

INSTRUCTIONS
for
MODEL NO. HT-300/500
HARDNESS TESTER
VERSION 2.0

KEY INTERNATIONAL, INC.
480 ROUTE 9
ENGLISHTOWN, NJ 07726
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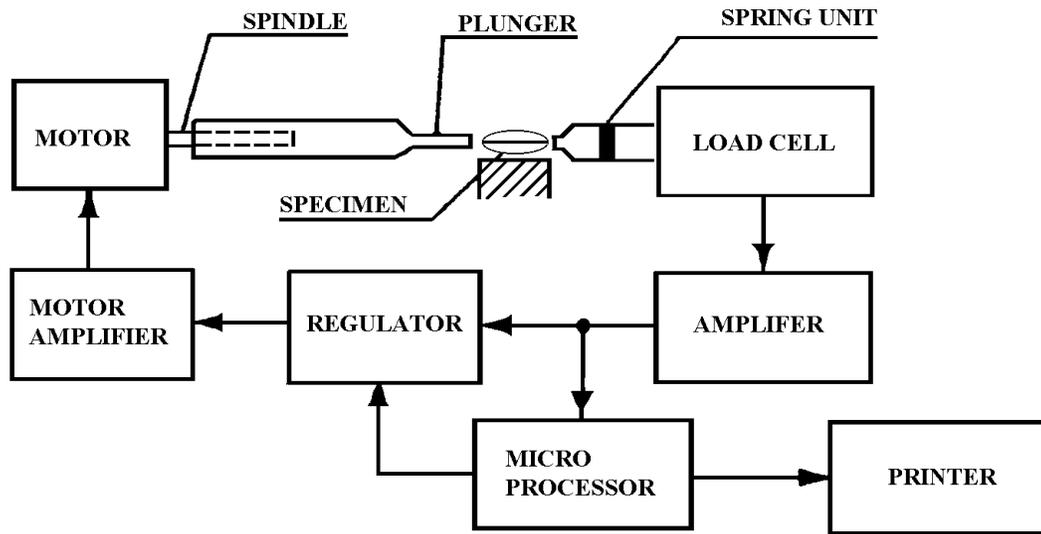
General Description

Introduction

The PTB 300 is a high performance hardness tester, which can accurately measure the tensile strength of tablets, ampoules, food and other articles, either in single or in series operation. The tensile strength can be printed out in Kilopond (Kp), Newton (N) or Strong Cobb (SC) units, according to the operator's wish.

Specifications

Sample Diameter	4 - 40 mm
Jaw Stroke	4 - 40 mm (externally adjustable)
Chart Speed	3 mm/second
Force Increase	2 Kp/second
Measuring Range	0.5 - 30 Kp, (convertable to Newtons (N), Kilo Ponds (Kp), or Strong Cobbs (Sc))
Measured Value	3 digit LED display and printed on the built in printer
Resolution	0.1 Kp
Accuracy	+/- 1% Full Scale
Measuring Jaws	Interchangable for different sample forms (tablets, ampoules, etc...)
Dimensions	(W) 530 mm x (D) 240 mm x (H) 180 mm
Power Supply	Switch Selectable, 110/220 volt, 50/60 Hz., Single Phase
Input	External Start Switch (optional)
Output	BCD Parallel

Method of Operation**Figure 1 Method of Operation**

After pressing the START-key, the zero value of the load cell is determined and stored in the microprocessor. If the value is within the permitted range, the motor, controlled by the regulator unit and the motor amplifier, causes the plunger to move at a constant speed toward the sample. As soon as the plunger touches the sample and produces a force on the load cell, the microprocessor switches the regulator on so that a linear increasing force is produced via the control circuit (load cell - regulator - motor - sample) until the sample breaks. The decreasing signal from the load cell indicates to the microprocessor that a break has occurred, which subtracts from this value the zero value stored at the beginning of the test (automatic zero-point correction) and prints out the calculated value in the desired units (N, kp, SC).

The spring unit in front of the load cell provides a smooth transition from the constant velocity phase of the plunger to the linear power increase phase.

Putting into Operation

NOTE: Before putting the HT-300 into operation, check the voltage setting switch on the back of the unit (220 V resp. 115 V) and make sure that the operating voltage corresponds to the local power supply.

Wiring

- connect the signal cables to any additional units
- connect the signal cable from the external start-key (if fitted)
- connect power supply line.

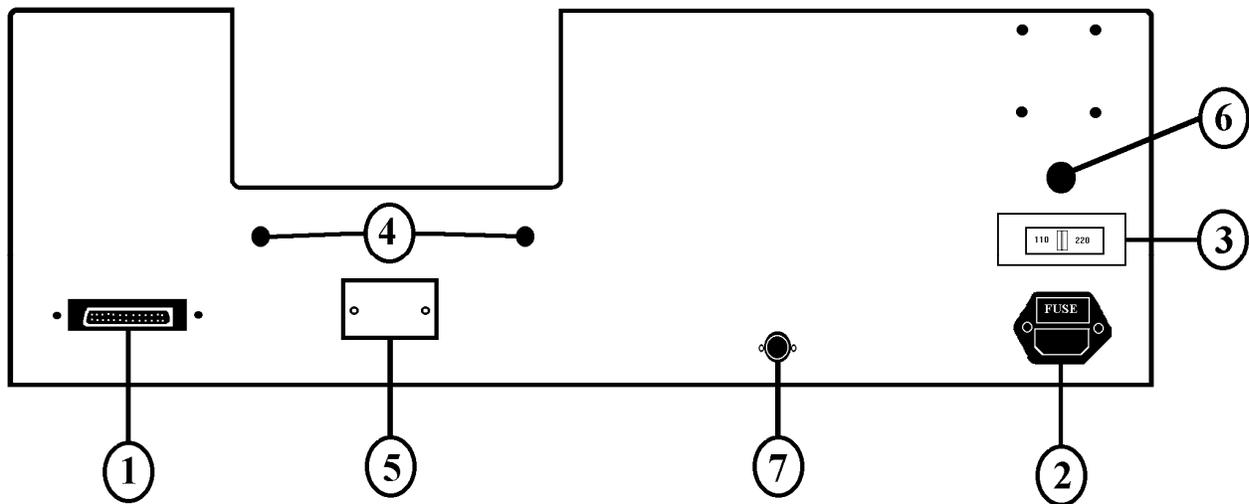


Figure 2 Back of Unit

- (1) Output 25-pin, plug female type D (parallel-interface)
- (2) Power input with fuse located in compartment under power cord.
for 220 Volt operation use 250 mA fuse
for 115 Volt operation use 500 mA fuse
- (3) Voltage selector switch 220 V / 115 V
- (4) Waste Container Mounting Bolts
- (5) Under the Waste container and behind the access door is the switch for units selection, the potentiometer for zero adjustment and the potentiometer for balancing the load cell
- (6) Motor fuse. for model HT-300 use 400 mA fuse
for model HT-500 use 800 mA fuse
- (7) Input socket plug, if fitted (optional external start switch)

Inserting the Chart Paper

NOTE: The instrument should never be operated without paper.

To insert the paper into the unit open the paper compartment door (1). Insert the paper spindle into a new roll of paper (2). Place the paper spindle into the paper holder with the paper feeding up from the back of the compartment (3).

Then feed the paper into the printer (4), the dull side of the paper should be facing you, while turning the paper transport wheel (5) to lead the paper through the printer.

Printing Paper

Part Number: 15-156-0053

Per box (4 rolls per box) or Case of 36 boxes (144 rolls)

Call for current pricing:

Key International, Inc.

480 Route 9

Englishtown, NJ 07726

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Operating Keyboard

Operating controls

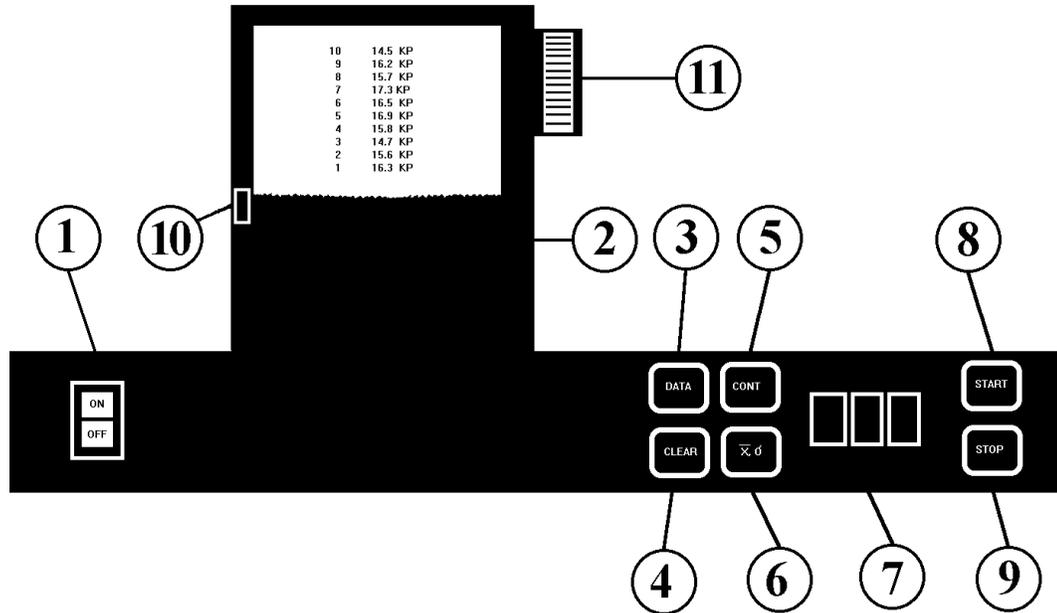


Figure 3 Operating Controls

Power Button

Switch on the instrument by pressing the POWER button (1). When pressed the switch should illuminate to indicate that the power has been switched on.

Printer

The printer (2) should never be operated without paper, otherwise a clean printout and proper operation can not be guaranteed.

To remove the paper when it is torn or jammed, move the paper release lever (10) in direction of the arrow and gently remove the paper from the printer. The release lever must not be touched during printer operation.

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Data Button

With the DATA button (3) the printout of results is turned on (LED lite) or off. By default at power up DATA is turned on. The DATA button is active until the plunger touches the sample being tested. Error messages and statistical results are always printed regardless of the DATA switch being turned on or off.

Clear Button

If the statistics function, button (6), is turned on, the last measured value can be deleted from the statistical calculation by pressing the CLEAR button (4) (eg. faulty measurement). The display shows "0" and the printer repeats the last line and prints an equal "=" behind the number and result that has been cleared. The CLEAR button (4) is active after the break of the sample and until the plunger starts moving for the next test.

Cont Button

For continuous operation between samples press and hold the CONT button (5) and the display will begin cycling between "-" and "5" allowing the operator to select the number of seconds between sample tests. When the display shows the number of delay seconds desired release the CONT button (5). To turn off the delay select the "-" and the continuous operation will be turned off. When the continuous mode is turned on the LED of the CONT button (5) will be illuminated. By momentarily pressing and releasing the CONT button (5) the current setting will be displayed for about 1 second.

X σ Button

If a statistical print out is desired the operator must press the X σ button (6) before the first sample is tested. Once pressed the printer prints a row of zeros "00000000000000000000000000000000" and the LED of the X σ button (6) is illuminated. Once the statistical mode is turned on it will remain on until it is turned off or the power of the unit is switched on then off. By default the statistics mode is off when the unit is powered on. To turn the statistics mode off press and hold the CLEAR button (4) then press the X σ button (6) and release both, the LED will turn off.

When the statistical mode is activated the value of each sample tested will be added to the calculations and a sample number will precede the printed result if the DATA button (3) is illuminated. After all the samples have been tested and the testing cycle has been stopped press the X σ button (6) and the statistical report will be printed.

The statistical report includes:

NR = Number of samples tested. (HT-300 Max. 99 samples, HT-500 Max. 50 samples)

XM = Mean value = Sum of Values / Number of Samples = $\Sigma X / n$

SD = Standard Deviation = $\sqrt{(\Sigma X^2 - NR * XM^2) / (NR - 1)}$

SREL = Relative Standard Deviation = $SD / XM * 100\%$

X Min = Smallest Value

X Max = Largest Value

After the print out of the statistical report is completed the unit is ready to begin testing the next series of samples.

Display

The display (7) will show the result of the last samples tested. In addition, the following states are also possible.

“0”	After power up
“0”	After the Clear button (4) is pressed
“-” to “5”	when using the CONT button (5)
“ - ”	after ERROR messages
“ _ “	during the measuring procedure

Start Button

The START button (8) is only active when the plunger is in the neutral position.

When the CONT mode button (5) is turned off pressing the START button (8) will begin the testing procedure for a single sample. Additional samples can be tested by pressing the START button (8) after each sample is placed on the pedestal.

When the CONT mode button (5) is turned on pressing the START button (8) will begin the testing for a series of samples. After a sample is broken the unit will pause for the number of seconds as selected by the CONT button (5). When the time has expired the unit will automatically begin to test the next sample. The unit will continue testing samples until the STOP button (9) is pressed or until an error occurs.

Stop Button

By pressing the STOP button (9) the testing procedure can be interrupted at any time. The STOP button (9) is also used at the end of a series of samples when using the CONT mode button (5).

Adjustments

Jaw Stroke

By means of the limit switch the jaw stroke can be adjusted from approximately 4 - 40 mm.

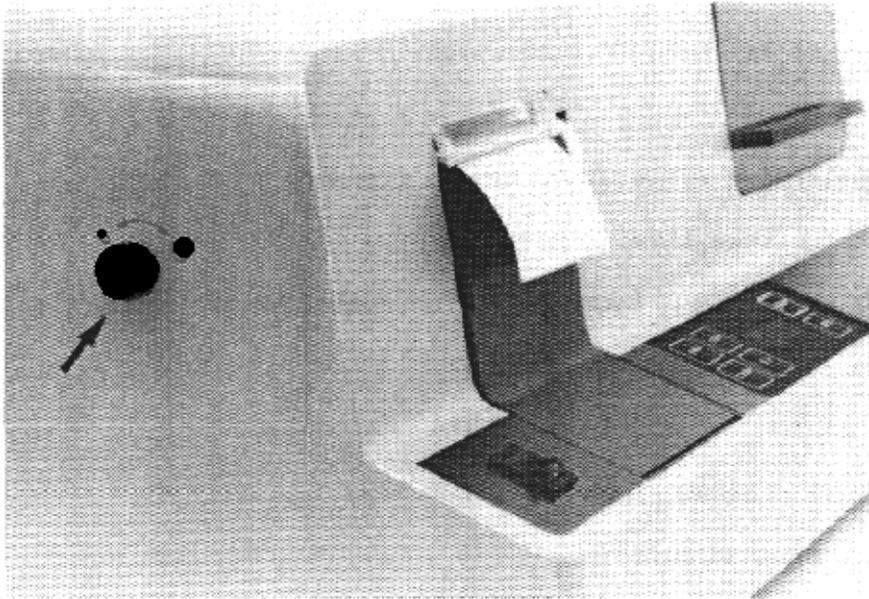


Figure 4 Limit Switch Adjustment

Units Selection Switch

Using this switch the following units can be selected as required: Kp, N, SC.

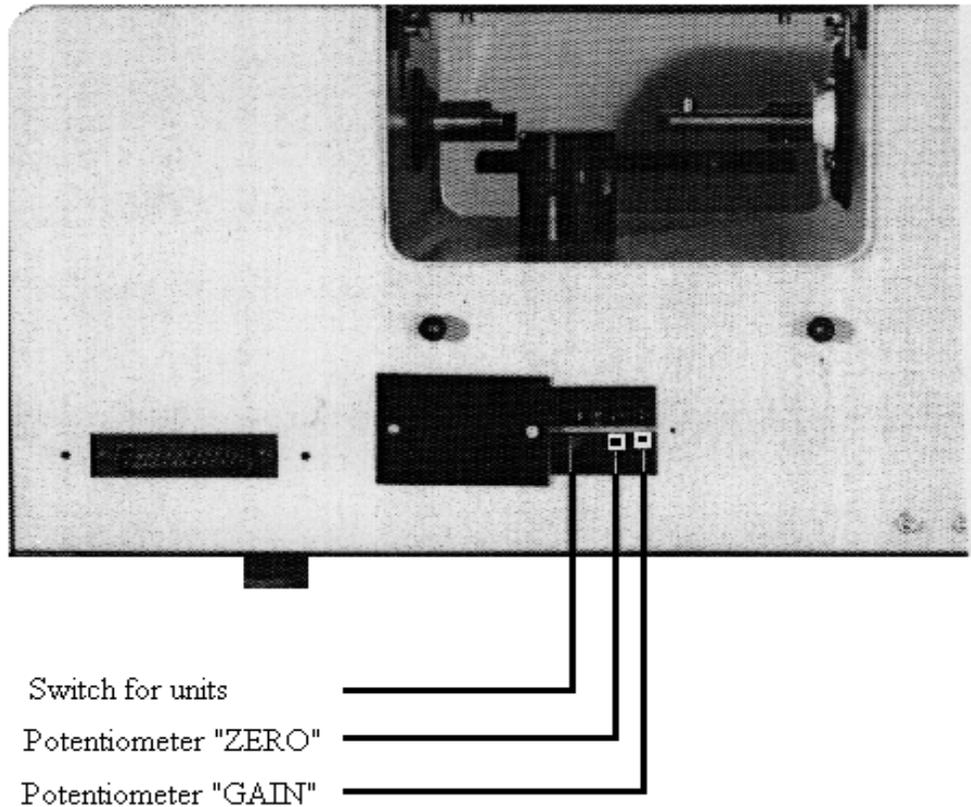


Figure 5 Switch Location

Test Program

NOTE: Before starting the test program make sure the jaw stroke adjusting knob has been turned all the way toward the large circle. This is done to make calibration easier.

A test program has been incorporated into the HT-300/500 unit to allow the operator to check and if necessary adjust the zero point setting and load cell calibration.

Starting the Test Program

The movable plunger must be in neutral position. If you are calibrating the unit it is best to turn the stroke adjustment knob toward the large circle so the jaws are in the full open position before starting the test program.

Press the STOP button (9) and hold it down then press the START button (8) and release both buttons at the same time.

The message "HT 300 xx.xx" is printed out. (The number xx.xx is the version of the electronics and is important for service, parts requests, manual requests, etc.).

Display Test

After starting the test program press the CONT button (5) and the test program will begin to illuminate each segment of the LED display. After each segment has been tested individually all the segments will be illuminated at the same time completing the test.

Zero Point

After starting the test program press the CLEAR button (4).

The message "yyyy" is printed out. V

The value "yyyy" must lie between 20 and 60. If this is not the case, adjust the potentiometer "ZERO" so that the value is within this range. By pressing the CLEAR button (4) the zero point can be printed out as often as required. Differences of less than 7 between the single printouts are normal and do not influence the accuracy of the instrument. It is recommended that the zero point be set to 40 +/- 2 when the unit is calibrated.

If the value of the zero point drops too low the error message "ZERO" will print on the printer. If the value of the zero point is too high the plunger will touch the sample and retract, not breaking it, and giving a very low and impossible result eg. 0.3 Kp. To solve either of these problems follow the instructions to set the zero point.

Calibration

The unit should be recalibrated at least two (2) times each year. Before proceeding with the calibration or validation of the unit it is necessary to have a class F certified weigh calibration kit. The calibration kit contains a range of weights from 5 N to a combined total of 98.066 N required for calibration and verification of the unit. The weight kit should be recertified each year and is available from Key International, Inc.

As the recertification of the calibration kit can be costly the unit can be returned to Key International, Inc. for service and calibration. Returning the unit to Key International, Inc. for calibration and/or service by a qualified service technician assures that all functions of the unit are operating properly.

Calibration Kit	Part Number: 04-168-0001
Contains	(1) 10 N Support Bar
	(2) 5 N Weights
	(2) 10 N Weights
	(2) 10.066 N Weights
	(2) 20 N Weights
	(1) Storage Case
	(1) Traceable Certificate

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The best procedure for verification and calibration of the unit is to test a series of weights for verification, comparing these results to the actual values, and then adjusting the unit if required. The range used by Key International, Inc. is 5 N, 10 N, 20 N, 30 N, 40 N, 50 N, 60 N, 70 N, 80 N, 98.066 N. Each weight value is tested and the result is recorded. The values are then compared to the actual weight value and any discrepancy is recorded. Next, any adjustments needed to return the unit to calibration are made. Finally, the weight range is tested one last time to make sure the tested values are within the calibration range.

1. The unit must be in the Test Program mode as instructed above.
2. Remove the “Long” jaw (Plunger) from the unit by pulling it straight out.
3. Remove the Pedestal by unscrewing it from the base of the unit.
4. Remove the “Short” jaw from the unit by pulling it straight out.
5. Turn the unit on its right side so the black Jaw Stroke adjustment knob is pointing up.
6. Press the $X\sigma$ button (6) to zero the load cell.
7. Place the 5 N weight on the stub where the short jaw was removed.
8. Now press the DATA button (3) to print the weight value recorded by the load cell.
9. Repeat steps 6 to 8 for each weight in the range.

If the weight values tested are not in the calibration range the operator needs to adjust the “GAIN” potentiometer in the back on the unit under the access plate. Turning clock-wise increases the value, counter clock-wise to decrease the value. When adjusting the values it is best to adjust the 80 N value first.

Error Messages

The following error messages are produced by the internal operating program and will be printed on the printer.

- | | |
|-------------|---|
| “NO SAMPLE” | Forward load cell has been reached and no sample has been detected. |
| “> MAX “ | The sample has exceeded the maximum force of the unit. 300 N for the model HT-300 and 500 N for the model HT-500. |
| “ZERO” | This message appears if the sample is already applying a force to the load cell when the START button is pressed. This error may also indicate that the Zero Point needs to be adjusted (see Zero Point Adjustment in this manual). |
| “STOP” | The STOP button (9) has been pressed. |

“ERROR” After the initial power up of the unit indicates that the built in self test program of the microprocessor has detected an error. The unit may be partially operational or not operational at all. Contact the Key International, Inc. service department.

Technical Information

External Start Key

It is possible to connect an external START button (eg. footswitch) to the five pin connector (if fitted) on the back of the unit. The function of the external START button is identical to that of the internal one. When starting the pins one (1) and three (3) must be short circuited (30 Volt 30 mA). Pin five (5) is grounded when the movable plunger is in the neutral position. (Open collector output NPN, allowable load 30 Volt, 50 mA).

External Start Pinout

Pin 1	Start Signal (input)
Pin 2	No Connection
Pin 3	Earth, Ground
Pin 4	No Connection
Pin 5	Neutral Position of Plunger (output)

RS-232 Interface

The unit includes an RS-232 port for communication with an external device such as a computer. The same information which is printed on the printer is echoed to the RS-232 port of the machine. Commands sent by the connected device can control the machine (see Data Input section).

Port Settings

Jumper Block Selectable

BAUD Rate	110, 150, 300, 600, 1200, 2400, 4800, 9600
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Dip Switch Selectable

	<u>OFF</u>	<u>ON</u>
STOP Bits	1	2
Parity	OFF (aus)	ON (ein)
Parity	ODD (ungerade)	EVEN (gerade)
DATA Bits	7	8

Data Output

All the information that is printed on the built in printer is echoed to the RS-232 serial port.

Data Input

The following set of commands will be accepted:

<u>Sign</u>	<u>Function</u>	<u>Keyboard Equivalent</u>
S	START	START Button (8)
A	STOP	STOP Button (9)
P	Printer On	DATA Button (3)
N	Printer Off	DATA Button (3)
M	Statistics	X σ Button (6)
?	Repeat Output	The previous data output is repeated

- All other signs are ignored.
- If a sign is accepted it is sent back, except the “?”, it repeats the last data output directly.
- If a parity error or an overflow is detected on the input register then a “?” is sent back.

RS-232 Pinout

Pin No.	Signal	Signal Description	Function	Signal Direction
1		Protective Ground or Earth	The line is connected to the instrument casing. It can be connected with external ground lines.	
2	TxD	Transmitted Data	This line carries the Data which is transmitted by the HT-300/500.	Output
3	RxD	Recieved Data	This line carries the data transmitted from the external device to the HT-300/500.	Input
4	RTS	Request to Send	Is in the 1-state if the HT-300/500 wants to send data to the external device.	Output
5	CTS	Clear to Send	Is in the 1-state if the external device is ready to receive the data from the HT-300/500.	Input
6	DSR	Data Set Ready	Not Used	Input
7	GND	Signal Ground	This line is the return line for all interfact signals; however, without protective ground.	
20	DTR	Data Terminal Ready	Is in the 1-state if the HT-300/500 is ready to receive data from the external device.	Output

- Connector is a male 25 pin sub D.
- All pins not listed are not used.

Spare Parts

<u>Part Number</u>	<u>Description</u>
15-156-0014	Printer

Print Head for Printer
Paper Cutter for Printer
Paper Spindle for Holding Paper Roll
Power Rocker Switch