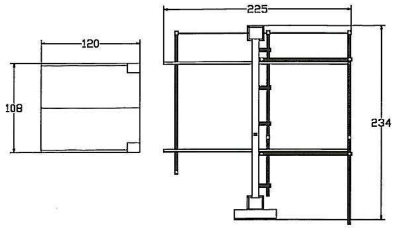
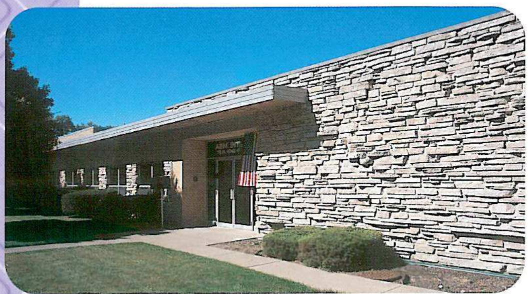
QUALITY

- ABM International, Inc. is a vertically integrated manufacturer with in-house design, programming, welding / fabricating, machining and assembly.
- With over 55 years of experience in manufacturing quilting machines, our highly trained expert staff consistently delivers the quality our customers deserve.

IN-HOUSE MACHINE DESIGN

- ABM's highly trained engineering design team anxiously awaits your projects.
- We are available 24 hours a day for customer service, so you can rest well at night!





ABM INTERNATIONAL, INC.

ABM International, Inc.
18209 Chisholm Trail #110, Houston, Texas
77060 Phone: 281-443-4440 Fax: 281-443-4404
Website: www.abminternational.com
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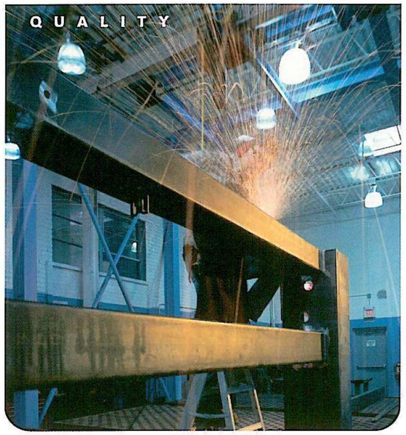


TECHNICAL DATA

- IBM compatible Pentium-based PC
- 1.5 gig hard drive
- 3.5" floppy disk drive
- Standard material size up to 96" x 108"
- Standard sewing line 84" x 96"
- Max. material size 140" x 140"
- Max. sewing line 128" x 128"
- Max. axis speed 1,000 IPM
- Max. sewing speed 4,000 SPM
- Machine weight 3,500 lbs.
- 220 volts three phase, 15 amps
- 100 PSI at 2.5 CFM
- Floor space 16' XL6000 w/table 20'x 28'

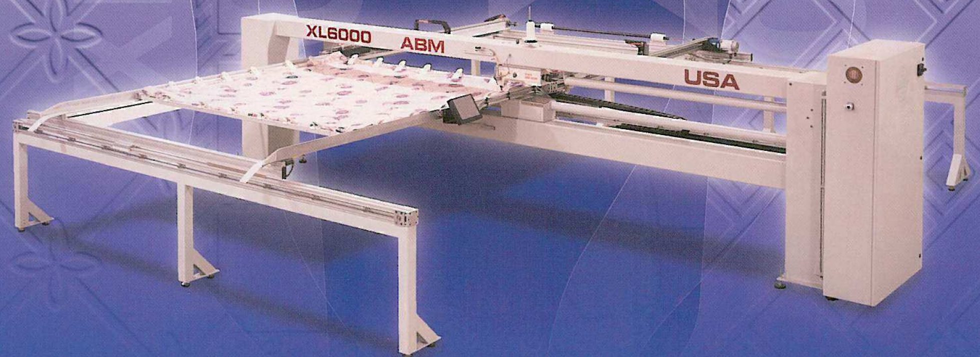
SINCE 1947

ABM International, Inc., headquartered in Illinois, has been serving the home furnishing market of the textile industry for over 55 years.

At ABM International, Inc. we are committed to manufacturing excellence and superior customer service. Let us provide you with the highest quality state-of-the-art machinery that will enhance your operations, improve your production, reduce your costs—and ensure your success!

XL6000 COMPUTER QUILTER

SINCE 1947



SINCE 1947

XL6000 COMPUTER QUILTER

THE WORLD'S MOST ECONOMICAL SINGLE NEEDLE PANEL QUILTING MACHINE

ABM International, Inc. manufactures the world's highest production, lowest cost computerized quilting machine. With just one operator, the XL6000 Computer Quilter can produce up to 250 comforters of average design per shift. It features three-axis digital brushless servo control, providing superior quality patterns, ease of pattern and size changes, and low maintenance operation.

Utilizing the unique XL6000 Frame Changing Table, one operator stretches and racks a comforter while the machine simultaneously quilts another comforter.

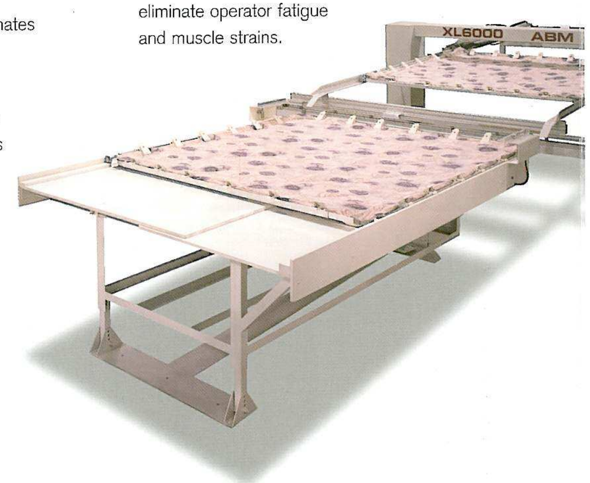
PICTURED HERE IS THE XL6000 EQUIPPED WITH A PFAFF SEWHEAD

FEATURES & BENEFITS

- The Sewing Head — a fully computer controlled quilting system — is capable of sewing any pattern design.
- A color Touch Screen user interface using a Pentium computer processor allows for user-friendly operation.
- The XL6000's carriage-less design eliminates inertia problems and pattern distortion.
- Equipped with a pair of adjustable aluminum frames capable of racking twin through king size comforters and includes ergonomically designed clamps.

AUTOMATIC FRAME CHANGE TABLE

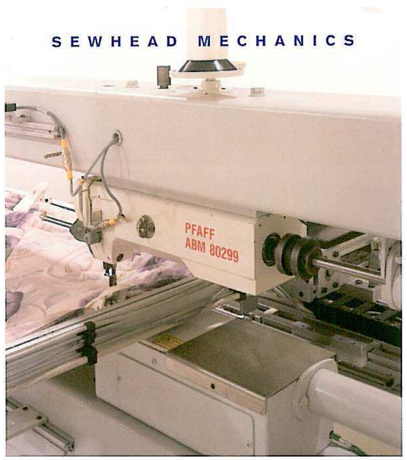
- The extremely low maintenance SL7847 Frame Changing Table pneumatically raises and lowers the frames to create ease of inserting and removal of frames from the quilting machine within 6 seconds.
- Ergonomically designed clamps eliminate operator fatigue and muscle strains.

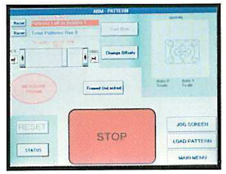


SEWHEAD MECHANICS

- A variety of sewheads are available.
- Available sew speed up to 4,000 SPM.
- X, Y, linear table speeds up to 1,000 IPM.
- Standard frame size 96" x 108."
- Maximum frame size up to 140" x 140."
- Automatic thread break sensor.
- Automatic backtack at every start and stop during the pattern cycle.
- Automatic thread trimming for tack and jump patterns.

SEWHEAD MECHANICS





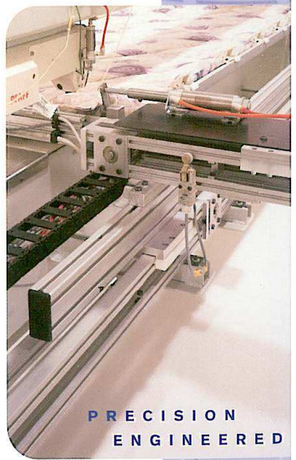
INTERFACE

COLOR TOUCH SCREEN OPERATOR INTERFACE

- The XL6000 features an extremely user-friendly color touch screen operator interface.
- The programming computer is a standard PC using a Windows Operating System.
- Standard CAD systems are available for pattern generation.
- A consistent stitch length is produced under all sewing conditions.
- Production data acquisition is available.

PRECISION ENGINEERED

- The XL6000 is the most cost-effective, precision engineered quilting machine available.
- Our expert team of engineers has spent many hours designing and testing the mechanisms utilized on the XL6000 through rigorous stress and strain analysis to manufacture the most efficient, low maintenance, quilting machine available.
- The XL6000's X, Y linear table utilizes a carriage-less design for extremely low inertia.
- Low inertia eliminates pattern distortion typical of conventional quilters and allows the XL6000 to be capable of extremely high speeds.
- The X, Y linear table is driven by a linear actuator which consists of a steel reinforced polyurethane timing belt. Only minimal maintenance is required and no lubrication is necessary.



PRECISION ENGINEERED

XL6000

XL6000

Computerized Quilting Machine Manual:
Version: Emerald Series
www.abminternational.com

- Installation instructions
- Operational guide
- Troubleshooting guide
- Parts list

Contact Information

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- 24hr. Helpline 847-910-6152

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Figure 0.1 – XL6000 Computerized Quilter

Introduction

ABM International would like to thank you for the purchase of an XL-6000 Computerized Quilting Machine. ABM is confident that this machine will meet or exceed your expectations for cost, speed and durability.

If at anytime you experience problems with any of your ABM machines we ask that you contact us - 24 hours a day by calling our service department at (281) 443-4440. We can help you solve the problem quickly, and correctly. Your calls, questions, and comments will in turn help us to perfect the quality of our products and services in the future.

Once again, we thank you for your purchase.

ABM International, Inc.

Engineering Department

Section 1: Safety

1.0 Safety Introduction

As with the operation of all machinery, safe operation of the XL6000 is a major concern of ABM International, Inc. The purpose of this section is to inform personnel of the safe and prudent operation of an XL6000.

We have attempted to recommend the most effective methods and calculations to warn against actions that could result in personal injury, or make equipment unsafe. It is important to understand that ABM cannot anticipate, or list all conceivable safety methods and warn of all the possible hazards. In the interest of promoting safety, ABM advises that the operating personnel should always make sure that personal safety and the safe operation of the machine will not be adversely affected by their actions.

It is imperative that the operating personnel of the XL6000 read and understand the information in this manual before operating the machine.

1.1 Safety Policy Statement

The conservation of the assets of any company, which include the buildings, equipment, supplies and inventories as well as personnel, must be and is the responsibility of all levels of management. The purpose of a personnel and property conservation program is to insure that all phases of management recognize that personnel and property conservation are both inseparable parts of a company's objective…to produce quality products at the lowest possible cost.

Safety of personnel in every aspect must be of first consideration. The implementation of a conservation program will eliminate human suffering and effectively lower the direct and indirect costs resulting from employee injury. It will substantially reduce the exposure and probability of damage and / or loss of company's physical assets.

1.2 Safety Practices

The safety factors must be observed to ensure safe operation of the XL6000.

1. Read and understand the operating instructions of the XL6000 before operating.
2. Use extreme caution when working around the XL6000 electrical controls.
3. Keep hands or other body parts away from the moving parts of the XL6000.
4. Wear appropriate personal safety protection.
5. Stop the XL6000 immediately at any sign of malfunction or danger.
6. Do not crawl under or into the XL6000 for any reason during the operation of the machine.
7. Do not reach into the XL6000 at any time during the operation of the machine.
8. Do not climb, walk, or stand on the XL6000 at any time.
9. Do not tamper with factory installed guards and or safety devices.
10. Never operate machinery without all ABM installed guards and safety devices intact, and in working order.

11. Before starting the XL6000, ensure that no loose tools, bars or parts are lying in or on any part of the machine.
12. Proper fire fighting equipment should be kept in good operating condition and kept near in the event of fire.
13. Never attempt to service any of the pneumatic components until the unit is relieved of all air pressure.
14. Never attempt to service any part of the machine with the power on.
15. Always disconnect the power when working on the machine.
16. Do not wear loose clothing or jewelry when operating the XL6000.
17. Always keep hair from coming in contact with moving parts.

SECTION 2.0 – Machine Setup

The XL6000 ships fully tested ready to operate. As a result, this manual provides a section on machine setup so that you can install the machine. Please read this manual in its entirety and follow all ABM instructions, especially the inspections. Total setup time, less power and air hook-up, should take approximately 6 hours.

SETUP INSTRUCTIONS:

INSPECTION #1: Upon receipt of the machine, check to ensure that there is no visible damage. Figure 0.1 and the front cover of this manual are enough for this inspection. **Note: that some components may be in different locations depending on the version of the machine.**

Determine the location in your facility for the quilting machine. Attach the eight (8) machine legs supplied with the machine to the end stands that were used to bolt the machine to its skid. Level and position the machine in the desired location. Though not required, ABM recommends that the machine be bolted to the floor. Place the rails stands in front and rear of the machine on the floor install Five (5) machine legs and level. Carefully, place the Y rails in position and attach with supplied bolts be extra careful not to damage the wires and connections. Make all necessary airline connections and low voltage connections on the rails.

Run a 220 -235VAC line single phase (25AMP) to the machine location. ABM does not recommend the use of any type of extension cord to power the machine. As with any machine, power should be run through approved conduit and ducting with proper termination. ABM does not supply a main power disconnect with the machine and recommends that the customer install one. You may connect the power to the machine at this time.

Voltages below 210 volts AC or above 240 volts ACmay generate servo alarm failures, which may cause damage to the amplifiers or motors. Such damage is not normally protected under factory warranty.

Failure to provide a proper Earth ground rod and connection may void your factory warranty.

Plumb the machine with an air line capable of at least 100psi. ABM recommends that an air line of no less than .5 inches diameter be used for supply air. **NOTE: DO NOT CONNECT AIR TO MACHINE YET. UNTIL PROPER ELECTRICAL FUNCTION IS CONFIRMED. CONNECTING POWER AT THIS TIME CAN POSSIBLY RESULT IN INJURY.**

INSPECTION #2: Will confirm that the electronics of the quilting machine are functioning properly.

WARNING: ELECTRICAL SHOCK HAZARD. THIS INSPECTION WILL REQUIRE POWER TO BE ON WHILE THE ELECTRONICS CABINET IS OPEN. IF A PROBLEM IS FOUND, YOU SHOULD NOT ATTEMPT TO REPAIR IT WITH THE POWER ON. DISCONNECT THE MACHINE PRIOR TO ADJUSTING ANY COMPONENTS WITHIN THE ELECTRICAL CABINET.

Step one; open the electronics cabinet located at the end of the horizontal beam of the machine. The internals of the cabinet will look like Figure 1.0. From left to right the components are as follows: IIS Emerald servo controller, main power disconnect, power supply, circuit breakers, terminal blocks, X amplifier, Y amplifier, Z amplifier .

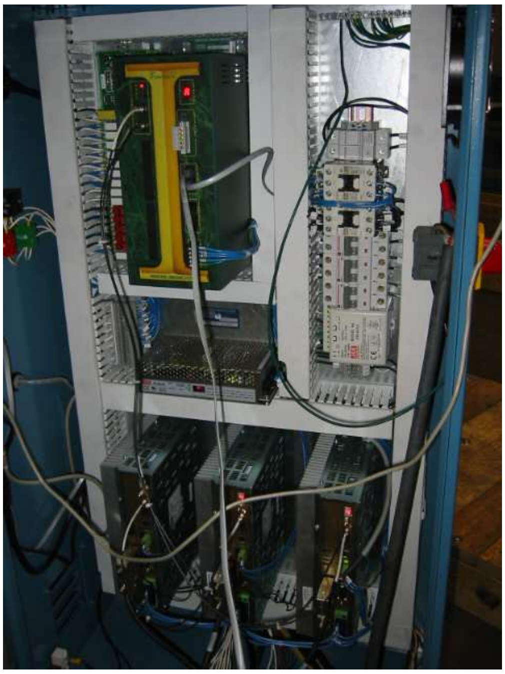


Figure 2.0 – Electrical Panel.

Upon power up, the motion controller should have the symbol (A.) and the touch screen should power up to the main menu. If a different screen is visible, contact ABM for technical assistance. If (A.) is not visible on the motion controller, check the incoming power and circuit breakers for proper supply.

INPUT INSPECTION: From the main menu on the touch screen display press the maintenance button and enter your password. At the maintenance parameter screen press the I/O button. Once in the I/O screen you may test all the functionality of the machine. Depress and release the red stop button and see if the led on the touch screen changes to green. Now depress the start button and see if its corresponding led turns to green. Repeat this procedure for all the external operator buttons and check to be certain all connections are functioning properly.

WARNING – WHEN CONNECTING AIR TO THE MACHINE, YOU MUST ENSURE THAT THERE ARE NO LOOSE ITEMS SUCH AS TOOLS FOOD DRINKS ETC. ON THE MACHINE AND THAT ALL PESONNEL ARE CLEAR OF THE MACHINE.

The machine is now ready for the air connection. When the air is turned on, the presser foot should lift and the frame locks should open. (see figure 2.1). Adjust the pressure regulator so that a pressure reading of 90-100 psi is visible on the gauge.

OUTPUT INSPECTION: Depress the frame lock button on the touch screen and see if the frame locks actuate. Depress the oil pump and manually pump oil to the sewhead to make certain it is adequately lubricated. Repeat this procedure and test all the output buttons making sure that all features of the quilting machine are functioning properly.

If both the inputs and outputs have checked out, the electronics cabinet should be securely closed.

Figure 2.1 – Air Input location and Pressure adjustment

Inspect the entire machine and ensure that all bolts are tight and that there are no obstructions in the movement path of the machine. Check to ensure proper alignment of the rails and that the mechanical linear drives move freely.

Step 1: Load a comforter frame with a comforter in it.

Step 2: At the operator screen press the size change button. The machine will move across both it's X and Y axis and measure the frame.

Step 3: Choose a pattern from the load pattern screen. The machine will automatically scale the pattern to fit.

Step 4: Slide the speed button to 25% and test the machine at a safe reduced speed.

Step 5: Properly thread the sewing head and needle.

Step 6: Press the start button and make your first quilt.

Now check the proper functions of the buttons.

Step 1: Depress and release the stop button and test to see if the machine stops in the middle of the pattern.

.

Step 2: Depress the rethread button. The machine should return to the home positions and the operator can rethread the needle.

Step 3: Depress the restart button and the machine should return to where the operator stopped the machine. This procedure is the same as in a thread break where the thread sensor stops the machine. If you press this button again the machine will back up through the pattern in 12" increments.

Step 4: Depress the start button and the machine will begin sewing again.

Setup and inspection is now complete.

Fig. 2.2 Operator start stop station

SECTION 3.0 – Troubleshooting guide

This section is included to help diagnose and solve any problems that may occur with the XL6000. ABM has done its best to include as much information as possible. However, not all problems are listed, therefore ABM asks that whenever a problem occurs you contact a service technician at our home office. To reach service dial 281-443-4440 and ask for a service technician, they are on call 24 hours a day, seven days a week.

Electrical power:

The XL6000 runs on a 20 amp, 220VAC supply line. The PLC, inputs and outputs (valves) run on 24Vdc produced by the power supply found in the cabinet. The PLC has its' incoming power fused through a terminal block found inside the cabinet. A fuse with a 1/2A rating is standard.

Pneumatic systems:

The pneumatic system of an ABM XL6000 is very straightforward. The system consists of a valve block with four (4) valves, two cylinders for frame locks, one pneumatic oil pump for the sewhead, one cylinder to lift the presser foot, one cylinder to fire the thread trimmer and one (1) filter/regulator combo unit.

Valve block: a device used to distribute air to multiple valves from a common location. The valve block on the XL6000 has four (4) valves and a 25-pin connector for communication to the PLC. See figure 3.1.

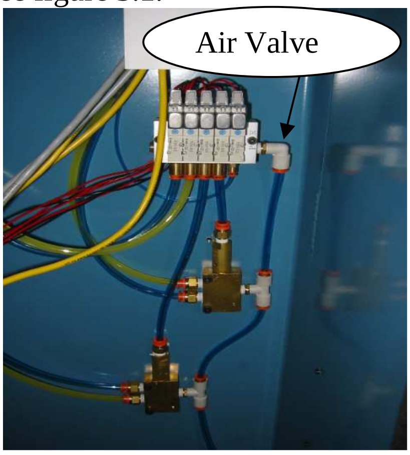


Figure 3.1 Air valve

Valve (individual): A valve is a device found on the valve block that is operated individually through the motion controller. It is possible to manually cycle an individual valve by depressing the small orange button located directly on the valve. A small screwdriver or a pen may be needed to depress the button properly. Removal of a valve for service is accomplished by loosening the small socket head cap screw located directly above the valve, and gently pulling the valve out away from the manifold. Installation is made by reversing the above procedure.

Cylinders: The cylinders are uneconomical to repair and thus any damage that may occur to a cylinder should be rectified by replacing the cylinder.

Filter/regulator combo unit: The combo unit is the machines last line of defense against foreign materials (water, steel particles, etc.) found in a facilities pneumatic lines. The machine can be run without a combo unit but serious damage can occur to the valve block and cylinders. The combo unit also performs the task of regulating the incoming air pressure. Air pressure on both the compression and ejection cylinders is individually adjustable. Pressures should be set according to machine demand. Lower pressures may cause the machine to function improperly.

Figure 3.2 Air filter combo unit

Linear drive: The linear drive is a device that moves the frame in both the X and Y directions. It transfers power by a polyeurathane timing belt from the motor to create motion.

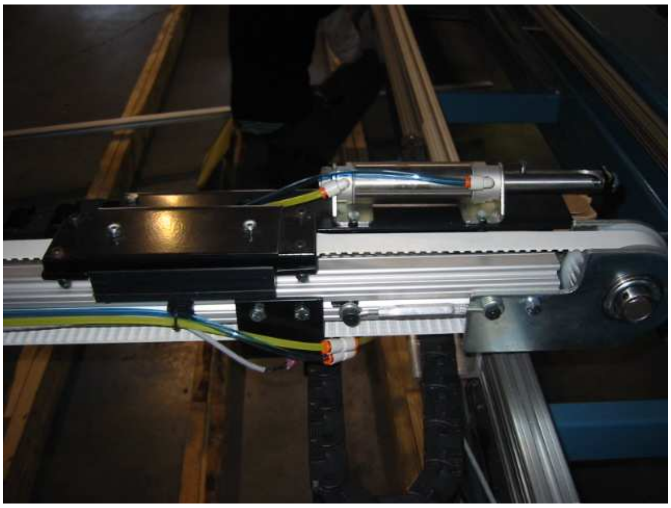


Fig. 3.3 Linear Drive

4.0 Maintenance

The XL6000 computerized quilter rarely requires servicing if the proper preventative maintenance if performed. There may be the unlikely event when the equipment suffers a failure. In the unlikely event of this happening, follow the outline included in this section to best determine the cause of the problem.

4.1 Maintenance Schedule

1 week after initial start-up:

1. Check all nuts and bolts for tightness
2. Check all electrical connections and tighten.
3. Check all belts for proper tension
4. Check the oiling system for proper lubrication.

Daily:

1. Wipe off the machine and clear the bridge of any clutter.
2. Check the sewhead for wear.
3. Replace the needle.
4. Check the hook and bobbin case for wear.
5. Ceck the frames to ensure all screws are tight.
6. Visually inspect the machine for loose connections.

Weekly:

1. Clean the sewhead and remove any thread wrapped around the take-up lever.
2. Clean the hook area and remove any thread wrapped behind the hook.
3. Visually inspect the frame changing table for wear.
4. Check air hoses for leaks.

Monthly:

1. Check all belts for proper tension.
2. Grease pillow blocks.
3. Check all couplings and pulleys for wear or loose screws.
4. Check all nuts/bolts/screws for tightness.
5. Check oil reservoir for oil level.

Troubleshooting notes:

A few blank pages are provided so that you and your personnel can keep records and notes of machine problems. By using this section and keeping it attached to the manual, you will always have your own personalized quick reference repair section.

TROUBLESHOOTING NOTES:

Date	Problem	Solution

TROUBLESHOOTING NOTES:

Date	Problem	Solution

Date	Problem	Solution

SECTION 5.0 – Parts List

This section lists the ABM part numbers needed to order any part on the XL6000. The section is divided into two lists. Both lists show the quantity, item description and ABM part number for all the components needed to completely rebuild a machine. ABM carries all of the components below in stock at all times. Any order placed before 6:00 P.M. CST can be shipped the same day for next day delivery. The parts/service department can be reached at (281)443-4440. As with any machine, buying the correct parts from the correct manufacturer will allow your machines to operate their best. Buying parts from sources other than ABM will void your warranty.

Mechanical Components:
Following spreadsheet.

IM-3155

INSTRUCTION MANUAL APRIL 2002

ABM INTERNATIONAL

XL6000 Quilter

EMERALD SERIES

INSTRUCTION MANUAL

ABM INTERNATIONAL, Inc.

Revision - A
Approved By:

TABLE OF CONTENTS

1.0 DESCRIPTION

The XL6000 is a Servo controlled sewing machine that is used in the textile industry. This machine is capable of sewing various quilt patterns that are supplied to the machine in a G-code machine format. An IIS MSC-250 dual axis motion controller controls all Servomotors.

1.1 PURPOSE

The purpose of this document is to describe the operation of software packages SFO-3251 and 3252. These applications work together to direct the overall operation of the XL6000.

SFO 3251 is an application written in the IIS Macroprogramming language.
This application contains the necessary routines to direct the operation of the MSC-250 during sewing and other various tasks.

SFO-3252 is a front-end application written in Visual BASIC 3 as an operator interface. This is an application that is loaded into a touch screen to provide the operator with various command buttons and menus to direct the operation of SFO 3251.

This manual will provide an overview of the Hardware that is used with the MSC-250 and SFO 3251 but will mainly focus on the front end Application (SFO 3252).

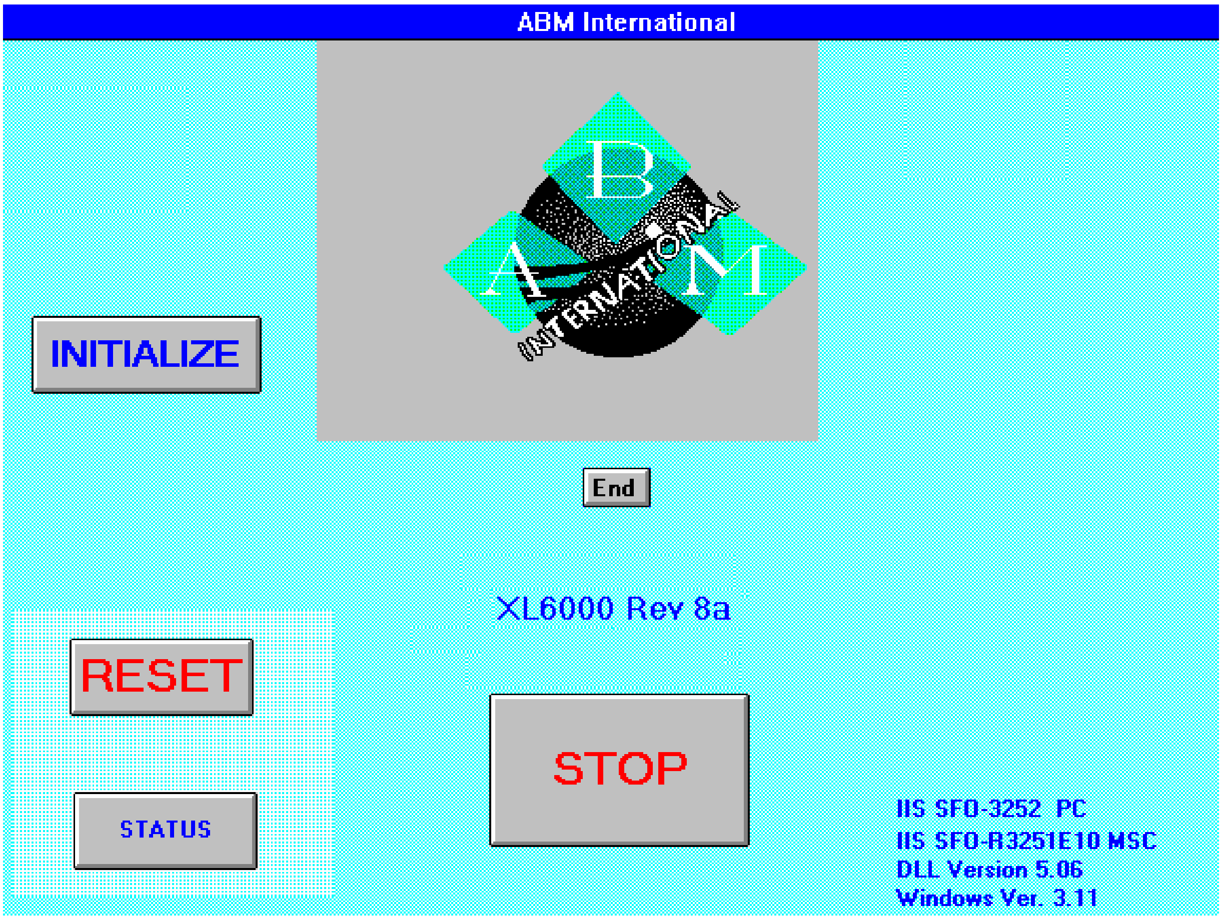
1.2 REQUIREMENTS

MEDIA:	3-1/2" disk
FORMAT:	IBM PC format
MSC DEVELOPMENT SOFTWARE:	Macropro
PROGRAM NAME:	SFO3251.PRG
	SFO3251.MCM
	SFO3251.SYM
	SFO3251.DBG
	SFO3251.ERR
Visual BASIC Application:	XL6000#.exe
	Patdll.dll

2.0 XL6000 OPERATING SYSTEM OVERVIEW - The XL6000 operating system is the main operating interface between the touch screen and the MSC-250

2.1 MAIN SCREEN

When the XL6000 operating system is loaded, the un-initialized MAIN screen appears.



This screen has the INITIALIZE button highlighted. In order to access any other screen the XL6000 system must be initialized. This done by selecting the INITIALIZE button.

The Initialization process consists of two individual checks. First, the needle is energized and if no fault occurs a check appears in the Sewing Head Initialized box in the STATUS screen. (To view the status, select the STATUS button. The STATUS box and the different states are discussed later in section).

The Initialize routine is followed by the frame moving in a diagonal direction towards the opening of the frame until the X and Y limit sensors are tripped.

THE MAIN SCREEN - Continued

This position is remembered by XL6000 and used as machine zero.
If a "Rethread" position has been saved, the XL6000 will then move the frame to the preset Rethread position within the sewing area.

If this entire procedure is successful, a check will appear in the XY Initialize box of the STATUS screen. The Initialize procedure is only necessary on first power up after loading software or when a fault occurs and requires operator to re-initialize the machine.

When the XL6000 system is properly initialized the MAIN screen appears as **Figure 2.1b**.

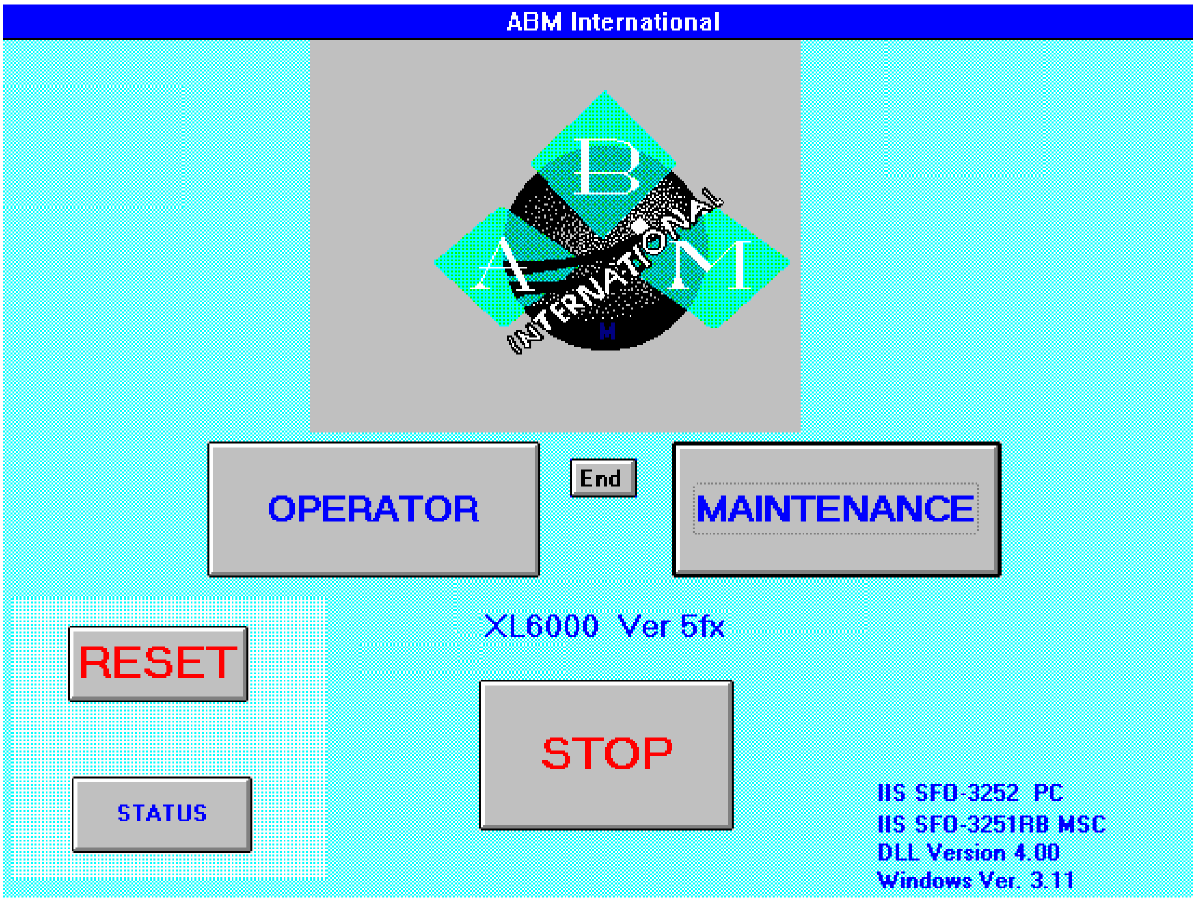


Figure 2.1b - The Initialized Main Screen

This screen shows the OPERATOR and MAINTENANCE buttons. Notice the INITIALIZE button is no longer visible. This screen also displays that the software revisions of the VB, MacroCode and the current DLL version.

The DLL is the program that allows the translation of Pattern G-Codes to a format that the MSC-250 understands.

The **RESET button** is used to clear any errors that may occur while in this screen.

The **STOP button** is used to interrupt the initialization process.

The **MAINTENANCE** button is used to enter the maintenance screen to change operating parameters.

This screen is password protected. Operating parameters for the patterns should be set up by the Technical personnel and should not have to be changed during normal operation. These screens are discussed in the Maintenance section.

Selecting the **Status button** will bring up the following screen, which is the normal running screen used for comforter sewing.

2.2 THE STATUS SCREEN

This screen shows the current state of the XL6000 system. The **Status button** is available on all screens.

The system Faults and the state of operation can be determined from this screen. The faults or current operating states are checked when that condition is in effect.

The Status and Mode settings are as follows:

Sewing Pattern:

This box will appear checked during normal sewing operation while a pattern is being sewed

Sewing Suspended:

Any time the machine is stopped during sewing, this box becomes checked. This can occur if there is a thread break, a sensor is tripped, or the stop button is pressed, etc.

Thread Break Enabled:

The *PARAMETER* screen has a parameter to set the Thread cut delay. The delay can be from 0 to 2000 milliseconds. If this parameter is not 0, this box becomes checked.

Thread Break:

When XL6000 senses that the thread has broken this box becomes checked.

Moving To Home:

This box becomes check while the XL6000 is moving to the unload rethread position.

Moving to Re-Sew:

This box becomes checked when the machine is moving to the restart position.

X Axis Fault:

If the X-axis servo motor faults, this box becomes checked.

Y Axis Fault:

If the Y-axis servo motor faults, this box becomes checked.

Needle Axis Fault:

The needle also has its separate servo and when it faults, this box becomes checked.

XY Initialized:

When the position of the sensors in the horizontal and vertical planes has been determined, this box becomes checked. Sewing will not take place until these sensor positions are known.

Sewing Head Initialized:

The initialization process attempts to turn the bobbin and to energize the sewing needle. If this process is fault free this box becomes checked. Sewing will not take place until this box is checked.

At Home:

When the operator selects the **HOME** button from the **OPERATORS** panel, XL6000 will move to the rethread position. When it gets there, this box becomes checked.

Measure Complete:

After a frame measure has been completed the **Measure Complete** box is checked.

Air Fault:

Compressed air is used to sequence the bobbin, activate the thread cutter, and open and close the Frame locks. These are I/O outputs that are displayed in the *I/O* screen.

XY Limit Exceeded:

If the frame attempts to move beyond the X or Y limit switches, an XY Limit Exceeded box becomes checked.

Measure in progress:

When the operator selects the frame measure button, this box becomes checked and will stay checked until the operation is complete.

Unused:

This status is currently not in use.

Abort/Fault:

If any Fault appears, this Box becomes checked.

Force_Calc:

This box becomes checked for the following reasons:

1. If any of the settings in the *Parameter* screen are changed, this box becomes checked. These parameters are:
   Any of the Border Offsets
   The state of Auto Border changes
   The Xborder or Yborder distance changes
   The Linear Acceleration changes
   The Minimum Sew Speed changes

2. When the frame of the sewing area changes:
3. When the maintenance personnel enters the I/O screens for any reason
4. When the maintenance personnel changes the X or Y Scaling factors

NOTE: Changing settings 2 and 4 will force a frame measure.

Needle Overtemp:

There is a temperature sensor on the needle motor. If the motor reaches a temperature that would damage the motor a fault occurs and this box becomes checked.

Frame Lock Failure:

If both cylinders don't close properly while the sewing frame is being secured, a fault will occur and this box will become checked.

2.3 THE OPERATOR SCREEN: Selecting the **OPERATOR button** will bring up the following screen, which is the normal running screen used for comforter sewing.

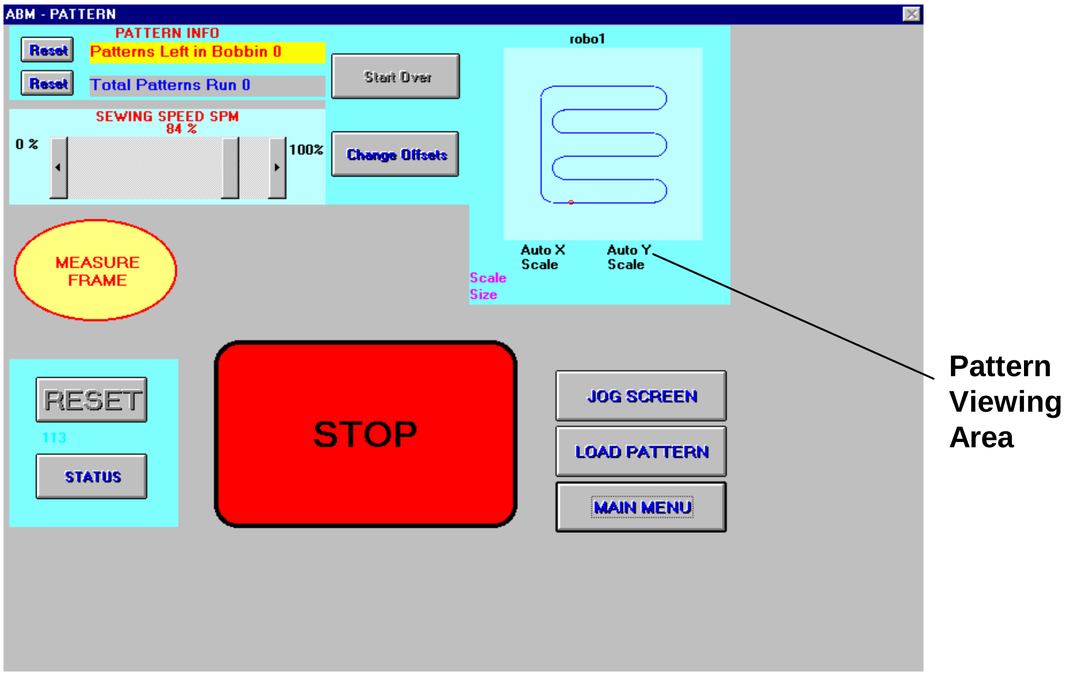


Figure 2.3a - The Operator Screen

Operator Screen Options: (refer to figure 2.3a)

The Pattern info area displays how many patterns per bobbin are left. The starting value is set in the Maintenance Parameter screen.

The next value is the total patterns run. Each of these values can be reset by using the corresponding buttons.

The **Sewing speed** is displayed in stitches per minute. This value consists of a percentage of the maximum value set in the parameter screen.

Start Over Button – During normal operation, sewing can be started and stopped at any given time. If the machine stops by selecting the Stop Button or a thread break the machine will restart and continue sewing the pattern.

Selecting the **Measure Frame** button initiates the measure frame process, which is followed by a pattern download to the MSC-250 controller.
The frame is measured from the initialized point to the farthest sensor in both the X and Y directions.

The **Reset Button** performs the same function as in the Main screen. If there is status fault this button will appear red.

A description of the fault can be viewed by selecting the **Status Button**.

The **Stop Button** stops the machine to a point where sewing can be resumed.

Pressing the **Start Over Button** causes the machine to restart sewing from the pattern home position.

The **Change Offsets** button is used to change the sewing offsets. The sewing offsets can also be modified in the Maintenance Parameter screen.

In the **Pattern viewing area**, a picture of the pattern selected is displayed as well as scaling information. If manual scaling is used the operator has the option to adjust the scaling directly from this window.

The pattern scaling has a range from 4 to 12. 12 being a 120% of the actual size of the pattern.

After a successful frame measure has been completed, the **Run Screen button** will appear.

2.4 THE RUN SCREEN – To enter the Running screen; select the **Run screen button** from the operator menu.

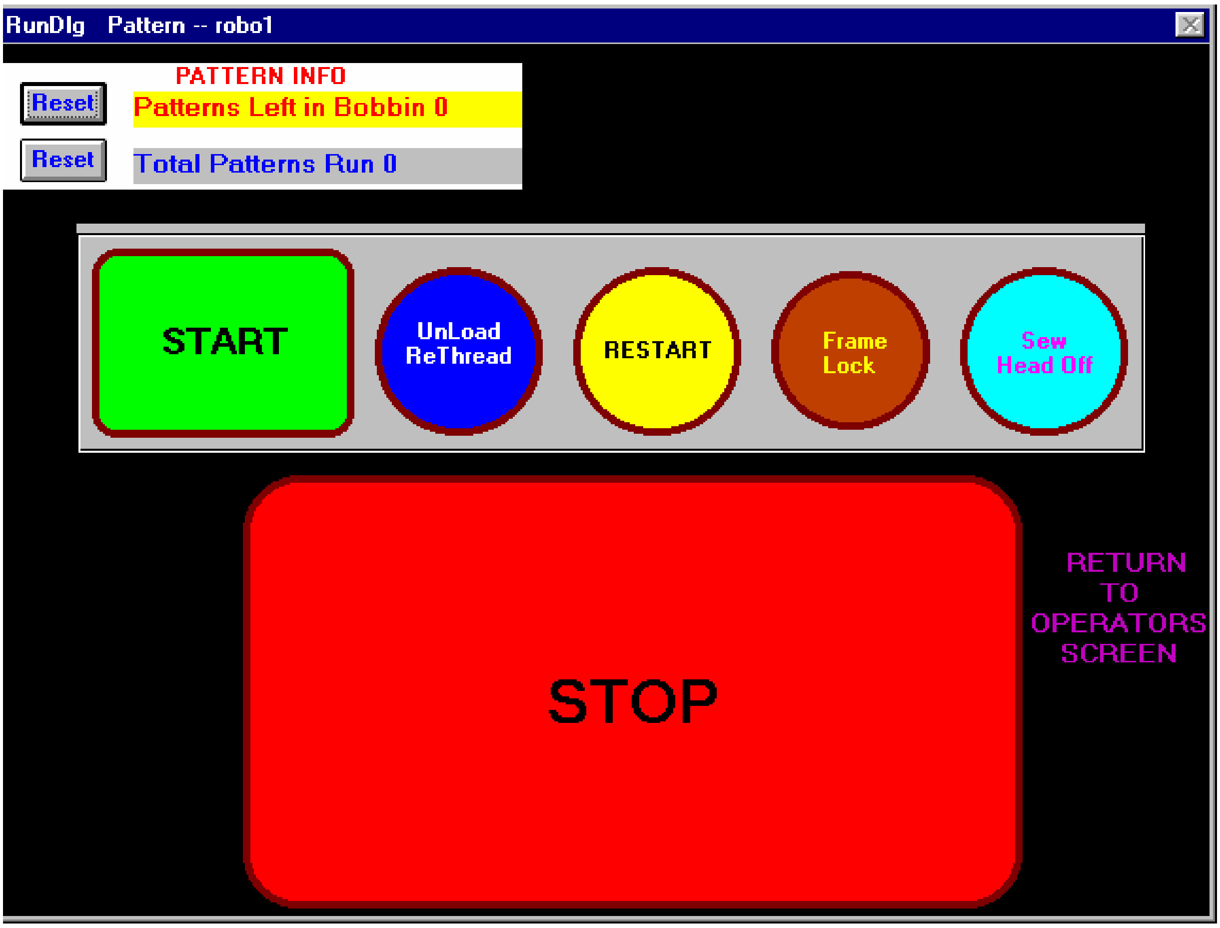


Figure 2.4a - Running Screen

In this screen there is no **Status button**. If a fault occurs, a message will be displayed indicating the nature of the fault

Run Screen Options (Refer to figure 2.4a)

The **Pattern Info** serves the same purpose as it dose when you are in the Operator screen.

The **Start Button** begins the sewing of the pattern.

The **Unload Rethread button** sends the frame to the position as it was set in the Jog screen.

The **Restart button** comes in handy after a thread break. After the thread has been reloaded, the operator can use the **Restart button** to back up in 12-inch increments through the pattern to the exact location where thread break took place. Following this procedure the operator can resume sewing by pressing the start button.

The **Frame Lock button** when pressed will engage or disengage the frame lock solenoids.

The **Sew Head Off button -**Engages or disengages the sew head
Using the feature the operator is able to simulate sewing with running the sew head. This prevents damage to the sew head during a machine setup.

To return to the operator screen touch area labeled Return **to Operators Screen.**

From the operator screen select the **Jog Screen button** to enter the **Jog Screen**.

2.5 The Jog Screen

The Jog Screen- Selecting the JOG SCREEN button allows the operator to enter the JOG screen.

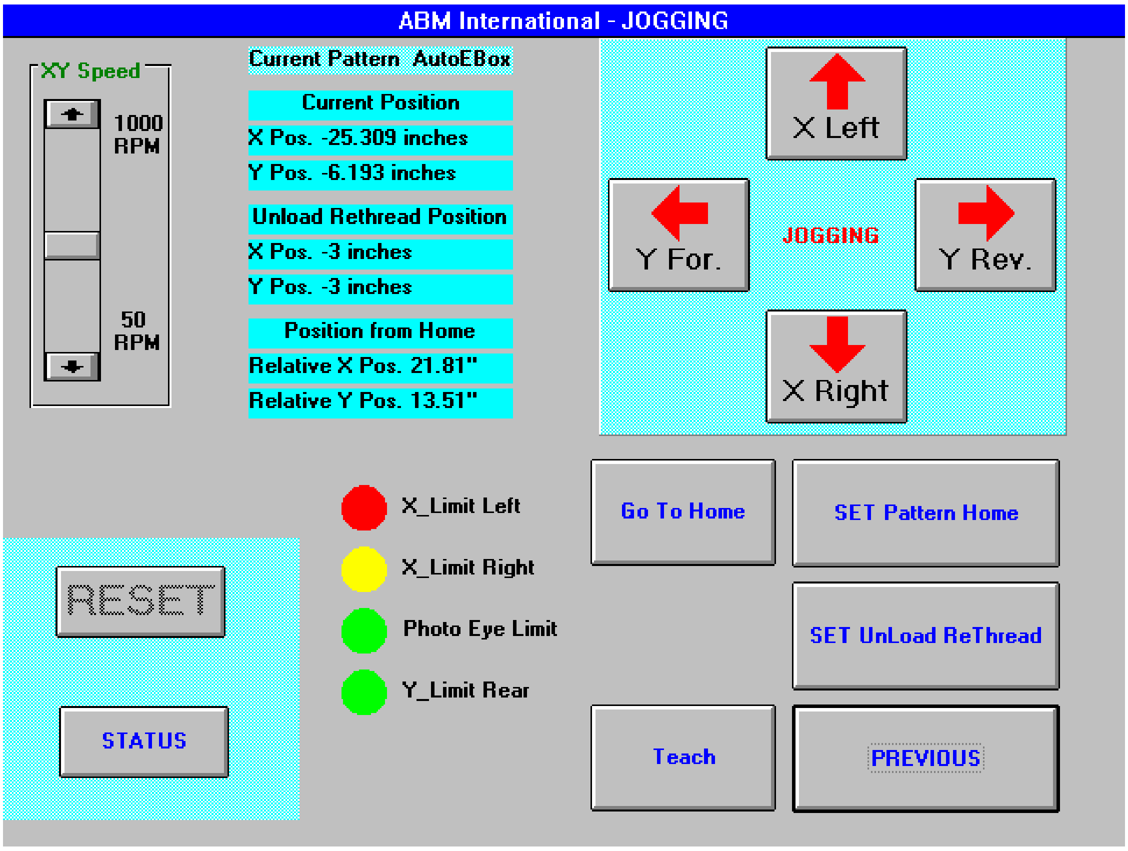


Figure 2. 5a - The Jog Screen

The box in the upper right has four Jogging buttons. These buttons allow the operator to jog the frame in the X and Y directions.

The XY Speed scroll bar can be used to adjust the jog speed. The range is from 50 to 1000 rpm.

The Current Pattern displays the name of the pattern that is being sewed.

The X and Y Current Position of the frame are shown by the X Pos and Y Pos indicators. When the frame is jogged, the new position is updated.

Unload Rethread displays the position that the frame returns to when the XL6000 is finished sewing. This position can set by jogging the frame to a desired position and selecting Set Unload Rethread button.

Position From Home displays the position of the frame in relation to the pattern home that was set by the operator. To set the pattern home, move the frame to a desired position and selecting the Set Pattern Home button. This position is stored and used as a starting to sew point for the pattern.

The Position from Home indicator and the Pattern home button only appear when the pattern selected is using Manual Mode scaling.

The Go To Home button will go to the rethread position that has been set by the unload rethread button.

2.6 THE TEACH AND LEARN SCREEN-To enter the teach and learn screen the Teach Button can be selected.

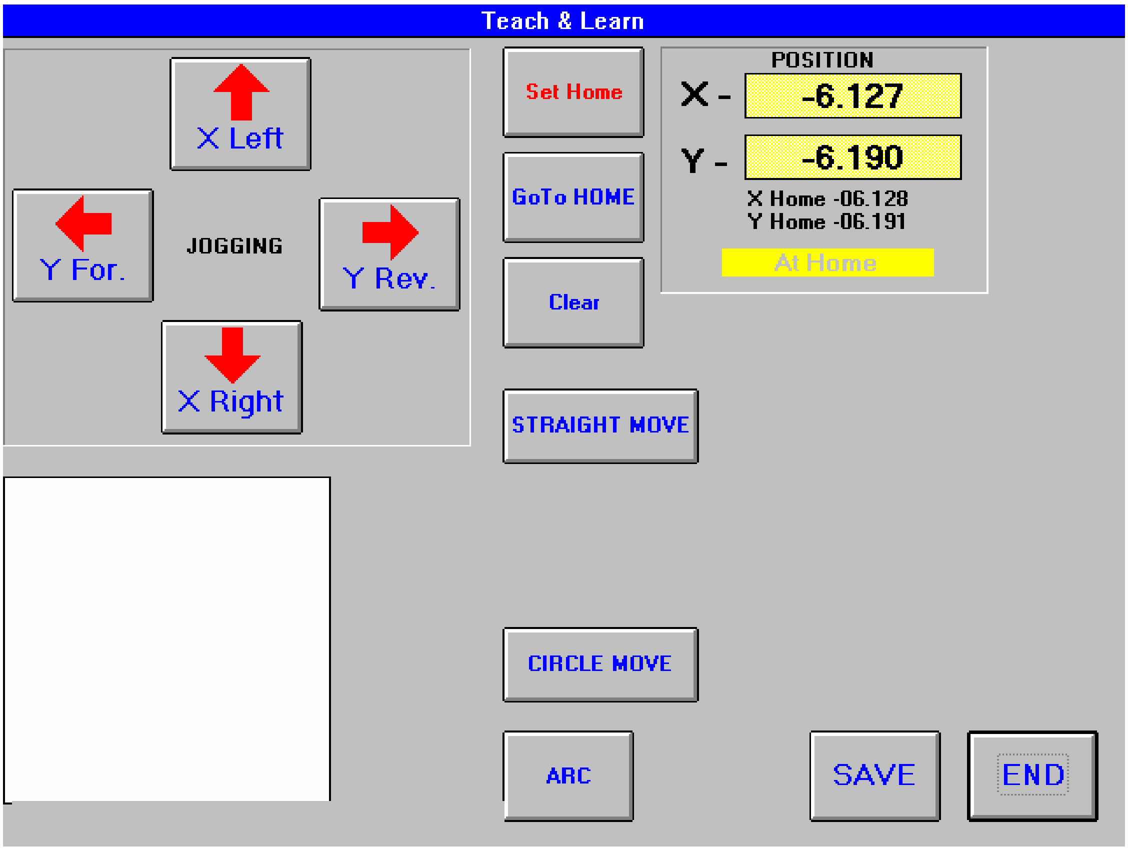


Figure 2.6a - The Teach and Learn Screen

While in the teach and learn screen, the operator attempts to simulate sewing a pattern by manually moving the frame through the pattern and recording positions.

The operator then saves the file as a new pattern that can be loaded into the XL6000 for sewing.

The preceding **(figure 2.6a)** page shows the Teach & Learn Screen.

The X and Y position is at Home and the screen is ready to accept a new Home position, or do a Straight Move, a Circle Move, or a Arc Command.

The Save button will ask for a file name, and will use the given name to create 2 files. One will be used for the pattern name and will be filed with the others in the patterns directory. The 2nd file is assigned as different file extension that will be used to save all Teach commands done up to this point in time, for this Teach session.

Developing a pattern can be a time consuming task. In order to overcome this, it is suggested that difficult parts of the pattern be saved to a separate file.

When the Arc command is first used, it will ask if you want to use a saved file.

If a pattern or Arc was created previously, it can be retrieved and used in the present pattern being developed. This can drastically reduce time when creating a pattern from scratch.

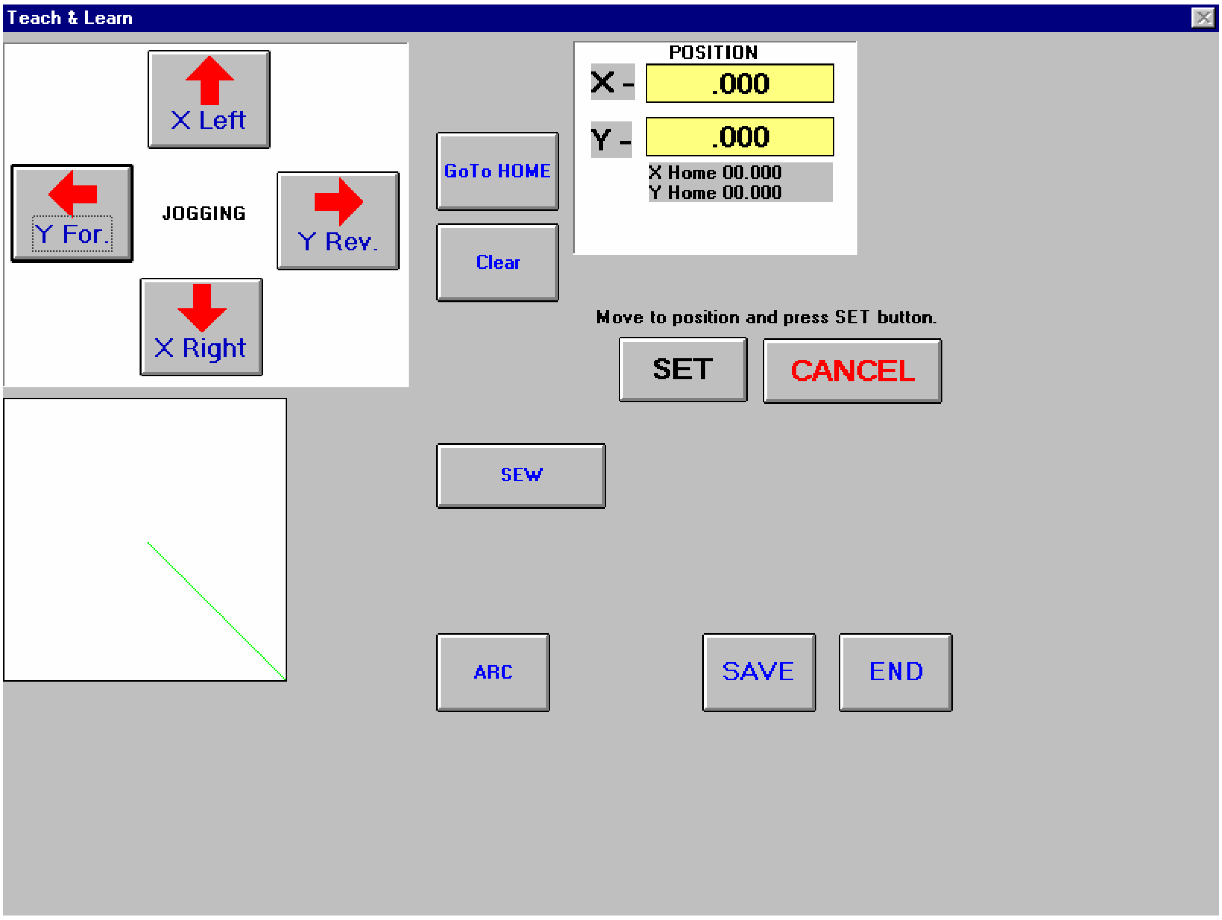
Developing a Pattern

The operator begins selecting a home or starting position for the sewing.

There are four separate jog buttons located at the top left hand corner of the screen. Start by jogging the machine to desired start of sewing position and select the **Set Home button.** This will set the start of sewing and cause the Home button to disappear from the screen.

After jogging away from this position, the operator can select the **Go to Home button.** This causes the machine to automatically position itself back to the preset home position. During the developing process it might become necessary to erase the pattern and start over. This can be accomplished by selecting the **Clear button**. Clearing the pattern will erase the pattern and cause the **Set home button** reappear.

After setting home the operator can decide whether to start the pattern with a straight line or create a circle. To create a straight line, jog the machine to the desired ending position of the line and select the **Straight Move button.**



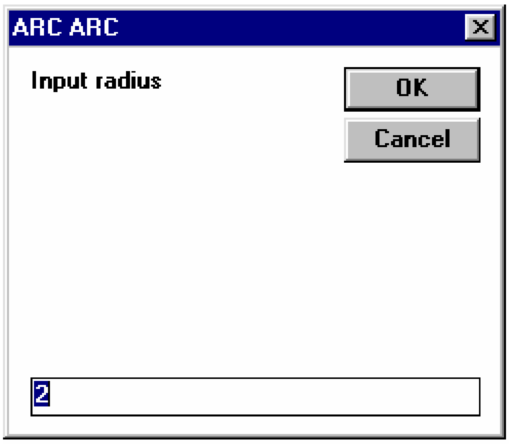
When these options appear, choose the **Set button** to record the move or the **Cancel button** remove the move.

If this line is not going to be a sewing line, click on the **Sew button** to change it to **No Sew.** This is required when jumping to different patterns with in the same area.

To use the Arc command click on the **Arc button.** A message box comes up displaying an option to retrieve an Arc from a file.

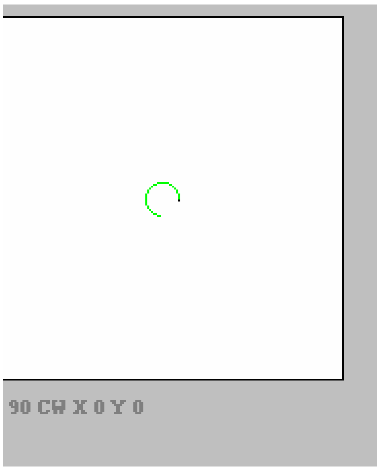
To create a more uniform pattern, an Arc can be copied into areas where the same type is needed.

If an input file is selected, another window will be displayed asking for the **Radius.**

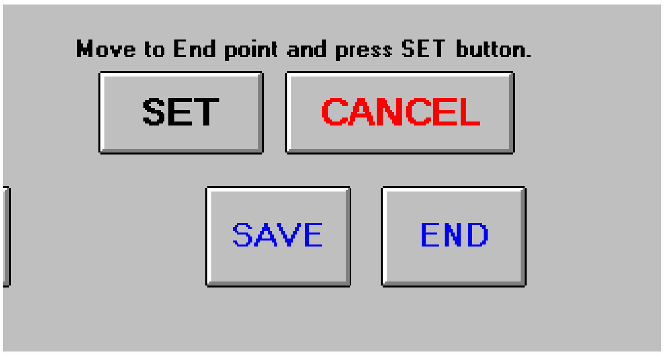


The radius is the distance perpendicular to current end point. This value can be a positive or negative number depending o the direction of the arc.

The next two windows are the degree value and direction of rotation. The degree value is in reference to the current point in a certain direction (Cw or CCw). A 90-degree rotation in a clockwise direction with a2 inch radius looks like this.



To use the **Circle button** starting from the last endpoint, move to the midpoint of the circle. Click the **Set button.** Next move to the point where the circle will end and click on set.



After the pattern is completed, click on the **Save button.** Give the file a name and when you enter the **Load Pattern Screen** the pattern will be available for sewing.

Click on the **End button** to return to the **Jog Screen**.

From the **Jog Screen** select the **Load Pattern button** to enter the pattern download screen.

2.7 THE LOAD PATTERN SCREEN

Patterns for sewing are selected from this screen. See **Figure 2.7a** below.

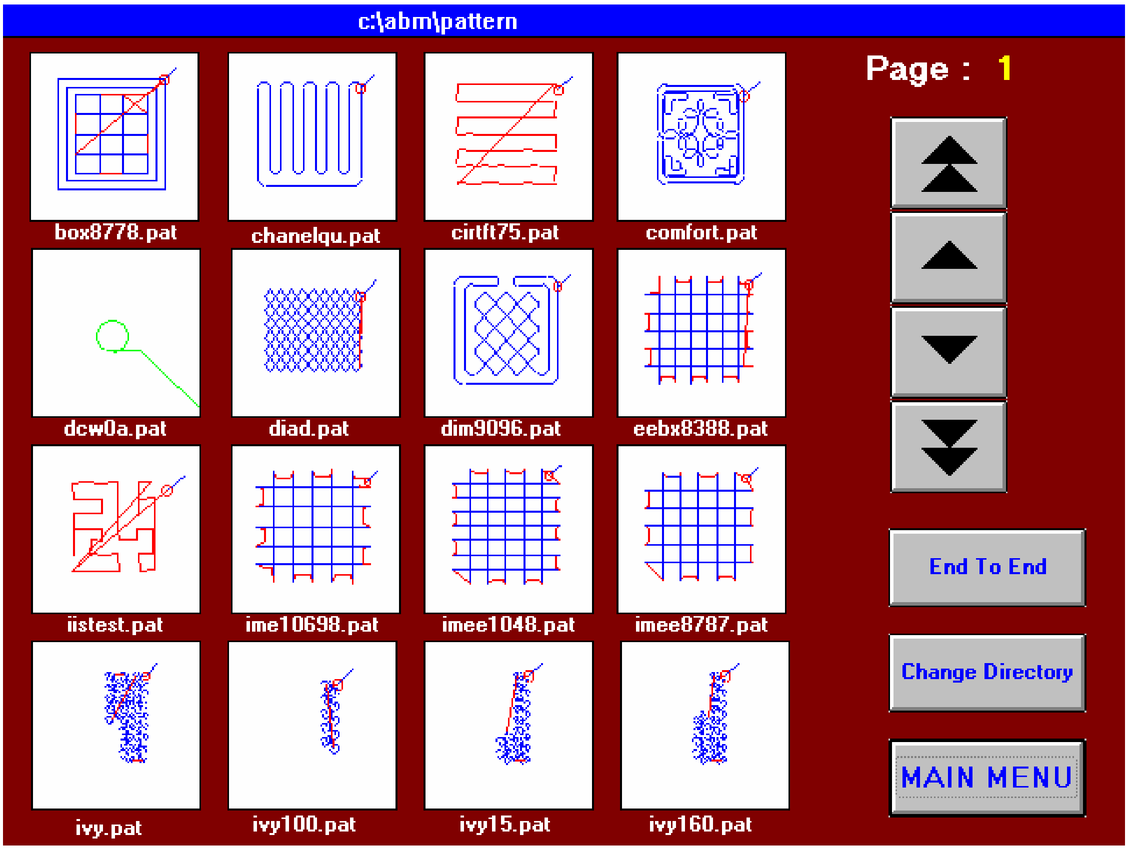


Figure 2.7a - The Load Pattern screen

From this screen up to sixteen patterns can be viewed. Other patterns if available can be selected by using the Arrow Keys.

The operator has the option of selecting a pattern by clicking on the picture displaying the pattern or choosing End To End by clicking on the End-To-End button.

When End-TO-End is selected, a pattern is automatically generated by inputting the number of X and Y lines required for that pattern.

The **Change Directory** button allows the operator to select patterns from another directory on the XL6000 System.

The **MAIN MENU** button takes you back to the OPERATION screen.

3.0 MAINTENANCE

The MAINTENANCE button can be selected from the MAIN screen. An assigned password to proceed further is required. The password procedure has two screens (see **Figures 3.1a and 3.2a**).

3.1 ENTER PASSWORD

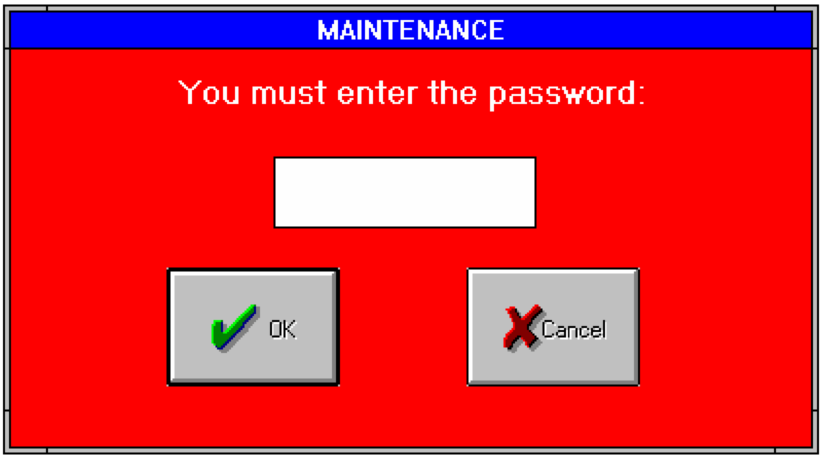


Figure 3.1a - The First Password Screen

Selecting the Cancel button will return you to the MAIN screen.

Select the empty white box and enter your password. Selecting the OK button will validate a password. You will see a message box showing the result of the validation. If the password is not correct, you will see an "Invalid Password" message.

3.2 ALPHA-NUMERIC KEYPAD

The ALPHA-NUMERIC KEYPAD screen will appear that will allow you to enter alphanumeric keys for password entry (see **Figure 3.2a**).

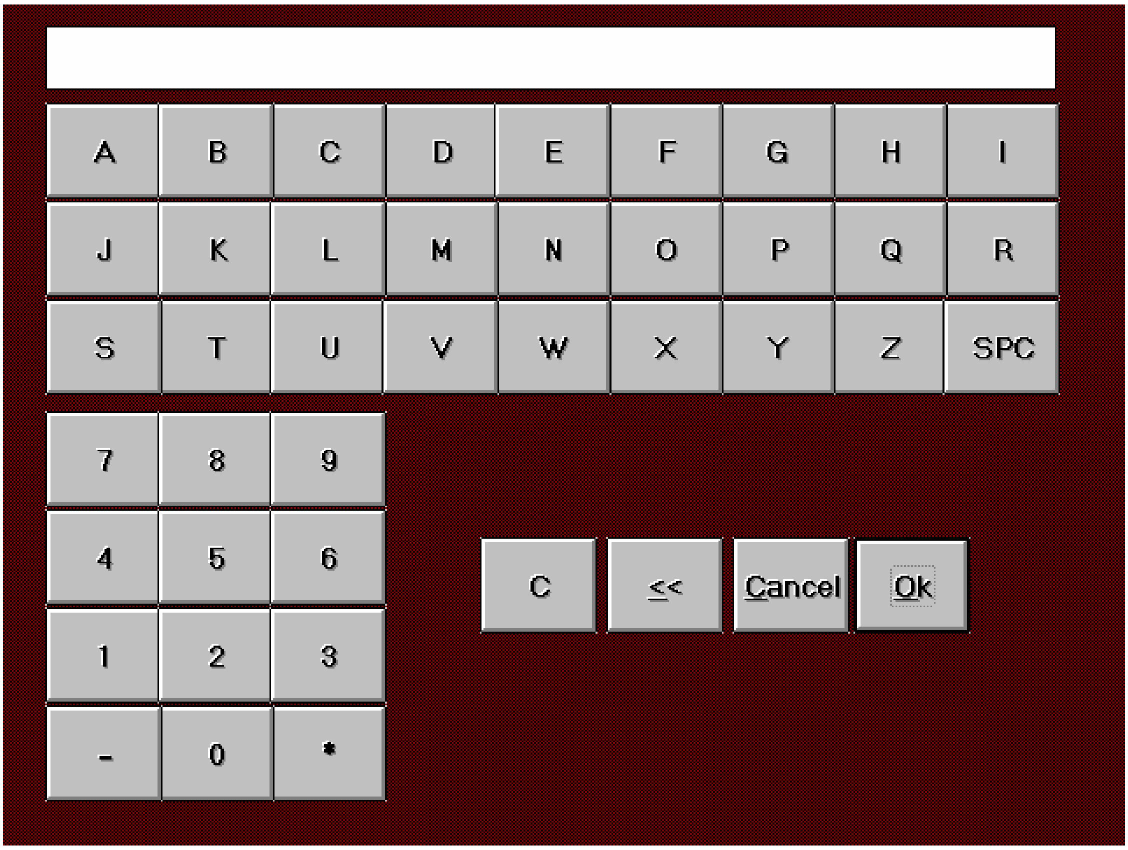


Figure 3.2a - Alpha-Numeric Keypad Screen

When this screen appears you must correctly enter the password. If you make an entry mistake, you can backspace or clear your entry. Selecting the OK button will validate your entry.

If your entry is acceptable, the PARAMETER screen (**Figure 3.3a**) will appear. If your password entry is not valid, you will get the invalid password message and you can retry and attempt to enter a correct password.

3.3 THE PARAMETER SCREEN

The PARAMETER screen allows entry of parameters and variables that both the IIS Macro-Program and the XL6000 Operating System need for proper sewing of individual comforter patterns. There can be an individual parameter list for the patterns or any pattern can use the default parameters from which custom parameters can be designed (see **Figure 3.3a**).

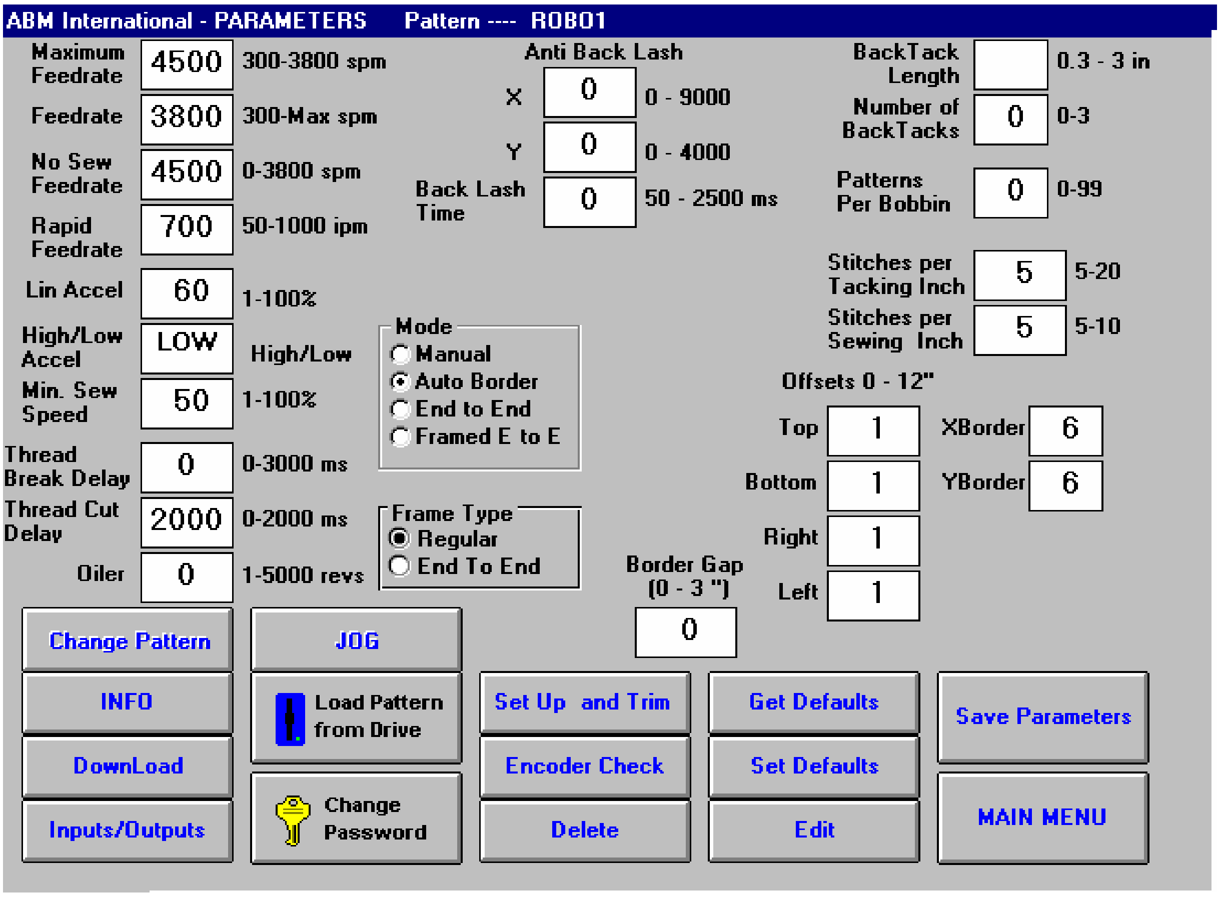


Figure 3.3a - The Parameter Screen

Selecting any parameter box will bring up a keypad that will allow you to enter or change the parameter setting. All of the parameters are range checked and have acceptable values. There are several that only accept a Yes or No value. The rest of the parameters have a minimum and a maximum acceptable value. The keypad will only allow entries within this range. When your parameter changes are complete, select the Save Parameter button. This will update or generate custom parameters for the sewing pattern selected.

When the **Set Defaults button** is selected, the parameters displayed will be saved as Default Parameter values. These Default values will be loaded for all selected patterns when the Save Parameters button has not been selected for the pattern.

The Parameter Screen - Continued

At any time, you can select the **Get Defaults button**. This will restore all the parameters from the Default saved values. If a parameter is changed that the IIS Macro-Program uses, new

Macro-Program elements will be generated. You will see the downloading message box when you select the **MAIN MENU button** to return to the MAIN screen.

Maximum Feedrate: Limits the fastest sewing speed. The XL6000 System will not allow a sewing speed more than this value. This is the limit of the speed bar on the OPERATION SCREEN. This entry is limited by the internal maximum value limit of the XL6000 System and is the maximum value of the limit range shown.

Feedrate: The speed in Inches/Minute of actual sewing. This is the bar position as shown in the OPERATION SCREEN. The initial Feedrate can be set here. Changing the bar position changes this value.

No Sew Feedrate: The speed in Inches/Minute of the XL6000 system when the sew head button is off.

Rapid Feedrate: The speed of the system when going HOME or when Tacking.

Stitches per Inch: The number of stitches sewn per inch of travel. This value accepts tenths of inches within the limits shown.

Lin Accel: The Linear Acceleration parameter sets the point at which slow down begins around corners. At a setting of 100%, slow down occurs for small changes in direction. At a setting of 50%, the speed decrease begins at an angle of 45 degrees and declines linearly to a 90-degree change in direction. Everything above 90 degrees is sewn at minimum speed.

High / low Accel: If there is a pattern that has a lot of sharp turns it is recommended that this be set on low. This helps to smooth out the sewing process.

Minimum Sew Speed: The percentage of Feedrate used as the minimum sewing speed around sharp corners or reversals in sew direction.

Thread Cut Delay: The amount of delay in milli-seconds when the needle is positioned to the up position and the thread is cut.

Thread Break Delay: The amount of delay in milliseconds before faulting the system on a thread break.

The Parameter Screen - Continued

Oiler:	This determines how often the sew head will be oiled during operation.
Anti Back Lash:	This helps to overcome gear backlash on the X and Y-axis.
Modes-:	Manual this is used when the machine is set up manually.
Auto Border:	When selected, enables the Auto Border mode. This mode will produce the borders as selected by Xborder & Yborder parameters.
End-to-End:	This is used when sewing patterns that only need to have the number of lines entered.
Framed End to End:	This is used the same as above but it has an outside border.
Offsets:	These are offset to the currently selected border. They will decrease the sewing area for the pattern by the amount selected.
Frame Type:	This is used in conjunction with the mode selection determining which frame will be used.
Border Gap:	This allows the border vary the outside border.
Back Tack Length:	The length in inches of the Back Tack.
Number of Back Tacks:	The number of back tacks to perform for the Back Tack.
Patterns per Bobbin:	The number of patterns that can be run on a bobbin. This value is pattern dependent.
Back Tack Stitches per Inch:	The number of stitches per inch used in back tacking.
Sewing Stitches per Inch:	Determines how many sewing stitches there are in an inch.
Xborder:	The Xborder element for Auto Border.
Yborder:	The Yborder element for Auto Border.

3.4 THE SET UP AND TRIM SCREEN

From the PARAMETER screen the Set Up and Trim button can be selected (see **Figure 3.4a** below).

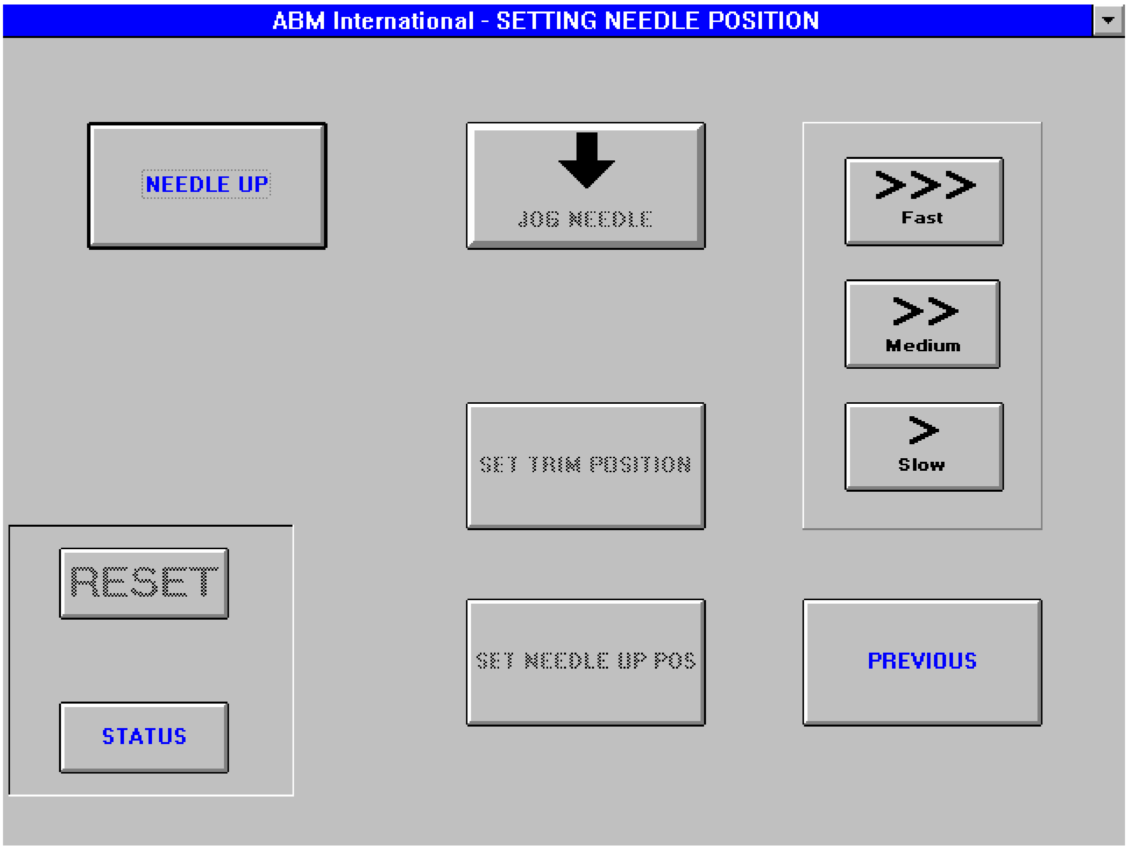


Figure 3.4a - The Set Up and Trim Screen

Selecting the **NEEDLE UP button** will enable the **JOG NEEDLE** button. The **JOG NEEDLE** button moves the needle in and out at a selected jog needle speed. When the needle is in position for trim, the **SET TRIM POSITION button** is selected. This will inform the IIS Macro-Program this is Trim needle position. The set needle up position can also be selected. The needle is again jogged for the desired position and the **SET NEEDLE UP POS button** is selected.

The three buttons Slow, Medium and Fast select the needle jog speed.

Selecting the PREVIOUS button will return you to the PARAMETER screen.

3.5 The Encoder Check Screen

Selecting the Encoder Check button from the PARAMETER screen will bring up the ENCODER screen (see **Figure 3.5a**).

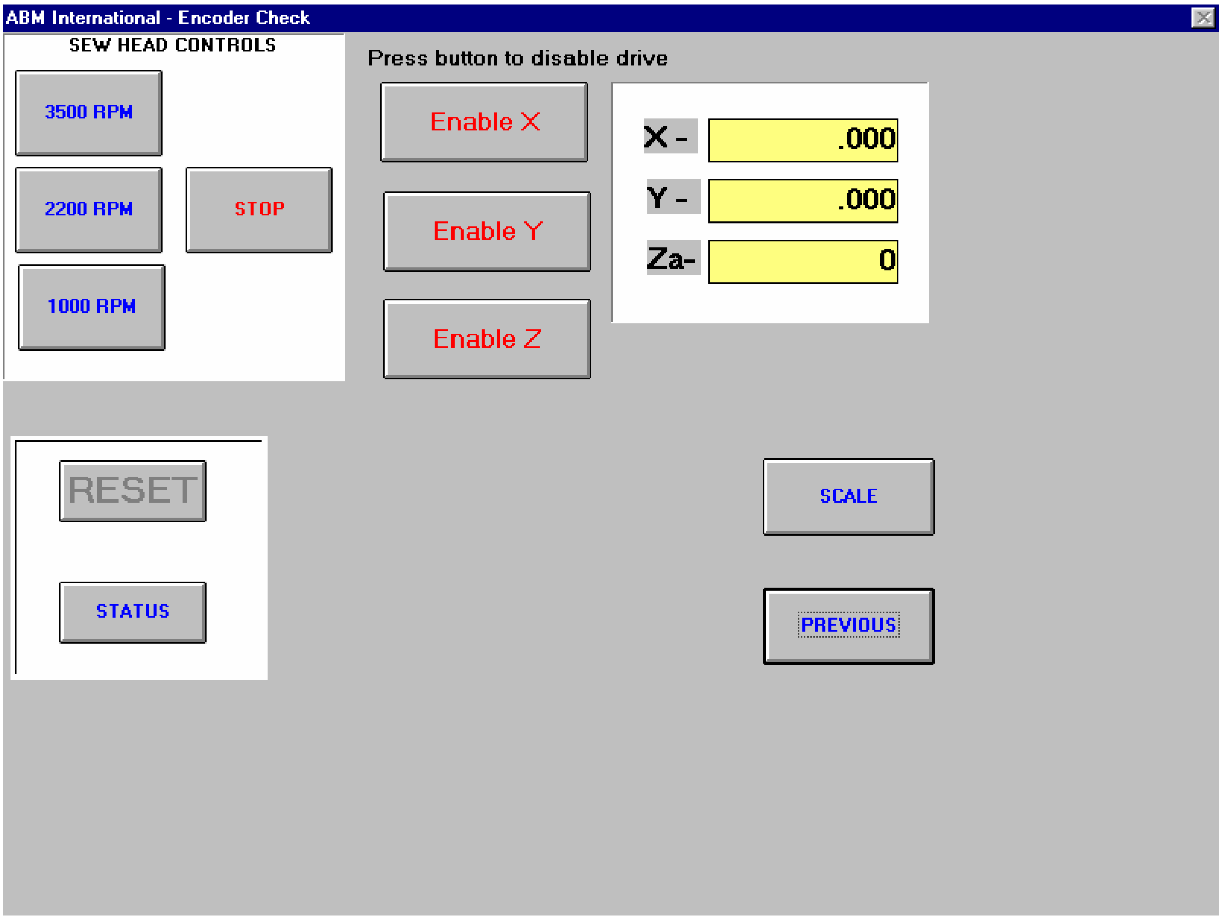


Figure 3.5a - The Encoder Screen

This example screen indicates 3 servo motor controls and 3 read out boxes.

The Enable X button will disable/enable the X-axis servo motor. When the button is selected, the X-axis will be disabled and the button will read Kill X. Re-selecting the button will enable the X-axis servo. The X encoder position can be read in the X - read out box.

The Enable Y button will disable/enable the Y-axis servo motor and functions as above.

The Enable Z button will disable/enable the Z-axis. The Z-axis servo controls the needle position. The Za- readout shows the sewing needle position. This button needs to be selected before any adjustments to the sewing area can be made or before removing/replacing a needle.

The SEW HEAD CONTROLS panel controls the needle speed settings. Selecting a speed will run the needle and selecting the STOP button will stop the needle. Selecting any of the speed buttons will disable the Z-axis servo. The Z-axis can be re-enabled by selecting the STOP button, then selecting the Kill Z button.

Selecting the PREVIOUS button will return the XL6000 system to the PARAMETER screen.

The SCALE button is password protected with a different password. When selected the PASSWORD screens will appear.

3.6 THE SCALE SCREEN

When the correct password has been entered, the SCALE screen will appear (see **Figure 3.6a**).

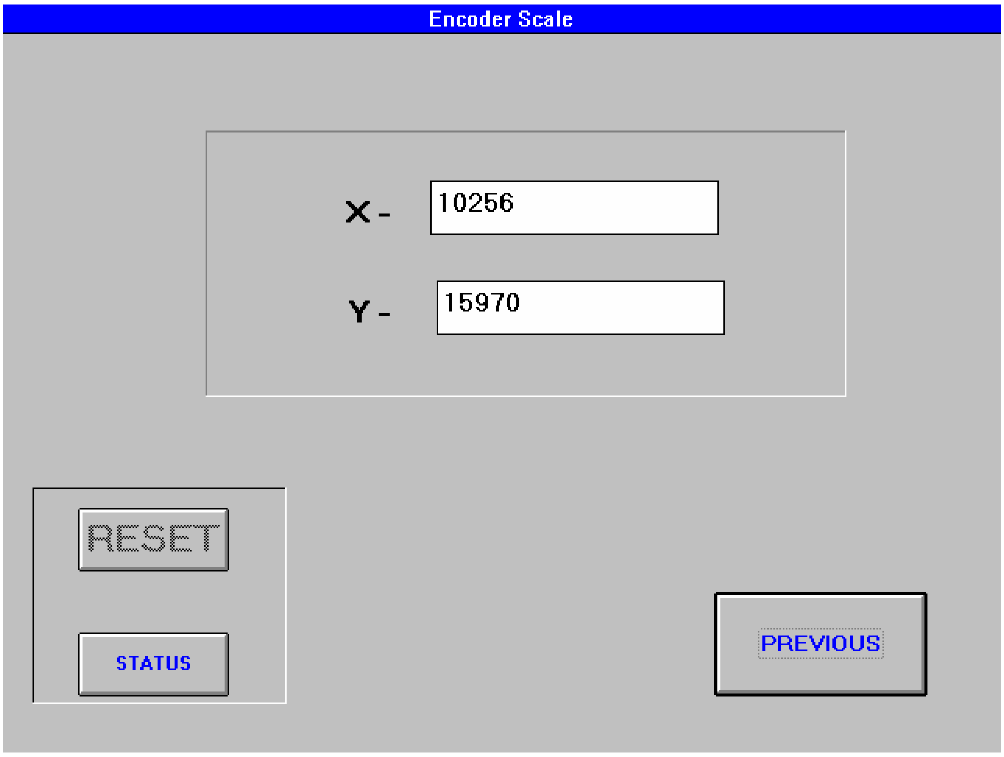


Figure 3.6a - The Scale Screen

The current X and Y-axis scale factors are shown in the readout boxes. To adjust an encoder scale, select the appropriate readout box. A keypad will appear for entry of a new scale factor. These scale factors are range checked and when an entry is selected that is out of range, the original scale factor is maintained.

The scale factor relates to the number of bits needed to travel 1 inch in the plane of travel. The encoder for the X plane is the same as the one for the Y plane but the gearing is different. Each servo has 4096 bits per revolution but to get 1 inch of travel in the X plane requires 10256 bits and to get 1 inch of travel in the y plane requires the Y servo to rotate 15970 bits.

Selecting the PREVIOUS button will return to the ENCODER screen.

3.7 THE LOAD PATTERN FROM DRIVE SCREEN

When the Load Pattern from Drive button is selected from the PARAMETERS screen (see **Figure 3.7a**) the LOAD NEW PATTERN screen will appear.

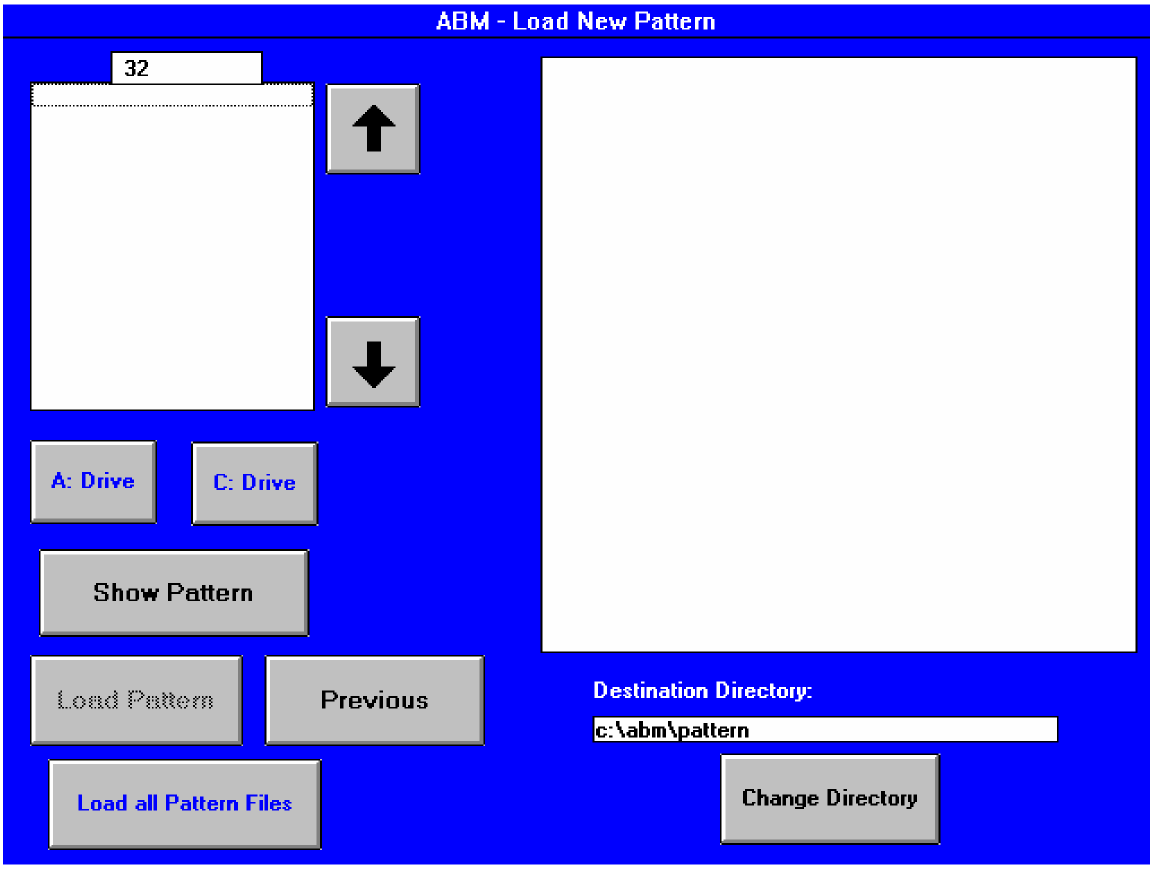


Figure 3.7a - The Load New Pattern Screen

The Load New Pattern Screen - Continued

New patterns can be entered into the XL6000 system. They can be selected from the root directory of a diskette in the A: drive or from the C:\abm\edit directory of the C: drive.

Either the A: Drive or the C: Drive button is selected. The names of the patterns from the selected drive are shown. If the selected drive has no patterns, then no names are shown. That is, if no patterns have been edited and saved, then the C:\abm\edit directory will be empty and no pattern names will be show when drive C: is selected.

To load an individual pattern, select the pattern name. The Show Pattern button is then selected and is shown in the display box. Other patterns can be selected and viewed. Select the Load Pattern button to install the pattern being viewed. The pattern will be installed in the directory & path as shown in the Destination Directory: box. (See above) This directory can be changed by selecting the Change Directory button (See **Section 3.8 & Figure 3.7b**).

The A: Drive button must be selected to use the Load all Pattern Files button. When selected, the LOADALL screen appears. Selecting the GO button will load all the patterns (see **Figure 3.7b**).

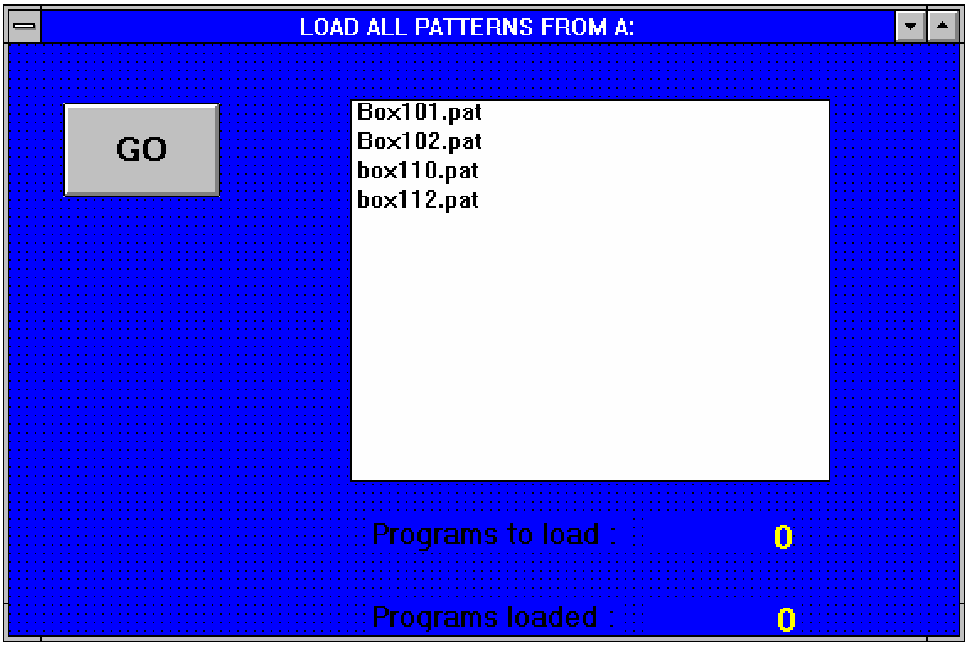


Figure 3.7b - The Load All Patterns Screen

When all of the patterns are loaded from the diskette, a message will appear indicating that the load is complete.

Selecting the Previous button from the Load New Pattern screen will return you to the PARAMETERS screen.

3.8 THE CHANGE DIRECTORY SCREEN

When the Change Directory button is selected from the LOAD NEW PATTERN screen, the Change Directory screen will appear (see **Figure 3.8a**).

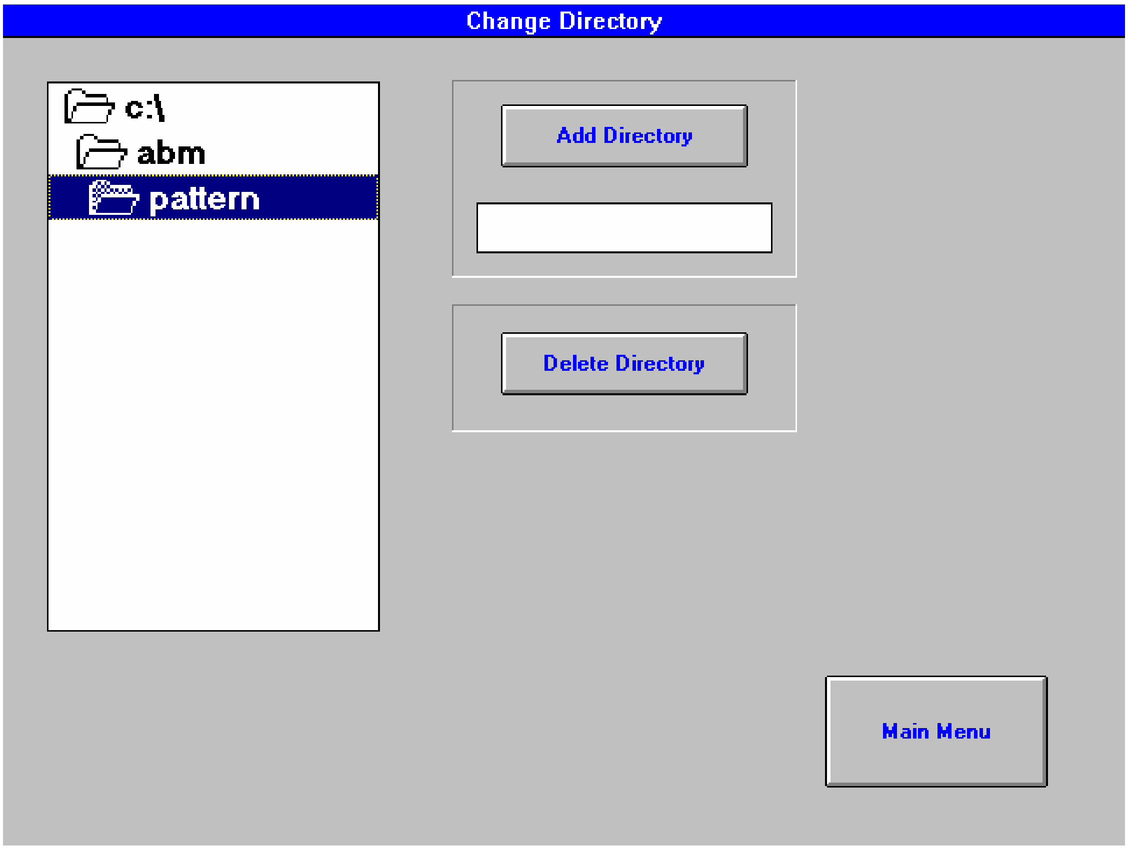


Figure 3.8a - The Change Directory Screen

The directory tree is shown with the normal default directory highlighted. The white box under the Add directory button can be selected to add sub directories under the pattern directory. When selected, a keypad will appear for entry of a sub directory name. When entered, the sub directory will be shown under the pattern directory. Sub directories can only be installed under the pattern directory. **Important: Only sub directories can be deleted by using the Delete Directory button.**

The Main Menu button will return you to the LOAD NEW PATTERN screen. If a sub directory is created and then highlighted before you return, the new Destination Directory will be shown upon return.

3.9 THE CHANGE PASSWORD SCREEN

When the Change Password button is selected from the PARAMETERS screen, the CHANGE PASSWORD screen appears (see **Figure 3.9a**).

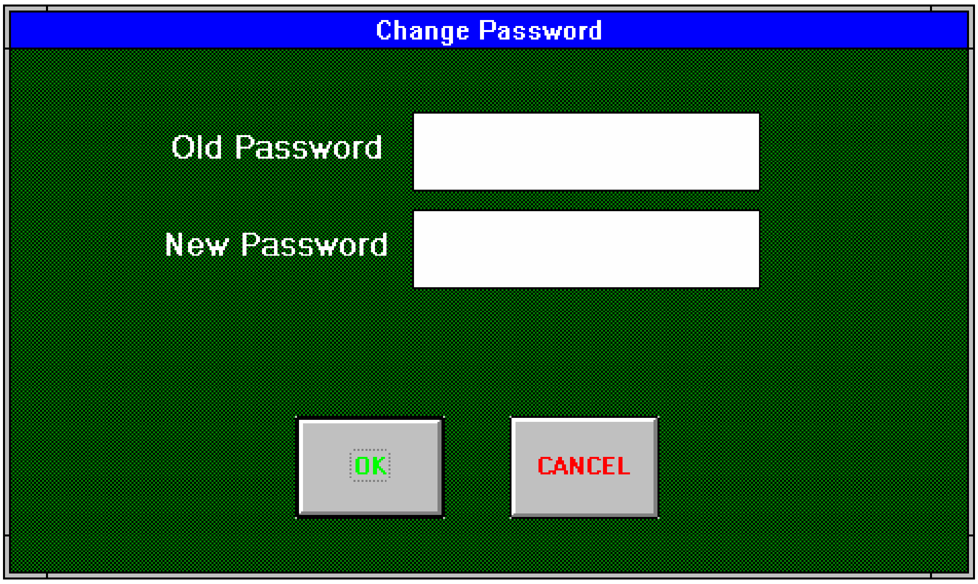


Figure 3.9a - The Change Password Screen

This screen will change the password that the XL6000 system has stored for entry into the PARAMETERS screen. **The old password must be correctly entered then the new password can be entered.**

Selecting the OK button will change the system password.

3.10 DELETING FILES

Selecting the Delete button from the PARAMETERS screen will bring up the DELETE FILES screen (see **Figure 3.10a**).

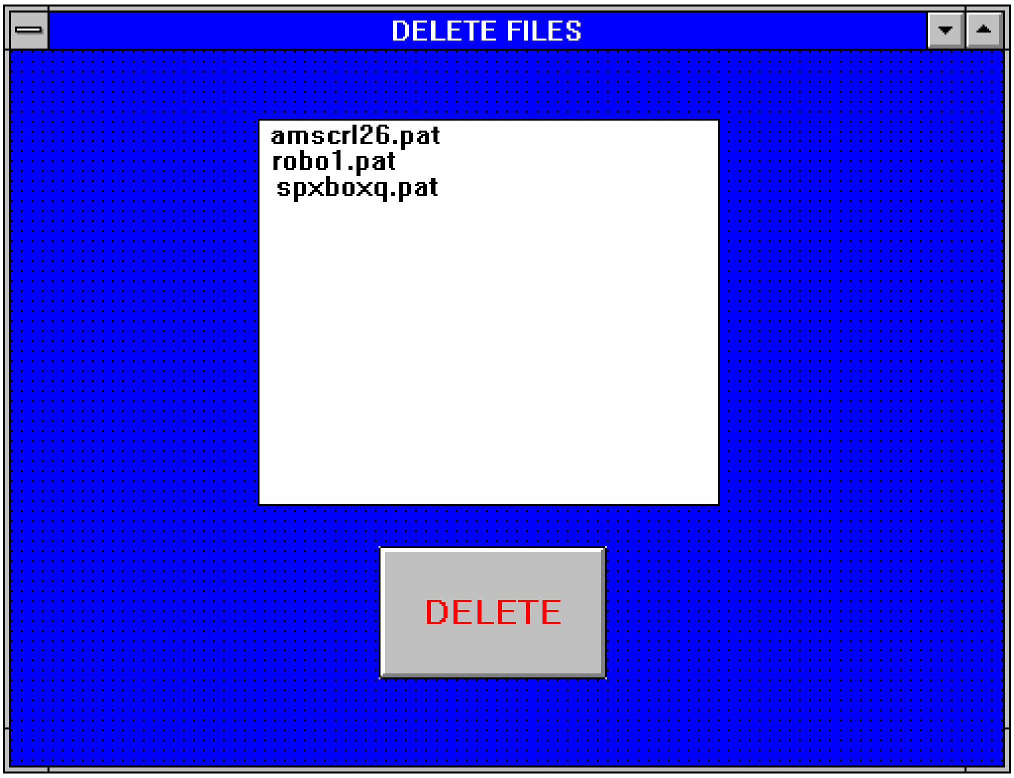


Figure 3.10a - The Delete Files Screen

From this screen you can individually select patterns for deletion. The pattern is selected, and then the DELETE button is selected. The pattern will be deleted from the C:\ABM\PATTERN file and will no longer be shown for pattern selection in the LOAD PATTERN screen.

Select the Previous button to return to the PARAMETERS screen.

3.11 THE INPUT OUTPUT SCREEN

Selecting the Inputs/Outputs button from the PARAMETERS screen will bring up the INPUTS screen (see **Figure 3.11a**).

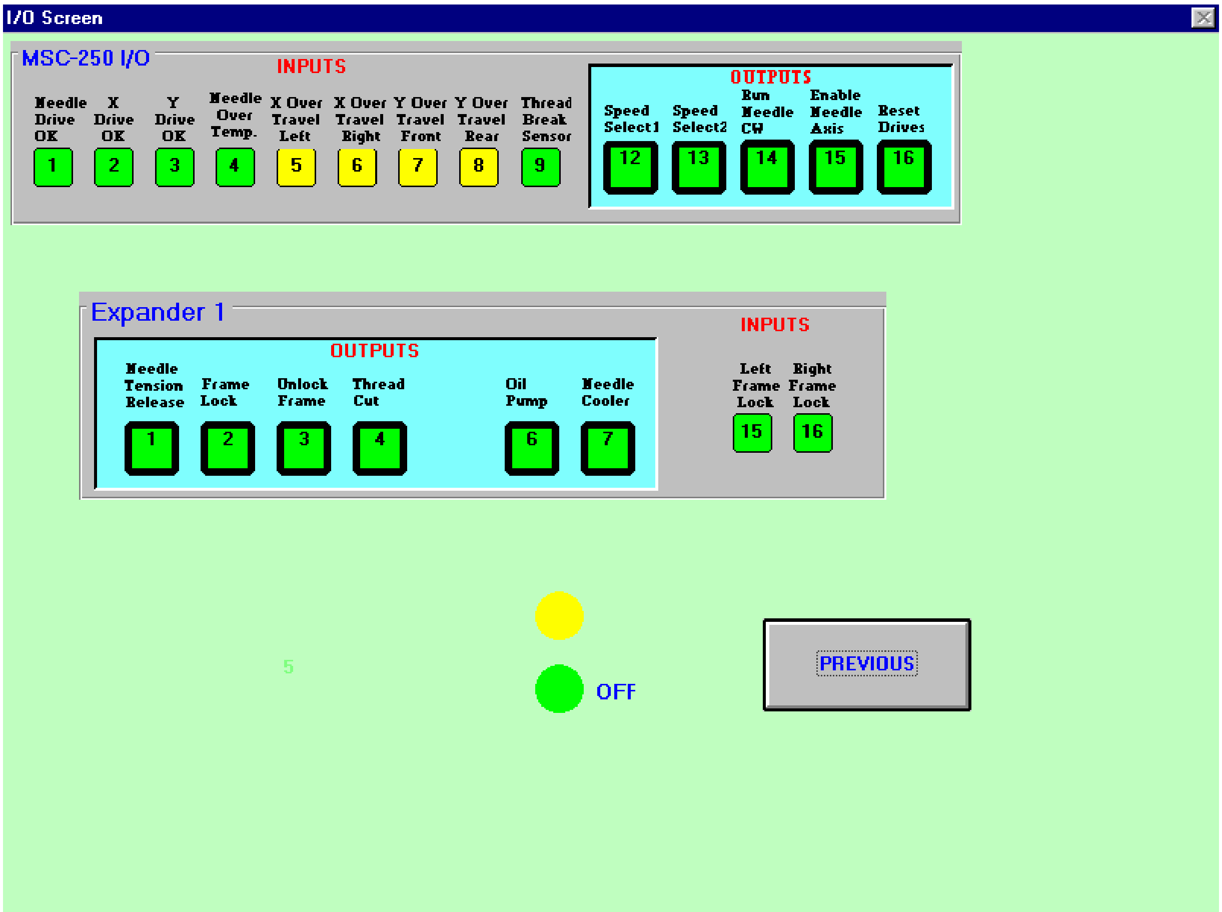


Figure 3.11a - The Input I/O Screen

This screen shows the Inputs for the XL6000 Operating System by control expander module and by expander position. It also shows the current state of the Inputs. If the input is green, it is off and if the input is yellow, it is on.

Only outputs can be toggled on and off from this screen.

I/O Definitions:

Needle Drive Ok	This input signals the MSC-250 in the case of fault in the Needle Drive.
X drive Ok	This input signals the MSC-250 in the case of a fault in the X-Axis Drive.
Y Drive Ok	This input signals the MSC-250 in the case of a fault in the Y-Axis Drive.
Needle over Temp	This input is for monitoring the temperature of the needle motor.
X Over travel Left **X Over travel Right**	These inputs serve as overtravel limits that prevent the frame from crashing into the sew head in the X-Direction.
Y Over Travel Front **Y over Travel Rear**	These inputs serve as overtravel limits to prevent the frame from crashing into the sew head in the Y-Direction
Thread Break Sensor	This is a constant pulsing input. Interruption of this signal will cause a fault condition.
Speed Sel1 **Speed Sel2**	These two outputs are connected to the needle drive for different speed modes
Run needle CW	This output is used to allow the MSC-250 place the needle drive in Run mode
Enable Needle Axis	This output is used to allow the MSC-250 enable and disable the needle drive.
Reset Drives	This output is used to reset all drives in the case of a drive fault condition.

Expander 1 Definitions – These are I/O that are located on the IOE-850 board.

Needle Tension	The MSC-250 controls the tension release on the sew head with this output.
Frame Lock	The MSC-250 controls the frame-lock air solenoid with this output.
Frame Unlock	The MSC-250 controls the frame –unlock solenoid with this output.
Thread Cut	This output is used to control the operation of the thread cutter solenoid.
Oil Pump	The oil pump valve solenoid is controlled by this output.
Needle Cooler	This is connected to the air solenoid that controls the cooling system for the needle.
Left Frame Lock	These inputs monitor the frame lock sensor switches. The absence of either input causes a fault.
Right Frame Lock	

3.12 THE INFO SCREEN

Selecting the INFO button will bring up the MSC INFORMATION screen (see **Figure 3.12a**).

Figure 3.12a - MSC Information

This screen shows the Name, Date and Time of the Macro-Program that is currently running in the MSC.

It also shows the name of the sewing pattern last loaded to the MSC.

The MSC System Status box shows the current state of the MSC.

The MSC Controller Information lists all the controller cards installed along with the installed firmware revision.

3.13 THE DOWNLOAD SCREEN

Selecting the Download button will bring up the MACROPRO DOWNLOAD screen (see **Figure 3.13a**).

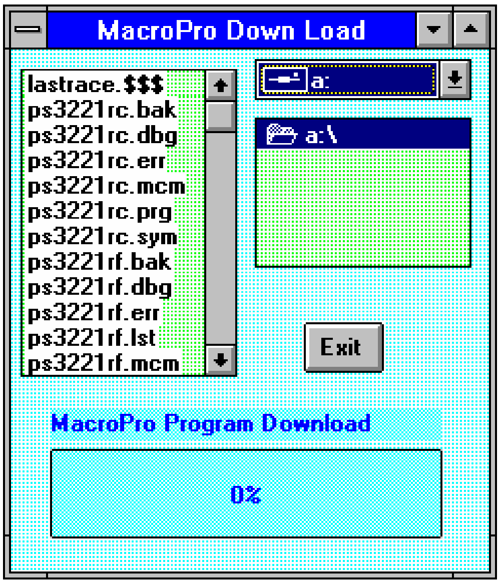


Figure 3.13a - MACROPRO Download Screen

A floppy is needed with the Macro-Program that is to be downloaded. Maintenance personnel select the proper program from the list by clicking on it and then Macro-Program code is sent to the MSC.

A progress bar will be shown along with several down load messages. When the process is complete, selecting Exit will return you to the PARAMETERS screen.

3.14 THE PROGRAM EDIT SCREEN

Selecting the Edit button from the PARAMETERS screen will bring up the PROGRAM EDIT screen (see **Figure 3.14a**).

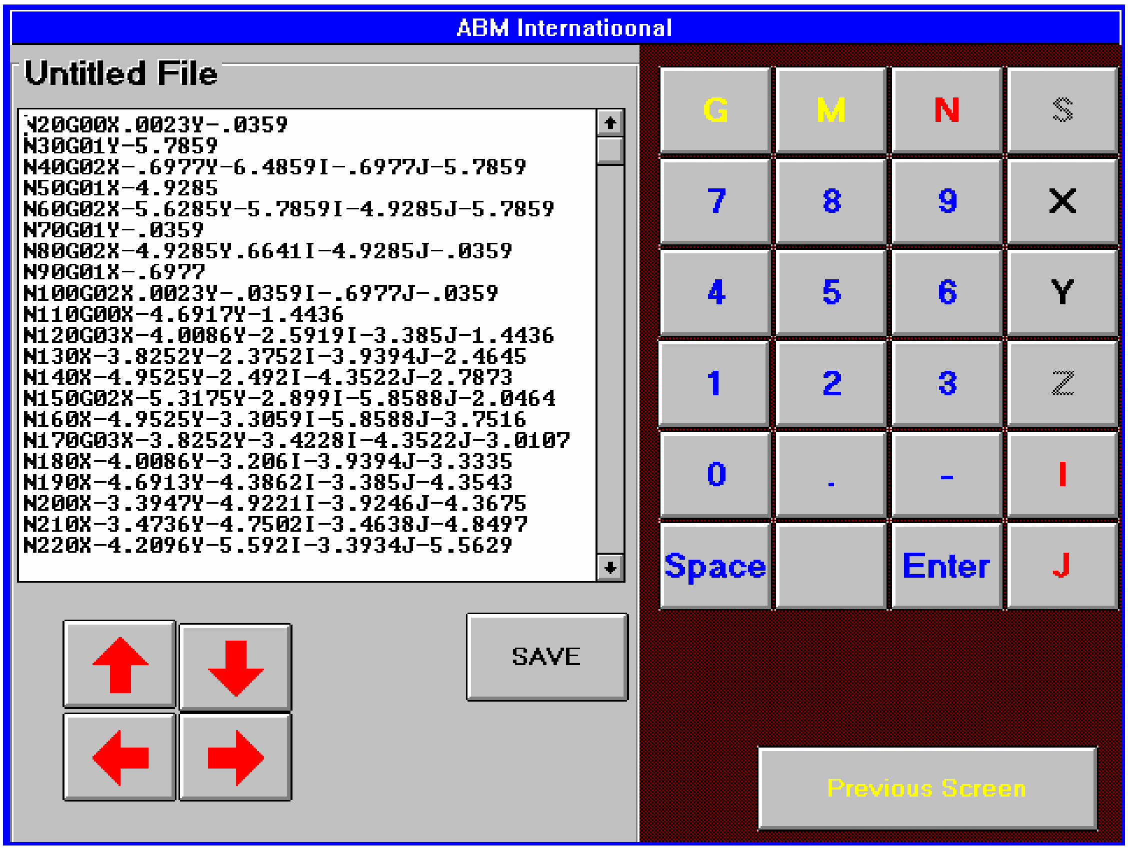


Figure 3.14a - The PROGRAM EDIT Screen

The selected patterns G codes are shown. The cursor can be positioned anywhere in the G code list. The code can be changed in any manor via the keypad. When editing is done selecting the SAVE button will save the edited file in a specific directory (C:\ABM\Edit).

Selecting the edited pattern for sewing must be done from the LOAD NEW PATTERN screen by selecting the C: Drive button and then selecting the pattern from the list of edited patterns.

PFAFF

1181
1183

Adjustment Manual

1181-D
1183-D

This Adjustment Manual is valid for machines from the following serial numbers onwards:

6 063 202 →

296-12-19 023/002
Justieranleitung engl. 08.07

PFAFF Industrie Maschinen AG

Postfach 3020

D-67653 Kaiserslautern

Königstr. 154
D-67655 Kaiserslautern

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13 Adjustment

On the **PFAFF 1181** and **1183** do not use a screw clamp on the needle bar! The special coating of the needle bar could be damaged.

Please observe all notes from Chapter **1** Safety of the instruction manual! In particular care must be taken to see that all protective devices are refitted properly after adjustment, see Chapter **1.06** Danger warnings of the instruction manual!
If not otherwise stated, the machine must be disconnected from the electrical power supply.
Danger of injury due to unintentional starting of the machine!

Notes on adjustment

All following adjustments are based on a fully assembled machine and may only be carried out by expert staff trained for this purpose. Machine covers, which have to be removed and replaced to carry out checks and adjustments, are not mentioned in the text.
The order of the following chapters corresponds to the most logical work sequence for machines which have to be completely adjusted. If only specific individual work steps are carried out, both the preceding and following chapters must be observed.
Screws, nuts indicated in brackets ( ) are fastenings for machine parts, which must be loosened before adjustment and tightened again afterwards.

13.01 Tools, gauges and other accessories for adjusting

- **1** set of screwdrivers with blade widths from **2** to **10 mm**
- **1** set of wrenches with jaw widths from **7** to **14 mm**
- **1** set of Allan keys from **1.5** to **6 mm**
- **1** metal rule, (Part No. **08-880 218-00)**
- **1** feed dog adjustment gauge, Part No. **61-111 639-71**
- **1** adjustment pin (**5 mm** dia.), Part No. **13-033 346-05**
- Adjustment gauge, part No. **61-111 639-73**
- **1** adjustment gauge for tightening the hook drive belt, Part-No. **61-111 639-76**

13.02 Abbreviations

TDC = top dead center
BDC = bottom dead center

13.03 Explanation of the symbols

In this adjustment manual, symbols emphasize operations to be carried out or important information. The symbols used have the following meaning:

Note, information

Service, repair, adjustment, maintenance
(work to be carried out by qualified staff only)

13.04 Checking and adjusting aids

With the aid of blocking pin **1** (part No. **13-033346-05)** and if necessary adjustment gauge **3** (part No. **61-111** 639-73) the machine can be blocked in the following positions for adjustment

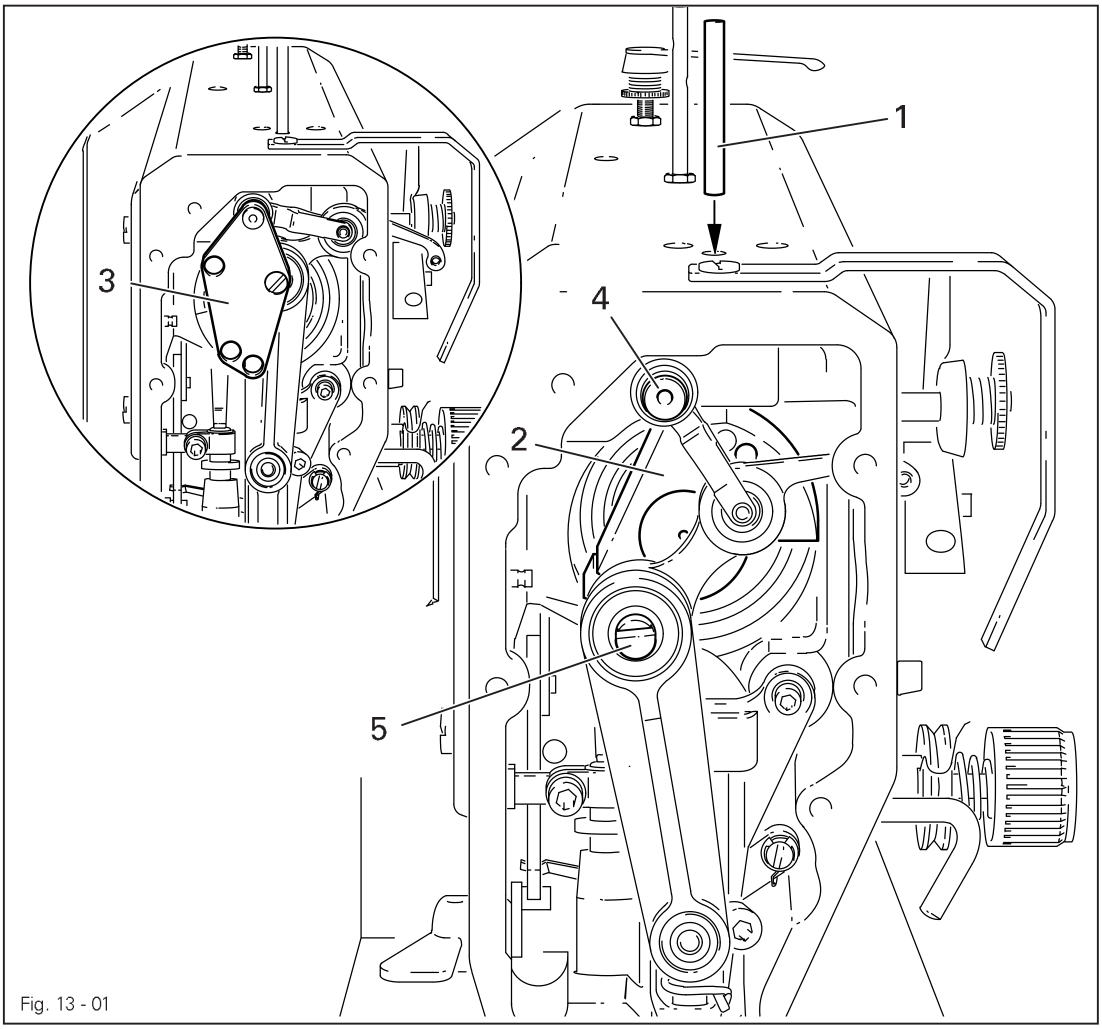


Fig. 13 - 01

Needle bar position 1.8 mm past b.d.c.

- Turn balance wheel until needle bar is roughly in required position
- Insert blocking pin **1** in hole
- Turn balance wheel slightly back and forth until blocking pin engages crank **2**

Needle bar position 0.6 mm past t.d.c.

- Set needle bar roughly at required position
- Place adjustment gauge **3** onto pins **4** and **5,** making sure right side is used (for **30** or **36 mm** needle bar stroke)

Needle bar position 0.6 mm past b.d.c.

- Set needle bar roughly at required position
- Place adjustment gauge **3** onto pins **4** and **5,** making sure right side is used **(for 30 or 36 mm needle bar stroke)**

13.05 Adjusting the basic machine

13.05.01 Basic position of the machine drive

This adjustment is only required if toothed belt **2** has been removed.

Requirement
When the needle bar is positioned **0,6 mm** past b.d.c., the markings **3** and **4** should be in alignment..

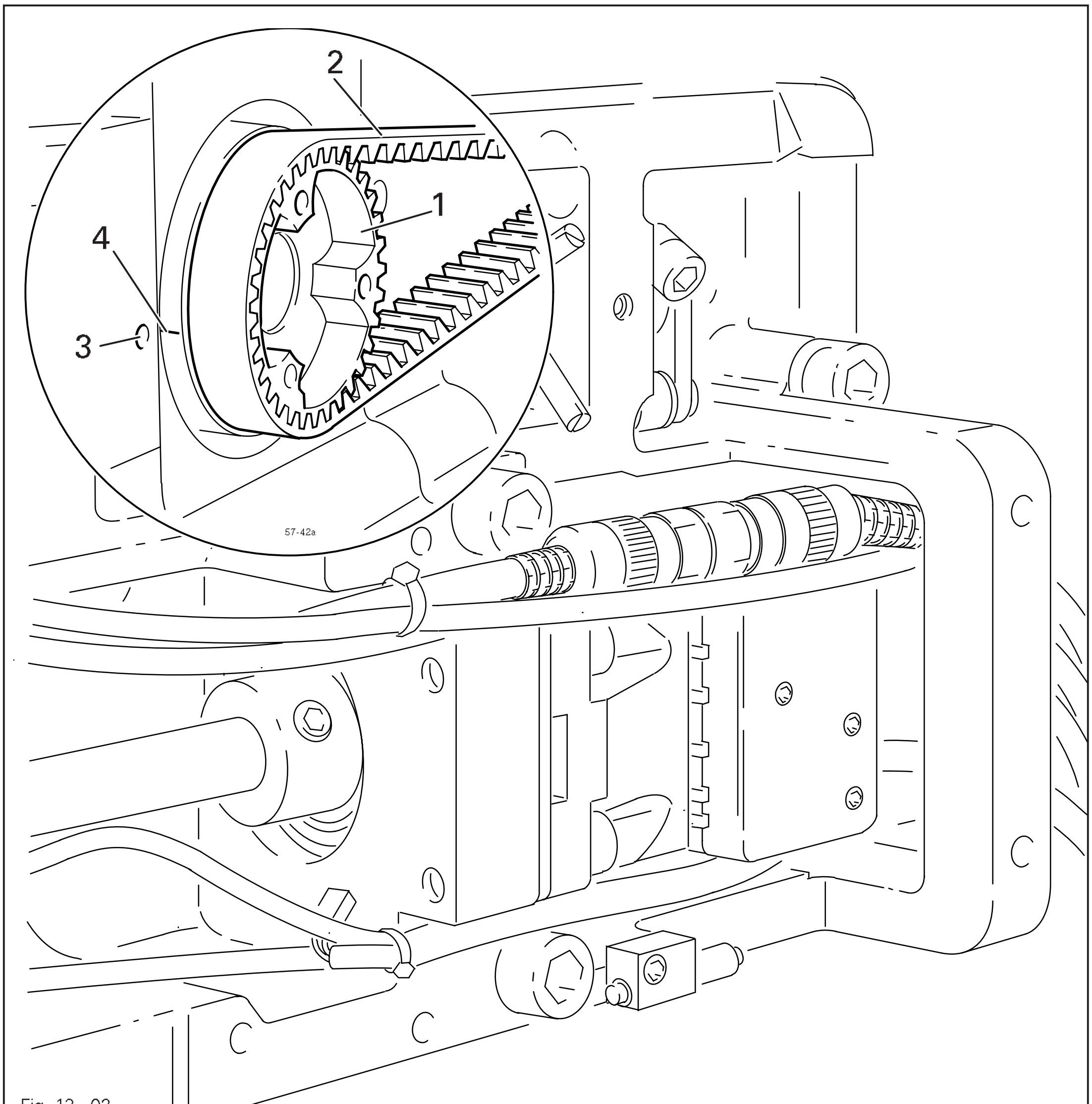


Fig. 13 - 02

- Turn toothed belt sprocket **1** according to **Requirement** and push on toothed belt **2.**

When installing the motor pay attention to the correct position of shaft flange, shock absorber and motor flange!

13.05.02 Preadjusting the needle height

Requirement
When the needle bar is positioned **1.8 mm** above BDC, the mark on the needle bar **1** must be flush with the bottom edge of the needle bar frame **3.**

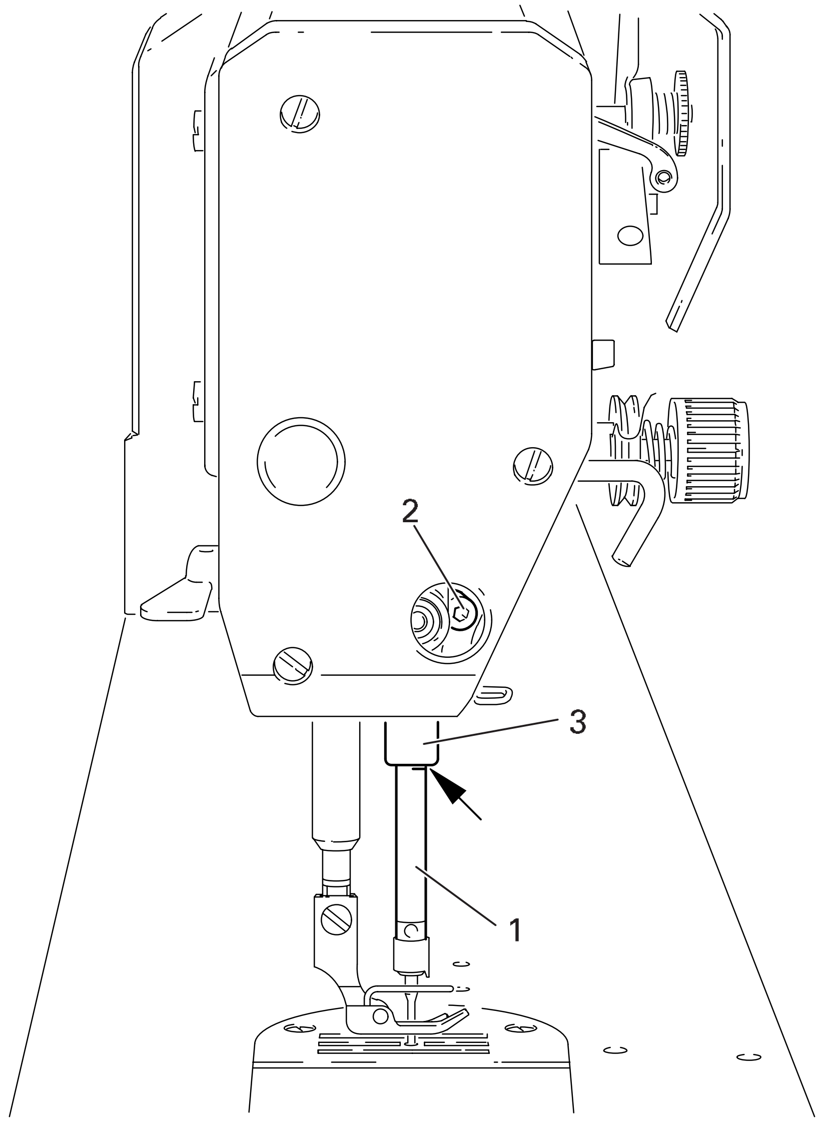
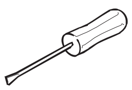


Fig. 13 - 03



- Set needle bar at **1.8 mm** past b.d.c. and block machine with blocking pin, see Chapter **13.04 Checking and adjusting aids.**
- Move needle bar **1** (screw **2**), without turning it, according to the **requirement.**

13.05.03 Bottom feed neutral position

Requirement
At stitch length setting "**0**", cranks **1** and **3** must be flush and the feed dog must not make any feeding motion when the balance wheel is turned.

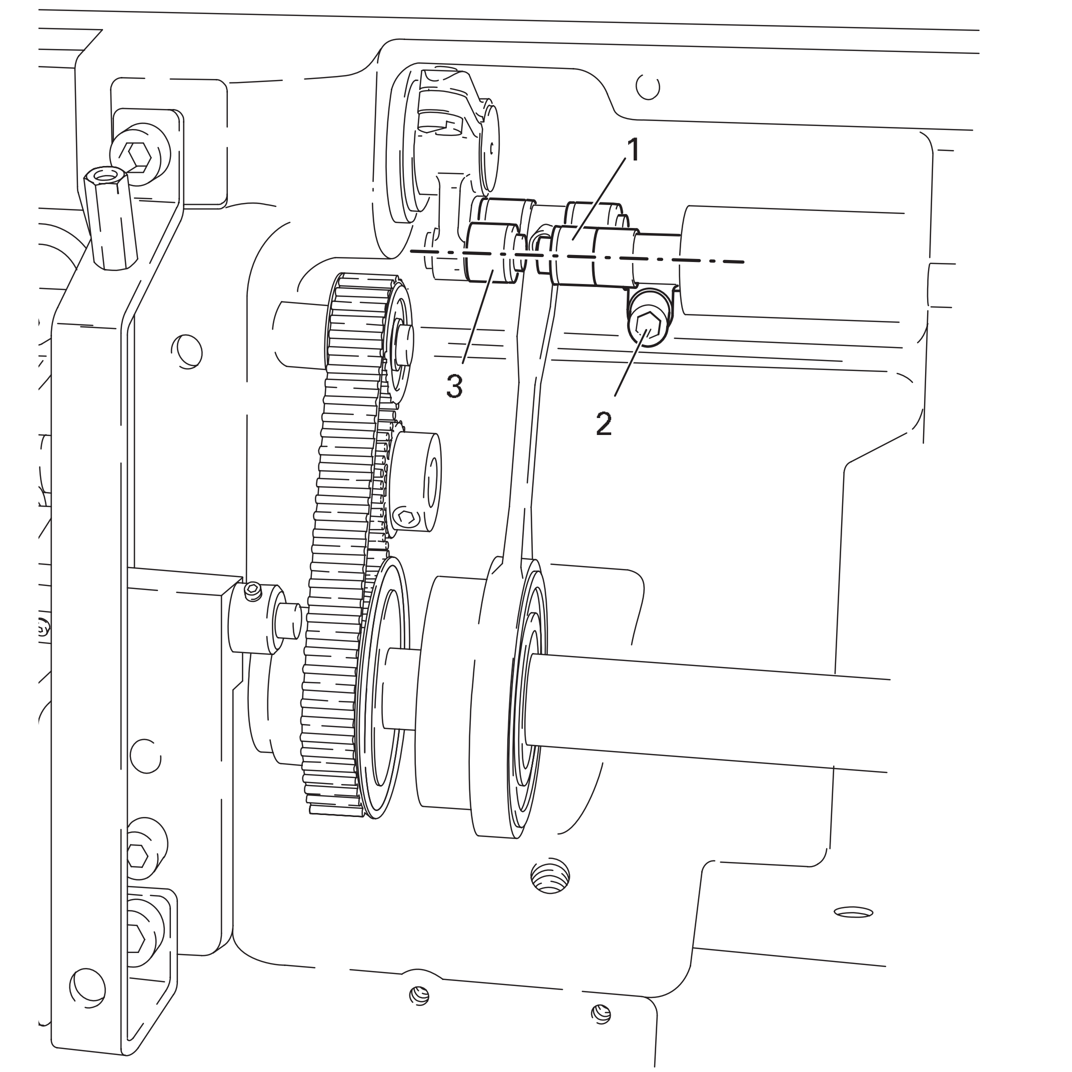
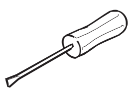


Fig. 13 - 04



- Raise the presser foot and set the stitch length to "**0**".
- Turn crank **1** (screw **2**) according to the **requirement**.

13.05.04 Neutral position of the needle feed (only on PFAFF 1181)

Requirement
At stitch length setting "**0**" the needle bar must not make any feeding motion when the balance wheel is turned.

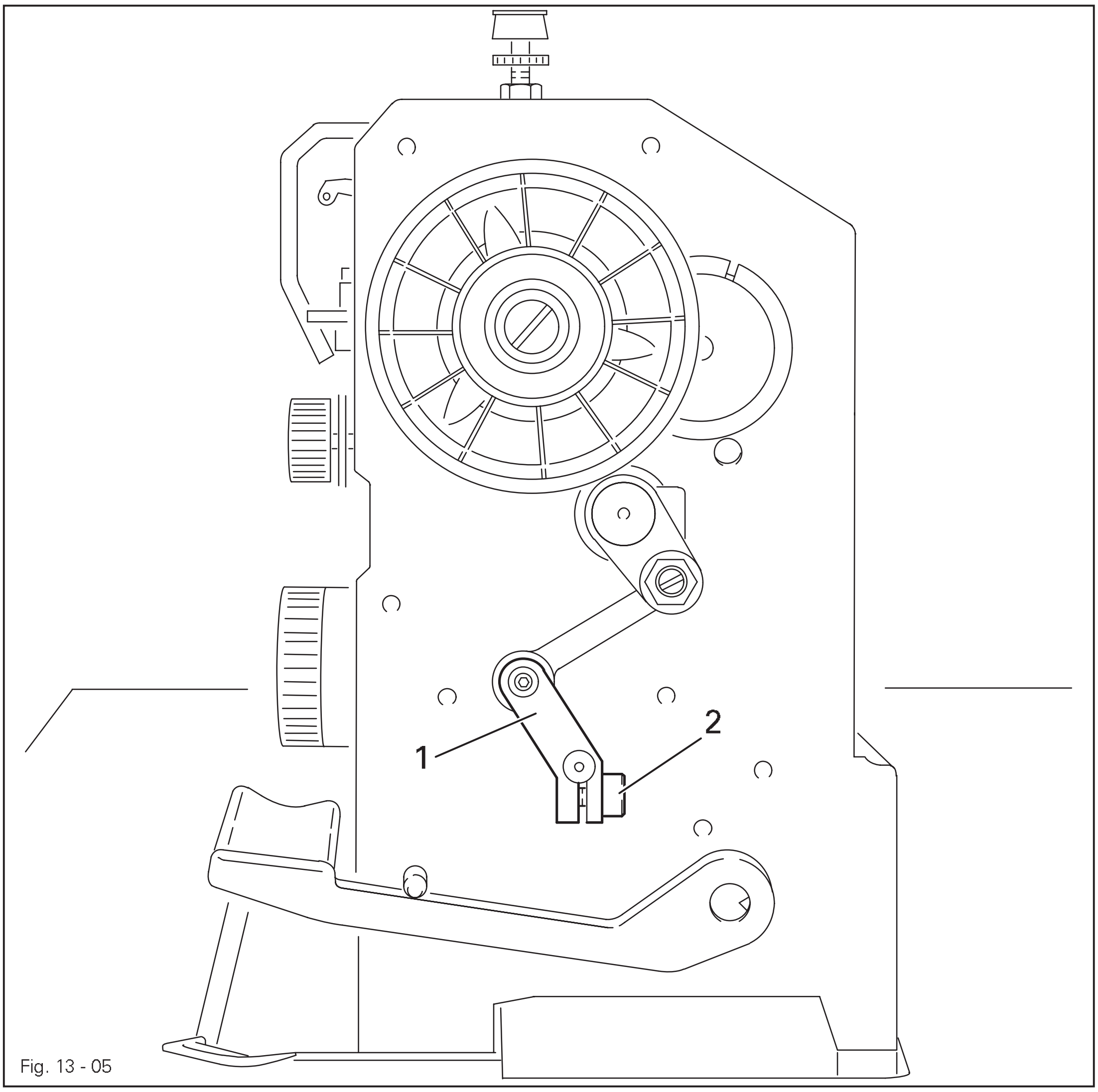
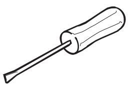


Fig. 13 - 05



- Set stitch length "**0**".
- Turn crank **1** (screw **2**) according to **Requirement**.

13.05.05 Bottom feed lifting motion

Requirement
At stitch length setting "**0**" and needle bar position **0.6** past b.d.c. on the **PFAFF 1181** and at needle bar position t.d.c. on the **PFAFF 1183,**
1. the bottom feed dog must be at its highest position,
2. ontrol cam **3** must rest on lifting eccentric **1.**

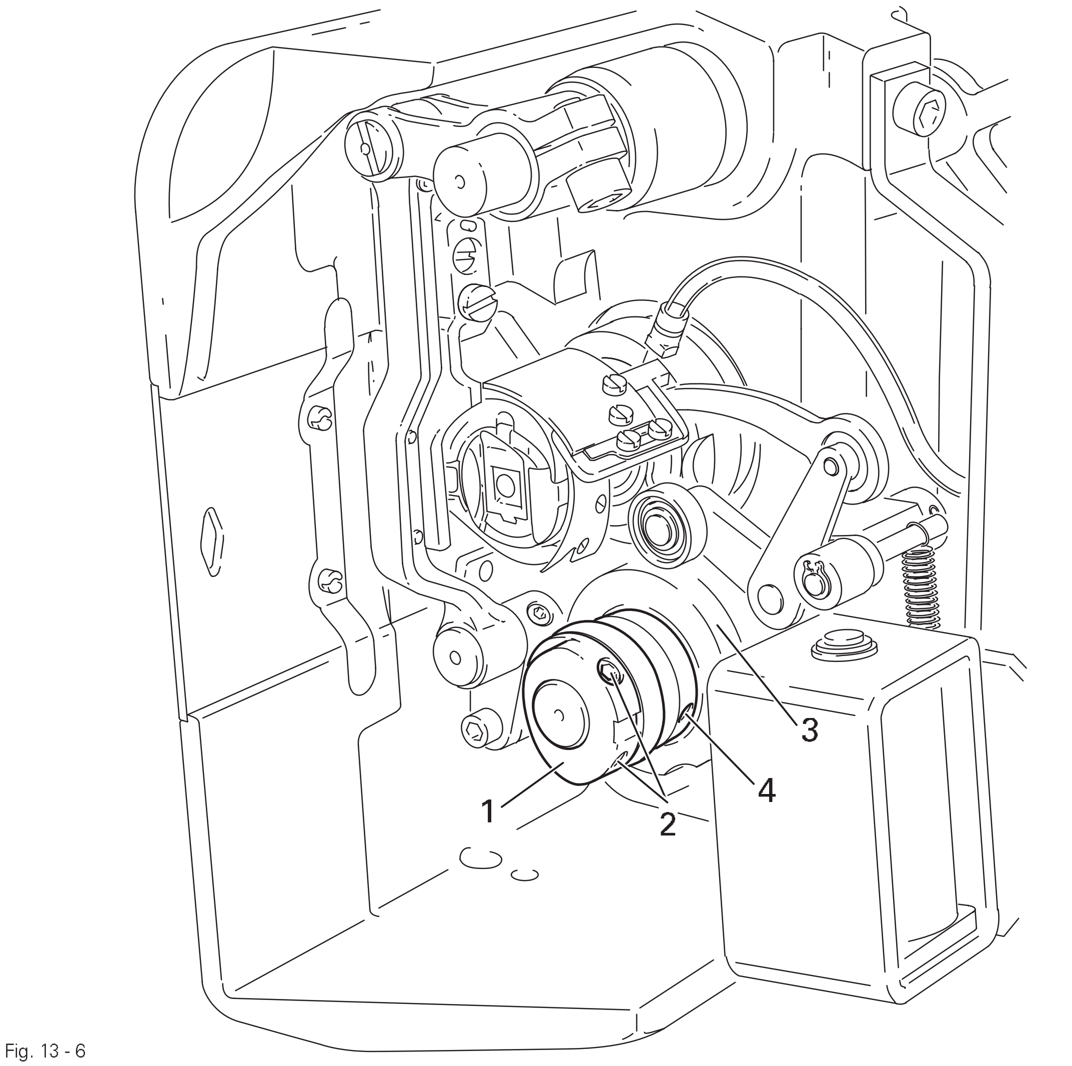
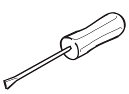


Fig. 13 - 6



- Set stitch length "**0**" and set needle bar at required position
- Turn eccentric **1** (screws **2**) according to **Requirement 1.**
- Adjust control cam **3** (screws **4**) according to **Requirement 2.**

13.05.06 Bottom feed dog height

Requirement
When feed dog **1** is at its highest point at stitch length setting "**0**" it must

1. be centred in the feed slot crosswise and in feeding direction
2. Rest on feed dog adjustment gauge **2** over its entire length.

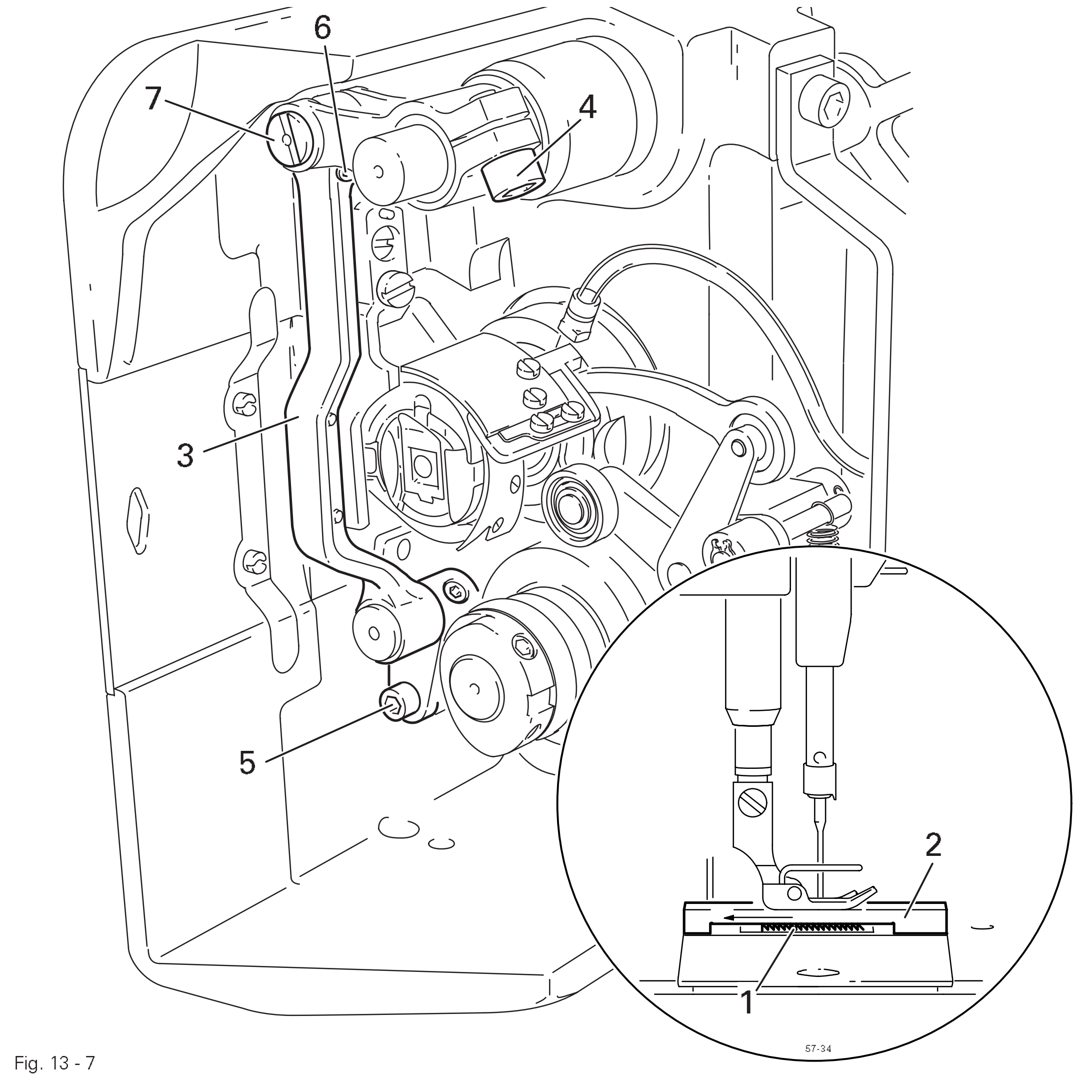
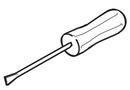


Fig. 13 - 7



- Set stitch length at "**0**" and feed dog **1** at its highest position
- Raise the presser foot.
- Place feed dog adjustment gauge **2** on the needle plate cutout with the arrow in sewing direction so that it is flush with the front edge, and lower the presser foot onto it.
- Adjust feed bar **3** (screws **4**) according to **Requirement 1.**
- Loosen screws **5** and **6.**
- Adjust feed bar **3** or eccentric **7** according to **Requirement 2.**
- Tighten screws **5** and **6** firmly.

13.05.07 Feed dog motion of bottom feed dog

Requirement
With the needle bar at a position **0.6** past b.d.c. on the **PFAFF 1181** or in position **0.6** past t.d.c. on the **PFAFF 1183** the feed dog must not make any feeding motion when reverse-feed lever **3** is operated at the longest stitch length setting.

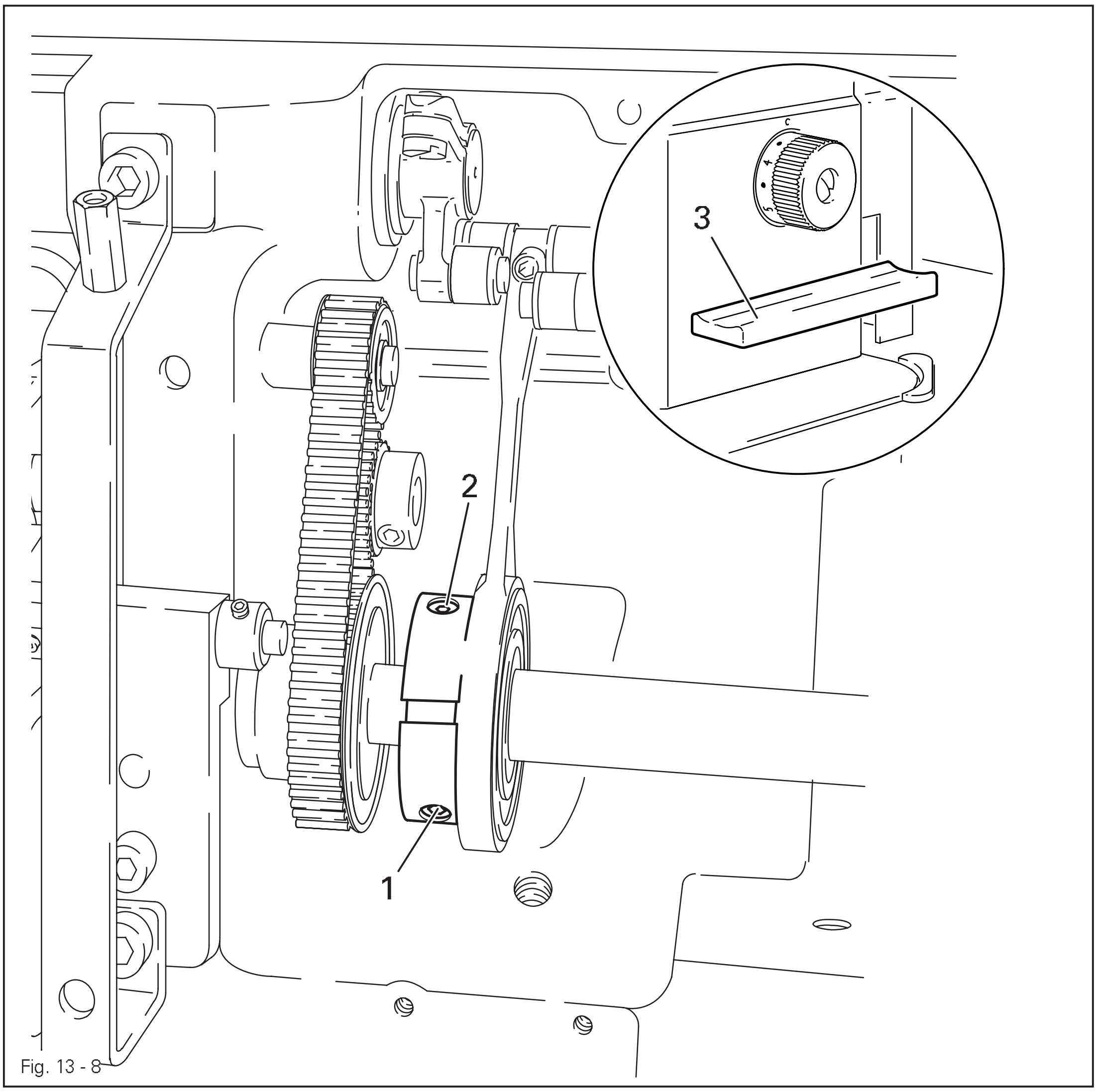
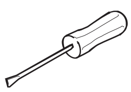


Fig. 13 - 8



- Set the longest stitch and the needle bar at the corresponding position.
- Adjust eccentric **1** (loosen screws **2** a little) according to **Requirement**, but make sure it is not moved sideways.

13.05.08 Feeding motion of needle feed (only on PFAFF 1181)

Requirement
When the longest stitch length is set and the needle bar is positioned **0.6 mm** past b.d.c., the needle should not move when the reverse-feed key **4** is operated..

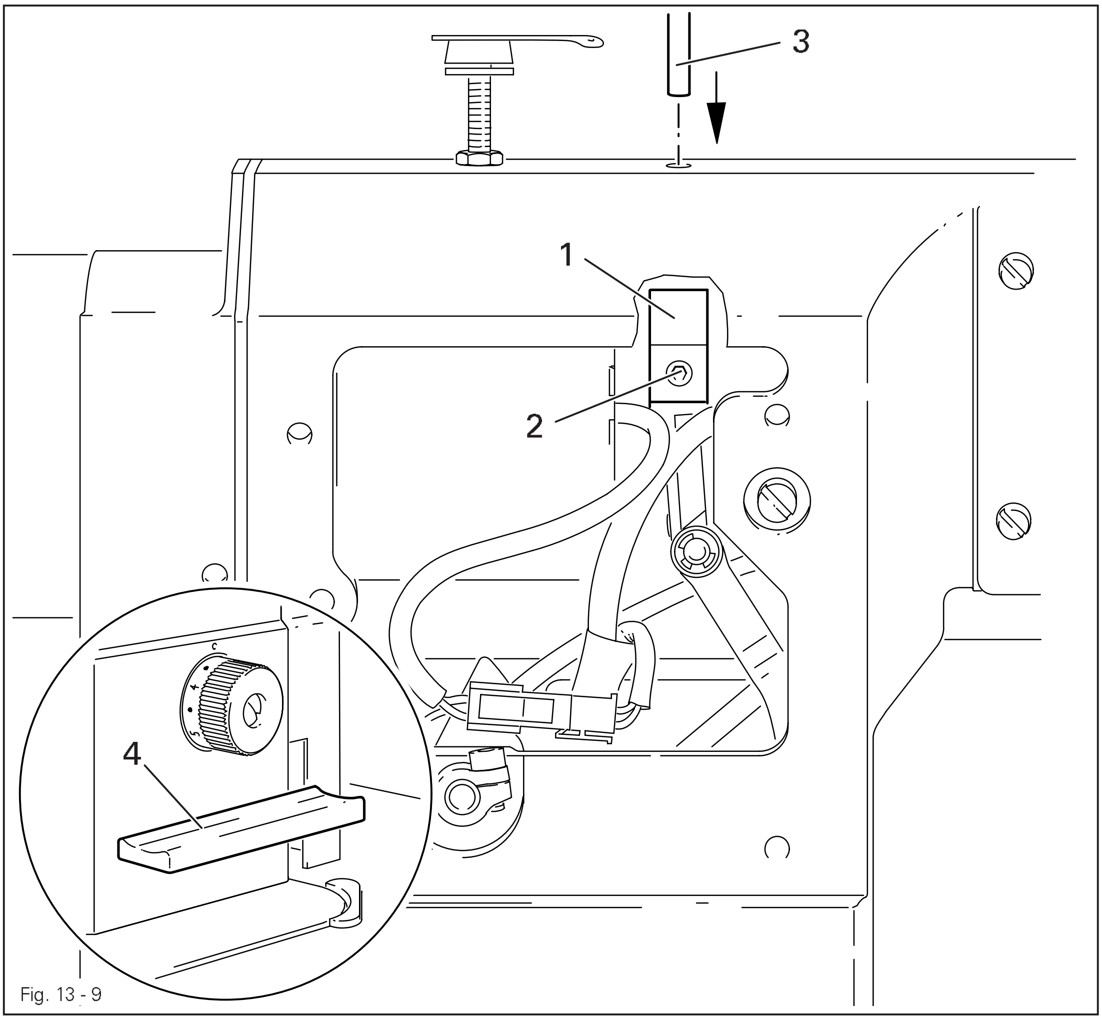


Fig. 13 - 9

- Bring the needle bar into the position **0.6 mm** past t.d.c.
- Turn eccentric **1** (screws **2**) until the adjustment pin **3** locks into place.

13.05.09 Needle in needle hole center (only on PFAFF 1183)

Requirement
The needle must penetrate the needle hole exactly in the middle.

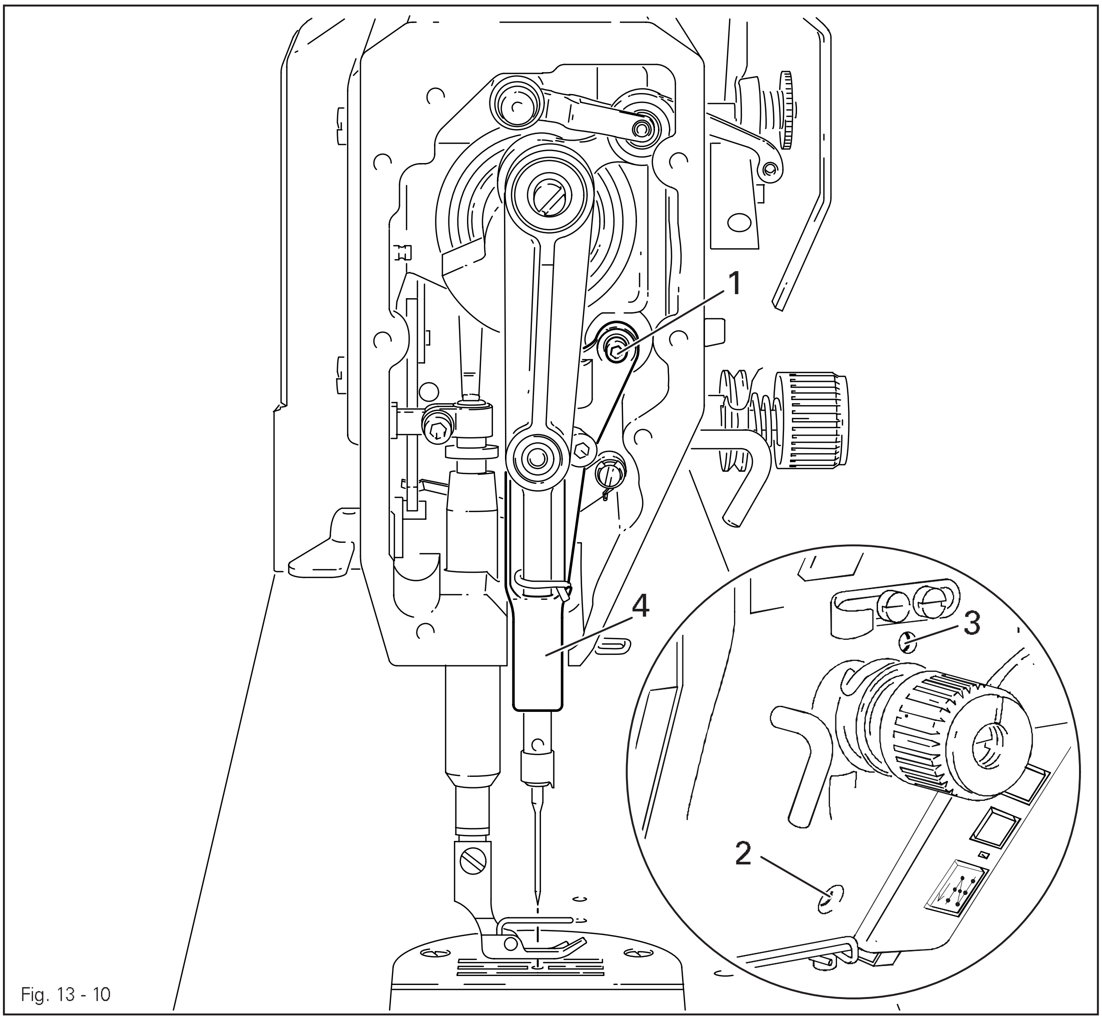
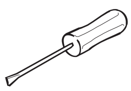


Fig. 13 - 10



- Set the needle in the needle hole.
- Loosen screws **1, 2** and **3.**
- Move the needle bar frame **4** according to the **requirement.**
- Tighten screw **2** and turn screw **3** slightly.
- Via screw **1,** bring the retracted guide bolt to the eye of the needle bar frame **4** and tighten it.
- Turn the handwheel a few times to prevent distortion to the needle bar frame **4.**
- Tighten screw **3**

13.05.10 Needle to needle hole centre (on PFAFF 1181)

Requirement
The needle must enter excatly in the centre of the needle hole.

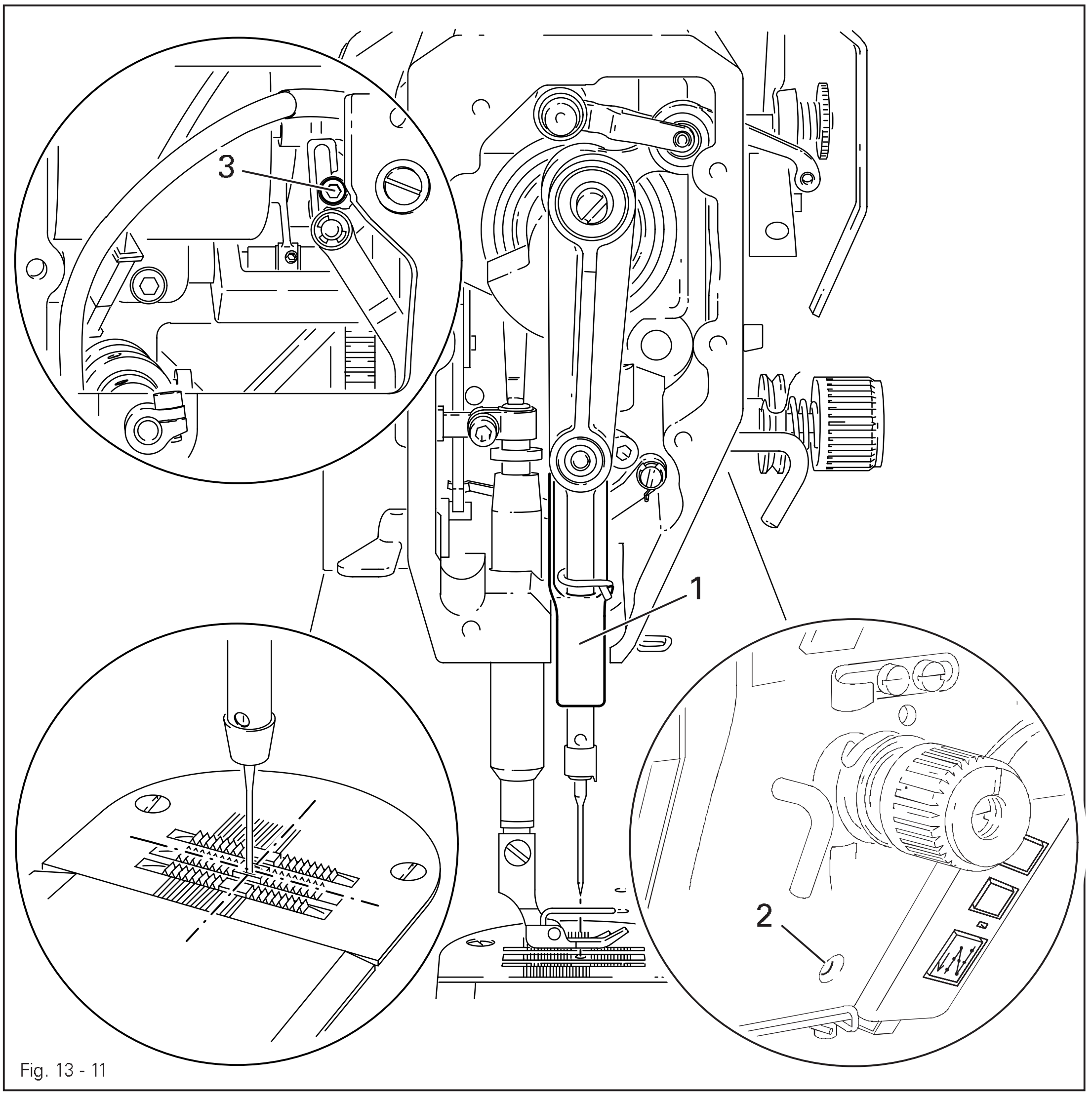
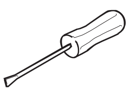


Fig. 13 - 11



- Set stitch length "**0**".
- Set the needle in the needle hole by turning the balance wheel
- Turn needle bar frame **1** (screws **2** and **3)** according to **Requirement**.

13.05.11 Synchronous strokes of needle- and drop feed (only on PFAFF 1181)

Requirement
At the longest stitch length setting the needle and feed dog must move by the same stroke when the balance wheel is turned.

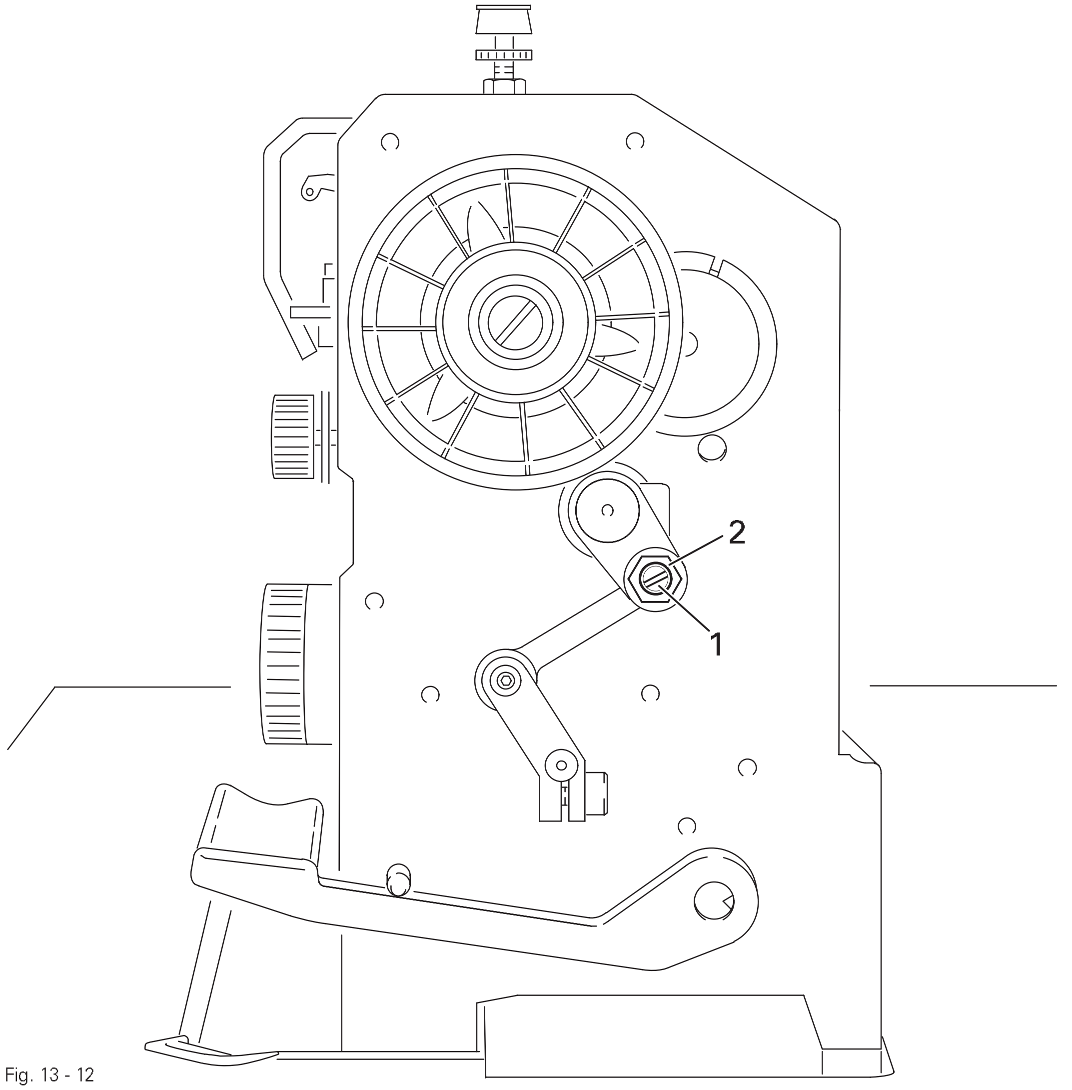
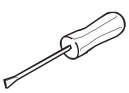


Fig. 13 - 12



- Set the longest stitch.
- Turn eccentric **1** (nut **2**) according to **Requirement** .

13.05.12 Hook shaft bearing and toothed belt tension

Requirement
1. The front edge of the hook shaft **6** must be at a distance of **14.5 mm** to the needle center. At the same time, the slot in the hook shaft bearing **1** (see arrow) must be parallel to the bedplate and pointing opposite to the direction of sewing.
2. The toothed belt should be tightened in such a way that, when the gauge is pushed onto the toothed belt, the marking in the gauge window corresponds to the marking on the bushing.

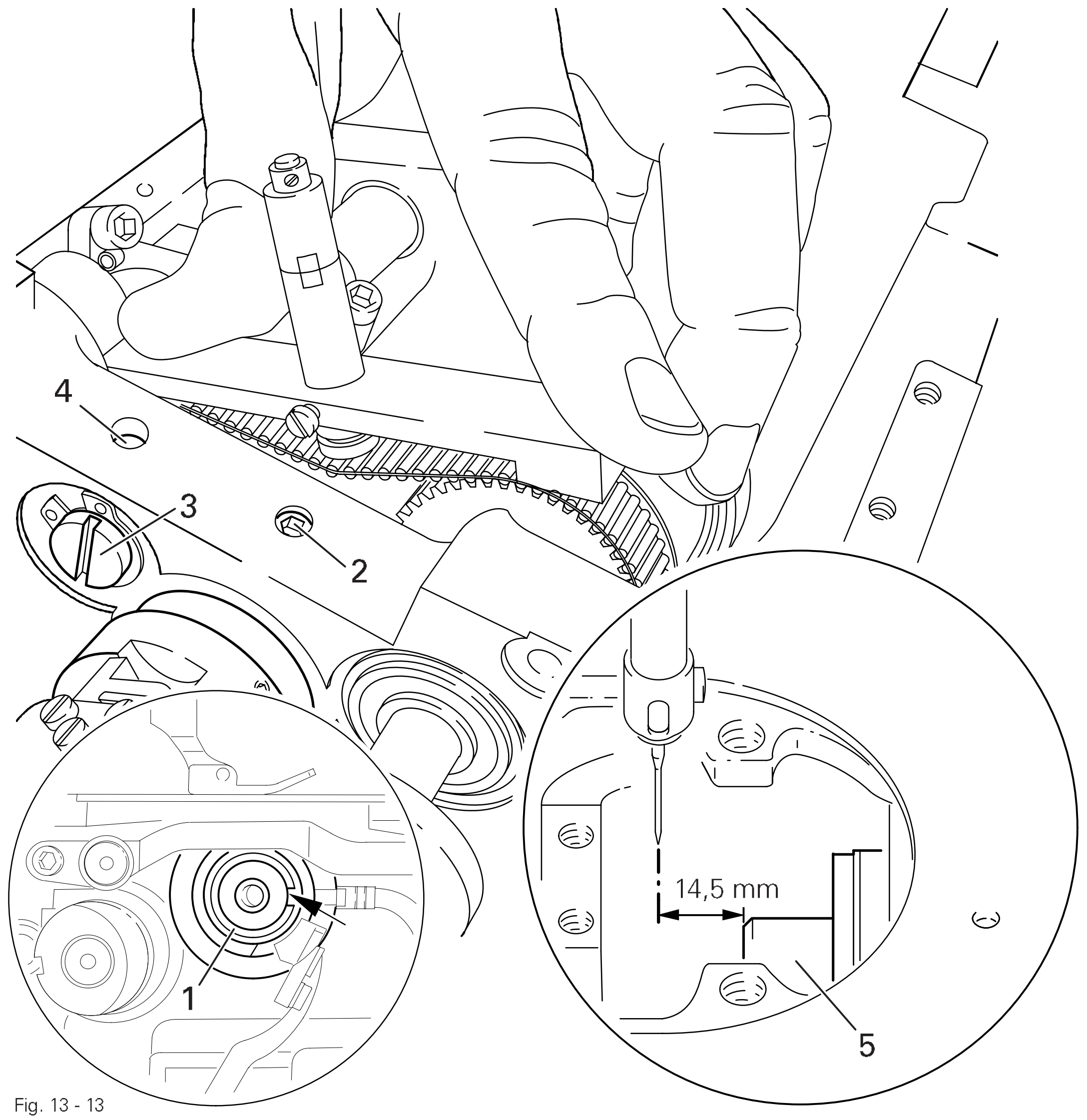
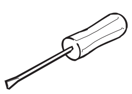


Fig. 13 - 13



- Align hook shaft bearing **1** (screw **2**) according to **requirement 1.**
- Push the gauge (Part-No. **61-111 639-76**) onto the toothed belt so that it is centred to the toothed belt and touching the bearing of the sliding shaft. The gauge window must be facing the hook.
- Eccentric **3** (screw **4**) clockwise in accordance with **requirement 2,** taking care that the axial position of eccentric **3** is not altered.

13.05.13 Hook lubrication

Requirement

1. The centrifugal disk **1** must be positioned **1.5 mm** in front of the oil ring **3.**
2. When the machine is running at full speed, after approx. **10** seconds a mark should be made by a fine stripe of oil on the strip of paper placed over the needle plate cutout.

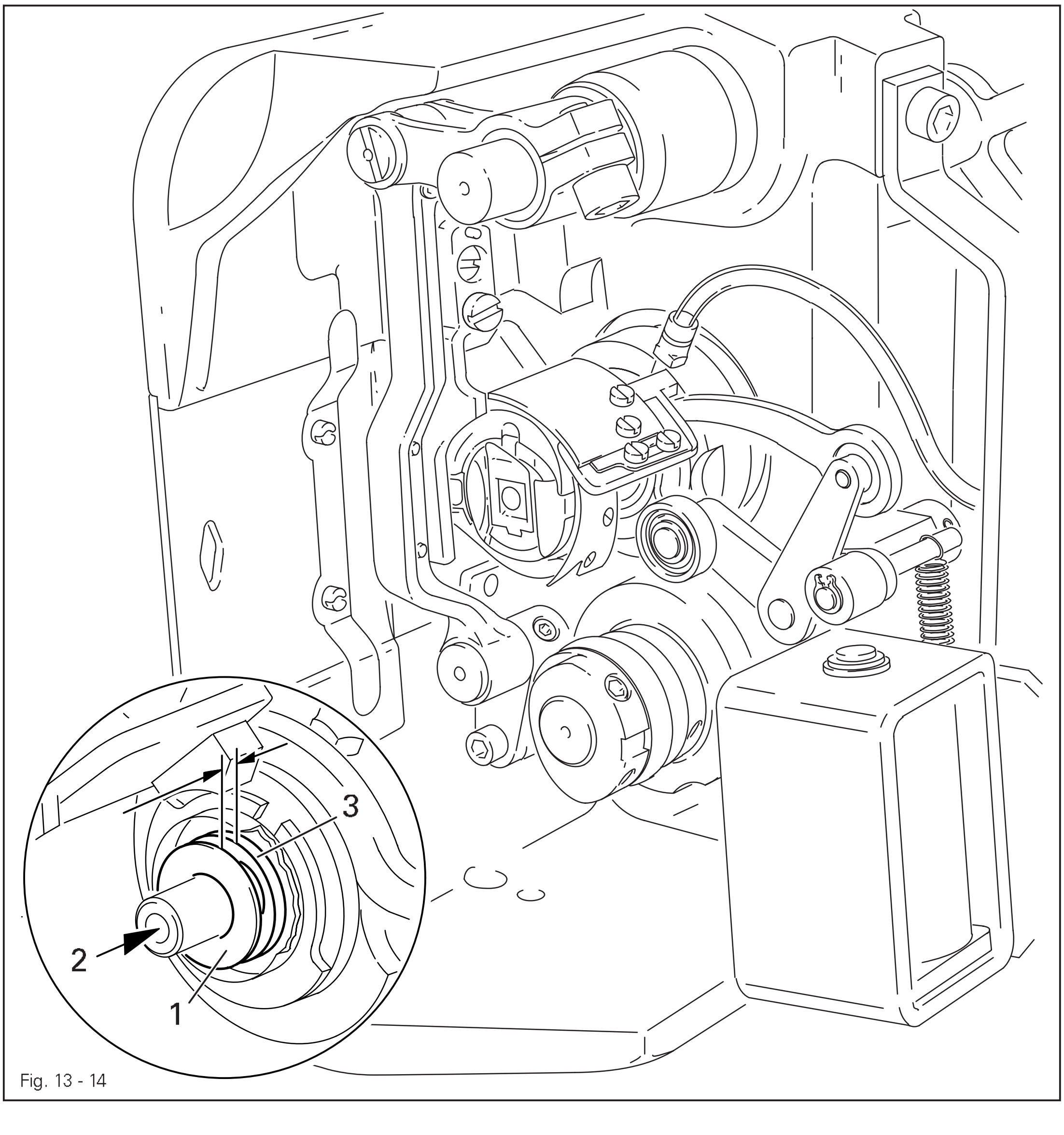
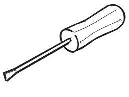


Fig. 13 - 14

The adjustment is only necessary if the wick has been replaced.
When replacing the wick, make sure that the new wick is impregnated with oil.



- Move the centrifugal disk **1** (screw **2**) according to **requirement 1.**
- Check **requirement 2.** If necessary, move centrifugal disk **1.**

13.05.14 Needle rise, hook-to-needle clearance, needle height and bobbin case position finger

Requirement
With the needle at **1.8 mm** after BDC,
1. the hook point **6** must point to the middle of the needle and be at a distance of **0.05 mm** - **0.1 mm** to the clearance cut of the needle, and
2. the top edge of the needle eye must be **0.8 mm** below the hook point.
3. Between the projection of the bobbin case position finger **4** and the bottom of the retaining groove there should be a distance of **0.5 mm.**

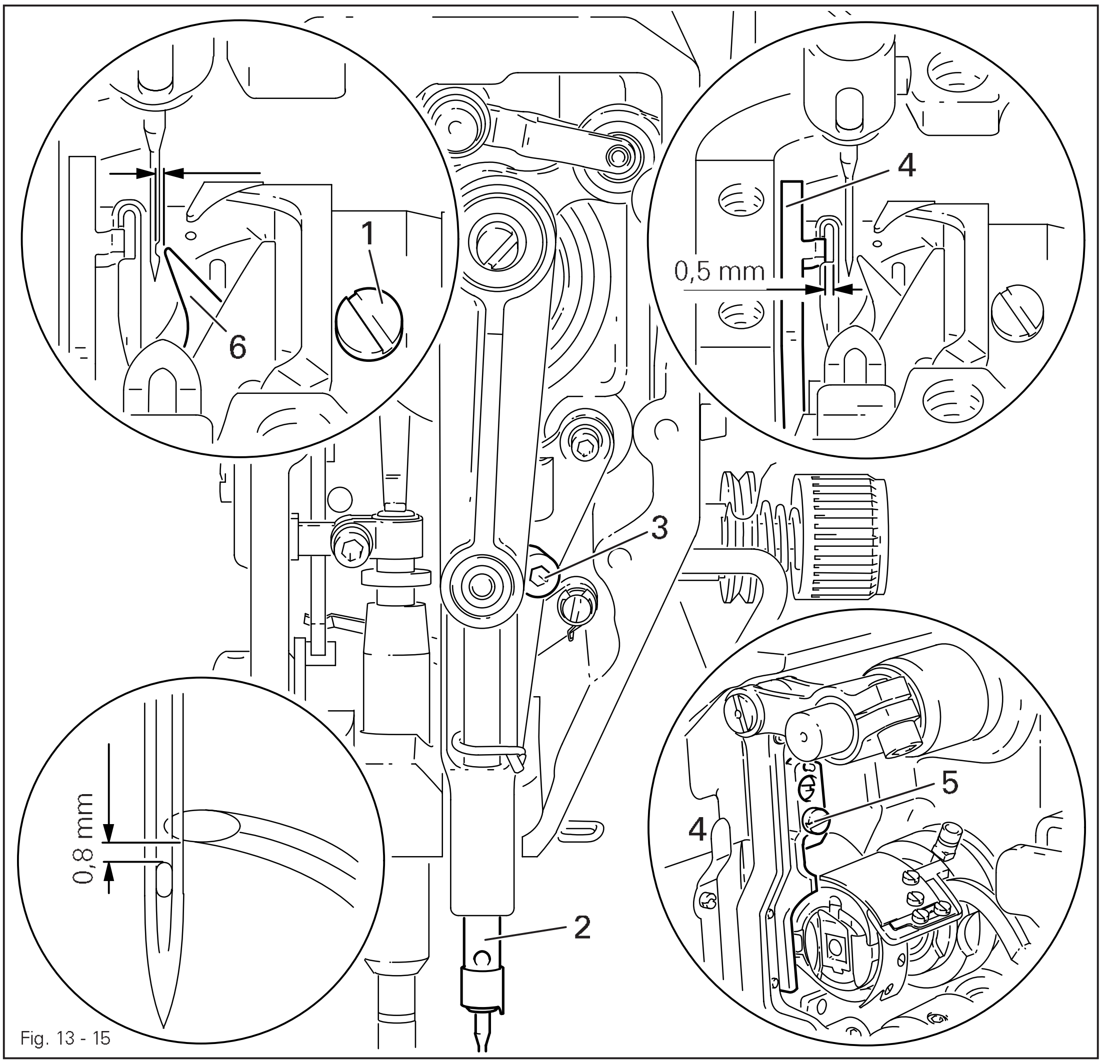
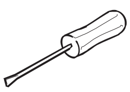


Fig. 13 - 15



- Using the adjustment pin, position the needle bar at **1.8 mm** after BDC.
- Adjust the hook according to **requirement 1.**
- Tighten screw **1.**
- Move needle bar **2** (screw **3)** without turning it according to **requirement 2.**
- Align bobbin case position finger **4** (screw **5)** according to **requirement 3.**

13.05.15 Thread check spring and slack thread regulator

Requirement
1. The motion of the thread check spring must be completed when the needle point enters the material (spring stroke approx. **7 mm**).
2. When the thread loop is at its largest when going around the hook, the thread check spring must have moved by approx. **1 mm.**

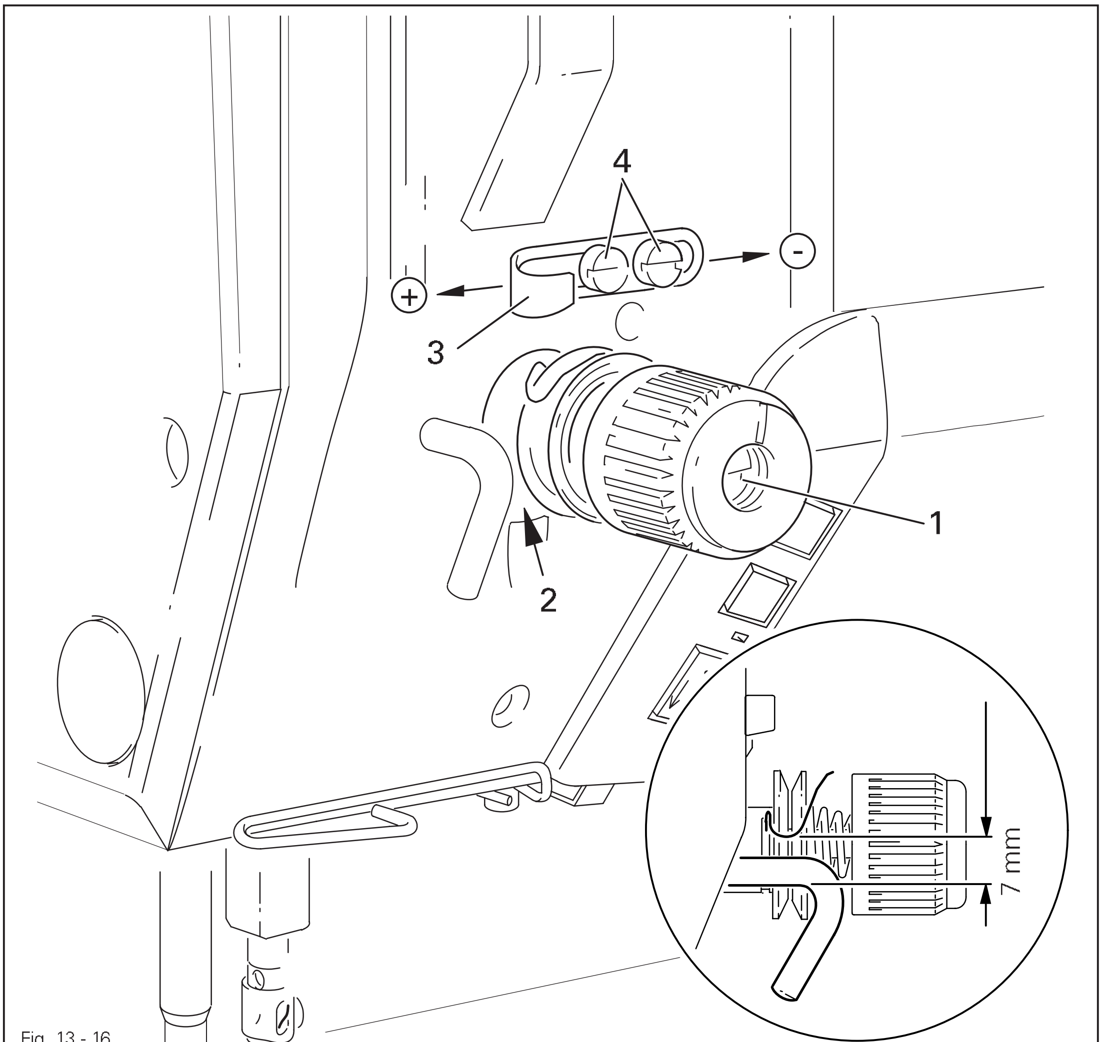
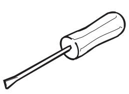
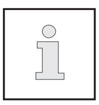


Fig. 13 - 16



- Turn thread tension **1** (screw **2**) according to **requirement 1.**
- Turn thread tension **3** (screw **4**) according to **requirement 2.**



Due to technical sewing reasons it may be necessary to deviate from the spring stroke indicated above.
Move the slack thread regulator **3** (screw **4**) toward the "+" (= more thread) or toward the "-" (= less thread)

13.05.16 Position of knee lever

Requirement

1. When the knee lever is in its resting position, the axle **5** must be parallel to the bedplate.
2. When the presser foot is resting on the needle plate, the presser bar lifting lever **6** must be touching the circlip **8** lightly and be at a distance of approx. **1 mm** from lifting piece **7.**

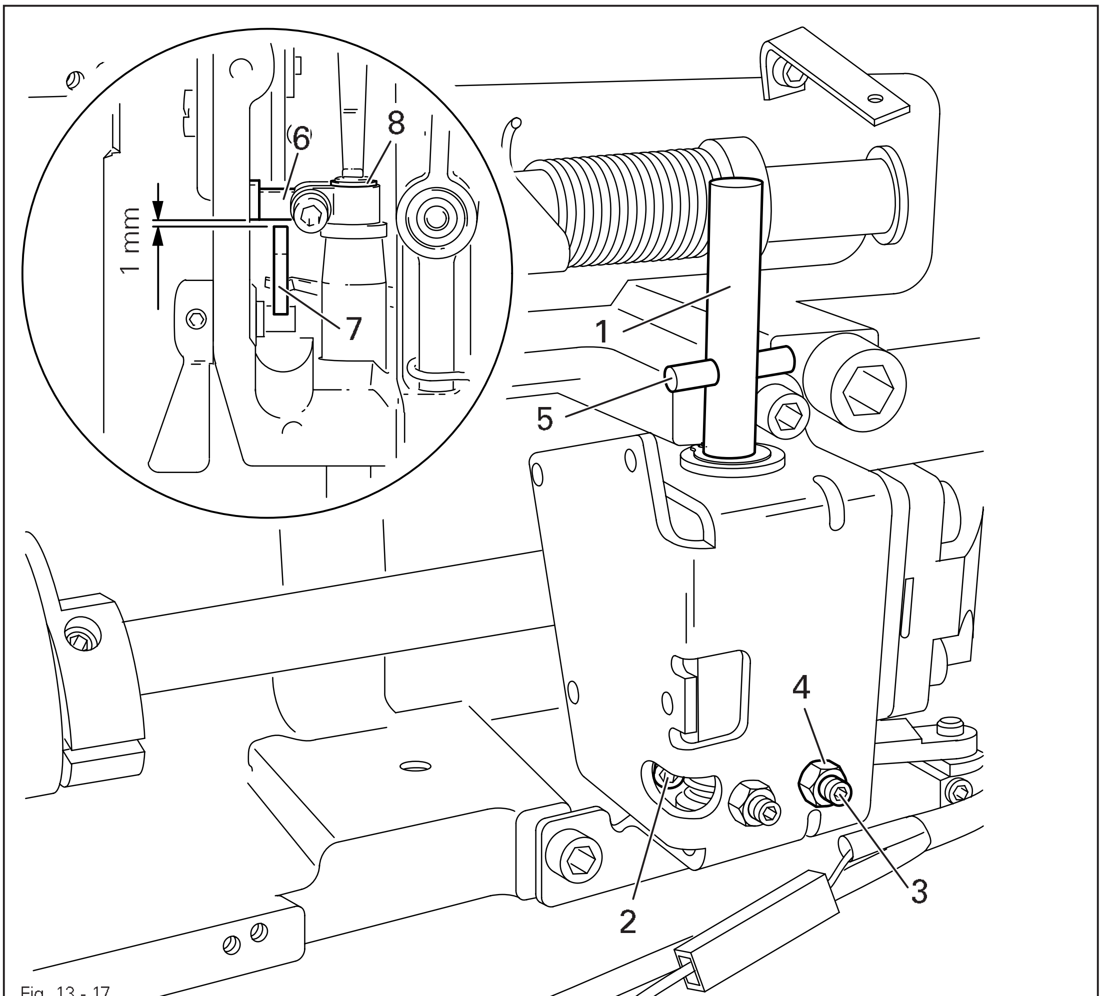


Fig. 13 - 17

- Lower the presser foot onto the needle plate.
- Turn shaft **1** (screws **2)** according to **Requirement 1.**
- Turn screw **3** (nut **4)** according to **Requirement 2.**

13.05.17 Knee lever stop

Requirement
When the knee lever is fully actuated,
1. the presser foot must be raised approx. **9 mm** (or approx. **13 mm** for a large needle bar stroke) above the needle plate, and
2. lever **3** must swing down automatically.

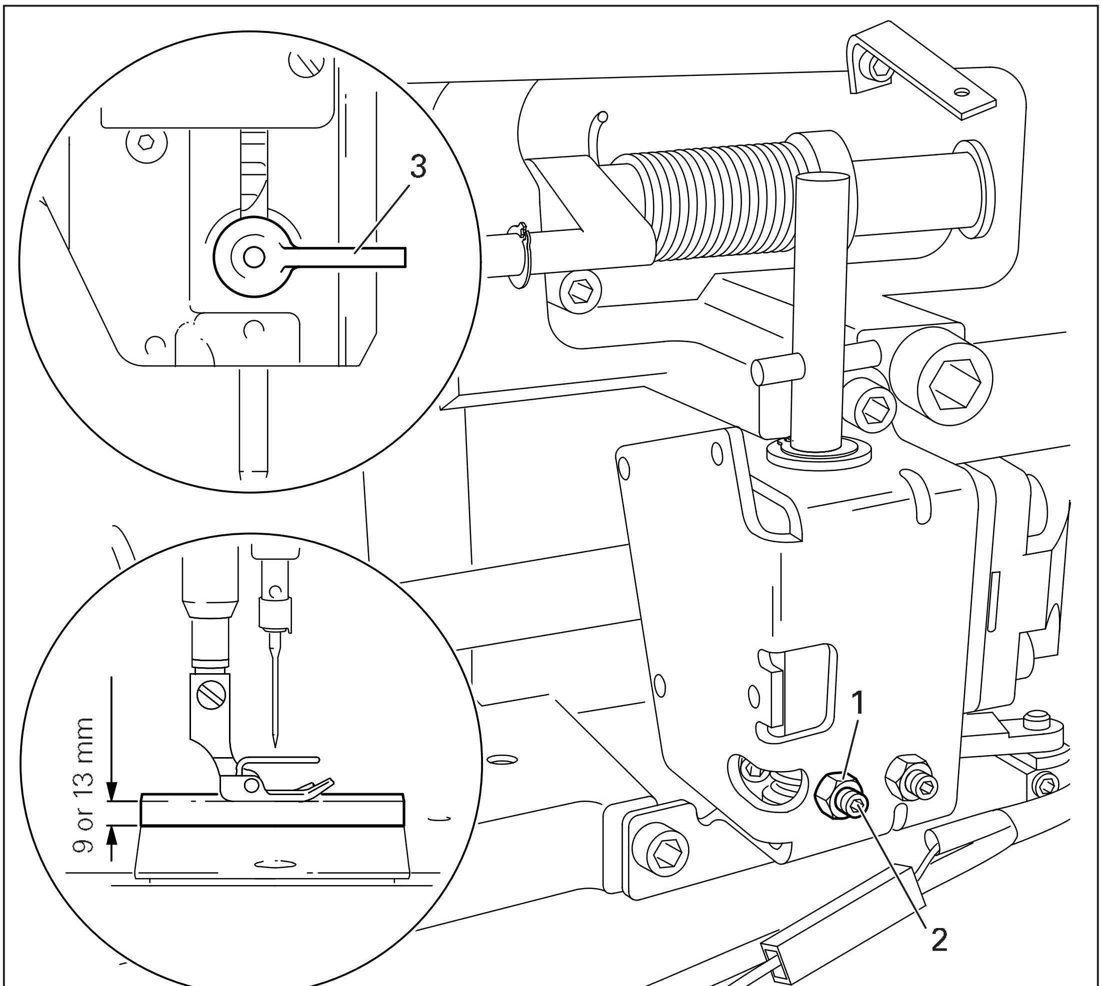
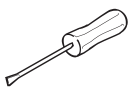


Fig. 13 - 18



- Loosen nut **1** and unscrew screw **2** a few turns.
- Raise the presser foot and slide a **9 mm** (for small needle bar stroke) or **13 mm** (for large needle bar stroke) thick spacer under the presser foot.
- Swing down lever **3**
- Move the knee lever until it is fully actuated. The presser foot must remain on the spacer.
- Now turn screw **2** as far as it will go.
- Turn screw **2** a half turn back and tighten nut **1.**

13.05.18 Bobbin winder

Requirement

1. With the bobbin winder on, the drive wheel **1** must engage reliably.
2. With the bobbin winder off, the friction wheel **5** must not be driven by the drive wheel **1.**
3. The bobbin winder must turn off automatically when the thread level is approx. **1 mm** from the edge of the bobbin.

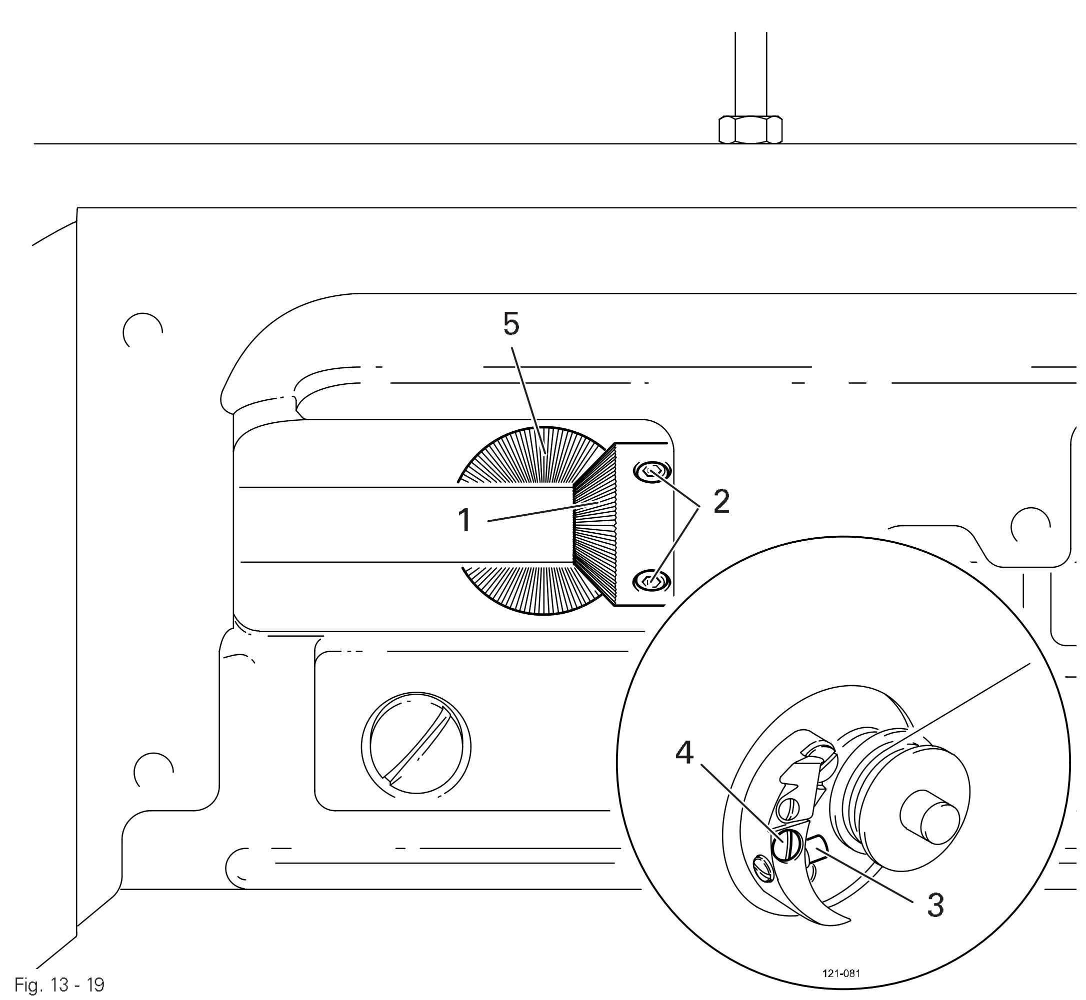
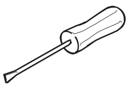


Fig. 13 - 19



- Move drive wheel **1** (screws **2**) in accordance with **requirement 1** and **2.**
- Move bolt **3** (screw **4**) in accordance with **requirement 3.**

13.05.19 Limiting the stitch length

The maximum stitch length which can be selected can be limited mechanically.

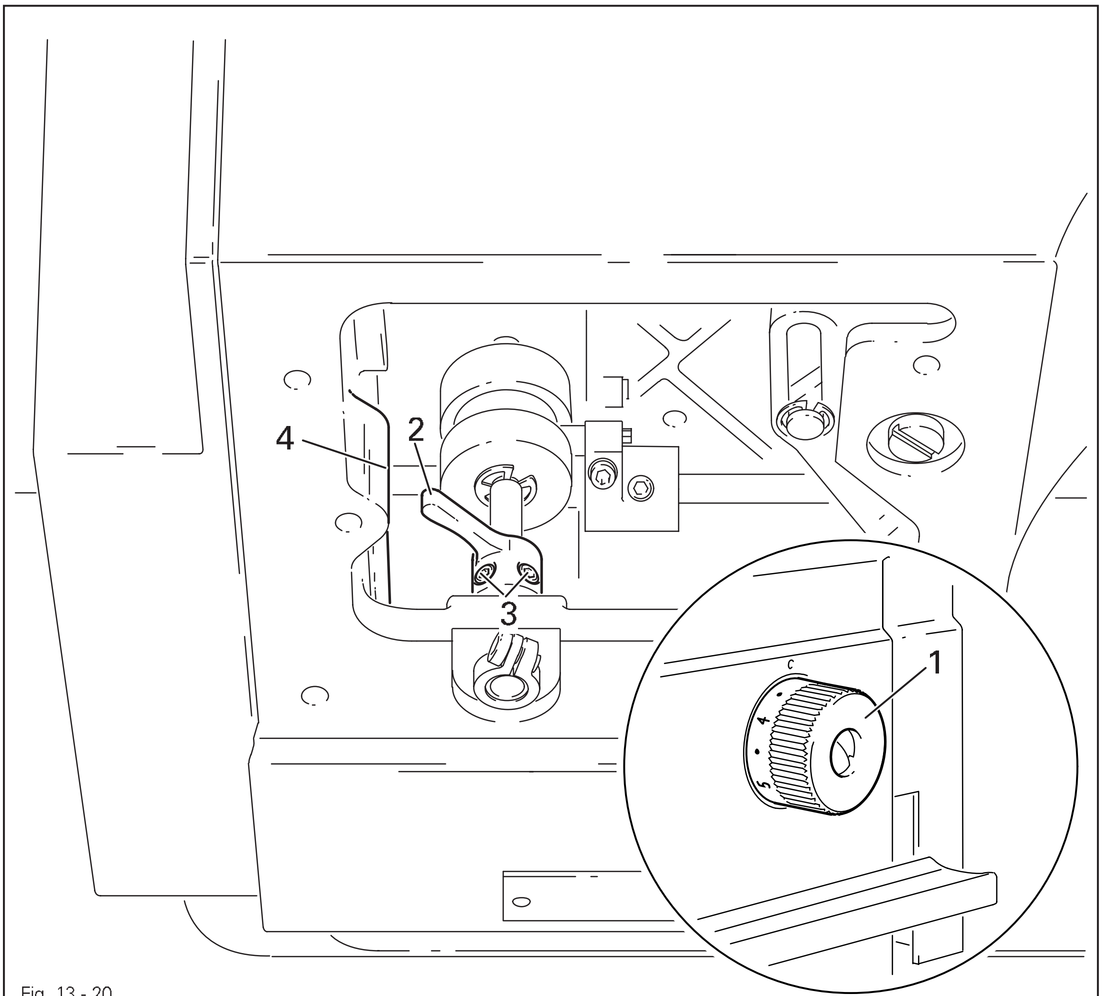


Fig. 13 - 20

When using Version **A** and **B** part sets, the maximum adjustable stitch length must **not be larger** than **3.0** or **4.5 mm** (see chapter **3 Specifications**, in the instruction manual)!

- Set the desired maximum stitch length with regulator disk **1.**
- Move crank **2** (screws **3**) down against stop **4.**

13.05.20 Presser foot pressure

Requirement
The material must be fed reliably. In the process, pressure marks on the material must not be made.

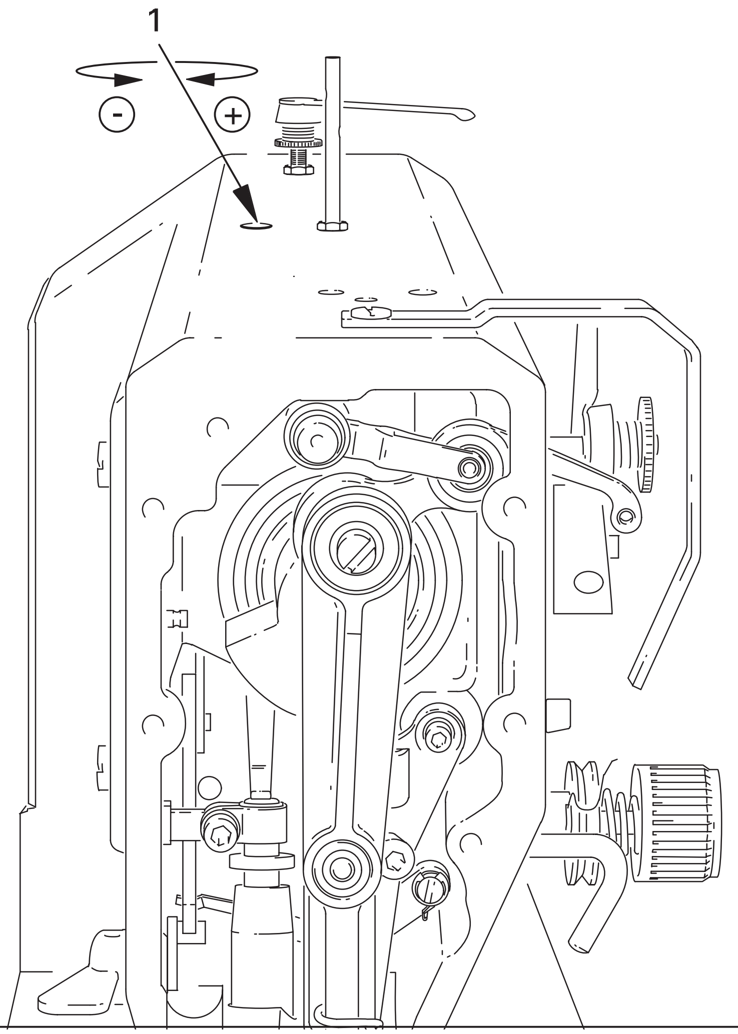
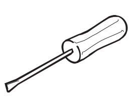


Fig. 13 - 21



- Turn screw **1** in accordance with the **requirement**.

13.05.21 Modifying the needle bar stroke

The needle bar stroke is preset in the factory according to **requirement**. The needle bar stroke can be modified later if specific operating conditions make it necessary to do so.

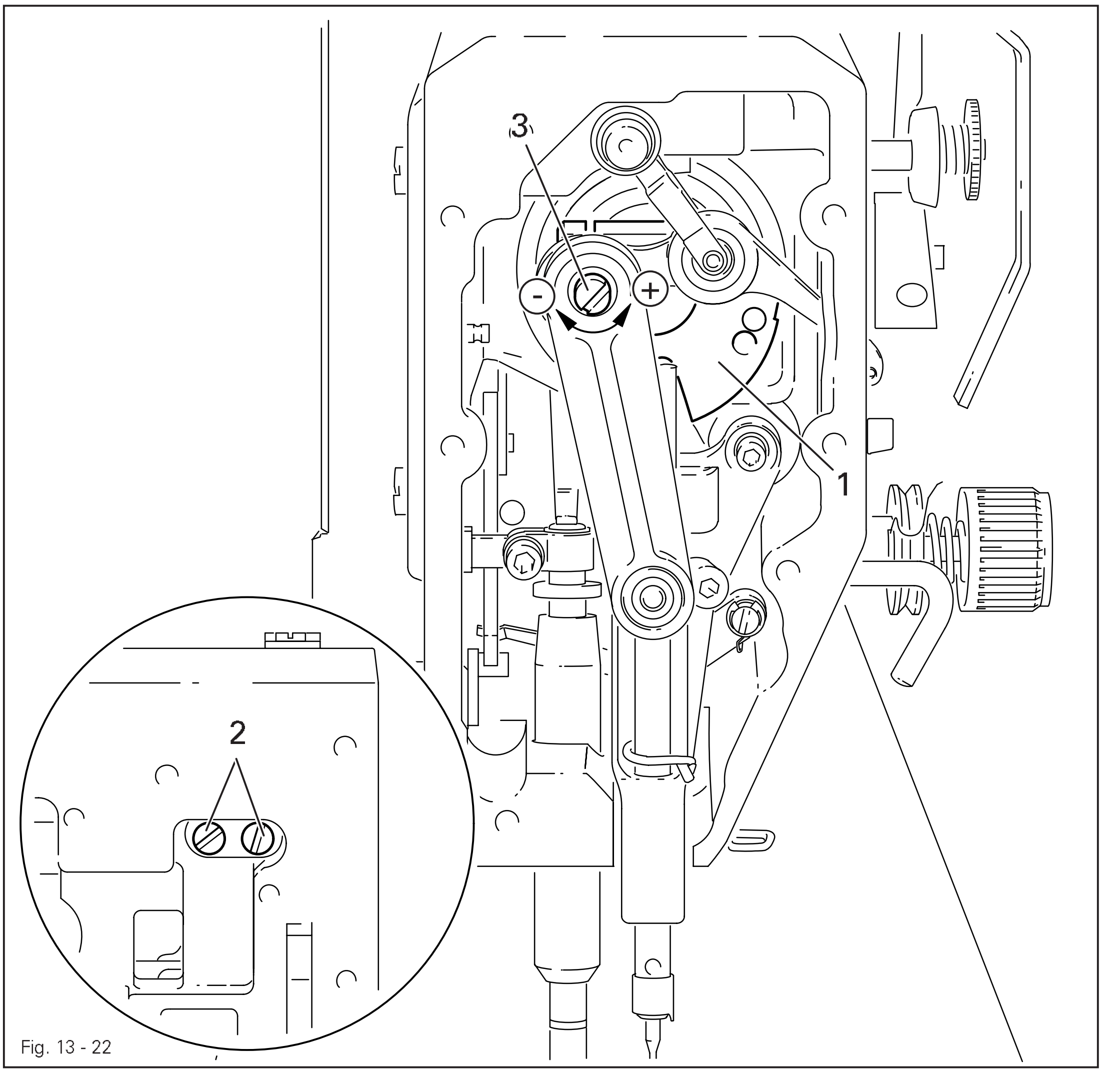


Fig. 13 - 22

When the needle bar stroke is altered, it is absolutely necessary to readjust the needle height! With a **36 mm** needle bar stroke, the maximum speed must be limited to **3800** spm.

- Via the hand wheel, turn crank **1** until the screws **2** can be accessed from the side opening of the housing.
- Turn eccentric **3** (screws **2**) as far as possible toward "+" (= large needle bar stroke) or toward "-" (= small needle bar stroke).
- Adjust needle height (see chapter **13.05.02 Preadjusting the needle height and** /or chapter **13.05.14 Needle rise, hook-to-needle clearance, needle height and bobbin case position finger.**

13.06 Adjusting the edge trimmer –731/01

13.06.01 Zero position of the knife

Requirement
With the edge trimmer switched off, the knife should not move when the balance wheel is turned.

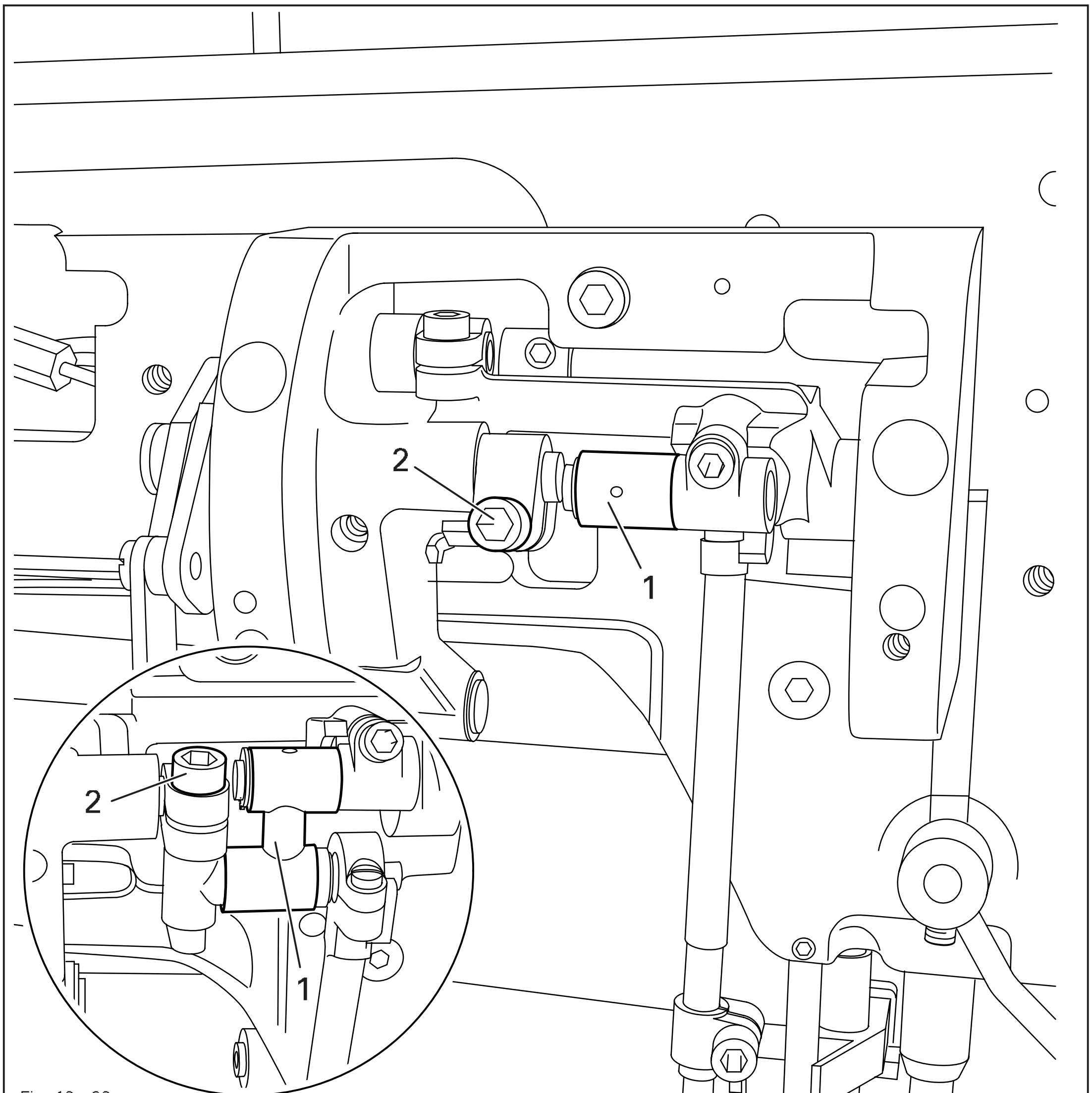
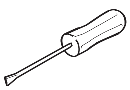


Fig. 13 - 23



- Turn crank **1** (screw **2**) according to the **requirement**.

13.06.02 Cutting motion

Requirement
With the edge trimmer switched on and the needle bar at its t.d.c. on the **PFAFF 1183,** or at its b.d.c. on the **PFAFF 1181,** the knife should be at the top of its stroke.

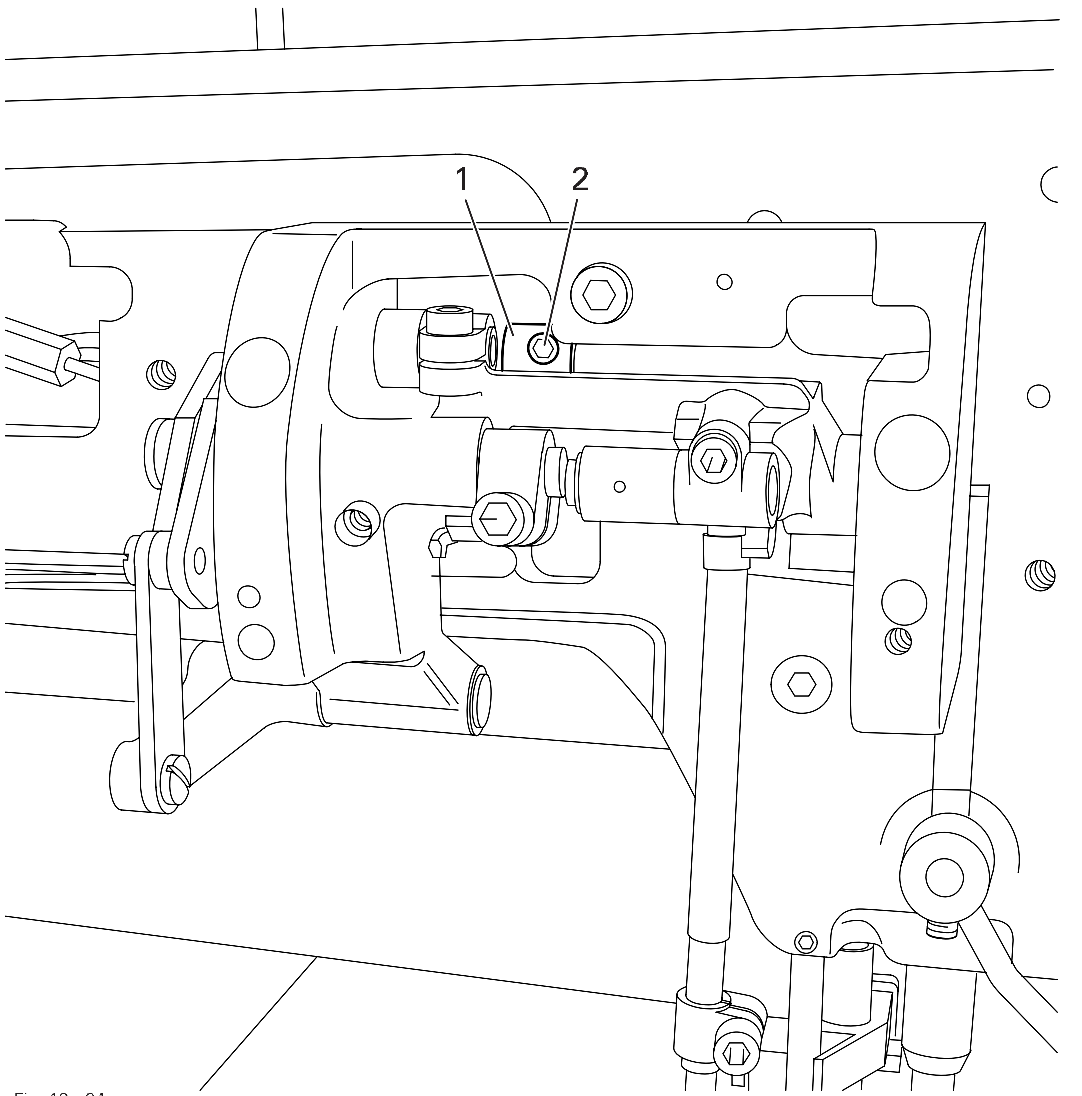
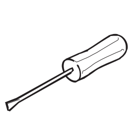


Fig. 13 - 24



- Switch on the edge trimmer and bring the needle bar to t.d.c. or b.d.c. (see **requirement**).
- Turn eccentric **1** (two screws **2)** according to the **requirement**.

13.06.03 Knife height

Requirement
When the knife is at the bottom of its stroke, the front edge of the knife blade should be approx. **0.5 mm** below the top edge of the stationary knife.

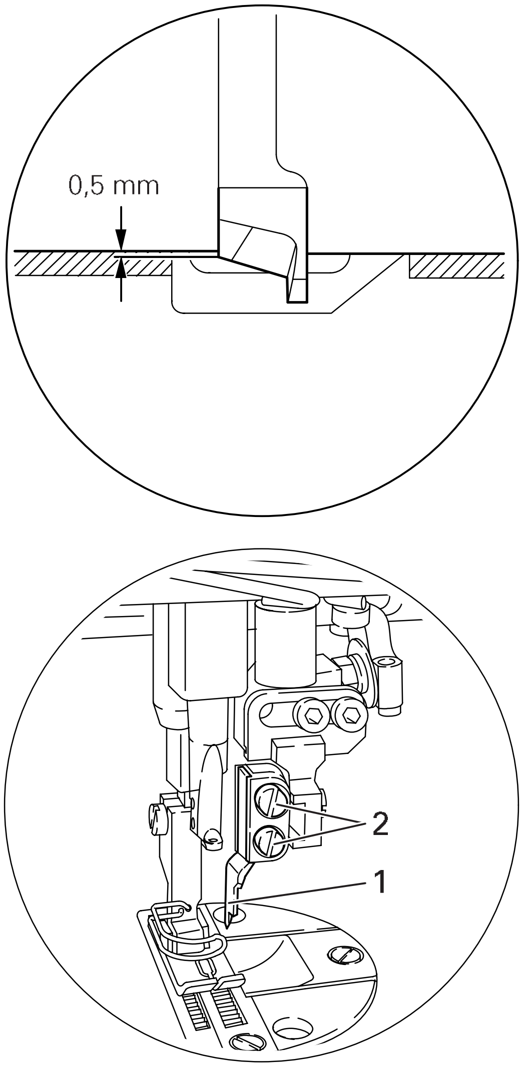
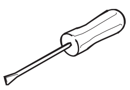


Fig. 13 - 25



- Switch on the edge trimmer and bring the knife to the bottom of its stroke.
- Adjust knife **1** (screws **2**) according to the **requirement**.

13.06.04 Cutting angle of the knife

Requirement
The knife should be
1. Touching the stationary knife **6** without counter pressure and
2. Be at a **0.1 mm** slant to the stationary knife **6.**

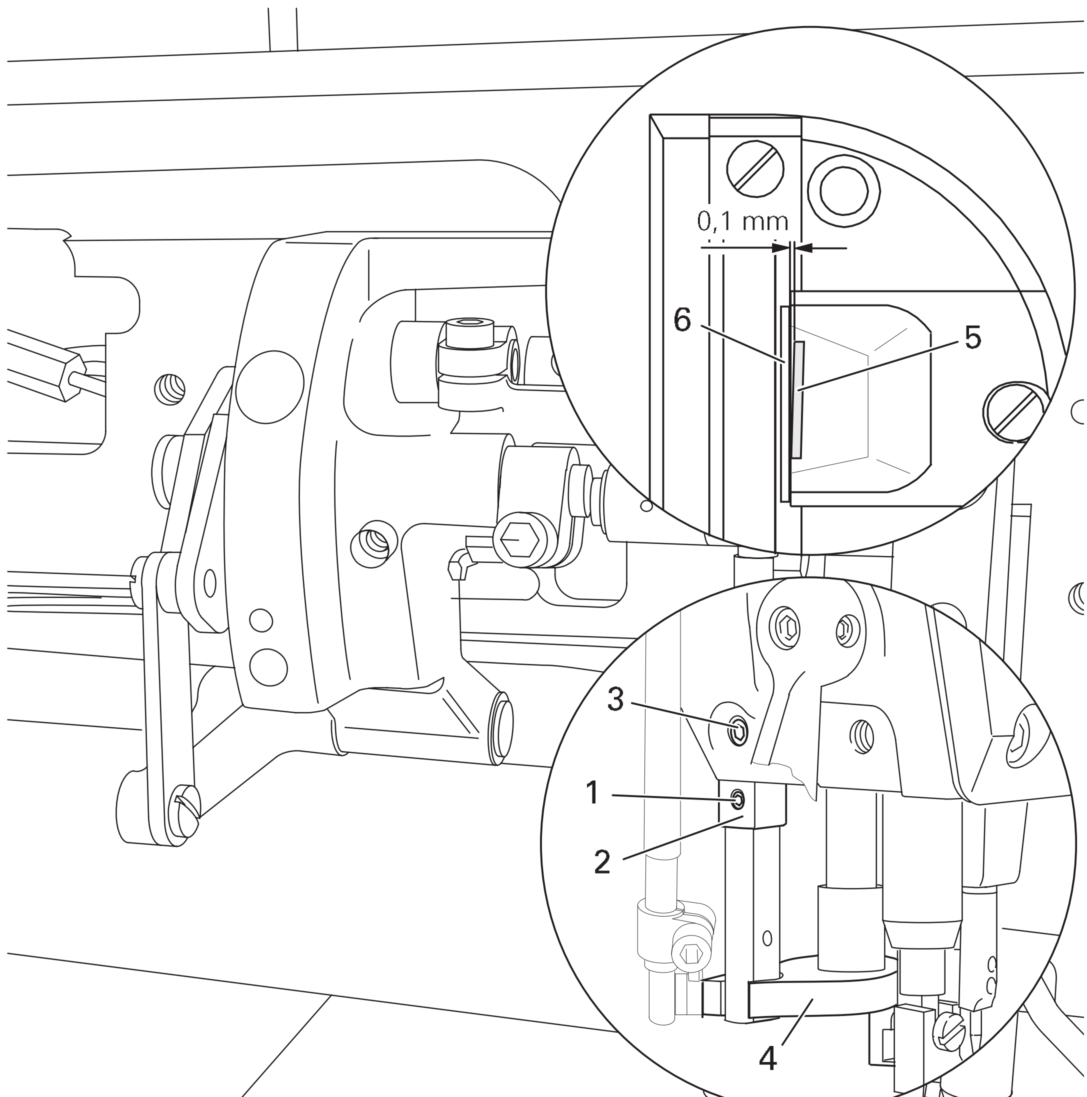
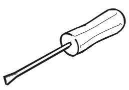


Fig. 13- 26



- Loosen screws **1.**
- Adjust eccentric **2** (screw **3)** in accordance with the **requirement**s.
- Tighten screws **1.**

Make sure that knife guide **4** is moving smoothly!

13.06.05 Knife position in sewing direction

Requirement
When the needle is at its b.d.c., the centre of the knife blade should be positioned at "needle centre".

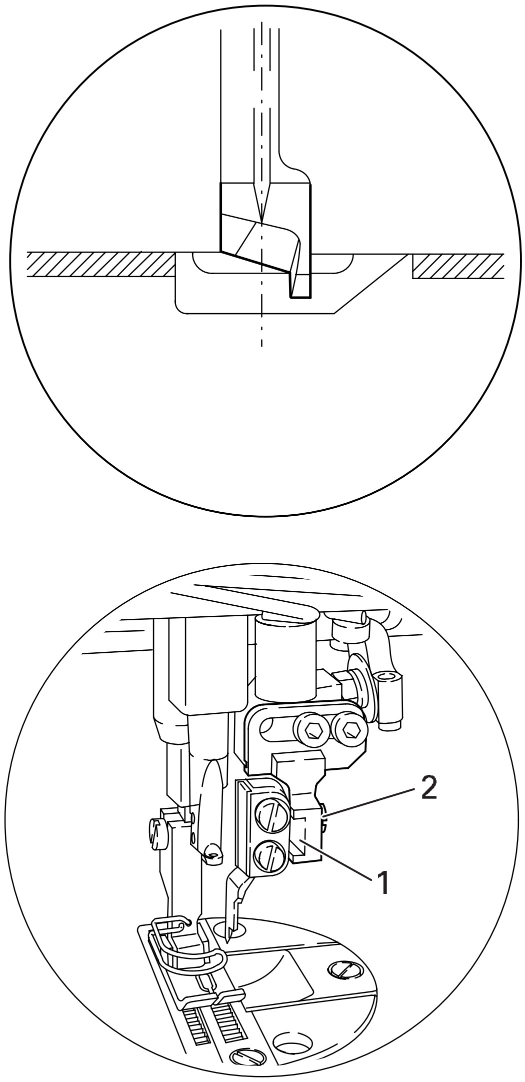
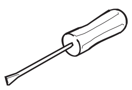


Fig. 13- 27



- Adjust knife bracket **1** (screw **2**) according to the **requirement**.

13.06.06 Knife position crosswise to sewing direction

Requirement
The knife should be resting on the stationary knife **3** with light pressure.

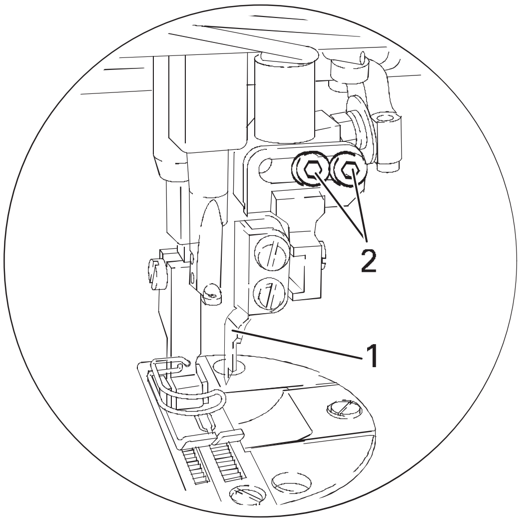
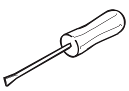


Fig. 13- 28



- Adjust knife bracket **1** (screw **2**) according to the **requirement**.

13.07 Adjusting the thread trimming device -900/24

13.07.01 Adjusting the solenoid / preliminary adjustment of the control cam

Requirement

1. When solenoid **3** is completely extended, roller lever **4** should be at the lowest point of the control cam.
2. When the needle bar is positioned at **1.8 mm** after b.d.c. (needle rise position), roller lever **4** should engage in the appropriate recess of the control cam.

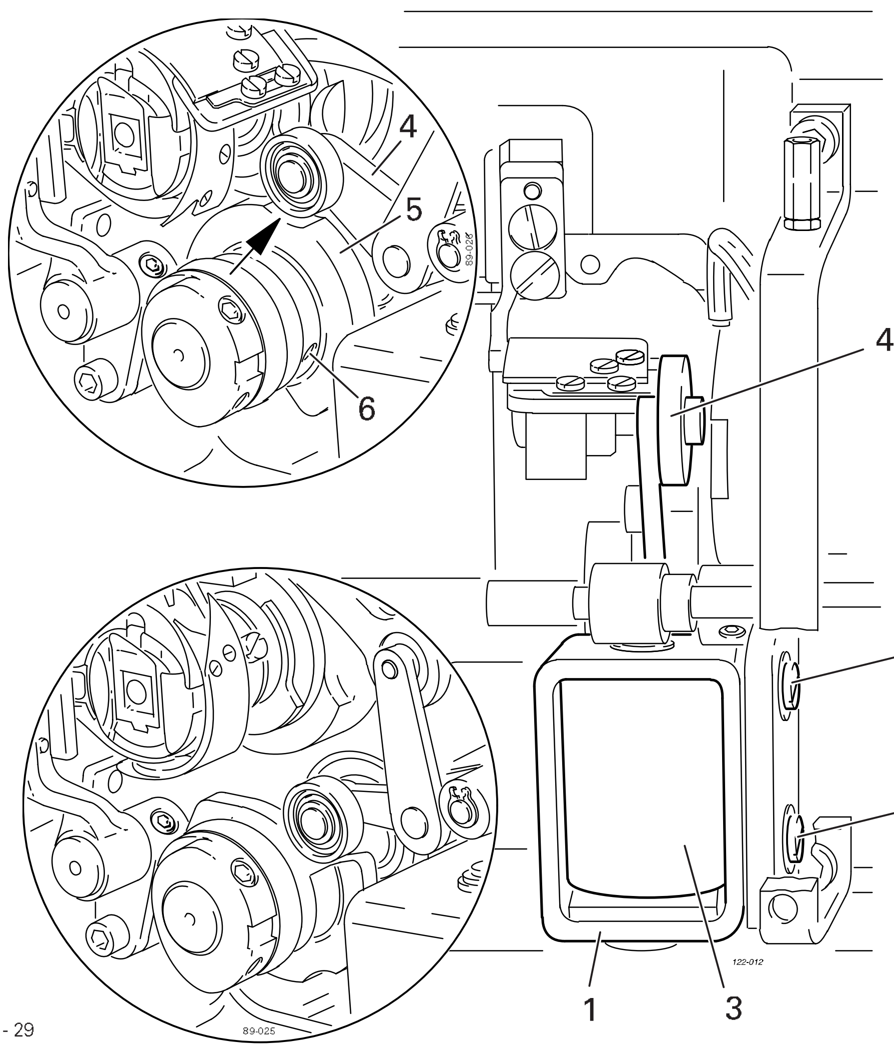
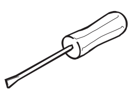


Fig. 13 - 29



- Adjust solenoid holder **1** (screws **2**) in accordance with **requirement 1.**
- Adjust control cam **5** (screws **6**) in accordance with **requirement 2.**

13.07.02 Lateral alignment of the thread catcher

Requirement

1. The tip of the thread catcher **5** must point exactly to the center of the needle.
2. The thread catcher **5** must be horizontal. It must not graze anything when it is operating.

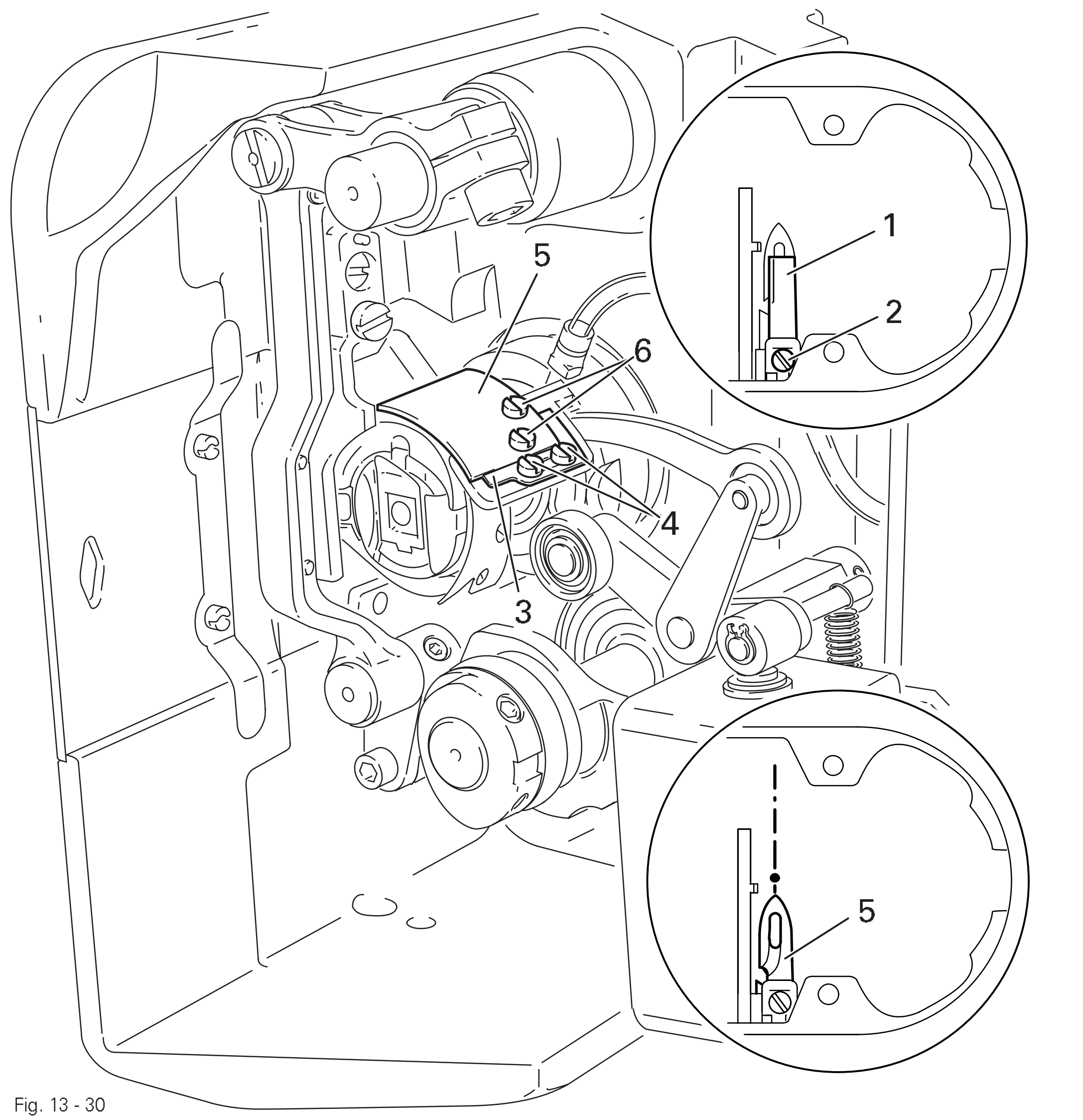
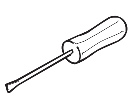


Fig. 13 - 30



- Remove knife **1** (screw **2**).
- Move needle bar to its BDC.
- Loosen stop **3** (screws **4**).
- Position thread catcher **5** (screw **6**) manually in front of the needle.
- Align thread catcher **5** (screws **7**) according to the **requirement**s.

For further adjustments, leave knife **1** removed and stop **3** loosened.

13.07.03 Knife position

Requirement
1. There must be a distance of **4 mm** between the cutting edge of the knife and the needle.
2. The right edge of the knife **1** must not extend beyond the right edge of the thread catcher (see arrow).

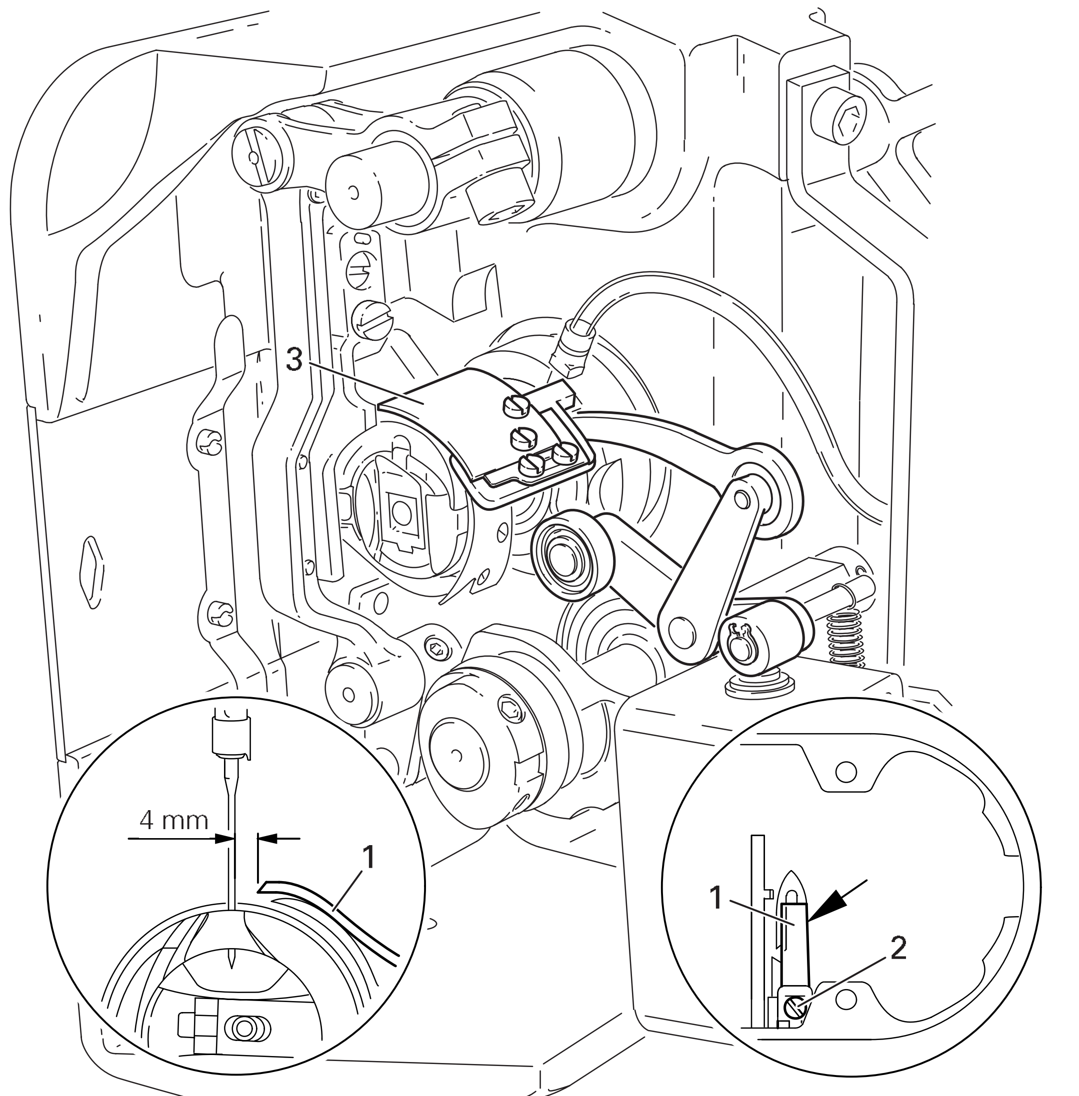
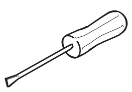


Fig. 13 - 31



- Bring the needle bar to BDC.
- Slide knife **1** under the locking tab and align according to **requirement 1.**
- Tighten screw **2** lightly.
- Adjust thread catcher carrier **3** by hand until the wedge point in the thread catcher is positioned just in front of the cutting edge of the knife.
- Align knife **1** according to **requirement 2** and tighten screw **2.**

13.07.04 Front point of reversal of the thread catcher

Requirement
At the front point of reversal of thread catcher **4**, the tip of the thread catcher cutout should be **1 mm** in front of the bobbin case position finger **5**.

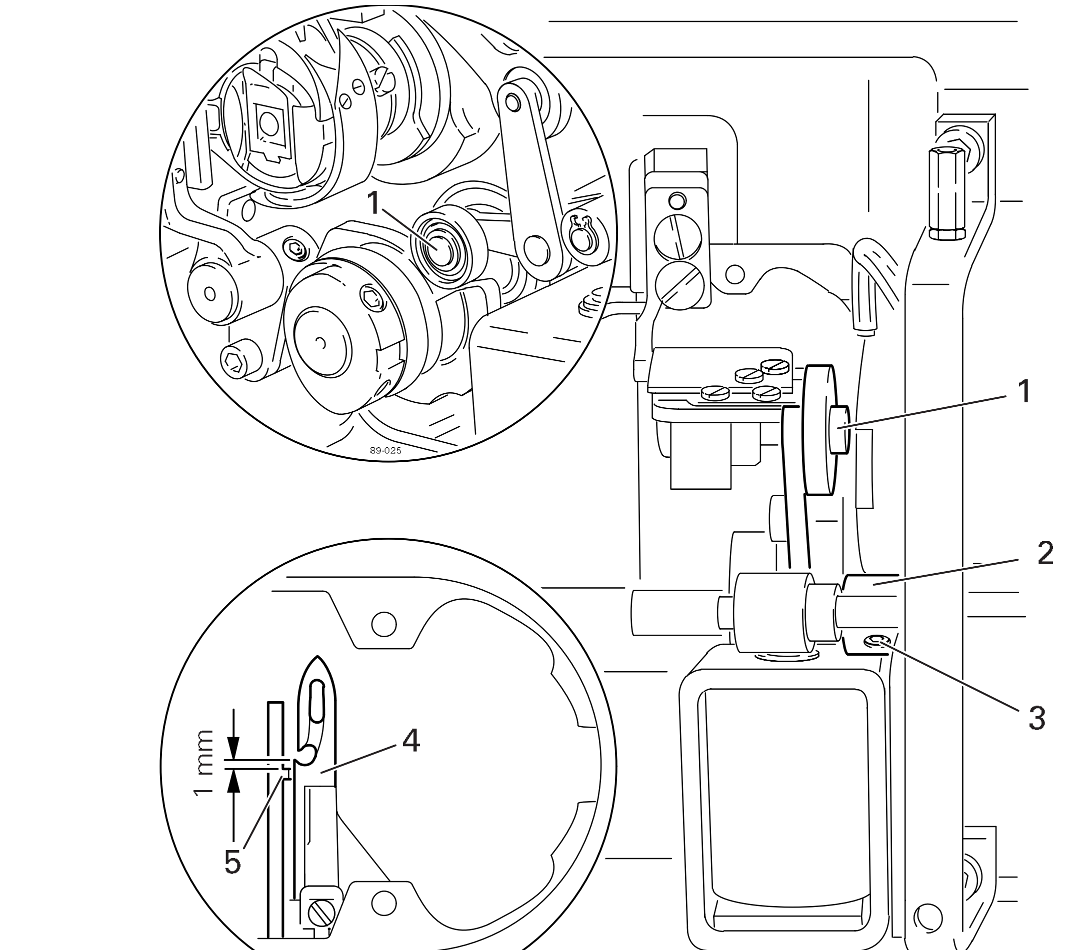
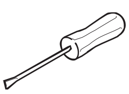


Fig. 13 - 32



- Position roller lever **1** at the lowest point of the control cam.
- Adjust bush **2** (screws **3**) according to the **requirement.**

13.07.05 Manual trimming check

Requirement
Two threads must be cut perfectly both left and right in the cutout of thread catcher **1.**

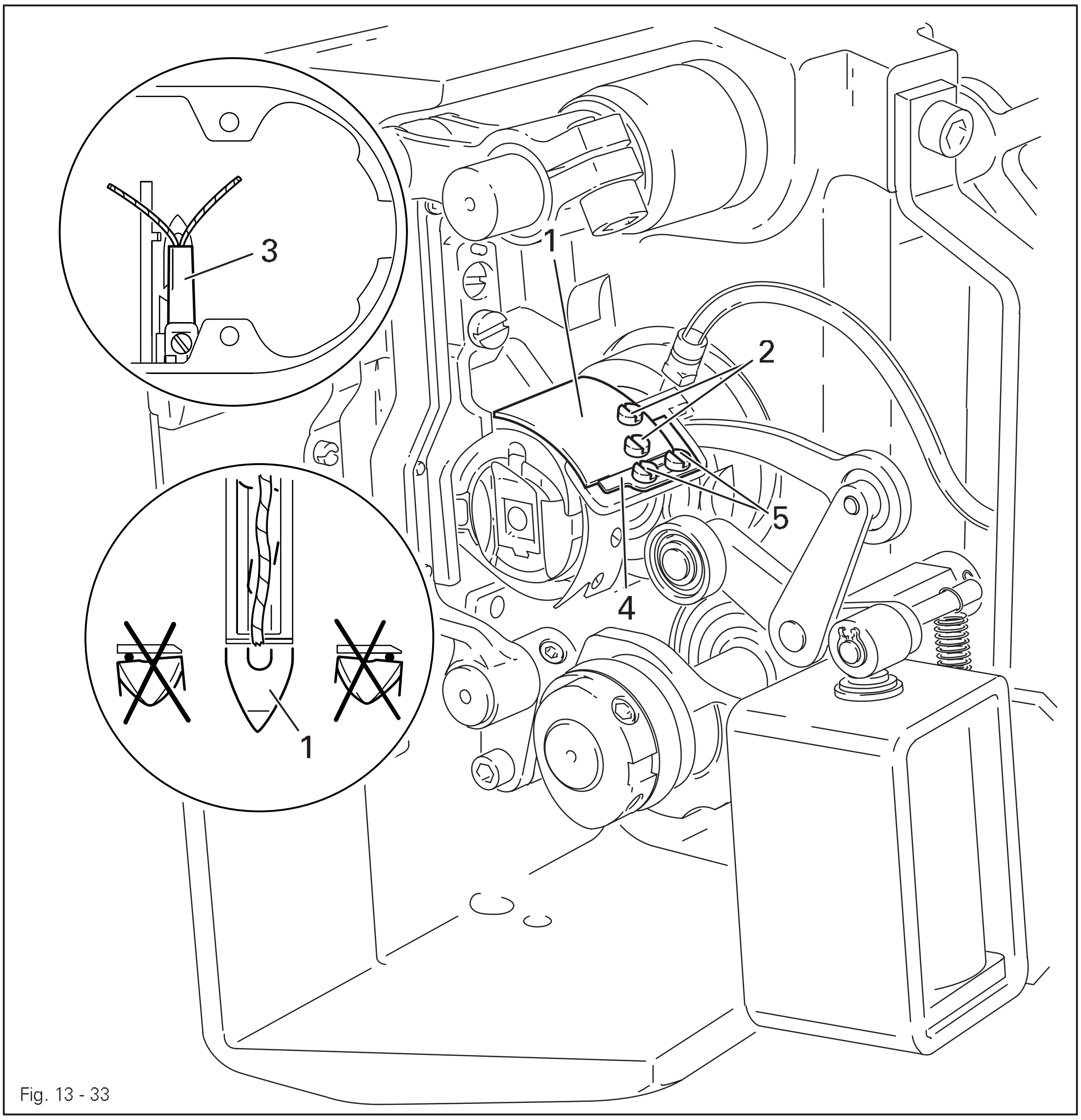


Fig. 13 - 33

- Move thread catcher **1** by hand to its front point of reversal.
- Double the thread and insert into catcher cutout.
- Carry out trimming operation manually.
- If the threads are not cut according to the **requirement**, align thread catcher **1** (screws **2)** with knife **3** accordingly.
- Move stop **4** against thread catcher **1** and tighten screws **5.**
- Check chapter **13.07.02 Lateral alignment of the thread catcher**, and readjust if necessary.

13.07.06 Needle thread tension release

Requirement
1. The magnet lift should be **1.5 mm**.
2. When the magnet **5** is operated by hand, there should be a distance of at least **0.5 mm** between the tension discs **6.**

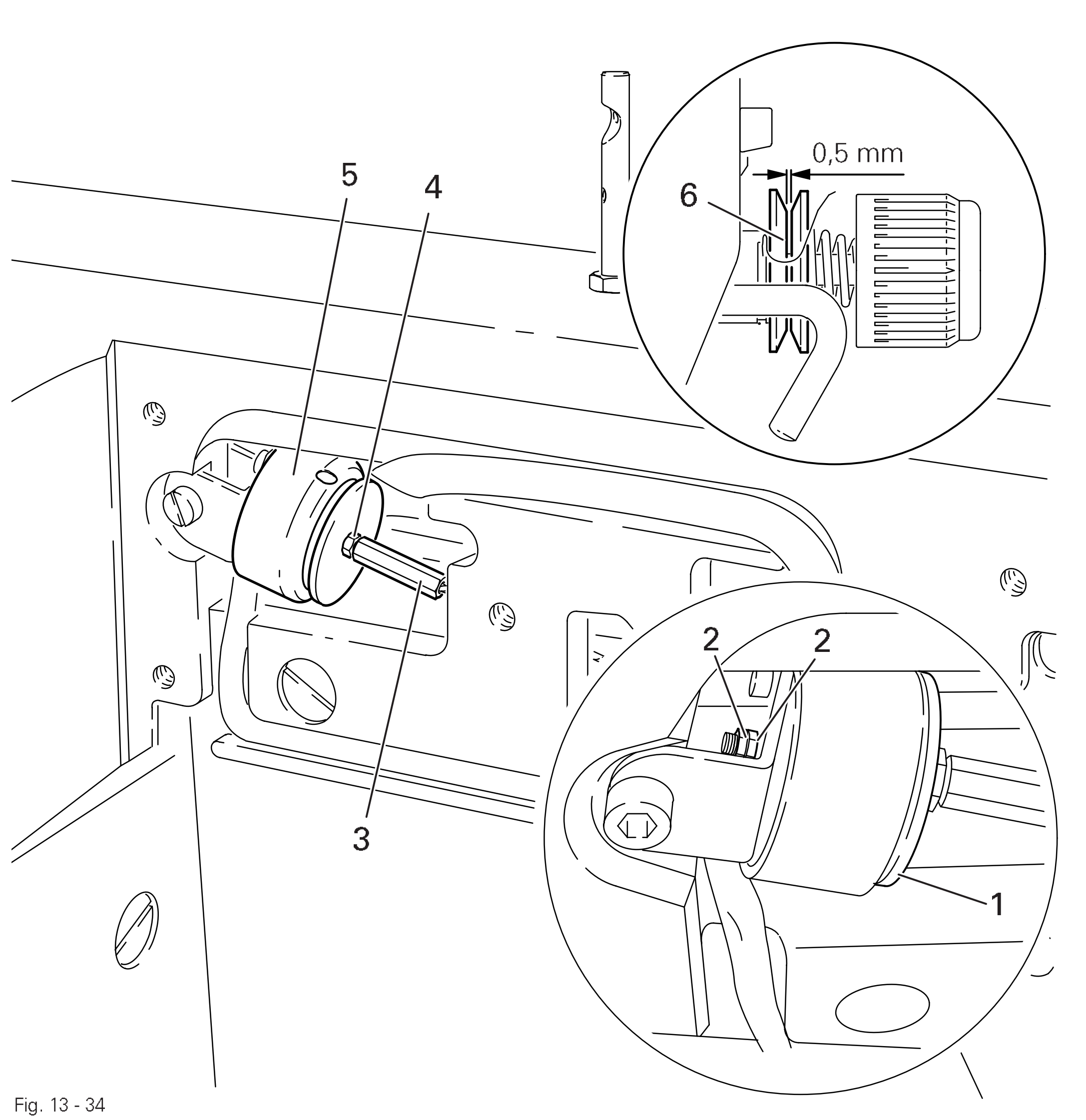
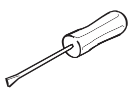


Fig. 13 - 34



- Adjust disc **1** (nuts **2**) according to the **requirement**.
- Adjust screw **3** (nut **4**) according to the **requirement**.

13.07.07 Readjusting the control cam

Requirement
When the take-up lever is in its t.d.c., control cam **1** should have moved thread catcher **3.**

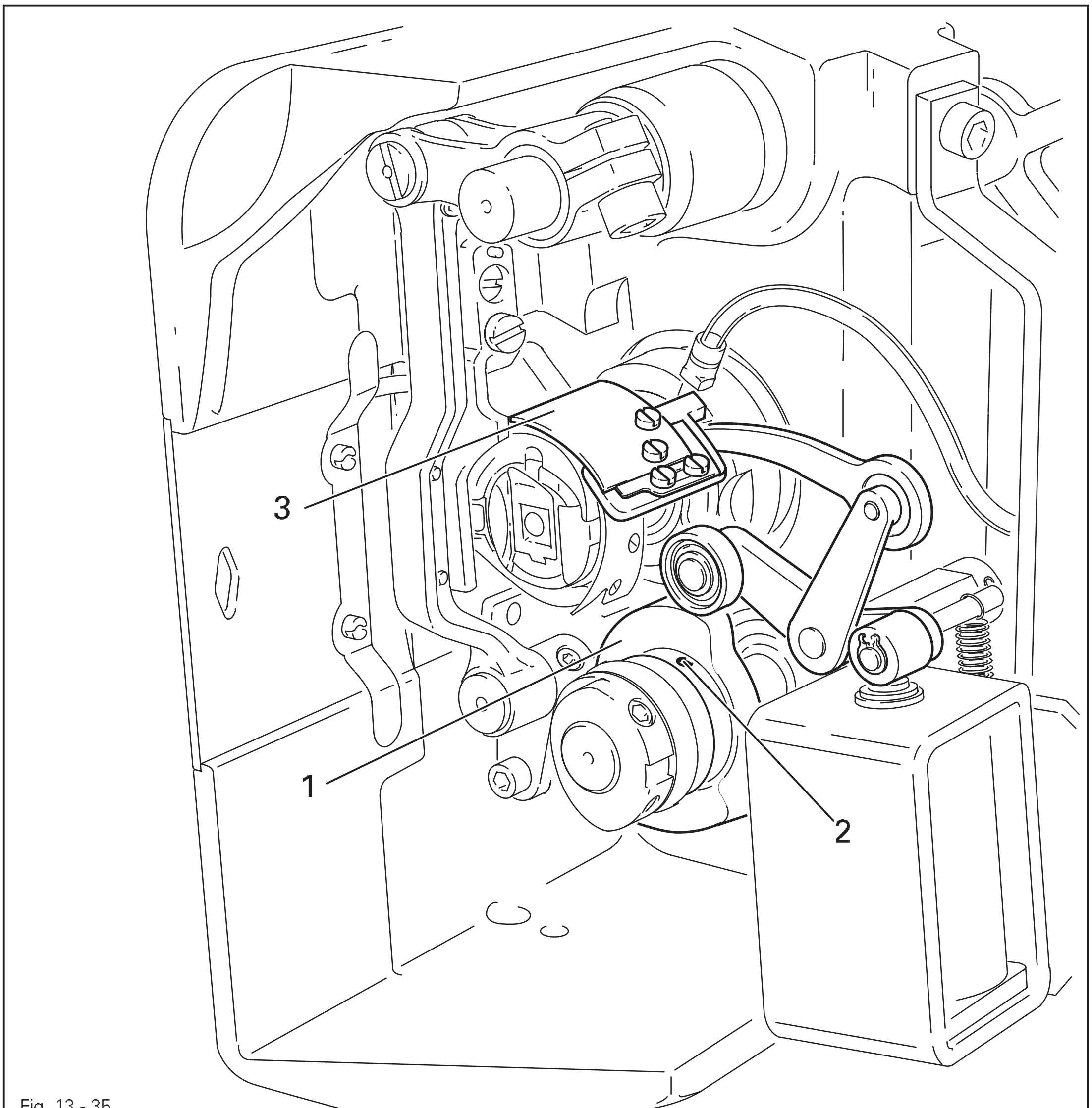
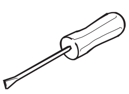


Fig. 13 - 35



- Adjust control cam **1** (screws **2**) according to the **requirement**.

13.08 Adjusting the automatic presser foot lift -910/06

Requirement
When the automatic presser foot lift is operated, the clearance between the presser foot and the needle plate must be **9 mm** for a small needle bar stroke and **13 mm** for a large needle bar stroke.

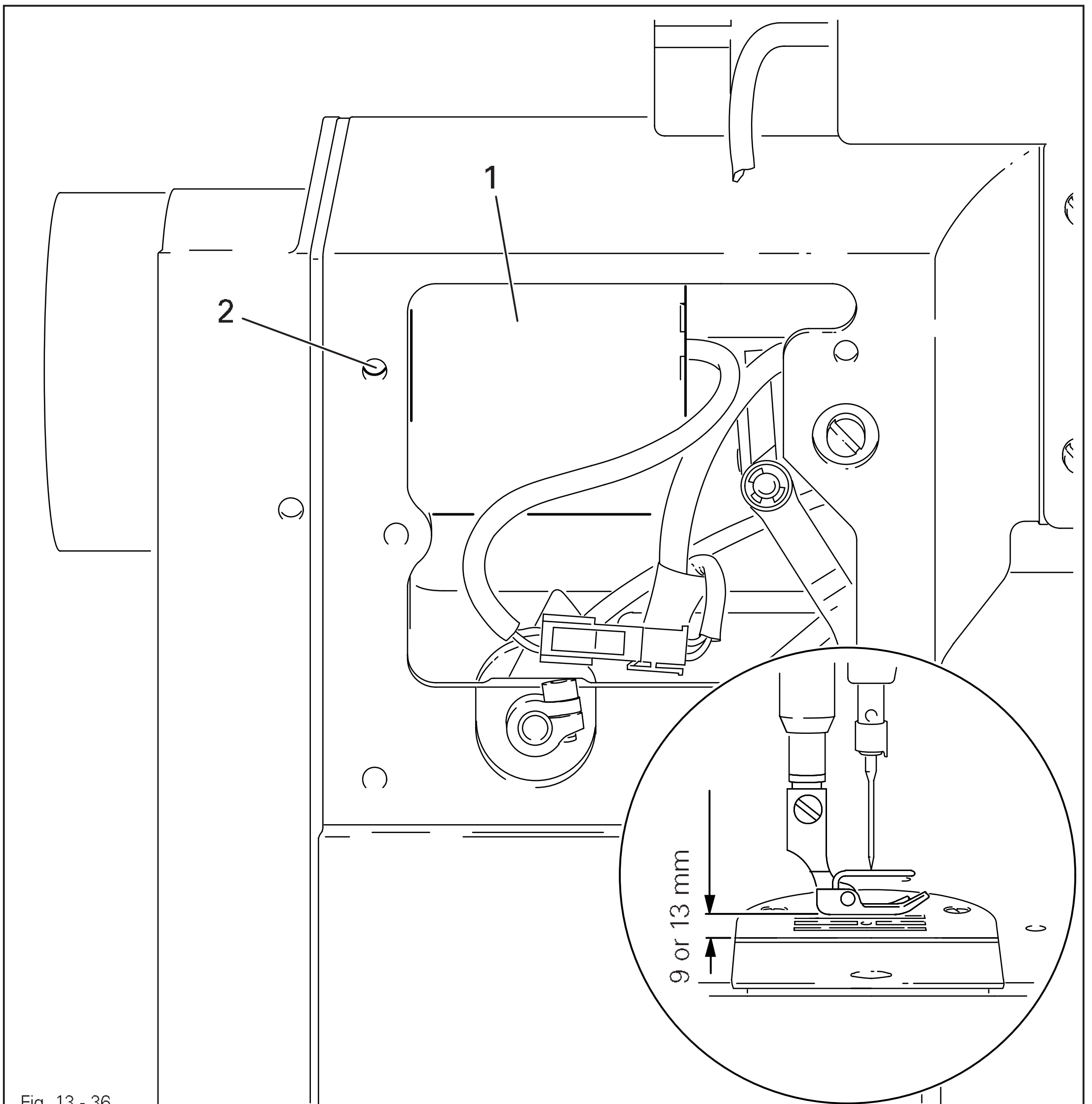
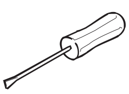


Fig. 13 - 36



- Move magnet **1** (screw **2**) according to the **requirement**.

13.09 Adjusting the back-tacking mechanism –911/37

Requirement
When the longest stitch length is set, the reverse-feed control switch **3** operated and the plunger extended, lever **1** should not touch the bed-plate..

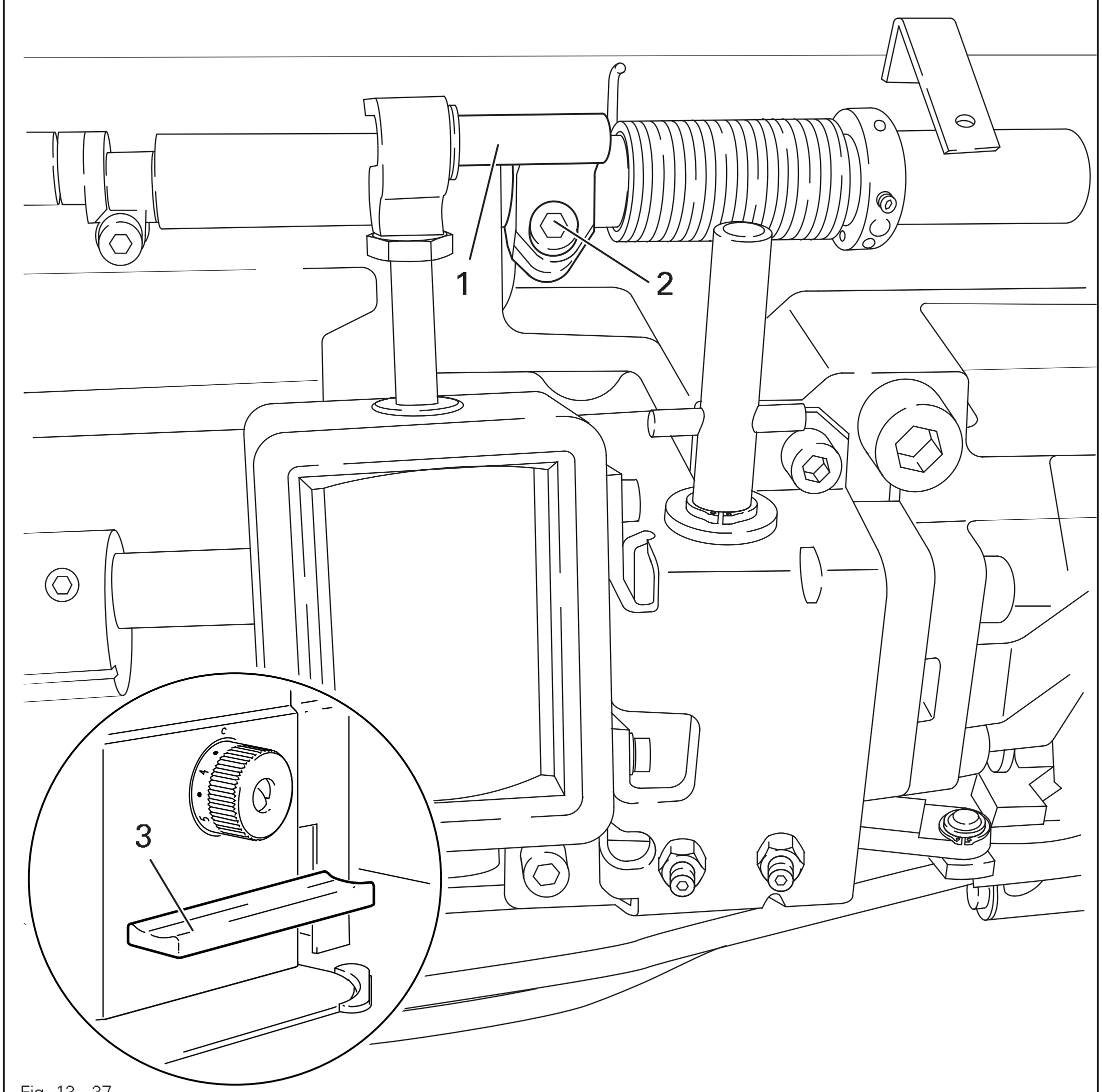
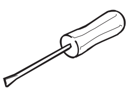


Fig. 13 - 37



- Adjust lever **1** (screw **2**) according to the **requirement**.

13.10 Parameter settings

(only on machines with Quick-EcoDrive and control unit P40ED or Quick-PicoDrive and control unit P40PD)

- The selection of the user level and the alteration of parameters is described in the separate instruction manual for the drive unit.

13.10.01 Parameter list

Group	Parameter	Description	User lever	Setting range	Set value P40 ED	Set value P40 PD
1	105	Speed for start backtackl	B, C	300 - 2000	1200	1200
	110	Speed for end backtack	B, C	300 - 2000	1200	1200
6	606	Speed min	B, C	30 - 300	180	180
	607	Speed max.	B, C	300 - 6000	▲	▲
6	609	Cutting speed 1	B, C	60 - 300	180	180
	660	Bobbin thread control 0 = off, 1 = thread monitor, 2 = reverse counter	A, B, C	0 - 2	0	-
	668	Thread wiper/thread blower 1 = on; 0 = off	B, C	0 - 1	0	-
7	700	Needle position 0 (needle reference position	B, C	0 -255	*	*
	702	Needle position 1 (needle lowered)	B, C	0 - 255	90	90
	703	Needle position 2 (take-up lever raised)	B, C	0 - 255	236	236
	705	Needle position 5 (end cutting signal 1)	B, C	0 - 255	200	200
	706	Needle position 5 (start cutting signal 2)	B, C	0 - 255	136	136
	707	Needle position 9 (start thread tension release/start thread catcher)	B, C	0 - 255	164	164
	760	Multiplier for the fixed value (200) stitch count	A,B, C	0 - 250	5	-
	797	Hardwaretest (OFF / ON),	B, C		OFF	OFF

▲ See Chapter **3** Specifications

* Adjustment see Chapter **8.05 Basic position of the machine drive unit.**

Group	Parameter	Description	User lever	Setting range	Set value P40 ED	Set value P40 PD
7	799	Selected machine class	C	1 - 3	1	2
8	800	Rotating direction of the motor	C	0 - 1	0	0
	802	Main drive reduction ratio 0 = 1:1 1 = variable	C	0 - 1	-	0
9	985	Switch on angle for thread trapper	B, C	0 -255	67	67
	986	Switch off angle for thread trapper	B, C	0 -255	206	206
	989	Thread trapper at beginning of seam 1 = yes, 0 = no	B, C	0 - 2	0	0

Further parameters and the description for an internet update of the machine software and reset /cold start of the machine can be found in the instruction manual for the control panel.

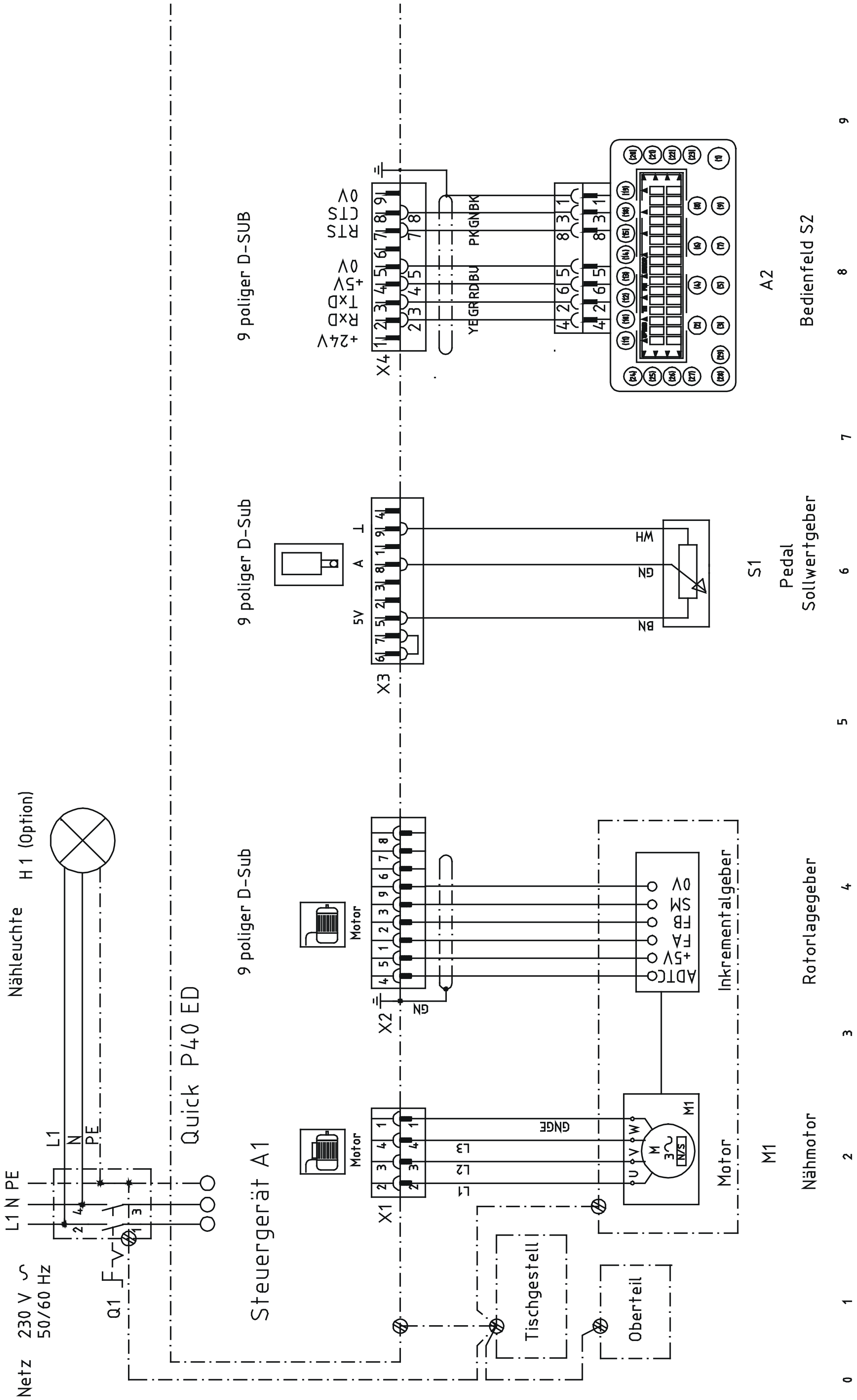
14 Circuit diagrams

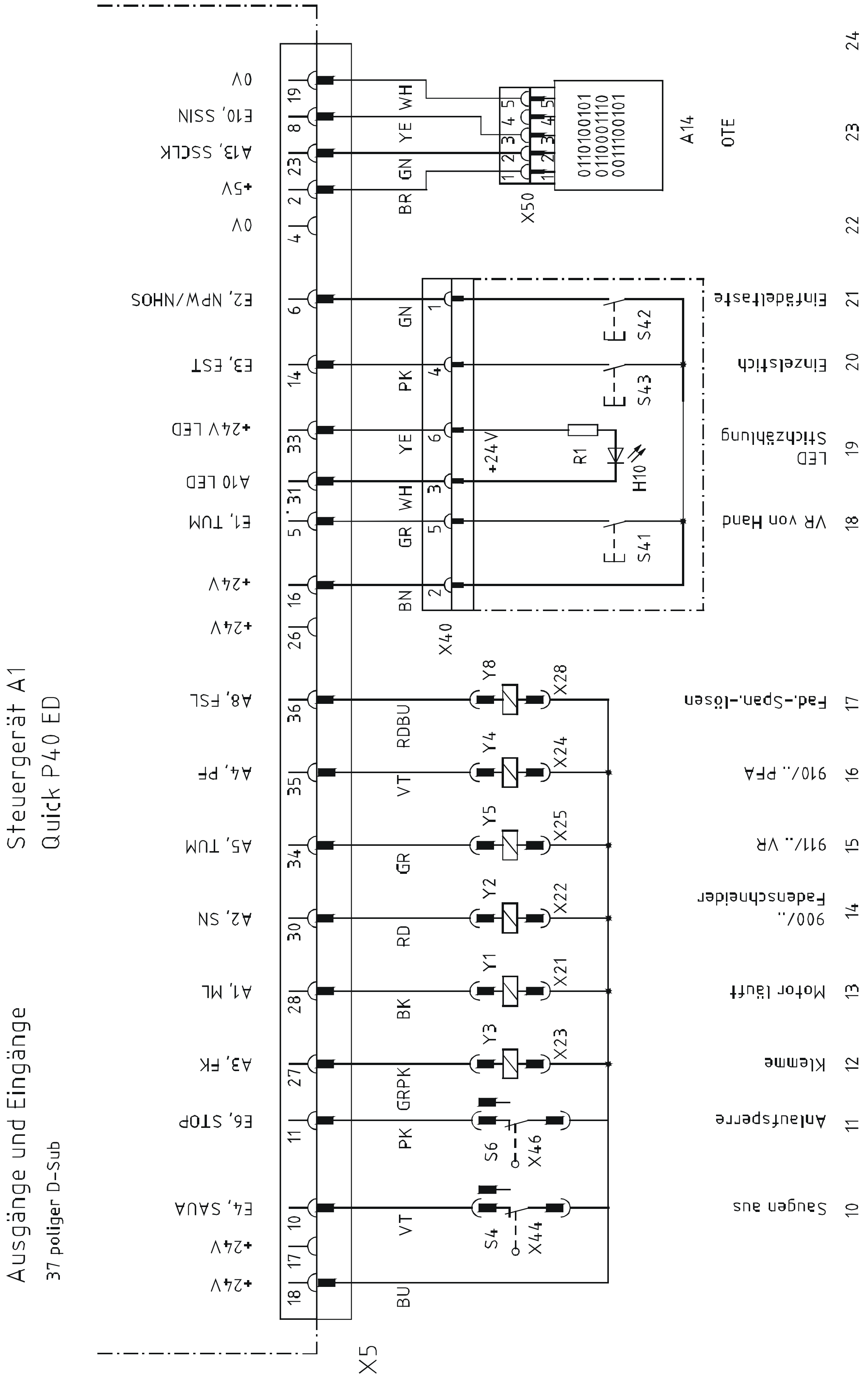
14.01 Reference list for the Circuit diagrams 91-191 516-95 and 91-191 521-95

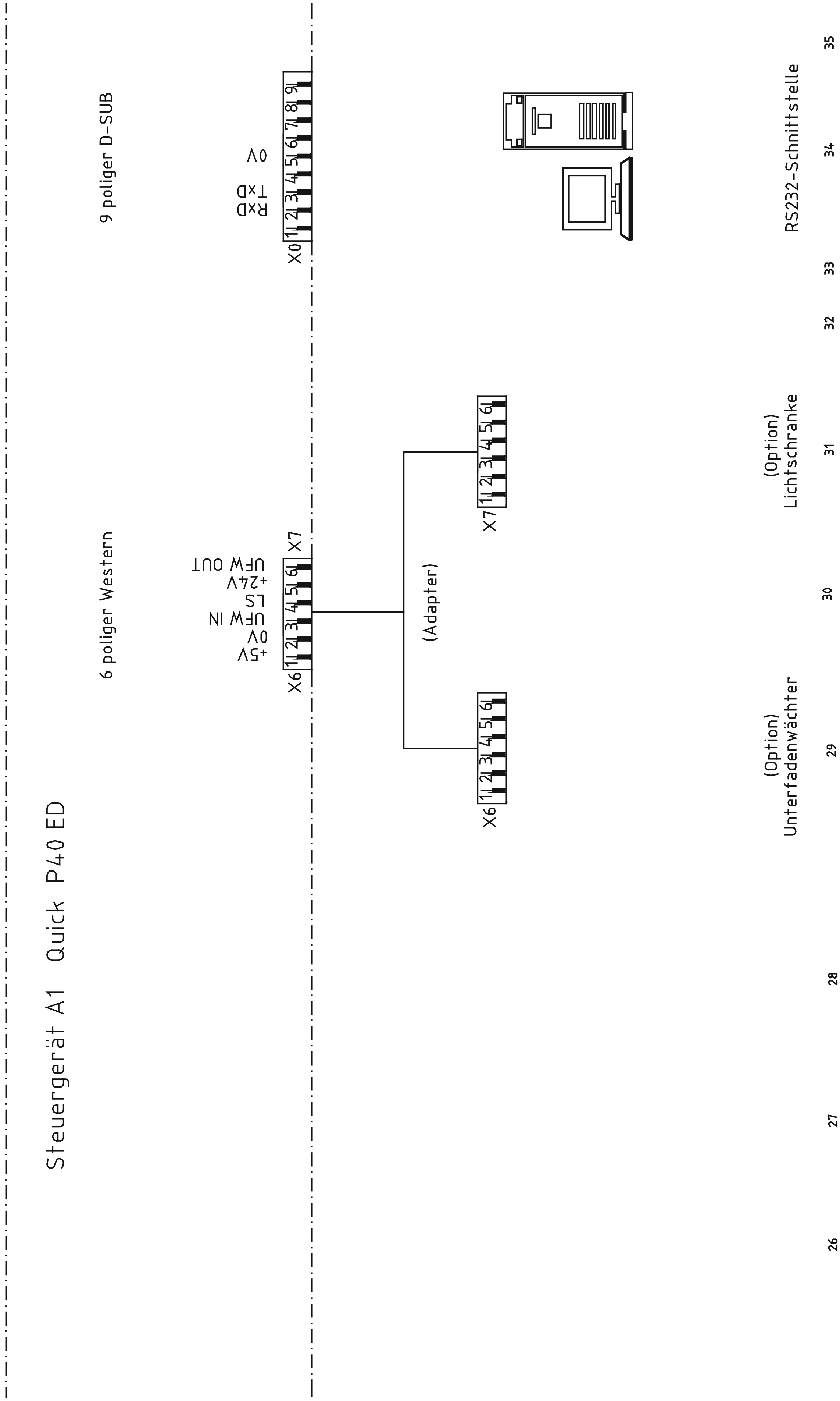
Control package		
	P40 ED	P40 PD
	91-191 516-95	91-191 521-95
A1	Control unit Quick P40ED	Control unit Quick P40PD
A2	S2 control panel	PicoTop control panel
A14	Sewing head recognition	-
H1	Sewing lamp	-
H10	LED reverse stitch counting	-
HQ1	-	Control lamp main switch
M1	Sewing motor with incremental transmitter	
M10	Knife motor	-
PD3	External synchronizer PD3 (sub-cl. -712/..)	-
Q1	Main switch	
S1	Pedal (speed control unit)	
S6	Start inhibitor switch	
S10	Knife motor key	-
S41	Manual backtacking key	
S42	Needle position change / threading key	
S43	Single stitch key	
S44	Suction off	-
X0	RS 232 interface (PC) plug	-
X1	Sewing motor plug	
X2	Incremental transmitter plug	
X3	Pedal (speed control unit) plug	
X4	S2 control panel plug	Pico to control panel/RS232 (PC) plug
X5	Outputs/inputs plug	
X6	Bobbin thread monitor plug (optional)	-
X7	Light barrier plug (optional	Synchronizer PD3 plug (optional)
X8	-	Light barrier plug (optional)
X21	Motor running	-
X22	Thread trimmer (-900/..) plug	
X23	Thread clamp plug	
X24	Automatic presser foot lift (-910/..) plug	
X25	Backtacking device (-911/..) plug	
X28	Thread tension release plug	
X40	Keyboard plug	
X44	Suction off plug	-
X46	Start inhibitor plug	
X50	Sewing head recognition plug	-

Control package		
	P40 ED	P40 PD
	91-191 516-95	91-191 521-95
Y1	Motor running	-
Y2	Thread trimmer (-900/..)	
Y3	Thread clamp	
Y4	Automatic presser foot lift (-910/..)	
Y5	Backtacking device (-911/..)	
Y8	Thread tension release	

14.02 Circuit diagrams 91-191 516-95




Steuergerät A1
Quick P40 ED
Ausgänge und Eingänge
37 poliger D-Sub
X5
X40
X50
A14
OTE
0110100101
0110001110
0011100101
0V
E10, SSIN
A13, SSCLK
+5V
0V
E2, NPW/NHOS
E3, EST
+24V LED
A10 LED
E1, TUM
+24V
+24V
A8, FSL
A4, PF
A5, TUM
A2, SN
A1, ML
A3, FK
E6, STOP
E4, SAUA
+24V
+24V
WH
YE
GN
BR
GN
PK
YE
WH
GR
BN
RDBU
VT
GR
RD
BK
GRPK
PK
VT
BU
+24V
R1
H10
S41
S42
S43
S4
S6
Y1
Y2
Y3
Y4
Y5
Y8
X21
X22
X23
X24
X25
X28
X44
X46
Einfädeltaste
Einzelstich
Stichzählung LED
VR von Hand
Fad.-Span.-lösen
910/.. PFA
911/.. VR
Fadenschneider 900/..
Motor läuft
Klemme
Anlaufsperre
Saugen aus


Steuergerät A1 Quick P40 ED
9 poliger D-SUB
X0
RxD
TxD
0V
6 poliger Western
X6
X7
+5V
0V
UFW IN
LS
+24V
UFW OUT
(Adapter)
X7
X6
RS232-Schnittstelle
(Option)
Lichtschranke
(Option)
Unterfadenwächter
26
27
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30
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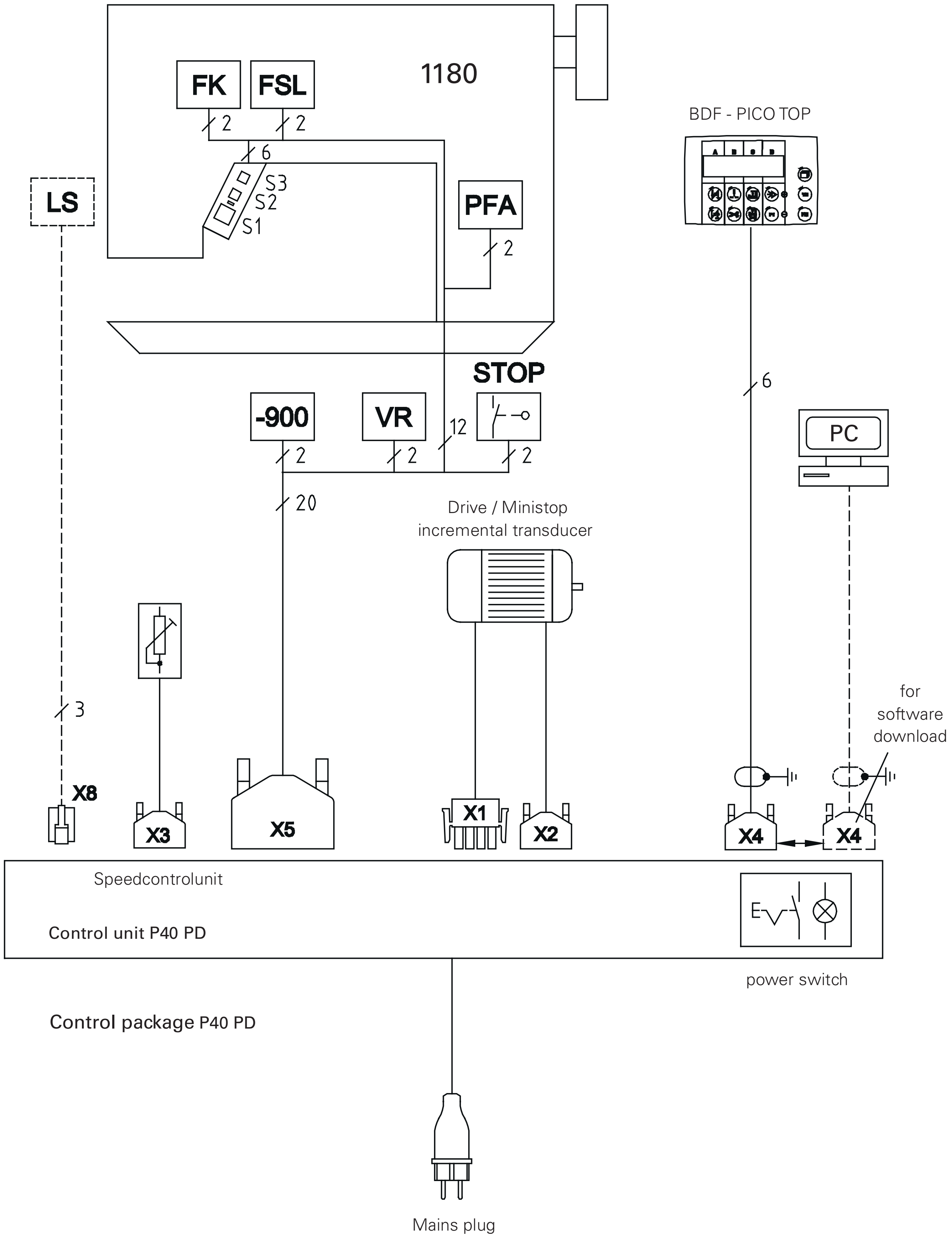
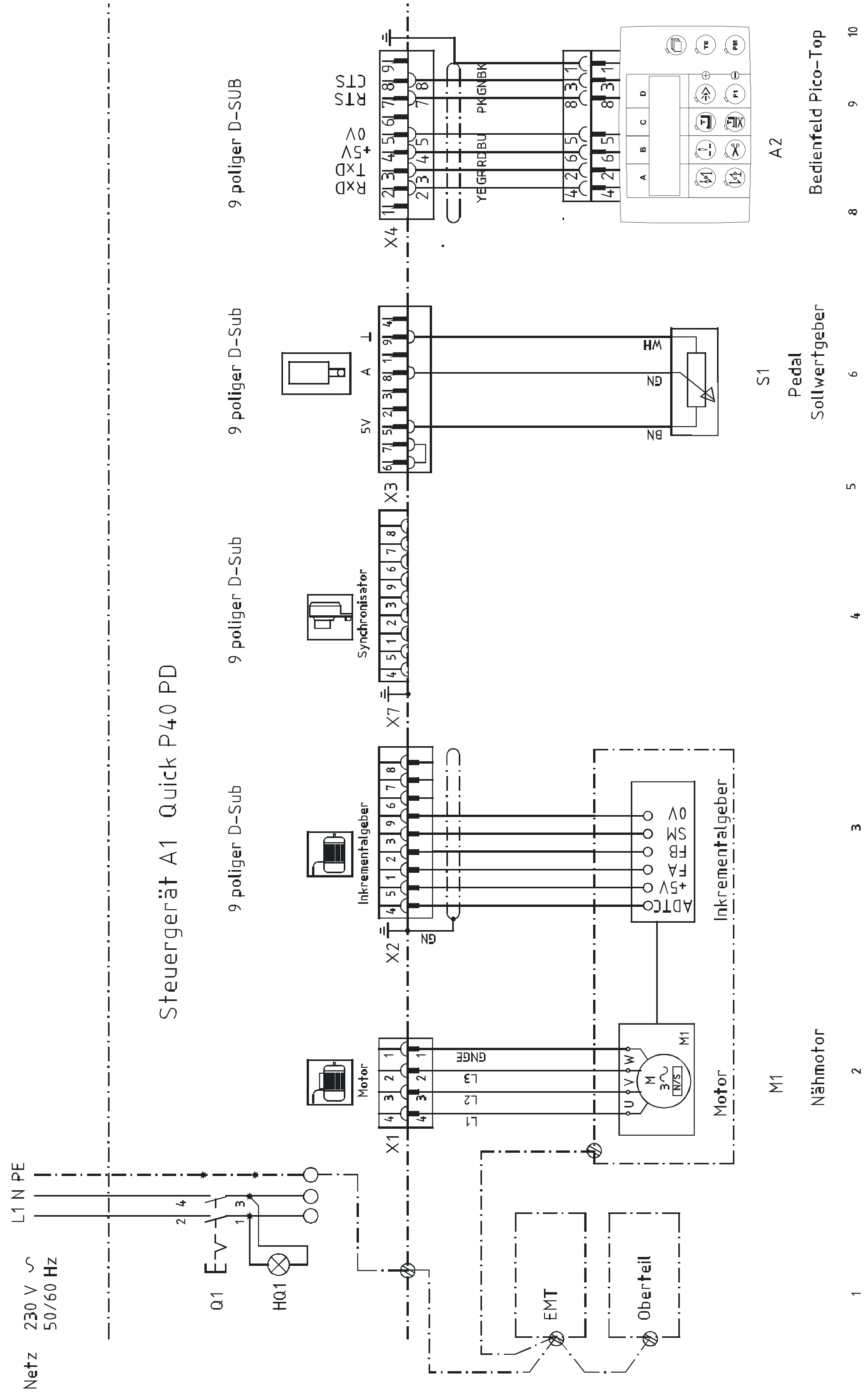
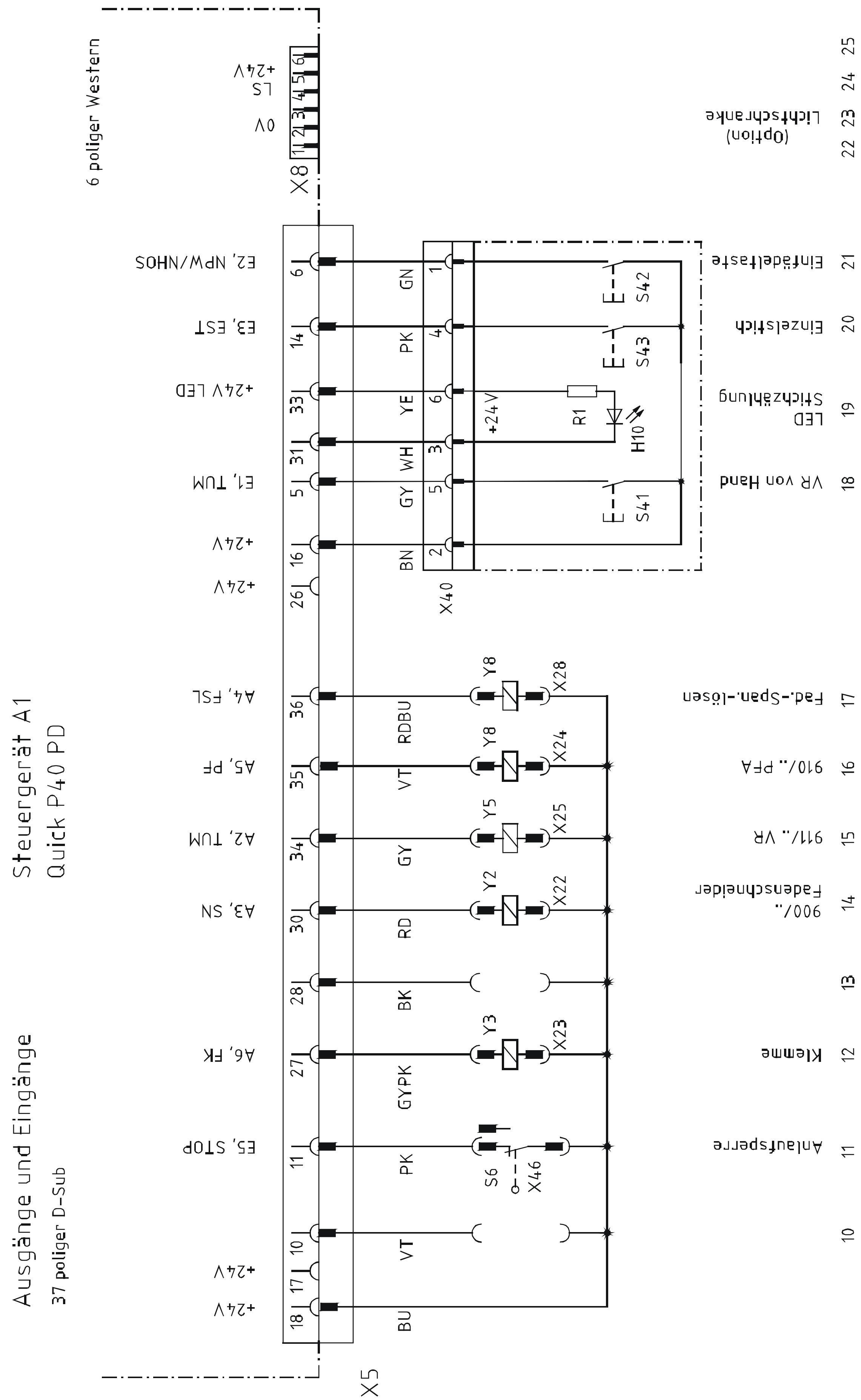
14.03 Block diagram PFAFF 1180 with control unit P40 PD

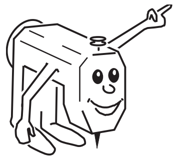


14.04 Circuit diagrams 91-191 521-95





6 poliger Western
X8
0V
LS
+24V
Lichtschranke (Option)
Steuergerät A1
Quick P40 PD
Ausgänge und Eingänge
37 poliger D-Sub
X5
X40
E2, NPW/NHOS
E3, EST
+24V LED
E1, TUM
+24V
A4, FSL
A5, PF
A2, TUM
A3, SN
A6, FK
E5, STOP
Einfädeltaste
Einzelstich
LED Stichzählung
VR von Hand
Fad.-Span.-lösen
910/.. PFA
911/.. VR
Fadenschneider 900/..
Klemme
Anlaufsperre
S41
S42
S43
R1
H10
Y2
Y3
Y5
Y8
S6
X22
X23
X24
X25
X28
X46



Notes

PFAFF

PFAFF Industrie Maschinen AG

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Telefon: (0631) 200-0
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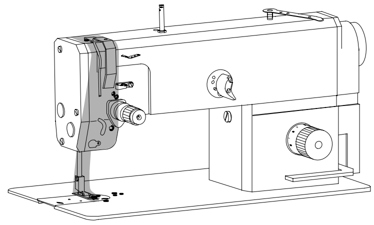
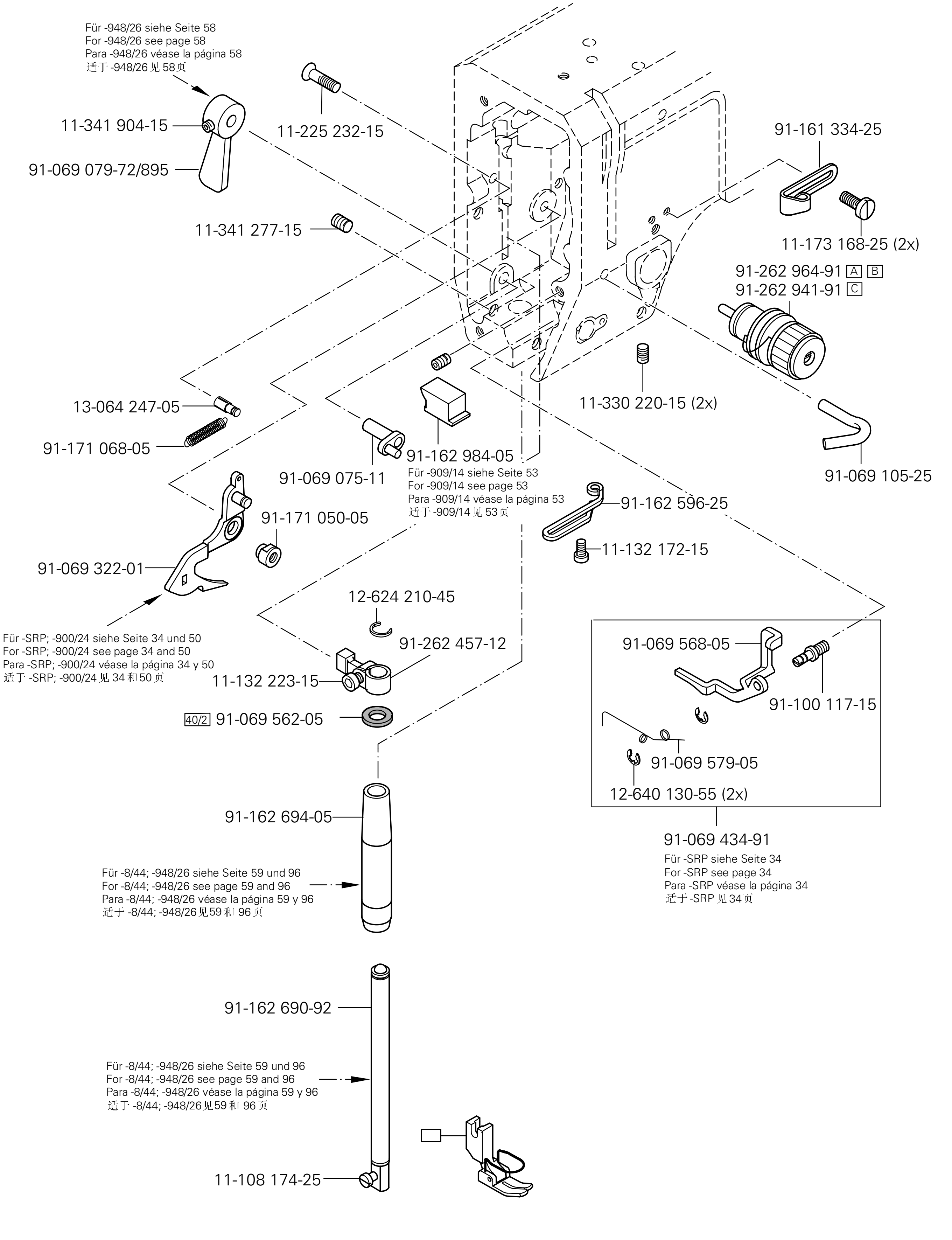
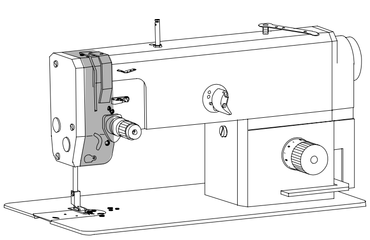
E-Mail: info@pfaff-industrial.com



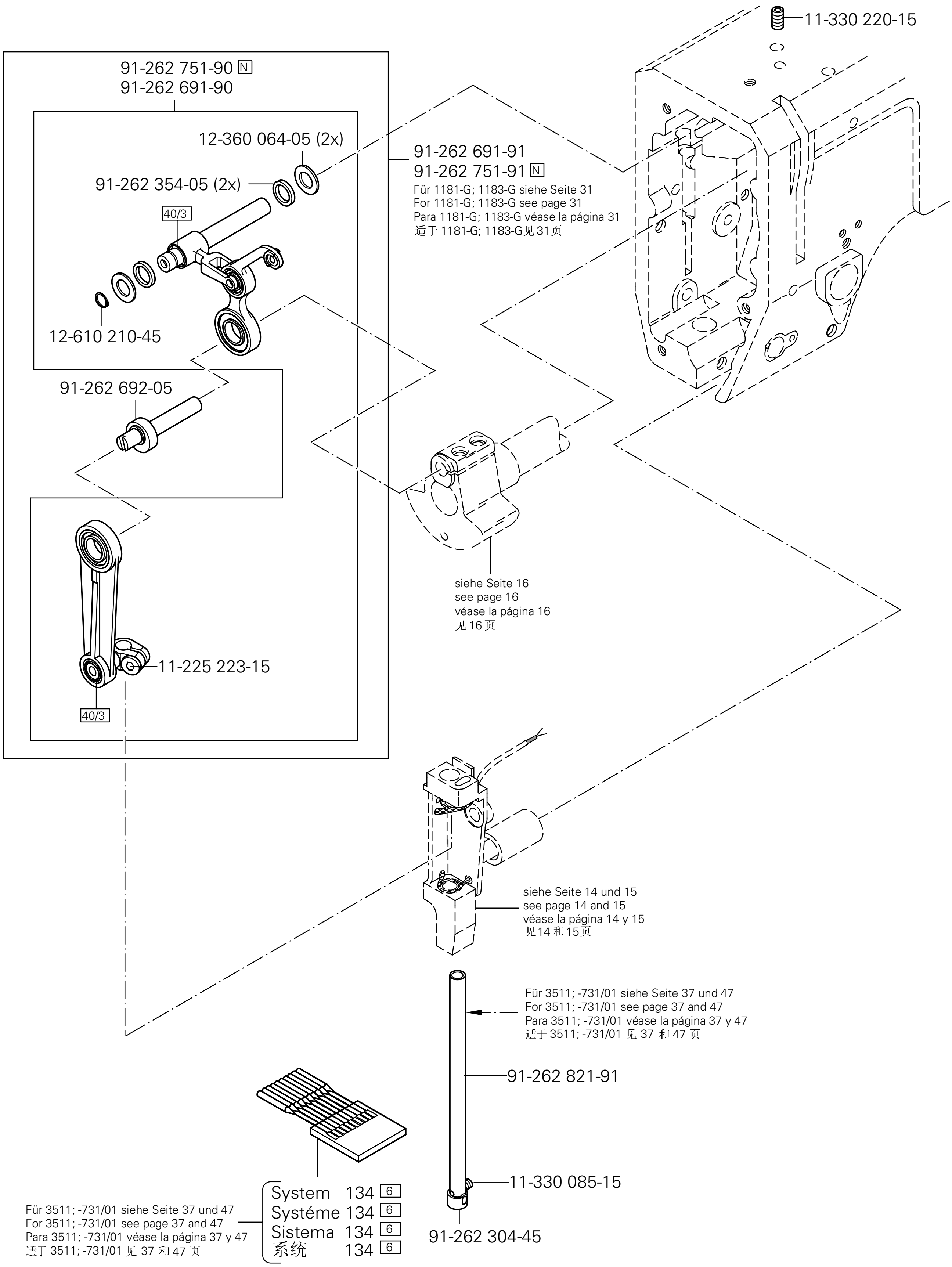


siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明

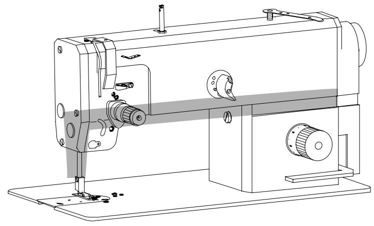


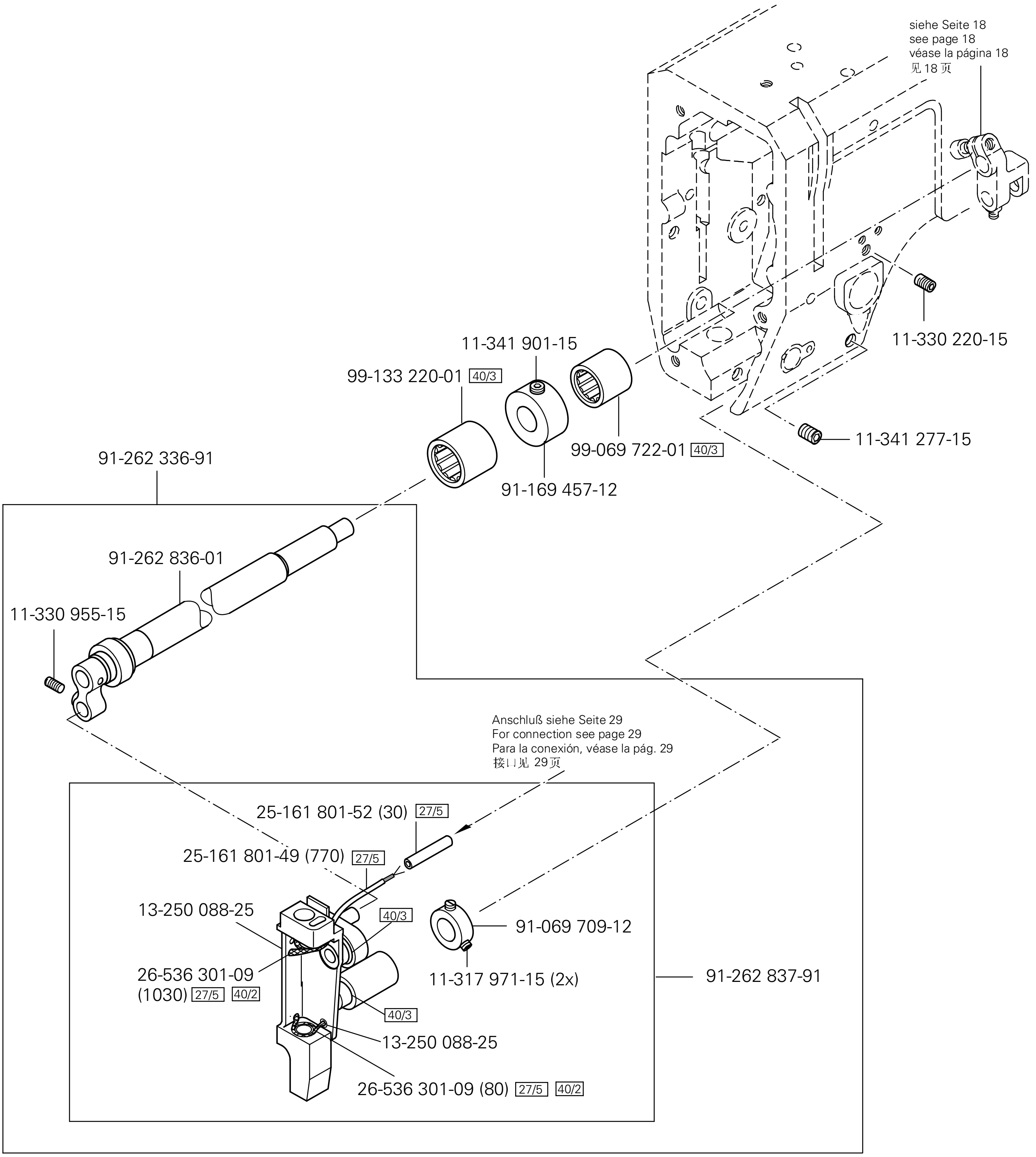
Kopfteile
Needle head parts
Piezas de la cabeza
机头零件

PFAFF 1181;1181- D
PFAFF 1183;1183- D

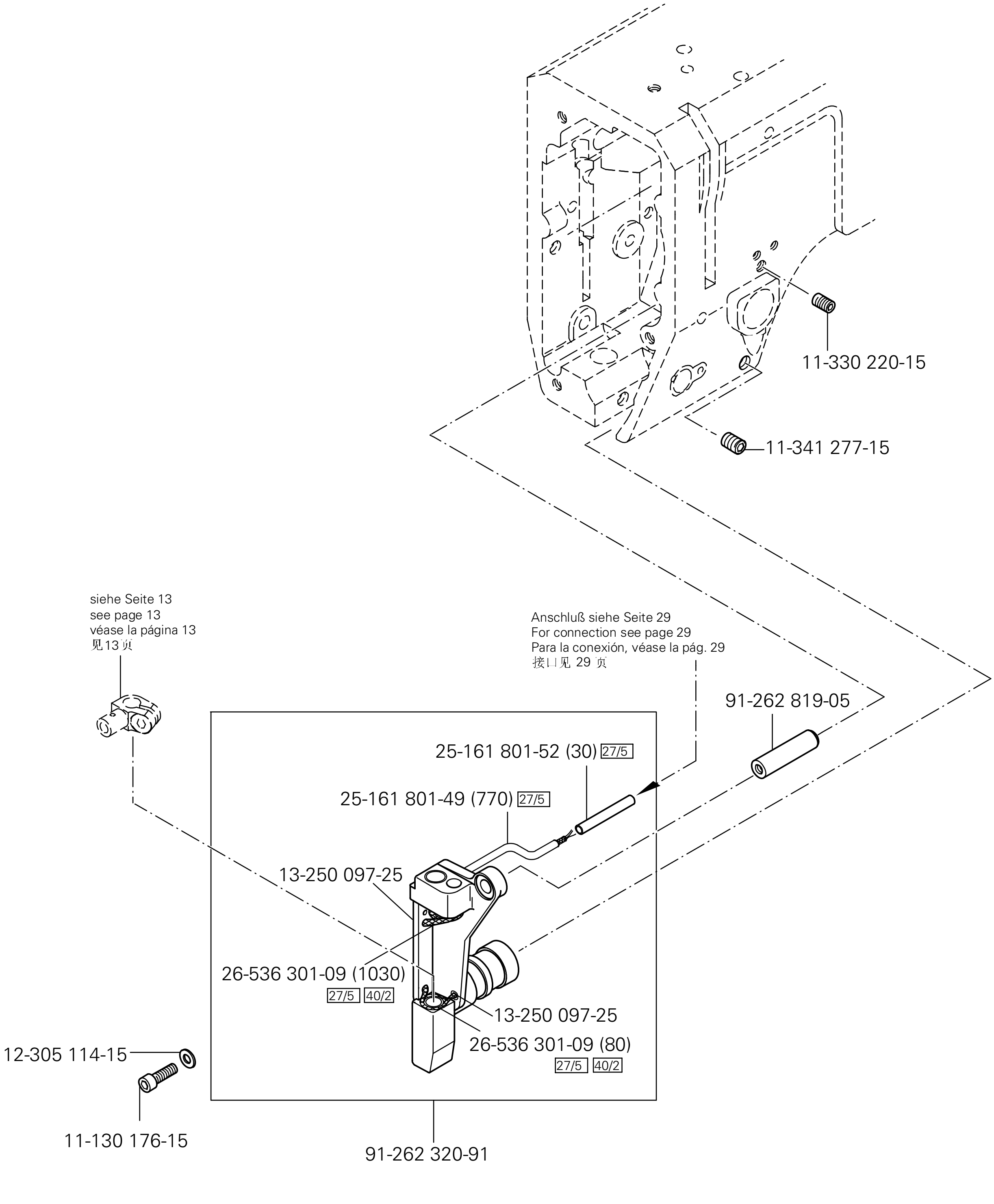


siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明

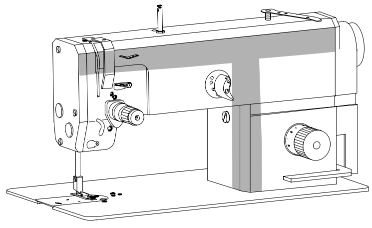


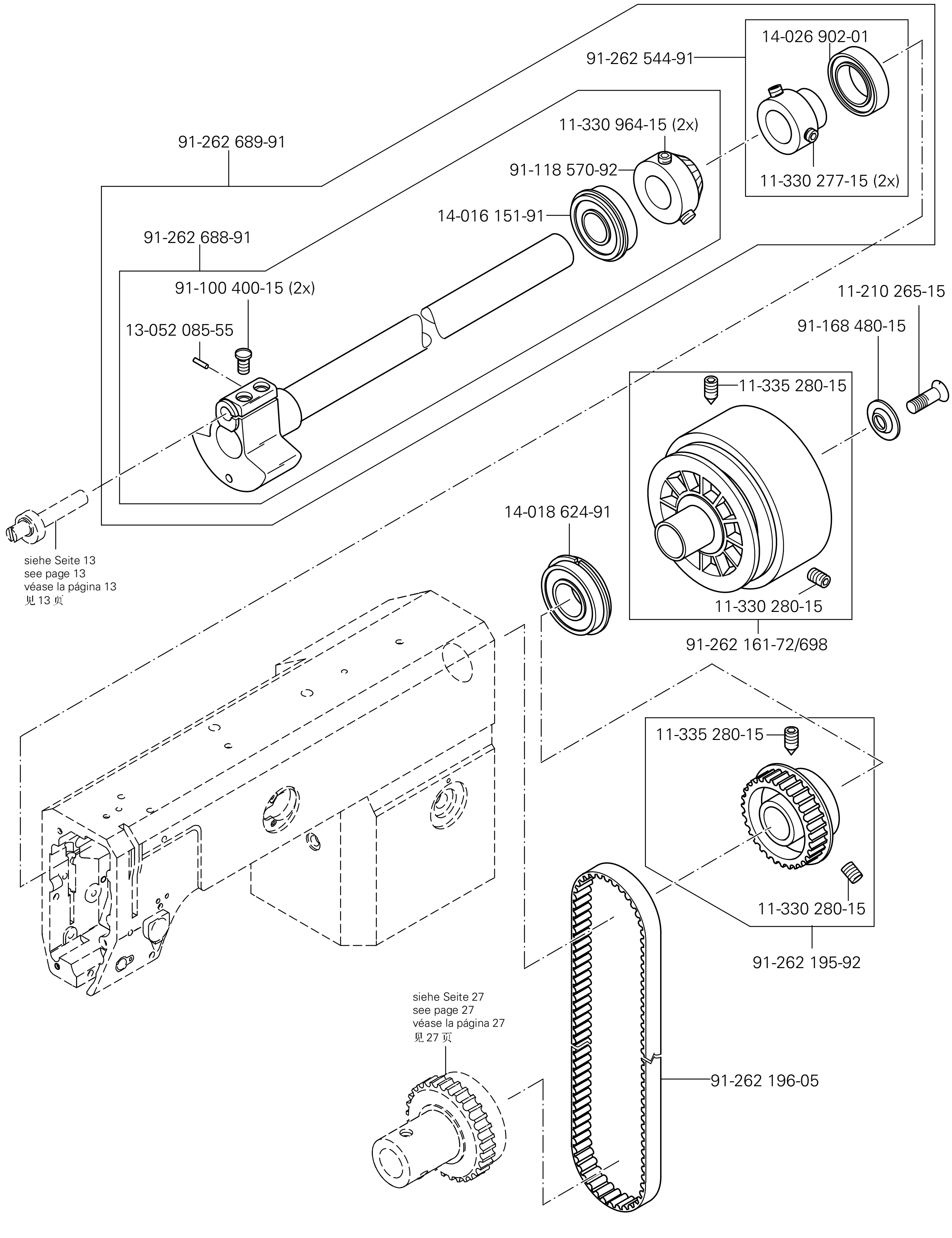


siehe Seite 18
see page 18
véase la página 18
见 18 页
11-330 220-15
11-341 901-15
99-133 220-01 40/3
11-341 277-15
99-069 722-01 40/3
91-262 336-91
91-169 457-12
91-262 836-01
11-330 955-15
Anschluß siehe Seite 29
For connection see page 29
Para la conexión, véase la pág. 29
接口见 29页
25-161 801-52 (30) 27/5
25-161 801-49 (770) 27/5
13-250 088-25
40/3
91-069 709-12
26-536 301-09
(1030) 27/5 40/2
11-317 971-15 (2x)
91-262 837-91
40/3
13-250 088-25
26-536 301-09 (80) 27/5 40/2

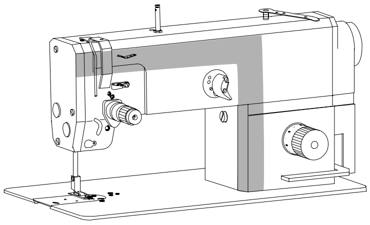


11-330 220-15
11-341 277-15
siehe Seite 13
see page 13
véase la página 13
见13页
Anschluß siehe Seite 29
For connection see page 29
Para la conexión, véase la pág. 29
接口见 29 页
91-262 819-05
25-161 801-52 (30) 27/5
25-161 801-49 (770) 27/5
13-250 097-25
26-536 301-09 (1030)
27/5 40/2
13-250 097-25
26-536 301-09 (80)
27/5 40/2
12-305 114-15
11-130 176-15
91-262 320-91



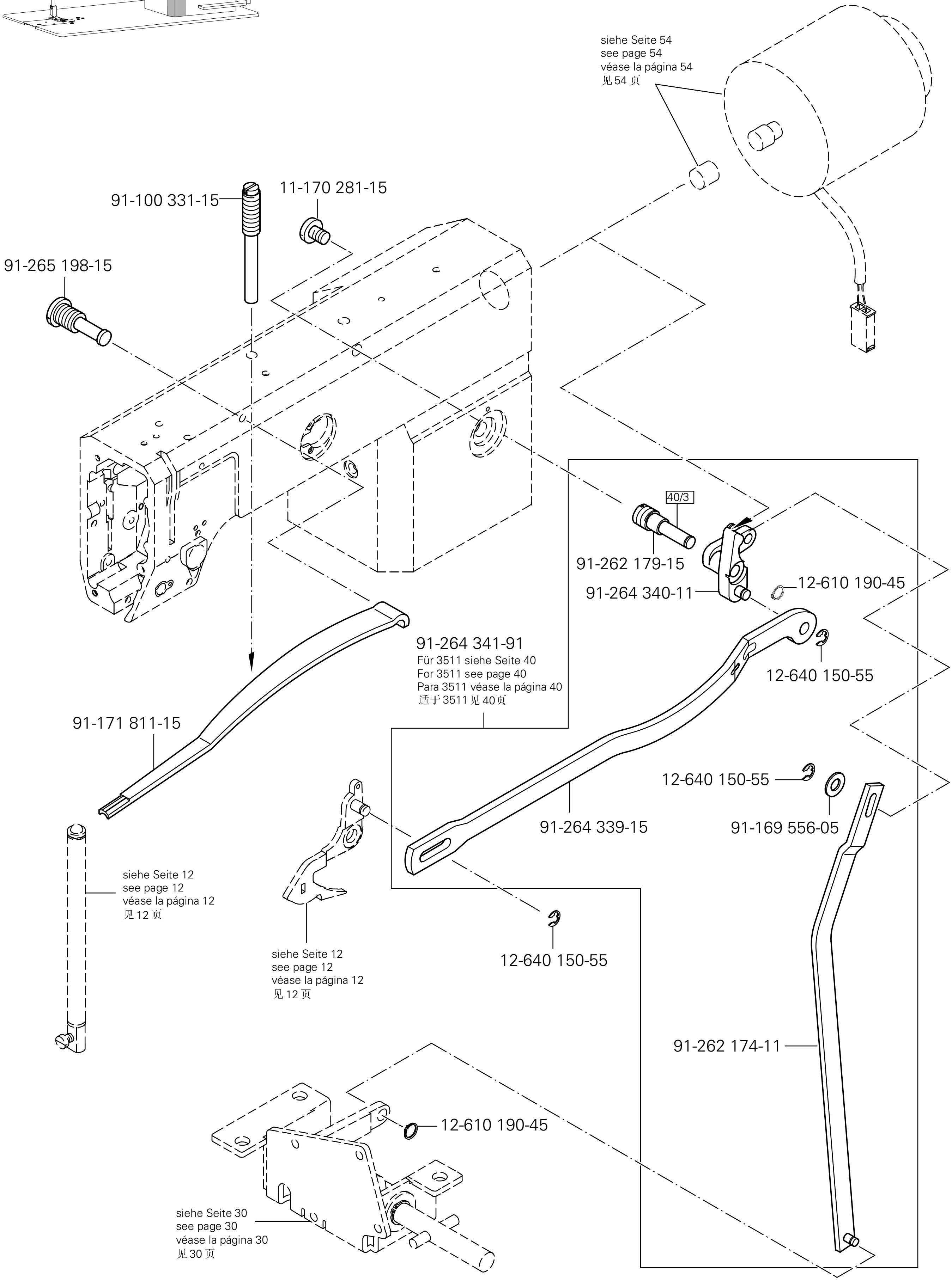


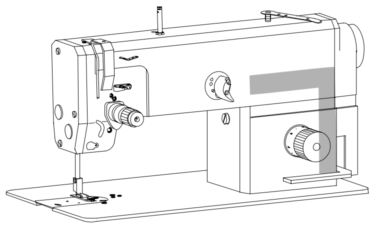
siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明

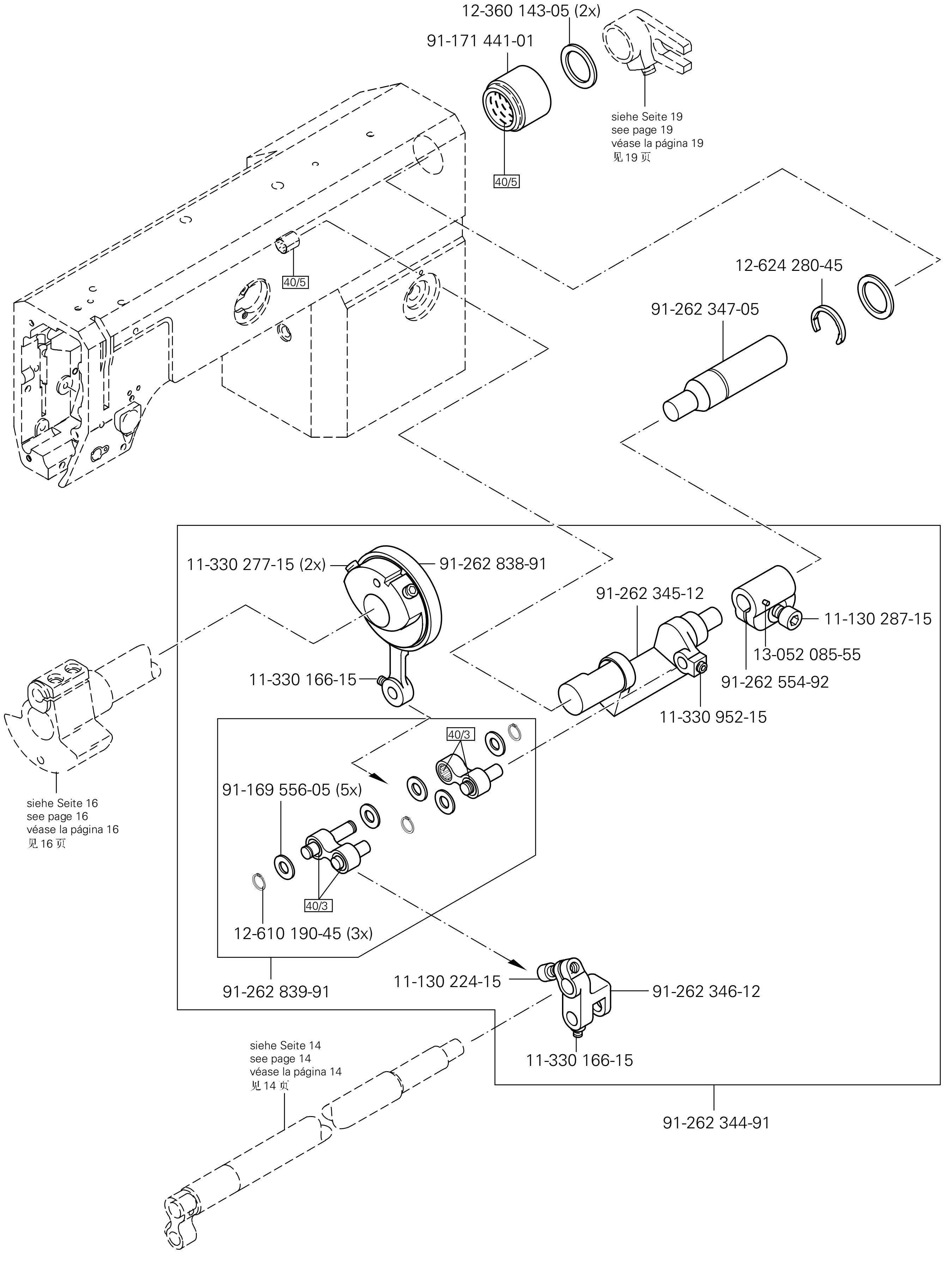


Armteile
Arm parts
Piezas del brazo
机臂零件

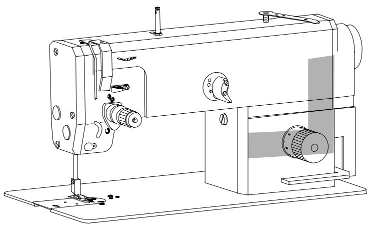
PFAFF 1181;1181- D
PFAFF 1183;1183- D

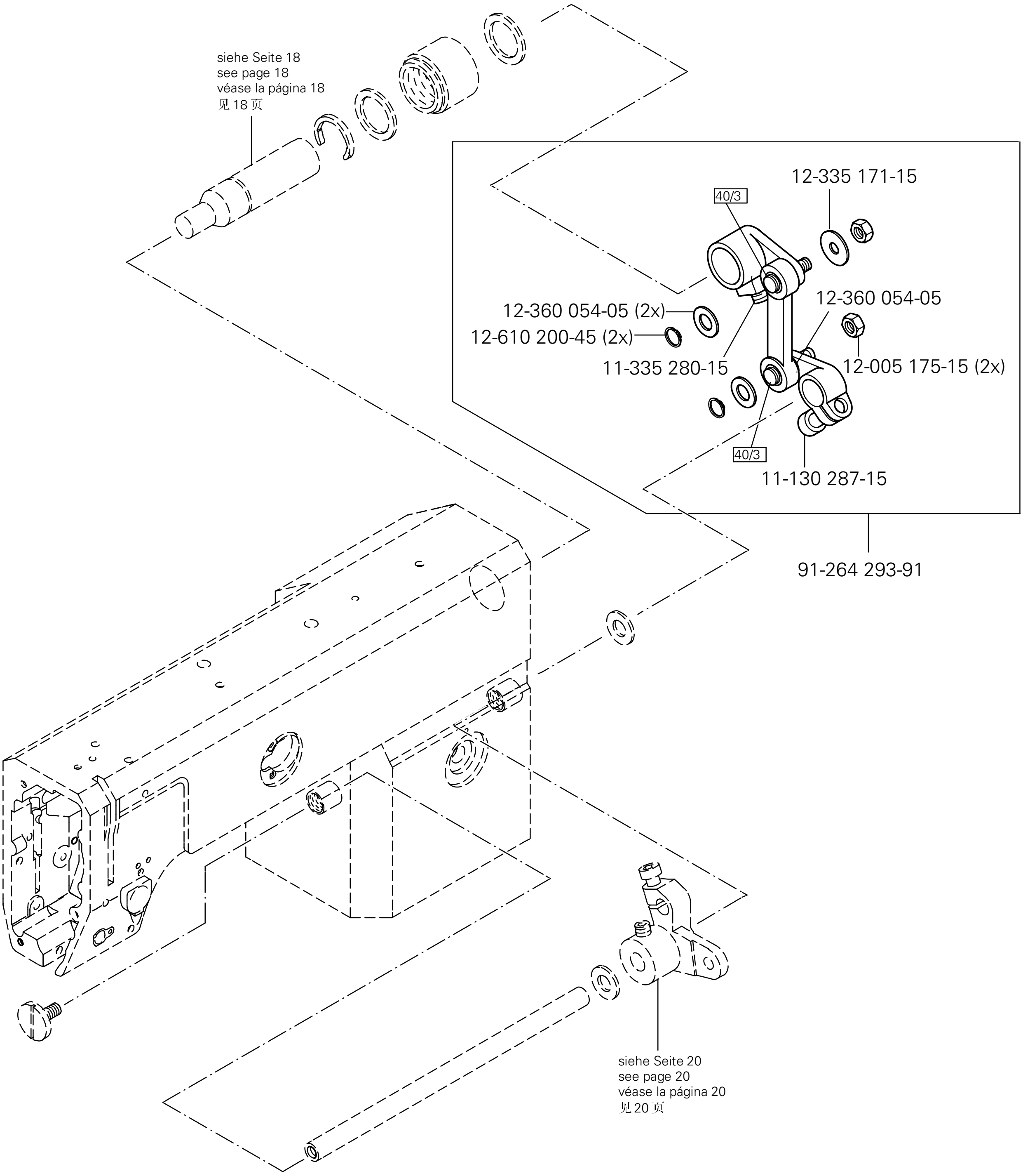






siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明





siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
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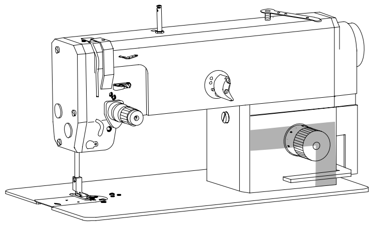
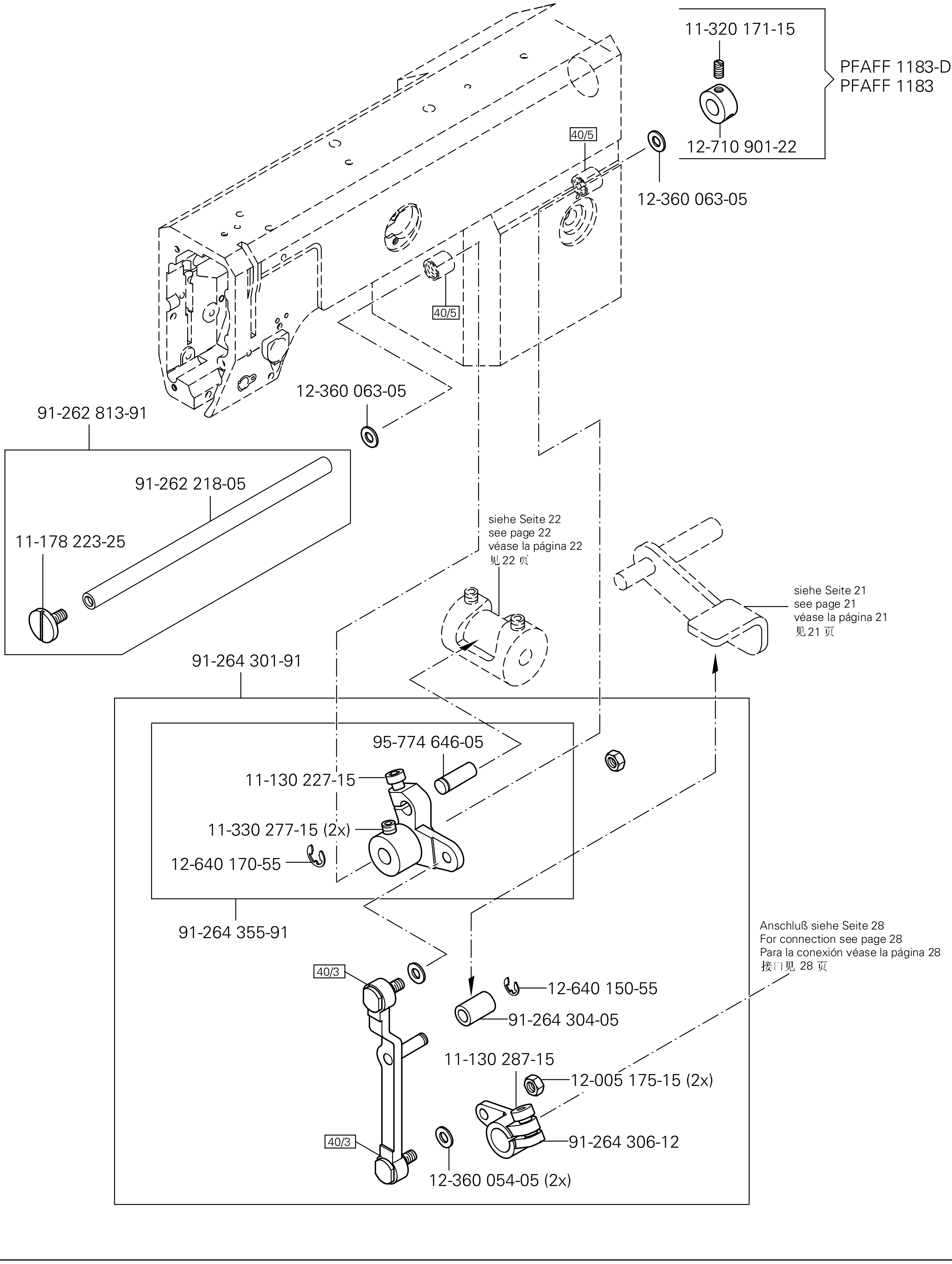
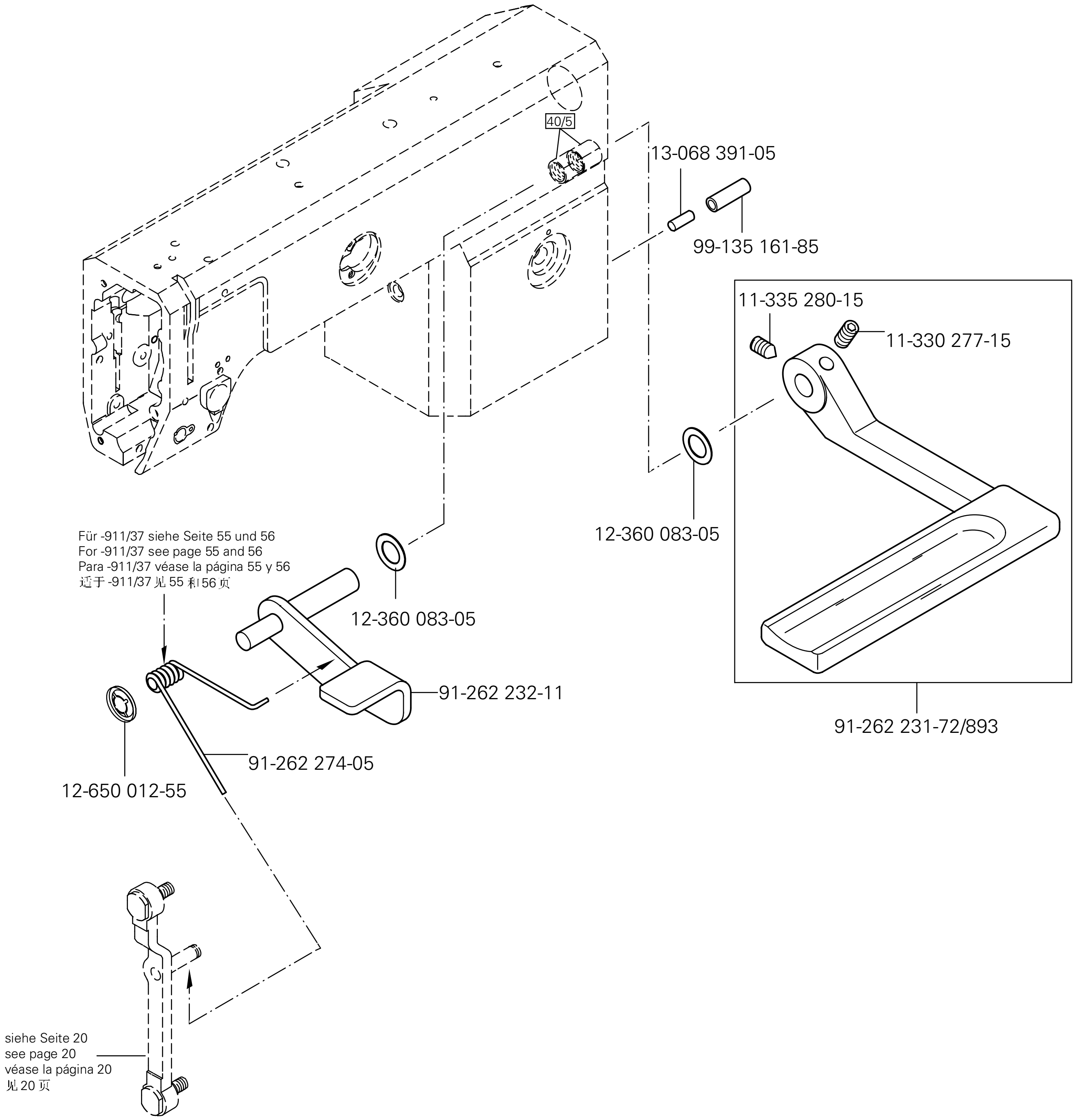
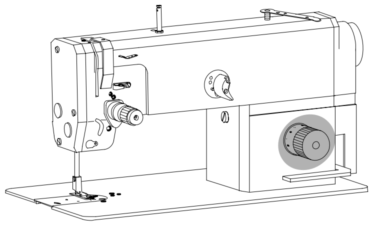


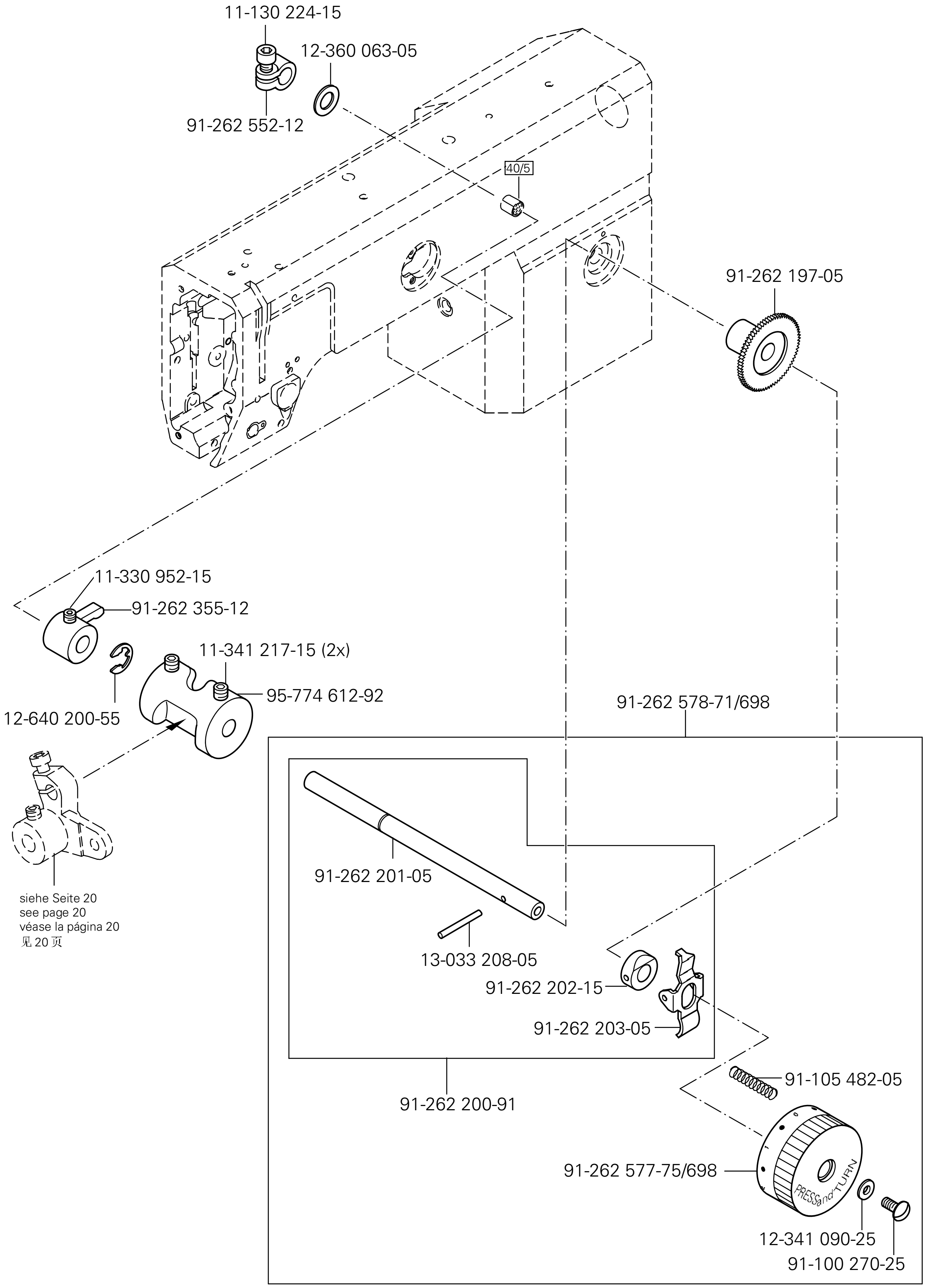


siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明



40/5
13-068 391-05
99-135 161-85
11-335 280-15
11-330 277-15
12-360 083-05
Für -911/37 siehe Seite 55 und 56
For -911/37 see page 55 and 56
Para -911/37 véase la página 55 y 56
适于-911/37见55和56页
12-360 083-05
91-262 232-11
91-262 231-72/893
91-262 274-05
12-650 012-55
siehe Seite 20
see page 20
véase la página 20
见20页





siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
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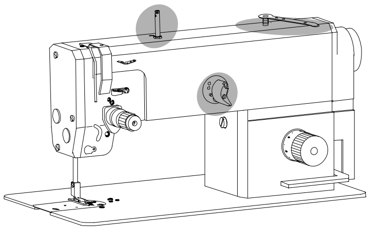

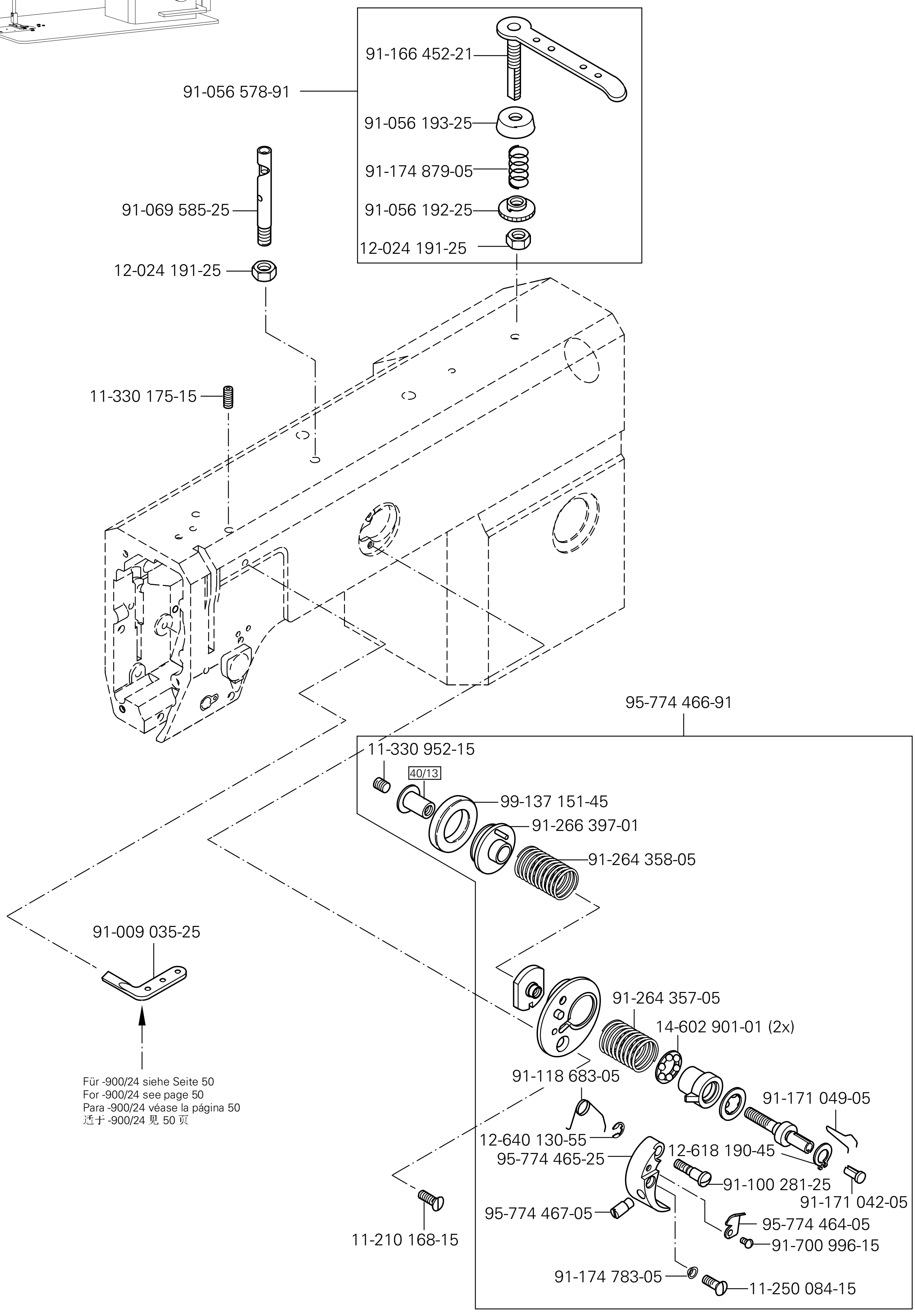
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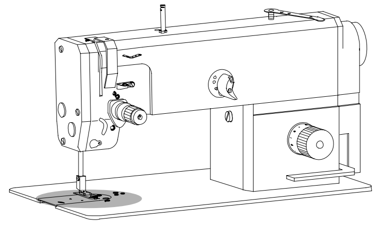
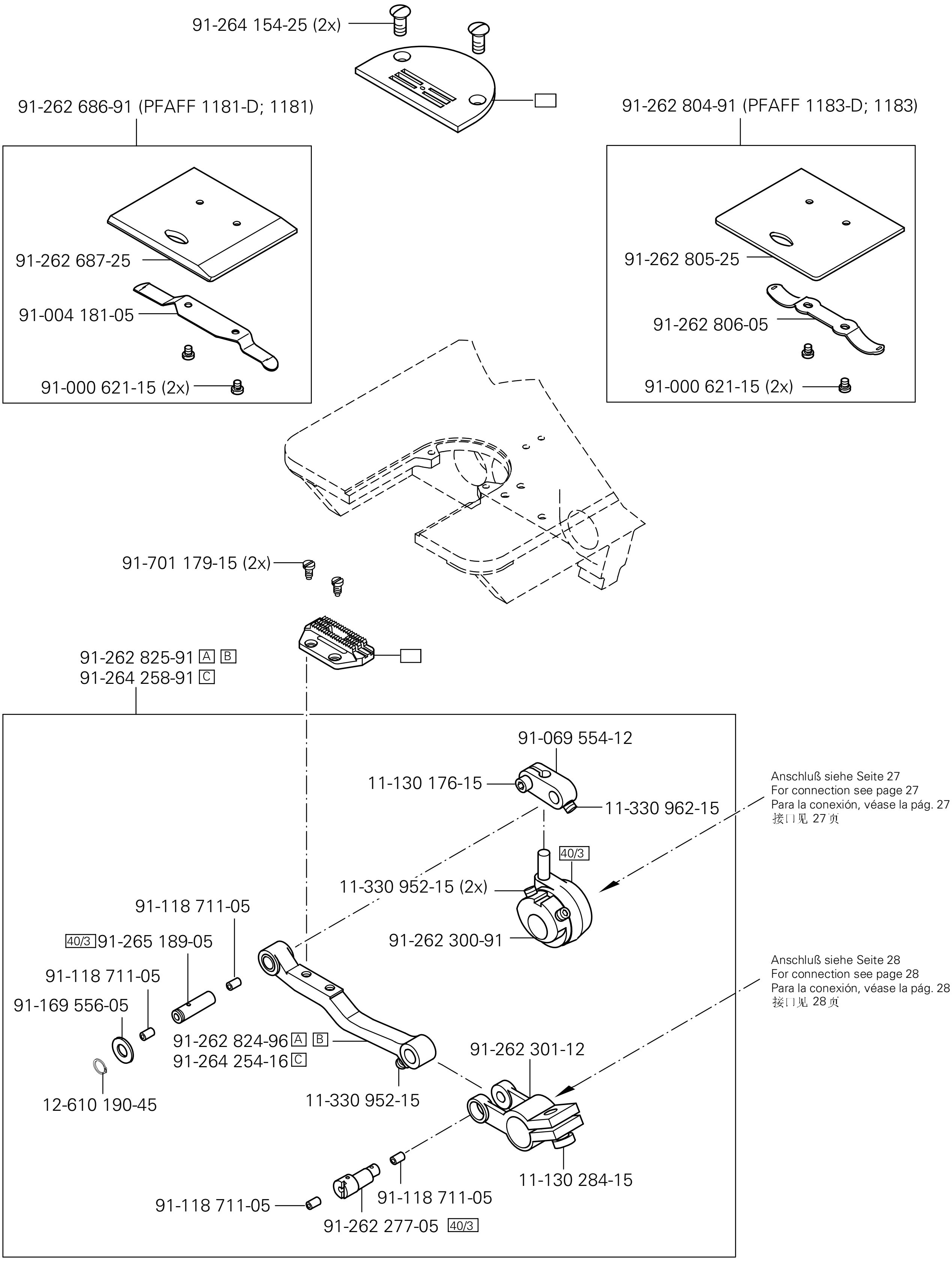
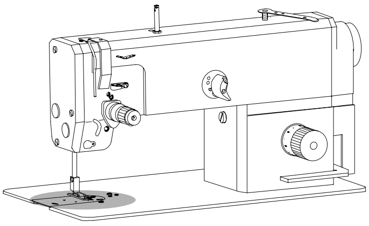
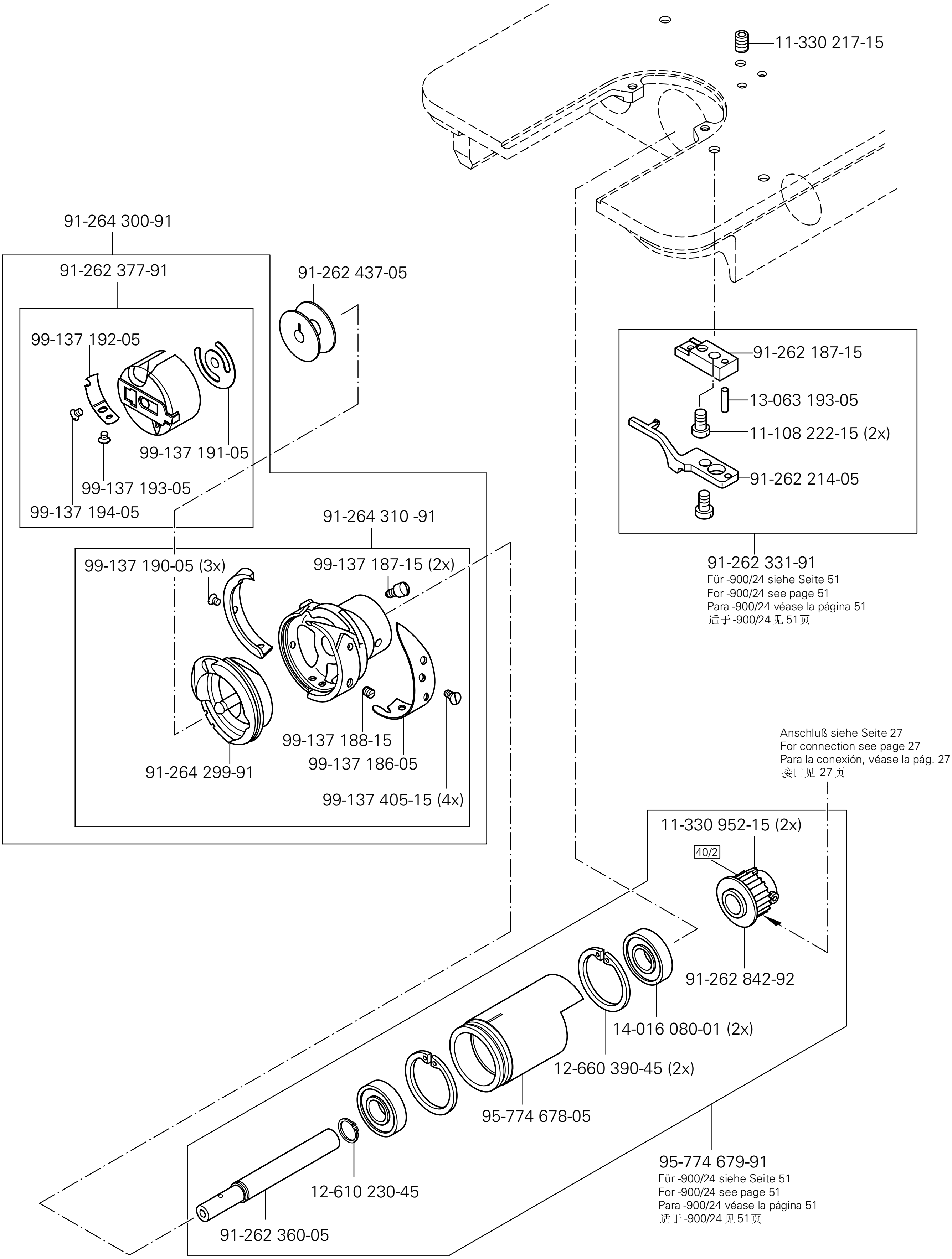
91-056 193-25
91-174 879-05
91-069 585-25
91-056 192-25
12-024 191-25
12-024 191-25
11-330 175-15
95-774 466-91
11-330 952-15
40/13
99-137 151-45
91-266 397-01
91-264 358-05
91-009 035-25
91-264 357-05
14-602 901-01 (2x)
91-118 683-05
91-171 049-05
Für -900/24 siehe Seite 50
For -900/24 see page 50
Para -900/24 véase la página 50
适于 -900/24 见 50 页
12-640 130-55
12-618 190-45
95-774 465-25
91-100 281-25
91-171 042-05
95-774 467-05
95-774 464-05
91-700 996-15
11-210 168-15
91-174 783-05
11-250 084-15





siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明





siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
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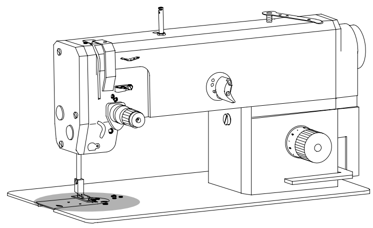

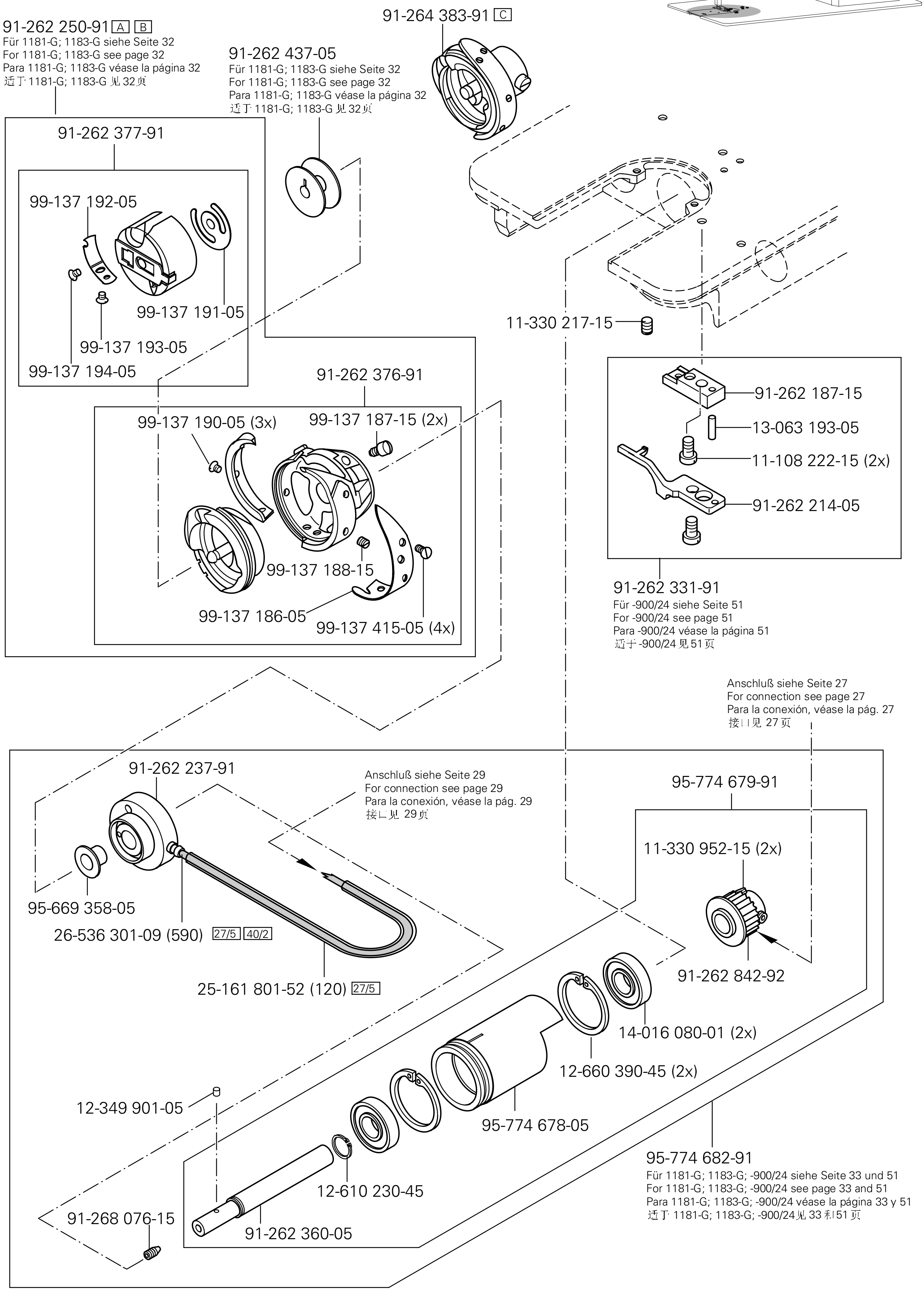

91-262 250-91 A B
Für 1181-G; 1183-G siehe Seite 32
For 1181-G; 1183-G see page 32
Para 1181-G; 1183-G véase la página 32
适于 1181-G; 1183-G 见32页
91-262 437-05
Für 1181-G; 1183-G siehe Seite 32
For 1181-G; 1183-G see page 32
Para 1181-G; 1183-G véase la página 32
适于 1181-G; 1183-G 见32页
91-264 383-91 C
91-262 377-91
99-137 192-05
99-137 191-05
99-137 193-05
99-137 194-05
11-330 217-15
91-262 376-91
99-137 190-05 (3x)
99-137 187-15 (2x)
99-137 188-15
99-137 186-05
99-137 415-05 (4x)
91-262 187-15
13-063 193-05
11-108 222-15 (2x)
91-262 214-05
91-262 331-91
Für -900/24 siehe Seite 51
For -900/24 see page 51
Para -900/24 véase la página 51
适于-900/24见51页
Anschluß siehe Seite 27
For connection see page 27
Para la conexión, véase la pág. 27
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91-262 237-91
Anschluß siehe Seite 29
For connection see page 29
Para la conexión, véase la pág. 29
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95-774 679-91
11-330 952-15 (2x)
95-669 358-05
26-536 301-09 (590) 27/5 40/2
25-161 801-52 (120) 27/5
91-262 842-92
14-016 080-01 (2x)
12-660 390-45 (2x)
12-349 901-05
95-774 678-05
95-774 682-91
Für 1181-G; 1183-G; -900/24 siehe Seite 33 und 51
For 1181-G; 1183-G; -900/24 see page 33 and 51
Para 1181-G; 1183-G; -900/24 véase la página 33 y 51
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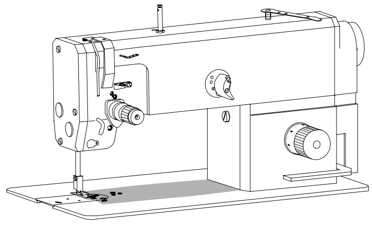
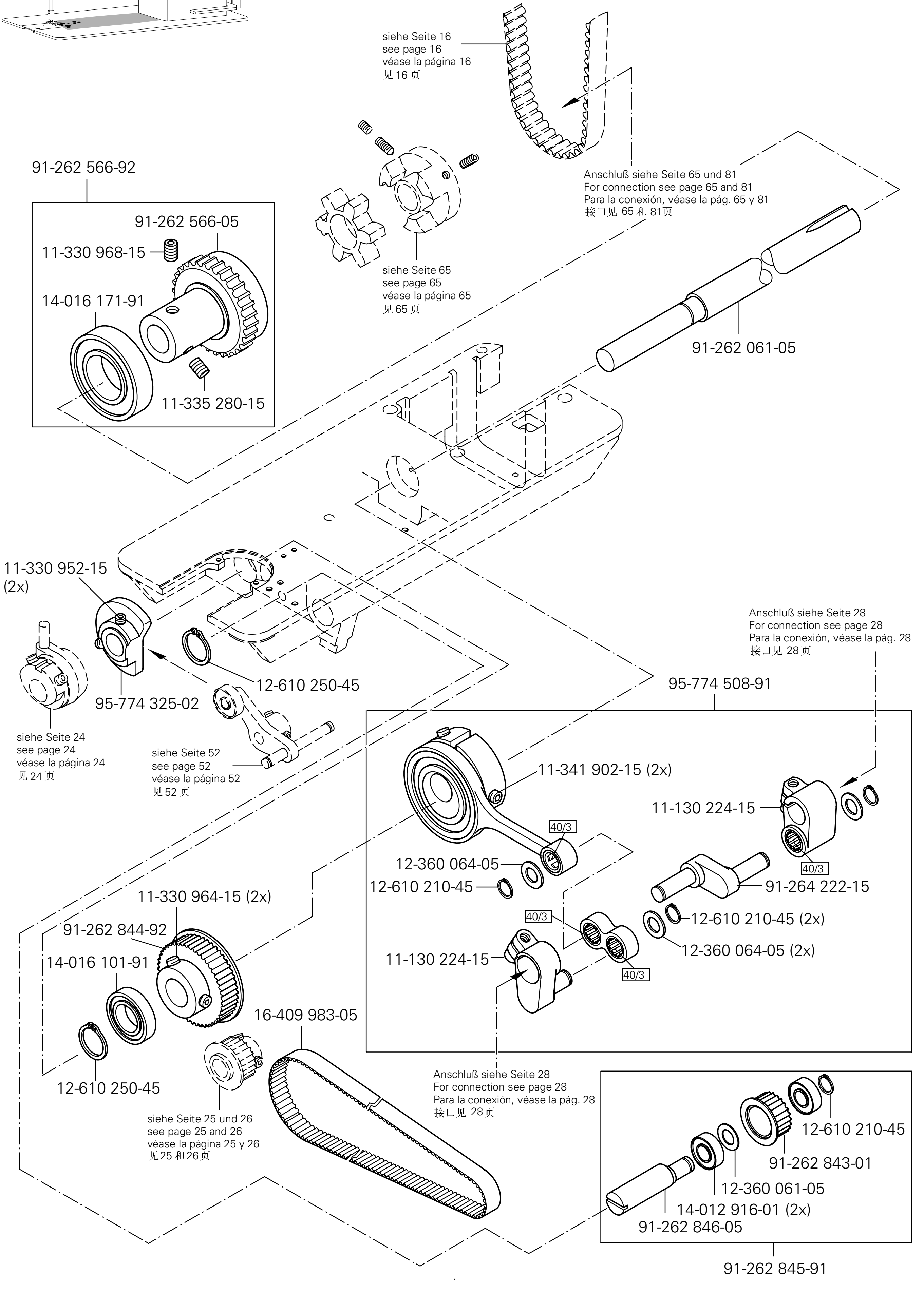
12-610 230-45
91-268 076-15
91-262 360-05





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91-262 566-92
91-262 566-05
11-330 968-15
14-016 171-91
11-335 280-15
Anschluß siehe Seite 65 und 81
For connection see page 65 and 81
Para la conexión, véase la pág. 65 y 81
接口见 65 和 81页
siehe Seite 65
see page 65
véase la página 65
见 65 页
91-262 061-05
11-330 952-15
(2x)
12-610 250-45
95-774 325-02
siehe Seite 24
see page 24
véase la página 24
见 24 页
siehe Seite 52
see page 52
véase la página 52
见 52 页
Anschluß siehe Seite 28
For connection see page 28
Para la conexión, véase la pág. 28
接口见 28 页
95-774 508-91
11-341 902-15 (2x)
11-130 224-15
40/3
12-360 064-05
12-610 210-45
91-264 222-15
11-330 964-15 (2x)
91-262 844-92
14-016 101-91
12-610 210-45 (2x)
12-360 064-05 (2x)
11-130 224-15
16-409 983-05
12-610 250-45
siehe Seite 25 und 26
see page 25 and 26
véase la página 25 y 26
见25 和26页
Anschluß siehe Seite 28
For connection see page 28
Para la conexión, véase la pág. 28
接口见 28 页
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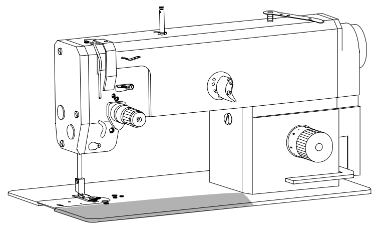
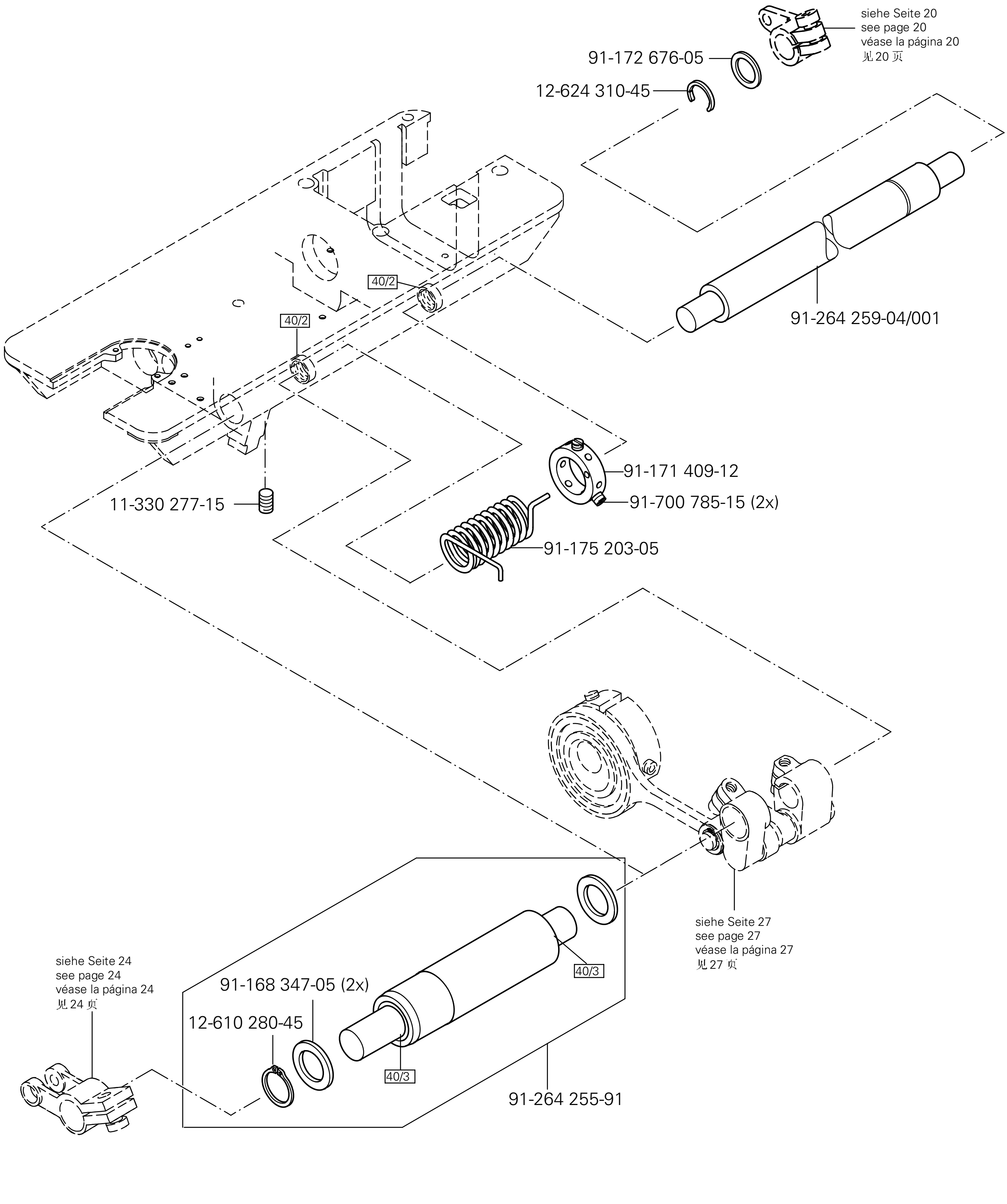
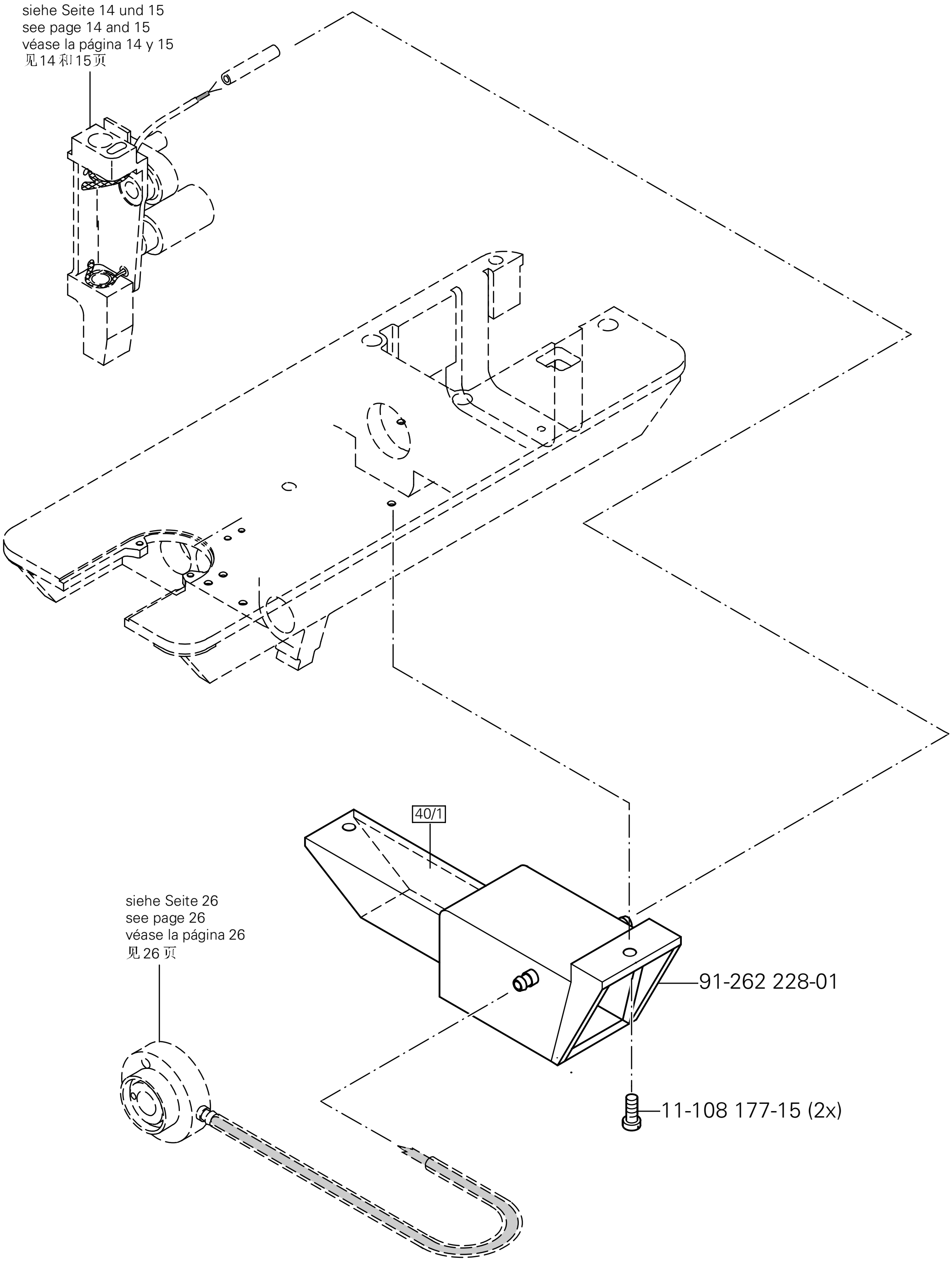
91-262 843-01
12-360 061-05
14-012 916-01 (2x)
91-262 846-05
91-262 845-91





siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明


siehe Seite 14 und 15
see page 14 and 15
véase la página 14 y 15
见14和15页
40/1
siehe Seite 26
see page 26
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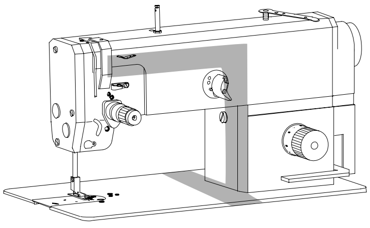
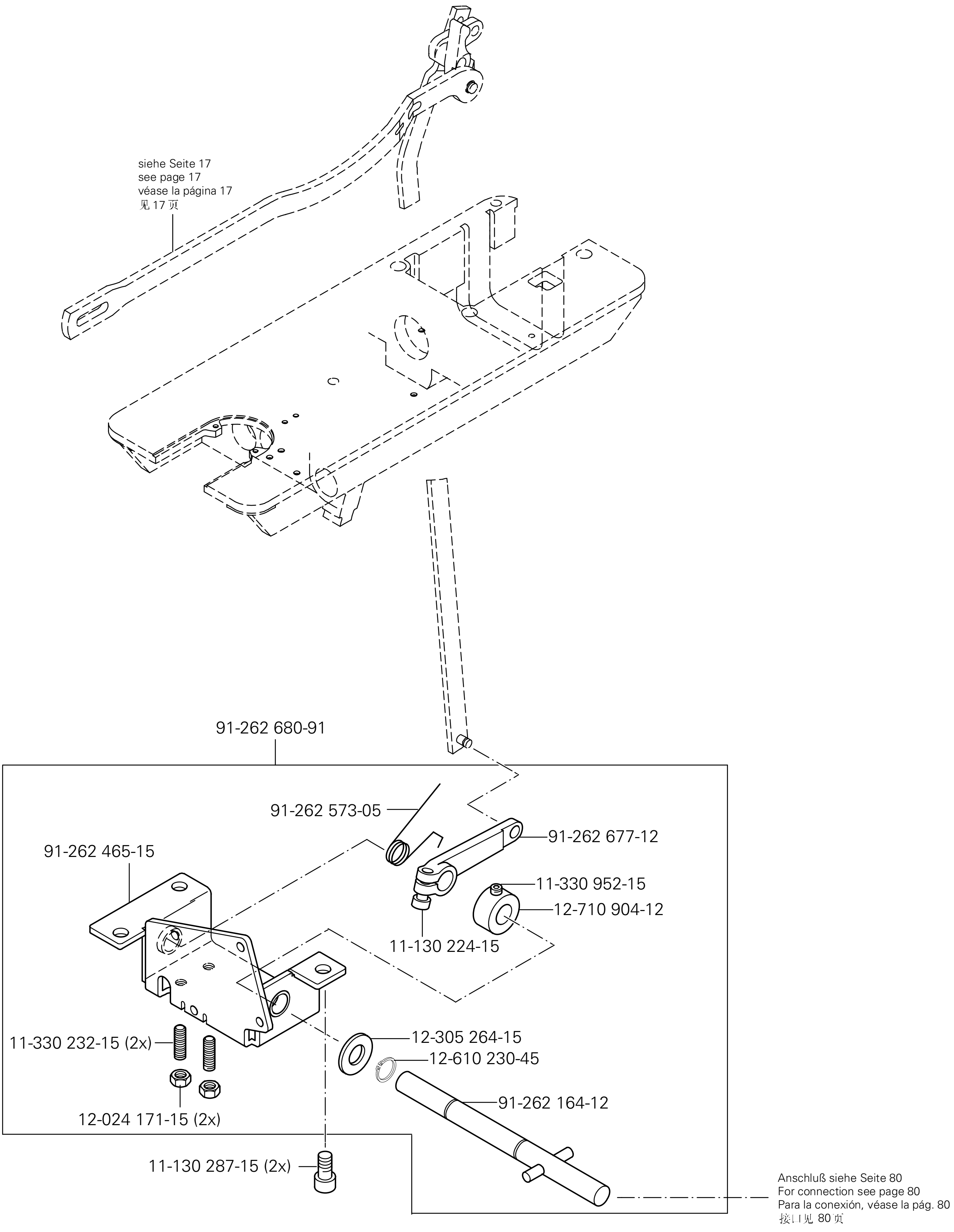
见26页
91-262 228-01
11-108 177-15 (2x)

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see page 17
véase la página 17
见 17 页
91-262 680-91
91-262 573-05
91-262 677-12
91-262 465-15
11-330 952-15
12-710 904-12
11-130 224-15
11-330 232-15 (2x)
12-305 264-15
12-610 230-45
91-262 164-12
12-024 171-15 (2x)
11-130 287-15 (2x)
Anschluß siehe Seite 80
For connection see page 80
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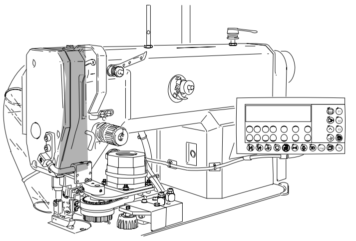
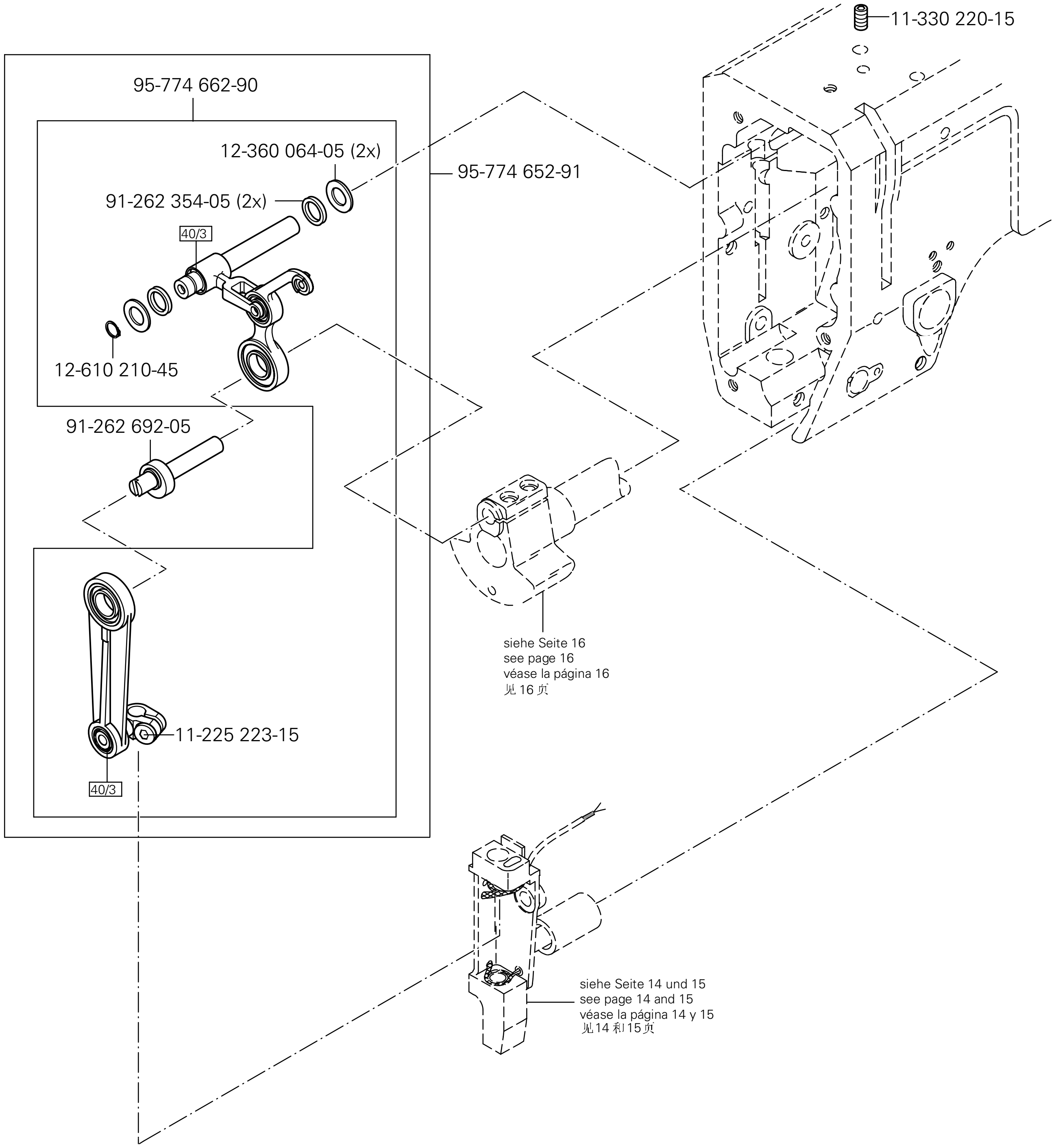
接口见 80 页

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95-774 662-90
12-360 064-05 (2x)
95-774 652-91
91-262 354-05 (2x)
40/3
12-610 210-45
91-262 692-05
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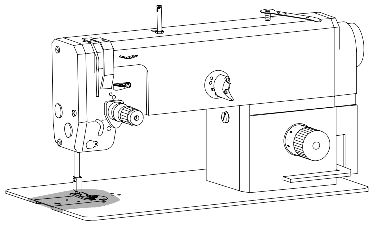
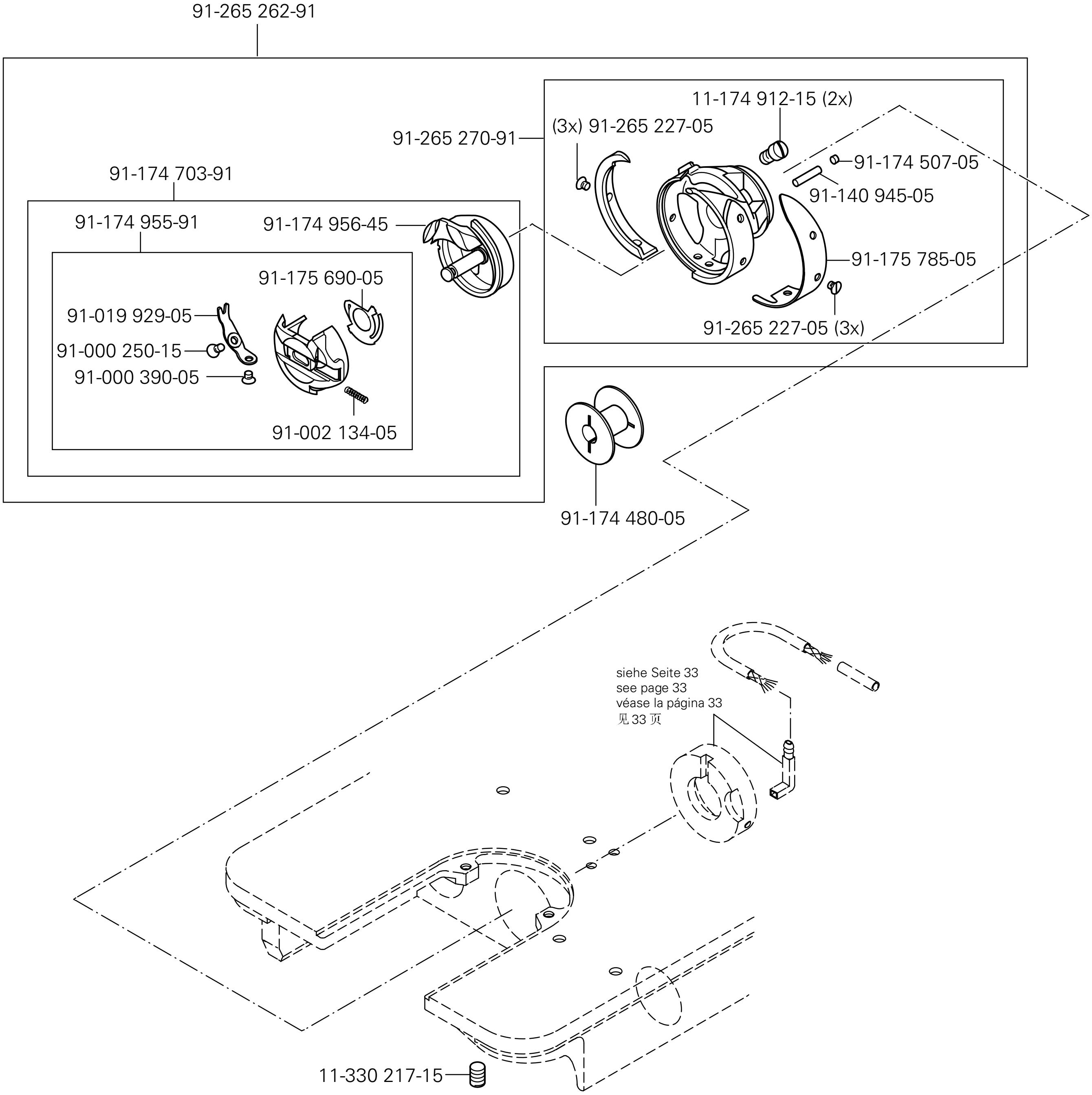
see page 16
véase la página 16
见 16 页
11-225 223-15
40/3
siehe Seite 14 und 15
see page 14 and 15
véase la página 14 y 15
见14 和15页





(die sonstigen Teile wie in Register 3.01 bis 3.04)
(for all other parts see Sections 3.01 to 3.04)
(las demás piezas como en los registros 3.01 al 3.04)
(其它零件与3.01至3.04 章中的相同)

siehe Kapitel 2 Erläuterung der Schlüsselzeichen
see chapter 2 Explanation of key markings
véase el Cap. 2 Explicaciones de los signos clave
见第2章标记说明

PFAFF

IB-20B004

EMERALD EMC-2005

INSTRUCTION BOOK

ERRATA SHEET, IB-20B004 REV. 0 JUNE 2007

ate	Rev.	ECN No.	DR	CHK	CHK
7/19/05	0	ECN-05-252 (See Note 1)	KY	KY	
1/6/06	A	ECN-05-437 (See Note 2)	KY	KY	
8/8/06	B	ECN-06-188 (See Note 3)	KY	CD	
6/1/07	C	ECN-07-162 (See Note 4)	KY	KY	

Notes:

1) Page 3-1, dated July 2005, supersedes page 3-1, dated May 2005.
2) Added End User License Agreement to Appendix F.
3) Table of Contents, page iii, List of Illustrations, page vii, and Section 4, dated August 2006, supersedes Table of Contents, page iii, List of Illustrations, page vii, and Section 4, dated May 2005.
4) Appendix B, dated June 2007, supersedes Appendix B, dated May 2005.

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INTRODUCTION

Thank you for selecting Industrial Indexing Systems' Emerald Series products. You join many other companies around the world in your choice of these powerful, flexible motion control products.

The EMC-2005 embodies a blend of open architecture features with a true real-time operating system. The result is a state-of-the art performance and superior connectivity to other systems and network components.

The EMC-2005 has a wide array of features, including a 64-bit MIPS processor, SERCOS Interface^{TM}, DeviceNet/CanBus port, two RS-232 ports, Encoder master follower input, programmmable limit switch (PLS) Functions, 2 software simulated motors (pacers), failsafe watchdog timer and high visibility status displays. The EMC-2005 also offers 2 PCI Mezzanine slots (PMC) for interfacing a large selection of optional features, including a master follower resolver, Ethernet, removable memory, embedded PC and modem.

The controller is programmed using our friendly **E**merald **M**otion **P**rogramming **L**anguage (EML) and powerful new **E**merald **D**evelopment **E**nvironment (EDE) software tools for the PC.

SECTION 1 - OVERVIEW

This manual is organized so that information is easy to find and easy to use. It begins by detailing how to identify the EMC-2005 Controller and its options. This section is followed by a general description of the product and its components. Next, a comprehensive hardware specification is provided followed by connector wiring diagrams. The section that follows documents the controller status displays. Sections on EMC-2005 installation guidelines and cables drawings round out the manual.

1.1 IDENTIFYING THE EMERALD CONTROLLER

Emerald Controller packages can be identified as follows.

Your EMERALD Controller model number uses this designation:

EMC-2005XXX

WHERE:

XXX = option list in alphabetical order

E = Ethernet Single Slot PMC Card
B = Removable memory port single slot PMC card
R = Master resolver single slot PMC card
P = Embedded PC dual slot PMC card
M = Modem single slot PMC card
S = DeviceNet Scanner Software

Example: EMC-2005ERS

DeviceNet Scanner Software
Master Resolver PMC
Ethernet PMC

SECTION 2 - DESCRIPTION

The Emerald EMC-2005 product is a SERCOS Master servo motion controller, with the ability to command up to 16 SERCOS Slave Devices. The application program that operates the controller is created on a PC using the EDE software tools and sent serially to the controller via an RS-232 link.

NOTE

All commands used by the EMERALD are part of the Emerald Motion Language (EML). Refer to the Emerald Development Environment (EDE) PC tools online help for detailed information on the commands and their proper usage.

The external connections that exist on the Emerald are shown in **Figure 2.1**, and consist of 2 RS-232 ports, DeviceNet/Can Bus port, Master Encoder Input, SERCOS Transmitter and Receiver, as well as a Hardware Watchdog and power connections.

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Figure 2.1 - Emerald Layout

2.1 COMPONENTS

2.1.1 STATUS INDICATORS

> **NOTE**
> **For indicator status information, refer to Section 5 - Status & Error Codes.**

1. Controller Status Display - This single seven-segment LED display with decimal point provides status information of various operating conditions.

2. SERCOS Status LEDs - This 4 LED Array indicates the status of the SERCOS Interface™.

3. DeviceNet Status LEDs - The combination of these 2 bi-color LEDs indicates the status of DeviceNet network or Can Bus.

2.1.2 CONNECTORS

> **NOTE**
> **For proper pinouts for each connector refer to Section 4 - Emerald Wiring.**

1. PORT 1 - This 6-pin RJ-11 connector is an RS-232 serial communication port. It uses a custom protocol to communicate with the EDE software tools on a PC. This port also facilitates firmware download.

2. PORT 2 - This 6-pin RJ-11 connector is an RS-232 serial communication port. It can be used to communicate with the IIS OPI-50 or similar RS-232 type device. The protocol is selectable through the EML programming language. This port does default to the custom protocol for communicating with the EDE software tools on a PC.

3. PORT 3 - This 5-pin header is a DeviceNet/Can Bus interface port. The Emerald can operate as both a slave (standard) and master scanner (optional) on a DeviceNet network. EML program data and EMERALD System Status Flags can be sent or monitored over this Network

4. ENCODER - This 10-pin header is a high-speed master encoder pulse input.

5. WD/24V - This connector is used to connect the required 24VDC external power supply. This connector also provides a normally open hardware watchdog output for external monitoring of the EMERALD operation. The watchdog output contact will be closed when the Motion Application is executing.

6. RX - This SMA style interface port is the SERCOS Fiber Optic Receiver. This is return connection for SERCOS Interface Ring.

7. TX - This SMA style interface port is the SERCOS Fiber Optic Transmitter. This connection is the start of the SERCOS Interface Ring.

SECTION 3 - EMERALD SPECIFICATIONS

3.1 GENERAL

Weight	5.8 lbs / 2.2 Kgs
Dimensions	Width 4.80 in (121.9 mm) Height 12.5 in (317.4 mm) Depth 7.28 in (184.8 mm)
Recommended Panel Depth	12.00 in (304.8 mm) (See **Section 6 - Installation Guidelines**)

3.2 POWER REQUIREMENT

Supply Voltage	24 volts DC ± 10%, Class 2 power supply
Supply Current	.75 amps max. with no PMC option cards installed.

3.3 SERCOS INTERFACE

Interface Version	V01.02
Topology	Multi drop fiber optic ring
Transmission Rates	2, 4, 8 and 16 MB/second

3.4 ENVIRONMENT

Storage Temperature	-10 to 70°C/14-158°F
Operating Temperature	0 to 50°C/32-122°F
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and Vibration	1 G or less
Operating Conditions	Free of dust, liquids, metallic particles and corrosive gases. Use in a pollution degree 2 environment.

3.5 COMMUNICATION PORTS

Port 1	Classification: RS-232 Data Transfer: EMC Packet protocol Protocol: 38400 baud, 1 stop bit, 8 data bits, No parity
Port 2	Classification: RS-232 Data Transfer: EMC Packet protocol (default), Programmable Protocol: Configurable
DeviceNet / CAN Bus	Classification: CAN bus DeviceNet: Data Transfer and Protocol are defined by the DeviceNet specifications. OR CAN Bus: IIS unique software protocol for easy to use multidrop control. **Reference IB-11B023**.
Fiber Optic Transmitter/ Receiver	Classification: SMA style - SERCOS compatible Fiber Optics SERCOS: Data Transfer and Protocol are define by the SERCOS Specification (IEC-61491 or EN-61491).

3.6 ENCODER INTERFACE

A quad B with marker	Three differential Inputs. Input Frequency DC to 1.5 MHz. ON: 5V±5% @ 20mA max. OFF: 1V±5% less than 1mA.
Trap	Input for trapping encoder's 32 bit signed position. 24V±10% @ 10 mA max. Max. Trap Rate 1 kHz. Trap Register is updated on falling edge of input. Consult factory for availability of rising edge Trap Input.

3.7 WATCHDOG PROTECTION

Contact Type	Relay normally open dry contact
Rating	Up to 28 VAC/VDC, 1.0 Amp Maximum

SECTION 4 - EMERALD WIRING

This section details the pinouts of the external connectors on the EMERALD controller. Refer to **Section 7 INTERFACE CABLES** for part numbers of cables to interface to these connectors.

4.1 PORT 1 & PORT 2

The ports are used for communication and use RJ-11 connectors to interface to respective devices. The port 1 & port 2 pinouts are shown in **Figure 4.1**.

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Figure 4.1 - Port 1 & Port 2

4.2 PORT 3 (DeviceNet/Can Bus)

DeviceNet/Can Bus is to be powered by a 12 to 24 volt, Class 2 power supply.

The DeviceNet/Can Bus pinouts are shown in **Figure 4.2**.

Error! No topic specified.

Figure 4.2 - DeviceNet/CAN Bus

4.2.1 WIRING RECOMMENDATIONS

A. A termination resistor at either end of the Can Bus trunk.
- Termination Resistor Specifications
  - 121 ohm
  - 1% Metal Film
  - ¼ Watt

B. Ideally the Drain Wire (pin-3) should be tied to the supply ground at the power supply. At that power supply the ground should be tied to earth.

C. DeviceNet Specifications for further wiring concerns can be found with the Open DeviceNet Vendors Association (ODVA).

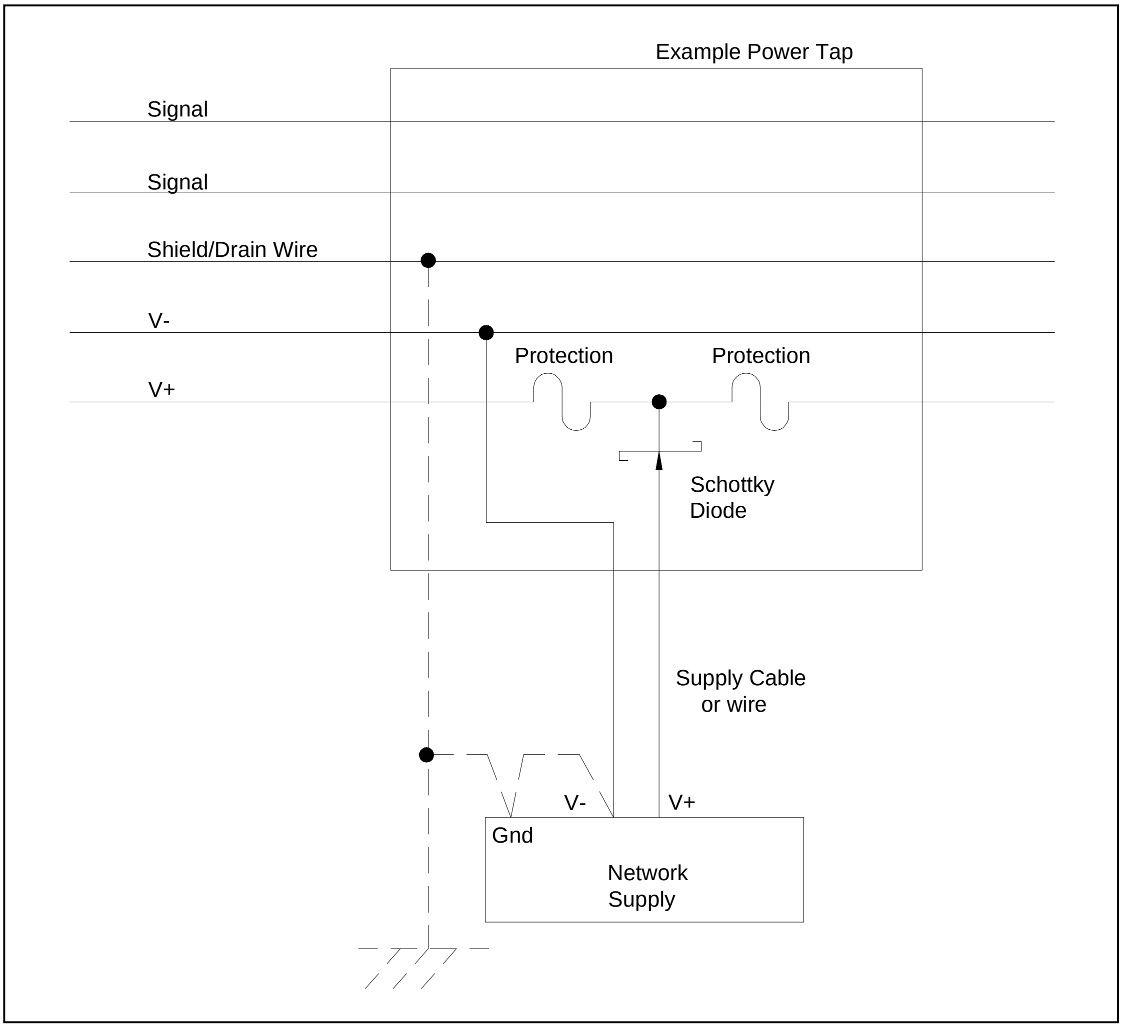

Figure 4.3 - Diagram of DeviceNet Power Tap

4.3 ENCODER INTERFACE

The Encoder interface connector pinouts are shown in **Figure 4.4**.

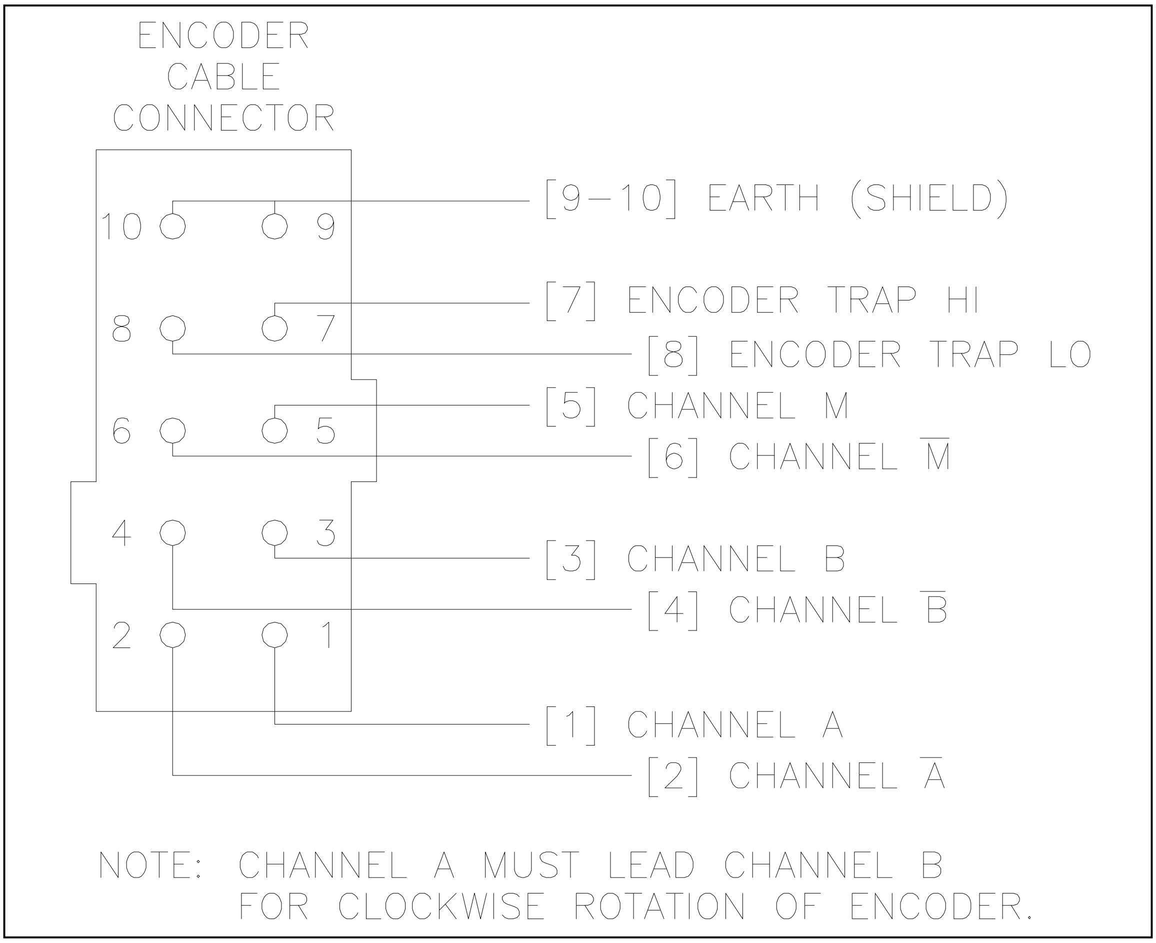

Figure 4.4 - Encoder Interface Connector Pinouts

4.4 POWER AND WATCHDOG CONNECTER

The 24-volt, Class 2 power supply is to be used to power the EMC-2005.

The pinouts of the WD/24V connector are shown in **Figure 4.5**.

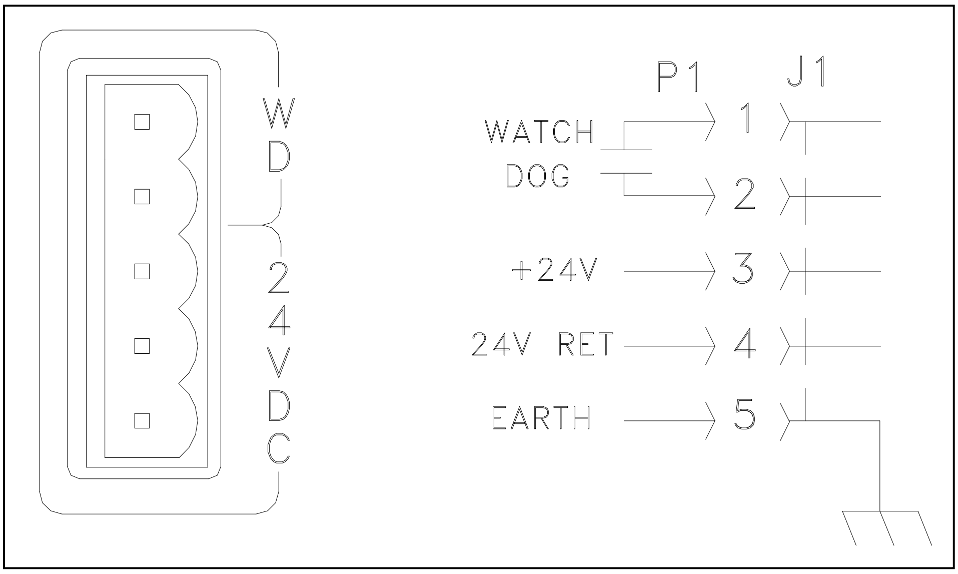

Figure 4.5 - Power and Watchdog Connection

4.5 SERCOS INTERFACE TX/RX

The SERCOS Interface™ is a multi-drop fiber-optic ring with 1 Master Controller command multiple Slave devices. The EMERALD acts as the Master Controller in this arrangement.

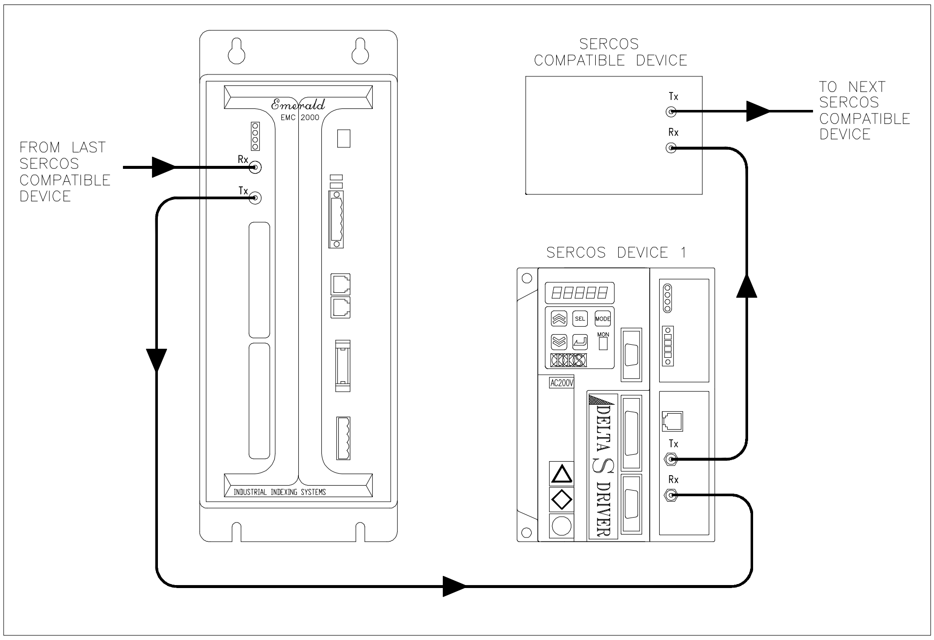

Figure 4.6 - Typical SERCOS Ring

SECTION 5 - STATUS & ERROR CODES

5.1 CONTROLLER STATUS

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Figure 5.1 - Controller Status

5.2 SERCOS STATUS DISPLAYS

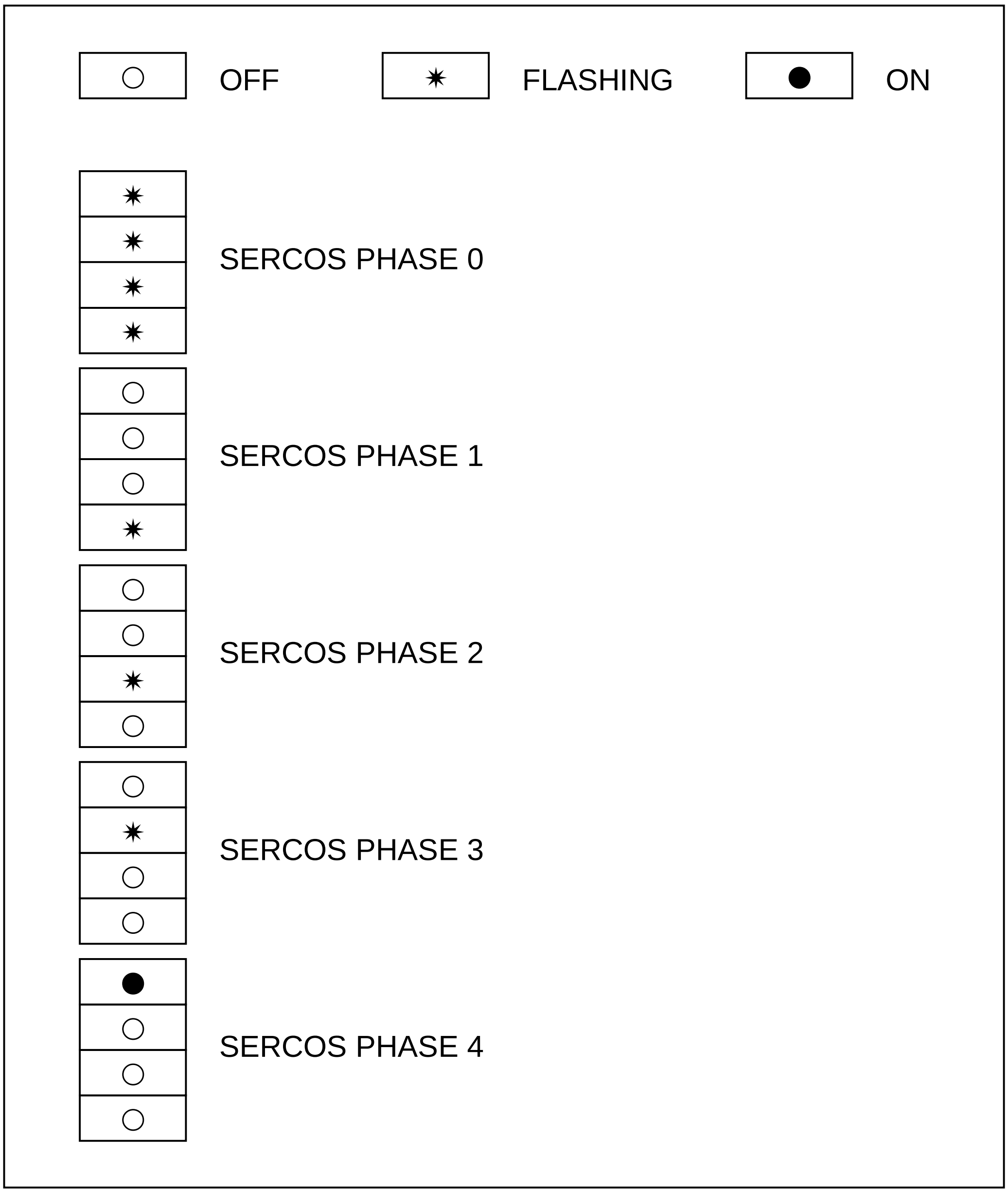

Figure 5.2 - SERCOS Status Displays

5.3 DEVICENET STATUS DISPLAYS FOR PORT 3

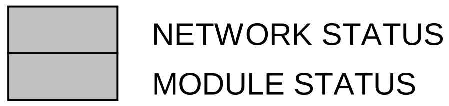

Figure 5.3 - DeviceNet

5.3.1 MODULE STATUS LED

The lower bi-color (green/red) LED provides DeviceNet device status. It indicates whether or not the device has power and is operating properly. **Table 5.1** and **Figure 5.3** define the Module Status LED states.

STATE	LED IS	TO INDICATE
No Power	Off	There is no power applied to the device.
Device Operational	Green	The device is operating in a normal condition.
Device in Standby (The Device Needs Commissioning)	Flashing Green	The device needs commissioning due to configuration missing, incomplete or incorrect. The device may be in the standy state.
Minor Fault	Flashing Red	Recoverable fault.
Unrecoverable Fault	Red	The device has an unrecoverable fault; may need replacing.
Device Self Testing	Flashing Red & Green	The device in self-test.

Table 5.1 - Module Status LED

5.3.2 NETWORK STATUS LED

The upper bi-color (green/red) LED indicates the status of the communication link.

Table 5.2 defines the Network Status LED states.

STATE	LED IS	TO INDICATE
Not Powered/Not On-line	Off	Device is not on-line. - The device has not completed the Dup_MAC_ID test yet. - The device may not be powered, look at Module Status LED.
On-line, Not Connected	Flashing Green	Device is on-line but has no connections in the established state. - The device has passed the Dup_MAC_ID test, is on-line, but has no established connections to other nodes. - For a Group 2 Only device it means that this device is not allocated to a master. - For a UCMM capable device it means that the device has no established connections.
Link OK On-Line, Connected	Green	The device is on-line and has connections in the established state. - For a Group 2 Only device it means that the device is allocated to a Master. - For a UCMM capable device it means that the device has one or more established connections.
Connection Time-Out	Flashing Red	One or more I/O Connections are in the Timed-Out state.
Critical Link Failure	Red	Failed communications device. The device detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID or Bus-off).
Communication Faulted and Received an Identify Comm Fault Request - Long Protocol	Flashing Red & Green	A specific Communication Faulted device. The device has detected a Network Access error and is in the Communication Faulted state. The device has subsequently received and accepted an Identify Communication Faulted Request - Long Protocol message.

Table 5.2 - Network Status LED

SECTION 6 - INSTALLATION GUIDELINES

6.1 GENERAL

This section contains the specific information needed to properly install the Emerald EMC-2005 controller unit. For maximum performance it is recommended that the controller unit be installed in a NEMA 12 type enclosure and certain other criteria be met.

6.2 ENCLOSURE CABINET REQUIREMENTS

Ideally, the EMC-2005 controller unit, along with other related electronic components, should be mounted on a panel housed in a NEMA 12 enclosure. It is recommended that the cabinet have a depth of 12.00 inches (304.8 mm) to accommodate the bend radius of the SERCOS fiber optic cables. The enclosure should be mounted as far away as practical from noise generating devices, such as SCR equipment.

6.3 MOUNTING THE SYSTEM UNIT

The EMC-2005 controller unit is designed for mounting on a grounded panel, and is secured to the panel with four #10 screws. Be sure to provide adequate spacing around the controller unit for ease of maintenance and proper ventilation. Typically wire ways can be located up to 3 inches (76 mm) from the edge of the controller unit back plate. Refer to drawing number EMC-2005 in **Section 6.7 - Installation Drawings** for mounting dimensions.

6.4 CABLE ISOLATION REQUIREMENTS

It is imperative that any low-voltage signal conductors, such as resolvers, encoders or communications, (24V or less) be routed in conduits or wire ways separate from high-voltage, such as motor cables, and transformer lines (100V or more). This will insure that electromagnetic fields produced by high power transmission do not corrupt the low level signals. All cabling shields must be connected according to manufacturer specifications.

6.5 GROUNDING REQUIREMENTS

The site must have a suitable earth ground rod and ground bus installed. The NEMA 12 enclosure, wire ways, conduits, and machine frame must be connected to this ground bus. The EMC-2005 earth ground must be connect to this ground bus.

6.6 POWER ISOLATION

Although the unit is equipped with a fuse and transient voltage protection, it is recommended that the EMC-2005 unit be connected to a separate 24 VDC power supply than the supply used for system I/O. This will isolate noisy I/O contacts from the controller power.

6.7 INSTALLATION DRAWINGS

DRAWING NUMBER	**DESCRIPTION**
EMC-2005	Emerald Controller

SECTION 7 - CABLES AND ACCESSORIES

DRAWING NUMBER	DESCRIPTION
C-752YYY	SERCOS Fiber Optic Cable, External
C-753YYY	SERCOS Fiber Optic Cable, Internal
C-822YYY	Adaptor Cable
C-987YYY	Modular Data Cable
INT-810	Encoder Cable Adapter

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APPENDIX A - MODEM PMC OPTION BOARD

A.1 MODEM OVERVIEW

The PMC-Modem option board for the Emerald Motion Controller (EMC-2005) has been developed around the Conexant Smart Socket Modem; refer to "www.conexant.com".

The PMC-Modem is a 33.6KBaud modem.

The Emerald Development Environment (EDE) fully supports connection remotely over the phone lines to the EMC-2005 with a PMC-Modem installed.

The PMC-Modem once installed into the EMC-2005 from the factory is configured to Auto-Answer a phone line connection. It will also auto-negotiate the carrier and data baud rates of the United States by just connecting to a direct phone line.

Operation of the PMC-Modem outside the United States can be achieved with minor setup changes to the modem.

A.2 POWER REQUIREMENT

The PMC-Modem option board requires an addition 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 be a little generous and add about .5 Amps of current for each Modem installed.

A.3 WIRING

The PMC-Modem accepts a standard phone RJ11 connector, therefore RING is on PIN-3 and TIP is on PIN-4.

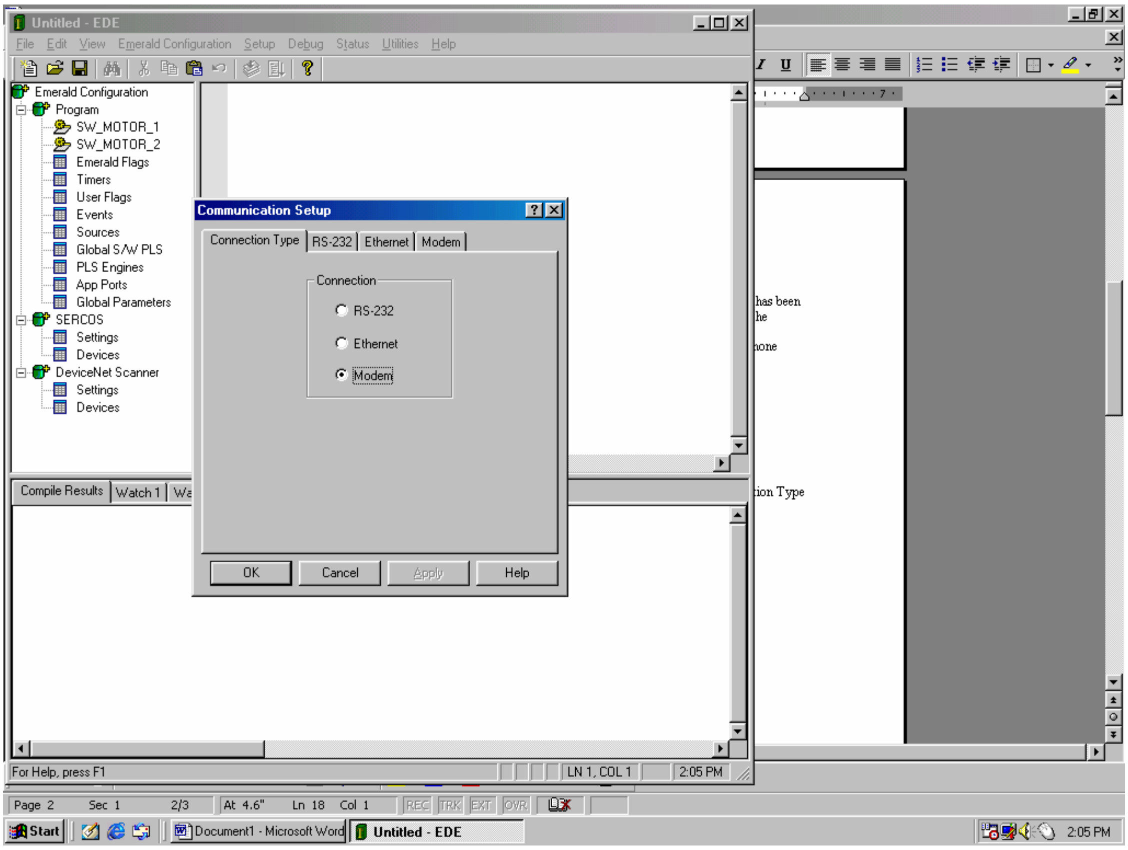
A.4 EDE SETUP FOR MODEM COMMUNICATION

The EDE is a PC Windows application developed by Industrial Indexing Systems to program the Emerald Motion Controller. The EDE can be configured to communicate remotely with the EMC via RS232, ETHERNET, or MODEM.

For remote access to the EMC-2005 with a PMC-Modem it is necessary to configure the EDE for communication via modem. It is required that the PC running the EDE has an installed modem.

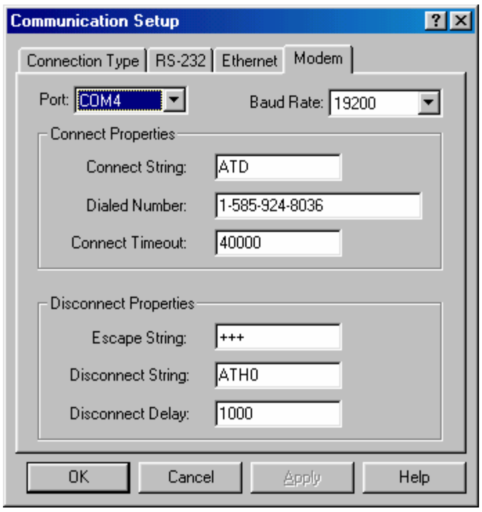
A.4.1 SELECT MODEM FOR CONNECTION

From EDE tool bar go to **Setup** then select **Communication**, once the screen for connection Type appears select **Modem** as shown below.



A.4.2 MODEM EDE CONFIGURATION SCREEN

When the EDE is not connected to a controller the modem settings for the PC in which the EDE is running from can be change from the Modem Communication Setup Screen as seen below.



Port: Allows selection of the COM port in which the modem resides on the development platform (PC). The COM port for the modem in any PC running Windows 98 and higher may be gotten from the System display in the Control Panel.

1. Double Click on My Computer from the Windows Desk Top.
2. Double Click on Control Panel.
3. Double Click on Modem.
4. Select Desired Modem from Pull down then click on properties.

Baud Rate: Allows user selection for desired bit rate. The PMC-Modem will operate up to a Baud Rate of 28800, however depending on phone line integrity slower rates may have to be used for error free operation. It's possible to select the highest rate available and let the modems auto-negotiate to the best rate under current line conditions.

A.4.3 CONNECTION PROPERTIES

Connect String: Allows user selection of the string to originate a call via the modem. Most modems will work with a setting of ATD; this is an ASCII Terminal Command to the modem.

Dialed Number: Allows user to select the phone number to connect to the EMC-2005. For the EDE to connect to an EMC-2005 with a Modem, the EMC-2005 needs to be plugged into a phone line, this phone line must have a number to be entered here.

NOTE

The EMC-2005 modem should be plugged into a direct phone line and not one in which the line goes thru an operator or switchboard.

Connection Timeout: Allows the user select the amount of time to wait for the connection to the EMC-2005 to take place.

A.4.4 DISCONNECT PROPERTIES

Escape String: Allows user selection of string to tell the modem to drop from data mode and accept ASCII Terminal Commands.

Disconnect String: Allows user selection to tell the modem to Hang-Up. Most modems will work with a setting of ATH0; this is an ASCII Terminal Command.

Disconnect Delay: Allows the user to select the time in which the EDE should wait for the modem to disconnect.

A.5 EMC ASCII TERMINAL MODE

ASCII Terminal mode is a typical means of communicating with any modem directly no matter what the platform it resides. ASCII Terminal communication is accomplished over Port 1 of the EMC-2005 to the modem plugged into one of the EMC's PMC Option Slots. To communicate to the PMC-Modem in this manner it is necessary to use a terminal emulator such as HyperTerminal. HyperTerminal is shipped with most Microsoft Windows Products, it can be found in the Accessories/Communications folder.

HyperTerminal Setup/Properties:

1. Connect using: Direct to COMx
2. Configure
    a. Bits per second: 38400
    b. Data bits: 8
    c. Parity: None
    d. Stop bits: 1
    e. Flow Control: None
3. ASCII setup:
    a. Enable typed characters locally.

In step 1 above, replace COMx with the COM port of the PC in which the modem resides. For instance, if the modem in the PC was configured on the fourth COM Port use COM4.

Once ASCII Terminal Emulator is setup type in "AT?<cr>" for the EMC's ASCII Terminal help screen to be displayed.

If characters are not displayed in the ASCII Terminal window as they are typed in, the user may ask the EMC-2005 to echo them by typing in "AT;E1<cr>".

NOTE: <cr> is the Enter key on the PC keyboard.

A.6 PMC-MODEM LEDS

The PMC-Modem has four status LEDs; see description below:

Tx: A green LED that turns on when ever the PMC-Modem is transmitting data out the phone line.

Rx: A yellow LED that turns on when ever the PMC-Modem is receiving data from the phone line.

On: A green LED with three statuses:

- FLASHING - When the Modem phone line is ringing for the EMC Modem to pick up.
- SOLID ON - Modem normal indication, indication that self-tests passed and successful initialization, modem is ready to Auto-Answer. The On LED should stay LIT after answering and during a connection.
- SOLID OFF - Modem initialization failed, modem not operational, contact factory.

Ct: A red LED with two statuses:

- SOLID OFF - No carrier detected, modem is waiting for a connection.
- SOLID ON - Carrier has been detected; modem has a connection and is awaiting data. Data is present when Rx and Tx LEDs are FLASHING.

All LEDs are on during initial power-up, booting, of the EMC when the EMC's Status Display is a "**b**", but then should transition to just the **On** LED turned ON once the boot cycle is complete. If during power-up the Modem should fail any of the initialization all its LEDs are turned OFF, this is an indication that the modem is not operational.

A.7 EMC STATUS DISPLAYS FOR PMC-MODEM

The EMC will monitor the PMC-Modem operation and display any errors it detects as follows:

Flashing "**=**" then "**0**": Top PMC slot modem receiver over run error.
Flashing "**=**" then "**1**": Top PMC slot modem framing error.
Flashing "**=**" then "**2**": Top PMC slot modem parity error.
Flashing "**=**" then "**3**": Top PMC slot modem break mode error.
Flashing "**=**" then "**4**": Top PMC slot modem reserved.
Flashing "**=**" then "**5**": Top PMC slot modem inter-character timeout.

For a modem in the Bottom PMC slot replace the "**=**" character with the "**-**" character.

A.8 OPERATION OUTSIDE OF UNITED STATES

The PMC-Modem can be setup to operate outside of the United States by setting one of its available country codes.

It is important to verify which modem card is installed prior to setting the country code. The user will need to type the following AT command into the ASCII Terminal Emulator "ATI3" the data returned is the DSP that is used in the modem simply match it up to one of the charts below for the proper country codes. It is also possible to get the list of country codes that are in the modem by typing the AT command "AT+GCI=?". This only returns the codes not the countries that they belong to.

ATI3=P2109-v34

COUNTRY	CODE	COUNTRY	CODE	COUNTRY	CODE
Australia	09	Hong Kong	50	Norway	82
Austria	0A	Hungry	51	Philippines	89
Belgium	0F	India	53	Poland	8A
Brazil	16	Ireland	57	Portugal	8B
Bulgaria	1B	Israel	58	Russia	B8
Canada	20	Italy	59	Singapore	9C
China	26	Japan	00	South Africa	9F
Czech and Slovak Rep.	2E	Korea	61	Spain	A0
Denmark	31	Luxemburg	69	Sweden	A5
Finland	3C	Malaysia	6C	Switzerland	A6
France	3D	Mexico	73	Taiwan	FE
Germany	42	Netherlands	7B	United Kingdom	B4
Greece	46	New Zealand	7E	United States	B5

ATI3=CX81802-v34

COUNTRY	CODE	COUNTRY	CODE	COUNTRY	CODE
Argentina	07	Greece	FD	Netherlands	FD
Australia	09	ICELAND	FD	New Zealand	7E
Austria	FD	Ireland	FD	Norway	FD
Belgium	FD	Indonesia	99	Philippines	B5
Brazil	16	Israel	B5	Poland	99
Canada	B5	Italy	FD	Portugal	FD
Chile	99	Japan	00	Spain	FD
Cyprus	FD	Korea	B5	Sweden	FD
China	B5	Liechtenstein	FD	Switzerland	FD
Denmark	FD	Luxembourg	FD	Taiwan	FE
Estonia	FD	Malaysia	6C	Turkey	FD
France	FD	Mexico	B5	United Kingdom	FD
Germany	FD			United States	B5

If the desired country for installation doesn't appear in the table, it is recommended that the operator try a country within the same region. For example, if it is desired to install an EMC-2005 with a modem in South America, it's suggested to use Brazil's country code.

The country code may be set using the ASCII Terminal Mode (see Section A.5) over Port 1 (RS232) of the controller. The AT command when setting the country code, as seen from help screen (AT?), is AT+GCI=00 for Japan.

A.9 EMC MODEM PROGRAMMING INSTRUCTIONS

Using the EMC-2005's programming language it is possible to configure a PMC-Modem to operate as needed per an application.

It is intended that an application program could achieve the following:

- Set the modems country of installation setting.
- Retrieve the modems country of installation setting.

To avoid confusion the list of instructions and an explanation of there usage is maintain in the EDE, please refer to the EDE help for further information when programming the PMC-Modem.

APPENDIX B - ETHERNET PMC ETHERNET BOARD

B.1 ETHERNET OVERVIEW

The PMC-Ethernet card enables the application programmer to run the EDE software tools via Ethernet.

The PMC-Ethernet card creates an embedded XML document, which allows data to be transferred between a web application and the Emerald Motion Controller (EMC-2005). The application programmer can specify the exact nature of the resources available to the XML.

B.2 POWER REQUIREMENT

The PMC-Ethernet card requires an addition 4.8 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 add .5 Amps of current for each Ethernet card installed.

B.3 WIRING

The PMC-Ethernet accepts a standard RJ-45 plug, therefore PIN-1 is Input Receive Data +, PIN-2 is Input Receive Data -, PIN-3 Output Transmit Data +, PIN-6 Output Transmit Data –, and pins 4,5,7, and 8 are not used.

B.4 PMC-ETHERNET LEDS

The PMC-Ethernet has four status LEDs; see description below:

Rx: A green LED that turns on when ever the PMC-Ethernet card is receiving data.

Tx: A yellow LED that turns on when ever the PMC-Ethernet card is transmitting data.

L: A green LED that turns on when there is a valid link exists.

100: A yellow LED that is on when the unit is set in 100 Mbits/s mode.

B.5 EDE SETUP FOR ETHERNET COMMUNICATION

The EDE is a PC Windows application developed by Industrial Indexing Systems to program the Emerald Motion Controller. The EDE can be configured to communicate remotely with the EMC via RS232, ETHERNET, or MODEM.

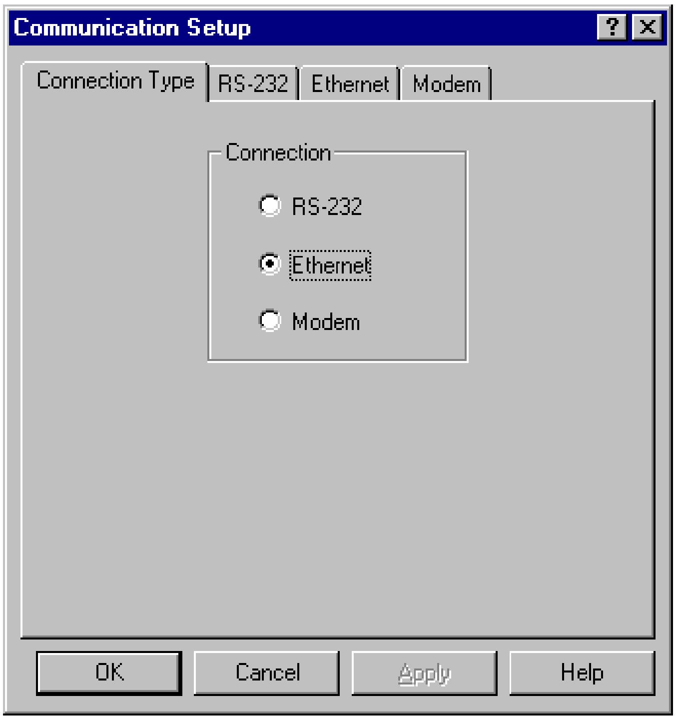
For remote access to the EMC-2005 with a PMC-Ethernet card, it is necessary to configure the EDE for communication via Ethernet. It is required that the PC running the EDE has an Ethernet connection.

B.5.1 SELECT ETHERNET FOR CONNECTION TYPE

From the EDE toolbar go to **Setup** then select **Communication**, once the screen for Connection Type appears select **Ethernet** as shown below.

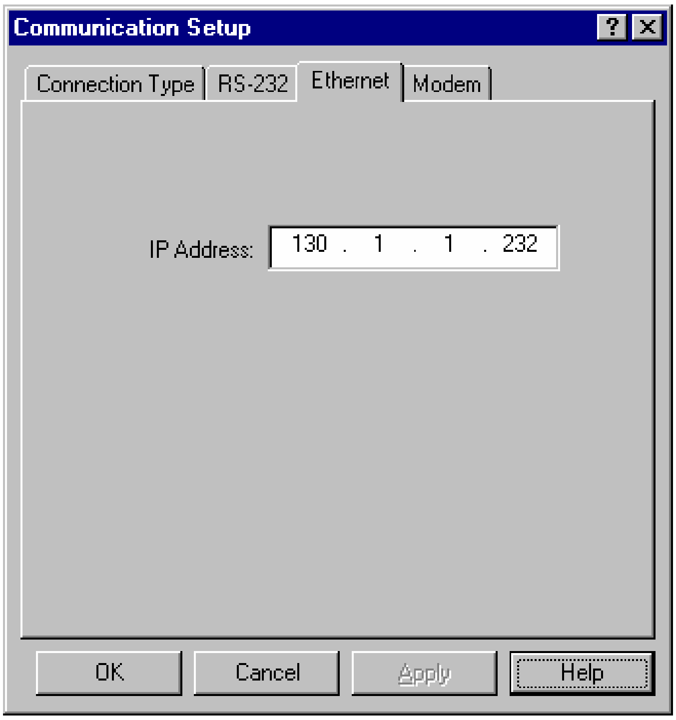
NOTE

To be able to select communication, the EDE must not be currently connected.



B.5.2 ETHERNET EDE CONFIGURATION SCREEN

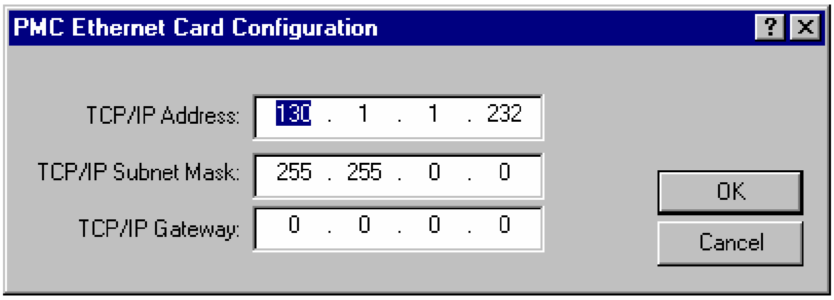
After the Connection Type is set to Ethernet, select the Ethernet tab and the screen below will be displayed.



IP Address: This needs to be set to the IP Address of the Emerald controller that you desire to communicate to. After this value is entered, the EDE should be able to communicate over the Ethernet to the desired controller by selecting debug then connect from the EDE toolbar.

B.6 ETHERNET CARD SETUP

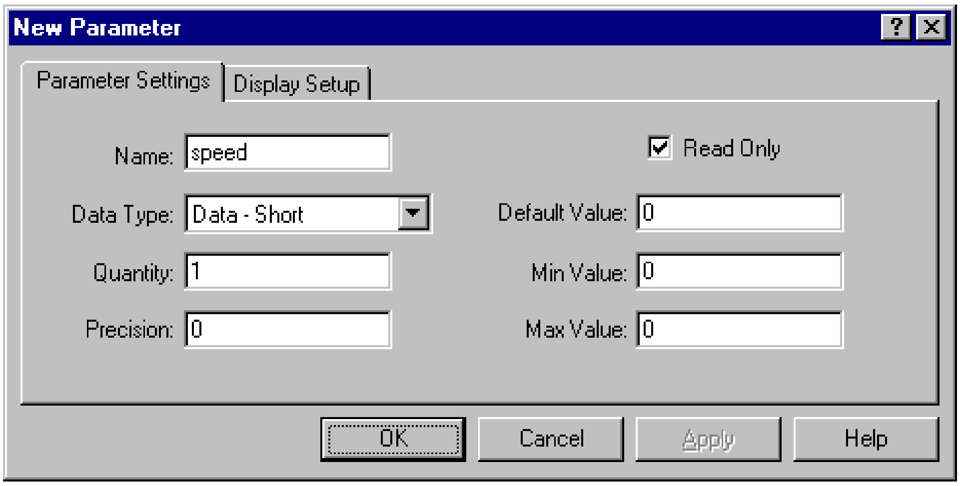
While you are connected using either RS-232 or Modem, from the EDE toolbar go to **Emerald Configuration** then select **PMC Cards** and then the Ethernet card from the desired slot. If Ethernet card is not displayed in the list, then the Emerald controller is not recognizing that the card is installed. After selected the desired Ethernet card the following window will be displayed:



These settings can be modified to the desired settings while connected.

B.7 GLOBAL PARAMETERS

Using the EMC-2005's programming language it is possible to configure 128 Global parameters. These parameters are accessible through XML and controlled through the global parameter configuration.



Name: The name field must match a name used in the configuration section or program area of the selected data type.

Data Type: The type of data that is specified in the name field.

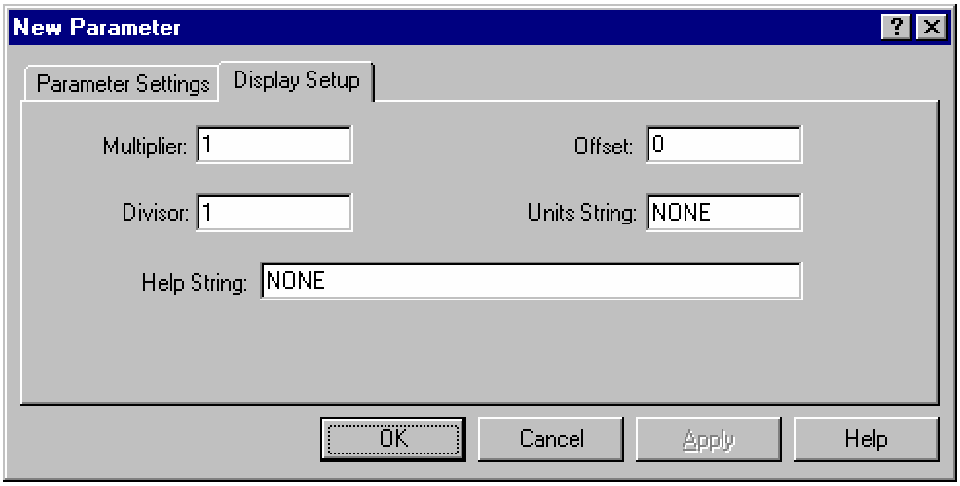
Quantity: This field is only used for data types that can be arrays. The number entered should be the same size or less then the size of the array.

Default Value: This value is currently not being used.

Read Only: If this box is checked the user cannot write any information to this parameter over a network connection.

Min Value: This value will limit the value written to this parameter.

Max Value: This value will limit the value written to this parameter.



B.7 GLOBAL PARAMETERS (cont'd)

The values on this tab of the global parameters can be used to modify the actual value for display purposes.

The following formulas should be used for data types short, long, text, short ext memory, and long ext memory by the web page developer to input a value to the controller and to display a value returned from the controller:

$$\text{Displayed Value} = \frac{(\text{Emerald value} + \text{offset}) * \text{multiplier}}{\text{divisor} * (10 \wedge \text{precision})}$$

NOTE: The value displayed should contain the number of decimal places of the entered precision.

$$\text{Value written to Emerald} = \frac{\text{value entered} * \text{divisor} * (10 \wedge \text{precision})}{\text{multiplier}} - \text{offset}$$

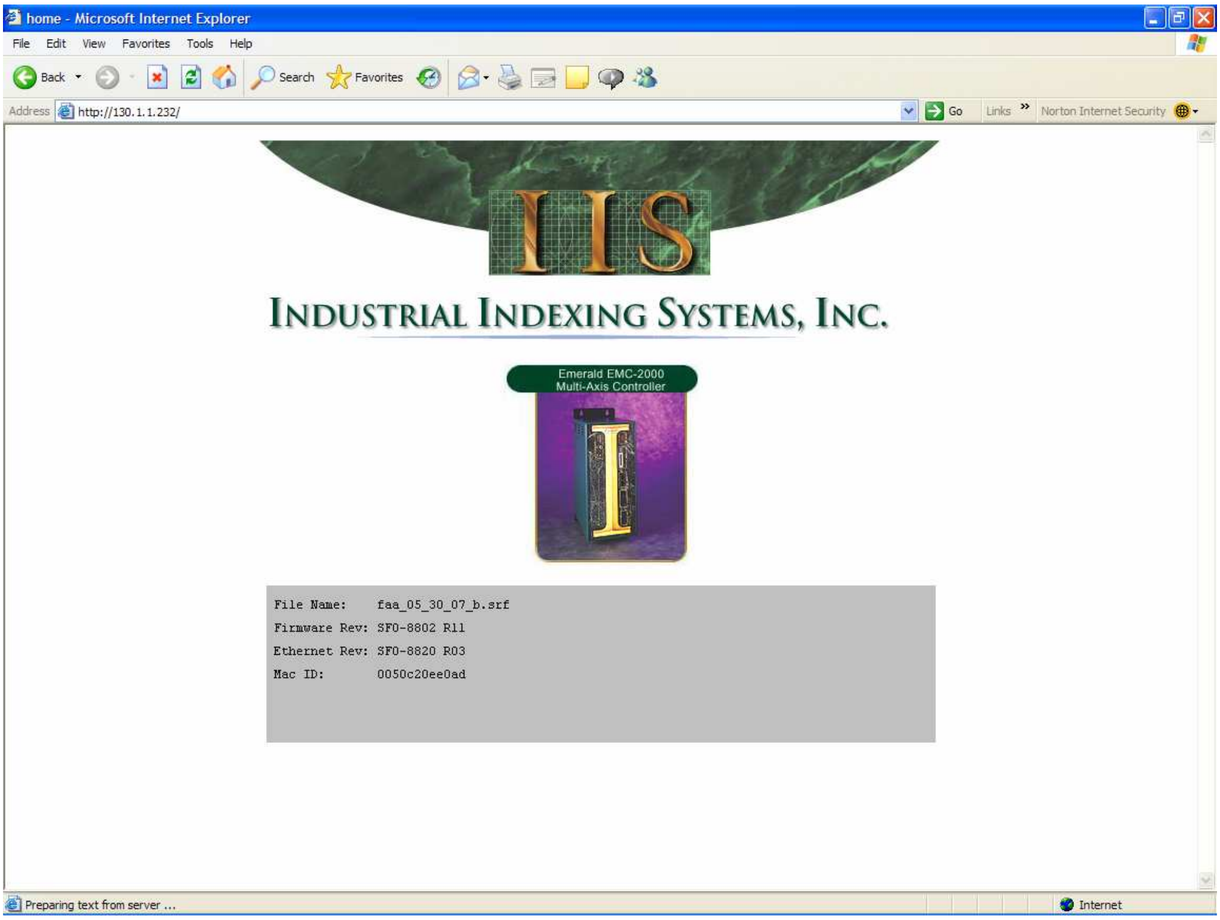
NOTE: When the Emerald receives the value it is compared against the min and max limits. If a value is greater then the max limit the number is set equal to the max limit before it is written to the emerald memory. If a value is less then the min limit it is set equal to the min limit value before it is written to the emerald memory.

The unit's string is served up as part of the XML document.

The help string is not currently used.

B.8 DEFAULT WEB PAGE

The PMC-Ethernet card will serve up a home page as shown below:



File Name: Program Currently loaded in the Emerald Controller.

Firmware Rev: Revision of firmware currently in the Emerald Controller.

Ethernet Rev: Revision of firmware in the Ethernet card.

Mac ID: Ethernet Mac ID.

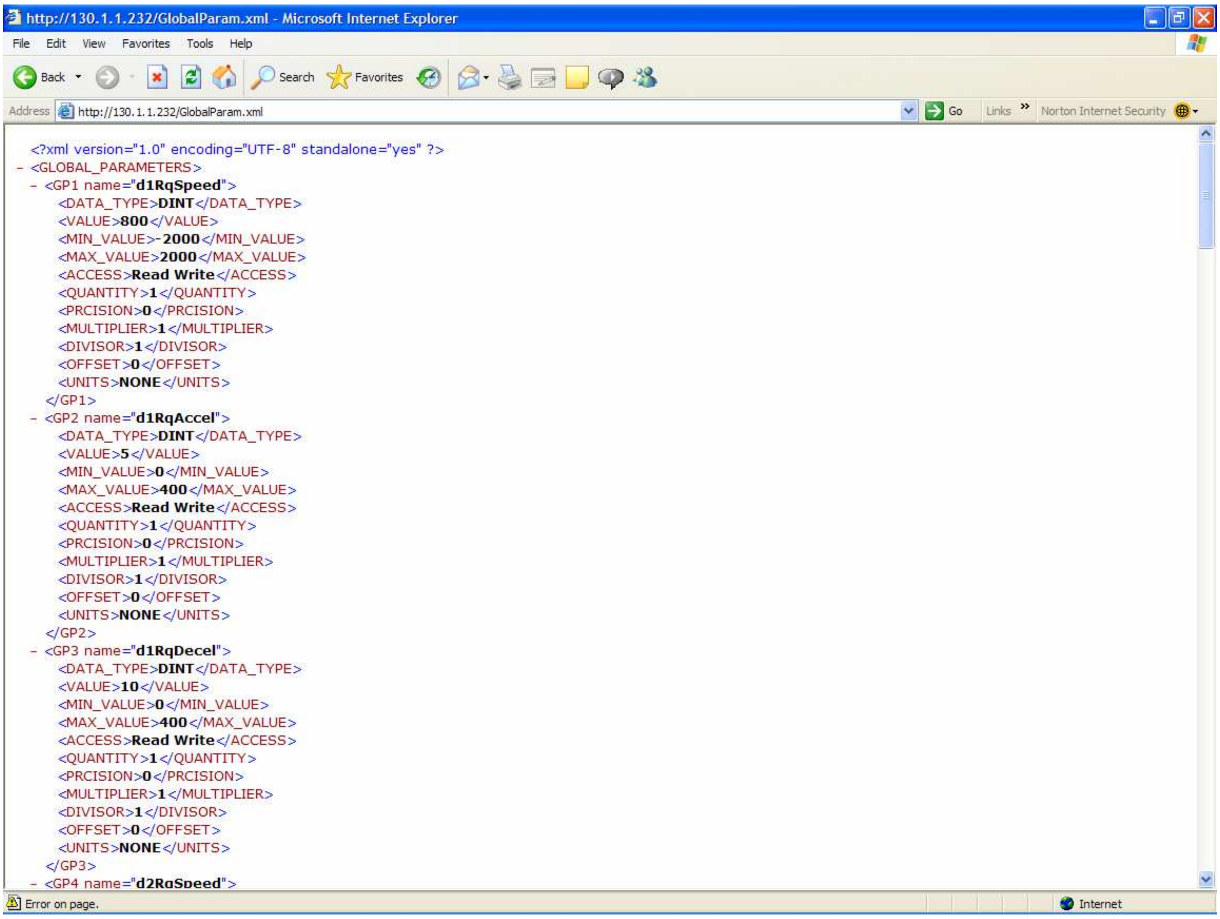
B.9 EMBEDDED XML DOCUMENT – READ ALL GLOBAL PARAMETERS

For web page developers the PMC-Ethernet card will serve up an embedded XML document. The document contains application specific data defined during application development using Global Parameter configuration.

To read all Global Parameters enter the home page
address/GlobalParam.xml

The string "***GlobalParam.xml***" is case sensitive.

If a value has a quantity greater then 1, a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.




```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <GLOBAL_PARAMETERS>
- <GP1 name="d1RqSpeed">
    <DATA_TYPE>DINT</DATA_TYPE>
    <VALUE>800</VALUE>
    <MIN_VALUE>-2000</MIN_VALUE>
    <MAX_VALUE>2000</MAX_VALUE>
    <ACCESS>Read Write</ACCESS>
    <QUANTITY>1</QUANTITY>
    <PRCISION>0</PRCISION>
    <MULTIPLIER>1</MULTIPLIER>
    <DIVISOR>1</DIVISOR>
    <OFFSET>0</OFFSET>
    <UNITS>NONE</UNITS>
  </GP1>
- <GP2 name="d1RqAccel">
    <DATA_TYPE>DINT</DATA_TYPE>
    <VALUE>5</VALUE>
    <MIN_VALUE>0</MIN_VALUE>
    <MAX_VALUE>400</MAX_VALUE>
    <ACCESS>Read Write</ACCESS>
    <QUANTITY>1</QUANTITY>
    <PRCISION>0</PRCISION>
    <MULTIPLIER>1</MULTIPLIER>
    <DIVISOR>1</DIVISOR>
    <OFFSET>0</OFFSET>
    <UNITS>NONE</UNITS>
  </GP2>
- <GP3 name="d1RqDecel">
    <DATA_TYPE>DINT</DATA_TYPE>
    <VALUE>10</VALUE>
    <MIN_VALUE>0</MIN_VALUE>
    <MAX_VALUE>400</MAX_VALUE>
    <ACCESS>Read Write</ACCESS>
    <QUANTITY>1</QUANTITY>
    <PRCISION>0</PRCISION>
    <MULTIPLIER>1</MULTIPLIER>
    <DIVISOR>1</DIVISOR>
    <OFFSET>0</OFFSET>
    <UNITS>NONE</UNITS>
  </GP3>
- <GP4 name="d2RqSpeed">
```

B.10 EMBEDDED XML DOCUMENT – READ A GLOBAL PARAMETER

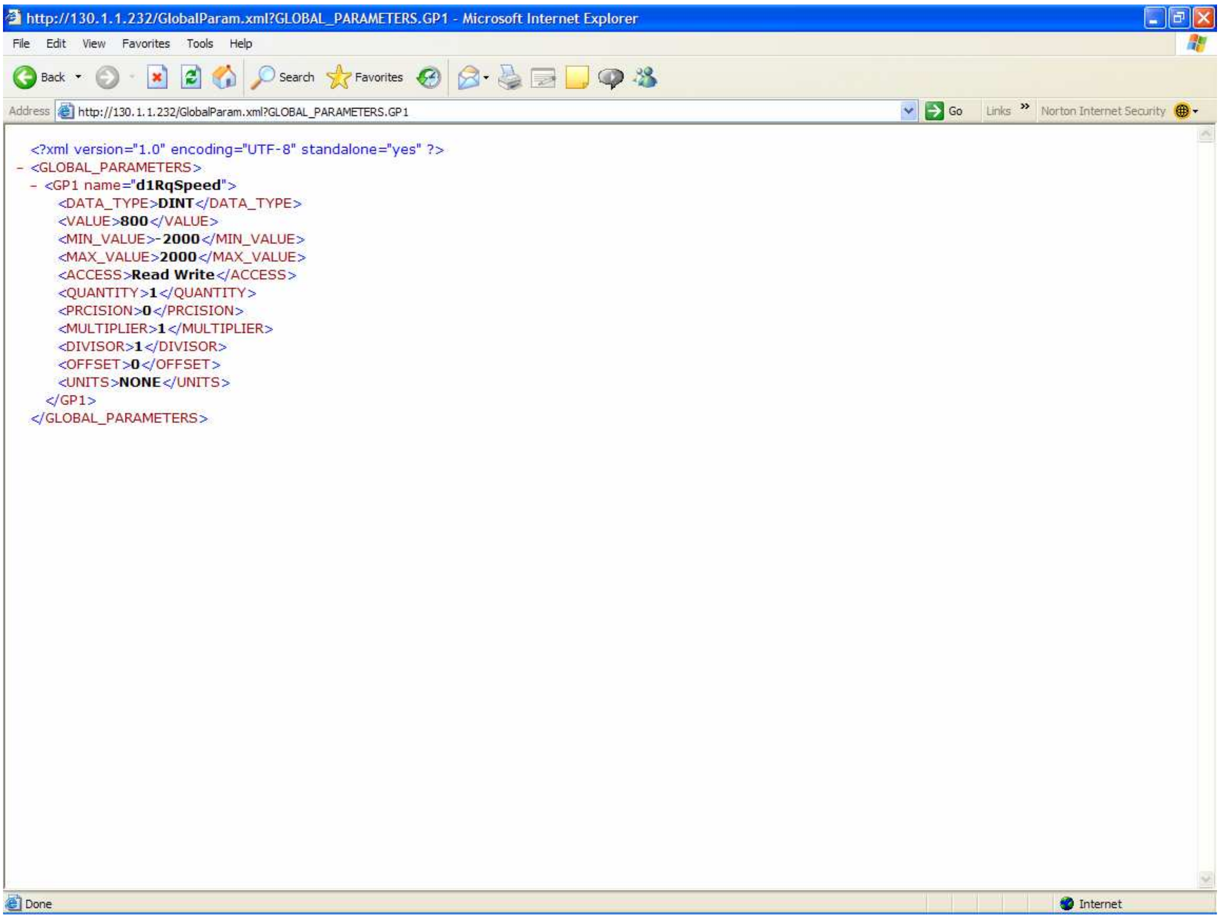
To read a single Global Parameter enter the home page

address/GlobalParam.xml?GLOBAL_PARAMETERS.GPXX

where XX is the desired parameter number.

The strings "***GlobalParam.xml***" and "***GLOBAL_PARAMETERS.GP***" are case sensitive.

If a value has a quantity greater then 1, then a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.

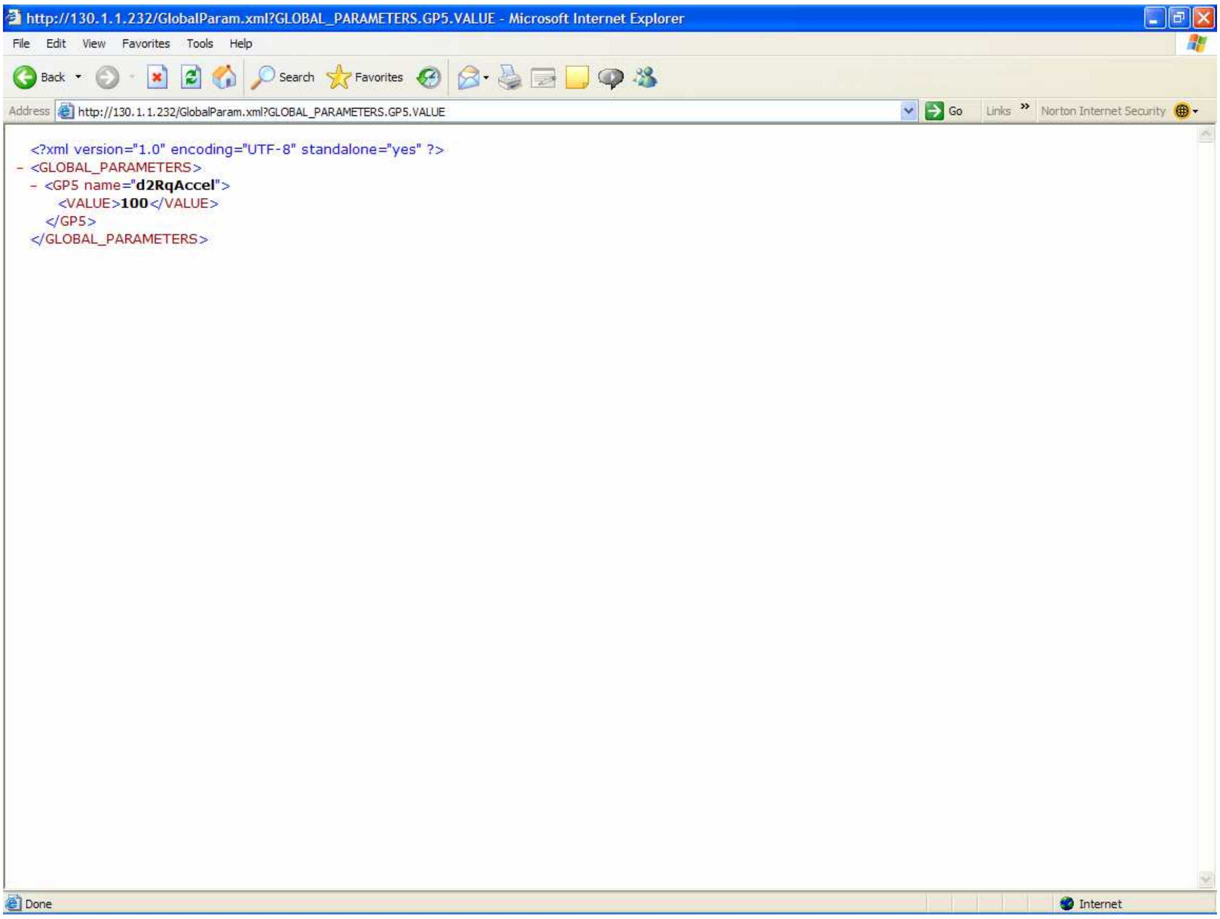


B.11 EMBEDDED XML DOCUMENT – READ A GLOBAL PARAMETER VALUE

To read a single Global Parameter Value enter the home page
address/GlobalParam.xml?GLOBAL_PARAMETERS.GPXX.VALUE
where XX is the desired parameter number.

The strings "***GlobalParam.xml***" and "***GLOBAL_PARAMETERS.GPXX.VALUE***" are case sensitive.

If a value has a quantity greater then 1, then a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.



B.12 EMBEDDED XML DOCUMENT – WRITE A GLOBAL PARAMETER VALUE

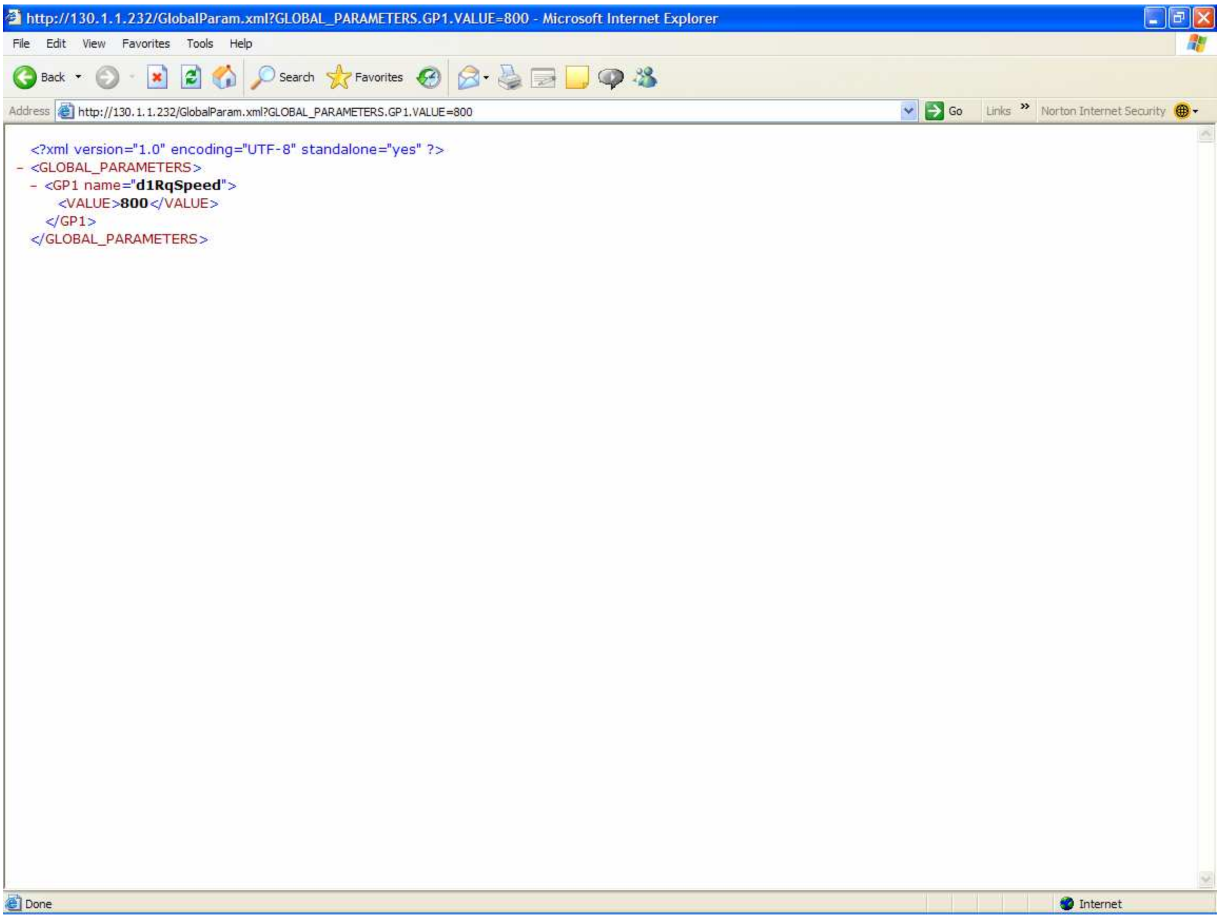
To write a single Global Parameter value enter the home page
address/GlobalParam.xml?GLOBAL_PARAMETERS.GPXX.VALUE=YYY
where XX is the desired parameter number and YYY is the desired input value. The page that will be displayed in the browser is the get a parameter value page.

To write several values to a Global Parameter with a quantity greater than 1, enter the home page
address/GlobalParam.xml?GLOBAL_PARAMETERS.GPXX.VALUE=YYY,ZZZ
where XX is the desired parameter, YYY is the first value, and ZZZ is the second value.

The strings "***GlobalParam.xml***" and "***GLOBAL_PARAMETERS.GPXX.VALUE***" are case sensitive.

If the Global Parameter is a flag, setting the value to 0 will turn the flag OFF while setting it to one will turn the flag ON.

In order to write a value to the controller memory, the Global Parameter *must not be read only*. Before a value is written, it is compared against the min and max parameter values. If the value is greater then the max value, then the max value will be written. If the value is less then the min value, then the min value will be written to memory.



APPENDIX C - MASTER RESOLVER PMC OPTION BOARD

C.1 MASTER RESOLVER OVERVIEW

The PMC-Resolver card enables the application programmer to connect a resolver to the Emerald Controller. The attached resolver can then be configured as a Master Source in the application via the EDE software tools.

C.2 POWER REQUIREMENT

The PMC-Resolver card requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 add .5 Amps of current for each PMC-Resolver Card installed.

C.3 WIRING

Error! No topic specified.

Figure C.1 - PMC-Resolver Card Wiring

C.4 PMC-RESOLVER LEDS

The PMC-Resolver card has two status LEDs:

On: A green LED that turns on at power up and remains on if the PMC-Resolver card is initialized correctly by the EMC-2005.

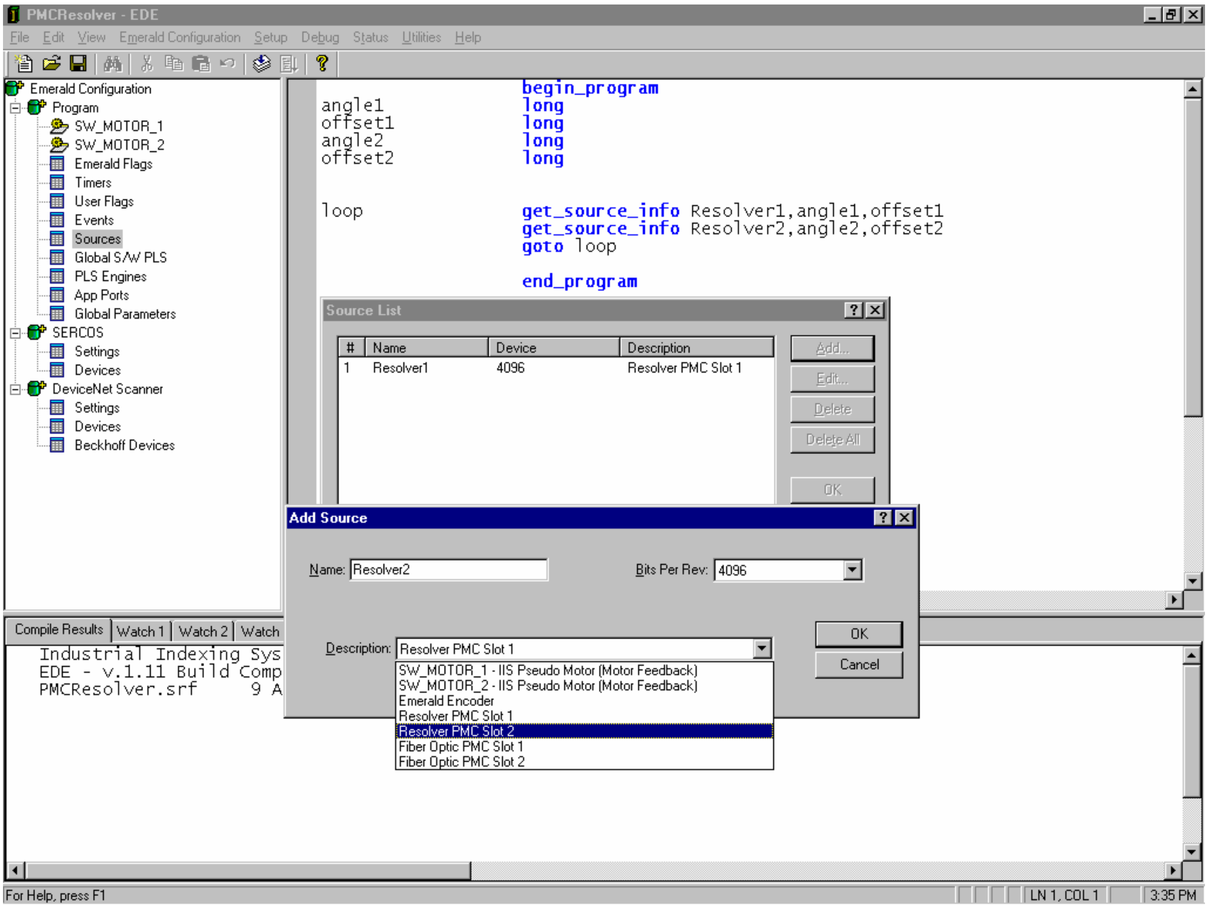
Flt: A red LED that turns on at power up. This LED will go out after the EMC-2005 initializes the PMC-Resolver card and no fault exists on the card. If the red LED is still on then check if resolver is connected correctly and the bit resolution is configured appropriately for the application.

C.5 PMC-RESOLVER CARD SETUP

To utilize the resolver position feedback from a PMC-Resolver card in an application, the card must be configured as a Master Position Source in the application.

C.5.1 CONFIGURING A RESOLVER AS A MASTER POSITION SOURCE

To configure the PMC-Resolver card as a source first determine which PMC option slot location the card is installed (See **Section 2, Figure 2.1**). From the Emerald Configuration tree select "SOURCES". A Source List dialog box will appear. From the Source list dialog box select "Add" button to add a source. The Add Source Dialog box will appear. In the Add Source dialog box name your source and select "Resolver PMC Slot 1" or "Resolver PMC Slot 2" as the description.



You will then need to set the bit resolution of the position feedback in bits per rev. The table below defines the maximum shaft speed the resolver for a given bit resolution. A shaft speed above the Maximum for a given resolution will cause a fault on the card and may return errors in the resolver position.

Resolution (Bit)	Bits Per Revolution	Max Resolver Shaft Speed	Description
10	1024	14400	10 Bit Mode
12	4096	3600	12 Bit Mode
14	16384	900	14 Bit Mode
16	65536	225	16 Bit Mode

APPENDIX D - FIBER OPTIC MASTER PMC OPTION BOARD

D.1 FIBER OPTIC MASTER OVERVIEW

The PMC-FIBER OPTIC MASTER (PMC-FOM herein) card enables the application programmer to connect an Industrial Indexing Systems Fiber Optic Master Signal to the Emerald Controller. The Fiber Optic Master can then be configured as a Master Source in the application via the EDE software tools.

More than one Emerald can easily receive the same master signal from an encoder or resolver using the PMC-FOM option boards. The PMC-FOM(s) allow a fiber-optic chain to be utilized, accomplished by connecting one Emerald's PMC-FOM Transmitter to the next Emerald's PMC-FOM Receiver with fiber-optic cables.

Error! No topic specified.

Figure D.1 - Fiber Optic Master Overview

D.2 SPECIFICATIONS

D.2.1 POWER REQUIREMENTS

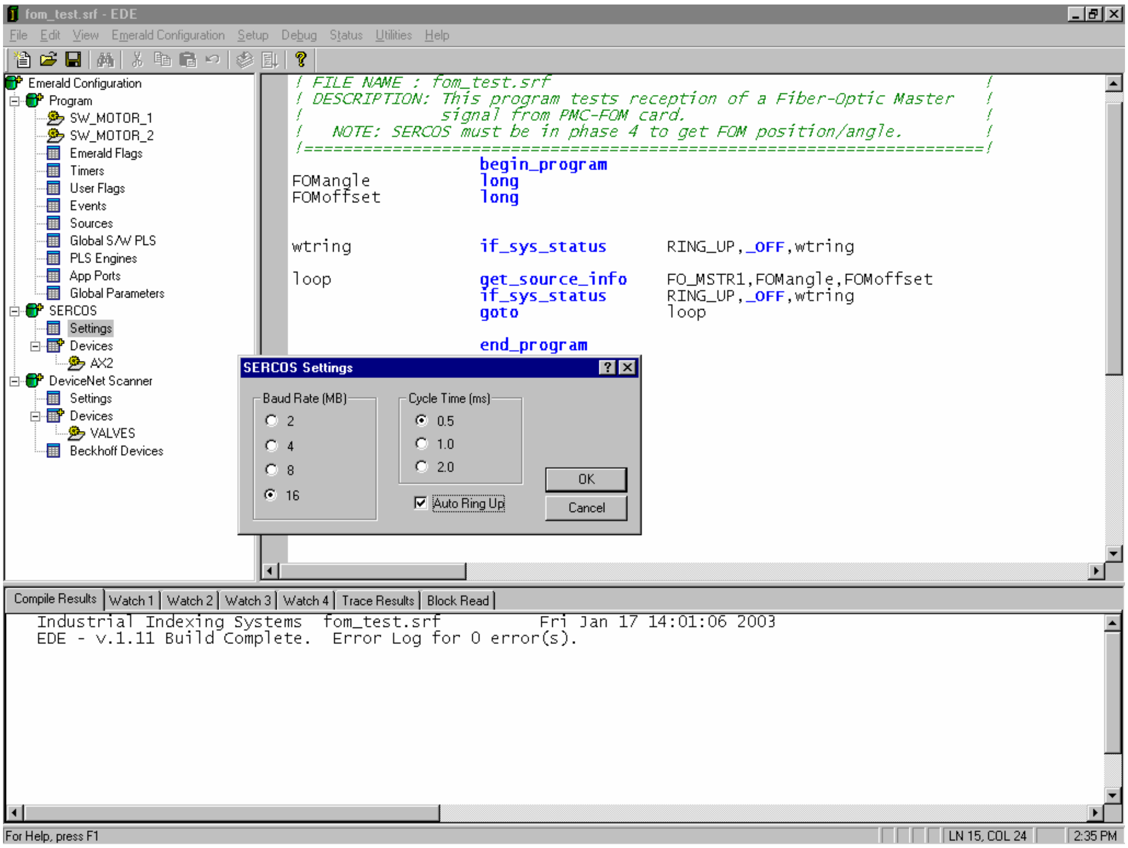
The PMC-FOM card requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 add .5 Amps of current for each PMC-FOM Card installed.

D.2.2 OPTICAL MASTER PROPOGATION

Master Signal Reception to Master Signal Transmission to be within 200 nanoseconds.

D.2.3 MASTER POSITION UPDATE

Fiber Optic Master Signal is conditioned internally by the EMC-2005 at the SERCOS cycle time. The SERCOS cycle time is setup within the SERCOS settings as shown below:



D.3 DESCRIPTION

Error! No topic specified.

Figure D.2 - Fiber Optic Master Description

D.4 PMC-FOM LEDS

Green

The PMC-FOM card has two status LEDs:

Red

A green LED that turns on at power up and remains on if the PMC-FOM card is initialized correctly by the EMC-2005. Once the EMC-2005 controller has successfully brought up its SERCOS control ring and the Fiber-optic signal from the PMC-FOM has no signal the ON green LED will flash.

Transmitter (Gray)

Receiver (Blue)

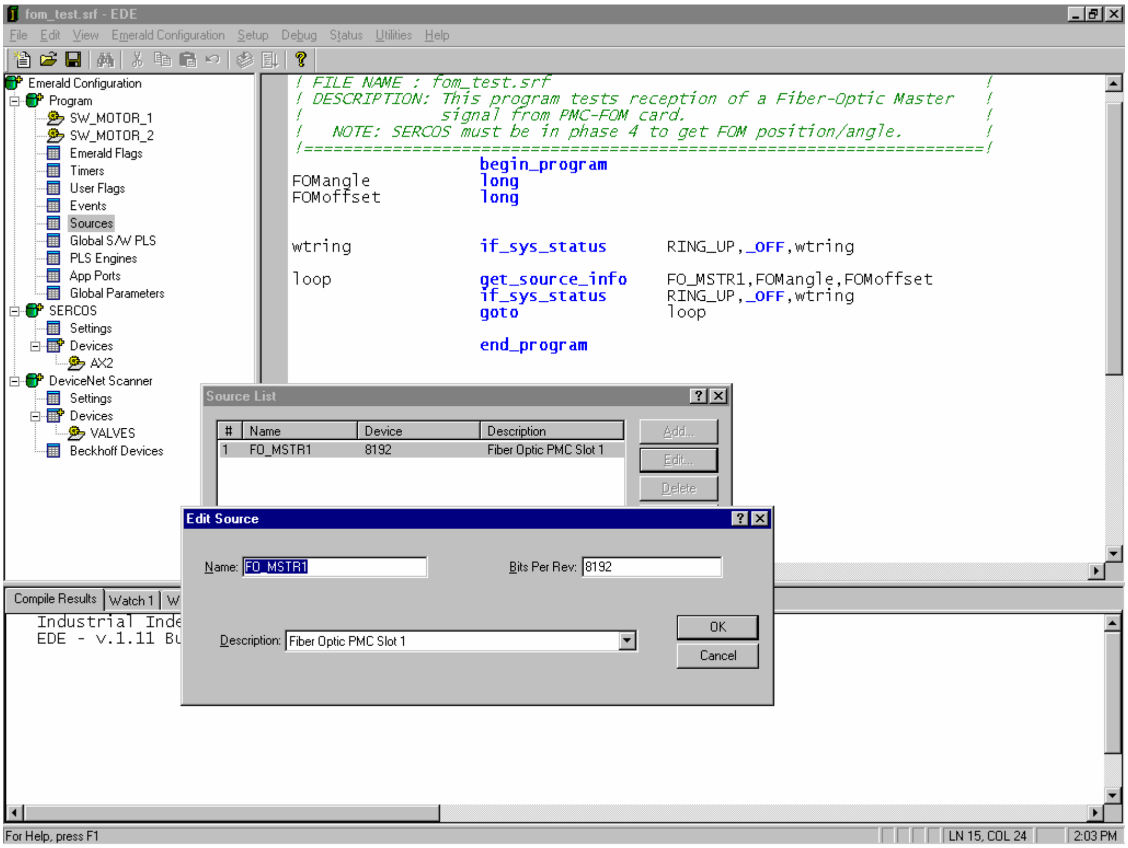
A red LED that turns on at power up and goes out after the EMC-20[illegible] FOM card and no fault exists on the card. If the red LED is on with no Fiber-optic cable connected to the receiver the EMC-2005 was not able to initialize the card. If the red LED is on o[illegible]er-optic signal, then check for incorrect transmission rate settings at the Fiber-Optic Master source.

D.5 PMC-FOM CARD SETUP

To utilize the Fiber-Optic position feedback from a PMC-FOM card in an application, the card must be configured as a Master Position Source in the application.

D.5.1 CONFIGURING A PMC-FOM AS A MASTER POSITION SOURCE

To configure the PMC-FOM card as a source first determine which PMC option slot location the card is installed (See **Section 2, Figure 2.1**). From the Emerald Configuration tree select "SOURCES". A Source List dialog box will appear. From the Source list dialog box select "Add" button to add a source. The Add Source Dialog box will appear. In the Add Source dialog box name your source and select "Fiber Optic PMC Slot 1" or "Fiber Optic PMC Slot 2" as the description.



You will then need to set the bit resolution of the position feedback in bits per rev expected from master source transducer and IIS Fiber-Optic converter, typically an EFC or RFC connected to a encoder or resolver respectively.

APPENDIX E - SMARTMEDIA MEMORY PMC OPTION BOARD

E.1 SMARTMEDIA MEMORY OVERVIEW

The optional PMC-SmartMedia board facilitates EMC-2005 Application Program and Operating System Firmware uploads from power-up, using readily available "SmartMedia Memory Cards" (herein referred to as just SmartMedia). SmartMedia can be obtained from local retailers in the business of supplying consumer electronic and computer equipment.

E.2 SPECIFICATIONS

E.2.1 POWER REQUIREMENTS

The optional PMC-SmartMedia board requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 add .5 Amps of current.

E.2.2 SMARTMEDIA SUPPORT

All of the following sizes are supported from any manufacture:

1MegaByte	16MegaByte
2MegaByte	32MegaByte
4Megabyte	64MegaByte
8MegaByte	128MegaByte

E.3 PMC-SMARTMEDIA DESCRIPTION

When the PMC-SmartMedia board is installed in an Emerald Controller the SmartMedia insertion slot and two LEDS are visible. The LEDs help to determine functional status of the SmartMedia option board and memory. The SmartMedia are to be inserted into the socket until only about 1/8" of the card is showing outside the socket.

Error! No topic specified.

Figure E.1 - PMC-SmartMedia Description

E.4 PMC-SMARTMEDIA LEDS

The PMC-SmartMedia option board has two status LEDs marked with **B** and **F** meaning busy and fault respectively. Upon power-up of the EMC-2005 both LEDS will be ON until the PMC-SmartMedia board is properly initialized, then both the **B** and **F** led should go out. If the PMC-SmartMedia board has malfunctioned during this process the red **F**ault LED will stay ON.

NOTE: In The Event Of A Power-Up Fault The Green Busy Led May Also Stay On With The Red Fault Led.

The following constitutes the remaining statuses from the LEDs:

B (Busy green LED):

ON - Indicates that the SmartMedia socket is active, **<u>don't</u>** disturb the memory card.
OFF - Indicates socket is idle and SmartMedia may be removed or inserted.

F (Fault red LED):

ON - SmartMedia is possibly damaged or of incorrect format. Remove the memory and cycle power to the EMC-2005 to see if the power-up initialization is successful.
OFF - No faults.

E.5 PMC-SMARTMEDIA OPERATION

The SmartMedia may be inserted or removed with or without the Emerald controller having power applied.

IMPORTANT

Avoid removing SmartMedia memory cards when the Busy LED is on, in that this could damage the SmartMedia memory card.

The PMC-SmartMedia board will search the root directory of an inserted SmartMedia to find an application program and or EMC-2005 Operating System Firmware to upload the controller with, files of the extensions *.exf and *.abs respectively. If only the Application Program is desired to be uploaded than the *.abs file should not be in the root directory of the SmartMedia only the *.exf file. Likewise if its desired that only the Operating System Firmware be uploaded then the *.exf file should not reside in the root directory of the SmartMedia only the *.abs file. Its important to note that only one *.exf and one *.abs file may reside in the root directory of the SmartMedia for proper operation. It is okay for a directory tree and other files of differing extensions, other than *.exf or *.abs, too reside in the root directory without effecting PMC-SmartMedia board operation.

Files are to be copied to the SmartMedia using a PC with SmartMedia read/write support.

APPENDIX F - EMBEDDED PC PMC OPTION BOARD

F.1 EMBEDDED PC OVERVIEW

The Embedded PC option board for the Emerald Motion Controller (EMC-2005) has been developed around the Geode SC2200 integrated processor.

General Features

- 32-bit x86 processor with MMX instruction set support running at 300 MHz
- 256 Mbyte SDRAM
- 1 VGA Port
- 3 USB ports, OHCI version 1.0 compliant
- 1 10/100 Mbit Ethernet port
- 1 Isolated 3-wire serial port
- 20 Gbyte Hard Drive

The Embedded PC interfaces to the EMC-2005 over the PCI bus. Windows drivers are available to interface a Visual Basic application to the EMC-2005. See IIS Document IB-20B003 for details on the Windows driver.

F.2 POWER REQUIREMENT

The Embedded PC option board requires an additional 12 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2005 be a little generous and add about .5 Amps of current.

F.3 WIRING

Most of the connections to the Embedded PC use standard PC connectors.

F.3.1 ETHERNET

The Ethernet Port on the Embedded PC accepts a standard RJ-45 plug.

F.3.2 USB

The three USB ports on the Embedded PC are standard USB Type-A sockets.

F.3.3 SERIAL PORT

The serial port on the Embedded PC accepts a standard RJ-11 phone plug. The table below lists the pin out for the connector.

RJ-11 Plug (On the cable)	Function
1	NC
2	NC
3	Tx
4	Ground
5	Rx
6	NC

F.3.4 VGA

To connect a VGA monitor to the Embedded PC IIS adapter cable C-763000.5 is needed.

F.4 LEDS

There are four LEDs on the Embedded PC to indicate Ethernet and Hard Drive status.

100 - Green LED indicating a 100Mbit Ethernet Link
10 - Green LED indicating a 10Mbit Ethernet Link
ACT - Amber LED indicating Ethernet Activity
HDD - Red LED indicating Hard Drive Activity

F.5 USB PORTS

As mentioned above there are three USB ports on the Embedded PC. Any USB device that is supported by the operating system can be connected to any of the three ports. Each port is capable of supplying 500mA to its connected devices.

The BIOS for the Embedded PC has two USB features that aid in loading an operating system and performing non-Windows functions. First, legacy USB keyboard and mouse support is provided, allowing a USB keyboard and mouse to function just like a standard keyboard or mouse. Secondly, the BIOS allow booting from a USB Mass Storage Device for operating system installation.

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  - If you use the EMC-20XXP to access or utilize the services or functionality of Microsoft Windows Server products (such as Microsoft Windows Server 2003), or use the EMC-20XXP to permit workstation or computing devices to access or utilize the services or functionality of Microsoft Windows Server products, you may be required to obtain a Client Access License for the EMC-20XXP and/or each such workstation or computing device. Please refer to the end user license agreement for your Microsoft Windows Server product for additional information.
  - **NOT FAULT TOLERANT.** THE SOFTWARE IS NOT FAULT TOLERANT. IIS HAS INDEPENDENTLY DETERMINED HOW TO USE THE SOFTWARE IN THE EMC-20XXP, AND MS HAS RELIED UPON IIS TO CONDUCT SUFFICIENT TESTING TO DETERMINE THAT THE SOFTWARE IS SUITABLE FOR SUCH USE.
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INTRODUCTION

Thank you for selecting ABM INTERNATIONALS' Emerald Series products. You join many other companies around the world in your choice of these powerful, flexible motion control products.

The Emerald Driver can be configured by the user to operate as a Single Axis Driver /Controller combination (CONTROLLER Mode) or as a Slave Device connected to a SERCOS Interface[TM1] Master controller (SERCOS Mode).

The design of the Emerald Drivers combine the latest in all-digital electronic design, SMT circuit board construction and clever engineering to deliver high performance, advanced features and reasonable cost. Compact, high power density motors provide low rotor inertia, making them the logical choice for positioning and indexing applications.

Emerald Drivers have a wide array of features, including a powerful embedded high speed 32-bit 150 MHz Digital Signal Processor, high visibility 7-segment LED Status display, Support for Analog and Digital I/0, programmable limit switches, S-curve profiling, fault history log and many more. Dozens of operational parameters can be programmed. Utilizing Emerald's Windows based PC software tools, allows quick set-up for a full range of diagnostics and PC oscilloscope functions to display speed and current waveforms and most any other diagnostic data the user may need.

Reference materials for the Emerald Series of Motion Control Systems:

IB-20B004	EMC-2005 Emerald Multi-Axis Controller
HPB Catalog	Additional Motor Specifications
EDE	Emerald Software Development Tools
EDrive	Diagnostic Tools
SMA2000	Servo Mechanical Analysis

[1] SERCOS Interface is a trademark of Interest Groups SERCOS

SECTION 1 - INSTALLATION AND SAFETY

Definition - Within this document will be the phrase "MAIN BUS POWER SUPPLY". This phrase is to define the AC power as 220V AC +/-20% or 440V AC +/-20%, see **Section 4.1.2** for further details.

WHEN INSTALLING AN EMERALD SERVO DRIVE FOR THE FIRST TIME OR REPLACING AN EXISTING DRIVE ALWAYS FOLLOW BOTH SECTIONS 1.1.4 AND 1.2.

1.1 INSTALLING THE EMERALD SERVO DRIVE

When installing the Emerald servo drive into an enclosure you should follow the guidelines below. First consider what regulatory directives you should follow, such as UL, TUV, CE or other regulatory agencies, see **Sections 1.1.1 and 1.1.2**. Then select the electrical enclosure best suited for the system components, power dissipation in the electrical enclosure, and regulatory approvals. If you need any assistance with the installation of the Emerald servo drive or would like a quote for a full enclosure assembly, please contact ABM INTERNATIONAL INC. When laying out the wiring of the electrical enclosure, be sure to route the wiring as explained in **1.1.3** and to keep in mind regulatory requirements. Before applying power to the system, follow all checks listed in **Section 1.1.4** and then follow the first time system power procedure in **Section 1.2**.

If you are replacing a drive in an existing electrical enclosure with an Emerald servo drive, make sure you read through and follow all precautions and wiring requirements for the Emerald servo drive. Always follow the first time system power up procedure after the installation of a new drive, even if the Emerald drive you just installed was replacing an existing Emerald servo drive, see **Section 1.2.1**.

THE EMERALD SERVO DRIVE IS A HIGH LEAKAGE CURRENT DEVICE. MAKE SURE THAT THE EARTH GROUND IS ATTACHED PROPERLY AS DESCRIBED IN SECTION 5.1.

1.1.1 REGULATORY AGENCY INSTALLATIONS

To comply with the agency approvals for electrical enclosure installation, you must follow all wiring guidelines, install proper safety devices, and follow all labeling requirements for the regulatory agency of your choice. See **Section 1.3.1** for more details. For CE applications you must add noise suppression components as described in **Section 1.3.1**.

1.1.2 CHOOSING AN ELECTRICAL ENCLOSURE

If your installation requires CE approval, you must have a NEMA12 or IEC6 electrical enclosure with RF shielded gasketing. Make sure the electrical enclosure you choose has the appropriate agency approvals for use. Using the information provided in **Sections 4.1.2, 5.3.1**, and the average running motor(s) current, find the power loss of the drive system. Add the power loss of the Emerald servo drive system with all other components to come up with a full system power loss. Then using the information provided by the electrical enclosure manufacturer, derive the ambient temperature rise inside the electrical enclosure. Determine if you will need a cooling system for the electrical enclosure by keeping the temperature inside the electrical enclosure below 55 Degrees C in the final installation environment. If a cooling system is required be sure to use air filtration devices to keep dust, water vapors, or other contaminates from accumulating in the electrical enclosure.

1.1.3 EMERALD SERVO DRIVE AND REGEN RESISTOR MOUNTING

WHEN DRILLING, TAPPING, CUTTING, WELDING, OR OTHER ACTIVITY THAT MAY CAUSE METAL DEBRIS, THE EMERALD SERVO DRIVE SHALL BE REMOVED FROM THE ELECTRICAL ENCLOSURE. THE EMERALD SERVO DRIVE IS OF OPEN TYPE CONSTRUCTION AND FOREIGN MATTER COULD LODGE INTO THE CIRCUITRY OF THE UNIT.

When mounting the Emerald servo drive in the electrical enclosure, always mount the drive upright in the horizontal position. Always leave at least 1 inch of space between the Emerald servo drive and any other component. Tighten all mounting screws to the specified mounting torque using proper grounding methods to tie the Emerald servo drive case to earth ground. When routing the wiring in the electrical enclosure, be sure to follow proper codes, bending radii, wire gauge and separation of voltages.

When installing a Regen resistor, mount it in a location where there is free access to airflow and no flammable material is near the Regen resistor. Never mount the Regen resistor closer than 6 inches from any other device. Doing so can cause undo temperature rise to other components and impede airflow to the Regen resistor.

1.1.4 FINAL CHECKS PRIOR TO APPLYING POWER

FAILURE TO COMPLY WITH ANY OF THE PROCEEDING INFORMATION MAY CAUSE INJURY OR DEATH TO PERSONNEL OR CAUSE DAMAGE TO THE EQUIPMENT.

1) Verify you have fuses or circuit breakers in line with each Emerald servo drive in accordance with **Section 5.2.1**. Also verify if the wiring of the contactor, if one is installed, with the information in **Section 5.2.2**.

2) Verify the 24V power supply connected to the Emerald servo drive is a class 2 power supply capable of delivering not more than 10A continuous and is used for powering Emerald servo drives, Emerald controllers, and ESD-I/O16 control power only. Any I/O that drives relays, contactors, or high current devices should be powered by a separate 24V power supply. Verify the 24V power supply connected to the Emerald servo drive is connected as shown in **Section 5, Figure 5.1**.

1.1.4 FINAL CHECKS PRIOR TO APPLYING POWER (cont'd)

3) Verify the wiring to the Emerald servo drive main bus power input connector meets **Section 5, Figure 5.1** and the correct voltages and wire gauges are used. Verify the Emerald servo drive main bus power supply is wired in accordance with the information in **Sections 4.1.2 and 5.2.3**. If a transformer is used, verify it meets the information described in **Section 5.2.4**. It is recommended to use line filters of type SHAFFNER FN258-55-07 or equivalent.

CAUTION - LINE FILTERS HAVE HIGH LEAKAGE CURRENTS. THEY MUST BE PROPERLY CONNECTED TO EARTH GROUND.

CAUTION - FIRE COULD RESULT IF THE REGEN RESISTOR IS MOUNTED NEAR ANY FLAMMABLE MATERIAL.

4) If an external Regen resistor is used, verify it is mounted away from any flammable material and is wired to the Emerald servo drive in accordance with **Section 5, Figure 5.1**. Also verify the Regen resistor is mounted at least 6 inches away from any other components as described in **Section 1.1.3**.

5) Verify wiring of the electrical enclosure maintains separation of voltages. This will keep EMI from entering on to a low voltage cable. If EMI is present on a low voltage cable, it could cause intermittent operation of the Emerald servo drive.

NEVER DISABLE ANY SAFETY DEVICE IN THE SYSTEM FOR ANY REASON. INDUSTRIAL INDEXING SYSTEMS INC. CANNOT BE RESPONSIBLE FOR ANY PRACTICES NOT COMPLYING WITH THIS MANUAL, SAFETY PROCEDURES OUTLINED BY A REGULATORY AGENCY, AND/OR YOUR COMPANIES SAFETY GUIDE LINES AND PROCEDURES.

6) Verify all ESTOPS and protective devices are installed and properly wired both inside and outside of the electrical enclosure.

SOME APPLICATIONS MAY REQUIRE A CONTACTOR BETWEEN THE EMERALD SERVO DRIVE AND THE MOTOR. TO DETERMINE IF THIS IS SO, CONTACT YOUR LOCAL SAFETY REGULATORY AGENCY. IF THIS CONTACTOR IS UTILIZED, PRECAUTIONS MUST BE MADE TO ASSURE THAT THE DRIVE IS DISABLED BEFORE OPENING THE CONTACTOR OR THE MOTOR INDUCTANCE WILL CAUSE HIGH VOLTAGE ARCING IN THE CONTACTOR POSSIBLY DAMAGING THE CONTACTOR AND THE EMERALD SERVO DRIVE.

7) All cables with internal shield shall have the shield connected to the electrical enclosure case. The electrical enclosure case shall be tied to earth ground. To tie the cables shield to the electrical enclosure, a small portion of the cable jacket is removed which exposes the shield braid. The shield braid shall be clamped to a conductive harness, which is then properly secured to the electrical enclosure.

1.2 POWERING UP AN EMERALD SERVO DRIVE FOR THE FIRST TIME

DANGER - HIGH VOLTAGE EXISTS WITHIN THE DRIVE AND ON THE REGEN RESISTOR CONNECTOR FOR 5 MINUTES AFTER AC POWER IS REMOVED.

CAUTION - NEVER APPLY MAIN BUS POWER SUPPLY UNTIL ALL CHECKS FOR PROGRAM AND ALARM CONDITIONS HAVE BEEN MADE.

1.2.1 STEPS TO FIRST TIME POWER UP

CAUTION - Whether you are using an Emerald controller or have the Emerald servo drive in controller mode, NEVER assume the controller has no program loaded into it. If the controller has an unknown program loaded and the MAIN BUS POWER SUPPLY is applied to the system, the motor could move in an unexpected manner.

1) Check switch settings on the Emerald servo drive. See **Section 6.1** for more details.

2) Apply 24V power to the system and connect a computer to the Emerald controller or the Emerald servo drive in controller mode with the EDE tools. Verify the program loaded is correct for your system. If not, down load the correct program now. If your Emerald controller has a boot loader option card installed, you may use the memory card preloaded with the appropriate program to load the controller. See **IB-20B004** for more details.

3) EMERALD SERVO DRIVE IN CONTROLLER MODE.
Verify the Emerald servo drive has an “A” in the status display and is not flashing any fault codes. If a fault code is flashing on the Emerald servo drive, see **Section 7** of this manual.
DO NOT CONTINUE THE POWER UP PROCEDURE IF THE EMERALD SERVO DRIVE IS SHOWING A FAULT CODE.

4) EMERALD SERVO DRIVES WITH AN EMERALD CONTROLLER.
Verify the Emerald controller has an “A” in the status display. Also verify the Sercos status LED's on the Emerald controller is indicating “Phase 4” and is solid on. On the Emerald servo drive, verify the status display is showing a “4” and is not flashing any other codes. If a fault code is flashing on the Emerald servo drive, see **Section 7** of this manual.
DO NOT CONTINUE THE POWER UP PROCEDURE IF THE EMERALD SERVO DRIVE OR EMERALD CONTROLLER IS SHOWING A FAULT CODE.

5) If you removed any fuses earlier to disable the MAIN BUS POWER SUPPLY source, then remove all power from the electrical enclosure and replace the fuses now. Then turn on any ESTOPS or circuit breakers to enable the MAIN BUS POWER SUPPLY to the Emerald servo drive. Verify the amber bus indicator on the Emerald servo drive is lit. If the amber bus indicator is not lit, check to see if one or more safety criteria are not met. If all safety requirements have been met and the amber bus indicator is still not lit, then contact INDUSTRIAL INDEXING SYSTEMS INC.

6) You are now ready to use you Emerald servo drive.

1.3 BUILDING AN ELECTRICAL ENCLOSURE FOR AGENCY APPROVAL

1.3.1 BUILDING AN ELECTRICAL ENCLOSURE FOR CE

For the electrical enclosure to meet CE specifications there are a few additions that must be made to the electrical enclosure bill of material.

1) The electrical enclosure must be of type NEMA12 or IP6X and have RF shielded gasketing.

2) A line filter of type SHAFFNER FN258-55-07 or equivalent must be installed on the MAIN BUS POWER SUPPLY inlet.

3) A main line transformer must be installed supplying the electrical enclosure with MAIN BUS POWER SUPPLY.

4) A ferrite core must be placed around the wires of U, V, and W of the motor cable at the Emerald servo drive side of part number 0431176451 from FAIR-RITE corporation or equivalent.

5) The motor cable must be a shielded cable of part number EAC-XYZMMM or equivalent where "Z" must be of selection E, F, H, or J. See documentation on armature cables series EAC for further details.

6) The 24V power supply for the Emerald servo drive control power must be of a linear type. This will ensure any momentary dropout of main supply voltages do not interrupt the Emerald servo drives control power.

SECTION 2 - OVERVIEW

This manual is organized so that information is easy to find and easy to use. It begins by detailing how to identify the basic electrical characteristics of Emerald Drivers and Emerald Motors (See **Appendix A**), and provides comprehensive product specifications.

Drive configuration and programming is detailed, followed by a comprehensive list of drive fault and status information with trouble shooting remedies. Sections on power and driver wiring, and regen resistor selection follow. A driver/motor tuning overview is included to help with setting up the driver.

2.1 IDENTIFYING EMERALD DRIVES

Emerald Drivers can be identified as follows. This information is on the Driver label:

Your Emerald Driver model number uses this designation:

ESD-XX/YZMO,

WHERE:

XX = Continuous Driver Current in amps (rms)
- 5 = 5 Amps
- 10 = 10 Amps
- 20 = 20 Amps
- 40 = 40 Amps
- 50 = 50 Amps
- 60 = 60 Amps

Y = input voltage:
- A = 220 VAC input (3∅ input voltage, 1∅/3∅ ESD-5/AXX only)
- C = 440 VAC input (3∅ input voltage)

Z = feedback method:
- E = Encoder Feedback

M = mechanical variations:
- P = Panel Mount

O = option card:
- (Blank) = No option card
- R = Resolver Option

Example: An Emerald Driver designated ESD-10/AEP has a continuous current rating of 10 Amp rms, 220 VAC 3∅ input voltage, encoder feedback, and Panel Mount Construction.

2.2 IDENTIFYING EMERALD MOTORS

Emerald Motors can be identified in one of two ways. This information is on the motor label.

METHOD I

Your Emerald Motor model number uses this designation:

ESMXXX-WWWW/YYZM

WHERE:

XXX = Flange size in millimeters

WWWW = Rated Power in watts

YY = Rated Speed/100 (truncated to 2 digits)

Z = Feedback Type
E=Encoder (ABZUVW)

M = Mechanical Variations (Left blank means no modifications to standard motor).
F=Fan over cooled

Example: An Emerald Motor designated ESM130-1800/34E is a 130 mm flange 1800-watt motor with a 3400 rpm rated speed and encoder feedback.

METHOD II

Your Emerald Motor model number uses this designation:

ESMXXXY(W)-M

WHERE:

XXX = Flange size in millimeters

Y = Stack length A, B, C, etc

W = Winding selection (Left blank if only one winding available)

M = Mechanical Variations (Left blank means no modifications to standard motor).
C = Connectors on motors that come standard with flying leads

Example: A Emerald Motor designated ESM120C(I) is a 120 mm flange motor. Is a 3-stack motor for this flange size and utilizes a low voltage winding.

SECTION 3 - DESCRIPTION

The Emerald Driver can operate as a SERCOS Interface compatible servo drive (SERCOS Mode) or as a standalone single axis controller /drive (CONTROLLER Mode). In either mode of operation, access can be made to a wide variety of hardware features.

The external connections that exist on the Emerald are shown in **Figure 3.1**, and consist of 1 RS-232 port, 1 USB port, I/O BUS interface, SERCOS Fiber Optic Transmitter and Receiver, as well as motor, encoder, and power connections. The Emerald drive also has a +/-10V analog input and general purpose PWM based analog output.

Error! No topic specified.

Figure 3.1 - Emerald Layout

3.1 COMPONENTS

3.1.1 STATUS INDICATORS

1. **STATUS -** This is a seven-segment display, which indicates the current status of the EMERALD driver. (See **Section 7.1)**

2. **I/O STATUS** - This is a bi-color LED that indicates the I/O BUS Expander Interface Status. (See **Section 7.3)**

3. **SERCOS RECEIVER STATUS -** This is a red LED that indicates that the SERCOS Fiber-optic receiver is detecting errors in transmitted data. (See **Section 7.4**)

3.1.2 CONNECTIONS

1. **SERCOS -** These fiber optic Transmitter/Receiver ports allow the drive to be interfaced to a SERCOS Master Controller when the drive is configured in SERCOS Mode (See **Section 4.1.6, 5.5 & Section 6.1**).

2. **COM -** This 6-pin RJ-11 connector is an RS-232 serial communication port. This port can be used to update the firmware in the drive, and to connect EDrive Diagnostic Tools. When configured in CONTROLLER mode (See **Section 6.1**), this port can be used to download CONTROLLER Application Programs. Also, this port can be configured in the CONTROLLER application as an application port. This allows the CONTROLLER to communicate directly to a wide variety of RS-232 devices including operator interfaces (See **Section 4.1.8**).

3. **USB** (USB-B connector) **-** This standard USB 2.0 device port allows a PC to communicate to the drive via serial to USB 2.0 driver available from IIS. This port can be used to update the firmware in the drive, and to connect EDrive Diagnostic Tools. When in CONTROLLER mode, this port can be used to download CONTROLLER Application Programs (See **Section 4.1.8**). Use standard USB A/B cable to connect to this port.

4. **I/O BUS EXPANDER** - Utilizes standard CAN hardware to interface the EMERALD driver to the ESD-IO16 input/output rack. This allows the EMERALD driver IO support of up to 2 ESD-IO16 racks with up to 32 I/O points utilizing industry standard I/O modules (See **Section 4.1.7 & Appendix B**).

5. **PROBE INPUTS** - High Speed Optically Isolated inputs that can be configured to trap the motor feedback position or the auxiliary encoder position (See **Section 4.1.10 & Section 5**).

6. **MOTOR ENCODER** - This is a 15 Pin Male D connector used for the encoder feedback from the motor to the drive (See **Section 4.1.9 & Section 5**).

7. **ANALOG I/O** - These pins allow connection to the Analog input and the PWM based analog output (See **Section 4.1.10 & Section 5**).

8. **AUXILIARY ENCODER** - Allows the connection of a second encoder input that can be read at the application level and used to implement Master/Slave axis functions in CONROLLER Mode (See **Section 4.1.9 & Section 5**).

9. **24 VOLT DC POWER** - Allows connection of the 24 VDC supply to power the drives control circuitry (See **Section 4.1.3 & Section 5.1**).

3.1.2 CONNECTIONS (cont'd)

10. **CONTROLLER OK** - A normally open dry contact that indicates the Drive is OK and ready to run when the contact is closed (See **Section 5**).

11. **MOTOR/POWER WIRING -** These are terminal blocks used to wire the incoming AC line voltage as well as the motor power cable (See **Section 5**).

12. **OPTIONAL DC LINK REACTOR -** Many of the drivers support the addition of a DC Link reactor to help with EMC noise suppression (See **Section 5.4**).

13. **OPTIONAL REGEN RESISTOR** - All of the drivers support the connection of external regeneration power resistors (See **Section 5.3**).

SECTION 4 - SPECIFICATIONS

4.1 DRIVER SPECIFICATIONS

Emerald Driver	ESD-5	ESD-10	ESD-20	ESD-40	ESD-60
Weight	7.7 lb 3.5 kg	11.2 lb 5.1 kg	13.6 lb 6.2 kg	19.1 lb 8.6 kg	29.9 lb 13.6 kg

4.1.1 MOTOR OUTPUT

Emerald Driver	ESD-5		ESD-10		ESD-20		ESD-40		ESD-60	
Motor Output	PWM, 3 Phase, sine wave									
Output Voltage	200 VRMS									
Speed (RPM)	6000									
PWM Frequency	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz
Continuous Output Current	5 A rms	4 A rms	10 A rms	8 A rms	20 A rms	16 A rms	40 A rms	32 A rms	60 A rms	48 A rms
Maximum Output Current	12.5 A rms	10 A rms	25 A rms	20 A rms	50 A rms	40 A rms	100 A rms	80 A rms	120A rms	96 A rms

4.1.2 MAIN BUS POWER SUPPLY

Emerald Driver	ESD-5		ESD-10/A		ESD-20/A		ESD-40/A		ESD-60/A	
Main Bus Power Supply Voltage	3 Phase (3∅), (1∅/3∅ ESD-5 ONLY) Nominal: 220 VAC, Max Range: 170-264 VAC, 50/60 Hz									
Continuous Input Current	8.7 A/1∅ 5 A/3∅ rms		10 A Rms		20 A rms		40 A rms		60 A rms	
Max Inrush Current	55 A Rms		55 A Rms		20 A rms		40 A rms		63 A rms	
Main Circuit Heat Loss	40 Watts	45 Watts	75 Watts	85 Wats	140 Watts	155 Watts	300 Watts	330 Watts	450 Watts	510 Watts
Main Supply Capacity	1.1 KVA	0.8 KVA	2.2 KVA	1.8 KVA	4.4 KVA	3.6 KVA	8.8 KVA	7.2 KVA	13.2 KVA	10.6 KVA
Internal Regen Absorption Capacity	0 Watts	0 Watts	0 Watts	0 Watts	120 Watts	120 Watts	120 Watts	120 Watts	300 Watts	300 Watts
External Regen Absorption Capacity	2000 Watts	2000 Watts	4000 Watts	4000 Watts	8000 Watts	8000 Watts	16000 Watts	16000 Watts	24000 Watts	24000 Watts

4.1.3 CONTROL POWER SUPPLY

NOTE: The 24V power supply must be short circuit proof and must be able to deliver no more than 10A before shutting down.

Emerald Driver	**ESD-5**	**ESD-10**	**ESD-20**	**ESD-40**	**ESD-60**
Power Supply Voltage	24 VDC +/- 10%				
Minimum Power Supply Current Requirements	0.5A	0.5A	1.0 A	1.5A	1.5A
Inrush Current	2A @ 100 ms	2A @ 100 ms	-2A @ 100 ms	2.5A @ 100 ms	2.5A @ 100 ms
Control Circuit Heat Loss	12 Watts	12 Watts	24 Watts	36 Watts	36 Watts
Brown out protection	Can sustain up to a 5 mSec drop in 24 VDC power supply before shutting down.				

4.1.4 CONTROL PERFORMANCE

Feedback	Encoder - (ABZ plus UVW with 5V line driver)
Feedback Resolution	See motor/driver speed torque curves in **Appendix A** for encoder resolution**.**
Feedback Accuracy	Less than 2 arc minutes
Current Loop Update Rate	62.5 µsec
Velocity Loop Update Rate	250 µsec
Position Loop Update Rate	500 µsec
Speed Regulation	Load (0%-100%): ±0.02% Power (70-264 VAC): ±0.02% Temperature (0-55°C/32-131°F): ±0.2%
Torque Regulation	Power (170-264 VAC): ±2% Temperature (0-55°C/32-131°F): ±2%

4.1.5 ENVIRONMENT

Storage Temperature	-10 to 70°C/14-158°F
Operating Temperature	0 to 55°C/32-131°F
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and Vibration	1 G or less
Operating Conditions	Free of dust, liquids, metallic particles and corrosive gases. Use in a pollution degree 2 environment.
Drive Enclosure	The drive is rated as “open type equipment” by Underwriters Laboratories, Inc.

4.1.6 SERCOS INTERFACE

Interface Version	V02.04
Topology	Multi drop fiber optic ring
Transmission Rate	16 MB/second

4.1.7 SERIAL I/O INTERFACE

Topology	Multi drop CAN Hardware
Protocol	IIS Can
Transmission Rate	500kbits/sec with 1mSec updates

4.1.8 COMMUNICATION PORTS

RS232	Up to 38400 bits/sec
USB	Version 2.0 Compliant

4.1.9 MOTOR/AUXILIARY ENCODER IINPUTS

A B Z U V W (motor encoder only)	On voltage: 5 VDC ± 5% at 20 ma Off voltage: 1 VDC ± 5% at 20 ma 2 MHz maximum frequency AB quadratured Optically isolated

4.1.10 PROBE INPUTS

Probe Input 1 Probe Input 2	24 VDC 5mA

4.1.11 ANALOG I/O SIGNALS

Analog Input	Maximum Input Voltage: ± 10 VDC Input Impedance: 274 kΩ A/D resolution: 1/4096 at ±10V (12 bit)
PWM Analog Output	PWM Output 0 to 15 volts 50mA maximum out PWM Duty Cycle Resolution: 1/9372 @ 8kHz 1/4686 @ 16kHz

4.1.12 PROTECTION

Fault Checks	Under Voltage, Over Voltage, Motor Short, Output Short, Feedback Loss, Regeneration Resistor Over Temperature and Malfunction, Driver Over Temperature, Following Error, Internal Watchdog Timer, Processor Diagnostics, Communications Errors

4.2 MOTOR SPECIFICATIONS

4.2.1 GENERAL

Duty	Continuous at rated speed and rated torque
Type	Permanent magnet synchronous
Insulation	See motor drawings in **Appendix A**
Sealing	See motor drawings in **Appendix A**
Storage Temperature	-10 to +70ºC/14 to 158ºF
Ambient Operating Temperature	-10 to +40ºC/14 to 104ºF
Shock and Vibration	2 G's
Mounting	Motor can be mounted in any position

4.2.2 FEEDBACK DEVICE

Type: Encoder	ABZ plus UVW 5V line driver

4.2.3 OTHER

Weight Shaft Loading Brake Specifications Dimensions	See motor drawings in **Appendix A**
Torque Ratings Speed Torque Curves	See specifications in **Appendix A**

SECTION 5 - CONNECTIONS/WIRING

This section details the recommended power source requirements necessary to power the Emerald drivers. The Emerald driver has been designed to NRTL certification requirements and this section will recommend the appropriate hardware necessary to maintain this certification as a system. **Figure 5.1** shows the required interconnect to all system components.

NOTE: The Emerald series drive cannot be HI-POT tested in the field due to internal protective devices. Contact Industrial Indexing Systems, Inc. if your system needs to be HI-POT tested.

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Figure 5.1 - Wiring Interconnect

5.1 CONTROL POWER WIRING

The Emerald drive controller power is connected to a 24 VDC supply. See **Section 4.1.3** for control voltage supply requirements. The control power connector has multiple power pins to ease the wiring connections. Drive power can be daisy chained as shown to connect back to power supply. When sizing the 24VDC supply, the load requirements of each drive must be summed up to determine the current rating of the supply. The maximum current that can be carried by the chain is 10 Amp DC. See **Figure 5.1** for the required control power wiring.

5.2 MAIN BUS POWER SUPPLY WIRING

Connect the Emerald drive main bus power (L1, L2, L3) to the incoming line or transformer (See **Section 4.1.2 & Section 5.2.4**). Section 5.2.3 details the required wiring to maintain the NRTL Certification. It is important that the recommended components or equivalent components with NRTL approval be included in system design. See **Figure 5.1** for the required power wiring connections.

5.2.1 SUPPLEMENTAL CIRCUIT PROTECTION

It is required that each driver/motor combination be provided with a circuit protector for each driver and motor pair. All of the drives are suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes.

Drive Part No.	Motor Rated Current (Amps)	Circuit Protectors					
		Edison MEQ FUSE	Rating	Edison JDL FUSE	Rating	Edison CIRCUIT BREAKER	Rating
ESD-5/AEP (single phase)	1.7A to 3.4A	MEQ5	5A	JDL5	5A	----	----
ESD-5/AEP (single phase)	3.4A and up	MEQ10	10A	JDL10	10A	----	----
ESD-5/AEP (3-Phase)	1.7A and up	MEQ5	5A	JDL5	5A	----	----
ESD-10/AEP (3-Phase)	3.4A and up	MEQ10	10A	JDL10	10A	----	----
ESD-20/AEP (3-Phase)	6.7A and up	MEQ20	20A	JDL20	20A	G3P-020	20A
ESD-40/AEP (3-Phase)	13.4A and up	----	----	JDL40	40A	GP3-040	40A

ESD-60/AEP (3-Phase)	20.0A and up	----	----	JDL60	60A	GP3-060	60A

Table 5.1 - Recommended Circuit Protector

The circuit protector is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The chart contains specific vendor and size recommendations. Other types of circuit protectors or fuses may be used provided the continuous ratings are equivalent, the instantaneous rating is 10 to 15 times continuous and can support 3 times continuous for at least 3 seconds. Contact ABM INTERNATIONAL, Inc. for specific recommendations of circuit protective devices.

NOTE: All drive sizes can be run on single-phase AC input. However with the exception of the ESD-5/XXX drive, all other drives will have their capabilities reduced by up to 50%. ABM does not recommend running any drive with the exception of the ESD-5/XXX with a single-phase AC input.

5.2.2 CONTACTOR

It is recommended that each driver have an external power bus contactor. **Table 5.2** contains a chart of the recommended contactor for each driver size including manufacturer part number and ratings.

Drive Part No.	Rated Current (Amps)	Contactors					
		Square D	Rating	Siemens	Rating	FUJI	Rating
ESD-5/AEP (single phase)	8.7	LC1D12BD	12	3RT10 17-1BB4x	12	SC-E03G-24VDC	12
ESD-5/AEP (3-Phase)	5	LC1D09BD	9	3RT16 17-1BB4x	9	SC-E02G-24VDC	9
ESD-10/AEP (3-Phase)	10	LC1D12BD	12	3RT10 17-1BB4x	12	SC-E03G-24VDC	12
ESD-20/AEP (3-Phase)	20	LC1D25BD	25	3RT10 26-1BB40	25	SC-E05G-24VDC	25
ESD-40/AEP (3-Phase)	40	LC1D40BD	40	3RT10 35-1BB40	40	SC-E2G-24VDC	40
ESD-60/AEP (3-Phase)	60	LC1D65BD	65	3RT10 44-1BB40	65	SC-E3G-24VDC	65

Table 5.2 - Recommended Circuit Breakers
(Note: Part number specifies 24 VCD coils)

The contactor is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The charts contain specific vendor and size recommendations. Other types of contactors may be used provided the continuous ratings are equivalent and the maximum instantaneous rating is 10 to 15 times continuous. The driver is equipped with a soft start circuit to limit the contactor inrush current.

To utilize the DRIVE_OK output relay to drive the contactor, the coil voltage should be 24 VDC and no more than 500 mA current draw. An appropriate suppressor must be placed across DRIVE_OK as shown in wiring diagram.

5.2.3 WIRE SIZES

It is required that each driver be installed with the appropriate size wire for proper operation. **Table 5.3** shows a chart of recommended wire gauges and terminal connection tightening torques for each driver size.

The wire is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The charts contain specific METRIC and AWG size recommendations for stranded wire. All wires to supply earth to the drive shall be of the same wire size used for the AC source. Use only copper wire rated for 60/75 degree C or greater. The driver terminals are specifically designed to handle the recommended wire gauge with lug or ferrule terminations. See wiring diagrams for more details.

Drive Part No.	Rated Current (Amps)	Wire Size		Required Tightening torque on power wiring terminals (LB-IN)
		(AWG)	(MM^2)	
ESD-5/AEP (single phase)	8.7	14	2	4.5
ESD-5/AEP (3-Phase)	5	14	2	4.5
ESD-10/AEP (3-Phase)	10	14	2	13.5
ESD-20/AEP (3-Phase)	20	12	3.5	13.5
ESD-40/AEP (3-Phase)	40	10	5.5	13.5
ESD-60/AEP (3-Phase)	60	8	8.5	22.5

Table 5.3 - Recommended Bus Power Wire Size

Note: ** Field wiring connection shall be made by a NRTL Certified crimped on ferrule sized for the wire gauge involved. Ferrule must be fixed using the crimp tool specified by the connector manufacturer.

5.2.4 TRANSFORMERS

Isolating the driver from the facility power line with a transformer is recommended but not required. A transformer may be required to step down or step up the facility power line to meet the driver voltage specifications in **Section 4**.

If a transformer is used, select a transformer with the following characteristics:

- Isolation type.
- Load regulation less than 10%.
- Ability to provide 3 times rated current for 3 to 5 seconds without saturation.
- Ability to drive load with a power factor of 0.85.
- Primary or secondary taps to provide -10%; nominal; +10%; supply voltage.

To achieve maximum performance from the driver, the power input to the driver should be as close to nominal driver input voltage rating as possible. The facility line voltage varies through wide ranges in many parts of the world and it is recommended to match the nominal facility voltage to the nominal input voltage rating of the driver with a transformer. This gives the system the maximum operating range with facility line voltage fluctuations.

If the line voltage is too low, intermittent under voltage alarms may occur. A high line voltage will result in excessive regeneration dumping or intermittent over voltage alarms.

Buck boost transformers may be used to optimally match the facility line voltage to the driver line voltage rating. Buck boost transformers can be used with or without an isolation transformer. If buck boost transformers are used in conjunction with an isolation transformer, it is best to put the buck boost transformers on the primary side of the isolation transformer.

As a general rule the transformer rating can be calculated using the following formulas:

For single phase transformer:

$$\text{Transformer Capacity (VA)} = \frac{\text{Rated Mechanical Output (Watts)}}{0.7}$$

Where: Rated Mechanical Output is from Emerald Motor and Drive Package rating.
0.7 = motor/drive efficiency and single phase full wave rectifier factor

Example: Select transformer for a Delta S-200HRA motor/drive package

$$\text{Transformer Capacity (VA)} = \frac{200}{0.7} = 285\ \text{VA}$$

For three phase transformer:

$$\text{Transformer Capacity (Watts)} = \frac{\text{Rated Mechanical Output (Watts)}}{0.85}$$

Where: Rated Mechanical Output is from Emerald Motor and Drive Package rating.
0.85 is motor/drive efficiency and three phase rectifier factor

Example: Select transformer for a Delta S-6500HRA motor/drive package

$$\text{Transformer Capacity (VA)} = \frac{6500}{0.85} = 7647\ \text{VA}$$

5.2.4 TRANSFORMERS (cont'd)

One transformer can supply multiple motor/driver packages. Simply add the rated mechanical output of the motor/driver packages together and use the above formulas. If one transformer is used to supply multiple drivers, be sure to protect each driver with the appropriate circuit breaker or fuse.

IIS offers a full line of transformers for various line voltage and frequencies, enclosed and open frame types. Contact ABM Application Engineering Department for full details.

5.2.5 WIRING PRACTICES AND GROUNDING

All wiring must conform to accept standards such as NEMA and NEC codes. Signal and low voltage I/O wires must be physically separated from high voltage wires by at least 12 inches or separated by a suitable barrier such as steel conduit or wiring trough separator.

The driver must be adequately grounded for proper operation and to provide personnel safety. The proper grounding technique is shown in **Figure 5.1.**

5.3 DRIVER REGENERATION CAPACITIES

The Emerald motor and driver have the ability to act as a brake for a rotating load. This condition typically occurs during the deceleration of the load or when the system is stopping a vertical load such as an elevator or lift. In both cases, the driver may have to absorb the mechanical and potential energy in the system. The driver must absorb the energy if the energy in the load exceeds to mechanical losses in the system.

The driver has 2 ways to absorb the energy from the load.

- Store the energy by charging the internal main DC bus capacitors (E_C)
- Dissipate the energy using a regeneration resistor (P_R)

The Emerald driver internal energy absorption capacities are as shown in **Table 5.4**.

DRIVER SIZE	**REGEN CAPACITY** (P_R)	**CHARGING CAPACITY** (E_C)
ESD-5	0 W	28J
ESD-10	0 W	38J
ESD-20	120 W	79J
ESD-40	120 W	159J
ESD-60	300 W	239J

Table 5.4 - Energy Absorption Capabilities

The Emerald drivers are equipped with internal circuitry to detect a rise in the main DC power bus indicating energy absorption. If the DC power bus reaches approximately 410 VDC, the regeneration circuit is turned on to prevent the main DC power bus from rising to 430 VDC which will result in an over voltage alarm F02.

5.3.1 SELECTION OF AN EXTERNAL REGENERATION RESISTOR

The amount of energy stored in the moving components of the system must be calculated and compared to the energy absorption capacity of the driver to determine if an external regeneration resistor is required.

The stored energy is of two basic types, kinetic energy in the form of a moving mass and potential energy of a mass being held against gravity.

$E_k = 0.5 * (J_M + J_L) * (2 * \pi * N / 60)^2$

$E_P = (2 * \pi * N * T_g * t_b / 60)$

Calculate the system losses in the motor, driver and friction.

$E_L = (P_M + (\pi * N * T_f / 60)) * t_a$

Calculate the regeneration power.

$P_R = (E_k + E_P - E_L - E_C) / t_c$

If regeneration power P_R is greater than 0.0, a regeneration resistor will be needed to prevent the main DC power bus from generating an over voltage alarm F02.

Where:

E_k = Net kinetic energy Joules
E_P = Net Potential energy Joules
E_L = Energy loss due to friction Joules
E_C = Driver charging capacity Joules
J_M = Motor rotor inertia kg-m^2
J_L = Load inertia kg-m^2
N = Motor speed in RPM
P_M = Motor loss watts (10% of motor rating)
T_f = System friction torque N-m
T_g = Net torque to hold up load against gravity N-m
P_R = Regen power watts
t_a = Deceleration time
t_b = Move time
t_c = Cycle time

See **Figure 5.2**

* The above equations are reasonable approximations.

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Figure 5.2 - Time

5.3.1 SELECTION OF AN EXTERNAL REGENERATION RESISTOR (cont'd)

Drivers ESD-5 and ESD-10 do not contain an internal regeneration resistor. If a regeneration resistor is required, an external resistor with a power rating of at least P_R watts must be connected.

Drivers ESD-20 through ESD-60 contain internal regeneration resistors. If the internal regeneration resistor capacity is greater than P_R watts, no external resistor is needed. If the internal resistor is not large enough, an external resistor will need to be used. The external resistor is wired in parallel with the internal resistor. Therefore care must be taken to calculate the appropriate resistance and power value such that the internal resistor power rating is not exceeded.

Calculation of External Regeneration Resistor on drive with internal Regen resistor:

Since $P_R = \frac{E^2}{R_R}$ then: $E^2 = P_R * R_R = P_{R(INTERNAL)} * R_{R(INTERNAL)} = P_{R(INTERNAL)} * R_{R(INTERNAL)}$

(for Parallel Resistances)

It then can be derived that:

$$R_{R(EXTERNAL)} \leq \frac{P_{R(INTERNAL)} * R_{R(INTERNAL)}}{P_{R(EXTERNAL)}}$$

DRIVER SIZE	$P_{R(INTERNAL)}$ Watts	$R_{R(INTERNAL)}$ Ohms	$R_{R(EXTERNAL)}$ Min Ohms	P_R Max Watts	WIRE GAUGE
ESD-5	N/A	N/A	30	400	14 AWG 1.25 mm^2
ESD-10	N/A	N/A	30	600	14 AWG 1.25 mm^2
ESD-20	120	100	10	1300	12 AWG 3.5 mm^2
ESD-40	120	100	5	2500	10 AWG 5.5 mm^2
ESD-60	300	50	3	5000	8 AWG 16 mm^2

Table 5.5 - Regeneration Resistor Selection Data

Figure 5.1 shows how to connect an external regeneration resistor to the Emerald drivers.

5.3.2 STANDARD REGENERATION RESISTOR PACKAGES

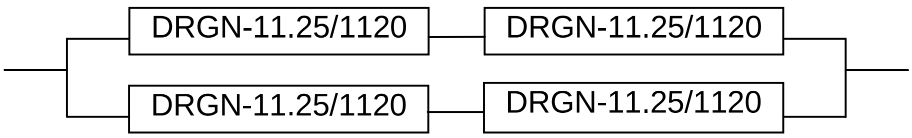
In general, wound metal ribbon resistors are recommended for this type of application. IIS offers a complete line of enclosed panel mounted regen resistor units to complement the Emerald driver. Various combinations of series and parallel connections are allowed to provide adequate regen resistor capacity.

IIS P/N	Description
MFS30A300J*	30 Ohm 30 Watts
RGH200-30*	30 Ohm 200 Watts
DRGN-20/400*	20 Ohm 400 Watts
DRGN-45/420	45 Ohm 420 Watts
DRGN-22.5/655	22.5 Ohm 655 Watts
DRGN-15/880	15 Ohm 880 Watts
DRGN-11.25/1120	11.25 Ohm 1120 Watts

*Not UL/CE approved

EXAMPLE CALCULATION:

If 4 KW of regen were needed on an ESD-60 driver, four (4) DRGN-11.25/1120 units could be connected as follows to yield 11.25 Ohms at 4480 Watts.



DRAWING NUMBER	**DESCRIPTION**
MFS30A300J	Resistor
RGH200-30	Regen Resistor
DRGN-20/400	Regen Resistor
DRGN-45/420	Regen Resistor
DRGN-45/420-2	Regen Resistor
DRGN-22.5/655	Regen Resistor
DRGN-15/880	Regen Resistor
DRGN-11.25/1120	Regen Resistor

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5.4 DC LINK REACTOR

The Emerald driver provides the ability to connector an external DC LINK reactor to help with CE requirements. Proper selection of the inductance is application specific. Please consult IIS factory additional information. See **Figure 5.1** for proper connection of the line reactor.

5.5 SERCOS TX/RX CONNECTIONS

When the driver is configured as a SERCOS Device Slave (See **Figure 6.1**), the Emerald will need to be connected to a SERCOS Device Master. SERCOS Fiber Optic cable are connected from the Transmitter (TX) of one device to Receiver (RX) of the next device to form a ring with one Master and multiple slave devices (See **Figure 5.3**).

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Figure 5.3 - Connecting the SERCOS Ring

5.6 TOUCHSCREEN & PC CONNECTIONS

The Emerald drive (in Controller Mode) may be connected to a touchscreen interface with PC Support or directly to a PC (See **Figure 5.4**).

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Figure 5.4 - Connecting the Emerald to a Touchscreen & PC

SECTION 6 - CONFIGURATION & PROGRAMMING

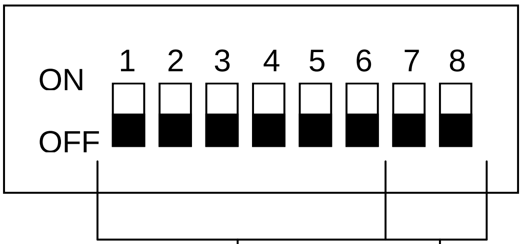
This section gives information on the Operation Data and Procedure Commands that can be transmitted over the SERCOS Communication ring, over RS-232, or over USB. It also details the settings needed in order to communicate to the drive over the SERCOS ring.

6.1 CONFIGURATION SWITCH

The eight DIP switches on top of the Emerald Drive are used to set the SERCOS device address and fiber optic transmitter intensity, in SERCOS mode. Turning all of the switches on will put the drive in CONTROLLER mode (See **Figure 6.1**).

A Device ID of Zero will put the Device in repeater mode and it will not recognize commands over SERCOS.

Switches 7 and 8 set the transmitter power. The table below lists the possible settings.



SERCOS Transmitter Power

SETTING		TX POWER LEVEL	LENGTH OF TRANSMISSION LINE
SW7	SW8		
0	0	1	0-15 m
1	0	2	15-30 m
0	1	3	30-45 m
1	1	4	>45 m

SERCOS Device ID

SW1-SW6	SERCOS Address
000000	0
100000	1
010000	2
---	---
011111	62

Note: Turning all of the switches ON will configure the drive in CONTROLLER Mode (SW1-SW8). Then connect the controller directly to the PC running EDE Software.

Figure 6.1 - Configuration Switch Settings

6.2 IDENTIFICATION NUMBERS

The Emerald Drive has an extensive list of Identification Numbers (IDN) to access its Operation Data and Procedure Commands. Refer to EDE or manufacturer's controller documentation for how to set IDN Parameters.

6.2.1 IDN LIST IN NUMERICAL ORDER

IDN	NAME
(STANDARD PARAMETERS)	
00001	Control Unit Cycle Time (t_{Ncyc})
00002	Communication Cycle Time (t_{Scyc})
00003	Shortest AT Transmission Starting Time (t_{1min})
00004	Transmit/Receive Transition Time (t_{ATMT})
00005	Minimum Feedback Processing Time (t_5)
00006	AT Transmission Starting Time (t_1)
00007	Feedback Acquisition Capture Point (t_4)
00008	Command Value Valid Time (t_3)
00009	Position of Data Record in MDT
00010	Length of MDT
00011	Class 1 diagnostic (C1D)
00012	Class 2 diagnostic (C2D)
00013	Class 3 diagnostic (C3D)
00014	Interface Status
00015	Telegram Type Parameter
00016	Configuration List of AT
00017	IDN - List of all Operation Data
00018	IDN - List of Operation Data for Phase 2
00019	IDN - List of Operation Data for Phase 3
00021	IDN - List of Invalid Operation Data for Phase 2
00022	IDN - List of Invalid Operation Data for Phase 3
00024	Configuration List of MDT
00025	IDN - List of all Procedure Commands
00028	MST Error Counter
00029	MDT Error Counter
00030	Manufacturer Version
00032	Primary Operation Mode
00033	Secondary Operation Mode 1
00034	Secondary Operation Mode 2
00035	Secondary Operation Mode 3
00036	Velocity Command Value
00040	Velocity Feedback Value
00041	Homing Velocity
00042	Homing Acceleration
00043	Velocity Polarity Parameter
00044	Velocity Data Scaling Type
00047	Position Command Value
00051	Position Feedback Value 1(Motor Feedback)
00052	Reference Distance 1
00053	Position Feedback Value 2 (Auxiliary Encoder Feedback)
00055	Position Polarity Parameters
00057	Position Window
00076	Position Data Scaling Type
00080	Torque Command Value
00082	PositiveTorque Limit
00083	Negative Torque Limit
00084	Torque Feedback Value

6.2.1 IDN LIST IN NUMERICAL ORDER (cont'd)

IDN	NAME
00085	Torque Polarity Parameter
00086	Torque/Force Data Scaling Type
00088	Receive to Receive Recovery Time (t_{MTSY})
00089	MDT Transmission Starting Time (t_2)
00090	Command Value Proceeding Time (t_{MTSG})
00091	Bipolar Velocity Limit Value
00092	Bipolar Torque Limit Value
00095	Diagnostic Message
00096	Slave Arrangment (SLKN)
00097	Mask Class 2 Diagnostics
00098	Mask Class 3 Diagnostics
00099	Reset Class 1 Diagnostics
00100	Velocity Loop Proportional Gain
00101	Velocity Loop Integral Action Time
00102	Velocity Loop Differential Time
00104	Position Loop Kv Factor
00105	Position Loop Integral Action Time
00106	Current Loop Proportional Gain 1
00107	Current Loop Integral Action Time 1
00109	Motor Peak Current
00110	Amplifier Peak Current
00112	Amplifier Rated Current
00113	Maximum Motor Speed
00119	Current Loop Proportional Gain 2
00120	Current Loop Integral Action Time 2
00124	Standstill Window
00125	Velocity Threshold
00126	Torque Threshold
00127	Phase 3 Transition Check
00128	Phase 4 Transition Check
00129	Product Specific Class 1 Diagnostics
00130	Probe 1 Value Positive Edge
00131	Probe 1 Value Negative Edge
00132	Probe 2 Value Positive Edge
00133	Probe 2 Value Negative Edge
00134	Master Control Word
00135	Drive Status Word
00138	Bipolar Acceleration Limit Value
00140	Controller Type
00142	Application Type
00143	SERCOS Interface Version
00147	Homing Parameter
00148	Drive Controlled Homing Procedure Command
00157	Velocity Window
00159	Monitoring Window
00160	Acceleration Data Scaling Type
00161	Acceleration Data Scaling Factor
00162	Acceleration Data Scaling Exponent
00169	Probe Control Parameter
00170	Probing Cycle Procedure Command
00179	Probe Status
00185	Length of the configurable Data Record in the AT
00186	Length of the configurable Data Record in the MDT
00187	IDN - List of configurable Data Record in the AT

6.2.1 IDN LIST IN NUMERICAL ORDER (cont'd)

IDN	**NAME**
00188	IDN - List of configurable Data Record in the MDT
00189	Following Distance
00196	Motor Rated Current
00200	Amplifier Warning Temperature
00203	Amplifier Shut-Down Temperature
00206	Drive On Delay Time
00207	Drive Off Delay Time
00208	Temperature Data Scaling Type
00273	Maximum Drive off delay time
00295	Drive Enable Delay Time
00296	Velocity Feed Forward Gain
00300	Real-time Control Bit 1
00301	Allocation of Real-time Control Bit 1
00302	Real-time Control Bit 2
00303	Allocation of Real-time Control Bit 2
00304	Real-time Status Bit 1
00305	Allocation of Real-time Status Bit 1
00306	Real-time Status Bit 2
00307	Allocation of Real-time Status Bit 2
00348	Acceleration Feed Forward Gain
00380	DC Bus Voltage
00384	Amplifier Temperature
00400	Home Switch
00401	Probe 1
00402	Probe 2
00403	Position Feedback Value Status
00405	Probe 1 Enable
00406	Probe 2 Enable
00409	Probe 1 Positive Latched
00410	Probe 1 Negative Latched
00411	Probe 2 Positive Latched
00412	Probe 2 Negative Latched

IDN	**NAME**
(IIS SPECIFIC PARAMETERS)	
32769	U Current Sensor Calibration Offset
32770	U Current Sensor Calibration Gain
32771	V Current Sensor Calibration Offset
32772	V Current Sensor Calibration Gain
32773	U Current Sensor
32774	V Current Sensor
32775	Procedure Command Remove Calibration Write-Protect
32776	Procedure Command Save Calibration Parameters
32777	DC Bus Calibration Offset
32778	DC Bus Calibration Gain
32783	Analog Input Calibration Offset
32784	Analog Input Calibration Gain
32785	W Current Sensor Calibration Offset
32786	W Current Sensor Calibration Gain
32787	W Current Sensor
32788	Current fault factor
33000	Digital Outputs 1
33001	Digital Outputs 2
33200	Probe Source
33300	I/O Device 1 Configuration

6.2.1 IDN LIST IN NUMERICAL ORDER (cont'd)

IDN	NAME
33301	I/O Device 2 Configuration
33304	I/O Device 1 Type
33305	I/O Device 2 Type
33500	Digital Inputs 1
33501	Digital Inputs 2
33600	Analog Input 1
33650	PWM Output
33700	Alarm History
33701	Current Drive Alarm
33702	Drive Alarm Bitmap 1
33703	Drive Alarm Bitmap 2
33704	Drive Alarm Bitmap 3
33705	Drive Alarm Bitmap 4
33799	Clear Alarm History Procedure Command
33800	Following Error Delay Time
33801	PWM Frequency
34000	Motor Code
34003	Motor Poles
34004	Feedback Type
34005	Resolver Cycles
34006	Motor Feedback Configuration
34007	Motor Rated Speed
34009	Overload Time
34011	Encoder Line Count
34224	Position Loop Differential Time
34243	Current Command (Amps)
34244	Current Feedback (Amps)
34245	Velocity Command (RPM)
34246	Velocity Feedback (RPM)
34260	Motor Phase Angle
34280	Current Command Filter Rejection Frequency
34281	Current Command Filter Bandwidth
34282	Tuning Parameter List
34283	Motor Parameter List
34284	Monitor Parameter List
34285	Monitor I/O List
34286	Monitor Alarm List
34287	Serial Error Register
34288	Power Board ID
34300	Auxiliary Encoder Features Setup
34810	Home Switch IDN
34811	Home Switch Bit
34812	Boot ROM SFO Number
34813	Regen RMS Power
34820	Password
34821	Test Mode Procedure Command
34822	Power Transistor Bitmap
35000	Resolver Card Configuration
35001	Resolver Feedback Value
35002	Resolver Feedback Polarity Parameter
35011	Auxiliary Feedback Value
35012	Auxiliary Feedback Polarity Parameter
35020	Position Feedback 1 Configuration
35021	Position Feedback 2 Configuration

6.2.2 IDN LIST BY FUNCTION

Position Control	
00032	Primary Operation Mode
00033	Secondary Operation Mode 1
00034	Secondary Operation Mode 2
00035	Secondary Operation Mode 3
00047	Position Command Value
00051	Position Feedback Value 1(Motor Feedback)
00053	Position Feedback Value 2 (Auxiliary Encoder Feedback)
00055	Position Polarity Parameters
00057	Position Window
00076	Position Data Scaling Type
00138	Bipolar Acceleration Limit Value
00159	Monitoring Window
00160	Acceleration Data Scaling Type
00161	Acceleration Data Scaling Factor
00162	Acceleration Data Scaling Exponent
00189	Following Distance
33800	Following Error Delay Time
34300	Auxiliary Encoder Features Setup
35000	Resolver Card Configuration
35001	Resolver Feedback Value
35002	Resolver Feedback Polarity Parameter
35011	Auxiliary Feedback Value
35012	Auxiliary Feedback Polarity Parameter
35020	Position Feedback 1 Configuration
35021	Position Feedback 2 Configuration

Velocity Control	
00032	Primary Operation Mode
00033	Secondary Operation Mode 1
00034	Secondary Operation Mode 2
00035	Secondary Operation Mode 3
00036	Velocity Command Value
00040	Velocity Feedback Value
00043	Velocity Polarity Parameter
00044	Velocity Data Scaling Type
00091	Bipolar Velocity Limit Value
00124	Standstill Window
00125	Velocity Threshold
00138	Bipolar Acceleration Limit Value
00157	Velocity Window
00160	Acceleration Data Scaling Type
00161	Acceleration Data Scaling Factor
00162	Acceleration Data Scaling Exponent

Torque Control	
00032	Primary Operation Mode
00033	Secondary Operation Mode 1
00034	Secondary Operation Mode 2
00035	Secondary Operation Mode 3
00080	Torque Command Value
00082	PositiveTorque Limit
00083	Negative Torque Limit

6.2.2 IDN LIST BY FUNCTION (cont'd)

00084	Torque Feedback Value
00085	Torque Polarity Parameter
00086	Torque/Force Data Scaling Type
00092	Bipolar Torque Limit Value
00126	Torque Threshold

Communications

00001	Control Unit Cycle Time (t_{Ncyc})
00002	Communication Cycle Time (t_{Scyc})
00003	Shortest AT Transmission Starting Time (t_{1min})
00004	Transmit/Receive Transition Time (t_{ATMT})
00005	Minimum Feedback Processing Time (t_5)
00006	AT Transmission Starting Time (t_1)
00007	Feedback Acquisition Capture Point (t_4)
00008	Command Value Valid Time (t_3)
00009	Position of Data Record in MDT
00010	Length of MDT
00014	Interface Status
00015	Telegram Type Parameter
00016	Configuration List of AT
00017	IDN - List of all Operation Data
00018	IDN - List of Operation Data for Phase 2
00019	IDN - List of Operation Data for Phase 3
00021	IDN - List of Invalid Operation Data for Phase 2
00022	IDN - List of Invalid Operation Data for Phase 3
00024	Configuration List of MDT
00025	IDN - List of all Procedure Commands
00088	Receive to Receive Recovery Time (t_{MTSY})
00089	MDT Transmission Starting Time (t_2)
00090	Command Value Proceeding Time (t_{MTSG})
00096	Slave Arrangment (SLKN)
00127	Phase 3 Transition Check
00128	Phase 4 Transition Check
00134	Master Control Word
00135	Drive Status Word
00185	Length of the configurable Data Record in the AT
00186	Length of the configurable Data Record in the MDT
00187	IDN - List of configurable Data Record in the AT
00188	IDN - List of configurable Data Record in the MDT
00206	Drive On Delay Time
00207	Drive Off Delay Time
00273	Maximum Drive off delay time
00295	Drive Enable Delay Time
00300	Real-time Control Bit 1
00301	Allocation of Real-time Control Bit 1
00302	Real-time Control Bit 2
00303	Allocation of Real-time Control Bit 2
00304	Real-time Status Bit 1
00305	Allocation of Real-time Status Bit 1
00306	Real-time Status Bit 2
00307	Allocation of Real-time Status Bit 2

6.2.2 IDN LIST BY FUNCTION (cont'd)

Diagnostics	
00011	Class 1 diagnostic (C1D)
00012	Class 2 diagnostic (C2D)
00013	Class 3 diagnostic (C3D)
00028	MST Error Counter
00029	MDT Error Counter
00095	Diagnostic Message
00097	Mask Class 2 Diagnostics
00098	Mask Class 3 Diagnostics
00099	Reset Class 1 Diagnostics
00110	Amplifier Peak Current
00112	Amplifier Rated Current
00129	Product Specific Class 1 Diagnostics
00200	Amplifier Warning Temperature
00203	Amplifier Shut-Down Temperature
00380	DC Bus Voltage
00384	Amplifier Temperature
33700	Alarm History
33701	Current Drive Alarm
33702	Drive Alarm Bitmap 1
33703	Drive Alarm Bitmap 2
33704	Drive Alarm Bitmap 3
33705	Drive Alarm Bitmap 4
33799	Clear Alarm History Procedure Command
34243	Current Command (Amps)
34244	Current Feedback (Amps)
34245	Velocity Command (RPM)
34246	Velocity Feedback (RPM)
34260	Motor Phase Angle
34282	Tuning Parameter List
34283	Motor Parameter List
34284	Monitor Parameter List
34285	Monitor I/O List
34286	Monitor Alarm List
34287	Serial Error Register
34813	Regen Resistor RMS Power

Probes	
00130	Probe 1 Value Positive Edge
00131	Probe 1 Value Negative Edge
00132	Probe 2 Value Positive Edge
00133	Probe 2 Value Negative Edge
00169	Probe Control Parameter
00170	Probing Cycle Procedure Command
00179	Probe Status
00401	Probe 1
00402	Probe 2
00405	Probe 1 Enable
00406	Probe 2 Enable
00409	Probe 1 Positive Latched
00410	Probe 1 Negative Latched
00411	Probe 2 Positive Latched
00412	Probe 2 Negative Latched
33200	Probe Source

6.2.2 IDN LIST BY FUNCTION (cont'd)

Inputs/Outputs	
33000	Digital Outputs 1
33001	Digital Outputs 2
33300	I/O Device 1 Configuration
33301	I/O Device 2 Configuration
33304	I/O Device 1 Type
33305	I/O Device 2 Type
33500	Digital Input 1
33501	Digital Input 2
33600	Analog Input 1
33650	PWM Output

Tuning Parameters	
00100	Velocity Loop Proportional Gain
00101	Velocity Loop Integral Action Time
00102	Velocity Loop Differential Time
00104	Position Loop Kv Factor
00105	Position Loop Integral Action Time
00106	Current Loop Proportional Gain 1
00107	Current Loop Integral Action Time 1
00119	Current Loop Proportional Gain 2
00120	Current Loop Integral Action Time 2
00296	Velocity Feed Forward Gain
00348	Acceleration Feed Forward Gain
34224	Position Loop Differential Time
34280	Current Command Filter Rejection Frequency
34281	Current Command Filter Bandwidth

Miscellaneous	
00030	Manufacturer Version
00140	Controller Type
00142	Application Type
00143	SERCOS Interface Version
00208	Temperature Data Scaling Type
32788	Current fault factor
33801	PWM Frequency
34288	Power Board ID
34812	Boot ROM SFO Number

Homing	
00041	Homing Velocity
00042	Homing Acceleration
00052	Reference Distance 1
00147	Homing Parameter
00148	Drive Controlled Homing Procedure Command
00400	Home Switch
00403	Position Feedback Value Status
34810	Home Switch IDN
34811	Home Switch Bit

6.2.2 IDN LIST BY FUNCTION (cont'd)

Motor Parameters	
00109	Motor Peak Current
00113	Maximum Motor Speed
00196	Motor Rated Current
34000	Motor Code
34003	Motor Poles
34004	Feedback Type
34005	Resolver Cycles
34006	Motor Feedback Configuration
34007	Motor Rated Speed
34009	Overload Time
34011	Encoder Line Count

Calibration

32769	U Current Sensor Calibration Offset
32770	U Current Sensor Calibration Gain
32771	V Current Sensor Calibration Offset
32772	V Current Sensor Calibration Gain
32773	U Current Sensor
32774	V Current Sensor
32775	Procedure Command Remove Calibration Write-Protect
32776	Procedure Command Save Calibration Parameters
32777	DC Bus Calibration Offset
32778	DC Bus Calibration Gain
32783	Analog Input Calibration Offset
32784	Analog Input Calibration Gain
32785	W Current Sensor Calibration Offset
32786	W Current Sensor Calibration Gain
32787	W Current Sensor
34820	Password
34821	Test Mode Procedure Command
34822	Power Transistor Bitmap

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS

00001: CONTROL UNIT CYCLE TIME, (t_{Ncyc})

The control unit cycle time defines the cyclic interval during which the control unit makes new command values available. The control unit cycle time (t_{Ncyc}) must be set equal to the communication cycle time (t_{Scyc}). This value is calculated and loaded into the drive by the Master Control Unit in Phase 2. This value becomes active in phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	500 - 5000	1 uSec	Phases 2, 3 and 4	Phase 2	5000

00002: COMMUNICATION CYCLE TIME, (t_{Scyc})

The communication cycle time of the interface defines the intervals during which the cyclic data are transferred. The communication cycle can be set from 500uSec to 5000 uSec in steps of 250 uSec. This value is calculated and loaded into the drive by the Master Control Unit in Phase 2. This value becomes active in phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	500 - 5000	1 uSec	Phases 2, 3 and 4	Phase 2	5000

00003: SHORTEST AT TRANSMISSION STARTING TIME, (t_{1min})

Indicates the time requirement of the drive between the end of the reception of the MST and the start of the transmission of the AT. Read by the Master Controller in Phase 2, t_{1min} is used to calculate the AT Transmission Starting Time, t_1 (IDN 00006).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	15	1 uSec	Phases 2, 3 and 4	None	

00004: TRANSMIT/RECEIVE TRANSITION TIME, (t_{ATMT})

Time required by the drive to switch from transmitting the AT to receiving the MDT. Read by the Master Controller in Phase 2 and is used to determine the MDT starting time, t_2 (IDN 00089).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0	1 uSec	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00005: MINIMUM FEEDBACK PROCESSING TIME, (t_5)

Time required by the drive between the start of feedback acquisition and the arrival of the next MST. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	200	1 uSec	Phases 2, 3 and 4	None	

00006: AT TRANSMISSION STARTING TIME, (t_1)

The time the drive sends the AT after the end of the MST. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3. ($t_1 \geq t_{1min}$)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	15 - 5000	1 uSec	Phases 2, 3 and 4	Phase 2	12

00007: FEEDBACK ACQUISITION CAPTURE POINT, (t_4)

The time the drive captures the AT Data. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - (tScyc - t5)	1 uSec	Phases 2, 3 and 4	Phase 2	0

00008: COMMAND VALUE VALID TIME, (t3)

The time the drive can start using the data sent in the MDT. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 5000	1 uSec	Phases 2, 3 and 4	Phase 2	0

00009: POSITION OF DATA RECORD IN MDT

The position within the MDT that the drives command data can be obtained. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65531	1 byte	Phases 2, 3 and 4	Phase 2	1

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00010: LENGTH OF MDT

The length of the MDT, expressed in bytes, includes data records for all drives. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	4 - 65534	1 byte	Phases 2, 3 and 4	Phase 2	4

00011: CLASS 1 DIAGNOSTICS (C1D)

Indicates a Drive Shutdown Error.

A Drive error situation leads to the following.

a) Drive safely decelerates to and releases torque when stopped.
b) The shutdown error Bit (Bit 13) is set to 1 in the drive status. IDN 99 must be issued and no Class 1 diagnostic errors exist to clear the error bit.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	Amplifier over temperature error
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Feedback error
Bit 6:	Error in the "commutation" system
Bit 7:	Over current error
Bit 8:	Over voltage error
Bit 9:	Under voltage error
Bit 10:	Reserved
Bit 11:	Excessive position deviation
Bit 12:	Communication error
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Manufacturer-specific error (see IDN 00129)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes		1 byte	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00012: CLASS 2 DIAGNOSTICS (C2D)

Indicates a Drive Shutdown Warning.

The shutdown warning Bit (Bit 12) is set to 1 in the drive status.
When this IDN is read the warning bit is cleared and this IDN is reset to 0.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	Amplifier over temperature warning
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Under Voltage warning
Bit 10:	Reserved
Bit 11:	Reserved
Bit 12:	Reserved
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes		1 byte	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00013: CLASS 3 DIAGNOSTICS (C3D)

Drive operation status flags.

The status flag Bit (Bit 11) is set to 1 in the drive status when a change in C3D occurs. When this IDN is read the status bit (Bit 11) in the drive status is cleared.

Bit supported by drive:

BIT NUMBER	DESCRIPTION	
Bit 0:	$n_{feedback} = n_{command}$	(See: Velocity Window IDN 00157)
Bit 1:	$n_{feedback} = 0$	(See: Standstill Window IDN 00124)
Bit 2:	$\| n_{feedback} \| < \| n_x \|$	(See: Velocity Threshold IDN 00125)
Bit 3:	$\| T \| >= \| T_x \|$	(See: Torque Threshold IDN 00126)
Bit 4:	$\| T \| >= \| T_{limit} \|$	(See: Torque Limit IDN 00082, IDN 00083, and IDN 00092)
Bit 5:	$\| n_{command} \| > \| n_{limit} \|$	(See: Velocity Limit IDN 00091)
Bit 6:	In Position	(See: Position Window IDN 00057)
Bit 7 - 15:	Reserved	

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes		1 byte	Phases 2, 3 and 4	None	

00014: INTERFACE STATUS

Status of the SERCOS Interface. When an interface error occurs, the error and the phase the error occurred is recorded. Can only be cleared by the Reset Class 1 Diagnostics (IDN 00099).

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 2 - 0:	Communication phase
Bit 3:	MST Failure
Bit 4:	MDT Failure
Bit 5:	Invalid Phase (Phase > 4)
Bit 6:	Error During Phase Upshift (Invalid Sequence)
Bit 7:	Error During Phase Downshift (Not To Phase 0)
Bit 8:	Phase Switching without Ready Acknowledge
Bit 9:	Switching to Uninitialized Operating Mode
Bit 10 - 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes		1 byte	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00015: TELEGRAM TYPE PARAMETER

Selects the Telegram Configuration Type of the AT and the MDT cyclic data. Set by the Master Controller in Phase 2.

TYPE	CONFIGURATION
0	No AT or MDT IDNs
1	IDN 80 (Torque Command) in the MDT
2	IDN 36 (Velocity Command) in the MDT and IDN 40 (Velocity Feedback) in the AT
3	IDN 36 (Velocity Command) in the MDT and IDN 51 (Position Feedback) in the AT
4	IDN 47 (Position Command) in the MDT and IDN 51 (Position Feedback) in the AT
5	IDN 47 (Position Command), IDN 36 (Velocity Command) in the MDT and IDN 51 (Position Feedback), IDN 40 (Velocity Feedback in the AT
6	IDN 36 (Velocity Command) in the MDT
7	User Defined At and MDT (See IDNs 16 and 24)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 7		Phases 2, 3 and 4	Phase 2	0

00016: CONFIGURATION LIST OF AT

List of IDNs that are to be included in the User Defined AT Cyclic Data. Set by the Master Controller in Phase 2. Only Valid if Telegram Type 7 is selected for IDN 00015. (Refer to **IDN 00185** and **IDN 00187**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable	See IDN00185, IDN00187		Phases 2, 3 and 4	Phase 2	0

00017: IDN - LIST OF ALL OPERATION DATA

Returns the list of all valid operation Data IDN's

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00018: IDN - LIST OF OPERATION DATA FOR PHASE 2

Returns the list of all IDN's that must be written by the Master in Phase 2.
IDN's 00001, 00002, 00006, 00007, 00008, 00009, 00010, 00015, 00032 and 00089 must be written.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00019: IDN - LIST OF OPERATION DATA FOR PHASE 3

Returns the list of all IDN's that must be written by the Master in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00021: IDN - LIST OF INVALID OPERATION DATA FOR PHASE 2

Returns the list of all operation Data IDN's for Phase 2 that is considered invalid by the drive and will need to be written before switchover to phase 3 can be made.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00022: IDN - LIST OF INVALID OPERATION DATA FOR PHASE 3

Returns the list of all operation Data IDN's for Phase 3 that is considered invalid by the drive and will need to be written before switchover to phase 4 can be made.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00024: CONFIGURATION LIST OF MDT

List of IDNs that are to be included in the User Defined MDT Cyclic Data. Set by the Master Controller in Phase 2. Only Valid if Telegram Type 7 is selected for IDN 00015. (Refer to **IDN 00186** and **IDN 00188**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable	See IDN00186, IDN00188		Phases 2, 3 and 4	Phase 2	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00025: IDN - LIST OF ALL PROCEDURE COMMANDS

Returns the list of all valid Procedure Command IDN's on drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00028: MST ERROR COUNTER

The MST error counter counts all invalid MST's in Communication Phase 3 and 4. In the case where more than 2 consecutive MST's are invalid, only the first two are counted. The MST error counter counts up to a maximum of 2^{16} -1. This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	0

00029: MDT ERROR COUNTER

The MDT error counter counts all invalid MDT's in Communication Phase 3 and 4. In the case where more than 2 consecutive MDT's are invalid, only the first two are counted. The MDT error counter counts up to a maximum of 2^{16} -1. This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	0

00030: MANUFACTURER VERSION

Identifies the current software version number in the drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00032: PRIMARY OPERATION MODE

The drive operation mode defined by this ID Number becomes active when the Primary Operation mode is set in the Control word of the MDT. Must be configured in phase 2.

VALUES	VALID MODES
0	No Command Mode
1	Torque Control Mode using Cyclic command values
2	Velocity Control Mode using Cyclic command values
3	Position Control using Cyclic command values
16385	Torque Control ignoring Cyclic command values
16386	Velocity Control ignoring Cyclic command values

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2	0

00033 SECONDARY OPERATION MODE 1

The drive operation mode defined by this ID Number becomes active when the Secondary Operation mode 1 is set in the Control word of the MDT. Must be configured in phase 2.

VALUES	VALID MODES
0	No Command Mode
1	Torque Control Mode using Cyclic command values
2	Velocity Control Mode using Cyclic command values
3	Position Control using Cyclic command values
16385	Torque Control ignoring Cyclic command values
16386	Velocity Control ignoring Cyclic command values

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00034: SECONDARY OPERATION MODE 2

The drive operation mode defined by this ID Number becomes active when the Secondary Operation mode 2 is set in the Control word of the MDT. Must be configured in phase 2.

VALUES	VALID MODES
0	No Command Mode
1	Torque Control Mode using Cyclic command values
2	Velocity Control Mode using Cyclic command values
3	Position Control using Cyclic command values
16385	Torque Control ignoring Cyclic command values
16386	Velocity Control ignoring Cyclic command values

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2	0

00035: SECONDARY OPERATION MODE 3

The drive operation mode defined by this ID Number becomes active when the Secondary Operation mode 3 is set in the Control word of the MDT. Must be configured in phase 2.

VALUES	VALID MODES
0	No Command Mode
1	Torque Control Mode using Cyclic command values
2	Velocity Control Mode using Cyclic command values
3	Position Control using Cyclic command values
16385	Torque Control ignoring Cyclic command values
16386	Velocity Control ignoring Cyclic command values

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2	0

00036: VELOCITY COMMAND VALUE

In the velocity control-operating mode in the drive, the control unit transfers the velocity command values to the drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-32768 - +32768	32768bits = 6000RPM	Phases 2, 3 and 4	Phase 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00040: VELOCITY FEEDBACK VALUE

The velocity feedback value is transferred from the drive to the control unit in order to allow the control unit to periodically display the velocity.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes		32768bits = 6000RPM	Phases 2, 3 and 4	None	

00041: HOMING VELOCITY

The homing velocity is used during the procedure command 'drive controlled homing' (IDN 148) when activated. The drive performs its own homing control.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 - +32768	32768bits = 6000RPM	Phases 2, 3 and 4	Phase 4	0

00042: HOMING ACCELERATION

The homing acceleration is needed by the drive if the procedure command 'drive controlled homing' (IDN 148) is activated.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 25000.000	rad/sec^2	Phases 2, 3 and 4	Phase 4	0

00043: VELOCITY POLARITY PARAMETER

This parameter is used to switch polarities of velocity data for specific applications. Polarities are not switched internally but externally (on the input and output) of a closed loop system. The motor shaft turns clockwise when there is a positive velocity command difference and no inversion is programmed (see **Figure 6.2**).

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Velocity command value = 0 - non-inverted = 1 - inverted
Bit 1:	Reserved
Bit 2:	Velocity feedback value = 0 - non-inverted = 1 - inverted
Bit 15 - 3:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

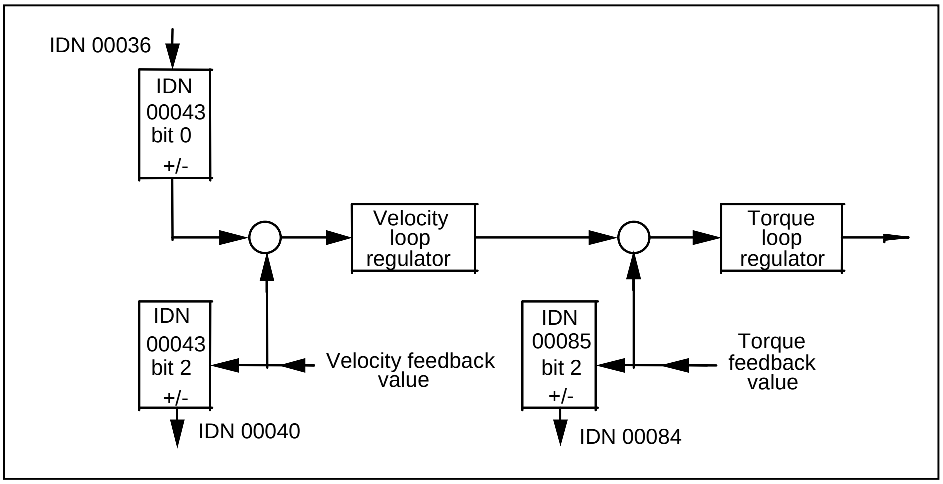


Figure 6.2 - Velocity Polarity Parameter

00044: VELOCITY DATA SCALING TYPE

Defines the scaling option for all velocity data. Only the "No scaling Method is currently supported by the drive.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 2-0:	Scaling method 000 - no scaling
All others:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

00047: POSITION COMMAND VALUE

During the position control drive operation mode, the position command values are transferred from the control unit to the drive according to the time pattern of the control unit cycle.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	Phases 2, 3 and 4	Phase 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00051: POSITION FEEDBACK VALUE 1 (MOTOR FEEDBACK)

The position feedback value 1 is transferred from the drive to the control unit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes		1 bit	Phases 2, 3 and 4	None	

00052: REFERENCE DISTANCE 1

This parameter describes the distance between the machine zero point and the reference point related to the motor feedback. After the homing procedure, the position feedback value 1 is calculated by:
- reference distance 1;

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00053: POSITION FEEDBACK VALUE 2

The position feedback value 2 is transferred from the drive to the control unit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes		1 bit	Phases 2, 3 and 4	None	

00055: POSITION POLARITY PARAMETERS

This parameter is used to switch polarities of reported position data for specific applications. Polarities are switched outside (i.e. on the input and output) of a closed loop system. The motor shaft turns clockwise (when viewed from the output shaft) when there is a positive position command difference and no inversion is programmed (see **Figure 6.3**).

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Position command value 0 - Non-inverted 1 - Inverted
Bit 1:	Reserved
Bit 2:	Position feedback value 1 0 - Non-inverted 1 - Inverted
Bit 3:	Position feedback value 2 0 - Non-inverted 1 - Inverted
Bit 4-15:	Reserved

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

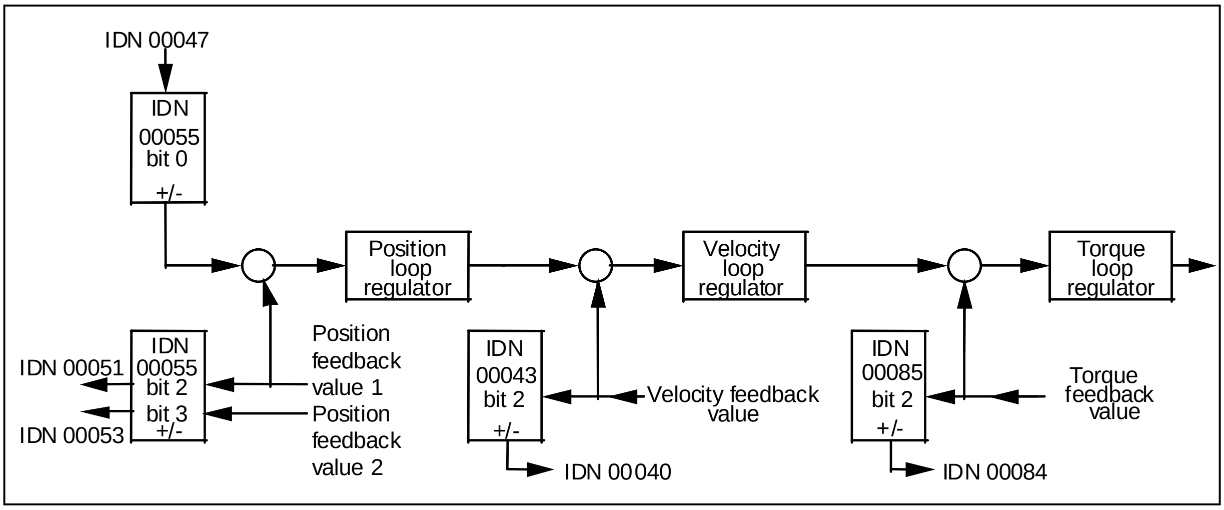


Figure 6.3 - Position Polarity Parameter

00057: POSITION WINDOW

When the difference between the position command value and the position feedback value is within the range of the position window, then the drive sets the status "in position" in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - $+2^{31}$ - 1	1 bit	Phases 2, 3 and 4	Phases 2, 3 and 4	-2^{31} - 1

00076: POSITION DATA SCALING TYPE

Defines the scaling option for all position data. Only the "No scaling" method is currently supported by the drive.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 2-0:	Scaling method 000 - no scaling
All others:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00080: TORQUE COMMAND VALUE

During the torque control operation mode of the drive, torque command values are transferred from the control unit to the drive. This IDN is scaled as a percentage of the drive or motor's peak torque, whichever is less.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-100.00 - +100.00	0.01%	Phases 2, 3 and 4	Phase 4	0

00082: POSITIVE TORQUE LIMIT

The positive torque limit value limits the maximum torque in the positive direction. If the torque limit is exceeded, the drive sets the status T >= T_{limit} in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	0.00 - 100.00	0.01%	Phases 2, 3 and 4	Phases 2, 3 and 4	100.00

00083: NEGATIVE TORQUE LIMIT

The negative torque limit value limits the maximum torque in the negative direction. If the torque limit is exceeded, the drive sets the status T >= T_{limit} in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	0.00 - 100.00	0.01%	Phases 2, 3 and 4	Phases 2, 3 and 4	-100.00 ?

00084: TORQUE FEEDBACK VALUE

The torque feedback value is transferred from the drive to the control unit. This IDN is scaled as a percentage of the drive or motor's peak torque, whichever is less.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		0.01%	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00085: TORQUE POLARITY PARAMETER

This parameter is used to switch polarities of reported torque data for specific applications. Polarities are not switched internally but externally (on the input and output) of a closed loop system. The motor shaft turns clockwise when there is a positive torque command difference and no inversion (see **Figure 6.4**).

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Torque command value 0 - Non-inverted 1 - Inverted
Bit 1:	Reserved
Bit 2:	Torque feedback value 0 - Non-inverted 1 - Inverted
Bit 15-3:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

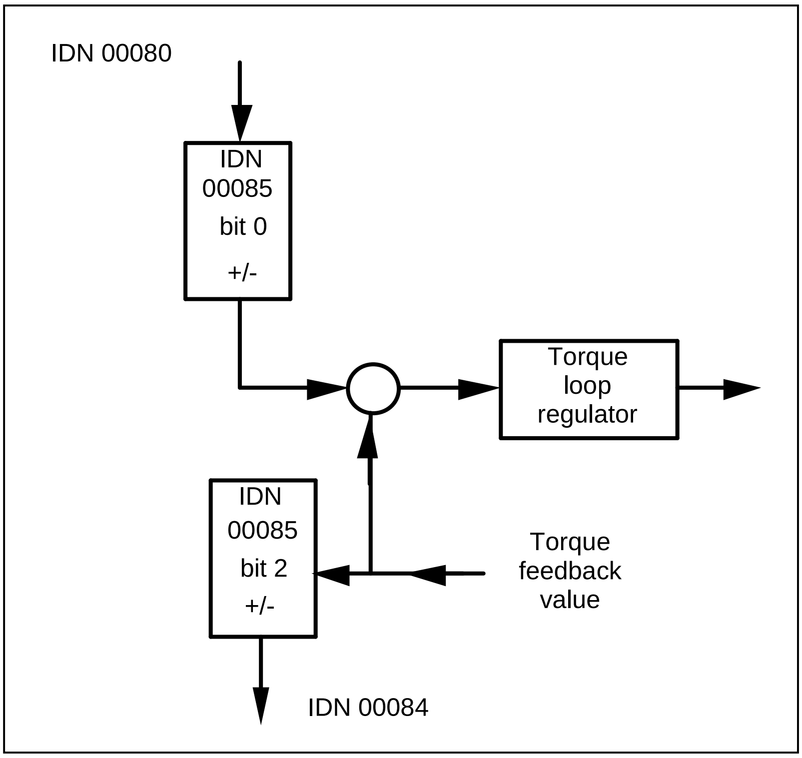


Figure 6.4 - Torque Polarity Parameter

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00086: TORQUE DATA SCALING TYPE

Defines the scaling option for all torque data. Only the "Percentage Scaling" method is currently supported by the drive.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 2-0:	Scaling method 000 - Percentage scaling
Bit 3-15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

00088: RECEIVE TO RECEIVE RECOVERY TIME (t_{mtsy})

Recovery time of the slave after reception of a MDT to switch over to receive the next MST. The master reads this time during CP_2 to ensure that the interval will be sufficient between the end of the MDT and the beginning of the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1 µs	Phases 2, 3 and 4	None	

00089: MDT TRANSMISSION STARTING TIME (t_2)

The MDT transmission starting time determines when the master shall send its MDT during CP_3 and CP_4, following the MST. This parameter is transferred by the master to the slave during CP_2 and becomes active during CP_3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal Number	2 bytes	1 - 5000	1 µs	Phases 2, 3 and 4	Phase 2	0 ?

00090: COMMAND VALUE PROCEEDING TIME (t_{mtsg})

The time required by the slave to make command values available for a drive after receipt of a MDT. This time is read by the master during CP_2 in order to calculate correctly the command value valid time t_3 (IDN 00008).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1 µs	Phases 2, 3 and 4	None	1

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00091: BIPOLAR VELOCITY LIMIT VALUE

The bipolar velocity limit value describes the maximum allowable velocity in both directions. If the velocity limit value is exceeded, the drive responds by setting the status '$n_{command} > n_{limit}$' in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 - 32768	32768 bits = 6000 RPM	Phases 2, 3 and 4	Phases 2, 3 and 4	32768

00092: BIPOLAR TORQUE LIMIT VALUE

The bipolar torque limit value limits the maximum torque symmetrically in both directions. If the torque limit value is exceeded, the drive sets the status '$T \geq T_{limit}$' in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	0 - +100.00	0.01%	Phases 2, 3 and 4	Phases 2, 3 and 4	100.00

00095: DIAGNOSTIC MESSAGE

Not currently supported at this time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00096: SLAVE ARRANGEMENT (SLKN)

During initialization, the master needs to recognize which physical slaves and their associated drives are present in order to optimize the automatic timeslot computation. The master can request this information from the drives during CP_2. By this entry the master recognizes other drives which belong to the same physical slave. Valid drive addresses are all decimal values from 1 to 254, in accordance with hexadecimal values $(01)_H$ through $(FE)_H$.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	

SLKN:

Since each Emerald Drive is configured with one drive per slave, then "Next Drives Address" = "Drive Address".

Next Drives Address (1 through 255)
Drive Address (1 through 255)

Example:

A drive with an address of "03" has a value of:

03 03

00097: MASK CLASS 2 DIAGNOSTIC

By means of this mask, warnings in class 2 diagnostic can be masked with respect to their effect on the change bit in drive status. When changing masked warnings, the change bit for class 2 diagnostic is not set in the drive status. The mask does not affect the operation data of class 2 diagnostic (see **IDN 00012**). Setting a bit to 0 masks the effects of the correspond C2D bit on the Class 2 diagnostic change bit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00098: MASK CLASS 3 DIAGNOSTIC

By means of this mask, condition flags in C3D can be masked with respect to their effect on the change bit in drive status. When masked condition flags change, the change bit for C3D is not set in the drive status. The mask does not affect the operation data of C3D (see **IDN 00013**). Setting a bit to 0 masks the effects of the correspond C3D bit on the Class 3 diagnostic change bit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

00099: RESET CLASS 1 DIAGNOSTIC

When this procedure command is received by the drive via the service channel and no error exists, C1D, the interface status, the manufacturer's C1D, the drive shutdown error (drive status bit 13), and the drive shutdown mechanism in the drive are all reset (see **IDN 00011, IDN 00014, and IDN 00129**).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

00100: VELOCITY LOOP PROPORTIONAL GAIN

Sets the proportional gain for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 65.535	0.001 Amp/(rad/sec)	Phases 2, 3 and 4	Phases 2, 3 and 4	0.400

00101: VELOCITY LOOP INTEGRAL ACTION TIME

Sets the integral time constant for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00102: VELOCITY LOOP DIFFERENTIAL TIME

Sets the derivative time for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00104: POSITION LOOP K_V - FACTOR

The K_V-factor determines the gain of the position loop regulator throughout the entire velocity range.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 (rad/sec)/rad	Phases 2, 3 and 4	Phases 2, 3 and 4	30.0

00105: POSITION LOOP INTEGRAL ACTION TIME

Sets the integral time constant for the postion loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00106: CURRENT LOOP PROPORTIONAL GAIN 1

Sets the proportional gain for the torque/force-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 100.000	0.001 V/A	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00107: CURRENT LOOP INTEGRAL ACTION TIME 1

Sets the integral time constant for the torque/force-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 µsec	Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00109: MOTOR PEAK CURRENT

If the motor peak current is less than that of the amplifier, the amplifier is automatically limited to the level of the motor peak current. The setting range for this IDN is dependant on drive size and PWM frequency.

Emerald Driver	ESD-5		ESD-10		ESD-20		ESD-40		ESD-60	
PWM Frequency	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz
Min. Setting	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak
Max. Setting	17.675 A peak	14.140 A peak	35.350 A peak	28.280 A peak	70.700 A peak	56.560 A peak	141.40 A peak	113.12 A peak	169.68 A peak	135.74 4 A peak

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	See table above	0.001 A	Phases 2, 3 and 4	Phases 2 and 3	0.000

00110: AMPLIFIER PEAK CURRENT

The amplifier peak current is limited by the hardware, which means that the current for the maximum attainable torque limit value is fixed as well.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes		0.001 A peak	Phases 2, 3 and 4	None	Depends on drive size

00112: AMPLIFIER RATED CURRENT

The amplifier rated current is equal to the allowable continuous current of the drive unit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes		0.001 A peak	Phases 2, 3 and 4	None	Depends on drive size

00113: MAXIMUM MOTOR SPEED

The maximum motor speed is listed in the motor spec sheet provided by the manufacturer.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0000 - 6000.0000	0.0001 RPM	Phases 2, 3 and 4	Phases 2 and 3	0.0000

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00119: CURRENT LOOP PROPORTIONAL GAIN 2

Sets the proportional gain for the flux-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 100.000	0.001 V/A	Phases 2, 3 and 4	Phases 2, 3 and 4	0.000

00120: CURRENT LOOP INTEGRAL ACTION TIME 2

Sets the integral time constant for the flux-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 μsec	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00124: STANDSTILL WINDOW

The standstill window describes the amount of the deviation of the velocity from 0. If the velocity feedback value is within the standstill window the drive sets the status $n_{\text{feedback}} = 0$ in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 32768	32768 bits = 6000 RPM	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00125: VELOCITY THRESHOLD (n_x)

If the velocity feedback value falls below the velocity threshold n_X, the drive sets the status '$n_{\text{feedback}} < n_X$ ' in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 32768	32768 bits = 6000 RPM	Phases 2, 3 and 4	Phases 2, 3 and 4	32768

00126: TORQUE THRESHOLD (T_X)

If the torque feedback value exceeds the torque threshold T_X, the drive sets the status '$T \geq T_X$' in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - +100.00	0.01%	Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00127: CP_3 TRANSITION CHECK

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP_3. Otherwise, this procedure command results in an error (see **IDN 00021**). After the procedure command is performed correctly, the control unit has to cancel the procedure command. The control unit can then activate CP_3 in the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 2	0

00128: CP_4 TRANSITION CHECK

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP_4. Otherwise, this procedure command results in an error (see **IDN 00022**). After the procedure command is performed correctly, the control unit has to cancel the procedure command. The control unit can then activate CP_4 in the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 3	0

00129: MANUFACTURER CLASS 1 DIAGNOSTIC

If an error is set in the manufacturer class 1 diagnostic, the manufacturer-specific error bit in class 1 diagnostic (see **IDN 00011**) is set as well. The drive cancels the manufacturer-specific error and resets to '0' only if the error in manufacturer class 1 diagnostic has been eliminated and on receiving the command 'reset class 1 diagnostic' (see **IDN 00099**) via the service channel.

Bits supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Sercos synchronization error
Bit 1:	Non-volatile parameter loss
Bit 2:	I/O CAN network error
Bit 3:	Regen resistor errort (Open or Over-Temperature)
Bit 4:	Power board not recognized
Bit 5:	Power module fault
Bit 6:	Cycle of power required
Bit 7 - 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00130: PROBE VALUE 1 POSITIVE EDGE

Based on the configure Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the positive edge of the input signal of probe 1 (see **IDN 00401**). This allows the control unit to read 'probe value 1 positive edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

00131: PROBE VALUE 1 NEGATIVE EDGE

Based on the configure Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the negative edge of the input signal of probe 1 (see **IDN 00401**). This allows the control unit to read 'probe value 1 negative edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

00132: PROBE VALUE 2 POSITIVE EDGE

Based on the configured Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the positive edge of the input signal of probe 2 (see **IDN 00402**). This allows the control unit to read 'probe value 2 positive edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

00133: PROBE VALUE 2 NEGATIVE EDGE

Based on the configured Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the negative edge of the input signal of probe 2 (see **IDN 00402**). This allows the control unit to read 'probe value 2 negative edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00134: MASTER CONTROL WORD

Allows reading of the master control word on the control unit screen, via the service channel. (This can be useful during start-up and error recovery.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00135: DRIVE STATUS WORD

Allows reading of the drive status word on the control unit screen, via the service channel. (This can be useful during start-up and error recovery.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00138: BIPOLAR ACCELERATION LIMIT VALUE

The bipolar acceleration parameter limits the maximum acceleration ability of the drive symmetrically to the programmed value in both directions.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 25000.000	rad/sec/sec	Phases 2, 3 and 4	Phases 2, 3 and 4	25000.000

00140: CONTROLLER TYPE

The operation data of the controller type contains the name of the company and the manufacturer controller type.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	None	

00142: APPLICATION TYPE

The operation data of the application type contains the type of the drive application (e.g., main spindle drive, round axis).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	Phases 2, 3 and 4	Not defined

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00143: SYSTEM INTERFACE VERSION

The operation data of SYSTEM interface version contains the version of the SYSTEM Interface specification.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	None	V02.04

00147: HOMING PARAMETER

This parameter is used to setup the Homing Procedure.

Structure of homing parameter:
Bit 0: Homing direction
- 0 - positive: increasing position values
- 1 - negative: decreasing position values

Bit 1: Position feedback marker pulse
- 0 - first marker pulse after the positive edge of the home switch (S-0-0400)
- 1 - first marker pulse after the negative edge of the home switch (S-0-0400)

Bit 2: Home switch (S-0-0400)
- 0 - connected to the control unit **(Not Supported)**
- 1 - connected to the drive

Bit 3: Homing
- 0 - using motor feedback
- 1 - using external feedback **(Not Supported)**

Bit 4: **(Not Supported)**
Bit 5: Evaluation of home switch
- 0 - home switch is evaluated
- 1 - home switch is not evaluated

Bit 6 Evaluation of position feedback marker pulse
- 0 - marker pulse is evaluated
- 1 - marker pulse is not evaluated

Bits 7-15: **(Not Supported)**

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00148: DRIVE CONTROLLED HOMING PROCEDURE COMMAND

When the Master sets and enables the Drive Controlled homing procedure command, the drive automatically activates the drive internal position control and accelerates to the homing velocity (S-0-0041) taking the Homing acceleration (S-0-0042) into account. The drive resets the bit "position feedback value status" (S-0-0403). Further options for the homing procedure are programmed in the "homing parameter" (S-0-0147). All changes of the cyclic command values are ignored as long as the procedure command is activated. After passing over the reference marker pulse, the drive decelerates to standstill, taking the homing acceleration into account. The procedure command "drive controlled homing" is successfully completed when the drive has stopped and the position feedback value is referred to the reference point of the machine. The drive announces this by setting the bit "position feedback value status" (S-0-0403). The drive internally calculates the commanded position value (S-0-0047) relationship to the reference mark and adjusts S-0-0047 accordingly. The control unit must then either read the "position command value" (S-0-0047) of the drive via the service channel and resets it's position command value to this position command value, or the control sets its position command off the reference distance (S-0-0052), (S-0-0147 must be set to 1). Afterwards, the control unit cancels the procedure command and the drive once again follows the command values of the control unit. An interrupt of this procedure command will result in the position feedback value not being referenced to the position feedback reference mark. Also the 'position feedback status value' bit will not be set. When an error of C1D occurs, the procedure command results in an error in the procedure command acknowledgment.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

00157: VELOCITY WINDOW

The velocity window" relates the current velocity to the velocity command value (IDN 00036). If the current velocity feedback value falls within the calculated velocity window, the drive sets the status '*n* feedback = *n* command' in C3D (IDN 00013)·

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 32768	32768 bits = 6000 RPM	Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

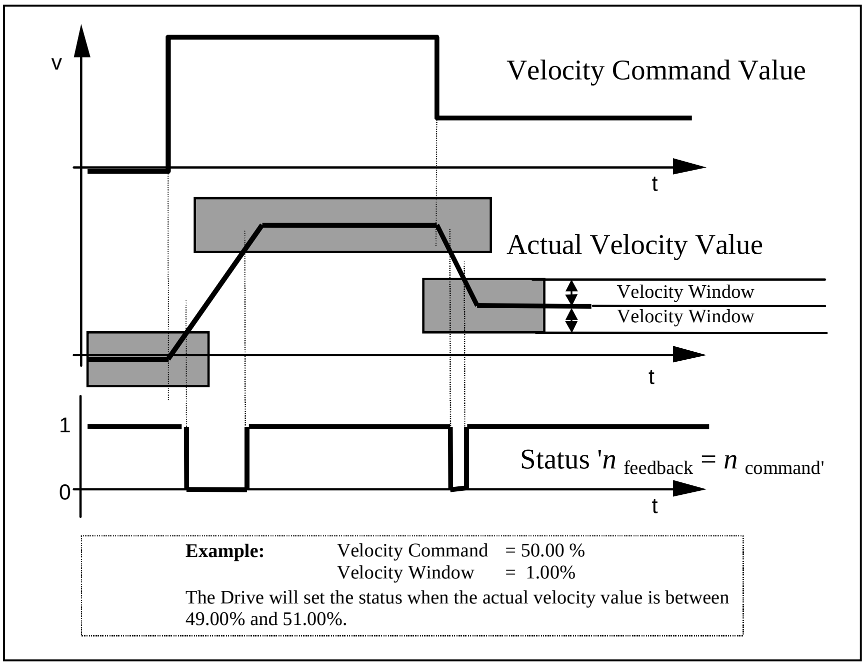


Figure 6.5 - Example of Velocity Window

00159: MONITORING WINDOW

By means of the monitoring window, the maximum position deviation, as referenced to the active actual position value, can be defined for the position feedback value. When the position error value exceeds the maximum position window value for a time longer than the following error delay time (IDN 33800), the drive sets an error for excessive position deviation in C1D (IDN 00011).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	$0\text{-}+2^{31} - 1$		Phases 2, 3 and 4	Phases 2, 3 and 4	$-2^{31} - 1$

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00160: ACCELERATION DATA SCALING TYPE

Structure of the acceleration data scaling type:
Bits 2-0: Scaling method
- 000 - no scaling **(Not Supported)**
- 001 - linear scaling **(Not Supported)**
- 010 - rotational scaling
- 011 - ramp time **(Not Supported)**

Bit 3:
- 0 - preferred scaling
- 1 - parameter scaling **(Not Supported)**

Bit 4: Units for linear scaling
- 0 - meters [m] **(Not Supported)**
- (1 - inches [in]) additional **(Not Supported)**

Bit 4: Units for rotational scaling
- 0 - radian [rad]
- 1 - (reserved)

Bit 5: Time units
- 0 - seconds [s]
- 1 - (reserved)

Bit 6: Data reference
- 0 - at the motor shaft
- 1 - at the load **(Not Supported)**

(All other bits are reserved)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	2

00161: ACCELERATION DATA SCALING FACTOR

This parameter defines the scaling factor for all acceleration data in a drive. This parameter is read only and is always a value of 1.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	1

00162: ACCELERATION DATA SCALING EXPONENT

This parameter defines the scaling exponent for all acceleration data in a drive. This parameter is read only and is always a value of -3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes			Phases 2, 3 and 4	None	-3

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00169: PROBE CONTROL PARAMETER

This parameter fixes which probes and which edges are activated for the probing cycle procedure command. Only 1 edge (either rising or falling) can be selected for each probe input.

Bits supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	0 - positive edge is not active 1 - positive edge is active
Bit 1:	0 - negative edge is not active 1 - negative edge is active
Bit 2:	0 - positive edge is not active 1 - positive edge is active
Bit 3:	0 - negative edge is not active 1 - negative edge is active
Bit 4 -15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

00170: PROBING CYCLE PROCEDURE COMMAND

When the master sets and enables the probing cycle procedure command, the drive reacts on the following parameters:

- Probe 1/2 enable (IDN 00405/00406); and
- Probe 1/2 (IDN 00401/00402) as programmed in the probe control parameter (IDN 00169).

While the procedure command is activated the control unit can start multiple measurements.

If the control unit does not want any more measurements the control unit cancels the procedure command.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00179: PROBE STATUS

Indicates the latch status of Probe1 and Probe 2

Bits supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	0 - positive edge is not latched 1 - positive edge is latched
Bit 1:	0 - negative edge is not latched 1 - negative edge is latched
Bit 2:	0 - positive edge is not latched 1 - positive edge is latched
Bit 3:	0 - negative edge is not latched 1 - negative edge is latched
Bit 4 -15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00185: LENGTH OF THE CONFIGURABLE DATA RECORD IN THE AT

This parameter indicates the maximum length, in bytes, which can be processed in the configurable data record of the AT.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1 Byte	Phases 2, 3 and 4	None	36

00186: LENGTH OF THE CONFIGURABLE DATA RECORD IN THE MDT

This parameter indicates the maximum length, in bytes, which can be processed in the configurable data record of the MDT.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1 Byte	Phases 2, 3 and 4	None	36

00187: IDN-LIST OF CONFIGURABLE DATA IN THE AT

In this list the IDNs of operation data that can be processed by the drive cyclically as feedback values.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00188: IDN-LIST OF CONFIGURABLE DATA IN THE MDT

In this list the IDNs of operation data that can be processed by the drive cyclically as command values.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable			Phases 2, 3 and 4	None	

00189: FOLLOWING DISTANCE

The drive uses the operation data of this IDN to store the distance between position command value and the position feedback value 1. Calculation of the following distance:
following distance = position command value - position feedback value 1

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

00196: MOTOR RATED CURRENT

The motor rated current is the current at which the motor produces the rated torque according to the motor spec sheet. The setting range for this IDN is dependant on drive size and PWM frequency.

Emerald Driver	ESD-5		ESD-10		ESD-20		ESD-40		ESD-60	
PWM Frequency	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz
Min. Setting	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak	0 A peak
Max. Setting	7.070 A peak	5.656 A peak	14.140 A peak	11.312 A peak	28.280 A peak	22.624 A peak	56.560 A peak	45.248 A peak	84.840 A peak	67.872 A peak

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	See table above	0.001 A	Phases 2, 3 and 4	Phases 2 and 3	0

00200: AMPLIFIER WARNING TEMPERATURE

When the amplifier temperature exceeds the amplifier warning temperature value, the drive sets the warning bit for amplifier over temperature in C2D (IDN 12).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 105.0	IDN 208	Phases 2, 3 and 4	Phases 2, 3 and 4	105.0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00203: AMPLIFIER SHUTDOWN TEMPERATURE

When the amplifier temperature exceeds the amplifier shutdown temperature value, the drive sets the bit for amplifier over temperature shutdown in C1D (IDN 11).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		IDN 208	Phases 2, 3 and 4	None	105.0

00206: DRIVE ON DELAY TIME

After torque is activated (bit 14, drive status is set) "drive on delay time" is started. The drive follows the command values after the "drive on delay time" has elapsed.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 6553.6	0.1 ms	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00207: DRIVE OFF DELAY TIME

After "drive off" (bit 15 of the master control word) is reset and n_{min} is reached, the torque remains activated in the drive until this waiting time is elapsed.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 6553.6	0.1 ms	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00208: TEMPERATURE DATA SCALING TYPE

This scaling type parameter determines whether temperature is used in units of ℃ or F. Temperature scaling is 0,1 ℃ or 0,1 F.

Structure of temperature data scaling type:
Bit 0:

0 - entry in 0,1 ℃
1 - entry in 0,1 F **(Not Supported)**

(All other bits are reserved)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00273: MAXIMUM DRIVE OFF DELAY TIME

After "drive off" (bit 15, control word) is reset, the "maximum drive off delay time" is started. After the "maximum drive off delay time" is elapsed, the locking of the brake is initiated and the torque is disabled.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 6553.6	0.1 ms	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00295: DRIVE ENABLE DELAY TIME

When "drive enable" is set (bits 14, control word) the "drive enable delay time" is started. Motor current (torque) will first be activated after this time delay. The enable delay is required at use of a contactor in the motor cable.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 6553.6	0.1 ms	Phases 2, 3 and 4	Phases 2, 3 and 4	0

00296: VELOCITY FEED FORWARD GAIN

Velocity feed forward serves to reduce the velocity-dependent following error.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0.0 - 200.0	0.1%	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00300: REAL-TIME CONTROL BIT 1

Contains the state of the control signal defined in IDN 00301 in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00301: ALLOCATION OF REAL-TIME CONTROL BIT 1

Assigns a control signal to the real-time control bit 1 by writing the IDN of the control signal to this IDN. After the allocation the assigned signal appears in the real-time control bit 1.
Valid IDN's are (IDN 00405, 00406).

Writing a value of zero disables Real Time Control Bit 1. (Default)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00302: REAL-TIME CONTROL BIT 2

Contains the state of the control signal defined in IDN 00303 in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

00303: ALLOCATION OF REAL-TIME CONTROL BIT 2

Assigns a control signal to the real-time control bit 2 by writing the IDN of the control signal to this IDN. After the allocation the assigned signal appears in the real-time control bit 2.
Valid IDN's are (IDN 00405, 00406).

Writing a value of zero disables Real Time Control Bit 2. (Default)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

00304: REAL-TIME STATUS BIT 1

Contains the state of the status signal defined in IDN 00305 in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

00305: ALLOCATION OF REAL-TIME STATUS BIT 1

Assigns a control signal to the real-time status bit 1 by writing the IDN of the control signal to this IDN. After the allocation the assigned signal appears in the real-time status bit 1.
Valid IDN's are (IDN 00401, 00402, 00409, 00410, 00411, 00412).

Writing a value of zero disables real time status bit 1. (Default)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00306: REAL-TIME STATUS BIT 2

Contains the state of the status signal defined in IDN 00307 in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00307: ALLOCATION OF REAL-TIME STATUS BIT 2

Assigns a control signal to the real-time status bit 2 by writing the IDN of the control signal to this IDN. After the allocation the assigned signal appears in the real-time status bit 2.
Valid IDN's are (IDN 00401, 00402, 00409, 00410, 00411, 00412).

Writing a value of zero disables real time status bit 2. (Default)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

00348: ACCELERATION FEED FORWARD GAIN

Acceleration feed forward serves to reduce acceleration / deceleration-dependent following error.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0 - 6553.5	0.1 (mAsec^2/rad)	Phases 2, 3 and 4	Phases 2, 3 and 4	0.0

00380: DC BUS VOLTAGE

The drive's DC (intermediate) bus voltage value is placed in this parameter.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1 volt	Phases 2, 3 and 4	None	

00384: AMPLIFIER TEMPERATURE

The drive places the measured (actual) amplifier temperature (output stage) in this parameter.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		IDN 208	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00400: HOME SWITCH

This parameter is used to assign an IDN to the home switch (external signal).

Structure of home switch:
Bit 0 = 0: inactive switch
1: active switch

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00401: PROBE 1

Contains the state of the Probe 1 Input in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00402: PROBE 2

Contains the state of the Probe 2 Input in Bit 0.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00403: POSITION FEEDBACK VALUE STATUS

When the drive switches the position feedback values to the coordinates referred to the machine zero point the drive sets bit 0 of this parameter in order to inform the control unit that all actual position values are based on the zero point of the machine. Bit 0 is reset when the procedure command "drive controlled homing procedure" (IDN 148) is started or when the drive loses its reference to the zero point of the machine. Bit 0 is defined for operation data only.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00405: PROBE 1 ENABLE

Probe 1 enable is checked by the drive only if the procedure commands "probing cycle" (IDN 00170) is active. For a new probing cycle with the same edge of probe 1 the control unit has to reset probe 1 enable to "0" and set it to "1". (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

00406: PROBE 2 ENABLE

Probe 2 enable is checked by the drive only if the procedures command "probing cycle" (IDN 00170) is active. For a new probing cycle with the same edge of probe 2 the control unit has to reset probe 2 enable to "0" and set it to "1". (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

00409: PROBE 1 POSITIVE LATCHED

This parameter is used to assign an IDN to probe 1 positive latched. This allows assigning the status "probe 1 positive latched" to a real-time status bit (see **IDN 00305**). Bit 0 of this parameter is set by the drive only if the procedure command "probing cycle" (IDN 00170) is active, the signal "probe 1 enable" (IDN 00405) is set to 1 and the positive edge of "probe 1" (IDN 00401) is announced. Simultaneously the drive stores the position feedback value in "probe 1 positive edge" (IDN 00130). The drive resets this bit when the control unit cancels the procedure command "probing cycle" or when probe 1 enable is reset to 0. Bit 0 is defined for operation data only. (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

00410: PROBE 1 NEGATIVE LATCHED

This parameter is used to assign an IDN to probe 1 negative latched. This allows assigning the status "probe 1 negative latched" to a real-time status bit (see **IDN 00305**). Bit 0 of this parameter is set by the drive only if the procedure command "probing cycle" (IDN 00170) is active, the signal "probe 1 enable" (IDN 00405) is set to 1 and the negative edge of "probe 1" (IDN 00401) is announced. Simultaneously the drive stores the position feedback value in "probe 1 negative edge" (IDN 00131). The drive resets this bit when the control unit cancels the procedure command "probing cycle" or when probe 1 enable is reset to 0. Bit 0 is defined for operation data only. (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00411: PROBE 2 POSITIVE LATCHED

This parameter is used to assign an IDN to probe 2 positive latched. This allows assigning the status "probe 2 positive latched" to a real-time status bit (see IDN 00305). Bit 0 of this parameter is set by the drive only if the procedure command "probing cycle" (IDN 00170) is active, the signal "probe 2 enable" (IDN 00406) is set to 1 and the positive edge of "probe 2" (IDN 00402) is announced. Simultaneously the drive stores the position feedback value in "probe 2 positive edge" (IDN 00132). The drive resets this bit when the control unit cancels the procedure command "probing cycle" or when probe 2 enable is reset to 0. Bit 0 is defined for operation data only. (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

00412: PROBE 2 NEGATIVE LATCHED

This parameter is used to assign an IDN to probe 2 negative latched. This allows assigning the status "probe 2 negative latched" to a real-time status bit (see **IDN 00305**). Bit 0 of this parameter is set by the drive only if the procedure command "probing cycle" (IDN 00170) is active, the signal "probe 2 enable" (IDN 00406) is set to 1 and the negative edge of "probe 2" (IDN 00402) is announced. Simultaneously the drive stores the position feedback value in "probe 2 negative edge" (IDN 00133). The drive resets this bit when the control unit cancels the procedure command "probing cycle" or when probe 2 enable is reset to 0. Bit 0 is defined for operation data only. (For more details see **IDN 00179**.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

32769: U CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the U leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	Phases 2, 3 and 4	See Above	Factory set

32770: U CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the U leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	Phases 2, 3 and 4	See Above	Factory set

32771: V CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the V leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	Phases 2, 3 and 4	See Above	

32772: V CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the V leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	Phases 2, 3 and 4	See Above	Factory set

32773: U CURRENT SENSOR

This IDN returns the current sensed by the U leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		None	Phases 2, 3 and 4	None	Factory set

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

32774: V CURRENT SENSOR

This IDN returns the current sensed by the V leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		None	Phases 2, 3 and 4	None	

32775: PROCEDURE COMMAND REMOVE CALIBRATION WRITE-PROTECT

Activating this Procedure Command removes the write-protection on the following Calibration IDNs: 32769, 32770, 32771, 32772, 32777, 32778, 32783, 32784, 32785, 32786

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

32776: PROCEDURE COMMAND SAVE CALIBRATION PARAMETERS

Activating this Procedure Command causes all calibration data to be saved into non-volatile memory.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

32777: DC BUS CALIBRATION OFFSET

This IDN is used to set a calibration offset for the DC Bus Voltage measurement. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	Phases 2, 3 and 4	See Above	Factory set

32778: DC BUS CALIBRATION GAIN

This IDN is used to set a calibration gain for the DC Bus Voltage measurement. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	None	Phases 2, 3 and 4	See Above	Factory set

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

32783: ANALOG INPUT CALIBRATION OFFSET

This IDN is used to set a calibration offset for the Analog Input. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	Phases 2, 3 and 4	See Above	Factory set

32784: ANALOG INPUT CALIBRATION GAIN

This IDN is used to set a calibration gain for the Analog Input. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	None	Phases 2, 3 and 4	See Above	Factory set

32785: W CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the W leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	Phases 2, 3 and 4	See Above	Factory set

32786: W CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the W leg current sensor. This IDN is write-protected until Procedure Command Remove Calibration Write-Protect (IDN 32775) is active.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	$-2^{31} - +2^{31}-1$	None	Phases 2, 3 and 4	See Above	Factory set

32787: W CURRENT SENSOR

This IDN returns the current sensed by the W leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		None	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

32788: CURRENT FAULT FACTOR

This IDN is used to set the peak current fault point. The fault point is set as a percentage of the motor or drive's peak current, whichever is less. The default is 120%.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		1%	Phases 2, 3 and 4	None	120

33000: DIGITAL OUTPUTS 1

The state of the digital outputs on I/O device 1 can be set via this parameter.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2, 3 and 4	0

33001: DIGITAL OUTPUTS 2

The state of the digital outputs on I/O device 2 can be set via this parameter.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2, 3 and 4	0

33200: PROBE SOURCE

This parameter sets which feedback is trapped by the probes.

Bits supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	0 - Probe 1 traps position feedback value 1 1 - Probe 1 traps position feedback value 2
Bit 1:	0 - Probe 2 traps position feedback value 1 1 - Probe 2 traps position feedback value 2
Bit 2 -15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 3		Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

33300: I/0 DEVICE 1 CONFIGURATION

This parameter configures I/O device 1. Currently only the ESD-I/O16 device is supported. This device has 16 configurable digital I/O.

Bits supported by drive for ESD-I/O16:

BIT NUMBER	DESCRIPTION
Bit 0 - 15:	0 - Configured as Input 1 - Configured as Output

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2, 3 and 4	0

33301: I/0 DEVICE 2 CONFIGURATION

This parameter configures I/O device 2. Currently only the ESD-I/O16 device is supported. This device has 16 configurable digital I/O.

Bits supported by drive for ESD-I/O16:

BIT NUMBER	DESCRIPTION
Bit 0 - 15:	0 - Configured as Input 1 - Configured as Output

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2, 3 and 4	0

33304: I/O DEVICE 1 TYPE

This parameter sets the expected device type for I/O device 1. Currently only the ESD-I/O16 is supported with a device type of 1.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	1		Phases 2, 3 and 4	Phases 2, 3 and 4	0

33305: I/O DEVICE 2 TYPE

This parameter sets the expected device type for I/O device 2. Currently only the ESD-I/O16 is supported with a device type of 1.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	1		Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

33500: DIGITAL INPUTS 1

Reads the State of the Digital Inputs from I/0 Device 1.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Input 1
Bit 1:	Input 2
Bit 2:	Input 3
Bit 3:	Input 4
Bit 4:	Input 5
Bit 5:	Input 6
Bit 6:	Input 7
Bit 7:	Input 8
Bit 8:	Input 9
Bit 9:	Input 10
Bit 10:	Input 11
Bit 11:	Input 12
Bit 12:	Input 13
Bit 13:	Input 14
Bit 14:	Input 15
Bit 15:	Input 16

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

33501: DIGITAL INPUTS 2

Reads the State of the Digital Inputs from I/0 Device 2.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Input 1
Bit 1:	Input 2
Bit 2:	Input 3
Bit 3:	Input 4
Bit 4:	Input 5
Bit 5:	Input 6
Bit 6:	Input 7
Bit 7:	Input 8
Bit 8:	Input 9
Bit 9:	Input 10
Bit 10:	Input 11
Bit 11:	Input 12
Bit 12:	Input 13
Bit 13:	Input 14
Bit 14:	Input 15
Bit 15:	Input 16

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None	

33600: ANALOG INPUT 1

Read the counts from the Analog Input 1.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		-2^{15} - $+2^{15} - 1$ = -10V - +10V	Phases 2, 3 and 4	None	

33650: PWM OUTPUT

This parameter sets the duty cycle for the general purpose PWM output. The switching frequency for this output is the same as the motor switching frequency and is set by IDN 33801. The output swings between 0 and +15V.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	0 - 65535 = 0% -100% duty cycle	Phases 2, 3 and 4	None	0

33700: ALARM HISTORY

The drive maintains a list of the last 15 Fault Codes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	Variable 1 byte each			Phases 2, 3 and 4	None	

33701: CURRENT DRIVE FAULT

This IDN returns the fault code of the most recent drive fault. If there are no faults a value of 0 will be returned.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

33702: CURRENT DRIVE FAULT BITMAP 1

Returns a status bitmap of faults 0 - 31. Some bits are reserved so see **Section 7** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	4 bytes			Phases 2, 3 and 4	None	

33703: CURRENT DRIVE FAULT BITMAP 2

Returns a status bitmap of faults 32 - 63. Some bits are reserved so see **Section 7** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	4 bytes			Phases 2, 3 and 4	None	

33704: CURRENT DRIVE FAULT BITMAP 3

Returns a status bitmap of faults 64 - 95. Some bits are reserved so see **Section 7** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	4 bytes			Phases 2, 3 and 4	None	

33705: CURRENT DRIVE FAULT BITMAP 4

Returns a status bitmap of faults 96 - 127. Some bits are reserved so see **Section 7** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	4 bytes			Phases 2, 3 and 4	None	

33799: CLEAR DRIVE FAULT HISTORY PROCEDURE COMMAND

This procedure command sets all values in the drive fault history (IDN 33700) to zero.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

33800: FOLLOWING ERROR DELAY TIME

This parameter sets a time delay from when the position deviation is outside the monitoring window (IDN 159) and when a fault is triggered.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 msec	Phases 2, 3 and 4	Phases 2, 3 and 4	0

33801: PWM FREQUENCY

Sets the PWM switching frequency for the motor and the general purpose PWM output. If this parameter is changed from its current value a Fault 50 will result and the drive's 24V power must be cycled.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	8 or 16	kHz	Phases 2, 3 and 4	Phases 2	Non-volatile

34000: MOTOR CODE

This parameter is used to store a unique code for every motor that IIS has approved to run on the Emerald drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2 and 3	0

34003: MOTOR POLES

This parameter sets the number of motor magnetic poles.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	2 - 12		Phases 2, 3 and 4	Phases 2 and 3	4

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34004: FEEDBACK TYPE

This parameter sets the motor feedback type.

Values supported by drive:

VALUE	DESCRIPTION
0	Resolver **(Not Supported)**
1	Incremental Encoder

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 or 1		Phases 2, 3 and 4	Phases 2 and 3	1

34005: RESOLVER CYCLES

Not yet supported.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	1 or 2		Phases 2, 3 and 4	Phases 2 and 3	0

34006: MOTOR FEEDBACK CONFIGURATION

This parameter is used to change the direction of the motor feedback.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	0 - Motor Feedback is inverted. 1 - Motor Feedback is not inverted.
Bit 2 - 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 or 1		Phases 2, 3 and 4	Phases 2 and 3	1

34007: MOTOR RATED SPEED

The rated motor speed is listed in the motor spec sheet provided by the manufacturer.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0000 - 6000.0000	0.0001 RPM	Phases 2, 3 and 4	Phases 2 and 3	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34009: OVERLOAD DELAY TIME

Reserved for future use.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Decimal	2 bytes	0.1 - 6553.5	0.1 ms	Phases 2, 3 and 4	Phases 2 and 3	0

34011: ENCODER LINE COUNT

This parameter sets the encoder line count before quadrature.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535		Phases 2, 3 and 4	Phases 2 and 3	2000

34224: POSITION LOOP DIFFERENTIAL TIME

Sets the derivative time for the position loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Phases 2, 3 and 4	Phases 2, 3 and 4	0

34243: CURRENT COMMAND (AMPS)

This IDN returns the current loop command value in Amps. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes		0.001 Amps	Phases 2, 3 and 4	None	

34244: CURRENT FEEDBACK (AMPS)

This IDN returns the current loop feedback value in Amps. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes		0.001 Amps	Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34245: VELOCITY COMMAND (RPM)

This IDN returns the velocity loop command value in RPM. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		1 RPM	Phases 2, 3 and 4	None	

34246: VELOCITY FEEDBACK (RPM)

This IDN returns the velocity loop feedback value in RPM. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes		1 RPM	Phases 2, 3 and 4	None	

34260: MOTOR PHASE ANGLE

This IDN returns the motor's phase angle used for commutation. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		0.1 Degree	Phases 2, 3 and 4	None	

34280: CURRENT COMMAND REJECTION FREQUENCY

This parameter sets rejection frequency for a notch filter on the current loop command value.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	50 - 950	1 Hz	Phases 2, 3 and 4	Phases 2, 3 and 4	900

34281: CURRENT COMMAND REJECTION BANDWIDTH

This parameter sets bandwidth for a notch filter on the current loop command value.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 500	1 Hz	Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34282: TUNING PARAMETERS LIST

This IDN returns a list of all available control loop-tuning IDNs.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable 2 byte each			Phases 2, 3 and 4	None	

34283: MOTOR PARAMETER LIST

This IDN returns a list of all available motor specific IDNs.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable 2 byte each			Phases 2, 3 and 4	None	

34284: MONITOR PARAMETERS LIST

This IDN returns a list of IDNs that could be useful for monitor or display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable 2 byte each			Phases 2, 3 and 4	None	

34285: MONITOR I/O LIST

This IDN returns a list of I/O related IDNs that could be useful for monitor or display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable 2 byte each			Phases 2, 3 and 4	None	

34286: MONITOR ALARM LIST

This IDN returns a list of IDNs that provide diagnostic or fault code information.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	Variable 2 byte each			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34287: READ ERROR

This IDN returns error information when reading/writing IDNs over RS-232 or USB. The structure of this IDN is as follows:

BYTE NUMBER	DESCRIPTION
Byte 0 - 1	Number of bytes returned. Always 4.
Byte 2 - 3	Maximum bytes available. Always 4.
Byte 4 - 5	IDN Number.
Byte 6 - 7	Element Number.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	Variable 2 byte each			Phases 2, 3 and 4	None	

34288: POWER BOARD ID

This IDN returns the ID of the power stage.

POWER BOARED ID	DRIVE SIZE
1	ESD-5
2	ESD-10
4	ESD-20
8	ESD-40
16	ESD-60
All Other IDs	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34300: AUXILIARY ENCODER FEATURES SETUP

This IDN enables/disables special features of the Emerald Drive's Auxiliary Encoder.

BYTE NUMBER	DESCRIPTION
Bit 0:	Wait for marker
Bits 1 - 15:	Reserved

Setting the bit "Wait for marker" will zero the Auxiliary Encoder and the Emerald Drive will not count Auxiliary Encoder pulses until the first marker pulse is observed. This bit will always be read as a "0".

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 1		Phases 2, 3 and 4	Phases 2, 3 and 4	0

34810: CONFIGURATION OF HOME SWITCH

Assigns a control signal to the home switch by writing the IDN of the control signal to this IDN. After the allocation the assigned signal appears in IDN 400.
Valid IDN's are (IDN 00401, 00402, 33500, 33501).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	401

34811: CONFIGURATION OF HOME SWITCH BIT

Configures the bit position of the home switch within the IDN defined by IDN 34810.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 15		Phases 2, 3 and 4	Phases 2, 3 and 4	0

34812: BOOT ROM VERSION

This IDN returns the revision of the drive's boot ROM.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Text	Variable			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34813: REGEN POWER

This IDN returns the average power being dissipated by the internal regen resistor.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes		1 Watt	Phases 2, 3 and 4	None	

34820: PASSWORD

This IDN is used to enter a password to unlock some special features.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	None	Phases 2, 3 and 4	Phases 2, 3 and 4	0

34821: TEST MODE PROCEDURE COMMAND

This procedure command puts the drive in a special mode for factory test purposes. A valid Password (IDN 34820) must be entered before entering test mode. After running in test mode the drive's power must be cycled in order to return to normal operation.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

34822: POWER TRANSISTOR BITMAP

This IDN is used to set the state of each power transistor individually. The drive must be in test mode for this IDN to be active.

BIT NUMBER	Transistor
Bit 0	U HI
Bit 1	U LO
Bit 2	V HI
Bit 3	V LO
Bit 4	W HI
Bit 5	W LO
Bit 6	REGEN
Bit 7 - 15	Reserved

An error will be generated if the following conditions are met:

1) An attempt is made to both transistors in a pair.
2) An attempt is made to change the state of both transistors in a pair simultaneously. Both transistors in a pair must be turned off before one of them can change from off to on.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	None	Phases 2, 3 and 4	Phases 4	0

35000: RESOLVER CARD CONFIGURATION

This IDN is used to setup the resolver option card. This parameter is stored in non-volatile memory. If it is changed from the current stored setting you will need to cycle the drive's power.

BIT NUMBER	DESCRIPTION
Bit 0	Reference Frequency 0 - 2500Hz 1 - 5000Hz
Bit 1	Gain 0 - 0.5 1 - 1.0
Bit 2	Accuracy 0 - 12 bit 1 - 14 bit
Bit 3 - 15	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 7		Phases 2, 3 and 4	Phases 2, 3 and 4	0

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

35001: RESOLVER FEEDBACK VALUE

This IDN is used to read the position returned from the resolver option card.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

35002: RESOLVER FEEDBACK POLARITY PARAMETER

This parameter is used to switch polarities of reported position data for specific applications. There is a positive position difference when the resolver shaft turns clockwise (when viewed from the output shaft) and no inversion is programmed.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Resolver feedback value 0 - Non-inverted 1 - Inverted
Bit 1-15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 1		Phases 2, 3 and 4	Phases 2, 3 and 4	0

35011: AUXILIARY FEEDBACK VALUE

This IDN is used to read the position returned from the Auxiliary Encoder.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes			Phases 2, 3 and 4	None	

6.2.3 IDN DESCRIPTION - STANDARD PARAMETERS (cont'd)

35012: AUXILIARY FEEDBACK POLARITY PARAMETER

This parameter is used to switch polarities of reported position data for specific applications. There is a positive position difference when the encoder shaft turns clockwise (when viewed from the output shaft) and no inversion is programmed.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Auxiliary encoder feedback value 0 - Non-inverted 1 - Inverted
Bit 1-15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 1		Phases 2, 3 and 4	Phases 2, 3 and 4	0

35020: POSITION FEEDBACK 1 CONFIGURATION

Not implemented at this time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4	0

35021: POSITION FEEDBACK 2 CONFIGURATION

This IDN configures which auxiliary feedback device points to position feedback 2 (IDN 00053)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS	DEFAULT
Operation Data	IDN	2 bytes	35001, 35011		Phases 2, 3 and 4	Phases 2, 3 and 4	35011

SECTION 7 - FAULT CODES / STATUS

7.1 STATUS

Error! No topic specified.

Figure 7.1- System Status (7 Segment Status Display)

7.2 FAULT CODES

FAULT CODE	DESCRIPTION	REMEDY
F01 Internal Power Module Error	Driver has detected the following: • Overcurrent • Overheat • Gate voltage drop	Check if the motor wire (A/B/C) is shorted or grounded. Ambient temperature over 55° C. Indicates a fatal fault in the driver power stage. If motor wires are not shorted and temperature is below 55° C, contact IIS factory.
F02 Overvoltage	DC power bus exceeds max. bus voltage.	Power line voltage fluctuation above maximum. 264 VAC for ESD-XX/A style drives. Excessive regeneration energy. Check line voltage fluctuations. Add additional external regeneration resistor.
F03 Under Voltage	DC power bus below min. bus voltage.	Power line voltage fluctuation below minimum. 170 VAC or ESD-XX/A style drives. Check line voltage fluctuations. Check for missing phase of AC line power.
F04 DC Bus Contactor Error	DC bus contactor FAILED TO CLOSE CORRECTLY	Contact IIS factory
F07 Power Stage Error	Main control unit does not recognize the power stage of the driver.	Indicates a fatal fault in the driver power stage. Contact IIS factory.
F09 Regen Resistor Over Temperature	Excessive regen energy being dissipated by the internal or external regeneration resistor.	The frequency or rate of acceleration/deceleration may be too high. Excessive power line voltage. Add additional regen resistor capacity.
F10 Regen Resistor Open	Regen transistor is ON for more than 50ms.	**WITH POWER OFF:** If the drive has an internal regen resistor (20, 40, 60 Amp drives only), check that the resistance from P3 to R is: Approx. 100 ohms for 20 and 40 Amp Drives Approx. 50 ohms for 60 Amp Drive If an external regen resistor is used, verify the regen resistor is the proper value and that all wiring to the resistor is secure.
F15 Excessive Current	Motor current exceeds the rating by 120%.	Check if the motor wire (A/B/C) is shorted or grounded. Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive.
F16 Speed amp Saturated	Internal speed loop is saturated and max.torque is applied for more than 3 sec.	Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive. Acel/decel rate is too large for the inertia load on the motor causing maximum torque during acel/decel.
F19 Resolver Error	Resolver feedback error.	Check resolver cable and connectors. Verify that resolver cable is separated from power wiring to prevent noise coupling to resolver signals.

Table 7.1 - Fault Codes

7.2 FAULT CODES (cont'd)

FAULT CODE	DESCRIPTION	REMEDY
F25 Option	Self-diagnostic checks of options failed or wrong option card installed.	Option card configured in program does not match installed option card. Option card not functioning to specification. Return to factory.
F40 Encoder Signal Short	U, V or W phases of encoder not functional.	Check encoder cable and connections.
F50 Cycle Power	A change has been made that requires the drive's control power to be cycled.	Power needs to be cycled to the drive if: PWM switching frequency is changed Option card configuration is changed Cycle the drive's control power.
F70 Following Error	Motor is not following the command	Check monitoring window (IDN 00159). Check for binding in mechanical travel of motor.
F71* SERCOS synchronization Error	The drive is not maintaining synchronization with the SERCOS master.	Contact IIS Factory.
F72 Non-Volatile Parameter Failure	Non-Volatile calibration data has been lost.	Contact IIS Factory.
F73 Amplifier Over-Temperature	Drive heat-sink temperature rose to over 105°C.	Ambient temperature exceeds 55°C. Continuous current demand from the drive exceeds its rating. Reduce the ambient temperature. Decrease current demand on the drive.
F74 Encoder Phase Error	Encoder A or B tracks are out of phase with U track.	Check encoder wiring. Make sure there are no loose connections. Make sure encoder cable is separated from any high-power wiring.
F75 W-Phase Over-Current	W-phase current exceeds the rating by 120%.	Check if the motor wire (A/B/C) is shorted or grounded. Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive.
F80* SERCOS MST Error	Drive has detected unacceptable errors in the Master Sync Telegrams of the SERCOS Communication	Check fiber optic connections on the SERCOS Ring. Replace fiber optic cable.
F81* SERCOS MDT Error	Drive has detected unacceptable errors in the Master Data telegram	Check fiber optic connections on the SERCOS Ring. Replace fiber optic cable.
F82* Invalid SERCOS Phase	Drive has detected an invalid phase in the initialization of the SERCOS Ring	Contact IIS Factory.
F83* SERCOS Phase UP_SHIFT Error	Invalid sequence of the SERCOS Ring Initialization Phases	Re-initialize the SERCOS Ring at the controller.

Table 7.1 - Fault Codes (cont'd)

7.2 FAULT CODES (cont'd)

FAULT CODE	DESCRIPTION	REMEDY
F84* SERCOS Phase DOWN_SHIFT Error	Invalid sequence of the SERCOS Ring Initialization Phases	Re-initialize the SERCOS Ring at the controller.
F85* SERCOS Phase Switching Error	Attempt to switch phase with out satisfying the requirements of the previous phase.	Verify that all required parameters are written in Phase 2 (See IDN 00018) and that Command 127 and 128 execute successfully.
F86 Invalid Operation Mode	A request was made to switch to an invalid operation mode.	Check for a programming error.
F90 I/O Device 1 Communication Error	The drive cannot communicate with I/O device 1.	Check that there is power to the I/O CAN network. Check that the address switches are set properly for I/O device 1. Check the I/O CAN network cabling.
F91 I/O Device 2 Communication Error	The drive cannot communicate with I/O device 2.	Check that there is power to the I/O CAN network. Check that the address switches are set properly for I/O device 2. Check the I/O CAN network cabling.
F94 I/O Device 1 Wrong Type	Configured I/O Device 1 type and actual device type do not match.	Check that your program has the correct I/O Device type configured for device 1.
F95 I/O Device 2 Wrong Type	Configured I/O Device 2 type and actual device type do not match.	Check that your program has the correct I/O Device type configured for device 2.
F98 No I/O CAN Network Power	External I/O CAN network power is off.	Make sure you have an external power supply for the I/O CAN network. Check the cabling between the I/O devices and the drive.

Table 7.1 - Fault Codes (cont'd)

* Indicates a fault that can only exist when the drive is configured for SERCOS communications.

	Class 1 Diagnostics (IDN 00011)																Manufacturer Class 1 Diagnostics (IDN 00129)															
Fault Code	Bit 0: reserved	Bit 1: Amplifier overtemperature error	Bit 2: reserved	Bit 3: reserved	Bit 4: reserved	Bit 5: Feedback error	Bit 6: Error in the "commutation" system	Bit 7: Over current error	Bit 8: Over voltage error	Bit 9: Under voltage error	Bit 10: reserved	Bit 11: Excessive position deviation	Bit 12: Communication Error	Bit 13: reserved	Bit 14: reserved	Bit 15: Manufacturer-specific error	Bit 0: Sercos synchronization error	Bit 1: Non-volatile parameter loss	Bit 2: I/O CAN network error	Bit 3: Regen resistor error	Bit 4: Power board not recognized	Bit 5: Power module error	Bit 6: Cycle of power required	Bit 7: Option card error	Bit 8: reserved	Bit 9: reserved	Bit 10: reserved	Bit 11: reserved	Bit 12: reserved	Bit 13: reserved	Bit 14: reserved	Bit 15: reserved
F01																X						X										
F02									X																							
F03										X																						
F07																X					X											
F09																X				X												
F10																X				X												
F15								X																								
F16								X																								
F19						X																										
F25																X								X								
F40						X																										
F50																X							X									
F70												X																				
F71																X	X															
F72																X		X														
F73		X																														
F74							X																									
F75								X																								
F80													X																			
F81													X																			
F82													X																			
F83													X																			
F84													X																			
F85													X																			
F86													X																			
F90																X			X													
F91																X			X													
F94																X			X													
F95																X			X													
F98																X			X													

Table 7.2 - Cross Reference of Fault Codes to Class 1 Diagnostics

7.3 I/O CAN NETWORK STATUS DISPLAY

STAT

The bi-color (green/red) LED provides the I/O CAN network status. It indicates whether or not the devices have power and are operating properly. The table below defines the status LED states.

STATE	LED IS	TO INDICATE
No Power	Flashing Red	There is no power applied to the device. See also fault code F98
Network Operational	Green	The entire network is operating in a normal condition.
Device Error	Red	At least one of the I/O devices is missing or not operational. See also fault codes F90, F91, F94, and F95.
Watchdog Error	Flashing Green/Red	Indicates that the microprocessor watchdog timer has timed out. This display is not necessarily related to the I/O CAN network. Contact IIS factory.

7.4 SERCOS RECEIVER ERROR LED

When this LED is on, the driver is indicating that it is receiving bit errors or transmission errors from the device preceding it in the SERCOS Ring. To trouble shoot, first verify that the SERCOS master is trying to communicate to the driver. If the SERCOS Master SERCOS communication is not active then the Error LED is appropriate. If communications is established or is trying to be established then further checks are necessary. Verify all devices in the ring are connected correctly (**Section 5.5**). Verify that the SERCOS communication baud-rate on all devices in the ring is set the same. Verify all devices have unique device ID (**Section 6.1**). Verify transmitter power of the device preceding the Emerald in the ring is set correctly for the length of fiber optic cable connected between the devices. Replace if necessary any suspected damaged fiber optic cables. (NOTE: Only active in SERCOS mode.)

APPENDIX B - ESD-IO16 I/O EXPANDER

B.1 OVERVIEW

This manual is organized so that information is easy to find and easy to use. It begins by giving a general description of the ESD I/O-16. Next, a comprehensive hardware specification is provided followed by connector wiring diagrams, and finally the status indicators.

B.2 DESCRIPTION

The ESD I/O-16 provides I/O for Industrial Indexing Systems E-Series and is a DIN rail mounted assembly. Power supplied to the ESD I/O-16 is 24V DC. See section 3 on specifications. Each ESD I/O-16 may be configured to have 16 I/O in any configuration. Each E-Series Device can support 2 ESD I/O-16. The ESD I/O-16 must be configured through the EDE (Emerald Development Environment) to function as needed.

The ESD I/O-16 is connected to an E Series Device using an IIS EXC-XYZYYY cable (see **Appendix A**). Two ESD I/O-16 can be connected together using 2 EXC-XYZYYY cables **(**see **Appendix A).**

The ESD I/O-16 reads SW1 to determines the address. If the address is valid it starts trying to establish a connection with the ESD-Drive. When the E-Series device receives the request for a connection from the ESD I/O-16 it responds by sending over the I/O configuration. After the ESD I/O-16 receives the configuration the status returned to the E-Series device is changed indicating that the ESD I/O-16 is correctly configured. The E-Series device then begins requesting data and setting the output state every 1 millisecond. If the something causes the update rate to be greater then 1 millisecond then the ESD I/O-16 will return to the not configured state. The E-Series device will fault when this happens.

B.3 SPECIFICATIONS

B.3.1 POWER REQUIREMENT

Control Voltage	24V DC +/- 10% .25 Amps

B.3.2 ENVIRONMENT

Storage Temperature	-10 to 70°C/14-158°F
Operating Temperature	0 to 55°C/32-131°F
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and Vibration	1 G or less
Operating Conditions	Free of dust, liquids, metallic particles and corrosive gases. Use in a pollution degree 2 environment.

B.3.3 SIZE

Length	11.54 in.
Width	3.00 in.
Height	4.00in. ref. Depending on I/O height.

Error! No topic specified.

Figure B.1 - ESD Layout

B.3.4 DIGITAL INPUTS/OUTPUTS

PART NUMBER	DESCRIPTION
GIAC5	90 to 140 VAC Input Module
GIAC5A	180 to 280 VAC Input Module
GIDC5	10 to 32 VDC/15 to 32 VAC Input Module
GIDC5LOW	3 to 32 VDC Input Module
GOAC5A	24 to 280 VAC Output Module
GODC5	5 to 60 VDC Output Module

NOTE: Be sure to check the current requirements, timing, size, and voltage levels when selecting modules. The modules must be 5 Volt Logic.

B.4 WIRING

B.4.1 POWER & COMMUNICATION WIRING

See **Appendix B** for details.

CONNECTOR P1	COMMUNICATION	POWER
PIN #	FUNCTION	FUNCTION
1	V-	24V GND
2	CAN_L	Termination Resistor
3	DRAIN/SHIELD	Earth Ground
4	CAN_H	Termination Resistor
5	V+	24VDC

B.4.2 I/0 WIRING

I/O is wired to the ESD I/O-16 using TB1 as shown in **Figure B.2**. **Figure B.3** shows how the different modules should be wired.

Error! No topic specified.
Figure B.2 - ESD Wiring Using TB1

B.4.2 I/O WIRING (cont'd)

Error! No topic specified.

Figure B.3 - Wiring for Modules

B.5 HARDWARE CONFIGURATION, DIP SWITCH SETTING

SW1 is located between P1 and P2. The 4 switches in the DIP determine the address of the ESD I/O-16. The table below lists the settings and the resulting DINT addresses. All other settings will cause the ESD I/O-16 to not function.

SW1				Address
1	2	3	4	
ON	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	2

B.6 STATUS LEDS

The Tables below list all the Staus LEDs on the board and their purpose.

LED	COLOR	DESCRIPTION	
1	Green	ESD Status	Flashing - WatchDog failure Solid on - Power on
2	Red	Can Status	Flashing - Invalid address Solid on - Invalid Configuration
3	Green	Comm Status	Flashing -Trying to connect to drive. Solid On - Communicating with drive

APPENDIX C - EMC INSTALLATION GUIDELINES FOR EMERALD SERIES MOTORS AND DRIVERS

C.1 INTRODUCTION TO EMC GUIDELINES

This chapter provides guidance and requirements when installing IIS Emerald Series motors and drivers into industrial control machinery required to be CE marked. These guidelines are intended to provide the machine builder with the necessary EMC information, including parts and wiring techniques to comply with the European Community Standards for industrial control equipment. The final conformance to the standards for the overall machine remains the sole responsibility of the machine builder.

C.2 EMC REQUIREMENTS

In 1996, the European Community enacted standards concerning conducted and radiated emissions and immunity to various types of interference for industrial control equipment. The EMC Directive 89/336/EEC and harmonized standards define specific EMC levels and test procedures to gain conformance.

Emission Standards provide maximum levels of noise permitted to be generated by the equipment. Immunity Standards subject the equipment to various types of disturbances and verifies that the equipment continues to perform in a safe manner.

The IIS Emerald Series motors and drivers have been tested and have been shown to comply with the following standards when installed per the guidelines in this section.

<u>EMISSIONS STANDARDS:</u>

EN55011 Class A	Power line conducted noise
EN55011 Class A	Radiated noise

<u>IMMUNITY STANDARDS:</u>

EN61000-4-2	Static discharge
ENV50140 & ENV50204	Electromagnetic irradiation
EN61000-4-4	Burst noise injected into power and signal wiring
EN61000-4-5	Lightning surge into power line
ENV50141	RF frequency injection into power and signal wiring
EN61000-4-8	Power frequency magnetic field
EN61000-4-11	Power line fluctuation and drop out

C.3 CONTROL ENCLOSURE

The Emerald Series drivers must be installed in a suitable control enclosure that provides a good quality ground system and tight construction. The cabinets can be of welded construction, metal to metal conductive joints or have overlapping EMC gasketed joints. All joints and removable panels must have metal-to-metal ground contact. All hinged panels or doors must have a bonded ground wire from the hinged panel to the main body of the enclosure.

C.4 ENCLOSURE MOUNTING PANEL

It is highly recommended that a galvanized panel be used. Galvanized panels provide a continuous conductive surface that provides a low impedance ground plane for mounting the servo components.

The mounting panel must be grounded to the control enclosure with metal to metal joints, bolted together with external tooth lock washers or have multiple short ground jumper wires between the panel and the enclosure.

Painted panels can be used if the mounting area for the servo components and all grounding points have been masked off or have the paint removed.

All servo components that require grounding must use fasteners with external tooth lock washers.

C.5 POWER WIRING SHIELDING AND FILTERING

Proper shielding and filtering methods must be followed to prevent high frequency noise from exiting the control panel via the wiring to the driver. This section illustrates the recommended guidelines for the Emerald Driver.

Error! No topic specified.

Figure C.1 - Power Wiring Shielding and Filtering

C.5.1 POWER LINE FILTER

A filter must be installed between the Emerald Series Driver and the incoming power line to prevent conducted noise for getting onto the power line. It is recommended that a separate filter be used for each driver but it is possible to use a single larger filter to supply multiple drivers if the wiring between the filter and drivers is kept as short as possible. See **Figure C.1**.

The following power line filters are recommended for use with the Emerald Series motors and drivers:

Total Motor Capacity	Phase	SCHAFFNER ELECTRONIC AG
500W max.	1	FN 2070-3
500W -> 1000W	1	FN 2070-6
1000W ->2200W	3	FN 258-16
2200W -> 3700W	3	FN 258-30
3700W -> 6500W	3	FN 258-42
6500W -> 11000W	3	FN 258-55

C.5.2 DRIVER OUTPUT (MOTOR ARMATURE) FILTER

The Emerald Series Driver uses pulse width modulation (PWM) control of the motor windings. The PWM switching of the motor output generates transient voltages that must be suppressed before exiting the control enclosure. A simple ferrite core can be used as shown in **Figure C.1**.

The following ferrite core filters are recommended for use with the Emerald Series motors and drivers:

Drive Size	Manufacturer	Part Number
ESD-5/AEP -> ESD-60/AEP	Fair-Rite	0431176451

C.5.3 SHIELDED MOTOR CABLE

The motor armature cable between the driver and motor must be shielded and grounded at both the driver and motor end. The motor armature cable length between the control enclosure and motor must be less than 50 meters or additional shield is necessary. The shielded motor armature cables specified in **Appendix B** wire are recommended. Either SKINTOP or saddle clamp method of grounding must be used as shown in **Figure C.1**.

C.5.4 REGENERATION RESISTOR WIRING SHIEILDING (OPTION)

If the regeneration resistor is located in the same enclosure as the driver, shielded wire is not necessary if the wiring is kept as short as possible. If the regeneration resistor is located in another enclosure, the regeneration resistor wire must be shielded and grounded in both enclosures. The SKINTOP ground fittings or saddle clamp method of grounding must be used as shown in **Figure C.2**.

Error! No topic specified.

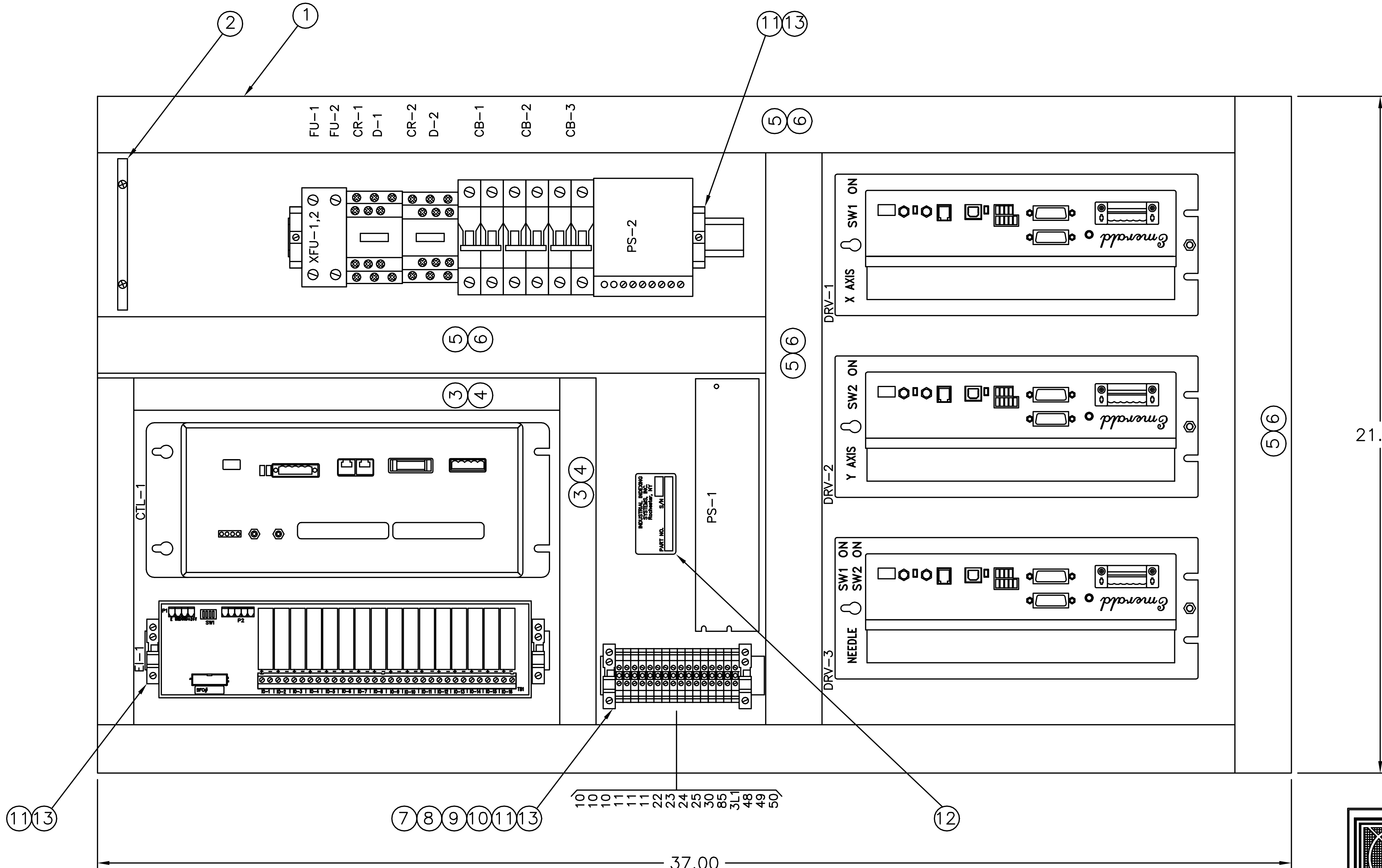
Figure C.2 - Regeneration Resistor Wire Shielding

C.6 DIGITAL CONTROL SIGNALS

High speed, fast rise time signals used with the Emerald driver, such as encoder inputs or pulse outputs, radiate high frequency noise. This noise must be suppressed to prevent excessive EMC radiation.

If the positioning controller and Emerald driver are in the same control enclosure, the cable between the two must be shielded and grounded at both ends. If the positioning controller is located in a separate control enclosure, the cable between enclosures must be a braided shielded cable with both enclosure entries grounded with SKINTOP fittings or saddle clamps.

DATE	SYM	REVISION RECORD	DR	CK	CK
11APR06	0	PER ECN 06-092	JC		
11NOV06	A	PER ECN 06-327	JC		



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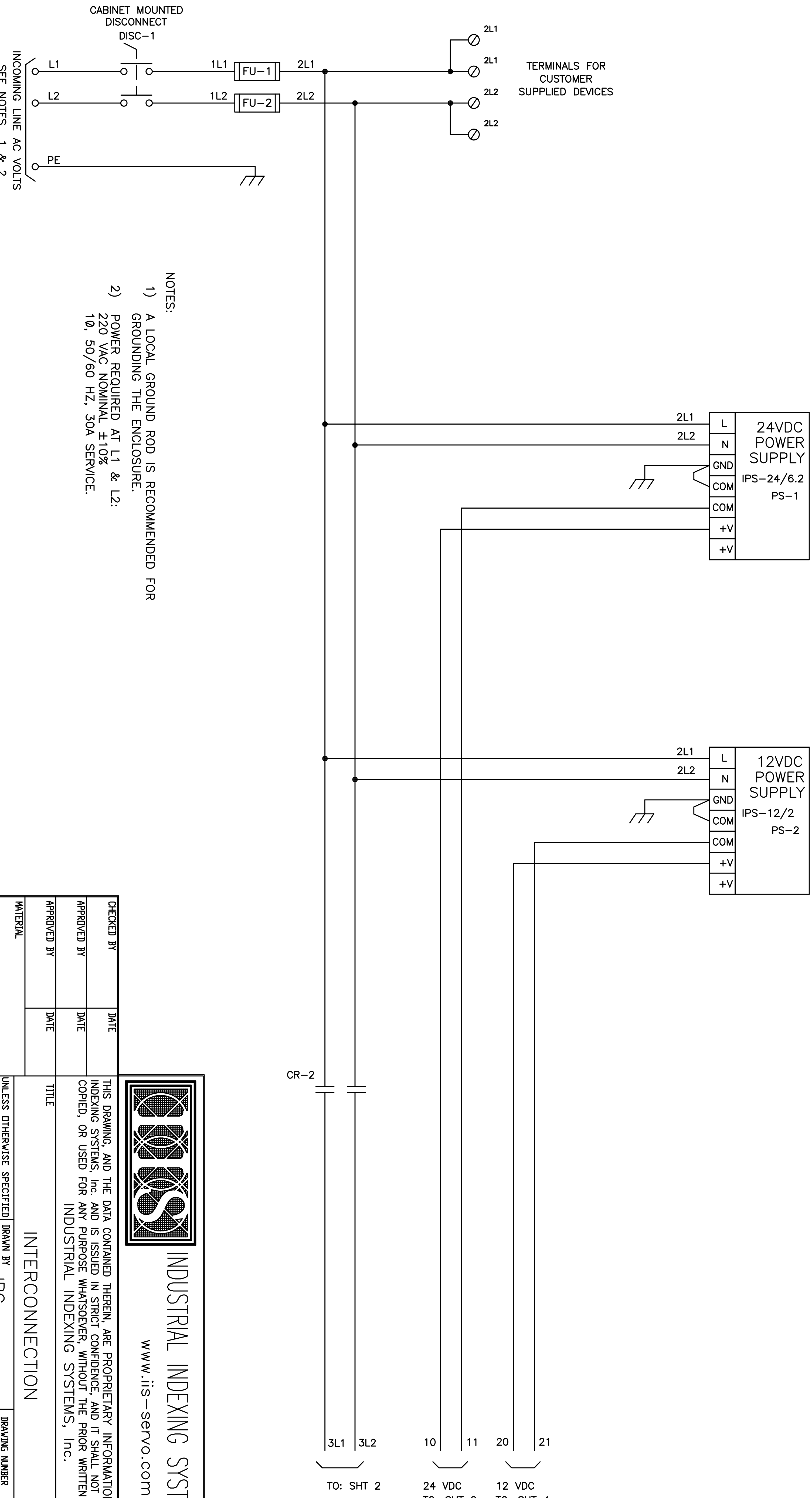
CHECKED BY	DATE	THIS DRAWING, AND THE DATA CONTAINED THEREIN, ARE PROPRIETARY INFORMATION OF; INDUSTRIAL INDEXING SYSTEMS, Inc. AND IS ISSUED IN STRICT CONFIDENCE, AND IT SHALL NOT BE REPRODUCED, COPIED, OR USED FOR ANY PURPOSE WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF; INDUSTRIAL INDEXING SYSTEMS, Inc.
APPROVED BY	DATE	
APPROVED BY	DATE	TITLE: ENCLOSURE ASSEMBLY
MATERIAL: ----------		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
FINISH: ----------		TOLERANCES: X.X± --- X.XX± --- X.XXX± --- ANGULAR ± ---

DRAWN BY	AutoCAD FILE LOCATION	DRAWING NUMBER	SIZE	DATE	SCALE	SHEET NO.	REVISION
JBC	Q\CURRENT DWGS	EN-167003	B	11APR06	---	1 OF 1	A



NOTES:

1) A LOCAL GROUND ROD IS RECOMMENDED FOR GROUNDING THE ENCLOSURE.
2) POWER REQUIRED AT L1 & L2:
220 VAC NOMINAL ±10%
1Ø, 50/60 HZ, 30A SERVICE.

DATE	SYM	REVISION RECORD	DR	CK	CK
12APR06	0	PER ECN 06-031	JC		
21JUL06	A	PER ECN 06-174	CD		
07SEP06	B	PER ECN 06-251	CD		
11NOV06	C	PER ECN 06-327	JC		
13MAR07	D	PER ECN 07-053	CD		

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MATERIAL
- - - - - - - - - - -

FINISH
- - - - - - - - - - -

TITLE: INTERCONNECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± --
X.XXX± --
ANGULAR ± --

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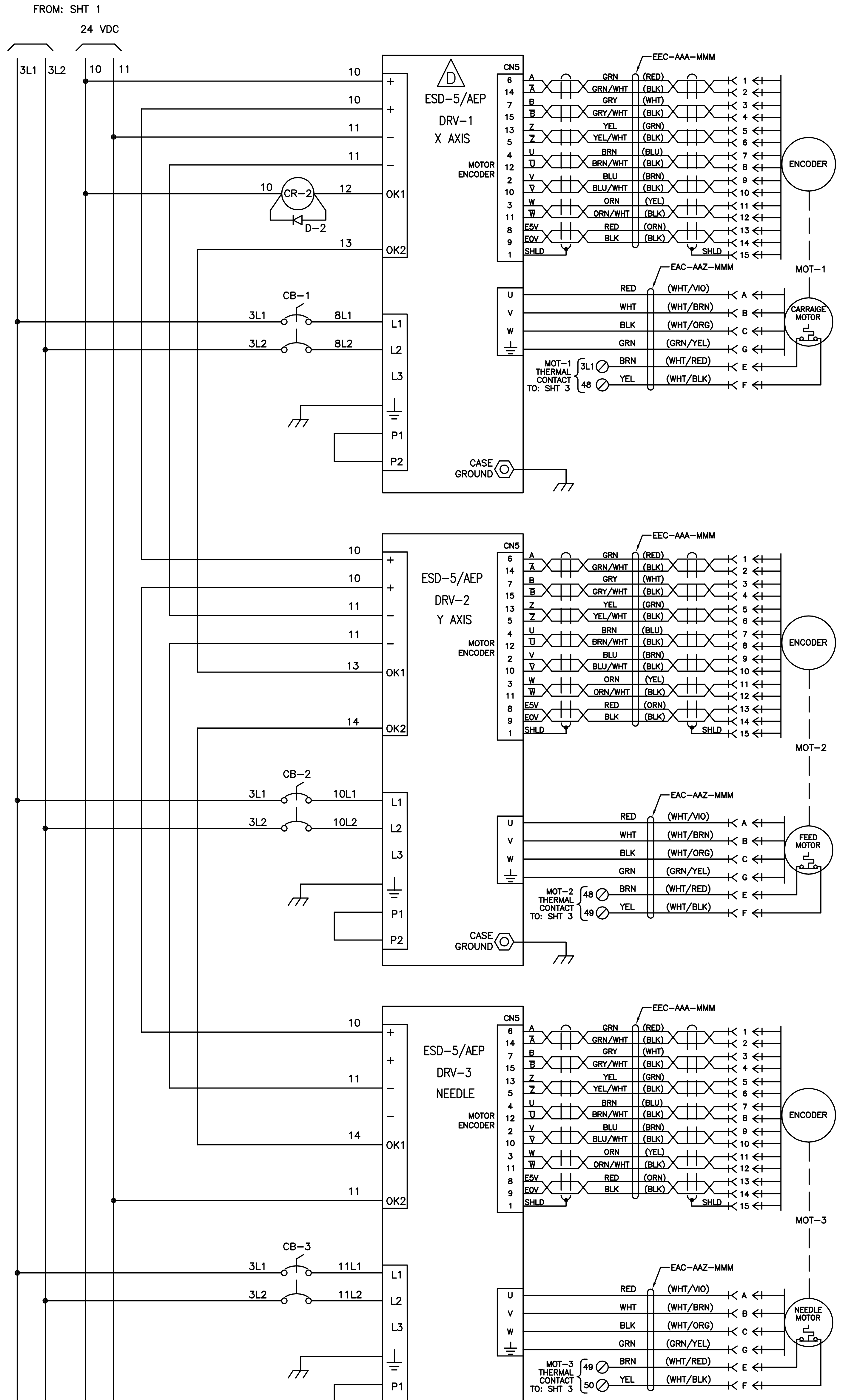

DATE	SYM	REVISION RECORD	DR	CK	CK
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21JUL06	A	PER ECN 06-174	CD		
07SEP06	B	PER ECN 06-251	CD		
11NOV06	C	PER ECN 06-327	JC		
13MAR07	D	PER ECN 07-053	CD		

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CHECKED BY | DATE
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APPROVED BY | DATE
MATERIAL ----------
FINISH ----------

TITLE: INTERCONNECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY: JBC
DRAWING NUMBER: IC-167005
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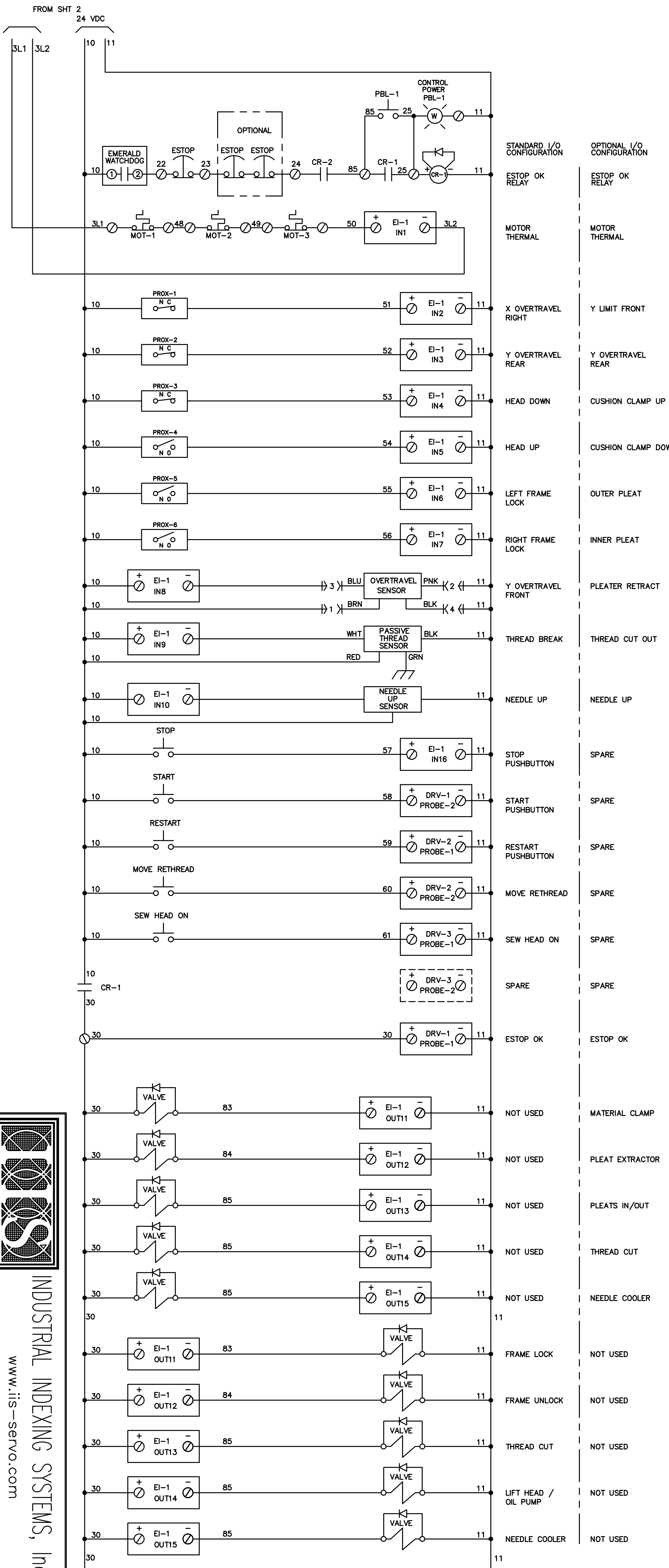
DATE: 30MAR06
SCALE: ---
SHEET NO.: 2 OF 4
REVISION: D



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04MAY06	A	PER ECN 06-174	JC		
07SEP06	B	PER ECN 06-251	CD		
08NOV06	C	PER ECN 06-327	JC		
13MAR07	D	PER ECN 07-053	CD		

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APPROVED BY — DATE
APPROVED BY — DATE
MATERIAL ————————
FINISH ————————

TITLE: INTERCONNECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY: JBC
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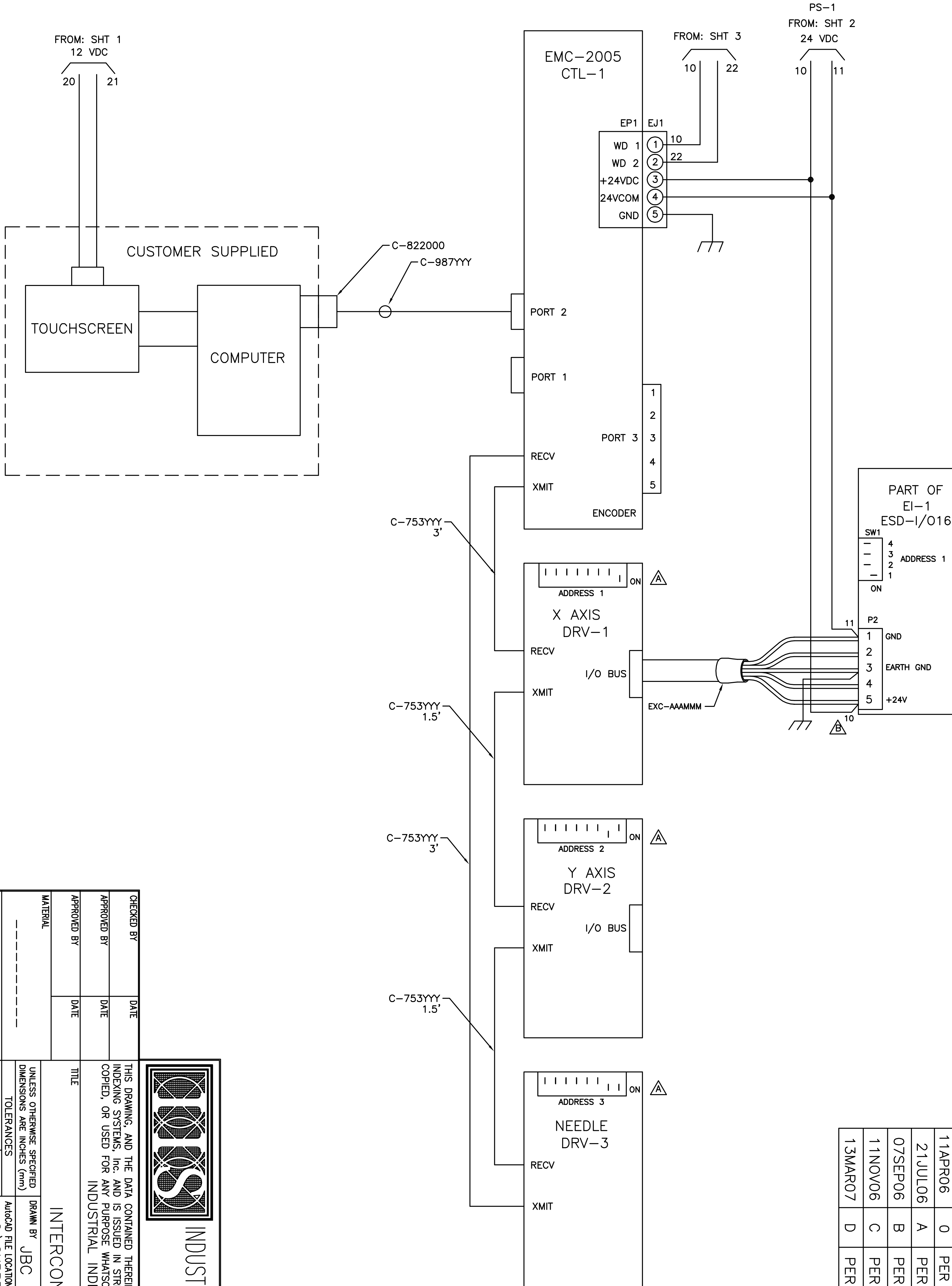
SCALE: ---
SHEET NO. 3 OF 4
REVISION: D



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21JUL06	A	PER ECN 06-174	CD		
07SEP06	B	PER ECN 06-251	CD		
11NOV06	C	PER ECN 06-327	JC		
13MAR07	D	PER ECN 07-053	CD		

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CHECKED BY — DATE
APPROVED BY — DATE
APPROVED BY — DATE
MATERIAL ---------
FINISH ---------

TITLE: INTERCONNECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY: JBC
DRAWING NUMBER: IC-167005
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 30MAR06
SCALE: ---
SHEET NO.: 4 OF 4
REVISION: D