3. Tests the result of 2 above. If it is less than zero, the main loop is done and the program branches to the second loop.

4. Complements the direction bit saved in 1 above and combines it with the new delta of 2 above.

5. Sets a time limit for the carriage travel.

6. Outputs the delta of 4 above.

7. Tests position mode. If true, goes to step 1.

8. Tests the elapsed time. If it is over the value set in 5 above, sets bit light value and jumps to error routine (described later).

9. Tests if check occurred. If so, sets bit light value and jumps to error routine.

10. Jumps to step 7.

Initialization for the main loop is with the first carriage delta value and a jump to step 5.

After successfully completing the main loop, the program outputs a carriage delta which should send the carriage almost to home position, initializes a 1/2 step counter, and then jumps into the second loop at step 2. The second loop:

1. Outputs a hexadecimal 1001 (1/2 step left) to the carriage delta counter.

2. Tests for carriage position mode and carriage limit. If both are true, exists loop. If not in position, repeats this step.

3. If in position mode but not at limit, decrements 1/2 step counter and tests it. If it is not zero, jumps to step 1.

4. If the 1/2 step counter is at zero, sets bit light pattern and jumps to error routine.

After completing the second loop, the 1/2 step counter is tested. If it is at the value it was initialized to, the bit light pattern is set and program jumps to error routine. The carriage should not be at the limit on the 'home'.

IMPORTANT: Notice that the second loop does not test for a check condition. After passing the first loop without a check, the chances of having a check in the second loop are remote. A check in the second loop will "hang up" the test, and the bit lights will not be relevant. Furthermore, the CONTINUE button will not be operative.

PRINTWHEEL TEST

This test also has two program loops, of which the second loop is the main one.

The first loop does one thing--send the printwheel to the index. It does this by testing whether the printwheel is in position 00, outputting a hexadecimal 01 to the printwheel delta counter if it is not at the index, briefly waiting, and then jumping to the beginning of the loop.

IMPORTANT: If the printwheel absolute position counter is faulty, the printwheel may not stop and will "hang up" at this point in the test. The bit lights will not be relevant if this happens and the CONTINUE button will not be effective.

After completing the first loop (not necessarily proving that the printwheel is really at the index), the program initializes the first printwheel delta value and the first value of the software-controlled printwheel absolute position counter and jumps into the main loop at step 7. The main loop:

1. Removes and saves the direction bit from a RAM register containing the last printwheel delta output to the printwheel delta counter.

2. Subtracts a constant from the resulting delta magnitude of 1 above.

3. Tests the result of 2 above. If it is less than zero, the main loop is done and the program branches to the final operation in this test.

4. Complements the direction bit saved in 1 above.

5. Updates the software-controlled printwheel absolute counter using the new delta in step 2 and based on the direction bit in 4 above (either adds or subtracts the delta to/from the counter).

6. Combines the new direction with the new delta.

7. Sets a time limit for the printwheel motion.

8. Outputs the delta of 6 above to the printwheel delta counter.

9. Checks for printwheel position mode. If false, tests elapsed time. If not over the value in 7 above, repeats this step. Otherwise, sets bit light pattern and branches to error routine (described later).

10. In position mode, the printwheel absolute position counter is input and compared to its software-controlled counterpart. If the two counters are not equal, sets bit light pattern and branch to error routine.

11. Jumps to step 1.

Following successful completion of the main loop, the program outputs a printwheel delta that should send the printwheel to the index. The index is tested after position mode is established and short delay. If the printwheel is not at the index, the bit light pattern is set and the program jumps to the error routine.

Another Restore is performed at this point to initialize the carriage to home, and to initialize the RAM registers for main printer program use for the following test.

PAPER FEED TEST

This test uses the main printer program. Just prior to the command input part of the main program, the program branches to the diagnostic program if the Micro 3 ActivityMonitor is connected. The diagnostic then loads a printwheel or a paper feed command into the next available position in the software input buffer, tests the buffer to see if it is full, and sets an appropriate 'comeback code'. The diagnostic then jumps to the point in the main printer program which is just after where it stores a command into the software input buffer.

As long as the 'comeback code' is not a buffer full type, the above happens and the main program executes the commands in the buffer as though they came in through the external I/O interface.

When the software input buffer is full, the diagnostic ceases to load it until it becomes empty so it can adjust buffer pointers. It does this because four bytes at the end of that buffer are used by the diagnostic program.

The result of the paper feed test is a vertical printing of SELF TEST produced by a series of complex combinations of printwheel and paper feed commands. If the printer is working satisfactorily, the printing is reasonably evenly spaced (allowing for paper slippage) and spelled as above.

At the beginning of this test the ribbon should lift. It is <u>not</u> dropped at the conclusion of this test but is dropped at the beginning of the diagnostic. During the test, take note of the ribbon feed operating just prior to the printing of each letter.

IMPORTANT: This test has no internal checks and does not stop if a malfunction occurs. The results are seen during and after the test as mentioned above.

ERROR ROUTINE

This routine is used for all <u>tested</u> error conditions. Just before the program branches to it, it sets the bit light pattern to be displayed in the bit lights for the identification of the error, and it also sets the address of where the program may jump when the CONTINUE button is depressed. The routine displays the bit light pattern, delays, tests the CONTINUE button, and either branches to the address set if it was depressed, or branches back to the beginning of the error routine.

In the case of the ROM Test and the I/O Lines Test, the address set is the error routine so the CONTINUE button is not effective. In the Carriage Test it is the start of the Printwheel Test, and in the Printwheel Test it is the start of the Paper Feed Test.

TEST POINTS

The following three pages list the signals that are found on the printed circuit board test points. The lists are organized by printed circuit board numbers in numberical order.

SPRINT MICRO 3 PCB #1 TEST POINTS

TEST POINT	SIGNAL NAME
1	"AP" (A sine wave positive peak)
2	"$\overline{A}$" (Inverted A sine wave)
3	"A" (A sine wave)
4	"A SUM"
5	AMPLITUDE COMPENSATION
6	"$\overline{A}$P" (Inverted A sine wave positive peak)
7	"$\overline{B}$" (Inverted B sine wave)
8	"B" (B sine wave)
9	POSITION COMPENSATION
10	VELOCITY REFERENCE (TACHOMETER)
11	COMMAND VELOCITY STAIRCASE
12	"$\overline{B}$P" (Inverted B sine wave positive peak)
13	"BP" (B sine wave positive peak)
14	not used
15	"B SUM"
16	"Z THRESHOLD"
17	CAM DRIVER
18	CURRENT WAVEFORM
19	$\overline{\text{CA POS}}$
20	not used

SPRINT MICRO 3 PCB #2 TEST POINTS

TEST POINT	SIGNAL NAME	TEST POINT	SIGNAL NAME
1	TEST CONT (Self Test)	18	$\overline{B1}$ (I/O BUS)
2	DIAG (Self Test)	19	I/O PORT 0 Bit 0
3	+5 VDC	20	I/O PORT 0 Bit 1
4	GROUND	21	I/O PORT 0 Bit 2
5	WRITE CLOCK	22	I/O PORT 0 Bit 3
6	GROUND	23	I/O PORT 4 Bit 7
7	MASTER CLOCK (2 MHz)	24	not used
8	DIAG RST (Self Test)	25	not used
9	I/O PORT 0 Bit 6	26	I/O PORT 5 Bit 1
10	I/O PORT 0 Bit 5	27	I/O PORT 4 Bit 6
11	$\overline{OP4}$ (Output 4)	28	$\overline{START}$ T2
12	$\overline{B6}$ (I/O BUS)	29	not used
13	$\overline{B7}$ (I/O BUS)	30	not used
14	I/O PORT 0 Bit 7	31	GROUND
15	$\overline{B4}$ (I/O BUS)	32	$\overline{B2}$ (I/O BUS)
16	$\overline{B5}$ (I/O BUS)	33	$\overline{B3}$ (I/O BUS)
17	$\overline{B0}$ (I/O BUS)		

SPRINT MICRO 3 PCB #3 TEST POINTS

TEST POINT	SIGNAL NAME
1	AMPLITUFE COMPENSATION
2	PWM DRIVE
3	"$\overline{A}$P" (Inverted A sine wave positive peak)
4	"AP" (A sine wave positive peak)
5	CURRENT WAVEFORM
6	"PWM BASE"
7	"$\overline{A}$" (Inverted A sine wave)
8	"A SUM"
9	COMMAND VELOCITY STAIRCASE
10	POSITION COMPENSATION
11	$\overline{\text{PW POSITION}}$
12	"B" (B sine wave)
13	"$\overline{B}$" (Inverted B sine wave)
14	VELOCITY REFERENCE (TECHOMETER)
15	not used
16	"BP" (B sine wave positive peak)
17	"B SUM"
18	"Z THRESHOLD"
19	-5 VDC (Regulated)
20	"BP" (Inverted B sine wave positive peak)
21	"$\overline{\text{PW INDEX}}$"
22	"PWM"
23	"A" (A sine wave)
24	not used
25	not used

SPRINT MICRO 3

MICRO I/O ROUTINE

A Sprint Micro 3 PCB #2 is a microcomputer, dedicated to controlling the SM3 printer mechanism and receiving commands from the customer's controller via the data interface (J1). The microcomputer chip set must receive data from the hardware input command buffer; the printwheel absolute position counter; sixteen miscellaneous inputs; and, optionally, the custom character ROM. The microcomputer must output data to the printwheel and carriage delta counters. These transfers of data are made via the 8 bit I/O bus. The following list indicates what data is passed from the I/O bus to a printer circuit or from which printer circuit to the I/O bus by the input (e.g. IP2) and output (e.g. OP3) commands.

I/O STATUS	I/O SIGNAL		
$\overline{IP\ 0}$	CODED	→	$\overline{B7}$
"	STROBE	→	$\overline{B6}$
"	(see Note 1)	→	$\overline{B5}$
"	D1024 (DIR)	→	$\overline{B4}$
"	D2048 (or RIB LIFT)	→	$\overline{B3}$
"	D512	→	$\overline{B2}$
"	D256	→	$\overline{B1}$
"	D128	→	$\overline{B0}$
$\overline{IP\ 1}$	D1/2	→	$\overline{B7}$
"	D64	→	$\overline{B6}$
"	D32	→	$\overline{B5}$
"	D16	→	$\overline{B4}$
"	D 8	→	$\overline{B3}$
"	D 4	→	$\overline{B2}$
"	D 2	→	$\overline{B1}$
"	D 1	→	$\overline{B0}$

Note 1:

The coded strobe indicates which customer or printer originated signal has loaded data into the input command buffer.

Strobe or Signal Name	U38 Pin #	3	5	7
	I/O Bus Line	$\overline{B7}$	$\overline{B6}$	$\overline{B5}$
Paper Feed Auxiliary Strobe		1	0	1
Paper Feed Main Strobe		1	0	0
Top of Form Strobe		0	1	1
Character Strobe		0	1	0
Carriage Strobe		0	0	1
EN REST		1	1	1

I/O STATUS	I/O SIGNAL	
$\overline{\text{IP 2}}$	PW ADDR 128	→ $\overline{\text{B7}}$
"	PW ADDR 64	→ $\overline{\text{B6}}$
"	PW ADDR 32	→ $\overline{\text{B5}}$
"	PW ADDR 16	→ $\overline{\text{B4}}$
"	PW ADDR 8	→ $\overline{\text{B3}}$
"	PW ADDR 4	→ $\overline{\text{B2}}$
"	PW ADDR 2	→ $\overline{\text{B1}}$
"	PW ADDR 1	→ $\overline{\text{B0}}$
$\overline{\text{IP 3}}$	$\overline{\text{CHECK}}$	→ $\overline{\text{B7}}$
"	$\overline{\text{COVER INT}}$ (EOR)	→ $\overline{\text{B6}}$
"	$\overline{\text{HEAVY PW}}$	→ $\overline{\text{B5}}$
"	$\overline{\text{MOVE RIBBON SW}}$	→ $\overline{\text{B4}}$
"	RIBBON LIFT	→ $\overline{\text{B3}}$
"	T2	→ $\overline{\text{B2}}$
"	$\overline{\text{PW POS}}$	→ $\overline{\text{B1}}$
"	$\overline{\text{STD ROM}}$	→ $\overline{\text{B0}}$
$\overline{\text{IP 4}}$	$\overline{\text{RDY EN}}$	→ $\overline{\text{B7}}$
"	$\overline{\text{TOF}}$	→ $\overline{\text{B6}}$
"	$\overline{\text{TEST CONT}}$	→ $\overline{\text{B5}}$
"	$\overline{\text{DIAG}}$	→ $\overline{\text{B4}}$
"	Auxiliary PF	→ $\overline{\text{B3}}$
"	$\overline{\text{PW INDEX}}$	→ $\overline{\text{B2}}$
"	$\overline{\text{CA LIMIT}}$	→ $\overline{\text{B1}}$
"	$\overline{\text{CA POS}}$	→ $\overline{\text{B0}}$
$\overline{\text{CROM SEL}}$	CROM D08	→ $\overline{\text{B7}}$
"	CROM D07	→ $\overline{\text{B6}}$
"	CROM D06	→ $\overline{\text{B5}}$
"	CROM D05	→ $\overline{\text{B4}}$
"	CROM D04	→ $\overline{\text{B3}}$
"	CROM D03	→ $\overline{\text{B2}}$
"	CROM D02	→ $\overline{\text{B1}}$
"	CROM D01	→ $\overline{\text{B0}}$

I/O STATUS		I/O SIGNAL
$\overline{\text{OP 1}}$	$\overline{\text{B7}}$ →	PW DIRECTION
"	$\overline{\text{B6}}$ →	PW Δ 64
"	$\overline{\text{B5}}$ →	PW Δ 32
"	$\overline{\text{B4}}$ →	PW Δ 16
"	$\overline{\text{B3}}$ →	PW Δ 8
"	$\overline{\text{B2}}$ →	PW Δ 4
"	$\overline{\text{B1}}$ →	PW Δ 2
"	$\overline{\text{B0}}$ →	PW Δ 1
$\overline{\text{OP 2}}$	$\overline{\text{B7}}$ →	CA Δ 128
"	$\overline{\text{B6}}$ →	CA Δ 64
"	$\overline{\text{B5}}$ →	CA Δ 32
"	$\overline{\text{B4}}$ →	CA Δ 16
"	$\overline{\text{B3}}$ →	CA Δ 8
"	$\overline{\text{B2}}$ →	CA Δ 4
"	$\overline{\text{B1}}$ →	CA Δ 2
"	$\overline{\text{B0}}$ →	CA Δ 1
$\overline{\text{OP 3}}$	$\overline{\text{B7}}$ →	--------
"	$\overline{\text{B6}}$ →	--------
"	$\overline{\text{B5}}$ →	--------
"	$\overline{\text{B4}}$ →	CA DIRECTION
"	$\overline{\text{B3}}$ →	CA Δ 2048
"	$\overline{\text{B2}}$ →	CA Δ 1024
"	$\overline{\text{B1}}$ →	CA Δ 512
"	$\overline{\text{B0}}$ →	CA Δ 256

The following tells how to restore the high-speed printer to normal operation after replacing or repairing major parts and subassemblies. Step-by-step procedures are given for the mechanical alignment.

A preliminary word of caution is in order. Despite its apparent mechanical simplicity, the printer is a highly sophisticated piece of machinery. In many cases, the tolerances and adjustments that are carefully established on the assembly line are not obvious to the untrained eye. Yet, failure to observe these tolerances can result in degraded output quality, excessive stress, accelerated wear, and unnecessary premature failures. Only qualified personnel should attempt repair of high-speed character printers, and even these should be sure beforehand that they have read and understood the instructions thoroughly. Above all, resist the impulse to tamper with adjustments or to disassemble parts of the mechanism indiscriminately. If in doubt, contact Qume Technical Support for advice and instructions.

For the most part, the tools and equipment required for these adjustments are already available in the serviceman's tool kit. Whenever special tools, alignment fixtures, or test equipment are called for, they are noted prominently in the text. Section IV contains a consolidated listing of special tools and support equipment.

ROUTINE PROCEDURES

Cover Removal

The Sprint Micro 3 printer has a three-piece plastic cover. The uppermost section is a snap-on lid that protects the operator from carriage and printwheel movements during normal operation. To remove the top cover grasp the front edge firmly, and lift upward. The top cover snaps back into place in the same way.

Removing the top cover is an operator function, and must be done to replace the ribbon cartridge or exchange printwheels for various type styles. When replacing the top cover, be sure that the interlock switch is activated. The interlock switch is at the left-rear corner of the top cover, and disables the printer while the top is open (if this option is installed).

Middle Section

(1) Remove the platen by grasping at each end, and depressing both latch mechanisms.

(2) Remove the three 8/32 screws at the rear of the unit.

(3) Unscrew the seven 10/32 captive screws inside the periphery of the cover.

(4) Lift the center cover section free of the printer chassis. Be careful to disconnect any associated wiring.

(5) If the printer is to be run with the covers off, a jumper must be placed on J20 or J4, where the interlock switch connection was removed. The particular option configurations of the printer will determine which is the easiest to jumper.

CIRCUIT BOARDS

Standard Sprint 3 control electronics are contained on three printed circuit boards, each having edge connectors that mate with corresponding connectors on the mother board.

For purposes of identification, these assemblies are numbered sequentially, beginning at the rear of the printer. The board at the rear of the unit is thus PCB #1; that nearest the front of the unit is PCB #3. The TwinTrack model uses the same printed circuit boards, but has a second #2 and #3 board. All of these boards (1, 2 and 3) are interchangable between Sprint 3 models. In other words a #2 board can be used as a #2 board in all models including the TwinTrack. If the options are the same. Likewise with the #3 board, etc. The TwinTrack model has, however, one printed circuit board, and the mother boards (2 of them), that are not interchangable except within the TwinTrack model.

Removing and replacing electronic assemblies is routine. Using extractors, however, makes this task easier and minimizes the possibility of damage to the printed circuit boards. Always turn power OFF before removing or replacing any assembly. Connectors on the mother board are staggered, making it impossible to insert a printed circuit board in the wrong mother board position. When replacing printed circuit boards, be certain that they are seated firmly in their mating connectors.

Selected Resistors

Printed circuit boards #1 and #3 each have a factory selected resistor in the servo compensation circuit. These resistors are selected at the factory, and require no further attention unless some component within the circuit is changed. If the circuit is repaired or modified, the value of the selected resistor must be verified and/or re-selected. The selection procedure is outlined below.

Tools needed are: Oscilloscope - dual trace with 2 probes
Resistance decade box
Printer exerciser (P.N. 80630-04, -05, or 99000-00, -01)
or a system that will operate the printer as given below

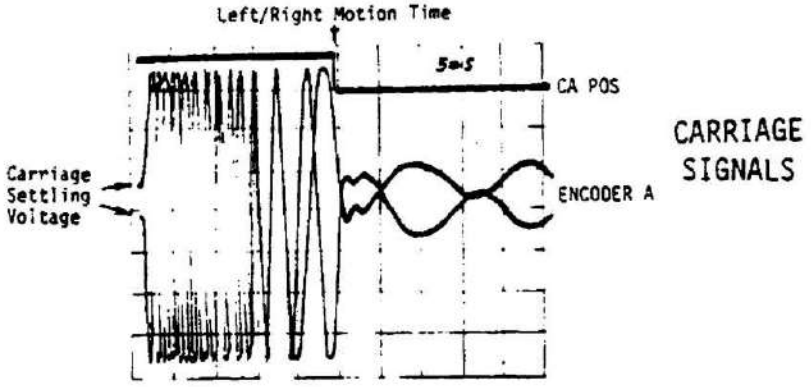
Board #1:

- Remove, by unsoldering, the selected resistor (see the specific revision level logic schematics for the R number and physical location).
- In the place of the resistor, connect a resistance decade box, initially set to 1,000 OHMS.
- Connect an oscilloscope probe to TP19 on circuit board #1 (CA POS).
- Connect a second oscilloscope probe to TP3, circuit board #1 (Encoder A).
- Using the printer exerciser, cause the carriage to move alternately right and left 0.1 inches (12 increments of 1/120 inches). This movement should be at the center of the carriage motion; directly in front of the motor pulley. The ribbon cartridge must be in place during this test.

Selected Resistors [continued]

- Set the oscilloscope to trigger on the CA POS probe, and display the encoder A signal at nearly full screen in height and centered vertically.

- Vary the carriage strobe rate (on the exerciser) until the servo settling waveform is displayed on the screen (see the waveform below).



- Vary the resistance decade box (usually between 0.5k OHMS and 1.5k OHMS) to change the right to left and left to right carriage motion times.

- Adjust the resistance until both motions show identical times.

- Observe the encoder A waveform. The settling voltage may vary slightly, but must be within ±3 volts of the average center voltage of the entire waveform. The settling voltage is easiest, and most accurately observed at the beginning of the waveform. The beginning point starts from the settled voltage of the previous cycle.

- If the settling voltage is not within ±3 volts of the center, adjust the resistor decade box until it is within the specification.

- Observe the carriage travel time again. The left-to-right and right-to-left movements must be within 3 ms of the same time. In some cases the resistance must be varied to a compromise point. But the encoder A settling voltage must be within ±3 volts of the center and the right/left left/right movements must be within 3 ms of each other.

- Boards that cannot be adjusted to the above specifications are defective, and must be repaired. Check all op-amps and associated components within the circuit.

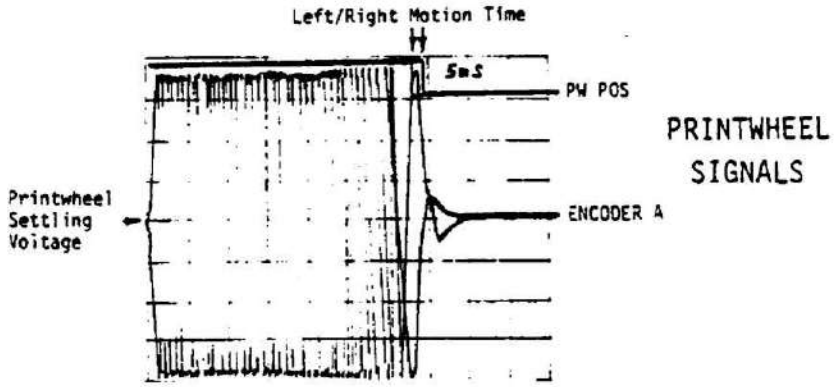
- When a resistance value is found that allows both the settling voltage and the movement time to be within specifications, select a 1% resistor at the nearest value to that shown on the decade box.

- Insert and solder the selected resistor.

- Recheck the encoder A settling voltage (±3 volts) and the difference in travel time for the two directions (with 3 ms). If these values are not within specification, the resistor (R209) must be re-selected, repeating the steps above.

Board #3:

- Remove the resistor by unsoldering.
- In the place of the resistor, connect a resistance decade box, initially set to 1,000 OHMS.
- Connect an oscilloscope probe to TP11 on board #3 (PW position).
- Connect a second oscilloscope probe to TP23 on board #3 (encoder A).
- With the printer exerciser, alternately move the printwheel 47 characters clockwise, and 47 characters counterclockwise (w and % will do this).
- Vertically center the waveform on the screen.
- Vary the character strobe rate (on the exerciser) until the servo setting waveform is displayed on the screen (see the waveform below).



- Vary the resistance decade box to change the settling voltage level of the encoder A signal until the voltage is either centered in both directions or is symetrical about center in both directions. The final settling voltage is most accurately reflected at the beginning of the following cycle, shown as the starting point on the oscilloscope.
- The encoder A display must be centered vertically on the screen during this test or the values are meaningless. The settling voltage must be within ±2 volts of the average encoder voltage. The average encoder voltage will be the zero line in the middle of the oscilloscope graticule if the display is centered properly.
- Check the other trace for the difference in motion times between clockwise and counterclockwise. The difference between the two directions should not exceed 4 ms.
- If a selected resistance cannot be chosen that allows the encoder A settling voltage for each direction of travel to be within ±2 volts of center, and the time difference between the two motions to be 4 ms or less, the board is defective, and must be repaired. Check the operational amplifier and associated components within the circuit.

- When a resistance value is found that allows both parameters to be within specification, select a 1% resistor of the nearest value to that shown on the decade box.

- Insert and solder the selected resistor.

- Re-check the settling voltage and the difference in the motion time. If the settling voltage is not within ±2 volts and the difference in motion is not 4 ms or less, the resistor must be re-selected using the steps above.

MECHANICAL ALIGNMENT

Although mechanical misalignment can result in noisy operation or in damage to the equipment, the first indication is usually a visible deterioration of the print quality. Symptoms frequently observed include characters that are too light or dark, characters that are heavier at the top or at the bottom edge, characters that appear to taper and become uneven at one or both extremes of carriage travel, and characters that seem to fade out at the horizontal line is scanned. Maladjustment occasionally produces positional inaccuracies that are most evident in the smeared appearance of overprinted characters or in the ragged "picket-fence" aspect of the horizontal lines.

Misalignment of the printer is seldom the result of ordinary wear. More often it is attributable to an accident, or to physical abuse of the printer. Any unit subject to a violent shock should be checked carefully for visible evidence of such maladjustment. However, re-adjustment will also be indicated as a matter of routine, whenever any of the following components and subassemblies are repaired or replaced:

Printwheel carriage
Printwheel servomotor
Printhammer solenoid
Ribbon lift solenoid
Carriage servomotor
Paper feed stepper motor
And/or platen drive gears
Plastic card guide

A complete re-alignment will seldom be called for, but, you must be careful to restore any and all adjustments that may have been disturbed. We therefore recommend that you read the following section carefully before beginning any repair. The preface to each procedure enumerates the conditions that make the particular adjustment necessary.

Note that the alignment procedures are grouped, as follows:

Printhammer adjustments
Platen adjustments
Paper feed roller adjustments
Carriage adjustments
Ribbon adjustments
Mother board alignment

Some of the adjustments that are given have interaction. We therefore recommend that all the procedures in a given group be performed at the same time. Observe the order of adjustments carefully, and take special note of those few cases where adjustments in one group necessitate re-checking adjustments in another.

PRINTHAMMER

Printhammer misadjustment usually produces characters that are too light, too dark, or uneven. Occasionally, however, a faulty adjustment will cause noisy operation or printwheel breakage. Printhammer adjustments should be made as a group, and in the given order. Check all adjustments first. Do not change hammer adjustments unless there is known trouble, or a check shows one or more dimensions out of specification. All platen adjustments must be correct and hammer cleaning and lubrication performed before the hammer adjustments are made.

Complete realignment of the printhammer assembly is necessary whenever any of the following parts have been removed or replaced:

Printhammer
Printhammer actuating solenoid
Armature limit bumpers
Printwheel servomotor

Printhammer Vertical Alignm

This procedure requires a special alignment tool (#80739), a screwdriver, and a 3/16" wrench or nut driver. The alignment tool gauges the angle and vertical position of the printhammer. However, because of possible tolerance buildup, final adjustment must be made with print quality as the criteria.

(1) Remove all power to the printer.

(2) Remove the top cover.

(3) Remove the platen by grasping at both ends, and depressing both latch mechanisms.

(4) Remove the ribbon cartridge and printwheel.

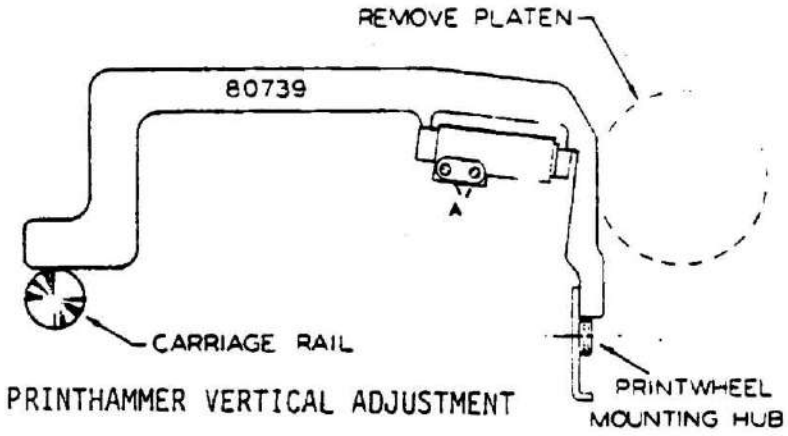
(5) Loosen the two printhammer retaining screws (A) that secure the printhammer housing to the carriage.

Most Sprint 3 Printers

(6) Install the printhammer alignment gauge (#80739), as shown in the figure. Be certain that the upper carriage is locked in its normal operating position. Check this by pushing down on the C (close) button near the end of the printwheel motor.

(7) Move the printhammer assembly into alignment. The movable hammer should contact the fixture lightly at both ends, as shown in the diagram.

(8) Hold the printwheel housing in the aligned position, and re-tighten the two retaining screws. This completes the vertical alignment.



PRINTHAMMER VERTICAL ADJUSTMENT

S3/X30 and S3/X40 Models Only

(6) Install the metalized printwheel on the printwheel motor hub. Be sure that the printwheel is correctly seated, and that the printwheel is not damaged or worn.

(7) Verify that the printwheel motor assembly is locked into the normal operating position by pressing down on the "C" button.

(8) Verify that the Multiple Copy Selector Lever is in the extreme forward position (toward the operator).

(9) Gently push the hammer against the printwheel spoke until the font character lightly touches the platen.

(10) Observe the contact between the hammer face and the back of the character font. When the character font is lightly touching the platen, the hammer face should be flat against the back side of the font. If there is space at the top or bottom, adjust the hammer angle for best contact.

After adjusting the printhammer vertical position, it is a good idea to run a print sample and check the evenness of the impression. Vertical misalignment produces characters that are darker at the top or bottom edge. If characters are heavier at the top or bottom, it may be necessary to raise or lower the adjustment slightly, so that the hammer is more nearly horizontal. Uniform appearance of the sample is the ultimate criterion to be applied. A small adjustment can be made by loosening only the screw closest to the printwheel, and moving the printhammer slightly. Before re-adjusting the hammer, however, be sure to check the platen height adjustment as described later in this section. Maladjustment of the platen can produce much the same result as faulty printhammer alignment, so the platen should be checked before concluding that the printhammer is to blame for a visible defect.

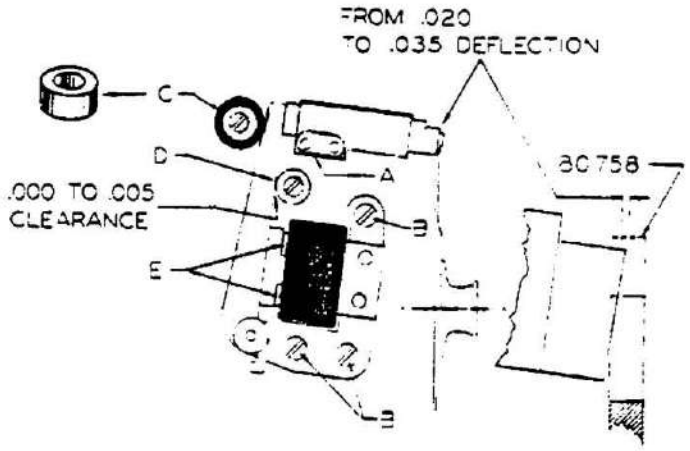
Hammer Armature Core Adjustment

Before the hammer armature core is adjusted, the platen and hammer vertical adjustments must be made. Because this adjustment is made following the hammer vertical adjustment, it is assumed that the power is off, and the top cover and printwheel are both removed. Qume special tool, 80758, is used for this adjustment (see PRINTWHEEL INDEX ALIGNMENT for an illustration of this tool).

(1) Install the alignment disc (P.N. 80758) where the printwheel normally resides. With the printwheel motor tilted back to attach the alignment disc, "This Side Up" should be visable. This can be secured with a discarded printwheel center hub.

(2) Rotate the disc until the notch on the flattened portion is toward the hammer. Be sure the alignment disc is securely seated on the printwheel motor shaft.

(3) Using a 3/16" wrench, loosen the retaining nut at the opposite end of the eccentric forward limit bumper. (Item D in the figure below.)



HAMMER ARMATURE CORE ADJUSTMENT

(4) Rotate the bumper beneath screw D to the maximum possible clearance between the bumper and the armature. Do not re-tighten, this adjustment will be completed later.

(5) Loosen the three screws (B) holding the armature core.

(6) Pinch and hold the armature lever against the core piece, and position the entire assembly so that the hammer extends .020" to .035" into the slot on the alignment disc. There are two scribed lines on the flat edge of the alignment disc to aid this measurement.

(7) While still holding the assembly in position, tighten the three screws (B).

(8) Hold the armature core to the polepiece.

(9) With a screwdriver, rotate the eccentric bumper (D) to within .000" to .005" of the hammer armature.

(10) While holding the adjustment with a screwdriver, tighten the nut at the opposite end of D.

(11) Loosen the retaining nut at the opposite end of screw (C).

(12) Place the ring gauge (P.N. 73046) over the plastic bumper on C. If no ring gauge is available, use a .65" (.063" -.000 +.005) spacer or feeler gauge.

(13) While holding the armature against the core, rotate the eccentric screw (E) until the ring gauge lightly touches the hammer armature.

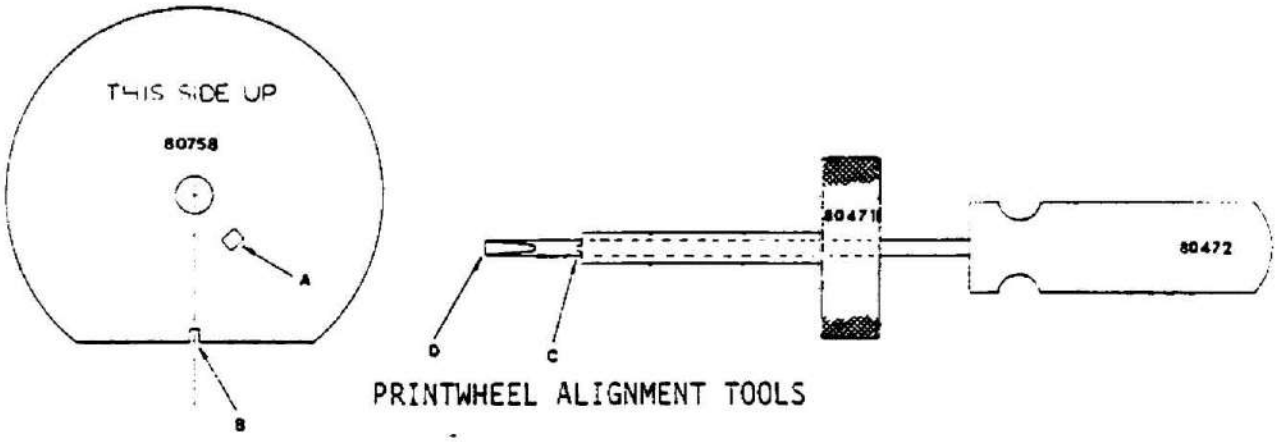
(14) Continue to hold the eccentric screw with the screwdriver; and tighten the retaining nut at the other end of the screw. The hammer armature will be held by the gauge during this part of the operation.

(15) Remove the gauge from the bumper.

PRINTWHEEL INDEX ADJUSTMENT (HUB)

Although the printwheel index adjustment is not technically a printhammer adjustment, it should be checked when the printhammer adjustments are made. Printhammer maladjustment can produce symptoms ranging from poor print quality to physically breaking the printwheel spokes. The printwheel should not be adjusted until after all other adjustments are perfect, and then only if the misalignment is visable.

The printwheel index adjustment requires the special tools illustrated below. DO NOT ATTEMPT ADJUSTMENT WITHOUT THESE TOOLS.



PRINTWHEEL ALIGNMENT TOOLS

WARNING

This adjustment is made with the printer energized. Keep hands and tools clear of the carriage and printwheel, except as specifically instructed in the text.

(1) Remove the top cover, if it is not already off.

(2) Bypass the cover interlock switch if necessary by placing a small bit of folded paper into the opening to hold the switch lever. The interlock switch is located at the left rear of the top cover opening (as seen from the operator position).

(3) Disconnect the data cable from the printer unit, and apply power.

(4) Extend the printhammer and verify that the lower case "w" is squarely in front of the printhammer. If it is aligned properly, skip the remaining procedure, otherwise continue.

(5) Release the carriage locking lever by depressing the "O" button on the carriage.

(6) Remove the printwheel by grasping firmly at the hub, and pulling away from the shaft.

(7) Briefly activate the ribbon feed switch inside the lower right portion of the carrier travel area. The ribbon will raise and advance, then return to the lowered position. When the ribbon returns to the lowered position, the printwheel will index to a "home position", where the lower case 'w' is in the printing position (index pointer on the "X" models).

(8) Using the collet adjusting tool and the concentric screwdriver, hold the shaft with the screwdriver and loosen the hub collet. The collet loosens by twisting the knurlled knob of the tool counterclockwise.

(9) Mount the alignment disc on the printwheel hub with the "UP" side away from the motor. The "UP" marking references the flat surface, not the rotation.

(10) Place the ring gauge (P.N. 73046) over the plastic return stop bumper behind the armature, causing the printhammer to extend.

(11) While holding the motor shaft with the screwdriver portion of the adjustment tool, rotate the disc (but not the motor shaft) until the extended tip of the printhammer engages (or aligns with) the cut in the flat edge of the disc.

(12) Carefully tighten the collet hub by turning the knurlled knob clockwise. DO NOT tighten with brut force. A very snug fit is sufficient.

(13) Remove the alignment tools, the disc, and the ring gauge.

(14) Re-mount the printwheel onto the motor shaft.

(15) Briefly activate the ribbon feed switch again.

(16) Verify that the lower case "w" is squarely in front of the printhammer. If it is not, remove the printwheel and repeat the adjustment.
*For the "X" models, verify that the printwheel index pointer is exactly straight up.

(17) When the adjustment is complete, return the carriage to the operating position, and press the "C" button to lock it into place.

PLATEN ADJUSTMENTS

Platen misalignment usually causes variation in print quality over the width of the page, ragged lines, lines that taper, or lines that gradually fade from side to side. Difficulty in accurate overprinting may also indicate platen maladjustment. The platen should be aligned routinely when any of the following items are replaced:

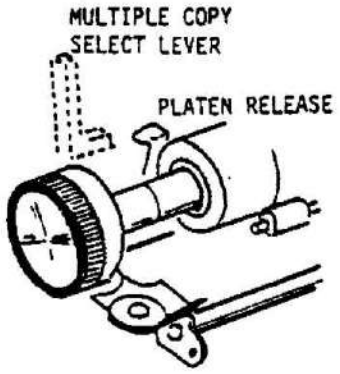
Paper Feed Stepper Motor
Paper Feed Idler Gear
Carriage
Printwheel Servo Motor

Adjustments within this group are highly interdependent, and should be performed as a group, in the order that is given. These adjustments bring the platen alignment to within specifications, but the final criteria should be print quality.

Platen Depth

(1) Remove the top and middle cover sections. Cover removal instructions are given in the first portion of this section of the manual.

(2) Place the multiple copy select lever in the extreme forward position. The forms thickness lever is behind the platen on the top left side. Be sure that the platen is properly seated and latched into position (the two platen releases have returned to the latched position).

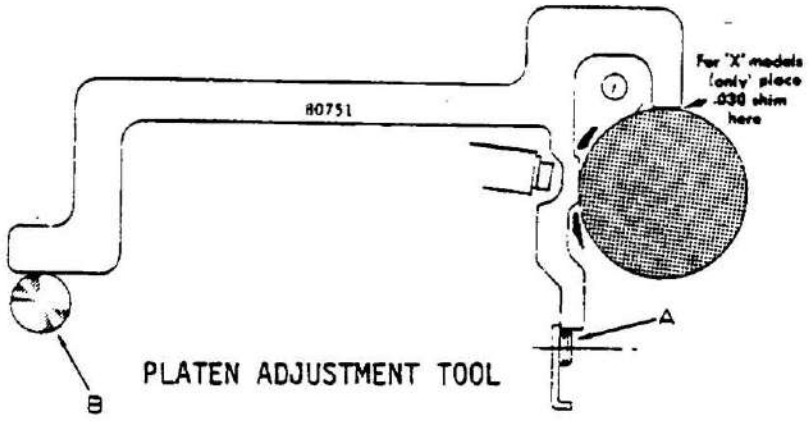


(3) Tilt the carriage forward, and remove the printwheel (as described in OPERATION).

(4) Return the carriage to the operating position, and lock into place by depressing the "C" button.

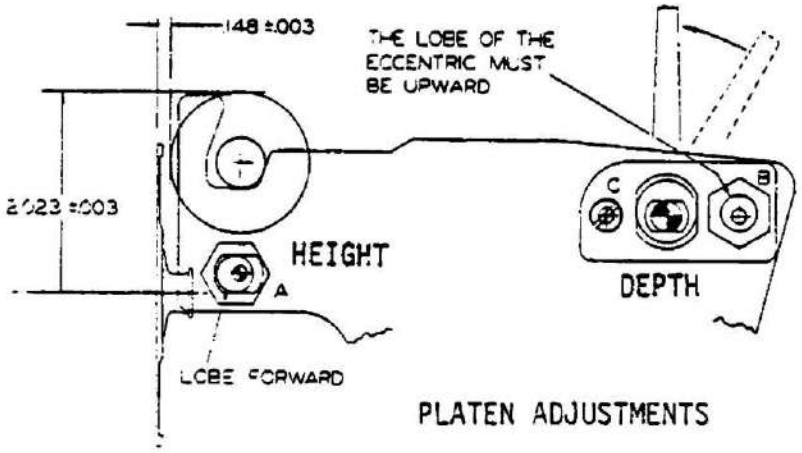
(5) Manually position the carriage to the end of travel on the side that is to be adjusted.

(6) Place the alignment tool (80751) on the platen, printwheel hub, and front carriage rail as shown in the following illustration.



PLATEN ADJUSTMENT TOOL

(7) The figure below shows the adjustment on the platen frame assembly. The adjustment locations are the same for each end, and are "mirror images" of each other. Each adjustment has a slotted locking screw, and 5/8" hex adjustment eccentric. With a screwdriver, loosen, but do not remove, the two lock screws.



PLATEN ADJUSTMENTS

(8) Using the hex eccentric, adjust the plate until the forward edge of the platen barely touches the flattened vertical edge of the alignment gauge.

(9) When the adjustment is correct, tighten the lock screws, and repeat the procedure for the opposite end of the platen.

Platen Height

(1) Place the alignment gauge (80751) as shown on the previous page. This is the same tool, in the same place as for the depth adjustment.Note that the "X" models require a .030" shim beneath the gauge (the platen is adjusted .030" lower).

(2) Loosen the locking screw for the eccentric. (See the illustration.)

(3) Adjust until the top of the platen barely touches the gauge.

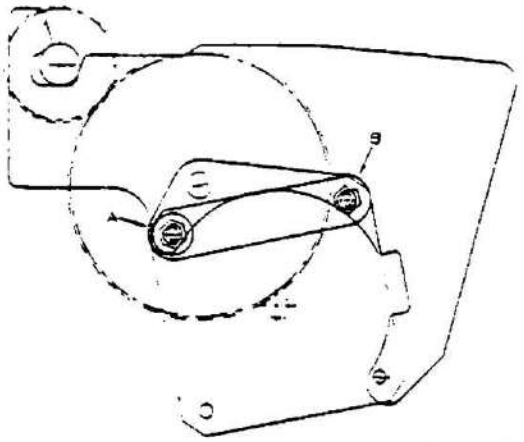
(4) Re-tighten the locking screw, being careful not to change the adjustment.

Platen Drive Gear Adjustment

Adjust the platen drive gear for minimum backlash in the paper feed gear train. A drive mechanism that is too tight will bind, causing poor vertical positioning. A mechanism that is too loose causes poor registration and overprinting, or uneven lines.

The gear train is adjusted at the factory, but must be checked when any of the platen adjustments are made, or when a paper feed motor is replaced. The illustration below shows the location of the adjustment screws. Access to the screw labeled A is through a hole in the intermediate gear (the large black gear).

(1) Loosen the two retaining screws, A and B. These should be loose enough to allow adjustment, but retain the position without being held.



PLATEN GEAR DRIVE ADJUSTMENT

(2) Move the intermediate gear into both of the other gears. This should gently bottom without binding.

(3) Re-tighten the securing screws, and check for backlash or binding. The large gear should be able to slide in and out on the shaft (within the limits of the endplay) but it should not have any rotation motion.

(4) Rotate the platen knob to verify that there is no binding or backlash at some other point in the rotation. The paper feed motor will exert some resistance, even without power.

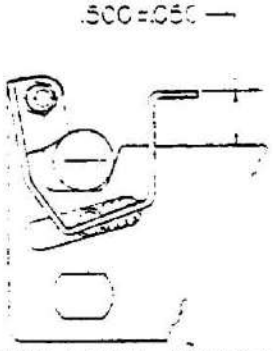
(5) If the gear cannot be adjusted to eliminate backlash, the condition must be corrected by replacing worn parts. However, the quality of the printout should determine if that is necessary.

Platen Latch Adjustment

(1) Remove the platen by pressing both releases, and lifting the platen.

(2) Loosen the locking screw (slot head). See the illustration for the screw location.

(3) Adjust the eccentric slightly in the desired direction.



PLATEN LATCH ADJUSTMENT

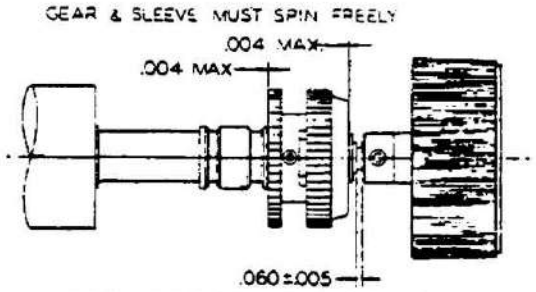
Platen Latch Adjustment [continued]

(4) Replace the platen, and measure the distance shown in the illustration. If necessary, repeat steps (1), (2) and (3) until the adjustment is correct. Do NOT attempt to adjust with the platen in place.

(5) Re-tighten the locking screw, and replace the platen.

Platen Release Adjustment

The figure below shows the required spacings and tolerances for the platen release mechanism. Under normal circumstances this adjustment will not be required. If adjustment is required, remove the platen and adjust by loosening the set screws.



PLATEN RELEASE ADJUSTMENT

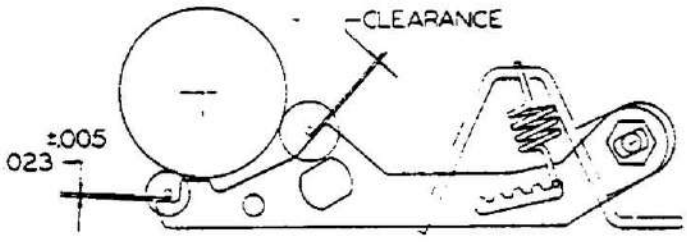
PAPER FEED ROLLER ADJUSTMENTS

Feed rollers that are not properly adjusted may cause the paper to "creep" sideways or become misaligned as the paper passes through. All of the paper feed roller adjustments are interdependent, and should be performed as a group.

Remove all power from the unit when making these adjustments.

Feed Roller Depth

The figure below shows the mechanical details of one of the four feed roller arms. The arm is spring loaded from an adjustable pivot point. By moving the arm toward the front or rear, the roller alignment is adjusted. All four arms must be adjusted, one at a time, to assure proper tracking.



FEED ROLLER DEPTH

PAPER FEED ROLLER ADJUSTMENTS (continued)

(1) Using two wrenches, loosen the adjustment on one arm. Loosen only enough to allow movement with finger pressure.

(2) Adjust the front clearance to the value shown. The front and rear clearance should be approximately equal.

(3) Re-tighten the adjustment screws, being careful that the adjustment does not change when the screw is tightened.

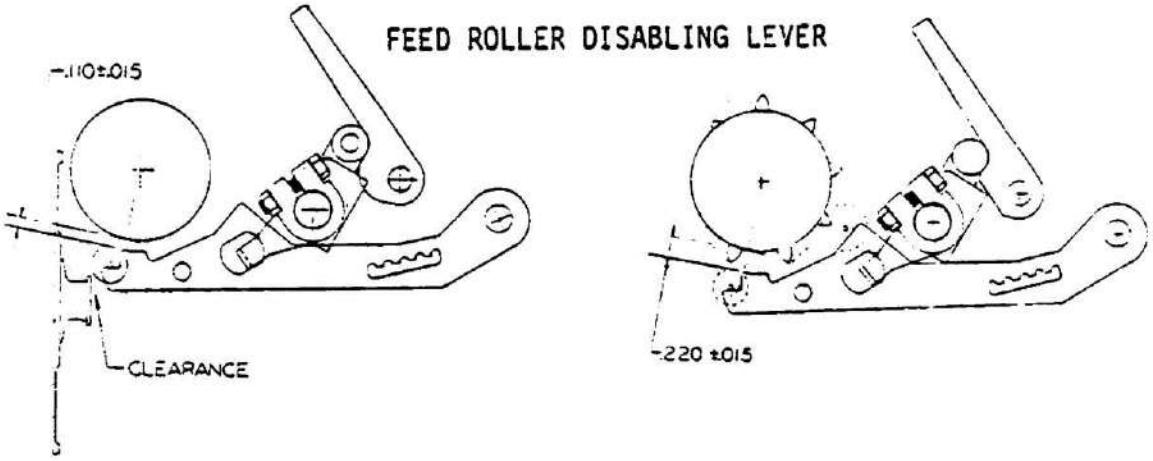
(4) Adjust the other three arms in the same manner. Before operating the unit, manually slide the carriage over the entire travel to verify that there is no interferrence between the front portion of the arm and the printwheel hub.

Feed Roller Disabling Lever Adjustment

(1) Remove the platen from the unit.

(2) Carefully lift the cradle assembly (under the platen) and allow it to lay back, out of the way. Do not stretch the springs that are attached to the assembly.

(3) Move the paper release all the way forward; replace the platen. Place a gauge between the platen and one lever arm. (See the illustration for the proper gauge thickness for friction platen or pin feed.)



FRICTION PLATEN SHORT PIN FEED

(4) Adjust the arm for zero clearance by loosening the clamp, and changing the position of the lever.

(5) Re-tighten the clamp, making sure that the adjustment does not change when doing so.

(6) Adjust the other three arms in the same manner.

(7) Re-install the cradle assembly and the platen.

(8) With the paper release lever in the forward position, manually move the carriage over the entire range of movement. Check to be sure that there is adequate clearance between each of the paper feed rollers and the printwheel hub.

(9) Return the paper release lever to the rear position, and check that all of the rollers engage the platen.

CARRIAGE CABLE TENSION ADJUSTMENT

Cable tension should be checked routinely during preventive maintenance inspections or whenever the carriage is removed and replaced. Cable tension is maintained by spring tension on one idler pulley at the right side of the printer. Adjust the cable tension as follows:

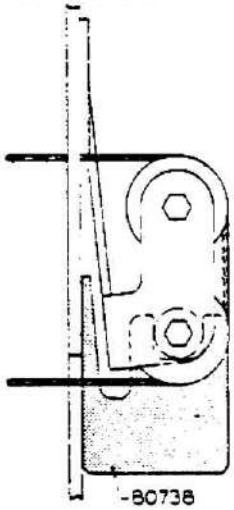
Most Sprint 3 Printers

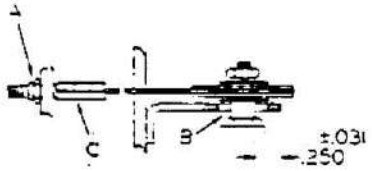
(1) Slide the adjustment tool, 80738, along the side frame as shown in the illustration.

(2) Hold the cable (C in the illustration) and use a 3/16" wrench, to adjust the nut (A) until the bearing assembly (B) is centered in the gauge as shown. Either, or both ends of the cable may be adjusted, whichever is convenient, but DO NOT TWIST THE CABLE.

S3/55, S3/WideTrack, and S3/TwinTrack

(1) While holding the cable end (C), adjust at A until the bearing assembly (B) is centered in the hole of the side bracket as shown in the illustration.





CARRIAGE CABLE ADJUSTMENT

LEFT MARGIN PHOTO SENSOR

The optical sensor sets the beginning point for carriage travel. It is used only during the RESTORE sequence, which is issued in initialization and reset sequences.

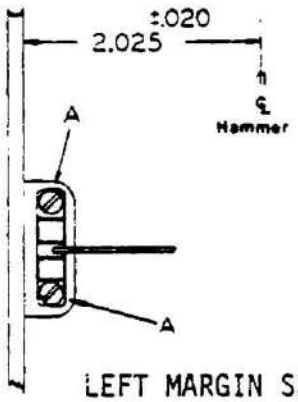
(1) Initialize the printer by removing power, then returning the power. The carriage should move to the left side of the travel.

LEFT MARGIN PHOTO SENSOR (continued)

(2) Using a graduated rule or other suitable measuring instrument, measure the distance from the printhammer axis to the frame (see the illustration).

(3) If the distance must be adjusted, loosen the two mounting screws on the photo sensor, and move the assembly.

(4) When the adjustment has been moved, re-initialize the printer by power OFF/ON. The carriage will move to the adjusted location.

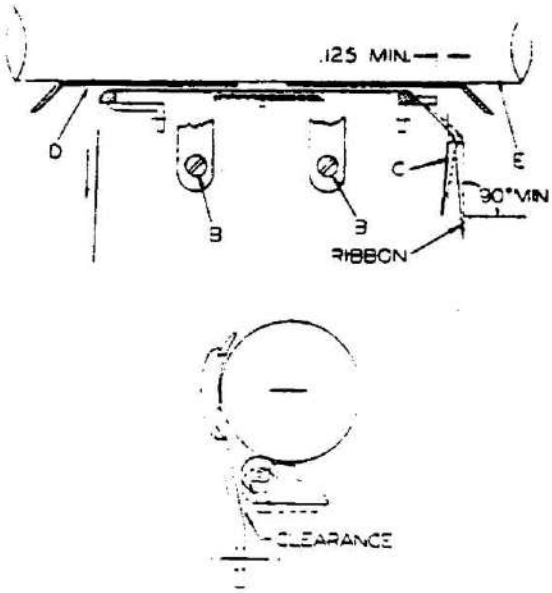


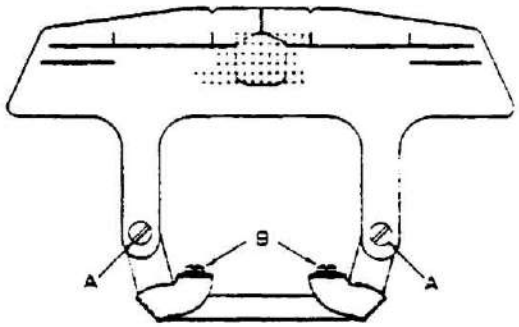
LEFT MARGIN SENSOR

CARD GUIDE ADJUSTMENT

The card guide must operate with both proper clearance and alignment. Adjust with power off and the multicopy select lever forward. Loosen the two mounting screws (B) shown in the illustration below. The card guide should lightly touch the platen along the entire working surface of the guide. Be sure that when the adjustment is made, there is clearance between the guide and the front platen rollers (see the lower illustration).

To set the card guide height, type several lines of capital I's at 6 lines per inch spacing. Adjust the guide by loosening the two screws (A) shown in the illustration. At 6 lines/inch, two lines should "rest" on the guide lines, while the center line is between the guide lines. The vertical mark, indicating the print position, should point directly at the center of the letter (see the illustration below).





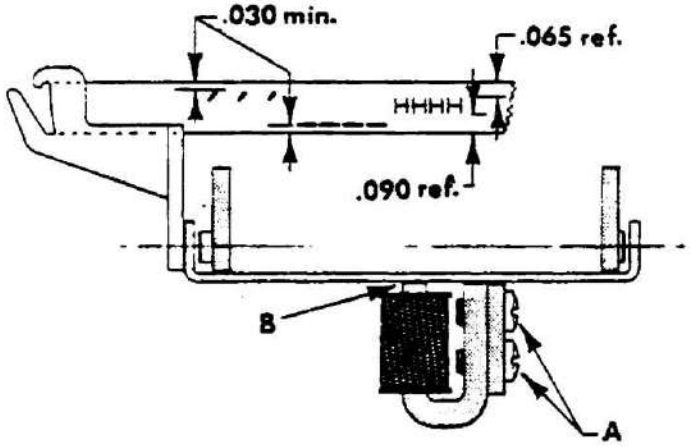
CARD GUIDE ADJUSTMENT

RIBBON LIFT HEIGHT

(1) Print a few characters, alternating between the apostrophe (') and the underscore (_).

(2) Examine the ribbon to be sure that the characters are centered on the ribbon. If the ribbon is a dual color, the characters will be centered on one of the two colors.

The illustration shows a single width ribbon, properly aligned. If adjustment is necessary proceed as follows.



RIBBON LIFT HEIGHT ADJUSTMENT

(1) Release the ribbon cartridge by depressing the red release lever.

(2) The ribbon cartridge can either be removed or set askew so that the feed motor will not feed ribbon if it rotates. The ribbon can, but need not, be unthreaded from the lift guides.

(3) Loosen the two coil mounting screws (A) shown in the drawing above.

(4) Activate the ribbon lift by depressing and holding the ribbon advance button. The ribbon motor will also spin, but this is of no consequence.

(5) Adjust the lift height while maintaining the coil-lift bail contact at B in the drawing. If, during the adjustment, the lift bail separates from the magnet, release the ribbon advance briefly, then re-activate. (The initial lift pulse is much greater, and will re-establish the magnetic contact.)

(6) When the height is properly adjusted, re-tighten the coil mounting screws (A).

(7) Release the ribbon advance button.

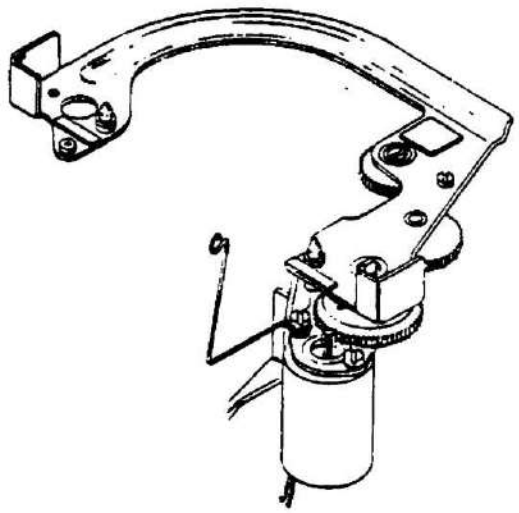
(8) Replace the ribbon cartridge, and check the printing height.

(9) Repeat the adjustment if necessary.

RIBBON DRIVE GEAR ADJUSTMENT

The drive gear on the ribbon motor must rotate freely while meshing with the larger gear on the ribbon clutch. At the same time, only a minimum of backlash is allowable. Adjust if necessary as follows:

(1) Loosen, but do not remove, the two motor mounting screws (B).



(2) Adjust the motor position as necessary.

(3) Re-tighten the two mounting screws (B).

(4) If the motor mounting screws do not allow enough adjustment latitude, loosen the three screws at A, and re-position the plate.

TwinTrack Carriage Synchronization

Test the two print heads of a TwinTrack printer for alignment as follows, and addjust if necessary.

(1) Connect the TwinTrack printer to a commanding device that can cause the two print heads to alternately print at the same spot on the paper

(2) Install identical printwheels on both print stations (i.e. print, move 5.50", print, move back 5.50", print, etc.).

(3) Install ribbons of opposing (easy to distinquish from each other) colors.

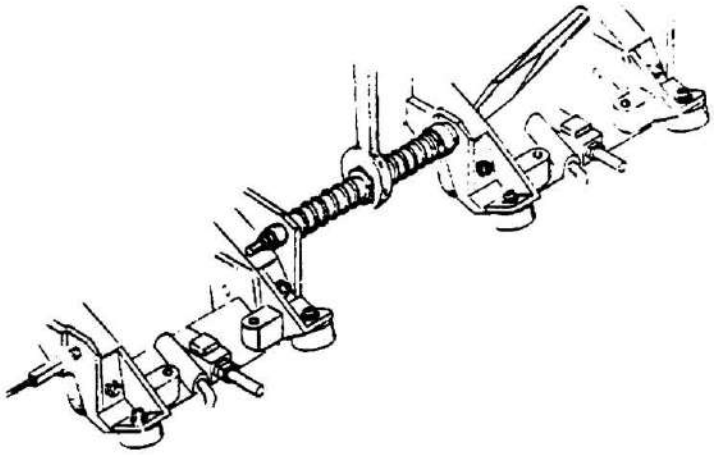
(4) Install paper and print identical characters from each print head at the same character column on the paper.

(5) Observe the printed characters, they should exactly coinside (i.e. be superimposed).

(6) Use the color difference between the two printed characters to determine direction of adjustment if the characters do not superimpose.

(7) Adjust laterally by loosening or tightening the spring lasded screw (shown below).

(8) Adjust for vertical misalignment by loosening the locknut (shown below) and rotating the eccentric stud. Be sure to re-tighten the locknut when the adjustment is complete.



RIBBON LIFT SPACING

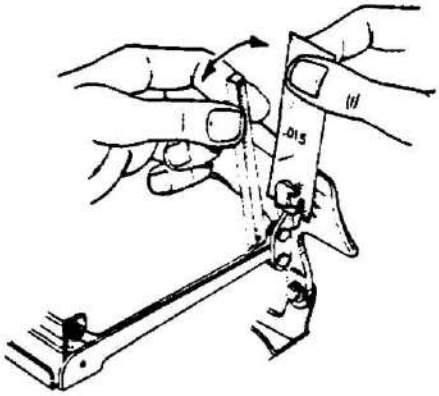
(1) Remove any paper from the printer. Remove the printer top cover.

(2) Place the Multiple Copy Selector Lever in the extreme forward position (toward the operator).

(3) Remove the ribbon cartridge.

(4) Raise the ribbon lift guides by pressing downward on the bar portion of the bail assembly (over the lift coil).

(5) Gently place a 0.15 inch thickness gauge between the card guide and one of the ribbon guides. (See the figure below.) The thickness gauge should touch both the card guide and the ribbon guide, but not deflect them. There may be a small movement within ribbon guide assembly, however, because of tolerances in the rivets.



RIBBON LIFT SPACING (continued)

(6) Place the .015 inch thickness gauge between the card guide and the other ribbon guide. The gauge should touch both as described in the step above.

If either or both of the ribbon guides requires adjustment, proceed as follows:

(1) Place the adjusting tool, Qume P.N. 80833, on the ribbon lift link that is to be adjusted (see the figure). The ribbon lift link is the inner of the two pieces of metal.

(2) While holding pressure to keep the tool from slipping off, gently move the tool to adjust the ribbon lift guide. Lifting upward on the outer end of the tool decreases clearance between the card guide and ribbon lift guide. Downward increases clearance. DO NOT OVERFORM.

(3) Re-check the clearance with the .015 inch thickness gauge.

(4) When the ribbon lift guide properly clears the card guide, the ribbon to printwheel clearance should not be closer than .030 inches.

RIBBON TRACKING

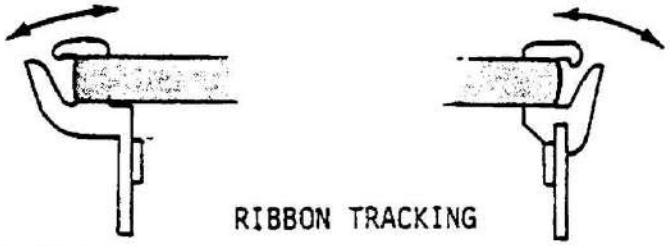
(1) Replace the ribbon, but do not replace the printer top cover.

(2) With power ON, depress the ribbon advance button, and observe the ribbon as it move across between the lift arms.

(3) If any ribbon "curling" is present, determine which guide is causing it.

(4) Carefully twist the arm to be adjusted outward to correct "curling" at the top of the ribbon, or inward to correct "curling" at the bottom of the ribbon. (See the illustration below.)

(5) Check the adjustment by depressing the ribbon advance button again, and observing the ribbon as it travels across between the lift guides. Re-adjust if necessary.



RIBBON TRACKING

MOTHERBOARD ALIGNMENT

If difficulty is encountered when inserting or removing the power and data connectors at the rear of the chassis, re-aligning the motherboard may help.

(1) Remove all power from the unit.

(2) Remove the top and middle cover sections.

(3) Remove the printed circuit boards from the inside of the printer.

(4) Loosen, but do not remove, the eight pan-head screws that hold the motherboard.

(5) Insert the power and data connectors. Be sure that both connectors are well seated onto the motherboard connector.

(6) Tighten the jackscrews on the connectors.

(7) Tighten the eight motherboard mounting screws.

(8) Replace the printed circuit cards and the covers. Be sure that all printed curcuit cards are securely seated, and the board switches are in the proper positions.

COVER INTERLOCK

The cover interlock switch should be adjusted to faithfully disable the printer when the top cover is removed, while never falsely disabling the printer when the cover is in place. Adjust as follows:

(1) Remove the top cover.

(2) Lightly depress the interlock switch to its limit.

(3) Slowly release the switch until a "click" is heard and felt. Note the position of the switch lever, it should be within .010" to .020" of resting against the intermediate cover.

(4) If necessary slightly bend the switch lever to conform to the proper spacing.

(5) After adjusting, check that the switch lever travels at least .035" from the resting position before the "click" is heard.