

XMODEM

This is a simple file transfer program to allow transfers between the Microtan and a console device utilizing the X-modem/CRC transfer protocol.

The source code for generating this program is provided on subsequent pages. The following notes apply:

The program comprises four elements:

- CRC Table generation program
- Main user program
- CRC Table Low
- CRC Table High

The first 4 lines of the source code are the location addresses for the 4 elements of this program, CRCTAB, START, CRCLO, CRCHI respectively.

The two CRC tables are best located at the top end of user RAM. Table CRCHI must immediately follow table CRCLO and their start addresses such that:

CRCL0 = \$n00

CRCHI = \$(n+1)00

To minimise the size of the final program, the Main User program should be placed immediately before the CRC tables.

Once the assembled code has been generated, the CRC Table generation program should be executed. This will populate the 2 tables commencing at CRCLO and CRCHI. Thereafter the Table generation program is no longer required.

The assembled code between START and the end of the CRCHI table becomes the final user program.

10		CRCTAB	=	\$A290		
20		START	=	\$A2D0		
30		CRCL0	=	\$A600		
40		CRCHI	=	\$A700		
50		ICHAR	=	\$0001		
60		HXPKL	=	\$0013		
70		HXPKH	=	\$0014		
80		LASTBK	=	\$0050		
90		BLKNO	=	\$0051		
100		ERRCNT	=	\$0052		
110		BFLAG	=	\$0053		
120		CRCL	=	\$0054		
130		CRCH	=	\$0055		
140		PTRL	=	\$0056		
150		PTRH	=	\$0057		
160		EOFPL	=	\$0058		
170		EOFPH	=	\$0059		
180		RETRY1	=	\$005A		
190		RETRY2	=	\$005B		
200		RBUFF0	=	\$0200		
210		RBUFF1	=	\$0201		
220		RBUFF2	=	\$0202		
230		RBUFF3	=	\$0203		
240		DATA	=	\$BFD0		
250		STATUS	=	\$BFD1		
260		COMND	=	\$BFD2		
270		CONTRL	=	\$BFD3		
280		POLLKB	=	\$FDFA		
290		OUTCR	=	\$F80C		
300		OPCHR	=	\$F80E		
310		HEXPCK	=	\$F817		
320		RETMON	=	\$FC00		
330		*	=	CRCTAB		
A290	A200	340	CRCTAB:	LDX	#\$0	
A292	A900	350		LDA	#\$0	
A294	9D00A6	360	ZLOOP:	STA	CRCL0,X	
A297	9D00A7	370		STA	CRCHI,X	
A29A	E8	380		INX		
A29B	D0F7	390		BNE	ZLOOP	
A29D	A900	400		LDA	#\$0	
A29F	8A	410	FETCH:	TXA		
A2A0	5D00A7	420		EOR	CRCHI,X	
A2A3	9D00A7	430		STA	CRCHI,X	
A2A6	A008	440		LDY	#\$8	
A2A8	1E00A6	450	FETCH1:	ASL	CRCL0,X	
A2AB	3E00A7	460		ROL	CRCHI,X	
A2AE	9010	470		BCC	FETCH2	
A2B0	BD00A7	480		LDA	CRCHI,X	
A2B3	4910	490		EOR	#\$10	
A2B5	9D00A7	500		STA	CRCHI,X	
A2B8	BD00A6	510		LDA	CRCL0,X	
A2BB	4921	520		EOR	#\$21	
A2BD	9D00A6	530		STA	CRCL0,X	
A2C0	88	540	FETCH2:	DEY		
A2C1	D0E5	550		BNE	FETCH1	
A2C3	E8	560		INX		
A2C4	D0D9	570		BNE	FETCH	
A2C6	4C00FC	580		JMP	RETMON	
		590		*	=	START
A2D0	20B4A4	600		JSR	INIT	
A2D3	200BA5	610		JSR	Q1MSG	

XMOD A2	2	DATED :	AUG 2020
A2D6	58	620	CLI
A2D7	20FAFD	630	POLKB1: JSR POLLKB
A2DA	A501	640	LDA ICHAR
A2DC	C953	650	CMP #0053
A2DE	F00E	660	BEQ XMODTX
A2E0	C952	670	CMP #0052
A2E2	F007	680	BEQ JXMODR
A2E4	C91B	690	CMP #001B
A2E6	D0EF	700	BNE POLKB1
A2E8	4C00FC	710	JMP RETMON
A2EB	4CDDA3	720	JXMODR: JMP XMODRX
A2EE	200EF8	730	XMODTX: JSR OPCHR
A2F1	2022A5	740	JSR Q2MSG
A2F4	20F6A4	750	JSR GETADD
A2F7	A513	760	LDA HXPKL
A2F9	8556	770	STA PTRL
A2FB	A514	780	LDA HXPKH
A2FD	8557	790	STA PTRH
A2FF	2038A5	800	JSR Q3MSG
A302	20F6A4	810	JSR GETADD
A305	A513	820	LDA HXPKL
A307	8558	830	STA EOFPL
A309	A514	840	LDA HXPKH
A30B	8559	850	STA EOFPH
A30D	200CF8	860	JSR OUTCR
A310	204EA5	870	JSR PRMSG
A313	A900	880	LDA #0000
A315	8552	890	STA ERRCNT
A317	8550	900	STA LASTBK
A319	A901	910	LDA #0001
A31B	8551	920	STA BLKNO
A31D	A9FF	930	WAITCR: LDA #00FF
A31F	855B	940	STA RETRY2
A321	20D9A4	950	JSR GETBYT
A324	90F7	960	BCC WAITCR
A326	C943	970	CMP #0043
A328	F00A	980	BEQ SETADD
A32A	C91B	990	CMP #001B
A32C	D0EF	1000	BNE WAITCR
A32E	20CEA3	1010	JSR PRTABL
A331	4C00FC	1020	JMP RETMON
A334	A901	1030	SETADD: LDA #0001
A336	8D0002	1040	STA RBUFF0
A339	A9FE	1050	LDA #00FE
A33B	8D0102	1060	STA RBUFF1
A33E	A556	1070	LDA PTRL
A340	8D0202	1080	STA RBUFF2
A343	A557	1090	LDA PTRH
A345	8D0302	1100	STA RBUFF3
A348	A204	1110	LDX #0004
A34A	A000	1120	LDY #0000
A34C	4C66A3	1130	JMP LDBUF1
A34F	A550	1140	LDBUFF: LDA LASTBK
A351	F003	1150	BEQ LDBUF0
A353	4CD7A3	1160	JMP TDONE
A356	A202	1170	LDBUF0: LDX #0002
A358	A000	1180	LDY #0000
A35A	E651	1190	INC BLKNO
A35C	A551	1200	LDA BLKNO
A35E	8D0002	1210	STA RBUFF0
A361	49FF	1220	EOR #00FF

XMOD	A2	3	DATED :	AUG 2020
A363	8D0102	1230		STA RBUFF1
A366	B156	1240	LDBUF1:	LDA (PTRL), Y
A368	9D0002	1250		STA RBUFF0, X
A36B	38	1260		SEC
A36C	A558	1270		LDA EOFPL
A36E	E556	1280		SBC PTRL
A370	D014	1290		BNE LDBUF4
A372	A559	1300		LDA EOFPH
A374	E557	1310		SBC PTRH
A376	D00E	1320		BNE LDBUF4
A378	E650	1330		INC LASTBK
A37A	E8	1340	LDBUF3:	INX
A37B	E082	1350		CPX #\$0082
A37D	F012	1360		BEQ SCALCR
A37F	A900	1370		LDA #\$0000
A381	9D0002	1380		STA RBUFF0, X
A384	F0F4	1390		BEQ LDBUF3
A386	E656	1400	LDBUF4:	INC PTRL
A388	D002	1410		BNE LDBUF5
A38A	E657	1420		INC PTRH
A38C	E8	1430	LDBUF5:	INX
A38D	E082	1440		CPX #\$0082
A38F	D0D5	1450		BNE LDBUF1
A391	20DDA5	1460	SCALCR:	JSR CALCRC
A394	A555	1470		LDA CRCH
A396	990002	1480		STA RBUFF0, Y
A399	C8	1490		INY
A39A	A554	1500		LDA CRCL
A39C	990002	1510		STA RBUFF0, Y
A39F	A200	1520	RESEND:	LDX #\$0000
A3A1	A901	1530		LDA #\$0001
A3A3	20CCA4	1540		JSR PUTCHR
A3A6	BD0002	1550	SEENBK:	LDA RBUFF0, X
A3A9	20CCA4	1560		JSR PUTCHR
A3AC	E8	1570		INX
A3AD	E084	1580		CPX #\$0084
A3AF	D0F5	1590		BNE SEENBK
A3B1	A9FF	1600		LDA #\$00FF
A3B3	855B	1610		STA RETRY2
A3B5	20D9A4	1620		JSR GETBYT
A3B8	900C	1630		BCC SETERR
A3BA	C906	1640		CMP #\$0006
A3BC	F091	1650		BEQ LDBUFF
A3BE	C915	1660		CMP #\$0015
A3C0	F004	1670		BEQ SETERR
A3C2	C91B	1680		CMP #\$001B
A3C4	F008	1690		BEQ PRTABL
A3C6	E652	1700	SETERR:	INC ERRCNT
A3C8	A552	1710		LDA ERRCNT
A3CA	C90A	1720		CMP #\$000A
A3CC	D0D1	1730		BNE RESEND
A3CE	20ECA4	1740	PRTABL:	JSR FLUSH
A3D1	208DA5	1750		JSR PRERR
A3D4	4C00FC	1760		JMP RETMON
A3D7	20ADA5	1770	TDONE:	JSR PRGOOD
A3DA	4C00FC	1780		JMP RETMON
A3DD	200EF8	1790	XMODRX:	JSR OPCHR
A3E0	200CF8	1800		JSR OUTCR
A3E3	204EA5	1810		JSR PRMSG
A3E6	A901	1820		LDA #\$0001
A3E8	8551	1830		STA BLKNO

XMOD	A2	4	DATED :	AUG 2020
A3EA	8553	1840		STA BFLAG
A3EC	A943	1850	CRCCHK:	LDA #0043
A3EE	20CCA4	1860		JSR PUTCHR
A3F1	A9FF	1870		LDA #00FF
A3F3	855B	1880		STA RETRY2
A3F5	A900	1890		LDA #0000
A3F7	8554	1900		STA CRCL
A3F9	8555	1910		STA CRCH
A3FB	20D9A4	1920		JSR GETBYT
A3FE	B00B	1930		BCS GOTBYT
A400	90EA	1940		BCC CRCCHK
A402	A9FF	1950	STBLCK:	LDA #00FF
A404	855B	1960		STA RETRY2
A406	20D9A4	1970		JSR GETBYT
A409	90F7	1980		BCC STBLCK
A40B	C91B	1990	GOTBYT:	CMP #001B
A40D	D003	2000		BNE GOTBY1
A40F	A9FE	2010		LDA #00FE
A411	00	2020		BRK
A412	C901	2030	GOTBY1:	CMP #0001
A414	F007	2040		BEQ BEGBLK
A416	C904	2050		CMP #0004
A418	D04B	2060		BNE BADCRC
A41A	4CA6A4	2070		JMP RDONE
A41D	A200	2080	BEGBLK:	LDX #0000
A41F	A9FF	2090	GETBLK:	LDA #00FF
A421	855B	2100		STA RETRY2
A423	20D9A4	2110		JSR GETBYT
A426	903D	2120		BCC BADCRC
A428	9D0002	2130		STA RBUFF0, X
A42B	E8	2140		INX
A42C	E084	2150		CPX #0084
A42E	D0EF	2160		BNE GETBLK
A430	A200	2170		LDX #0000
A432	BD0002	2180		LDA RBUFF0, X
A435	C551	2190		CMP BLKNO
A437	F009	2200		BEQ GOODB1
A439	208DA5	2210		JSR PRERR
A43C	20ECA4	2220		JSR FLUSH
A43F	A9FD	2230		LDA #00FD
A441	00	2240		BRK
A442	49FF	2250	GOODB1:	EOR #00FF
A444	E8	2260		INX
A445	DD0002	2270		CMP RBUFF0, X
A448	F009	2280		BEQ GOODB2
A44A	208DA5	2290		JSR PRERR
A44D	20ECA4	2300		JSR FLUSH
A450	A9FC	2310		LDA #00FC
A452	00	2320		BRK
A453	20DDA5	2330	GOODB2:	JSR CALCRC
A456	B90002	2340		LDA RBUFF0, Y
A459	C555	2350		CMP CRCH
A45B	D008	2360		BNE BADCRC
A45D	C8	2370		INX
A45E	B90002	2380		LDA RBUFF0, Y
A461	C554	2390		CMP CRCL
A463	F00B	2400		BEQ GOODCR
A465	20ECA4	2410	BADCRC:	JSR FLUSH
A468	A915	2420		LDA #0015
A46A	20CCA4	2430		JSR PUTCHR
A46D	4C02A4	2440		JMP STBLCK

XMOD	A2	5	DATED :	AUG 2020
A470	A202	2450	GOODCR:	LDX #0002
A472	A551	2460		LDA BLKNO
A474	C901	2470		CMP #0001
A476	D012	2480		BNE COPYBK
A478	A553	2490		LDA BFLAG
A47A	F00E	2500		BEQ COPYBK
A47C	BD0002	2510		LDA RBUFF0, X
A47F	8556	2520		STA PTRL
A481	E8	2530		INX
A482	BD0002	2540		LDA RBUFF0, X
A485	8557	2550		STA PTRH
A487	E8	2560		INX
A488	C653	2570		DEC BFLAG
A48A	A000	2580	COPYBK:	LDY #0000
A48C	BD0002	2590	COPYB3:	LDA RBUFF0, X
A48F	9156	2600		STA (PTRL), Y
A491	E656	2610		INC PTRL
A493	D002	2620		BNE COPYB4
A495	E657	2630		INC PTRH
A497	E8	2640	COPYB4:	INX
A498	E082	2650		CPX #0082
A49A	D0F0	2660		BNE COPYB3
A49C	E651	2670		INC BLKNO
A49E	A906	2680		LDA #0006
A4A0	20CCA4	2690		JSR PUTCHR
A4A3	4C02A4	2700		JMP STBLCK
A4A6	A906	2710	RDONE:	LDA #0006
A4A8	20CCA4	2720		JSR PUTCHR
A4AB	20ECA4	2730		JSR FLUSH
A4AE	20ADA5	2740		JSR PRGOOD
A4B1	4C00FC	2750		JMP RETMON
A4B4	A91F	2760	INIT:	LDA #001F
A4B6	8DD3BF	2770		STA CONTRL
A4B9	A90B	2780		LDA #000B
A4BB	8DD2BF	2790		STA COMND
A4BE	60	2800		RTS
A4BF	18	2810	GETCHR:	CLC
A4C0	ADD1BF	2820		LDA STATUS
A4C3	2908	2830		AND #0008
A4C5	F004	2840		BEQ GETCH2
A4C7	ADD0BF	2850		LDA DATA
A4CA	38	2860		SEC
A4CB	60	2870	GETCH2:	RTS
A4CC	48	2880	PUTCHR:	PHA
A4CD	ADD1BF	2890	PUTCH1:	LDA STATUS
A4D0	2910	2900		AND #0010
A4D2	F0F9	2910		BEQ PUTCH1
A4D4	68	2920		PLA
A4D5	8DD0BF	2930		STA DATA
A4D8	60	2940		RTS
A4D9	A900	2950	GETBYT:	LDA #0000
A4DB	855A	2960		STA RETRY1
A4DD	20BFA4	2970	CKLOOP:	JSR GETCHR
A4E0	B009	2980		BCS GETBY1
A4E2	C65A	2990		DEC RETRY1
A4E4	D0F7	3000		BNE CKLOOP
A4E6	C65B	3010		DEC RETRY2
A4E8	D0F3	3020		BNE CKLOOP
A4EA	18	3030		CLC
A4EB	60	3040	GETBY1:	RTS
A4EC	A970	3050	FLUSH:	LDA #0070

```

XMOD A2          6   DATED :   AUG 2020

A4EE  855B   3060          STA   RETRY2
A4F0  20D9A4 3070          JSR   GETBYT
A4F3  B0F7   3080          BCS   FLUSH
A4F5  60     3090          RTS
A4F6  20FAFD 3100   GETADD: JSR   POLLKB
A4F9  A501   3110          LDA   ICHAR
A4FB  C90D   3120          CMP   #$000D
A4FD  F006   3130          BEQ   GOPACK
A4FF  200EF8 3140          JSR   OPCHR
A502  4CF6A4 3150          JMP   GETADD
A505  A005   3160   GOPACK: LDY   #$0005
A507  2017F8 3170          JSR   HEXPCK
A50A  60     3180          RTS
A50B  A200   3190   Q1MSG:  LDX  #$0000
A50D  BD18A5 3200   Q1MSG1: LDA  Q1TXT,X
A510  F00F   3210          BEQ   Q1MSG2
A512  200EF8 3220          JSR   OPCHR
A515  E8     3230          INX
A516  D0F5   3240          BNE   Q1MSG1
A518  0D     3250   Q1TXT:  DEFB $0D
A519  53
A51A  20
A51B  4F
A51C  52
A51D  20
A51E  52
A51F  3F     3260          DEFM 'S OR R?'
A520  00     3270          BRK
A521  60     3280   Q1MSG2: RTS
A522  A200   3290   Q2MSG:  LDX  #$0000
A524  BD2FA5 3300   Q2MSG1: LDA  Q2TXT,X
A527  F00E   3310          BEQ   Q2MSG2
A529  200EF8 3320          JSR   OPCHR
A52C  E8     3330          INX
A52D  D0F5   3340          BNE   Q2MSG1
A52F  0D     3350   Q2TXT:  DEFB $0D
A530  53
A531  54
A532  41
A533  52
A534  54
A535  3A     3360          DEFM 'START:'
A536  00     3370          BRK
A537  60     3380   Q2MSG2: RTS
A538  A200   3390   Q3MSG:  LDX  #$0000
A53A  BD45A5 3400   Q3MSG1: LDA  Q3TXT,X
A53D  F00E   3410          BEQ   Q3MSG2
A53F  200EF8 3420          JSR   OPCHR
A542  E8     3430          INX
A543  D0F5   3440          BNE   Q3MSG1
A545  0D     3450   Q3TXT:  DEFB $0D
A546  45
A547  4E
A548  44
A549  20
A54A  20
A54B  3A     3460          DEFM 'END  ':
A54C  00     3470          BRK
A54D  60     3480   Q3MSG2: RTS
A54E  A200   3490   PRMSG:  LDX  #$0000
A550  BD5CA5 3500   PRMSG1: LDA  BEGMSG,X

```

```

XMOD A2          7   DATED :   AUG 2020

A553 F006      3510          BEQ   PRMSG2
A555 20CCA4   3520          JSR   PUTCHR
A558 E8        3530          INX
A559 D0F5     3540          BNE   PRMSG1
A55B 60        3550  PRMSG2:  RTS
A55C 42
A55D 65
A55E 67
A55F 69
A560 6E
A561 20
A562 58
A563 4D
A564 4F
A565 44
A566 45
A567 4D        3560  BEGMSG:  DEFM 'Begin XMODEM
A568 20
A569 74
A56A 72
A56B 61
A56C 6E
A56D 73
A56E 66
A56F 65
A570 72
A571 2E
A572 20
A573 50
A574 72
A575 65
A576 73
A577 73        3570          DEFM ' transfer. Press
A578 20
A579 3C
A57A 45
A57B 53
A57C 43
A57D 3E
A57E 20
A57F 74
A580 6F
A581 20
A582 61
A583 62
A584 6F
A585 72
A586 74
A587 2E
A588 2E
A589 2E        3580          DEFM ' <ESC> to abort...
A58A 0D
A58B 0A        3590          DEFB $0D,$0A
A58C 00        3600          BRK
A58D A200     3610          PRERR:  LDX #$0000
A58F BD9BA5   3620          PRERR1: LDA ERRMSG,X
A592 F006     3630          BEQ   PRERR2
A594 20CCA4   3640          JSR   PUTCHR
A597 E8        3650          INX
A598 D0F5     3660          BNE   PRERR1
A59A 60        3670          PRERR2:  RTS

```

```

XMOD A2          8   DATED :   AUG 2020

A59B  54
A59C  72
A59D  61
A59E  6E
A59F  73
A5A0  66
A5A1  65
A5A2  72      3680  ERRMSG:  DEFM 'Transfer
A5A3  20
A5A4  45
A5A5  72
A5A6  72
A5A7  6F
A5A8  72
A5A9  21      3690          DEFM ' Error!
A5AA  0D
A5AB  0A      3700          DEFB $0D,$0A
A5AC  00      3710          BRK
A5AD  A200    3720  PRG00D:   LDX #$0000
A5AF  BDBBA5 3730  PG00D1:   LDA GDMSG,X
A5B2  F006    3740          BEQ  PG00D2
A5B4  20CCA4 3750          JSR  PUTCHR
A5B7  E8      3760          INX
A5B8  D0F5    3770          BNE  PG00D1
A5BA  60      3780  PG00D2:   RTS
A5BB  04
A5BC  0D
A5BD  0A      3790  GDMSG:   DEFB $04,$0D,$0A
A5BE  04
A5BF  0D
A5C0  0A      3800          DEFB $04,$0D,$0A
A5C1  04
A5C2  0D
A5C3  0A      3810          DEFB $04,$0D,$0A
A5C4  0D
A5C5  0A      3820          DEFB $0D,$0A
A5C6  54
A5C7  72
A5C8  61
A5C9  6E
A5CA  73
A5CB  66
A5CC  65
A5CD  72      3830          DEFM 'Transfer
A5CE  20
A5CF  73
A5D0  75
A5D1  63
A5D2  63
A5D3  65
A5D4  73
A5D5  73
A5D6  66
A5D7  75
A5D8  6C
A5D9  21      3840          DEFM ' successful!
A5DA  0D
A5DB  0A      3850          DEFB $0D,$0A
A5DC  00      3860          BRK
A5DD  A900    3870  CALCRC:   LDA #$0000
A5DF  8554    3880          STA  CRCL

```

```

XMOD A2          9   DATED :   AUG 2020

A5E1  8555   3890           STA   CRCH
A5E3  A002   3900           LDY   #\$0002
A5E5  B90002 3910   CALCR1: LDA  RBUFF0,Y
A5E8  4555   3920           EOR   CRCH
A5EA  AA     3930           TAX
A5EB  A554   3940           LDA   CRCL
A5ED  5D00A7 3950           EOR   CRCHI,X
A5F0  8555   3960           STA   CRCH
A5F2  BD00A6 3970           LDA   CRCL0,X
A5F5  8554   3980           STA   CRCL
A5F7  C8     3990           INY
A5F8  C082   4000           CPY   #\$0082
A5FA  D0E9   4010           BNE   CALCR1
A5FC  60     4020           RTS
                4030           *
                =   CRCL0
A600  00     4040   CRCL0: BRK
                4050           *
                =   CRCHI

```

No errors.
End of object = \$A700

```

CRCTAB = $A290  START = $A2D0  CRCL0 = $A600  CRCHI = $A700
ICHAR  = $0001  HXPKL  = $0013  HXPKH  = $0014  LASTBK = $0050
BLKNO  = $0051  ERRCNT = $0052  BFLAG  = $0053  CRCL   = $0054
CRCH   = $0055  PTRL   = $0056  PTRH   = $0057  EOFPL  = $0058
EOFPH  = $0059  RETRY1 = $005A  RETRY2 = $005B  RBUFF0 = $0200
RBUFF1 = $0201  RBUFF2 = $0202  RBUFF3 = $0203  DATA  = $BFD0
STATUS = $BFD1  COMND  = $BFD2  CONTRL = $BFD3  POLLKB = $FDFA
OUTCR  = $F80C  OPCHR  = $F80E  HEXPCK = $F817  RETMON = $FC00
CRCTAB = $A290  ZLOOP  = $A294  FETCH  = $A29F  FETCH1 = $A2A8
FETCH2 = $A2C0  POLKB1 = $A2D7  JXMODR = $A2EB  XMODTX = $A2EE
WAITCR = $A31D  SETADD = $A334  LDBUFF = $A34F  LDBUF0 = $A356
LDBUF1 = $A366  LDBUF3 = $A37A  LDBUF4 = $A386  LDBUF5 = $A38C
SCALCR = $A391  RESEND = $A39F  SENDBK = $A3A6  SETERR = $A3C6
PRTABL = $A3CE  TDONE  = $A3D7  XMODRX = $A3DD  CRCCHK = $A3EC
STBLCK = $A402  GOTBYT = $A40B  GOTBY1 = $A412  BEGBLK = $A41D
GETBLK = $A41F  GOODB1 = $A442  GOODB2 = $A453  BADCRC = $A465
GOODCR = $A470  COPYBK  = $A48A  COPYB3 = $A48C  COPYB4 = $A497
RDONE  = $A4A6  INIT   = $A4B4  GETCHR = $A4BF  GETCH2 = $A4CB
PUTCHR = $A4CC  PUTCH1 = $A4CD  GETBYT = $A4D9  CKLOOP = $A4DD
GETBY1 = $A4EB  FLUSH  = $A4EC  GETADD = $A4F6  GOPACK = $A505
Q1MSG  = $A50B  Q1MSG1 = $A50D  Q1TXT  = $A518  Q1MSG2 = $A521
Q2MSG  = $A522  Q2MSG1 = $A524  Q2TXT  = $A52F  Q2MSG2 = $A537
Q3MSG  = $A538  Q3MSG1 = $A53A  Q3TXT  = $A545  Q3MSG2 = $A54D
PRMSG  = $A54E  PRMSG1 = $A550  PRMSG2 = $A55B  BEGMSG = $A55C
PRERR  = $A58D  PRERR1 = $A58F  PRERR2 = $A59A  ERRMSG = $A59B
PRGOOD = $A5AD  PGOOD1 = $A5AF  PGOOD2 = $A5BA  GDMSG  = $A5BB
CALCRC = $A5DD  CALCR1 = $A5E5  CRCL0  = $A600  CRCHI  = $A700

```