



LABORATORIES, INC.

PRELIMINARY MAINTENANCE PLAN

Very Low Cost Daisy
DW-20 Series

Prepared by New Product Group
Customer Engineering
Freddie Tubbs - Engineer

DISTRIBUTION

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1. PRODUCT OVERVIEW

1.1 General Description

The model DW-20 Daisy Printer is the newest family member of letter quality printers from WANG Laboratories. This new printer is a highly reliable, twenty (20) cps (characters per second) standard width Daisy wheel printer. The model DW-20 is positioned as WANG Labs' lowest priced letter quality printer and will complement the 30-35 cps Daisy printer. The DW-20 printer will be available on all WANG Labs' OIS, VS 2200 and WP 5-20-25 and 30 product lines.

PRICING AND AVAILABILITY

PRODUCT PRICING

U.S. PRICING ONLY - 10% HIGHER IN ALASKA

<u>PRODUCT LINE</u>	<u>DW-20 MODEL NUMBER</u>			
WP-5	DW/5-20			
WP-20, 25, 30	DW/WP-20			
OIS and VS	DW/OS-20			
VS-Remote	DW/R-20			
2200	DW/22-20			

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>PURCHASE PRICE</u>	<u>MONTHLY MAINT.</u>	<u>MONTHLY RENTAL</u>
DW-20 Series	20 CPS, bi-directional daisy wheel printer	\$2,695	\$37	\$127
FT-1	Mono-directional Forms Tractor	\$ 250	N/C	N/C

CANADIAN PRICING

(Canadian Dollars)

<u>MODEL</u>	<u>EXEMPT FST & DUTY</u>	<u>FST EXEMPT DUTY PAID</u>	<u>FST & DUTY INCLUDED</u>	<u>MONTHLY MAINT.</u>	<u>MONTHLY RENTAL</u>
DW/5-20 DW/WP-20 DW/OS-20	\$3,350	\$3,525	\$3,725	\$45	\$175
DW/R-20 DW/22-20	\$3,650	\$3,825	\$4,050	\$48	\$210
FT-1	\$ 325	\$ 350	\$ 375	N/C	N/C

INTERNATIONAL PRICING

(U.S. Dollars)

	<u>DW-20 Series</u>	<u>FT-1</u>
Recommended Purchase	\$3,370	\$315
Recommended Monthly Maint.	\$ 50	N/C

1.2.2. Options/Upgrades

The DW-20 Daisy Printer will support the following options:

1. Twin sheet feeder
2. Envelope feeder
3. Bi-directional forms tractor
4. Mono-directional forms tractor

All options or upgrades will be field installable. All necessary material to install the option (cable software, etc.) will be shipped with the upgrade.

1.2.3. Sales Forecast

Domestic System	Q2	1981			1982	
		Q3	Q4	Q1	Q2	
WP/OIS	192	395	620	898	998	
VS	42	104	200	247	277	
2200	20	72	97	123	161	
International System	Q2	Q3	Q4	Q1	Q2	
WP/OIS	144	308	407	500	733	
VS	28	54	78	103	122	
2200	20	60	93	128	151	
Combine Totals						
Domestic	257	571	917	1268	1438	
International	192	422	578	731	1006	
Totals	449	993	1495	1999	2444	

1.2.3.1 Availability - International & Domestic

<u>Product Line</u>	<u>Availability</u>
1. OIS and VS	Jan., 1982
2. WP-5,2200 and VS-Remote	Apr., 1982
3. WP-20,25,30	July, 1982

II. PRODUCT DESCRIPTION

2.1 Product Description Hardware Description

2.1.1 Physical Dimensions

Height 9.0 inches (22.9cm)

Height (with forms tractor) 12.5 inches (31.7cm)

Depth 19.5 inches (49.5cm)

Width 25.0 inches (63.5cm)

2.1.2 Weight

43.0 lbs. (19.5 Kg)

2.1.2.1 Speed 20 CPS

2.1.3. Operator Control Panel

A. Low and High Impression

This switch provides two levels of print intensity to accommodate print wheel front variations. Low is used for light printing and high for multiple copies.

B. Test

When depressed the printer will print out the character on the daisy wheel.

C. Power

This indicator is constantly illuminated while power is on.

D. Malfunction

This indicator indicates a system malfunction.

E. Change Daisy

This indicator is under software control, it illuminates when a change in the daisy wheel is required.

F. Change Ribbon

This indicator has a dual function. It illuminates when the ribbon supply is exhausted and also illuminates when the cover interlock is open.

G. Change Paper

This indicator lights when a new supply of paper is needed.

H. Top of Page

This switch when depressed advances paper to the top of the next form page.

I. Select

When depressed this switch illuminates and allows inputs to the printer, when selected the operator can interrupt programmed control by manually deselecting.

2.1.4 Customer Engineer's Interface

The customer engineer will use the Hex error display on the sub-panel to identify failing areas.

2.1.5 Media

1. Paper Specifications

Minimum Width 3.5 inches (8.9cm)
Maximum Width 15 inches (38.1cm)

2. Pitch/Line Length

10 pitch - 132 characters
12 pitch - 158 characters
15 pitch - 198 character (OIS only)
proportional spacing - 13 inches (33cm)

3. Paper Thickness

.027 inches (.069cm) (five copies, plus original)

4. Character Set

96 characters

5. Ribbon Cartridges

Carbon or fabric

2.2 System's Integration (Software Descriptions)

2.2.1 System Application

Not available at this time

2.2.2 Interface

Not available at this time

2.2.3 Operating System

Not available at ths time

III. DESIGN SPECIFICATIONS

3.1 Performance characteristics

3.1.1 Specifications

Print Rate - 20 cps
Print Method - Daisy wheel
Print Direction - Bi-directional

3.2 Power Requirements (Domestic-International)

The DW-20 will have a switching power supply.

115 or 230VAC $\pm 10\%$
50 or 60 Hz ± 1 Hz
1.2 Amps at 115V
.6 Amps at 230V

3.3 Environmental Requirements

3.3.1 Operating

3.3.1.1 Temperature 50 degrees F to 90 degrees F
(10 degrees C to 32 degrees C)

3.3.1.2 Humidity 35% to 65% relative humidity
noncondensing (recommended)

3.4 Government industry standards and approvals (Domestic/International)

3.4.1 Safety

Engineering support will perform this test on an early pre-production unit.

3.4.2 EMI/RFI/UL

These tests will be conducted with the safety test.

3.5 Packaging

3.5.1 Device shipping package

Not available at this time

3.5.2 Special Handling

Not available at this time

IV. MAINTENANCE GOALS MODEL DW-20

4.1 Mean time between failure (predicted)

Part Number	Description	MTBF Hrs.	Failure 106 Hrs.
210-7868	Driver Board	19256	51.930
210-7867	CPV Board	62774	15.930
210-7738	Siblink Board	21445	46.630
279-9000-22	Carr. Dr. Mtr. Assm.	28727	34.810
279-9000-26	Print Head Assm.	4444	225.000
210-7877	Sub-panel	1000000	1.000
270-0727	Power Supply	33333	30.000

4.1.1 Customer Duty Cycle

Approx. 3000 hrs. at 25%

4.1.2 Failure Data

Same as 4.1

4.1.3 Optimum Replaceable unit

210-7868 Driver Board
210-7867 CPU Board
210-7877 Sub Panel
270-0727 Power Supply
210-7738 Siblink

4.2 Mean time between calls

Mean time between calls is the adjusted figure of MTBF that reflects the actual amount of service calls placed on the printer. The MTBE estimate takes into account the situations which do not constitute a failure but a service call is required to verify this.

MTBF = 2297 hours .95 calls per year
MTBF = 2329 hours .94 failures per year

4.3 Mean time to repair

1/2 hr.

4.4 Product life

Not available at this time

V. Maintenance Philosophy

5.1 Installations

5.1.1 Pre site planning

Pre installation forms which include power requirements, system grounding, equipment work area, temperature, humidity and location to the host system should be filled out.

5.1.2 Initial Installation

Support personnel should have at least one year's experience on existing WANG Daisy printers. The C.E. must be able to install and maintain the printer. They must be capable of identifying problems either similar or unique to other WANG Daisy printers. They must be able to provide reliable feedback on initial problems and suggest an attainable solution using the RTR system so New Products can work with R&D on solving the initial problems.

5.1.3 Customer Training

Customer training will consist of correct power up and down procedures. A familiarization with the control panel operation and indicator. The item will also be contained in the Customer User's manual.

5.1.4 Options/Upgrades

See Section 1.2.2

5.2 Corrective Maintenance

5.2.1 Level of Repair

Repair at the customer site will be to the optimum replaceable unit (ORU) as described in Section 4.1.3 of this Maintenance Plan.

5.2.2 Level of Personnel

An associate C.E. or above who has successfully completed the existing WANG Daisy printer training course will be able to provide the ability to isolate and replace the failing ORU.

5.2.3 Diagnostic Goals

Not available at this time

5.3 Preventive Maintenance

5.3.1 Preventive maintenance required

The recommended preventive maintenance is normal cleaning and inspection every six months, each 500 hours of operation or present service call, whichever occurs first. The printer will need a visual inspection, cleaning and minimal lubrication. Normal time required to perform these procedures should not exceed 30 minutes.

VI. SUPPORTING ELEMENTS

6.1 New Products Assurance

6.1.1 Rationale

- Project management - to coordinate all support elements.
- Control information flow.
- Identify/escalate problems to appropriate management.
- Carry CE concerns to the rest of the company.

6.1.2 Responsibilities

- a. Call project team meetings.
- b. Accumulate/collate Maintenance Plan outputs into the completed plan.
- c. Ensure that the Maintenance Plan consistently supports the maintenance philosophy originally established.
- d. Obtain marketing product objectives.
- e. Collect specifications and technical documentation from R&D groups.
- f. Reliability predictions - calculate MTBF.
- g. Establish MTR goals.
- h. Submit RSL info as available.
- i. Kick-off meetings.
- j. Disseminate preliminary and final Maintenance Plans.
- k. On site support during product launch phase.

6.1.3 Project Team (Lawrence)

New Product Assurance	Freddie Tubbs
Product Support	Charlie Jetter
Logistics	Barbara Stefaney
Training	John Carpentier
	Don Olesen
Technical Writing	Ed Bogusz
Board Repair	Jim Riley
International	P. Cabie
Diagnostics	Dan Hunter
Business Planning	L. Sullivan

6.1.4 Schedule

<u>May 81</u>	<u>June 81</u>	<u>July 81</u>	<u>Aug 81</u>	<u>Sept 81</u>	<u>Oct 81</u>
Start Involvement	Initial Input to R&D	Obtain Development Forecast	Build Prototype Units	Hold Kick-off Meeting	Preliminary Maint. Plan
				Organize CE Development Team	Coordinate R&D Seminar
<u>Nov 81</u>	<u>Dec 81</u>	<u>Jan 82</u>	<u>Feb 82</u>	<u>March 82</u>	
Maint. Plan Development	-----				
Set up Beta Test Sites	Supply CE with Proto Units	Customer Ship			
	Review Customer Support				
<u>Apr 82</u>	<u>May 82</u>	<u>June 82</u>	<u>July 82</u>	<u>Aug 82</u>	<u>Sept 82</u>
Turn Product over to Product Support					

6.2 Diagnostics

Not available at this time

TECHNICAL DOCUMENTATION

6.3.1 Documentation Rationale (Domestic and International)

The documentation rationale for the DW-20 is derived from the following unit maintenance philosophy.

- A. Installations - The CE performs the installation including all necessary cabling, initial turnon and startup, and verification of correct operation by running diagnostics.
- B. Corrective Maintenance - Performed on-site by the CE using diagnostic programs to identify faults down to the PCB level.
- C. Preventive Maintenance - Performed periodically by the CE.
- D. Mechanical Adjustments - Performed as necessary by the CE.
- E. Special Tools and Test Equipment - None required other than the standard items provided in the WANG CE Tool Kit.

6.3.2 Types of Documentation

6.3.2.1 New Products Phase Manual

The initial documentation effort for the DW-20 will consist of a New Products Phase (NPP) manual to meet the documentation rationale specified in section 6.3.1 above. The NPP manual will include the following:

- A. An overview of the DW-20 (functional, electrical, and mechanical).
- B. Theory of operation of the DW-20 and each PCB down to the major functional block level.
- C. Procedures for:
 - a. Installation
 - b. Cabling
 - c. Initial turn-on and start-up
 - d. Performing diagnostic tests
 - e. Analyzing failure indications
 - f. Removal and replacement of assemblies
 - g. Adjustments and alignments
 - h. Preventive maintenance
- D. A photo IPB for the approved RSL components. Electrical components will be shown on the appropriate schematics and mechanical drawings, and part numbers specified on the BOM.

6.3.2.2 Product Support Phase Manual

The contents of the Product Support Phase manual will be defined at a later date (equipment transition phase).

6.3.3 Responsibilities

6.3.3.1 Customer Engineering Product Support Technical Documentation (CEPSTD)

The New Products Phase Writing Group (RDB 3951) will be responsible for gathering information (verbal, written, tape-recorded, hands-on, etc.) for inclusion in the DW-20 New Products Phase manual to meet the documentation rationale specified in section 6.3.1.

6.3.3.2 Logistics

Logistics is responsible for document distribution as specified below in section 6.3.4.

6.3.3.3 New Products Assurance Group

The New Products Assurance Group is responsible for providing sources of information, access to equipment, arrangement of seminars, etc. for the technical writer.

6.3.4 Distribution/Media

6.3.4.1 Standard

Logistics will supply printed copies of DW-20 documentation for distribution to customer engineers. Extra copies of all documents will be printed to allow a reserve in the stockroom for future requisitions.

6.3.4.2 Printing

An initial printing of 2500 copies of the DW-20 New Products Phase manual will provide 1300 copies for initial distribution, 600 copies for International follow-up distribution, and 600 copies for stock.

6.3.5 Schedules

The schedule for the DW-20 New Products Phase manual is shown on the chart below. CEPSTD responsibilities are defined as items A thru F and the New Products Assurance Group responsibilities are shown as items G thru O. The schedule for Product Support Phase documentation will be defined at the New Product Assurance/Product Support equipment transition meeting time.

PMM SCHEDULE

1981							1982		
OCT		NOV			DEC	JAN	FEB		
1	5	8	15	2	9	16	23	15	5
A	G	B	C	H, I	J, K	L, M	D	E	F
						N, O		(FCS)	

CEPSTD Responsibilities

- A - Writer assigned
- B - Input to Maintenance Plan
- C - Detailed outline complete
- D - Manual provided for engineering review
- E - Manual to Printing (FCS) and available for early field support
- F - Printed copies available.

New Products Assurance Group Responsibilities

- G - Equipment specifications, marketing data sheets, and schematics
- H - Cabling and interconnection wiring diagrams
- I - Block level basic theory seminars
- J - Installation procedure
- K - Turn-on procedure
- L - Equipment available for IPB photographs
- M - BOM (hardware items only)
- N - Fault analysis and diagnostics
- O - Equipment available to writer for validating procedures.

6.3.6 Costs

Initial New Products Phase Documentation.....\$6800.00
 Documentation Update Program.....\$1360.00

Product Support Phase documentation costs will be defined at the New Product Assurance/Product Support equipment transition meeting time.

6.4 Training

6.4.1 Domestic

6.4.1.1 Philosophy:

There are NO initial ATS/DTS level training classes planned pertaining to the DW-20 Daisy Printer. A video tape will be produced on this product to meet the training needs of the C.E.'s in the field. DW-20 Daisy Printer training is being evaluated for inclusion into the appropriate on-line Technician Training class as the printer is released across various product lines.

6.4.1.2 Responsibilities:

Coordinator and Assigned Personnel

John JR. Carpentier (Supervisor)

Ron Olesen (Curriculum Developer)

1. To produce the necessary course curriculum to meet the field training needs for this product.

6.4.1.3 Goals:

1. To provide DW-20 Daisy Printer maintenance training to a sufficient number of field personnel in order to support customer shipments of this product.
2. To provide instructor and lab tech training to the Technician Training group of the Technical Training Center.
3. To produce a video program to support the product training needs of the field and the Technical Training Center's technician training group.

6.4.1.4 Course Prerequisites:

6.4.1.4.1 Initial Training

There are NO initial ATS/DTS/instructor level training classes planned to support Beta sites and initial customer shipments of the DW-20 Daisy Printer.

6.4.1.4.2 On-Line Training

DW-20 Daisy Printer training is being evaluated for inclusion into the appropriate on-line Technician Training class as the printer is released across various product lines.

6.4.1.5 Video Module Section Outline:
(Preliminary)

- I. Introduction to:
 - A. Product
- II. Product Familiarization
 - A. Location of assemblies & subassemblies
- III. Operation
 - A. Operator's controls
 - B. Mechanical assemblies
 - C. Electrical assemblies
- IV. Functional Description
 - A. Power supply and Power distribution
 - 1. Switching power supply PRECAUTIONS
 - B. Functional block diagram flow
- V. Alignment & Adjustments
 - A. Mechanical adjustment procedures
 - B. Electrical adjustment procedures
- VI. Diagnostics
 - A. Procedures
 - B. Error interpretation
- VII. Installation
 - A. Unpacking
 - B. Checkout procedures

6.4.1.6 Training Support Spares:

1 each of all DW-20 Daisy Printer PCA's

6.4.1.7 Special Tools and Test Equipment

New products support in acquiring any special tools required to support training on this product.

6.4.1.8 Documentation Support

Technical Training Center (TTC) requires twenty-five (25) copies of the DW-20 Daisy, New Product Phase, Product Maintenance manual, if a separate manual is developed for this product, from Technical Documentation to support DW-20 Daisy training for a two week period. The remaining manual requirements will be met by the TTC until the DW-20 Daisy Product Maintenance manual becomes a stocked item.

6.4.1.9 Capital Equipment

6 (six) New Product Assurance supported DW-20 Daisy Printers.

6.4.1.10 Costs

Equipment (approximate)

6 DW-20 Daisy Printers at approximately \$2,500.00 each for a total of \$15,000.00.

Total annual depreciation of \$2,100.00 (14,000 x 14%) @ a rate of \$175.00 per month.

Total depreciation FY'82: \$175.00 x 8 months = \$1400.00.

Video Course Development (approximate)

4 man months to Research, Develop, and assist in Video Production effort:

4 man months salary & fringe = (to be furnished upon request)

Video Production Costs (approximate)

To be determined

6.4.1.11 Schedule

6.4.1.11.1 Project Schedule (preliminary)

OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.
------	------	------	------	------	------	------	-----	------	------	------

X-----X Research DW-20 Daisy product (1 man-month)

X Estimated equip. arrival date at TTC

X-----X Video script & workbook development

X-X Script review process

X Script ready for narration

X--X Script narration

X-----X Video production

X Video tape technical review

X--X Tape Duplication

X-X Tape distribution to field

6.41.1.11.2 Course*Schedule

NOT APPLICABLE - Video Program

6.4.1.12 Training Support to International

1. Home Office Training

NOT APPLICABLE - Video Program

2. Documentation

To distribute a copy of the DW-20 Daisy training video tape, to all International training centers when the completed program becomes available.

3. Outreach Training

None planned.

6.4.2 International

*** This portion of the maintenance plan will be submitted to the New Product Group by the International area offices for inclusion in the Product Maintenance Plan following distribution of the PRELIMINARY Maintenance Plan.***

6.4.2.1 Philosophy

6.4.2.2 Responsibilities

6.4.2.3 Capital Equipment

6.4.2.4 Training Support Spares

6.4.2.5 Schedule

DW-20 Low Cost Daisy Printer
Maintenance Plan Input - PRELIMINARY

6.5 Logistics

6.5.1 Logistics Support Philosophy

The Logistics support philosophy, both Domestic and International will consist of spares as listed in the product RSL (see section 6.5.3). At present, no extenuating circumstances exist which warrant any exception to Customer Engineering's normal support philosophy.

6.5.2 Responsibilities

The responsible senior planner for this product is (to be determined).

6.5.3 Recommended Spares List

A-Level

<u>Part No.</u>	<u>Description</u>	
210-7738	Siblink PCB	RIL
210-7867	CPU PCB	RIL
210-7868	Driver PCB	RIL
210-7877	Sub-Panel PCB	
220-3184	Keyboard Cable Assy	
220-3185	Siblink Cable Assy	
220-3187	CPU to Drive Assy	
279-5126	Paper Drive Motor	
279-9000-26	Carriage Dr. Mtr. Assy	
323-0010	Counter	
325-2468	Sheet Metal Keyboard	
400-1001	Cooling Fan	
461-2023	Idler Gear	
650-9069	Margin Sensor	

B-Level

270-0727	Switch Pwr. Supply	RIL
279-9000-22	Print Head Assy	RIL
325-2122	Thermal Sensor	
325-2403	Paper Out Switch	

6.5.4 Special Tools

At present there are no special tools needed to support this product.

6.5.5. Field Ordering Requirements

All RIL (Restricted Item List) parts will be automatically allocated to the Field upon first customer shipment into an RDB. Replenishment of each spare will happen automatically depending on the sparing ratio. Example: If the spare is a B level and at a 1:5 ratio, upon FCS into the RDB a spare(s) will be allocated.

6.5.6 Test Site Support

Initial test site support will be provided by R&D. There is in place a reporting and tracking procedure for the first 25 units shipped to the field. These first 25 units will be replaced on a one for one basis once failures occur. With these initial 25 shipments, 25 back-up units will be shipped to the selected sites. When a problem occurs, the local C.E. will go to the site and merely effect an exchange. The failing unit will be shipped back to R&D for repair and evaluation. This procedure is the responsibility of Bob Chen at R&D.

6.5.7 Financial Analysis

The financial analysis cannot be completed at this time as the RSL costing is incomplete.

6.5.8 Special Packaging and Handling

No special packaging and handling needs exist at present.

6.5.9 Schedule

The spares for the DW-20 low cost Daisy Printer will be forecasted for the first time this month. Delivery should coincide with first customer shipment.

Field Service Center Repair Plan
For: DW-20 Daisy Printer

6.6 Repair

6.6.1 Repair Plan Objective

The goals of the repair plan are:

To insure there are repair methods available for the product at Beta Site introduction.

List the initial repair methods that will be available during the initial product introduction.

List the primary repair methods to be used when available in the Field Service centers.

List those Field Service centers (Domestic and International) responsible for the initial repairs of the product.

6.6.1.1 DW-20 Daisy Printer Preliminary Repair Plan

The preliminary repair plan for the DW-20 Daisy Printer is to use millennium signature analysis for repair of the Z80 based 210-7738 Siblinc and 210-7867 CPU boards. The millennium emulation is already in FSC's for the 210-7738 Siblinc, which was developed for the 5575 high speed bank printer. The 210-7738 Siblinc PCB will be reviewed for A.T.E. because of the increase in volume.

The 210-7868 printer dr. will be repaired using a Tech and Diagnostics. The switching power supply is being reviewed for best test method.

6.6.2 New Products Needs/Requirements

6.6.2.1 Domestic New Product Capital Equipment Requirements

It is recommended that each Domestic FSC repair center order a minimum of one (1) DW-20 printer for use as repair and burn-in.

The DW-20 Daisy Printer will be used on the following equipment: 2200 System/OIS System 5/2200 VS/Wangwriter II. The Printer interface with the OIS/VS will be available in January. The 2200 System interface will not be available until April or May. At this time it is recommended to use OIS 125A capital equipment in FSC repair centers for system test and burn-in.

6.6.2.2 International New Product Capital Equipment Requirements

It is recommended that each International FSC repair center order a minimum of one (1) DW-20 Daisy Printer for use as repair and burn-in.

The DW-20 Daisy Printer will be used on the following equipment: 2200 System OIS/System 5/2200 VS/Wangwriter II. The printer interface with the OIS/VS will be available in January. The 2200 System interface will not be available until April or May. At this time it is recommended to use OIS 125A capital equipment in FSC repair centers for system test and burn-in.

The DW-20 Daisy Printer Field Service Center Repair Plan will be revised as more information becomes available.

6.7 Product Support

6.7.1 Responsibilities

6.7.1.1 P.S.G. will become involved in the product approximately 90 days prior to Beta test of the unit.

6.7.1.2 P.S.G. will offer input to

1. Maintenance Plan
2. Training Course
3. Diagnostics
4. Documentation

6.7.2 Support Personnel

Initially Charlie Jetter will be the P.S.G. engineer involved with the prototype and Beta sites.

6.7.3 Field Implementation Plan

After product transition from New Product group to Product Support the Pheripheral Support group will be the Home Office Customer Engineering interface for this product.

6.7.4 Test Site Support

Product Support will be involved with Alpha and Beta install as a hand on training experience. The P.S.G. individual will not be H.O. support in place of N.P.G. Product Support will become primary Home Office support after transition of the product from New Product Assurance.

6.7.5 Capitol Equipment Requirements

6 - Training
4 - Repair
2 - Product Support
3 - International (Repair)
1 - New Products
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6.7.6 Schedule

Due to first customer ship dates possibly changing, Product Support will be somewhat flexible in scheduled involvement.

VIII. FEEDBACK

At a meeting held 9/16/81 it was agreed that the first twenty-five (25) units will be shipped with a backup unit to be held at the branch, and these backup units will be installed if the customer's unit fails. This is to enable the failing unit to be returned untouched and intact to R&D for evaluation.

Doc. 0660Z



LABORATORIES, INC.

TO: AREA DIRECTORS, COUNTRY MANAGERS, BRANCH MANAGERS,
AND ALL SALES AND SUPPORT PERSONNEL

FROM: JOSEPH GRANT AND JOHN MOLITOR

SUBJECT: MODEL DW-20 DAISY PRINTER ANNOUNCEMENT

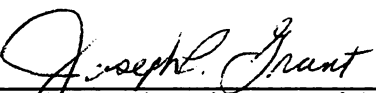
DATE: OCTOBER 1, 1981

Wang Laboratories is pleased to announce the availability of the Model DW-20 Daisy Printer as the newest family member of letter quality printers for use on all Word Processing, Office Information Systems, VS and 2200 series Product Lines.

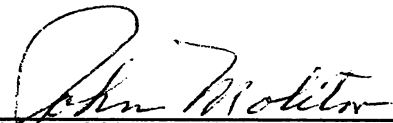
This announcement of a highly reliable, low priced daisy wheel printer is a demonstration of our ability to continually support and enhance our product offering, and gives evidence of our commitment to the Marketplace.

Details of this announcement are outlined in the accompanying package prepared by Market Planning and Development. Your thorough review of the information enclosed with this announcement will help you understand this new product and will ensure a better posture for you to sell more effectively.

Our best wishes for your continued success.



Joseph Grant, Vice President
Market Planning and Development



John Molitor, Vice President
Marketing Support

JG:JM:dc:l845T

Enclosure



WANG

LABORATORIES, INC.

TO: AREA DIRECTORS, COUNTRY MANAGERS, BRANCH MANAGERS,
ALL SALES AND SUPPORT PERSONNEL

FROM: PRODUCT LINE MANAGEMENT

SUBJECT: MODEL DW-20 DAISY PRINTER ANNOUNCEMENT

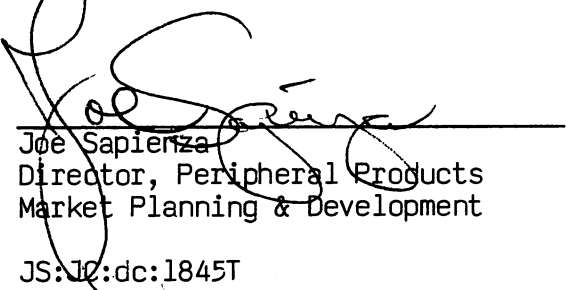
DATE: OCTOBER 1, 1981

Wang Laboratories is pleased to announce the availability of the Model DW-20 Daisy Printer as the newest family member of letter quality printers for use on all WP, OIS, VS and 2200 Product Lines.


This Announcement package contains:

1. Product Description
2. Market Opportunities and Strategies
3. Pricing and Availability
4. Printer Supplies and Options
5. Data Sheets

With the announcement of this low priced, highly reliable daisy wheel printer, Wang Laboratories continues to show its commitment to develop the most complete line of printers to address the needs of today's marketplace.

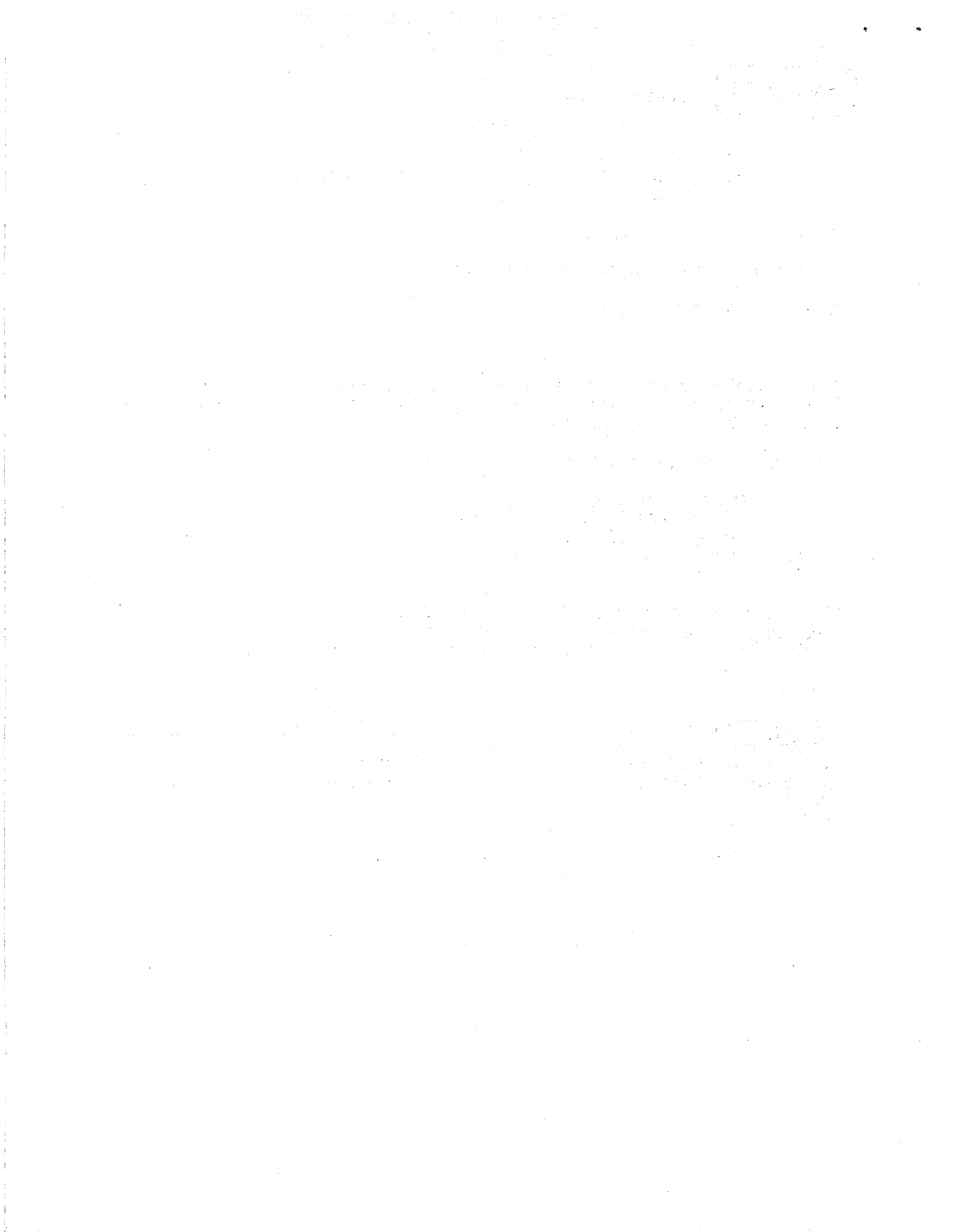


Joe Sapienza
Director, Peripheral Products
Market Planning & Development



Jim Curran
Product Specialist
Market Planning & Development

JS:JC:dc:1845T



PRODUCT POSITION

PRODUCT DESCRIPTION

The Model DW-20 Daisy Printer is the newest family member of letter quality printers from Wang Laboratories. This new printer is a HIGHLY RELIABLE, twenty (20) CPS (Characters Per Second) standard-width daisy wheel printer. The Model DW-20 is positioned as Wang Laboratories lowest priced, letter quality printer and will complement the 30-35 CPS daisy printer, the newly announced Model 5577 High Density Matrix printer, and the Image Printer.

The DW-20 printer will be available on all Wang Laboratories Word Processing, Office Information Systems (OIS), VS and 2200 Product Lines.

Several models of the DW-20 printers are offered to cover an assortment of interface requirements. The Model Numbers for each Product Line are identified below:

<u>PRODUCT LINE</u>	<u>DW-20 MODEL NUMBER</u>
WP-5	DW/5-20
WP-20, 25, 30	DW/WP-20
OIS AND VS	DW/OS-20
VS-Remote	DW/R-20
2200	DW/22-20

The DW-20 printer offers superior print quality and a design that has been simplified by minimizing the number of moving parts, adjustments and electronic components resulting in a highly reliable product.

The DW-20 printer is rated at 20 CPS when printing the industry standard Shannon Text with a 10 pitch printwheel. Overall throughput of the DW-20 daisy printer is enhanced by using techniques intended to print the text in the fastest possible way and by the availability of automatic paper handling devices.

The DW-20 printers are plug compatible with the 6581W daisy printer used on the Word Processing, OIS, and VS Product lines. The features and functions of both daisy printers are the same with the exception of the reduced speed and significantly lower prices of the DW-20. In addition, all 5541/6581W printer supplies and options are supported by the DW-20 daisy printer.

The 2200 version of the DW-20 printer is strictly a letter quality printer without the special plotting and forms filling commands of the Model 2281W. The Model DW/22-20 can serve as either a system or terminal printer for the 2200 LVP, SVP, MVP or VP Wang Systems, and is ideal for Wang 2200 Series word processing applications.

The DW-20 printer is equipped with an automatic diagnostic program and test button to aid the operator and the Wang Customer Engineer in diagnosing a failure when one should occur.

- The automatic diagnostic program is executed during the powering on of the DW-20 printer and will report type of failure onto a digital read out display. This display is located inside the front cover of printer.
- Additional diagnostics may be activated by selecting the "Test" button located on the new light touch control panel. When activated the test button further defines the failure by providing a sample printout.

The information provided by these diagnostic capabilities improves the serviceability of the DW-20 printer resulting in a faster repair when a failure should occur.

Ease of use features have been incorporated making this printer more convenient to use than the Model 5541W and 6581W daisy printer. They include:

- A new tilt printhead design allowing for an easy removal of printwheel without the need of removing the ribbon cartridge.
- A simplified ribbon handling mechanism for quick and easy replacement of the snap in ribbon cartridge.

DW-20 PRODUCT HIGHLIGHTS

- . 20 CPS, bi-directional daisy wheel printer.
- . Highly reliable - 3000 hours (MTBF) at 25% duty cycle.
- . Low Priced - Wang Laboratories lowest priced letter quality printer.
- . Automatic diagnostic test program and test button to aid in diagnosing failures.
- . Supports wide variety of interchangeable metal or plastic printwheels.
- . Easy to use snap in carbon or fabric ribbon cartridges.
- . Improved serviceability of less than 30 minutes (MTTR).
- . Supports paper widths of 3.5" to 15" and up to 6 part forms.
- . All 5541W/2281W/6581W printer options such as Twin Sheet Feeders, Envelope Feeders, Mono and Bi-directional Forms Tractors are adaptable with the DW-20 daisy printer.
- . Capable of cutting stencils.

MARKETING OPPORTUNITIES AND STRATEGIES

The DW-20 printer is positioned, through innovative design and human engineering, to provide the user with a highly reliable, letter quality printer at a significantly lower price than was previously available.

The aggressive pricing of the DW-20 daisy printer allows effective selling of additional letter quality printers. These low priced quality printers are designed to be distributed throughout the organization to increase productivity, improve turnaround, and most of all, improve customer satisfaction with a reliable printer.

In order to assist in the effective sale of this product it is important that you are aware of three major considerations that relate to the product objectives and provide you with effective selling tools. These considerations are outlined below and include:

1. DW-20 and 6581W Price/Performance Comparisons
2. Product Reliability
3. Configuration Considerations - A Case Study

1. DW-20 and 6581W PRICE/PERFORMANCE COMPARISONS

The DW-20 is a twenty (20) CPS daisy printer. The print rate is approximately two-thirds the speed of the 6581W. The DW-20 printer is not expected to handle the same amount of daily output as the 5541W/6581W printers and should not be considered as a one for one replacement. The aggressive pricing allows you to offer two DW-20 printers at a price that is less than one 35 CPS printer. Using this approach, your customer can achieve increased productivity and a more even distribution of the workload.

The following chart (Figure 1) is provided to further clarify the price/performance of the DW-20 when comparing to the 6581W.

ASSUMPTIONS

1. An average page contains 2500 characters (50 lines x 50 characters).
2. The DW-20 daisy printer is capable of printing up to 72,000 characters per hour.
3. The 5541W/6581W daisy printer is capable of printing up to 115,000 characters per hour.
4. Print rates do not include operator intervention such as the loading and unloading of paper or changing of ribbons and printwheels.

	<u>DW-20</u> (U.S. List \$2,695)	<u>6581W</u> (U.S. List \$6,000)	<u>Two DW-20's</u> (U.S. List \$5,390)
2 hours	60 pages	90 pages	115 pages
4 hours	115 pages	185 pages	230 pages

FIGURE 1

2. PRODUCT RELIABILITY

With the introduction of a new generation of Daisy Printers, many vendors are expressing failure rates in terms of Mean Time Between Failures (MTBF). The MTBF is the rate at which the printer is expected to breakdown during a certain period of time. This term is meaningless unless accompanied by another parameter; "Duty Cycle". The term Duty Cycle defines the portion of time the printer is actually printing when compared to the time the printer is powered on.

It is a product objective of the DW-20 printer to provide a more reliable alternative to the 5541W/6581W daisy printer. To assist in maximizing the improved reliability of the DW-20, the following analysis (Figures 1 & 2) is provided to put the relationship between MTBF and Duty Cycle in a meaningful perspective. Using the charts, you can determine expected failures at various levels of usage. This allows you to configure the DW-20 printer properly, thus maintaining the DW-20 as one of the most reliable printers in its class.

NOTE: The terms "failure" and "service call" are not synonymous when referring to the following charts. This is due to factors that are uncontrollable by Wang Laboratories such as improper operator procedures, environmental conditions, or the misuse of printer options and supplies. This implies that a customer may experience more service calls per year than those indicated by the failure rate on the following charts.

Because no user operates his printers exactly the same, it is necessary to define a set of "standard" or assumed conditions. Those Assumptions follow:

1. All statistics are based on a 260 day work year (52 weeks x 5 days).
2. Mean Time Between Failure is a function of the design, use, operating environment and the maintenance of the DW-20 daisy printer and is expressed in Power-On hours.
3. Duty Cycle is calculated on an 8-hour day for example, a 25% Duty Cycle equates to two hours of actual printing.

DW-20 DAISY PRINTER ANALYSIS

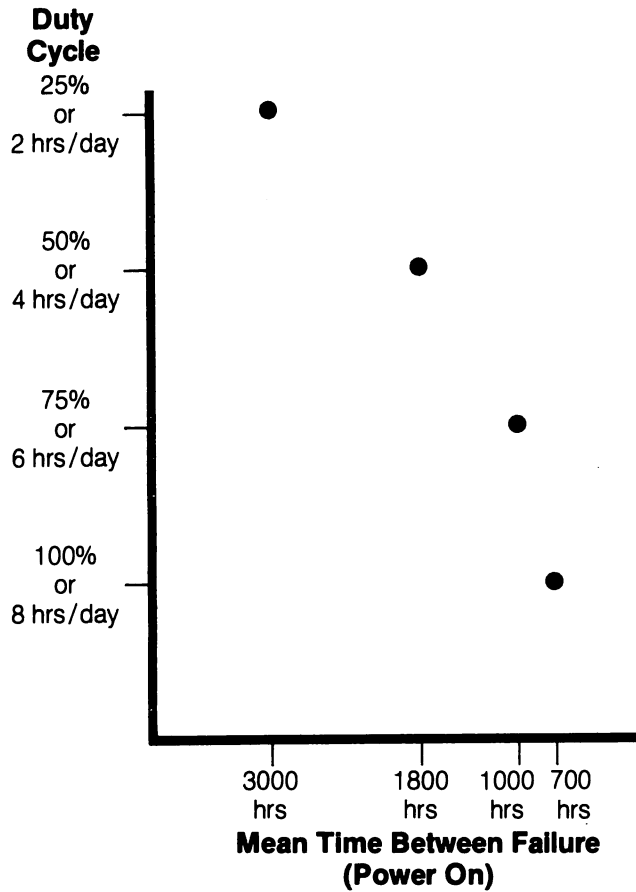


Figure 1. Relationship of Mean Time Between Failure to Duty Cycle

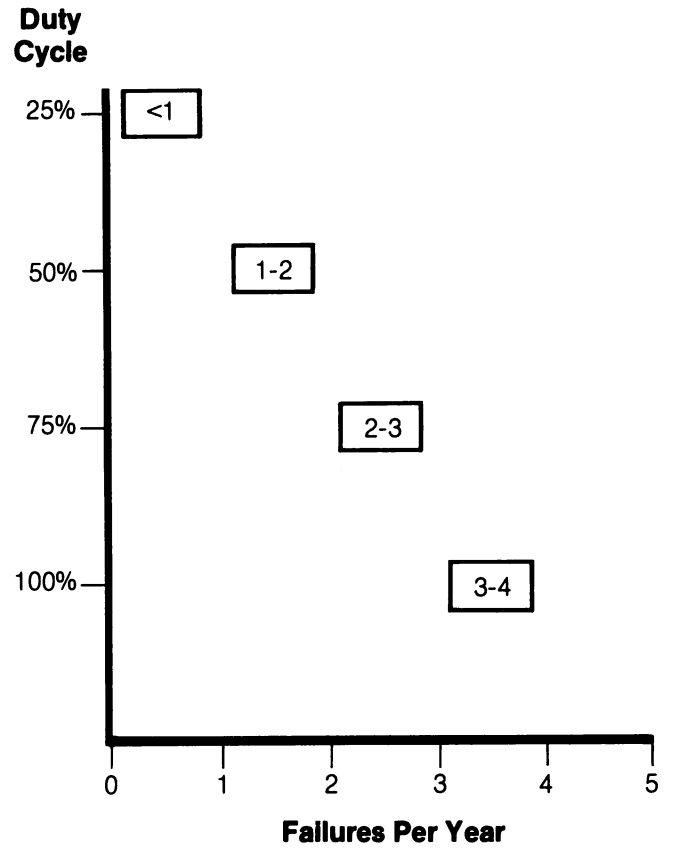


Figure 2. Relationship of Usage (Duty Cycle) to Failures

CONCLUSIONS:

1. At two hours of printing per day or 520 hours of printing per year, the end user will average less than 1 failure per year.
2. At four hours of printing per day or 1040 hours of printing per year, the end user will average between 1 and 2 failures per year.
3. At six hours per day or 1560 hours of printing per year, the end user will average between 2 to 3 failures per year.
4. At eight hours per day or 2080 hours of printing per year, the end user will average between 3 to 4 failures per year.

3. CONFIGURATION CONSIDERATIONS - A CASE STUDY

Proper configuring of hard copy devices is the key for ultimate customer satisfaction. Daily output requirements vary from customer to customer, therefore each organization may require a different configuration of printing devices. In the past, it was common to find the daisy printer handling the bulk of the workload. Too many times, the daisy printer was overworked resulting in excessive service calls. By understanding your customer needs and the expanded printer offering from Wang laboratories you can now meet the needs of your customer with better results.

The following case study illustrates one approach of configuring a variety of printers to meet the application and cost requirements of a Corporate Word Processing Center:

CASE STUDY

<u>Working Environment:</u>	Corporate Word Processing Center
<u>Printing Volume:</u>	2000 pages per day
<u>Applications:</u>	1. <u>Letter Quality</u> such as business letters and executive reports: 15% or 300 pages per day. 2. <u>Draft Quality</u> for documents requiring several revisions: 25% or 500 pages per day. 3. <u>High Volume/Multiple Copy</u> such as bids or repetitive documents: 60% or 1200 pages per day.

Analysis: In this case study, the printing requirements have been identified by printing categories (letter or draft copy). With this understanding, the printer system may be configured to best meet the requirements of this Word Processing Center. One approach of configuring this system will be with: five (5) DW-20 Daisy Printers, a Model 5535 Matrix Printer and a Wang Intelligent Image Printer. This proposal of printers is very capable of handling all the identified applications within the duty cycle recommendation of each device. The 300 pages of letter quality print can be handled by the DW-20 daisy printers at an ideal 25% duty cycle usage. The Model 5535 Matrix can easily handle the 500 pages of draft printing that is required each day. The Wang Intelligent Image printer is capable of handling the daily volume of 1200 pages of high volume/multiple copy workload.

Reliability and cost considerations are also important when configuring the printer systems. As stated in the case study, all the proposed printers were selected to operate within their recommended duty cycle. This means increase productivity and less service calls to your customer.

The costing of a system is also important. For example, using the same conditions of the case study (workload, duty cycle usage) it would have taken (22) 6581W daisy printers to accomplish the same task. This is a substantial investment of \$132,000 on the part of the customer. For comparison purposes, the proposed printing system in the case study totals only \$49,975. By taking advantage of the Wang Printer Family you can now offer substantial savings to your customer in meeting their requirements.

In summary, Wang Laboratories offers an extensive line of printer products for a wide range of applications. The success and rewards of printing solutions is dependent upon the understanding of your customer requirements and matching them to the right printer family. By mixing and matching within the Wang Printer Family you are better able to meet the needs of your customer with better results.

PRICING AND AVAILABILITY

PRODUCT PRICING

U.S. PRICING ONLY - 10% HIGHER IN ALASKA

<u>PRODUCT LINE</u>	<u>DW-20 MODEL NUMBER</u>
WP-5	DW/5-20
WP-20, 25, 30	DW/WP-20
OIS AND VS	DW/OS-20
VS-Remote	DW/R-20
2200	DW/22-20

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>PURCHASE PRICE</u>	<u>MONTHLY MAINT.</u>	<u>MONTHLY RENTAL</u>
DW-20 Series	20 CPS, bi-directional daisy wheel printer	\$2,695	\$37	\$127
FT-1	Mono-directional Forms Tractor	\$ 250	N/C	N/C

CANADIAN PRICING

(Canadian Dollars)

<u>MODEL</u>	<u>EXEMPT FST & DUTY</u>	<u>FST EXEMPT DUTY PAID</u>	<u>FST & DUTY INCLUDED</u>	<u>MONTHLY MAINT.</u>	<u>MONTHLY RENTAL</u>
DW/5-20 DW/WP-20 DW/OS-20	\$3,350	\$3,525	\$3,725	\$45	\$175
DW/R-20 DW/22-20	\$3,650	\$3,825	\$4,050	\$48	\$210
FT-1	\$ 325	\$ 350	\$ 375	N/C	N/C

INTERNATIONAL PRICING

(U.S. Dollars)

	<u>DW-20 Series</u>	<u>FT-1</u>
Recommended Purchase	\$3,370	\$315
Recommended Monthly Maint.	\$ 50	N/C

AVAILABILITY

Orders for all DW-20 daisy printers may be taken immediately with a phased delivery schedule by Product Line:

	<u>PRODUCT LINE</u>	<u>AVAILABILITY</u>
1.	OIS and VS	January, 1982
2.	WP-5, 2200 and VS-Remote	April, 1982
3.	WP-20, 25, 30	July, 1982

DW-20 DAISY PRINTER SUPPLIES AND OPTIONS

The Model DW-20 Daisy Printer is supported by the most complete line of supplies and options in the industry. This extensive offering allows your customers to configure the DW-20 Printer into a wider range of applications than can be met by other system vendors. All the DW-20 printer supplies and options are directly compatible with the 5541W/2281W/6581W printers and are immediately available from Wang Laboratories.

The following consumables and options are supported on the DW-20 daisy printer:

1. Wide variety of interchangeable Metal and Plastic printwheels in both 10 and 12 pitch. Additional styles of Proportional Spaced and 15 pitch are also available for the OIS and VS systems. Please refer to the Wang Supplies Catalog (700-5725A) for pricing and ordering procedures.
2. Assortment of Multi-Strike, Single Strike and fabric ribbon cartridges. Please refer to the Wang Supplies Catalog (700-5725A) for pricing and ordering procedures.
3. The Model FT-1 Mono-directional forms tractor.
4. The Model BFT-1 Bi-directional forms tractor.
5. Twin Sheet Feeders including: Models TSF-01, 03, 20, 21, 31 and 33.
6. Envelope feeders including: Models EF-1, 2, 3, 11, 12 and 13.



AUG 9 1982

MEMORANDUM

To: Jim Curran
From: Rich Racicot/John Haynes
Subject: DW20/2281W Specification differences
Date: July 28, 1982

cc:

Pete Seymour
Dick Therrien
Steve Owens
Paul Wilder
Fred Tubbs
Alan Goldman

J. Belanger
J. Proulx
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D. Morelle
R. Rosen
B. Patel
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J. Thibault
E. Dilorenzo
P. Welch
E. Kelly

~~XXXXXXXXXX~~
D. Buttlar
T. DiPietro
R. Fox
J. Green

The below functions, that are resident on the DW20, are enhancements to the 2281W specifications (Note: These sequences are described in full on following pages):

- | | | |
|-----|-----------------------------|---|
| 1. | 02 02 dd ... OF | Select character font. |
| 2. | 02 04 xx yy zz ... OE or OF | Define meaning of isolated HEX(OE) code. |
| 3. | 02 07 OE | Select Printer |
| 4. | 02 09 01 02 dd ee OF | Set Pitch -- dd ee = a hexadecimal value giving the integral and fractional value of the desired pitch. |
| 5. | 02 12 01 01 ff 01 cc dd OE | Load Font description |
| 6. | 02 1D dd ... dd 1E OF | Load DAVFU code. |
| 7. | 02 01 02 1F 0d OF | Skip on DAVFU channel #d |
| 8. | 02 01 02 1F 1d OF | Skip 'd' lines on DAVFU |
| 9. | 02 01 02 01 dd OF | Start built in diagnostics. |
| 10. | 02 0A dd OF | Execute partial line feed. |

The following are slight modifications to a few of the same code sequences used in the 2281W:

VERTICAL TAB-HEX(OB)

If the Form length is not an even inch increment, Hex 'OR' will cause the printer to go to top-of-form after the last tab location. For example, if the form length is 13.5 inches, after the 13th tab the printer goes to the top of the next form. If a VFU is downloaded without setting tabs in channel 2, a vertical tab(Hex 'OB') will function like a top of form(Hex 'OC'). A 'skip on channel 2' will execute in the same manner as the vertical tab(Hex 'OR').

SET LINE FEED SPACING-HEX(E9yyff)

Setting a new line feed size should have NO affect on the current form feed size, but if set while within a form, where the next top of form will fall is unpredictable. This is avoided if the line feed size is set after the following:

- printer powered off then on
- execution of power on reset sequence
- execution of form feed code(OC)

MOVE ABSOLUTE-HEX(E7xxxxyyy)

This command should be capable of moving the platten to any position in the current or following form. Defining a vector that places the platten outside the left or right boundaries of the printer, will print current contents of the buffer, position print wheel to the exceeded left or right boundary, light the error light and deselect the printer.

SET FORM LENGTH-sequence(O2 OC 01 cc dd ... dd OF)

If not at top of form, this sequence first generates a top of form(Hex 'OC'), before setting new form length. A change from a standard form length (11", 12" or 14") to another standard form length will change the number of lines per page according to the LPI (Lines/page=LPI x Form len"). A change to a non-standard form length will result in some integer value of total lines per page that would be close to the (LPI x Form len") but the value would be unpredictable.

The following functions, resident in the 2281W, are not supported on the DW20:

A. Control Codes:

HEX(09)	Tab
HEX(19)	Clear Tab
HEX(1A)	Set Tab
HEX(7F)	Clear Buffer
HEX(EO)	Move Long
HEX(E5)	Power On Home
HEX(E6)	Move Short

B. BASIC Statement:

PLOT (with its variations)

C. **Print Head positioning with the printer keyboard.** Subroutines may be written to simulate the 2281W keyboard from the terminal if there is sufficient interest.

The DW20 does not automatically insert a leading space into the printer buffer, as did the 2281W.

Description of HEX(02...) sequence enhancements to the DW20.

1. Select Font

02 02 dd ... 0F

- dd = 00 for font zero (i.e., default)
- = 02 for alternate font # 1
- = 04 for alternate font # 2

Although fonts are generally device dependent, we have adopted the following philosophy regarding their structure. A font is to be regarded by the programmer as consisting of 240 bytes; that is, 256 bytes minus 16 control codes. In a given implementation, a font may contain fewer than 240 characters. This is the case with the Wang 2281W daisy printer, for example, when the daisy wheel has only 96 petals, and more than 16 control codes are defined. It is also the case in the 2236DE terminal where codes above HEX(90) are defined to be underscored characters. The default font on any 2200 printer or display device should be defined as identical to the 2236DE character set as possible. This includes defining the 80-bit to produce the underscored characters from HEX(10) to HEX(7F). The 2200 Daisy printer line is an exception to this rule. The design of alternate fonts could interpret the 80-bit in the same fashion or as non-underscored characters that are different from those at HEX(10) to HEX(7F). The Daisy Printers should implement the select font sequence in the following manner:

- a. Upon receipt of a valid code sequence, print the data currently in the buffer; do not execute an automatic line feed.
- b. Deselect the printer, and light the 'Change daisy' lamp on the printer's keyboard.
- c. Select the correct font and wait for the printer to be SELECTed. When the SELECT switch is pressed, turn off the 'Change daisy' lamp.
- d. Continue accepting data until a HEX(0D) is received or the buffer becomes full and then print the remainder of the buffer from the selected font.
- e. The new font should remain selected until the receipt of a new font select sequence; or the receipt of the reset default sequence (HEX(02 0D 0C 03 0F)), or the printer is powered off and then back on.

2. Define Meaning of Isolated HEX(OE) Code

02 04 xx yy zz ... OE or OF

Most 2200 printer/display devices have some ability to enhance or highlight output. This is most often done by underscoring, expanding, blinking, reversing the video, intensifying the video, or changing color. The usual method of activating highlighted output is by sending an isolated HEX(OE) code to the device (an isolated code is one which is not part of a predefined code sequence). The techniques used to highlight output are all device dependent. The code sequence given above allows the user to specify which techniques he wishes to use on a given device. The defined values for the parameters xx, yy, and zz are as follows:

02 for bright intensity (CRT only)/Emphasized or overstrike printing
04 for blink (CRT only)
xx = 00 for neither (CRT only)
0B for both(for the printer, overstrike only)

02 for reverse video (CRT only)
04 for underscore (CRT and printer)(see note at end of section)
yy = 00 for neither
0B for both(for the printer, underscore only)

02 for horizontal expand print
04 for vertical expand print
zz = 00 for neither
0B for both

This sequence may be terminated with either a HEX(OE) code or a HEX(OF) code. These codes are used to specify when the desired attribute will be activated and when and how it will be deactivated. If the sequence terminates with a HEX(OE) code then the attribute should be turned on immediately upon receipt of the HEX(O2) sequence. In the case of buffered printers, this means the data currently in the buffer should be printed first and then the attribute should be turned on. The attribute should remain on until the occurrence of any of the following events (regardless of intervening carriage returns (HEX(OD)) or isolated HEX(OE) codes):

- a. an isolated HEX(OF) code.
- b. another HEX(O2 O4 xx yy zz OE or OF) sequence
- c. a HEX(O2 OD OC O3 OF) sequence (i.e., reset defaults)
- d. printer powered OFF and then ON.

If the HEX(O2 O4 xx yy zz OE or OF) sequence is terminated by a HEX(OF) code, then the attribute should be turned on only upon receipt of an isolated HEX(OE) code. It should be turned off upon receipt of an isolated HEX(OF) code or a carriage return (HEX(OD)) code, whichever occurs first. The specified meaning of HEX(OE) should remain in effect until the occurrence of either of the following events:

- a. another HEX(O2 O4 xx yy zz OE or OF) sequence
- b. a HEX(O2 OD OC O3 OF) sequence (i.e., reset defaults)
- c. printer powered OFF and then ON.

NOTE: The occurrence of a HEX(OO) value for xx, yy, or zz turns off the attribute while the HEX(O2ODOCO3OF) sequence causes all attributes to be reset to their power on default values.

Examples:

1. Define enhanced print as underscore. Turn on the attributes with HEX(OE) and turn off with HEX(OF) or carriage return:

```
10 PRINT HEX(02040004000F)
20 PRINT "ABC"; HEX(OE); "XYZ"; HEX(OF); "123"
30 PRINT "ABC"; HEX(OE); "XYZ123"
40 PRINT HEX(OE); "ABCXYZ123"
```

OUTPUT

```
ABCXYZ123
ABCXYZ123
ABCXYZ123
```

2. Define enhanced print as underscore. Turn on immediately and turn off with HEX(OF).

```
10 PRINT HEX(02040004000E)
20 PRINT "ABC"
30 PRINT "XYZ"
40 PRINT "123"; HEX(OF)
50 PRINT "END OF TEST"
```

OUTPUT

```
AEC
XYZ
123
END OF TEST
```

3. Printer Select

02 07 0E

Upon receipt of this sequence, the printer should follow the "Execution Sequence" (page 6) and should light its SELECT lamp and go into an ON LINE state.

4. Select Pitch

02 09 01 02 dd ee OF

dd ee = a hexadecimal value giving the integral and fractional pitch.

This sequence should be implemented on any device that is capable of offering more than one pitch. The specified pitch remains selected until:

- a. The occurrence of another select pitch sequence.
- b. A HEX (020D0C030F) Sequence (i.e. reset defaults).
- c. The device is powered off and on.

Examples:

```
10 PRINT HEX(0209010208000F) select proportional
10 PRINT HEX(020901020A000F) select 10-pitch
10 PRINT HEX(020901020C000F) select 12-pitch
10 PRINT HEX(020901020F000F) select 15-pitch
10 PRINT HEX(0209010200000F) select default (i.e. 10-pitch)
```

5. Down Load Font Description

```
02 12 01 01 ff 01 cc dd...cs /01 cc dd...cs/ OF
```

12 defines the sequence as 'Load Font', ff is a one byte font position value, cc a byte count of following bytes and dd...cs is the data block.

This sequence down loads character pin data from the CPU to the printer. The specific font position is specified by 'ff' and the pin data for that position is described in a single or mutiple variable-length data block. The length of each data block is given by 'cc' and the ccth byte ('cs') must be a checksum for that data block.

6. Load DAVFU Code

```
02 1D dd ... dd 1E OF
```

The exact specifications for the values of dd ... dd may be found in the respective printer manuals. In general, before attempting to change the DAVFU loading, the host computer should execute a form feed (HEX(0C)) and a set line feed size sequence if the new DAVFU data is intended for a different line feed size than the previous DAVFU loading.

7. Skip to Next Tab on DAVFU

```
02 01 02 1F 0d OF
```

d = a single hexadecimal digit from 0 to C representing the channel number.

This sequence causes the printer platten to advance to the next vertical tab stop in channel d of the DAVFU. This sequence should be executed before the current content of the line buffer is printed.

8. Skip Lines Using DAVFU

```
02 01 02 1F 1d OF
```

d = a single hex digit from 0 to F.

This sequence causes the printer to skip d lines using the currently selected line feed size. It should be executed before the current content of the line buffer is printed.

9. Execute Built-in Diagnostics

02 01 02 01 dd OF

dd = 00 for all diagnostics

This sequence is defined for all devices having diagnostic routines included in the printer microcode, and should conform to the 'Execution Sequence' (below).

10. Execute Partial Line Feed

02 0A dd OF

dd=00	no line feed
02	1/4
04	1/2
08	3/4

This sequence is used to generate partial line feeds in increments of 1/4, 1/2, and 3/4 of the currently selected full line feed increment. The exact implementation may be somewhat device dependent. In general, the device should come as near as possible to these partial increments. Implementation should follow these rules:

- a. The partial line feed should be performed immediately. It should not cause the line buffer to be printed.
- b. Execution of a normal line feed should cause the platten to be advanced to the start of the next normal line position. This would be the case if a line feed code (HEX(OA)) were received, or a carriage return code (HEX(OD)) were received with auto line feed activated. The host computer should normally suppress the auto line feed (see #11) before using the Partial Line Feed command. Output would then consist of normal printout interspersed with partial line feed commands. The auto line feed mode should then be re-activated (see #10).

Example:

```
0010 SELECT PRINT 204
0020 PRINT "THE EQUATION FOR Z IS:"
0030 REM SUPPRESS AUTO LINE FEED
      : PRINT HEX (020A0F)
0040 REM PRINT SUPER SCRIPTS
      : PRINT "      2  2"
0050 REM ADVANCE ONE HALF OF A LINE
      : PRINT HEX (020A040F)
0060 REM PRINT BASE LINE
      : PRINT "Z = X + Y - 2*(X+Y)"
0070 REM ADVANCE ONE HALF OF A LINE
      : PRINT HEX (020A040F)
```

```

0080 REM PRINT SUBSCRIPTS
      : PRINT "      3"
0090 REM REACTIVATE AUTO LINE FEED
      : PRINT HEX (020A0E)
0100 REM MOVE TO NEXT FULL LINE POSITION
      : PRINT
0110 REM PRINT NEXT LINE
      : PRINT "TO CONTINUE WITH THIS LINE OF THOUGHT,"

```

THE EQUATION FOR Z IS:

$$Z = X^2 + Y^2 - 2*(X+Y)$$

TO CONTINUE WITH THIS LINE OF THOUGHT,

* Execution Sequence: If this Control Code or Escape Code Sequence is imbedded within a line of printable data, it should cause the data currently in the printer buffer to be printed before this Control Code or Escape Code Sequence is performed.

EXAMPLE: The following Basic program statement using the Control Code Hex(OA) would produce a 'stepped' line of output:

```

10 PRINT "ONE";HEX(OA);"TWO";HEX(OA);"THREE"
(output)

```

```

FIRST
SECOND
THIRD

```

Please note that this is not the way early 'Centronics like' WANG line printers execute the HEX(OA) code.

EXAMPLE: Assuming the printer supports it, the following BASIC program using the Escape Code Sequence Hex(O2 07 0F) prints the characters "DESELECT" then extinguishes its SELECT lamp and goes into an OFF LINE state without doing a line feed:

```

10 PRINT "DESELECT";HEX(O2070F)

```

output

```

DESELECT

```



ECO

ECO NO. 24103

SHEET 1 OF 4

ORIGINATOR Stephen Owens EXT. 3930 DATE 07/16/82

WRITTEN BY Valerie Goguen EXT. 4313 DATE 07/16/82

PART NO./ITEM NO. 210-7886-1A

DWG. NO./P. L. NO. 7886

TITLE CPU & I/O

NEXT ASSY. EFFECTED Y

MODEL NO. DW/22-20, 1205, 2200

TITLE PEP#C016

DESCRIPTION OF CHANGE

Change schematic and software loading chart per attached sheet # 2.

Change BOM 210-7886-1A as follows:

WLI #	DESCRIPTION	QTY
Delete 377-0424	EPROM	4
Add 378-7009	Prom	1
378-7010	Prom	1
378-7011	Prom	1
378-7012	Prom	1

SPECIAL INSTRUCTIONS:

When installing the DW/22-20 code in the 1205 printer, the carriage flag on the bottom of the head assembly should be moved to the extreme left, to move carriage home as far to the right as possible so that the 1205 and 81W carriage home will be as close as feasible. This will be necessary until ECO's go through to mechanically change the 1205's carriage home.

REASON/SYMPOTM FOR CHANGE

To release the microcode for new daisy printer.

DOCUMENTS

	REV			EFFECTED
	F	T	Y	
BOM				
ARTWORK			✓	
E-REV				✓
SAMPLE BD				✓
ASSY. DWG.				✓
DRILL DWG.				✓
SCHEM. DWG.				✓
MECH. DWG			✓	
DATE TO DOCUM				✓

DISPOSITION	Banded	FINAL ASSY AREA	SUB ASSY AREA	PARTS		FUTURE MFG
				IN HOUSE	OUTSIDE VENDOR	
USE AS IS TO PREVIOUS REV.						
TO CONFORM						✗
TO CONFORM WHERE FEASIBLE						

APPROVALS

FINAL

DES. ENGR. Stephen Owens 7/20/82

CUST. ENGRG. R. O'Brien 7/20/82

MFG. ENGRG.

OTHER SIGN

DRAWING UPDATED

DESIGN IMPROVEMENT VENDOR REQUEST VALUE ENGRG NO. _____

M E M O R A N D U M

WANG

TO: Dan Murphy

CC: Tina Casten
Anne Drazen
Stan Neumann

FROM: Rich Amico

DATE: October 6, 1982

SUBJ: DW-20 PRINTER ISSUES - 2200 WORD PROCESSING

Per our conversation regarding the DW-20 printer, a caution should be issued to all prospective customers that unpredictable results may occur if specific 2200 Word Processing functions are utilized. The actual printer microcode is in the process of being modified by Bob Schenkein's staff and indications are that it will require approximately six to eight (6 - 8) weeks for completion.

In the interim, however, it is recommended that a notice be published via the weekly telex procedure indicating the nature of the problem, the probability of obtaining erroneous results and an indication of the anticipated completion dates. The following is a sample detailed description that could be used. It is written in paragraph structures that continually describe an even greater level of detail; a process that will allow you an opportunity to decide on the necessary information that should actually be disseminated.

A caution is issued to both existing and potential 2200 Word Processing customers that use of a DW-20 printer will cause erroneous results under certain conditions. The issues are currently being addressed by the printer microcode staff and measures are in place to expedite the process. Indications are that this process will approximate six to eight (6 - 8) weeks.

Basically, two sets of functions will provide erroneous results on a DW-20 printer: 1) backspace oriented features such as underlining, bold print, overstrike and double underscores, and 2) line-feed operations such as super/subscripting and embedded format lines of zero, triple or greater line feeds.

Regarding the first issue, the underline facility will print the underlined character without its intended text; the bold print facility will produce double characters for those indicated; the overstrike feature will cause the characters to print in a consecutive fashion as opposed to simultaneously; and, double underscores are printed sequentially rather than simultaneously.

A further description siting specific examples is provided for your review:

1. Underscoring - the underscored text will be ignored when being printing out on a DW-20.

Eg: "An Example" becomes "An _____".

2. Bold Print - each bold printed character when printed on a DW-20 becomes a doubled character.

Eg: "ABC" becomes "AABBCC".

3. Overstrike - on the DW-20, overstrikes follow the character in which they were intended.

Eg: "~~ABC~~" becomes "A/B/C/".

4. Double Underscore - on the DW-20, underscores are printed sequentially rather than simultaneously. Additionally, the text is ignored as in no. 1 above.

Eg: "ABC" becomes "_ _ _ _".

As it relates to the super/subscripting and format lines, page breaks may occur in an unpredictable manner. Specifically, if a DW-20 is used without a twin-sheet feeder, the automatic page eject may be suppressed in many cases. A DW-20 with an attached twin-sheet feeder is likely to issue frequent unrequested page ejects within a document if the line-feed operations previously mentioned are encountered.

It would be most appreciated if you would forward either the above sample or your derivative of it through the weekly update cycle; it is most important that customers - both existing and potential - be made aware of these issues at the earliest possible convenience. If - in the interim - there are any comments and/or questions, please feel free to contact me at your convenience.

Thank you in advance for your assistance.

To: Distribution
From: John Haynes/Brock Hotaling
Subject: DW/22-20 Firmware Release
Date: November 30, 1982

A new release of DW/22-20 firmware(RO2) was necessary for making it and the 2281W printers more compatible with old 2200 WP software. Although the DW/22-20 is a buffered line printer, it was necessary to modify the spec so that it could execute the character orientated 2200 WP printer routines, as does the 2281W.

The new firmware release has been tested and evaluated for both 2200 and WP applications. To the extent that we've tested the firmware, all bugs have been found and worked out. We now feel that this new release RO2 can be released to the field with a high level of confidence.

John Haynes



Brock Hotaling



Distribution:

Neeraj Sen
Rich Racicot
Pete Seymour
Stan Neumann
Rich Amico
Brock Hotaling
James Curran
Dick Therrien
Steve Owens
Paul Wilder
Fred Tubbs
Alan Goldman
J. Belanger
J. Proulx
J. Mulno
D. Morelle
R. Rosen
B. Patel
B. Ruggirello
G. Mantoni
J. Thibault
E. Dilorenzo
P. Welch
E. Kelly
F. Sullivan/
D. Buttler
T. DiPietro
R. Fox
J. Green
B. Olszewski

To: Distribution
From: John Haynes
Subject: Revised DW/22-20 Functional Specification
Revised DW/22-20 and 2281W Differences Specification
Date: November 30, 1982

The latest revision of the DW/22-20 firmware, R02, has been reviewed and approved for release. A new release was necessary for making the DW/22-20 and 2281W printers more compatible with old 2200 WP software. Although the DW/22-20 is a buffered line printer, it was necessary to modify the spec so that it could execute the character orientated 2200 WP printer routines, as does the 2281W.

Attached are the revised printer specifications.

Distribution:

Neeraj Sen
Rich Racicot
Pete Seymour
Stan Neumann
Rich Amico
Brock Hotaling
James Curran
Dick Therrien
Steve Owens
Paul Wilder
Fred Tubbs
Alan Goldman
J. Belanger
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J. Thibault
E. Dilorenzo
P. Welch
E. Kelly
F. Sullivan
D. Buttlar
T. DiPietro
R. Fox
J. Green
B. Olszewski

TO: Distribution
FROM: Rich Racicot/John Haynes/Stephen Owens
SUBJECT: Revised Functional Specification for the DW/22-20 Daisy Printer
DATE: November 30, 1982

GENERAL INFORMATION

This memo is the revised spec for the DW/22-20 software interface. Revisions were necessary to make the DW/22-20 Printer compatible with old 2200 WP software. Changes to the previous spec dated June 30, 1982 have been noted.

DW 22/20 BUFFER and EXECUTION SEQUENCE

Before discussing the control codes for the DW 22/20 interface, it would be profitable to review the 1205's line buffer and its relation to the Execution Sequence. The 1205's buffer contains the following information: the ascii value of the character, the pitch of that character, and control bits for bold or underscore attributes. Also held is current character position for the last character entered into the buffer, position of left margin, and offset from left margin to be added before printing the first character in the buffer.

When the buffer is printed out, all spaces are collected and skipped over. The buffer is checked for occurrences of underscores and they are done on a separate pass if they occur with any printable character. After the buffer is printed, the normal course for a carriage return would be to zero the buffer and position variables.

The execution sequence is generally used when printer commands involving paper moves are received without an intervening carriage return. The buffer is printed out and new input to the buffer should follow the horizontal position of the last character that the buffer pointer addressed. As an example the code sequence `PRINT "ONE";HEX (0A);"TWO";HEX (0A);"THREE"` would produce output:

```
ONE
  TWO
    THREE
```

Normally the buffer pointer will address the rightmost character in the buffer. However, if the backspace command was used to decrement the buffer pointer and the execution sequence is used, input for the next line may not follow the end of the previous line. As an example the sequence `PRINT "12345";Hex (08 08 08 5F 0A);"6"` produces output:

```
12345
  6
```

The previous version of the 1205 code only saved the position where the first character should be printed and then reset the buffer to zero. In this case sending a backspace immediately after the execution sequence had no meaning since the buffer was "empty". The new spec fills the buffer with spaces after printing with the execution sequence. The attributes are zeroed out with the exception of the pitch of the character. This allows the backspace to move backward in character increments after printing. Since the buffer now contains spaces, they can be overwritten. However, the pitch of the character can not be changed for the following reason. If the printer is in proportional space pitch and is backspacing into a nearly full buffer, replacing a small pitch character with a large one will overflow the line although no "new" characters have been added to it. For applications where pitch remains constant this idiosyncrasy should remain invisible.

ISOLATED CONTROL CODES

This section describes the functional specification for the isolated hexadecimal codes form Hex (00) to Hex (FF) for DW 22/20 printer

1. Hex (00)- Hex (01) NULL. These codes are received by the printer, but cause no action.
2. Hex (02) INITIATE ESCAPE SEQUENCE. This code starts an escape sequence. (See section on Escape Sequences)
3. Hex (03)- Hex (06) NULL. These codes are received by the printer, but cause no action.
4. Hex (07) BELL. This code generates a 1/2 second audible alarm. It is executed immediately with no effect to the printer buffer.
5. Hex (08) BACKSPACE¹⁾. This code decrements the buffer pointer by one to address the last entered character. If the buffer pointer is at the beginning of buffer, the pointer remains the same. After issuing a backspace, two constructive things may be done. Sending an underscore Hex (5F) to the printer will cause the character that the buffer pointer addresses to be underlined (regardless of whether it is a space or printable character). If a printable character is sent and the character addressed by the buffer pointer is a space, the space will be replaced by the printable character. Otherwise a printable character or space will cause the buffer pointer to be incremented without any effect to the buffer contents until the pointer has reached the rightmost character entered. As a further caution, the character pitch is not changed when a new character replaces a space in the buffer. Normally, this will not be noticed except during proportional spaced printing. Backspace has no effect after a Hex (E7), move with respect to home, command is issued. The command clears the buffer to zero and positions the printer to commence printing at a certain vertical and horizontal position. Since the printer's buffer is cleared. The backspace is ignored.

¹⁾ Previously backspace had no effect when issued immediately following a line feed since the execution sequence maintained only the horizontal position of the last character after printing the buffer. Now the buffer is set to spaces so backspacing allows the line that was last printed to be overstruck if hex (0A FA) was issued.

6. Hex (09)- NULL. This code is received by the printer, but causes no action.
7. Hex (0A) LINE FEED. This code causes the contents of the buffer to be printed out (see EXECUTION SEQUENCE) and the paper to advance one line using the currently selected line feed increment size.
8. Hex (0B) VERTICAL TAB¹. Vertical tab causes the contents of the line buffer to be printed out using the EXECUTION SEQUENCE. The paper is then advanced to the next vertical tab stop. The tab stops are located at one inch intervals starting with the top of form. If the paper is positioned at less than one inch of the bottom of the form, issuing a vertical tab will move the paper to the top of the next form rather than a distance equivalent to one inch.
9. Hex (0C) FORM FEED². Form feed causes the contents of the buffer to be printed out using the EXECUTION SEQUENCE. The paper is then moved to the top of the next form. Normally this would be paper position zero, however the Twin Sheet Feeder's top of form is either 1/2 or 1" down from the physical top of the paper (depending on which top margin option is selected) and the Envelope Feeder's top of form is seven lines (1.16") from the top of the envelope.
10. Hex (0D) CARRIAGE RETURN. Carriage return causes the buffer to be printed out and then reset. If automatic line feed is enabled, the paper is advanced to the next line. If the printer attributes (bold or underscore printing) were enabled with Hex (0F) as the escape sequence terminator, the attributes are disabled. If the buffer exceeds the platen length (13.2" default, 8.2" for Twin Sheet Feeder, and 10.13" for Envelope Feeder), the buffer is printed as though a carriage return were received from the system.
11. Hex (0E) ATTRIBUTE ENABLE. Hex (0E) enables the printer attributes (no bold, underscore to be disabled by Hex (0D) or Hex (0F) as default status) for all characters sent to the printer

¹) Previously vertical tab was a function of the davfu. Tab stops were defined at intervals of 6 lines starting from the top of the form. A vertical tab moved to the next tab stop, the distance of course being dependent on the current line feed size selection.

²) In the last spec, the form feed was defined as a skip to channel one on the davfu. Since the davfu has been deleted, it now merely advances to paper position zero.

following it. The attributes are changed with the set printer attributes escape sequence. Hex (OE) is also used to terminate escape sequences.

12. Hex (OF) ATTRIBUTE DISABLE. Hex (OF) disables the printer attributes for all characters following it. Hex (OF) is also used to terminate escape sequences.
13. Hex (10)-
Hex (7F) CHARACTER CODES. These codes are part of the font. Undefined codes are treated as ascii spaces. The font resident in the printer is the Wang 06 daisy wheel font.
14. Hex (E4) SET HOME. This code is included for forms processing. It allows the designation of a specific point on a form as the place where moves are referenced from. As a default, this point is paper position zero (Top of Form) and (carriage position zero (leftmost printable position). If set home is issued after the moving from this spot, the current physical carriage position determines both the new vertical and horizontal home position.
15. Hex (E7XXXXYYYY) MOVE ABSOLUTE WITH RESPECT TO HOME. Receipt of this command causes the contents of the line buffer to be printed out and the buffer to be cleared (WARNING: this is not equivalent to the EXECUTION SEQUENCE!). The printer then moves to new horizontal and vertical position with respect to the home position. An offset is added to the buffer so the first character in the buffer will be printed at the new carriage position. The horizontal position of the next line depends on the left margin setting.

The new position is specified by the four bytes following the Hex (E7). The first two bytes are carriage position in 1/60" increments sent in two's complement. As an example, Hex (0078) would be sent to move the carriage 2" right from home and Hex (FF88) would be sent to move the carriage 2" left from home. The last two bytes are paper position in 1/48" increments sent in two's complement. As an example, Hex (0090) moves the platen 3" down from the current home position, Hex (FF70) moves the platen 3" up from the home position.

This command should be capable of moving the platen to any position in the current or following form. Moving the carriage beyond the bounds of the platen (outside the left or right platen boundaries) causes the carriage to move to the extreme right or left, deselect, sound the alarm, light the malfunction led, and display the error code (capital A) for a bad home move. Likewise a paper move to a previous form, moves the platen to the top of form, stops, and results in the same error.

16. Hex (E8XXXX) SET LEFT MARGIN. Transmission of this sequence to the printer moves the left margin with respect to carriage position zero. The two bytes following the Hex (E8) are the new margin position in 1/60" increments. Normally the default margin is 0, however with the Envelope Feeder, the margin is set to .73" so the first character will be printed on the edge of the envelope.
17. Hex (E9YYFF) SET LINE FEED SPACING'. Default line feed spacing is six lines per inch or 8/48" increments. Sending the Hex (E9) sequence alters the line feed spacing. The first byte indicates the line feed spacing in 1/48" increments. The second byte indicates the spacing in fractions of 1/48" increments which has no application on the DW/22-20 since the minimum paper move is 1/48".
18. Hex (FA) REVERSE LINE FEED. Reverse line feed causes the contents of the line buffer to be printed out using the EXECUTION SEQUENCE. Then the platen is moved in a reverse direction the distance of the currently selected line feed size.
19. NOTE: Codes from Hex (80) - Hex (FF) that aren't isolated control codes are treated as nulls, received by the printer causing no action.

SUMMARY OF ESCAPE CODE SEQUENCES

Escape sequences begin with Hex (02), end with Hex (0E) or (0F), may be of several bytes in length, and are used to control various printer functions. The following is a summary of escape codes for the 2200 system and the applications if any.

1.	02 01 02 1F 0x 0F ¹	Skip on DAVFU channel #x
2.	02 01 02 1F 1x 0F ¹	Skip "x" lines on DAVFU
3.	02 01 02 01 dd 0F ²	Start built in diagnostics
4.	02 01 01 04 0F	Adjust Twin Sheet Feeder line
5.	02 01 01 08 0F	Select 1/2" margin option on TSF
6.	02 02 dd 0F	Select character font
7.	02 03 0F	Eject sheet or envelope from platen
8.	02 04 dd ee ff 0E or 0F	Define attributes
9.	02 05 0F ²	Blink cursor
10.	02 06 dd 0F	Select TSF paper bin
11.	02 07 0E	Select printer
12.	02 07 0F	Deselect printer
13.	02 08 09 0F ²	Send self identification message
14.	02 09 01 02 dd ee 0F	Set pitch
15.	02 0A 0E	Enable auto line feed following carriage return
16.	02 0A 0F	Disable auto line feed following carriage return
17.	02 0A 01 02 dd ee 0E	Set line feed size and enable line feed following carriage return
18.	02 0A 01 02 dd ee 0F	Set line feed size and disable line feed following carriage return
19.	02 0A dd 0F	Execute partial line feed
20.	02 0B dd dd 0F ²	Box Graphics

¹⁾ In a departure from the previous 1205 spec, the davfu commands have been eliminated because of the problems it introduced in handling forms.

²⁾ Not applicable on DW/22-20

- | | | |
|-----|---|----------------------------|
| 21. | 02 0C 01 cc dd dd 0F | Set Form Length |
| 22. | 02 0D 0C 03 0F | Restore power on defaults |
| 23. | 02 11 01 02 aa aa 01 cc dd cs 0E ¹ | Down line load microcode |
| 24. | 02 12 01 01 ff 01 cc dd cs 0E | Down load font description |
| 25. | 02 1D dd ... dd 0F ² | Down load DAVFU |

¹) Not applicable on DW/22-20

²) In a departure from the previous 1205 spec, the davfu commands have been eliminated because of the problems it introduced in handling forms.

IMPLEMENTATION OF ESCAPE CODE SEQUENCES

This section describes the escape codes in detail.

1. SKIP ON DAVFU CHANNEL #x Hex (02 01 02 1F 0x 0F)

Not supported on DW/22-20.

2. SKIP "x" LINES ON DAVFU Hex (02 01 02 1F 1x 0F)

Not supported on DW/22-20

3. START BUILT IN DIAGNOSTICS Hex (02 01 02 01 dd 0F)

Not supported on DW/22-20

4. ADJUST TWIN SHEET FEEDER LINE Hex (02 01 01 04 0F)

This escape code sets a flag in the printer which causes it to discard the first two characters entered into the buffer regardless of whether or not a margin exists. The function will take effect immediately, if it is issued in the middle of a line, the next two characters sent to the buffer will be discarded. It can only be disabled by power on reset or the reset defaults command.

5. SELECT 1/2" MARGIN OPTION ON TSF Hex (02 01 01 08 0F)

As a default for the twin sheet feeder, the top of form is located one inch down from the top of the page. Sending this escape sequence sets a flag that changes the top of form to 1/2 inch below the top of the page. Since the one inch margin is a default, it will be in effect after a power on reset or a reset defaults command.

6. SELECT CHARACTER FONT Hex (02 02 dd 0F)

The DW/22-20 has two fonts: a prom font which is Font 0 and a ram loadable font, Font 1. Font 0 contains the hammer, ribbon, and petal data for the Wang 06 Daisy Wheel and is the default font. At power on reset and the reset defaults command, Font 0 becomes the font selected for printing. In addition the ram loadable font is reset to exactly match Font 0.

To change fonts, the sequence Hex (02 02 dd 0F) is used where: dd = Hex (00) for Font 0, and dd = Hex (02) for Font 1 (any other hex code sent in place of dd is ignored and causes no printer action.).

Changing fonts causes the following actions:

The contents of line buffer are printed out using the EXECUTION SEQUENCE.

The printer is deselected and the alarm sounds.

The Change Daisy led is illuminated to inform the operator to install desired daisy wheel.

When the printer has been reselected, the Change Daisy led is extinguished.

The printer continues accepting data for the current line until a carriage return where the data is printed out from the newly selected font.

If the new font is the same as the previously selected font, the above sequence of actions is not performed.

7. EJECT SHEET/ENVELOPE FROM PLATEN Hex (02 03 0F)

.This sequence causes the following effects:

The contents of the line buffer are printed out using the EXECUTION SEQUENCE.

If the Twin sheet feeder or envelope feeder are installed and there is paper in the platen, the sheet or envelope is ejected without feeding a new sheet or envelope.

If the ejection fails because of a jam, the printer will deselect, sound an alarm, light the malfunction led, and wait for the operator to clear the jam and reselect the printer.

8. DEFINE ATTRIBUTES Hex (02 04 xx yy 0E or 0F)

The printer has two attributes: bold and underscore printing. They are activated in two ways, by sending the above escape sequence or by using the single byte control code Hex (0E) which functions in conjunction with this escape sequence.

Sending the sequence defines a new set and disables the old set of attributes. Byte xx controls the bold attribute:

Hex (00) disables bold.

Hex (02) enables bold.

Hex (0B) enables bold.

Byte yy controls the underscore attribute:

Hex (00) disables underscore.

Hex (04) enables underscore.

Hex (0B) enables underscore.

The escape terminator Hex (OE or OF) determines when and how the attributes selected by the escape sequence will be activated and deactivated. If the sequence ends with a hex (OE), the attributes will be immediately enabled. They will remain activated until one of the following conditions:

- a. an isolated Hex (OF) code.
- b. another Hex (02 04 xx yy OE or OF) sequence
- c. a Hex (02 0D 0C 03 OF) sequence (ie restore defaults)
- d. printer powered off then on

If the terminator is Hex (OF), the attributes are not activated until the receipt of an isolated Hex (OE) code. The attributes will be disabled at the first occurrence of one of the following conditions:

- a. an isolated Hex (OF) code
- b. an intervening carriage return Hex (0D)
- c. another Hex (02 04 xx yy OE or OF) sequence
- d. a Hex (02 0D 0C 03 OF) sequence (ie restore defaults)
- e. printer powered off then on

The default state of the attributes is: bold disabled, underscore enabled, with a terminator of hex (OF). The underscore is not turned on until Hex (OE) is sent and it is turned off when either Hex (OF) or Hex (0D) is sent.

9. BLINK CURSOR Hex (02 05 OF)

Not supported on DW/22-20

10. SELECT TSF PAPER BIN Hex (02 06 dd OF)

The twin sheet feeder can feed paper from either the rear bin, Bin 1, or the front bin, Bin 2. At power on reset or reset defaults the printer defaults to Bin 1, the rear bin. To change the bin that paper is fed from, the above sequence is used with byte dd: Hex (01) for Bin 1 (rear tray) and Hex (02) for Bin 2 (front tray). Any other value for byte dd has no effect. Other than selecting the tray from which the next sheet of paper will be fed, this command has no side effects.

11. SELECT PRINTER Hex (02 07 OE)

This sequence lights the select led on the printer and is equivalent to pressing the select switch on the printer.

12. DESELECT PRINTER Hex (02 07 OF)

After the deselect sequence is sent to the printer, the contents of the line buffer are printed out using the EXECUTION SEQUENCE. Then the printer deselects and disables power to the motors. Printer will not print again until operator reselects the printer.

13. SEND SELF IDENTIFICATION MESSAGE Hex (02 08 09 0F)

Not supported on DW/22-20

14. SET PITCH Hex (02 09 01 02 dd ee 0F)

The DW/22-20 supports 4 pitches 10 pitch (which is power on reset default, 12 pitch, 15 pitch, and proportional spaced pitch (which is dependant on the ribbon advance values in the font table). The above sequence changes the pitch where dd ee equals a hexadecimal value giving the integral and fractional pitch:

dd ee = Hex (00 00) for default pitch (ie 10 pitch)
 dd ee = Hex (08 00) for proportional spaced pitch
 dd ee = Hex (0A 00) for 10 pitch
 dd ee = Hex (0C 00) for 12 pitch
 dd ee = Hex (0F 00) for 15 pitch

Changing the pitch does not result in the contents of the line buffer being printed out.

15. ENABLE AUTO LF AFTER CARRIAGE RETURN Hex (02 0A 0E)

This sequence causes the printer to perform an automatic line feed with the currently selected line feed size following a carriage return. The automatic line feed is enabled as a power up/reset default.

16. DISABLE AUTO LF AFTER CARRIAGE RETURN Hex (02 0A 0F)

Sending the above disables the automatic line feed following a carriage return. It will take effect immediately.

17. SET LINE FEED SIZE/ENABLE AUTO LF Hex (02 0A 01 02 dd ee 0E)

This sequence alters the line feed size and enables the automatic line feed following a carriage return. It takes effect with the next carriage return or line feed command. The new line feed size is sent in 1/48" increments where dd = integer multiple of 1/48" and ee = fractional part of 1/48" (ignored on DW/22-20 since smallest increment is 1/48"). The default line feed size at power up/reset is 6 lines per inch or Hex (08). As an example of some different line feed sizes Hex (02 0a 01 02 06 00 0E) sets

6/48" or 8 lines per inch, Hex (02 0A 01 02 10 00 0E) sets 16/48" or 3 lines per inch.

18. SET LINE FEED SIZE/DISABLE AUTO LF Hex (02 0A 01 02 dd ee 0F)

This command is essentially the same as above, save that using Hex (0F) as the sequence terminator causes the automatic line feed following the carriage return to be disabled.

19. EXECUTE PARTIAL LINE FEED Hex (02 0A dd 0F)

This sequence allows the user to move the paper in fractions of the currently selected line feed size. Byte dd indicates the fraction of the line feed:

dd = Hex (00) for no line feed
 dd = Hex (02) for 1/4 of current line feed size
 dd = Hex (04) for 1/2 of current line feed size
 dd = Hex (08) for 3/4 of current line feed size

The partial line feed is executed immediately without causing the contents of the buffer to be printed. The next line feed whether a hex (0A) or automatic line feed will move the paper to the start of the next whole line.

20. BOX GRAPHICS Hex (02 0B dd dd 0F)

Not supported on DW/22-20

21. SET FORM LENGTH Hex (02 0C 01 cc dd ... dd 0F)

Default form length depends on what is attached to the printer: the form length defaults to 11" (66 lines at 6 lpi) or Hex (02 10) for no attachments, the form length defaults to 10.83" (65 lines at 6 lpi) or Hex (02 08) for the twin sheet feeder, the form length defaults to 3.83" (23 lines at 6 lpi) or Hex (00 B8) for the envelope feeder.

The above sequence allows the form length to be altered. Format of the command is:

Byte cc = Hexadecimal count of bytes to follow (excluding the terminator Hex (0F))
 Byte dd = hexadecimal value of form length in 1/48" increments.

¹⁾ The deletion of the DAVFU from the printer allows the selection of any form length. With the previous version of the code, the form length would be truncated to an exact multiple of the current line feed size

Before changing the form length, the contents of the buffer are printed out using the EXECUTION SEQUENCE. The forms position is reset to zero¹.

22. RESTORE POWER ON DEFAULTS

Hex (02 0D 0C 03 0F)

The restore defaults command sequence is a way to restore the printer to a known state. Before the restore is processed the line buffer is printed out (not using the EXECUTION SEQUENCE, next character on next line will be at margin.). The carriage is repositioned at print position zero. The forms position is reset to zero.¹

The following is a list of the defaults and their states:

Left margin	Print position zero, if the envelope feeder is installed, left margin defaults to .73" or 88 1/120" to make sure the first character is on the edge of the envelope.
Platen length	13.2" or 1584 1/120", if the twin sheet feeder is installed platen length defaults to 8.2" or 984 1/120", if the envelope feeder is installed platen length defaults to 10.13" or 1216 1/120".
Form length	11", if the twin sheet feeder is installed form length = 10.83", if the envelope feeder is installed the form length = 3.83".
Line feed size	The line feed size defaults to 6 lines per inch or 8 1/48" increments.
Auto line feed	The auto line feed is enabled to provide a line feed following all carriage returns.
Font	The font defaults to Font 1, the prom resident font equivalent to the Wang 06 Daisy wheel. Font 2, the ram loadable font is cleared and the table values reset to those of Font 1.
Pitch	The pitch defaults to 10 Pitch.
TSF Top margin	The top margin option on the Twin sheet feeder defaults to 1" margin.
TSF Line adjust	The twin sheet feeder line adjust margin is disabled.

¹ Both the Set Form Length and Restore Defaults commands moved the paper to the top of the next form if the printer was not already at the top of form in the previous spec. The current spec sets the forms position to zero and does not generate a top of form.

TSF tray select The twin sheet feeder is selected to feed from the rear tray or bin 1.

Home position Carriage home set to print position zero, paper home set to forms position zero (top of form.)

Attributes The attributes default to underscore and no bold. They are enabled with a Hex (0E) and disabled with a Hex (0F) or carriage return Hex (0D).

23. DOWN LINE LOAD MICROCODE Hex (02 11 01 02 aa aa 01 cc dd cs 0E)

Not supported on DW/22-20.

24. DOWN LINE LOAD FONT DESCRIPTION Hex (02 12 01 01 ff 01 cc dd cs 0E)

The format for the load font sequence is as follows:

Byte ff = Font Currently Hex (02) for Font 2 is the only acceptable entry, any other code will cause the sequence to be ignored.

Byte cc = count The count equals the number of data bytes following plus one for the checksum byte.

Byte(s) dd For the 1205 Font data must be sent in packets of 3 bytes per character: aaaa aaaa www zzyy yxxx xxxx.

Byte cs Checksum computed starting from Hex (00) the Exclusive Or of all data bytes.

The description of the 3 data bytes is as follows:

Byte aaaa aaaa Hex value of the character to be defined. Hex (00 - 0F) are the Hex values for the overstrike characters, Hex (10 - 7F) are the regular ascii character codes.

Bits www Are the double strike reference character (if non-zero character will be overstruck with character stored in the table with value Hex (0 www)).

Bits zz Are the hammer force ranging from 00 for level 1 to 11 for level for 4.

Bits yyy Are the ribbon advance (with Least significant bit stored is or'd with the petal address) ranging from 000 for an advance of 2 to 110 for 8.

Bits xxx xxxx Represent the daisy petal address ranging from 0 to 95. It is sent in 2's complement format (ie petal 8=Hex(78), petal 88=Hex(28)).

The following is example of how two characters in the table are redefined.

character value Hex (1E) "ç"
 Daisy wheel petal position = 8
 Ribbon advance = 5
 Hammer force = 3
 Overstrike character = 1 (assumed to be "/")

character value = Hex (30) "0"
 Daisy wheel petal position = 64
 Ribbon advance = 5
 Hammer force = 4
 no overstrike character

The sequence would be:

Hex (02 12 01 01 02¹ 01 07² 1E 19 F8³ 30 0D C0⁴ 02⁵ 0E)

- 1 - Font number
- 2 - Count of bytes to follow
- 3 - 3 bytes necessary to define "ç"
- 4 - 3 bytes necessary to define "0"
- 5 - Checksum for all six data bytes

There are two error conditions that may result from down line loading a font. First if the number of bytes sent is not a multiple of three (plus one for checksum). A character in the font needs three bytes for definition. Secondly, if the checksum generated by the printer does not match the checksum sent with the data stream. The checksum is an exclusive or of all of the data bytes starting with a Hex (00).

If either of these conditions are not satisfied, the printer will deselect, sound the alarm, light the malfunction led, set the seven segment display to "F" for font load error, and wait for the printer to be reselected to warn the operator that the font was incorrectly loaded.

25. DOWN LOAD DAVFU

Hex (02 1D dd ... dd 0F)

Not supported on DW/22-20.

MEMORANDUM

To: Distribution
From: Rich Racicot/John Haynes
Subject: Revised DW/22-20 and 2281W Differences Specification
Date: November 30, 1982

The below functions, that are resident on the DW20, are enhancements to the 2281W specifications (Note: These sequences are described in full on following pages):

- | | | |
|----|-------------------------------|---|
| 1. | 02 02 dd OF | Select character font. |
| 2. | 02 04 xx yy OE or OF | Define attributes. |
| 3. | 02 07 OE | Select Printer. |
| 4. | 02 09 01 02 dd ee OF | Set Pitch -- dd ee = a hexadecimal value giving the integral and fractional value of the desired pitch. |
| 5. | 02 12 01 01 ff 01 cc dd cs OE | Load Font description. |
| 6. | 02 01 02 01 dd OF | Start built in diagnostics. |
| 7. | 02 0A dd OF | Execute partial line feed. |

The following functions, resident in the 2281W, are not supported on the DW20:

A. Control Codes:

HEX(09)	Tab
HEX(19)	Clear Tab
HEX(1A)	Set Tab
HEX(7F)	Clear Buffer
HEX(E0)	Move Long
HEX(E5)	Power On Home
HEX(E6)	Move Short

B. BASIC Statement:

PLOT (with its variations)

- C. Print Head postioning with the printer keyboard. Subroutines may be written to simulate the 2281W keyboard from the terminal if there is sufficient interest.
- D. Automatic insertion of a leading space into the printer buffer.

Description of HEX(02...) sequence enhancements to the DW20.

1. Select Font

02 02 dd OF

The DW/20 has two fonts: a PROM font which is Font 0 and a RAM loadable font, Font 1. Font 0 contains wheel position, hammer, ribbon and pedal data for the Wang 06 Daisy Wheel and is the default font. At power on reset and the reset defaults command, Font 0 becomes the font selected for printing. In addition the RAM loadable font is reset to exactly match Font 0.

To change fonts, the sequence HEX(02 02 dd OF) is used where: dd=HEX(00) for Font 0 and HEX(02) for Font 1 (any other HEX code sent in place of dd is ignored and causes no printer action).

Changing fonts causes the following actions:

The contents of the line buffer are printed out using the EXECUTION SEQUENCE.

The printer is deselected and the alarm sounds.

The Change Daisy LED is illuminated to inform the operator to install desired daisy wheel.

When the printer has been reselected, the Change Daisy LED is extinguished.

The printer continues accepting data for the current line until a carriage return where the data is printed out from the newly selected font.

If the new font is the same as the previously selected font, the above sequence of actions is not performed.

2. Define Attributes

02 04 xx yy OE or OF

The printer has two attributes: bold and underscore printing. They are activated in two ways, by sending the above escape sequence or by using the single byte control code HEX(OE) which functions in conjunction with this escape sequence.

Sending the sequence defines a new set of attributes. Byte xx controls the bold attribute:

HEX(00) disables bold

HEX(02) enables bold

HEX(0B) enables bold

Byte yy controls the underscore attribute:

HEX(00) disables underscore

HEX(04) enables underscore

HEX(0B) enables underscore

The escape terminator HEX(OE or OF) determines when and how the attributes selected by the escape sequence will activated and deactivated. If the sequence ends with a HEX(OE), the attributes will be immediately enabled. They will remain activated until one of the following conditions:

- an isolated HEX(OE) code
- another HEX(O2 04 xx yy OE or OF) sequence
- a HEX(O2 0D 0C 03 OF) sequence(restore defaults)
- printer powered off then on

If the terminator is HEX(OE), the attributes are not activated until the receipt of an isolated HEX(OE) code. The attributes will be disabled at the occurrence of one of the following conditions:

- an isolated HEX(OE) code
- an intervening carriage return HEX(OD)
- another HEX(O2 04 xx yy OE or OF) sequence
- another HEX(O2 0D 0C 03 OF) sequence(restore defaults)
- printer powered off then on

The default state of the attribute is: bold disabled, underscore enabled, with a terminator of HEX(OE). The underscore is not turned on until HEX(OE) is sent and it is turned off when either HEX(OE) or HEX(OD) is sent.

Examples:

1. Define enhanced print as underscore. Turn on the attributes with HEX(OE) and turn off with HEX(OE) or carriage return:

```
10 PRINT HEX(O2040004OF)
20 PRINT "ABC"; HEX(OE); "XYZ": HEX(OE); "123"
30 PRINT "ABC"; HEX(OE); "XYZ123"
40 PRINT HEX(OE); "ABCXYZ123"
```

OUTPUT

```
ABCXYZ123
ABCXYZ123
ABCXYZ123
```

2. Define enhanced print as underscore. Turn on immediately and turn off with HEX(OE).

```
10 PRINT HEX(O2040004OE)
20 PRINT "ABC"
30 PRINT "XYZ"
40 PRINT "123"; HEX(OE)
50 PRINT "END OF TEST"
```

OUTPUT

```
ABC
XYZ
123
END OF TEST
```

3. Printer Select

02 07 0E

Upon receipt of this sequence, the printer should follow the EXECUTION SEQUENCE and should light its SELECT lamp and go into an ON LINE state.

4. Select Pitch

02 09 01 02 dd ee 0F

dd ee = a hexadecimal value giving the integral and fractional pitch.

This sequence should be implemented on any device that is capable of offering more than one pitch. The specified pitch remains selected until:

- a. The occurrence of another select pitch sequence.
- b. A HEX (020D0C030F) Sequence (i.e. reset defaults).
- c. The device is powered off and on.

Examples:

```
10 PRINT HEX(0209010208000F) select proportional
10 PRINT HEX(020901020A000F) select 10-pitch
10 PRINT HEX(020901020C000F) select 12-pitch
10 PRINT HEX(020901020F000F) select 15-pitch
10 PRINT HEX(0209010200000F) select default (i.e. 10-pitch)
```

5. Down Load Font Description

02 12 01 01 ff 01 cc dd...cs 0E

12 defines the sequence as 'Load Font', ff is a one byte font position value, cc a byte count of following bytes and dd...cs is the data block.

This sequence down loads character print wheel data from the CPU to the printer. The specific font position is specified by 'ff' and the pin data for that position is described in a single or mutiple variable-length data block. The length of each data block is given by 'cc' and the ccth byte ('cs') must be a checksum for that data block.

6. Execute Built-in Diagnostics

02 01 02 01 dd 0F

dd = 00 for all diagnostics

This sequence is defined for all devices having diagnostic routines included in the printer microcode, and should conform to the EXECUTION SEQUENCE.

7. Execute Partial Line Feed

02 0A dd 0F

dd=00	no line feed
02	1/4
04	1/2
08	3/4

This sequence is used to generate partial line feeds in increments of 1/4, 1/2, and 3/4 of the currently selected full line feed increment. The exact implementation may be somewhat device dependent. In general, the device should come as near as possible to these partial increments. Implementation should follow these rules:

- a. The partial line feed should be performed immediately. It should not cause the line buffer to be printed.
- b. Execution of a normal line feed should cause the platten to be advanced to the start of the next normal line position. This would be the case if a line feed code (HEX(OA)) were received, or a carriage return code (HEX(OD)) were received with auto line feed activated. The host computer should normally suppress the auto line feed (see #11) before using the Partial Line Feed command. Output would then consist of normal printout interspersed with partial line feed commands. The auto line feed mode should then be re-activated (see #10).

Example:

```
0010 SELECT PRINT 204
0020 PRINT "THE EQUATION FOR Z IS:"
0030 REM SUPPRESS AUTO LINE FEED
      : PRINT HEX (020A0F)
0040 REM PRINT SUPER SCRIPTS
      : PRINT "  2  2"
0050 REM ADVANCE ONE HALF OF A LINE
      : PRINT HEX (020A040F)
0060 REM PRINT BASE LINE
      : PRINT "Z = X + Y - 2*(X+Y)"
0070 REM ADVANCE ONE HALF OF A LINE
      : PRINT HEX (020A040F)
0080 REM PRINT SUBSCRIPTS
      : PRINT "    3"
0090 REM REACTIVATE AUTO LINE FEED
      : PRINT HEX (020A0E)
0100 REM MOVE TO NEXT FULL LINE POSITION
      : PRINT
0110 REM PRINT NEXT LINE
      : PRINT "TO CONTINUE WITH THIS LINE OF THOUGHT,"
```

THE EQUATION FOR Z IS:

$$Z = X_3^2 + Y^2 - 2*(X+Y)$$

TO CONTINUE WITH THIS LINE OF THOUGHT,

EXECUTION SEQUENCE

6

If this Control Code or Escape Code Sequence is imbedded within a line of printable data, it should cause the data currently in the printer buffer to be printed before this Control Code or Escape Code Sequence is performed.

EXAMPLE: The following Basic program statement using the Control Code Hex(OA) would produce a 'stepped' line of output:

```
10 PRINT "ONE";HEX(OA);"TWO";HEX(OA);"THREE"  
(output)  
    FIRST  
        SECOND  
            THIRD
```

Please note that this is not the way early 'Centronics like' WANG line printers execute the HEX(OA) code.

EXAMPLE: Assuming the printer supports it, the following BASIC program using the Escape Code Sequence Hex(O2 07 0F) prints the characters "DESELECT" then extinguishes its SELECT lamp and goes into an OFF LINE state without doing a line feed:

```
10 PRINT "DESELECT";HEX(O2070F)
```

output:

```
    DESELECT
```


WANG

M E M O R A N D U M

TO: 2200 TSC System Support Analysts

FROM: Lee Collette

DATE: 06/03/83

SUBJECT: 2200 DW/22-20 Daisy Printer...Select Character Font/
Down Line Load Font Description

I've received a call asking about the Select Character Font and Down Load Font Description functionality on the DW 22-20 printer as described on page 6-18 of the DW 22-20 user manual.

The sections in the manual are confusing as well as erroneous. John Haynes, who worked on the development of the printer was able to clarify the manual by providing us with sections from the Functional Specifications which are attached. Refer to sections 6 and 24.

Note: there are only two fonts (not three as stated in the manual) which are supported.

IMPLEMENTATION OF ESCAPE CODE SEQUENCES

This section describes the escape codes in detail.

- 1. SKIP ON DAVFU CHANNEL #x . . . Hex (02 01 02 1F 0x 0F)

Not supported on DW/22-20.

- 2. SKIP "x" LINES ON DAVFU Hex (02 01 02 1F 1x 0F)

Not supported on DW/22-20

- 3. START BUILT IN DIAGNOSTICS Hex (02 01 02 01 dd 0F)

Not supported on DW/22-20

- 4. ADJUST TWIN SHEET FEEDER LINE Hex (02 01 01 04 0F)

- This escape code sets a flag in the printer which causes it to discard the first two characters entered into the buffer regardless of whether or not a margin exists. The function will take effect immediately, if it is issued in the middle of a line, the next two characters sent to the buffer will be discarded. It can only be disabled by power on reset or the reset defaults command.

- 5. SELECT 1/2" MARGIN OPTION ON TSF Hex (02 01 01 08 0F)

As a default for the twin sheet feeder, the top of form is located one inch down from the top of the page. Sending this escape sequence sets a flag that changes the top of form to 1/2 inch below the top of the page. Since the one inch margin is a default, it will be in effect after a power on reset or a reset defaults command.

- 6. SELECT CHARACTER FONT Hex (02 02 dd 0F)

The DW/22-20 has two fonts: a prom font which is Font 0 and a ram loadable font, Font 1. Font 0 contains the hammer, ribbon, and petal data for the Wang 06 Daisy Wheel and is the default font. At power on reset and the reset defaults command, Font 0 becomes the font selected for printing. In addition the ram loadable font is reset to exactly match Font 0.

To change fonts, the sequence Hex (02 02 dd 0F) is used where: dd = Hex (00) for Font 0, and dd = Hex (02) for Font 1 (any other hex code sent in place of dd is ignored and causes no printer action.).

Changing fonts causes the following actions:

The contents of line buffer are printed out using the EXECUTION SEQUENCE.

The printer is deselected and the alarm sounds.

The Change Daisy led is illuminated to inform the operator to install desired daisy wheel.

When the printer has been reselected, the Change Daisy led is extinguished.

The printer continues accepting data for the current line until a carriage return where the data is printed out from the newly selected font.

If the new font is the same as the previously selected font, the above sequence of actions is not performed.

7. EJECT SHEET/ENVELOPE FROM PLATEN Hex (02 03 0F)

This sequence causes the following effects:

The contents of the line buffer are printed out using the EXECUTION SEQUENCE.

If the Twin sheet feeder or envelope feeder are installed and there is paper in the platen, the sheet or envelope is ejected without feeding a new sheet or envelope.

If the ejection fails because of a jam, the printer will deselect, sound an alarm, light the malfunction led, and wait for the operator to clear the jam and reselect the printer.

8. DEFINE ATTRIBUTES Hex (02 04 xx yy 0E or 0F)

The printer has two attributes: bold and underscore printing. They are activated in two ways, by sending the above escape sequence or by using the single byte control code Hex (0E) which functions in conjunction with this escape sequence.

Sending the sequence defines a new set and disables the old set of attributes. Byte xx controls the bold attribute:

Hex (00) disables bold.
Hex (02) enables bold.
Hex (0B) enables bold.

Byte yy controls the underscore attribute:

Hex (00) disables underscore.
Hex (04) enables underscore.
Hex (0B) enables underscore.

TSF tray select The twin sheet feeder is selected to feed from the rear tray or bin 1.

Home position Carriage home set to print position zero, paper home set to forms position zero (top of form.)

Attributes The attributes default to underscore and no bold. They are enabled with a Hex (OE) and disabled with a Hex (OF) or carriage return Hex (OD).

23. DOWN LINE LOAD MICROCODE Hex (02 11 01 02 aa aa 01 cc dd cs OE)

Not supported on DW/22-20.

24. DOWN LINE LOAD FONT DESCRIPTION Hex (02 12 01 01 ff 01 cc dd cs OE)

The format for the load font sequence is as follows:

Byte ff = Font Currently Hex (02) for Font 2 is the only acceptable entry, any other code will cause the sequence to be ignored.

Byte cc = count The count equals the number of data bytes following plus one for the checksum byte.

Byte(s) dd For the 1205 Font data must be sent in packets of 3 bytes per character: aaaa aaaa www zzyy yxxx xxxx.

Byte cs Checksum computed starting from Hex (00) the Exclusive Or of all data bytes.

The description of the 3 data bytes is as follows:

Byte aaaa aaaa Hex value of the character to be defined. Hex (00 - 0F) are the Hex values for the overstrike characters, Hex (10 - 7F) are the regular ascii character codes.

Bits www Are the double strike reference character (if non-zero character will be overstruck with character stored in the table with value Hex (0 www)).

Bits zz Are the hammer force ranging from 00 for level 1 to 11 for level for 4.

Bits yyy Are the ribbon advance (with Least significant bit stored is or'd with the petal address) ranging from 000 for an advance of 2 to 110 for 8.

Bits xxx xxxx Represent the daisy petal address ranging from 0 to 95. It is sent in 2's complement format (ie petal 8=Hex(78), petal 88=Hex(28)).

The following is example of how two characters in the table are redefined.

character value Hex (1E) "¢"
 Daisy wheel petal position = 8
 Ribbon advance = 5
 Hammer force = 3
 Overstrike character = 1 (assumed to be "/")

character value = Hex (30) "0"
 Daisy wheel petal position = 64
 Ribbon advance = 5
 Hammer force = 4
 no overstrike character

The sequence would be:

Hex (02 12 01 01 02¹ 01 07² 1E 19 F8³ 30 0D C0⁴ 02⁵ 0E)

- 1 - Font number
- 2 - Count of bytes to follow
- 3 - 3 bytes necessary to define "¢"
- 4 - 3 bytes necessary to define "0"
- 5 - Checksum for all six data bytes

There are two error conditions that may result from down line loading a font. First if the number of bytes sent is not a multiple of three (plus one for checksum). A character in the font needs three bytes for definition. Secondly, if the checksum generated by the printer does not match the checksum sent with the data stream. The checksum is an exclusive or of all of the data bytes starting with a Hex (00).

If either of these conditions are not satisfied, the printer will deselect, sound the alarm, light the malfunction led, set the seven segment display to "F" for font load error, and wait for the printer to be reselected to warn the operator that the font was incorrectly loaded.

25. DOWN LOAD DAVFU

Hex (02 1D dd ... dd 0F)

Not supported on DW/22-20.

Operation of 2200 Printer Font Download Utility

1. Ready the Printer to which the new font is to be downloaded. This includes checking that the new print wheel has been installed. Verify that there is paper ready and in position, and check that the ready light is activated.
2. When the Printer has been selected, place the diskette with the Download Utility into a diskette drive and select the appropriate device address. An example would be either 'SELECT DISK 310' or 'SELECT DISK B10' depending on which was utilized.
3. Load and run the utility by entering the command 'LOAD RUN "DOWNLOAD"'.
The program will clear the screen and display the message "DW22-20 Character Set Download Utility". Additionally, it will permit the user to both enter the device address of the printer that is to be the recipient of the new character set as well as to choose the specific character set desired from the list of all those available in the tables.
The program scans the table file and displays the heading information of each International character set available. The user is then permitted to select the appropriate choice via the use of the Space Bar.
5. When the device address has been entered and the selection chosen, press the EXECUTE key. A prompt will be displayed requesting the user to either press CANCEL to terminate or EXECUTE to continue.
6. Upon keying EXECUTE, the program will forward the appropriate character set information to the printer. At this point, the printer is automatically deselected.
7. Upon selecting the printer, a sample of the character set that was requested will be printed and the program subsequently terminated.
8. The diskette containing the utility may be removed and normal operations continued.
9. Upon powering down the system, the printer font set is deactivated and must be re-entered as described above.

M E M O R A N D U M

TO: TSC 2200 Analysts

FROM: Lee Collette

DATE: 07/12/83

SUBJECT: Use of OCR-A Print wheels on DW20 printers

— OCR - A print wheels can now be used on a DW20 printer. This is accomplished by downloading a font into the DW20's PROM.

The package includes 2 diskettes and instructions. It is available to customers who request it from Margaret Ann Maloney EXT 3375. She will also be the R&D support person for this package.