Quick Printer II

Catalog Number 26-1155

Radio Shack

TRS-80 MICRO COMPUTER SYSTEM

HARDWARE
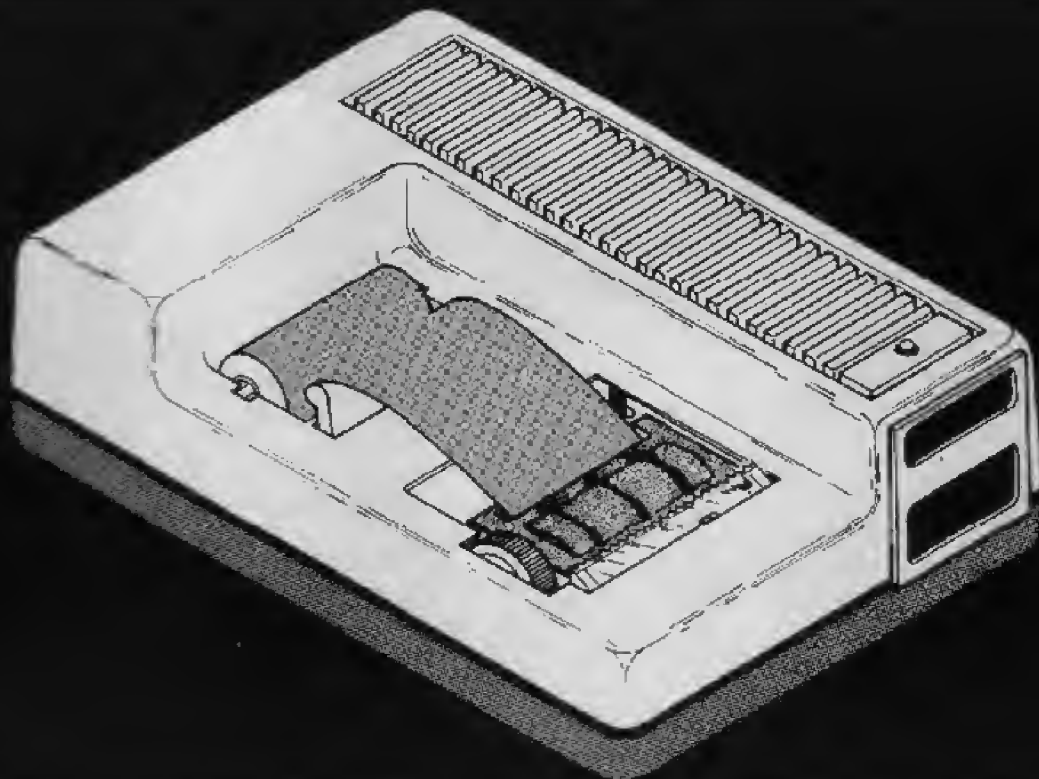
Congratulations for selecting this Radio Shack computer product!

The Quick Printer II is a compact, affordable and extremely versatile line printer. You can connect it directly to the TRS-80, to the Expansion Interface via an optional cable, or to a serial (RS-232C) output unit. A built-in microprocessor controls the Printer and communicates with the output device (TRS-80 or other Computer, etc.).

Other exceptional features include:
- Upper and lower case characters
- Software selectable 16 and 32 characters/line printout
- Switch-selectable inputs: TRS-80, TRS-80 Expansion Interface, or Serial Interface
- ON-LINE/BUSY/RESET Switch
- Automatic "wrap-around" when text exceeds maximum line length — no lost data due to overflow
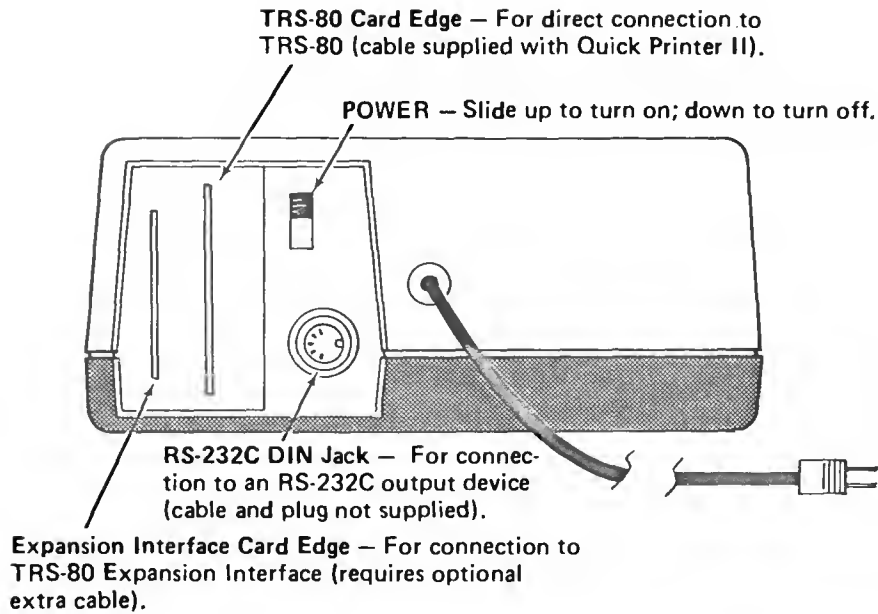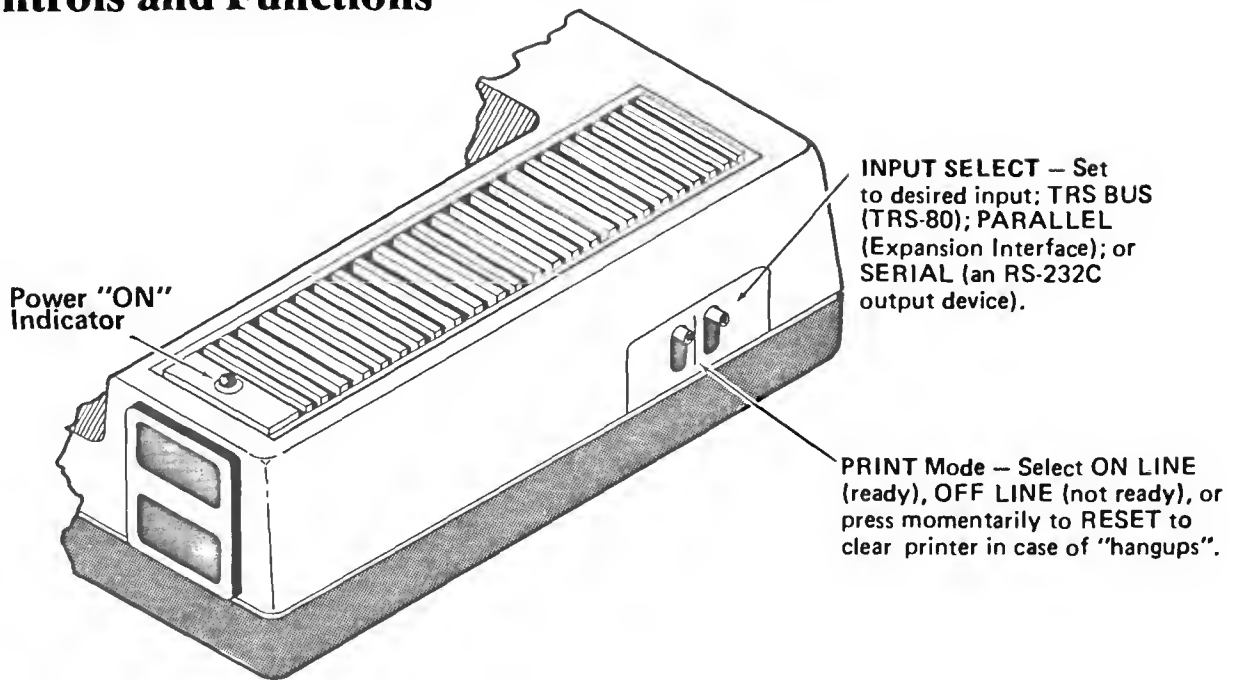
Note: The Quick Printer II is supplied with a cable for connection to the TRS-80. For connection to the TRS-80 Expansion Interface, you need to buy an optional extra cable, Catalog Number 26-1406.

Contents

Controls and Functions

INPUT SELECT — Set to desired input; TRS BUS (TRS-80); PARALLEL (Expansion Interface); or SERIAL (an RS-232C output device).

Power "ON" Indicator

PRINT Mode — Select ON LINE (ready), OFF LINE (not ready), or press momentarily to RESET to clear printer in case of "hangups".

TRS-80 Card Edge — For direct connection to TRS-80 (cable supplied with Quick Printer II).

POWER — Slide up to turn on; down to turn off.

RS-232C DIN Jack — For connection to an RS-232C output device (cable and plug not supplied).

Expansion Interface Card Edge — For connection to TRS-80 Expansion Interface (requires optional extra cable).

Paper Loading Instructions

Try not to touch the shiny surface of the paper — hold it by the edges instead. Fingerprints mar the printing surface and cause uneven printing.

1. Put the paper spindle into the paper roll as shown in Figure 1, so the narrow end of the spindle is on the right and the paper feeds downward from the back, with the shiny side down.
2. Mount the larger end of the spindle in the larger slot, and the narrow end into the smaller slot on the other side of the paper compartment.
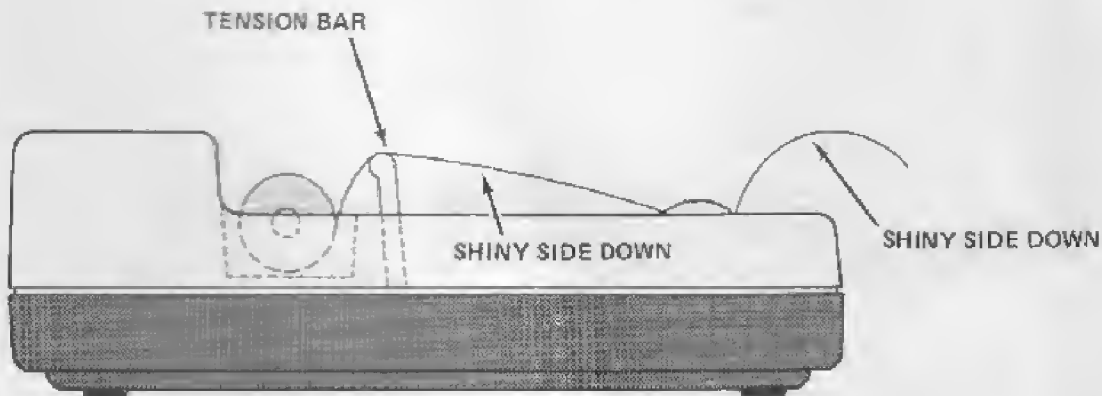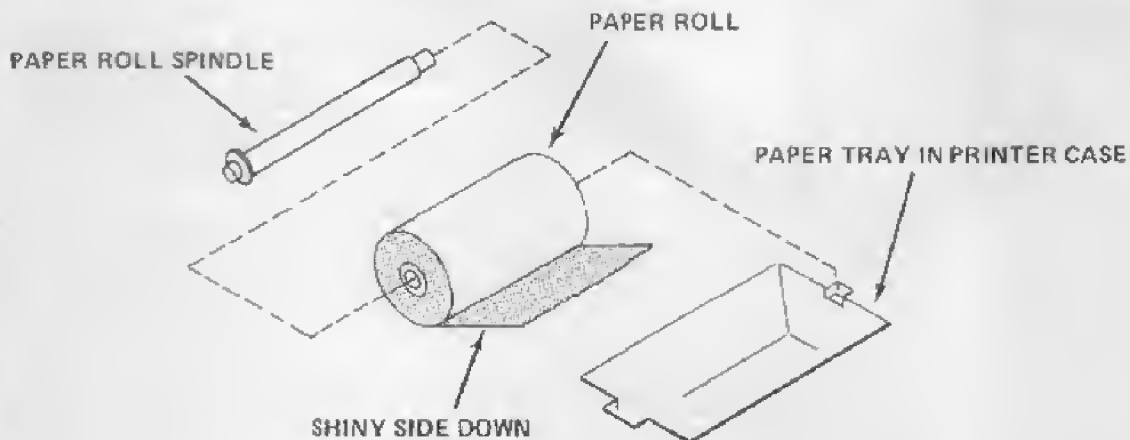
PAPER ROLL

PAPER ROLL SPINDLE

PAPER TRAY IN PRINTER CASE

SHINY SIDE DOWN

TENSION BAR

SHINY SIDE DOWN

SHINY SIDE DOWN

Figure 1.   Inserting the paper roll.

3. Unroll about six inches of paper, and guide the leading edge of the paper over the tension bar and down into the feed gate (Figure 2). Rotate the paper-feed wheel until the paper comes up behind the print mechanism and the paper cutter edge.

PAPER
GUARD

PRESS FORWARD TO
RELEASE PAPER

PAPER FEED GATE
INSERT PAPER HERE
SHINY SIDE DOWN

PAPER
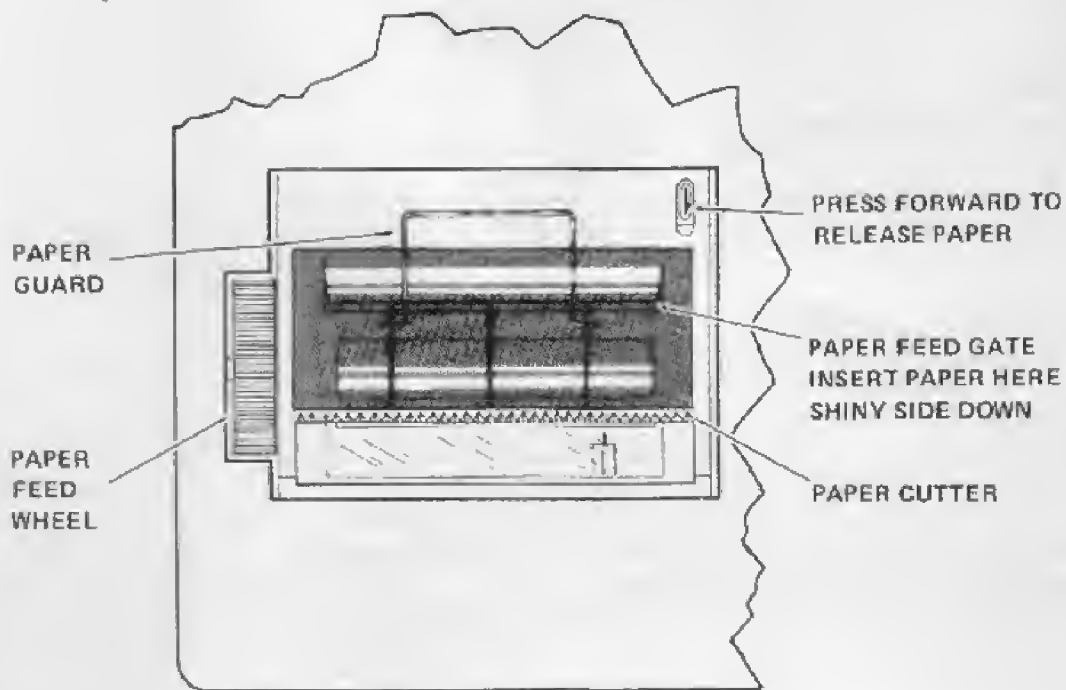FEED
WHEEL

PAPER CUTTER

Figure 2.   Detail of paper motion mechanism.

To Remove the Paper Roll:

Press and hold the paper release lever forward, and rotate the roll backwards until the leading paper edge is free of the paper drive wheel.

Connection

You can connect the Quick Printer II directly to the TRS-80 card-edge; to the TRS-80 Expansion Interface Line Printer card-edge; or to another device equipped with an RS-232C Interface. There is a separate input jack for each of these options, and a switch to tell the Printer which input you want to use.

To a TRS-80

1. Turn off both the Printer and the TRS-80.
2. Load printer-paper.
3. Plug the Printer power cord into a source of 120 VAC, 60 Hz power. Notice that the Printer has a "safety" plug with a built-in ground to help assure reliable operation. Do not defeat this ground.
4. Slide **INPUT SELECT** to TRS BUS position.
5. Notice there are two card-edges at the back of the Printer. Connect the two-foot cable supplied with the Quick Printer II to the wider of these two card-edges, as shown in Figure 3. Be sure the flat cable exits from the left of the card-edge connector.
6. Remove the Expansion Port door from the left rear of the TRS-80 to expose the TRS BUS card-edge. Mate the other end of the two-foot cable onto this card edge, making sure that the flat cable exits from the bottom of the connector. See Figure 3.
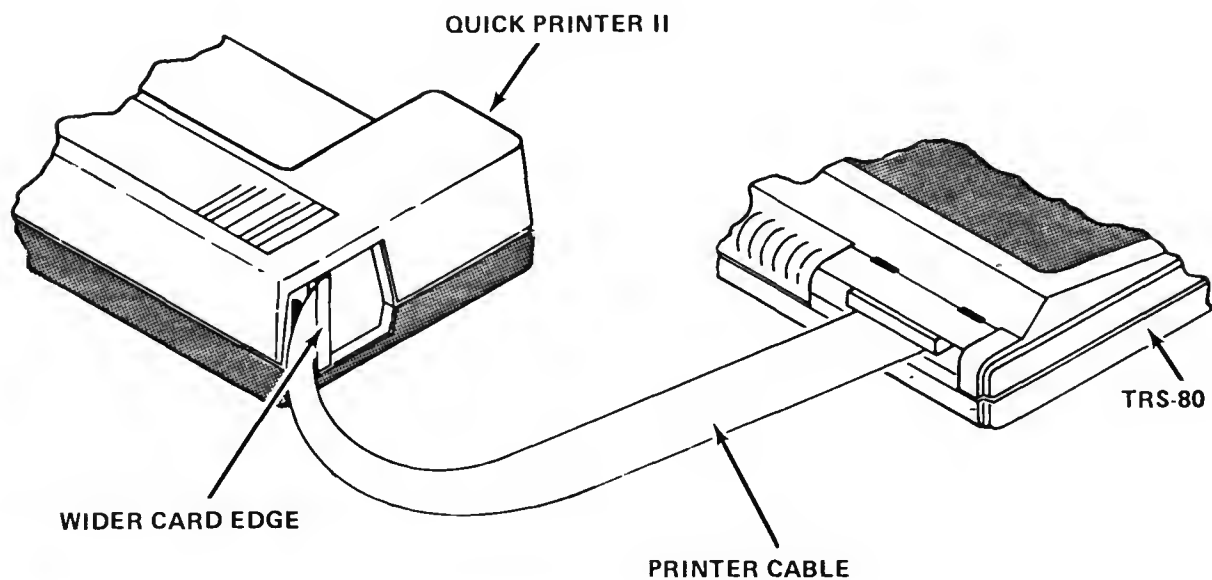7. Before turning on your system, read the Operation Section later on.

Figure 3.   Connection to TRS-80 Card-Edge

To a TRS-80 Expansion Interface

Note: To make this connection, you'll need an optional extra cable, Catalog Number 26-1406.

1. Turn off both the Printer and the TRS-80.
2. Load printer-paper.
3. Plug the Printer line cord into a source of 120 VAC, 60 Hz power. Notice that the Printer has a "safety" plug with a built-in ground to help assure reliable operation. Do not defeat this ground.
4. Slide **INPUT SELECT** to the PARALLEL position.

5. Notice there are two card-edges at the back of the Printer. Connect the special Quick Printer II/Expansion Interface cable to the narrower of these two card-edges, as shown in Figure 4. Be sure the flat cable exits from the left of the card-edge connector.
6. Connect the other end of the special cable to the Line Printer card-edge, making sure the flat cable exits from the bottom of the connector. See Figure 4.
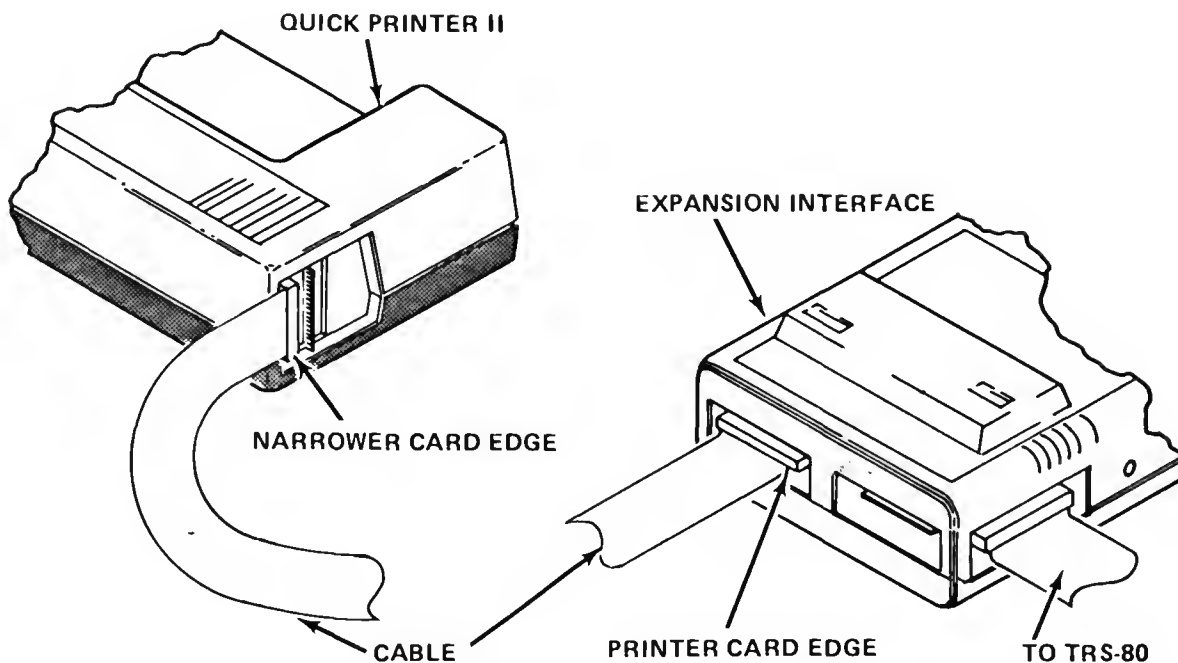7. Before turning on your system, read the **Operation** Section later on.

**Figure 4.** **Connection to TRS-80 Expansion Interface Printer Card Edge.**

To a Serial Output Device

Cable Assembly
You will need to assemble a special three-wire cable to make this
connection. Attach a DIN plug to one end for connection to the
Quick Printer II and connect as follows:

Pin #	Signal	Function
4	CLEAR TO SEND (LP output)	Handshake
5	DATA (input to LP)	Serial data input
2	GND	Ground to System Common

GROUND
2
DATA—5   4—CLEAR TO SEND
NOT USED—3   1—NOT USED
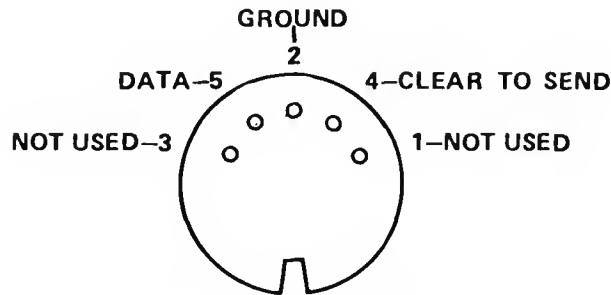
(Viewed from end of plug)

Connection

1. Turn off both the Printer and the Serial Device.
2. Load printer-paper.
3. Plug the Printer line cord into a source of 120 VAC, 60 Hz power.
   Notice the Printer has a "safety" plug with a built-in ground to
   help assure reliable operation. Do not defeat this ground.
4. Slide INPUT SELECT to SERIAL position.
5. Attach your custom-made connector to the DIN jack on the rear
   of the Printer, below the POWER switch. Connect the other end
   of the cable to your serial output equipment.
6. Before turning on the system, read the Sections, Operation and
   Using with a Serial Interface, later on in this manual.

Power-On/Power-Off Sequence

If you turn the Printer on or off while the Computer is on, the Computer may "lock up" (the keyboard may appear "dead", the Computer may lose any BASIC program in memory, etc.).

To avoid this problem, always turn on your Expansion Interface (if connected) first, then the Printer, and lastly, the TRS-80 (or other serial output device).

For the same reason, do not turn off the Printer until you are through using the Computer.

(The Quick Printer II is a solid-state device with no moving parts, except during actual printing. So you don't need to worry about leaving it on during an entire session with the Computer — when it is not printing, the unit is totally silent and consumes very little power.)

Power-Up Messages

When you have everything connected, turn on the Printer by sliding the **POWER** switch up to the ON position. When you first turn it on, the Printer will display a ready message to assure you that it is connected properly and that its built-in microprocessor has everything "under control".

The message also tells you which input you have selected.

R》》》》》》》 PRINTER READY ‹‹‹‹‹‹‹S

indicates you have selected the Radio Shack TRS BUS input.

E》》》》》》》 PRINTER READY ‹‹‹‹‹‹‹]

indicates you have selected the Expansion Interface input.

S》》》》》》》 PRINTER READY ‹‹‹‹‹‹‹]

indicates you have selected the Serial Interface input.

You are now ready to turn on the rest of your system and use the Quick Printer II.

Using the PRINT Mode Switch

The PRINT mode switch has three positions: ON LINE, OFF LINE and RESET, which is a momentary-contact position. Set this switch to ON LINE. Now the Quick Printer II will accept output from the Computer and print it out, one line at a time.

ON LINE/OFF LINE. To interrupt the Printer at any time — even if it is in a print cycle — without losing data, select the OFF LINE setting. The Printer will complete any line it's printing, and then stop. It will tell the Computer, "I'm busy — don't send any more until I'm ready again."

To continue printing, return the PRINT switch to the ON LINE position.

RESET. To RESET the Printer, press the PRINT switch momentarily to the RESET position (down) and release it. This re-initializes the Printer, without requiring you to turn off the system. There are several situations when you may need to Reset the Printer:

- If for any reason you change the INPUT SELECT setting while the Printer is on, you will need to Reset the Printer to re-initialize it for the new input. After Reset the Printer will come back with another ready message.
- If you simply want to check the INPUT SELECT setting.
- If the Printer's built-in microprocessor ever gets "lost" due to a temporary loss of power or a severe brownout, use RESET to get it on track again. (Of course, any characters currently in the print buffer will be lost.)

Output to the Quick Printer II

The simplest way to drive the Quick Printer II is with LEVEL II BASIC LPRINT and LLIST statements. See the *LEVEL II BASIC Reference Manual* for details.

The Quick Printer II doesn't print each character as it is received — it waits until it has received an entire line and then prints. That's why it's called a line printer instead of a character-printer. Each line can contain up to 32 characters. (There's also a 16-character/line mode, described later under Special Features.)

If the line you are printing exceeds 32 characters, the Quick Printer II will automatically wrap-around to the next line, so no data will be lost.

Note: While entering and running programs which output to the Quick Printer II, it will help to put the Video Display in the 32-character/line mode (**SHIFT ▪**). That way, the lines you see on the Display correspond to what will be LPRINTed or LLISTed.

Special Features

Double-Size Mode (16-characters/line)
For special effects like titling pages, printing headings, etc., you can switch the Printer to a double-size mode. In this mode, each line can contain up to 16 characters.

To switch to the double-size mode using LEVEL II BASIC, simply include CHR$(15) as the first item in your LPRINT list. For example:

```
10 LPRINT CHR$(15) "FAT LETTERS"
```

will produce the following printout:

```
FAT LETTERS
```

Note: This will only work if the Printer's holding buffer has been cleared by execution of a carriage return. If the buffer already contains some data, the CHR$(15) will be ignored.

If you have LPRINTed something with a trailing comma or semi-colon, the buffer won't be printed until it is filled. In such a case LPRINT CHR$(15) may not put the code at the beginning of the buffer. It will *always* be first if you precede it with an LPRINT " " statement. More later . . .)

When the Printer finishes printing the double-size line, it automatically switches back to the 32-character mode so it will be ready to print a regular 32-character line. Later on, we'll show you how to print long messages in the double-size mode.

Only 16 characters at a time can be printed in the double-size mode. If you exceed 16 characters, the printer automatically wraps around to the next line and reverts to the 32-character/line mode.

Note: LLIST always uses the 32-character/line mode.

For details on using the double-size mode (e.g., how to print long messages in the double-size mode), see Control Codes, later on.

Lower Case Characters

Although the Quick Printer II cannot produce the TRS-80 Video graphics characters, it *can* produce both upper and lower case letters, plus many other symbols. See Printable Characters for a complete listing.

Here are a couple of ways to use this capability from LEVEL II BASIC.

1. You can enter the lower-case characters from the keyboard when you are setting up messages and values to be LPRINTed. Even though the Display will show a capital letter, it will be stored in memory as lower-case.

   To enter a lower case character from the keyboard, hold down **SHIFT** key while hitting the key (just the opposite from a normal typewriter).

   For example, type in the following line, holding down the **SHIFT** key wherever you want a lower-case letter:

   ```
   100 LPRINT"Press SHIFT for l.c."
   ```

   You will see the lower case letters when you LLIST the line, or when you RUN it — even though the line appears on the Display as all capitals.

2. You can LPRINT the ASCII codes for the lower case characters, using the CHR$ function. For example:

   ```
   100 FOR I% = 97 TO 122
   110    LPRINT CHR$(I%);" ";
   120 NEXT
   ```

Note: Be careful about using lower-case letters outside of quotes in your BASIC programs. There are some cases where this will produce a hard-to-find syntax error. For example, the statement,

```
100 PRINT@120, "HI"
```

won't work if you used a **SHIFT** –@ instead of a simple @.

Details of Operation

The Quick Printer II stores characters for printing until one of two things happens:

1. Its 32-character holding buffer is filled
2. It receives a carriage-return code (hexadecimal 0D)

When (1) or (2) occurs, the Printer prints out the contents of its 32-character buffer. If the buffer is empty when the carriage return is received, the Printer simply advances the paper one line, leaving a blank line in the printout.

Control Codes

According to the American Standard Code for Information Interchange (ASCII), there are 32 control codes in addition to the codes for the printable characters. (Control codes are sent as data, but the receiving device interprets them as abbreviated "instructions", communications-status messages, etc.)

The Quick Printer II will recognize two of these control codes:

Function	Code Hex	Decimal
Carriage Return	0D	13
SHIFT IN (16 char/line)	0F	15

It will ignore all other control codes.

Note: To output a control code from LEVEL II BASIC, use the CHR$ function, as follows:

```
100 LPRINT CHR$(13)
110 LPRINT CHR$(15)
```

Whenever a carriage-return code is received, the Printer will print out the current contents of its holding buffer, then clear the buffer to get ready for the next line of data.

For example, you can force several carriage returns with a single LPRINT statement as follows:

```
100 LPRINT"1 2 3"CHR$(13)"------
```

will produce:

```
1 2 3
------
```

The Shift In code tells the Printer to switch to the 16-character/ line format. It must be the first code received by the Printer after a carriage return, otherwise it will be ignored.

This means that you cannot mix the normal and the double-size characters on the same line. Once you select the double-size, the Printer will remain in that mode until . . .
A) It has printed 16 characters
or
B) It reaches the end of the line
whichever comes first.

One way to print long messages in the double size mode with BASIC LPRINT statements is to insert CHR$(13) CHR$(15) pairs in the LPRINT list every 16th character or so. For example:

```
100 DB$=CHR$(13)+CHR$(15)
110 LPRINT DB$"THIS IS GOING"DB$
"TO BE A"DB$"LONG MESSAGE"
```

Printable Characters

The Quick Printer II can produce all ASCII characters from hex $2\emptyset$ through hex 7F (decimal 32 through 127). Here's what they look like:

```
    !  "  #  $  %  &  '
 (  )  *  +  ,  -  .  /
 0  1  2  3  4  5  6  7
 8  9  :  ;  <  =  >  ?
 @  A  B  C  D  E  F  G
 H  I  J  K  L  M  N  O
 P  Q  R  S  T  U  V  W
 X  Y  Z  ↑  ↓  ←  →  _
 '  a  b  c  d  e  f  g
 h  i  j  k  l  m  n  o
 p  q  r  s  t  u  v  w
 x  y  z  {  |  }  ~  ▓
```

Note that four of the codes are different from the usual ASCII character set.

Hex Code	Dec. Code	ASCII char.	Quick Printer II char.
5B	91	[	↑
5C·	92	\	↓
5D	93	]	←
5E	94	^	→

The arrows are more useful since they correspond to the TRS-80's Video Display character set.

Assembly Language Output from a TRS-80

Here's a subroutine to output a single byte to the Quick Printer II.
Load the data byte in ASCII into the A-register, then call the
subroutine. To force a carriage return, load register A with hex OD.

```
PRTDVR LD   A,(37E8H) ;STATUS
       AND  0F8H      ;MASK
       CP   38H       ;BUSY?
       JR   PRTDVR    ;IF YES
       LD   A,C       ;SEND-IT
       LD   (37E8H),A
       RET            ;RETURN
```

Using with a Serial Output Device

RS-232C Setting

Set up your Serial Output equipment as follows:

Transmission rate: 600 baud

Error/checking and **parity**, choose one of the following:
A. 7-bit data, even or odd parity, one or two stop bits
B. 7-bit data, no parity, two stop bits
C. 8-bit data, no parity, one or two stop bits

Note: Quick Printer II does not test for parity errors.

In the Serial Interface mode, the Quick Printer II's built-in microprocessor receives data and converts it into seven-bit ASCII codes (the eighth bit is always set to zero). These codes are then processed as follows:

If it's a carriage-return code, the printer will print out contents of the holding buffer (actually a stack). If the character is a Shift In (hex 0F), and the holding buffer is empty, the Printer will convert to double-size mode (16-character/line). All other control codes are ignored.

If it's a printable-character, the Printer will put it in the holding buffer. When the buffer is full, the Printer will print out the line currently in the holding buffer.

Since the microprocessor also controls the Printer mechanism, it cannot receive data during a print cycle. During this period, the CLEAR TO SEND output serves as a busy indicator to the serial device.

Many output devices will continue to send data after receiving a busy (CLEAR TO SEND=Mark) indication from the Printer. The Quick Printer II is programmed to accept one "extra" word so it won't be lost.

However, if the output device sends more than one word after CLEAR TO SEND=Mark, these extra words will be lost. Some other output devices are not equipped to recognize a CLEAR TO SEND signal at all.

In both the preceding cases, you must write a driver routine which gives the Quick Printer II time to process each byte and to print out each line.

Details of the Quick Printer II Handshake

Assume that you have just reset the Printer, and that it is in the
Serial Interface mode. When the built-in microprocessor (CPU)
receives a valid start bit, it assembles the first word of serial data.
After a stop bit has been received, CLEAR TO SEND will go from
Space (positive) to Mark (Negative). The word just assembled is
temporarily stored, and a timer is started. Then one of two things
happens:

A. If another start bit is recognized within 2∅.5 milliseconds, this
   next character will also be assembled. After the stop bit of the
   second character is received, the second word is temporarily stored
   and the first word is retrieved and processed. Then the second
   word is retrieved and processed, and CLEAR TO SEND is set to
   Space (not busy).

B. If another start bit is not recognized within 2∅.5 mS after the first
   character is stored, the CPU will simply process the first character
   as described above, and set CLEAR TO SEND=Space.

See Figure 5 for a simplified flow chart of this handshake
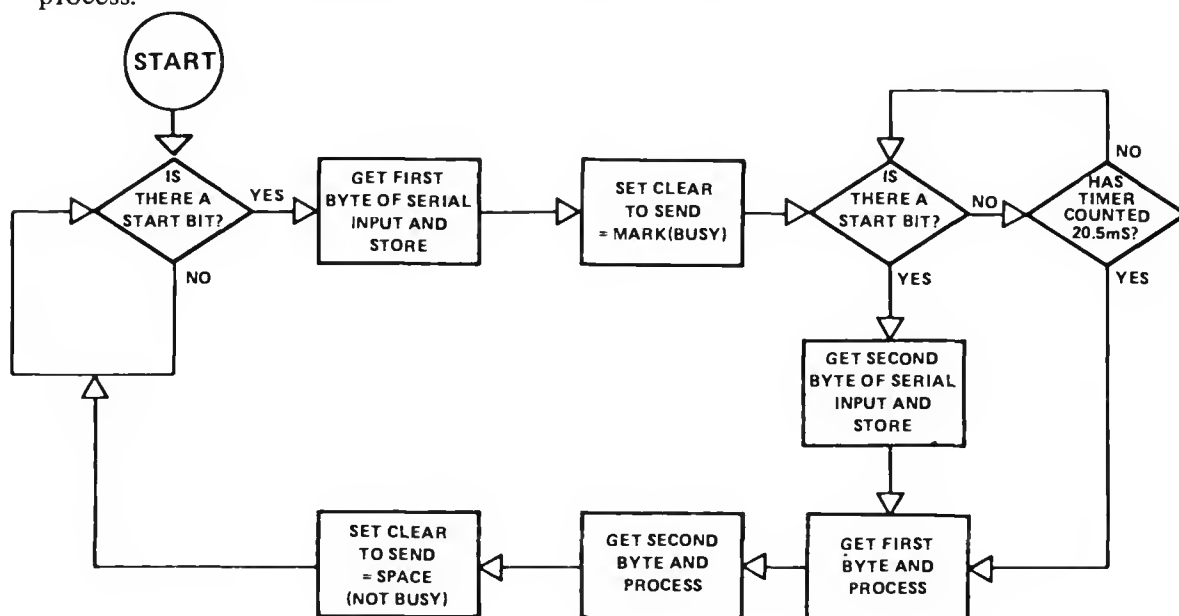process.

Figure 5. Quick Printer serial input routine to allow for one "extra" byte of data

If You Have Problems

We hope you don't . . . but just in case . . . see if you can solve them
by using the table below. If you can't, then try to determine which
component in your system is at fault, and bring it into your local Radio
Shack for repair. We'll have it back ASAP!

Problem	Probable Causes/Solutions
TRS-80 won't operate	Cable on upside down or Printer power is OFF. Check connection and power switches. Power-up again according to Power-Up Sequence.
TRS-80 okay, but won't line-print	Cable not attached; wrong INPUT selected; Printer OFF LINE; Printer power is OFF. Check connection and all control and power settings.
Printer runs continuously	Cable on upside down; wrong INPUT selected; Printer's microprocessor is "lost". Check connections and control settings, and Reset the Printer.
Printer okay, but paper won't advance	Paper jammed. Remove and reload paper (see Loading the Paper)
Many errors in Serial Interface mode	Improper connections; bad safety ground. Check the wiring to your DIN plug, and ensure the Printer is grounded at the power cord.
Printer characters are too light	Paper contaminated — remove a short length of it. Print head dirty — clean it (see instructions later on).
Prints broken characters (missing dots) or extra dots and lines	Print head shorted — clean it.

Care and Maintenance

The Quick Printer II requires very little maintenance. Simply treat it with the same care you'd give any electro-mechanical device — avoid physical shocks; keep it dry, etc.

The printer mechanism requires no lubrication.

If the print-quality deteriorates, you probably need to clean the print head. Remove the paper cutter (slide it to the left and lift it off). With small, fine brush, remove any debris from the print head. Replace the paper cutter.
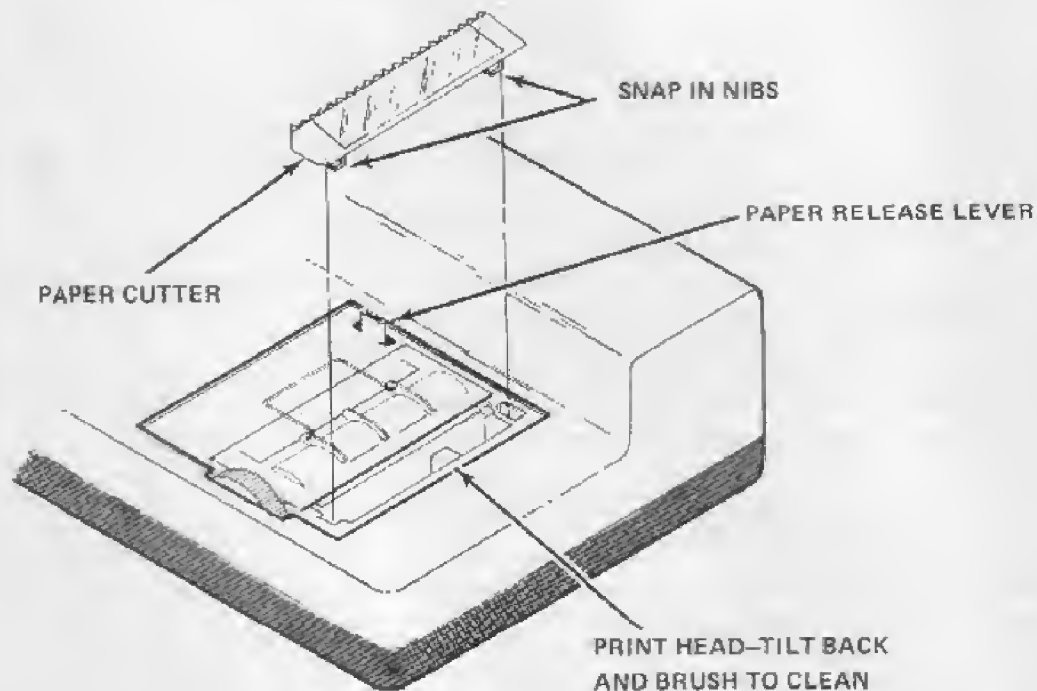
SNAP IN NIBS

PAPER RELEASE LEVER

PAPER CUTTER

PRINT HEAD—TILT BACK AND BRUSH TO CLEAN

Figure 6. Removing the paper cutter

Specifications

Printing Speed	120 lines per minute 64 characters per second
Characters per Line	32 or 16 (software selectable)
Character Form	5 x 7 dot matrix
Vertical Spacing	6 lines per inch
Horizontal Spacing	18 or 9 characters per inch (software selectable)
Print Head Life	30 million characters
Character Set	Modified Subset of ASCII, 96 characters with upper and lower case
Interfaces	TRS BUS (direct to TRS-80) Expansion Interface (26-1140) Serial (RS-232C) Device, 600 baud
Temperature Ranges Operating Storage	 23° to 122° F/-5° to +50° C −40° to 176° F/-40° to +80° C
Paper	Aluminum-coated, Radio Shack Catalog Number 26-1412
Size	3-5/16" x 6-3/4" 9-1/4" 8.4 cm x 17.2 cm x 23.5 cm (HWD)
Power Requirements	120 VAC, 60 Hz

Schematic Diagram

Addendum for the
TRS-80 Quick Printer II
Catalog Number 26-1155

Figure 8, Schematic Diagram on page 35 is in error. The corrections have been made as indicated below:
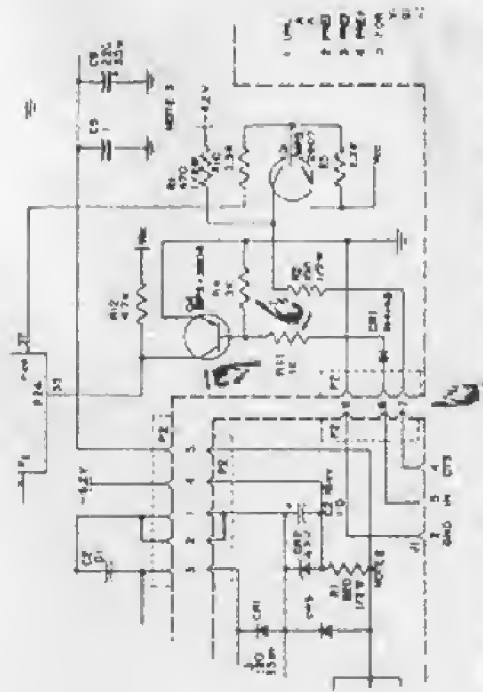
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