3210

Technical Manual
and
Parts Catalog

INTRODUCTION

This publication is provided solely as a guide for individuals who have received METTLER TOLEDO Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

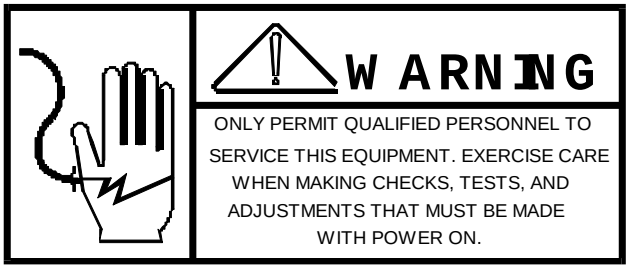
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

PRECAUTIONS

- **READ** this manual before operating or servicing this equipment.

- **ALWAYS REMOVE POWER** and wait at least 30 seconds **BEFORE** connecting or disconnecting any internal harnesses. Failure to observe these precautions may result in damage to, or destruction of the equipment.

- **ALWAYS** take proper precautions when handling static sensitive devices.



- **DO NOT** connect or disconnect a load cell scale base to the equipment with power connected or damage will result.

- **SAVE** this manual for future reference.

- **DO NOT** allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

- **ALWAYS DISCONNECT** this equipment from the power source before servicing.

- **CALL** METTLER TOLEDO for parts, information, and service.

1. GENERAL DESCRIPTION

The Toledo Model 3210 counting or straight weight scale provides a digital display for the operator and has 100% tare capability. Data output for printers is provided.

2. SYSTEM DESCRIPTION

Model 3210 uses Toledo's "gated power supply" technique to provide zero stability with temperature. Span stability, with temperature, is provided by a multislope, self-compensating A/D converter with precision thin film resistors. An active linear filter circuit reduces effects of vibration of the scale mounting surface. A/D logic and counting functions are controlled by as microprocessor, which also provides additional data filtering, tare storage and net weight calculation, lb/kg conversion, auto-zero maintenance, and weight in motion detection.

Weight display is six digit 7 segment vacuum fluorescent. Keyboard provides pushbutton zero, as well as pushbutton and keyboard tare entry provisions.

3. SPECIFICATIONS

3.1 ELECTRICAL AND PHYSICAL

3.1.1 Power Requirements
120, 220 or 240 VAC, -15 +10%, 50 or 60 Hz.

3.1.2 Capacity
5 lb x 0.001 lb/2.5 kg x 0.0005 kg
10 lb x 0.002 lb/5 kg x 0.001 kg
25 lb x 0.005 lb/12 kg X 0.005 kg
50 lb x 0.01 lb/25 kg x 0.005 kg
100 lb x 0.002 lb/50 kg x 0.01 kg

3.1.3 Digital Display
Six digits including minus sign, 7 segment vacuum fluorescent, 0.55 inches high.

3.1.4 Lighted Legends
Six lighted spots adjacent to printed legend are available.

3.2 INTERNAL FUNCTIONS AND INTERLOCKS

3.2.1 Display Message or Signals

1). Weight greater than 5 increments over capacity blanks weight display.

2). Under zero display reads true negative numbers with minus sight. Blanks at about 5% under with minus sign ON.

3). Display blinks on power up until the scale is zeroed.

4). Alternate action of the CLEAR button displays all segments and legends ON or all OFF.

3.2.2 Motion Detection
Zero, tare and printing functions are inhibited whenever motion is detected.

3.2.3 Automatic Zero Maintenance
Weight variations within ± 0.2 increments per second are compensated to zero.

Compensation range is ± 2% of capacity from true zero (as calibrated) or a total of 4% of capacity.

3.2.4 Pushbutton Zero
When the weight displayed is within the zero correction range and no motion is present, pressing the zero pushbutton will cause the weight display to be zero.

The range of this correction is ± 2% of scale capacity.

3.2.5 Tare
Platform tare and keyboard entered tare may be used at any time unless tare interlock is selected.

3.2.6 Data Output
Data Output is via 20 mA current loop (source by scale) ASCII code, 300 baud, even parity. Data Output occurs when the PRINT button is pressed.

3.2.7 Keyboard Entry Time Out
When using the keyboard to enter tare, sample size or average piece weight the data entered will appear on the display immediately. You then have three seconds after the last numerical entry to depress the function key.

3.3 EXTERNAL CONTROLS

3.3.1 Power Switch
The power switch is located on the back of the unit. This switch is on a signal line to the microprocessor which is held at 5 VDC by a pull-up resistor when the switch is open. In this open position the display is OFF. Closing the switch brings the signal to ground and the display is then turned ON.

CAUTION: WHEN THE LINE CORD IS PLUGGED INTO A POWER SOURCE, THE LINE VOLTAGE IS PRESENT AND THE SCALE IS ON. TO SERVICE THE UNIT, UNPLUG THE LINE CORD AND OBSERVE SAFETY PRECAUTIONS.

3.4 BACK PANEL AND PCB DIAGRAM

4. INSTALLATION INSTRUCTION

4.1 SET UP PROCEDURE

4.1.1 Upon removing the scale from the shipping carton, inspect the outside of the unit for any loose or damaged parts.

4.1.2 Remove the top cover and continue the inspection, checking to insure that all interconnecting harnesses and mounting hardware are securely fastened.

4.1.3 Check the voltage input selection switch, to insure that the proper voltage is selected for use in each installation.

NOTE: All units are shipped for 120 VAC operation.

1). If the voltage selection switch requires changing, simply loosen the two retaining bracket screws and slide the retaining bracket until the selection switch is in the correct position for the voltage required. Tighten the retaining bracket screws.

4.1.4 Install, if purchased, the battery power pack option. Refer to Section 5 for a detailed description of this installation procedure.

4.1.5 Re-install the top cover and platter assembly.

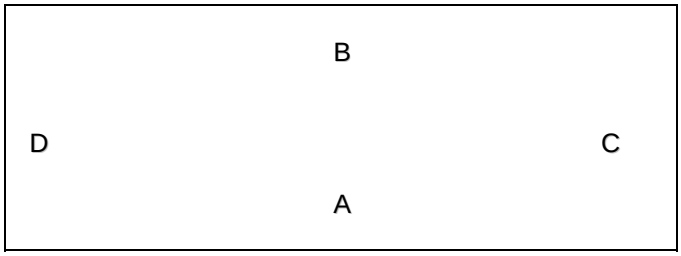
4.1.6 Apply power and allow one-half hour for warm-up.

4.1.7 At this time, check the unit for possible shift error. A shift test is acceptable only if all of the following guidelines are met.

1). Test weights equal to one-half scale capacity are used.

2). Scale is operating in the expand mode (SW1-1 ON).

3). Weights are placed on any one of the four points shown and the indication does not differ from the other three points by more than 15 expanded increments.



NOTE: The diagrammed points are 1/2 the distance from the center of the platter to the edge of the platter.

4). If a shift error does exist, the two possible causes for this are: 1) a mechanical bind or defect, 2) a defective load cell.

4.1.8 Return switch SW1-1 to the OFF position.

4.1.9 Set all programming switches for the proper operation of the installation. Refer to the detailed program switch summaries.

4.2 CALIBRATION

When calibrating the unit, first check the programming switches on the Main PCB for the correct setting of capacity and display selections.

4.2.1 Auto Calibration
This feature is used to allow calibration of the unit without removing the top cover and is mostly for the convenience of the customer. A 5 lb test weight (2 kg for metric) is used for factory Numbers 1,2,6 and 7. A 25 lb test weight (10 kg for metric) is used for Factory Numbers 3.4.5,8,9 and 10. To operate SW 1-4 on the main PCB must be in the ON position. Corrections are limited to ± 0.2% of the applied test load.

1). After the unit is unlocked, leveled, and allowed to warm-up for a minimum of 1/2 hour, remove all weight from the platter. Press the 'Z' key. The blinking will stop and the display will read zero.

2). Press the 'CALIB' key. The display will read -CALI-.

3). Place the test weight in the center of the platter. Depending upon the size of the text weight, the display will show the amount of that test weight. A weight reading greater or less than 0.2% of the applied test weight will not be corrected and the calibration error must be adjusted by using the span potentiometer (R20) on the main PCB.

4). Press the 'CALIB' key again and the display will read the desired weight depending upon the desired weight used. Remove the test weight and the unit is calibrated and ready to use.

4.2.2 Manual Calibration

1). Remove the platter, top cover, and display PCB. Place display PCB on static work station.

2). Re-install the platter with top cover removed.

3). Apply power to the unit.

4). Adjust the zero potentiometer (R-19) until the display stops blinking and reads zero.

5). Place a test weight equal to at least 15% of the units total capacity on the platter. Adjust the span potentiometer (R-20) until the display shows the applied test weight.

6). Remove the test weight, the display should read close to zero. Repeat Steps 2.4 and 2.5 as required.

NOTE: If the display does not return to zero, do not use the zero pushbutton to obtain the zero, use the zero potentiometer (R-19).

7). The final calibration should be done using test weights equal to full capacity of the scale.

8). Remove the platter, re-install the display PCB and top cover, and re-install platter assembly.

4.3 PARTS COUNTING SCALE - FACTORY NUMBERS 1,2,3,4, AND 5

4.3.1 Program Switch Summary

NOTE: If a printer is used, it is important to first check the printer Technical Manual for any switch settings that may affect the printer operation or print format.

SW1-1 Expand Enable
When this switch is ON, the weight is displayed in increments and is multiplied 80 times. This means that at full capacity (5000 increments), the scale will display 400,000. Off, expand is disabled.

SW1-2 Platter/Scoop Select
When this switch is ON, the use of the full sized platter (12" x 16") is enabled. When this switch is OFF, the small sized platter (8-1/2" x 8-1/2") or the scoop kit of parts is enabled.

SW1-3 Sample Size Select
When this switch is ON, the minimum sample weight required to count is one half (0.5) of an increment. When this switch is OFF the minimum sample weight required is (10) ten increments.

SW1-4 Auto-Calibration Enable
When this switch is ON, the auto-calibration feature is enabled. When this switch is OFF, the auto calibration feature is disabled.

NOTE: The auto-calibration feature operates only on initial power up.

SW2-1 Not Used (should be OFF)

SW2-2, SW2-3, SW2-4 Capacity Selection (see chart below)

FAC NO.	CAPACITY	SW2-2	SW2-3	SW 2-4
0001	5 lb x 0.001 lb	ON	ON	ON
0002	10 lb x 0.002 lb	OFF	ON	ON
0003	25 lb x 0.005 lb	OFF	ON	ON
0004	50 lb x 0.01 lb	ON	OFF	ON
0005	100 lb x 0.002 lb	OFF	OFF	ON
0001	2.5 kg x 0.0005 kg	ON	ON	OFF
0002	5 kg x 0.001 kg	OFF	ON	OFF
0003	10 kg x 0.002 kg	OFF	ON	OFF
0004	25 kg x 0.005 kg	ON	OFF	OFF
0005	50 kg x 0.01 kg	OFF	OFF	OFF

NOTE: This avoirdupois selections allow lb/kg switching. The metric selections allow kg only.

SW2-5 Tare Inhibit
When this switch is ON, tare cannot be used. When this switch is OFF, tare is mandatory.

SW2-6 Auto Clear Enable
When this switch is ON, the scale will clear all data (tare, APW, etc.) when the scale returns to zero. When this switch is OFF, tare and average piece weight data is retained for further use and the 'C' key must be used before entering new data.

SW2-7, SW2-8 -Print options (see chart below)

SW2-7	SW2-8	PRINT OPTIONS
OFF	OFF	Single Width Count
ON	OFF	Double Width Count
OFF	ON	1 line, WT -APW - COUNT
ON	ON	3 lines, WT - APW - COUNT

NOTE: SW2-7 ON and SW2-8 ON will print ONLY weight data when using models 301,307, and 8810/20/20 printers.

SW2-9 Not used (Should be OFF)

Comma Jumper
There is one (1) program jumper located on the lower left hand corner of the main PCB. When the jumper is installed, a comma will appear in place of the decimal point.

4.3.2 Function Keys and LED's

1). C or Clear
Used to clear input data and reset scale to accept new information. Defaults to gross weight on display and appropriate LED is flashing to prompt next operator action.

2). Z or Zero
Used to zero the scale platform weight.

3). Calib
May be used only on initial power up of scale. At zero, press Calib once and display -CALI-. Place specified test weight on platter and press Calib second time. If the span weight is within correction range, the display will update to the test weight value.

4). LB/KG - Print
LB/KG selection is available only at zero and is indicated by appropriate LED. Print command is active only after count has been obtained.

5). Sample - APW
Sample or Average Piece Weight mode is selectable only at zero and is indicated by an LED. Up scale he key is used to enter keyboard data. When the count is displayed, pressing the key sequentially will recall and display APW and net weight before returning to count. LED will indicate that display is Pieces or APW.

6). Tare
Used to enter keyboard tare or tare platform weight to zero. LED, when flashing, indicates that tare is the next operator function. When LED is stable, tare has been stored. When LED is OFF, tare is disabled.

4.3.3 Operation Instructions

1). Count parts added to the scale or count up.
a). Zero the scale.

b). Take container, if required.

c). Add sample to scale and enter sample count or average piece weight as needed.

d). Add balance of parts and count is displayed. Print if desired.

2). Operation to count parts removed form the scale or count down.
a). Zero the scale.

b). Place parts on the scale (with or without container).

c). Tare platform to zero.

d). Remove pieces until the display stops flashing and enter this count.

OR

Enter known average piece weight.

e). Remove number of pieces desired.

f). Tare may be taken after each batch is removed to allow count for next batch.

4.4 STRAIGHT WEIGH SCALE - FACTORY NUMBERS 6,7,8,9 AND 10

4.4.1 Program Switch Summary

NOTE: If a printer is used, it is important to first check the printer Technical Manual for any switch settings that may affect the printer operation or print format.

SW1-1 Expand Enable
When this switch is ON, the weight is displayed in increments and is multiplied 80 times. This means that at full capacity (5000 increments) the scale will display 400,000. Off, expand is disabled.

SW1-2 Platter/Scoop Select
When this switch is ON, the use of the full sized platter (12" x 16") is enabled. When this switch is OFF the small sized platter (8-1/2" x 8-1/2") or the scoop kit of parts is enabled.

SW1-3 Averaging Enable
When this switch is ON, eight successive readings will be added, then divided by eight and the scale will be updated to the new data.

NOTE: If SW1-3 is ON, SW2-9 must be OFF.

SW1-4 Auto Calibration enable
When this switch is ON, the auto-calibration feature is enabled. When this switch is OFF, the auto-calibration feature is disabled.

NOTE: The auto-calibration feature operates only at initial power up.

SW2-1 Not Used (should be OFF)

SW2-2, SW2-3, SW2-4 Capacity Selection (see chart below)

RAM	CAPACITY	SW2-2	SW2-3	SW2-4

0006	5 lb x 0.001 lb	ON	ON	ON
0007	10 lb x 0.002 lb	OFF	ON	ON
0008	25 lb x 0.005 lb	OFF	ON	ON
0009	50 lb x 0.01 lb	ON	OFF	ON
0010	100 lb x 0.02 lb	OFF	OFF	ON
0006	2.5 kg x 0.0005 kg	ON	ON	OFF
0007	5 kg x 0.001 kg	OFF	ON	OFF
0008	10 kg x 0.002 kg	OFF	ON	OFF
0009	25 kg x 0.005 kg	ON	OFF	OFF
0010	50 kg x 0.01 kg	OFF	OFF	OFF

NOTE: The avoirdupois selections allow lb/kg switching. the metric selections allow kg only.

SW2-5 Tare Interlock Enable
When this switch is ON, tare can be taken once only. To enter a different tare requires a clear from either the keyboard or auto clear. When this switch is OFF, tare may be taken anytime.

SW2-6 Auto Clear Enable
When this switch is ON, the scale will Clear all weight data when he scale returns to zero. When this switch is OFF, weight data is retained for further use and the 'C" key must be used before entering new data.

SW2-7
SW2-8 --Print Options (see chart below)

SW2-7	SW2-8	PRINT OPTIONS
OFF	OFF	Single Width Display Print
ON	OFF	Double Width Display Print
OFF	ON	1 Line, Gross - Tare - Net
ON	ON	3 Lines, Gross - Tare - Net

NOTE: SW2-7 ON and SW2-8 ON will print ONLY gross data with models 301,307, and 8810/20/30 printers.

SW2-9 Motion Track Enable
When this switch is ON, the display will continuously update. When this switch is OFF, the display updates ONLY when no motion exists.

NOTE: SW2-9 must be OFF when SW1-3 is ON.

Comma Jumper
There is one (1) program jumper located on the lower left hand corner of the main PCB. When the jumper is installed, a comma will appear in place of the decimal point.

4.4.2 Function Keys and LED's

1). C or Clear
Used to clear input data and reset scale to accept new information. Defaults to gross weight on display.

2). Z or Zero

Used to zero the scale platform weight.

3). Calib
May be used only on initial power up on scale. At zero, press Calib once and display - CALI-. Place specified test weight on platter and press Calib a second time. If the span weight is within correction range, the display will update to the test weight value.

4). Print
Will initiate the print command.

5). LB/KG
Will select LB or KG as indicated by LED at any time when SW2-4 is ON.

6). Used to enter keyboard tare or tare platform weight to zero. LED, when flashing, indicates that tare is the next operator function. When Led is stable, tare has been stored. When LED is OFF, tare is disabled.

5. OPTIONAL BATTERY PACK INSTALLATION

When installing the optional battery pack (0910-0010), use the following steps as an aid to the Installation Instructions packed with the battery pack.

5.1 INSTALLATION STEPS

5.1.1 Remove power from the unit.

5.1.2 Remove the platter and top cover assembly.

5.1.3 Remove the five (5) retaining screws which hold the battery access cover pate, located on the rear of the unit. Discard the cover plate as it will no longer be used. Re-install the retaining screws.

5.1.4 Remove plug P-3 from the Main PCB. (This is the harness from the Power Supply Assembly).

5.1.5 Install the Charger - Inverter PCB by snapping it in place onto the four existing plastic clips.

5.1.6 Place the Bridge Rectifier onto the existing mounting stud and tighten. connect the rectifier harness to K-11 of the Charger - Inverter PCB.

5.1.7 Connect P-3 (Power Supply Harness) to J-7 of the Charger-Inverter PCB.

5.1.8 Connect P-9 of the existing battery harness to J-9 of the Charger - Inverter PCB.

5.1.9 Install the interconnecting harness onto J-8 of the Charger-Inverter PCB and J-3 of the main PCB. Connect TO 1 on the Charger - inverter PCB to the pin labeled + 48 on the Main PCB with the single wire portion of the harness.

5.1.10 Slide the battery into the battery cavity and connect the attached cable to the rear mounted connector (J-2).

6. PREVENTIVE MAINTENANCE

The Model 3210 is designed to require a minimum of maintenance and service. This section provides instructions and procedures for the maintenance of this unit, as well as a troubleshooting guide to aid in problem analysis.

6.1 REQUIRED TOOLS AND SUPPLIES

The following items are recommended for maintenance and repair of the unit. Common hand tools are also required.

--Volt - Ohm Meter
--Load Cell simulator (P/N 100865 00A)
--Cleaning Cloth
--Static Control Bags
--Static Control Wrist Strap
--Static Control Work Station

6.2 MAINTENANCE SCHEDULE

The normal frequency at which maintenance (cleaning and inspection) should be performed is twice a year.

6.3 CLEANING

Clean the keyboard and cover with a soft, clean cloth that has been dampened with a mild window type cleaner. (DO NOT USE ANY TYPE OF INDUSTRIAL SOLVENT. DOT NOT SPRAY CLEANER DIRECTLY ONTO THE UNIT).

6.4 TROUBLESHOOTING

6.4.1 If operational difficulties are encountered, obtain as much information as possible regarding the particular problem as this may eliminate a lengthy, detailed checkout procedure.

6.4.2 Check fuses, primary power lines, external circuit elements and related wiring for possible defects. Failures and malfunctions often may be traced to simple causes such as loose or improper circuits, power supply connections or fuse failure.

6.4.3 Use the electrical interconnecting diagram as an aid in locating trouble causes. The diagram contains various voltage measurements that are average for normal operation. Use instrument probes carefully to avoid causing short circuits and damaging circuit components.

6.4.4 A printed circuit board believed to be defective may be checked by replacing it with a known good PCB and observing whether the problem is corrected. WHEN HANDLING A PRINTED CIRCUIT BOARD, BE CERTAIN TO WEAR A STATIC CONTROL WRIST-STRAP AS WELL AS USING A STATIC CONTROL BAG FOR BOTH THE NEW AND DEFECTIVE BOARDS. When replacing a suspected faulty PCB, do not program the replacement PCB form the original as the problem may be caused by a programming error. Use the proper Technical Manual to determine necessary switch and/or jumper position.

6.4.5 To be certain that the problem is contained in the removed PCB, re-install the board and retest. This simple test will eliminate the possibility of having replaced a good PCB

because of a loose or poor connection.

6.5 TESTING THE OPERATIONAL VOLTAGES

6.5.1 LOAD CELL EXCITATION

This excitation voltage is gated on and off and therefore cannot be measured accurately with a voltmeter as they generally measure average voltage.

The voltage, when measured with a voltmeter, will be:

MAIN PCB

J-2 Pin 9 to Pin 7 =+3.7 VDC
J-2 Pin 1 to Pin 7 = - 3.7 VDC
J-2 Pin 1 to Pin 9 = +7.5 VDC

The raw supply voltages can be measured at the filter capacitors mounted on the Main PCB. These capacitors are labeled C54 and C53 and will read +VDC and -VDC respectively. The input voltage for these capacitors can be measured at P7 on the Main PCB if there is no battery option used or on P3 of the Charger- Inverter PCB if the battery option is used. The measured voltages are as follows:

P3/P7 Pin 7 to Pin 9 = 11 VAC
P3/P7 Pin 8 to Pin 9 = 11 VAC
P3/P7 Pin 7 to Pin 8 = 22 VAC

6.5.2 LOGIC SUPPLY VOLTAGES

A-C SUPPLY VOLTAGE	A-C VOLTAGE	REC. BRIDGE	FILTER CAPACITOR	REGULATOR	D-C VOLTAGE	TEST POINT	MAX. RIPPLE
J-3 Pin 2 & 3	10 VAC	CR4	C55	Q8	+5 VDC	C58	.1 VAC
J-3 Pin 7 &8	22 VAC	CR9	C54	Q6	+15 VDC	C49	.2 VAC
J-3 Pin 2 & 3	22 VAC	CR9	C53	Q5	-15 VDC	C48	.2 VAC
J-3 Pin 2 & 3	22 VAC	CR5 & 9	C57	--	+48 VDC	TP1	.4 VAC

6.53 TESTING THE 20 MILLIAMP CURRENT LOOP

The test must be performed at the printer end of the interconnecting cable with the cable connected to the 3210 but removed from the printer. Set the volt-ohm meter to read D-C milliamps.

After determining which printer is being used, refer to the following chart by printer model number to determine where to connect the meter leads. After connecting your meter leads to the proper cable pins, the meter should show from 18.0 to 40.0 milliamps. Depress the 'Print' key on the 3210 keyboard, and observe the meter reading. The reading should fluctuate to approximately half the original meter reading, which indicates there is a transmission, then return to the original meter reading.

MODEL NUMBER	PLACE RED LEAD ON PIN # (20 mA RECEIVE +)	PLACE BLACK LEAD ON PIN # (20 mA RECEIVE -)

301, 307 8805* 8806 8855	6 26 16 3	7 28 18 22

NOTE: This test cannot be done if a Model 8810, 8820, or 8830 printer is being used.

6.6 INPUT/OUTPUT CONNECTIONS

6.6.1 Printer Output

SIGNAL NAME	3210 J-1	301/307 J-9	8805 J-1	8806 J-1	8810 J-25	8855 J-1
Chassis Ground 20 mA Transmit + 20 mA Supply (Transmit) Supply Ground 20 mA Transmit --	5 14 15 16 19	Shield 7 6	Shield 28 26	Shield 18 16	Shield 18 19	Shield 22 3
Jumpers on Indicator end of cable		16 19	16 19	14 15		16 19
Jumper on Printer end of cable					16 19	

6.6.2 Interconnecting Cables

PRINTER	LENGTH	PART NUMBER
301 AND 307	6 Ft..	11713700A
301 AND 307	20 Ft.	11713800A
8805	6 Ft.	11713900A
8805	20 Ft.	11714000A
8806	6	11550000A
8806	20 Ft.	11550100A
8820/30	6	11714300A
8820/30	20 Ft.	11714400A
8855	6	11714100A
8855	20 Ft.	11714200A

6.7 SPARE PARTS LISTING

PART NUMBER	DESCRIPTION	QTY.
111778 00A	Main PCB	1
B120988 00A	Prom PCB, Fac. Nos. 1,2	1
B120990 00A	Prom PCB, Fac. Nos. 3,4,5	1
124953 00A	Prom PCB, Fac. Nos. 6,7	1
124954 00A	Prom PCB, Fac. Nos. 8.9.10	1
114689 00A	Keyboard, Fac. Nos. 1-5	1
116539 00A	Power Supply	1
114584 00A	Charger Inverter PCB	1
114688 00A	Keyboard, Fac, Nos. 6-10	1