TELNET LOGGER/SERVER For Host LL-67

The attached writeup documents the TELNET LOGGER/SERVER for the
CP/CMS system on the Lincoln Laboratory 360>67 (host 10). The
facility serves both half duplex and full duplex TELNET users with
data in either ASCII or EBCDIC codes.

Use of the hide-your-input and noecho TELNET controls are used for
the EBCDIC print suppress (bypass) and print restore features during
the login procedure. To support half duplex terminals, the TELNET
control break (reverse break) is sent as an input prompt when input
is desired. This code can also be used to indicate that a previous
line sent without an end of line sequence (CR-LF) should be printed.

                      Operation of the Lincoln Laboratory
                       CP/CMS TELNET LOGGER/SERVER

ICP Connection

   The TELNET LOGGER/SERVER follows the ICP protocol for making a pair
   of connections. The LOGGER is initially enabled for a connection on
   socket X'00000001'. When an RFC is received for this socket a pair
   of sockets will be chosen for the TELNET connections. If the maximum
   number of TELNET users which can be served are active, the initial
   connection is refused. Currently, three TELNET users can be served.

TELNET LOGGER

   After the ICP connections have been setup, the LOGGER expects a
   TELNET data type code, a string of network ASCII characters, or a
   null line (just CR-LF) to indicate whether its operation should be in
   ASCII or in EBCDIC character codes. ASCII is assumed unless the
   first byte received is the TELNET EBCDIC data type code (X'A2). When
   something has been received, the message:

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   will be transmitted by the LOGGER. For example, if ASCII operation
   is desired a null line (just CR-LF) transmitted on the send socket
   will cause the welcoming message to be sent in ASCII. The CP login
   procedure can then begin. If communications is desired to be carried
   on with EBCDIC character codes, the first byte transmitted should be
   the TELNET data type code for EBCDIC (X'A2'). Thereafter all
   communications will be in the code originally used.

   The CP login procedure expects the user to enter:

                             LOGIN userid

   where the userid specifies the desired virtual machine. CP then
   replies with:

                           ENTER PASSWORD:

   followed by the EBCDIC code for bypass (x'24') which is mapped into
   the TELNET code hide-your-input.

   The user should then enter a password. Passwords entered from the
   network may be different from those entered from a local terminal.
   The LOGGER maps network passwords into a corresponding CP password.
   Thus, access to an account can only be made from the network if a
   network password, together with a CP password and userid, is entered

into a file which is read by the LOGGER. If a userid entered from
the network is not in the LOGGER FILE (or if the network password
does not match the one included in the file for the specified userid)
the LOGGER passes an invalid userid (or password) to CP. The CP
response for an invalid userid or password is then sent to the
network user.

After a password is received by CP, CP transmits the EBCDIC code for
restore (X'14') which is mapped into the TELNET control noecho.

TELNET SERVER

Since the CP/CMS system operates with EBCDIC codes, ASCII codes must
be translated into EBCDIC before being sent to a virtual machine.
Figure 1 gives the ASCII codes and their EBCDIC mapping. When the
ASCII sequence CR-LF is received, it is mapped into the EBCDIC code
NL. Whenever the TELNET control NOP is included in an input string,
it is mapped into an EBCDIC idle (X'17') and then removed from the
string. Thus, if TELNET NOP codes are included between a CR and LF,
they are removed before the CR-LF is mapped into the EBCDIC NL.

The TELNET control hide-your-input is mapped into the EBCDIC code for
bypass (X'24') and the TELNET control echo is mapped into the EBCDIC
control for restore (X'14'). If the TELNET control echo is received,
the SERVER should send the control noecho but this feature has not
yet been implemented. Instead, the TELNET control echo is mapped
into the EBCDIC code X'23'. If the TELNET break is received, it is
interpreted as an attention signal and the appropriate action is
taken by CP or CMS.

CP/CMS is a line at a time system and expects all input to consist of
lines ending with a NL code. Characters received are buffered until
the newline code is received.

Since CP/CMS is also a half duplex system, characters are only
examined when the system is expecting input. If the system is not
expecting input, a network interrupt is required to cause the SERVER
to process received characters. On receipt of a network interrupt,
characters received before the TELNET data mark is received are
examined and discarded, except that if a TELNET break code is found,
the appropriate CP/CMS interrupt action is stimulated.

On output, EBCDIC codes are mapped into network ASCII if a mapping
exists; otherwise, the codes are mapped into the TELNET control NOP.
A NL code is mapped into CR-LF. The EBCDIC code for bypass maps into
the TELNET control hide-your-input and the EBCDIC code for restore
maps into the TELNET control noecho. Also, the code X'23' maps into
the TELNET control echo and the code X'38' maps into the TELNET

control break.

Since CP/CMS is a line at a time, half duplex system the TELNET
control break is transmitted as an end of message signal and also as
an input prompt code. If characters were output without a NL, the
break, as an end of message code, indicates to the user TELNET
operating on a line at a time mode that the characters previously
transmitted should be printed without waiting for the end of line
sequence. If the user TELNET is also operating in a half duplex
mode, the break as an input prompt indicates that the system is ready
for input.

If input had been anticipated and sent by a full duplex user TELNET,
the TELNET SERVER will have that input available for immediate
processing. Thus, in the case of a full duplex user TELNET the break
as a prompt should be ignored.

Though CP/CMS operates in a half duplex mode, it supports half duplex
terminals with the reverse break feature allowing the system to abort
an input mode in order to transmit a priority output message. In
this situation, the TELNET SERVER transmits a TELNET SYNC. A half
duplex user TELNET should interpret this by aborting the input mode,
i.e., revoking a previous TELNET break which was interpreted as an
input prompt.

No codes in the output character stream can cause the TELNET data
mark to be transmitted.

LOGOUT

When a user logs out from his virtual machine, CP passes the
equivalent of a line disconnect to the LOGGER. The LOGGER then
closes the TELNET send and receive sockets.

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
0	0	(00)	NUL	(00)	00
1	1	(01)	SOH	(01)	01
2	2	(02)	STX	(02)	02
3	3	(03)	ETX	(03)	03
4	4	(04)	EOT	(37)	55
5	5	(05)	ENQ	(2D)	45
6	6	(06)	ACK	(2E)	46
7	7	(07)	BEL	(2F)	47
8	10	(08)	BS	(16)	22
9	11	(09)	HT	(05)	05
10	12	(0A)	LF	(25)	37
11	13	(0B)	VT	(0B)	11
12	14	(0C)	FF	(0C)	12
13	15	(0D)	CR	(0D)	13
14	16	(0E)	SO	(0E)	14
15	17	(0F)	SI	(0F)	15
16	20	(10)	DLE	(10)	16
17	21	(11)	DC1	(11)	17
18	22	(12)	DC2	(12)	18
19	23	(13)	DC3	(13)	19
20	24	(14)	DC4	(3C)	60
21	25	(15)	NAK	(3D)	61
22	26	(16)	SYN	(32)	50
23	27	(17)	ETB	(26)	38
24	30	(18)	CAN	(18)	24
25	31	(19)	EM	(19)	25
26	32	(1A)	SUB	(3F)	63
27	33	(1B)	CTL	(27)	39
28	34	(1C)	FS	(1C)	28
29	35	(1D)	GS	(1D)	29
30	36	(1E)	RS	(1E)	30
31	37	(1F)	US	(1F)	31

ASCII/EBCDIC Code Mappings
FIGURE 1

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
32	40	(20)	SP	(40)	64
33	41	(21)	!	(5A)	90
34	42	(22)	"	(7F)	127
35	43	(23)	#	(7B)	123
36	44	(24)	$	(5B)	91
37	45	(25)	%	(6C)	108
38	46	(26)	&	(50)	80
39	47	(27)	'	(7D)	124
40	50	(28)	(	(4D)	77
41	51	(29)	)	(5D)	93
42	52	(2A)	*	(5C)	92
43	53	(2B)	+	(4E)	78
44	54	(2C)	,	(6D)	109
45	55	(2D)	–	(60)	96
46	56	(2E)	.	(4B)	75
47	57	(2F)	/	(61)	97
48	60	(30)	0	(F0)	240
49	61	(31)	1	(F1)	241
50	62	(32)	2	(F2)	242
51	63	(33)	3	(F3)	243
52	64	(34)	4	(F4)	244
53	65	(35)	5	(F5)	245
54	66	(36)	6	(F6)	246
55	67	(37)	7	(F7)	247
56	70	(38)	8	(F8)	248
57	71	(39)	9	(F9)	249
58	72	(3A)	:	(7A)	122
59	73	(3B)	;	(5E)	94
60	74	(3C)	<	(4C)	76
61	75	(3D)	=	(7E)	126
62	76	(3E)	>	(6E)	110
63	77	(3F)	?	(6F)	111

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC	
64	100	(40)	@	(7C)	124	
65	101	(41)	A	(C1)	193	
66	102	(42)	B	(C2)	194	
67	103	(43)	C	(C3)	195	
68	104	(44)	D	(C4)	196	
69	105	(45)	E	(C5)	197	
70	106	(46)	F	(C6)	198	
71	107	(47)	G	(C7)	199	
72	110	(48)	H	(C8)	200	
73	111	(49)	I	(C9)	201	
74	112	(4A)	J	(D1)	209	
75	113	(4B)	K	(D2)	210	
76	114	(4C)	L	(D3)	211	
77	115	(4D)	M	(D4)	212	
78	116	(4E)	N	(D5)	213	
79	117	(4F)	O	(D6)	214	
80	120	(50)	P	(D7)	215	
81	121	(51)	Q	(D8)	216	
82	122	(52)	R	(D9)	217	
83	123	(53)	S	(E2)	226	
84	124	(54)	T	(E3)	227	
85	125	(55)	U	(E4)	228	
86	126	(56)	V	(E5)	229	
87	127	(57)	W	(E6)	230	
88	130	(58)	X	(E7)	231	
89	131	(59)	Y	(E8)	232	
90	132	(5A)	Z	(E9)	233	
91	133	(5B)	[	(AD)	173	
92	134	(5C)	<cent>	(4A)	74	(BACK-SLASH)
93	135	(5D)	]	(BD)	189	
94	136	(5E)	^	(71)	113	(CARAT)
95	137	(5F)	_	(6D)	109	

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII	ASCII	ASCII	SYMBOLS	EBCDIC	EBCDIC	
DEC	OCT	HEX		HEX	DEC	
96	140	(60)	`	(79)	121	(GRAVE)
97	141	(61)	a	(81)	129	
98	142	(62)	b	(82)	130	
99	143	(63)	c	(83)	131	
100	144	(64)	d	(84)	132	
101	145	(65)	e	(85)	133	
102	146	(66)	f	(86)	134	
103	147	(67)	g	(87)	135	
104	150	(68)	h	(88)	136	
105	151	(69)	i	(89)	137	
106	152	(6A)	j	(91)	145	
107	153	(6B)	k	(92)	146	
108	154	(6C)	l	(93)	147	
109	155	(6D)	m	(94)	148	
110	156	(6E)	n	(95)	149	
111	157	(6F)	o	(96)	150	
112	160	(70)	p	(97)	151	
113	161	(71)	q	(98)	152	
114	162	(72)	r	(99)	153	
115	163	(73)	s	(A2)	162	
116	164	(74)	t	(A3)	163	
117	165	(75)	u	(A4)	164	
118	166	(76)	v	(A5)	165	
119	167	(77)	w	(A6)	166	
120	170	(78)	x	(A7)	167	
121	171	(79)	y	(A8)	168	
122	172	(7A)	z	(A9)	169	
123	173	(7B)	{	(8B)	139	
124	174	(7C)	|	(4F)	79	(BAR/OR)
125	175	(7D)	}	(9B)	155	
126	176	(7E)	<bent bar>	(5F)	95	(TILDE/NOT)
127	177	(7F)	DEL	(07)	7	

ASCII	ASCII	ASCII	TELNET	EBCDIC	EBCDIC	
DEC	OCT	HEX	CONTROLS	HEX	DEC	
128	100	(80)	DATA-MARK	(80)	128	
129	101	(81)	BREAK	(38)	56	
130	102	(82)	NOP	(17)	23	IDLE
131	103	(83)	NOECHO	(14)	20	RESTORE
132	104	(84)	ECHO	(23)	35	
133	105	(85)	HIDE-YOUR INPUT	(24)	36	BYPASS

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

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