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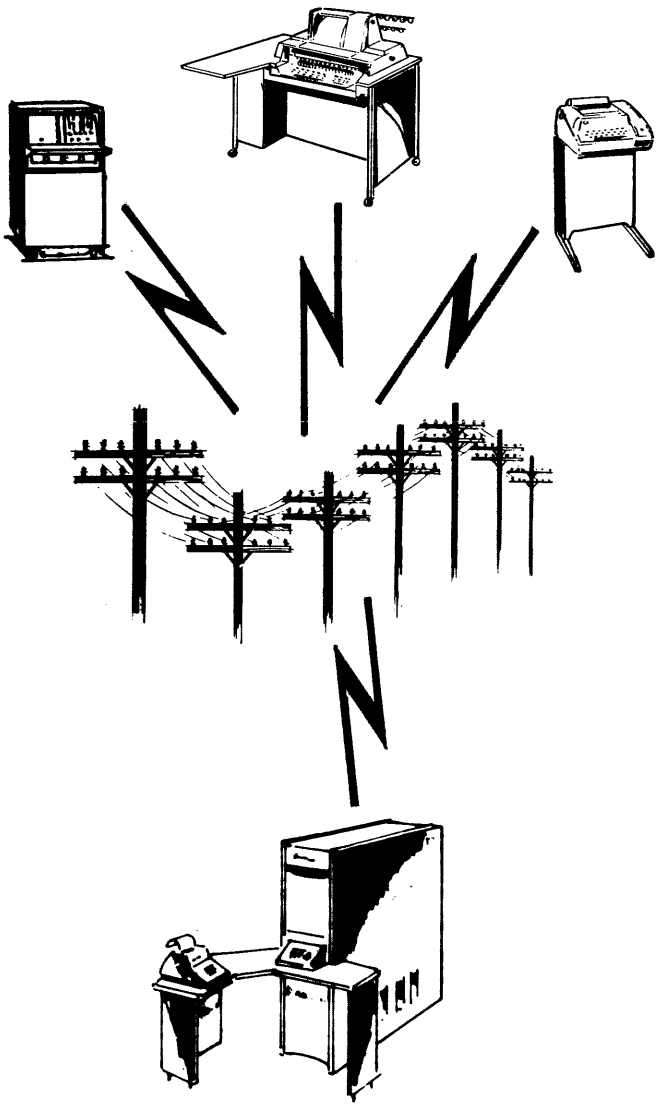

DATA COMMUNICATIONS

INFORMATION MANUAL

Burroughs

B 2500 AND B 3500 SYSTEMS

DATA COMMUNICATIONS INFORMATION MANUAL

Burroughs Corporation
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INTRODUCTION.

IN RECENT YEARS DATA PROCESSING HAS UNDERGONE AN IMPORTANT CHANGE: ITS USE, UNTIL THEN RESTRICTED TO THE COMPUTER SITE, HAS BECOME AVAILABLE TO GEOGRAPHICALLY DISTANT USERS THROUGH A COMBINATION OF THE DATA PROCESSING AND TELE-COMMUNICATIONS EQUIPMENT. COMPUTER PROGRAMMERS, HITHERTO CONCERNED ONLY WITH THE DATA PROCESSING EQUIPMENT, MUST BECOME FAMILIAR WITH THE COMPLEX SYSTEMS AND THE CO-ORDINATION OF THE TELE-COMMUNICATIONS AND DATA PROCESSING HARDWARE.

THE PURPOSE OF THIS MANUAL IS TO GIVE:

1. A CONCISE GENERAL DESCRIPTION OF THE EQIPMENT AND DEFINITION OF THE TERMS COMMONLY USED IN DATA COMMUNICATION OPERATIONS (PART I.);

2. A DESCRIPTION OF THE DATA COMMUNICATION ORIENTED HARDWARE FEATURES OF THE B2500/3500 COMPUTER SYSTEM (PART II.), AND OF THE VARIOUS REMOTE DEVICES WHICH MAY OPERATE IN THE ENVIRONMENT OF THE SYSTEM (PART VI.);

3. B2500/3500 DATA COMMUNICATION PROGRAMMING INFORMATION, COVERING THE SYSTEM'S DATA COMMUNICATION FEATURES IN THE MCP AND ADVANCED ASSEMBLER (PART III.), FORTRAN (PART IV.), AND COBOL (PART V.) LANGUAGES.

THE READER SHOULD BE FAMILIAR WITH THE FOLLOWING LITERATURE:

B2500/3500 SYSTEMS REFERENCE MANUAL,
B2500/3500 MASTER CONTROL PROGRAMS INFORMATION MANUAL,
B2500/3500 ADVANCED ASSEMBLER LANGUAGE MANUAL,
B2500/3500 SYSTEMS COBOL REFERENCE MANUAL.

PART I.

THE TRANSMISSION LINES.

THE FOUR BASIC REQUIREMENTS OF A DATA COMMUNICATION SYSTEM ARE:

1. TRANSMITTER;
2. TRANSMISSION LINE;
3. RECEIVER;
4. DATA SET (REQUIRED, EXCEPT FOR DIRECT CONNECT).

THE RECEIVER AND TRANSMITTER ARE IN THIS CASE A B2500/3500 COMPUTER SYSTEM AND SOME TERMINAL UNIT(S), WHICH THE COMPUTER AND ITS MASTER CONTROL PROGRAM ARE ABLE TO HANDLE. HOWEVER, A TRANSMITTER DOES NOT NECESSARILY DENOTE A TERMINAL UNIT, BECAUSE MESSAGES ARE BEING SENT TO AND FROM BOTH THE COMPUTER AND THE TERMINAL, AND THEY ALTERNATE IN THEIR ROLES AS TRANSMITTER AND RECEIVER.

THE TRANSMISSION LINE IS THE TELE-COMMUNICATION COMPONENT IN THE DATA COMMUNICATION SYSTEM. A TRANSMISSION LINE (OR "COMMUNICATION CHANNEL") IS DEFINED AS THE MEDIUM OVER WHICH SIGNALS MAY BE SENT. IT MAY BE A TELEPHONE OR TELEGRAPH LINE, OR FOR HIGH SPEED TRANSMISSIONS WIRE, MICROWAVE, OR SATELLITE. THE MOST COMMONLY USED TRANSMISSION LINE IS NATURALLY THE TELEPHONE LINE.

TELEPHONE LINES CARRY INFORMATION IN THE FORM OF TONES. DATA IN THE COMPUTERS, ON THE OTHER HAND, IS REPRESENTED IN THE FORM OF PULSES. MODULATORS AND DEMODULATORS ARE USED TO CONVERT THE PULSES INTO TONES AND RECONVERT THE TONES TO PULSES. THE MODULATORS AND DEMODULATORS ARE CALLED "MODEM"-S, OR IN POPULAR USAGE "DATA SET"-S.

TECHNICALLY, THE LINES MAY BE:

1. SIMPLEX LINES, WHICH ALLOW DATA TRANSMISSION IN ONE DIRECTION ONLY;

2. HALF-DUPLEX LINES, WHICH ALLOW DATA TRANSMISSION IN BOTH DIRECTIONS, BUT ONLY SEQUENTIALLY;

3. FULL-DUPLEX LINES, WHICH SERVE FOR SIMULTANEOUS TRANSMISSION IN BOTH DIRECTIONS.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

DATA COMMUNICATIONS WITH THE B2500/3500 ARE IN HALF-DUPLEX MODE. FULL-DUPLEX LINES MAY BE USED, BUT THEY REQUIRE TWO ADAPTERS; TRANSMISSION WITH ONE LINE ADAPTER MAY OCCUR ONLY IN HALF-DUPLEX MODE, I.E., ONLY IN ONE DIRECTION AT A TIME.

TELEPHONE COMPANIES OFFER TWO KINDS OF LINES FOR DATA TRANSMISSION PURPOSES. ONE IS OVER THE TELEPHONE SWITCHED MESSAGE NETWORK, THE OTHER OVER PRIVATE (OR LEASED) LINES.

ON PRIVATE LINE FACILITIES TRANSMISSION CAN BE FASTER, AND THE LINES CAN BE ENGINEERED ACCORDING TO THE NEEDS AND SPECIFICATIONS OF THE USER. PRIVATE LINE TRANSMISSIONS ARE RESTRICTED TO THE POINTS CONNECTED BY THAT LINE. A LINE CONNECTING ONLY ONE TRANSMITTER AND ONE RECEIVER IS CALLED A "POINT-TO-POINT" OR "SINGLE-POINT" LINE. A LINE-SYSTEM CONNECTING MORE TRANSMITTERS AND RECEIVERS IS REFERRED TO AS A "MULTI-POINT" OR "N-POINT" LINE.

A SYSTEM CONNECTED TO THE SWITCHED MESSAGE NETWORK CAN DIAL THROUGH THE TELEPHONE COMPANY'S CENTRAL OFFICE ANY TELEPHONE NUMBER ON THAT SYSTEM AND COMMUNICATE WITH ANY OTHER STATION ON THAT NETWORK. (SWITCHED OR DIALED LINES.)

THE TERM "DATA LINK" IS USED TO REFER TO A COMMUNICATION CHANNEL AND THE COMMUNICATION CONTROLS OF ALL STATIONS (TRANSMITTERS AND RECEIVERS) CONNECTED TO THAT CHANNEL. IN OTHER WORDS, THE DATA LINK IS A COMBINATION OF THE VARIOUS STATIONS AND COMMUNICATION CHANNELS.

THE SPEED OF TRANSMISSION.

THE SOUND WAVE CAUSES A COMPRESSION AND RAREFACTION OF THE AIR, WHICH CAN BE ILLUSTRATED BY A SINE WAVE. ONE COMPLETE SOUND WAVE FROM BEGINNING (COMPRESSION PHASE) TO END (RAREFACTION PHASE) IS DEFINED AS ONE CYCLE; THE NUMBER OF CYCLES IN THE PERIOD OF ONE SECOND IS CALLED "FREQUENCY". FREQUENCY IS EXPRESSED AS "CYCLES" OR "HERTZ", BOTH OF WHICH MEAN CYCLES PER SECOND.

THE WORD "BANDWIDTH" IS USED TO DENOTE A CERTAIN RANGE OF FREQUENCIES, BETWEEN AN UPPER AND LOWER LIMIT, EXPRESSED IN CYCLES. ON THIS BASIS, WE DISTINGUISH THREE BANDWIDTHS:

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

1. NARROWBAND (0 - 600 CYCLES).
2. VOICEBAND, ALSO REFERRED TO AS VOICE-GRADE (200 - 4000 CYCLES).
3. BROADBAND (ABOVE 3000 CYCLES).

TRANSMISSION OF ONE BIT REQUIRES (GENERALLY) TWO CYCLES.

IN NARROWBAND AND VOICEBAND TRANSMISSIONS, TELEPHONE LINES ARE USED.

NARROWBAND.

IN PRIVATE LINE USE, NARROWBAND FACILITIES ARE CLASSIFIED IN FIVE CATEGORIES, CALLED "SCHEDULE"-S. THE LIMITS OF THE SCHEDULES ARE LAID DOWN BY THE FEDERAL COMMUNICATIONS COMMISSION AND RANGE BETWEEN 0 TO 300 BITS PER SECOND. THE MOST OFTEN USED TERMINALS ON THIS TYPE OF COMMUNICATIONS NETWORK ARE THE TELETYPE MODEL 28 AND TELETYPE MODEL 33/35 TELETYPEWRITERS.

DATA CAN ALSO BE TRANSMITTED OVER THE BELL TELEPHONE SYSTEM SWITCHED NETWORK (TWX NETWORK), AT A SPEED OF 110 BITS PER SECOND, AND OVER THE WESTERN UNION TELETYPEWRITER EXCHANGE (TELEX), AT A RATE OF 50 BITS PER SECOND. BOTH OF THESE SERVICES OFFER DIALING CAPABILITIES TO ANOTHER TELETYPEWRITER ON THE SAME EXCHANGE SERVICE.

VOICEBAND.

VOICEBAND FACILITIES PROVIDE A FLEXIBLE, GOOD QUALITY, AND ECONOMICAL MEANS OF TRANSMITTING DATA.

VOICE-GRADE TRANSMISSION IS AVAILABLE AS A PRIVATE LINE SERVICE, WITH A MAXIMUM OF 2400 BITS PER SECOND TRANSMISSION SPEED.

TRANSMISSION ON SWITCHED LINE NETWORK IS SLOWER THAN ON PRIVATE LINES. TRANSMITTER AND RECEIVERS USED ON SWITCHED LINE NETWORKS MUST NOT EXCEED A TRANSMISSION SPEED OF 2000 BITS/SECOND. A BELL SYSTEM DATA-PHONE DATA SET MUST BE USED TO INTERFACE THE SWITCHED MESSAGE NETWORK. THE DATA SET IS NECESSARY TO CONVERT DIRECT CURRENT PULSES REPRESENTING DATA-BITS, INTO FREQUENCY TONES, SINCE TELEPHONE LINES DO NOT RECOGNIZE ELECTRICAL PULSES. SIMILARLY, ANOTHER DATA SET IS NEEDED AT THE RECEIVING END OF THE LINE TO RECONVERT THE FREQUENCY TONES INTO

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

ELECTRICAL PULSES.

BROADBAND.

IN THE BROADBAND TRANSMISSION GROUP, THE LEAST EXPENSIVE AND MOST COMMON MEDIUM IS THE TRANSMISSION BY WIRE. THE BELL SYSTEM OFFERS SUCH A SERVICE UNDER THE NAME "TELPAK". IT CONSISTS ESSENTIALLY OF A SPECIAL GROUPING OF PRIVATE LINES CAPABLE OF TRANSMISSIONS - DEPENDING UPON THE TELPAK ARRANGEMENTS - FROM 40,800 BITS UP TO 500,000 BITS PER SECOND.

LINE DISCIPLINE.

AT THIS POINT IT IS NECESSARY TO DEFINE A FEW GENERAL TERMS USED IN DATA COMMUNICATION LITERATURE. A COMPUTER HANDLING A NUMBER OF REMOTE TERMINALS THROUGH A MULTI-POINT NETWORK IS A CONTROL STATION; I.E., TERMINALS MAY NOT COMMUNICATE WITH EACH OTHER WITHOUT APPROVAL OF THE CONTROL STATION, OR ONLY THROUGH THE CONTROL STATION. THE CONTROL STATION ALONE HAS THE RIGHT TO TRANSMIT A POLLING SUPERVISORY SEQUENCE. POLLING MEANS INQUIRING OF THE REMOTE STATIONS WHETHER THEY ARE READY TO TRANSMIT. SELECTION MEANS DESIGNATING THE REMOTE STATIONS WHICH ARE TO RECEIVE THE MESSAGE THAT IS TO BE TRANSMITTED.

"LINE DISCIPLINE" IS THE MANAGEMENT OF THE TRAFFIC OF INFORMATION ON THE COMMUNICATION LINES BY THE CONTROL STATION.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

SCHEMATIC LAYOUT OF A DATA COMMUNICATIONS SYSTEM.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

THE TELE-COMMUNICATION COMPONENTS IN THE ILLUSTRATED SYSTEM ARE THE TWO DATA SETS AND THE WIRE NETWORK CONNECTING THEM.

WE MAKE THE ARBITRARY ASSUMPTION THAT IN THE ABOVE DRAWING THE "TRANSMITTER" IS A TERMINAL UNIT, THE RECEIVER IS A B2500/3500 SYSTEM. A TRANSMITTER MAY BE ANY OF THE MORE THAN 15 TERMINAL STATIONS THE B2500/3500 SYSTEM AND ITS MCP IS EQUIPPED TO HANDLE, INCLUDING OTHER B2500/3500 SYSTEMS. SINCE EACH OF THESE TERMINAL STATIONS HAVE THEIR OWN CHARACTERISTICS. PART VI. OF THIS MANUAL DESCRIBES EACH TERMINAL INDIVIDUALLY.

CERTAIN TYPES OF TERMINALS (REMOTE DEVICES) ARE PERMITTED TO INPUT MCP CONTROL INFORMATION TO THE SYSTEM. THESE TERMINALS ARE SAID TO HAVE

REMOTE KEYBOARD CONTROL FACILITIES (REMOTE SPO).

TO QUALIFY AS A REMOTE SPO, THE TERMINAL MUST HAVE THE FOLLOWING CAPABILITIES:

1. TERMINALS MUST BE OUTPUT AS WELL AS INPUT DEVICES;
2. TERMINALS MUST NOT REQUIRE POLLING OR SELECTION;
3. THEY MUST USE ONE OF THE CODES FOR WHICH THE MCP PROVIDES TRANSLATION;
4. THEY MUST NOT REQUIRE ACKNOWLEDGEMENT TO THEIR MESSAGES.

THE INPUT/OUTPUT DEVICE.

IN CASE OF THE TRANSMITTER, THIS VARIES ACCORDING TO MACHINE TYPE. IT MAY BE A KEYBOARD, OR A PAPER TAPE READER AND PUNCH, CARD READER AND PUNCH, PRINTER, MAGNETIC TAPE, ETC.

IN CASE OF THE RECEIVER, IT IS THE B2500/3500 SYSTEM.

THE INPUT-OUTPUT CONTROLS. ("LINE CONTROLS.")

ON THE B2500/3500 SYSTEM, A SINGLE LINE CONTROL PROVIDES CONNECTION BETWEEN A SINGLE I/O CHANNEL AND A SINGLE COMMUNICATION LINE. THE MULTIPLE-LINE CONTROL ALLOWS A NUMBER OF COMMUNICATION LINES, UP TO A

MAXIMUM OF 36, TO TIME-SHARE ONE I/O CHANNEL. ONE LINE ADAPTER IS REQUIRED FOR EACH COMMUNICATION LINE.

THE INPUT/OUTPUT CONTROL UNITS PERFORM A BUFFERING FUNCTION. ON THE INPUT SIDE, THEY COLLECT THE DATA TO BE TRANSMITTED, STORE IT TEMPORARILY, THEN TRANSMIT IT AT A RATE COMPATIBLE WITH THE COMMUNICATIONS FACILITY. ON THE OUTPUT SIDE, THEY COLLECT THE INCOMING DATA, STORE IT, AND THEN TRANSMIT IT TO THE RECEIVER AT THE APPROPRIATE RATE. THE B2500/3500 SENDS AND RECEIVES DATA ONE CHARACTER AT A TIME; THE INPUT/OUTPUT CONTROL UNITS MUST THEREFORE COLLECT AND STORE THE APPROPRIATE NUMBER OF BITS BEFORE TRANSMISSION TO OR FROM THE COMPUTER CAN TAKE PLACE.

ON THE B2500/3500 SYSTEM, THE LINE CONTROL UNITS ALSO CONTAIN THE

ERROR CONTROL UNITS.

SINCE ERRORS ARE INEVITABLE IN ANY DATA TRANSMISSION SYSTEMS, TWO COMMON TECHNIQUES HAVE BEEN DEVELOPED FOR ERROR DETECTION. CHARACTER VALIDITY CHECKING (ALSO CALLED "VERTICAL REDUNDANCY CHECKING", ABBREVIATED AS "VRC") IS PERFORMED ON EACH CHARACTER TO ASCERTAIN THAT THE BIT CONFIGURATION HAS NOT CHANGED THROUGH TRANSMISSION ERROR. THIS METHOD OF ERROR CHECKING IS AVAILABLE FOR ANY MACHINE GENERATING A PARITY BIT FOR EACH CHARACTER.

MESSAGE VALIDITY CHECKING (LONGITUDINAL REDUNDANCY CHECK, OR ABBREVIATED AS "LRC") IS A CHECK OF THE TOTAL OF THE TRANSMITTED DATA BITS. THIS CHECKING IS DONE NOT ON INDIVIDUAL CHARACTERS, BUT ON DATA BLOCKS. BOTH THE TRANSMITTER AND THE RECEIVER KEEP A COUNT OF THE ONE AND ZERO BITS TRANSMITTED IN EACH CHARACTER POSITION AND AT THE END OF THE TRANSMISSION OF A BLOCK THE COUNT ITSELF IS TRANSMITTED AND COMPARED. THE CHARACTER CONTAINING THIS COUNT IS CALLED THE "BLOCK CHECK CHARACTER", ABBREVIATED AS "BCC".

THE "TIME OUT" FEATURE.

IF, DURING TRANSMISSION, A CHARACTER IS NOT RECEIVED WITHIN EVERY N SECOND (N DEPENDING ON THE CHARACTERISTICS OF THE LINE ADAPTER IN USE), THE I/O OPERATION IS TERMINATED AND A "TIME OUT" CONDITION REPORTED TO THE PROGRAM.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

ERROR CHECKING IS ALWAYS THE FUNCTION OF THE RECEIVER.

ANOTHER IMPORTANT COMPONENT OF THE LINE CONTROL UNITS ARE THE

SYNCHRONIZATION UNITS.

DATA SIGNALS ARE TIME DEPENDENT. BITS MUST BE TRANSMITTED AT PRECISE TIME INTERVALS, THUS SYNCHRONIZATION MUST EXIST BETWEEN THE TRANSMITTING AND THE RECEIVING STATIONS. THERE ARE TWO COMMON TECHNIQUES FOR OBTAINING SYNCHRONIZATION:

1. ASYNCHRONOUS (START/STOP) TRANSMISSION. IN THIS MODE OF TRANSMISSION EVERY CHARACTER IS PRECEDED BY A ZERO BIT AND DELIMITED BY A ONE BIT.TRANSMISSION OF DATA BITS WITHIN THE START/STOP BITS MUST BE IN STRICT TIME ORDER; DATA CHARACTERS, HOWEVER, NEED NOT BE TRANSMITTED IN TIME ORDER, SINCE THE START/STOP BITS CLEARLY DEFINE THE BEGINNING AND THE END OF EACH CHARACTER. THE ADVANTAGE OF THIS METHOD IS THAT IT ALLOWS TRANSMISSION FROM SUCH IRREGULAR DEVICES AS A KEYBOARD. HOWEVER, TRANSMISSION OF THE START/STOP BITS INCREASES THE TIME OF TRANSMISSION.

2. SYNCHRONOUS TRANSMISSION. IN THIS TYPE OF TRANSMISSION, THERE ARE NO START AND STOP BITS; INFORMATION BITS FLOW AT A STRICT TIME INTERVAL AND THE RECEIVING STATION INTERPRETS THE INCOMING BITS; THE B2500/3500 COLLECTS AND STORES AN APPROPRIATE NUMBER OF BITS AND INTERPRETS THEM AS A CHARACTER. SYNCHRONOUS TERMINALS REQUIRE SYNCHRONIZATION ("SYNC") CHARACTERS, I.E., A CHARACTER DEFINED FOR THE PURPOSE OF ESTABLISHING TIME-COORDINATION BETWEEN THE TRANSMITTER AND RECEIVER STATIONS. (IN USASCII THIS CHARACTER IS: "16".) PRIOR TO RECEIVING THE "SYNC" CHARACTERS, THE RECEIVER STATION IS NOT SENSITIVE TO ANY OTHER CODE. THE MINIMUM NUMBER OF THE REQUIRED "SYNC" CHARACTERS DEPENDS UPON THE SPECIFICATIONS OF THE PARTICULAR TERMINAL; THE NUMBER MAY BE INCREASED PROGRAMMATICALLY. THE "SYNC" CHARACTERS ARE NOT COUNTED IN THE BCC AND NOT STORED IN MEMORY. THEY ARE ALSO IGNORED IN THE TRANSPARENT MODE OPERATIONS.

THIS METHOD GIVES A HIGHER TRANSMISSION RATE.

THE LINE ADAPTERS.

THE LINE ADAPTERS ARE DEVICES REQUIRED TO INTERFACE THE I/O CHANNELS AND THE COMMUNICATION LINES. ONE LINE ADAPTER IS REQUIRED FOR EACH

COMMUNICATION LINE, I.E., FOR A SINGLE LINE CONTROL ONE ADAPTER, FOR A MULTI-LINE CONTROL AS MANY ADAPTERS AS THERE ARE THERE ARE COMMUNICATION LINES CONNECTED TO THE I/O CHANNEL.

ADAPTERS PROVIDE SUCH INFORMATION TO THE LINE CONTROLS AS CHARACTER LENGTH, NUMBER OF START AND STOP BITS, TYPE OF TRANSMISSION (SYNCHRONOUS OR ASYNCHRONOUS), TYPE OF LINE CONTROL, ETC.

TO SUM UP, THE ADAPTER DEFINES THE CHARACTERISTICS OF THE REMOTE DEVICE ATTACHED TO THAT LINE; AN ADAPTER, DESIGNED TO HANDLE THE SPECIAL FEATURES OF THE ATTACHED REMOTE DEVICE, MUST CONNECT THE B2500/3500 AND THE TELEPHONE LINE.

CODES.

IN ADDITION TO EBCDIC, THE B2500/3500 SYSTEM CAN HANDLE THE FOLLOWING CODES:

1. BAUDOT CODE. THIS CODE SYSTEM IS USED BY TELETYPE MODEL 28 TELETYPEWRITER. FIVE BITS ARE USED TO REPRESENT A CHARACTER, GIVING A TOTAL OF 32 VARIATIONS, I.E., 32 CHARACTERS. SINCE THIS IS NOT ENOUGH TO MEET THE REQUIREMENTS OF THE ALPHA AND NUMERIC CHARACTERS, A SPECIAL CODE, THE "SHIFT" CODE IS USED TO INDICATE WHETHER THE INCOMING CHARACTER IS A "LETTER" OR A "FIGURE".

2. PTTC/6. THIS CODE IS USED BY THE IBM 1050 TERMINAL.

3. USASCII. (USA STANDARD CODE FOR INFORMATION INTERCHANGE). THIS IS AN 8 BIT CODE, 7 BITS REPRESENTING EVERY CHARACTER, PLUS ONE PARITY BIT. THE CHARACTER SET CONSISTS OF 128 CHARACTERS, OF WHICH 34 ARE CONTROL SYMBOLS. (ALSO REFERRED TO AS "CONTROL CHARACTERS".)

4. BCL (BURROUGHS COMMON LANGUAGE). 7-BIT ALPHANUMERIC CODE, AS TRANSMITTED FROM THE B500 SERIES COMPUTER.

TRANSLATION TABLES ARE CHARTS SHOWING ONE OF THE ABOVE LISTED CODE SETS AND THE CORRESPONDING EBCDIC CODES WHICH REPLACE THEM IN THE B2500/3500 COMPUTER IF TRANSLATION IS REQUESTED. THE TABLES ARE SHOWN IN PART VI., IN THE SECTIONS DEALING WITH THE PARTICULAR HARDWARE THAT USES THAT CODE.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

THE B2500/3500 MASTER CONTROL PROGRAM PROVIDES THE OPTION FOR OBJECT PROGRAMS TO INVOKE CODE TRANSLATION WITH THE READ OR WRITE REQUEST. IF THE CODE TRANSLATION FACILITIES OF THE MCP ARE NOT USED, IT IS THE OBJECT PROGRAMS RESPONSIBILITY TO CONSTRUCT THE PROPER CODE STRINGS FOR COMMUNICATION WITH THE DESIRED DEVICE.

CONTROL CHARACTERS. (CONTROL SYMBOLS.)

CONTROL CHARACTERS HAVE BEEN DEFINED BY THE USA STANDARD CODE FOR INFORMATION INTERCHANGE SYSTEM TO INSURE THE ORDERLY SEQUENCE AND PROPER SEPARATION OF MESSAGES BETWEEN TRANSMITTING STATIONS.

THESE CONTROL CHARACTERS HAVE SEVERAL FUNCTIONS:

1. THEY SERVE TO ESTABLISH COMMUNICATION BETWEEN THE STATIONS WHICH ARE READY TO TRANSMIT AND RECEIVING STATION(S), WHICH MAY OR MAY NOT BE READY TO RECEIVE THE MESSAGE.

2. THEY DEFINE THE BEGINNING AND END OF THE MESSAGES AND WITHIN THE MESSAGES SEPARATE THE "HEADING" AND THE "TEXT" (WHERE SUCH STRUCTURING IS REQUIRED), AND POSSIBLY OTHER PARTS. THE "HEADING" OF THE MESSAGE IS A SEQUENCE OF CHARACTERS SENT BY THE TRANSMITTER AND MAY CONTAIN SUCH INFORMATION AS ROUTING, PRIORITY, SECURITY, ETC. THE "TEXT" PART OF THE MESSAGE CONTAINS THE ACTUAL INFORMATION TO BE TRANSMITTED.

3. A CONTROL CHARACTER SIGNALS THE END OF AN ORDERLY TRANSMISSION.

CONTACT BETWEEN THE TRANSMITTER AND RECEIVER MAY BE ESTABLISHED IN SEVERAL WAYS. THE METHODS DEPEND ON THE TYPE OF EQUIPMENT USED AND WILL BE POINTED OUT IN THE SECTION DEALING WITH THE INDIVIDUAL TERMINALS. NOT ALL OF THE CONTROL CHARACTERS DESCRIBED ON THE FOLLOWING PAGES MAY BE ALLOWABLE OR NECESSARY IN EVERY TYPE OF TRANSMISSION. THE READER MUST REFER TO THE DESCRIPTION OF THE SPECIFIC TERMINALS IN PART VI. TO LEARN WHICH CONTROL CHARACTERS HE MAY USE IN HIS PROGRAM.

THE CONTROL SYMBOLS ARE DEFINED BY THE USA STANDARDS AND GROUPED IN THREE CATEGORIES. A "CONTROL CHARACTER" IS DEFINED AS A CHARACTER INTENDED TO CONTROL OR FACILITATE TRANSMISSION OF INFORMATION OVER COMMUNICATION NETWORKS. A "FORMAT EFFECTOR" IS A CHARACTER WHICH CONTROLS THE LAYOUT OR POSITIONING OF INFORMATION IN PRINTING OR DISPLAY

DEVICES. AN "INFORMATION SEPARATOR" IS A CHARACTER USED TO SEPARATE AND QUALIFY INFORMATION IN A LOGICAL SENSE.

NUL — NULL: THE ALL-ZEROES CHARACTER WHICH MAY SERVE TO ACCOMPLISH TIME FILL AND MEDIA FILL.

SOH — START OF HEADING: A COMMUNICATION CONTROL CHARACTER USED AT THE BEGINNING OF A SEQUENCE OF CHARACTERS WHICH CONSTITUTE A MACHINE-SENSIBLE ADDRESS OR ROUTING INFORMATION. SUCH A SEQUENCE IS REFERRED TO AS A "HEADING". AN STX CHARACTER HAS THE EFFECT OF TERMINATING A HEADING.

STX — START OF TEXT: A COMMUNICATION CONTROL CHARACTER WHICH PRECEDES A SEQUENCE OF CHARACTERS THAT IS TO BE TREATED AS AN ENTITY AND ENTIRELY TRANSMITTED THROUGH THE ULTIMATE DESTINATION. SUCH A SEQUENCE IS REFERRED TO AS "TEXT". STX MAY BE USED TO TERMINATE A SEQUENCE OF CHARACTERS STARTED BY SOH.

ETX — END OF TEXT: A COMMUNICATION CONTROL CHARACTER USED TO TERMINATE A SEQUENCE OF CHARACTERS STARTED WITH STX AND TRANSMITTED AS AN ENTITY.

EOT — END OF TRANSMISSION: A COMMUNICATION CONTROL CHARACTER USED TO INDICATE THE CONCLUSION OF A TRANSMISSION, WHICH MAY HAVE CONTAINED ONE OR MORE TEXTS AND ANY ASSOCIATED HEADINGS.

ENQ — ENQUIRY: A COMMUNICATION CONTROL CHARACTER USED IN DATA COMMUNICATION SYSTEMS AS A REQUEST FOR A RESPONSE FROM A REMOTE STATION. IT MAY BE USED AS A "WHO ARE YOU" (WRU) TO OBTAIN IDENTIFICATION, OR MAY BE USED TO OBTAIN STATION STATUS, ETC.

ACK — ACKNOWLEDGE: A COMMUNICATION CONTROL CHARACTER TRANSMITTED BY A RECEIVER AS AN AFFIRMATIVE RESPONSE TO THE SENDER.

BEL — BELL: A CHARACTER FOR USE WHEN THERE IS A NEED TO CALL FOR HUMAN ATTENTION. IT MAY CONTROL ALARM OR ATTENTION DEVICES.

PART I. - DATA COMM. EQUIPMENT AND TERMINOLOGY.

BS — BACKSPACE: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION ONE PRINTING SPACE BACKWARD ON THE PRINTING LINE.

HT — HORIZONTAL TABULATION: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION TO THE NEXT IN A SERIES OF PREDETERMINED POSITIONS ALONG THE PRINTING LINE. (APPLICABLE ALSO TO DISPLAY DEVICES AND THE SKIP FUNCTION ON PUNCHED CARDS.)

LF — LINE FEED: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION TO THE NEXT PRINTING LINE. (APPLICABLE ALSO TO DISPLAY DEVICES.)

VT — VERTICAL TABULATION: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION TO THE NEXT IN A SERIES OF PREDETERMINED PRINTING LINES. (APPLICABLE ALSO TO DISPLAY DEVICES.)

FF — FORM FEED: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION TO THE FIRST PRE-DETERMINED PRINTING LINE ON THE NEXT FORM OR PAGE. (APPLICABLE ALSO TO DISPLAY DEVICES.)

CR — CARRIAGE RETURN: A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF THE PRINTING POSITION TO THE FIRST PRINTING POSITION ON THE SAME PRINTING LINE. (APPLICABLE ALSO TO DISPLAY DEVICES.)

SO — SHIFT OUT: A CONTROL CHARACTER INDICATING THAT THE CODE COMBINATIONS WHICH FOLLOW SHALL BE INTERPRETED AS OUTSIDE OF THE CHARACTER SET OF THE STANDARD CODE TABLE UNTIL A "SHIFT IN" CHARACTER IS REACHED.

SI — SHIFT IN: A CONTROL CHARACTER INDICATING THAT THE CODE COMBINATIONS WHICH FOLLOW SHALL BE INTERPRETED ACCORD-ING TO THE STANDARD CODE TABLE.

DLE — DATA LINK ESCAPE: A COMMUNICATION CONTROL CHARACTER WHICH WILL CHANGE THE MEANING OF A LIMITED NUMBER OF CONTIGUOUSLY FOLLOWING CHARACTERS. IT IS USED EXCLUSIVELY TO PROVIDE

SUPPLEMENTARY CONTROLS IN DATA COMMUNICATIONS NETWORKS.

DC1, DC2, DC3, DC4 — DEVICE CONTROLS: CHARACTERS FOR THE CONTROL OF ANCILLARY DEVICES ASSOCIATED WITH DATA PROCESSING OR TELECOMMUNICATION SYSTEMS, MORE ESPECIALLY SWITCHING DEVICES "ON" OR "OFF".(IF A SINGLE "STOP" CONTROL IS REQUIRED TO INTERRUPT OR TURN OFF ANCILLARY DEVICES, DC4 IS THE PREFERRED ASSIGNMENT.)

NAK — NEGATIVE ACKNOWLEDGE: A COMMUNICATION CONTROL CHARACTER TRANSMITTED BY A RECEIVER AS A NEGATIVE RESPONSE TO THE SENDER.

SYN — SYNCHRONOUS IDLE: A COMMUNICATION CONTROL CHARACTER USED BY A SYNCHRONOUS TRANSMISSION SYSTEM IN THE ABSENCE OF ANY OTHER CHARACTER TO PROVIDE A SIGNAL FROM WHICH SYNCHRONISM MAY BE ACHIEVED OR RETAINED.

ETB — END OF TRANSMISSION BLOCK: A COMMUNICATION CONTROL CHARACTER USED TO INDICATE THE END OF A BLOCK OF DATA FOR COMMUNICATION PURPOSES. ETB IS USED FOR BLOCKING DATA WHERE THE BLOCK STRUCTURE IS NOT NECESSARILY RELATED TO THE PROCESSING FORMAT.

CAN — CANCEL: A CONTROL CHARACTER USED TO INDICATE THAT THE DATA WITH WHICH IT IS SENT IS IN ERROR OR IS TO BE DISREGARDED.

EM — END OF MEDIUM: A CONTROL CHARACTER ASSOCIATED WITH THE SENT DATA WHICH MAY BE USED TO IDENTIFY THE PHYSICAL END OF THE MEDIUM, OR THE END OF THE USED OR WANTED, PORTION OF INFORMATION RECORDED ON A MEDIUM. (THE POSITION OF THIS CHARACTER DOES NOT NECESSARILY CORRESPOND TO THE PHYSICAL END OF THE MEDIUM.)

SUB — SUBSTITUTE: A CHARACTER THAT MAY BE SUBSTITUTED FOR A CHARACTER WHICH IS DETERMINED TO BE INVALID OR IN ERROR.

ESC — ESCAPE: A CONTROL CHARACTER INTENDED TO PROVIDE CODE EXTENSION (SUPPLEMENTARY CHARACTERS) IN GENERAL

INFORMATION INTERCHANGE. THE ESCAPE CHARACTER ITSELF IS A PREFIX AFFECTING THE INTERPRETATION OF A LIMITED NUMBER OF CONTIGUOUSLY FOLLOWING CHARACTERS.

FS FILE SEPARATOR,
GS GROUP SEPARATOR,
RS RECORD SEPARATOR,
US UNIT SEPARATOR:
THESE INFORMATION SEPARATORS MAY BE USED WITHIN DATA IN OPTIONAL FASHION, EXCEPT THAT THEIR HIERARCHICAL RELATIONSHIP SHALL BE: FS IS THE MOST INCLUSIVE, THEN GS, THEN RS, AND US IS LEAST INCLUSIVE. (THE CONTENT OF FILE, GROUP, RECORD OR UNIT ARE NOT SPECIFIED.)

DEL DELETE: THIS CHARACTER IS USED PRIMARILY TO ERASE OR OBLITERATE ERRONEOUS OR UNWANTED CHARACTERS IN PERFORATED TAPE. (IN THE STRICT SENSE DEL IS NOT A CONTROL CHARACTER.)

SP SPACE: A NORMALLY NON PRINTING GRAPHIC CHARACTER USED TO SEPARATE WORDS. IT IS ALSO A FORMAT EFFECTOR WHICH CONTROLS THE MOVEMENT OF A PRINTING POSITION, ONE PRINTING POSITION FORWARD. (APPLICABLE ALSO TO DISPLAY DEVICES.)

PART II. - B2500/3500 DATA COMM. FEATURES.

PART II.

B2500/3500 DATA COMM I/O DESCRIPTORS.

THE GENERAL FORMAT OF THE DATA COMM I/O DESCRIPTORS IS:

OP. CODE	2 DIGITS
UU FIELD	2 DIGITS
VV FIELD	2 DIGITS
A-ADDRESS (BEG.ADDR.)	6 DIGITS
B-ADDRESS (END-ADDR.)	6 DIGITS

THE OPERATOR CODES ARE:

OP. CODE	FUNCTION	VARIANT BITS ALLOWED
32	READ TO CONTROL	V1,V2,V5,V7 AND V8=2 CONCURRENTLY
33	WRITE TRANSPARENT - READ TO CONTROL	V1,V7
34	WRITE TO CONTROL	V1,V2,V3,V4, V5,V6,V7,V8
31	BUFFER EMPTY	NONE
35	INPUT REQUEST ENABLE	NONE
39	UNCONDITIONAL CANCEL	V1,V7
37	CONDITIONAL CANCEL	NONE

THE UU FIELD CONTAINS THE ADAPTER NUMBER. FOR SINGLE LINE CONTROLS IT IS ALWAYS 00, FOR MULTI-LINE CONTROLS IT IS A TWO-DIGIT NUMBER FROM 01 THROUGH 36.

THE VV FIELD CONTAINS THE VARIANT DIGITS (8 BITS) WHICH ARE INTERPRETED IN THE FOLLOWING MANNER:

```
V:  8  7  6  5  4  3  2  1
    .....  .....
   DIGIT #5   DIGIT #6
```

THE VARIANT BITS TURNED ON (V = 1) ARE INTERPRETED:

PART II. - B2500/3500 DATA COMM. FEATURES.

V1 = DIAL MODE OR DISCONNECT TELEPHONE LINE,
V2 = STREAM MODE,
V3 = FLIP TO READ CONTROL,
V4 = FLIP TO READ TRANSPARENT,

V3 AND V4 CONCURRENTLY = AUTOMATIC POLLING,

V5 = PRESET STX,
V6 = DELETE ETX,
V7 = INHIBIT TIME OUT OR TRANSMIT BREAK,
V8 = VOICE RESPONSE MODE

V4 AND V8 CONCURRENTLY = TONE RESPONSE.

V8 AND V2 CONCURRENTLY = IGNORE ENQ.

V1, V5, V6, V7 MAY BE USED INDEPENDENTLY.

THE FOLLOWING VARIANTS USED CONCURRENTLY ARE UNDEFINED, AND MAY CAUSE UNPREDICTABLE RESULTS:

1. V2, V4, V8.
2. V2, V4.

DESCRIPTOR OPERATION.

READ TO CONTROL.

THIS OPERATOR CAUSES A READ FROM THE REMOTE DEVICE INTO ASCENDING MEMORY LOCATIONS STARTING WITH THE A-ADDRESS UNTIL AN ENDING CONTROL CHARACTER IS DETECTED, BUT NOT INTO THE B-ADDRESS.

AN ENDING CONTROL CHARACTER IS DEFINED AS ANY CONTROL CHARACTER RECOGNIZED BY THE LINE ADAPTER AS A CHARACTER WHICH TERMINATES THE I/O OPERATION.

WRITE TRANSPARENT - READ TO CONTROL.

WRITE TO REMOTE DEVICE FROM ASCENDING MEMORY LOCATIONS STARTING AT A-ADDRESS, AND CONTINUE TO WRITE UNTIL B-ADDRESS IS REACHED, REGARDLESS TO THE OCCURRENCE OF ENDING CHARACTERS. CONTINUE WITH READING FROM THE REMOTE DEVICE INTO ASCENDING MEMORY LOCATIONS STARTING AT B-ADDRESS UNTIL AN ENDING CONTROL CHARACTER IS DETECTED, BUT NOT INTO B-ADDRESS+ 200.

WRITE TO CONTROL.

WRITE TO REMOTE DEVICE FROM ASCENDING MEMORY LOCATIONS STARTING AT A-ADDRESS AND CONTINUING UNTIL AN ENDING CONTROL CHARACTER IS DETECTED BUT NOT INTO THE B-ADDRESS.

BUFFER EMPTY.

THIS DESCRIPTOR IS USED IN THE STREAM MODE TO NOTIFY THE CONTROL, THAT THE TRAILING 100-CHARACTER BUFFER HAS BEEN EMPTIED OR FILLED, ACCORDING TO THE STREAM OPERATION READ OR WRITE. (SEE THE DESCRIPTION OF THE V2 FUNCTION.)

INPUT REQUEST ENABLE.

THIS DESCRIPTOR HAS THREE FUNCTIONS:

ON DIALED LINES:

IT RECOGNIZES THE RING INDICATOR. THIS MEANS THAT IT RECOGNIZES THAT A REMOTE STATION IS CALLING THE COMPUTER ON A DIALED TELEPHONE LINE.

AFTER CONNECTION HAS BEEN ESTABLISHED BETWEEN A REMOTE STATION AND THE COMPUTER, AN ENABLE OPERATOR DISCONNECTS THE TELEPHONE LINE.

PART II. - B2500/3500 DATA COMM. FEATURES.

ON LEASED LINES:

THE ENABLE DESCRIPTOR RECOGNIZES THE INPUT REQUEST CHARACTER (ENQ).

UNCONDITIONAL CANCEL.

THIS DESCRIPTOR CANCELS A PRIOR DESCRIPTOR UNCONDITIONALLY. FURTHER INPUT REQUESTS ARE IGNORED.

CONDITIONAL CANCEL.

THIS DESCRIPTOR CANCELS A PRIOR DESCRIPTOR ONLY IF AN OPERATION IS NOT IN PROGRESS. FURTHER INPUT REQUESTS ARE IGNORED.

VARIANT OPERATIONS:

V1 - DIAL MODE (OR DISCONNECT).

THE DIAL NUMBER IS STORED IN MEMORY STARTING AT THE A-ADDRESS. THE FIELD CONTAINING THE DIAL NUMBER MUST BE DECLARED UNSIGNED NUMERIC AND MUST CONSIST OF DIGITS ONLY. UNDIGITS ARE NOT PERMITTED. THE DIAL FIELD MUST BE TERMINATED BY THE CONTROL CODE 1100 (BINARY), WHICH IS THE UNDIGIT "C". THE TOTAL NUMBER OF DIGITS MUST BE EVEN, - IF IT IS NOT EVEN, A FILLER DIGIT MUST BE ADDED. THE FILLER DIGIT MAY BE ANY DIGIT AND MUST IMMEDIATELY FOLLOW THE UNDIGIT "C".

INFORMATION TO BE WRITTEN OR RECEIVED STARTS IN THE FIELD FOLLOWING THE CONTROL (OR FILLER) DIGIT.

V1 USED WITH THE UNCONDITIONAL CANCEL CODE PERFORMS AN ENTIRELY DIFFERENT FUNCTION: IT DISCONNECTS THE TELEPHONE LINE.

V2 - STREAM MODE.

THIS VARIANT MAY BE USED WITH THE READ TO CONTROL OR WRITE-TO-CONTROL OPERATORS ONLY. ORDINARILY, INFORMATION IS TRANSMITTED BEGINNING FROM THE A-ADDRESS UNTIL AN ENDING CONTROL CHARACTER IS DETECTED, BUT NOT INTO B-ADDRESS. HOWEVER, IF THE STREAM MODE VARIANT BIT IS SET, INFORMATION WILL BE CONTINUALLY TRANSFERRED TO OR FROM CORE MEMORY UNTIL AN ENDING CONTROL CHARACTER IS DETECTED, I.E., BEYOND THE B-ADDRESS. THE STREAM MODE OPERATION REQUIRES THAT THE I/O CONTROL BE NOTIFIED THAT THE PREVIOUS 100 CHARACTERS OF THE BUFFER HAVE BEEN FILLED OR EMPTIED. THIS IS ACCOMPLISHED BY THE BUFFER EMPTY OPERATOR. IF THE I/O CONTROL DOES NOT RECEIVE THE BUFFER EMPTY DESCRIPTOR BETWEEN EVERY 100 CHARACTERS READ OR WRITTEN, THE STREAM MODE OPERATION STOPS.

IN STREAM MODE, INFORMATION TRANSFER BEGINS AT A-ADDRESS AND CONTINUES UNTIL B-ADDRESS+200.

V3 - FLIP TO READ CONTROL.

THIS VARIANT MAY BE USED WITH THE WRITE TO CONTROL DESCRIPTOR ONLY. WHEN THE WRITE TO CONTROL OPERATION IS FINISHED, THE VARIANT BIT INITIATES A READ TO CONTROL FROM THE REMOTE DEVICE INTO ASCENDING MEMORY LOCATIONS BEGINNING IMMEDIATELY AT THE LOCATION FOLLOWING THE CONTROL CHARACTER WHICH TERMINATED THE WRITE TO CONTROL OPERATION, UNTIL AN ENDING CONTROL CHARACTER IS DETECTED, BUT NOT INTO THE B-ADDRESS. THIS TERMINATES THE READ TO CONTROL OPERATION.

V4 - FLIP TO READ TRANSPARENT.

THIS VARIANT MAY BE USED ONLY WITH THE WRITE TO CONTROL OPERATOR. WHEN THE WRITE TO CONTROL OPERATION IS FINISHED BY ENCOUNTERING AN ENDING CHARACTER, THE VARIANT INITIATES A READ TRANSPARENT FROM THE REMOTE DEVICE INTO MEMORY LOCATIONS BEGINNING AT THE LOCATION FOLLOWING THE WRITE TO CONTROL-S TERMINATING CONTROL CHARACTER, AND CONTINUING UNTIL THE B-ADDRESS IS REACHED, BUT NOT INTO B-ADDRESS. THE READ TRANSPARENT DOES NOT END WHEN IT ENCOUNTERS AN ENDING CONTROL CHARACTER.

AS IN ALL TRANSPARENT OPERATORS, REACHING THE END-ADDRESS, WHEN CAUSED BY THE READ PORTION OF THE DESCRIPTOR, DOES NOT SET THE ERROR CONDITION (BIT #8) INDICATOR IN THE RESULT DESCRIPTOR. (SEE "RESULT DESCRIPTORS".)

V3 AND V4 - AUTOMATIC POLLING.

PART II. - B2500/3500 DATA COMM. FEATURES.

THIS COMBINATION OF VARIANTS INDICATES POLLING (OR SELECTION). IT IS USED WITH A WRITE OPERATOR ONLY, AND INCLUDES PERFORCE A FLIP TO READ (V3).

THE OUTPUT BUFFER WILL CONSIST OF A SERIES OF CONTIGUOUS POLLING OR SELECTION SEQUENCES. A WRITE-FLIP-READ WILL BE EXECUTED WITH THE FIRST SUCH SEQUENCE; IF A MESSAGE OTHER THAN NAK RETURNS, THE ENTIRE OPERATION TERMINATES WITH THE CONTROL CHARACTER AT THE END OF THE MESSAGE, OTHERWISE THE NAK IS DISCARDED AND ANOTHER WRITE-FLIP-READ IS AUTOMATICALLY INITIATED WITH THE NEXT SEQUENCE. IF ONLY NAK-S ARE RETURNED, THE OPERATION IS TERMINATED BY TWO SUCCESSIVE ENDING CHARACTERS. IF A MESSAGE IS RETURNED, IT IS WRITTEN IN THE BUFFER AFTER THE SEQUENCE THAT ELICITED THIS RESPONSE, OVERLAYING SUCCESSIVE SEQUENCES.

V5 - PRESET STX.

THE FIRST CODE SENT OR RECEIVED IS CONSIDERED TEXT AND IS USED IN GENERATING THE LRC (LONGITUDINAL REDUNDANCY CHECK), WITHOUT WAITING FOR THE RECEIPT OF A STX CHARACTER.

V6 - DELETE ETX.

IN CASE OF WRITE-TO-CONTROL OPERATIONS THE CONTROL CODE DENOTING ETX IS NOT TRANSMITTED, THE EOT FUNCTION IS IGNORED, AND THE LRC IS NOT GENERATED OR SENT.

V7 - INHIBIT TIME-OUT (OR BREAK).

THE TIME-OUT FEATURE IS INHIBITED ON THE READ PORTION OF THE OPERATOR, WHEN USED WITH THE READ TO CONTROL, WRITE TO CONTROL/READ TO CONTROL, OR WRITE TRANSPARENT/READ TO CONTROL DESCRIPTORS.

WHEN USED WITH THE UNCONDITIONAL CANCEL DESCRIPTOR, THIS VARIANT TRANSMITS A BREAK TO THE REMOTE STATION. THE BREAK IS APPLICABLE ONLY ON FULL DUPLEX DATA SETS. (SEE PART III., THE "CANCEL REQUESTS".)

PART II. - B2500/3500 DATA COMM. FEATURES.

V8 - VOICE RESPONSE MODE. (V4 AND V2 MUST BE ZERO.)

THIS VARIANT CAUSES CHARACTERS RECEIVED FROM MEMORY TO BE SENT TO THE VOICE RESPONDER. THESE CHARACTERS ARE USED AS VOICE TRACK ADDRESSES.

V8 AND V4 CONCURRENTLY - TONE RESPONSE. (V2 MUST BE ZERO.)

THIS COMBINATION OF VARIANTS ALLOWS THE CHARACTERS "A" AND "B" TO BE SENT TO THE TONE RESPONSE ADAPTER TO SELECT A PARTICULAR TONE FOR A PERIOD OF 200 TO 400 MILLISECONDS. ANY OTHER CHARACTER SELECTS NO TONE, BUT ALLOWS A PAUSE FOR THE SPECIFIED PERIOD.

CHARACTER	TONE (CYCLES PER SEC)	TIME IN MIL.SEC-S
A	1017	200-400
B	2025	200-400
ANY OTHER THAN A OR B	NO TONE	200-400

V8, V3 AND V2 CONCURRENTLY - IGNORE ENQ.

THIS VARIANT SETTING CAUSES A READ OPERATION TO IGNORE THE RESPONSE CODE "ENQ".

RESULT DESCRIPTORS.

THE B2500/3500, WHEN OPERATING IN A DATA COMMUNICATION ENVIRONMENT, GENERATES RESULT DESCRIPTORS UPON COMPLETION OF DATA TRANSMISSION OPERATIONS.

IT MUST BE REMEMBERED, THAT IN CASE OF A SINGLE LINE OPERATION, ONE COMMUNICATION LINE IS CONNECTED TO ONE I/O CHANNEL, WHEREAS IN A MULTI-LINE OPERATION UP TO 36 COMMUNICATION LINES MAY BE CONNECTED THROUGH AN EQUAL NUMBER OF LINE ADAPTERS TO ONE I/O CHANNEL. CONSEQUENTLY, THE RESULT DESCRIPTOR OF THE SINGLE LINE ADAPTER IS THE SAME AS THAT OF THE I/O CHANNEL TO WHICH IT IS CONNECTED; THE RESULT DESCRIPTORS OF THE N MULTI-LINE ADAPTERS ARE, HOWEVER, DIFFERENT FROM THE RESULT DESCRIPTOR

PART II. - B2500/3500 DATA COMM. FEATURES.

OF THEIR COMMON I/O CHANNEL.

IN THE FOLLOWING DESCRIPTION, A SEPARATE TABLE SHOWS THE LAYOUT OF THE MULTI-LINE CONTROL CHANNEL DESCRIPTOR. FOR REASONS EXPLAINED ABOVE, NO SUCH TABLE IS NEEDED IN CASE OF SINGLE LINE OPERATIONS. THE ERROR CONDITIONS, WHICH IN CASE OF A MULTI-LINE CONTROL ARE REGISTERED IN THE I/O CHANNEL DESCRIPTOR, WILL BE INDICATED IN CASE OF SINGLE-LINE CONTROLS IN THE PROCESSOR RESULT DESCRIPTOR.

THE DESCRIPTORS CONSIST OF 4 DIGITS (16 BITS). AND THE INDIVIDUAL BITS ARE REFERENCED IN THE ORDER SHOWN BELOW:

D1	D2	D3	D4
1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

THE BITS, WHICH HAVE BEEN TURNED ON (BIT=1) ARE INTERPRETED AS FOLLOWS:

1	OPERATION COMPLETE
2	EXCEPTION CONDITION
3	NOT READY - LOCAL (LINE CONTROL SWITCH IN LOCAL)
4	DATA ERROR
5	ACR ("ABANDON CALL AND RETRY" - DIALED LINE FAILS TO ANSWER WITHIN 7 TO 40 SECONDS.)
6	CANCEL COMPLETE
7	EOT
8	ATTEMPT TO EXCEED MAX. ADDRESS
9	TIME OUT
10	MEMORY PARITY ERROR
11	WRITE ERROR
12	CARRIER LOSS
13	END OF STREAM OPERATION
4 AND 5	DATA LOSS
6 AND 7	BREAK DETECTED
14-16	RESERVED

THE DESCRIPTOR BITS IN THE MULTI-LINE CONTROL CHANNEL RESULT DESCRIPTOR ARE INTERPRETED:

1	OPERATION COMPLETE
2	EXCEPTION CONDITION
3	NOT READY - LOCAL
4	BUSY ADAPTER: I-O DESCRIPTOR NOT ACCEPTED OR IDLE ADAPTER-CANCEL NOT ACCEPTED OR BUFFER EMPTY DESCRIPTOR NOT ACCEPTED.
5-12	RESERVED
13-16	UNIT NO = 0

RESULT DESCRIPTORS AND HARDWARE ACTION.

IN THE TABLE BELOW THE FOLLOWING ABBREVIATIONS ARE USED:

MLC = MULTI LINE CONTROL.
SLC = SINGLE LINE CONTROL.
ARD = ADAPTER RESULT DESCRIPTOR.
CHR = CHANNEL RESULT DESCRIPTOR.
PRR = PROCESSOR RESULT DESCRIPTOR.

CONDITION:	HARDWARE ACTION:	WHEN CONDITION OCCURS:
OPERATION COMPLETE	BIT 1 SET IN ARD	
FLAG INDICATING SOME EXCEPTION CONDITION	BIT 2 SET IN ARD	
STREAM MODE "INTERMEDIATE" COMPLETE (EVERY TIME THE B-ADDR. OR THE B+200 ADDR. IS REACHED.)	BIT #1 SET IN ARD.	READ OR WRITE
LOCAL DATA SET NOT IN READY STATUS: POWER NOT ON. OR IN "VOICE" RATHER THAN "DATA" MODE.	MLC: AT START OF OPERATION: BIT 3 IN CHR. MLC: DURING OPER. BIT 3 IN ARD. SLC: BIT 3 IN ARD.	READ OR WRITE
DATA ERROR (MESSAGE OR	BIT 4 IN ARD PLUS:	

PART II. - B2500/3500 DATA COMM. FEATURES.

CHAR. PARITY)	ONLY ON READ: INPUT CONTINUES UNTIL ETX, EOT, OR B-ADDR. EOT ALSO SETS BIT 7. B-ADDR. ALSO SETS BIT 8. LINE IS NOT DIS- CONNECTED.	READ
INVALID DESCRIPTOR	SLC:BIT 4 IN PRR MLC:BIT 4 IN CHR LINE DISCONNECTED	READ OR WRITE
ACR	BIT 5 IN ARD LINE DISCONNECTED	READ OR WRITE
CANCEL COMPLETE	IF CANCEL TAKES PLACE: BIT 6 IN ARD. IF ANY CANCEL IS SENT TO IDLE CONTROL OR A COND. CANCEL IS RECEIVED WHILE OPER- ATION IS IN PROCESS, THE BITS SET ARE: SLC: BIT 4 IN PRR MLC: BIT 4 IN CHR.	READ OR WRITE OR ENABLE
EOT	BIT 7 IN ARD SET. LINE IS DIS- CONNECTED.	READ OR WRITE
ATTEMPT TO EXCEED MAX. ADDRESS OR IN CASE OF STREAM MODE OPERATION, BUFFER EMPTY COMMAND NOT GIVEN IN TIME.	IN CASE OF READ: BIT 8 IN ARD SET. IN CASE OF WRITE: BITS 8 & 11 IN ARD ARE SET. LINE IS NOT DIS- CONNECTED.	READ OR WRITE
TIME OUT	BIT 9 IN ARD SET. LINE IS NOT DIS- CONNECTED.	READ OR WRITE.
MEMORY PARITY	BITS 10 & 11 IN	ONLY ON

ERROR	ARD ARE SET. LINE IS NOT DIS-CONNECTED.	WRITE
CARRIER LOSS (MEANS: TRANS-MISSION MEDIUM HAS BEEN INTERRUPTED)	BIT 12 IN ARD SET LINE IS NOT DIS-CONNECTED. READ CON-TINUES UNTIL TERMI-NATED BY ETX, EOT, OR B-ADDRESS. IF EOT, SET ALSO BIT 7, IF B-ADDRESS, DO TIME OUT AND SET ALSO BITS 7,8, AND 9.	READ ONLY
DATA LOSS (MISSED MEMORY ACCESS OR MISSED MLC CYCLE)	BITS 4 & 5 IN ARD ARE SET. READ OPERATION CON-TINUES UNTIL ETX, EOT, OR B-ADDRESS. IF EOT, SET ALSO BIT 7; IF B-ADDRESS DO TIME OUT AND SET ALSO BITS 8 & 9. WRITE OPERATION IS TERMINATED AND BIT 11 IS ALSO SET. LINE IS NOT DIS-CONNECTED.	READ OR WRITE
BREAK DETECTED	SET BITS 6 & 7 IN ARD. LINE IS NOT DISCONNECTED.	WRITE ONLY

PART III.

PREPARING THE B2500/3500 SYSTEM FOR DATA COMMUNICATION OPERATIONS.

THE SYSTEM MUST BE CONDITIONED TO ENABLE IT TO HANDLE DATA COMMUNICATION OPERATIONS.

1. THE MCP IN CORE MUST BE AN MCP VERSION WITH DATA COMMUNICATION HANDLING CAPABILITIES.

2. THE REMOTE DEVICES MUST BE INCORPORATED IN THE SYSTEM ENVIRONMENT.

THESE REQUIREMENTS MAY BE FULFILLED AT THE TIME THE SYSTEM IS LOADED, OR DYNAMICALLY LATER, WHEN THE SYSTEM IS ALREADY IN OPERATION. NORMALLY, HOWEVER, THESE REQUIREMENTS WOULD BE TAKEN CARE OF AT THE TIME OF LOADING, I.E., AT "COLD START ROUTINE" TIME.

1. PROCEDURE DURING THE "COLD START" LOADING.

DURING THE "COLD START" LOADING OPERATION, THE SYSTEM LOADER CONTROL DECK CONTAINS THE "MCP SPECIFICATION CARD" (CARD #3 IN THE DECK), WHICH DESIGNATES THE MCP TO BE LOADED. IF DATA COMMUNICATION OPERATIONS ARE DESIRED, ONE OF THE FOLLOWING MCP VERSIONS MUST BE SPECIFIED:

CP14D CP20D CP40D CP56D CP56C

IF MULTI-LINE CONTROL IS USED, EACH CHANNEL CONNECTED TO THE MULTI-LINE CONTROL MUST BE DECLARED THROUGH A "CHANNEL" CONTROL CARD. THE CHANNEL NUMBERS MUST BE 20 OR GREATER. CHANNEL EXCHANGES ARE NOT PERMITTED, I.E., EACH CHANNEL CARD MAY CONTAIN ONLY ONE INTEGER.

THE SEQUENCE OF THE CHANNEL CONTROL CARDS IN THE SYSTEM LOADER CONTROL DECK ESTABLISHES THE ORDER IN WHICH THE CHANNEL I/O RESULT DESCRIPTORS WILL BE SCANNED. (SEE PART III, THE "INTERROGATE REQUEST".)

THE "MULTI-LINE CONTROL" ITSELF MUST BE DECLARED ON THE "UNIT CARD",

PART III. - DATA COMM. MCP

SPECIFYING PERIPHERAL UNIT TYPE CODE "12".

THE REMOTE DEVICES MUST BE INTRODUCED INDIVIDUALLY ON "UNIT CARD" -S IN THE FOLLOWING FORMAT:

? UNIT <HARDWARE TYPE CODE> = <CC/U> SPO (INQ) <ADAPTER ID.> SM DIAL LOG <DIRECTION>

WHERE
<HARDWARE TYPE CODE> IS A TWO DIGIT CODE NUMBER ASSIGNED TO THE REMOTE DEVICES:

13	9350 TYPEWRITER
14	B606 OLB TERMINAL
16	TWX (MODEL 33 AND 35 TELETYPEWRITERS)
17	IBM 1050
18	DCT 2000
20	ANOTHER B2500 OR 3500 SYSTEM
21	BA1 SYSTEM
24	IBM 1030
25	BURROUGHS TOUCH-TONE SYSTEM (BTT)
26	BURROUGHS INPUT-OUTPUT DISPLAY SYSTEM (BIDS)
30	TC500
31	B300 OR B500 SERIES COMPUTER

CC = ON SINGLE LINE CONTROLS: CHANNEL #,
ON MULTI-LINE CONTROLS: THE ADAPTER POSITION+19.
THE ADAPTER POSITION IS THE LOCATION NUMBER OF THE ADAPTER IN THE I/O CABINET. CC IS A UNIQUE NUMBER, E.G., CC = 20 MEANS ADAPTER POSITION 1.

U = ALWAYS 0 (ZERO).

<ADAPTER I.D.> = IDENTIFIER OF 1 TO 6 CHARACTERS. THE FIRST CHARACTER MUST BE ALPHABETIC, THE REMAINING CHARACTERS MAY BE ALPHABETIC OR NUMERIC. WITHIN THESE RESTRICTIONS ANY IDENTIFIER MAY BE USED FOR ANY ADAPTER AS LONG AS IT IS UNIQUE. NO TWO ADAPTERS MAY HAVE THE SAME <ADAPTER I.D.>. THE <ADAPTER ID.> WILL BE USED BY THE OBJECT PROGRAMS IN THEIR FILE DECLARATIONS.

DIAL = MUST BE GIVEN FOR SWITCHED LINES.

PART III. - DATA COMM. MCP

OPTIONAL ENTRIES:

SPO = INDICATES THAT THE REMOTE DEVICE ATTACHED TO THIS ADAPTER IS TO BE HANDLED AS A REMOTE SPO.

SM = REQUEST TO PRINT SYSTEM MESSAGES ON REMOTE SPO CENNECTED WITH ANY PROGRAM INITIATED BY THE REMOTE SPO.

INQ = RESERVE A NON-OVERLAYABLE BUFFER FOR A NON-REMOTE SPO DATA COMMUNICATION DEVICE.

LOG = REQUEST THAT A LOCAL (ON SITE) LOG BE KEPT FOR THIS REMOTE DEVICE.

DIRECTION = MAY SPECIFY IN (OR) OUT.
"IN" CAUSES A LOG TO BE KEPT OF THE SYSTEM MESSAGES COMING FROM THE REMOTE DEVICE ON THAT CHANNEL, "OUT" CAUSES THE LOG TO BE KEPT OF THE SYSTEM MESSAGES GOING TO THE REMOTE DEVICE ON THAT CHANNEL. IF BOTH THE INCOMING AND THE OUTGOING SYSTEM MESSAGES ARE TO BE ENTERED IN THE LOG, THE <DIRECTION> OPTION MUST NOT BE USED.

AS MENTIONED ABOVE, THE LOG IS WRITTEN ON A 9-TRACK MAGNETIC TAPE LABELLED "REMOTE/SPOLOG", IN UNBLOCKED RECORDS. THE USER HAS TO WRITE HIS OWN PROGRAM TO PRINT THIS LOG FILE.

LOG FORMAT OF THE REMOTE SPO SYSTEM MESSAGES.

COLS.	DATA
1-3	"LOG"
4-9	DATE (FORMAT: MMDDYY)
10-13	TIME (FORMAT: HOUR:MIN.)
14-15	CHANNEL NUMBER
16-115	TEXT OF MESSAGE

2. PROCEDURE DURING OPERATION OF THE SYSTEM.

THE WORKING MCP MAY BE CHANGED WITHOUT EXECUTING A NEW COLD START ROUTINE BY USING THE <MCPLDR> OR THE <DKDKLD> LOADER ROUTINES. IT IS NOT POSSIBLE TO CHANGE THE NUMBER OF CHANNELS HANDLED BY AN MCP WITHOUT A COLD START.

REMOTE DEVICES MAY BE DELETED FROM THE SYSTEM ENVIRONMENT THROUGH USE OF THE DL KEYBOARD INPUT MESSAGE.

REMOTE DEVICES MAY BE INTRODUCED INTO THE SYSTEM ENVIRONMENT BY THE "UNIT" CONTROL CARD.(NOT TO BE CONFUSED WITH THE "UNIT" CARD USED IN THE SYSTEM LOADER.) THE TEXT OF THE <UNIT> CONTROL CARD MAY ALSO BE COMMUNICATED TO THE SYSTEM IN THE FORM OF A CC KEYBOARD INPUT MESSAGE.

IT HAS BEEN MENTIONED IN THE PREVIOUS SECTION, THAT THE <UNIT> LOAD CARD MAY SPECIFY THE SM OPTION, REQUESTING THE PRINTING OF THE PERTINENT SYSTEM OUTPUT MESSAGES ON THE REMOTE SPO WHICH INITIATED THE PROGRAM.

THE SAME MAY BE ACCOMPLISHED WITH AN SM KEYBOARD INPUT MESSAGE. THE PRINTING OF THE SYSTEM OUTPUT MESSAGES MAY BE DISCONTINUED BY AN HM KEYBOARD INPUT MESSAGE.

THE <ADAPTER ID.> SPECIFIED ON THE <UNIT> LOAD CARD MAY BE CHANGED THROUGH AN SI KEYBOARD INPUT MESSAGE. THE INTRODUCED NEW ADAPTER IDENTIFIER LASTS ONLY TO THE NEXT HALT/LOAD.

THE CP KEYBOARD INPUT MESSAGE ALLOWS CHANGING DYNAMICALLY THE ORDER OF SCANNING THE I/O COMPLETE RESULT DESCRIPTORS. A HALT/LOAD OPERATION, HOWEVER, WILL RESTORE THE SCANNING ORDER ESTABLISHED BY THE COLD START PROGRAM.

THE SL MESSAGE CAUSES THE LIST OF THE REMOTE SPO-S IN THE SYSTEM ENVIRONMENT TO BE PRINTED.

THE ABOVE LISTED MESSAGES AND THEIR FORMATS ARE DESCRIBED IN DETAIL IN THE B2500/3500 MCP INFORMATION MANUAL.

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

DATA COMMUNICATION CONSTRUCTS OF THE B2500/3500 ADVANCED ASSEMBLER.

NOTE: THE PSEUDO OP. CODES SHOWN IN COLUMNS 14-17 MUST BE WRITTEN EXACTLY AS SHOWN.

DECLARING A REMOTE DEVICE AS A FILE.

THE OBJECT PROGRAM, WHICH WANTS TO USE A REMOTE DEVICE, MUST DECLARE THAT DEVICE AS A FILE IN THE PROGRAM. THERE MUST BE ONE FILE DECLARATION FOR EACH DATA COMMUNICATIONS ADAPTER OR LINE.

THE FORMAT OF THIS FILE DECLARATION IS:

COLS.	CONTENTS:
1	BLANK
2-7	SEQUENCE NUMBER
8-13	FILE NAME
14-17	FILE
19-21	BLANK
22-27	ADAPTER I.D. OR "REMSPO". (*NOTE 1)
28-33	BLANK
34-36	TYPE (*NOTE 2)
37	TRANSLATION (*NOTE 3)
38-51	BLANK
52-54	BLOCKING: FOR STREAM MODE ONLY:002, OTHERWISE BLANK
55	BUFFER TECHNIQUE (*NOTE 4)
56-57	BLANK
58-63	WTL (* NOTE 5)
64-70	BLANK

NOTE 1:

THIS I.D. MUST BE THE SAME AS ON THE "UNIT CARD" IN THE SYSTEM LOADER CONTROL DECK. - IF THIS FIELD IS LEFT BLANK, THE MCP ATTEMPTS TO FIND AN UNASSIGNED ADAPTER OF THE SAME HARDWARE TYPE.

THE SIX CHARACTERS "REMSPO" IN THIS FIELD HAVE A SPECIAL MEANING. IF AN OBJECT PROGRAM OPENS A FILE WITH "REMSPO" IN THE <ADAPTER ID.> FIELD OF THE FILE DECLARATION, MCP WILL OPEN THE REMOTE DEVICE WHICH CAUSED THE PROGRAM TO BE EXECUTED, REGARDLESS OF THE <ADAPTER ID.> ASSOCIATED WITH THE DEVICE ON THE <UNIT> LOAD OR CONTROL CARD. (SEE ALSO "REMOTE KEYBOARD CONTROL FACILITIES" IN PART III.)

NOTE 2:

A 3-CHARACTER SYMBOLIC NAME OF THE REMOTE DEVICE FROM THE FOLLOWING LIST:

TYP - B9350 TYPEWRITER
TWX - TWX
T50 - IBM 1050
T30 - IBM 1030
OLB - B606
D20 - UNIVAC DCT 2000
B35 - B3500 COMPUTER
B25 - B2500 COMPUTER
AA1 - BA1
A3B - B3B3 (TELETYPE 28)
BTT - BURROUGHS TOUCHTONE VOICE RESPONSE
BDD - BURROUGHS DIGITAL DISPLAY
TC5 - BURROUGHS TC 500
B05 - BURROUGHS 300 OR 500 SERIES COMPUTER

NOTE 3:

N = NO TRANSLATION
T OR BLANK = STANDARD MCP TRANSLATION
F = NON-STANDARD IBM 1030 OR 1050 TRANSLATION, OR
NON-STANDARD 1965 ASCII TRANSLATION.

MESSAGES FROM REMOTE SPO-S ARE ALWAYS TRANSLATED BY THE MCP INTO STANDARD EBCDIC CODE, AND EXAMINED FOR POSSIBLE KEYBOARD INPUT MESSAGES. THE OBJECT PROGRAM USING REMOTE SPO-S SHOULD ALWAYS EXPECT TO SEE MESSAGES IN STANDARD EBCDIC CODE.

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

STANDARD TRANSLATION MEANS THAT LOWER CASE ASCII AND PTTC/6 CHARACTERS ARE TRANSLATED TO LOWER CASE EBCDIC CHARACTERS, AND UPPER CASE ASCII, PTTC/6, BAUDOT, AND BCL (BURROUGHS COMMON LANGUAGE) CHARACTERS TO UPPER CASE EBCDIC CHARACTERS.

IN CASE OF NON-STANDARD TRANSLATION, BOTH UPPER AND LOWER CASE ASCII AND PTTC/6 ALPHABETIC CHARACTERS ARE TRANSLATED TO UPPER CASE EBCDIC ALPHABETIC CHARACTERS. THE TRANSLATION OF CHARACTERS, WHICH ARE ACTUALLY TYPED IN LOWER CASE BUT WHICH ARE NOT ALPHABETIC CHARACTERS, IS NOT AFFECTED BY NON-STANDARD TRANSLATION.

NOTE 4:

B = ONE BUFFER, NO RECORD AREA,
BLANK = ONE BUFFER AND ONE RECORD AREA.

THE DATA COMM MCP WILL MAKE USE OF RECORD AREAS ASSIGNED TO FILES. THE DATA COMM MCP DOES NOT UTILIZE MORE THAN ONE INPUT-OUTPUT BUFFER AREA PER DATA COMMUNICATION FILE. THERE IS NO RESTRICTION IN THE ASSEMBLER LANGUAGE IN THIS RESPECT AND MORE THAN ONE BUFFER MAY BE ASSIGNED TO ALL FILES, BUT SINCE EACH DATA COMMUNICATION FILE IS ASSOCIATED WITH ONLY ONE LINE, THERE IS NO ADVANTAGE IN HAVING ALTERNATE BUFFERS.

THERE IS AN ADVANTAGE TO HAVING A RECORD AREA IF THE COMPUTER APPLICATION INVOLVES A CONSIDERABLE AMOUNT OF OUTPUT OPERATIONS ON THE REMOTE DEVICE. AN OUTPUT OPERATION IS A WRITE-TO-CONTROL OR A WRITE-TRANSPARENT AS OPPOSED TO A WRITE-READ. THE ADVANTAGE GAINED IS DUE TO THE FACT THAT THE PROGRAM IS FREE TO RUN IMMEDIATELY AFTER THE WRITE INSTRUCTION IS EXECUTED, REGARDLESS WHETHER IT HAS BEEN COMPLETED OR NOT. SINCE RECORD AREAS MUST BE OF THE SAME SIZE AS THE INPUT-OUTPUT BUFFER, THE SIZE OF THE PROGRAM WILL BE INCREASED BY THEIR USE.

THE ABOVE CONSIDERATIONS DO NOT APPLY TO STREAM MODE OPERATIONS.

NOTE 5:

WTL = IDENTIFIER OF 6 CHAR. FIELD SPECIFYING THE LENGTH OF THE WRITE PORTION OF A WRITE TRANSPARENT/READ-TO-CONTROL OR THE TOTAL RECORD SIZE OF A WRITE-TO-CONTROL/READ TRANSPARENT PSEUDO

INSTRUCTION.

RECORD DECLARATIONS.

THE DATA COMMUNICATION MCP, IN NON-STREAM MODE, HANDLES ONLY UNBLOCKED RECORD I/O OPERATIONS. IN STREAM MODE (SEE "STREAM MODE" SECTION) LOGICAL RECORDS MUST BE 100 CHARACTERS LONG, BLOCKED BY TWO.

RECORD DECLARATIONS, AS SPECIFIED IN THE ADVANCED ASSEMBLER LANGUAGE, ARE REQUIRED.

CONTROL CHARACTERS. (CONTROL SYMBOLS.)

THE CONTROL CHARACTERS (SEE PART I.), WHICH THE PROGRAM IS GOING TO USE, MUST BE DECLARED AS UN CONSTANTS.

THE EBCDIC CODES FOR THE CONTROL CHARACTERS ARE THE FOLLOWING:

CONTROL CHAR:	EBCDIC CODE:
NUL	00
SOH	01
STX	02
ETX	03
HT	05
DEL	07
VT	08
FF	0C
CR	0D
SO	0E
SI	0F
DLE	10
DC1	11
DC2	12
DC3	13
DC4	14
NL	15
BS	16
CAN	18
EM	19

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

FS	1C
GS	1D
RS	1E
US	1F
LF	25
ETB	26
ESC	27
ENQ	2D
ACK	2E
BEL	2F
SYN	32
EOT	37
DC4	3C
NAK	3D
SUB	3F
DELIM.	CF

(THE LETTERS DENOTE "UNDIGIT"-S 10 THROUGH 15.)

THE OPEN REQUEST.

THE FORMAT OF THE OPEN REQUEST IS:

COLS.	CONTENTS:
14-17	OPEN
18-19	TYPE OF OPEN
22-27	FILE NAME

THE "TYPE OF OPEN" PARAMETER SPECIFIES HOW THE REMOTE DEVICE IS TO BE OPENED. THE VALUES OF THE PARAMETER ARE INTERPRETED:

0 = INPUT,
1 = OUTPUT,
2 = INPUT/OUTPUT,
3 = OUTPUT/INPUT.

THE FILE NAME MUST BE SHOWN AS IT APPEARS IN COLS. 8-13 OF THE FILE DECLARATION.

IN GENERAL, FILES MUST BE OPENED PRIOR TO THEIR USE BY THE PROGRAM.

WHEN REFERRING TO A REMOTE DEVICE, THE OPEN REQUEST CAUSES THAT DEVICE TO BE ASSIGNED TO THE OBJECT PROGRAM. AS MAY BE SEEN, THIS STEP MUST PRECEDE THE PROCEDURE OF ESTABLISHING CONTACT BETWEEN THE COMPUTER AND THE REMOTE DEVICE.

A REMOTE DEVICE, WHICH HAS THE CAPABILITY TO READ AND WRITE, MAY BE OPENED AS INPUT/OUTPUT.

ESTABLISHING CONTACT BETWEEN THE COMPUTER AND THE REMOTE DEVICE(S).

AT THIS POINT THE OBJECT PROGRAM NOTIFIED THE MCP THAT IT INTENDS TO USE THE REMOTE DEVICE SPECIFIED IN THE FILE DECLARATION, AND THE MCP ASSIGNED THAT DEVICE TO THE REQUESTING OBJECT PROGRAM. NO CONTACT HAS BEEN ESTABLISHED YET BETWEEN THE COMPUTER AND THE REMOTE DEVICE, AND THIS MUST BE THE NEXT STEP BEFORE THE TRANSMITTAL OF INFORMATION CAN BEGIN.

CONTACT CAN BE ESTABLISHED IN SEVERAL WAYS, DEPENDING ON THE CHARACTERISTICS OF THE REMOTE DEVICE AND THE COMMUNICATION NETWORK.

LET US CONSIDER THE FOLLOWING CASES, ASSUMING TELEPHONE LINES AS COMMUNICATION MEDIA.

1. SWITCHED MESSAGE NETWORK:

A. THE COMPUTER EXECUTES AN OBJECT PROGRAM, WHICH WANTS TO COMMUNICATE WITH A REMOTE DEVICE. THE PROGRAM MOVES THE TELEPHONE NUMBER (SEE PART II., "VARIANT OPERATIONS", - "V1 - DIAL MODE"), WHICH MAY BE PART OF THE PROGRAM, OR MAY BE DATA TO THE PROGRAM, INTO THE FIRST PART OF ITS BUFFER AND EXECUTES, AS THE PROGRAM MAY REQUIRE, ONE OF THE FOLLOWING PSEUDO-OPERATORS:

```
READ-TO-CONTROL
WRITE-TO-CONTROL
WRITE-TO-CONTROL/READ-TO-CONTROL
WRITE-TO-CONTROL/READ TRANSPARENT
WRITE TRANSPARENT/READ-TO-CONTROL
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THE TELEPHONE NUMBER IS NOW DIALED BY THE COMPUTER AND THE

OPERATION BECOMES COMPLETE AND THE RESULT DESCRIPTOR STORED WHEN THE REMOTE DEVICE RETURNS AN ANSWER TO THE CALL. THE ANSWER OF THE REMOTE DEVICE MAY BE THE "ACK" CONTROL CHARACTER, IF IT IS READY TO RECEIVE, OR THE "NAK" CONTROL CHARACTER, IF IT IS NOT READY. IT IS THE OBJECT PROGRAM'S RESPONSIBILITY TO TAKE THE NECESSARY ACTION IN EITHER CASE.

B. WHEN THE REMOTE OPERATOR DIALS THE COMPUTER, THE REMOTE DEVICE CAN ESTABLISH CONTACT ONLY IF THE COMPUTER EXECUTED PREVIOUSLY AN ENABLE INSTRUCTION, SO THAT IT RECOGNIZES THE RING INDICATOR. (I.E., THE FACT THAT THE TELEPHONE IS CALLING.) THE REMOTE DEVICE MAY NOW DIAL THE COMPUTER (PROGRAMMATICALLY, OR THE OPERATOR MANUALLY, DEPENDING UPON THE CAPABILITIES OF THE REMOTE DEVICE), AND WHEN THE RING INDICATOR IS RECOGNIZED, THE I/O OPERATION BECOMES COMPLETE.

2. LEASED (OR PRIVATE) LINE NETWORK:

REMOTE DEVICES DO NOT HAVE THE ABILITY TO INITIATE TRANSMISSION UNLESS THEY ARE ADDRESSED, POLLED, OR ENABLED BY THE COMPUTER. SOME REMOTE DEVICES HAVE NEITHER POLLING SEQUENCES, NOR THE CAPABILITY TO RESPOND TO AN ENABLE DESCRIPTOR. SUCH DEVICES START TRANSMISSION WHEN THE COMPUTER ADDRESSES THEM WITH AN I/O DESCRIPTOR.

THE COMPUTER MAY CONTACT REMOTE DEVICES BY TRANSMITTING THEIR ADDRESSING OR POLLING SEQUENCES. ADDRESSING OR POLLING SEQUENCES ARE CHARACTER SEQUENCES DEFINED FOR SUCH PURPOSE AND ARE PARTICULAR TO THE TYPE OF HARDWARE. (PART VI., INDIVIDUAL DESCRIPTION OF REMOTE DEVICES.) ADDRESSING IS USED, IF THE COMPUTER WANTS TO TRANSMIT INFORMATION TO THE REMOTE DEVICE, POLLING IS USED WHEN THE COMPUTER AUTHORIZES THE REMOTE DEVICE TO TRANSMIT.

IF THE POLLED REMOTE DEVICE HAS NOTHING TO TRANSMIT AT THE TIME WHEN THE COMPUTER TRANSMITS ITS POLLING SEQUENCE, IT MUST WAIT UNTIL THE COMPUTER POLLS AGAIN.

THOSE DEVICES, HOWEVER, WHICH HAVE THE CAPABILITY TO RESPOND TO AN ENABLE DESCRIPTOR WITH AN "ENQ" CONTROL CHARACTER, MAY BE PLACED IN AN ENABLED CONDITION BY THE COMPUTER AND WHEN THE REMOTE DEVICE IS READY TO START TRANSMISSION, THE OPERATOR DEPRESSES THE "ENQ" KEY ON HIS CONSOLE THEREBY CAUSING AN I/O COMPLETE. THIS ACTION LOCKS OUT ALL THE OTHER REMOTE DEVICES

ON THAT CHANNEL, ESTABLISHES THE DATA LINK BETWEEN THE COMPUTER AND THE RESPONDING REMOTE DEVICE, AND TRANSMISSION MAY BEGIN.

THE ENABLE REQUEST.

THE ENABLE REQUEST, THE USE OF WHICH HAS BEEN OUTLINED ABOVE, HAS THE FOLLOWING FORMAT:

COLS.	CONTENTS:
14-17	ENBL
22-27	FILE NAME
46-51	ACTION LABEL (OPTIONAL)

THE ACTION LABEL IS A RETURN POINT TO WHICH THE OBJECT PROGRAM IS RETURNED AFTER THE EXECUTION OF A "WAIT" REQUEST.

IT HAS ALREADY BEEN MENTIONED IN PART II., THAT THE ENABLE DESCRIPTOR DISCONNECTS THE TELEPHONE LINE, IF EXECUTED AFTER CONNECTION HAS BEEN ESTABLISHED. IN OTHER WORDS, IT FUNCTIONS IN THE SAME MANNER AS AN UNCONDITIONAL CANCEL.

THE FILL REQUEST.

REMOTE DEVICES, WHICH ARE CONNECTED THROUGH PRIVATE OR LEASED LINES TO THE COMPUTER, AND WHICH HAVE NO CAPABILITY TO RESPOND TO POLLING OR ENABLING, MUST BE ADDRESSED BY THE COMPUTER WITH AN I/O DESCRIPTOR BEFORE THEY CAN START TRANSMITTING.

THE I/O DESCRIPTORS RETURN CONTROL TO THE OBJECT PROGRAM ONLY WHEN THE OPERATION BECOMES COMPLETE, AND SINCE IT IS UNPREDICTABLE WHEN A REMOTE DEVICE WILL HAVE INPUT TO TRANSMIT,THE OBJECT PROGRAM COULD REGAIN CONTROL ONLY AFTER AN UNPREDICTABLE PERIOD OF WAITING

THE FILL PSEUDO OPERATOR SERVES TO SOLVE THIS PROBLEM. UPON RECEIPT OF A FILL REQUEST, THE MCP INITIATES THE INDICATED I/O OPERATION FOR THE BUFFER AND IMMEDIATELY RETURNS CONTROL TO THE OBJECT PROGRAM. TO USE THE FILL REQUEST, THE PROGRAM SHOULD HAVE A BUFFER AND A WORK AREA

DECLARED. (WITHOUT A WORK AREA THE DESIRED BUFFERING EFFECT IS LOST.) THE FORMAT OF THE FILL REQUEST:

COLS.	CONTENTS:
1	BLANK
2-7	SEQ. NUMBER (OPTIONAL)
8-13	LABEL (OPTIONAL)
14-17	FILL
18-21	VARIANTS (OPTIONAL)
22-27	FILE NAME
28-30	BLANK
31	S (OPTIONAL, STREAM MODE, SEE I-O REQUESTS)
32-33	BLANK
34-39	PSEUDO-OP,CODE (*NOTE 1)
40-45	BLANK
46-51	ACTION LABEL (OPTIONAL)
51-72	BLANK

THE FOLLOWING VARIANTS ARE ALLOWED WITH THE FILL REQUEST:

D T X E V P Q

HOWEVER, THE VARIANTS ALLOWED IN A PARTICULAR FILL REQUEST DEPEND UPON THE I-O PSEUDO OPERATOR SPECIFIED IN COLUMNS 34-39. (SEE EXPLANATION OF THE VARIANTS IN "I/O REQUESTS" SECTION.)

NOTE 1: THE FILL MAY SPECIFY ANY ONE OF THE FOLLOWING I/O PSEUDO OPERATORS:

REED RITE WCRC WCRT WTRC

THE ACTION LABEL IN COLS. 46-51 DESIGNATES A POINT IN THE PROGRAM TO WHICH RETURN IS MADE, IF THE FILL OPERATION BECOMES COMPLETE AFTER THE EXECUTION OF A WAIT PSEUDO OPERATION.

TO ACCESS A "FILLED" RECORD, THE OBJECT PROGRAM MUST PERFORM A READ REQUEST THAT MATCHES THE READ OPERATION DONE BY THE FILL. IF THE I/O OPERATION INITIATED BY THE FILL IS COMPLETE, THE I/O REQUEST MOVES THE DATA FROM THE BUFFER TO THE RECORD AREA. IF THE OPERATION IS NOT COMPLETE, THE I/O REQUEST WAITS FOR COMPLETION BEFORE IT PERFORMS THE

MOVE.

THE WAIT REQUEST.

AFTER THE OBJECT PROGRAM EXECUTED ONE OR MORE ENABLE OR FILL REQUESTS, IT MAY CONTINUE PROCESSING, OR IT MAY HAVE TO WAIT UNTIL SOME INPUT IS RECEIVED FROM THE REMOTE STATION(S). THE WAIT PSEUDO OPERATOR SERVES TO SUSPEND PROCESSING OF THE PROGRAM. IT DOES NOT AFFECT ANY OTHER PROGRAMS IN THE MIX.

IT FUNCTIONS IN THE FOLLOWING MANNER:

1. IT SUSPENDS THE OBJECT PROGRAM UNTIL A RESPONSE TO AN ENABLE OR THE COMPLETION OF A FILL REQUEST OCCURS. AT THAT TIME CONTROL IS RETURNED TO THE ACTION LABEL IN THE OBJECT PROGRAM GIVEN WITH THE ENABLE OR FILL REQUEST FOR THAT DEVICE. IF NO ACTION LABEL WAS GIVEN, THE PROCESSING CONTINUES AT THE STATEMENT IMMEDIATELY FOLLOWING THE WAIT REQUEST.

2. OPTIONALLY, THE WAIT REQUEST MAY BE PROGRAMMED TO PLACE THE OBJECT PROGRAM IN WAIT STATUS UNTIL A SPECIFIED NUMBER OF SECONDS HAVE ELAPSED OR UNTIL A PREVIOUSLY INITIATED FILL OR ENABLE OPERATION BECOMES COMPLETE, WHICHEVER OCCURS FIRST.

THE FORMAT OF THE WAIT REQUEST IS:

COLS.	CONTENTS:
14-17	WAIT
22-27	ACTION LABEL OR ZEROES.

IF THE WAIT CONSTRUCT SPECIFYING A PERIOD OF TIME IS USED, THE LABEL IN THE ADDRESS FIELD MUST BE THE ADDRESS OF A FIVE DIGIT UN CONSTANT, CONTAINING THE WAITING TIME EXPRESSED IN SECONDS.

IF TIME IS NOT SPECIFIED, THE A-ADDRESS FIELD MUST CONTAIN ZEROES.

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PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

THE ENABLE AND FILL REQUESTS PERFORM ESSENTIALLY SIMILAR FUNCTIONS, I.E., THEY SERVE NOTICE TO THE REMOTE DEVICES THAT AN OBJECT PROGRAM IN THE COMPUTER IS IN A READY STATUS TO SEND OR RECEIVE INFORMATION. THE HARDWARE CAPABILITIES OF THE REMOTE DEVICES DECIDE WHICH OF THE TWO PSEUDO OPERATORS SHOULD BE USED BY THE PROGRAM.

THE WAIT REQUEST IS A NECESSARY TOOL FOR THE PROGRAMMER TO TIME THE INTERACTIONS OF THE PROCESSING OBJECT PROGRAM AND THE INFORMATION FLOW BETWEEN THE OBJECT PROGRAM AND THE REMOTE DEVICES.

IF MORE THAN ONE I/O COMPLETE OCCURS AT A GIVEN TIME, THE ENABLE AND FILL COMPLETES ARE SERVICED IN THE ORDER OF PRIORITIES ESTABLISHED AT THE TIME OF THE COLD START LOADING , OR BY THE CP KEYBOARD INPUT MESSAGE. (SEE FOR DETAILS PART III., MCP SECTION.)

THE SEGMENT CONTAINING THE ACTION LABEL GIVEN IN THE FILL OR ENABLE REQUESTS MUST BE PRESENT IN CORE AT THE TIME THE WAIT REQUEST IS EXECUTED.

THE I/O REQUESTS.

THE ADVANCED ASSEMBLER LANGUAGE OFFERS FIVE I/O CONSTRUCTS:

PSEUDO OP. CODE:	OPERATION:
REED	READ TO CONTROL
RITE	WRITE TO CONTROL
WCRC	WRITE TO CONTROL - READ TO CONTROL
WTRC	WRITE TRANSPARENT - READ TO CONTROL
WCRT	WRITE TO CONTROL - READ TRANSPARENT

THE FORMAT OF THE I/O REQUESTS IS:

COLS.	CONTENTS:
2-7	SEQUENCE NUMBER (OPTIONAL)
8-13	LABEL (OPTIONAL)
14-17	PSEUDO OP. CODE

18-21	VARIANT CHARACTER (*NOTE 1)
22-27	RECORD NAME, FOR REED ONLY: FILE NAME
31	S (OPTIONAL, STREAM MODE, SEE * NOTE 2)
34-39	END OF FILE LABEL (OPTIONAL)

NOTE 1: THE VARIANT CHARACTERS (SEE PART II., "VARIANT OPERATIONS") ARE THE FOLLOWING:

VARIANT OPERATION:

D = DIAL
E = DELETE ETX
P = POLL
Q = IGNORE ENQ
R = TONE RESPONSE
T = TIME OUT INHIBIT
V = VOICE RESPONSE
X = PRESET STX

THE PSEUDO OP. CODE DETERMINES WHICH OF THE VARIANT CHARACTERS MAY BE USED IN CONJUNCTION WITH IT:

PSEUDO OP. VARIANTS ALLOWED:
CODE:

REED	D	T	X	Q			
RITE	D		X	E	V	R	
WCRC	D	T	X	E	V	P	Q
WTRC	D	T					
WCRT	D	T					

NOTE 2: STREAM MODE OPERATION IS ALLOWED ONLY WITH THE REED, RITE, AND WCRC REQUESTS.

THE PSEUDO OPERATORS ARE ACTUALLY MACRO GENERATORS, WHICH PASS TO THE MCP THE ADDRESS OF THE FIB OF THE FILE INVOLVED IN THE OPERATION, THE I/O DESCRIPTOR AND VARIANT OPERATORS WHICH ARE TO BE EXECUTED, AND OTHER INFORMATION CONCERNING OPTIONAL REQUESTS. THE REQUEST IS THEN EXECUTED BY THE MCP.

READ-TO-CONTROL. (REED)

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

THIS PSEUDO OPERATOR MAKES THE NEXT LOGICAL RECORD FROM A DATA COMMUNICATION FILE (REMOTE DEVICE) AVAILABLE TO THE PROGRAM.

IF THE PROGRAM HAS ONLY A BUFFER DECLARED, MCP INITIATES THE OPERATION FOR THE BUFFER AND CONTROL IS RETURNED TO THE OBJECT PROGRAM UPON COMPLETION OF THE REQUESTED OPERATION.

IF THE PROGRAM HAS A BUFFER AND A WORK AREA, THE RECORD IS MOVED FROM THE BUFFER TO THE WORK AREA AND CONTROL IS RETURNED TO THE OBJECT PROGRAM ONLY AFTER THE RECORD HAS BEEN PLACED IN THE WORK AREA.

WRITE-TO-CONTROL. (RITE)

THIS PSEUDO OPERATOR RELEASES ONE LOGICAL RECORD TO A DATA COMMUNICATION OUTPUT FILE (I.E., THE REMOTE DEVICE).

IF THE PROGRAM HAS ONLY ONE BUFFER, AND NO WORK AREA, MCP INITIATES THE WRITE OPERATION FOR THE BUFFER AND CONTROL IS RETURNED TO THE OBJECT PROGRAM UPON COMPLETION OF THE OPERATION.

IF THE PROGRAM HAS A WORK AREA IN ADDITION TO THE BUFFER, THIS OPERATOR MOVES THE RECORD FROM THE WORK AREA TO THE BUFFER, AND RETURNS CONTROL TO THE OBJECT PROGRAM AFTER INITIATION OF THE I/O OPERATION.

WRITE-TO-CONTROL/READ-TO-CONTROL.(WCRC)

THIS PSEUDO OPERATOR RELEASES A LOGICAL RECORD FOR A DATA COMMUNICATION OUTPUT FILE (I.E., A REMOTE DEVICE), THEN FLIPS TO READ AND MAKES THE NEXT LOGICAL RECORD FROM THE DATA COMM. INPUT FILE AVAILABLE TO THE PROGRAM.

THE WRITE TO CONTROL PART OF THE OPERATION STOPS AT THE ENDING CONTROL CHARACTER; THE RESPONSE FROM THE REMOTE DEVICE (THE READ TO CONTROL PART) IS READ INTO THE BUFFER AREA FOLLOWING THE ENDING CONTROL CHARACTER OF THE WC PORTION OF THE MESSAGE. BOTH THE WC AND THE RC PORTIONS OF THE MESSAGE MAY BE OF VARIABLE LENGTH.

IT IS AN ERROR CONDITION, IF THE WC PORTION DOES NOT DETECT AN ENDING CONTROL CHARACTER AND CONTINUES TO WRITE UP TO THE B-ADDRESS. AT THIS POINT THE OPERATION IS STOPPED BY THE HARDWARE, AND THE RC PORTION IS ABORTED.

WRITE-TO-CONTROL/READ TRANSPARENT.(WCRT)

THIS OPERATOR WRITES A LOGICAL RECORD TO THE REMOTE DEVICE BEGINNING FROM THE A-ADDRESS, UNTIL AN ENDING CONTROL CHARACTER IS DETECTED. THEN IT FLIPS TO READ THE RESPONSE FROM THE REMOTE DEVICE INTO THE BUFFER AREA, STARTING AT THE LOCATION FOLLOWING THE ENDING CONTROL CHARACTER OF THE WRITE PORTION OF THE OPERATION, UNTIL THE ENDING LOCATION SPECIFIED BY THE B-ADDRESS IS REACHED, BUT NOT INTO B-ADDRESS.

A READ OR WRITE "TO CONTROL" OPERATION ENDS, WHEN IT ENCOUNTERS AN ENDING CONTROL CHARACTER. A TRANSPARENT OPERATION (READ OR WRITE) TREATS ALL CONTROL CHARACTERS AS NORMAL CHARACTERS. I.E., IT DISREGARDS THE SPECIAL FUNCTIONS ASSIGNED TO CONTROL CHARACTERS.

(FOR EXAMPLE, BY IGNORING THE SPECIAL SIGNIFICANCE OF THE END OF TRANSMISSION (ETX) CONTROL SYMBOL, IT CAN WRITE OR READ A FULL BUFFER LENGTH.)

IN THIS CASE, AS IN THE CASE OF WCRC, IT IS AN ERROR CONDITION AND THE READ TRANSPARENT PART OF THE OPERATION IS ABORTED, IF THE WRITE TO CONTROL PART IS NOT STOPPED BY A CONTROL CHARACTER BEFORE IT REACHES THE B-ADDRESS.

WRITE-TRANSPARENT/READ-TO-CONTROL. (WTRC)

THIS PSEUDO OPERATOR INITIATES A WRITE TRANSPARENT OPERATION. THE LENGTH OF THE WT MUST BE SPECIFIED IN THE FILE DECLARATION (SEE *NOTE 5 IN "DECLARING A REMOTE DEVICE AS A FILE" SECTION). THE RESPONSE IS READ INTO THE AREA IMMEDIATELY FOLLOWING THE WT PORTION AND IS LIMITED IN SIZE TO 100 CHARACTERS. THE READ PORTION IS TERMINATED BY AN ENDING CONTROL CHARACTER.

THIS REQUEST IS APPLICABLE ONLY TO B25 OR B35 ADAPTERS AND IS INTENDED TO BE USED ONLY IN COMPUTER-TO-COMPUTER COMMUNICATION.

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

*****

THE PSEUDO OPERATORS DESCRIBED IN THE LAST THREE SECTIONS (WRITE - FLIP TO READ) HAVE BEEN SPECIFICALLY DESIGNED FOR DATA COMMUNICATIONS APPLICATIONS. GENERALLY SPEAKING, EITHER THE WRITE, OR THE READ PART SERVES TO TRANSMIT SOME CONTROL MESSAGE. E.G., THE WRITE MAY CONSIST OF SOME ADDRESSING SEQUENCE, OR FORMAT EFFECTORS, AND THEN FLIP TO READ IN ORDER TO RECEIVE THE INPUT DATA; OR IT MAY WRITE AN OUTPUT RECORD TO THE REMOTE DEVICE AND THEN FLIP TO READ A CONTROL MESSAGE FROM THE REMOTE DEVICE, SUCH AS AN ACKNOWLEDGEMENT OR A NEGATIVE ACKNOWLEDGEMENT.

*****

STREAM MODE AND THE "READY" PSEUDO OP. CODE.

IF THE VARIANT DIGITS IN THE DESCRIPTOR INDICATE STREAM MODE OPERATION, THE READ-TO-CONTROL DESCRIPTORS, WRITE-TO-CONTROL DESCRIPTORS, AND BOTH PORTIONS OF WRITE-TO-CONTROL/READ-TO-CONTROL DESCRIPTORS OPERATE IN A CONTINUOUS STREAM MODE. THIS MEANS THAT INFORMATION IS CONTINUALLY TRANSFERRED TO OR FROM CORE MEMORY UNTIL AN ENDING CONTROL CODE, SUCH AS ETX OR EOT, IS TRANSMITTED.

STREAM MODE OPERATION IS BEST EXPLAINED BY USE OF AN EXAMPLE: A PROGRAM WISHES TO READ A PAPER TAPE FROM A REMOTE DEVICE WHICH IS CONNECTED TO THE COMPUTER ON A DIALED LINE. THE TAPE HAS A NUMBER OF VARIABLE LENGTH RECORDS, EACH OF WHICH IS TERMINATED BY A CARRIAGE RETURN CHARACTER. THE TAPE IS TERMINATED BY AN EOT CHARACTER, WHICH DISCONNECTS THE LINE WHEN IT IS READ.

SINCE THE PROGRAM CANNOT HAVE AN INFINITELY LARGE BUFFER, AND ASSUMING IT CANNOT STOP THE REMOTE TAPE READER AFTER IT BEGINS OPERATION, THE TAPE IS READ INTO CORE IN STREAM MODE AND WRITTEN ON DISK IN 100 CHARACTER RECORDS. WHEN THE EOT CHARACTER IN THE TAPE IS READ AND THE LAST 100 CHARACTER RECORD HAS BEEN WRITTEN ON DISK, THE DISK FILE IS CLOSED AND THEN REOPENED AS INPUT. THE DISK FILE NOW MAY BE READ AND THE INFORMATION CONTAINED ON THE ENTIRE TAPE PROCESSED.

THE FIRST INSTRUCTION TO READ A REMOTE FILE CONTAINS DIAL AND STREAM MODE BITS IN THE DESCRIPTOR VARIANTS. AT THE EXECUTION OF THE FIRST STREAM MODE READ ON A FILE, THE PROGRAM IS MARKED WAITING I/O AND IS NOT ALLOWED TO RUN. INFORMATION COMES INTO THE BUFFER AREA AND THE PROGRAM CONTINUES TO WAIT UNTIL THE BUFFER IS FILLED TO THE B-ADDRESS OF THE DESCRIPTOR. WHEN THE BUFFER IS FILLED TO THIS POINT, AN I/O INTERRUPT

IS RECEIVED. THE DATA IN THE BUFFER IS TRANSLATED IF NECESSARY, MOVED FROM THE BUFFER TO THE RECORD AREA, IF ANY. IF THE FILE DOES NOT HAVE A RECORD AREA, THE PROGRAM INDEX REGISTER #2 WILL BE SET TO THE ADDRESS OF THE RECORD IN THE BUFFER AND THE PROGRAM IS MARKED READY TO RUN.

INFORMATION DOES NOT STOP COMING INTO THE BUFFER BUT CONTINUES INTO CORE LOCATIONS BEYOND THE B-ADDRESS OF THE DESCRIPTOR. IT WILL CONTINUE TO BE READ INTO MEMORY UNTIL AN ADDRESS OF B PLUS 200 IS REACHED, OR UNTIL A CONTROL CODE IS RECEIVED. ONCE THE PROGRAM IS MARKED READY TO RUN, IT BECOMES THE PROGRAM-S RESPONSIBILITY TO PROCESS THE RECORD RECEIVED AND TO ISSUE A "REDY" INSTRUCTION (THE "REDY" PSEUDO OPERATOR GENERATES THE "BUFFER EMPTY" OP. CODE. SEE PART II., I/O DESCRIPTORS.) ON THE FILE BEFORE THE CONTROL HAS FILLED THE BUFFER TO THE ADDRESS GIVEN BY B PLUS 200. THE TIMING OF THIS OPERATOR, HOWEVER, IS CRITICAL.

WHEN THE CONTROL HAS REACHED LOCATION B PLUS 200, AND ASSUMING THAT THE PROGRAM HAS ISSUED A "REDY" INSTRUCTION, THE INFORMATION IN THE AREA BETWEEN THE B-ADDRESS AND THE B PLUS 200 ADDRESS WILL BE PASSED TO THE PROGRAM AND THE PROGRAM MAY THEN PROCESS THIS BLOCK OF DATA. IT IS IMPORTANT TO REMEMBER THAT THE CONTROL DOES NOT STOP TRANSFERRING INFORMATION UNTIL A CONTROL CODE IS RECEIVED. WHEN IT HAS FILLED UP TO B PLUS 200, IT CAUSES AN I/O INTERRUPT AND BEGINS TRANSFERRING THE NEXT CHARACTER INTO THE BUFFER AT A LOCATION GIVEN BY B MINUS 200. IT MUST RECEIVE THE NEXT "REDY" INSTRUCTION BEFORE IT REACHES THE B-ADDRESS.

OBVIOUSLY, THE PROGRAM MUST LIMIT THE AMOUNT OF PROCESSING DONE ON EACH 100 CHARACTER RECORD. THE TIME AVAILABLE FOR PROCESSING EACH RECORD IS A FUNCTION OF THE SPEED OF THE REMOTE DEVICE. IF THE CONTROL DOES NOT RECEIVE THE "REDY" INSTRUCTION BEFORE IT IS READY TO "PING-PONG" THE BUFFER, IT WILL STOP TRANSFERRING INFORMATION INTO CORE MEMORY. SINCE THE TAPE READER CANNOT BE STOPPED, INFORMATION WILL BE LOST. THE CONTROL STORES A RESULT DESCRIPTOR IN CORE MEMORY EACH TIME IT PASSES THE B AND B PLUS 200 ADDRESSES. THIS RESULT DESCRIPTOR WILL CONTAIN AN OPERATION COMPLETE (#1) BIT. IF ERROR CONDITIONS ARE ENCOUNTERED, THE EXCEPTION BIT AND THE RESPECTIVE ERROR BITS WILL BE ON. WHEN THE STREAM MODE OPERATION HAS COME TO A SUCCESSFUL END, BITS #1 AND 13 WILL BE SET. THIS IS NORMAL FOR STREAM MODE OPERATION.

IF THE STREAM MODE OPERATION IS A WRITE OR A WRITE/READ, CONTROL IS RETURNED TO THE PROGRAM IMMEDIATELY AFTER EXECUTION OF THE FIRST I/O OPERATOR, AND A SECOND I/O OPERATION MUST BE INITIATED IMMEDIATELY TO FILL THE NEXT BUFFER. IF THE OPERATION WAS A WRITE-TO-CONTROL/ READ-TO-CONTROL, MCP MUST BE NOTIFIED WHEN THE EXECUTION OF THE READ PORTION IS BEGUN. AFTER THE WRITE-TO-CONTROL INSTRUCTION FOR THE LAST BUFFER WAS EXECUTED.

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

STREAM MODE OPERATIONS CAN BE USED WITH THE "FILL" PSEUDO INSTRUCTION IF THE OPERATION INDICATED IN THE FILL PERMITS THE USE OF STREAM MODE.

THE REMOTE FILE SHOULD BE DECLARED TO HAVE 100 CHARACTER RECORDS AND THEY MUST BE BLOCKED TWO RECORDS PER BLOCK. (SEE "FILE DECLARATION.") THIS WILL INSURE THAT INFORMATION IS TRANSFERRED INTO A BUFFER AREA ONLY. THE MCP DOES NOT INITIATE A STREAM MODE OPERATOR, IF THERE ARE NOT AT LEAST 100 CHARACTERS BETWEEN THE A AND B ADDRESSES OF THE DESCRIPTOR.

THE BUFFER DECLARED BY THE OBJECT PROGRAM MUST BE 200 CHARACTERS LONG. IF A DIAL NUMBER IS TO BE USED, THEN THE BUFFER SHOULD BE 200 CHARACTERS PLUS THE SIZE OF THE DIAL NUMBER, CONTROL CODE, AND FILLER DIGIT, IF NEEDED.

THE REDY PSEUDO OP. CODE HAS THE FORMAT:

COLS.	CONTENTS:
14-17	REDY
22-27	FILE NAME

A "REED" OR "RITE" (WHICHEVER APPLICABLE) INSTRUCTION WITH THE STREAM VARIANT SET ACCOMPLISHES THE SAME FUNCTION AS THE "REDY" PSEUDO INSTRUCTION.

THE INTERROGATE REQUEST. (INTR)

THIS REQUEST PERMITS THE OBJECT PROGRAM TO OBTAIN INFORMATION REGARDING THE STATUS OF THE ADAPTER SPECIFIED IN THE REQUEST.

THE REQUEST PRODUCES A COPY OF THE ADAPTER RESULT DESCRIPTOR (CHANNEL RESULT DESCRIPTOR IN CASE OF SINGLE LINE CONTROLS) IN THE FORM OF A 16 DIGIT FIELD, WHERE EVERY DIGIT IS EQUAL TO ZERO OR ONE, CORRESPONDING TO THE BITS TURNED ON OR OFF IN THE RESULT DESCRIPTOR ITSELF.

ALL ZEROES IN THE STATUS FIELD INDICATE THAT AN I/O WAS INITIATED BUT HAS NOT BEEN COMPLETED YET.

DIGIT #1 = 1 INDICATES THE NORMAL COMPLETION OF AN I/O OPERATION. DIGIT

#2 = 1 IS AN EXCEPTION FLAG; THE CAUSE OF THE EXCEPTION CONDITION IS SPECIFIED BY DIGITS #3 THROUGH #12 SET EQUAL TO 1. THESE DIGITS ARE SET TO CORRESPOND WITH THE BIT-SETTING OF THE RESULT DESCRIPTOR AND ARE INTERPRETED IN THE SAME MANNER. (FOR DETAILS SEE PART II., "RESULT DESCRIPTORS".)

WE NOTE THAT THE EXCEPTION BITS SET IN OTHER RESULT DESCRIPTORS ARE NOT AVAILABLE TO THE OBJECT PROGRAM. THE REASON FOR THIS IS THAT THE CONDITION CAN BE CORRECTED EITHER BY THE OPERATOR (FOR EXAMPLE, IN THE CASE OF AN "ADAPTER NOT READY" CONDITION), OR BY THE MCP, AND NO INTERVENTION ON PART OF THE OBJECT PROGRAM IS NECESSARY.

THE FORMAT OF THE INTERROGATE REQUEST IS:

COLS.	CONTENTS:
14-17	INTR
22-27	FILE NAME
34-39	ADDRESS OF 16 DIGIT FIELD FOR COPY OF RESULT DESCRIPTOR

*****

THE OBJECT PROGRAM SHOULD ASCERTAIN WHETHER AN I/O OPERATION HAS COME TO AN ORDERLY COMPLETION. IT IS THE OBJECT PROGRAM'S RESPONSIBILITY TO ANALYZE THE INFORMATION CONTAINED IN THE RESULT DESCRIPTOR AND TAKE CORRECTIVE ACTION IF SO REQUIRED.

AN EXCEPTION CONDITION SHOULD NOT NECESSARILY BE CONSIDERED AN ERROR CONDITION. FOR EXAMPLE, DIGITS #2 AND #6 SET TO ONE INDICATE THAT A CANCEL REQUEST HAS BEEN EXECUTED. DIGITS #2 AND #7 SET TO ONE INDICATE THE RECEIPT OF AN EOT CONTROL SYMBOL. THE MEANING OF SUCH CONDITIONS CAN BE EVALUATED ONLY WITH REGARD TO THE CHARACTERISTICS OF THE REMOTE DEVICE AND THE PROGRAM'S OBJECTIVES.

THE INTERROGATE ADDRESS REQUEST. (INTA)

THE INTERROGATE ADDRESS REQUEST MAY BE USED TO OBTAIN THE NUMBER OF CHARACTERS READ OR WRITTEN IN THE COURSE OF THE EXECUTION OF THE LAST I/O DESCRIPTOR ON THE CHANNEL ASSOCIATED WITH A PARTICULAR FILE. THE REQUEST SHOULD BE USED WHEN I/O OPERATION IS NOT IN PROGRESS ON THE

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

CHANNEL.

OF THE MANY POSSIBLE USES OF THIS REQUEST, THE FOLLOWING IS POINTED OUT:

A PROGRAM IS HANDLING SEVERAL POLLED REMOTE DEVICES CONNECTED ON THE SAME LINE. IF THE PROGRAM INITIATES A WRITE-TO-CONTROL OPERATOR WITH POLLING VARIANTS (CALLED A "POLL DESCRIPTOR") ON THE SEVERAL DEVICES AND ANY ONE OF THEM IS TURNED OFF, THE POLL DESCRIPTOR WILL TIME OUT AND THE PROGRAM WOULD HAVE TO POLL EACH DEVICE INDIVIDUALLY TO DETERMINE WHICH ONE IS TURNED OFF.

THE CHARACTER COUNT RETURNED BY THE INTERROGATE ADDRESS REQUEST POINTS IN THE POLL LIST PAST THE DEVICE WHICH CAUSED THE DESCRIPTOR TO TIME OUT.

THE FORMAT OF THE REQUEST IS:

COLS.	CONTENTS:
14-17	INTA
22-27	FILE NAME
34-39	ADDRESS OF SIX DIGIT FIELD WHERE THE CHARACTER COUNT IS TO BE STORED.

THE CANCEL REQUESTS. (CONDITIONAL CANCEL: CNCL. UNCONDITIONAL CANCEL: UNCL).

THERE ARE TWO CONSTRUCTS WHICH ALLOW THE OBJECT PROGRAM TO CANCEL A PREVIOUSLY INITIATED I/O OPERATION. THE CANCEL REQUEST MAY BE CONDITIONAL OR UNCONDITIONAL.

THE EFFECT OF THE CANCEL REQUESTS IS SHOWN BELOW:

CONDITIONAL:	UNCONDITIONAL:
1. IF NO I-O IS WAITING AND NO I-O IS IN PROGRESS, NO ACTION IS IS TAKEN FOR THE CANCEL REQUEST.	1. IF NO I-O IS WAITING AND NO I-O IS IN PROGRESS, NO ACTION IS IS TAKEN FOR THE CANCEL REQUEST.

2. IF I-O IS IN PROGRESS, THE OPERATION IS CANCELED IMMEDIATELY IF
   A. NO DATA TRANSMISSION IS CURRENTLY IN PROGRESS, OR
   B. INPUT REQUESTS FROM THE REMOTE DEVICE HAVE BEEN IGNORED.
   (FOR EXAMPLE, AN ENABLED DEVICE WHICH DID NOT RESPOND WITH AN "ENQ" CHARACTER.)

IN ANY OTHER CASE THE REQUEST IS IGNORED, I.E., IT DOES NOT INTERRUPT THE DATA FLOW.

2. IF I-O IS IN PROGRESS, THIS REQUEST CANCELS UNCONDITIONALLY AND IMMEDIATELY ANY OPERATION IN PROGRESS. INPUT REQUESTS FROM REMOTE DEVICES ARE IGNORED, AND THE DATA FLOW IS INTERRUPTED.

3. IF I-O IS WAITING FOR INITIATION, THE REQUEST IS CANCELED.

3. IF I-O IS WAITING FOR INITIATION, THE REQUEST IS CANCELED.

THE UNCONDITIONAL CANCEL ALLOWS THE USE OF THE B AND H VARIANTS. (SEE PART II., DESCRIPTION OF V1 AND V7 VARIANT BITS.)

THE B VARIANT CAUSES A "BREAK". A BREAK MAY BE USED ONLY BY FULL DUPLEX DATA SETS AND BY TERMINALS SENSITIVE TO THIS CODE. IT FUNCTIONS IN THE FOLLOWING WAY: IF THE TRANSMITTER IS TRANSMITTING ON ITS SENDING LINE, THE RECEIVING STATION, THROUGH THE USE OF THE "BREAK", CAN REQUEST THE TRANSMITTER, THROUGH THE RECEIVING LINE, TO STOP TRANSMITTING. THE UNCONDITIONAL CANCEL DESCRIPTOR WITHOUT THE BREAK VARIANT WOULD TERMINATE THE FLOW OF INFORMATION ONLY AT THE ADAPTER OF THE RECEIVING STATION, BUT WOULD NOT NECESSARILY CAUSE THE TRANSMITTING STATION TO STOP. AS A RESULT, THE TRANSMITTER MIGHT NOT BE READY TO RECEIVE INFORMATION SENT TO IT.

THE H VARIANT DISCONNECTS THE DIALLED TELEPHONE LINE.

THE FORMAT OF THE CANCEL REQUESTS IS:

COLS.	CONTENTS:
14-17	CONDITIONAL CANCEL: CNCL UNCONDITIONAL CANCEL: UNCL

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

18-21	VARIANT WITH UNCL ONLY: B OR H
22-27	FILE NAME

THE CLOSE REQUEST.

IN GENERAL, THE CLOSE REQUEST TERMINATES THE USE OF A FILE. WHEN REFERRING TO A REMOTE DEVICE AS A DATA COMMUNICATION CONSTRUCT, IT TERMINATES THE USE OF THAT DEVICE BY THE PROGRAM. FILES (REMOTE DEVICES) WHICH HAVE BEEN CLOSED MAY NOT BE REFERENCED BY THE OBJECT PROGRAM UNTIL THEY ARE OPENED AGAIN.

THE CLOSE REQUEST MAY SPECIFY THREE TYPES OF CLOSING ACTIONS FOR A FILE:

1. NORMAL CLOSE REQUEST RETAINS THE ASSIGNMENT OF THE REMOTE DEVICE TO THE OBJECT PROGRAM, UNTIL THE PROGRAM IS FINISHED.

2. THE "CLOSE WITH RELEASE" RELEASES THE REMOTE DEVICE TO THE SYSTEM.

3. THE "CLOSE WITHOUT DISCONNECT" REQUEST RELEASES THE REMOTE DEVICE TO THE SYSTEM, BUT DOES NOT DISCONNECT THE DIALLED LINE.

THE FIRST TWO CLOSE REQUESTS WILL DISCONNECT IMMEDIATELY A DIALLED LINE ASSOCIATED WITH A FILE UNLESS THE DEVICE IS A REMOTE SPO AND THE OPERATOR HAS "LOGGED IN".

THE FORMAT OF THE CLOSE REQUEST:

COLS.	CONTENTS:
14-17	CLOS
19	TYPE OF CLOSE: N OR BLANK = NORMAL CLOSE R = CLOSE WITH RELEASE

18-19 CLOSE WITHOUT DISCONNECT: ND

22-27 FILE NAME

REMOTE KEYBOARD CONTROL FACILITIES.

THOSE REMOTE DEVICES, WHICH HAVE REMOTE KEYBOARD CONTROL FACILITIES (SEE DEFINITION IN PART I,), AND HAVE BEEN DECLARED AS SUCH ON THE <UNIT> CARD, MAY BE USED IN A MANNER SIMILAR TO THE SPO AT THE COMPUTER CONSOLE.

THIS MEANS, THAT THE REMOTE SPO MAY BE USED TO ENTER CONTROL INFORMATION TO THE COMPUTER. WHEN A "?" IS ENTERED AS THE FIRST DATA CHARACTER OF A MESSAGE, THE INPUT IS RECOGNIZED AS A CONTROL MESSAGE AND INTERCEPTED BY THE DATA COMM MCP. THE TEXT FOLLOWING THIS FIRST QUESTION MARK IS IDENTICAL TO THAT ENTERED AT THE COMPUTER CONSOLE.

FOR CONTROL CARD INPUT "?" OR CC MUST FOLLOW THE FIRST QUESTION MARK AND PRECEDE THE INPUT CONTROL INFORMATION.

IT SHOULD BE NOTED, THAT THE REMOTE SPO USER MAY OPERATE ONLY WITH A RESTRICTED SET OF THE CONSOLE SPO FACILITIES.

.HE REMOTE SPO IS PERMITTED TO INITIATE ONLY CONTROL MESSAGES RELATED TO THE PARTICULAR JOB TO WHICH IT IS ASSIGNED.

REMOTE SPO-S MAY OPERATE ONLY WITH THE LIMITED SET OF KEYBOARD INPUT MESSAGES LISTED IN THE B3500 MCP INFORMATION MANUAL. IN GENERAL, SUCH INPUT MESSAGES WHICH WOULD AFFECT THE WHOLE OPERATING SYSTEM MAY NOT BE USED BY THE REMOTE SPO.

REMOTE SPO STATIONS, WHICH HAVE INITIATED THE EXECUTION OF A PROGRAM, RECEIVE ALL SYSTEM MESSAGES RELEVANT TO THAT JOB, UNLESS THE STATION SPECIFIED OTHERWISE WITH AN HM KEYBOARD INPUT MESSAGE. ALL SYSTEM MESSAGES WHICH ARE TRANSMITTED TO THE REMOTE SPO STATIONS ARE ALSO PRINTED ON THE COMPUTER SPO. ON THE COMPUTER SPO, SUCH MESSAGES ARE PREFIXED WITH THE STATION NUMBER (CHANNEL AND UNIT) OF THE REMOTE TERMINAL. NOTE: THE UNIT NUMBER USED FOR REMOTE STATIONS IS ALWAYS 0 (ZERO).

*****

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

IT FOLLOWS FROM THE ABOVE, THAT A REMOTE SPO NEED NOT BE DECLARED, OR OPENED AS A FILE BY AN OBJECT PROGRAM AS A CONDITION TO ITS COMMUNICATION WITH THE COMPUTER. ONCE ENABLED BY THE COMPUTER, THE OPERATOR MUST "LOG IN" TO THE DATA COMMUNICATIONS MCP AT THE COMPUTER SITE WITH AN "LI" OR "BO" KEYBOARD INPUT MESSAGE (SEE FOR DETAILS: B2500/3500 MCP INFORMATION MANUAL), AND FROM THEN ON THE OPERATOR MAY INITIATE CONTROL INFORMATION FROM HIS REMOTE SPO. THIS, HOWEVER, DOES NOT MEAN, THAT A REMOTE SPO DEVICE CANNOT BE USED (DECLARED AND OPENED) BY AN OBJECT PROGRAM IN THE SAME MANNER, AS A REMOTE DEVICE WITHOUT REMOTE SPO CAPABILITIES.

OBJECT PROGRAMS, WHOSE EXECUTION WAS INITIATED BY A CONTROL INPUT MESSAGE FROM THE REMOTE SPO, ARE AN EXCEPTION FROM THE RULES DESCRIBED IN THE FOREGOING PARAGRAPH.

IF THE PROGRAM OPERATES IN THE "CONVERSATIONAL MODE" ("CONVERSATIONAL MODE" MEANS THAT OUTPUT TO THE REMOTE DEVICE IS CONTINGENT UPON THE INPUT FROM THE SAME DEVICE), THE PROGRAM MUST OPEN THE REMOTE DEVICE WITH WHICH IT IS TO CONVERSE.

IF THE OBJECT PROGRAM-S FILE DECLARATION IDENTIFIES THE REMOTE DEVICE AS "REMSPO" (SEE "DECLARING A REMOTE DEVICE AS A FILE" SECTION), MCP WILL ASSOCIATE THE REMOTE SPO WHICH CAUSED THE PROGRAM TO BE EXECUTED WITH THE OBJECT PROGRAM-S FILE. THIS MAKES THE OBJECT PROGRAM TO OPEN THE CORRECT DEVICE WITHOUT KNOWING THE <ADAPTER ID.> ASSOCIATED WITH THE DEVICE.

THERE IS A DIFFERENCE IN THE HANDLING OF THE REMOTE SPO-S BY THE DATA COMMUNICATION MCP, DEPENDING UPON THE DATA COMMUNICATION NETWORKS USED.

IF THE COMMUNICATION LINE IS THE SWITCHED NETWORK, THE SEQUENCE OF EVENTS FOR A GIVEN ADAPTER N IS THE FOLLOWING:

1. HALT/LOAD.

2. MCP ENABLES ALL SWITCHED LINE REMOTE SPO ADAPTERS.

3. IF AN OBJECT PROGRAM DECLARED THE REMOTE SPO AS A FILE BEFORE THE REMOTE STATION DIALED ADAPTER N, IT BECOMES THE OBJECT PROGRAM-S RESPONSIBILITY TO HANDLE LINE DISCIPLINE (I.E., TO USE, OR TO RELEASE THE REMOTE SPO, OR TO RESPOND TO THE REMOTE SPO-S BREAK OR WRU REQUESTS.)

4. IF NO OBJECT PROGRAM USES ADAPTER N, CONTROL IS STILL WITH MCP AND THE REMOTE SPO MAY DIAL ADAPTER N.

5. MCP RESPONDS WITH WRITING THE MCP IDENTIFIER ON THE REMOTE SPO. THE MCP IDENTIFIER APPEARS IN THE FOLLOWING FORM:

<MCP NAME> <ADAPTER ID.> <CC/U>

6. MCP INITIATES A WCRC OPERATION.

THE WRITE-TO-CONTROL PORTION CONSISTS OF THE FOLLOWING CONTROL SYMBOLS: "BELL CR LF". THE BELL SIGNALS THE STATION THAT IT IT IS NOW IN A MCP READ STATE.

THE READ-TO-CONTROL PORTION EXPECTS CONTROL INFORMATION FROM THE REMOTE SPO. ANY OTHER INPUT CAUSES AN "INVALID KEY-BOARD" RESPONSE.

THE FIRST INPUT INFORMATION MUST CONSIST OF A "LOG IN", OR A "BLACK OUT" MESSAGE. ("LI" OR "BO" KEYBOARD INPUT MESSAGES.)

A. IF THE REMOTE OPERATOR HAS NOTHING TO SEND TO THE MCP, HE TAKES NO ACTION AND THE STATION REMAINS IN A CONSTANT READ STATE.

B. IF THE OPERATOR, IN RESPONSE TO THE BELL, DEPRESSES THE "WRU" KEY ON HIS CONSOLE (WHICH GENERATES THE SAME USA STANDARD CODE AS THE "ENQ" KEY), THE MCP DISPLAYS THE MCP IDENTIFICATION IN A FORMAT SIMILAR TO THE ONE DESCRIBED UNDER # 4.

C. IF CONTROL INFORMATION IS ENTERED FROM THE REMOTE STATION, IT IS PROCESSED AND THEN MCP AGAIN INITIATES A WCRC, AS DESCRIBED UNDER #6.

7. IF THE RC PORTION CONTAINS A REQUEST TO EXECUTE A PROGRAM, WHICH THEN OPENS THE REMOTE SPO AS A FILE, THE RESPONSIBILITY TO MAINTAIN THE LINE DISCIPLINE RESTS FROM HEREON WITH THE OBJECT PROGRAM.

8. ALL INPUT FROM THE REMOTE SPO TO THE OBJECT PROGRAM (AS A RESULT OF AN OBJECT PROGRAM RC OR WCRC) IS MONITORED FOR CONTROL INFORMATION BY THE MCP.

   IF CONTROL INFORMATION IS DETECTED, IT IS PROCESSED AND THE ORIGINAL OBJECT PROGRAM I/O OPERATION RE-INSTATED.

9. IF THE OBJECT PROGRAM DISCONNECTS THE REMOTE SPO THROUGH USE OF AN UNCONDITIONAL CANCEL, OR CLOSES WITH RELEASE THE FILE ASSOCIATED WITH ADAPTER N (WHICH RELEASES THE ADAPTER TO THE SYSTEM), OR THE REMOTE SPO SENDS AN END OF TRANSMISSION CHARACTER,

   A. MCP ASSUMES THAT THE ADAPTER IS NO LONGER ATTACHED TO THE PROGRAM AND LOGS OUT THE REMOTE SPO.

   B. MCP ENABLES ADAPTER N.

   C. THE PROCEDURE AS DESCRIBED IN THIS SECTION FROM #3 IS REPEATED.

IF THE COMMUNICATION LINE IS A LEASED OR PRIVATE LINE, THE CORRESPONDING SEQUENCE OF EVENTS IS AS FOLLOWS:

1. HALT/LOAD.

2. MCP WRITES THE MCP IDENTIFICATION TO EACH REMOTE SPO.

3. IF AN OBJECT PROGRAM DECLARED THE REMOTE SPO AS A FILE BEFORE MCP INITIATED A WCRC, IT BECOMES THE OBJECT PROGRAM-S RESPONSIBILITY TO HANDLE LINE DISCIPLINE, AS DESCRIBED IN #3 OF THE SWITCHED LINE NETWORK MESSAGE FLOW.

4. IF NO OBJECT PROGRAM USES ADAPTER N, MCP INITIATES A WCRC.

FROM HERE ON, THE SEQUENCE OF EVENTS IS THE SAME AS ON SWITCHED LINE NETWORKS. DUE TO THE DIFFERENCE IN THE COMMUNICATION MEDIA, THE OBJECT PROGRAM TERMINATES ITS USE OF A REMOTE SPO ONLY BY CLOSING THE FILE WITH RELEASE.

WHEN THIS OCCURS, MCP CONSIDERS THE ADAPTER NO LONGER ATTACHED TO THE PROGRAM, AND STARTS THE ABOVE DESCRIBED SEQUENCE AGAIN BY INITIATING A NEW WCRC.

*****

TO ALLOW THE COMMUNICATION BETWEEN ANY OBJECT PROGRAM AND ANY REMOTE SPO THAT IS LOGGED IN, REGARDLESS OF ITS STATUS AS A FILE, THE

ACCEPT AND DISPLAY REQUESTS

ARE PROVIDED.

THE ACCEPT REQUEST PERMITS THE REMOTE SPO TO SEND DATA TO AN OBJECT PROGRAM.

THE DISPLAY REQUEST PROVIDES FOR TRANSMITTAL OF DATA FROM AN OBJECT PROGRAM TO A REMOTE SPO.

THE FORMAT OF THE REQUESTS IS:

14-17	ACCEPT: ACPR DISPLAY: DISR
22-27	ACCEPT: LABEL REFERENCING THE BUFFER DESIGNATED TO RECEIVE THE DATA. DISPLAY: LABEL REFERENCING THE BUFFER WHERE DATA IS STORED.
34-39	<ADAPTER ID.> REFERENCING THE REMOTE SPO, OR LABEL REFERENCING THE CHANNEL AND UNIT NUMBER OF THE REMOTE SPO. <ADAPTER ID.> MUST BE THE SAME AS ON THE <UNIT> LOAD CARD, CHANNEL AND UNIT NUMBER MUST BE DECLARED ALPHANUMERIC AND

STATED IN THE FORMAT: "CC/U.", FOLLOWED BY A BLANK.

THE EXECUTION OF THE ACCEPT REQUEST CAUSES THE OBJECT PROGRAM TO STOP AND WAIT FOR THE DATA TO BE ENTERED.

THE ACCEPT REQUEST WILL APPEAR ON THE SPO IN THE FOLLOWING FORMAT:

** <J-S> ACCEPT

AND THE OPERATOR MUST RESPOND BY ENTERING THE DATA (MAX. 72 CHARACTERS) FROM THE SPO WITH AN AX KEYBOARD INPUT MESSAGE.

THE DATA DISPLAYED APPEARS IN THE FOLLOWING FORMAT:

<J-S> DATA

(<J-S> MEANS: <PROGRAM NAME> = <MIX NUMBER>).

*****

A FURTHER CAPABILITY AVAILABLE ONLY TO REMOTE SPO USERS IS THE

B2500/3500 CORE SHARING SYSTEM.

IF TWO OR MORE REMOTE SPO USERS INITIATE THE EXECUTION OF THE SAME OBJECT PROGRAM (CALLED HEREAFTER THE "SHARED PROGRAM"), MCP RESERVES THE CORE NEEDED TO RUN ONE COPY OF THE SHARED PROGRAM, AND USES THE SAME AREA OF CORE TO EXECUTE THE PROGRAM FOR THE SECOND, THIRD, ETC. REQUESTORS. WHENEVER THE EXECUTION OF THE PROGRAM FOR ONE REQUESTOR IS INTERRUPTED, HIS COPY OF THE PROGRAM IS WRITTEN ONTO DISK, AND THE COPY OF ANOTHER REQUESTOR IS BROUGHT INTO CORE AND PROCESSED.

IF THE REMOTE SPO USER INITIATES THE EXECUTION OF A PROGRAM WITH THE FOLLOWING CONTROL INPUT MESSAGE:

? CC RUN <P-N>

THIS SIGNALS TO THE MCP THAT THE PROGRAM IS TO BE EXECUTED ON A CORE SHARED BASIS.

UPON THE FIRST REQUEST, MCP RESERVES, IN ADDITION TO THE CORE AREA NEEDED TO RUN THE PROGRAM, A DISK AREA, WHERE THE PROGRAM WILL BE COPIED WHEN ITS EXECUTION IS INTERRUPTED. FOR SUBSEQUENT RUN REQUESTS ONLY THE APPROPRIATE DISK AREA IS RESERVED.

IN A SHARED PROGRAM, REMOTE FILES (I.E., WHERE <F-ID> = <ADAPTER ID.>) ARE LIMITED TO A BUFFER SIZE OF 100 CHARACTERS. THIS IS BECAUSE MESSAGES TO AND FROM REMOTE SPO STATIONS ARE DIRECTED THROUGH A NON-OVERLAYABLE 100 CHARACTER LONG DATA COMMUNICATION MCP BUFFER. THIS CIRCUMSTANCE EXCLUDES THE USE OF STREAM MODE WITH CORE SHARED PROGRAMS.

THE OPERATOR OF THE REMOTE SPO MAY DISCONTINUE (DS) ONLY THE PROCESSING OF HIS COPY OF THE SHARED PROGRAM.

*****

THE WORKING OF THE CORE SHARING SYSTEM IS BEST EXPLAINED BY AN EXAMPLE:

THE DATA COM MCP CHECKS FOR PROGRAMS WAITING TO BE BROUGHT INTO CORE EACH TIME A CORE-SHARED PROGRAM INITIATES I/O ON ITS ASSOCIATED REMOTE SPO, EACH TIME SUCH AN I/O OPERATION GOES TO COMPLETION, AND EACH TIME THE N-SECOND ROUTINE IS EXECUTED.

"COPY A" OF A PROGRAM IS CURRENTLY EXECUTING AND INITIATES A WRITE/READ ON A REMOTE DEVICE. ASSUMING THAT A FILL WAS NOT USED, THE PROGRAM CANNOT RUN UNTIL THE READ PORTION IS COMPLETE. THE MCP NOW LOOKS FOR ANOTHER COPY OF THE PROGRAM WHICH MAY BE EXECUTED WHILE "COPY A" IS WAITING. IF NO OTHER PROGRAMS ARE WAITING, NO ACTION IS TAKEN. HOWEVER, IF ANOTHER COPY OF THE PROGRAM, FOR EXAMPLE "COPY B" IS WAITING TO BE BROUGHT INTO CORE, "COPY A" WILL BE STOPPED AND WRITTEN ONTO DISK. IT WILL ALSO BE MARKED WAITING I/O AND WILL NOT BE BROUGHT INTO CORE AGAIN UNTIL THE INITIATED I/O IS COMPLETE. AS SOON AS "COPY A" IS OUT OF CORE, "COPY B" IS BROUGHT IN AND ALLOWED TO RUN.

WHEN A PROGRAM IS STOPPED, ALL I/O INITIATED FROM BUFFERS WITHIN A PROGRAM-S AREA MUST BE COMPLETE. IT SHOULD BE REMEMBERED THAT BUFFERS FOR REMOTE SPO-S AND INQUIRY DEVICES ARE NOT WITHIN A PROGRAM-S AREA. ASSUMING EQUAL PRIORITIES, THE MCP DOES NOT ALLOW ONE COPY OF A CORE-

PART III. - ADVANCED ASSEMBLER CONSTRUCTS.

SHARED PROGRAM TO RUN FOR LONGER THAN ONE N-SECOND PERIOD IF ANOTHER COPY OF THE PROGRAM IS WAITING TO BE BROUGHT INTO CORE.

PART IV.

DATA COMMUNICATIONS WITH FORTRAN PROGRAMS.

THE B2500/3500 FORTRAN COMPILER DOES NOT PROVIDE SPECIAL DATA COMMUNICATION CONSTRUCTS. A FORTRAN PROGRAM, WHICH WANTS TO UTILIZE THE DATA COMMUNICATION CAPABILITIES OF THE SYSTEM, MUST HAVE THOSE SECTIONS, WHICH HANDLE THE DATA LINKS, CODED IN "FORBLR" LANGUAGE AS SUBROUTINES, AND ADDED TO THE FORTRAN LIBRARY. THE FORTRAN PROGRAM WILL CALL THE SUBROUTINES, WHEN THEY ARE NEEDED.

THE "FORBLR" LANGUAGE IS AN ASSEMBLER LANGUAGE SPECIALLY DESIGNED TO BE USED FOR CERTAIN SPECIAL APPLICATIONS WITH FORTRAN. THE DATA COMMUNICATION CONSTRUCTS OF THE "FORBLR" ASSEMBLER ARE IDENTICAL TO THE CORRESPONDING ADVANCED ASSEMBLER CONSTRUCTS, AS DESCRIBED IN PART III.

PART V.

DATA COMMUNICATION CONSTRUCTS IN COBOL.

IT HAS BEEN MENTIONED IN PART III., THAT THE DATA COMMUNICATION PSEUDO OPERATORS IN THE ADVANCED ASSEMBLER LANGUAGE ARE MACRO-GENERATORS, WHICH PASS THE NECESSARY INFORMATION FOR A REMOTE DEVICE I/O OPERATION TO THE MCP, WHICH THEN EXECUTES THE OPERATION.

THE COBOL LANUAGE MAKES SIMILAR I/O CONSTRUCTS AVAILABLE, WHICH PERFORM THE SAME FUNCTIONS, BUT ARE DIFFERENT IN FORMAT. THE SYNTAX OF THE COBOL STATEMENTS HAS BEEN DEFINED IN ACCORDANCE WITH THE GENERAL PRINCIPLES OF THE LANGUAGE, I.E., THE STATEMENTS ARE BUILT FROM ORDINARY ENGLISH WORDS.

IN THE FOLLOWING PAGES, THE COBOL CONSTRUCTS ARE DESCRIBED IN THE SAME ORDER, AS THE CORRESPONDING PSEUDO-OPS OF THE ADVANCED ASSEMBLER LANGUAGE IN PART III. THE EXPLANATIONS PERTAINING TO THE PROGRAMMATIC USE AND FUNCTIONS OF THESE CONSTRUCTS ARE NOT REPEATED, BUT DIFFERENCES, IF ANY, ARE POINTED OUT.

SINCE THIS MANUAL IS PRODUCED ON THE LINE PRINTER, THE LIMITATIONS OF THE AVAILABLE CHARACTER SET MAKE CERTAIN DEPARTURES FROM THE SYNTACTICAL NOTATIONS OF THE B2500/3500 "COBOL REFERENCE MANUAL" INEVITABLE.

THE FOLLOWING NOTATIONS USED IN THIS MANUAL ARE DIFFERENT FROM THE COBOL SYNTAX:

GENERIC TERMS, ("LOWER CASE WORDS").

GENERIC TERMS, WHICH MUST BE SUPPLIED IN THAT FORMAT POSITION BY THE PROGRAMMER, ARE ENCLOSED IN BROKEN BRACKETS.

EXAMPLE: <FILE-NAME-1>

ALTERNATE WORDS OR PHRASES, ("BRACES").

ALLOWABLE ALTERNATE WORDS OR PHRASES, ENCLOSED IN BRACES IN THE COBOL

MANUAL, ARE SEPARATED BY SLASHES.

EXAMPLE: (NUMERIC/ALPHABETIC)

IN EVERY OTHER RESPECT THE RULES OF THE COBOL LANGUAGE, AS DESCRIBED IN THE B2500/3500 "COBOL REFERENCE MANUAL", APPLY.

*****

THE OPERATING REQUIREMENTS AND FUNCTIONS OF THE MCP, AS DESCRIBED IN THE FIRST SECTIONS OF PART III., ARE ALSO APPLICABLE TO PROGRAMS WRITTEN IN COBOL.

ENVIRONMENT DIVISION.

REMOTE DEVICES, WHICH ARE TO BE USED BY AN OBJECT PROGRAM, MUST BE IDENTIFIED AS FILES IN THE ENVIRONMENT DIVISION OF THE COBOL SOURCE PROGRAM. WITHIN THE STRUCTURE OF THAT DIVISION (INPUT-OUTPUT SECTION, FILE CONTROL PARAGRAPH), THE CONSTRUCT, AS FAR AS A REMOTE DEVICE IS CONCERNED, IS:

SELECT (OPTIONAL) <FILE-NAME-1> ASSIGN TO <HARDWARE-NAME-1>

(NO TRANSLATION/TRANSLATION NON STANDARD)

(RESERVE NO/<INTEGER-1> ALTERNATE AREA/AREAS)

IN THE ABOVE CONSTRUCT:

1. THE WORD OPTIONAL MUST BE USED IN THE SELECT STATEMENT WHENEVER AN INPUT FILE CAN BE OMITTED DURING CERTAIN OPERATIONAL CIRCUMSTANCES.

2. THE ASSIGN CLAUSE MUST BE USED IN ORDER FOR THE MCP TO ASSOCIATE THE FILE WITH A HARDWARE COMPONENT, I.E., A REMOTE DEVICE. THE ALLOWABLE HARDWARE-NAME ENTRIES FOR REMOTE DEVICES ARE:

PART V. - COBOL.

ENTRY FORMAT:	REMOTE DEVICE:
B-9350	TYPEWRITER MOD. 33,
TWX	MOD. 33 OR 35 TELETYPE
IBM-1050	
IBM-1030	
O-L-BANKING	BURROUGHS B606
DCT-2000	UNIVAC DCT 2000
B-3500	BURROUGHS B3500 COMPUTER
B-2500	BURROUGHS B2500 COMPUTER
ATT-8A1	MOD. 35 TELETYPE
TT-28	8383 SYSTEM (TELETYPE MOD.28)
TOUCH-TONE	BURROUGHS BTT
DISPLAY-UNIT	BURROUGHS BDD
TC-500	BURROUGHS TC500
B-500	BURROUGHS 500 SERIES COMPUTER

3. THE NO TRANSLATION/TRANSLATION NON-STANDARD CLAUSE IS OPTIONAL; IF OMITTED, IT MEANS STANDARD TRANSLATION.

4. THE RESERVE OPTION MAY BE USED IN CONNECTION WITH REMOTE DEVICES, BUT SINCE DATA COMM. MCP DOES NOT UTILIZE MORE THAN ONE INPUT-OUTPUT BUFFER AREA PER REMOTE DEVICE, THERE IS NO ADVANTAGE IN HAVING ALTERNATE AREAS.

FOR MORE DETAILED EXPLANATIONS CONCERNING TRANSLATION AND BUFFER TECHNIQUES, SEE PART III., "DECLARING A REMOTE DEVICE AS A FILE", NOTES 3, AND 4.

DATA DIVISION.

THE USE OF DATA COMMUNICATION EQUIPMENT AFFECTS THE FILE SECTION OF THE DATA DIVISION. THE REMOTE DEVICE, WHICH HAS BEEN INTRODUCED IN THE ENVIRONMENT DIVISION AS A PARTICULAR TYPE OF HARDWARE, MUST NOW BE IDENTIFIED AS A FILE. INFORMATION CONCERNING THE PHYSICAL STRUCTURE OF THE FILE, AND IDENTIFICATION OF THE REMOTE DEVICE MUST BE FURNISHED TO THE COMPILER.

DUE TO THE SPECIAL REQUIREMENTS OF THE DATA COMMUNICATION MCP, THE FILE DESCRIPTION OF A REMOTE DEVICE, WHILE FOLLOWING THE GENERAL RULES AS

DESCRIBED IN THE SYNTAX OF THE "COBOL REFERENCE MANUAL", IS SUBJECT IN ITS CONTENTS TO SOME RESTRICTIONS.

THE FILE DESCRIPTION MUST FURNISH THE FOLLOWING INFORMATION:

FD <FILE-NAME-1>

(BLOCK CONTAINS <INTEGER-4> RECORDS/CHARACTERS)

VA/VALUE OF ID IS <LITERAL-1>

(ACTUAL KEY IS <DATA-NAME>)

IN THE ABOVE SYNTAX:

1. <FILE-NAME-1> MUST BE SHOWN AS IN THE ENVIRONMENT DIVISION ENTRY.

2. THE BLOCK ENTRY:

THIS ENTRY IS REQUIRED ONLY IF THE DEVICE WILL OPERATE IN STREAM MODE. GENERALLY, THE DATA COMMUNICATION MCP HANDLES UNBLOCKED RECORDS ONLY, IN WHICH CASE THIS ENTRY IS NOT NEEDED. IN STREAM MODE, HOWEVER, THE REMOTE FILE MUST BE DECLARED TO HAVE 100 CHARACTER RECORDS AND THEY MUST BE BLOCKED TWO RECORDS PER BLOCK. THE ENTRY SHOULD THEREFORE INDICATE

<INTEGER-4> = 2 RECORDS.

3. VALUE OF ID. CLAUSE: <LITERAL-1> MUST SHOW THE <ADAPTER ID.> AS CURRENTLY USED BY THE MCP. (SEE PART III., MCP SECTION.)

4. THE ACTUAL KEY CLAUSE IS REQUIRED ONLY WHEN THE WRITE-TRANS-READ OR THE WRITE-READ-TRANS VERBS ARE USED, NORMALLY ONLY IN DATA COMMUNICATION BETWEEN COMPUTERS. THE <DATA-NAME> MUST SPECIFY IN CASE OF A WRITE-TRANS-READ VERB THE LENGTH OF THE WRITE PORTION OF THE VERB, OR IN CASE OF A WRITE-READ-TRANS VERB, THE TOTAL LENGTH OF THE RECORD SIZE. IN

BOTH CASES, THE LENGTH MUST BE EXPRESSED IN CHARACTERS.

THE <DATA-NAME> MUST BE PC9(6)CMP, OTHERWISE ERROR #860 ("ACTUAL KEY FOR DATA COMM NOT PC9(6)CMP") WILL BE GENERATED.

THERE ARE NO LIMITATIONS IMPOSED ON THE RECORD DESCRIPTIONS, ALL ALLOWABLE CONSTRUCTS MAY BE USED, AS DEEMED NECESSARY BY THE PROGRAMMER.

THE CONTROL CHARACTERS (SEE DEFINITIONS IN PART I., EBCDIC CODES IN PART III.) WHICH ARE TO BE USED BY THE PROGRAM, SHOULD BE DESCRIBED IN THE WORKING STORAGE SECTION. (SEE SAMPLE PROGRAM IN PART VI.)

PROCEDURE DIVISION.

COBOL INCLUDES A NUMBER OF VERBS DESIGNED SPECIFICALLY FOR DATA COMMUNICATION APPLICATIONS. THESE VERBS, TOGETHER WITH SOME OF THE INPUT-OUTPUT VERBS IN GENERAL USE IN THE LANGUAGE, SERVE TO CONTROL THE OPERATIONS OF THE REMOTE DEVICES.

OPEN.

THE FILE DESIGNATED IN THE ENVIRONMENT DIVISION MUST BE OPENED BEFORE THE PROGRAM STARTS USING IT. THE FOLLOWING PARTS OF THE SYNTAX OF THE OPEN STATEMENT ARE APPLICABLE:

OPEN (INPUT <FILE-NAME-1> (<FILE-NAME-2>))

(OUTPUT <FILE-NAME-3> (<FILE-NAME-4>))

(INPUT-OUTPUT/I-O <FILE-NAME-5> (<FILE-NAME-6...>))

MCP HAS INFORMATION FROM THE ENVIRONMENT AND DATA DIVISION ENTRIES TO THE EFFECT THAT THE FILE IS A REMOTE DEVICE WHICH, DEPENDING UPON THE HARDWARE CAPABILITIES, MAY FUNCTION AS INPUT, OR OUTPUT, OR INPUT-OUTPUT DEVICE. THIS OPEN VERB IS NOT SUBJECT TO THE RESTRICTION THAT INPUT-

OUTPUT OPTIONS PERTAIN TO MASS STORAGE FILES ONLY; REMOTE DEVICES MAY BE OPENED AS INPUT-OUTPUT FILES ALSO.

EXCEPTION: REMOTE DEVICES, WHICH HAVE REMOTE KEYBOARD CONTROL FACILITIES, AND WHICH HAVE BEEN DESIGNATED AS REMOTE SPO-S, ARE ABLE TO COMMUNICATE WITH THE COMPUTER WITHOUT HAVING BEEN OPENED.

ENABLE.

THE FUNCTION OF THIS VERB IS TO

1. RECOGNIZE INPUT INQUIRY REQUESTS FROM A REMOTE DEVICE,

2. RECOGNIZE THE RING INDICATOR,

3. DISCONNECT THE TELEPHONE LINE ON DIALLED LINES.

(FOR MORE DETAILED EXPLANATION, SEE PART III., "ESTABLISHING CONTACT BETWEEN THE COMPUTER AND A REMOTE DEVICE", ALSO THE SEQUENCE OF EVENTS ON SWITCHED NETWORKS IN THE "REMOTE KEYBOARD CONTROL FACILITIES" SECTION.)

SYNTAX FOR THE STATEMENT IS:

ENABLE <FILE-NAME> (PROCEED TO <PARAGRAPH-NAME>)

SINCE THE FLOW OF EVENTS FOLLOWING THE ENABLE IS UNPREDICTABLE, THE NEXT INSTRUCTION WOULD PROBABLY BE A WAIT STATEMENT, DEPENDING ON THE HARDWARE CAPABILITIES OF THE REMOTE DEVICE.

IF THE OPTIONAL ?PROCEED TO <PARAGRAPH-NAME>? CLAUSE IS USED, PROCESSING WILL BE RESUMED WITH THE FIRST STATEMENT IN THE <PARAGRAPH-NAME>, AFTER THE ENABLE IS COMPLETED. <PARAGRAPH-NAME> MUST BE IN THE NON-OVERLAYABLE PROGRAM SEGMENT OR IN THE SAME SEGMENT AS THE WAIT.

IF THE PROCEED CLAUSE IS OMITTED, THE PROGRAM EXECUTION WILL CONTINUE WITH THE STATEMENT FOLLOWING THE WAIT.

PART V. - COBOL.

FILL.

REFER FOR DETAILS TO PART III., THE "FILL REQUEST."

THE FILL VERB FUNCTIONS ESSENTIALLY IN A WAY SIMILAR TO THE "FILL REQUEST" DESCRIBED IN PART III. THE "COBOL REFEENCE MANUAL" LISTS THREE OPTIONS OF THE VERB; HOWEVER, OPTIONS #2 AND 3 ARE NOT DISCUSSED HERE, BECAUSE THEY DO NOT INVOLVE THE USE OF REMOTE DEVICES AND TELE-COMMUNICATION EQUIPMENT.

THE SYNTAX TO CAUSE THIS VERB TO LOAD INPUT DATA TO THE <FILE-NAME> BUFFER IS:

FILL <FILE-NAME> (NO-TIME-OUT) (START-TEXT) (DIAL) (END-TEXT)

(POLL) (VOICE) (TONE) (IGNORE) (STREAM) WITH

READ / WRITE / WRITE-READ / WRITE-READ-TRANS / WRITE-TRANS-READ

(PROCEED TO <PARAGRAPH-NAME>)

THE FOLLOWING OPTIONAL CLAUSES INVOKE THE CORRESPONDING VARIANT BIT OPERATIONS:

CLAUSE IN SYNTAX:	VARIANT OPERATION (DESCRIBED IN PART II.)
NO-TIME-OUT	INHIBIT TIME-OUT (V7)
START-TEXT	PRESET STX (V5)
DIAL	DIAL MODE (V1) THE DIAL NUMBER IS ACCESSED

	FROM MEMORY STARTING AT THE 01 LEVEL ENTRY OF THE <RECORD-DESCRIPTION> FOR THE <FILE-NAME> SPECIFIED. THE DIAL NUMBERS MUST BE DECLARED AS USAGE COMPUTATIONAL. - THE RULES OF CONSTRUCTING THE TELEPHONE NUMBER ARE AS DESCRIBED IN PART II., "V1 - DIAL MODE."
END-TEXT	DELETE ETX (V6)
VOICE	VOICE-RESPONSE MODE (V8)
TONE	TONE RESPONSE (V8 AND V4)
IGNORE	IGNORE ENQ (V8,V2)
STREAM	STREAM MODE (V2) STREAM MODE IS SUBJECT TO THE SAME RULES AS DESCRIBED IN PART III.
POLL	AUTOMATIC POLLING (V3 AND V4)

THE PROGRAM MUST DO A READ TO MOVE THE DATA FROM THE BUFFER TO THE RECORD AREA, OR TO SET THE PROGRAM-S INDEX REGISTER 2.

THE OPTIONS, WHICH MAY BE USED (OR USED CONCURRENTLY) IN THE FILL STATEMENT ARE CONTINGENT UPON THE I-O OPERATION DESIGNATED IN THE STATEMENT. (SEE THE SYNTAXES OF THE I-O VERBS.)

NOTE: THE (AT END) CLAUSE MUST NOT BE USED WITH THE FILL VERB.

WAIT.

FOR DETAILS REFER TO PART III., "THE WAIT REQUEST".

PART V. - COBOL.

THE WAIT VERB ALLOWS THREE OPTIONS, WHICH ARE THE FOLLOWING:

OPTION 1:

WAIT

THIS OPTION SUSPENDS AN OBJECT PROGRAM UNTIL AN ENABLED REMOTE DEVICE RESPONDS WITH AN INQUIRY, OR UNTIL A FILL BECOMES COMPLETE. IT IS USEFUL IN CONJUNCTION WITH THE FILL ONLY IF MORE THAN ONE REMOTE DEVICES ARE INVOLVED IN THE OPERATION, OTHERWISE THE FILL ALONE ACCOMPLISHES THE SAME PURPOSE.

OPTION 2:

WAIT UNTIL <LITERAL> / <DATA-NAME>

THE <LITERAL> IN THIS OPTION MEANS THE TIME IN SECONDS, FOR WHICH THE OBJECT PROGRAM IS SUSPENDED. IF <DATA-NAME> IS USED, IT MUST BE DECLARED 9(5) COMPUTATIONAL AND MUST ALSO DENOTE SECONDS.

THE OBJECT PROGRAM WILL BE RESUMED PRIOR TO THE SPECIFIED TIME, IF INPUT IS RECEIVED.

OPTION 3:

WAIT <LITERAL> / <DATA-NAME>

THIS VERSION SUSPENDS THE OBJECT PROGRAM UNCONDITIONALLY FOR THE SPECIFIED PERIOD OF TIME AND THE PROGRAM WILL NOT BE RESUMED, IF INPUT IS RECEIVED. THIS OPTION IS USEFUL IN A POLLING LOOP, WHERE CONTINUOUS POLLING IS NOT REQUIRED, ONLY AT CERTAIN INTERVALS.

THE MAXIMUM TIME, FOR WHICH AN OBJECT PROGRAM MAY BE SUSPENDED, IS 23 HOURS, 59 MINUTES AND 59 SECONDS.

PART V. - COBOL.

THE I-O VERBS:

READ.

THIS VERB IS THE IMPLEMENTATION OF THE READ-TO-CONTROL DESCRIPTOR (SEE PART II., "DESCRIPTOR OPERATION", AND PART III., "REED".)

LOADING STARTS WITH THE LOCATION SPECIFIED BY THE 01 LEVEL OF THE RECORD-DESCRIPTION OF A FILE.

THE SYNTAX OF THE READ VERB IS:

READ <FILE-NAME> (INTO <RECORD-NAME>)

(NO-TIME-OUT) (START-TEXT) (STREAM) (DIAL)

(AT END <ANY STATEMENT>)

THE ABOVE OPTIONS ARE DESCRIBED IN THE PRECEDING SECTION DEALING WITH THE FILL VERB.

ANOTHER READ STATEMENT MUST BE GIVEN IN COBOL TO CORRESPOND TO THE "REDY" INSTRUCTION.

WRITE

THIS VERB IS THE IMPLEMENTATION OF THE WRITE-TO-CONTROL OPERATOR. (SEE PART II., "DESCRIPTOR OPERATION", AND PART III., "RITE".)

THE SYNTAX IS:

WRITE <RECORD-NAME-1> (FROM <RECORD-NAME-2>)

PART V. - COBOL.

(END-TEXT) (START-TEXT) (STREAM) (DIAL) (VOICE) (TONE)

(AT END <ANY STATEMENT>)

DATA WILL BE WRITTEN TO A REMOTE DEVICE FROM ASCENDING MEMORY LOCATIONS BEGINNING AT THE 01 LEVEL OF THE PERTINENT RECORD DESCRIPTION, UNTIL AN ENDING CONTROL CHARACTER IS ENCOUNTERED.

<RECORD-NAME-1> MUST BE DEFINED IN THE DATA DIVISION AS A 01 ENTRY UNDER THE FD ENTRY FOR A FILE. <RECORD-NAME-2> SPECIFIES THE AREA FROM WHICH THE RECORD IS TO BE MOVED TO <RECORD-NAME-1>.

THE ALLOWABLE OPTIONS LISTED IN THE SYNTAX ARE DESCRIBED IN THE "FILL" VERB SECTION.

ANOTHER WRITE STATEMENT MUST BE GIVEN TO CORRESPOND TO THE "REDY" PSEUDO OPERATOR.

WRITE-READ

FOR DETAILS OF THE OPERATION PERFORMED BY THIS VERB, REFER TO PART III., "WCRC".

THE SYNTAX IS:

WRITE-READ <RECORD-NAME-1> (FROM <RECORD-NAME-2>)

(NO-TIME-OUT) (END-TEXT) (VOICE) (DIAL) (TONE) (STREAM)

(START-TEXT) (POLL) (IGNORE)

(AT END <ANY STATEMENT>)

NOTE: (STREAM) AND (VOICE) MAY NOT BE USED TOGETHER IN THE SAME STATEMENT.

DATA WILL BE PASSED TO THE REMOTE DEVICE FROM ASCENDING MEMORY LOCATIONS STARTING AT THE 01 LEVEL OF <RECORD-NAME-1>. THE DATA WILL BE READ FROM THE REMOTE DEVICE INTO MEMORY LOCATIONS IMMEDIATELY FOLLOWING THE CONTROL CODE WHICH TERMINATED THE WRITE PORTION OF THE OPERATION.

WRITE-READ-TRANS.

THIS VERB FUNCTIONS IN THE SAME MANNER AS THE CORRESPONDING CONSTRUCT DESCRIBED IN PART III. DATA IS PASSED TO THE REMOTE DEVICE FROM ASCENDING MEMORY LOCATIONS STARTING AT THE 01 LEVEL OF <RECORD-NAME-1> UNTIL AN ENDING CONTROL CODE IS ENCOUNTERED, THEN A READ TRANSPARENT IS INITIATED WHICH WILL READ INTO THE RECORD AREA UNTIL THE END OF <RECORD-NAME-1>.

THE APPLICABLE SYNTAX IS:

WRITE-TRANS-READ <RECORD-NAME-1> (FROM <RECORD-NAME-2>)

(DIAL) (NO-TIME-OUT) (AT END <ANY STATEMENT>)

WRITE-TRANS-READ.

FOR DESCRIPTION OF THE FUNCTION OF THIS VERB REFER TO THE CORRESPONDING CONSTRUCT IN PART III.

THE SYNTAX OF THE VERB IS:

WRITE-TRANS-READ <RECORD-NAME-1> (FROM<RECORD-NAME-2>)

PART V. - COBOL.

(DIAL) (NO-TIME-OUT) (AT END <ANY STATEMENT>)

INTERROGATE

THE FUNCTION OF THIS VERB IS TO OBTAIN THE RESULT DESCRIPTOR REPRESENTING THE STATUS OF THE REMOTE DEVICE. SEE ALSO PART III., "THE INTERROGATE REQUEST."

THE SYNTAX IS:

INTERROGATE <FILE-NAME> INTO <DATA-NAME>

<DATA-NAME> MUST BE DEFINED AS AN ELEMENTARY ITEM WITH A PICTURE 9(16) COMPUTATIONAL AND MUST BE REDEFINED TO MAKE REFERENCE TO EACH ELEMENT WITHIN THE RESULT DESCRIPTOR.

THE INTERPRETATION OF THE RESULT DESCRIPTOR BITS IS GIVEN IN PART II., "RESULT DESCRIPTORS", AND "RESULT DESCRIPTORS AND HARDWARE ACTION" SECTIONS.

INTERROGATE ADDRESS.

THE FUNCTION AND USE OF THIS STATEMENT IS DESCRIBED IN PART III., IN THE "INTERROGATE ADDRESS REQUEST" SECTION.

THE SYNTAX FOR THE VERB IS:

INTERROGATE END-TEXT <FILE-NAME-1> INTO <DATA-NAME>

<DATA-NAME> MUST BE DEFINED AS AN ELEMENTARY ITEM WITH A PICTURE 9(6) CMP.

DISABLE

THIS VERB FUNCTIONS IN A WAY SIMILAR TO THE CONDITIONAL AND UNCONDITIONAL CANCEL REQUESTS DESCRIBED IN PART III.

THE SYNTAX IS:

DISABLE <FILE-NAME> ON (NO-DATA) (BREAK) (DISCONNECT)

THE NO-DATA OPTION CORRESPONDS TO THE CONDITIONAL CANCEL, I.E., THE INPUT REQUEST WILL BE CANCELLED ONLY IF AN I/O OPERATION IS NOT IN PROGRESS, OTHERWISE THE DISABLE REQUEST IS IGNORED. IN OTHER WORDS, THE NO-DATA OPTION DOES NOT INTERRUPT THE DATA FLOW.

THE ?BREAK? VARIANT CORRESPONDS TO THE B VARIANT, THE ?DISCONNECT? TO THE H VARIANT IN THE ASSEMBLER LANGUAGE AND BOTH WORK AS DESCRIBED IN THE REFERENCED SECTION IN PART III.

CLOSE

THE CLOSE VERB, APPLIED TO A DATA COMMUNICATION FILE, HAS THE FOLLOWING SYNTAX:

CLOSE <FILE-NAME> (WITH RELEASE) / (NO DISCONNECT)

AS DESCRIBED IN THE "CLOSE REQUEST" IN PART III., A FILE CAN BE

1. CLOSED AND REMAIN ASSIGNED TO THE PROGRAM (NORMAL CLOSE), OR

2. IT MAY BE CLOSED WITH THE RELEASE OPTION, IN WHICH CASE THE REMOTE DEVICE IS RELEASED TO THE SYSTEM.

3. IF THE "NO DISCONNECT" OPTION IS USED, THE FILE IS RELEASED TO THE SYSTEM, BUT THE DIALLED TELEPHONE LINE IS NOT DISCONNECTED.

PART V. - COBOL.

REMOTE KEYBOARD CONTROL FACILITIES.

THE DESCRIPTION IN PART III. ON THE OPERATIONAL CAPABILITIES OF REMOTE DEVICES WITH REMOTE KEYBOARD CONTROL FACILITIES ARE APPLICABLE AND THE

ACCEPT AND DISPLAY

VERBS ARE PROVIDED FOR DATA TRANSFER BETWEEN THE OBJECT PROGRAM AND THE REMOTE SPO.

THE SYNTAX FOR THE ACCEPT VERB IS:

ACCEPT <DATA-NAME-1> FROM <LITERAL> / <DATA-NAME-2>

WHERE <LITERAL> OR <DATA-NAME-2> MUST FURNISH THE <ADAPTER-ID>.

A MAXIMUM OF 60 CHARACTERS MAY BE ENTERED FROM THE KEYBOARD.

THE SYNTAX FOR THE DISPLAY VERB IS:

DISPLAY <LITERAL-1> / <DATA/NAME-1> (<LITERAL-2> / <DATA-NAME-2>...)

UPON <LITERAL-3> / <DATA-NAME-3>

WHERE <LITERAL-3> OR <DATA-NAME-3> MUST FURNISH THE <ADAPTER-ID>.

FOR FURTHER DETAILS REFER TO PART III., "THE ACCEPT AND DISPLAY REQUESTS", AND THE "COBOL REFERENCE MANUAL".

*****

IF THE REMOTE DEVICE USES A CODE FOR WHICH THE MCP DOES NOT PROVIDE TRANSLATION, OR THE OPTIONAL CODE TRANSLATING FUNCTION OF THE MCP IS NOT INVOKED, IT BECOMES THE RESPONSIBILITY OF THE OBJECT PROGRAM TO CONSTRUCT THE PROPER CODE STRINGS FOR COMMUNICATION WITH THE REMOTE DEVICE. THE "TRANSLATE" INSTRUCTION OF THE B2500/3500 COMPUTER SERVES THIS FUNCTION (SEE B2500/3500 ADVANCED ASSEMBLER LANUAGE MANUAL) AND THE COBOL LANGUAGE PROVIDES THE

ENTER

VERB TO ALLOW THE PROGRAMMERS TO MAKE USE OF THIS CAPABILITY OF THE COMPUTER.

THE ENTER VERB PROVIDES FOR THE USE OF AN ALTERNATE LANGUAGE.

THE CONSTRUCT OF THE VERB IS:

ENTER SYMBOLIC / COBOL.

"ENTER SYMBOLIC" IS USED AT THE POINT THE COBOL SOURCE PROGRAM STARTS USING THE ALTERNATE LANGUAGE. "ENTER COBOL" IS THE RETURN POINT FROM THE ALTERNATE LANGUAGE TO COBOL.

THE GENERAL RULES OF THIS CONSTRUCT ARE DESCRIBED IN THE "COBOL REFERENCE MANUAL". IN DATA COMMUNICATION PROGRAMMING THE MOST IMPORTANT FEATURE OF THIS ALTERNATE LANGUAGE IS TO ALLOW THE USE OF THE "TRN" OPERATOR, WHICH READS NNNN CHARACTERS, OR DIGITS FROM THE A-FIELD, SUBSTITUTES ACCORDING TO THE TABLE IN THE B-FIELD, AND STORES THE SUBSTITUTE CHARACTERS IN THE C-FIELD. THE ADDRESS OF THE TABLE LOCATED AT THE B-FIELD MUST BE MOD 1000.

NATURALLY, THE USE OF THE ALTERNATE LANGUAGE IN COBOL IS NOT LIMITED TO THE "TRN" OPERATOR, BUT FOR DATA COMMUNICATION PROGRAMMING PURPOSES IT IS THE MOST IMPORTANT FEATURE OF THE ALTERNATE LANGUAGE.

PART VI. - B9350.

THE B9350 TELETYPEWRITER.

GENERAL.

THE B9350 IS A REMOTE TYPEWRITER (TELETYPE MODEL 33 KEYBOARD SEND - RECEIVE SET), CONSISTING OF A MANUAL KEYBOARD FOR ORIGINATING MESSAGES AND A PRINTER THAT PRINTS ON CONTINUOUS PAPER FORM BOTH THE INCOMING AND OUTGOING MESSAGES. THE LAYOUT OF THE KEYBOARD IS SIMILAR TO THE STANDARD TYPEWRITER KEYBOARDS. THE REMOTE STATION OPERATES ON HALF DUPLEX SWITCHED OR PRIVATE TELEPHONE LINES AND HAS A CHARACTER SET OF A TOTAL OF 96 UPPER CASE LETTERS, DIGITS, SPECIAL CHARACTERS, AND CONTROL CODES.

THE TRANSMISSION CODE IS THE 1963 ASCII CODE, TRANSMITTED IN ASYNCHRONOUS, START/STOP MODE AT A SPEED OF 110 BITS PER SECOND.

THE BIT-CONFIGURATION AND THE ORDER OF BIT TRANSMISSION WITHIN A CHARACTER IS:

1. START BIT: 1
2. DATA BITS: 7
3. MARKING BIT: 1
4. STOP BITS: 2

THE TOTAL NUMBER OF BITS IN A CHARACTER IS 11.

NO ERROR CHECKING IS DONE ON THE TRANSMITTED CHARACTERS OR BLOCKS OF THE MESSAGES.

THE MESSAGES ARE NOT ACKNOWLEDGED BY THE TERMINAL.

"TIME OUT" CONDITION IS SENSED BY THE COMPUTER AFTER 20 SEC.-S.

PART VI. - B9350.

THE 1963 ASCII CODE.

THE 1963 ASCII CODE USED BY THIS TERMINAL IS THE FOLLOWING:

BITS 4,5,6,7	BITS 1, 2, 3 = 000	001	010	011	100	101	110	111
0000	NULL	DC0	BL	0	@	P		
0001	SOM	DC1	NOTE1	1	A	Q		
0010	EOA	DC2	"	2	B	R		
0011	EOM	DC3	#	3	C	S		
0100	EOT	DC4	$	4	D	T		
0101	WRU	ERR	%	5	E	U		
0110	RU	SYNC	&	6	F	V		
0111	BELL	LEM	NOTE2	7	G	W	IIN=	
1000	FE0	S0	(	8	H	X	ASSIGNED	
1001	HT/SK	S1	)	9	I	Y		
1010	LF	S2	*	:	J	Z		
1011	V (TAB)	S3	+	;	K	?		
1100	FF	S4	,	<	L	NOTE3	ACK	

PART VI. - B9350.

BITS 4,5,6,7	BITS 1, 2, 3 000	001	010	011	100	101	110	111
1101	CR	S5	-	=	M	?		NOTE4
1110	SO	S6	.	>	N	NOTE5		ESC
1111	SI	S7	/	?	O	←		DEL

CERTAIN CHARACTERS DEFINED BY THE 1963 ASCII CODE ARE NOT AVAILABLE ON THE LINE PRINTER. THESE ARE INDICATED IN THE TABLE BY "NOTE N" AND ARE LISTED BELOW:

NOTE1 : EXCLAMATION POINT,
NOTE2 : APOSTROPHE,
NOTE3 : REVERSE SLASH,
NOTE5 : UNDERSCORE.

NOTE4 DENOTES AN UNASSIGNED CONTROL.

THE B9350 KEYBOARD IS CAPABLE OF TRANSMITTING THE FOLLOWING CONTROL CODES:

CR (CARRIAGE RETURN)
EOT (END OF TRANSMISSION)
WRU (WHO ARE YOU)
NAK (ERROR)
EOM (END OF MESSAGE)
LF (LINE FEED)
BEL (BELL)

THE B9350 INTERPRETS ONLY THE FOLLOWING CODES:

CR (CARRIAGE RETURN)
BEL
LF (LINE FEED)
WRU ("WHO ARE YOU?")

MCP PROVIDES TRANSLATION FROM THE 1963 ASCII CODE TO EBCDIC CODE, IF THE PROGRAM REQUESTS SUCH TRANSLATION. THE 1963 ASCII TO EBCDIC AND EBCDIC

PART VI. - B9350.

TO 1963 ASCII TRANSLATION TABLES ARE ESSENTIALLY THE SAME AS THE CORRESPONDING TRANSLATION TABLES OF THE 1967 ASCII CODE. (THESE TABLES ARE REPRODUCED IN FULL IN THE "BURROUGHS TC500 TERMINAL COMPUTER" SECTION.) THE DIFFERENCES ARE SHOWN BELOW:

EBCDIC		1963 ASCII		1967 ASCII	
CODE	GRAPHIC	CODE	GRAPHIC	CODE	GRAPHIC
06	UNASSIGNED	7C	ACK	06	ACK
2E	ACK	7C	ACK	06	ACK
5F	LOGICAL NOT	00	UNDE-FINED	LOGICAL NOT	7E
81 THRU 89	LOWER CASE LETTERS FROM A THRU I	00-00	UNDE-FINED	61 THRU 69	LOWER CASE LETTERS FROM A THRU I
91 THRU 99	LOWER CASE LETTERS FROM J THRU R	00-00	UNDE-FINED	6A THRU 6F 70 THRU 72	LOWER CASE LETTERS FROM J THRU R
A2 THRU A9	LOWER CASE LETTERS FROM S THRU Z	00-00	UNDE-FINED	A2 THRU A9	LOWER CASE LETTERS FROM S THRU Z

*****

THE OBJECT PROGRAM MAY FORGO THE USE OF THE TRANSLATION PROVIDED BY THE MCP, AND SUPPLY ITS OWN TRANSLATION TABLE. (SEE "TRANSLATE BY TABLE" SECTION IN THE "B2500/3500 ASSEMBLERS REFERENCE MANUAL", AND THE "ENTER" CONSTRUCT IN THE "COBOL REFERENCE MANUAL".)

IN CASES WHERE LITTLE INTERNAL PROCESSING IS REQUIRED, THIS MAY RESULT IN CONSIDERABLE TIME SAVING. FOR EXAMPLE, IF THE INCOMING INFORMATION IN ASCII CODE IS TO BE TRANSMITTED TO ANOTHER REMOTE DEVICE WHICH ALSO USES THE ASCII CODE, TRANSLATION MAY NOT BE NECESSARY AT ALL. ANOTHER

PART VI. - B9350.

CASE IN POINT WOULD BE, IF THE INCOMING ASCII CODE IS TO BE TRANSMITTED TO ANOTHER REMOTE DEVICE WHICH USES A CODE DIFFERENT FROM ASCII OR EBCDIC, E.G., BAUDOT OR PTTC/6. IN SUCH CASE, IT MAY BE ADVANTAGEOUS TO TRANSLATE FROM ASCII DIRECT TO THE CODE OF THE NEXT RECEIVER.

*****

PART VI. - B9350.

A. MESSAGE EXCHANGES ON SWITCHED TELEPHONE LINES:

1. B9350 CALLS THE COMPUTER:

COMPUTER SENDS	ENABLE	WC	/RC	WC	/RC	ENABLE
			E		E	
		GO AHEAD	O	TEXT	O	DISCONNECT
			M		M	
B9350 SENDS	DIAL		E		E	
			TEXT		O	DISCONNECT
			M		T	

2. COMPUTER CALLS B9350.

COMPUTER SENDS	WC (WITH DIAL)			ENABLE	
		E	E		
	N...N	O	TEXT	O	DISCONNECT
		N		T	
B9350 RECEIVES					DISCONNECT

IN THE ABOVE ILLUSTRATION

N...N = TELEPHONE NUMBER
EON = UNDIGIT "C" PLUS FILLER DIGIT IF REQUIRED.

PART VI. - B9350.

B. MESSAGE EXCHANGE ON DIRECT LINE.

B9350 INQUIRES TO COMPUTER, COMPUTER RESPONDS:

COMPUTER SENDS	ENABLE	WC	/RC	WC	/RC	ENABLE NOTE*
		GO AHEAD	EOM	TEXT	EOM	END OF TRANSMISSION
B9350 SENDS		WRU	TEXT EOM		EOT	END OF TRANSMISSION

NOTE*: THIS "ENABLE" HAS NO FUNCTION IN TERMINATING THE ILLUSTRATED MESSAGE; IT RATHER MAKES THE SYSTEM READY TO HANDLE THE NEXT MESSAGE. THE TIME INTERVAL BETWEEN THE FIRST "ENABLE" AND THE "WC/RC" INSTRUCTION IS OF INDETERMINATE LENGTH, WHILE THE SECOND "ENABLE" FOLLOWS THE EOT IMMEDIATELY.

*****

SAMPLE PROGRAM WITH OBJECT PROGRAM TRANSLATION:

```
       IDENTIFICATION DIVISION.
       PROGRAM-ID.  TEST .
       DATE-COMPILED.
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. B-3500.
       OBJECT-COMPUTER. B-3500.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT TYPEWRITER ASSIGN TO B-9350 NO TRANSLATION.
           SELECT PRINTER-FILE ASSIGN TO PRINTER.
       I-O-CONTROL.
       DATA DIVISION.
       FILE SECTION.
       FD  TYPEWRITER
           VALUE OF ID IS "REMOT3".
       01  TYPE-RECORD  PC X(72).
       FD  PRINTER-FILE  LABEL RECORDS OMITTED.
```

```
       01  PRINTER-RECORD  PC X(132).
       WORKING-STORAGE SECTION.
       01  ASCII-TO-EBCDIC  MOD.
           02  FILLER  PC 9(20)  CMP  VA @000102030004050607008.
           02  FILLER  PC 9(20)  CMP  VA @08090A0B000C0D0E0F008.
           02  FILLER  PC 9(20)  CMP  VA @1011121300141516170 8.
           02  FILLER  PC 9(20)  CMP  VA @18191A1B001C1D1E1F008.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @405A7F7B005B6C507D008.
           02  FILLER  PC 9(20)  CMP  VA @4D5D5C4E006B604B61008.
           02  FILLER  PC 9(20)  CMP  VA @F0F1F2F300F4F5F6F7008.
           02  FILLER  PC 9(20)  CMP  VA @F8F97A5E004C7E6E6F008.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @7CC1C2C300C4C5C6C7008.
           02  FILLER  PC 9(20)  CMP  VA @C8C9D1D200D3D4D5D6008.
           02  FILLER  PC 9(20)  CMP  VA @D7D8D9E200E3E4E5E6008.
           02  FILLER  PC 9(20)  CMP  VA @E7E8E970004A6A6D4F008.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @71C1C2C300C4C5C6C7008.
           02  FILLER  PC 9(20)  CMP  VA @C8C9D1D200D3D4D5D6008.
           02  FILLER  PC 9(20)  CMP  VA @D7D8D9E200E3E4E5E6008.
           02  FILLER  PC 9(20)  CMP  VA @E7E8E972000673 FFF008.
       01  EBCDIC-TO-ASCII  MOD.
           02  FILLER  PC 9(20)  CMP  VA @000102030004050607008.
           02  FILLER  PC 9(20)  CMP  VA @08090A0B000C0D0E0F008.
           02  FILLER  PC 9(20)  CMP  VA @1011121300141516170 8.
           02  FILLER  PC 9(20)  CMP  VA @18191A1B001C1D1E1F008.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @2000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @00005C2E003C282B5F008.
           02  FILLER  PC 9(20)  CMP  VA @2600000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000212400 2A293B7E008.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @2D2F000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @00005D2C00255E3E3F008.
           02  FILLER  PC 9(20)  CMP  VA @5B607B7D000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @00003A2300 40273D2200 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0061626300 64656667008.
           02  FILLER  PC 9(20)  CMP  VA @6869000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @006A6B6C006D6E6F7000 8.
           02  FILLER  PC 9(20)  CMP  VA @7172000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000737400 75767778008.
           02  FILLER  PC 9(20)  CMP  VA @797A000000000000000 8.
           02  FILLER  PC 9(20)  CMP  VA @0000000000000000000 8.
```

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```
        02  FILLER  PC 9(20)  CMP  VA @00000000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @00000000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @00414243044445464700@.
        02  FILLER  PC 9(20)  CMP  VA @48490000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @004A4B4C004D4E4F5000@.
        02  FILLER  PC 9(20)  CMP  VA @51520000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @00000000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @00005354005556575800@.
        02  FILLER  PC 9(20)  CMP  VA @595A000000000000000@.
        02  FILLER  PC 9(20)  CMP  VA @30313233034353637000@.
        02  FILLER  PC 9(20)  CMP  VA @38390000000007F0000@.
PROCEDURE DIVISION.
START.
    OPEN OUTPUT PRINTER-FILE.
    OPEN I-O TYPEWRITER.
L1. READ TYPEWRITER.
    ENTER SYMBOLIC.
        TRN  72  TYPE-RECORD  ASCII-TO-EBCDIC  PRINTER-RECORD
    ENTER COBOL.
    WRITE PRINTER-RECORD.
    ENTER SYMBOLIC.
        TRN  72  PRINTER-RECORD EBCDIC-TO-ASCII PRINTER-RECORD
    ENTER COBOL.
    WRITE TYPE-RECORD FROM PRINTER-RECORD.
    GO TO L1.
    STOP RUN.
```

*****

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

THE 8A1 DATA SELECTIVE CALLING SYSTEM.

THE 8A1 DATA SELECTIVE CALLING SYSTEM IS A DATA COMMUNICATION SYSTEM OPERATING IN HALF DUPLEX MODE ON A SINGLE PRIVATE OR LEASED LINE. THE SYSTEM CONSISTS OF A NUMBER OF MODIFIED TELETYPE MODEL 35 TELETYPEWRITER STATIONS UNDER THE CONTROL OF A B2500/3500 COMPUTER (MASTER STATION). THE TELETYPEWRITERS MAY BE OF THE FOLLOWING MODELS:

ASR (SEND-RECEIVE SET WITH KEYBOARD AND PAPER TAPE READER AND PUNCH).

KSR (SEND-RECEIVE SET WITH MANUAL KEYBOARD).

RO (RECEIVE ONLY SET, NO SENDING CAPABILITY).

THE MAIN CHARACTERISTICS OF THE 8A1 SYSTEM TELETYPEWRITER ARE:

MODE OF OPERATION:	HALF DUPLEX.
DATA SETS:	FULL DUPLEX.
TRANSMISSION SPEED:	110 BITS PER SEC. (100 WORDS/MIN.)
CODE:	1963 ASCII. (SEE TABLE IN "B9350" SECTION.)
START OF TEXT:	ANY CODE EXCEPT "REVERSE SLASH" OR ASTERISK.
END OF TEXT:	EOM OR EOT
MAX. NUMBER OF STATIONS POLLED:	25
BIT CONFIGURUTION WITHIN A CHARACTER:	1 START BIT, 7 DATA BITS.

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

1 PARITY BIT,
2 STOP BITS.

TIME-OUT: PAPER-TAPE OPERATION: 5 SEC-S,
MANUAL OPERATION: 25 SEC-S.

THE BITS ARE TRANSMITTED IN THE ORDER DESCRIBED ABOVE; THE DATA BITS ARE TRANSMITTED LOW ORDER BIT FIRST.

NO PARITY CHECKING IS DONE BY THE TELETYPE STATIONS.

THE "BREAK" CAN BE GENERATED AND IS RECOGNIZED BY THE STATIONS.

*****

POLLING.

THE MASTER STATION (THE B2500/3500 COMPUTER) MAINTAINS CONTROL OVER ALL ACTIVITY ON THE LINE. NO STATION IS ALLOWED TO TRANSMIT WITHOUT BEING POLLED BY THE COMPUTER.

THE COMPUTER INITIATES THE SYSTEMS ACTIVITIES BY POLLING THE STATIONS. THIS IS DONE BY TRANSMITTING A TWO CHARACTER CODE (THE "TRANSMITTER START CODE", ABBREVIATED: TSC) TO THE STATIONS IN SOME PROGRAMMATICALLY DETERMINED ORDER. THE TSC CODE ITSELF CONSISTS OF THE CONTROL CODE "DC0" FOLLOWED BY ANY OF THE 26 ALPHABETIC CHARACTERS. EACH STATION HAS A UNIQUE TSC CODE ASSIGNED TO IT. THE TSC SENT OUT BY THE COMPUTER IS SENSED BY ALL STATIONS, BUT ONLY THE STATION TO WHICH THE CODE IS ASSIGNED, WILL RESPOND.

THE STATION WHICH IS POLLED (I.E., TO WHICH THE TSC IS ASSIGNED), MAY RESPOND IN ANY OF THE FOLLOWING WAYS:

1. IT MAY ANSWER BACK THAT IT HAS NO TRAFFIC TO SEND.

   THE NO-TRAFFIC RESPONSE CODE IS: REVERSE SLASH ACK. SINCE THE LINE PRINTER HAS NO REVERSE SLASH PRINTING CHARACTER, THE <RS> SYMBOL WILL BE USED IN THIS MANUAL TO REFERENCE THIS CHARACTER.

2. THE STATION HAVING TRAFFIC STARTS SENDING. THE MESSAGE FORMAT AND THE REQUIRED CONTROL CODES ARE DESCRIBED FURTHER BELOW.

   TO BEGIN SENDING, THE OPERATOR OF THE STATION MUST MOVE THE "BID" LEVER ON THE KEYBOARD, AND HAVE THE PAPER-TAPE READER READY FOR TRANSMISSION.

3. IF A STATION IS IN LOW PAPER OR LOW PAPER TAPE CONDITION, NO ANSWER IS RETURNED, AND A TIME-OUT CONDITION OCCURS.

4. A STATION DESIRING TO SEND BY KEYBOARD INSTEAD OF THE PAPER TAPE READER, RESPONDS WITH THE CONTROL CODE SEQUENCE: SOM SOM, WHICH IS GENERATED BY THE HARDWARE IN RESPONSE TO A TSC.

IF THE STATION TRANSMITS FROM PAPER TAPE, 5 SECONDS ARE ALLOWED IN A POLLING OPERATION FOR RESPONSE TO A TSC, AFTER WHICH THE NEXT TSC IS GENERATED. IF NO RESPONSE HAS BEEN RECEIVED WITHIN THE 5 SECONDS, A TIME-OUT CONDITION OCCURS AND THE COMPUTER POLLS THE NEXT STATION.

IF THE STATION TRANSMITS FROM THE MANUAL KEYBOARD, THE TIME INTERVAL BETWEEN TWO CONSECUTIVE CHARACTERS IS MUCH LONGER WHILE THE ATTENDANT IS OPERATING THE STATION KEYBOARD. THE COMPUTER RECOGNIZES FROM THE "SOM SOM" CODE THAT MANUAL OPERATION IS TAKING PLACE AND ALLOWS THE POLLED STATION 25 SECONDS (FROM THE TIME THE "SEND" LAMP IS LIGHTED) TO BEGIN TRANSMITTING.

THE TIME-OUT INTERVAL IS SET FOR THE DURATION OF THE MANUAL OPERATION TO 25 SECONDS.

THE END OF THE MANUAL OPERATION IS DETECTED FROM THE EOT CONTROL CODE WHICH FINISHES THIS OPERATION. AT THIS TIME THE SYSTEM RETURNS TO THE 5 SEC. TIME-OUT MODE.

THE COMPUTER MAY BE PROGRAMMED TO POLL ALL STATIONS, OR SOME STATIONS, WHICH HAVE HEAVY TRAFFIC, MORE OFTEN THAN OTHERS. THE PROGRAM MAY ALSO SUSPEND POLLING FOR A SPECIFIED PERIOD OF TIME, ("REST"), IF NO STATION RESPONDS WITH TRAFFIC TO THE POLLING.

THE STATION OPERATOR CAN SIGNAL TO THE COMPUTER THAT THE STATION HAS INFORMATION TO TRANSMIT BY MOVING THE "BID" LEVER. THIS LEVER WILL

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

GENERATE AND SEND AN <RS> ACK ON THE LINE, WHICH IS RECOGNIZED BY THE COMPUTER, IF IT IS IN READ STATE, AS A "WAKE-UP" SIGNAL. THE STATION MUST WAIT FOR THE TRANSMISSION UNTIL IT IS POLLED BY THE COMPUTER.

IN IDLE STATE, MARKINGS (ONE BITS) ARE TRANSMITTED BY THE STATION. THE CHANGE FROM MARKINGS TO SPACINGS (ZERO BITS) IS THE "WAKE-UP" SIGNAL TO THE COMPUTER; IT FOLLOWS THAT THE <RS> IS THE SIGNIFICANT ELEMENT IN THE "WAKE-UP" CODE, THE ACK IS TRANSMITTED ONLY BECAUSE IT IS PART OF THE NORMAL ANSWER-BACK CODE.

SELECTION. (MESSAGE ROUTING.)

THE "CALL DIRECTING CODE" -S (ABBREVIATED: CDC) ARE THE IDENTIFIERS OF THE STATIONS ON THE SYSTEM. THE CDC CODE IS USED FOR SELECTING THE STATION OR STATIONS WHICH ARE TO RECEIVE A MESSAGE.

THE CDC CONSISTS OF 2 ALPHABETIC CHARACTERS, ALLOWING A COMBINATION OF 676 CDC-S PER SYSTEM.

A CDC IS ASSIGNED TO EACH STATION, AND SEPARATE CDC-S MAY BE ASSIGNED TO THE STATIONS PRINTER, PUNCH, OR A COMBINED CDC FOR THE PRINTER AND PUNCH. (THE COMPUTERS CDC IS: "SOM EOM", REFERRED TO AS "AC".)

STATIONS MAY BE ASSIGNED GROUP AND BROADCAST CDC-S, IN WHICH CASE EVERY STATION IN THE GROUP OR ON THE SYSTEM WILL RECEIVE THE MESSAGE.

A STATION STARTS TRANSMISSION WITH THE CDC OF THE STATION TO WHICH THE MESSAGE IS DIRECTED. THE STATION RECOGNIZES THE CDC OF THAT STATION, AND

1. IF THE STATION IS READY TO RECEIVE, RETURNS A "<RS> ACK" ANSWER.

2. IF THE STATION IS DISABLED, NO ANSWER IS RETURNED.

3. IF THE STATION CANNOT RECEIVE DUE TO LOW PAPER OR LOW PAPER-TAPE CONDITION, NO ANSWER IS RETURNED.

IN CASES 2 AND 3, A TIME-OUT CONDITION OCCURS.

UPON RECEIPT OF THE EOA CODE, (THE END OF MESSAGE HEADING), THE STATION SELECTED BY THE CDC IS PLACED IN "NON-SELECT/PRINT" MODE, (OR "NON-SELECT/PUNCH"), WHILE ALL THE STATIONS NOT SELECTED ENTER INTO "NON-SELECT/NON-PRINT" MODE. WHEN THE END OF TRANSMISSION IS SIGNALLED BY THE EOT CODE, ALL STATIONS ARE PLACED INTO "SELECT/NON-PRINT" MODE.

SINCE DURING THE TRANSMISSION OF THE MESSAGE HEADING ALL THE STATIONS, INCLUDING THE SELECTED STATION, ARE IN "SELECT/NON-PRINT" MODE, THE MESSAGE HEADING WILL NOT BE PRINTED.

*****

THE COMPUTER SHOULD BE PROGRAMMED TO HANDLE A TIME-OUT IN RESPONSE TO A POLL OR CDC. IT SHOULD ALSO BE ABLE TO DETECT THAT A SELECTED STATION IN A DOWNSTREAM OPERATION FAILED TO ANSWER ITS CDC. (A DOWNSTREAM OPERATION MEANS THAT A STATION SENDS INFORMATION TO OTHER STATIONS ON THE SYSTEM DIRECTLY.) WHEN THIS CASE IS ENCOUNTERED, THE COMPUTER SHOULD SEND A PROGRAMMED "* ACK" CODE TO THE CALLING STATION , WHICH THEN TRANSMITS THE MESSAGE TO THE COMPUTER. THE COMPUTER MUST RECORD THE MESSAGE AND PROVIDE FOR ITS LATER TRANSMISSION TO THE ORIGINALLY SELECTED STATION.

MESSAGE FORMAT.

THE SYSTEM REQUIRES THAT THE MESSAGES MEET CERTAIN FORMAT SPECIFICATIONS. EVERY MESSAGE CONSISTS OF TWO PARTS:

A. HEADING,

B. TEXT.

A. THE MESSAGE HEADING ON PAPER TAPE HAS THE FOLLOWING FORMAT:

1. FROM ONE TO FIVE INCHES OF DELETE CHARACTERS. (THESE ARE NEEDED TO MAKE IT POSSIBLE TO INSERT THE TAPE IN THE READER HEAD.)

2. THE CDC FOLLOWED BY A DELETE CHARACTER FOR EACH OF THE SELECTED STATIONS. (THE DELETE CHARACTERS ARE REQUIRED TO ALLOW THE TAPE READER TO STOP ON A NON-INFORMATION CHARACTER WHILE THE ANSWER-

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

BACK IS RETURNED.)

3. EOA (END OF ADDRESS CODE) FOLLOWED BY A DELETE CHARACTER. THIS CODE SERVES TO LOCK OUT ALL STATIONS WHICH ARE NOT SELECTED, SO THEY WILL NOT BE STARTED BY A SEQUENCE IN THE MESSAGE TEXT WHICH HAS THE SAME APPEARANCE AS THEIR CDC. IT ALSO STARTS THE PRINTER (OR PUNCH) OF THE SELECTED UNIT(S).
THE EOA MUST BE FOLLOWED BY A DELETE.

EXAMPLE FOR THE HEADING OF A MULTIPLE ADDRESS MESSAGE ON TAPE:

DELETE....DELETE CDC1 DELETE CDC2 DELETE EOA DELETE

1-5 INCHES TAPE

THE MESSAGE HEADING SHOULD BE ENTERED FROM THE KEYBOARD IN THE FOLLOWING WAY:

1. TURN ON THE "BID" KEY,

2. ENTER THE CDC ON THE KEYBOARD,

3. PAUSE AFTER EACH CDC FOR <RS> ANSWER-BACK,

4. ENTER DELETE FROM KEYBOARD,

5. ENTER EOA AFTER LAST "CDC DELETE" SEQUENCE,

B. TEXT.

IN PREPARING THE TEXT, THE PAGE FORMAT EFFECTOR CODES AVAILABLE ON THE STATIONS MAY BE USED, FOLLOWED BY A DELETE CHARACTER CODE. THE SENDING STATION WILL NORMALLY PAUSE WHILE THE FORMAT EFFECTOR ACTION TAKES PLACE. THE TEXT SHOULD ALWAYS BEGIN WITH A "CR LF" SEQUENCE TO INSURE THAT THE CARRIAGE PRINTER IS PROPERLY POSITIONED AT THE LEFT MARGIN OF THE PAPER.

THE TEXT IS ENDED BY AN "EOT DELETE" CODE SEQUENCE. THE LAST MESSAGE ON TAPE SHOULD BE FOLLOWED BY SIX DELETE CHARACTERS.

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

AN EXAMPLE OF A TAPE MESSAGE IN ITS VARIOUS PHASES OF TRANSMISSION IS GIVEN BELOW. THE ILLUSTRATIONS INCLUDE THE HEADING (CDC1 = AB, CDC2 = AC), WHERE APPLICABLE.

1. THE PREPARED TAPE AT THE SENDING STATION:

DELETE....DELETE AB DELETE AC DELETE EOA DELETE CR LF DELETE
TEXT OF MESSAGE CR LF DELETE TAB DELETE 1111 CR LF DELETE TAB DELETE
2222 CR LF DELETE TAB DELETE 3333 CR LF DELETE EOT DELETE DELETE
DELETE DELETE DELETE DELETE

2. THE SAME MESSAGE MONITORED AT THE SENDING STATION WOULD APPEAR:

AB <RS> AC <RS>
TEXT OF MESSAGE
    1111
    2222
    3333

3. THE MESSAGE RECEIVED BY STATIONS AB AND AC:

TEXT OF MESSAGE
    1111
    2222
    3333

4. THE TAPE PUNCHED BY STATIONS AB AND AC:

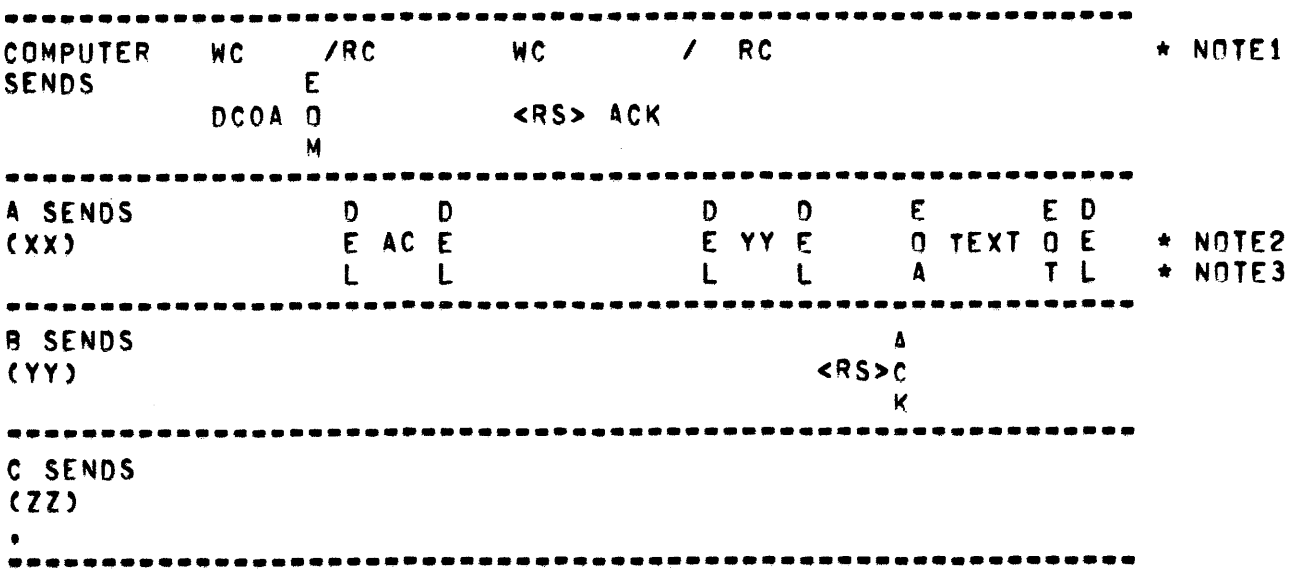
CR LF DELETE TEXT OF MESSAGE CR LF DELETE TAB DELETE 1111
CR LF DELETE TAB DELETE 2222 CR LF DELETE TAB DELETE 3333
CR LF DELETE EOT DELETE

IF THE TEXT IS SENT FROM THE MANUAL KEYBOARD, THE FOLLOWING DIFFERENCES SHOULD BE NOTED: IF A CDC APPEARS IN THE TEXT, (I.E. AFTER THE EOA CODE), WHICH IS TO BE PUNCHED ON TAPE AT THE RECEIVING STATION FOR RETRANSMISSION, IT MUST BE FOLLOWED BY A DELETE. - THE EOT CODE NEED NOT BE FOLLOWED BY DELETE-S.

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

SCHEMATIC ILLUSTRATIONS OF 8A1 SYSTEM OPERATIONS:

1. COMPUTER POLLS STATION A, A HAS MESSAGE FOR COMPUTER AND STATION B:



NOTE1: THE FIRST WC/RC INSTRUCTION IS SET WITH "DELETE ETX" OPTION.

NOTE2: STATIONS HAVE A DCO (ZERO) CONTROL CODE PLUS ONE LETTER POLLING SEQUENCE (A,B,C), AND A TWO LETTER ADDRESSING SEQUENCE (XX, YY,ZZ).

NOTE3: DEL STANDS FOR DELETE CONTROL CODE, WHICH IS GENERATED BY A HARDWARE KEY.

2. COMPUTER POLLS STATION B, B HAS MESSAGE FOR STATIONS A AND C:

```
COMPUTER   WC    / RC                                                        DELETE ETX
SENDS           E                                                            OPTION SET.
           DCOB O
                M
--------------------------------------------------------------------------------
A SENDS                                          A
(XX)                                        <RS> C
                                                 K
--------------------------------------------------------------------------------
B SENDS              D          D    D          D    D       E      E   D
(YY)                 E SOM SOM  E XX E          E ZZ E       O TEXT O   E
                     L          L    L          L    L       A      T   L
--------------------------------------------------------------------------------
C SENDS                                                          A
(ZZ)                                                        <RS> C
                                                                 K
--------------------------------------------------------------------------------
```

3. COMPUTER ADDRESSES B AND C.

```
---------------------------------------------------------------------------
COMPUTER   WC          /RC      WC          /RC      WC           NOTE:
SENDS      D    D E             D    D E             E        E   WC/RC=S
           E YY E O             E ZZ E O             O TEXT   O   DELETE ETX
           L    L M             L    L M             A        T   OPT. SET.
---------------------------------------------------------------------------
A SENDS
(XX)
.
---------------------------------------------------------------------------
B SENDS                    A
(YY)                  <RS> C
.                          K
---------------------------------------------------------------------------
C SENDS                                          A
(ZZ)                                        <RS> C
.                                                K
---------------------------------------------------------------------------
```

PART VI - 8A1 DATA SELECTIVE CALLING SYSTEM.

4. COMPUTER POLLS STATION A, A HAS MESSAGE FOR COMPUTER AND STATION B. B IS DISABLED OR HAS LOW PAPER OR LOW PAPER TAPE AND DOES NOT RETURN A RESPONSE WHEN IT IS ADDRESSED.

COMPUTER SENDS	WC / RC DCOA EOM	WC / RC <RS>ACK	WC / RC TIME-OUT	WC / RC *NOTE *ACK
A SENDS	DEL ACK DEL	DEL YY DEL		EOA TEXT EOT
B SENDS			NO RESPONSE	
.				
C SENDS				
.				
.				

NOTE: DELETE ETX OPTION SET WITH FIRST WC/RC INTRUCTION.

*****

PART VI - 8383 TTY SELECTIVE CALLING SYSTEM.

THE 8383 TTY SELECTIVE CALLING SYSTEM.

THE 8383 TTY SELECTIVE CALLING SYSTEM IS A DATA COMMUNICATION SYSTEM OPERATING ON ONE PRIVATE (OR LEASED) TELEPHONE OR TELEGRAPH LINE UNDER CONTROL OF A B2500/3500 COMPUTER, USING TELETYPE MODEL 28 TELETYPEWRITERS AS REMOTE STATIONS.

THE SYSTEM CAN BE EXPANDED BY INTERCONNECTING TWO OR THREE SEPARATE 8383 LINES, IN WHICH CASE THE LINE ATTACHED TO THE CONTROL STATION IS CALLED THE "HOME LINE", THE SEPARATE LINES (MAXIMUM TWO) CONNECTED TO THE HOME LINE ARE REFERRED TO AS "FOREIGN LINES". THE STATIONS ON THE FOREIGN LINES ARE THE "OUTLYING STATIONS".

THE MESSAGES ORIGINATED ON THE HOME LINE CAN BE AUTOMATICALLY DELIVERED TO THE STATIONS ON THE FOREIGN LINE, AND VICE-VERSA. THIS IS ACCOMPLISHED THROUGH AN INTERCONNECTING RELAY STATION, WHICH INCLUDES A REPERFORATOR-TRANSMITTER UNIT, WITH THE REPERFORATOR PART FUNCTIONING AS A TERMINATING STATION ON THE HOME LINE. IT RECEIVES THE ORIGINATED MESSAGE AND PUNCHES IT IN TAPE FOR RETRANSMISSION BY THE TRANSMITTER PART. THE TRANSMITTER FUNCTIONS AS ORIGINATING STATION ON THE FOREIGN LINE AND WILL SEND THE MESSAGE, RECEIVED BY THE REPERFORATOR, TO A TERMINATING STATION ON THE FOREIGN LINE. THIS RELAY TRANSMITTING ON THE 8383 SYSTEM IS CALLED "MULTILINE OPERATION", IN CONTRAST TO THE "SINGLE-LINE OPERATION", WHICH MEANS TRANSMISSION OF MESSAGES BETWEEN THE STATIONS CONNECTED EXCLUSIVELY BY THE HOME LINE.

THE TELETYPE MODEL 28 TELETYPEWRITERS ARE EQUIPPED WITH MANUAL KEYBOARD (KSR SETS), OR WITH KEYBOARD AND PAPER TAPE READER AND PUNCH (ASR SET).

THE MAIN CHARACTERISTICS OF THE MODEL 28 TELETYPEWRITER ARE:

TRANSMISSION MODE:	SERIAL
OPERATION:	HALF DUPLEX
"BREAK"	NONE
DATA CODE:	BAUDOT
CHARACTER LENGTH:	8 BITS

PART VI - 83B3 TTY SELECTIVE CALLING SYSTEM.

(5 DATA BITS, 1 START AND 2 STOP BITS)

TIME-OUT 20 SEC-S

TRANSMISSION SPEED: 100 WORDS (=600 CHARACTERS) PER MIN.
74.2 BITS PER SEC.

THE BAUDOT CODE.

THE CODE USED BY THIS SYSTEM IS CALLED THE "BAUDOT" CODE. IT CONSISTS OF 5 DATA BITS, AND SINCE THE POSSIBLE COMBINATIONS OF 5 BITS ARE INSUFFICIENT TO REPRESENT A 64 CHARACTER SET, TWO CHARACTERS HAVE BEEN DESIGNATED TO FUNCTION AS "SHIFT CHARACTERS", I.E., TO SIGNAL THAT THE FOLLOWING CHARACTER IS TO BE INTERPRETED AS "LETTERS" OR "FIGURES".

THE SHIFT CHARACTERS ARE:

11011 = "UPPER CASE" OR "FIGURE" SHIFT,
11111 = "LOWER CASE" OR "LETTER" SHIFT.

SHIFT CHARACTERS ARE DELETED FROM THE INPUT.

THE 5 BIT CHARACTERS FOLLOWING AN UPPER CASE SHIFT CHARACTER ARE STORED IN MEMORY WITH THE 3 HIGH ORDER BITS OF THE 8 BITS SET TO 001. (ZERO-ZERO-ONE.)

THE CHARACTERS FOLLOWING A LOWER CASE SHIFT CHARACTER ARE STORED WITH THE THREE HIGH ORDER BITS SET TO 000. (ZERO-ZERO-ZERO.) ON EACH I/O OPERATION, LOWER CASE IS ASSUMED INITIALLY UNTIL RECEIPT OF A SHIFT CHARACTER. CONTROL CODES ARE ALSO FLAGGED AS UPPER OR LOWER CASE CHARACTERS.

THE MODEL 28 TELETYPEWRITERS HAVE SEVERAL OPTIONAL UPPER CASE CHARACTER SETS. IN THE TABLE BELOW, THE "COMMUNICATIONS SET" CHARACTERS ARE SHOWN.

PART VI - 8383 TTY SELECTIVE CALLING SYSTEM.

BAUDOT 5-LEVEL CODE.

BIT-PATTERN:	LETTERS:	FIGURES:
00000	BLANK	BLANK
00001	T	5
00010	CARRIAGE RET	CARRIAGE RET
00011	O	9
00100	SPACE	SPACE
00101	H	#
00110	N	,
00111	M	.
01000	LINE FEED	LINE FEED
01001	L	)
01010	R	4
01011	G	&
01100	I	8
01101	P	0
01110	C	:
01111	V	;
10000	E	3
10001	Z	"
10010	D	$
10011	B	?
10100	S	BELL
10101	Y	6
10110	F	EXCLAMATION PT.
10111	X	/
11000	A	-
11001	W	2
11010	J	'
11011	FIG.SHIFT	FIG.SHIFT
11100	U	7

PART VI - 83B3 TTY SELECTIVE CALLING SYSTEM.

11101	Q	1
11110	K	(
11111	LETTER SHIFT	LETTER SHIFT

POLLING.

NOTE: FOR DEFINITIONS OF POLLING SEQUENCES (TSC-S), AND CALL DIRECTING CODE-S (CDC-S), SEE DESCRIPTION OF 8A1 SYSTEM.

A TSC (POLLING PATTERN) CONSISTS OF 2 ALPHABETIC CHARACTERS. THE FIRST CHARACTER IS ONE OF 10, 20, OR 19 LETTERS DEPENDING ON THE NUMBER OF STATIONS ON THE LINE AND THE POLLING PATTERN USED. THE SECOND CHARACTER IS THE LETTER "M" FOR 10, OR 20 STATIONS, AND IF MORE STATIONS ARE INVOLVED, FOR THE FIRST 19 STATIONS. FOR STATIONS BEYOND 19, THE LETTER "G" IS THE SECOND CHARACTER. THE POLLING PATTERNS, AS SHOWN BELOW, MUST BE USED, BUT IT IS NOT NECESSARY TO USE THEM IN THAT ORDER.

TSC-S FOR SYSTEM WITH 1-10 STATIONS:

AM	CM	EM	IM	LM	NM	PM	RM	SM	ZM

TSC-S FOR SYSTEM WITH 11-20 STATIONS:

AM	CM	EM	IM	LM	NM	PM	RM	SM	ZM
WM	KM	DM	UM	GM	XM	QM	JM	FM	BM

TSC-S FOR SYSTEMS WITH 21-38 STATIONS:

AM	CM	EM	IM	LM	NM	PM	RM	SM	ZM
WM	KM	DM	UM	XM	QM	JM	FM	BM	
AG	CG	EG	IG	LG	NG	PG	RG	SG	ZG
WG	KG	DG	UG	XG	QG	JG	FG	BG	

MESSAGE ROUTING.

THE CDC-S IN THE 83B3 SYSTEM CONSIST OF 2 ALPHABETICAL CHARACTERS FOLLOWED BY A "LTRS" (LOWER SHIFT) CHARACTER. THE FOLLOWING ALPHABETICAL CHARACTERS MUST NOT BE USED IN CDC-S:

PART VI - 83B3 TTY SELECTIVE CALLING SYSTEM.

T O M V G H Y

THE CONTROL STATION (COMPUTER) HAS BEEN ASSIGNED A SPECIAL CDC: "BB". IT MUST BE SO ADDRESSED.

A CDC MAY BE ASSIGNED TO CONNECT A GROUP OF STATIONS OR ALL THE STATIONS ON A LINE. ONLY ONE STATION OF A GROUP ON A LINE CAN BE ARRANGED TO SEND AN ANSWER-BACK ON RECEIPT OF THE CDC.

OTHER CONTROL CODES ON THE 83B3 SYSTEM:

EOA (END OF ADDRESS)	THE SEQUENCE: CR LF LTRS
EOM (END OF MESSAGE) OR EOT (END OF TRANSMISSION)	THE SEQUENCE: FIGS H LTRS
AB (ANSWER-BACK)	THE CHARACTER: V
NTR (NO TRAFFIC RESPONSE)	THE CHARACTER: V
FILLER CHARACTER:	LTRS

SPECIAL RULES FOR MULTILINE OPERATIONS.

IF A MESSAGE IS TO BE DELIVERED TO A STATION ON A FOREIGN LINE, THE MESSAGE FORMAT MUST ALSO INCLUDE THE RELAY (REPERFORATOR/TRANSMITTER UNIT) STATIONS CDC. THIS IS A CODE HAVING THE LETTER Y AS THE SECOND CHARACTER.

THE CDC'S IN THE MESSAGE HEADING MUST BE ARRANGED IN THE FOLLOWING ORDER:

A. CDC'S OF STATIONS ON HOME LINE,
B. CDC OF RELAY STATION,
C. CDC'S OF STATIONS ON FOREIGN LINE.

PART VI - 83B3 TTY SELECTIVE CALLING SYSTEM.

IF ANY OF THE CDC-S OF THE STATIONS ON THE FOREIGN LINE IS A DUPLICATE OF ONE USED ON THE HOME LINE, THE ORDER OF THE CDC-S MUST BE:

A. CDC-S OF THE HOME LINE STATIONS,
B. CDC OF THE RELAY STATION,
C. THE FOLLOWING SEQUENCE: CR LF LTRS,
D. CDC-S OF THE FOREIGN LINE STATIONS.

SPECIAL MESSAGE FORMATS ARE REQUIRED FOR TRANSMISSION OF MESSAGES FROM THE HOME LINE THROUGH THE FIRST FOREIGN LINE TO STATIONS ON A SECOND FOREIGN LINE. THE FORMATS TO ACCOMPLISH THIS DOUBLE RELAYING DEPEND UPON THE INTERCONNECTING ARRANGEMENTS OF THE THREE LINES.

*****

BAUDOT TO EBCDIC TRANSLATION TABLE.

BAUDOT CODE	BAUDOT GRAPHIC	EBCDIC GRAPHIC	EBCDIC CODE
00	BLK	NUL	00
01	E	E	C5
02	LF	LF	25
03	A	A	C1
04	SPACE	SPACE	40
05	S	S	E2
06	I	I	C9
07	U	U	E4
08	CR	CR	0D
09	D	D	C4
0A	R	R	D9
0B	J	J	D1
0C	N	N	D5
0D	F	F	C6
0E	C	C	C3
0F	K	K	D2
10	T	T	E3
11	Z	Z	E9
12	L	L	D3
13	W	W	E6
14	H	H	C8
15	Y	Y	E8
16	P	P	D7
17	Q	Q	D8
18	O	O	D6

19	B	B	C2
1A	G	G	C7
1B	FIGURES	UC (UPPER CASE)	36
1C	M	M	D4
1D	X	X	E7
1E	V	V	E5
1F	LETTERS	LC (LOWER CASE)	06
20	BLK	NUL	00
21	3	3	F3
22	LF	LF	25
23	-	-	60
24	SPACE	SPACE	40
25	BELL	BEL	2F
26	8	8	F8
27	7	7	F7
28	CR	CR	0D
29	$	$	5B
2A	4	4	F4
2B	PRIME	'	68
2C	' (OR 7/8)	PRIME	7D
2D	EXCLAMATION POINT	VERTICAL BAR	4F
2E	: (OR 1/8)	:	7A
2F	((OR 1/2)	(	4D
30	5	5	F5
31	"	"	7F
32	) (OR 3/4)	)	5D
33	2	2	F2
34	DIAMOND	#	7B
35	6	6	F6
36	0	0	F0
37	1	1	F1
38	9	9	F9
39	QUESTION MARK (5/8)	QUESTION MARK	6F
3A	&	&	50
3A	&	&	50
3B	FIGURES	UC (UPPER CASE)	36
3C	.	.	4B
3D	/	/	61
3E	; (OR 3/8)	;	5E
3F	LETTERS	LC (LOWER CASE)	06

EBCDIC TO BAUDOT TRANSLATION TABLE.

EBCDIC CODE	EBCDIC GRAPHIC	BAUDOT GRAPHIC	BAUDOT CODE
00	NUL	BLK	00
06	LC (LOWER CASE)	LETTERS	1F
0D	CR	CR	28

PART VI - 83B3 TTY SELECTIVE CALLING SYSTEM.

25	LF	LF	02
2F	BEL	S	05
36	UC (UPPER CASE)	FIGURES	1B
40	SPACE	SPACE	04
4B	.	M	1C
4D	(	K	0F
4F	VERTICAL BAR	F	0D
50	&	G	1A
5B	$	D	09
5D	)	L	12
5E	;	V	1E
60	-	A	03
61	/	X	1D
6B	,	J	0B
6F	QUESTION MARK	B	19
7A	:	C	0E
7B	#	H	14
7D	PRIME	N	0C
7F	"	Z	11
81	A (LOWER CASE)	A	03
82	B (LOWER CASE)	B	19
83	C (LOWER CASE)	C	0E
84	D (LOWER CASE)	D	09
85	E (LOWER CASE)	E	01
86	F (LOWER CASE)	F	0D
87	G (LOWER CASE)	G	1A
88	H (LOWER CASE)	H	14
89	I (LOWER CASE)	I	0B
91	J (LOWER CASE)	J	0B
92	K (LOWER CASE)	K	0F
93	L (LOWER CASE)	L	12
94	M (LOWER CASE)	M	1C
95	N (LOWER CASE)	N	0C
96	O (LOWER CASE)	O	18
97	P (LOWER CASE)	P	16
98	Q (LOWER CASE)	Q	17
99	R (LOWER CASE)	R	0A
A2	S (LOWER CASE)	S	05
A3	T (LOWER CASE)	T	10
A4	U (LOWER CASE)	U	07
A5	V (LOWER CASE)	V	1E
A6	W (LOWER CASE)	W	13
A7	X (LOWER CASE)	X	1D
A8	Y (LOWER CASE)	Y	15
A9	Z (LOWER CASE)	Z	11
C1	A	A	03
C2	B	B	19
C3	C	C	0E
C4	D	D	09
C5	E	E	01
C6	F	F	0D

C7	G	G	1A
C8	H	H	14
C9	I	I	06
D1	J	J	0B
D2	K	K	0F
D3	L	L	12
D4	M	M	1C
D5	N	N	0C
D6	O	O	18
D7	P	P	16
D8	Q	Q	17
D9	R	R	0A
E2	S	S	05
E3	T	T	10
E4	U	U	07
E5	V	V	1E
E6	W	W	13
E7	X	X	1D
E8	Y	Y	15
E9	Z	Z	11
F0	0	P	16
F1	1	Q	17
F2	2	W	13
F3	3	E	01
F4	4	R	0A
F5	5	T	10
F6	6	Y	15
F7	7	U	07
F8	8	I	06
F9	9	O	18

PART VI - BURROUGHS TC500

BURROUGHS TC500 TERMINAL COMPUTER.

THE TC500 TERMINAL COMPUTER IS A DESK SIZE COMPUTER EQUIPPED WITH A MANUAL KEYBOARD FOR INPUT AND CONTROLS. IT HAS A DISK MEMORY AND TWO PROCESSORS, ONE OF WHICH SERVES FOR INTERNAL PROCESSING, THE OTHER IS DESIGNED TO HANDLE THE TERMINAL COMPUTERS DATA COMMUNICATION LINES. THE TC500-S TWO PROCESSORS COMMUNICATE WHITH EACH OTHER. THE TC500 MUST BE PROGRAMMED; WHEN FUNCTIONING IN A DATA COMMUNICATION ENVIRONMENT, ITS PROGRAM MUST BE CO-ORDINATED WITH THE PROGRAM OF THE B2500/3500 COMPUTER, WHICH ACTS AS THE CONTROL STATION. FOR INFORMATION REGARDING THE HARDWARE AND THE FIRMWARE OF THE TC500, PLEASE REFER TO THE CORRESPONDING REFERENCE MANUALS.

THE CHARACTERISTICS OF THE ADAPTER:

CODE:	US. ASCII 1967 EUROPE: STANDARD ECMA-6 DIFFERENCES BETWEEN THE TWO CODES RELATE TO GRAPHIC CHARACTERS FOR SPECIFIC NATIONAL USAGE.
CHARACTER LENGTH:	7 DATA, 1 PARITY (EVEN)
START BIT:	1
STOP BIT:	1
SIGNALLING SPEED:	600 OR 1200 BITS PER SEC.
BREAK:	NONE
TIME-OUT:	1 SEC.
BIT SEQUENCE:	LEAST SIGNIFICANT BIT FIRST
TRANSMISSION MODE:	ASYNCHRONOUS

USA STANDARD CODE FOR INFORMATION INTERCHANGE. (USAS X3.4 - 1967.)

BITS 7 6 5 / COLUMNS	000 0	001 1	010 2	011 3	100 4	101 5	110 6	111 7
4 3 2 1 ROWS								
0 0 0 0 0	NUL	DLE	SP	0	@	P	*6	P
0 0 0 1 1	SOH	DC1	*1	1	A	Q	A	P
0 0 1 0 2	STX	DC2	"	2	B	R	B	R
0 0 1 1 3	ETX	DC3	#	3	C	S	C	S
0 1 0 0 4	EOT	DC4	$	4	D	T	D	T
0 1 0 1 5	ENQ	NAK	%	5	E	U	E	U
0 1 1 0 6	ACK	SYN	&	6	F	V	F	V
0 1 1 1 7	BEL	ETB	*2	7	G	W	G	W
1 0 0 0 8	BS	CAN	(	8	H	X	H	X
1 0 0 1 9	HT	EM	)	9	I	Y	I	Y
1 0 1 0 10	LF	SUB	*	!	J	Z	J	Z
1 0 1 1 11	VT	ESC	+	;	K	?	K	*7
1 1 0 0 12	FF	FS	,	<	L	*3	L	*8
1 1 0 1 13	CR	GS	-	=	M	?	M	*9
1 1 1 0 14	SO	RS	.	>	N	*4	N	*10
1 1 1 1 15	SI	US	/	?	O	*5	O	DEL

THE CHARACTERS IN THE TABLE ARE REFERENCED BY THEIR COLUMN AND ROW NUMBER.

PART VI - BURROUGHS TC500

E.G., 2/4 IS THE "$".

THE CHARACTERS FROM 4/1 THROUGH 5/10 ARE THE UPPER CASE LETTERS OF THE ALPHABET. THE CHARACTERS FROM 6/1 THROUGH 7/10 ARE THE LOWER CASE LETTERS.

10 CHARACTERS COULD NOT BE PRINTED ON THE LINE PRINTER, THEY ARE INDICATED IN THE TABLE BY "*N", WHERE N IS A NUMBER FROM 1 THROUGH 10. THESE NON-ILLUSTRATED CHARACTERS ARE DESCRIBED BELOW:

# IN TABLE	COL.	ROW	NAME
*1	2	1	EXCLAMATION POINT
*2	2	7	APOSTROPHE (CLOSING SINGLE QUOTATION MARK)
*3	5	12	REVERSE SLANT
*4	5	14	CIRCUMFLEX
*5	5	15	UNDERLINE
*6	6	0	GRAVE ACCENT (OPENING SINGLE QUOTATION MARK)
*7	7	11	OPENING BRACE
*8	7	12	VERTICAL LINE
*9	7	13	CLOSING BRACE
*10	7	14	OVERLINE (TILDE; GENERAL ACCENT)

ASCII TO EBCDIC TRANSLATION TABLE.

ASCII		EBCDIC	
CODE	GRAPHIC	GRAPHIC	CODE
00	NUL	NUL	00
01	SOH	SOH	01
02	STX	STX	02
03	ETX	ETX	03
04	EOT	EOT	37
05	ENQ	ENQ	2D
06	ACK	ACK	2E
07	BEL	BEL	2F
08	BS	BS	16
09	HT	HT	05
0A	LF	LF	25
0B	VT	VT	0B

0C	FF	FF	0C
0D	CR	CR	0D
0E	SO	SO	0E
0F	SI	SI	0F
10	DLE	DLE	10
11	DC1	DC1	11
12	DC2	DC2	12
13	DC3	DC3	13
14	DC4	DC4	3C
15	NAK	NAK	3D
16	SYN	SYN	32
17	ETB	ETB	26
18	CAN	CAN	18
19	EM	EM	19
1A	SUB	SUB	3F
1B	ESC	ESC	27
1C	FS	FS	1C
1D	GS	GS	1D
1E	RS	RS	1E
1F	US	US	1F
20	SPACE	SPACE	40
21	EXCLAMATION POINT	EXCLAMATION POINT	4F
22	"	"	7F
23	#	#	7B
24	$	$	5B
25	%	%	6C
26	&	&	50
27	PRIME	PRIME	7D
28	(	(	4D
29	)	)	5D
2A	*	*	5C
2B	+	+	4E
2C	,	,	6B
2D	-	-	60
2E	.	.	4B
2F	/	/	61
30	0	0	F0
31	1	1	F1
32	2	2	F2
33	3	3	F3
34	4	4	F4
35	5	5	F5
36	6	6	F6
37	7	7	F7
38	8	8	F8
39	9	9	F9
3A	:	:	7A
3B	;	;	5E
3C	<	<	4C
3D	=	=	7E
3E	>	>	6E

PART VI - BURROUGHS TC500

3F	QUESTION MARK	QUESTION MARK	6F
40	@	@	7C
41	A	A	C1
42	B	B	C2
43	C	C	C3
44	D	D	C4
45	E	E	C5
46	F	F	C6
47	G	G	C7
48	H	H	C8
49	I	I	C9
4A	J	J	D1
4B	K	K	D2
4C	L	L	D3
4D	M	M	D4
4E	N	N	D5
4F	O	O	D6
50	P	P	D7
51	Q	Q	D8
52	R	R	D9
53	S	S	E2
54	T	T	E3
55	U	U	E4
56	V	V	E5
57	W	W	E6
58	X	X	E7
59	Y	Y	E8
5A	Z	Z	E9
5B	?	?	4A
5C	BACKWARD SLASH		49
5D	?	?	5A
5E	CARAT		00
5F	UNDERSCORE	UNDERSCORE	6D
60	PRIME	PRIME	7D
61	A (LOWER CASE)	A (LOWER CASE)	81
62	B (LOWER CASE)	B (LOWER CASE)	82
63	C (LOWER CASE)	C (LOWER CASE)	83
64	D (LOWER CASE)	D (LOWER CASE)	84
65	E (LOWER CASE)	E (LOWER CASE)	85
66	F (LOWER CASE)	F (LOWER CASE)	86
67	G (LOWER CASE)	G (LOWER CASE)	87
68	H (LOWER CASE)	H (LOWER CASE)	88
69	I (LOWER CASE)	I (LOWER CASE)	89
6A	J (LOWER CASE)	J (LOWER CASE)	91
6B	K (LOWER CASE)	K (LOWER CASE)	92
6C	L (LOWER CASE)	L (LOWER CASE)	93
6D	M (LOWER CASE)	M (LOWER CASE)	94
6E	N (LOWER CASE)	N (LOWER CASE)	95
6F	O (LOWER CASE)	O (LOWER CASE)	96
70	P (LOWER CASE)	P (LOWER CASE)	97
71	Q (LOWER CASE)	Q (LOWER CASE)	98

72	R (LOWER CASE)	R (LOWER CASE)	99
73	S (LOWER CASE)	S (LOWER CASE)	A2
74	T (LOWER CASE)	T (LOWER CASE)	A3
75	U (LOWER CASE)	U (LOWER CASE)	A4
76	V (LOWER CASE)	V (LOWER CASE)	A5
77	W (LOWER CASE)	W (LOWER CASE)	A6
78	X (LOWER CASE)	X (LOWER CASE)	A7
79	Y (LOWER CASE)	Y (LOWER CASE)	A8
7A	Z (LOWER CASE)	Z (LOWER CASE)	A9
7B	OPENING BRACE	PLUS ZERO	C0
7C	ACK	ACK	06
7D	CLOSING BRACE	MINUS ZERO	D0
7E	LOGICAL NOT	LOGICAL NOT	5F
7F	DEL	DEL	07

EBCDIC TO ASCII TRANSLATION TABLE.

EBCDIC		ASCII	
CODE	GRAPHIC	GRAPHIC	CODE
00	NUL	NUL	00
01	SOH	SOH	01
02	STX	STX	02
03	ETX	ETX	03
04	UNASSIGNED	EOT	04
05	HT	HT	09
06	UNASSIGNED	ACK	06
07	DEL	DEL	7F
08	UNASSIGNED	BS	08
09	UNASSIGNED	HT	09
0A	UNASSIGNED	LF	0A
0B	VT	VT	0B
0C	FF	FF	0C
0D	CR	CR	0D
0E	SO	SO	0E
0F	SI	SI	0F
10	DLE	DLE	10
11	DC1	DC1	11
12	DC2	DC2	12
13	DC3	DC3	13
14	UNASSIGNED	DC4	04
15	NL	NAK	15
16	BS	BS	08
17	UNASSIGNED	ETB	17
18	CAN	CAN	18

PART VI - BURROUGHS TC500

19	EM	EM	19
1A	UNASSIGNED	SUB	1A
1B	UNASSIGNED	ESC	1B
1C	FS	FS	1C
1D	GS	GS	1D
1E	RS	RS	1E
1F	US	US	1F
20	UNASSIGNED	NUL	00
21	UNASSIGNED	NUL	00
22	UNASSIGNED	NUL	00
22	UNASSIGNED	NUL	00
23	UNASSIGNED	NUL	00
24	UNASSIGNED	NUL	00
25	LF	LF	0A
26	ETB	ETB	17
27	ESC	ESC	1B
18	UNASSIGNED	NUL	00
29	UNASSIGNED	NUL	00
2A	UNASSIGNED	NUL	00
2B	UNASSIGNED	NUL	00
2C	UNASSIGNED	NUL	00
2D	ENQ	ENQ	05
2E	ACK	ACK	06
2F	BEL	BEL	07
30	UNASSIGNED	NUL	00
31	UNASSIGNED	NUL	00
32	SYN	SYN	16
33	UNASSIGNED	NUL	00
34	UNASSIGNED	NUL	00
35	UNASSIGNED	NUL	00
36	UNASSIGNED	NUL	00
37	EOT	EOT	04
38	UNASSIGNED	NUL	00
39	UNASSIGNED	NUL	00
3A	UNASSIGNED	NUL	00
3B	UNASSIGNED	NUL	00
3C	DC4	DC4	14
3D	NAK	NAK	15
3E	UNASSIGNED	NUL	00
3F	SUB	SUB	1A
40	SPACE	SPACE	20
41	UNASSIGNED	NUL	00
42	UNASSIGNED	NUL	00
43	UNASSIGNED	NUL	00
44	UNASSIGNED	NUL	00
45	UNASSIGNED	NUL	00
46	UNASSIGNED	NUL	00
47	UNASSIGNED	NUL	00
48	UNASSIGNED	NUL	00
49	UNASSIGNED	NUL	00
4A	?	?	5B

4B	.	.	2E
4C	<	<	3C
4D	(	(	28
4E	+	+	2B
4F	EXCLAMATION POINT	EXCLAMATION POINT	21
50	&	&	26
51	UNASSIGNED	NUL	00
52	UNASSIGNED	NUL	00
53	UNASSIGNED	NUL	00
54	UNASSIGNED	NUL	00
55	UNASSIGNED	NUL	00
56	UNASSIGNED	NUL	00
57	UNASSIGNED	NUL	00
58	UNASSIGNED	NUL	00
59	UNASSIGNED	NUL	00
5A	?	?	5D
5B	$	$	24
5C	*	*	2A
5D	)	)	29
5E	;	;	3B
5F	LOGICAL NOT	LOGICAL NOT	7E
60	MINUS SIGN	MINUS SIGN	2D
61	/	/	2F
62	UNASSIGNED	NUL	00
63	UNASSIGNED	NUL	00
64	UNASSIGNED	NUL	00
65	UNASSIGNED	NUL	00
65	UNASSIGNED	NUL	00
66	UNASSIGNED	NUL	00
67	UNASSIGNED	NUL	00
68	UNASSIGNED	NUL	00
69	UNASSIGNED	NUL	00
6A	UNASSIGNED	NUL	00
6B	,	,	2C
6C	%	%	25
6D	UNDERSCORE	UNDERSCORE	5F
6E	>	>	3E
6F	QUESTION MARK	QUESTION MARK	3F
70	UNASSIGNED	NUL	00
71	UNASSIGNED	NUL	00
72	UNASSIGNED	NUL	00
73	UNASSIGNED	NUL	00
74	UNASSIGNED	NUL	00
75	UNASSIGNED	NUL	00
76	UNASSIGNED	NUL	00
77	UNASSIGNED	NUL	00
78	UNASSIGNED	NUL	00
79	UNASSIGNED	NUL	00
7A	:	:	3A
7B	#	#	23
7C	@	@	40

PART VI - BURROUGHS TC500

7D	PRIME	PRIME	27
7E	=	=	3D
7F	"	"	22
80	UNASSIGNED	NUL	00
81	A (LOWER CASE)	A (LOWER CASE)	61
82	B (LOWER CASE)	B (LOWER CASE)	62
83	C (LOWER CASE)	C (LOWER CASE)	63
84	D (LOWER CASE)	D (LOWER CASE)	64
85	E (LOWER CASE)	E (LOWER CASE)	65
86	F (LOWER CASE)	F (LOWER CASE)	66
87	G (LOWER CASE)	G (LOWER CASE)	67
88	H (LOWER CASE)	H (LOWER CASE)	68
89	I (LOWER CASE)	I (LOWER CASE)	69
8A	UNASSIGNED	NUL	00
8B	UNASSIGNED	NUL	00
8C	UNASSIGNED	NUL	00
8D	UNASSIGNED	NUL	00
8E	UNASSIGNED	NUL	00
8F	UNASSIGNED	NUL	00
90	UNASSIGNED	NUL	00
91	J (LOWER CASE)	J (LOWER CASE)	6A
92	K (LOWER CASE)	K (LOWER CASE)	6B
93	L (LOWER CASE)	L (LOWER CASE)	6C
94	M (LOWER CASE)	M (LOWER CASE)	6D
95	N (LOWER CASE)	N (LOWER CASE)	6E
96	O (LOWER CASE)	O (LOWER CASE)	6F
97	P (LOWER CASE)	P (LOWER CASE)	70
98	Q (LOWER CASE)	Q (LOWER CASE)	71
99	R (LOWER CASE)	R (LOWER CASE)	72
9A	UNASSIGNED	NUL	00
9B	UNASSIGNED	NUL	00
9C	UNASSIGNED	NUL	00
9D	UNASSIGNED	NUL	00
9E	UNASSIGNED	NUL	00
9F	UNASSIGNED	NUL	00
A0	UNASSIGNED	NUL	00
A1	UNASSIGNED	NUL	00
A2	S (LOWER CASE)	S (LOWER CASE)	73
A3	T (LOWER CASE)	T (LOWER CASE)	74
A4	U (LOWER CASE)	U (LOWER CASE)	75
A5	V (LOWER CASE)	V (LOWER CASE)	76
A6	W (LOWER CASE)	W (LOWER CASE)	77
A7	X (LOWER CASE)	X (LOWER CASE)	78
A8	Y (LOWER CASE)	Y (LOWER CASE)	79
A9	Z (LOWER CASE)	Z (LOWER CASE)	7A
AA	UNASSIGNED	NUL	00
AB	UNASSIGNED	NUL	00
AC	UNASSIGNED	NUL	00
AD	UNASSIGNED	NUL	00
AE	UNASSIGNED	NUL	00
AF	UNASSIGNED	NUL	00

B0	UNASSIGNED	NUL	00
B1	UNASSIGNED	NUL	00
B2	UNASSIGNED	NUL	00
B3	UNASSIGNED	NUL	00
B4	UNASSIGNED	NUL	00
B5	UNASSIGNED	NUL	00
B6	UNASSIGNED	NUL	00
B7	UNASSIGNED	NUL	00
B8	UNASSIGNED	NUL	00
B9	UNASSIGNED	NUL	00
BA	UNASSIGNED	NUL	00
BB	UNASSIGNED	NUL	00
BC	UNASSIGNED	NUL	00
BD	UNASSIGNED	NUL	00
BE	UNASSIGNED	NUL	00
BF	UNASSIGNED	NUL	00
C0	PLUS ZERO	OPENING BRACE	7B
C1	A	A	41
C2	B	B	42
C3	C	C	43
C4	D	D	44
C5	E	E	45
C6	F	F	46
C7	G	G	47
C8	H	H	48
C9	I	I	49
CA	UNASSIGNED	NUL	00
CB	UNASSIGNED	NUL	00
CC	UNASSIGNED	NUL	00
CD	UNASSIGNED	NUL	00
CE	UNASSIGNED	NUL	00
CF	DELIMITER	DEL	7F
D0	MINUS ZERO	CLOSING BRACE	7D
D1	J	J	4A
D2	K	K	4B
D3	L	L	4C
D4	M	M	4D
D5	N	N	4E
D6	O	O	4F
D7	P	P	50
D8	Q	Q	51
D9	R	R	52
DA	UNASSIGNED	NUL	00
DB	UNASSIGNED	NUL	00
DC	UNASSIGNED	NUL	00
DD	UNASSIGNED	NUL	00
DE	UNASSIGNED	NUL	00
DF	UNASSIGNED	NUL	00
E0	UNASSIGNED	NUL	00
E1	UNASSIGNED	NUL	00
E2	S	S	53

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E3	T	T	54
E4	U	U	55
E5	V	V	56
E6	W	W	57
E7	X	X	58
E8	Y	Y	59
E9	Z	Z	5A
EA	UNASSIGNED	NUL	00
EB	UNASSIGNED	NUL	00
EC	UNASSIGNED	NUL	00
ED	UNASSIGNED	NUL	00
EE	UNASSIGNED	NUL	00
EF	UNASSIGNED	NUL	00
F0	0	0	30
F1	1	1	31
F2	2	2	32
F3	3	3	33
F4	4	4	34
F5	5	5	35
F6	6	6	36
F7	7	7	F7
F8	8	8	38
F9	9	9	39
FA	UNASSIGNED	NUL	00
FB	UNASSIGNED	NUL	00
FC	UNASSIGNED	NUL	00
FD	UNASSIGNED	NUL	00
FE	UNASSIGNED	NUL	00
FF	UNASSIGNED	NUL	00

*****

BURROUGHS CORP. SUPPLIES A SOFTWARE PACKAGE TO HANDLE THE DATA COMMUNICATION FUNCTIONS OF THE TC500. THIS SOFTWARE PACKAGE IMPLEMENTS THE "STANDARD LINE CONTROL PROCEDURES", AS DEFINED BY BURROUGHS CORPORATION.

THE "STANDARD LINE CONTROL PROCEDURES", THE APPLICABLE SECTIONS OF WHICH ARE DESCRIBED ON THE FOLLOWING PAGES, APPLY TO SYSTEMS CONTAINING A CENTRAL COMPUTER (CONTROL), AND SEVERAL REMOTE TERMINALS ON EACH OF SEVERAL (PRIVATE OR LEASED) COMMUNICATION LINES (MULTI-POINT SERVICE).

THE STANDARD LINE CONTROL PROCEDURES ARE BASED ON THE "NINTH DRAFT PROPOSED U.S.A STANDARD COMMUNICATIONS CONTROL PROCEDURES", - X3.3.4/ 121, JULY 1967. THE REFERENCE DOCUMENT RELATED TO EUROPEAN APPLICATIONS IS "DRAFT ECMA STANDARD FOR THE IMPLEMENTATION OF THE STANDARD ECMA - 6 FOR 7-BIT CODE ON DATA TRANSMISSION CHANNELS", ECMA/TC-9/67/32, DATED

JULY 1967.

BURROUGHS STANDARD LINE CONTROL PROCEDURES.

TRANSMISSION MODE IS ASYNCHRONOUS. THE START BIT HAS A POLARITY OF ZERO (SPACING), THE STOP BIT HAS A POLARITY OF ONE (MARKING). THE SEVEN DATA BITS ARE FOLLOWED BY A PARITY BIT TO MAKE THE ONE BITS IN THE GROUP OF 8 BITS EVEN. (START AND STOP BITS ARE EXCLUDED FROM THIS COUNT.) THERE IS NO INTER-CHARACTER INTERVAL (I.E., FIXED TIME INTERVAL BETWEEN THE STOP BIT AND THE START BIT OF THE NEXT CHARACTER.)

CONTROL CHARACTERS.

EOT — END OF TRANSMISSION. USED TO INDICATE THE CONCLUSION OF A COMMUNICATION SEQUENCE.
EOT SENT BY THE CENTRAL COMPUTER WILL SET ALL REMOTE TERMINALS INTO A PASSIVE STATE IN WHICH THEY ARE LISTENING FOR THE BALANCE OF A POLLING OR SELECTION SEQUENCE. TO BE SURE THAT TERMINALS ARE IN A PASSIVE STATE AT THE BEGINNING OF A POLL OR SELECTION SEQUENCE, EOT WILL BE TRANSMITTED AS THE FIRST CHARACTER OF A SEQUENCE.
FOR THIS APPLICATION, THE I-O DESCRIPTOR MUST HAVE THE "DELETE ETX" VARIANT SET.

EOT MAY BE TRANSMITTED BY A MASTER STATION TO ABORT A TRANSMISSION SEQUENCE.

EOT IS TRANSMITTED BY A REMOTE TERMINAL AS "NO-TRAFFIC" RESPONSE TO A POLL.

SOH — START OF HEADING. REQUIRED ONLY WHEN A HEADING IS TO BE SENT ON A TRANSMISSION. WHEN USED, SOH IS THE FIRST OF A SEQUENCE OF CHARACTERS WHICH FORM THE HEADING. SOH IS NOT INCLUDED IN THE SUMMATION TO FORM OR CHECK THE BCC.

THE HEADING ALSO MAY CONTAIN TERMINAL IDENTIFICATION AD1, AD2, AND MAY UNDER DEFINITION FOR THE SPECIFIC APPLICATION, CONTAIN OTHER INFORMATION PERTINENT TO THE TRANSMISSION SUCH AS TRANSMISSION NUMBER (XM #). A

HEADING IS ENDED BY STX.

STX — START OF TEXT. PRECEDES A SEQUENCE OF CHARACTERS WHICH FORM THE TEXT OF THE TRANSMISSION. STX TERMINATES A HEADING. IF A TRANSMISSION BLOCK CONTAINS SOH AND STX (I.E., IF HEADER AND TEXT ARE TRANSMITTED IN THE SAME BLOCK), STX WILL BE INCLUDED IN THE SUMMATION TO FORM AND CHECK THE BCC, OTHERWISE IT IS NOT INCLUDED.

ETB — END OF TRANSMISSION BLOCK. OPTIONALLY USED WHEN MESSAGES ARE OF SUFFICIENT LENGTH TO WARRANT THEIR BEING BROKEN INTO SMALLER TRANSMISSION BLOCKS. ETB INDICATES THE END OF A BLOCK OF DATA IN A HEADING OR IN A TEXT. THE HEADING OR TEXT WILL BE RESUMED AFTER THE TRANSMISSION OF BLOCK NUMBER AND SOH OR STX. ETB MAY BE FOLLOWED BY THE OPTIONAL BCC.

ETX — END OF TEXT. USED TO INDICATE THE END OF A STREAM OF CHARACTERS IDENTIFIED AS A TEXT. ETX MAY BE FOLLOWED BY THE OPTIONAL BCC.

ACK — ACKNOWLEDGEMENT. AN AFFIRMATIVE RESPONSE TO A NORMAL SELECTION (INDICATING "READY TO RECEIVE"), OR A TRANSMISSION (INDICATING "MESSAGE RECEIVED"). AS AN AFFIRMATIVE RESPONSE TO A SELECTION, ACK MAY OPTIONALLY BE PRECEDED BY STATION IDENTIFICATION, AD1, AD2.

NOTE: THE AFFIRMATIVE RESPONSE TO A POLL IS THE TRANSMISSION OF A MESSAGE.

NAK — NEGATIVE ACKNOWLEDGEMENT. A NEGATIV RESPONSE TO A NORMAL SELECTION (INDICATING "NOT READY TO RECEIVE"), OR A TRANSMISSION (INDICATING CHARACTER PARITY FAILURE FOR ANY CHARACTER OF A BLOCK OR, IN A MESSAGE, A FAILURE OF THE BCC, OR BLOCK NUMBER SEQ. CHECK FAILURE). NAK MAY OPTIONALLY BE PRECEDED BY STATION IDENTIFICATION AD1, AD2.

ENQ — ENQUIRY. A REQUEST FOR A RESPONSE FROM A STATION.

ALSO USED AS THE FINAL CHARACTER OF A POLL OR IN A SELECTION WHEN RESPONSE FROM THE OTHER STATION IS REQUIRED.

OTHER CHARACTERS DEFINED FOR THE PROCEDURES ARE:

AD1, AD2 ADDRESS 1, ADDRESS 2, A TWO-CHARACTER ADDRESS, ESTABLISHED AS THE ADDRESS OF A TERMINAL. IT IS USED TO

1. ADDRESS A TERMINAL IN POLLING OR SELECTION,

2. IN THE MESSAGE HEADING TO IDENTIFY THE TERMINAL FROM WHOM A MESSAGE IS TRANSMITTED,

3. (OPTIONALLY) AS AN IDENTIFICATION PREFIX TO ACKNOWLEDGEMENT (ACK) THAT A TERMINAL IS READY TO RECEIVE A MESSAGE OR TO IDENTIFY "NAK".

4.IN SYSTEMS WHICH PRECLUDE DOWNSTREAM (TERMINAL TO TERMINAL) COMMUNICATION, AD1 - AD2 IN THE HEADER TRANSMITTED BY THE CENTRAL COMPUTER MAY BE DEFINED TO REPRESENT THE TERMINAL ADDRESS AND WILL BE USED FOR ADDRESS CHECKING.

5. FOR GROUP ADDRESSING OF BROADCAST (TO ALL TERMINALS) AD1, AD2 INDICATES THE TERMINAL WHICH WILL ACKNOWLEDGE RECEIPT OF THE MESSAGE.

POL POLL. A CHARACTER USED TO INDICATE "THIS IS A POLL", PRECEDING "ENQ" IN A POLLING SEQUENCE. POLL WILL USUALLY BE REPRESENTED BY THE CHARACTER 7/0 (LOWER CASE "P").

SEL SELECT. A CHARACTER USED TO INDICATE "THIS IS A NORMAL SELECT", PRECEDING "ENQ" IN A SELECTION SEQUENCE. SELECT WILL BE REPRESENTED BY THE CHARACTER 7/1 (LOWER CASE "Q").

BSL BROADCAST SELECT. A CHARACTER USED TO INDICATE "THIS IS A BROADCAST MESSAGE" TO ALL STATIONS. IN A BROADCAST SEQUENCE, AD1 - AD2 IDENTIFIES THE STATION WHICH WILL ACKNOWLEDGE RECEIPT OF THE MESSAGE. "BROADCAST SELECT" IS FOLLOWED BY "SOH" OR "STX" WITHOUT ACKNOWLEDGEMNT. BROADCAST SELECT WILL BE REPRESENTED BY THE CHARACTER 7/4 (LOWER CASE "T").

XM# TRANSMISSION NUMBER. A NUMBER IDENTIFYING IN SEQUENCE, TRANSMISSIONS FROM OR TRANSMISSIONS TO A TERMINAL. OPTIONALLY USED AS A PART OF A MESSAGE HEADER TO ASSIST IN MESSAGE RECOVERY. EACH DIGIT OF XM# WILL BE REPRESENTED HEXADECIMALLY BY CHARACTERS FROM THE USASCII CODE COLUMNS 2 THROUGH 6. THE NUMBER OF DIGITS TO BE USED IN XM# SHALL BE SELECTED FOR EACH PARTICULAR SYSTEM IMPLEMETATION AND CAN BE UP TO 3 DIGITS.

BCC BLOCK CHECK CHARACTER. A REDUNDANT CHARACTER ADDED TO THE END OF A TRANSMISSION BLOCK FOR THE PURPOSE OF ERROR DETECTION AND CONTROL. BCC IS FORMED BY TAKING A BINARY SUM WITHOUT CARRY ON EACH OF THE SEVEN BITS OF THE TRANSMITTED CHARACTERS FOLLOWING "SOH", OR "STX" IF THERE IS NO "SOH", INCLUDING "ETB" OR "ETX". THE CHARACTERS PARITY BIT (BIT 8) OF BCC IS SET AS IN ALL OTHER CHARACTERS. BCC IMMEDIATELY FOLLOWS "ETB" OR "ETX" IN A TRANSMISSION BLOCK. (SEE COMMENTS ON "ETB" AND "ETX").

THE CHARACTERS DESCRIBED BELOW ARE DEFINED IN THE STANDARD LINE CONTROL PROCEDURES, BUT HAVE NOT BEEN IMPLEMENTED ON THE TC500 AT THE TIME OF THE WRITING OF THIS MANUAL:

FSL FAST SELECT. A CHARACTER USED TO INDICATE "THIS IS A FAST SELECT", IN A SELECTION SEQUENCE TRANSMITTED BY THE CENTRAL COMPUTER. FAST SELECT WILL BE REPRESENTED BY THE CHARACTER 7/3 (LOWER CASE "S"). FAST SELECT IS FOLLOWED BY "SOH" OR "STX" WITHOUT ACKNOWLEDMENT.

GSL GROUP SELECT. A CHARACTER USED TO INDICATE "THIS IS A MESSAGE FOR A GROUP OF STATIONS." IN THE GROUP SELECT SEQUENCE, AD1 - AD2 IDENTIFIES THE STATION WHICH WILL ACKNOWLEDGE RECEIPT OF THE MESSAGE. GROUP SELECT IS FOLLOWED BY "SOH" OR "STX" WITHOUT ACKNOWLEDGMENT. GROUP SELECT MAY BE REPRESENTED BY ANY AGREED ON CHARACTER SELECTED FROM COLUMN 2 THROUGH 6.

CON CONTENTION. A CHARACTER USED TO INSTRUCT ALL TERMINALS WHICH RECEIVE THE INSTRUCTION TO GO TO CONTENTION MODE. NUL CHARACTERS REPLACE AD1-AD2 IN THE CONTENTION SEQUENCE. THERE IS NO ACKNOWLEDGMENT OF THE CONTENTION INSTRUCTION. CONTENTION SHALL BE REPRESENTED BY THE CHARACTER 0/7 ("BEL").

A REMOTE TERMINAL IN CONTENTION MODE SHALL REQUEST THAT IT BE POLLED BY TRANSMITTING THE CHARACTERS 7/0 (LOWER CASE "P") - ENQ TO THE CENTRAL COMPUTER. THE TERMINAL MAY OPTIONALLY PRECEDE THE "POL ENQ" SEQUENCE WITH ITS OWN ADDRESS.

SEQ — SEQUENTIAL SELECT. A CHARACTER USED TO INDICATE THAT A GROUP OF REMOTE TERMINALS IS BEING SELECTED TO RECEIVE A MESSAGE ADDRESSED TO THAT GROUP. THE LAST TERMINAL SELECTED IN A GROUP WILL ACKNOWLEDGE RECEIPT OF SEQUENTIAL SELECT. SEQUENTIAL SELECT SHALL BE REPRESENTED BY THE CHARACTER 7/2 (LOWER CASE "R") AND SHALL BE FOLLOWED BY AD1 - AD2 OF ANOTHER TERMINAL. WHEN THIS OPTION IS EMPLOYED, NO AD1 OR AD2 CAN BE TAKEN FROM COLUMN 7 OF THE ASCII CHARACTER TABLE.

BL# — BLOCK NUMBER, AN OPTION WHICH MAY BE USED WHEN DATA MUST BE SUBDIVIDED INTO SEPARATE UNITS FOR TRANSMISSION. REDUNDANCY CHECK (BCC) IS NORMALLY EMPLOYED AND STRONGLY RECOMMENDED. BL # CONSISTS OF A TWO-CHARACTER NUMBER IDENTIFYING THE SEQUENTIAL BLOCK NUMBER IN A BLOCKED MESSAGE. BL # IS REPRESENTED AS FOLLOWS:

BLK. NO.	REPRESENTATION CHAR. #1	CHAR. #2	ASCII CODE COL.	ROW
1	DLE	EXCL. POINT	2	1
2	DLE	"	2	2
3	DLE	#	2	3
4	DLE	$	2	4
5	DLE	%	2	5
6	DLE	&	2	6
7	DLE	APOSTROPHE	2	7
0	DLE	SPACE	2	0
1	ETCETERA			

TIME-OUTS FOR THE B2500/3500 COMPUTER, AS CONTROL STATION, ARE:

1. OPEN LINE CONDITION.

START TIMING ON RECEIPT OF EACH CHARACTER OTHER THAN A

CHARACTER SIGNIFYING REVERSAL OF DIRECTION OF TRANSMISSION. TIME SPECIFIED FOR THE TC500 SYSTEM IS 1 SECOND. IF THE NEXT CHARACTER IS NOT RECEIVED IN THIS TIME, THE CENTRAL PROCESSOR WILL INTERRUPT AND ENTER ERROR RECOVERY PROCEDURES.

2. NO RESPONSE.

TIMING WILL START AFTER TRANSMISSION OF A CHARACTER SIGNIFYING REVERSAL OF TRANSMISSION DIRECTION. TIME SPECIFIED IS 1 SECOND. IF THE FIRST CHARACTER OF A TERMINAL TRANSMISSION IS NOT RECEIVED, OR IF THE CHARACTER RECEIVED IS NOT VALID IN THIS TIME, THE CENTRAL PROCESSOR WILL REPEAT ITS TRANSMISSION N TIMES ("N"=FROM 0 TO 3, DEPENDING ON THE PROGRAM), THEN, IF THE SAME CONDITION EXISTS, IT WILL INTERRUPT AND ENTER ERROR RECOVERY PROCEDURES.

3. RUNAWAY REMOTE.

IF A TERMINAL CONTINUES TO TRANSMIT MORE CHARACTERS THAN ALLOWED FOR THE SYSTEM, IT CAN OVERFLOW THE RECEIVING BUFFER AREA. THIS "RUNAWAY REMOTE" CONDITION WILL BE DETECTED BY BUFFER OVERFLOW DETECTION AND WILL CAUSE THE PROCESSOR TO INTERRUPT AND ENTER RECOVERY PROCEDURES.

TIME-OUT PROVIDED BY THE TC500 IS:

BUFFER OVERFLOW

IF THE TERMINAL BUFFER OVERFLOWS, IT WILL ABORT COMMUNICATION BY TRANSMITTING AN "EOT", IT WILL CLEAR ITS BUFFER AND PREPARE FOR A RETRANSMISSION OF THE MESSAGE.

THE "BREAK"

IN A FOUR WIRE NON-SIMULTANEOUS NETWORK WHEN A REMOTE IS TRANSMITTING, THE CONTROL STATION CAN CAUSE THE TRANSMISSION TO TERMINATE BY GOING TO CONTINUOUS SPACE ON THE TRANSMIT FOR A SPECIFIED PERIOD OF TIME (25 MS). THE REMOTE MUST DETECT THIS AND TURN OFF ITS OWN CARRIER. IT WILL THEN WAIT FOR A POLL OR SELECTION FROM THE CONTROL

STATION.

TC500 MESSAGE FORMATS.

POLLING SEQUENCE.

EOT AD1 AD2 POL ENQ

EXAMPLE FOR POLLING THREE TERMINALS(AD1 AD2 OF THE TERMINALS ARE:
#1 = 1A, #2 = 1B, #3 = 1C.)

EOT 1A P ENQ EOT 1B P ENQ EOT 1C P ENQ ETX

THE POLLED TERMINAL MAY RESPOND WITH:

1. NO TRAFFIC = EOT

2. MESSAGE TO THE COMPUTER IN THE FOLLOWING FORMAT:

   SOH AD1 AD2 XM# STX TEXT ETX BCC

3. MESSAGE TO ANOTHER TERMINAL:

   AD1 AD2 SEL ENQ

PROCEDURE #3 IS CALLED DOWNSTREAM SELECTION. POLLED TERMINAL "A" CAN SELECT ANOTHER TERMINAL (TERMINAL "B"), WHICH WILL RESPOND TO THE SELECTION AS IF SELECTED BY THE CENTRAL COMPUTER.

IF THE CENTRAL COMPUTER RECEIVES A MESSAGE FOR WHICH CHARACTER PARITY, BLOCK CHECK, OR TERMINAL ADDRESS TEST FAILS, "NAK" WILL BE TRANSMITTED, CALLING FOR A REPEAT OF THE TRANSMISSION. THIS CAN BE REPEATED PROGRAMMATICALLY "N" TIMES ("N" IS TO BE DEFINED FOR EACH PARTICULAR SYSTEM AND MAY BE ZERO), AT WHICH TIME, IF THE TEST FAILS, THE CENTRAL COMPUTER SHOULD RECORD AN ERROR AND TRANSMIT AN EOT, TERMINATING THE SEQUENCE. THE TERMINAL WILL TRANSMIT THE SAME MESSAGE WHEN NEXT POLLED.

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IF THE TERMINAL DOES NOT RECEIVE ACK, NAK, OR EOT, IT WILL RETAIN ITS MESSAGE AND REMAIN QUIET. THE CENTRAL COMPUTER WILL TIME-OUT AND TRANSMIT EOT, TERMINATING THE SEQUENCE. IN THIS CASE THE MESSAGE WILL BE RETRANSMITTED WHEN NEXT POLLED.

SELECTION SEQUENCE.

THE CONTROL STATION SELECTS A TERMINAL WHICH IS TO RECEIVE A MESSAGE WITH THE FOLLOWING SEQUENCE:

EOT AD1 AD2 SEL ENQ

WHERE AD1 AD2 IS THE ADDRESS OF THE SELECTED TERMINAL, MEANING: "YOU ARE".

THE SELECTED TERMINAL RESPONDS:

1. IF NOT READY TO RECEIVE: NAK

IN THIS CASE, THE CENTRAL COMPUTER SHOULD BE PROGRAMMED TO RETRY THE SELECTION AT THE TERMINAL'S PROPER SEQUENCE; HOWEVER, FOR SOME INSTALLATIONS IT MAY BE DESIRED TO REPEAT A SELECTION SEQUENCE IMMEDIATELY.

2. IF THE TERMINAL IS READY TO RECEIVE: ACK

AD1 AD2 ARE IN BOTH CASES THE ADDRESS OF THE SELECTED TERMINAL, MEANING: "I AM".

THE CENTRAL COMPUTER SENDS ITS MESSAGE IN THE FOLLOWING FORMAT:

SOH AD1 AD2 XM# STX TEXT ETX BCC

WHERE AD1 AD2 IS THE ADDRESS OF THE SENDER, MEANING: "I AM". HOWEVER, IN CERTAIN SYSTEMS IMPLEMENTATIONS WHERE DOWNSTREAM COMMUNICATION IS NOT PERMITTED AND TRANSMISSION CAN ONLY BE TO THE CENTRAL PROCESSOR, THE IDENTIFICATION CHARACTERS IN A TRANSMISSION MAY REPRESENT THE TERMINAL

ADDRESS ("YOU ARE") FOR SELECTION VERIFICATION PURPOSES.

IF CHARACTER PARITY, BLOCK CHECK, OR TERMINAL IDENTIFICATION ARE NOT VALIDATED BY THE TERMINAL, IT WILL SEND NAK. IN THIS CASE THE CENTRAL COMPUTER SHOULD BE PROGRAMMED TO RETRANSMIT THE MESSAGE "P" TIMES ("P" MAY BE EQUAL TO ZERO), AND IF THE TERMINAL DOES NOT ACKNOWLEDGE THE MESSAGE, THE CENTRAL COMPUTER SHOULD TERMINATE THE SEQUENCE WITH EOT.

IF THE CENTRAL COMPUTER DOES NOT RECEIVE A RESPONSE (ACK OR NAK) TO ITS MESSAGE, IT MAY TIME OUT AND RETRANSMIT THE BLOCK "N" TIMES, WHERE "N" MAY EQUAL ZERO. IF STILL NO RESPONSE IS RECEIVED, THE COMPUTER WILL TERMINATE THE SEQUENCE WITH EOT, AFTER RECORDING THE ERROR. THE CENTRAL COMPUTER WILL RETAIN THE MESSAGE FOR TRANSMISSION ON THE NEXT SELECTION SEQUENCE TO THIS TERMINAL.

BROADCAST.

THE BROADCAST SEQUENCE IS:

1. IF NO MESSAGE SEQUENCE NUMBER IS USED:

    EOT AD1 AD2 BSL STX TEXT ETX BCC

2. IF MESSAGE SEQUENCE NUMBER (1 TO 3 DIGITS OR UNDIGITS) IS USED:

    EOT AD1 AD2 BSL SOH XM# STX TEXT ETX BCC

IN CASE 1, BCC IS COMPUTED ON EVERYTHING FOLLOWING STX INCLUDING ETX.
IN CASE 2, BCC IS COMPUTED ON EVERYTHING FOLLOWING SOH, INCLUDING STX AND ETX.

AD1 AD2 IS SELECTED TO REPRESENT THE TERMINAL WHICH WILL ACKNOWLEDGE RECEIPT OF THE MESSAGE. (ONE TERMINAL ACKNOWLEDGES FOR ALL.)

SPECIAL SEQUENCES OF NUMBERS MUST BE MAINTAINED IF TRANSMISSIONS ARE NUMBERED IN A SYSTEM WHERE BROADCAST IS EMPLOYED.

IF THE ACKNOWLEDGING TERMINAL DOES NOT RECEIVE A VALID MESSAGE (I.E., THERE IS A PARITY ERROR OR TRANSMISSION ERROR), THE CENTRAL COMPUTER

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SHOULD BE PROGRAMMED TO REPEAT THE TOTAL BROADCAST.

IF THE CENTRAL COMPUTER DOES NOT RECEIVE A RESPONSE (ACK OR NAK) TO ITS BROADCAST, IT MAY TIME OUT AND REBROADCAST THE MESSAGE "N" TIMES, WHERE "N" MAY EQUAL ZERO. IF NO RESPONSE IS RECEIVED, THE COMPUTER WILL TERMINATE THE BROADCAST MODE WITH EOT AFTER RECODING THE ERROR.

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PROGRAMMING EXAMPLES.

ON THE FOLLOWING PAGES WE SHOW A B3500 COBOL PROGRAM, AND A CORRESPONDING TC500 PROGRAM. THE B3500 IS THE CONTROL STATION, THE TC500 ACTS AS A TERMINAL. THE TWO PROGRAMS PERFORM THE FOLLOWING TASKS:

1. THE B3500 POLLS THE TERMINAL.
2. THE TC500 RESPONDS WITH ONE OF THE FOLLOWING REQUESTS:

   A. INQUIRY FOR ACCOUNT INFORMATION,
   B. DEPOSIT REPORT FOR AN ACCOUNT,
   C. WITHDRAWAL FROM AN ACCOUNT.

   IF THE TC500 SENDS AN INQUIRY, THE B3500 COMPUTES THE CURRENT BALANCE; IN CASE OF A WITHDRAWAL OR DEPOSIT, IT COMPUTES THE NEW BALANCE. IN EACH CASE, THE B3500 SENDS TO THE TERMINAL THE ACCOUNT NUMBER AND THE NEW OR OLD BALANCE.

THE ACCOUNT INFORMATION IN THE B3500 PROGRAM CONSISTS OF A 6-DIGIT ACCOUNT NUMBER, A 6-DIGIT BALANCE IN THE FORM: XXXX.XX, AND THE NAME OF THE ACCOUNT HOLDER.

THE TC500 ACCEPTS INFORMATION ENTERED THROUGH ITS KEYBOARD, TRANSMITS THE REQUEST TO THE B3500 WHEN POLLED, AND FORMATS THE INPUT RECEIVED FROM THE B3500 FOR PRINTING.

```
001010 IDENTIFICATION DIVISION.
001020 PROGRAM-ID. TCOLSV.
001030 AUTHOR. BOB THORNLEY.
001040 DATE-WRITTEN. JUNE 17, 1968.
001050 DATE-COMPILED.
001060 ENVIRONMENT DIVISION.
001070 SOURCE-COMPUTER. B-3500.
001080 OBJECT-COMPUTER. B-3500.
001090 INPUT-OUTPUT SECTION.
001100 FILE-CONTROL.
001120     SELECT REPORT ASSIGN TO PRINTER RESERVE NO.
001130     SELECT REMOTE ASSIGN TO TC-500.
001140 DATA DIVISION.
001150 FILE SECTION.
002120 FD REMOTE RECORDING MODE IS STANDARD DATA RECORDS OUTA .
002140 01 OUTA  PC X(50).
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003040 FD REPORT RECORD CONTAINS 132 CHARACTERS DATA RECORD PRINT-LINE.
003050 01 PRINT-LINE.
003060     03 ACTNO  PC 9(6).
003070     03 FILLER PC X(5).
003072     03 OLDBAL PC Z,ZZ9.99.
003074     03 FILLER PC XXX.
003076     03 TRANSACTION PC X(7).
003078     03 FILLER PC XXXX.
003080     03 DEPOSIT PC Z,ZZ9.99.
003082     03 FILLER PC X(5).
003084     03 WITHDRAWAL PC Z,ZZ9.99.
003086     03 FILLER PC X(5).
003088     03 NWBL PC Z,ZZ9.99.
003090     03 FILLER PC XXX.
003100     03 NAMER PC X(20).
003102     03 FILLER PC X(4).
003104     03 RMARKS PC X(32).
003110     03 MACHINE PC X.
003115     03 FILLER PC X(5).
003120 WORKING-STORAGE SECTION.
003210 77 COUNT PC 9 VA 0.
003220 77 REPEATS PC 9 VA 0.
       01  CONTROLNUMERICS.
           02  FILLER  PC 99  CMP  VA @00@.
           02  FILLER  PC 99  CMP  VA @01@.
           02  FILLER  PC 99  CMP  VA @02@.
           02  FILLER  PC 99  CMP  VA @03@.
           02  FILLER  PC 99  CMP  VA @04@.
           02  FILLER  PC 99  CMP  VA @05@.
           02  FILLER  PC 99  CMP  VA @06@.
           02  FILLER  PC 99  CMP  VA @07@.
           02  FILLER  PC 99  CMP  VA @08@.
           02  FILLER  PC 99  CMP  VA @09@.
           02  FILLER  PC 99  CMP  VA @0A@.
           02  FILLER  PC 99  CMP  VA @0B@.
           02  FILLER  PC 99  CMP  VA @0C@.
           02  FILLER  PC 99  CMP  VA @0D@.
           02  FILLER  PC 99  CMP  VA @0E@.
           02  FILLER  PC 99  CMP  VA @0F@.
           02  FILLER  PC 99  CMP  VA @10@.
           02  FILLER  PC 99  CMP  VA @11@.
           02  FILLER  PC 99  CMP  VA @12@.
           02  FILLER  PC 99  CMP  VA @13@.
           02  FILLER  PC 99  CMP  VA @14@.
           02  FILLER  PC 99  CMP  VA @15@.
           02  FILLER  PC 99  CMP  VA @16@.
           02  FILLER  PC 99  CMP  VA @17@.
           02  FILLER  PC 99  CMP  VA @18@.
           02  FILLER  PC 99  CMP  VA @19@.
           02  FILLER  PC 99  CMP  VA @1A@.
           02  FILLER  PC 99  CMP  VA @1B@.
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            02  FILLER  PC 99  CMP  VA @1C@.
            02  FILLER  PC 99  CMP  VA @1D@.
            02  FILLER  PC 99  CMP  VA @1E@.
            02  FILLER  PC 99  CMP  VA @1F@.
        01  CONTROLCODES REDEFINES CONTROLNUMERICS.
            02  NUL    PC X.
            02  SOH    PC X.
            02  STX    PC X.
            02  ETX    PC X.
            02  EOT    PC X.
            02  WRU    PC X.
            02  ACK    PC X.
            02  BEL    PC X.
            02  BS     PC X.
            02  HT     PC X.
            02  LF     PC X.
            02  VT     PC X.
            02  FF     PC X.
            02  CR     PC X.
            02  SO     PC X.
            02  SI     PC X.
            02  DLE    PC X.
            02  DC1    PC X.
            02  DC2    PC X.
            02  DC3    PC X.
            02  DC4    PC X.
            02  NAK    PC X.
            02  SYN    PC X.
            02  ETB    PC X.
            02  CAN    PC X.
            02  EM     PC X.
            02  SS     PC X.
            02  ESC    PC X.
            02  FS     PC X.
            02  GS     PC X.
            02  RS     PC X.
            02  US     PC X.
004010  01  MESGA.
004015      03  OUT1 PC 9(10) CMP  VA @04F1C19705@.
004020      03  MSG1 REDEFINES OUT1 PC X(5).
004030      03  OUT2 PC 9(10) CMP VA @04F1C19805@.
004040      03  MSG2 REDEFINES OUT2 PC X(5).
004050      03  OUT3 PC 9(10) CMP VA @01F1C1F102@.
004060      03  MSG3 REDEFINES OUT3 PC X(5).
004080  01  MESGB.
004085      03  OUT4 PC 9(10) CMP VA @04F1C29705@.
004090      03  MSG4 REDEFINES OUT4 PC X(5).
004100      03  OUT5 PC 9(10) CMP VA @04F1C29805@.
004110      03  MSG5 REDEFINES OUT5 PC X(5).
004120      03  OUT6 PC 9(10) CMP VA @01F1C2F102@.
004130      03  MSG6 REDEFINES OUT6 PC X(5).
```

PART VI - BURROUGHS TC500

```
004150 01 HOLD.
004160      03 POLE PC X(5).
004170      03 SLECT PC X(5).
004180      03 XMIT PC X(5).
005010 01 TEST-WORD PC 9(16) CMP.
005015 01 RES-DES REDEFINES TEST-WORD.
005020      03 OP-COMP PC 9 CMP.
005030      03 EX-COND PC 9 CMP.
005040      03 NOT-RDY PC 9 CMP.
005050      03 DATA-ER PC 9 CMP.
005060      03 ABANDON PC 9 CMP.
005065      03 CAN-COM PC 9 CMP.
005070      03 END-TRN PC 9 CMP.
005080      03 MAX-ADD PC 9 CMP.
005090      03 TIM-OUT PC 9 CMP.
005100      03 MEM-PAR PC 9 CMP.
005110      03 WRT-ERR PC 9 CMP.
005120      03 CAR-LOS PC 9 CMP.
005130      03 UNIT1   PC 9 CMP.
005140      03 UNIT2   PC 9 CMP.
005150      03 UNIT3   PC 9 CMP.
005160      03 UNIT4   PC 9 CMP.
005165 01 OUTC.
005170      03 CONTROLS PC X(5).
005180      03 TEXT.
005190          05 ACCTNO PC 9(6).
005195      05 SEPARATOR PC X.
005200        05 NEWB PC 9(4)V99.
005200      03 CORRECTOR PC X.
005201      03 FILLER PC XX.
005202          03 NAIME PC X(20).
005203      03 SPACER PC X.
005205      03 FILLER PC X(6).
005210      03 ENDCOD PC X.
005215      03 REPCOD PC X.
005220 01 POLLED.
005225      03 CONTROLLS.
005230      05 CONTROLL PC X.
005240      05 CONTS PC X(4).
005242      03 MESAGE.
005243      05 ANSCOD PC X.
005246      05 REST PC X(4).
005250      05 ACNO.
005251          07 ONES PC 9(4).
005252          07 NUMBR PC 99.
005255      05 TCOD PC X.
005260      05 OB PC S9(4)V99.
005270      05 TRANS PC 9(4)V99.
005280      03 FILLER PC X(20).
005290      03 ENDER PC X.
005295 01 ACT-KEY PC 99.
```

```
005300 01 ACCOUNTS.
005305      02 CLIENTS.
005310      03 R01 PC X(32) VA "111101010000EDWARD ROFF          ".
005330      03 R02 PC X(32) VA "111102020000ROSS W. CUMMINGS     ".
005340      03 R03 PC X(32) VA "111103030000DWAYNE MC CARTHY     ".
005350      03 R04 PC X(32) VA "111104040000ROBERT H. RITCHINGS  ".
005360      03 R05 PC X(32) VA "111105050000JOHN SHORTER         ".
005370      03 R06 PC X(32) VA "111106060000FREDERICK KALLMEYER  ".
005380      03 R07 PC X(32) VA "111107070000JAMES REITZEL        ".
005390      03 R08 PC X(32) VA "111108080000ARTHUR CAMP-         ".
005400      03 R09 PC X(32) VA "111109090000JOHN C. WISNER       ".
005410      03 R10 PC X(32) VA "111110100000HENRY KALBERG        ".
005420      03 R11 PC X(32) VA "111111110000ROBERT M. MAUST      ".
005430      03 R12 PC X(32) VA "111112120000JAMES K. LAWRENCE    ".
005440      03 R13 PC X(32) VA "111113130000HERBERT OHL          ".
005450      03 R14 PC X(32) VA "111114140000CRAWFORD WINNER      ".
005460      03 R15 PC X(32) VA "111115150000WILLIAM HODEL        ".
005470      03 R16 PC X(32) VA "111116160000FRANKLIN FULLER      ".
005480      03 R17 PC X(32) VA "111117170000WILLIAM CHICHESTER   ".
005490      03 R18 PC X(32) VA "111118180000KENNETH WHITFIELD    ".
005500      03 R19 PC X(32) VA "111119190000LEWIS HUGHES         ".
005510      03 R20 PC X(32) VA "111120200000DAVID KANE           ".
005520      03 R21 PC X(32) VA "111121210000EDWARD FLYNN         ".
005530      03 R22 PC X(32) VA "111122220000NICHOLAS CONSTANTINE".
005540      03 R23 PC X(32) VA "111123230000FREDERICK STONEALL   ".
005550      03 R24 PC X(32) VA "111124240000HOEN PHILLIPS        ".
005560      03 R25 PC X(32) VA "111125250000JAMES BURRELL        ".
005570      03 R26 PC X(32) VA "111126260000BURWELL TAYLOR       ".
005580      03 R27 PC X(32) VA "111127270000ROY LOUGHRIDGE       ".
005590      03 R28 PC X(32) VA "111128280000NORTON CLARK         ".
005600      03 R29 PC X(32) VA "111129290000RICHARD DIEHL        ".
005610      03 R30 PC X(32) VA "111130300000MARIO ANTOCI         ".
005620      03 R31 PC X(32) VA "111131310000EUGENE BARNARD       ".
005630      03 R32 PC X(32) VA "111132320000ORIN STRIDE          ".
005640      03 R33 PC X(32) VA "111133330000DORIS ASPEL          ".
005650      03 R34 PC X(32) VA "111134340000DAVID BUTTA          ".
005660      03 R35 PC X(32) VA "111135350000JOSEPH PATRICCA      ".
005670      03 R36 PC X(32) VA "111136360000DON LEWIS            ".
005671      02 CLIENTA REDEFINES CLIENTS.
005672         03 CLIENT PC X(32) OCCURS 36 TIMES DEPENDING ON ACT-KEY.
005685 01 TEMPORARY.
005690      03 ACTNUM PC 9(6).
005700      03 BAL PC S9999V99.
005710      03 NAMES PC X(20).
005720 01 HEADER.
005730      03 PART1 PC X(33) VA "A/C NO.     OLD BAL      TRANS     ".
005740      03 PART2 PC X(33) VA "DEPOSIT      WDRAWAL      NEW BAL  ".
005750      03 PART3 PC X(33) VA "    NAME                          ".
005760      03 PART4 PC X(33) VA "REMARKS                    MACHINE".
006010 PROCEDURE DIVISION.
006020 START. OPEN OUTPUT REPORT.
```

```
006025      MOVE 0 TO COUNT.
006030      OPEN I-O REMOTE.
006040      MOVE MESGA TO HOLD.
006050      MOVE HEADER TO PRINT-LINE.
006060      WRITE PRINT-LINE BEFORE ADVANCING 2 LINES.
006060      MOVE SPACES TO PRINT-LINE.
006061 SWCH. IF COUNT IS = 1 MOVE MESGA TO HOLD SUBTRACT 1 FROM COUNT GO
006062      TO TRAN.
006063      IF COUNT IS = 0 MOVE MESGB TO HOLD ADD 1 TO COUNT GO TO TRAN.
006070 TRAN. MOVE SPACES TO OUTA.
006071      MOVE SPACES TO OUTC.
006072      MOVE SPACES TO POLLED.
006073      MOVE POLE TO CONTROLLS.
006074      MOVE ZEROS TO REPEATS.
006075      MOVE POLLED TO OUTA.
006076      MOVE FS TO CORRECTOR.
006080 CC.  WRITE-READ OUTA.
006091      INTERROGATE REMOTE INTO TEST-WORD.
006092      IF TIM-OUT IS =1 GO TO SWCH.
006093      MOVE OUTA TO POLLED.
006095      IF ANSCOD IS = EOT GO TO SWCH.
006096      MOVE ACK TO CONTROLL.
006097      MOVE POLLED TO OUTA.
006098      WRITE-READ OUTA.
006099      MOVE OUTA TO POLLED.
006111 BB.  IF ACNO IS < 111101 GO TO REPLY.
006112      IF ACNO IS > 111136 GO TO REPLY.
006115      MOVE NUMBR TO ACT-KEY.
006120      MOVE CLIENT (ACT-KEY) TO TEMPORARY.
006125      MOVE FS TO SEPARATOR.
006128      IF BAL IS < ZERO SUBTRACT OB FROM ZERO GIVING OB.
006129      MOVE BAL TO OLDBAL.
006130      IF TCOD IS = "I" GO TO ASK.
006140      IF OB IS NOT = BAL GO TO REPLY.
006150      IF TCOD IS = "D" GO TO PUT.
006160      IF TCOD IS = "W" GO TO TAKE.
006180 REPLY. MOVE ALL 9 TO NEWB.
006184      MOVE GS TO CORRECTOR.
006185      MOVE GS TO SEPARATOR.
006186      MOVE ACNO TO ACCTNO.
006190      GO TO ZZ.
006200      GO TO TRAN.
007010 PUT.  ADD TRANS TO BAL.
007011      MOVE TRANS TO DEPOSIT.
007012      MOVE "DEPOSIT" TO TRANSACTION.
007015 XX.  IF BAL IS < ZERO MOVE GS TO SEPARATOR MOVE "OVERDRAFT" TO
007016      RMARKS MOVE ALL 9 TO NEWB MOVE OB TO NWBL MOVE GS TO
007016      CORRECTOR PERFORM WW THRU VV GO TO ZZ.
007017      MOVE BAL TO NWBL.
007020      MOVE BAL TO NEWB.
007030 WW.  MOVE ACNO TO ACCTNO.
```

```
007050      MOVE ACNO TO ACTNO.
007060      MOVE NAMES TO NAMER.
007065      MOVE NAMES TO NAIME.
007068      MOVE NUL TO SPACER.
007069      IF COUNT IS = 0 MOVE "A" TO MACHINE GO TO VV.
007069      IF COUNT IS = 1 MOVE "B" TO MACHINE.
007070 VV. WRITE PRINT-LINE.
007080      MOVE SPACES TO PRINT-LINE.
007100 YY. MOVE TEMPORARY TO CLIENT (ACT-KEY).
007110 ZZ. MOVE SLECT TO CONTROLS.
007115      MOVE OUTC TO OUTA.
007120 RP. WRITE-READ OUTA.
007130      MOVE OUTA TO POLLED.
007135      ADD 1 TO REPEATS.
007136      IF REPEATS IS = 4 GO TO SWCH.
007140      IF ANSCOD IS = NAK GO TO RP.
007150      IF ANSCOD IS NOT = ACK GO TO RP.
007160      MOVE XMIT TO CONTROLS.
007170      MOVE ETX TO ENDCOD.
007175      MOVE OUTC TO OUTA.
007180 AG. WRITE-READ OUTA.
007195      MOVE OUTA TO OUTC.
007200      IF REPCOD IS = NAK GO TO ZZ.
008010      IF REPCOD IS = ACK GO TO SWCH.
008020      GO TO ZZ.
008030 TAKE. SUBTRACT TRANS FROM BAL.
008031      MOVE "WDRAWAL" TO TRANSACTION. MOVE TRANS TO WITHDRAWAL.
008040      GO TO XX.
008050 ASK. MOVE "INQUIRY" TO TRANSACTION MOVE BAL TO NEWB.
008051      PERFORM WW THRU VV.
008055      IF BAL IS < ZERO MOVE GS TO SEPARATOR.
008060      GO TO ZZ.
```

THE TC-500 PROGRAM IS AS FOLLOWS:

```
        25,6
       160,0
       129,0
         3,0          FLGLOP
        16,0          ENTRY
        21,2          SKIP
        22,0          REST
        26,0          OUT
        26,2          SEND
        27,0          RECEIV
        34,2          REPEAT
        60,0          TABLE
```

PART VI - BURROUGHS TC500

```
          64,0          FORMAT
          70,0          I
          80,0          ACCTNO
          81,0          BALANC
          82,0          AMOUNT
          83,0          NEWBAL
          84,0          DATE
          96,0          BUFOUT
         128,0          BUFFIN


                   1          NOTE
                   2          NOTE
                   3          NOTE
0 0  FC3C          4          LPKR    TABLE                      60
  1  F840          5          LPNR    FORMAT                     64
  2  654F          6          RST     X       1234
  3  655F          7          RST     Y       1234


1 0  0800          8          NOP
  1  650C          9          RST     R       23
  2  EB09         10          POS     10
  3  F054         11          LKBR    DATE                       84


2 0  F601         12          PKA     1
  1  0800         13          NOP
  2  AD0D         14          TKM     13

          *** COMMENT: TYPE DATE. ***

  3  ED01         16          AL      1


3 0  4304         17  FLGLOP  SK      R       2       3
  1  4538         18          EX      B       3       1

          *** COMMENT: KEYBOARD EMPTY. ***

  2  7003         19          BRU     FLGLOP                  3 0
  3  7010         20          BRU     ENTRY                  16 0


4 0  0000         21          STOP

          *** COMMENT: A PROGRAM FOR PROCESSING UNSOLICITED
                       MESSAGES COULD BE INSERTED HERE. ***
```

```
                        22              NOTE
                        22.1            NOTE
                        23              ORG     16
16 0    ED01            24      ENTRY   AL      1
   1    FB00            25              POS     1
   2    F602            26              PKA     2
   3    0800            27              NOP


17 0    A660            28              NK      6           0

            *** COMMENT: ENTER ACCOUNT NUMBER. ***

   1    D450            29              PN      5           0
   2    F060            30              LKBR    BUFOUT                  96
   3    3050            31              TRM     ACCTNO                  80

18 0    1506            32              TRAB    6
   1    EB09            33              POS     10
   2    C854            34              PA      DATE                    84
   3    EB19            35              POS     26

19 0    F604            36              PKA     3
   1    0800            37              NOP
   2    AD01            38              TKM     1

            *** COMMENT: TYPE TRANSACTION CODE. ***

   3    3860            39              TRA     BUFOUT                  96

20 0    0302            40              SLROS   0           2
   1    03E0            41              SLROS   14          0

            *** COMMENT: ISOLATE TRANSACTION CODE. ***

   2    DA46            42              CPA     I                       70
   3    7815            43              BRU     SKIP                 21 2

            *** COMMENT: EQUALITY EXIT. ***

21 0    7016            44              BRU     REST                 22 0
   1    7016            45              BRU     REST                 22 0
```

PART VI - BURROUGHS TC500

```
    2  6552        46   SKIP     RST     Y          1
    3  701A        47            BRU     OUT                  26 0

22  0  6752        48   REST     SET     Y          1
    1  EB1D        49            POS     30
    2  F608        50            PKA     4
    3  0800        51            NOP

23  0  A460        52            NKR     6          0

          *** COMMENT: ENTER BALANCE. ***

    1  D151        53            PNS=    5          1
    2  C52D        54            PC=     =
    3  EB28        55            POS     41

24  0  3051        56            TRM     BALANC               81
    1  1506        57            TRAB    6
    2  F610        58            PKA     5
    3  0800        59            NOP

25  0  A660        60            NK      6          0

          *** COMMENT: ENTER AMOUNT. ***

    1  D451        61            PN      5          1
    2  3052        62            TRM     AMOUNT               82
    3  1506        63            TRAB    6

26  0  1F03        64   OUT      TSB     BUFOUT               96

          *** COMMENT: OUTPUT TEXT IS FIXED LENGTH:
                       ######TBBBBBBAAAAAA,
                       WHERE
                                 # = ACCOUNT NUMBER,
                                 T = TRANSACTION CODE,
                                 B = BALANCE,
                                 A = AMOUNT.

                    64.1         NOTE
                    64.2         NOTE
                    64.3         NOTE
                    64.4         NOTE
```

```
                    64.5            NOTE
    1  6708         65              SET     R           3
    2  4508         66    SEND      EX      R           3       1

            *** COMMENT: WAIT FOR MESSAGE TO BE SENT. ***

    3  781A         67              BRU     SEND                        26 2

27  0  4104         68    RECEIV    SK      R           2       1

            *** COMMENT: WAIT FOR REPLY TO BE RECEIVED. ***

    1  701B         69              BRU     RECEIV                      27 0
    2  1E04         70              TRB     BUFFIN                       128

            *** COMMENT: INPUT TEXT IS FIXED LENGTH:
                         ######SNNNNNN,
                         WHERE
                                   # = ACCOUNT NUMBER,
                                   S = SIGN (FS=+, GS=-),
                                   N = NEW BALANCE,
                         ALTERNATELY:
                         ######XNNNNNNS,
                         WHERE
                                   X = NULL CHARACTER,

                    70.1            NOTE
                    70.2            NOTE
                    70.3            NOTE
                    70.4            NOTE
                    70.5            NOTE
                    70.6            NOTE
                    70.7            NOTE
                    70.8            NOTE
                    71              NOTE
    3  EB33         71.1            POS     52

28  0  1880         72              LRBR    BUFFIN                       128
    1  1B07         73              TRBA    7
    2  9850         74              SUA     ACCTNO                        80
    3  4100         75              SKZ     1

29  0  741A         76              BRU     OUT     +1                  26 1
    1  1B07         77              TRBA    7
    2  4591         78              EX      K         4       1
```

```
               *** COMMENT: IF FS FOLLOWS THE NEW BALANCE,
                            PRINT IT +; IF GS MAKE IT -. ***

                  78.1           NOTE
   3  67C1        79             SET    A          -


30 0  D151        80             PNS-   5          1


   1  C52D        81             PC-    -
   2  4152        82             SK     Y          1     1
   3  7822        83             BRU    REPEAT                 34 2


               *** COMMENT: END OF TRANS=I. ***

31 0  3053        84             TRM    NEWBAL                   83
   1  EB4B        85             POS    76
   2  C854        86             PA     DATE                     84
   3  9851        87             SUA    BALANC                   81


32 0  41C1        88             SK     A          -     1


               *** COMMENT: PRINT AMOUNT IN POS. 90 IF NEW BALANCE
                            IS LESS THAN OLD BALANCE; ELSE PRINT
                            AMOUNT IN 100. ***

   1  EB59        89             POS    90
   2  45C1        90             EX     A          -     1
   3  EB63        91             POS    100


33 0  3852        92             TRA    AMOUNT                   82
   1  D451        93             PN     5          1
   2  EB6D        94             POS    110
   3  3853        95             TRA    NEWBAL                   83


34 0  D151        96             PNS-   5          1
   1  C52D        97             PC-    -
   2  650F        97.1 REPEAT    RST    R          1234


               *** COMMENT: TO PRINT NAMES, APPROPRIATE PROGRAM
                            WOULD BE INSERTED AT THIS POINT. ***
```

```
    3  7003        98              BRU     FLGLOP                  3 0


35 0   0800        99              NOP
   1   0800       100              NOP
   2   0800       101              NOP
                  102              ORG     60
60 0   0800       103    TABLE     NOP

                *** COMMENT: DATE, ACCOUNT NUMBER, TRANSACTION CODE,
                             BALANCE, AMOUNT IN LOC. "TABLE" ETC. ***

   1   0800       104              NOP
   2   0800       105              NOP
   3   0800       106              NOP


61 0   0800       107              NOP
   1   0800       108              NOP
   2   0800       109              NOP
   3   0800       110              NOP


62 0   0800       111              NOP
   1   0800       112              NOP
   2   0800       113              NOP
   3   0800       114              NOP


63 0   0800       115              NOP
   1   0800       115.1            NOP
   2   0800       115.2            NOP
   3   0800       115.3            NOP


64 0   6E66E667   116    FORMAT    MASK    ZZZ,ZZZ,ZZZ,ZZZ,ZZD
       066E66E6


65 0   66E66797   117              MASK    Z,ZZZ,ZZZ,ZZZ,ZZD.DD
       0E66E66E


                  118              ORG     70
70 0               119    I         ALF     I*


                  120              ORG     80
80 0               121    ACCTNO    NUM                     0
```

PART VI - BURROUGHS TC500

```
 81 0          122   BALANC   NUM                0

 82 0          123   AMOUNT   NUM                0

 83 0          124   NEWBAL   NUM                0

 84 0          125   DATE     REG    2
               126            ORG    96
 96 0          127   BUFOUT   REG    32
128 0          128   BUFFIN   REG    32
               129            END
```

*****

PART VI - THE B300 COMPUTER.

THE B300 COMPUTER.

THE B300 COMPUTER CAN BE ATTACHED TO THE B2500/3500 COMPUTER AS A TERMINAL. THE CHARACTERISTICS OF THE B300 AS A TERMINAL ARE THE FOLLOWING:

CHARACTER LENGTH:	7 DATA BITS, 1 PARITY BIT (ODD)
SIGNALLING SPEED:	2000 BITS PER SEC. ON SWITCHED LINES, 2400 BITS PER SEC. ON PRIVATE OR LEASED LINES
TRANSMISSION MODE:	SYNCHRONOUS
BREAK FEATURE:	NONE
TIME-OUT:	1 SECOND
LONG. PARITY:	EVEN - 7 BITS - EXCLUDES VP TRACK, ODD VERTICAL PARITY ON LPC THE LONGITUDINAL PARITY CHARACTER IS GENERATED OVER ALL CHARACTERS FOLLOWING THE STX OR SOH CHARACTER AND FOLLOWS THE ETX CHARACTER IN THE TRANSMISSION.
CODE:	7 BIT BCL CODE SET.

THE BCL-EBCDIC AND EBCDIC-BCL TRANSLATION TABLES.

THE BCL-EBCDIC TRANSLATION TABLE IS SHOWN BELOW:

CODE	GRAPHIC	GRAPHIC	CODE
00	NUL	NUL	00
01	SOH	SOH	01
02	STX	STX	02
03	ETX	ETX	03

04	EOT	EOT	04
05	ENQ	ENQ	05
06	ACK	ACK	06
07	BEL	BEL	07
08	BS	BS	08
09	HT	HT	09
0A	LF	LF	0A
0B	VT	VT	0B
0C	FF	FF	0C
0D	CR	CR	0D
0E	SO (SHIFT OUT)	SO	0E
0F	SI (SHIFT IN)	SI	0F
10	DLE	DLE	10
11	DC1	DC1	11
12	DC2	DC2	12
13	DC3	DC3	13
14	DC4	DC4	14
15	NAK	NAK	15
16	SYN	SYN	15
17	ETB	ETB	17
18	CAN	CAN	18
19	EM	EM	19
1A	SUB	SUB	1A
1B	ESC	ESC	1B
1C	FS	FS	1C
1D	GS	GS	1D
1E	RS	RS	1E
1F	US	US	1F
20	- (MINUS)	-	60
21	J	J	D1
22	K	K	D2
23	L	L	D3
24	M	M	D4
25	N	N	D5
26	O	O	D6
27	P	P	D7
28	Q	Q	D8
29	R	R	D9
2A	] (MULTIPLY SIGN)	MZ (MINUS ZERO)	D0
2B	$	$	5B
2C	*	*	5C
2D	)	)	5D
2E	;	;	5E
2F	≤	LOGICAL NOT	5F
30	& (AMPERSAND)	&	50
31	A	A	C1
32	B	B	C2
33	C	C	C3
34	D	D	C4
35	E	E	C5
36	F	F	C6

37	G	G	C7	
38	H	H	C8	
39	I	I	C9	
3A	+	+	4E	
3B	.	.	4B	
3C	?	?	4A	
3D	(	(	4D	
3E	<	<	4C	
3F	← (LEFT ARROW)	VERTICAL BAR	4F	
40	QUESTION MARK	QUESTION MARK	6F	
41	1	1	F1	
42	2	2	F2	
43	3	3	F3	
44	4	4	F4	
45	5	5	F5	
46	6	6	F6	
47	7	7	F7	
48	8	8	F8	
49	9	9	F9	
4A	0 (NUMERIC ZERO)	0	F0	
4B	#	#	7B	
4C	@ (AT SIGN)	@	7C	
4D	:	:	7A	
4E	>	>	6E	
4F	≥	PRIME	7D	
50	BLANK	BLANK	40	
51	/	/	61	
52	S	S	E2	
53	T	T	E3	
54	U	U	F4	
55	V	V	E5	
56	W	W	E6	
57	X	X	E7	
58	Y	Y	E8	
59	Z	Z	E9	
5A	≠	UNDERSCORE	6D	
5B	,	,	6B	
5C	% (PERCENT SIGN)	%	6C	
5D	=	=	7E	
5E	?	?	5A	
5F	"	"	7F	
60	PRIME	PRIME	7D	SEE ALSO BCL 4F
60	A (LOWER CASE)	A (LOWER CASE)	81	
62	B (LOWER CASE)	B (LOWER CASE)	82	
63	C (LOWER CASE)	C (LOWER CASE)	83	
6J	D (LOWER CASE)	D (LOWER CASE)	84	
65	E (LOWER CASE)	E (LOWER CASE)	85	
6L	F (LOWER CASE)	F (LOWER CASE)	86	
67	G (LOWER CASE)	G (LOWER CASE)	87	
68	H (LOWER CASE)	H (LOWER CASE)	88	

69	I (LOWER CASE)	I (LOWER CASE)	89	
6A	J (LOWER CASE)	J (LOWER CASE)	91	
6B	K (LOWER CASE)	K (LOWER CASE)	92	
6C	L (LOWER CASE)	L (LOWER CASE)	93	
6D	M (LOWER CASE)	M (LOWER CASE)	94	
6E	M (LOWER CASE)	N (LOWER CASE)	95	
6E	N (LOWER CASE)	O (LOWER CASE)	96	
6F	O (LOWER CASE)	P (LOWER CASE)	97	
70	P (LOWER CASE)	Q (LOWER CASE)	98	
71	Q (LOWER CASE)	Q (LOWER CASE)	98	
72	R (LOWER CASE)	R (LOWER CASE)	99	
73	S (LOWER CASE)	S (LOWER CASE)	A2	
74	T (LOWER CASE)	T (LOWER CASE)	A3	
75	U (LOWER CASE)	U (LOWER CASE)	A4	
76	V (LOWER CASE)	V (LOWER CASE)	A5	
77	W (LOWER CASE)	W (LOWER CASE)	A6	
78	X (LOWER CASE)	X (LOWER CASE)	A7	
79	Y (LOWER CASE)	Y (LOWER CASE)	A8	
7A	Z (LOWER CASE)	Z (LOWER CASE)	A9	
7B	OPENING BRACE	MZ (MINUS ZERO)	B0	SEE ALSO BCL 2A
7C	VERTICAL BAR	VERTICAL BAR	4F	
7D	CLOSING BRACE	PZ (PLUS ZERO)	C0	
7E	NOT	NOT	5F	
7F	DEL	DEL	FF	

THE FOLLOWING IS THE EBCDIC-BCL TRANSLATION TABLE:

EBCDIC		BCL	
CODE	GRAPHIC	GRAPHIC	CODE
00	NUL	NUL	00
01	SOH	SOH	01
02	STX	STX	02
03	ETX	ETX	03
04	UNDEFINED	EOT	04
05	HT	HT	09
06	UNDEFINED	ACK	06
07	DEL	DEL	7F
08	UNDEFINED	BS	08
09	UNDEFINED	HT	09
0A	UNDEFINED	LF	0A
0B	VT	VT	0B
0C	FF	FF	0C
0D	CR	CR	0D
0E	SO	SO	0E

0F	SI	SI	0F
10	DLE	DLE	10
11	DC1	DC1	11
12	DC2	DC2	12
13	DC3	DC3	13
14	UNDEFINED	DC4	14
15	NL	CR	0D
16	BS	BS	08
17	UNDEFINED	ETB	17
18	CAN	CAN	18
19	EM	EM	19
1A	UNDEFINED	SUB	1A
1B	UNDEFINED	ESC	1B
1C	FS	FS	1C
1D	GS	GS	1D
1E	RS	RS	1E
1F	US	US	1F
20	UNDEFINED	NUL	00
21	UNDEFINED	NUL	00
22	UNDEFINED	NUL	00
23	UNDEFINED	NUL	00
24	UNDEFINED	NUL	00
25	LF	LF	0A
26	ETB	ETB	17
27	ESC	ESC	1B
28	UNDEFINED	NUL	00
29	UNDEFINED	NUL	00
2A	UNDEFINED	NUL	00
2B	UNDEFINED	NUL	00
2C	UNDEFINED	NUL	00
2D	ENQ	ENQ	05
2E	ACK	ACK	06
2F	BEL	BEL	07
30	UNDEFINED	NUL	00
31	UNDEFINED	NUL	00
32	SYN	SYN	16
33	UNDEFINED	NUL	00
34	UNDEFINED	NUL	00
35	UNDEFINED	NUL	00
36	UNDEFINED	NUL	00
37	EOT	EOT	04
38	UNDEFINED	NUL	00
39	UNDEFINED	NUL	00
3A	UNDEFINED	NUL	00
3B	UNDEFINED	NUL	00
3C	DC4	DC4	14
3D	NAK	NAK	15
3E	UNDEFINED	NUL	00
3F	SUB	SUB	1A
40	BLANK	BLANK	50
41	UNDEFINED	NUL	00

42	UNDEFINED	NUL	00
43	UNDEFINED	NUL	00
44	UNDEFINED	NUL	00
45	UNDEFINED	NUL	00
46	UNDEFINED	NUL	00
47	UNDEFINED	NUL	00
48	UNDEFINED	NUL	00
49	UNDEFINED	NUL	00
4A	?	?	3C
4B	.	.	3B
4C	<	<	3E
4D	(	(	3D
4E	+	+	3A
4F	VERTICAL BAR	NUL	00
50	&	&	30
51	UNDEFINED	NUL	00
52	UNDEFINED	NUL	00
53	UNDEFINED	NUL	00
54	UNDEFINED	NUL	00
55	UNDEFINED	NUL	00
56	UNDEFINED	NUL	00
57	UNDEFINED	NUL	00
58	UNDEFINED	NUL	00
59	UNDEFINED	NUL	00
5A	?	NUL	00
5B	$	$	2B
5C	*	*	2C
5D	)	)	2D
5E	;	;	2E
5F	LOGICAL NOT	≤	2F
60	-	-	20
61	/	/	51
62	UNDEFINED	NUL	00
63	UNDEFINED	NUL	00
64	UNDEFINED	NUL	00
65	UNDEFINED	NUL	00
66	UNDEFINED	NUL	00
67	UNDEFINED	NUL	00
68	UNDEFINED	NUL	00
69	UNDEFINED	NUL	00
6A	UNDEFINED	NUL	00
6B	,	,	5B
6C	%	%	5C
6D	UNDERSCORE	≠	5A
6E	>	>	4E
6F	QUESTION MARK	QUESTION MARK	40
70	UNDEFINED	NUL	00
71	UNDEFINED	NUL	00
72	UNDEFINED	NUL	00
73	UNDEFINED	NUL	00
74	UNDEFINED	NUL	00

75	UNDEFINED	NUL	00
76	UNDEFINED	NUL	00
77	UNDEFINED	NUL	00
78	UNDEFINED	NUL	00
79	UNDEFINED	NUL	00
7A	:	:	4D
7B	#	#	4B
7C	@	@	4C
7D	PRIME	NUL	00
7E	=	=	5D
7F	"	"	5F
80	UNDEFINED	NUL	00
81	A (LOWER CASE)	A	31
82	B (LOWER CASE)	B	32
83	C (LOWER CASE)	C	33
84	D (LOWER CASE)	D	34
85	E (LOWER CASE)	E	35
86	F (LOWER CASE)	F	36
87	G (LOWER CASE)	G	37
88	H (LOWER CASE)	H	38
89	I (LOWER CASE)	I	39
8A	UNDEFINED	NUL	00
8B	UNDEFINED	NUL	00
8C	UNDEFINED	NUL	00
8D	UNDEFINED	NUL	00
8E	UNDEFINED	NUL	00
8F	UNDEFINED	NUL	00
9/	UNDEFINED	NUL	00
91	J (LOWER CASE)	J	21
92	K (LOWER CASE)	K	22
93	L (LOWE= CASE)	L	23
94	M (LOWER CASE)	M	24
95	N (LOWER CASE)	N	25
96	O (LOWER CASE)	O	26
97	P (LOWER CASE)	P	27
98	Q (LOWER CASE)	Q	28
99	R (LOWER CASE)	R	29
9A	UNDEFINED	NUL	00
9B	UNDEFINED	NUL	00
9C	UNDEFINED	NUL	00
9D	UNDEFINED	NUL	00
9E	UNDEFINED	NUL	00
9F	UNDEFINED	NUL	00
A0	UNDEFINED	NUL	00
A1	UNDEFINED	NUL	00
A2	S (LOWER CASE)	S	52
A3	T (LOWER CASE)	T	53
A4	U (LOWER CASE)	U	54
A5	V (LOWER CASE)	V	55
A6	W (LOWER CASE)	W	56
A7	X (LOWER CASE)	X	57

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A8	Y (LOWER CASE)	Y	58
A9	Z (LOWER CASE)	Z	59
C0	+	+	3A
C1	A	A	31
C2	B	B	32
C3	D	D	33
C4	E	E	34
C5	E	E	35
C6	F	F	36
C7	G	G	37
C8	H	H	38
C9	I	I	39
D0	MZ	MULTIPLY SIGN	2A
D1	J	J	21
D2	K	K	22
D3	L	L	23
D4	M	M	24
D5	N	N	25
D6	O	O	26
D7	P	P	27
D8	Q	Q	28
D9	R	R	29
E2	S	S	52
E3	T	T	53
E4	U	U	54
E5	V	V	55
E6	W	W	56
E7	X	X	57
E8	Y	Y	58
E9	Z	Z	59
F0	0	0	4A
F1	1	1	41
F2	2	2	42
F3	3	3	43
F4	4	4	44
F5	5	5	45
F6	6	6	46
F7	7	7	47
F8	8	8	48
F9	9	9	49

THE CONTROL CHARACTERS PERMISSIBLE WITH THE B300/B3500 SYSTEM ARE LISTED BELOW WITH THEIR BINARY AND GRAPHIC REPRESENTATIONS:

B300 REPRESENTATION:			B2500/3500 REPRESENTATION:	
CHAR.	BINARY:	CONTROL CODES:	CHAR.	BINARY:

0	0100110	ACK	2F	0010 1110
E	0010101	NAK	3D	0011 1101
K	1100010	STX	02	0000 0010
L	0100011	ETX	03	0000 0011
J	1100001	SOH	01	0000 0001
G	1010111	ETB	26	0010 0110
7	1100100	EOT	04	0000 0100
N	0100101	ENQ	05	0000 0101
		SYN	32	0011 0010

THE MESSAGES SENT BY THE B2500/3500 COMPUTER MUST BE FRAMED BY THE ABOVE LISTED CONTROL CHARACTERS. THE DATA IS IN 7-BIT BCL CODE. SINCE TRANSMISSION MODE IS SYNCHRONOUS, MESSAGES MUST BE PREFACED BY FOUR "SYN" CHARACTERS. ON THE B2500/3500 THE "SYN" CHARACTERS MUST BE CODED. THE B300 GENERATES THE REQUIRED "SYN" CHARACTERS ITSELF. EXAMPLE OF A MESSAGE TO BE TRANSMITTED FROM THE B3500 TO THE B300:

SYN SYN SYN SYN STX ABC 123 ETX

THE ABOVE MESSAGE IS REPRESENTED BY THE FOLLOWING NUMERIC CHARACTERS:

32 32 32 32 02 41 42 43 31 32 33 03

IF THE MESSAGE CONSISTS OF ONE CHARACTER ONLY, IT SHOULD BE CODED IN THE FOLLOWING MANNER:

SYN SYN SYN SYN CAN ACK

IN THIS MESSAGE THE "CAN" CONTROL CHARACTER IS INSERTED ONLY AS A FILLER CHARACTER, REQUIRED BY THE ADAPTER. ANY CHARACTER, EXCEPT ENDING CONTROL CHARACTERS, MAY BE USED AS FILLER CHARACTER.

THE B300 ALSO TRANSMITS IN BCL, BUT USES THE ? CHARACTER TO CHANGE MODES FROM CONTROL MODE TO TEXT AND BACK TO CONTROL MODE. THE MODE CHANGE CHARACTER ? MUST FOLLOW THE STX CHARACTER AND PRECEDE THE ETX CHARACTER AND IS NOT TRANSMITTED. THE ? CHARACTER IS NOT PERMITTED IN THE TEXT. THE " (QUOTE) CHARACTER SERVES AS A GROUP MARK AND IS USED TO SIGNAL THE END OF A MESSAGE. BELOW IS SHOWN AN EXAMPLE OF A MESSAGE ORIGINATING FROM THE B300:

K ? ABC 123 ? L "

PART VI - THE B300 COMPUTER.

A MESSAGE CONSISTING OF A SINGLE CHARACTER (ENQ IN THE EXAMPLE) IS CODED IN THE FOLLOWING WAY: N "

*****

tear along dotted line

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DATA PROCESSING PUBLICATIONS
REMARKS FORM

TITLE: _____
_____
_____

FORM: _____
DATE: _____

CHECK TYPE OF SUGGESTION:

☐ ADDITION ☐ DELETION ☐ REVISION ☐ ERROR

GENERAL COMMENTS AND/OR SUGGESTIONS FOR IMPROVEMENT OF PUBLICATION:

FROM: NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
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DATE _____

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