

# TRAK<sup>®</sup> KMX Installation Upgrade Manual

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## Covers Models:

### Retrofits

- MX2 To KMX2 Upgrade
- MX3 To KMX3 Upgrade
- M2 To KMX2 Upgrade
- M3 To KMX3 Upgrade
- AGE2 To KMX2 Upgrade
- AGE3 To KMX3 Upgrade
- EDGE To KMX2 Upgrade
- EMX To KMX2 Upgrade

### TRAK Knee & Bed Mills

- AGE2 Knee Mill to KMX2 Upgrade
- EMX Knee Mill to KMX2 Upgrade
- EDGE Knee Mill to KMX2 Upgrade
- MX2/AGE2 TRM to KMX2 Upgrade
- MX3/AGE3 DPM to KMX3 Upgrade
- M3 Sport B3 to KMX3 Upgrade
- M3 Sport B5 to KMX3 Upgrade
- AGE3 DPM5 to KMX3 Upgrade

### Models Not Covered Within this Installation Manual

- MX2 To KMX3 Upgrade
- M2 To KMX3 Upgrade
- AGE2 To KMX3 Upgrade

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TOOLS



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**TRAK Warranty Policy**

# 1.0 Upgrade Instructions to a KMX Control

The following instructions describe how to upgrade a 2 or 3-axis MX, M, AGE, EDGE or EMX control to a KMX control.

## 1.1 Parts to Remove and Return to SWI

The following are parts that must be returned to SWI. Not all parts are found on each machine. Return Authorization forms are provided in the kit.

- MX2, MX3, M2, M3, AGE2, AGE3, EDGE, EMX Pendant
- MX2, AGE2 or MX3, AGE3 Computer Module
- MX Servo Drivers
- Z Glass Scale
- M250C Sensors
- DPM Switch Box
- Cable Breakout Box
- 29820 cable - CABLE ASS'Y-GSO/SENSOR TO DB25 – return if not used

### Notes

1. Remove the computer module from the computer cabinet and throw the computer cabinet away.
2. Package the return parts in the packaging provided.

## 1.2 Pendant Arm and Pendant Mounting

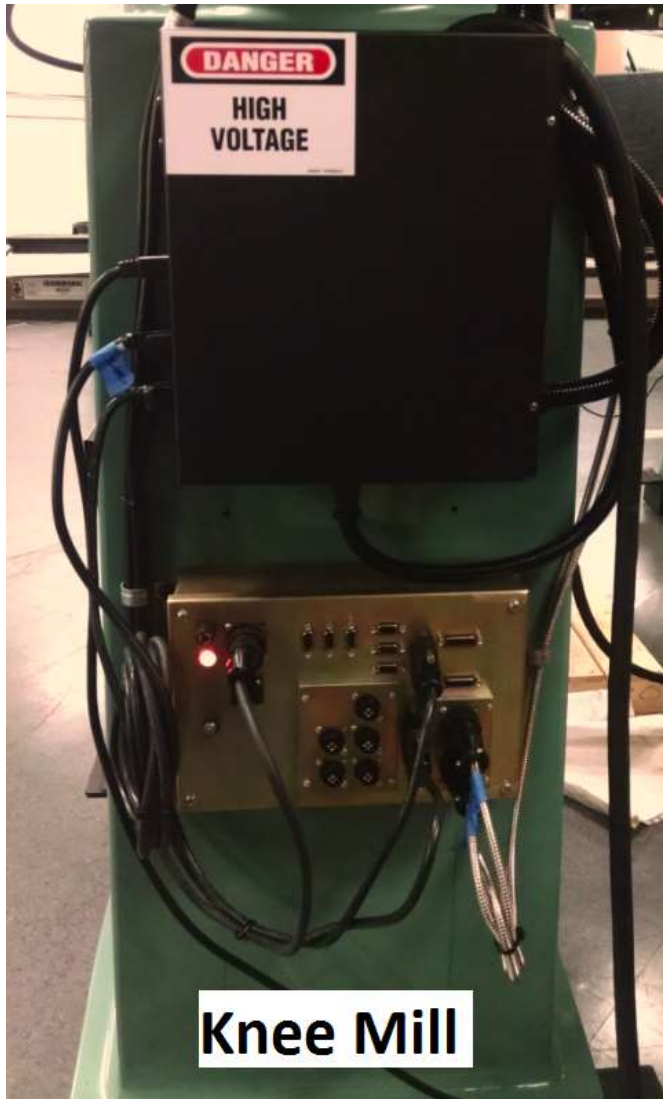
1. Remove the old pendant arm.
2. Mounting the new pendant arm using the same hardware as the old pendant arm (except EMX upgrades). See drawing 29756-3.
3. Mount the KMX pendant to the pendant arm with M6 x 25 mm SHCS's and M6 flat washers and M6 serrated lock washer.
4. Add cable mounts to back of pendant arm with ¼-20 button head screws and tie wrap cables to arm.
5. For EMX upgrades, additional pendant arm parts are provided in the kit. See drawing 29756-2 or 29756-4.
6. For K4 machines, the kit comes with a new ram adaptor bracket so you can move the pendant arm back several inches. This is required so the quill handle does not interfere with KMX the pendant arm.

## 1.3 Mounting the Cable Breakout Box (optional item)

A cable breakout box is standard on DPM5 and B5 upgrades and optional on all other KMX upgrades. The cable breakout box is required when a user adds or has electronic handwheels, has limit switches or the user has auxiliary functions (3 axis knee mills

only). Electronic handwheels were standard on DPM5 and B5 machines and hence the cable breakout box comes in these kits.

1. Mount the cable breakout box to the rear of the machine in the approximate location as shown in the picture. The cable breakout box mounts with ¼-20 hardware.
2. Install the 2 DB25 cables that route between the pendant and cable breakout box per drawing 29819 (sheets 1, 3 and 6).
3. For 3 axis knee mills that are being upgraded and came originally with an aux function option, then an additional power cable (16158-2) is needed to go between the pendant and cable breakout box. This carries the 110 volt power for the 110 volt outlet. See sheet 3 or 6 on drawing 29819.
4. Move the coolant pump power cable and indexer cable from the old auxiliary function box and plug into the new cable breakout box.
5. When an upgrade comes with a cable breakout box, then plug the TRAK sensors or glass scales into the cable breakout box. See drawing 29819 for how to route cables.
6. On 3 axis knee mills, the ballscrew encoder cable plugs into the Z axis port on the pendant. See sheets 3 through 6 on drawing 29819.
7. For machines shown in sheets 3 and 4 on drawing 29819, connect existing cable 21856 into the pendant and electrical box as shown.



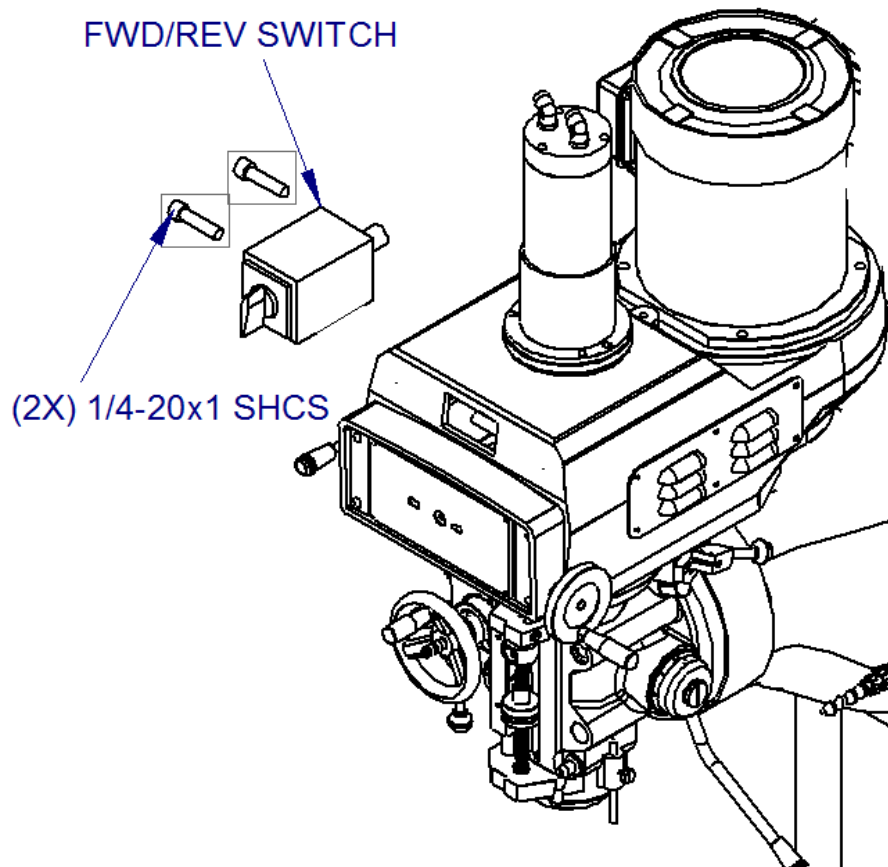
**Knee Mill**



**Bed Mill**

#### **1.4 Mounting FWD/REV Switch**

1. For TRM, DPM and DPM5 mills, mount the FWD/REV switch that comes in the kit to the side of the head. Drill and tap  $\frac{1}{4}$ -20 and use  $\frac{1}{4}$ -20 SHCS that come in the kit.



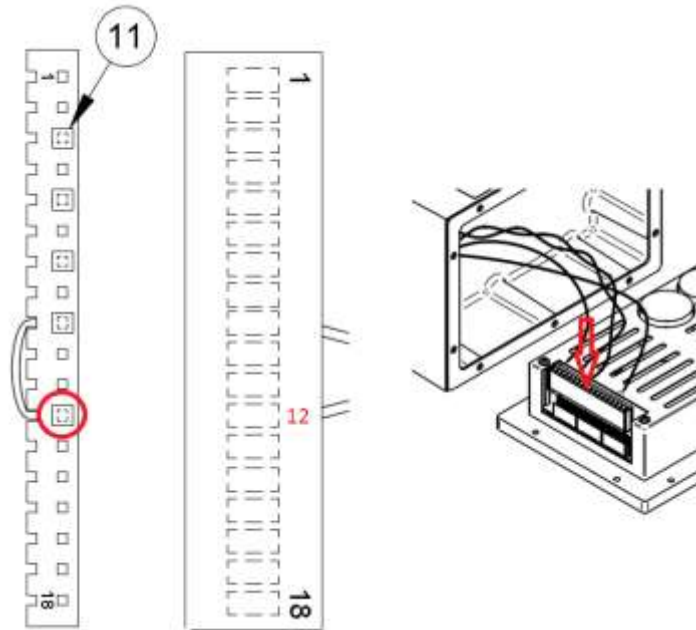
2. All other upgrades already have this switch.
3. See drawing 29819 for where to plug in the forward/reverse switch. This may vary depending on the type of upgrade you are doing.

### **1.5 Upgrading MX Servo Drivers**

On MX systems, the servo drivers for each motor are to be replaced.

1. Turn power off to the machine.
2. On the connector that fastens to the servo driver, you most likely need to remove a plug in Pin 12 that would not allow the cable to plug into a newer servo amp. The plug as shown in the picture below can be pushed out with a small screwdriver or paper clip. Push the pin out in the direction of the arrow below.





3. Replace X, Y and Z servo driver if you are upgrading a MX2 or MX3 control.
4. See instructions and illustration below of how the servo driver connects to the servo motor.
5. After removing MX servo drivers return with the other components to SWI.

### 1.5.1 Servo Driver Replacement

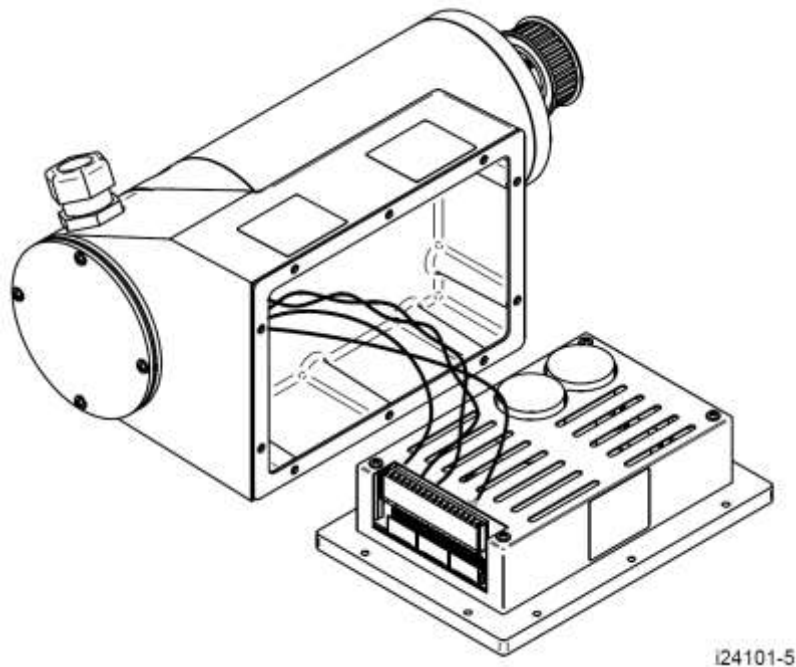
**WARNING!**  
**Do not work with the Servo Drivers unless the power is disconnected from the machine. The servo drivers are run by 110 VAC. There is possibility of death by electrocution!**

The Servo Driver for each axis is integrated into the servo motor casting.

**DANGER!**  
**Always engage (push in) the Emergency Stop switch, turn the ProtoTRAK Control off, and disconnect the servo motor/driver cable at the pendant.**

1. Press in the Emergency Stop.
2. Remove the servo motor/driver assembly from its mounting bracket (the Y axis assembly is located inside the front of the bed on bed mills). On the Z axis on bed mills, the motor must be removed from the column to replace the servo driver.
3. Remove the 10 cap screws that hold the servo driver and its heat sink plate to the motor casting.

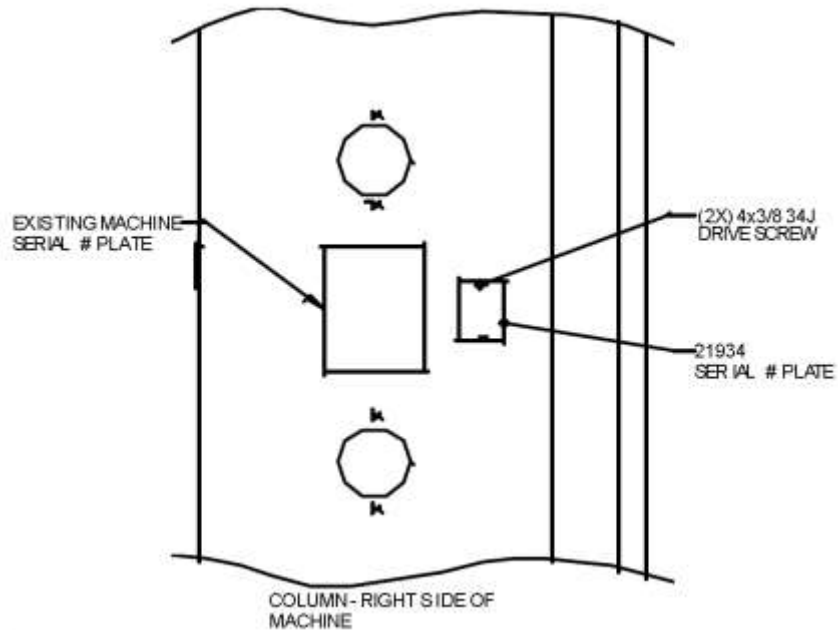
4. Disconnect the cable connector. Do not pull on the wires.
5. Reinstall the new servo driver with its heat sink plate. Be certain the gasket properly seals the assembly.
6. Reinstall the motor/driver assembly. Make certain the belt is tight so that there is little play if pinched in the middle.



**Figure 1.5.1 – Servo Driver Assembly**

### **1.6 Mounting the Serial # Plate**

1. For SWI machines that had a serial number plate mounted to the column of the machine (knee mills and bed mills), mount the serial # plate on the right side of the original serial number plate with (2) 4 x 3/8 drive screws as shown below.



2. Do not remove the original serial # plate.
3. For retrofits or old systems that did not have a serial number plate fastened to the machine, mount the serial number plate on the pendant arm as shown on drawing 29756-3.

### 1.7 Routing of Cables and Machine ID Key

1. Please see drawing 29819 for a cable connection diagram. There are 6 pages detailing different upgrades. Select the one that matches your upgrade.
2. Make sure to plug the machine ID key into the correct port on the pendant. The system will not work with this key missing.
3. The TRAK sensors or glass scales will plug into the pendant with a Y cable if no cable breakout box is part of upgrade. If a cable breakout box is provided then they plug into the cable breakout box per drawing 29819.
4. The sensor/glass scale adaptor cable should be returned if the upgrade you are doing does not require the cable. For example, M2 and B3 upgrades on machines without sensors or glass scales will not need this cable.
5. Make sure to plug in the jumper (21786-5) into the DB9 connector on the pendant called EURO e-stop.
6. For bed mill and K4 upgrades, it will be necessary to use motor extension cables (23760) provided in kit to allow motor cables to reach the pendant for the X and Y axis.
7. For most knee mills, motor extension cables should not be needed. The X and Y motor cables need to be routed like the picture below.

8. For the DPM5 and Sport B5 upgrades, plug the electronic handwheel cables into the adaptor cables 29808 supplied in the kit. The adaptor cables then plug into the cable breakout box per drawing 29819 See sheets 1 and 3.
9. On DPM's, plug existing power cable 17501 into the back of the pendant where it says AC Inlet and from there plugs into the relay module as shown on sheets 1 and 2 of drawing 29819.
10. Power cable 22608 plugs into the back of the pendant where it says AC Inlet and from there plugs into the electrical cabinet on the machine or into a wall outlet if this is a retrofit or non SWI machine. See drawing 29819 sheets 3 through 6.

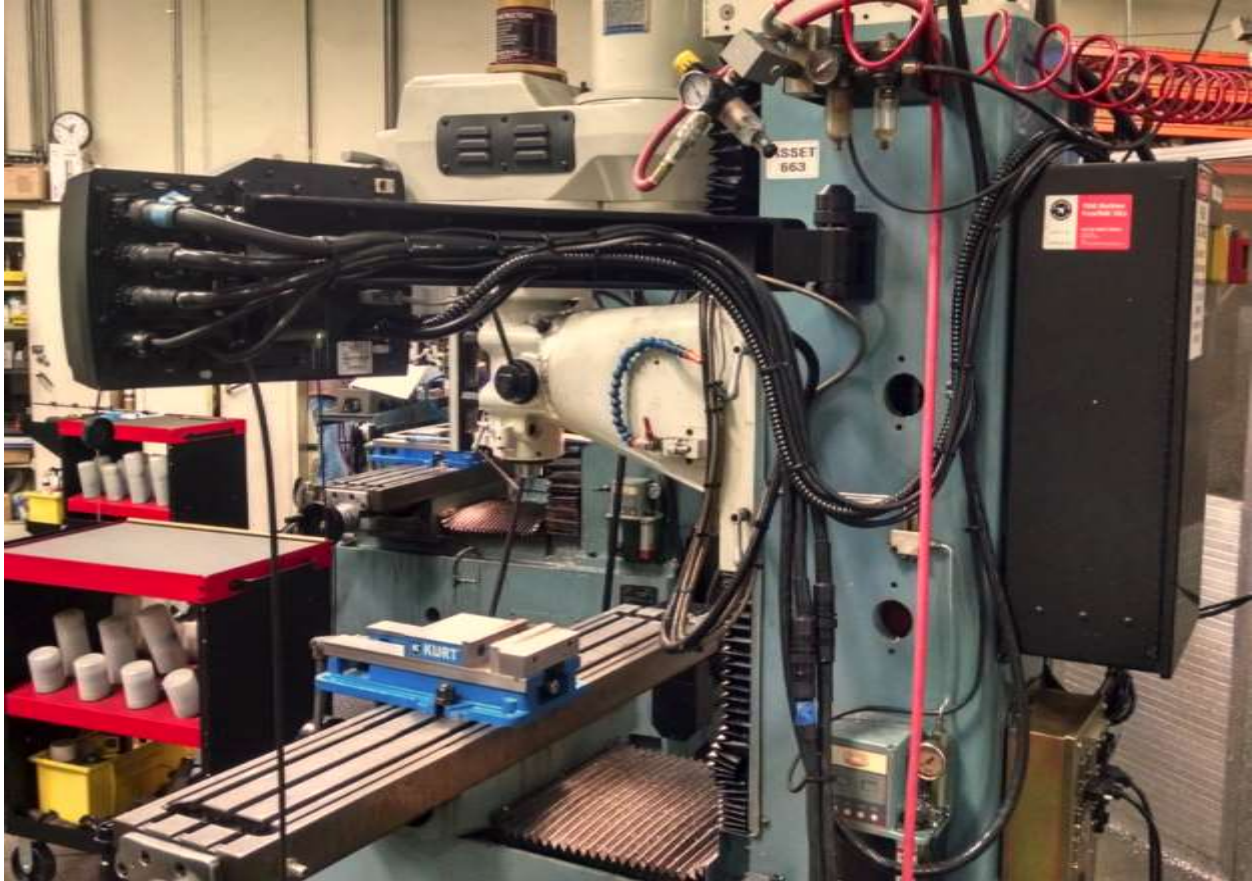


**Typical Routing of Cables – Knee Mill**



**Routing of X and Y Axis Motor Cables on Knee Mill**





## Typical Routing of Cables – Bed Mill

### 1.8 DPM Electrical Box (relay module)

For DPM and DPM5 upgrades, we will continue to use the main electrical box and relay module (inside of box) to provide power and auxiliary functions. The following 2 cables will be reused and run from this electrical box to the KMX pendant. See drawing 29819 for how to route cables from this box to the KMX pendant.

1. 17501 CABLE ASSY CORD-POWER – power cable 110 volts – carries 110 volts from electrical box to pendant
2. 17000 CABLE-EXTERNAL-SWITCH BOX – carries spindle signals down to relay module

### 1.9 Coolant Switch Bracket

An optional bracket may be provided in upgrade kit. The bracket is required if a user has a manual coolant switch that SWI provided with the original machine. When we change the pendant arm, the bracket for the coolant switch will no longer work. A new bracket will fasten to the rear of the KMX pendant as shown in the picture.



### 1.10 Electronic Handwheel (EHW) Option

1. Some upgrades may add EHW's to the X and Y axis.
2. Please see the drawing 23890 or 23891 for how to install EHW.
3. Note – DPM5 and B5 machines came with EHW's standard.

### 1.11 Limit Switches

Machines that came with limit switches require a cable breakout box in order to function. The upgrade kit should contain this cable breakout box. If your machine has limit switches, then plug the 1 input type limit switches into the appropriate connectors on the cable breakout box per drawing 29819.

### 1.12 Upgrading a 2 Axis Knee Mill to 3 Axis Knee Mill

1. This is a more advanced installation and requires a trained field service person to install. This should not be done by a customer.
2. Remove the quill glass scale or sensors
3. Install the provided 3 axis kit (25000-xx) per the instructions in the service manual.
4. The kit provided uses the new style 3 axis retrofit kit which requires a different machine ID key that the old style used on the old MX and AGE versions.

### 1.13 RM – Mounting of Electrical Box

1. On TRM's with MX and AGE controls, remove the relay module and electrical box and replace with the one provided in the kit.

2. Installed the 20676 electrical box to the rear of the machine using  $\frac{1}{4}$ -20 x  $\frac{3}{4}$  long SHCS, flat washer and serrated washer.
3. Run cable 21856 from this electrical box to the rear of the KMX pendant. This cable controls the spindle and will turn it off in an E stop condition.
4. See drawing 29819 sheets 3 or 4 for how to route cables.

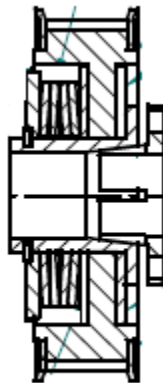
### 1.14 Pulley Upgrade Option

On some machines, users may want to remove their old TRAK sensors or glass scales and just use the motor encoders to position the machine. When this is the case, the slip clutches on the X and Y axis should be replaced with solid pulleys that can no longer slip during a crash.

Note – failure to replace the slip clutches may allow them to slip during a crash and the user would lose their absolute zero.

When replacing the slip clutches, it may be necessary to use some shims to insure the new ballscrew pulleys line up with the motor pulleys. In the pulley upgrade kit are a number of 0.100" and 0.050" thick washers. Use the washers that are required for your application.

For example, the slip clutch shown below is thicker than our solid pulley design. This mostly likely means a 0.100" spacer will need to be used to space the pulley properly.



In the kit we also provide (2) 10-32 x  $\frac{3}{4}$ " SHCS in the kit which facilitates removing the tapered ferrule on this slip clutch. It should be noted that not all slip clutch designs have a tapered ferrule like shown.

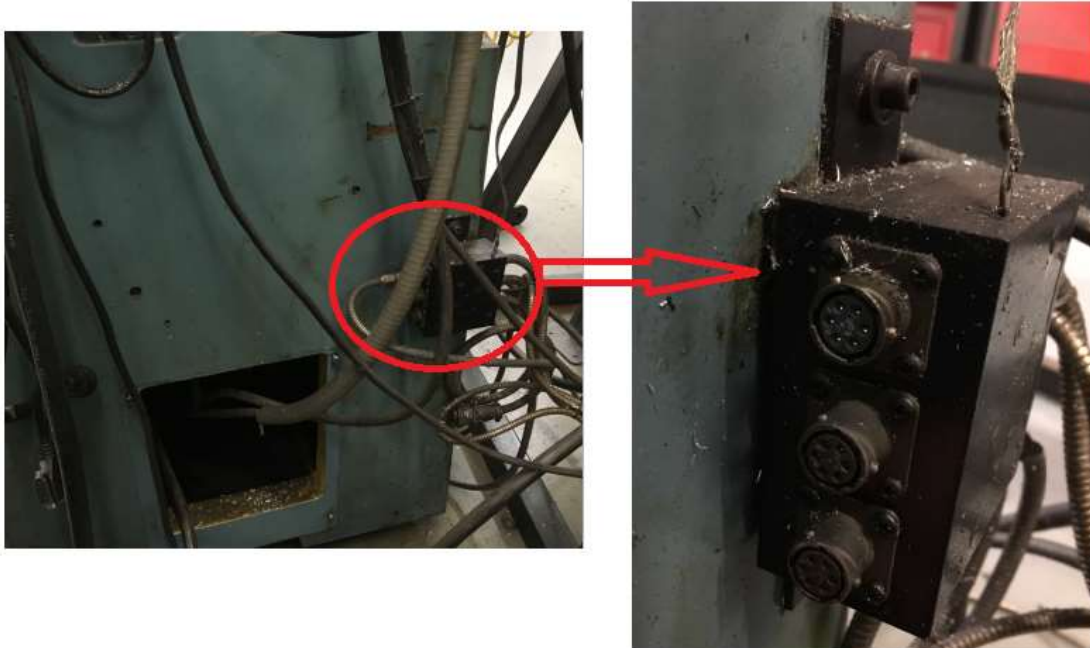
### 1.15 Old Style Glass Scales

1995 and earlier SWI machines and retrofits may have left with a glass scale that had a different style connector from what we use today. Today we use 14 pin CPC connectors. If the machine you are upgrading has old style glass scales, then cable



extensions (part number 15302-10) will be needed to get the Z glass scale connector up to the pendant. On the X and Y axis, this also may be necessary if you do not have a cable breakout box option. Without this option, the X and Y glass scales also need to plug into the pendant using cable 29820. This means you will need 2 more 15302-10 extension cables. See drawing 29819 for an illustration showing the 29820 cable.

To identify if your machine has an old style glass scale, look for this box mounted to the rear of the machine.



The glass scales plug into the military connector shown and the extension cable would plug into the cable coming out the other side of this box. The cable coming out of the other side of the box is 18" or so long and hence not long enough to reach the pendant, but it is long enough if you are plugging it into a cable breakout box that mounts to the rear of the machine.

### **1.16 Inspection Checklist**

Upon completion of the installation, please perform the installation checklist in section 2.0 of this manual.

## 2.0 Installation Checklist

### Installation Instructions & Checklist

Installer: Use this checklist to assure a complete set-up of a KMX upgrade. Section 3 explains each service code in more detail.

<input type="checkbox"/>	1. Turn on power to the machine and control. The power switch is at the back of the pendant.
<input type="checkbox"/>	2. Verify the latest software has been loaded into the KMX control. Software can be downloaded from our website.
<input type="checkbox"/>	3. Turn on features like glass scales, limit switches and electronic handwheels via service codes 304, 305, 312 (338) and 350
<input type="checkbox"/>	4. Jog each axis. If you see a fault, you may need to reverse the direction the glass scales or sensors via service codes 322 and 321. On PT3 (old style) 3 axis knee mills, you may need to reverse the ballscrew encoder using service code 325. Use service code 131 to verify scale vs motor encoder count directions. If you still see a fault during JOG mode only, please lower the value in service code 150. See section 3.2.18 for further explanation.
<input type="checkbox"/>	5. If the motors are running the wrong direction, perform service code 97.
<input type="checkbox"/>	6. Check to make sure that the E-Stop button is functioning correctly and turns off power to the axis motors. On SWI machines make sure the spindle turns off as well. On retrofits we do not interface with the spindle.
<input type="checkbox"/>	7. Check and adjust gibs as required.
<input type="checkbox"/>	8. Perform Service Code 12, Feed Forward Constant.
<input type="checkbox"/>	9. Perform Service Code 100 in both directions for the X and Y and make sure the feedrate is at least 120 ipm. For DPM machines, the feedrate on the Z-axis should be 180 ipm. Note – code 100 on the Z axis does not work on 3 axis knee mills.
<input type="checkbox"/>	10. Perform Service Code 11 to automatically calculate the backlash for the X and Y-axis of glass scale machines
<input type="checkbox"/>	11. Perform Service Code 123 to calibrate the X and Y-axis using a 150mm standard. If you do not have a precision standard, cut part and measure and enter a calibration factor in service code 122.
<input type="checkbox"/>	12. Perform Service Code 128 to enter backlash for the X and Y-axis of single feedback machines (i.e. motor encoder only).
<input type="checkbox"/>	13. Check for positional accuracy and repeatability on the X and Y-axis using programs SWI Test programs 1.PT4 and 2.PT4 respectively. Positioning and repeatability values should be less than or = to 0.0005". Only applicable to SWI personnel installing upgrade.
<input type="checkbox"/>	14. Perform Service Code 123 and press Z to calibrate the Z-axis ram (DPM machines and 3 axis knee mill) using a 75mm or 3" standard. If you do not have a precision standard, cut part and measure and enter a calibration factor in service code 122.

<input type="checkbox"/>	15. Perform Service Code 128 to enter backlash for the Z-axis ram. Applies to 3 axis systems only.
<input type="checkbox"/>	16. Check for positional accuracy and repeatability on the Z-axis using SWI test program 3.PT4 Positioning and repeatability values should be less than or = to 0.0005". If using a 3" standard, the Z repeat program will need to be modified to use 3" vs 75 mm. Only applicable to SWI personnel installing upgrade.
<input type="checkbox"/>	17. Perform Service Code 123 and quill softkey to calibrate the Z-axis quill (2 axis knee mills) or press Z axis to calibrate the 3 <sup>rd</sup> axis on 3 axis knee mills using a 75mm or 3" standard. If you do not have a precision standard, cut part and measure and enter a calibration factor in service code 122.
<input type="checkbox"/>	18. Check that all other options that came with the upgrade are installed, functioning or adjusted properly. They included EHW's and limit switches.
<input type="checkbox"/>	19. If the upgrade came with an auxiliary function option or already had an auxiliary function option, then use accessory key on pendant and make sure the coolant pump and/or solenoid for the mister fires. The accessory key should be in the ON position to test coolant pump or solenoid. The control should be in DRO mode. Make sure air is hooked up to the machine during the test. If the machine has a separate coolant pump switch mounted to the pendant, then turn this on and off to test.
<input type="checkbox"/>	20. Perform service code 530 and enter machine serial number. The pendant serial number should be set at the factory.

## 3.0 Service Codes

The following is a list of service codes used on the KMX control system. The table below is a quick summary of the service codes. More detailed information can be found below.

### 3.1 Machine Set-Up Service Codes

Code	Description	Comment
11	Hysterisis	Measures the backlash between motor encoders and glass scales.
12	Feed Forward Constant	Measures the friction characteristic of the machine.
97	Axis Configuration	It allows the user to set the positive direction for each axis.
122	Axis Calibration Using Offset	This is a scale factor (one per axis) that is defined as the length of the part programmed divided by the physical dimension of the actual part measured. It is less than 1 for a part that was cut too big and greater than 1 for a part that was cut too small.
123	Calibration Mode	Use to calibrate the KMX control with a precision standard
128	Backlash Calibration Constant	Use to load backlash compensation for each axis. Not required on TRAK Sensor or Glass scale machines
150	Set Jog Acceleration Percentage	Used to adjust the jog speed to adjust for a compatibility issue with some older servo's (p/n 20375-XX)
304	Toggle X Sensor/Glass Scale On or Off	Turn on or off
305	Toggle Y Sensor/Glass Scale On or Off	Turn on or off
312	Toggle Limit Switches On or Off	Turns limit switches on or off
321	Reverse Y Position Sensor	Reverse the direction of sensor or glass scale
322	Reverse X Position Sensor	Reverse the direction of the sensor or glass scale
338	Selects 1 or 2-input type limit switch	Switch between 1 or 2 input limit switches. All upgrades will have 1 input limit switches.
350	Turn EHW On or Off	Turns the EHW option on or off since EHW are optional.
530	Set Pendant and Machine Serial Numbers	Service code to record pendant and machine serial numbers. A warning will be given to user until this requirement is met.

## 3.2 Machine Set-Up Service Codes Further Explained

The following codes are used primarily when setting up a new machine. To get to any of these codes go to Setup mode and press the Service Code button, press "B" and enter the code you wish to view.

### 3.2.1 Code 11: Hysteresis

Note: This code is use only for systems with Sensors or Glass Scales on the table and saddle.

The Code 11 service routine checks the readings of the motor encoder against the sensor encoder. It is a measurement of how much motor motion is necessary to create table or saddle motion. This test helps us to look at two things:

- Play: How much backlash must be taken up when motion is reversed.
- Friction: How much the mechanical components must be "torqued up" in order to break the friction and create motion.

The Code 11 procedure is very useful and will help in diagnosing all types of motion and performance problems.

1. Position the table and saddle in the center of travel. Note: You will lose your DRO position reference.
2. Go into the Service Codes and input Code 11.
3. The system will run the checking routine automatically and then display the values in the position readout.

Explanation:

As an overall measure of the system hysteresis, we are looking for the X and Y values to be less than .004". A value greater than this indicates a problem with either excessive friction or play that may affect the finish or accuracy of machined parts.

### 3.2.2 Code 12: Feed Forward Constant

The Code 12 procedure helps the control "learn" the friction characteristics of the machine by sending a graduated series of motor signals and observing the results. The process takes 30 to 45 seconds to run. It is both a diagnostic routine that displays values, and a routine that sets the parameters of the control for the particular machine.

The Code 12 is used for diagnosing and resolving:

- Problems with machine motion.
- Machined parts come out bad – especially poor finish.

Note: Code 12 routine will set the parameters for the particular machine and its particular situation. If the machine changes its friction characteristic, the Feed Forward Constant should change too, or the system will not servo properly. Whenever gibs are adjusted or a heavy workpiece has been added to the table, you should run a Code 12. When the heavy workpiece is removed, Code 12 should be run again.

1. Position the table and addle in the center of travel. Note: You will lose your DRO position reference.
2. Go into the Service Codes and input the Code 12.
3. Press Auto
4. The system will run the routine automatically and then display values on the position readout.

Explanation:

Typical values should be between 8.08 and 12.12 are considered normal for each axis. Higher values indicate excessive friction in the system. Lower values indicate a loose system and may mean a gib adjustment is necessary. Value 8.08 means the friction is a factor of 8 in one direction, and 8 in the other direction. The values should be within 3 or 4 of each other in both directions. A value of 8.10 would still be considered normal.

### **3.2.3 Code 97: Set Positive Motor Encoder Direction**

This procedure sets the Plus and Minus motion for the Motor encoders.

It may be necessary to perform this procedure after a new installation or after installing a new Computer Module.

#### **STEPS:**

1. Center the table and saddle and position the quill about halfway down.
2. Go into Service Codes and input Code 97.
3. Very carefully, move the table, the saddle and the quill in the positive direction, approximately 1 inch for each axis. Positive motion is:
  - X - table moves to the left (so the tool moves to the right relative to the workpiece)
  - Y - saddle moves toward the front (so the tool moves up relative to the workpiece).
  - Z – the head moves up (DPM machines)
  - Z - the quill moves up.

If you do not move correctly from the beginning, repeat the procedure.

4. Press INC SET to signal the procedure is complete.

Note – on 3 axis PT3 (old style) knee mills, if the motor encoder and ballscrew encoder are counting backwards then you may need to run service code 325 to reverse the ballscrew encoder.

### **3.2.4 Code 100: Axis Open Loop Test**

Code 100 procedure is used to diagnose problems with the configuration of the system, the encoders and incoming A/C voltage.

**IMPORTANT -- SAFETY NOTICE**

**During this procedure the designated axis will be given a command to move at maximum speed for 1 second in the direction you choose. Avoid crashes by making sure the quill is out of the way and by starting with the table and saddle centered. MAKE SURE THAT NO ONE IS STANDING IN THE WAY OF THE TABLE OR SADDLE!**

*Note: You will lose the DRO reference position.*

This procedure is to be run for each axis that is servo-driven, and for both the plus and minus direction for each axis.

1. Center the table and saddle and raise the head. Make sure the gib locks are released.
2. On the Pendant display, go into the Service Codes and input the Code 100.
3. The conversation line will say: "SELECT AXIS". Input the axis. Either X, Y or Z.
4. In the conversation line it will say "WHICH DIRECTION? PLUS".
  - If you want to run in the plus direction, press INC SET.
  - If you want to run in the minus direction, press +/-, then INC SET
5. In the conversation line it will say "PRESS GO". Press Go after you are sure that the machine will not crash in the direction and axis that you have specified.
6. Afterward the screen will display values next to the DRO position axes. The table below assumes machine has secondary feedback. Machines with motor encoders only will display the reading next to the axis in question.
- 7.

Your input	Display	Data displayed.
X +	X	Motor encoder reading
	Y	nothing (should be 0)
	Z	Table encoder reading
	Feedrate	the maximum feedrate attained

X -	X	Motor encoder reading
	Y	nothing (should be 0)
	Z	Table encoder reading
	Feedrate	the maximum feedrate attained

Y +	X	nothing (should be 0)
	Y	Motor encoder reading
	Z	Table encoder reading
	Feedrate	the maximum feedrate attained

<b>Your input</b>	X	nothing (should be 0)
Y -	Y	Motor encoder reading
	Z	Table encoder reading
	Feedrate	the maximum feedrate attained

<b>Your input</b>	X	nothing (should be 0)
Z +	Y	nothing (should be 0)
	Z	motor encoder reading
	Feedrate	the maximum feedrate attained

<b>Your input</b>	X	nothing (should be 0)
Z -	Y	nothing (should be 0)
	Z	motor encoder reading
	Feedrate	the maximum feedrate attained

Interpretation of the resulting values displayed:

The values for the encoder displays should be in the range of 2.0000" to 3.0000" for the X and Y motor and 3.0000" and 4.0000" for the Z axis motors on bed mills.

- If the motor encoder and sensor or glass scale reading is not within this value, then the one that is out of specification may be the problem. If one of the encoders is not reading then it will need to be replaced.
- The feedrate should be a minimum of 120 ipm for the X and Y axis and 180 ipm for the Z axis of bed mills.
- If the feedrate is less than 120 or 180 ipm and inconsistent in both directions, check the incoming AC voltage and mechanics of the drive train.

### 3.2.5 Code 122: X, Y, Z and Quill Calibration Using Part Measurements

This service code can be used to calibrate each axis if you do not have a precision standard which is used when calibrating with service code 123.

Service code 122 allows you to apply a scale factor (one per axis) that is defined as the length of the part programmed divided by the physical dimension of the actual part measured. It is less than 1 for a part that was cut too big and greater than 1 for a part that was cut too small.

The values are limited between .99 and 1.01. If the user enters a number outside that range, limit the number and prompt the user that the value was limited.

An example of how a user might use this service code. This would be used if you did not have a precision standard like our FST's carry. The user could cut a 3" square and then measure the length along the X axis. For example, let's say



the user measure 2.9985". He would then take 3.0000/2.9985 and enter 1.0005003 into service code 122 for the X axis. This service code allows up to 8 digits to be entered after the decimal point.

For your ram (Z axis on bed mill) or quill scale calibration, machine a reference plane and set your DRO Z readout to 0. Use the DRO to position the quill or ram down some number, for example 1.0000". Machine some material away from a corner so it will be easy to measure the difference between your reference plane and your new plane.

To calculate your offset with a 1.0000" difference in position, measure the actual amount machined and compare it with 1.0000".

For example, if your measurement showed the difference between the reference plane and the machined plane is 0.9975", calculate the offset:

$$\text{Z calibration offset} = \text{DRO} \div \text{actual} = 1.0000 \div 0.9975 = 1.0025063$$

Once you have calculated your values, use Service Code 122 to enter them.

### **3.2.6 Code 123: X, Y, Z (Ram) and Quill Calibration**

Calibration is used teach the machine a known distance. We typically calibrate our machines over a 150 mm distance. There is no limit to how far you can calibrate the machine.

1. Set-up a gauge block or standard and indicate it parallel to the axis you are calibrating.

*Note: Put the display in Inch or mm to match your gage block. Recommended gage blocks are:*

- X and Y -- 150mm or 6"
  - Z -- 75 mm or 3"
3. Set a 0.0001" indicator in the spindle and move it up to one side of the gage block or standard.
  4. Go to setup mode, go to section "B" and press CODE 123.
  5. Select the axis you want to calibrate X, Y or Z. For the quill press the F1 key labeled QUILL.
  6. Follow the instructions on the screen to complete calibration.

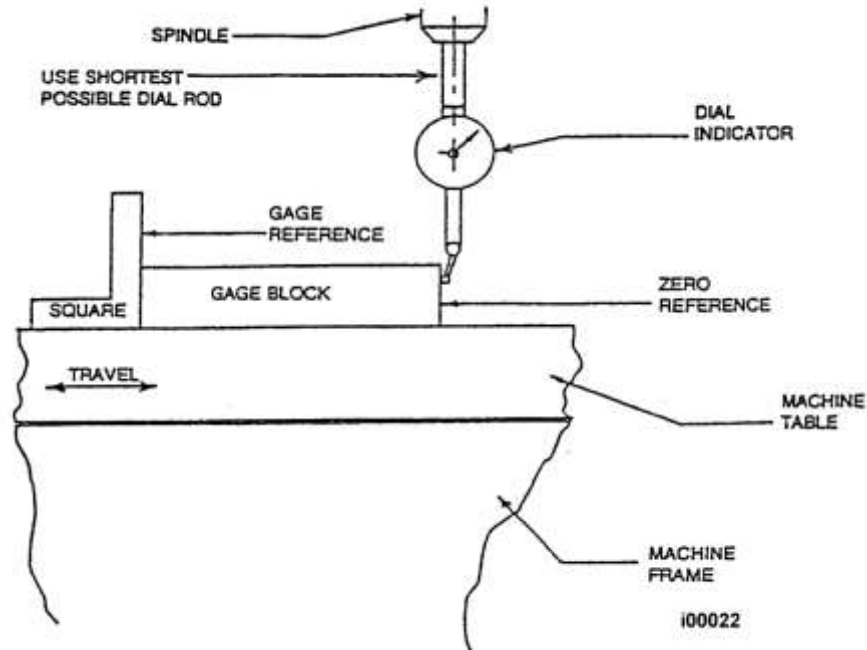


Figure 3.2.6  
*Calibration Set-Up*

### **3.2.7 Code 128: Input Backlash Constant**

Code 128 allows you to enter the backlash values for each axis. It displays the value after it enters. This code is only used on machines with motor encoders only.

### **3.2.8 Code 304: Toggles X Sensor or Glass Scale On/Off**

This service code toggles the X sensor or glass scale on or off. It is used to configure the machine and also is a useful tool for troubleshooting.

### **3.2.9 Code 305: Toggles Y Sensor or Glass Scale On/Off**

This service code toggles the Y sensor or glass scale on or off.

### **3.2.10 Code 312: Toggles Limit Switch On/Off**

This service code turns on and off the limit switch option. By default they will be turned off. Once you turn on our limit switches, make sure to select if you have a 2 input type limit switch or a 1 input type. Old ProtoTRAK systems all came with 1 input type limit switches.

### **3.2.11 Code 321: Reverse Y Position Sensor Direction**

This service code reverses the direction of the encoder. It may be needed if sensors or glass scales are mounted on different sides of the machine. If you turn on your TRAK Sensors or Glass scales and get an immediate axis fault, there is a good chance the table encoders are reading backwards to the motor encoders. Use this service code for Y and code 322 for X to reverse their direction.

### 3.2.12 Code 322: Reverse X Position Sensor Direction

This service code reverses the direction of the encoder. It may be needed if sensors or glass scales are mounted on different sides of the machine.

### 3.2.13 Code 338: Selects 1 or 2-input type limit switch

Older machines that used M, MX or AGE controls all came with 1 input type limit switches. Please select 1 input when upgrading to the KMX control.

### 3.2.14 Code 350: Turn EHW On or Off

This service code turns the Electronic Handwheel (EHW) option on or off. EHW's are optional.

### 3.2.15 Code 530 – Set Pendant and Machine Serial Numbers

This service code allows us to keep track of pendants and machines by serial number. The values entered show up in our message logs and allow us to know what software is running on certain hardware. If you fail to enter a value for these serial numbers, the control will remind you to do so.

The screenshot shows the 'Code 530 - Set Pendant and Machine Serial Numbers' screen in the TRAK KMX Offline software. The interface includes a top navigation bar with buttons for 'SERV', 'COARSE', '3 AXIS', and 'INCH'. The main content area contains the following text:

Please enter the pendant and machine/system serial number into this service code. The pendant serial number should be added at the factory when the pendant is first assembled. If it is not, the serial number can be found on a label on the back of the pendant. The machine/system serial number should be already set if the machine came from our factory. For controls installed in the field, the machine/system serial number should come on a serial number plate found in the kit. The MAC address is updated automatically via our software. The Set Defaults button will set the serial numbers back to default and require the user to re-enter.

MAC Address: 2C-33-7A-FF-AC-37  
Pendant Serial Number: Not Entered  
Machine/System Serial Number: Not Entered

The right sidebar contains buttons for 'PENDANT SERIAL', 'MACHINE SERIAL', 'SET DEFAULTS', and 'RETURN'.

### 3.2.16 Code 325: Reverse Quill Position Sensor Direction

This service code reverses the direction of the encoder. It may be needed if sensors or glass scales are mounted on different sides of the machine. It would also reverse a ballscrew encoder on an old style 3 axis knee mill.

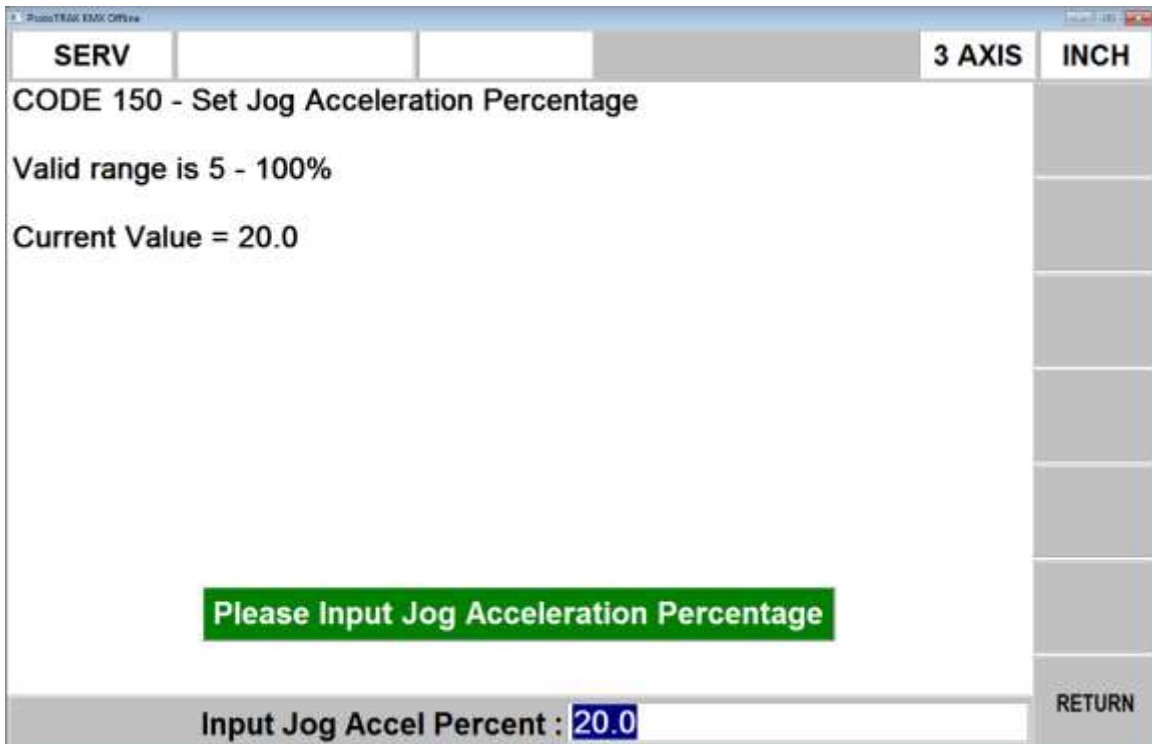
### 3.2.17 Code 131: Manual DRO

A manual diagnostic routine to check the motor encoder and table encoders: Turn the X hand wheel to display the encoder readings. This code will display the actual DRO counts and the raw encoder counts before the calibration and backlash factors have been factors into the counts. It will also show the ballscrew encoder counts on old style 3 axis knee mills.

### 3.2.18 Code 150: Set Jog Acceleration Percentage

This service code was added because we learned during some upgrades that some older servo's (p/n 20375-XX) had different characteristics than our newer servos. These characteristics caused some servos to fault when trying to JOG an axis. The symptom does not appear in any other run modes nor does it happen when a user has an EHW option.

The value chosen below we believe will work for most situations, but if it does not and you are still seeing a fault, the number should be lowered until the faulting goes away. The downside to a lower value is the acceleration of the motors will be slower in JOG mode. For newer servos, the value can be set to 100 and no problems should be noticed. It is engineering's opinion that most users will not notice any issues leaving the value at 20%.



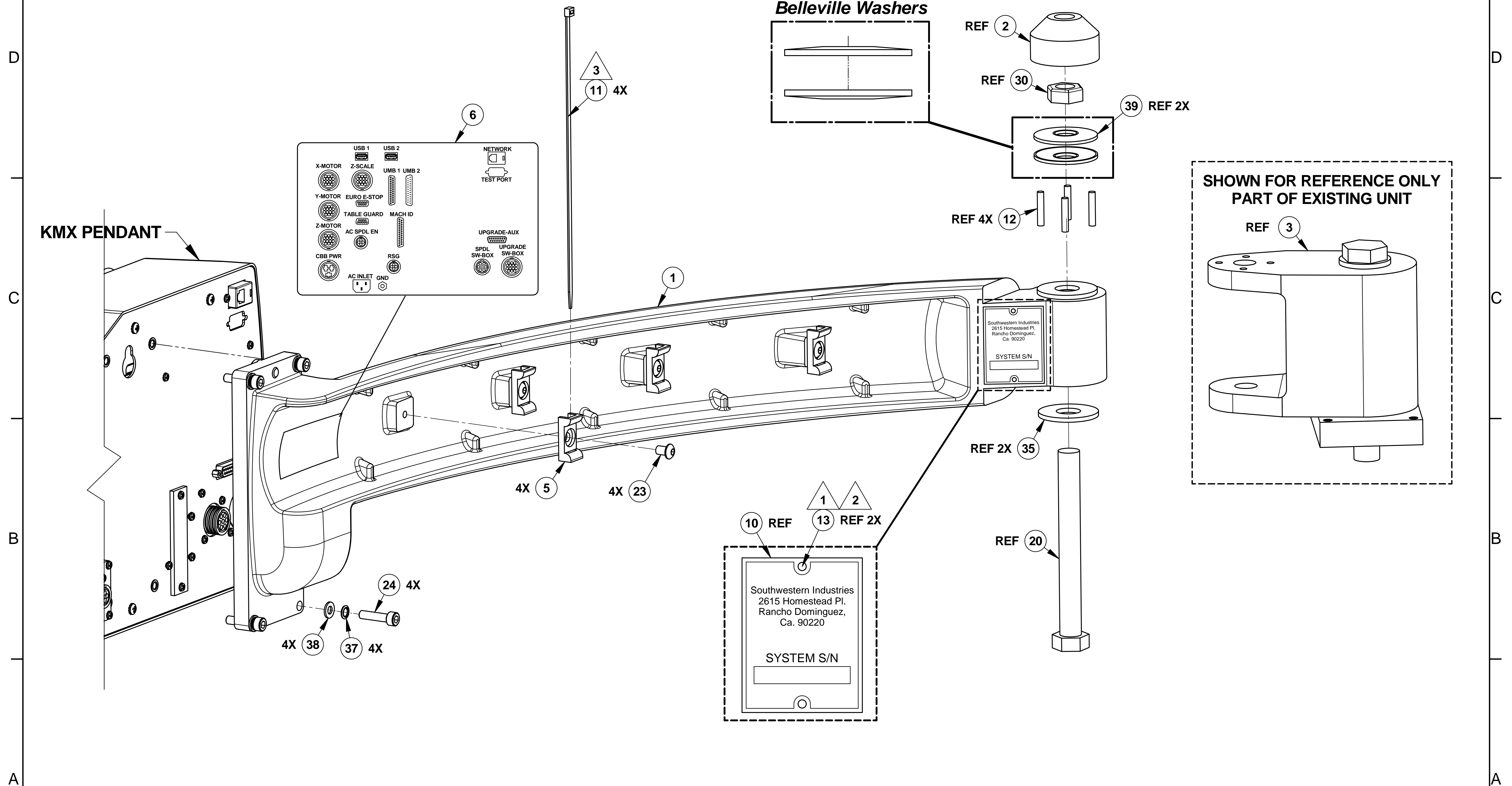
## **4.0 Drawings**

- 29756-3 PENDANT ARM KIT-TOP MOUNT-KMX UPGRADE**
- 29756-2 PENDANT ARM KIT-SIDE MOUNT-KMX RETROFIT**
- 29756-4 PENDANT ARM KIT-TOP MOUNT-KMX RETROFIT**
- 29819 SYSTEM DIAGRAM-KMX NEW MACHINES & UPGRADES**
- 23891 ELECTRONIC HANDWHEEL – KIT – KNEE MILL – X & Y AXIS**

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REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14570	09/07/16	CC	DM
B	ITEM 24 WAS: M6-1.0X20 25B.	14611	12/13/16	Sal	DM
C	ITEM 39 WAS: 9712K93	14604	1.31.17	CC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).

- 1 FOR S/N SEE ES-374.
- 2 DRILL 2 HOLES USE # 37 DRILL BIT, FASTEN NAME PLATE (ITEM 10) WITH 2 4X 3/8 34J DRIVE SCREWS (ITEM 13).
- 3 THREE ADDITIONAL CABLE TIES (ITEM 11) ARE NOT SHOWN IN DRAWING.

DIMENSIONS ARE IN INCHES DEC. X = ±.1, .XX = ±.01, .XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5	APPROVALS	DATE	<b>SOUTHWESTERN INDUSTRIES, INC.</b> 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610	<b>TITLE</b> PENDANT ARM KIT-TOP MOUNT-KMX UPGRADE	<b>REV</b> C	
	DRAWN BY	CJC				8.25.16
	ENGINEER	DSM				8.25.16
	ENGINEER					
MATERIAL	29775-CSTG		<b>SIZE</b> D	<b>CODE IDENT. NO.</b> 06238	<b>DWG NO.</b> 29756-3	
FINISH	THIRD ANGLE PROJECTION		SCALE:	SHEET 1 OF 1		

Parts List for Assembly P/N: 29756-3

Printed 1/31/2017

29756-3

PENDANT ARM KIT-TOP MOUNT-KMX UPGRADE

Type	PL	Dwg Size	D
Revision	C	Product	
Status	R	Engineer	DM
Date	4/20/2016	Planner Code	
By	CC	Comm Code	

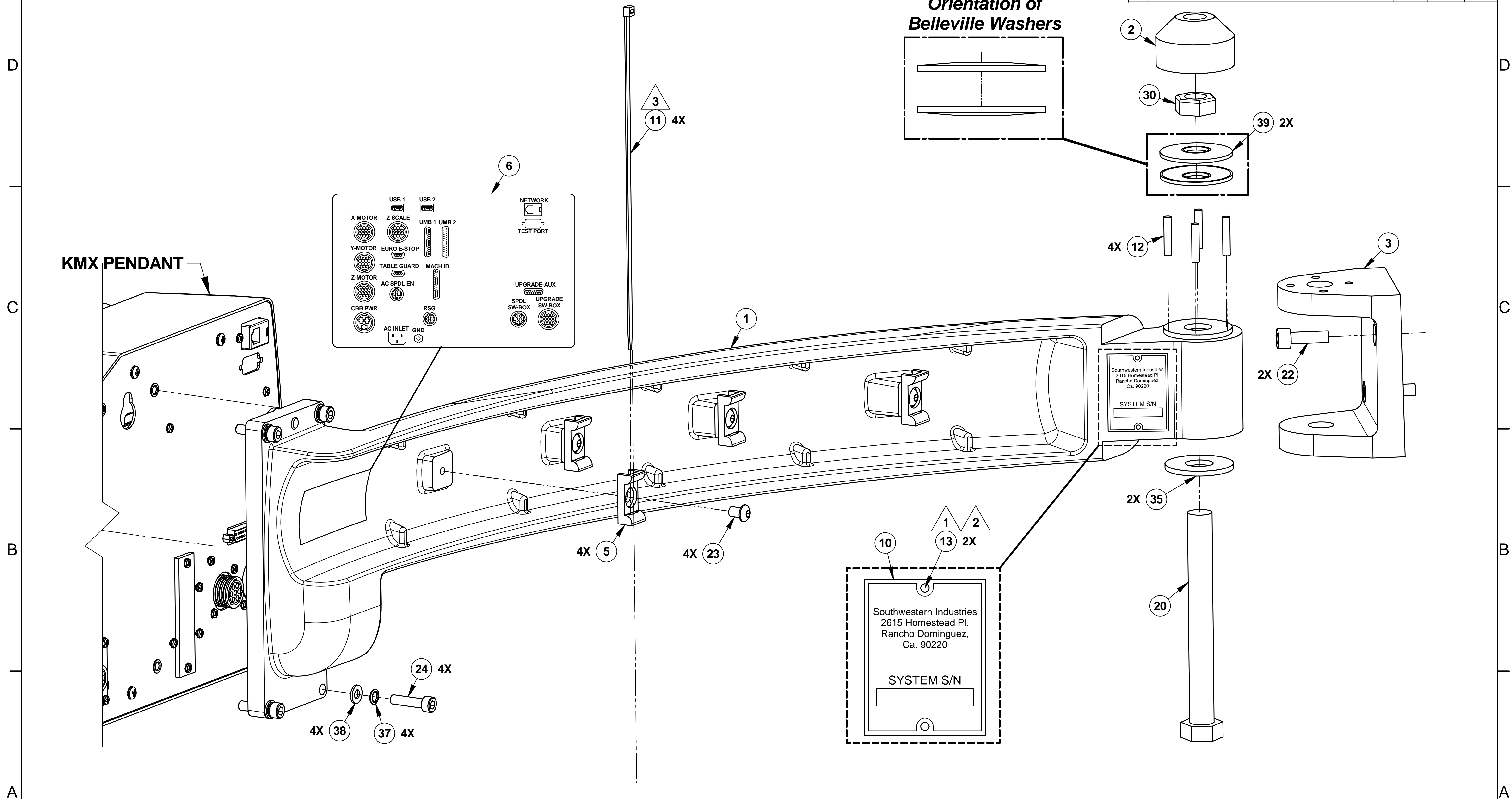
Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
1	29775-3	PENDANT ARM ASSY-KMX		1	EA	A	R	PL	
2	15896	CAP-PENDANT		(1)	EA	C	R	DWG	
3	16797	RAM SUPPORT MACHINED		(1)	EA	A	R	PL	
5	26050	CABLE TIE MOUNT		4	EA	-	R	DWG	
6	29751-1-LB1	LABEL-PENDANT-KMX		1	EA	A	R	DWG	
12	3/16X1 80P	PIN-DOWEL-STL-PLAIN		(4)	EA		R	PS	
20	5/8-18X5 1/2 24B	SCREW-HEX HD-STL-BO		(1)	EA		R	PS	
23	1/4-20X3/8 27B	SCREW-BHCS-STL-BO		4	EA		R	PS	
24	M6-1.0X25 25B	SCREW-SHCS-STL-BO		4	EA	A	R	PS	
30	5/8-18 57Z	NUT-NYLON LOCK-JAM-STL-ZINC		(1)	EA		R	PS	
35	5/8 70P	WASHER-FLAT USS-STL-PLAIN		(2)	EA		R	PS	
37	24009-3	WASHER-BELLEVILLE SPRING LK-SERRATED	.264 ID x .374 OD x .024 THK-1/4 or M6	4	EA	D	R	DWG	
38	M6 70B	WASHER-FLAT USS-STL-BO		4	EA	-	R	PS	
39	21969	WASHER-BELLEVILLE SPRING LK	.630 ID x 1.875 OD x .086 THK	(2)	EA	B	R	DWG	
45	29756-3-DOC	PENDANT ARM ASSY-TOP MOUNT- KMX UPGRADE		1	EA	A	R	DOC	



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REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14570	09/07/16	CC	DM
B	ITEM 24 WAS: M6-1.0X20 25B.	14611	12/13/16	Sal	DM
C	ITEM 39 WAS: 9712K93	14604	1.31.17	CC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).

- 1 FOR S/N SEE ES-374.
- 2 DRILL 2 HOLES USE # 37 DRILL BIT, FASTEN NAME PLATE (ITEM 10) WITH 2 4X 3/8 34J DRIVE SCREWS (ITEM 13).
- 3 THREE ADDITIONAL CABLE TIES (ITEM 11) ARE NOT SHOWN IN DRAWING.

DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5		APPROVALS	DATE	SOUTHWESTERN INDUSTRIES, INC. 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610	
MATERIAL 29775-CSTG		DRAWN BY CJC	8.25.16	TITLE PENDANT ARM KIT-SIDE MOUNT-KMX RETROFIT	
FINISH		ENGINEER DSM	8.25.16	CHECKER DSM	
THIRD ANGLE PROJECTION		SIZE D	CODE IDENT. NO. 06238	DWG NO. 29756-2	REV C
SCALE: 1:2				SHEET 1 OF 1	



Parts List for Assembly P/N: 29756-2

Printed 1/31/2017

29756-2

PENDANT ARM KIT-SIDE MOUNT-KMX RETROFIT

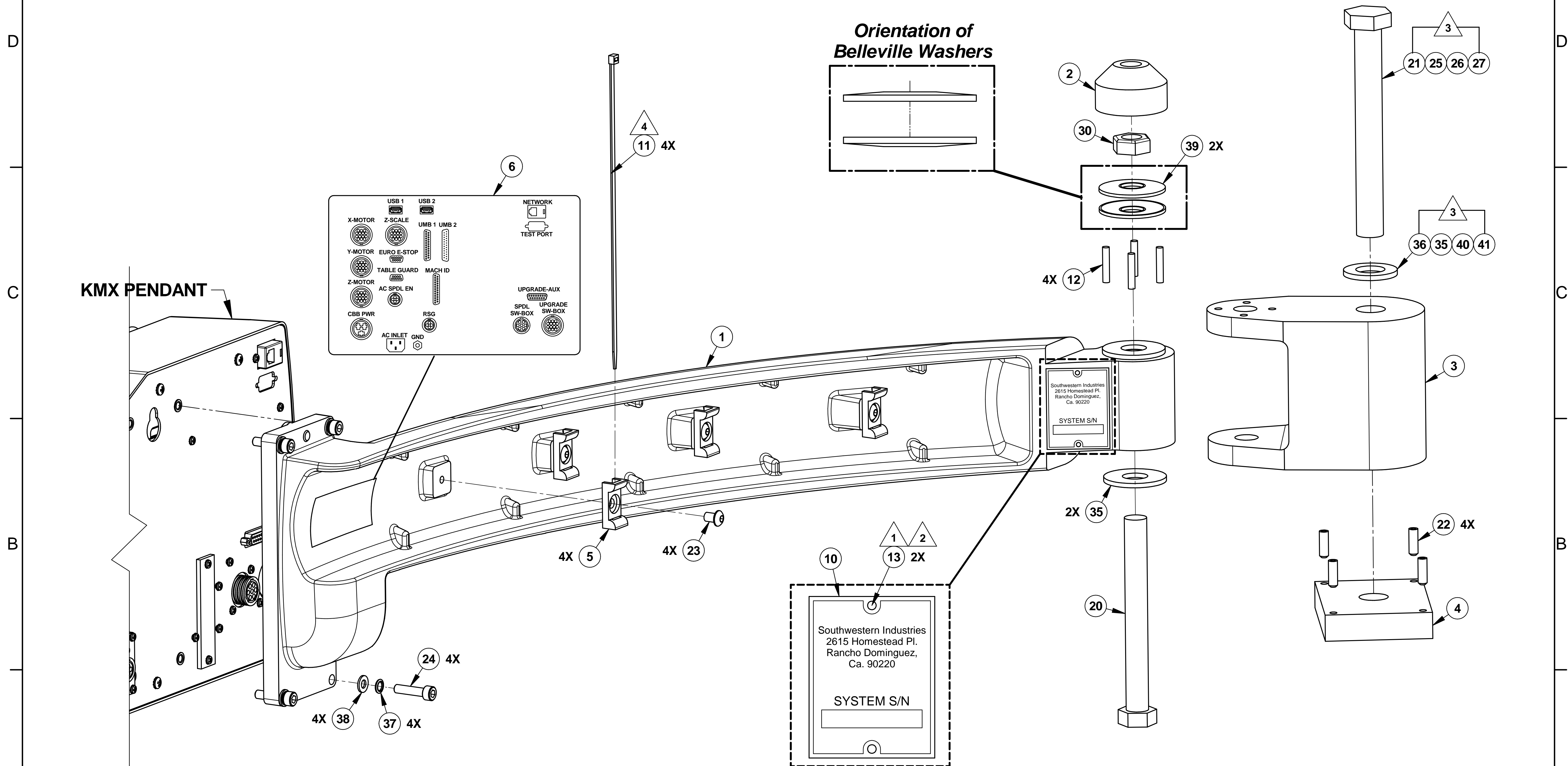
Type	PL	Dwg Size	D
Revision	C	Product	KMX
Status	R	Engineer	DM
Date	4/20/2016	Planner Code	
By	CJC	Comm Code	

Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
1	29775-3	PENDANT ARM ASSY-KMX		1	EA	A	R	PL	
2	15896	CAP-PENDANT		1	EA	C	R	DWG	
3	15992	RAM SUPPORT-MACHINED		1	EA	D	R	DWG	
5	26050	CABLE TIE MOUNT		4	EA	-	R	DWG	
6	29751-1-LB1	LABEL-PENDANT-KMX		1	EA	A	R	DWG	
10	21934	NAMEPLATE-SYSTEM S/N		1	EA	-	R	DWG	
11	21968	CABLE TIE-PLASTIC 8 IN LONG (TCA1)		4	EA	-	R	DWG	
12	3/16X1 80P	PIN-DOWEL-STL-PLAIN		4	EA		R	PS	
13	4X3/8 34J	SCREW-DRIVE-4-SS		2	EA	A	R	PS	
20	5/8-18X5 1/2 24B	SCREW-HEX HD-STL-BO		1	EA		R	PS	
22	M8-1.25X25 25B	SCREW-SHCS-STL-BO		2	EA		R	PS	
23	1/4-20 X 3/8 27B	SCREW-BHCS-STL-BO		4	EA	A	R	PS	
24	M6-1.0X25 25B	SCREW-SHCS-STL-BO		4	EA	A	R	PS	
30	5/8-18 57Z	NUT-NYLON LOCK-JAM-STL-ZINC		1	EA		R	PS	
35	5/8 70P	WASHER-FLAT USS-STL-PLAIN		2	EA		R	PS	
37	24009-3	WASHER-BELLEVILLE SPRING LK-SERRATED	.264 ID x .374 OD x .024 THK-1/4 or M6	4	EA	D	R	DWG	
38	M6 70B	WASHER-FLAT USS-STL-BO		4	EA	-	R	PS	
39	21969	WASHER-BELLEVILLE SPRING LK	.630 ID x 1.875 OD x .086 THK	2	EA	B	R	DWG	
45	29756-2-DOC	PENDANT ARM KIT-SIDE MOUNT-KMX RETROFIT		1	EA	A	R	DOC	

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REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14570	09/07/16	CC	DM
B	ITEM 24 WAS: M6-1.0X20 25B.	14611	12/13/16	Sal	DM
C	ITEM 39 WAS: 9712K93	14604	1.31.17	CC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).

- 1 FOR S/N SEE ES-374.
- 2 DRILL 2 HOLES USE # 37 DRILL BIT, FASTEN NAME PLATE (ITEM 10) WITH 2 4X 3/8 34J DRIVE SCREWS (ITEM 13).
- 3 BOLT & WASHER COMBINATION MAY VARY DEPENDING ON THE UNIT BEING REVISED
- 4 THREE ADDITIONAL CABLE TIES (ITEM 11) ARE NOT BEING SHOWN ON DRAWING.

<small>DIMENSIONS ARE IN INCHES DEC. X = ±.1, .XX = ±.01, .XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5</small>		<small>APPROVALS</small> DRAWN BY: CJC ENGINEER: DSM CHECKER: DSM		<small>DATE</small> DATE:	
<small>MATERIAL</small> 29775-CSTG		<small>THIRD ANGLE PROJECTION</small>		<small>SCALE: 1:2</small>	
<small>FINISH</small>		<small>SIZE</small> D		<small>CODE IDENT. NO.</small> 06238	
<small>FINISH</small>		<small>SIZE</small> D		<small>DWG NO.</small> 29756-4	
<small>FINISH</small>		<small>REV</small> C		<small>SHEET 1 OF 1</small>	

**SOUTHWESTERN INDUSTRIES, INC.**  
 2615 HOMESTEAD PLACE  
 RANCHO DOMINGUEZ, CA 90220-5610

TITLE: **PENDANT ARM KIT-TOP MOUNT-KMX RETROFIT**

DATE: 1.31.17

SCALE: 1:2

SHEET 1 OF 1

Parts List for Assembly P/N: 29756-4

Printed 1/31/2017

29756-4

PENDANT ARM KIT-TOP MOUNT-KMX RETROFIT

Type	PL	Dwg Size	D
Revision	C	Product	
Status	R	Engineer	DM
Date	4/20/2016	Planner Code	
By	CC	Comm Code	

Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
1	29775-3	PENDANT ARM ASSY-KMX		1	EA	A	R	PL	
2	15896	CAP-PENDANT		1	EA	C	R	DWG	
3	16797	RAM SUPPORT MACHINED		1	EA	A	R	PL	
4	16919	PLATE-LEVELING		1	EA		R	DWG	
5	26050	CABLE TIE MOUNT		4	EA	-	R	DWG	
6	29751-1-LB1	LABEL-PENDANT-KMX		1	EA	A	R	DWG	
10	21934	NAMEPLATE-SYSTEM S/N		1	EA	-	R	DWG	
11	21968	CABLE TIE-PLASTIC 8 IN LONG (TCA1)		4	EA	-	R	DWG	
12	3/16X1 80P	PIN-DOWEL-STL-PLAIN		4	EA		R	PS	
13	4X3/8 34J	SCREW-DRIVE-4-SS		2	EA	A	R	PS	
20	5/8-18X5 1/2 24B	SCREW-HEX HD-STL-BO		1	EA		R	PS	
21	3/4-10X6 24P	SCREW-HEX HD-STL-PLAIN		1	EA		R	PS	
22	1/4-20X3/4 40B	SCREW-SOC SET-STL-BO-CUP		4	EA		R	PS	
23	1/4-20 X 3/8 27B	SCREW-BHCS-STL-BO		4	EA	A	R	PS	
24	M6-1.0X25 25B	SCREW-SHCS-STL-BO		4	EA	A	R	PS	
25	1/2-13X6 24P	SCREW-HEX HD-STL-PLAIN		1	EA		R	PS	
26	5/8-11X6 24P	SCREW-HEX HD-STL-PLAIN		1	EA		R	PS	
27	M20-2.5X150 24P	SCREW-HEX HD-STL-PLAIN		1	EA		R	PS	
30	5/8-18 57Z	NUT-NYLON LOCK-JAM-STL-ZINC		1	EA		R	PS	
35	5/8 70P	WASHER-FLAT USS-STL-PLAIN		3	EA		R	PS	
36	3/4 71P	WASHER-FLAT SAE-STL-PLAIN		1	EA		R	PS	

Parts List for Assembly P/N: 29756-4  
 PENDANT ARM KIT-TOP MOUNT-KMX RETROFIT

29756-4  
 Rev C  
 Printed 1/31/2017

Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
37	24009-3	WASHER-BELLEVILLE SPRING LK-SERRATED	.264 ID x .374 OD x .024 THK-1/4 or M6	4	EA	D	R	DWG	
38	M6 70B	WASHER-FLAT USS-STL-BO		4	EA	-	R	PS	
39	21969	WASHER-BELLEVILLE SPRING LK	.630 ID x 1.875 OD x .086 THK	2	EA	B	R	DWG	
40	1/2 70P	WASHER-FLAT USS-STL-PLAIN		1	EA		R	PS	
41	M20 70P	WASHER-FLAT USS-STL-PLAIN		1	EA	A	R	PS	
45	29756-4-DOC	PENDANT ARM KIT-TOP MOUNT-KMX RETROFIT		1	EA	A	R	DOC	

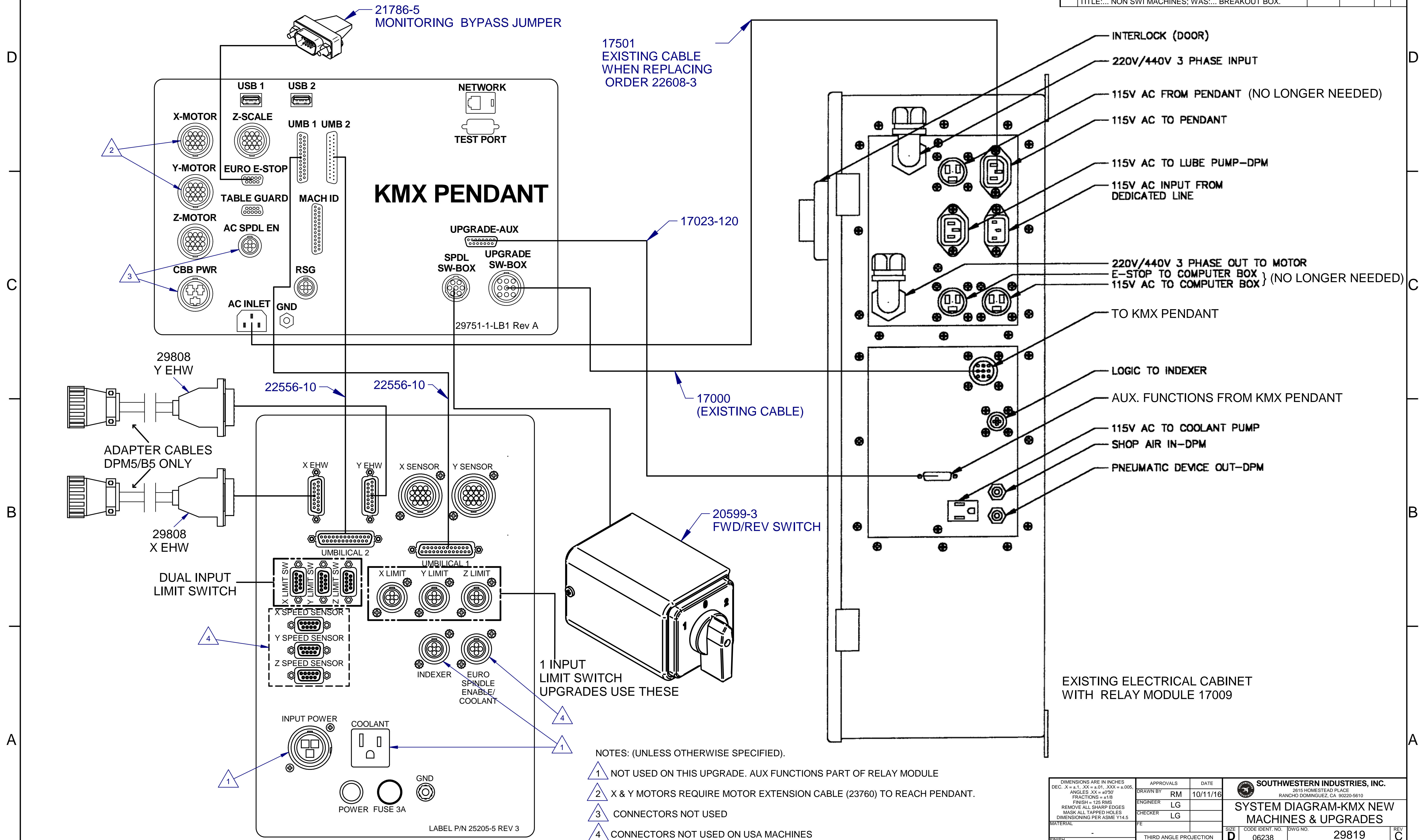


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# DPM3/DPM5 UPGRADE WITH CABLE BREAKOUT BOX

REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).

- 1 NOT USED ON THIS UPGRADE. AUX FUNCTIONS PART OF RELAY MODULE
- 2 X & Y MOTORS REQUIRE MOTOR EXTENSION CABLE (23760) TO REACH PENDANT.
- 3 CONNECTORS NOT USED
- 4 CONNECTORS NOT USED ON USA MACHINES

DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = 40°/30° FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5		APPROVALS	DATE	SOUTHWESTERN INDUSTRIES, INC. 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610	
DRAWN BY RM		10/11/16		SYSTEM DIAGRAM-KMX NEW MACHINES & UPGRADES	
ENGINEER LG					
CHECKER LG					
MATERIAL	FE	THIRD ANGLE PROJECTION	SCALE: D	CODE IDENT. NO. 06238	DWG NO. 29819
FINISH					REV C
				SHEET 1 OF 6	

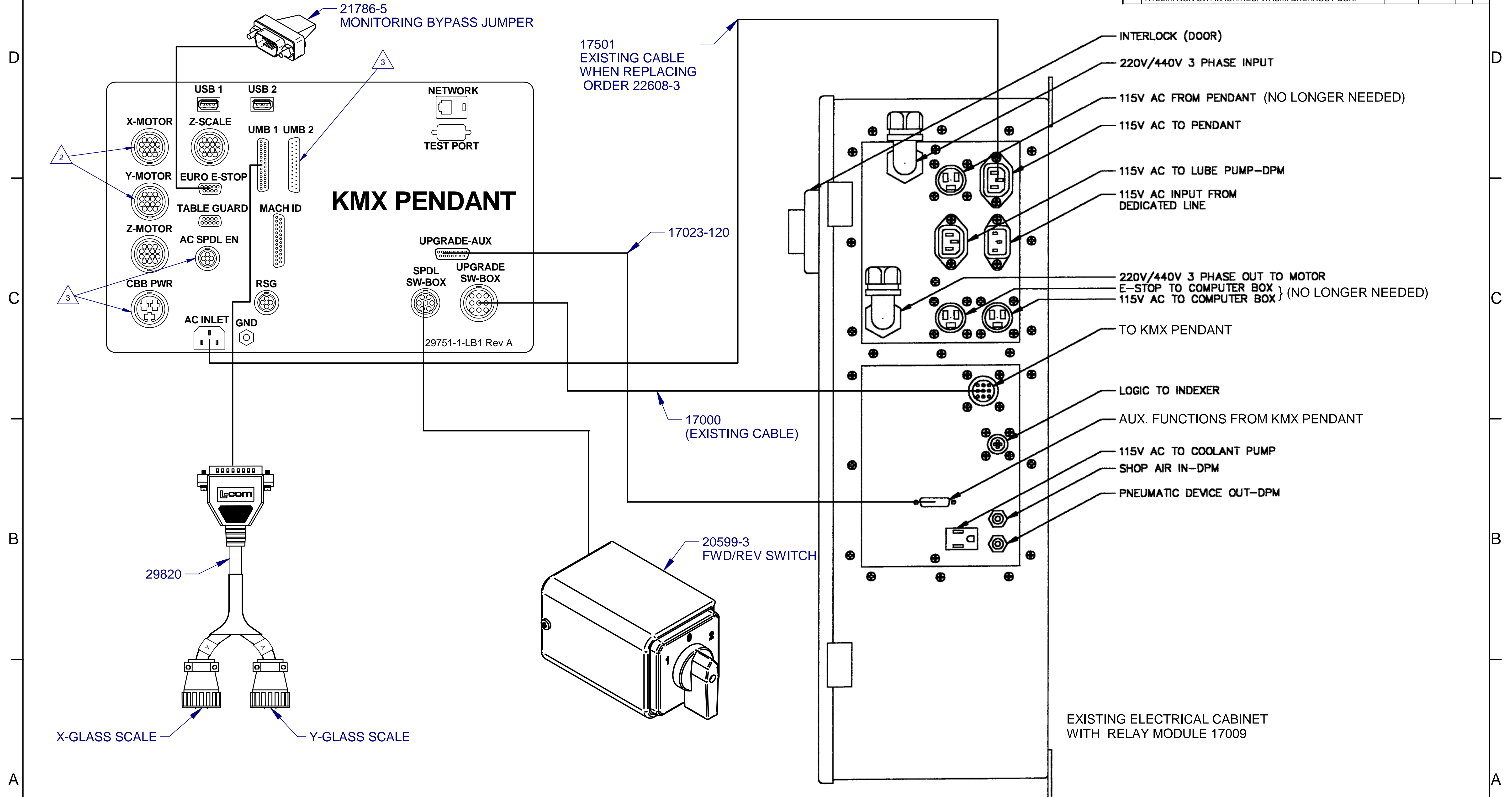


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# DPM3 UPGRADE NO CABLE BREAKOUT BOX

REV	DESCRIPTION	REVISIONS			
		ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).  
 2 X & Y MOTORS REQUIRE MOTOR EXTENSION CABLE (23760) TO REACH PENDANT.  
 3 CONNECTORS NOT USED

<small>DIMENSIONS ARE IN INCHES          DEC. X = ±.1, XX = ±.01, XXX = ±.005          ANGLES: XX = 40°/30'          FRACTIONS = ±1/8          FINISH = 125 RMS          REMOVE ALL SHARP EDGES          MASK ALL TAPPED HOLES          DIMENSIONING PER ASME Y14.5</small>		<small>APPROVALS</small> DRAWN BY: RM ENGINEER: LG CHECKER: LG	<small>DATE</small> 10/11/16	<b>SOUTHWESTERN INDUSTRIES, INC.</b> <small>2615 HOMESTEAD PLACE          RANCHO DOMINGUEZ, CA 90220-5610</small>
<small>MATERIAL</small> -		<small>THIRD ANGLE PROJECTION</small> 		<b>SYSTEM DIAGRAM-KMX NEW MACHINES &amp; UPGRADES</b> <small>CODE IDENT. NO. 06238</small> <small>DWG NO. 29819</small> <small>REV C</small>
<small>FINISH</small> -		<small>SCALE:</small> 		<small>SHEET 2 OF 6</small>



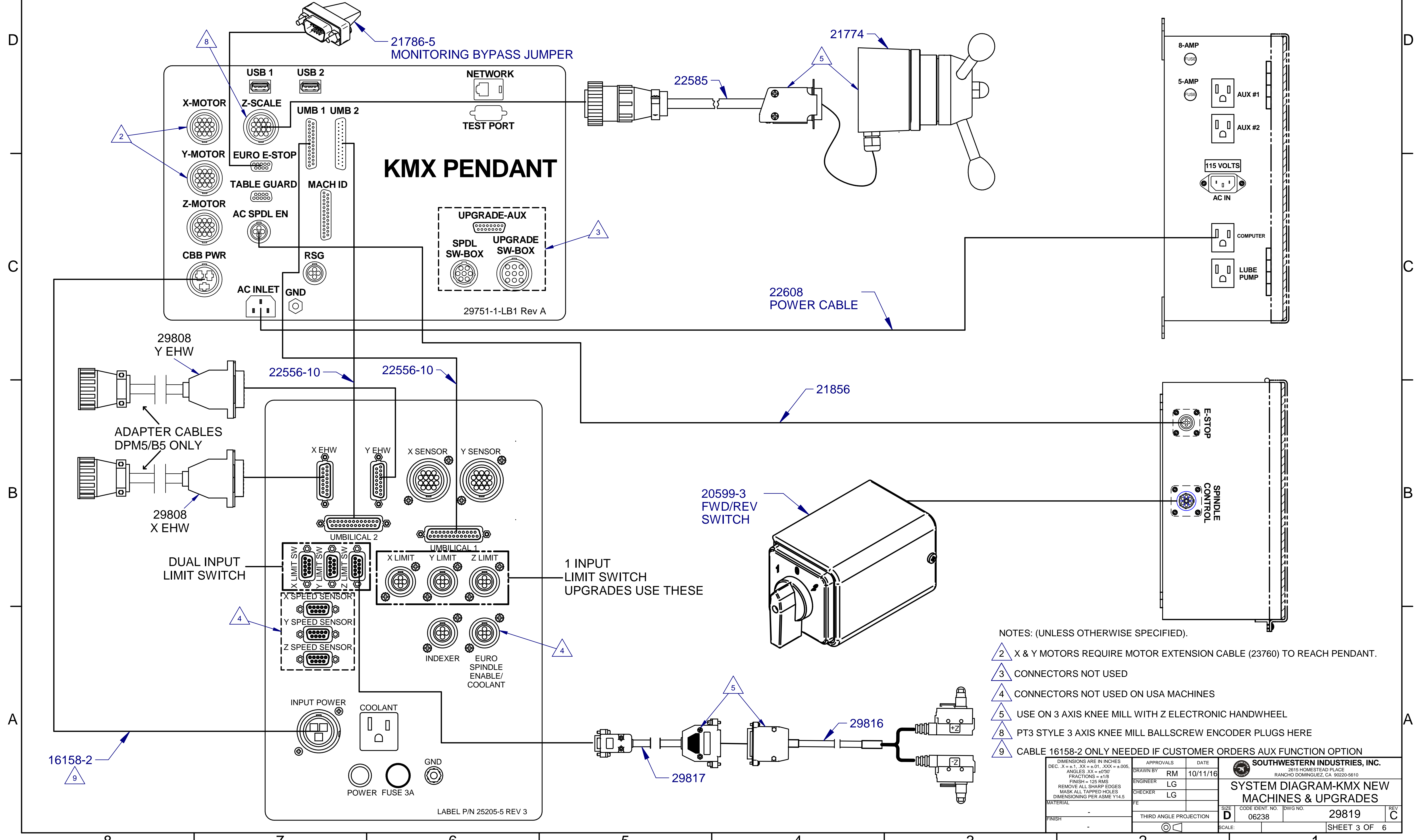
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# TRM, B3/B5 UPGRADE

## 2 AXIS & 3 AXIS KNEE MILL UPGRADE WITH CABLE BREAKOUT BOX-SWI MACHINES

REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG



- NOTES: (UNLESS OTHERWISE SPECIFIED).
- 2 X & Y MOTORS REQUIRE MOTOR EXTENSION CABLE (23760) TO REACH PENDANT.
  - 3 CONNECTORS NOT USED
  - 4 CONNECTORS NOT USED ON USA MACHINES
  - 5 USE ON 3 AXIS KNEE MILL WITH Z ELECTRONIC HANDWHEEL
  - 8 PT3 STYLE 3 AXIS KNEE MILL BALLSCREW ENCODER PLUGS HERE
  - 9 CABLE 16158-2 ONLY NEEDED IF CUSTOMER ORDERS AUX FUNCTION OPTION

<small>DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5</small>		<small>APPROVALS</small> DRAWN BY: RM ENGINEER: LG CHECKER: LG		<small>DATE</small> 10/11/16		<b>SOUTHWESTERN INDUSTRIES, INC.</b> <small>2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610</small>	
<small>MATERIAL</small> -		<small>THIRD ANGLE PROJECTION</small> 		<small>CODE IDENT. NO.</small> 06238		<small>DWG NO.</small> 29819	
<small>FINISH</small> -		<small>SCALE:</small> 		<small>REV</small> C		<small>SHEET 3 OF 6</small>	

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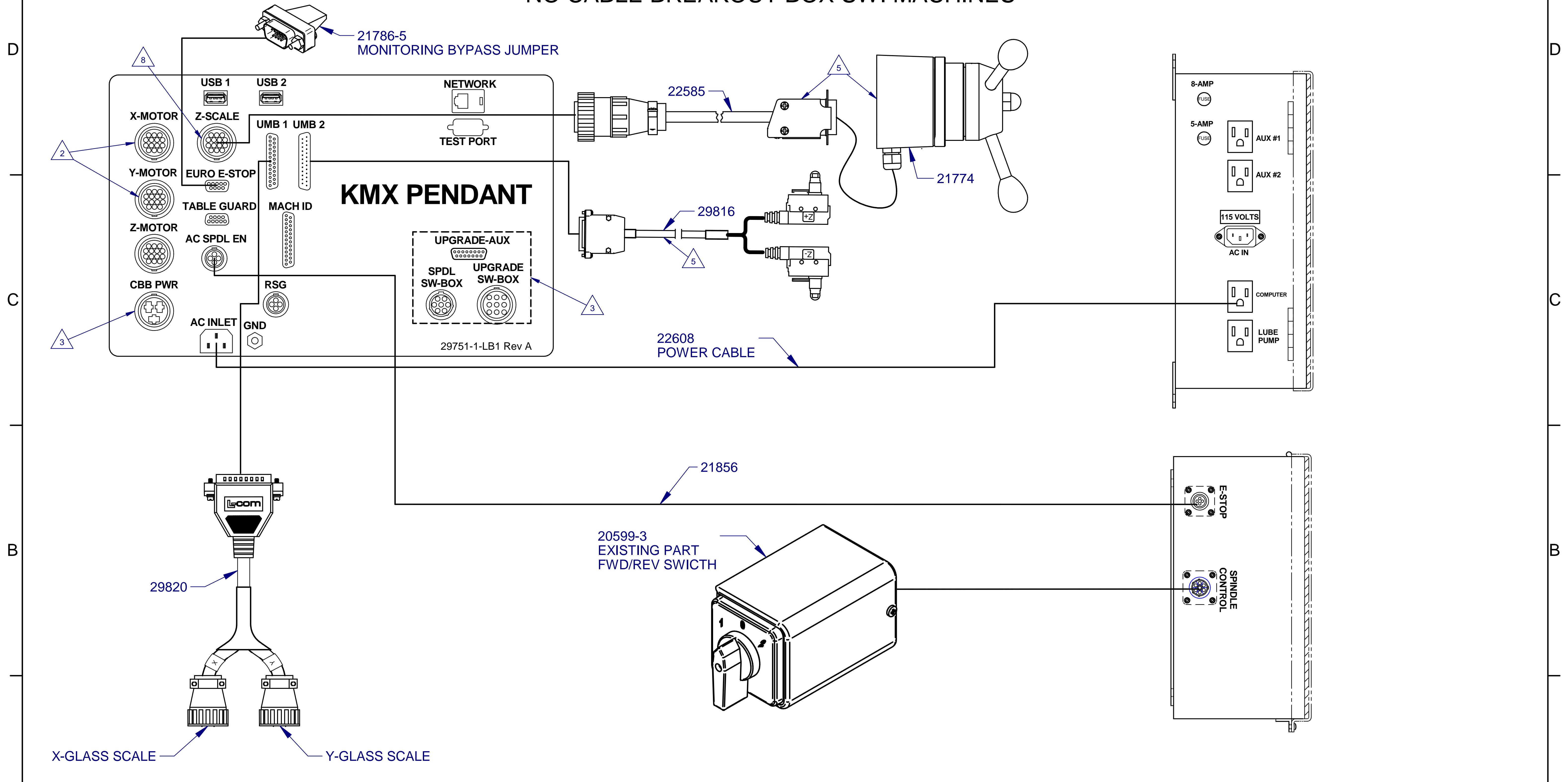
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# TRM,B3 UPGRADE

## 2 AXIS & 3 AXIS KNEE MILL UPGRADE

### NO CABLE BREAKOUT BOX-SWI MACHINES

REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG



NOTES: (UNLESS OTHERWISE SPECIFIED).

- 2 ON B3, X & Y MOTORS REQUIRE MOTOR EXTENSION CABLE (23760) TO REACH PENDANT.
- 3 CONNECTORS NOT USED
- 5 USE ON 3 AXIS KNEE MILL WITH Z ELECTRONIC HANDWHEEL
- 8 PT3 STYLE 3 AXIS KNEE MILL BALLSCREW ENCODER PLUGS HERE

<small>DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5</small>		<small>APPROVALS</small> DRAWN BY: RM ENGINEER: LG CHECKER: LG	<small>DATE</small> 10/11/16	<small>SOUTHWESTERN INDUSTRIES, INC.</small> 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610
<small>MATERIAL</small> -		<small>THIRD ANGLE PROJECTION</small>		<small>SYSTEM DIAGRAM-KMX NEW MACHINES &amp; UPGRADES</small>
<small>FINISH</small> -	<small>SCALE</small> D	<small>CODE IDENT. NO.</small> 06238	<small>DWG NO.</small> 29819	<small>REV</small> C
			<small>SHEET 4 OF 6</small>	

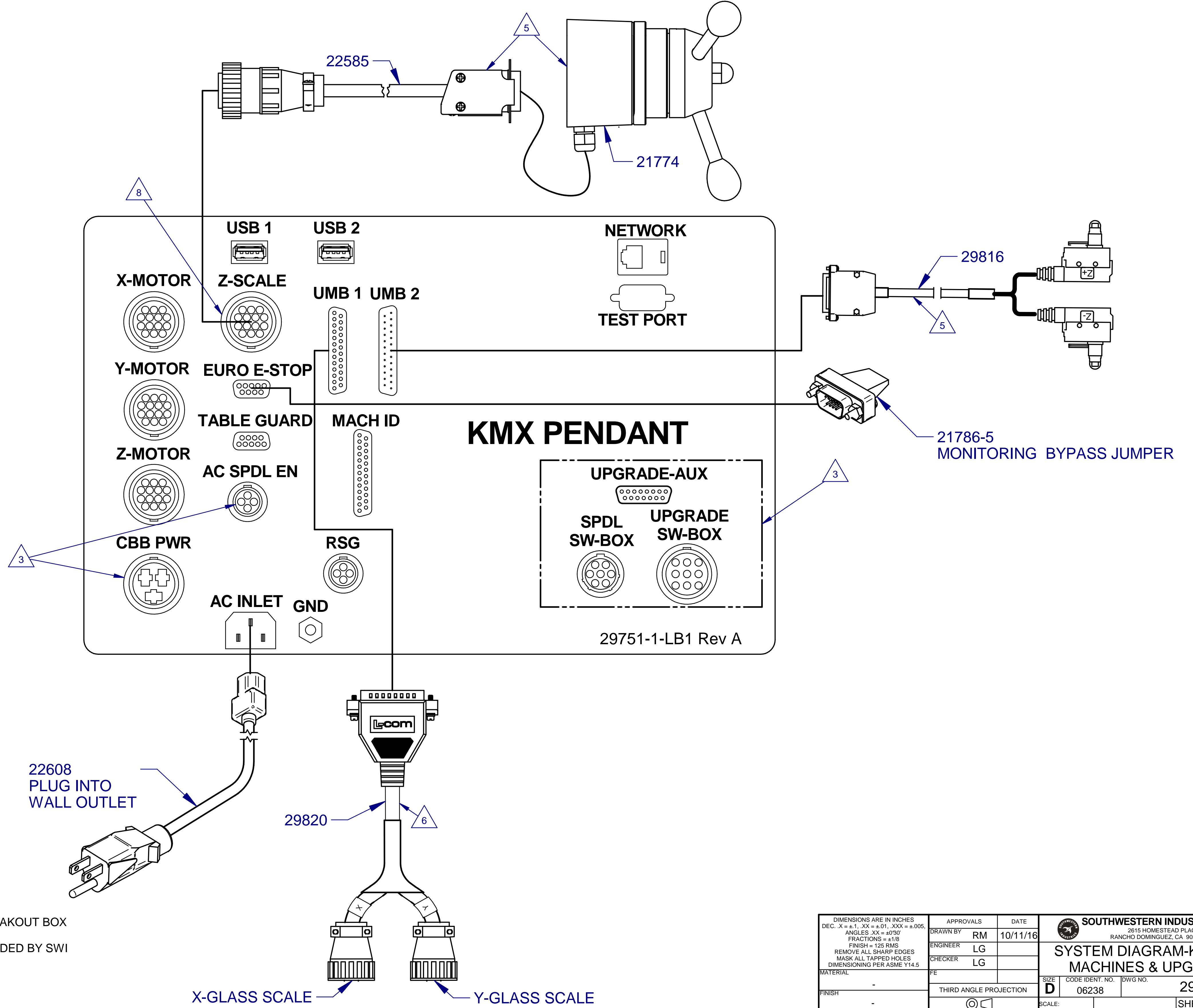


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REVISIONS					
REV	DESCRIPTION	ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG

# KMX 2 AXIS RETRO OR UPGRADE NO CABLE BREAKOUT BOX-NON SWI MACHINES KMX 3 AXIS RETRO OR UPGRADE NO CABLE BREAKOUT BOX-NON SWI MACHINES



NOTES: (UNLESS OTHERWISE SPECIFIED).

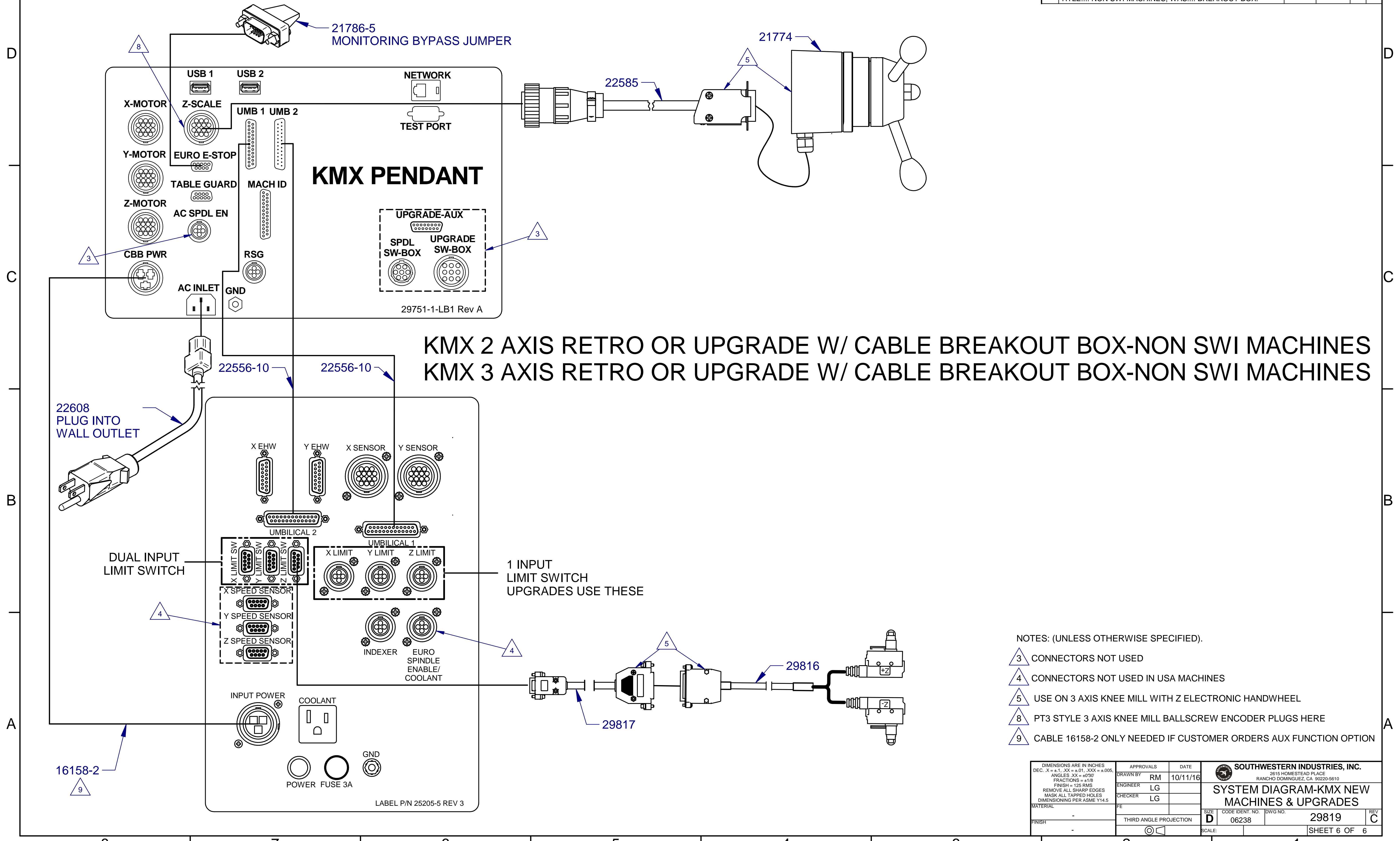
- 3 CONNECTORS NOT USED
- 5 USE ON 3 AXIS KNEE MILL WITH Z ELECTRONIC HANDWHEEL
- 6 CABLE NEEDED IF USER ORDERS CLASS SCALE OPTION AND NO CABLE BREAKOUT BOX
- 7 ELECTRICAL BOX AND FWD/REV SWITCH PART OF MACHINE AND NOT PROVIDED BY SWI
- 8 PT3 STYLE 3 AXIS KNEE MILL BALLSCREW ENCODER PLUGS HERE

<small>DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = 40°/50° FRACTIONS = 1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5</small>		<small>APPROVALS</small> DRAWN BY: RM ENGINEER: LG CHECKER: LG		<small>DATE</small> 10/11/16		<b>SOUTHWESTERN INDUSTRIES, INC.</b> <small>2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610</small>	
<small>MATERIAL</small> -		<small>THIRD ANGLE PROJECTION</small> 		<small>SIZE</small> <b>D</b>		<small>CODE IDENT. NO.</small> 06238	
<small>FINISH</small> -		<small>SCALE</small> 		<small>DWG NO.</small> 29819		<small>REV</small> C	
				<small>SHEET 5 OF 6</small>			

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REV	DESCRIPTION	REVISIONS			
		ECN	DATE	DFT	ENG
A	PRODUCTION RELEASE	14578	10/28/16	RM	LG
B	(2C7) DELETED 22556-10	14713	08/14/17	AC	LG
C	(3B4)(4B5) 21856 WAS: 21856 EXISTING CABLE. SHEET 6 TITLE:... NON SWI MACHINES; WAS:... BREAKOUT BOX.	14742	09/29/17	AC	LG

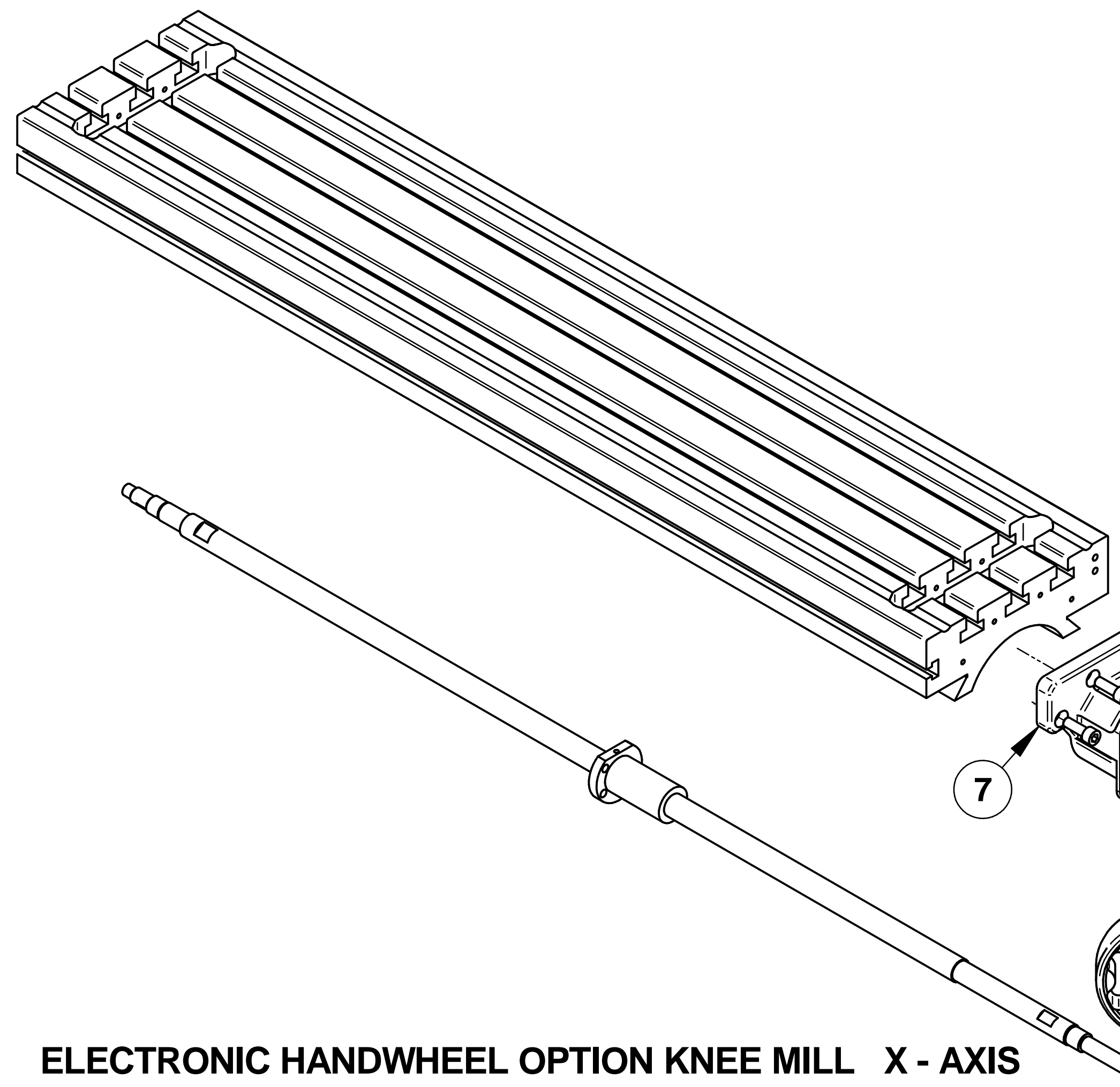


DIMENSIONS ARE IN INCHES DEC. X = ±.1, XX = ±.01, XXX = ±.005 ANGLES: XX = ±0°30' FRACTIONS = ±1/8 FINISH = 125 RMS REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONING PER ASME Y14.5		APPROVALS DRAWN BY: RM ENGINEER: LG CHECKER: LG	DATE 10/11/16	<b>SOUTHWESTERN INDUSTRIES, INC.</b> 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA 90220-5610	
MATERIAL: -		THIRD ANGLE PROJECTION		SIZE: <b>D</b>	CODE IDENT. NO.: 06238
FINISH: -		SCALE: 1		DWG NO.: 29819	REV: C
				SHEET 6 OF 6	

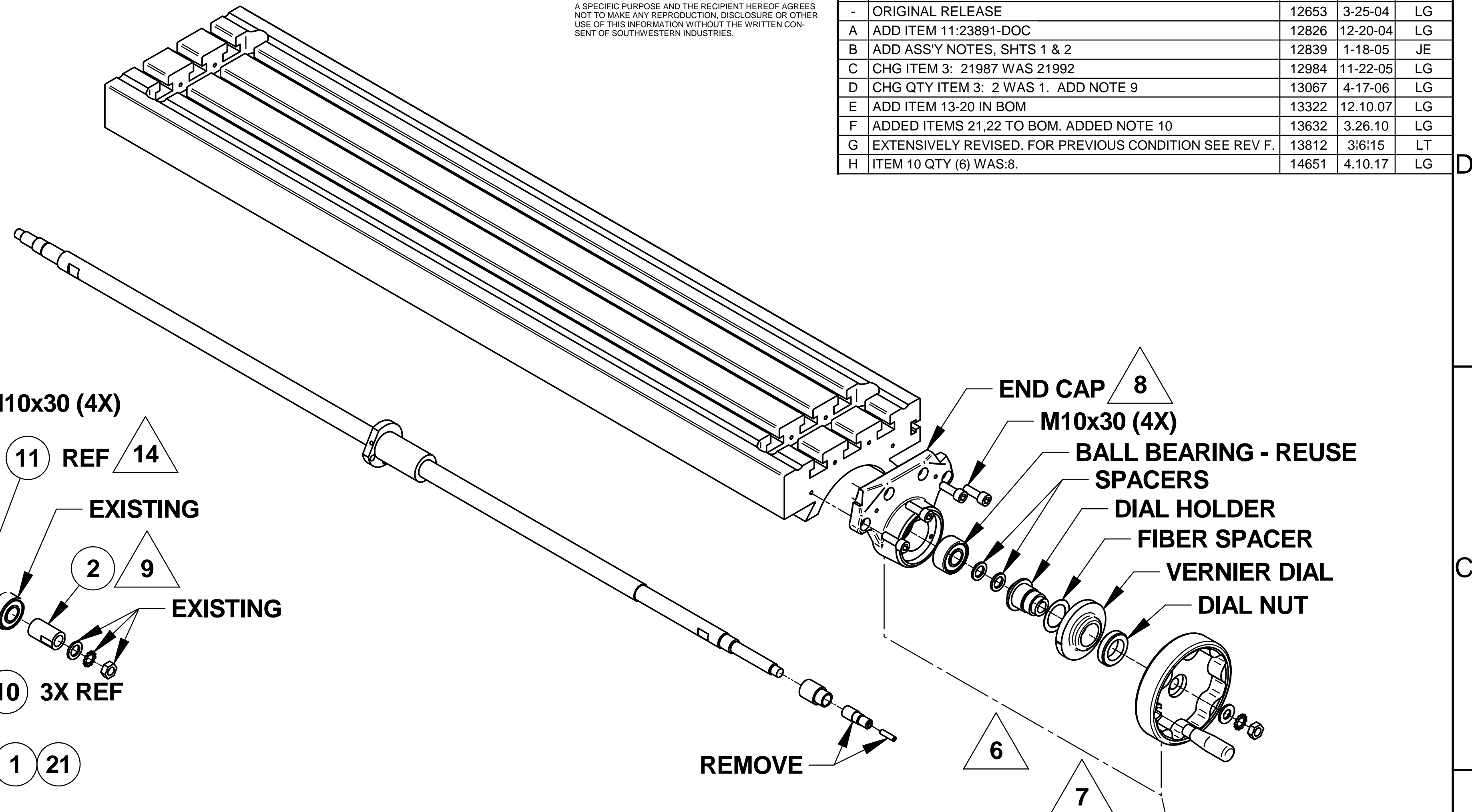


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REVISIONS				
REV	DESCRIPTION	ECN	DATE	APPRV
-	ORIGINAL RELEASE	12653	3-25-04	LG
A	ADD ITEM 11:23891-DOC	12826	12-20-04	LG
B	ADD ASS'Y NOTES, SHTS 1 & 2	12839	1-18-05	JE
C	CHG ITEM 3: 21987 WAS 21992	12984	11-22-05	LG
D	CHG QTY ITEM 3: 2 WAS 1. ADD NOTE 9	13067	4-17-06	LG
E	ADD ITEM 13-20 IN BOM	13322	12.10.07	LG
F	ADDED ITEMS 21,22 TO BOM. ADDED NOTE 10	13632	3.26.10	LG
G	EXTENSIVELY REVISED. FOR PREVIOUS CONDITION SEE REV F.	13812	3/6/15	LT
H	ITEM 10 QTY (6) WAS:8.	14651	4.10.17	LG



**ELECTRONIC HANDWHEEL OPTION KNEE MILL X - AXIS**



**STANDARD KNEE MILL X - AXIS**

**ALL PARTS TO BE REMOVED FOR INSTALLATION OF ELECTRONIC HANDWHEEL OPTION EXCEPT BALL BEARING.**

**NOTES: UNLESS OTHERWISE SPECIFIED**

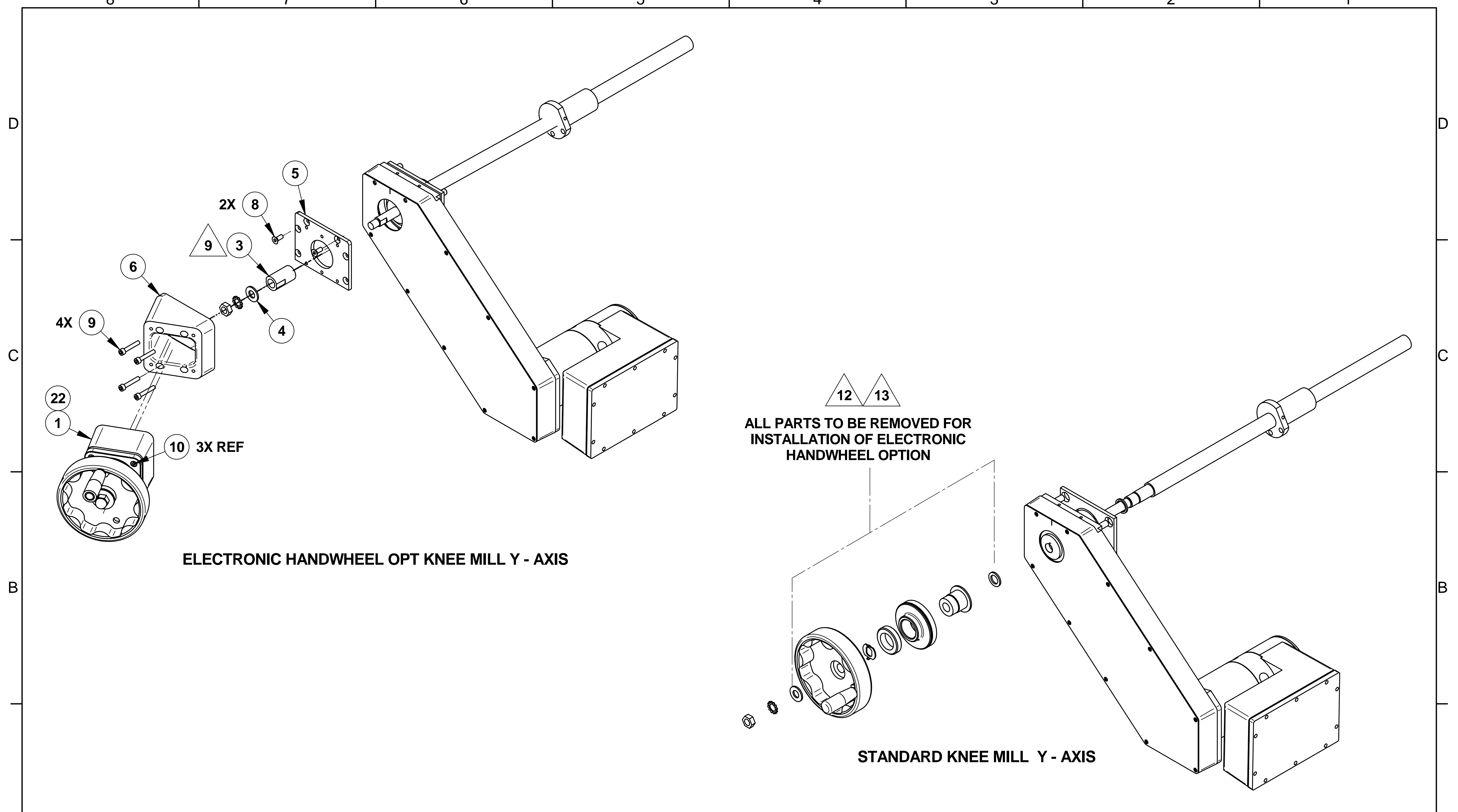
1. RECORD ROLLING TORQUE 3 PLCS BEFORE DISASSEMBLING.
2. ALIGN RIGHT SIDE OF TABLE WITH SADDLE.
3. REMOVE PARTS PER DRAWING.
4. INSTALL PARTS PER DRAWING.
5. ALIGN BRACKET TO MAINTAIN SAME TORQUE.
- △ 6. RETURN TO STOCK: 15616 (HANDWHEEL ASSY), 15057 (SHAFT EXTENSION). (1C2)
- △ 7. RETURN TO BINS: 16534 (DIAL HOLDER), 15836 (DIAL NUT), 16533 (VERNIER DIAL). (1B2)
- △ 8. RETURN TO DPMS3 BIN FOR REUSE ON DPMS3. (1C1)
- △ 9. ON K2 USE BUSHING 21987 (ITEM 3) ON X AND Y.  
ON K3 AND K4 USE BUSHING 21992-1 (ITEM 2) ON X AND BUSHING 21987 (ITEM 3) ON Y. (1C5, 2C7)
10. APPLY LABELS (ITEM 21& 22) TO HANDWHEEL (ITEM 1) ON CABLE AT THE CONNECTOR END.

(SEE SHEET 2 FOR ADDITIONAL NOTES)

△ 14. 15058-7 (ITEM 11) IS PART OF BALLSCREW EXTENSION KIT

FOR PARTS LIST SEE SEPARATE "A" SIZE SHEET

DIMENSIONS ARE IN MILLIMETERS 1-4 +0.020, 4-16 ±0.025 16-63 ±0.050, 63-250 ±0.070, 250-1000 ±0.100, 1000-1500 ±0.200 REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONS PER ASME Y14.5		APPROVALS DRAWN BY JJ 2-10-04 ENGINEER LG 3-01-04 MFE PE		DATE 2-10-04 3-01-04		SOUTHWESTERN INDUSTRIES, INC. 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA. 90220-5610			
MATERIAL		FINISH		SCALE: 1 : 2		TITLE <b>ELECTRONIC HANDWHEEL- KIT-KNEE MILL-X &amp; Y AXIS</b>		REV H	
SIZE D		CODE IDENT. NO. 06238		DWG NO. 23891		SHEET 1 OF 2			



**ELECTRONIC HANDWHEEL OPT KNEE MILL Y - AXIS**

**ALL PARTS TO BE REMOVED FOR  
INSTALLATION OF ELECTRONIC  
HANDWHEEL OPTION**

**STANDARD KNEE MILL Y - AXIS**

- 11. INSTALL OPTION PER DRAWING.
- 12 RETURN TO STOCK: 15616 (HANDWHEEL ASSY). (2C4)
- 13 RETURN TO BIN: 16533 (VERNIER DIAL), 15627-1 (DIAL HOLDER), & 15836 (DIAL NUT). (2C4)

FOR PARTS LIST SEE SEPARATE "A" SIZE SHEET

DIMENSIONS ARE IN MILLIMETERS 1-4 +0.020, 4-16 ±0.025 16-63 ±0.050, 63-250 ±0.070, 250-1000 ±0.100, 1000-1500 ±0.200 REMOVE ALL SHARP EDGES MASK ALL TAPPED HOLES DIMENSIONS PER ASME Y14.5		APPROVALS	DATE	SOUTHWESTERN INDUSTRIES, INC. 2615 HOMESTEAD PLACE RANCHO DOMINGUEZ, CA. 90220-5610		
DRAWN BY	JJ	2-10-04		TITLE <b>ELECTRONIC HANDWHEEL- KIT-KNEE MILL-X &amp; Y AXIS</b>		
ENGINEER	LG	3-01-04				
MATERIAL	FE	SIZE	CODE IDENT. NO.	DWG NO.	REV	
FINISH		D	06238	23891	H	
SCALE: 1 : 2				SHEET 2 OF 2		

Parts List for Assembly P/N: 23891

Printed 4/10/2017

23891

ELECTRONIC HANDWHEEL KIT-KNEE MILL-X & Y AXIS

Type	PL	Dwg Size	D
Revision	H	Product	K-MILL
Status	R	Engineer	LG
Date	1/30/2004	Planner Code	
By	JJ	Comm Code	

Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
1	21946	ELEC HANDWHEEL-X & Y AXIS		2	EA	K	R	PL	
2	21992-1	BUSHING - BALL SCREW	1.125 LG.	1	EA	C	R	DWG	
3	21987	BUSHING-Y-AXIS		2	EA	B	R	DWG	
4	14772	SPACER-CNC X AXIS HANDLE	.100" THICK	1	EA	B	R	DWG	
5	21984	BRACKET - WAY COVER FRONT Y-AXIS DRIVE		1	EA	F	R	DWG	
6	21985	SPACER ANGLED 30 DEGREE Y-AXIS		1	EA	E	R	PL	
7	22718	SPACER 45° - MACHINED		1	EA	C	R	DWG	
8	1/4-20X5/8 26B	SCREW-FHCS-STL-BO		2	EA		R	PS	
9	M6-1.0X25 25B	SCREW-SHCS-STL-BO		4	EA	A	R	PS	
10	M6-1.0X75 25B	SCREW-SHCS-STL-BO		(6)	EA	-	R	PS	
11	15058-7	BUSHING		(1)	EA	L	R	DWG	
12	23891-DOC	ELECTRONIC HANDWHEEL KIT - KNEE MILL		1	EA	-	R	DOC	
13	15616	HANDWHEEL ASSY w/ FOLD-AWAY HANDLE		-2	EA	E	R	PL	
14	15614	WASHER-TAB		-1	EA	A	R	DWG	
15	22007	END CAP-X AXIS FC006		-1	EA	A	R	DWG	
16	16534	FRU-DPM-DIAL HOLDER DPM X-AXIS		-1	EA		R	DWG	
17	15627-1	DIAL HOLDER		-1	EA	G	R	DWG	
18	16533	VERNIER DIAL		-2	EA	-	R	DWG	PJ
19	15836	DIAL NUT		-2	EA	A	R	DWG	
20	15057	EXTENSION-SHAFT		-1	EA	G	R	DWG	
21	22768-36	LABEL-TEXT-WHITE-1.00W x 1.437H	EHW X	1	EA	AD	R	DWG	

TRAK Machine Tools  
Southwestern Industries, Inc

# TRAK Warranty Policy

## Warranty

TRAK products are warranted to the original purchaser to be free from defects in workmanship and materials for the following periods:

Product	Warranty Period	
	Materials	Factory Labor
New TRAK/ProtoTRAK	1 Year	1 Year
Any EXCHANGE Unit	90 Days	90 Days

The warranty period starts on the date of the invoice to the original purchaser from Southwestern Industries, Inc. (SWI) or their authorized distributor.

If a product, subsystem or component proves to be defective in workmanship and fails within the warranty period, it will be repaired or exchanged at our option for a properly functioning unit in similar or better condition. Such repairs or exchanges will be made FOB Factory/Los Angeles or the location of our nearest factory representative or authorized distributor.

## Warranty Disclaimers

- This warranty is expressly in lieu of any other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability on the part of SWI (or any producing entity, if different).
- Warranty repairs/exchanges do not cover incidental costs such as installation, labor, freight, etc.
- SWI is not responsible for consequential damages from use or misuse of any of its products.
- TRAK products are precision mechanical/electromechanical/electronic systems and must be given the reasonable care that these types of products require. Evidence that the product does not receive adequate Preventative Maintenance may invalidate the warranty. Excessive chips built up around ballscrews and way surfaces is an example of this evidence.
- Accidental damage, beyond the control of SWI, is not covered by the warranty. Thus, the warranty does not apply if a product has been abused, dropped, hit or disassembled.
- Improper installation by or at the direction of the customer in such a way that the product consequently fails, is considered to be beyond the control of the manufacturer and outside the scope of the warranty.
- Warranty does not cover wear items that are consumed under normal use of the product. These items include, but are not limited to: windows, bellows, wipers, filters, drawbars and belts.

Parts List for Assembly P/N: 23891  
ELECTRONIC HANDWHEEL KIT-KNEE MILL-X & Y AXIS

23891

Rev H

Printed 4/10/2017

Item	P/N	Title	Detail	Qty	UseAs	Rev	Stat	Type	Mfr
22	22768-37	LABEL-TEXT-WHITE-1.00W x 1.437H	EHW Y	1	EA	AD	R	DWG	