

# DENSO Robot Swap out Manual

**\*\*Attention\*\***

Read this resource material carefully and in its entirety before use, to ensure it is understood and used properly. Failure to properly follow the instructions in the resource materials DPAM provides may result in damage to your equipment. As a result, by using the resource materials, you are assuming the risks associated with modifying your equipment. DENSO holds no liability, implied or otherwise, for damage, injury or any legal responsibility incurred, directly or indirectly from the use of the resource materials, including any loss of data or damage to property which may occur by your use of the resource materials. The use of the resource materials are not recommended unless you have technical knowledge and functional experience with the equipment and related software. DENSO is unable to provide support, remote or otherwise, for the information included in the resource material, nor for the ancillary topics relating to the information included in the resource materials. Therefore, if you are not fully comfortable with it, we strongly recommend that you send your unit to one of our Regional Support Centers for repair. The information contained in the resource materials are subject to change at the sole discretion of DPAM.

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## 1. Overview of Swapping Out a Robot Arm

### Step 1

Determine if you have a compatible spare robot,  
If you're not sure contact a Denso Regional  
Service Dealer or call **1-888-4ROBOTX** for more information.



### Step 2

Remove your damaged robot



### Step 3

Install your compatible spare robot arm.



### Step 4

CALSET your spare robot to the controller.



### Step 5

5

Verify your positions.



## Step 6

Contact a Denso Regional Service Dealer for Service or call **1-888-4ROBOTX** for more information.

## 2. Is Your Spare Robot Arm Compatible?

- When swapping out a robot, the first item which must be confirmed is if you have a compatible spare arm. Spare robots must be an exact model replacement. To confirm the compatibility of a spare robot arm, you must reference the model number of the failed robot. Over the years, different model numbers for robots have been used to designate what robot controller they were manufactured with. Below is a short list of different robot model numbers that are compatible with each other.

VS6556E-BW = VS6556G-BW = VS6556M-BW – The robots specified here are all the same model robot and are 100% compatible with one another

HM40852E2-W = HM40852E2/G-W = HM40852E2/M-W – The robots specified here are all the same model robot and are 100% compatible with one another.

Note: There is typically a good deal of confusion surrounding the robot model number, and their compatibilities with one another. If a situation arises where you are unsure the compatibility of a spare robot, and a damaged robot, please contact a Denso Regional Service Dealer or **Denso Robotics at 1-888-4ROBOTX** with your robot model numbers, and the robot serial numbers.

## 3. Removing Your Damaged Robot Arm

\*Note - An up-to-date backup project for your robot controller is critical. If your facility doesn't currently perform regular backups of your Denso Robot controller, it is highly

recommended you implement a regular recurring schedule to extract backup projects from all Denso Robot equipment in your facility. If you don't have a current backup project of the controller connected to your faulty arm, create a backup before turning power off and removing the robot arm.

- Using WINCAPS III create a backup of the controller that is connected to the faulty robot arm.
- Power down the controller and remove the power source cable. Note the location of and disconnect all wiring and airlines going to the wiring plate on the back of the robot.
- Note the orientation of the tooling, wiring, air lines, ect connected to the end of the robot arm and remove.
- Have someone support the robot arm as you unbolt it from your work cell. The robot arm likely has dowel pins installed for alignment.
- Carefully remove the robot arm from the work cell.

## 4. Installing the Replacement Robot Arm

- Before you install the replacement arm it's a good idea to note or take a picture of the RANG sticker located at the base of the robot in the event that the RANG Sticker is not viewable once the arm is bolted in place.
- Carefully place the robot arm in position within your work cell.
- Align dowels and mounting holes, torque the mounting bolts to specifications of your robot arm.
- Reconnect all wiring and airlines that you noted and removed from the robot arm in step 3.  
\* **Do not install the end of arm tooling at this time**, this will be done after the CALSET is performed.
- Reconnect the power cable to your controller and power on the system.

## 5. After Powering on the Replacement Robot Arm

### 5.1.1 Resetting encoders

If the robot has been in storage for a long period, you may end up with **J\* encoder system down failures**. If these errors are not present, proceed to the next step. If you do have these errors reset the encoders using the encoder reset function on the teaching pendant.

Press **[Setting]->[Login]->[Maintainer]->[5596060]->[Cancel to the main screen]->[Arm]->[Shift]->[Maintenance]->[Encoder]->[Encoder Reset]**(Reset each joint).

\*After Encoders have been reset you **must** restart the controller. Power off and then power back on.

### 5.1.2 Changing RANG Data

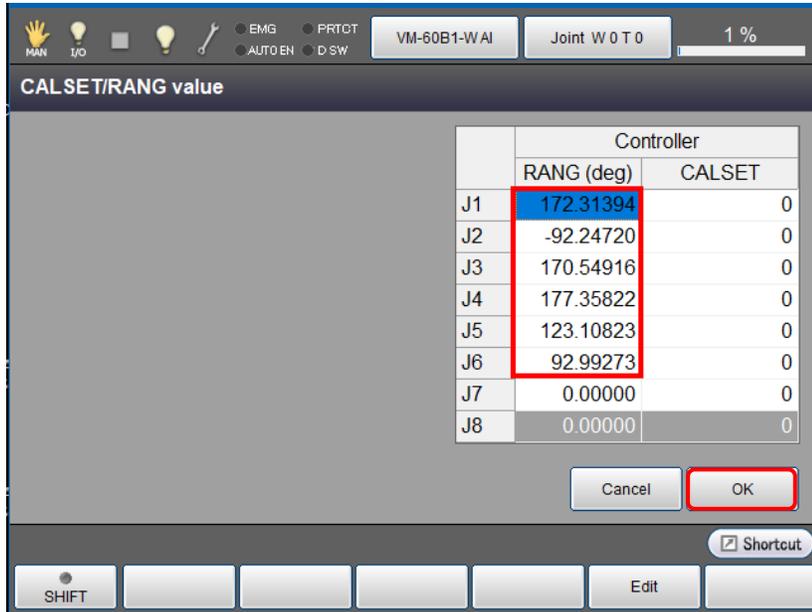
The RANG values for each robot arm are unique, these calculated numbers represent the distance from 0 degrees (In a known direction + or -) to the CALSET position hard stops for each joint. These numbers are different from robot to robot even in the same model type arms because the castings for each joint are not *exactly* the same. Inputting the RANG data then performing a CALSET allows us to get as close as possible to the same coordinate positions as the robot arm that was just removed.

- The next step will be to input the RANG Data from the sticker at the base of the robot.

RANG	
1	172.88910
2	-103.98430
3	171.12139
4	182.07478
5	124.13509
6	94.90647

- You must login as *Maintainer* to change RANG values. **[Setting]->[Login]->[Maintainer]->[5596060]->[OK]**
- After you've logged in as *Maintainer*, navigate to the RANG Input Screen **[Arm]->[Shift]->[Maintenance]->[CALSET]->[Input Number]**

- Edit each joints RANG (deg) and input the value from the RANG Sticker, once the values match the RANG Sticker press **[OK]**.



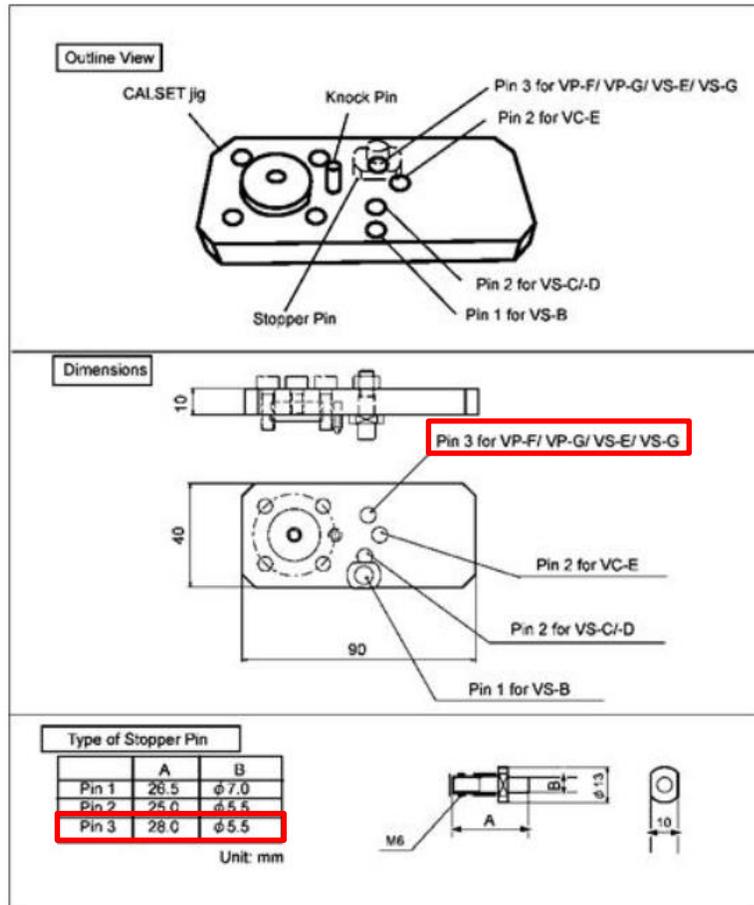
- Once you have the RANG Data input into the controller you're ready to perform CALSET.

## 6.1 VP CALSET

### 6.1.1 Before beginning the CALSET

- Before performing the CALSET of your VP Robot Arm you must log into the RC8 controller as *Maintainer*, if you're not sure how to do this review section 5 of this manual.
- Before performing the CALSET of your VP Robot Arm you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J6. Part # 410192-0010 pictured below.

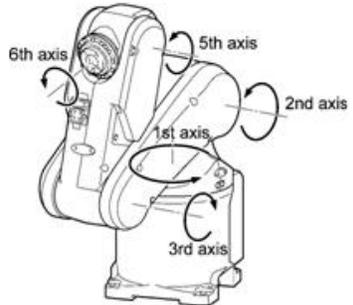
Fit a stopper pin in the CALSET jig.



### 6.1.1 VP Model

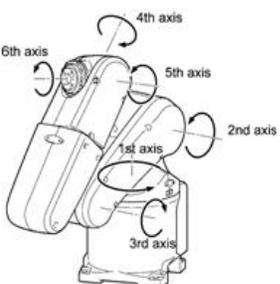
The VP Robot is available in a 5 axis (VP-5242) or 6 axis (VP-6242) model. Please see details below as to the CALSET position needed for your robot arm.

Axis		CALSET position
Position	1st axis	Turning end in the positive direction (counterclockwise end when viewed from top)
	2nd axis	Turning end in the negative direction
	3rd axis	Turning end in the positive direction
	5th axis	Turning end in the negative direction
	6th axis	Turning end in the positive direction, which is set by a CALSET jig.



The diagram shows a robotic arm with six axes labeled. The 1st axis is at the base, 2nd is at the shoulder, 3rd is at the elbow, 4th is at the wrist, 5th is at the end effector, and 6th is at the very tip. Arrows indicate the positive rotation direction for each axis.

Axis		CALSET position
Position	1st axis	Turning end in the positive direction (counterclockwise end when viewed from top)
	2nd axis	Turning end in the negative direction
	3rd axis	Turning end in the positive direction
	4th axis	Turning end in the positive direction (counterclockwise end when viewed from the arm end)
	5th axis	Turning end in the positive direction
	6th axis	Turning end in the positive direction, which is set by a CALSET jig

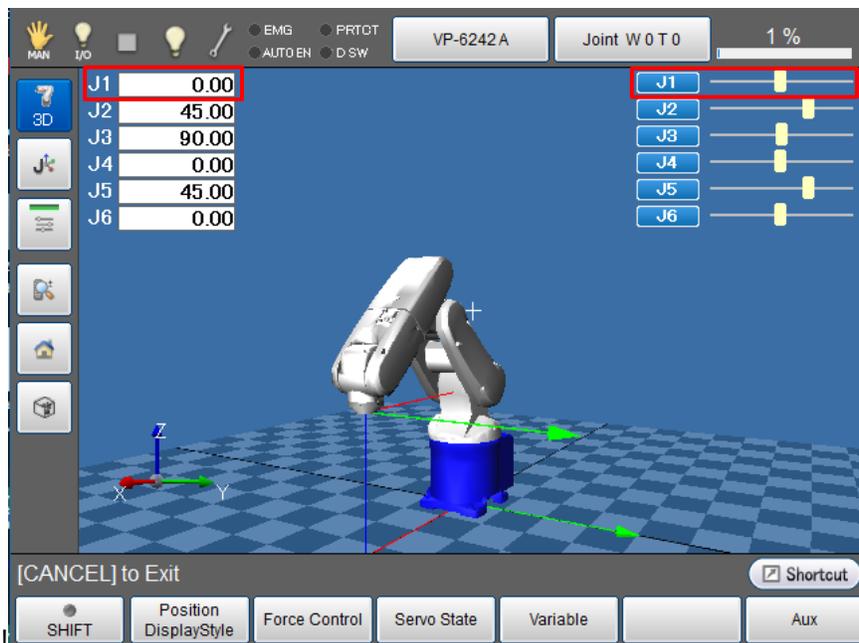


The diagram shows a robotic arm with six axes labeled. The 1st axis is at the base, 2nd is at the shoulder, 3rd is at the elbow, 4th is at the wrist, 5th is at the end effector, and 6th is at the very tip. Arrows indicate the positive rotation direction for each axis.

## 6.1.2 VP CALSETTING J1.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J1 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “Caution Brake will be released!” Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



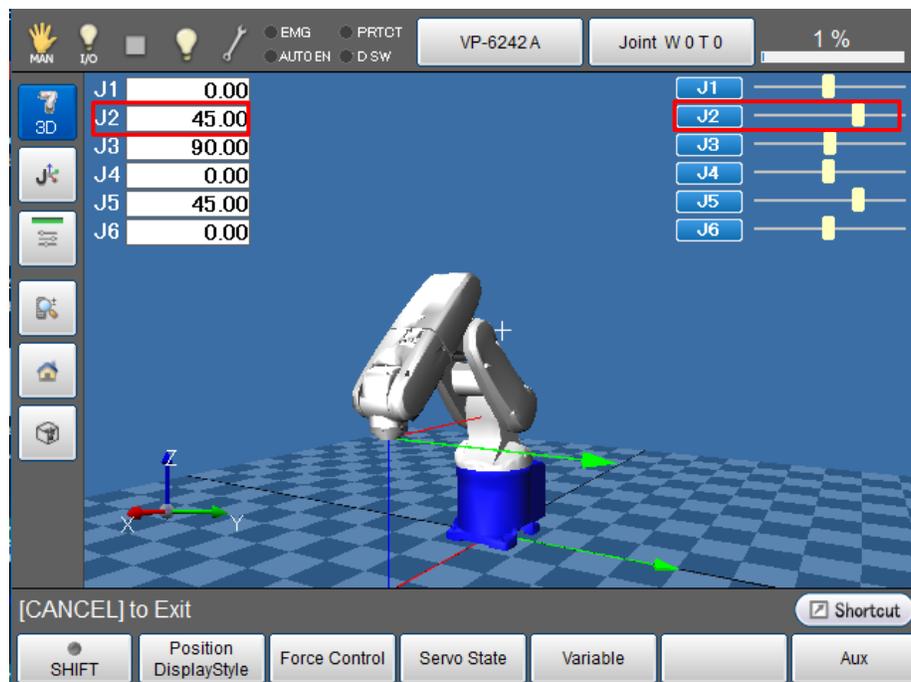
- While you move J1 by hand, watch the number values as well as the slider bar for J1 to verify you are moving in the correct direction, (**+ Positive**) for J1 CALSET position. If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET Position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Once you reach the (**+ Positive**) hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1]** then press **[OK]**
- “**Execute CALSET?**” is displayed, choose **[OK]**, “**CALSET succeeded!**” is displayed.

- J1 CALSET is complete.

### 6.1.3 VP CALSETTING J2

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J2 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release. \*If not supported Joint 2 may drift when brake is released.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



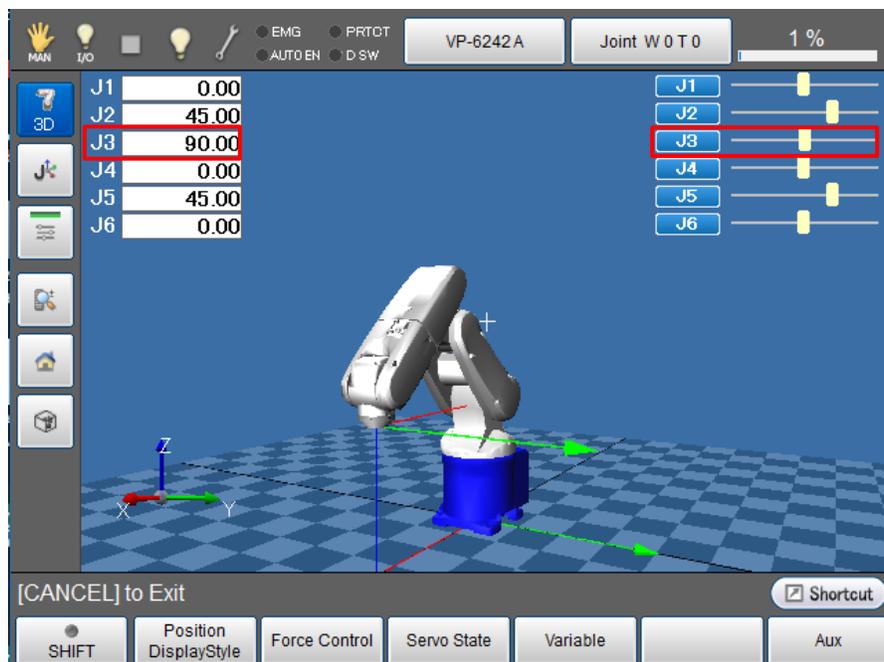
- While you move J2 by hand, watch the number values as well as the slider bar for J2 to verify you are moving in the correct direction (**- Negative**) for J2 CALSET position. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Once you touch the negative hard stop re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2] then press [OK].
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J2 CALSET is complete.

#### 6.1.4 VP CALSETTING J3

Navigate to the Brake Release screen.

- [Arm]->[Shift]->[Maintenance]->[Brake]
- Change the setting of the J3 Brake from [Lock] to [Free], press [OK].
- Message is “Caution Brake will be released!” Press the [OK] on the teaching pendant and the brake should release. \*If not supported Joint 3 may drift when brake is released.
- Once the brake is released press [Cancel] two times, you should now be on the **ARM** page as seen below.



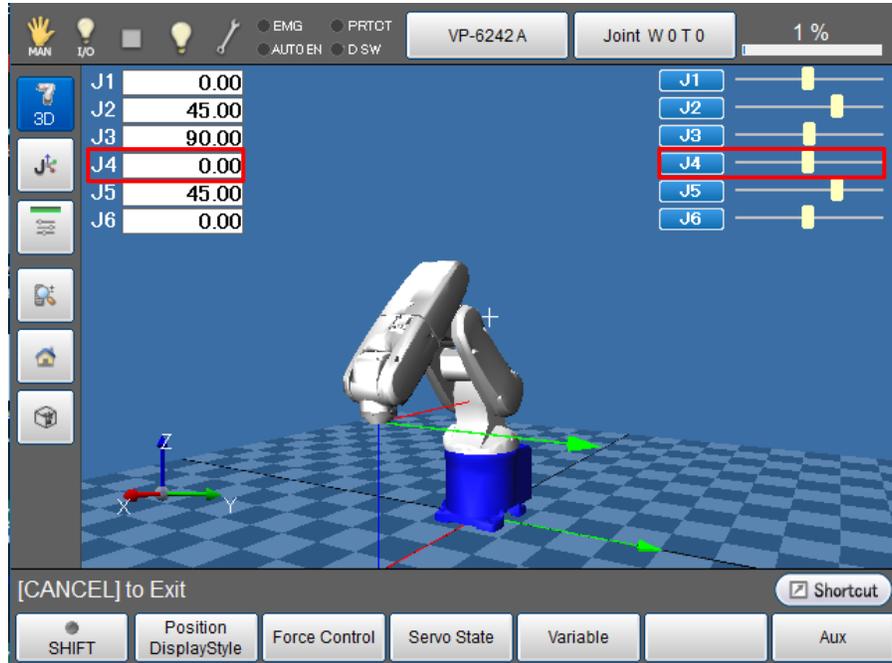
- While you move J3 by hand, watch the number values as well as the slider bar for J3 to verify you are moving in the correct direction (**+ Positive**) for J3 CALSET position. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Once you touch the (**+ Positive**) hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3]** then press **[OK]**.
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J3 CALSET is complete.

#### 6.1.5 VP CALSETTING J4 (VP-6242)

If you're CALSETTING a VP-5242 skip to section [6.1.7](#) as the VP-5242 does not use the 4<sup>th</sup> Axis.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**.
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**.
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



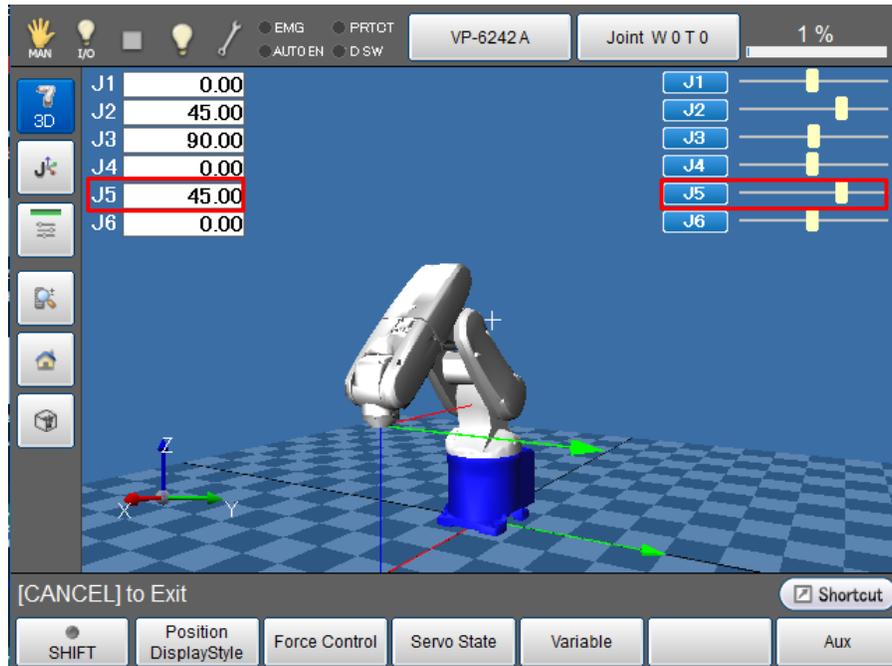
- While you move J4 by hand, watch the number values as well as the slider bar for J4 to verify you are moving in the correct direction (**+ Positive**) for J4 CALSET position. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Once you touch the (**+ Positive**) hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**.
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J4 CALSET is complete.

### 6.1.6 VP CALSETTING J5

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**.
- Change the setting of the J5 Brake from **[Lock]** to **[Free]**, press **[OK]**.
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.

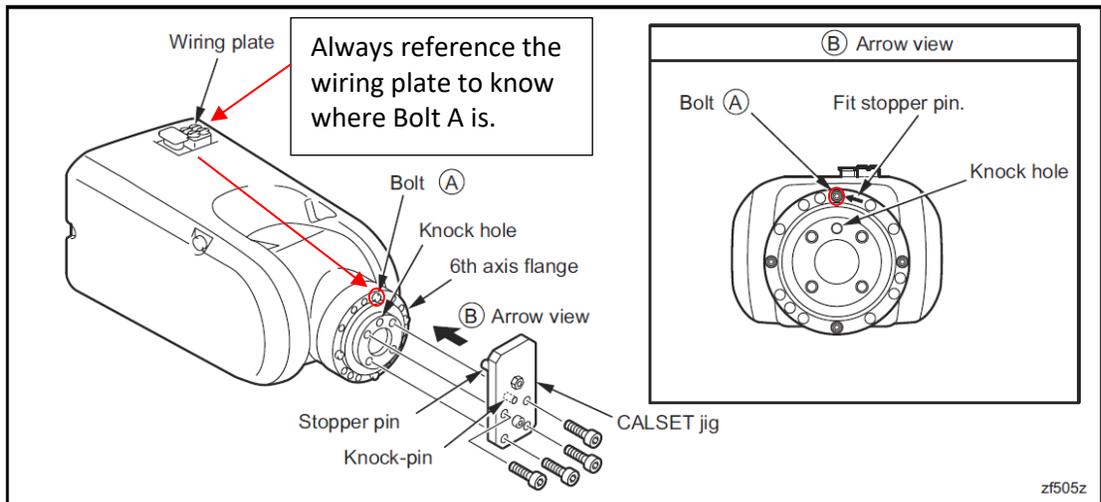
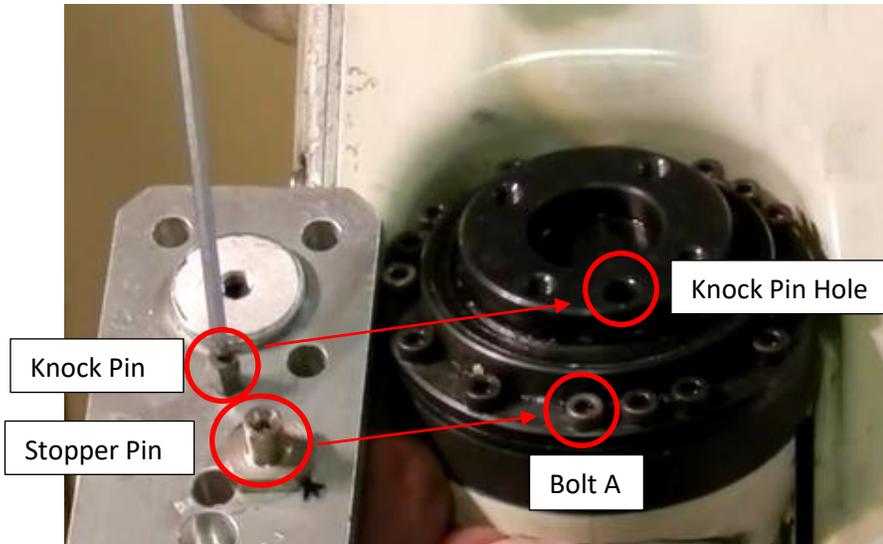
- Once the brake is released press [**Cancel**] two times, you should now be on the **ARM** page as seen below.



- While you move J5 by hand, watch the number values as well as the slider bar for J5. If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- For a **VP-6242** move J5 in the (+ **Positive**) *Direction* until you touch the *positive* hard stop. Once you’re against the **Positive** hard stop, re-engage the brake [**Arm**]->[**Shift**]->[**Maintenance**]->[**Brake**] change setting from [**Free**] to [**Lock**].
- For a **VP-5242** move J5 in the (- **Negative**) *Direction* until you touch the *negative* hard stop. Once you’re against the **Negative** hard stop, re-engage the brake [**Arm**]->[**Shift**]->[**Maintenance**]->[**Brake**] change setting from [**Free**] to [**Lock**].
- Press [**Arm**]->[**Shift**]->[**Maintenance**]->[**CALSET**]->[**CALSET**]->[**Select J5**] then press [**OK**].
- “**Execute CALSET?**” is displayed, choose [**OK**], “**CALSET succeeded!**” is displayed.
- J5 CALSET is complete.

### 6.1.7 VP CALSETTING J6

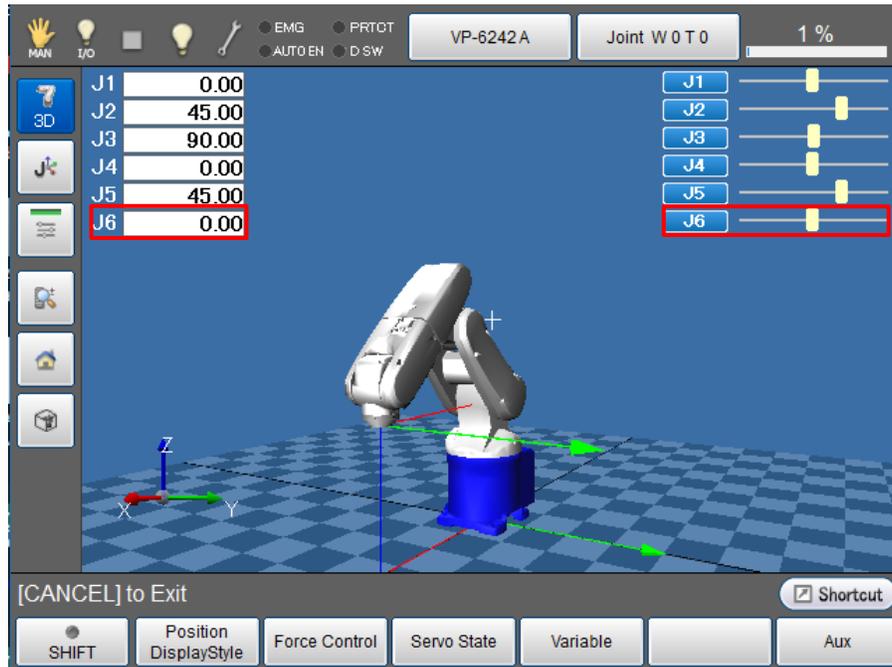
- Install the J6 Calibration jig to the J6 flange. Make sure the *knock pin* is aligned in the *knock hole* and the *Stopper Pin* can rotate and touch against *Bolt A* while moving in the positive direction.



- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is "**Caution Brake will be released!**" Press the **[OK]** on the teaching

pendant and the brake should release.

- Once the brake is released press [**Cancel**] two times, you should now be on the **ARM** page as seen below.



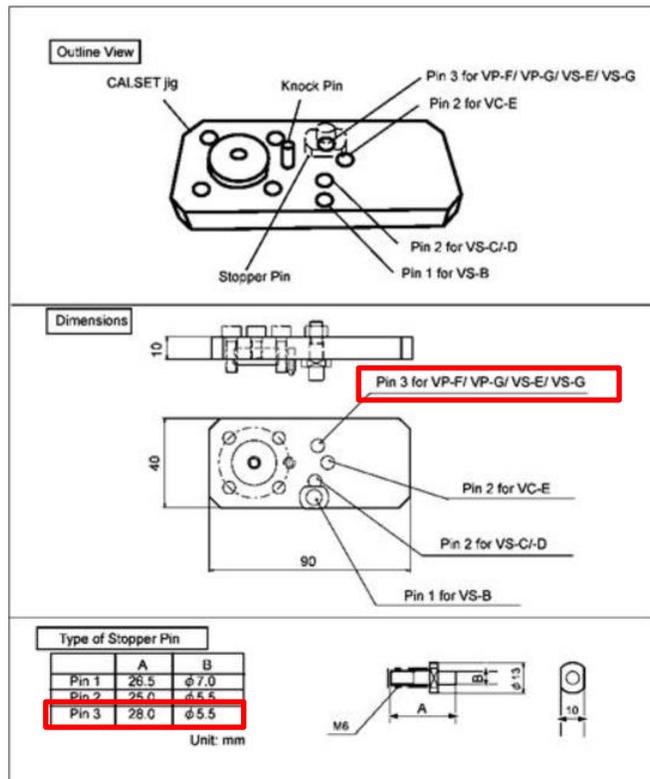
- While you move the J6 CALSET jig by hand, watch the number values as well as the slider bar for J6. If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Move J6 in the (+ **Positive**) Direction until you touch Bolt A with the Stopper Pin. With the Stopper Pin resting against Bolt A re-engage the brake [**Arm**]->[**Shift**]->[**Maintenance**]->[**Brake**] change setting from [**Free**] to [**Lock**].
- Press [**Arm**]->[**Shift**]->[**Maintenance**]->[**CALSET**]->[**CALSET**]->[**Select J6**] then press [**OK**]
- “**Execute CALSET?**” is displayed, choose [**OK**], “**CALSET succeeded!**” is displayed.
- J6 CALSET is complete.
- Reinstall your end-of-arm tooling to the J6 flange.
- Always verify the CALSET by Manually Moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.2 VS 6556/6577 CALSET

### 6.2.1 Before beginning the CALSET

- Before performing the CALSET of your VS Robot Arm you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your VS Robot Arm you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J6. Part # 410192-0010 pictured below.

Fit a stopper pin in the CALSET jig.



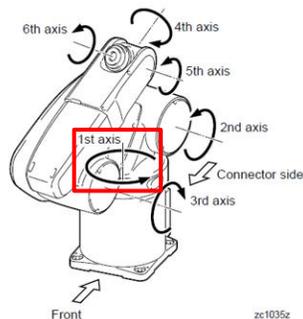
Axis	CALSET position
1st	Positive direction rotation end (counterclockwise end when viewed from top)
2nd	Negative direction rotation end
3rd	Positive direction rotation end
4th	Positive direction rotation end set by CALSET jig (counterclockwise end when viewed from the tip of arm) (See <b>Fig. 3-2 on page 3-14</b> )
5th	Positive direction rotation end (5th arm upper direction end)
6th	Positive direction rotation end set by CALSET jig (See <b>Fig. 3-3 on page 3-14</b> )

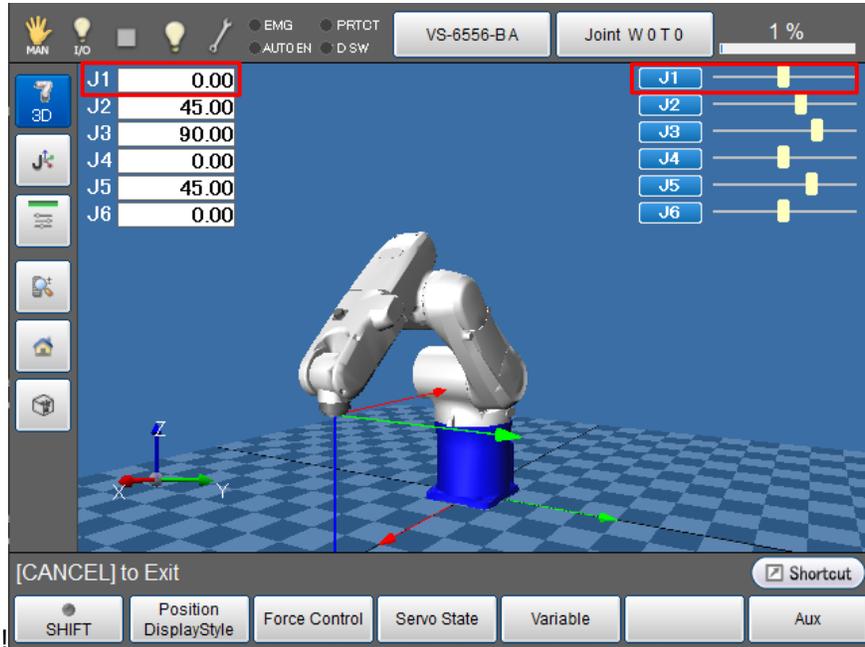
  

Fig.3-1: CALSET Setting Positions of 1st to 6th Axes

## 6.2.2 VS 6556/6577 CALSETTING J1.

- Using the teaching pendant open the **ARM** page.
- Apply pressure to J1 of the Robot in the **(+ Positive)** direction to move J1 towards the J1 CALSET hard stop bolt. While you move J1 by hand, watch the number values as well as the slider bar for J1 to verify you are moving in the correct direction, **(+ Positive)** for J1 CALSET position.  
 \*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.





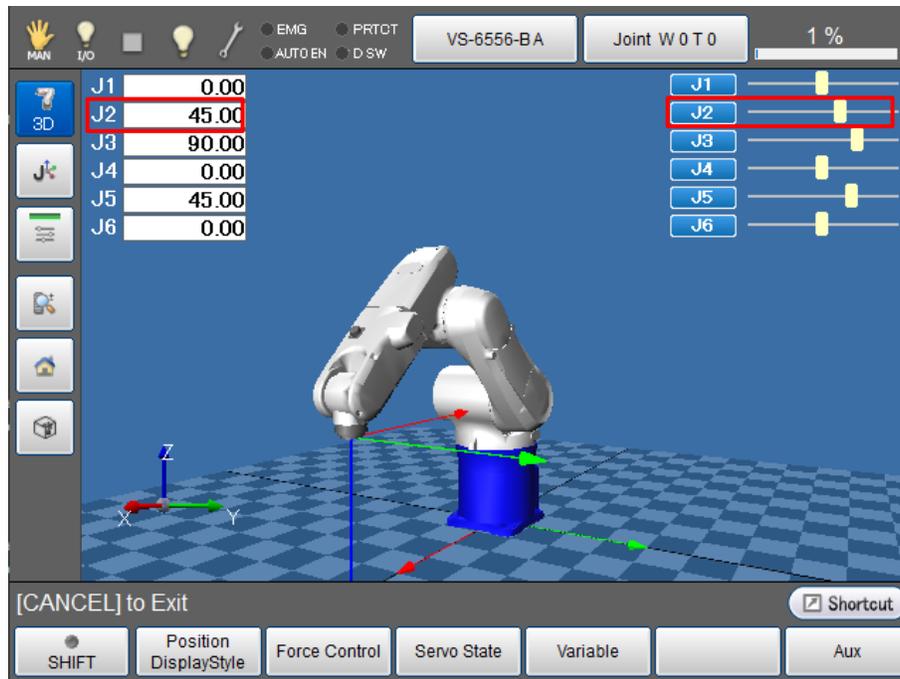
- Once you reach the J1 (+ **Positive**) hard stop perform CALSET of J1. Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J1 CALSET is complete.

### 6.2.3 VS 6556/6577 CALSETTING J2

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J2 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “**Caution Brake will be released!**” Press the **[OK]** on the teaching pendant and the brake should release. \*If not supported Joint 2 may drift when brake is released.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM**

page as seen below.



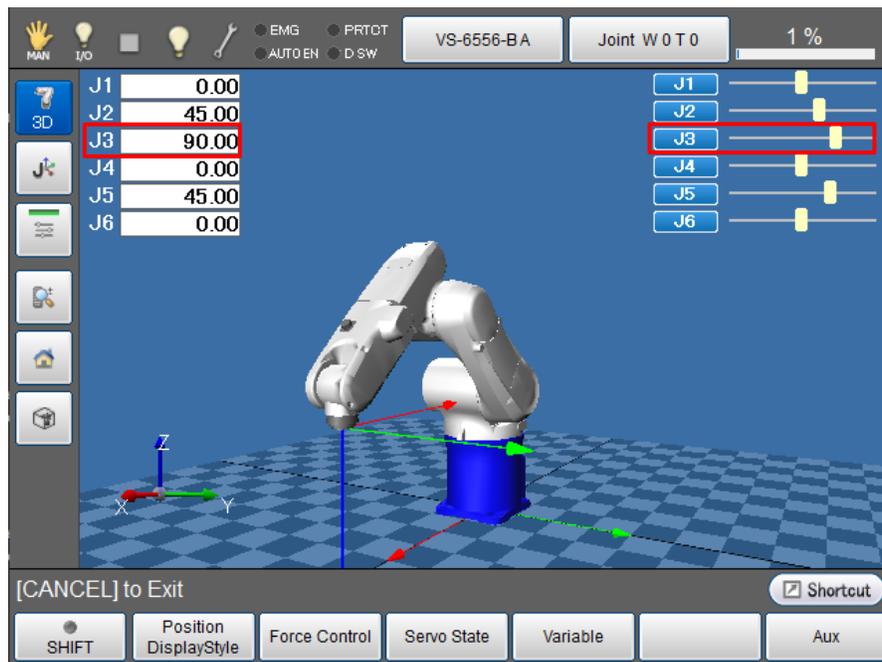
- While you move J2 by hand, watch the number values as well as the slider bar for J2 to verify you are moving in the correct direction (**- Negative**) for J2 CALSET position. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position, perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Once you reach the negative hard stop, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake], change the setting from [Free] to [Lock].
- Press [Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2] then press [OK]
- **“Execute CALSET?”** is displayed, choose [OK], **“CALSET succeeded!”** is displayed.
- J2 CALSET is complete.

#### 6.2.4 VS 6556/6577 CALSETTING J3

Navigate to the Brake Release screen.

- [Arm]->[Shift]->[Maintenance]->[Brake]

- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release. \*If not supported Joint 3 may drift when brake is released.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.

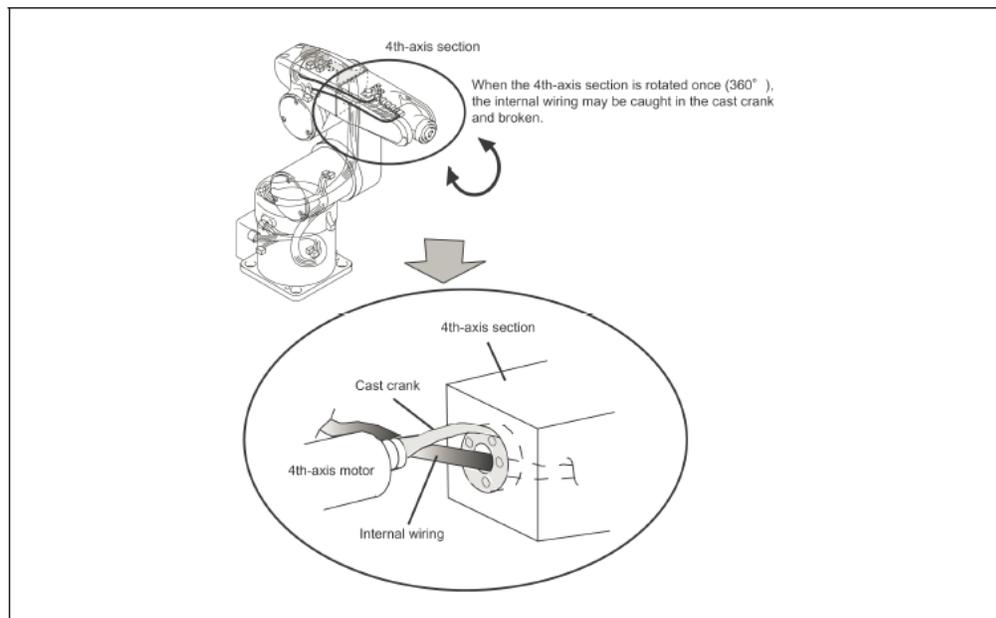


- While you move J3 by hand, watch the number values as well as the slider bar for J3 to verify you are moving in the correct direction (**+ Positive**) for J3 CALSET position. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position
- Once J3 touches the (**+ Positive**) hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]-> [Select J3]** then press **[OK]**

- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J3 CALSET is complete.

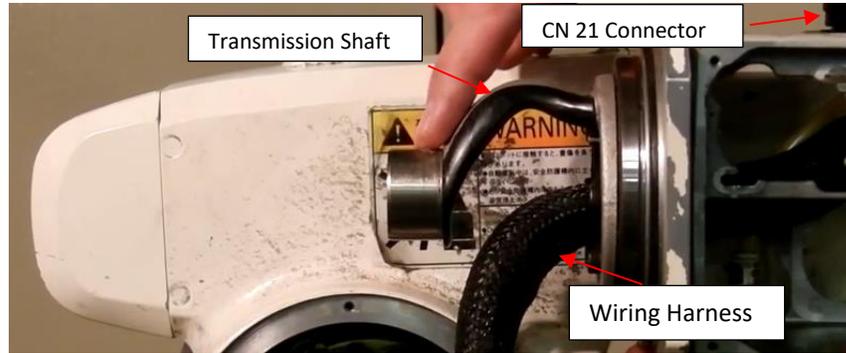
### 6.2.5 VS 6556 CALSETTING J4

- Use extreme caution when CALSETTING J4. If it is done incorrectly, damage to the wiring harness can occur.



Note that turning the 4th-axis section by more than 360° may break the internal wiring

- For VS-6556 models remove the round cover at J3. Using a flashlight view the wiring harness as it transitions from J3 through J4, make sure the Harness is hanging freely *under* the Transmission Shaft (as referenced below) and *not* twisted around the shaft. The CN21 connector plate should be on top as well. If Joint 4 is not in this position, release the brake and rotate to this position. This will be the starting point for CALSETTING J4.



Navigate to the Brake Release screen.

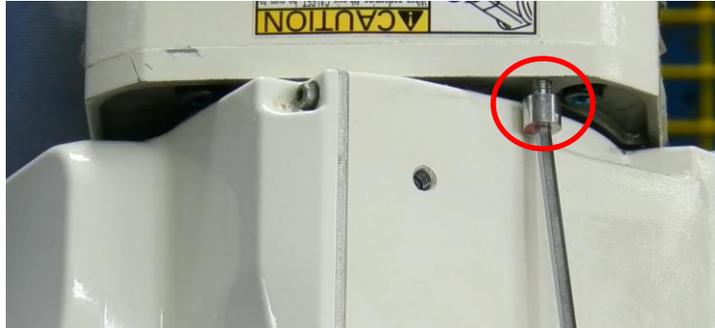
- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.

\*Do not continue until you have Joint 4 positioned as pictured above (CN 21 on top, Harness running freely under the Transmission Shaft)

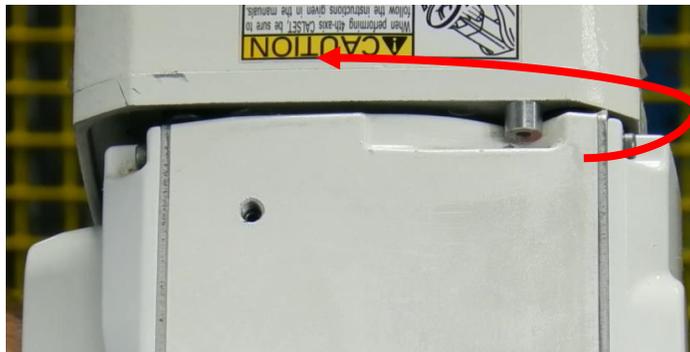
- Remove the J4 CALSET Jig which is stored inside the J3 Motor housing as pictured below.



- With the J4 brake released rotate J4 in the **(+ Positive)** Direction (around 170 degrees). The CN 21 Connector should be facing downward now. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Insert the J4 CALSET Jig into the bolt hole as pictured below.



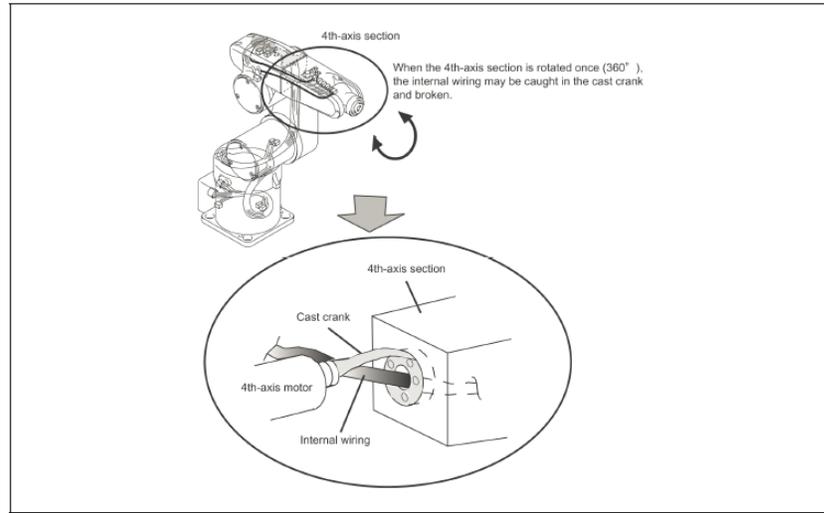
- Once you have the J4 CALSET Jig installed continue to rotate Joint 4 in the (+ **Positive**) direction until the casting touches the CALSET Jig as pictured below.



- Once the casting comes into contact with the CALSET Jig re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J4 CALSET is complete.
- Be sure to remove the J4 CALSET Jig. Release the brake to perform this task, do not try and jog J4 you can crash into and break the jig if you jog the robot in the wrong direction.
- It’s always a good idea to verify the CALSET of J4 by releasing the brake and moving the joint by hand all the way to the + and – soft limits while viewing the wiring harness and transmission shaft from the J3 housing. The wiring harness may come in contact with the Transmission Shaft but will not apply too much pressure, and should never wrap around the shaft.

## 6.2.6 VS 6577 CALSETTING J4

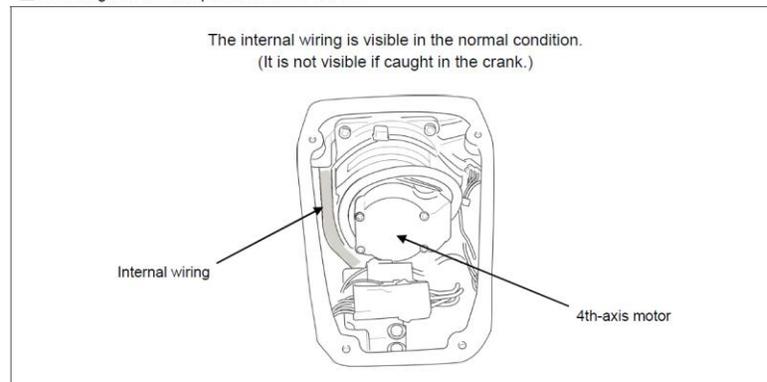
- Use extreme caution when CALSETTING J4. If it is done incorrectly, damage to the wiring harness can occur.



Note that turning the 4th-axis section by more than 360° may break the internal wiring

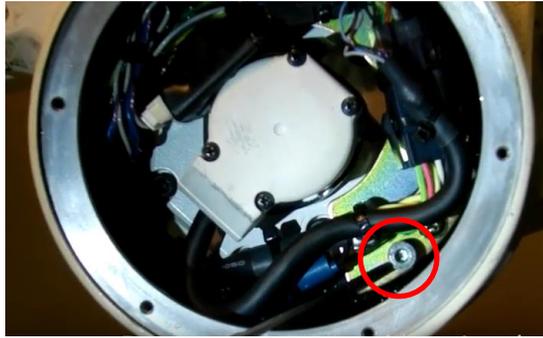
- For the 6577 model, remove the J4 Motor Cover so that the wiring harness position can be confirmed. The wiring should be routed as pictured below. In addition to the routing, the CN21 Connector should be facing upward before you begin CALSETTING J4.

### ■ Checking the 4th-axis position for VS-6577G

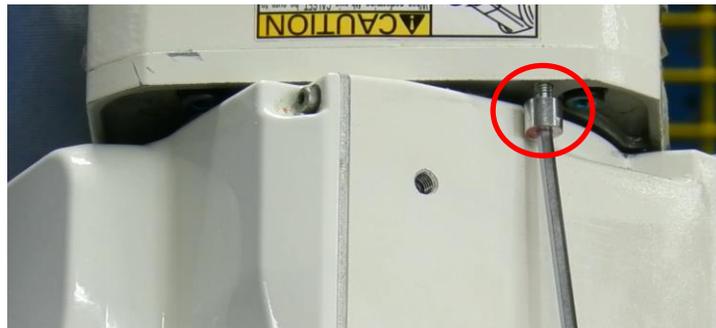


- If the Internal wiring does not transition from the J3 to J4 as pictured above, remove the J3 motor housing cover (round) and inspect. The harness may be wrapped around the transmission shaft.

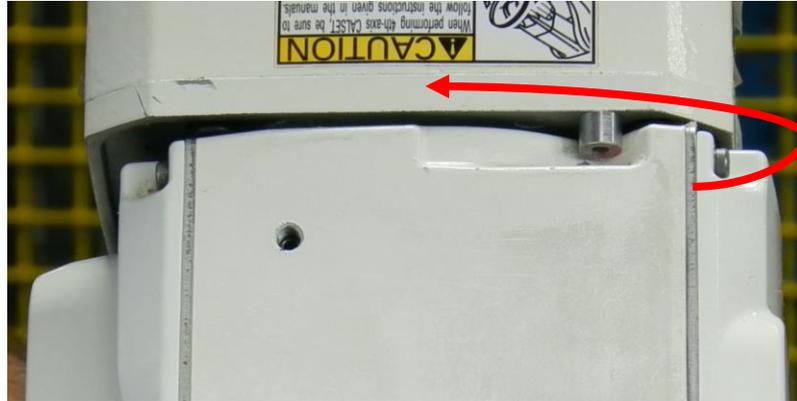
- Do not continue until you have Joint 4 positioned as pictured above, in addition to having the CN21 connector facing up.
- Remove the J4 CALSET Jig which is stored inside the J3 Motor housing as pictured below.



- With the J4 brake released rotate J4 in the **(+ Positive)** direction (around 170 degrees). The CN 21 Connector should be facing downward now. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Insert the J4 CALSET Jig into the bolt hole as pictured below.



- Once you have the J4 CALSET Jig installed continue to rotate Joint 4 in the **(+ Positive)** direction until the casting touches the CALSET Jig as pictured below.



- Once the casting comes into contact with the CALSET Jig re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J4 CALSET is complete.
- Be sure to remove the J4 CALSET Jig. Release the brake to perform this task, do not try and jog J4.
- It’s always a good idea to verify the CALSET of J4 by releasing the brake and moving the joint by hand all the way to the + and – soft limits while viewing the wiring harness and transmission shaft from the J3 housing. The wiring harness may come in contact with the Transmission Shaft but will not apply too much pressure, and should never wrap around the shaft.

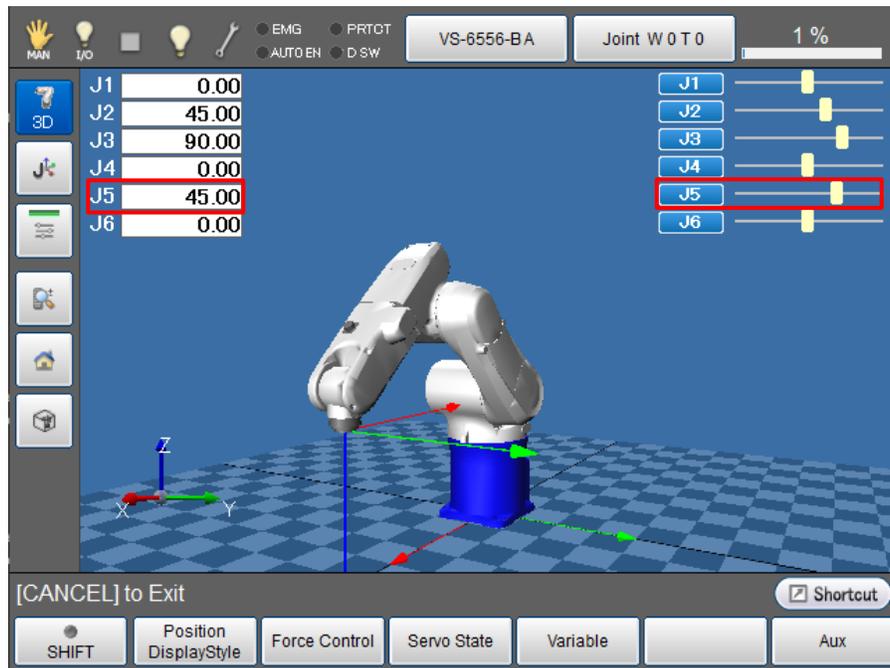
#### 6.2.7 VS 6556/6577 CALSETTING J5 and J6

- The VS-6556 and VS-6577 model robot J5 and J6 **must** be calibrated together, with both joints at their respective hard stops.

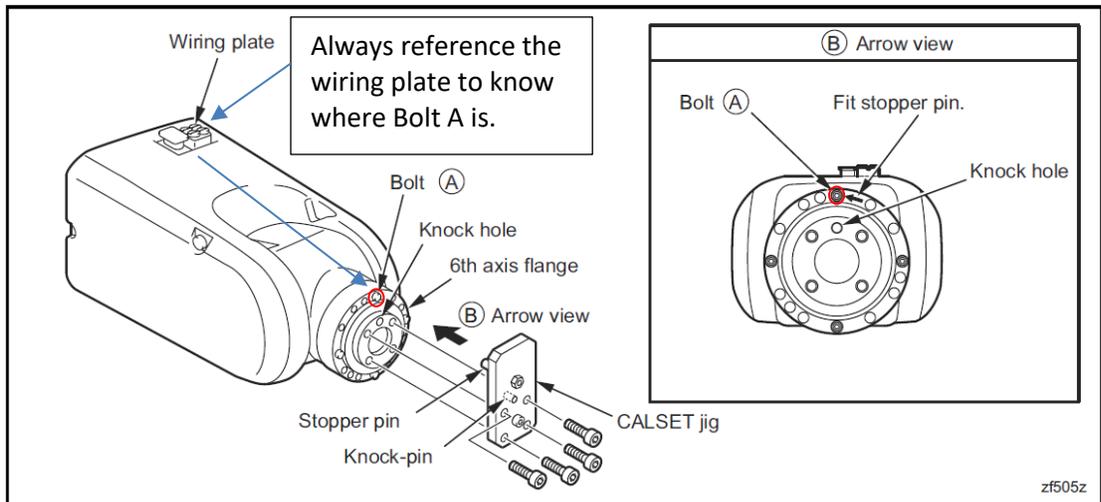
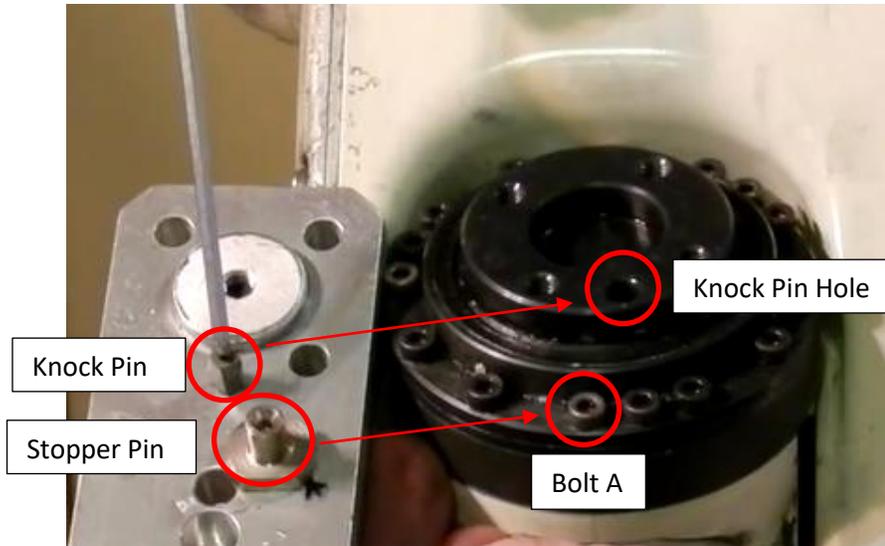
Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J5 Brake from **[Lock]** to **[Free]**, press **[OK]**

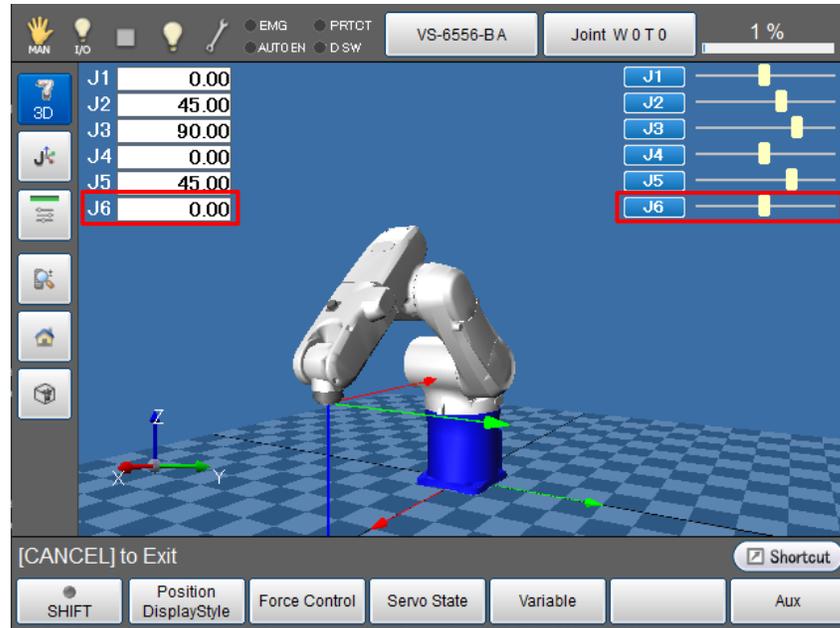
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- While you move J5 by hand, watch the number values as well as the slider bar for J5. If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Move J5 in the **(+ Positive) Direction** until you touch the **(+ Positive) hard stop** re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from **[Free]** to **[Lock]**.
- Install the J6 Calibration jig to the J6 flange. Make sure the *knock pin* is aligned in the *knock hole* and the *Stopper Pin* can rotate and touch against *Bolt A* while moving in the positive direction. (You may find this task easier with J4 rotated 180 degrees)



- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- While you move the J6 CALSET jig by hand, watch the number values as well as the slider bar for J6. If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Move J6 in the (**+ Positive**) Direction until you touch Bolt A with the Stopper Pin. With the Stopper Pin resting against Bolt A, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- CALSET J5 and J6, press[Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J5]->[Select J6] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J5 and J6 CALSET is complete.
- Reinstall your end-of-arm tooling to the J6 flange.
- Always verify the CALSET by manually moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.3 VS050/060 CALSET

### 6.3.1 Before beginning the CALSET

- Before performing the CALSET of your VS050/060 Robot Arm you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your VS050/060 Robot Arm you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J6, Standard, IP67, Communication Flange models use jig part # 410192-0050. Clean Room Type Robot uses jig part # 410192-0060.

	Axis	CALSET position
Position	1st axis	Positive direction rotation end (counterclockwise end when viewed from top)
	2nd axis	Negative direction rotation end
	3rd axis	Positive direction rotation end
	4th axis	Negative direction rotation end set by CALSET jig (counterclockwise end when viewed from the tip of arm) (See <a href="#">Table 3-2 on page 3-4</a> )
	5th axis	Negative direction rotation end set by CALSET bolt (5th arm upper direction end)
	6th axis	Negative direction rotation end set by CALSET jig (See <a href="#">Table 3-4 ~ 7 on page 3-8</a> )

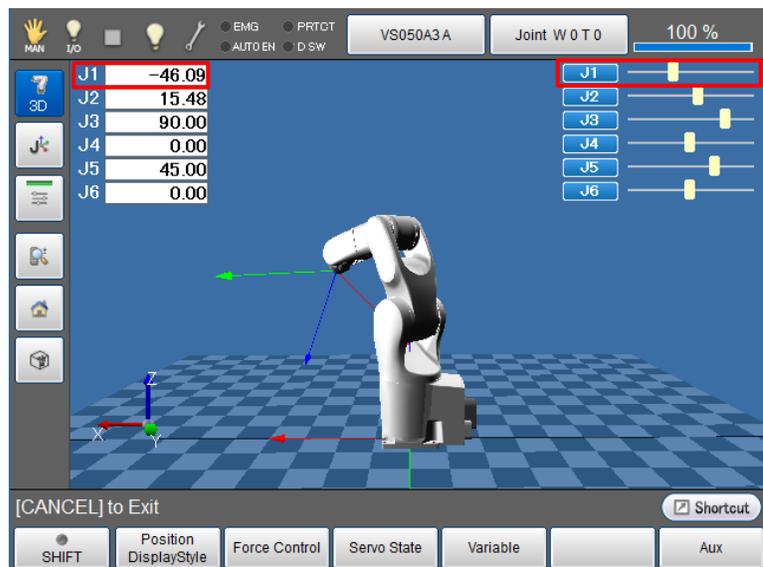
  

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### 6.3.2 VS050/060 CALSETTING J1.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J1 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(+ Positive)** direction to move J1 towards the J1 CALSET hard stop bolt. While you move J1 by hand, watch the number values as well as the slider bar for J1 to verify you are moving in the correct direction, **(+ Positive)** for J1 CALSET position.

\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

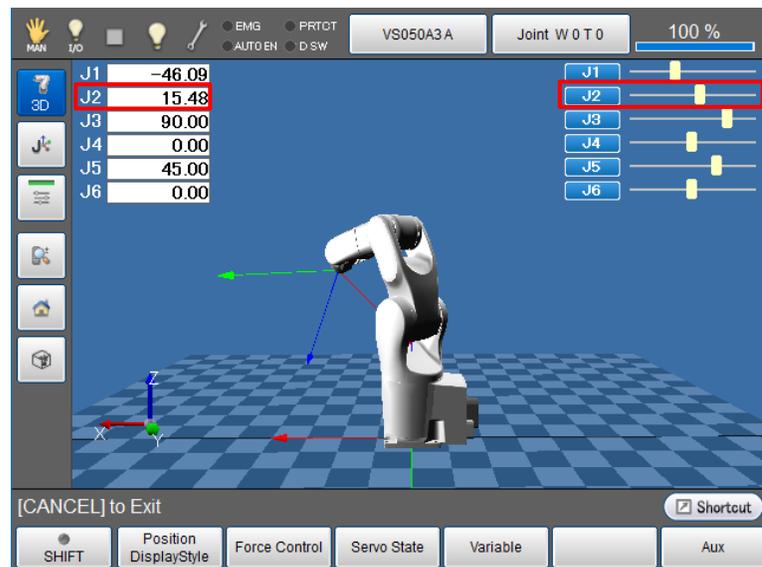
- Once you have J1 resting against the J1 **(+ Positive)** hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.

- Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J1 CALSET is complete.

### 6.3.3 VS050/060 CALSETTING J2.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J2 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “**Caution Brake will be released!**” Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(- Negative)** direction to move J2 towards the J2 CALSET hard stop bolt. While you move J2 by hand, watch the number values as well as the slider bar for J2 to verify you are moving in the correct direction, **(- Negative)** for J2 CALSET position.

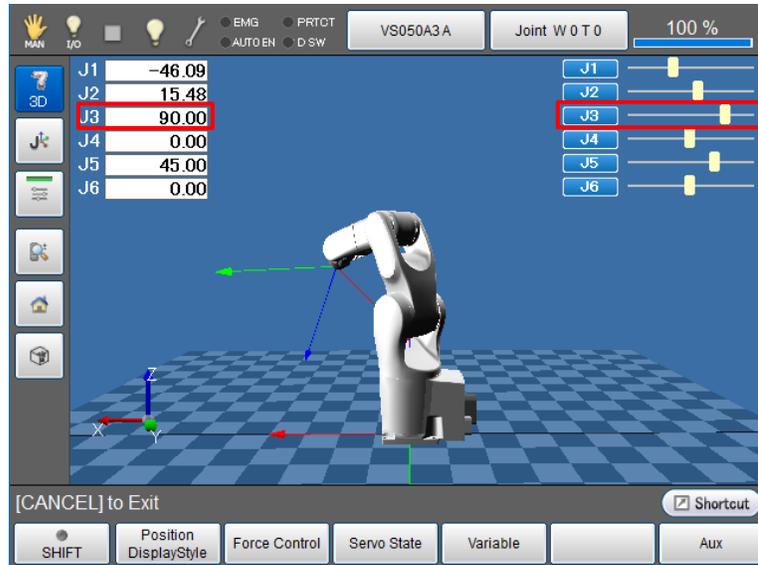
\*If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Once you reach the J2 (- **Negative**) hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Now press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2]** then press **[OK]**
- “**Execute CALSET?**” is displayed, choose **[OK]**, “**CALSET succeeded!**” is displayed.
- J2 CALSET is complete.

#### 6.3.4 VS050/060 CALSETTING J3.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “**Caution Brake will be released!**” Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(+ Positive)** direction to move J3 towards the J3 CALSET hard stop bolt. While you move J3 by hand, watch the number values as well as the slider bar for J3 to verify you are moving in the correct direction, **(+ Positive)** for J3 CALSET position.

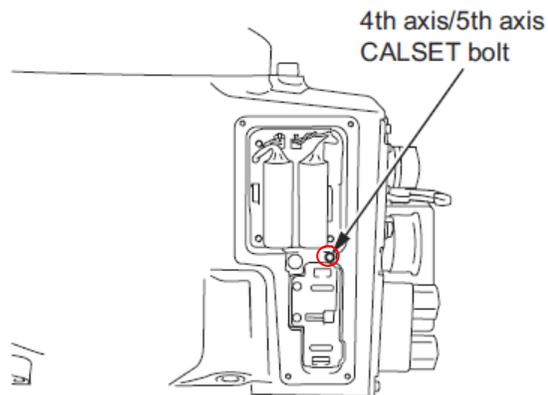
\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Once you reach the J3 **(+ Positive)** hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J3 CALSET is complete.

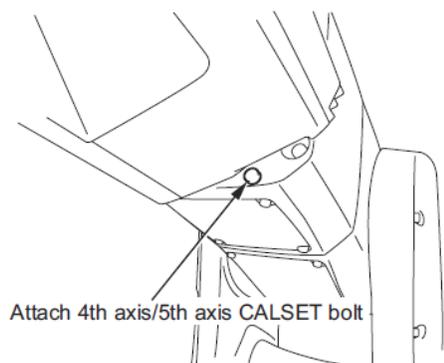
### 6.3.5 VS050/060 CALSETTING J4.

\*Pay careful attention to the following steps, improper CALSET of J4 can cause internal damage to the FPC assembly and will require the robot to be sent in for repair.

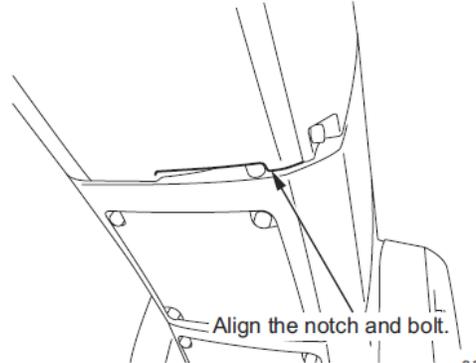
- You will need to retrieve the J4/J5 CALSET bolt located in the battery compartment of the robot arm to perform this task. (See pictures below)



- Next reset the Encoder for J4. Press **[Setting]->[Login]->[Maintainer]->[5596060]->[Cancel to the main screen]->[Arm]->[Shift]->[Maintenance]->[Encoder]->[Encoder Reset]->[Reset J4]**
- Release the brake for J4 **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- With the J4 brake release *slowly* rotate J4 in the **(+ Positive)** direction until you feel the positive limit (This limit does not feel solid but kind of spongy, depending on where you’re starting it may be over 360 degrees to the hard stop). **\*Do not try to rotate any further in the (+ Positive) direction, this is NOT the Calset position, continue to follow the steps below.**
- After you’ve located and are resting against the **(+ Positive)** limit begin rotating J4 in the **(- Negative)** direction approximately 360 degrees, you should now be able to insert the 4<sup>th</sup> Axis CALSET bolt as pictured below.



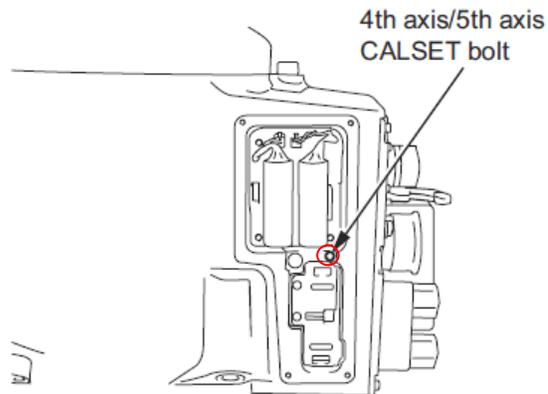
- Once you've inserted the 4<sup>th</sup> Axis CALSET bolt rotate the arm in the (**- Negative**) direction until the Arm contacts the CALSET bolt as pictured below. **This is the CALSET position for J4.** Re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.



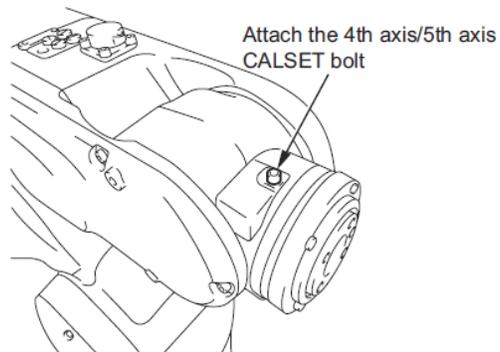
- Perform the CALSET of J4. Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J4 CALSET is complete.
- Remove the J4 CALSET bolt, to do this release the brake for J4 and rotate the arm in the (**+ Positive**) direction until the bolt can be extracted. **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “**Caution Brake will be released!**” Press the **[OK]** on the teaching pendant and the brake should release.
- It's always a good idea to verify the CALSET of J4 by releasing the brake and while viewing the **[ARM]** page move the joint by hand all the way to the + and – soft limits making sure no hard stops are contacted.

### 6.3.6 VS050/060 CALSETTING J5.

- You will need to retrieve the 4th/5<sup>th</sup> axis CALSET bolt located in the battery compartment of the robot arm to perform this task. (See pictures below)

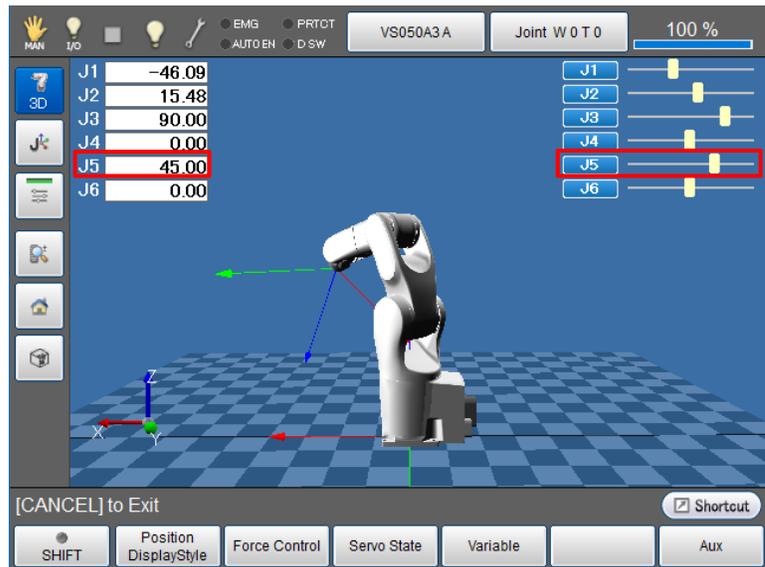


- Attach the 4<sup>th</sup>/5<sup>th</sup> axis CALSET bolt in the location shown below.

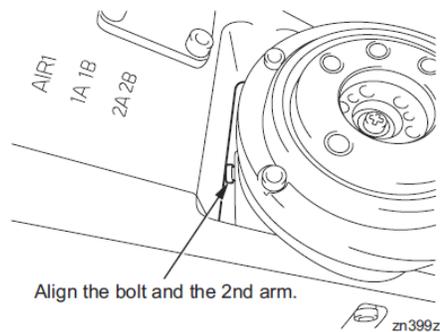


Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J5 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **"Caution Brake will be released!"** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(- Negative)** direction to move J5 towards the J5 CALSET position. While you move J5 by hand, watch the number values as well as the slider bar for J5 to verify you are moving in the correct direction, **(- Negative)** for J5 CALSET position.
- \*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

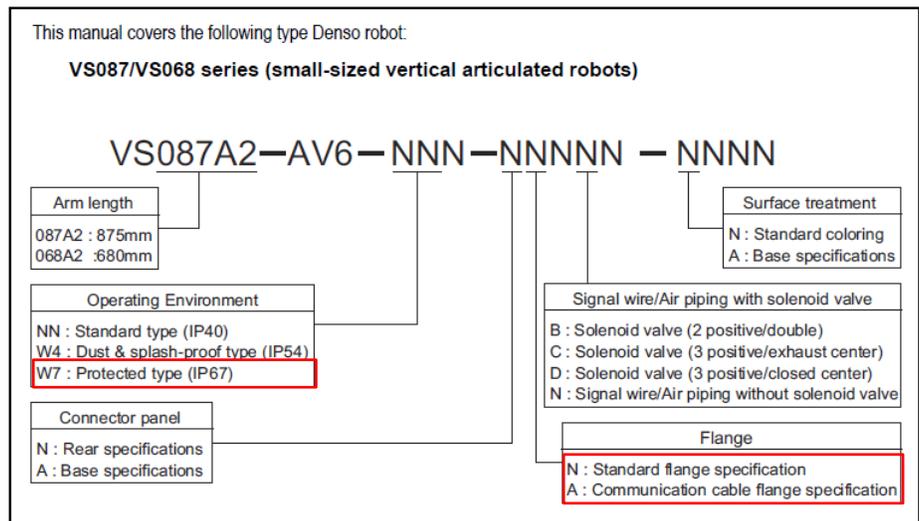


- Once you have the CALSET bolt touching the 2<sup>nd</sup> arm as pictured above re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- From the **Main Screen** of the pendant press **[Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J5]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.

- J5 CALSET is complete.
- Release the J5 brake and remove the 4<sup>th</sup>/5<sup>th</sup> axis CALSET bolt.

### 6.3.7 VS050/060 CALSETTING J6.

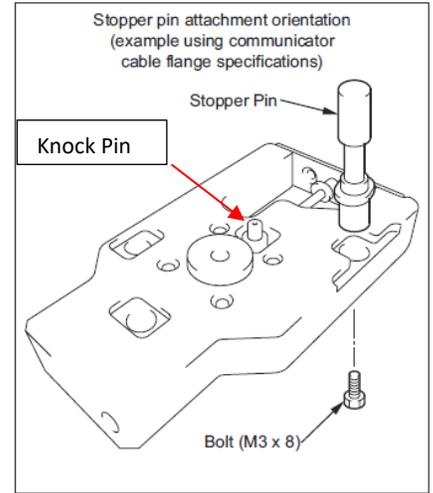
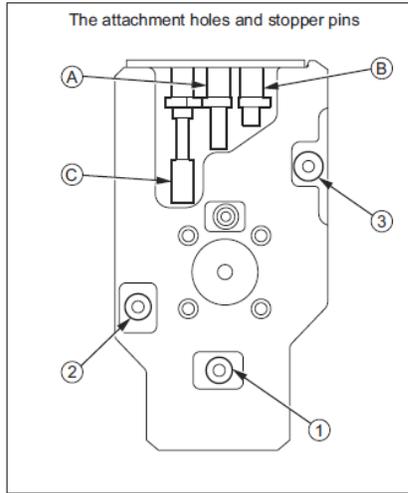
- The VS068/087 has 3 different J6 flange configurations, before you CALSET joint 6 configure the J6 CALSET Jig to your specification as displayed in the charts below.



This page shows how to install the 6th axis CALSET jig for the VS068/VS087 series

Attach stopper pins that suit the specifications of each flange part into each attachment hole of the 6th axis CALSET jig, and fasten it with a bolt (M3 x 8).

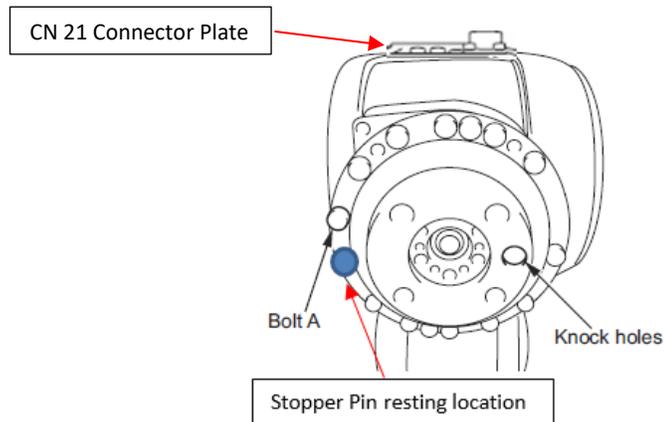
Flange Part Specifications	Attachment Hole	Stopper Pin
Standard Flange Specifications	①	(A)
W7 Specifications	②	(B)
Communicator Cable Flange Specifications	③	(C)



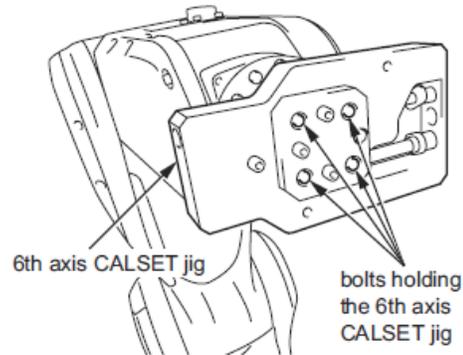
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### 6.3.7.1 VS050/060 CALSETTING J6 (Standard Flange)

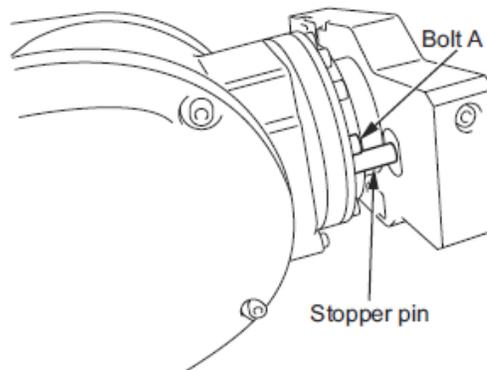
- Position the J6 flange as pictured below, so that the *Knock Pin* of the CALSET jig can be installed into the *Knock Pin Hole* of the J6 flange. In addition the *Stopper Pin* should be able to rest just below *Bolt A*.



- Attach the 6<sup>th</sup> axis CALSET jig and tighten the four bolts holding the jig to the flange.



- With CALSET jig in position now release the brake on J6, **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- With the brake for J6 released, rotate the jig in the **(- Negative)** direction until the *Stopper Pin* touches against *Bolt A* as pictured below.

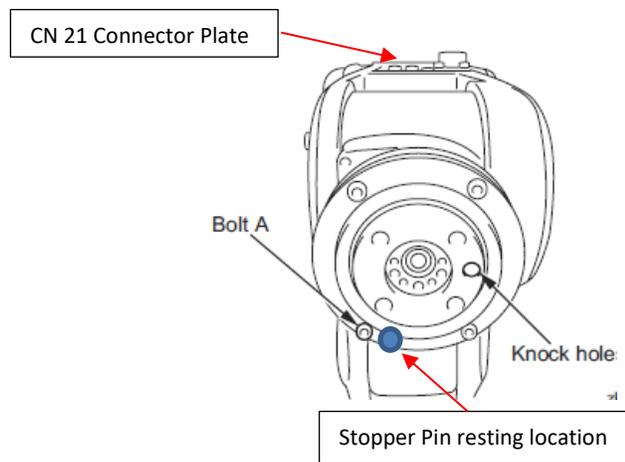


- With the *Stopper Pin* resting on *Bolt A*, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6]** then press **[OK]**

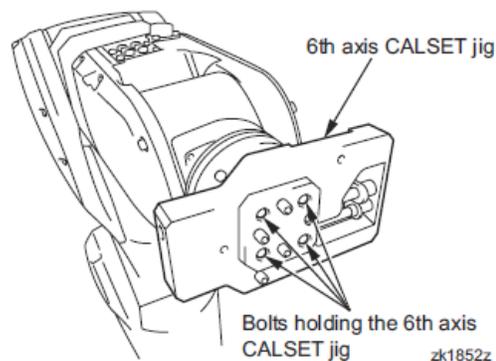
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J6 CALSET is complete.

### 6.3.7.2 VS050/060 CALSETTING J6 (W7 Specification Flange)

- Position the J6 flange as pictured below, so that the *Knock Pin* of the CALSET jig can be installed into the *Knock Pin Hole* of the J6 flange. In addition the *Stopper Pin* should be able to rest just below *Bolt A*.

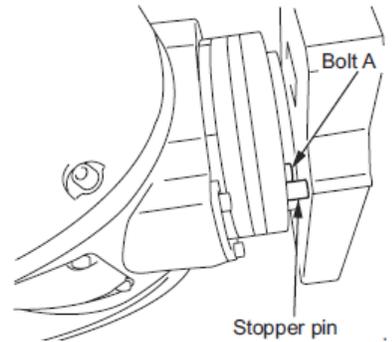


- Attach the 6<sup>th</sup> axis CALSET jig and tighten the four bolts holding the jig to the flange.



- With CALSET jig in position now release the brake on J6, [Arm]->[Shift]->[Maintenance]->[Brake]
- Change the setting of the J6 Brake from [Lock] to [Free], press [OK]

- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- With the brake for J6 released, rotate the jig in the (**- Negative**) direction until the *Stopper Pin* touches against *Bolt A* as pictured below.



- With the *Stopper Pin* resting on *Bolt A*, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J6 CALSET is complete.

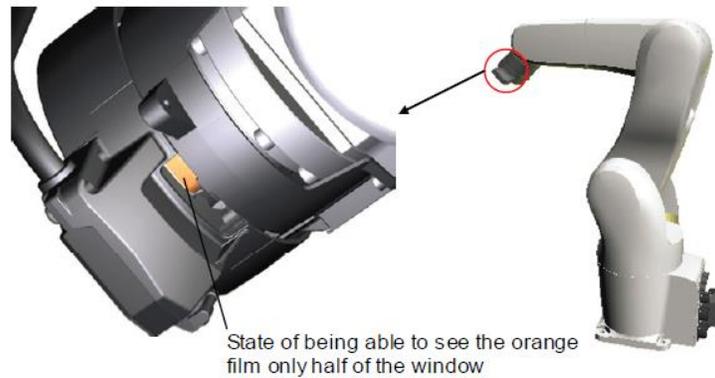
### 6.3.7.3 VS050/060 CALSETTING J6 (Communicator Cable Specification Flange)

- The Communicator Spec Flange is not a Boundless Rotation Joint, it is extremely important to check the rotational position of the Communicator Flange before CALSETTING so that internal damage of the FPC cable does not happen.
- The J6 Communicator Flange has a viewing window to help determine the current rotational position of the flange. Position J6 so that you can see the Orange film in half the window. See the picture below.

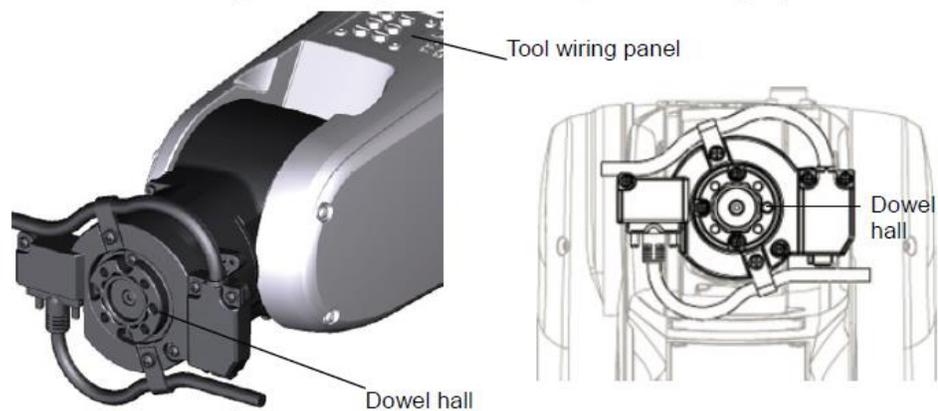
\*If you cannot see any Orange in the window turn the 6<sup>th</sup> Axis in the (- **Negative**) direction until half the window is displaying Orange.

\*If the entire window viewing area is Orange rotate (by hand) the 6<sup>th</sup> Axis in the (+ **Positive**) direction until half the window is displaying Orange.

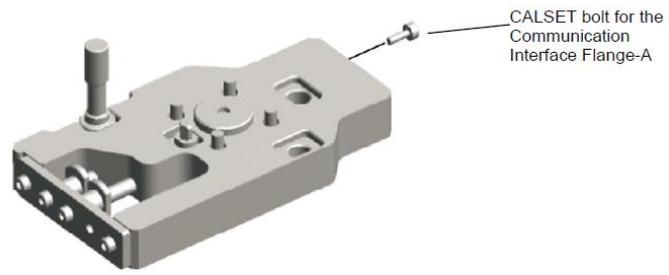
- Release the brake so that the Communicator Flange can be repositioned as described above, Change the setting of the J6 Brake from [**Lock**] to [**Free**], press [**OK**]
- Message is “**Caution Brake will be released!**” Press the [OK] on the teaching pendant and the brake should release.



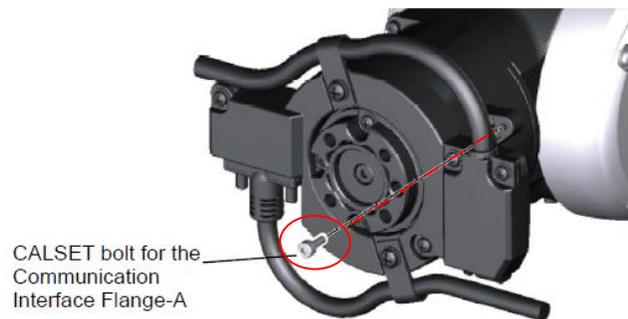
- With half the viewing window showing the Orange film, the flange orientation should look like the picture below.



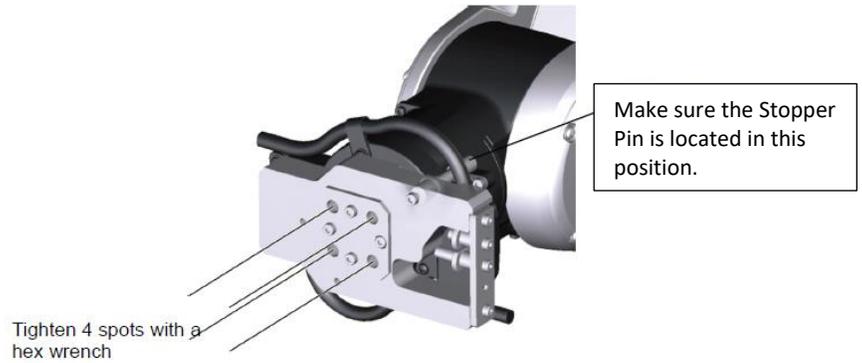
- Remove the CALSET bolt from the CALSET jig as pictured below.



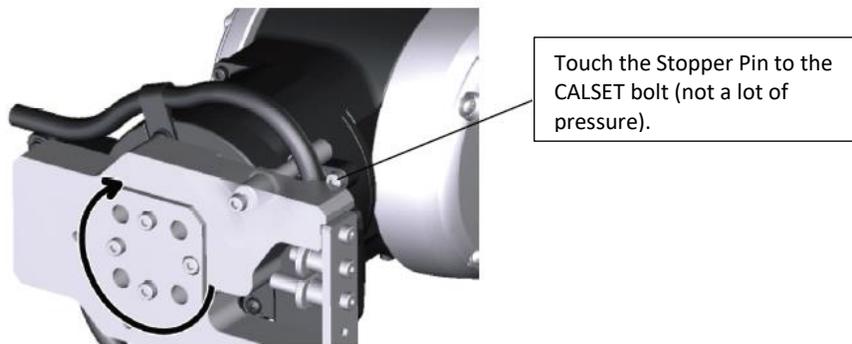
- Secure the CALSET bolt to the communication flange as pictured below, tightening torque; 0.8 +/-1.7Nm.



- Mount the CALSET jig to the communication flange making sure the *Stopper Pin* is located as pictured below, just above the *CALSET bolt* you previously added. Tightening torque 8.8 +/-1.7Nm.



- Rotate the CALSET jig clockwise, touch the Stopper Pin to the CALSET bolt (lightly).



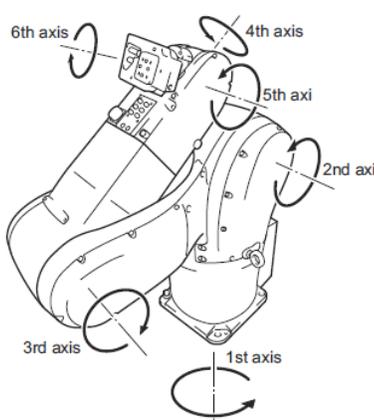
- Once the Stopper Pin is touching the CALSET bolt, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until you display the **Main Screen** of the pendant, now press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J6 CALSET is complete.
- Release the J6 brake and remove the CALSET jig and CALSET bolt from the flange.
- Always verify the CALSET by Manually Moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.4 VS068/087 CALSET

### 6.4.1 Before beginning the CALSET

- Before performing the CALSET of your VS068/087 Robot you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your VS068/087 Robot you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J6. Standard, IP67, Communication Flange models use jig part # 410192-0050. Clean Room Type Robot uses jig part # 410192-0060.

	Axis	CALSET position
Position	1st axis	Positive direction rotation end (counterclockwise end when viewed from top)
	2nd axis	Negative direction rotation end
	3rd axis	Positive direction rotation end
	4th axis	Negative direction rotation end set by CALSET jig (counterclockwise end when viewed from the tip of arm) (See <a href="#">Table 3-5</a> )
	5th axis	Negative direction rotation end (5th arm upper direction end)
	6th axis	Negative direction rotation end set by CALSET jig (See <a href="#">Table 3-6 ~ 8</a> )

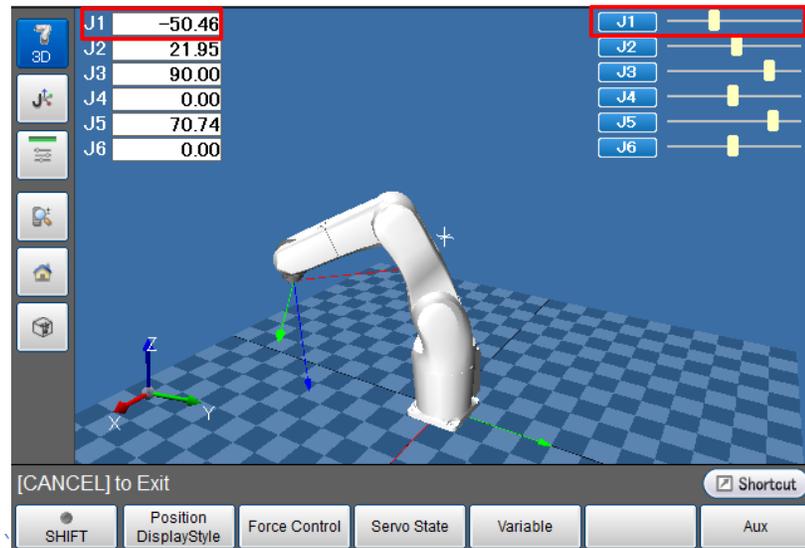
The diagram shows a 6-axis robot arm with the following rotation directions indicated by arrows: 1st axis (counterclockwise from top), 2nd axis (negative direction), 3rd axis (positive direction), 4th axis (negative direction from tip), 5th axis (negative direction upper), and 6th axis (negative direction). A small 'zk1859z' label is in the bottom right corner of the diagram area.

### 6.4.2 VS068/087 CALSETTING J1.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**

- Change the setting of the J1 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(+ Positive)** direction to move J1 towards the J1 CALSET hard stop bolt. While you move J1 by hand, watch the number values as well as the slider bar for J1 to verify you are moving in the correct direction, **(+ Positive)** for J1 CALSET position.

\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

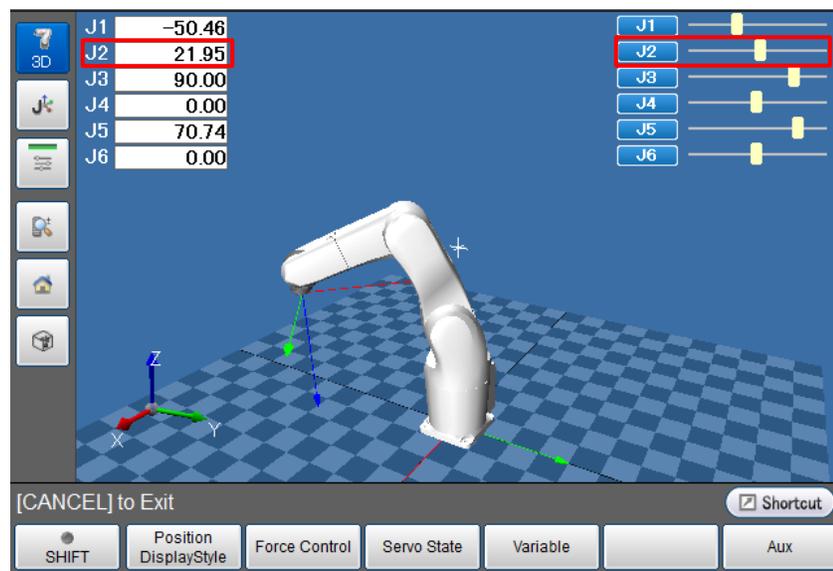
- Once you have J1 resting against the J1 **(+ Positive)** hard stop, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.

- J1 CALSET is complete.

### 6.4.3 VS068/087 CALSETTING J2.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J2 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(- Negative)** direction to move J2 towards the J2 CALSET hard stop bolt. While you move J2 by hand, watch the number values as well as the slider bar for J2 to verify you are moving in the correct direction, **(- Negative)** for J2 CALSET position.

\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

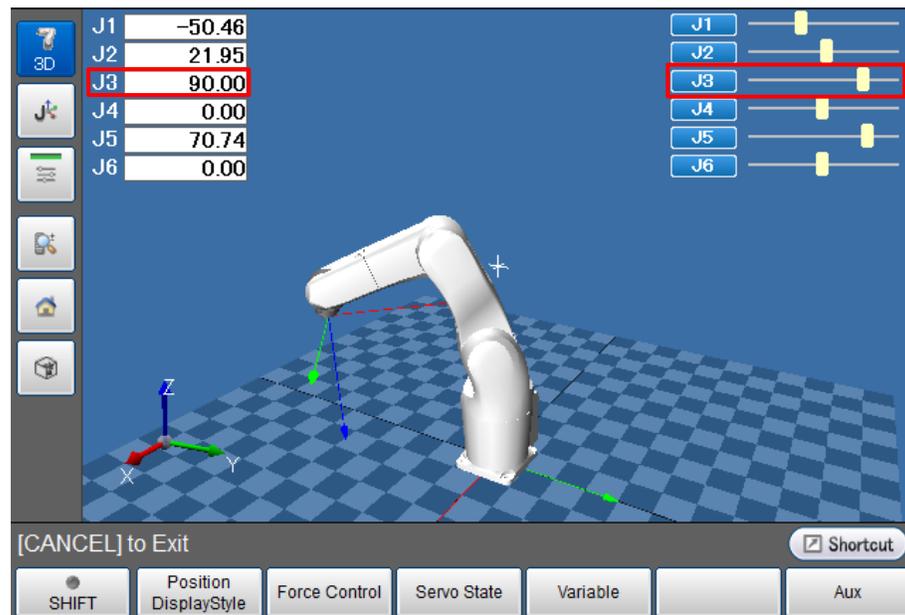
- Once you reach the J2 **(- Negative)** hard stop re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.

- Now press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J2 CALSET is complete.

#### 6.4.4 VS068/087 CALSETTING J3.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is “**Caution Brake will be released!**” Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the **(+ Positive)** direction to move J3 towards the J3 CALSET hard stop bolt. While you move J3 by hand, watch the number values as well

as the slider bar for J3 to verify you are moving in the correct direction, (+ **Positive**) for J3 CALSET position.

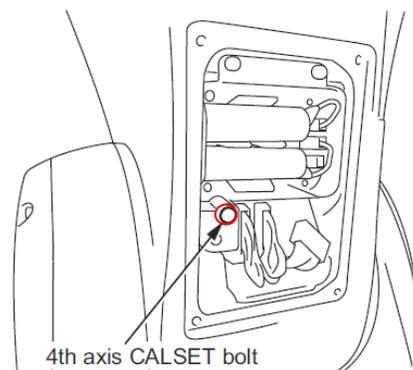
\*If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Once you reach the J3 (+ **Positive**) hard stop re-engage the brake [**Arm**]->[**Shift**]->[**Maintenance**]->[**Brake**] change setting from [**Free**] to [**Lock**].
- Now press [**Cancel**] until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press [**Shift**]->[**Maintenance**]->[**CALSET**]->[**CALSET**]->[**Select J3**] then press [**OK**]
- “**Execute CALSET?**” is displayed, choose [**OK**], “**CALSET succeeded!**” is displayed.
- J3 CALSET is complete.

#### 6.4.5 VS068/087 CALSETTING J4.

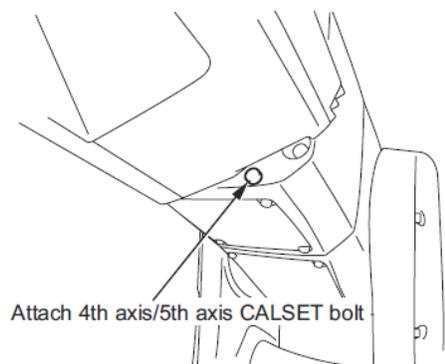
\*Pay careful attention to the following steps, improper CALSET of J4 can cause internal damage to the FPC assembly and will require the robot to be sent in for repair.

- You will need to retrieve the J4 CALSET bolt located in the battery compartment of the robot arm to perform this task. (See pictures below)

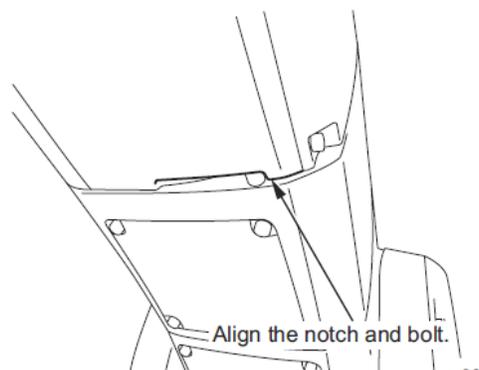


- Next reset the Encoder for J4. Press [**Setting**]->[**Login**]->[**Maintainer**]->[**5596060**]->[**Cancel to the main screen**]->[**Arm**]->[**Shift**]->[**Maintenance**]->[**Encoder**]->[**Encoder Reset**]->[**Reset J4**]

- Release the brake for J4 [Arm]->[Shift]->[Maintenance]->[Brake]
- Change the setting of the J4 Brake from [Lock] to [Free], press [OK]
- Message is “**Caution Brake will be released!**” Press the [OK] on the teaching pendant and the brake should release.
- With the J4 brake release *slowly* rotate J4 in the (+ **Positive**) direction until you feel the positive limit (This limit does not feel solid but kind of spongy, depending on where you’re starting it may be over 360 degrees to the hard stop). **\*Do not try to rotate any further in the (+ Positive) direction, this is NOT the Calset position, continue to follow the steps below.**
- After you’ve located and are resting against the (+ **Positive**) limit begin rotating J4 in the (- **Negative**) direction approximately 300 degrees, you should now be able to insert the 4<sup>th</sup> Axis CALSET bolt as pictured below.



- Once you’ve inserted the 4<sup>th</sup> Axis CALSET bolt rotate the arm in the (- Negative) direction until the Arm contacts the CALSET bolt as pictured below. **This is the CALSET position for J4.** Re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].

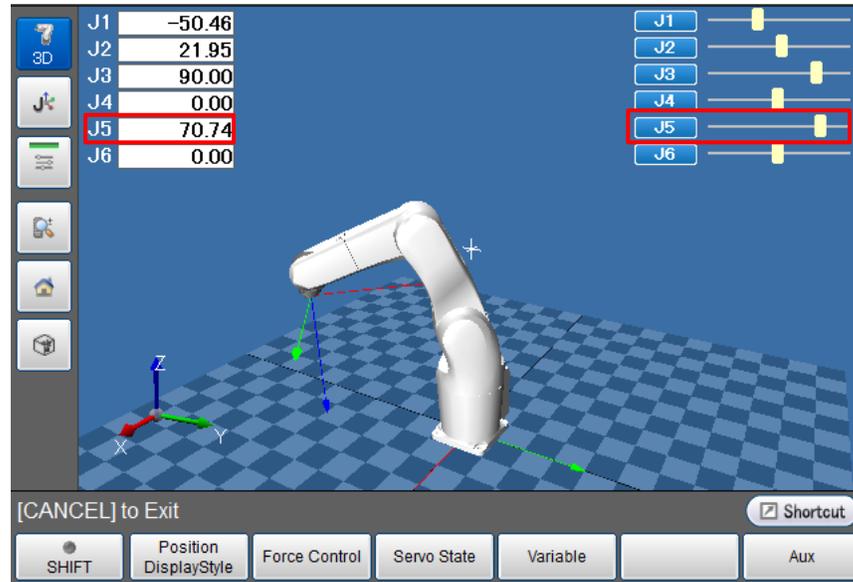


- Perform the CALSET of J4. Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J4 CALSET is complete.
- Remove the J4 CALSET bolt, to do this release the brake for J4 and rotate the arm in the **(+ Positive)** direction until the bolt can be extracted. **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- It’s always a good idea to verify the CALSET of J4 by releasing the brake and while viewing the **[ARM]** page move the joint by hand all the way to the + and – soft limits making sure no hard stops are contacted.

#### 6.4.6 VS068/087 CALSETTING J5.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J5 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



- Apply pressure to the arm in the (- **Negative**) direction to move J5 towards the J5 CALSET position. While you move J5 by hand, watch the number values as well as the slider bar for J5 to verify you are moving in the correct direction, (- **Negative**) for J5 CALSET position.
- \*If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.
- Once you have J5 against the (- **Negative**) hard stop re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Cancel] until you have reached the **Main Screen** of the pendant, now press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J5] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J5 CALSET is complete.

#### VS068/087 CALSETTING J6.

- The VS068/087 has 3 different J6 flange configurations, before you CALSET joint 6 configure the J6 CALSET Jig to your specification as displayed in the charts below.

This manual covers the following type Denso robot:

**VS087/VS068 series (small-sized vertical articulated robots)**

**VS087A2—AV6—NNN—NNNNN—NNNN**

Arm length
087A2 : 875mm
068A2 : 680mm

Operating Environment
NN : Standard type (IP40)
W4 : Dust & splash-proof type (IP54)
W7 : Protected type (IP67)

Connector panel
N : Rear specifications
A : Base specifications

Surface treatment
N : Standard coloring
A : Base specifications

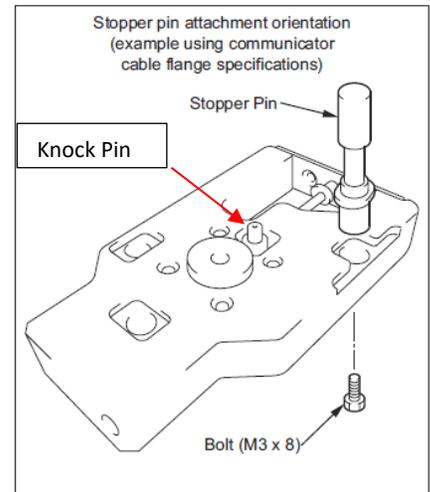
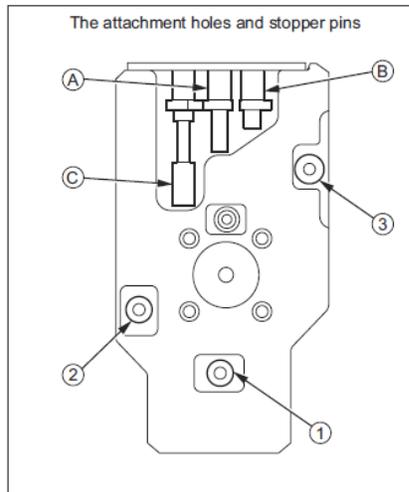
Signal wire/Air piping with solenoid valve
B : Solenoid valve (2 positive/double)
C : Solenoid valve (3 positive/exhaust center)
D : Solenoid valve (3 positive/closed center)
N : Signal wire/Air piping without solenoid valve

Flange
N : Standard flange specification
A : Communication cable flange specification

This page shows how to install the 6th axis CALSET jig for the VS068/VS087 series

Attach stopper pins that suit the specifications of each flange part into each attachment hole of the 6th axis CALSET jig, and fasten it with a bolt (M3 x 8).

Flange Part Specifications	Attachment Hole	Stopper Pin
Standard Flange Specifications	①	Ⓐ
W7 Specifications	②	Ⓑ
Communicator Cable Flange Specifications	③	Ⓒ

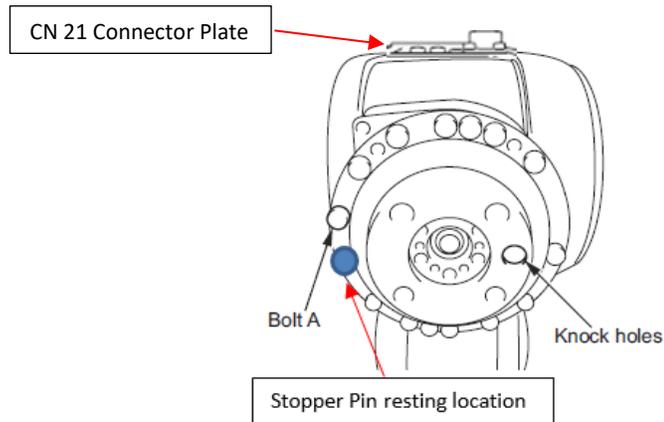


zk1860z

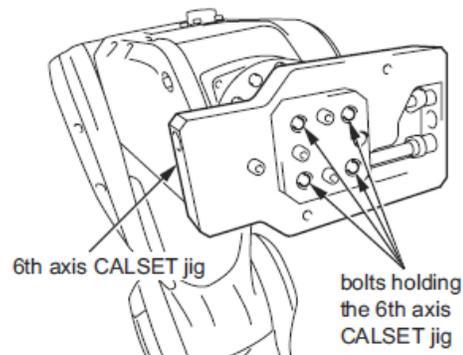
6.4.7.1 VS068/087 CALSETTING J6 (Standard Flange)

- Position the J6 flange as pictured below, so that the *Knock Pin* of the CALSET jig can

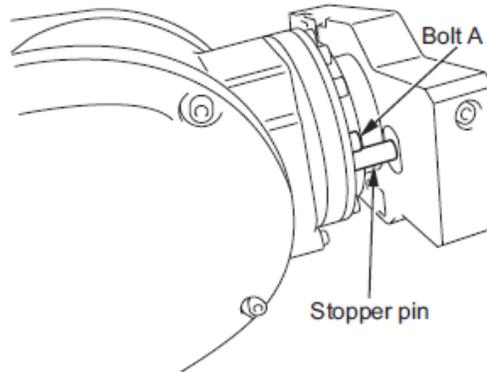
be installed into the *Knock Pin Hole* of the J6 flange. In addition the *Stopper Pin* should be able to rest just below *Bolt A*.



- Attach the 6<sup>th</sup> axis CALSET jig and tighten the four bolts holding the jig to the flange.



- With CALSET jig in position now release the brake on J6, [**Arm**]->[**Shift**]->[**Maintenance**]->[**Brake**]
- Change the setting of the J6 Brake from [**Lock**] to [**Free**], press [**OK**]
- Message is "**Caution Brake will be released!**" Press the [OK] on the teaching pendant and the brake should release.
- With the brake for J6 released, rotate the jig in the (**- Negative**) direction until the *Stopper Pin* touches against *Bolt A* as pictured below.

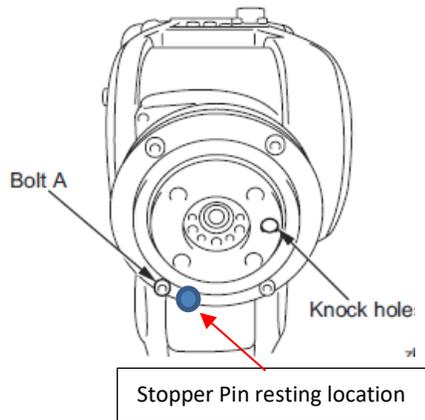


- With the *Stopper Pin* resting on *Bolt A*, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Navigate to the Main Screen of the pendant and then press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J6 CALSET is complete.
- Always verify the CALSET by Manually Moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

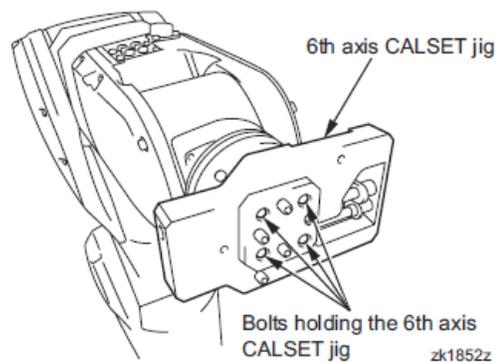
#### 6.4.7.2 VS068/087 CALSETTING J6 (W7 Specification Flange)

- Position the J6 flange as pictured below, so that the *Knock Pin* of the CALSET jig can be installed into the *Knock Pin Hole* of the J6 flange. In addition the *Stopper Pin* should be able to rest just below *Bolt A*.

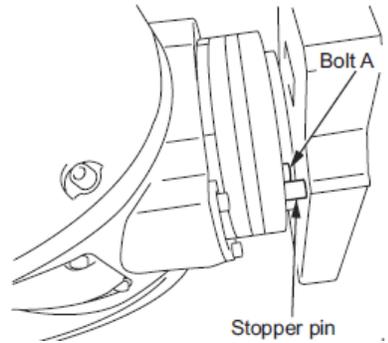




- Attach the 6<sup>th</sup> axis CALSET jig and tighten the four bolts holding the jig to the flange.



- With CALSET jig in position now release the brake on J6, **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- With the brake for J6 released, rotate the jig in the **(- Negative)** direction until the *Stopper Pin* touches against *Bolt A* as pictured below.



- With the *Stopper Pin* resting on *Bolt A*, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Cancel] until the Main Page of the pendant is displayed.
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J6 CALSET is complete.
- Always verify the CALSET by Manually Moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

#### 6.4.7.3 VS068/087 CALSETTING J6 (Communicator Cable Specification Flange)

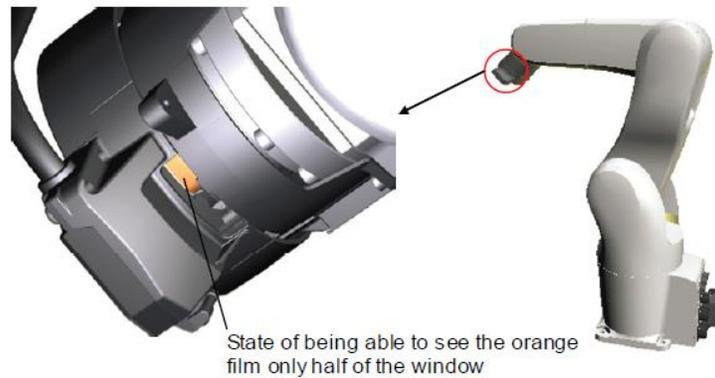
- The Communicator Spec Flange is not a Boundless Rotation Joint, it is extremely important to check the rotational position of the Communicator Flange before CALSETTING so that internal damage of the FPC cable does not happen.
- The J6 Communicator Flange has a viewing window to help determine the current rotational position of the flange. Position J6 so that you can see the Orange film in half the window. See the picture below.

\*If you cannot see any Orange in the window turn the 6<sup>th</sup> Axis in the (- **Negative**)

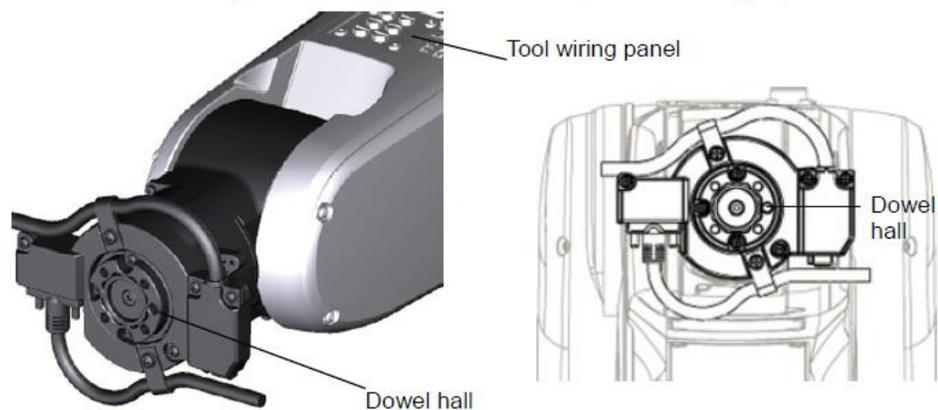
direction until half the window is displaying Orange.

\*If the entire window viewing area is Orange rotate (by hand) the 6<sup>th</sup> Axis in the **(+ Positive)** direction until half the window is displaying Orange.

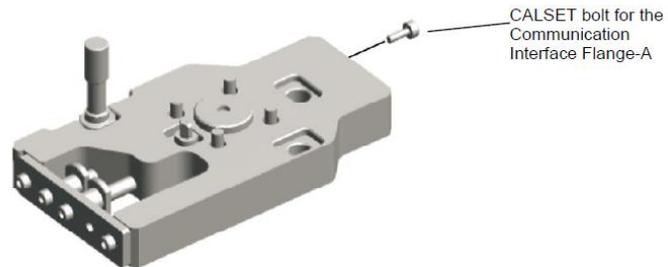
- Release the brake so that the Communicator Flange can be repositioned as described above, Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.



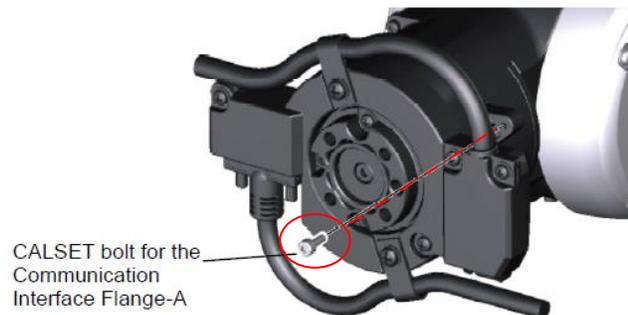
- With half the viewing window showing the Orange film, the flange orientation should look like the picture below.



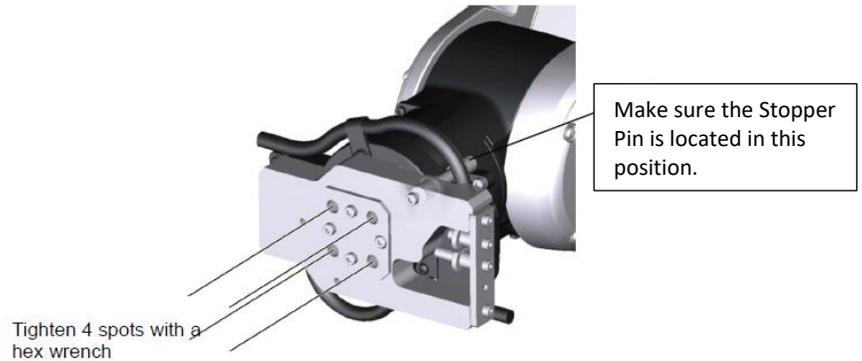
- Remove the CALSET bolt from the CALSET jig as pictured below.



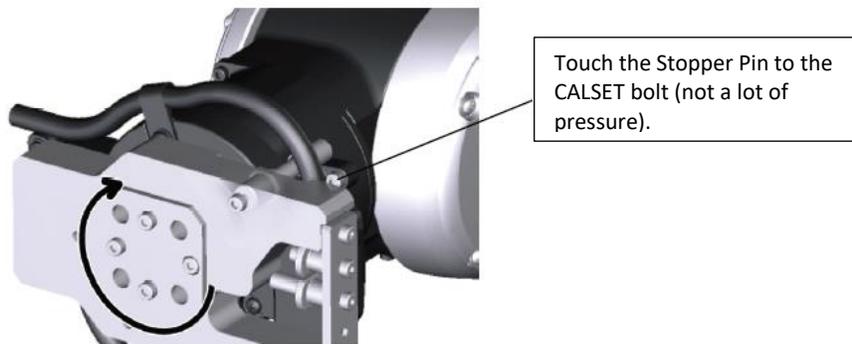
- Secure the CALSET bolt to the communication flange as pictured below, tightening torque; 0.8 +/-1.7Nm.



- Mount the CALSET jig to the communication flange making sure the *Stopper Pin* is located as pictured below, just above the *CALSET bolt* you previously added. Tightening torque 8.8 +/-1.7Nm.



- Rotate the CALSET jig clockwise, touch the Stopper Pin to the CALSET bolt (lightly).



- Once the Stopper Pin is touching the CALSET bolt, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until you have the **Main Screen** displayed.
- From the **Main Screen** of the pendant press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J6]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J6 CALSET is complete.
- Release the J6 brake and remove the CALSET jig and CALSET bolt from the flange.
- Always verify the CALSET by Manually Moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.5 VM 6083/60B1 CALSET

### 6.5.1 Before beginning the CALSET

- Before performing the CALSET of your VM Robot you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your VM Robot you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J6, part # 410192-0030

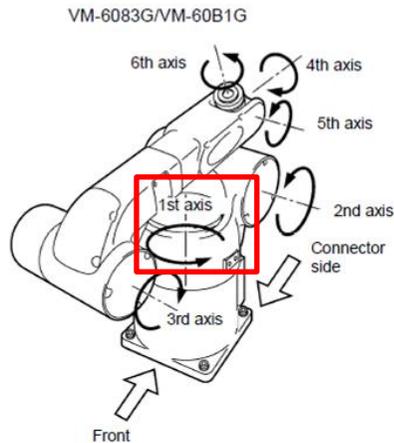
Axis		CALSET positions
Position	1st axis	Turning end in the positive direction (counterclockwise end when viewed from top)
	2nd axis	Turning end in the negative direction
	3rd axis	Turning end in the positive direction
	4th axis	<u>Models having no mechanical stop on the 4th axis</u> Turning end in the positive direction, which is set by a CALSET jig. (See Section 2.4.4) (counterclockwise end when viewed from the arm end)
	5th axis	Turning end in the positive direction (upward end of the 5th-axis arm)
	6th axis	Turning end in the positive direction, which is set by a CALSET jig. (See Section 2.4.4)

VM-6083G/VM-60B1G

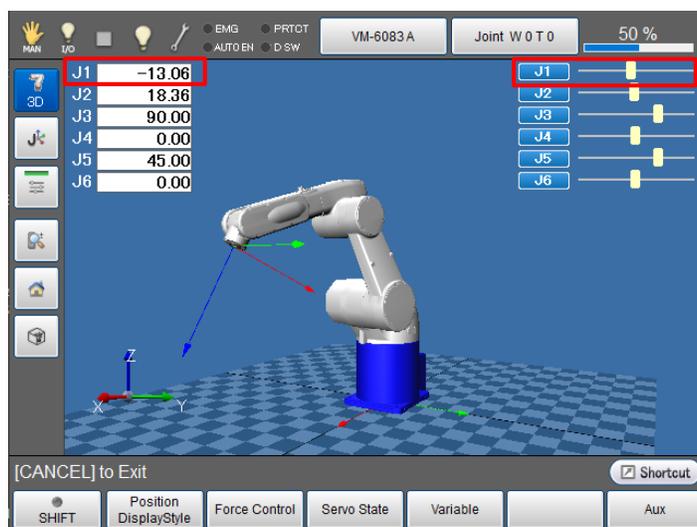
## 6.5.2 VM 6083/60B1 CALSETTING J1.

- J1 of the VM Model robot does not have a brake, move J1 in the **(+Positive)** direction towards the J1 CALSET hard stop bolt.



- If you are uncertain about which direction is **(+ Positive)** or **(- Negative)** navigate to the **ARM** page of the pendant. While you move J1 by hand, watch the number values as well as the slider bar for J1 to verify you are moving in the correct direction, **(+ Positive)** for J1 CALSET position.

\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset ([Section 5.1.1](#)) for that joint. This will open up the motion window to allow you to reach the CALSET position.



- Once you reach the J1 **(+Positive)** hard stop perform CALSET of J1. Press **[Cancel]** until

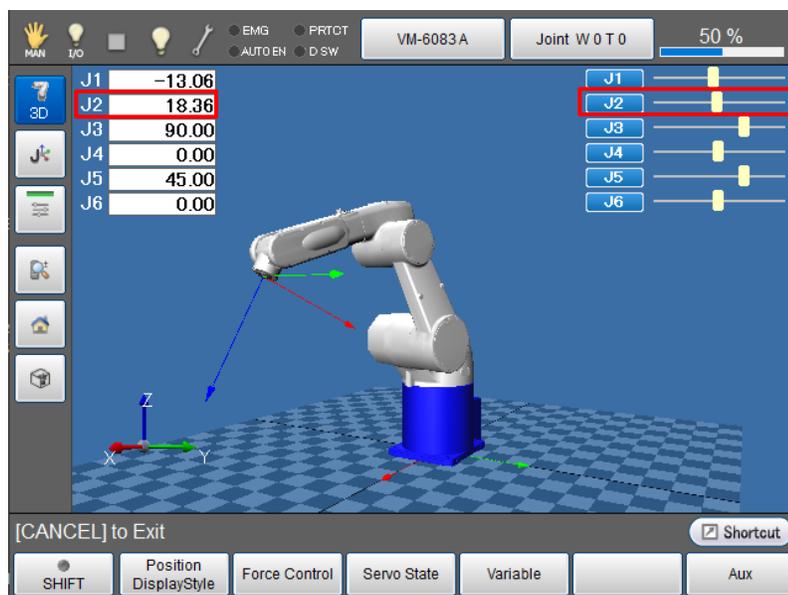
you have the **Main Screen** displayed.

- From the **Main Screen** of the pendant press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J1 CALSET is complete.

### 6.5.3 VM 6083/60B1 CALSETTING J2

Navigate to the Brake Release screen.

- [Arm]->[Shift]->[Maintenance]->[Brake]
- Change the setting of the J2 Brake from [Lock] to [Free], press [OK]
- Message is “Caution Brake will be released!” Press the [OK] on the teaching pendant and the brake should release. \*If not supported Joint 2 may drift when brake is released.
- Once the brake is released press [Cancel] two times, you should now be on the **ARM** page as seen below.



- While you move J2 by hand, watch the number values as well as the slider bar for J2

to verify you are moving in the correct direction (**- Negative**) for J2 CALSET position.

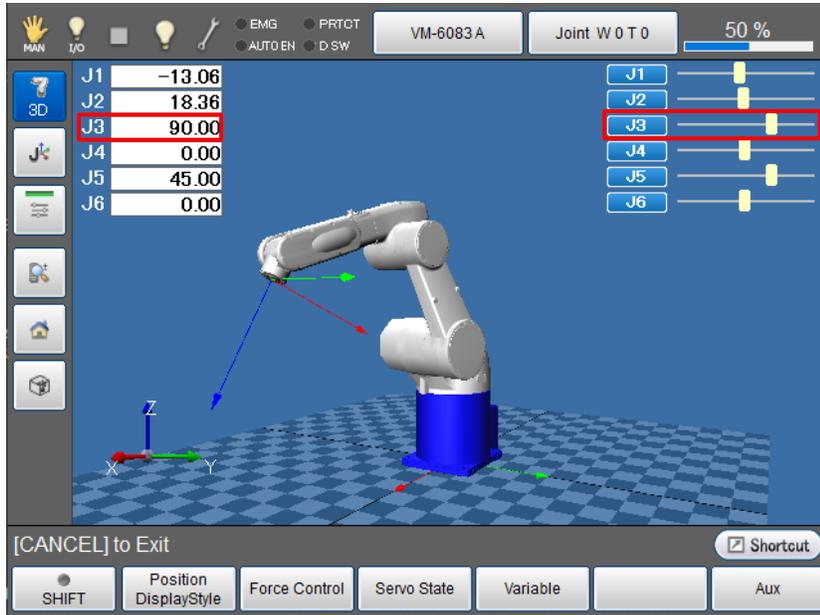
\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Once you touch the (**- Negative**) hard stop, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J2 CALSET is complete.

#### 6.5.4 VM 6083/60B1 CALSETTING J3

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release. \*If not supported Joint 3 may drift when brake is released.
- Once the brake is released press **[Cancel]** two times, you should now be on the **ARM** page as seen below.



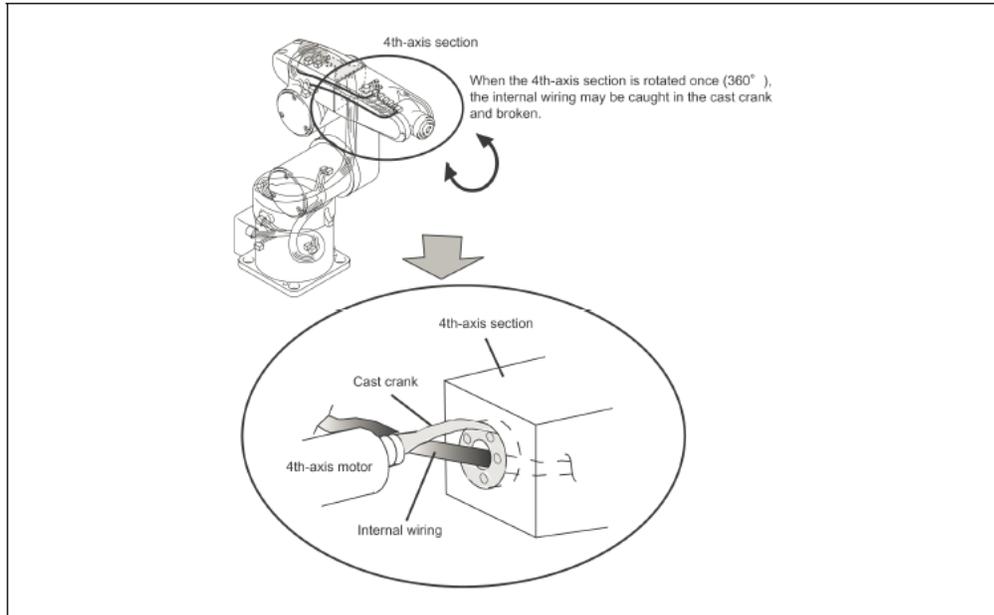
- While you move J3 by hand, watch the number values as well as the slider bar for J3 to verify you are moving in the correct direction (**+ Positive**) for J3 CALSET position.

\*If you receive a “**Soft Motion Limit Error**” while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position

- Once you touch the (**+ Positive**) hard stop, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Cancel] until the Main Screen of the pendant is displayed, now press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3] then press [OK] “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J3 CALSET is complete.

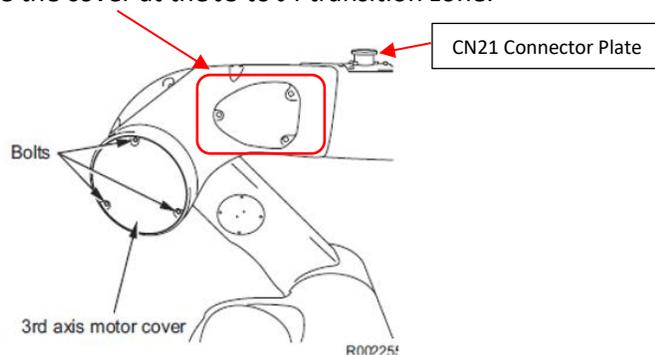
#### 6.5.5 VM 6083/60B1 CALSETTING J4

- Use extreme caution when CALSETTING J4. If it is done incorrectly, damage to the wiring harness can occur.

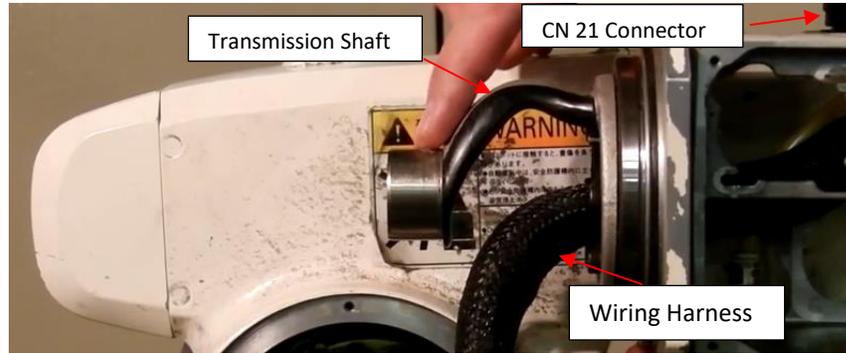


Note that turning the 4th-axis section by more than 360° may break the internal wiring

- Remove the cover at the J3 to J4 transition zone.



- Using a flashlight view the wiring harness as it transitions from J3 through J4, make sure the **Harness is hanging freely under the Transmission Shaft (as referenced below) and not twisted around the shaft**. The CN21 connector plate should be on top as well. If Joint 4 is not in the position pictured below, release the brake and rotate to this position. This will be the starting point for CALSETTING J4.

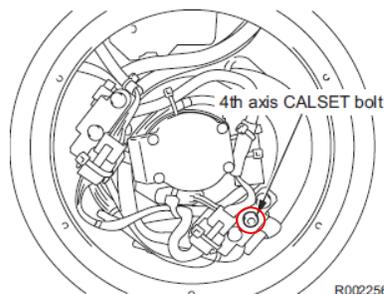


Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J4 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.

\*Do not continue until you have Joint 4 positioned as pictured above.

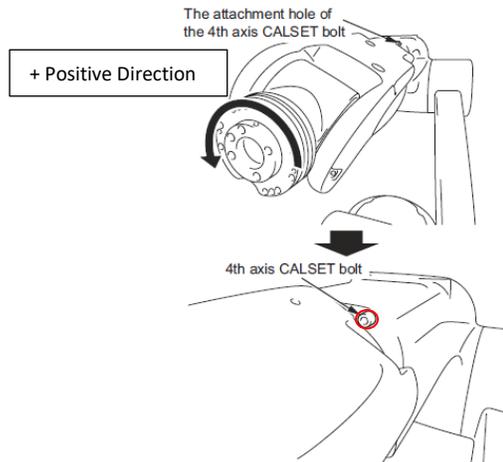
- Remove the J4 CALSET Jig which is stored inside the J3 Motor housing as pictured below.



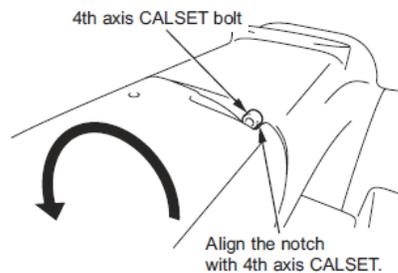
- With the J4 brake released rotate J4 in the **(+ Positive)** direction, around 170 degrees. The CN 21 Connector should be facing downward now.

\*If you receive a **“Soft Motion Limit Error”** while moving a joint to its CALSET position perform an Encoder Reset for that joint. This will open up the motion window to allow you to reach the CALSET position.

- Insert the J4 CALSET Jig into the bolt hole as pictured below.



- Once you have the J4 CALSET Jig installed continue to rotate Joint 4 in the (+ Positive) direction until the casting touches the CALSET Jig as pictured below.

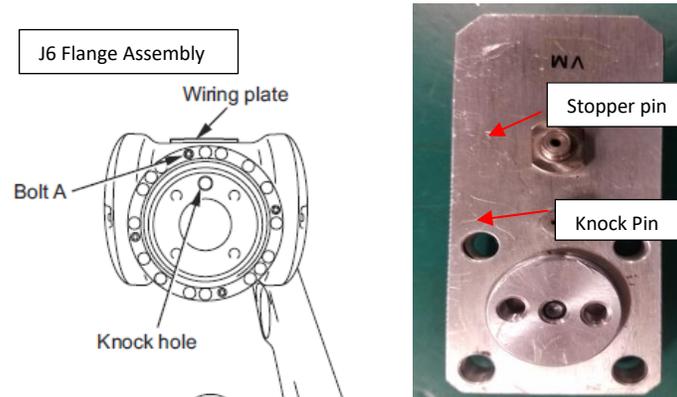


- Once you come in contact with the CALSET Jig, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock]. Release the E-stop on the pendant.
- Press [Cancel] until the Main Screen of the pendant is displayed.
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J4 CALSET is complete.
- Be sure to remove the J4 CALSET Jig. Release the brake to perform this task, do not try and jog J4 you can crash into and break the jig if you jog in the wrong direction.
- It’s always a good idea to verify the CALSET of J4 by releasing the brake and moving the joint by hand all the way to the + and – soft limits while viewing the wiring harness and transmission shaft from the J3 housing. The wiring harness may come in

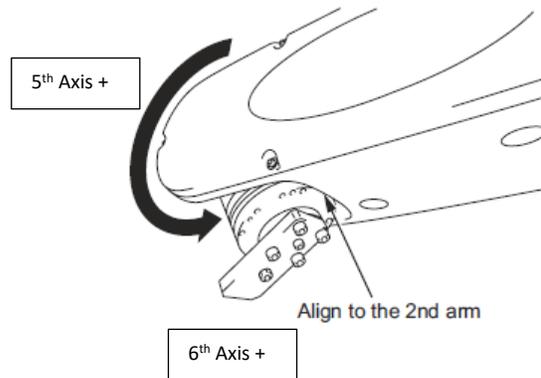
contact with the Transmission Shaft but will not apply too much pressure, and should never wrap around the shaft before faulting for Soft Motion Limit.

#### 6.5.6 VM 6083/60B1 CALSETTING J5 and J6

- The VM model robots Joints 5 and 6 must be calibrated together, with both joints at their respective hard stops.
- Release the brake for J6, from the **Main Screen-> [Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J6 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Reposition the J6 Flange so that the *Knock Hole* is aligned as pictured below. Install the J6 Calibration jig to the J6 flange and secure using (4) M6x10 bolts. Make sure the *knock pin* is aligned in the *knock hole* and the *Stopper Pin* can rotate and touch against *Bolt A* while moving in the positive direction. Use the position of the wiring plate as a reference to where *Bolt A* is.



- Release the 5<sup>th</sup> axis brake (If the J6 Brake is not already, release it as well). From the **Main Screen-> [Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J5 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Turn the 5<sup>th</sup> axis in the **(+ Positive)** direction (opposite the CN21/Wiring plate) by hand until you reach the **(+ Positive)** limit. Now turn the J6 CALSET jig in the **(+ Positive)** direction until the *Stopper Pin* is against *Bolt A*.



- When you have J5 against the **(+ Positive)** limit and J6 against the **(+Positive)** limit re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until the Main Screen of the pendant is displayed.
- CALSET J5 and J6, from the **Main Screen** press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J5]->[Select J6]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J5 and J6 CALSET is complete.
- Reinstall your end-of-arm tooling to the J6 flange.
- Always verify the CALSET by Manually moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.6 HS (E/G, A0, A1) CALSET

### 6.6.1 Before beginning the CALSET

- Before performing the CALSET of your HS Robot Arm you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your HS Robot Arm you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need special CALSET jigs to perform calibration of J4. These are located within the base of the robot around the J1 CALSET hard stop bolt.

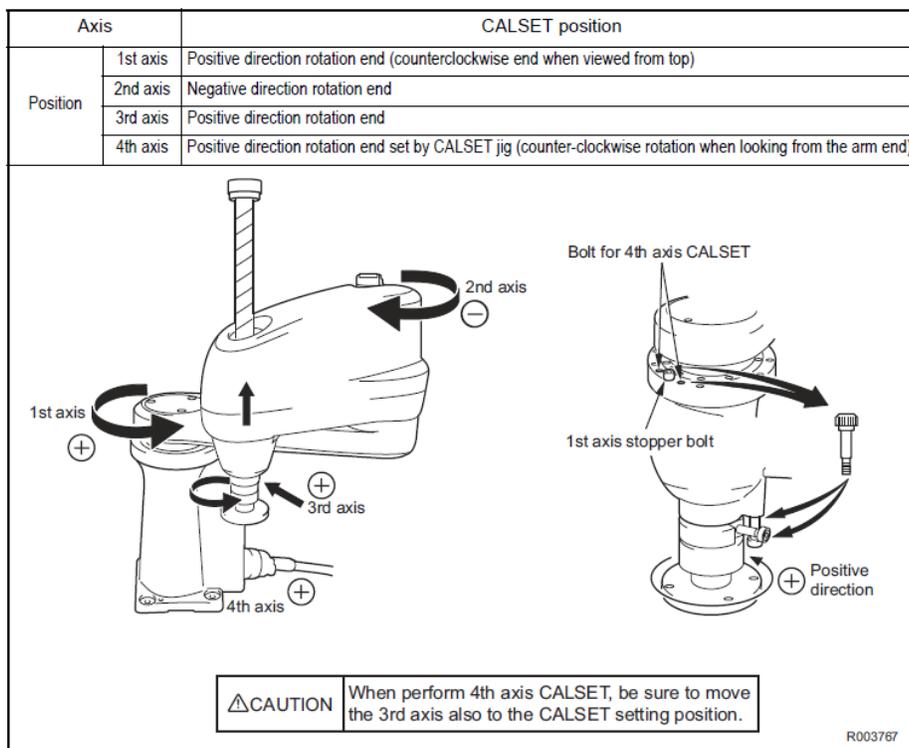
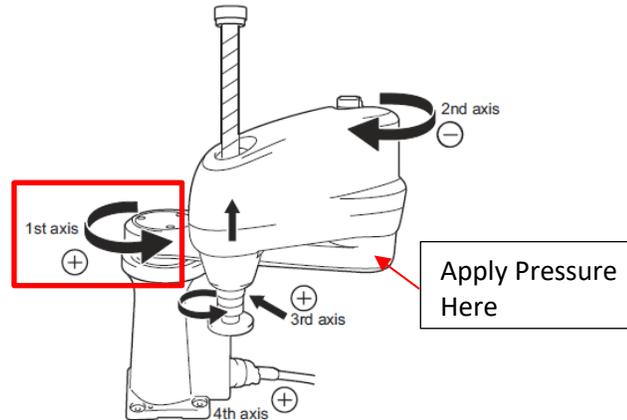


Fig.3-1: CALSET Setting Positions of 1st to 4th Axis

### 6.6.2 HS (E/G, A0, A1) CALSETTING J1

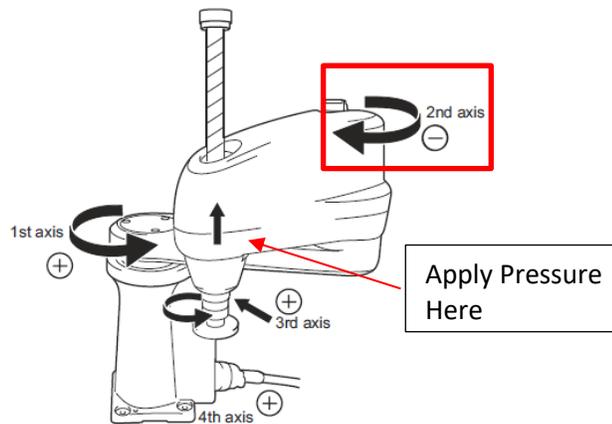
- J1 of the HS robot does not have a brake. Apply pressure to the first arm to move J1 in the (+ **Positive**) direction (see picture below) towards the J1 CALSET hard stop.



- Once you touch the (+ **Positive**) hard stop for J1 navigate to the CALSET page.
- Press [Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J1 CALSET is complete.

### 6.6.3 HS (E/G, A0, A1) CALSETTING J2

- J2 of the HS robot does not have a brake. Apply pressure to the second arm to move J2 in the (- **Negative**) direction (see picture below) towards the J2 CALSET hard stop.

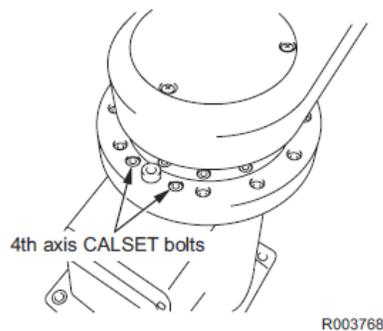


- Once Joint 2 touches the (- **Negative**) hard stop for J2 navigate to the CALSET page.

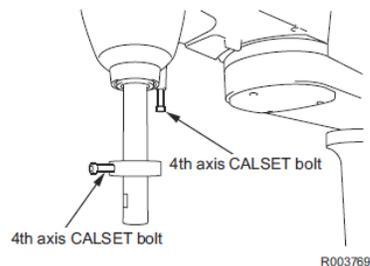
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J2 CALSET is complete.

#### 6.6.4 HS (E/G, A0, A1) CALSETTING J3 and J4

- On the HS Model Robot J3 and J4 **must** be CALSET at the same time, with both joints resting against their respective hard stop.
- Remove the 4<sup>th</sup> Axis CALSET bolts (Socket Head Cap Shoulder Bolts) from the base of the robot near the J1 CALSET hard stop. (see picture below)



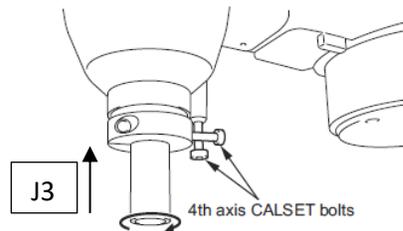
- Attach the two CALSET bolts as pictured below, one mounts to the robot casting and the other to the collar of the J3 shaft.



- Rotate the J4 shaft in the (**+Positive**) direction until the shoulders of the bolts touch as seen below.

Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the **[OK]** on the teaching pendant and the brake should release.
- Move J3 in the **(+ Positive)** direction (upward) until you touch the **(+Positive)** hard stop (All the way up) while *rotating* the shaft in the **(+ Positive)** direction until the shoulders of the bolts touch as seen below.



- Once you're against the J3 **(+ Positive)** hard stop and the 4<sup>th</sup> Axis CALSET bolts are in contact as pictured above, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until the Main Screen of the pendant is displayed.
- CALSET J3 and J4, press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3]->[Select J4]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.
- J3 and J4 CALSET is complete.
- Reinstall your end-of-arm tooling.
- Always verify the CALSET by Manually moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.7 HM E2/G CALSET

### 6.7.1 Before beginning the CALSET

- Before performing the CALSET of your HM Robot Arm you must log into the RC8 controller as Maintainer, if you're not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your HM Robot Arm you must have the correct RANG Data entered into the controller, if you're not sure how to do this review [Section 5](#) of this manual.
- You will need a special CALSET jig to perform calibration of J4. This jig is located within the base of the robot around the J1 CALSET hard stop bolt.

Axis	CALSET position
1st axis	Positive direction rotation end (counterclockwise end when viewed from top)
2nd axis	Negative direction rotation end
3rd axis	Positive direction rotation end
4th axis	Positive direction rotation end set by CALSET bolt (counterclockwise end when viewed from the top)

**Floor type**

**Hung type**

R003494

**CAUTION**

(1) When performing CALSET, release the brake of axis to CALSET and press it on to mechanical end. (See "**Chapter 4. Auxiliary work**" on RC7M Controller or RC8 Controller Service Manual for encoder brake releasing method.)

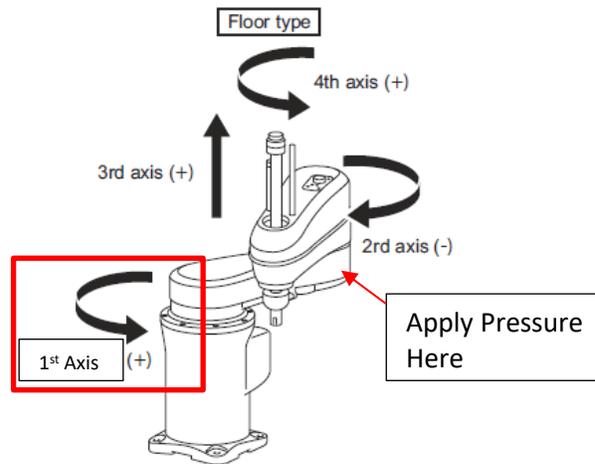
(2) When performing CALSET for 3rd axis, make sure that air balance is adjusted. If air balance is not adjusted, 3rd axis may fall down due to its weight when the brake is released. (See "**Chapter 4. Auxiliary work**" on RC7M Controller or RC8 Controller Service Manual for air balance adjusting method.)

## 6.7.2 HM E2/G CALSETTING J1

- J1 of the HM robot (non UL) does not have a brake. Apply pressure to the first arm to move J1 in the **(+ Positive)** direction (see picture below) towards the J1 CALSET hard stop.

\*UL Versions of the HM Robot does have a brake on the J1,J2 and J3 Motors, you will need to release the brake first to move these joints to their CALSET positions.

\* To release the brakes (1,2 &3) on a UL model HM. **Turn the power on the controller -> Make sure the Motor “ON” light is off -> Press the Brake release switch on top of the 2<sup>nd</sup> arm cover**



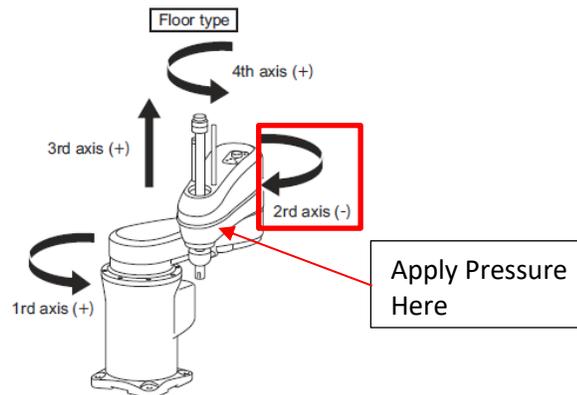
- Once you touch the **(+ Positive)** hard stop for J1 navigate to the CALSET page.
- From the main screen of the pendant, Press **[Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1]** then press **[OK]**
- **“Execute CALSET?”** is displayed, choose **[OK]**, **“CALSET succeeded!”** is displayed.

- J1 CALSET is complete.

### 6.7.3 HM E2/G CALSETTING J2

- J2 of the HM robot (non UL) does not have a brake. Apply pressure to the second arm to move J2 in the (- **Negative**) direction (see picture below) towards the J2 CALSET hard stop.

\*If your HM is a UL model you will need to release the J2 brake before moving Joint 2 (see steps in section 6.7.2 for releasing the brake).



- Once J2 contacts the (- **Negative**) hard stop for J2 navigate to the CALSET page.
- Press **[Arm]**->**[Shift]**->**[Maintenance]**->**[CALSET]**->**[CALSET]**->**[Select J2]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J2 CALSET is complete.

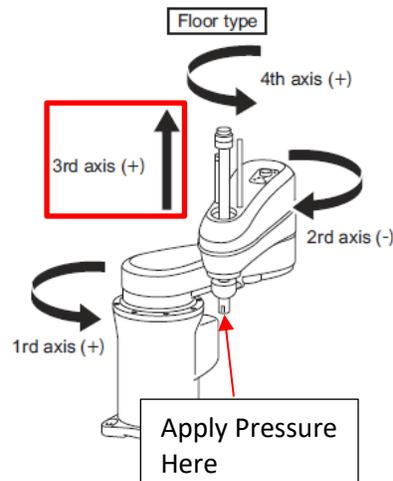
### 6.7.4 HM E2/G CALSETTING J3

- To CALSET J3 of the HM model robot first you must release the brake for the J3 motor. Navigate to the Brake Release screen.

\*If your HM is a UL model you will release the brake using a different method (see steps in section 6.7.2 for releasing the brake).

- **[Arm]**->**[Shift]**->**[Maintenance]**->**[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**

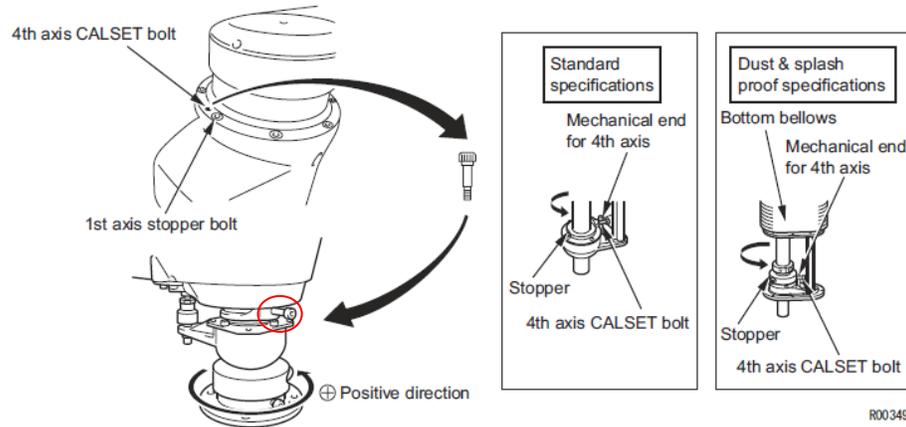
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Move J3 in the **(+ Positive)** direction (upward) until you touch the **(+Positive)** hard stop (All the way up).



- Once Joint 3 is against the J3 **(+ Positive)** hard stop, re-engage the brake [Arm]->[Shift]->[Maintenance]->[Brake] change setting from [Free] to [Lock].
- Press [Cancel] until the Main Screen of the pendant is displayed.
- Perform CALSET of J3, press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3] then press [OK]
- **“Execute CALSET?”** is displayed, choose [OK], **“CALSET succeeded!”** is displayed.
- J3 CALSET is complete

#### 6.7.5 HM E2/G CALSETTING J4

- Remove the J4 CALSET jig from the base of the robot near the J1 CALSET hard stop bolt. Install the bolt into the threaded hole as pictured below.
- \* If your HM is a Dust and Splash Spec. model you will need to remove the bolts holding the bellows in place first to install the CALSET jig, see pictures below. After completing the Calset of J4 the tightening torque of the bellows fixing bolts is 1.2 Nm.



- With the CALSET jig installed onto the shaft, rotate J4 in the **(+ Positive)** direction slowly until it rests against the “White Post” of the shaft assembly.
- Once the CALSET bolt is against the J4 **(+ Positive)** hard stop (White Post) perform CALSET of J4, press **[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J4]** then press **[OK]**
- “Execute CALSET?” is displayed, choose **[OK]**, “CALSET succeeded!” is displayed.
- J4 CALSET is complete.
- Reinstall your end-of-arm tooling.
- Always verify the CALSET by Manually moving the robot to a “Known” position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying.

## 6.8 HSR CALSET

### 6.8.1 Before beginning the CALSET

- Before performing the CALSET of your HSR Robot Arm you must log into the RC8A controller as Maintainer, if you’re not sure how to do this review [Section 5](#) of this manual.
- Before performing the CALSET of your HSR Robot Arm you must have the correct RANG Data entered into the controller, if you’re not sure how to do this review [Section 5](#) of this manual.
- You will need special CALSET jigs to perform calibration of J4. These are located at just above the connector plate wiring at the rear of the robot arm.

Axis	CALSET position
1st axis	Positive direction rotation end (counterclockwise end when viewed from top)
2nd axis	Negative direction rotation end
3rd axis	Floor type: The rise end (the plus direction end) Ceiling type: The descent end (the minus direction end)
4th axis	Positive direction rotation end set by CALSET jig (counterclockwise end when viewed from the tip of arm) <b>(See Table 3-2 on page 3-3)</b>

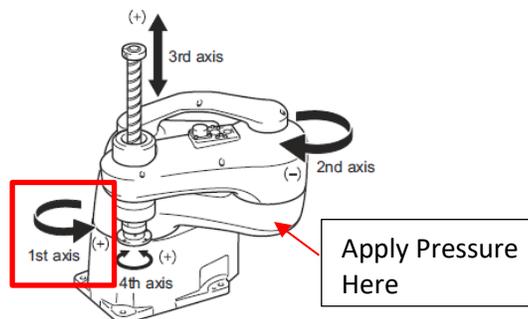
  
  

⚠ CAUTION	When perform 4th axis CALSET, be sure to move the 3rd axis also to the CALSET setting position.
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### 6.8.2 HSR CALSETTING J1

- J1 of the HSR robot does not have a brake. Apply pressure to the first arm to move J1 in the (+ Positive) direction (see picture below) towards the J1 CALSET hard stop.



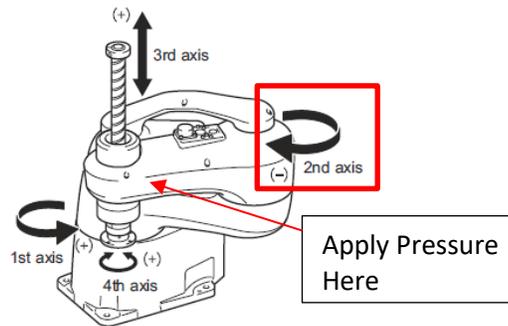
- Once you touch the (+ Positive) hard stop for J1 navigate to the CALSET page.
- Press [Arm]-> [Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J1] then press

[OK]

- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J1 CALSET is complete.

### 6.8.3 HSR CALSETTING J2

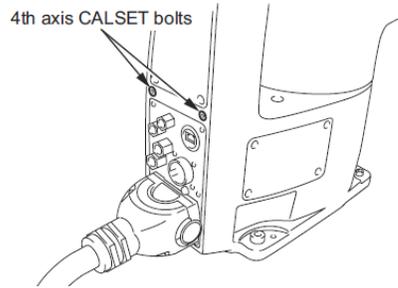
- J2 of the HSR robot does not have a brake. Apply pressure to the second arm to move J2 in the (- **Negative**) direction (see picture below) towards the J2 CALSET hard stop.



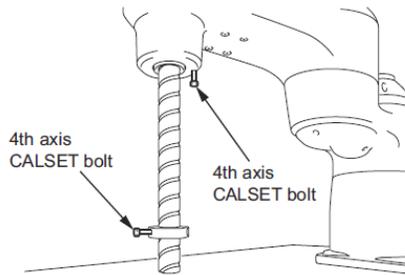
- Once Joint 2 touches the (- **Negative**) hard stop for J2 navigate to the CALSET page.
- Press [Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J2] then press [OK]
- “Execute CALSET?” is displayed, choose [OK], “CALSET succeeded!” is displayed.
- J2 CALSET is complete.

### 6.8.4 HSR CALSETTING J3 and J4

- On the HSR Model Robot J3 and J4 **must** be CALSET at the same time, with both joints resting against their respective hard stop.
- Remove the 4<sup>th</sup> Axis CALSET bolts (Socket Head Cap Shoulder Bolts) from the rear of the robot near the wiring connector plate. (see picture below)

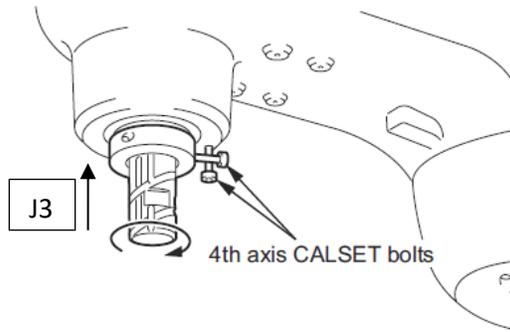


- Attach the two CALSET bolts as pictured below, one mounts to the robot casting and the other to the collar of the J3 shaft.



Navigate to the Brake Release screen.

- **[Arm]->[Shift]->[Maintenance]->[Brake]**
- Change the setting of the J3 Brake from **[Lock]** to **[Free]**, press **[OK]**
- Message is **“Caution Brake will be released!”** Press the [OK] on the teaching pendant and the brake should release.
- Move J3 in the **(+ Positive)** direction (upward) until you touch the **(+Positive)** hard stop (All the way up) while *rotating* the shaft in the **(+ Positive)** direction until the shoulders of the bolts touch as seen below. **\*Ceiling mount HSR is different view drawing on top of page 86.**



- Once you're against the J3 (**+ Positive**) hard stop and the 4<sup>th</sup> Axis CALSET bolts are in contact as pictured above, re-engage the brake **[Arm]->[Shift]->[Maintenance]->[Brake]** change setting from **[Free]** to **[Lock]**.
- Press **[Cancel]** until the Main Screen of the pendant is displayed.
- CALSET J3 and J4, press **[Arm]->[Shift]->[Maintenance]->[CALSET]->[CALSET]->[Select J3]->[Select J4]** then press **[OK]**
- "Execute CALSET?" is displayed, choose **[OK]**, "CALSET succeeded!" is displayed.
- J3 and J4 CALSET is complete.
- Reinstall your end-of-arm tooling.
- Always verify the CALSET by Manually moving the robot to a "Known" position (ex. P2 Home Position). Never run the Robot in Auto Mode without first verifying

## 6 Sending Your Damaged Robot in For Repair

- Record the complete model number (ex. VS-6556G-BW) and the serial number (ex. 06M221) of the damaged robot arm.
- Contact a Denso Regional Service Dealer or call **1-888-4ROBOTX**. A list of Denso Regional Service Dealers can be found at <https://www.densorobotics.com/support/>
- Remove all tooling from the robot arm and secure it inside a sturdy crate **or** securely bolt the arm to a sturdy pallet then cover with a heavy cardboard box for protection.
- Due to the potential damage that can occur while a robot is being shipped, we highly recommend that the pallet/crate be sent via AIR as opposed to GROUND shipping.
- If your robot controller associated with the robot arm can be sent in with the robot arm, Denso can perform a factory CALSET on the system before it is returned.





