

PERCOM DATA CO.

TM-CIS-30-15

TECHNICAL MEMO

CASSETTE DATA SYSTEMS

FEBRUARY 15, 1978

SUBJECT: SOFTWARE HINTS FOR USING THE PERCOM CIS-30+ WITH ACIA
I/O INTERFACES (MOTOROLA PART NUMBER MC-6850)

MANY 6800 COMPUTING SYSTEMS USE AN ASYNCHRONOUS COMMUNICATIONS
INTERFACE ADAPTER (ACIA) TO COMMUNICATE BETWEEN THE MPU AND
AND SERIAL I/O DEVICES SUCH AS THE DATA TERMINAL AND THE PRINTER.
THE SWTP MP-S INTERFACE IS AN EXAMPLE OF SUCH AN INTERFACE. THE
ACIA IS ALSO THE STANDARD I/O INTERFACE FOR THE MITS 680B COMPUTER.
THE PERCOM CIS-30 IS DESIGNED TO BE CONNECTED IN THE SERIAL RS-232
DATA LINE BETWEEN THE ACIA AND AN EXISTING DATA TERMINAL.

OUTPUTTING DATA TO CASSETTE

WHEN DATA IS OUTPUTTED FROM THE ACIA TRANSMITTER TO THE DATA TERM-
INAL, THE DATA STREAM IS SAMPLED BY THE CASSETTE INTERFACE WHICH
THEN TRANSFORMS THE DATA INTO ONE OR THE OTHER OF A PAIR OF TONES
WHICH MAY BE RECORDED ON MAGNETIC TAPE. NO SWITCHING BETWEEN THE
DATA TERMINAL AND CASSETTE IS REQUIRED. SIMPLY TURN ON THE TAPE
RECORDER AND SAVE THE ACTION! OBVIOUSLY THE SOFTWARE REQUIRED TO
OUTPUT DATA TO TAPE IS THE SAME AS THAT REQUIRED TO OUTPUT DATA
TO THE DATA TERMINAL.

FOR EXAMPLE:

	LDAB DATA	GET DATA BYTE TO BE OUTPUT
	LDX #PORT	GET PORT ADDRESS
LOOP	LDAA 0,PORT	GET ACIA STATUS
	ASRA	MOVE TRANSMITTER READY BIT
	ASRA	INTO CARRY BIT
	BCC LOOP	BRANCH IF NOT READY
	STAB 1,PORT	OUTPUT DATA BYTE
	RTS	

BEFORE DATA IS OUTPUTTED TO TAPE WE SUGGEST THE ACIA BE PROGRAMMED
FOR TWO STOP BITS. THIS IS TO PREVENT THE TAPE DATA FROM 'OVER-
SPEEDING' THE ACIA WHEN THE DATA IS PLAYED BACK. MORE ABOUT THIS
POINT LATER.

TO PROGRAM THE ACIA TRANSMITTER TO OUTPUT TWO STOP BITS:

SWTP MP-S	MITS 680B
LDX #PORT	
LDAA #\$11	LDAA #\$51
STAA 0,PORT	STAA \$F000

THE DIFFERENCE BETWEEN THE SWTP MP-S AND MITS 680B CODE IS CAUSED BY THE DIFFERENCES IN I/O PORT ADDRESSES AND THE INACTIVE STATE OF THE 'RTS' OUTPUT FROM THE ACIA FOR EACH PARTICULAR COMPUTER. IF YOU REQUIRE MORE INFORMATION ON THESE TWO POINTS WE SUGGEST YOU STUDY THE ACIA DATA SHEET AND THE SCHEMATICS OF YOUR PARTICULAR COMPUTER.

INPUTTING DATA FROM CASSETTE

THIS IS WHERE THE DISCUSSION GETS A LITTLE COMPLICATED. HANG ON IT ISN'T TOO PAINFUL.

THE ACIA RECEIVER CAN GET DATA FROM TWO SOURCES: THE DATA TERMINAL OR THE CASSETTE TAPE. SINCE WE DO NOT WANT THESE TWO DATA SOURCES TO INTERFERE WITH EACH OTHER, THE CIS-30 HAS A MEANS TO SWITCH BETWEEN THE DATA TERMINAL AND THE CASSETTE. IF THE CIS-30 'TAPE' SWITCH IS IN THE 'ON' POSITION, THE CASSETTE DEMODULATOR IS THE DATA SOURCE. IF THE 'TAPE' SWITCH IS IN THE 'AUTO' POSITION, THE DATA SOURCE IS SELECTED BY A 'READER CONTROL' LINE WHICH MAY BE DRIVEN BY THE 'RTS' (REQUEST TO SEND) OUTPUT FROM THE ACIA.

DEPENDING ON THE HARDWARE DESIGN OF YOUR PARTICULAR COMPUTER, THE INACTIVE STATE OF THE 'RTS' LINE MAY BE EITHER HIGH OR LOW. FOR EXAMPLE, THE 'RTS' INACTIVE STATE ON THE SWTP MP-S INTERFACE IS LOW, WHILE ON THE MITS 680B THE 'RTS' INACTIVE STATE IS HIGH.

BEFORE WE CAN GIVE YOU THE CODE, WE NEED TO DISCUSS ONE MORE POINT:

--OVERSPEED--

SUPPOSE YOU HAVE A CASSETTE RECORDED WITH TWO STOP BITS AS DESCRIBED IN THE PREVIOUS SECTION. LET US ALSO ASSUME THAT YOU WISH TO ECHO THE DATA BACK TO THE DATA TERMINAL AS IT IS READ FROM THE CASSETTE. IF THE ACIA TRANSMITTER IS PROGRAMMED FOR TWO STOP BITS EVERYTHING WILL BE OK -UNLESS- THE CASSETTE IS PLAYING BACK DATA FASTER THAN THE ACIA TRANSMITTER IS TRANSMITTING.

IF THE ACIA RECEIVER IS RECEIVING DATA FASTER THAN IT CAN BE TRANSFERRED TO THE ACIA TRANSMITTER, THE ACIA RECEIVER WILL BE PERIODICALLY 'OVERRUN' RESULTING IN THE LOSS OF A BYTE OF DATA.

THERE ARE TWO SIMPLE SOLUTIONS:

1. DO NOT ECHO WHEN READING DATA FROM CASSETTE.
2. IF YOU MUST ECHO, MAKE SURE THE CASSETTE WAS RECORDED WITH TWO STOP BITS THEN PROGRAM THE ACIA TRANSMITTER FOR 'ONE' STOP BIT WHEN READING DATA FROM CASSETTE. THIS PROTECTS THE SYSTEM FROM APPROXIMATELY 10% OVERSPEED.

TO PROGRAM THE ACIA FOR 'ONE' STOP BIT AND TURN ON THE 'READER CONTROL' LINE:

SWTP MF-S	MITS 680B
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LDX #PORT	
LDAA #\$55	LDAA #\$15
STAA 0,PORT	STAA \$F000

YOU CAN USE THE SAME SOFTWARE SUBROUTINES TO READ DATA FROM THE CASSETTE AS IS USED TO READ THE DATA TERMINAL KEYBOARD. FOR EXAMPLE:

	LDX #PORT	GET PORT ADDRESS
LOOP	LDAA 0,PORT	GET ACIA STATUS
	ASRA	MOVE DATA AVAILABLE BIT INTO CARRY
	BCC LOOP	BRANCH IF NO DATA
	LDAB 1,PORT	GET DATA BYTE
	RTS	

WHEN FINISHED READING THE DATA FROM CASSETTE YOU WILL WANT TO TURN OFF THE 'READER CONTROL' LINE AND REPROGRAM THE ACIA TRANSMITTER FOR TWO STOP BITS.

SWTP MF-S	MITS 680B
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LDX #PORT	
LDAA #\$11	LDAA #\$51
STAA 0,PORT	STAA \$F000

THE ABOVE EXAMPLES WILL HAVE TO BE MODIFIED SLIGHTLY IF DIFFERENT ADDRESSING MODES ARE CHOSEN TO IMPLEMENT THE VARIOUS ROUTINES. IN ANY EVENT WE STRONGLY RECOMMEND THAT YOU STUDY THE ACIA DATA SHEET TO UNDERSTAND THE CONTROL BIT MANIPULATION AND HOW IT RELATES TO YOUR COMPUTER.

FINAL POINT

THE PHASE LOCKED OSCILLATOR IN THE CIS-30 IS THE CIRCUIT FEATURE WHICH PERMITS OPERATION AT 600 AND 1200 BAUD. AT 1200 BAUD THE PHASE LOCKED OSCILLATOR REQUIRES ONE OR TWO CHARACTER TIMES TO ESTABLISH SYNCHRONIZATION WITH THE DATA STREAM WHEN DATA IS READ FROM TAPE. IN GENERAL, THE PHASE LOCKED OSCILLATOR WILL REQUIRE THIS SYNCHRONIZATION TIME WHENEVER THERE IS A DISCONTINUITY IN THE FLOW OF DATA.

FOR THIS REASON WE SUGGEST THAT EACH BLOCK OF DATA TO BE RECORDED ON CASSETTE BE PRECEDED BY SEVERAL NULL OR LEADER BYTES TO PERMIT THE PHASE LOCKED OSCILLATOR TO BE PROPERLY SYNCHRONIZED BEFORE THE

DATA FLOW COMMENCES. THIS OCCURS AUTOMATICALLY IN MOST WELL DESIGNED SYSTEMS BUT YOU SHOULD BE AWARE OF THE REQUIREMENT IF YOU ARE WRITING YOUR OWN SOFTWARE.

AN INSIDIOUS DISCONTINUITY MAY OCCUR IF THE DATA IS NOT OUTPUTTED SMOOTHLY WITH THE START BIT OF EACH DATA BYTE IMMEDIATELY AND WITHOUT DELAY FOLLOWING THE STOP BIT OF THE PREVIOUS CHARACTER. THIS MEANS THE ACIA TRANSMITTER BUFFER MUST BE LOADED BEFORE THE ACIA FINISHES TRANSMITTING THE PREVIOUS CHARACTER. THIS REQUIREMENT IS EASILY MET IN MOST APPLICATIONS UNLESS A LOT OF PROCESSING OCCURS BETWEEN OUTPUTS. AT 1200 BAUD, YOU HAVE MORE THAN 8 MILLISECONDS AVAILABLE TIME BETWEEN CHARACTER OUTPUTS.