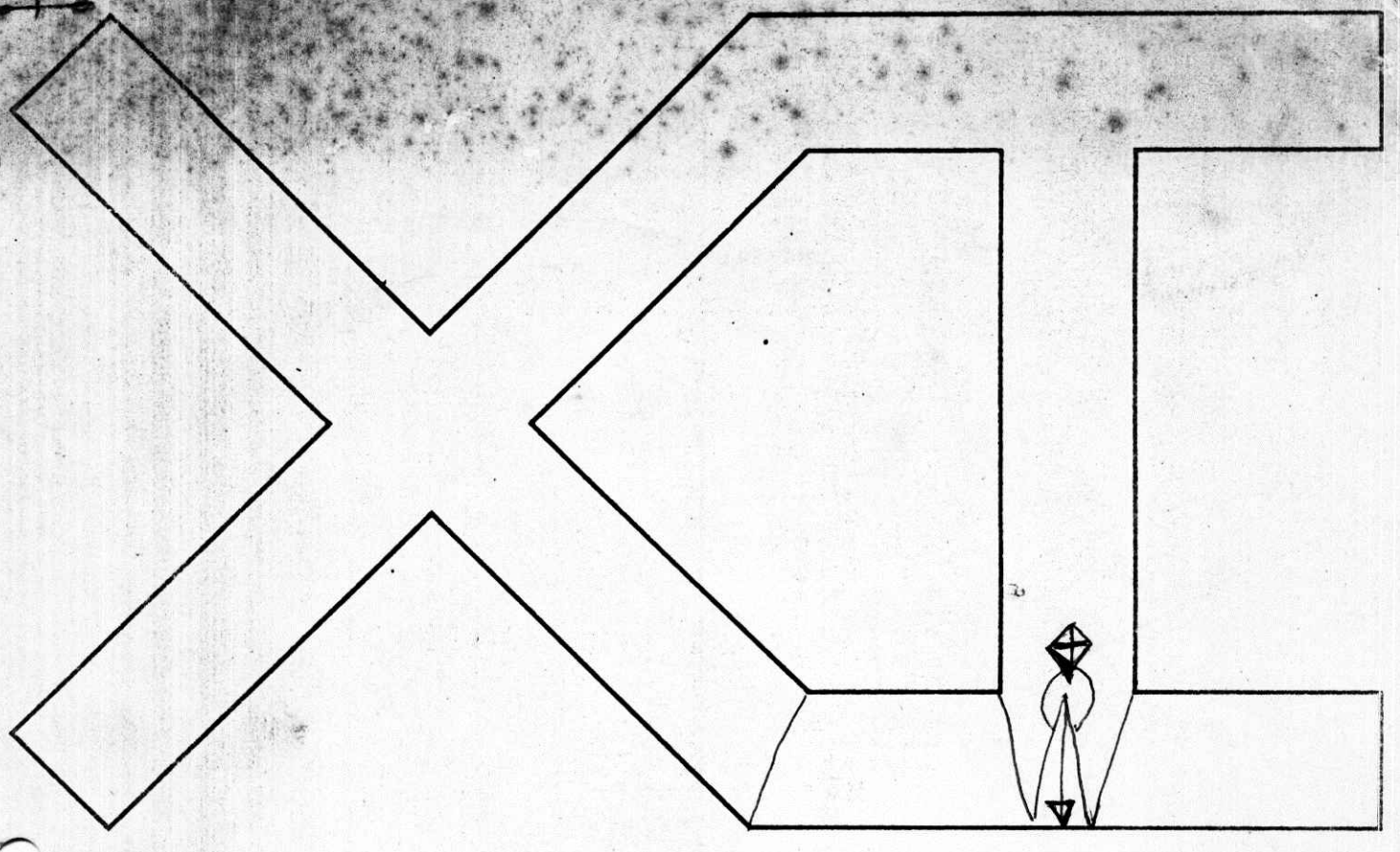

MONROBOT XI

UTILITY PROGRAMS FOR EIGHT CHANNEL TAPE INPUT

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The UTILITY PROGRAMS which follow are intended for use with a Monrobot XI computer installed with an eight-channel tape reader and tape punch at Device 2 for program input/output.

UTILITY PROGRAMS are also available for use with computers having punched card or five-channel tape as the program input/output medium. While in many instances the utility programs have the same end result the coding and operating instructions are different.

The primary purpose of these Utility Programs is to enable the programmer to input or output program instructions from a variety of devices and to verify the output or reproduce additional copies.

Some Utility Programs are used for diagnostic purposes to determine the location of program instructions which may cause an error or instructions which must be changed.

Other Utility Programs are used as working tools by the programmer. All of these routines allow rapid communication with the computer for program testing purposes.

Each program tape is identified by a UT number punched in the tape. Following this is the program punched in eight-channel code. The tape must be placed in the reader so that the pins are in the tape feed section following the UT number. A short section separated by tape feed code completes the tape. This section of tape will not be read in during program input as it is the code for relocation of the Utility Program using the UT-13 Relocation Program.

TABLE OF CONTENTS

Procedure to be Used to Record the PROGRAM INPUT FROM TAPE Instructions on the Drum of the Monrobot XI

1. Press the RESET button.

2. From the input/output typewriter or 16 key device connected to input box number one, enter the following:

Enter	PRESS LOAD Button	Enter	PRESS START Button
T3W1S380	"	240173W5	"
T3W2S380	"	U0059008	"
T3W3S380	"	X005T3W6	"
T3W4S380	"	T00533W1	"
T3W5S380	"	2400X3W3	"

Note: If the 16 key device is connected to input box number one, change all S380 instructions to 0000.

3. Insert the UT-1 tape (PROGRAM INPUT FROM TAPE) in the tape reader connected to input box number two. Enter 33W10000, press the LOAD and START buttons.

Note: The number two input and parity lights on the control panel will light as each carriage return code is read from the tape. Reading will continue through the end of the tape including the tape feed code.

4. Press the RESET button. The PROGRAM INPUT FROM TAPE Utility Routine can now be used to read in a previously-prepared program tape. See Step 6.

5. If it is necessary to connect the program input tape reader to input box number three, change two instructions in Step 2 above, as follows:

T3W1S380	LOAD	280173W5	START
T3W5S380	LOAD	2800X3W3	START

After the PROGRAM INPUT FROM TAPE Utility Routine is read in, press the RESET button and enter:

T3X3S380 LOAD T0052801 START

Note: If this change is required, it will also be necessary to make corresponding changes of input and/or output instructions in the Utility Routines which use a tape reader or tape punch.

Procedure to be Used for
PROGRAM INPUT FROM TAPE

6. After the Utility Routine has been recorded on the drum, the following rules for use must be observed:

The routine must always be entered with a jump mark instruction to ensure that FA 2 will be properly loaded with an exit instruction. This may be in one of three forms:

37X03ADR where ADR represents the starting address of the program being read in.

37X00000 if a stop is desired after program input.

37X033X1 if a group of program tapes are to be read in or if more than one field of parameters appears on the program tape. All sections of the tape will be read in.

7. When the computer is not in automatic operation, press the RESET button, enter the selected form of the 37X0 instruction, press the LOAD and START buttons. The program tape will be read into the computer.

8. If a parity error occurs, reading of the tape will stop, the input from Device 1 and parity lights on the control panel will be on. Mark with a pencil the character on the tape just ahead of the reading pins, open the tape gate and reset the tape back two spaces to the marked character. Close the tape gate, touch the space bar on the typewriter and reading will continue.

9. The 37X03ADR entrance to the PROGRAM INPUT FROM TAPE routine may be used by the programmer at any location in his program where it may be necessary to read in additional program instructions and/or data. The exit at the end of reading will return operation to the proper location in the previous program sequence.

RELOCATION ADDRESSES: 3W7-3XX

Tape Reader at Device No. 2.

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM INPUT FROM TAPE

PAGE	DATE	PROGRAMMER
3W0		

REGISTER		CONTENTS	NOTES
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
..7	A		Stored exit from FA 2
	B		
3W8	A	V003	Load store address
	B	X004	Increment
3W9	A	T003	Save store address
	B	U500	Clear FA 5
3WS	A	3400	Jump return to read character, add previous input
	B	9020	Binary shift left 6 bits
3WT	A	3400	Jump return to read and convert
	B	9008	Binary shift left 4 bits
U	A	3400	Jump return to read and convert
	B	9020	Binary shift left 6 bits
3WV	A	3400	Jump return to read and convert
	B	9020	Binary shift left 6 bits
3WW	A	3400	Jump return to read and convert
	B	9008	Binary shift 4 bits
3WX	A	3400	Jump return to read last character
	B	3003	Jump to store

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM INPUT FROM TAPE

PAGE	DATE	PROGRAMMER
3X0		

REGISTER		CONTENTS	NOTES
3X0	A	V002	Load exit
	B	T3W7	Save
3X1	A	V3X3	Load input instruction
	B	T000	Save
3X2	A	V3XW	Load virgin instruction
	B	T001	Save
3X3	A	T005	Store character
	B	2401	Input character
3X4	A	W3XV	Subtract start code "TX"
	B	73X3	Jump if negative to ignore, read next character
3X5	A	3400	Jump return to read first address character
	B	9020	Binary shift left 6 bits
3X6	A	3400	Jump return to read second address character
	B	53X9	Starting address to A link of FA 5, address increment to FA4
3X7	A	9S01	Generate high order bit into cleared accumulator
	B	X3XU	Add virgin 300033W8 = T00033W8
3X8	A	X005	Add address = TADR33W8
	B	33W9	Jump to input register contents
3X9	A	0001	Constant: address increment
	B	0000	
3XS	A	W3XX	Subtract end code
	B	63W7	Jump if zero to exit
3XT	A	2200	Halt, was parity error
	B	V005	Load conversion
3XU	A	3000	Return to input routine. Also used as virgin for
	B	33W8	3X7
3XV	A	0000	Constant: start code
	B	00TX	
3XW	A	73XS	Instruction for FA 1
	B	X005	
3XX	A	8000	Constant: end code with forced parity error
	B	00S1	

Procedure to be Used for PROGRAM INPUT FROM TYPEWRITER

1. Press the RESET button.

2. Place the UT-2 program tape on the program input tape reader.

3. Type 37X033S0. Press the LOAD and START buttons. The program tape will be read into the computer and a carriage return will occur.

4. Type the three sexadecimal character address of the first register in which the program input from typewriter is to be stored.

5. Press the START button; a carriage return will occur.

6. Type the three sexadecimal character address of the last register to be used to store the program input from typewriter. If an error is made while typing either address, press the RESET button, type 33S00000, press the LOAD and START buttons, repeat from Step 4.

7. Press the START button; a carriage return will occur. The START light and the input from device one light on the control panel will now be on.

8. Type the eight character program instruction which is to be stored at the starting address. If an incorrect character is typed, retype the correct information, since only the last eight characters typed will be stored.

   Note: The typewriter has keys for the digits "one" and "zero". These must be used rather than the keys for alpha characters "O" "L".

9. When the last eight characters are the correct ones, touch the space bar on the typewriter. This will cause the computer to store the instructions in the proper register and execute a carriage return.

10. Repeat Steps 8 and 9 which will store the typed instructions in successive registers.

11. A parity error can occur if two keys are struck together by accident. If this happens, a carriage return will occur and all eight characters of the register must be typed again.

12. When instructions have been stored in the last register (given in Step 6 above) an "E" will be printed on the typewriter indicating that all registers between and including the starting and ending addresses have had instructions stored in them.

13. An error has occured if the "E" is printed before the last register has been input or if the "E" does not print when expected. Either one register has been entered twice (in the first instance) or a register has been omitted. In order to avoid extensive repetition, it is suggested that not more than one page of coding be input within a set of parameters. (e.g., start at 050, end at 05X.)

14. After the "E" has been printed, the program will repeat from Step 4. If no further program is to be input, press the RESET button.

RELOCATION ADDRESSES: 3S0-3TS

Typewriter at Device No. 1

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM INPUT FROM TYPEWRITER

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A B	S380 V3T7	(3T6) Carriage Return Load Constant 00000001
3S1	A B	T001 V3T8	Store in FA 1 Load Constant 00000008
3S2	A B	T002 V3T9	Store in FA 2 Load Constant 00000010
3S3	A B	T003 U500	Store in FA 3 Clear FA 6 to 0
3S4	A B	0000 S380	Type in beginning register number. Depress start. Carriage Return
3S5	A B	X3TS T3T2	Add Constant V005T000 Store modified beginning register in Reg. 3T2
3S6	A B	U500 0000	Clear FA 6 to 0 Type in ending register number. Depress start.
3S7	A B	X3TS X001	Add Constant V005T000 Add Constant 00000001
3S8	A B	T000 33S9	Store modified ending register plus 1 in FA 0 No-op
3S9	A B	S380 63T6	(3SU) (3T5) Carriage Return Jump 0 to Register 3T6
3SS	A B	U500 33ST	Clear FA 6 to 0 No-op
3ST	A B	T005 2200	(3T0) Store word in FA 5 Type in one character of instruction to be stored
3SU	A B	73TT ~~73S9~~ 63T2	Jump on parity to Register 3S9 Jump 0 to Register 3T2, (Space Character)
3SV	A B	W003 63SX	Subtract Constant 00000010 (Code Conversion) Jump zero to Register 3SX
3SW	A B	73T1 X002	Jump minus to Register 3T1 Add Constant 00000008
3SX	A B	U005 9008	(3SV) (3T1) Interchange with FA 5 Binary Shift Left 4

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM INPUT FROM TYPEWRITER

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	X005	Add latest character in Tetrad 0 to shifted input
	B	33ST	Jump to type in another character
3T1	A	X003	(3SW) Add Constant 00000010
	B	33SX	Jump to Register 3SX
3T2	A	( )	(3SU) Load completed Input in FA 6
	B		Store in proper register
3T3	A	V3T2	Load modified storage register
	B	X001	Add Constant 00000001
3T4	A	T3T2	Store new modified storage register
	B	W000	Subtract modified ending register plus 1
3T5	A	33S9	Jump to Register 3S9
	B	33T6	Fill
3T6	A	S375	(3S9) Print "E" (Signal for end of input)
	B	33S0	Jump to repeat program
3T7	A	0000	Constant
	B	0001	
3T8	A	0000	Constant
	B	0008	
3T9	A	0000	Constant
	B	0010	
3TS	A	V005	Constant
	B	T000	
3TT	A	S367	INSTRUCTION OUTPUT DEVICE 1 'P' } PARITY
	B	S340	" " " " SPACE } ERROR
3TU	A	S375	" " " " 'E' } PRINTOUT
	B	33S9	JUMP BACK TO INPUT REGISTER AGAIN } ROUTINE
	A		
	B		
	A		
	B		
	A		
	B		

Procedure to be Used for PROGRAM OUTPUT TO PUNCHED TAPE

This Utility Routine is used to produce a program tape which is compatible with the PROGRAM INPUT FROM TAPE (UT-1) Utility Routine.

1. Press the RESET button.
2. Place the UT-3 program tape on the program input tape reader.
3. Type 37X0~~3380~~, press the LOAD and START buttons. The program tape will be read into the computer ~~and a carriage return will occur~~. Type either 307X 3010 4+5 or 307X 3380 4+5
4. Type the address of the first program register which is to be punched on tape. The address must be three sexadecimal characters.
5. Press the START button; a carriage return will occur.
6. Type the address of the last program register to be punched on tape. Press the START button.
7. Twelve inches of tape lead will be output followed by the start code and the starting address of the registers being taped out. The remaining output will be the contents of the registers within and including the parameters. Attach the leading end of the tape to the tape rewind reel.
8. After the required registers have been output to tape, 12 inches of tape feed will be produced. The program is terminated when an "E" is typed and the RESET light is on. Remove the program tape from the punch.
9. If another tape is to be made, the program will repeat from Step 4; if not, press the RESET button.
10. Switch No. 1 can be used to restrict output of tape lead. If the switch is off, tape lead will be produced; if on, no tape lead will appear. If several sets of parameters are to be punched in one continuous tape, turn Switch No. 1 on after punching starts. During the punching of the last parameters, turn Switch No. 1 off so that tape lead will be added.
11. After the tape is made, it should be verified by use of the PROGRAM TAPE TO DRUM COMPARISON (UT-4) Utility Routine.

RELOCATION ADDRESSES: 3S0-3TS

Typewriter at Device No. 1, Tape Punch at Device No. 2.

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM OUTPUT TO PUNCHED TAPE

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	S380	(3T9) Carriage Return
	B	U500	Clear FA 6 to 0
3S1	A	0000	Halt, enter starting address
	B	S380	Carriage Return
3S2	A	X3T1	Add virgin 73T8V000 = 73T8VADR
	B	T000	Store in FA 0
3S3	A	U500	Clear FA 6 to 0
	B	0000	Halt, enter ending address
3S4	A	X3T1	Add virgin 73T8V000 = 73T8VADR
	B	T003	Store in FA 3
3S5	A	V3T2	Load shift and punch virgin 8U20 S47X
	B	T001	Store in FA 1
3S6	A	37T3	Jump mark to output tape lead and set FA 4
	B	S5TX	Output "TX" start code
3S7	A	V000	Load instruction 73T8VADR, starting address
	B	9080	
3S8	A	9080	Shift starting address to A link
	B	9008	
3S9	A	3401	Jump mark to punch first 6 bits of address
	B	3401	Jump mark to punch last 6 bits of address
3SS	A	3400	(3T0) Test for end and load register contents/output
	B	U000	Contents to FA 0/address to FA 6
3ST	A	X004	Add Constant 00000001
	B	U000	Incremented address to FA 0/ contents to FA 6
3SU	A	3401	Jump mark to output second 6 bits
	B	9802	Binary shift right 2 bits
3SV	A	3401	Jump mark to output 4 bits
	B	3401	Jump mark to output 6 bits
3SW	A	3401	Jump mark to output 6 bits
	B	9802	Binary shift right 2 bits
3SX	A	3401	Jump mark to output last 4 bits
	B	V003	Load last register address

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM OUTPUT TO PUNCHED TAPE

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	W000	Subtract address of register just punched
	B	33SS	Jump to test for end
3T1	A	73T8	Virgin for starting and ending address
	B	V000	
3T2	A	8U20	Shift and punch instruction for FA 1
	B	S47X	
3T3	A	V3TS	(3S6) (3T8) Load Constant 00000001
	B	T004	Save as subtractor
3T4	A	S07X	Clear FA 5 to 0
	B	U401	Test Switch No. 1
3T5	A	7002	Jump if set to omit tape lead
	B	8104	Generate a decimal 100
3T6	A	S540	Output space code to punch
	B	W004	Subtract 1
3T7	A	6002	Jump if zero to exit
	B	33T6	Jump to repeat
3T8	A	S5W0	Output end code S0
	B	37T3	Jump mark to output tape lead
3T9	A	S375	Print "E"
	B	33S0	Jump to repeat program
3TS	A	0000	Constant
	B	0001	
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		

Procedure to be Used for PROGRAM TAPE TO DRUM COMPARISON

VERIFY

This Utility Routine is used to compare the program output tape produced by the UT-3 Utility Program with the equivalent registers on the drum. The purpose is to verify a program output tape against the contents of the drum to be certain that the program tape has been punched correctly. When two versions of a program tape exist, one may be read into the computer and the other compared with it by use of this routine. Or, when a program is known to run but fails when read into the computer, the comparison utility routine may help in detecting the trouble.

1. The program against which comparison is to be made must be present on the computer drum.

2. Press the RESET button.

3. Place the UT-4 program tape on the program input tape reader.

4. Insert paper in the typewriter and touch the carriage return key, then set tab stops 6 and 17 spaces from the left margin.

5. Type 37X00000, press the LOAD and START buttons. The UT-4 program will read into the computer.

6. Press the RESET button. Place the program tape which is to be compared with the drum on the program input tape reader.

7. If the program tape contains only a single set of parameters, type 37S00000 and press the LOAD and START buttons. If the program tape contains several sets of parameters, type in 37S033S1 and press the LOAD and START buttons.

8. If a parity error is read from the program tape which is being compared to the drum, the Input from Device No. 1 light will come on. If the character has been punched correctly, open the gate and backspace the tape two characters and close the reader gate. Press the space bar on the typewriter and the character will be re-read. If the tape has been mispunched, a new tape must be produced for comparison.

9. If the tape register does not match the drum register, the following will print on the typewriter:

(Register Address)	(Contents of Tape)	(Contents of Drum)
XXX	XXXXXXXX	XXXXXXXX

Example:

294	220073W0	240073W0

10. The program terminates with the print out of the address of the last register compared to the drum.

RELOCATION ADDRESSES: 3S0-3V4

Typewriter at Device No. 1, Tape Reader at Device No. 2.

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TO DRUM COMPARISON

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	V002	Load exit
	B	T3UT	Save
3S1	A	V3S3	Load read instruction
	B	T000	Store in FA 0
3S2	A	V3UU	Load 73U5X005
	B	T001	Store in FA 1
3S3	A	T005	Save character
	B	2401	Read character from tape
3S4	A	W3UW	Subtract start code "TX"
	B	73S3	Jump negative to read tape lead
3S5	A	3400	Jump mark to read first 6 bits of starting address
	B	9020	Binary shift left 6 bits
3S6	A	3400	Jump mark to read last 6 bits of starting address
	B	53UX	Address to 005/00010000 to 004
3S7	A	V005	Load starting address
	B	X3UV	Add Constant V00033T2
3S8	A	S380	Carriage Return
	B	33SS	Jump to read tape register
3S9	A	V003	(3T2)(3TS) Load VADR33T2
	B	X3UX	Add Constant 00010000
3SS	A	T003	(3S8) Store incremented instruction
	B	U500	Clear FA 6 to 0
3ST	A	3400	Jump mark to read first 6 bits of register
	B	9020	Binary shift left 6 bits
3SU	A	3400	Jump mark to read 6 bits, add previous
	B	9008	Binary shift left 4 bits
3SV	A	3400	Jump mark to read 4 bits, add previous
	B	9020	Binary shift left 6 bits
3SW	A	3400	Jump mark to read 6 bits, add previous
	B	9020	Binary shift left 6 bits
3SX	A	3400	Jump mark to read 6 bits, add previous
	B	9008	Binary shift left 4 bits

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TO DRUM COMPARISON

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	3400	Jump mark to read last 4 bits, add previous
	B	T005	Save tape register contents
3T1	A	3003	Jump to load drum register
	B	33T2	Fill
3T2	A	W005	Subtract tape register contents from drum contents
	B	63S9	0= tape and drum agree
3T3	A	V005	Load tape register contents
	B	T004	Store in FA 4
3T4	A	V003	Load VADR33T2
	B	X7V0	Extract XXXX0000
3T5	A	9008	Binary shift left 4 bits
	B	3TTT	Jump mark to print address
3T6	A	V004	Load tape register contents
	B	S35W	Tab
3T7	A	3TTV	Jump mark to print tape register contents
	B	V003	Load VADR33T2
3T8	A	X3V1	Add 7 = VADR33T9
	B	3006	Jump to load drum register contents
3T9	A	S35W	Tab
	B	3TTV	Jump mark to print drum register contents
3TS	A	S380	Carriage Return
	B	33S9	Jump to increment VADR33T2
3TT	A	X3UX	Add Constant 00010000
	B	S07X	Clear FA 5 to 0
3TU	A	8U08	Binary Left End Around Shift 4 bits
	B	33TW	Jump to print
3TV	A	S07X	Clear Fa 5 to 0
	B	8W08	Generate a flag, binary left end around shift 4 bits
3TW	A	6002	0 = end of input; exit
	B	U005	Word to 005/character to 006
3TX	A	63U3	0 = zero character
	B	W3V2	Subtract Constant 0000000S

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TO DRUM COMPARISON

PAGE	DATE	PROGRAMMER
3U0		

REGISTER		CONTENTS	NOTES
3U0	A B	73U4 X3V3	Jump negative, character 1-9 Add alpha factor, character S-X
3U1	A B	U005 S27X	Character to 005/word to 006 Print character
3U2	A B	8U08 33TW	Binary end around shift 4 bits Jump to repeat
3U3	A B	9410 33U1	(3TX) Generate an IBM zero Jump to continue
3U4	A B	X3V2 33U1	(3U0) Add back 10 Jump to continue
3U5	A B	W3V4 63U8	Subtract end code Jump if zero to exit from program
3U6	A B	2200 S35V	Parity error, input from typewriter Backspace
3U7	A B	V005 3000	Load previous input Jump to read again
3U8	A B	V003 W3UX	(3U5) Load VADR33T2 Subtract 1
3U9	A B	X7V0 9008	Extract XXXX0000 Binary shift left 4 bits
3US	A B	37TT S380	Jump mark to print ending address Carriage Return
3UT	A B		Saved exit
3UU	A B	73U5 X005	Instruction for FA 1
3UV	A B	V000 33T2	Virgin load instruction for FA 3
3UW	A B	0000 00TX	Constant: start code
3UX	A B	000T 0000	Constant: address increment

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TO DRUM COMPARISON

PAGE	DATE	PROGRAMMER
3V0		

REGISTER		CONTENTS	NOTES
3V0	A	XXXX	A link extractor
	B	0000	
3V1	A	0000	Constant for jump address
	B	0007	
3V2	A	0000	Constant: 10
	B	000S	
3V3	A	0000	Constant: alpha factor
	B	0012	
3V4	A	8000	Constant: end code
	B	00S1	
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		

Utility Program UT-5

Procedure to be Used for PROGRAM OUTPUT TO TYPEWRITER (Monroe Form 92C)

This Utility Routine is used to output the contents of a series of program registers in the format required by the reproducible pinfeed coding sheet, Monroe form MO-92C.

1. Press the RESET button.
2. Place the UT-5 program tape on the program input tape reader.
3. Attach the form alignment device to the typewriter and insert the continuous form MO-92C. Set the left margin so that the three character register address will type out in the "Register" block on the form. Then set a tab stop nine spaces from the left margin.
4. Type 37X033S0, then press the LOAD and START buttons; a carriage return will occur.
5. Type the address of the first program register which is to be typed. The address must be three sexadecimal characters.
6. Press the START button; a carriage return will occur.
7. Type the address of the last program register to be typed and press the START button. Align the form to the A link of the first register to be typed on the printed form and touch the backspace key. The three character register address will be typed followed by the A and B link instructions for each register within and including the address parameters. If a register contains zeros the address will be typed but no zeros will be typed in the contents area on the form.
8. After the contents of the last register address have been typed the program will repeat from Step 5 if further typeout is desired. If not, press the RESET button.

RELOCATION ADDRESSES: 3S0-3U9

Typewriter at Device No. 1.

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM OUTPUT TO TYPEWRITER (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
T10 3S0		

REGISTER		CONTENTS	NOTES
3S0	A B	S380 U500	(3T3) Carriage Return Clear FA 6 to 0
3S1	A B	0000 53U5	Halt, enter starting address Start ADR to 005/0 to 006/00010000 to 004
3S2	A B	S380 C000	Carriage Return Halt, enter ending address
3S3	A B	U005 X3U4	Ending address to 005/starting address to 006 Add Constant V0003002
3S4	A B	T000 V005	Store VADR3002 in FA 0 Load ending address
3S5	A B	5404 2200	Ending address to 005 Halt, adjust form, enter backspace or carriage return
3S6	A B	V3U4 X005	Load Constant V0003002 Add ending address
3S7	A B	T003 X004	Store VADR3002 in FA 3 Add Constant 00010000
3S8	A B	T001 37U3	Store ending address plus 1 instruction in FA 1 Jump mark to clear FA 5
3S9	A B	9008 37T8	(3T7)Binary shift left 4 bits
3SS	A B	37T8 37T8	Jump mark to print address
3ST	A B	3400 63U2	Jump mark to load register contents Register contents zero, omit
3SU	A B	S35W 33SV	Tab No-op
3SV	A B	37T3 37T8	Jump mark to print A link
3SW	A B	37T3 37T3	
3SX	A B	S380 S35W	Carriage Return Tab

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM OUTPUT TO TYPEWRITER (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
T80 3T0		

REGISTER		CONTENTS	NOTES
3T0	A	37T8	Jump mark to print B link
	B	37T8	
3T1	A	37T8	
	B	37T8	
3T2	A	S380	(3U2) Carriage Return
	B	V000	Load VADR3002
3T3	A	V003	Subtract ending address instruction
	B	63S0	0 = end, repeat program
3T4	A	X001	Increment present address
	B	T000	Store instruction
3T5	A	X7U6	Extract 000X0000
	B	63TX	0 = carriage return to next form
3T6	A	S380	(3U0) Carriage Return
	B	V000	Load VADR3002
3T7	A	33S9	Jump to print address
	B	33T8	Fill
3T8	A	8U08	Binary end around shift 4 bits
	B	U005	Word to 005/character to 006
3T9	A	63TV	0 = zero character
	B	W3U7	Subtract Constant 0000000S
3TS	A	73TW	Negative = character 1-9
	B	X3U8	Add alpha factor = character S-X
3TT	A	U005	Character to 005/word to 006
	B	S27X	Print character
3TU	A	3002	Jump to exit
	B	33TV	Fill
3TV	A	9410	Generate an IBM zero
	B	33TT	Jump to continue
3TW	A	X3U7	Add Back 0000000S
	B	33TT	Jump to continue
3TX	A	V3U9	Load Constant 00110000
	B	33U0	No-op

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM OUTPUT TO TYPEWRITER (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
T90 3U0		

REGISTER		CONTENTS	NOTES
3U0	A	S380	Carriage Return
	B	63T6	0 = exit
3U1	A	W004	Subtract 1
	B	33U0	Jump to carriage return
3U2	A	S380	(3ST) Carriage Return
	B	33T2	Jump to test for end of program
3U3	A	S07X	Clear FA 5 to 0
	B	33U4	No-op
3U4	A	V000	Load VADR3002
	B	3002	Jump to exit
3U5	A	0001	Constant: address increment
	B	0000	
3U6	A	000X	Constant: extractor
	B	0000	
3U7	A	0000	Constant: 10
	B	000S	
3U8	A	0000	Constant: alpha factor
	B	0012	
3U9	A	0011	Constant: carriage return
	B	0000	
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		

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Utility Program UT-6

Procedure to be Used for PROGRAM TAPE TYPEOUT

This Utility Routine is used to typeout the contents of a program tape in the format required by the reproducible pinfeed coding sheet Monroe Form 92C.

1. Press the RESET button.

2. Place the UT-6 program tape on the program input tape reader.

3. Type 37X00000, press the LOAD and START buttons. The program tape will read into the computer. Upon completion the computer will halt in Reset condition.

4. Attach the form alignment device to the typewriter and insert the continuous form MO-92C. Set the left margin so that the three character register address will type out in the "Register" block on the form. Then set a tab stop nine spaces from the left margin.

5. Place the program tape to be typed out on the tape reader at Device No. 2.

6. Press the RESET button.

7. Type 33S00000, press the LOAD and START buttons. The Input Device No. 1 light will come on.

8. Align the form to the A link of the first register to be typed out on the printed form and touch the backspace key. The three character register address will be typed followed by the A and B link instructions for each register of the program tape until the end code "SO" is read. If a register contains zeros, the address will be typed but no zeros will be typed in the contents area on the form.

9. When the end code "S0" is read, the computer will halt in Reset condition.

10. To repeat program, press the START button.

RELOCATION ADDRESSES: 3S0-3VS

Typewriter at Device No. 1, Tape Reader at Device No. 2.

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TYPEOUT (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	2200	(3T9) Halt, adjust form
	B	V3T2	Load read instruction
3S1	A	T000	Store in FA 0
	B	V3T3	Load Constant 73T6X005
3S2	A	T001	Store in FA 1
	B	V3T4	Load Constant T3VS33TS
3S3	A	T003	Store in FA 3
	B	V3T5	Load Constant V3VS3002
3S4	A	T004	Store in FA 4
	B	33S5	No-op
3S5	A	2401	Read character from tape
	B	W3V2	Subtract start code "TX"
3S6	A	63S7	0 = start code
	B	33S5	Jump to read tape lead
3S7	A	3400	Jump mark to read first 6 bits of starting address
	B	9020	Binary shift left 6 bits
3S8	A	3400	Jump mark to read last 6 bits of starting address
	B	9080	Binary shift left 8 bits
3S9	A	9080	Binary shift left 8 bits
	B	9008	Binary shift left 4 bits
3SS	A	T3V9	Store starting address
	B	33ST	No-op
3ST	A	U500	(3V0) (3U6) Clear FA 6 to 0
	B	3400	Jump mark to read first 6 bits of register
3SU	A	9020	Binary shift left 6 bits
	B	3400	Jump mark to read 6 bits, add previous
3SV	A	9008	Binary shift left 4 bits
	B	3400	Jump mark to read 4 bits, add previous
3SW	A	9020	Binary shift left 6 bits
	B	3400	Jump mark to read 6 bits, add previous
3SX	A	9020	Binary shift left 6 bits
	B	3400	Jump mark to read 6 bits, add previous

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TYPEOUT (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A B	9008 3400	Binary shift left 4 bits Jump mark to read last 4 bits, add previous
3T1	A B	3003 33T2	Jump to store register contents and print Fill
3T2	A B	T005 2401	Constant: read instruction
3T3	A B	73T6 X005	Constant: test for parity or end code
3T4	A B	T3VS 33TS	Constant: store register contents
3T5	A B	V3VS 3002	Constant: load register contents
3T6	A B	W3V3 63T9	(3T3) Subtract end code "SO" 0 = end code read
3T7	A B	2200 V005	Input typewriter, parity error Load previous input
3T8	A B	3000 33T9	Jump to read again Fill
3T9	A B	0000 33S0	(3T6) Halt, press START to repeat program Jump to repeat program
3TS	A B	S07X V3V9	(3T4) Clear FA 5 to 0 Load address
3TT	A B	37U7 37U7	Jump mark to print address
3TU	A B	37U7 3404	Jump mark to load register contents
3TV	A B	63UW S35W	0 = register contents zero, omit Tab
3TW	A B	37U7 37U7	Jump mark to print A link
3TX	A B	37U7 37U7	

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TYPEOUT (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
3U0		

REGISTER		CONTENTS	NOTES
3U0	A	S380	Carriage Return
	B	S35W	Tab
3U1	A	37U7	Jump mark to print B link
	B	37U7	
3U2	A	37U7	
	B	37U7	
3U3	A	S380	(3UW) Carriage Return
	B	V3V9	Load address
3U4	A	X3V4	Add Constant 00100000
	B	T3V9	Store incremented address
3U5	A	X7V5	Extract 00X00000
	B	63UX	0 = carriage return to next form
3U6	A	S380	Carriage Return
	B	33ST	Jump to read next register
3U7	A	8U08	Binary end around shift 4 bits
	B	U005	Word to FA 5/ character to FA 6
3U8	A	63UU	0.= zero character
	B	W3V6	Subtract Constant 0000000S
3U9	A	73UV	Jump negative = character 1-9
	B	X3V7	Add alpha factor = character S-X
3US	A	U005	Word to FA 6/character to FA 5
	B	S27X	Print character
3UT	A	3002	Jump to exit
	B	33UU	Fill
3UU	A	9410	Generate an IBM zero
	B	33US	Jump to continue
3UV	A	X3V6	Add back 0000000S
	B	33US	Jump to continue
3UW	A	S380	(3TV) Carriage Return
	B	33U3	Jump to increment address
3UX	A	V3V8	(3U5) Load 01200000
	B	33V0	No-op

MONROBOT XI PROGRAM SHEET

PROGRAM

PROGRAM TAPE TYPEOUT (Monroe Form 92C)

PAGE	DATE	PROGRAMMER
3V0		

REGISTER		CONTENTS	NOTES
3V0	A	S380	Carriage Return
	B	63ST	0 = exit
3V1	A	W3V4	Subtract Constant 00100000
	B	33V0	Jump to carriage return
3V2	A	0000	Constant: start code
	B	00TX	
3V3	A	8000	Constant: end code with forced parity
	B	00S1	
3V4	A	0010	Constant: address increment
	B	0000	
3V5	A	00X0	Constant: extractor
	B	0000	
3V6	A	0000	Constant: 10
	B	000S	
3V7	A	0000	Constant: alpha factor
	B	0012	
3V8	A	0120	Constant: carriage return
	B	0000	
3V9	A	( )	Address
	B		
3VS	A	( )	Register contents of tape
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		

Utility Program UT-7

Procedure to be Used for TAPE REPRODUCE AND VERIFY

This Utility Program is used to reproduce and verify any eight-channel tape of odd parity, such as program tapes or data tapes produced by the computer or an off-line tape punching device.

1. Press the RESET button.

2. Place the UT-7 program tape on the program input tape reader.

3. Type 37X00000, then press the LOAD and START buttons. The program tape will be read into the computer.

4. When the RESET light appears, type

   33S00000, if a tape is to be reproduced.
   33S10000, if a reproduced tape is to be verified against the original.
   33S20000, if an additional tape is to be reproduced while verifying a previously reproduced tape.

5. Place the tape to be reproduced on the tape reader at Device 2. Press the LOAD and START buttons. A lead will be output to the tape punch and the tape on the reader will be reproduced by the tape punch. When the tape has been read through by the reader and the computer halts, press the RESET button.

6. If a tape reader is available at Device 3 the reproduced tape can be verified. Place the original tape and the reproduced tape on the two tape readers with the reading pins in the last tape feed code before the punching of actual data.

7. Type 33S10000, then press the LOAD and START buttons. Reading will proceed character by character to the end of the tape. If the tapes do not verify, the word VER will be typed out. Inspect both tapes to determine if the characters just ahead of the reading pins are identical. If they match, set the tape on both readers back two characters, then press the space bar on the typewriter. The characters will be re-read. If the characters did not match, another tape will have to be reproduced. When verification has been completed, press the RESET button.

8. If a tape is to be reproduced while verifying a tape made previously, place the original tape on the Device 2 tape reader and the tape to be verified on the Device 3 tape reader as in Step 6 above. Type 33S20000, then press the LOAD and START buttons. The program will proceed as in Steps 5 and 7 above.

Parity Error:

If a parity error occurs, the typed indication 4P (Device 2) or 8P (Device 3) will identify the device which caused the error. Set the tape back two spaces and press the space bar on the typewriter. If the error occurs a second time, inspect the tape for faulty punching.

Note: If two tape readers are not available, a program tape can be verified by use of the UT-4 Utility Routine.

RELOCATION ADDRESSES: 3S0-3U1

Typewriter at Device No. 1, Tape Reader and Punch at Device No. 2; Tape Reader at Device No. 3 in order to verify.

MONROBOT XI PROGRAM SHEET

PROGRAM

TAPE REPRODUCE AND VERIFY

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	37S3	Jump mark to punch tape lead
	B	33SS	Jump to reproduce a tape
3S1	A	33SW	Jump to verify a tape
	B	33S2	Fill
3S2	A	37S3	Jump to punch tape lead
	B	33T8	Jump to reproduce and verify
3S3	A	V3U0	Load Constant 00000078
	B	33S4	No-op
3S4	A	S540	Punch a space
	B	W3U1	Subtract Constant 1
3S5	A	6002	0 = exit
	B	33S4	Jump to punch tape lead
3S6	A	S304	Print a 4
	B	33S8	Jump to print P
3S7	A	S308	Print an 8
	B	33S8	No-op
3S8	A	S367	Print P
	B	2200	Halt, parity error
3S9	A	3002	Jump to exit
	B	33SS	Fill
3SS	A	2400	Read character from tape Device 2
	B	T005	Save character
3ST	A	73SV	Jump negative = parity error
	B	S47X	Punch character
3SU	A	33SS	Jump to read next character
	B	33SV	Fill
3SV	A	37S6	Jump mark to print 4P
	B	33SS	Jump to read again
3SW	A	2400	Read character from tape Device 2.
	B	T005	Save character
3SX	A	73T3	Jump negative = parity error
	B	33T0	No-op

MONROBOT XI PROGRAM SHEET

PROGRAM

TAPE REPRODUCE AND VERIFY

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	2800	Read character from tape Device 3
	B	73T4	Jump negative = parity error
3T1	A	W005	Subtract character read from Device 2
	B	63SW	0 = characters the same
3T2	A	37T5	Jump mark to print "VER"
	B	33SW	Jump to read and compare
3T3	A	37S6	Jump mark to print 4P
	B	33SW	Jump to read and compare
3T4	A	37S7	Jump mark to print 8P
	B	33T0	Jump to read and compare
3T5	A	S315	Print V
	B	S375	Print E
3T6	A	S329	Print R
	B	2200	Halt, input typewriter
3T7	A	S380	Carriage Return
	B	3002	Jump to exit
3T8	A	2400	Read character from tape Device 2
	B	T005	Save character
3T9	A	73TW	Jump negative = parity error
	B	33TS	No-op
3TS	A	2800	Read character from tape Device 3
	B	73TX	Jump negative = parity error
3TT	A	W005	Subtract character read from Device 2
	B	63TV	0 = characters the same
3TU	A	37T5	Jump mark to print "VER"
	B	33T8	Jump to read and compare
3TV	A	S47X	Punch character
	B	33T8	Jump to read and compare
3TW	A	37S6	Jump mark to print 4P
	B	33T8	Jump to read and compare
3TX	A	37S7	Jump mark to print 8P
	B	33TS	Jump to read and compare

MONROBOT XI PROGRAM SHEET

PROGRAM

TAPE REPRODUCE AND VERIFY

PAGE	DATE	PROGRAMMER
3U0		

REGISTER		CONTENTS	NOTES
3U0	A	0000	Constant: tape lead
	B	0078	
3U1	A	0000	Constant: tape lead
	B	0001	
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		
	A		
	B		

Procedure to be Used for REGISTER SEARCH OF PROGRAM TAPE

This Utility Routine is used for diagnostic purposes to locate registers containing references to addresses, devices, or any portion of a program instruction. Since the search is made from a program tape, the program does not have to be stored on the drum. If the program is on the drum during testing, use Utility Routine UT-9.

1. Press the RESET button.
2. Place the UT- 8 program tape on the program input tape reader.
3. Type 37X033S0, then press the LOAD and START buttons. After the program is read into the computer, a carriage return will occur.
4. Place the program tape to be searched on the tape reader. Type in an extractor mask of not more than four sexadecimal characters containing those bits which are to be examined. Press the START button; a carriage return will occur.
5. Type in the first reference item to be searched for. Not more than four sexadecimal characters can be used. Press the START button; a carriage return will occur.
6. Repeat Step 5 until all references have been entered, then press the START button one more time; a carriage return will occur.
7. The tape will then be read and the A and B links searched for the desired references. If a reference is found, the address of the register containing the reference will be typed out.
8. After the tape has been searched, the program will repeat from Step 4.

Example:

A tape is to be searched for references to addresses 310, 25X, 27W, and 109. Type in

```
TXX     (Address mask to be used as extractor)
310     (Addresses to be searched for)
25X
27W
109
```

100 (Locations of references typed out by operation of
101 the program.)
119
21W
350
37X
391

It is evident that with some experience in the use of masks more complex searches can be done with this program.

RELOCATION ADDRESSES: 3S0-3VW*

Typewriter at Device No. 1, Tape Reader at Device No. 2

*A table will be compiled starting at the register following the ending address.

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF PROGRAM TAPE

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	V3V5	Load Constant 0000T3VW
	B	T001	Store in FA 1
3S1	A	S380	(3S4) Carriage Return
	B	U500	Clear FA 6 to 0
3S2	A	3401	Jump mark to enter extractor and references
	B	63S5	0 = finished entering
3S3	A	V001	Load constant store instruction
	B	X3V6	Add Constant 00000001
3S4	A	T001	Store in FA 1
	B	33S1	Jump to continue entering
3S5	A	2401	(3S2) (3S6) Read character from tape
	B	W3V7	Subtract start code TX
3S6	A	63S7	0 = start code
	B	33S5	Jump to read tape lead
3S7	A	V3V3	(3S6) Load Constant read instructions
	B	T000	Store in FA 0
3S8	A	V3V2	Load Constant 73UWX005
	B	T001	Store in FA 1
3S9	A	U500	Clear FA 6 to 0
	B	S07X	Clear FA 5 to 0
3SS	A	3400	Jump mark to read first 6 bits of starting address
	B	9020	Binary shift left 6 bits
3ST	A	3400	Jump mark to read last 6 bits of starting address
	B	9080	Binary shift left 8 bits
3SU	A	9080	Binary shift left 8 bits
	B	9008	Binary shift left 4 bits
3SV	A	T3VV	Store starting address
	B	33SW	No-op
3SW	A	U500	(3U5) Clear FA 6 to 0
	B	S07X	Clear FA 5 to 0
3SX	A	3400	Jump mark to read first 6 bits of register
	B	9020	Binary shift left 6 bits

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF PROGRAM TAPE

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	3400	Jump mark to read 6 bits, add previous
	B	9008	Binary shift left 4 bits
3T1	A	3400	Jump mark to read 4 bits, add previous
	B	9020	Binary shift left 6 bits
3T2	A	3400	Jump mark to read 6 bits, add previous
	B	9020	Binary shift left 6 bits
3T3	A	3400	Jump mark to read 6 bits, add previous
	B	9008	Binary shift left 4 bits
3T4	A	3400	Jump mark to read last 4 bits, add previous
	B	T005	Store register contents in FA 5
3T5	A	9880	Binary shift right 8 bits
	B	9880	Binary shift right 8 bits (0000AAAA)
3T6	A	X7VW	Extract mask
	B	T003	Store in FA 3 (A link)
3T7	A	V005	Load register contents
	B	X7VW	Extract mask
3T8	A	T004	Store in FA 4 (B link)
	B	V3V4	Load reference load instruction
3T9	A	T001	Store in FA 1
	B	V3V8	Load Constant 00010000
3TS	A	T005	Store in FA 5
	B	3401	Jump mark to load reference item
3TT	A	W003	Subtract extracted A link
	B	63U0	0 = items compare
3TU	A	X003	Restore item
	B	W004	Subtract extracted B link
3TV	A	63U0	0 = items compare
	B	V001	Load reference load instruction
3TW	A	X005	Add 00010000
	B	T001	Store back in FA 1
3TX	A	3001	Jump to load next reference item
	B	33U0	Fill

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF PROGRAM TAPE

PAGE	DATE	PROGRAMMER
3U0		

REGISTER		CONTENTS	NOTES
3U0	A	V3VV	(3TT) (3TV) Load address
	B	37U6	
3U1	A	37U6	Jump mark to print address
	B	37U6	
3U2	A	S380	Carriage Return
	B	33U3	No-op
3U3	A	V3VV	Load address
	B	X3V9	Add Constant 00100000
3U4	A	T3VV	Store incremented address
	B	V3V2	Load 73UWX005
[illegible]5	A	T001	Store back in FA 1
	B	33SW	Jump to read next register
3U6	A	S07X	Clear FA 5 to 0
	B	8U08	Binary left end around shift 4 bits
3U7	A	U005	Word to FA 5/character to FA 6
	B	63UU	0 = character zero
3U8	A	W3VS	Subtract Constant 0000000S
	B	73UV	Jump negative = character 1-9
3U9	A	X3VT	Add alpha factor
	B	33US	No-op
3US	A	U005	Character to FA 5/word to FA 6
	B	S27X	Print character
3UT	A	3002	Jump to exit
	B	33UU	Fill
[illegible]U	A	9410	(3U7) Generate an IBM zero
	B	33US	Jump to continue
3UV	A	X3VS	(3U8) Add back Constant 0000000S
	B	33US	Jump to continue
3UW	A	W3VU	Subtract end code "SO"
	B	63V1	0 = end code
3UX	A	2200	Input typewriter, parity error
	B	V005	Load previous input

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF PROGRAM TAPE

PAGE	DATE	PROGRAMMER
3V0		

REGISTER		CONTENTS	NOTES
3V0	A B	3000 33V1	Jump to read character again Fill
3V1	A B	S375 33S0	(3UW) Print E Jump to repeat program
3V2	A B	73UW X005	Constant: for FA 1
3V3	A B	T005 2401	Constant: read instruction
3V4	A B	V3VX 63U3	Constant: reference load instruction
3V5	A B	0000 T3VW	Constant: reference store instruction
3V6	A B	0000 0001	Constant: address store increment
3V7	A B	0000 00TX	Constant: start code
3V8	A B	0001 0000	Constant: address load increment
3V9	A B	0010 0000	Constant: address increment
3VS	A B	0000 000S	Constant: 10
3VT	A B	0000 0012	Constant: alpha factor
3VU	A B	8000 00S1	Constant: end code with forced parity
3VV	A B		Address
3VW	A B		Extractor mask
	A B		

Procedure to be Used for REGISTER SEARCH OF MEMORY

This Utility Routine is used for diagnostic purposes to locate registers containing references to addresses, devices, or any portion of a program instruction. The program to be searched must be stored on the drum.

1. Press the RESET button.

2. Place the UT-9 program tape on the program input tape reader.

3. Type 37X033S0, then press the LOAD and START buttons. After the program is read into the computer, a carriage return will occur.

4. The words SEARCH FOR will be printed out. Type in not more than four sexadecimal characters. Press the START button. A carriage return will occur and the word MASK will be printed out, type in not more than four sexadecimal characters to be used as an extractor mask. Press the START button. A carriage return will occur and the word START will be typed out. Type the three character sexadecimal address of the program where searching is to begin. Press the START button.

5. The computer will search the A and B links of every program register from the starting address through 3XX or TXX. If a reference is found, the address of the register containing the reference will be typed out. After the register 3XX or TXX has been searched, the computer will print out END and halt in RESET.

6. If another search is to be made, press the START button and repeat from STEP 4.

Example 1:

If register 29X contains program instructions which are becoming altered through an error in programming, the search for references to 29X would be done as follows:

```
SEARCH FOR 29X
MASK       TXX (Mask for any address)
START      050 (Or the starting address of your program)
```

The address of all registers containing references to 29X will be typed out.

Example 2:

If all output to Device No. 1 is to be changed to Device No. 3, the location of all S27X and S3CC program instructions must be determined. Two searches will be required as follows:

```
SEARCH FOR S27X
MASK       XXXX
START       ADR where your program begins.
```

The second run would be,

```
SEARCH FOR S300
MASK       XX00
START       ADR same as above.
```

Operating Time: 2:40 to search 050 through 3XX.

RELOCATION ADDRESSES: 3S0-3VV

Typewriter at Device No. 1.

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF MEMORY

PAGE	DATE	PROGRAMMER
3S0		

REGISTER		CONTENTS	NOTES
3S0	A	S380	(3U4) Carriage Return
	B	S352	Print S
3S1	A	S375	Print E
	B	S331	Print A
3S2	A	S329	Print R
	B	S373	Print C
3S3	A	S338	Print H
	B	S340	Space
3S4	A	S376	Print F
	B	S326	Print O
3S5	A	S329	Print R
	B	S340	Space
3S6	A	U500	Clear FA 6 to 0
	B	0000	Halt, enter search
3S7	A	S380	Carriage Return
	B	T3VS	Store search (B link)
3S8	A	9080	Binary shift left 8 bits
	B	9080	Binary shift left 8 bits
3S9	A	T3VT	Store search (A link)
	B	S364	Print M
3SS	A	S331	Print A
	B	S352	Print S
3ST	A	S362	Print K
	B	S340	Space
3SU	A	U500	Clear FA 6 to 0
	B	0000	Halt, enter mask
3SV	A	S380	Carriage Return
	B	T3VU	Store mask (B link)
3SW	A	9080	Binary shift left 8 bits
	B	9080	Binary shift left 8 bits
3SX	A	T3VV	Store mask (A link)
	B	S352	Print S

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF MEMORY

PAGE	DATE	PROGRAMMER
3T0		

REGISTER		CONTENTS	NOTES
3T0	A	S313	Print T
	B	S331	Print A
3T1	A	S329	Print R
	B	S313	Print T
3T2	A	S340	Space
	B	S331	Print A
3T3	A	S334	Print D
	B	S329	Print R
3T4	A	S340	Space
	B	V3V3	Load Constant 00000001
3T5	A	T000	Store in FA 0
	B	V3V4	Load Constant 30020000
3T6	A	T004	Store in FA 4
	B	U500	Clear FA 6 to 0
3T7	A	0000	Halt, enter starting address
	B	S380	Carriage Return
3T8	A	X3V2	Add Constant V3VVX400
	B	T001	Store instruction in FA 1
3T9	A	W3V5	Subtract 00010000
	B	T003	Store in FA 3
3TS	A	3401	(3U1) Jump mark to load mask and extract A link
	B	W3VT	Subtract search
3TT	A	63U5	0 = items compare
	B	3403	Jump mark to load mask and extract B link
3TU	A	W3VS	Subtract search
	B	63U5	0 = items compare
3TV	A	V001	Load instruction
	B	X000	Add Constant 00000001
3TW	A	T001	Store incremented instruction
	B	V003	Load FA 3 instruction
3TX	A	X000	Add Constant 00000001
	B	T003	Store incremented instruction

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF MEMORY

PAGE	DATE	PROGRAMMER
3U0		

REGISTER		CONTENTS	NOTES
3U0	A	X7V6	Extract Constant 00000400
	B	63U2	0 = end of program
3U1	A	33TS	Jump to continue
	B	33U2	Fill
3U2	A	S375	(3U0) Print E
	B	S325	Print N
3U3	A	S334	Print D
	B	S380	Carriage Return
3U4	A	0000	Halt
	B	33S0	Jump to repeat program
3U5	A	V001	(3TT) Load FA 1 instruction
	B	X7V7	Extract 00000TXX (address)
3U6	A	9080	Binary shift left 8 bits
	B	9080	Binary shift left 8 bits
3U7	A	9008	Binary shift left 4 bits
	B	S07X	Clear FA 5 to 0
3U8	A	37UT	Jump mark to print address
	B	37UT	
3U9	A	37UT	
	B	S380	Carriage Return
3US	A	33TV	Jump to increment address
	B	33UT	Fill
3UT	A	8U08	Binary left end around shift 4 bits
	B	U005	Word to FA 5/character to FA 6
3UU	A	63V0	0 = zero character
	B	W3V8	Subtract Constant 0000000S
3UV	A	73V1	Jump negative = character 1-9
	B	X3V9	Add alpha factor
3UW	A	U005	Character to FA 5/word to FA 6
	B	S27X	Print character
3UX	A	3002	Jump to exit
	B	33V0	Fill

MONROBOT XI PROGRAM SHEET

PROGRAM

REGISTER SEARCH OF MEMORY

PAGE	DATE	PROGRAMMER
3V0		

REGISTER		CONTENTS	NOTES
3V0	A	9410	(3UU) Generate an IBM zero
	B	33UW	Jump to continue
3V1	A	x3V8	(3UV) Add back 0000000S
	B	33UW	Jump to continue
3V2	A	V3VV	Constant: load and extract instruction
	B	x400	
3V3	A	0000	Constant: address increment
	B	0001	
3V4	A	3002	Constant: exit for FA 4
	B	0000	
3V5	A	0001	Constant: load increment
	B	0000	
3V6	A	0000	Constant: ending register
	B	0400	
3V7	A	0000	Constant: address extractor
	B	01XX	
3V8	A	0000	Constant: 10
	B	000S	
3V9	A	0000	Constant: alpha factor
	B	0012	
3VS	A	( )	Search for B link
	B		
3VT	A	( )	Search for A link
	B		
3VU	A	( )	Mask for B link
	B		
3VV	A	( )	Mask for A link
	B		
	A		
	B		
	A		
	B		