A 6502 Disassembler from Apple

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DESCRIPTION

This subroutine package is used to display single or sequential 6502 instructions in mnemonic form. The subroutines are tailored to disassemblers and debugging aids, but tables with more general usage (assemblers) are included. The subroutines occupy one page (256 bytes) and tables most of another. Seven page zero locations are used.

FEATURES

Four output fields are generated for each disassembled instruction: 1) Address of instruction, in hexadecimal (hex); 2) Hex code listing of instruction, 1 to 3 bytes; 3) 3-character mnemonic, or "???" for invalid ops (which assume a length of 1 byte); and 4) Address field, in one of the following formats.

Format	Address Mode
(empty)	Invalid, Implied, Accumulator
$12	Page zero
$1234	Absolute, Branch (*target* printed)
#$12	Immediate
$12,X	Zero page, indexed by X
$12,Y	Zero page, indexed by Y
$1234,X	Absolute, indexed by X
$1234,Y	Absolute, indexed by Y
($1234)	Indirect
($12,X)	Indexed Indirect
($12),Y	Indirect Indexed

Note that unlike MOS TECHNOLOGY assemblers, which use "A" for accumulator addressing, the APPLE disassembler outputs an empty field to avoid confusion and facilitate byte counting.

USAGE

The following subroutine entries are useful.

DSMBL	Disassembles and displays 20 sequential instructions beginning at the address specified by the page zero variables PCL and PCH. For example, if called with $D2 in PCL and $38 in PCH, 20 instructions beginning at address $38D2 will be disassembled. PCL and PCH are updated to contain the address of the last disassembled instruction. Must be called with 6502 in hexadecimal mode ('D' status bit clear). All processor registers are altered (except S–stack pointer). Uses INSTDSP and PCADJ.
INSTDSP	Disassembles and displays a single instruction whose address is specified by PCL and PCH. Must be called in hexadecimal mode. All processor registers (except S) are altered. Uses PCADJ3, PRPC, PRBLNK, PRBL2, PRNTAX, PRBYTE, and CHAROUT.
PRPC	Outputs a carriage return, 4 hex digits corresponding to PCH and PCL, a dash, and 3 blanks. Alters A, clears X. Uses PRNTAX and CHAROUT.
PRNTX	Outputs the contents of X as two hex digits. Alters A. Uses CHAROUT.
PRNTAX	Outputs two hex digits for the contents of A, then two hex digits for the contents of X. A is altered. Uses CHAROUT.
PRNTYX	Same as PRNTAX except that Y and X are output. Alters A. Uses CHAROUT.
PRBLNK	Outputs 3 blanks. Alters A, clears X. Uses CHAROUT.
PRBL2	Outputs the number of blanks specified by the contents of X (0 for 256 blanks). Alters A, clears X. Uses CHAROUT.
PRBL3	Outputs a character from the A register followed by X-1 blanks. In other words, X specifies the total number of characters output. (0 for 256 blanks). Alters A, clears X. Uses CHAROUT.
PCADJ	(PCL,PCH) + 1 + (contents of page zero variable LENGTH) →Y & A (low order byte in Y). For example, if PCL = $D2, PCH = $38, and LENGTH = 1 (corresponding to a 2 byte instruction), PCADJ will leave Y = $D4 and A = $38. X is always loaded with PCH.
PCADJ2	Same as PCADJ except that A is used in place of LENGTH.
PCADJ3	Same as PCADJ2 except that the increment (+1) is specified by the carry (set = +1, clear = +0).

RUNNING AS A PROGRAM

The following program will run a disassembly.

Supplied on APPLE-1 cassette tapes.

```
9F0  200  8     JSR DSMBL
9F3  4C1FFF     JMP MONITOR
```

First, put the starting address of code you want disassembled in PCL (low order byte) and PCH (high order byte). Then type 9F0 R **CR** (on APPLE-1 system). 20 instructions will be disassembled. Hitting R **CR** again will give the next 20, etc.

Cassette tapes supplied for the ACI-1 (APPLE Cassette Interface) are intended to be loaded from $800 to $9FF.

NON-APPLE SYSTEMS

Source and object code supplied occupies pages 8 and 9. All code is on page 8, tables are on page 9. These tables may be relocated at will: MODE, MODE2, CHAR1, ChAR2, MNEML, and MNEMR. The code may also be relocated. Be careful if you use pages 0 or 1. Page 1 is the subroutine return stack and page 0 must contain 7 variables (to use DSMBL). These may be relocated on page 0 but PCL must always immediately precede PCH for (Z-page), Y addressing.

locations used by supplied code

```
$40  FORMAT   Used
$41  LENGTH  } by
$42  LMNEM   } INSTDSP,
$43  RMNEM     DSMBL
$44  PCL     } Used by PCADJ,
$45  PCH     } INSTDSP, DSMBL
$46  COUNT   } Used by DSMBL only
```

MODIFICATIONS

a) To change '#' to '=' for immediate mode change location $955 (on code enclosed) from a $A3 to a $BD.

b) To skip the '$' (meaning hex) preceding disassembled values make the following changes:

946: 01 (was 81)
947: 02 (was 82)
94C: 11 (was 91)
94D: 12 (was 92)
94E: 06 (was 86)
950: 05 (was 85)
951: 1D (was 9D)
95B: 00 (was A4)
95C: 00 (was A4)

c) To have address field of accumulator-addressed instructions print as 'A'.

1) Must skip $ preceding disassembled values by making modification b) above.

2) Change the following locations:

949: 80 (was 00)
957: C1 (was A4)

d) To add ROR and addressing modes, change the following locations:

991: 9C (was 00)
9D1: 26 (was 00)
919: 02 (was 00)
91A: 45 (was 40)
91B: B3 (was B0)
91D: 08 (was 00)
91F: 09 (was 00)

```
ASM65 ASSEMBLER

REV 1.4    8/11/76

                     XREF
              FORMAT EQU     $40
              LENGTH EQU     $41
              LMNEM  EQU     $42
              RMNEM  EQU     $43
              PCL    EQU     $44
              PCH    EQU     $45
              COUNT  EQU     $46
              PRBYTE EQU     $FFDC
              CHAROU EQU     $FFEF
                     ORG     $800
0800 A9 13    DSMBL  LDA     #$13          COUNT FOR 20 INSTR DSMBLY.
0802 85 46           STA     COUNT
0804 20 12 08 DSMBL2 JSR     INSTDSP       DISASSEMBLE AND DISPLAY INSTR.
0807 20 EF 08        JSR     PCADJ
080A 85 44           STA     PCL           UPDATE PCL,H TO NEXT INSTR.
080C 84 45           STY     PCH
080E C6 46           DEC     COUNT         DONE FIRST 19 INSTRS.?
0810 D0 F2           BNE     DSMBL2        * YES, LOOP.  ELSE DSMBL 20TH.
0812 20 D3 08 INSTDS JSR     PRPC          PRINT PCL,H.
0815 A1 44           LDA     (PCL,X)       GET OP CODE.
0817 A8              TAY
0818 4A              LSR     A             * EVEN/ODD TEST.
0819 90 0B           BCC     IEVEN
081B 4A              LSR     A             *  TEST B1.
081C B0 17           BCS     ERR           *  XXXXXX11 INSTR INVALID.
081E C9 22           CMP     #$22
0820 F0 13           BEQ     ERR           *  10001001 INSTR INVALID.
0822 29 07           AND     #$7           MASK 3 BITS FOR ADDRESS MODE &
0824 09 80           ORA     #$80          *  ADD INDEXING OFFSET.
0826 4A       IEVEN  LSR     A             * LSB INTO CARRY FOR
0827 AA              TAX                   * LEFT/RIGHT TEST BELOW.
0828 BD FC 08        LDA     MODE,X        INDEX INTO ADDRESS MODE TABL.
082B B0 04           BCS     RTMODE        IF CARRY SET USE LSD FOR
082D 4A              LSR     A             * PRINT FORMAT INDEX.
082E 4A              LSR     A
082F 4A              LSR     A             * IF CARRY CLEAR USE MSD.
0830 4A              LSR     A
0831 29 0F    RTMODE AND     #$F           MASK FOR 4-BIT INDEX.
0833 D0 04           BNE     GETFMT        $0 FOR INVALID OPCODES.
0835 A0 80    ERR    LDY     #$80          SUBSTITUTE $80 FOR INVALID OP,
0837 A9 00           LDA     #$0           SET PRINT FORMAT INDEX TO 0.
0839 AA       GETFMT TAX
083A BD 40 09        LDA     MODE2,X       INDEX INTO PRINT FORMAT TABLE.
083D 85 40           STA     FORMAT        SAVE FOR ADDRESS FIELD FORMAT.
083F 29 03           AND     #$3           MASK 2-BIT LENGTH.  0=1-BYTE,
0841 85 41           STA     LENGTH        *  1=2-BYTE, 2=3-BYTE.
0843 98              TYA                   * OP CODE.
0844 29 8F           AND     #$8F          MASK IT FOR 1XXX1010 TEST.
0846 AA              TAX                   * SAVE IT.
0847 98              TYA                   * OP CODE TO A AGAIN.
0848 A0 03           LDY     #$3
084A E0 8A           CPX     #$8A
084C F0 0B           BEQ     MNNDX3
084E 4A       MNNDX1 LSR     A
084F 90 08           BCC     MNNDX3        FORM INDEX INTO MNEMONIC TABL
0851 4A              LSR     A
0852 4A       MNNDX2 LSR     A             * 1XXX1010 -> 00101XXX
0853 09 20           ORA     #$20          * XXXYYY01 -> 00111XXX
0855 88              DEY                   * XXXYYY10 -> 00110XXX
0856 D0 FA           BNE     MNNDX2        * XXXYY100 -> 00100XXX
0858 C8              INY                   * XXXXX000 -> 000XXXXX
0859 88       MNNDX3 DEY
085A D0 F2           BNE     MNNDX1
085C 48              PHA                   * SAVE MNEMONIC TABLE INDEX.
085D B1 44    PROP   LDA     (PCL),Y
085F 20 DC FF        JSR     PRBYTE
0862 A2 01           LDX     #$1
0864 20 E6 08 PROPBL JSR     PRBL2
0867 C4 41           CPY     LENGTH        PRINT INSTR (1 TO 3 BYTES)
0869 C8              INY                   *  IN A 12-CHARACTER FIELD.
086A 90 F1           BCC     PROP
086C A2 03           LDX     #$3           CHAR COUNT FOR MNEMONIC PRINT.
086E C0 04           CPY     #$4
0870 90 F2           BCC     PROPBL
0872 68              PLA                   * RECOVER MNEMONIC INDEX.
0873 A8              TAY
0874 B9 5C 09        LDA     MNEML,Y
0877 85 42           STA     LMNEM         FETCH 3-CHAR MNEMONIC.
0879 B9 9C 09        LDA     MNEMR,Y       *  (PACKED IN 2 BYTES)
087C 85 43           STA     RMNEM
087E A9 00    PRMN1  LDA     #$0
0880 A0 05           LDY     #$5
0882 06 43    PRMN2  ASL     RMNEM
0884 26 42           ROL     LMNEM         SHIFT 5 BITS OF CHAR INTO A.
0886 2A              ROL     A             *   (CLEARS CARRY)
0887 88              DEY
0888 D0 F8           BNE     PRMN2
088A 69 BF           ADC     #$BF          ADD '?' OFFSET.
088C 20 EF FF        JSR     CHAROUT       OUTPUT A CHARACTER OF MNEMONIC
088F CA              DEX
0890 D0 EC           BNE     PRMN1
0892 20 E4 08        JSR     PRBLNK        OUTPUT 3 BLANKS.
0895 A2 06           LDX     #$6           COUNT FOR 6 PRINT FORMAT BITS.
0897 E0 03    PRADR1 CPX     #$3
0899 D0 12           BNE     PRADR3        IF X=3 THEN PRINT ADDRESS VAL.
089B A4 41           LDY     LENGTH
089D F0 0E           BEQ     PRADR3        NO PRINT IF LENGTH=0.
089F A5 40    PRADR2 LDA     FORMAT
08A1 C9 E8           CMP     #$E8          HANDLE REL ADDRESSING MODE
08A3 B1 44           LDA     (PCL),Y       SPECIAL (PRINT TARGET ADR)
08A5 B0 1C           BCS     RELADR        *   (NOT DISPLACEMENT)
08A7 20 DC FF        JSR     PRBYTE        OUTPUT 1- OR 2-BYTE ADDRESS.
08AA 88              DEY                   *  MORE SIGNIFICANT BYTE FIRST
08AB D0 F2           BNE     PRADR2
08AD 06 40    PRADR3 ASL     FORMAT        TEST NEXT PRINT FORMAT BIT.
08AF 90 0E           BCC     PRADR4        IF 0, DON'T PRINT
08B1 BD 4F 09        LDA     CHAR1-1,X     *  CORRESPONDING CHARS.
08B4 20 CF FF        JSR     CHAROUT       OUTPUT 1 OR 2 CHARS.
08B7 BD 55 09        LDA     CHAR2-1,X     *  (IF CHAR FROM CHAR2 IS 0,
08BA F0 03           BEQ     PRADR4        *     DON'T OUTPUT IT)
08BC 20 EF FF        JSR     CHAROUT
08BF CA       PRADR4 DEX
08C0 D0 D5           BNE     PRADR1
08C2 60              RTS                   *RETURN IF DONE 6 FORMAT BITS.
08C3 20 F2 08 RELADR JSR     PCADJ3        PCL,H + DISPL + 1 TO A,Y.
08C6 AA              TAX
08C7 E8              INX
08C8 D0 01           BNE     PRNTYX        *    +1 TO X,Y.
08CA C8              INY
08CB 98       PRNTYX TYA
08CC 20 DC FF PRNTAX JSR     PRBYTE        PRINT TARGET ADR OF BRANCH
08CF 8A       PRNTX  TXA                   *  AND RETURN
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```
08D0 4C DC FF           JMP    PRBYTE
08D3 A9 8D      PRPC    LDA    #$8D
08D5 20 EF FF           JSR    CHAROUT         OUTPUT CARRIAGE RETURN.
08D8 A5 45              LDA    PCH
08DA A6 44              LDX    PCL
08DC 20 CC 08           JSR    PRNTAX          OUTPUT PCH AND PCL.
08DF A9 AD              LDA    #$AD
08E1 20 EF FF           JSR    CHAROUT         OUTPUT '-'
08E4 A2 03      PRBLNK  LDX    #$3             BLANK COUNT.
08E6 A9 A0      PRBL2   LDA    #$A0
08E8 20 EF FF   PRBL3   JSR    CHAROUT         OUTPUT A BLANK.
08EB CA                 DEX
08EC D0 F8              BNE    PRBL2           LOOP UNTIL COUNT = 0.
08EE 60                 RTS
08EF A5 41      PCADJ   LDA    LENGTH          0=1-BYTE, 1=2-BYTE, 2=3-BYTE.
08F1 38         PCADJ2  SEC
08F2 A4 45      PCADJ3  LDY    PCH
08F4 AA                 TAX                    * TEST DISPL SIGN (FOR REL
08F5 10 01              BPL    PCADJ4          *   BRANCH).  EXTEND NEG
08F7 88                 DEY                    *   BY DECREMENTING PCH.
08F8 65 44      PCADJ4  ADC    PCL
08FA 90 01              BCC    RTS1            PCL+LENGTH (OR DISPL) +1 TO A.
08FC C8                 INY                    *  CARRY INTO Y (PCH)
08FD 60         RTS1    RTS
08FE 40         MODE    DFB    $40
08FF 02                 DFB    $2
0900 45                 DFB    $45
0901 03                 DFB    $3
0902 D0                 DFB    $D0
0903 08                 DFB    $8
0904 40                 DFB    $40
0905 09                 DFB    $9
0906 30                 DFB    $30             XXXXXXZ0 INSTRS.
0907 22                 DFB    $22
0908 45                 DFB    $45             *  Z=0, LEFT HALF-BYTE
0909 33                 DFB    $33             *  Z=1, RIGHT HALF-BYTE
090A D0                 DFB    $D0
090B 08                 DFB    $8
090C 40                 DFB    $40
090D 09                 DFB    $9
090E 40                 DFB    $40
090F 02                 DFB    $2
0910 45                 DFB    $45
0911 33                 DFB    $33
0912 D0                 DFB    $D0
0913 08                 DFB    $8
0914 40                 DFB    $40
0915 09                 DFB    $9
0916 40                 DFB    $40
0917 00                 DFB    $0
0918 40                 DFB    $40
0919 B0                 DFB    $B0
091A D0                 DFB    $D0
091B 00                 DFB    $0
091C 40                 DFB    $40
091D 00                 DFB    $0
091E 00                 DFB    $0
091F 22                 DFB    $22
0920 44                 DFB    $44
0921 33                 DFB    $33
0922 D0                 DFB    $D0
0923 8C                 DFB    $8C
0924 44                 DFB    $44
0925 00                 DFB    $0
0926 11                 DFB    $11
0927 22                 DFB    $22
0928 44                 DFB    $44
0929 33                 DFB    $33
092A D0                 DFB    $D0
092B 8C                 DFB    $8C
092C 44                 DFB    $44
092D 9A                 DFB    $9A
092E 10                 DFB    $10
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092F 22                 DFB    $22
0930 44                 DFB    $44
0931 33                 DFB    $33
0932 D0                 DFB    $D0
0933 08                 DFB    $8
0934 40                 DFB    $40
0935 09                 DFB    $9
0936 10                 DFB    $10
0937 22                 DFB    $22
0938 44                 DFB    $44
0939 33                 DFB    $33
093A D0                 DFB    $D0
093B 08                 DFB    $8
093C 40                 DFB    $40
093D 09                 DFB    $9
093E 62                 DFB    $62
093F 13                 DFB    $13             YYXXXZ01 INSTRS.
0940 78                 DFB    $78
0941 A9                 DFB    $A9
0942 00         MODE2   DFB    $0              ERR
0943 21                 DFB    $21             IMM
0944 81                 DFB    $81             Z-PAG
0945 82                 DFB    $82             ABS
0946 00                 DFB    $0              IMPL
0947 00                 DFB    $0              ACC
0948 59                 DFB    $59             (Z-PAG,X)
0949 4D                 DFB    $4D             (Z-PAG),Y
094A 91                 DFB    $91             Z-PAG,X
094B 92                 DFB    $92             ABS,X
094C 86                 DFB    $86             ABS,Y
094D 4A                 DFB    $4A             (ABS)
094E 85                 DFB    $85             Z-PAG,Y
094F 9D                 DFB    $9D             REL
0950 AC         CHAR1   DFB    $AC             ','
0951 A9                 DFB    $A9             ')'
0952 AC                 DFB    $AC             ','
0953 A3                 DFB    $A3             '#'
0954 A8                 DFB    $A8             '('
0955 A4                 DFB    $A4             '$'
0956 D9         CHAR2   DFB    $D9             'Y'
0957 00                 DFB    $0
0958 D8                 DFB    $D8             'X'
0959 A4                 DFB    $A4             '$'
095A A4                 DFB    $A4             '$'
095B 00                 DFB    $0
095C 1C         MNEML   DFB    $1C             XXXXX000 INSTRS.
095D 8A                 DFB    $8A
095E 1C                 DFB    $1C
095F 23                 DFB    $23
0960 5D                 DFB    $5D
0961 8B                 DFB    $8B
0962 1B                 DFB    $1B
0963 A1                 DFB    $A1
0964 9D                 DFB    $9D
0965 8A                 DFB    $8A
0966 1D                 DFB    $1D
0967 23                 DFB    $23
0968 9D                 DFB    $9D
0969 8B                 DFB    $8B
096A 1D                 DFB    $1D
096B A1                 DFB    $A1
096C 00                 DFB    $0
096D 29                 DFB    $29
096E 19                 DFB    $19
096F AE                 DFB    $AE
0970 69                 DFB    $69
0971 A8                 DFB    $A8
0972 19                 DFB    $19
0973 23                 DFB    $23
0974 24                 DFB    $24
0975 53                 DFB    $53
0976 1B                 DFB    $1B
0977 23                 DFB    $23
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0978 24            DFB   $24
0979 53            DFB   $53
097A 19            DFB   $19
097B A1            DFB   $A1        XXXYY100 INSTRS.
097C 00            DFB   $0
097D 1A            DFB   $1A
097E 5B            DFB   $5B
097F 5B            DFB   $5B
0980 A5            DFB   $A5
0981 69            DFB   $69
0982 24            DFB   $24
0983 24            DFB   $24
0984 AE            DFB   $AE        1XXX1010 INSTRS.
0985 AE            DFB   $AE
0986 A8            DFB   $A8
0987 AD            DFB   $AD
0988 29            DFB   $29
0989 00            DFB   $0
098A 7C            DFB   $7C
098B 00            DFB   $0
098C 15            DFB   $15        XXXYYY10 INSTRS.
098D 9C            DFB   $9C
098E 6D            DFB   $6D
098F 00            DFB   $0
0990 A5            DFB   $A5
0991 69            DFB   $69
0992 29            DFB   $29
0993 53            DFB   $53        XXXYYY01 INSTRS.
0994 84            DFB   $84
0995 13            DFB   $13
0996 34            DFB   $34
0997 11            DFB   $11
0998 A5            DFB   $A5
0999 69            DFB   $69
099A 23            DFB   $23
099B A0            DFB   $A0
099C D8     MNEMR  DFB   $D8        XXXXX000 INSTRS
099D 62            DFB   $62
099E 5A            DFB   $5A
099F 48            DFB   $48
09A0 26            DFB   $26
09A1 62            DFB   $62
09A2 94            DFB   $94
09A3 88            DFB   $88
09A4 54            DFB   $54
09A5 44            DFB   $44
09A6 C8            DFB   $C8
09A7 54            DFB   $54
09A8 68            DFB   $68
09A9 44            DFB   $44
09AA E8            DFB   $E8
09AB 94            DFB   $94
09AC 00            DFB   $0
09AD B4            DFB   $B4
09AE 08            DFB   $8
09AF 84            DFB   $84
09B0 74            DFB   $74
09B1 B4            DFB   $B4
09B2 28            DFB   $28
09B3 6E            DFB   $6E
09B4 74            DFB   $74
09B5 F4            DFB   $F4
09B6 CC            DFB   $CC
09B7 4A            DFB   $4A
09B8 72            DFB   $72
09B9 F2            DFB   $F2
09BA A4            DFB   $A4
09BB 8A            DFB   $8A        XXXYY100 INSTRS
09BC 00            DFB   $0
09BD AA            DFB   $AA
09BE A2            DFB   $A2
09BF A2            DFB   $A2
09C0 74            DFB   $74
09C1 74            DFB   $74
09C2 74            DFB   $74
09C3 72            DFB   $72
09C4 44            DFB   $44        1XXX1010 INSTRS.
09C5 68            DFB   $68
09C6 B2            DFB   $B2
09C7 32            DFB   $32
09C8 B2            DFB   $B2
09C9 00            DFB   $0
09CA 22            DFB   $22
09CB 00            DFB   $0
09CC 1A            DFB   $1A        XXXYYY10 INSTRS.
09CD 1A            DFB   $1A
09CE 26            DFB   $26
09CF 00            DFB   $0
09D0 72            DFB   $72
09D1 72            DFB   $72
09D2 88            DFB   $88
09D3 C8            DFB   $C8
09D4 C4            DFB   $C4        XXXYYY01 INSTRS.
09D5 CA            DFB   $CA
09D6 26            DFB   $26
09D7 48            DFB   $43
09D8 44            DFB   $44
09D9 44            DFB   $44
09DA A2            DFB   $A2
09DB C8            DFB   $C8
                   END
CROSS REFERENCE TABLE       46 SYMBOLS  DEFINED
CHAR1    0950   0230   0108
CHAR2    0956   0236   0110
CHAROU   FDED   0010   0090   0109   0112   0126   0131   0134
COUNT    0046   0008   0013   0018
DSMBL    0800   0012
DSMBL2   0804   0014   0019
ERR      0835   0041   0026   0028
FORMAT   0040   0002   0045   0099   0106
GETFMT   0839   0043   0040
IEVEN    0826   0031   0024
INSTDS   0812   0020   0014
LENGTH   0041   0003   0047   0070   0097   0138
LMNEM    0042   0004   0079   0085
MNEML    0950   0242   0078
MNEMR    099C   0306   0080
MNNDX1   084E   0055   0064
MNNDX2   0852   0058   0061
MNNDX3   0859   0063   0054   0056
MODE     00FE   0148   0033
MODE2    0942   0216   0044
PCADJ    08EF   0138   0015
PCADJ2   08F1   0139
PCADJ3   08F2   0140   0116
PCADJ4   08F8   0144   0142
PCH      0045   0007   0017   0127   0140
PCL      0044   0006   0016   0128   0144   0021   0066   0101
PRADR1   0897   0095   0114
PRADR2   089F   0099   0105
PRADR3   08AD   0106   0096   0098
PRADR4   08AF   0113   0107   0111
PRBL2    08E6   0133   0069   0136
PRBL3    08E8   0134
PRBLNK   08F4   0132   0093
PRBYTE   FDDC   0009   0067   0103   0122   0124
PRMN1    087E   0082   0092
PRMN2    0882   0084   0088
PRNTAX   08CC   0122   0129
PRNTX    08CF   0123
PRNTYX   08CB   0121   0119
PROP     085D   0066   0072
PROPBL   0864   0069   0075
PRPC     08D3   0125   0020
RELADR   08C3   0116   0102
RMNEM    0043   0005   0081   0084
RTMODE   0831   0039   0034
RTS1     08FD   0147   0145
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