320M SERIES ECHOSOUNDER

TROUBLESHOOTING AND MAINTENANCE MANUAL

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KNUDSEN
ENGINEERING LIMITED

Knudsen Engineering Limited
10 Industrial Road
Perth, Ontario, Canada

CONTENTS

1 INTRODUCTION 1-1
1.1 About this manual 1-1
1.2 The 320M Echosounder 1-1
1.3 Technical Support 1-1

2 HARDWARE 2-1
2.1 Hardware Architecture 2-1

3 STATUS MESSAGES 3-1
3.1 Power-On Messages 3-1
3.1.1 SPM Sign-On Messages 3-1
3.1.2 Non-Volatile Memory Error 3-1
3.1.3 SRAM Errors 3-2
3.1.4 Clock Errors 3-2
3.1.5 Printer Sign-On Error 3-2
3.2 Operational Messages 3-3
3.2.1 Printer Errors 3-3
3.2.2 SPM Operational Errors 3-3
3.3 Serial Control Messages 3-3
3.3.1 Communication Link not Initialized 3-3
3.3.2 Communication Link Aborted 3-4
3.3.3 Old Firmware 3-4
3.3.4 Port Timeout 3-4

4 TROUBLESHOOTING 4-1
4.1 Basic Troubleshooting Procedures 4-1
4.1.1 System Appears Dead 4-1
4.1.2 Breaker Tripped 4-1

5 MAINTENANCE 5-1
5.1 User-serviceable Components 5-1
5.2 Normal User Maintenance 5-1
5.2.1 Printhead Cleaning 5-1
5.2.2 Printer Slip-Clutch Adjustment 5-1
5.2.3 User Calibration 5-2
5.2.4 Software Upgrades in the Field 5-2
5.2.5 Voltage Adjustments 5-3

6 SYSTEM UPGRADE INSTALLATIONS 6-4
6.1 Stepping Motor Heatsink Installation 6-4
6.2 Slip Clutch Installation 6-5
6.3 Printhead Installation 6-5

7 FREQUENTLY ASKED QUESTIONS 7-1

8 INTERNAL MODULES 8-1

LIST OF TABLES

Table 5.1: Printer Slip-Clutch Adjustments 5-1

LIST OF FIGURES

Figure 2.1: 320M Signal Flow 2-1
Figure 3.1: Communication link not initialized 3-3
Figure 3.2: Communication link aborted 3-4
Figure 3.3: Old Firmware 3-4
Figure 3.4: Port Timeout 3-4
Figure 4.1: PDM LED's and Fuse 4-1
Figure 5.1: 320M Connector Panel 5-2
Figure 5.2: MPM 5V Test Points 5-3
Figure 5.3: PDM Adjustment Potentiometers 5-4
Figure 6.1: 320M Thermal Printer Assembly 6-6
Figure 8.1: Signal Processing Module 8-1
Figure 8.2: Printer Control Module 8-1
Figure 8.3: Front Panel Module 8-2
Figure 8.4: Standard Transmitter Module 8-2
Figure 8.5: Main Processing Module 8-3
Figure 8.6: Power Distribution Module 8-4
Figure 8.8: Printer Illumination Module 8-4
Figure 8.7: Depth Display Module 8-4

1 INTRODUCTION

1.1 About this manual

This manual provides maintenance and troubleshooting information for the 320M series echosounder. It is advisable for all users to become familiar with the relevant sections in this manual to ensure that the echosounder is used to its optimum capability.

1.2 The 320M Echosounder

The 320M Marine Echosounder was designed and built in Canada by Knudsen Engineering Limited (KEL). The 320M is distinguished by compact size and high performance; with the flexibility, versatility and accuracy provided by Digital Signal Processing. The echosounder is configurable for one or two sounding channels with frequency of operation from 3.5 kHz to 250 kHz .

Five key technologies combine in the 320M to create an echosounding system of remarkable flexibility and performance:

- TMS320C25 Digital Signal Processing computer technology
- Thermal greyscale printer technology
- Field Programmable Gate Array (FPGA) technology
- MOSFET switchmode amplifier technology
- FLASH non-volatile computer memory

The survey echosounder must produce a high quality and detailed hardcopy profile with demonstrable precision and accuracy. It must also digitize the bottom depth with reliable accuracy. The digitizer must be discriminating, yet track unpredictable bottom trends in the presence of fish, weeds, ledges, thermoclines and double reflections in order to minimize the need for post-survey checking and editing. In addition to the basics, automatic time and position MARKs, interfaces to differential GPS positioning data and heave compensators are standard requirements on modern surveys in order to improve overall accuracy and productivity.

1.3 Technical Support

For technical support or to report problems please contact your local representative or:

Technical Support
Knudsen Engineering Limited
10 Industrial Road
Perth, Ontario
K7H 3P2

Voice: (613) 267-1165 8:30 am to 5:00 pm E.S.T. Core Hours
Fax: (613) 267-7085
E-Mail: support@knudsenengineering.com
WebSite: http://knudsenengineering.com/

2 HARDWARE

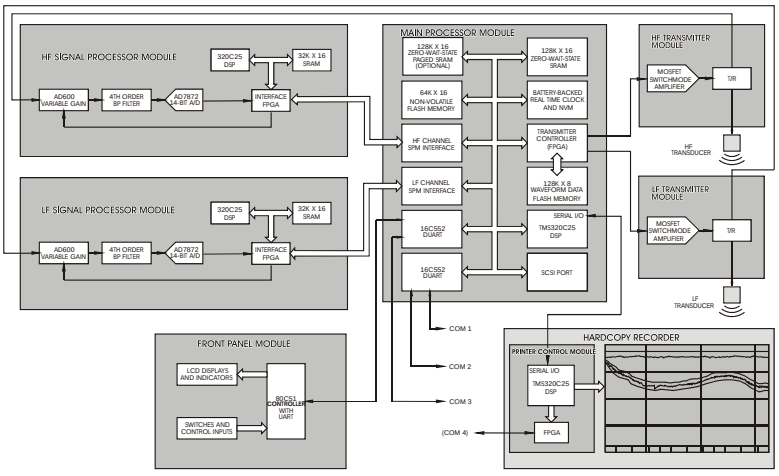
2.1 Hardware Architecture

The 320M Marine Echosounder incorporates a very modular architectural design. The system is composed of the following modules along with their accompanying mechanical and cable assemblies.

MPM: Main Processor Module,
SPM: Signal Processing Module,
STM: Switchmode Transmit Module,
PDM: Power Distribution Module,
PCM: Printer Control Module,
FPM: Front Panel Module

The MPM is the host board of the system, the brain of the system, which uses a TMS320C25 as the DSP processor. This board controls all the internal modules as well as providing interfaces to external computers or sensors such as GPS and Heave. This board interfaces with one or two SPMs and STMs depending on single or dual frequency configurations. The MPM takes power from a 5Vdc power cable from the PDM. It interfaces to external devices through four serial port 3-wire cable assemblies (one used internally for FPM and one SCSI port ribbon cable assembly. Each SPM connects to the MPM as a daughter board using a 36-pin SBX connector, drawing power through this connector in addition to exchanging commands and data with the MPM. The STMs interface using a 10-pin ribbon cable for transmit drive signals from the MPM, 48Vdc power from the PDM, and a twisted cable for the received analog signal to the SPM. The FPM provides the interface from the front panel displays and switches to the MPM. It connects to the MPM via a 3-wire serial cable used for data transfers. It takes 5Vdc from the PDM. The PCM is a computer board, using a TMS320C25 as the processor. It has some built-in self-tests, but stays in an idle loop until it receives control instructions and data from the MPM. The PCM connects to the MPM via a 16-pin ribbon cable that provides a high-speed serial communication link. The PCM connects to the PDM with a combined 5Vdc (for digital power) and 24Vdc (for printhead and motor power) power cable.

Figure 2.1: 320M Signal Flow



3 STATUS MESSAGES

3.1 Power-On Messages

Upon power-up, the dot matrix LCD will display an initial Front Panel test screen, while internal self-tests are performed (lasts approximately 3 seconds). If any errors are encountered in the self-tests, the LCD screen will display individual messages for each error condition encountered. The user will need to acknowledge each error condition report with a **MENU** press. Once all the error conditions have been acknowledged, or if no error conditions occur, the display will report on the status of the SPM modules installed in the system. This screen indicates if the LF and HF SPM's are responding and if the proper SPM frequencies were detected for each channel. It will remain for approximately 6 seconds, before the initial menu screen appears at which point the user can now operate the system.

3.1.1 SPM Sign-On Messages

LF: 50kHz — this message indicates that a nominally functional 50kHz SPM was detected on the LF channel and that it matches the frequency supported by the currently installed version of software.

HF: invalid H/W — this message indicates that a nominally functional SPM was detected on the HF channel but that its frequency is not supported by the currently installed version of software. The sounder disables controls for an unsupported frequency SPM.

LF: not present — this message indicates that either an SPM module is not installed, or that the installed module is not functioning properly and needs to be serviced or replaced.

Double check the SPM sign-on messages to ensure that the installed SPM modules are recognized by the system.

3.1.2 Non-Volatile Memory Error

NVM DATA INVALID
LOADED DEFAULTS

This typically means the setup data stored in the NVM has been corrupted. The NVM is protected by the checksum in order to assure that only valid data is used in sounding. In event of an invalid checksum, the 320M and the NVM are loaded with the original default settings. If power fails or is shut off while the processor is computing the checksum on an adjusted parameter, there is a small chance that this message will result. In theory, it is possible for the NVM memory IC to wear out after millions of writes and require replacement; this may be indicated by continual NVM faults.

3.1.3 SRAM Errors

PS SRAM FAILED
Error code: xxh

DS SRAM FAILED
Error code: xxh

These error messages indicate hardware problems on the Main Processing Module. The PS SRAM message means that the SRAM chips used for program storage during operation failed the built-in self-tests. The DS SRAM message means that the SRAM chips used for data storage during operation failed their built-in self-tests. If either of these error messages occur, the system's performance is compromised and qualified technical help is required.

NOTE: On older systems, the serial sign-on message may indicate a DS SRAM error = 01h. This simply means that the unit does not have the optional extended SRAM memory chips installed. These extended memory chips are only needed for systems using 3.5kHz correlation; the unit will function normally for all other frequencies.

3.1.4 Clock Errors

VALIDATION
ERROR CLOCK

This error message indicates a hardware problem with the internal real-time clock. If the clock fails its validation test, the clock's internal battery backup has failed, and the clock needs to be replaced. The internal battery is rated for a life of ten years.

3.1.5 Printer Sign-On Error

ERROR: PRINTER
FAILED SIGN-ON!

This error message indicates a problem with the printer module. The Main Processing Module attempts a handshake sequence with the printer on power up; if the printer does return the appropriate response to the Main Processing Module this error message will occur. This could be a result of older incompatible firmware in the Printer Control Module; a firmware upgrade would solve this problem. It could also be due to a hardware problem in the Printer Control Module, or poor cabling from either the Main Processing Module or the Power Duistribtion Module. Technical support should be contacted if this error consistently occurs.

3.2 Operational Messages

3.2.1 Printer Errors

WARNING - PRINTER
NOT RESPONDING

This message occurs when the Main Processing Module does not get the expected status word codes from the printer. If the printer's status LEDs do not indicate an error, check to make sure the cables between the MPM and the printer are firmly seated.

3.2.2 SPM Operational Errors

TIMING ERROR:
data acquisition

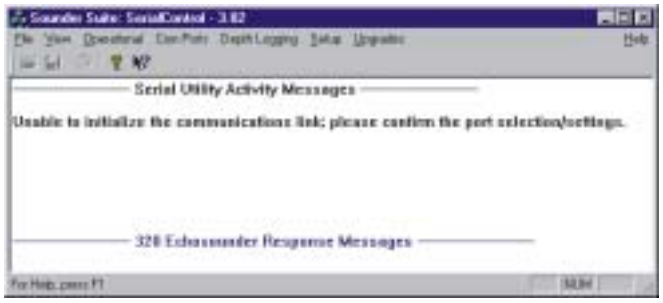
This message occurs when one or more of the SPM modules do not send the correct amount of data to the Main Processing Module within an allowable amount of time. This is an indication that the SPM module is faulty and requires repair or replacement.

3.3 Serial Control Messages

3.3.1 Communication Link not Initialized

This message occurs when the Serial Control Program has tried all baud rates and still cannot establish a link to echosounder. This could indicate that the communication cable is damaged or that the echosounder has not been turned on.

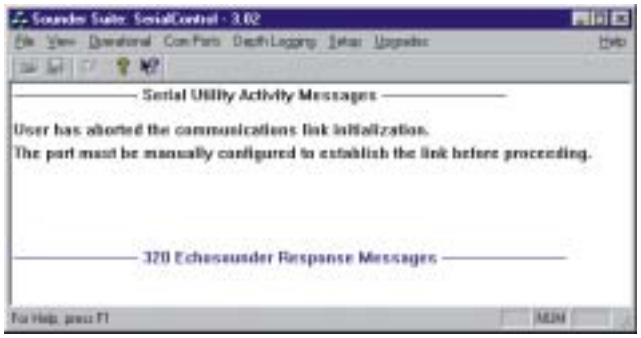
Figure 3.1: Communication link not initialized



3.3.2 Communication Link Aborted

This message occurs when the Serial Control Program has been terminated prior to establishing a communication link to the echosounder.

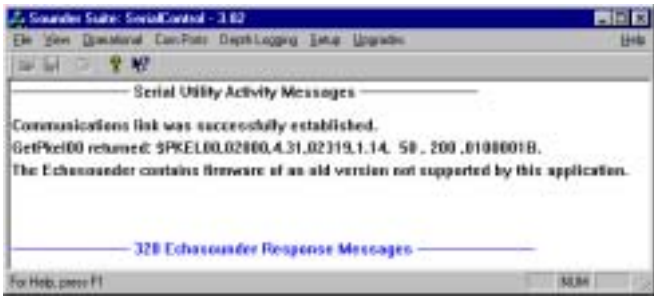
Figure 3.2: Communication link aborted



3.3.3 Old Firmware

This message occurs when the echosounder has detected an older version of firmware than the Serial Control Program supports.

Figure 3.3: Old Firmware



3.3.4 Port Timeout

This message occurs when the communication link has been lost during an update.

Figure 3.4: Port Timeout

4 TROUBLESHOOTING

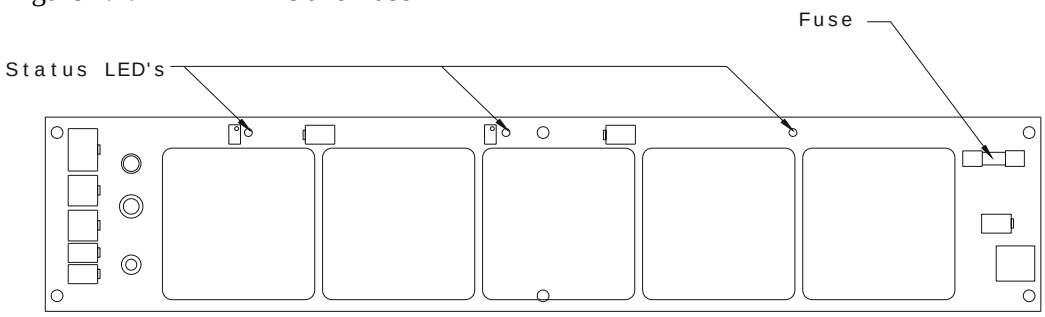
4.1 Basic Troubleshooting Procedures

The 320M can be bench tested with a transducer using in-air echoes from a wall or other hard surfaces. There are no exposed hazards inside the unit, although the Transmitters can generate several hundred volts at the secondary of the output transformer. These points are under a removable protective cover.

4.1.1 System Appears Dead

If the system is totally lifeless, start by examining for obvious problems. Open the printer door and check the power distribution module. It has three LEDs which should all be ON in order for the unit to operate; one is for +5V, one for +24 V and one for +48 V. The power distribution module has a backup fuse inside, check it first.

Figure 4.1: PDM LED's and Fuse



4.1.2 Breaker Tripped

After resetting the breaker, check the input DC polarity, then open the printer door and check the status of the shunt diode across the supply. Then, one by one, start disconnecting power cables at the power distribution module from the STMs, FPM, Printer and MPM until a module is isolated or fault appears.

If the power input is connected with the wrong polarity, a protective diode shunts the current to the breaker on the connector panel, causing it to trip. Check the input wiring, then reset the breaker.

If the power input is accidentally connected to AC power, the large currents involved cause the protective diode to fail shorted. The diode must be replaced before the system can be properly powered up.

5 MAINTENANCE

5.1 User-serviceable Components

The only user-serviceable components in the system are the protection fuses located on the MPM, STM, and PDM. These fuses are standard 5mm x 20mm slow blow glass type. If a module has a blown fuse, check the input power source to confirm the setting is within specification (9-36Vdc). Replace the fuse and test. If the fuse blows again, please consult the factory. If normal functionality is achieved, continue with use. If a module is determined to be faulty, typically a new replacement module is provided in exchange for the faulty one. A board replacement is easily accomplished and allows for faster system repair than trying to find and repair faulty board components in the field.

5.2 Normal User Maintenance

5.2.1 Printhead Cleaning

The most important maintenance item is the proper cleaning care of the printhead. As the printer is used, small particles of dirt and grit can accumulate on the printhead surface. If too much debris collects on the printing surface, the printing quality deteriorates and missing pixels appear as white lines on the printout. If this debris is not cleaned off, the affected pixels can be permanently damaged. This debris can be cleaned using a cotton swap with isopropyl alcohol solution. Release the printhead and then gently wipe the swap across the printing surface of the printhead. Let the surface dry completely before re-engaging the printhead and resuming printing.

5.2.2 Printer Slip-Clutch Adjustment

The printer is designed with a slip-clutch assembly that enables the user to adjust the amount of paper tension at the take-up end. This adjustment is optimized for use with the KND320 plastic thermal media before the system is delivered and should not normally require any change. However, if any of the following symptoms develop, the described adjustment should remedy the problem. If problems continue, contact the factory.

Table 5.1: Printer Slip-Clutch Adjustments

SYMPTOM	ACTION
No paper take-up.	1) Loosen set screw on the slip-clutch collar. 2) Turn the collar a 1/4 turn clock-wise. 3) Tighten the set screw on the collar.
Paper wound too loose.	1) Loosen set screw on the slip-clutch collar. 2) Turn the collar slightly less than a 1/4 turn clockwise. 3) Tighten the set screw on the collar.

Printer making “clunking” sound.	Suggestion 1: 1) Loosen set screw on the slip-clutch collar. 2) Turn the collar a 1/4 turn counter-clockwise. 3) Tighten the set screw on the collar. Suggestion 2: 1) Measure the 24V line on the printer board. (At the 24V fuse) 2) If voltage is less than 24V, contact KEL.

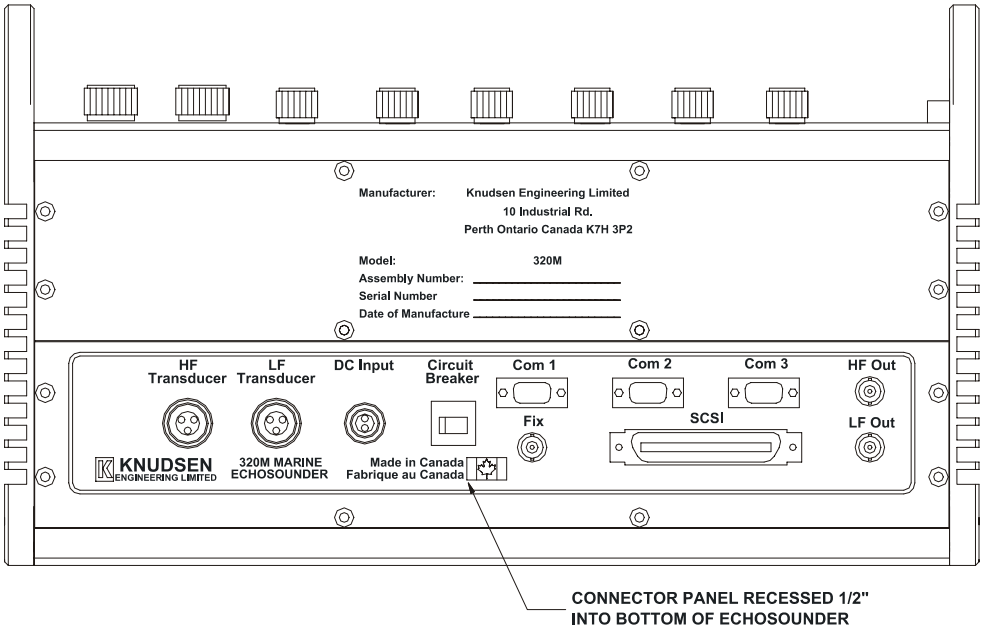
5.2.3 User Calibration

The only user calibration required is a DRAFT and SPEED OF SOUND modification. This is done typically by using a BAR CHECK (see Echosounder Concepts Technical Note D10-02251).

5.2.4 Software Upgrades in the Field

There may be a time when a software upgrade is desired, or required to meet a specific user's special requirement. Knudsen Engineering Limited provides Internet FTP downloads so that the user can get new or revised software. The user can then upload this software into the 320M. The Flash Eprom technology allows serial RS232 software transfer and programming thus eliminating the need to replace eproms. Refer to the Software Installation/Upgrade Manual for instructions to complete the upgrade.

Figure 5.1: 320M Connector Panel



5.2.5 Voltage Adjustments

There may be a time when the internal 5V and 24V lines need to be trimmed up. The Power Distribution Module (PDM) features two adjustment potentiometers for this purpose. In order to check if the 5V line needs to be trimmed, measure the DC voltage between the test points labelled GND and +5 located in the top corners of the Main Processing Module. If the voltage is below 4.9V, turn the potentiometer clockwise until proper voltage level is reached (5.05V-5.10V) If the stepping motor seems to be struggling or if the printhead appears to be printing light, an adjustment of the 24V might be needed. The voltage can be checked using the same GND test point on the MPM and placing the positive lead of your multimeter on the glass fuse located in the middle of the exposed Printer Control Module (PCM). In order to trim the voltage to the proper level, adjust the potentiometer clockwise.

Figure 5.2: MPM 5V Test Points

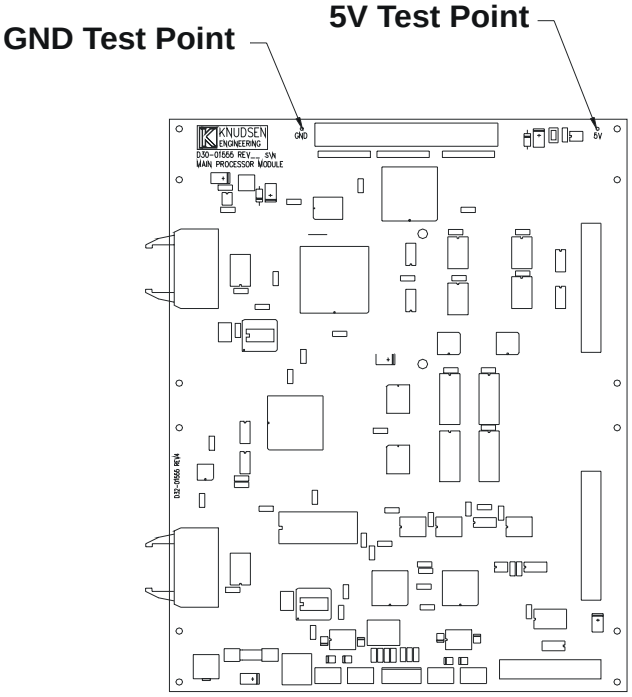
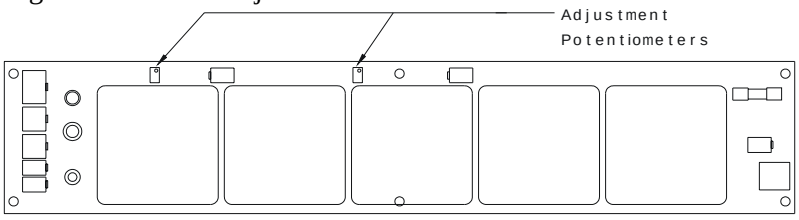


Figure 5.3: PDM Adjustment Potentiometers



6 SYSTEM UPGRADE INSTALLATIONS

6.1 Stepping Motor Heatsink Installation

The following is a list of step-by-step instructions on how to install a heatsink under your existing 320M Thermal Printer stepping motor (P/N PH265M-32) for additional cooling.

1) Disconnect all cables to the 320M Printer Assembly. Remove the Printer Assembly from the 320M chassis.
2) Remove the four screws that attach the Printer Control Module (PCM) mounting plate from the Printer Assembly.
3) Disconnect all cables to the PCM and remove mounting plate from printer assembly.
4) Remove any paper rolls from the assembly and close printhead lever.
5) Remove the two springs from the printhead plate.
6) Remove the two screws that attach the fixed window to the printer front panel. Slide out both the fixed window and the sliding window.
7) Remove the ten screws that attach the printer front panel to the assembly.
8) Remove front panel, window tracks, and printer platen from assembly.

At this point you will have access to all four sides of the stepper motor and therefore all mounting screws.
9) Remove the four screws that attach the stepper motor to the assembly. Remove spacers.
10) Lift the motor away from the two belts.
11) Reinstall the motor in the belts with the heatsink in place off the standoffs. Make sure that the groove on the heatsink cutout is against the stepper motor and not the assembly.
12) Use the same four screws to reattach the stepper motor to the assembly.
13) Reinstall the platen, window tracks, and printer front panel. If your assembly does not have alignment pins (not on older revisions), make sure that the platen is installed straight. This will reduce paper skewing. As well, confirm that the window tracks are orientated with the larger end to the platen.
14) Reinstall the printhead springs.
15) Reattach all cables to the PCM and install mounting plate.

6.2 Slip Clutch Installation

The following is a list of step-by-step instructions on how to install a new upgraded slip clutch design in your existing 320M Thermal Printer.

1) Disconnect all cables to the 320M Printer Assembly. Remove the Printer Assembly from the 320M chassis.
2) Remove the four screws that attach the Printer Control Module (PCM) mounting plate from the Printer Assembly.
3) Disconnect all cables to the PCM and remove mounting plate from printer assembly.
4) Remove any paper rolls from the assembly and close printhead lever.
5) Remove the two springs from the printhead plate.
6) Remove the two screws that attach the fixed window to the printer front panel. Slide out both the fixed window and the sliding window.
7) Remove the ten screws that attach the printer front panel to the assembly.
8) Remove front panel, window tracks, and printer platen from assembly.

At this point you will have access to the existing slip clutch and belts.
9) Remove the shoulder screw of the printer take up drive hub.
10) Remove the drive hub from its drive belt.
11) Remove the shoulder screw that attaches the slip clutch to the printer bottom plate.
12) Remove old slip clutch.
13) Loosen that four screws that attach the stepper motor to the printer bottom plate.
14) Slide 180 groove belt onto the new clutch. Install under the 75 groove belt.
15) Align new clutch into position and install shoulder screw.
16) Align and tighten the four screws attaching the stepper motor to the printer bottom plate.
17) Install take up drive gear into 180 groove belt and align with mounting hole. Install shoulder screw.
18) Install printer platen, window tracks, and the printer cover plate by aligning the ten screws from the cover plate into the printer top and bottom plates.
19) Make sure printhead lever is in closed position and install printhead tension springs.
20) Slide both windows back into place.
21) Install the fixed window mount.
22) Connect all cables from printer assembly to the printer control module.
23) Install the four screws and standoffs that attach the printer control module to the printer assembly.

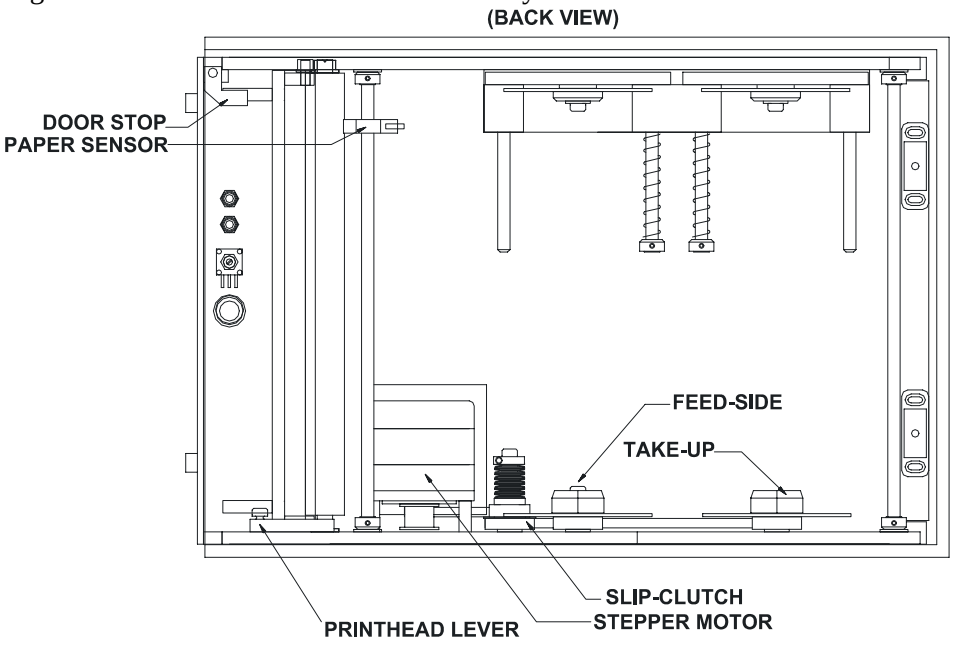
6.3 Printhead Installation

The following is a list of step-by-step instructions on how to change a damaged printhead in your existing 320M Thermal Printer.

1) Disconnect all cables to the 320M Printer Assembly. Remove the Printer Assembly from the 320M chassis.
2) Remove the four screws that attach the Printer Control Module (PCM) mounting plate from the Printer

Assembly.
3) Disconnect all cables to the PCM and remove mounting plate from printer assembly.
4) Remove any paper rolls from the assembly and close printhead lever.
5) Remove the two springs from the printhead plate.
6) Remove the two screws that attach the printhead plate to the upper bushing block.
7) Remove the upper bushing block and bronze bearing.
8) Remove the two screws that attach the printhead plate to the lower bushing block.
9) Remove the lower bushing block and bronze bearing.
10) Slide the printhead plate out from the printer assembly.
11) Remove the four screws that attach the printhead to the printhead plate.
12) Change printheads.
13) Install the printhead mounting screws.
14) Slide the printhead plate back into postion.
15 Install the lower bushing block and bronze bearing. When aligned install two mounting screws.
16) Install the upper bushing block and bronze bearing. When aligned, install the two mounting screws.
17) Install the printhead lever.
18) With printhead lever in closed position, install the printhead tension springs.
19) Connect all cables back to the printer control module.
20) Install the four screws and standoffs that attach the printer control module to the printer assembly.

Figure 6.1: 320M Thermal Printer Assembly



7

FREQUENTLY ASKED

QUESTIONS

Problem: Printer grid keeps changing.
Solution # 1: The communication cable from the MPM to the PCM has become damaged. Inspect the cable for possible breaks.
Solution # 2: The 5V line provided by the Power Distribution Module has dropped to a low level. Adjust the 5V trimpot on the PDM.
Solution # 3: Software mismatch between the PCM and MPM. Confirm versions with KEL Tech Support.

Problem: Depth displays show “5.678"
Solution # 1: The communication cable from the MPM to the FPM has become disconnected.
Solution # 2: The 5V line provided by the Power Distribution Module has dropped to a low level. Adjust the 5V trimpot on the PDM.
Solution # 3: The fuse on the MPM has failed. Replace the fuse.

Problem: Paper skewing.
Solution # 1: Make sure that paper is loaded straight. A small skew at the start of a paper roll can amount to problems by the end of a paper roll.

Problem: No output to transducers.
Solution # 1: Damage to transducer cable. Inspect the cable for possible breaks.
Solution # 2: The fuse on the Transmitter module has failed. Replace the fuse.
Solution # 3: There is no input voltage from the PDM. Measure and confirm 48V at fuse of transmitter module.

Problem: No serial communication to PC via COM3
Solution # 1: Confirm proper baud rate and parity parameters on both ends.
Solution # 2: Make sure communication cable is serial null modem cable.

Problem: Menu display shows error message “Printer not found”.
Solution # 1: The communication cable from the MPM to the PCM has become damaged. Inspect the cable for possible breaks.
Solution # 2: The 5V line provided by the Power Distribution Module has dropped to a low level. Adjust the 5V trimpot on the PDM.
Solution # 3: The power cable from the PDM to the PCM has become damaged. Inspect the cable for possible breaks.

Problem: There is a constant blank line on the printout.
Solution #1: Debris has built up on the printhead. Clean with cotton swab.
Solution #2: One or more elements on the printhead have been burned out.

Problem: The contrast of paper record printout seems light.

Solution # 1: Adjust the 24V trimpot on the PDM.
Solution # 2: Make sure nothing is impeding the printhead plate from contacting the print roller.

Problem: The echosounder seems to reset in warmer conditions, but fine when cooled.
Solution # 1: Confirm the presence and then functionality of internal fans. Earlier models did not include this feature.
Solution # 2: Confirm that the printer stepping motor has attached heatsink. Earlier models did not include this feature.

8 INTERNAL MODULES

Figure 8.1: Signal Processing Module

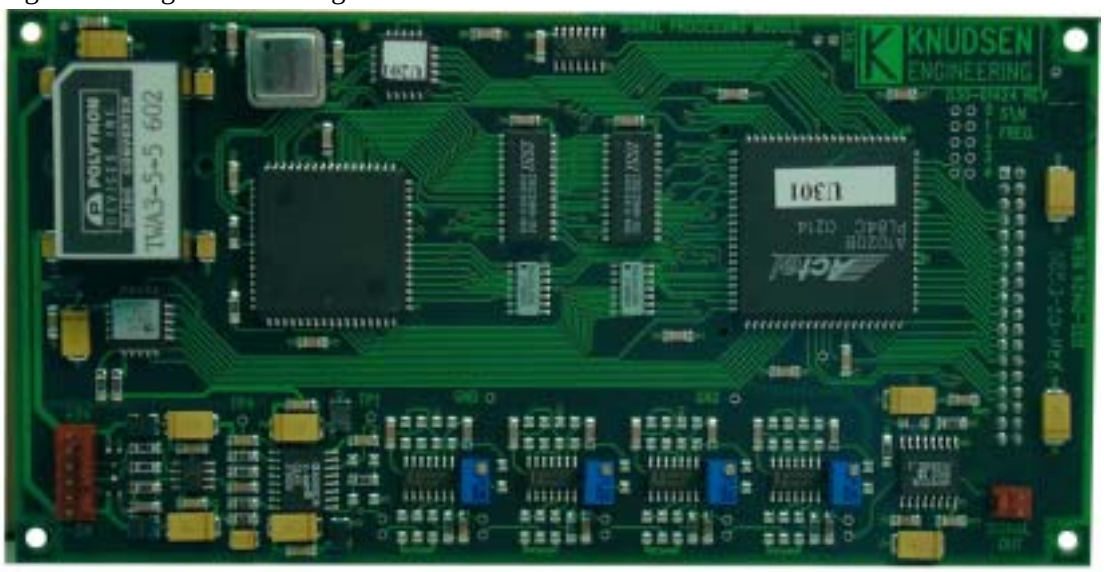


Figure 8.2: Printer Control Module

Figure 8.3: Front Panel Module

Figure 8.4: Standard Transmitter Module

Figure 8.5: Main Processing Module

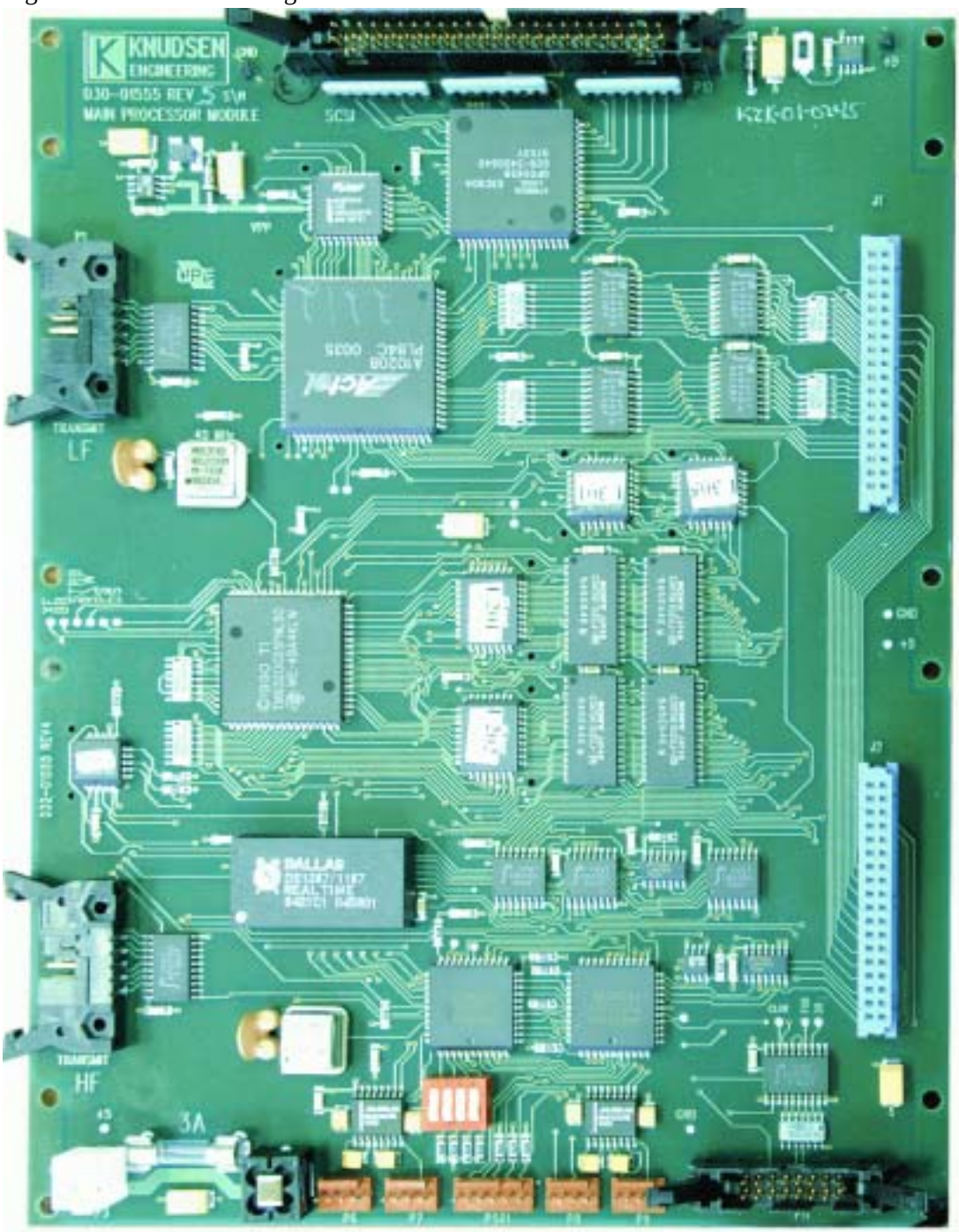


Figure 8.6: Power Distribution Module

Figure 8.7: Depth Display Module

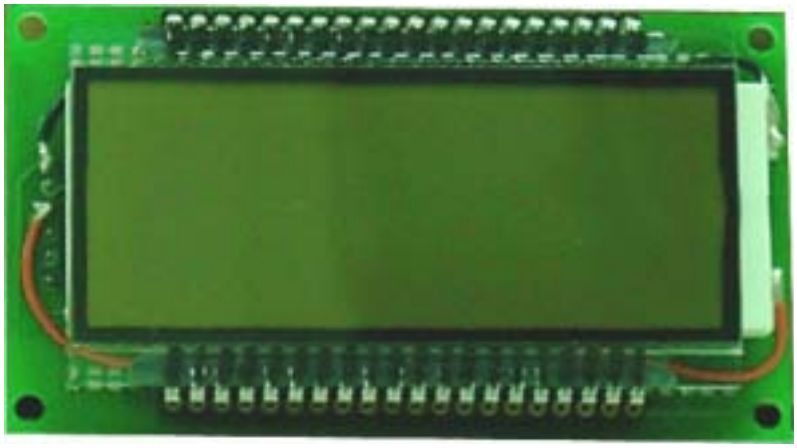


Figure 8.8: Printer Illumination Module