

ELLIOTT 900 SERIES SIMULATOR

ACD UTILITIES.

Elliott's Airborne Computing Division (ACD) developed a number of different utilities from those supplied by Elliott Computers to support their software development processes. Often these utilities were improved versions of the standard ones. As ACD continued to use 920 telecode quite late into the life of the 900 series many of the utilities could work with 920 and 900 telecodes.

All of the utilities can be found in the ACDUTILITIES directory.

(The information in this section was taken from ACD Library Book 120, Copy 23, Amendment 0 "903 UTILITY SOFTWARE".)

900 AMEND - AMEND(900).BIN - "900 AMEND 20/7/70"
920 AMEND - AMEND(920).BIN - "920 AMEND 20/7/70"

Amend is a simple assembler for loading small symbolic program tapes (e.g., corrections to a program already in store).

The correction tape must be in either 900 or 920 telecode according to the version of AMEND used and may make use of the following SIR facilities:

- Comments (including titles)
- Patches of the form ^N where N is an unsigned integer
- Skips of the form >N
- Integers in the range -131071 to +131071
- Octal numbers of up to six digits preceded by '&'
- Instructions with absolute addresses e.g., /4 3000
- Instructions with relative addresses, e.g. 8 ;+0

The correction tape must be terminated by a halt code on a line by itself.

AMEND is distributed as SIR source tape and must be assembled either as part of a larger program, or as a standalone program to run in a free area of store.

To read the correction tape, enter at the address of the global label AMEND.

Error indications are given by continuous punching
000o00001 - parity error on correction tape

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000o00111 - syntax error
BINCOP - BINCOP.BIN - "BINCOP 20/7/70, Binary Mode 3"

BINCOP is a program for making fully checked copies of a tape. It may be used to copy tapes containing only even parity characters up to 171 feet long (about 20,000 characters), tapes with no holes in track 8 up to 171 feet long and any other tape up to 150 feet long.

Entry points

- 8 Read in tape and check for even parity.
- 9 Resume reading when stopped after 2" of blank tape.
- 10 Re-read master tape and verify stored version, if o.k. punch a copy.
- 11 Read in any tape with no checking.
- 12 Read in tape and check for absence of holes in track 8.

Reading stops whenever 2" of blank tape is found.

Error indications

Errors are signalled by continuous punching of a legible code:

00000o001 Even parity check failed.
10000o000 Track 8 check failed.
11111o000 Tape too long to be stored.
00000o010 Tape being read disagrees with stored copy.

BINCOP is demonstrated by DEMO1 (copy a short tape) and DEMO2 (attempt to copy a long tape) in the directory ACDUTILITIES.

BOWDLER

BOWDLER is a program for editing telecode tapes of any length.

The user punches a steering tape that defines the edits to be made to the master tape. The steering tape is read in and stored. The master tape is then read in and an edited version punched. The edit version can then be read in and verified against a sumcheck.

Two versions of BOWDLER are provided. The first, BOWDLER 20/7/70 is the one described in the ACD "903 UTILITY SOFTWARE" manual and would have been the version used by ACD. The second version, BOWDLER 13/7/82, is a much improved later version written by Terry Froggatt. This later version has

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several advantages over the original - the ability to search for identifiers, better telecode conversion facilities and simpler operation, especially with long tapes.

Both versions are described below.

BOWDLER70.BIN - "BOWDLER 20/7/70"

Telecode instructions

The steering tape must start with a blank line followed by two telecode instructions, the first specifies the telecode of the edit tape, the second the telecode of the main tape and followed by the edit instructions. The telecode instructions are '920', '903' or 'ISO' for the 920, 903 or 900 telecodes respectively.

Editing commands

SPE	Preserve erase characters
INB	Insert 4 blanks after each newline sequence

C - copy
D - delete
L - string found at start of line
S - string found anywhere on a line
I - inclusive of string
E - exclusive of string

CSE	string	Copy up to but excluding string
CSI	string	Copy up to and including string
CLE	string	Copy up to and including newline before line
CLI	string	Copy up to and including newline after line
DSE	string	Delete up to but excluding string
DSI	string	Delete up to and including string
DLE	string	Delete up to and including the newline before line
DLI	string	Delete up to and including newline after string

CHE	Copy up to but excluding next halt code
CHI	Copy up to and including next halt code
DHE	Delete up to but excluding next halt code
DHI	Delete up to and including next halt code
PNL	Punch one newline
PHT	Punch one horizontal tab
PSP	Punch one space
DNL	Delete one newline

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DHT Delete one horizontal tab
DSP Delete one space

INS
String^%, Insert

RTS String RTI String RTL String RTH
String ^%, String^%, String^%, String^%,

Replace string, identifier, line, halt code.

REP Digit ... END Repetitive edit
CAN Digit Cancel repetitive edit
WAI Wait (stop editing and delete remainder of
 master tape)
WTS Wait on halt code (and delete)
COP Copy to next halt code.

The string of an instruction on the edit tape is independent of any layout characters and string searches are independent of any layout on the master tape.

After the steering tape is read in BOWDLER punches a count of the number of instructions read. After the output tape is produced BOWDLER punches a sequence of 120 blanks, 10 erases and a further 120 blanks.

Entry Points

8. Read Steering Tape. Errors in 920 Telecode.
9. Read and Edit Main Tape.
10. Read & Edit Main Tape. Continue after Wait.
11. Output Instruction Count.
13. Read Steering Tape. Errors in 900 Telecode.

Error Codes

The format of error messages is

E "M" where M is the error number in the list below
I "N" where N is the number of the instruction being
 compiled or executed as appropriate

EO One of the initial two telecode words is missing or
 incorrect
E1 Edit instruction incomplete or incorrect
E2 No search string specified

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- E3 No digit after a REP or CAN
- E4 Two REP or END instructions used consecutively
- E5 REP has same label as another group, or CAN has been used for a non-existent group.
- E6 REP instruction not followed by copy search or replace instruction
- E7 Character cannot be converted between input and output telecodes
- E8 String longer than 253 characters
- E9 string search or replace cannot be obeyed at end of input tape
- E10 Sum check failure
- E11 First character on tape not a blank
- E12 Tape has been partially read by not stretch or 2 or more blanks after a newline character in the part of the tape which has been read
- E13 first character on the tape not a 920, 903 or 900 newline character
- E14 Parity error

Warning messages follow a similar format:

- W0 End of steering tape in the middle of a set of repetitive instructions
- W1 Additional characters found after in an instruction designator
- W2 A non-cancel instruction has been used in a repetitive group of instructions
- W3 No space left for edit instructions
- W4 More than 64 characters in a search or replace string
- W5 A non-cancel instruction has been used twice.

BOWDLER70 is demonstrated by DEMO4 in the directory ACDUTILITIES. The example is taken from ACD Book 120 "903 UTILITY SOFTWARE".

BOWDLER.BIN - "BOWDLER 13/7/82"

Editing commands

CAM Cases to be matched (default)
CAD Cases to be distinguished

C - copy
D - delete

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L - string found at start of line
 S - string found anywhere on a line
 I - identifier string found anywhere on a line
 I - inclusive of string
 E - exclusive of string

CSE	string	Copy up to but excluding string
CSI	string	Copy up to and including string
CIE	string	Copy up to but excluding identifier
CII	string	Copy up to and including identifier
CLE	string	Copy up to and including newline before line
CLI	string	Copy up to and including newline after line
DSE	string	Delete up to but excluding string
DSI	string	Delete up to and including string
DIE	string	Delete up to but excluding identifier
DII	string	Delete up to and including identifier
DLE	string	Delete up to and including the newline before line
DLI	string	Delete up to and including newline after string

CHE	Copy up to but excluding next halt code
CHI	Copy up to and including next halt code
DHE	Delete up to but excluding next halt code
DHI	Delete up to and including next halt code
PNL	Punch one newline
PHT	Punch one horizontal tab
PSP	Punch one space
DNL	Delete one newline
DHT	Delete one horizontal tab
DSP	Delete one space

INS
 String^%, Insert

RTS String	RTI String	RTL String	RTH
String ^%,	String^%,	String^%,	String^%,

Replace string, identifier, line, halt code.

REP Digit ...	END	Repetitive edit
CAN Digit		Cancel repetitive edit
WAI		Wait (stop editing and delete remainder of master tape)
WTS		Wait on halt code (and delete)
COP		Copy to next halt code.

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The string of an instruction on the edit tape is independent of any layout characters and string searches are independent of any layout on the master tape.

Entry Points

- 8. Read Steering Tape. Errors in 920 Telecode.
- 9. Read and Edit Main Tape.
- 10. Read & Edit Main Tape. Continue after Wait.
- 11. Output Instruction Count.
- 13. Read Steering Tape. Errors in 900 Telecode.

Error Codes

A: <H> in REP.
B: Not All REPs Cancelled.
C: <H> in Comment.
D: <H> in Command.
E: Unrecognized Command.
F: More than 120 Characters in Line.
G: Telecode Commands not at Start.
H: Nested REP.
I: CAN inside REP.
J: COP inside REP.
K: END outside REP.
L: Empty REP.
M: First Instruction in REP not Copy.
N: REP Does Not Advance.
O: REP or CAN Label Error.
P: CAN Label Not Declared or Cancelled.
Q: REP Label Active in Other REP.
R: More than 32 REPs Active.
S: Spurious Character in Command.
T: String Expected.
U: More Than 3 Characters in Escape Sequence.
V: Spurious Character After ^%.
W: <H> Encountered While Matching.
X: Command Buffer Full.

BOWDLER is demonstrated by DEMO3 in the directory ACDUTILITIES. The example is taken from ACD Book 120 "903 UTILITY SOFTWARE".

CLEAR - CS8KSTOP.BIN / CS8KCONT.BIN

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Clear store sets locations 2-8177 of store to zero. The CS8KSTOP version halts after clearing store in a dynamic loop. The CS8KCONT version jumps to the initial instructions once the store is cleared. CLEAR is illustrated in DEMO10.

DO-ALL 4 - DOALL4.BIN - "DO-ALL 4 3/8/70"

DOALL-4 combines several utility programs in one. It may be used to perform the following functions in 903/900 or 920 telecode:

- A. Remove blanks and erases.
- B. Insert 4 blanks after after newline.
- C. Join several tapes into one.
- D. Copy tapes of any length.
- E. Convert to legible tape.
- F. Convert from one telecode to the other.

It may be used to perform the following functions on any 8-track paper tape:

- G. Parity check.
- H. Check that tapes are the same.
- I. Copy tapes of any length.

Entry points.

- 8. Convert to Legible Tape.
- 9. Select 920 Telecode for output.
- 10. Select 900 Telecode for output.
- 11. Select Clean (i.e., punch 4 blanks after newlines).
- 12. Select Unclean (i.e., no blanks after newlines).
- 16. Read and Punch Telecode. First Tape.
- 17. Read and Punch Telecode. Subsequent Tape.
- 18. Punch <Halt Code>
- 19. Select 903 Telecode for output.
- 20. Read and Form Sumchecks. Even Parity.
- 21. Read & Form Sumchecks. Otherwise.
- 17. Read and Form Sumchecks. Continue after 2 inches Blank.
- 22. Read & Punch (QCOPY). Check Sumchecks.
- 23. Read & Check Sumchecks.

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Note that the entries at 9, 10, 11, 12 and 19 only set flags.

The telecode of each input tape is determined by its first significant character, which should be a newline. Note that this allows tapes of different telecodes to be joined and converted to the output telecode.

Error indications (punched as legible tape).

CH I/O ERROR 1.	Parity Error.
CH I/O ERROR 2.	First Character not <N>.
CH I/O ERROR 3.	Illegal Character.
CH I/O ERROR 4.	Over 120 Characters on Line.
QCOPY ERROR 1.	Parity Error.
QCOPY ERROR 2.	Sumchecks Disagree.

DEMO4 in the directory ACDUTILITIES demonstrates DOALL-4 producing legible tape. DEMO5 illustrates copying; joining and code conversion. DEMO6 demonstrates copying a large tape (QCOPY).

DUMP - DUMP.BIN "DUMP 15/4/70"

Dump is a program for producing a store dump of all non-zero locations from 2-8000 inclusive in the ACD binary format used by ACD SIR. Dump is read in by initial instructions and is self-triggering so the dump is produced immediately. The dumped tape can be read back into the computer under initial instructions.

DEMO10 illustrates the use of DUMP to dump out the results of a 903 FORTRAN compilation, the use of VERIFY to check the content of the dump, CLEAR to clear store and then reloading the dumped program and running it again.

GENSORT - GENSORT.BIN - "GENSORT 8/3/71"

GENSORT is a program for sorting lines of text into alphabetical or numerical order. The user defines the collating sequence by means of a short alphabet tape.

The alphabet tape and the tapes to be sorted must be in the same telecode (903, 900 or 920 telecode, or ASCII with even parity).

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The alphabet tape should comprise:

A newline

The characters used on the tapes to be sorted , excluding newline and halt code, but including space and tab if required, in the desired collating sequence, to a maximum of 63 characters. Blanks, erase and return are ignored on the alphabet tape.

Tapes to be sorted must be terminated with a halt code.

Blanks, erase and return will be ignored.

The text to be sorted may be on multiple tapes. Each tape should not exceed about 20,000 characters.

Entry points:

- 8 Read alphabet tape
- 9 Read first tape to sort
- 10 Read subsequent tape to sort
- 11 Read sorted tape and output merged data
- 12 Output sorted data to punch.

Entry at 11 allows the user to sort and merge. Data previously read in by entry at 9 (and 10) will be output appropriately merged with the presented sorted input tape.

Error indications

Errors are signalled by continuous punching of a legible code:

- 00000o001 Alphabet tape does not start with a newline sequence.
- 00000o010 Non-alphabet character appears in tape to be sorted or merged.
- 00000o011 Character appears twice on alphabet tape
- 00000o100 Over 63 characters in alphabet
- 00000o101 halt code appears in alphabet, or alphabet punched on more than one line
- 00000o110 Character store full.

DEMO8 illustrates the use of GENSORT to sort one tape and then merge with the contents of another sorted tape. It is based on the example in the "ACD UTILITIES" manual.

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MONITOR - MONITOR.900 - "MONITOR 12/3/71"

This routine is a version of 903 SIR MONITOR modified to be a single SIR block and with the entry point having global name QMON rather than MONITOR. In all other respects it is the same. ACD MONITOR is demonstrated in DEMO17.

900 STORE PRINT - STOREPRINT.900
- "900 STORE PRINT 3/8/70"
920 STORE PRINT - STOREPRINT.920
- "920 STORE PRINT 3/8/70"

STORE PRINT is a cut down version of 903 QCHECK used to assist in the checking of programs by printing the content of any number of store locations in either 900 or 920 telecode according to the version used.

STORE PRINT is distributed as a SIR source tape to be assembled as part of a larger system or as a standalone utility.

STORE PRINT should be entered at the location of global label QCHECK. A data tape will then be read in, consisting of one line for each region of store to be printed, terminated by a halt code on a line by itself. Each line should contain two unsigned integers denoting the first and last locations to print and a letter to indicate the style of printing as follows:

- O - instruction
- F - fraction
- I - integer
- B - octal.

If only one location is to be printed the second integer can be omitted.

The output format is suitable for loading with AMEND.
TATDOC - TATDOC.BIN - "TATDOC 27/7/70, Binary Mode 3"

TATDOC is a program used to document telecode tapes. It adds extra newlines and regular intervals allowing a continuous printout to be cut into pages. A page number is inserted at the top of each page, and if the input is a SIR or ALGOL program, the program title will appear at the top of the page also.

50 lines of text appear on each page.

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Source tapes must be in 900 or 920 telecode and each tape must start with a newline and end with a halt code. No line may exceed 74 characters (excluding the newline and any blanks or erases).

If the tape to be documented is a single SIR program it must start with a SIR title. If the tape being documented is a single ALGOL program it must start with an ALGOL title. If the tape to be documented is a SIR label list it must start with a SIR title and end with a halt that is not on a newline. If the tape being documented is of a general nature, the first non-empty line should not start with the symbol "(" or end with the symbol ";".

As an optional facility a title can be read in to be printed near the centre of the top and bottom of each page. The title can consist of up to 50 characters preceded by a newline and terminated by a halt code.

Entry points

- 8 Read first tape to document (SIR, ALGOL or general)
- 9 Read subsequent tape
- 11 Read SIR label list tape to document
- 12 Read heading
- 13 As 8, but use stored title on output
- 14 As 11, but use store title on output
- 15 Set 900 telecode output
- 16 Set 920 telecode output

Error indications

TATDOC gives the following error indication in legible tape form:

CH I/O ERROR 1. Parity error on tape being read.
CH I/O ERROR 2. First character on tape is not a newline, carriage return or line feed.
CH I/O ERROR 3. When reading or punch in 920 telecode, a character cannot be converted to orf rom internal code.

DOCUMENTATION ERROR 1. Entry at 9 used before entry at 8, 11, 13 or 14; or entry at 13 or 14 has been used before entry at 12.
DOCUMENTATION ERROR 2. Character string read in at 12 is too long or contains an illegal separator.

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DOCUMENTATION ERROR 3. Title contains lower case letters or an illegal separator, or a tape entered at 11 or 14 has no title.
DOCUMENTATION ERROR 4. A line of input text is too wide.
DOCUMENTATION ERROR 5. Halt code found in wrong position, probably due to reading a program at 11 or a label list at 8.

EMO9 illustrate TATDOC being used to produce a printout of a label list arising from the assembly of QF, followed by a second run documenting a SIR program (QSMATH) using the top-and-tail facility.

```
900 TELECOP - TELECOP(900).BIN
              - "900 TELECOP 20/7/70"
920 TELECOP - TELECOP(920).BIN
              - "920 TELECOP 20/7/70"
```

TELECOP is a program for joining and making fully checked copies of tapes punched in either 920 or 900 telecode, depending on which version is used. It may be used to copy tapes containing only even parity characters up to 171 feet long (about 20,000 characters) excluding blanks and erase. Each of the tapes to be joined must end with a halt code. When tapes are joined, only the halt code on the final tape will be reproduced.

Entry points

- 8 Read in and store first tape.
- 9 Read a subsequent tape.
- 10 Re-read master tape and verify stored version, if o.k. punch a 'clean' copy.
- 11 As 10 but punch an 'unclean' copy.

Clean copies have return, line feed, blank, blank, blank, blank as the newline sequence, unclean copies have just return, line feed.

Error indications

Errors are signalled by continuous punching of a legible code:

```
00000o001 Even parity check failed.
111110111 Tapes too long to be copied.
00000o010 Tape being read disagrees with stored copy.
```

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TELECOP is demonstrated by DEMO7 which shows the use of both the 900 telecode and 920 telecode versions.

T5-CUM-QIN

T5_QIN1.920 "920 QIN1 20/7/70"

T5_QIN1.900 "900 QIN1 20/7/70"

T5-CUM-QIN is a "direct" version of the QIN1 routine in the ACD QS I/O SIR subroutine package. It reads numbers directly from the reader in place of using the device independent CHIP routine and therefore takes less store. It is provided in versions for 920 and 900 telecode.

T6-CUM-QOUT

T6_QOUT1.920 "920 QOUT1 22/10/68"

T6_QOUT1.900 "900 QOUT1 22/10/68"

T6-CUM-QOUT is a "direct" version of the QOUT1 routine in the ACD QS I/O SIR subroutine package. It outputs numbers directly to the punch in place using the device independent CHOP routine and therefore takes less store. It is provided in versions for 920 and 900 telecode.

900 VERIFY - VERIFY(900).BIN - "

920 VERIFY - VERIFY(920).BIN - "

VERIFY is a program to compare binary tapes in the ACD binary format with the contents of store. VERIFY cannot be used to check binary tapes in T22/23 format - use the 903 utility C4 instead. There are two versions, one that punches error messages in 900 telecode, the other in 920 telecode.

VERIFY is loaded by initial instructions and then entered at 8001 & 17501 with the tape to be verified in the paper tape reader. If the tape is an ACD binary tape and matches store it will be read in its entirety and the program will halt at the end of the tape.

Error indications:

If VERIFY finds a word on the tape and a word in store disagree it will punch on one line in octal:

The address of the word;

The word on the tape;

The word in the store.

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Other errors are indicated by punching codes as follows:

EA	tape being verified loads into area occupied by VERIFY
EL	non-standard loader found at start of the tape
EF	format error - tape not in ACD binary format
ES	sum check failure.

VERIFY is illustrated in DEMO11. A SIR simple program is assembled to a binary tape (without a leading clear store) and loaded in memory. The contents of store are then checked against the binary tape.