

## SECTION 9

### INTERFACING WITH AUDIO CASSETTE RECORDERS AND TELETYPE

AIM 65 provides interfaces to two types of external peripherals: audio cassette recorder and teletype. These peripherals allow permanent storage of source and object programs as well as program data of general text. There are two major reasons why permanent storage is desirable:

- The AIM 65 RAM is volatile memory--its memory contents are altered to an unpredictable state when RAM power is removed.
- A permanent storage medium is desired to save source programs, object programs, and data currently in RAM, to make room for other programs and data.

#### 9.1 INTERFACING WITH AUDIO CASSETTE RECORDERS

AIM 65 can interface and operate with one or two audio cassette recorders. Information recorded on cassette may be read by AIM 65 as many times as desired. In addition, data can be transferred between recorders.

The AIM 65 audio cassette interface hardware and software is designed to provide flexible and useful AIM 65 operation. The capability to record and read both source and object data allows program and data development and usage at either or both levels. A binary data recording technique for object data allows rapid and efficient program dumping and loading.

A blocked, multi-record, object code format enables recording of program or data segments from different portions of memory. Since the starting address is provided with each record, program segments from different portions of memory can be recorded on the same file.

The block format, in conjunction with I/O data buffering allows processing to be performed between block read operations. This supports such functions as assembling from cassette and reading new data into a partially filled Editor Text Buffer.

Only a single recorder is needed to record or to read source or object data. Two recorders are required to assemble input source code from one cassette while directing output object code to the other cassette.

Remote control capability allows the recorders to be set up for reading or recording, then letting AIM 65 initiate the recorder operation at the proper time during command execution. Note that remote control is a convenient feature, but not required for recording data from Monitor dump, load, or verify commands, Editor List or initial Read commands. Remote control is required, however, in order to assemble from cassette or to read source data into a partially loaded Editor Text Buffer.

A dual remote control feature along with the blocked format structure allows cassette-to-cassette assembly. This feature maximizes use of on-board RAM during both assembly and subsequent loading of object code.

The audio tape interface allows low cost audio cassette recorders to be used. It is recommended, however, that the highest quality recorders and cassette tapes be used to obtain maximum performance and reliability.

#### 9.1.1 Recorder Requirements

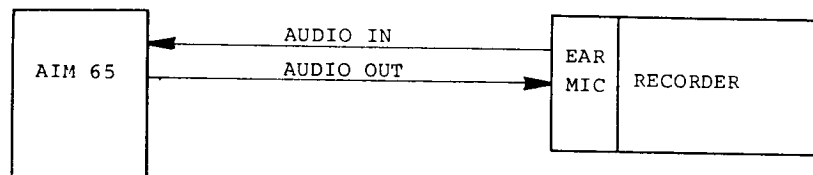
The audio cassette recorders used should be equipped with the following features:

- An earphone (EAR) jack. The AIM 65 audio input line will use it to read cassette data into AIM 65.
- A microphone (MIC) jack. The AIM 65 audio output line will use it to record cassette data from AIM 65.
- A remote (REM) jack. An AIM 65 output recorder control line will use it to turn the recorder on or off automatically or by user command. This line is not required for most operations.

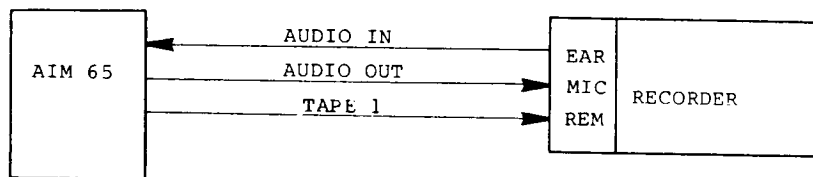
A tape counter, while not required for operation, provides a convenient reference for location programs written on cassette.

#### 9.1.2 Cassette Recorder Installation

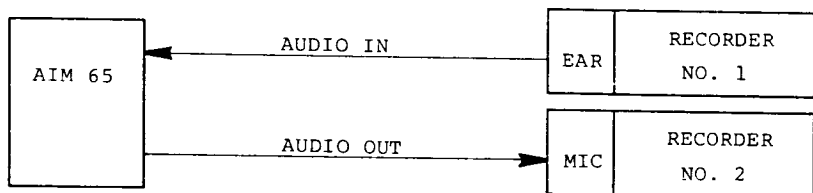
AIM 65 contains a built-in interface for one or two audio cassette recorders, with or without remote control. Figure 9-1 illustrates the connections required with each of the four possible combinations.



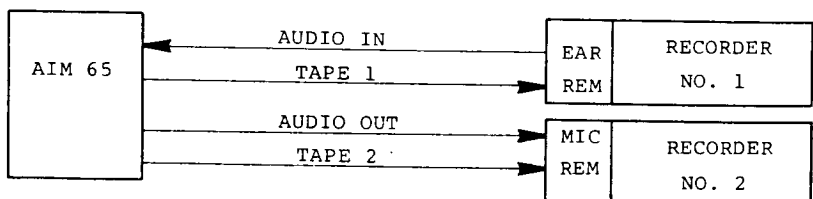
1. ONE RECORDER WITH NO REMOTE CONTROL LINE



2. ONE RECORDER WITH ONE REMOTE CONTROL LINE



3. TWO RECORDERS WITH NO REMOTE CONTROL LINES



4. TWO RECORDERS WITH TWO REMOTE CONTROL LINES

Figure 9-1. Typical Audio Cassette Recorder Hookups

#### INSTALLING RECORDERS WITHOUT REMOTE CONTROL

Recorders lacking remote control are connected to AIM 65 with just two lines, AUDIO IN and AUDIO OUT. If only one recorder is being used, AUDIO IN will plug into the recorder's EAR jack and AUDIO OUT will plug into the recorder's MIC jack. If two recorders are being used, AUDIO IN will plug into the EAR jack of the input recorder and AUDIO OUT will plug into the MIC jack of the output recorder.

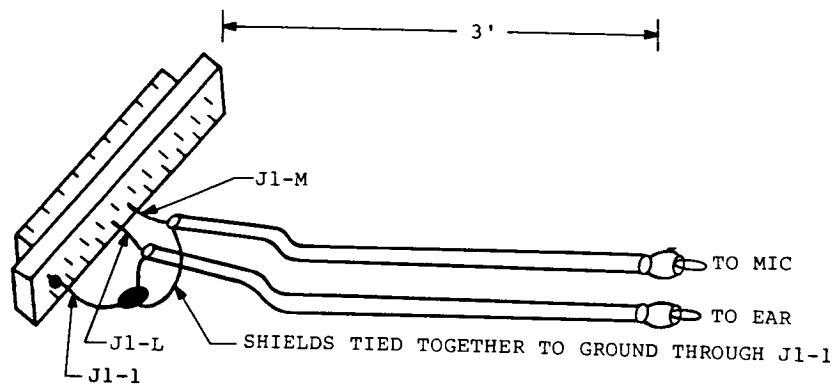
Figure 9-2 shows how these lines should be wired to AIM 65 Application Connector J1. In making the hookup, the leads should be kept as short as possible, and should be positioned far away from such sources of electrical interference as AC line cords and transformers. Note also that the AIM 65 ground connection, J1-1, should be used rather than an external ground.

#### INSTALLING RECORDERS WITH REMOTE CONTROL

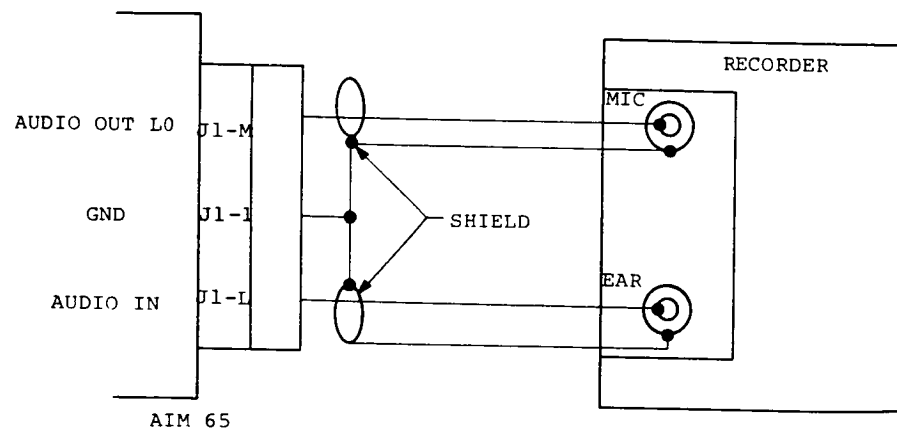
For remote control applications, you must install the AUDIO IN and AUDIO OUT lines using the procedure just described, then hook up the remote line(s).

AIM 65's remote control circuitry supports four different types of recorder remote control circuits:

- Type I -- Positive Voltage, Motor Return to Phono Jack Shield Connection (PRS)
- Type II -- Positive Voltage, Motor Return to Phono Jack Center Connection (PRC)



PICTORIAL OF SUGGESTED INTERFACE WIRING



SCHEMATIC

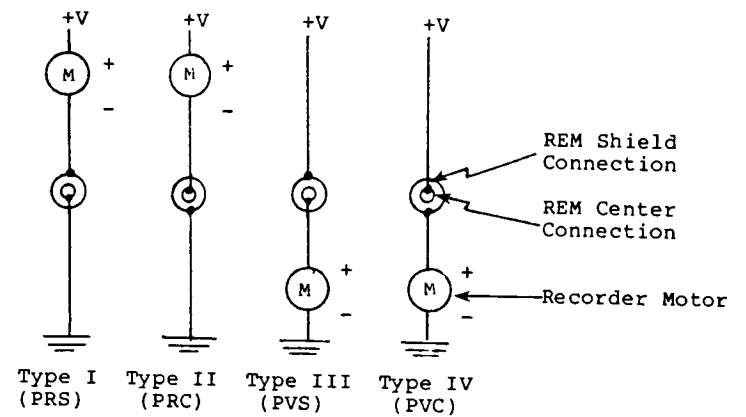
Figure 9-2. Cassette Recorder Audio Line Connection

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Type III -- Positive Voltage, Motor Voltage to Phono Jack Shield Connection (PVS)

Type IV -- Positive Voltage, Motor Voltage to Phono Jack Center Connection (PVC)



If you are not sure which type of recorder you have, you will find out in the course of this installation procedure:

1. Construct a recorder-to-AIM 65 remote control cable, by attaching a recorder-compatible phono plug to a single conductor shielded cable. To do this, connect the shield

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cable inner conductor to the phono plug center connection, and the cable shield to the phono plug shield connection. Leave the AIM 65 end of the cable disconnected and not shorted together.

2. With the remote control cable disconnected from the recorder, turn the recorder on in the Play mode. The recorder motor should run.
3. Plug the remote control cable into the recorder's REM phono jack. The motor should stop. If the motor continues to run, a short circuit exists between the REM jack's center and shield connections. If this problem occurs, it must be corrected before proceeding; as an initial step, check your cable conductor connections to the phono plug.
4. Connect the remote control cable conductors together at the AIM 65 end. The recorder motor should run. If it does not, an open circuit exists between the phono jack center and shield connections; this problem must be corrected before proceeding.
5. Connect the phono plug to the recorder's REM phono jack. With the recorder motor running, use a voltmeter to make the following measurement: Touch the voltmeter's "+" lead to the remote control cable center conductor (at the AIM 65 end) and the "-" lead to a ground point, such as the recorder chassis, or the shield connection on either the MIC or ear jack. Record the measured voltage here: \_\_\_\_ Vdc.
  - a. If the voltage measures 0 Vdc, you have a Type I or Type II recorder. Proceed to Step 6.

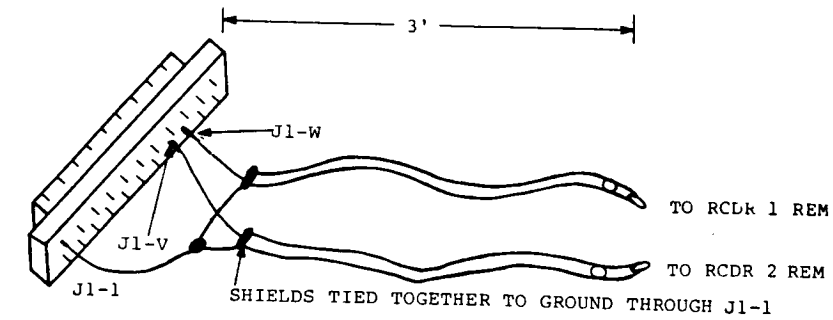
- b. If the voltage measures +6 to +8 Vdc, you have a Type III or Type IV recorder. Proceed to Step 6.
  - c. If the voltage measures -6 to -8 Vdc, the remote control circuit in your recorder is not compatible with AIM 65, and you are restricted to using it with only the audio lines connected, unless an interface adapter or relays are employed.
6. Disconnect the remote control cable center conductor from the shield conductor at the AIM 65 end. The recorder motor will stop. With the recorder in the Play mode, measure the voltage on the remote control cable center conductor. Record the measured voltage here: \_\_\_\_ Vdc. The recorder remote control circuit type can be determined by referring to this table:

Step 5 (Vdc)	0		+6 to +8	
Step 6 (Vdc)	0	+6 to +8	0	+6 to +8
Type	I	II	III	IV

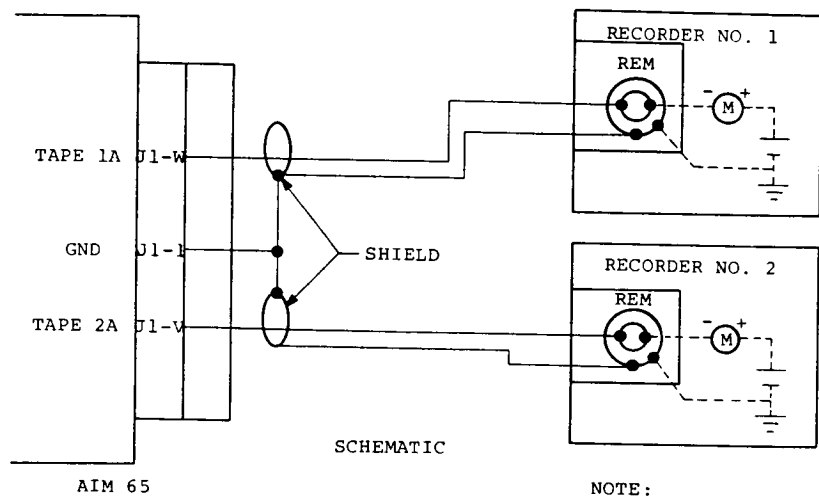
7. Connect the remote control cable to AIM 65 Application Connector J1 per Table 9-1. Figures 9-3 and 9-4 show hookups to recorders with Type II (PRC) and Type IV (PVC) remote control circuitry, respectively.

Table 9-1 Recorder Remote Control Connection

RECORDER TYPE	PHONO JACK CONNECTION TO AIM 65			
	RECORDER 1		RECORDER 2	
	SHIELD	CENTER	SHIELD	CENTER
Type I (PRS)	J1-W	J1-1	J1-V	J1-1
Type II (PRC)	J1-1	J1-W	J1-1	J1-V
Type III (PVS)	J1-F	J1-E	J1-J	J1-H
Type IV (PVC)	J1-E	J1-F	J1-H	J1-J

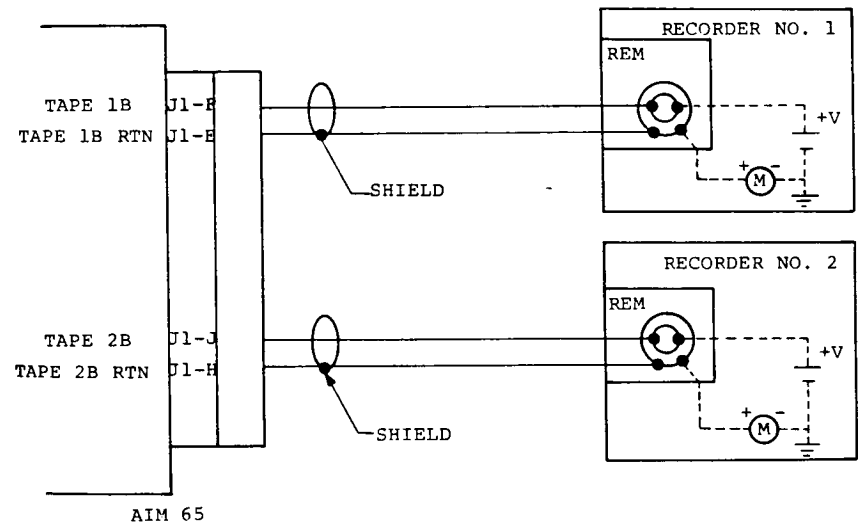
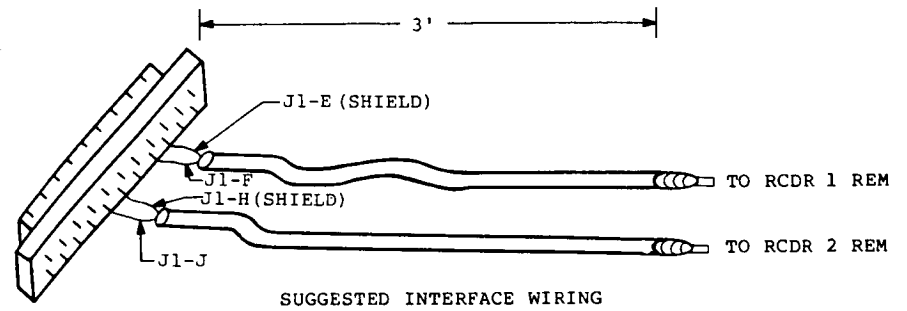


SUGGESTED INTERFACE WIRING



The remote control lines may be connected as desired to either recorder.

Figure 9-3. Audio Cassette Recorder Remote Control Connections - Type II (PRC)



The remote control lines may be connected as desired to either recorder.

Figure 9-4. Audio Cassette Recorder Remote Control Connections - Type IV (PVC)

### 9.1.3 Cassette Recorder Operation

To save time and effort when using audio cassette recorders:

- When installing a cassette into a recorder, always rewind the cassette until it stops, then reset the recorder counter.
- When recording the first file on the tape, BE SURE THE CASSETTE HAS ADVANCED BEYOND ANY NON-RECORDABLE LEADER ON THE TAPE. If you cannot see the physical start of the magnetic portion of the tape through a transparent cassette housing, allow at least five counts on the recorder counter, or about 15 seconds.
- A large gap (10 counts, or three inches of tape) should be allowed between recorded files. This permits the tape to be manually positioned between files before initiating a read operation.

### 9.1.4 AIM 65 Operation Verification Procedure

After installing the audio cassette recorders, run a SYN pattern record and read test to verify correct recorder interface connection and operation. The short program described below will run such a test.

This test writes a continuous stream of SYN (ASCII 16) characters onto a cassette tape, then has AIM 65 attempt to read the tape. If the SYN characters are read by AIM 65, a Y is displayed, otherwise an N is displayed.

### SYN TEST PATTERN PROGRAM

Enter the following program into AIM 65 RAM using the instructions mnemonic entry command (I).

#### SYN Write Program

```
0000    +=0200
0000 20 JER 0210
0002 20 JER 0210
0006 40 JMP 0000
```

#### SYN Read Program

```
0009    +=0210
0010 A0 LDX #00
0012 A0 LDR #00
0014 20 JER 0010
0017 20 JER 0010
001A A0 LDX #00
001C A0 LDR #00
001E 20 JER 0010
0021 20 JER 0010
0024 00 CMP #10
0026 A0 BEQ 0011
0028 D0 BNE 0010
```

#### Write SYN Characters on Tape

1. Connect data lines per Figure 9-1
2. Install a blank, or scratch, tape into the recorder. Advance the tape past the leader.

3. Ensure the TSPEED value in \$A408 equals \$C7 for AIM 65 format, or equals \$5A or \$5B for KIM-1 format.
4. Execute the program to record the SYN characters on the tape as follows:

```
<*>=0300
<G>/
```

5. Start the tape recorder in the Record Mode.
6. Wait for a few minutes while a long string of continuous SYN characters are recorded.
7. Return control to Monitor by pressing the AIM 65 RESET button.
8. Turn off the recorder.

#### Read Recorder SYN Characters

1. Rewind tape to the start of the SYN file.
2. Execute the SYN read program.
 

```
<*>=0310
<G>/
```
3. Increase the recorder volume control to the highest level.

4. Increase the tone control (if available) to the highest treble level.
5. Start the tape recorder in the Play Mode.
6. The display will show N until the SYN characters are read, at which time it should show a steady Y. Decrease the volume control until the Y and N alternate on the display.

If a steady Y display cannot be obtained at or near maximum volume, check for one of the following:

- poor audio line connection
- recorder batteries are low
- recorder is malfunctioning
- AIM 65 VR1 is out of adjustment  
(see Circuit Adjustment)

7. Stop the recorder. Set the volume control to the maximum loudness level. A steady Y or N will remain on the display.
8. Return control to the Monitor by pressing the RESET button.
9. Turn off the tape recorder.

#### CIRCUIT ADJUSTMENT FOR CASSETTE INTERFACE

VR1 on the audio cassette interface (see Figure 7-12) has been factory-adjusted for proper operation. If the setting is accidentally altered, it can be re-adjusted by



the following two procedures. If you have a voltmeter or oscilloscope, perform both the coarse adjustment and the fine adjustment. In the absence of this equipment, perform only the fine adjustment.

The coarse adjustment procedure is:

1. Turn on AIM 65 power.
2. Connect the + lead of the voltmeter or oscilloscope to Z8-3 and the - lead to Z8-1.
3. Adjust VR1 for  $2.5 \pm 0.1$  VDC.

The fine adjustment procedure is:

1. Record a SYN test pattern tape per Section 9.1.4.
2. Read the test pattern tape per Section 9.1.4.
3. After the volume control is adjusted until Y and N are alternating, adjust VR1 until a steady Y is displayed.
4. Decrease the volume control until Y and N again alternate on the display.
5. Adjust VR1 until a steady Y is again displayed.
6. Repeat Steps 4 and 5 until no further adjustment is required to VR1.

#### 9.1.5 Recording On A Cassette

Text or object data may be recorded on audio cassette in AIM 65 format for any AIM 65 command allowing output device code =T. The recording format is shown in Appendix F. These commands and the type of recorded data are:

<u>COMMAND</u>	<u>DATA TYPE</u>	<u>DATA FORM</u>
Monitor Dump D	Object	Hexadecimal
Editor List L	Text	ASCII
Assembler Listing Output	Assembly	ASCII
Assembler Object Code Output	Listing Object	Hexadecimal

Object code may be recorded in KIM-1 format for the Monitor Dump command by specifying output device code =K. Before dumping in KIM-1 format, change user-alterable parameter TSPEED at location \$A408 to \$5A (for one times KIM-1 speed) or to \$5B (for three times KIM-1 speed) before recording. TSPEED is defined in Section 7.6; KIM-1 format is described in Appendix G.

The record procedure is:

1. Install the cassette and manually position the tape to where the recording is to start. Be sure to initialize the counter to the start of the tape.

Allow about 10 counts (or three inches of tape) between the last recorded file and the new file. Enter the tape count on a tape dictionary for future reference. Figure 9-5 shows a typical form, with an example.

NOTE

If a remote control line is installed, the recorder will not manually operate unless the control line is ON.

Tape ID T001

File Name	SRC/ OBJ	Tape Count		Address		Program Name	Notes
		High	Low	Low	High		
TMR1S	S	010	032	---	---	Timer 1	
TMR1L	L	040	047	0200	03D0	Timer 1	
TST3S	S	060	071	---	---	Test 3	
TST3L	L	080	084	0200	02F2	Test 3	

Figure 9-5. AIM 65 Audio Cassette Dictionary Form

CAUTION

In installations using remote control, some recorders may require a larger audio tape GAP (location \$A409) value than is provided by the default value, \$08. If you encounter errors in reading from your recorder, alter \$A409 to \$40.

- Set up the desired AIM 65 command. AIM 65 will prompt for the output device code with:

OUT=

Type K if the output from the Monitor Dump Command (D) is to be recorded in KIM-1 format; otherwise type T.

If T was entered, AIM 65 will display T and ask for the file name (F=). Enter the file name, up to five alphanumeric or special characters. If the file name is less than five digits, end the input with RETURN or SPACE. If five digits are entered, the file name entry will automatically end. AIM 65 will display the file name and ask for the recorder number. If NAME1 has been entered, AIM 65 will respond with:

OUT=T F=NAME1 T=

If K was entered, type a two-digit hexadecimal file number in the range 01 to FE in response to the F= prompt.

- Type the recorder number 1 or 2. RETURN will default to 1. If the entered number is incorrect, type ESC to escape back to the Monitor and reinitialize the command.

4. Put the recorder into the Record Mode. If the remote control is not being used, or if it is being used and is in the ON state, the tape will start recording. In this case, go directly to Step 5. If the remote control is hooked up and is in the OFF state, the recording will not start until the next step is performed.
5. Type RETURN or SPACE to initiate record command execution. If the remote control was hooked up in the OFF state, the ON state will automatically be commanded. The block count will be displayed as the recording progresses (unless the data is being dumped in KIM-1 format). For example:

```
OUT=T F=NAME1 T=1 03
```

indicates block 03 is being recorded in the file NAME1 on recorder 1.

Completion of the dump is signaled by display of the Monitor prompt.

#### NOTE

The output process may be terminated at any time by holding down ESC until the Monitor prompt is displayed. This type of termination will cause the last end of file record to be omitted from the tape. Subsequent attempts to read the partially recorded file will read the data properly up to the termination point but will not properly close out the read process.

6. The output will end in accordance with the specific command termination. If the termination is normal, the control will be returned to command Monitor function, i.e., Monitor, Editor or Assembler. The tape must be stopped manually or by typing 1 or 2 to toggle the proper remote control command to OFF.

If a Monitor Dump command is being performed, the Monitor will automatically stop the tape when MORE? prompt is displayed if the remote control is connected. The tape will likewise be started when the response answers to this prompt sequence are complete. If a remote control line is not connected, the tape will continue to record during the prompt display and response entry. In this case the tape can be manually stopped, then restarted, prior to answering the MORE? prompt, or it can be allowed to run. If allowed to run, a punctual response to the MORE? prompt will minimize the delay during subsequent reading.

#### NOTE

Data is recorded by filling a tape buffer in memory with 80 bytes of data. When the buffer is full, the data is output to the recorder. When the MORE? prompt is displayed, up to 79 bytes of unrecorded object data may reside in the tape buffer. If the dump command is terminated with an ESC at this point rather than N, any unrecorded data in the tape buffer will remain unrecorded. Not only will unrecorded data be lost but the last record will not be recorded which will cause subsequent improper read termination.

Also, a short file -- of less than 80 bytes including the last record (see Appendix F) -- will not be recorded if the dump is terminated with an ESC or RESET instead of typing N to the MORE? prompt.

7. Upon completion of recording, switch the recorder out of the record mode, note the tape counter value on the tape directory, and advance the tape about 5 counts on the recorder counter for subsequent recording.

#### 9.1.6 Reading From a Cassette

Text or object data may be read from audio cassette tape recorded in the AIM 65 format using any AIM 65 command allowing input device =T. These commands are:

<u>COMMAND</u>	<u>DATA TYPE</u>	<u>DATA FORM</u>
Monitor Load Command L	Object	Hexadecimal
Editor Read Command R	Text	ASCII
Assembler Source Code Input	Text	ASCII
Monitor Verify Tape Command 3	Text Object	ASCII Hexadecimal

Object code recorded in KIM-1 format may be read using the Monitor Load command by specifying input device code=K. However, before reading KIM-1 formatted object code, change user-alterable parameter TSPEED at location \$A408 to either \$5A (for one times KIM-1 speed) or \$5B (for three times KIM-1 speed).

The read procedure is:

1. Install the cassette and manually position the tape to about five counts or a couple of inches of tape before the start of the desired file. Remember to initialize the tape counter to the start of the cassette tape if not done previously.
2. Set up the desired AIM 65 command. AIM 65 will prompt for the input device code with:

IN=

Type K if the input is from a cassette recorded in KIM-1 format; otherwise, type T.

If T was entered, AIM 65 will display T and ask for the file name (F=). Enter the file name under which the file was recorded, up to five alphanumeric or special characters. An input error before entry of the fifth digit may be corrected by typing DEL and retyping the correct character. If the file name is less than five digits, end the input with RETURN or SPACE. If five digits are entered, the file name entry will automatically end.

AIM 65 will display the file name and ask for the recorder number. If NAME1 has been entered, AIM 65 will respond with:

IN=T F=NAME1 T=

If K was entered, type the two-digit hexadecimal file number in response to F=.

3. Type the recorder number, 1 or 2. RETURN will default to 1. If the entered number is incorrect, type ESC to escape back to the Monitor and re-initialize the command.
4. If remote control is not used, go to Step 5.

If remote control is installed, set the proper recorder control line to OFF using the Monitor 1 or 2 command. Switch the recorder into the Read Mode. The tape should not move; if it does, the remote control line is probably hooked up incorrectly or it is in the ON state. If this occurs, stop the tape. If necessary, rewind the tape to position the start of the file before the read head. Either check the remote control and repeat this step or continue on under manual control.

5. Type RETURN or SPACE to initiate read command execution. If 1 is entered, AIM will display:

IN=T F=NAME1 T=1

6. If manual control is used, place the recorder in the Read mode. The tape will then start reading. If remote control is used, the Monitor will turn the remote control line ON to enable tape reading.

AIM 65 will search for the entered file name. Upon locating the first readable tape file, the file name on tape will be compared to the entered file name. If the file names are not identical, AIM 65 will display the search message, the file name read from tape, and (unless KIM-1 formatted data is being read) the recorded block count (see Appendix F.1) as the file passes. If file name PROG1 was read, AIM 65 will display the search message.

SRCH F=PROG1 BLK=XX

Where XX=the block count

If the displayed block count is the last block count on the file, the displayed block count will not change until a new file is located.

NOTE:

If the tape is started within a file, the block count will be displayed as part of the command message until the first file is read:

IN=T F=NAME1 T=1XX

Upon reading the entered file name from the tape, AIM 65 will display the load message and block count (except for KIM-1 format) as the data is read. For example, when file NAME1 is located, AIM 65 will display:

LOAD F=NAME1 BLK=XX

Completion of the read is indicated by return to the command that existed before the tape read, e.g., Monitor or Editor Command states.

## ERROR MESSAGES

If any error is detected during the reading of a file, either during search or load, an error message will be generated, the reading terminated, and the Monitor reentered.

### 9.2 INTERFACING WITH TELETYPE

AIM 65 provides an interface to a teletype (TTY). A TTY usually has a paper tape punch and reader. Using the punched paper, both source and object programs may be stored on and retrieved from paper tape. The Monitor provides the capability to dump and load object code while the Editor allows source code or any other text in ASCII format to be listed and read.

A TTY also provides an alternative keyboard and hard copy facility. Since AIM 65 includes a full-size keyboard, the operating procedure with the TTY keyboard is almost identical to AIM 65. This section describes the differences between AIM 65 keyboard and TTY keyboard operation.

Since the TTY printer is wider than the AIM 65 printer, the printer output may be formatted differently.

#### 9.2.1 Interface Considerations

AIM 65 provides a 4-wire, 20 mA current loop interface to the TTY. The TTY must be configured to operate with this interface, and to operate in full-duplex mode. Figure 9-6 shows a typical connection to a TTY ASR 33.

AIM 65 adjusts automatically to the TTY data transmission rate so no special adjustments are required.

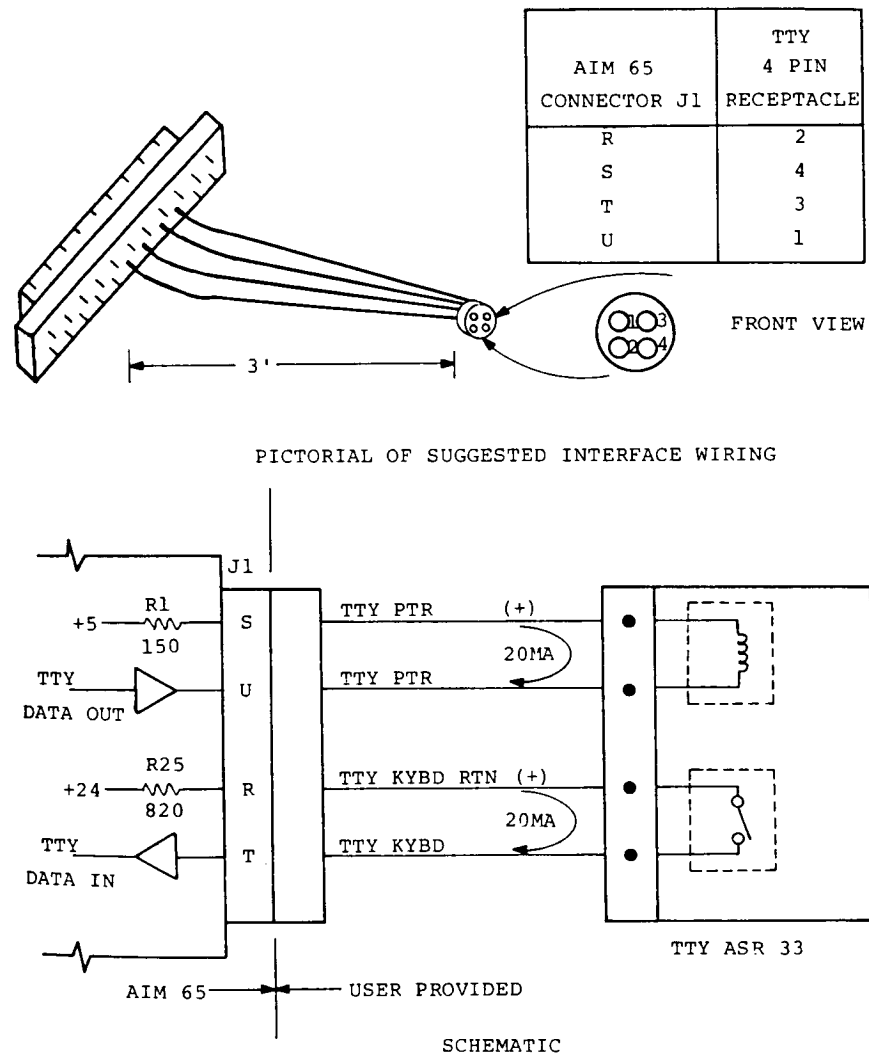


Figure 9-6. AIM 65 to TTY Connection

### 9.2.2 TTY Installation and Turn-On Procedure

1. Disconnect power from the TTY.
2. Configure the TTY for 4-wire, 20 mA current loop operation in full duplex mode per the TTY manufacturer's instructions.
3. Ensure AIM 65 power is turned off.
4. Connect the four TTY interface lines to the AIM 65 application connector (J1) per Figure 9-6.
5. Position the TTY control switch to OFF.
6. Apply TTY power.
7. Position the AIM 65 KB/TTY switch to KB.
8. Apply AIM 65 power. AIM 65 will display/print:

```
ROCKWELL AIM 65  
<
```

9. Position the AIM 65 KB/TTY switch to TTY.
10. Position the TTY control switch to LINE.
11. Press AIM 65 RESET button.
12. Type RUBOUT on the TTY. AIM 65 will print:

```
ROCKWELL AIM 65  
<
```

### NOTE

This step is important since AIM 65 adjusts automatically to the TTY data transmission rate in response to the typing of RUBOUT. Once the data rate is computed, keyboard control can be subsequently transferred between AIM 65 and TTY without use of the RESET and RUBOUT entries.

All AIM 65 Monitor and Editor features described in Sections 3, 4, and 5 are available. Consult the following sections for any differences in operation for specific TTY operations.

If the ROCKWELL AIM 65 message and prompt do not appear, the hookup is probably incorrect. Repeat Steps 1 through 12. If the problem persists, refer to the TTY troubleshooting procedure in Section 11.

### 9.2.3 AIM 65 to TTY Keyboard Transfer

If the AIM 65 Keyboard is active and it is desired to switch to TTY keyboard operation, one of two procedures may be followed:

1. To use a send-and-receive TTY for the first time after AIM 65 power is turned on:

- A. Position the KB/TTY switch to TTY.
- B. Depress the AIM 65 RESET button.
- C. Position the TTY control switch to LINE.
- D. Type RUBOUT on the TTY.

AIM 65 will respond by entering the Monitor and printing:

```
ROCKWELL AIM 65
<
```

The next keyboard entry should be made from the TTY keyboard.

2. If the TTY keyboard has previously been active since AIM 65 power turn on and the computed and stored TTY data transmission rate has not been altered:
  - A. Position the KB/TTY switch to TTY.
  - B. Type SPACE on the keyboard. Control will switch to the TTY keyboard. If control does not transfer to the TTY keyboard, press AIM 65 RESET and type RUBOUT on the TTY to enter and initialize the Monitor.
3. AIM 65 can be used to communicate with a terminal over the 20 ma. current loop or SERIAL IN lines at rates up to 9600 baud. If the terminal cannot transmit

the RUBOUT character, the baud rate must be manually entered into memory before setting the KB/TTY switch to TTY. The baud rate can be specified as follows:

<u>BAUD</u>	<u>CNTH30</u> <u>(\$A417)</u>	<u>CNTL30</u> <u>(\$A418)</u>	<u>MAXIMUM</u> <u>CHARACTERS/SECOND</u>
110	23	3F	10
150	19	B7	15
300	0C	C2	30
600	06	3F	60
1200	02	FD	120
2400	01	5D	240
4800	00	8D	240
9600	00	25	240

The 240 character/second rate limitation above is due to the following:

- When the KB/TTY switch is in the TTY position, up to 4 milliseconds are required to display the incoming character.
- When the KB/TTY switch is in the KB position, the rate is limited due to the time required to process the TTY keyboard or SERIAL IN characters, even though they are not displayed.

#### 9.2.4 TTY to AIM 65 Keyboard Transfer

To switch from the TTY keyboard to the AIM 65 keyboard:



1. Position the KB/TTY switch to KB.
2. Type the SPACE key on the TTY. Control will transfer to the AIM 65 keyboard. If control does not transfer to the AIM 65 keyboard, press AIM 65 RESET to enter and initialize the Monitor.

#### 9.2.5 TTY Keyboard Operation Differences

Since the AIM 65 and the TTY keyboards are nearly identical, the command and data entry procedures are essentially the same. There are minor differences, however, that must be considered to ensure proper operation.

##### Use of RUBOUT Key

The TTY RUBOUT or DEL key is used the same as the AIM 65 DEL key: to delete input characters. When the AIM 65 DEL is typed, the deleted character is erased from the display and the character input cursor backspaced one position. When used on a TTY, a slash character is printed to indicate character deletion.

##### Character Input Cursor

No character input cursor (^) is printed on the TTY; the TTY print head shows character input position.

##### Line Input Cursor

In the Editor Read R and Insert I commands, a line input cursor (\*) is printed to indicate the start of an input line.

##### Break/Escape

In some Monitor and Editor commands (see Table 2-5), the keyboard is sampled at the end of an output line to determine if ESC is typed for return to the Monitor. In these modes, the TTY BREAK key must be held down during the output processing until the output has ended. After releasing the BREAK key, ESC can then be typed to cause Monitor re-entry.

##### CAUTION

If the TTY hangs up in a local mode, TTY control can be returned to the AIM 65 Monitor by depressing AIM 65 RESET then TTY RUBOUT.

##### User Function Keys

To enter the user functions from a TTY, type the following keys:

	<u>AIM 65</u>	<u>TTY</u>
	<u>KEYBOARD</u>	<u>KEYBOARD</u>
User Function 1	F1	[
User Function 2	F2	]
User Function 3	F3	^

##### Print

The PRINT and CTRL PRINT functions are not available on the TTY keyboard.

### 9.2.6 Punching Paper Tape

Paper Tape may be punched by any AIM 65 command allowing output device code =L. These commands are:

<u>COMMAND</u>	<u>DATA TYPE</u>	<u>DATA FORM</u>
Monitor Dump Command D	Object	Hexadecimal
Editor List Command L	Text	ASCII
Assembler Object Code Output	Object	Hexadecimal

The following procedure can be used to punch paper tape using either the AIM 65 or the TTY keyboard :

1. Position the TTY control switch to LOCAL.
2. Depress the TTY tape punch ON button.
3. Type the TTY HERE IS key a few times to obtain about 8 inches of clean paper tape leader.
4. Press the TTY tape punch OFF button.
5. Position the TTY control switch to LINE.
6. Set up the AIM 65 command using either the AIM 65 or TTY keyboard until AIM 65 asks for the output device code:  
  
OUT=  
  
7. Press the TTY tape punch ON button.

8. If the AIM 65 keyboard is active, position the KB/TTY switch to TTY, then type L on the AIM 65 keyboard.

If the TTY keyboard is active, type L on the TTY keyboard.

The output will be punched on the TTY paper tape.

#### NOTE

If object code is being dumped, AIM 65 will ask MORE? at the end of the dump. Continue the dump by typing Y and responding to prompts; end the dump by typing N. Leave the punch on until the Monitor prompt < is displayed. The messages and prompts will be punched on the tape but will be ignored during subsequent load of object code.

9. Press the TTY tape punch OFF button.
10. Position the TTY control switch to LOCAL.
11. Press the TTY tape punch ON button.
12. Type HERE IS a few times to punch clear trailer tape containing only sprocket holes.
13. Press the TTY tape punch OFF button.

### 9.2.7 Reading Paper Tape

Punched paper tape may be read by any AIM 65 command allowing input device code =L. These commands are:

<u>COMMAND</u>	<u>DATA TYPE</u>	<u>DATA FORM</u>
Monitor Load Command L	Object	Hexadecimal
Editor Read Command R	Text	ASCII
Assembler Source Code Input	Text	ASCII

The following procedure can be used to read punched paper tape using either the AIM 65 or the TTY keyboard:

1. Set up the AIM 65 command using either the AIM 65 or the TTY keyboard until AIM 65 asks for the input device code:

IN=

2. Position the paper tape in the TTY tape reader with the clear leader over the read head.
3. If the AIM 65 keyboard is active, position the AIM 65 KB/TTY switch to TTY, then type L on the AIM 65 key board.

If the TTY keyboard is active, type L on the TTY keyboard.

4. Start the TTY tape reader.