pin is the basis of the sort while in the other the B tool pin is the basis. Both listings are appropriately marked.

The drawing documentation provided by WRAPIT 3 is a "complete by signal number" listing. This documentation is intended for continuity inspection and is official wiring list drawing documentation.

WRAPIT 3 uses the wire code and the wire length approximation carried on each card to approximate the total length of wire by wire type for each plate to be wrapped. The wire code on a card is used to select the correct sum to which the wire length of that card is added. In each wire code, a 1.25 inch factor is added for each pin wrapped to account for the actual wrapping length which is stripped and wound on the pin.

The only error message for a data fault is in case the wire code for any wire is an illegal code. This causes the program to terminate. All legal wire codes are listed in Table 2. Note that the definitions for the various codes may be changed for any run by the user, but only those letters listed in the symbol table of Table 2 may be used.

The output of WRAPIT 3 is the "complete by signal number" drawing documentation, the wire length per wire code per wire plate, and a group of punched and interpreted engineering document aperture cards (yellow stripe), one for each sheet of drawing documentation and for each sheet of preliminary notes.

WIRE CODES

SYMBOL	DEFINITION
A	30 AWG INSULATED
B	26 AWG INSULATED
C	24 AWG INSULATED
D	22 AWG INSULATED
E	20 AWG INSULATED
F	30 AWG UNINSULATED
G	INNER CONDUCTOR OF COAX
H	OUTER CONDUCTOR OF COAX
J	BLACK CONDUCTOR OF TWISTED PAIR
K	WHITE CONDUCTOR OF TWISTED PAIR
M	BLACK CONDUCTOR OF TWISTED TRIAD
N	WHITE CONDUCTOR OF TWISTED TRIAD
P	RED CONDUCTOR OF TWISTED TRIAD
R	SINGLE CONDUCTOR SHIELDED
S	SHIELD OR DRAIN WIRE
T	BUSS BAR

TABLE 2

F. WRAPIT RESEQUENCE, F-07-68-60, FIZMOP

    1. <u>Definitions</u>

        a. Wire Wrap Machine Control Card - A computer output card with machine instructions in columns 1 through 14 for connecting and routing a single wire on the Gardner-Denver Wire Wrap machine.

        b. Z-level - A reference number designating a distance from the base of a pin to the beginning of the wrapping. Level 1 signifies the base; level 2 signifies one-third of the pin length; level 3 signifies two-thirds of the pin length.

        WRAPIT RESEQUENCE is one of the two support programs developed to allow changes in a WRAPIT generated Wire Wrap machine control card deck after the WRAPIT MAINLINE SYSTEM has generated and documented the deck. The sole function of WRAPIT RESEQUENCE is to resequence a Wire Wrap machine control card deck, with all job requestor changes incorporated, in accordance with the Gardner-Denver Wire Wrap machine requirements for sequencing. The requirement for sequencing specified by Gardner-Denver is that the number in column 14 of one card be the same as that in column 1 of the next card for each pair of cards throughout the deck. In this program, each Z-level is given its own sequencing with each sequence beginning at 1 and being incremented throughout by 1. The sequence number of column 14 is also punched in card columns 77 through 80 of each card to allow for easy reference when the cards are interpreted.

        WRAPIT RESEQUENCE provides no error messages since the only possible errors are in data input, card reads or card punches, none of which the program would detect.

        The output of WRAPIT RESEQUENCE is the resequenced Wire Wrap Machine Control Card deck. All cards which are designated dummy wraps or test wraps will not be included in the sequencing.

G. WRAPIT DOCUMENTATION GENERATOR, F-01-69-42, FIZMOP

    1. Definitions

        a. Wire Wrap Machine Control Card - A computer output card with machine instructions in columns 1 through 14 for connecting and routing a single wire on the Gardner-Denver Wire Wrap machine.

        b. Z-level - A reference number designating a distance from the base of a pin to the beginning of the wrapping. Level 1 signifies the base; level 2 signifies one-third of the pin length; level 3 signifies two-thirds of the pin length.

WRAPIT DOCUMENTATION GENERATOR (WRAPIT D. G.) is one of the two support programs developed to allow changes in a WRAPIT generated Wire Wrap Machine Control Card deck. The sole function of WRAPIT D.G. is to update the WRAPIT wiring list drawing documentation, using for this purpose the Wire Wrap Machine Control Card deck which has undergone substantial changes.

The theory behind the WRAPIT D.G. program is two-fold. First, when a Wire Wrap Machine Control Card deck has undergone substantial changes, the wiring list drawing documentation from WRAPIT 2 must be updated and revised for each change. To eliminate this "busy work", the engineer need only run the totally revised Wire Wrap Machine Control Card deck through WRAPIT D.G. When used in conjunction with WRAPIT 3, as described later, all drawing documentation can be quickly updated. Second, though WRAPIT 2 does give the same form documentation, some of the wire routings developed by hand would never be generated by WRAPIT 2 and, thus, there is the need for a program which just documents and does no routing.

No error printouts are provided in WRAPIT D.G. since the Wire Wrap Machine Control Card deck is assumed to be correct when submitted.

The output of WRAPIT D.G. is a printout in the form of wiring list drawing documentation. The drawing documentation is in a B size drawing format suitable for microfilming. The documentation is given in

the same sequence as in WRAPIT 2. All drawing documentation supplied by
this program is official wiring list drawing documentation.

III. WRAPIT MAINLINE SYSTEM USE

A. GENERAL

The four (4) programs of the WRAPIT MAINLINE SYSTEM were designed with the idea that the input would be correct with regard to the minimum and maximum wiring boundaries as defined in Sections II-C and III-B, with regard to the coordinates of the number 1 pin of each and every module as described in Sections II-B and III-B, and with regard to the pins which are to receive a common signal. If this is the case, WRAPIT MAINLINE SYSTEM users need only know Section III-B and the SYSTEM output meaning and use, although knowledge of all sections is recommended.

In each of the following sections, one phase of the SYSTEM is described and all terminology, data preparations, inputs and outputs are defined. To elucidate each section, a simple problem is carried through at the end of that section and all data preparations, inputs and outputs are displayed.

A Computer Work Request is to be filled out for WRAPIT MAINLINE SYSTEM usage. A sample is shown in Fig. 2a. If no density map is desired from the SYSTEM, a sample Computer Work Request so specifying is shown in Fig. 2b. One request must accompany each job and all applicable spaces must be filled.

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COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TIME	
CATEGORY	B2

WIZ ☐

FORTRAN ☒

☐ _____

Problem Name _WRAPIT MAINLINE SYSTEM_

Problem Number ////////////

(To be assigned by D/840.)

Problem Originator   Name _____

                        Dept. _____ Ext. _____

Job order for labor only _____

Programmer _____

Coder _____

Special Instructions: _____

_____(ANY SPECIAL INSTRUCTIONS TO_

_____CHANGE ANY PART OF THE NORMAL_

_____WRAPIT MAINLINE SYSTEM FLOW)_

_____

_____

_____

FIGURE   2a

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TITLE	
CATEGORY	B2

WIZ ☐

FORTRAN ☒

☐ _____

Problem Name __WRAPIT MAINLINE SYSTEM__

Problem Number ///////////
(To be assigned by D / ..)

Problem Originator   Name _____

                        Dept. _____ Ext. _____

Job order for labor only_____

Programmer_____

Coder_____

Special Instructions: __DO NOT RUN WRAPIT__

__DENSITY_____

__(ANY OTHER SPECIAL INSTRUCTIONS :__

__TO CHANGE ANY PART OF THE__

__NORMAL WRAPIT MAINLINE__

__SYSTEM FLOW)_____

FIGURE   2b

B. WRAPIT 1 INPUT

Three types of information are required from a job requestor
using the WRAPIT MAINLINE SYSTEM. These types of information are:
(1) wire plate positioning on the Gardner-Denver Wire Wrap machine pallet
(wire plate positioning corresponds to wiring boundaries information);
(2) X-Y coordinates of the number 1 pin of each module with respect to
the wire plate (0, 0); and (3) common signals and the pins they go to.

1. Wiring Boundaries Information

a. An example of the Wiring Boundaries Card Information Input
Sheet is shown in Fig. 3. All of the terminology on that
sheet will be explained here.

b. Systems Command - Identification by the word AIR or ORD (or
any other three character abbreviation) of the command that
is applicable to the job being processed (NAVAIR, NAVORD).

c. Drawing Revision - Latest update revision letter(s).

d. Code Ident Number - Identification number corresponding to
the system command signified in 1-b above.

e. Drawing Number - Module wiring assembly drawing number.

f. Drawing Revision - As in 1-c above.

g. Minimum X-Y Wiring Boundaries - Offset of Wire Plate (0, 0)
from Gardner-Denver Wire Wrap machine pallet (0, 0).

h. Maximum X-Y Wiring Boundaries - Offset of Wire Plate (0, 0)
from Gardner-Denver Wire Wrap machine pallet (0, 0) plus
maximum Wire Plate X-Y values. At NAFI both Minimum and
Maximum X-Y Wiring Boundaries values are obtained from Tool
Design, D/245.1.

WIRING BOUNDARIES INFORMATION

SYSTEMS COMMAND

1	2	9

DRAWING REVISION

4	5	6

CODE IDENT NUMBER

8	9	10	11	12

DRAWING NUMBER

15	16	17	18	19	20	21	22	23

DRAWING REVISION

24	

MINIMUM

X

56	57	58	59	

Y

40	41	42	43	

MAXIMUM

X

63	64	65	66	

Y

67	68	69	70	

FIGURE 3

2. <u>Module Definition Information</u>

    a. An example of a Module Definition Information Input Sheet is shown in Fig. 4. All of the terminology on that sheet will be explained here. NOTE: Each module must be defined by a Module Definition Card.

    b. Drawing Number - Module wiring assembly drawing number.

    c. Drawing Revision - Latest update revision letter.

    d. Module Number - An arbitary alphanumeric three character module reference number assigned to a module by the job requestor. Each module must have a unique number. The most oft-used assignment is: The first character of the module number is a letter representing a row of modules, and the last two characters are numbers representing a column of modules, e.g., module number "B06" would reference the sixth module from the left in the second row of modules from the bottom (See Fig. 6, page 38).

    e. X-Y - The number of one-tenth (1/10) inch increments in the X and the Y directions from the wire plate origin (0, 0) to the number 1 pin of the module being defined.

MODULE DEFINITION SHEET

FIGURE 4

3. <u>Module Termination Information</u>

    a. An example of a Module Termination Information Input Sheet is shown in Fig. 5. All of the terminology on that sheet will be explained here. NOTE: Each pin which is to receive a signal through interconnections on the wire side of the wire plate must be defined by a Module Termination Card.

    b. Drawing Number - Module wiring assembly drawing number.

    c. Drawing Revision - Latest Update revision letter.

    d. Card Code - A number that specifies the method of inter-connection (See Table 3). WRAPIT will interpret a card code other than "1" as a non-machine connection and will not punch coded machine instructions on the output card of WRAPIT 2. The non-machine connection card will not be assigned a sequence number in the Wire Wrap Machine Control Card deck, but all other information will be carried on it. The non-machine connection cards must be removed before using the control card deck on the Gardner-Denver Wire Wrap machine.

    e. Wire Code - A letter that specifies the type of connection to be used (See Table 3). Only the codes in Table 2 may, and must be used although the codes may be redefined.

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MODULE TERMINATION SHEET

FIGURE 5

WIRE CODES

SYMBOL	DEFINITION
A	30 AWG INSULATED
B	26 AWG INSULATED
C	24 AWG INSULATED
D	22 AWG INSULATED
E	20 AWG INSULATED
F	30 AWG UNINSULATED
G	INNER CONDUCTOR OF COAX
H	OUTER CONDUCTOR OF COAX
J	BLACK CONDUCTOR OF TWISTED PAIR
K	WHITE CONDUCTOR OF TWISTED PAIR
M	BLACK CONDUCTOR OF TWISTED TRIAD
N	WHITE CONDUCTOR OF TWISTED TRIAD
P	RED CONDUCTOR OF TWISTED TRIAD
R	SINGLE CONDUCTOR SHIELDED
S	SHIELD OR DRAIN WIRE
T	BUSS BAR

TABLE 2

CARD CODES

SYMBOL	DEFINITION
1	MACHINE WRAP
2	HAND WRAP
3	BUSSING/STRAPPING
4	GROUND/POWER PLANE
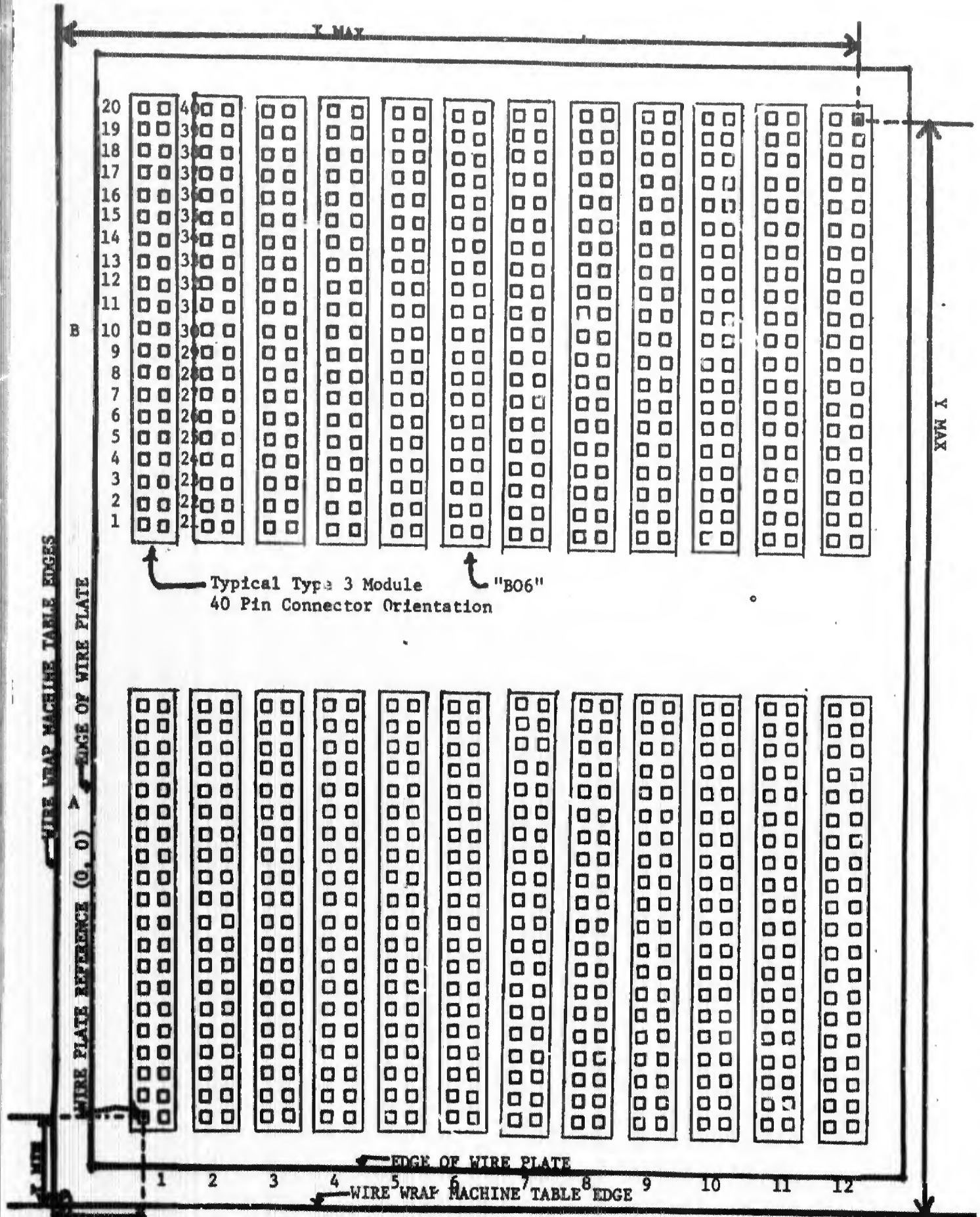
TABLE 3

Typical Type 3 Module — "B06"
40 Pin Connector Orientation

"Wire Plate" viewed from wire side in normal wiring position showing
X-Y MIN. and MAX. Wiring boundaries and reference points.

Figure 6

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f. Signal Number - A number between -999 and 9999 which specifies
    terminals that are to be wired in a common circuit. Each
    common circuit (tree) must have a unique, though arbitrarily
    assigned, signal number. All common circuit terminals must
    have the same signal number and must be grouped together
    (See Fig. 7).

g. Module Number - A three character alphanumeric symbol, the
    same as one of the Module Numbers defined in the Module
    Definition cards, specifying that the signal and pin of this
    card are in this module.

h. Pin Number - A number from 1 through 40 that specifies that
    the terminal with this number of the module defined in
    Section B-3-g is to receive the signal defined in Section B-3-f.

SIGNAL NUMBER EXAMPLE

SIGNAL NUMBER	MODULE NUMBER	PIN NUMBER
1	A01	1
1	B01	1
1	A02	5
2	A01	25
2	A02	2
3	A01	22
3	A02	1
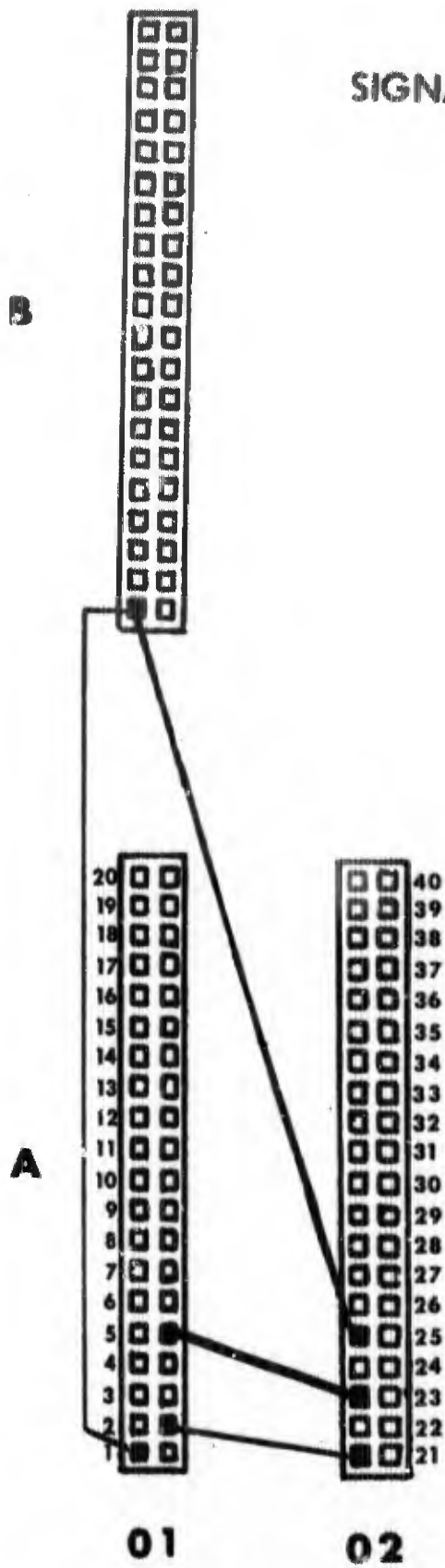
FIGURE 7

i. Sort Flag - A "1" or a blank. A "1" specifies that the
    terminals of the common signal numbers in which the "1's"
    appear are to be wired together in exactly the sequence in
    which the Module Termination Cards appear. Note that if any
    terminal in a signal number is to have a "1" for its sort
    flag, then all terminals in that signal number must have "1"
    for their sort flags. A blank signifies that the terminals of
    a common signal are to be sorted and wired together according
    to the description given in Section II-B (See Fig. 8).

j. On the Module Termination Sheet, the first twelve (12) columns
    are left blank with no heading. In these columns, the user
    may put any information he wishes; however, the information
    in these columns will not be carried through to any output.
    Thus, the user may specify signal number 3 as "CLOCK" and each
    pin in the Module Termination Sheet with signal number 3 may
    carry "CLOCK" anywhere in the first twelve (12) columns.

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SORT FLAG EXAMPLE

CARD SEQUENCE				
SIGNAL NUMBER	MODULE NUMBER	PIN NUMBER	SORT FLAG OPTIONS	
			SORT Solid Line	NO SORT Dashed
1	A02	12		1
1	A01	21		1
1	A02	3		1
1	A01	36		1
1	A01	28		1
1	A02	5		1
1	A01	25		1

FIGURE 8

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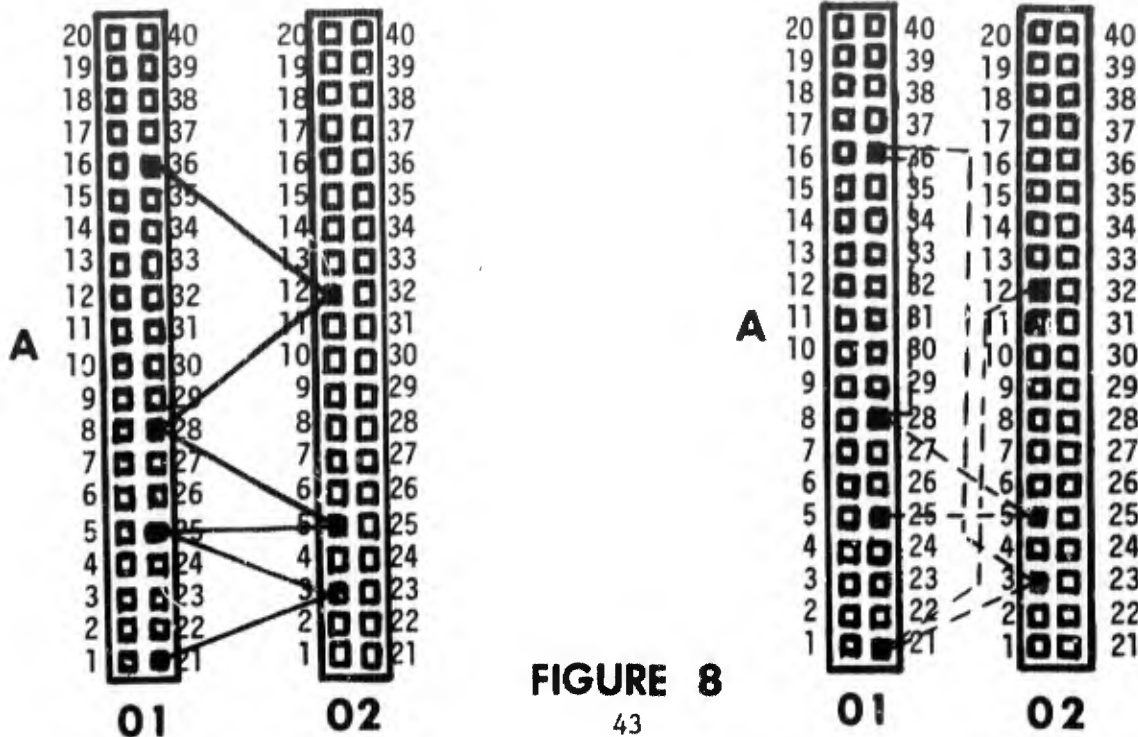
4. The Wiring Boundaries Information Sheet, the Module Definition sheets, and the Module Termination sheets are to be submitted with the completed Computer Work Request described in Section III-A to Computer Operations Branch, D/842.

5. <u>Example</u>

In Fig. 9, the diagram displays an almost trivial problem of wiring connections for the WRAPIT MAINLINE SYSTEM. All of the black lines between square pins represent desired wiring connections.

In Fig. 10, the Wiring Boundaries Information Sheet is filled out for the example. In this case, the SYSTEMS COMMAND was arbitrarily assigned AIR and the DRAWING REVISION was arbitrarily assigned A.

In Fig. 11, the Module Definition Sheet is completed for this example. Note that despite the fact that modules A05, A10, A11, A12, B01, B02, B04, and B05 exist we need not define them since they are not used.

In Figs. 12a and 12b, the Module Termination sheets for the example are displayed.

All of the sheets in Figs. 10, 11, 12a, and 12b were submitted to Computer Operations Branch, D/842 at NAFI, with a Computer Work Request (Fig. 13). The cards were keypunched and run with the WRAPIT MAINLINE SYSTEM.

Figure 9

WIRING BOUNDARIES INFORMATION

SYSTEMS COMMAND

1	2	3
A	I	R

DRAWING REVISION

4	5	6
		A

CODE IDENT NUMBER

8	9	10	11	12
3	0	0	0	5

DRAWING NUMBER

15	16	17	18	19	20	21	22	23
E	X	A	M	P	L	E		

DRAWING REVISION

24
A

X MINIMUM

36	37	38	39
		0	5

Y MINIMUM

40	41	42	49
		0	4

MAXIMUM

63	64	65	66
		3	9

MAXIMUM

67	68	69	70
		4	8

FIGURE 10

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MODULE DEFINITION SHEET

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	DRAWING NUMBER (16–30)															REV (24–25)	MODULE NUMBER (31–35)					X (36–40)					Y (41–43)		
															E	X	A	M	P	L	E		A								A	0	1				0	0			0	0
																															A	0	2				0	3			0	0
																															A	0	3				0	6			0	0
																															A	0	4				0	9			0	0
																															A	0	6				1	5			0	0
																															A	0	7				1	8			0	0
																															A	0	8				2	1			0	0
																															A	0	9				2	4			0	0
																															B	0	3				0	6			2	5
																															B	0	6				1	5			2	5
																															B	0	7				1	8			2	5
																															B	0	8				2	1			2	5
																															B	0	9				2	4			2	5
																															B	1	0				2	7			2	5
																															B	1	1				3	0			2	5
															E	X	A	M	P	L	E		A								B	1	2				3	3			2	5

FIGURE II

MODULE TERMINATION SHEET

FIGURE 12a

MODULE TERMINATION SHEET

DRAWING NUMBER	REV	CCWC SLWG BDBO DBRE	SIGNAL NUMBER	MODULE NUMBER	PIN NO.	JOB
EXAMPLE A1A			-117	A02	17	
			-35	1023	7	
			-35	A03	20	
			3	A03	40	
			3	B03	21	
UNSORTED			15	B06	40	1
			15	B07	19	1
			15	B06	38	1
			15	B07	17	1
			15	B06	36	1
			15	B07	15	1
			15	B07	34	1
			15	B08	13	1
			15	B07	32	1
			15	B08	11	1
			15	B07	30	1
			15	B08	09	1
UNSORTED EXAMPLE A1A			15	B07	28	1

FIGURE 12b

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TIME	
CATEGORY	B2

WIZ ☐

FORTRAN ☒

☐ _____

Problem Name _WRAPIT MAINLINE SYSTEM_

Problem Number /////////////
(To be assigned by D/840)

Problem Originator   Name _J. P. WELCHANS_

Dept. _844_   Ext. _3255_

Job order for labor only _Ø 840_

Programmer_____

Coder_____

Special Instructions: _____

DATA FOR DENSITY MAP IS:

(2,3) TYPE 1

_____

_____

_____

_____

FIGURE 13

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C. WRAPIT 1 OUTPUT

1. The output of WRAPIT 1 is the set of X-Y Wire Plate Cards and a
card summary listing from the printer.

Figure 14 shows which columns of the X-Y Wire Plate Cards are
used and what the usage of each column is. Note that blanks may occur in
any of these columns.

Under FROM and TO in Fig. 14, we have several headings. Each
card represents one interconnection between the modules and pins of that
card. X and Y refer to the X-Y coordinates of the associated pin with
respect to the wire plate (0, 0); hence, the name "X-Y Wire Plate Card."
7 refers to the Z-level of the interconnection of this card.

The heading D/842 IDENTIFICATION refers to data not input by
the job requestor. The number in those spaces is a cross-reference
number assigned to the submitted job since at NAFI the WRAPIT MAINLINE
SYSTEM input data and the X-Y Wire Plate Cards are stored for one (1)
year in the D/842 files. At the end of the year, the job requestor is
interrogated by D/842 as to the disposition of these cards for the next
year.

WIRE LENGTH and TRP are data which are output for use in
preparation of the X-Y Wire Plate Cards for input to WRAPIT 2.

X-Y WIRE PLATE CARD COLUMN USE

FIGURE 14

2. Example

In Fig. 15, we have the card summary printout provided by WRAPIT 1 for the example. The job requestor receives this listing.

In Fig. 16, we have a listing of the X-Y Wire Plate Cards with column headings provided to help interpret the card columns. Note that in these cards no D/842 IDENTIFICATION NUMBER is given. This is because this is not a regular Wire Wrap job, only an example.

***** WIRE WRAP DATA *****

***** DRAWING NUMBER *****

***** EXAMPLE -A *****

ZA	7B	CARD NO.	SIG NO.	MOD. NO.	PIN	X	Y	MOD.	PIN	X	Y	CARD CODE	WIRE CODE	L	TRP
2	2	1	0	B08	19	21	43	B08	39	22	43	1	A	1	1
1	1	2	0	B08	39	22	43	B09	19	24	43	1	A	2	1
2	2	3	0	B09	19	24	43	B09	39	25	43	1	A	1	1
1	1	4	0	B09	39	25	43	B10	19	27	43	1	A	2	1
2	2	5	0	B10	19	27	43	B10	39	28	43	1	A	1	1
1	1	6	0	B10	39	28	43	B11	19	30	43	1	A	2	1
2	2	7	0	B11	19	30	43	B11	39	31	43	1	A	1	1
1	1	8	0	B11	39	31	43	B12	19	33	43	1	A	2	1
2	2	9	0	B12	19	33	43	B12	39	34	43	1	A	1	1
2	2	10	1	B03	20	6	44	B07	20	18	44	1	A	12	1
2	2	11	-10	A01	23	1	2	A03	4	6	3	1	A	6	3
1	1	12	-10	A03	4	6	3	A04	3	9	2	1	A	4	3
2	2	13	-10	A04	3	9	2	A06	4	15	3	1	A	7	3
1	1	14	-10	A06	4	15	3	A07	3	18	2	1	A	4	3
2	2	15	-10	A07	3	18	2	A09	4	24	3	1	A	7	3
2	2	16	2	A09	9	24	8	A08	30	22	9	1	A	3	1
1	1	17	2	A08	30	22	9	A09	10	24	9	1	A	2	1
2	2	18	70	A06	13	15	12	A08	15	21	14	1	A	8	1
1	1	19	70	A08	15	21	14	A07	36	19	15	1	A	3	1
2	2	20	70	A07	36	19	15	A06	37	16	16	1	A	4	1
1	1	21	70	A06	37	16	16	A07	17	18	16	1	A	2	1
2	2	22	12	A03	24	7	3	A04	5	9	4	1	A	3	1
2	2	23	-117	A01	36	1	15	A02	16	3	15	1	A	2	1
1	1	24	-117	A02	16	3	15	A02	17	3	16	1	A	1	2
2	2	25	-35	A02	37	4	16	A03	20	6	19	1	A	5	1
2	2	26	3	A03	40	7	19	B03	21	7	25	1	A	6	2
2	2	27	15	B06	40	16	44	B07	19	18	43	1	A	3	1
1	1	28	15	B07	19	18	43	B06	38	16	42	1	A	3	1
2	2	29	15	B06	38	16	42	B07	17	18	41	1	A	3	1
1	1	30	15	B07	17	18	41	B06	36	16	40	1	A	3	1
2	2	31	15	B06	36	16	40	B07	15	18	39	1	A	3	1
1	1	32	15	B07	15	18	39	B07	34	19	38	1	A	2	1
2	2	33	15	B07	34	19	38	B08	13	21	37	1	A	3	1
1	1	34	15	B08	13	21	37	B07	32	19	36	1	A	3	1
2	2	35	15	B07	32	19	36	B08	11	21	35	1	A	3	1
1	1	36	15	B08	11	21	35	B07	30	19	34	1	A	3	1
2	2	37	15	B07	30	19	34	B08	9	21	33	1	A	3	1
1	1	38	15	B08	9	21	33	B07	28	19	32	1	A	3	1

WRAPIT 1 PRINTER OUTPUT

FIGURE 15

			FROM					TO				
DRAWING NUMBER	R ECWSIG. VCC	PN MODIO NO.NO.N.	X	Y	Z	D/842 IDENT NUMBER	PN MODIO NO.N.	X	Y	Z	IGT RTR EHP	/L /// //WN/// CARD NO.
EXAMPLE	A1A	0B0819	21	432			B0839	22	432	11		1
EXAMPLE	A1A	0B0839	22	431			B0919	24	431	21		2
EXAMPLE	A1A	0B0919	24	432			B0939	25	432	11		3
EXAMPLE	A1A	0B0939	25	431			B1019	27	431	21		4
EXAMPLE	A1A	0B1019	27	432			B1039	28	432	11		5
EXAMPLE	A1A	0B1039	28	431			B1119	30	431	21		6
EXAMPLE	A1A	0B1119	30	432			B1139	31	432	11		7
EXAMPLE	A1A	0B1139	31	431			B1219	33	431	21		8
EXAMPLE	A1A	0B1219	33	432			B1239	34	432	11		9
EXAMPLE	A1A	1B0320	6	442			B0720	18	442	121		10
EXAMPLE	A1A	-10A0123	1	22			A03 4	6	32	63		11
EXAMPLE	A1A	-10A03 4	6	31			A04 3	9	21	43		12
EXAMPLE	A1A	-10A04 3	9	22			A06 4	15	32	73		13
EXAMPLE	A1A	-10A06 4	15	31			A07 3	18	21	43		14
EXAMPLE	A1A	-10A07 3	18	22			A09 4	24	32	73		15
EXAMPLE	A1A	2A09 9	24	82			A0830	22	92	31		16
EXAMPLE	A1A	2A0830	22	91			A0910	24	91	21		17
EXAMPLE	A1A	70A0613	15	122			A0815	21	142	81		18
EXAMPLE	A1A	70A0815	21	141			A0736	19	151	31		19
EXAMPLE	A1A	70A0736	19	152			A0637	16	162	41		20
EXAMPLE	A1A	70A0637	16	161			A0717	18	161	21		21
EXAMPLE	A1A	12A0324	7	32			A04 5	9	42	31		22
EXAMPLE	A1A-117A0136		1	152			A0216	3	152	21		23
EXAMPLE	A1A-117A0216		3	151			A0217	3	161	12		24
EXAMPLE	A1A	-35A0237	4	162			A0320	6	192	51		25
EXAMPLE	A1A	3A0340	7	192			B0321	7	252	62		26
EXAMPLE	A1A	15B0640	16	442			B0719	18	432	31		27
EXAMPLE	A1A	15B0719	18	431			B0638	16	421	31		28
EXAMPLE	A1A	15B0638	16	422			B0717	18	412	31		29
EXAMPLE	A1A	15B0717	18	411			B0636	16	401	31		30
EXAMPLE	A1A	15B0636	16	402			B0715	18	392	31		31
EXAMPLE	A1A	15B0715	18	391			B0734	19	381	21		32
EXAMPLE	A1A	15B0734	19	382			B0813	21	372	31		33
EXAMPLE	A1A	15B0813	21	371			B0732	19	361	31		34
EXAMPLE	A1A	15B0732	19	362			B0811	21	352	31		35
EXAMPLE	A1A	15B0811	21	351			B0730	19	341	31		36
EXAMPLE	A1A	15B0730	19	342			B08 9	21	332	31		37
EXAMPLE	A1A	15B08 9	21	331			B0728	19	321	31		38

LISTING of X-Y WIRE PLATE CARDS

FIGURE 16

D. WRAPIT 2 INPUT

1. The input of WRAPIT 2 consists of the Wiring Boundaries card (See Section III-B-1) from the WRAPIT 1 input and the X-Y Wire Plate Cards sorted for efficient use of the Gardner-Denver Wire Wrap machine. The sorts arrange the X-Y Wire Plate Cards so as to minimize the table rotation time when wrapping any Z-level.

2. Example

Figure 17 is a listing of the X-Y Wire Plate Cards after they have gone through the sort on Table Rotation Position (TRP). The arrow indicates the TRP column.

Figure 18 is a listing of the X-Y Wire Plate Cards after they have gone through the sort on A-tool Z-level (AZ). The heavy arrow indicates the AZ column and the light arrow indicates the TRP column. Figure 18 is also the listing of the input to WRAPIT 2. The first card in Fig. 18 is the Wiring Boundaries Card from WRAPIT 1 input and the last card is a card supplied by Computer Operations Branch to tell the program that there is no more data.

Note that Section II-C specifies that there are to be two more sorts. In this example, the indicated sorts have no effect on the ordering of the data.

EXAMPLE	A1A	0B0819	21	432		B0839	22	432	11	1
EXAMPLE	A1A	0B0839	22	431		B0919	24	431	21	2
EXAMPLE	A1A	0B0919	24	432		B0939	25	432	11	3
EXAMPLE	A1A	0B0939	25	431		B1019	27	431	21	4
EXAMPLE	A1A	0B1019	27	432		B1039	28	432	11	5
EXAMPLE	A1A	0B1039	28	431		B1119	30	431	21	6
EXAMPLE	A1A	0B1119	30	432		B1139	31	432	11	7
EXAMPLE	A1A	0B1139	31	431		B1219	33	431	21	8
EXAMPLE	A1A	0B1219	33	432		B1239	34	432	11	9
EXAMPLE	A1A	1B0320	6	442		B0720	18	442	121	10
EXAMPLE	A1A	2A09 9	24	82		A0830	22	92	31	16
EXAMPLE	A1A	2A0830	22	91		A0910	24	91	21	17
EXAMPLE	A1A	70A0613	15	122		A0815	21	142	81	18
EXAMPLE	A1A	70A0815	21	141		A0736	19	151	31	19
EXAMPLE	A1A	70A0736	19	152		A0637	16	162	41	20
EXAMPLE	A1A	70A0637	16	161		A0717	18	161	21	21
EXAMPLE	A1A	12A0324	7	32		A04 5	9	42	31	22
EXAMPLE	A1A-117A0136		1	152		A0216	3	152	21	23
EXAMPLE	A1A	-35A0237	4	162		A0320	6	192	51	25
EXAMPLE	A1A	15B0640	16	442		B0719	18	432	31	27
EXAMPLE	A1A	15B0719	18	431		B0638	16	421	31	28
EXAMPLE	A1A	15B0638	16	422		B0717	18	412	31	29
EXAMPLE	A1A	15B0717	18	411		B0636	16	401	31	30
EXAMPLE	A1A	15B0636	16	402		B0715	18	392	31	31
EXAMPLE	A1A	15B0715	18	391		B0734	19	381	21	32
EXAMPLE	A1A	15B0734	19	382		B0813	21	372	31	33
EXAMPLE	A1A	15B0813	21	371		B0732	19	361	31	34
EXAMPLE	A1A	15B0732	19	362		B0811	21	352	31	35
EXAMPLE	A1A	15B0811	21	351		B0730	19	341	31	36
EXAMPLE	A1A	15B0730	19	342		B08 9	21	332	31	37
EXAMPLE	A1A	15B08 9	21	331		B0728	19	321	31	38
EXAMPLE	A1A-117A0216		3	151		A0217	3	161	12	24
EXAMPLE	A1A	3A0340	7	192		B0321	7	252	62	26
EXAMPLE	A1A	-10A0123	1	22		A03 4	6	32	63	11
EXAMPLE	A1A	-10A03 4	6	31		A04 3	9	21	43	12
EXAMPLE	A1A	-10A04 3	9	22		A06 4	15	32	73	13
EXAMPLE	A1A	-10A06 4	15	31		A07 3	18	21	43	14
EXAMPLE	A1A	-10A07 3	18	22		A09 4	24	32	73	15

X-Y WIRE PLATE CARDS after TRP COLUMN SORT

FIGURE 17

AIR A 30003

EXAMPLE	A	0B0839	05	04
EXAMPLE	A1A	0B0939	22	431
EXAMPLE	A1A	0B1039	25	431
EXAMPLE	A1A	0B1139	28	431
EXAMPLE	A1A	2A0830	31	431
EXAMPLE	A1A	70A0815	22	91
EXAMPLE	A1A	70A0637	21	141
EXAMPLE	A1A	15R0719	16	161
EXAMPLE	A1A	15B0717	18	431
EXAMPLE	A1A	15B0715	18	411
EXAMPLE	A1A	15B0813	18	391
EXAMPLE	A1A	15B0811	21	371
EXAMPLE	A1A	15B08 9	21	351
EXAMPLE	A1A-117A0216		21	331
EXAMPLE	A1A -10A03 4		3	151
EXAMPLE	A1A -10A06 4		6	31
EXAMPLE	A1A	0B0819	15	31
EXAMPLE	A1A	0B0919	21	432
EXAMPLE	A1A	0B1019	24	432
EXAMPLE	A1A	0B1119	27	432
EXAMPLE	A1A	0B1219	30	432
EXAMPLE	A1A	1B0320	33	442
EXAMPLE	A1A	2A09 9	6	82
EXAMPLE	A1A	70A0613	24	122
EXAMPLE	A1A	70A0736	15	152
EXAMPLE	A1A	12A0324	19	32
EXAMPLE	A1A-117A0136		7	152
EXAMPLE	A1A -35A0237		1	162
EXAMPLE	A1A	15B0640	4	442
EXAMPLE	A1A	15B0638	16	422
EXAMPLE	A1A	15B0636	16	402
EXAMPLE	A1A	15B0734	16	382
EXAMPLE	A1A	15B0732	19	362
EXAMPLE	A1A	15B0730	19	342
EXAMPLE	A1A	3A0340	19	192
EXAMPLE	A1A -10A0123		7	22
EXAMPLE	A1A -10A04 3		1	22
EXAMPLE	ã1A -10A07 3		9	22
EXAMPLE	A1A		18	0

			→	
B0919	39	48	21	2
B1019	24	431	21	4
B1119	27	431	21	6
B1219	30	431	21	8
A0910	33	431	21	17
A0736	24	91	31	19
A0717	19	151	21	21
B0638	18	161	31	28
B0636	16	421	31	30
B0734	16	401	21	32
B0732	19	381	31	34
B0730	19	361	31	36
B0728	19	341	31	38
90728	19	321	12	24
A0217	3	161	43	12
A04 3	9	21	43	14
A07 3	18	21	11	1
B0839	22	432	11	3
B0939	25	432	11	5
B1039	28	432	11	7
B1139	31	432	11	9
B1239	34	432	11	10
B0720	18	442	121	16
A0830	22	92	31	18
A0815	21	142	81	20
A0637	16	162	41	22
A04 5	9	42	31	23
A0216	3	152	21	25
A0320	6	192	51	27
B0719	18	432	31	29
B0717	18	412	31	31
B0715	18	392	31	33
B0813	21	372	31	35
B0811	21	352	31	37
B08 9	21	332	31	26
B0321	7	252	62	11
A03 4	6	32	63	13
A06 4	15	32	73	15
A09 4	24	32	73	

WRAPIT 2 INPUT DATA
FIGURE 18

FLAG FOUR

E. WRAPIT 2 OUTPUT

1. The WRAPIT 2 output consists of the Wire Wrap Machine Control Card deck and the Wiring List Drawing Documentation in a B size drawing format.

In the Wire Wrap Machine Control Card deck, all 80 columns have been allocated for data. The columns are used as follows:

COLUMN(S)	USE
1 through 14	Wire Wrap Machine control instructions in the sequence specified by Gardner-Denver.
15 through 23	Module wiring assembly drawing number.
24	Drawing revision letter.
25	Card Code (See Section III-B-3-d).
26	Wire Code (See Section III-B-3-e).
27 through 30	Signal Number (See Section III-B-3-f).
31 through 33	Module number of one end of this card's interconnection (FROM).
34 and 35	Pin number of one end of this card's interconnection (FROM).
36 through 39	X coordinate of pin in 34 and 35.
40 through 43	Y coordinate of pin in 34 and 35.
44	Z-level of interconnection for pin in 34 and 35.
45 through 47	X coordinate of via point. If no dressing finger is used, this space will be blank. If only one dressing finger is used, this space will contain its X coordinate. If two dressing fingers are used, the dressing finger closest to the tool wrapping the pin in 34 and 35 will have its X coordinate here.
48 through 50	Y coordinate of via point. The corresponding X coordinate is in 45 through 47.

COLUMN(S)	USE
51	Pattern Code (See Section II-D). This will be blank if pattern 3 or 8 is used in this card.
52 through 54	X coordinate of via point. Blank if no dressing finger or one dressing finger is used. If two dressing fingers are used, this space will contain the X coordinate of the dressing finger farthest from the pin in 34 and 35.
54 through 57	Y coordinate of via point. The corresponding X coordinate is in 52 through 54.
58 through 60	Module number of one end of this card's interconnection (TO).
61 and 62	Pin number of one end of this card's interconnection (TO).
63 through 66	X coordinate of pin in 61 and 62.
67 through 70	Y coordinate of pin in 61 and 62.
71	Z-level of interconnection for pin in 61 and 62.
72 through 74	Wire length approximation (pin-to-pin).
75	Table Rotation Position.
76	Error indication punch (See Section II-C).
77 through 80	Card sequence number. This number is the same as the binary coded number in column 14.

2. Example

Figure 19 is a listing of the Wire Wrap Machine Control Card
ceck with column numbers added at the top to help in interpreting with
respect to the list in Part 1, this section. Columns 1 through 14 make
no apparent sense due to the type of coding in the machine instructions
(See Section II-C, Machine Binary Definition).

Figures 20a and 20b are the Wiring List Drawing Documentation
outputs from the program. The drawing, when output by the computer, is
actual B-size drawing. Figures 20a and 20b have been reduced for
incorporation here.

LISTING of WRAPIT 2 OUTPUT CARDS

```
          1111111111222222222233333333334444444444555555555566666666667777777777
1234567890123456789012345678901234567890123456789012345678901234567890123456789018
************************************************************************************

SZ(+7#ZX-X59+EXAMPLE   A1A 0B0839 22 4310250421           B0919 24 4310041 0001
+SZ5+7(ZX-X99-EXAMPLE  A1A 0B0939 25 4310260421           B1019 27 4310041 0002
-SZV+7#ZX-X99-EXAMPLE  A1A 0B1039 28 4310290421           B1119 30 4310041 0003
-SZ5+7(ZX-X990EXAMPLE  A1A 0B1135 31 4310520421           B1215 33 4310041 0004
OSZ(+=#ZW-W99UEXAMPLE  A1A 2A0830 22 7102250081           A0915 24 9100041 0005
OSZ4+,(ZX-U59JEXAMPLE  A1A 70A0756 19 1510200151          A0815 21 1410051 0006
OSZ(+#2#-#99UEXAMPLE   A1A 70A0657 16 1610170151          A0717 16 1610041 0007
OSZ(+(#ZX-#99IEXAMPLE  A1A 15B0636 16 4210170411          B0717 16 4310051 0008
1SZ(+X#Z(-799AEXAMPLE  A1A 15B0636 16 4010170391          B0717 16 4110051 0009
ASZUZ7U-(9999JEXAMPLE  A1A 15B0715 18 391                 B0734 19 3810021 0010
JSZ4+V(ZX-#99JEXAMPLE  A1A 15B0732 19 3610200351          B0813 21 3710051 0011
JSZ4+V(Z(-599/EXAMPLE  A1A 15B073C 19 3410260331          B0811 21 3510051 0012
/SZ4+((ZV-#99/EXAMPLE  A1A 15B0728 19 3210200311          B0811 21 3310051 0013
/TZX-XXZX9999/EXAMPLE  A1A-117A0216 3  151                B08 9   21 1610012 0014
/,ZX+((0(-(27/EXAMPLE  A1A -10A03 4  3100700450080044A04  A0217 3  210063 0015
/,Z#+(70(-(Z72EXAMPLE  A1A -10A06 4  3101600450170044A07  B08 9   18 210063 0016
2SR7-X72ZX9999+EXAMPLE A1A 0B0819 21 432                  B0839 22 4320011 0001
+SRX-XXZX9999-EXAMPLE  A1A 0B0919 24 432                  B0939 25 4320011 0002
-SR#-X#ZX9999-EXAMPLE  A1A 0B1019 27 432                  B1039 28 4320011 0003
-SRV-XVZX99990EXAMPLE  A1A 0B1119 30 432                  B1139 31 4320011 0004
OSR#-X#ZX9999UEXAMPLE  A1A 0B1219 33 432                  B1239 34 4320011 0005
OSRW+(#0I-#Z#0EXAMPLE  A1A 1B032C 6  4420070435017043B0720 B0720 18 4420141 0006
OSR(+,#Z=-W99UEXAMPLE  A1A 2A0630 22 920230071            A09 5   24 820051 0007
OSR7-4(0,Z#991IEXAMPLE A1A 70A0613 15 1220200157          A0615 21 1420081 0008
1SR(+4U04-#ZUAEXAMPLE  A1A 70A0637 16 1620170145018014A0736 A0736 19 1520061 0009
ASR7+2,Z3-V99JEXAMPLE  A1A 12A0324 7  320080021           A04 5   9  420051 0010
JSRU-#=0UZ(99/EXAMPLE  A1A-117A0136 1  1520020141         A0216 3  1520041 0011
JSR(+7#2X-#99/EXAMPLE  A1A -35A0237 4  1620050177         A0320 6  1920051 0012
/SR(+7#2X-#99/EXAMPLE  A1A 15B0640 16 4420170421          B0719 18 4320051 0013
/SR(+7#Z(-#99/EXAMPLE  A1A 15B0628 16 4220170401          B0717 16 4120051 0014
/SR(+##Z(-799/EXAMPLE  A1A 15B0636 16 4020170361          B0715 16 3920051 0015
/SR4+5(ZX-7592EXAMPLE  A1A 15B0734 17 3820260361          B0613 21 3720051 0016
2SR4+##(Z(-#99BEXAMPLE A1A 15B0732 19 3620260341          B0811 21 3520051 0017
BSR4+#(ZV-599KEXAMPLE  A1A 15B0730 19 3420200321          B08 9   21 3320051 0018
KTRU+##Q#-XZXKEXAMPLE  A1A 3A0340 7  19200802050080024B0321 B0321 7  2520082 0019
K,R#+(70(-7Z(SEXAMPLE  A1A -10A0123 1  2600200450050044A03 A03 4   6  320083 0020
S,R(+(#0(-7Z(SEXAMPLE  A1A -15A04 3  2201000450140044A06 A06 4   15 320093 0021
S,R#+(XU(-7Z(SEXAMPLE  A1A -10A07 3  2201900450230044A09 A09 4   24 320093 0022
```

FIGURE 19

EXAMPLE

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP PLATE X	Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W REV C LTR		SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP PLATE X	Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W REV C LTR
0	B08	39	1	023	042	B09	19	1	1	1	A A		0	B09	39	1	026	042	B18	19	1	2	1	A A
0	B10	39	1	029	042	B11	19	1	3	1	A A		0	B11	39	1	032	042	B12	19	1	.	1	A A
2	A08	30	1	023	008	A09	18	1	5	1	A A		70	A07	36	1	028	013	A08	15	1	6	1	A A
70	A86	37	1	017	015	A07	17	1	7	1	A A		15	B06	38	1	017	041	B07	19	1	8	1	A A
15	B06	36	1	017	039	B07	17	1	9	1	A A		15	B07	15	1			B07	34	1	10	1	A A
15	B07	32	1	020	035	B08	13	1	11	1	A A		15	B07	30	1	020	033	B08	11	1	12	1	A A
15	B07	28	1	020	031	B06	9	1	13	1	A A		-117	A02	16	1			A02	17	1	14	1	A A
-10	A03	4	1	007 004	008 004	A04	3	1	15	1	A A		-10	A86	4	1	016 004	017 004	A07	3	1	16	1	A A

WIRING LIST, MACHINE, BY Z LEVEL,
SOLDERLESS WRAPPED CONNECTION

SIZE	CODE IDENT NO.	NAVAIR DRAWING NO.
B	30003	EXAMPLE
	REV A	SHEET 4

FIGURE 20.

EXAMPLE

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP X	VIA WRAP Y	PLATE X	PLATE Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W	REV LTR
0	B08	19	2					B08	39	2	1	1	A	A
0	B10	19	2					B10	39	2	3	1	A	A
0	B12	19	2					B12	39	2	5	1	A	A
2	A08	30	2	023	007			A09	9	2	7	1	A	A
70	A06	37	2	017	014	018	014	A07	36	2	9	1	A	A
-117	A01	36	2	002	014			A02	16	2	11	1	A	A
15	B06	40	2	017	042			B07	19	2	13	1	A	A
15	B06	36	2	017	038			B07	15	2	15	1	A	A
15	B07	32	2	020	034			B08	11	2	17	1	A	A
3	A03	40	2	008	020	008	024	B03	21	2	19	1	A	A
-10	A04	3	2	010	004	014	004	A06	4	2	21	1	A	A

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP X	VIA WRAP Y	PLATE X	PLATE Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W	REV LTR
0	B09	19	2					B09	39	2	2	1	A	A
0	B11	19	2					B11	39	2	4	1	A	A
1	B03	20	2	007	043	017	043	B07	20	2	6	1	A	A
70	A06	13	2	020	013			A08	15	2	8	1	A	A
12	A03	24	2	008	002			A04	5	2	10	1	A	A
-35	A02	37	2	005	017			A03	20	2	12	1	A	A
15	B06	38	2	017	040			B07	17	2	14	1	A	A
15	B07	34	2	020	036			B08	13	2	16	1	A	A
15	B07	30	2	020	032			B08	9	2	18	1	A	A
-10	A01	23	2	002	004	005	004	A03	4	2	20	1	A	A
-10	A07	3	2	019	004	023	004	A09	4	2	22	1	A	A

WIRING LIST, MACHINE, BY Z LEVEL.
SOLDERLESS WRAPPED CONNECTION

SIZE B   CODE IDENT NO. 30003   NAVAIR DRAWING NO. EXAMPLE

REV A   SHEET 5

FIGURE 20b

65

F. WRAPIT DENSITY INPUT

1. WRAPIT DENSITY input consists of the maximum Z-level data and maximum density level as specified on the WRAPIT MAINLINE SYSTEM Computer Work Request, the Wiring Boundaries information card of WRAPIT 1, the Wire Wrap Machine Control Card deck, and blanks supplied by Computer Operations Branch according to the type of density map(s) specified on the WRAPIT MAINLINE SYSTEM Computer Work Request.

2. Example

In Fig. 21, the input data for WRAPIT DENSITY for the example is shown. The first three lines of printing are added to this figure as column headings to illustrate the card columns.

FIGURE 21

G. WRAPIT DENSITY OUTPUT

1. The output of WRAPIT DENSITY consists of the density map(s) as
specified in the density map(s) type declaration on the WRAPIT MAINLINE
SYSTEM Computer Work Request and a list of all wires which pass through
areas of density greater than the maximum density level.

2. Example

The Z-level 1 output of WRAPIT DENSITY is shown in Fig. 22.
The Z-level 2 output of WRAPIT DENSITY is shown in Fig. 23.

Figure 24 gives an example of WRAPIT DENSITY output used in
conjuction with the clear plastic overlay mentioned in Section II-D. The
WRAPIT DENSITY output is taken from Fig. 23. As in Figs. 22 and 23, the
orientation of the data in Fig. 24 is increasing Y values across the
page and increasing X values down the page. Note that the overlay
extends beyond the boundaries of the wire plate. This happens because
the overlay was generated to handle all cases up to the maximum wire
plate size that WRAPIT DENSITY can accommodate.

EXAMPLE A

WRAPIT DENSITY OUTPUT
Z LEVEL 1

FIGURE 22

EXAMPLE   A

WRAPIT   DENSITY   OUTPUT
Z   LEVEL   2

FIGURE   23

WRAPIT DENSITY OUTPUT with OVERLAY
FIGURE 24
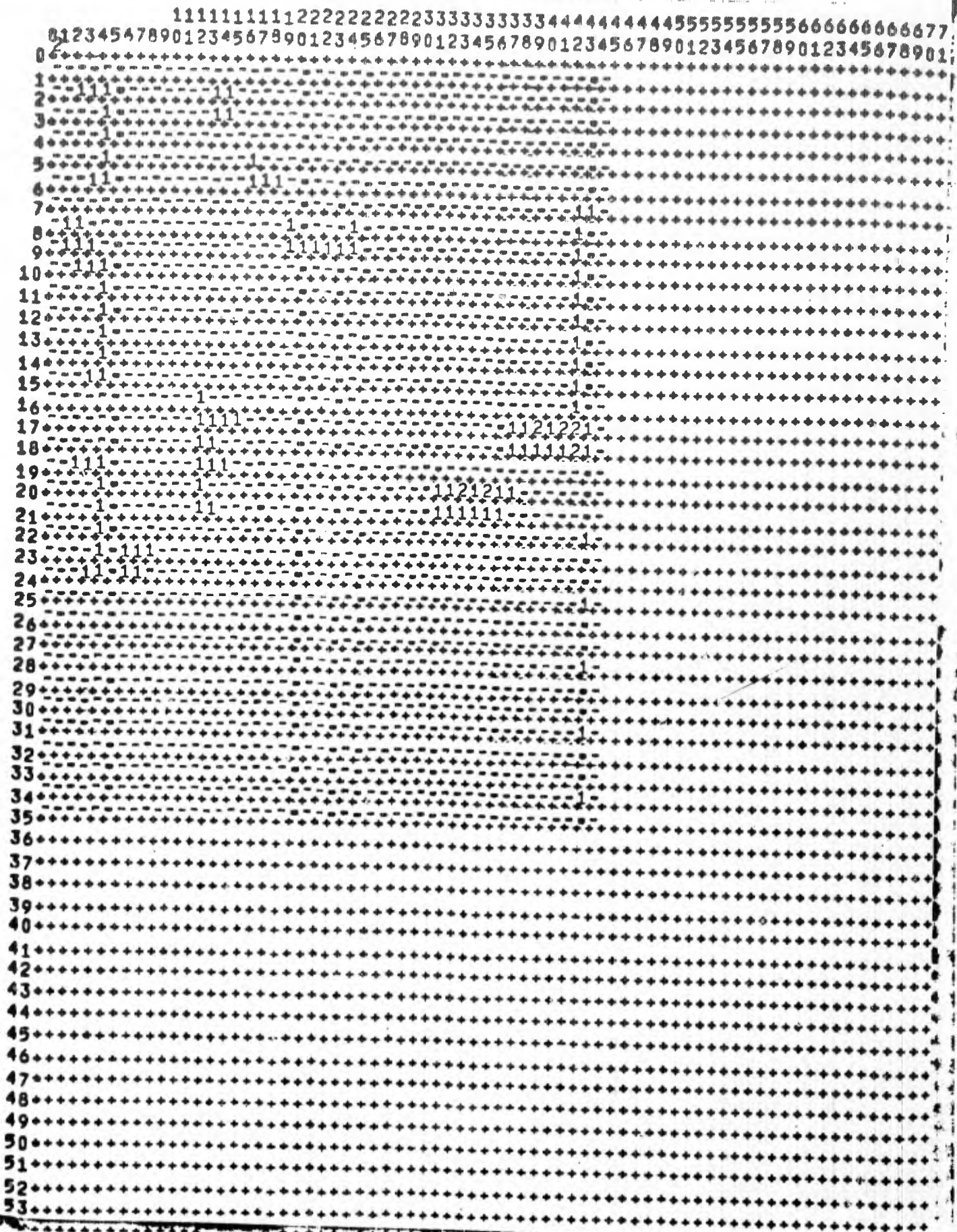
H. WRAPIT 3 INPUT

1. The input to WRAPIT 3 consists of the Wiring Boundaries card from WRAPIT 1, the Wire Wrap Machine Control Card deck sorted to group common signal numbers together, and a card supplied by Computer Operations to tell the program that there is no more data.

2. <u>Example</u>

For the Wire-Wrap machine operation personnel, two sets of sortings and listings must be performed on the Wire Wrap Machine Control Card deck before it is readied for WRAPIT 3 input. Figure 25 shows the result of the first set of sortings and is one of the listings that the job requestor would receive. The black bar indicates the columns on which the sorting was done. Figure 26 shows the result of the second set of sortings and is another listing that the job requestor would receive. The black bar is as in the last figure.

Figure 27 shows the input to WRAPIT 3 for the example. The first three lines of printing are added to this figure as column headings to illustrate the card columns. The black bar above the column headings indicates the columns on which the sorting to form common signal number aggregates was done.

Minimum X-Y FROM Listing by Z Level

FIGURE 25

Minimum X-Y TO Listing by Z Level

FIGURE 26

WRAPIT 3 INPUT DATA

FIGURE 27

I. WRAPIT 3 OUTPUT

1. The WRAPIT 3 output consists of "Complete by Signal Number"
Drawing Documentation in a B size drawing format, an approximation of the
total amount of wire of each type to be used for each plate, and engineering
document aperture cards (yellow stripe) with the appropriate columns
punched. Before the aperture cards are returned to the job requestor, the
punches are interpreted in the proper columns on the top of the card.

2. Example

Figure 28 is the totality of the computer printout for this
job. The "Complete by Signal Number" Drawing Documentation was not
separated from the wire length approximation to show what the job requestor
can expect to receive. Note that the page sequence is continuous from
WRAPIT 2 generated drawing documentation to WRAPIT 3 generated drawing
documentation. Again, as in the case of Figs. 20a and 20b, the actual
output has been reduced in size for incorporation here.

Figure 29 is a listing of the yellow stripe aperture cards.
Note that aperture cards have been generated for the notes that the
engineer must include in the first three pages. Figure 30 is a Xerox
copy of the aperture cards.

EXAMPLE

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W C	REV LTR
0	B08	39	1	B09	19	1	1	1	A	A
0	B10	39	1	B11	19	1	3	1	A	A
0	B08	19	2	B08	39	2	1	1	A	A
0	B10	19	2	B10	39	2	3	1	A	A
0	B12	19	2	B12	39	2	5	1	A	A
2	A08	30	1	A09	10	1	5	1	A	A
12	A03	24	2	A04	5	2	10	1	A	A
15	B06	38	1	B07	19	1	8	1	A	A
15	B07	28	1	B08	9	1	13	1	A	A
15	B07	32	1	B08	13	1	11	1	A	A
15	B06	38	2	B07	17	2	14	1	A	A
15	B07	30	2	B08	9	2	16	1	A	A
15	B07	34	2	B08	13	2	16	1	A	A
70	A06	37	1	A07	17	1	7	1	A	A
70	A06	37	2	A07	36	2	9	1	A	A
-10	A03	4	1	A04	3	1	15	1	A	A
-10	A01	23	2	A03	4	2	20	1	A	A
-10	A07	3	2	A09	4	2	22	1	A	A
-117	A02	16	1	A02	17	1	14	1	A	A

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W C	REV LTR
0	B09	39	1	B10	19	1	2	1	A	A
0	B11	39	1	B12	19	1	4	1	A	A
0	B09	19	2	B09	39	2	2	1	A	A
0	B11	19	2	B11	39	2	4	1	A	A
1	B03	20	2	B07	20	2	6	1	A	A
2	A08	30	2	A09	9	2	7	1	A	A
15	B04	36	1	R07	17	1	9	1	A	A
15	B07	15	1	B07	34	1	10	1	A	A
15	B07	30	1	B08	11	1	12	1	A	A
15	R06	36	2	B07	15	2	15	1	A	A
15	B06	40	2	R07	19	2	13	1	A	A
15	R07	32	2	B08	11	2	17	1	A	A
3	A03	40	2	B03	21	2	19	1	A	A
70	A07	36	1	A08	15	1	6	1	A	A
70	A06	13	2	A08	15	2	8	1	A	A
-10	A06	4	1	A07	3	1	16	1	A	A
-10	A04	3	2	A06	4	2	21	1	A	A
-35	A02	37	2	A03	20	2	12	1	A	A
-117	A01	36	2	A02	16	2	11	1	A	A

WIRING LIST, COMPLETE, BY SIGNAL NUMBER

SOLDERLESS WRAPPED CONNECTION

WIRING FOR EXAMPLE   TOTAL WIRE, CODE A WIRE, IS APPROXIMATELY   113.5 INCHES.

SIZE	CODE IDENT NO.	NAVAIR DRAWING NO.
B	30003	EXAMPLE
	REV A	SHEET 6

FIGURE 28

```
          1111111111222222222233333333334444444444555555555566666666667777777777 8
1234567890123456789012345678901234567890123456789012345678901234567890
********************************************************************* **
4LEXAMPLE   30003  1  6                                    UKJBTN
4LEXAMPLE   30003  2  6                                    UKJBTN
4LEXAMPLE   30003  3  6                                    UKJBTN
4LEXAMPLE   30003  4  6                                    UKJBTN
4LEXAMPLE   30003  5  6                                    UKJBTN
4LEXAMPLE   30003  6  6                                    UKJBTN
```

Listing of Engineering Document Aperture Cards

FIGURE 29

Xerox Copy of Engineering Document Aperture Cards

FIGURE 30

J. OUTPUT TO USER SUMMARY

The following is a list of items which are returned to the job requestor using the WRAPIT MAINLINE SYSTEM (The figure references correspond to the example carried through in Section III):

1. WRAPIT 1 generated card summary listing (Fig. 15, page 55)

2. Wire Wrap Machine Control Card Deck (listing, Fig. 19, page 63)

3. Wiring List Drawing Documentation (Figs. 20a and 20b, pages 64 & 65)

4. WRAPIT DENSITY printouts, if generated (Figs. 22 and 23, pages 69-70)

5. Minimum X-Y listings for Wire Wrap Machine operation personnel's visual inspection (Figs. 25 and 26, pages 73-74)

6. "Complete by Signal Number" Drawing Documentation (Fig. 28, page 77)

7. Engineering document aperture cards (Fig. 30, listing in Fig. 29, page 78-79)

In addition to these items, the WRAPIT 1 input and the WRAPIT 1 output cards (X-Y Wire Plate cards) are retained by Computer Operations (D/842, NAFI) and are available to the user on request.

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IV. WRAPIT SUPPORT PROGRAM USAGE

A. WRAPIT RESEQUENCE USAGE

1. The input to WRAPIT RESEQUENCE consists of the Wire Wrap Machine Control Card Deck sequenced as the job requestor desires. The only constraints to the sequencing are that all cards from any Z-level be grouped together and that the Z-level groupings be in the order: Z-level 1, Z-level 2, Z-level 3. The output cards will be interpreted when the computer program is completed and both input and output decks will be returned to the job requestor. For each Wire Wrap Machine Control Card deck to be resequenced, the job requestor must submit to Computer Operations Branch, D/842, a completed Computer Work Request specifying a WRAPIT RESEQUENCE job and the Wire Wrap Machine Control Card Deck.

2. <u>Example</u>

Figure 31 is a listing of the Wire Wrap Machine Control Card Deck, from the example carried through Section III, rearranged in preparation for input to WRAPIT RESEQUENCE. The rearrangement is random within the constraints outlined above.

Figure 32 is the Computer Work Request which accompanies the Wire Wrap Machine Control Card Deck listed in Fig. 31 when submitted to the Computer Operations Branch.

A listing of the new, resequenced Wire Wrap Machine Control Card Deck generated by WRAPIT RESEQUENCE is given in Fig. 33. It cannot be seen in the listing that columns 1 and 14 of each card have been changed. This fact is due to the machine binary coding (See Section II-D, Definitions) which is not accepted by the lister.

WRAPIT RESEQUENCE INPUT

FIGURE 31

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TIME	
CATEGORY	B2

WIZ ☐

FORTRAN ☒ *FIZ*

☐ _____

Problem Name **WRAPIT RESEQUENCE**

Problem Number **F-07-68-60**
(To be assigned by D/84Ω)

Problem Originator　　　Name _____

　　　　　　　　　　　　　Dept. _____ Ext. _____

Job order for labor only_____ _____

Programmer_____

Coder_____

Special Instructions:_____

_____

_____

_____

_____

_____

FIGURE 32

WRAPIT RESEQUENCE OUTPUT

FIGURE 33

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B. WRAPIT DOCUMENTATION GENERATOR USAGE

1. Supplied by the WRAPIT DOCUMENTATION GENERATOR (WRAPIT D.G.) user are the following:

a. An updated Wiring Boundaries Information Sheet (See Fig. 3) showing all information including latest drawing revision status, and

b. The modified Wire Wrap Machine Control Card Deck in the following sequence: (1) machine wraps, Z-level 1; (2) machine wraps, Z-level 2; (3) machine wraps, Z-level 3; (4) non-machine made interconnections, Z-level 1; (5) non-machine made interconnections, Z-level 2; and (6) non-machine made interconnections, Z-level 3.

Computer Operations will supply the computer card to tell the program that there is not more data to be documented.

The output of this program is new Wiring List Drawing Documentation.

Since WRAPIT D.G. does not supply Complete by Signal Number Drawing Documentation, the input to WRAPIT D.G. will be sorted after completion of WRAPIT D.G. and run with WRAPIT 3. WRAPIT 3 will generate the new Complete by Signal Number Drawing Documentation and a new set of Engineering Document aperture cards (yellow stripe).

Each job submitted to Computer Operations to be run with WRAPIT D.G. must be accompanied by a completed Computer Work Request.

2. Example

In this example, the resequenced Wire Wrap Machine Control Card Deck generated by WRAPIT RESEQUENCE in Section IV-A-2 will be the modified deck for input. These cards are listed in Fig. 33. Figure 34 is the updated Wiring Boundaries Information Sheet submitted with the Computer Work Request, shown in Fig. 35, and the Wire Wrap Machine Control Card Deck of Fig. 33.

WIRING BOUNDARIES INFORMATION

DRAWING REVISION

24
B

DRAWING NUMBER

15	16	17	18	19	20	21	22	23	
E	X	A	M	P	L	E			

CODE IDENT NUMBER

8	9	10	11	12
3	0	0	0	3

DRAWING REVISION

4	5	6
		B

SYSTEMS COVERED

1	2	3
A	I	R

X

36	37	38	39
		0	5

Y

40	41	42	43
		0	4

MINIMUM

MAXIMUM

63	64	65	66
		3	9

67	68	69	70
		4	8

FIGURE 34

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TIME	
CATEGORY	B2

W I Z   ☐

FORTRAN   ☒ FIZ

☐ _____

Problem Name _WRAPIT DOCUMENTATION GEN._

Problem Number /////////////
        (To be assigned by D/840)

Problem Originator   Name _____

                 Dept. _____ Ext. _____

Job order for labor only_____

Programmer_____

Coder_____

Special Instructions: _____

_____

_____

_____

_____

_____

_____

FIGURE 35

Figure 36 is a listing of the data as it is actually input to WRAPIT D.G. The output of WRAPIT D.G. is shown in Figs. 37a and 37b. Again, as in the case of WRAPIT 2 and WRAPIT 3, the Wiring List Drawing Documentation is a B-size drawing and has been reduced for incorporation here.

The input for this example for WRAPIT 3 is listed in Fig. 38. Figure 39 is the Complete by Signal Number Drawing Documentation reduced for incorporation here.

The aperture cards will be as in the listing in Fig. 29, though possibly fewer or more in number, and as in the Xerox copy in Fig. 30.

Wrapit Documentation Generator Input

EXAMPLE

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP X	Y	VIA PLATE X	Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W REV LTR
78 A07	36	1	020	013				A08	15	1	0001	1 A	A
15 B07	30	1	020	033				B08	11	1	0003	1 A	A
15 B07	15	1						B07	34	1	0005	1 A	A
8 B09	39	1	026	042				B10	19	1	0007	1 A	A
8 B11	39	1	032	042				B12	19	1	0009	1 A	A
8 B08	39	1	023	042				B09	19	1	0011	1 A	A
2 A08	38	1	023	008				A09	19	1	0013	1 A	A
15 B06	36	1	017	039				B07	17	1	0015	1 A	A

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	VIA WRAP X	Y	VIA PLATE X	Y	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W REV LTR
15 B07	28	1	020	033				B08	9	1	0002	1 A	A
15 B07	32	1	020	035				B08	13	1	0004	1 A	A
-117 A02	16	1						A02	17	1	0006	1 A	A
8 B10	39	1	029	042				B11	19	1	0008	1 A	A
-10 A03	4	1	007	004	008	004		A04	3	1	0010	1 A	A
15 B06	36	1	017	041				B07	19	1	0012	1 A	A
78 A06	37	1	017	019				A07	17	1	0014	1 A	A
-10 A06	4	1	016	004	017	004		A07	3	1	0016	1 A	A

WIRING LIST, MACHINE, BY Z LEVEL, SOLDERLESS WRAPPED CONNECTION

FIGURE 37a

SIZE	CODE IDENT NO.	NAVAIR DRAWING NO.
B	30003	EXAMPLE
	REV B	SHEET 4

EXAMPLE

SGNL NO.	MOD NO.	FROM PIN NO.	Z LEV	VIA WRAP X	VIA WRAP Y	VIA PLATE X	VIA PLATE Y	MOD NO.	TO PIN NO.	Z LEV	CARD NO.	C C	W REV LTR
1	B03	20	2	007	043	017	043	B07	20	2	0001	1 A	A
-35	A02	37	2	005	017			A03	20	2	0003	1 A	A
0	B09	19	2					B09	39	2	0005	1 A	A
15	B07	34	2	020	036			B05	13	2	0007	1 A	A
15	B07	32	2	020	034			B06	11	2	0009	1 A	A
3	A03	40	2	008	020	008	024	B03	21	2	0011	1 A	A
0	B10	19	2					B10	39	2	0013	1 A	A
0	B12	19	2					B12	39	2	0015	1 A	A
15	B06	36	2	017	039			B07	15	2	0017	1 A	A
15	B06	40	2	017	042			B07	19	2	0019	1 A	A
-10	A04	3	2	010	004	014	004	A06	4	2	0021	1 A	A

SGNL NO.	MOD NO.	FROM PIN NO.	Z LEV	VIA WRAP X	VIA WRAP Y	VIA PLATE X	VIA PLATE Y	MOD NO.	TO PIN NO.	Z LEV	CARD NO.	C C	W REV LTR
12	A03	24	2	008	002			A04	5	2	0002	1 A	A
-117	A01	36	2	002	014			A02	16	2	0004	1 A	A
70	A06	13	2	020	013			A08	15	2	0006	1 A	A
15	B07	30	2	020	032			B08	9	2	0008	1 A	A
0	B08	19	2					B08	39	2	0010	1 A	A
0	B11	19	2					B11	39	2	0012	1 A	A
2	A08	30	2	023	007			A09	9	2	0014	1 A	A
70	A06	37	2	017	014	018	014	A07	36	2	0016	1 A	A
15	B06	38	2	017	040			B07	17	2	0018	1 A	A
-10	A07	3	2	019	004	023	004	A09	4	2	0020	1 A	A
-10	A01	23	2	002	004	005	004	A03	4	2	0022	1 A	A

WIRING LIST. MACHINE, BY Z LEVEL.

SOLDERLESS WRAPPED CONNECTION

FIGURE 37b

SIZE	CODE IDENT NO.	NAVAIR DRAWING NO.
C3	30003	EXAMPLE
	REV B	SHEET 5

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Wrapit 3 Input for FIGURE 36

FIGURE 38

EXAMPLE

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W 1	REV LTR
0	B09	39	1	B10	19	1	7	1	A	A
0	B11	39	1	B12	19	1	9	1	A	A
0	B09	19	2	B09	39	2	5	1	A	A
0	B11	19	2	B11	39	2	12	1	A	A
0	B12	19	2	B12	39	2	15	1	A	A
2	A08	30	1	A09	10	1	13	1	A	A
3	A03	40	2	B03	21	2	11	1	A	A
15	B07	28	1	B06	9	1	2	1	A	A
15	B07	32	1	B08	13	1	4	1	A	A
15	B06	38	1	B07	19	1	12	1	A	A
15	B07	34	2	B08	13	2	7	1	A	A
15	B07	32	2	B08	11	2	9	1	A	A
15	B06	38	2	B07	17	2	16	1	A	A
70	A07	36	1	A08	15	1	11	1	A	A
70	A06	13	2	A08	15	2	6	1	A	A
-10	A03	4	1	A04	3	1	10	1	A	A
-10	A17	3	2	A09	4	2	20	1	A	A
-10	A01	23	2	A03	4	2	22	1	A	A
-117	A02	16	1	A02	17	1	6	1	A	A

SGNL NO.	FROM MOD NO.	PIN NO.	Z LEV	TO MOD NO.	PIN NO.	Z LEV	CARD NO.	C C	W 1	REV LTR
0	B10	39	1	B11	19	1	8	1	A	A
0	B08	39	1	B09	19	1	11	1	A	A
0	B08	19	2	B08	39	2	10	1	A	A
0	B10	19	2	B10	39	2	13	1	A	A
1	B03	20	2	B07	20	2	1	1	A	A
2	A08	30	2	A09	9	2	14	1	A	A
12	A03	24	2	A04	5	2	2	1	A	A
15	B07	30	1	B08	11	1	3	1	A	A
15	B07	15	1	B07	34	1	5	1	A	A
15	B06	36	1	A07	17	1	15	1	A	A
15	B07	30	2	B08	9	2	8	1	A	A
15	B06	36	2	B07	15	2	17	1	A	A
15	B06	40	2	B07	19	2	19	1	A	A
70	A06	37	1	A07	17	1	14	1	A	A
70	A06	37	2	A07	36	2	16	1	A	A
-10	A06	4	1	A07	3	1	16	1	A	A
-10	A04	3	2	A06	4	2	21	1	A	A
-35	A02	37	2	A03	20	2	3	1	A	A
-117	A01	36	2	A02	16	2	4	1	A	A

WIRING LIST, COMPLETE, BY SIGNAL NUMBER

SOLDERLESS WRAPPED CONNECTION

SIZE	CODE IDENT NO.	NAVAIR DRAWING NO.
B	30063	EXAMPLE
	REV B	SHEET 6

WIRING FOR EXAMPLE   TOTAL WIRE, CODE A WIRE, IS APPROXIMATELY   113.5 INCHES.

FIGURE 39

V. ABBERRATIONS AND DEVIATIONS

A. THREE WRAPS ON ONE WRAP-POST

1. It was previously mentioned in this manual that there were several reasons for WRAPIT MAINLINE SYSTEM not assigning any wrapping on Z-level 3 (Section II-B). This section has one of the several reasons.

Let us suppose that for some reason the WRAPIT MAINLINE SYSTEM user wants to distribute a critical signal from one pin onto a large number of pins without going through a long string of wires and many connections. The tack he can take is as follows.

About the pin from which the critical signal will emanate, the user should divide the wire plate into three areas with approximately equal numbers of pins to receive the signal under consideration in each area. For two of the areas all the pins in those areas receiving the critical signal and the signal distributing pin are to receive the same signal number and be grouped together on the Module Termination sheets. On the Module Termination sheets, another complete set of same signal number pins must now be listed. When the listing for the different signal number is completed, the listing for the final set of pins to receive the critical signal is begun again under the same signal number assigned to the previous set of pins receiving this signal. In this listing are all those pins in the third area which are to receive the critical signal and the signal distributing pin. Note that the signal distributing pin is included in both listings.

In both listings of pins under the critical signal number, all pins will have a number 1 in the sort column on the Module Termination sheets. The sequence in which the pins are listed within the first listing of the signal number should reflect an attempt to go from the farthest pins from the signal distributing pin in the first area, pin-to-pin, to the closer pins and crossing into the second area at the signal distributing pin. In the second area, the sequence proceeds from

the signal distributing pin out, pin-to-pin to the farthest pins. The
sequence in the third area should be as in the first area - pin-to-pin,
farthest to, and including, the signal distributing pin.

All the Module Termination sheets are to be submitted to the
WRAPIT MAINLINE SYSTEM with a Computer Work Request. On the Computer
Work Request special instructions must include that the output cards of
WRAPIT 1 are to be returned to the job requestor immediately after step 8
on the WRAPIT MAINLINE SYSTEM CHECK LIST.

When the output of WRAPIT 1 (the X-Y Wire Plate cards) is
returned to the job requestor, only the card which connects the signal
distributing pin to a pin in the third area needs to be changed. In that
card, the Z-levels (columns 44 and 71) must be changed to 3. When this is
completed, the WRAPIT 1 output is then resubmitted to Computer Operations
for completion of the WRAPIT MAINLINE SYSTEM execution sequence.

2. Example

Figure 40 shows the wire side of a wire plate and those pins
which are blacked in show all the pins which are to receive a certain
critical signal. The arrow indicates the pin which will distribute the
critical signal to the rest of the pins and which will have the three wraps.
The lines radiating out from the signal distributing pin divide the wire
plate into three areas with approximately equal numbers of pins to receive
the critical signal in each area.

Figure 41 is the Module Termination Sheet for this part of the
job. The pins for signal number 9000 are not shown in Fig. 40 and are
added here to break up the lists for the first two areas and the third
area. Other wiring for the job would precede and/or follow this signal
number as prescribed in Section III-B-2.

NAFI TR-1233
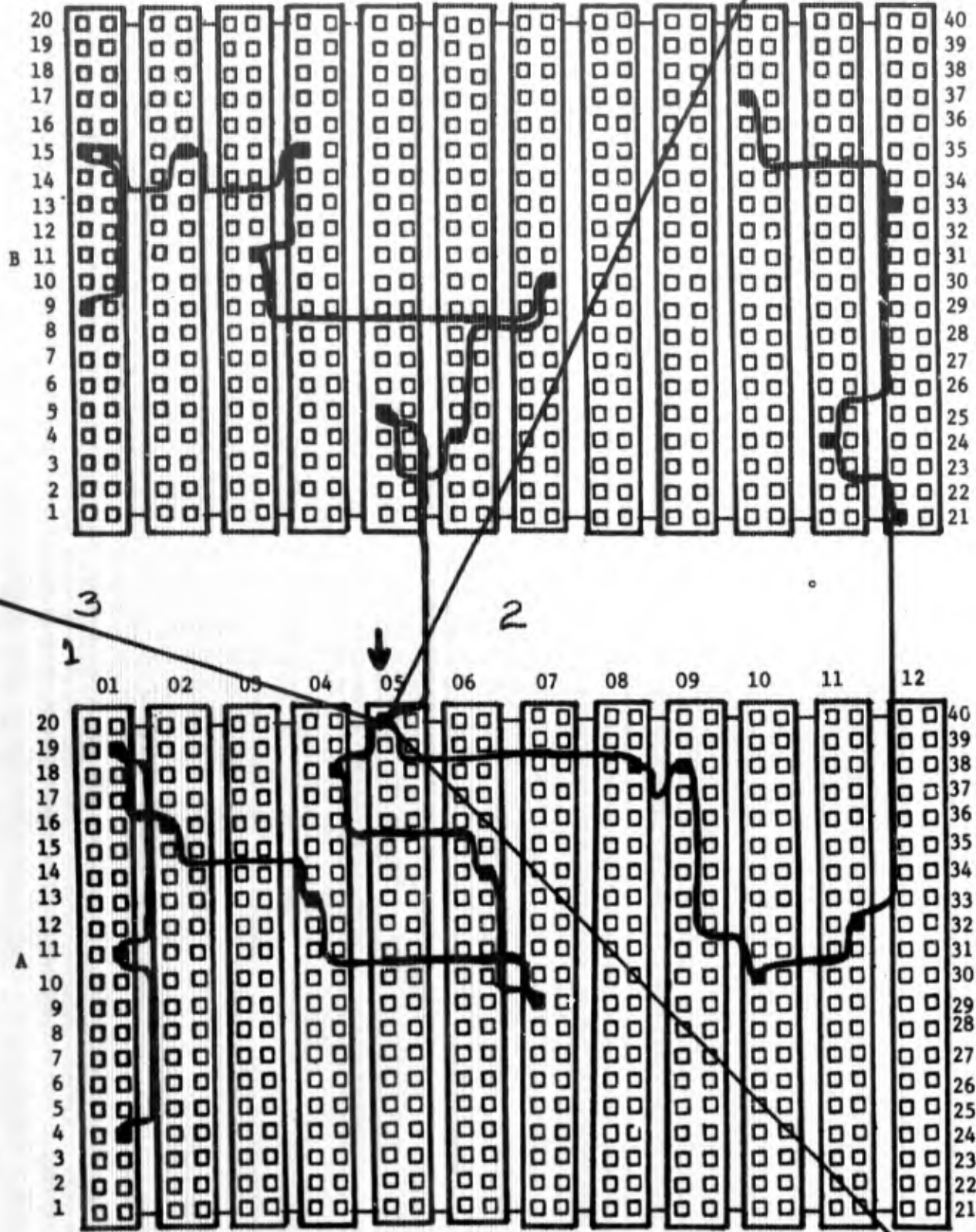
Diagram For Three Wraps On One Post

FIGURE 40

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MODULE TERMINATION SHEET

DESCRIPTION	DRAWING NUMBER	SIGNAL NUMBER	S.O.B.
CRITICAL	CRIT.SIG. 1A	880A0124	1
SIGNAL, AREA		880A0131	1
ONE		880A0139	1
		880A0226	1
		880A0423	1
		880A0709	1
		880A0634	1
		880A0438	1
DISTRIBUTOR		880A0520	1
AREA TWO		880A0838	1
		880A0918	1
		880A1020	1
		880A1132	1
		880B1201	1
		880B1104	1
		880B1213	1
		880B1017	1
		9000A1221	1
		9000B0120	1
CRITICAL		880B0109	1
SIGNAL, AREA		880B0115	1
THREE		880B0135	1
		880B0235	1
		880B0415	1
		880B0331	1
		880B0730	1
		880B0604	1
		880B0505	1
DISTRIBUTOR	CRIT.SIG. 1A	880A0520	1

FIGURE 41

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The resultant X-Y Wire Plate cards for this example are listed in Fig. 42 while Fig. 43 lists the X-Y Wire Plate cards after the previously indicated change.

Wrapit 1 Output for Three Wraps on One Post Example

```
1111111111222222222233333333334444444444555555555566666666667777777777 8
1234567890123456789012345678901234567890123456789012345678901234567890
**********************************************************************
CRIT.SIG.  1A 880A0124   1   32    AC131    1  102   72    1
CRIT.SIG.  1A 880A0131   1  101    A0139    1  181   82    2
CRIT.SIG.  1A 880A0139   1  182    A0216    3  152   51    3
CRIT.SIG.  1A 880A0216   3  151    AC413    5  121   91    4
CRIT.SIG.  1A 860A0413   9  122    A07 9   16   82  131    5
CRIT.SIG.  1A 880A07 9  18   81    A0634   16  131   71    6
CRIT.SIG.  1A 880A0634  16  132    AC436   10  172  101    7
CRIT.SIG.  1A 860A0438  10  171    A0520   12  191   41    8
CRIT.SIG.  1A 880A0520  12  192    AC838   22  172  121    9
CRIT.SIG.  1A 88CA0638  22  171    A0918   24  171   21   10
CRIT.SIG.  1A 880A0918  24  172    A1020   27   92  111   11
CRIT.SIG.  1A 880A1C1C  27   91    A1132   31  111   61   12
CRIT.SIG.  1A 880A1132  31  112    912 1   33  252  161   13
CRIT.SIG.  1A 880P12 1  33  251    B11 4   30  281   61   14
CRIT.SIG.  1A 880B11 4  30  282    B1213   33  372  121   15
CRIT.SIG.  1A 880B1213  33  371    B1017   27  411  101   16
CRIT.SIG.  1A9000A1221  34   02    BC120    0  442  781   17
CRIT.SIG.  1A 880BC1 9   0  332    BC115    0  392   62   18
CRIT.SIG.  1A 88CB0115   0  391    5C135    1  391   11   19
CRIT.SIG.  1A 88CR0135   1  392    R0235    4  392   31   20
CRIT.SIG.  1A 88CB0235   4  391    B0415    9  391   51   21
CRIT.SIG.  1A 880BC415   9  392    EC331    7  352   61   22
CRIT.SIG.  1A 880P0351   7  251    E0730   19  341  131   23
CRIT.SIG.  1A 580B0730  19  342    5C6 4   15  281  101   24
CRIT.SIG.  1A 860B06 4  15  281    B05 5   12  271   41   25
CRIT.SIG.  1A 880BC5 5  12  292    A0520   12  192  102   26
```

FIGURE 42

X-Y Wire Plate Cards for Three Wraps on One Post after Changes

FIGURE 43

Figure 44 shows what wiring would have resulted had not this method been used. Figure 40 shows the actual patterns which were chosen
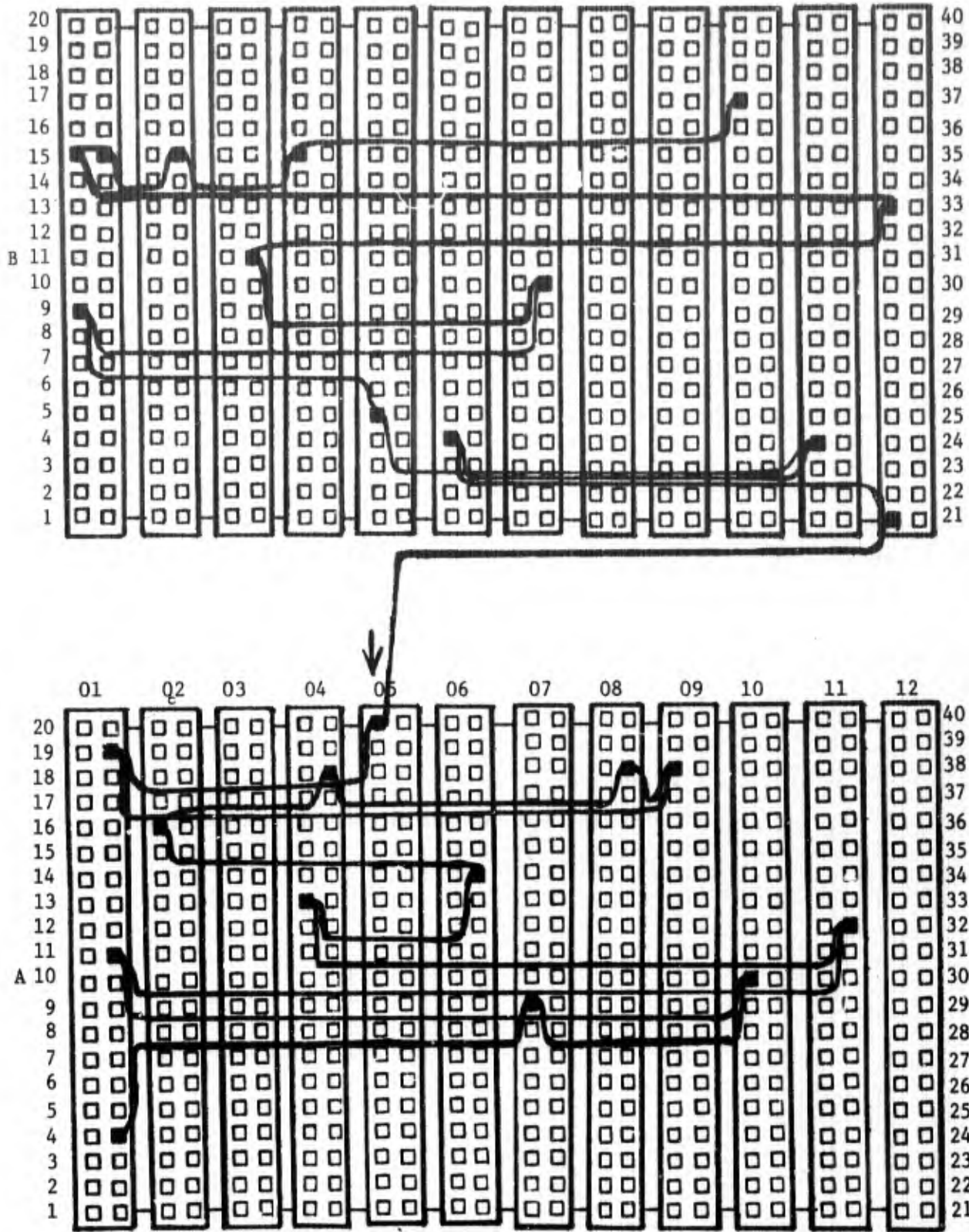
Wiring For Three Wraps On One Post If Regular Sort
Allowed And Used

FIGURE 44

B. LOOP WITH AN ODD NUMBER OF WIRES

1. It was previously mentioned in this manual that there were several reasons for WRAPIT MAINLINE SYSTEM not assigning any wrapping on Z-level 3 (Section II-B). This section has one of the several reasons.

Let us suppose that for some reason the WRAPIT MAINLINE SYSTEM user wants to run a loop of wires among a set of pins. If the user is distributing the signal among an even number of pins, the number of wires will be an even number and there will be no conflict of wrapping levels. In this case, the user need only begin his Module Termination Sheet listing of the pins for this signal number at any pin in the loop, proceed to list all other pins in the loop, and finally, list the original pin again. On the Module Termination sheets. all the pins of this signal number must have a 1 in the sort column.

If the user is distributing the signal among an odd number of pins, the number of wires will be an odd number and there will be a conflict of wrapping levels on the initial (and terminal) pin. The listing of the pins on the Module Termination sheets is exactly as in the case of an even number of pins. However, when the Computer Work Request is turned in for running the job with WRAPIT MAINLINE SYSTEM, the special instructions must include that the WRAPIT 1 output cards be returned to the job requestor after completion of step 8 on the WRAPIT MAINLINE SYSTEM CHECK LIST.

When the WRAPIT 1 output cards (X-Y Wire Plate cards) are returned to the job requestor, two cards of the signal number of the loop will indicate wrapping at Z-level 2 on the pin where the loop listing was begun. In either of these cards, but not both, the job requestor need only change the Z-levels (columns 44 and 71) to 3. The X-Y Wire Plate cards should then be resubmitted to Computer Operations for completion of the WRAPIT MAINLINE SYSTEM execution sequence.

2. Example

Figure 45 shows seven (7) pins blackened on the wire side of a Wire Plate which are to be connected in a closed loop. Figure 46 shows the

listing in the Module Termination sheets of the pins in the loop of
Fig 45. Note that there are eight pins listed, the first and the last
in this signal number being the same. Figure 47 is a listing of the X-Y
Wire Plate cards before the Z-level changes and Fig. 48 is a listing of
the same cards after the Z-level changes have been made and they are ready
to be resubmitted to complete the WRAPIT MAINLINE SYSTEM execution sequence.
Figure 45 also shows the wiring which results from these cards.
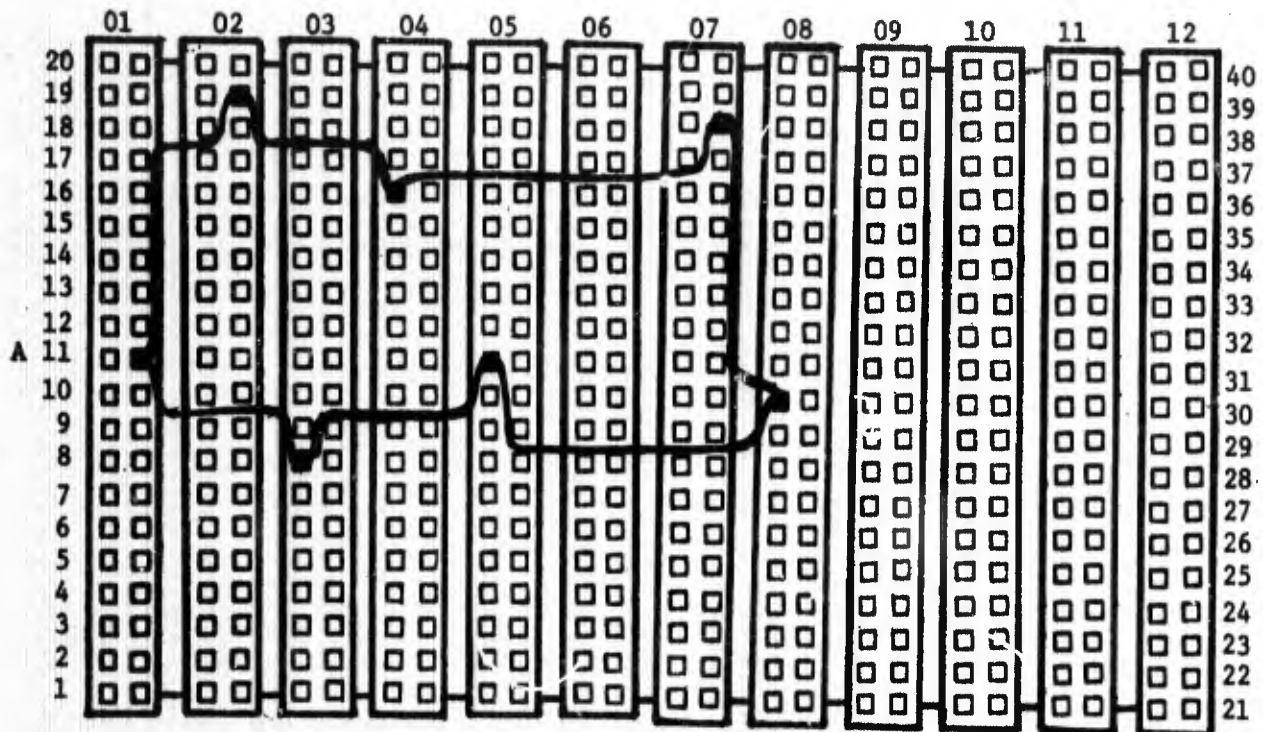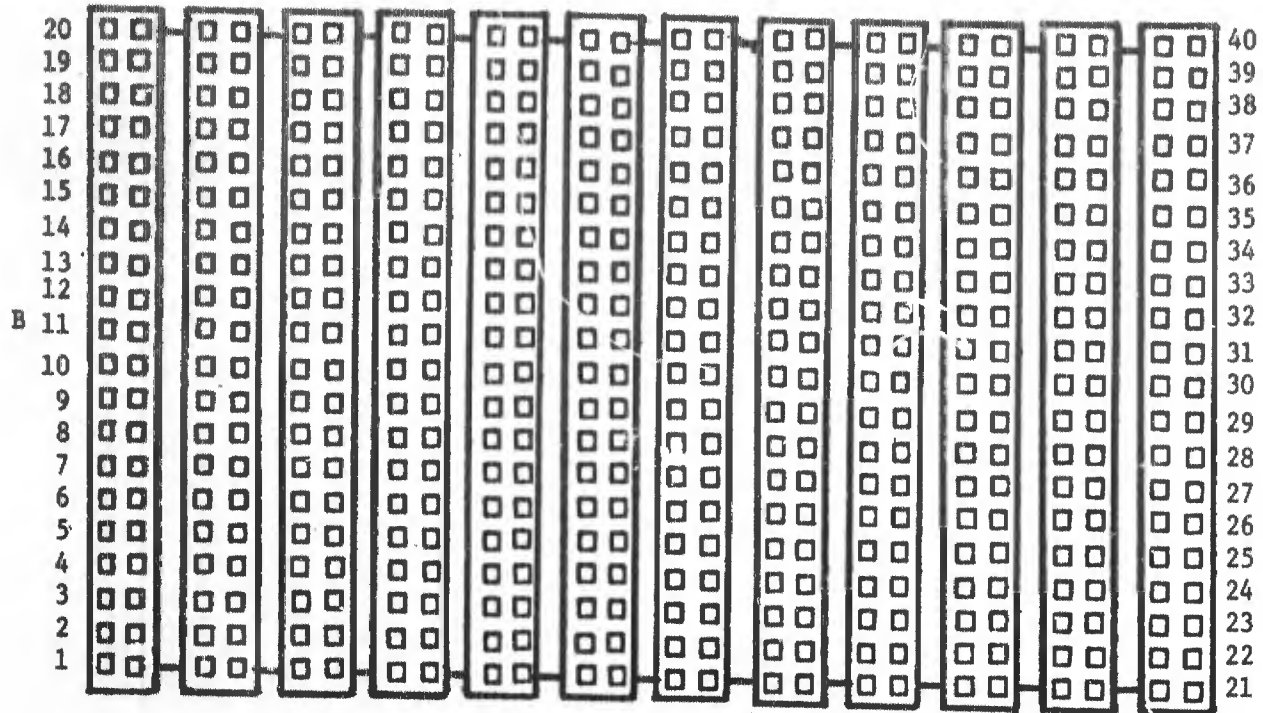
Loop With An Odd Number Of Wires

FIGURE 45

MODULE TERMINATION SHEET

	DRAWING NUMBER	REV	CCWC	SIGNAL NUMBER	MODULE NUMBER	PIN NO.		
1 2 3 4 5 6 7 8 9 10 11 12 13 14	15 16 17 18 19 20 21 22 23	24	25 26	27 28 29 30	31 32 33	34 35	36 37 38 39 40 41 42 43 44 45	46
CLOSED LOOP	LOOP	1	A	4346	A01	31		1
				4346	A03	08		1
				4346	A05	11		1
				4346	A08	10		1
				4346	A07	38		1
				4346	A04	16		1
				4346	A02	39		1
CLOSED LOOP				4346	A01	32		1

FIGURE 46

X-Y Wire Plate Cards for Loop with An Odd Number of Wires

FIGURE 47

```
     1111111111222222222233333333334444444444555555555566666666667777777777
1234567890123456789012345678901234567890123456789012345678901234567890
**********************************************************************
LOOP  1A4346A03  8   6   71    A0511  12  101  91    2
LOOP  1A4346A081C  21   91    AC738  19  171  101    4
LOOP  1A4346A0416   9  151    AC239   4  181   81    6
LOOP  1A4346A0131   1  102    AO3  8   6   72   81    1
LOOP  1A4346A0511  12  102    AC810  21   92  101    3
LOOP  1A4346A0738  19  172    AC416   9  152  121    5
LOOP  1A4346A0239   4  18?    AO131   -  103  111    7
```

X-Y Wire Plate Cards for Loop with An Odd Number of Wires after changes and sort

FIGURE 48

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C. INCOMPLETE AND OVERCOMPLETE MODULES

1. It occasionally happens that a few "stray" pins may be needed on a Wire Plate. "Stray" is used here in the sense of not being in a complete 40 pin module. Such may occur when a buss bar is run between rows of modules and various pins in complete 40 pin modules are to be tied to the buss bar, or when a 50 pin module is needed at some place for an unusual situation. These by no means exhaust the possibilities of "stray" pins occurring, and the individual reader may know of other examples.

The handling of this situation depends on one fact about WRAPIT 1: WRAPIT 1 has no inherent check for overlapping of modules when they are defined.

Words are extremely inadequate in this case due to the excessive amount of verbage necessary to describe handling the problem. Thus, using the old adage that a picture is worth 10^3 words, the following description will be with regard to Figs. 49 and 50. In those figures, the top two rows of pins in the B row of modules have been wholly or partially cut off due to the size of the page. Between the buss bar rows are numbers with lines drawn to specific pins. These numbers represent the X coordinate of the respective pins and the X coordinate of any pin shown can be found easily with these numbers as references. Similarly, the numbers along the left side of the modules and of the buss bars indicate the Y coordinate of the respective pins.

In the case of Fig. 49, the "stray" pins are the buss bars. Wrapping to these pins requires formulating imaginary modules which have a Y coordinate of 21 for the number 1 pin of each. The imaginary modules encompassing these pins could be designated the S row of modules, and the X-Y coordinates of the number 1 pin of each S row module would be defined as follows:

MODULE	X	Y
S01	0	21
S02	2	21
S03	4	21
S04	6	21
S05	8	21
S06	10	21

BUSS BARS
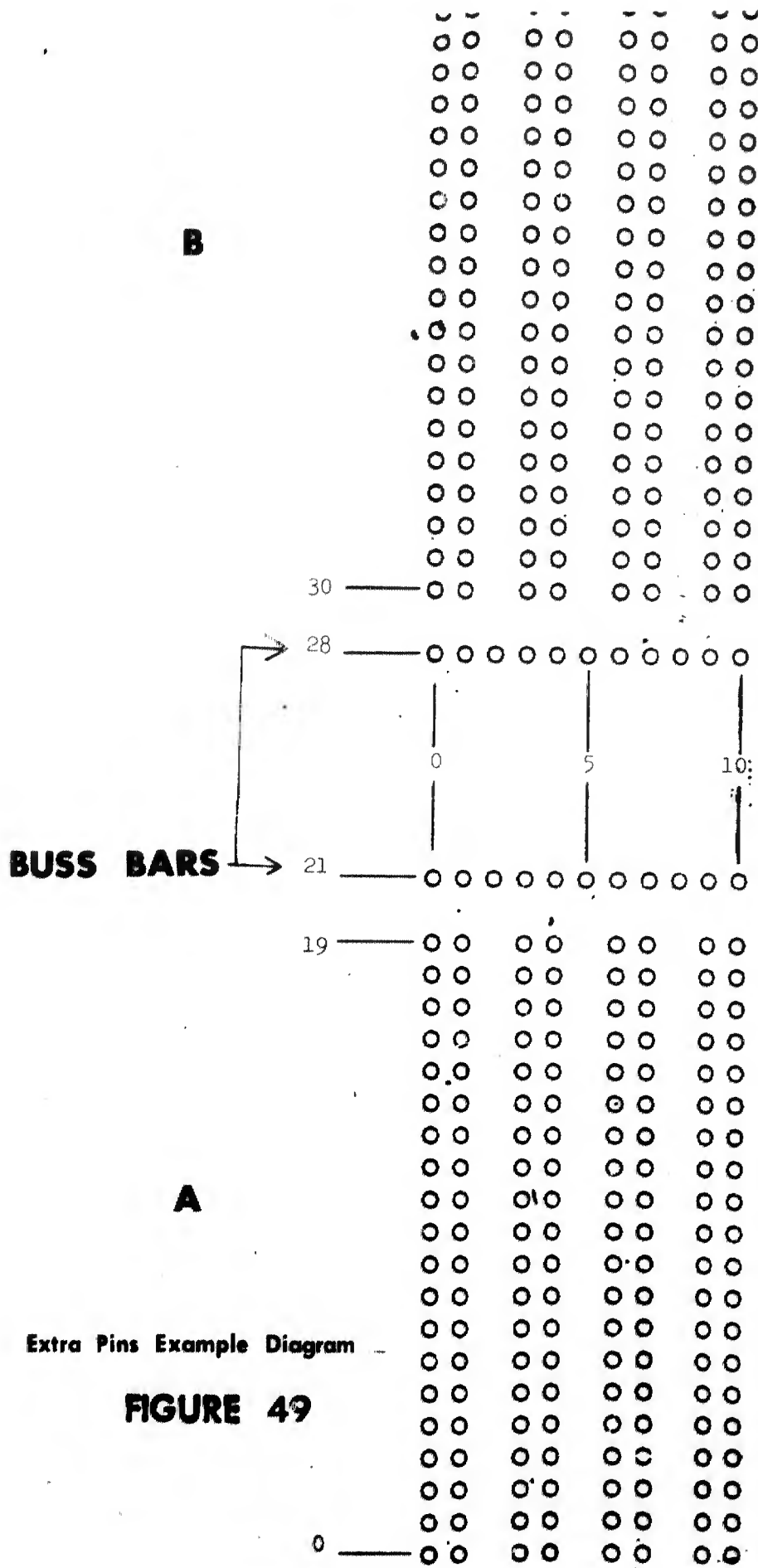
Extra Pins Example Diagram

FIGURE 49

In Fig. 50, the imaginary modules are outlined and the pins they would encompass are shown. However, we are not interested in the pins in the imaginary modules which are also in the real 40 pin modules. In modules S01, S02, S03, S04, and S05, we have the equivalent of a real 40 pin module's pins number 1, 8, 21, and 28, while in S06 we have the equivalent of a real 40 pin module's pins number 1 and 8.

Now if the WRAPIT MAINLINE SYSTEM user wanted to tie pin 15 of module A03 to the buss bar at (6, 21), his Module Termination sheets would show a signal number with pins A0315 and S0401, where the X-Y coordinates of module S04 are as in the preceding paragraph. Similarly, if the WRAPIT MAINLINE SYSTEM user wanted to connect pin 3 of module B04 to the buss bar at (8, 28), his Module Termination sheets would show a signal number, distinct from the previous buss bar tie signal numbers, with pins B0403 and S0508.

In like fashion, if there were buss bars between the B row of modules and the C row of modules, the WRAPIT MAINLINE SYSTEM user could define an imaginary T row of modules there.

In the case of a 50 pin module, it is important to know that WRAPIT 1 considers each module defined to have 40 pins arranged in 20 pin columns. If the 50 pin module had 25 pin columns, then pins 1 through 20 would be where WRAPIT 1 expects them to be, but WRAPIT 1 would consider pins 26 through 45 as pins 21 through 40 and would be oblivious of the actual pins 21 through 25 and 46 through 50. Thus, the pins must be used and named exactly as WRAPIT 1 considers them, and an imaginary module must be defined for the forgotten 10 pins such that the actual pin 21 of the 50 pin module would be pin 1 of the imaginary module and the actual pin 46 of the 50 pin module would be pin 21 of the imaginary module. After WRAPIT 1, the job requestor would only need bring the pseudonymous module numbers and pin numbers back to reality.

B

BUSS BARS →

A
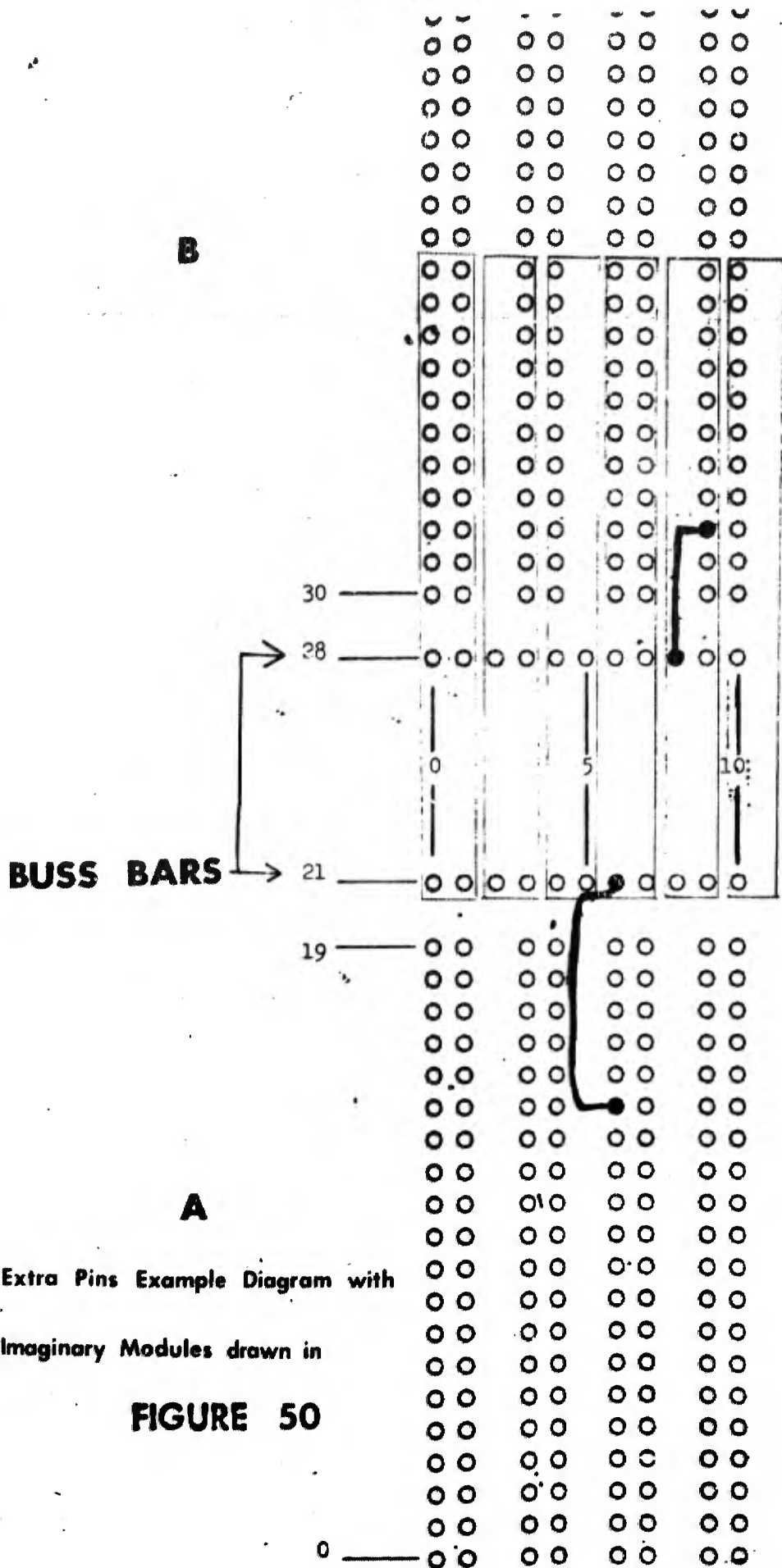
Extra Pins Example Diagram with

Imaginary Modules drawn in

FIGURE 50

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D. AFFIXING SEVERAL PLATES TO THE WIRE WRAP MACHINE PALLET AND WIRING

1. It may occur that the WRAPIT MAINLINE SYSTEM user will have a Wire Plate which is small in comparison to the Wire Wrap Machine Pallet. If the Wire Plates are small enough so that more than one Wire Plate can be affixed to the Pallet at one time, the WRAPIT MAINLINE SYSTEM user can employ the following method to exploit this capability.

When the WRAPIT MAINLINE SYSTEM user is going to Tool Design for the minimum X-Y offset information for the Wiring Boundaries Information sheets (as specified in Section III-B-1-h), he must specify that he wants to have as many Wire Plates as possible (or as many as he desires) on the Pallet at one time for wrapping. When the X-Y offset information is returned from Tool Design, the user must fill out one (1) Wiring Boundaries Information sheet for each plate to be affixed to the Pallet in the multiple affixing. Only one set of Module Definition sheets and one set of Module Termination sheets need be submitted for the job.

On the Computer Work Request, the following special instructions must be included: "Duplicate Module Definition cards and Module Termination cards n times. Accompany each Wiring Boundaries Information card with a Module Definition cards deck and a Module Termination cards deck." (Here n is the number of Wire Plates in the multiple affixing.)

As long as the maximum X minus the minimum X is a constant value throughout the Wiring Boundaries Information sheets and the maximum Y minus the minimum Y is a constant value also, the WRAPIT MAINLINE SYSTEM user may use any one of the sets of documentation he receives as the drawing documentation for the job since, when the previous conditions hold, each Wire Plate will be wired exactly the same as all others regardless of where each is located on the Wire Wrap Machine Pallet.

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E.   ELIMINATING DENSITY PROBLEMS

1.   It was previously mentioned in this manual that there were several reasons for WRAPIT MAINLINE SYSTEM not assigning any wrapping on Z-level 3 (Section II-B). This section has one of the several reasons.

There are two sources from which a WRAPIT MAINLINE SYSTEM user may observe density problems. First, there is the actual wrapping of a Wire Plate under the control of a Wire Wrap Machine Control Card deck. Procedures for eliminating the problems in this case are given in Section V-E-2. Second, there is the WRAPIT DENSITY map and analysis, provided the Wire Plate is not larger than 11 inches in either direction. Procedures for eliminating the problems in this case are given in Section V-E-3.

2.   In the case of a Wire Plate which has already been wrapped and the density problems have been found, there are two available recourses. If the need for completing the Wire Plate wrapping is urgent, part a. following, should be used. If the need is not urgent, part b. will give satisfactory results in several days time.

a.   The simplest method of eliminating density problems on either Z-level 1 or 2 is to raise several wires to Z-level 3. This method is quick, effective, and easy as long as for each wire raised to Z-level 3, Z-level 3 was not previously assigned on either pin for some reason. Thus, it is important to update all drawing documentation and listings immediately when any wire is raised to Z-level 3. The following six (6) steps must be observed for each wire to be raised to Z-level 3.

(1) Choose a wire to be raised to Z-level 3 and trace that wire to either wrappost to which it is connected, observing the X-Y coordinates of the wrappost and the Z-level on which this wire is wrapped.

(2) Search the minimum X-Y pin coordinates listings, generated for the visual inspection by the machine operation personnel, for the X-Y

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coordinates of step (1) on the Z-level of step (1) and record the card sequence number.

(3) Remove the Wire Wrap Machine Control Card with the card sequence number of step (1), insert a dummy wrap card, and unwrap the chosen wire.

(4) Punch column 3 of the removed Wire Wrap Machine Control Card with a 12 punch (+), and 11 punch (-), a 0(zero) punch and a 1 punch (NOTE: Some of the punches will already be in column 3).

(5) Update by hand the drawing documentation and the minimum X-Y pin coordinate listings to show the chosen wire being wrapped on Z-level 3. (NOTE: Update the drawing documentation by changing the Z-levels for that card to 3. Update the minimum X-Y pin coordinate listings by listing the card at the end of the original listing, with the annotation of Z-level 3).

(6) Put the update card at the end of the Z-level 3 wraps. The machine operation personnel can ignore the sequencing data fault.

With these six steps per wire to be raised to Z-level 3, the wrapping may proceed to completion. However, using this method reduces previous documentation and data to near worthlessness. To rectify this situation, the X-Y Wire Plate cards must be modified so that every card which corresponds to a wire raised to Z-level 3 must have columns 44 and 71 changed to a 3. All the X-Y Wire Plate cards and an updated Wiring Boundaries Information Sheet must then be submitted to Computer Operations with a Computer Work Request for WRAPIT MAINLINE SYSTEM with special instructions to begin at step 9 on the WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST.

When the execution of the SYSTEM is completed, the documentation and the data will be complete and corrected for all changes made.

b. The method in this part is somewhat similar to the method of part a. The first thing that must be done is to submit the X-Y Wire Plate cards to Computer Operations accompanied by a Computer Work Request as in Fig. 51. In the following procedure, there are four (4) steps for each wire to be raised to Z-level 3.

(1) Choose a wire from the density problem area to be raised to Z-level 3 and trace that wire to either wrappost to which it is connected, observing the X-Y coordinates of the wrappost and the Z-level on which this wire is wrapped.

(2) Search the minimum X-Y pin coordinate listings, generated for the visual inspection by the machine operation personnel, for those X-Y coordinates of step (1) on the Z-level of step (1) and record the FROM and TO module-pin numbers of that card.

(3) In the card summary printout from WRAPIT 1, locate the card which has the TO and FROM module-pin numbers recorded in step (2) and record the associated card number on the printout (NOTE: Due to the functioning of WRAPIT 2, the TO module-pin numbers recorded in step (2) may appear as either the FROM or the TO on the WRAPIT 1 printout. Likewise, the FROM recorded in step (2) may be in either position.)

(4) For the X-Y Wire Plate card whose card number was recorded in step (3), change columns 44 and 71 to the value 3.

When every wire which is to be raised to Z-level 3 has been processed in the prescribed manner, the modified X-Y Wire Plate card deck and an updated Wiring Boundaries Information sheet must be submitted to Computer Operations accompanied by a Computer Work Request for WRAPIT MAINLINE SYSTEM (See Figs. 2a and 2b) with special instructions to begin at step 9 on the WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST.

When execution is completed, the drawing documentation will be updated and the problems with which the WRAPIT user dealt will be alleviated.

3. In the case of a WRAPIT DENSITY analysis showing a wire density problem, automatic rules on procedures to be followed and changes to be made are ill-advised. Experience has shown that WRAPIT DENSITY is correct when it analyzes the number of wires passing through any .1 inch square on the Wire Plate; yet, when the totals are printed out they can be very deceptive. Instances have occurred where WRAPIT DENSITY shows a density problem, while no problem occurred when the Wire Plate was wrapped. One situation in which a density problem was indicated, but did not occur, was in a .1 inch square which did not have a pin on each corner of the square. In this case, the wire was able to overspread the area normally taken by the pins, and, thus, alleviate the crowding problem. Another situation in which a density problem was indicated, but did not occur, was in a .1 inch square with a pin at each corner. In this case, almost all wires were running in the same direction, allowing for maximum packing together of wires. With these cases in mind, a quick rule of thumb might be formulated as "Take no action unless the density buildup is massive"; however, that any action to be taken is at the WRAPIT user's discretion must be stressed.

There are two methods of alleviating density problems to be discussed here. Both methods are relatively simple and do not exhaust all possible methods. Before beginning either of the following procedures, the WRAPIT user must submit the X-Y Wire Plate card deck to Computer Operations with a Computer Work Request as in Fig. 51. In each of the following parts when reference is made to a card sequence number, the referral is to a wire chosen by the WRAPIT user from the lists provided by WRAPIT DENSITY of all the wires which pass through an area of density greater than the user allowed.

a. The following method is the simpler for the WRAPIT MAINLINE SYSTEM user to implement and the more time consuming for actual wrapping of the Wire Plates. For a card sequence number record the FROM and TO module-pin numbers and find the corresponding X-Y Wire Plate card in the WRAPIT 1 card summary printout. In that X-Y Wire Plate card change column 25 to a 2 to indicate a hand wrap. The user is now free of specifying any routing he chooses on the Z-level of that card.

COMPUTER WORK REQUEST
NAFI-5202/17 (Rev. 8/61)

TIME	
CATEGORY	B2

WIZ ☐

FORTRAN ☐

☒ NUMERICAL SORTING

Problem Name _WIRE WRAP_

Problem Number //////////////

(To be assigned by D/840)

Problem Originator   Name _____

                       Dept. _____ Ext. _____

Job order for labor only_____

Programmer_____

Coder_____

Special Instructions: _SORT THE ACCOMPANYING_

CARDS ON COLUMNS 80, 79, 78

AND 77

_____

_____

_____

_____

FIGURE 51

b. The following method requires constant and immediate manual updating of all drawing documentation and listings to insure no attempts are made to wrap two wires on Z-level 3 on any pin. For each card sequence number, record the FROM and TO module-pin numbers of that card and proceed as in steps (3) and (4) of Section E-2-b.

In each of the two previous cases, when all changes are completed, the X-Y Wire Plate card deck and an updated Wiring Boundaries Information Sheet must be submitted to Computer Operations with a Computer Work Request for WRAPIT MAINLINE SYSTEM with special instructions to begin at step 9 on the WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST.

When execution is completed, the drawing documentation will be updated and the density problems with which the WRAPIT user dealt will be alleviated.

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VI. WRAPIT SYSTEM CLERICAL OPERATIONS

A. GENERAL

Any of the instructions in this or the following sections may
be altered by special instructions on the Computer Work Request.

If a Computer Work Request specifies WRAPIT MAINLINE SYSTEM as
the program to be executed, attach a WRAPIT MAINLINE SYSTEM PROGRAM
CHECK LIST (WMSPCL) to the Computer Work Request. The correlation of
this section against the WMSPCL is as follows: Section VI-B refers to
WMSPCL #1 through #3; Section VI-C refers to the data preparation for
WMSPCL #4; Section VI-D refers to WMSPCL #5 through #8; Section VI-E
refers to WMSPCL #9 and the data preparation for #10; Section VI-F refers
to WMSPCL #11 and #12; Section VI-G refers to the data preparation for
WMSPCL #13; Section VI-H refers to WMSPCL #14; Section VI-I refers to the
data preparation for WMSPCL #15; and Section VI-J refers to WMSPCL #16
through #18.

If a Computer Work Request specifies any one of the six WRAPIT
programs, data preparations for WRAPIT 1 are in Section VI-C, for WRAPIT 2
are in Section VI-E, for WRAPIT DENSITY are in Section VI-G, for WRAPIT 3
are in Section VI-I, for WRAPIT RESEQUENCE are in Section VI-K, and for
WRAPIT DOCUMENTATION GENERATOR (WRAPIT D.G.) are in Section VI-L.

WRAPIT MAINLINE SYSTEM
PROGRAM CHECK LIST

Retain this check list with the Computer Work Request. WRAPIT MAINLINE SYSTEM is a sequential operation. Check each step when completed. Specific instructions for each step are given in WRAPIT MAINLINE SYSTEM CLERICAL OPERATIONS or WRAPIT MAINLINE SYSTEM COMPUTER OPERATIONS, whichever is applicable for a given step.

1. Assign Problem Number (WW --------)

2. Keypunch and Sequence Data

3. List Data Cards

4. Execute WRAPIT 1 with Data Cards

5. Return WRAPIT 1 Printout to Job Requestor

6. Duplicate Wiring Boundaries Information Card Twice; File One Card in Cross Index File and Keep Other Card with WRAPIT 1 Output Deck

7. File WRAPIT 1 Input Deck Under Problem Number

8. Interpret WRAPIT 1 Output Cards

9. Perform Numerical Sorts on WRAPIT 1 Output Cards

10. Execute WRAPIT 2 with Sorted WRAPIT 1 Output Deck

11. File WRAPIT 2 Input Deck Under Problem Number

12. Interpret WRAPIT 2 Output Deck

13. Execute WRAPIT DENSITY with WRAPIT 2 Output Deck, unless specified otherwise on Computer Work Request

14. Perform Numerical Sorts and Listings on WRAPIT 2 Output Deck

15. Execute WRAPIT 3 with Sorted WRAPIT 2 Output Deck

16. Take WRAPIT 3 Punched Aperture Cards to D/060 for Interpreting

17. Perform Numerical Sorts on WRAPIT 2 Output Deck

18. Return WRAPIT 2 Output Deck, Aperture Cards, and All Printouts and Listings to Job Requestor

B. WRAPIT 1 INPUT PREPARATION

1. Assign Problem Number for use in filing of data. This problem number is assigned when the WRAPIT MAINLINE SYSTEM job is logged in and should be written on the Computer Work Request and directly beneath the drawing number on the Wiring Boundaries Information Sheet.

2. The data accompanying the Computer Work Request is to be punched on the following color cards:

    a. Wiring Boundaries Information – Violet Stripe

    b. Module Definition Cards – Yellow Stripe

    c. Module Termination Cards – Rose Stripe

The Wiring Boundaries Information card will have 0000 punched as a sequence number in columns 77 through 80. The WW number directly beneath the drawing number must be punched on the violet stripe card beginning in column 48, carrying no dashes (-), for 8 columns. Both the Module Termination and the Module Definition cards (rose stripe and yellow stripe, respectively) must carry the WW number, duplicated from the violet stripe card. Both the yellow stripe and the rose stripe cards will be sequenced by 10's with each set beginning at 0010.

3. Arrange the data cards in the sequence violet stripe, yellow stripe, and rose stripe. List these cards and check the list against the data sheets.

WRAPIT MAINLINE SYSTEM
PROGRAM CHECK LIST

Retain this check list with the Computer Work Request. WRAPIT MAINLINE SYSTEM is a sequential operation. Check each step when completed. Specific instructions for each step are given in WRAPIT MAINLINE SYSTEM CLERICAL OPERATIONS or WRAPIT MAINLINE SYSTEM COMPUTER OPERATIONS, whichever is applicable for a given step.

1. Assign Problem Number (WW ---------)

2. Keypunch and Sequence Data

3. List Data Cards

4. Execute WRAPIT 1 with Data Cards

5. Return WRAPIT 1 Printout to Job Requestor

6. Duplicate Wiring Boundaries Information Card Twice; File One Card in Cross Index File and Keep Other Card with WRAPIT 1 Output Deck

7. File WRAPIT 1 Input Deck Under Problem Number

8. Interpret WRAPIT 1 Output Cards

9. Perform Numerical Sorts on WRAPIT 1 Output Cards

10. Execute WRAPIT 2 with Sorted WRAPIT 1 Output Deck

11. File WRAPIT 2 Input Deck Under Problem Number

12. Interpret WRAPIT 2 Output Deck

13. Execute WRAPIT DENSITY with WRAPIT 2 Output Deck, unless specified otherwise on Computer Work Request

14. Perform Numerical Sorts and Listings on WRAPIT 2 Output Deck

15. Execute WRAPIT 3 with Sorted WRAPIT 2 Output Deck

16. Take WRAPIT 3 Punched Aperture Cards to D/060 for Interpreting

17. Perform Numerical Sorts on WRAPIT 2 Output Deck

18. Return WRAPIT 2 Output Deck, Aperture Cards, and All Printouts and Listings to Job Requestor

3. WRAPIT 1 INPUT PREPARATION

1. Assign Problem Number for use in filing of data. This problem number is assigned when the WRAPIT MAINLINE SYSTEM job is logged in and should be written on the Computer Work Request and directly beneath the drawing number on the Wiring Boundaries Information Sheet.

2. The data accompanying the Computer Work Request is to be punched on the following color cards:

   a. Wiring Boundaries Information - Violet Stripe

   b. Module Definition Cards - Yellow Stripe

   c. Module Termination Cards - Rose Stripe

The Wiring Boundaries Information card will have 0000 punched as a sequence number in columns 77 through 80. The WW number directly beneath the drawing number must be punched on the violet stripe card beginning in column 48, carrying no dashes (-), for 8 columns. Both the Module Termination and the Module Definition cards (rose stripe and yellow stripe, respectively) must carry the WW number, duplicated from the violet stripe card. Both the yellow stripe and the rose stripe cards will be sequenced by 10's with each set beginning at 0010.

3. Arrange the data cards in the sequence violet stripe, yellow stripe, and rose stripe. List these cards and check the list against the data sheets.

C.   WRAPIT 1 INPUT SETUP

For each WRAPIT 1 job to be processed, two additional cards must be added to the violet stripe, the yellow stripe, and the rose stripe cards. The two cards have the following formats:

Blue Stripe

1	2	3	4	5	6	7	8
F	L	A	G		O	N	E

Green Stripe

1	2	3	4	5	6	7	8		31	32	33
F	L	A	G		T	W	O		0	0	0

For each WRAPIT 1 job to be processed, the data must be set up as follows:

Flag Two Card – Green Stripe
Module Termination Cards – Rose Stripe
Flag One Card – Blue Stripe
Module Definition Cards – Yellow Stripe
Wiring Boundaries Card – Violet Stripe

If more than one job is to be executed in one computer run, no additional cards are necessary; one job's data can, and must, be put directly behind another job's data.

Submit all data, Computer Work Request(s), and WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST(s) for WRAPIT 1 execution.

D. WRAPIT 1 OUTPUT HANDLING PROCEDURES

1. When the WRAPIT 1 execution is terminated, separate the loading map information from the program output. If more than one job was run in the WRAPIT 1 execution, each will be identified by a heading containing the different drawing numbers. Separate the different job printouts and return each to the job requestor listed on the respective Computer Work Requests.

2. Take each violet stripe card from the input and duplicate twice. File one duplicate card in the D/842 Wire Wrap Cross Index File. Put the other duplicated card with the WRAPIT 1 output cards (yellow cards).

3. File each WRAPIT 1 input deck (violet stripe card, yellow stripe cards, blue stripe card, rose stripe cards, and green stripe card) in the D/842 files under the WW problem number listed in columns 48 through 55 of the violet stripe card.

4. Interpret WRAPIT 1 output cards (yellow cards), skipping columns 1 through 14. If more than one job was executed, there will be a blank card between jobs. Put the duplicated violet stripe cards at the beginning of their respective jobs.

C. WRAPIT 1 INPUT SETUP

For each WRAPIT 1 job to be processed, **two additional cards** must be added to the violet stripe, the yellow stripe, and the rose stripe cards. The two cards have the following formats:

Blue Stripe

1	2	3	4	5	6	7	8
F	L	A	G		O	N	E

Green Stripe

1	2	3	4	5	6	7	8		31	32	33
F	L	A	G		T	W	O		0	0	0

For each WRAPIT 1 job to be processed, the data must be set up as follows:

Flag Two Card - Green Stripe
Module Termination Cards - Rose Stripe
Flag One Card - Blue Stripe
Module Definition Cards - Yellow Stripe
Wiring Boundaries Card - Violet Stripe

If more than one job is to be executed in one computer run, no additional cards are necessary; one job's data can, and must, be put directly behind another job's data.

Submit all data, Computer Work Request(s), and **WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST(s)** for WRAPIT 1 execution.

D. WRAPIT 1 OUTPUT HANDLING PROCEDURES

1. When the WRAPIT 1 execution is terminated, separate the loading map information from the program output. If more than one job was run in the WRAPIT 1 execution, each will be identified by a heading containing the different drawing numbers. Separate the different job printouts and return each to the job requestor listed on the respective Computer Work Requests.

2. Take each violet stripe card from the input and duplicate twice. File one duplicate card in the D/842 Wire Wrap Cross Index File. Put the other duplicated card with the WRAPIT 1 output cards (yellow cards).

3. File each WRAPIT 1 input deck (violet stripe card, yellow stripe cards, blue stripe card, rose stripe cards, and green stripe card) in the D/842 files under the WW problem number listed in columns 48 through 55 of the violet stripe card.

4. Interpret WRAPIT 1 output cards (yellow cards), skipping columns 1 through 14. If more than one job was executed, there will be a blank card between jobs. Put the duplicated violet stripe cards at the beginning of their respective jobs.

E.   WRAPIT 2 INPUT PREPARATION AND SETUP

1.   For each WRAPIT 1 output deck (yellow cards), the following six (6) sorts are to be performed on all cards except the violet stripe card.   If more than one WRAPIT 1 output deck is to be prepared, complete the sorting of one deck before beginning on the next deck.

      a.   Numerical sort, column 75, merge in order 1, 2, 3, 4.

      b.   Numerical sort, column 44, do not merge, place cards in appropriate sorter rack bins.

      c.   Numerical sort, column 73, cards in sorter rack bin 1, merge in order blank, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 and replace in sorter rack bin 1.

      d.   Numerical sort, column 73, cards in sorter rack bin 2, merge in order 0, 9, 8, 7, 6, 5, 4, 3, 2, 1, blank and replace in sorter rack bin 2.

      e.   Numerical sort, column 73, cards in sorter rack bin 3 (if any), merge as in d. and replace in sorter rack bin 3.

      f.   Merge sorter rack bin contents in order 1, 2, 3 and numerical sort, column 25, and merge in order 1, 2, 3, 4, 5, 6, 7, 8, 9. Replace violet stripe card at front of deck.

2.   For each WRAPIT 2 job to be processed, an additional card must be added to the violet stripe and the yellow cards.   The card has the following format:

Blue

1	2	3	4	5	6	7	8	9		44
F	L	A	G		F	O	U	R		0

For each WRAPIT 2 job to be processed, the data must be set up as follows:
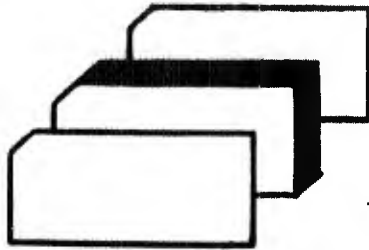
Flag Four Card - Blue

WRAPIT Output Cards - Yellow

Wiring Boundaries Card - Violet Stripe

If more than one job is to be executed in one computer run, no additional cards are necessary; one job's data can, and must, be put directly behind another job's data.

Submit all data, Computer Work Request(s) and WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST(s) for WRAPIT 2 execution.

GREEN BLANK

BUFF CARDS, SORTER BIN 3

BUFF CARDS SORTER BIN 2

GREEN BLANK

BUFF CARDS, SORTER BIN 1

WIRING BOUNDARIES CARD (violet stripe)

ROSE
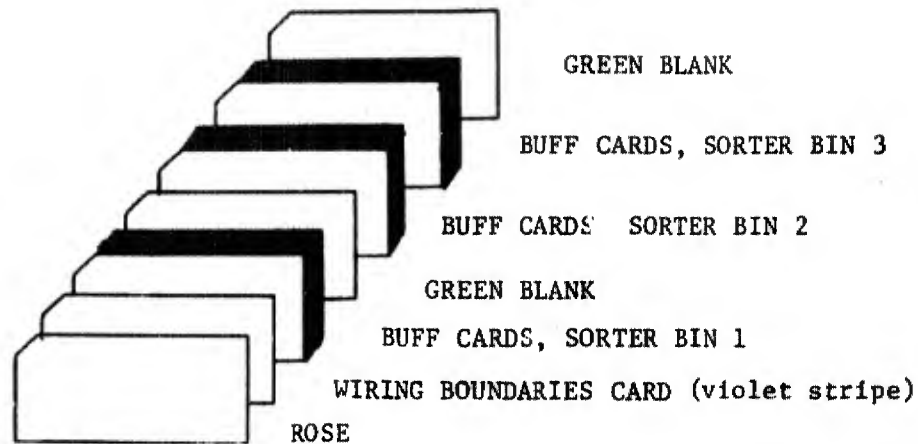
e. If the TYPE on the Special Instructions is 3, arrange the
data as follows:

GREEN BLANK

BUFF CARDS, SORTER BIN 3

GREEN BLANK

BUFF CARDS, SORTER BIN 2

BUFF CARDS, SORTER BIN 1

WIRING BOUNDARIES CARD (violet stripe)
ROSE
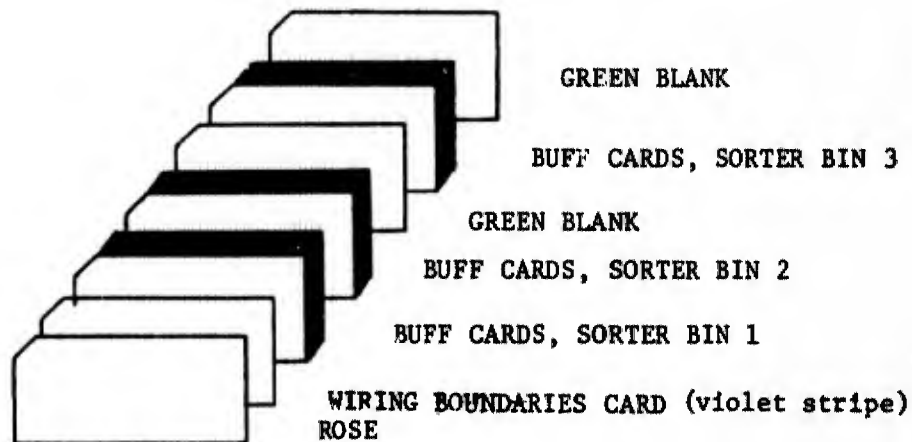
f. If the TYPE on the Special Instructions is 4, arrange the
data as follows:

GREEN BLANK

BUFF CARDS, SORTER BIN 3

BUFF CARDS, SORTER BIN 2

BUFF CARDS, SORTER BIN 1

WIRING BOUNDARIES CARD (violet stripe)
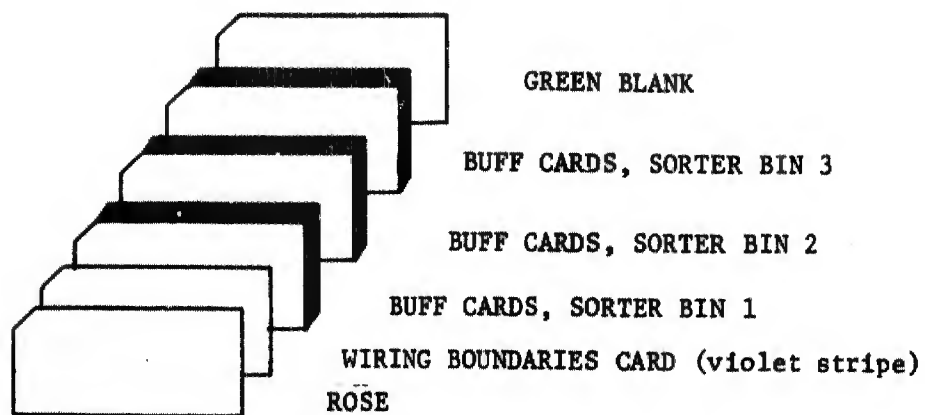
ROSE

g. If the TYPE on the Special Instructions is 5, arrange the
    data as in d. NOTE: In this case in column 10 of the rose
    colored card, there must be a 1. If there is not, change the
    value to a 1.

h. If the TYPE on the Special Instructions is 6, arrange the data
    as follows:

BUFF CARDS, SORTER BIN 2

BUFF CARDS, SORTER BIN 1

GREEN BLANK

BUFF CARDS, SORTER BIN 2

WIRING BOUNDARIES CARD (violet stripe)
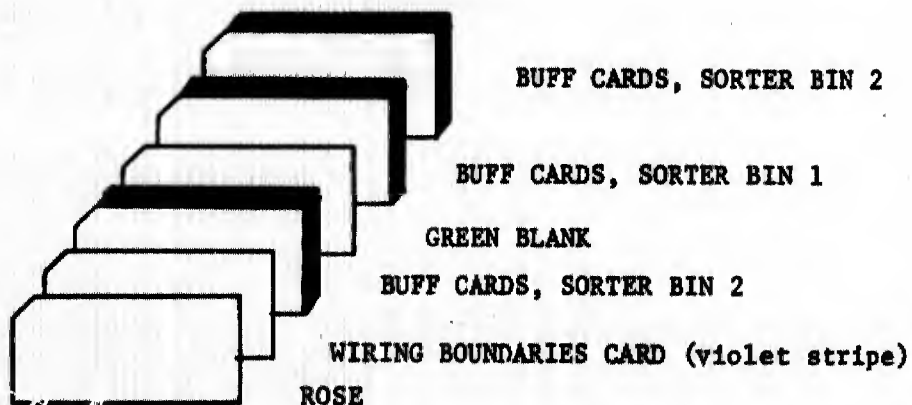
ROSE

NOTE: In this case in column 10 of the rose colored card, there must be a
       2. If there is not, change the value to a 2.

i. If the TYPE on the Special Instructions is 7, arrange the
    data as follows:

BUFF CARDS, SORTER BIN 2

BUFF CARDS, SORTER BIN 1

GREEN BLANK

BUFF CARDS, SORTER BIN 3

WIRING BOUNDARIES CARD (violet stripe)
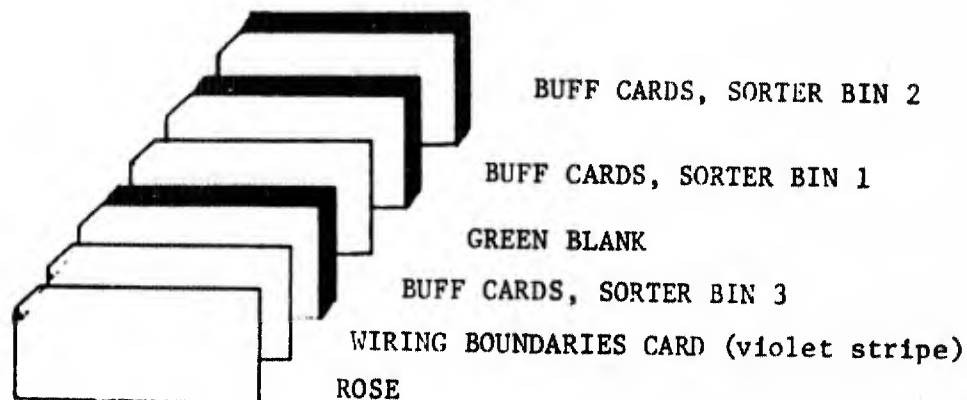
ROSE

NOTE: In this case in column 10 of the rose colored card, there must be
        a 3. If there is not, change the value to a 3.

j. Submit the data cards, the Computer Work Request and the
    WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST for execution with
    WRAPIT DENSITY. Each job must be submitted individually since
    the program does not allow for batch processing.

H. WRAPIT 3 INPUT PREPARATION

1. Dispose of all cards except:

a. Wiring Boundaries Card (violet stripe) and

b. Wire Wrap Machine Control Cards (Buff)

2. In the following sorts, merge in order: rejects, 12, 11, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Perform the sorts only on the buff cards.

a. Numerical sort, column 35
b. Numerical sort, column 34
c. Numerical sort, column 33
d. Numerical sort, column 32
e. Numerical sort, column 31
f. Zone sort, column 31
g. Numerical sort, column 44

3. List the buff cards on the 407 and write the following on the first sheet: "Minimum FROM X-Y listing by Z-level." These will eventually be returned to the job requestor.

4. In the following sorts, merge in order: rejects, 12, 11, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Perform the sorts only on the buff cards.

a. Numerical sort, column 62
b. Numerical sort, column 61
c. Numerical sort, column 60
d. Numerical sort, column 59
e. Numerical sort, column 58
f. Zone sort, column 58
g. Numerical sort, column 71

5.   List the buff cards on the 407 and write the following on the first sheet: "Minimum TO X-Y listing by Z-level." These will eventually be returned to the job requestor.

6.   In the following sorts, place rejects before zeroes. 11 and 12 punches are possible. Perform the sorts only on the buff cards.

    a.   Numerical sort, column 30
    b.   Numerical sort, column 29
    c.   Numerical sort, column 28
    d.   Numerical sort, column 27

7.   Put violet stripe card in front of buff cards.

I. WRAPIT 3 INPUT SETUP

For each WRAPIT 3 job to be processed, an additional card must
be added to the Wiring Boundaries (violet stripe) and the Wire Wrap
Machine Control (buff) cards set up in the previous section (Section VI-H)
and the Wiring Boundaries (violet stripe) card must be updated.

The additional card must have the following format:

Blue

1	2	3	4	5	6	7	8	9		44
F	L	A	G		F	O	U	R		0

The update on the Wiring Boundaries (violet stripe) card is a number to
be punched in the last columns. Each page of WRAPIT 2 generated (or
WRAPIT DOCUMENTATION GENERATOR generated) printout will have a sheet
number in the lower right corner. The highest sheet number for each job
must be punched in the respective Wiring Boundaries (violet stripe) card
in the last columns. Thus, if the highest sheet number is 86, this number
must be punched in columns 79 and 80. If the highest sheet number is 104,
this number must be punched in columns 78, 79, and 80.

For each WRAPIT 3 job to be processed, the data must be set up
as follows:
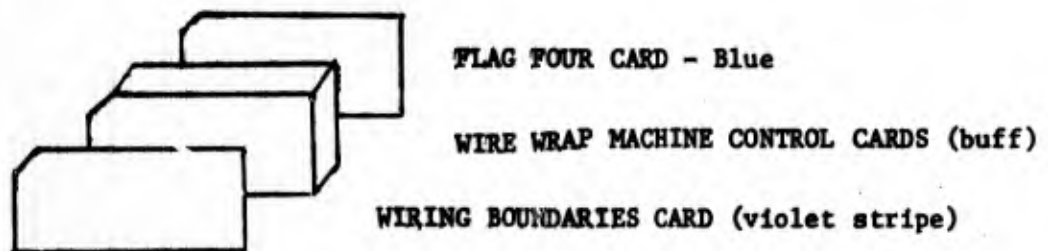
FLAG FOUR CARD - Blue

WIRE WRAP MACHINE CONTROL CARDS (buff)

WIRING BOUNDARIES CARD (violet stripe)

If more than one job is to be executed in one computer run, no
additional cards are necessary; one job's data can, and must, be put
directly behind another job's data.

Submit all data, Computer Work Request(s), and WRAPIT MAINLINE
SYSTEM PROGRAM CHECK LIST(s) (WMSPCL) for WRAPIT 3 execution. If any
Computer Work Request specified WRAPIT DOCUMENTATION GENERATOR, there will
be no WMSPCL accompanying the request.

J. WRAPIT SYSTEM OUTPUT DISTRIBUTION

1. The output of WRAPIT 3 consists of punched aperture cards and a printout. The aperture cards need to be interpreted in a special manner on equipment which D/060 operates. Thus, the aperture cards must be taken to D/060 and accompanied by an ADP Request in a previously generated form which D/060 has.

2. The following sorts are to be performed on the Wire Wrap Machine Control cards (buff):

      a. Numerical sort, column 80

      b. Numerical sort, column 79

      c. Numerical sort, column 78

      d. Numerical sort, column 77

      e. Numerical sort, column 44

      f. Numerical sort, column 25

Place the violet stripe card in front of the buff cards and dispose of the blue Flag Four card.

3. Separate the loading map information from the WRAPIT 3 printout. If more than one job was executed, the printouts can be separated by comparing the drawing number at the bottom right of each page with the drawing number at the very top of the next page. If the drawing numbers differ, the sheets belong to separate jobs and are to be separated.

4. When the interpreted aperture cards are returned from D/060, the following will be returned to the respective job requestors.

      a. WRAPIT 2 printout (or WRAPIT DOCUMENTATION GENERATOR printout if the Computer Work Request specified WRAPIT D.G.)

      b. WRAPIT 3 printout

      c. Interpreted aperture cards

      d. Violet stripe card and buff cards

      e. Two (2) minimum X-Y listings

f. WRAPIT DENSITY output (unless Computer Work Request specified
   WRAPIT D.G. or unless Computer Work Request Special Instructions
   specified not running WRAPIT DENSITY)

K. WRAPIT RESEQUENCE DATA PROCEDURES

1. Input

No clerical operations are required. The data is to be sub-mitted, exactly as received, for execution with WRAPIT RESEQUENCE.

2. Output

Any printout from WRAPIT RESEQUENCE may be thrown away.

The punched card output (buff cards) must be interpreted, skipping columns 1 through 14.

3. Distribution

Return input and output card decks to the job requestor.

L. WRAPIT DOCUMENTATION GENERATOR (WRAPIT D.G.) DATA PROCEDURES

1. Input

    a. Keypunch the Wiring Boundaries Information in a violet stripe card.

    b. Keypunch a card in the following format:

Blue

1	2	3	4	5	6	7	8	9	44
F	L	A	G		F	O	U	R	0

    c. Submit for execution with WRAPIT D.G. the data set up in the following sequence:
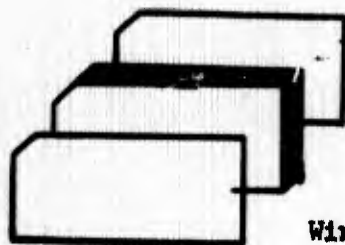
Flag Four Card-blue

Data, exactly as submitted by requestor

Wiring Boundaries Information Card-violet stripe

2. Output

Separate the loading map information from the WRAPIT D.G. printout.

Go to Section VI-H and proceed with all steps in Sections VI-H, I, and J. The input cards to WRAPIT D.G. are the Wire Wrap Machine Control cards of those sections.

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VII. WRAPIT SYSTEM COMPUTER OPERATIONS

A. GENERAL

Any of the instructions in the following sections may be altered by Special Instructions on the Computer Work Request.

If a Computer Work Request is accompanied by a WRAPIT MAINLINE SYSTEM PROGRAM CHECK LIST (WMSPCL), WMSPCL #4 refers to Section VII-B, WMSPCL #10 refers to Section VII-C, WMSPCL #13 refers to Section VII-D, and WMSPCL #15 refers to Section VII-E. The following page is a WMSPCL.

If a Computer Work Request specifies any one of the six WRAPIT programs, the section in Section VII on that program is applicable for execution setup and I/O devices.

All binary decks of programs referred to in Section VII are in the Computer Operations Branch, D/842, files. Each binary deck in the files has as its last card a transfer card.

WRAPIT MAINLINE SYSTEM
PROGRAM CHECK LIST

Retain this check list with the Computer Work Request. WRAPIT MAINLINE SYSTEM is a sequential operation. Check each step when completed. Specific instructions for each step are given in WRAPIT MAINLINE SYSTEM CLERICAL OPERATIONS or WRAPIT MAINLINE SYSTEM COMPUTER OPERATIONS, whichever is applicable for a given step.

1. Assign Problem Number (WW ————————)

2. Keypunch and Sequence Data

3. List Data Cards

4. Execute WRAPIT 1 with Data Cards

5. Return WRAPIT 1 Printout to Job Requestor

6. Duplicate Wiring Boundaries Information Card Twice; File One Card in Cross Index File and Keep Other Card with WRAPIT 1 Output Deck

7. File WRAPIT 1 Input Deck Under Problem Number

8. Interpret WRAPIT 1 Output Cards

9. Perform Numerical Sorts on WRAPIT 1 Output Cards

10. Execute WRAPIT 2 with Sorted WRAPIT 1 Output Deck

11. File WRAPIT 2 Input Deck Under Problem Number

12. Interpret WRAPIT 2 Output Deck

13. Execute WRAPIT DENSITY with WRAPIT 2 Output Deck, unless specified otherwise on Computer Work Request

14. Perform Numerical Sorts and Listings on WRAPIT 2 Output Deck

15. Execute WRAPIT 3 with Sorted WRAPIT 2 Output Deck

16. Take WRAPIT 3 Punched Aperture Cards to D/060 for Interpreting

17. Perform Numerical Sorts on WRAPIT 2 Output Deck

18. Return WRAPIT 2 Output Deck, Aperture Cards, and All Printouts and Listings to Job Requestor

B. WRAPIT 1, F-01-68-42, FIZMOP

1. If an error occurs, as indicated by an interruption in the normal printout format, notify the job requestor before performing further operations.

2. <u>I/O Devices Used</u>

    a. Card Reader

    b. Printer

    d. Card Punch (Yellow Cards)

3. <u>Card Setup for Execution</u>
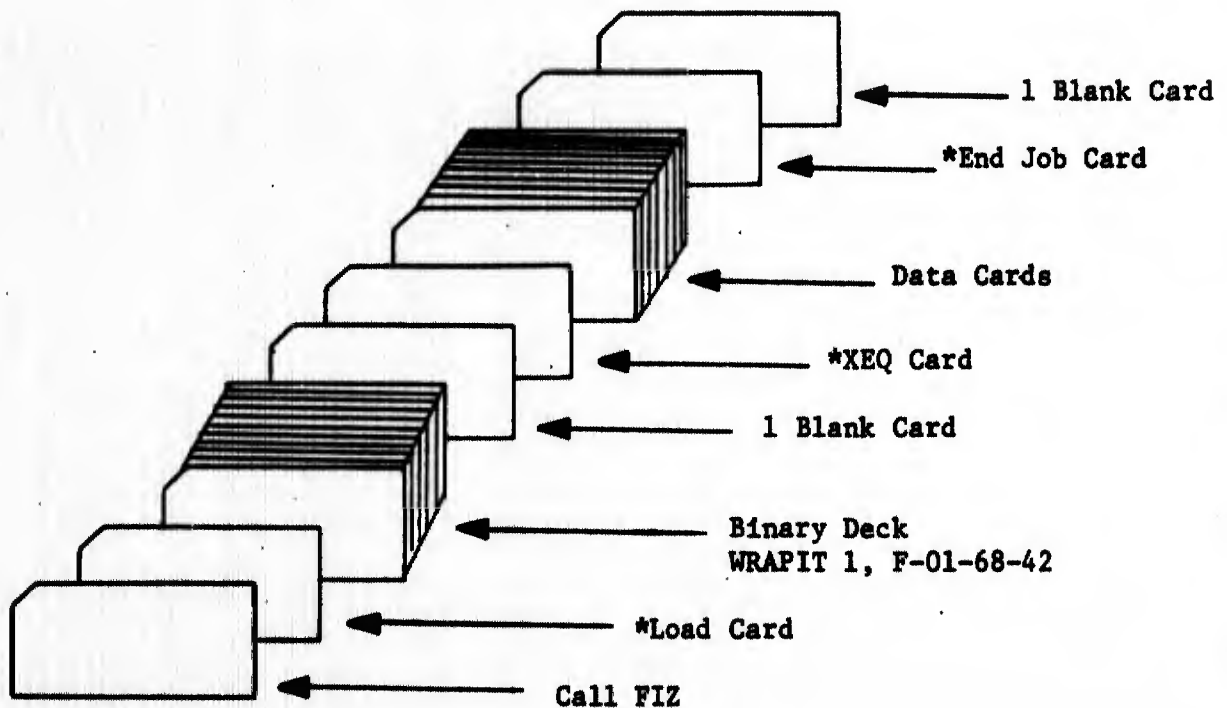
    1 Blank Card

    *End Job Card

    Data Cards

    *XEQ Card

    1 Blank Card

    Binary Deck
    WRAPIT 1, F-01-68-42

    *Load Card

    Call FIZ

4. <u>Distribution</u>

a. After execution, return all data cards, output cards, and printouts to the Computer Operations clerical staff.

b. Return the WRAPIT 1 binary program deck to the Computer Operations file.

C. WRAPIT 2, F-01-68-34, FIZMOP

1. If an error occurs, as indicated by a typewriter error message, allow the run to finish but notify the job requestor before performing further operations.

2. I/O Devices Used

    a. Card Reader

    b. Typewriter

    c. Printer (black ink, unlined paper, set to print line 1)

    d. Card Punch (Buff cards)

3. Card Setup for Execution

1 Blank Card

*End Job Card

Data Cards

*XEQ Card

1 Blank Card

Binary Deck
WRAPIT 2, F-01-68-34

*Load Card

Call FIZ

4. <u>Distribution</u>

   a. After execution, return all data cards, output cards, and printouts to the Computer Operations clerical staff.

   b. Return the WRAPIT 2 binary program deck to the Computer Operations file.

D. WRAPIT DENSITY, F4-11-68-40, FORTRAN IV

1. This program will give no error messages. The program may, however, terminate on the first data card with the following message on the printer: NO MAP, WIRE PLATE MORE THAN 11 INCHES ONE WAY. If this occurs, the program is finished.

2. <u>I/O Devices Used</u>

    a. Card Reader

    b. Printer

    c. Tape Handler 6, scratch tape

3. <u>Card Setup for Execution</u>

- $EØJ Card
- 3 Blank Cards
- Data Cards
- $LØAD Card
- Binary Deck WRAPIT DENSITY, F4-11-68-40
- $Binary Card
- $Job Card
- F4 Call Card

4. <u>Distribution</u>

    a. After execution, return all the data cards and printouts to the Computer Operations clerical staff.

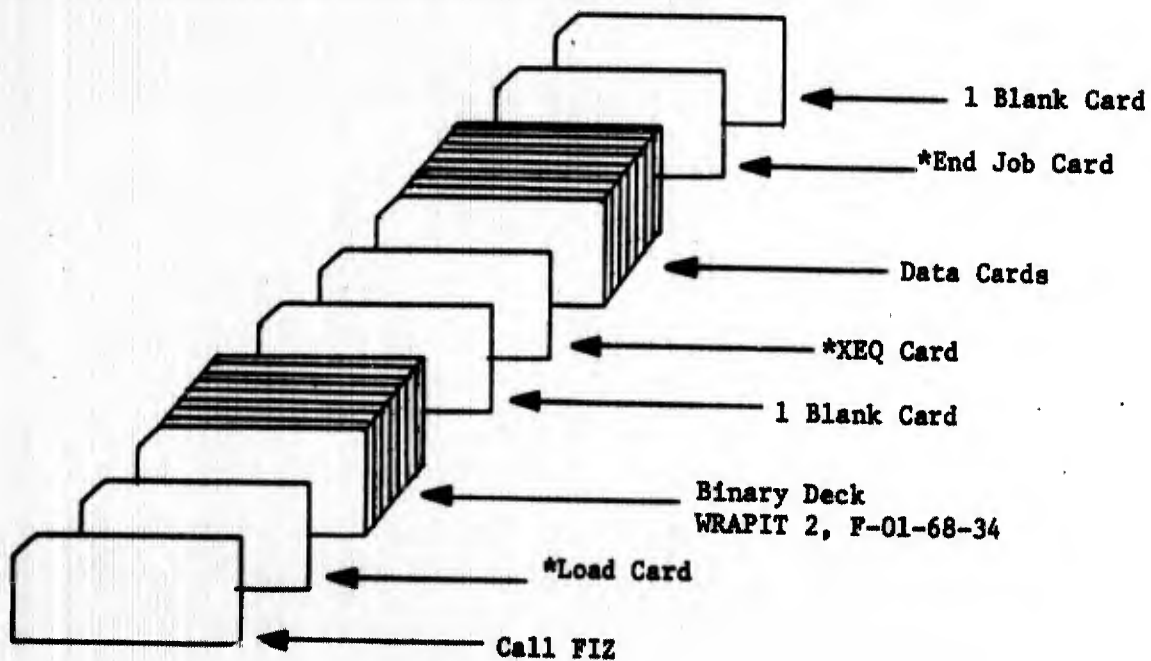   b. Return the WRAPIT DENSITY binary program deck to the Computer Operations file.

E. WRAPIT 3, F-11-68-20, FIZMOP

1. If an error occurs, as indicated by a printer message and job termination, notify the job requestor before any further operations.

2. <u>I/O Devices Used</u>

    a. Card Reader

    b. Printer (black ink, unlined paper, set to print line 1)

    c. Card Punch (aperture cards)

3. <u>Card Setup for Execution</u>

1 Blank Card

*End Job Card

Data Cards

*XEQ Card

1 Blank Card

Binary Deck
WRAPIT 3, F-11-68-20

*Load Card

Call FIZ

4. <u>Distribution</u>

    a. After execution, return all data cards, all output aperture cards, and printouts to the Computer Operations clerical staff.

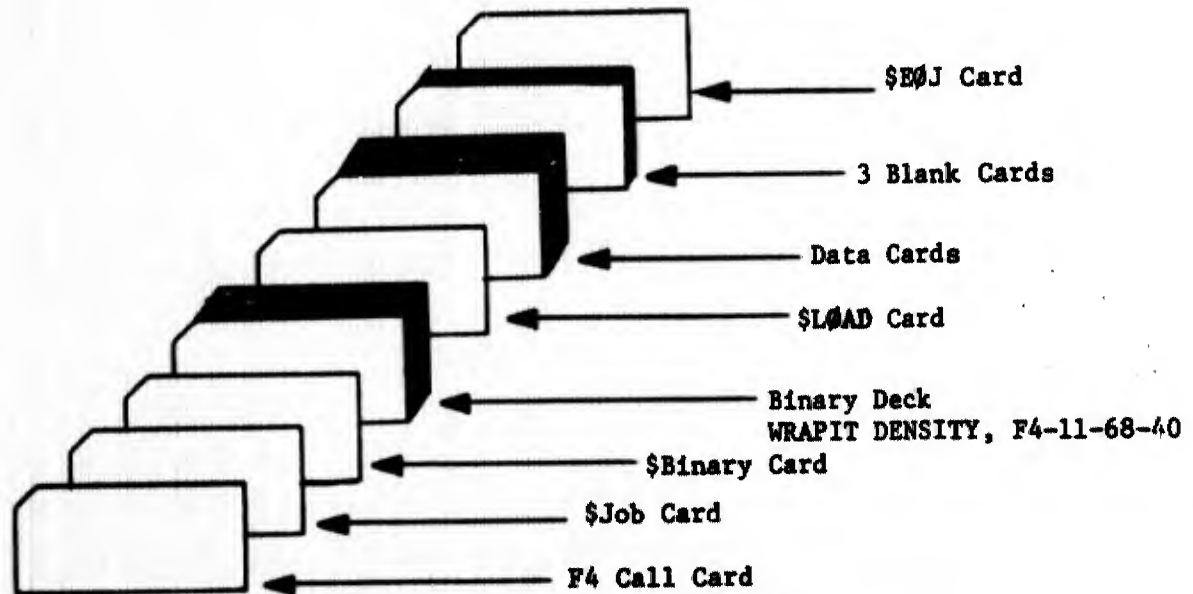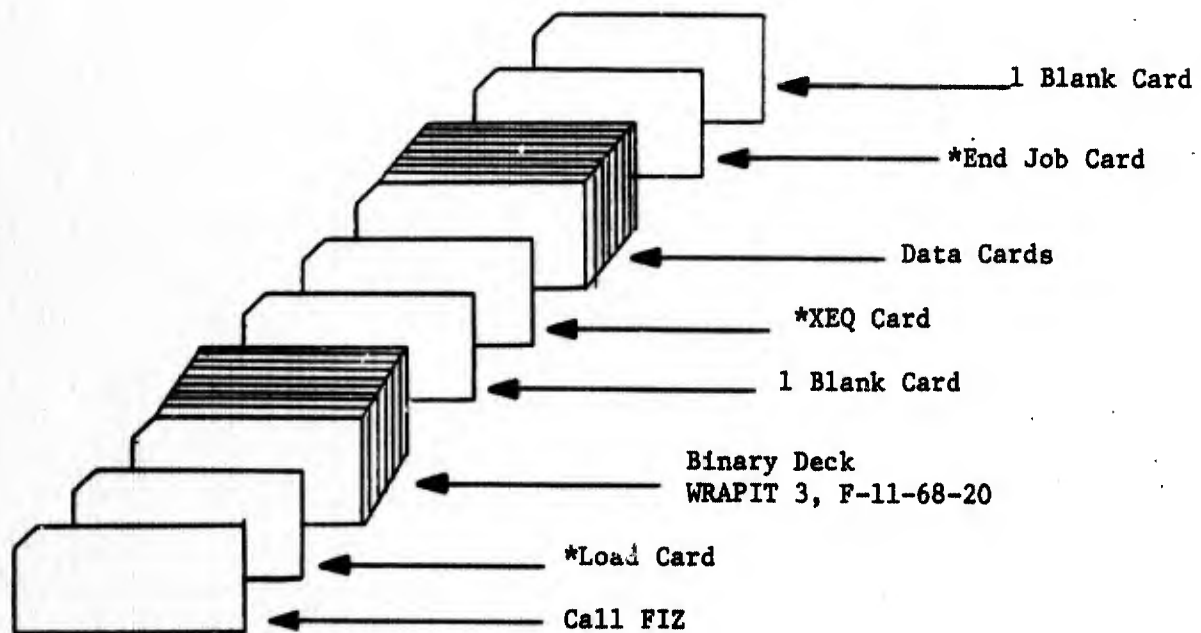   b. Return the WRAPIT 3 binary program deck to the Computer Operations file.

F. WRAPIT RESEQUENCE, F-07-68-60, FIZMOP

1. This program will terminate on a "*END JOB" card directly after the last data card.

2. I/O Devices Used

    a. Card Reader

    b. Card Punch (buff cards)

3. Card Setup for Execution

    1 Blank Card
    *END Job Card
    Data Cards
    *XEQ Card
    1 Blank Card
    Binary Deck
    WRAPIT RESEQUENCE, F-07-68-60
    *Load Card
    Call FIZ
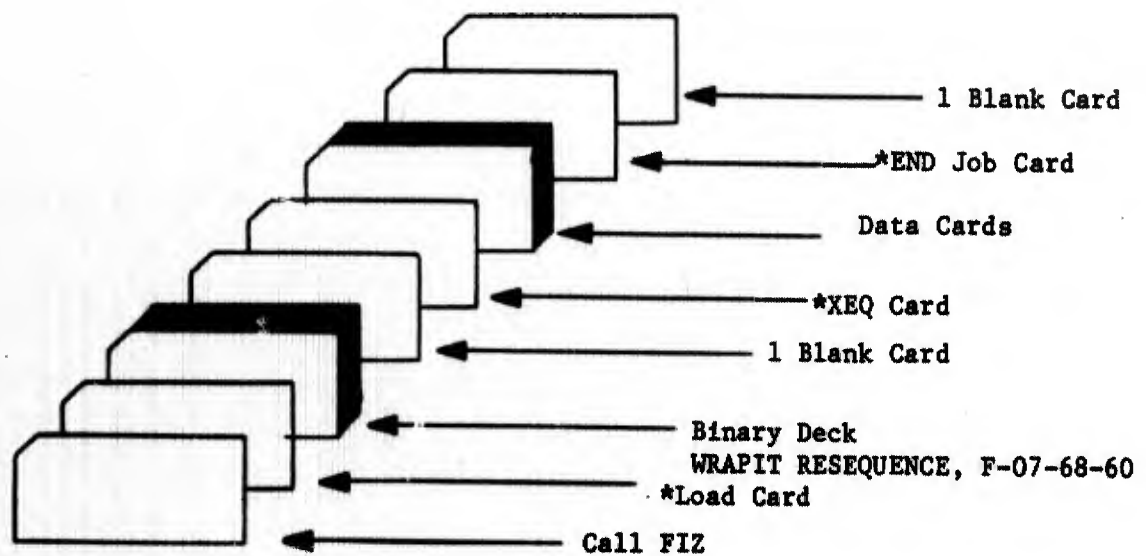
4. Distribution

    a. After execution, return all data cards and all output cards to the Computer Operations clerical staff.

    b. Return the WRAPIT RESEQUENCE binary program deck to the Computer Operations file.

G. WRAPIT DOCUMENTATION GENERATOR, F-01-69-42, FIZMOP

    1. <u>I/O Devices Used</u>

        a. Card Reader

        b. Printer (black ink, unlined paper, set to print line 1)

    2. <u>Card Setup for Execution</u>

    3. <u>Distribution</u>

        a. After execution, return all data cards and printouts to the
        Computer Operations clerical staff.

        b. Return the WRAPIT DOCUMENTATION GENERATOR binary program deck
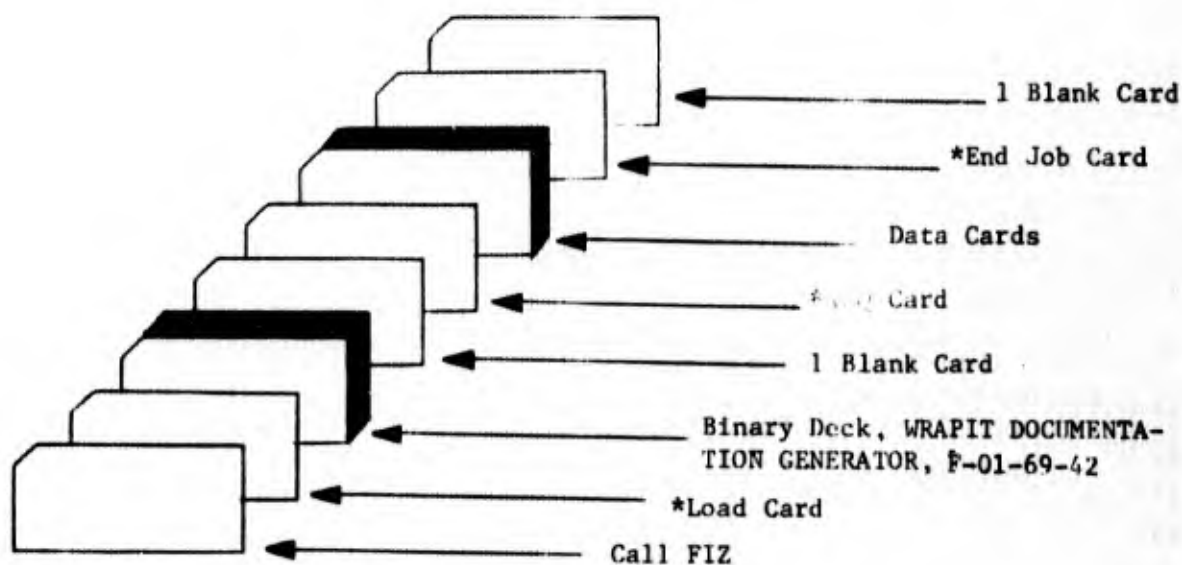   to the Computer Operations file.

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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Naval Avionics Facility Indianapolis, Indiana 46218	UNCLASSIFIED
	2b GROUP

3. REPORT TITLE

WIRE ROUTING FOR AUTOMATIC, PROGRAM INSTRUCTED TOOLS - USER's MANUAL

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

NAFI TR-1233 - 28 January 1970

5. AUTHOR(S) (Last name, first name, initial)

WELCHANS, John P.

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY

13. ABSTRACT

This report contains user information about the Wire Routing for Automatic, Program Instructed Tools (WRAPIT) system programs and the associated support programs for the Gardner-Denver Wire-Wrap Machine, Model 14F-22X22X.025. The programs are WRAPIT 1, WRAPIT 2, WRAPIT 3, WRAPIT RESEQUENCE, WRAPIT WIRE DENSITY ANALYSIS, AND WIRE WRAP DOCUMENTATION GENERATOR, all developed at Naval Avionics Facility, Indianapolis (NAFI).

DD FORM 1473 0101-807-6800

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT

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Naval Avionics Facility, Indianapolis
NAFI TR-1233   28 January 1970
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SUPPLEMENTARY

INFORMATION

ADDENDUM #2   28 July 1970

NAFI TR-1233, Wire Routing for Automatic, Program Instructed Tools - User's Manual, dated 28 January 1970.

Make the following changes:

Delete Table 2, page 17 and insert Table 4, page 17 in its place.

Page 12, line 1, item D. Please change as follows:

                D. WRAPIT DENSITY, F4-11-68-40, FORTRAN IV

Page 16, line 25. Change Table 2 to Table 4.

DENSITY MAP TYPE CODES

CODE	DEFINITION
1	SINGLE MAP, Z LEVEL 1 SINGLE MAP, Z LEVEL 2 SINGLE MAP, Z LEVEL 3
2	SINGLE MAP, Z LEVEL 1 SINGLE MAP, Z LEVELS 2 & 3
3	SINGLE MAP, Z LEVELS 1 & 2 SINGLE MAP, Z LEVEL 3
4	SINGLE MAP, Z LEVELS 1, 2 & 3
5	SINGLE MAP, Z LEVEL 1
6	SINGLE MAP, Z LEVEL 2
7	SINGLE MAP, Z LEVEL 3

TABLE 4

SUPPLEMENTARY

INFORMATION

ADDENDUM #4   22 October 1970

NAFI TR-1233, Wire Routing for Automatic, Program Instructed Tools - User's Manual, dated 28 January 1970.

Please insert APPENDIX 1 to NAFI TR-1233.

APPENDIX 1

RULES FOR LISTING ROUTING INFORMATION

1. A comma (,) must appear between the X and the Y coordinates when X-Y coordinates are used.

2. A slash (/) must appear between points.

3. A star (*) signifies the end of the routing data.

4. The first and last pins designated on a routing information card must be the pins to be wrapped.

5. If two via points are to be used, the list must follow the routing desired for the wire.

6. When module-pin definition is used to designate a point, five spaces must be used (no blanks) and the first character of the module name must be alphabetic.

SUPPLEMENTARY

INFORMATION

Addendum # 5   29 January 1971

NAFI TR-1233, Wire Routing for Automatic, Program Instructed Tools -
User's Manual, dated 28 January 1970.

Ref: (a) Memorandum 212:WEW:ald of 14 Dec 1970

         Due to a timing problem between the input device (modified
IBM-026 card punch) and the Gardner-Denver Wire Wrap machine, the following
card format change has been made in the WRAPIT system of programs:

	CARD COLUMN	INFO.
OLD FORMAT:	1-14	Machine Moves
	15-23	Dwg. No.
	24	Dwg. Rev.
NEW FORMAT:	1-9	Dwg. No.
	10	Dwg. Rev.
	11-24	Machine Moves

This change will not affect the original WRAPIT 1 input but will affect
all other card input output formats in the system of programs.

         The following TR pages should be marked to reflect the format
change.

PAGE	LINE NO. FROM TOP	LINE NO. FROM BOTTOM
7	10	
10		2
12	10	
20	12	
24	4	9, 12
25	4	
53	1	
59	New Listing	
60	7, 10, 11	
61		1
62	4	
63	New Listing	
67	New Listing	
73	New Listing	
74	New Listing	
75	New Listing	
82		3
83	New Listing	
85	New Listing	
91	New Listing	
94	New Listing	
102	New Listing	
103	New Listing	

PAGE	LINE NO. FROM TOP	LINE NO. FROM BOTTOM
110	New Listing	
111	New Listing	
132		3
135	8	
145		3

Formal corrections to NAFI TR-1233 will be made at a later date.